

# ICC-ES Evaluation Report

## ESR-3016

Reissued July 2023

Revised October 2023

This report is subject to renewal July 2025.

**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**

**DIVISION: 09 00 00—FINISHES**  
**Section: 09 22 13—Metal Furring**  
**Section: 09 22 16.13—Non-Structural Metal Stud Framing**

**REPORT HOLDER:**

**CALIFORNIA EXPANDED METAL PRODUCTS COMPANY (CEMCO)**

**EVALUATION SUBJECT:**

**COLD-FORMED STEEL FRAMING**

**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)

For evaluation for compliance with the codes adopted by Los Angeles Department of Building and Safety (LADBS), see [ESR-3016 LABC and LARC Supplement](#).

For evaluation for compliance with codes 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 Architects (DSA), see [ESR-3016 CBC and CRC Supplement](#).

**Property evaluated:**

Structural

**2.0 USES**

Members with a minimum G60 or equivalent coating (Studs, Tracks, and U-channels) as allowed by the North American Standard for Cold-Formed Steel Structural Framing (AISI S240) may be used as structural members.

Members with a minimum G40 or equivalent coating may be used as nonstructural members as defined by the North

American Standard for Cold-Formed Steel Framing – Nonstructural Members (AISI S220).

**3.0 DESCRIPTION**

**3.1 General:**

The steel framing described in this report, consisting of structural C-shapes (studs and joists), tracks, furring channels and U-channels, is fabricated from coils of cold-rolled steel. The C-shapes are manufactured with or without web punch-outs; all other framing members (tracks, U-channels and furring hat channels) are manufactured without web punch-outs. When provided in the structural C-shapes, punch-outs measuring up to 0.75 inch by 2 inches (19 mm by 51 mm) for the 2.5-inch-deep members and 1.5 inches by 3.25 inches (38 mm by 83 mm) for the other sized members are located along the centerline of the webs. (**Note:** 120Sxxx-118 members are un-punched only.) The minimum distance between the end of the C-shape and the near edge of the web punch-out is 10 inches (254 mm). The minimum distance between centerlines of punch-outs is 24 inches (610 mm). See Tables 1, 2, 7, 8 and Figure 1 for recognized framing section names, profiles, and dimensions. The values in each of the tables for C-shapes are for C-shapes with punch-outs. See Table 10 for manufacturing locations.

**3.2 Materials:**

**3.2.1 General:** Steel framing members are available in design steel thicknesses ranging from 0.0188 inch to 0.1242 inch (0.478 mm to 3.155 mm), as shown in Table 3, and in the sizes and configurations shown in Tables 1, 2, 7, 8 and Figure 1.

**3.2.2 Studs and Tracks:** Studs and tracks are cold-formed from galvanized steel coils conforming to ASTM A653, SS Grade 33 or Grade 50, Class 1; or ASTM A1003, Structural Grade 33, Type H, (ST33H) or Structural Grade 50, Type H (ST50H). The steel has a minimum metallic coating of G60 in accordance with ASTM A653, AZ50 in accordance with ASTM A792, or CF30 in accordance with ASTM A875.

**3.2.3 U-channels:** U-channels are cold-formed from galvanized steel coils conforming to ASTM A653, SS Grade 50; or ASTM A1003, Structural Grade 50, Type H (ST50H), with a minimum metallic coating of G60 in accordance with ASTM A653, AZ50 in accordance with ASTM A792, or CF30 in accordance with ASTM A875.

**3.2.4 Furring Channels:** Furring channels are cold-formed from galvanized steel coils conforming to ASTM A1003, Nonstructural Grade 33 (NS33), with a minimum metallic coating of G40 in accordance with ASTM A653.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design:

**4.1.1 IBC Method:** The section properties indicated in Tables 4, 5, 7 and 8 have been determined in accordance with the applicable edition of the North American Specification for Design of Cold-formed Steel Structural Members (AISI). The allowable moments as indicated in Tables 4, 5, 7 and 8 are for use with Allowable Strength Design (ASD), and are for flexural members installed with the compression flange continuously braced. For other conditions of compression flange bracing, the allowable moment must be determined in accordance with the applicable edition of AISI. Allowable concentrated loads and reactions based on web crippling are shown in Table 6, for related web crippling loading conditions. The design of flexural members used for framing of nonload-bearing interior walls, curtain walls, load-bearing walls, floors or ceilings must address combined bending and web crippling, and combined bending and shear.

**4.1.2 IRC Method:** The steel framing members identified in Table 9 comply with the structural framing requirements of IRC Sections R505.2, R603.2 and R804.2, and qualify for use with the prescriptive requirements of the IRC. When steel framing members are used to construct buildings that do not conform to the applicable requirements of IRC Section R505.1.1, R603.1.1 or R804.1.1; and for steel framing members not identified in Table 3, the structural analysis and design must be in accordance with the IBC, as described in Section 4.1.1 of this report.

### 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.

## 5.0 CONDITIONS OF USE

The CEMCO cold-formed steel framing 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** The framing members are installed in accordance with the applicable code, the approved construction documents, and this report.

**5.2** Minimum uncoated steel thickness of the framing members as delivered to the jobsite is at least 95 percent of the design steel thickness noted in Table 3.

**5.3** Complete construction documents and calculations verifying compliance with this report and the applicable code 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.

## 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-3016) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.

**7.2** At a spacing not exceeding 96 inches (2440 mm) on center, each framing member is stamped with the name of the manufacturer; the member designation as provided in Tables 1, 2, 7 and 8; the evaluation report number (ESR-3016); the minimum uncoated steel thickness in decimal inches; the steel designation; in addition to the following:

- For structural members, each member must have the minimum specified yield strength; and the designation CP 60 for G60, AZ50, or CF30 and greater coatings.
- For nonstructural members, each member must have the minimum specified yield strength (if other than 33 ksi); and the designation "NS".

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

**CALIFORNIA EXPANDED METAL PRODUCTS  
COMPANY (CEMCO)**

**13191 CROSSROADS PARKWAY NORTH**

**SUITE 325**

**CITY OF INDUSTRY, CALIFORNIA 91746**

**(800) 416-2278**

[www.cemcosteel.com](http://www.cemcosteel.com)

TABLE 1—C-SHAPES

MEMBER	WEB <sup>2</sup> (in)	FLANGE (in)	LIP (in)	THICKNESS <sup>3</sup> (mils)	AREA (in <sup>2</sup> )	WEIGHT (lb/ft)	MEMBER	WEB <sup>2</sup> (in)	FLANGE (in)	LIP (in)	THICKNESS <sup>3</sup> (mils)	AREA (in <sup>2</sup> )	WEIGHT (lb/ft)
250S137-33	2.500	1.375	0.375	33	0.197	0.67	400S162-33	4.000	1.625	0.500	33	0.275	0.94
250S137-43	2.500	1.375	0.375	43	0.255	0.87	400S162-43	4.000	1.625	0.500	43	0.357	1.21
250S137-54	2.500	1.375	0.375	54	0.316	1.07	400S162-54	4.000	1.625	0.500	54	0.443	1.51
250S137-68	2.500	1.375	0.375	68	0.390	1.33	400S162-68	4.000	1.625	0.500	68	0.550	1.87
250S137-97	2.500	1.375	0.375	97	0.533	1.81	400S162-97	4.000	1.625	0.500	97	0.762	2.59
250S162-33	2.500	1.625	0.500	33	0.223	0.76	400S162-118	4.000	1.625	0.500	118	0.910	3.10
250S162-43	2.500	1.625	0.500	43	0.289	0.98	400S200-33	4.000	2.000	0.625	33	0.310	1.05
250S162-54	2.500	1.625	0.500	54	0.358	1.22	400S200-43	4.000	2.000	0.625	43	0.402	1.37
250S162-68	2.500	1.625	0.500	68	0.443	1.51	400S200-54	4.000	2.000	0.625	54	0.500	1.70
250S162-97	2.500	1.625	0.500	97	0.610	2.07	400S200-68	4.000	2.000	0.625	68	0.622	2.12
350S137-33	3.500	1.375	0.375	33	0.232	0.79	400S200-97	4.000	2.000	0.625	97	0.864	2.94
350S137-43	3.500	1.375	0.375	43	0.300	1.02	400S200-118	4.000	2.000	0.625	118	1.034	3.52
350S137-54	3.500	1.375	0.375	54	0.372	1.27	400S250-43	4.000	2.500	0.625	43	0.447	1.52
350S137-68	3.500	1.375	0.375	68	0.461	1.57	400S250-54	4.000	2.500	0.625	54	0.556	1.89
350S137-97	3.500	1.375	0.375	97	0.635	2.16	400S250-68	4.000	2.500	0.625	68	0.693	2.36
350S162-33	3.500	1.625	0.500	33	0.258	0.88	400S250-97	4.000	2.500	0.625	97	0.966	3.29
350S162-43	3.500	1.625	0.500	43	0.334	1.14	400S250-118	4.000	2.500	0.625	118	1.158	3.94
350S162-54	3.500	1.625	0.500	54	0.415	1.41	400S300-54	4.000	3.000	0.875	54	0.641	2.18
350S162-68	3.500	1.625	0.500	68	0.515	1.75	400S300-68	4.000	3.000	0.875	68	0.800	2.72
350S162-97	3.500	1.625	0.500	97	0.711	2.42	400S300-97	4.000	3.000	0.875	97	1.118	3.80
350S200-33	3.500	2.000	0.625	33	0.292	0.99	400S300-118	4.000	3.000	0.875	118	1.345	4.58
350S200-43	3.500	2.000	0.625	43	0.379	1.29	400S350-54	4.000	3.500	1.000	54	0.712	2.42
350S200-54	3.500	2.000	0.625	54	0.471	1.60	400S350-68	4.000	3.500	1.000	68	0.889	3.03
350S200-68	3.500	2.000	0.625	68	0.586	1.99	400S350-97	4.000	3.500	1.000	97	1.245	4.24
350S200-97	3.500	2.000	0.625	97	0.813	2.77	400S350-118	4.000	3.500	1.000	118	1.50	5.10
362S137-33	3.625	1.375	0.375	33	0.236	0.80	550S137-33	5.500	1.375	0.375	33	0.301	1.02
362S137-43	3.625	1.375	0.375	43	0.306	1.04	550S137-43	5.500	1.375	0.375	43	0.391	1.33
362S137-54	3.625	1.375	0.375	54	0.379	1.29	550S137-54	5.500	1.375	0.375	54	0.486	1.65
362S137-68	3.625	1.375	0.375	68	0.470	1.60	550S137-68	5.500	1.375	0.375	68	0.604	2.05
362S137-97	3.625	1.375	0.375	97	0.648	2.20	550S137-97	5.500	1.375	0.375	97	0.838	2.85
362S162-33	3.625	1.625	0.500	33	0.262	0.89	550S162-33	5.500	1.625	0.500	33	0.327	1.11
362S162-43	3.625	1.625	0.500	43	0.340	1.16	550S162-43	5.500	1.625	0.500	43	0.424	1.44
362S162-54	3.625	1.625	0.500	54	0.422	1.44	550S162-54	5.500	1.625	0.500	54	0.528	1.80
362S162-68	3.625	1.625	0.500	68	0.524	1.78	550S162-68	5.500	1.625	0.500	68	0.657	2.24
362S162-97	3.625	1.625	0.500	97	0.724	2.46	550S162-97	5.500	1.625	0.500	97	0.915	3.11
362S162-118	3.625	1.625	0.500	118	0.863	2.94	550S200-33	5.500	2.000	0.625	33	0.362	1.23
362S200-33	3.625	2.000	0.625	33	0.297	1.01	550S200-43	5.500	2.000	0.625	43	0.469	1.60
362S200-43	3.625	2.000	0.625	43	0.385	1.31	550S200-54	5.500	2.000	0.625	54	0.585	1.99
362S200-54	3.625	2.000	0.625	54	0.479	1.63	550S200-68	5.500	2.000	0.625	68	0.729	2.48
362S200-68	3.625	2.000	0.625	68	0.595	2.02	550S200-97	5.500	2.000	0.625	97	1.016	3.46
362S200-97	3.625	2.000	0.625	97	0.826	2.81	600S137-33	6.000	1.375	0.375	33	0.318	1.08
362S200-118	3.625	2.000	0.625	118	0.988	3.36	600S137-43	6.000	1.375	0.375	43	0.413	1.41
362S250-43	3.625	2.500	0.625	43	0.430	1.46	600S137-54	6.000	1.375	0.375	54	0.514	1.75
362S250-54	3.625	2.500	0.625	54	0.535	1.82	600S137-68	6.000	1.375	0.375	68	0.640	2.18
362S250-68	3.625	2.500	0.625	68	0.666	2.27	600S137-97	6.000	1.375	0.375	97	0.889	3.03
362S250-97	3.625	2.500	0.625	97	0.927	3.16	600S162-33	6.000	1.625	0.500	33	0.344	1.17
362S250-118	3.625	2.500	0.625	118	1.112	3.78	600S162-43	6.000	1.625	0.500	43	0.447	1.52
362S300-54	3.625	3.000	0.875	54	0.620	2.11	600S162-54	6.000	1.625	0.500	54	0.556	1.89
362S300-68	3.625	3.000	0.875	68	0.773	2.63	600S162-68	6.000	1.625	0.500	68	0.693	2.36
362S300-97	3.625	3.000	0.875	97	1.080	3.67	600S162-97	6.000	1.625	0.500	97	0.966	3.29
362S300-118	3.625	3.000	0.875	118	1.298	4.42	600S162-118	6.000	1.625	0.500	118	1.158	3.94
362S350-54	3.625	3.500	1.000	54	0.691	2.35	600S200-33	6.000	2.000	0.625	33	0.379	1.29
362S350-68	3.625	3.500	1.000	68	0.862	2.93	600S200-43	6.000	2.000	0.625	43	0.492	1.67
362S350-97	3.625	3.500	1.000	97	1.207	4.11	600S200-54	6.000	2.000	0.625	54	0.613	2.09
362S350-118	3.625	3.500	1.000	118	1.453	4.95	600S200-68	6.000	2.000	0.625	68	0.764	2.60
400S137-33	4.000	1.375	0.375	33	0.249	0.85	600S200-97	6.000	2.000	0.625	97	1.067	3.63
400S137-43	4.000	1.375	0.375	43	0.323	1.10	600S200-118	6.000	2.000	0.625	118	1.283	4.36
400S137-54	4.000	1.375	0.375	54	0.401	1.36							
400S137-68	4.000	1.375	0.375	68	0.497	1.69							
400S137-97	4.000	1.375	0.375	97	0.686	2.33							

For SI: 1 inch = 25.4 mm, 1 pcf = 1.4882 kg/m

TABLE 1—C-SHAPES (Continued)

MEMBER	WEB <sup>2</sup> (in)	FLANGE (in)	LIP (in)	THICKNESS DESIGNATION <sup>3</sup> (mils)	AREA (in <sup>2</sup> )	WEIGHT (lb/ft)	MEMBER	WEB <sup>2</sup> (in)	FLANGE (in)	LIP (in)	THICKNESS DESIGNATION <sup>3</sup> (mils)	AREA (in <sup>2</sup> )	WEIGHT (lb/ft)
600S250-43	6.000	2.500	0.625	43	0.537	1.83	1000S162-43 <sup>1</sup>	10.000	1.625	0.500	43	0.627	2.13
600S250-54	6.000	2.500	0.625	54	0.670	2.28	1000S162-54	10.000	1.625	0.500	54	0.783	2.66
600S250-68	6.000	2.500	0.625	68	0.836	2.84	1000S162-68	10.000	1.625	0.500	68	0.978	3.33
600S250-97	6.000	2.500	0.625	97	1.169	3.98	1000S162-97	10.000	1.625	0.500	97	1.372	4.67
600S250-118	6.000	2.500	0.625	118	1.407	4.79	1000S162-118	10.000	1.625	0.500	118	1.655	5.63
600S300-54	6.000	3.000	0.875	54	0.754	2.57	1000S200-43 <sup>1</sup>	10.000	2.000	0.625	43	0.672	2.29
600S300-68	6.000	3.000	0.875	68	0.943	3.21	1000S200-54	10.000	2.000	0.625	54	0.839	2.86
600S300-97	6.000	3.000	0.875	97	1.321	4.50	1000S200-68	10.000	2.000	0.625	68	1.050	3.57
600S300-118	6.000	3.000	0.875	118	1.593	5.421	1000S200-97	10.000	2.000	0.625	97	1.474	5.02
600S350-54	6.000	3.500	1.000	54	0.825	2.81	1000S200-118	10.000	2.000	0.625	118	1.779	6.05
600S350-68	6.000	3.500	1.000	68	1.032	3.51	1000S250-43 <sup>1</sup>	10.000	2.500	0.625	43	0.717	2.44
600S350-97	6.000	3.500	1.000	97	1.449	4.93	1000S250-54	10.000	2.500	0.625	54	0.896	3.05
600S350-118	6.000	3.500	1.000	118	1.748	5.949	1000S250-68	10.000	2.500	0.625	68	1.121	3.81
800S137-33 <sup>1</sup>	8.000	1.375	0.375	33	0.388	1.32	1000S250-97	10.000	2.500	0.625	97	1.576	5.36
800S137-43	8.000	1.375	0.375	43	0.503	1.71	1000S250-118	10.000	2.500	0.625	118	1.904	6.48
800S137-54	8.000	1.375	0.375	54	0.627	2.13	1000S300-54	10.000	3.000	0.875	54	0.981	3.34
800S137-68	8.000	1.375	0.375	68	0.782	2.66	1000S300-68	10.000	3.000	0.875	68	1.228	4.18
800S137-97	8.000	1.375	0.375	97	1.093	3.72	1000S300-97	10.000	3.000	0.875	97	1.728	5.88
800S162-33 <sup>1</sup>	8.000	1.625	0.500	33	0.413	1.41	1000S300-118	10.000	3.000	0.875	118	2.090	7.11
800S162-43	8.000	1.625	0.500	43	0.537	1.83	1000S350-54	10.000	3.500	1.000	54	1.052	3.58
800S162-54	8.000	1.625	0.500	54	0.670	2.28	1000S350-68	10.000	3.500	1.000	68	1.317	4.48
800S162-68	8.000	1.625	0.500	68	0.836	2.84	1000S350-97	10.000	3.500	1.000	97	1.855	6.31
800S162-97	8.000	1.625	0.500	97	1.169	3.98	1000S350-118	10.000	3.500	1.000	118	2.245	7.64
800S162-118	8.000	1.625	0.500	118	1.407	4.79	1200S162-54 <sup>1</sup>	12.000	1.625	0.500	54	0.896	3.05
800S200-33 <sup>1</sup>	8.000	2.000	0.625	33	0.448	1.52	1200S162-68	12.000	1.625	0.500	68	1.121	3.81
800S200-43	8.000	2.000	0.625	43	0.582	1.98	1200S162-97	12.000	1.625	0.500	97	1.576	5.36
800S200-54	8.000	2.000	0.625	54	0.726	2.47	1200S200-54 <sup>1</sup>	12.000	2.000	0.625	54	0.953	3.24
800S200-68	8.000	2.000	0.625	68	0.907	3.09	1200S200-68	12.000	2.000	0.625	68	1.192	4.06
800S200-97	8.000	2.000	0.625	97	1.271	4.32	1200S200-97	12.000	2.000	0.625	97	1.677	5.71
800S200-118	8.000	2.000	0.625	118	1.531	5.21	1200S200-118 <sup>4</sup>	12.000	2.000	0.625	118	2.028	6.90
800S250-43	8.000	2.500	0.625	43	0.627	2.13	1200S250-54 <sup>1</sup>	12.000	2.500	0.625	54	1.009	3.43
800S250-54	8.000	2.500	0.625	54	0.783	2.66	1200S250-68	12.000	2.500	0.625	68	1.263	4.30
800S250-68	8.000	2.500	0.625	68	0.978	3.33	1200S250-97	12.000	2.500	0.625	97	1.779	6.05
800S250-97	8.000	2.500	0.625	97	1.372	4.67	1200S250-118 <sup>4</sup>	12.000	2.500	0.625	118	2.152	7.32
800S250-118	8.000	2.500	0.625	118	1.655	5.63	1200S300-54 <sup>1</sup>	12.000	3.000	0.875	54	1.094	3.72
800S300-54	8.000	3.000	0.875	54	0.868	2.95	1200S300-68	12.000	3.000	0.875	68	1.370	4.66
800S300-68	8.000	3.000	0.875	68	1.085	3.69	1200S300-97	12.000	3.000	0.875	97	1.932	6.57
800S300-97	8.000	3.000	0.875	97	1.525	5.19	1200S300-118 <sup>4</sup>	12.000	3.000	0.875	118	2.338	7.96
800S300-118	8.000	3.000	0.875	118	1.842	6.27	1200S350-54 <sup>1,4</sup>	12.000	3.500	1.000	54	1.168	3.96
800S350-54	8.000	3.500	1.000	54	0.938	3.19	1200S350-68 <sup>4</sup>	12.000	3.500	1.000	68	1.460	4.97
800S350-68	8.000	3.500	1.000	68	1.174	4.00	1200S350-97 <sup>4</sup>	12.000	3.500	1.000	97	2.059	7.01
800S350-97	8.000	3.500	1.000	97	1.652	5.62	1200S350-118 <sup>4</sup>	12.000	3.500	1.000	118	2.494	8.48
800S350-118	8.000	3.500	1.000	118	1.997	6.79							

For SI: 1 inch = 25.4 mm, 1 plf = 1.4882 kg/m

<sup>1</sup>Web-height to thickness ratio exceeds 200. Web Stiffeners are required at all support points and concentrated loads. Punchouts/holes in the web are outside the scope of this report.

