# STRUCTURAL CALCULATIONS

**Project Name:** **Kellogg Garage**
**Jay Street**
**La Crosse, WI**

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**Prepared for:** **Zettler Design Studio**

**Date Issued:** **March 2026**


Design per ASCE 7-16 and IBC 2021

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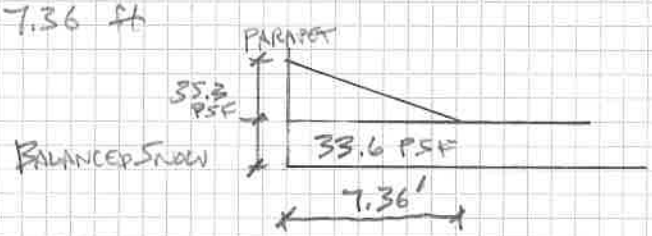
3400 Losey Boulevard South
La Crosse, WI 54601

Project KELLOGG GARAGE
Subject
Date 3.23.26
1/12
Signed

LOADS PER ASCE 7-16 + IBC 2021
SNOW LOAD PER ASCE 7-16 CH 7
$P_g$ = 40 PSF
$I_s$ = 1.0
$C_e$ 1.0
$C_t$ = 1.2

$P_f = 0.7 P_g I_s C_e C_t = .7(40)(1.2) = 33.6$ PSF

DRIFT LOAD @ PARAPET WALLS
$l_u$ = 25'
$h_d = .43 \sqrt[3]{l_u}\,\sqrt[4]{P_g+10} - 1.5 = .43\sqrt[3]{25}\,\sqrt[4]{50} - 1.5 = 1.84$ ft
$\gamma = 0.13 P_g + 14 = 19.2$ PCF
SNOW LOAD INTENSITY = $h_d\gamma = 1.84(19.2) = 35.3$ PSF
DRIFT LENGTH = $4h_d$ = 7.36 ft




WIND LOADS PER ASCE 7-16 CH 28 Simplified Procedure
FIGURE 28.5-1
MWFRS LOADS
V = 115 mph
h = 15'
Roof Angle 5°

| HORIZ PRESSURES | | VERT PRESSURES | |
|---|---|---|---|
| ZONE A | 21 PSF | ZONE E | -25.2 PSF |
| B | -10.9 PSF | F | -14.3 PSF |
| C | 13.9 PSF | G | -17.5 PSF |
| D | -6.5 PSF | H | -11.1 PSF |

Components & CLADDING LOADS PER ASCE 7-16
FIGURE 30.4-1

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ROOF FRAMING $l = 15'$

MAX LOAD = 33.6 PSF SNOW + 30 PSF DRIFT + 12 PSF DL

$65.6(2) = 131.2$ PLF

$M = \frac{wl^2}{8} = \frac{131.2(15^2)}{8} = 3690$ lb-ft

2x10 $S_x = \frac{bd^2}{6} = 21.39$ IN$^3$

$F_b'$ REQD $= \frac{M}{S_x} = \frac{3690(12)}{21.39} = 2070$ PSI

2x10 DFL Select Structural

$F_b' = 1500(1.15)(1.15)(1.1) = 2182$ PSI $> 2070$ PSI OK
($C_D$ $C_r$ $C_F$)

USE 2x10 DFL SELECT STRUCTURAL ROOF JOISTS @ 24" O.C. PROVIDE BLOCKING @ BEARING WALL & @ MID SPAN

HEADERS @ OH DOORS

MAX SPAN = 12' $l = 12.5$

LOAD = $6(10) + 1(66) = 126$ PLF
(WALL ABOVE ROOF)

$M = \frac{wl^2}{8} = \frac{126(12.5)^2}{8} = 2461$ lb-ft

Find $S_x$ REQD @ $F_b' = 2950(1.15) = 3393$ PSI ($C_D$)

$S_x = \frac{2461(12)}{3393} = 8.7$ IN$^3$

DIMENSIONAL LUMBER OPTION DFL #2

$F_b' = 900(1.15)(1.0) = 1138.5$ PSI ($C_D$ $C_F$)

Find $S_x$ REQD @ $F_b' = 1138.5$ PSI

$S_x = \frac{2461(12)}{1138.5} = 26$ IN$^3$

USE 3 PLY 2x10 DFL #2 W/ 2x TOP & BOTTOM W/ 2 JACK STUDS & 2 KING STUDS

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HEADERS @ MAN DOORS

$L = 4'$

LOAD = $15/2\,(33.6+15) = 365$ PLF

$M = \frac{wL^2}{8} = \frac{365(4)^2}{8} = 730$ lb-ft

FIND $S_x$ REQ'D $F_b = 900(1.15)(1.1) = 1139$ PSI ($C_D$ $C_F$)

$S_x = \frac{730(12)}{1139} = 7.7\ in^3$

USE 2 Ply 2x8 DF#2 or SPF#2 W/ 1D JACK + 1 KING

---

STUD WALLS 14' WALL W/ ROOF LOAD + WIND LOAD

WIND LOAD FROM COMPONENTS + CLADDING

V=115 mph WALLS ZONE 4 20 SF = -24.7 PSF

LOADS: DL ROOF = 15(6.5) = 98 PLF

DL WALL 14(10) = 140 PLF

SNOW 6.5(33.6) = 218 PLF

USE LOAD COMBINATION DL + .75 SNOW + .7(.6) WIND

$P_{MAX} = (98+140)1.33_{16"\,OC} + 218(.75)(1.33)_{16"\,O.C.} = 535\#$

$M_{MAX} = .6(.75)\frac{wL^2}{8} = \frac{.6(.75)(24.7)(14)^2(1.33)}{8} = 362$ lb-ft

TRY 2x6 SPF#2 STUDS @ 16" O.C.

