

# ICC-ES Evaluation Report

ESR-4313

Reissued May 2024


This report also contains:

Subject to renewal May 2026

- CBC Supplement
- FBC Supplement
- LABC Supplement

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<p><b>DIVISION: 05 00 00— METALS</b></p> <p><b>Section: 05 31 00— STEEL DECKING</b></p> <p><b>Section: 05 31 13— STEEL FLOOR DECKING</b></p>	<p><b>REPORT HOLDER: METAL TECH, INC.</b></p>	<p><b>EVALUATION SUBJECT: STEEL DECK PANELS</b></p>	
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## 1.0 EVALUATION SCOPE

**Compliance with the following codes:**

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

For evaluation for compliance with codes adopted by the [Los Angeles Department of Building and Safety \(LADBS\)](#), see [ESR-4313 LABC Supplement](#).

**Properties evaluated:**

- Structural

## 2.0 USES

Metal Tech, Inc. concrete filled steel decks are used as floors to support vertical gravity loads and as horizontal diaphragms to resist lateral loads due to wind and seismic forces.

## 3.0 DESCRIPTION

### 3.1 Steel Decks:

The steel deck panels are cold-formed from steel sheets complying with ASTM A653 SS Grade 50 and have a minimum G30 galvanized coating. For use with floor decks and composite action with concrete, the steel deck panels have Type 1 embossments complying with SDI C-2017. The steel deck panel properties are provided in [Table 1](#) and depictions of the steel deck panels are provided in [Figure 1](#).

### 3.2 Support and Sidelap (Seam) Connections:

Screws used to attach steel deck panels to structural steel supports and used to attach steel deck panel sidelaps together must be No. 12 self-drilling or self-piercing tapping screws complying with ASTM C1513. The screws must be long enough to penetrate through the connected steel deck panels and the supporting steel member with a minimum of three threads protruding past the back side of the supporting steel member.

### 3.3 Concrete Fill:

Concrete must be in accordance with the IBC and must have a minimum 28-day compressive strength of 3,000 psi (20.68 MPa). Lightweight concrete fill must be minimum 110 pcf (1762 kg/m<sup>3</sup>). Normalweight concrete fill must be 145 pcf (2323 kg/m<sup>3</sup>)

## 4.0 DESIGN VALUES

Allowable stress design values for use in the design to resist the loads prescribed in Chapter 16 of the IBC are provided in [Tables 1](#) through [6](#). For structural concrete-filled diaphragm shear strength, refer to AISI S310-20 Section D4.2. For lightweight insulating concrete-filled diaphragm shear strength, refer to AISI S310-20 Section D4.3.

## 5.0 CONDITIONS OF USE:

The Metal Tech, Inc. steel deck panels described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The steel deck panels must be installed in accordance with this report and Metal Tech, Inc. published installation guidelines and instructions. If there is a conflict between Metal Tech, Inc. published installation guidelines and instructions and this report, this report governs.
- 5.2 The minimum delivered thickness of the steel deck panel must be 95% of the design base metal thickness exclusive of all coatings.
- 5.3 Special inspection must comply with IBC Chapter 17.
- 5.4 Calculations and details demonstrating that the loads applied to the steel deck panels comply with this report must be submitted to the code official for approval. Calculations and drawings, must be prepared, signed and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.5 The minimum loads of IBC Section 1607 (including concentrated loads) in addition to the construction loads required by the reference in IBC Section 2210.1.1 must be considered by the registered design professional, as applicable.
- 5.6 Concrete-filled sections must not be used to support loads that are predominantly vibratory, such as those for operation of heavy machinery, reciprocating motors or moving loads.
- 5.7 The steel deck panels are manufactured in Menifee, California under an approved quality control program with annual inspections by ICC-ES.

## 6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with the [ICC-ES Acceptance Criteria for Steel Deck Roof and Floor Systems \(AC43\)](#), dated June 2022.

