Faben Point Home

Project Number: 21-127

6202 SE 22nd St.

Mercer Island, WA 98040

Structural Calculations

6/12/24

Reviewed by:

Nabil Kausal-Hayes, PE

206-601-9728

www.nkhengineering.com

Prepared By:

Allen Rishel, EIT

June 12th, 2024

NKH ENGINEERING

PROJECT: Faben Point Home
DESIGNER: NKH & AKR
DATE: June 12th, 2024
JOB #: 21-127

PROJECT SUMMARY & DESIGN CRITERIA

Background

Project Summary:

This is second story addition on an existing two story, wood framed house with basement for Shane Katsoolis & Hana Nguyen on Mercer Island, WA. The structure consists of wood roof & floor trusses/joists bearing on wood framed walls, posts, & beams. The house is supported by existing concrete retaining walls & shallow spread footings. This project is designed in accordance with the 2021 International Building Code along with the codes listed below and corresponding state & city/county amendments.

Notes:

All input variables are highlighted in yellow, resources bolded, and links to resources bolded and underlined. Areas highlighted in blue are code/design checks and green - unity checks.

Resources:

- American Wood Council (AWC). (2018). "National Design Specifications for Wood Construction (NDS)."
- American Wood Council (AWC). (2021). "Special Design Provisions for Wind and Seismic (SDWS)."
- American Concrete Institute (ACI). (2019). "Building Code Requirements for Structural Concrete (ACI 318-19)."
- American Institute of Steel Construction (AISC). (2016). "Steel Construction Manual." 15th Ed.
- American Society of Civil Engineers (ASCE). (2022). "Minimum Design Loads for Buildings and Other Structures."
- State of Washington (2021). "International Building Code (IBC)."

Material Properties

Soil:

-Soil Bearing Pressure (min per IBC1806.2) $p_{brg} := 1500psf$

-Frost Depth $FD := 12in$

- Active & Passive Soil Pressure $q_a := 35 \cdot pcf$ $q_p := 250 \cdot pcf$

Concrete:

-Compressive Strength $f'_c := 2500psi$

-Density, Normal Weight $\gamma_{conc} := 150pcf$

-Density, Light Weight $\gamma_{conc\_LW} := 115pcf$

-Reinforcing Steel, ASTM A615 $f_{yr} := 60ksi$

Steel:

- Modulus of Elasticity $E_c := 29000ksi$

-Anchor Rods/Bolts, ASTM A307 Shear & Tension Yield Strength $F_{nv} := 24ksi$ $F_{nt} := 45ksi$

- Plates, ASTM A36, Yield Strength $F_{y1} := 36ksi$

- Hollow Structural Sections, Tube ASTM A500 Gr. B Yield Strength $F_{y2} := 46ksi$

Wood:

-Solid Sawn Joists, Beams, Headers, & Studs DF-L #1 6x & Larger, DF-L #2 All Other (UNO)

-Glulam Beams 24F-V4 (Simple Span), 24F-V8 (Cont/Cantilever)

Gravity Loading

Roof Dead Load

Roofing		$R := 1.5 \cdot psf$
Insulation		$I := 2.0 \cdot psf$
Ceiling		$C := 2 \cdot psf$
Sheathing	$t := 0.5in$	$SH := \left(\frac{t}{.125in}\right) \cdot 0.4 \cdot psf = 1.6 \cdot psf$
Structural Members		$S := 2.5 \cdot psf$
Lights		$L := 1 \cdot psf$
Mechanical		$M := 1.5 \cdot psf$
Misc.		$MISC := 2.9 \cdot psf$

$DL_{rf} := R + I + C + SH + S + L + M + MISC$ $DL_{rf} = 15 \cdot psf$ $DL_{pv} := 0psf$

Seismic Roof Dead Load

$SDL_{rf} := DL_{rf} - MISC = 12.1\,psf$ $SDL_{rf} = 12\,psf$

Floor Dead Load

Flooring		$F := 1.5 \cdot psf$
Insulation		$I := 2.0 \cdot psf$
Ceiling		$C := 0 \cdot psf$
Sheathing	$t := 0.75in$	$SH := \left(\frac{t}{.125in}\right) \cdot 0.4 \cdot psf = 2.4 \cdot psf$
Structural Members		$S := 3.4 \cdot psf$
Lights		$L := 1 \cdot psf$
Mechanical		$M := 1.5 \cdot psf$
Misc.		$MISC := 3.2 \cdot psf$

$DL_{flr} := F + I + C + SH + S + L + M + MISC$ $DL_{flr} = 15 \cdot psf$

Seismic Floor Dead Load

$SDL_{flr} := DL_{flr} = 15\,psf$ $SDL_{flr} = 15 \cdot psf$

Wall Dead Loads

Exterior Wood	$p_{ext\_w} := 10psf$
Interior Wood	$p_{int} := 9psf$

Live Loads

Roof	$LL_{rf} := 20 \cdot psf$	Roof Snow Load	$SL := 25psf$
Floor Live Load	$LL_{flr} := 40psf$		
Deck Live Load	$LL_{deck} := 1.5 \cdot LL_{flr} = 60\,psf$		

Deflection Criteria

$\Delta_{rf\_TL} := \frac{L}{240}$ $\Delta_{rf\_LL} := \frac{L}{360}$ $\Delta_{flr\_TL} := \frac{L}{360}$ $\Delta_{flr\_LL} := \frac{L}{480}$

NKH ENGINEERING

PROJECT: Faben Point Home
DESIGNER: NKH & AKR
DATE: June 12th, 2024
JOB #: 21-127

Lateral Analysis

References

Lateral Summary

General

LRFD

Risk Cat.: II (ref. 1.5-1)

$L := 72ft$	Building Length	$SDL_{rf} = 12 \cdot psf$	Seismic Roof Dead Load
$B := 34ft$	Building Width	$SDL_{flr} = 15 \cdot psf$	Seismic Floor Dead Load
$h_{rf} := 30ft$	Avg Roof Height	$p_{ext\_w} = 10 \cdot psf$	Exterior Stud Wall Load
$h_p := 0ft$	Parapet Height	$p_{int} = 9 \cdot psf$	Interior Stud Wall Load
$h_{wall} := 10ft$	Wall Height	$a := \min(10\% \cdot B, 0.4h_{rf}) = 3.4\,ft$	Width of Pressure Coefficient Zone

MWFRS (per ASCE 7-16, Chapter 26 & 27)

$\theta := \operatorname{atan}\left(\frac{0.67in}{12in}\right) = 3.2 \cdot deg$ Roof Slope

Design Velocity Pressure - Enclosed/Partially Enlosed Buildings

$V_w := 110$ mph	Basic Wind Speed (per figure 26.5-1A & city/county design criteria)
$K_d := 0.85$	Directionality Factor (ref. section 26.6 & table 26.6-1)
$exp := "C"$	Exposure Category (ref. section 26.7)
$K_{zt} := 1.0$	Topographic Factor (ref. section 26.8)
$K_z = 0.98$	Velocity Pressure Exposure Coefficient (ref. table 26.10-1)

$q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V_w^{\,2} \cdot (psf)$ Velocity pressure (eq 27.3-1) $q_z = 25.8 \cdot psf$

Design Wind Pressure

$p_{w\_min} := 16psf$ Minimum Design Pressure

$G_e := 0.85$ Gust Effect Factor (ref. section 26.9)

Walls

$GC_{pi} := \begin{pmatrix} -0.85 \\ 0.85 \end{pmatrix}$ Internal Pressure Coefficient (ref. table 26.11-1)

Veolcity Pressure Evaluated at Mean Roof Height, h

$q_h := q_z = 25.8 \cdot psf$

External Pressure Coefficients for Walls (ref. figure 27.4-1)

$\frac{L}{B} = 2.12$ $C_{pww} := 0.8$ Windward Wall $C_{plw} = -0.3$ Leeward Wall

Design MWFRS Wind Pressures (eq 27.4-1)

$p_w := \max\left[p_{w\_min}, \max\left[q_h \cdot \left[G_e \cdot \left(C_{pww} + C_{plw}\right) - GC_{pi}\right]\right]\right] = 32.9 \cdot psf$ $p_w = 32.9 \cdot psf$

Parapet (ref. section 27.4.5)

$GC_{pnw} := 1.5$ Windward Combined Net Pressure Coefficient

$GC_{pnL} := -1.0$ Leeward Combined Net Pressure Coefficient

$p_p := \text{if}\left[h_p \le 0, 0psf, q_z \cdot \left(GC_{pnw} - GC_{pnL}\right)\right]$ Combined Net Pressure on Parapet $p_p = 0 \cdot psf$

Design Wind Pressure (cont'd)

$\frac{h_{rf}}{L} = 0.42$

Roof (fig. 27.4-1)

$GC_{pi} = \begin{pmatrix} -0.85 \\ 0.85 \end{pmatrix}$ Internal pressure coefficient (ref. table 26.11-1)

External pressure coefficients for roofs (ref. figure 27.4-1)

$\frac{h_{rf}}{L} = 0.42$ $C_{prf} := \begin{pmatrix} -0.3 \\ -0.6 \end{pmatrix}$ Windward & leeward coefficients

Veolcity pressure evaluated at mean roof height, h

$q_h := q_z = 25.8 \cdot psf$

Design MWFRS wind pressure (ref. eq 27.4-1)

$p_{rf1} := q_h \cdot \left(G_e \cdot \min\left(C_{prf}\right) - GC_{pi}\right) = \begin{pmatrix} 8.8 \\ -35.1 \end{pmatrix} \cdot psf$ $p_{rf2} := q_h \cdot \left(G_e \cdot \max\left(C_{prf}\right) - GC_{pi}\right) = \begin{pmatrix} 15.4 \\ -28.5 \end{pmatrix} \cdot psf$

$p_{rf} := \max\left(\left|\min\left(p_{rf1}\right)\right|, \left|\max\left(p_{rf2}\right)\right|\right) = 35.09 \cdot psf$ $p_{rf\_horiz} := p_{rf} \cdot \sin(\theta) = 2 \cdot psf$

$p_{w\_up} := 0.6DL_{rf} + 0.6 \cdot \left(\min\left(p_{rf1}, p_{rf2}\right)\right)$ Net uplift pressure (ASD) $p_{w\_up} = -12.1 \cdot psf$

Roof Overhangs

$C_{poh} := -0.8$ External pressure coefficients for roof overhangs (ref. 27.5.3)

$p_{oh} := q_z \cdot \left(G_e \cdot C_{poh}\right) + \min\left(p_{rf1}, p_{rf2}\right)$ Overhang pressure $p_{oh} = -52.6 \cdot psf$

$OH_{net} := 0.6DL_{rf} + 0.6 \cdot p_{oh}$ Net uplift pressure (ASD) $OH_{net} = -23 \cdot psf$

C&C (per ASCE 7-16, Chapter 30)

Walls (ref. eq. 30.4-1 & figure 30.4-1)

$GC_{pw4} := \begin{pmatrix} 1.0 \\ -1.1 \end{pmatrix}$ exterior pressure coefficients

$GC_{pw5} := \begin{pmatrix} 1.0 \\ -1.4 \end{pmatrix}$ exterior pressure coefficients (corner zone)

$p_{cc\_w4pos} := q_h \cdot \left(\max\left(GC_{pw4}\right) - GC_{pi}\right) = \begin{pmatrix} 47.7 \\ 3.9 \end{pmatrix} \cdot psf$ Positive design wind pressure (ref. eq. 30.4-1)

$p_{cc\_w4neg} := q_h \cdot \left(\min\left(GC_{pw4}\right) - GC_{pi}\right) = \begin{pmatrix} -6.5 \\ -50.3 \end{pmatrix} \cdot psf$ Negative design wind pressure

$p_{cc\_w5pos} := q_h \cdot \left(\max\left(GC_{pw5}\right) - GC_{pi}\right) = \begin{pmatrix} 47.7 \\ 3.9 \end{pmatrix} \cdot psf$ Corner zone positive design wind pressure

$p_{cc\_w5pos} := q_h \cdot \left(\min\left(GC_{pw5}\right) - GC_{pi}\right) = \begin{pmatrix} -14.2 \\ -58.1 \end{pmatrix} \cdot psf$ Corner zone negative design wind pressure

Roofs (ref. eq. 30.4-1 & figure 30.4-2B)

Negative design wind pressure $GC_{pr1} := -0.9$ $GC_{pr2} := -1.7$ $GC_{pr3} := -2.6$

$p_{cc\_r1} := q_h \cdot \left(GC_{pr1} - GC_{pi}\right) = \begin{pmatrix} -1.3 \\ -45.2 \end{pmatrix} \cdot psf$

$p_{cc\_r2} := q_h \cdot \left(GC_{pr2} - GC_{pi}\right) = \begin{pmatrix} -21.9 \\ -65.8 \end{pmatrix} \cdot psf$

$p_{cc\_r3} := q_h \cdot \left(GC_{pr3} - GC_{pi}\right) = \begin{pmatrix} -45.2 \\ -89 \end{pmatrix} \cdot psf$

Positive design wind pressure $GC_{pr\_pos} := 0.5$

$p_{cc\_rpos} := q_h \cdot \left(GC_{pr\_pos} - GC_{pi}\right) = \begin{pmatrix} 34.8 \\ -9 \end{pmatrix} \cdot psf$

Wind Base Shear

$A_{wall\_L} := 1736ft^2$ $A_{roof\_L} := 0ft^2$ $A_{wall\_T} := 907ft^2$ $A_{roof\_T} := 0ft^2$

$V_{wu\_L} := p_w \cdot A_{wall\_L} + A_{roof\_L} p_{rf\_horiz}$ $V_{wu\_L} = 57.1 \cdot kip$ Longitudinal diaphragm shear

$V_{wu\_T} := p_w \cdot A_{wall\_T} + A_{roof\_T} p_{rf\_horiz}$ $V_{wu\_T} = 29.8 \cdot kip$ Transverse diaphragm shear

Seismic Main Floor - Roof (per ASCE 7-16, 12.8)

LRFD

Basic Parameters

- **Equivalent Lateral Force Procedure (ELFP)**
- **Site class: C**
- **Seismic design category: D**
- **Light Framed Wood Walls Sheathed w/ Wood Panels**

$I_s := 1.0$ Seismic importance factor (ref. table 1.5-2)

$S_{DS} := 0.927$ Design spectral acceleration parameter (ref. ATC summary report)

$R := 6.5$ Response modification factor - (ref. table 12.2-1)

$\Omega_o := 3$ System overstrength factor (ref. table 12.2-1)

$C_d := 4$ Deflection amp. factor (ref. table 12.2-1)

$\rho := 1.0$ Redundancy factor (ref section 12.3.4)

$C_s := \frac{S_{DS}}{\left(\frac{R}{I_s}\right)} = 0.14$ Seismic response coefficient (EQ. 12.8-2)

$S_{D1} := 0.485$ $S_1 := 0.485$ < 0.6g therefore 12.8-6 does not apply

$h_n := h_{rf} = 30\,ft$ Highest level of structure $h_{wall} = 10\,ft$ Wall height

$C_t := 0.02$ $x := 0.75$ Table 12.8-2

$T_a := C_t \cdot \left(\frac{h_n}{ft}\right)^x = 0.26$ EQ 12.8-7

Seismic Response Coefficient

$C_{smax} := \frac{S_{D1}}{T_a \cdot \left(\frac{R}{I_s}\right)}$ $C_{smax} = 0.29$

$C_s := \max\left(\min\left(C_s, C_{smax}\right), 0.01\right)$ $C_s = 0.143$

$C_{s\_min} := \text{if}\left[S_1 > 0.6, \frac{0.5 \cdot S_{D1}}{\left(\frac{R}{I_s}\right)}, 0.044 \cdot S_{DS} \cdot I_s\right] = 0.041$ EQ 12.8-5 & 12.8-6

$C_{s\_wood} := \rho \cdot C_s$ $C_{s\_wood} = 0.143$

Seismic Base Shear

Building Weights Contributing to Seismic Forces

Diaphragms

$W_{diaphragm\_rf} := 1131ft^2 \cdot SDL_{rf}$ $W_{diaphragm\_flr} := (2360 + 2379)ft^2 \cdot SDL_{flr}$

$W_{diaphragm} := W_{diaphragm\_rf} + W_{diaphragm\_flr}$ $W_{diaphragm} = 85 \cdot kip$

Walls

$W_{walls\_T} := (p_{ext\_w} + p_{int}) A_{wall\_T} \cdot 2$ $W_{walls\_T} = 34 \cdot kip$

$W_{walls\_L} := (p_{ext\_w} + p_{int}) A_{wall\_L} \cdot 2$ $W_{walls\_L} = 66 \cdot kip$

Shear Loads

$V_{su} := C_{s\_wood} \cdot (W_{diaphragm} + W_{walls\_T} + W_{walls\_L})$ $V_{su} = 26.41 \cdot kip$

Lateral Summary (ASD)

Seismic/Wind Shearwall Capacity Factor
(ref. NDS Shearwall Capacities)

$C_{sw\_cap} := \frac{310psf}{435psf} = 0.71$

	Wind	*Seismic*
Transverse	$V_{w\_T} := 0.6V_{wu\_T} \cdot C_{sw\_cap} = 12.759 \cdot kip$	$V_{s\_T} := 0.7V_{su} = 18.49 \cdot kip$

$V_T := if(V_{w\_T} > V_{s\_T}, "WIND CONTROLS", "SEISMIC CONTROLS") = "SEISMIC CONTROLS"$

Longitudinal	$V_{w\_L} := 0.6V_{wu\_L} \cdot C_{sw\_cap} = 24.42 \cdot kip$	$V_{s\_L} := 0.7V_{su} = 18.49 \cdot kip$

$V_L := if(V_{w\_L} > V_{s\_L}, "WIND CONTROLS", "SEISMIC CONTROLS") = "WIND CONTROLS"$

Wall Line Wind Force Reactions - Roof

$h_{wall} = 10\,ft$ Average Wall Height

$h_{rf\_proj} := 2ft$ Roof Projection Above Wall

$p_w = 32.9 \cdot psf$ Design Wall Wind Pressure (ref. Wind Loading)

$p_{rf\_horiz} = 2 \cdot psf$ Design Roof Wind Pressure (ref. Wind Loading)

Longitudinal Wall Line Reactions (Ref. Shear Wall Diagram)

Reaction 1

$$trib1 := \frac{26ft}{2} = 13\,ft$$

$$R_{Lrf\_1} := \left[p_w \cdot \left(\frac{h_{wall}}{2}\right) + p_{rf\_horiz} \cdot h_{rf\_proj}\right] \cdot trib1$$

$R_{Lrf\_1} = 2.19 \cdot kip$

Reaction 2

$$trib2 := \frac{7ft}{2} = 3.5\,ft$$

$$R_{Lrf\_2} := \left[p_w \cdot \left(\frac{h_{wall}}{2}\right) + p_{rf\_horiz} \cdot h_{rf\_proj}\right] \cdot (trib1 + trib2)$$

$R_{Lrf\_2} = 2.78 \cdot kip$

Transverse Wall Line Reactions (Ref. Shear Wall Diagram)

Reaction A

$$tribA := \frac{28ft}{2} = 14\,ft$$

$$R_{Trf\_A} := \left[p_w \cdot \left(\frac{h_{wall}}{2}\right) + p_{rf\_horiz} \cdot h_{rf\_proj}\right] \cdot tribA$$

$R_{Trf\_A} = 2.36 \cdot kip$

Reaction B

$$tribB := \frac{28ft}{2} = 14\,ft$$

$$R_{Trf\_B} := \left[p_w \cdot \left(\frac{h_{wall}}{2}\right) + p_{rf\_horiz} \cdot h_{rf\_proj}\right] \cdot tribB$$

$R_{Trf\_B} = 2.36 \cdot kip$

Vertical Distribution of Seismic Forces - Roof Diaphragm (Per ASCE 7-16, 12.8.3)

$V_{su} = 26.41 \cdot kip$ Total Base Shear

$$C_{vx\_rf} := \frac{\left(W_{diaphragm\_rf} + W_{walls\_L} \cdot \frac{1}{6} + W_{walls\_T} \cdot \frac{1}{6}\right)}{\left(W_{diaphragm} + W_{walls\_L} + W_{walls\_T}\right)} = 0.164$$

$V_{rf} := V_{su} \cdot C_{vx\_rf}$ Distributed Shear to Roof $V_{rf} = 4.34 \cdot kip$

Wall Line Seismic Force Reactions - Roof

Longitudinal

Reaction 1

$$R_{Lrf\_1\_EL} := \frac{3}{8} \cdot V_{rf}$$ $R_{Lrf\_1\_EL} = 1.63 \cdot kip$

Reaction 2

$$R_{Lrf\_2\_EL} := \frac{5}{8} \cdot V_{rf}$$ $R_{Lrf\_2\_EL} = 2.71 \cdot kip$

Transverse

Reaction A

$$R_{Trf\_A\_EL} := \frac{1}{2} \cdot V_{rf}$$ $R_{Trf\_A\_EL} = 2.17 \cdot kip$

Reaction B

$$R_{Trf\_B\_EL} := \frac{1}{2} \cdot V_{rf}$$ $R_{Trf\_B\_EL} = 2.17 \cdot kip$

Wall Line Wind Force Reactions - Upper Floor

$h_{wall} = 10\,ft$ Average Wall Height

$p_w = 32.9 \cdot psf$ Design Wall Wind Pressure (ref. Wind Loading)

Longitudinal Wall Line Reactions (Ref. Shear Wall Diagram)

Reaction 1

$$trib1 := \frac{70ft}{2} = 35\,ft$$

$$R_{Lup\_1} := \left[p_w \cdot \left(h_{wall}\right)\right] \cdot trib1 + R_{Lrf\_1} + \frac{R_{Lrf\_2}}{2}$$

$R_{Lup\_1} = 15.09 \cdot kip$

Reaction 2

$$trib2 := \frac{70ft}{2} = 35\,ft$$

$$R_{Lup\_2} := \left[p_w \cdot \left(h_{wall}\right)\right] \cdot trib2 + \frac{R_{Lrf\_2}}{2}$$

$R_{Lup\_2} = 12.9 \cdot kip$

Transverse Wall Line Reactions (Ref. Shear Wall Diagram)

Reaction A

$$tribA := \frac{35ft}{2} = 17.5\,ft$$

$$R_{Tup\_A} := \left[p_w \cdot \left(h_{wall}\right)\right] \cdot tribA + R_{Trf\_A}$$

$R_{Tup\_A} = 8.11 \cdot kip$

Reaction B

$$tribB := \frac{35ft}{2} = 17.5\,ft$$

$$R_{Tup\_B} := \left[p_w \cdot \left(h_{wall}\right)\right] \cdot tribB + R_{Trf\_B}$$

$R_{Tup\_B} = 8.11 \cdot kip$

Vertical Distribution of Seismic Forces - Upper Floor Diaphragm (Per ASCE 7-16, 12.8.3)

$V_{su} = 26.41 \cdot kip$ Total Base Shear

$$C_{vx\_up} := \frac{\left[W_{diaphragm\_flr} \cdot \frac{2360}{(2360 + 2379)} + \left(W_{walls\_L} \cdot \frac{1}{3} + W_{walls\_T} \cdot \frac{1}{3}\right)\right]}{\left(W_{diaphragm} + W_{walls\_L} + W_{walls\_T}\right)} = 0.372$$

$V_{up} := V_{su} \cdot C_{vx\_up}$ Distributed Shear to Upper Floor

$V_{up} = 9.82 \cdot kip$

Seismic Lateral Forces - Upper Floor

Longitudinal

Reaction 1

$$R_{Lup\_1\_EL} := \frac{1}{2} \cdot V_{up} + R_{Lrf\_1\_EL} + \frac{R_{Lrf\_2\_EL}}{2}$$

$R_{Lup\_1\_EL} = 7.89 \cdot kip$

Reaction 2

$$R_{Lup\_2\_EL} := \frac{1}{2} \cdot V_{up} + \frac{R_{Lrf\_2\_EL}}{2}$$

$R_{Lup\_2\_EL} = 6.27 \cdot kip$

Transverse

Reaction A

$$R_{Tup\_A\_EL} := \frac{1}{2} \cdot V_{up} + R_{Trf\_A\_EL}$$

$R_{Tup\_A\_EL} = 7.08 \cdot kip$

Reaction B

$$R_{Tup\_B\_EL} := \frac{1}{2} \cdot V_{up} + R_{Trf\_B\_EL}$$

$R_{Tup\_B\_EL} = 7.08 \cdot kip$

Wall Line Wind Force Reactions - Main Floor

$h_{wall} = 10\,ft$ Average Wall Height

$p_w = 32.9 \cdot psf$ Design Wall Wind Pressure (ref. Wind Loading)

Longitudinal Wall Line Reactions (Ref. Shear Wall Diagram)

Reaction 1

$$trib1 := \frac{70ft}{2} = 35\,ft$$

$$R_{Lmain\_1} := \left[p_w \cdot \left(\frac{h_{wall}}{2}\right)\right] \cdot trib1 + R_{Lup\_1}$$

$R_{Lmain\_1} = 20.85 \cdot kip$

Reaction 2

$$trib2 := \frac{70ft}{2} = 35\,ft$$

$$R_{Lmain\_2} := \left[p_w \cdot \left(\frac{h_{wall}}{2}\right)\right] \cdot trib2 + R_{Lup\_2}$$

$R_{Lmain\_2} = 18.66 \cdot kip$

Transverse Wall Line Reactions (Ref. Shear Wall Diagram)

Reaction A

$$tribA := \frac{35ft}{2} = 17.5\,ft$$

$$R_{Tmain\_A} := \left[p_w \cdot \left(\frac{h_{wall}}{2}\right)\right] \cdot tribA + R_{Tup\_A}$$

$R_{Tmain\_A} = 10.99 \cdot kip$

Reaction B

$$tribB := \frac{35ft}{2} = 17.5\,ft$$

$$R_{Tmain\_B} := \left[p_w \cdot \left(\frac{h_{wall}}{2}\right)\right] \cdot tribB + R_{Tup\_B}$$

$R_{Tmain\_B} = 10.99 \cdot kip$

Vertical Distribution of Seismic Forces - Upper Floor Diaphragm (Per ASCE 7-16, 12.8.3)

$V_{su} = 26.41 \cdot kip$ Total Base Shear

$$C_{vx\_main} := \frac{\left[W_{diaphragm\_flr} \cdot \frac{2379}{(2360 + 2379)} + \left(W_{walls\_L} \cdot \frac{1}{3} + W_{walls\_T} \cdot \frac{1}{3}\right)\right]}{\left(W_{diaphragm} + W_{walls\_L} + W_{walls\_T}\right)} = 0.373$$

$V_{main} := V_{su} \cdot C_{vx\_main}$ Distributed Shear to Upper Floor $V_{main} = 9.86 \cdot kip$

Seismic Lateral Forces - Upper Floor

Longitudinal

Reaction 1

$$R_{Lmain\_1\_EL} := \frac{1}{2} \cdot V_{main} + R_{Lup\_1\_EL}$$ $R_{Lmain\_1\_EL} = 12.83 \cdot kip$

Reaction 2

$$R_{Lmain\_2\_EL} := \frac{1}{2} \cdot V_{main} + R_{Lup\_2\_EL}$$ $R_{Lmain\_2\_EL} = 11.2 \cdot kip$

Transverse

Reaction A

$$R_{Tmain\_A\_EL} := \frac{1}{2} \cdot V_{main} + R_{Tup\_A\_EL}$$ $R_{Tmain\_A\_EL} = 12.01 \cdot kip$

Reaction B

$$R_{Tmain\_B\_EL} := \frac{1}{2} \cdot V_{main} + R_{Tup\_B\_EL}$$ $R_{Tmain\_B\_EL} = 12.01 \cdot kip$

Lateral Summary

Diaphragm Check

Diaphragm Check (ref. ANSI/AF&PA SDPWS-2015)

Aspect Ratio

$L_T := 35ft$ $L_L := 70ft$ Length & width of diaphragm

$check_D := if\left(\frac{L_L}{L_T} > 4, "NG", "OK"\right)$ $ratio := \frac{L_L}{L_T} = 2$ $check_D = "OK"$

Diaphragm Shear

Shear capacities for 15/32" APA Rated OSB/Plywood Sheathing - Un-Blocked (ref. table 4.2A):

$\Omega_D := 2.0$ ASD reduction factor

$v_{w6\_ub} := 475plf \div \Omega_D = 238 \cdot plf$ Allowable Wind Shear Capacity- 8d's @ 6" oc

$v_{s6\_ub} := 340plf \div \Omega_D = 170 \cdot plf$ Allowable Seismic Shear Capacity- 8d's @ 6" oc

Diaphragm

$L_T = 35\,ft$ Diaphragm length in transverse direction

$V_{diaphT} := R_{Tup\_B\_EL} \cdot 0.7 = 5 \cdot kip$ Diaphragm shear transverse direction

$L_L = 70\,ft$ Diaphragm length in longitudinal direction

$V_{diaphL} := R_{Lup\_2} \cdot 0.6 = 7.7 \cdot kip$ Diaphragm shear longitudinal direction

Transverse Shear

$v_T := \frac{V_{diaphT}}{L_L}$ Diaphragm shear

6" Nailing

$v := v_T = 71 \cdot plf$

$Check := if\left(v \le v_{s6\_ub}, "OK", "NG!!"\right)$ $Check = "OK"$ Use 6" nailing everywhere

Longitudinal Shear

$v_T := \frac{V_{diaphL}}{L_T}$ Diaphragm shear

6" Nailing

$v := v_T = 221 \cdot plf$

$Check := if\left(v \le v_{w6\_ub}, "OK", "NG!!"\right)$ $Check = "OK"$ Use 6" nailing everywhere

Use 15/32 APA Shtg w/ 10d nails @ 6"o.c. @ panel edges,
12" o.c. @ interior supports.

