Evaluation Report CCMC 13132-R
TJI® SERIES JOISTS

MasterFormat:	06 17 33.01
Evaluation issued:	2003-11-14
Re-evaluated:	2019-11-19
Revised:	2021-03-03

1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that "TJI Series Joists," 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 of Canada (NBC) 2015:

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

- Clause 1.2.1.1.(1)(b) of 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

This opinion is based on CCMC's evaluation of the technical evidence in Section 4.1 provided by the Report Holder.

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(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. 05-06-130 (13132-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 2005-05-15 (revised on 2017-03-22) 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

This product's family of joists consists of prefabricated wood I-joists consisting of two continuous "Microllam® LVL" (refer to CCMC 08675-R), "TimberStrand® LSL" (refer to CCMC 12627-R), or sawn lumber flanges glued to one of the two thicknesses of oriented strandboard (OSB) web (9.5 mm or 11.0 mm).

The dimensions of the different products in this series are listed in Table 2.1.

For TJI® s31, s33 and s47 Series Joists, the web-flange connection is made by inserting the profiled OSB web into a tapered groove in the centre of the flange. The web material is manufactured in 2 743-mm lengths and end-jointed by gluing a full thickness V-joint. The flange fingerjoints

are bonded with a polyurethane adhesive (refer to CCMC 13512-L) and the web-to-web and web-to-flange joints are bonded with a phenol-resorcinol waterproof adhesive (refer to CCMC 13054-L).

For the other joists in this series, the web-flange connection is made by inserting the profiled OSB web into a machined, tapered groove in the centre of the flange. The web segments are installed into the flanges in 1 220-mm or 1 372-mm lengths. The web segments are serrated and all the joints are bonded with a phenol-resorcinol waterproof adhesive (refer to CCMC 13054-L).

All vented joists are 406 mm deep and are manufactured with 64-mm-diameter holes cut through the web at 305 mm on centre (o.c.) near one flange. The vented joist is used in roof deck or roof joist applications only.

Table 2.1 Product Dimensions

Product[(1)]	Flange Size (width × thickness) (mm)	Web Thickness (mm)	Range of Joist Depths (mm)
TJI® 110	Min. 44.5 × 31.8	9.5	241 to 356
TJI® 210	Min. 52.8 × 31.8	9.5	241 to 406
TJI® 230	Min. 58.5 × 31.8	9.5	241 to 406
TJI® 360	Min. 58.5 × 35	9.5	241 to 508
TJI® 560	Min. 89 × 35	11.0	241 to 508
TJI® 560D	89 × 38	11.0	241 to 762
TJI® s31	63.5 × 38	9.5	241 to 406
TJI® s33	63.5 × 38	9.5	241 to 406
TJI® s47	89 × 38	11.0	302 to 508
TJI® L65	63.5 × 38	11.0	241 to 762
TJI® L90	89 × 38	11.0	241 to 762
TJI® H90	89 × 44.5	11.0	241 to 762

Note to Table 2.1:

(1) The manufacturer must provide to the designer the factored compression perpendicular to the grain of the flange for bearing design.

3. Conditions and Limitations

CCMC's compliance opinion in Section 1 is bound by the "TJI® Series Joists" 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 following pre-engineering has been provided to CCMC by Weyerhaeuser to demonstrate compliance with Part 9, Housing and Small Buildings, of the NBC 2015 for acceptance by the local authority having jurisdiction (AHJ):

i. Weyerhaeuser Pre-engineered Floor Span Charts

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 specifier's guides, in limit states design for Canada entitled:

(1) "TJI® 110, 210, 230, 360, 560 Joists," (#TJ-4500) (Limit States Design for Western Canada), dated July 2019; and
(2) "TJI® s31, s33, s47 Joists," (#TJ-4510) (Limit States Design for Eastern Canada), dated July 2019.

The products must be installed in accordance with Weyerhaeuser's installation guidelines noted in these documents 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. Weyerhaeuser Pre-engineered Installation Details

Weyerhaeuser's pre-engineered details within the documents outlined in i. above are limited in scope to building designs where the anticipated loads on the following structural details are not exceeded:

- rim joist and blocking resistance (page 27 of (1) and page 12 of (2));
- rim board resistance (page 27 of (1) and page 12 of (2));
- web stiffener requirements (pages 25–26 of (1) and pages 10–11 of (2));
- floor span tables (pages 7–9 and 17–18 of (1) and pages 6–8 of (2));
- load-bearing cantilever tables (pages 10–11 and 20–21 of (1) and pages 14–15 of (2));
- web hole tables (pages 16 and 24 of (1) and page 13 of (2));
- roof span tables (pages 12 and 19 of (1), page 16 of (2));
- roof uniform load tables (pages 13 and 19 of (1) and page 17 of (2)); and
- specified hanger factored resistance (pages 14–15 and 22–23 of (1), pages 22–23 of (2)).

iii. Engineering Required

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

Installations beyond the scope and limitations of i. and 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 or high seismicity;
- stair openings;
- design of supporting wall studs/beams when the total load exceeds the NBC 2015 pre-engineered floor/roof joist tables;
- design of supporting foundation footings when the total load exceeds the NBC 2015 pre-engineered floor/roof joist tables; and
- fire resistance (see applicable fire-resistance assembly listings for special joist and adhesives used).

