APA PRODUCT REPORT®

www.apawood.org

APA Performance-Rated PRI-405 Commercial I-Joists

PR-L405

Revised February 13, 2014

Products: APA PRI-405 Commercial I-Joists

1. Basis of the product report:
   - 2012 and 2009 International Building Code (IBC): Sections 104.11 Alternative Materials and 2303.1.2 Prefabricated wood I-joists
   - 2012 and 2009 International Residential Code (IRC): Sections R104.11 Alternative Materials and R502.1.4 Prefabricated wood I-joists
   - ASTM D5055-09 and D5055-05 recognized by the 2012 IBC and IRC, and 2009 IBC and IRC, respectively
   - APA PRI-405 Performance Standard for APA EWS Commercial I-Joists
   - APA Product Reports, and qualification test reports and data

2. Product description:
   The prefabricated wood I-joists described herein comply with the APA PRI-405 *Performance Standard for APA EWS Commercial I-Joists*, and are commonly used in non-residential floor and roof construction. The standard complies with the requirements of the codes and ASTM D5055.

   PRI-405 I-joists are manufactured with flanges of sawn lumber or structural composite lumber (SCL) in a net width of 3-1/2 inches and a minimum net thickness of 1-5/16 inches. The flange materials have a specific gravity of 0.46 or higher for C1, and 0.50 for C2 and C3 series of I-joists. The PRI-405 I-joist webs are manufactured with structural-use panels, including plywood and oriented strand board (OSB), meeting the requirements of PS 1, PS 2, CSA O325, or CSA O437. Adhesives conforming to ASTM D5055 are used for flange-to-flange, flange-to-web, and web-to-web joints.

3. Design properties:
   Table 1 lists the design properties for PRI-405 I-joists covered in this report. The allowable spans for the I-joists series covered in this report shall be in accordance with the recommendations provided by the manufacturer. Alternatively, the allowable spans shall be engineered using the design properties provided in this report.

4. Product installation:
   PRI-405 I-joists covered in this report shall be installed in accordance with the recommendations provided by the manufacturer or the engineering drawing approved by the engineer of record. Permissible web holes and cantilever reinforcements shall be in accordance with the recommendations provided by the manufacturer or the engineering drawing.

5. Fire-rated assemblies:
   Fire-rated assemblies shall be constructed in accordance with the recommendations provided by the manufacturer or with APA *Fire-Rated Systems*, Form W305 (www.apawood.org/publications), as applicable. I-joists listed in this report may be used in the fire rated assemblies described in the 2012 IBC Table 721.1(3) and 2009 IBC Table 720.1(3), Items 21-1.1, and 23-1.1 through 28-1.1, provided the I-joists used meet the criteria described in the table's "Floor or Roof Construction" column.

6. Limitations:
   a) PRI-405 I-joists shall be designed in accordance with the code using the design properties published in this report.

b) PRI-405 I-joists are limited to dry service conditions where the average equilibrium moisture content of solid-sawn lumber is less than 16 percent.
c) PRI-405 I-joists listed in this report are produced by manufacturing facilities shown in Table 2 under a quality assurance program audited by APA.
d) This report is subject to re-examination in one year.

7. Identification:
PRI-405 I-joists described in this report are identified by a label bearing the manufacturer's name and/or trademark, the APA assigned plant number, the I-joist series designation and depth, the APA logo, the report number PR-L405, and a means of identifying the date of manufacture.

