Evaluation Report CCMC 12412-R
LP® SolidStart I-Joists: LPI® 18, LPI® 18FB, LPI® 20Plus, LPI® 20FB, LPI® 32Plus, LPI® 36, LPI® 42Plus, LPI® 42FB, LPI® 52Plus, LPI® 56, LPI® 450 and LPI® 530

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1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that "LP® SolidStart I-Joists: LPI® 18, LPI® 18FB, LPI® 20Plus, LPI® 20FB, LPI® 32Plus, LPI® 36, LPI® 42Plus, LPI® 42FB, LPI® 52Plus, LPI® 56, LPI® 450 and LPI® 530," when used as joists in floor and roof applications in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code (NBC) of Canada 2015:

- Clause 1.2.1.1.(1)(a), Division A, using the following acceptable solutions from Division B:
  - Sentence 4.3.1.1.(1), Design Basis for Wood (CAN/CSA-O86-14, "Engineering Design in Wood," for I-joist qualification)

- Clause 1.2.1.1.(1)(b), Division A, as an alternative solution that achieves at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the following applicable acceptable solutions:
  - Article 9.10.8.10., Application to Houses (Fire rating is not required for single-family houses constructed as per Part 9 of the NBC, conventional wood-frame construction)[1];
  - Sentence 9.23.4.2.(2), Spans for Joists, Rafters and Beams (Structural)

This opinion is based on the CCMC evaluation of the technical evidence in Section 4 provided by the Report Holder.

1. Sections 4.2 and 4.3 of this Report provide "fire-protection options" for this proprietary floor joist system as an alternative solution to the acceptable solution in Part 9 for conventional wood-frame floor construction. The proposed joists' fire protection options, referenced in Sections 4.2 and 4.3 and listed in Appendix B, are provided to the authority having jurisdiction (AHJ) for information purposes. The fire-protection options, proposed and explained in Sections 4.2 and 4.3, are provided by the joist manufacturer, and the fire performance has been reviewed by CCMC as performing "as well as" the inherent fire resistance of exposed lumber floors.

Ruling No. 05-08-132 (12412-R) authorizing the use of this product in Ontario, subject to the terms and conditions contained in the Ruling, was made by the Minister of Municipal Affairs and Housing on 2005-05-13 pursuant to s. 29 of the *Building Code Act, 1992* (see Ruling for terms and conditions). This Ruling is subject to periodic revisions and updates.

2. Description

The products are prefabricated wood I-joists consisting of two continuous sawn lumber flanges or two structural composite lumber (SCL) flanges glued to one of the two thicknesses of an oriented strandboard (OSB) web (9.5 mm or 11.1 mm). The OSB web is manufactured specifically for Louisiana-Pacific Corporation and conforms to CSA O325, "Construction Sheathing," Product Standard PS 2, and the LP proprietary web specifications. The dimensions of each product are listed in Table 2.1.

The web-flange connection is made by inserting a beveled OSB web into a machined groove in the center of the flange. Web segments are end-jointed together to form a continuous web. The web-flange connection and the web segment end joints are glued with a phenol-resorcinol adhesive (see CCMC 13054-L and 13291-L). Fingerjoints are glued using either phenol-resorcinol adhesives (see CCMC 12917-L) or a water-based melamine resin (see CCMC 13307-L).

Table 2.1 Dimensions of the Products

Product	Flange Size Width x Thickness, mm (in.)	Web Thickness mm (in.)	Range of Joist Depths mm (in.)
Sawn Lumber Flanges			
LPI® 18	63.5 × 38 (2½ × 1½)	9.5 (⅜)	200 to 406 (7⅞ to 16)
LPI® 20Plus	63.5 × 38 (2½ × 1½)	9.5 (⅜)	200 to 406 (7⅞ to 16)
LPI® 32Plus	63.5 × 38 (2½ × 1½)	9.5 (⅜)	200 to 406 (7⅞ to 16)
LPI® 42Plus	89 × 38 (3½ × 1½)	9.5 (⅜)	200 to 406 (7⅞ to 16)
LPI® 42Plus	89 × 38 (3½ × 1½)	11.1 (7/16)	457 to 610 (18 to 24)
LPI® 52Plus	89 × 38 (3½ × 1½)	11.1 (7/16)	235 to 610 (9¼ to 24)
LVL Flanges			
LPI® 36	57 × 38 (2¼ × 1½)	9.5 (⅜)	301 to 610 (11⅞ to 24)
LPI® 56	89 × 38 (3½ × 1½)	11.1 (7/16)	301 to 610 (11⅞ to 24)
LPI® 450	45 × 33 (1¾ × 1-5/16)	9.5 (⅜)	241 to 406 (9½ to 16)
LPI® 530	53 × 33 (2-1/16 × 1-5/16)	9.5 (⅜)	241 to 406 (9½ to 16)

3. Conditions and Limitations

The CCMC compliance opinion in Section 1 is bound by the "LP® SolidStart I-Joists: LPI® 18, LPI® 20Plus, LPI® 32Plus, LPI® 36, LPI® 42Plus, LPI® 52Plus, LPI® 56, LPI® 450 and LPI® 530" being used in accordance with the conditions and limitations set out below:

- The products are intended for use in structural applications such as floor, ceiling or roof joists, and are intended for dry service use[1] applications only.
- The pre-engineering tables in the literature listed below have been provided to CCMC by the manufacturer to demonstrate compliance to Part 9, Housing and Small Buildings, of the NBC 2015 for acceptance by the local authority having jurisdiction (AHJ):

i. **Louisiana-Pacific Corporation Pre-engineered Tables**

When the products are used to support uniform loads only, the installation must be in accordance with the span tables (including vibration criteria[2] found in the documents entitled:

a. "Technical Guide for Residential Construction LPI® 18, 20Plus, 32Plus, 36, 42Plus, 52Plus, and 56 Series" for Canada − Limit States Design," March 2019; and
b. "Technical Guide for Light-Frame Commercial and Multifamily Construction LPI® 20Plus, 32Plus, 36, 42Plus, 52Plus and 56 Series I-Joists and 2900F_b − 2.0E LVL" for Canada − Limit States Design," September 2019.

The product must be installed in accordance with the manufacturer's installation guidelines noted in the documents listed in 3(i) for those applications falling within the scope of the documents. Applications outside the scope of these installation guidelines require engineering on a case-by-case basis.

ii. **Louisiana-Pacific Corporation Pre-engineered Installation Details**

The manufacturer's pre-engineered details within documents (a) and (b) outlined in 3(i) are limited in scope to building designs where the anticipated loads on the following structural details are not exceeded:

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1. All lumber, wood-based panels and proprietary engineered wood products are intended for dry service conditions. "Dry service" is defined as the in-service environment under which the equilibrium moisture content (MC) of lumber is 15% or less over a year and does not exceed 19% at any time. Wood contained within the interior of dry, heated or unheated buildings has generally been found to have a MC between 6% and 14% according to season and location. During construction, all wood-based products should be protected from the weather to ensure that the 19% MC is not exceeded in accordance with Article 9.3.2.5., Moisture Content, of Division B of the NBC 2015.
2. In cases where concrete topping is applied or bridging/blocking is used and joists are installed at the maximum spans, the current vibration criteria may not address all occupant performance expectations. Therefore, the manufacturer should be consulted for span adjustments, if necessary, in these types of installations.
    - rim joist resistance, pages 5 and 30 of (a) and pages 5 and 44 of (b);
    - web stiffener requirements, page 5 of (a) and page 22 of (b);

- uniform floor load tables, pages 10-11 of (a);
- loadbearing cantilever tables, pages 18-21 of (a);
- brick ledge cantilever, pages 22-23 of (a);
- web hole tables, pages 24-25 of (a) and pages 20-21 of (b);
- floor span tables, pages 6-9 of (a) and pages 6-15 of (b);
- roof span tables, pages 14-17 of (a) and pages 16-19 of (b); and
- uniform roof load tables, pages 12-13 of (a).

iii. **Engineering Required**

For structural applications beyond the scope/limitations of the above-referenced publications or when required by the AHJ, the drawings or related documents must bear the authorized seal of a professional engineer skilled in wood design and licensed to practice under the appropriate provincial or territorial legislation.