The engineer, or AHJ-approved certified authority, must design in accordance with CSA O86 and may use the "Engineering Guide for Wood Frame Construction" published by the Canadian Wood Council as a guide.

The factored resistance and engineering properties for the products must not exceed the values set forth in Tables 4.1.1 to 4.1.4.

The ends of all "TJI® Series Joists" 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 "TJI® Series Joists" members used as joists and rafters must be laterally supported at least every 610 mm, except where design is done in accordance with CSA O86.

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

iv. Engineering Support Provided by Manufacturer

Weyerhaeuser may provide engineering services in conjunction with Weyerhaeuser product specification and offers the following support contact number for their Canadian offices: 888-453-8358.

- This product must be identified with the phrase "CCMC 13132-R" along the side of the product. This CCMC number is only valid when it appears in conjunction with the WHI certification mark of Intertek Testing Services and/or the mark of PFS Corporation, and/or in conjunction with the certification mark of APA-EWS for the TJI® s31, TJI® s33, and TJI® s47 joists.

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(1) All lumber, wood-based panels and proprietary engineered wood products are intended for dry service conditions. "Dry service condition" is defined as the in-service environment in which the average 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. Weyerhaeuser should therefore be consulted for span adjustments, if necessary, in these types of installations.

4. Technical Evidence

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

4.1 Design Requirements

Table 4.1.1 Basic Engineering Properties of "TJI® Series Joists"

Basic Properties – Limit States Design						
Product	**Joist Depth (mm)**	**Joist Weight (N/m)**	**Factored Resistance**		**EI × 10^6 (kN·mm^2)**	**K × 10^4 (kN/m)**
			Moment(1) (N·m)	**Vertical Shear (N)**		
TJI® 110	241	33	5 635	8 565	451	7.9
	302	37	7125	10 945	766	7.9
	356	41	8 435	13 055	1 125	7.9
TJI® 210	241	37	6 765	9 340	534	7.9
	302	41	8 560	11 610	904	7.9
	356	45	10 125	13 655	1 326	7.9
	406	48	11 590	15 370	1 805	7.9
TJI® 230	241	40	7 510	9 340	591	7.9
	302	44	9 505	11 610	996	7.9
	356	48	11 250	13 655	1 461	7.9
	406	51	12 875	15 370	1 983	7.9
	406V	51	12 875	12 500	1 983	7.9
TJI® 360	241	40	10 800	10 010	715	7.9
	302	44	13 940	11 965	1 202	7.9
	356	48	16 540	13 725	1 756	7.9
	406	51	18 955	15 370	2 382	7.9
	457	54	21 345	17 035	3 114	7.9
	508	58	23 705	18 680	3 949	7.9
TJI® 560	241	53	16 590	11 720	1 085	9.2
	302	58	21 415	14 390	1 825	9.2
	356	62	25 430	16 770	2 657	9.2
	406	66	29 145	19 040	3 593	9.2
	457	70	32 815	21 285	4 681	9.2
	508	74	36 455	23 485	5 923	9.2

Table 4.1.1 Basic Engineering Properties of "TJI® Series Joists" (cont.)

Basic Properties – Limit States Design						
Product	**Joist Depth (mm)**	**Joist Weight (N/m)**	**Factored Resistance**		**EI × 10^6 (kN·mm^2)**	**K × 10^4 (kN/m)**
			Moment(1) (N·m)	**Vertical Shear (N)**		
TJI® 560D	241	56	16 720	11 720	1 093	9.2
	302	61	21 660	14 390	1 845	9.2
	356	65	25 775	16 770	2 698	9.2
	406	69	29 575	19 040	3 653	9.2
	457	73	33 340	21 285	4 767	9.2
	508	77	37 060	23 485	6 041	9.2
	559	81	40 760	25 310	7 479	9.2
	610	85	44 425	22 465	9 083	9.2
	660	89	48 065	22 465	10 857	9.2
	711	93	51 675	22 465	12 808	9.2
	762	97	55 270	22 465	14 937	9.2
TJI® s31	241	38	6 765	8 450	588	7.9
	302	42	8 555	10 740	999	7.9
	356	45	10 130	12 790	1 466	7.9
	406	50	11 590	14 500	1 997	7.9
TJI® s33	241	38	8 575	8 450	694	7.9
	302	42	11 110	10 740	1 179	7.9
	356	45	13 375	12 790	1 728	7.9
	406	50	15 510	14 500	2 347	7.9
TJI® s47	302	53	15 715	13 525	1 647	9.2
	356	55	18 925	14 925	2 411	9.2
	406	58	21 950	16 370	3 272	9.2
	457	63	24 820	17 795	4 273	9.2
	508	66	27 470	19 240	5 421	9.2

Note to Table 4.1.1:

(1) The factored moment resistance values listed in Table 4.1.1 must not be increased by any Code-allowed repetitive member system factor.