## 7.0 IDENTIFICATION

- 7.1 Each bundle of steel deck panels is marked with labels with Metal Tech, Inc., the minimum base-metal thickness (uncoated), minimum specified yield strength and the ICC-ES Report number ESR-4313.
- 7.2 The report holder's contact information is the following:

**METAL TECH, INC.**  
**27368 VIA INDUSTRIA**  
**SUITE 101**  
**TEMECULA, CALIFORNIA 92590**

TABLE 1—SECTION PROPERTIES OF THE STEEL DECK PANELS<sup>1</sup>

GAGE	DESIGN BASE METAL THICKNESS (inch)	F <sub>y</sub> (ksi)	WEIGHT (plf)	I <sub>p</sub> (in. <sup>4</sup> /ft.)	I <sub>n</sub> (in. <sup>4</sup> /ft.)	S <sub>p</sub> (in. <sup>3</sup> /ft.)	S <sub>n</sub> (in. <sup>3</sup> /ft.)	M <sub>n,p</sub> /Ω (lb.-in./ft.)	M <sub>n,n</sub> /Ω (lb.-in./ft.)	V <sub>n</sub> /Ω (lb./ft.)
22	0.0295	50	1.80	0.278	0.278	0.236	0.236	6975	6976	916
20	0.0358	50	2.10	0.354	0.354	0.312	0.312	9239	9240	1309
18	0.0474	50	2.70	0.486	0.486	0.442	0.442	13130	13132	1715
16	0.0598	50	3.30	0.627	0.628	0.587	0.587	17463	17466	2139

For SI: 1 in. = 25.4 mm; 1 ft. = 305 mm; 1 lb. = 4.45 N

1. Tabulated values based on AISI S100-16.

2. To convert from ASD to LRFD, multiply the allowable moment by 1.5 and multiply the allowable shear by 1.52.

Gage (design base metal thickness)

I<sub>p</sub> – Effective Positive Moment of Inertia

I<sub>n</sub> – Effective Negative Moment of Inertia

S<sub>p</sub> – Effective Positive Section Modulus

S<sub>n</sub> – Effective Negative Section Modulus

M<sub>n,p</sub>/Ω - ASD Allowable Positive Moment

M<sub>n,n</sub>/Ω - ASD Allowable Negative Moment

V<sub>n</sub>/Ω - ASD Allowable Shear

ASD – Allowable Strength Design

TABLE 2—ASD ALLOWABLE REACTIONS BASED ON WEB CRIPPLING OF THE STEEL DECK PANELS<sup>1,2,3,4,5</sup>

MINIMUM BEARING LENGTH AT SUPPORTS (inch)	22 GA				MINIMUM BEARING LENGTH AT SUPPORTS (inch)	20 GA			
	ONE-FLANGE LOADING		TWO-FLANGE LOADING			ONE-FLANGE LOADING		TWO-FLANGE LOADING	
	Interior Reaction	End Reaction	Interior Reaction	End Reaction		Interior Reaction	End Reaction	Interior Reaction	End Reaction
	R <sub>bi</sub> /Ω (lb./ft.)	R <sub>be</sub> /Ω (lb./ft.)	R <sub>bi</sub> /Ω (lb./ft.)	R <sub>be</sub> /Ω (lb./ft.)		R <sub>bi</sub> /Ω (lb./ft.)	R <sub>be</sub> /Ω (lb./ft.)	R <sub>bi</sub> /Ω (lb./ft.)	R <sub>be</sub> /Ω (lb./ft.)
2	582	391	686	365	2	844	560	1012	561
3	658	450	784	409	3	951	643	1151	625
4	722	500	867	446	4	1040	712	1268	680
5	779	544	939	478	5	1119	773	1371	728
MINIMUM BEARING LENGTH AT SUPPORTS (inch)	18 GA				MINIMUM BEARING LENGTH AT SUPPORTS (inch)	16 GA			
	ONE-FLANGE LOADING		TWO-FLANGE LOADING			ONE-FLANGE LOADING		TWO-FLANGE LOADING	
	Interior Reaction	End Reaction	Interior Reaction	End Reaction		Interior Reaction	End Reaction	Interior Reaction	End Reaction
	R <sub>bi</sub> /Ω (lb./ft.)	R <sub>be</sub> /Ω (lb./ft.)	R <sub>bi</sub> /Ω (lb./ft.)	R <sub>be</sub> /Ω (lb./ft.)		R <sub>bi</sub> /Ω (lb./ft.)	R <sub>be</sub> /Ω (lb./ft.)	R <sub>bi</sub> /Ω (lb./ft.)	R <sub>be</sub> /Ω (lb./ft.)
2	1443	941	1760	1029	2	2242	1443	2768	1681
3	1613	1072	1989	1139	3	2492	1635	3109	1850
4	1757	1183	2181	1232	4	2703	1797	3397	1993
5	1883	1280	2351	1314	5	2889	1939	3650	2118

For SI: 1 in. = 25.4 mm; 1 ft. = 305 mm; 1 lb. = 4.45 N

1. Tabulated values based on AISI S100-16.

2. R<sub>bi</sub>/Ω – ASD allowable web crippling reactions at interior supports.

3. R<sub>be</sub>/Ω – ASD allowable web crippling reactions at exterior supports.

4. Steel deck panels must be fasteners to structural steel supports. Support fasteners must be spaced less than or equal to 12 inches o.c.

