Truss Design Drawing Notes
TPI Meeting Discussion

TRUSS DESIGN DRAWING NOTE #1 [for RDP Prepared Plans and Specs. pre-June 2012.]:

This is for projects that are on-going from pre-June 2012 that are still using SYP Design Values from pre-June 2012 (the "2002 SPIB Grading Rules Design Values") per Project RDP approval to do so.

All truss and component designs utilize American Lumber Standards Committee (ALSC) approved rules-writing agency lumber design values (where Southern Pine has been specified, those design values are as tabulated in Southern Pine Inspection Bureau Grading Rules 2002 Edition including Supplement Nos. 1-8 as appropriate). Lumber design values correspond with the grade stamp prior to cross cutting as (a) approved by the Board of Review of ALSC (b) tabulated and footnoted by the applicable rules-writing agency using a published effective date, (c) approved and published by the American Wood Council for use in the *NDS* engineering equations for the design of structures using lumber, and (d) referenced in the latest edition of ANSI/TPI 1, Section 6.3.

TRUSS DESIGN DRAWING NOTE #2 [for RDP Prepared Plans and Specs. June 2012 to June 2013]:

This is for projects that are on-going from June 2012 to June 2013 that are still using SP Design Values from the period of June 2012 to June 2013 per Project RDP approval to do so.

All truss and component designs utilize American Lumber Standards Committee (ALSC) approved rules-writing agency lumber design values (where Southern Pine has been specified, those design values are as tabulated in Southern Pine Inspection Bureau Grading Rules 2002 Edition including Supplement No. 9). Lumber design values correspond with the grade stamp prior to cross cutting as (a) approved by the Board of Review of ALSC (b) tabulated and footnoted by the applicable rules-writing agency using a published effective date, (c) approved and published by the American Wood Council for use in the *NDS* engineering equations for the design of structures using lumber, and (d) referenced in the latest edition of ANSI/TPI 1, Section 6.3.

TRUSS DESIGN DRAWING NOTE #3 [effective June 1, 2013 SPIB Design Values]:

This is the note for all Truss Design Drawings for all projects using the new June 2013 SP lumber design values.

All truss and component designs utilize American Lumber Standards Committee (ALSC) approved rules-writing agency lumber design values (where Southern Pine has been specified, those design values are as tabulated in Southern Pine Inspection Bureau Grading Rules 2002 Edition Supplement No. 13). Lumber design values correspond with the grade stamp prior to cross cutting as (a) approved by the Board of Review of ALSC (b) tabulated and footnoted by the applicable rules-writing agency using a published effective date, (c) approved and published by the American Wood Council for use in the *NDS* engineering equations for the design of structures using lumber, and (d) referenced in the latest edition of ANSI/TPI 1, Section 6.3.

A Transparent View of SPIB Design Values and Supplement No. 13 Appendix A.

Appendix A from SPIB's Grading Rules 2002 Edition follow with the top potion being the predecessor to Supplement No. 13:

APPENDIX A
DESIGN VALUES

The single member value for use in fabricated wood structural components may be adjusted in design formulas by modification factors with other design criteria within the designer's judgment.

Tables 1, 3, 6, and 7 show the design values for grades of Southern Pine dimension lumber. Design values for fiber stress in bending, tension, compression parallel-to-grain, and Modulus of Elasticity are derived from test data on full-size structural lumber using procedures specified in ASTM D 1990. Design values for horizontal shear and compression perpendicular to grain are derived using procedures specified in ASTM D2555 and ASTM D245.

Tables 4a, 5, and 8a show design values for grades of timbers and decking. Design values are derived using procedures specified in ASTM D2555 and ASTM D245.

Mixed Southern Pine

Southern Pine of the minor species of pond pine and Virginia pine are treated as a separate species group and are so identified on the grade-mark. Spruce pine and sand pine are treated as a separate species and are so identified. These species are the only minor species which exist in sufficient volume to find their way into lumber production in certain limited areas, and for which standing timber volume data are published in ASTM D2555.