<sup>2</sup>Web height measured from outside face to outside face of flanges.

<sup>3</sup>See Table 3 for design thickness, minimum thickness, and inside bend radius.

<sup>4</sup>These members are available un-punched only.

TABLE 2—TRACKS

MEMBER	WEB <sup>2</sup> (in)	FLANGE (in)	THICKNESS DESIGNATION <sup>3</sup> (mils)	AREA (in <sup>2</sup> )	WEIGHT (lb/ft)	MEMBER	WEB <sup>2</sup> (in)	FLANGE (in)	THICKNESS DESIGNATION <sup>3</sup> (mils)	AREA (in <sup>2</sup> )	WEIGHT (lb/ft)
250T125-33	2.500	1.250	33	0.173	0.59	400T125-33	4.000	1.250	33	0.225	0.76
250T125-43	2.500	1.250	43	0.225	0.77	400T125-43	4.000	1.250	43	0.293	1.00
250T125-54	2.500	1.250	54	0.282	0.96	400T125-54	4.000	1.250	54	0.367	1.25
250T125-68	2.500	1.250	68	0.355	1.21	400T125-68	4.000	1.250	68	0.462	1.57
250T125-97	2.500	1.250	97	0.506	1.72	400T125-97	4.000	1.250	97	0.659	2.24
250T150-33	2.500	1.500	33	0.190	0.65	400T125-118	4.000	1.250	118	0.804	2.74
250T150-43	2.500	1.500	43	0.248	0.84	400T150-33	4.000	1.500	33	0.242	0.82
250T150-54	2.500	1.500	54	0.311	1.06	400T150-43	4.000	1.500	43	0.315	1.07
250T150-68	2.500	1.500	68	0.391	1.33	400T150-54	4.000	1.500	54	0.396	1.35
250T150-97	2.500	1.500	97	0.557	1.90	400T150-68	4.000	1.500	68	0.498	1.69
250T200-33	2.500	2.000	33	0.225	0.76	400T150-97	4.000	1.500	97	0.710	2.41
250T200-43	2.500	2.000	43	0.293	1.00	400T150-118	4.000	1.500	118	0.866	2.95
250T200-54	2.500	2.000	54	0.367	1.25	400T200-33	4.000	2.000	33	0.277	0.94
250T200-68	2.500	2.000	68	0.462	1.57	400T200-43	4.000	2.000	43	0.360	1.23
250T200-97	2.500	2.000	97	0.659	2.24	400T200-54	4.000	2.000	54	0.452	1.54
250T250-43	2.500	2.500	43	0.338	1.15	400T200-68	4.000	2.000	68	0.569	1.94
250T250-54	2.500	2.500	54	0.424	1.44	400T200-97	4.000	2.000	97	0.811	2.76
250T250-68	2.500	2.500	68	0.534	1.82	400T200-118	4.000	2.000	118	0.990	3.38
250T250-97	2.500	2.500	97	0.761	2.59	400T250-43	4.000	2.500	43	0.405	1.38
350T125-33	3.500	1.250	33	0.207	0.71	400T250-54	4.000	2.500	54	0.509	1.73
350T125-43	3.500	1.250	43	0.270	0.92	400T250-68	4.000	2.500	68	0.641	2.18
350T125-54	3.500	1.250	54	0.339	1.15	400T250-97	4.000	2.500	97	0.913	3.11
350T125-68	3.500	1.250	68	0.427	1.45	400T250-118	4.000	2.500	118	1.115	3.79
350T125-97	3.500	1.250	97	0.608	2.07	400T300-54	4.000	3.000	54	0.565	1.92
350T150-33	3.500	1.500	33	0.225	0.76	400T300-68	4.000	3.000	68	0.712	2.42
350T150-43	3.500	1.500	43	0.293	1.00	400T300-97	4.000	3.000	97	1.015	3.45
350T150-54	3.500	1.500	54	0.367	1.25	400T300-118	4.000	3.000	118	1.239	4.21
350T150-68	3.500	1.500	68	0.462	1.57	550T125-33	5.500	1.250	33	0.277	0.94
350T150-97	3.500	1.500	97	0.659	2.24	550T125-43	5.500	1.250	43	0.360	1.23
350T200-33	3.500	2.000	33	0.259	0.88	550T125-54	5.500	1.250	54	0.452	1.54
350T200-43	3.500	2.000	43	0.338	1.15	550T125-68	5.500	1.250	68	0.569	1.94
350T200-54	3.500	2.000	54	0.424	1.44	550T125-97	5.500	1.250	97	0.811	2.76
350T200-68	3.500	2.000	68	0.534	1.82	550T150-33	5.500	1.500	33	0.294	1.00
350T200-97	3.500	2.000	97	0.761	2.59	550T150-43	5.500	1.500	43	0.383	1.30
350T250-43	3.500	2.500	43	0.383	1.30	550T150-54	5.500	1.500	54	0.480	1.63
350T250-54	3.500	2.500	54	0.480	1.63	550T150-68	5.500	1.500	68	0.605	2.06
350T250-68	3.500	2.500	68	0.605	2.06	550T150-97	5.500	1.500	97	0.862	2.93
350T250-97	3.500	2.500	97	0.862	2.93	550T200-33	5.500	2.000	33	0.329	1.12
362T125-33	3.625	1.250	33	0.212	0.72	550T200-43	5.500	2.000	43	0.428	1.46
362T125-43	3.625	1.250	43	0.276	0.94	550T200-54	5.500	2.000	54	0.537	1.83
362T125-54	3.625	1.250	54	0.346	1.18	550T200-68	5.500	2.000	68	0.676	2.30
362T125-68	3.625	1.250	68	0.436	1.48	550T200-97	5.500	2.000	97	0.964	3.28
362T125-97	3.625	1.250	97	0.621	2.11	550T250-43	5.500	2.500	43	0.473	1.61
362T125-118	3.625	1.250	118	0.757	2.58	550T250-54	5.500	2.500	54	0.594	2.02
362T150-33	3.625	1.500	33	0.229	0.78	550T250-68	5.500	2.500	68	0.748	2.54
362T150-43	3.625	1.500	43	0.298	1.02	550T250-97	5.500	2.500	97	1.066	3.63
362T150-54	3.625	1.500	54	0.374	1.27	600T125-33	6.000	1.250	33	0.294	1.00
362T150-68	3.625	1.500	68	0.471	1.60	600T125-43	6.000	1.250	43	0.383	1.30
362T150-97	3.625	1.500	97	0.672	2.29	600T125-54	6.000	1.250	54	0.480	1.63
362T150-118	3.625	1.500	118	0.820	2.79	600T125-68	6.000	1.250	68	0.605	2.06
362T200-33	3.625	2.000	33	0.264	0.90	600T125-97	6.000	1.250	97	0.862	2.93
362T200-43	3.625	2.000	43	0.343	1.17	600T125-118	6.000	1.250	118	1.052	3.58
362T200-54	3.625	2.000	54	0.431	1.47	600T150-33	6.000	1.500	33	0.311	1.06
362T200-68	3.625	2.000	68	0.543	1.85	600T150-43	6.000	1.500	43	0.405	1.38
362T200-97	3.625	2.000	97	0.773	2.63	600T150-54	6.000	1.500	54	0.509	1.73
362T200-118	3.625	2.000	118	0.944	3.21	600T150-68	6.000	1.500	68	0.641	2.18
362T250-43	3.625	2.500	43	0.389	1.32	600T150-97	6.000	1.500	97	0.913	3.11
362T250-54	3.625	2.500	54	0.487	1.66	600T150-118	6.000	1.500	118	1.115	3.79
362T250-68	3.625	2.500	68	0.614	2.09	600T200-33	6.000	2.000	33	0.346	1.18
362T250-97	3.625	2.500	97	0.875	2.98	600T200-43	6.000	2.000	43	0.451	1.53
362T250-118	3.625	2.500	118	1.068	3.63	600T200-54	6.000	2.000	54	0.565	1.92
362T300-54	3.625	3.000	54	0.544	1.85	600T200-68	6.000	2.000	68	0.712	2.42
362T300-68	3.625	3.000	68	0.685	2.33	600T200-97	6.000	2.000	97	1.015	3.45
362T300-97	3.625	3.000	97	0.977	3.32	600T200-118	6.000	2.000	118	1.239	4.21
362T300-118	3.625	3.000	118	1.192	4.06						

For SI: 1 inch = 25.4 mm, 1 plf = 1.4882 kg/m

TABLE 2—TRACKS (Continued)

MEMBER	WEB <sup>2</sup> (in)	FLANGE (in)	THICKNESS DESIGNATION <sup>3</sup> (mils)	AREA (in <sup>2</sup> )	WEIGHT (lb/ft)	MEMBER	WEB <sup>2</sup> (in)	FLANGE (in)	THICKNESS DESIGNATION <sup>3</sup> (mils)	AREA (in <sup>2</sup> )	WEIGHT (lb/ft)
600T250-43	6.000	2.500	43	0.496	1.69	1000T150-43 <sup>1</sup>	10.000	1.500	43	0.586	1.99
600T250-54	6.000	2.500	54	0.622	2.12	1000T150-54	10.000	1.500	54	0.735	2.50
600T250-68	6.000	2.500	68	0.783	2.67	1000T150-68	10.000	1.500	68	0.926	3.15
600T250-97	6.000	2.500	97	1.116	3.80	1000T150-97	10.000	1.500	97	1.320	4.49
600T250-118	6.000	2.500	118	1.363	4.64	1000T150-118	10.000	1.500	118	1.611	5.48
600T300-54	6.000	3.000	54	0.679	2.31	1000T200-43 <sup>1</sup>	10.000	2.000	43	0.631	2.15
600T300-68	6.000	3.000	68	0.855	2.91	1000T200-54	10.000	2.000	54	0.792	2.69
600T300-97	6.000	3.000	97	1.218	4.15	1000T200-68	10.000	2.000	68	0.997	3.39
600T300-118	6.000	3.000	118	1.487	5.06	1000T200-97	10.000	2.000	97	1.422	4.84
800T125-33 <sup>1</sup>	8.000	1.250	33	0.363	1.24	1000T200-118	10.000	2.000	118	1.736	5.91
800T125-43	8.000	1.250	43	0.473	1.61	1000T250-43 <sup>1</sup>	10.000	2.500	43	0.676	2.30
800T125-54	8.000	1.250	54	0.594	2.02	1000T250-54	10.000	2.500	54	0.848	2.89
800T125-68	8.000	1.250	68	0.748	2.54	1000T250-68	10.000	2.500	68	1.068	3.64
800T125-97	8.000	1.250	97	1.066	3.63	1000T250-97	10.000	2.500	97	1.523	5.18
800T125-118	8.000	1.250	118	1.301	4.43	1000T250-118	10.000	2.500	118	1.860	6.33
800T150-33 <sup>1</sup>	8.000	1.500	33	0.380	1.29	1000T300-54	10.000	3.000	54	0.905	3.08
800T150-43	8.000	1.500	43	0.496	1.69	1000T300-68	10.000	3.000	68	1.140	3.88
800T150-54	8.000	1.500	54	0.622	2.12	1000T300-97	10.000	3.000	97	1.625	5.53
800T150-68	8.000	1.500	68	0.783	2.67	1000T300-118	10.000	3.000	118	1.984	6.75
800T150-97	8.000	1.500	97	1.116	3.80	1200T125-54 <sup>1</sup>	12.000	1.250	54	0.820	2.79
800T150-118	8.000	1.500	118	1.363	4.64	1200T125-68	12.000	1.250	68	1.033	3.51
800T200-33 <sup>1</sup>	8.000	2.000	33	0.415	1.41	1200T125-97	12.000	1.250	97	1.472	5.01
800T200-43	8.000	2.000	43	0.541	1.84	1200T150-54 <sup>1</sup>	12.000	1.500	54	0.848	2.89
800T200-54	8.000	2.000	54	0.679	2.31	1200T150-68	12.000	1.500	68	1.068	3.64
800T200-68	8.000	2.000	68	0.854	2.91	1200T150-97	12.000	1.500	97	1.523	5.18
800T200-97	8.000	2.000	97	1.218	4.15	1200T150-118	12.000	1.500	118	1.860	6.33
800T200-118	8.000	2.000	118	1.487	5.06	1200T200-54 <sup>1</sup>	12.000	2.000	54	0.905	3.08
800T250-43	8.000	2.500	43	0.586	1.99	1200T200-68	12.000	2.000	68	1.140	3.88
800T250-54	8.000	2.500	54	0.735	2.50	1200T200-97	12.000	2.000	97	1.625	5.53
800T250-68	8.000	2.500	68	0.926	3.15	1200T200-118	12.000	2.000	118	1.984	6.75
800T250-97	8.000	2.500	97	1.320	4.49	1200T250-54 <sup>1</sup>	12.000	2.500	54	0.962	3.27
800T250-118	8.000	2.500	118	1.611	5.48	1200T250-68	12.000	2.500	68	1.211	4.12
800T300-54	8.000	3.000	54	0.792	2.69	1200T250-97	12.000	2.500	97	1.727	5.88
800T300-68	8.000	3.000	68	0.997	3.39	1200T250-118	12.000	2.500	118	2.108	7.17
800T300-97	8.000	3.000	97	1.422	4.84	1200T300-54 <sup>1</sup>	12.000	3.000	54	1.018	3.46
800T300-118	8.000	3.000	118	1.736	5.91	1200T300-68	12.000	3.000	68	1.282	4.36
1000T125-43 <sup>1</sup>	10.000	1.250	43	0.563	1.92	1200T300-97	12.000	3.000	97	1.828	6.22
1000T125-54	10.000	1.250	54	0.707	2.41	1200T300-118	12.000	3.000	118	2.232	7.60
1000T125-68	10.000	1.250	68	0.890	3.03						
1000T125-97	10.000	1.250	97	1.269	4.32						
1000T125-118	10.000	1.250	118	1.549	5.27						

For SI: 1 inch = 25.4 mm, 1 plf = 1.4882 kg/m

<sup>1</sup>Web-height to thickness ratio exceeds 200. Web Stiffeners are required at all support points and concentrated loads.

<sup>2</sup>Web height measured from inside face to inside face of flanges.

<sup>3</sup>See Table 3 for design thickness, minimum thickness, and inside bend radius.

TABLE 3—UNCOATED STEEL THICKNESS

THICKNESS DESIGNATION (mils)	DESIGN THICKNESS (in)	MINIMUM THICKNESS <sup>1</sup> (in)	INSIDE BEND RADIUS (in)
18	0.0188	0.0179	0.0843
27	0.0283	0.0269	0.0796
33	0.0346	0.0329	0.0764
43	0.0451	0.0428	0.0712
54	0.0566	0.0538	0.0849
68	0.0713	0.0677	0.1069
97	0.1017	0.0966	0.1525
118	0.1242	0.1180	0.1863

For SI: 1 inch = 25.4 mm.

<sup>1</sup>Minimum thickness represents 95 percent of the design thickness and is the minimum acceptable thickness of the uncoated steel delivered to the jobsite.

