

**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 16.13—Non-Structural Metal Stud Framing**

**REPORT HOLDER:**

**SCOTTSDALE CONSTRUCTION SYSTEMS**

**ADDITIONAL LISTEE:**

**DRAGONFLY VERT**

**EVALUATION SUBJECT:**

**COLD-FORMED STEEL FRAMING MEMBERS**

## 1.0 EVALUATION SCOPE

**Compliance with the following codes:**

- 2015 and 2012 *International Building Code (IBC)*
- 2015 and 2012 *International Residential Code (IRC)*

**Property evaluated:**

- Structural

## 2.0 USES

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

## 3.0 DESCRIPTION

Member designations are provided in Tables 2, 3, 4, and 5. Also, see Figure 1. Punch-outs are noncircular holes with a diameter of 1.125 inches by 4 inches (28.6 mm by 102 mm) spaced 24 inches (610 mm) on center. The punch-outs are a minimum of 10 inches (254 mm) clear from the ends of the studs.

The framing members are cold-rolled from steel coils complying with the specification listed in Table 1.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design:

The values in Tables 2, 3, 4, and 5 have been determined in accordance with the North American Specification for Design of Cold-formed Steel Structural Members (AISI S100).

### 4.2 Installation:

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

## 5.0 CONDITIONS OF USE

The cold-formed steel framing members 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 cold-formed steel framing members must be installed in accordance with the applicable code, the approved plans and this report.
- 5.2** Minimum uncoated base-metal thickness of the framing members as delivered to the jobsite must be at least 95 percent of the design base-metal thickness.
- 5.3** Complete plans and calculations verifying compliance with this report must be submitted to the code official for each project at the time of permit application. The calculations and drawings must be prepared and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.4** The framing members are manufactured by Dragonfly Vert in Union City, California.

## 6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Cold-formed Steel Framing Members (AC46), dated June 2012 (editorially revised April 2015).

## 7.0 IDENTIFICATION

- 7.1** Each member must have a legible label, stamp or embossment, at a maximum of 96 inches (2440 mm) on center, indicating the listee's name; the evaluation report number (ESR-1538); member designation; minimum base-metal thickness (uncoated) in decimal thickness or mils; in addition to the following:
  - All members with a G40 coating and members complying with the non-loading bearing specifications in Table 1 must also have the designation "NS".

- Load-bearing members must also have the minimum yield strength, and the protective coating designation (minimum G60).

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

**SCOTTSDALE CONSTRUCTION SYSTEMS**  
**17 CADBURY ROAD, ONEKAWA**  
**NAPIER, HAWKE'S BAY**  
**NEW ZEALAND 4112**  
**+64 21 512895**  
[www.scottsdalesteelframes.com](http://www.scottsdalesteelframes.com)  
[scott.kimble@scottsdalesteelframes.com](mailto:scott.kimble@scottsdalesteelframes.com)

7.3 The additional listee's contact information is the following:

**DRAGONFLY VERT**  
**777 MARINERS ISLAND BOULEVARD**  
**SAN MATEO, CALIFORNIA 94404**  
**(650) 292-0752**

**DEFINITIONS OF SYMBOLS**

**Gross Properties**

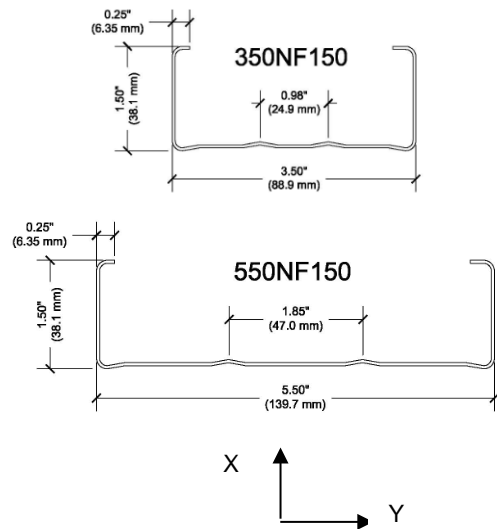
- $I_x$  - moment of inertia of the cross section about the x-axis
- $S_x$  - section modulus about the x-axis
- $R_x$  - radius of gyration of cross section about the x-axis
- $I_y$  - moment of inertia of the cross section about the y-axis
- $S_y$  - section modulus about the y-axis

**Effective Properties**

- $I_{xe}$  - moment of inertia of the cross section about the x-axis
- $S_{xe}$  - section modulus about the x-axis
- $M_{al}$  - allowable moment based on local buckling
- $M_{ad}$  - allowable moment based on distortional buckling
- $L_u$  - Critical unbraced length for lateral-torsional buckling. Members are considered fully braced when unbraced length is less than  $L_u$ .

