Supplement No. 12 to the
Southern Pine Inspection Bureau
Grading Rules 2002 Edition
Effective: August 1, 2012

This supplement makes no changes in the provisions of the 2002 SPIB Standard Grading Rules except for the following:

- Incorporates Supplement 2, 10, and 11 MSR/MEL classifications.

- Deleted "2" and Less in Thickness" from paragraphs 600, 603, and 606.

- Added paragraph 602.1, "Grades with 1000 psi F_b or greater", and paragraph 602.2, "Grades with less than 1000 psi F_b".

- Added the designation "2W" to paragraph 600.2 and 603.2: ("The grade mark may include the designation of "1W" or "2W" to signfy that the lumber has been visually graded to meet or exceed the wane restrictions for No. 1 or No. 2 wane as specified in paragraph 312 and 313.")

Adopted by the Board of Governors of the Southern Pine Inspection Bureau
Approved by the Board of Review of the American Lumber Standard Committee

SECTION 600
MECHANICALLY GRADED LUMBER

600. MACHINE STRESS RATED LUMBER
All Species of Southern Pine
2" and Wider

600.1 Machine stress rated (MSR) lumber is lumber that has been evaluated by mechanical stress rating equipment. MSR lumber is distinguished from visually stress graded lumber in that each piece is non-destructively tested and marked to indicate the modulus of elasticity. MSR lumber is also required to meet certain visual requirements as set forth herein.

600.2 A grade-mark on machine stress rated lumber indicates the stress rating system used meets requirements of the grading agency's qualification and quality control procedures. The grade-mark will show the agency trademark, the mill name or number, will include the phrase "Machine Rated" or "MSR", the species identification, seasoning designation, and the "E" rating for the grade. The "E" rating is the rated modulus of elasticity in millions of pounds per square inch. Stress rating machines are adjusted so that the output will average the "E" level shown on the grade-mark. (The grade mark may include the designation of “1W” or “2W” to signify that the lumber has been visually graded to meet or exceed the wane restrictions for No. 1 or No. 2 wane as specified in paragraph 312 and 313.)

600.3 Machine output is controlled by testing pieces and adjusting machines so that the minimum assigned fiber stress in bending value, derived from a 5% exclusion level of modulus of rupture, is met after applying the same reduction factors as are applied to visually graded lumber in accordance with ASTM D245.

600.4 For any given "F_b" value, the average "E" value may vary depending upon timber source and other variables. The tabulated design "E" values shown in paragraph 601 are those usually associated with each "F_b" level. Grade-marks may show higher or lower values (in increments of 100,000 pounds per square inch) if machine rating indicates the assignment is appropriate. However, when an "E" value associated with

an "F_b" level is lower than those listed in paragraph 601, special testing and quality control procedures are required to assure the listed "F_t" values associated with the "F_b" values are applicable. The remaining assigned allowable properties ("$F_{c//}$", "$F_{c\perp}$", and "F_v") for a grade shall be those listed in paragraph 601. Higher values for "$F_{c\perp}$" and "F_v" may be assigned as described below.

600.5(a) Average specific gravity values (based on oven dry weight and oven dry volume) of the various species or species combinations shall be those set forth in the ***National Design Specification for Wood Construction*** published by the American Forest and Paper Association. The specific gravity values for Southern Pine (major species) MSR grades are also provided in paragraph 601. A Machine Stress Rated Lumber grade may alternatively be assigned an average specific gravity value different than the NDS value provided quality control procedures maintain compliance. If a major species Southern Pine grade of 1.8E or greater is run in combination with one or more equal or higher grade(s), then specific gravity must be qualified and quality controlled for the lower grade(s) as determined by the agency (except for 1.8E grades that assign a .55 specific gravity). The qualification of a major species Southern Pine grade of 1.8E shall include specific gravity qualification. When qualified, the 1.8E grade is assigned specific gravity, "$F_{c\perp}$" and "F_v" values as listed in paragraph 601 for 1.9E and higher grades. Otherwise, 1.8E grades shall include the specific gravity of .55 on the grade-mark and the "$F_{c\perp}$" and "F_v" values are as listed for the 1.7 million psi and less grades shown in paragraph 601.

