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**CCMC 13281-R**



*EVALUATION  
REPORT*

**DIVISION 06094**

**Issued 2007-06-26**

**Re-evaluation due 2010-06-26**

## *Cullen Joist Hangers (FFI, TFI, LI and HI)*

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### ***1. Purpose of Evaluation***

The proponent sought confirmation from the Canadian Construction Materials Centre (CCMC) that "Cullen Joist Hangers (FFI, TFI, LI and HI)" listed in Table 1 can serve as joist hangers in compliance with Part 4 and Part 9 of the National Building Code of Canada (NBC) 2005.

### ***2. Opinion***

Subject to the limitations and conditions stated in this report, test results and assessments provided by the proponent show that "Cullen Joist Hangers (FFI, TFI, LI and HI)" listed in Table 1 comply with CCMC's Technical Guide for Joist Hangers, MasterFormat number 06094, dated 2007-01-16, and comply with the following applicable acceptable solutions identified in Division B of the NBC 2005:

- Article 4.3.1.1. (CAN/CSA-O86-01, "Engineering Design in Wood," including supplement CAN/CSA-O86S1-05) and Clause 9.23.9.2.(2)(a).

Canada Mortgage and Housing Corporation permits the use of this product in construction

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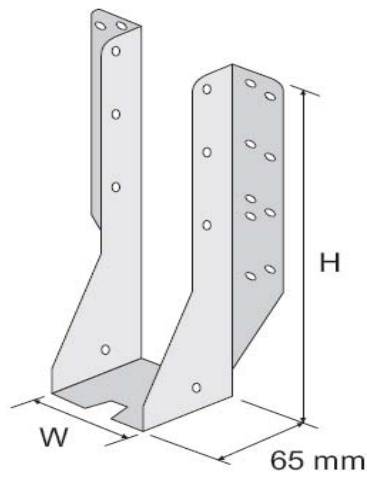
financed or insured under the *National Housing Act*.

### 3. Description

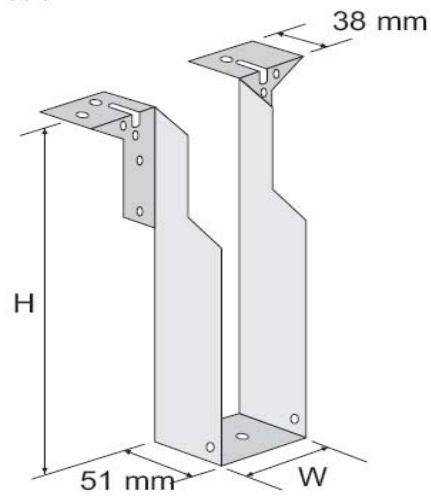
Cullen Building Products Inc.'s hangers listed in Table 1 consist of a top and face mount metal joist hanger with fasteners used to transfer the loads from the supported member to the supporting member. A typical drawing of each hanger model series is shown in Figure 1.

The FFI face mounted hanger and the TFI top mounted hanger have a light gauge steel of 1.2 mm. The LI face mounted hanger and the HI combined top and face mounted hanger have a light gauge steel of 2.0 mm. All hangers are fabricated with a galvanized finish of G90.

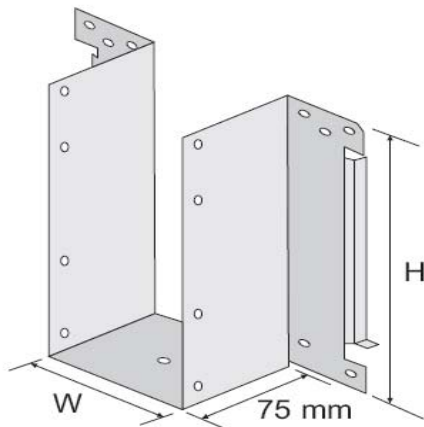
FFI



TFI



LI



HI

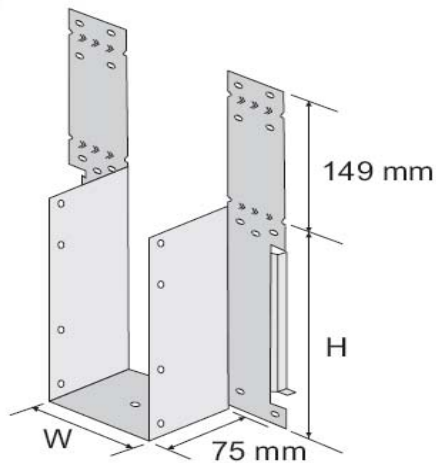


Figure 1. Product details of "Cullen Joist Hangers (FFI, TFI, LI and HI)."