Chord Check (ref. ANSI/AF&PA SDPWS-2015)

Longitudinal

$V_{astot} := (R_{Lup\_1} + R_{Lup\_2}) \cdot 0.6 = 16.8 \cdot kip$ Distributed Shear in Diaphragm

$w_a := L_L = 70\,ft$ Width of Diaphragm

$d_a := L_T = 35\,ft$ Depth of Diaphragm

$$T_{chord} := \frac{V_{astot}}{w_a \cdot d_a \cdot 2} \cdot \frac{w_a^2}{4} = 4.2 \cdot kip$$ Tension in chord

Chord Splice Check

$C_D := 1.6$

$sp_n := 4in$ nail spacing $n_{row} := 2$ rows of nailing $L_{splice} := 4ft$ length of splice

$Z_n := 141lbf \cdot C_D = 225.6\,lbf$ allowable nail shear

$$Check_a := if\left(T_{chord} > Z_n \cdot n_{row} \cdot \frac{L_{splice}}{sp_n}, "NG", "OK"\right) \quad ratio_a := \frac{T_{chord}}{Z_n \cdot n_{row} \cdot \frac{L_{splice}}{sp_n}} = 0.78 \quad Check_a = "OK"$$

Use 4'-0" long splice w/ (2) rows of 16d nails @ 4" o.c.

Transverse

$V_{astot} := (R_{Tup\_A\_EL} + R_{Tup\_A\_EL}) \cdot 0.7 = 9.91 \cdot kip$ Distributed Shear in Diaphragm

$w_a := L_T = 35\,ft$ Width of Diaphragm

$d_a := L_L = 70\,ft$ Depth of Diaphragm

$$T_{chord} := \frac{V_{astot}}{w_a \cdot d_a \cdot 2} \cdot \frac{w_a^2}{4} = 0.62 \cdot kip$$ Tension in chord

Chord Splice Check

$C_D := 1.6$

$sp_n := 6in$ nail spacing $n_{row} := 2$ rows of nailing $L_{splice} := 4ft$ length of splice

$Z_n := 141lbf \cdot C_D = 225.6\,lbf$ allowable nail shear

$$Check_a := if\left(T_{chord} > Z_n \cdot n_{row} \cdot \frac{L_{splice}}{sp_n}, "NG", "OK"\right) \quad ratio_a := \frac{T_{chord}}{Z_n \cdot n_{row} \cdot \frac{L_{splice}}{sp_n}} = 0.17 \quad Check_a = "OK"$$

Use 4'-0" long splice w/ (2) rows of 16d nails @ 6" o.c.

Diaphragm Check

Upper Floor Shear Walls

Shear Wall Check - Upper Floor to Roof (ref. ANSI/AF&PA SDPWS-2015)

SW1 SEISMIC IN - PLANE SHEAR

$h_t := 9 \cdot ft$ Wall height

$L_s := 28ft$ Total shear wall length

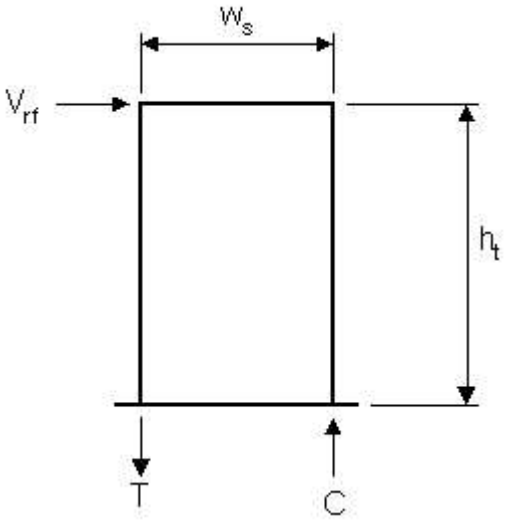
$DL_{rf} = 15 \cdot psf$ Dead load of roof

$R := R_{Lrf\_1\_EL} = 1.63 \cdot kip$ Reaction at wall line

$w_{rf} := \frac{2ft}{2}$ Tributary width of roof on wall

$p_{ext\_w} = 10 \cdot psf$ Dead load of exterior walls

$w_s := 28ft$ Shear wall length



Aspect Ratio (Blocked Shear Wall)

$\frac{h_t}{w_s} = 0.32$

$check_{ratio} := if\left(\frac{h_t}{w_s} > 3.5, "NG", "OK"\right)$

$check_{ratio} = "OK"$

$(WSP) := if\left(\frac{h_t}{w_s} < 2.0, 1.0, 1.25 - 0.125 \cdot \frac{h_t}{w_s}\right)$ Aspect ratio factor

$(WSP) = 1.0$

Overturning Forces

$V_{rf} := \left(R \cdot \frac{w_s}{L_s}\right) 0.7$ Shear load at top of wall (ASD)

$V_{rf} = 1.14 \cdot kip$

$M_{ot} := V_{rf} \cdot h_t$ Overturning moment (ASD)

$M_{ot} = 10.3 \cdot kip \cdot ft$

Resisting Forces

$P_{rf} := DL_{rf} \cdot w_{rf} \cdot (w_s)$ Roof load

$P_{rf} = 0.42 \cdot kip$

$P_w := p_{ext\_w} \cdot (h_t) \cdot (w_s)$ Wall load

$P_w = 2.52 \cdot kip$

$M_{res} := \left[\left(P_{rf} + P_w\right) \cdot \frac{w_s}{2}\right] \cdot 0.6$ Resisting moment (ASD)

$M_{res} = 24.7 \cdot kip \cdot ft$

Plywood Shear (ref. ANSI/AF&PA SDPWS)

$\Omega_s := 2.0$ (ref. section 4.3.3) $n := 1$ sides

$w_v := \frac{V_{rf}}{w_s} = 41 \cdot plf$

$w_{all} := \frac{(WSP) \cdot v_{s6} \cdot n}{\Omega_s} = 240 \cdot plf$ $check_{wv} := if\left(\frac{w_v}{w_{all}} > 1.0, "NG", "OK"\right)$ $check_{wv} = "OK"$

Single Sided 7/16" sheathing w/ 8d @ **6" O.C.** Panel Edges @ 12" O.C.
Interior Supports (ref. table 4.3A)

Bottom Plate Nailing $C_D := 1.6$

$t_{sp} := 1.5in$ Bottom plate thickness $dia_a := 16d$ Fastener Type/Size $sp_a := 6in$ Fastener spacing

$Z_{ll} := v_n \cdot C_D = 0.23 \cdot kip$ Allowable load parallel to grain (ref. NDS table 12)

$V_{sp} := w_v \cdot sp_a = 0.02 \cdot kip$ Shear load to each anchor

$Check_a := if\left(V_{sp} > Z_{ll}, "NG", "OK"\right)$ $ratio_a := \frac{V_{sp}}{Z_{ll}} = 0.09$ $Check_a = "OK"$

Use 16d Nail at 6"o.c. Staggered

Holdown

$T := \frac{M_{ot} - M_{res}}{w_s} = -0.52 \cdot kip$ $check_T := if(T > 150lbf, "HD REQ'D", "NOT REQ'D")$ $check_T = "NOT REQ'D"$

SW2 SEISMIC IN - PLANE SHEAR

$h_t := 9 \cdot ft$ Wall height

$L_s := 4.42ft$ Total shear wall length

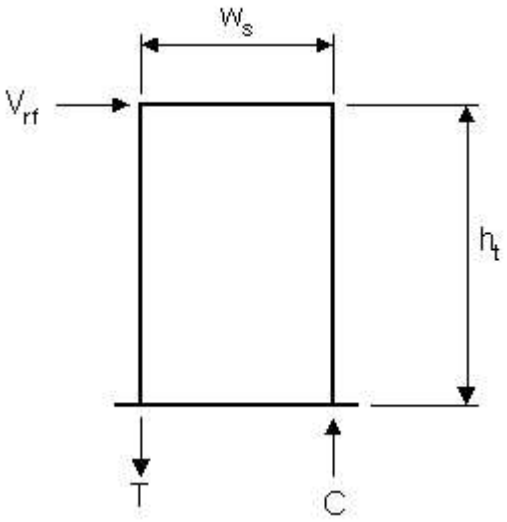
$DL_{rf} = 15 \cdot psf$ Dead load of roof

$R := R_{Lrf\_2\_EL} = 2.71 \cdot kip$ Reaction at wall line

$w_{rf} := \frac{4ft}{2}$ Tributary width of roof on wall

$p_{ext\_w} = 10 \cdot psf$ Dead load of exterior walls

$w_s := 4.42ft$ Shear wall length



Aspect Ratio (Blocked Shear Wall)

$\frac{h_t}{w_s} = 2.04$

$check_{ratio} := if\left(\frac{h_t}{w_s} > 3.5, "NG", "OK"\right)$

$check_{ratio} = "OK"$

$(WSP) := if\left(\frac{h_t}{w_s} < 2.0, 1.0, 1.25 - 0.125 \cdot \frac{h_t}{w_s}\right)$ Aspect ratio factor

$(WSP) = 1.0$

Overturning Forces

$V_{rf} := \left(R \cdot \frac{w_s}{L_s}\right) 0.7$ Shear load at top of wall (ASD)

$V_{rf} = 1.9 \cdot kip$

$M_{ot} := V_{rf} \cdot h_t$ Overturning moment (ASD)

$M_{ot} = 17.1 \cdot kip \cdot ft$

Resisting Forces

$P_{rf} := DL_{rf} \cdot w_{rf} \cdot (w_s)$ Roof load

$P_{rf} = 0.13 \cdot kip$

$P_w := p_{ext\_w} \cdot (h_t) \cdot (w_s)$ Wall load

$P_w = 0.4 \cdot kip$

$M_{res} := \left[\left(P_{rf} + P_w\right) \cdot \frac{w_s}{2}\right] \cdot 0.6$ Resisting moment (ASD)

$M_{res} = 0.7 \cdot kip \cdot ft$

Plywood Shear (ref. ANSI/AF&PA SDPWS)

$\Omega_s := 2.0$ (ref. section 4.3.3) $n := 1$ sides

$w_v := \frac{V_{rf}}{w_s} = 429 \cdot plf$

$w_{all} := \frac{(WSP) \cdot v_{s2} \cdot n}{\Omega_s} = 582.4 \cdot plf$ $check_{wv} := if\left(\frac{w_v}{w_{all}} > 1.0, "NG", "OK"\right)$ $check_{wv} = "OK"$

Single Sided 7/16" sheathing w/ 8d @ **2" O.C.** Panel Edges @ 12" O.C.
Interior Supports (ref. table 4.3A)

Bottom Plate Nailing $C_D := 1.6$

$t_{sp} := 1.5in$ Bottom plate thickness $dia_a := 16d$ Fastener Type/Size $sp_a := 3in$ Fastener spacing

$Z_{ll} := v_n \cdot C_D = 0.23 \cdot kip$ Allowable load parallel to grain (ref. NDS table 12)

$V_{sp} := w_v \cdot sp_a = 0.107 \cdot kip$ Shear load to each anchor

$Check_a := if\left(V_{sp} > Z_{ll}, "NG", "OK"\right)$ $ratio_a := \frac{V_{sp}}{Z_{ll}} = 0.48$ $Check_a = "OK"$

Use 16d Nail at 3"o.c. Staggered

Holdown

$T := \frac{M_{ot} - M_{res}}{w_s} = 3.71 \cdot kip$ $check_T := if(T > 150lbf, "HD REQ'D", "NOT REQ'D")$ $check_T = "HD REQ'D"$

$T_{all} := MST60 = 6.235 \cdot kip$ Allowable tension load (Simpson **MST60**)

$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right)$ $ratio := \frac{T}{T_{all}} = 0.59$ $check_{HD} = "OK"$

Use Simpson MST60 w/ (46) 16d Nails into (2) 2x min Post Stitch Nailed

SWA SEISMIC IN - PLANE SHEAR

$h_t := 9 \cdot ft$ Wall height

$L_s := 3.83ft + 5.83ft + 3ft$ Total shear wall length

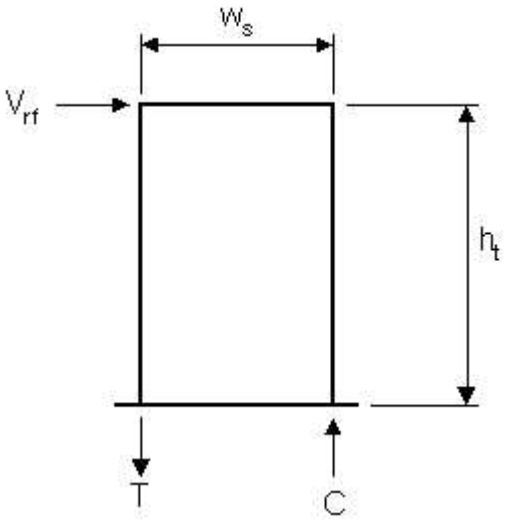
$DL_{rf} = 15 \cdot psf$ Dead load of roof

$R := R_{Trf\_A\_EL} = 2.17 \cdot kip$ Reaction at wall line

$w_{rf} := \frac{13ft}{2} + 4ft$ Tributary width of roof on wall

$p_{ext\_w} = 10 \cdot psf$ Dead load of exterior walls

$w_s := 3ft$ Shear wall length



Aspect Ratio (Blocked Shear Wall)

$\frac{h_t}{w_s} = 3$

$check_{ratio} := if\left(\frac{h_t}{w_s} > 3.5, "NG", "OK"\right)$

$check_{ratio} = "OK"$

$(WSP) := if\left(\frac{h_t}{w_s} < 2.0, 1.0, 1.25 - 0.125 \cdot \frac{h_t}{w_s}\right)$ Aspect ratio factor

$(WSP) = 0.9$

Overturning Forces

$V_{rf} := \left(R \cdot \frac{w_s}{L_s}\right) 0.7$ Shear load at top of wall (ASD)

$V_{rf} = 0.36 \cdot kip$

$M_{ot} := V_{rf} \cdot h_t$ Overturning moment (ASD)

$M_{ot} = 3.2 \cdot kip \cdot ft$

Resisting Forces

$P_{rf} := DL_{rf} \cdot w_{rf} \cdot (w_s)$ Roof load

$P_{rf} = 0.47 \cdot kip$

$P_w := p_{ext\_w} \cdot (h_t) \cdot (w_s)$ Wall load

$P_w = 0.27 \cdot kip$

$M_{res} := \left[\left(P_{rf} + P_w\right) \cdot \frac{w_s}{2}\right] \cdot 0.6$ Resisting moment (ASD)

$M_{res} = 0.67 \cdot kip \cdot ft$

Plywood Shear (ref. ANSI/AF&PA SDPWS)

$\Omega_s := 2.0$ (ref. section 4.3.3) $n := 1$ sides

$$w_v := \frac{V_{rf}}{w_s} = 120 \cdot plf$$

$$w_{all} := \frac{(WSP) \cdot v_{s6} \cdot n}{\Omega_s} = 210 \cdot plf \qquad check_{wv} := if\left(\frac{w_v}{w_{all}} > 1.0, "NG", "OK"\right)$$

$check_{wv} = "OK"$

Single Sided 7/16" sheathing w/ 8d @ **6" O.C.** Panel Edges @ 12" O.C.
Interior Supports (ref. table 4.3A)

Bottom Plate Nailing $C_D := 1.6$

$t_{sp} := 1.5in$ Bottom plate thickness $dia_a := 16d$ Fastener Type/Size $sp_a := 6in$ Fastener spacing

$Z_{ll} := v_n \cdot C_D = 0.23 \cdot kip$ Allowable load parallel to grain (ref. NDS table 12)

$V_{sp} := w_v \cdot sp_a = 0.06 \cdot kip$ Shear load to each anchor

$Check_a := if(V_{sp} > Z_{ll}, "NG", "OK")$ $ratio_a := \frac{V_{sp}}{Z_{ll}} = 0.27$ $Check_a = "OK"$

Use 16d Nail at 6"o.c. Staggered

Holdown

$$T := \frac{M_{ot} - M_{res}}{w_s} = 0.86 \cdot kip \qquad check_T := if(T > 150lbf, "HD REQ'D", "NOT REQ'D")$$

$check_T = "HD REQ'D"$

$T_{all} := MST37 = 2.705 \cdot kip$ Allowable tension load (Simpson **MST37**)

$$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right) \qquad ratio := \frac{T}{T_{all}} = 0.32$$

$check_{HD} = "OK"$

Use Simpson MST37 w/ (22) 16d Nails into (2) 2x min Post Stitch Nailed

Holdown w/ Overstrength Factor $\Omega_{hd} := 2.5$

$$T := \frac{M_{ot} - M_{res}}{w_s} \cdot \Omega_{hd} = 2.14 \cdot \qquad check_T := if(T > 150lbf, "HD REQ'D", "NOT REQ'D")$$

$check_T = "HD REQ'D"$

$T_{all} := MSTC48B3 = 3.975 \cdot kip$ Allowable tension load (Simpson **MSTC48B3**)

$$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right) \qquad ratio := \frac{T}{T_{all}} = 0.54$$

$check_{HD} = "OK"$

Use Simpson MSTC48B3 w/ (14) 10d to face of beam, (4) 10d to bottom of beam,
& (38) into (2) 2x min post stitch nailed

SWB SEISMIC IN - PLANE SHEAR

$h_t := 9 \cdot ft$ Wall height

$L_s := 4ft + 12.83ft$ Total shear wall length

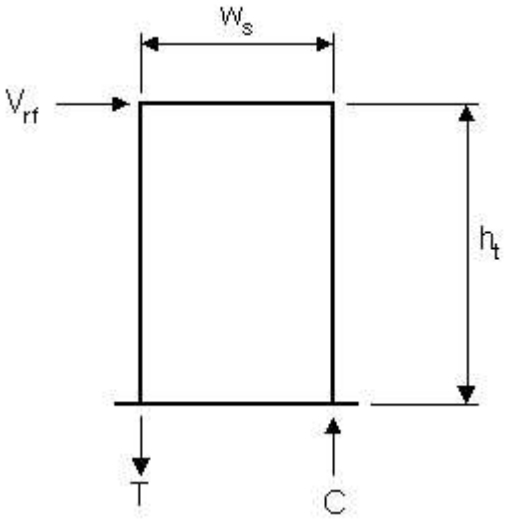
$DL_{rf} = 15 \cdot psf$ Dead load of roof

$R := R_{Trf\_B\_EL} = 2.17 \cdot kip$ Reaction at wall line

$w_{rf} := \frac{13ft}{2}$ Tributary width of roof on wall

$p_{ext\_w} = 10 \cdot psf$ Dead load of exterior walls

$w_s := 4ft$ Shear wall length



Aspect Ratio (Blocked Shear Wall)

$\frac{h_t}{w_s} = 2.25$

$check_{ratio} := if\left(\frac{h_t}{w_s} > 3.5, "NG", "OK"\right)$

$check_{ratio} = "OK"$

$(WSP) := if\left(\frac{h_t}{w_s} < 2.0, 1.0, 1.25 - 0.125 \cdot \frac{h_t}{w_s}\right)$ Aspect ratio factor

$(WSP) = 1.0$

Overturning Forces

$V_{rf} := \left(R \cdot \frac{w_s}{L_s}\right) 0.7$ Shear load at top of wall (ASD)

$V_{rf} = 0.36 \cdot kip$

$M_{ot} := V_{rf} \cdot h_t$ Overturning moment (ASD)

$M_{ot} = 3.2 \cdot kip \cdot ft$

Resisting Forces

$P_{rf} := DL_{rf} \cdot w_{rf} \cdot (w_s)$ Roof load

$P_{rf} = 0.39 \cdot kip$

$P_w := p_{ext\_w} \cdot (h_t) \cdot (w_s)$ Wall load

$P_w = 0.36 \cdot kip$

$M_{res} := \left[\left(P_{rf} + P_w\right) \cdot \frac{w_s}{2}\right] \cdot 0.6$ Resisting moment (ASD)

$M_{res} = 0.9 \cdot kip \cdot ft$

Plywood Shear (ref. ANSI/AF&PA SDPWS)

$\Omega_s := 2.0$ (ref. section 4.3.3) $n := 1$ sides

$$w_v := \frac{V_{rf}}{w_s} = 90 \cdot plf$$

$$w_{all} := \frac{(WSP) \cdot v_{s6} \cdot n}{\Omega_s} = 232.5 \cdot plf \qquad check_{wv} := if\left(\frac{w_v}{w_{all}} > 1.0, "NG", "OK"\right)$$

$check_{wv} = "OK"$

Single Sided 7/16" sheathing w/ 10d @ **6" O.C.** Panel Edges @ 12" O.C.
Interior Supports (ref. table 4.3A)

Bottom Plate Nailing $C_D := 1.6$

$t_{sp} := 1.5in$ Bottom plate thickness $dia_a := 16d$ Fastener Type/Size $sp_a := 6in$ Fastener spacing

$Z_{ll} := v_n \cdot C_D = 0.23 \cdot kip$ Allowable load parallel to grain (ref. NDS table 12)

$V_{sp} := w_v \cdot sp_a = 0.045 \cdot kip$ Shear load to each anchor

$Check_a := if(V_{sp} > Z_{ll}, "NG", "OK")$ $ratio_a := \frac{V_{sp}}{Z_{ll}} = 0.2$ $Check_a = "OK"$

Use 16d Nail at 6"o.c. Staggered

Holdown

$$T := \frac{M_{ot} - M_{res}}{w_s} = 0.59 \cdot kip \qquad check_T := if(T > 150lbf, "HD REQ'D", "NOT REQ'D")$$

$check_T = "HD REQ'D"$

$T_{all} := MST37 = 2.705 \cdot kip$ Allowable tension load (Simpson **MST37**)

$$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right) \qquad ratio := \frac{T}{T_{all}} = 0.22$$

$check_{HD} = "OK"$

Use Simpson MST37 w/ (22) 16d Nails into (2) 2x min Post Stitch Nailed

Holdown w/ Overstrength Factor $\Omega_{hd} := 2.5$

$$T := \frac{M_{ot} - M_{res}}{w_s} \cdot \Omega_{hd} = 1.47 \cdot \qquad check_T := if(T > 150lbf, "HD REQ'D", "NOT REQ'D")$$

$check_T = "HD REQ'D"$

$T_{all} := MSTC48B3 = 3.975 \cdot kip$ Allowable tension load (Simpson **MSTC48B3**)

$$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right) \qquad ratio := \frac{T}{T_{all}} = 0.37$$

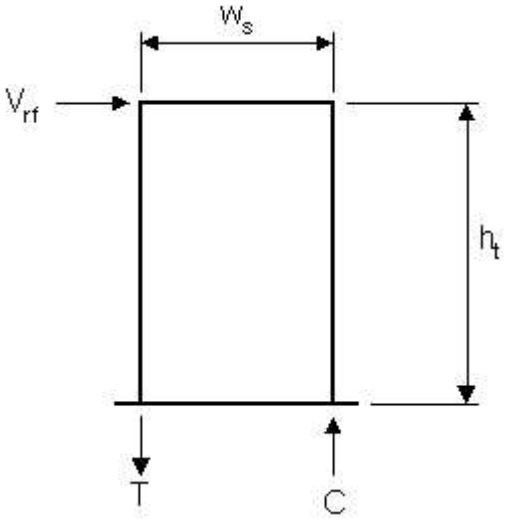
$check_{HD} = "OK"$

Use Simpson MSTC48B3 w/ (14) 10d to face of beam, (4) 10d to bottom of beam,
& (38) into (2) 2x min post stitch nailed

Main Floor Shear Walls

Shear Wall Check - Main to Upper Floor (ref. ANSI/AF&PA SDPWS-2015)

SW1 IN - PLANE SHEAR



$h_t := 9 \cdot ft$ Wall height

$L_s := 28.5ft$ Total shear wall length

$DL_{rf} = 15 \cdot psf$ Dead load of roof

$R := R_{Lup\_1} = 15.09 \cdot kip$ Reaction at wall line

$w_{rf} := \frac{2ft + 1.33ft}{2}$ Tributary width of framing on wall

$p_{ext\_w} = 10 \cdot psf$ Dead load of exterior walls

$w_s := 28.5ft$ Shear wall length

Aspect Ratio (Blocked Shear Wall)

$\frac{h_t}{w_s} = 0.32$

$check_{ratio} := if\left(\frac{h_t}{w_s} > 3.5, "NG", "OK"\right)$

$check_{ratio} = "OK"$

$(WSP) := if\left(\frac{h_t}{w_s} < 2.0, 1.0, 1.25 - 0.125 \cdot \frac{h_t}{w_s}\right)$ Aspect ratio factor

$(WSP) = 1.0$

Overturning Forces

$V_{rf} := \left(R \cdot \frac{w_s}{L_s}\right) 0.6$ Shear load at top of wall (ASD)

$V_{rf} = 9.06 \cdot kip$

$M_{ot} := V_{rf} \cdot h_t$ Overturning moment (ASD)

$M_{ot} = 81.5 \cdot kip \cdot ft$

Resisting Forces

$P_{rf} := (DL_{rf}) \cdot w_{rf} \cdot (w_s)$ Roof load

$P_{rf} = 0.71 \cdot kip$

$P_w := p_{ext\_w} \cdot (2h_t) \cdot (w_s)$ Wall load

$P_w = 5.13 \cdot kip$

$M_{res} := \left[(P_{rf} + P_w) \cdot \frac{w_s}{2}\right] \cdot 0.6$ Resisting moment (ASD)

$M_{res} = 49.95 \cdot kip \cdot ft$

Plywood Shear (ref. ANSI/AF&PA SDPWS)

$\Omega_s := 2.0$ (ref. section 4.3.3) $n := 1$ sides

$w_v := \frac{V_{rf}}{w_s} = 318 \cdot plf$

$w_{all} := \frac{(WSP) \cdot v_{w6} \cdot n}{\Omega_s} = 335 \cdot plf$ $check_{wv} := if\left(\frac{w_v}{w_{all}} > 1.0, "NG", "OK"\right)$ $check_{wv} = "OK"$

Single Sided 7/16" sheathing w/ 8d @ **6" O.C.** Panel Edges @ 12" O.C.
Interior Supports (ref. table 4.3A)

Bottom Plate Nailing

$C_D := 1.6$

$t_{sp} := 1.5in$ Sill plate thickness $dia_a := 16d$ Nail Size $sp_a := 6in$ Nail spacing

$Z_{ll} := v_n \cdot C_D = 0.23 \cdot kip$ Allowable load parallel to grain (ref. NDS table 12)

$V_{sp} := w_v \cdot sp_a = 0.159 \cdot kip$ Shear load to each nail

$Check_a := if\left(V_{sp} > Z_{ll}, "NG", "OK"\right)$ $ratio_a := \frac{V_{sp}}{Z_{ll}} = 0.7$ $Check_a = "OK"$