**Torsional and Other Properties**

- J - St. Venant torsion constant.
- $C_w$  - Warping constant
- $X_o$  - Distance from shear center to neutral axis in the x-direction
- $Y_o$  - Distance from shear center to neutral axis in the y-direction
- j - Section property for torsional-flexural buckling
- m - Distance from shear center to mid-plane of web
- $R_o$  - Polar radius of gyration of cross section about the shear center
- $\beta$  - Torsional flexural constant.  $1-(X_o/R_o)^2$
- $K_\phi$  - Rotational stiffness.



**FIGURE 1 – PROFILES**

**TABLE 1—STEEL SPECIFICATIONS<sup>1,2</sup>**

Specification	Grades of Steel for:		
	$F_y = 33$ ksi	$F_y = 50$ ksi	$F_y = 70$ ksi
ASTM A653	SS Grade 33	SS Grade 50 Class 1, 2 or 4 HSLAS Grade 50	SS Grade 70 HSLAS Grade 70
ASTM A1003	ST33H NS33 <sup>1</sup>	ST50H NS50 <sup>1</sup>	NS70 <sup>1</sup>
ASTM A1039	---	SS Grade 50	---
ASTM A1063	SS Grade 33	SS Grade 50 HSLAS Grade 50 Class 1 or 2	---

<sup>1</sup>The steel has either a minimum metallic coating designation of G40 or G60 coating.

<sup>2</sup>The NS grades of steels and G40 coatings are limited to nonstructural applications as defined by AISI S220.

TABLE 2—GROSS AND TORSIONAL SECTION PROPERTIES<sup>2</sup>

Member Designation	Design Thickness (in)	Gross Properties							Torsional Properties					
		Area (in <sup>2</sup> )	Weight (lb/ft)	I <sub>xx</sub> (in <sup>4</sup> )	S <sub>xx</sub> (in <sup>3</sup> )	R <sub>x</sub> (in)	I <sub>yy</sub> (in <sup>4</sup> )	R <sub>y</sub> (in)	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
350NF150-21	0.0219	0.149	0.51	0.297	0.168	1.414	0.041	0.525	0.024	0.102	-1.039	0.632	1.831	0.678
350NF150-27	0.0283	0.191	0.65	0.381	0.215	1.410	0.052	0.522	0.051	0.129	-1.031	0.628	1.824	0.680
350NF150-33	0.0346	0.233	0.79	0.461	0.260	1.407	0.063	0.519	0.093	0.154	-1.024	0.624	1.816	0.682
350NF150-43	0.0451	0.301	1.02	0.591	0.334	1.401	0.079	0.513	0.204	0.195	-1.012	0.617	1.803	0.685
350NF150-54	0.0566	0.375	1.28	0.729	0.412	1.395	0.096	0.507	0.400	0.236	-0.999	0.610	1.789	0.688
350NF150-68	0.0713	0.467	1.59	0.898	0.507	1.387	0.117	0.500	0.791	0.283	-0.982	0.601	1.771	0.693
550NF150-21 <sup>1</sup>	0.0219	0.192	0.65	0.834	0.303	2.086	0.047	0.493	0.031	0.277	-0.866	0.551	2.311	0.860
550NF150-27	0.0283	0.247	0.84	1.070	0.388	2.082	0.059	0.489	0.066	0.351	-0.859	0.547	2.305	0.861
550NF150-33	0.0346	0.301	1.02	1.299	0.471	2.078	0.071	0.486	0.120	0.422	-0.852	0.543	2.298	0.862
550NF150-43	0.0451	0.39	1.33	1.672	0.607	2.071	0.090	0.480	0.264	0.534	-0.841	0.537	2.286	0.865
550NF150-54	0.0566	0.486	1.65	2.070	0.751	2.063	0.109	0.474	0.519	0.649	-0.829	0.530	2.274	0.867
550NF150-68	0.0713	0.607	2.07	2.562	0.930	2.054	0.132	0.467	1.029	0.785	-0.814	0.521	2.258	0.870
550NF189-27	0.0283	0.276	0.94	1.281	0.465	2.152	0.122	0.663	0.074	0.726	-1.253	0.776	2.577	0.764
550NF189-33	0.0346	0.337	1.15	1.556	0.564	2.149	0.147	0.660	0.134	0.875	-1.246	0.772	2.570	0.765
550NF189-43	0.0451	0.437	1.49	2.006	0.728	2.143	0.187	0.654	0.296	1.114	-1.235	0.766	2.558	0.767
550NF189-54	0.0566	0.545	1.85	2.487	0.902	2.136	0.229	0.649	0.582	1.361	-1.222	0.759	2.545	0.770
550NF189-68	0.0713	0.682	2.32	3.085	1.120	2.128	0.280	0.641	1.155	1.658	-1.206	0.749	2.528	0.773

