Evaluation Report CCMC 14001-R
Pinkwood PKI 10, PKI 20, PKI 23, PKI 35 Plus, PKI 40 and PKI 50 Series I-Joists and WEBshield®

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1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that "Pinkwood PKI 10, PKI 20, PKI 23, PKI 35 Plus, PKI 40 and PKI 50 Series I-Joists and WEBshield®," 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 (CSA O86-14 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

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 a "fire-protection option" 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 option, referenced in Sections 4.2 and 4.3 and listed in Appendix B, is provided to the authority having jurisdiction (AHJ) for information purposes. The fire-protection option, proposed and explained in Sections 4.2 and 4.3, is 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.

2. Description

The products are prefabricated wood I-joists consisting of six proprietary grade fingerjointed lumber flanges that are graded in accordance with the Pinkwood Quality Assurance Manual and glued flatwise to a 9.5-mm- or 11.1-mm-thick oriented strandboard (OSB) web. The I-joist series are available in depths ranging from 241 mm to 610 mm. Table 2.1 provides a description of the products.

The OSB web material is installed with the wafer orientation parallel to the length of the joist. The web segments are bonded with a V-joint using a phenol-resorcinol adhesive (see CCMC 13054-L). The flange is bonded to the web using the same adhesive. The flange fingerjoints are bonded with a melamine formaldehyde adhesive (see CCMC 13252-L).

Table 2.1 Descriptions of the Pinkwood I-Joist Series

Joist Series	Joist Type	Joist Depth (mm)	Flange Dimension (mm)	Flange Grade	Web Thickness (mm)
PKI 10	PKI 10-10	241	38 × 63.5	Ripped 2 × 6 enhanced No. 2 spruce-pine-fir (S-P-F) and better S-P-F lumber	9.5
	PKI 10-12	302			
	PKI 10-14	356			
PKI 20	PKI 20-10	241	38 × 63.5	Proprietary enhanced machine stress-rated (MSR) lumber	9.5
	PKI 20-12	302			
	PKI 20-14	356			
	PKI 20-16	406			
PKI 23	PKI 23-10	241	38 × 63.5	Proprietary enhanced MSR lumber	11.1
	PKI 23-12	302			
	PKI 23-14	356			
	PKI 23-16	406			
PKI 35 Plus	PKI 35 Plus-10	241	38 × 89	Ripped 2 × 8 enhanced No. 2 S-P-F and better S-P-F lumber or 2 × 4 enhanced Douglas fir-larch (north)	9.5
	PKI 35 Plus-12	302			
	PKI 35 Plus-14	356			
	PKI 35 Plus-16	406			
PKI 40	PKI 40-10	241	38 × 89	Proprietary enhanced MSR lumber	9.5
	PKI 40-12	302			
	PKI 40-14	356			
	PKI 40-16	406			
	PKI 40-18	457			11.1
	PKI 40-20	508			
	PKI 40-22	559			
	PKI 40-24	610			
PKI 50	PKI 50-12	302	38 × 89	Proprietary enhanced MSR lumber	11.1
	PKI 50-14	356			
	PKI 50-16	406			
	PKI 50-18	457			
	PKI 50-20	508			
	PKI 50-22	559			
	PKI 50-24	610			

3. Conditions and Limitations

The CCMC compliance opinion in Section 1 is bound by "Pinkwood PKI 10, PKI 20, PKI 23, PKI 35 Plus, PKI 40 and PKI 50 Series I-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, roof and rim joists, and are intended for dry service use[1] applications only.

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.

i. **Pinkwood Ltd. Pre-engineered Floor Span Charts**

The pre-engineering tables in the publication outlined below have been provided to CCMC by the manufacturer to demonstrate compliance with Part 9 buildings for acceptance by the local authority having jurisdiction (AHJ).