Table 4.1.2 Reaction Engineering Properties of "TJI® Series Joists"(1)

Reaction Properties – Limit States Design											
Product	Joist Depth (mm)	Factored End Reaction (N)					Factored Intermediate Reaction (N)				
		45-mm Brg. Length		89-mm Brg. Length		Web Stiff. Nails(2)	89-mm Brg. Length		133-mm Brg. Length		Web Stiff. Nails(2)
		Web Stiffeners		Web Stiffeners			Web Stiffeners		Web Stiffeners		
		No	Yes	No	Yes		No	Yes	No	Yes	
TJI® 110	241	6 385	N/A	8 565	N/A	N/A	13 590	N/A	16 480	N/A	N/A
	302	6 385	8 385	9 655	10 945	3-63.5	13 590	15 900	16 480	18 795	3-63.5
	356	6 385	8 385	9 655	11 965	3-63.5	13 590	15 900	16 480	18 795	3-63.5
TJI® 210	241	7 050	N/A	9 340	N/A	N/A	15 055	N/A	18 015	N/A	N/A
	302	7 050	9 365	10 255	11 610	3-63.5	15 055	17 370	18 015	20 330	3-63.5
	356	7 050	9 365	10 255	12 545	3-63.5	15 055	17 370	18 015	20 330	3-63.5
	406	7 050	9 365	10 255	12 454	3-63.5	15 055	17 370	18 015	20 330	3-63.5
TJI® 230	241	7 450	N/A	9 340	N/A	N/A	16 905	N/A	19 615	N/A	N/A
	302	7 450	9 740	10 430	11 610	3-63.5	16 905	19 215	19 615	21 905	3-63.5
	356	7 450	9 740	10 430	12 720	3-63.5	16 905	19 215	19 615	21 905	3-63.5
	406	7 450	9 740	10 430	12 720	3-63.5	16 905	19 215	19 615	21 905	3-63.5
	406V	7 450	9 740	10 430	12 720	3-63.5	16 905	19 215	19 615	21 905	3-63.5
TJI® 360	241	7 585	N/A	10 010	N/A	N/A	17 280	N/A	21 085	N/A	N/A
	302	7 585	9 895	10 585	11 965	3-63.5	17 280	19 570	21 085	23 375	3-63.5
	356	7 585	9 895	10 585	12 880	3-63.5	17 280	19 570	21 085	23 375	3-63.5
	406	7 585	9 895	10 585	12 880	3-63.5	17 280	19 570	21 085	23 375	3-63.5
	457	7 585	9 895	10 585	12 880	3-63.5	17 280	19 570	21 085	23 375	3-63.5
	508	7 585	9 895	10 585	12 880	3-63.5	17 280	19 570	21 085	23 375	3-63.5
TJI® 560	241	8 875	N/A	11 720	N/A	N/A	21 060	N/A	24 265	N/A	N/A
	302	8 875	11 920	12 100	14 390	3-89	21 060	24 130	24 265	27 310	3-89
	356	8 875	11 920	12 100	15 170	3-89	21 060	24 130	24 265	27 310	3-89
	406	8 875	11 920	12 100	15 170	3-89	21 060	24 130	24 265	27 310	3-89
	457	8 875	11 920	12 100	15 170	3-89	21 060	24 130	24 265	27 310	3-89
	508	8 875	11 920	12 100	15 170	3-89	21 060	24 130	24 265	27 310	3-89
TJI® 560D	241	8 875	N/A	11 720	N/A	N/A	21 060	N/A	24 265	N/A	N/A
	302	8 875	11 945	12 120	14 390	3-89	21 060	24 130	24 265	27 310	3-89
	356	8 875	11 945	12 120	15 170	3-89	21 060	24 130	24 265	27 310	3-89
	406	8 875	12 965	12 120	16 190	4-89	21 060	25 130	24 265	28 335	4-89
	457	8 875	12 965	12 120	16 190	4-89	21 060	25 130	24 265	28 335	4-89
	508	8 875	13 965	12 120	17 215	5-89	21 060	26 115	24 265	29 360	5-89
	559	N/A	14 990	N/A	18 215	6-89	N/A	32 270	N/A	35 475	11-89
	610	N/A	14 990	N/A	18 215	6-89	N/A	34 320	N/A	37 505	13-89
	660	N/A	16 015	N/A	19 240	7-89	N/A	35 340	N/A	38 520	14-89
	711	N/A	16 750	N/A	20 260	8-89	N/A	36 340	N/A	39 545	15-89
	762	N/A	16 750	N/A	20 260	8-89	N/A	37 100	N/A	41 590	17-89