Use 16d Nail at 6"o.c. Staggered

Holdown

$T := \frac{M_{ot} - M_{res}}{w_s} = 1.11 \cdot kip$ $check_T := if(T > 200lbf, "HD REQ'D", "NOT REQ'D")$ $check_T = "HD REQ'D"$

$T_{all} := MST37 = 2.705 \cdot kip$ Allowable tension load (Simpson **MST37**)

$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right)$ $ratio := \frac{T}{T_{all}} = 0.41$ $check_{HD} = "OK"$

Use Simpson MST37 w/ (22) 16d Nails into (2) 2x min Post Stitch Nailed

SW2 IN - PLANE SHEAR

$h_t := 9 \cdot ft$ Wall height

$L_s := 3.67ft + 6ft + 6.5ft$ Total shear wall length

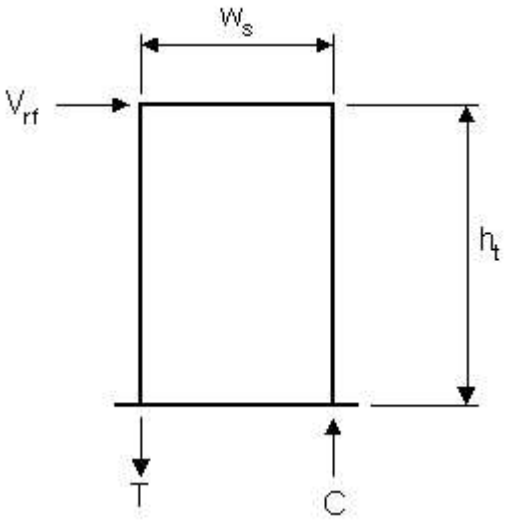
$DL_{rf} = 15 \cdot psf$ Dead load of roof

$R := R_{Lup\_2} = 12.90 \cdot kip$ Reaction at wall line

$w_{rf} := \frac{2ft + 1.33ft}{2}$ Tributary width of framing on wall

$p_{ext\_w} = 10 \cdot psf$ Dead load of exterior walls

$w_s := 3.67ft$ Shear wall length



Aspect Ratio (Blocked Shear Wall)

$\frac{h_t}{w_s} = 2.45$

$check_{ratio} := if\left(\frac{h_t}{w_s} > 3.5, "NG", "OK"\right)$ $check_{ratio} = "OK"$

$(WSP) := if\left(\frac{h_t}{w_s} < 2.0, 1.0, 1.25 - 0.125 \cdot \frac{h_t}{w_s}\right)$ Aspect ratio factor $(WSP) = 0.9$

Overturning Forces

$V_{rf} := \left(R \cdot \frac{w_s}{L_s}\right) 0.6$ Shear load at top of wall (ASD) $V_{rf} = 1.76 \cdot kip$

$M_{ot} := V_{rf} \cdot h_t$ Overturning moment (ASD) $M_{ot} = 15.8 \cdot kip \cdot ft$

Resisting Forces

$P_{rf} := (DL_{rf}) \cdot w_{rf} \cdot (w_s)$ Roof load $P_{rf} = 0.09 \cdot kip$

$P_w := p_{ext\_w} \cdot (h_t) \cdot (w_s)$ Wall load $P_w = 0.33 \cdot kip$

$M_{res} := \left[\left(P_{rf} + P_w\right) \cdot \frac{w_s}{2}\right] \cdot 0.6$ Resisting moment (ASD) $M_{res} = 0.46 \cdot kip \cdot ft$

Plywood Shear (ref. ANSI/AF&PA SDPWS)

$\Omega_s := 2.0$ (ref. section 4.3.3) $n := 1$ sides

$w_v := \frac{V_{rf}}{w_s} = 479 \cdot plf$

$w_{all} := \frac{(WSP) \cdot v_{w3} \cdot n}{\Omega_s} = 594.4 \cdot plf$ $check_{wv} := if\left(\frac{w_v}{w_{all}} > 1.0, "NG", "OK"\right)$ $check_{wv} = "OK"$

Single Sided 7/16" sheathing w/ 8d @ **3" O.C.** Panel Edges @ 12" O.C.
Interior Supports (ref. table 4.3A)

Bottom Plate Nailing

$C_D := 1.6$

$t_{sp} := 1.5in$ Sill plate thickness $dia_a := 16d$ Nail Size $sp_a := 3in$ Nail spacing

$Z_{ll} := v_n \cdot C_D = 0.23 \cdot kip$ Allowable load parallel to grain (ref. NDS table 12)

$V_{sp} := w_v \cdot sp_a = 0.12 \cdot kip$ Shear load to each nail

$Check_a := if\left(V_{sp} > Z_{ll}, "NG", "OK"\right)$ $ratio_a := \frac{V_{sp}}{Z_{ll}} = 0.53$ $Check_a = "OK"$

Use 16d Nail at 3"o.c. Staggered

Holdown w/ Overstrength Factor

$\Omega_{hd} := 2.5$

$T := \frac{M_{ot} - M_{res}}{w_s} \cdot \Omega_{hd} = 10.46 \cdot kip$ $check_T := if(T > 150lbf, "HD REQ'D", "NOT REQ'D")$ $check_T = "HD REQ'D"$

$T_{all} := HDU14 = 14.445 \cdot kip$ Allowable tension load (Simpson **HDU14**)

$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right)$ $ratio := \frac{T}{T_{all}} = 0.72$ $check_{HD} = "OK"$

Use Simpson HDU14 to 6x6 post w/ SDS screws & 6x10 beam w/ 1" dia. thru-bolt

SWA SEISMIC IN - PLANE SHEAR

$h_t := 8 \cdot ft$ Wall height

$L_s := 3.75ft \cdot 2 + 7.75ft$ Total shear wall length

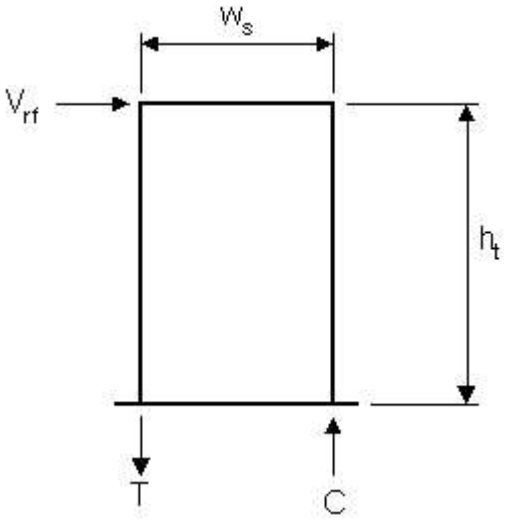
$DL_{rf} = 15 \cdot psf$ Dead load of roof

$R := R_{Tup\_A\_EL} = 7.08 \cdot kip$ Reaction at wall line

$w_{rf} := \frac{13ft + 13ft}{2} + 4ft \cdot 2$ Tributary width of framing on wall

$p_{ext\_w} = 10 \cdot psf$ Dead load of exterior walls

$w_s := 3.75ft$ Shear wall length



Aspect Ratio (Blocked Shear Wall)

$\frac{h_t}{w_s} = 2.13$

$check_{ratio} := if\left(\frac{h_t}{w_s} > 3.5, "NG", "OK"\right)$

$check_{ratio} = "OK"$

$(WSP) := if\left(\frac{h_t}{w_s} < 2.0, 1.0, 1.25 - 0.125 \cdot \frac{h_t}{w_s}\right)$ Aspect ratio factor

$(WSP) = 1.0$

Overturning Forces

$V_{rf} := \left(R \cdot \frac{w_s}{L_s}\right) 0.7$ Shear load at top of wall (ASD)

$V_{rf} = 1.22 \cdot kip$

$M_{ot} := V_{rf} \cdot h_t$ Overturning moment (ASD)

$M_{ot} = 9.8 \cdot kip \cdot ft$

Resisting Forces

$P_{rf} := (DL_{rf}) \cdot w_{rf} \cdot (w_s + 4ft)$ Roof load

$P_{rf} = 2.44 \cdot kip$

$P_w := p_{ext\_w} \cdot (2h_t) \cdot (w_s)$ Wall load

$P_w = 0.6 \cdot kip$

$M_{res} := \left[(P_{rf} + P_w) \cdot \frac{w_s}{2}\right] \cdot 0.6$ Resisting moment (ASD)

$M_{res} = 3.42 \cdot kip \cdot ft$

Plywood Shear (ref. ANSI/AF&PA SDPWS)

$\Omega_s := 2.0$ (ref. section 4.3.3) $n := 1$ sides

$$w_v := \frac{V_{rf}}{w_s} = 325 \cdot plf$$

$$w_{all} := \frac{(WSP) \cdot v_{s3} \cdot n}{\Omega_s} = 442.5 \cdot plf \qquad check_{wv} := if\left(\frac{w_v}{w_{all}} > 1.0, "NG", "OK"\right)$$

$check_{wv} = "OK"$

Single Sided 15/32" sheathing w/ 8d @ **3" O.C.** Panel Edges @ 12" O.C.
Interior Supports (ref. table 4.3A)

Bottom Plate Nailing

$C_D := 1.6$

$t_{sp} := 1.5in$ Sill plate thickness $dia_a := 16d$ Nail Size $sp_a := 4in$ Nail spacing

$Z_{ll} := v_n \cdot C_D = 0.23 \cdot kip$ Allowable load parallel to grain (ref. NDS table 12)

$V_{sp} := w_v \cdot sp_a = 0.108 \cdot kip$ Shear load to each nail

$Check_a := if\left(V_{sp} > Z_{ll}, "NG", "OK"\right)$ $ratio_a := \frac{V_{sp}}{Z_{ll}} = 0.48$

$Check_a = "OK"$

Use 16d Nail at 4"o.c. Staggered

Holdown

$$T := \frac{M_{ot} - M_{res}}{w_s} = 1.69 \cdot kip \qquad check_T := if(T > 200lbf, "HD REQ'D", "NOT REQ'D")$$

$check_T = "HD REQ'D"$

$T_{all} := MST37 = 2.705 \cdot kip$ Allowable tension load (Simpson **MST37**)

$$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right) \qquad ratio := \frac{T}{T_{all}} = 0.62$$

$check_{HD} = "OK"$

Use Simpson MST37 w/ (22) 16d Nails into (2) 2x min Post Stitch Nailed

SWB SEISMIC IN - PLANE SHEAR

$h_t := 8 \cdot ft$ Wall height

$L_s := 3.75ft + 4.5ft$ Total shear wall length

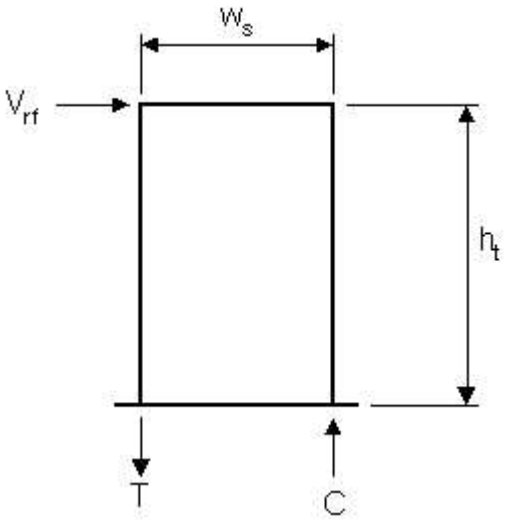
$DL_{rf} = 15 \cdot psf$ Dead load of roof

$R := R_{Tup\_B\_EL} = 7.08 \cdot kip$ Reaction at wall line

$w_{rf} := \frac{13ft + 13ft}{2}$ Tributary width of framing on wall

$p_{ext\_w} = 10 \cdot psf$ Dead load of exterior walls

$w_s := 3.75ft$ Shear wall length



Aspect Ratio (Blocked Shear Wall)

$\frac{h_t}{w_s} = 2.13$

$check_{ratio} := if\left(\frac{h_t}{w_s} > 3.5, "NG", "OK"\right)$

$check_{ratio} = "OK"$

$(WSP) := if\left(\frac{h_t}{w_s} < 2.0, 1.0, 1.25 - 0.125 \cdot \frac{h_t}{w_s}\right)$ Aspect ratio factor

$(WSP) = 1.0$

Overturning Forces

$V_{rf} := \left(R \cdot \frac{w_s}{L_s}\right) 0.7$ Shear load at top of wall (ASD)

$V_{rf} = 2.25 \cdot kip$

$M_{ot} := V_{rf} \cdot h_t$ Overturning moment (ASD)

$M_{ot} = 18 \cdot kip \cdot ft$

Resisting Forces

$P_{rf} := (DL_{rf}) \cdot w_{rf} \cdot (w_s + 4ft)$ Roof load

$P_{rf} = 1.51 \cdot kip$

$P_w := p_{ext\_w} \cdot (2h_t) \cdot (w_s)$ Wall load

$P_w = 0.6 \cdot kip$

$M_{res} := \left[(P_{rf} + P_w) \cdot \frac{w_s}{2}\right] \cdot 0.6$ Resisting moment (ASD)

$M_{res} = 2.38 \cdot kip \cdot ft$

Plywood Shear (ref. ANSI/AF&PA SDPWS)

$\Omega_s := 2.0$ (ref. section 4.3.3) $n := 2$ sides

$w_v := \frac{V_{rf}}{w_s} = 601 \cdot plf$

$w_{all} := \frac{(WSP) \cdot v_{s3} \cdot n}{\Omega_s} = 885 \cdot plf$ $check_{wv} := if\left(\frac{w_v}{w_{all}} > 1.0, "NG", "OK"\right)$ $check_{wv} = "OK"$

Double Sided 15/32" sheathing w/ 8d @ **3" O.C.** Panel Edges @ 12" O.C.
Interior Supports (ref. table 4.3A)

Bottom Plate Nailing

$C_D := 1.6$

$t_{sp} := 1.5in$ Sill plate thickness $dia_a := 16d$ Nail Size $sp_a := 3in$ Nail spacing

$Z_{ll} := v_n \cdot C_D = 0.23 \cdot kip$ Allowable load parallel to grain (ref. NDS table 12)

$V_{sp} := w_v \cdot sp_a = 0.15 \cdot kip$ Shear load to each nail

$Check_a := if\left(V_{sp} > Z_{ll}, "NG", "OK"\right)$ $ratio_a := \frac{V_{sp}}{Z_{ll}} = 0.67$ $Check_a = "OK"$

Use 16d Nail at 3"o.c. Staggered

Holdown

$T := \frac{M_{ot} - M_{res}}{w_s} = 4.17 \cdot kip$ $check_T := if(T > 200lbf, "HD REQ'D", "NOT REQ'D")$ $check_T = "HD REQ'D"$

$T_{all} := MST60 = 6.235 \cdot kip$ Allowable tension load (Simpson **MST60**)

$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right)$ $ratio := \frac{T}{T_{all}} = 0.67$ $check_{HD} = "OK"$

Use Simpson MST66 w/ (46) 16d Nails into (2) 2x min Post Stitch Nailed

Holdown w/ Overstrength Factor

$\Omega_{hd} := 2.5$

$T := \frac{M_{ot} - M_{res}}{w_s} \cdot \Omega_{hd} = 10.43$ $check_T := if(T > 150lbf, "HD REQ'D", "NOT REQ'D")$ $check_T = "HD REQ'D"$

$T_{all} := HDU14 = 14.445 \cdot kip$ Allowable tension load (Simpson **HDU14**)

$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right)$ $ratio := \frac{T}{T_{all}} = 0.72$ $check_{HD} = "OK"$

Use Simpson HDU14 to 6x6 post w/ SDS screws & 6x10 beam w/ 1" dia. thru-bolt

Shear Wall Check - Main to Upper Floor (ref. ANSI/AF&PA SDPWS-2015)

SW1 IN - PLANE SHEAR

$h_t := 9 \cdot ft$ Wall height

$L_s := 28.5ft$ Total shear wall length

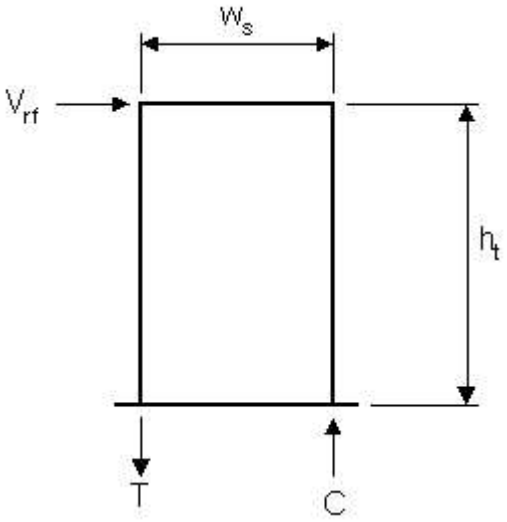
$DL_{rf} = 15 \cdot psf$ Dead load of roof

$R := R_{Lmain\_1} = 20.85 \cdot kip$ Reaction at wall line

$w_{rf} := \frac{2ft + 1.33ft + 1.33ft}{2}$ Tributary width of framing on wall

$p_{ext\_w} = 10 \cdot psf$ Dead load of exterior walls

$w_s := 28.5ft$ Shear wall length



Aspect Ratio (Blocked Shear Wall)

$\frac{h_t}{w_s} = 0.32$ $check_{ratio} := if\left(\frac{h_t}{w_s} > 3.5, "NG", "OK"\right)$ $check_{ratio} = "OK"$

$(WSP) := if\left(\frac{h_t}{w_s} < 2.0, 1.0, 1.25 - 0.125 \cdot \frac{h_t}{w_s}\right)$ Aspect ratio factor $(WSP) = 1.0$

Overturning Forces

$V_{rf} := \left(R \cdot \frac{w_s}{L_s}\right) 0.6$ Shear load at top of wall (ASD) $V_{rf} = 12.51 \cdot kip$

$M_{ot} := V_{rf} \cdot h_t$ Overturning moment (ASD) $M_{ot} = 112.6 \cdot kip \cdot ft$

Resisting Forces

$P_{rf} := (DL_{rf}) \cdot w_{rf} \cdot (w_s)$ Roof load $P_{rf} = 1 \cdot kip$

$P_w := p_{ext\_w} \cdot (2h_t) \cdot (w_s)$ Wall load $P_w = 5.13 \cdot kip$

$M_{res} := \left[(P_{rf} + P_w) \cdot \frac{w_s}{2}\right] \cdot 0.6$ Resisting moment (ASD) $M_{res} = 52.38 \cdot kip \cdot ft$

Plywood Shear (ref. ANSI/AF&PA SDPWS)

$\Omega_s := 2.0$ (ref. section 4.3.3) $n := 1$ sides

$$w_v := \frac{V_{rf}}{w_s} = 439 \cdot plf$$

$$w_{all} := \frac{(WSP) \cdot v_{w4} \cdot n}{\Omega_s} = 490 \cdot plf \qquad check_{wv} := if\left(\frac{w_v}{w_{all}} > 1.0, "NG", "OK"\right)$$

$check_{wv} = "OK"$

Single Sided 7/16" sheathing w/ 8d @ **6" O.C.** Panel Edges @ 12" O.C.
Interior Supports (ref. table 4.3A)

Holdown

$$T := \frac{M_{ot} - M_{res}}{w_s} = 2.11 \cdot kip \qquad check_T := if(T > 150lbf, "HD REQ'D", "NOT REQ'D")$$

$check_T = "HD REQ'D"$

$T_{all} := DTT2Z = 2.145 \cdot kip$ Allowable tension load (Simpson **DTT2Z**)

$$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right) \qquad ratio := \frac{T}{T_{all}} = 0.98$$

$check_{HD} = "OK"$

Anchor

$$T_{LRFD} := \frac{\frac{M_{ot}}{0.6} - M_{res} \cdot \frac{0.9}{0.6}}{w_s}$$ Tension in anchor bolt (LRFD)

$T_{LRFD} = 3.83 \cdot kip$

Use Simpson DTT2Z w/ 5/8" Dia. Anchor, 10" min. embed (Ref. Anchor Output)

Footing Uplift

$L_{ftg} := w_s + 5ft = 33.5\,ft$	Length of footing	$t_{slab} := 4in$	Slab thickness
$W_{ftg} := 1.33ft$	Width of footing	$trib_{slab} := 6ft$	Slab tributary
$t_{ftg} := 8in$	Thickness of footing	$t_{stem} := 6in$	Stem wall thick
$trib_{flr} := 0ft$	Floor/deck tributary	$ht_{stem} := 18in$	Stem wall height

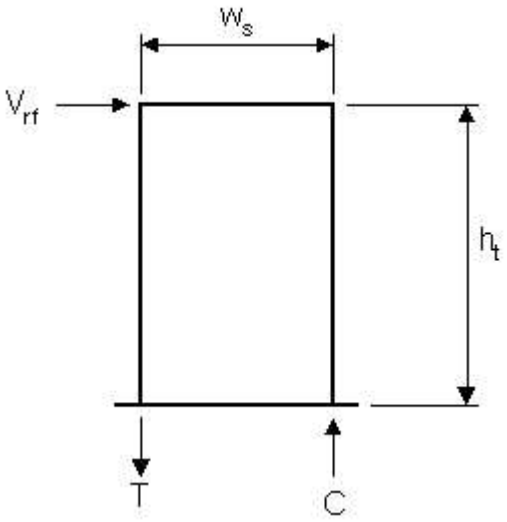
$$wt_{resist} := \left[\left(W_{ftg} \cdot t_{ftg} + t_{slab} \cdot trib_{slab} + t_{stem} \cdot ht_{stem}\right) \cdot 150pcf + trib_{flr} \cdot DL_{flr}\right] \cdot \frac{L_{ftg}}{2} = 9.14 \cdot kip$$ Weight resisting uplift

$$check_{ftg} := if\left(wt_{resist} > T, "OK", "NG"\right) \qquad ratio := \frac{T}{wt_{resist}} = 0.23$$

$check_{ftg} = "OK"$

Existing footing OK, therefore no upgrades required

SW2 IN - PLANE SHEAR



$h_t := 9 \cdot ft$ Wall height

$L_s := 15ft$ Total shear wall length

$DL_{rf} = 15 \cdot psf$ Dead load of roof

$R := R_{Lmain\_2} \cdot 50\% = 9.33 \cdot kip$ Reaction at wall line

$w_{rf} := \frac{4ft + 4.5ft}{2}$ Tributary width of framing on wall

$p_{ext\_w} = 10 \cdot psf$ Dead load of exterior walls

$w_s := 15ft$ Shear wall length

Aspect Ratio (Blocked Shear Wall)

$\frac{h_t}{w_s} = 0.6$

$check_{ratio} := if\left(\frac{h_t}{w_s} > 3.5, "NG", "OK"\right)$

$check_{ratio} = "OK"$

$(WSP) := if\left(\frac{h_t}{w_s} < 2.0, 1.0, 1.25 - 0.125 \cdot \frac{h_t}{w_s}\right)$ Aspect ratio factor

$(WSP) = 1.0$

Overturning Forces

$V_{rf} := \left(R \cdot \frac{w_s}{L_s}\right) 0.6$ Shear load at top of wall (ASD)

$V_{rf} = 5.6 \cdot kip$

$M_{ot} := V_{rf} \cdot h_t$ Overturning moment (ASD)

$M_{ot} = 50.4 \cdot kip \cdot ft$

Resisting Forces

$P_{rf} := (DL_{rf}) \cdot w_{rf} \cdot (w_s)$ Roof load

$P_{rf} = 0.96 \cdot kip$

$P_w := p_{ext\_w} \cdot (h_t) \cdot (w_s)$ Wall load

$P_w = 1.35 \cdot kip$

$M_{res} := \left[\left(P_{rf} + P_w\right) \cdot \frac{w_s}{2}\right] \cdot 0.6$ Resisting moment (ASD)

$M_{res} = 10.38 \cdot kip \cdot ft$

Plywood Shear (ref. ANSI/AF&PA SDPWS)

$\Omega_s := 2.0$ (ref. section 4.3.3) $n := 1$ sides

$w_v := \frac{V_{rf}}{w_s} = 373 \cdot plf$

$w_{all} := \frac{(WSP) \cdot v_{w4} \cdot n}{\Omega_s} = 490 \cdot plf$ $check_{wv} := if\left(\frac{w_v}{w_{all}} > 1.0, "NG", "OK"\right)$ $check_{wv} = "OK"$

Single Sided 7/16" sheathing w/ 8d @ **4" O.C.** Panel Edges @ 12" O.C.
Interior Supports (ref. table 4.3A)

Holdown

$T := \frac{M_{ot} - M_{res}}{w_s} = 2.67 \cdot kip$ $check_T := if(T > 150lbf, "HD REQ'D", "NOT REQ'D")$ $check_T = "HD REQ'D"$

$T_{all} := HDU5 = 5.645 \cdot kip$ Allowable tension load (Simpson **HDU5**)

$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right)$ $ratio := \frac{T}{T_{all}} = 0.47$ $check_{HD} = "OK"$

Anchor

$T_{LRFD} := \frac{\frac{M_{ot}}{0.6} - M_{res} \cdot \frac{0.9}{0.6}}{w_s}$ Tension in anchor bolt (LRFD) $T_{LRFD} = 4.56 \cdot kip$

Use Simpson HDU5 w/ 5/8" Dia. Anchor, 12" min. embed (Ref. Anchor Output)

Footing Uplift

$L_{ftg} := w_s + 5ft = 20\,ft$	Length of footing	$t_{slab} := 4in$	Slab thickness
$W_{ftg} := 1.33ft$	Width of footing	$trib_{slab} := 6ft$	Slab tributary
$t_{ftg} := 8in$	Thickness of footing	$t_{stem} := 6in$	Stem wall thick
$trib_{flr} := 0ft$	Floor/deck tributary	$ht_{stem} := 18in$	Stem wall height

$wt_{resist} := \left[\left(W_{ftg} \cdot t_{ftg} + t_{slab} \cdot trib_{slab} + t_{stem} \cdot ht_{stem}\right) \cdot 150pcf + trib_{flr} \cdot DL_{flr}\right] \cdot \frac{L_{ftg}}{2} = 5.46 \cdot kip$ Weight resisting uplift

$check_{ftg} := if\left(wt_{resist} > T, "OK", "NG"\right)$ $ratio := \frac{T}{wt_{resist}} = 0.49$ $check_{ftg} = "OK"$

Existing footing OK, therefore no upgrades required

SWA SEISMIC IN - PLANE SHEAR

$h_t := 8 \cdot ft$ Wall height

$L_s := 5.5ft + 8ft + 6ft + 6.5ft + 7ft$ Total shear wall length

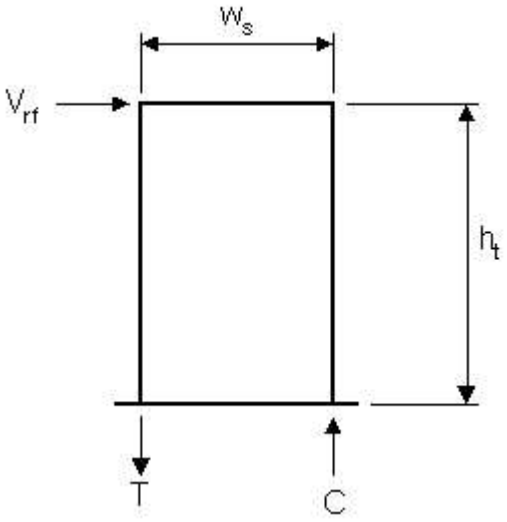
$DL_{rf} = 15 \cdot psf$ Dead load of roof

$R := R_{Tmain\_A\_EL} = 12.01 \cdot kip$ Reaction at wall line

$w_{rf} := \frac{13ft + 13ft}{2} + 4ft \cdot 2$ Tributary width of framing on wall

$p_{ext\_w} = 10 \cdot psf$ Dead load of exterior walls

$w_s := 5.5ft$ Shear wall length



Aspect Ratio (Blocked Shear Wall)

$\frac{h_t}{w_s} = 1.45$

$check_{ratio} := if\left(\frac{h_t}{w_s} > 3.5, "NG", "OK"\right)$

$check_{ratio} = "OK"$

$(WSP) := if\left(\frac{h_t}{w_s} < 2.0, 1.0, 1.25 - 0.125 \cdot \frac{h_t}{w_s}\right)$ Aspect ratio factor

$(WSP) = 1.0$

Overturning Forces

$V_{rf} := \left(R \cdot \frac{w_s}{L_s}\right) 0.7$ Shear load at top of wall (ASD)

$V_{rf} = 1.4 \cdot kip$

$M_{ot} := V_{rf} \cdot h_t$ Overturning moment (ASD)

$M_{ot} = 11.2 \cdot kip \cdot ft$

Resisting Forces

$P_{rf} := (DL_{rf}) \cdot w_{rf} \cdot (w_s + 4ft)$ Roof load

$P_{rf} = 2.99 \cdot kip$

$P_w := p_{ext\_w} \cdot (2h_t) \cdot (w_s)$ Wall load

$P_w = 0.88 \cdot kip$

$M_{res} := \left[(P_{rf} + P_w) \cdot \frac{w_s}{2}\right] \cdot 0.6$ Resisting moment (ASD)

$M_{res} = 6.39 \cdot kip \cdot ft$

Plywood Shear (ref. ANSI/AF&PA SDPWS)

$\Omega_s := 2.0$ (ref. section 4.3.3) $n := 1$ sides

$w_v := \frac{V_{rf}}{w_s} = 255 \cdot plf$

$w_{all} := \frac{(WSP) \cdot v_{s4} \cdot n}{\Omega_s} = 350 \cdot plf$ $check_{wv} := if\left(\frac{w_v}{w_{all}} > 1.0, "NG", "OK"\right)$ $check_{wv} = "OK"$

Single Sided 15/32" sheathing w/ 8d @ **4" O.C.** Panel Edges @ 12" O.C.
Interior Supports (ref. table 4.3A)

Holdown

$T := \frac{M_{ot} - M_{res}}{w_s} = 0.88 \cdot kip$ $check_T := if(T > 150lbf, "HD REQ'D", "NOT REQ'D")$ $check_T = "HD REQ'D"$

$T_{all} := HDU5 = 5.645 \cdot kip$ Allowable tension load (Simpson **HDU5**)

$check_{HD} := if\left(\frac{T}{T_{all}} > 1.0, "NG", "OK"\right)$ $ratio := \frac{T}{T_{all}} = 0.16$ $check_{HD} = "OK"$

Anchor

$T_{LRFD} := \frac{\frac{M_{ot}}{0.7} - M_{res} \cdot \frac{0.9}{0.6}}{w_s}$ Tension in anchor bolt (LRFD) $T_{LRFD} = 1.17 \cdot kip$

Use Simpson HDU5 w/ 5/8" Dia. Anchor, 12" min. embed (Ref. Anchor Output)

Footing Uplift

$L_{ftg} := w_s + 5ft = 10.5\,ft$	Length of footing	$t_{slab} := 4in$	Slab thickness
$W_{ftg} := 1.33ft$	Width of footing	$trib_{slab} := 6ft$	Slab tributary
$t_{ftg} := 8in$	Thickness of footing	$t_{stem} := 6in$	Stem wall thick
$trib_{flr} := 0ft$	Floor/deck tributary	$ht_{stem} := 18in$	Stem wall height

$wt_{resist} := \left[\left(W_{ftg} \cdot t_{ftg} + t_{slab} \cdot trib_{slab} + t_{stem} \cdot ht_{stem}\right) \cdot 150pcf + trib_{flr} \cdot DL_{flr}\right] \cdot \frac{L_{ftg}}{2} = 2.86 \cdot kip$ Weight resisting uplift

$check_{ftg} := if\left(wt_{resist} > T, "OK", "NG"\right)$ $ratio := \frac{T}{wt_{resist}} = 0.31$ $check_{ftg} = "OK"$

Existing footing OK, therefore no upgrades required

HDU/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.