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

<sup>1</sup>Web height-to-thickness ratio (h/t) exceeds 200. Webs must have bearing stiffeners. See AISI S100 Section B1.2.

<sup>2</sup>Gross and torsional properties are based on the full-unreduced cross section away from the punch-outs.

TABLE 3—EFFECTIVE SECTION PROPERTIES<sup>1</sup>

Member Designation	Design Thickness (in)	Effective Properties <sup>3</sup> (Based on F <sub>y</sub> = 33 ksi)							Effective Properties <sup>3</sup> (Based on F <sub>y</sub> = 50 ksi)							Effective Properties <sup>3</sup> (Based on F <sub>y</sub> = 70 ksi)						
		I <sub>xe</sub> <sup>4</sup>	S <sub>xe</sub>	M <sub>a-L</sub>	M <sub>a-D</sub>	V <sub>ag</sub>	V <sub>aNet</sub>	L <sub>u</sub>	I <sub>xe</sub> <sup>4</sup>	S <sub>xe</sub>	M <sub>a-L</sub>	M <sub>a-D</sub>	V <sub>ag</sub>	V <sub>aNet</sub>	L <sub>u</sub>	I <sub>xe</sub> <sup>4</sup>	S <sub>xe</sub>	M <sub>a-L</sub>	M <sub>a-D</sub>	V <sub>ag</sub>	V <sub>aNet</sub>	L <sub>u</sub>
		(in <sup>4</sup> )	(in <sup>3</sup> )	(in-k)	(in-k)	(lb)	(lb)	(in)	(in <sup>4</sup> )	(in <sup>3</sup> )	(in-k)	(in-k)	(lb)	(lb)	(in)	(in <sup>4</sup> )	(in <sup>3</sup> )	(in-k)	(in-k)	(lb)	(lb)	(in)
350NF150-21	0.0219	0.273	0.125	2.47	2.14	280	262	35.1	0.264	0.104	3.12	2.74	280	262	28.5	0.256	0.091	3.81	3.32	280	262	24.0
350NF150-27	0.0283	0.365	0.175	3.46	3.07	606	437	35.0	0.344	0.16	4.79	3.95	606	437	28.4	0.334	0.138	5.77	4.82	606	437	24.0
350NF150-33	0.0346	0.452	0.223	4.40	4.06	1024	600	34.9	0.432	0.206	6.17	5.27	1112	652	28.3	0.411	0.194	8.15	6.45	1112	652	23.9
350NF150-43	0.0451	0.583	0.311	6.15	5.83	1739	775	34.8	0.579	0.283	8.49	7.66	2141	954	28.2	0.558	0.266	11.15	9.45	2477	1104	23.7
350NF150-54	0.0566	0.725	0.398	8.90	8.6	2292	805	32.6	0.717	0.376	11.27	10.51	3372	1185	28.1	0.715	0.35	14.65	13.07	3989	1402	23.6
350NF150-68	0.0713	0.898	0.494	11.30	11.61	2862	787	32.2	0.897	0.492	14.72	14.35	4336	1193	28.0	0.884	0.465	19.48	18.08	6070	1670	23.5
550NF150-21 <sup>2</sup>	0.0219	0.792	0.192	3.80	3.36	176	176	34.5	0.714	0.162	4.86	4.27	176	176	28.1	0.649	0.143	5.98	5.16	176	176	23.7
550NF150-27	0.0283	1.045	0.294	5.81	4.9	381	381	34.4	1.005	0.246	7.35	6.26	381	381	27.9	0.938	0.214	8.98	7.59	381	381	23.6
550NF150-33	0.0346	1.275	0.414	8.18	6.57	698	698	34.3	1.246	0.345	10.33	8.44	698	698	27.8	1.210	0.298	12.50	10.28	698	698	23.5
550NF150-43	0.0451	1.65	0.572	11.30	9.63	1551	1318	34.1	1.64	0.53	15.86	12.52	1551	1318	27.6	1.599	0.472	19.77	15.33	1551	1318	23.3
550NF150-54	0.0566	2.058	0.729	16.30	14.45	2739	1844	31.8	2.037	0.697	20.86	17.49	3079	2073	27.4	2.031	0.656	27.50	21.59	3079	2073	23.1
550NF150-68	0.0713	2.562	0.908	20.79	20.28	4347	2307	31.2	2.558	0.905	27.09	24.43	5350	2840	27.2	2.523	0.864	36.21	30.49	6190	3285	22.9
550NF189-27	0.0283	1.23	0.343	6.78	6.02	381	381	45.1	1.192	0.286	8.56	7.70	381	381	36.7	1.111	0.248	10.40	9.34	381	381	31.0
550NF189-33	0.0346	1.517	0.477	9.43	7.99	698	698	45.0	1.456	0.393	11.76	10.28	698	698	36.5	1.419	0.339	14.21	12.52	698	698	30.9
550NF189-43	0.0451	1.984	0.65	12.85	11.55	1551	1318	44.9	1.935	0.603	18.05	15.01	1551	1318	36.4	1.860	0.525	22.00	18.39	1551	1318	30.7
550NF189-54	0.0566	2.487	0.863	17.05	15.75	2739	1844	44.7	2.435	0.79	23.65	20.69	3079	2073	36.2	2.392	0.742	31.11	25.51	3079	2073	30.6
550NF189-68	0.0713	3.085	1.076	23.96	23.28	4347	2307	41.9	3.051	1.056	31.62	28.51	5350	2840	36.0	3.010	0.98	41.10	35.47	6190	3285	30.4