Reaction Properties – Limit States Design											
Product	Joist Depth (mm)	Factored End Reaction (N)					Factored Intermediate Reaction (N)				
		45-mm Brg. Length		89-mm Brg. Length		Web Stiff. Nails[2]	89-mm Brg. Length		133-mm Brg. Length		Web Stiff. Nails[2]
		Web Stiffeners		Web Stiffeners			Web Stiffeners		Web Stiffeners		
		No	Yes	No	Yes		No	Yes	No	Yes	
TJI® s31	241	7 585	N/A	8 450	N/A	N/A	19 350	N/A	21 905	N/A	N/A
	302	8 430	10 720	10 320	10 740	3-63.5	19 350	21 640	22 350	24 665	3-63.5
	356	8 430	10 720	10 320	12 635	3-63.5	19 350	21 640	22 350	24 665	3-63.5
	406	8 430	10 720	10 320	12 635	3-63.5	19 350	21 640	22 350	24 665	3-63.5
TJI® s33	241	7 585	N/A	8 450	N/A	N/A	19 350	N/A	21 905	N/A	N/A
	302	8 430	10 720	10 320	10 740	3-63.5	19 350	21 640	22 350	24 665	3-63.5
	356	8 430	10 720	10 320	12 635	3-63.5	19 350	21 640	22 350	24 665	3-63.5
	406	8 430	10 720	10 320	12 635	3-63.5	19 350	21 640	22 350	24 665	3-63.5
TJI® s47	302	8 985	12 055	10 455	13 525	3-89	19 370	22 440	22 440	25 490	3-89
	356	8 985	12 055	10 455	13 525	3-89	21 195	24 265	23 775	26 825	3-89
	406	8 985	12 055	10 455	13 525	3-89	22 465	25 535	24 930	27 980	3-89
	457	8 985	12 055	10 455	13 525	3-89	22 465	25 535	25 245	28 290	3-89
	508	8 985	12 055	10 455	13 525	3-89	22 465	25 535	25 245	28 290	3-89

Notes to Table 4.1.2:

(1) "N/A" means not applicable.

(2) All nails are box nails, A = 63.5 mm, B = 89 mm.

Table 4.1.3 Basic Engineering Properties of "TJI® Series Joists" – Custom Applications

Basic Properties – Limit States Design						
Product	Joist Depth (mm)	Weight (N/m)	Factored Resistance		EI × 10^6 (kN·mm^2)	K × 10^4 (kN/m)
			Moment[1] (N·m)	Vertical Shear (N)		
TJI® L65	241	44	11 755	11 765	755	9.2
	302	49	15 225	13 525	1 291	9.2
	356	53	18 105	14 925	1 911	9.2
	406	57	20 770	16 370	2 620	9.2
	457	61	23 410	17 795	3 458	9.2
	508	65	26 025	19 240	4 434	9.2
	559	69	28 615	20 615	5 550	9.2
	610	73	31 185	21 485	6 813	9.2
	660	77	33 740	20 350	8 231	9.2
	711	81	36 275	20 350	9 806	9.2
	762	85	38 795	20 350	11 551	9.2
TJI® L90	241	56	16 725	11 765	1 047	9.2
	302	61	21 665	13 525	1 782	9.2

Basic Properties – Limit States Design						
Product	Joist Depth (mm)	Weight (N/m)	Factored Resistance		EI × 10^6 (kN·mm^2)	K × 10^4 (kN/m)
			Moment[1] (N·m)	Vertical Shear (N)		
	356	65	25 775	14 925	2 620	9.2
	406	69	29 575	16 370	3 576	9.2
	457	73	33 330	17 795	4 693	9.2
	508	77	37 060	19 240	5 984	9.2
	559	81	40 755	20 615	7 452	9.2
	610	85	44 425	21 485	9 104	9.2
	660	89	48 065	20 350	10 946	9.2
	711	93	51 675	20 350	12 985	9.2
	762	97	55 275	20 350	15 227	9.2
TJI® H90	302	67	24 715	13 525	1 972	9.2
	356	71	29 525	14 925	2 914	9.2
	406	75	33 970	16 370	3 985	9.2
	457	79	38 360	17 795	5 242	9.2
	508	83	42 715	19 240	6 690	9.2
	559	87	47 035	20 615	8 335	9.2
	610	91	51 315	21 485	10 184	9.2
	660	95	55 575	20 350	12 244	9.2
	711	99	59 800	20 350	14 519	9.2
	762	103	64 000	20 350	17 018	9.2

Note to Table 4.1.3:

(1) The factored moment resistances listed in Table 4.1.3 must not be increased by any Code-allowed repetitive member system factor.

Table 4.1.4 Reaction Engineering Properties of "TJI® Series Joists" – Custom Applications[1]

Reaction Properties											
Product	Joist Depth (mm)	Factored End Reaction (N)					Factored Intermediate Reaction (N)				
		45-mm Brg. Length		89-mm Brg. Length		Web Stiff. Nails[2]	89-mm Brg. Length		133-mm Brg. Length		Web Stiff. Nails[2]
							133-mm Brg. Length[3]		178-mm Brg. Length[4]		
		Web Stiffeners		Web Stiffeners			Web Stiffeners		Web Stiffeners		
		No	Yes	No	Yes		No	Yes	No	Yes	
TJI® L65	241	9 075	N/A	11 765	N/A	N/A	19 350	N/A	23 685	N/A	N/A
	302	9 075	11 385	12 235	13 525	3-A	19 350	21 640	23 685	26 000	3-A
	356	9 075	11 965	12 235	14 925	5-A	19 350	23 175	23 685	27 535	5-A
	406	9 075	11 965	12 235	16 370	6-A	19 350	23 955	23 685	28 290	6-A
	457	9 075	11 965	12 235	17 595	7-A	19 350	24 710	23 685	29 070	7-A
	508	N/A	11 965	N/A	18 370	8-A	N/A	25 490	N/A	29 825	8-A
	559	N/A	11 965	N/A	19 125	9-A	N/A	26 245	N/A	30 605	9-A
	610	N/A	11 965	N/A	19 905	10-A	N/A	26 510	N/A	31 360	10-A