HDU holdowns are pre-deflected during the manufacturing process, virtually eliminating deflection under load due to material stretch. They use Strong-Drive® SDS Heavy-Duty Connector screws which install easily, reduce fastener slip and provide a greater net section when compared to 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 DTT2Z 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 p. 289 for deck applications).

For more information on holdown options, contact Simpson Strong-Tie.

HDU Features:

- Uses Strong-Drive SDS Heavy-Duty Connector screws which install easily, reduce fastener slip and provide a greater net section area of the post compared to bolts
- Strong-Drive SDS Heavy-Duty Connector screws are supplied with the holdowns to ensure proper fasteners are used
- No stud bolts to countersink at openings

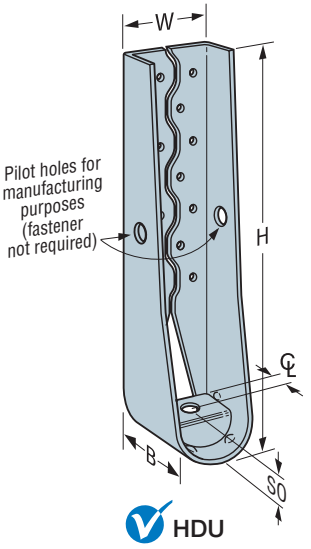
Material: See table

Finish: HDU — galvanized; DTT1Z and DTT2Z — ZMAX® coating; DTT2SS — stainless steel

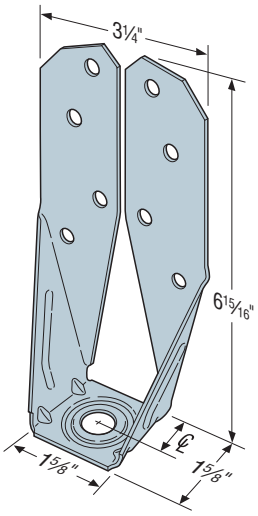
Installation:

- See Holdown and Tension Tie General Notes on pp. 49–50.
- The HDU requires no additional washer; the DTT requires a standard-cut washer (included with DTT2Z) be installed between the nut and the seat.
- Strong-Drive SDS Heavy-Duty Connector screws install best with a low-speed high-torque drill with a ⅜" hex-head driver.
- Fasteners and crescent washer are included with the holdowns. For replacements, order part no. SDS25212-HDU_. (Fill in the size needed, e.g. HDU2.)

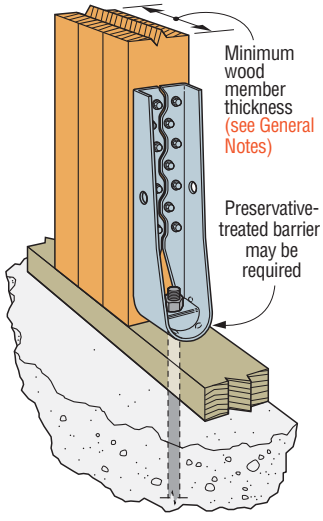
Codes: See p. 12 for Code Reference Key Chart



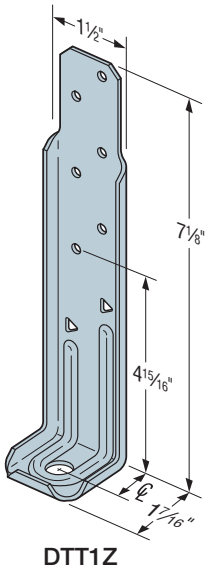
HDU



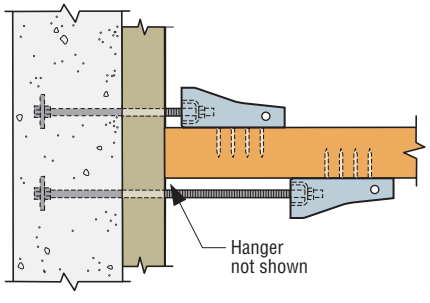
DTT2Z
U.S. Patent 8,555,580



Vertical HDU Installation



DTT1Z
U.S. Patent Pending



Horizontal HDU Offset Installation
(plan view)
See Holdown and Tension Tie General Notes.

HDU/DTT

Holdowns (cont.)

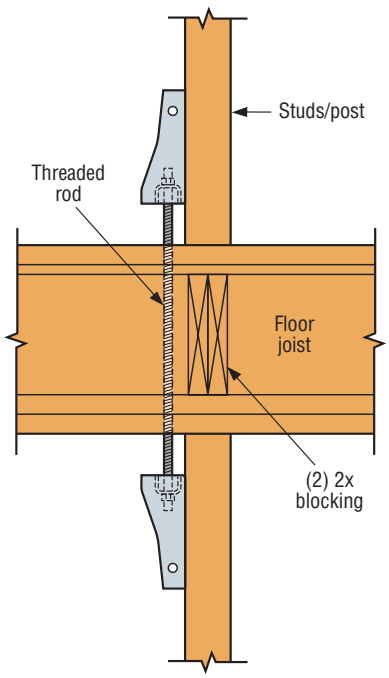
These products are available with additional corrosion protection. For more information, see p. 15.

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. 335-337 for more information.

Model No.	Ga.	Dimensions (in.)					Fasteners (in.)		Minimum Wood Member Size (in.)	Allowable Tension Loads (160)			Code Ref.
		W	H	B	CL	SO	Anchor Bolt Dia. (in.)	Wood Fasteners		DF/SP	SPF/HF	Deflection at Allowable Load (in.)	
DTT1Z	14	1½	7⅛	1⁷⁄₁₆	¾	⁵⁄₁₆	⅜	(6) SD #9 x 1½	1½ x 5½	840	840	0.17	IBC, FL, LA
								(6) 0.148 x 1½		910	640	0.167	
								(8) 0.148 x 1½		910	850	0.167	
SS DTT2Z	14	3¼	6¹⁵⁄₁₆	1⅝	¹³⁄₁₆	⁵⁄₁₆	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	
SS DTT2Z-SDS2.5								(8) ¼ x 2½ SDS	3 x 3½	2,145	2,105	0.128	
HDU2-SDS2.5	14	3	8¹⁄₁₆	3¼	1⁵⁄₁₆	1⅜	⅝	(6) ¼ x 2½ SDS	3 x 3½	3,075	2,215	0.088	
HDU4-SDS2.5	14	3	10¹⁵⁄₁₆	3¼	1⁵⁄₁₆	1⅜	⅝	(10) ¼ x 2½ SDS	3 x 3½	4,565	3,285	0.114	
HDU5-SDS2.5	14	3	13⅜	3¼	1⁵⁄₁₆	1⅜	⅝	(14) ¼ x 2½ SDS	3 x 3½	5,645	4,340	0.115	
HDU8-SDS2.5	10	3	16⅝	3½	1⅜	1½	⅞	(20) ¼ x 2½ SDS	3 x 3½	6,765	5,820	0.11	
									3½ x 3½	6,970	5,995	0.116	
									3½ x 4½	7,870	6,580	0.113	
HDU11-SDS2.5	10	3	22¼	3½	1⅜	1½	1	(30) ¼ x 2½ SDS	3½ x 5½	9,335	8,030	0.137	
									3½ x 7¼	11,175	9,610	0.137	
HDU14-SDS2.5	7	3	25 ¹¹⁄₁₆	3½	1⁹⁄₁₆	1⁹⁄₁₆	1	(36) ¼ x 2½ SDS	3½ x 5½	10,770	9,260	0.122	—
									3½ x 7¼	14,390	12,375	0.177	IBC, FL, LA
									5½ x 5½	14,445	12,425	0.172	

1. HDU14 requires heavy-hex anchor nut to achieve tabulated loads (supplied with holdown).
2. HDU14 loads on 4x6 post are applicable to installation on either the narrow or the wide face of the post.



Typical HDU Tie Between Floors

HRS/ST/HTP/LSTA/LSTI/MST/MSTA/MSTC/MSTI

Strap Ties

Straps are designed to transfer tension loads in a wide variety of applications.

HRS — Heavy strap designed for installation on the edge of 2x members. The HRS416Z installs with Strong-Drive® SDS Heavy-Duty Connector screws.

HTP — Heavy tie plate designed for installation on the side of 2x4 or larger members.

LSTA and MSTA — Designed for use on the edge of 2x members, with a nailing pattern that reduces the potential for splitting.

LSTI and MSTI — Light and medium straps that are suitable where pneumatic-nailing is necessary through diaphragm decking and wood chord open-web trusses.

MST — High-capacity strap that can be installed with either nails or bolts. Suitable for double 2x member connections or greater.

MSTC — High-capacity strap that utilizes a staggered nail pattern to help minimize wood splitting. Nail slots have been countersunk to provide a lower nail head profile.

Finish: Galvanized. Some products are available in stainless steel, ZMAX® coating or black powder coat (add PC to sku); contact Simpson Strong-Tie. See Corrosion Information, pp. 13–15.

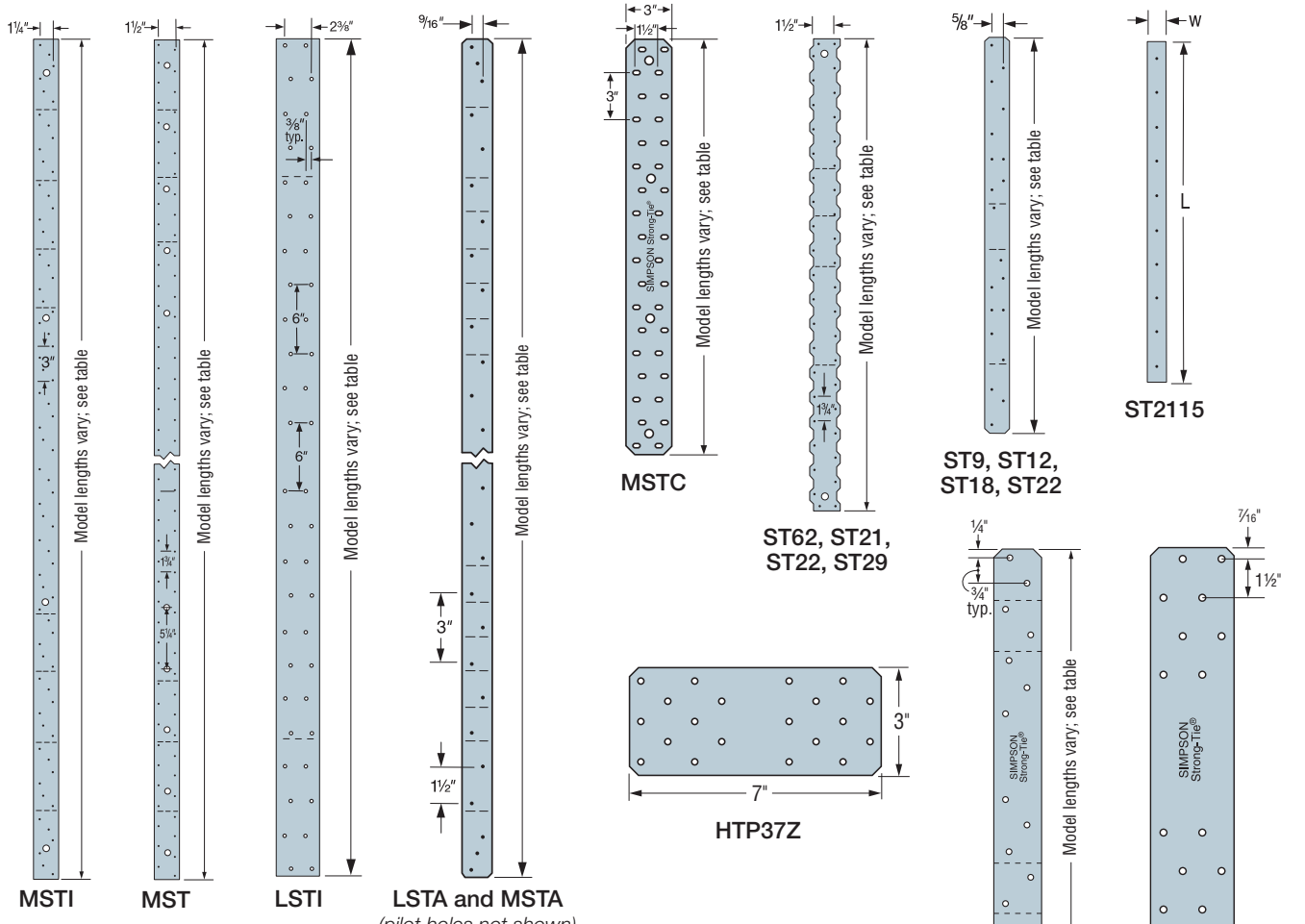
Installation: Use all specified fasteners; see General Notes

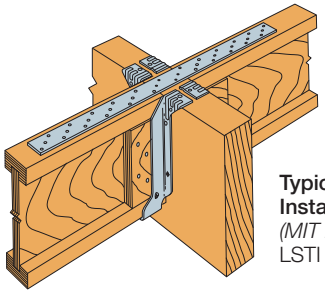
Options: Special sizes can be made to order; contact Simpson Strong-Tie

Codes: See p. 12 for Code Reference Key Chart

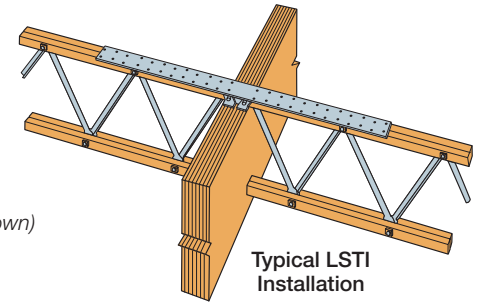
MSTC and RPS meet code requirements for reinforcing cut members (16 gauge) at top plate and RPS at sill plate.
International Residential Code® — 2012/2015/2018 R602.6.1
International Building Code® — 2012/2015/2018 2308.9.8

(For RPS, refer to p. 303.)

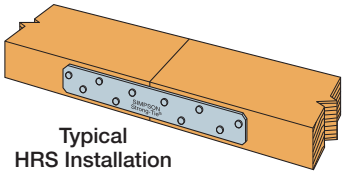




Typical MSTI Installation
(MIT hanger shown)
LSTI similar



Typical LSTI Installation



Typical HRS Installation

Strap Ties (cont.)

Codes: See p. 12 for Code Reference Key Chart

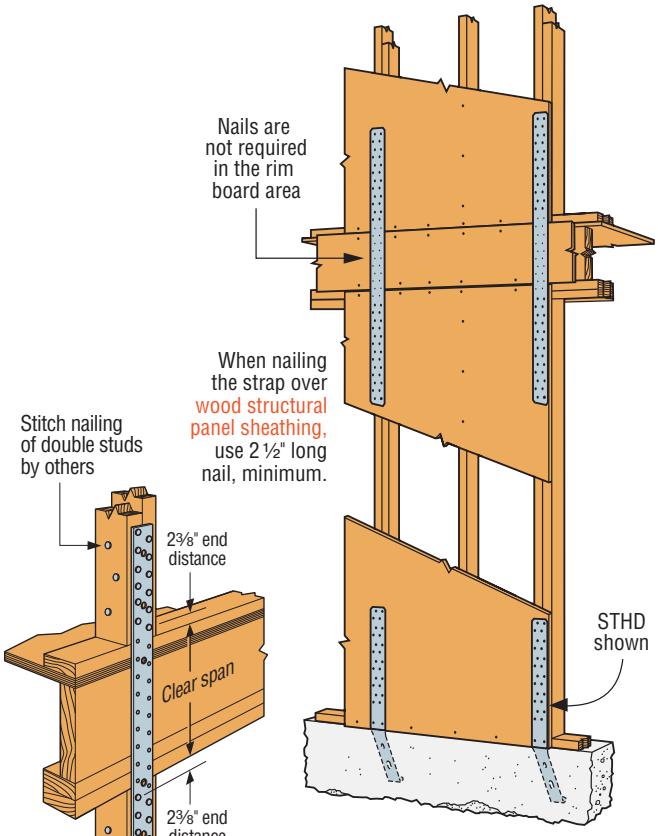
These products are available with additional corrosion protection. For more information, see p. 15.

SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 335–337 for more information.

Floor to Floor Span Table

Model No.	Clear Span (in.)	Fasteners (Total) (in.)	Allowable Tension Loads (DF/SP) (160)	Allowable Tension Loads (SPF/HF) (160)
MSTA49	18	(26) 0.148 x 2½	2,020	2,020
	16	(26) 0.148 x 2½	2,020	2,020
MSTC28	18	(12) 0.148 x 3¼	1,150	995
	16	(16) 0.148 x 3¼	1,535	1,330
MSTC40	24	(20) 0.148 x 3¼	1,920	1,660
	18	(28) 0.148 x 3¼	2,690	2,325
	16	(32) 0.148 x 3¼	3,070	2,655
MSTC52	24	(36) 0.148 x 3¼	3,455	2,990
	18	(44) 0.148 x 3¼	4,225	3,650
	16	(48) 0.148 x 3¼	4,610	3,985
MSTC66	30	(48) 0.148 x 3¼	4,775	4,130
	24	(54) 0.148 x 3¼	5,375	4,645
	18	(64) 0.148 x 3¼	5,850	5,505
	16	(68) 0.148 x 3¼	5,850	5,850
MSTC78	30	(64) 0.148 x 3¼	5,850	5,505
	24	(72) 0.148 x 3¼	5,850	5,850
	18	(76) 0.148 x 3¼	5,850	5,850
MST37	24	(14) 0.162 x 2½	1,720	1,500
	18	(20) 0.162 x 2½	2,460	2,140
	16	(22) 0.162 x 2½	2,705	2,355
MST48	24	(26) 0.162 x 2½	3,210	2,780
	18	(32) 0.162 x 2½	3,950	3,425
	16	(34) 0.162 x 2½	4,200	3,640
MST60	30	(34) 0.162 x 2½	4,605	3,995
	24	(40) 0.162 x 2½	5,240	4,700
	18	(46) 0.162 x 2½	6,235	5,405
MST72	30	(48) 0.162 x 2½	6,505	5,640
	24	(54) 0.162 x 2½	6,730	6,345
	18	(62) 0.162 x 2½	6,730	6,475

See footnotes below.



Floor-to-Floor Tie Installation Showing a Clear Span

Typical Detail with Strap Installed over Wood Structural Panel Sheathing

Model No.	Ga.	Dimensions (in.) W	Dimensions (in.) L	Fasteners (Total) Nails (in.)	Fasteners (Total) Bolts Qty.	Fasteners (Total) Bolts Dia.	Allowable Tension Loads (DF/SP) Nails (160)	Allowable Tension Loads (DF/SP) Bolts (160)	Allowable Tension Loads (SPF/HF) Nails (160)	Allowable Tension Loads (SPF/HF) Bolts (160)	Code Ref.
MST27	12	2⅛6	27	(30) 0.162 x 2½	4	½	3,700	2,165	3,210	2,000	IBC, FL, LA
MST37		2⅛6	37½	(42) 0.162 x 2½	6	½	5,070	3,030	4,495	2,800	
MST48		2⅛6	48	(50) 0.162 x 2½	8	½	5,310	3,675	5,190	3,395	
MST60	10	2⅛6	60	(68) 0.162 x 2½	10	½	6,730	4,490	6,475	4,150	
MST72		2⅛6	72	(68) 0.162 x 2½	10	½	6,730	4,490	6,475	4,150	

1. See pp. 260–261 for Straps and Ties General Notes.
2. Install bolts or nails as specified by Designer. Bolt and nail values may not be combined.
3. Allowable bolt loads are based on parallel-to-grain loading and minimum member thickness: MST – 2½".
4. Splitting may be a problem with installations on lumber smaller than 3½"; either fill every nail hole with 0.148" x 1½" nails or fill every other hole with 0.162" x 2½" nails. Reduce the allowable load based on the size and quantity of fasteners used.
5. **Fasteners:** Nail dimensions in the table are listed diameter by length. See pp. 21–22 for fastener information.

MSTC48B3/MSTC66B3Z

Pre-Bent Straps

The MSTC48B3 and MSTC66B3Z are pre-bent straps designed to transfer tension load from an upper-story shearwall to a beam on the story below.

Material: 14 gauge

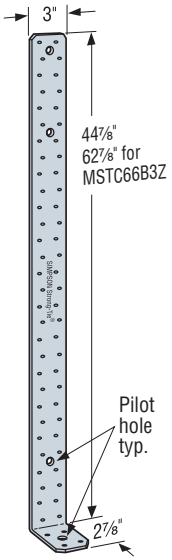
Finish: Galvanized; contact Simpson Strong-Tie

Codes: See p. 12 for Code Reference Key Chart

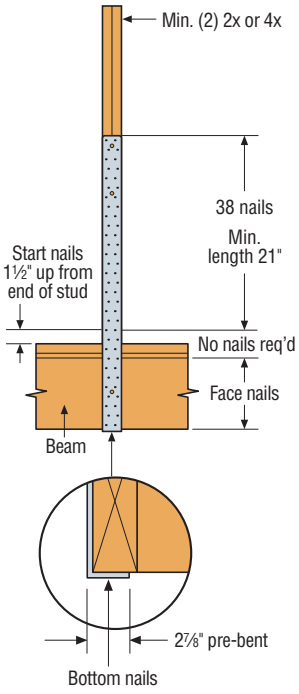
These products are available with additional corrosion protection. For more information, see p. 15.

Model No.	Min. Wood Beam Dimension (in.)		Fasteners (in.)			Allowable Tension Loads		Code Ref.
			Beam		Studs/ Post			
	Width (min.)	Depth (min.)	Face	Bottom		DF/SP (160)	SPF/HF (160)	
MSTC48B3	3	9¼	(12) 0.148 x 3	(4) 0.148 x 3	(38) 0.148 x 3	3,975	3,900	IBC, FL, LA
MSTC66B3Z	3½	11¼	(14) 0.148 x 3			4,490	4,490	

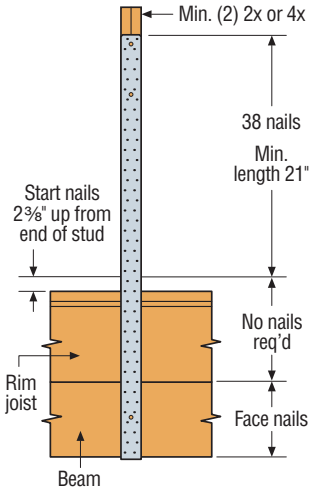
1. Using fewer than 38 nails in the studs/post will reduce the allowable load of the connection. To calculate a reduced allowable load, use 199 lb. per nail for DF/SP or 172 lb. per nail for HF/SPF. Minimum length of extent of reduced nails may not be less than 21" as is shown in graphic.
2. Nails in studs/post shall be installed symmetrically. Nails may be installed over the entire length of the strap in the studs/post.
3. The minimum 3"-wide beam may be made up of two 2x members.
4. MSTC48B3 and MSTC66B3Z installed over wood structural panel sheathing up to ½" thick achieve 0.85 of table loads.
5. PSL beam may be used in lieu of a standard-dimension lumber beam with no load reductions.
6. Multiply allowable loads by 1.85 to attain an allowable load for installations where two straps have been installed with a 1½" clear space between straps.
7. Structural composite lumber columns have sides that show either the wide face or the edges of the lumber strands/veneers known as the narrow face. Values in the tables reflect installation into the wide face. See technical bulletin T-C-SCLCLM at **strongtie.com** for load reductions resulting from narrow-face installations.
8. **Fasteners:** Nail dimensions in the table are listed diameter by length. See pp. 21–22 for fastener information.