600.5(b) When the specific gravity of the grade is controlled as part of the daily quality control program, the allowable stresses for compression perpendicular-to-grain and horizontal shear may be calculated using the equations listed below. When qualified, the specific gravity value must be included on the grade-mark. Based on the specific gravity value on the grade-mark, the "$F_{c\perp}$" and "F_v" values may be determined using the equations in paragraph 601.

600.6 Standard lengths are 6', 7', 8', 9', 10', and in multiples of 2' after 10'.

601. MACHINE STRESS RATED LUMBER
Allowable Design Values (in psi)

Fiber Stress in Bending "F_b" [(1)]	"f-E" Classifi-Cation	Modulus of Elasticity (million psi) "E"	Tension Parallel to Grain "F_t"	Compression Parallel To Grain "$F_{c//}$"
750	750f-1.4E	1.4	425	925
850	850f-1.4E	1.4	475	975
975	975f-1.6E	1.6	550	1450
1050	1050f-1.2E	1.2	450	1225
1050	1050f-1.6E	1.6	575	1500
1200	1200f-1.3E	1.3	600	1400
1200	1200f-1.6E	1.6	650	1550
1250	1250f-1.6E	1.6	725	1600
1350	1350f-1.4E	1.4	750	1600
1450	1450f-1.3E	1.3	825	1600
1500	1500f-1.5E	1.5	900	1650
1500	1500f-1.6E	1.6	900	1650
1500	1500f-1.7E	1.7	900	1650
1650	1650f-1.5E	1.5	1020	1700
1650	1650f-1.7E	1.7	1020	1750
1800	1800f-1.6E	1.6	1175	1750
1850	1850f-1.7E	1.7	1175	1850
1950	1950f-1.5E	1.5	1375	1800
1950	1950f-1.7E	1.7	1375	1800
2100	2100f-1.8E	1.8	1575	1875
2250	2250f-1.9E	1.9	1750	1925
2400	2400f-2.0E	2.0	1925	1975
2550	2550f-1.8E	1.8	1400	2000
2550	2550f-2.1E	2.1	2050	2025
2700	2700f-2.2E	2.2	2150	2100
2850	2850f-1.8E	1.8	1600	2100
2850	2850f-2.3E	2.3	2300	2150
3000	3000f-2.4E	2.4	2400	2200

Major Species Southern Pine: E Level	F_v	$F_{c\perp}$	Specific Gravity
1.7 million psi and less:	175 psi	565 psi	0.55
1.8 million psi:	See paragraph 600.5(a).		
1.9 million psi and higher:	190 psi	805 psi	0.57

601.1 When a grade is qualified by test and quality controlled for specific gravity, the allowable compression perpendicular-to-grain value may be determined using the following equation:

$$F_{c\perp (0.04)} = (2252.4 * SPG) - 480$$

Compression perpendicular-to-grain values determined from the equation above are based on a 0.04 inch deformation limit and are standard for most structures. Values at 0.02 inch deformation can be obtained with the following equation:

$$F_{c\perp (0.02)} = (0.71 * F_{c\perp (0.04)}) + 14.1$$

601.2 When a grade is qualified by test and quality controlled for specific gravity, the allowable horizontal shear value may be determined using the following equation:

$$F_v = (266 * SPG) + 40$$

602. VISUAL GRADING REQUIREMENTS (MSR)

Mechanically stress rated lumber must be well manufactured and visually graded to limit certain characteristics even though actual strength is not affected. All pieces shall be visually graded to assure that the characteristics affecting strength are no more serious than the following limiting characteristics:

602.1 Grades with 1000 psi F_b or greater

Checks - seasoning checks not limited; through checks at ends limited as splits

Manufacture - standard F (see para. 722(f))

Shakes - if through at ends, limited as splits; away from ends, through heart shakes up to 2' long, well separated; if not through, single shakes may be 3' or up to 1/4 the length whichever is greater

