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ESR-3787

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This report is subject to renewal 07/2019.

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:

iSPAN SYSTEMS LP

EVALUATION SUBJECT:

COMPOSITE TOTALJOIST® BY iSPAN®



“2014 Recipient of Prestigious Western States Seismic Policy Council (WSSPC) Award in Excellence”



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DIVISION: 05 00 00—METALS

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COMPOSITE TOTALJOIST® BY iSPAN®

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015, 2012 and 2009 *International Building Code*®
- 2015, 2012 and 2009 *International Residential Code*®

Property evaluated:

- Structural

2.0 USES

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

3.0 DESCRIPTION

3.1 General:

The Composite TotalJoist® by iSPAN® floor system is comprised of cold-formed steel framing (TotalJoist®), cold-formed steel deck (Total-Lewis-Deck), 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, 1¹¹/₃₂ inch (34 mm) in diameter, are placed with the 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 Total-Lewis-Deck:

The Total-Lewis-Deck is a proprietary cold-formed steel deck placed on top of the Composite TotalJoist®. It has a minimum base metal thickness of 0.0231inch (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 Total-Lewis-Deck 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 Total-Lewis-Deck to the Composite TotalJoist® must be either No. 10—16-by-³/₄-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:

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 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, as specified in Section 3.5 above, are used to attach the Total-Lewis-Deck to the Composite TotalJoist®. The fasteners must be installed in accordance with the manufacturer's installation instructions and placed at a spacing not exceeding 7 inches (178 mm) o.c. as illustrated in Figure 3.

Concrete, as specified in Section 3.4 above, is placed on the Total-Lewis-Deck. See Table 2 for required thickness.

5.0 CONDITIONS OF USE

The Composite TotalJoist® by iSPAN® 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® is outside the scope of this report.

- 5.4 Composite TotalJoist® framing members must not be cut or notched, or have additional holes placed in them.
- 5.5 Composite TotalJoist® framing members are manufactured by iSPAN® Systems LP at their facility located in Princeton, Ontario, Canada, 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 Open Web Steel Joists Supporting Concrete Decks (AC343), dated February 2006, editorially revised October 2016.
- 6.2 Data in accordance with ICC-ES Acceptance Criteria for Cold-formed Steel Framing Members (AC46), dated June 2012, editorially revised April 2015.

7.0 IDENTIFICATION

- 7.1 At a spacing not exceeding 96 inches (2440 mm) on center, each TotalJoist® is stamped with the iSPAN® Systems name; the member designation as provided in Table 1; and the evaluation report number (ESR-3787).

The Total-Lewis-Deck is marked with the iSPAN® Systems LP name; the minimum base metal thickness (in inches or mils), the minimum specified yield strength (50 ksi [340 mPa]); and the evaluation report number (ESR-3787).

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

iSPAN® SYSTEMS LP
70 BRENTWOOD DRIVE
PRINCETON, ONTARIO N0J 1V0
CANADA
(519) 458-4222
www.iSPANsystems.com

TABLE 1— TOTALJOIST® MEMBERS

SECTION IDENTIFICATION	MEMBER DEPTH ¹ (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 ¹ / ₈ x 3 ¹ / ₂
10-ic-4	10.0	2.0	0.0750	0.0713	
12-ic-3	12.0	2.0	0.0600	0.0570	11 ⁷ / ₈ x 6 ¹ / ₆
12-ic-4	12.0	2.0	0.0750	0.0713	
14-ic-3	14.0	2.0	0.0600	0.0570	15 ¹ / ₂ 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 ⁷ / ₈ 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 ⁷ / ₈ x 10

For SI: 1 inch = 25.4 mm

¹Member depth is measured from outside face to outside face of flanges.

