

DESIGN VALUES OF MSR LUMBER

MSR lumber assures the performance and reliability of your engineered components and structures. The machine grading process sorts dimension lumber by strength and stiffness to improve consistency. Daily quality control testing for strength and stiffness ensures that products meet structural requirements. Machine graded lumber certification and quality control procedures are based on approved American or Canadian lumber standards (ALS or CLS).

Design values in pounds per square inch (psi)

Grade Designation	Bending F_b	Tension parallel to grain F_t	Compression parallel to grain $F_{c//}$	Modulus of Elasticity E
1650f-1.5E	1650	1020	1700	1,500,000
1800f-1.6E	1800	1175	1750	1,600,000
2100f-1.8E	2100	1575	1875	1,800,000
2400f-2.0E	2400	1925	1975	2,000,000

Notes:

- (1) **Other grades:** The grades listed above are meant as examples of commonly produced MSR grades. This is not intended to be a complete list. The *Supplement to the National Design Specification (NDS) for Wood Construction* (AF&PA, 1997) provides a good summary of the established grades in Machine Stress Rated (MSR) and Machine Evaluated Lumber (MEL) in Table 4C on page 35.
- (2) **Quality Control:** QC testing takes place on a daily basis for all machine graded lumber products. Depending on the grade requirements, testing takes place for one or more of the following properties: E, F_b , F_t . This testing process is established to verify that production meets design requirements for all product shipped to customers as MSR, MEL, or E-rated laminating grades.
- (3) **Common Species:** The *MSR Lumber Production Survey* (MSR Lumber Producers Council, 1998) identifies Spruce-Pine-Fir (SPF) as the species in which the majority of MSR is produced (69% of total MSR in 1998). Douglas Fir-Larch (DFL), Hem-Fir (HF), and Southern Pine (SYP), share significant volumes as well (5% to 14% of total MSR in 1998). Consult the *MSR Lumber Production Survey* for more information.
- (4) **Species-specific design values:** MSR lumber simplifies many design considerations since a grade like 1650f-1.5E maintains the same F_b , F_t , $F_{c//}$, and E values no matter what species or size is considered. Other properties, however, change by species as they relate to the specific gravity (density) of wood. A couple of examples are listed below. Please refer to NDS Supplement footnotes #2 for Table 4C for more detailed information. Grade rules writing agencies are another good source of up-to-date information on this topic (see NDS Supplement Section 1.1 on page 2).

Grade Designation	Species	SG	Shear parallel to grain F_v	Compression perpendicular to grain $F_{c\perp}$
1650f-1.5E	SPF	0.42	135	425
1650f-1.5E	HF	0.46	145	405
2400f-2.0E	SPF	0.50	170	615
2400f-2.0E	SYP	0.57	190	805

- (5) **Adjustment Factors:** Adjustment factors must be applied to the allowable design values presented here. Adjustments to values are taken for duration of load, repetitive member situations, beam and column stability, and other factors as summarized in NDS Table 2.3.1 on page 9. Machine graded lumber enjoys specific advantages in beam stability, column stability, and buckling stiffness factors as a result of the consistency of E compared to visually graded lumber.

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