# STRUCTURAL CALCULATIONS

| | |
|---|---|
| **Project Name:** | **4 Unit Apartment Building**<br>**Chase Street**<br>**La Crosse, WI** |
| **Prepared for:** | **Eskay Architecture** |
| **Prepared by:** | **Andrew D. Clements, P.E.** |
| **Date Issued:** | **October 2022** |

WISCONSIN
ANDREW D.
CLEMENTS
E-36640
LA CROSSE,
WI
PROFESSIONAL ENGINEER

Andrew D. Clements

10-6-2022

INDEX:

Cary Specialized Services
3400 Losey Boulevard South
La Crosse, WI 54601

Project: 4-UNIT APARTMENT
Subject: CHASE ST.
Date: 9.28.22
Signed: ARC



LOADS

SNOW LOADS PER ASCE 7-10 CHAPTER 7

$P_g = 40$ PSF

$I_s = 1.0$ RISK CATEGORY II

$C_t = 1.1$

$C_e = 1.0$

$S = 2.0$ 6/12 PITCH

$C_s = 1.0$

$P_f = 0.7 C_e C_t I_s P_g = 30.8$ PSF

Unbalanced snow @ LIVING AREA = 40 PSF ON ONE SIDE ⌀ on OTHER
W = 19' ≤ 20'

Unbalanced snow @ GARAGE TRUSSES

$l_u = W = 29 + 1.33 = 30.33$ ft
(EAVE TO RIDGE)

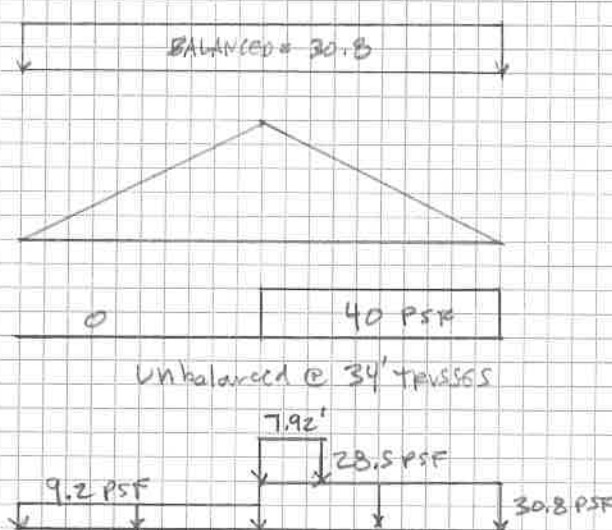
$h_d = 0.43 \sqrt[3]{l_u} \sqrt[4]{P_g + 10} - 1.5 =$
$.43 (3.12)(2.66) - 1.5 = 2.1$ ft

$\gamma = 19.2$ PSF

Horiz dist from Ridge $= \frac{8}{3} h_d \sqrt{S} = \frac{8}{3}(2.1)\sqrt{2} = 7.92$ ft

Windward $= 0.3 P_s = .3(30.8) = 9.2$ PSF

Leeward $= \frac{h_d \gamma}{\sqrt{S}} = \frac{2.1(19.2)}{\sqrt{2}} = 28.5$ PSF




Unbalanced @ GARAGE TRUSSES

Cary Specialized Services
3400 Losey Boulevard South
La Crosse, WI 54601

Project 4-UNIT - CHASE ST.

Subject

PG 2/25

Date 10-2-22

Signed ABC

DRIFT LOAD @ GARAGE

$l_u = 70$ ft

$h_d = .43 \sqrt[3]{l_u} \sqrt[4]{P_g + 10} - 1.5 = 3.2$ ft

$3.2(19.2) = 61.7$ PSF

DRIFT LENGTH = $4h_d = 12.8$ ft

DRIFT LOAD @ CANOPIES

$l_u = 34'$

$h_d = .43 \sqrt[3]{34} \sqrt[4]{50} - 1.5 = 2.2$ ft

$2.2(19.2) = 42.2$ PSF

$4h_d = 8.8$ ft

DRIFT LOAD @ MONO TRUSSES @ GARAGE

$l_u = 85$ ft

$h_d = .43 \sqrt[3]{85} \sqrt[4]{50} - 1.5 = 3.5$ ft

$3.5(19.2) = 67.2$ PSF

$4h_d = 14$ ft

Cary Specialized Services
3400 Losey Boulevard South
La Crosse, WI 54601

Project 4 UNIT APARTMENT
Subject CHASE ST
Date 9.28.22
PG 3/25
Signed APC

WIND LOADS PER TABLE 27.5-1 ASCE 7-10. DETERMINE MWFRS LOADS: ENCLOSED SIMPLE DIAPHRAM $h \le 160'$

h= 25 ft
L/B= 2

STEP 1 - RISK CATEGORY II
STEP 2 V= 115 MPH
STEP 3 DETERMINE WIND LOAD PARAMETERS
h=25'
EXPOSURE B
ENCLOSURE CLASSIFICATION: ENCLOSED
STEP 4 TABLE 27.6-1
CLASS 1 BUILDING
$P_h$= 17.5 PSF
$P_0$= 16.5 PSF

STEP 5 TABLE 27.6-2 NET ROOF PRESSURES
6/12 PITCH
ADJ FACTOR = 0.7

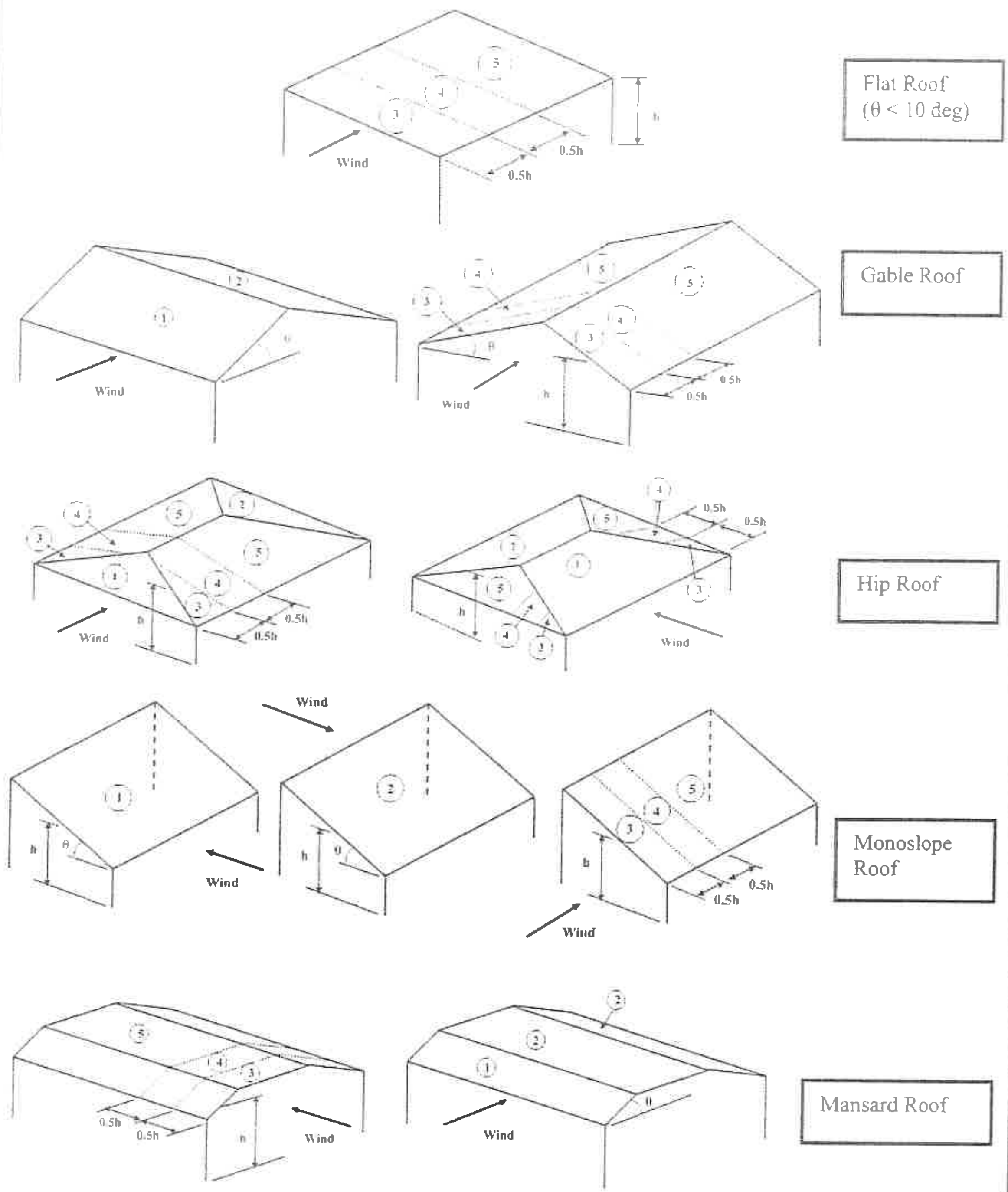
| ZONE | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| LOAD CASE 1 | -15 (.7) | -18.7 (.7) | -28.8 (.7) | -25.6 (.7) | -21 (.7) |
| | -10.5 PSF | -13.1 PSF | -20.6 PSF | -17.9 PSF | -14.7 PSF |
| LOAD CASE 2 | 11.8 (.7) | -9 (.7) | 0 | 0 | 0 |
| | 8.3 PSF | -6.3 PSF | | | |

COMPONENT + CLAD LOADS PER ASCE 7-10 TABLE 30.7-2 ADJ FACTOR: .7 LOADS FOR 10 SF AREA

| ZONE | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| LOAD CASE 1 | -32 (.7) | -53.7 (.7) | -80.8 (.7) | -34.7 (.7) | -53.7 (.7) |
| | -22.4 PSF | -37.6 PSF | -56.6 PSF | -24.3 PSF | -37.6 PSF |
| LOAD CASE 2 | 18.4 (.7) | 18.4 (.7) | 18.4 (.7) | 32 (.7) | 29.2 (.7) |
| | 12.9 PSF | 12.9 PSF | 12.9 PSF | 22.4 PSF | 20.4 PSF |