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

<sup>1</sup>See Page 2 for definition of symbols.

<sup>2</sup>Web height-to-thickness ratio (h/t) exceeds 200. Webs must have bearing stiffeners. See AISI S100 Section B1.2.

<sup>3</sup>The effective properties are based on the reduced cross section at the web punch-out.

<sup>4</sup>Use I<sub>xe</sub> deflection calculations.

<sup>5</sup>Distortional buckling moment (M<sub>ad</sub>) is calculated without the beneficial effect of sheathing to rotational stiffness. K<sub>φ</sub> = 0.

**TABLE 4—ALLOWABLE WEB CRIPPLING LOADS FOR SINGLE MEMBERS<sup>1,2</sup> (lbs)**

Member Designation		Design Thickness (in)	Fy (ksi)	Condition 1 (End 1 Flange) Fastened to Support					Condition 2 (Interior 1 Flange) Fastened to Support					Condition 3 (End 2 Flange) Fastened to Support					Condition 4 (Interior 2 Flange) Fastened to Support				
				Bearing Length (in)					Bearing Length (in)					Bearing Length (in)					Bearing Length (in)				
				1	1.5	3.5	4	6	1	1.5	3.5	4	6	1	1.5	3.5	4	6	1	1.5	3.5	4	6
350	NF__-21	0.0219	33	67	78	109	115	-	120	133	171	178	-	42	47	59	61	-	139	150	182	188	-
350	NF__-21	0.0219	50	102	118	164	174	-	182	202	259	270	-	64	71	89	93	-	211	228	276	285	-
350	NF__-21	0.0219	70	143	165	230	243	-	254	282	362	378	-	90	99	125	130	-	296	319	386	399	-
350	NF__-27	0.0283	33	112	129	177	187	-	210	231	293	305	-	81	88	110	114	-	246	264	316	326	-
350	NF__-27	0.0283	50	169	195	269	284	-	318	350	443	462	-	122	134	166	173	-	373	401	478	494	-
350	NF__-27	0.0283	70	237	273	376	397	-	445	490	621	647	-	171	187	233	242	-	523	561	670	691	-
350	NF__-33	0.0346	33	165	189	259	273	321	321	352	442	459	521	130	141	174	181	204	382	408	482	497	548
350	NF__-33	0.0346	50	250	287	392	413	487	487	534	669	696	790	197	214	264	274	309	579	618	730	753	831
350	NF__-33	0.0346	70	350	402	549	579	682	682	748	937	975	1106	275	300	369	383	432	810	865	1022	1054	1163
350	NF__-43	0.0451	33	275	313	423	445	522	559	609	752	781	880	237	257	312	323	362	674	715	834	858	941
350	NF__-43	0.0451	50	416	474	641	675	791	846	922	1139	1183	1334	360	389	473	490	548	1021	1084	1264	1300	1426
