

# ICC-ES Evaluation Report

ESR-3787

Reissued July 2024


This report also contains:

- CBC and CRC Supplement

Subject to renewal July 2025

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<b>DIVISION: 05 00 00—METALS</b>  <b>Section: 05 10 00—Structural Metal Framing</b>  <b>Section: 05 20 00—Metal Joists</b>  <b>Section: 05 40 00—Cold-Formed Metal Framing</b>  <b>Section: 05 42 00—Cold-Formed Metal Joist Framing</b>	<b>REPORT HOLDER:</b>  <b>BAILEY METAL PRODUCTS LIMITED</b>	<b>EVALUATION SUBJECT:</b>  <b>COMPOSITE TOTALJOIST®</b>	
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## 1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021, 2018, 2015, 2012 and 2009 [International Building Code® \(IBC\)](#)
- 2021, 2018, 2015, 2012 and 2009 [International Residential Code® \(IRC\)](#)

Property evaluated:

- Structural

## 2.0 USES

Composite TotalJoist® is used to provide a structural floor system.

## 3.0 DESCRIPTION

### 3.1 General:

The Composite TotalJoist® floor system is comprised of cold-formed steel framing (Composite TotalJoist®), cold-formed steel deck (TotalDeck), and a concrete deck slab. The system acts compositely to provide a structural floor system. See [Figure 1](#) for an illustration of the system.

### 3.2 Composite TotalJoist®:

Composite TotalJoist® is a proprietary I-shaped cold-formed steel framing member. Composite TotalJoist® is illustrated in [Figure 2](#) and designations are noted in [Table 1](#). The joists have large web openings capable of passing mechanical, electrical, and plumbing utilities within the plenum. The holes are located at a minimum of 30 inches (762 mm) from the end of the member to the center of the hole and at distances of no less than 36 inches (914 mm) on center. Two smaller holes, 1<sup>11</sup>/<sub>32</sub> inch (34 mm) in diameter, are located near each large hole. The Composite TotalJoist® is available in minimum base steel thicknesses of 0.0570 inch (1.448 mm) and 0.0713 inch (1.803 mm), and is cold-formed from galvanized steel coils conforming to ASTM A653, HSLAS Grade 60. The steel has a minimum G60 galvanization coating designation in conformance with ASTM A653.

The Composite TotalJoist® has a steel shoe welded to each end to provide an end restraint for the concrete deck. The shoe is comprised of an angular piece of steel fabricated from steel conforming to CSA G40.21 50W (ASTM A572) and a strut and a diagonal conforming to ASTM A1011 SS Grade 50 or ASTM A1008 SS Grade 50. All of the steel used in the shoe is painted after fabrication with a zinc-rich paint.

The joist bridging is cold-formed from galvanized steel coils conforming to ASTM A653, SS Grade 33. The steel has a minimum G60 galvanization coating designation in conformance with ASTM A653.

### 3.3 TotalDeck:

The TotalDeck is a proprietary cold-formed steel deck placed on top of the Composite TotalJoist®. It has a minimum base metal thickness of 0.0231 inch (0.587 mm) and is cold-formed from galvanized steel coils conforming to ASTM A653, SS Grade 50, Class 1, 3 or 4. The steel has a minimum G60 galvanization coating designation in conformance with ASTM A653.

### 3.4 Concrete:

Structural concrete, plain or reinforced, is placed on the TotalDeck at thicknesses noted in [Table 2](#). The concrete must be in accordance with IBC Chapter 19 and must have a minimum compressive strength ( $f'_c$ ) of 3000 psi (20,685 kPa). Concrete deck slab thickness ranges from 3 inches (76 mm) to 5 inches (127 mm).

### 3.5 Fasteners:

Fasteners attaching the TotalDeck to the Composite TotalJoist® must be either No. 10-16 x <sup>3</sup>/<sub>4</sub>-inch HWH T/3 screws complying with ASTM C1513 or Hilti X-HSN-24 (ESR-2197) powder-driven fasteners.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design:

The design moment for the system must be no greater than the maximum factored moment ( $M_{rc}$ ) specified in [Table 2](#). The equivalent steel moment of inertia ( $I_{xc}$ ), specified in [Table 2](#) is used to determine deflections using the standard deflection equations for a simply supported beam. The modulus of elasticity (E) for steel is used in the deflection equations.

### 4.2 Installation:

Composite TotalJoist® framing members must be installed in accordance with the applicable code, the approved construction documents, and this report. If there is a conflict between the construction documents submitted for approval and this report, this report governs. The approved construction documents, including the erection drawings referenced in Section 7.2, must be available at the jobsite at all times during installation.

