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ESR-1144

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 17 33—Wood I-Joists

REPORT HOLDER:

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EVALUATION SUBJECT:

AJS SERIES PREFABRICATED WOOD I-JOISTS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2009 *International Building Code*® (2009 IBC)
- 2009 *International Residential Code*® (2009 IRC)
- 2006 *International Building Code*® (2006 IBC)
- 2006 *International Residential Code*® (2006 IRC)

Property evaluated:

Structural

2.0 USES

The AJS series prefabricated wood I-joists are used as floor joists and blocking panels to support floor design loads.

3.0 DESCRIPTION

3.1 General:

The AJS Series prefabricated wood I-joists have solid-sawn lumber or composite lumber flanges and oriented strand board (OSB) webs. The top and bottom flanges are parallel, creating constant-depth joists. The web-to-web joints of the I-joists are square butt joints and conform to the specifications in the approved quality control manuals. The web-to-flange connection is a proprietary grooved connection, also conforming to the approved quality control manuals. The I-joists are available in various lengths and depths. See Table 1 for a description of the I-joists.

3.2 Material Specifications:

3.2.1 Flanges: The flanges of the I-joists are sawn lumber or composite lumber conforming to the specifications in the approved quality control manuals. The composite lumber flanges are $1^1/_2$-inch-by-$2^1/_2$-inch (38 by 64 mm) spruce-pine-fir (SPF) and are used interchangeably with any of the sawn lumber flanges of the same dimensions. The sawn lumber flange material, grade, width and depth are noted in Table 1.

3.2.2 Web: Web material for the I-joists is $^3/_8$-inch-thick (10 mm) or $^7/_{16}$-inch-thick (11 mm) OSB conforming to Exposure 1 requirements of DOC PS-2, with further requirements set forth in the approved quality control manuals and manufacturing standards.

3.2.3 Adhesive: Adhesives used in the fabrication of the I-joists are exterior-type, heat durable adhesives complying with ASTM D 2559 and Section 5.3.3 of ASTM D 5055-08a, and are specified in the quality control manuals and the manufacturing standards.

4.0 DESIGN AND INSTALLATION

Design of the prefabricated wood I-joists described in this report must be in accordance with the applicable code. Additionally, the design and installation of the prefabricated wood I-joists must comply with Sections 4.1 through 4.12, and the manufacturer's installation instructions.

4.1 Allowable Structural Capacity:

Reference design moments, reactions, vertical shear capacity, and I-joist stiffness (*EI*) are specified in Table 2. Reference design end reactions are based on a minimum bearing length of $1^1/_2$ inches (38 mm) for simple spans on joists having depths of $9^1/_4$ to 16 inches (235 mm to 406 mm), and $1^3/_4$ inches (44.5 mm) on joists having depths of 18 inches (457 mm) or greater. Reference design intermediate reactions are based on a minimum bearing length of $3^1/_2$ inches (89 mm) at intermediate support points for continuous spans. Floor assemblies, consisting of a minimum $^{23}/_{32}$-inch-thick (18 mm) Sturd-I-Floor rated sheathing nailed to the I-joists in accordance with the applicable code requirements and adhered to the top flanges of the I-joists using AFG-01 construction adhesive, have the allowable spans shown in Table 3.

4.2 Fasteners:

Reference withdrawal design values and lateral load values, for nails installed into the flanges, must be determined in accordance with the applicable code, using a specific gravity of 0.42. Fastener spacing must comply with the minimum spacing requirements prescribed by the applicable code for nails installed in sawn lumber.

4.3 Web Stiffeners:

Web stiffener requirements for the I-joists at reaction and concentrated load locations are noted in Figure 1.

4.4 Lateral Support:

The compression flange requires continuous lateral support, and the joist ends require restraint to prevent rollover. Methods specified in the applicable code for lateral support of sawn lumber are acceptable. Bridging is not required for floor joist applications.

4.5 Holes in I-joist Web:

Holes in the web of the I-joist are permitted. For I-joists with a simple span and supporting uniform loads only, holes in the webs must be in accordance with Tables 4 and 5 (for round holes) or Tables 6 and 7 (for square and rectangular holes). The reduced shear capacity due to the presence of holes in the web, V_{hole}, must be calculated as follows:

For round holes:

$$V_{hole} = V_r \left[B_c - M_c \left(\frac{holediameter}{joistdepth - 2\times flangedepth} \right) \right]$$

For square and rectangular holes:

$$V_{hole} = V_r \left[B_R - 0.28 \left(\frac{holedepth}{joistdepth - 2\times flangedepth} \right) - 0.29 \left(\frac{holewidth}{18} \right) \right]$$

where:

V_r is the shear value, for the joist, provided in Table 2.

B_c = 0.88 for joist depths less than or equal to 16 inches

0.91 for joist depths greater than 16 inches.

M_c = 0.69 for joist depths less than or equal to 16 inches

0.84 for joist depths greater than 16 inches

B_R = 0.60 for joist depths less than or equal to 16 inches

0.57 for joist depths greater than 16 inches

Where multiple holes occur in the web, the minimum edge-to-edge spacing between holes must be two times the size of the largest dimension of either hole.

4.6 Duration of Load:

Adjustments for duration of load must be in accordance with Sections 7.3.2 and 10.3.2 of the American Forest & Paper Association National Design Specification for Wood Construction (NDS), 2005 edition.

4.7 In-service Moisture Conditions:

I-joists must be installed in dry, covered conditions where the in-service moisture content of the wood does not exceed 16 percent.

4.8 Repetitive-member Use:

The repetitive-member use factor applicable to the resistive moment capacities listed in Table 2 is limited to 1.0.

4.9 Member Spans:

I-joist spans must be determined in accordance with Section 3.2.1 of the NDS and the applicable code. Shear calculations include all loads within the span from face to face of supports.

4.10 Deflection:

Total I-joist deflection must be calculated using the formula for deflection due to bending and the following formula for deflection due to shear:

$$\Delta_{shear} = \frac{8M}{K}$$

where:

Δ_{shear} = Deflection caused by shear stress [inches (mm)].

M = Design moment [inch-lbs (mm-N)].

K = Shear modulus constant [in-lbs/in (mm-N/mm)].

Deflection of a uniformly loaded, simple-span I-joist must be determined using the following formula:

$$\Delta_{Total} = \Delta_{bending} + \Delta_{shear} = \frac{5wL^4}{384EI} + \frac{wL^2}{K}$$

Deflection of a simple-span I-joist with a concentrated load at mid-span must be determined using the following formula:

$$\Delta_{Total} = \Delta_{bending} + \Delta_{shear} = \frac{PL^3}{48EI} + \frac{2PL}{K}$$

where:

Δ_{Total} = Total I-joist deflection [inches (mm)].

w = Applied uniform loads [lbf/inch (N/mm)].

P = Applied concentrated load [lbf (N)].

L = I-joist span [inches (mm)].

EI = I-joist stiffness from Table 2 [in^2-lbf (mm^2-N)].

M = Design moment [inch-lbs (mm-N)].

K = Shear modulus constant from Table 2 [in-lbf/in (mm-N/mm)].

4.11 Blocking Panels:

Bearing walls perpendicular to, and supported by, I-joists at the end or intermediate supports, or both, require full depth blocking. I-joists used as blocking panels must be installed between I-joists and have a maximum applicable vertical load capacity shown in Table 2.

4.12 Cantilevered Joists:

I-joists may be installed with cantilevers, provided the cantilevered portion does not exceed a maximum length equal to one-third of the adjacent span. Additionally, the cantilevered I-joist must be limited to supporting only uniform loads, unless additional design details are provided by a design professional.

5.0 CONDITIONS OF USE

The AJS Series I-joists described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 For applications based on Table 2, reference design properties for AJS I-joists, design calculations and details for specific applications must be furnished to the code official. Calculations and drawings must be prepared, signed, and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.2 Flanges of the I-joist may not be cut or notched, unless an engineered design prepared by a registered design professional is submitted to the code official for approval.

5.3 The I-joists are produced by Boise Cascade Wood Products, LLC at their plant located in St. Jacques, New Brunswick, Canada; or by Les Chantiers de Chibougamau, at their plant in Chibougamau, Quebec, Canada; or by International Beams, Inc., at their plant in Pohénégamook, Quebec, Canada. The I-joists with composite lumber flanges are produced by Boise Cascade Wood Products, LLC at the plant located in St. Jacques, New Brunswick, Canada. Quality control inspections are conducted by PFS Corporation (AA-652).

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Prefabricated Wood I-joists (AC14), dated October 2007, editorially revised February 2010.

7.0 IDENTIFICATION

AJS I-joists are identified by a stamp indicating the joist model; company name (Boise Cascade Wood Products, LLC); manufacturing location; evaluation report number (ESR-1144); and the name and logo of the inspection agency (PFS Corporation).