Reaction Properties											
Product	Joist Depth (mm)	Factored End Reaction (N)					Factored Intermediate Reaction (N)				
		45-mm Brg. Length		89-mm Brg. Length		Web Stiff. Nails[2]	89-mm Brg. Length		133-mm Brg. Length		Web Stiff. Nails[2]
							133-mm Brg. Length[3]		178-mm Brg. Length[4]		
		Web Stiffeners		Web Stiffeners			Web Stiffeners		Web Stiffeners		
		No	Yes	No	Yes		No	Yes	No	Yes	
	660	N/A	11 965	N/A	20 350	11-A	N/A	32 140	N/A	36 475	11-A
	711	N/A	11 965	N/A	20 350	12-A	N/A	32 895	N/A	37 255	12-A
	762	N/A	11 965	N/A	20 350	13-A	N/A	33 675	N/A	38 030	13-A
TJI® L90	241	9 075	N/A	11 765	N/A	N/A	22 710	N/A	26 645	N/A	N/A
	302	9 075	11 120	12 235	13 525	2-B	22 710	24 755	26 645	28 670	2-B
	356	9 075	12 145	12 235	14 925	3-B	22 710	25 755	26 645	29 690	3-B
	406	9 075	13 165	12 235	16 305	4-B	22 710	26 780	26 645	30 715	4-B
	457	9 075	13 165	12 235	16 305	4-B	22 710	26 780	26 645	30 715	4-B
	508	N/A	14 170	N/A	17 325	5-B	N/A	27 800	N/A	31 740	5-B
	559	N/A	15 190	N/A	18 350	6-B	N/A	33 920	N/A	37 885	11-B
	610	N/A	15 190	N/A	18 350	6-B	N/A	35 940	N/A	39 880	13-B
	660	N/A	16 215	N/A	19 350	7-B	N/A	40 700	N/A	40 700	14-B
	711	N/A	16 745	N/A	20 350	8-B	N/A	40 700	N/A	40 700	15-B
	762	N/A	16 745	N/A	20 350	8-B	N/A	40 700	N/A	40 700	17-B
TJI® H90	302	9 075	11 120	12 235	13 525	2-B	22 710	24 755	26 645	28 670	2-B
	356	9 075	12 145	12 235	14 925	3-B	22 710	25 755	26 645	29 690	3-B
	406	9 075	13 165	12 235	16 305	4-B	22 710	26 780	26 645	30 715	4-B
	457	9 075	13 165	12 235	16 305	4-B	22 710	26 780	26 645	30 715	4-B
	508	N/A	14 170	N/A	17 325	5-B	N/A	27 800	N/A	31 740	5-B
	559	N/A	15 190	N/A	18 350	6-B	N/A	33 920	N/A	37 855	11-B
	610	N/A	15 190	N/A	18 350	6-B	N/A	35 940	N/A	39 880	13-B
	660	N/A	16 215	N/A	19 350	7-B	N/A	40 700	N/A	40 700	14-B
	711	N/A	16 745	N/A	20 350	8-B	N/A	40 700	N/A	40 700	15-B
	762	N/A	16 745	N/A	20 350	8-B	N/A	40 700	N/A	40 700	17-B

Notes to Table 4.1.4:

(1) "N/A" means not applicable.
(2) All nails are box nails, A = 63.5 mm, B = 89 mm.
(3) Shaded cells indicate results determined using 133-mm bearing lengths.
(4) Shaded cells indicate results determined using 178-mm bearing lengths.

Additional engineering data and load/span tables are available from the manufacturer.
Note that RedBuilt™, LLC is the owner of the Stayton, OR plant and manufactures "TJI® Series Joists" for Weyerhaeuser according to Weyerhaeuser Manufacturing Standards. The TJI® s31, s33 and s47 series are manufactured at the EACOM Timber Corporation plant in Sault Ste. Marie, ON.

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.

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(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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Plant(s)

Castleberry, AL, USA
Eugene, OR, USA
Natchitoches, LA, USA
Stayton, OR, USA

Disclaimer

This evaluation is issued by the Canadian Construction Materials Centre (CCMC), a program of the Construction Research Centre at the National Research Council of Canada (NRC). The evaluation must be read in the context of the entire CCMC Registry of Product Evaluations and Certifications and the legislated applicable building code in effect.

CCMC was established in 1988 on behalf of the applicable regulator (i.e., the Provinces and Territories) to ensure—through assessment—conformity of alternative and acceptable solutions to regional building codes as determined by the local authority having jurisdiction (AHJ) as part of the issuance of a building permit.