For all installations:

- Blocking/bridging must be provided at intervals of not more than 10 feet (3048 mm).
- Minimum end bearing must be 3 inches (76 mm).
- Attachment of the Composite TotalJoist® to the supporting walls must be in accordance with standard engineering practice for the wall supporting the Composite TotalJoist®.

Fasteners specified in Section 3.5 are used to attach the TotalDeck to the Composite TotalJoist®. The fasteners must be installed in accordance with the fastener manufacturer's installation instructions and placed at a spacing not exceeding 7 inches (178 mm) o.c. as illustrated in [Figure 3](#).

Concrete specified in Section 3.4 is placed on the TotalDeck. See [Table 2](#) for required thickness.

## 5.0 CONDITIONS OF USE:

The Composite TotalJoist® floor system described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 Complete construction documents and calculations verifying compliance with this report must be submitted to the code official for each project. The calculations and construction documents must be prepared and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.2 Installations are limited to simple span gravity load conditions.

- 5.3 Support of any load, other than dead and live loads from the deck above, by the Composite TotalJoist<sup>®</sup> is outside the scope of this report.
- 5.4 Composite TotalJoist<sup>®</sup> framing members must not be cut or notched, or have additional holes placed in them.
- 5.5 Composite TotalJoist<sup>®</sup> framing members are manufactured under a quality control program with inspections by ICC-ES.

## 6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with [ICC-ES Acceptance Criteria for Composite Open Web Steel Joists Supporting Concrete Decks \(AC343\)](#), dated February 2006, editorially revised November 2021.
- 6.2 Data in accordance with [ICC-ES Acceptance Criteria for Cold-formed Steel Framing Members \(AC46\)](#), dated June 2012, editorially revised December 2020.

## 7.0 IDENTIFICATION

- 7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-3787) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.
- 7.2 Each bundle of Composite TotalJoist<sup>®</sup> is labeled with job identifiers and as noted in Section 7.1. Each Composite TotalJoist<sup>®</sup> is marked with a unique identifier which corresponds to erection drawings issued by the report holder. These erection drawings indicate the Section Identification number from [Table 1](#) that is applicable for each Composite TotalJoist<sup>®</sup>.

Each panel of TotalDeck is printed with the minimum base metal thickness (in inches or mils), and the material specification, including the minimum specified yield strength (50 ksi [340 mPa]).

- 7.3 The report holder's contact information is the following:

**BAILEY METAL PRODUCTS LIMITED**  
**1 CALDARI ROAD**  
**CONCORD, ONTARIO L4K 3Z9**  
**CANADA**  
**(905) 738-9267**  
[info@bmp-group.com](mailto:info@bmp-group.com)  
[www.totaljoist.com](http://www.totaljoist.com)

**TABLE 1—COMPOSITE TOTALJOIST<sup>®</sup> MEMBERS**

SECTION IDENTIFICATION	MEMBER DEPTH <sup>1</sup> (in.)	FLANGE (in.)	DESIGN STEEL THICKNESS (in.)	MINIMUM BASE STEEL THICKNESS (in.)	HOLE SIZE (in.)
8-ic-3	8.0	2.0	0.0600	0.0570	4 x 2
8-ic-4	8.0	2.0	0.0750	0.0713	
10-ic-3	10.0	2.0	0.0600	0.0570	7 <sup>1</sup> / <sub>8</sub> x 3 <sup>1</sup> / <sub>2</sub>
10-ic-4	10.0	2.0	0.0750	0.0713	
12-ic-3	12.0	2.0	0.0600	0.0570	11 <sup>7</sup> / <sub>8</sub> x 6 <sup>1</sup> / <sub>6</sub>
12-ic-4	12.0	2.0	0.0750	0.0713	
14-ic-3	14.0	2.0	0.0600	0.0570	15 <sup>1</sup> / <sub>2</sub> x 8
14-ic-4	14.0	2.0	0.0750	0.0713	
16-ic-3	16.0	2.0	0.0600	0.0570	17 <sup>7</sup> / <sub>8</sub> x 10
16-ic-4	16.0	2.0	0.0750	0.0713	
18-ic-4	18.0	2.0	0.0750	0.0713	17 <sup>7</sup> / <sub>8</sub> x 10

For **SI**: 1 inch = 25.4 mm

<sup>1</sup>Member depth is measured from outside face to outside face of flanges.