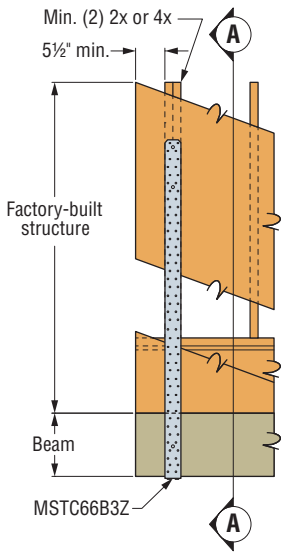
MSTC48B3



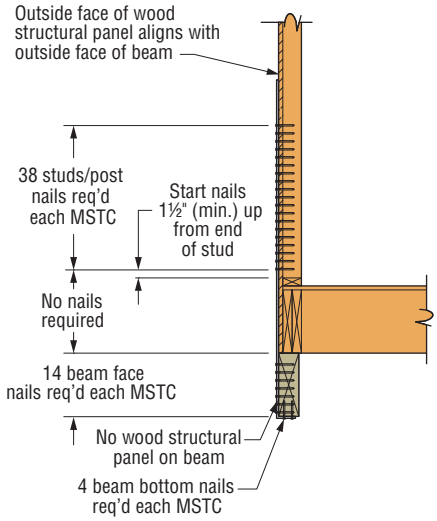
MSTC48B3 Installation with No Rim Board



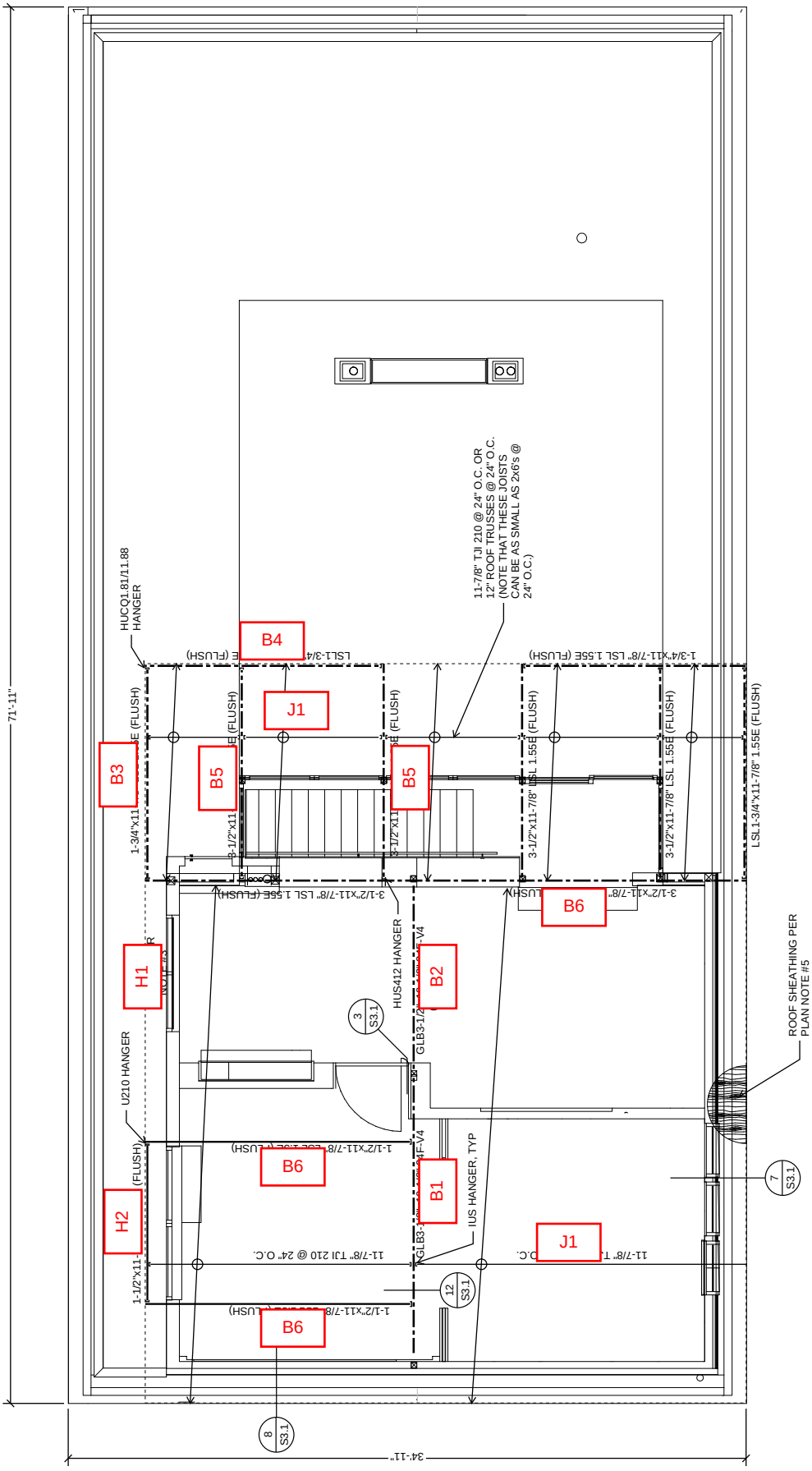
MSTC66B3Z Installation with Rim Board



(2) MSTC66B3Z Installation



Section A-A

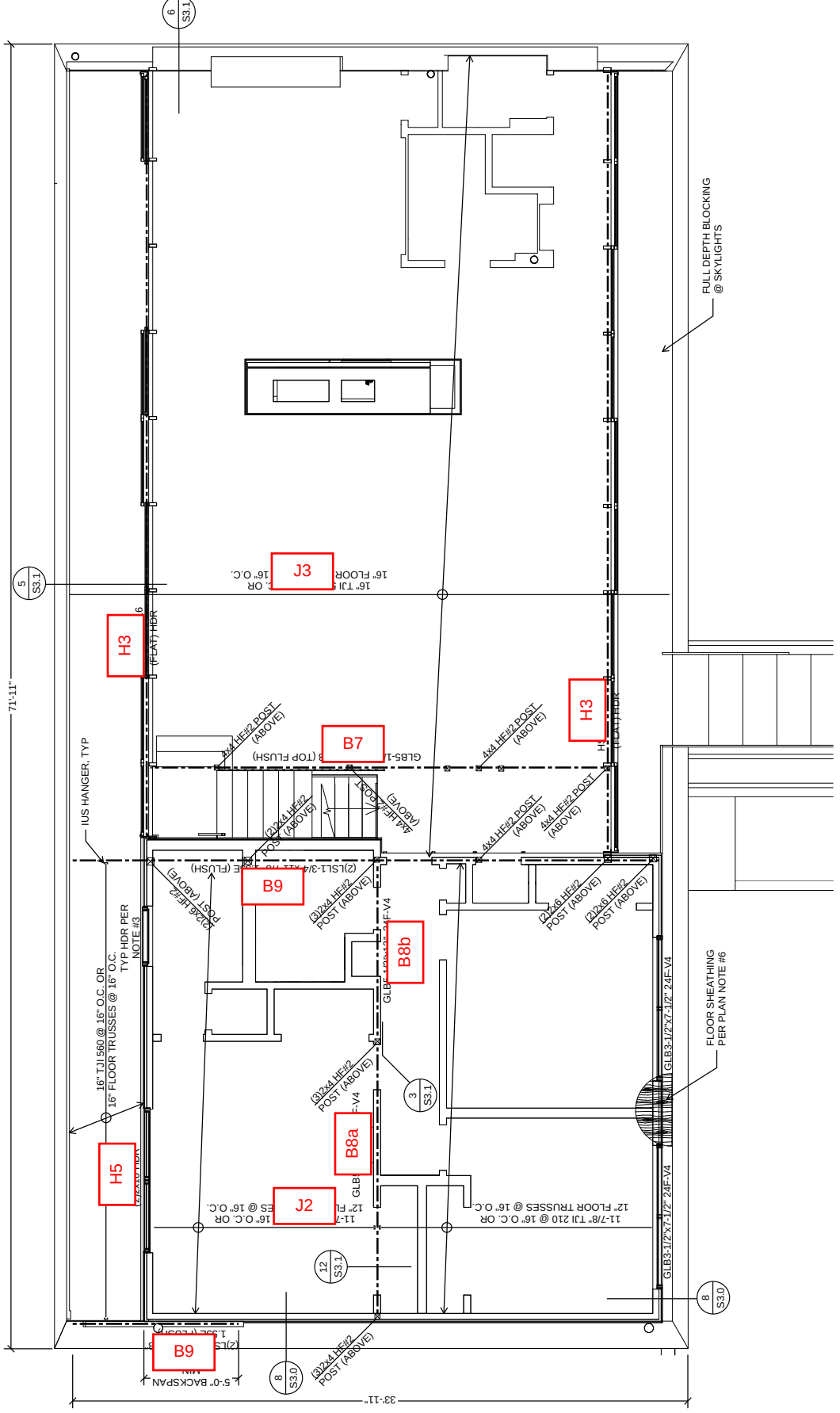


NKH ENGINEERING

PROJECT: Faben Point Home

DESCRIPTION: Roof Framing Keyplan

BY: AKR DATE: 6/8/2023 JOB #: 21-127

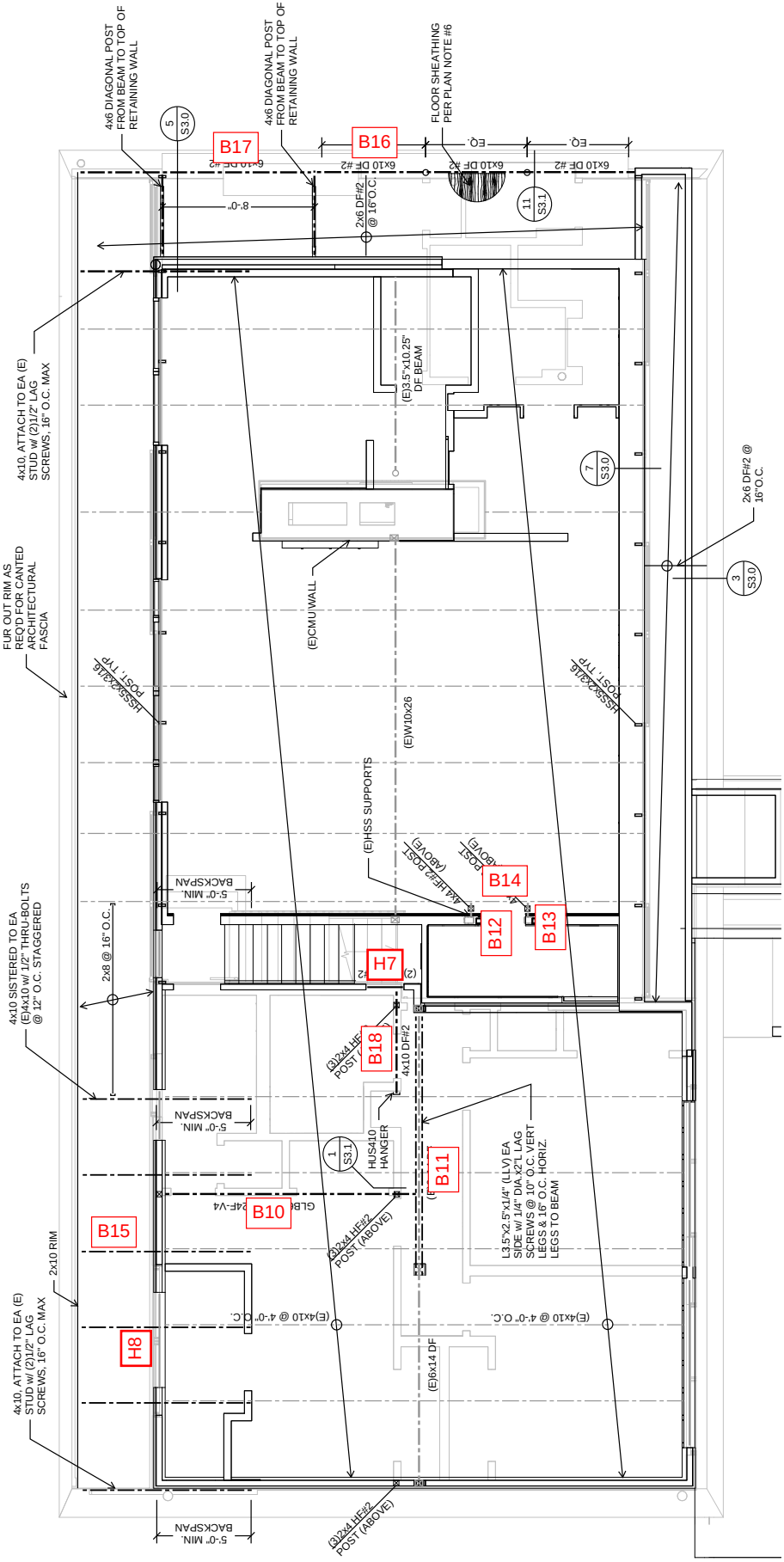


NKH ENGINEERING

PROJECT: Faben Point Home

DESCRIPTION: Upper Floor Framing Keyplan

BY: AKR DATE: 6/8/2023 JOB #: 21-127



NKH ENGINEERING

PROJECT: Faben Point Home

DESCRIPTION: Main Floor Framing Keyplan

BY: AKR DATE: 6/8/2023 JOB #: 21-127

Roof			
Member Name	**Results (Max UTIL %)**	**Current Solution**	**Comments**
J1 - Roof Joist	Passed (64% M)	1 piece(s) 11 7/8" TJI® 210 @ 24" OC	Web Stiffeners Required
B1 - Roof Flush Beam	Passed (101% M+)	1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam	
B2 - Roof Flush Beam	Passed (63% M+)	1 piece(s) 3 1/2" x 9" 24F-V4 DF Glulam	
B3 - Patio Roof Flush Beam	Passed (25% R)	1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL	
B4 - Patio Roof Flush Beam	Passed (53% ΔT)	1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL	
B5 - Patio Roof Flush Beam	Failed (72% R)	1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL OK, hardware resolves uplift	An excessive uplift of -1444 lbs at support located at 3 1/2" failed this product.
H1 - Typ Roof Header	Passed (87% M)	2 piece(s) 2 x 6 HF No.2	
H2 - Roof Header	Passed (89% M)	2 piece(s) 2 x 8 DF No.2	
Upper Floor/Deck			
Member Name	**Results (Max UTIL %)**	**Current Solution**	**Comments**
J2 - Floor Joist	Passed (67% M)	1 piece(s) 11 7/8" TJI® 210 @ 16" OC	
J2 - Floor Joist Cant Version	Passed (83% ΔL)	1 piece(s) 2 x 10 DF No.2 @ 16" OC	
J3 - Floor/Deck Joist	Passed (99% ΔL)	1 piece(s) 16" TJI® 560 @ 16" OC	
(Not Used) B7 - Deck Flush Beam	Passed (58% M)	1 piece(s) W12X40 (A992) ASTM Steel	
B7 - Deck Flush Beam w/ Posts	Passed (81% R)	1 piece(s) 5 1/2" x 12" 24F-V8 DF Glulam	
H3 - Typ Deck Header	Passed (80% M)	2 piece(s) 2 x 10 DF No.2	
H4 - Deck Header @ B7	Passed (83% V)	1 piece(s) 5 1/2" x 9" 24F-V4 DF Glulam	
H5 - 8' Header @ Guest Room 2	Passed (84% M+)	1 piece(s) 3 1/2" x 7 1/2" 24F-V4 DF Glulam	
H5b - 3' Header @ Guest Room 2	Passed (58% M)	2 piece(s) 2 x 6 DF No.2	
H6 - 8' Header @ Room 3 & 4	Passed (78% M+)	1 piece(s) 3 1/2" x 7 1/2" 24F-V4 DF Glulam	
B8a - Floor Flush Beam	Passed (91% ΔL)	1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam	
B8b - Floor Flush Beam (Short)	Passed (35% M+)	1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam	
B9: Deck Flush Beam	Passed (46% R)	2 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL	
P9: Post @ B8b & B9	Passed (50% B/C)	3 piece(s) 2 x 4 DF No.2	
Main Floor			
Member Name	**Results (Max UTIL %)**	**Current Solution**	**Comments**
B10 - Floor Flush Beam	Passed (89% V)	1 piece(s) 6 3/4" x 9" 24F-V4 DF Glulam	
B11 - (E)Floor Dropped Beam	Failed (116% M+)	1 piece(s) 5 1/2" x 13 1/2" 24F-V4 DF Glulam OK, Steel was used to strengthen	
B12 - Floor Blocking	Passed (0% R)	1 piece(s) 4 x 10 HF No.2	
B13 - Floor Blocking	Passed (102% R)	1 piece(s) 4 x 10 HF No.2	
B15 - Cantilevered Deck Beams	Passed (77% M)	1 piece(s) 4 x 10 DF No.2	
B16 - Short Beam @ East Wall	Passed (40% M)	1 piece(s) 4 x 8 DF No.2	
B17 - Long Beam @ East Wall	Passed (65% M)	1 piece(s) 4 x 10 DF No.2	
B18: Beam @ P9	Passed (92% V)	1 piece(s) 4 x 10 DF No.2	
J4 - Deck Joist	Passed (94% ΔL)	1 piece(s) 2 x 8 DF No.2 @ 16" OC	
H7 - Header Supporting B18	Passed (91% V)	2 piece(s) 2 x 8 DF No.2	
H8 - (E)Header	Passed (74% M)	1 piece(s) 4 x 8 DF No.1	

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

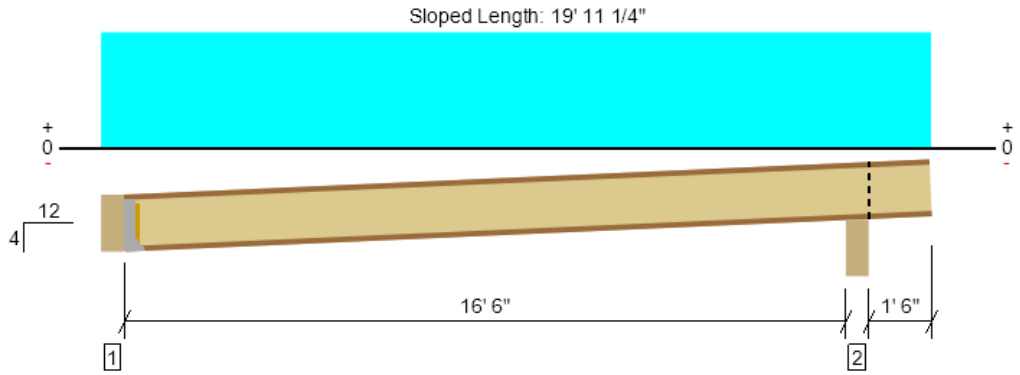
FORTEWEB

MEMBER REPORT

PASSED

Roof, J1 - Roof Joist

1 piece(s) 11 7/8" TJI® 210 @ 24" OC



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	678 @ 5 1/2"	1156 (1.75")	Passed (59%)	1.15	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	678 @ 5 1/2"	1903	Passed (36%)	1.15	1.0 D + 1.0 S (Alt Spans)
Moment (Ft-lbs)	2813 @ 8' 9 1/8"	4364	Passed (64%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.338 @ 8' 9 11/16"	0.882	Passed (L/626)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.550 @ 8' 9 5/8"	1.176	Passed (L/385)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 19' 9 7/16"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 4/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Hanger on 11 7/8" DF beam	5.50"	Hanger[1]	1.75" / - [2]	275	351	439	714	See note [1]
2 - Beveled Plate - DF	5.50"	5.50"	3.50"	322	407	509	831	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.
- [2] Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 4" o/c	
Bottom Edge (Lu)	8' 8" o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.
- Dimensions for lateral bracing intervals are measured along the length of the member for sloped conditions.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LSSR2.1Z	1.88"	N/A	14-10dx2.5	12-10dx1.5	Web Stiffeners

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location	Spacing	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 18' 11"	24"	15.0	20.0	25.0	Roof

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

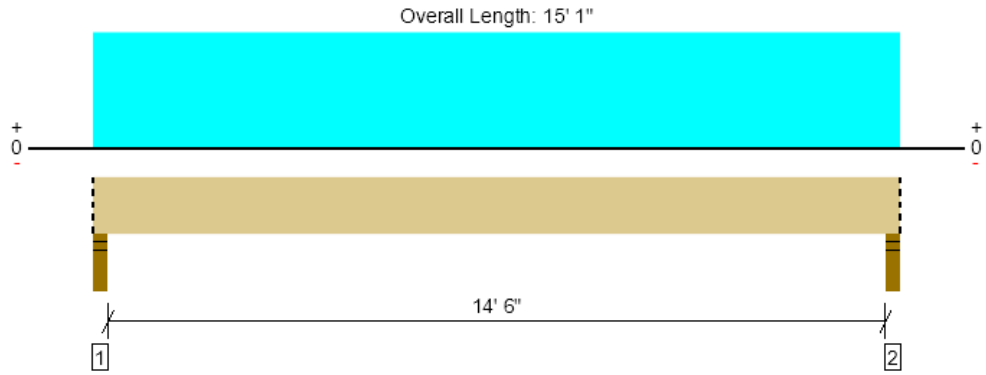
ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

Roof, B1 - Roof Flush Beam

1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4140 @ 2"	7656 (3.50")	Passed (54%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3499 @ 1' 2"	7466	Passed (47%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	14928 @ 7' 6 1/2"	14792	Passed (101%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.591 @ 7' 6 1/2"	0.738	Passed (L/299)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.962 @ 7' 6 1/2"	0.983	Passed (L/184)	--	1.0 D + 1.0 S (All Spans)

Member Length : 15' 1"
System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 14' 9".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.89"	1595	2036	2545	4140	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.89"	1595	2036	2545	4140	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6" o/c	
Bottom Edge (Lu)	15' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 15' 1"	N/A	8.9	--	--	
1 - Uniform (PSF)	0 to 15' 1" (Top)	13' 6"	15.0	20.0	25.0	Roof

• Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

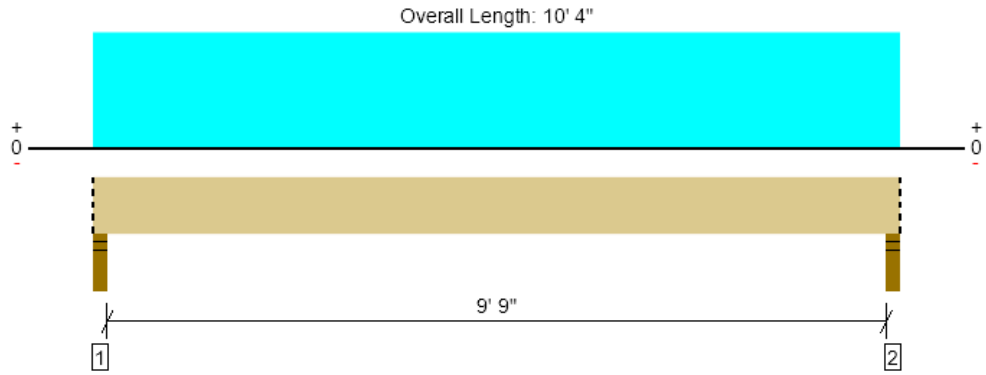
FORTEWEB

MEMBER REPORT

PASSED

Roof, B2 - Roof Flush Beam

1 piece(s) 3 1/2" x 9" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2830 @ 2"	7656 (3.50")	Passed (37%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2259 @ 1' 1/2"	6400	Passed (35%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	6846 @ 5' 2"	10868	Passed (63%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.198 @ 5' 2"	0.500	Passed (L/605)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.322 @ 5' 2"	0.667	Passed (L/373)	--	1.0 D + 1.0 S (All Spans)

Member Length : 10' 4"
System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 10'.
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.50"	1086	1395	1744	2830	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	1086	1395	1744	2830	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	10' 4" o/c	
Bottom Edge (Lu)	10' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 10' 4"	N/A	7.7	--	--	
1 - Uniform (PSF)	0 to 10' 4" (Top)	13' 6"	15.0	20.0	25.0	Roof

• Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

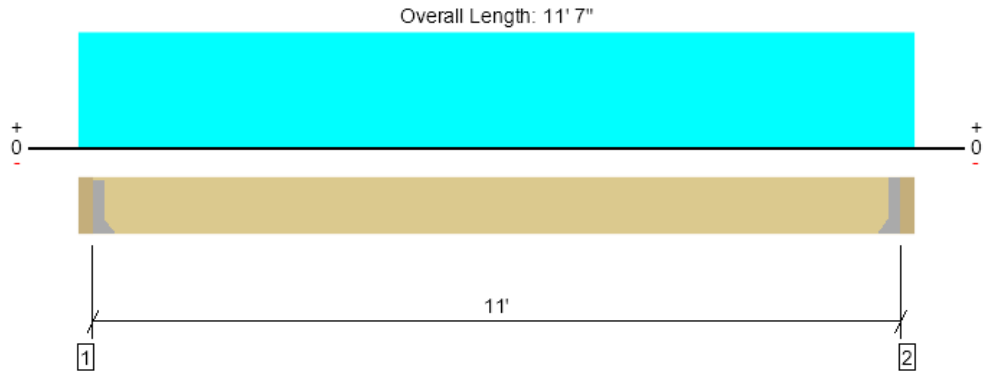
FORTEWEB

MEMBER REPORT

PASSED

Roof, B3 - Patio Roof Flush Beam

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	586 @ 3 1/2"	2363 (1.50")	Passed (25%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	480 @ 1' 3 3/8"	4939	Passed (10%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1611 @ 5' 9 1/2"	9173	Passed (18%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.061 @ 5' 9 1/2"	0.550	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.104 @ 5' 9 1/2"	0.733	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

Member Length : 11'
System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Hanger on 11 7/8" DF beam	3.50"	Hanger[1]	1.50"	253	290	362	615	See note [1]
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger[1]	1.50"	253	290	362	615	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	11' o/c	
Bottom Edge (Lu)	11' o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	IUS1.81/9.5	2.00"	N/A	8-10dx1.5	2-10dx1.5	
2 - Face Mount Hanger	IUS1.81/9.5	2.00"	N/A	8-10dx1.5	2-10dx1.5	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	3 1/2" to 11' 3 1/2"	N/A	6.5	--	--	
1 - Uniform (PSF)	0 to 11' 7" (Front)	2' 6"	15.0	20.0	25.0	Roof

- Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

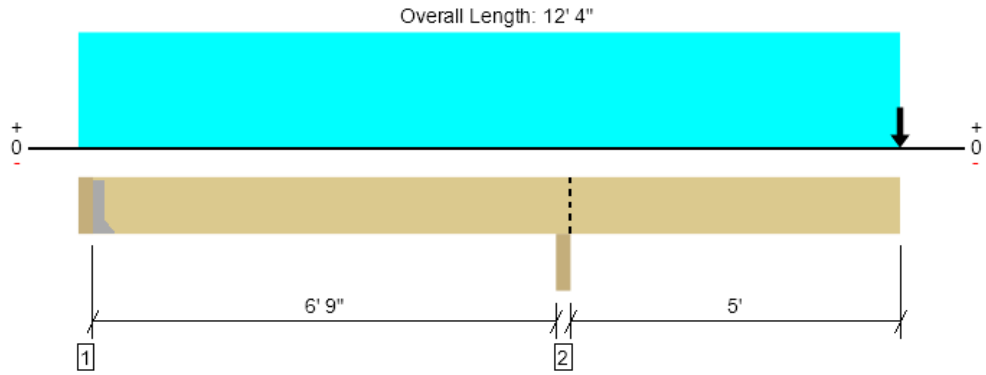
FORTEWEB

MEMBER REPORT

PASSED

Roof, B4 - Patio Roof Flush Beam

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1563 @ 7' 2 1/4"	3828 (3.50")	Passed (41%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	801 @ 8' 3 7/8"	4939	Passed (16%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-3780 @ 7' 2 1/4"	9173	Passed (41%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.215 @ 12' 4"	0.515	Passed (2L/574)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.366 @ 12' 4"	0.686	Passed (2L/338)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 12' 1/2"
System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Right cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -419 lbs uplift at support located at 3 1/2". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Hanger on 11 7/8" DF beam	3.50"	Hanger[1]	1.50"	-152	-214	-268	-419	See note [1]
2 - Beam - DF	3.50"	3.50"	1.50"	668	717	895	1563	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	12' 1" o/c	
Bottom Edge (Lu)	9' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	HUS1.81/10	3.00"	N/A	30-10dx1.5	10-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	3 1/2" to 12' 4"	N/A	6.5	--	--	
1 - Uniform (PSF)	0 to 12' 4" (Front)	1'	15.0	20.0	25.0	Roof
2 - Point (lb)	12' 4" (Front)	N/A	253	290	362	Linked from: B3 - Patio Roof Flush Beam, Support 2

- Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC

ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2

File Name: 21-127

FORTEWEB

MEMBER REPORT

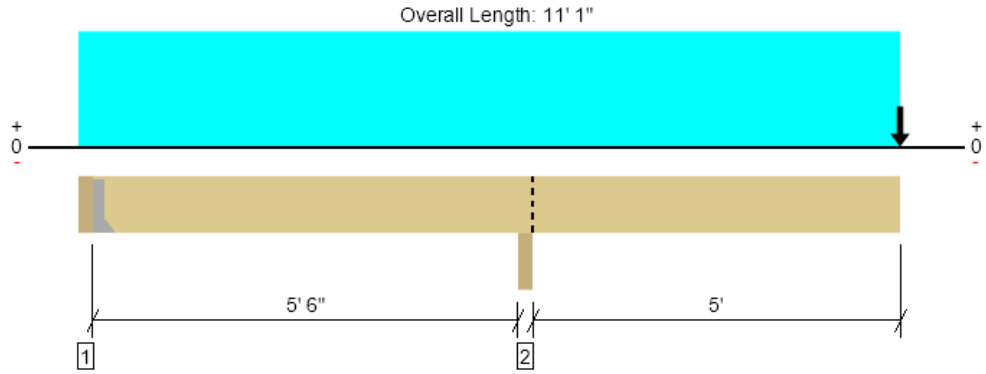
FAILED

OK, hardware resolves uplift

Roof, B5 - Patio Roof Flush Beam

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL

An excessive uplift of -1444 lbs at support located at 3 1/2" failed this product.