350	NF__-43	0.0451	70	582	664	898	945	1108	1185	1291	1595	1656	1867	504	544	662	685	767	1429	1517	1770	1820	1996
350	NF__-54	0.0566	33	423	479	642	674	788	891	965	1178	1221	1369	392	422	506	523	582	1088	1150	1327	1362	1485
350	NF__-54	0.0566	50	641	726	973	1022	1193	1350	1462	1785	1850	2075	594	639	767	793	883	1649	1742	2010	2064	2251
350	NF__-54	0.0566	70	897	1017	1362	1431	1670	1890	2047	2500	2590	2905	832	894	1074	1110	1236	2309	2439	2815	2890	3151
350	NF__-68	0.0713	33	654	737	977	1025	1191	1425	1535	1852	1915	2135	645	690	820	846	936	1764	1855	2118	2170	2353
350	NF__-68	0.0713	50	991	1117	1480	1553	1805	2159	2326	2806	2901	3235	978	1046	1242	1281	1418	2672	2811	3209	3288	3565
350	NF__-68	0.0713	70	1387	1564	2072	2174	2527	3022	3256	3928	4062	4529	1369	1465	1739	1794	1985	3741	3935	4492	4604	4991
550	NF__-27	0.0283	33	104	119	165	174	-	203	224	283	295	-	58	63	79	82	-	214	229	274	283	-
550	NF__-27	0.0283	50	157	181	249	263	-	308	339	429	447	-	87	96	119	124	-	324	347	415	428	-
550	NF__-27	0.0283	70	220	253	349	368	-	431	475	601	626	-	122	134	167	173	-	454	486	581	600	-
550	NF__-33	0.0346	33	155	177	242	255	301	312	342	429	446	507	100	108	134	139	156	338	361	427	440	486
550	NF__-33	0.0346	50	234	268	367	387	456	473	519	650	676	768	151	164	202	210	237	512	547	647	667	736
550	NF__-33	0.0346	70	328	376	514	542	638	662	726	910	947	1075	211	230	283	294	331	717	766	905	933	1030
550	NF__-43	0.0451	33	260	296	400	421	494	545	594	733	761	859	194	210	255	264	295	610	647	755	776	851
550	NF__-43	0.0451	50	393	448	606	638	748	826	899	1111	1154	1301	294	318	386	400	447	924	980	1144	1176	1290
550	NF__-43	0.0451	70	551	628	849	893	1047	1156	1259	1556	1615	1821	411	445	540	560	626	1293	1373	1601	1647	1806
550	NF__-54	0.0566	33	403	456	611	642	750	871	944	1153	1194	1339	332	357	429	444	494	999	1056	1218	1251	1364
550	NF__-54	0.0566	50	610	692	926	973	1136	1320	1430	1746	1810	2029	503	541	650	672	748	1514	1600	1846	1895	2066
550	NF__-54	0.0566	70	854	968	1297	1362	1591	1849	2002	2445	2533	2841	705	758	910	941	1047	2120	2240	2584	2653	2893
550	NF__-68	0.0713	33	627	706	936	982	1142	1397	1505	1816	1878	2094	563	602	715	737	816	1639	1724	1968	2017	2187