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#### 4. Usage and Limitations

“Cullen Joist Hangers (FFI, TFI, LI and HI)” listed in Table 1 are used to support joists consisting of lumber, wood trusses, glued-laminated timber, prefabricated wood I-joists or structural composite lumber. Installation (including web stiffeners, filler blocks and backer blocks) and maintenance shall conform to the manufacturer’s specifications and instructions.

The design values (factored resistances) provided in this report are valid for the wood species and the hanger models shown in Table 1. However, the design value (factored resistance) can be valid for other wood products provided that:

- the relative density (or compressive strength perpendicular to grain “ $f_{cp}$ ”) of the wood product is equal or superior to the wood product tested with the hanger; and
- where structural composite lumber (SCL) products are intended to be used, only TimberStrand® (LSL), Parallam® (PSL) and laminated veneer lumber (LVL) of vertical veneer are acceptable. The top mount portion of the hanger must conform to nail spacing prescribed by the SCL manufacturer.

Common nails with specifications shown in Table 1 must be used for the published values to be valid. The hanger must be fastened to both the joist and the header, and either all fastener holes must be filled, or there must be a minimum number of nails as per the engineer's specifications.

The hanger shall display no fracturing in either the protective coating or the base metal.

Steel shall be coated with a corrosion protection equivalent to the G60 coating designation in ASTM A 653/A 653M-03, “Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process,” or higher. When used in attics, at rim boards or in high humidity or corrosive environments, the user should consult the manufacturer to determine the

appropriate level of corrosion protection for the intended use of the hanger.

Structural wood members (joists and headers) assembled with the evaluated joist hangers must be designed in accordance with the NBC 2005 by a professional engineer licensed to practice under provincial or territorial legislation.

“Cullen Joist Hangers (FFI, TFI, LI and HI)” listed in Table 1 must be identified with the phrase “CCMC 13281-R.”

#### 5. Performance

Testing and assessments were conducted at a laboratory recognized by CCMC in accordance with ASTM D 1761-88, “Standard Test Methods for Mechanical Fasteners in Wood.” The ultimate lateral resistances were obtained from the above-mentioned vertical load tests performed on three pairs of hangers, and used to calculate the factored resistances in accordance with Article 10.10.3.1 of CAN/CSA-O86-01, “Engineering Design in Wood.” Factored resistances based on testing are listed in Table 1.