TABLE 1—DESCRIPTION FOR AJS I-JOISTS

JOIST SERIES	FLANGE		WEB MATERIAL	RANGE OF JOIST DEPTHS (inches)
	Material[1]	Dimensions (depth x width) (inches)		
AJS-5	APG SPF	1.5 x 2.5	$^3/_8$-inch OSB	$9^1/_2$ to $11^7/_8$
AJS-10	APG Black Spruce	1.5 x 2.5	$^3/_8$-inch OSB	$9^1/_2$ to 16
AJS-20	MSR 2100F_b – 1.8E	1.5 x 2.5	$^3/_8$-inch OSB	$9^1/_2$ to 16
AJS-140	APG SPF	1.5 x 2.5	$^3/_8$-inch OSB	$9^1/_2$ to 16
AJS-150	MSR 1650F_b – 1.5E	1.5 x 2.5	$^3/_8$-inch OSB	$9^1/_2$ to 16
AJS-160	MSR 1800F_b – 1.6E	1.5 x 2.5	$^3/_8$-inch OSB	$9^1/_2$ to 16
AJS-170	MSR 1950F_b – 1.7E	1.5 x 2.5	$^3/_8$-inch OSB	$9^1/_2$ to 16
AJS-180	MSR 2100F_b – 1.8E	1.5 x 2.5	$^3/_8$-inch OSB	$9^1/_2$ to 16
AJS-190	MSR 2250F_b – 1.9E	1.5 x 2.5	$^3/_8$-inch OSB	$9^1/_4$ to 16
AJS-200	MSR 2400F_b – 2.0E	1.5 x 2.5	$^3/_8$-inch OSB	$9^1/_2$ to 16
AJS-25	MSR 2100F_b – 1.8E	1.5 x 3.5	$^3/_8$-inch OSB	$9^1/_2$ to 16
			$^7/_{16}$-inch OSB	18 to 24
AJS-30	MSR 2400F_b – 2.0E	1.5 x 3.5	$^7/_{16}$-inch OSB	18 to 24

For **SI:** 1 inch = 25.4 mm.

[1]APG = AJS Proprietary Grade
SPF = Spruce-pine-fir
MSR = Machine Stress Rated lumber

TABLE 2—REFERENCE DESIGN PROPERTIES FOR AJS I-JOISTS[1]

JOIST SERIES	DEPTH (in.)	MOMENT M_r (ft-lb)	SHEAR V_r (lb)	EI[2] X 10^6 (lb-in^2)	K[2] x 10^6 (in-lb/in)	END REACTION, R_r (lb)[9]				INTERMEDIATE REACTION, R_r (lb)[9]				BLOCKING PANEL[6] (lb/ft)	WEIGHT (lb/ft)
						With $1^1/_2$" Bearing[3,7]		With $3^1/_2$" Bearing		With $3^1/_2$" Bearing[3]		With $5^1/_4$" Bearing			
						No[4]	Yes[5]	No[4]	Yes[5]	No[4]	Yes[5]	No[4]	Yes[5]		
AJS-5	$9^1/_2$	2,175	1,160	182	5.2	950	1,200	1,175	1,480	2,350	2,450	2,350	2,450	1,875	2.2
	$11^7/_8$	2,820	1,490	310	6.6	955	1,335	1,215	1,595	2,390	2,800	2,390	2,800	1,680	2.5
AJS-10	$9^1/_2$	2,960	1,160	232	5.2	950	1,240	1,175	1,480	2,350	2,450	2,350	2,450	1,875	2.5
	$11^7/_8$	3,835	1,490	394	6.6	955	1,335	1,215	1,595	2,390	2,800	2,390	2,800	1,680	2.8
	14	4,620	1,790	578	7.8	960	1,420	1,250	1,700	2,430	3,130	2,430	3,130	1,500	3.0
	16	5,355	2,065	786	9.0	970	1,500	1,285	1,800	2,465	3,435	2,465	3,435	1,340	3.3
AJS-20	$9^1/_2$	3,395	1,160	232	5.2	950	1,240	1,175	1,480	2,350	2,450	2,350	2,450	1,875	2.5
	$11^7/_8$	4,400	1,490	394	6.6	955	1,335	1,215	1,595	2,390	2,800	2,390	2,800	1,680	2.8
	14	5,295	1,790	578	7.8	960	1,420	1,250	1,700	2,430	3,130	2,430	3,130	1,500	3.0
	16	6,140	2,065	786	9.0	970	1,500	1,285	1,800	2,465	3,435	2,465	3,435	1,340	3.3
AJS-140	$9^1/_2$	2,450	1,160	182	5.2	950	1,240	1,175	1,480	2,350	2,450	2,350	2,450	1,875	2.2
	$11^7/_8$	3,175	1,490	310	6.6	955	1,335	1,215	1,595	2,390	2,800	2,390	2,800	1,680	2.5
	14	3,825	1,790	457	7.8	960	1,420	1,250	1,700	2,430	3,130	2,430	3,130	1,500	2.8
	16	4,435	2,065	623	9.0	970	1,500	1,285	1,800	2,465	3,435	2,465	3,435	1,340	3.1
AJS-150	$9^1/_2$	2,820	1,160	194	5.2	950	1,240	1,175	1,480	2,350	2,450	2,350	2,450	1,875	2.2
	$11^7/_8$	3,650	1,490	331	6.6	955	1,335	1,215	1,595	2,390	2,800	2,390	2,800	1,680	2.5
	14	4,390	1,790	487	7.8	960	1,420	1,250	1,700	2,430	3,130	2,430	3,130	1,500	2.7
	16	5,090	2,065	664	9.0	970	1,500	1,285	1,800	2,465	3,435	2,465	3,435	1,340	3.0
AJS-160	$9^1/_2$	3,057	1,160	207	5.2	950	1,240	1,175	1,480	2,350	2,450	2,350	2,450	1,875	2.4
	$11^7/_8$	3,959	1,490	352	6.6	955	1,335	1,215	1,595	2,390	2,800	2,390	2,800	1,680	2.7
	14	4,767	1,790	517	7.8	960	1,420	1,250	1,700	2,430	3,130	2,430	3,130	1,500	2.9
	16	5,527	2,065	705	9.0	970	1,500	1,285	1,800	2,465	3,435	2,465	3,435	1,340	3.2
AJS-170	$9^1/_2$	3,300	1,160	219	5.2	950	1,240	1,175	1,480	2,350	2,450	2,350	2,450	1,875	2.5
	$11^7/_8$	4,270	1,490	372	6.6	955	1,335	1,215	1,595	2,390	2,800	2,390	2,800	1,680	2.8
	14	5,140	1,790	547	7.8	960	1,420	1,250	1,700	2,430	3,130	2,430	3,130	1,500	3.0
	16	5,960	2,065	746	9.0	970	1,500	1,285	1,800	2,465	3,435	2,465	3,435	1,340	3.3
AJS-180	$9^1/_2$	3,640	1,160	232	5.2	950	1,240	1,175	1,480	2,350	2,450	2,350	2,450	1,875	2.5
	$11^7/_8$	4,710	1,490	394	6.6	955	1,335	1,215	1,595	2,390	2,800	2,390	2,800	1,680	2.8
	14	5,675	1,790	578	7.8	960	1,420	1,250	1,700	2,430	3,130	2,430	3,130	1,500	3.0
	16	6,580	2,065	786	9.0	970	1,500	1,285	1,800	2,465	3,435	2,465	3,435	1,340	3.3
AJS-190	$9^1/_4$	3,770	1,125	229	5.1	950	1,185	1,170	1,480	2,350	2,450	2,350	2,450	1,875	2.5
	$9^1/_2$	3,895	1,160	244	5.2	950	1,200	1,175	1,480	2,350	2,450	2,350	2,450	1,875	2.5
	$11^1/_4$	4,740	1,400	365	6.2	955	1,280	1,205	1,595	2,390	2,800	2,390	2,800	1,680	2.8
	$11^7/_8$	5,045	1,490	414	6.6	955	1,335	1,215	1,595	2,390	2,800	2,390	2,800	1,680	2.8
	14	6,070	1,790	608	7.8	960	1,420	1,250	1,700	2,430	3,130	2,430	3,130	1,500	3.0
	16	7,040	2,065	827	9.0	970	1,500	1,285	1,800	2,465	3,435	2,465	3,435	1,340	3.3
AJS-200	$9^1/_2$	4,155	1,160	257	5.2	950	1,240	1,175	1,480	2,350	2,450	2,350	2,450	1,875	2.6
	$11^7/_8$	5,385	1,490	435	6.6	955	1,335	1,215	1,595	2,390	2,800	2,390	2,800	1,680	2.9
	14	6,485	1,790	638	7.8	960	1,420	1,250	1,700	2,430	3,130	2,430	3,130	1,500	3.1
	16	7,515	2,065	868	9.0	970	1,500	1,285	1,800	2,465	3,435	2,465	3,435	1,340	3.4
AJS-25	$9^1/_2$	5,370	1,160	322	5.3	950	1,240	1,175	1,480	2,600	2,850	2,600	2,850	1,875	3.1
	$11^7/_8$	6,960	1,490	545	6.7	955	1,335	1,215	1,595	2,690	3,190	2,690	3,190	1,680	3.4
	14	8,380	1,790	798	7.9	960	1,420	1,250	1,700	2,770	3,500	2,770	3,500	1,500	3.7
	16	9,720	2,065	1,082	9.1	970	1,505	1,285	1,800	2,850	3,800	2,850	3,800	1,340	3.9
	18	10,975	3,010	1,427	12.3	N/A	2,240[7]	N/A	2,620	N/A	4,720	N/A	4,720	3,200[8]	4.6
	20	12,270	3,240	1,813	13.7		2,490[7]		2,980		5,110		5,110		4.9
	22	13,455	3,470	2,249	15.0		2,490[7]		3,150		5,230		5,505	2,700[8]	5.1
	24	14,625	3,690	2,737	16.5		2,490[7]		3,320		5,345		5,900		5.4
AJS-30	18	13,905	3,010	1,575	12.3	N/A	2,240[7]	N/A	2,620	N/A	4,720	N/A	4,720	3,200[8]	4.6
	20	15,540	3,240	1,998	13.7		2,490[7]		2,980		5,110		5,110		4.9
	22	17,040	3,470	2,477	15.0		2,490[7]		3,150		5,230		5,505	2,700[8]	5.1
	24	18,525	3,690	3,012	16.5		2,490[7]		3,320		5,345		5,900		5.4

For **SI:** 1 inch = 25.4 mm; 1 ft-lb = 1.36 N-m; 1 in^2-lb = 179 mm^2-N, 1 in-lb/in = 4.4 N-mm/mm; 1 lb = 4.45 N; 1 lb/ft = 14.6 N/m.