TABLE 4—C-SHAPE PROPERTIES<sup>4,5</sup>

MEMBER	F <sub>y</sub> (ksi)	GROSS PROPERTIES <sup>3</sup>					EFFECTIVE PROPERTIES <sup>2</sup>						TORSIONAL PROPERTIES <sup>3</sup>					L <sub>U</sub> (in)	
		I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>ag</sub> (lb)	V <sub>anet</sub> (lb)	M <sub>ad</sub> (in-k)	Jx1000 (in <sup>4</sup> )	C <sub>w</sub> (in <sup>6</sup> )	X <sub>o</sub> (in)	m (in)	R <sub>o</sub> (in)		β
250S137-33 <sup>7</sup>	33	0.203	0.163	1.015	0.052	0.515	0.203	0.163	3.502	975	399	3.361	0.079	0.072	-1.139	0.675	1.611	0.5	33.2
250S137-43 <sup>7</sup>	33	0.261	0.209	1.011	0.067	0.511	0.261	0.209	4.577	1265	394	4.577	0.173	0.09	-1.127	0.668	1.598	0.502	33
250S137-54 <sup>7</sup>	50	0.318	0.255	1.004	0.08	0.504	0.318	0.255	8.523	2353	565	8.446	0.337	0.107	-1.112	0.659	1.581	0.505	26.4
250S137-68 <sup>7</sup>	50	0.386	0.309	0.995	0.096	0.496	0.386	0.309	10.615	2866	519	10.616	0.661	0.125	-1.091	0.648	1.558	0.509	26
250S137-97 <sup>7</sup>	50	0.508	0.406	0.976	0.121	0.477	0.508	0.406	14.685	3798	429	14.686	1.839	0.149	-1.046	0.622	1.508	0.519	25.4
250S162-33 <sup>7</sup>	33	0.235	0.188	1.027	0.087	0.624	0.235	0.188	3.84	975	399	3.749	0.089	0.14	-1.469	0.859	1.898	0.401	42.6
250S162-43 <sup>7</sup>	33	0.302	0.242	1.022	0.111	0.62	0.302	0.242	5.226	1265	394	5.226	0.196	0.176	-1.457	0.852	1.885	0.402	41.4
250S162-54 <sup>7</sup>	50	0.37	0.296	1.016	0.135	0.614	0.37	0.296	9.751	2353	565	9.683	0.383	0.211	-1.442	0.844	1.868	0.404	33.3
250S162-68 <sup>7</sup>	50	0.451	0.36	1.008	0.163	0.606	0.451	0.36	12.154	2866	519	12.154	0.752	0.249	-1.422	0.833	1.845	0.406	32.9
250S162-97 <sup>7</sup>	50	0.598	0.478	0.99	0.211	0.588	0.598	0.478	16.868	3798	429	16.868	2.102	0.308	-1.379	0.808	1.797	0.411	32.4
350S137-33	33	0.442	0.252	1.38	0.059	0.503	0.442	0.252	4.863	1024	487	4.558	0.093	0.144	-1.013	0.618	1.784	0.678	33.7
350S137-43 <sup>7</sup>	33	0.568	0.324	1.375	0.075	0.499	0.568	0.324	7.005	1740	631	6.82	0.204	0.182	-1.001	0.611	1.773	0.681	31.7
350S137-54 <sup>7</sup>	50	0.696	0.398	1.368	0.09	0.492	0.696	0.398	13.094	3372	947	12.277	0.398	0.217	-0.986	0.603	1.756	0.685	25.4
350S137-68 <sup>7</sup>	50	0.85	0.485	1.357	0.108	0.483	0.85	0.485	16.394	4203	897	16.076	0.782	0.254	-0.966	0.591	1.734	0.69	24.9
350S137-97 <sup>7</sup>	50	1.132	0.647	1.335	0.137	0.464	1.132	0.647	22.936	5705	775	22.937	2.189	0.31	-0.922	0.566	1.688	0.701	23.8
350S162-33	33	0.508	0.291	1.404	0.098	0.617	0.508	0.291	5.425	1024	487	5.32	0.103	0.265	-1.323	0.794	2.025	0.574	41.7
350S162-43 <sup>7</sup>	33	0.655	0.374	1.4	0.125	0.613	0.655	0.374	7.974	1740	631	7.822	0.227	0.335	-1.311	0.787	2.013	0.576	39.6
350S162-54 <sup>7</sup>	50	0.805	0.46	1.393	0.152	0.606	0.805	0.46	14.93	3372	947	14.185	0.443	0.403	-1.296	0.779	1.997	0.579	31.8
350S162-68 <sup>7</sup>	50	0.985	0.563	1.383	0.184	0.598	0.985	0.563	18.699	4203	897	18.465	0.872	0.478	-1.276	0.768	1.975	0.582	31.2
350S162-97 <sup>7</sup>	50	1.322	0.756	1.363	0.239	0.58	1.322	0.756	26.223	5705	775	26.223	2.452	0.599	-1.233	0.744	1.928	0.591	30.3
350S200-33	33	0.599	0.342	1.431	0.175	0.773	0.599	0.342	5.896	1024	487	6.089	0.117	0.523	-1.76	1.038	2.396	0.461	52.7
350S200-43 <sup>7</sup>	33	0.771	0.441	1.426	0.224	0.768	0.771	0.441	9.269	1740	631	9.014	0.257	0.664	-1.747	1.032	2.383	0.462	50.5
350S200-54 <sup>7</sup>	50	0.95	0.543	1.42	0.274	0.762	0.95	0.543	17.382	3372	947	16.077	0.503	0.803	-1.733	1.023	2.366	0.464	40.7
350S200-68 <sup>7</sup>	50	1.167	0.667	1.411	0.333	0.754	1.167	0.667	21.765	4203	897	21.384	0.993	0.963	-1.713	1.013	2.344	0.466	40.1
350S200-97 <sup>7</sup>	50	1.578	0.902	1.393	0.441	0.737	1.578	0.902	30.553	5705	775	30.553	2.803	1.233	-1.671	0.989	2.297	0.471	39.2
362S137-33	33	0.479	0.264	1.424	0.059	0.502	0.479	0.264	4.971	1024	521	4.74	0.094	0.156	-0.999	0.611	1.811	0.695	33.7
362S137-43 <sup>7</sup>	33	0.616	0.34	1.419	0.076	0.497	0.616	0.34	7.355	1740	676	7.151	0.207	0.196	-0.988	0.605	1.799	0.699	31.7
362S137-54 <sup>7</sup>	50	0.756	0.417	1.412	0.091	0.49	0.756	0.417	13.753	3372	1016	12.786	0.405	0.234	-0.973	0.596	1.783	0.702	25.4
362S137-68 <sup>7</sup>	50	0.923	0.509	1.401	0.109	0.481	0.923	0.509	17.229	4370	1004	16.878	0.797	0.275	-0.952	0.585	1.761	0.708	24.8
362S137-97 <sup>7</sup>	50	1.231	0.679	1.378	0.138	0.462	1.231	0.679	24.138	5943	875	24.138	2.233	0.335	-0.909	0.56	1.715	0.719	23.7
362S162-33	33	0.551	0.304	1.45	0.099	0.616	0.551	0.304	5.567	1024	521	5.534	0.105	0.284	-1.307	0.787	2.047	0.592	41.7
362S162-43 <sup>7</sup>	33	0.71	0.392	1.445	0.127	0.611	0.71	0.392	8.363	1740	676	8.195	0.23	0.36	-1.295	0.78	2.035	0.595	39.6
362S162-54 <sup>7</sup>	50	0.873	0.482	1.438	0.154	0.605	0.873	0.482	15.664	3372	1016	14.771	0.451	0.433	-1.28	0.772	2.018	0.598	31.7
362S162-68 <sup>7</sup>	50	1.069	0.59	1.429	0.186	0.596	1.069	0.59	19.629	4370	1004	19.364	0.887	0.514	-1.26	0.761	1.996	0.602	31.1
362S162-97 <sup>7</sup>	50	1.437	0.793	1.409	0.242	0.578	1.437	0.793	27.559	5943	875	27.559	2.496	0.644	-1.217	0.737	1.95	0.61	30.1
362S162-118 <sup>7</sup>	50	1.676	0.925	1.393	0.275	0.565	1.676	0.925	33.128	6996	784	33.128	4.44	0.711	-1.185	0.718	1.914	0.617	29.5

For SI: 1 inch = 25.4 mm; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup> mm<sup>3</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>5</sup> mm<sup>4</sup>; 1 inch<sup>6</sup> = 2.69x10<sup>8</sup> mm<sup>6</sup>; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 4—C-SHAPE PROPERTIES<sup>4,5</sup> (Continued)

MEMBER	F <sub>y</sub> (ksi)	GROSS PROPERTIES <sup>3</sup>					EFFECTIVE PROPERTIES <sup>2</sup>						TORSIONAL PROPERTIES <sup>3</sup>						L <sub>u</sub> (in)
		I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>ag</sub> (lb)	V <sub>anet</sub> (lb)	M <sub>ad</sub> (in-k)	Jx1000 (in <sup>4</sup> )	C <sub>w</sub> (in <sup>6</sup> )	X <sub>o</sub> (in)	m (in)	R <sub>o</sub> (in)	β	
362S200-33	33	0.648	0.358	1.478	0.177	0.772	0.648	0.358	6.111	1024	521	6.334	0.118	0.558	-1.741	1.03	2.411	0.479	52.5
362S200-43 <sup>7</sup>	33	0.836	0.461	1.474	0.227	0.768	0.836	0.461	9.71	1740	676	9.383	0.261	0.709	-1.729	1.023	2.398	0.48	50.4
362S200-54 <sup>7</sup>	50	1.03	0.568	1.467	0.277	0.761	1.03	0.568	18.216	3372	1016	16.732	0.511	0.858	-1.714	1.015	2.381	0.482	40.6
362S200-68 <sup>7</sup>	50	1.266	0.699	1.459	0.338	0.753	1.266	0.699	22.82	4370	1004	22.399	1.008	1.029	-1.694	1.004	2.359	0.484	40.1
362S200-97 <sup>7</sup>	50	1.713	0.945	1.44	0.447	0.736	1.713	0.945	32.066	5943	875	32.066	2.847	1.32	-1.653	0.981	2.312	0.489	39.1
362S200-118 <sup>7</sup>	50	2.01	1.109	1.427	0.516	0.723	2.01	1.109	38.614	6996	784	38.614	5.078	1.483	-1.62	0.963	2.277	0.493	38.6
362S250-43	33	0.98	0.541	1.51	0.385	0.946	0.98	0.541	9.765	1740	676	9.408	0.292	1.192	-2.198	1.277	2.83	0.397	63
362S250-54	50	1.21	0.668	1.504	0.473	0.94	1.21	0.668	18.55	3372	1016	16.693	0.571	1.448	-2.183	1.268	2.813	0.398	51
362S250-68 <sup>7</sup>	50	1.491	0.823	1.496	0.578	0.931	1.491	0.823	26.434	4370	1004	23.704	1.129	1.746	-2.163	1.257	2.79	0.399	48.7
362S250-97 <sup>7</sup>	50	2.029	1.119	1.479	0.774	0.914	2.029	1.119	37.119	5943	875	36.707	3.197	2.267	-2.121	1.234	2.742	0.402	47.8
362S250-118 <sup>7</sup>	50	2.391	1.319	1.466	0.9	0.9	2.391	1.319	44.714	6996	784	44.714	5.717	2.574	-2.088	1.215	2.706	0.404	47.4
362S300-54	50	1.423	0.785	1.515	0.822	1.151	1.423	0.785	19.511	3372	1016	19.693	0.662	3.151	-2.862	1.642	3.437	0.307	65.5
362S300-68	50	1.757	0.969	1.507	1.011	1.143	1.757	0.969	28.096	4370	1004	26.453	1.31	3.829	-2.843	1.632	3.415	0.307	65.5
362S300-97 <sup>7</sup>	50	2.402	1.325	1.491	1.37	1.126	2.402	1.325	43.275	5943	875	42.947	3.723	5.057	-2.803	1.61	3.369	0.308	62.4
362S300-118 <sup>7</sup>	50	2.842	1.568	1.48	1.609	1.113	2.842	1.568	52.183	6996	784	52.183	6.675	5.822	-2.772	1.592	3.334	0.309	62.1
362S350-54	50	1.614	0.89	1.528	1.241	1.34	1.573	0.868	19.988	3372	1016	21.252	0.738	5.312	-3.449	1.957	4.004	0.258	77.7
362S350-68	50	1.996	1.101	1.521	1.53	1.332	1.996	1.101	28.946	4370	1004	28.672	1.461	6.481	-3.431	1.947	3.982	0.258	77.8
362S350-97 <sup>7</sup>	50	2.738	1.51	1.506	2.087	1.315	2.738	1.51	48.747	5943	875	47.302	4.162	8.636	-3.392	1.925	3.937	0.258	74.7
362S350-118 <sup>7</sup>	50	3.246	1.791	1.495	2.464	1.302	3.246	1.791	58.793	6996	784	58.793	7.473	10.012	-3.362	1.908	3.903	0.258	74.4
400S137-33	33	0.603	0.302	1.556	0.061	0.496	0.603	0.302	5.275	976	595	5.295	0.099	0.193	-0.961	0.593	1.895	0.743	33.6
400S137-43 <sup>7</sup>	33	0.776	0.388	1.551	0.078	0.491	0.776	0.388	8.432	1740	810	8.038	0.219	0.243	-0.95	0.587	1.884	0.746	31.6
400S137-54 <sup>7</sup>	50	0.953	0.477	1.543	0.094	0.485	0.953	0.477	15.785	3372	1223	14.321	0.428	0.29	-0.935	0.578	1.868	0.75	25.3
400S137-68 <sup>7</sup>	50	1.166	0.583	1.531	0.112	0.475	1.166	0.583	19.808	4871	1356	19.334	0.842	0.341	-0.915	0.567	1.846	0.755	24.6
400S137-97 <sup>7</sup>	50	1.559	0.78	1.508	0.143	0.456	1.559	0.78	27.851	6658	1207	27.851	2.365	0.418	-0.872	0.542	1.801	0.765	23.5
400S162-33	33	0.692	0.346	1.586	0.103	0.611	0.692	0.346	5.946	976	595	6.184	0.11	0.348	-1.261	0.766	2.117	0.645	41.4
400S162-43 <sup>7</sup>	33	0.892	0.446	1.581	0.131	0.606	0.892	0.446	9.558	1740	810	9.271	0.242	0.44	-1.249	0.759	2.105	0.648	39.3
400S162-54 <sup>7</sup>	50	1.098	0.549	1.574	0.16	0.6	1.098	0.549	17.922	3372	1223	16.538	0.473	0.53	-1.235	0.751	2.089	0.651	31.6
400S162-68 <sup>7</sup>	50	1.347	0.673	1.564	0.193	0.592	1.347	0.673	22.491	4871	1356	22.111	0.933	0.63	-1.215	0.74	2.067	0.655	30.9
400S162-97 <sup>7</sup>	50	1.815	0.907	1.543	0.251	0.573	1.815	0.907	31.677	6658	1207	31.677	2.628	0.793	-1.173	0.716	2.021	0.663	29.9
400S162-118 <sup>7</sup>	50	2.121	1.061	1.527	0.285	0.56	2.121	1.061	38.171	7869	1102	38.171	4.679	0.878	-1.141	0.697	1.986	0.67	29.1
400S200-33	33	0.812	0.406	1.619	0.183	0.769	0.812	0.406	6.681	976	595	7.071	0.124	0.673	-1.687	1.006	2.462	0.53	52.2
400S200-43	33	1.048	0.524	1.615	0.235	0.765	1.048	0.524	10.226	1740	810	9.928	0.272	0.856	-1.675	0.999	2.449	0.532	52.1
400S200-54 <sup>7</sup>	50	1.292	0.646	1.608	0.287	0.758	1.292	0.646	19.374	3372	1223	17.884	0.534	1.038	-1.66	0.991	2.433	0.534	41.7
400S200-68 <sup>7</sup>	50	1.59	0.795	1.599	0.35	0.75	1.59	0.795	26.057	4871	1356	25.316	1.054	1.246	-1.641	0.98	2.411	0.537	39.7
400S200-97 <sup>7</sup>	50	2.157	1.079	1.58	0.464	0.733	2.157	1.079	36.714	6658	1207	36.714	2.978	1.603	-1.599	0.957	2.364	0.543	38.7
400S200-118 <sup>7</sup>	50	2.536	1.268	1.566	0.535	0.719	2.536	1.268	44.304	7869	1102	44.304	5.318	1.806	-1.567	0.939	2.329	0.547	38.1

For SI: 1 inch = 25.4 mm; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup> mm<sup>3</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>5</sup> mm<sup>4</sup>; 1 inch<sup>6</sup> = 2.69x10<sup>8</sup> mm<sup>6</sup>; 1 lb/ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksi = 6.89 Mpa; 1 lb = 4.45 N.



TABLE 4—C-SHAPE PROPERTIES<sup>4,5</sup> (Continued)

