ICC-ES Evaluation Report

ESR-2093

Reissued August 2023

Revised June 2024

Subject to renewal August 2025

This report also contains:

- CBC Supplement

- FBC Supplement

- SBC Supplement

See *ESR-2093-AU* for Australian Codes

See *ESR-2093-NZ* for New Zealand Codes

ICC-ES Evaluation Reports are not to be construed as representing aesthetics or any other attributes not specifically addressed, nor are they to be construed as an endorsement of the subject of the report or a recommendation for its use. There is no warranty by ICC Evaluation Service, LLC, express or implied, as to any finding or other matter in this report, or as to any product covered by the report.

DIVISION: 05 00 000—METALS **Section: 05 40 00—Cold-Formed Metal Framing** **Section: 05 41 00—Structural Metal Stud Framing** **Section: Cold-Formed Metal Joist Framing** **Section: 05 44 00—Cold-Formed Metal Trusses**	**REPORT HOLDER:** **SCOTTSDALE CONSTRUCTION SYSTEMS** **ADDITIONAL LISTEE:** **DVELE OMEGA**	**EVALUATION SUBJECT:** **COLD-FORMED STEEL FRAMING MEMBERS**	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021, 2018, and 2015 *International Building Code* (IBC)
- 2021, 2018, and 2015 *International Residential Code* (IRC)
- 2013 *Abu Dhabi International Building Code* (ADIBC) †

†The ADIBC is based on the 2009 IBC as referenced under the ADIBC.

Property evaluated:

- Structural

2.0 USES

The cold-formed steel framing members are used for top and bottom chords of trusses in load-bearing roofs and floors.

3.0 DESCRIPTION

3.1 General:

Member designations are provided in Table 1. Also, see Figure 1.

3.2 Material:

The framing members are cold-rolled from steel coils complying with ASTM A 1003 Structural Grade 50, Type H (ST50H), or ASTM A 653 SS Grade 50 Class 1, or ASTM A 1039 SS Grade 70. The members have minimum G60 coating.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The values in Tables 2 and 3 have been determined in accordance with the North American Specification for Design of Cold-formed Steel Structural Members (AISI S100) based on lateral force resistance design (LRFD) method.

Truss design, assembly, and installation must comply with the provisions of North American Standard for Cold-Formed Steel Framing – Truss Design (AISI S214).

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 cold-formed steel 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 Recognition of complete cold-formed steel truss assemblies is outside the scope of this report. The design, quality assurance, installation, and testing of the cold-formed steel trusses must comply with AISI S214, and are subject to approval by the code official.

5.5 The framing members are manufactured under quality control programs with inspections 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 December 2020).

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-2093) along with the name, registered trademark, or registered logo of the report holder or listee must be included in the product label.

7.2 In addition, each member must have a legible label, stamp or embossment, at a maximum of 96 inches (2440 mm) on center; member designation; minimum base-metal thickness (uncoated) in decimal thickness or mils; the minimum yield strength; and the protective coating designation (minimum G60).

