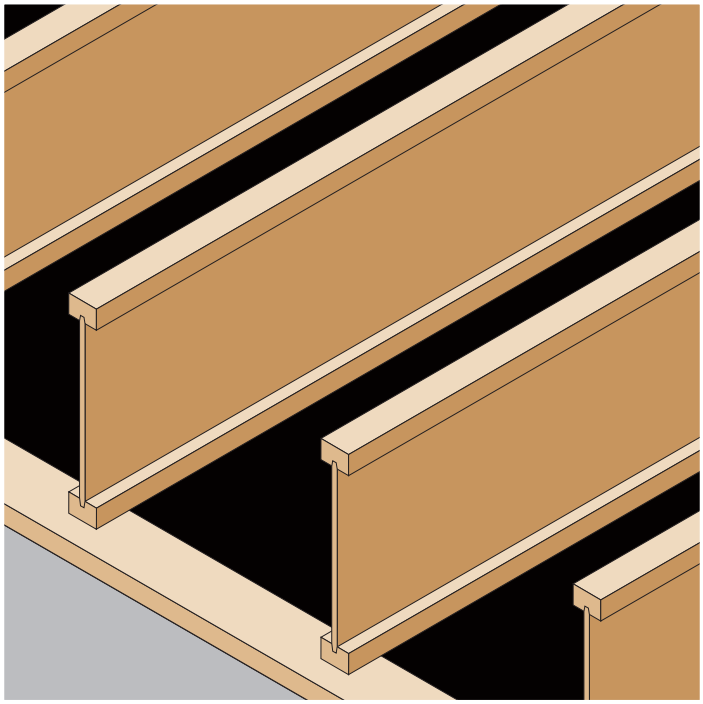
APA STANDARD

PRI-400 Performance Standard for *APA EWS* I-Joists (Limit States Design)

NOVEMBER 2013



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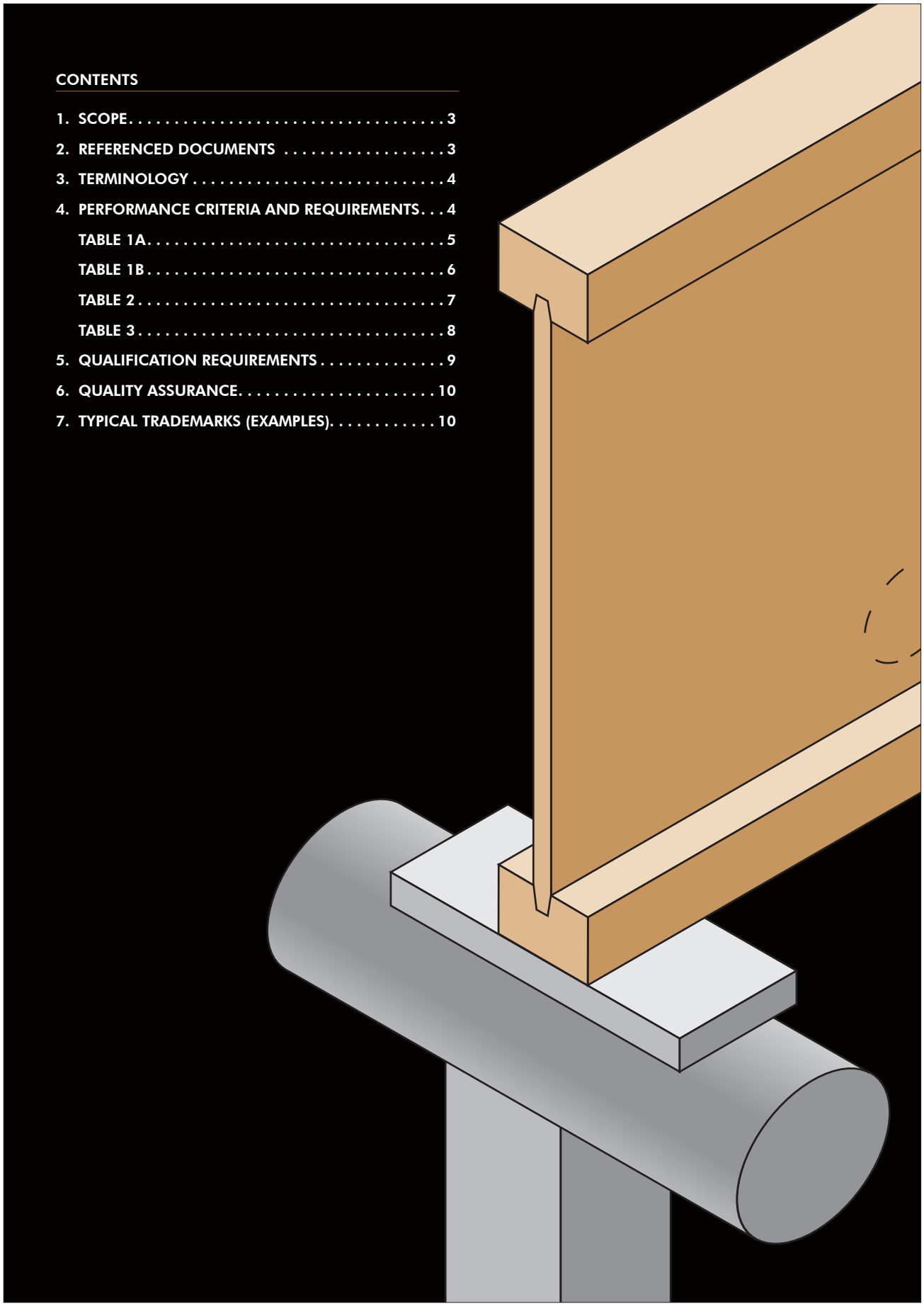

PRI-400 PERFORMANCE STANDARD FOR *APA EWS* I-JOISTS USED IN RESIDENTIAL FLOORS (LIMIT STATES DESIGN)

1. Scope

1.1 The *APA EWS* Performance-Rated I-joist is an "I"-shaped prefabricated structural member using solid-sawn lumber or structural composite lumber flanges and structural-use panel webs bonded together with exterior adhesives.

