APA PRODUCT REPORT®

www.apawood.org

BCI Series I-Joists
Boise Cascade Company

PR-L323

Revised Jun 29, 2018

Products: BCI® Series I-Joists
Boise Cascade Company, 1000 North Park Drive, Roxboro, North Carolina 27573
(336) 599-1000
www.bc.com

1. Basis of the product report:
   - 2018, 2015, and 2012 International Building Code (IBC): Sections 104.11 Alternative materials and 2303.1.2 Prefabricated wood I-joists
   - 2018 and 2015 International Residential Code (IRC): Sections R104.11 Alternative materials, and R502.1.2 and R802.1.8 (2018 IRC only) Prefabricated wood I-joists
   - 2012 IRC: Sections R104.11 Alternative materials and R502.1.4 Prefabricated wood I-joists
   - ASTM D5055-13e1, D5055-13, and D5055-09 recognized by the 2018 IBC and IRC, 2015 IBC and IRC, and 2012 IBC and IRC, respectively
   - APA Reports T2017P-43 and T2018P-16, and other qualification data

2. Product description:
   The BCI Series I-joists covered by this report, as described in Table 1, are made with VERSA-LAM® LVL flanges and OSB webs in accordance with the in-plant manufacturing standard approved by APA. BCI 60S shall be permitted to be manufactured with proprietary Thermax™ as described in APA Product Report PR-S201.

3. Design properties:
   Tables 2a and 2b list the design properties for BCI Series I-joists covered by this report. The allowable spans for BCI Series I-joists covered in this report shall be in accordance with the recommendations provided by the manufacturer (www.bc.com). For connection design, the specific gravity for the BCI flanges shall be limited to 0.43 for edge nail withdrawal, and 0.50 for face nail withdrawal, nail lateral, and bolt lateral.

   Allowable shear values with web holes (V_{hole}) can be calculated based on the tabulated allowable shear values (V_r), hole size, and hole type using the following equations:

   Circular holes

$$V_{hole} = V_r \left[0.88 - 0.7\left(\frac{hole\ diameter}{joist\ depth - 2\ x\ flange\ depth}\right)\right]$$

   Square or rectangular holes

$$V_{hole} = V_r \left[0.5 - 0.25\left(\frac{hole\ depth}{joist\ depth - 2\ x\ flange\ depth}\right) - 0.25\left(\frac{hole\ length}{18}\right)\right]$$

   where:

   V_r = Allowable shear value from Table 2a

4. Product installation:
   BCI Series I-joists shall be installed in accordance with the recommendations provided by the manufacturer (see link above). Permissible web holes and cantilever reinforcements shall be in accordance with the recommendations provided by the manufacturer.

5. Fire-rated assemblies:
Fire-rated assemblies shall be constructed in accordance with the recommendations provided by the manufacturer (see link above), or as shown in APA Product Report PR-S201 (www.apawood.org/resource-library). BCI 60S-2.0 Series I-joists shall be permitted to be used in the fire rated assemblies described in the 2018, 2015, and 2012 IBC as follows:

2018 IBC[a]	2015 IBC[a]	2012 IBC[a]	2009 IBC[a]	BCI 60S-2.0
23-1.1	23-1.1	23-1.1	23-1.1	Applicable
26-1.1	26-1.1	26-1.1	26-1.1	Applicable
27-1.1	27-1.1	27-1.1	27-1.1	Applicable
28-1.1	28-1.1	28-1.1	28-1.1	Applicable
30-1.1	30-1.1	NA	NA	Applicable

[a] In accordance with Table 721.1(3) of the 2018, 2015, and 2012 IBC, and Table 720.1(3) of the 2009 IBC.

6. Limitations:
   a) BCI Series I-joists covered by this report shall be designed in accordance with the code using the design properties specified in this report.
   b) BCI Series I-joists covered by this report are limited to dry service conditions where the average equilibrium moisture content of sawn lumber is less than 16 percent.
   c) BCI Series I-joists are produced at Boise Cascade Company's facility in Roxboro, North Carolina under a quality program audited by APA.
   d) This report is subject to re-examination in one year.

7. Identification:
The BCI Series prefabricated wood I-joists described in this report are identified by a label bearing the manufacturer's name (Boise Cascade or Boise Cascade Company) and/or trademark (BCI), the APA assigned plant number (1027), the I-joist depth and series, the APA logo, the report number PR-L323, and a means of identifying the date of manufacture.