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

SCOTTSDALE CONSTRUCTION SYSTEMS
P.O. BOX 520981
SALT LAKE CITY, UT 84152, USA
1 (888) 406-2080

UNIT 4/5 HENRY ST.
LOGANHOLME, QLD 4129
AUSTRALIA

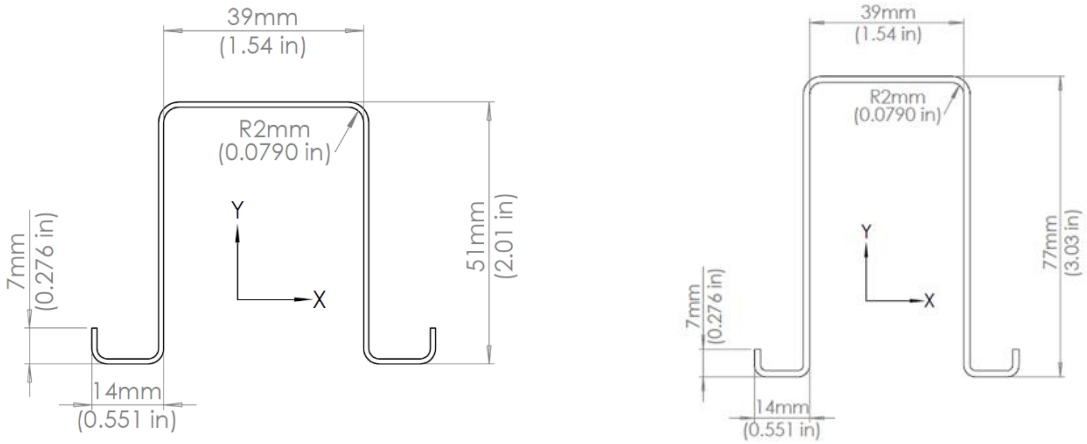
17 CADBURY ROAD, ONEKAWA
NAPIER 4110
NEW ZEALAND
+64 21 512895
www.scottsdalesteelframes.com
sales@scottsdalesteelframes.com

7.4 The additional listee contact information is the following:

DVELE OMEGA CORPORATION
5580 LA JOLLA BLVD. SUITE 7
LA JOLLA, CA 92037, USA
(909) 796-2561
www.dvele.com
info@dvele.com

Definitions for Tables 1 and 2

A_e	Effective area for compression based on local buckling at stress = Fy
ϕP_{no}	Axial strength (factored resistance) for fully braced member at stress = Fy
ϕP_{nd}	Axial strength (factored resistance) for distortional buckling with $k_\phi = 0$
ϕT_n	Tensile strength (factored resistance)
I_{ye}	Effective moment of inertia about the Y-Y axis at yield
S_{ye}	Effective section modulus about the Y-Y axis at yield
ϕM_{nyo}	Flexural strength (factored resistance) about the Y-Y axis at yield.
$+I_{xe+}$	Effective moment of inertia about the X-X axis, for positive bending (top flange in compression), at yield.
$+S_{xe}$	Effective section modulus about the X-X axis, for positive bending (top flange in compression), at yield.
$+\phi M_{nxo}$	Flexural strength (factored resistance) about the X-X axis, for positive bending (top flange in compression), at yield.
$-I_{xe}$	Effective moment of inertia about the X-X axis, for negative bending (bottom flanges in compression), at yield.
$-S_{xe}$	Effective section modulus about the X-X axis, for negative bending (bottom flanges in compression), at yield.
$-\phi M_{nxo}$	Flexural strength (factored resistance) about the X-X axis, for negative bending (bottom flanges in compression), at yield.
$-\phi M_{nd}$	Flexural strength (factored resistance) for distortional buckling about the negative X-X axis, (bottom flanges in compression).



CSTRUSS 2.0 **3.0**

FIGURE 1—HAT SECTIONS

TABLE 1—MEMBER DESIGNATION

Member Designation	Gauge	Mils	Thickness (inches)	Web (inches)	Flange (inches)
51H39-048 (20TC18)	25	18	0.0188	2.01	1.54
51H39-056 (20TC21)	24	21	0.0219	2.01	1.54
51H39-072 (20TC27)	22	27	0.0283	2.01	1.54
51H39-088 (20TC33)	20	33	0.0346	2.01	1.54
51H39-114 (20TC43)	18	43	0.0451	2.01	1.54
77H39-072 (30TC27)	22	27	0.0283	3.03	1.54
77H39-088 (30TC33)	20	33	0.0346	3.03	1.54
77H39-114 (30TC43)	18	43	0.0451	3.03	1.54
77H39-144 (30TC54)	16	54	0.0566	3.03	1.54

Note: The parenthetical designation indicates the equivalent label for the shape used in the U.S. market.