MEMBER	F <sub>y</sub> (ksi)	GROSS PROPERTIES <sup>3</sup>					EFFECTIVE PROPERTIES <sup>2</sup>						TORSIONAL PROPERTIES <sup>3</sup>						L <sub>u</sub> (in)
		I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>ag</sub> (lb)	V <sub>anet</sub> (lb)	M <sub>ad</sub> (in-k)	J <sub>x</sub> 1000 (in <sup>4</sup> )	C <sub>w</sub> (in <sup>6</sup> )	X <sub>o</sub> (in)	m (in)	R <sub>o</sub> (in)	β	
400S250-43	33	1.224	0.612	1.655	0.399	0.945	1.224	0.612	10.929	1740	810	10.524	0.303	1.44	-2.138	1.251	2.864	0.443	62.6
400S250-54	50	1.512	0.756	1.649	0.49	0.938	1.512	0.756	20.785	3372	1223	18.622	0.594	1.752	-2.123	1.243	2.847	0.444	50.6
400S250-68 <sup>7</sup>	50	1.865	0.933	1.64	0.599	0.93	1.865	0.933	30.044	4871	1356	26.496	1.174	2.115	-2.103	1.232	2.824	0.446	48.4
400S250-97 <sup>7</sup>	50	2.543	1.272	1.623	0.803	0.912	2.543	1.272	42.291	6658	1207	41.715	3.329	2.753	-2.06	1.208	2.777	0.45	47.5
400S250-118 <sup>7</sup>	50	3.002	1.501	1.61	0.935	0.898	3.002	1.501	51.038	7869	1102	51.038	5.956	3.133	-2.028	1.19	2.74	0.453	46.9
400S300-54	50	1.777	0.888	1.665	0.853	1.153	1.777	0.888	21.974	3372	1223	22.004	0.685	3.716	-2.794	1.614	3.45	0.344	64.8
400S300-68	50	2.196	1.098	1.657	1.049	1.145	2.196	1.098	31.674	4871	1356	29.616	1.356	4.519	-2.775	1.604	3.429	0.345	64.7
400S300-97 <sup>7</sup>	50	3.01	1.505	1.641	1.422	1.128	3.01	1.505	49.251	6658	1207	48.765	3.855	5.981	-2.734	1.582	3.382	0.346	61.5
400S300-118 <sup>7</sup>	50	3.566	1.783	1.629	1.672	1.115	3.566	1.783	59.491	7869	1102	59.492	6.914	6.896	-2.703	1.564	3.347	0.348	61
400S350-54	50	2.013	1.006	1.681	1.286	1.344	1.96	0.98	22.564	3372	1223	23.792	0.76	6.192	-3.377	1.929	4.005	0.289	76.6
400S350-68	50	2.491	1.246	1.674	1.587	1.336	2.491	1.246	32.708	4871	1356	32.16	1.507	7.56	-3.359	1.919	3.983	0.289	76.6
400S350-97 <sup>7</sup>	50	3.425	1.712	1.658	2.166	1.319	3.425	1.712	55.385	6658	1207	53.213	4.293	10.092	-3.319	1.898	3.938	0.29	73.5
400S350-118 <sup>7</sup>	50	4.068	2.034	1.647	2.559	1.306	4.068	2.034	66.909	7869	1102	66.862	7.712	11.716	-3.289	1.881	3.903	0.29	73
550S137-33	33	1.283	0.467	2.065	0.067	0.472	1.205	0.438	6.502	698	698	7.443	0.12	0.39	-0.835	0.531	2.277	0.865	33
550S137-43	33	1.655	0.602	2.059	0.085	0.467	1.655	0.602	10.028	1550	1199	10.594	0.265	0.493	-0.825	0.525	2.267	0.868	32.9
550S137-54	50	2.039	0.742	2.049	0.103	0.461	2.039	0.742	18.963	3093	1881	18.8	0.519	0.591	-0.811	0.516	2.251	0.87	26.4
550S137-68	50	2.504	0.911	2.036	0.123	0.451	2.504	0.911	26.948	5352	2532	25.237	1.023	0.699	-0.792	0.505	2.231	0.874	26
550S137-97 <sup>7</sup>	50	3.382	1.23	2.008	0.157	0.432	3.382	1.23	44.378	9518	3026	44.108	2.891	0.866	-0.752	0.482	2.188	0.882	22.9
550S162-33	33	1.459	0.53	2.112	0.113	0.589	1.364	0.496	7.34	698	698	8.78	0.13	0.684	-1.11	0.693	2.458	0.796	40.7
550S162-43	33	1.883	0.685	2.107	0.145	0.584	1.883	0.685	11.349	1550	1199	12.432	0.288	0.868	-1.099	0.687	2.447	0.798	40.5
550S162-54	50	2.325	0.845	2.098	0.176	0.578	2.325	0.845	21.543	3093	1881	22.094	0.564	1.048	-1.085	0.679	2.432	0.801	32.7
550S162-68	50	2.862	1.041	2.087	0.213	0.569	2.862	1.041	30.824	5352	2532	29.547	1.114	1.253	-1.066	0.668	2.411	0.805	32.3
550S162-97 <sup>7</sup>	50	3.889	1.414	2.062	0.277	0.551	3.889	1.414	49.791	9518	3026	49.791	3.154	1.593	-1.025	0.645	2.368	0.812	29
550S200-33	33	1.694	0.616	2.164	0.204	0.751	1.572	0.572	8.419	698	698	10.09	0.144	1.283	-1.505	0.922	2.741	0.698	51.3
550S200-43	33	2.189	0.796	2.159	0.261	0.746	2.189	0.796	13.04	1550	1199	14.291	0.318	1.635	-1.494	0.916	2.73	0.7	51.1
550S200-54	50	2.707	0.984	2.152	0.32	0.74	2.707	0.984	24.808	3093	1881	25.388	0.624	1.987	-1.479	0.908	2.714	0.703	41.2
550S200-68	50	3.341	1.215	2.141	0.39	0.731	3.341	1.215	35.641	5352	2532	34.023	1.235	2.396	-1.46	0.897	2.693	0.706	40.9
550S200-97 <sup>7</sup>	50	4.566	1.66	2.12	0.517	0.713	4.566	1.66	56.923	9518	3026	56.915	3.504	3.11	-1.419	0.874	2.649	0.713	37.6
600S137-33	33	1.582	0.527	2.229	0.069	0.464	1.443	0.481	7.006	638	638	8.093	0.127	0.474	-0.801	0.513	2.414	0.89	32.9
600S137-43	33	2.042	0.681	2.223	0.087	0.459	2.042	0.681	10.835	1415	1240	11.575	0.28	0.6	-0.791	0.507	2.404	0.892	32.7
600S137-54	50	2.518	0.839	2.214	0.105	0.453	2.518	0.839	20.512	2822	1947	20.533	0.549	0.72	-0.777	0.499	2.389	0.894	26.2
600S137-68	50	3.095	1.032	2.2	0.126	0.444	3.095	1.032	29.276	5352	2880	27.714	1.084	0.852	-0.758	0.488	2.369	0.898	25.9
600S137-97 <sup>7</sup>	50	4.191	1.397	2.171	0.16	0.424	4.191	1.397	50.49	10472	3806	49.295	3.066	1.059	-0.719	0.465	2.326	0.904	22.7
600S162-33	33	1.793	0.598	2.282	0.116	0.581	1.63	0.543	7.896	638	638	9.617	0.137	0.827	-1.068	0.673	2.586	0.829	40.5
600S162-43	33	2.316	0.772	2.277	0.148	0.576	2.316	0.772	12.236	1415	1240	13.667	0.303	1.051	-1.058	0.666	2.576	0.831	40.3
600S162-54	50	2.861	0.954	2.268	0.181	0.57	2.861	0.954	23.242	2822	1947	24.273	0.594	1.27	-1.043	0.658	2.56	0.834	32.4
600S162-68	50	3.526	1.175	2.255	0.218	0.561	3.526	1.175	33.364	5352	2880	32.561	1.174	1.519	-1.025	0.647	2.54	0.837	32.1
600S162-97 <sup>7</sup>	50	4.8	1.6	2.23	0.284	0.543	4.8	1.6	56.42	10472	3806	56.193	3.329	1.936	-0.985	0.624	2.497	0.844	28.9
600S162-118 <sup>7</sup>	50	5.658	1.886	2.21	0.324	0.529	5.658	1.886	68.574	12526	3622	68.575	5.956	2.164	-0.955	0.607	2.465	0.85	28
600S200-33	33	2.075	0.692	2.34	0.209	0.743	1.877	0.626	9.055	638	638	11.085	0.151	1.542	-1.454	0.898	2.854	0.74	50.9
600S200-43	33	2.683	0.894	2.335	0.269	0.739	2.683	0.894	14.053	1415	1240	15.75	0.334	1.967	-1.443	0.891	2.843	0.742	50.8
600S200-54	50	3.32	1.107	2.327	0.329	0.732	3.32	1.107	26.747	2822	1947	27.962	0.655	2.392	-1.429	0.883	2.827	0.745	41
600S200-68	50	4.101	1.367	2.316	0.4	0.724	4.101	1.367	38.533	5352	2880	37.564	1.295	2.886	-1.41	0.872	2.807	0.748	40.7
600S200-97 <sup>7</sup>	50	5.615	1.872	2.294	0.532	0.706	5.615	1.872	64.238	10472	3806	63.928	3.679	3.753	-1.369	0.85	2.763	0.754	37.4
600S200-118 <sup>7</sup>	50	6.646	2.215	2.276	0.615	0.692	6.646	2.215	78.087	12526	3622	78.09	6.595	4.266	-1.339	0.832	2.73	0.76	36.5

For SI: 1 inch = 25.4 mm; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup> mm<sup>3</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>9</sup> mm<sup>4</sup>; 1 inch<sup>6</sup> = 2.69x10<sup>8</sup> mm<sup>6</sup>; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 4—C-SHAPE PROPERTIES<sup>4,5</sup> (Continued)

MEMBER	F <sub>y</sub> (ksi)	GROSS PROPERTIES <sup>3</sup>					EFFECTIVE PROPERTIES <sup>2</sup>						TORSIONAL PROPERTIES <sup>3</sup>						L <sub>u</sub> (in)
		I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>ag</sub> (lb)	V <sub>anet</sub> (lb)	M <sub>ad</sub> (in-k)	J <sub>x1000</sub> (in <sup>4</sup> )	C <sub>w</sub> (in <sup>6</sup> )	X <sub>o</sub> (in)	m (in)	R <sub>o</sub> (in)	β	
600S250-43	33	3.083	1.028	2.396	0.458	0.923	3.083	1.028	15.903	1415	1240	16.503	0.364	3.308	-1.871	1.133	3.177	0.653	61.7
600S250-54	50	3.82	1.273	2.388	0.563	0.917	3.82	1.273	30.305	2822	1947	29.213	0.715	4.037	-1.856	1.125	3.161	0.655	49.8
600S250-68	50	4.728	1.576	2.379	0.689	0.908	4.728	1.576	43.764	5352	2880	39.622	1.416	4.898	-1.836	1.114	3.139	0.658	49.5
600S250-97 <sup>7</sup>	50	6.499	2.166	2.358	0.925	0.889	6.499	2.166	72.542	10472	3806	67.431	4.03	6.443	-1.795	1.091	3.094	0.664	46.2
600S250-118 <sup>7</sup>	50	7.718	2.573	2.342	1.078	0.876	7.718	2.573	88.105	12526	3622	87.359	7.234	7.393	-1.763	1.073	3.06	0.668	45.4
600S300-54	50	4.463	1.488	2.432	0.986	1.144	4.432	1.477	34.454	2822	1947	34.535	0.806	7.89	-2.482	1.48	3.658	0.54	62.7
600S300-68	50	5.535	1.845	2.423	1.215	1.135	5.535	1.845	49.937	5352	2880	46.89	1.597	9.632	-2.463	1.469	3.637	0.541	62.5
600S300-97 <sup>7</sup>	50	7.642	2.547	2.405	1.651	1.118	7.642	2.547	83.852	10472	3806	78.844	4.556	12.854	-2.422	1.447	3.592	0.545	59.1
600S300-118 <sup>7</sup>	50	9.105	3.035	2.391	1.944	1.105	9.105	3.035	101.874	12526	3622	101.491	8.191	14.918	-2.391	1.43	3.557	0.548	58.3
600S350-54	50	5.023	1.674	2.467	1.491	1.344	4.83	1.61	36.774	2822	1947	37.22	0.881	12.634	-3.036	1.787	4.137	0.461	73.7
600S350-68	50	6.238	2.079	2.459	1.842	1.336	6.238	2.079	53.497	5352	2880	50.675	1.748	15.477	-3.017	1.777	4.115	0.462	73.5
600S350-97 <sup>7</sup>	50	8.634	2.878	2.441	2.52	1.319	8.634	2.878	93.561	10472	3806	85.192	4.994	20.809	-2.977	1.755	4.07	0.465	70
600S350-118 <sup>7</sup>	50	10.31	3.437	2.428	2.982	1.306	10.31	3.437	113.643	12526	3622	110.377	8.99	24.293	-2.946	1.738	4.035	0.467	69.3
800S137-33 <sup>1</sup>	33	3.198	0.8	2.873	0.073	0.435	2.729	0.682	9.5	379	-	10.016	0.155	0.91	-0.69	0.453	2.986	0.947	32
800S137-43	33	4.134	1.033	2.866	0.093	0.43	3.943	0.986	14.779	1051	1051	14.505	0.341	1.154	-0.68	0.448	2.977	0.948	31.8
800S137-54	50	5.11	1.278	2.855	0.113	0.424	4.914	1.229	28.061	2091	2091	26.093	0.67	1.386	-0.668	0.44	2.962	0.949	25.4
800S137-68	50	6.304	1.576	2.839	0.134	0.415	6.304	1.576	40.425	4220	3367	36.062	1.325	1.645	-0.65	0.429	2.942	0.951	25
800S137-97 <sup>7</sup>	50	8.601	2.15	2.806	0.171	0.396	8.601	2.15	77.991	10888	5940	66.647	3.767	2.058	-0.614	0.407	2.899	0.955	21.9
800S162-33 <sup>1</sup>	33	3.582	0.896	2.943	0.125	0.55	3.052	0.763	10.613	379	-	12.55	0.165	1.567	-0.931	0.601	3.136	0.912	39.6
800S162-43	33	4.634	1.158	2.937	0.16	0.546	4.414	1.103	16.531	1051	1051	18.096	0.364	1.994	-0.921	0.595	3.126	0.913	39.3
800S162-54	50	5.736	1.434	2.927	0.195	0.539	5.512	1.378	31.455	2091	2091	32.066	0.715	2.415	-0.908	0.587	3.112	0.915	31.7
800S162-68	50	7.091	1.773	2.913	0.235	0.53	7.091	1.773	45.466	4220	3367	43.68	1.416	2.898	-0.89	0.577	3.092	0.917	31.3
800S162-97 <sup>7</sup>	50	9.717	2.429	2.883	0.306	0.512	9.717	2.429	85.917	10888	5940	77.743	4.03	3.717	-0.853	0.555	3.05	0.922	28
800S162-118 <sup>7</sup>	50	11.511	2.878	2.86	0.349	0.498	11.511	2.878	104.966	16239	7117	102.084	7.234	4.177	-0.824	0.538	3.018	0.925	27.1
800S200-33 <sup>1</sup>	33	4.096	1.024	3.023	0.228	0.713	3.481	0.87	12.085	379	-	14.884	0.179	2.878	-1.284	0.813	3.361	0.854	50
800S200-43	33	5.302	1.326	3.018	0.292	0.708	5.039	1.26	18.842	1051	1051	21.375	0.395	3.677	-1.273	0.807	3.351	0.856	49.9
800S200-54	50	6.573	1.643	3.009	0.357	0.701	6.302	1.575	35.911	2091	2091	37.877	0.775	4.48	-1.259	0.799	3.336	0.857	40.2
800S200-68	50	8.142	2.035	2.996	0.435	0.693	8.142	2.035	52.038	4220	3367	51.434	1.537	5.422	-1.241	0.788	3.316	0.86	39.8
800S200-97 <sup>7</sup>	50	11.207	2.802	2.97	0.578	0.674	11.207	2.802	96.41	10888	5940	89.365	4.381	7.094	-1.202	0.766	3.274	0.865	36.4
800S200-118 <sup>7</sup>	50	13.322	3.331	2.95	0.668	0.661	13.322	3.331	117.702	16239	7117	116.377	7.872	8.103	-1.173	0.749	3.243	0.869	35.4
800S250-43	33	6.016	1.504	3.097	0.5	0.893	5.696	1.424	21.25	1051	1051	22.551	0.425	6.188	-1.671	1.039	3.63	0.788	60.9
800S250-54	50	7.466	1.866	3.088	0.615	0.886	7.131	1.783	40.542	2091	2091	39.954	0.836	7.568	-1.656	1.031	3.615	0.79	49.2
800S250-68	50	9.262	2.316	3.077	0.752	0.877	9.262	2.316	58.853	4220	3367	54.588	1.658	9.206	-1.637	1.02	3.594	0.793	48.9
800S250-97 <sup>7</sup>	50	12.793	3.198	3.053	1.011	0.858	12.793	3.198	107.325	10888	5940	94.09	4.731	12.183	-1.596	0.997	3.551	0.798	45.5
800S250-118 <sup>7</sup>	50	15.248	3.812	3.035	1.179	0.844	15.248	3.812	130.836	16239	7117	123.186	8.511	14.044	-1.566	0.979	3.518	0.802	44.5
800S300-54	50	8.658	2.164	3.159	1.085	1.118	8.228	2.057	46.623	2091	2091	47.257	0.927	14.241	-2.241	1.369	4.031	0.691	61.7
800S300-68	50	10.76	2.69	3.149	1.337	1.11	10.76	2.69	67.825	4220	3367	64.575	1.839	17.428	-2.222	1.358	4.01	0.693	61.4
800S300-97 <sup>7</sup>	50	14.917	3.729	3.128	1.819	1.092	14.917	3.729	122.985	10888	5940	109.749	5.257	23.377	-2.181	1.336	3.967	0.698	57.9
800S300-118 <sup>7</sup>	50	17.831	4.458	3.112	2.143	1.079	17.831	4.458	149.904	16239	7117	142.946	9.469	27.239	-2.151	1.319	3.934	0.701	56.9

For SI: 1 inch = 25.4 mm; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>5</sup> mm<sup>4</sup>; 1 inch<sup>6</sup> = 2.69x10<sup>8</sup> mm<sup>6</sup>; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksi = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 4—C-SHAPE PROPERTIES<sup>4,5</sup> (Continued)

MEMBER	F <sub>y</sub> (ksi)	GROSS PROPERTIES <sup>3</sup>					EFFECTIVE PROPERTIES <sup>2</sup>						TORSIONAL PROPERTIES <sup>3</sup>						L <sub>u</sub> (in)
		I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>ag</sub> (lb)	V <sub>anet</sub> (lb)	M <sub>ad</sub> (in-k)	J <sub>x</sub> 1000 (in <sup>4</sup> )	C <sub>w</sub> (in <sup>6</sup> )	X <sub>o</sub> (in)	m (in)	R <sub>o</sub> (in)	β	
800S350-54	50	9.683	2.421	3.212	1.647	1.325	9.105	2.276	51.233	2091	2091	51.048	1.002	22.352	-2.765	1.666	4.44	0.612	72.4
800S350-68	50	12.047	3.012	3.203	2.035	1.316	12.047	3.012	74.68	4220	3367	69.814	1.99	27.443	-2.745	1.655	4.419	0.614	72.1
800S350-97 <sup>7</sup>	50	16.741	4.185	3.183	2.786	1.299	16.741	4.185	136.273	10888	5940	118.108	5.696	37.069	-2.705	1.633	4.375	0.618	68.6
800S350-118 <sup>7</sup>	50	20.048	5.012	3.169	3.3	1.286	20.048	5.012	166.016	16239	7117	154.287	10.267	43.433	-2.675	1.617	4.341	0.62	67.7
1000S162-43 <sup>1</sup>	33	8.026	1.605	3.577	0.168	0.518	7.41	1.482	21.751	669	-	21.104	0.425	3.299	-0.818	0.539	3.706	0.951	38.4
1000S162-54	50	9.951	1.99	3.566	0.205	0.511	9.266	1.853	41.446	1660	1660	37.095	0.836	4	-0.805	0.531	3.691	0.952	30.8
1000S162-68	50	12.327	2.465	3.55	0.247	0.503	12.327	2.465	60.141	3345	3345	52.125	1.658	4.806	-0.788	0.521	3.671	0.954	30.4
1000S162-97 <sup>7</sup>	50	16.971	3.394	3.517	0.322	0.484	16.971	3.394	104.455	9862	7175	87	4.731	6.188	-0.753	0.5	3.629	0.957	29.2
1000S162-118 <sup>7</sup>	50	20.177	4.035	3.491	0.366	0.471	20.177	4.035	147.39	16239	9539	128.006	8.511	6.974	-0.727	0.484	3.597	0.959	26.2
1000S200-43 <sup>1</sup>	33	9.086	1.817	3.676	0.309	0.678	8.375	1.675	24.559	669	-	26.149	0.456	6.043	-1.142	0.738	3.908	0.915	48.9
1000S200-54	50	11.279	2.256	3.666	0.378	0.671	10.487	2.097	46.858	1660	1660	46.262	0.896	7.373	-1.129	0.731	3.894	0.916	39.3
1000S200-68	50	13.996	2.799	3.652	0.46	0.662	13.996	2.799	68.125	3345	3345	63.485	1.779	8.938	-1.111	0.72	3.874	0.918	39
1000S200-97 <sup>7</sup>	50	19.34	3.868	3.622	0.611	0.644	19.34	3.868	124.725	9862	7175	107.168	5.082	11.737	-1.075	0.698	3.833	0.921	36.8
1000S200-118 <sup>7</sup>	50	23.06	4.612	3.6	0.707	0.63	23.06	4.612	163.169	16239	9539	148.192	9.149	13.444	-1.047	0.682	3.802	0.924	34.6
1000S250-43 <sup>1</sup>	33	10.203	2.041	3.771	0.531	0.861	9.384	1.877	27.477	669	-	28.245	0.486	10.184	-1.512	0.96	4.153	0.867	60.2
1000S250-54	50	12.678	2.536	3.762	0.653	0.854	11.761	2.352	52.474	1660	1660	50.053	0.957	12.472	-1.498	0.952	4.138	0.869	48.6
1000S250-68	50	15.753	3.151	3.749	0.8	0.845	15.753	3.151	76.401	3345	3345	68.874	1.899	15.196	-1.48	0.941	4.118	0.871	48.2
1000S250-97 <sup>7</sup>	50	21.832	4.366	3.722	1.075	0.826	21.832	4.366	139.324	9862	7175	116.078	5.433	20.184	-1.441	0.919	4.076	0.875	46
1000S250-118 <sup>7</sup>	50	26.088	5.218	3.702	1.254	0.812	26.088	5.218	179.25	16239	9539	158.802	9.788	23.333	-1.411	0.902	4.044	0.878	43.8
1000S300-54	50	14.588	2.918	3.857	1.162	1.088	13.482	2.696	60.004	1660	1660	59.754	1.047	23.011	-2.047	1.276	4.5	0.793	60.9
1000S300-68	50	18.154	3.631	3.845	1.431	1.08	18.154	3.631	87.59	3345	3345	82.108	2.081	28.205	-2.028	1.265	4.479	0.795	60.6
1000S300-97 <sup>7</sup>	50	25.241	5.048	3.822	1.947	1.061	25.241	5.048	159.146	9862	7175	136.719	5.959	37.959	-1.989	1.243	4.437	0.799	58.3
1000S300-118 <sup>7</sup>	50	30.239	6.048	3.804	2.295	1.048	30.239	6.048	203.542	16239	9539	184.958	10.746	44.344	-1.96	1.227	4.405	0.802	56
1000S350-54	50	16.221	3.244	3.927	1.769	1.297	14.836	2.967	65.578	1660	1660	64.754	1.123	35.72	-2.543	1.563	4.855	0.726	71.7
1000S350-68	50	20.206	4.041	3.917	2.186	1.288	20.206	4.041	95.89	3345	3345	88.976	2.232	43.92	-2.524	1.552	4.835	0.727	71.4
1000S350-97 <sup>7</sup>	50	28.152	5.63	3.895	2.995	1.27	28.152	5.63	169.217	9862	7175	143.76	6.397	59.514	-2.484	1.53	4.792	0.731	70.5
1000S350-118 <sup>7</sup>	50	33.78	6.756	3.879	3.548	1.257	33.78	6.756	223.942	16239	9539	199.228	11.544	69.901	-2.455	1.514	4.759	0.734	66.8
1200S162-54 <sup>1</sup>	50	15.731	2.622	4.19	0.212	0.487	13.674	2.279	48.681	1102	-	41.445	0.957	6.045	-0.724	0.485	4.28	0.971	30.1
1200S162-68	50	19.52	3.253	4.173	0.256	0.478	18.535	3.089	69.976	2770	2770	57.881	1.899	7.27	-0.708	0.475	4.26	0.972	29.6
1200S162-97	50	26.971	4.495	4.137	0.333	0.46	26.971	4.495	119.847	8145	7410	99.383	5.433	9.382	-0.676	0.455	4.217	0.974	28.8
1200S200-54 <sup>1</sup>	50	17.663	2.944	4.306	0.394	0.643	15.356	2.559	54.679	1102	-	52.041	1.017	11.119	-1.025	0.674	4.473	0.948	38.6
1200S200-68	50	21.949	3.658	4.291	0.48	0.634	21.012	3.502	79.751	2770	2770	72.365	2.02	13.492	-1.008	0.663	4.453	0.949	38.2
1200S200-97	50	30.422	5.07	4.259	0.637	0.616	30.422	5.07	138.151	8145	7410	119.377	5.783	17.759	-0.973	0.642	4.412	0.951	37.4
1200S200-118 <sup>7</sup>	50	36.356	6.059	4.234	0.736	0.603	36.356	6.059	193.477	14982	-	163.868	10.427	20.38	-0.947	0.626	4.38	0.953	35.6
1200S250-54 <sup>1</sup>	50	19.681	3.28	4.416	0.683	0.823	17.03	2.838	60.442	1102	-	58.577	1.078	18.843	-1.37	0.885	4.697	0.915	47.9
1200S250-68	50	24.485	4.081	4.402	0.837	0.814	23.347	3.891	88.387	2770	2770	81.21	2.141	22.984	-1.352	0.875	4.677	0.916	47.5
1200S250-97	50	34.021	5.67	4.373	1.124	0.795	34.021	5.67	155.059	8145	7410	133.054	6.134	30.601	-1.315	0.853	4.635	0.92	46.7
1200S250-118 <sup>6,7</sup>	50	40.736	6.789	4.351	1.311	0.781	40.736	6.789	217.266	14982	-	182.467	11.065	35.442	-1.287	0.836	4.604	0.922	44.6
1200S300-54 <sup>1</sup>	50	22.48	3.747	4.533	1.222	1.057	19.365	3.227	68.524	1102	-	71.467	1.168	34.385	-1.887	1.196	5.023	0.859	60.3
1200S300-68	50	28.005	4.667	4.521	1.505	1.048	26.605	4.434	100.481	2770	2770	98.605	2.322	42.191	-1.869	1.186	5.003	0.86	59.9
1200S300-97	50	39.023	6.504	4.495	2.049	1.03	39.023	6.504	177.924	8145	7410	160.269	6.66	56.912	-1.831	1.164	4.961	0.864	59.2
1200S300-118 <sup>6,7</sup>	50	46.827	7.804	4.475	2.415	1.016	46.827	7.804	262.683	14982	-	225.575	12.023	66.604	-1.802	1.147	4.93	0.866	55.2