The characteristics permitted and limiting provisions for grades in the minor species shall be the same as the corresponding grades of the principal species. When the minor species of pond pine and Virginia pine are grade-marked, the mark will indicate the particular species or show "Mixed Southern Pine", and the grades of these species are assigned design values as shown in Tables 6-8a. When spruce pine is grade-marked, the mark will indicate "spruce pine", and sand pine will indicate "sand pine".. Design values are assigned according to the procedures on page A15.

The SPIB submission leading up to the ALSC Board of Review meeting that was held on January 30, 2013 provided for review of SPIB's Grading Rules 2002 Edition with the proposed Supplement No. 13 language. This version of Supplement No. 13 Appendix A follows and key elements of it are highlighted:

APPENDIX A

DESIGN VALUES FOR WOOD

Wood is a natural product subject to variations in geography, climate, specific site characteristics, silvacultural practices, and harvesting decisions. Its' strength properties are not only anisotropic (vary by principal axis) but also can vary with proximity to the center of the tree. These characteristics complicate the assignment of individual pieces into design value groups based on the visual appearance. American Society for Testing and Materials consensus standards D245, D2555 and D1990 are all used to assign design values for bending, tension and compression parallel to grain to visually graded lumber. The particular standard used is dependent upon the species or species grouping under consideration. Design values for horizontal shear and compression perpendicular to grain for visually graded lumber are derived using only the procedures specified in ASTM D245 and ASTM D2555. Design values for Timbers and industrial lumber are also established using only ASTM D245 and ASTM D2555. The use of D245 and D2555 results in design values which are based upon testing clear wood samples of each species or each species within a species grouping. For species groups, the strength values for each species are combined into a single value by using a weighting procedure based on standing timber volume of each species in the group. On the other hand, design values for visually graded dimension lumber for some species such as Southern pine are established using ASTM D1990. These values are based upon testing a representative sample of lumber meeting the visual requirements of the grade group under consideration. Not every grade group is tested nor is every physical property tested. Interpolations and calculations are used to provide design values for the grade groups. While the Modulus of Elasticity is represented by an average value, other properties such as bending strength and compression parallel to grain are represented by a lower 5% exclusion value. The sample data is adjusted for testing conditions, adjusted to a characteristic size and ranked by value (numerical order). This procedure, following the ASTM D2915, produces a tolerance limit that provides 75% confidence that the true population 5^{th} percentile value is higher than this estimate. This value is then used to establish the design value. Designers of wood structures are cautioned to take into consideration the variability of wood within a species and grade grouping. Each piece or lot of visually graded lumber is not mechanically tested to verify strength properties. Since the stress ratings are representative of the entire producing region, lots from a specific location may have physical properties at the extremes of the property range or statistical distribution representing that range of strength values.

At the ALSC Board of Review meeting objections to this language were made by SBCA. After discussion a motion was made by Dr. Don Bender, P.E. of Washington State University, representing consumers on the American Lumber Standards Committee to change the language of Supplement No. 13 Appendix A to the following as highlighted:

APPENDIX A
Design Values for Wood

Wood is a natural product subject to variations in geography, climate, specific site characteristics, silvacultural practices, and harvesting decisions. Its' strength properties are not only anisotropic (vary by principal axis) but also can vary with proximity to the center of the tree. These characteristics complicate the assignment of individual pieces into design value groups based on the visual appearance. American Society for Testing and Materials consensus standards D245, D2555 and D1990 are all used to assign design values for bending, tension and compression parallel to grain to visually graded lumber. The particular standard used is dependent upon the species or species grouping under consideration. Design values for horizontal shear and compression perpendicular to grain for visually graded lumber are derived using only the procedures specified in ASTM D245 and ASTM D2555. Design values for Timbers and industrial lumber are also established using only ASTM D245 and ASTM D2555. The use of D245 and D2555 results in design values which are based upon testing clear wood samples of each species or each species within a species grouping. For species groups, the strength values for each species are combined into a single value by using a weighting procedure based on standing timber volume of each species in the group. On the other hand, design values for visually graded dimension lumber for some species such as Southern pine are established using ASTM D1990. These values are based upon testing a representative sample of lumber meeting the visual requirements of the grade group under consideration. Not every grade group is tested nor is every physical property tested. Interpolations and calculations are used to provide design values for the grade groups. While the Modulus of Elasticity is represented by an average value, other properties such as bending strength and compression parallel to grain are represented by a lower 5% exclusion value. The sample data is adjusted for testing conditions, adjusted to a characteristic size and ranked by value (numerical order). This procedure, following the ASTM D2915, produces a tolerance limit that provides 75% confidence that the true population 5th percentile value is higher than this estimate. This value is then used to establish the design value. Each piece or lot of visually graded lumber is not mechanically tested to verify strength properties. Since the stress ratings are representative of the entire producing region, lots from a specific location may have physical properties at the extremes of the property range or statistical distribution representing that range of strength values.