**TABLE 4—ALLOWABLE WEB CRIPPLING LOADS FOR SINGLE MEMBERS<sup>1,2</sup> (lbs) (Continued)**

Member Designation		Design Thickness (in)	Fy (ksi)	Condition 1 (End 1 Flange)					Condition 2 (Interior 1 Flange)					Condition 3 (End 2 Flange)					Condition 4 (Interior 2 Flange)				
				Bearing Length (in)					Bearing Length (in)					Bearing Length (in)					Bearing Length (in)				
				1	1.5	3.5	4	6	1	1.5	3.5	4	6	1	1.5	3.5	4	6	1	1.5	3.5	4	6
550	NF__68	0.0713	50	949	1070	1418	1488	1730	2117	2281	2751	2845	3173	853	912	1083	1117	1236	2483	2612	2982	3056	3313
550	NF__68	0.0713	70	1329	1498	1985	2083	2422	2964	3193	3852	3983	4442	1194	1277	1516	1564	1730	3476	3657	4174	4278	4638

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

<sup>1</sup>Tabulated values are for unpunched webs and punched webs where the clear distance between the edge of bearing is such that the web crippling reduction factor, Rc, per AISI S100 Section C3.4.2 = 1.0. For webs with punchouts closer to the edge of bearing a web crippling reduction factor must be applied per AISI S100, Section C3.4.2.

<sup>2</sup>See notes at end of Table 5 for definitions of 1 and 2 flange loading.

**TABLE 5—ALLOWABLE WEB CRIPPLING LOADS FOR BACK TO BACK MEMBERS<sup>1,2</sup>(lbs)**

Member Designation		Design Thickness (in)	Fy (ksi)	Condition 1 (End One Flange) Fastened to Support				Condition 2 (Interior 1 Flange) Fastened to Support				Condition 3 (End 2 Flange) Unfastened to Support				Condition 4 (Interior 2 Flange) Unfastened to Support			
				Bearing Length (in)				Bearing Length (in)				Bearing Length (in)				Bearing Length (in)			
				1	1.5	3.5	4	1	1.5	3.5	4	1	1.5	3.5	4	1	1.5	3.5	4
350	NF__21	0.0219	33	332	381	-	-	433	474	-	-	159	171	-	-	326	352	-	-
350	NF__21	0.0219	50	503	577	-	-	656	718	-	-	240	259	-	-	494	533	-	-
350	NF__21	0.0219	70	704	808	-	-	918	1006	-	-	336	363	-	-	692	746	-	-
350	NF__27	0.0283	33	534	609	-	-	726	790	-	-	291	312	-	-	609	653	-	-
350	NF__27	0.0283	50	809	923	-	-	1100	1197	-	-	441	473	-	-	923	990	-	-
350	NF__27	0.0283	70	1133	1292	-	-	1540	1676	-	-	617	662	-	-	1292	1386	-	-
350	NF__33	0.0346	33	773	878	-	-	1085	1175	-	-	460	492	-	-	976	1042	-	-
350	NF__33	0.0346	50	1171	1330	-	-	1643	1781	-	-	698	745	-	-	1479	1579	-	-
350	NF__33	0.0346	70	1640	1861	-	-	2301	2493	-	-	977	1043	-	-	2071	2210	-	-
350	NF__43	0.0451	33	1258	1418	-	-	1835	1976	-	-	830	882	-	-	1784	1894	-	-
350	NF__43	0.0451	50	1905	2149	-	-	2781	2994	-	-	1258	1336	-	-	2703	2870	-	-
350	NF__43	0.0451	70	2668	3008	-	-	3893	4191	-	-	1762	1870	-	-	3785	4018	-	-
350	NF__54	0.0566	33	1907	2139	-	-	2874	3078	-	-	1362	1439	-	-	2955	3122	-	-
350	NF__54	0.0566	50	2889	3240	-	-	4354	4664	-	-	2064	2180	-	-	4477	4730	-	-
350	NF__54	0.0566	70	4045	4536	-	-	6096	6529	-	-	2889	3052	-	-	6267	6622	-	-
350	NF__68	0.0713	33	2912	3246	-	-	4528	4825	-	-	2234	2350	-	-	4888	5142	-	-