TABLE 4—C-SHAPE PROPERTIES<sup>4,5</sup> (Continued)

MEMBER	F <sub>y</sub> (ksi)	GROSS PROPERTIES <sup>3</sup>					EFFECTIVE PROPERTIES <sup>2</sup>						TORSIONAL PROPERTIES <sup>3</sup>					L <sub>u</sub> (in)	
		I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>ag</sub> (lb)	V <sub>anet</sub> (lb)	M <sub>ad</sub> (in-k)	Jx1000 (in <sup>4</sup> )	C <sub>w</sub> (in <sup>6</sup> )	X <sub>o</sub> (in)	m (in)	R <sub>o</sub> (in)		β
1200S350-54 <sup>1,6</sup>	50	24.861	4.144	4.62	1.867	1.266	21.29	3.548	75.037	1102	-	78.096	1.244	53.036	-2.358	1.473	5.339	0.805	70.9
1200S350-68 <sup>6</sup>	50	30.998	5.166	4.609	2.307	1.257	29.28	4.88	110.167	2770	-	107.719	2.473	65.279	-2.34	1.463	5.319	0.807	70.6
1200S350-97 <sup>6</sup>	50	43.274	7.212	4.585	3.162	1.239	43.274	7.212	195.648	8145	-	174.844	7.098	88.653	-2.301	1.441	5.277	0.81	69.9
1200S350-118 <sup>6,7</sup>	50	52.002	8.667	4.567	3.746	1.226	52.002	8.667	285.043	14982	-	242.868	12.821	104.303	-2.272	1.424	5.246	0.812	66.2

For SI: 1 inch = 25.4 mm; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>5</sup> mm<sup>4</sup>; 1 inch<sup>6</sup> = 2.69x10<sup>8</sup> mm<sup>6</sup>; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

<sup>1</sup>Web-height to thickness ratio, h/t, exceeds 200. Web Stiffeners designed in accordance with AISI are required at support points and concentrated Loads. Holes/punchouts in the web are outside the scope of this report

<sup>2</sup>The values are for members with punch-outs.

<sup>3</sup>Gross properties are based on the full, unreduced cross-section, away from web punchouts.

<sup>4</sup>Use the effective moment of inertia for deflection calculation.

<sup>5</sup>Allowable moment is lesser of M<sub>a</sub> and M<sub>ad</sub>. Distortional buckling is based on an assumed KΦ = 0.

<sup>6</sup>These members are available un-punched only.

<sup>7</sup>Stress increase due to cold work of forming was incorporated in the provided effective section properties and allowable moment capacities.

**SYMBOLS**

I<sub>x</sub> = Strong axis moment of inertia  
 S<sub>x</sub> = Strong axis section modulus  
 R<sub>x</sub> = Strong axis radius of gyration  
 I<sub>y</sub> = Weak axis moment of inertia  
 R<sub>y</sub> = Weak axis radius of gyration

M<sub>a</sub> = Strong axis allowable bending moment  
 V<sub>ag</sub> = Allowable shear of unpunched web section  
 V<sub>anet</sub> = Allowable shear of punched web section  
 L<sub>u</sub> = Unbraced length based on gross section

M<sub>ad</sub> = Allowable moment based on distortional buckling  
 J = St. Venant torsion constant  
 C<sub>w</sub> = Torsional warping constant  
 X<sub>o</sub> = Distance from shear center to the centroid along the principal X-axis

m = Distance from shear center to mid-plane of web  
 R<sub>o</sub> = Torsional radii of gyration  
 β = Torsional flexural constant

TABLE 5—TRACK PROPERTIES<sup>3</sup>

MEMBER	F <sub>y</sub> (ksi)	GROSS <sup>2</sup>					EFFECTIVE PROPERTIES				TORSIONAL PROPERTIES					
		I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>ag</sub> (lb)	Jx1000 (in <sup>4</sup> )	C <sub>w</sub> (in <sup>6</sup> )	X <sub>o</sub> (in)	m (in)	R <sub>o</sub> (in)	β
250T125-33	33	0.192	0.145	1.054	0.027	0.397	0.166	0.103	2.03	1024	0.069	0.033	-0.760	0.456	1.358	0.687
250T125-43	33	0.250	0.188	1.055	0.035	0.395	0.231	0.147	2.91	1356	0.153	0.042	-0.755	0.453	1.356	0.690
250T125-54	50	0.318	0.236	1.062	0.043	0.392	0.297	0.188	5.64	2563	0.301	0.054	-0.749	0.449	1.357	0.696
250T125-68	50	0.408	0.297	1.072	0.054	0.389	0.402	0.262	7.85	3199	0.602	0.069	-0.740	0.444	1.360	0.704
250T125-97	50	0.604	0.423	1.092	0.074	0.383	0.604	0.423	12.67	4476	1.745	0.101	-0.724	0.434	1.365	0.719
250T150-33	33	0.221	0.167	1.079	0.045	0.485	0.179	0.107	2.11	1024	0.076	0.054	-0.973	0.573	1.532	0.596
250T150-43	33	0.289	0.217	1.080	0.058	0.483	0.252	0.154	3.03	1356	0.168	0.070	-0.968	0.570	1.529	0.599
250T150-54	50	0.368	0.273	1.088	0.072	0.481	0.325	0.197	5.89	2563	0.332	0.089	-0.961	0.566	1.529	0.605
250T150-68	50	0.472	0.344	1.099	0.089	0.478	0.445	0.276	8.27	3199	0.663	0.114	-0.953	0.561	1.531	0.613
250T150-97	50	0.701	0.491	1.121	0.124	0.471	0.701	0.463	13.86	4476	1.921	0.168	-0.935	0.550	1.534	0.629
250T200-33	33	0.280	0.212	1.117	0.097	0.658	0.203	0.112	2.22	1024	0.090	0.118	-1.418	0.813	1.921	0.455
250T200-43	33	0.366	0.275	1.118	0.126	0.657	0.288	0.163	3.21	1356	0.198	0.153	-1.413	0.810	1.918	0.457
250T200-54	50	0.466	0.346	1.127	0.157	0.654	0.371	0.209	6.25	2563	0.392	0.195	-1.405	0.806	1.917	0.462
250T200-68	50	0.600	0.437	1.139	0.196	0.652	0.517	0.296	8.86	3199	0.783	0.251	-1.396	0.800	1.916	0.469
250T200-97	50	0.893	0.626	1.165	0.275	0.646	0.856	0.510	15.27	4476	2.271	0.374	-1.376	0.789	1.915	0.484
250T250-43	33	0.443	0.333	1.146	0.230	0.826	0.318	0.169	3.34	1356	0.229	0.283	-1.873	1.053	2.346	0.362
250T250-54	50	0.565	0.419	1.155	0.287	0.824	0.410	0.217	6.50	2563	0.453	0.361	-1.865	1.049	2.343	0.366
250T250-68	50	0.728	0.530	1.168	0.360	0.821	0.576	0.310	9.27	3199	0.904	0.466	-1.855	1.043	2.341	0.372
250T250-97	50	1.086	0.761	1.195	0.506	0.815	0.972	0.541	16.20	4476	2.622	0.696	-1.834	1.031	2.336	0.384
350T125-33	33	0.405	0.222	1.397	0.030	0.379	0.354	0.165	3.27	1024	0.083	0.070	-0.668	0.414	1.594	0.824
350T125-43	33	0.528	0.288	1.397	0.038	0.377	0.490	0.233	4.61	1739	0.183	0.090	-0.663	0.412	1.592	0.826
350T125-54	50	0.668	0.361	1.404	0.048	0.375	0.626	0.297	8.89	3372	0.362	0.114	-0.658	0.408	1.595	0.830
350T125-68	50	0.851	0.454	1.412	0.059	0.372	0.839	0.407	12.18	4536	0.723	0.144	-0.650	0.403	1.599	0.835
350T125-97	50	1.243	0.645	1.430	0.081	0.366	1.243	0.645	19.30	6383	2.096	0.209	-0.636	0.394	1.607	0.844
350T150-33	33	0.461	0.253	1.432	0.049	0.469	0.382	0.171	3.39	1024	0.090	0.114	-0.866	0.527	1.738	0.752
350T150-43	33	0.601	0.328	1.433	0.064	0.467	0.531	0.243	4.80	1739	0.198	0.148	-0.861	0.525	1.736	0.754
350T150-54	50	0.761	0.412	1.440	0.079	0.465	0.679	0.310	9.28	3372	0.392	0.187	-0.855	0.521	1.738	0.758
350T150-68	50	0.972	0.518	1.450	0.099	0.462	0.919	0.428	12.81	4536	0.783	0.238	-0.847	0.516	1.741	0.763
350T150-97	50	1.422	0.738	1.469	0.136	0.455	1.422	0.701	20.98	6383	2.271	0.346	-0.831	0.506	1.748	0.774
350T200-33	33	0.574	0.315	1.487	0.108	0.647	0.428	0.181	3.57	1024	0.103	0.249	-1.285	0.761	2.069	0.614
350T200-43	33	0.749	0.409	1.489	0.140	0.645	0.600	0.257	5.09	1739	0.229	0.323	-1.280	0.758	2.066	0.616
350T200-54	50	0.949	0.513	1.496	0.175	0.642	0.770	0.329	9.85	3372	0.453	0.409	-1.273	0.754	2.067	0.621
350T200-68	50	1.213	0.647	1.508	0.218	0.639	1.054	0.458	13.71	4536	0.904	0.522	-1.264	0.749	2.069	0.626
350T200-97	50	1.780	0.923	1.530	0.305	0.633	1.708	0.769	23.01	6383	2.622	0.765	-1.247	0.738	2.073	0.638
350T250-43	33	0.896	0.490	1.530	0.257	0.819	0.659	0.268	5.29	1739	0.260	0.593	-1.719	0.996	2.443	0.505
350T250-54	50	1.137	0.615	1.538	0.321	0.817	0.846	0.343	10.26	3372	0.513	0.752	-1.712	0.992	2.442	0.509
350T250-68	50	1.454	0.776	1.550	0.401	0.814	1.168	0.479	14.35	4536	1.025	0.961	-1.703	0.987	2.443	0.514
350T250-97	50	2.139	1.109	1.575	0.563	0.808	1.924	0.815	24.39	6383	2.973	1.413	-1.684	0.975	2.443	0.525

For SI: 1 inch = 25.4 mm; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>5</sup> mm<sup>4</sup>; 1 inch<sup>6</sup> = 2.69x10<sup>8</sup> mm<sup>6</sup>; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksi = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 5—TRACK PROPERTIES<sup>3</sup> (Continued)

MEMBER	F <sub>y</sub> (ksi)	GROSS <sup>2</sup>					EFFECTIVE PROPERTIES				TORSIONAL PROPERTIES					
		I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>ag</sub> (lb)	Jx1000 (in <sup>4</sup> )	C <sub>w</sub> (in <sup>6</sup> )	X <sub>o</sub> (in)	m (in)	R <sub>o</sub> (in)	β
362T125-33	33	0.438	0.232	1.438	0.030	0.377	0.384	0.174	3.44	1024	0.085	0.076	-0.658	0.409	1.626	0.836
362T125-43	33	0.571	0.302	1.439	0.039	0.375	0.531	0.245	4.84	1739	0.187	0.098	-0.654	0.407	1.625	0.838
362T125-54	50	0.723	0.378	1.445	0.048	0.373	0.678	0.312	9.34	3372	0.369	0.123	-0.648	0.404	1.627	0.841
362T125-68	50	0.921	0.475	1.454	0.060	0.370	0.907	0.427	12.78	4703	0.738	0.156	-0.641	0.399	1.631	0.846
362T125-97	50	1.343	0.675	1.471	0.082	0.363	1.343	0.675	20.20	6622	2.140	0.226	-0.626	0.390	1.639	0.854
362T125-118	50	1.666	0.821	1.483	0.097	0.358	1.666	0.821	28.24	8008	3.894	0.278	-0.615	0.383	1.645	0.860
362T150-33	33	0.499	0.264	1.475	0.050	0.467	0.414	0.180	3.56	1024	0.091	0.124	-0.854	0.522	1.767	0.766
362T150-43	33	0.650	0.343	1.476	0.064	0.465	0.574	0.255	5.04	1739	0.202	0.160	-0.850	0.519	1.766	0.768
362T150-54	50	0.823	0.431	1.483	0.080	0.462	0.735	0.325	9.74	3372	0.400	0.202	-0.844	0.516	1.768	0.772
362T150-68	50	1.050	0.542	1.492	0.099	0.459	0.993	0.449	13.43	4703	0.799	0.257	-0.836	0.511	1.771	0.777
362T150-97	50	1.534	0.771	1.512	0.138	0.453	1.534	0.733	21.94	6622	2.315	0.374	-0.820	0.501	1.778	0.787
362T150-118	50	1.907	0.939	1.525	0.165	0.448	1.907	0.939	31.65	8008	4.214	0.462	-0.808	0.494	1.784	0.795
362T200-33	33	0.619	0.328	1.532	0.110	0.645	0.464	0.190	3.76	1024	0.105	0.269	-1.270	0.754	2.092	0.631
362T200-43	33	0.808	0.427	1.534	0.142	0.643	0.649	0.270	5.34	1739	0.233	0.350	-1.265	0.752	2.090	0.633
362T200-54	50	1.024	0.536	1.541	0.177	0.640	0.832	0.345	10.34	3372	0.460	0.442	-1.259	0.748	2.091	0.637
362T200-68	50	1.307	0.675	1.552	0.221	0.638	1.138	0.480	14.37	4703	0.919	0.564	-1.250	0.743	2.093	0.643
362T200-97	50	1.917	0.963	1.575	0.308	0.631	1.839	0.803	24.06	6622	2.666	0.825	-1.232	0.732	2.097	0.655
362T200-118	50	2.388	1.176	1.591	0.371	0.627	2.388	1.072	32.09	8008	4.852	1.026	-1.219	0.724	2.100	0.663
362T250-43	33	0.966	0.510	1.577	0.260	0.818	0.713	0.281	5.56	1739	0.263	0.641	-1.702	0.990	2.460	0.521
362T250-54	50	1.224	0.641	1.585	0.324	0.816	0.914	0.360	10.77	3372	0.521	0.812	-1.695	0.986	2.460	0.525
362T250-68	50	1.565	0.808	1.597	0.406	0.813	1.259	0.502	15.04	4703	1.040	1.038	-1.686	0.980	2.460	0.530
362T250-97	50	2.300	1.155	1.621	0.570	0.807	2.069	0.851	25.49	6622	3.016	1.524	-1.667	0.969	2.461	0.541
362T250-118	50	2.868	1.413	1.639	0.688	0.802	2.732	1.149	34.41	8008	5.491	1.900	-1.653	0.961	2.462	0.549
362T300-54	50	1.425	0.746	1.619	0.531	0.988	0.995	0.371	11.11	3372	0.581	1.337	-2.146	1.227	2.863	0.439
362T300-68	50	1.823	0.941	1.631	0.665	0.985	1.364	0.519	15.55	4703	1.161	1.711	-2.136	1.221	2.862	0.443
362T300-97	50	2.682	1.348	1.657	0.937	0.979	2.269	0.887	26.55	6622	3.367	2.518	-2.116	1.209	2.860	0.453
362T300-118	50	3.349	1.650	1.676	1.133	0.975	3.022	1.205	36.09	8008	6.130	3.145	-2.101	1.201	2.859	0.460
400T125-33	33	0.549	0.265	1.563	0.031	0.371	0.484	0.201	3.97	940	0.090	0.095	-0.630	0.396	1.725	0.867
400T125-43	33	0.716	0.344	1.563	0.040	0.369	0.666	0.282	5.57	1739	0.198	0.122	-0.626	0.394	1.724	0.868
400T125-54	50	0.904	0.431	1.569	0.049	0.366	0.849	0.359	10.74	3372	0.392	0.154	-0.621	0.390	1.727	0.871
400T125-68	50	1.150	0.541	1.577	0.061	0.363	1.134	0.488	14.62	5205	0.783	0.194	-0.614	0.386	1.731	0.874
400T125-97	50	1.673	0.768	1.594	0.084	0.357	1.673	0.768	23.00	7337	2.271	0.280	-0.600	0.377	1.740	0.881
400T125-118	50	2.072	0.934	1.605	0.100	0.352	2.072	0.934	32.14	8881	4.134	0.343	-0.589	0.370	1.746	0.886
400T150-33	33	0.622	0.300	1.603	0.051	0.460	0.519	0.208	4.12	940	0.097	0.155	-0.821	0.507	1.859	0.805
400T150-43	33	0.811	0.390	1.604	0.066	0.458	0.719	0.293	5.80	1739	0.214	0.200	-0.817	0.504	1.857	0.807
400T150-54	50	1.025	0.489	1.610	0.082	0.456	0.918	0.374	11.19	3372	0.422	0.252	-0.811	0.501	1.860	0.810
400T150-68	50	1.306	0.615	1.619	0.102	0.453	1.237	0.513	15.35	5205	0.844	0.320	-0.804	0.496	1.864	0.814
400T150-97	50	1.903	0.874	1.638	0.141	0.447	1.903	0.832	24.92	7337	2.447	0.463	-0.788	0.487	1.872	0.823
400T150-118	50	2.360	1.064	1.651	0.169	0.442	2.360	1.064	35.86	8881	4.453	0.572	-0.777	0.479	1.877	0.829
400T200-33	33	0.768	0.371	1.666	0.113	0.639	0.581	0.220	4.34	940	0.110	0.336	-1.229	0.737	2.166	0.678
400T200-43	33	1.002	0.482	1.668	0.146	0.637	0.811	0.311	6.14	1739	0.244	0.436	-1.224	0.734	2.164	0.680
400T200-54	50	1.268	0.604	1.675	0.182	0.635	1.037	0.397	11.88	3372	0.483	0.551	-1.217	0.730	2.165	0.684
400T200-68	50	1.617	0.761	1.685	0.227	0.632	1.412	0.549	16.42	5205	0.965	0.702	-1.209	0.725	2.168	0.689
400T200-97	50	2.363	1.085	1.707	0.317	0.625	2.268	0.911	27.28	7337	2.797	1.022	-1.192	0.715	2.173	0.699
400T200-118	50	2.937	1.325	1.722	0.381	0.621	2.937	1.211	36.25	8881	5.092	1.268	-1.179	0.707	2.177	0.707