1.2 To be classified as an *APA EWS* Performance-Rated I-joist, the joist shall meet an L/480 live load deflection criterion and the intent of the floor vibration provisions specified in the National Building Code of Canada for residential floor applications, in addition to meeting all other requirements of this standard.

1.3 *APA EWS* Performance-Rated I-joists are intended for use as joists in residential floor construction. Products carrying the *APA EWS* Performance-Rated I-joist trademark are to be installed in accordance with recommendations published by *APA – The Engineered Wood Association*.

1.4 *APA EWS* Performance-Rated I-joists can be used for applications other than residential floor construction provided that appropriate design properties of the I-joists are used in design.

1.5 *APA EWS* Performance-Rated I-joists are intended for use in dry-service conditions where the average equilibrium moisture content of solid-sawn lumber is less than 16%.

1.6 This standard provides a span system for a series of *APA EWS* Performance-Rated I-joists used in residential floor construction. To qualify for trademarking as an *APA EWS* Performance-Rated I-joist, the I-joist shall demonstrate conformance to the performance requirements for the published span as well as the design properties set forth in this standard.

2. Referenced Documents

The following referenced documents are applicable to this standard. The latest edition of the referenced document (including any amendments) applies.

2.1 ASTM Standards:

D3498 Specification for Adhesives for Field-Glued Plywood to Lumber Framing for Floor Systems
D5055 Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists
D5456 Specification for Evaluation of Structural Composite Lumber Products

2.2 Other Standards:

Voluntary Product Standard PS 1 – Structural Plywood
Voluntary Product Standard PS 2 – Performance Standard for Wood-Based Structural-Use Panels
CAN/CSA O325 – Construction Sheathing
CSA O437 – Standards for OSB and Waferboard
National Building Code of Canada

2.3 APA Publications:

AFG-01 Adhesive for Field-Gluing Plywood to Wood Framing
Quality Assurance Policy for *APA EWS* Performance-Rated I-Joists

3. Terminology

3.1 Definitions – See the referenced documents for definitions of terms used in this standard.

3.2 Description of terms specific to this standard:

Bending EI: A measure of flexural stiffness without the influence of shear deflection.

Characteristic value: A value determined from test data for derivation of a design property. For the mechanical properties referenced in this standard, the characteristic values represent the 5th percentile estimates with 75% confidence, except for the stiffness (EI) and uniform vertical load capacities (VLC), which are based on the mean value. In addition, the coefficient of shear deflection (K) is determined based on theoretical calculations.

Clear span: The distance between the faces of two adjacent supports, which is the basis for the published spans given in this standard.

Design span (test span): The distance between the centerlines of two adjacent supports, which is typically referenced in full-scale beam tests or used in a structural design.

Prefabricated wood I-joist: A structural member manufactured using solid-sawn lumber or structural composite lumber flanges and structural panel webs, bonded together with exterior adhesives, forming an "I" cross-sectional shape.

4. Performance Criteria and Requirements

This section provides performance criteria and requirements for *APA EWS* Performance-Rated I-joists. *APA EWS* Performance-Rated I-joists shall be qualified by demonstrating conformance to the performance requirements given in this section.

4.1 Sizes and Tolerances

4.1.1 ***Flanges –*** *APA EWS* Performance-Rated I-joists are produced using either structural composite lumber or solid-sawn lumber as flange materials.

4.1.2 ***Webs –*** *APA EWS* Performance-Rated I-joists are produced using structural-use panels, including plywood and oriented strand board (OSB) meeting PS 1, PS 2, CSA O325, or CSA O437, as web materials.

4.1.3 ***Depth –*** *APA EWS* Performance-Rated I-joists shall have a net depth of 241 mm (9-1/2 inches), 302 mm (11-7/8 inches), 356 mm (14 inches), or 406 mm (16 inches).

4.1.4 ***Flange dimension –*** The net flange width for *APA EWS* Performance-Rated I-joists depends on the flange materials used, but shall have a minimum net width of 38 mm (1-1/2 inches) and minimum net thickness of 33 mm (1-5/16 inches).

4.1.5 ***Tolerances –*** The tolerances permitted at the time of manufacture shall be as follows:
Flange Width – Plus or minus 0.8 mm (1/32 inch)
Flange Thickness – Minus 1.6 mm (1/16 inch)
I-Joist Depth – Plus 0 or minus 3.2 mm (1/8 inch)

4.2 Maximum Span

4.2.1 The maximum spans, as shown in Tables 1A and 1B, indicate the maximum clear span for various joist spacings under typical residential floor loads of 0.48 kPa (10 psf) dead load and 1.92 kPa (40 psf) live load.