5. As defined by AISI S100-16:

- One-flange loading or reaction is defined as the condition where the clear distance between the bearing edges of adjacent opposite concentrated loads or reactions is equal to or greater than 1.5h.
- Two-flange loading or reaction is defined as the condition where the clear distance between the bearing edges of adjacent opposite concentrated loads or reaction is less than 1.5h.
- End loading or reaction is defined as the condition where the distance from the edge of the bearing to the end of the member is equal to or less than 1.5h.
- Interior loading or reaction is defined as the condition where the distance from the edge of the bearing to the end of the member is greater than 1.5h.

TABLE 3—MAXIMUM UNSHORED CONSTRUCTION CLEAR SPANS

STEEL DECK PANEL GAGE	TOTAL SLAB THICKNESS (inch)	MAXIMUM CONSTRUCTION CLEAR SPANS <sup>1,2</sup>							
		CONCRETE TYPE (weight, psf)	Number of Spans	Span Length		CONCRETE TYPE (weight, psf)	Number of Spans	Span Length	
				feet	inch			feet	inch
22	4	NWC (36.3)	1	7	9	LWC (27.5)	1	8	6
			2	9	0		2	9	6
			3	9	3		3	9	9
	4 1/2	NWC (42.3)	1	7	5	LWC (32.1)	1	8	1
			2	8	6		2	9	3
			3	8	9		3	9	7
	5	NWC (48.3)	1	7	1	LWC (36.7)	1	7	9
			2	8	1		2	8	11
			3	8	4		3	9	2
	5 1/2	NWC (54.4)	1	6	9	LWC (41.3)	1	7	6
			2	7	9		2	8	7
			3	8	0		3	8	10
20	4	NWC (36.3)	1	9	3	LWC (27.5)	1	10	1
			2	10	3		2	10	10
			3	10	7		3	11	3
	4 1/2	NWC (42.3)	1	8	9	LWC (32.1)	1	9	7
			2	9	9		2	10	8
			3	10	1		3	11	1
	5	NWC (48.3)	1	8	5	LWC (36.7)	1	9	2
			2	9	4		2	10	2
			3	9	8		3	10	7
	5 1/2	NWC (54.4)	1	8	1	LWC (41.3)	1	8	10
			2	9	0		2	9	10
			3	9	3		3	10	2
18	4	NWC (36.3)	1	10	3	LWC (27.5)	1	11	2
			2	12	2		2	12	10
			3	12	7		3	13	3
	4 1/2	NWC (42.3)	1	9	9	LWC (32.1)	1	10	7
			2	11	7		2	12	7
			3	12	0		3	13	0
	5	NWC (48.3)	1	9	4	LWC (36.7)	1	10	2
			2	11	1		2	12	1
			3	11	5		3	12	6
	5 1/2	NWC (54.4)	1	9	0	LWC (41.3)	1	9	10
			2	10	7		2	11	8
			3	11	0		3	12	1
16	4	NWC (36.3)	1	11	1	LWC (27.5)	1	12	1
			2	14	0		2	14	9
			3	13	8		3	14	11
	4 1/2	NWC (42.3)	1	10	7	LWC (32.1)	1	11	6
			2	13	3		2	14	5
			3	13	1		3	14	3
	5	NWC (48.3)	1	10	2	LWC (36.7)	1	11	0
			2	12	8		2	13	11
			3	12	6		3	13	8
	5 1/2	NWC (54.4)	1	9	9	LWC (41.3)	1	10	8
			2	12	2		2	13	5
			3	12	1		3	13	2

For SI: 1 in. = 25.4 mm; 1 ft. = 305 mm

- The maximum construction clear spans are based on only the steel deck panel properties noted in [Table 1](#).
- The maximum construction clear spans are based on the construction loading diagrams in SDI C-2017 Appendix 1 Figures 1, 2, and 3 and the following:
  - The dead load of the steel deck panel and dead load of the concrete;
  - A concentrated construction live load of 150 lbs;
  - A uniform construction live load of 20 psf; and
  - The lesser of a deflection limit of L/180 of the span or 0.75 inch, whichever is the worst case.