$F_b = 875$ PSI

$F_{c\perp} = 1150$ PSI

$A = 8.25\ in^2$

$S_x = 7.56\ in^3$

$E = 1.4 \times 10^6$

ADJUSTMENT FACTORS: $C_r = 1.15$ $C_F = 1.3$ ($F_b$) $C_F = 1.1$ ($F_c$) $C_D = 1.6$

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STUD WALLS CONT

$F_c^* = 1150(1.15)(1.1)(1.6) = 2328$ PSI

$K_{CE} = 0.3$ VISUALLY GRADED LUMBER

$\frac{l_e}{d} = \frac{14(12)}{5.5} = 30.5$

$F_{cE} = \frac{K_{CE} E}{\left(\frac{l_e}{d}\right)^2} = \frac{.3(1.4\times10^6)}{(30.5)^2} = 451.5$ PSI

$C_p = \frac{1+F_{cE}/F_c^*}{2c} - \sqrt{\left(\frac{1+F_{cE}/F_c^*}{2c}\right)^2 - \frac{F_{cE}/F_c^*}{c}}$ .74 − .55 − .24 .74 − .56 = .18

$C = 0.8$

$F_{cE}/F_c^* = \frac{451.5}{2328} = .19$

$C_p = 0.18$

$F_c' = F_c^* C_p = 2328(.18) = 419$ PSI

$f_c = P/A = \frac{535}{8.25} = 64.8$ PSI

$F_b' = F_b C_r C_f C_p = 875(1.15)(1.3)(1.6) = 2093$ PSI

$f_b = \frac{M}{S_x} = \frac{362(12)}{7.56} = 574$ PSI

Check Combined AXIAL + BENDING

$$\left(\frac{f_c}{F_c'}\right)^2 + \frac{f_b}{F_b'\left(1-f_c/F_c'\right)} \leq 1.0$$

$$\left(\frac{64.8}{419}\right)^2 + \frac{574}{2093\left(1-\frac{64.8}{419}\right)} = 0.34 < 1.0 \quad \text{OK}$$

.02 + .32

USE 2x6 SPF #2 STUDS @ 16" O.C.

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Signed AOC

SHEAR WALLS

NAIL Plywood to STUDS 4 8d NAILS @ 6" O.C. & USE SIMPSON DTT2Z @ Corner Posts

@ WALL 4 ON DOORS INSTALL PORTAL FRAMES PER USC PG 30

HOLD DOWNS - USE HI @ LOW SIDE STUDS

@ Center Wall USE H10A-2

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Date 3-23-26

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FOUNDATIONS:

MAX LOAD = 14(10) = 140 PLF — WALL DL

15/2 (33.6+30+15) = 590 PLF — ROOF LOADS

.5(150)(1.5) = 113 PLF — CONC CURB

TOTAL = 843 PLF

FTG SIZE = $\frac{843 \text{ PLF}}{1850 \text{ PSF}}$ = .46 ft

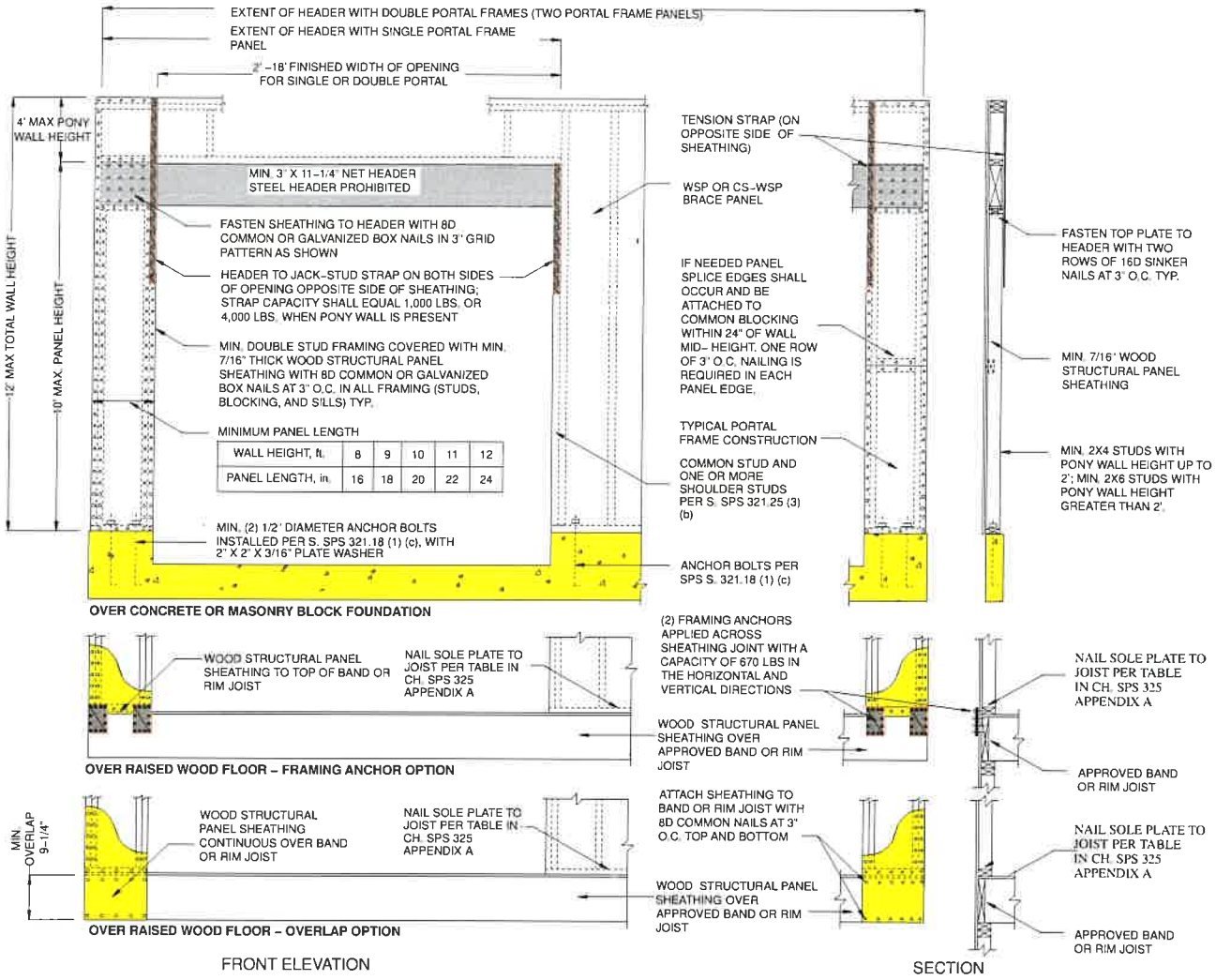
SOIL BRG PRESSURE = 2000 PSF − 150 PSF FTG WT.