It is the responsibility of the local AHJs, design professionals, and specifiers to confirm that the evaluation is current and has not been withdrawn or superseded by a later issue. Please refer to http://www.nrc-cnrc.gc.ca/ccmc or contact the Canadian Construction Materials Centre, Construction Research Centre, National Research Council of Canada, 1200 Montreal Road, Ottawa, Ontario, K1A 0R6. Telephone: 613-993-6189. Fax: 613-952-0268.

The NRC has evaluated the material, product, system or service described herein only for those characteristics stated herein. The information and opinions in this evaluation are directed to those who have the appropriate degree of experience to use and apply its contents (i.e., AHJs, design professionals and specifiers). This evaluation is only valid when the product is installed in strict compliance with the stated conditions and limitations of evaluation and the applicable local building code. In circumstances where no applicable local building permit is issued and that no confirmation of compliance 'for use in the intended field application' is undertaken, this evaluation is null and void in all respects. This evaluation is provided without representation, warranty, or guarantee of any kind, expressed, or implied, and the NRC provides no endorsement for any evaluated material, product, system or service described herein. The NRC accepts no responsibility whatsoever arising in any way from any and all use and reliance on the information contained in this evaluation with respect to its compliance to the referenced code(s) and standard(s). The NRC is not undertaking to render professional or other services on behalf of any person or entity nor to perform any duty owed by any person or entity to another person or entity. Revised: 2019-12-02

Date modified:
2021-03-03

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In the case of any discrepancy between the English and French version of this document, the English version shall prevail.
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Appendix A

The original design values obtained from testing to ASTM D 5055-04 and -08a, "Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists," as specified in CAN/CSA-O86-01 and -09, "Engineering Design in Wood," are summarized below. The manufacturer's published pre-engineered joist spans were designed in accordance with CSA O86-14.

Table A1. Additional Test Information for "TJI® Series Joists"

Property	Test Information
Shear capacity	The shear capacity of the specimens was established by combining data in accordance with ASTM D 5055-04. 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.
Moment capacity	The moment capacity qualification was carried out using the analytical method based on the characteristics of the flange material, with confirmatory testing in accordance with ASTM D 5055-04. 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.
Stiffness	An appropriate test program was used to confirm the stiffness capacity. The following formula was used to predict mid-span deflection: $$deflection = \frac{5wL^4}{384EI \times 10^3} + \frac{wL^2}{Kd}$$ where: w = load (kN/m), L = span (mm), EI and K from Table 4.1.1.1 and 4.1.1.2, and d = joist depth (mm).
End joints	End joints were qualified as part of the flange tension qualification. The flanges are in-plant fingerjointed, and regular tension testing is conducted.
Creep	Specimens were tested for creep performance in accordance with ASTM D 5055-04. The specimens recovered more than 90% of the basic dead load deflection.
Bearing length	The product reaction properties listed in Tables 4.1.2 and 4.1.4 are specific to bearing lengths shown and are based on a rational bearing analysis methodology applicable to "TJI® Series Joists." Data submitted confirm satisfactory performance to the rational methodology. Reaction properties for end or intermediate bearing lengths within ranges shown in Tables 4.1.2 and 4.1.4 may be determined by linear interpolation. Extrapolation of reaction properties in Tables 4.1.2 and 4.1.4 is not allowed.
Adhesive qualification	For the "TJI® s31, s33, and s47 Series Joists," the adhesive for the flange fingerjoints is a polyurethane adhesive (see CCMC 13512-L). The other adhesives used comply with CSA O112.7-M1977, "Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood (Room- and Intermediate- Temperature Curing)" (see CCMC 13054-L). For the remaining products in this series the adhesive used complies with CSA O112.7-M1977, "Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood (Room- and Intermediate- Temperature Curing)" (see CCMC 13054-L).
Web stock	The web stock complies with CAN/CSA-O325.0-92, "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 Weyerhaeuser TJI® SERIES 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.

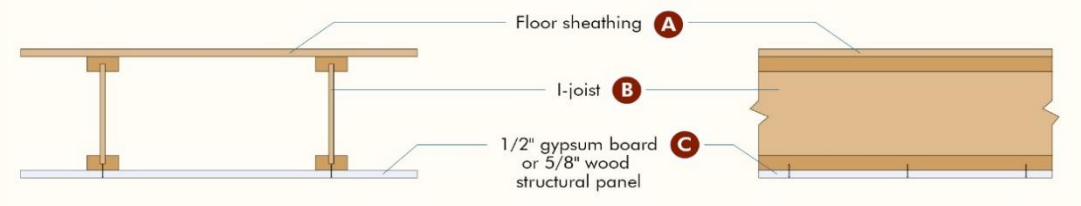
Table B2. Applicable "TJI® Series Joists for Fire-Protection Assemblies" based on Flange Size