Installations beyond the scope/limitations of 3(i) and 3(ii) imply, but are not limited to, the following:

- higher loads/longer spans than the manufacturer's pre-engineered details;
- concentrated loads;
- offset bearing walls;
- areas of high wind and seismicity;
- stair openings;
- design of supporting wall studs/beams when total load exceeds the NBC 2015 pre-engineered floor/roof joist tables;
- design of supporting foundation footings when total load exceeds the NBC 2015 pre-engineered floor/roof joist tables; and
- fire resistance (see applicable fire-resistance assembly listings for specific joist and adhesives used).

The engineer must design in accordance with CAN/CSA-O86, and may use as a guide the *Engineering Guide for Wood-Frame Construction*, published by the Canadian Wood Council.

The factored resistance and engineering properties for the products must not exceed the values set forth in Table 4.1.1.

The ends of all I-joist members used as joists, rafters and beams must be restrained to prevent rollover. This is normally achieved by attaching a diaphragm sheathing to the top or to the compression edge, and to an end wall or shear transfer panel capable of transferring a minimum unfactored uniform load of 730 N/m or the required shear forces due to wind or seismic conditions. Blocking or cross-bracing with equivalent strength may be used.

The compression edges of all the products' members used as joists and rafters must be laterally supported at least every 610 mm, except where design is done in accordance with CAN/CSA-O86.

Nailing of the products must be in accordance with the manufacturer's engineering details provided on a case-by-case basis.

iv. **Engineering Support Provided by Manufacturer**

Louisiana-Pacific Corp. provides engineering support through either their local distributor or a professional engineer skilled in wood design and licensed to practice under the appropriate provincial or territorial legislation. Louisiana-Pacific Corp. may also be consulted in the use of the product.

- Louisiana-Pacific Corp. (technical support): 1-888-820-0325; e-mail: customer.support@lpcorp.com.

- Damaged or defective products must not be used, unless *repaired* in accordance with written instructions from the manufacturer.
- This product must be identified with the phrase "CCMC 12412-R" along the side of the product. This CCMC number is only valid when it appears in conjunction with the certification mark of APA-EWS.

4. Technical Evidence

The Report Holder has submitted technical documentation for the CCMC evaluation. Testing was conducted at laboratories recognized by CCMC. The corresponding technical evidence for this product is summarized below.

Additional engineering data and load/span tables are available from the manufacturer as outlined in 3(i) above.

4.1 Design Requirements

Table 4.1.1 Engineering Properties of the Products

Joist Series	Joist Depth	Factored Resistance		EI x 10^6	K x 10^6
		Moment[1]	Shear		
	mm (in.)	N-m (lb-ft)	N (lb)	kN-mm^2 (lb-in.^{2})	N (lb-ft/in.)
Sawn Lumber Flanges					
LPI® 18	200 (7⅞)	4 305 (3 175)	6 605 (1 485)	198 (69)	16.12 (0.302)
	225 (8⅞)	4 867 (3 590)	7 406 (1 665)	264 (92)	17.83 (0.334)
	235 (9¼)	5 003 (3 690)	7 717 (1 735)	327 (114)	18.52 (0.347)
	241 (9½)	5 098 (3 760)	7 940 (1 785)	407 (142)	18.95 (0.355)
	286 (11¼)	5 762 (4 250)	8 985 (2 020)	654 (228)	22.10 (0.414)
	302 (11⅞)	6 033 (4 450)	9 363 (2 105)	712 (248)	23.22 (0.435)
	356 (14)	8 385 (6 185)	10 608 (2 385)	1 065 (371)	27.12 (0.508)
	406 (16)	9 538 (7 035)	11 698 (2 630)	1 475 (514)	30.80 (0.577)
LPI® 20Plus	200 (7⅞)	5 037 (3 715)	7 339 (1 650)	336 (117)	16.28 (0.305)
	225 (8⅞)	5 816 (4 290)	8 251 (1 855)	451 (157)	17.99 (0.337)
	235 (9¼)	6 108 (4 505)	8 607 (1 935)	496 (173)	18.68 (0.35)
	241 (9½)	6 331 (4 670)	8 852 (1 990)	531 (185)	19.11 (0.358)
	286 (11¼)	7 687 (5 670)	10 008 (2 250)	804 (280)	22.26 (0.417)
	302 (11⅞)	8 473 (6 250)	10 431 (2 345)	913 (318)	23.38 (0.438)
	356 (14)	9 924 (7 320)	11 787 (2 650)	1 360 (474)	27.33 (0.512)
	406 (16)	11 388 (8 400)	13 122 (2 950)	1 871 (652)	31.06 (0.582)

Joist Series	Joist Depth	Factored Resistance		EI x 10^6	K x 10^6
		Moment[1]	Shear		
	mm (in.)	N-m (lb-ft)	N (lb)	kN-mm^2 ($lb-in.^2$)	N (lb-ft/in.)
LPI® 32Plus	200 (7⅞)	6 026 (4 445)	7 339 (1 650)	405 (141)	16.28 (0.305)
	225 (8⅞)	6 962 (5 135)	8 251 (1 855)	531 (185)	17.99 (0.337)
	235 (9¼)	7 314 (5 395)	8 607 (1 935)	594 (207)	18.68 (0.35)
	241 (9½)	7 552 (5 570)	8 852 (1 990)	634 (221)	19.11 (0.358)
	286 (11¼)	9 192 (6 780)	10 008 (2 250)	950 (331)	22.26 (0.417)
	302 (11⅞)	9 775 (7 210)	10 431 (2 345)	1 076 (375)	23.38 (0.438)
	356 (14)	11 768 (8 680)	11 787 (2 650)	1 575 (549)	27.33 (0.512)
	406 (16)	13 646 (10 065)	13 122 (2 950)	2 132 (743)	31.06 (0.582)
LPI® 42Plus	200 (7⅞)	9 667 (7 130)	8 029 (1 805)	585 (204)	18.20 (0.341)
	225 (8⅞)	11 151 (8 225)	8 874 (1 995)	781 (272)	20.55 (0.385)
	235 (9¼)	11 741 (8 660)	9 207 (2 070)	864 (301)	21.40 (0.401)
	241 (9½)	12 120 (8 940)	9 408 (2 115)	921 (321)	21.99 (0.412)
	286 (11¼)	14 764 (10 890)	10 875 (2 445)	1 377 (480)	26.05 (0.488)
	302 (11⅞)	15 706 (11 585)	11 409 (2 565)	1 570 (547)	27.49 (0.515)
	356 (14)	18 913 (13 950)	13 166 (2 960)	2 301 (802)	32.40 (0.607)
	406 (16)	21 936 (16 180)	14 856 (3 340)	3 134 (1 092)	36.99 (0.693)
	457 (18)	24 797 (18 290)	17 948 (4 035)	3 825 (1 333)	51.24 (0.96)
	508 (20)	27 447 (20 245)	19 616 (4 410)	4 844 (1 688)	56.95 (1.067)
	559 (22)	30 064 (22 175)	21 284 (4 785)	5 992 (2 088)	62.61 (1.173)
	610 (24)	32 646 (24 080)	22 952 (5 160)	7 272 (2 534)	68.32 (1.28)

