Evaluation Report CCMC 13053-R
P3 Joist® PJI-40, PJI-60, PJI-80 I-Joists

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1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that "P3 Joist® PJI-40, PJI-60, PJI-80 I-Joists," when used as joists in accordance with the conditions and limitations stated in Section 3 of this Report, comply with the National Building Code (NBC) of Canada 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, "Engineering Design in Wood," 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 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. 07-16-174 (13053-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 2007-05-29 (revised on 2017-03-31) 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 families of prefabricated, wood I-joists consisting of two continuous proprietary grade Spruce-Pine-Fir (S-P-F) flanges glued to a 9.5-mm-thick oriented strandboard (OSB) web. The flange sizes and grades are listed in Table 2.1.

The web-flange connection is made by inserting the profiled OSB web into a tapered groove in the centre of the wide face of the flange at various depths. The OSB web material is manufactured in 2 743-mm lengths and end-jointed by gluing a full thickness V-joint. The flange finger joints are bonded with a polyurethane adhesive (see CCMC 13512-L). The web-to-web and web-to-flange joints are bonded with a phenol-resorcinol waterproof adhesive (see CCMC 13054-L).

APA – The Engineered Wood Association (APA EWS trademark) conducts regular audits of the manufacturing plant and the quality assurance program.

The engineering properties of the products are listed in Tables 4.1.1 and 4.1.2.

Table 2.1 Flange Sizes and Grades of the Products

Product	Width (mm)	Thickness (mm)	Grade
PJI-40	63.5	38.0	Enhanced 1650f-1.5E
PJI-60	63.5	38.0	2100f-1.8E
PJI-80	89.0	38.0	2100f-1.8E

3. Conditions and Limitations

The CCMC compliance opinion in Section 1 is bound by the "P3 Joist® PJI-40, PJI-60, PJI-80 I-Joists" being used in accordance with the conditions and limitations set out below:

- The products are intended for structural applications such as floor joists, and are intended for dry service use(1) applications only.
- The following pre-engineering information has been provided to CCMC by the manufacturer to demonstrate compliance with Part 9, Housing and Small Buildings, of the NBC 2015, for acceptance by the local authority having jurisdiction (AHJ):

i. **EACOM Pre-engineered Floor Span Charts**

When the products are used as floor joists in simple (single) span or continuous (multiple) span applications supporting uniform loads only, the installation must be in accordance with the span tables (including vibration criteria(2)) found in the "P3 Joist User Guide Canada 2018," January 2019.

The products must be installed in accordance with EACOM's "P3 Joist Installation Guide Canada 2018," January 2018 installation guidelines for those applications falling within the scope of the document. Applications outside the scope of these installation guidelines require engineering on a case-by-case basis.

ii. **EACOM Pre-engineered Installation Details**

The product is to be installed in accordance with the manufacturer's pre-engineered details outlined in the user guide specified in i. above, where the following requirements are met and limits are not exceeded:

- blocking panel and rim board, maximum factored uniform vertical load (page 8);
- squash blocks, maximum factored vertical load per pair (page 9);
- stair opening header (page 11);
- web stiffener requirements (page 12);
- cantilever balcony (page 13);
- loadbearing cantilever load table (page 15);
- web hole rules and specifications, and table (pages 16 and 17);
- joist roof framing and construction details (pages 18 to 23);
- roof span and uniform load tables (pages 24 to 29); and
- connectors (pages 31 and 32).

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 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 lumber floor/roof joist tables; and
- design of supporting foundation footings when the total load exceeds the NBC 2015 pre-engineered lumber floor/roof joist tables.

(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 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 or blocking is used and joists are installed at the maximum spans, the current vibration criteria may not address all occupant performance expectations. EACOM should therefore be consulted for span adjustments, if necessary, in these types of installations.

The engineer must design in accordance with CSA O86-14 and may use as a guide the *Engineering Guide for Wood-Frame Construction* published by the Canadian Wood Council.

iv. **Engineering Support Provided by Manufacturer**

APA EWS provides engineering support in conjunction with EACOM product support. EACOM and APA EWS offer the following support contact numbers: APA EWS help desk: 253-620-7400 and APA EWS email: help@apawood.org.