TABLE 1A

MAXIMUM CLEAR SPANS FOR *APA EWS* PERFORMANCE-RATED I-JOISTS – SIMPLE SPAN ONLY[a,b,c,d]

		Simple Spans			
		On Center Spacing			
Depth	**Joist Series**	**305 mm (12 in.)**	**406 mm (16 in.)**	**488 mm (19.2 in.)**	**610 mm (24 in.)**
241 mm (9-1/2 in.)	PRI-20	4.42 m (14 ft 6 in.)	4.19 m (13 ft 9 in.)	4.06 m (13 ft 4 in.)	4.01 m (13 ft 2 in.)
	PRI-30	4.57 m (15 ft 0 in.)	4.32 m (14 ft 2 in.)	4.19 m (13 ft 9 in.)	4.14 m (13 ft 7 in.)
	PRI-40	4.67 m (15 ft 4 in.)	4.42 m (14 ft 6 in.)	4.27 m (14 ft 0 in.)	4.24 m (13 ft 11 in.)
	PRI-50	4.67 m (15 ft 4 in.)	4.42 m (14 ft 6 in.)	4.29 m (14 ft 1 in.)	4.24 m (13 ft 11 in.)
	PRI-60	4.80 m (15 ft 9 in.)	4.55 m (14 ft 11 in.)	4.39 m (14 ft 5 in.)	4.34 m (14 ft 3 in.)
302 mm (11-7/8 in.)	PRI-20	4.95 m (16 ft 3 in.)	4.70 m (15 ft 5 in.)	4.55 m (14 ft 11 in.)	4.50 m (14 ft 9 in.)
	PRI-30	5.11 m (16 ft 9 in.)	4.83 m (15 ft 10 in.)	4.67 m (15 ft 4 in.)	4.65 m (15 ft 3 in.)
	PRI-40	5.23 m (17 ft 2 in.)	4.95 m (16 ft 3 in.)	4.80 m (15 ft 9 in.)	4.75 m (15 ft 7 in.)
	PRI-50	5.26 m (17 ft 3 in.)	4.95 m (16 ft 3 in.)	4.80 m (15 ft 9 in.)	4.75 m (15 ft 7 in.)
	PRI-60	5.38 m (17 ft 8 in.)	5.08 m (16 ft 8 in.)	4.93 m (16 ft 2 in.)	4.88 m (16 ft 0 in.)
	PRI-70	5.51 m (18 ft 1 in.)	5.18 m (17 ft 0 in.)	5.03 m (16 ft 6 in.)	4.95 m (16 ft 3 in.)
	PRI-80	5.77 m (18 ft 11 in.)	5.38 m (17 ft 8 in.)	5.21 m (17 ft 1 in.)	5.13 m (16 ft 10 in.)
	PRI-90	5.89 m (19 ft 4 in.)	5.46 m (17 ft 11 in.)	5.28 m (17 ft 4 in.)	5.23 m (17 ft 2 in.)
356 mm (14 in.)	PRI-40	5.74 m (18 ft 10 in.)	5.38 m (17 ft 8 in.)	5.21 m (17 ft 1 in.)	5.16 m (16 ft 11 in.)
	PRI-50	5.77 m (18 ft 11 in.)	5.38 m (17 ft 8 in.)	5.21 m (17 ft 1 in.)	5.16 m (16 ft 11 in.)
	PRI-60	5.97 m (19 ft 7 in.)	5.54 m (18 ft 2 in.)	5.36 m (17 ft 7 in.)	5.28 m (17 ft 4 in.)
	PRI-70	6.12 m (20 ft 1 in.)	5.66 m (18 ft 7 in.)	5.46 m (17 ft 11 in.)	5.38 m (17 ft 8 in.)
	PRI-80	6.40 m (21 ft 0 in.)	5.94 m (19 ft 6 in.)	5.69 m (18 ft 8 in.)	5.61 m (18 ft 5 in.)
	PRI-90	6.55 m (21 ft 6 in.)	6.07 m (19 ft 11 in.)	5.82 m (19 ft 1 in.)	5.72 m (18 ft 9 in.)
406 mm (16 in.)	PRI-40	6.27 m (20 ft 7 in.)	5.82 m (19 ft 1 in.)	5.59 m (18 ft 4 in.)	5.51 m (18 ft 1 in.)
	PRI-50	6.27 m (20 ft 7 in.)	5.84 m (19 ft 2 in.)	5.61 m (18 ft 5 in.)	5.54 m (18 ft 2 in.)
	PRI-60	6.50 m (21 ft 4 in.)	6.02 m (19 ft 9 in.)	5.79 m (19 ft 0 in.)	5.72 m (18 ft 9 in.)
	PRI-70	6.65 m (21 ft 10 in.)	6.17 m (20 ft 3 in.)	5.92 m (19 ft 5 in.)	5.84 m (19 ft 2 in.)
	PRI-80	6.99 m (22 ft 11 in.)	6.45 m (21 ft 2 in.)	6.20 m (20 ft 4 in.)	6.10 m (20 ft 0 in.)
	PRI-90	7.14 m (23 ft 5 in.)	6.60 m (21 ft 8 in.)	6.32 m (20 ft 9 in.)	6.22 m (20 ft 5 in.)

(a) Clear span applicable to simple-span residential floor construction with a design dead load of 0.48 kPa (10 psf) and live load of 1.92 kPa (40 psf). The ultimate limit states are based on the factored loads of 1.25D + 1.50L. The serviceability limit states include the consideration for floor vibration and a live load deflection limit of span/480.

(b) Spans are based on a composite floor with glued-nailed sheathing meeting the requirements for APA Rated Sheathing or APA Rated STURD-I-FLOOR conforming to PS 1, PS 2, CSA O121, CSA O151, CSA O325, or CSA O437 with a minimum thickness of 15 mm (19/32 inch) (40/20 or 20 oc) for a joist spacing of 488 mm (19.2 inches) or less, or 18 mm (23/32 inch) (48/24 or 24 oc) for a joist spacing of 610 mm (24 inches). Adhesive shall meet the requirements given in ASTM D3498 or APA Specification AFG-01. No concrete topping, gypsum ceiling, or bridging element was assumed.