Skips - hit and miss, and in addition, 5% of the pieces may be hit or miss or heavy skip not longer than 2' (see paras. 720 (e), (f), and (g))

Slope of grain - for machines not evaluating slope of grain[2], the assigned bending design value shall limit the slope of grain as follows:

1000 psi - 1450 psi	:	1 in 8
1500 psi - 2050 psi	:	1 in 10
2100 psi and higher	:	1 in 12

Splits - equal in length to 1-1/2 times the width of the piece

Unsound wood - heart center streaks not over 1/3 the width or thickness

Wane - 1/3 thickness and 1/3 width full length or equivalent on each face provided that wane not exceed 2/3 the thickness or 1/2 the width for up to 1/4 the length (see para. 750)

Warp - light (see para. 752)

Worm-eaten pitch - regardless of the location, the worst face measurement is limited to the maximum edge knot present in the piece

For machines not evaluating knots, knot holes, burls, distorted grain, and decay, when located partially or wholly at edges of wide faces, these defects shall be limited as determined by grade level qualification tests.

602.2 Grades with less than 1000 psi F_b

Checks - seasoning checks not limited; through checks at ends are limited as splits

Manufacture - standard F (see para. 722(f))

Shakes - surface shakes permitted; if through at edges or ends, limited as splits; elsewhere through shakes 1/3 the length, scattered along the length

Skips - hit or miss, with a maximum of 10% of the pieces containing heavy skips (see paras. 720(e) and (g))

Slope of grain - for machines not evaluating slope of grain[(2)], slope of grain is limited to 1:4

Splits - equal to 1/6 the length of the piece

Unsound wood - must not destroy the nailing edge (see para. 710(e); heart center streaks are limited to 1/3 the cross section at any point along the length

Wane - 1/2 the thickness and 1/2 the width full length, or equivalent on each face, provided that wane not exceed 7/8 the thickness or 3/4 the width for up to 1/4 the length (see para. 750)

Warp - medium (see para. 752)

Worm-eaten pitch - regardless of the location, the worst face measurement is limited to the maximum edge knot present in the piece

For machines not evaluating knots, knot holes, burls, distorted grain, and decay, when located partially or wholly at edges of wide faces, these defects shall be limited as determined by grade level qualification tests.

603. MACHINE EVALUATED LUMBER
All Species of Southern Pine
2" and Wider

603.1 Machine Evaluated Lumber (MEL) is lumber that

has been non-destructively evaluated by ALSC Board of Review approved mechanical grading equipment to predict certain mechanical properties. The MEL machine evaluates each piece and sorts and marks the material into various strength classifications. MEL is also required to meet certain visual requirements as set forth herein.

603.2 A grade-mark on Machine Evaluated Lumber indicates the stress rating system used meets requirements of the grading agency's qualification and quality control procedures. The grade-mark will show the agency trademark, the mill number, the species identification, seasoning designation, and a grade code. The design values shown on the grade-mark will be fiber stress in bending, tension, and average modulus of elasticity. (The grade mark may include the designation of “1W” or “2W” to signify that the lumber has been visually graded to meet or exceed the wane restrictions for No. 1 or No. 2 wane as specified in paragraph 312 and 313.)

603.3 Design values for Machine Evaluated Lumber (MEL) are shown in paragraph 604. Grades of MEL may be produced with other stress assignments subject to revision of this grading rule.

603.4 Machine output is controlled by testing pieces and adjusting machines so that the desired average edge modulus of elasticity (MOE) and working stresses for bending (F_b), tension (F_t), and when applicable, compression parallel-to-grain ($F_{c//}$) are met. Working stresses are derived using a 5% exclusion level of strength properties with the same reduction factors as are applied to visually graded lumber in accordance with ASTM D245.

