Table 2 Mechanically Graded Lumber – 4˝ and less in thickness, 2˝ and wider

Based on Normal Load Duration and Dry Service (MC≤ 19%) — See Tables A-1 thru A-4 for Adjustment Factors

Grade	Bending F_b	Tension Parallel to Grain F_t	Shear Parallel to Grain F_v[1]	Compression Perpendicular to Grain $F_{c\perp}$[1]	Compression Parallel to Grain F_c	Modulus of Elasticity E	Modulus of Elasticity E_{min}
Machine Stress Rated (MSR) Lumber							
750f – 1.4E	750	425	175	565	925	1,400,000	710,000
850f – 1.4E	850	475	175	565	975	1,400,000	710,000
975f – 1.6E	975	550	175	565	1450	1,600,000	810,000
1050f – 1.2E	1050	450	175	565	1225	1,200,000	610,000
1050f – 1.6E	1050	575	175	565	1500	1,600,000	810,000
1200f – 1.3E	1200	600	175	565	1400	1,300,000	660,000
1200f – 1.6E	1200	650	175	565	1550	1,600,000	810,000
1250f – 1.6E	1250	725	175	565	1600	1,600,000	810,000
1350f – 1.4E	1350	750	175	565	1600	1,400,000	710,000
1450f – 1.3E	1450	825	175	565	1600	1,300,000	660,000
1500f – 1.5E	1500	900	175	565	1650	1,500,000	760,000
1500f – 1.6E	1500	900	175	565	1650	1,600,000	810,000
1500f – 1.7E	1500	900	175	565	1650	1,700,000	860,000
1650f – 1.5E	1650	1020	175	565	1700	1,500,000	760,000
1650f – 1.7E	1650	1020	175	565	1750	1,700,000	860,000
1800f – 1.6E	1800	1175	175	565	1750	1,600,000	810,000
1850f – 1.7E	1850	1175	175	565	1850	1,700,000	860,000
1950f – 1.5E	1950	1375	175	565	1800	1,500,000	760,000
1950f – 1.7E	1950	1375	175	565	1800	1,700,000	860,000
2100f – 1.8E[2]	2100	1575	190	805	1875	1,800,000	910,000
2250f – 1.9E	2250	1750	190	805	1925	1,900,000	970,000
2400f – 2.0E	2400	1925	190	805	1975	2,000,000	1,020,000
2550f – 1.8E[2]	2550	1400	190	805	2000	1,800,000	910,000
2550f – 2.1E	2550	2050	190	805	2025	2,100,000	1,070,000
2700f – 2.2E	2700	2150	190	805	2100	2,200,000	1,120,000
2850f – 1.8E[2]	2850	1600	190	805	2100	1,800,000	910,000
2850f – 2.3E	2850	2300	190	805	2150	2,300,000	1,170,000
3000f – 2.4E	3000	2400	190	805	2200	2,400,000	1,220,000

(1) When a grade is qualified by test and quality controlled for specific gravity, the shear and compression perpendicular-to-grain design values may be higher.

(2) When not qualified by test and quality controlled for specific gravity, the grademark for mechanically graded lumber grades with a 1,800,000 psi modulus of elasticity design value shall include a specific gravity of .55, a shear value of 175 psi, and a compression perpendicular-to-grain value of 565 psi.

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Table 2 (continued) Mechanically Graded Lumber – 4˝ and less in thickness, 2˝ and wider

Based on Normal Load Duration and Dry Service (MC≤ 19%) — See Tables A-1 thru A-4 for Adjustment Factors