TABLE 2—COMPOSITE TOTALJOIST® BY ISPAN® DESIGN VALUES

SLAB DEPTH ¹ (in.)	JOIST DEPTH ² (in.)	SECTION IDENTIFICATION	24" O.C.			36" O.C.			48" O.C.		
			Weight ³ (psf)	I _{xc} ³ (in ⁴)	M _{rc} ⁴ (k-ft)	Weight ³ (psf)	I _{xc} ³ (in ⁴)	M _{rc} ⁴ (k-ft)	Weight ³ (psf)	I _{xc} ³ (in ⁴)	M _{rc} ⁴ (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/m², 1 in⁴ = 416,231 mm⁴, 1 k-ft = 1360 N-m

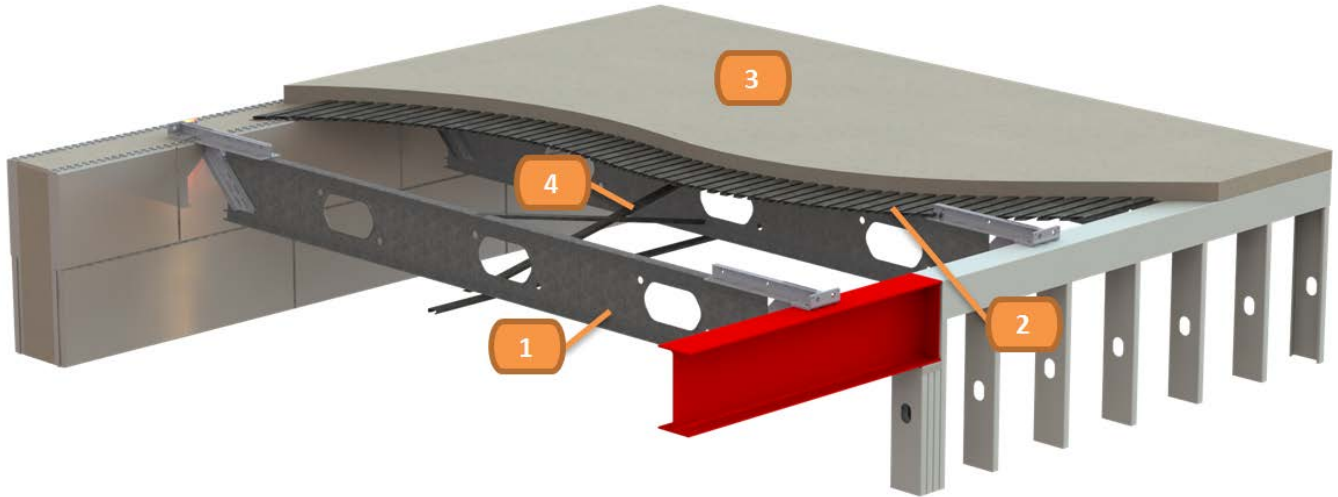
¹Slab Depth = Depth of the concrete slab measured from the bottom of the deck to the top of the slab.

²Joist Depth = Member depth is measured from outside face to outside face of flanges.

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

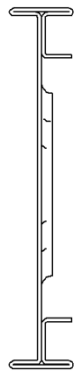
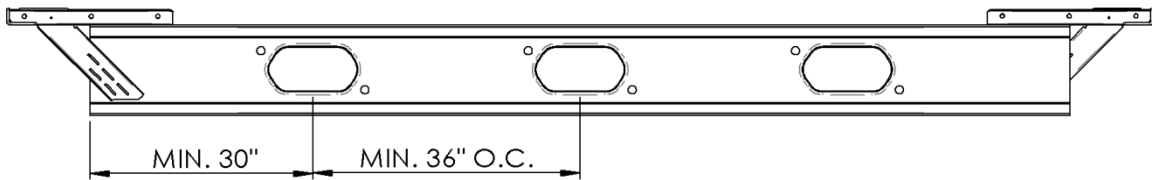
⁴I_{xc} = Equivalent steel moment of inertia about the x-axis for the composite cross-section.

⁵M_{rc} = Maximum available strength [factored resistance] positive moment for the composite cross-section. For allowable strength design (ASD) multiply by 0.665.



