ICC EVALUATION SERVICE®

# ICC-ES Evaluation Report

**ESR-2093**

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*This report is subject to renewal August 2022.*

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**DIVISION: 05 00 00—METALS**
**Section: 05 40 00—Cold-Formed Metal 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 top and bottom chords of trusses.

## 3.0 DESCRIPTION

### 3.1 General:

Member designations are provided in Tables 1 and 2. Also, see Figure 1.

### 3.2 Material:

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

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design:

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

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

### 4.2 Installation:

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

## 5.0 CONDITIONS OF USE

The cold-formed steel members described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

**5.1** The cold-formed steel framing members must be installed in accordance with the applicable code, the approved plans and this report.

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

**5.3** Complete plans and calculations verifying compliance with this report must be submitted to the code official for each project at the time of permit application. The calculations and drawings must be prepared and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

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

**5.5** The framing members are manufactured 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-2093); member

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designation; minimum base-metal thickness (uncoated) in decimal thickness or mils; the minimum yield strength; and the protective coating designation (minimum G60).

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

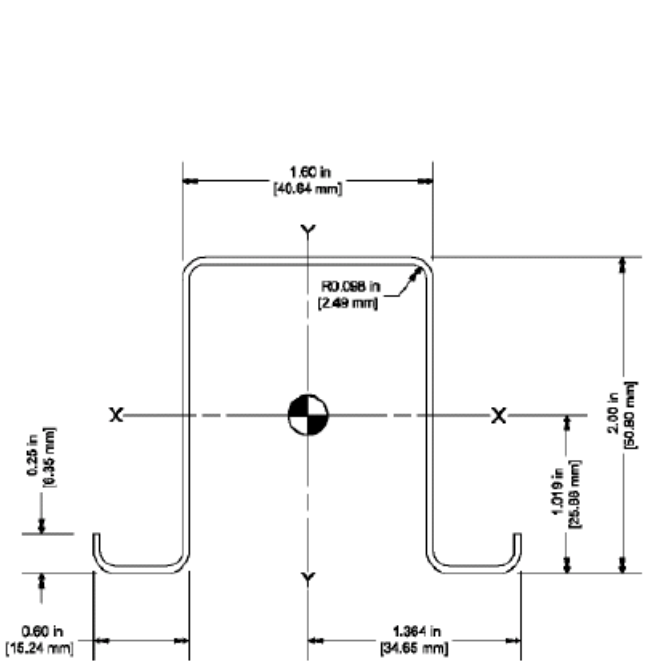
**SCOTTSDALE CONSTRUCTION SYSTEMS**
**17 CADBURY ROAD, ONEKAWA**
**NAPIER, HAWKE'S BAY**
**NEW ZEALAND 4112**
**+64 21 512895**
**www.scottsdalesteelframes.com**
**scott.kimble@scottsdalesteelframes.com**

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

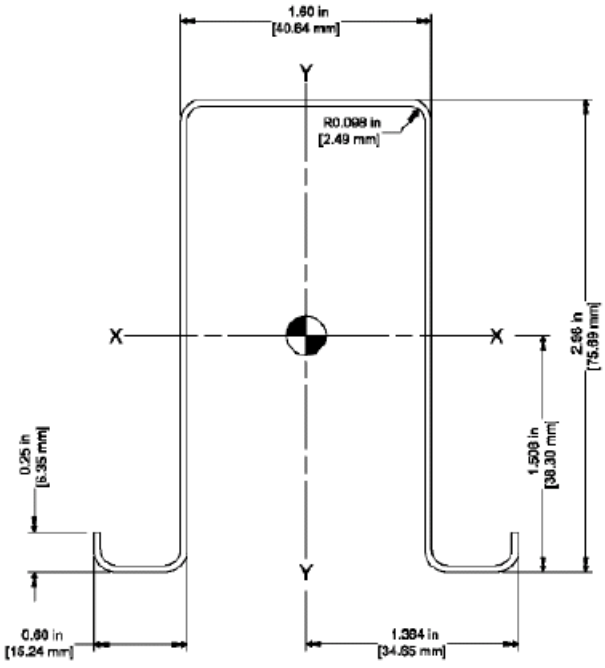
**DRAGONFLY VERT**
**777 MARINERS ISLAND BOULEVARD**
**SAN MATEO, CALIFORNIA 94404**
**(650) 292-0752**