[1] For I-joist description, see Table 1.
[2] Deflections are calculated using standard engineering formulae for bending deflection and 8M/K for shear deflection. Refer to Section 4.10 in this report.
[3] Minimum bearing length required.
[4] No = Web stiffener is not required.
[5] Yes = Web stiffener required. See Figure 1.
[6] Allowable vertical load capacity for I-joists used as blocking panels.
[7] For I-joists with depths greater than or equal to 18 inches, the minimum end bearing length must be $1^3/_4$ inches.
[8] Web stiffeners required at each end of blocking panel. See Figure 1. Distance between stiffeners must be ≤ 24 inches.
[9] The tabulated *reference* design reaction values, R_r, are for normal duration of load and are permitted to be adjusted for other load durations in accordance with the NDS, provided the *adjusted* design reaction, R_r', does not exceed the adjusted flange bearing capacity, $P_{c\perp}'$, calculated as follows:

$P_{c\perp}' = F_{c\perp}' \ell_b (w_f - 0.15)$

where: $F_{c\perp}'$ = 425 psi for end reactions, 470 psi for $3^1/_2$-inch intermediate reactions, and 455 psi for $5^1/_4$-inch intermediate reactions.
ℓ_b = Bearing length in inches.
w_f = The nominal width of the flange in inches.

TABLE 3—AJS ALLOWABLE FLOOR SPANS[1,2,3,4,5,6,7]

SERIES	DEPTH (inches)	ON-CENTER SPACING			
		12 inches	16 inches	19.2 inches	24 inches
AJS-5	9 1/2	18' - 6"	16' - 0"	14' - 7"	13' - 0"
	11 7/8	21' - 1"	18' - 3"	16' - 7"	14' - 10"
AJS-10	9 1/2	21 '- 2"	18' - 8"	17' – 0"	15' - 3"
	11 7/8	24' – 7"	21' - 3"	19' - 5"	17' - 4"
	14	27' - 0"	23' - 5"	21' - 4"	18' – 11"
	16	29' - 1"	25' - 2"	23' - 0"	*20' – 4"
AJS-20	9 1/2	21' - 2"	19' - 4"	18' - 3"	16' - 4"
	11 7/8	25' - 2"	22' - 10"	20' - 10"	18' - 7"
	14	28' - 6"	25' – 0"	22' - 10"	*20' – 3"
	16	31' - 2"	27' - 0"	*24' – 5"	*21' – 10"
AJS-140	9 1/2	19' - 9"	17' - 0"	15' - 6"	13' - 10"
	11 7/8	22' - 4"	19' - 4"	17' - 8"	15' - 9"
	14	24' - 7"	21' - 3"	19' - 5"	17' - 4"
	16	26' - 6"	22' - 11"	20' - 11"	18' - 8"
AJS-150	9 1/2	20' - 1"	18' - 3"	16' - 7"	14' - 10"
	11 7/8	23' - 11"	20' - 9"	18' - 11"	16' - 11"
	14	26' - 4"	22' - 9"	20' - 9"	18' - 7"
	16	28' - 5"	24' - 7"	22' - 5"	*19' – 10"
AJS-160	9 1/2	20' - 5"	18' - 9"	17' - 4"	15' - 6"
	11 7/8	24' - 4"	21' - 8"	19' - 9"	17' - 8"
	14	27' - 5"	23' - 9"	21' - 8"	*19' – 2"
	16	29' - 7"	25' - 7"	23' - 4"	*20' – 8"
AJS-170	9 1/2	20' - 9"	19' - 0"	18' - 0"	16' - 1"
	11 7/8	24' - 9"	22' - 6"	20' - 6"	18' - 4"
	14	28' - 1"	24' - 8"	22' - 6"	*19' – 11"
	16	30' - 9"	26' - 7"	24' – 1"	*21' – 6"
AJS-180	9 1/2	21' - 2"	19' - 4"	18' - 3"	16' – 11"
	11 7/8	25' - 2"	23' - 0"	21' - 4"	*19' – 1"
	14	28' - 6"	25' - 8"	23' - 8"	*21' – 0"
	16	31' - 7"	27' - 11"	*25' – 4"	*22' - 7"
AJS-190	9 1/4	21'-0"	19'-3"	18'-2"	16'-11"
	9 1/2	21' - 5"	19' - 7"	18' - 6"	17' - 3"
	11 1/4	24'-6"	22'-4"	21'-2"	*19' – 2"
	11 7/8	25' - 6"	23' - 4"	22' - 0"	*19' – 9"
	14	28' - 11"	26' - 5"	*24' – 4"	*21' – 8"
	16	32' - 0"	28' - 11"	*26' – 2"	*23' - 5"
AJS-200	9 1/2	21' - 9"	19' - 11"	18' - 10"	17' - 6"
	11 7/8	25' - 11"	23' - 8"	22' - 4"	*20' – 5"
	14	9' - 4"	26' - 10"	*25' - 4"	*22' – 5"
	16	32' - 6"	*29' - 8"	*27' – 1"	*24' - 2"
AJS25	9 1/2	23' - 3"	21' – 3"	20' – 1"	18' - 8"
	11 7/8	27' - 8"	25' - 3"	23' - 10"	*22' - 2"
	14	31' - 5"	28' – 8"	*27' – 0"	*24' – 8"
	16	34' - 9"	*31' – 8"	*29' – 11"	*25' – 4"
	18	38'-2"	34'-10"	32'-11"	29'-6"
	20	41'-4"	37'-8"	34'-10"	31'-2"
	22	44'-4"	40'-0"	36'-6"	32'-8"
	24	47'-4"	41'-9"	38'-1"	34'-0"
AJS30	18	39'-4"	35'-10"	33'-10"	31'-6"
	20	42'-6"	38'-10"	36'-7"	34'-1"
	22	45'-8"	41'-8"	39'-4"	36'-8"
	24	48'-9"	44'-8"	42'-0"	38'-4"

For **SI:** 1 inch = 25.4 mm; 1 psf = 47.88 Pa.

[1]For assemblies consisting of minimum 23/32-inch-thick Sturd-I-Floor rated sheathing nailed to the I-joists in accordance with the applicable code and adhered to the top flanges of the I-joists using AFG-01 construction adhesive.
[2]Spans are based on a uniform residential floor loading of 40 psf live load and 10 psf dead load.
[3]Spans are for simply supported joists.
[4]Minimum end bearing length is 1 1/2 inches for joist depths 16 inches or less, and 1 3/4 inches for joist depths 18 inches or greater, except for spans* (marked with an asterisk) which must have a minimum 3 1/2-inch bearing length.
[5]Maximum spans are measured in accordance with Section 4.9, and are based on uniformly loaded joists.
[6]Live load deflection must be limited to L/360; total load deflection must be limited to L/240.
[7]Allowable spans take into consideration the composite effect from the glued and nailed subfloor for deflection purposes.

TABLE 4—MINIMUM DISTANCE FROM INSIDE FACE OF SUPPORT TO NEAREST EDGE OF ROUND HOLE FOR JOIST DEPTHS OF 9 1/2 TO 16 INCHES [1,2,3,4,5,6]

SPAN (ft)	MINIMUM DISTANCE (ft-in)										
	Based on Joist Depth (in)										
	9 1/2		11 7/8		14			16			
	And Based on Hole Diameter (in)										
	3	6	3	6	3	6	9	3	6	9	12
8	1' - 0"	2' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"
10	1' - 0"	3' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"
12	1' - 0"	4' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	2' - 0"
14	1' - 6"	5' - 6"	1' - 0"	1' - 6"	1' - 0"	1' - 0"	2' - 0"	1' - 0"	1' - 0"	1' - 0"	3' - 0"
16	2' - 6"	6' - 6"	1' - 0"	3' - 0"	1' - 0"	1' - 0"	3' - 6"	1' - 0"	1' - 0"	1' - 0"	4' - 0"
18	3' - 6"	8' - 0"	1' - 0"	4' - 0"	1' - 0"	1' - 0"	4' - 6"	1' - 0"	1' - 0"	1' - 6"	5' - 0"
20	4' - 6"	9' - 0"	1' - 6"	5' - 6"	1' - 0"	2' - 0"	5' - 6"	1' - 0"	1' - 0"	3' - 0"	6' - 6"
22	6' - 0"	10' - 6"	2' - 6"	6' - 0"	1' - 0"	3' - 0"	7' - 0"	1' - 0"	1' - 0"	4' - 0"	7' - 6"
24	7' - 0"	11' - 6"	3' - 6"	7' - 6"	1' - 0"	4' - 6"	8' - 0"	1' - 0"	1' - 6"	5' - 0"	9' - 0"
26	—	—	5' - 0"	8' - 6"	2' - 0"	5' - 6"	9' - 0"	1' - 0"	3' - 0"	6' - 0"	10' - 0"
28	—	—	6' - 0"	10' - 0"	3' - 0"	6' - 6"	10' - 6"	1' - 0"	4' - 0"	7' - 6"	11' - 6"
30	—	—	—	—	4' - 0"	7' - 6"	11' - 6"	1' - 6"	5' - 0"	8' - 6"	12' - 6"
32	—	—	—	—	5' - 6"	9' - 0"	13' - 0"	3' - 0"	6' - 0"	9' - 6"	14' - 0"
34	—	—	—	—	—	—	—	4' - 0"	7' - 0"	11' - 0"	15' - 0"

For **SI:** 1 inch = 25.4 mm; 1 psf = 47.88 Pa.