- Damaged or defective joists must not be used, unless repaired in accordance with written instructions from the manufacturer.
- This product must be identified with the phrase “CCMC 13053-R” along the side of the flange. This CCMC number is only valid when it appears in conjunction with the APA EWS certification mark.

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.

4.1 Design Requirements

Table 4.1.1 Factored Resistances for the Products(1)

Basic Properties – Limit States Design					
Product	**Joist Depth (mm)**	**Factored Resistance**		**EI × 10^6 (kN·mm^2)**	**K × 10^6 (N)**
		Moment(2) (N·m)	**Vertical Shear (N)**		
PJI-40	241	6 167	7 860	554	21.97
	302	7 994	9 970	947	27.49
	356	9 629	12 010	1 383	32.38
	406	11 162	13 830	1 885	37.01
PJI-60	241	8 524	7 860	663	21.97
	302	11 049	9 970	1 136	27.49
	356	13 293	12 010	1 676	32.38
	406	15 413	13 830	2 293	37.01
PJI-80	302	15 650	9 970	1 570	27.49
	356	18 852	12 006	2 301	32.38
	406	21 851	13 830	3 134	37.01
	457	24 805	17 200	4 055	41.63
	508	27 466	17 760	5 137	46.26
	559	30 082	18 360	6 353	50.89
	610	32 675	18 920	7 711	55.51

Notes to Table 4.1.1:

(1) Design values were developed in accordance with CSA O86 for a standard term load duration (K_D = 1). All values, except EI and K, are permitted to be adjusted for other load durations as permitted by CSA O86.

(2) The factored moment resistances listed in this table must not be increased by any Code-allowed repetitive member system factor.

Table 4.1.2 Product Engineering Properties[(1)]

Reaction Properties – Limit States Design									
Product	Joist Depth (mm)	Factored End Reaction (N)				Factored Intermediate Reaction (N)			
		44-mm Bearing Length		102-mm Bearing Length		89-mm Bearing Length		140-mm Bearing Length	
		Web Stiffeners		Web Stiffeners		Web Stiffeners		Web Stiffeners	
		No	Yes	No	Yes	No	Yes	No	Yes
PJI-40	241	7 582	7 863	7 863	7 863	19 342	20 360	22 783	22 783
	302	8 425	9 197	9 970	9 970	19 342	21 378	22 783	23 695
	356	8 425	10 391	10 882	12 006	19 342	22 291	22 783	24 468
	406	8 425	11 514	10 882	13 831	19 342	23 169	22 783	25 240
PJI-60	241	7 582	7 863	7 863	7 863	19 342	20 360	22 783	22 783
	302	8 425	9 197	9 970	9 970	19 342	21 378	22 783	23 695
	356	8 425	10 391	10 882	12 006	19 342	22 291	22 783	24 468
	406	8 425	11 514	10 882	13 831	19 342	23 169	22 783	25 240
PJI-80	302	8 987	9 970	9 970	9 970	19 377	23 169	22 853	25 170
	356	8 987	12 006	10 882	12 006	21 203	24 257	24 116	26 293
	406	8 987	12 953	10 882	13 831	22 923	25 275	25 275	27 381
	457	8 776	14 393	11 584	17 201	22 467	27 732	25 626	30 541
	508	8 776	14 393	11 584	17 763	22 467	27 732	25 626	30 541
	559	8 776	14 393	11 584	18 359	22 467	27 732	25 626	30 541
	610	8 776	14 393	11 584	18 921	22 467	27 732	25 626	30 541

Note to Table 4.1.2:

(1) Design values were developed in accordance with CSA O86 for a standard term load duration (K_D = 1). The reaction resistances are permitted to be adjusted for other load durations as permitted by CSA O86.

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 CAN/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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Date modified:
2020-04-10

Appendix A

The methods used to determine the design values, except for bearing length capacities, were obtained from testing in accordance with ASTM D 5055-04, "Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists," as specified in CSA O86-09, and are summarized below. The methods used to determine the bearing length capacities were obtained from testing to ASTM D 5055-08, as specified in CSA O86-09, and are also summarized below. The manufacturer's published pre-engineered joist spans were designed in accordance with CSA O86-14.