**Definitions for Tables 1 and 2**

| | |
|---|---|
| $A_e$ | Effective area for compression based on local buckling at stress = Fy |
| $P_{ao}$ | Allowable compressive axial load at yield for fully braced member at stress = Fy |
| $P_{a-d}$ | Allowable compressive axial load for distortional buckling with $k_\phi = 0$ |
| $T_a$ | Allowable tensile axial load |
| $I_{ye}$ | Effective moment of inertia about the Y-Y axis at yield |
| $S_{ye}$ | Effective section modulus about the Y-Y axis at yield |
| $M_{a-y}$ | Allowable moment about the Y-Y axis at yield. |
| $+I_{xe+}$ | Effective moment of inertia about the X-X axis, for positive bending (top flange in compression), at yield. |
| $+S_{xe}$ | Effective section modulus about the X-X axis, for positive bending (top flange in compression), at yield. |
| $+M_{ax-l}$ | Allowable moment for local buckling about the X-X axis, for positive bending (top flange in compression), at yield. |
| $-I_{xe}$ | Effective moment of inertia about the X-X axis, for negative bending (bottom flanges in compression), at yield. |
| $-S_{xe}$ | Effective section modulus about the X-X axis, for negative bending (bottom flanges in compression), at yield. |
| $-M_{a-l}$ | Allowable moment for local buckling about the X-X axis, for negative bending (bottom flanges in compression), at yield. |
| $-M_{a-d}$ | Allowable moment for distortional buckling about the X-X axis, applies only for negative bending (bottom flanges in compression). |




**SCSTRUSS 2.0**




**SCSTRUSS 3.0**

**FIGURE 1—HAT SECTIONS**

**TABLE 1—GROSS AND TORSIONAL PROPERTIES**

| Member Designation | Design Steel Thickness (in.) | Gross Properties | | | | | | Torsional Properties | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Weight | Area | $I_x$ | $R_x$ | $I_y$ | $R_y$ | $Y_o$ | Jx1000 | $C_w$ | $R_o$ |
| | | (lb/ft) | ($in^2$) | ($in^4$) | (in) | ($in^4$) | (in) | (in) | ($in^4$) | ($in^6$) | (in) |
| 20TC21 | 0.0219 | 0.5129 | 0.1509 | 0.0886 | 0.7662 | 0.1044 | 0.8317 | 1.7288 | 0.0241 | 0.0331 | 2.0658 |
| 20CT27 | 0.0283 | 0.6583 | 0.1936 | 0.1127 | 0.7629 | 0.1322 | 0.8264 | 1.7255 | 0.0517 | 0.0414 | 2.0597 |
| 20CT33 | 0.0346 | 0.7994 | 0.2351 | 0.1357 | 0.7597 | 0.1585 | 0.8212 | 1.7223 | 0.0938 | 0.4906 | 2.0537 |
| 20CT43 | 0.0451 | 1.0303 | 0.3030 | 0.1724 | 0.7543 | 0.2000 | 0.8124 | 1.7168 | 0.2055 | 0.0606 | 2.0436 |
| 30CT43 | 0.0451 | 1.3308 | 0.3914 | 0.4555 | 1.0788 | 0.2535 | 0.8048 | 2.6646 | 0.2654 | 0.1758 | 2.9852 |
| 30CT54 | 0.0566 | 1.6541 | 0.4865 | 0.5592 | 1.0721 | 0.3082 | 0.7959 | 2.6596 | 0.5195 | 0.2103 | 2.9760 |