Joist Series	Joist Depth	Factored Resistance		EI x 10^6	K x 10^6
		Moment[1]	Shear		
	mm (in.)	N-m (lb-ft)	N (lb)	kN-mm^2 (lb-in.^{2})	N (lb-ft/in.)
LPI® 52Plus	235 (9¼)	14 303 (10 550)	12 032 (2 705)	958 (334)	26.31 (0.493)
	241 (9½)	14 764 (10 890)	12 254 (2 755)	1 022 (356)	27.06 (0.507)
	286 (11¼)	17 950 (13 240)	13 856 (3 115)	1 518 (529)	32.03 (0.6)
	302 (11⅞)	19 096 (14 085)	14 434 (3 245)	1 722 (600)	33.79 (0.633)
	356 (14)	22 994 (16 960)	16 369 (3 680)	2 508 (874)	39.87 (0.747)
	406 (16)	26 668 (19 670)	18 148 (4 080)	3 395 (1 183)	45.53 (0.853)
	457 (18)	30 145 (22 235)	19 972 (4 490)	4 419 (1 540)	51.24 (0.96)
	508 (20)	33 372 (24 615)	21 795 (4 900)	5 590 (1 948)	56.95 (1.067)
	559 (22)	36 551 (26 960)	23 597 (5 305)	6 910 (2 408)	62.61 (1.173)
	610 (24)	39 696 (29 280)	25 420 (5 715)	8 377 (2 919)	68.32 (1.28)
LVL Flanges					
LPI® 36	302 (11⅞)	14 527 (10 715)	11 342 (2 550)	1 231 (429)	24.98 (0.468)
	356 (14)	17 489 (12 900)	12 855 (2 890)	1 785 (622)	29.36 (0.55)
	406 (16)	20 282 (14 960)	14 189 (3 190)	2 399 (836)	33.36 (0.625)
	457 (18)	22 858 (16 860)	15 346 (3 450)	3 105 (1 082)	37.36 (0.7)
	508 (20)	25 407 (18 740)	16 280 (3 660)	3 903 (1 360)	41.31 (0.774)
	559 (22)	27 942 (20 610)	17 103 (3 845)	4 789 (1 669)	45.37 (0.85)
	610 (24)	30 450 (22 460)	17 725 (3 985)	5 768 (2 010)	49.21 (0.922)
LPI® 56	302 (11⅞)	22 939 (16 920)	14 434 (3 245)	1 917 (668)	29.30 (0.549)
	356 (14)	27 617 (20 370)	16 369 (3 680)	2 778 (968)	34.21 (0.641)
	406 (16)	32 030 (23 625)	18 148 (4 080)	3 733 (1 301)	38.91 (0.729)
	457 (18)	36 104 (26 630)	19 972 (4 490)	4 833 (1 684)	43.61 (0.817)
	508 (20)	40 144 (29 610)	21 795 (4 900)	6 069 (2 115)	48.31 (0.905)
	559 (22)	44 143 (32 560)	23 597 (5 305)	7 453 (2 597)	53.00 (0.993)
	610 (24)	48 116	25 420	8 973	57.70

Joist Series	Joist Depth	Factored Resistance		EI x 10^6	K x 10^6
		Moment[1]	Shear		
	mm (in.)	N-m (lb-ft)	N (lb)	kN-mm^2 (lb-in.^{2})	N (lb-ft/in.)
		(35 490)	(5 715)	(3 127)	(1.081)
LPI® 450	241 (9½)	7 552 (5 570)	8 630 (1 940)	488 (170)	25.2 (5.68)
	302 (11⅞)	9 742 (7 185)	10 031 (2 255)	821 (286)	31.2 (7.02)
	356 (14)	11 545 (8 515)	11 276 (2 535)	1 202 (419)	36.6 (8.23)
	406 (16)	13 212 (9 745)	12 455 (2 800)	1 633 (569)	41.7 (9.38)
LPI® 530	241 (9½)	9 023 (6 655)	9 408 (2 115)	574 (200)	25.5 (5.74)
	302 (11⅞)	11 613 (8 565)	10 987 (2 470)	967 (337)	31.5 (7.09)
	356 (14)	13 775 (10 160)	12 388 (2 785)	1 412 (492)	37.0 (8.32)
	406 (16)	15 761 (11 625)	13 723 (3 085)	1 911 (666)	42.1 (9.47)

Joist Series	Joist Depth	Factored End Reaction				Factored Intermediate Reaction				Factored Flange Bearing[5]
		N (lb)				N (lb)				
		38 mm (1½ in.) Bearing Length		102 mm (4 in.) Bearing Length		89 mm (3½ in.) Bearing Length		140 mm (5½ in.) Bearing Length		
	mm (in.)	w/o WS[4]	WS	w/o WS	WS	w/o WS	WS	w/o WS	WS	N/mm (lb/in.)
Sawn Lumber Flanges										
LPI® 18	200 (7⅞)	6 116 (1 375)	6 605 (1 485)	6 605 (1 485)	6 605 (1 485)	13 277 (2 985)	14 278 (3 210)	14 856 (3 340)	15 790 (3 550)	242 (1 380)
	225 (8⅞)	6 116 (1 375)	6 961 (1 565)	6 850 (1 540)	7 406 (1 665)	13 611 (3 060)	14 701 (3 305)	15 190 (3 415)	16 280 (3 660)	
	235 (9¼)	6 116 (1 375)	7 095 (1 595)	6 961 (1 565)	7 717 (1 735)	13 767 (3 095)	14 856 (3 340)	15 368 (3 455)	16 502 (3 710)	
	241 (9½)	6 116 (1 375)	7 206 (1 620)	6 983 (1 570)	7 940 (1 785)	13 856 (3 115)	14 990 (3 370)	15 479 (3 480)	16 636 (3 740)	
	286 (11¼)	6 116 (1 375)	7 784 (1 750)	7 228 (1 625)	8 985 (2 020)	14 500 (3 260)	15 701 (3 530)	16 146 (3 630)	17 547 (3 945)	
	302 (11⅞)	6 116 (1 375)	8 029 (1 805)	7 295 (1 640)	9 363 (2 105)	14 701 (3 305)	15 946 (3 585)	16 391 (3 685)	17 859 (4 015)	
	356 (14)	6 116 (1 375)	8 807 (1 980)	7 584 (1 705)	10 608 (2 385)	15 479 (3 480)	16 813 (3 780)	17 192 (3 865)	18 948 (4 260)	
	406 (16)	6 116 (1 375)	9 519 (2 140)	7 828 (1 760)	11 698 (2 630)	16 213 (3 645)	17 659 (3 970)	18 014 (4 050)	20 038 (4 505)	

Joist Series	Joist Depth	Factored End Reaction				Factored Intermediate Reaction				Factored Flange Bearing[5]
		N (lb)				N (lb)				
		38 mm (1½ in.) Bearing Length		102 mm (4 in.) Bearing Length		89 mm (3½ in.) Bearing Length		140 mm (5½ in.) Bearing Length		
	mm (in.)	w/o WS[4]	WS	w/o WS	WS	w/o WS	WS	w/o WS	WS	N/mm (lb/in.)
LPI® 20Plus	200 (7⅞)	6 805 (1 530)	7 339 (1 650)	7 339 (1 650)	7 339 (1 650)	14 745 (3 315)	15 902 (3 575)	16 502 (3 710)	17 547 (3 945)	242 (1 380)
	225 (8⅞)	6 805 (1 530)	7 717 (1 735)	7 628 (1 715)	8 251 (1 855)	15 168 (3 410)	16 369 (3 680)	16 925 (3 805)	18 103 (4 070)	
	235 (9¼)	6 805 (1 530)	7 895 (1 775)	7 717 (1 735)	8 607 (1 935)	15 301 (3 440)	16 524 (3 715)	17 103 (3 845)	18 370 (4 130)	
	241 (9½)	6 805 (1 530)	8 006 (1 800)	7 784 (1 750)	8 852 (1 990)	15 412 (3 465)	16 680 (3 750)	17 192 (3 865)	18 504 (4 160)	
	286 (11¼)	6 805 (1 530)	8 674 (1 950)	8 029 (1 805)	10 008 (2 250)	16 102 (3 620)	17 436 (3 920)	17 970 (4 040)	19 527 (4 390)	
	302 (11⅞)	6 805 (1 530)	8 940 (2 010)	8 140 (1 830)	10 431 (2 345)	16 369 (3 680)	17 725 (3 985)	18 215 (4 095)	19 860 (4 465)	
	356 (14)	6 805 (1 530)	9 786 (2 200)	8 429 (1 895)	11 787 (2 650)	17 236 (3 875)	18 704 (4 205)	19 126 (4 300)	21 106 (4 745)	
	406 (16)	6 805 (1 530)	10 608 (2 385)	8 696 (1 955)	13 122 (2 950)	18 037 (4 055)	19 616 (4 410)	20 016 (4 500)	22 284 (5 010)	
LPI® 32Plus	200 (7⅞)	6 805 (1 530)	7 339 (1 650)	7 339 (1 650)	7 339 (1 650)	14 745 (3 315)	15 902 (3 575)	16 502 (3 710)	17 547 (3 945)	297 (1 695)
	225 (8⅞)	6 805 (1 530)	7 717 (1 735)	7 628 (1 715)	8 251 (1 855)	15 168 (3 410)	16 369 (3 680)	16 925 (3 805)	18 103 (4 070)	
	235 (9¼)	6 805 (1 530)	7 895 (1 775)	7 717 (1 735)	8 607 (1 935)	15 301 (3 440)	16 524 (3 715)	17 103 (3 845)	18 370 (4 130)	
	241 (9½)	6 805 (1 530)	8 006 (1 800)	7 784 (1 750)	8 852 (1 990)	15 412 (3 465)	16 680 (3 750)	17 192 (3 865)	18 504 (4 160)	
	286 (11¼)	6 805 (1 530)	8 674 (1 950)	8 029 (1 805)	10 008 (2 250)	16 102 (3 620)	17 436 (3 920)	17 970 (4 040)	19 527 (4 390)	
	302 (11⅞)	6 805 (1 530)	8 940 (2 010)	8 140 (1 830)	10 431 (2 345)	16 369 (3 680)	17 725 (3 985)	18 215 (4 095)	19 860 (4 465)	
	356 (14)	6 805 (1 530)	9 786 (2 200)	8 429 (1 895)	11 787 (2 650)	17 236 (3 875)	18 704 (4 205)	19 126 (4 300)	21 106 (4 745)	
	406 (16)	6 805 (1 530)	10 608 (2 385)	8 696 (1 955)	13 122 (2 950)	18 037 (4 055)	19 616 (4 410)	20 016 (4 500)	22 284 (5 010)	

