

Requirements for the type
of lumber used for restraining
and bracing

by Jim Vogt, P.E.

The Building Component Safety Information (BCSI) booklet indicates that lumber used for restraining and bracing truss members must be *stress-graded*. The term *stress-graded* sometimes leads to confusion when determining the minimum grade of lumber that can be used. Though the topic has been discussed before in *SBC*, we revisit it here to clarify a couple of the more common misperceptions.

Question

I am a framing contractor who will be installing metal plate connected wood trusses in the roof of an apartment building. The truss manufacturer has provided BCSI summary sheets as part of its jobsite package. While reviewing the information, I noticed BCSI recommends that the lumber used for lateral restraint and diagonal bracing of the trusses should be minimum 2x4 stress-graded lumber. The term *stress-graded* puzzles me. Does this mean I need to use MSR lumber for the bracing, or is No. 2 SPF acceptable? Also, it used to be permissible to use 1x3s and 1x4s for truss bracing. Why the change?

You do not need to use machine stress rated (MSR) lumber for the truss member restraint and bracing. Certain visual grades will also meet BCSI recommendations. Stress-graded refers to lumber that has been graded for its mechanical (i.e., strength and stiffness) properties.

Answer

You do not need to use machine stress rated (MSR) lumber for the truss member restraint and bracing. Certain visual grades will also meet BCSI recommendations. *Stress-graded* refers to lumber that has been graded for its mechanical (i.e., strength and stiffness) properties. These properties include bending stress, F_b ; tension parallel to grain stress, F_t ; shear parallel to grain stress, F_v ; compression perpendicular to grain stress, $F_{c\perp}$; compression parallel to grain stress, F_c and modulus of elasticity, E . The properties are used by architects and engineers to determine the grade and size of lumber required to safely resist the anticipated design loads. The requirement that the lumber used for restraint and bracing of truss members be stress-graded is to ensure that the material has been graded to account for the effects of strength reducing characteristics (e.g., knot quality, size, location and frequency) and not solely on appearance.

Visually graded lumber grades that meet the definition of stress-graded include: Select Structural, No. 1, No. 2, No. 3, Stud, Construction, Standard and Utility. Various grades of mechanically graded lumber including MSR and machine evaluated lumber (MEL) also meet the stress-graded definition.

Design values for sawn lumber are available from several sources. This includes lumber grading agencies that develop the grading rules and lumber associations that provide technical and marketing support for the various products. The Supplement to the National Design Specification® (NDS®), published by the American Forest and Paper Association (AF&PA) includes the design values for all of the commercially

USE WITH TABLE 4A ADJUSTMENT FACTORS									
Species and commercial grade	Size classification	Design values in pounds per square inch (psi)						Gradation Rule Agency	
		Bending F_b	Tension parallel to grain F_t	Shear parallel to grain F_v	Compression perpendicular to grain $F_{c\perp}$	Compression parallel to grain F_c	Modulus Of Elasticity		
							E		E_{min}
SPRUCE-PINE-FIR									
Select Structural	2" & wider	1,250	700	135	425	1,400	1,500,000	550,000	NLGA
No. 1/No. 2		875	450	135	425	1,150	1,400,000	510,000	
No. 3		500	250	135	425	650	1,200,000	440,000	
Stud	2" & wider	675	350	135	425	725	1,200,000	440,000	
Construction		1,000	500	135	425	1,400	1,300,000	470,000	
Standard		2" – 4" wide	550	275	135	425	1,150	1,200,000	
Utility	275		125	135	425	750	1,100,000	400,000	
SPRUCE-PINE-FIR (SOUTH)									
Select Structural	2" & wider	1,300	575	135	335	1,200	1,300,000	470,000	NELM NSLB WCLIB WWPA
No. 1		875	400	135	335	1,050	1,200,000	440,000	
No. 2		775	350	135	335	1,000	1,100,000	400,000	
No. 3	450	200	135	335	575	1,000,000	370,000		
Stud	2" & wider	600	275	135	335	625	1,000,000	370,000	
Construction		875	400	135	335	1,200	1,000,000	370,000	
Standard		2" – 4" wide	500	225	135	335	1,000	900,000	
Utility	225		100	135	335	675	900,000	330,000	

available lumber in the United States. Figure 1 shows an excerpt from the 2005 Edition.

Let's clarify your point about using dimensions other than 2x4 for bracing and restraint. The building designer can certainly specify the use of other materials, including 1x3s and/or 1x4s for restraint and bracing. This is indicated in BCSI:

Minimum size Bracing and Lateral Restraint material is 2x4 stress-graded lumber, or approved Proprietary Metal Restraint/Bracing, unless otherwise specified by the Building Designer.

It is critical, however, to make sure that stress-graded board material is used. Board grades such as No. 1, No. 2 and No. 3 are sometimes mistaken to have the same design values as No. 1, No. 2 and No. 3 visually graded dimension lumber. In reality, No. 1, No. 2 and No. 3 boards are graded for appearance and primarily non-structural applications. Stress-graded boards from Canadian species and species from the eastern and western U.S. include the designation "SRB" on the grade stamp indicating a Stress-Rated Board. Stress-rated Southern Pine boards include the grades Industrial 55, Industrial 45 and Industrial 26. The design values for stress-rated boards are published by the grading agency for the particular species combination being used. **SBC**

To pose a question for this column, call the SBCA technical department at 608-274-4849 or email technicalqa@sbcmag.info.

Figure 1. Excerpt from Table 4A of the 2005 edition of the National Design Specification® (NDS®) Design Values for Wood Construction Supplement showing the reference strength values for various visual grades of SPRUCE-PINE-FIR and SPRUCE-PINE-FIR (South) lumber.



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