Grade	Bending F_b	Tension Parallel to Grain F_t	Shear Parallel to Grain F_v[1]	Compression Perpendicular to Grain $F_{c\perp}$[1]	Compression Parallel to Grain F_c	Modulus of Elasticity E	Modulus of Elasticity E_{min}
Machine Evaluated Lumber (MEL)							
M-32	750	425	175	565	925	1,400,000	650,000
M-33	850	475	175	565	975	1,400,000	650,000
M-5	900	500	175	565	1050	1,100,000	510,000
M-34	975	550	175	565	1450	1,600,000	750,000
M-35	1050	575	175	565	1500	1,600,000	750,000
M-6	1100	600	175	565	1300	1,000,000	470,000
M-7	1200	650	175	565	1400	1,100,000	510,000
M-36	1200	650	175	565	1550	1,600,000	750,000
M-37	1250	725	175	565	1600	1,600,000	750,000
M-8	1300	700	175	565	1500	1,300,000	610,000
M-10	1400	800	175	565	1600	1,200,000	560,000
M-9	1400	800	175	565	1600	1,400,000	650,000
M-38	1500	900	175	565	1650	1,600,000	750,000
M-11	1550	850	175	565	1675	1,500,000	700,000
M-29	1550	850	175	565	1650	1,700,000	790,000
M-12	1600	850	175	565	1675	1,600,000	750,000
M-13	1600	950	175	565	1675	1,400,000	650,000
M-39	1650	1020	175	565	1750	1,700,000	790,000
M-15	1800	1100	175	565	1750	1,500,000	700,000
M-16	1800	1300	175	565	1750	1,500,000	700,000
M-14	1800	1000	175	565	1750	1,700,000	790,000
M-40	1850	1175	175	565	1850	1,700,000	790,000
M-17[3]	1950	1300	175	565	2050	1,700,000	790,000
M-19	2000	1300	175	565	1825	1,600,000	750,000
M-18[2]	2000	1200	190	805	1825	1,800,000	840,000
M-20[3]	2000	1600	190	805	2100	1,900,000	890,000
M-30	2050	1050	175	565	1850	1,700,000	790,000
M-28	2200	1600	175	565	1900	1,700,000	790,000
M-21	2300	1400	190	805	1950	1,900,000	890,000
M-22	2350	1500	175	565	1950	1,700,000	790,000
M-23[2]	2400	1900	190	805	1975	1,800,000	840,000
M-41[2]	2550	1400	190	805	2000	1,800,000	840,000
M-24	2700	1800	190	805	2100	1,900,000	890,000
M-25	2750	2000	190	805	2100	2,200,000	1,030,000
M-26	2800	1800	190	805	2150	2,000,000	930,000
M-42[2]	2850	1600	190	805	2100	1,800,000	840,000
M-31	2850	1600	190	805	2150	1,900,000	890,000
M-27[3]	3000	2000	190	805	2400	2,100,000	980,000

(1) When a grade is qualified by test and quality controlled for specific gravity, the shear and compression perpendicular-to-grain design values may be higher. (2) When not qualified by test and quality controlled for specific gravity, the grademark for mechanically graded lumber grades with a 1,800,000 psi modulus of elasticity design value shall include a specific gravity of .55, a shear value of 175 psi, and a compression perpendicular-to-grain value of 565 psi. (3) MEL grades requiring compression parallel-to-grain qualification and quality control.

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Southern Pine Adjustment Factors

Based on SPIB Grading Rules and AWC National Design Specification®

Reference design values are for normal load duration under the moisture service conditions specified. Because the strength of wood varies with conditions under which it is used, reference design values should only be applied in conjunction with appropriate design and service recommendations from the *National Design Specification® (NDS®) for Wood Construction* published by the American Wood Council. The latest connection design information is also provided in the *NDS*.

Reference design values **(F_b F_t F_v $F_{c\perp}$ F_c E E_{min})** in Tables 1 thru 3 shall be multiplied by all applicable adjustment factors to determine adjusted design values **(F_b' F_t' F_v' $F_{c\perp}'$ F_c' E' E_{min}')**.

Table A-1 is excerpted from the *NDS* and summarizes the applicability of adjustment factors for solid-sawn lumber.