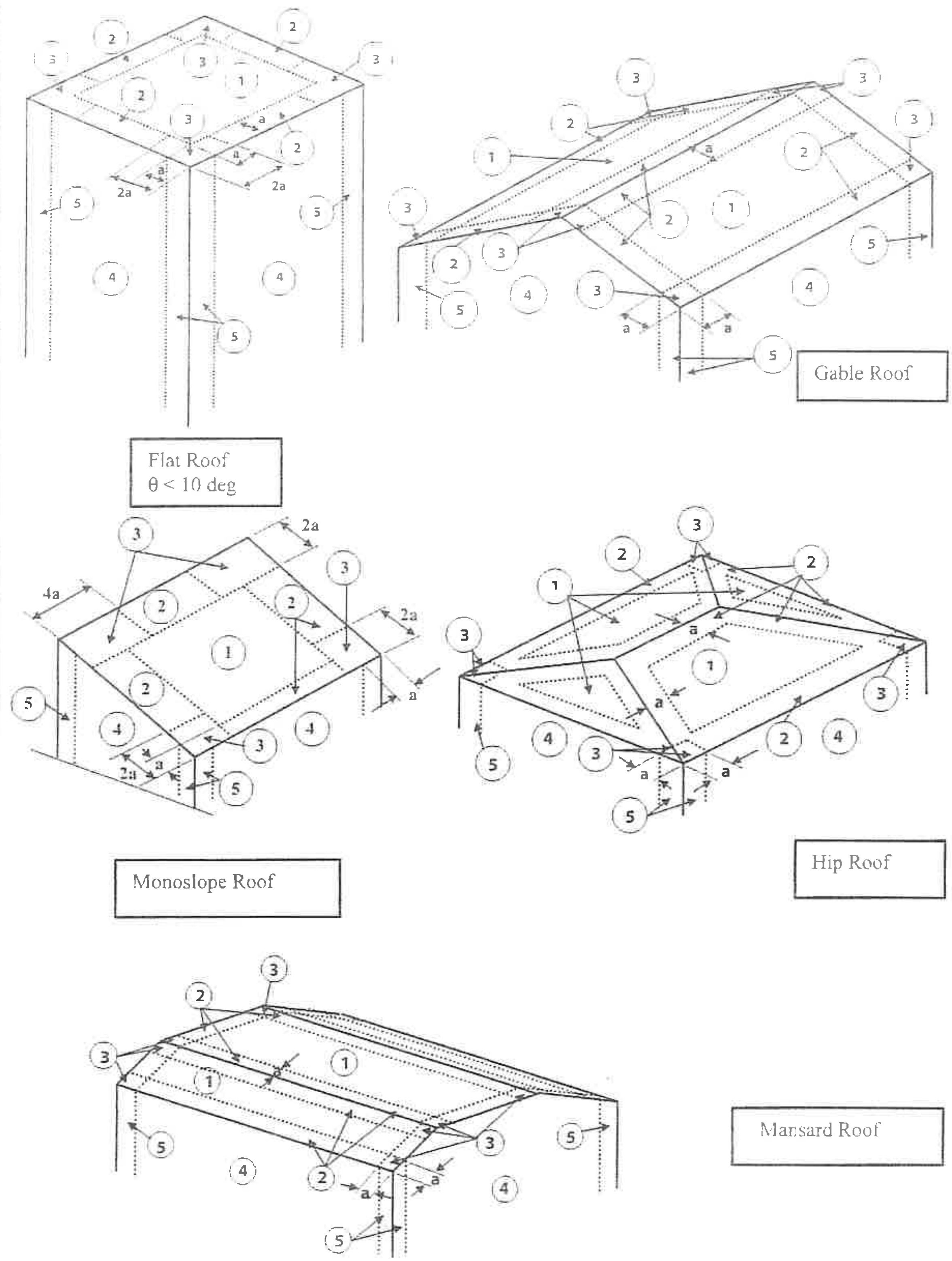
PG 4/25

| Main Wind Force Resisting System – Part 2 | | h ≤ 160 ft. |
|---|---|---|
| Table 27.6-2 | Wind Pressures - Roof | Application of Roof Pressures |
| Enclosed Simple Diaphragm Buildings | | |



PG 5/25

| Components and Cladding – Part 4 | | h ≤ 160 ft. |
|---|---|---|
| Table 30.7-2 | C & C Zones | C&C<br>Wall and Roof Pressures |
| Enclosed Buildings | | |



Cary Specialized Services
3400 Losey Boulevard South
La Crosse, WI 54601

Project 4-UNIT APARTMENT

Subject

PG 6/25

Date 10-2-22

Signed ADC

HEADERS

5' OPNGS

$\ell$ = 5'-6"

LOADS FLOOR 40 LL 20 DL 60(8.5) = 510 PLF

ROOF 30.8 LL 20 DL 50.8(19) = 965 PLF

WALL 20(10) 200 PLF

TOTAL: 1675 PLF

$M = \frac{w\ell^2}{8} = \frac{1675(5.5)^2}{8} = 6334$ lb-ft

TRY 2 PLY 2x12 DFL #1 $F_b' = F_b C_D C_F = 1150(1.15)(1) = 1323$ PSI

$S_x = 63.28$ in³

$F_b$ REQD $= \frac{M}{S_x} = \frac{1675(12)}{63.28} = 1201$ PSI < 1323 PSI OK

**USE 2 PLY 2x12 DFL #1**

3' OPNGS $\ell = 3'$-4"

$M = \frac{w\ell^2}{8} = \frac{1675(3.33)^2}{8} = 2321$ lb-ft

TRY 2 PLY 2x8 DFL #1 $F_b' = F_b C_D C_F = 1150(1.15)(1.2) = 1587$ PSI

$S_x = 26.28$ in³

Find $F_b$ REQD $= \frac{M}{S_x} = \frac{2321(12)}{26.28} = 1060$ PSI < 1587 PSI OK

**USE 2 PLY 2x8 DFL #1**

GARAGE DOOR HEADERS

$\ell$ = 9'-6"

LOADS = $50.8(8) + \underset{\text{DRIFT}}{30(8)} = 646$ PLF

$M = \frac{w\ell^2}{8} = \frac{646(9.5)^2}{8} = 7292$ lb-ft

$F_b' = 2950\underset{C_D}{(1.15)} = 3393$ PSI

$S_x$ REQD $= \frac{M}{F_b} = \frac{7292(12)}{3393} = 26$ IN³

**USE 2 PLY 1¾ x 9¼ LVL 2.0E**

Cary Specialized Services
3400 Losey Boulevard South
La Crosse, WI 54601

Project 4 UNIT CHASE ST.

Subject

PG 7/25

Date 10-2-22

Signed APC

HEADERS @ STAIRWELL AREA

$\ell = 5'$

LOAD = 60(4) = 240 PLF (FLOOR) + 55(120) (STAIR) = 900 PLF

$M = \frac{w\ell^2}{8} = \frac{900(5.5)^2}{8} = 3403$ PLF

TRY 2 PLY 2x12 DFL #1 $S_x = 63.28\ in^3$

$F_b$ REQD = $\frac{3403(12)}{63.28} = 645$ PSI

$F_b' = F_b\, C_D\, C_F = 1150(1.0)(1.0) = 1150$ PSI > 645 PSI OK

USE 2 PLY 2x12 DFL #1

---

2nd FLOOR FRAMING

MAX SPAN = 17'

LOAD = 40 PSF LIVE LOAD

20 PSF DEAD LOAD

USE LPI 36 OR EQUAL 11 7/8" I-JOISTS @ 16" O.C.

Cary Specialized Services
3400 Losey Boulevard South
La Crosse, WI 54601

Project 4-UNIT APARTMENT
Subject
Date 10.2.22
PG 8/25
Signed ADC

STUD WALL DESIGN - CRITICAL WALL
LOWER LEVEL WALL W/ FLOOR LOAD + ROOF LOAD

LOADS: DEAD LOADS ROOF DL $19(20) = 380$ PLF
2ND FLOOR DL $17/2(20) = 170$ PLF
WALL DL $18(10) = 180$ PLF
SNOW LOAD $30.8(19) = 585$ PLF
FLOOR LIVE LOAD = $17/2(40) = 340$ PLF

WIND LOAD FROM COMPONENTS + CLADDING ZONE 4 = $-24.3$ PSF
$W = 24.3(1.33) = 32.3$ PLF
16" O.C.

USE LOAD COMBINATION 16-13 $D + 0.75L + 0.75(.6W) + 0.75SL$

$P_{max} = 380 + 170 + 180 + .75(340) + .75(585) = 1424\ \#/ft\,(1.33) = 1894\#$

$M = \frac{wl^2}{8} = \frac{.6(.75)(32.3)(8)^2}{8} = 116.3$ lb.ft

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

$F_b = 875$ PSI
$F_c = 1150$ PSI
$A = 8.25$ IN$^2$
$S_x = 7.56$ IN$^3$
$I_x = 20.8$ IN$^4$
$E = 1.4 \times 10^6$ PSI

Adjustment FACTORS: $C_D = 1.6$ $C_r = 1.15$ $C_F = 1.3$ for $F_b$ $C_F = 1.1$ for $F_c$

$F_c^* = 1150(1.15)(1.1)(1.6) = 2328$ PSI
$F_b' = 875(1.15)(1.3)(1.6) = 2093$ PSI
$K_{cE} = 0.3$ VISUALLY GRADED LUMBER

$\frac{l_e}{d} = \frac{96}{5.5} = 17.5$

$F_{cE} = \frac{K_{cE}E'}{\left(\frac{l_e}{d}\right)^2} = \frac{0.3(1.4 \times 10^6)}{(17.5)^2} = 1371$ PSI

Cary Specialized Services
3400 Losey Boulevard South
La Crosse, WI 54601

Project 4-unit Apartment

Subject Chace St.

Date 10.2.22

pg 9/25

Signed ADC

STUD WALL CONT.

$$C_p = \frac{1+F_{cE}/F_c^*}{2c} - \left\{\left(\frac{1+F_{cE}/F_c^*}{2c}\right)^2 - \frac{F_{cE}/F_c^*}{c}\right\}^{1/2}$$

$$\frac{F_{cE}}{F_c^*} = \frac{1371}{2328} = 0.59 \qquad 1 - \left\{1 - .74\right\}^{1/2} = 0.49$$

$$F_c' = F_c^* C_p = 2328(.49) = 1141 \text{ PSI}$$

$$f_c = P/A = \frac{1894}{8.25} = 230 \text{ PSI}$$

$$f_b = \frac{M}{S_x} = \frac{116.3(12)}{7.56} = 185 \text{ PSI}$$

$$F_b' = 2093 \text{ PSI}$$

Check Combined Axial + Bending

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

$$\left(\frac{230}{1141}\right)^2 + \frac{185}{2093\left(1-\frac{230}{1141}\right)} = 0.15 < 1.0 \quad \text{OK.}$$

$$.04 + 0.11$$

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

Cary Specialized Services
3400 Losey Boulevard South
La Crosse, WI 54601

Project 4-UNIT APARTMENT
Subject CHASE ST.
PG 10/25
Date 10.3.2022
Signed AAC

FOUNDATIONS
PERIMETER WALLS

LOAD = FLOOR LIVE = 8.5 (40) = 340 PLF
FLOOR DEAD = 8.5 (20) = 170 PLF
ROOF LIVE = 19 (30.8) = 585 PLF
ROOF DEAD = 19 (20) = 380 PLF
WALL DEAD = 20 (10) = 200 PLF
CONC WALL DEAD = 100 (4) = 400 PLF
FOOTING = 100 PLF
TOTAL: 2175 PLF

SOIL BRG PRESSURE = 2000 PSF

FOOTING SIZE REQD = $\frac{2175}{2000}$ = 1.09 ft

USE 18" X 8" FOOTING W/(2) #4 BARS CONT.

---

INTERIOR STRIP FOOTINGS LOAD = FLOOR LIVE = 17 (40) = 680 PLF
FLOOR DEAD = 17 (20) = 340 PLF
WALL WT = 10 (20) = 200 PLF
FOOTING WT = 100 PLF

TOTAL LOAD = 1320 PLF

FOOTING SIZE REQD = $\frac{1320}{2000}$ = 0.66 ft

USE 18" X 8" FOOTING W/(2) #4 BARS CONT.