Table 1. Description of BCI Series I-Joists[a]

Joist Series	Joist Depths (in.)	Flanges			Web	
		Material	Dimension		Material	Thickness (in.)
			Depth (in.)	Width (in.)		
4500S-1.8	9-1/2 - 16	1.8 2500 VERSA-LAM	1.125	1.75	OSB	3/8
5000S-1.8	9-1/2 - 16	1.8 2500 VERSA-LAM	1.125	2.00	OSB	3/8
6000S-1.8	9-1/2 - 16	1.8 2500 VERSA-LAM	1.125	2.31	OSB	3/8
6500S-1.8	9-1/2 - 16	1.8 2500 VERSA-LAM	1.125	2.31	OSB	3/8
60S-2.0	9-1/2 – 16	2.0 3100 VERSA-LAM	1.500	2.31	OSB	3/8

[a] Referenced dimensions are nominal. Tolerances are as specified in the plant quality manual.

Table 2a. Design Properties for Boise Cascade BCI Series I-Joists[a]

Joist Series	Joist Depth (in.)	M[b] (lbf-ft)	EI[c] (10^6 lbf-in.^{2})	K[d] (10^6 lbf)	V[e] (lbf)	Uniform Vertical Load[f] (lbf/ft)	
						w/o Brg. Stiff	w/Brg. Stiff[f,g]
4500S-1.8	9 1/2	2360	155	5	1475	2300	N/A
	11 7/8	3025	260	6	1625	2150	N/A
	14	3585	380	8	1825	2000	N/A
	16	4090	515	9	1975	1900	2500
5000S-1.8	9 1/2	2725	175	5	1475	2300	N/A
	11 7/8	3485	295	6	1625	2150	N/A
	14	4130	430	8	1825	2000	N/A
	16	4715	580	9	1975	1900	2500
6000S-1.8	9 1/2	3165	200	5	1575	2300	N/A
	11 7/8	4060	335	6	1675	2150	N/A
	14	4815	490	8	1925	2000	N/A
	16	5495	660	9	2175	1900	2500
6500S-1.8	9 1/2	3505	220	5	1575	2300	N/A
	11 7/8	4495	365	6	1675	2150	N/A
	14	5330	535	8	1925	2000	N/A
	16	6085	720	9	2175	1900	2500
60S-2.0	9 1/2	4815	265	6	1575	2650	N/A
	11 7/8	6235	450	7	1675	2500	N/A
	14	7440	660	8	1925	2400	N/A
	16	8520	895	9	2175	2300	2700

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lbf = 4.448 N.

[a] The tabulated values are for normal duration of load. Values other than EI, K and uniform vertical load shall be permitted to be adjusted for other load durations as permitted by the code.

[b] Moment capacity (M) of the I-joist, which shall not be increased by any repetitive member use factor.

[c] Bending stiffness (EI) of the I-joist.

[d] Coefficient of shear deflection (K). For calculating uniform load and center-point load deflections of the I-joist in a simple-span application, use Eqs. 1 and 2.

Uniform Load: $$\delta = \frac{5w\ell^4}{384EI} + \frac{w\ell^2}{k} \quad [1]$$

Center-Point Load: $$\delta = \frac{P\ell^3}{48EI} + \frac{2P\ell}{k} \quad [2]$$

where:
δ = calculated deflection (in.),
w = uniform load (lbf/in.),
ℓ = design span (in.),
P = concentrated load (lbf),
EI = bending stiffness of the I-joist (lbf-in.^{2}), and
K = coefficient of shear deflection (lbf).

[e] Shear capacity (V) of the I-joist.

[f] Web stiffener required at each end.

[g] Three 8d box nails (0.113 in. x 2-1/2 in.) required in web stiffeners for blocking panels.

Table 2b. Design Properties for Boise Cascade BCI Series I-Joists[a]