**Table 1. Factored<sup>(1)</sup> Resistances of “Cullen Joist Hangers (FFI, TFI, LI and HI)”**

Hanger Model No.	Ga. (mm)	Hanger Dimensions (mm)		Wood Members Tested (mm)		Fasteners			Factored Resistance (kN)
		W	H	Header	Joist	Header		Joist	
						T	F		
FFI 1.5/9.25	1.2	38.1	235.0	38 x 235 S-P-F	38 x 235 S-P-F	0	14	4	6.11
FFI 1.5/9.25	1.2	38.1	235.0	38 x 235 D. Fir	38 x 235 D. Fir	0	14	4	12.23
FFI 1.5/11.25	1.2	38.1	285.8	38 x 286 S-P-F	38 x 286 S-P-F	0	18	4	7.03
FFI 1.5/11.25	1.2	38.1	285.8	38 x 286 D. Fir	38 x 286 D. Fir	0	18	4	12.38
FFI 1.75/9.5	1.2	44.5	241.3	44.5 x 241.3 LVL	44.5 x 241.3 LVL	0	14	4	14.48
FFI 1.75/11.88	1.2	44.5	301.6	44.5 x 301.8 LVL	44.5 x 301.8 LVL	0	18	4	15.87
FFI 1.75/14	1.2	44.5	355.6	44.5 x 355.6 LVL	44.5 x 355.6 LVL	0	26	4	17.11
FFI 1.75/16	1.2	44.5	406.4	44.5 x 406.4 LVL	44.5 x 406.4 LVL	0	30	4	15.79
FFI 2.5/9.5	1.2	63.5	241.3	63.5 x 241.3 I-J	63.5 x 241.3 I-J	0	14	4	11.12 <sup>(2)</sup>
FFI 2.5/9.5	1.2	63.5	241.3	28.7 x 241.3 R.B.	63.5 x 241.3 I-J	0	14	4	11.54
FFI 2.5/9.5	1.2	63.5	241.3	63.5 x 241.3 I-J	63.5 x 241.3 I-J	0	14	4	2.21 <sup>(2)(4)</sup>
FFI 2.5/11.88	1.2	63.5	301.6	63.5 x 301.8 I-J	63.5 x 301.8 I-J	0	18	4	12.74 <sup>(2)</sup>
FFI 2.5/11.88	1.2	63.5	301.6	28.7 x 301.8 R.B.	63.5 x 301.8 I-J	0	18	4	12.25
FFI 2.5/14	1.2	63.5	355.6	63.5 x 355.6 I-J	63.5 x 355.6 I-J	0	26	4	14.39 <sup>(2)</sup>
FFI 2.5/14	1.2	63.5	355.6	28.7 x 355.6 R.B.	63.5 x 355.6 I-J	0	26	4	16.84
FFI 2.5/16	1.2	63.5	406.4	63.5 x 406.4 I-J	63.5 x 406.4 I-J	0	30	4	14.15 <sup>(2)</sup>
FFI 2.5/16	1.2	63.5	406.4	28.7 x 406.4 R.B.	63.5 x 406.4 I-J	0	30	4	14.91
FFI 3.5/9.5	1.2	88.9	241.3	88.9 x 241.3 I-J	88.9 x 241.3 I-J	0	14	4	10.80 <sup>(2)</sup>
FFI 3.5/9.5	1.2	88.9	241.3	28.7 x 241.3 R.B.	88.9 x 241.3 I-J	0	14	4	11.24
FFI 3.5/9.5	1.2	88.9	241.3	44.5 x 241.3 LVL	2 - 44.5 x 241.3 LVL	0	14	4	15.51
FFI 3.5/9.5	1.2	88.9	241.3	88.9 x 241.3 I-J	88.9 x 241.3 I-J	0	14	4	2.27 <sup>(2)(4)</sup>
FFI 3.5/11.88	1.2	88.9	301.6	88.9 x 301.8 I-J	88.9 x 301.8 I-J	0	18	4	12.28 <sup>(2)</sup>
FFI 3.5/11.88	1.2	88.9	301.6	28.7 x 301.8 R.B.	88.9 x 301.8 I-J	0	18	4	11.31
FFI 3.5/11.88	1.2	88.9	301.6	44.5 x 301.8 LVL	2 - 44.5 x 301.8 LVL	0	18	4	17.61
FFI 3.5/14	1.2	88.9	355.6	88.9 x 355.6 I-J	88.9 x 355.6 I-J	0	26	4	14.49 <sup>(2)</sup>
FFI 3.5/14	1.2	88.9	355.6	28.7 x 355.6 R.B.	88.9 x 355.6 I-J	0	26	4	14.64
FFI 3.5/14	1.2	88.9	355.6	44.5 x 355.6 LVL	2 - 44.5 x 355.6 LVL	0	26	4	16.24
FFI 3.5/16	1.2	88.9	406.4	88.9 x 406.4 I-J	88.9 x 406.4 I-J	0	30	4	12.10 <sup>(2)</sup>
FFI 3.5/16	1.2	88.9	406.4	28.7 x 406.4 R.B.	88.9 x 406.4 I-J	0	30	4	18.24
FFI 3.5/16	1.2	88.9	406.4	44.5 x 406.4 LVL	2 - 44.5 x 406.4 LVL	0	30	4	17.59