- 1) Composite TotalJoist®
- 2) Total-Lewis-Deck
- 3) Concrete Slab
- 4) TotalJoist® Bridging / Cross Bridging

FIGURE 1— COMPOSITE TOTALJOIST® BY iSPAN® FLOOR SYSTEM



Cross Section



Shoe

FIGURE 2— COMPOSITE TOTALJOIST®

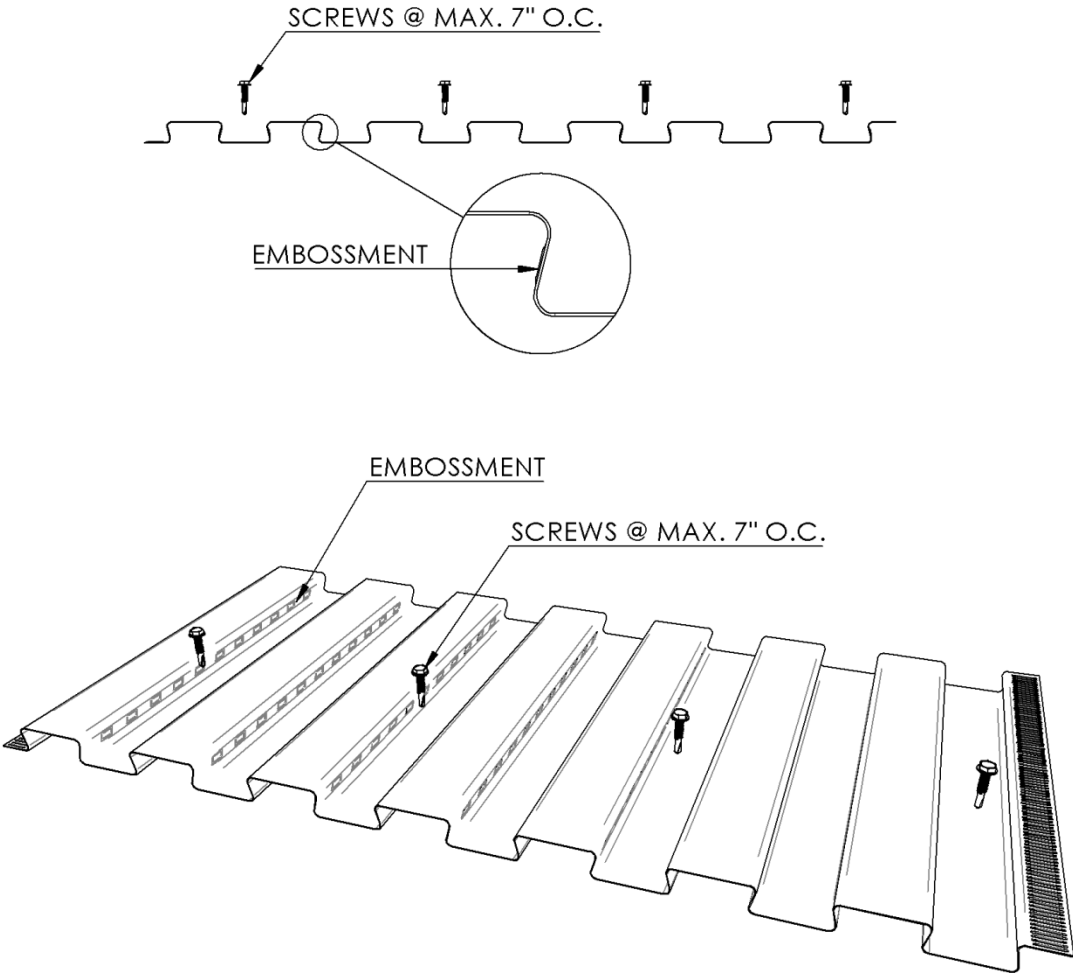


FIGURE 3—TOTAL-LEWIS-DECK