APA PRODUCT REPORT®

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PWI Joists
Pacific Woodtech Corporation

PR-L262
Revised January 26, 2011

Products: PWI-20, -30, -40, -45, -50, -60, -70, -80, -77 and -90 Series I-joist
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1. Basis of the product report:
   - 2009 and 2006 International Building Code (IBC): Sections 104.11 Alternative Materials and 2303.1.2 Prefabricated wood I-joists
   - 2009 and 2006 International Residential Code (IRC): Sections R104.11 Alternative Materials and R502.1.4 Prefabricated wood I-joists
   - ASTM D 5055-05 and D 5055-04 recognized by the 2009 IBC and IRC, and 2006 IBC and IRC, respectively
   - Performance Standard for APA EWS I-joist, PRI-400
   - APA Reports T2000P-2, T2000P-5, T2000P-6, T2000P-40, T2001P-25A, T2002P-41, T2002P-42, T2003P-54, T2003P-58, T2003P-68, T2008P-83, T2008P-84, T2009P-49, T2011P-03, and other qualification data

2. Product description:
   PWI I-joists are made with either lumber or laminated veneer lumber (LVL) flanges and OSB webs in accordance with the in-plant manufacturing standard and quality manual approved by APA.

3. Design properties:
   Tables 1a and 1b list the design properties for PWI I-joists. The allowable spans for PWI I-joists shall be in accordance with the recommendations provided by the manufacturer (www.pacificwoodtech.com/Documents1.asp).

4. Product installation:
   PWI I-joists shall be installed in accordance with the recommendations provided by the manufacturer. 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 and with APA Design/Construction Guide: *Fire-Rated Systems*, Form W305 (www.apawood.org/publications).

6. Limitations:
   a) PWI I-joists shall be designed in accordance with the code using the design properties specified in this report.
   b) PWI I-joists are limited to dry service conditions where the average equilibrium moisture content of sawn lumber is less than 16 percent.
   c) PWI I-joists are produced at the Pacific Woodtech Corporation manufacturing plant located in Burlington, Washington, under a quality assurance program audited by APA.
   d) This report is subject to re-examination in one year.

7. Identification:
   The PWI prefabricated wood I-joists described in this report are identified by a label bearing the manufacturer's name (Pacific Woodtech) and/or trademark, the APA assigned plant number (1048), the I-joist depth and series, the APA logo, the report number PR-L262, and a means of identifying the date of manufacture.

Table 1a. Design Properties (Allowable Stress Design) for PWI Series I-Joists [1]

Joist Series	Joist Depth [in.]	EI [2] [10^6 lbf-in.^{2}]	k [3] [10^6 lbf]	M [4] [ft-lbf]	V [5] [lbf]	Vertical Load [6] [plf]
PWI-20	9-1/2 [7]	145	4.94	2520	1120	2000
	11-7/8 [7]	253	6.18	3265	1420	2000
	14	373	7.28	3890	1710	2000
PWI-30	9-1/2 [7]	161	4.94	3225	1120	2000
	11-7/8 [7]	280	6.18	4170	1420	2000
PWI-40	9-1/4	181	4.81	2650	1080	2000
	9-1/2 [7]	193	4.94	2735	1120	2000
	11-7/8 [7]	330	6.18	3545	1420	2000
	14 [7]	482	7.28	4270	1710	2000
	16 [7]	657	8.32	4950	1970	2000
PWI-45	9-1/2	193	4.94	3345	1120	2000
	11-7/8	330	6.18	4315	1420	2000
	14	486	7.28	5140	1710	2000
	16	665	8.32	5880	1970	2000
PWI-50	9-1/2 [7]	186	4.94	3800	1120	2000
	11-7/8 [7]	322	6.18	4915	1420	2000
	14 [7]	480	7.28	5860	1710	2000
	16 [7]	663	8.32	6715	1970	2000
PWI-60	9-1/4	218	4.81	3665	1080	2000
	9-1/2 [7]	231	4.94	3780	1120	2000
	11-7/8 [7]	396	6.18	4900	1420	2000
	14 [7]	584	7.28	5895	1710	2000
	16 [7]	799	8.32	6835	1970	2000
PWI-70	11-7/8 [7]	440	6.18	6730	1420	2000
	14 [7]	644	7.28	8030	1710	2000
	16 [7]	873	8.32	9200	1970	2000
	18	1141	9.36	10355	2239	1450
	20	1447	10.40	11495	2506	1450
PWI-80	9-1/2	323	4.94	5355	1120	2000
	11-7/8 [7]	547	6.18	6940	1420	2000
	14 [7]	802	7.28	8360	1710	2000
	16 [7]	1092	8.32	9690	1970	2000
	18	1429	9.36	10960	2239	1450
	20	1816	10.40	12135	2506	1450
PWI-77	9-1/2	261	6.08	5155	1430	2400
	11-7/8	442	7.60	6675	1925	2400
	14	648	8.96	7960	2125	2400
	16	881	10.24	9120	2330	2400
	18	1152	11.52	10265	2535	1800
	20	1463	12.80	11395	2740	1800
	22	1815	14.08	12520	2935	1300
	24	2209	15.36	13630	3060	1300
PWI-90	9-1/2	392	6.08	7915	1430	2400
	11-7/8 [7]	661	7.60	10255	1925	2400
	14 [7]	965	8.96	12235	2125	2400
	16 [7]	1306	10.24	14020	2330	2400
	18	1703	11.52	15780	2535	1800
	20	2155	12.80	17520	2740	1800
	22	2664	14.08	19245	2935	1300
	24	3232	15.36	20955	3060	1300

