ICC-ES Evaluation Report

ESR-5518

Issued *September 2024*

Subject to renewal September 2025

This report also contains:

- LABC and LARC Supplement

- CBC and CRC Supplement

- FBC Supplement

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DIVISION: 05 00 00 - METALS **Section: 05 40 00 – Cold-formed Metal Framing** **Section: 05 41 00 – Structural Metal Stud Framing** **Section: 05 42 00 – Cold-formed Metal Joist Framing**	**REPORT HOLDER:** **WORTHINGTON MODERN STEEL FRAMING MANUFACTURING CO., LTD**	**EVALUATION SUBJECT:** **COLD-FORMED STEEL FRAMING MEMBERS**	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2024, 2021 and 2018 *International Building Code*® (IBC)
- 2024, 2021 and 2018 *International Residential Code*® (IRC)

Property evaluated:

Structural

2.0 USES

The cold-formed steel framing members are used for framing of nonload-bearing interior walls, curtain walls, and load-bearing walls, floors and roofs.

3.0 DESCRIPTION

3.1 General:

The framing members are manufactured with and without web punch-outs from coils of light gage steel. When provided, punch-outs measuring up to 38 milimeters wide by 100 millimetres long (1.5 inches by 3.9 inches) are located along the centerline of the webs of the stud sections and have a minimum 610-millimeter (24 inches) clear distance between punch-outs. The minimum distance between the end of the stud and the near edge of the web punch-out is 254 millimetres (10 inches). See Table 1A, 1B, 2A and 2B, and Figure 1 for descriptions and section properties of the stud and track sections.

3.2 Material:

The framing members are cold-formed from steel coils complying with Chinese National Standard GB/T 2518-2008 Grade S350GD+Z with a Z275 (G90) galvanized coating. S350GD+Z steel has a minimum yield strength of 350 MPa (50.7 ksi), a minimum tensile strength of 420 MPa (60.9 ksi), and a minimum elongation of 16 percent.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The stud and track section properties listed in Tables 1B and 2B have been determined in accordance with the North American Specification for Design of Cold-formed Steel Structural Members (AISI S100).

4.2 Installation:

The framing members must be installed in accordance with the applicable code, the approved plans and this report. If there is a conflict between the plans submitted for approval and this report, this report governs. The approved plans must be available at the jobsite at all times during the installation.

5.0 CONDITIONS OF USE:

The Worthington Modern Steel Framing Manufacturing Company's cold-formed steel framing members 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 cold-formed steel framing members must be installed in accordance with the applicable code, the approved plans and this report.

5.2 Minimum uncoated base-metal thickness of the framing members as delivered to the jobsite must be at least 95 percent of the design base-metal thickness.

5.3 Complete plans and calculations verifying compliance with this report must be submitted to the code official for each project at the time of permit application. The calculations and drawings 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.

5.4 The cold-formed steel framing members are manufactured under an approved quality control program by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Cold-formed Steel Framing Members (AC46), dated October 2019 (editorially revised February 2024).

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-5518) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.

7.2 In addition, each framing member recognized in this report must have a legible label, stamp or embossment, at a maximum of 96 inches (2440 mm) on center; the minimum base-metal thickness (uncoated) in decimal thickness or mils; minimum yield strength; and the Z275 (G90) galvanization coating.

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

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worthington2022@163.com

TABLE 1A – STUD DIMENSIONS, WEIGHT AND AREA

MEMBER DESIGNATION	Fy	DESIGN BASE METAL THICKNESS	STUD DEPTH	FLANGE WIDTH		LIP LENGTH	INSIDE CORNER RADII
				TOP	BOTTOM		
09S41	344.75 MPa (50 ksi)	1.15 mm (0.0453 in.)	92 mm (3.622 in.)	41 mm (1.614 in.)	41 mm (1.614 in.)	11 mm (0.433 in.)	2.381 mm (0.0937 in.)
15S41	344.75 MPa (50 ksi)	1.15 mm (0.0453 in.)	152 mm (5.984 in.)	41 mm (1.614 in.)	41 mm (1.614 in.)	11 mm (0.433 in.)	2.381 mm (0.0937 in.)
15S41	344.75 MPa (50 ksi)	1.45 mm (0.0571 in.)	152 mm (5.984 in.)	41 mm (1.614 in.)	41 mm (1.614 in.)	11 mm (0.433 in.)	2.381 mm (0.0937 in.)
20S41	344.75 MPa (50 ksi)	1.75 mm (0.0689 in.)	203 mm (7.992 in.)	41 mm (1.614 in.)	41 mm (1.614 in.)	11 mm (0.433 in.)	2.381 mm (0.0937 in.)
25S41	344.75 MPa (50 ksi)	1.75 mm (0.0689 in.)	254 mm (10.000 in.)	41 mm (1.614 in.)	41 mm (1.614 in.)	11 mm (0.433 in.)	2.381 mm (0.0937 in.)
30S41	344.75 MPa (50 ksi)	1.75 mm (0.0689 in.)	305 mm (12.008 in.)	41 mm (1.614 in.)	41 mm (1.614 in.)	11 mm (0.433 in.)	2.381 mm (0.0937 in.)