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 Pinkwood Ltd. "PKjoists Specifier Guide – Canada," May 2019. Applications outside the scope of these installation guidelines require engineering on a case-by-case basis.

ii. **Pinkwood Ltd. Pre-engineered Installation Details**

The manufacturer's pre-engineered details within the document noted in (i) above are limited in scope to building designs where the anticipated loads on the following structural details are not exceeded:

- floor span tables, pages 3 and 4;
- blocking panels and floor installation details, pages 5 and 6;
- web stiffeners, page 6;
- cantilevers, page 6; and
- web hole details and table, pages 7 and 8.

iii. **Engineering Required**

For structural applications beyond the scope/limitations of the above-noted publication 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;
- roof joists or rafters;
- concentrated loads;
- offset bearing walls;
- areas of high wind and/or high 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 special joist and adhesive used).

The engineer must design in accordance with CSA O86 and may refer to *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 Tables 4.1 and 4.2.

iv. **Engineering Support Provided by the Manufacturer**

Pinkwood Ltd. provides engineering support and must be consulted in the use of the product. Pinkwood Ltd. technical services may be reached at 403-279-3700.

- Damaged or defective joists must not be used, unless repaired in accordance with written instructions from the manufacturer.
- These products must be identified with the phrase "CCMC 14001-R" along the side of the product. This CCMC number is only valid when it appears in conjunction with the Intertek Testing Services certification mark.

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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, Pinkwood Ltd. should be consulted for span adjustments, if necessary, in these types of installations.

4. Technical Evidence

Table 4.1 Factored Resistance Specifications for the Products[1,2,3]

Joist Type	Depth (mm)	Factored Moment Resistance (N·m)	Factored Shear Resistance (N)	EI × 10^6 (kN·mm^2)	K × 10^6 (N)
PKI 10-10	241	5 098	8 852	482	21.97
PKI 10-12	302	6 033	10 431	819	27.47
PKI 10-14	356	8 386	11 788	1 205	32.38
PKI 20-10	241	6 338	8 852	554	21.97
PKI 20-12	302	8 474	10 431	938	27.49
PKI 20-14	356	9 931	11 788	1 375	32.38
PKI 20-16	406	11 402	13 122	1 871	37.01
PKI 23-10	241	7 254	11 121	597	21.97
PKI 23-12	302	9 409	12 677	1 010	27.47
PKI 23-14	356	11 328	14 079	1 478	32.38
PKI 23-16	406	13 131	15 369	2 009	37.01
PKI 35 Plus-10	241	7 565	8 852	671	21.97
PKI 35 Plus-12	302	9 796	10 431	1 137	27.49
PKI 35 Plus-14	356	11 748	11 788	1 664	32.38
PKI 35 Plus-16	406	13 355	13 122	2 259	37.01
PKI 40-10	241	12 148	9 408	941	21.97
PKI 40-12	302	15 714	11 410	1 587	27.49
PKI 40-14	356	18 927	13 167	2 316	32.38
PKI 40-16	406	21 937	14 857	3 134	37.01
PKI 40-18	457	24 811	17 793	4 079	41.64
PKI 40-20	508	27 455	18 816	5 163	46.26
PKI 40-22	559	30 065	19 772	6 383	50.89
PKI 40-24	610	32 648	20 684	7 744	55.51
PKI 50-12	302	17 937	14 991	1 621	27.49
PKI 50-14	356	20 744	16 014	2 365	32.38
PKI 50-16	406	24 025	16 948	3 200	37.01
PKI 50-18	457	28 798	17 793	4 170	41.64
PKI 50-20	508	31 963	18 816	5 276	46.26
PKI 50-22	559	32 899	19 772	6 523	50.89
PKI 50-24	610	35 726	20 684	7 912	55.51

Table 4.1.2 Bearing Factored Resistance Specifications for the Products[1,2,3]