For SI: 1 inch = 25.4 mm; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>5</sup> mm<sup>4</sup>; 1 inch<sup>6</sup> = 2.69x10<sup>8</sup> mm<sup>6</sup>; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 5—TRACK PROPERTIES<sup>3</sup> (Continued)

MEMBER	F <sub>y</sub> (ksi)	GROSS <sup>2</sup>					EFFECTIVE PROPERTIES					TORSIONAL PROPERTIES					
		I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>ag</sub> (lb)	Jx1000 (in <sup>4</sup> )	C <sub>w</sub> (in <sup>6</sup> )	X <sub>o</sub> (in)	m (in)	R <sub>o</sub> (in)	β	
400T250-43	33	1.193	0.573	1.715	0.268	0.813	0.888	0.324	6.40	1739	0.275	0.799	-1.653	0.970	2.517	0.569	
400T250-54	50	1.511	0.720	1.723	0.335	0.811	1.137	0.413	12.38	3372	0.543	1.011	-1.646	0.966	2.517	0.572	
400T250-68	50	1.928	0.907	1.735	0.418	0.808	1.559	0.574	17.19	5205	1.086	1.289	-1.637	0.961	2.518	0.578	
400T250-97	50	2.823	1.296	1.758	0.587	0.802	2.546	0.965	28.89	7337	3.148	1.886	-1.618	0.950	2.521	0.588	
400T250-118	50	3.514	1.585	1.776	0.709	0.798	3.349	1.297	38.84	8881	5.730	2.345	-1.605	0.942	2.523	0.595	
400T300-54	50	1.754	0.835	1.761	0.548	0.985	1.244	0.427	12.77	3372	0.604	1.662	-2.090	1.206	2.905	0.482	
400T300-68	50	2.239	1.054	1.774	0.686	0.982	1.687	0.594	17.78	5205	1.206	2.122	-2.081	1.200	2.905	0.487	
400T300-97	50	3.284	1.508	1.799	0.967	0.976	2.786	1.005	30.09	7337	3.499	3.111	-2.061	1.189	2.905	0.496	
400T300-118	50	4.091	1.845	1.817	1.170	0.972	3.696	1.360	40.72	8881	6.369	3.876	-2.047	1.180	2.904	0.503	
550T125-33	33	1.159	0.410	2.046	0.033	0.346	1.029	0.270	5.33	680	0.110	0.195	-0.541	0.350	2.145	0.936	
550T125-43	33	1.510	0.533	2.047	0.043	0.344	1.428	0.416	8.23	1504	0.244	0.252	-0.537	0.348	2.144	0.937	
550T125-54	50	1.903	0.668	2.052	0.053	0.342	1.811	0.535	16.01	2980	0.483	0.315	-0.532	0.345	2.147	0.939	
550T125-68	50	2.412	0.839	2.058	0.066	0.339	2.379	0.769	23.02	5350	0.965	0.397	-0.526	0.341	2.152	0.940	
550T125-97	50	3.483	1.190	2.072	0.090	0.333	3.483	1.190	35.62	10197	2.797	0.564	-0.514	0.333	2.161	0.943	
550T150-33	33	1.295	0.459	2.099	0.055	0.434	1.115	0.310	6.12	680	0.117	0.320	-0.714	0.455	2.259	0.900	
550T150-43	33	1.688	0.596	2.099	0.072	0.432	1.516	0.468	9.25	1504	0.260	0.414	-0.709	0.452	2.258	0.901	
550T150-54	50	2.128	0.747	2.105	0.089	0.430	1.928	0.595	17.81	2980	0.513	0.519	-0.704	0.449	2.261	0.903	
550T150-68	50	2.699	0.939	2.112	0.110	0.427	2.569	0.804	24.07	5350	1.025	0.655	-0.698	0.445	2.265	0.905	
550T150-97	50	3.904	1.333	2.128	0.153	0.421	3.904	1.278	38.27	10197	2.973	0.937	-0.684	0.436	2.275	0.909	
550T200-33	33	1.567	0.555	2.184	0.123	0.613	1.246	0.307	6.06	680	0.131	0.694	-1.088	0.674	2.516	0.813	
550T200-43	33	2.043	0.722	2.185	0.160	0.611	1.690	0.495	9.79	1504	0.290	0.900	-1.083	0.671	2.514	0.814	
550T200-54	50	2.578	0.905	2.191	0.199	0.609	2.153	0.630	18.86	2980	0.573	1.133	-1.077	0.668	2.517	0.817	
550T200-68	50	3.274	1.139	2.200	0.248	0.606	2.894	0.857	25.67	5350	1.146	1.434	-1.070	0.663	2.521	0.820	
550T200-97	50	4.746	1.621	2.219	0.347	0.600	4.566	1.391	41.64	10197	3.323	2.067	-1.055	0.653	2.529	0.826	
550T250-43	33	2.399	0.848	2.252	0.295	0.790	1.841	0.516	10.20	1504	0.321	1.643	-1.484	0.899	2.810	0.721	
550T250-54	50	3.029	1.063	2.259	0.368	0.788	2.405	0.657	19.66	2980	0.634	2.070	-1.478	0.895	2.812	0.724	
550T250-68	50	3.849	1.339	2.269	0.460	0.785	3.201	0.897	26.86	5350	1.267	2.627	-1.470	0.890	2.815	0.727	
550T250-97	50	5.588	1.908	2.290	0.646	0.779	5.073	1.470	44.01	10197	3.674	3.801	-1.453	0.880	2.822	0.735	
600T125-33	33	1.428	0.465	2.204	0.034	0.339	1.258	0.297	5.87	622	0.117	0.238	-0.516	0.337	2.289	0.949	
600T125-43	33	1.861	0.604	2.205	0.044	0.337	1.768	0.461	9.11	1377	0.260	0.307	-0.513	0.335	2.288	0.950	
600T125-54	50	2.344	0.756	2.209	0.054	0.335	2.241	0.592	17.73	2728	0.513	0.384	-0.508	0.332	2.291	0.951	
600T125-68	50	2.969	0.950	2.215	0.067	0.332	2.934	0.858	25.69	5350	1.025	0.483	-0.503	0.329	2.296	0.952	
600T125-97	50	4.281	1.347	2.228	0.092	0.326	4.281	1.347	40.33	10885	2.973	0.685	-0.491	0.321	2.305	0.955	
600T125-118	50	5.268	1.637	2.237	0.109	0.322	5.268	1.637	56.32	13539	5.411	0.832	-0.483	0.315	2.311	0.956	
600T150-33	33	1.590	0.517	2.260	0.057	0.426	1.334	0.303	5.99	622	0.124	0.390	-0.684	0.439	2.399	0.919	
600T150-43	33	2.072	0.673	2.261	0.073	0.424	1.890	0.474	9.36	1377	0.275	0.504	-0.680	0.437	2.398	0.920	
600T150-54	50	2.611	0.843	2.266	0.091	0.422	2.400	0.609	18.24	2728	0.543	0.632	-0.675	0.434	2.401	0.921	
600T150-68	50	3.309	1.059	2.273	0.113	0.419	3.162	0.891	26.68	5350	1.086	0.797	-0.669	0.430	2.406	0.923	
600T150-97	50	4.778	1.504	2.288	0.156	0.413	4.778	1.444	43.23	10885	3.148	1.138	-0.656	0.421	2.415	0.926	
600T150-118	50	5.886	1.829	2.298	0.186	0.409	5.886	1.829	61.64	13539	5.730	1.389	-0.647	0.415	2.422	0.929	

For SI: 1 inch = 25.4 mm; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>5</sup> mm<sup>4</sup>; 1 inch<sup>6</sup> = 2.69x10<sup>8</sup> mm<sup>6</sup>; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 5—TRACK PROPERTIES<sup>3</sup> (Continued)

MEMBER	F <sub>y</sub> (ksi)	GROSS <sup>2</sup>					EFFECTIVE PROPERTIES					TORSIONAL PROPERTIES					
		I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>ag</sub> (lb)	Jx1000 (in <sup>4</sup> )	C <sub>w</sub> (in <sup>6</sup> )	X <sub>o</sub> (in)	m (in)	R <sub>o</sub> (in)	β	
600T200-33	33	1.913	0.622	2.352	0.126	0.604	1.542	0.333	6.59	622	0.138	0.847	-1.048	0.655	2.645	0.843	
600T200-43	33	2.494	0.809	2.353	0.163	0.602	2.076	0.565	11.16	1377	0.305	1.098	-1.044	0.652	2.643	0.844	
600T200-54	50	3.145	1.015	2.359	0.203	0.600	2.641	0.717	21.48	2728	0.604	1.381	-1.038	0.649	2.646	0.846	
600T200-68	50	3.990	1.277	2.367	0.254	0.597	3.540	0.973	29.12	5350	1.206	1.746	-1.031	0.644	2.650	0.849	
600T200-97	50	5.773	1.816	2.385	0.354	0.591	5.558	1.568	46.94	10885	3.499	2.510	-1.016	0.635	2.659	0.854	
600T200-118	50	7.122	2.214	2.398	0.426	0.586	7.122	2.051	61.42	13539	6.369	3.083	-1.006	0.628	2.665	0.858	
600T250-43	33	2.916	0.946	2.425	0.303	0.781	2.322	0.563	11.13	1377	0.336	2.004	-1.436	0.878	2.925	0.759	
600T250-54	50	3.678	1.187	2.432	0.377	0.779	2.953	0.732	21.92	2728	0.664	2.523	-1.430	0.874	2.927	0.761	
600T250-68	50	4.670	1.495	2.442	0.472	0.776	3.918	1.017	30.46	5350	1.327	3.198	-1.422	0.869	2.930	0.764	
600T250-97	50	6.767	2.129	2.462	0.662	0.770	6.157	1.656	49.58	10885	3.849	4.616	-1.406	0.859	2.938	0.771	
600T250-118	50	8.359	2.598	2.477	0.798	0.765	7.990	2.188	65.51	13539	7.008	5.686	-1.394	0.852	2.943	0.776	
600T300-54	50	4.212	1.359	2.492	0.622	0.957	3.186	0.722	21.61	2728	0.725	4.129	-1.842	1.105	3.243	0.677	
600T300-68	50	5.351	1.712	2.502	0.778	0.955	4.238	1.053	31.53	5350	1.448	5.239	-1.834	1.100	3.246	0.681	
600T300-97	50	7.762	2.442	2.524	1.096	0.948	6.682	1.724	51.62	10885	4.200	7.583	-1.816	1.089	3.251	0.688	
600T300-118	50	9.595	2.982	2.540	1.325	0.944	8.734	2.291	68.59	13539	7.646	9.359	-1.803	1.082	3.255	0.693	
800T125-33 <sup>1</sup>	33	2.895	0.711	2.824	0.036	0.313	2.441	0.407	8.03	465	0.145	0.456	-0.439	0.294	2.875	0.977	
800T125-43	33	3.773	0.924	2.824	0.046	0.311	3.484	0.640	12.65	1030	0.321	0.589	-0.436	0.292	2.874	0.977	
800T125-54	50	4.745	1.158	2.827	0.057	0.309	4.426	0.824	24.66	2039	0.634	0.735	-0.432	0.289	2.877	0.977	
800T125-68	50	5.998	1.454	2.833	0.070	0.306	5.956	1.216	36.39	4087	1.267	0.920	-0.427	0.286	2.881	0.978	
800T125-97	50	8.613	2.062	2.843	0.096	0.301	8.613	2.062	61.72	10885	3.674	1.296	-0.417	0.279	2.889	0.979	
800T125-118	50	10.569	2.506	2.850	0.114	0.297	10.569	2.506	86.21	16235	6.688	1.567	-0.410	0.274	2.895	0.980	
800T150-33 <sup>1</sup>	33	3.180	0.781	2.891	0.060	0.397	2.569	0.414	8.18	465	0.152	0.751	-0.588	0.388	2.977	0.961	
800T150-43	33	4.144	1.015	2.891	0.077	0.395	3.689	0.655	12.95	1030	0.336	0.972	-0.584	0.386	2.976	0.961	
800T150-54	50	5.214	1.272	2.896	0.096	0.393	4.692	0.844	25.27	2039	0.664	1.215	-0.580	0.383	2.979	0.962	
800T150-68	50	6.594	1.599	2.902	0.119	0.390	6.361	1.255	37.58	4087	1.327	1.526	-0.575	0.379	2.984	0.963	
800T150-97	50	9.479	2.269	2.914	0.165	0.384	9.479	2.192	65.62	10885	3.849	2.162	-0.564	0.372	2.993	0.965	
800T150-118	50	11.641	2.760	2.923	0.197	0.380	11.641	2.760	93.00	16235	7.008	2.627	-0.555	0.366	2.999	0.966	
800T200-33 <sup>1</sup>	33	3.749	0.921	3.005	0.135	0.571	2.788	0.424	8.37	465	0.166	1.638	-0.917	0.589	3.194	0.918	
800T200-43	33	4.887	1.197	3.006	0.175	0.569	4.043	0.676	13.35	1030	0.367	2.124	-0.913	0.587	3.193	0.918	
800T200-54	50	6.152	1.501	3.011	0.218	0.567	5.149	0.871	26.09	2039	0.725	2.664	-0.908	0.584	3.196	0.919	
800T200-68	50	7.786	1.888	3.019	0.272	0.564	7.051	1.310	39.22	4087	1.448	3.357	-0.902	0.580	3.201	0.921	
800T200-97	50	11.212	2.683	3.034	0.379	0.558	10.833	2.347	70.27	10885	4.200	4.792	-0.889	0.571	3.210	0.923	
800T200-118	50	13.785	3.269	3.045	0.455	0.553	13.785	3.059	91.59	16235	7.646	5.854	-0.879	0.565	3.217	0.925	
800T250-43	33	5.629	1.380	3.100	0.326	0.746	4.655	0.739	14.60	1030	0.397	3.877	-1.274	0.801	3.433	0.862	
800T250-54	50	7.090	1.730	3.106	0.407	0.744	5.902	0.959	28.71	2039	0.785	4.870	-1.268	0.798	3.436	0.864	
800T250-68	50	8.978	2.177	3.114	0.509	0.741	7.756	1.560	46.72	4087	1.569	6.151	-1.261	0.793	3.441	0.866	
800T250-97	50	12.944	3.098	3.132	0.713	0.735	11.872	2.487	74.47	10885	4.550	8.818	-1.247	0.784	3.450	0.869	
800T250-118	50	15.930	3.777	3.144	0.860	0.731	15.272	3.248	97.26	16235	8.285	10.807	-1.236	0.777	3.457	0.872	
800T300-54	50	8.0278	1.9585	3.1843	0.6745	0.923	6.3363	0.9559	28.62	2039	0.8454	7.9602	-1.652	1.02	3.704	0.801	
800T300-68	50	10.171	2.466	3.194	0.844	0.920	8.345	1.548	46.36	4087	1.690	10.067	-1.644	1.015	3.708	0.803	
800T300-97	50	14.676	3.513	3.213	1.188	0.914	12.862	2.586	77.43	10885	4.901	14.473	-1.628	1.006	3.716	0.808	
800T300-118	50	18.074	4.286	3.227	1.436	0.910	16.563	3.394	101.63	16235	8.924	17.775	-1.617	0.998	3.722	0.811	

For SI: 1 inch = 25.4 mm; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>5</sup> mm<sup>4</sup>; 1 inch<sup>6</sup> = 2.69x10<sup>8</sup> mm<sup>6</sup>; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.