[1]Table is based on simple span, uniform loading of 40 psf (live) and 15 psf (dead), joist spacing less than or equal to 24 inches and reference design shear values.
[2]For multiple span or concentrated loads, shear at the hole location must not exceed what a uniform load would produce in a simple span at the distance shown in the table.
[3]Where more than one hole is desired, the length of web between holes must be equal to twice the diameter of the largest hole.
[4]Flanges may not be cut or notched.
[5]A 1 1/2-inch-diameter hole may be cut anywhere in the web.
[6]See Figure 2 in this report for details.

TABLE 5—MINIMUM DISTANCE FROM INSIDE FACE OF SUPPORT TO NEAREST EDGE OF ROUND HOLE FOR JOIST DEPTHS OF 18 TO 24 INCHES [1,2,3,4,5,6]

SPAN (ft)	MINIMUM DISTANCE (ft-in)											
	Based on Joist Depth (in)											
	18			20			22			24		
	And Based on Hole Diameter (in)											
	4.5	9	13.5	5	10	15	5.5	11	16.5	6	12	18
10	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"
12	1' - 0"	1' - 0"	2' - 0"	1' - 0"	1' - 0"	1' - 6"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"	1' - 0"
14	1' - 0"	1' - 0"	3' - 6"	1' - 0"	1' - 0"	2' - 6"	1' - 0"	1' - 0"	1' - 6"	1' - 0"	1' - 0"	1' - 0"
16	1' - 0"	1' - 0"	4' - 6"	1' - 0"	1' - 0"	3' - 6"	1' - 0"	1' - 0"	2' - 6"	1' - 0"	1' - 0"	2' - 0"
18	1' - 0"	1' - 0"	5' - 6"	1' - 0"	1' - 0"	4' - 6"	1' - 0"	1' - 0"	4' - 0"	1' - 0"	1' - 0"	3' - 0"
20	1' - 0"	1' - 0"	7' - 0"	1' - 0"	1' - 0"	6' - 0"	1' - 0"	1' - 0"	5' - 0"	1' - 0"	1' - 0"	4' - 0"
22	1' - 0"	1' - 0"	8' - 0"	1' - 0"	1' - 0"	7' - 0"	1' - 0"	1' - 0"	6' - 0"	1' - 0"	1' - 0"	5' -6"
24	1' - 0"	1' - 0"	9' - 6"	1' - 0"	1' - 0"	8' - 6"	1' - 0"	1' - 0"	7' - 6"	1' - 0"	1' - 0"	6' -6"
26	1' - 0"	2' - 0"	10' - 6"	1' - 0"	1' - 0"	9' - 6"	1' - 0"	1' - 0"	8' - 6"	1' - 0"	1' - 0"	7' -6"
28	1' - 0"	3' - 6"	12' - 0"	1' - 0"	2' - 0"	10' - 6"	1' - 0"	1' - 0"	9' - 6"	1' - 0"	1' - 0"	9' -0"
30	1' - 0"	4' - 6"	13' - 0"	1' - 0"	3' - 0"	12' - 0"	1' - 0"	2' - 0"	11' - 0"	1' - 0"	1' - 0"	10' -0"
32	1' - 0"	5' - 6"	14' - 6"	1' - 0"	4' - 0"	13' - 0"	1' - 0"	3' - 0"	12' - 0"	1' - 0"	2' - 0"	11' -6"
34	1' - 0"	6' - 6"	15' - 6"	1' - 0"	5' - 6"	14' - 6"	1' - 0"	4' - 0"	13' - 6"	1' - 0"	3' - 0"	12' -6"
36	1' - 0"	7' - 6"	17' - 0"	1' - 0"	6' - 6"	15' - 6"	1' - 0"	5' - 0"	14' - 6"	1' - 0"	4' - 0"	13' -6"
38	1' - 6"	9' - 0"	18' - 0"	1' - 0"	7' - 6"	17' - 0"	1' - 0"	6' - 0"	16' - 0"	1' - 0"	5' - 0"	15' -0"
40	—	—	—	1' - 0"	8' - 6"	18' - 0"	1' - 0"	7' - 6"	17' - 0"	1' - 0"	6' - 0"	16' -0"

For **SI:** 1 inch = 25.4 mm; 1 psf = 47.88 Pa.

[1]Table is based on simple span, uniform loading of 40 psf (live) and 15 psf (dead), joist spacing less than or equal to 24 inches and reference design shear values.
[2]For multiple span or concentrated loads, shear at the hole location must not exceed what a uniform load would produce in a simple span at the distance shown in the table.
[3]Where more than one hole is desired, the length of web between holes must be equal to twice the diameter of the largest hole.
[4]Flanges may not be cut or notched.
[5]A 1 1/2- inch-diameter-hole may be cut anywhere in the web.
[6]See Figure 2 in this report for details.

TABLE 6—MINIMUM DISTANCE FROM INSIDE FACE OF SUPPORT TO NEAREST EDGE OF RECTANGULAR HOLE FOR JOIST DEPTHS OF 9 1/2 TO 16 INCHES [1,2,3,4,5,6]

SPAN (ft)	MINIMUM DISTANCE (ft-in)												
	Based on Joist Depth (in)												
	9 1/2				11 7/8				14			16	
	And Based on Hole Dimensions (in)												
	5 x 8	5 x 10	5 x 12	5 x 14	7 x 10	7 x 12	7 x 14	7 x 16	10 x 12	10 x 14	10 x 16	12 x 14	12 x 16
8	1' - 6"	2' - 0"	2' - 6"	3' - 0"	1' - 6"	2' - 0"	2' - 6"	3' - 0"	2' - 0"	2' - 6"	3' - 0"	2' - 6"	3' - 0"
10	3' - 0"	3' - 0"	3' - 6"	4' - 0"	2' - 6"	3' - 0"	3' - 6"	4' - 0"	3' - 0"	3' - 6"	4' - 6"	3' - 6"	4' - 6"
12	4' - 0"	4' - 6"	5' - 0"	5' - 6"	3' - 6"	4' - 0"	5' - 0"	5' - 6"	4' - 6"	5' - 0"	5' - 6"	4' - 6"	5' – 6"
14	5' – 0"	5' – 6"	6' – 0"	6' – 6"	5' – 0"	5' – 6"	6' – 0"	6' – 6"	5' – 6"	6' – 0"	—	6' – 0"	—
16	6' – 6"	7' – 0"	7' – 6"	—	6' – 0"	6' – 6"	7' – 6"	—	6' – 6"	7' – 6"	—	7' – 0"	—
18	7' – 6"	8' – 0"	8' – 6"	—	7' – 6"	8' – 0"	8' – 6"	—	8' – 0"	—	—	8' – 6"	—
20	9' – 0"	9' – 6"	—	—	8' – 6"	9' – 0"	—	—	9' – 0"	—	—	9' – 6"	—
22	10' – 0"	10' – 6"	—	—	10' – 0"	10' – 6"	—	—	10' – 6"	—	—	—	—
24	11' – 6"	—	—	—	11' – 0"	11' – 6"	—	—	—	—	—	—	—
26	—	—	—	—	12' – 6"	—	—	—	—	—	—	—	—
28	—	—	—	—	13' – 6"	—	—	—	—	—	—	—	—
30	—	—	—	—	—	—	—	—	—	—	—	—	—
32	—	—	—	—	—	—	—	—	—	—	—	—	—
34	—	—	—	—	—	—	—	—	—	—	—	—	—

For **SI:** 1 inch = 25.4 mm; 1 psf = 47.88 Pa.

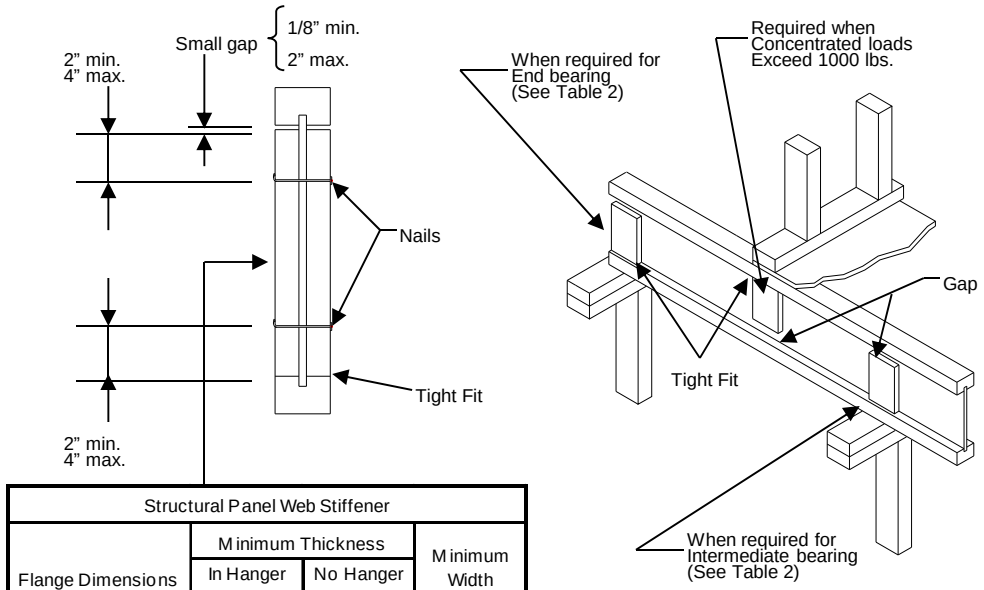
[1]Table is based on simple span, uniform loading of 40 psf (live) and 15 psf (dead), joist spacing less than or equal to 24 inches and reference design shear values.
[2]For multiple span or concentrated loads, shear at the hole location must not exceed what a uniform load would produce in a simple span at the distance shown in the table.
[3]Where more than one hole is desired, the length of web between holes must be equal to twice the greatest dimension of the largest hole.
[4]Flanges may not be cut or notched.
[5]A 1 1/2-inch-diameter hole may be cut anywhere in the web.
[6]See Figure 2 in this report for details.

