

Lumber Design Values for U.S. and Canadian Species Group Combinations—Applications to Metal Plate Connected Wood Trusses

by Kevin Cheung of Western Wood Products Association (WWPA) & WTCA Staff

Find out what component manufacturers need to know about combined species groups as they relate to component design.

The Western Lumber Grading Rules permit combinations of like-named U.S. and Canadian species groups. This paper reviews the development of lumber design values for these combinations of species groups and the applications in metal plate connected wood trusses.

Development of Design Values

The use of a combination of species groups allows lumber mills that have access to logs from the U.S. and Canada to mix logs originating from each country during production. Lumber produced from a mix of U.S. and Canadian logs must carry a grade stamp showing species group designations. The most common combinations are Douglas Fir-Larch, Hem-Fir and Spruce-Pine-Fir, as shown in Figure 1 from left to right, with the suffix “N” (for North) added to the first two combinations if the logs are sourced from Canada, and “S” (for South) to the last combination if sourced from the U.S.



Figure 1. Lumber produced from a mix of U.S. and Canadian logs must carry a grade stamp showing species group designations.

In order to use these combined species groups in the building components industry, the very next question most often asked is: What design values should we use in our software? The applicable design values for a given U.S. and Canadian species group combination are the lower of the two individual country values for each design value category. Although higher design values may be applicable to the individual species groups, they cannot be assumed to be applicable to the species group combination.

The method used for the development of the lumber design values (Base Values) for these combinations of species groups is presented in Table 1 on page 75. For the Douglas Fir-Larch combination, the design values for the visually graded NGR (National Grading Rules) grades from Table 4A of the 2005 NDS Supplement (National Design Specification Supplement - Design Values for Wood Construction) for Douglas Fir-Larch and the Douglas Fir-Larch (North) are tabulated (see Table 1). As you can see, the design values for the U.S. DF-L are reduced to accommodate the DF-L(N) design values. For example, if a component manufacturer is using No. 1 DF-L in its designs, the combined design value for bending goes from 1000 psi to 850 psi, tension goes from 675 psi to 500 psi, compression goes from 1500 psi to 1400 psi, and compression perpendicular to grain stays the same at 625 psi.

Specific gravity, which has the greatest effect on diaphragm and shear wall nailing, reduced as follows:

DF-L	= 0.50
DF-L(N)	= 0.49
DF-L & DF-L(N)	= 0.49

at a glance

- ❑ The Western Lumber Grading Rules permit combinations of like-named U.S. and Canadian species groups, which allows mills that have access to logs from the U.S. and Canada to mix them during production.
- ❑ The most common combinations are Douglas Fir-Larch, Hem-Fir and Spruce-Pine-Fir.
- ❑ The applicable design values for a given U.S. and Canadian species group combination that component manufacturers should use in their software are the lower of the two individual country values for each design value category (see Table 2 on page 76).

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Lumber Design Values

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When two species groups are combined, each design property is checked and the lowest value is used. The same design value adjustment method is applicable to other species group combinations (1) Hem-Fir & Hem-Fir (North), and (2) Spruce-Pine-Fir (South) & Spruce-Pine-Fir. Table 2 on page 76 is a tabulation of the lumber design values in Base Value format for the three species group combinations. (See **Support Docs** at www.sbcmag.info for size-adjusted values for these species group combinations.)

Applications to MPC Wood Trusses

The species group combination has the potential to be confusing given that there are two species designations on one grade stamp. Component manufacturers should be aware of the following:

1. Pay attention to the lumber grade stamps on the lumber you are buying. If you assume that the DF-L you have purchased is from U.S. logs and it turns out the lumber is from both Canadian and U.S. logs, the design values you use in your software are too high and will result in inaccurate truss designs.
2. There may be an economic advantage to buying species group combination lumber due to prevailing prices and availability. If this presents an opportunity for your company, consider the following:

- Ensure that the proper design values are loaded in your software and that it is clear in the design process that the lumber used is from the species group combination.
 - Perform a truss design comparison to fully understand the effects of using the combination on your typical truss designs.
 - Ensure that everyone in your organization who undertakes design and production understands the differences between regular DF-L and DF-L & DF-L(N) and that the dual-species group mark on the lumber gradestamp identifies the species groups that may be present when the lumber was produced and gradestamped.
3. If the species group combination design values are used by the software, the design can be fabricated with either lumber from the species group combination or from each individual species group.