Joist Series	Joist Depth (in.)	End Reaction (lbf)[c,d]						Intermediate Reaction (lbf)[c,e]					
		1 ½"[b]		3 ½"		5 ¼"		3 ½"[b]		5 ¼"		7"	
		w/o Brg. Stiff	w/Brg. Stiff	w/o Brg. Stiff	w/Brg. Stiff	w/o Brg. Stiff	w/Brg. Stiff	w/o Brg. Stiff	w/Brg. Stiff	w/o Brg. Stiff	w/Brg. Stiff	w/o Brg. Stiff	w/Brg. Stiff
4500S-1.8	9 1/2	950	1125	1125	1275	1275	1325	2100	2350	2525	2750	2525	2950
	11 7/8	950	1425	1425	1475	1475	1525	2250	2850	2525	3000	2525	3250
	14	950	1525	1450	1725	1675	1775	2350	3050	2525	3200	2525	3650
	16	950	1625	1475	1975	1750	1975	2400	3200	2525	3350	2525	3750
5000S-1.8	9 1/2	950	1125	1125	1275	1275	1325	2100	2350	2525	2750	2525	2950
	11 7/8	950	1425	1425	1475	1475	1525	2250	2850	2525	3000	2525	3250
	14	950	1525	1475	1725	1675	1775	2350	3050	2525	3200	2525	3650
	16	950	1625	1500	1975	1750	1975	2400	3200	2525	3350	2525	3750
6000S-1.8	9 1/2	1175	1375	1375	1425	1425	1475	2400	2650	2700	2750	3000	3150
	11 7/8	1175	1425	1425	1475	1475	1675	2500	2850	2900	3000	3200	3250
	14	1175	1525	1525	1725	1725	1925	2600	3150	2925	3200	3400	3650
	16	1175	1625	1550	1975	1900	2175	2650	3350	2950	3350	3575	3750
6500S-1.8	9 1/2	1175	1375	1375	1425	1425	1475	2400	2650	2700	2750	3000	3150
	11 7/8	1175	1425	1425	1475	1475	1675	2500	2850	2900	3000	3200	3250
	14	1175	1525	1525	1725	1725	1925	2600	3150	2925	3200	3400	3650
	16	1175	1625	1550	1975	1900	2175	2650	3350	2950	3350	3575	3750
60S-2.0	9 1/2	1175	1375	1375	1425	NA	NA	2400	2650	2700	2750	NA	NA
	11 7/8	1175	1425	1425	1475	NA	NA	2750	2850	3200	3250	NA	NA
	14	1175	1525	1525	1725	NA	NA	2750	3450	3200	3650	NA	NA
	16	1175	1625	1550	1975	NA	NA	2750	3650	3200	3750	NA	NA

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lbf = 4.448 N.

[a] The tabulated values are design values for normal duration of load. All values shall be permitted to be adjusted for other load durations as permitted by the code.

[b] Minimum bearing length required.

[c] Interpolation of the end reaction between 1-3/4-inch and 4-inch bearing, with or without bearing stiffeners, respectively, shall be permitted.

[d] The tabulated *reference* design reaction values, R_r, are for normal duration of load and shall be permitted to be adjusted for other load durations in accordance with the NDS, provided the *adjusted* design reaction, R_r', does not exceed the flange bearing capacity, as calculated in accordance with Eq. 3.

$$P_{c\perp}' = F_{c\perp}' \ell_b (w_f - 0.15) \geq R_r' \quad [3]$$

where: $P_{c\perp}'$ = Flange bearing capacity (lbf),
$F_{c\perp}'$ = 550 psi,
Note: The $F_{c\perp}'$ value listed above has included the bearing area factor (c_b in the NDS) and shall not be further adjusted for any load duration,
ℓ_b = Bearing length (in.), and
w_f = Nominal width of the flange (in.), as shown in Table 1.

[e] Interpolation of the intermediate reaction between 3-1/2- and 5-1/4-inch bearing, with or without bearing stiffeners, respectively, shall be permitted.

APA – The Engineered Wood Association is an approved national standards developer accredited by American National Standards Institute (ANSI). APA publishes ANSI standards and Voluntary Product Standards for wood structural panels and engineered wood products. APA is an accredited certification body under ISO/IEC 17065 by Standards Council of Canada (SCC), an accredited inspection agency under ISO/IEC 17020 by International Code Council (ICC) International Accreditation Service (IAS), and an accredited testing organization under ISO/IEC 17025 by IAS. APA is also an approved Product Certification Agency, Testing Laboratory, Quality Assurance Entity, and Validation Entity by the State of Florida, and an approved testing laboratory by City of Los Angeles.

APA – THE ENGINEERED WOOD ASSOCIATION
HEADQUARTERS
7011 So. 19th St. ▪ Tacoma, Washington 98466
Phone: (253) 565-6600 ▪ Fax: (253) 565-7265 ▪ Internet Address: www.apawood.org

PRODUCT SUPPORT HELP DESK
(253) 620-7400 ▪ *E-mail Address*: help@apawood.org

DISCLAIMER