TABLE 1B — STUD SECTION PROPERTIES[1,2,3]

MEMBER	F_y (ksi)	GROSS PROPERTIES							EFFECTIVE PROPERTIES					TORSIONAL PROPERTIES					L_u (in.)
		Area (in^2)	Weight (lb/ft)	I_x (in^4)	S_x (in^3)	r_x (in.)	I_y (in^4)	r_y (in.)	I_{xe} (in^4)	S_{xe} (in^3)	M_{al} (in-k)	M_{ad} (in-k)	V_{ay} (kip)	Jx1000 (in^4)	C_w (in^6)	x_o (in.)	r_o (in.)	ß	
09S41	50	0.332	1.131	0.691	0.381	1.443	0.117	0.593	0.643	0.339	10.155	9.680	2.158	0.2269	0.333	-1.239	1.992	0.613	32.8
15S41 (1.15mm thick)	50	0.439	1.496	2.247	0.751	2.262	0.136	0.557	2.107	0.678	20.326	16.851	1.447	0.3000	0.992	-1.012	2.540	0.841	32.1
15S41 (1.45mm thick)	50	0.550	1.875	2.798	0.935	2.255	0.167	0.551	2.722	0.895	26.797	23.248	2.913	0.5978	1.216	-1.000	2.528	0.843	31.9
20S41	50	0.798	2.721	6.737	1.686	2.905	0.211	0.514	6.386	1.522	45.596	41.233	3.796	1.2636	2.741	-0.858	3.072	0.922	30.9
25S41	50	0.936	3.193	11.749	2.349	3.541	0.221	0.487	10.694	1.968	58.950	51.353	3.008	1.4825	4.564	-0.761	3.655	0.956	30.0
30S41	50	1.075	3.664	18.651	3.106	4.165	0.229	0.462	16.249	2.414	72.286	60.113	2.491	1.7014	6.920	-0.684	4.246	0.974	29.2

For SI: 1 inch = 25.4 mm; 1 k = 1000 lb = 4.448 kN

[1]Properties are based on the full, unreduced cross-section away from any web punch-outs.
[2]Use the effective moment of inertia for deflection calculation.
[3]Allowable moment is lesser of M_{al} and M_{ad}. Distortional buckling is based on an assumed KΦ = 0.

SYMBOLS
I_x = Moment of inertia about x-axis
S_x = Section modulus about x-axis
r_x = Radius of gyration about x-axis
I_y = Moment of inertia about y-axis
r_y = Radius of gyration about y-axis
M_{al} = Allowable bending moment about x-axis based on local buckling
M_{ad} = Allowable moment about x-axis based on distortional buckling
V_{ay} = Allowable shear
J = St. Venant torsion constant
C_w = Torsional warping constant
x_o = Distance from shear center to the centroid along the principal X-axis
r_o = Polar radius of gyration about shear center
ß = Torsional flexural constant
L_u = Critical unbraced length for lateral-torsional buckling

TABLE 2A – TRACK DIMENSIONS, WEIGHT AND AREA

MEMBER DESIGNATION	Fy	DESIGN BASE METAL THICKNESS	STUD DEPTH	FLANGE WIDTH		INSIDE CORNER RADII
				TOP	BOTTOM	
09T45	344.75 MPa (50 ksi)	1.15 mm (0.0453 in.)	92 mm (3.622 in.)	41 mm (1.614 in.)	41 mm (1.614 in.)	2.381 mm (0.0937 in.)
15T45	344.75 MPa (50 ksi)	1.15 mm (0.0453 in.)	152 mm (5.984 in.)	41 mm (1.614 in.)	41 mm (1.614 in.)	2.381 mm (0.0937 in.)
15T45	344.75 MPa (50 ksi)	1.45 mm (0.0571 in.)	152 mm (5.984 in.)	41 mm (1.614 in.)	41 mm (1.614 in.)	2.381 mm (0.0937 in.)
20T45	344.75 MPa (50 ksi)	1.75 mm (0.0689 in.)	203 mm (7.992 in.)	41 mm (1.614 in.)	41 mm (1.614 in.)	2.381 mm (0.0937 in.)
25T45	344.75 MPa (50 ksi)	1.75 mm (0.0689 in.)	254 mm (10.000 in.)	41 mm (1.614 in.)	41 mm (1.614 in.)	2.381 mm (0.0937 in.)
30T45	344.75 MPa (50 ksi)	1.75 mm (0.0689 in.)	305 mm (12.008 in.)	41 mm (1.614 in.)	41 mm (1.614 in.)	2.381 mm (0.0937 in.)