**Table 1. Factored<sup>(1)</sup> Resistances of “Cullen Joist Hangers (FFI, TFI, LI and HI)” (cont’d)**

Hanger Model No.	Ga. (mm)	Hanger Dimensions (mm)		Wood Members Tested (mm)		Fasteners			Factored Resistance (kN)
		W	H	Header	Joist	Header		Joist	
						T	F		
TFI 1.5/9.25	1.2	38.1	235	38 x 235 S-P-F	38 x 235 S-P-F	4	8	2	5.78
TFI 1.5/9.25	1.2	38.1	235	38 x 235 D. Fir	38 x 235 D. Fir	4	8	2	10.78
TFI 1.5/11.25	1.2	38.1	285.8	38 x 286 S-P-F	38 x 286 S-P-F	4	8	2	4.19
TFI 1.5/11.25	1.2	38.1	285.8	38 x 286 D. Fir	38 x 286 D. Fir	4	8	2	11.19
TFI 1.75/9.5	1.2	44.5	241.3	44.5 x 241.3 LVL	44.5 x 241.3 LVL	4	8	2	10.49
TFI 1.75/11.88	1.2	44.5	301.6	44.5 x 301.8 LVL	44.5 x 301.8 LVL	4	8	2	9.34
TFI 1.75/16	1.2	44.5	406.4	44.5 x 406.4 LVL	44.5 x 406.4 LVL	4	8	2	9.86
TFI 2.5/9.5	1.2	63.5	241.3	63.5 x 241.3 I-J	63.5 x 241.3 I-J	4	8	2	8.52 <sup>(3)</sup>
TFI 2.5/9.5	1.2	63.5	241.3	63.5 x 241.3 I-J	63.5 x 241.3 I-J	4	8	2	3.08
TFI 2.5/9.5	1.2	63.5	241.3	63.5 x 241.3 I-J	63.5 x 241.3 I-J	4	8	2	1.19 <sup>(3)(4)</sup>
TFI 2.5/11.88	1.2	63.5	301.6	63.5 x 301.8 I-J	63.5 x 301.8 I-J	4	8	2	8.43 <sup>(3)</sup>
TFI 2.5/11.88	1.2	63.5	301.6	63.5 x 301.8 I-J	63.5 x 301.8 I-J	4	8	2	3.73
TFI 2.5/16	1.2	63.5	406.4	63.5 x 406.4 I-J	63.5 x 406.4 I-J	4	8	2	9.10 <sup>(3)</sup>
TFI 2.5/16	1.2	63.5	406.4	63.5 x 406.4 I-J	63.5 x 406.4 I-J	4	8	2	3.71
TFI 3.5/9.5	1.2	88.9	241.3	88.9 x 241.3 I-J	88.9 x 241.3 I-J	4	8	2	10.95 <sup>(3)</sup>
TFI 3.5/9.5	1.2	88.9	241.3	88.9 x 241.3 I-J	88.9 x 241.3 I-J	4	8	2	3.20
TFI 3.5/9.5	1.2	88.9	241.3	44.5 x 241.3 LVL	2 - 44.5 x 241.3 LVL	4	8	2	11.23
TFI 3.5/9.5	1.2	88.9	241.3	88.9 x 241.3 I-J	88.9 x 241.3 I-J	4	8	2	1.13 <sup>(3)(4)</sup>
TFI 3.5/11.88	1.2	88.9	301.6	88.9 x 301.8 I-J	88.9 x 301.8 I-J	4	8	2	8.40 <sup>(3)</sup>
TFI 3.5/11.88	1.2	88.9	301.6	88.9 x 301.8 I-J	88.9 x 301.8 I-J	4	8	2	3.36
TFI 3.5/11.88	1.2	88.9	301.6	44.5 x 301.8 LVL	2 - 44.5 x 301.8 LVL	4	8	2	9.92
TFI 3.5/16	1.2	88.9	406.4	88.9 x 406.4 I-J	88.9 x 406.4 I-J	4	8	2	9.71 <sup>(3)</sup>
TFI 3.5/16	1.2	88.9	406.4	88.9 x 406.4 I-J	88.9 x 406.4 I-J	4	8	2	2.51
TFI 3.5/16	1.2	88.9	406.4	44.5 x 406.4 LVL	2 - 44.5 x 406.4 LVL	4	8	2	11.25
LI 2.5/9.5	2.0	63.5	241.3	2 - 63.5 x 241.3 I-J	63.5 x 241.3 I-J	0	10	4	9.45
LI 2.5/9.5	2.0	63.5	241.3	2 - 63.5 x 241.3 I-J	63.5 x 241.3 I-J	0	10	4	3.01 <sup>(4)</sup>
LI 2.5/11.88	2.0	63.5	301.6	2 - 63.5 x 301.8 I-J	63.5 x 301.8 I-J	0	10	4	11.48
LI 2.5/16	2.0	63.5	406.4	2 - 63.5 x 406.4 I-J	63.5 x 406.4 I-J	0	10	4	10.29