LPI® 42Plus	200 (7⅞)	8 029 (1 805)	8 029 (1 805)	8 029 (1 805)	8 029 (1 805)	19 771 (4 445)	20 483 (4 605)	19 771 (4 445)	20 861 (4 690)	429 (2 450)
	225 (8⅞)	8 207 (1 845)	8 874 (1 995)	8 696 (1 955)	8 874 (1 995)	20 149 (4 530)	21 217 (4 770)	20 283 (4 560)	21 795 (4 900)	
	235 (9¼)	8 296 (1 865)	9 207 (2 070)	8 985 (2 020)	9 207 (2 070)	20 283 (4 560)	21 506 (4 835)	20 505 (4 610)	22 196 (4 990)	
	241 (9½)	8 318 (1 870)	9 408 (2 115)	9 163 (2 060)	9 408 (2 115)	20 350 (4 575)	21 728 (4 885)	20 639 (4 640)	22 440 (5 045)	
	286 (11¼)	8 629 (1 940)	10 275 (2 310)	10 631 (2 390)	10 875 (2 445)	21 017 (4 725)	22 952 (5 160)	21 595 (4 855)	24 086 (5 415)	
	302 (11⅞)	8 740 (1 965)	10 608 (2 385)	11 209 (2 520)	11 409 (2 565)	21 239 (4 775)	23 441 (5 270)	21 906 (4 925)	24 686 (5 550)	
	356 (14)	9 118 (2 050)	11 654 (2 620)	11 209 (2 520)	13 166 (2 960)	22 040 (4 955)	25 020 (5 625)	23 018 (5 175)	26 710 (6 005)	
	406 (16)	9 474 (2 130)	12 632 (2 840)	11 209 (2 520)	14 856 (3 340)	22 774 (5 120)	26 510 (5 960)	24 108 (5 420)	28 645 (6 440)	
	457 (18)	10 542[2] (2 370[2])	16 191[2] (3 640[2])	11 876 (2 670)	17 948 (4 035)	24 219 (5 445)	30 091 (6 765)	27 022 (6 075)	32 470 (7 300)	
	508 (20)	10 542[2] (2 370[2])	17 192[2] (3 865[2])	11 876 (2 670)	19 616 (4 410)	24 219 (5 445)	30 958 (6 960)	27 022 (6 075)	33 938 (7 630)	
	559 (22)	10 542[2] (2 370[2])	18 215[2] (4 095[2])	11 876 (2 670)	21 284 (4 785)	24 219 (5 445)	31 803 (7 150)	27 022 (6 075)	35 317 (7 940)	
	610 (24)	10 542[2] (2 370[2])	18 993[2] (4 270[2])	11 876 (2 670)	22 952 (5 160)	24 219 (5 445)	32 582 (7 325)	27 022 (6 075)	36 585 (8 225)	
LPI® 52Plus	235 (9¼)	9 341 (2 100)	11 454 (2 575)	11 164 (2 510)	12 032 (2 705)	23 864 (5 365)	25 843 (5 810)	24 575 (5 525)	26 688 (6 000)	429 (2 450)
	241 (9½)	9 363 (2 105)	11 587 (2 605)	11 231 (2 525)	12 254 (2 755)	23 864 (5 365)	26 043 (5 855)	24 686 (5 550)	26 955 (6 060)	
	286 (11¼)	9 541 (2 145)	12 454 (2 800)	11 698 (2 630)	13 856 (3 115)	23 975 (5 390)	27 555 (6 195)	25 309 (5 690)	28 845 (6 485)	
	302 (11⅞)	9 608 (2 160)	12 788 (2 875)	11 876 (2 670)	14 434 (3 245)	24 019 (5 400)	28 089 (6 315)	25 532 (5 740)	29 557 (6 645)	
	356 (14)	9 719 (2 185)	13 833 (3 110)	12 944 (2 910)	16 369 (3 680)	24 108 (5 420)	29 913 (6 725)	26 288 (5 910)	31 870 (7 165)	
	406 (16)	9 830 (2 210)	14 812 (3 330)	13 944 (3 135)	18 148 (4 080)	24 219 (5 445)	31 625 (7 110)	27 022 (6 075)	34 094 (7 665)	
	457 (18)	11 943[2] (2 685[2])	17 481[2] (3 930[2])	14 945 (3 360)	19 972 (4 490)	24 219 (5 445)	33 338 (7 495)	27 022 (6 075)	36 273 (8 155)	
	508 (20)	11 943[2] (2 685[2])	18 771[2] (4 220[2])	14 945 (3 360)	21 795 (4 900)	24 219 (5 445)	35 028 (7 875)	27 022 (6 075)	38 431 (8 640)	
	559 (22)	11 943[2] (2 685[2])	20 105[2] (4 520[2])	14 945 (3 360)	23 597 (5 305)	24 219 (5 445)	36 763 (8 265)	27 022 (6 075)	40 655 (9 140)	
	610 (24)	11 943[2] (2 685[2])	21 439[2] (4 820[2])	14 945 (3 360)	25 420 (5 715)	24 219 (5 445)	38 164 (8 580)	27 022 (6 075)	42 834 (9 630)	