TABLE 7—MINIMUM DISTANCE FROM INSIDE FACE OF SUPPORT TO NEAREST EDGE OF SQUARE HOLE FOR JOIST DEPTHS OF 18 TO 24 INCHES [1,2,3,4,5,6]

SPAN (ft)	MINIMUM DISTANCE (ft-in)											
	Based on Joist Depth (in)											
	18			20			22			24		
	And Based on Hole Dimensions (in)											
	10 x 10	12 x 12	14 x 14	12 x 12	14 x 14	16 x 16	12 x 12	14 x 14	16 x 16	14 x 14	16 x 16	18 x 18
8	1' - 0"	1' - 0"	2' - 0"	1' - 0"	1' - 0"	3' - 0"	1' - 0"	1' - 0"	2' - 0"	1' - 0"	1' - 0"	3' - 6"
10	1' - 0"	1' - 0"	3' - 6"	1' - 0"	2' - 0"	4' - 6"	1' - 0"	1' - 0"	3' - 0"	1' - 0"	2' - 0"	4' - 6"
12	1' - 0"	2' - 0"	4' - 6"	1' - 0"	3' - 0"	5' - 6"	1' - 0"	2' - 0"	4' - 6"	1' - 0"	3' - 0"	4' - 6"
14	1' - 0"	3' - 6"	6' - 0"	2' - 0"	4' - 6"	—	1' - 0"	3' - 0"	5' - 6"	2' - 0"	4' - 6"	—
16	2' - 6"	4' - 6"	7' - 0"	3' - 0"	5' - 6"	—	2' - 0"	4' - 6"	7' - 0"	3' - 0"	5' - 6"	—
18	3' - 6"	5' - 6"	8' - 6"	4' - 6"	7' - 0"	—	3' - 0"	5' - 6"	8' - 0"	4' - 6"	7' - 0"	—
20	4' - 6"	7' - 0"	9' - 6"	5' - 6"	8' - 0"	—	4' - 0"	6' - 6"	9' - 6"	5' - 6"	8' - 0"	—
22	5' - 6"	8' - 0"	—	6' - 6"	9' - 0"	—	5' - 6"	8' - 0"	10' - 6"	6' - 6"	9' - 6"	—
24	7' - 0"	9' - 6"	—	8' - 6"	10' - 6"	—	6' - 6"	9' - 0"	—	8' - 0"	10' - 6"	—
26	8' - 0"	10' - 6"	—	9' - 0"	12' - 0"	—	7' - 6"	10' - 6"	—	9' - 0"	12' - 0"	—
28	9' - 0"	12' - 0"	—	10' - 6"	13' - 0"	—	9' - 0"	11' - 6"	—	10' - 6"	13' - 0"	—
30	10' - 6"	13' - 0"	—	11' - 6"	14' - 6"	—	10' - 0"	13' - 0"	—	11' - 6"	14' - 6"	—
32	11' - 6"	14' - 6"	—	13' - 0"	15' - 6"	—	11' - 6"	14' - 0"	—	12' - 6"	15' - 6"	—
34	13' - 0"	15' - 6"	—	14' - 0"	—	—	12' - 6"	15' - 6"	—	14' - 0"	—	—

For **SI:** 1 inch = 25.4 mm; 1 psf = 47.88 Pa.

[1]Table is based on simple span, uniform loading of 40 psf (live) and 15 psf (dead), joist spacing less than or equal to 24 inches and reference design shear values.
[2]For multiple span or concentrated loads, shear at the hole location must not exceed what a uniform load would produce in a simple span at the distance shown in the table.
[3]Where more than one hole is desired, the length of web between holes must be equal to twice the greatest dimension of the largest hole.
[4]Flanges may not be cut or notched.
[5]A 1 1/2-inch-diameter hole may be cut anywhere in the web.
[6]See Figure 2 in this report for details.



Structural Panel Web Stiffener			
Flange Dimensions	Minimum Thickness		Minimum Width
	In Hanger	No Hanger	
1.5" x 2.5"	1"	1-1/2"	2-5/16"
1.5" x 3.5"	2x4 lumber (vertical)		

Web Stiffener Fastener Schedule	
Joist Depth	Minimum Required Fasteners
9-1/4"	3-10d (3" x 0.125")
9-1/2"	3-10d (3" x 0.125")
11-1/4"	3-10d (3" x 0.125")
11-7/8"	3-10d (3" x 0.125")
14"	5-10d (3" x 0.125")
16"	5-10d (3" x 0.125")
18"	5-10d (3" x 0.125")
20"	5-10d (3" x 0.125")
22"	5-10d (3" x 0.125")
24"	5-10d (3" x 0.125")

[1]Nails shall be equally spaced vertically.

[2]Stiffeners are required on all joists supported by U-type hangers when the sides of the hanger do not extend up far enough to support the top flanges laterally.

FIGURE 1—WEB STIFFENER INSTALLATION REQUIREMENTS

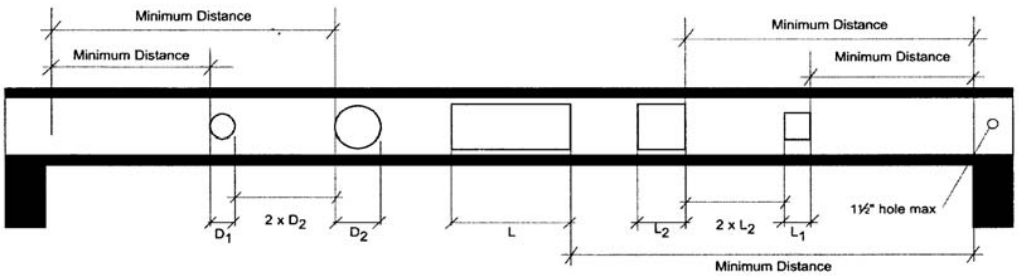


FIGURE 2—HOLE IN WEB REQUIREMENTS

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VAR-1017

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 17 13—Laminated Veneer Lumber
Section: 06 17 33—Wood I-joists
Section: 06 18 13—Glued-Laminated Beams

REPORT HOLDER:

BOISE CASCADE WOOD PRODUCTS, LLC
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WHITE CITY, OREGON 97503-0400
(208) 384-6153
http://www.bcewp.com

EVALUATION SUBJECT:

Structural Wood Products:

BCI® Wood I-Joists
ALLJoist® Wood I-Joists
VERSA-LAM® Laminated Veneer Lumber
VERSA-STUD® Laminated Veneer Lumber
VERSA-RIM® Laminated Veneer Lumber
BOISE GLULAM® Beams

Software Products:

BOISE CASCADE SOFTWARE SOLUTIONS (BC CALC®, BC FRAMER® AND BOISE TQBuild™)

1.0 EVALUATION SCOPE

Compliance with the following evaluation guidelines:

- ICC-ES Evaluation Guideline for Determination of Biobased Material Content (EG102), dated October 2008
- ICC-ES Evaluation Guideline for Determination of Regionally Extracted, Harvested or Manufactured Materials or Products (EG104), dated October 2008
- ICC-ES Evaluation Guideline for Determination of Formaldehyde Emissions of Composite Wood and Engineered Wood Products (EG108), dated October 2008
- ICC-ES Evaluation Guideline for Determination of Certified Wood and Certified Wood Content in Products (EG109), dated October 2008

Compliance eligibility with the applicable sections of the following green building rating systems, standards and codes:

- National Green Building Standard (ICC 700-2008) (see Table 2 for details)
- LEED for Homes 2008 (see Table 3 for details)
- LEED 2009 for New Construction and Major Renovations (see Table 4 for details)
- LEED 2009 for Schools New Construction and Major Renovations (see Table 5 for details)
- LEED for Core and Shell 2009 (see Table 6 for details)
- LEED for Commercial Interiors 2009 (see Table 7 for details)
- LEED for Existing Buildings 2008 (see Table 8 for details)
- 2010 California Green Building Standards Code (CALGreen), Title 24, Part 11 (see Table 9 for details)
- ANSI/GBI 01-2010 - Green Building Assessment Protocol for Commercial Construction (see Table 10 for details)
- International Green Construction Code – Public Version 2.0 (IGCC PV2.0) (see Table 11 for details)
- ANSI/ASHRAE/USGBC/IES Standard 189.1-2009 – Standard for the Design of High-Performance Green Buildings, Except Low-Rise Residential Buildings (see Table 12 for details)

2.0 USES

Boise Cascade structural wood products are used for a variety of interior and exterior framing and sheathing applications. Boise Cascade software assists designers and builders to optimize cut packages and designs as well as customize designs for optimization of resources that assists in the optimal use of materials and minimization of waste.

3.0 DESCRIPTION

3.1 Boise Cascade Structural Wood Products:

Boise Cascade structural wood products are manufactured from various wood species bonded with structural adhesives (where applicable) complying with applicable ICC-ES reports as indicated in Table 1.