(c) Minimum bearing length shall be 44 mm (1-3/4 inches) for the end bearings.

(d) Web stiffeners are not required when I-joists are used with the spans and spacings given in this table, except as required by hanger manufacturers and over supports at load-bearing cantilever locations.

TABLE 1B

MAXIMUM CLEAR SPANS FOR *APA EWS* PERFORMANCE-RATED I-JOISTS – MULTIPLE SPAN ONLY[a,b,c,d,e]

		Multiple Spans			
		On Center Spacing			
Depth	**Joist Series**	**305 mm (12 in.)**	**406 mm (16 in.)**	**488 mm (19.2 in.)**	**610 mm (24 in.)**
241 mm (9-1/2 in.)	PRI-20	4.78 m (15 ft 8 in.)	4.52 m (14 ft 10 in.)	4.37 m (14 ft 4 in.)	4.34 m (14 ft 3 in.)
	PRI-30	4.93 m (16 ft 2 in.)	4.65 m (15 ft 3 in.)	4.50 m (14 ft 9 in.)	4.47 m (14 ft 8 in.)
	PRI-40	5.03 m (16 ft 6 in.)	4.75 m (15 ft 7 in.)	4.62 m (15 ft 2 in.)	4.57 m (15 ft 0 in.)
	PRI-50	5.05 m (16 ft 7 in.)	4.78 m (15 ft 8 in.)	4.62 m (15 ft 2 in.)	4.57 m (15 ft 0 in.)
	PRI-60	5.18 m (17 ft 0 in.)	4.90 m (16 ft 1 in.)	4.75 m (15 ft 7 in.)	4.70 m (15 ft 5 in.)
302 mm (11-7/8 in.)	PRI-20	5.33 m (17 ft 6 in.)	5.05 m (16 ft 7 in.)	4.90 m (16 ft 1 in.)	4.85 m (15 ft 11 in.)
	PRI-30	5.54 m (18 ft 2 in.)	5.21 m (17 ft 1 in.)	5.05 m (16 ft 7 in.)	5.00 m (16 ft 5 in.)
	PRI-40	5.72 m (18 ft 9 in.)	5.33 m (17 ft 6 in.)	5.18 m (17 ft 0 in.)	5.13 m (16 ft 10 in.)
	PRI-50	5.72 m (18 ft 9 in.)	5.33 m (17 ft 6 in.)	5.18 m (17 ft 0 in.)	5.13 m (16 ft 10 in.)
	PRI-60	5.92 m (19 ft 5 in.)	5.51 m (18 ft 1 in.)	5.31 m (17 ft 5 in.)	5.26 m (17 ft 3 in.)
	PRI-70	6.07 m (19 ft 11 in.)	5.64 m (18 ft 6 in.)	5.41 m (17 ft 9 in.)	5.36 m (17 ft 7 in.)
	PRI-80	6.38 m (20 ft 11 in.)	5.92 m (19 ft 5 in.)	5.66 m (18 ft 7 in.)	5.59 m (18 ft 4 in.)
	PRI-90	6.53 m (21 ft 5 in.)	6.05 m (19 ft 10 in.)	5.79 m (19 ft 0 in.)	5.69 m (18 ft 8 in.)
356 mm (14 in.)	PRI-40	6.35 m (20 ft 10 in.)	5.89 m (19 ft 4 in.)	5.66 m (18 ft 7 in.)	5.59 m (18 ft 4 in.)
	PRI-50	6.35 m (20 ft 10 in.)	5.92 m (19 ft 5 in.)	5.66 m (18 ft 7 in.)	5.61 m (18 ft 5 in.)
	PRI-60	6.58 m (21 ft 7 in.)	6.12 m (20 ft 1 in.)	5.87 m (19 ft 3 in.)	5.79 m (19 ft 0 in.)
	PRI-70	6.76 m (22 ft 2 in.)	6.25 m (20 ft 6 in.)	5.99 m (19 ft 8 in.)	5.92 m (19 ft 5 in.)
	PRI-80	7.09 m (23 ft 3 in.)	6.55 m (21 ft 6 in.)	6.27 m (20 ft 7 in.)	6.20 m (20 ft 4 in.)
	PRI-90	7.24 m (23 ft 9 in.)	6.71 m (22 ft 0 in.)	6.43 m (21 ft 1 in.)	6.32 m (20 ft 9 in.)
406 mm (16 in.)	PRI-40	6.91 m (22 ft 8 in.)	6.43 m (21 ft 1 in.)	6.17 m (20 ft 3 in.)	6.07 m (19 ft 11 in.)
	PRI-50	6.91 m (22 ft 8 in.)	6.43 m (21 ft 1 in.)	6.17 m (20 ft 3 in.)	6.10 m (20 ft 0 in.)
	PRI-60	7.16 m (23 ft 6 in.)	6.65 m (21 ft 10 in.)	6.38 m (20 ft 11 in.)	6.30 m (20 ft 8 in.)
	PRI-70	7.34 m (24 ft 1 in.)	6.81 m (22 ft 4 in.)	6.53 m (21 ft 5 in.)	6.43 m (21 ft 1 in.)
	PRI-80	7.72 m (25 ft 4 in.)	7.14 m (23 ft 5 in.)	6.83 m (22 ft 5 in.)	6.73 m (22 ft 1 in.)
	PRI-90	7.87 m (25 ft 10 in.)	7.29 m (23 ft 11 in.)	6.99 m (22 ft 11 in.)	6.86 m (22 ft 6 in.)