Table A1 Additional Product Test Information(1)

Property	Test Information
Shear capacity	The shear capacity of the product was established by computing the shear capacity for each depth separately as per ASTM D 5055-04. Qualification tests were used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from CSA O86-09 was used to determine the specified strength.
Moment capacity	The moment capacity qualification was carried out using the analytical method in accordance with ASTM D 5055-04. At least 10 specimens of each joist depth were tested to verify the actual capacity versus the design capacity. Qualification tests were used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from CSA O86-09 was used to determine the specified strength.
Stiffness	A bending test program of varying depths was used to confirm the stiffness capacity. The following formula was used to predict mid-span deflection: $$deflection = \frac{5wL^4}{384EI \times 10^3} + \frac{wL^2}{K}$$ where EI = shear-free EI from Table 4.1.1, w = uniform load (kN/m), L = span (mm), K = shear deflection factor from Table 4.1.1.
End joints	End joints were qualified as part of the flange tension qualification. The flanges are finger-jointed in plant, and regular tension testing is conducted.
Creep	Product specimens were tested for creep performance as per ASTM D 5055-04, whereby two specimens from each I-joist series group are loaded to 1.5 times the design resistive moment capacity where the average deflection recovery must exceed 90%.
Bearing length	The design values on end bearing and intermediate reaction were analyzed using the procedure in ASTM D 5055-08 whereby linear interpolation was used to establish reaction capacities within the tested bounds of depth and bearing length. A minimum of 10 specimens were tested for four bearing lengths at I-joist extreme depths. Qualification tests were used to establish the applicable coefficient of variation, CV_w, and the reliability normalization factor from CSA O86 was used to determine the specified strength.
Adhesive qualification	The flange-to-flange finger joint is adhered with a polyurethane adhesive (see CCMC 13512-L); web-to-web and web-to-flange joints are bonded with a phenol-resorcinol formaldehyde adhesive complying with CSA O112.7-M1977, "Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood (Room- and Intermediate-Temperature Curing)" (see CCMC 13054-L).

Note to Table A1:

(1) Design values were developed in accordance with the referenced standards found herein. The requirements met have not changed in the current editions of the standards.

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 "P3 Joist® 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 that performs as well 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)]

(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 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.

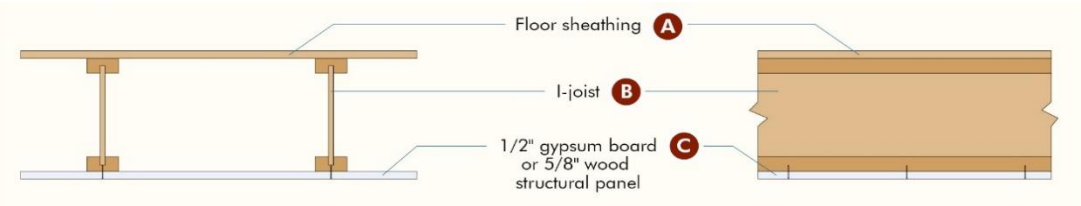
Table B2. Applicable P3 Joist® I-Joists for Fire Protection Assemblies based on Flange Size

Product	Flange Size (thickness x width) (mm)	Fire Protection Assembly
PJI-40	38 x 63.5	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
PJI-60	38 x 63.5	FP-01, FP-02, FP-03, FP-04, FP-06, FP-07, FP-09
PJI-80	38 x 89.0	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.

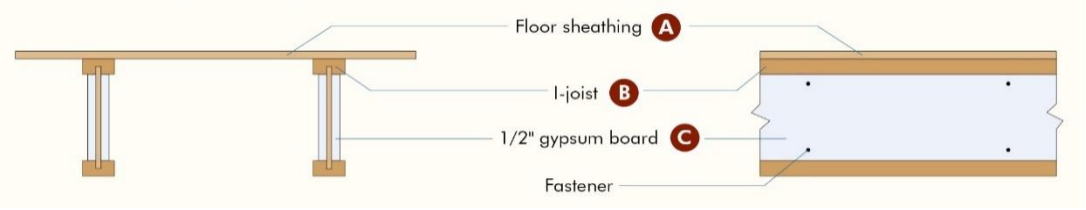
B. I-joist: installation in accordance with Section 3 of this Report. Maximum 24 in. on centre spacing. Applicable to all flange sizes. Minimum web thickness of 9.5 mm (3/8 in.).