---

FOOTING @ GARAGE W/ DRIFT LOAD
ROOF LIVE 30.8 (30) = 924 PLF
ROOF DEAD 20 (30) = 600 PLF
ROOF DRIFT 30 (30) = 900 PLF
WALL LOAD 10 (10) = 100 PLF
CONC WALL 4 (100) = 400 PLF
FOOTING = 100 PLF
TOTAL = 3024 PLF

SOIL BRG PRESSURE = 2000 PSF
FOOTING SIZE REQD = $\frac{3024}{2000}$ = 1.5 ft

USE 18" X 8" FTG W/(2) #4 BARS CONT

Cary Specialized Services

3400 Losey Boulevard South
La Crosse, WI 54601

Project 4 UNIT APARTMENT

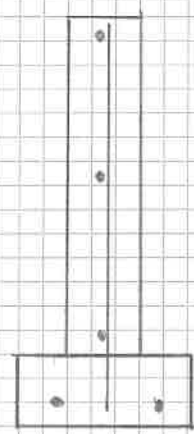
Subject CHASE ST.

PG 11/25

Date 10-3-2022

Signed ADC

EXTERIOR WALL USE #4 VERT @ 48" O.C. + (2) #4 CONT.



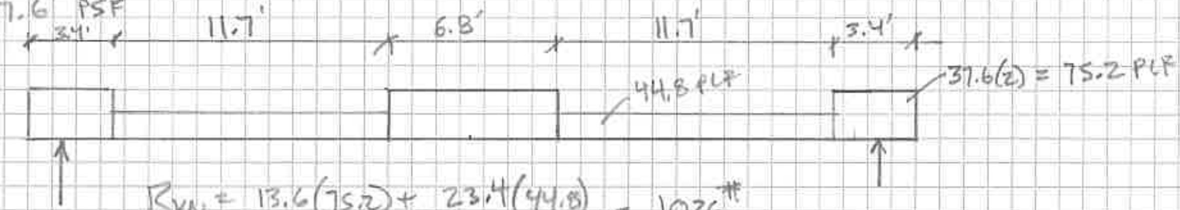
Cary Specialized Services
3400 Losey Boulevard South
La Crosse, WI 54601

Project 4 UNIT APARTMENT
Subject CHASE ST.
PG 12/25
Date 10-3-2022
Signed ADC

TRUSS HOLD DOWNS @ UPPER GABLE ROOF

a = 10 % least dimension 3.4 ft Controls
or 40% h = 10 ft

C&C LOADS
ZONE 1 -22.4 PSF
ZONE 2 -37.6 PSF




$R_{XN} = \frac{13.6(75.2) + 23.4(44.8)}{2} = 1036^{\#}$

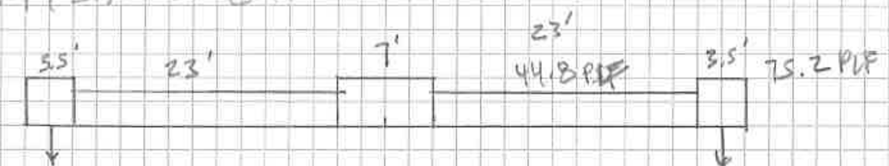
MIN DL = $15(\frac{37}{2})(2) = 555^{\#}$

NET UPLIFT = $1036 - 555 = 481^{\#}$

USE SIMPSON H2.5A @ EA END of EA TRUSS

HOLD DOWN @ GARAGE TRUSSES

a = .1(35) = 3.5 ft CONTROLS
.4(20) = 8 ft




$R_{XN} = \frac{14(75.2) + 46(44.8)}{2} = 1557^{\#}$

MIN DL = $15(2)(30) = 750^{\#}$

NET UPLIFT = $1557 - 750 = 797^{\#}$

USE SIMPSON H10A @ EA END of EA TRUSS

HOLD DOWN @ GIRDER LOAD = $3.5(797) = 2790^{\#}$

USE SIMPSON VGT HOLD DOWN

HOLD DOWN @ HIP GIRDER

| | | | | | | |
|---|---|---|---|---|---|---|
| TOTAL UPLIFT | 3.5 x 3.5 x 56.6 | Zone 3 | | $693^{\#}$ | $5436^{\#}$ | |
| | 8.5 x 3.5 x 2 x 37.6 | Zone 2 | GAVE | $2237^{\#}$ | $2160^{\#}$ | Dead LD. |
| | 7 x 8.5 x 37.6 | Zone 2 | HIP | $2237^{\#}$ | Net = $\frac{3276^{\#}}{2}$ | |
| | 12 SF Zone 1 @ 22.4 | | = | $269^{\#}$ | $1638^{\#}$ EA END | |

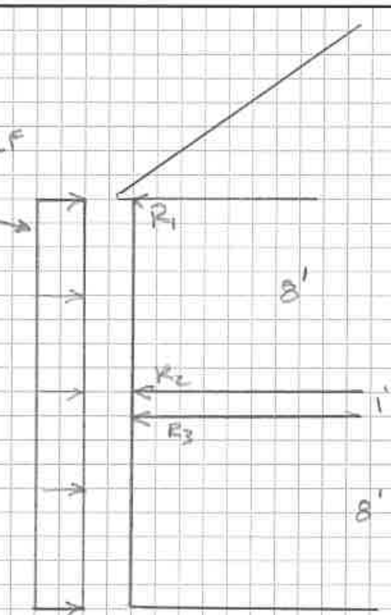
USE (2) MTS12 SIMPSON TIES

Cary Specialized Services
3400 Losey Boulevard South
La Crosse, WI 54601

Project 4-UNIT APARTMENT
Subject CHASE ST.
P6 13/25

Date 10-4-22
Signed APC

SHEAR WALLS @ 2 STORY AREA
Wind on 67' WALL




$R_1 = 1173(4) = 4690^{\#}$

$R_2: 4690 + (4.5)(1173) = 9966^{\#}$

$R_3 = 9966 + 4.5(1172.5) = 15{,}243^{\#}$

PER NDS TABLE 4.2A 15/32" OSB NAILED W/ 10d NAILS W/ 1 1/2" PENETRATION, BLOCKED WALLS 6" OC PERIMETER + INTERMEDIATE.

$\text{CAPACITY} = \frac{895(.92)}{2} = 412 \text{ PLF}$

EXTERIOR WALLS AVAILABLE = 34-10 = 24
24(412) = 9888#

PER NDS TABLE 4.3C 1/2" GYPSUM WALL BOARD FASTENED W/ NO. 6 TYPE S or W DRYWALL SCREWS 1 1/4" LONG @ 4" O.C PERIMETER + 12" O.C INTERMEDIATE, BLOCKED

$\text{CAPACITY} = \frac{310}{2} = 155 \text{ PLF}$

INT WALLS = 4 @ 12' = 48' (155) = 7440#

TOTAL RESISTANCE = 9888# + 7440# = 17,328# > 15,243# REQUIRED

ALL WALLS TO HAVE BOTTOM PLATE FASTENED W/ 1/2" x 8" ANCHOR BOLTS @ MAX 48" O.C. AND MAX 12" FROM ENDS OF EA WALL SECTION.

Cary Specialized Services
3400 Losey Boulevard South
La Crosse, WI 54601

Project 4 UNIT APARTMENT

Subject CHASE STREET

PG 14/25

Date 10-4-2022

Signed APC

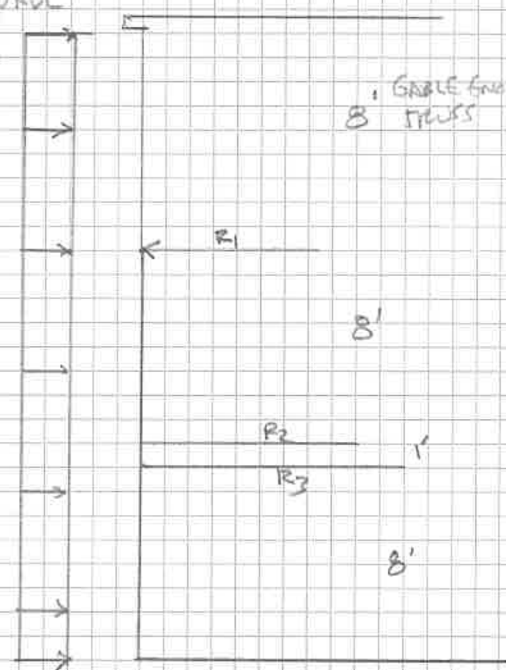
SHEAR WALLS @ 2 STORY AREA WIND ON 34' END WALL

$R_1 = 1/2(34)(8)(17.5) + 4(595) = 4760^{\#}$

34(17.5) = 595 PLF

$R_2 = 4760 + 4.5(595) = 7438^{\#}$

$R_3 = 7438 + 4.5(595) = 10115^{\#}$




EXTERIOR OSB WALLS (NDS TABLE 4.3C) SEE PREVIOUS PAGE.

$17' + 17' + 11' + 10' + 10' = 65'(412) = 26{,}780^{\#} > 10{,}115^{\#}$

OK.

Cary Specialized Services
3400 Losey Boulevard South
La Crosse, WI 54601

Project 4 UNIT APARTMENT
Subject CHASE ST.

PG 15/25

Date 10.4.22
Signed AGK

SHEAR WALLS @ GARAGE
WIND ON 58' WALL LOAD = 5(17.5)(58) = 5075#
USE END WALLS OSB + ONE CENTER GYP WALL
OSB RESISTANCE = 24+24−5−5 = 38(412) = 15,656#
GYP RESISTANCE = 24(155) = 3720#
TOTAL RESISTANCE = 15656+3720 = 19,376# > 5075# OK

WIND ON 24'-5½" WALL
LOAD = 5(24.5)(17.5) = 2144#
USE OSB WALLS @ GARAGE DOOR WALL + RETURN WALL @ TRIANGULAR PORCH
58 − 36 + 9' = 31 ft
31(412) = 12,772#

USE GYP WALLS @ REAR OF GARAGE BY STAIR WELLS
48−5−5−4−4 = 30 ft (155) = 4650#

TOTAL RESISTANCE = 12,772+4650 = 17,422# > 2144# OK

PG 16/25

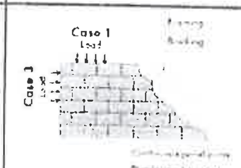
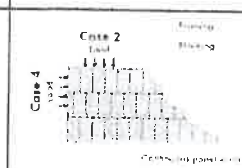
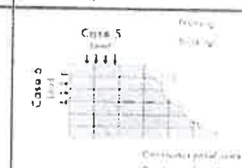
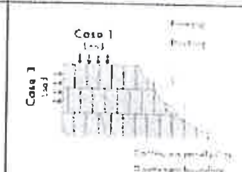
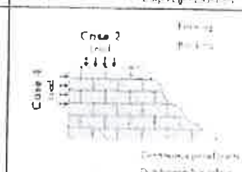
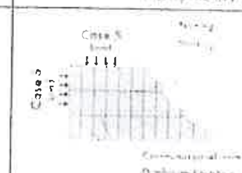
# Table 4.2A Nominal Unit Shear Capacities for Wood-Frame Diaphragms