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5494 @ 5' 11 1/4"	7656 (3.50")	Passed (72%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2538 @ 7' 7/8"	9878	Passed (26%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-11260 @ 5' 11 1/4"	18346	Passed (61%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.282 @ 11' 1"	0.515	Passed (2L/438)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.485 @ 11' 1"	0.686	Passed (2L/254)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 10' 9 1/2"
System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Right cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Hanger on 11 7/8" DF beam	3.50"	Hanger[1]	1.50"	-536	-727	-908	-1444	See note [1]
2 - Beam - DF	3.50"	3.50"	2.51"	2300	2557	3193	5494	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	10' 10" o/c	
Bottom Edge (Lu)	10' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LUS414	2.00"	N/A	10-SD9112	6-SD9212	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	3 1/2" to 11' 1"	N/A	13.0	--	--	
1 - Uniform (PSF)	0 to 11' 1" (Top)	5' 9"	15.0	20.0	25.0	Roof
2 - Point (lb)	11' 1" (Top)	N/A	668	717	895	Linked from: B4 - Patio Roof Flush Beam, Support 2

- Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

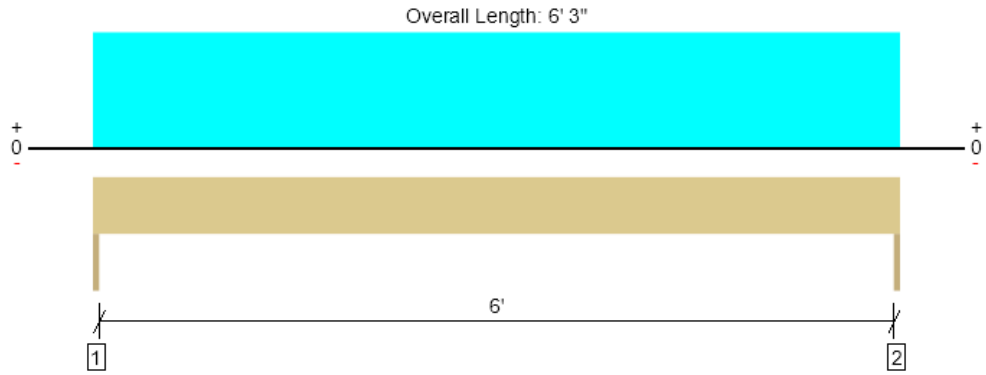
FORTEWEB

MEMBER REPORT

PASSED

Roof, H1 - Typ Roof Header

2 piece(s) 2 x 6 HF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	888 @ 0	1823 (1.50")	Passed (49%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	722 @ 7"	1898	Passed (38%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1388 @ 3' 1 1/2"	1602	Passed (87%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.111 @ 3' 1 1/2"	0.208	Passed (L/675)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.180 @ 3' 1 1/2"	0.313	Passed (L/416)	--	1.0 D + 1.0 S (All Spans)

Member Length : 6' 3"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Trimmer - DF	1.50"	1.50"	1.50"	341	438	547	888	None
2 - Trimmer - DF	1.50"	1.50"	1.50"	341	438	547	888	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 3" o/c	
Bottom Edge (Lu)	6' 3" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6' 3"	N/A	4.2	--	--	
1 - Uniform (PSF)	0 to 6' 3"	7'	15.0	20.0	25.0	Roof

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

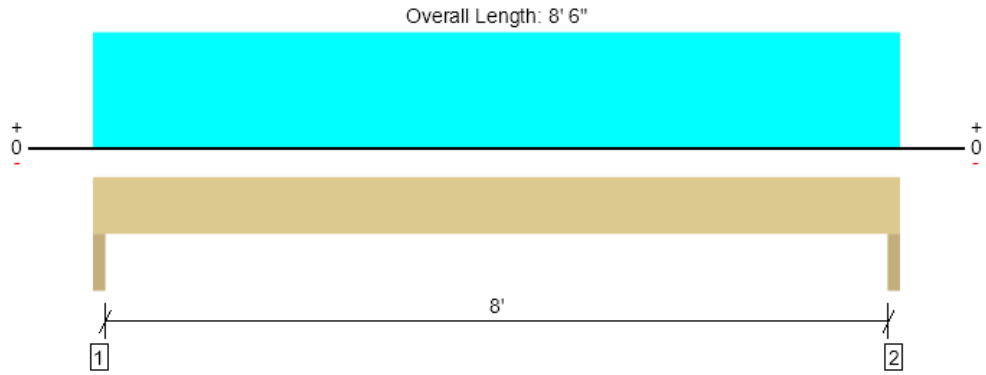
FORTEWEB

MEMBER REPORT

PASSED

Roof, H2 - Roof Header

2 piece(s) 2 x 8 DF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1213 @ 1 1/2"	5625 (3.00")	Passed (22%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	970 @ 10 1/4"	3002	Passed (32%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2429 @ 4' 3"	2720	Passed (89%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.120 @ 4' 3"	0.275	Passed (L/827)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.195 @ 4' 3"	0.313	Passed (L/507)	--	1.0 D + 1.0 S (All Spans)

Member Length : 8' 6"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (5/16").
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Trimmer - DF	3.00"	3.00"	1.50"	470	595	744	1213	None
2 - Trimmer - DF	3.00"	3.00"	1.50"	470	595	744	1213	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 6" o/c	
Bottom Edge (Lu)	8' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 8' 6"	N/A	5.5	--	--	
1 - Uniform (PSF)	0 to 8' 6"	7'	15.0	20.0	25.0	Roof

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

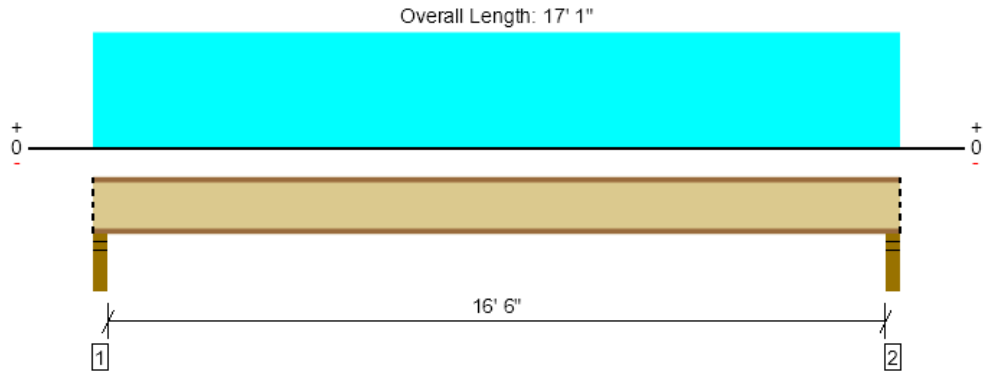
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, J2 - Floor Joist

1 piece(s) 11 7/8" TJI® 210 @ 16" OC



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	626 @ 2 1/2"	1460 (3.50")	Passed (43%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	605 @ 3 1/2"	1655	Passed (37%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2546 @ 8' 6 1/2"	3795	Passed (67%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.272 @ 8' 6 1/2"	0.417	Passed (L/734)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.375 @ 8' 6 1/2"	0.833	Passed (L/534)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	44	40	Passed	--	--

Member Length : 17' 1"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.75"	171	456	626	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.75"	171	456	626	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 7" o/c	
Bottom Edge (Lu)	17' 1" o/c	

•TJI joists are only analyzed using Maximum Allowable bracing solutions.
•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 17' 1"	16"	15.0	40.0	Floor Load

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

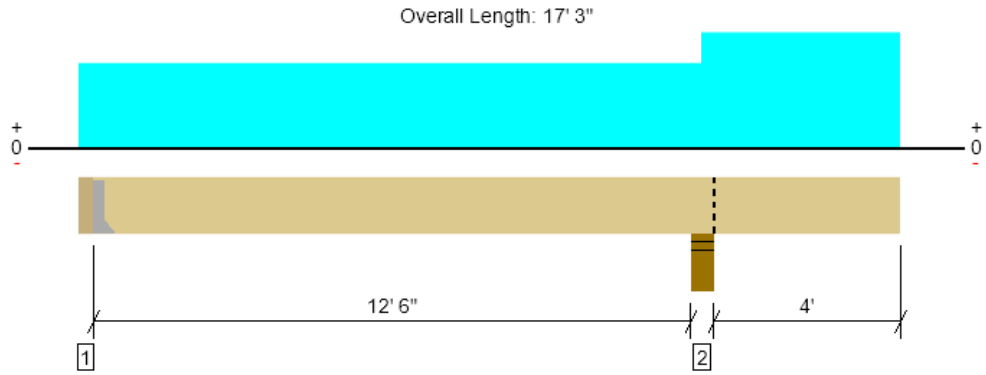
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, J2 - Floor Joist Cant Version

1 piece(s) 2 x 10 DF No.2 @ 16" OC



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	453 @ 3 1/2"	1406 (1.50")	Passed (32%)	--	1.0 D + 1.0 L (Alt Spans)
Shear (lbs)	464 @ 12' 1/4"	1665	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1397 @ 6' 5 9/16"	2029	Passed (69%)	1.00	1.0 D + 1.0 L (Alt Spans)
Live Load Defl. (in)	0.175 @ 17' 3"	0.211	Passed (2L/580)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.254 @ 6' 7 1/8"	0.636	Passed (L/602)	--	1.0 D + 1.0 L (Alt Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

Member Length : 16' 11 1/2"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Upward deflection on right cantilever exceeds overhang deflection criteria.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 9 1/4" DF beam	3.50"	Hanger[1]	1.50"	119	355/-41	474	See note [1]
2 - Stud wall - DF	5.50"	5.50"	1.50"	226	734	960	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 6" o/c	
Bottom Edge (Lu)	14' 8" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LU28	1.50"	N/A	8-10dx1.5	6-10dx1.5	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 13'	16"	15.0	40.0	Floor Load
2 - Uniform (PSF)	13' to 17' 3"	16"	15.0	60.0	Floor Load

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

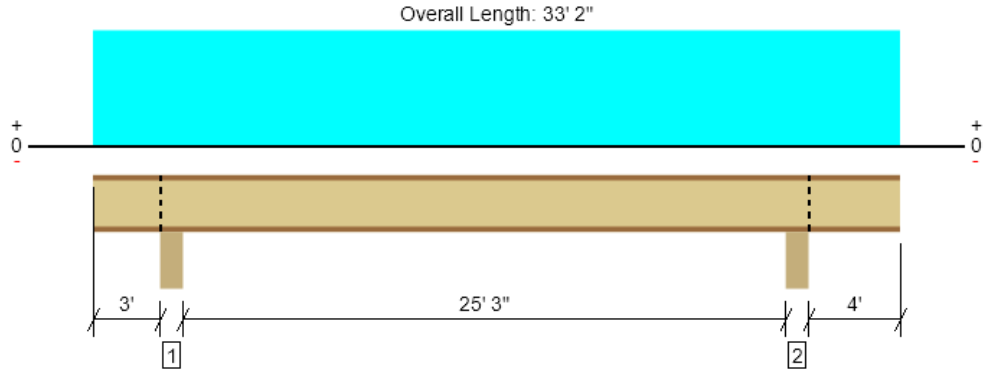
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, J3 - Floor/Deck Joist

1 piece(s) 16" TJI® 560 @ 16" OC



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1739 @ 28' 11 1/4"	3455 (5.25")	Passed (50%)	1.00	1.0 D + 1.0 L (Adj Spans)
Shear (lbs)	1209 @ 28' 8 1/2"	2710	Passed (45%)	1.00	1.0 D + 1.0 L (Adj Spans)
Moment (Ft-lbs)	8120 @ 16' 5/8"	12925	Passed (63%)	1.00	1.0 D + 1.0 L (Alt Spans)
Live Load Defl. (in)	0.666 @ 16' 15/16"	0.671	Passed (L/463)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.811 @ 16' 13/16"	1.285	Passed (L/380)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)
TJ-Pro™ Rating	40	40	Passed	--	--

Member Length : 33' 2"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/460) and TL (L/240).
- Overhang deflection criteria: LL (2L/460) and TL (2L/240).
- Upward deflection on left and right cantilevers exceeds overhang deflection criteria.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 1/2" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Beam - DF	5.50"	5.50"	3.50"	319	1303	537	1699	Blocking
2 - Beam - DF	5.50"	5.50"	3.50"	345	1394	578	1824	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	7' 1" o/c	
Bottom Edge (Lu)	14' 7" o/c	

•TJI joists are only analyzed using Maximum Allowable bracing solutions.
•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 33' 2"	16"	15.0	60.0	25.0	Deck

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

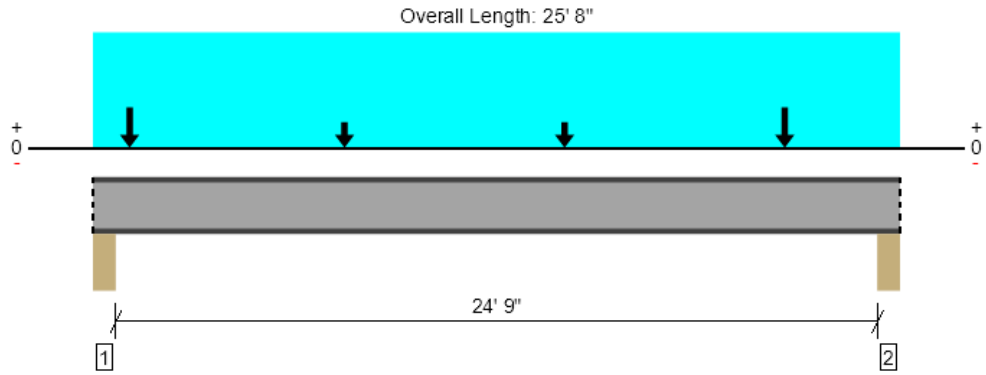
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, (Not Used) B7 - Deck Flush Beam

1 piece(s) W12X40 (A992) ASTM Steel



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	9847 @ 4"	27534 (5.50")	Passed (36%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	9805 @ 5 1/2"	70210	Passed (14%)	--	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	41455 @ 15'	71605	Passed (58%)	--	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.296 @ 13' 3/4"	0.625	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.525 @ 13' 3/4"	1.250	Passed (L/572)	--	1.0 D + 1.0 S (All Spans)

Member Length : 25' 8"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (Cb) of 1.0 has been assumed.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Beam - DF	5.50"	5.50"	5.50"	4275	1027	4119	5572	9847	Blocking
2 - Column - DF	5.50"	5.50"	5.50"	3627	1027	3355	4619	8246	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 25' 8"	N/A	40.0	--	--	--	
1 - Uniform (PSF)	0 to 25' 8" (Top)	1' 4"	15.0	60.0	-	25.0	Deck
2 - Point (lb)	8' (Top)	N/A	881	-	1180	1475	Patio Roof Flush Beams
3 - Point (lb)	15' (Top)	N/A	881	-	1180	1475	Patio Roof Flush Beams
4 - Point (lb)	1' 2" (Top)	N/A	2300	-	2557	3193	Linked from: B5 - Patio Roof Flush Beam, Support 2
5 - Point (lb)	22' (Top)	N/A	2300	-	2557	3193	Linked from: B5 - Patio Roof Flush Beam, Support 2

- Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

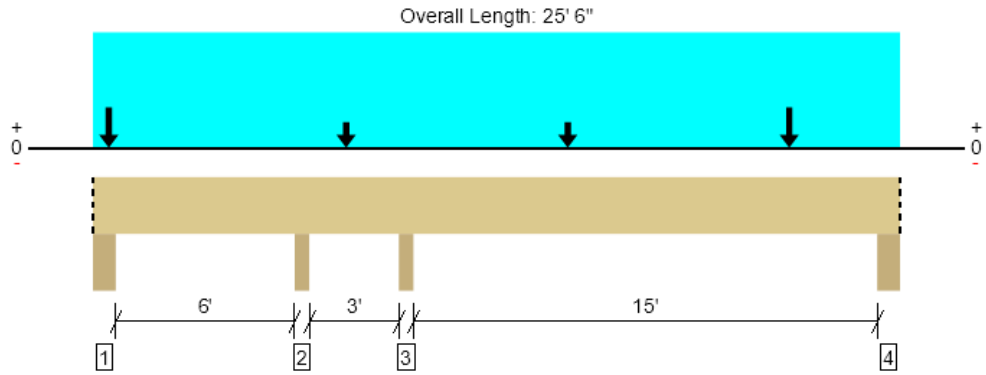
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, B7 - Deck Flush Beam w/ Posts

1 piece(s) 5 1/2" x 12" 24F-V8 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	10135 @ 9' 10 3/4"	12513 (3.50")	Passed (81%)	--	1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	5876 @ 8' 9"	13409	Passed (44%)	1.15	1.0 D + 1.0 S (Adj Spans)
Pos Moment (Ft-lbs)	14643 @ 22'	30360	Passed (48%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-lbs)	-14390 @ 9' 10 3/4"	30360	Passed (47%)	1.15	1.0 D + 1.0 S (Adj Spans)
Live Load Defl. (in)	0.169 @ 18' 9 15/16"	0.382	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.289 @ 18' 10 1/4"	0.764	Passed (L/634)	--	1.0 D + 1.0 S (Alt Spans)

Member Length : 25' 6"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 11' 8 7/8".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 6' 4 9/16".
- An excessive uplift of -3689 lbs detected at support located at 6' 7 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Beam - DF	5.50"	5.50"	1.70"	2455	289/-6	2613	3382	5837	Blocking
2 - Column - SPF	3.50"	3.50"	1.50"	-1325	522/-604	-1793	-2364	-3689	None
3 - Column - SPF	3.50"	3.50"	2.83"	4135	1559	4296	5999	10135	None
4 - Column - DF	5.50"	5.50"	1.50"	2016	511/-1	2024	2741	4757	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	25' 6" o/c	
Bottom Edge (Lu)	25' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 25' 6"	N/A	16.0	--	--	--	
1 - Uniform (PSF)	0 to 25' 6" (Top)	1' 4"	15.0	60.0	-	25.0	Deck
2 - Point (lb)	8' (Top)	N/A	881	-	1180	1475	Patio Roof Flush Beams
3 - Point (lb)	15' (Top)	N/A	881	-	1180	1475	Patio Roof Flush Beams
4 - Point (lb)	6" (Top)	N/A	2300	-	2557	3193	Linked from: B5 - Patio Roof Flush Beam, Support 2
5 - Point (lb)	22' (Top)	N/A	2300	-	2557	3193	Linked from: B5 - Patio Roof Flush Beam, Support 2

- Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC

ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2

File Name: 21-127

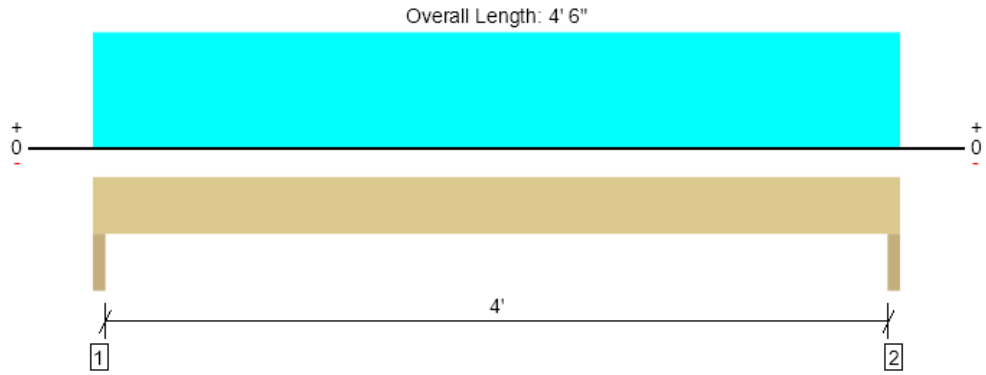
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, H3 - Typ Deck Header

2 piece(s) 2 x 10 DF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2939 @ 1 1/2"	5625 (3.00")	Passed (52%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1530 @ 1' 1/4"	3330	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2810 @ 2' 3"	3529	Passed (80%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.024 @ 2' 3"	0.142	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.030 @ 2' 3"	0.213	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 4' 6"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Trimmer - DF	3.00"	3.00"	1.57"	573	2228	928	2939	None
2 - Trimmer - DF	3.00"	3.00"	1.57"	573	2228	928	2939	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 6" o/c	
Bottom Edge (Lu)	4' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 4' 6"	N/A	7.0	--	--	
1 - Uniform (PSF)	0 to 4' 6"	16' 6"	15.0	60.0	25.0	Deck

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

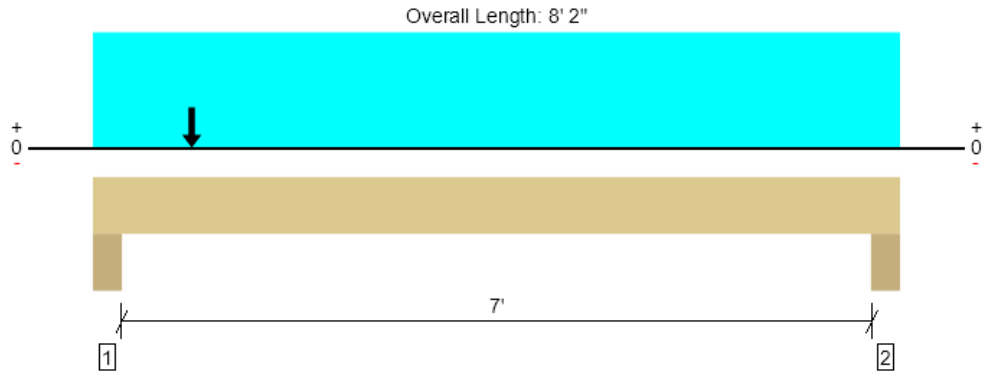
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, H4 - Deck Header @ B7

1 piece(s) 5 1/2" x 9" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	13890 @ 5 1/2"	25025 (7.00")	Passed (56%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	8348 @ 1' 4"	10057	Passed (83%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-lbs)	11296 @ 3' 6 11/16"	17078	Passed (66%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.134 @ 3' 11 13/16"	0.242	Passed (L/650)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.183 @ 3' 11 7/16"	0.363	Passed (L/476)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 8' 2"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 7' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Trimmer - DF	7.00"	7.00"	3.89"	5015	4993	3811	6840	13890	None
2 - Trimmer - DF	7.00"	7.00"	1.69"	1379	4119	308	2101	6044	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 2" o/c	
Bottom Edge (Lu)	8' 2" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 8' 2"	N/A	12.0	--	--	--	
1 - Uniform (PSF)	0 to 8' 2"	16' 6"	15.0	60.0	-	25.0	Deck
2 - Point (lb)	1'	N/A	4275	1027	4119	5572	Linked from: B7 - Deck Flush Beam, Support 1

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

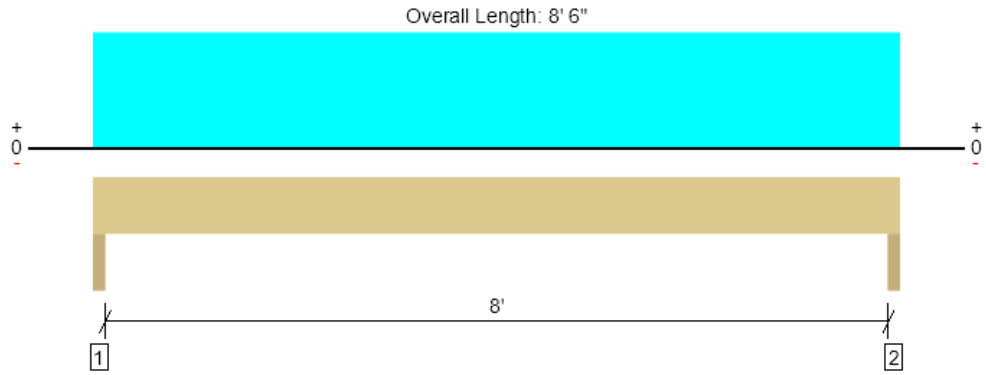
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, H5 - 8' Header @ Guest Room 2

1 piece(s) 3 1/2" x 7 1/2" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2744 @ 1 1/2"	6825 (3.00")	Passed (40%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2179 @ 10 1/2"	4638	Passed (47%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	5492 @ 4' 3"	6563	Passed (84%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.229 @ 4' 3"	0.275	Passed (L/432)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.304 @ 4' 3"	0.412	Passed (L/326)	--	1.0 D + 1.0 L (All Spans)

Member Length : 8' 6"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - DF	3.00"	3.00"	1.50"	675	2068	2744	None
2 - Trimmer - DF	3.00"	3.00"	1.50"	675	2068	2744	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 6" o/c	
Bottom Edge (Lu)	8' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 8' 6"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 8' 6"	6' 2"	15.0	40.0	Floor
2 - Uniform (PSF)	0 to 8' 6"	4'	15.0	60.0	Floor

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

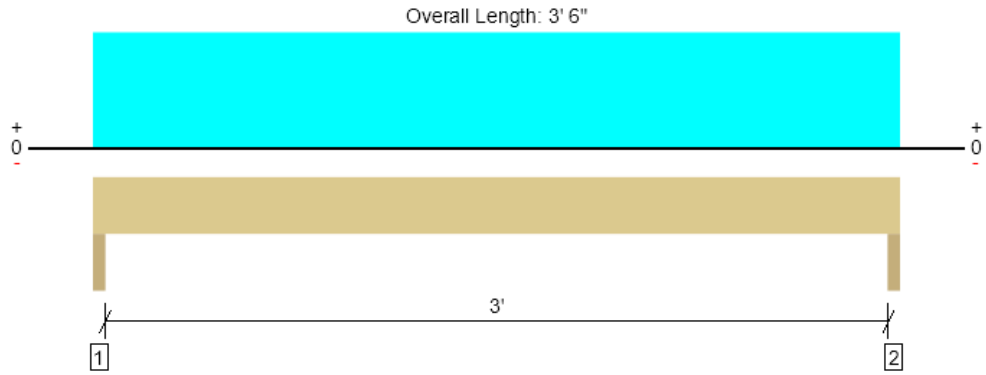
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, H5b - 3' Header @ Guest Room 2

2 piece(s) 2 x 6 DF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1126 @ 1 1/2"	5625 (3.00")	Passed (20%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	670 @ 8 1/2"	1980	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	849 @ 1' 9"	1475	Passed (58%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.018 @ 1' 9"	0.108	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.024 @ 1' 9"	0.162	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 3' 6"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - DF	3.00"	3.00"	1.50"	274	852	1126	None
2 - Trimmer - DF	3.00"	3.00"	1.50"	274	852	1126	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 6" o/c	
Bottom Edge (Lu)	3' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 6"	N/A	4.2	--	
1 - Uniform (PSF)	0 to 3' 6"	6' 2"	15.0	40.0	Floor
2 - Uniform (PSF)	0 to 3' 6"	4'	15.0	60.0	Floor

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

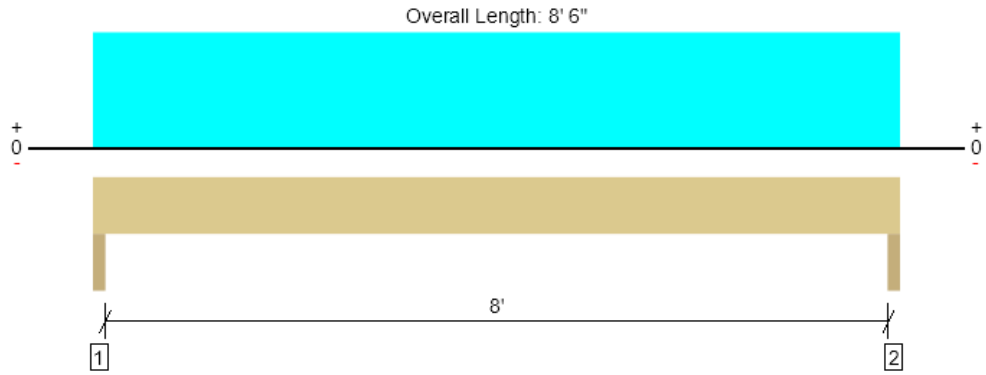
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, H6 - 8' Header @ Room 3 & 4