The operative words of Supplement No. 13 Appendix A are the following:

> Wood is a natural product subject to variations in geography, climate, specific site characteristics, silvacultural practices, and harvesting decisions. Its' strength properties are not only anisotropic (vary by principal axis) but also can vary with proximity to the center of the tree. These characteristics complicate the assignment of individual pieces into design value groups based on the visual appearance…..
>
> This value is then used to establish the design value. Each piece or lot of visually graded lumber is not mechanically tested to verify strength properties. Since the stress ratings are representative of the entire producing region, lots from a specific location may have physical properties at the extremes of the property range or statistical distribution representing that range of strength values.

The language removed in the final version follows:

> Designers of wood structures are cautioned to take into consideration the variability of wood within a species and grade grouping.

This language seems to be critical in that it is quite instructive as to the intentions of SPIB with respect to who is responsible for lumber design values in the context of how lumber design values are derived.

The resulting Supplement No. 13 then can be viewed, as currently written with modifications to table headings in the following manner:

> **Supplement No. 13 to the Southern Pine Inspection Bureau Grading Rules 2002 Edition Effective: June 1, 2013**
>
> This supplement makes no changes in Table 4a, Table 5, Table 8a, and the Conversion Factors for Determining Spruce Pine and Sand Pine Design Values. They have been included to consolidate visual design values into a single supplement.
>
> The following are the changes made to the design values in the 2002 SPIB Standard Grading Rules:
> 1. Incorporates Supplement 9 2x4 design values with minor changes in Tables 1a, 3, 6 (2x4 only) and 7 due to rounding factors.
> 2. Changes design values in Tables 1b, 1c, 1d, 1e, and 6 (2x6 and wider).
> 3. Appendix A has been rewritten.
>
> *Adopted by the Board of Governors of the Southern Pine Inspection Bureau*
> *Approved by the Board of Review of the American Lumber Standard Committee*

Table 1-a – STRUCTURAL LIGHT FRAMING, STRUCTURAL JOISTS AND PLANKS, AND STUDS -2" TO 4" THICK
(Each width has a separate set of design values)

GRADE	Suggested Extreme Fiber in Bending "Fb"	Suggested Tension Parallel to Grain "Ft"	Suggested Horizontal Shear "Fv"	Suggested Compression Perpendicular to Grain "Fc^"	Suggested Compression Parallel to Grain "$F_{c//}$"	Suggested Modulus of Elasticity (million psi) "E"
Kiln Dried or S-Dry, MC 15, MC 19						
APPLIES TO 2" - 4" THICK – 2" - 4" WIDE ONLY						
Dense Select Structural	2700	1900	175	660	2050	1.9
Select Structural	2350	1650	175	565	1900	1.8
Non Dense Select Structural	2050	1450	175	480	1800	1.6
No. 1 Dense	1650	1100	175	660	1750	1.8
No. 1	1500	1000	175	565	1650	1.6
No. 1 Non Dense	1300	875	175	480	1550	1.4
No. 2 Dense	1200	750	175	660	1500	1.6
No. 2	1100	675	175	565	1450	1.4
No. 2 Non Dense	1050	600	175	480	1450	1.3
No. 3 and Stud	650	400	175	565	850	1.3

Table 1-b – STRUCTURAL LIGHT FRAMING, STRUCTURAL JOISTS AND PLANKS, AND STUDS -2" TO 4" THICK
(Each width has a separate set of design values)