**TABLE 2—EFFECTIVE PROPERTIES**

| Member Designation | Design Steel Thickness (in) | Fy (ksi) | Axial | | | | Y-Y Axis Bending | | | Positive X-X Bending | | | Negative X-X Bending | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $A_e$ | $P_{ao}$ | $P_{a-d}$ | $T_a$ | $I_{ye}$ | $S_{ye}$ | $M_{a-y}$ | $+I_{xe+}$ | $+S_{xe}$ | $+M_{ax-l}$ | $-I_{xe}$ | $-S_{xe}$ | $-M_{a-l}$ | $-M_{a-d}$ |
| | | | ($in^2$) | (lb) | (lb) | (lb) | ($in^4$) | ($in^3$) | (in-k) | ($in^4$) | ($in^3$) | (in-k) | ($in^4$) | ($in^3$) | (in-k) | (in-k) |
| 20TC21 | 0.0219 | 50 | 0.1012 | 2811 | 2849 | 4516 | 0.0943 | 0.0645 | 1.931 | 0.0771 | 0.0724 | 2.168 | 0.0886 | 0.0873 | 2.615 | 1.911 |
| 20CT27 | 0.0283 | 50 | 0.1475 | 4097 | 4080 | 5797 | 0.1246 | 0.0877 | 2.625 | 0.1039 | 0.1008 | 3.019 | 0.1127 | 0.1109 | 3.321 | 2.682 |
| 20CT33 | 0.0346 | 50 | 0.1978 | 5494 | 5348 | 7040 | 0.1543 | 0.1111 | 3.327 | 0.1307 | 0.1302 | 3.899 | 0.1357 | 0.1333 | 3.991 | 3.476 |
| 20CT43 | 0.0451 | 50 | 0.2861 | 7947 | 7524 | 9073 | 0.2000 | 0.1476 | 4.420 | 0.1724 | 0.1688 | 5.053 | 0.1724 | 0.1688 | 5.053 | 4.420 |
| 30CT43 | 0.0451 | 50 | 0.3044 | 8454 | 8109 | 11719 | 0.2364 | 0.1676 | 5.016 | 0.4555 | 0.3013 | 9.020 | 0.4555 | 0.3013 | 9.020 | 5.532 |
| 30CT54 | 0.0566 | 50 | 0.4163 | 11565 | 10977 | 14565 | 0.3010 | 0.2209 | 6.613 | 0.5592 | 0.3687 | 11.039 | 0.5592 | 0.3687 | 11.039 | 6.869 |
| | | | | | | | | | | | | | | | | |
| 20TC21 | 0.0219 | 70 | 0.0935 | 3638 | 3424 | 6034 | 0.0918 | 0.0619 | 2.595 | 0.0744 | 0.0687 | 2.879 | 0.0886 | 0.0873 | 3.661 | 2.376 |
| 20CT27 | 0.0283 | 70 | 0.1360 | 5290 | 4959 | 7745 | 0.1213 | 0.0840 | 3.522 | 0.1003 | 0.0955 | 4.001 | 0.1127 | 0.1109 | 4.649 | 3.371 |
| 20CT33 | 0.0346 | 70 | 0.1827 | 7104 | 6569 | 9405 | 0.1503 | 0.1066 | 4.470 | 0.1264 | 0.1235 | 5.176 | 0.1357 | 0.1333 | 5.587 | 4.700 |
| 20CT43 | 0.0451 | 70 | 0.2681 | 10425 | 9409 | 12121 | 0.1977 | 0.1448 | 6.070 | 0.1702 | 0.1679 | 7.036 | 0.1724 | 0.1688 | 7.075 | 6.188 |
| 30CT43 | 0.0451 | 70 | 0.2811 | 10933 | 9837 | 15657 | 0.2281 | 0.1586 | 6.647 | 0.4497 | 0.2995 | 12.552 | 0.4555 | 0.3013 | 12.628 | 7.021 |
| 30CT54 | 0.0566 | 70 | 0.3887 | 15117 | 13467 | 19459 | 0.2913 | 0.2098 | 8.795 | 0.5592 | 0.3687 | 15.455 | 0.5592 | 0.3687 | 15.455 | 9.201 |

[1]Axial properties $A_e$ and $P_{ao}$ are based on local buckling of member at $F_y$, fully braced against global buckling.
[2]$P_{a-d}$ is based on $K\phi = 0$ and no discrete bracing against distortional buckling
[3]All local buckling allowable moments, Ma-y, Max-l and Ma-l are based on members fully braced against flexural and torsional-flexural buckling.
[4]Allowable distortional buckling moment, Ma-d is based on $K\phi = 0$ and no discrete bracing against distortional buckling.
[5]Y-Y axis is symmetric for bending. Properties for "positive" or "negative" bending are identical.
[6]Positive X-X Bending is for the top flange in compression.
[7]Negative X-X Bending is for the bottom flanges in compression.