603.5(a) Compression parallel-to-grain ($F_{c//}$) allowable design values may be assigned using the same "$F_{c//}$" to "F_b" relationship as assumed in Machine Stress Rated lumber. For MEL grades with "$F_{c//}$" values equal to or less than those from the assumed MSR "$F_{c//}$" to "F_b" relationship, no "$F_{c//}$" grade qualification and quality control is required. For MEL grades with "$F_{c//}$" values greater than those from the assumed MSR "$F_{c//}$" to "F_b" relationship, "$F_{c//}$" grade qualification and quality control is required. MEL grades requiring qualification and quality control for "$F_{c//}$" are indicated in paragraph 604.

603.5(b) Average specific gravity values (based on oven dry weight and oven dry volume) of the various species or species combinations shall be those set forth in the ***National Design Specification for Wood Construction*** published by the American Forest and Paper Association. The specific gravity values for Southern Pine (major species) MEL grades are also provided in paragraph 604. A Machine Evaluated Lumber grade may alternatively be assigned an average specific gravity value different than the NDS value provided quality control procedures maintain compliance. If a major species Southern Pine grade of 1.8E or greater is run in combination with one or more equal or higher grade(s), then specific gravity must be qualified and quality controlled for the lower grade(s) as determined by the agency (except for 1.8E grades that assign a .55 specific gravity). The qualification of a major species Southern Pine grade of 1.8E shall include specific gravity qualification. When qualified, the 1.8E grade is assigned specific gravity, "$F_{c\perp}$" and "F_v" values as listed in paragraph 604 for 1.9E and higher grades. Otherwise, 1.8E grades shall include the specific gravity of .55 on the grade-mark, and the "$F_{c\perp}$" and "F_v" values are as listed for the 1.7 million psi and less grades shown in paragraph 604.

603.5(c) When the specific gravity of the grade is controlled as part of the daily quality control program, the allowable stresses for compression perpendicular-to-grain and horizontal shear may be calculated using the equations listed below. When qualified, the specific gravity value must be included on the grade-mark. Based on the specific gravity value on the grade-mark, the "$F_{c\perp}$" and "F_v" values may be determined using the equations in paragraph 604.

603.5(d) In the absence of daily quality control for specific gravity, compression perpendicular-to-grain ($F_{c\perp}$) and horizontal shear (F_v) allowable design values shall be as indicated in paragraph 604.

603.6 Standard lengths are 6', 7', 8', 9', 10', and in multiples of 2' after 10'.

603.7 Machine Evaluated Lumber working stress assignments shall be limited to the increments specified in the following table:

Mechanical Property	Increment
Modulus of Elasticity (MOE)	100,000 psi
Fiber Stress in Bending (F_b)	50 psi
Fiber Stress in Tension (F_t)	25 psi
Compression Parallel-to-Grain ($F_{c//}$)	25 psi
Compression Perpendicular-to-Grain ($F_{c\perp}$)	5 psi
Horizontal Shear (F_v)	5 psi

604. MACHINE EVALUATED LUMBER
Design Values (in psi)

Grade Name	Fiber Stress in Bending "F_b" [1]	Tension Parallel To Grain "F_t"	Compression Parallel to Grain "$F_{c//}$"	Modulus of Elasticity (million psi) "E"
M-5	900	500	1050	1.1
M-6	1100	600	1300	1.0
M-7	1200	650	1400	1.1
M-8	1300	700	1500	1.3
M-9	1400	800	1600	1.4
M-10	1400	800	1600	1.2
M-11	1550	850	1675	1.5
M-12	1600	850	1675	1.6
M-13	1600	950	1675	1.4
M-14	1800	1000	1750	1.7
M-15	1800	1100	1750	1.5
M-16	1800	1300	1750	1.5
M-17[3]	1950	1300	2050	1.7
M-18	2000	1200	1825	1.8
M-19	2000	1300	1825	1.6
M-20[3]	2000	1600	2100	1.9
M-21	2300	1400	1950	1.9
M-22	2350	1500	1950	1.7
M-23	2400	1900	1975	1.8
M-24	2700	1800	2100	1.9
M-25	2750	2000	2100	2.2
M-26	2800	1800	2150	2.0
M-27[3]	3000	2000	2400	2.1
M-28	2200	1600	1900	1.7
M-29	1550	850	1650	1.7
M-30	2050	1050	1850	1.7
M-31	2850	1600	2150	1.9
M-32	750	425	925	1.4
M-33	850	475	975	1.4
M-34	975	550	1450	1.6
M-35	1050	575	1500	1.6
M-36	1200	650	1550	1.6
M-37	1250	725	1600	1.6
M-38	1500	900	1650	1.6
M-39	1650	1020	1750	1.7
M-40	1850	1175	1850	1.7