**TABLE 4—ASD ALLOWABLE PUNCHING SHEAR RESISTANCE OF COMPOSITE STEEL FLOOR DECK SLABS (lbs)<sup>1,2</sup>**

STEEL DECK PANEL GAGE	MINIMUM BEARING AREA		TOTAL SLAB THICKNESS (inch)			
	WIDTH (inch)	LENGTH (inch)	4	4 ½	5	5 ½
22, 20, 18, and 16	2.5	4	6354	9037	12159	15720
	4	5	6627	9288	12351	15815
	2.5	6	7449	10407	13803	17637
	5	6	8325	11502	15117	19170
	4	4	7011	9859	13145	16870
	6	6	8764	12050	15774	19937

For SI: 1 in. = 25.4 mm; 1 ft. = 305 mm; 1 lb. = 4.45 N; 1 kip = 4.45 kN

1. Tabulated values based on SDI C-2017.
2. The concentrated load creating punching shear must be transferred through a steel base plate.

**TABLE 5—MOMENT OF INERTIA, MOMENT, AND SHEAR CAPACITIES OF COMPOSITE STEEL FLOOR DECK SLABS<sup>1,2</sup>**

STEEL DECK PANEL GAGE	CONCRETE TYPE	TOTAL SLAB THICKNESS (inch)	I <sub>d</sub> (in. <sup>4</sup> /ft.)	M/Ω (lb.*ft./ft.)	V <sub>n</sub> /Ω (lb./ft.)
22	LWC	4	2.61	1961	1990
		4 1/2	3.74	2358	2181
		5	5.17	2774	2382
		5 1/2	6.93	3205	2595
	NWC	4	3.40	2047	2374
		4 1/2	4.91	2456	2628
5		6.81	2883	2897	
20	LWC	4	2.81	2320	2347
		4 1/2	4.01	2793	2538
		5	5.53	3291	2740
		5 1/2	7.39	3806	2952
	NWC	4	3.63	2430	2731
		4 1/2	5.21	2920	2985
5		7.22	3431	3254	
18	LWC	4	3.13	2643	2716
		4 1/2	4.45	3555	2907
		5	6.11	4198	3109
		5 1/2	8.16	4866	3321
	NWC	4	4.00	2643	3098
		4 1/2	5.73	3737	3353
5		7.91	4401	3622	
16	LWC	4	3.42	2566	3101
		4 1/2	4.82	3027	3292
		5	6.61	5002	3494
		5 1/2	8.80	5804	3706
	NWC	4	4.33	2566	3483
		4 1/2	6.17	3027	3738
5		8.50	5264	4007	
		5 1/2	11.36	6092	4289

For SI: 1 in. = 25.4 mm; 1 ft. = 305 mm; 1 lb. = 4.45 N

M/Ω – ASD Flexural Resistance  
 V<sub>n</sub>/Ω – ASD Allowable One-way Shear Strength  
 I<sub>d</sub> – Moment of Inertia

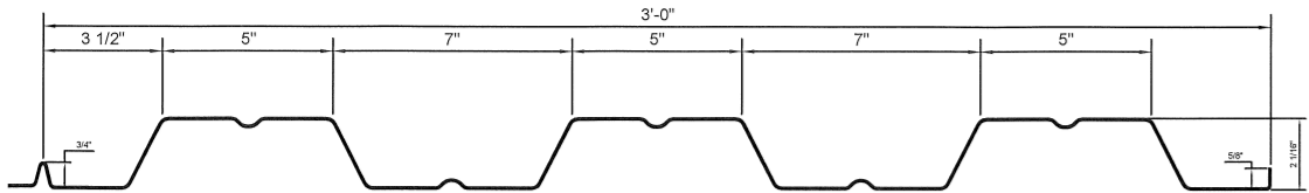
1. Tabulated values based on SDI C-2017 and Type 1 embossments.
2. Deflections resulting from concrete creep, where applicable, must be determined in accordance with SDI C-2017 Section 2.4.B.7.