**Table 1. Factored<sup>(1)</sup> Resistances of “Cullen Joist Hangers (FFI, TFI, LI and HI)” (cont’d)**

Hanger Model No.	Ga. (mm)	Hanger Dimensions (mm)		Wood Members Tested (mm)		Fasteners			Factored Resistance (kN)
		W	H	Header	Joist	Header		Joist	
						T	F		
LI 3.5/9.5	2.0	88.9	241.3	2 – 88.9 x 241.3 I-J	88.9 x 241.3 I-J	0	10	4	10.09
LI 3.5/9.5	2.0	88.9	241.3	2 – 88.9 x 241.3 I-J	88.9 x 241.3 I-J	0	10	4	3.23 <sup>(4)</sup>
LI 3.5/11.88	2.0	88.9	301.6	2 – 88.9 x 301.8 I-J	88.9 x 301.8 I-J	0	10	4	10.69
LI 3.5/16	2.0	88.9	406.4	2 – 88.9 x 406.4 I-J	88.9 x 406.4 I-J	0	10	4	10.64
HI 2.5/9.5	2.0	63.5	241.3	2 – 63.5 x 241.3 I-J	63.5 x 241.3 I-J	4	10	4	10.70
HI 2.5/9.5	2.0	63.5	241.3	2 – 63.5 x 241.3 I-J	63.5 x 241.3 I-J	4	10	4	2.69 <sup>(4)</sup>
HI 2.5/11.88	2.0	63.5	301.6	2 – 63.5 x 301.8 I-J	63.5 x 301.8 I-J	4	10	4	12.47
HI 2.5/16	2.0	63.5	406.4	2 – 63.5 x 406.4 I-J	63.5 x 406.4 I-J	4	10	4	14.37
HI 3.5/9.5	2.0	88.9	241.3	2 – 88.9 x 241.3 I-J	88.9 x 241.3 I-J	4	10	4	14.57
HI 3.5/9.5	2.0	88.9	241.3	2 – 88.9 x 241.3 I-J	88.9 x 241.3 I-J	4	10	4	2.97 <sup>(4)</sup>
HI 3.5/11.88	2.0	88.9	301.6	2 – 88.9 x 301.8 I-J	88.9 x 301.8 I-J	4	10	4	14.24
HI 3.5/16	2.0	88.9	406.4	2 – 88.9 x 406.4 I-J	88.9 x 406.4 I-J	4	10	4	13.31

**Notes to Table 1:**

- (1) Results are based on testing.
- (2) A backer block has been fixed to both sides of the I-joist header. The block was made from OSB for the 63.5-mm wide I-joist and made of sawn lumber for the 88.9-mm wide I-joist.
- (3) A backer block has been fixed to the hanger side of the I-joist header. The block was made from OSB for the 63.5-mm wide I-joist and made of sawn lumber for the 88.9-mm wide I-joist.
- (4) Uplift factored resistances.

**General notes to Table 1:**

- Factored resistances of joist hangers are calculated in accordance with CAN/CSA-O86-01, “Engineering Design in Wood,” including supplement CAN/CSA-O86S1-05, with standard load duration, dry service and no treatment.
- W = bearing width of the hanger, H = hanger height.
- D. Fir = Douglas fir lumber (select structural).
- S-P-F = Spruce-Pine-Fir lumber (No. 2 or better).
- LVL = Laminated veneer lumber (Temlam LVL: 1.8E).
- RB = Rim board is oriented strandboard (Norbord RIM: 28.6-mm thickness, see CCMC 13248-L).
- I-J = I-joist (38-mm x 63.5-mm flange is S-P-F No. 2 or better and 38-mm x 88.9-mm flange is MSR 2 100f-1.8E).