TABLE 2B — TRACK SECTION PROPERTIES[1,2]

MEMBER	F_y (ksi)	GROSS PROPERTIES							EFFECTIVE PROPERTIES				TORSIONAL PROPERTIES				
		Area (in^2)	Weight (lb/ft)	I_x (in^4)	S_x (in^3)	r_x (in.)	I_y (in^4)	r_y (in.)	I_{xe} (in^4)	S_{xe} (in^3)	M_{al} (in-k)	V_{ay} (kip)	Jx1000 (in^4)	C_w (in^6)	x_o (in.)	r_o (in.)	ß
09T45	50	0.315	1.076	0.664	0.366	1.451	0.100	0.565	0.493	0.233	6.995	2.158	0.2158	0.227	-1.091	1.901	0.670
15T45 (1.15mm thick)	50	0.422	1.440	2.147	0.717	2.254	0.116	0.524	1.600	0.460	13.782	1.447	0.2889	0.742	-0.886	2.478	0.872
15T45 (1.45mm thick)	50	0.531	1.811	2.685	0.897	2.248	0.144	0.522	2.212	0.672	20.119	2.913	0.5772	0.922	-0.883	2.471	0.872
20T45	50	0.777	2.650	6.494	1.625	2.890	0.185	0.488	5.279	1.167	34.967	3.796	1.2305	2.168	-0.761	3.028	0.936
25T45	50	0.916	3.121	11.341	2.268	3.519	0.193	0.460	8.832	1.514	45.348	3.008	1.4494	3.657	-0.672	3.612	0.965
30T45	50	1.054	3.593	18.036	3.004	4.136	0.199	0.435	13.402	1.861	55.727	2.491	1.6683	5.581	-0.602	4.202	0.979

For SI: 1 inch = 25.4 mm; 1 k = 1000 lb = 4.448 kN

[1]Properties are based on the full, unreduced cross-section away from any web punch-outs.
[2]Use the effective moment of inertia for deflection calculation.

SYMBOLS

I_x = Moment of inertia about x-axis
S_x = Section modulus about x-axis
r_x = Radius of gyration about x-axis
I_y = Moment of inertia about y-axis
r_y = Radius of gyration about y-axis
M_{al} = Allowable bending moment about x-axis based on local buckling
V_{ay} = Allowable shear
J = St. Venant torsion constant
C_w = Torsional warping constant
x_o = Distance from shear center to the centroid along the principal X-axis
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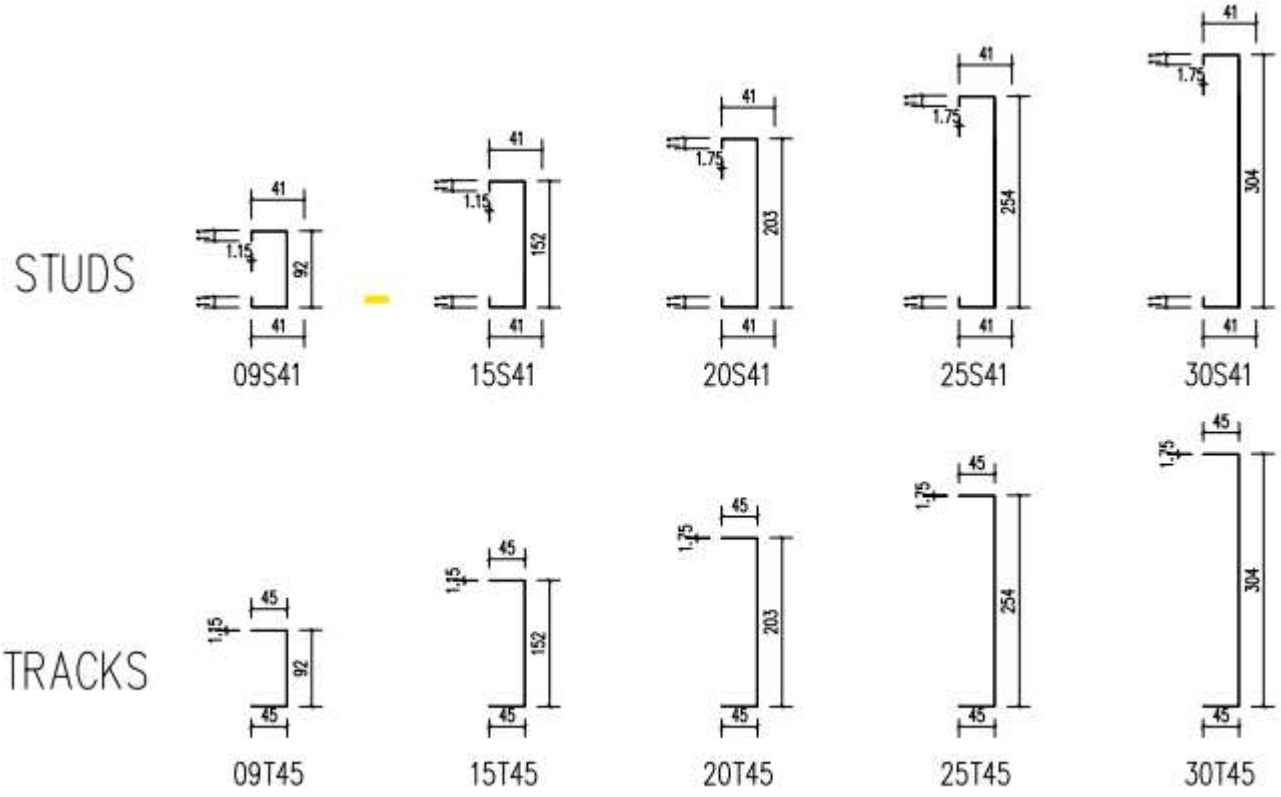