PER 4.2.3 DIVIDE BY 2 FOR ASD

## Blocked Wood Structural Panel Diaphragms[1,2,3,4,5]

| Sheathing Grade | Common Nail Size | Minimum Fastener Penetration in Framing Member or Blocking (in.) | Minimum Nominal Panel Thickness (in.) | Minimum Nominal Width of Nailed Face at Adjoining Panel Edges and Boundaries (in.) | A SEISMIC: Nail Spacing (in.) at diaphragm boundaries (all cases), at continuous panel edges parallel to load (Cases 3 & 4), and at all panel edges (Cases 5 & 6) | | | | | | | | | | | | B WIND: Nail Spacing (in.) at diaphragm boundaries (all cases), at continuous panel edges parallel to load (Cases 3 & 4), and at all panel edges (Cases 5 & 6) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 6 | | | 4 | | | 2-1/2 | | | 2 | | | 6 | 4 | 2-1/2 | 2 |
| | | | | | Nail Spacing (in.) at other panel edges (Cases 1, 2, 3, & 4) | | | | | | | | | | | | Nail Spacing (in.) at other panel edges (Cases 1, 2, 3, & 4) | | | |
| | | | | | 6 | | | 6 | | | 4 | | | 3 | | | 6 | 6 | 4 | 3 |
| | | | | | $v_s$ (plf) | $G_a$ (kips/in.) | | $v_s$ (plf) | $G_a$ (kips/in.) | | $v_s$ (plf) | $G_a$ (kips/in.) | | $v_s$ (plf) | $G_a$ (kips/in.) | | $v_w$ (plf) | $v_w$ (plf) | $v_w$ (plf) | $v_w$ (plf) |
| | | | | | | OSB | PLY | | OSB | PLY | | OSB | PLY | | OSB | PLY | | | | |
| Structural I | 6d | 1-1/4 | 5/16 | 2 | 370 | 15 | 12 | 500 | 8.5 | 7.5 | 750 | 12 | 10 | 840 | 20 | 15 | 520 | 700 | 1050 | 1175 |
| | | | | 3 | 420 | 12 | 9.5 | 560 | 7.0 | 6.0 | 840 | 9.5 | 8.5 | 950 | 17 | 13 | 590 | 785 | 1175 | 1330 |
| | 8d | 1-3/8 | 3/8 | 2 | 540 | 14 | 11 | 720 | 9.0 | 7.5 | 1060 | 13 | 10 | 1200 | 21 | 15 | 755 | 1010 | 1485 | 1680 |
| | | | | 3 | 600 | 12 | 10 | 800 | 7.5 | 6.5 | 1200 | 10 | 9.0 | 1350 | 18 | 13 | 840 | 1120 | 1680 | 1890 |
| | 10d | 1-1/2 | 15/32 | 2 | 640 | 24 | 17 | 850 | 15 | 12 | 1280 | 20 | 15 | 1460 | 31 | 21 | 895 | 1190 | 1790 | 2045 |
| | | | | 3 | 720 | 20 | 15 | 960 | 12 | 9.5 | 1440 | 16 | 13 | 1640 | 26 | 18 | 1010 | 1345 | 2015 | 2295 |
| Sheathing and Single-Floor | 6d | 1-1/4 | 5/16 | 2 | 340 | 15 | 10 | 450 | 9.0 | 7.0 | 670 | 13 | 9.5 | 760 | 21 | 13 | 475 | 630 | 940 | 1065 |
| | | | | 3 | 380 | 12 | 9.0 | 500 | 7.0 | 6.0 | 760 | 10 | 8.0 | 860 | 17 | 12 | 530 | 700 | 1065 | 1205 |
| | | | 3/8 | 2 | 370 | 13 | 9.5 | 500 | 7.0 | 6.0 | 750 | 10 | 8.0 | 840 | 18 | 12 | 520 | 700 | 1050 | 1175 |
| | | | | 3 | 420 | 10 | 8.0 | 560 | 5.5 | 5.0 | 840 | 8.5 | 7.0 | 950 | 14 | 10 | 590 | 785 | 1175 | 1330 |
| | 8d | 1-3/8 | 3/8 | 2 | 480 | 15 | 11 | 640 | 9.5 | 7.5 | 960 | 13 | 9.5 | 1090 | 21 | 13 | 670 | 895 | 1345 | 1525 |
| | | | | 3 | 540 | 12 | 9.5 | 720 | 7.5 | 6.0 | 1080 | 11 | 8.5 | 1220 | 18 | 12 | 755 | 1010 | 1510 | 1710 |
| | | | 7/16 | 2 | 510 | 14 | 10 | 680 | 8.5 | 7.0 | 1010 | 12 | 9.5 | 1150 | 20 | 13 | 715 | 950 | 1415 | 1610 |
| | | | | 3 | 570 | 11 | 9.0 | 760 | 7.0 | 6.0 | 1140 | 10 | 8.0 | 1290 | 17 | 12 | 800 | 1065 | 1595 | 1805 |
| | | | 15/32 | 2 | 540 | 13 | 9.5 | 720 | 7.5 | 6.5 | 1060 | 11 | 8.5 | 1200 | 19 | 13 | 755 | 1010 | 1485 | 1680 |
| | | | | 3 | 600 | 10 | 8.5 | 800 | 6.0 | 5.5 | 1200 | 9.0 | 7.5 | 1350 | 15 | 11 | 840 | 1120 | 1680 | 1890 |
| | 10d | 1-1/2 | 15/32 | 2 | 580 | 25 | 15 | 770 | 15 | 11 | 1150 | 21 | 14 | 1310 | 33 | 18 | 810 | 1080 | 1610 | 1835 |
| | | | | 3 | 650 | 21 | 14 | 860 | 12 | 9.5 | 1300 | 17 | 12 | 1470 | 28 | 16 | 910 | 1205 | 1820 | 2060 |
| | | | 19/32 | 2 | 640 | 21 | 14 | 850 | 13 | 9.5 | 1280 | 18 | 12 | 1460 | 28 | 17 | 895 | 1190 | 1790 | 2045 |
| | | | | 3 | 720 | 17 | 12 | 960 | 10 | 8.0 | 1440 | 14 | 11 | 1640 | 24 | 15 | 1010 | 1345 | 2015 | 2295 |

1. Nominal unit shear capacities shall be adjusted in accordance with 4.2.3 to determine ASD allowable unit shear capacity and LRFD factored unit resistance. For general construction requirements see 4.2.6. For specific requirements, see 4.2.7.1 for wood structural panel diaphragms. See Appendix A for common nail dimensions.
2. For species and grades of framing other than Douglas-Fir-Larch or Southern Pine, reduced nominal unit shear capacities shall be determined by multiplying the tabulated nominal unit shear capacity by the Specific Gravity Adjustment Factor = [1-(0.5-G)], where G = Specific Gravity of the framing lumber from the *NDS* (Table 12.3.3A). The Specific Gravity Adjustment Factor shall not be greater than 1.
3. Apparent shear stiffness values, $G_a$, are based on nail slip in framing with moisture content less than or equal to 19% at time of fabrication and panel stiffness values for diaphragms constructed with either OSB or 3-ply plywood panels. When 4-ply or 5-ply plywood panels or composite panels are used, $G_a$ values shall be permitted to be multiplied by 1.2.
4. Where moisture content of the framing is greater than 19% at time of fabrication, $G_a$ values shall be multiplied by 0.5.
5. Diaphragm resistance depends on the direction of continuous panel joints with respect to the loading direction and direction of framing members, and is independent of the panel orientation.

| | Cases 1&3: Continuous Panel Joints Perpendicular to Framing | Cases 2&4: Continuous Panel Joints Parallel to Framing | Cases 5&6: Continuous Panel Joints Perpendicular and Parallel to Framing |
|---|---|---|---|
| Long Panel Direction Perpendicular to Supports |  |  |  |
| Long Panel Direction Parallel to Supports[a] |  |  |  |

(a) Panel span rating for out-of-plane loads may be lower than the span rating with the long panel direction perpendicular to supports. (See Section 3.2.2 and Section 3.2.3)

4 LATERAL FORCE-RESISTING SYSTEMS

PG 17/25

# Table 4.3C Nominal Unit Shear Capacities for Wood-Frame Shear Walls[1]

PER 4.2.3 DIVIDE BY 2 FOR ASD

## Gypsum and Portland Cement Plaster

| Sheathing Material | Material Thickness | Fastener Type & Size[2] | Max. Fastener Edge Spacing (in)[3] | Max. Stud Spacing (in.) | | A SEISMIC $v_s$ (plf) | A SEISMIC $G_a$ (kips/in) | B WIND $v_w$ (plf) |
|---|---|---|---|---|---|---|---|---|
| Gypsum wallboard, gypsum base for veneer plaster, or water-resistant gypsum backing board | 1/2" | 5d cooler (0.086" x 1-5/8" long, 15/64" head) or wallboard nail (0.086" x 1-5/8" long, 9/32" head) or 0.120" nail x 1-1/2" long, min 3/8" head | 7 | 24 | unblocked | 150 | 4.0 | 150 |
| | | | 4 | 24 | unblocked | 220 | 6.0 | 220 |
| | | | 7 | 16 | unblocked | 200 | 5.5 | 200 |
| | | | 4 | 16 | unblocked | 250 | 6.5 | 250 |
| | | | 7 | 16 | blocked | 250 | 6.5 | 250 |
| | | | 4 | 16 | blocked | 300 | 7.5 | 300 |
| | | No. 6 Type S or W drywall screws 1 1/4" long | 8/12 | 16 | unblocked | 120 | 3.5 | 120 |
| | | | 4/16 | 16 | blocked | 320 | 8.0 | [illegible] |
| | | | 4/12 | 24 | blocked | 310 | 8.0 | 310 |
| | | | 8/12 | 16 | blocked | 140 | 4.0 | 140 |
| | | | 6/12 | 16 | blocked | 180 | 5.0 | 180 |
| | 5/8" | 6d cooler (0.092" x 1-7/8" long, 1/4" head) or wallboard nail (0.0915" x 1-7/8" long, 19/64" head) or 0.120" nail x 1-3/4" long, min 3/8" head | 7 | 24 | unblocked | 230 | 6.0 | 230 |
| | | | 4 | 24 | unblocked | 290 | 7.5 | 290 |
| | | | 7 | 16 | blocked | 290 | 7.5 | 290 |
| | | | 4 | 16 | blocked | 350 | 8.5 | 350 |
| | | No. 6 Type S or W drywall screws 1-1/4" long | 8/12 | 16 | unblocked | 140 | 4.0 | 140 |
| | | | 8/12 | 16 | blocked | 180 | 5.0 | 180 |
| | 5/8" (Two-Ply) | Base ply: 6d cooler (0.092" x 1-7/8" long, 1/4" head) or wallboard nail (0.0915" x 1-7/8" long, 19/64" head) or 0.120" nail x 1-3/4" long, min 3/8" head<br>Face ply: 8d cooler (0.113" x 2-3/8" long, 0.281" head) or wallboard nail (0.113" x 2-3/8" long, 3/8" head) or 0.120" nail x 2-3/8" long, min 3/8" head | Base: 9<br>Face: 7 | 16 | blocked | 500 | 11 | 500 |
| Gypsum sheathing board | 1/2" x 2' x 8' | 0.120" nail x 1-3/4" long, 7/16" head, diamond-point, galvanized | 4 | 16 | unblocked | 150 | 4.0 | 150 |
| | 1/2" x 4' | | 4 | 24 | blocked | 350 | 8.5 | 350 |
| | | | 7 | 16 | unblocked | 200 | 5.5 | 200 |
| | 5/8" x 4' | 6d galvanized cooler (0.092" x 1-7/8" long, 1/4" head) or wallboard nail (0.0915" x 1-7/8" long, 19/64" head) or 0.120" nail x 1 3/4" long, min 3/8" head | 4/7 | 16 | blocked | 400 | 9.5 | 400 |
| Gypsum lath, plain or perforated with vertical joints staggered | 3/8" lath and ½" plaster | 0.092" x 1-1/8" long, 19/64" head, gypsum wallboard blued nail or 0.120" nail x1-1/4" long, min 3/8" head | 5 | 16 | unblocked | 360 | 9.0 | 360 |
| Gypsum lath, plain or perforated | 3/8" lath and 1/2" plaster | 0.092" x 1-1/8" long, 19/64" head, gypsum wallboard blued nail or 0.120" nail x1-1/4" long, min 3/8" head | 5 | 16 | unblocked | 200 | 5.5 | 200 |
| Expanded metal or woven wire lath and Portland cement plaster | 7/8" | 0.120" nail x 1-½" long, 7/16" head | 6 | 16 | unblocked | 360 | 9.0 | 360 |

1. Nominal unit shear capacities shall be adjusted in accordance with 4.3.3 to determine ASD allowable unit shear capacity and LRFD factored unit resistance. For general construction requirements see 4.3.6. For specific requirements, see 4.3.7.4.
2. Type S or W drywall screws shall conform to requirements of ASTM C 1002.
3. Where two numbers are given for maximum fastener edge spacing, the first number denotes fastener spacing at the edges and the second number denotes fastener spacing along intermediate framing members.