TABLE 2—GROSS AND TORSIONAL PROPERTIES

Member Designation	Design Steel Thickness (in.)	Gross Properties						Torsional Properties			
		Weight	Area	I_x	R_x	I_y	R_y	Y_o	Jx1000	C_w	R_o
		(lb/ft)	(in^2)	(in^4)	(in)	(in^4)	(in)	(in)	(in^4)	(in^6)	(in)
51H39-048	0.0188	0.4425	0.1301	0.0766	0.7676	0.0865	0.8153	1.7507	0.0154	0.0276	2.0782
51H39-056	0.0219	0.5130	0.1508	0.0885	0.7663	0.1002	0.8153	1.7497	0.0241	0.0318	2.0769
51H39-072	0.0283	0.6602	0.1940	0.1131	0.7634	0.1290	0.8153	1.7476	0.0518	0.0403	2.0740
51H39-088	0.0346	0.8036	0.2361	0.1366	0.7606	0.1570	0.8153	1.7452	0.0944	0.0484	2.0710
51H39-114	0.0451	1.0369	0.3047	0.1741	0.7558	0.2026	0.8153	1.7408	0.2061	0.0611	2.0655
77H39-072	0.0283	0.8575	0.2520	0.3067	1.1031	0.1644	0.8077	2.7419	0.0673	0.1194	3.0639
77H39-088	0.0346	1.0448	0.3070	0.3716	1.1001	0.2007	0.8084	2.7405	0.1227	0.1442	3.0617
77H39-114	0.0451	1.3508	0.3970	0.4760	1.0950	0.2602	0.8096	2.7375	0.2685	0.1839	3.0575
77H39-144	0.0566	1.6861	0.4955	0.5879	1.0893	0.3258	0.8109	2.7332	0.5297	0.2264	3.0520

TABLE 3—EFFECTIVE PROPERTIES AND STRENGTH DESIGN VALUES

Member Designation	Design Steel Thickness (in)	Fy (ksi)	Axial				Y-Y Axis Bending			Positive X-X Bending			Negative X-X Bending			
			A_e	ϕP_{no}	ϕP_{nd}	ϕT_n	I_{ye}	S_{ye}	ϕM_{nyo}	$+I_{xe+}$	$+S_{xe}$	$+\phi M_{nxo}$	$-I_{xe}$	$-S_{xe}$	$-\phi M_{nxo}$	$-\phi M_{nd}$
			(in^2)	(lb)	(lb)	(lb)	(in^4)	(in^3)	(in-k)	(in^4)	(in^3)	(in-k)	(in^4)	(in^3)	(in-k)	(in-k)
51H39-048	0.0188	50	0.0790	3357	3487	5852	0.0753	0.0527	2.3723	0.0642	0.0591	2.6594	0.0764	0.0749	3.3698	2.2136
51H39-048	0.0188	70	0.0714	4251	4167	7803	0.0721	0.0495	3.1182	0.0620	0.0561	3.5366	0.0752	0.0729	4.5945	2.7049
51H39-056	0.0219	50	0.0989	4203	4318	6785	0.0895	0.0635	2.8578	0.0767	0.0718	3.2308	0.0885	0.0867	3.9027	2.7130
51H39-056	0.0219	70	0.0907	5396	5187	9046	0.0869	0.0607	3.8258	0.0739	0.0680	4.2862	0.0881	0.0860	5.4203	3.3255
51H39-072	0.0283	50	0.1449	5796	6180	8731	0.1204	0.0875	3.5011	0.1037	0.1003	4.5145	0.1131	0.1104	4.4145	3.8195
51H39-072	0.0283	70	0.1333	7465	7501	11642	0.1170	0.0837	4.6875	0.0999	0.0949	5.9768	0.1131	0.1104	6.1803	4.7119
51H39-088	0.0346	50	0.1952	8296	8115	10627	0.1515	0.1124	5.0580	0.1307	0.1300	5.8522	0.1367	0.1328	5.9776	4.9589
51H39-088	0.0346	70	0.1798	10067	9949	14169	0.1474	0.1076	6.0242	0.1262	0.1231	7.7559	0.1367	0.1328	7.4387	6.1546
51H39-114	0.0451	50	0.2848	12106	11426	13713	0.2026	0.1536	6.9139	0.1742	0.1791	7.5720	0.1742	0.1683	7.5720	6.8946
51H39-114	0.0451	70	0.2646	15746	14240	18283	0.1987	0.1488	9.3744	0.1705	0.1730	10.506	0.1742	0.1683	10.6008	8.6420
77H39-072	0.0283	50	0.1492	5969	5517	11340	0.1360	0.0930	3.7198	0.2847	0.1832	8.2450	0.3000	0.1907	7.6264	5.2223
77H39-072	0.0283	70	0.1364	7638	6518	15120	0.1311	0.0881	4.9321	0.2762	0.1752	11.0366	0.2948	0.1839	10.3006	6.3486
77H39-088	0.0346	50	0.2032	8636	7491	13817	0.1738	0.1215	5.4659	0.3576	0.2350	10.5765	0.3704	0.2395	10.7780	6.8776
77H39-088	0.0346	70	0.1855	10386	8900	18423	0.1672	0.1147	6.4236	0.3472	0.2248	14.1605	0.3648	0.2320	12.9927	8.3912
77H39-114	0.0451	50	0.3028	12868	11115	17863	0.2391	0.1725	7.7630	0.4761	0.3210	13.8371	0.4761	0.3075	13.8371	9.7884
77H39-114	0.0451	70	0.2774	16508	13327	23817	0.2302	0.1627	10.2527	0.4665	0.3111	19.1871	0.4761	0.3075	19.3720	12.0105
77H39-144	0.0566	50	0.4173	17736	15562	22298	0.3145	0.2333	10.4998	0.5882	0.3989	17.0021	0.5882	0.3778	17.0021	13.1994
77H39-144	0.0566	70	0.3891	23151	18857	29731	0.3036	0.2207	13.9067	0.5882	0.3989	23.8030	0.5882	0.3778	23.8030	16.2945