TABLE 5—TRACK PROPERTIES<sup>3</sup> (Continued)

MEMBER	F <sub>y</sub> (ksi)	GROSS <sup>2</sup>					EFFECTIVE PROPERTIES				TORSIONAL PROPERTIES					
		I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>ag</sub> (lb)	Jx1000 (in <sup>4</sup> )	C <sub>w</sub> (in <sup>6</sup> )	X <sub>o</sub> (in)	m (in)	R <sub>o</sub> (in)	β
1000T125-43 <sup>1</sup>	33	6.630	1.305	3.431	0.047	0.290	5.886	0.819	16.19	822	0.382	0.973	-0.379	0.259	3.464	0.988
1000T125-54	50	8.333	1.634	3.434	0.059	0.288	7.479	1.055	31.59	1628	0.755	1.212	-0.376	0.256	3.466	0.988
1000T125-68	50	10.522	2.053	3.438	0.073	0.286	10.155	1.575	47.15	3261	1.508	1.515	-0.372	0.253	3.470	0.989
1000T125-97	50	15.077	2.912	3.447	0.100	0.280	15.077	2.753	82.42	9507	4.375	2.123	-0.363	0.247	3.477	0.989
1000T125-118	50	18.471	3.540	3.453	0.118	0.276	18.471	3.535	105.85	16235	7.966	2.558	-0.357	0.243	3.482	0.990
1000T150-43 <sup>1</sup>	33	7.207	1.419	3.507	0.080	0.370	6.195	0.837	16.54	822	0.397	1.612	-0.513	0.345	3.564	0.979
1000T150-54	50	9.061	1.777	3.511	0.100	0.368	7.880	1.079	32.29	1628	0.785	2.013	-0.509	0.342	3.567	0.980
1000T150-68	50	11.445	2.233	3.516	0.124	0.366	10.774	1.621	48.53	3261	1.569	2.522	-0.505	0.339	3.571	0.980
1000T150-97	50	16.413	3.170	3.526	0.171	0.360	16.413	2.902	86.90	9507	4.550	3.557	-0.495	0.332	3.579	0.981
1000T150-118	50	20.121	3.857	3.534	0.204	0.356	20.121	3.852	115.32	16235	8.285	4.307	-0.488	0.328	3.585	0.982
1000T200-43 <sup>1</sup>	33	8.361	1.646	3.640	0.183	0.539	6.722	0.861	17.01	822	0.428	3.540	-0.813	0.534	3.769	0.953
1000T200-54	50	10.516	2.062	3.645	0.228	0.537	8.560	1.111	33.26	1628	0.845	4.434	-0.809	0.531	3.772	0.954
1000T200-68	50	13.292	2.594	3.651	0.284	0.534	11.820	1.684	50.42	3261	1.690	5.576	-0.803	0.527	3.776	0.955
1000T200-97	50	19.087	3.686	3.664	0.397	0.528	18.583	3.081	92.25	9507	4.901	7.924	-0.791	0.519	3.786	0.956
1000T200-118	50	23.422	4.489	3.674	0.476	0.524	23.422	4.208	125.99	16235	8.924	9.649	-0.783	0.514	3.793	0.957
1000T250-43 <sup>1</sup>	33	9.515	1.873	3.751	0.344	0.713	7.283	0.876	17.32	822	0.458	6.477	-1.147	0.737	3.987	0.917
1000T250-54	50	11.972	2.348	3.757	0.429	0.711	9.309	1.132	33.89	1628	0.906	8.125	-1.142	0.734	3.990	0.918
1000T250-68	50	15.138	2.954	3.764	0.536	0.708	12.867	1.726	51.68	3261	1.810	10.240	-1.135	0.730	3.995	0.919
1000T250-97	50	21.760	4.202	3.780	0.751	0.702	20.304	3.201	95.84	9507	5.252	14.617	-1.122	0.721	4.005	0.921
1000T250-118	50	26.723	5.122	3.791	0.905	0.698	25.734	4.422	132.38	16235	9.562	17.858	-1.112	0.715	4.012	0.923
1000T300-54	50	13.427	2.633	3.852	0.714	0.888	10.940	1.191	35.65	1628	0.966	13.289	-1.500	0.947	4.228	0.874
1000T300-68	50	16.985	3.314	3.860	0.894	0.885	14.316	1.904	57.01	3261	1.931	16.771	-1.493	0.943	4.233	0.876
1000T300-97	50	24.434	4.719	3.878	1.257	0.879	21.816	3.589	107.45	9507	5.602	24.009	-1.478	0.934	4.242	0.879
1000T300-118	50	30.024	5.755	3.890	1.519	0.875	27.760	4.668	139.76	16235	10.201	29.395	-1.468	0.927	4.249	0.881
1200T125-54 <sup>1</sup>	50	13.335	2.186	4.033	0.060	0.271	11.460	1.286	38.51	1354	0.876	1.820	-0.333	0.230	4.055	0.993
1200T125-68	50	16.826	2.747	4.036	0.074	0.268	15.686	1.934	57.90	2713	1.750	2.270	-0.329	0.227	4.059	0.993
1200T125-97	50	24.078	3.897	4.044	0.102	0.263	23.751	3.442	103.06	7902	5.076	3.171	-0.322	0.222	4.065	0.994
1200T150-54 <sup>1</sup>	50	14.378	2.357	4.117	0.103	0.348	12.020	1.313	39.31	1354	0.906	3.033	-0.454	0.310	4.156	0.988
1200T150-68	50	18.148	2.963	4.121	0.127	0.345	16.566	1.987	59.48	2713	1.810	3.795	-0.450	0.307	4.160	0.988
1200T150-97	50	25.987	4.206	4.130	0.176	0.340	25.719	3.616	108.27	7902	5.252	5.335	-0.441	0.301	4.168	0.989
1200T150-118	50	31.825	5.119	4.137	0.210	0.336	31.825	4.865	145.66	14434	9.562	6.444	-0.435	0.296	4.173	0.989
1200T200-54 <sup>1</sup>	50	16.464	2.699	4.265	0.236	0.510	12.962	1.350	40.41	1354	0.966	6.714	-0.730	0.487	4.357	0.972
1200T200-68	50	20.791	3.395	4.271	0.294	0.508	18.026	2.058	61.62	2713	1.931	8.431	-0.725	0.483	4.362	0.972
1200T200-97	50	29.805	4.824	4.283	0.410	0.502	28.959	3.819	114.35	7902	5.602	11.945	-0.714	0.476	4.371	0.973
1200T200-118	50	36.530	5.876	4.291	0.492	0.498	36.530	5.278	158.02	14434	10.201	14.513	-0.706	0.471	4.377	0.974
1200T250-54 <sup>1</sup>	50	18.550	3.041	4.392	0.445	0.681	14.092	1.374	41.14	1354	1.027	12.339	-1.039	0.680	4.565	0.948
1200T250-68	50	23.435	3.826	4.399	0.556	0.678	19.608	2.106	63.04	2713	2.052	15.529	-1.033	0.676	4.569	0.949
1200T250-97	50	33.623	5.442	4.413	0.780	0.672	31.596	3.954	118.37	7902	5.953	22.101	-1.021	0.668	4.579	0.950
1200T250-118	50	41.236	6.632	4.423	0.940	0.668	40.068	5.519	165.24	14434	10.839	26.943	-1.013	0.662	4.586	0.951

For SI: 1 inch = 25.4 mm; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup> mm<sup>3</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>5</sup> mm<sup>4</sup>; 1 inch<sup>6</sup> = 2.69x10<sup>8</sup> mm<sup>6</sup>; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksi = 6.89 Mpa; 1 lb = 4.45 N.

TABLE 5—TRACK PROPERTIES<sup>3</sup> (Continued)

MEMBER	F <sub>y</sub> (ksi)	GROSS <sup>2</sup>					EFFECTIVE PROPERTIES				TORSIONAL PROPERTIES					
		I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>ag</sub> (lb)	Jx1000 (in <sup>4</sup> )	C <sub>w</sub> (in <sup>6</sup> )	X <sub>o</sub> (in)	m (in)	R <sub>o</sub> (in)	β
1200T300-54 <sup>1</sup>	50	20.636	3.383	4.502	0.745	0.855	14.784	1.391	41.65	1354	1.087	20.211	-1.375	0.884	4.784	0.917
1200T300-68	50	26.079	4.258	4.510	0.932	0.852	20.690	2.140	64.06	2713	2.173	25.471	-1.369	0.880	4.789	0.918
1200T300-97	50	37.441	6.060	4.525	1.310	0.847	33.655	4.052	121.30	7902	6.304	36.357	-1.355	0.871	4.799	0.920
1200T300-118	50	45.941	7.389	4.537	1.583	0.842	42.986	5.695	170.51	14434	11.478	44.420	-1.346	0.865	4.806	0.922

For SI: 1 inch = 25.4 mm; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup> mm<sup>3</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>5</sup> mm<sup>4</sup>; 1 inch<sup>6</sup> = 2.69x10<sup>9</sup> mm<sup>6</sup>; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N

<sup>1</sup>Web-height to thickness ratio, h/t, exceeds 200. Web Stiffeners designed in accordance with AISI are required at support points and concentrated Loads.

<sup>2</sup>Gross properties are based on the full, unreduced cross-section.

<sup>3</sup>Use the effective moment of inertia for deflection calculation.

**SYMBOLS**

I<sub>x</sub> = Strong axis moment of inertia  
 S<sub>x</sub> = Strong axis section modulus  
 R<sub>x</sub> = Strong axis radius of gyration  
 I<sub>y</sub> = Weak axis moment of inertia

R<sub>y</sub> = Weak axis radius of gyration  
 M<sub>a</sub> = Strong axis allowable bending moment  
 V<sub>ag</sub> = Allowable shear of unpunched web section  
 V<sub>anet</sub> = Allowable shear of punched web section

J = St. Venant torsion constant  
 C<sub>w</sub> = Torsional warping constant  
 X<sub>o</sub> = Distance from shear center to the centroid along the principal X-axis  
 m = Distance from shear center to mid-plane of web  
 R<sub>o</sub> = Torsional radii of gyration  
 β = Torsional flexural constant

TABLE 6—ALLOWABLE CONCENTRATED LOADS AND END REACTIONS FOR C-SHAPES BASED ON WEB CRIPPLING<sup>2,4</sup> (lb)

STUD DESIGNATION	F <sub>y</sub> (ksi)	CONDITION 1 (E1F)				CONDITION 2 (I1F)				CONDITION 3 (E2F)				CONDITION 4 (I2F)			
		Bearing Length (in)				Bearing Length (in)				Bearing Length (in)				Bearing Length (in)			
		1	3.5	4	6	1	3.5	4	6	1	3.5	4	6	1	3.5	4	6
162S -33	33	180	See Note 1	See Note 1	See Note 1	336	See Note 1	See Note 1	See Note 1	170	See Note 1	See Note 1	See Note 1	441	See Note 1	See Note 1	See Note 1
250 S -33	33	173	271	285	See Note 1	330	453	472	See Note 1	150	201	209	See Note 1	411	519	535	See Note 1
250 S -43	33	287	443	466	See Note 1	580	780	810	See Note 1	267	351	364	See Note 1	720	892	918	See Note 1
250 S -54	50	656	996	1046	See Note 1	1350	1785	1850	See Note 1	652	842	870	See Note 1	1730	2109	2165	See Note 1
250 S -68	50	990	1480	1552	See Note 1	2073	2693	2785	See Note 1	1049	1333	1375	See Note 1	2750	3302	3384	See Note 1
250 S -97	50	1872	2726	See Note 1	See Note 1	4025	5095	See Note 1	See Note 1	2167	2683	See Note 1	See Note 1	5597	6575	See Note 1	See Note 1
350 S -33	33	166	260	274	323	324	445	463	526	131	175	182	205	384	484	499	551
350 S -43	33	278	428	451	528	571	768	798	900	240	315	326	365	680	842	866	949
350 S -54	50	637	967	1016	1186	1331	1761	1825	2046	594	768	794	883	1645	2005	2059	2245
350 S -68	50	965	1441	1512	1758	2047	2660	2751	3068	970	1232	1271	1406	2631	3159	3238	3510
350 S -97	50	1831	2666	2790	See Note 1	3983	5041	5198	See Note 1	2035	2520	2592	See Note 1	5397	6339	6479	See Note 1
362 S -33	33	165	259	273	322	323	444	462	525	129	173	179	202	381	480	495	547
362 S -43	33	277	427	449	526	570	767	796	898	236	311	322	360	675	836	860	943
362 S -54	50	634	963	1012	1182	1329	1758	1822	2043	588	760	785	874	1635	1994	2047	2232
362 S -68	50	962	1437	1507	1752	2044	2657	2747	3064	961	1221	1259	1393	2618	3143	3221	3492
362 S -97	50	1827	2659	2783	3212	3978	5035	5192	5738	2020	2501	2573	2821	5374	6313	6452	6936
362 S -118	50	2625	3764	3933	4521	5799	7235	7448	8189	3053	3729	3829	4178	8044	9340	9532	10201
400 S -33	33	163	256	269	317	322	442	460	522	122	164	170	192	372	469	483	534
400 S -43	33	274	422	444	520	567	763	792	893	227	299	309	346	662	819	843	924
400 S -54	50	628	954	1002	1170	1323	1750	1813	2034	569	735	760	846	1607	1960	2012	2194
400 S -68	50	953	1424	1494	1737	2036	2646	2736	3051	936	1188	1226	1356	2579	3096	3173	3440
400 S -97	50	1814	2640	2762	3189	3965	5018	5174	5718	1978	2448	2518	2761	5309	6236	6374	6852
400 S -118	50	2608	3739	3907	4491	5781	7212	7424	8163	2996	3659	3757	4099	7956	9238	9428	10089

For SI: 1 inch = 25.4 mm, 1 pound = 4.4482 N

TABLE 6—ALLOWABLE CONCENTRATED LOADS AND END REACTIONS FOR C-SHAPES BASED ON WEB CRIPPLING<sup>2</sup> (lb) (Continued)

STUD DESIGNATION	F <sub>y</sub> (ksi)	CONDITION 1 <sup>3</sup> (E1F)				CONDITION 2 <sup>3</sup> (I1F)				CONDITION 3 <sup>3</sup> (E2F)				CONDITION 4 <sup>3</sup> (I2F)			
		Bearing Length (in)				Bearing Length (in)				Bearing Length (in)				Bearing Length (in)			
		1	3.5	4	6	1	3.5	4	6	1	3.5	4	6	1	3.5	4	6
550 S__-33	33	155	243	256	302	315	432	450	511	100	134	139	157	339	428	441	487
550 S__-43	33	262	405	426	499	556	749	778	877	195	256	265	297	614	760	782	858
550 S__-54	50	606	920	966	1128	1302	1722	1784	2001	502	649	671	746	1508	1838	1887	2058
550 S__-68	50	923	1380	1447	1683	2007	2608	2697	3007	844	1071	1105	1223	2441	2931	3003	3256
550 S__-97	50	1766	2571	2691	3106	3917	4957	5111	5648	1826	2261	2325	2550	5078	5965	6097	6555
600 S__-33	33	153	240	253	297	313	430	447	507	93	125	130	146	329	416	429	473
600 S__-43	33	259	400	420	493	553	745	773	872	185	243	252	282	600	743	764	838
600 S__-54	50	599	909	956	1116	1295	1713	1775	1991	482	623	644	716	1478	1802	1850	2017
600 S__-68	50	914	1366	1433	1666	1998	2596	2685	2994	816	1036	1069	1183	2399	2881	2952	3201
600 S__-97	50	1752	2551	2669	3081	3902	4939	5093	5628	1781	2205	2268	2487	5010	5885	6014	6466
600 S__-118	50	2528	3625	3788	4354	5698	7108	7318	8046	2734	3339	3429	3741	7555	8772	8952	9581
800 S__-43	33	247	381	401	470	542	730	757	854	150	197	204	228	548	678	698	765
800 S__-64	50	575	872	917	1070	1272	1682	1743	1955	409	529	547	608	1370	1670	1714	1869
800 S__-68	50	882	1318	1382	1607	1966	2555	2642	2946	716	910	939	1038	2250	2701	2768	3001
800 S__-97	50	1702	2477	2592	2992	3850	4873	5025	5553	1618	2003	2060	2259	4761	5593	5716	6145
800 S__-118	50	2462	3531	3689	4241	5629	7023	7229	7949	2518	3075	3158	3445	7223	8387	8559	9160
1000 S__-54	50	553	840	882	1031	1251	1655	1715	1923	346	447	462	514	1275	1554	1595	1740
1000 S__-68	50	854	1275	1338	1555	1938	2518	2604	2904	629	799	824	912	2119	2544	2607	2826
1000 S__-97	50	1657	2412	2525	2914	3805	4815	4965	5487	1476	1827	1879	2060	4545	5338	5456	5866
1000 S__-118	50	2405	3449	3604	4143	5569	6948	7152	7864	2330	2845	2921	3187	6934	8051	8217	8794
1200 S__-68	50	828	1237	1298	1509	1913	2485	2570	2866	551	699	721	798	2001	2402	2462	2669
1200 S__-97	50	1618	2355	2464	2844	3764	4764	4912	5428	1348	1668	1716	1882	4350	5109	5222	5614
1200 S__-118	50	2354	3375	3527	4054	5515	6881	7083	7788	2161	2638	2709	2956	6675	7750	7910	8465

For SI: 1 inch = 25.4 mm, 1 pound = 4.4482 N

<sup>1</sup> Bearing length to web height ratio, N/h, exceeds 2. Web stiffeners are required.

<sup>2</sup> Values are for members fastened to supports.

<sup>3</sup> Allowable web conditions are as follows (See Figure 2 for illustration):

- Condition 1 – End One Flange Loading (E1F)
- Condition 2 – Interior One Flange Loading (I1F)
- Condition 3 – End Two Flange Loading (E2F)
- Condition 4 – Interior Two Flange Loading (I2F)

<sup>4</sup> Values are based on full-unreduced cross section of the member away from punch-outs, where the clear distance between the edge of bearing and the edge of the punch-out is larger than 2 times the full-depth of the web.

TABLE 7—STRUCTURAL PROPERTIES OF FURRING CHANNELS<sup>1,2</sup>

SECTION	F <sub>y</sub> (ksi)	DESIGN THICKNESS (in)	GROSS PROPERTIES						EFFECTIVE PROPERTIES		
			Area (in <sup>2</sup> )	Weight (lb/ft)	I <sub>x</sub> (in <sup>4</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (ft-lb)
087F125-18	33	0.0188	0.070	0.239	0.009	0.356	0.0422	0.774	0.0086	0.0160	26.41
087F125-30	33	0.0312	0.115	0.392	0.014	0.352	0.0691	0.774	0.0143	0.0307	50.47
087F125-33	33	0.0346	0.127	0.433	0.016	0.351	0.0763	0.774	0.0157	0.0337	55.43

For SI: 1 inch = 25.4 mm; 1 inch<sup>2</sup> = 645 mm<sup>2</sup>; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>5</sup> mm<sup>4</sup>; 1 inch<sup>5</sup> = 2.69x10<sup>6</sup> mm<sup>5</sup>; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

<sup>1</sup> For deflection calculations, use effective I<sub>x</sub>.

<sup>2</sup> Effective properties are given as the minimum value for positive or negative bending.