LATERAL FORCE-RESISTING SYSTEMS 4

PG 18/25

# Product Specifications: Design Values

## DESIGN VALUES

| Series | Depth | Weight (plf) | Moment (lb-ft) | EI (x 10⁶) (lb-in²) | K (x 10⁶) (lb-ft/in) | Shear (lbs) |
|---|---|---|---|---|---|---|
| LPI 36 | 11-7/8" | 3.1 | 6445 | 429 | 0.468 | 1615 |
| | 14" | 3.4 | 7755 | 622 | 0.550 | 1830 |
| | 16" | 3.6 | 8995 | 836 | 0.625 | 2020 |
| | 18" | 3.9 | 10135 | 1082 | 0.700 | 2185 |
| LPI 42Plus | 11-7/8" | 3.5 | 6965 | 547 | 0.515 | 1625 |
| | 14" | 3.8 | 8390 | 802 | 0.607 | 1875 |
| | 16" | 4.0 | 9725 | 1092 | 0.693 | 2115 |
| | 18" | 4.4 | 11000 | 1333 | 0.960 | 2555 |
| | 20" | 4.6 | 12170 | 1688 | 1.067 | 2795 |
| | 24" | 5.5 | 14480 | 2534 | 1.280 | 3270 |
| LPI 52Plus | 11-7/8" | 4.5 | 8475 | 600 | 0.633 | 2055 |
| | 14" | 4.8 | 10205 | 874 | 0.747 | 2330 |
| | 16" | 5.0 | 11835 | 1183 | 0.853 | 2585 |
| LPI 56 | 11-7/8" | 4.5 | 10170 | 668 | 0.549 | 2055 |
| | 14" | 4.8 | 12250 | 968 | 0.641 | 2330 |
| | 16" | 5.0 | 14205 | 1301 | 0.729 | 2585 |
| | 18" | 5.3 | 16010 | 1684 | 0.817 | 2845 |
| | 24" | 6.0 | 21340 | 3127 | 1.081 | 3620 |

**NOTES:**

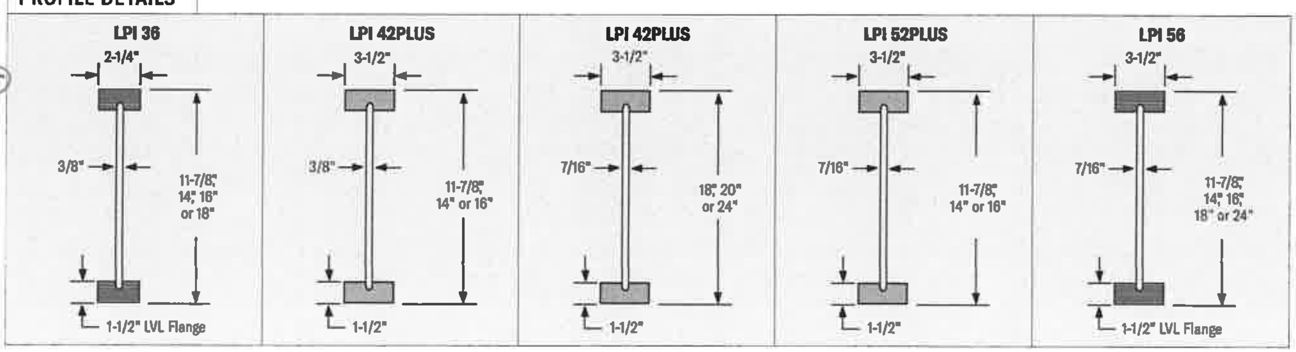
1. LP® SolidStart® I-Joists shall be designed for dry-use conditions only. Dry-use applies to products installed in dry, covered and well ventilated interior conditions in which the equivalent moisture content in lumber will not exceed 16%.
2. Moment and Shear are for normal load duration and shall be adjusted according to code.
3. Moment shall not be increased for repetitive member use.
4. Deflection calculations shall include both bending and shear deformations.

Deflection for a simple span, uniform load: $\Delta = \frac{22.5wL^4}{EI} + \frac{wL^2}{K}$

Where: $\Delta$ = deflection (in)   EI = bending stiffness (from table)
w = uniform load (plf)   K = shear stiffness (from table)
L = design span (ft)

Equations for other conditions can be found in engineering references.

## PROFILE DETAILS



# Product Specifications: Reaction Capacity

## REACTION AND BEARING CAPACITY

| Series | Depth | End Reaction Capacity (lbs)[1] | | | | | Interior Reaction Capacity (lbs)[1] | | | | Flange Bearing Capacity[2] (lb/in) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Minimum Bearing (see below) | | | Maximum Bearing (4") | | Minimum Bearing (3-1/2") | | Maximum Bearing (5-1/2") | | |
| | | W/out Stiffeners | With Stiffeners | Bearing Length | W/out Stiffeners | With Stiffeners | W/out Stiffeners | With Stiffeners | W/out Stiffeners | With Stiffeners | |
| LPI 36 | 11-7/8" | 1025 | 1500 | 1-1/2" | 1290 | 1615 | 2500 | 3105 | 2835 | 3470 | 1185 |
| | 14" | 1025 | 1515 | 1-1/2" | 1325 | 1830 | 2500 | 3205 | 2835 | 3565 | |
| | 16" | 1025 | 1525 | 1-1/2" | 1360 | 2020 | 2500 | 3305 | 2835 | 3655 | |
| | 18" | 1175 | 1800 | 2-1/2" | 1395 | 2185 | 2500 | 3405 | 2835 | 3750 | |
| LPI 42Plus | 11-7/8" | 1245 | 1510 | 1-1/2" | 1595 | 1625 | 3025 | 3340 | 3120 | 3515 | 1705 |
| | 14" | 1300 | 1660 | 1-1/2" | 1595 | 1875 | 3140 | 3565 | 3280 | 3805 | |
| | 16" | 1350 | 1800 | 1-1/2" | 1595 | 2115 | 3245 | 3775 | 3435 | 4080 | |
| | 18" | 1500 | 2305 | 2-1/2" | 1680 | 2555 | 3450 | 4285 | 3850 | 4625 | |
| | 20" | 1500 | 2450 | 2-1/2" | 1690 | 2795 | 3450 | 4410 | 3850 | 4835 | |
| | 24" | 1500 | 2705 | 2-1/2" | 1690 | 3270 | 3450 | 4640 | 3850 | 5210 | |
| LPI 52Plus | 11-7/8" | 1370 | 1820 | 1-1/2" | 1690 | 2055 | 3420 | 4000 | 3635 | 4210 | 2000 |
| | 14" | 1385 | 1970 | 1-1/2" | 1845 | 2330 | 3435 | 4260 | 3745 | 4540 | |
| | 16" | 1400 | 2110 | 1-1/2" | 1985 | 2585 | 3450 | 4505 | 3850 | 4855 | |
| LPI 56 | 11-7/8" | 1145 | 1660 | 1-1/2" | 1515 | 2055 | 3130 | 3860 | 3670 | 4060 | 1870 |
| | 14" | 1145 | 1755 | 1-1/2" | 1535 | 2330 | 3130 | 4055 | 3670 | 4300 | |
| | 16" | 1145 | 1845 | 1-1/2" | 1555 | 2585 | 3130 | 4245 | 3670 | 4525 | |
| | 18" | 1315 | 2300 | 2-1/2" | 1575 | 2845 | 3130 | 4435 | 3670 | 4750 | |
| | 24" | 1340 | 2770 | 2-1/2" | 1635 | 3620 | 3130 | 5000 | 3670 | 5430 | |

### NOTES:

1. End and Interior Reaction Capacity shall be limited by the Flange Bearing Capacity or the bearing capacity of the support material, whichever is less.
2. The Flange Bearing Capacity, per inch of bearing length, is based on the allowable compression perpendicular-to-grain of the I-Joist flange, accounting for eased edges.
3. To account for edge easing when determining the bearing capacity of the support material, subtract 0.25" from the flange width for the LPI 42Plus & LPI 52Plus, and subtract 0.10" from the flange width for the LPI 36 & LPI 56.
4. Reaction Capacity is for normal load duration and shall be adjusted according to code. Flange Bearing Capacity and the bearing capacity of any wood support shall not be adjusted for load duration.
5. Reaction Capacity and Flange Bearing Capacity may be increased over the values tabulated for the minimum bearing length. Linear interpolation of the Reaction Capacity between the minimum and maximum bearing length is permitted. Bearing lengths longer than the maximum do not further increase Reaction Capacity. Flange Bearing Capacity and that of a wood support will increase with additional bearing length.
5. See page 16 for information on web stiffeners sizes and nailing.

### EXAMPLE:

Determine the stiffened end reaction capacity for a 16" LPI 42Plus with 2" of bearing for a non-snow roof load and supported on an SPF wall plate.

1. Determine End Reaction (ER) w/ Stifferners:
   ER = 1800 + (2115 - 1800) * (2" - 1.5")/(4" - 1.5") = 1863 lbs
2. Adjust for load duration: Adjusted ER = 1863 * 1.25 = 2328 lbs
3. Determine Flange Bearing Capacity (FBC):
   FBC = 1705 lb/in * 2" = 3410 lbs
4. Determine wall plate bearing capacity (PBC):
   PBC = 425 psi * (3.5" - 0.25") * 2" = 2762 lbs
5. Final End Reaction Capacity w/Stiffeners = 2328 lbs

PG 20/25

# Uniform Floor Load (PLF) Tables: LPI 36 Simple Spans

**TO USE:**

1. Select the span required.
2. Compare the design total load to the Total Load column. Where two numbers are shown, the first number represents the Total Load capacity without web stiffeners. The second number represents the Total Load capacity with stiffeners. (See Additional Notes below.)
3. Compare the design live load to the appropriate Live Load column.
4. Select a product that exceeds both the design total and live loads.
5. Specify web stiffeners as dictated by the Total Load column.
6. Concentrated loads, where required, shall be evaluated by the designer.

**EXAMPLE:**

An I-Joist has the simple clear span of 18'-6", supporting 50 psf Floor Load and 25 psf Dead Load, spaced 24" oc. Select the shallowest joist that satisfies an L/600 live load deflection limit.