3.2 Boise Cascade Software:

BC CALC® software provides single member design and structural solutions to given inputs. The software output provides a ratio of actual design versus allowable design and a selection list of optimal solutions for the given input conditions.

BC FRAMER® software provides optimized framing layouts to assist in the proper placement of product at the jobsite. The input data is verified through links to the BC CALC® software to verify that the products selected are acceptable structurally for the given load and span conditions.

BOISE TQBuild™ software allows dealers and builders to integrate design information into pre-cut framing packages, which results in optimization of inventory and minimization of waste.

4.0 CONDITIONS

4.1 Code Compliance:

The Boise Cascade structural products that have been evaluated for compliance with, or otherwise deemed to comply with, the requirements of the International Codes are listed in Table 1 of this report.

The evaluation of the BOISE GLULAM beams and BC CALC®, BC FRAMER® and BOISE TQBuild™ optimization software for compliance with the requirements of the International Codes is outside the scope of this evaluation report. Compliance with all applicable code requirements must be demonstrated to the satisfaction of the Authority Having Jurisdiction (AHJ).

4.2 Green Rating Systems, Standards and Code Eligibility:

The information presented in Tables 2 through 12 of this report provides a matrix of areas of evaluation and corresponding limitations and/or additional project-specific requirements, and offer benefit to individuals who are assessing eligibility for credits or points.

The information on Life Cycle Assessment (LCA) is limited to the boundary conditions, the Life Cycle Inventory (LCI) inputs that consist of aggregated data and the methodology contained in the documentation noted in Section 5.8 of this report. The acceptance of this LCA information rests with the end-user. See Appendix A of this report for additional discussion on LCA.

The final interpretation of the specific requirements of the respective green building rating system and/or standard rests with the developer of that specific rating system or standard or the AHJ, as applicable.

Decisions on compliance for those items noted as "Eligible for Points" in Tables 2 through 12 rests with the user of this report, and those items are subject to the conditions noted. The user is advised of the project-specific provisions that may be contingent upon meeting specific conditions, and the verification of those conditions is outside the scope of this report. Rating systems or standards often provide supplemental information as guidance. Compliance for items noted as "Verified Attribute" is also subject to any conditions noted in the tables.

5.0 BASIS OF EVALUATION

The information in this report, including the "Verified Attribute," is based upon the following supporting documentation:

5.1 ICC-ES EG102. [Evaluation applies to ICC 700 Section 606.1(2); CALGreen Section A5.405.2; ANSI/GBI 01-2010 Section 10.2.1.1; IGCC PV2.0 Section 503.2.4; ASHRAE 189.1 Section 9.4.1.3.]

5.2 ICC-ES EG104. [Evaluation applies to ICC 700 Section 608.1; LEED Homes Credit MR 2.2(c); LEED NC Credit MR 5; LEED Schools Credit MR 5; LEED C&S Credit MR 5; LEED CI Credit MR5; LEED EB Credit MR 3; CALGreen Section A5.405.1; ANSI/GBI 01-2010 Section 10.1.4.1; IGCC PV2.0 Section 503.2.5; ASHRAE 189.1 Section 9.4.1.2.]

5.3 ICC-ES EG108. [Evaluation applies to ICC 700 Section 901.4(6); LEED NC Credit EQ 4.4, LEED Schools Credit EQ 4.4; LEED C&S Credit EQ 4.4; LEED CI Credit EQ4.4; LEED EB Credit MR 3; IGCC PV2.0 Section 806.1.]

5.4 ICC-ES EG109. [Evaluation applies to ICC 700 Section 606.2(2); ANSI/GBI 01-2010 Section 10.3.2.1; ASHRAE 189.1 Section 9.4.1.3.1.]

5.5 Documentation demonstrating conformance with HUD PATH and DOE recommendations for advanced framing techniques, as summarized in Table 13 of this report. [Evaluation applies to ICC 700 Section 601.2; LEED Homes Credit MR 1.4.]

5.6 Software output of the BC CALC and BC FRAMER software with detailed framing or structural plans, material quantity lists and on-site cut lists for framing, structural materials, and sheathing materials, to assist with waste minimization. [Evaluation applies to ICC 700 Section 601.4; LEED Homes Credit MR 1.2, 1.3 & 1.5.]

5.7 Software output of the BOISE TQBuild software with detailed framing or structural plans, material quantity lists and precut framing packages to assist in waste minimization. [Evaluation applies to ICC 700 Section 601.5(1); LEED Homes Credit MR 1.2, 1.3 & 1.5.]

5.8 Consortium for Research on Renewable Industrial Materials (CORRIM) Phase 1 report (available at http://www.corrim.org/reports/2006/final_phase_1/index.htm), containing an LCA analysis performed in accordance with ISO 14044. [Evaluation applies to ICC 700 Section 609.1; CALGreen Section A5.409.1; ASHRAE 189.1 Section 9.5.1.]

5.9 Documentation establishing that the environmental management system conforms to the requirements of ISO 14001 or equivalent. [Evaluation applies to ICC 700 Section 610.1.]

6.0 IDENTIFICATION

Boise Cascade structural wood products are identified with a stamp noting the name or logo of the manufacturer (Boise), the plant number, the product trade name and the ICC-ES evaluation report number (if applicable), and the name or logo of the inspection or grading agency. The report subjects are also identified on the product and/or packaging with the VAR number (VAR-1017) and the ICC-ES SAVE Mark, as applicable.

TABLE 1—REFERENCE STANDARD OR EVALUATION REPORT NUMBER FOR BOISE CASCADE STRUCTURAL WOOD PRODUCTS

PRODUCT	REPORT NUMBER/ REFERENCE STANDARD
BCI® Wood I-Joists	ESR-1336
ALLJoist® Wood I-Joists	ESR-1144
VERSA-LAM® Laminated Veneer Lumber	ESR-1040
VERSA-STUD® Laminated Veneer Lumber	ESR-1040
VERSA-RIM® Laminated Veneer Lumber	ESR-1040

TABLES 2 THROUGH 12

Section #	Section Intent	Possible Points	Conditions of Use to Qualify for Points	BCI Wood I-Joist ALLJoist Wood I-Joists	VERSA-LAM LVL VERSA-STUD LVL VERSA-RIM LVL	Boise GLULAM Beams	BC CALC	BC FRAMER	BC TQBuild
TABLE 2—SUMMARY OF AREAS OF ELEGIBILITY WITH THE NATIONAL GREEN BUILDING STANDARD (ICC 700—2008)									
601.2	Building-code-compliant structural systems or advanced framing techniques are implemented that optimize material usage	3 each 9 max	To earn 3 points the framing methods listed in Table 13 must be used for floor, wall or roof framing. To earn 9 points they must be used for all floor, wall and roof framing	○	○	○			
601.4	Detailed framing or structural plans, material quantity lists and on-site cut lists for framing, structural materials, and sheathing materials are provided	4	To earn 4 points the software generated plans/lists must be on site				○	○	
601.5(1)	Precut or preassembled components, or panelized or precast assemblies are utilized for a minimum of 90 percent of the floor system	4	To earn 4 points the precut package must be used for 90% or more of the floor system						○
606.1(2)	Two types of biobased materials are used, each for more than 1 percent of the project's projected building material cost	6	To earn 6 points products must be at least 1% of the construction material cost AND another bio-based product at 1% of material cost must be used. 1 or 3 points are available for greater than 0.5%	●	●	●			
606.2(2)	Two certified wood-based products are used for major elements of the building, such as all walls, floors or roof	4	To earn 4 points a second certified wood product must also be used as a major element [1]	●	●	●			
607.1	Products containing fewer materials are used to achieve the same end-use requirements as conventional products	3 each 9 max	To earn 3 points at least 80% of framing products used in the building are Boise Cascade products	●	●	●			
608.1	Indigenous materials	2 each 10 max	To earn 2 points verify local products that are originated, produced, grow naturally or occur naturally within 500 miles (805 km) of the job site. Distance can be determined by a distance calculator found at: www.bc.com/wood/ewp/SustainableBuildingCredits.html [2]	○	○	○			
609.1	A more environmentally preferable product or assembly is selected for an application based upon the use of a Life Cycle Assessment (LCA) tool complying with ISO 14044 or other recognized standards that compare the environmental impact of building materials, assemblies, or the whole building	3 each 15 max	To gain 15 points an ISO 14044-complaint LCA must be done on a whole building basis, such as that contained in the CORRIM report at www.corrim.org. 3 points may be earned where comparative LCA is done for individual products or systems	●	●	●			
610.1	Product manufacturer's operations and business practices include environmental management system concepts, and the production facility is ISO 14001 certified or equivalent	1 per % 10 max	1 point may be earned for each building products used that equals 1 percent or more of the estimated total building materials cost. Material cost breakdown to be verified and points adjusted to reflect actual percentage of all products from ISO 14001 facilities	●	●	●			
901.4(6)	Non-emitting products, which can include structural wood framing	4	A minimum of 85% of product in the building are the identified Boise Cascade products	●	●	●			

○ = Eligible for compliance

● = Verified attribute

= This provision does not apply to this product/service

Note: Footnotes are located after Table 12.