LVL Flanges										
LPI® 36	302 (11⅞)	7 205 (1 620)	10 540 (2 370)	9 030 (2 030)	11 345 (2 550)	17 525 (3 940)	21 795 (4 900)	19 905 (4 475)	24 355 (5 475)	301 (1 720)
	356 (14)	7 205 (1 620)	10 630 (2 390)	9 295 (2 090)	12 855 (2 890)	17 525 (3 940)	22 510 (5 060)	19 905 (4 475)	25 020 (5 625)	
	406 (16)	7 205 (1 620)	10 700 (2 405)	9 540 (2 145)	14 190 (3 190)	17 525 (3 940)	23 195 (5 215)	19 905 (4 475)	25 665 (5 770)	
	457 (18)	8 250[2] (1 855[2])	12 635[2] (2 840[2])	9 785 (2 200)	15 345 (3 450)	17 525 (3 940)	23 910 (5 375)	19 905 (4 475)	26 335 (5 920)	
	508 (20)	8 320[2] (1 870[2])	13 055[2] (2 935[2])	10 030 (2 255)	16 280 (3 660)	17 525 (3 940)	24 575 (5 525)	19 905 (4 475)	26 955 (6 060)	
	559 (22)	8 430[2] (1 895[2])	13 455[2] (3 025[2])	10 275 (2 310)	17 105 (3 845)	17 525 (3 940)	25 265 (5 680)	19 905 (4 475)	27 600 (6 205)	
	610 (24)	8 540[2] (1 920[2])	13 765[2] (3 095[2])	10 540 (2 370)	17 725 (3 985)	17 525 (3 940)	25 975 (5 840)	19 905 (4 475)	28 270 (6 355)	
LPI® 56	302 (11⅞)	8 030 (1 805)	11 655 (2 620)	10 630 (2 390)	14 435 (3 245)	21 975 (4 940)	27 090 (6 090)	25 775 (5 795)	28 515 (6 410)	476 (2 720)
	356 (14)	8 030 (1 805)	12 320 (2 770)	10 785 (2 425)	16 370 (3 680)	21 975 (4 940)	28 470 (6 400)	25 775 (5 795)	30 180 (6 785)	
	406 (16)	8 030 (1 805)	12 945 (2 910)	10 920 (2 455)	18 150 (4 080)	21 975 (4 940)	29 805 (6 700)	25 775 (5 795)	31 760 (7 140)	
	457 (18)	9 230[2] (2 075[2])	16 145[2] (3 630[2])	11 055 (2 485)	19 970 (4 490)	21 975 (4 940)	31 135 (7 000)	25 775 (5 795)	33 340 (7 495)	
	508 (20)	9 295[2] (2 090[2])	17 235[2] (3 875[2])	11 210 (2 520)	21 795 (4 900)	21 975 (4 940)	32 425 (7 290)	25 775 (5 795)	34 940 (7 855)	
	559 (22)	9 365[2] (2 105[2])	18 325[2] (4 120[2])	11 345 (2 550)	23 600 (5 305)	21 975 (4 940)	33 760 (7 590)	25 775 (5 795)	36 520 (8 210)	
	610 (24)	9 410[2] (2 115[2])	19 440[2] (4 370[2])	11 475 (2 580)	25 420 (5 715)	21 975 (4 940)	35 095 (7 890)	25 775 (5 795)	38 120 (8 570)	
LPI® 450	241 (9½)	5 894 (1 325)	7 718 (1 735)	7 295 1 640	8 630 1 940	13 033 (2 930)	14 635 (3 290)	15 413 (3 465)	16 948 (3 810)	231 (1 321)
	302 (11⅞)	5 894 (1 325)	8 496 (1 910)	7 517 1 690	10 031 (2 255)	13 478 (3 030)	15 658 (3 520)	15 836 (3 560)	17 615 (3 960)	
	356 (14)	5 894 (1 325)	9 163 (2 060)	7 718 1 735	11 276 (2 535)	13 945 (3 135)	16 570 (3 725)	16 191 (3 640)	18 215 (4 095)	
	406 (16)	5 894 (1 325)	9 786 (2 200)	7 896 1 775	12 455 (2 800)	14 368 (3 230)	17 437 (3 920)	16 570 (3 725)	18 816 (4 230)	
LPI® 530	241 (9½)	6 183 (1 390)	7 896 (1 775)	7 695 1 730	9 408 (2 115)	14 501 (3 260)	16 147 (3 630)	15 902 (3 575)	17 548 (3 945)	275 (1 572)
	302 (11⅞)	6 183 (1 390)	8 741 (1 965)	7 873 1 770	10 987 (2 470)	14 879 (3 345)	17 437 (3 920)	16 859 (3 790)	19 194 (4 315)	
	356 (14)	6 183 (1 390)	9 475 (2 130)	8 029 1 805	12 388 (2 785)	15 191 (3 415)	18 638 (4 190)	17 726 (3 985)	20 684 (4 650)	
	406 (16)	6 183 (1 390)	10 186 (2 290)	8 185 1 840	13 723 (3 085)	15 524 (3 490)	19 728 (4 435)	18 527 (4 165)	22 041 (4 955)	

Notes to Table 4.1.1:

1. The factored moment resistances listed in Table 4.1.1 must not be increased by any Code allowed repetitive member system factor.
2. Factored end reaction for 64 mm (2½ in.) bearing length.
3. For all depths of 241 mm (9½ in.) and greater, the factored intermediate reaction with a minimum bearing length of 76 mm (3 in.) shall be permitted to be determined by prorating based on the intermediate reaction values with a bearing length of 89 mm (3½ in.) and 140 mm (5½ in.).
4. WS: web stiffeners; w/o WS: without web stiffeners.
5. The factored compression perpendicular to the grain of the flange per mm (in.) of bearing length.

4.2 Additional Performance Data Submitted by the Report Holder

This section is beyond the scope of CCMC's opinion in Section 1 related to the evaluation of structural performance in Section 4.1. The performance of the fire-protection options has been reviewed by CCMC and is presented as additional information for AHJs.

4.2.1 Background

The following information is intended to be used by the AHJ when the fire performance of the alternative solution is deemed to perform "as well as" that of the Code-specified exposed lumber joists. The engineered joist manufacturer (Report Holder) has submitted to CCMC the fire-protection option for its proprietary joist system when used in single-family houses (unsprinklered). The submission was in response to the decision by the Canadian Commission on Construction Materials Evaluations (CCCME), as outlined in Section 4.3 of this Report.

4.2.2 Proposed Fire-Protection Options

The manufacturer's solutions for proposed fire protection of their proprietary joists are presented in Appendix B. CCMC has reviewed the fire testing and analysis of the fire-protection options in comparison to the fire performance of unprotected exposed 38 mm × 235 mm (2 × 10) floor joist system[1]. The fire testing demonstrated that the proposed fire-protection options perform "as well as" exposed 38 mm × 235 mm (2 × 10) lumber joists. It should be noted that the NBC exempts single-family houses constructed using conventional wood-frame construction, in accordance with Part 9, from requiring a fire-resistance rating (see Article 9.10.8.10. of Division B of the NBC 2015). The proposed fire-protection options for proprietary alternative floor joists are not to be considered in sprinklered single-family houses or where fire-resistance-rated assemblies are required.

1. Structural composite lumber, as defined in CSA O86 and evaluated by CCMC, is considered to have equivalent fire performance to lumber for joists of the same size.

4.3 Additional Health and Safety Data Identified by Third Parties

This section is beyond the scope of CCMC's opinion in Section 1 related to the evaluation of structural performance in Section 4.1. The performance of the fire protection options has been reviewed by CCMC and is presented as additional information for AHJs.

4.3.1 Canadian Commission on Construction Materials Evaluations (CCCME) – Fire Safety

The minimum fire performance of innovative structural materials, or alternative solutions, as compared to that of the NBC-specified conventional wood-frame construction, or acceptable solution, has been the subject of analysis and discussion for several years among fire officials, provincial and territorial regulators, and AHJs. The NRC fire tests[1] conducted between 2002 and 2008 demonstrated that the innovative structural joist systems tested, and currently in the marketplace (i.e., I-joists, C-channel steel joists, metal-plated wood trusses and metal-web trusses), had a time-to-collapse below the performance of exposed 38 mm × 235 mm (2 × 10) lumber joists (which is considered the benchmark or acceptable solution). At the May 2018 and October 2019 meetings of the CCCME, the Commission directed CCMC to provide floor fire performance information to the local AHJs across Canada to aid their decision-making on whether the fire performance of floors (i.e., the time to evacuate before failure occurs) for alternative joist systems performs "as well as" the inherent fire performance of exposed 38 mm × 235 mm (2 × 10) lumber joists. Testing has been carried out that follows the principles expressed in Appendix D of Division B of the NBC. Following the direction of the CCCME, this CCMC Evaluation Report has been modified to provide this manufacturer's information.

The CCCME asked CCMC to review and validate the fire-test data from manufacturer and publish the fire performance to assist the AHJ's decision regarding fire protection for alternative solutions to exposed lumber floor joists of conventional wood-frame construction. CCMC has agreed to review the proposed fire-protection alternatives and provide the AHJ with valid fire-protection options. It is confirmed that the I-joist fire-protection solutions submitted by this manufacturer have been reviewed by CCMC and are outlined in Appendix B. These joist fire-protection options, tested by following the principles of the CAN/ULC-S101 floor test[2], are considered by CCMC as having performed as well as exposed 38 mm × 235 mm (2 × 10) lumber joists.

1. Fire Performance of Houses. Phase I. Study of Unprotected Floor Assemblies in Basement Fire Scenarios, RR-252, 2008-12-15.

2. Essentially following the ULC S101 time-temperature curve, the floor joists loaded to in-service loads and structural joist failure as the criterion.