Product	Flange Size (thickness × width) (mm)	Fire-Protection Assembly
TJI® 110	Min. 31.8 × 44.5	FP-01, FP-03, FP-04
TJI® 210	Min. 31.8 × 52.8	FP-01, FP-03, FP-04, FP-06, FP-07, FP-09
TJI® 230	Min. 31.8 × 58.5	FP-01, FP-03, FP-04, FP-06, FP-07, FP-09
TJI® 360	Min. 35 × 58.5	FP-01, FP-03, FP-04, FP-06, FP-07, FP-09
TJI® 560	Min. 35 × 89	FP-01, FP-03, FP-04, FP-06, FP-07, FP-09
TJI® 560D	38 × 89	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
TJI® s31	38 × 63.5	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
TJI® s33	38 × 63.5	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
TJI® s47	38 × 89	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
TJI® L65	38 × 63.5	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
TJI® L90	38 × 89	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
TJI® H90	44.5 × 89	FP-01, FP-02, 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 38 mm × 235 mm (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.

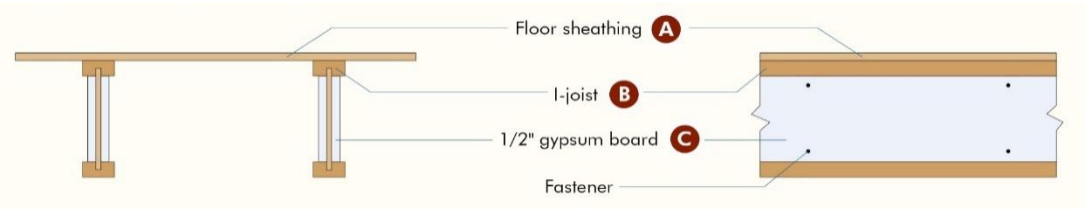
B. I-joist: installation in accordance with Section 3 of this Report. Maximum 24 in. on centre spacing. Applicable to all flange sizes. Minimum web thickness of 9.5 mm (3/8 in.).

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.

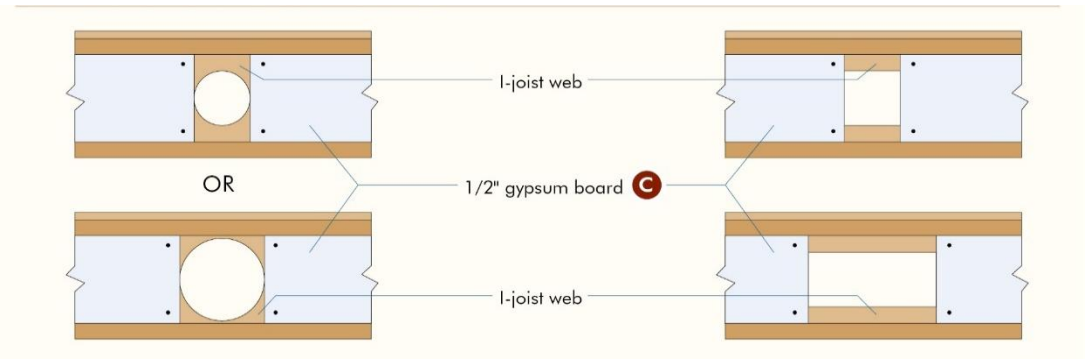
Figure 1. Fire Protection of Floors FP-01 – Fire Protection: 12.5 mm (1/2 in.) Gypsum Board Attached to Bottom of Flange

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

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



INSTALLATION REQUIREMENTS AT WEB HOLES



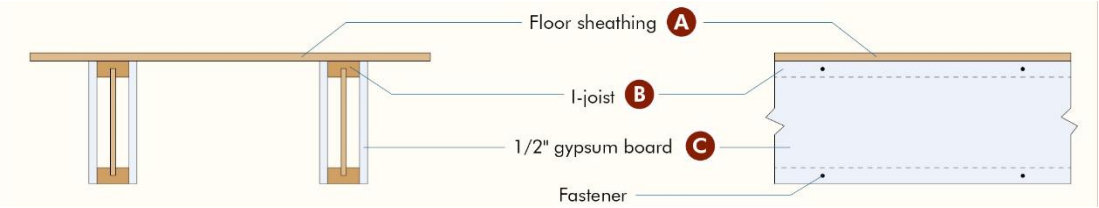
A. Floor sheathing: materials and installation in accordance with the NBC 2015.

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.

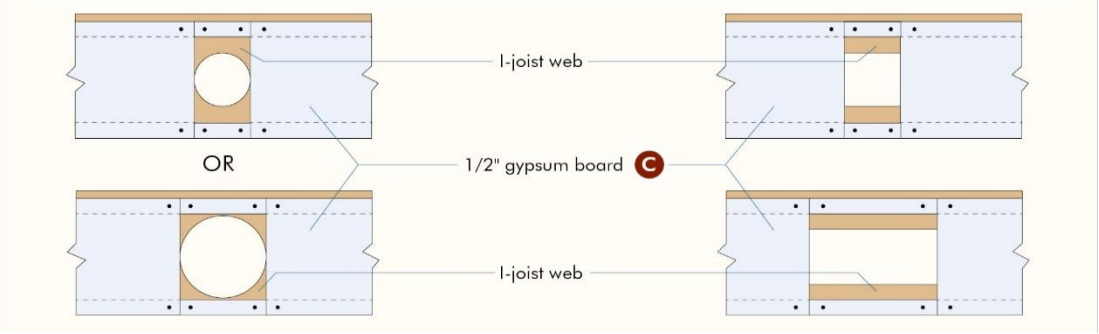
C. 12.5 mm (1/2 in.) gypsum board: materials (over entire length of I-joist) not required to be finished with tape and joint compound. Fasteners: minimum 25 mm (1 in.) screws (Type W or Type S) or nails installed 25 mm (1 in.) from edges and ends and 400 mm (16 in.) on center, top and bottom. Fasteners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