[1]Axial properties A_e and ϕP_{no} are based on local buckling of member at F_y, fully braced against global buckling.
[2] ϕP_{nd} is based on $K\phi$= 0 and no discrete bracing against distortional buckling
[3]All local buckling allowable moments, ϕM_{nyo}, ϕM_{nxo}+ are based on members fully braced against flexural and torsional-flexural buckling.
[4]Allowable distortional buckling moment, ϕM_{nd} is based on $K\phi$ = 0 and no discrete bracing against distortional buckling.
[5]Y-Y axis is symmetric for bending. Properties for "positive" or "negative" bending are identical.
[6]Positive X-X Bending is for the top flange in compression.
[7]Negative X-X Bending is for the bottom flanges in compression.
[8] Available ASD strengths may be determined by dividing the tabulated LRFD values by 1.5.

ICC-ES Evaluation Report

ESR-2093 CBC and CRC Supplement

Issued August 2023
Revised June 2024
This report is subject to renewal August 2025.

www.icc-es.org | (800) 423-6587 | (562) 699-0543 *A Subsidiary of the International Code Council®*

DIVISION: 05 00 000—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
Section: 05 44 00—Cold-Formed Metal Trusses

REPORT HOLDER:

SCOTTSDALE CONSTRUCTION SYSTEMS

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-2093, have 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 cold-formed steel framing members, described in Sections 2.0 through 7.0 of the evaluation report ESR-2093, 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-2093, provided the design and installation are in accordance with the 2021 *International Residential Code*® (IRC) provisions, as applicable, noted in the evaluation report.

This supplement expires concurrently with the evaluation report, reissued August 2023 and revised June 2024.

ICC-ES Evaluation Report

ESR-2093 FBC Supplement

Issued August 2023
Revised June 2024
This report is subject to renewal August 2025.

www.icc-es.org | (800) 423-6587 | (562) 699-0543 *A Subsidiary of the International Code Council®*

DIVISION: 05 00 000—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
Section: 05 44 00—Cold-Formed Metal Trusses

REPORT HOLDER:

SCOTTSDALE CONSTRUCTION SYSTEMS

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 the cold-formed steel framing members, described in ICC-ES evaluation report ESR-2093, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2023 and 2020 *Florida Building Code—Building*
- 2023 and 2020 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The cold-formed steel framing members, described in Sections 2.0 through 7.0 of the ICC-ES evaluation report ESR-2093, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential.* The design requirements must be determined in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable. The installation requirements noted in ICC-ES evaluation report ESR-2093 for the 2021 and 2018 *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 members 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 exception:

1. Cold-formed steel framing members are limited to 20 ga and thicker unless protection of metal is provided in accordance with the *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, reissued August 2023 and revised June 2024.