(Table Continued)

Grade Name	Fiber Stress in Bending "F_b" [1]	Tension Parallel To Grain "F_t"	Compression Parallel to Grain "$F_{c//}$"	Modulus of Elasticity (million psi) "E"
M-41	2550	1400	2000	1.8
M-42	2850	1600	2100	1.8

Major Species Southern Pine: E Level	F_v	$F_{c\perp}$	Specific Gravity
1.7 million psi and less:	175 psi	565 psi	0.55
1.8 million psi	See paragraph 603.5(b).		
1.9 million psi and higher:	190 psi	805 psi	0.57

604.1 When a grade is qualified by test and quality controlled for specific gravity, the allowable compression perpendicular-to-grain value may be determined using the following equation:

$$F_{c\perp\,(0.04)} = (2252.4 * SPG) - 480$$

Compression perpendicular-to-grain values determined from the equation above are based on a 0.04 inch deformation limit and are standard for most structures. Values at 0.02 inch deformation can be obtained with the following equation:

$$F_{c\perp\,(0.02)} = (0.71 * F_{c\perp\,(0.04)}) + 14.1$$

604.2 When a grade is qualified by test and quality controlled for specific gravity, the allowable horizontal shear value may be determined using the following equation:

$$F_v = (266 * SPG) + 40$$

605. VISUAL GRADING REQUIREMENTS (MEL)

Machine Evaluated Lumber must be well manufactured and visually graded to limit certain characteristics even though the actual strength is not affected. All pieces shall be visually graded to assure that the characteristics affecting strength and appearance are no more serious than the following limiting characteristics:

605.1 Grades with 1000 psi F_b or greater

Checks - seasoning checks not limited; through checks at ends limited as splits

Manufacture - standard F (see para. 722(f))

Shakes - if through at ends, limited as splits; away from ends, through heart shakes up to 2' long, well separated; if not through, single shakes may be 3'

or up to 1/4 the length whichever is greater

Skips - hit and miss, and in addition, 5% of the pieces may be hit or miss or heavy skip not longer than 2' (see paras. 720 (e), (f), and (g))

Slope of grain - for machines not evaluating slope of grain[(2)], the assigned bending design value shall limit the slope of grain as follows:

1000 psi - 1450 psi	:	1 in 8
1500 psi - 2050 psi	:	1 in 10
2100 psi and higher	:	1 in 12

Splits - equal in length to 1-1/2 times the width of the piece

Unsound wood - heart center streaks not over 1/3 the width or thickness

Wane - 1/3 thickness and 1/3 width full length or equivalent on each face provided that wane not exceed 2/3 the thickness or 1/2 the width for up to 1/4 the length (see para. 750)

Warp - light (see para. 752)

Worm-eaten pitch - regardless of the location, the worst face measurement is limited to the maximum edge knot present in the piece

For machines not evaluating knots, knot holes, burls, distorted grain, and decay, when located partially or wholly at edges of wide faces, these defects shall be limited as determined by grade level qualification tests.