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- Ga. = hanger gauge.
  - D. Fir and S-P-F were tested and their density fell in the specified range of Article 10.10.1.5 of CAN/CSA-O86-01. Where the density fell outside the standard range density, an adjustment factor has been applied to the factored resistance.
  - Web stiffeners, backer blocks and filler blocks have been used for the specimen preparation of double I-joists. They must be fitted as per the manufacturer's instructions.
  - Hot-dip galvanized common nails were used for testing and all were 3.76 mm in diameter and 38 mm in length (10d x 1 ½").
  - A minimum specified ultimate tensile strength of 330 MPa was used for all hanger calculations.

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Manager, CCMC

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**APPENDIX A**  
Additional Information

Based on the factored resistances listed in Table 1, professional engineers from Cullen Building Products Inc. have established conservative factored resistances for hangers that have not been tested. Therefore, CCMC has not evaluated the performance of the following factored resistances in accordance with the NBC 2005 since these factored resistances have not been determined strictly in accordance with the Code's testing requirements. However, these values have been generated in accordance with CCMC's Technical Guide for Joist Hangers, MasterFormat number 06094, dated 06-10-30.

The client's proposed factored resistances and the related hanger dimensions are listed in Table 2. The hanger dimensions must fall in the range of the dimensions specified in the appropriate hanger series. These proposed values represent custom order design values for use only with direct sale from Cullen Building Products Inc., limited to the end user and with involvement of Cullen Building Products Inc.

**Table 2. Client Proposed<sup>(1)</sup> Factored Resistances for "Cullen Joist Hangers (TFI, LI and HI)"**

Hanger Model No.	Ga. (mm)	Hanger Dimensions (mm) <sup>(2)</sup>		Wood Members <sup>(3)</sup> (mm)		Fasteners <sup>(4)</sup>			Factored Resistance (kN)
		W	H	Header	Joist	Header		Joist	
						T	F		
TFI 1.75/14	1.2	44.5	355.6	44.5 x 355.6 LVL	44.5 x 355.6 LVL	4	8	2	9.34
TFI 2.5/14	1.2	63.5	355.6	63.5 x 355.6 I-J	63.5 x 355.6 I-J	4	8	2	8.43 <sup>(5)</sup>
				63.5 x 355.6 I-J	63.5 x 355.6 I-J	4	8	2	3.71
TFI 3.5/14	1.2	88.9	355.6	88.9 x 355.6 I-J	88.9 x 355.6 I-J	4	8	2	8.40 <sup>(5)</sup>
				88.9 x 355.6 I-J	88.9 x 355.6 I-J	4	8	2	2.51
				88.9 x 355.6 LVL	2 - 44.5 x 355.6 LVL	4	8	2	9.92
LI 2.5/14	2.0	63.5	355.6	2 - 63.5 x 355.6 I-J	63.5 x 355.6 I-J	0	10	4	10.29
LI 3.5/14	2.0	88.9	355.6	2 - 88.9 x 355.6 I-J	88.9 x 355.6 I-J	0	10	4	10.64
HI 2.5/14	2.0	63.5	355.6	2 - 63.5 x 355.6 I-J	63.5 x 355.6 I-J	4	10	4	12.47
HI 3.5/14	2.0	88.9	355.6	2 - 88.9 x 355.6 I-J	88.9 x 355.6 I-J	4	10	4	13.31

**Notes to Table 2:**

- (1) Proposed values by Cullen Building Products Inc. based on engineering judgment and testing of similar assemblies.
- (2) Ga. = gauge, W = bearing width of the hanger and H = hanger height.
- (3) Grade of wood members must be equal or better than those used for testing similar assemblies.
- (4) Nails must be 3.76 mm in diameter and 38 mm in length (10d x 1 1/2").

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- (5) A backer block has been fixed to the hanger side of the I-joist header. The block was made from OSB for the 63.5-mm wide I-joist and made of sawn lumber for the 88.9-mm wide I-joist.