USE 8" WIDE X 12" DEEP THICKENED SLAB FOOTING W/ (2) #4 BARS CONT.

STEM WALL 6" X 16" W/ #4 VERT + (2) #4 BARS CONT (1 LOW, 1 HIGH)

**Figure 321.25–A**

**METHOD PF – PORTAL FRAME BRACE CONSTRUCTION**




**Note:** Steel headers are permitted if designed by structural analysis.

**Note:** As shown in the above cross–section, 1/2–inch gypsum wallboard is not required on the interior side of the wall.

(c) *Bracing amount.* Bracing methods and materials complying with Table 321.25–G shall be applied to walls in accordance with all of the following requirements:

1. For the purpose of determining bracing amounts, the outermost extents of the building plan at each floor level shall be circumscribed with a rectangle to define the overall length of each building side as shown in Figure 321.25–B.

2. In no case may the amount of bracing be less than two braced wall panels on walls parallel to each rectangle side for each floor level of the building.

3. Where used, the number of intermittent brace panels applied to walls parallel to each rectangle side shall comply with Table 321.25–I.

4. Where used, the total length of continuous sheathed brace panels applied to walls parallel to each building side shall comply with Table 321.25–J.

5. The location of brace panels applied to walls parallel to each building side shall comply with Figure 321.25–C.

6. Balloon–frame walls may be no longer than 21 feet and shall have a maximum height of two floors unless constructed in accordance with an approved design. Wall framing shall be continuous from the lowest floor to the wall top plate at the roof. All edges of sheathing shall be supported on and fastened to blocking or framing. Braced wall panels may not be required on the balloon–frame wall portion provided the bracing amount and brace spacing requirement are satisfied for the building side. Where brace panels are located on the balloon–frame wall portion, they shall have a height–to–width ratio of not more than 2.5:1.

7. For a gable end wall, if the brace–panel height does not exceed 12 feet at the highest portion and if the 12½–foot and 21–foot spacing requirements in Figure 321.25–C are met, the wall is adequately braced. Where a brace panel exceeds 12 feet in height, it shall have a height–to–width ratio of not more than 2.5:1, and comply with Figure 21.25–C.

# H/TSP

## Seismic and Hurricane Ties

Simpson Strong-Tie hurricane ties provide a positive connection between truss/rafter and the wall of the structure to resist wind and seismic forces.

**Material:** See table

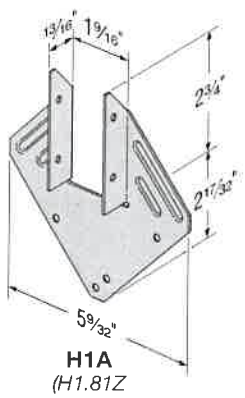
**Finish:** Galvanized. H1.81Z, H7Z and H11Z — ZMAX® coating. Some models available in stainless steel or ZMAX; H1A, H2.5A also available (in Spring 2026) in black powder coat (H1APC, H2.5APC)

**Installation:**

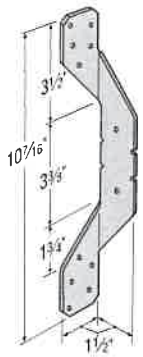
- Use all specified fasteners; see General Notes.
- Hurricane ties can be installed with flanges facing inward or outward.
- H2.5T, H3 and H6 ties are shipped in equal quantities of right and left versions (right versions shown).
- Hurricane ties do not replace solid blocking.
- When installing ties on plated trusses (on the side opposite the truss plate) do not fasten through the truss plate from behind. This can force the truss plate off of the truss and compromise truss performance.
- H10A optional nailing to connect shear blocking, use 0.131" x 2½" nails. Slots allow maximum field bending up to a pitch of 6:12, use H10A sloped loads for field-bent installation.

**Codes:** See p. 12 or Code Reference Key Chart

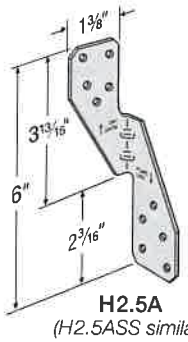
**Web Applications:** Visit **app.strongtie.com/rws** to access our Roof-to-Wall Selector web application.