ICC-ES Evaluation Report

ESR-2093 SBC Supplement

Issued September 2023
Revised June 2024
This report is subject to renewal August 2025.

www.icc-es.org | (800) 423-6587 | (562) 699-0543 *A Subsidiary of the International Code Council®*

DIVISION: 05 00 000—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
Section: 05 44 00—Cold-Formed Metal Trusses

REPORT HOLDER:

SCOTTSDALE CONSTRUCTION SYSTEMS

EVALUATION SUBJECT:

COLD-FORMED STEEL FRAMING MEMBERS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to provide evidence of suitability that the cold-formed steel framing members, described in ICC-ES evaluation report ESR-2093, have also been evaluated for compliance with the code noted below.

Applicable code edition:

- 2018 *Saudi Building Code-General* – SBC 201-CR

2.0 CONCLUSIONS

The cold-formed steel framing members, described in Sections 2.0 through 7.0 of the evaluation report ESR-2093, complies with the *2018 SBC 201*-CR provisions.

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-2093.
- The design, installation, conditions of use and identification of the anchors are in accordance with the evaluation report ESR-2093.
- Tables 1, 2 and 3 of ESR-2093 are replaced with Table 1 (SBC), Table 2 (SBC) and Table 3 (SBC) of this supplement.

This supplement expires concurrently with the evaluation report, reissued August 2023 and revised June 2024.

TABLE 1 (SBC) —MEMBER DESIGNATION

Member Designation	Thickness (mm)	Web (mm)	Flange (mm)
51H39-048	0.479	51	39
51H39-056	0.556	51	39
51H39-072	0.719	51	39
51H39-088	0.880	51	39
51H39-114	1.140	51	39
77H39-072	0.719	77	39
77H39-088	0.880	77	39
77H39-114	1.140	77	39
77H39-144	1.440	77	39

For Imperial Units: 1 m = 39.4 in

TABLE 2 (SBC)—GROSS AND TORSIONAL PROPERTIES

Member Designation	**Design Steel Thickness (mm)**	**Gross Properties**						**Torsional Properties**			
		Weight	**Area**	**I_x**	**R_x**	**I_y**	**R_y**	**Y_o**	**J**	**C_w**	**R_o**
		(kg/m)	**(mm^2)**	**(mm^4)**	**(mm)**	**(mm^4)**	**(mm)**	**(mm)**	**(mm^4)**	**(mm^6)**	**(mm)**
51H39-048	0.479	0.659	83.905	31899	19.498	36004	20.709	44.468	6.41	7424916	52.787
51H39-056	0.556	0.764	97.272	36850	19.464	41706	20.709	44.444	10.03	8545789	52.753
51H39-072	0.719	0.983	125.17	47068	19.391	53694	20.709	44.388	21.58	10834850	52.680
51H39-088	0.880	1.196	152.35	56860	19.319	65348	20.709	44.328	39.29	13000140	52.603
51H39-114	1.140	1.543	196.59	72458	19.198	84328	20.709	44.216	85.80	16399581	52.464
77H39-072	0.719	1.276	162.57	12763	28.019	68428	20.517	69.645	28.03	32074848	77.824
77H39-088	0.880	1.555	198.09	15466	27.942	83538	20.534	69.609	51.09	38734406	77.768
77H39-114	1.140	2.010	256.10	19811	27.813	10830	20.563	69.533	111.77	49391354	77.661
77H39-144	1.440	2.510	319.68	24471	27.668	13560	20.597	69.424	220.46	60803874	77.520