TABLES 2 THROUGH 12 (Continued)

Section #	Section Intent	Possible Points	Conditions of Use to Qualify for Points	BCI Wood I-Joist ALLJoist Wood I-Joists	VERSA-LAM LVL VERSA-STUD LVL VERSA-RIM LVL	Boise GLULAM Beams	BC CALC	BC FRAMER	BC TQBuild
TABLE 3—SUMMARY OF AREAS OF ELEGIBILITY WITH USGBC'S LEED FOR HOMES 2008									
MR 1.2	Detailed framing documents	1	Visually verify detailed framing plans and/or scopes of work					○	○
MR 1.3	Detailed cut list and lumber order	1	To earn 1 point verify that detailed framing cut list and lumber order are used						○
MR 1.4	Framing efficiencies	3 max	To earn 1 point verify that advanced framing measures in Table 13 are used for floors, walls OR roof framing	○	○	○			
MR 1.5	Off-site fabrication	4	To earn 4 points use off-site panelized or modular, prefabricated construction [3]						○
MR 2.1	FSC certified tropical wood	0.5 each 8 max	To earn 0.5 point per component use FSC-certified tropical wood [4]	4	4	4			
MR 2.2(c)	Environmentally preferable products for roof, wall and floors; interior and exterior framing and sheathing	0.5 each 8 max	To earn points use products that are extracted, processed and manufactured within 500 miles (805 km) of the site for a minimum of 90% (by weight or volume of the component). Distance can be determined by a distance calculator found at: www.bc.com/wood/ewp/SustainableBuildingCredits.html [2]	○	○	○			
TABLE 4—SUMMARY OF AREAS OF ELEGIBILITY WITH USGBC'S LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS									
MR 5 (MR 5.1)	Regional materials (10% of content)	1	To earn 1 point use products that are extracted, processed and manufactured within 500 miles (805 km) of the site for a minimum of 10% (by cost) of total materials value. To earn 2 points use a minimum of 20%.Distance can be determined by a distance calculator found at: www.bc.com/wood/ewp/SustainableBuildingCredits.html [2]	○	○	○			
MR 5 (MR 5.2)	Regional materials (20% of content)	2		○	○	○			
MR 7	Certified wood	1	To earn 1 point use a minimum 50% (based on cost) of wood-based materials/products certified to FSC requirements [4]	○[4]	○[4]	○[4]			
EQ 4.4	Low emitting materials	1	To earn 1 point use wood composite wood products containing no-added urea-formaldehyde resins	●	●	●			
TABLE 5—SUMMARY OF AREAS OF ELEGIBILITY WITH USGBC'S LEED 2009 FOR SCHOOLS NEW CONSTRUCTION AND MAJOR RENOVATIONS									
MR 5 (MR 5.1)	Regional materials (10% of content)	1	To earn 1 point use products that are extracted, processed and manufactured within 500 miles (805 km) of the site for a minimum of 10% (by cost) of total materials value. To earn 2 points use a minimum of 20%. Distance can be determined by a distance calculator found at: www.bc.com/wood/ewp/SustainableBuildingCredits.html [2]	○	○	○			
MR 5 (MR 5.2)	Regional materials (20% of content)	2		○	○	○			
MR 7	Certified wood	1	To earn 1 point use a minimum 50% (based on cost) of wood-based materials/products certified to FSC requirements [4]	○[4]	○[4]	○[4]			
EQ 4.4	Low emitting materials	1	Based on the LEED for Schools PIECAP, it is permissible to substitute LEED 2009 for New Construction EQ 4 Low-Emitting Materials credits in place of corresponding LEED 2009 for Schools EQ 4 Low-Emitting Materials credits.	●	●	●			

○ = Eligible for compliance

● = Verified attribute

= This provision does not apply to this product/service

Note: Footnotes are located after Table 12.

TABLES 2 THROUGH 12 (Continued)

Section #	Section Intent	Possible Points	Conditions of Use to Qualify for Points	BCI Wood I-Joist ALLJoist Wood I-Joists	VERSA-LAM LVL VERSA-STUD LVL VERSA-RIM LVL	Boise GLULAM Beams	BC CALC	BC FRAMER	BC TQBuild
TABLE 6—SUMMARY OF AREAS OF ELEGIBILITY WITH USGBC'S LEED 2009 FOR CORE AND SHELL DEVELOPMENT									
MR 5 (MR 5.1)	Regional materials (10% of content)	1	To earn 1 point use products that are extracted, processed and manufactured within 500 miles (805 km) of the site for a minimum of 10% (by cost) of total materials value. To earn 2 points use a minimum of 20%. Distance can be determined by a distance calculator found at: www.bc.com/wood/ewp/SustainableBuildingCredits.html [2]	○	○	○			
MR 5 (MR 5.2)	Regional materials (20% of content)	2		○	○	○			
MR 7	Certified wood	1	To earn 1 point use a minimum 50% (based on cost) of wood-based materials/products certified to FSC requirements [4]	○[4]	○[4]	○[4]			
EQ 4.4	Low emitting materials	1	To earn 1 point use wood composite wood products containing no-added urea-formaldehyde resins	●	●	●			
TABLE 7—SUMMARY OF AREAS OF ELEGIBILITY WITH USGBC'S LEED 2009 FOR COMMERCIAL INTERIORS									
MR 5 (Option 1)	Regional materials (20% of content)	1	To earn 1 point use products that are extracted, processed and manufactured within 500 miles (805 km) of the site for a minimum of 20% (by cost) of total materials value, including furniture. To earn 2 points use a minimum of 20% + 10%. Distance can be determined by a distance calculator found at: www.bc.com/wood/ewp/SustainableBuildingCredits.html [2]	○	○	○			
MR 5 (Option 2)	Regional materials (Meet Option 1 + 10% of content)	2		○	○	○			
MR 7	Certified wood	1	To earn 1 point use a minimum 50% (based on cost) of wood-based materials/products certified to FSC requirements [4]. Furniture material value is also included in determination of certified wood content	○[4]	○[4]	○[4]			
EQ 4.4	Low emitting materials	1	To earn 1 point use wood composite wood products containing no-added urea-formaldehyde resins	●	●	●			
TABLE 8—SUMMARY OF AREAS OF ELEGIBILITY WITH USGBC'S LEED FOR EXISTING BUILDING 2008									
MR 3	Regional materials	1	Maintain a sustainable purchasing program where the purchase of products contain a minimum of 50% materials (by cost) are extracted, processed and manufactured within 500 miles (805 km) of the site. Distance can be determined by a distance calculator found at: www.bc.com/wood/ewp/SustainableBuildingCredits.html [2]	○	○	○			
	Certified wood		Maintain a sustainable purchasing program where the purchase of products contain a minimum 50% (by cost) of wood-based materials/products certified to FSC requirements [4]	○[4]	○[4]	○[4]			
	Low emitting materials		Maintain a sustainable purchasing program where the purchase of wood composite wood products are those that contain no-added urea-formaldehyde resins	●	●	●			

○ = Eligible for compliance
● = Verified attribute
= This provision does not apply to this product/service

Note: Footnotes are located after Table 12.

TABLES 2 THROUGH 12 (Continued)

Section #	Section Intent	Possible Points	Conditions of Use to Qualify for Points	BCI Wood I-Joist ALLJoist Wood I-Joists	VERSA-LAM LVL VERSA-STUD LVL VERSA-RIM LVL	Boise GLULAM Beams	BC CALC	BC FRAMER	BC TQBuild
TABLE 9—SUMMARY OF AREAS OF ELEGIBILITY WITH 2010 CALIFORNIA GREEN BUILDING STANDARDS CODE (CALGREEN)									
4.504.5, 5.504.4.5	Composite wood product emissions	Mandatory	EWP and lumber products do not apply to the composite wood product definition [6]						
A4.404.3	Products containing fewer materials are used to achieve the same end-use requirements as conventional products	Residential Elective	Use premanufactured building systems as a substitute for solid lumber	●	●	●			
A4.404.4	Detailed cut list and material order	Residential Elective	Material lists are included in the plans which specify material quantity and provide direction for on-site cuts.					○	○
A4.405.4 (3) & (5)	Renewable sources	Residential Elective	Materials from renewable sources (such as engineered wood and solid wood products)	●	●	●			
A5.404.1	Advanced wood framing techniques	Commercial Elective	Advanced framing methods shall not conflict with structural framing methods or fire-rated assemblies required by the California Building Code. (See Table 13)	○	○	○			
A5.405.1	Regional materials	Commercial Elective	Verify local products that are extracted, processed and manufactured within California or 500 miles (805 km) of the job site. Distance can be determined by a distance calculator found at: www.bc.com/wood/ewp/SustainableBuildingCredits.html [2]	○	○	○			
A5.405.2	Bio-based materials	Commercial Elective	All Boise Cascade wood products are qualified as biobased	●	●	●			
A5.405.2.1	Certified wood	Commercial Elective	Under review by California Building Standards Commision [5]	N/A	N/A	N/A			
A5.409.1	Life cycle assessment	Commercial Elective	Select materials or assemblies based on an LCA done in accordance with ISO 14044, such as that contained in the CORRIM report at www.corrim.org	○	○	○			
TABLE 10—SUMMARY OF AREAS OF ELEGIBILITY WITH ANSI/GBI 01-2010—GREEN BUILDING ASSESSMENT PROTOCOL FOR COMMERCIAL BUILDINGS									
10.1.1.1	Life cycle impact - building assemblies	33 max	Use Green Globes LCA Credit Calculator	○	○	○			
10.1.2.2	Biobased Products - building assemblies	7 max	All Boise Cascade wood products are qualified as biobased	●	●	●			
10.1.4.1	Regional Materials - building assemblies	5 max	To earn credits use products that are extracted, processed and manufactured within 500 miles (805 km) of the site for a minimum of 90% (by weight or volume of the component. Distance can be determined by a distance calculator found at: www.bc.com/wood/ewp/SustainableBuildingCredits.html [2]	○	○	○			
10.3.2.1	Certified wood	6	Between 10% and 60% or more of wood-based products used in the building are third party certified	○	○	○			

○ = Eligible for compliance

● = Verified attribute

= This provision does not apply to this product/service

Note: Footnotes are located after Table 12.