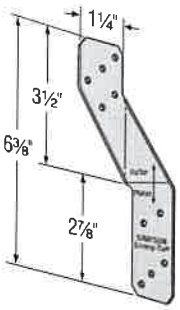

**H1A**
*(H1.81Z similar)*



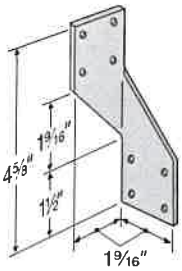

**H2A**
*(H2ASS similar)*



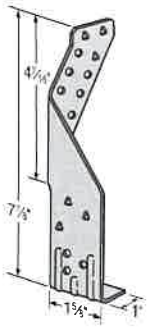

**H2.5A**
*(H2.5ASS similar)*



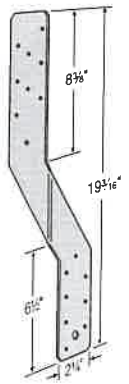

**H2.5T**



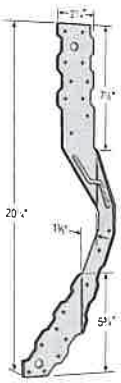

**H3**
*(H3SS similar)*



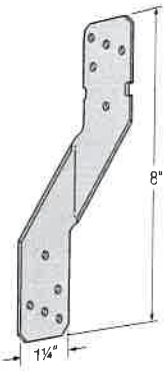

**TSP**



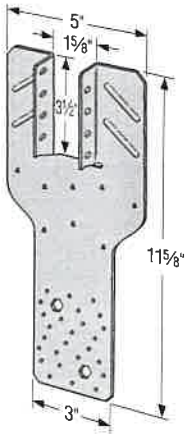

**H6**



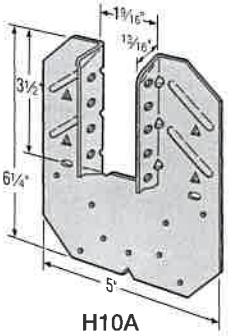

**H7Z**



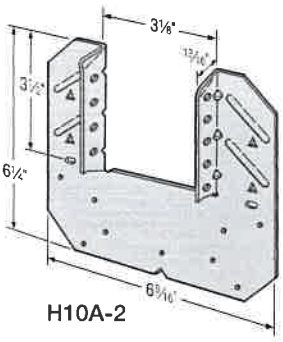

**H8**
*(H8SS similar)*



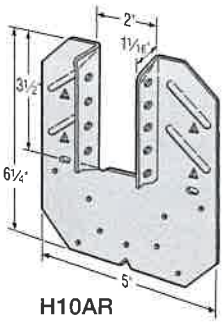

**H10S**



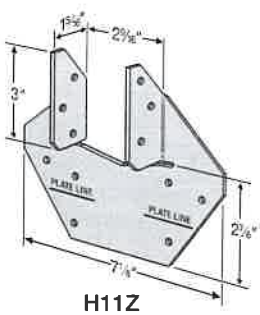

**H10A**
*(H10ASS similar)*



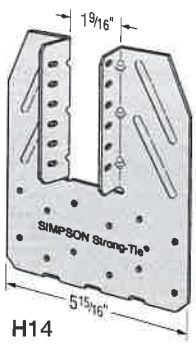

**H10A-2**



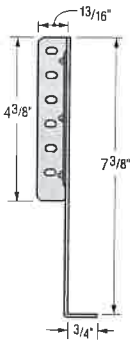

**H10AR**




**H11Z**




**H14**




**H14 Profile**

# H/TSP

## Seismic and Hurricane Ties (cont.)

These products are available with additional corrosion protection. For more information, see pp. 13–19.

SS For stainless-steel fasteners, see p. 25.

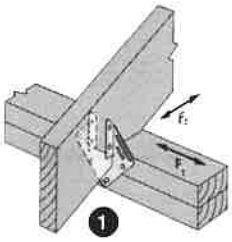
SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 380–382 for more information.