**TABLE 6—ASD ALLOWABLE UNIFORM SUPERIMPOSED LIVE LOADS OF COMPOSITE STEEL FLOOR DECK SLAB (psf) <sup>1,2,3,4,5</sup>**

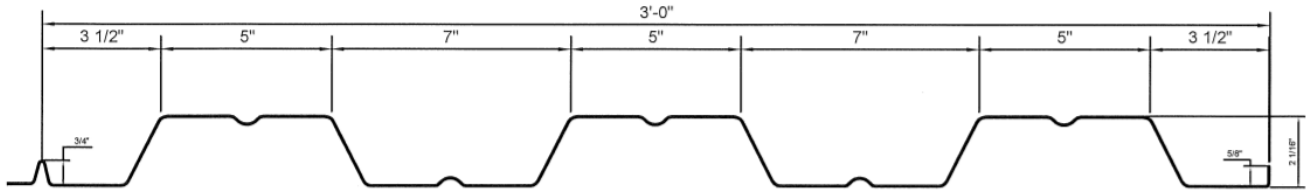
STEEL DECK PANEL GAGE	CONCRETE TYPE	TOTAL SLAB THICKNESS (inch)	CONCRETE WEIGHT (psf)	SPAN (feet – inch)					
				8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"
22	LWC	4	27.5	215	187	163	144	127	112
		4 1/2	32.1	239	223	198	174	154	136
		5	36.7	259	242	226	207	183	162
		5 1/2	41.3	281	262	245	230	212	189
	NWC	4	36.3	218	189	164	143	126	110
		4 1/2	42.3	263	228	198	174	152	134
5		48.3	310	269	235	205	181	159	
20	LWC	4	27.5	260	227	199	175	154	129
		4 1/2	32.1	283	264	241	213	189	168
		5	36.7	304	284	266	250	224	199
		5 1/2	41.3	326	304	285	267	252	232
	NWC	4	36.3	265	231	202	177	156	138
		4 1/2	42.3	321	279	244	214	189	167
5		48.3	356	330	289	254	224	199	
18	LWC	4	27.5	300	262	231	204	176	148
		4 1/2	32.1	329	307	288	271	250	218
		5	36.7	349	326	306	288	271	257
		5 1/2	41.3	371	347	325	306	288	272
	NWC	4	36.3	291	254	222	195	172	153
		4 1/2	42.3	374	350	324	286	254	226
5		48.3	400	375	351	330	301	268	
16	LWC	4	27.5	290	254	223	197	175	156
		4 1/2	32.1	344	300	264	234	207	185
		5	36.7	397	371	348	328	309	293
		5 1/2	41.3	400	391	367	346	326	308
	NWC	4	36.3	281	244	214	188	166	147
		4 1/2	42.3	333	290	253	223	197	174
5		48.3	400	400	394	370	349	330	
		5 1/2	54.4	400	400	400	394	371	351

For SI: 1 in. = 25.4 mm; 1 ft. = 305 mm; 1 lb. = 4.45 N

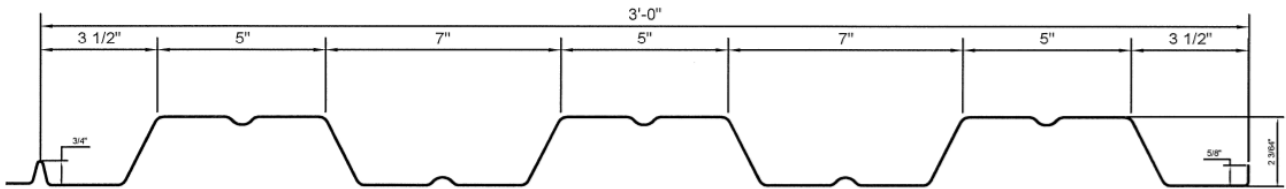
1. Tabulated values based on SDI C-2017.
2. Allowable Superimposed Uniform Live Loads of the composite steel floor deck-slab are based on:
  - a. The properties provided in [Table 5](#).
  - b. A total load deflection limit of L/240 (the dead load of the steel deck panel and concrete have been subtracted). Deflections resulting from concrete creep, where applicable, must be determined in accordance with SDI C-2017 Section 2.4.B.7.
  - c. A live load limit of 400 pif.
  - d. Simple spans between supports. If negative reinforcement is used such that continuity is established over supports, then the allowable loads may be determined in accordance with SDI C-2017 Section 2.4.B.12 (ACI 318).
3. Concrete and reinforcement must comply with SDI C-2017 Section 2.1.D.
4. Reinforcement for temperature and shrinkage must comply with SDI C-2017 Section 2.4.B.15.
5. Installation must comply with SDI C-2017 Section 3.0.