(a) Clear span applicable to multiple-span residential floor construction with a design dead load of 0.48 kPa (10 psf) and live load of 1.92 kPa (40 psf). The ultimate limit states are based on the factored loads of 1.25D + 1.50L. The serviceability limit states include the consideration for floor vibration and a live load deflection limit of span/480. The end spans shall be 40% or more of the adjacent span.

(b) Spans are based on a composite floor with glued-nailed sheathing meeting the requirements for APA Rated Sheathing or APA Rated STURD-I-FLOOR conforming to PS 1, PS 2, CSA O121, CSA O151, CSA O325, or CSA O437 with a minimum thickness of 15 mm (19/32 inch) (40/20 or 20 oc) for a joist spacing of 488 mm (19.2 inches) or less, or 18 mm (23/32 inch) (48/24 or 24 oc) for a joist spacing of 610 mm (24 inches). Adhesive shall meet the requirements given in ASTM D3498 or APA Specification AFG-01. No concrete topping, gypsum ceiling, or bridging element was assumed.

(c) Minimum bearing length shall be 44 mm (1-3/4 inches) for the end bearings, and 89 mm (3-1/2 inches) for the intermediate bearings.

(d) Web stiffeners are not required when I-joists are used with the spans and spacings given in this table, except as required by hanger manufacturers and over supports at load-bearing cantilever locations.

(e) The ends of the joists shall be anchored to resist a factored uplift force of 0.48 kPa (10 psf) x joist spacing x largest span, due to pattern loading.

4.3 Design Properties

4.3.1 *APA EWS* Performance-Rated I-joists shall be designed based on the tabulated values provided in Table 2.

4.4 Characteristic Test Values

4.4.1 *APA EWS* Performance-Rated I-joists shall have characteristic test values that are equal to or greater than the values given in Table 3.

TABLE 2

FACTORED RESISTANCE FOR *APA EWS* PERFORMANCE-RATED I-JOISTS[a]

Depth	Joist Series	EI[b] 10^6 kN•mm² (10^6 lbf-in.²)	M_r[c] kN•mm (lbf-ft)	V_r[d] kN (lbf)	IR_r[e,i] kN (lbf)	ER_r[f,i], kN (lbf) 44 mm (1-3/4 in.) Brg w/o Stiffeners	44 mm (1-3/4 in.) Brg w/ Stiffeners	102 mm (4 in.) Brg w/o Stiffeners	102 mm (4 in.) Brg w/ Stiffeners	VLC_r[g] kN/m (lbf/ft)	K[h] kN (10^6 lbf)
241 mm (9-1/2 in.)	PRI-20	379 (132)	5,683 (4,191)	7.86 (1,768)	11.94 (2,683)	5.83 (1,310)	5.83 (1,310)	7.86 (1,768)	7.86 (1,768)	48.7 (3,336)	21,973 (4.94)
	PRI-30	456 (159)	7,272 (5,364)	7.86 (1,768)	13.37 (3,007)	6.63 (1,492)	6.63 (1,492)	7.86 (1,768)	7.86 (1,768)	48.7 (3,336)	21,973 (4.94)
	PRI-40	528 (184)	6,167 (4,549)	7.86 (1,768)	15.16 (3,409)	7.58 (1,705)	7.58 (1,705)	7.86 (1,768)	7.86 (1,768)	48.7 (3,336)	21,973 (4.94)
	PRI-50	534 (186)	8,569 (6,320)	7.86 (1,768)	14.32 (3,220)	7.13 (1,602)	7.13 (1,602)	7.86 (1,768)	7.86 (1,768)	48.7 (3,336)	21,973 (4.94)
	PRI-60	628 (219)	8,524 (6,287)	7.86 (1,768)	15.16 (3,409)	7.58 (1,705)	7.58 (1,705)	7.86 (1,768)	7.86 (1,768)	48.7 (3,336)	21,973 (4.94)
302 mm (11-7/8 in.)	PRI-20	646 (225)	7,362 (5,430)	9.97 (2,241)	11.94 (2,683)	5.83 (1,310)	5.83 (1,310)	9.97 (2,241)	9.97 (2,241)	48.7 (3,336)	27,489 (6.18)
	PRI-30	778 (271)	9,403 (6,936)	9.97 (2,241)	13.37 (3,007)	6.63 (1,492)	6.63 (1,492)	9.97 (2,241)	9.97 (2,241)	48.7 (3,336)	27,489 (6.18)
	PRI-40	898 (313)	7,994 (5,896)	9.97 (2,241)	17.55 (3,946)	8.42 (1,894)	8.42 (1,894)	9.97 (2,241)	9.97 (2,241)	48.7 (3,336)	27,489 (6.18)
	PRI-50	907 (316)	11,083 (8,175)	9.97 (2,241)	14.32 (3,220)	7.13 (1,602)	7.13 (1,602)	9.97 (2,241)	9.97 (2,241)	48.7 (3,336)	27,489 (6.18)
	PRI-60	1,065 (371)	11,049 (8,150)	9.97 (2,241)	17.55 (3,946)	8.42 (1,894)	8.42 (1,894)	9.97 (2,241)	9.97 (2,241)	48.7 (3,336)	27,489 (6.18)
	PRI-70	1,194 (416)	14,872 (10,969)	9.97 (2,241)	16.39 (3,686)	8.14 (1,831)	8.14 (1,831)	9.97 (2,241)	9.97 (2,241)	48.7 (3,336)	27,489 (6.18)
	PRI-80	1,487 (518)	15,649 (11,543)	9.97 (2,241)	19.38 (4,356)	8.99 (2,020)	8.99 (2,020)	9.97 (2,241)	9.97 (2,241)	48.7 (3,336)	27,489 (6.18)
	PRI-90	1,639 (571)	19,776 (14,586)	13.52 (3,038)	23.55 (5,296)	9.83 (2,210)	9.83 (2,210)	13.23 (2,975)	13.52 (3,038)	48.7 (3,336)	27,489 (6.18)
356 mm (14 in.)	PRI-40	1,317 (459)	9,629 (7,102)	12.01 (2,699)	17.55 (3,946)	8.42 (1,894)	8.42 (1,894)	10.88 (2,447)	12.01 (2,699)	48.7 (3,336)	32,381 (7.28)
	PRI-50	1,329 (463)	13,214 (9,746)	12.01 (2,699)	14.32 (3,220)	7.13 (1,602)	7.13 (1,602)	10.88 (2,447)	12.01 (2,699)	48.7 (3,336)	32,381 (7.28)
	PRI-60	1,561 (544)	13,293 (9,805)	12.01 (2,699)	17.55 (3,946)	8.42 (1,894)	8.42 (1,894)	10.88 (2,447)	12.01 (2,699)	48.7 (3,336)	32,381 (7.28)
	PRI-70	1,748 (609)	17,735 (13,081)	12.01 (2,699)	16.39 (3,686)	8.14 (1,831)	8.14 (1,831)	10.88 (2,447)	12.01 (2,699)	48.7 (3,336)	32,381 (7.28)
	PRI-80	2,169 (756)	18,852 (13,904)	12.01 (2,699)	21.20 (4,767)	8.99 (2,020)	8.99 (2,020)	10.88 (2,447)	12.01 (2,699)	48.7 (3,336)	32,381 (7.28)
	PRI-90	2,388 (832)	23,587 (17,397)	14.92 (3,354)	23.55 (5,296)	9.83 (2,210)	9.83 (2,210)	13.23 (2,975)	14.92 (3,354)	48.7 (3,336)	32,381 (7.28)
406 mm (16 in.)	PRI-40	1,794 (625)	11,162 (8,233)	13.83 (3,109)	17.55 (3,946)	8.42 (1,894)	8.42 (1,894)	10.88 (2,447)	13.83 (3,109)	48.7 (3,336)	37,007 (8.32)
	PRI-50	1,808 (630)	15,142 (11,168)	13.83 (3,109)	14.32 (3,220)	7.13 (1,602)	7.13 (1,602)	10.88 (2,447)	13.83 (3,109)	48.7 (3,336)	37,007 (8.32)
	PRI-60	2,121 (739)	15,413 (11,368)	13.83 (3,109)	17.55 (3,946)	8.42 (1,894)	8.42 (1,894)	10.88 (2,447)	13.83 (3,109)	48.7 (3,336)	37,007 (8.32)
	PRI-70	2,370 (826)	20,317 (14,985)	13.83 (3,109)	16.39 (3,686)	8.14 (1,831)	8.14 (1,831)	10.88 (2,447)	13.83 (3,109)	48.7 (3,336)	37,007 (8.32)
	PRI-80	2,939 (1,024)	21,851 (16,116)	13.83 (3,109)	21.20 (4,767)	8.99 (2,020)	8.99 (2,020)	10.88 (2,447)	13.83 (3,109)	48.7 (3,336)	37,007 (8.32)
	PRI-90	3,231 (1,126)	27,026 (19,933)	16.36 (3,678)	23.55 (5,296)	9.83 (2,210)	9.83 (2,210)	13.23 (2,975)	16.36 (3,678)	48.7 (3,336)	37,007 (8.32)