| | Model No. | Ga. | Fasteners (in.) | | | DF/SP Allowable Loads | | | Uplift with 0.131" x 1½" Nails (160) | SPF/HF Allowable Loads | | | Uplift with 0.131" x 1½" Nails (160) | Code Ref. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | To Rafters/Truss | To Plates | To Studs | Uplift (160) | Lateral (160) | | | Uplift (160) | Lateral (160) | | | |
| | | | | | | | $F_1$ | $F_2$ | | | $F_1$ | $F_2$ | | |
| ■ | H1A | 18 | (4) 0.131 x 1½ | (4) 0.131 x 1½ | — | 545 | 420 | 265 | — | 470 | 360 | 205 | — | IBC, FL, LA |
| ■ | H1.81Z | 18 | (6) 0.131 x 1½ | (4) 0.131 x 2½ | — | 540 | 440 | 170 | 460 | 465 | 380 | 130 | 395 | — |
| ■ | H2A | 18 | (5) 0.131 x 1½ | (2) 0.131 x 1½ | (5) 0.131 x 1½ | 525 | 130 | 55 | — | 495 | 130 | 55 | — | IBC, FL, LA |
| SS | H2ASS | 18 | (5) 0.131 x 1½ | (2) 0.131 x 1½ | (5) 0.131 x 1½ | 400 | 130 | 55 | 400 | 345 | 130 | 55 | 345 | — |
| ■ | H2.5A | 18 | (5) 0.131 x 2½ | (5) 0.131 x 2½ | — | 700 | 110 | 110 | 625 | 615 | 110 | 110 | 540 | IBC, FL, LA |
| SS | H2.5ASS | 18 | (5) 0.131 x 2½ | (5) 0.131 x 2½ | — | 440 | 75 | 70 | 365 | 380 | 75 | 70 | 310 | — |
| | H2.5T | 18 | (5) 0.131 x 2½ | (5) 0.131 x 2½ | — | 590 | 135 | 145 | 480 | 565 | 135 | 145 | 475 | IBC, FL, LA |
| ■ | H3 | 18 | (4) 0.131 x 2½ | (4) 0.131 x 2½ | — | 400 | 210 | 170 | 400 | 365 | 180 | 145 | 290 | |
| SS | H3SS | 18 | (4) 0.131 x 2½ | (4) 0.131 x 2½ | — | 280 | 145 | 120 | 275 | 225 | 100 | 85 | 210 | — |
| ■ | H6 (to Plates) | 16 | — | (8) 0.131 x 2½ | (8) 0.131 x 2½ | 930 | — | — | — | 800 | — | — | — | IBC, FL, LA |
| ■ | H6 (to Rim) | 16 | (8) 0.131 x 2½ | — | (8) 0.131 x 2½ | 1,230 | — | — | — | 1,065 | — | — | — | |
| ■ | H7Z | 16 | (4) 0.131 x 2½ | (2) 0.131 x 1½ | (8) 0.131 x 2½ | 830 | 410 | — | — | 715 | 355 | — | — | |
| ■ | H8 | 18 | (5) 0.148 x 1½ | (5) 0.148 x 1½ | — | 780 | 95 | 90 | 630 | 710 | 95 | 90 | 510 | |
| SS | H8SS | 18 | (5) 0.148 x 1½ | (5) 0.148 x 1½ | — | 610 | 90 | 120 | 440 | 370 | 90 | 55 | 335 | — |
| ■ | H10A Field Bent | 18 | (9) 0.148 x 1½ | (9) 0.148 x 1½ | — | 780 | 565 | 285 | — | 760 | 485 | 285 | — | IBC, FL, LA |
| ■ | H10A | 18 | (9) 0.148 x 1½ | (9) 0.148 x 1½ | — | 1,040 | 565 | 285 | — | 1,015 | 485 | 285 | — | |
| SS | H10ASS | 18 | (9) 0.148 x 1½ | (9) 0.148 x 1½ | — | 970 | 565 | 170 | — | 835 | 485 | 170 | — | — |
| | H10AR | 18 | (9) 0.148 x 1½ | (9) 0.148 x 1½ | — | 1,050 | 490 | 285 | — | 905 | 420 | 285 | — | |
| ■ | H10S | 18 | (8) 0.131 x 1½ | (8) 0.131 x 1½ | (8) 0.131 x 2½ | 910 | 660 | 215 | 550 | 785 | 570 | 185 | 475 | IBC, FL, LA |
| ■ | H10A-2 | 18 | (9) 0.148 x 1½ | (9) 0.148 x 1½ | — | 1,080 | 680 | 260 | — | 930 | 585 | 225 | — | |
| ■ | H11Z | 18 | (6) 0.162 x 2½ | (6) 0.162 x 2½ | — | 830 | 525 | 760 | — | 715 | 450 | 655 | — | — |
| | H14 | 18 | (12) 0.131 x 1½ | (13) 0.131 x 2½ | — | 1,275 | 725 | 285 | — | 1,050 | 480 | 245 | — | IBC, FL, LA |
| | | | (12) 0.131 x 1½ | (15) 0.131 x 2½ | — | 1,340 | 670 | 230 | — | 1,050 | 480 | 245 | — | |
| | TSP | 16 | (9) 0.148 x 1½ | (6) 0.148 x 1½ | — | 755 | 310 | 190 | — | 650 | 265 | 160 | — | |
| | | | (9) 0.148 x 1½ | (6) 0.148 x 3 | — | 1,015 | 310 | 190 | — | 875 | 265 | 160 | — | |

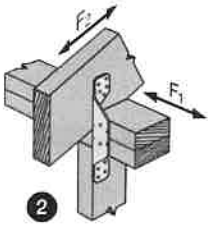
1. See pp. 288–289 for Straps and Ties General Notes.
2. Allowable loads are for one anchor. A minimum rafter thickness of 2½" must be used when framing anchors are used on each side of the joist and on the same side of the plate (exception: connectors installed such that nails on opposite side don't interfere).
3. Allowable DF/SP uplift load for stud-to-bottom plate installation (see detail 12) is 390 lb. (H2.5A); 265 lb. (H2.5ASS); and 310 lb. (H8). For SPF/HF values, multiply these values by 0.86.
4. Allowable loads in the $F_1$ direction are not intended to replace diaphragm boundary members and do not account for possible cross-grain bending of the truss or rafter members.
5. When cross-grain bending or cross-grain tension cannot be avoided in the members, mechanical reinforcement to resist such forces shall be considered by the designer.
6. Southern pine allowable uplift loads for H10A = 1,105 lb. (160), H2.5A with 0.131" x 1½" nails = 635 lb. (160) and H2.5A with 0.131" x 2½" nails = 730 lb. (160).
7. H10S can have the stud offset a maximum of 1" from the rafter (center to center) for a reduced uplift of 890 lb. (DF/SP) and 765 lb. (SPF).
8. H10S nails to plates are optional for uplift but required for lateral loads.
9. Some load values for the stainless-steel connectors shown here are lower than those for the carbon-steel versions. Ongoing test programs have shown this also to be the case with other stainless-steel connectors in the product line that are installed with nails. Visit **strongtie.com/corrosion** for updated information.
10. The allowable loads of stainless-steel connectors match carbon-steel connectors when installed with stainless-steel Strong-Drive SCNR™ Ring-Shank Connector nails. For more information, refer to engineering letter L-F-SSNAILS at **strongtie.com**.
11. Simpson Strong-Tie offers stainless-steel Strong-Drive SCNR Ring-Shank Connector nails. For bulk SCNR nails, see p. 375; for collated SCNR nails, see p. 376. For general fastener information, see pp. 25–26.
12. Allowable DF/SP/SPF uplift load for the H2.5A fastened to a 2x4 truss bottom chord and double top plates using five 0.131" x 1½" nails in the top plates and three 0.131" x 1½" nails in the lowest three flange holes into the truss bottom chord is 260 lb. (160).
13. For TSP installed stud to single plate see pp. 303–305.
14. **Fasteners:** Nail dimensions are listed diameter by length. See pp. 25–26 for fastener information.
15. Using Strong-Drive SD Connector (SD9112) for 0.131" x 1½" and 0.148" x 1½", Strong-Drive SD Connector (SD9212) for 0.131" x 2½" (and longer) and 0.148" x 2½" (and longer), Strong-Drive SD Connector (SD10212) for 0.162" x 2½" (and longer) will get the same load as nails.