The goal of this paper is to alert component manufacturers of this lumber design value issue and to provide background information so steps can be taken to ensure that the lumber is correctly specified and used. **SBC**

Kevin Cheung has been with WWPAA since 1986. His current position is Director of Technical Services. Over 30 of Cheung's papers have been published in engineering journals and conferences proceedings. Cheung holds a Ph.D. in Engineering Science (Structural Engineering), an M.S. in Civil Engineering (Structural Engineering), and a B.S. in Civil Engineering.

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DF-L & DF-L(N)

DF-L

DF-L(N)

MOE x 10 ⁶								MOE x 10 ⁶								MOE x 10 ⁶							
Grade	F _b single	F _t	F _v	F _{c⊥}	F _{c//}	E	E _{min}	Grade	F _b single	F _t	F _v	F _{c⊥}	F _{c//}	E	E _{min}	Grade	F _b single	F _t	F _v	F _{c⊥}	F _{c//}	E	E _{min}
Sel. Str.	1350	825	180	625	1700	1.9	0.69	Sel. Str.	1500	1000	180	625	1700	1.9	0.69	Sel. Str.	1350	825	180	625	1900	1.9	0.69
No.1&Btr.	1150	750	180	625	1550	1.8	0.66	No.1&Btr.	1200	800	180	625	1550	1.8	0.66	No.1&Btr.	1150	750	180	625	1800	1.8	0.66
No. 1	850	500	180	625	1400	1.6	0.58	No. 1	1000	675	180	625	1500	1.7	0.62	No. 1	850	500	180	625	1400	1.6	0.58
No. 2	850	500	180	625	1350	1.6	0.58	No. 2	900	575	180	625	1350	1.6	0.58	No. 2	850	500	180	625	1400	1.6	0.58
No. 3	475	300	180	625	775	1.4	0.51	No. 3	525	325	180	625	775	1.4	0.51	No. 3	475	300	180	625	825	1.4	0.51

Table 1. BASE VALUES for DF-L & DF-L(N)^{1,2} for dimension lumber 2" to 4" thick by 2" and wider

¹ Base Values are in psi ² Use with Size Factors (C_F)

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DF-L & DF-L(N)

HF & HF(N)

SPF^s & SPF

G ² =0.49								G ² =0.43								G ² =0.36							
MOE x 10 ⁶								MOE x 10 ⁶								MOE x 10 ⁶							
Grade	F _b single	F _t	F _v	F _{c⊥}	F _{c//}	E	E _{min}	Grade	F _b single	F _t	F _v	F _{c⊥}	F _{c//}	E	E _{min}	Grade	F _b single	F _t	F _v	F _{c⊥}	F _{c//}	E	E _{min}
Sel. Str.	1350	825	180	625	1700	1.9	0.69	Sel. Str.	1300	775	145	370	1500	1.6	0.58	Sel. Str.	1250	575	135	335	1200	1.3	0.47
No.1&Btr.	1150	750	180	625	1550	1.8	0.66	No.1&Btr.	1100	725	145	370	1350	1.5	0.55	No.1&Btr.	875	400	135	335	1050	1.2	0.44
No. 1	850	500	180	625	1400	1.6	0.58	No. 1	975	575	145	370	1350	1.5	0.55	No. 1	875	400	135	335	1050	1.2	0.44
No. 2	850	500	180	625	1350	1.6	0.58	No. 2	850	525	145	370	1300	1.3	0.47	No. 2	775	350	135	335	1000	1.1	0.40
No. 3	475	300	180	625	775	1.4	0.51	No. 3	500	300	145	370	725	1.2	0.44	No. 3	450	200	135	335	575	1.0	0.37

Table 2. BASE VALUES FOR WESTERN DIMENSION LUMBER¹ SPECIES GROUP COMBINATIONS • Sizes 2" to 4" thick by 2" and wider
 Grades described in *Western Lumber Grading Rules*, Sections 40.00, 41.00, 42.00 and 62.00 • ¹Design Values are in pounds per square inch (psi) • ²Species Gravity based on weight and volume when oven-dry: DF-L & DF-L(N)=0.49, HF & HF(N)=0.43, SPF^s & SPF=0.36

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6300 Enterprise Lane • Suite 200 • Madison, WI 53719
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