Joist Type	Depth (mm)	End Reaction (N)				Intermediate Reaction (N)			
		38 mm or 64 mm Bearing[4]		102 mm Bearing[5]		89 mm Bearing		140 mm Bearing	
		Bearing Stiffeners		Bearing Stiffeners		Bearing Stiffeners		Bearing Stiffeners	
		No	Yes	No	Yes	No	Yes	No	Yes
PKI 10-10	241	6 316	8 007	7 784	8 852	15 413	16 014	17 192	17 682
PKI 10-12	302	6 316	8 941	8 140	10 431	15 413	17 437	17 726	19 728
PKI 10-14	356	6 316	9 786	8 429	11 788	15 413	18 705	18 149	20 782
PKI 20-10	241	6 806	8 007	7 784	8 852	15 413	16 681	17 192	18 505
PKI 20-12	302	6 806	8 941	8 140	10 431	16 369	17 726	18 215	19 861
PKI 20-14	356	6 806	9 786	8 429	11 788	17 237	18 705	19 127	21 107
PKI 20-16	406	6 806	10 609	8 696	13 122	18 038	19 617	20 017	22 286
PKI 23-10	241	7 362	10 031	9 475	10 542	16 903	19 439	20 017	22 530
PKI 23-12	302	7 362	10 320	10 075	11 788	16 903	19 439	20 017	23 020
PKI 23-14	356	7 362	10 565	10 431	12 944	16 903	19 439	20 017	23 442
PKI 23-16	406	7 362	10 809	10 542	14 034	16 903	19 439	20 017	23 865
PKI 35 Plus-10	241	6 316	8 007	7 784	8 852	15 413	16 014	17 192	17 682
PKI 35 Plus-12	302	6 316	8 941	8 140	10 431	15 413	17 437	17 726	19 728
PKI 35 Plus-14	356	6 316	9 786	8 429	11 788	15 413	18 705	18 149	20 782
PKI 35 Plus-16	406	6 316	10 609	8 585	13 100	15 413	20 217	18 571	21 796
PKI 40-10	241	8 318	9 408	9 163	9 408	20 351	21 730	20 640	22 441
PKI 40-12	302	8 741	10 609	11 210	11 410	21 240	23 442	21 907	24 688
PKI 40-14	356	8 985	11 654	11 210	13 167	21 641	25 021	23 020	26 712
PKI 40-16	406	9 074	12 633	11 210	14 857	22 063	26 511	24 109	28 647
PKI 40-18	457	9 186	14 457	11 788	17 904	19 995	30 092	24 109	34 896
PKI 40-20	508	9 186	15 324	11 788	18 527	19 995	30 960	24 109	34 896
PKI 40-22	559	9 186	16 214	11 788	19 194	19 995	31 805	24 109	34 896
PKI 40-24	610	9 186	17 126	11 788	19 861	19 995	32 583	24 109	34 896
PKI 50-12	302	8 741	10 609	11 210	11 410	21 240	23 442	21 907	24 688
PKI 50-14	356	8 985	11 654	11 210	13 167	21 641	25 021	23 020	26 712
PKI 50-16	406	9 074	12 633	11 210	14 857	22 063	26 511	24 109	28 647
PKI 50-18	457	9 186	14 457	11 788	17 904	19 995	30 092	24 109	34 896
PKI 50-20	508	9 186	15 324	11 788	18 527	19 995	30 960	24 109	34 896
PKI 50-22	559	9 186	16 214	11 788	19 194	19 995	31 805	24 109	34 896
PKI 50-24	610	9 186	17 126	11 788	19 861	19 995	32 583	24 109	34 896

Notes to Tables 4.1 and 4.1.2:

1. Design values were developed in accordance with CSA O86-14.
2. All factored resistance values include the resistance factor and the reliability normalization factor (K_r).
3. Additional engineering data and load/span tables are available from the manufacturer.
4. For I-joists with a depth equal to or less than 406 mm, the end reaction is based on a 38 mm bearing length. For I-joists with a depth equal to or greater than 457 mm, the end reaction is based on a 64 mm bearing length.
5. For PKI 23 Series I-joists, the bearing length is 89 mm.

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.

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Date modified:
2020-04-10

Appendix A – Additional Information

The characteristic values obtained from testing to ASTM D5055-13e1, "Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists," as specified in CSA O86-14, 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 the Products