# H/TSP

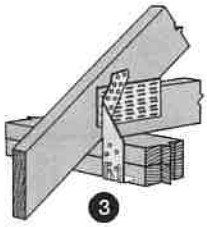
## Seismic and Hurricane Ties (cont.)



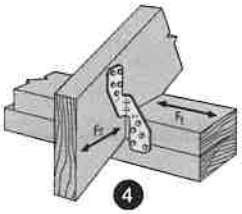
1 H1A Installation
*(H1.81Z similar)*



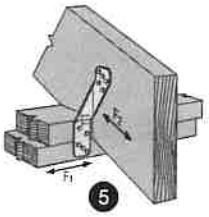
2 H2A Installation



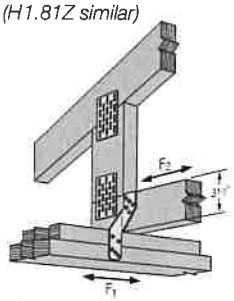
3 TSP Installation



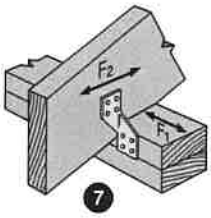
4 H2.5A Installation
*(nails into both top plates)*



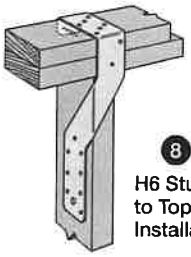
5 H2.5T Installation
*(nails into both top plates)*



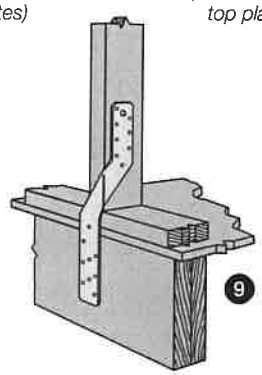
6 H2.5T Installation



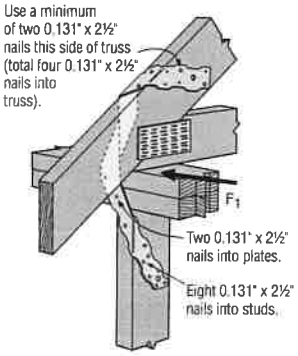
7 H3 Installation
*(nails into upper top plate)*



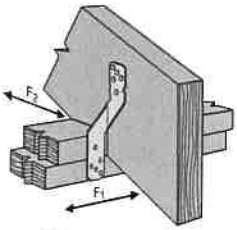
8 H6 Stud to Top Plate Installation



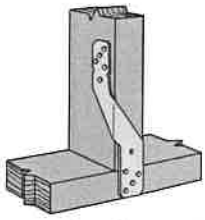
9 H6 Stud to Rim Board Installation



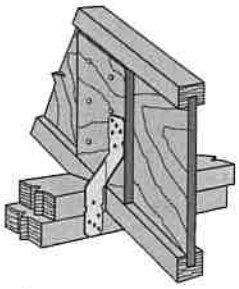

10 H7Z Installation



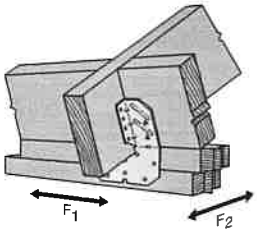
11 H8 Attaching Rafter to Double Top Plates



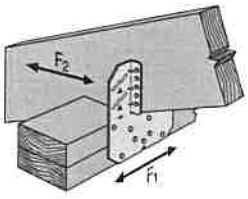
12 H8 attaching Stud to Sill
*((4) 0.131" x 2½" nails into plate, (5) 0.131" x 2½" nails into stud, refer to footnote 3 for loads)*



13 H8 attaching I-Joist to Double Top Plates

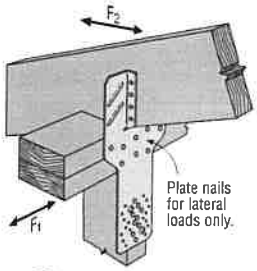


14 H10A Field-Bent Installation

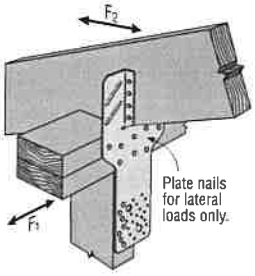


15 H10A Installation

H10A optional nailing connects shear blocking to rafter. Use 0.131" x 2½" nails. Slot allows maximum field-bending up to a pitch of 6:12, bend one time only.



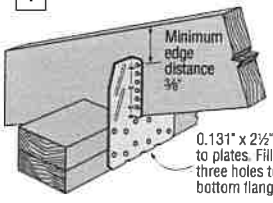

16 H10S Installation




17 H10S Installation with Stud Offset

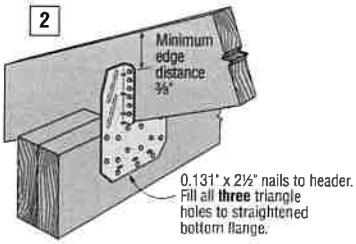
Visit **app.strongtie.com/rws** to access our Roof-to-Wall Selector web application.

1




18 H14 Installation to Double Top Plates

2




19 H14 Installation to Double 2x Header

# HDUE™/DTT™

## Holdowns



***This product is preferable to similar connectors because of (a) easier installation, (b) higher loads, (c) lower installed cost, or a combination of these features.***

Engineered for higher load capacity, the new patent-pending HDUE holdown is ideal for meeting the higher design demands of today's residential wood structures. The HDUE provides exceptional overturning resistance for shearwalls, braced wall panels and other lateral force-resisting applications in wood construction. The HDUE is available in six sizes to meet a wide range of load requirements.

