



# Tech Notes

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## NDS 2005 Specific Gravity Values for MSR Lumber

The majority of machine stress-rated (MSR) lumber produced is used in metal-plate connected (MPC) wood trusses, where lumber's specific gravity is a primary design parameter in sizing truss-plates.

Western Wood Products Association (WWPA) is a rules writing agency accredited by the American Lumber Standard Committee, Inc. (ALSC) and has provided quality control procedures for specific gravity of MSR lumber since 1996. Assigned specific gravity values for MSR lumber grades in Table 1 on the next page are based on models relating grading machine measurements to specific gravity or by qualification testing.

These specific gravity values allow more efficient use of MSR lumber products. In addition, this allows the recognition of interchangeable use of U.S. Spruce-Pine-Fir (SPFs) MSR lumber with Canadian SPF of the same grade and size.

Mills conducting daily testing for specific gravity as part of their MSR lumber quality control program can show the specific gravity value as part of the grade stamp. Figure 1 is an example MSR lumber grade stamp showing specific gravity of 0.47 qualified by test and quality controlled daily. The values indicated on the grade stamp may differ from those listed in Table 1.

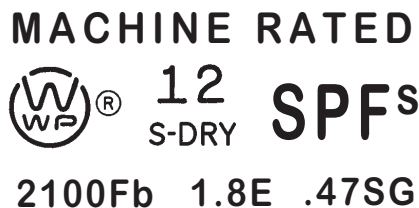


Figure 1. MSR Lumber Grade Stamp with Specific Gravity Quality Control

Tabulated specific gravity (SG) values may be used to calculate higher shear parallel to grain ( $F_V$ ) and compression perpendicular to grain ( $F_{C\perp}$ ) design values than those used for visually graded lumber. The equations for  $F_V$  and  $F_{C\perp}$  design values are:

### U.S. species,

$$F_V \text{ (in psi)} = 40 + (266 \times \text{SG})$$

$$F_{C\perp} \text{ (in psi)} = (2252.4 \times \text{SG}) - 480$$

### Canadian species,

$$F_V \text{ (in psi)} = 26.6 + (284.8 \times \text{SG})$$

$$F_{C\perp} \text{ (in psi)} = (2243.8 \times \text{SG}) - 473.8$$

Since  $F_V$  and  $F_{C\perp}$  design values may vary among lumber agencies, design values are tabulated in Table 1 as a convenience for designers.

The most current specific gravity values for MSR lumber have been published in the 2005 *NDS Supplement (National Design Specification® for Wood Construction, 2005 Edition, Design Values for Wood Construction Supplement*, published by American Forest and Paper Association's American Wood Council, [www.awc.org](http://www.awc.org)). Tabulated values for specific gravity are in accordance with each lumber agency's rules.

Assignment of specific gravity values to MSR lumber should expand choices of lumber products for users such as MPC wood truss manufacturers. Those using Canadian SPF MSR lumber can now select U.S. SPFs MSR lumber products of the same grade and size for use in MPC wood trusses.

(continued)

**Table 1.** Excerpted from Footnote 2 of Table 4C, Design Values for Mechanically Graded Dimension Lumber from the *Supplement of National Design Specification for Wood Construction 2005 Edition*.

SPECIFIC GRAVITY, SG, SHEAR PARALLEL TO GRAIN,  $F_v$ , AND COMPRESSION PERPENDICULAR TO GRAIN,  $F_{c\perp}$ . Values for specific gravity, SG, shear parallel to grain,  $F_v$ , and compression perpendicular to grain,  $F_{c\perp}$ , are provided below for MSR and MEL lumber. Higher SG values may be claimed when (a) specifically assigned by the rules writing agency or (b) when qualified by test, quality controlled for SG, and provided for on the grade stamp. When a different SG value is provided on the grade stamp, higher  $F_v$  and  $F_{c\perp}$  design values may be calculated in accordance with the grading rule requirements.

Species	Modulus of Elasticity	Specific Gravity	Shear parallel to grain	Compression perpendicular to grain
	E (x10 <sup>6</sup> psi)	SG	$F_v$ (psi)	$F_{c\perp}$ (psi)
Douglas Fir - Larch	1.0 and higher	0.50	180	625
	2.0	0.51	180	670
	2.1	0.52	180	690
	2.2	0.53	180	715
	2.3	0.54	185	735
	2.4	0.55	185	760
Douglas Fir - Larch (N)	1.2 - 1.9	0.49	180	625
	2.0 - 2.2	0.53	180	715
	2.3 and higher	0.57	190	715
Douglas Fir - South	1.0 and higher	0.46	180	520
Engelmann Spruce- Lodgepole Pine	1.0 and higher	0.38	135	335
	1.5 and higher	0.46	160	555
Hem-Fir	1.0 and higher	0.43	150	405
	1.6	0.44	155	510
	1.7	0.45	160	535
	1.8	0.46	160	555
	1.9	0.47	165	580
	2.0	0.48	170	600
	2.1	0.49	170	625
	2.2	0.50	175	645
	2.3	0.51	175	670
	2.4	0.52	190	690
Hem-Fir (N)	1.0 and higher	0.46	145	405
Southern Pine	1.0 and higher	0.55	175	565
	1.8 and higher	0.57	190	805
Spruce-Pine-Fir	1.2 and higher	0.42	135	425
	1.8 - 1.9	0.46	160	525
	2.0 and higher	0.50	170	615
Spruce-Pine-Fir (South)	1.0 and higher	0.36	135	335
	1.2 - 1.7	0.42	150	465
	1.8 - 1.9	0.46	160	555
	2.0 and higher	0.50	175	645
Western Cedars	1.0 and higher	0.36	155	425
Western Woods	1.0 and higher	0.36	135	335