1. Select the row corresponding to a 19' span.
2. Design Total Load = (50 + 25) * (24 / 12) = 150 plf
   Design Live Load = 50 * (24 / 12) = 100 plf
3. Select the first joist to exceed both Total Load and L/600:
   **The 18" LPI 36 supports 185 plf Total Load and 114 plf Live Load at L/600**
   NOTE: Web stiffeners required at both end supports.

| Span (ft) | 11-7/8" LPI 36 | | | | 14" LPI 36 | | | | 16" LPI 36 | | | | Span (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Live Load | | | Total Load | Live Load | | | Total Load | Live Load | | | Total Load | |
| | L/600 | L/480 | L/360 | | L/600 | L/480 | L/360 | | L/600 | L/480 | L/360 | | |
| 12' | 166 | 208 | | 171 / 246 | 230 | | | 171 / 251 | | | | 172 / 256 | 12' |
| 13' | 135 | 169 | 226 | 158 / 227 | 188 | | | 158 / 232 | | | | 159 / 236 | 13' |
| 14' | 111 | 139 | 186 | 147 / 211 | 156 | 195 | | 147 / 216 | 202 | | | 148 / 220 | 14' |
| 15' | 93 | 116 | 155 | 137 / 197 | 130 | 163 | | 137 / 202 | 169 | | | 138 / 205 | 15' |
| 16' | 78 | 97 | 130 | 129 / 185 | 110 | 137 | 183 | 129 / 189 | 143 | 179 | | 130 / 193 | 16' |
| 17' | 66 | 83 | 110 | 121 / 166 | 93 | 117 | 156 | 122 / 178 | 122 | 153 | | 122 / 182 | 17' |
| 18' | 56 | 70 | 94 | 115 / 141 | 80 | 100 | 133 | 115 / 169 | 105 | 131 | | 115 / 172 | 18' |
| 19' | 48 | 61 | 81 | 109 / 122 | 69 | 86 | 115 | 109 / 160 | 91 | 113 | 151 | 109 / 163 | 19' |
| 20' | 42 | 52 | 70 | 103 / 105 | 60 | 75 | 100 | 103 / 150 | 79 | 99 | 132 | 104 / 155 | 20' |
| 21' | 38 | 46 | 61 | 92 | 52 | 65 | 87 | 99 / 131 | 69 | 86 | 115 | 99 / 147 | 21' |
| 22' | 32 | 40 | 54 | 81 | 46 | 57 | 76 | 94 / 115 | 61 | 76 | 101 | 95 / 141 | 22' |
| 23' | 28 | 35 | 47 | 71 | 40 | 50 | 67 | 90 / 101 | 53 | 67 | 89 | 90 / 134 | 23' |
| 24' | 25 | 31 | 42 | 63 | 36 | 45 | 60 | 86 / 90 | 47 | 59 | 79 | 87 / 119 | 24' |
| 25' | 22 | 28 | 37 | 56 | 32 | 40 | 53 | 80 | 42 | 53 | 71 | 83 / 106 | 25' |
| 26' | - | - | - | - | 28 | 36 | 48 | 72 | 38 | 47 | 63 | 80 / 95 | 26' |
| 27' | - | - | - | - | 25 | 32 | 43 | 64 | 34 | 42 | 57 | 77 / 85 | 27' |
| 28' | - | - | - | - | 23 | 29 | 38 | 58 | 31 | 38 | 51 | 74 / 77 | 28' |
| 29' | - | - | - | - | 21 | 26 | 35 | 52 | 28 | 35 | 46 | 70 | 29' |
| 30' | - | - | - | - | 19 | 23 | 31 | 47 | 25 | 31 | 42 | 63 | 30' |
| 31' | - | - | - | - | - | - | - | - | 23 | 28 | 38 | 57 | 31' |
| 32' | - | - | - | - | - | - | - | - | 21 | 26 | 35 | 52 | 32' |
| 33' | - | - | - | - | - | - | - | - | 19 | 24 | 32 | 48 | 33' |
| 34' | - | - | - | - | - | - | - | - | 17 | 22 | 29 | 44 | 34' |
| 35' | - | - | - | - | - | - | - | - | - | - | - | - | 35' |
| 36' | - | - | - | - | - | - | - | - | - | - | - | - | 36' |
| 37' | - | - | - | - | - | - | - | - | - | - | - | - | 37' |
| 38' | - | - | - | - | - | - | - | - | - | - | - | - | 38' |

| Span (ft) | 18" LPI 36 | | | | Span (ft) |
|---|---|---|---|---|---|
| | Live Load | | | Total Load | |
| | L/600 | L/480 | L/360 | | |
| 12' | | | | 189 / 289 | 12' |
| 13' | | | | 175 / 268 | 13' |
| 14' | | | | 163 / 249 | 14' |
| 15' | 210 | | | 152 / 233 | 15' |
| 16' | 179 | | | 143 / 219 | 16' |
| 17' | 153 | 191 | | 134 / 206 | 17' |
| 18' | 131 | 164 | | 127 / 195 | 18' |
| 19' | 114 | 142 | | 121 / 185 | 19' |
| 20' | 99 | 124 | 166 | 115 / 176 | 20' |
| 21' | 87 | 109 | 145 | 109 / 168 | 21' |
| 22' | 77 | 96 | 128 | 104 / 160 | 22' |
| 23' | 68 | 85 | 113 | 100 / 150 | 23' |
| 24' | 60 | 75 | 101 | 96 / 138 | 24' |
| 25' | 54 | 67 | 90 | 92 / 127 | 25' |
| 26' | 48 | 60 | 80 | 88 / 118 | 26' |
| 27' | 43 | 54 | 72 | 85 / 109 | 27' |
| 28' | 39 | 49 | 65 | 82 / 98 | 28' |
| 29' | 35 | 44 | 59 | 79 / 89 | 29' |
| 30' | 32 | 40 | 54 | 77 / 81 | 30' |
| 31' | 29 | 36 | 49 | 73 | 31' |
| 32' | 26 | 33 | 44 | 67 | 32' |
| 33' | 24 | 30 | 41 | 61 | 33' |
| 34' | 22 | 28 | 37 | 56 | 34' |
| 35' | 20 | 26 | 34 | 52 | 35' |
| 36' | 19 | 24 | 32 | 48 | 36' |
| 37' | 17 | 22 | 29 | 44 | 37' |
| 38' | 16 | 20 | 27 | 41 | 38' |

**DESIGN ASSUMPTIONS:**

1. Span is the clear distance between supports for simple span applications only.
2. The values in the tables are for uniform loads only. Concentrated loads, where required, shall be evaluated by the designer.
3. Total Load is for normal (100%) duration.
4. These tables do not reflect any additional stiffness provided by the floor sheathing.
5. Live Load deflection is limited to L/360, L/480 or L/600 as noted in the table.
6. Total Load deflection is limited to L/240. Long term deflection (creep) has not been considered.
7. These tables assume full lateral support of the compression flange (maximum unbraced length of 24").
8. The spans are based on an end bearing length of at least 1-3/4" for depths up to 16" and at least 2-1/2" for depths greater than 16" and are limited to the bearing capacity for an SPF wall plate ($F_{c\perp}$ = 425 psi).

**ADDITIONAL NOTES:**

1. The allowable loads represent the capacity of the joist in pounds per lineal foot (plf) of length.
2. The designer shall check both the Total Load and the appropriate Live Load column.
3. To design a double I-Joist, the values in these tables can be doubled, or the design loads on the I-Joist may be halved to verify the capacity of each ply. The capacity is additive. See Double I-Joist Connection detail on page 15.
4. Web stiffeners are not required where only one value is shown for Total Load or when the design total load does not exceed the first value (capacity without stiffeners) in the Total Load column where two values are given. Web stiffeners are required at both end supports if the design total load exceeds the first value. Do not exceed the second value (capacity with stiffeners).
5. Web fillers are required for I-Joists seated in hangers that do not laterally support the top flange or for hangers that require nailing into the web.
6. Where the Live Load is blank, the Total Load governs the design.
7. Do not use a product where designated "-" without further analysis by a design professional.

PG 21/25

TECHNICAL BULLETIN

SIMPSON Strong-Tie

# Uplift Connectors
# Truss-to-Wall Tiedowns (Spruce-Pine-Fir)

The table below provides allowable loads and fastening requirements for the common application of a wood truss supported by a spruce-pine-fir or hem-fir double top plate. Some connections require wall studs directly below the truss; see installation figures on page 2.

| Application | Model No. | Total Fasteners (in.) | | SPF/HF Allowable Uplift (160) | Figure No. |
|---|---|---|---|---|---|
| | | To Truss | To Wall | | |
| Single-Ply Truss | H2.5T | (5) 0.131 x 1½ | (5) 0.131 x 1½ | 475 | 1 |
| | SDWC15600[3] | — | — | 505 | 14 |
| | H2.5A | (5) 0.131 x 1½ | (5) 0.131 x 1½ | 540 | 2 |
| | MTS12 | (7) 0.148 x 1½ | (7) 0.148 x 1½ | 850 | 4 |
| | (2) H2.5T | (10) 0.131 x 1½ | (10) 0.131 x 1½ | 950 | 5 |
| | H10A | (9) 0.148 x 1½ | (9) 0.148 x 1½ | 1,015 | 3 |
| | (2) H2.5A | (10) 0.131 x 1½ | (10) 0.131 x 1½ | 1,080 | 5 |
| | (2) MTS12 | (14) 0.148 x 1½ | (14) 0.148 x 1½ | 1,700 | 5 |
| Two-Ply Truss | H2.5T | (5) 0.131 x 2½ | (5) 0.131 x 2½ | 565 | 1 |
| | H2.5A | (5) 0.131 x 2½ | (5) 0.131 x 2½ | 615 | 2 |
| | MTS12 | (7) 0.148 x 1½ | (7) 0.148 x 1½ | 850 | 4 |
| | (2) SDWC15600[3,4] | — | — | 910 | 14 |
| | H10A-2 | (9) 0.148 x 1½ | (9) 0.148 x 1½ | 930 | 3 |
| | (2) H2.5T | (10) 0.131 x 2½ | (10) 0.131 x 2½ | 1,130 | 5 |
| | (2) H2.5A | (10) 0.131 x 2½ | (10) 0.131 x 2½ | 1,230 | 5 |
| | (4) H2.5A | (20) 0.131 x 1½ | (20) 0.131 x 1½ | 1,410 | — |
| | LGT2 | (16) 0.148 x 3 ¼ | (14) 0.148 x 3 ¼ | 1,755 | 6 |
| | MGT | (22) 0.148 x 3 | HDU4[8] with ⅝ ATR | 3,285[6] | 7 |
| | VGT | (16) ¼ x 3 SDS | HDU5[8] with ⅝ ATR | 3,555 | 8 |
| | (2) VGT | (32) ¼ x 3 SDS | (2) HDU4[8] with (2) ⅝ ATR | 5,170 | 8 |
| | HGT-2 | (16) 0.148 x 3 | (2) HTT4[8] with (2) ⅝ ATR | 6,485 | 9 |
| Three-Ply or Four-Ply Truss | H2.5T | (5) 0.131 x 2½ | (5) 0.131 x 2½ | 565 | 1 |
| | H2.5A | (5) 0.131 x 2½ | (5) 0.131 x 2½ | 615 | 2 |
| | MTS12 | (7) 0.148 x 1½ | (7) 0.148 x 1½ | 850 | 4 |
| | (2) H2.5T | (10) 0.131 x 2½ | (10) 0.131 x 2½ | 1,130 | 5 |
| | (2) H2.5A | (10) 0.131 x 2½ | (10) 0.131 x 2½ | 1,230 | 5 |
| | (3) SDWC15600[3,4] | — | — | 1,365 | 14 |
| | (4) H2.5A | (20) 0.131 x 1½ | (20) 0.131 x 1½ | 1,410 | — |
| | LGT3-SDS2.5 (3-ply truss) | (12) ¼ x 2½ SDS | (26) 0.148 x 3 ¼ | 2,505 | 6 |
| | LGT4-SDS3 (4-ply truss) | (16) ¼ x 3 SDS | (30) 0.148 x 3 ¼ | 2,920 | 6 |
| | VGT | (16) ¼ x 3 SDS | HDU5[8] with ⅝ ATR | 3,555 | 8 |
| | (2) VGT | (32) ¼ x 3 SDS | (2) HDU4[8] with (2) ⅝ ATR | 6,400 | 8 |
| | HGT-3 (3-ply truss) HGT-4 (4-ply truss) | (16) 0.148 x 3 | (2) HTT5[8] with (2) ⅝ ATR | 8,750[6] | 9 |
| | HGT-3 (3-ply truss) HGT-4 (4-ply truss) | (16) 0.148 x 3 | (2) HTT5KT[8] with (2) ⅝ ATR | 9,035 | 9 |
| | | | | 9,250 | 9 |
| Hip Truss | HCP2 | (6) 0.148 x 1½ | (6) 0.148 x 1½ | 510 | 10 |
| | MTS12 | (7) 0.148 x 1½ | (7) 0.148 x 1½ | 715 | 11 |
| | (2) HCP2 | (12) 0.148 x 1½ | (12) 0.148 x 1½ | 1,020 | 10 |
| | HTS16 | (8) 0.148 x 1½ | (8) 0.148 x 1½ | 1,215 | 11 |
| Straight Straps | CSHP20 | (7) 0.131 x 2½ | (7) 0.131 x 2½ | 1,160 | 12,13 |
| | CSHP18 | (9) 0.131 x 2½ | (9) 0.131 x 2½ | 1,540 | 12,13 |
| | CS16 | (11) 0.148 x 2½ | (11) 0.148 x 2½ | 1,705 | 12,13 |