Tested per ICC-ES AC155, higher capacity models uniquely combine fasteners in both shear and tension, while reducing the number of screws required. The HDUE is fast and easy to install using Strong Drive® SDS Heavy Duty Connector screws, which reduce fastener slip and allow wood posts to maintain a greater net section than bolts.

The DTT tension ties are designed for lighter-duty holdown applications on single 2x posts. The DTT1Z® is installed with nails or Strong-Drive SD Connector screws and the DTT2 installs easily with the Strong-Drive SDS Heavy-Duty Connector screws (included). The DTT1Z holdowns have been tested for use in designed shearwalls and prescriptive braced wall panels as well as prescriptive wood-deck applications (see pp. 326–327 for deck applications).

**HDUE Features:**

- Predeflected seat reduces deflection under load
- Angled fastening in the four larger sizes engages the screws in tension for higher load capacity, reducing the number of screws required
- Angled fastening tabs help drive fastener at a 45° angle and offset holes on the second back plate block the fastener from being driven straight
- Overlapping back plate increases fastener strength and shear values, helping prevent post splitting
- Optimized screw patterns reduce splitting at the end of the post and maximize individual fastener capacity
- Installs with Strong-Drive SDS Heavy Duty Connector screws (included)

**Material:** See table

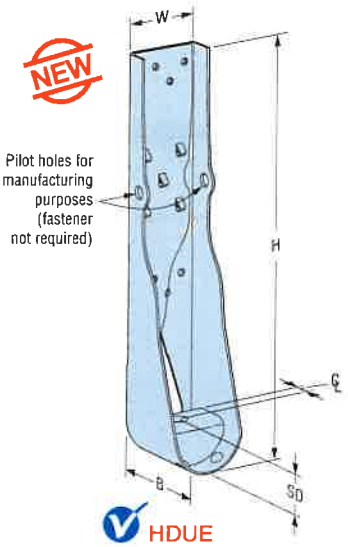
**Finish:** HDUE — G90 and HDG;
DTT1 and DTT2 — ZMAX® coating and stainless steel

**Installation:**

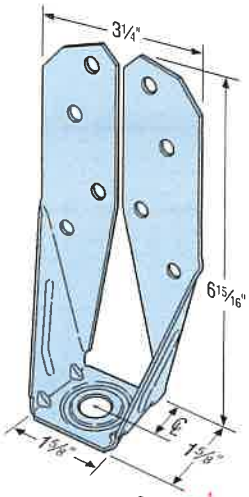
- See Holdown and Tension Tie General Notes on pp. 57–58.
- The HDUE requires no additional washer; the DTT requires a standard-cut washer (included) be installed between the nut and the seat.
- HDUE13 requires heavy hex nut (provided).
- Strong-Drive SDS Heavy-Duty Connector screws install best with a low-speed high-torque drill with a ⅜" hex-head driver.
- Angled fasteners should be driven at 45° angle.
- Fasteners and crescent washer are included with the holdowns. To order replacements, please contact Simpson Strong-Tie.

**Codes:** See p. 12 for Code Reference Key Chart

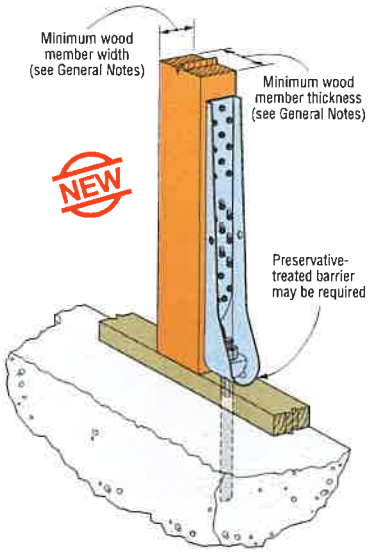
**Web Applications:** Visit **app.strongtie.com/pfd** to access our Post-to-Foundation Designer web application.



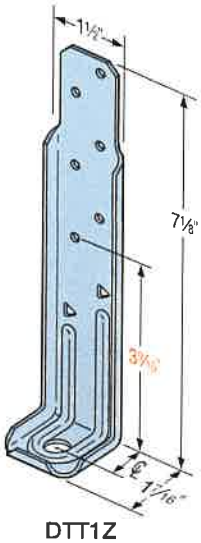

**HDUE**
US Patent Pending, see strongtie.com/patents



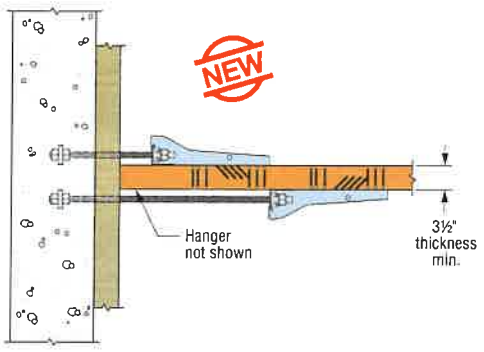

**DTT2Z®**
US Patent, see strongtie.com/patents




**Vertical HDUE Installation**




**DTT1Z**
US Patent, see strongtie.com/patents




**Horizontal HDUE Offset Installation**
*(plan view)*

See Holdown and Tension Tie General Notes on pp 57–58.