(See footnotes on next page)

Footnotes to Table 1a:

(1)The tabulated values are design values for normal duration of load. All values, except for EI, k and vertical load capacity shall be permitted to be adjusted for other load duration as permitted by the code.
(2)Bending stiffness (EI) of the I-joist.
(3)Coefficient of shear deflection (k). For calculating uniform load and center point load deflections of an I-joist in a simple-span application, use Equations 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).

(4)Moment capacity (M) of the I-joist. The tabulated values shall not be increased by any repetitive member factor.
(5)Shear capacity (V) of the I-joist.
(6)Blocking panel and rim joist vertical load capacity (plf).
(7)Design properties meet or exceed the requirements of the *PRI-400 Performance Standard for APA EWS I-Joists*, Form X720 (www.apawood.org/publications), for the corresponding joist series and depth.

Table 1b. Design Properties (Allowable Stress Design) for PWI Series I-Joists

Joist Series	Joist Depth [in.]	End Reaction [1] [lbf]			Intermediate Reaction [2] [lbf]			b_{EFF} [4] [in.]
		No Web Stiffeners	With Web Stiffeners	WS [3] Nails	No Web Stiffeners	With Web Stiffeners	WS [3] Nails	
PWI-20	9-1/2 [5]	117.1 × ℓ_b + 710	0.0 × ℓ_b + 1120	4	142.9 × ℓ_b + 1490	0.0 × ℓ_b + 2240	4	1.62
	11-7/8 [5]	222.9 × ℓ_b + 525	0.0 × ℓ_b + 1420	4	245.7 × ℓ_b + 1130	211.4 × ℓ_b + 1535	4	
	14	222.9 × ℓ_b + 525	97.1 × ℓ_b + 1370	4	245.7 × ℓ_b + 1130	211.4 × ℓ_b + 1535	4	
PWI-30	9-1/2 [5]	77.7 × ℓ_b + 809	77.7 × ℓ_b + 809	4	0.0 × ℓ_b + 1905	0.0 × ℓ_b + 1905	4	1.37
	11-7/8 [5]	210.9 × ℓ_b + 576	210.9 × ℓ_b + 576	4	0.0 × ℓ_b + 1905	0.0 × ℓ_b + 1905	4	
PWI-40	9-1/4	0.0 × ℓ_b + 1080	0.0 × ℓ_b + 1080	4	0.0 × ℓ_b + 2160	0.0 × ℓ_b + 2160	4	2.18
	9-1/2 [5]	17.7 × ℓ_b + 1049	17.7 × ℓ_b + 1049	4	0.0 × ℓ_b + 2160	0.0 × ℓ_b + 2160	4	
	11-7/8 [5]	97.7 × ℓ_b + 1029	97.7 × ℓ_b + 1029	4	0.0 × ℓ_b + 2500	0.0 × ℓ_b + 2500	4	
	14 [5]	155.4 × ℓ_b + 928	226.9 × ℓ_b + 803	4	0.0 × ℓ_b + 2500	0.0 × ℓ_b + 2500	4	
	16 [5]	155.4 × ℓ_b + 928	342.3 × ℓ_b + 601	4	0.0 × ℓ_b + 2500	0.0 × ℓ_b + 2500	4	
PWI-45	9-1/2	80.0 × ℓ_b + 840	0.0 × ℓ_b + 1120	4	0.0 × ℓ_b + 2240	0.0 × ℓ_b + 2240	4	1.93
	11-7/8	245.7 × ℓ_b + 550	0.0 × ℓ_b + 1420	4	180.0 × ℓ_b + 1620	137.1 × ℓ_b + 2120	4	
	14	245.7 × ℓ_b + 550	80.0 × ℓ_b + 1430	4	180.0 × ℓ_b + 1620	240.0 × ℓ_b + 1760	4	
	16	245.7 × ℓ_b + 550	228.6 × ℓ_b + 1170	4	180.0 × ℓ_b + 1620	240.0 × ℓ_b + 1760	4	
PWI-50	9-1/2 [5]	46.9 × ℓ_b + 933	46.9 × ℓ_b + 933	4	0.0 × ℓ_b + 2040	0.0 × ℓ_b + 2040	4	1.62
	11-7/8 [5]	180.0 × ℓ_b + 700	180.0 × ℓ_b + 700	4	0.0 × ℓ_b + 2040	0.0 × ℓ_b + 2040	4	
	14 [5]	164.6 × ℓ_b + 727	213.7 × ℓ_b + 641	4	0.0 × ℓ_b + 2040	0.0 × ℓ_b + 2040	4	