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



INSTALLATION REQUIREMENTS AT WEB HOLES



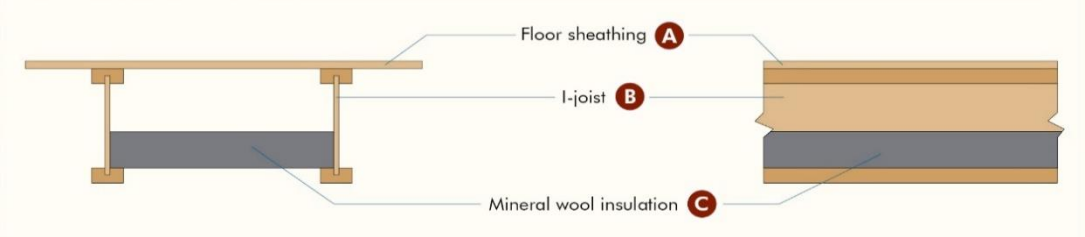
A. Floor sheathing: materials and installation in accordance with the NBC 2015.

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.**

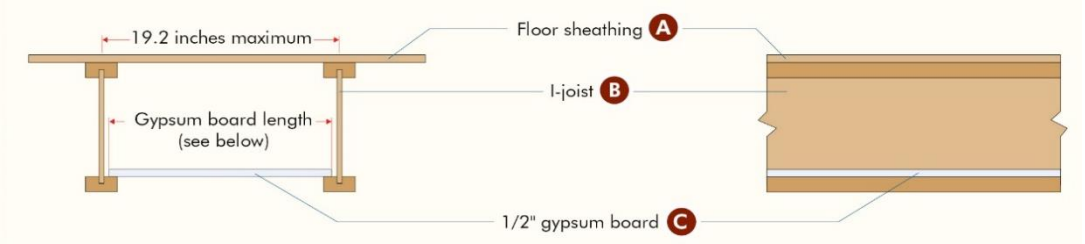
B. **I-joist: installation in accordance with Section 3 of this Report. Maximum 487 mm (19.2 in.) on centre spacing. Minimum flange size of 28.5 mm (1-1/8 in.) thick × 44.5 mm (1-3/4 in.) wide. Minimum web thickness of 9.5 mm (3/8 in.).**

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.

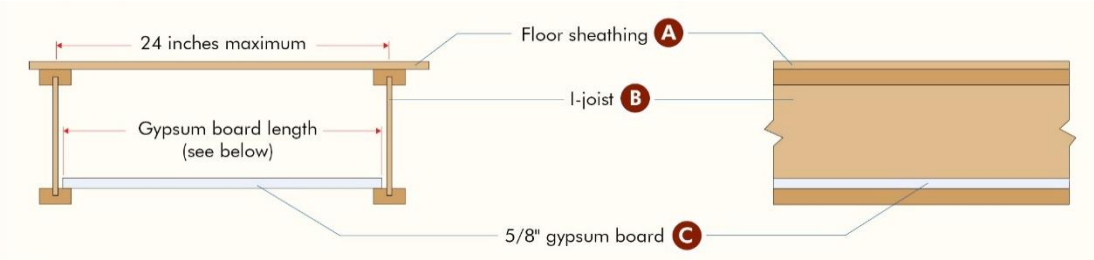
A. Floor sheathing: materials and installation in accordance with NBC 2015.

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: 12.5 mm (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.

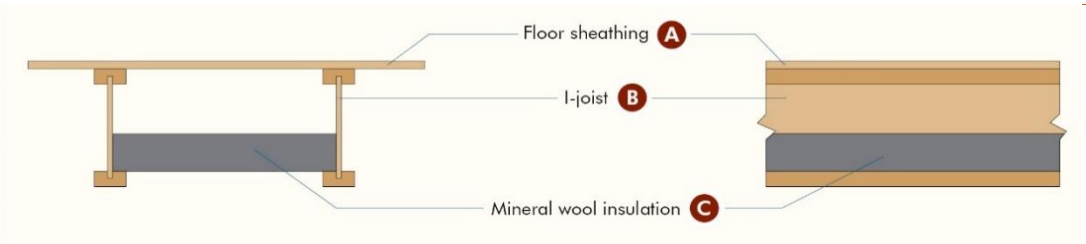
A. Floor sheathing: materials and installation in accordance with the NBC 2015.

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: 15.8 mm (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/m³ (2.5 lb/ft³) (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 center, 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