Report Holder

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Disclaimer

Date modified:
2020-04-10

Appendix A

The design values obtained from testing to ASTM D5055-08a, "Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists," as specified in CAN/CSA-O86-09, "Engineering Design in Wood," and in previous editions as summarized below. The manufacturer's published pre-engineered joist spans were designed in accordance with CAN/CSA-O86-09.

Table A1 Additional Test Information for the Products

Property	Test Information
Shear capacity	The shear capacity was established for each depth separately, as per ASTM D5055-04. Data from quality control (QC) tests have been used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from Table 13.2.3.2 of CAN/CSA-O86-01 was used to determine the specified strength. The shear capacity was revised to meet the requirements of ASTM D5055-08 and CAN/CSA-O86-01.
Moment capacity	The moment capacity qualification was carried out using the analytical method based on the characteristics of the flange material, and with confirmatory testing done in accordance with ASTM D5055-04. Data from QC tests have been used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from Table 13.2.3.2 of CAN/CSA-O86-01 was used to determine the specified strength. Moment capacities for LPI® 18, 20Plus, 32Plus, 42Plus and 52Plus were revised to meet the requirements of ASTM D5055-08a and CAN/CSA-O86-09.
Stiffness	An appropriate test program was used to confirm the stiffness capacity. The following formula was used to predict mid-span deflection: $$deflection = \frac{5wL^4}{384EI} + \frac{wL^2}{K}$$ where: w = load (kN/m), L = span (mm), EI and K are taken from Table 4.1.1
End joints	Flange tension tests were conducted in accordance with ASTM D5055-04, Section 6.3.1.3. The tensile capacity was determined in accordance with ASTM D5055-04, Section 6.3.1.4.
Creep	Specimens were tested for creep performance in accordance with ASTM D5055-04. The specimens recovered more than 90% of the basic dead load deflection.
Bearing length	Qualification tests were conducted to qualify minimum bearing lengths. The I-joist design properties on end reaction and intermediate reaction for LPI® 18, 20Plus, 32Plus, 42Plus and 52Plus were analyzed using ASTM D5055-08, whereby design values were based on linear interpolation within the tested bounds of depth and bearing length (4-corner method). Qualification tests for the reaction values were used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from Table 13.2.3.2 of CAN/CSA-O86-01 was used to determine the specified strength. Extrapolation of reaction properties in Table 4.1.1 is not allowed. LPI® 36 and LPI® 56 reaction properties shown in Table 4.1.1 are specific to the bearing lengths shown and are based on a rational bearing analysis methodology. Data submitted confirm satisfactory performance to the rational methodology. Qualification test data for the reaction values were used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from Table 14.2.3.2 of CSA O86-09 was used to determine the specified strength.
Adhesive qualification	The adhesive used complies with CSA O112.7-M1977, "Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood (Room- and Intermediate-Temperature Curing)" (see CCMC 12917-L, 13054-L and 13291-L). An alternate water-based melamine adhesive for flange fingerjoints complies with CSA O112.9-04, "Evaluation of Adhesives for Structural Wood Products (Exterior Exposure)" (see CCMC 13307-L).
Web stock	The web stock complies with CSA O325.0-92 (R2003), "Construction Sheathing."

Appendix B

B-1 CCMC Important Note from the CCMC Registry of Product Evaluations

Fire Performance of Innovative Structural Products in Houses

This Registry contains opinions on the suitability-for-use of products intended as structural elements in houses. Although historically there has been no need to regulate the structural fire performance of houses, an inherent intent of the National Building Code of Canada (NBC) is that occupants have sufficient time to escape from a building in the event of a fire.

There are many factors that may determine whether that intent is achieved. The fire endurance of structural elements may be one. However, its importance may be minimized by other factors such as combustible content load, early warning devices, smoke movement and toxicity, and fire department response time; all contributing to the overall system performance. Research is underway within the NRC Construction Research Centre to determine the critical factors that affect occupant escape from houses.

Some innovative structural products have been used in the marketplace for several years and have gained the confidence of design professionals, code authorities and users with respect to their performance under typical fire scenarios in today's house system. Some newer products have not been in service long enough to have gained that confidence and may present a more obvious concern.

Unless otherwise stated, innovative structural products for houses have not been evaluated in the context of the NBC intent noted above. As is the case for all innovative products, designers and authorities need to exercise judgment in considering the use of innovative structural products for houses.

B-2 "LP® SolidStart I-Joists" – Fire Protection Options

The following seven (7) options of I-joist floor fire protection alternative solutions are provided by the manufacturer[1]. These floor assemblies have demonstrated fire performance as good as conventional wood-frame 38 mm × 235 mm (2 × 10) exposed-floor construction.

The details of the following fire protection floor assemblies are outlined in the Figures 1 to 7, below.

1) Fire Protection of Floors FP-01 – 12.5 mm (1/2 in.) Gypsum Board Attached to Bottom of Flange;
2) Fire Protection of Floors FP-02 – 12.5 mm (1/2 in.) Gypsum Board Attached Directly to Web;
3) Fire Protection of Floors FP-03 – 12.5 mm (1/2 in.) Gypsum Board Attached Directly to Sides of Flange;
4) Fire Protection of Floors FP-04 – Mineral Wool Insulation[2];
5) Fire Protection of Floors FP-06 – 12.5 mm (1/2 in.) Gypsum Board Installed on Top of the Bottom Flange;
6) Fire Protection of Floors FP-07 – 15.8 mm (5/8 in.) Gypsum Board Installed on Top of the Bottom Flange;
7) Fire Protection of Floors FP-09 – Rockwool SAFE'n'Sound® Mineral Wool Insulation.[2]

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1. These floor assemblies and supporting fire test data have been provided to CCMC by the I-joist industry in collaboration with the APA-Engineered Wood Association. The floor assemblies contained herein reviewed by the CCMC provide equivalent fire performance to exposed 38 mm × 235 mm (2 × 10) lumber joists, and are a subset of those published in APA System Report SR-405G, dated April 2019.

2. For assemblies where mineral-fibre insulation is installed to provide joist protection in a fire, as per NBC 2015, Sentence 9.25.2.3.(7), any insulation that may be subjected to mechanical damage is to be protected by a covering such as gypsum board, plywood, particleboard, oriented strandboard (OSB) or hardboard.

Table B2. Applicable LP® SolidStart I-Joists for Fire Protection Assemblies based on Flange Size

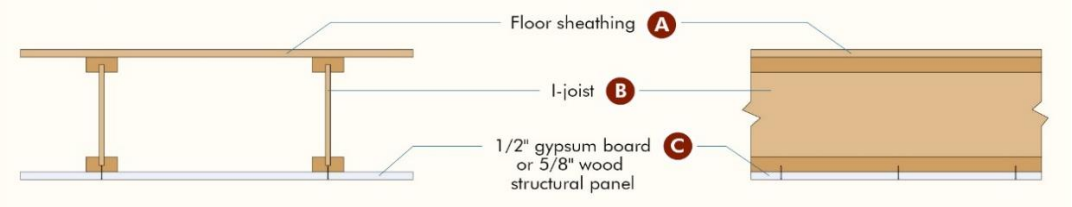
Product	Flange Size (thickness × width) (mm)	Fire Protection Assembly
LPI® 18	38 × 63.5	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
LPI® 20Plus	38 × 63.5	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
LPI® 32Plus	38 × 63.5	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
LPI® 42Plus	38 × 89	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
LPI® 42Plus	38 × 89	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
LPI® 36	38 × 57	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
LPI® 56	38 × 89	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09

Product	Flange Size (thickness × width) (mm)	Fire Protection Assembly
LPI® 450	33 × 45	FP-01, FP-03, FP-04
LPI® 530	33 × 53	FP-01, FP-03, FP-04, FP-06, FP-07, FP-09

Figures 1 to 7 of Fire Protection Assemblies

The following floor assembly design (Figure 1) is the default alternative solution for all cases and where the manufacturer has not undertaken any specific testing to show equivalency to exposed 38x235mm (2×10) lumber with proprietary joist fire protection options.