1. Loads have been increased for wind loading with no further increase allowed; reduce where other loads govern.
2. For uplift continuous load path, truss-to-plate connector and plate-to-stud connector must be on same side of the wall.
3. Where noted, refer to the current *Fastening Systems* catalog or F-F-QUIKSTIK for SDWC truss-to-wall installation requirements. Load reductions apply to truss heel conditions that do not have a minimum 3½" overhang; see L-F-SDWCEHEEL at **strongtie.com** for more information.
4. One SDWC screw is installed in each ply of a two-ply or three-ply assembly; SDWC screws in multi-ply assemblies must be spaced a minimum of 1½" o.c.
5. ATR is all-thread rod, ASTM F1554 Grade 36 minimum.
6. Where noted, the tabulated allowable uplift is governed by the holdown capacity.
7. The tabulated allowable uplift for straight straps (CSHP20, CSHP18 and CS16) is per strap; multiply table value by number of straps for total allowable uplift.
8. Where noted, refer to the current *Wood Construction Connectors* catalog for holdown and tension tie fasteners. HTT4 and HTT5 require 0.162" x 2½" nails.
9. For hip truss applications, MTS12 and HTS16 shall be field bent one time only to match hip angle.
10. Multiple truss plies must be fastened together to act as one unit to resist the applied load. This must be determined by the Truss Designer.
11. Refer to the current *Wood Construction Connectors* catalog or *High Wind-Resistant Construction* application guide for additional uplift connectors, lateral load capacities, and information on evaluating connectors that are loaded simultaneously in more than one direction.
12. **Fasteners:** Nail dimensions in the table are listed diameter by length. SDS screws are Strong-Drive® screws.

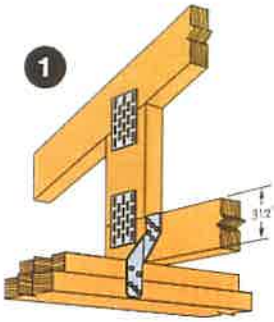
PG 22/25

TECHNICAL BULLETIN

# Uplift Connectors
# Truss-to-Wall Tiedowns (Spruce-Pine-Fir)

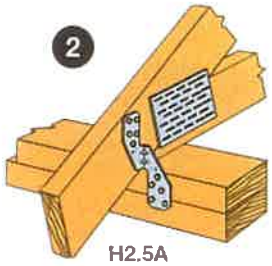
SIMPSON Strong-Tie

1



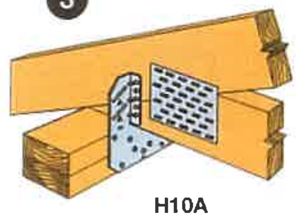

H2.5T

2



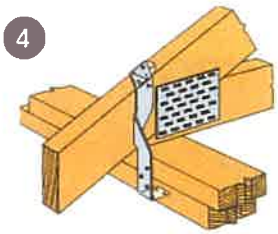
H2.5A

3



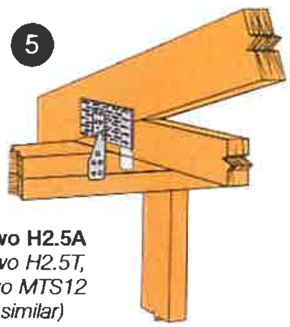
**H10A**
*(H10A-2 similar)*

4



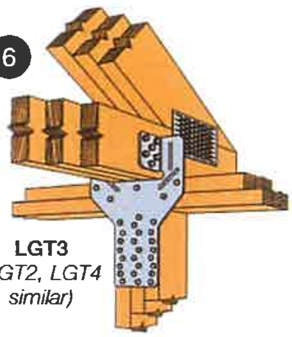
MTS12

5



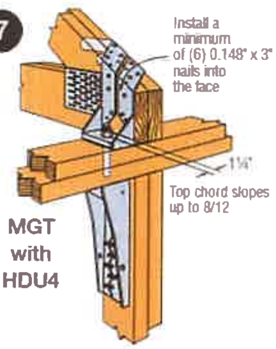
**Two H2.5A**
*(two H2.5T, two MTS12 similar)*

6



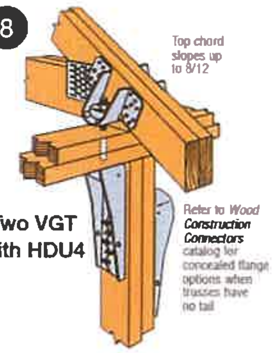
**LGT3**
*(LGT2, LGT4 similar)*

7



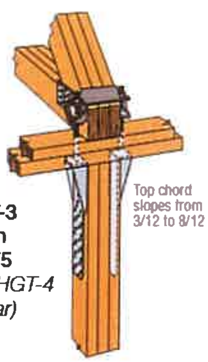

**MGT with HDU4**

8



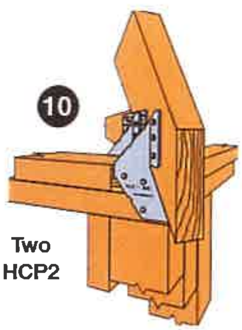

**Two VGT with HDU4**

9



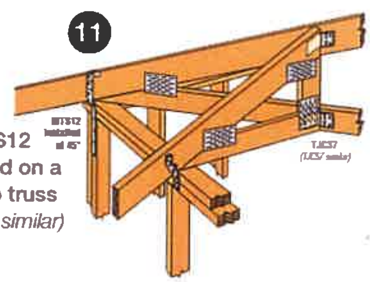

**HGT-3 with HTT5**
*(HGT-2, HGT-4 similar)*

10



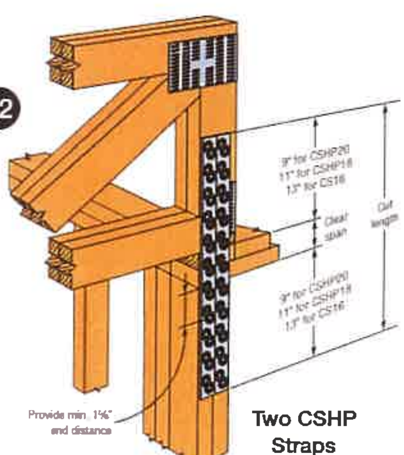
**Two HCP2**

11



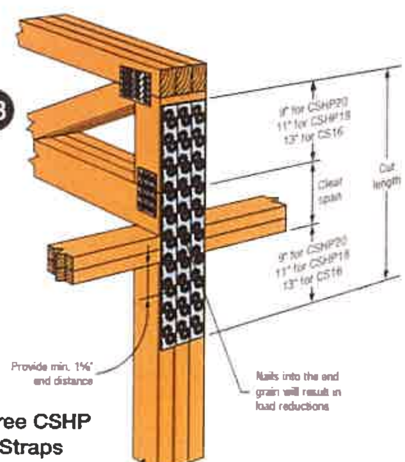
**MTS12 installed on a 45° hip truss**
*(HTS16 similar)*

12




**Two CSHP Straps**
*(CS similar)*

13




**Three CSHP Straps**
*(CS similar)*

14

Refer to F-F-QUIKSTIK for other approved installations

**SDWC 15600**
*(two or three SDWC, one in each ply of a two-ply or three-ply truss, similar)*

This technical bulletin is effective until December 31, 2023, and reflects information available as of December 1, 2021. This information is updated periodically and should not be relied upon after December 31, 2023. Contact Simpson Strong-Tie for current information and limited warranty or see strongtie.com.

 T-C-UPLIFTSPF22 12/21 exp. 12/23

(800) 999-5099
strongtie.com

PG 23/25



SIMPSON Strong-Tie

# 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.

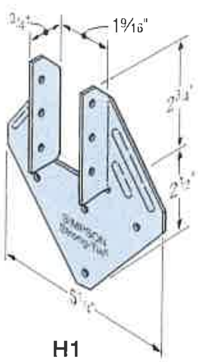
**Material:** See table

**Finish:** Galvanized. H1.81Z, H7Z and H11Z — ZMAX® coating. Some models available in stainless steel or ZMAX; see Corrosion Information, pp. 12–15 or visit **strongtie.com**.

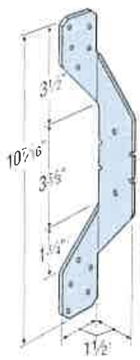
**Installation:**

- 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.