# Holdowns (cont.)

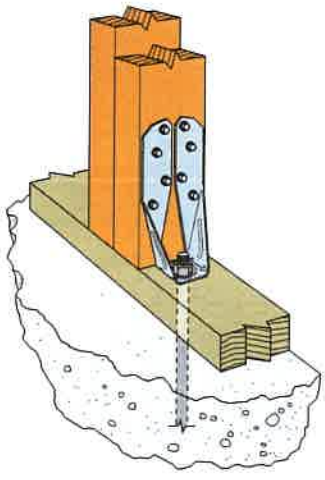
These products are available with additional corrosion protection. For more information, see pp. 13–19.

SS For stainless-steel fasteners, see p. 25.

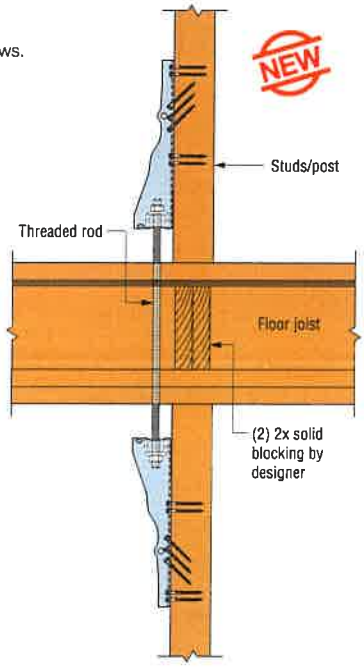
SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 380–382 for more information.

| Model No. | Ga. | Dimensions (in.) | | | | | Fasteners (in.) | | Minimum Wood Member Size Thickness x Width (in.) | Allowable Tension Loads (160) | | | Code Ref. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | W | H | B | CL | SO | Anchor Bolt Dia. | Wood Fasteners | | DF/SP | SPF/HF | Deflection at Allowable Load (in.) | |
| DTT1Z® | 14 | 1½ | 7⅞ | 1⁷⁄₁₆ | ¾ | ⁹⁄₁₆ | ⅜ | (6) #9 x 1½ SD | 1½ x 3½ | 840 | 840 | 0.170 | IBC, FL, LA |
| | | | | | | | | (6) 0.148 x 1½ | | 910 | 640 | 0.167 | |
| | | | | | | | | (8) 0.148 x 1½ | | 910 | 850 | 0.167 | |
| DTT2Z® | 14 | 3¼ | 6¹⁵⁄₁₆ | 1⅝ | 1³⁄₁₆ | ⅜ | ½ | (8) ¼ x 1½ SDS | 1½ x 3½ | 1,825 | 1,800 | 0.105 | |
| | | | | | | | | (8) ¼ x 1½ SDS | 3 x 3½ | 2,145 | 1,835 | 0.128 | |
| DTT2Z-SDS2.5 | | | | | | | | (8) ¼ x 2½ SDS | 3 x 3½ | 2,145 | 2,105 | 0.128 | |
| HDUE3-SDS3 | 14 | 2⁷⁄₈ | 8¹⁵⁄₁₆ | 3⅜ | 1³⁄₈ | 1½ | ⅝ | (7) ¼ x 3 SDS | 3 x 3½ | 3,790 | 3,340 | 0.127 | |
| HDUE5-SDS3 | 14 | 2⅞ | 11¹⁵⁄₁₆ | 3⅜ | 1⅜ | 1½ | ⅝ | (10) ¼ x 3 SDS | 3 x 3½ | 5,375 | 4,700 | 0.146 | |
| HDUE7-SDS3 | 14 | 2⅞ | 14¹¹⁄₁₆ | 3⅜ | 1⅜ | 1½ | ⅝ | (13) ¼ x 3 SDS | 3 x 3½ | 7,015[1] | 6,030 | 0.154 | |
| HDUE9-SDS3.5 | 12 | 3 | 17⅞ | 4⁹⁄₁₆ | 1⁷⁄₁₆ | 1½ | ⅞ | (16) ¼ x 3½ SDS | 3½ x 3½ | 8,425 | 7,305 | 0.159 | |
| | | | | | | | | | 4½ x 3½ | 9,390 | 7,995 | 0.134 | |
| HDUE13-SDS3.5 | 12 | 3 | 23⅛ | 4⁹⁄₁₆ | 1⁷⁄₁₆ | 1½ | 1 | (23) ¼ x 3½ SDS | 5½ x 3½ | 11,900 | 10,215 | 0.164 | |
| | | | | | | | | | 7¼ x 3½ | 12,950 | 11,030 | 0.145 | |
| | | | | | | | | | 5½ x 5½ | 13,110 | 10,980 | 0.135 | |
| HDUE17-SDS4.5 | 10 | 3 | 27⅞ | 5⁹⁄₁₆ | 1¹⁵⁄₁₆ | 1½ | 1 | (28) ¼ x 4½ SDS | 5½ x 3½ | 16,040 | 13,545 | 0.094 | |
| | | | | | | | | | 5½ x 5½ | 17,685[3] | 14,775 | 0.111 | |

1. Allowable loads have been increased for wind or earthquake loading with no further increase allowed. Reduce where other loads govern.
2. To obtain LRFD values for holdowns, multiply allowable loads by 1.4. See evaluation report for LRFD deflections.
3. The designer must specify anchor bolt type, length and embedment. Some of the tabulated holdown tension loads exceed the tensile strength for of ASTM F1554 Grade 36 anchor bolts.
4. HDUE13 requires heavy-hex anchor nut to achieve tabulated loads (supplied with holdown).
5. Allowable loads for alternate HDUE installations using shorter screws are provided in engineering letter L-C-HDUESDS at **strongtie.com**.
6. Refer to p. 327 for DTT1SS loads and required fasteners.
7. **Fasteners:** Nail dimensions are listed diameter by length. SD and SDS screws are Simpson Strong-Tie Strong-Drive SD Connector and SDS Heavy-Duty Connector screws. See pp. 25–26 for fastener information.



Typical DTT2Z Installation




Typical HDUE Tie Between Floors