TABLE 2—COMPOSITE TOTALJOIST<sup>®</sup> DESIGN VALUES

SLAB DEPTH <sup>1</sup> (in.)	JOIST DEPTH <sup>2</sup> (in.)	SECTION IDENTIFICATION	24" O.C.			36" O.C.			48" O.C.		
			Weight <sup>3</sup> (psf)	I <sub>xc</sub> <sup>3</sup> (in <sup>4</sup> )	M <sub>rc</sub> <sup>4</sup> (k-ft)	Weight <sup>3</sup> (psf)	I <sub>xc</sub> <sup>3</sup> (in <sup>4</sup> )	M <sub>rc</sub> <sup>4</sup> (k-ft)	Weight <sup>3</sup> (psf)	I <sub>xc</sub> <sup>3</sup> (in <sup>4</sup> )	M <sub>rc</sub> <sup>4</sup> (k-ft)
3	8	8-ic-3	35.7	29.9	25.0	35.0	31.9	25.3	34.6	33.4	25.4
		8-ic-4	36.2	35.5	30.6	35.3	38.0	31.0	34.9	39.7	31.2
	10	10-ic-3	35.9	42.6	31.4	35.1	45.0	31.7	34.7	46.7	31.8
		10-ic-4	36.5	50.8	38.4	35.5	53.9	38.9	35.0	56.0	39.1
	12	12-ic-3	36.2	58.5	39.9	35.3	61.4	40.2	34.8	63.4	40.4
		12-ic-4	36.8	70.0	48.9	35.7	73.8	49.5	35.1	76.3	49.8
	14	14-ic-3	36.4	76.4	48.3	35.4	79.8	48.8	34.9	82.1	49.0
		14-ic-4	37.1	91.6	59.4	35.9	96.1	60.0	35.3	99.1	60.4
	16	16-ic-3	36.6	97.1	57.5	35.6	101.0	58.0	35.0	104.0	58.3
		16-ic-4	37.4	117.0	70.7	36.1	122.0	71.5	35.4	126.0	71.9
	18	18-ic-4	37.7	155	82.9	36.3	162.0	83.8	35.6	167.0	84.3
4	8	8-ic-3	47.8	38.1	27.7	47.0	41.6	27.9	46.7	44.7	28.1
		8-ic-4	48.3	44.9	33.9	47.4	48.9	34.3	46.9	52.2	34.5
	10	10-ic-3	48.0	51.8	34.2	47.2	55.7	34.5	46.8	58.9	34.7
		10-ic-4	48.5	61.5	42.0	47.5	66.0	42.4	47.0	69.6	42.6
	12	12-ic-3	48.3	68.8	43.1	47.4	73.1	43.4	46.9	76.6	43.6
		12-ic-4	48.9	82.2	52.9	47.8	87.3	53.4	47.2	91.2	53.7
	14	14-ic-3	48.5	87.8	51.8	47.5	92.5	52.3	47.0	96.2	52.5
		14-ic-4	49.2	105.0	63.7	48.0	111.0	64.3	47.4	115.0	64.7
	16	16-ic-3	48.7	110.0	61.3	47.7	115.0	61.8	47.1	119.0	62.0
		16-ic-4	49.5	132.0	75.4	48.2	138.0	76.1	47.5	143.0	76.5
	18	18-ic-4	49.8	174.0	87.9	48.4	182.0	88.8	47.7	187.0	89.3
5	8	8-ic-3	59.9	49.2	30.3	59.1	55.7	30.6	58.8	61.7	30.7
		8-ic-4	60.4	57.2	37.2	59.5	64.1	37.5	59.0	70.4	37.7
	10	10-ic-3	60.1	63.8	37.1	59.2	70.5	37.4	58.8	76.7	37.5
		10-ic-4	60.6	74.9	45.5	59.6	82.3	45.9	59.1	88.8	46.2
	12	12-ic-3	60.3	81.8	46.3	59.4	88.9	46.6	59.0	95.3	46.8
		12-ic-4	61.0	96.8	56.8	59.9	105.0	57.4	59.3	111.0	57.7
	14	14-ic-3	60.6	102.0	55.3	59.6	109.0	55.7	59.1	116.0	55.9
		14-ic-4	61.3	121.0	68.0	60.1	129.0	68.6	59.5	136.0	69.0
	16	16-ic-3	60.8	125.0	65.0	59.7	132.0	65.5	59.2	139.0	65.8
		16-ic-4	61.6	149.0	80.0	60.3	158.0	80.8	59.6	165.0	81.1
	18	18-ic-4	61.8	194.0	92.9	60.4	204.0	93.8	59.7	212.0	94.2

For SI: 1 inch = 25.4 mm, 1 psf = 16.02 kg/m<sup>3</sup>, 1 in<sup>4</sup> = 416,231 mm<sup>4</sup>, 1 k-ft = 1360 N-m