(a) The tabulated values are for the standard term of load duration (K_D = 1.0). All values, except for EI and K, are permitted to be adjusted for other load durations as permitted by the code, and the VLC_r values shall not be increased for shorter durations.

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

(c) Factored moment capacity (M_r) of the I-joist.

(d) Factored shear resistance (V_r) of the I-joist.

(e) Factored intermediate reaction (IR_r) of the I-joist with a minimum bearing length of 89 mm (3-1/2 inches) without bearing stiffeners.

(f) Factored end reaction (ER_r) of the I-joist. Interpolation between 44-mm (1-3/4-in.) and 102-mm (4-in.) bearings is permitted with or without bearing stiffeners.

(g) Factored uniform vertical (bearing) load capacity (VLC_r).

(h) Coefficient of shear deflection (K), which shall be used to calculate uniform load and center-point load deflections of the I-joist in a simple-span application based on 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 (mm), ω = unfactored uniform load (kN/mm), P = concentrated load (kN),
ℓ = design span (mm), EI = bending stiffness of the I-joist (kN•mm²), and K = coefficient of shear deflection (kN).

(i) The IR_r and ER_r adjusted for applicable modification factors, including load duration, shall not exceed the factored compressive resistance perpendicular to grain (Q_r) of the bearing plate supporting the I-joist.

TABLE 3

CHARACTERISTIC VALUES FOR *APA EWS* PERFORMANCE-RATED I-JOISTS[a]