605.2 Grades with less than 1000 psi F_b

Checks - seasoning checks not limited; through checks at ends are limited as splits

Manufacture - standard F (see para. 722(f))

Shakes - surface shakes permitted; if through at edges or ends, limited as splits; elsewhere through shakes 1/3 the length, scattered along the length

Skips - hit or miss, with a maximum of 10% of the pieces containing heavy skips (see paras. 720(e) and (g))

Slope of grain - for machines not evaluating slope of grain[(2)], slope of grain is limited to 1:4

Splits - equal to 1/6 the length of the piece

Unsound wood - must not destroy the nailing edge (see para. 710(e); heart center streaks are limited to 1/3 the cross section at any point along the length

Wane - 1/2 the thickness and 1/2 the width full length, or equivalent on each face, provided that wane not exceed 7/8 the thickness or 3/4 the width for up to

1/4 the length (see para. 750)

Warp - medium (see para. 752)

Worm-eaten pitch - regardless of the location, the worst face measurement is limited to the maximum edge knot present in the piece

For machines not evaluating knots, knot holes, burls, distorted grain, and decay, when located partially or wholly at edges of wide faces, these defects shall be limited as determined by grade level qualification tests.

606. E-RATED STRUCTURAL LAMINATIONS
All species of Southern Pine
2" and Wider

606.1 E-rated Structural Laminations are suitable to be used as individual laminations for structural glued laminated timbers. This lumber has been non-destructively evaluated by an ALSC approved machine.

606.2 The grade-mark on E-rated Structural Laminations indicates the stress rating system used meets requirements of the grading agency's qualification and quality control procedures. The grade-mark will show the agency trademark, the mill number, the species identification, seasoning designation, and the E-grade designation followed by the word LAM. The "E" designation shall be the average "flat-wise" long span "E" of the grade as determined by qualification test and maintained by quality control. The grade-mark may also indicate the applicable Machine Stress Rated or Machine Evaluated Lumber grade in accordance with paragraphs 600-605.

606.2(a) E-Rated Tension Laminations. The grade-mark may indicate the applicable tension design value, "F_t". The tension design value shall be determined by qualification test and maintained by quality control.

606.2(b) MSR/MEL Tension Laminations. The grade-mark may indicate the applicable Machine Stress Rated or Machine Evaluated Lumber grade in accordance with paragraphs 600-605.

606.3 Standard lengths are 6', 7', 8', 9', 10', and in multiples of 2' after 10'.

607. VISUAL GRADING REQUIREMENTS

E-rated structural laminations must be well manufactured and visually graded to limit certain characteristics even though actual strength is not affected. All pieces shall be visually graded to assure that the characteristics affecting strength are no more

serious than the following limiting characteristics:

Checks - seasoning checks not limited; through checks at ends limited as splits.

Knots - knots may be sound, unsound or not firmly fixed. A knot is measured by the area of the cross-section it occupies. Edge knots are limited to 1/2 the cross-section unless a more restrictive knot size is specified.

Knot holes - knot holes may be the same as knots permitted in the grade. Other holes are permitted if no more damaging in effect than the allowable knot hole.

Pitch or bark pockets - medium scattered pitch or bark pockets are permitted. Pitch streaks shall not exceed 1/6 of the width.

Shakes and splits - permitted if extending from wide faces into the thickness at an angle of 45 degrees or more from the wide face.

Skips - hit and miss, and in addition, 5% of the pieces may be hit or miss (see paras. 720(e), (f), and (g)).

Slope of grain - for machines not evaluating slope of grain[(2)], the edge knot category shall limit the slope of grain as follows:

1/3 and larger	1 in 10
1/4 and smaller	1 in 12

Torn grain - medium torn grain. Spots of heavy torn grain around knot areas or equivalent.

Wane - not to exceed 1/4" deep by 1/4" wide unless a more restrictive requirement is specified.

Warp - light (see para. 752) unless a more restrictive requirement is specified.

Worm-eaten pitch - regardless of the location, the worst face measurement is limited to the allowable edge knot size.

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(1) The tabulated Fiber Stress in Bending values "F_b" are applicable to lumber loaded on edge. When loaded flatwise, these values may be increased by multiplying by the following factors:

NOMINAL WIDTH (in.)	4"	6"	8"	10"	12"	14"
FACTOR	1.1	1.15	1.15	1.2	1.2	1.2

(2) Machines which measure MOE by deflection indirectly evaluate slope of grain.

(3) Grade requires "F_{cll}" qualification and quality control.