1/2-IN. GYPSUM BOARD ATTACHED TO BOTTOM OF FLANGE



A. **Floor sheathing: materials and installation in accordance with the NBC 2015.**

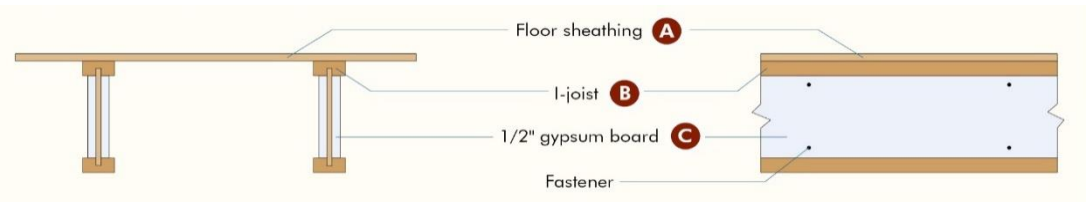
B. **I-joist: installation in accordance with Section 3 of this Report. Maximum 24 in. on centre spacing. Applicable to all flange sizes. Minimum web thickness of 9.5 mm (3/8 in.).**

C. **12.5 mm (1/2 in.) gypsum board: materials and installation in accordance with the NBC 2015. 1×3 (nominal) wood furring strips are permitted to be installed perpendicular to the bottom flange of the I-joists at 400 mm (16 in.) on centre provided that the gypsum boards are directly attached to the furring strips using 32 mm (1-1/4 in.) Type W drywall screws at 300 mm (12 in.) on centre. Gypsum board not required to be finished with tape and joint compound.**

Figure 1. Fire Protection of Floors FP-01 – Fire Protection: 12.5 mm (1/2 in.) Gypsum Board Attached to Bottom of Flange

The following fire resistance designs, Figures 2 to 7, provided by the manufacturer provide fire performance as good as to 38 mm × 235 mm (2 × 10) dimensional lumber exposed floor joists.

12.5 MM (1/2 IN.) GYPSUM BOARD ATTACHED TO WEB



INSTALLATION REQUIREMENTS AT WEB HOLES

A. Floor sheathing: materials and installation in accordance with the NBC 2015.

B. I-joist: installation in accordance with Section 3 of this Report. Maximum 24 in. on centre spacing. Minimum flange size of 38 mm (1-1/2 in.) thick × 50 mm (2 in.) wide. Minimum web thickness of 9.5 mm (3/8 in.). At hole location, fasteners shall be installed 25 mm (1 in.) from the edge and end of the gypsum board.

C. 12.5 mm (1/2 in.) gypsum board: materials (over entire length of I-joist) not required to be finished with tape and joint compound. Fasteners: minimum 25 mm (1 in.) screws (Type W or Type S) or nails installed 25 mm (1 in.) from edges and ends and 400 mm (16 in.) on center, top and bottom. Fasteners may be staggered from top to bottom.

Figure 2. Fire Protection of Floors FP-02 – Fire Protection: 12.5 mm (1/2 in.) Gypsum Board Attached Directly to Web

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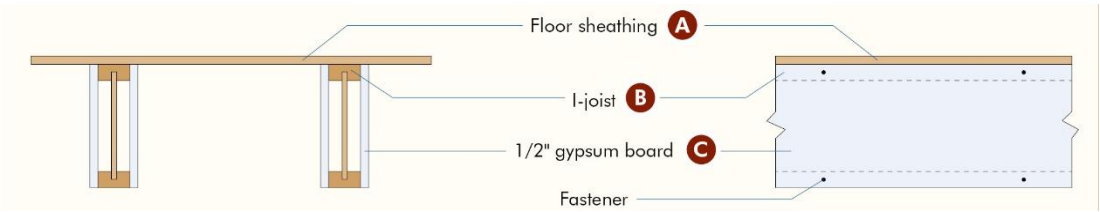
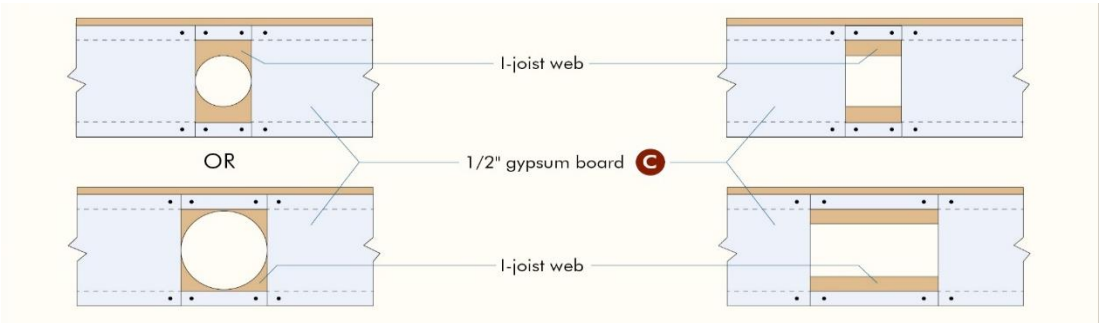
12.5 MM (1/2 IN.) GYPSUM BOARD ATTACHED TO SIDES OF FLANGE



INSTALLATION REQUIREMENTS AT WEB HOLES



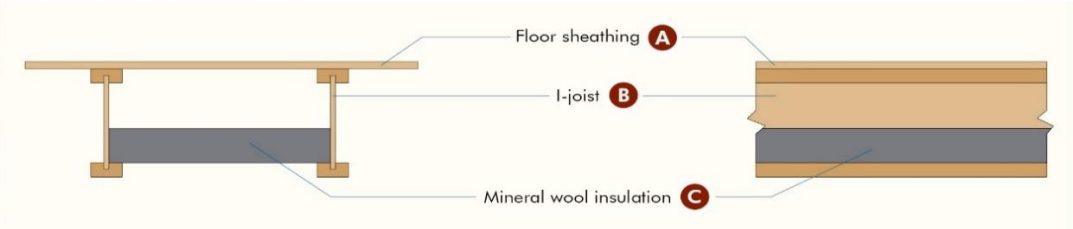
A. Floor sheathing: materials and installation in accordance with the NBC 2015.

B. I-joist: installation in accordance with Section 3 of this Report. Maximum 600 mm (24 in.) on centre spacing. Minimum flange size of 28.5 mm (1-1/8 in.) thick × 44.5 mm (1-3/4 in.) wide. Minimum web thickness of 9.5 mm (3/8 in.). At hole location, fasteners shall be installed 12.5 mm (1/2 in.) from the edge and 1 in. from the end of the gypsum board. Maximum fastener spacing shall be no more than 8 in. on gypsum board above and below the hole.

C. 12.5 mm (1/2 in.) gypsum board: materials (over entire length of I-joist) not required to be finished with tape and joint compound. Fasteners: minimum 25 mm (1 in.) screws (Type W or Type S) or nails installed 12.5 mm (1/2 in.) from edges and 1 in. from ends, and 400 mm (16 in.) on centre, top and bottom. Fasteners may be staggered from top to bottom.

Figure 3. Fire Protection of Floors FP-03 – Fire Protection: 12.5 mm (1/2 in.) Gypsum Board Attached Directly to Sides of Flange

MINERAL WOOL INSULATION



A. **Floor sheathing: materials and installation in accordance with the NBC 2015.**

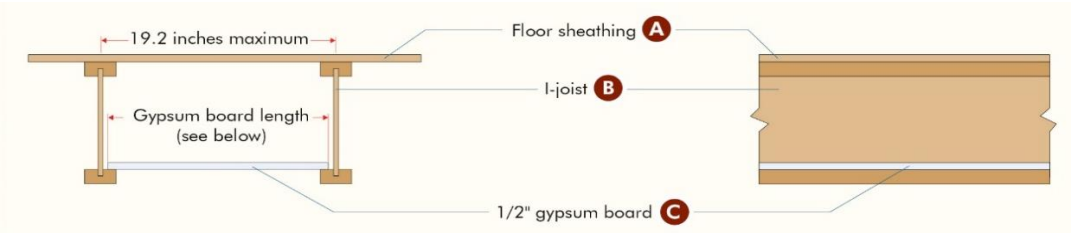
B. **I-joist: installation in accordance with Section 3 of this Report. Maximum 487 mm (19.2 in.) on centre spacing. Minimum flange size of 28.5 mm (1-1/8 in.) thick × 44.5 mm (1-3/4 in.) wide. Minimum web thickness of 9.5 mm (3/8 in.).**

C. **Mineral wool insulation: minimum 46.5 kg/m^3 (2.9 lb/ft^3) (nominal) and 50 mm (2 in.) thick mineral wool insulation made of rock slag, complying with ULC S702 with CCMC Listing, installed without gaps between individual batts as shown with stay wire insulation supports, spaced no more than 600 mm (24 in.) apart and no more than 100 mm (4 in.) from ends of batts. Minimum 40 kg/m^3 (2.5 lb/ft^3) (nominal) and 50 mm (2 in.) thick mineral wool insulation shall be permitted if the I-joists are spaced no more than 400 mm (16 in.) on centre. Use minimum 387 mm (15.25 in.) and 470 mm (18.5 in.) wide batts when I-joist spacing is 400 mm (16 in.) and 487 mm (19.2 in.) on centre, respectively.**

Note. As per NBC 2015, Sentence 9.25.2.3.(7), any insulation that may be subjected to mechanical damage is to be protected by a covering such as gypsum board, plywood, particleboard, OSB or hardboard.