**TABLE 5—ALLOWABLE WEB CRIPPLING LOADS FOR BACK TO BACK MEMBERS<sup>1,2</sup> (lbs)**

Member Designation		Design Thickness (in)	Fy (ksi)	Condition 1 (End 1 Flange) Fastened to Support				Condition 2 (Interior 1 Flange) Fastened to Support				Condition 3 (End 2 Flange) Unfastened to Support			Condition 4 (Interior 2 Flange) Unfastened to Support			
				Bearing Length (in)				Bearing Length (in)				Bearing Length (in)			Bearing Length (in)			
				1	1.5	3.5	4	1	1.5	3.5	4	1	1.5	3.5	4	1.5	3.5	4
350	NF__-68	0.0713	50	4411	4919	-	-	6860	7310	-	-	3385	3561	-	-	7790	-	-
350	NF__-68	0.0713	70	6176	6886	-	-	9604	10234	-	-	4740	4985	-	-	10907	-	-
550	NF__-27	0.0283	33	532	607	822	865	724	788	973	1010	233	249	298	308	522	624	644
550	NF__-27	0.0283	50	807	920	1245	1311	1097	1194	1474	1530	352	378	451	466	792	945	976
550	NF__-27	0.0283	70	1129	1288	1744	1835	1535	1672	2064	2142	493	529	632	652	1108	1323	1366
550	NF__-33	0.0346	33	771	875	1175	1234	1082	1172	1432	1484	383	409	483	498	866	1024	1055
550	NF__-33	0.0346	50	1168	1326	1780	1870	1639	1776	2169	2248	580	619	732	754	1312	1551	1599
550	NF__-33	0.0346	70	1636	1857	2492	2619	2295	2486	3037	3147	812	867	1024	1056	1837	2172	2238
550	NF__-43	0.0451	33	1255	1415	1876	1968	1831	1971	2375	2456	717	761	887	913	1634	1907	1961
550	NF__-43	0.0451	50	1901	2144	2843	2982	2774	2987	3599	3721	1086	1153	1345	1383	2476	2889	2971
550	NF__-43	0.0451	70	2661	3002	3980	4175	3884	4182	5038	5209	1520	1614	1882	1936	3467	4044	4160
550	NF__-54	0.0566	33	1903	2134	2799	2932	2868	3072	3658	3775	1204	1272	1468	1507	2759	3184	3269
550	NF__-54	0.0566	50	2883	3234	4241	4442	4346	4654	5542	5720	1824	1927	2224	2283	4181	4824	4953
550	NF__-54	0.0566	70	4037	4527	5937	6219	6084	6516	7759	8007	2554	2698	3113	3196	5853	6754	6934
550	NF__-68	0.0713	33	2906	3241	4202	4394	4519	4816	5668	5838	2013	2118	2418	2478	4633	5289	5421
550	NF__-68	0.0713	50	4403	4910	6366	6657	6848	7297	8587	8845	3051	3209	3663	3754	7020	8014	8213
550	NF__-68	0.0713	70	6165	6874	8913	9320	9587	10215	12022	12384	4271	4492	5128	5255	9828	11220	11498

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

<sup>1</sup>The distance between the webs of the back-to-back member must be kept to a minimum.

<sup>2</sup>Tabulated values are for unpunched webs and punched webs where the clear distance between the edge of bearing is such that the web crippling reduction factor,  $R_c$ , per AISI S100 Section C3.4.2 = 1.0. For webs with punchouts closer to the edge of bearing a web crippling reduction factor must be applied per AISI S100, Section C3.4.2.

As defined by AISI S100 (For use with Tables 4 and 5):

- One-flange loading or reaction is defined as the condition where the clear distance between the bearing edges of adjacent opposite concentrated loads or reactions is equal to or greater than 1.5h.
- Two-flange loading or reaction is defined as the condition where the clear distance between the bearing edges of adjacent opposite concentrated loads or reaction is less than 1.5h.
- End loading or reaction is defined as the condition where the distance from the edge of the bearing to the end of the member is equal to or less than 1.5h.
- Interior loading or reaction is defined as the condition where the distance from the edge of the bearing to the end of the member is greater than 1.5h, except as other noted in AISI S100 Chapter C.