**SYMBOLS**

I<sub>x</sub> = Strong axis moment of inertia  
R<sub>x</sub> = Strong axis radius of gyration

I<sub>y</sub> = Weak axis moment of inertia  
R<sub>y</sub> = Weak axis radius of gyration

S<sub>x</sub> = Strong axis section modulus  
M<sub>a</sub> = Strong axis allowable bending moment

TABLE 8—STRUCTURAL PROPERTIES OF U-CHANNELS<sup>1,2</sup>

SECTION	F <sub>y</sub> (ksi)	DESIGN THICKNESS	GROSS						EFFECTIVE PROPERTIES			
			Area (in <sup>2</sup> )	Weight (lb/ft)	I <sub>x</sub> (in <sup>4</sup> )	R <sub>x</sub> (in)	I <sub>y</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	I <sub>x</sub> (in <sup>4</sup> )	S <sub>x</sub> (in <sup>3</sup> )	M <sub>a</sub> (in-k)	V <sub>a</sub> (lb)
75U050-54	50	0.0566	0.087	0.30	0.007	0.288	0.002	0.155	0.007	0.019	0.45	315
150U050-54	50	0.0566	0.129	0.44	0.039	0.547	0.003	0.144	0.039	0.052	1.22	840
200U050-54	50	0.0566	0.157	0.54	0.079	0.709	0.003	0.136	0.079	0.079	1.87	1190

For SI: 1 inch = 25.4 mm; 1 inch<sup>2</sup> = 645 mm<sup>2</sup>; 1 inch<sup>3</sup> = 1.64x10<sup>4</sup>; 1 inch<sup>4</sup> = 4.15x10<sup>5</sup> mm<sup>4</sup>; 1 inch<sup>5</sup> = 2.69x10<sup>6</sup> mm<sup>5</sup>; 1 lb/lin ft = 14.5939 N/m; 1 kip-in = 112.99 N-m; 1 ksl = 6.89 Mpa; 1 lb = 4.45 N.

<sup>1</sup>For deflection calculations, use effective I<sub>x</sub>.

**SYMBOLS**

I<sub>x</sub> = Strong axis moment of inertia  
R<sub>x</sub> = Strong axis radius of gyration

I<sub>y</sub> = Weak axis moment of inertia  
R<sub>y</sub> = Weak axis radius of gyration

S<sub>x</sub> = Strong axis section modulus V<sub>a</sub> = Allowable shear of web section  
M<sub>a</sub> = Strong axis allowable bending moment

TABLE 9—C-SECTIONS FOR USE WITH THE IRC<sup>3</sup>

IRC MEMBER DESIGNATION	EQUIVALENT CEMCO MEMBER DESIGNATION				
	t = 33	t = 43	t = 54 <sup>1</sup>	t = 68 <sup>1</sup>	t=97 <sup>2</sup>
350S162-t	350S162-33	350S162-43	350S162-54	350S162-68	350S162-97
550S162-t	550S162-33	550S162-43	550S162-54	550S162-68	550S162-97
800S162-t	800S162-33	800S162-43	800S162-54	800S162-68	---
1000S162-t	---	1000S162-43	1000S162-54	1000S162-68	---
1200S162-t	---	---	1200S162-54	1200S162-68	---

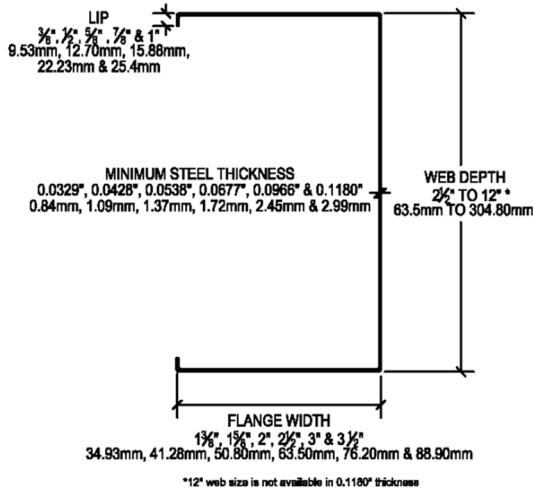
<sup>1</sup>These members are applicable to the 2021, 2018, 2015 and 2012 IRC and are not applicable to the 2009 IRC.

<sup>2</sup>These members are applicable to the 2021 and 2018 IRC and are not applicable to the 2015, 2012 and 2009 IRC.

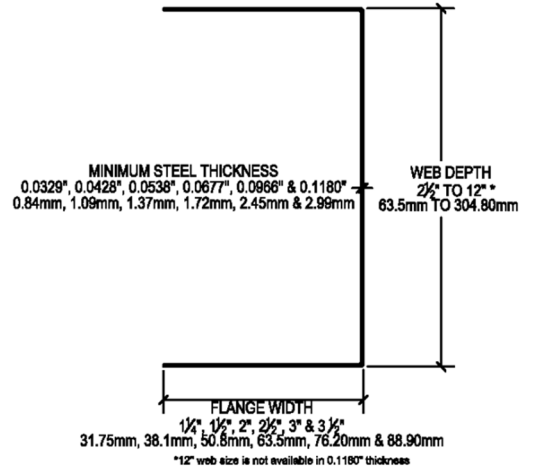
<sup>3</sup>Framing members must have a minimum lip size of 0.5 inch (12.7 mm).

TABLE 10—MANUFACTURING LOCATIONS

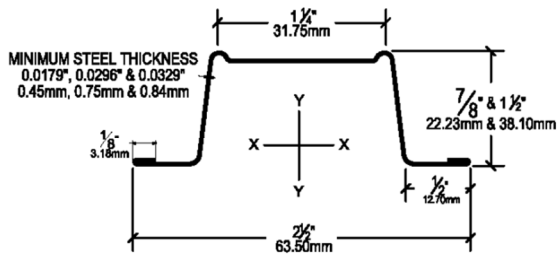
CEMCO – City of Industry City of Industry, CA 91746
CEMCO – Pittsburg Pittsburg, CA 94565
CEMCO – Denver Denver, CO 80204
CEMCO – Fort Worth Fort Worth, TX 76140



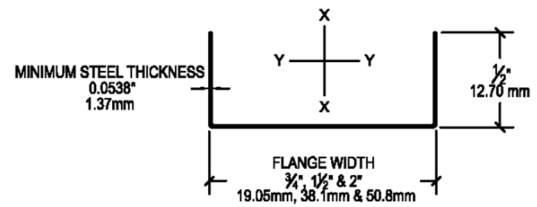
**STRUCTURAL STUD**



**STRUCTURAL TRACK**



**FURRING HAT CHANNEL**



**U-CHANNEL**

FIGURE 1—SECTION PROFILES

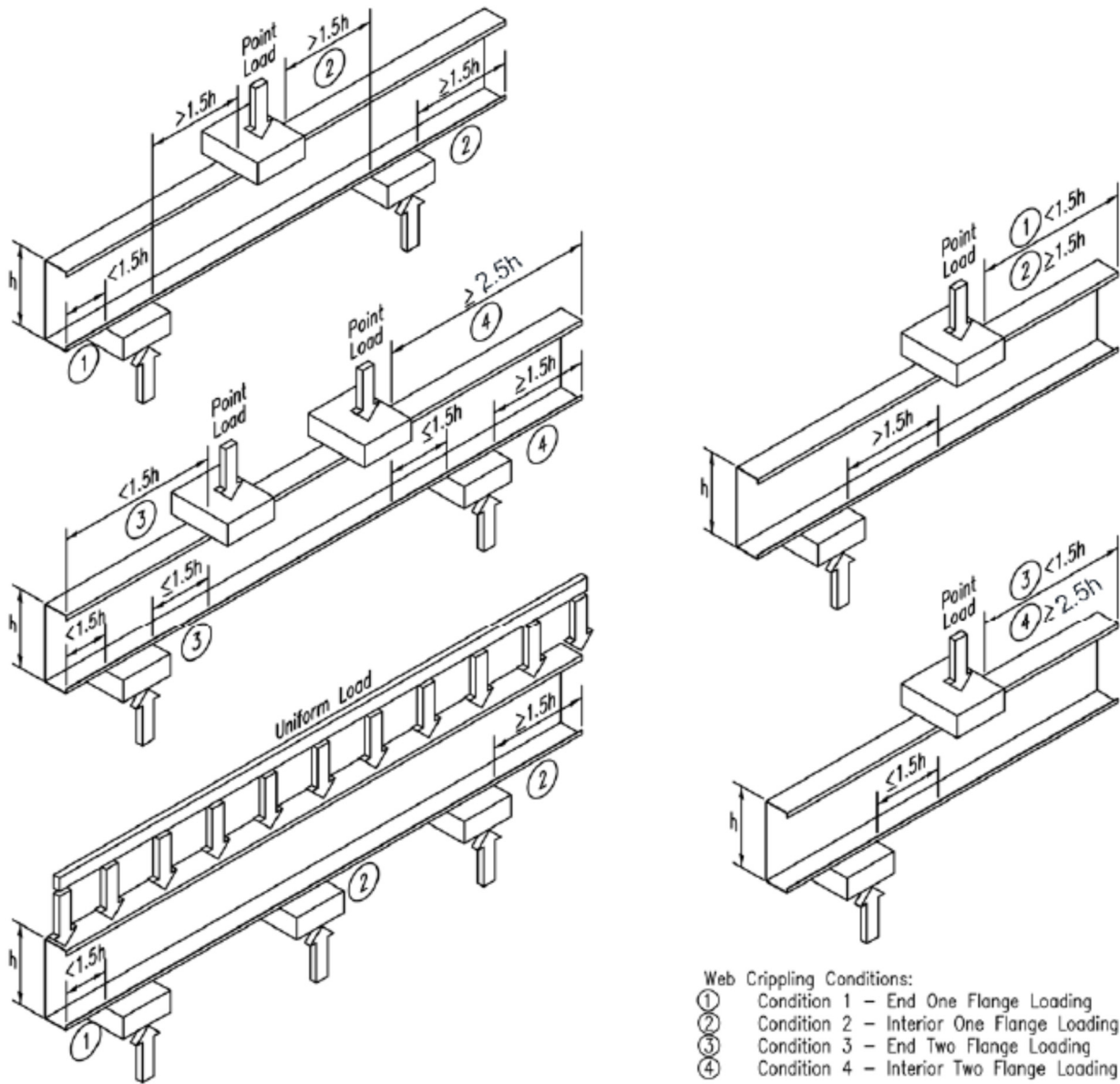


FIGURE 2

**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

**DIVISION: 09 00 00—FINISHES**

Section: 09 22 13—Metal Furring

Section: 09 22 16.13—Non-Structural Metal Stud Framing

**REPORT HOLDER:**

CALIFORNIA EXPANDED METAL PRODUCTS COMPANY (CEMCO)

**EVALUATION SUBJECT:**

COLD-FORMED STEEL FRAMING

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

The purpose of this evaluation report supplement is to indicate that the CEMCO Cold-Formed Steel Framing, described in ICC-ES evaluation report [ESR-3016](#), has 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 CEMCO Cold-Formed Steel Framing, described in Sections 2.0 through 7.0 of the evaluation report [ESR-3016](#), complies with the LABC Chapter 22, and the LARC Chapter 3 and Sections R505.2, R603.2 and R804.2, and is subject to the conditions of use described in this supplement.

**3.0 CONDITIONS OF USE**

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

- All applicable sections in the evaluation report [ESR-3016](#).
- The design, installation, conditions of use and identification of the CEMCO Cold-Formed Steel Framing are in accordance with the 2021 *International Building Code*® (IBC) provisions noted in the evaluation report [ESR-3016](#).
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16, 17 and 22, as applicable.
- Under the LARC Chapter 3, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

This supplement expires concurrently with the evaluation report, reissued July 2023 and revised October 2023.

**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

**DIVISION: 09 00 00—FINISHES**

Section: 09 22 13—Metal Furring

Section: 09 22 16.13—Non-Structural Metal Stud Framing

**REPORT HOLDER:**

CALIFORNIA EXPANDED METAL PRODUCTS COMPANY (CEMCO)

**EVALUATION SUBJECT:**

COLD-FORMED STEEL FRAMING

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

The purpose of this evaluation report supplement is to indicate that the CEMCO Cold-Formed Steel Framing, described in ICC-ES evaluation report ESR-3016, 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 CEMCO Cold-Formed Steel Framing, described in Sections 2.0 through 7.0 of the evaluation report ESR-3016, complies with CBC Chapter 22, provided the design and installation are in accordance with the 2021 *International Building Code*® (IBC) provisions, as applicable, noted in the evaluation report, and the additional requirements of CBC Chapters 16, 17 and 22, as applicable.

**2.1.1 OSHPD:** The CEMCO Cold-Formed Steel Framing, described in Sections 2.0 through 7.0 of the evaluation report ESR-3016, complies with CBC amended sections in Chapters 16, 17 and 22, and Chapters 16A, 17A and 22A, provided the design and installation are in accordance with the 2021 *International Building Code*® (IBC) provisions, as applicable, noted in the evaluation report, and the additional requirements in Sections 2.1.1.1 and 2.1.1.2 of this supplement.

**2.1.1.1 Conditions of Use:**

1. All loads applied to the cold-formed steel members shall be determined by a registered design professional and shall comply with applicable loads from CBC Chapter 16 and amendments [OSHPD 1R, 2, 3 and 5] and Chapter 16A [OSHPD 1 and 4].
2. Cold-formed steel members shall not be part of the lateral resisting elements in light-framed wall with shear panels of all other materials and cold-formed steel special bolted moment frames, unless allowed by the exceptions, in accordance with CBC Section 1617A1.4 [OSHPD 1 & 4].
3. Prescriptive framing is not permitted in accordance with CBC Section 2211A.1.2 [OSHPD 1 & 4].



4. Cold-formed steel structures shall be designed and detailed in accordance with the requirements of AISI S100 and AISI S400 [OSHPD 1R, 2 & 5].
5. In accordance with CBC Section 2211A.1.1.1, the design of cold-formed steel light-frame construction to resist seismic forces in Seismic Design Categories B and C is not permitted [OSHPD 1 & 4].
6. In accordance with CBC Sections 2211.1.1.2 and 2211A.1.1.2, the design of cold-formed steel light-frame construction to resist seismic forces in Seismic Design Categories D through F, shall be designed and detailed in accordance with AISI S400 and comply with the following requirements [OSHPD 1, 1R, 2, 4 & 5]:
  - Cold-formed steel stud foundation plates or sills shall be bolted or fastened to the foundation or foundation wall in accordance with CBC Section 2304.3.4, Item 2.
  - Shear wall assemblies in accordance with Sections E5, E6 and E7 of AISI S400 are not permitted within the seismic force-resisting system of the buildings.
7. In accordance with CBC Sections 2211.2 and 2211A.2, for cold-formed steel light-frame construction, the design and installation of nonstructural members and connections shall be in accordance with AISI S220 for noncomposite assembly design. Where nonstructural members do not qualify for design under AISI S220, the design and installation of nonstructural members and connections, shall be in accordance with AISI S240 or S100 [OSHPD 1, 1R, 2, 4 & 5].

#### 2.1.1.2 Verification Test Requirements:

In accordance with CBC Sections 2213A.2 and 2213.2, end-welded studs shall be tested in accordance with the requirements of AWS D1.1 Sections 7.7 and 7.8 [OSHPD 1, 1R, 2, 4 & 5], as applicable.

#### 2.1.1.3 Special Inspection Requirements:

1. In accordance with CBC Section 1704.2 Exception 3, special inspection is required for portions of structures designed and constructed in accordance with the cold-formed steel light-frame construction provisions of CBC Section 2211.1.2 [OSHPD 1R, 2 & 5].
2. Periodic special inspections shall be required in accordance with CBC Section 1705 and amendments [OSHPD 1R, 2, 3 and 5] and CBC Section 1705A [OSHPD 1 & 4].

**2.1.2 DSA:** The CEMCO Cold-Formed Steel Framing, described in Section 2.0 through 7.0 of the evaluation report ESR-3016, complies with CBC amended sections in Chapters 16 and 22, and Chapters 16A, 17A and 22A, provided the design and installations are in accordance with the 2021 *International Building Code*<sup>®</sup> (IBC) provisions noted in the evaluation report, and the additional requirements in Sections 2.1.2.1 and 2.1.2.2 of this supplement:

#### 2.1.2.1 Conditions of Use:

1. All loads applied to the cold-formed steel members shall be determined by a registered design professional and shall comply with applicable loads from CBC Chapter 16 and amendments [DSA-SS/CC] and Chapter 16A [DSA-SS].
2. Cold-formed steel members shall not be part of the lateral resisting elements in light-framed wall with shear panels of all other materials and cold-formed steel special bolted moment frames, unless allowed by the exceptions, in accordance with CBC Sections 1617.11.3 [DSA-SS/CC] and 1617A1.4 [DSA-SS].
3. In accordance with CBC Section 2212.5.2 [DSA-SS/CC], cold-formed steel stud foundation plates or sills shall be bolted or fastened to the foundation or foundation wall in accordance with Section 2304.3.4, Item 2.
4. In accordance with CBC Section 2212.5.3, cold-formed steel stud shear wall assemblies in accordance with Sections E5, E6 and E7 of AISI S400 are not permitted within the seismic force-resisting system of buildings or structures assigned to Occupancy Categories II, III, IV, or buildings designed to be relocatable [DSA-SS/CC].
5. In accordance with CBC Section 2211A.1.1.1, the design of cold-formed steel light-frame construction to resist seismic forces in Seismic Design Categories B and C is not permitted [DSA-SS].
6. In accordance with CBC Section 2211A.1.1.2, the design of cold-formed steel light-frame construction to resist seismic forces in Seismic Design Categories D through F, shall be designed and detailed in accordance with AISI S400 and comply with the following requirements [DSA-SS]:
  - Cold-formed steel stud foundation plates or sills shall be bolted or fastened to the foundation or foundation wall in accordance with CBC Section 2304.3.4, Item 2.
  - Shear wall assemblies in accordance with Sections E5, E6 and E7 of AISI S400 are not permitted within the seismic force-resisting system of the buildings.
7. Prescriptive framing is not permitted in accordance with CBC Section 2211A.1.2 [DSA-SS].
8. In accordance with CBC Section 2211A.2, for cold-formed steel light-frame construction, the design and installation of nonstructural members and connections shall be in accordance with AISI S220 for noncomposite assembly design. Where nonstructural members do not qualify for design under AISI S220, the design and installation of nonstructural members and connections, shall be in accordance with AISI S240 or S100 [DSA-SS].

**2.1.2.2 Verification Test Requirements:**

In accordance with CBC Sections 2212.6.2 [DSA-SS/CC] or 2213A.2 [DSA-SS], end-welded studs shall be tested in accordance with the requirements of AWS D1.1 Sections 7.7 and 7.8 [DSA-SS/C or DSA-SS], as applicable.

**2.1.2.3 Special Inspection Requirements:**

Periodic special inspections shall be required in accordance with CBC Section 1705A [DSA-SS/CC and DSA-SS], as applicable.

**2.2 CRC:**

The CEMCO Cold-Formed Steel Framing, described in Sections 2.0 through 7.0 of the evaluation report ESR-3016, complies with CRC Chapters 5, 6 and 8, provided the design and installation are in accordance with the 2021 *International Residential Code*<sup>®</sup> (IRC) provisions, as applicable, noted in the evaluation report and the additional requirements of CBC Chapters 16, 17 and 22, as applicable.

This supplement expires concurrently with the evaluation report, reissued July 2023 and revised October 2023.