Table 1. Design Properties for APA PRI-405 I-Joist Series[a]

Joist Depth and Series	EI[b] (10^6 lbf-in.^{2})	M[c] (lbf-ft)	V[d] (lbf)	ER[e,k] (lbf)					IR[h,k] (lbf)					VLC[i] (plf)	K[j] (10^6 lbf)
				1-3/4"		3-1/2"		No. of Nails[g] Required	3-1/2"		5-1/4"		No. of Nails[g] Required		
				Bearing Stiffeners[f]					Bearing Stiffeners[f]						
				No	Yes	No	Yes		No	Yes	No	Yes			
11-7/8" C1	518	6,940	1,420	1,280	1,390	1,390	1,390	4	2,760	2,840	2,810	2,840	4	2,000	6.18
14" C1	756	8,360	1,710	1,280	1,585	1,490	1,665	4	3,020	3,230	3,090	3,370	6	2,000	7.28
16" C1	1,024	9,690	1,970	1,280	1,770	1,490	1,925	6	3,020	3,600	3,090	3,865	8	2,000	8.32
18" C1	1,329	10,900	2,500	1,400	2,035	1,625	2,395	7	3,355	4,160	3,450	4,500	9	1,750	11.52
20" C1	1,682	12,065	2,685	NA	2,135	NA	2,565	8	NA	4,320	NA	4,715	11	1,450	12.80
22" C1	2,081	13,215	2,875	NA	2,240	NA	2,735	10	NA	4,480	NA	4,925	13	1,200	14.08
24" C1	2,526	14,355	3,060	NA	2,345	NA	2,900	11	NA	4,640	NA	5,140	15	1,000	15.36
26" C1	3,017	15,480	3,245	NA	2,450	NA	3,070	13	NA	4,800	NA	5,355	17	850	16.64
28" C1	3,557	16,590	3,435	NA	2,555	NA	3,240	14	NA	4,960	NA	5,565	18	750	17.92
30" C1	4,146	17,695	3,620	NA	2,655	NA	3,405	16	NA	5,120	NA	5,780	20	650	19.20
11-7/8" C2	571	8,440	1,925	1,400	1,715	1,625	1,880	4	3,355	3,665	3,450	3,850	4	2,200	7.60
14" C2	832	10,165	2,125	1,400	1,825	1,625	2,060	4	3,355	3,835	3,450	4,075	6	2,200	8.96
16" C2	1,126	11,785	2,310	1,400	1,930	1,625	2,225	6	3,355	3,995	3,450	4,290	8	2,100	10.24
18" C2	1,467	13,325	2,500	1,400	2,035	1,625	2,395	7	3,355	4,160	3,450	4,500	9	1,750	11.52
20" C2	1,856	14,750	2,685	NA	2,135	NA	2,565	8	NA	4,320	NA	4,715	11	1,450	12.80
22" C2	2,295	16,155	2,875	NA	2,240	NA	2,735	10	NA	4,480	NA	4,925	13	1,200	14.08
24" C2	2,783	17,545	3,060	NA	2,345	NA	2,900	11	NA	4,640	NA	5,140	15	1,000	15.36
26" C2	3,322	18,920	3,245	NA	2,450	NA	3,070	13	NA	4,800	NA	5,355	17	850	16.64
28" C2	3,913	20,280	3,435	NA	2,555	NA	3,240	14	NA	4,960	NA	5,565	18	750	17.92
30" C2	4,558	21,630	3,620	NA	2,655	NA	3,405	16	NA	5,120	NA	5,780	20	650	19.20
11-7/8" C3	713	11,260	1,925	1,400	1,715	1,625	1,880	4	3,355	3,665	3,450	3,850	4	2,200	7.60
14" C3	1,057	13,700	2,125	1,400	1,825	1,625	2,060	4	3,355	3,835	3,450	4,075	6	2,200	8.96
16" C3	1,444	16,000	2,310	1,400	1,930	1,625	2,225	6	3,355	3,995	3,450	4,290	8	2,200	10.24
18" C3	1,896	18,180	2,500	1,400	2,035	1,625	2,395	7	3,355	4,160	3,450	4,500	9	2,000	11.52
20" C3	2,412	20,210	2,685	NA	2,135	NA	2,565	8	NA	4,320	NA	4,715	11	1,650	12.80
22" C3	2,993	22,210	2,875	NA	2,240	NA	2,735	10	NA	4,480	NA	4,925	13	1,350	14.08
24" C3	3,641	24,185	3,060	NA	2,345	NA	2,900	11	NA	4,640	NA	5,140	15	1,150	15.36
26" C3	4,357	26,135	3,245	NA	2,450	NA	3,070	13	NA	4,800	NA	5,355	17	950	16.64
28" C3	5,141	28,070	3,435	NA	2,555	NA	3,240	14	NA	4,960	NA	5,565	18	800	17.92
30" C3	5,994	29,985	3,620	NA	2,655	NA	3,405	16	NA	5,120	NA	5,780	20	700	19.20