	16 [5]	164.6 × ℓ_b + 727	293.7 × ℓ_b + 501	4	0.0 × ℓ_b + 2040	0.0 × ℓ_b + 2040	4	
PWI-60	9-1/4	0.0 × ℓ_b + 1080	0.0 × ℓ_b + 1080	4	0.0 × ℓ_b + 2160	0.0 × ℓ_b + 2160	4	2.18
	9-1/2 [5]	17.7 × ℓ_b + 1049	17.7 × ℓ_b + 1049	4	0.0 × ℓ_b + 2160	0.0 × ℓ_b + 2160	4	
	11-7/8 [5]	97.7 × ℓ_b + 1029	97.7 × ℓ_b + 1029	4	0.0 × ℓ_b + 2500	0.0 × ℓ_b + 2500	4	
	14 [5]	155.4 × ℓ_b + 928	226.9 × ℓ_b + 803	4	0.0 × ℓ_b + 2500	0.0 × ℓ_b + 2500	4	
	16 [5]	155.4 × ℓ_b + 928	342.3 × ℓ_b + 601	4	0.0 × ℓ_b + 2500	0.0 × ℓ_b + 2500	4	
PWI-70	11-7/8 [5]	148.6 × ℓ_b + 900	0.0 × ℓ_b + 1420	4	288.6 × ℓ_b + 1325	41.7 × ℓ_b + 2621	4	2.18
	14 [5]	260.0 × ℓ_b + 705	67.4 × ℓ_b + 1474	4	305.7 × ℓ_b + 1265	305.7 × ℓ_b + 1697	4	
	16 [5]	260.0 × ℓ_b + 705	216.0 × ℓ_b + 1214	4	305.7 × ℓ_b + 1265	305.7 × ℓ_b + 1697	4	
	18	260.0 × ℓ_b + 705	246.3 × ℓ_b + 1377	6	305.7 × ℓ_b + 1265	305.7 × ℓ_b + 2129	8	
	20	260.0 × ℓ_b + 705	260.0 × ℓ_b + 1353	6	305.7 × ℓ_b + 1265	305.7 × ℓ_b + 2129	8	
PWI-80	9-1/2	0.0 × ℓ_b + 1120	0.0 × ℓ_b + 1120	4	0.0 × ℓ_b + 2240	0.0 × ℓ_b + 2240	4	3.37
	11-7/8 [5]	80.0 × ℓ_b + 1140	0.0 × ℓ_b + 1420	4	0.0 × ℓ_b + 2840	0.0 × ℓ_b + 2840	4	
	14 [5]	200.0 × ℓ_b + 930	0.0 × ℓ_b + 1710	4	20.0 × ℓ_b + 3195	0.0 × ℓ_b + 3420	4	
	16 [5]	200.0 × ℓ_b + 930	0.0 × ℓ_b + 1970	4	20.0 × ℓ_b + 3195	194.3 × ℓ_b + 2920	4	
	18	200.0 × ℓ_b + 930	108.0 × ℓ_b + 1861	6	20.0 × ℓ_b + 3195	301.7 × ℓ_b + 2894	8	
	20	200.0 × ℓ_b + 930	160.6 × ℓ_b + 1944	6	20.0 × ℓ_b + 3195	606.9 × ℓ_b + 1826	8	
PWI-77	9-1/2	82.9 × ℓ_b + 1140	0.0 × ℓ_b + 1430	4	94.3 × ℓ_b + 2365	0.0 × ℓ_b + 2860	4	2.18
	11-7/8	271.4 × ℓ_b + 810	20.0 × ℓ_b + 1855	4	260.0 × ℓ_b + 1785	345.7 × ℓ_b + 1820	4	
	14	271.4 × ℓ_b + 810	134.3 × ℓ_b + 1655	4	260.0 × ℓ_b + 1785	345.7 × ℓ_b + 1820	4	
	16	271.4 × ℓ_b + 810	251.4 × ℓ_b + 1450	4	260.0 × ℓ_b + 1785	345.7 × ℓ_b + 1820	4	
	18	271.4 × ℓ_b + 810	225.7 × ℓ_b + 1745	6	260.0 × ℓ_b + 1785	194.3 × ℓ_b + 3090	8	
	20	271.4 × ℓ_b + 810	291.4 × ℓ_b + 1630	6	260.0 × ℓ_b + 1785	194.3 × ℓ_b + 3090	8	
	22	NA	291.4 × ℓ_b + 1880	8	NA	171.4 × ℓ_b + 3525	10	
	24	NA	291.4 × ℓ_b + 1880	8	NA	171.4 × ℓ_b + 3525	10	
PWI-90	9-1/2	17.1 × ℓ_b + 1370	0.0 × ℓ_b + 1430	4	0.0 × ℓ_b + 2860	0.0 × ℓ_b + 2860	4	3.37
	11-7/8 [5]	285.7 × ℓ_b + 900	14.3 × ℓ_b + 1875	4	282.9 × ℓ_b + 2365	0.0 × ℓ_b + 3850	4	
	14 [5]	285.7 × ℓ_b + 900	128.6 × ℓ_b + 1675	4	351.4 × ℓ_b + 2125	225.7 × ℓ_b + 3065	4	
	16 [5]	285.7 × ℓ_b + 900	245.7 × ℓ_b + 1470	4	351.4 × ℓ_b + 2125	351.4 × ℓ_b + 2625	4	
	18	285.7 × ℓ_b + 900	220.0 × ℓ_b + 1765	6	351.4 × ℓ_b + 2125	351.4 × ℓ_b + 3125	8	
	20	285.7 × ℓ_b + 900	285.7 × ℓ_b + 1650	6	351.4 × ℓ_b + 2125	351.4 × ℓ_b + 3125	8	
	22	NA	285.7 × ℓ_b + 1900	8	NA	351.4 × ℓ_b + 3375	10	
	24	NA	285.7 × ℓ_b + 1900	8	NA	351.4 × ℓ_b + 3375	10	