GRADE	Suggested Extreme Fiber in Bending "Fb"	Suggested Tension Parallel to Grain "Ft"	Suggested Horizontal Shear "Fv"	Suggested Compression Perpendicular to Grain "Fc^"	Suggested Compression Parallel to Grain "$F_{c//}$"	Suggested Modulus of Elasticity (million psi) "E"
Kiln Dried or S-Dry, MC 15, MC 19						
APPLIES TO 2" - 4" THICK – 5" - 6" WIDE ONLY						
Dense Select Structural	2400	1650	175	660	1900	1.9
Select Structural	2100	1450	175	565	1800	1.8
Non Dense Select Structural	1850	1300	175	480	1700	1.6
No. 1 Dense	1500	1000	175	660	1650	1.8
No. 1	1350	875	175	565	1550	1.6
No. 1 Non Dense	1200	775	175	480	1450	1.4
No. 2 Dense	1050	650	175	660	1450	1.6
No. 2	1000	600	175	565	1400	1.4
No. 2 Non Dense	950	525	175	480	1350	1.3
No. 3 and Stud	575	350	175	565	800	1.3

Table 1-c – STRUCTURAL LIGHT FRAMING, STRUCTURAL JOISTS AND PLANKS, AND STUDS -2” TO 4” THICK
(Each width has a separate set of design values)

GRADE	Suggested Extreme Fiber in Bending “Fb”	Suggested Tension Parallel to Grain “Ft”	Suggested Horizontal Shear “Fv”	Suggested Compression Perpendicular to Grain “Fc^”	Suggested Compression Parallel to Grain “Fc//”	Suggested Modulus of Elasticity (million psi) “E”
Kiln Dried or S-Dry, MC 15, MC 19						
APPLIES TO 2” - 4” THICK – 8” WIDE ONLY (1)						
Dense Select Structural	2200	1550	175	660	1850	1.9
Select Structural	1950	1350	175	565	1700	1.8
Non Dense Select Structural	1700	1200	175	480	1650	1.6
No. 1 Dense	1350	900	175	660	1600	1.8
No. 1	1250	800	175	565	1500	1.6
No. 1 Non Dense	1100	700	175	480	1400	1.4
No. 2 Dense	975	600	175	660	1400	1.6
No. 2	925	550	175	565	1350	1.4
No. 2 Non Dense	875	500	175	480	1300	1.3
No. 3 and Stud	525	325	175	565	775	1.3

Table 1-d – STRUCTURAL LIGHT FRAMING, STRUCTURAL JOISTS AND PLANKS, AND STUDS -2” TO 4” THICK
(Each width has a separate set of design values)

GRADE	Suggested Extreme Fiber in Bending “Fb”	Suggested Tension Parallel to Grain “Ft”	Suggested Horizontal Shear “Fv”	Suggested Compression Perpendicular to Grain “Fc^”	Suggested Compression Parallel to Grain “Fc//”	Suggested Modulus of Elasticity (million psi) “E”
Kiln Dried or S-Dry, MC 15, MC 19						
APPLIES TO 2” - 4” THICK – 10” WIDE ONLY (1)						
Dense Select Structural	1950	1300	175	660	1800	1.9
Select Structural	1700	1150	175	565	1650	1.8
Non Dense Select Structural	1500	1050	175	480	1600	1.6
No. 1 Dense	1200	800	175	660	1550	1.8
No. 1	1050	700	175	565	1450	1.6
No. 1 Non Dense	950	625	175	480	1400	1.4
No. 2 Dense	850	525	175	660	1350	1.6
No. 2	800	475	175	565	1300	1.4
No. 2 Non Dense	750	425	175	480	1250	1.3
No. 3 and Stud	475	275	175	565	750	1.3

Table 1-e – STRUCTURAL LIGHT FRAMING, STRUCTURAL JOISTS AND PLANKS, AND STUDS -2" TO 4" THICK
(Each width has a separate set of design values)