Figure 4. Fire Protection of Floors FP-04 – Fire Protection: Mineral Wool Insulation

12.5 MM (1/2 IN.) GYPSUM BOARD



Joist spacing	Required length for gypsum boards
300 mm (12 in.)	282.5 mm (11-1/8 in.) ± 3.2 mm (1/8 in.)
400 mm (16 in.)	384.2 mm (15-1/8 in.) ± 3.2 mm (1/8 in.)
487 mm (19.2 in.)	467 mm (18-3/8 in.) ± 3.2 mm (1/8 in.)
Note: *Gypsum board lengths shown above provide at least a 6 mm (1/4 in.) bearing on the top of the bottom flange in each I-joist as installed. For other joist spacings, the required gypsum board lengths shall be adjusted so that the required gypsum board lengths are determined based on a full bearing on the flange at one end of the joist spacing, while maintaining at least a 6 mm (1/4 in.) bearing at the other end. If double joists are used, the required gypsum board lengths shall be reduced from the table above by a length equal to the flange width.*	

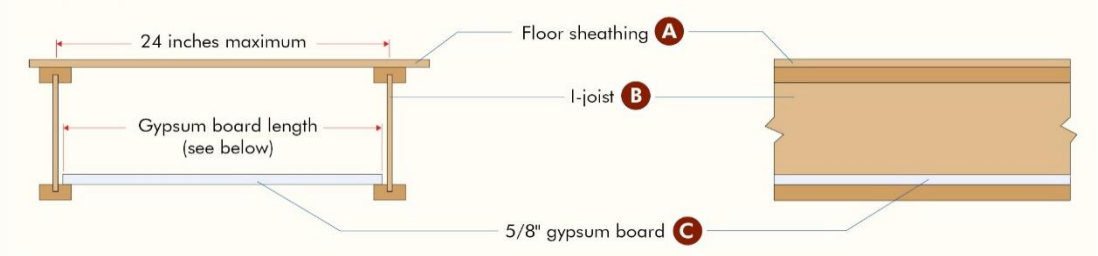
A. **Floor sheathing: materials and installation in accordance with NBC 2015.**

B. **I-joist: installation in accordance with Section 3 of this Report. Maximum 487 mm (19.2 in.) on centre spacing. Minimum flange size of 28.5 mm (1-1/8 in.) thick × 50 mm (2 in.) wide. Minimum web thickness of 9.5 mm (3/8 in.).**

C. **One layer of 12.5 mm (1/2 in.) lightweight or normal weight (nominal 7.3 kg/m^2 (1.5 psf) minimum) gypsum wall board meeting ASTM C 1396, installed on the top of the bottom flange. Mechanical fastener or adhesive attachment to the top of the bottom flange is not required.**

Figure 5. Fire Protection of Floors FP-06 – Fire Protection: 12.5mm (1/2 in.) Gypsum Board Installed on Top of the Bottom Flange

15.8 MM (5/8 IN.) GYPSUM BOARD



Joist spacing	Required length for gypsum boards
300 mm (12 in.)	282.5 mm (11-1/8 in.) ± 3.2 mm (1/8 in.)
400 mm (16 in.)	384.2 mm (15-1/8 in.) ± 3.2 mm (1/8 in.)
487 mm (19.2 in.)	467 mm (18-3/8 in.) ± 3.2 mm (1/8 in.)
600 mm (24 in.)	587 mm (23-1/8 in.) ± 3.2 mm (1/8 in.)

Note:
Gypsum board lengths shown above provide at least a 6 mm (1/4 in.) bearing on the top of the bottom flange in each I-joist as installed. For other joist spacings, the required gypsum board lengths shall be adjusted so that the required gypsum board lengths are determined based on a full bearing on the flange at one end of the joist spacing, while maintaining at least a 6 mm (1/4 in.) bearing at the other end. If double joists are used, the required gypsum board lengths shall be reduced from the table above by a length equal to the flange width.

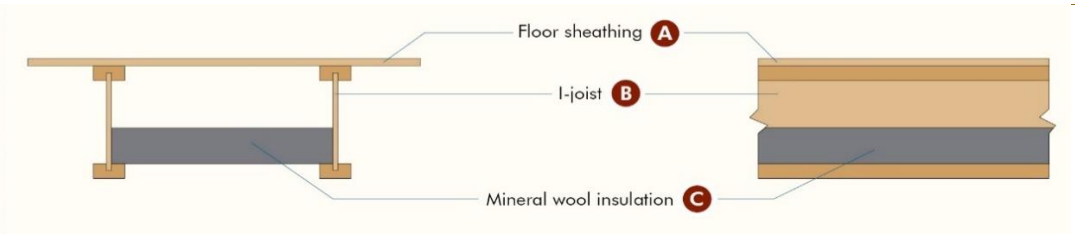
A. Floor sheathing: materials and installation in accordance with the NBC 2015.

B. I-joist: installation in accordance with Section 3 of this Report. Maximum 600mm (24 in.) on centre spacing. Minimum flange size of 28.5 mm (1-1/8 in.) thick × 50 mm (2 in.) wide. Minimum web thickness of 9.5 mm (3/8 in.).

C. One layer of 15.8 mm (5/8 in.) lightweight or normal weight (nominal 9.3 kg/m^2 (1.9 psf) minimum) gypsum wall board meeting ASTM C 1396, installed on the top of the bottom flange. Mechanical fastener or adhesive attachment to the top of the bottom flange is not required.

Figure 6. Fire Protection of Floors FP-07 – Fire Protection: 15.8mm (5/8 in.) Gypsum Board Installed on Top of the Bottom Flange

ROCKWOOL SAFE'n'SOUND® MINERAL WOOL INSULATION



A. Floor sheathing: materials and installation in accordance with the NBC 2015.

B. I-joist: installation in accordance with Section 3 of this Report. Maximum 600 mm (24 in.) on centre spacing. Minimum flange size of 28.5 mm (1-1/8 in.) thick × 50 mm (2 in.) wide. Minimum web thickness of 9.5 mm (3/8 in.).

C. Mineral wool insulation: Rockwool SAFE'n'SOUND® minimum 40 kg/m^3 (2.5 lb/ft^3) (nominal) and 75 mm (3 in.) thick mineral wool batt insulation made of rock or furnace slag (ASTM C 665 Type 1-compliant) installed as shown with insulation stay wire supports, spaced no more than 600 mm (24 in.) apart and no more than 100 mm (4 in.) from ends of batts. Use minimum 387 mm (15.25 in.), 470 mm (18.5 in.) and 584 mm (23 in.) wide batts when I-joist spacing is 400 mm (16 in.), 487 mm (19.2 in.) and 600 mm (24 in.) on centre, respectively.

Note. *As per NBC 2015, Sentence 9.25.2.3.(7), any insulation that may be subjected to mechanical damage is to be protected by a covering such as gypsum board, plywood, particleboard, OSB or hardboard.*

Figure 7. Fire Protection of Floors FP-09 – Fire Protection: Rockwool SAFE'n'Sound® Mineral Wool Insulation