See Footnotes on next page.

(a) The tabulated values are design values for normal duration of load (10 years). All values, except for EI and K, shall be permitted to be adjusted for other load durations as permitted by the code, and the VLC values shall not be increased for shorter durations. The cell noted as "NA" indicates that the value is not available.

(b) Bending stiffness (EI) of the I-joist.

(c) Moment capacity (M) of the I-joist.

(d) Shear capacity (V) of the I-joist.

(e) End reaction (ER) of the I-joist with a minimum bearing length as specified with or without bearing stiffeners. For a bearing length of 4 inches, the end reaction with bearing stiffeners may be set equal to the tabulated shear value. Interpolation of the end reaction with or without bearing stiffeners between 1-3/4 and 3-1/2-inch bearing is permitted. Interpolation of the end reaction with bearing stiffeners between 3-1/2 and 4-inch bearing (i.e., the tabulated shear value) is also permitted

(f) The bearing stiffeners, when required, shall have a thickness of 1-1/2 in. and a width of 3-1/2 in. (e.g., 2x4) for a bearing length of 4 in. or less, or a width of 5-1/2 in. (e.g., 2x6) for a bearing length greater than 4 in.

(g) The total number of 10d box (0.128 x 3 in.) nails required for a pair of bearing stiffeners.

(h) Intermediate reaction (IR) of the I-joist with a minimum bearing length as specified with or without bearing stiffeners. Interpolation of the intermediate reaction with or without bearing stiffeners between 3-1/2-inch and 5-1/4-inch bearing is permitted

(i) Uniform vertical (bearing) load capacity (VLC).

(j) 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: $$\delta = \frac{5\omega\ell^4}{384EI} + \frac{\omega\ell^2}{K} \quad [1]$$

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

Where:

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

(k) The IR and ER design values after being adjusted for load duration shall meet the requirement given in Eq. 3.

$$ER \times C_D \text{ or } IR \times C_D \text{ (lbf)} \le C_b\, b_{brg}\, L_{brg}\, F_{c\perp}, \text{ or the capacity of the bearing plate supporting the I-joist (lbf), whichever is smaller} \quad [3]$$

Where:

C_D = Load duration factor for ER and IR in accordance with the applicable code,
C_b = Bearing area factor as defined in Section 3.10.4 of the NDS (= 1.0 for end reaction),
b_{brg} = Bearing width of the I-joist = typically the flange width (b_f) minus 0.15 in. due to edge easing, (in.) = 3.35 in.,
L_{brg} = Bearing length of the I-joist (in.), and
$F_{c\perp}$ = Compressive stress perpendicular to grain of the I-joist flanges (lbf/in.^{2}) = 425 psi (refer to the manufacturer for specific flange $F_{c\perp}$ values as needed).

Table 2. Qualified Manufacturers of APA PRI-405 I-Joists

Manufacturer	Location	Mill Number	PRI-405 Series	Qualified Depths	Also Qualified As (Proprietary Series)	APA Product Report (Proprietary Series)
Pacific Woodtech Corporation	Burlington, WA	1048	C1	11-7/8 - 16	PWI-80	PR-L262
			C2	11-7/8 - 24	PWI-90	

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 65 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 and Miami-Dade County.

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