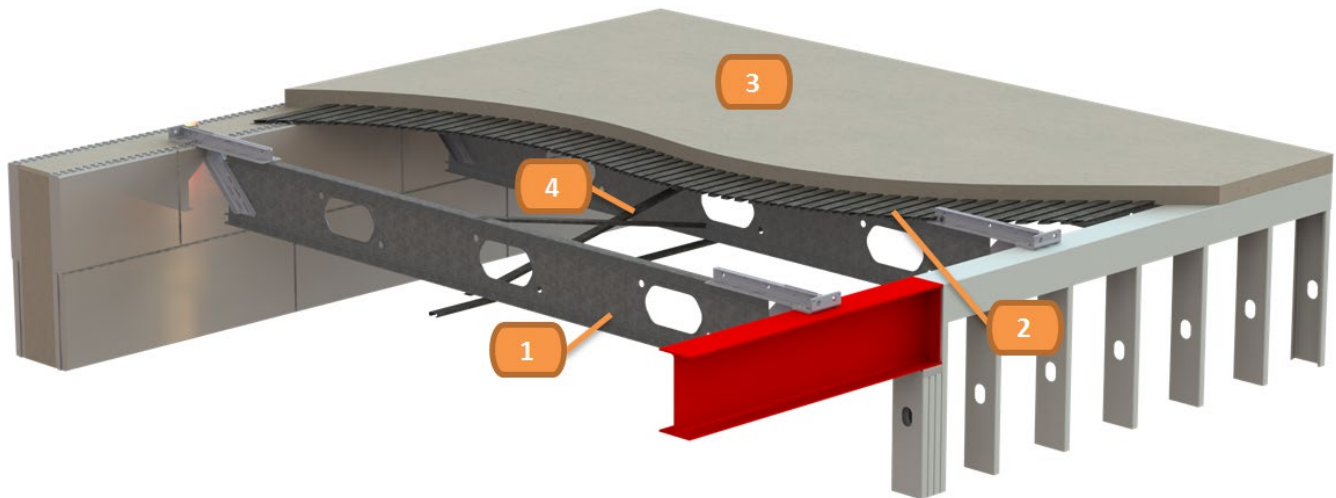
<sup>1</sup>Slab Depth = Depth of the concrete slab measured from the bottom of the deck to the top of the slab.

<sup>2</sup>Joist Depth = Member depth is measured from outside face to outside face of flanges.

<sup>3</sup>Weight = Total weight of joist, tributary area of steel deck, and tributary area of normal-weight concrete.

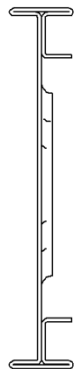
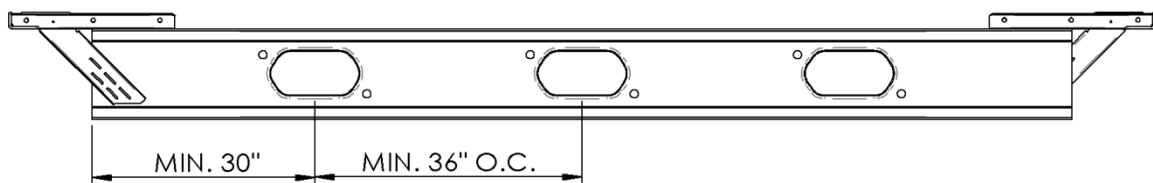
<sup>4</sup>I<sub>xc</sub> = Equivalent steel moment of inertia about the x-axis for the composite cross-section.

<sup>5</sup>M<sub>rc</sub> = Maximum available strength [factored resistance] positive moment for the composite cross-section. For allowable strength design (ASD) multiply by 0.665.



- 1) Composite TotalJoist<sup>®</sup>
- 2) TotalDeck
- 3) Concrete Slab
- 4) TotalJoist<sup>®</sup> Bridging / Cross Bridging