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.

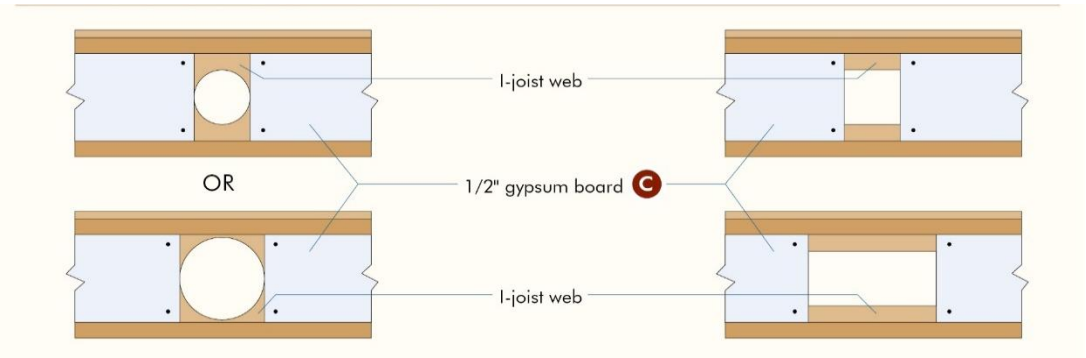
Figure 1. Fire Protection of Floors FP-01 – Fire Protection: 12.5 mm (1/2 in.) Gypsum Board Attached to Bottom of Flange

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



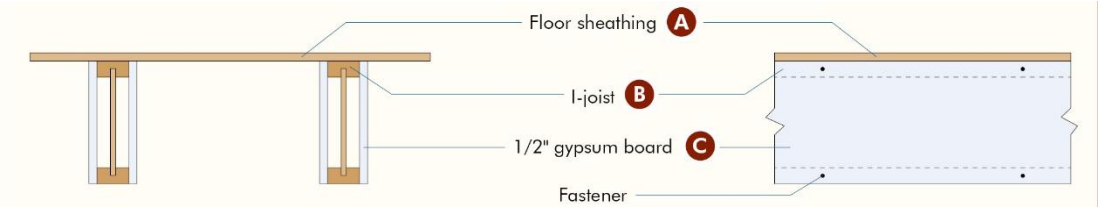
A. Floor sheathing: materials and installation in accordance with the NBC 2015.

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.

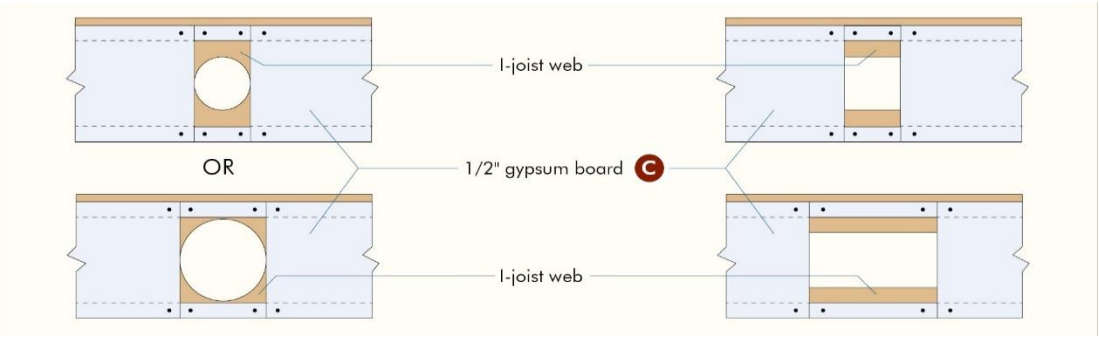
C. 12.5 mm (1/2 in.) gypsum board: materials (over entire length of I-joist) not required to be finished with tape and joint compound. Fasteners: minimum 25 mm (1 in.) screws (Type W or Type S) or nails installed 25 mm (1 in.) from edges and ends and 400 mm (16 in.) on center, top and bottom. Fasteners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