Table A-1 Applicability of Adjustment Factors for Sawn Lumber

		ASD only	ASD and LRFD											LRFD only		
Adjusted Design Value	Reference Design Value	Load Duration Factor	Wet Service Factor	Temperature Factor	Beam Stability Factor	Size Factor	Flat Use Factor	Incising Factor	Repetitive Member Factor	Column Stability Factor	Buckling Stiffness Factor	Bearing Area Factor	Format Conversion Factor	Resistance Factor	Time Effect Factor
													K_F	ϕ	
F_b' =	F_b *	C_D *	C_M *	C_t *	C_L *	C_F *	C_{fu} *	C_i *	C_r *				2.54 *	0.85 *	λ
F_t' =	F_t *	C_D *	C_M *	C_t *		C_F *		C_i *					2.70 *	0.80 *	λ
F_v' =	F_v *	C_D *	C_M *	C_t *				C_i *					2.88 *	0.75 *	λ
F_c' =	F_c *	C_D *	C_M *	C_t *		C_F *		C_i *		C_P *			2.40 *	0.90 *	λ
$F_{c\perp}'$ =	$F_{c\perp}$ *		C_M *	C_t *				C_i *				C_b *	1.67 *	0.90	
E' =	E *		C_M *	C_t *				C_i							
E_{min}' =	E_{min} *		C_M *	C_t *				C_i *			C_T *		1.76 *	0.85	

ASD – Allowable Stress Design; **LRFD** – Load and Resistance Factor Design

Tables A-2 thru A-4 highlight the most common adjustment factors as they apply to Southern Pine. In addition, Table 1 and 3 footnotes provide information about the Size Factor, C_F. For complete information on adjustment factors, see the *NDS*.

Table A-2 Wet Service Factor, C_M

For lumber 2″ to 4″ thick

Applies to all values

When dimension lumber is used under conditions where the moisture content of the wood in service will exceed 19% for an extended time period, reference design values shall be multiplied by the appropriate wet service factors to the right.

F_b	F_t	F_v	$F_{c\perp}$	F_c	E	E_{min}
0.85 [1]	1.0	0.97	0.67	0.8 [2]	0.9	0.9

(1) When $F_b \leq 1150$ psi, $C_M = 1.0$

(2) When $F_c \leq 750$ psi, $C_M = 1.0$

Table A-3 Load Duration Factor, C_D

For all solid wood products – Allowable Stress Design Only

Applies to F_b, F_t, F_v, and F_c values
Does not apply to $F_{c\perp}$, E, and E_{min} values

Wood has the property of carrying substantially greater maximum loads for short durations than for long durations of loading. Reference design values apply to normal load duration, meaning a load that fully stresses a member to its allowable design value by the application of the full design load for a cumulative duration of approximately ten years. When the cumulative duration of the full maximum load does not exceed the specified time period, all reference design values (except $F_{c\perp}$, E, and E_{min}) shall be multiplied by the appropriate load duration factor. Frequently used load duration factors are provided to the right.

Load Duration *(Typical Design Loads)*	C_D
Permanent *(dead load)*	0.9
Ten years *(occupancy live load)*	1.0
Two months *(snow load)*	1.15
Seven days *(construction load)*	1.25
Ten minutes *(wind/earthquake load)*	1.6
Impact [1] *(impact load)*	2.0

(1) Load duration factors greater than 1.6 shall not apply to structural members pressure treated with waterborne preservatives, or fire-retardant chemicals. The impact load duration factor shall not apply to connections.

Table A-4 Flat Use Factor, C_{fu}

For lumber 2″ to 4″ thick

Applies to F_b values only

Reference bending design values, F_b, are based on edgewise use (load applied to narrow face). When dimension lumber is used flatwise (load applied to wide face), F_b shall also be multiplied by the flat use factors to the right.

Flat Use Factors, C_{fu}		
Width (depth)	*Thickness* (breadth)	
	2″ & 3″	4″
2″ & 3″	1.0	–
4″	1.1	1.0
5″	1.1	1.05
6″	1.15	1.05
8″	1.15	1.05
10″ & wider	1.2	1.1