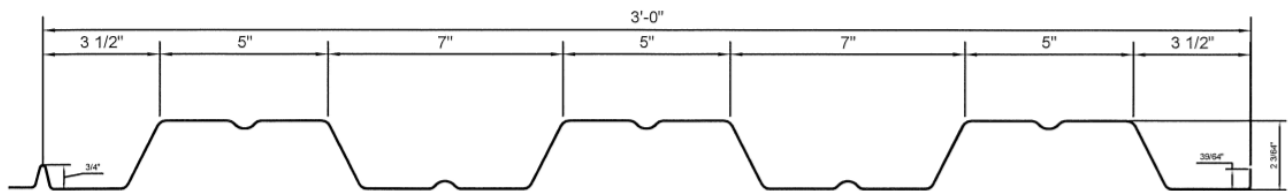
16 Ga. = .0598"



18 Ga. = .0474"



20 Ga. = .0358"



22 Ga. = .0295"

FIGURE 1—STEEL DECK PANELS

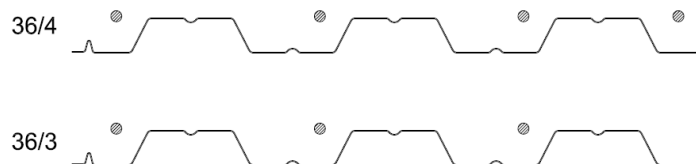


FIGURE 2—SUPPORT FASTENER PATTERN

**DIVISION: 05 00 00—METALS**  
**Section: 05 31 00—Steel Decking**  
**Section: 05 31 13—Steel Floor Decking**

**REPORT HOLDER:**

METAL TECH, INC.

**EVALUATION SUBJECT:**

STEEL DECK PANELS

**1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that the steel deck panels, described in ICC-ES evaluation report [ESR-4313](#), have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

**Applicable code edition:**2020 *City of Los Angeles Building Code* (LABC)**2.0 CONCLUSIONS**

The steel deck panels, described in Sections 2.0 through 7.0 of the evaluation report [ESR-4313](#), comply with the LABC Chapter 22, and are subjected to the conditions of use described in this supplement.

**3.0 CONDITIONS OF USE**

The steel deck panels described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report [ESR-4313](#).
- The design, installation, conditions of use and identification are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report [ESR-4313](#).
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.
- Diaphragm shear strength values in the evaluation report must not be increased for load combinations that include wind or seismic loads.
- For diaphragms that are used to provide wall anchorage, the adequacy of the steel deck panel end and side seam connections, shall be verified by a design professional to the satisfaction of the code official.
- When exposed to weather, the deck units shall be galvanized.

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



**DIVISION: 05 00 00—METALS**  
**Section: 05 31 00—Steel Decking**  
**Section: 05 31 13—Steel Floor Decking**

**REPORT HOLDER:**

METAL TECH, INC.

**EVALUATION SUBJECT:**

STEEL DECK PANELS

**1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that the steel deck panels, described in ICC-ES evaluation report ESR-4313, have also been evaluated for compliance with the code(s) noted below.

**Applicable code edition:**

- 2019 *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.

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

The steel deck panels, described in Sections 2.0 through 7.0 of the evaluation report ESR-4313, comply with CBC Chapter 22, provided the design and installation are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements of CBC Chapters 16, and 17, as applicable.

**2.1.1 OSHPD:**

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

**2.1.2 DSA:**

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

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

**DIVISION: 05 00 00—METALS**  
**Section: 05 31 00—Steel Decking**  
**Section: 05 31 13—Steel Floor Decking**

**REPORT HOLDER:**

METAL TECH, INC.

**EVALUATION SUBJECT:**

STEEL DECK PANELS

**1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that the steel deck panels, described in ICC-ES evaluation report ESR-4313, have also been evaluated for compliance with the code noted below.

**Applicable code edition:**2020 *Florida Building Code—Building***CONCLUSIONS**

The steel deck panels, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-4313, comply with the *Florida Building Code—Building*, provided the design requirements are determined in accordance with the *Florida Building Code—Building*. The installation requirements noted in ICC-ES evaluation report ESR-4313 for the 2018 *International Building Code*® meet the requirements of the *Florida Building Code—Building*.

Use of the steel deck panels has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* except that the 22 gage steel deck panels must have a minimum G90 galvanized coating in accordance with 2222.6.1 of the *Florida Building Code—Building*.

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with ICC-ES evaluation report ESR-4313, reissued May 2024.