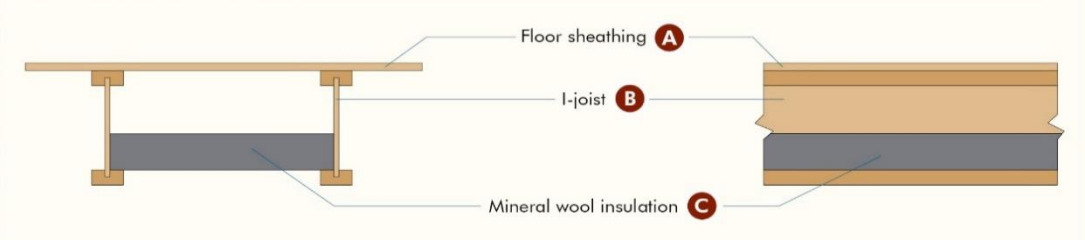
A. **Floor sheathing: materials and installation in accordance with the NBC 2015.**

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.**

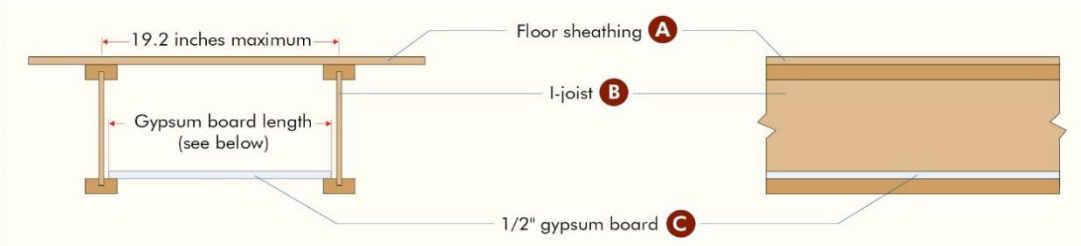
B. **I-joist: installation in accordance with Section 3 of this Report. Maximum 487 mm (19.2 in.) on centre spacing. Minimum flange size of 28.5 mm (1-1/8 in.) thick × 44.5 mm (1-3/4 in.) wide. Minimum web thickness of 9.5 mm (3/8 in.).**

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.*	

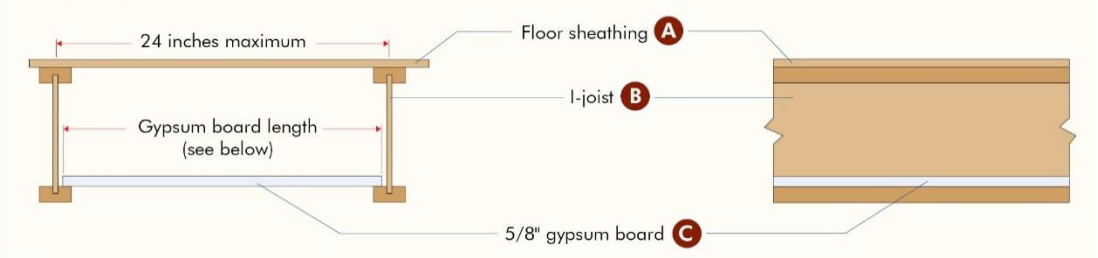
A. Floor sheathing: materials and installation in accordance with NBC 2015.

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: 12.5mm (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.

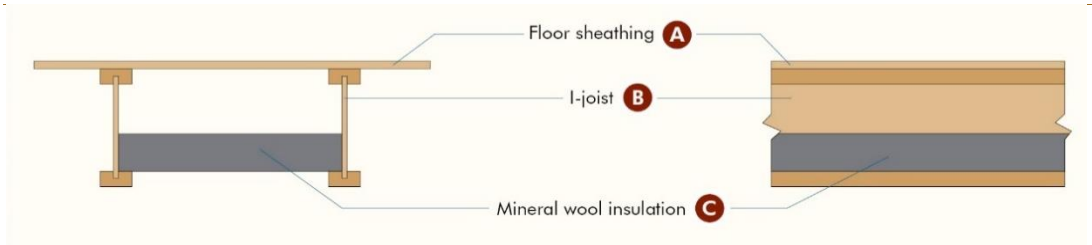
A. Floor sheathing: materials and installation in accordance with the NBC 2015.

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: 15.8 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/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 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