Depth	Joist Series	EI[b] 10^6 kN•mm² (10^6 lbf-in.²)	M_c[c] kN•mm (lbf-ft)	V_c[d] kN (lbf)	IR_c[e] kN (lbf)	ER_c[f], kN (lbf)				VLC_c[g] kN/m (lbf/ft)	K[h] kN (10^6 lbf)
						44 mm (1-3/4 in.) Brg w/o Stiffeners	44 mm (1-3/4 in.) Brg w/ Stiffeners	102 mm (4 in.) Brg w/o Stiffeners	102 mm (4 in.) Brg w/ Stiffeners		
241 mm (9-1/2 in.)	PRI-20	379 (132)	7,179 (5,295)	11.81 (2,655)	17.93 (4,030)	8.76 (1,970)	8.76 (1,970)	11.81 (2,655)	11.81 (2,655)	87.6 (6,000)	21,973 (4.94)
	PRI-30	456 (159)	9,186 (6,775)	11.81 (2,655)	20.08 (4,515)	9.96 (2,240)	9.96 (2,240)	11.81 (2,655)	11.81 (2,655)	87.6 (6,000)	21,973 (4.94)
	PRI-40	528 (184)	7,789 (5,745)	11.81 (2,655)	22.77 (5,120)	11.39 (2,560)	11.39 (2,560)	11.81 (2,655)	11.81 (2,655)	87.6 (6,000)	21,973 (4.94)
	PRI-50	534 (186)	10,819 (7,980)	11.81 (2,655)	21.51 (4,835)	10.72 (2,410)	10.72 (2,410)	11.81 (2,655)	11.81 (2,655)	87.6 (6,000)	21,973 (4.94)
	PRI-60	628 (219)	10,765 (7,940)	11.81 (2,655)	22.77 (5,120)	11.39 (2,560)	11.39 (2,560)	11.81 (2,655)	11.81 (2,655)	87.6 (6,000)	21,973 (4.94)
302 mm (11-7/8 in.)	PRI-20	646 (225)	9,301 (6,860)	14.99 (3,370)	17.93 (4,030)	8.76 (1,970)	8.76 (1,970)	14.99 (3,370)	14.99 (3,370)	87.6 (6,000)	27,489 (6.18)
	PRI-30	778 (271)	11,877 (8,760)	14.99 (3,370)	20.08 (4,515)	9.96 (2,240)	9.96 (2,240)	14.99 (3,370)	14.99 (3,370)	87.6 (6,000)	27,489 (6.18)
	PRI-40	898 (313)	10,094 (7,445)	14.99 (3,370)	26.35 (5,925)	12.65 (2,845)	12.65 (2,845)	14.99 (3,370)	14.99 (3,370)	87.6 (6,000)	27,489 (6.18)
	PRI-50	907 (316)	13,999 (10,325)	14.99 (3,370)	21.51 (4,835)	10.72 (2,410)	10.72 (2,410)	14.99 (3,370)	14.99 (3,370)	87.6 (6,000)	27,489 (6.18)
	PRI-60	1,065 (371)	13,951 (10,290)	14.99 (3,370)	26.35 (5,925)	12.65 (2,845)	12.65 (2,845)	14.99 (3,370)	14.99 (3,370)	87.6 (6,000)	27,489 (6.18)
	PRI-70	1,194 (416)	18,778 (13,850)	14.99 (3,370)	24.62 (5,535)	12.23 (2,750)	12.23 (2,750)	14.99 (3,370)	14.99 (3,370)	87.6 (6,000)	27,489 (6.18)
	PRI-80	1,487 (518)	19,761 (14,575)	14.99 (3,370)	29.11 (6,545)	13.50 (3,035)	13.50 (3,035)	14.99 (3,370)	14.99 (3,370)	87.6 (6,000)	27,489 (6.18)
	PRI-90	1,639 (571)	24,974 (18,420)	20.31 (4,565)	35.38 (7,955)	14.77 (3,320)	14.77 (3,320)	19.88 (4,470)	20.31 (4,565)	87.6 (6,000)	27,489 (6.18)
356 mm (14 in.)	PRI-40	1,317 (459)	12,162 (8,970)	18.04 (4,055)	26.35 (5,925)	12.65 (2,845)	12.65 (2,845)	16.35 (3,675)	18.04 (4,055)	87.6 (6,000)	32,381 (7.28)
	PRI-50	1,329 (463)	16,690 (12,310)	18.04 (4,055)	21.51 (4,835)	10.72 (2,410)	10.72 (2,410)	16.35 (3,675)	18.04 (4,055)	87.6 (6,000)	32,381 (7.28)
	PRI-60	1,561 (544)	16,785 (12,380)	18.04 (4,055)	26.35 (5,925)	12.65 (2,845)	12.65 (2,845)	16.35 (3,675)	18.04 (4,055)	87.6 (6,000)	32,381 (7.28)
	PRI-70	1,748 (609)	22,398 (16,520)	18.04 (4,055)	24.62 (5,535)	12.23 (2,750)	12.23 (2,750)	16.35 (3,675)	18.04 (4,055)	87.6 (6,000)	32,381 (7.28)
	PRI-80	2,169 (756)	23,808 (17,560)	18.04 (4,055)	31.85 (7,160)	13.50 (3,035)	13.50 (3,035)	16.35 (3,675)	18.04 (4,055)	87.6 (6,000)	32,381 (7.28)
	PRI-90	2,388 (832)	29,787 (21,970)	22.42 (5,040)	35.38 (7,955)	14.77 (3,320)	14.77 (3,320)	19.88 (4,470)	22.42 (5,040)	87.6 (6,000)	32,381 (7.28)
406 mm (16 in.)	PRI-40	1,794 (625)	14,094 (10,395)	20.77 (4,670)	26.35 (5,925)	12.65 (2,845)	12.65 (2,845)	16.35 (3,675)	20.77 (4,670)	87.6 (6,000)	37,007 (8.32)
	PRI-50	1,808 (630)	19,124 (14,105)	20.77 (4,670)	21.51 (4,835)	10.72 (2,410)	10.72 (2,410)	16.35 (3,675)	20.77 (4,670)	87.6 (6,000)	37,007 (8.32)
	PRI-60	2,121 (739)	19,463 (14,355)	20.77 (4,670)	26.35 (5,925)	12.65 (2,845)	12.65 (2,845)	16.35 (3,675)	20.77 (4,670)	87.6 (6,000)	37,007 (8.32)
	PRI-70	2,370 (826)	25,659 (18,925)	20.77 (4,670)	24.62 (5,535)	12.23 (2,750)	12.23 (2,750)	16.35 (3,675)	20.77 (4,670)	87.6 (6,000)	37,007 (8.32)
	PRI-80	2,939 (1,024)	27,591 (20,350)	20.77 (4,670)	31.85 (7,160)	13.50 (3,035)	13.50 (3,035)	16.35 (3,675)	20.77 (4,670)	87.6 (6,000)	37,007 (8.32)
	PRI-90	3,231 (1,126)	34,125 (25,170)	24.58 (5,525)	35.38 (7,955)	14.77 (3,320)	14.77 (3,320)	19.88 (4,470)	24.58 (5,525)	87.6 (6,000)	37,007 (8.32)