TABLES 2 THROUGH 12 (Continued)

Section #	Section Intent	Possible Points	Conditions of Use to Qualify for Points	BCI Wood I-Joist ALLJoist Wood I-Joists	VERSA-LAM LVL VERSA-STUD LVL VERSA-RIM LVL	Boise GLULAM Beams	BC CALC	BC FRAMER	BC TQBuild
TABLE 11—SUMMARY OF AREAS OF ELEGIBILITY WITH INTERNATIONAL GREEN CONSTRUCTION CODE - PUBLIC VERSION 2.0 (IGCC PV2.0)									
503.2.4(2)	Biobased products	N/A	All Boise Cascade wood products are labeled in accordance with the SFI Standard fiber procurement system. Manufacturer's fiber procurement systems is audited by an accredited third-party	●	●	●			
503.2.5	Indigenous materials	N/A	To qualify products must be extracted, processed and manufactured within 500 miles (805 km) of the site. Boise I-Joists, the web stock is transported by rail so the distance to the building site can be determined by multiplying the distance that the resources are transported by rail by 0.25, and adding that number to the distance transported by means other than water or rail. Distances for all products can be determined by a distance calculator found at: www.bc.com/wood/ewp/SustainableBuildingCredits.html [2]	○	○	○			
806.1	Formaldehyde emissions	N/A	Boise Glulam beams do not use urea-formaldehyde resins and qualify under the exception 1 to Section 806.1			●			
		N/A	Boise Wood I-Joists comply with ASTM D 5055 (See Table 1 of this report) and meet the requirements of Table 806.1	●					
		N/A	Boise LVL products comply with ASTM D 5456 (See Table 1 of this report) and meet the requirements of Table 806.1		●				
TABLE 12—SUMMARY OF AREAS OF ELEGIBILITY WITH ASHRAE STANDARD 189.1—2009									
8.4.2.4	Composite wood product emissions	Prescriptive option	EWP and lumber products exempt from the composite wood product emissions requirements [6]						
9.3.2	Extracting, harvesting and manufacturing	Mandatory	Wood products containing wood from endangered species shall conform to trade requirement of CITES	●	●	●			
9.4.1.2	Regional materials	Prescriptive option	A minimum of 15% of building materials or products used are extracted/harvested/recoverd or manufactured within 500 miles (805 km) of the site. Source distance can be done by use of the regional distance calculator at www.bc.com/wood/ewp/SustainableBuildingCredits.html [2]	○	○	○			
9.4.1.3	Biobased products	Prescriptive option	All Boise Cascade wood products are qualified as biobased	●	●	●			
9.4.1.3.1	Wood Building Components	Prescriptive option	Chain of custody compliance is through one of three available options: 1) an on-product chain of custody label, 2) chain of custody paperwork, or 3) vendors may supply to the AHJ a statement that the annual average amount of certified content of the total annual wood products purchased by the vendor is 60% or greater, for which they have chain of custody verification not older than two years[4]	○[4]	○[4]	○[4]			
9.5.1	Life cycle assessment	Performance option	Select materials or assemblies based on an LCA done in accordance with ISO 14044, such as that contained in the CORRIM report at www.corrim.org	○	○	○			

○ = Eligible for compliance
● = Verified attribute
= This provision does not apply to this product/service

[1]Certification is required of the manufacturer only. Vendor Chain of Custody is not required to qualify for this point.

[2]Information on how to determine both the distance from source to mill and mill to site is located on the distance calculator web page.

[3]Applicable only when a third-party prefabricates the framing package prior to arrival on the site. TQBuild allows for either prefabrication off-site or assembly on-site using materials labeled and cut to precision-end-trim dimensions off-site.

[4]Forest certification credit currently resources FSC. The specific BOISE products and manufacturing locations that are FSC certified can be viewed at www.bc.com/sustainability/certification.html and by reviewing FSC License Codes: FSC-C084674, FSC-C019369 and FSC-C041295 at http://info.fsc.org. Credit for products or plants listed under other certification schemes is at the discretion of the verifier.

[5]CALGreen recognizes importance of use of certified forest products however the specific requirements are currently under development.

[6]This area is not be confused with the provisions of EQ 4.4 in LEED (Tables 4, 5, 6, 7 and 8) because the California Air Resources Board (CARB) does not regulate engineered wood product emissions and are exempt in ASHRAE 189.1.

N/A = Not applicable

TABLE 13—ADVANCED FRAMING TECHNIQUES

	RATING SYSTEM/CODES[1]		
	ICC-700	**LEED-HOMES**	**CALGREEN**
PRESCRIPTIVE-BASED COMPLIANCE CRITERIA			
19.2- or 24-inch OC floor framing	✓	✓	✓
19.2- or 24-inch OC bearing walls	✓	✓	✓
24-inch OC roof framing	✓	✓	✓
24-inch OC interior partitions	✓	✓	✓
Single top plate walls	✓	See footnote 3	✓
Right sized or insulated headers (where required)	✓	✓	✓
Eliminate headers in non-bearing walls	✓	✓	✓
Doubling rim joist in lieu of header (2x6 or deeper wall)	✓	See footnote 3	See footnote 4
Ladder blocking at interior wall-to-exterior wall intersections	✓	✓	See footnote 4
Two stud corner framing	✓	✓	✓
Doubling rim joist in lieu of header (2x6 or deeper wall)	✓	See footnote 3	See footnote 4
Other measures that reduce material usage	See footnote 2	See footnote 3	See footnote 4
PERFORMANCE-BASED COMPLIANCE CRITERIA			
Optimized design per Wood Frame Construction Manual	✓	See footnote 3	See footnote 4
Optimized design per National Design Specification for Wood Construction	✓	See footnote 3	See footnote 4
Precut framing packages	N/A	✓	See footnote 4

For **SI:** 1 inch = 25.4 mm.

[1] ✓ represents that the criteria is deemed to comply when conditions are met.

[2] In ICC-700 Section 601.2, 3 points may be gained for each advanced framing technique that exceeds 80% usage in the building up to 9 points maximum. See references in 601.2 commentary for additional details on prescriptive-based compliance criteria.

[3] In LEED for Homes Section MR 1.4, Table 23, alternative measures to Table 23 are eligible for points if they save comparable amounts of framing material.

[4] Other framing techniques as permitted by the U.S. Department of Energy's Office of Building Technology, State and Community Programs, subject to approval by the AHJ.

Appendix A

Discussion Related to Life-Cycle Assessment

A1.0 GENERAL

The following information is intended to provide some general background on LCA provisions in existing rating systems and standards. Users are advised that the science of LCA is still evolving and there are no standardized procedures for such an analysis. It must be noted that Section 609.1 of ICC 700, Section A5.409.1 of CALGreen, Section 9.5.1 of ASHRAE 189.1, and Section 10.1.1 of Green Globes encourage the use of comparative LCA as means of selecting preferable materials, systems or building assemblies. However, LCA results should not be interpreted beyond the scope of the boundary limits used in performing the LCA.

This VAR indicates that Boise products may be eligible for points related to LCA by use of the information contained in the documentation noted in Section 5.8 of this report. This appendix discusses additional information required by the user of this report related to achieving points or demonstrating compliance based on LCA output.

A2.0 DISCUSSION RELATED TO ICC 700

As indicated in the ICC 700 Commentary, points can be obtained based on the results of an analysis based on an LCA. For the purpose of compliance with the intent of ICC 700, the following steps (as a minimum) are recommended:

- Fully define the benchmark material, product, assembly, or structure
- Fully define the product or assembly proposed as more environmentally friendly
- Fully define the endpoints or boundaries of the analysis (so-called cradle-to-gate, cradle-to-grave, cradle-to-cradle, gate-to-gate, etc). For analyses that go beyond cradle-to-gate, a separate report is recommended for each application or use category. Such reports are also recommended to include a discussion of the sensitivity of the analysis to major assumptions for major parameters.
- Employ an LCA method complying with ISO 14044.
- Report all applicable attributes of the benchmark analysis and the proposed product/assembly analysis that are relevant to the LCA.
- The involvement of an individual with experience in the field of LCA and who is knowledgeable in the latest research and standards related to LCA, from the earliest planning stages through completion of the final assessment, is recommended.
- An independent peer review of the entire LCA methodology and its conclusions by an individual knowledgeable in LCA is recommended.

Examples of an LCA that meets these requirements can be found in the series of CORRIM reports (www.corrim.org) that address a broad range of wood-based building materials.

A3.0 DISCUSSION RELATED TO CALGREEN AND ASHRAE 189.1

Similar to the requirements of ICC 700, Section A5.409.1 of CALGreen and Section 9.5.1 of ASHRAE 189.1 allows the use of selected materials or assemblies based on LCA done in accordance with ISO 14044.

A4.0 DISCUSSION RELATED TO ANSI/GBI 01-2010

Although life-cycle assessment in its broad sense is too complex for standardization at this time, the use of a specific tool (e.g., Green Globes LCA Credit Calculator) in strict accordance with the rating system intent of comparative analysis of specific components of the building is reasonable. However, users are advised to consult with persons familiar with LCA tools when conducting this analysis. Additional guidance regarding the Green Globes LCA Credit Calculator is provided in Appendix N of the Green Globes document.