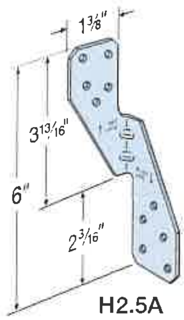
**Codes:** See p. 11 for Code Reference Key Chart



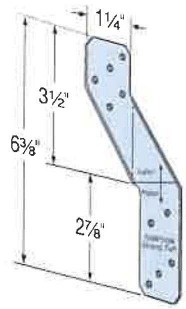
**H1**
*(H1.81Z similar)*



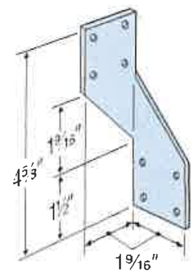
**H2A**
*(H2ASS similar)*



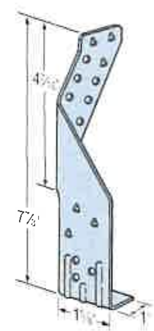
**H2.5A**
*(H2.5ASS similar)*



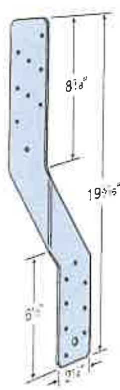
**H2.5T**



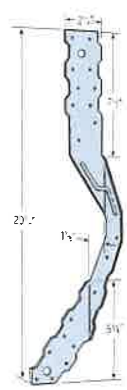
**H3**
*(H3SS similar)*



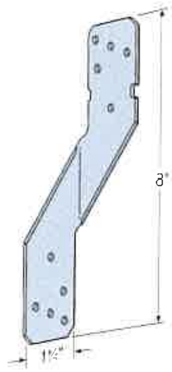
**TSP**



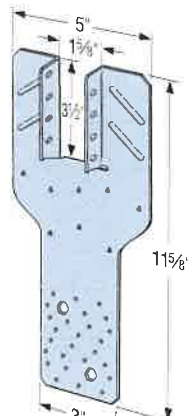
**H6**



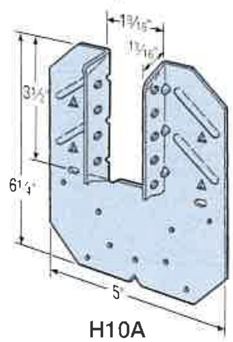
**H7Z**



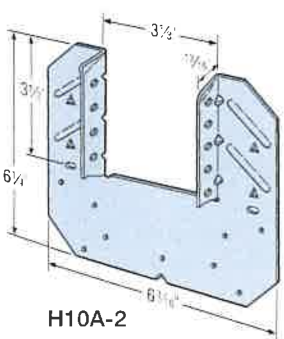
**H8**
*(H8SS similar)*



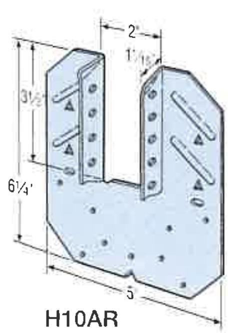
**H10S**



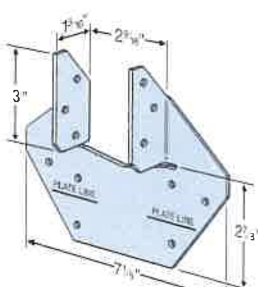
**H10A**
*(H10ASS similar)*



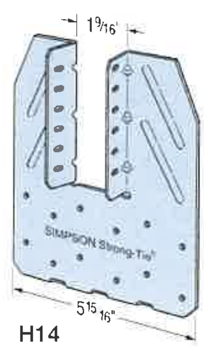
**H10A-2**



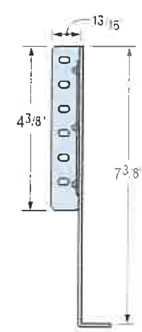
**H10AR**



**H11Z**



**H14**



**H14 Profile**

# H/TSP

## Seismic and Hurricane Ties (cont.)

These products are available with additional corrosion protection. For more information, see p. 14.

SS For stainless-steel fasteners, see p. 21.

SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 348–352 for more information.

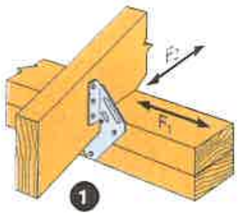
| Model No. | Ga. | Fasteners (in.) To Rafters/Truss | Fasteners (in.) To Plates | Fasteners (in.) To Studs | DF/SP Allowable Loads Uplift (160) | DF/SP Lateral (160) $F_1$ | DF/SP Lateral (160) $F_2$ | Uplift with 0.131" x 1½" Nails (160) | SPF/HF Allowable Loads Uplift (160) | SPF/HF Lateral (160) $F_1$ | SPF/HF Lateral (160) $F_2$ | Uplift with 0.131" x 1½" Nails (160) | Code Ref. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H1 | 18 | (6) 0.131 x 1½ | (4) 0.131 x 2½ | — | 480 | 510 | 190 | 455 | 425 | 440 | 165 | 370 | 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 |
| 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 |
| 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 | |
| H3SS | 18 | (4) 0.131 x 2½ | (4) 0.131 x 2½ | — | 280 | 145 | 120 | 275 | 225 | 100 | 85 | 210 | — |
| H6 | 16 | — | (8) 0.131 x 2½ | (8) 0.131 x 2½ | 1,230 | — | — | — | 1,065 | — | — | — | IBC, FL, LA |
| 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 | |
| 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 | 590 | 285 | — | 760 | 505 | 285 | — | IBC, FL, LA |
| H10A | 18 | (9) 0.148 x 1½ | (9) 0.148 x 1½ | — | 1,040 | 565 | 285 | — | 1,015 | 485 | 285 | — | |
| 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 |
| H14 | 18 | (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 | — | |
| TSP | 16 | (9) 0.148 x 1½ | (6) 0.148 x 3 | — | 1,015 | 310 | 190 | — | 875 | 265 | 160 | — | |

1. See pp. 266–267 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. Hurricane ties are shown installed on the outside of the wall for clarity and assume a minimum overhang of 3½". Installation on the inside of the wall is acceptable. For uplift Continuous Load Path, connections in the same area (i.e., truss-to-plate connector and plate-to-stud connector) must be on same side of the wall.
7. 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).
8. Refer to Simpson Strong-Tie® technical bulletin T-C-HTIEBEAR at **strongtie.com** for allowable bearing enhancement loads.
9. 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).
10. H10S nails to plates are optional for uplift but required for lateral loads.
11. 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.
12. 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**.
13. Simpson Strong-Tie offers stainless-steel Strong-Drive SCNR Ring-Shank Connector nails. For bulk SCNR nails, see p. 345; for collated SCNR nails, see p. 346. For general fastener information, see pp. 21–22.
14. 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).
15. For TSP installed stud to single plate see pp. 280–281.
16. For simultaneous loads in more than one direction, the connector must be evaluated using either the Unity Equation or the 75% Rule as described in Straps and Ties General Notes on p. 267.
17. **Fasteners:** Nail dimensions are listed diameter by length. See pp. 21–22 for fastener information.

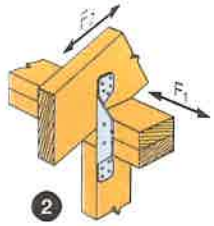
# H/TSP

SIMPSON Strong-Tie

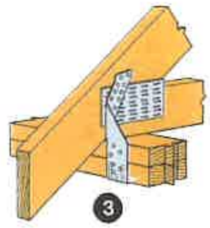
## Seismic and Hurricane Ties (cont.)

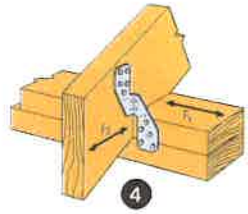


1 H1 Installation
*(H1.81Z similar)*

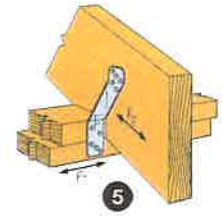


2 H2A Installation

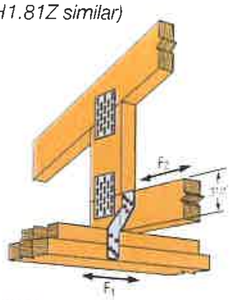

3 TSP Installation



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

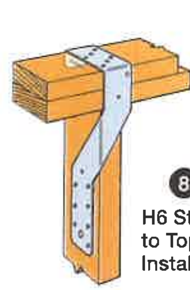


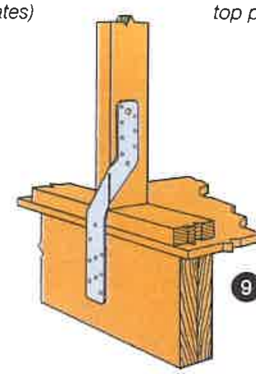
5 H2.5T Installation
*(nails into both top plates)*

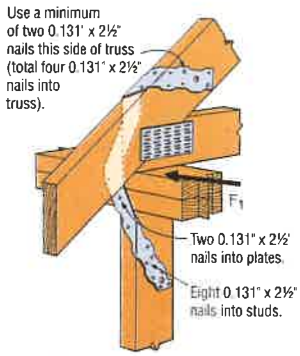


6 H2.5T Installation

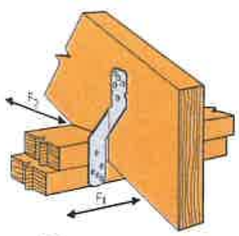
7 H3 Installation
*(nails into upper top plate)*


8 H6 Stud to Top Plate Installation

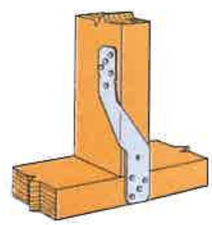

9 H6 Stud to Rim Board Installation

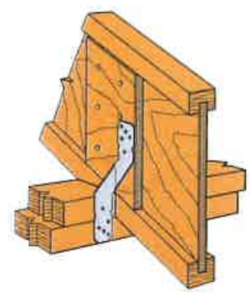


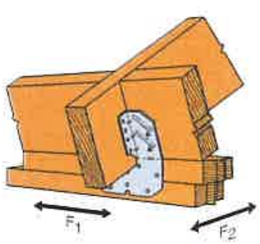
10 H7Z Installation



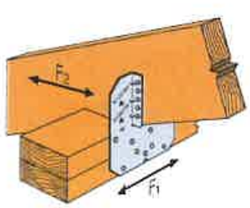
11 H8 Attaching Rafter to Double Top Plates


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

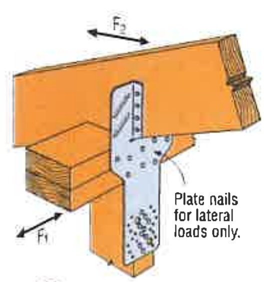


14 H10A Field-Bent Installation

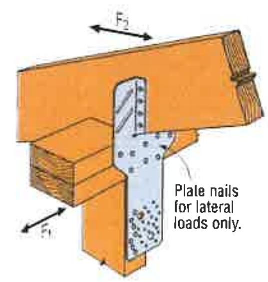


15 H10A Installation

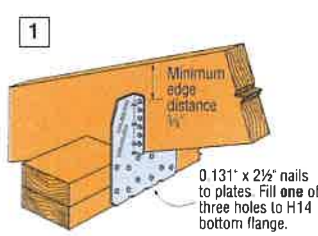
H10A optional nailing connects shear blocking to rafter. Use 0.131" x 2½" nails. Slot allows maximum field-bending up to a pitch of 6/12, use 75% of the table uplift load; bend one time only.



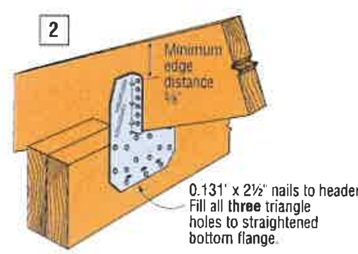
16 H10S Installation



17 H10S Installation with Stud Offset



18 H14 Installation to Double Top Plates



19 H14 Installation to Double 2x Header

Straps and Ties