(a) The tabulated values are test values. Use the values given in Table 2 for design.

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

(c) Characteristic moment capacity (M_c) of the I-joist.

(d) Characteristic shear capacity (V_c) of the I-joist.

(e) Characteristic intermediate reaction (IR_c) of the I-joist with a minimum bearing length of 89 mm (3-1/2 inches) without bearing stiffeners.

(f) Characteristic end reaction (ER_c) of the I-joist.

(g) Mean ultimate uniform vertical (bearing) load capacity (VLC_c). The required mean test value at the 1.5-mm (0.06-inch) deformation shall be 1/3 of the tabulated value or greater.

(h) Coefficient of shear deflection (K).

5. Qualification Requirements

5.1 All *APA EWS* Performance-Rated I-joists shall be qualified based on the requirements specified in this section. Qualification tests shall be conducted in accordance with the principles set forth in ASTM D5055 with additional requirements specifically noted in this standard.

5.2 Flange Materials

5.2.1 Flanges can be solid-sawn lumber or structural composite lumber with a net dimension in conformance with Section 4.1.4. The flange materials shall have a published specific gravity of 0.42 or higher on average.

5.2.2 End joints are permitted for flange materials provided that such joints conform to the requirements of ASTM D5055.

5.2.3 Flange materials used for the top flange of the I-joist shall be the same grade/type as those used for the bottom (balanced construction).

5.2.4 Qualification for flange materials shall be in accordance with ASTM D5055 and *Quality Assurance Policy for APA EWS Performance-Rated I-Joists*.

5.3 Web Materials

5.3.1 Structural-use panels in conformance with PS 1, PS 2, CSA O325, or CSA O437 shall be used as web materials provided that the glue bond characteristics meet the requirements of EXPOSURE 1 or EXTERIOR, and *Quality Assurance Policy for APA EWS Performance-Rated I-Joists*.

5.4 Adhesives

5.4.1 Adhesives shall conform to the requirements of ASTM D5055.

5.5 I-Joist Products

5.5.1 Sampling procedures, number of samples, test methods, and data analyses for the I-joist qualification shall conform to the principles set forth in ASTM D5055 with additional requirements specifically noted in this section.

5.5.2 Manufacturing parameters, such as web types, thicknesses, and grades; flange types and sizes; web-flange joints; and web joints shall be identified as part of the qualification procedures. Changes in these parameters shall require an engineering evaluation or re-qualification by APA.

5.5.3 Qualification test results for *APA EWS* Performance-Rated I-joists shall conform to the characteristic test values given in Table 3.

6. Quality Assurance

6.1 Qualification Tests

6.1.1 Required qualification tests and criteria are detailed in Sections 1 and 4 of this standard. Retests shall be conducted using a new independent sample set.

6.2 Product Evaluation

6.2.1 Upon satisfactory completion of the requirements in Sections 1 and 4, all manufacturing variables shall be documented in the in-plant quality manual in accordance with the *Quality Assurance Policy for APA EWS Performance-Rated I-Joists*.

6.2.2 Periodic reevaluation of structural capacities shall be conducted in accordance with the requirements given in ASTM D5055 and the *Quality Assurance Policy for APA EWS Performance-Rated I-Joists*. This reevaluation shall be performed at the end of the first 6 months for any new plant or any new production line and shall not be longer than every 12 months for any existing plant or any existing production line.

6.3 Quality Assurance

6.3.1 Quality assurance of *APA EWS* Performance-Rated I-joists shall follow the in-plant manufacturing standard and the *Quality Assurance Policy for* APA EWS *Performance Rated I-Joists*.

6.4 Trademarking

6.4.1 All *APA EWS* Performance-Rated I-joists shall be identified with an *APA EWS* trademark, as shown in Section 7, bearing the net I-joist depth, joist referenced standard (PRI-400) or APA Product Report number, and manufacturing plant number.

7. Typical Trademarks (Examples)

7.1 9-1/2-inch depth

7.2 11-7/8-inch depth

7.3 14-inch depth

7.4 16-inch depth

PRI-400 Performance Standard for *APA EWS* I-Joists (Limit States Design)

We have field representatives in many major U.S. cities and in Canada who can help answer questions involving APA trademarked products. For additional assistance in specifying engineered wood products, contact us:

APA HEADQUARTERS
7011 So. 19th St. ▪ Tacoma, Washington 98466
(253) 565-6600 ▪ Fax: (253) 565-7265

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

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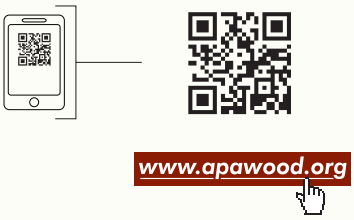

Form No. E720A CA/Revised November 2013

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