GRADE	Suggested Extreme Fiber in Bending "Fb"	Suggested Tension Parallel to Grain "Ft"	Suggested Horizontal Shear "Fv"	Suggested Compression Perpendicular to Grain "Fc^"	Suggested Compression Parallel to Grain "Fc//"	Suggested Modulus of Elasticity (million psi) "E"
Kiln Dried or S-Dry, MC 15, MC 19						
APPLIES TO 2" - 4" THICK – 12" WIDE ONLY (1), (2)						
Dense Select Structural	1800	1250	175	660	1750	1.9
Select Structural	1600	1100	175	565	1650	1.8
Non Dense Select Structural	1400	975	175	480	1550	1.6
No. 1 Dense	1100	750	175	660	1500	1.8
No. 1	1000	650	175	565	1400	1.6
No. 1 Non Dense	900	575	175	480	1350	1.4
No. 2 Dense	800	500	175	660	1300	1.6
No. 2	750	450	175	565	1250	1.4
No. 2 Non Dense	700	400	175	480	1250	1.3
No. 3 and Stud	450	250	175	565	725	1.3

Table 3 – LIGHT FRAMING – 2" TO 4" THICK

GRADE	Suggested Extreme Fiber in Bending "Fb"	Suggested Tension Parallel to Grain "Ft"	Suggested Horizontal Shear "Fv"	Suggested Compression Perpendicular to Grain "Fc^"	Suggested Compression Parallel to Grain "Fc//"	Suggested Modulus of Elasticity (million psi) "E"
Kiln Dried or S-Dry, MC 15, MC 19						
APPLIES TO 2" - 4" THICK – 2" - 4" WIDE						
Construction	875	500	175	565	1600	1.4
Standard	475	275	175	565	1300	1.2
Utility *	225	125	175	565	850	1.2

*Design values apply to 4" widths only.

DESIGN VALUES FOOTNOTES (1-12)

(1) For 4" thick material that is 8" or greater in width, the F_b value may be multiplied by 1.1.

(2) For sizes wider than 12", use 90% of the F_b, F_t, and $F_{c//}$ specified for the 12" width. Use 100% of the F_v, $F_{c\perp}$ (perpendicular-to-grain), and MOE specified for the 12" width.

(3) In construction where three or more load-carrying members such as joists, rafters, studs or decking are contiguous or are spaced not more than 24 inches in frame construction and are joined by transverse floor, roof or other load distributing elements, an increase in bending stress of 15 percent for members used in such systems is allowed as a design consideration, as provided in ASTM D1990.

(4) For flatwise use, the following adjustments apply to the F_b values. These adjustments are not applicable to the values listed in Table 5.

Nominal thickness		2" & 3"	4"
Width	4"	1.10	1.00
	5"	1.10	1.05
	6"	1.15	1.05
	8"	1.15	1.05
	10" & wider	1.20	1.10

(5) All stress rated grades under these rules are established on a basis that permits cutting graded members to shorter lengths without impairment of stress ratings in the shorter pieces.

(6) See paragraphs 163-164.4 for conditions applicable to seasoned lumber. In widths of 12" and less in lengths of 24' and less, seasoning is required for all lumber of 2" thickness and less, but has to be specified if desired for other widths and lengths or for thicknesses in excess of 2".

(7) Grade restrictions established under the SPIB Standard Grading Rules apply the entire length of each piece, and each piece therefore is suitable for use in continuous spans, over double spans or under concentrated loads without the necessity of regrading for special shear or other special stress requirements.

(8) The allowable unit stresses for all stress rated grades under these rules are for normal loading conditions and apply in all cases other than those for which special exceptions are to be made. Where a member is to be fully loaded to the maximum design stress for many years, either continuously or cumulatively, working stresses 90% of those indicated herein should be used. The stresses may be modified on a similar basis for railroad bridges and other structures that involve unusually hazardous or severe service conditions.

(9) Compression perpendicular-to-grain values are design stresses for 0.04" deformation. For design stress at 0.02" deformation, use 74% of the corresponding tabulated values.

(10) The allowable unit stresses and adjustments apply to lumber used under conditions continuously dry, as in most covered structures.