Property	Test Information
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 D5055-13e1. Data from confirmatory tests were used to establish the applicable coefficient of variation, CV_w. The reliability normalization factor from Table 16.2.3.2 of CSA O86-14 was used to determine the specified strength.
Shear capacity	The shear capacity was established for each depth separately as per ASTM D5055-13e1. Qualification tests have been used to establish the applicable coefficient of variation, CV_w. The reliability normalization factor from Table 16.2.3.2 of CSA O86-14 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: $$\Delta_{deflection} = \frac{5wL^4}{384EI} + \frac{wL^2}{K}$$ where: w = load (kN/m), L = span (mm), EI and K from Table 4.1.
End joints	Flange tension tests were conducted in accordance with Section 6.4.1.3. of ASTM D5055-13e1. The tensile capacity was determined in accordance with Section 6.4.1.4. of ASTM D5055-13e1. Tests have been used to establish the applicable coefficient of variation, CV_w. The reliability normalization factor from Table 16.2.3.2 of CSA O86-14 was used to determine the specified strength.
Creep	Specimens were tested for creep performance in accordance with Section 6.6.3. of ASTM D5055-13e1. 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 were analyzed using ASTM D5055-13e1. Qualification tests for the reaction values were used to establish the applicable coefficient of variation, CV_w. The reliability normalization factor from Table 16.2.3.2 of CSA O86-14 was used to determine the specified strength.
Adhesive qualification	The web-to-web adhesive and the web-to-flange adhesive comply with CSA O112.7-M1977, "Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood (Room- and Intermediate-Temperature Curing)" (see CCMC 13054-L). The flange fingerjoint adhesive complies with CSA O112.9-04, "Evaluation of Adhesives for Structural Wood Products (Exterior Exposure)" (see CCMC 13252-L).
Web stock	The web stock meets the requirements of CSA O325, "Construction Sheathing," and is certified by APA, a third-party certification agency.

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.

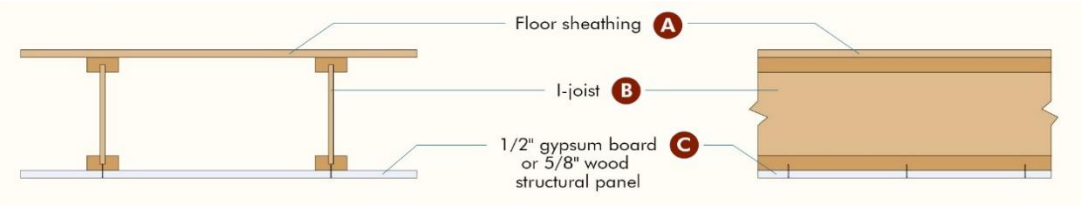
Some innovative structural products have been used in the marketplace for several years and have gained the confidence of design professionals, code authorities and users with respect to their performance under typical fire scenarios in today's house system. Some newer products have not been in service 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 "Pinkwood PKI Series I-Joist" – Fire Protection Options

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 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 600mm (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 floor assembly design is provided by the manufacturer provide fire performance as good as to 38x235mm (2x10) dimensional lumber exposed floor joists.

"Pinkwood FRI Assembly – WEBshield®"

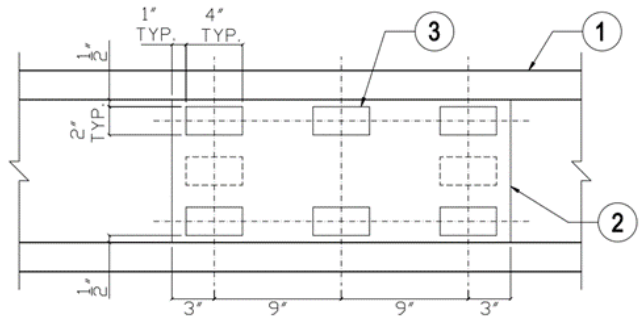
Pinkwood I-joists protected with Pinkwood WEBshield® Panels, a patented fire protective assembly called Pinkwood FRI Assembly, offers fire protection to perform as well as unprotected 38 mm × 235 mm (2 × 10) lumber floors. WEBshield® Panels are OSB panels, nominal $^{15}/_{32}$-in.-thick (11.91 mm), 24 in. (610 mm) long, and manufactured to fit between the top and bottom flanges to protect the webs of the Pinkwood I-Joists in FRI Assembly. The application of FRI Assembly is subject to the following conditions:

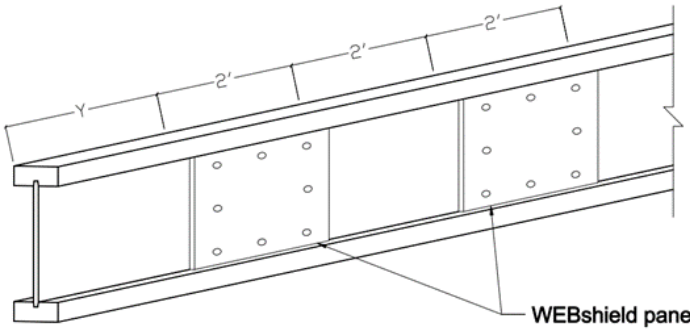
C.1 **Installation of WEBshield® Panels**: The WEBshield® Panels are installed in-plant in accordance with Figure C.1. Pinkwood Joists with WEBshield® Panels installed are certified by Intertek Testing Services.

C.2 **I-joists used in FRI Assembly:** Pinkwood I-joists used in FRI Assembly shall be limited to $9^{1}/_{2}$-in. (241 mm) through 14-in. (356 mm) depths with OSB webs, and shall meet the minimum size and strength property requirements specified in Table C.2.

C.3 **Design**: The Pinkwood FRI Assembly shall be used for applications having a maximum live load of 40 psf (1,915 N/m^2) and a maximum dead load of 20 psf (958 N/m^2). For use in FRI Assembly, the published moment resistance of Pinkwood I-joists shall be reduced to 82% for minimum WEBshield® coverage as specified in Table C.3-1 of this report.

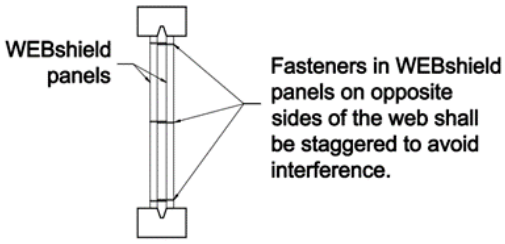
1) Wood I-joist per plan
2) WEBshield panels
3) Fastener zones - one fastener to be installed in each of the 8 zones





- WEBshield panels shall be installed tightly against the I-joist web at prescribed intervals, back-to-back on each side, to protect the web against exposure to flame. Fasten each panel using 16-gauge 3/4 - inch long by 7/16-inch crown staples, or equivalent, according to the following specifications.
- Installation Details: Use (8) 3/4-inch-long staples, minimum, to attach WEBshield panels as shown. WEBshield panels shall be installed at 4-foot-on-center spacing intervals with a 0.5" spacing tolerance. End panels shall begin within 2 feet from the ends of the I-joist (dimension y).
- The 3/4-inch-long fasteners shall be installed at 90 degrees to the panel surface for adequate penetration to hold the panel against the I-joist web.

See Table C.3-1 - Minimum Quantity of WEBshield Panels



Section View

FIGURE C.1 - WEBshield Installation Details

Table C.2 - Requirements for I-Joists Used in FRI Assembly

Flange			Webstock	Min. Design Properties[1]	
Min. Specific Gravity	Min. Size (mm)		Min. Thickness (mm)	Factored Moment Resistance (N·m)	Bending Stiffness EI ($x10^6$ kN·mm^2)
	Depth	Width			
0.42	38	63.5	9.5	5098	482

Note:

1. Min. Design Properties refer to the design preoperties of I-joists for Limit States Design publshied in the CCMC evaluation report. For the Factored Moment Resistance, it is the published design value before the reduction factor 0.82 is applied.

TABLE C.3-1 - Minimum Quantity of WEBshield Panels

Joist Span ≤	WEBshield Length 24" Min. Quantity	12"	Joist Span ≤	WEBshield Length 24" Min. Quantity	12"	Joist Span ≤	WEBshield Length 24" Min. Quantity	12"
26'	12		18'	8		10'	4	
25'	12		17'	8		9'	4	
24'	12		16'	8		8'	4	
23'	10	2	15'	6	2	7'	2	2
22'	10		14'	6		6'	2	
21'	10		13'	6		5'	2	
20'	10		12'	6		4'	2	
19'	8	2	11'	4	2	3'		2

See diagram below on the placement of the WEBShield® on the Pinkwood I-joists.

FRI Assemblies - 15/32" WEBshield

2' gap with 2' panel length and 2' end start section. Field Trimmable.