**FIGURE 1—COMPOSITE TOTALJOIST<sup>®</sup> FLOOR SYSTEM**



Cross Section



Shoe

**FIGURE 2—COMPOSITE TOTALJOIST<sup>®</sup>**

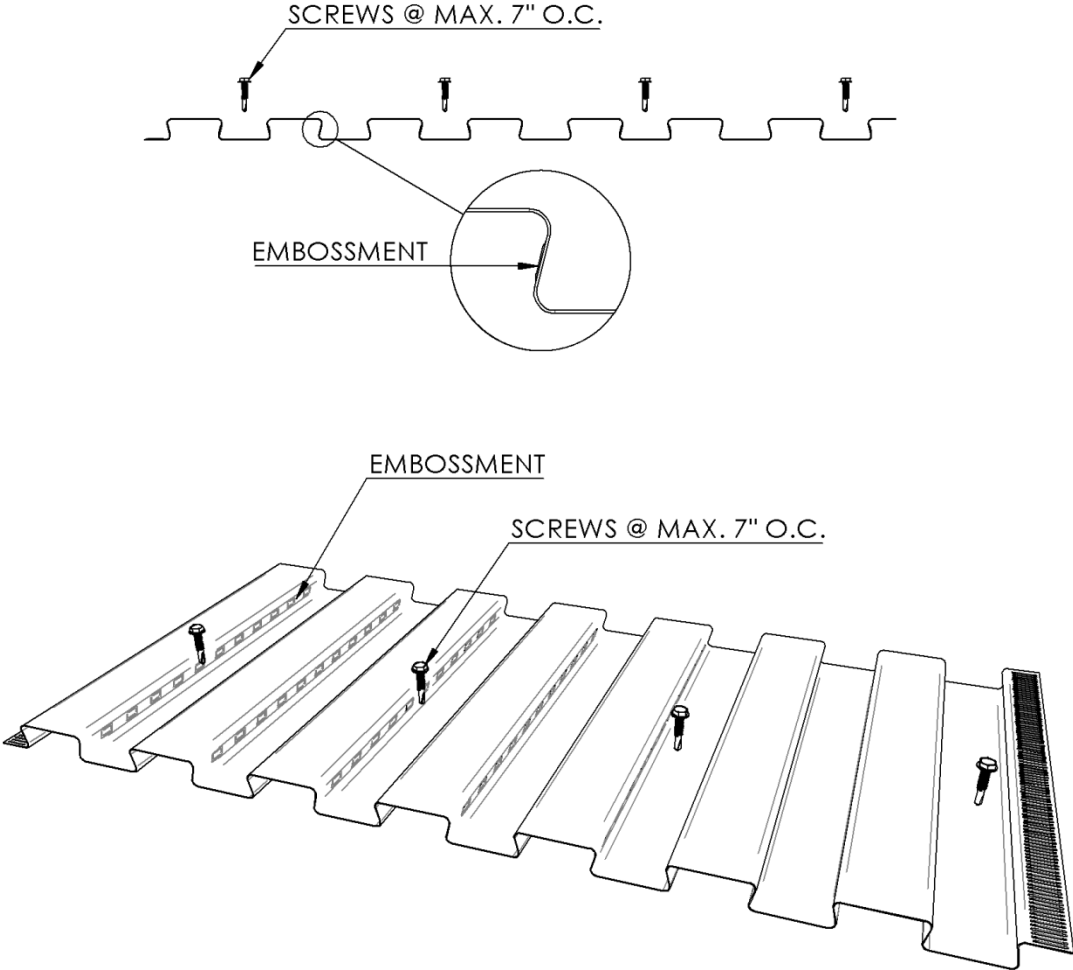


FIGURE 3—TOTALDECK

**DIVISION: 05 00 00—METALS****Section: 05 10 00—Structural Metal Framing****Section: 05 20 00—Metal Joists****Section: 05 40 00—Cold-Formed Metal Framing****Section: 05 42 00—Cold-Formed Metal Joist Framing****REPORT HOLDER:****BAILEY METAL PRODUCTS LIMITED****EVALUATION SUBJECT:****COMPOSITE TOTALJOIST®****1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that Composite TotalJoist®, described in ICC-ES evaluation report ESR-3787, has also been evaluated for compliance with the codes noted below.

**Applicable code editions:**

- 2022 *California Building Code* (CBC)

For evaluation of applicable Chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2022 *California Residential Code* (CRC)

**2.0 CONCLUSIONS****2.1 CBC:**

The Composite TotalJoist®, described in Sections 2.0 through 7.0 of the evaluation report ESR-3787, complies with CBC Chapter 22, provided the design and installation are in accordance with the 2021 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements of CBC Chapters 16, 17 and 22, as applicable.

**2.1.1 OSHPD:**

The applicable OSHPD Sections and Chapters of the CBC are beyond the scope of this supplement.

**2.1.2 DSA:**

The applicable DSA Sections and Chapters of the CBC are beyond the scope of this supplement.

**2.2 CRC:**

The Composite TotalJoist®, described in Sections 2.0 through 7.0 of the evaluation report ESR-3787, complies with CRC Chapter 3, provided the design and installation are in accordance with the 2021 *International Residential Code*® (IRC) provisions noted in the evaluation report.

This supplement expires concurrently with the evaluation report, reissued July 2024.