(See footnotes on next page)

Footnotes to Table 1b:

(1) For 1-3/4 inches ≤ ℓ_b ≤ 3-1/2 inches, where ℓ_b is the bearing length in inches. See Footnote 4.
(2) For 3-1/2 inches ≤ ℓ_b ≤ 5-1/4 inches, where ℓ_b is the bearing length in inches. See Footnote 4.
(3) Number of nails needed for web stiffeners, refer to Table 2 for web stiffener and nail dimensions.
(4) After adjustment for pertinent load duration, ER shall not exceed $b_{EFF} \times \ell_b \times F_{c\perp}$ and IR shall not exceed $b_{EFF} \times \ell_b \times F_{c\perp} \times C_b$, where b_{EFF} is the effective width of the flange in inches, ℓ_b is the bearing length in inches, $F_{c\perp}$ is the reference compression design value perpendicular to grain in pounds per square inch and $C_b = (\ell_b + 0.375) \div \ell_b$. For the LVL flanges, $F_{c\perp}$ = 510 psi. For PWI-40 lumber flanges, $F_{c\perp}$ = 425 psi. For PWI-60 and PWI-80 lumber flanges, $F_{c\perp}$ = 525 psi. Do not adjust $F_{c\perp}$ for load duration when using the equation provided in this footnote. Compression of the support surface must also be checked.
(5) Design properties meet or exceed the requirements of the *PRI-400 Performance Standard for APA EWS I-Joists*, Form X720 (www.apawood.org/publications), for the corresponding joist series and depth.

Table 2. Minimum Dimensions for Web Stiffeners and Accompanying Nails (1)

Joist Series	Minimum Dimensions		
	Web Stiffeners		Nails
	Thickness	Width	
PWI-20	19/32”	2-5/16”	2-1/2” x 0.131”
PWI-30	15/32”	2-5/16”	2-1/2” x 0.131”
PWI-40	7/8”	2-5/16”	2-1/2” x 0.131”
PWI-45	23/32”	2-5/16”	2-1/2” x 0.131”
PWI-50	19/32”	2-5/16”	2-1/2” x 0.131”
PWI-60	7/8”	2-5/16”	2-1/2” x 0.131”
PWI-70	7/8”	2-5/16”	2-1/2” x 0.131”
PWI-80	1-1/2”	3-1/2”	3-1/4” x 0.131”
PWI-77	7/8”	2-5/16”	2-1/2” x 0.131”
PWI-90	1-1/2”	3-1/2”	3-1/4” x 0.131”

(1) Web stiffener length is approximately 1/8” less than the clear distance between flanges.

APA – The Engineered Wood Association is an accredited certification body under ISO 65 by Standards Council of Canada (SCC) and an accredited inspection agency by the International Code Council (ICC) International Accreditation Service (IAS) under ISO/IEC 17020. APA is also an accredited testing organization recognized by IAS and SCC under ISO/IEC 17025. APA is a recognized testing laboratory by Miami-Dade County, and a Product Testing Laboratory, Product Quality Assurance Entity, and Product Validation Entity by the Florida Department of Community Affairs (DCA).

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