FIGURE 1 – STUD AND TRACK PR

DIVISION: 05 00 00—METALS
Section: 05 40 00—Cold-formed Metal Framing
Section: 05 41 00—Structural Metal Stud Framing
Section: 05 42 00—Cold-formed Metal Joist Framing

REPORT HOLDER:

WORTHINGTON MODERN STEEL FRAMING MANUFACTURING CO., LTD

EVALUATION SUBJECT:

COLD-FORMED STEEL FRAMING MEMBERS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Cold-Formed Steel Framing Members, described in ICC-ES evaluation report ESR-5518, 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 editions:

- 2023 *City of Los Angeles Building Code* (LABC)
- 2023 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The Cold-Formed Steel Framing Members, described in Sections 2.0 through 7.0 of the evaluation report ESR-5518, comply with the LABC Chapter 22, and the LARC, and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Cold-Formed Steel Framing Members described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-5518.
- The design, installation, conditions of use and identification of the Cold-Formed Steel Framing Members are in accordance with the 2021 *International Building Code*® (IBC) and 2021 *International Residential Code*® (IRC) provisions, as applicable, noted in the evaluation report ESR-5518.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16, 17 and 22, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

This supplement expires concurrently with the evaluation report, issued September 2024.

DIVISION: 05 00 00—METALS
Section: 05 40 00—Cold-formed Metal Framing
Section: 05 41 00—Structural Metal Stud Framing
Section: 05 42 00—Cold-formed Metal Joist Framing

REPORT HOLDER:

WORTHINGTON MODERN STEEL FRAMING MANUFACTURING CO., LTD

EVALUATION SUBJECT:

COLD-FORMED STEEL FRAMING MEMBERS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Cold-Formed Steel Framing Members, described in ICC-ES evaluation report ESR-5518, have also been evaluated for compliance with the codes noted below.

Applicable code edition*(s)*:

- *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 Cold-Formed Steel Framing Members, described in Sections 2.0 through 7.0 of the evaluation report ESR-5518, comply 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 Cold-Formed Steel Framing Members, described in Sections 2.0 through 7.0 of the evaluation report ESR-5518, comply with CRC Chapters 5, 6 and 8, provided the design and installation are in accordance with the 2021 *International Residential Code*® (IRC) provisions, as applicable.

This supplement expires concurrently with the evaluation report, issued September 2024.

DIVISION: 05 00 00—METALS
Section: 05 40 00—Cold-formed Metal Framing
Section: 05 41 00—Structural Metal Stud Framing
Section: 05 42 00—Cold-formed Metal Joist Framing

REPORT HOLDER:

WORTHINGTON MODERN STEEL FRAMING MANUFACTURING CO., LTD

EVALUATION SUBJECT:

COLD-FORMED STEEL FRAMING

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Cold-Formed Steel Framing, described in ICC-ES evaluation report ESR-5518, has also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2023 *Florida Building Code—Building*
- 2023 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Cold-Formed Steel Framing, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-5518, complies with the 2023 Florida Building Code—Building and the 2023 Florida Building Code—Residential. The design requirements must be determined in accordance with *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable. The installation requirements noted in ICC-ES evaluation report ESR-5518 for the 2021 *International Building Code*® meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable.

Use of the Cold-Formed Steel Framing has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *Florida Building Code—Residential* with the following condition:

1. Protection of metal must be in accordance with *Florida Building Code-Building* Section 2222.6.

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 the evaluation report, issued September 2024.