For Imperial Units: 1 m = 39.4 in; 1 kg/m = 0.672 lb/ft

TABLE 3 (SBC)—EFFECTIVE PROPERTIES AND STRENGTH DESIGN VALUES

Member Designation	Design Steel Thickness (mm)	Fy (MPa)	Axial				Y-Y Axis Bending			Positive X-X Bending			Negative X-X Bending			
			A_e	ϕP_{no}	ϕP_{nd}	ϕT_n	I_{ye}	S_{ye}	ϕM_{nyo}	$+I_{xe+}$	$+S_{xe}$	$+\phi M_{nxo}$	$-I_{xe}$	$-S_{xe}$	$-\phi M_{nxo}$	$-\phi M_{nd}$
			(mm^2)	(N)	(N)	(N)	(mm^4)	(mm^3)	(kNm)	(mm^4)	(mm^3)	(kNm)	(mm^4)	(mm^3)	(kNm)	(kNm)
51H39-048	0.479	344.74	50.96	14933	15509	26033	31356	864	0.268	26725	968	0.301	31815	1227	0.381	0.250
51H39-048	0.479	482.63	46.09	18907	18535	36446	30026	811	0.352	25795	920	0.400	31281	1195	0.519	0.306
51H39-056	0.556	344.74	63.80	18694	19207	30180	37270	1041	0.323	31907	1177	0.365	36855	1421	0.441	0.307
51H39-056	0.556	482.63	58.51	24004	23071	42252	36190	995	0.432	30764	1115	0.484	36668	1410	0.612	0.376
51H39-072	0.719	344.74	93.49	25783	27490	38838	50113	1434	0.396	43146	1644	0.510	47079	1809	0.499	0.432
51H39-072	0.719	482.63	86.00	33206	33365	54374	48703	1372	0.530	41587	1555	0.675	47079	1809	0.698	0.532
51H39-088	0.880	344.74	125.94	36903	36099	47270	63080	1842	0.572	54413	2131	0.661	56880	2177	0.675	0.560
51H39-088	0.880	482.63	115.98	44780	44256	66177	61366	1763	0.681	52529	2017	0.876	56880	2177	0.841	0.695
51H39-114	1.144	344.74	183.77	53849	50824	60997	84344	2518	0.781	72503	2935	0.856	72503	2757	0.856	0.779
51H39-114	1.144	482.63	170.74	70043	63343	85395	82701	2438	1.059	70974	2836	1.187	72503	2757	1.198	0.976
77H39-072	0.719	344.74	96.27	26551	24539	50442	56628	1524	0.420	118520	3002	0.932	124865	3124	0.862	0.590
77H39-072	0.719	482.63	87.99	33974	28993	70619	54556	1443	0.557	114982	2871	1.247	122688	3014	1.164	0.717
77H39-088	0.880	344.74	131.09	38413	33321	61461	72328	1990	0.618	148863	3852	1.195	154171	3925	1.218	0.777
77H39-088	0.880	482.63	119.66	46201	39587	86046	69602	1880	0.726	144520	3683	1.600	151827	3802	1.468	0.948
77H39-114	1.144	344.74	195.33	57238	49444	79459	99536	2827	0.877	198176	5261	1.563	198176	5039	1.563	1.106
77H39-114	1.144	482.63	179.00	73432	59282	111243	95823	2667	1.158	194192	5098	2.168	198176	5039	2.189	1.357
77H39-144	1.439	344.74	269.24	78894	69222	99187	130913	3824	1.186	244844	6537	1.921	244844	6191	1.921	1.491
77H39-144	1.439	482.63	251.03	102980	83881	138862	126384	3617	1.571	244844	6537	2.689	244844	6191	2.689	1.841

[1]Axial properties A_e and ϕP_{no} are based on local buckling of member at F_y, fully braced against global buckling.
[2]ϕP_{nd} is based on K_ϕ= 0 and no discrete bracing against distortional buckling
[3]All local buckling allowable moments, ϕMnyo, ϕMnxo+ are based on members fully braced against flexural and torsional-flexural buckling.
[4]Allowable distortional buckling moment, ϕMnd is based on Kϕ = 0 and no discrete bracing against distortional buckling.
[5]Y-Y axis is symmetric for bending. Properties for "positive" or "negative" bending are identical.
[6]Positive X-X Bending is for the top flange in compression.
[7]Negative X-X Bending is for the bottom flanges in compression.