1 piece(s) 3 1/2" x 7 1/2" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2872 @ 1 1/2"	6825 (3.00")	Passed (42%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2030 @ 10 1/2"	4638	Passed (44%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	5116 @ 4' 3"	6563	Passed (78%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.195 @ 4' 3"	0.275	Passed (L/508)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.318 @ 4' 3"	0.412	Passed (L/311)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 8' 6"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Trimmer - DF	3.00"	3.00"	1.50"	1111	1445	723	903	2872	None
2 - Trimmer - DF	3.00"	3.00"	1.50"	1111	1445	723	903	2872	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 6" o/c	
Bottom Edge (Lu)	8' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 8' 6"	N/A	6.4	--	--	--	
1 - Uniform (PSF)	0 to 8' 6"	8' 6"	15.0	40.0	-	-	Floor
2 - Uniform (PSF)	0 to 8' 6"	8' 6"	15.0	-	20.0	25.0	Roof

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

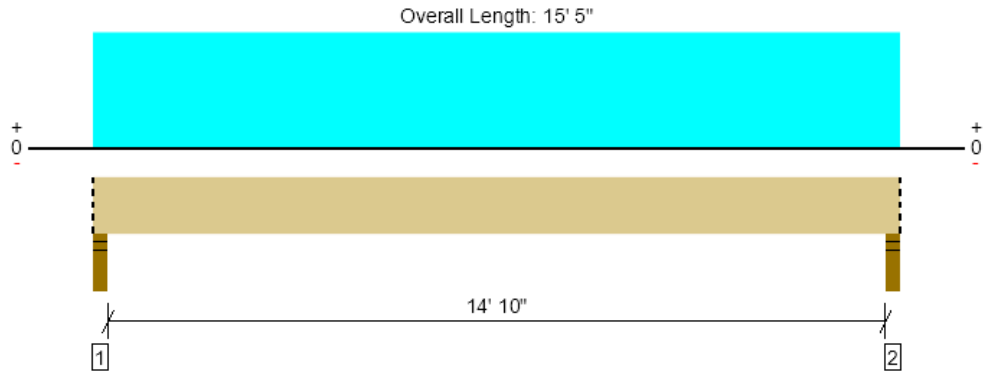
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, B8a - Floor Flush Beam

1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5735 @ 2"	12031 (3.50")	Passed (48%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4774 @ 1' 3 1/2"	11660	Passed (41%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	21159 @ 7' 8 1/2"	26400	Passed (80%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.457 @ 7' 8 1/2"	0.503	Passed (L/396)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.608 @ 7' 8 1/2"	0.754	Passed (L/298)	--	1.0 D + 1.0 L (All Spans)

Member Length : 15' 5"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 15' 1".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.67"	1419	4317	5735	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.67"	1419	4317	5735	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	15' 5" o/c	
Bottom Edge (Lu)	15' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 15' 5"	N/A	16.0	--	
1 - Uniform (PSF)	0 to 15' 5" (Top)	14'	12.0	40.0	Floor

• Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

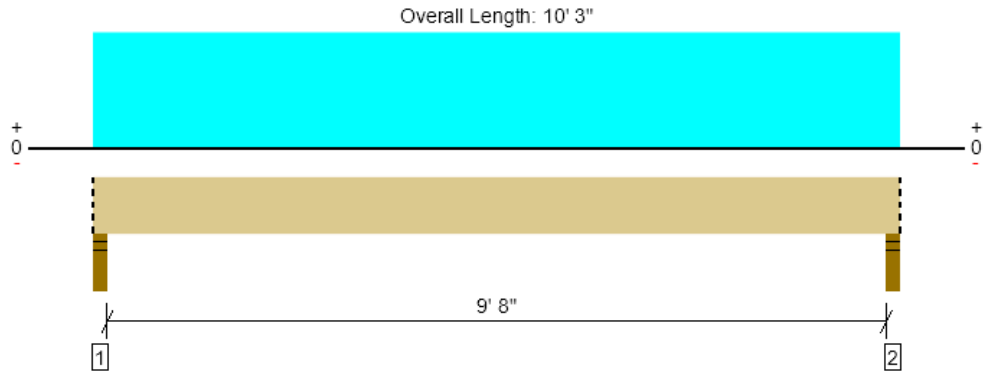
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, B8b - Floor Flush Beam (Short)

1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3813 @ 2"	12031 (3.50")	Passed (32%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2852 @ 1' 3 1/2"	11660	Passed (24%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	9146 @ 5' 1 1/2"	26400	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.085 @ 5' 1 1/2"	0.331	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.114 @ 5' 1 1/2"	0.496	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 10' 3"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 9' 11".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.50"	943	2870	3813	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	943	2870	3813	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	10' 3" o/c	
Bottom Edge (Lu)	10' 3" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 10' 3"	N/A	16.0	--	
1 - Uniform (PSF)	0 to 10' 3" (Top)	14'	12.0	40.0	Floor

• Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

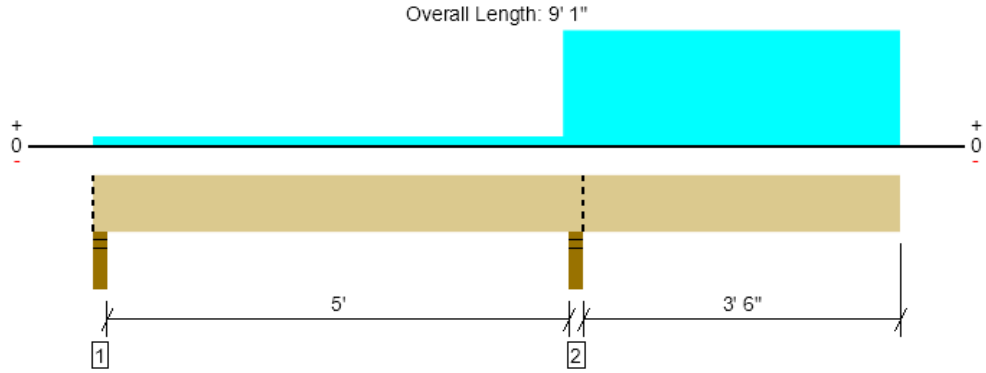
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor/Deck, B9: Deck Flush Beam

2 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3510 @ 5' 5 1/4"	7656 (3.50")	Passed (46%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1664 @ 6' 6 7/8"	8590	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-4406 @ 5' 5 1/4"	15953	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.086 @ 9' 1"	0.200	Passed (2L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.112 @ 9' 1"	0.365	Passed (2L/780)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 9' 1"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (0.2") and TL (2L/240).
- Right cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -766 lbs uplift at support located at 2". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.50"	-135	113/-630	-766	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.60"	885	2625	3510	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	9' 1" o/c	
Bottom Edge (Lu)	9' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 9' 1"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 5' 3 1/2" (Front)	1'	12.0	40.0	Default Load
2 - Uniform (PSF)	5' 3 1/2" to 9' 1" (Front)	12' 6"	12.0	40.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

FORTEWEB

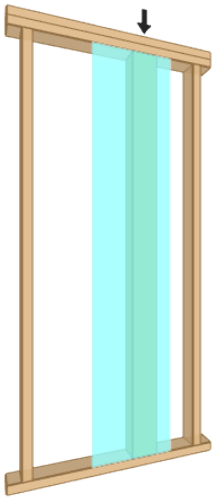
MEMBER REPORT

PASSED

Upper Floor/Deck, P9: Post @ B8b & B9

3 piece(s) 2 x 4 DF No.2

Wall Height: 7' Member Height: 6' 7 1/2" Tributary Width: 1'



Drawing is Conceptual

Design Results	Actual	Allowed	Result	LDF	Load: Combination [Load Group]
Slenderness	23	50	Passed (45%)	--	--
Compression (lbs)	4341	10055	Passed (43%)	1.00	1.0 D + 1.0 L [1]
Plate Bearing (lbs)	4341	9844	Passed (44%)	--	1.0 D + 1.0 L [1]
Lateral Reaction (lbs)	52	--	--	1.60	1.0 D + 0.6 W [1]
Lateral Shear (lbs)	47	3024	Passed (2%)	1.60	1.0 D + 0.6 W [1]
Lateral Moment (ft-lbs)	85 @ mid-span	1647	Passed (5%)	1.60	1.0 D + 0.6 W [1]
Total Deflection (in)	0.05 @ mid-span	0.66	Passed (L/1512)	--	1.0 D + 0.45 W + 0.75 L + 0.75 S [1]
Bending/Compression	0.50	1	Passed (50%)	1.00	1.0 D + 1.0 L [1]

- Lateral deflection criteria: Wind (L/120)
- Input axial load eccentricity for this design is 16.67% of applicable member side dimension.
- Applicable calculations are based on NDS.
- The column stability factor (Kf = 0.6) applied to this design assumes nailed built-up columns per NDS section 15.3.3. For Weyerhaeuser ELP products refer to the U.S. Wall Guide for multiple-member connection requirements.

Supports	Type	Material
Top	Dbl 2X	Douglas Fir-Larch
Base	2X	Douglas Fir-Larch

System : Wall
Member Type : Column
Building Code : IBC 2021
Design Methodology : ASD

Max Unbraced Length	Comments
6' 7 1/2"	

Lateral Connections

Supports	Connector	Type/Model	Quantity	Connector Nailing
Top	Nails	8d (0.113" x 2 1/2") (Toe)	2	N/A
Base	Nails	8d (0.113" x 2 1/2") (Toe)	2	N/A

- Nailed connection at the top of the member is assumed to be nailed through the bottom 2x plate prior to placement of the top 2x of the double top plate assembly.

Vertical Loads	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
1 - Point (lb)	N/A	1086	-	1395	1744	Linked from: B2 - Roof Flush Beam, Support 2
2 - Point (lb)	N/A	-536	-	-727	-908	Linked from: B5 - Patio Roof Flush Beam, Support 1
3 - Point (lb)	N/A	943	2870	-	-	Linked from: B8b - Floor Flush Beam (Short), Support 2
4 - Point (lb)	N/A	-135	113/-630	-	-	Linked from: B9: Deck Flush Beam, Support 1

Lateral Load	Location	Tributary Width	Wind (1.60)	Comments
1 - Uniform (PSF)	Full Length	1'	25.9	

- ASCE/SEI 7 Sec. 30.4: Exposure Category (B), Mean Roof Height (33'), Topographic Factor (1.0), Wind Directionality Factor (0.85), Basic Wind Speed (115), Risk Category(II), Wind Zone (4), GCpi (+/- 0.18), Effective Wind Area determined using full member span and trib. width.
- IBC Table 1604.3, footnote f: Deflection checks are performed using 42% of this lateral wind load.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22 Data: V8.1.6.2
File Name: 21-127

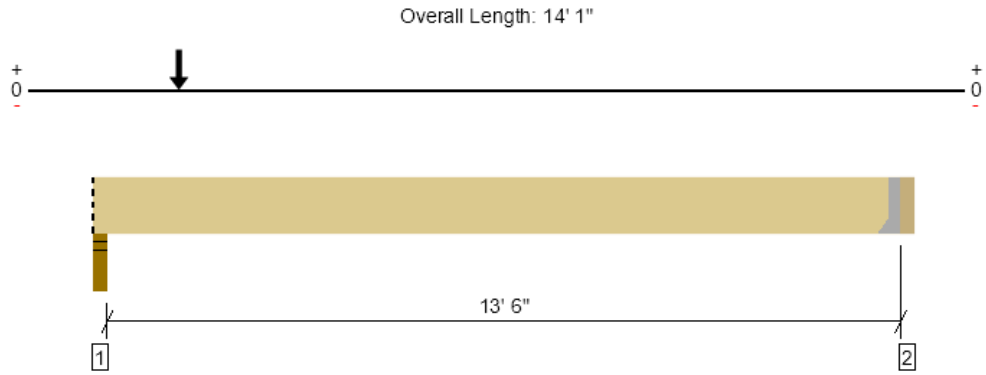
FORTEWEB

MEMBER REPORT

PASSED

Main Floor, B10 - Floor Flush Beam

1 piece(s) 6 3/4" x 9" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	11009 @ 2"	14766 (3.50")	Passed (75%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	10993 @ 1' 1/2"	12342	Passed (89%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-lbs)	14662 @ 1' 6"	20959	Passed (70%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.276 @ 6' 1/8"	0.454	Passed (L/593)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.458 @ 6' 9/16"	0.681	Passed (L/357)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 13' 9 1/2"
System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 13' 7 1/2".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Stud wall - DF	3.50"	3.50"	2.61"	4223	5178	3095	3869	11009	Blocking
2 - Hanger on 9" DF beam	3.50"	Hanger[1]	1.50"	548	562	336	420	1284	See note [1]

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	13' 10" o/c	
Bottom Edge (Lu)	13' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	HGUS6.88/10	4.00"	N/A	46-10d	16-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 13' 9 1/2"	N/A	14.8	--	--	--	
1 - Point (lb)	1' 6" (Top)	N/A	1595	-	2036	2545	Linked from: B1 - Roof Flush Beam, Support 2
2 - Point (lb)	1' 6" (Top)	N/A	1086	-	1395	1744	Linked from: B2 - Roof Flush Beam, Support 1
3 - Point (lb)	1' 6" (Top)	N/A	943	2870	-	-	Linked from: B8b - Floor Flush Beam (Short), Support 2
4 - Point (lb)	1' 6" (Top)	N/A	943	2870	-	-	Linked from: B8b - Floor Flush Beam (Short), Support 1

• Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

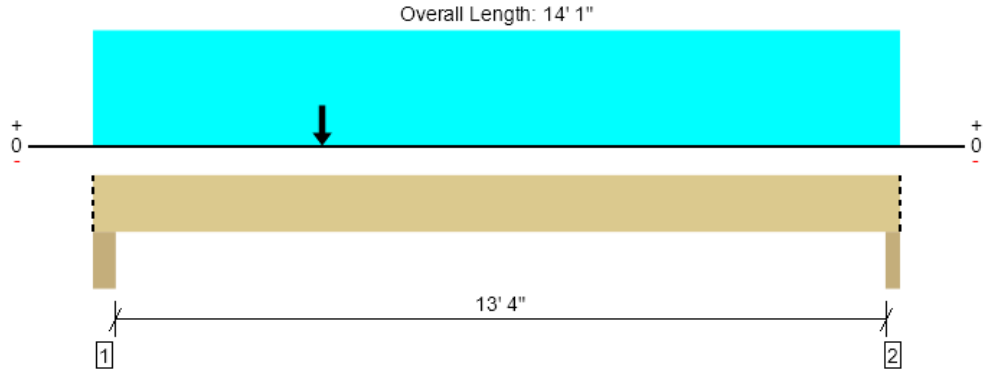
FORTEWEB

MEMBER REPORT

FAILED

Main Floor, B11 - (E)Floor Dropped Beam

1 piece(s) 5 1/2" x 13 1/2" 24F-V4 DF Glulam



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	12355 @ 4"	19663 (5.50")	Passed (63%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	10998 @ 1' 7"	13118	Passed (84%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	38729 @ 4'	33413	Failed (116%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.381 @ 6' 8 7/16"	0.453	Passed (L/428)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.590 @ 6' 8 3/16"	0.679	Passed (L/276)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 14' 1"
System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 13' 7".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Column - DF	5.50"	5.50"	3.46"	4409	7770	2260	2825	12355	Blocking
2 - Column - DF	3.50"	3.50"	2.16"	2435	5294	835	1044	7729	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6" o/c	
Bottom Edge (Lu)	14' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 14' 1"	N/A	18.0	--	--	--	
1 - Uniform (PSF)	0 to 14' 1" (Top)	14'	12.0	40.0	-	-	1/2 of Floor Load
2 - Point (lb)	4' (Top)	N/A	4223	5178	3095	3869	Linked from: B10 - Floor Flush Beam, Support 1

• Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

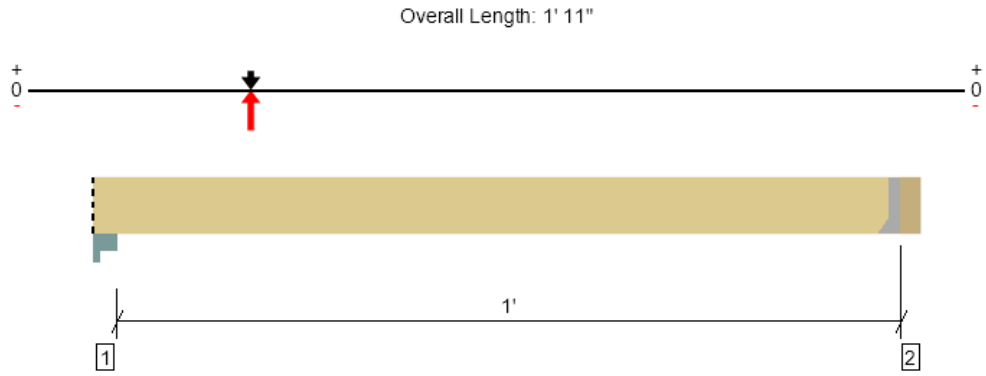
FORTEWEB

MEMBER REPORT

PASSED

Main Floor, B12 - Floor Blocking

1 piece(s) 4 x 10 HF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern) [Group]
Member Reaction (lbs)	5 @ 1' 6"	2126 (1.50")	Passed (0%)	--	1.0 D (All Spans) [1]
Shear (lbs)	3 @ 1' 3 1/4"	2914	Passed (0%)	0.90	1.0 D (All Spans) [1]
Moment (Ft-lbs)	1 @ 11 1/4"	3818	Passed (0%)	0.90	1.0 D (All Spans) [1]
Live Load Defl. (in)	0.000 @ 0	0.028	Passed (2L/999+)	--	1.0 D (All Spans) [1]
Total Load Defl. (in)	0.000 @ 0	0.056	Passed (2L/999+)	--	1.0 D (All Spans) [1]

Member Length : 1' 6"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- An excessive uplift of -3681 lbs detected at support located at 4 1/2".
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Column Cap - steel	6.00"	6.00"	1.50"	-1317	522/-604	-1793	-2364	-3681	Blocking
2 - Hanger on 9 1/4" DF beam	5.00"	Hanger[1]	1.50"	5	-	-	-	5	See note [1]

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	1' 6" o/c	
Bottom Edge (Lu)	1' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	LUS48	2.00"	N/A	6-10dx1.5	4-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 1' 6"	N/A	8.2	--	--	--	
1 - Point (lb)	4 1/2" (Top)	N/A	-1325	522/-604	-1793	-2364	Linked from: B7 - Deck Flush Beam w/ Posts, Support 2

- Side loads are assumed to not induce cross-grain tension.

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC

ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2

File Name: 21-127

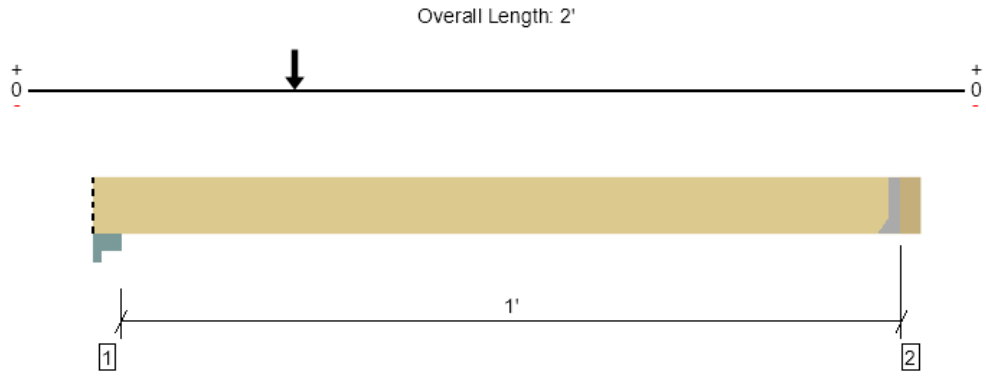
FORTEWEB

MEMBER REPORT

PASSED

Main Floor, B13 - Floor Blocking

1 piece(s) 4 x 10 HF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	10142 @ 5 1/2"	9923 (7.00")	Passed (102%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3 @ 1' 4 1/4"	2914	Passed (0%)	0.90	1.0 D (All Spans)
Moment (Ft-lbs)	1 @ 1' 1/4"	3818	Passed (0%)	0.90	1.0 D (All Spans)
Live Load Defl. (in)	0.000 @ 0	0.028	Passed (2L/999+)	--	1.0 D (All Spans)
Total Load Defl. (in)	0.000 @ 0	0.056	Passed (2L/999+)	--	1.0 D (All Spans)

Member Length : 1' 7"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Column Cap - steel	7.00"	7.00"	7.16"	4143	1559	4296	5999	10142	Blocking
2 - Hanger on 9 1/4" DF beam	5.00"	Hanger[1]	1.50"	5	-	-	-	5	See note [1]

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	1' 7" o/c	
Bottom Edge (Lu)	1' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	LUS48	2.00"	N/A	6-10dx1.5	4-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 1' 7"	N/A	8.2	--	--	--	
1 - Point (lb)	6" (Top)	N/A	4135	1559	4296	5999	Linked from: B7 - Deck Flush Beam w/ Posts, Support 3

- Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC

ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2

File Name: 21-127

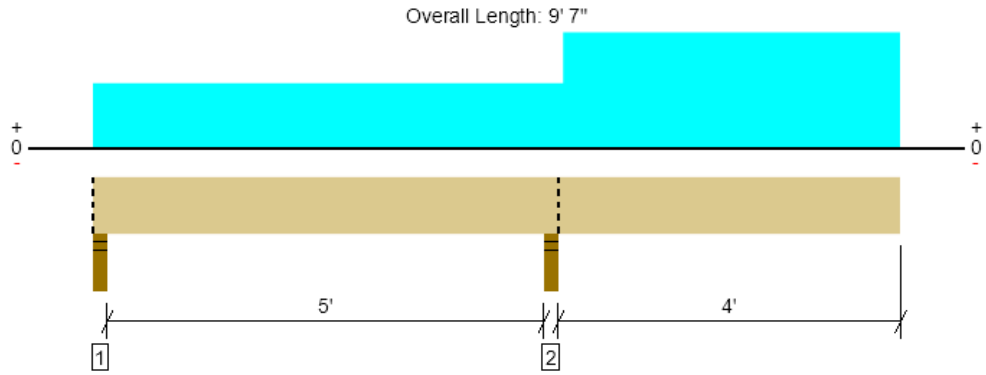
FORTEWEB

MEMBER REPORT

PASSED

Main Floor, B15 - Cantilevered Deck Beams

1 piece(s) 4 x 10 DF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2898 @ 5' 5 1/4"	7656 (3.50")	Passed (38%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1298 @ 6' 4 1/4"	3885	Passed (33%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-3453 @ 5' 5 1/4"	4492	Passed (77%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.147 @ 9' 7"	0.207	Passed (2L/678)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.179 @ 9' 7"	0.415	Passed (2L/556)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 9' 7"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Right cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -464 lbs uplift at support located at 2". Strapping or other restraint may be required.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.50"	49	448/-513	498/-464	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	679	2218	2898	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	9' 7" o/c	
Bottom Edge (Lu)	9' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 9' 7"	N/A	8.2	--	
1 - Uniform (PSF)	0 to 5' 7" (Top)	4'	15.0	40.0	Default Load
2 - Uniform (PSF)	5' 7" to 9' 7" (Top)	5' 3"	15.0	60.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

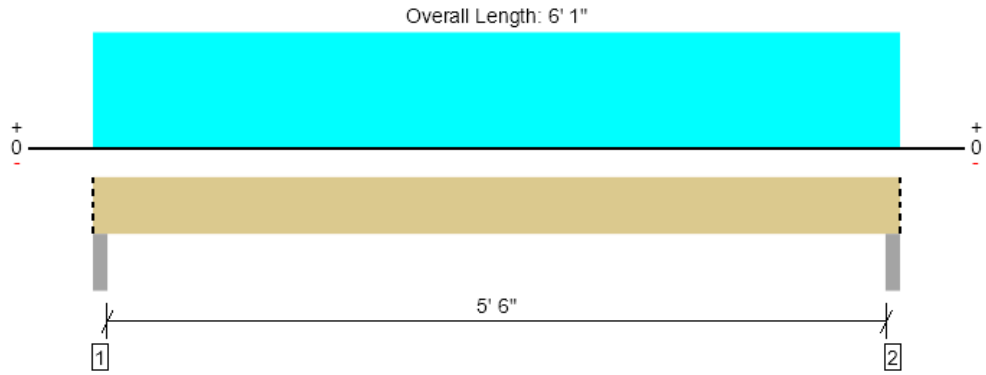
FORTEWEB

MEMBER REPORT

PASSED

Main Floor, B16 - Short Beam @ East Wall

1 piece(s) 4 x 8 DF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	876 @ 2"	7656 (3.50")	Passed (11%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	618 @ 10 3/4"	3045	Passed (20%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1190 @ 3' 1/2"	2989	Passed (40%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.014 @ 3' 1/2"	0.144	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.040 @ 3' 1/2"	0.287	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 6' 1"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - steel	3.50"	3.50"	1.50"	572	304	876	Blocking
2 - Column - steel	3.50"	3.50"	1.50"	572	304	876	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 1" o/c	
Bottom Edge (Lu)	6' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 6' 1"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 6' 1" (Top)	2' 6"	15.0	40.0	Roof
2 - Uniform (PSF)	0 to 6' 1" (Top)	12'	12.0	-	Wall

• Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

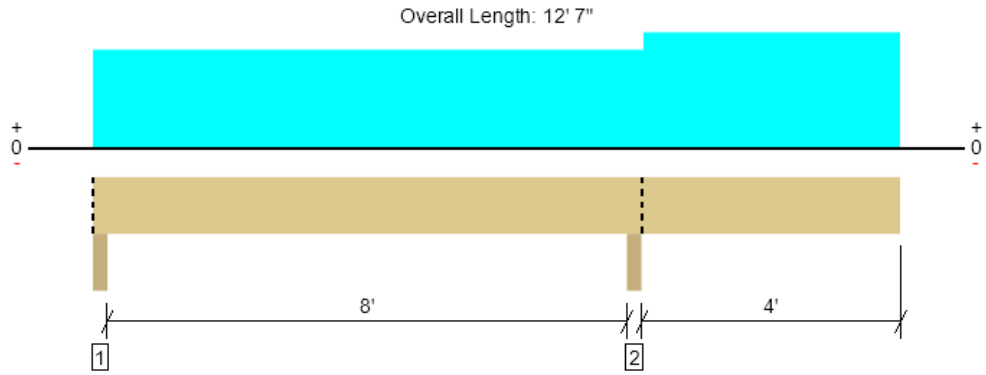
FORTEWEB

MEMBER REPORT

PASSED

Main Floor, B17 - Long Beam @ East Wall

1 piece(s) 4 x 10 DF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2952 @ 8' 5 1/4"	7656 (3.50")	Passed (39%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1285 @ 7' 6 1/4"	3885	Passed (33%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-2919 @ 8' 5 1/4"	4492	Passed (65%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.095 @ 12' 7"	0.207	Passed (2L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.128 @ 12' 7"	0.415	Passed (2L/778)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 12' 7"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - DF	3.50"	3.50"	1.50"	619	430/-156	1049	Blocking
2 - Column - DF	3.50"	3.50"	1.50"	1768	1184	2952	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	12' 7" o/c	
Bottom Edge (Lu)	12' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 12' 7"	N/A	8.2	--	
1 - Uniform (PSF)	0 to 8' 7" (Top)	2' 6"	15.0	40.0	Roof
2 - Uniform (PSF)	0 to 12' 7" (Top)	12'	12.0	-	Wall
3 - Uniform (PSF)	8' 7" to 12' 7" (Top)	2' 6"	15.0	60.0	Roof

• Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

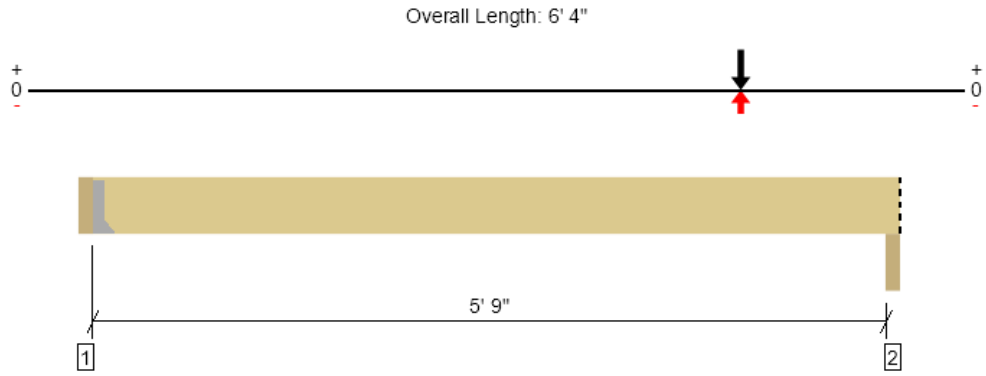
FORTEWEB

MEMBER REPORT

PASSED

Main Floor, B18: Beam @ P9

1 piece(s) 4 x 10 DF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern) [Group]
Member Reaction (lbs)	4046 @ 6' 2"	7656 (3.50")	Passed (53%)	--	1.0 D + 0.75 L + 0.75 S (All Spans) [1]
Shear (lbs)	3579 @ 5' 3 1/4"	3885	Passed (92%)	1.00	1.0 D + 1.0 L (All Spans) [1]
Moment (Ft-lbs)	3880 @ 5' 1"	4492	Passed (86%)	1.00	1.0 D + 1.0 L (All Spans) [1]
Live Load Defl. (in)	0.038 @ 3' 7 3/16"	0.147	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans) [1]
Total Load Defl. (in)	0.053 @ 3' 7 3/16"	0.294	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans) [1]

Member Length : 6' 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Hanger on 9 1/4" DF beam	3.50"	Hanger[1]	1.50"	279	550/-116	257/-134	322/-167	933	See note [1]
2 - Beam - DF	3.50"	3.50"	1.85"	1155	2433/-514	1138/-593	1422/-741	4046	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 1" o/c	
Bottom Edge (Lu)	6' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LUS48	2.00"	N/A	6-10dx1.5	4-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	3 1/2" to 6' 4"	N/A	8.2	--	--	--	
1 - Point (lb)	5' 1" (Top)	N/A	2055/-671	2983/-630	1395/-727	1744/-908	Linked from: P9: Post @ B8b & B9, Support 1

- Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC

ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2

File Name: 21-127

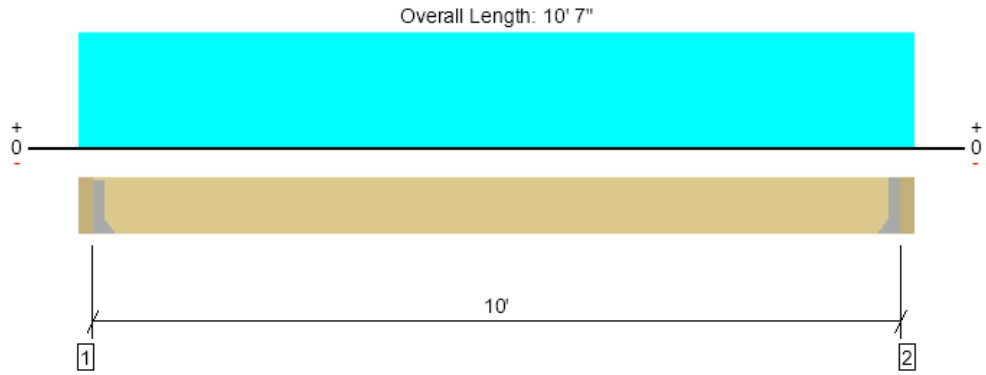
FORTEWEB

MEMBER REPORT

PASSED

Main Floor, J4 - Deck Joist

1 piece(s) 2 x 8 DF No.2 @ 16" OC



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	500 @ 3 1/2"	1406 (1.50")	Passed (36%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	440 @ 10 3/4"	1305	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1250 @ 5' 3 1/2"	1360	Passed (92%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.236 @ 5' 3 1/2"	0.250	Passed (L/508)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.295 @ 5' 3 1/2"	0.500	Passed (L/406)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

Member Length : 10'
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 7 1/4" DF beam	3.50"	Hanger[1]	1.50"	106	423	529	See note [1]
2 - Hanger on 7 1/4" DF beam	3.50"	Hanger[1]	1.50"	106	423	529	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 1" o/c	
Bottom Edge (Lu)	10' o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LU26	1.50"	N/A	6-10dx1.5	4-10dx1.5	
2 - Face Mount Hanger	LU26	1.50"	N/A	6-10dx1.5	4-10dx1.5	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 10' 7"	16"	15.0	60.0	Default Load

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

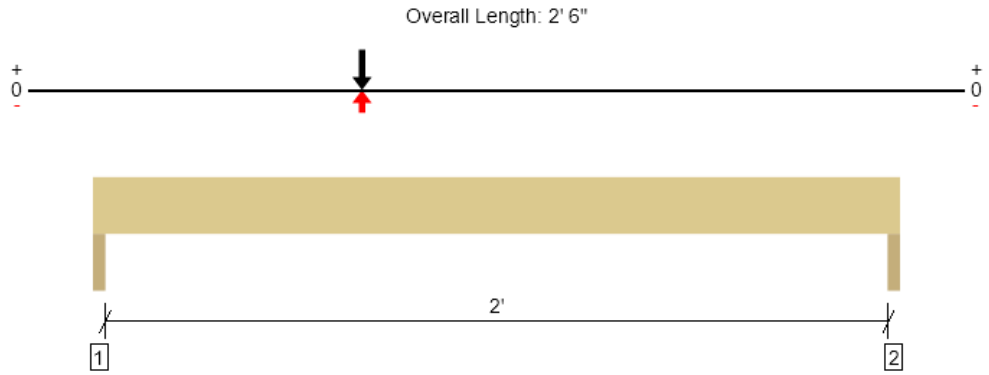
FORTEWEB

MEMBER REPORT

PASSED

Main Floor, H7 - Header Supporting B18

2 piece(s) 2 x 8 DF No.2



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern) [Group]
Member Reaction (lbs)	2779 @ 1 1/2"	5625 (3.00")	Passed (49%)	--	1.0 D + 0.75 L + 0.75 S (All Spans) [1]
Shear (lbs)	2376 @ 10 1/4"	2610	Passed (91%)	1.00	1.0 D + 1.0 L (All Spans) [1]
Moment (Ft-lbs)	1744 @ 10"	2365	Passed (74%)	1.00	1.0 D + 1.0 L (All Spans) [1]
Live Load Defl. (in)	0.006 @ 1' 2 7/16"	0.075	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans) [1]
Total Load Defl. (in)	0.009 @ 1' 2 7/16"	0.112	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans) [1]

Member Length : 2' 6"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Factored	
1 - Trimmer - DF	3.00"	3.00"	1.50"	798	1667/-352	780/-406	974/-508	2779	None
2 - Trimmer - DF	3.00"	3.00"	1.50"	370	766/-162	358/-187	448/-233	1281	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	2' 6" o/c	
Bottom Edge (Lu)	2' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 2' 6"	N/A	5.5	--	--	--	
1 - Point (lb)	10"	N/A	1155	2433/-514	1138/-593	1422/-741	Linked from: B18: Beam @ P9, Support 2

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

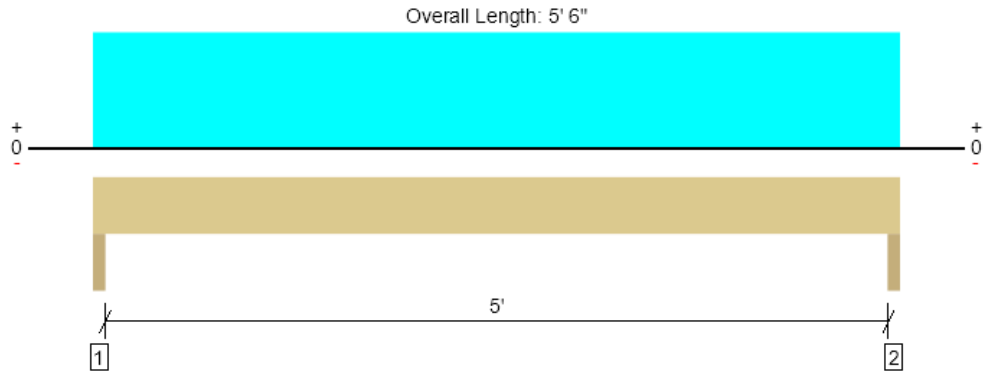
FORTEWEB

MEMBER REPORT

PASSED

Main Floor, H8 - (E)Header

1 piece(s) 4 x 8 DF No.1



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1967 @ 1 1/2"	6563 (3.00")	Passed (30%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1356 @ 10 1/4"	3045	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2464 @ 2' 9"	3322	Passed (74%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.049 @ 2' 9"	0.175	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.065 @ 2' 9"	0.262	Passed (L/974)	--	1.0 D + 1.0 L (All Spans)

Member Length : 5' 6"
System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Trimmer - DF	3.00"	3.00"	1.50"	482	1485	1967	None
2 - Trimmer - DF	3.00"	3.00"	1.50"	482	1485	1967	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 6" o/c	
Bottom Edge (Lu)	5' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 5' 6"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 5' 6"	6' 9"	15.0	40.0	Default Load
2 - Uniform (PSF)	0 to 5' 6"	4' 6"	15.0	60.0	Deck

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Allen Rishel NKH Engineering (206) 641-1733 allen@nkhengineering.com	

Weyerhaeuser

6/13/2024 5:42:37 PM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: 21-127

Project Title: Faben Point Home
Engineer: NKH
Project ID: 21-127
Project Descr:

Steel Beam

Project File: Steel Framing.ec6

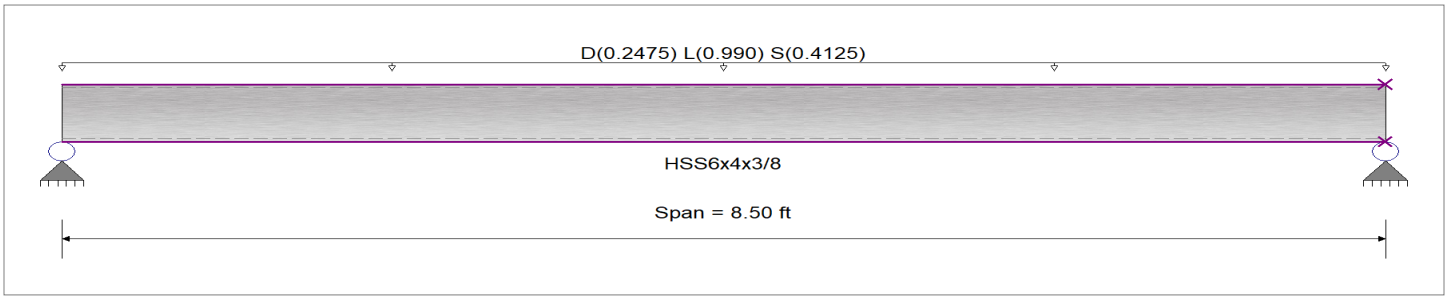
DESCRIPTION: Typ HSS Header

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling	E: Modulus :	29,000.0 ksi
Bending Axis :	Minor Axis Bending		



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.0150, L = 0.060, S = 0.0250 ksf, Tributary Width = 16.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.535 : 1	Maximum Shear Stress Ratio =	0.152 : 1
Section used for this span	HSS6x4x3/8	Section used for this span	HSS6x4x3/8
Ma : Applied	11.937 k-ft	Va : Applied	5.617 k
Mn / Omega : Allowable	22.305 k-ft	Vn/Omega : Allowable	37.027 k
Load Combination	+D+0.750L+0.750S	Load Combination	+D+0.750L+0.750S
		Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.270 in	Ratio =	377	>=360.	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360.0	n/a
Max Downward Total Deflection	0.361 in	Ratio =	283	>=240.	Span: 1 : +D+0.750L+0.750S
Max Upward Total Deflection	0 in	Ratio =	0	<240.0	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mny	Mny/Omega	Cb	Rm	Summary of Shear Values Va Max	VnyVny/Omega
D Only												
Dsgn. L = 8.50 ft	1	0.109	0.031	2.44		2.44	37.25	22.31	1.00	1.00	1.15	61.84 37.03
+D+L												
Dsgn. L = 8.50 ft	1	0.510	0.145	11.38		11.38	37.25	22.31	1.00	1.00	5.35	61.84 37.03
+D+S												
Dsgn. L = 8.50 ft	1	0.276	0.078	6.16		6.16	37.25	22.31	1.00	1.00	2.90	61.84 37.03
+D+0.750L												
Dsgn. L = 8.50 ft	1	0.410	0.116	9.14		9.14	37.25	22.31	1.00	1.00	4.30	61.84 37.03
+D+0.750L+0.750S												
Dsgn. L = 8.50 ft	1	0.535	0.152	11.94		11.94	37.25	22.31	1.00	1.00	5.62	61.84 37.03
+0.60D												
Dsgn. L = 8.50 ft	1	0.066	0.019	1.46		1.46	37.25	22.31	1.00	1.00	0.69	61.84 37.03

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.3609	4.274		0.0000	0.000

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	5.617	5.617
Max Upward from Load Combinations	5.617	5.617
Max Upward from Load Cases	4.208	4.208

Steel Beam

DESCRIPTION: Typ HSS Header

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
D Only	1.147	1.147
+D+L	5.354	5.354
+D+S	2.900	2.900
+D+0.750L	4.303	4.303
+D+0.750L+0.750S	5.617	5.617
+0.60D	0.688	0.688
L Only	4.208	4.208
S Only	1.753	1.753

Project Title: Faben Point Home
Engineer: NKH
Project ID: 21-127
Project Descr:

Steel Column

Project File: Steel Framing.ec6

DESCRIPTION: HSS Post/Mullions

Code References

Calculations per AISC 360-16, IBC 2021, CBC 2022, ASCE 7-22
Load Combinations Used : ASCE 7-22

General Information

Steel Section Name : **HSS3-1/2x3-1/2x1/4**

Analysis Method :	Allowable Strength
Steel Stress Grade	
Fy : Steel Yield	46.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height	10.0 ft
Top & Bottom Fixity	Top & Bottom Pinned
Brace condition :	

Fully braced against buckling ABOUT X-X Axis
Unbraced Length for buckling ABOUT Y-Y Axis = 10 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 105.10 lbs * Dead Load Factor
AXIAL LOADS . . .
HSS Headers: Axial Load at 10.0 ft, D = 1.860, L = 7.450, S = 3.10 k
BENDING LOADS . . .
Lat. Uniform Load creating Mx-x, W = 0.2550 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.3736** : 1

Load Combination	+D+0.750L+0.750S+0.450W	
Location of max.above base	5.034	ft
At maximum location values are . . .		
Pa : Axial	9.878	k
Pn / Omega : Allowable	45.972	k
Ma-x : Applied	1.434	k-ft
Mn-x / Omega : Allowable	8.034	k-ft
Ma-y : Applied	0.0	k-ft
Mn-y / Omega : Allowable	8.034	k-ft

PASS Maximum Shear Stress Ratio = **0.03546** : 1

Load Combination	+D+0.60W	
Location of max.above base	0.0	ft
At maximum location values are . . .		
Va : Applied	0.7650	k
Vn / Omega : Allowable	21.572	k

Maximum Load Reactions . .

Top along X-X	0.0 k
Bottom along X-X	0.0 k
Top along Y-Y	1.275 k
Bottom along Y-Y	1.275 k

Maximum Load Deflections . . .

Along Y-Y 0.3968 in at 5.034 ft above base
for load combination : W Only

Along X-X 0.0 in at 0.0 ft above base
for load combination :

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Ry	KyLy/Rx	Maximum Shear Ratios: Stress Ratio	Status	Location
D Only	0.043	PASS	0.00 ft	1.00	1.00	0.00	90.91	0.000	PASS	0.00 ft
+D+L	0.205	PASS	0.00 ft	1.00	1.00	0.00	90.91	0.000	PASS	0.00 ft
+D+S	0.110	PASS	0.00 ft	1.00	1.00	0.00	90.91	0.000	PASS	0.00 ft
+D+0.750L	0.164	PASS	0.00 ft	1.00	1.00	0.00	90.91	0.000	PASS	0.00 ft
+D+0.750L+0.750S	0.215	PASS	0.00 ft	1.00	1.00	0.00	90.91	0.000	PASS	0.00 ft
+D+0.60W	0.259	PASS	4.97 ft	1.00	1.00	0.00	90.91	0.035	PASS	0.00 ft
+D+0.750L+0.450W	0.261	PASS	5.03 ft	1.00	1.00	0.00	90.91	0.027	PASS	0.00 ft
+D+0.750L+0.750S+0.450	0.374	PASS	5.03 ft	1.00	1.00	0.00	90.91	0.027	PASS	0.00 ft
+0.60D+0.60W	0.251	PASS	4.97 ft	1.00	1.00	0.00	90.91	0.035	PASS	0.00 ft
+0.60D	0.026	PASS	0.00 ft	1.00	1.00	0.00	90.91	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments @ Base	Mx - End Moments @ Top	My - End Moments @ Base	My - End Moments @ Top
	k					k-ft			
D Only	1.965								
+D+L	9.415								
+D+S	5.065								
+D+0.750L	7.553								

Project Title: Faben Point Home
Engineer: NKH
Project ID: 21-127
Project Descr:

Steel Column

Project File: Steel Framing.ec6

DESCRIPTION: HSS Post/Mullions

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
+D+0.750L+0.750S	9.878									
+D+0.60W	1.965				0.765	0.765				
+D+0.750L+0.450W	7.553				0.574	0.574				
+D+0.750L+0.750S+0.450W	9.878				0.574	0.574				
+0.60D+0.60W	1.179				0.765	0.765				
+0.60D	1.179									
L Only	7.450									
S Only	3.100									
W Only					1.275	1.275				

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
Axial @ Base	Maximum	9.878									
"	Minimum					1.275	1.275				
Reaction, X-X Axis Base	Maximum	1.965									
"	Minimum	1.965									
Reaction, Y-Y Axis Base	Maximum					1.275	1.275				
"	Minimum	1.965									
Reaction, X-X Axis Top	Maximum	1.965									
"	Minimum	1.965									
Reaction, Y-Y Axis Top	Maximum	1.965									
"	Minimum	1.965									
Moment, X-X Axis Base	Maximum	1.965									
"	Minimum	1.965									
Moment, Y-Y Axis Base	Maximum	1.965									
"	Minimum	1.965									
Moment, X-X Axis Top	Maximum	1.965									
"	Minimum	1.965									
Moment, Y-Y Axis Top	Maximum	1.965									
"	Minimum	1.965									

Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance
D Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+S	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750L+0.750S	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.60W	0.0000 in	0.000 ft	0.238 in	5.034 ft
+D+0.750L+0.450W	0.0000 in	0.000 ft	0.179 in	5.034 ft
+D+0.750L+0.750S+0.450W	0.0000 in	0.000 ft	0.179 in	5.034 ft
+0.60D+0.60W	0.0000 in	0.000 ft	0.238 in	5.034 ft
+0.60D	0.0000 in	0.000 ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
S Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
W Only	0.0000 in	0.000 ft	0.397 in	5.034 ft

Steel Section Properties : HSS3-1/2x3-1/2x1/4

Steel Section Properties : HSS3-1/2x3-1/2x1/4

Project Title: Faben Point Home
Engineer: NKH
Project ID: 21-127
Project Descr:

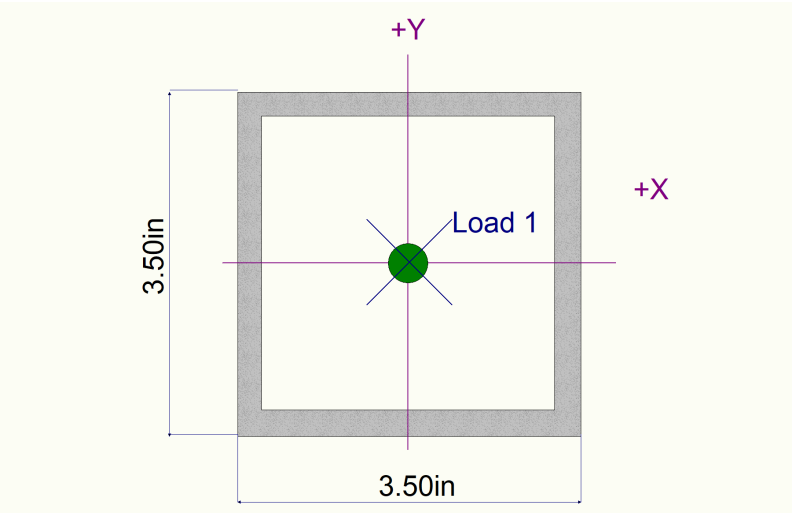
Steel Column

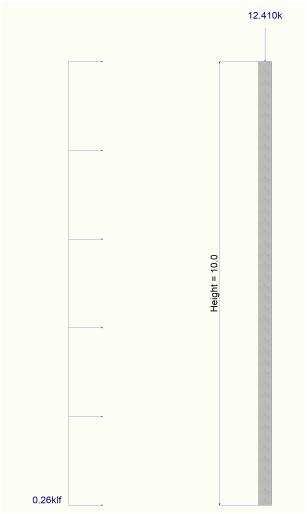
Project File: Steel Framing.ec6

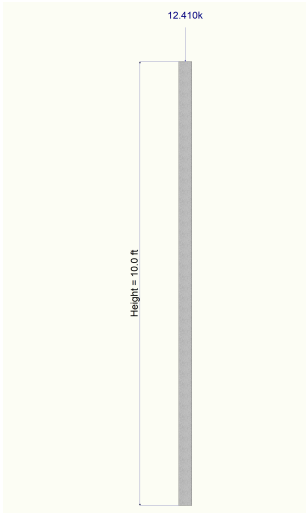
DESCRIPTION: HSS Post/Mullions

Depth	=	3.500	in	I xx	=	5.04	in^4	J	=	8.350	in^4
Design Thick	=	0.233	in	S xx	=	2.88	in^3				
Width	=	3.500	in	R xx	=	1.320	in				
Wall Thick	=	0.250	in	Zx	=	3.500	in^3				
Area	=	2.910	in^2	I yy	=	5.040	in^4	C	=	4.920	in^3
Weight	=	10.510	plf	S yy	=	2.880	in^3				
				R yy	=	1.320	in				
Ycg	=	0.000	in								

Sketches







NKH ENGINEERING

Project Title: Faben Point Home
Engineer: NKH
Project ID: 21-127
Project Descr:

Cantilevered Retaining Wall

Project File: Steel Framing & Ret Walls.ec6

DESCRIPTION: Site Retaining Walls

Code Reference

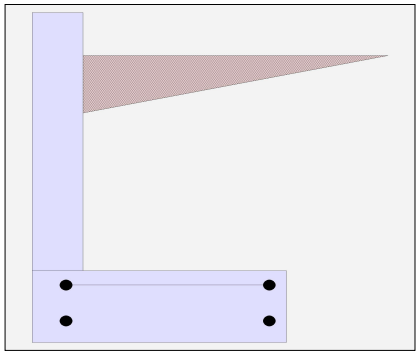
Calculations per IBC 2021, CBC 2022, ASCE 7-22

Criteria

Retained Height	=	2.50 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	600.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

NKH ENGINEERING

Project Title: Faben Point Home
Engineer: NKH
Project ID: 21-127
Project Descr:

Cantilevered Retaining Wall

Project File: Steel Framing & Ret Walls.ec6

DESCRIPTION: Site Retaining Walls

Design Summary

Wall Stability Ratios

Overturning	=	6.88	OK
Sliding	=	2.91	OK
Global Stability	=	4.19	

Total Bearing Load	=	1,173	lbs
...resultant ecc.	=	0.98	in

Eccentricity within middle third

Soil Pressure @ Toe	=	520 psf	OK
Soil Pressure @ Heel	=	350 psf	OK
Allowable	=	600 psf	

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	729 psf	
ACI Factored @ Heel	=	489 psf	
Footing Shear @ Toe	=	0.0 psi	OK
Footing Shear @ Heel	=	0.8 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	194.4 lbs	
less 100% Passive Force	-	97.2 lbs	
less 100% Friction Force	-	469.3 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

Vertical component of active lateral soil pressure IS considered in the calculation of soil bearing pressures.

Load Factors

Building Code	
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	SD
Thickness	=	6.00
Rebar Size	=	# 4
Rebar Spacing	=	18.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	**0.059**
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	175.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	145.8
Moment.....Allowable	=	2,432.0
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	3.4
Shear.....Allowable	psi =	67.1
Anet (Masonry)	in2 =	
Wall Weight	psf =	75.0
Rebar Depth 'd'	in =	4.25

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,000.0
Fy	psi =	60,000.0

NKH ENGINEERING

Project Title: Faben Point Home
Engineer: NKH
Project ID: 21-127
Project Descr:

Cantilevered Retaining Wall

Project File: Steel Framing & Ret Walls.ec6

DESCRIPTION: Site Retaining Walls

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0082 in2/ft		
(4/3) * As :	0.011 in2/ft	Min Stem T&S Reinf Area 0.432 in2	
200bd/fy : 200(12)(4.25)/60000 :	0.17 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.144 in2/ft	
0.0018bh : 0.0018(12)(6) :	0.1296 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1296 in2/ft	#4@ 16.67 in	#4@ 33.33 in
Provided Area :	0.1333 in2/ft	#5@ 25.83 in	#5@ 51.67 in
Maximum Area :	0.4606 in2/ft	#6@ 36.67 in	#6@ 73.33 in

Footing Data

Toe Width	=	0.00 ft
Heel Width	=	2.50
Total Footing Width	=	2.50
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	729	489	psf
Mu' : Upward	=	0	1,106	ft-#
Mu' : Downward	=	0	1,235	ft-#
Mu: Design	=	0 OK	128	ft-# OK
phiMn	=	OK - Flush	7,286	
Actual 1-Way Shear	=	0.00	0.81	psi
Allow 1-Way Shear	=	0.00	75.00	psi

Toe Reinforcing = Flush toe condition. No reinforcing required.
Heel Reinforcing = # 4 @ 11.11 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: Flush toe condition. No reinforcing required.

Heel: #4@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 55.55 in, #10@ 70.55 in

Key: No key defined

Min footing T&S reinf Area 0.54 in2
Min footing T&S reinf Area per foot 0.22 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 11.11 in	#4@ 22.22 in
#5@ 17.22 in	#5@ 34.44 in
#6@ 24.44 in	#6@ 48.89 in

NKH ENGINEERING

Project Title: Faben Point Home
Engineer: NKH
Project ID: 21-127
Project Descr:

Cantilevered Retaining Wall

Project File: Steel Framing & Ret Walls.ec6

DESCRIPTION: Site Retaining Walls

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	194.4	1.11	216.0			
HL Act Pres (be water tbl)						
Hydrostatic Force						
Buoyant Force =						
Surcharge over Heel =						
Surcharge Over Toe =						
Adjacent Footing Load =						
Added Lateral Load =						
Load @ Stem Above Soil =						
=						
				Soil Over HL (ab. water tbl)	550.0	1.50	825.0
				Soil Over HL (bel. water tbl)		1.50	825.0
				Water Table			
				Sloped Soil Over Heel =			
				Surcharge Over Heel =			
				Adjacent Footing Load =			
				Axial Dead Load on Stem =			
				* Axial Live Load on Stem =			
				Soil Over Toe =			
				Surcharge Over Toe =			
				Stem Weight(s) =	225.0	0.25	56.3
				Earth @ Stem Transitions =			
				Footing Weight =	312.5	1.25	390.6
				Key Weight =			
				Vert. Component =	85.8	2.50	214.6
Total =	194.4	**O.T.M.** =	216.0	**Total =**	1,173.3 lbs	**R.M.=**	1,486.5

Resisting/Overturning Ratio = **6.88**

Vertical Loads used for Soil Pressure = 1,173.3 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.017	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

Cantilevered Retaining Wall

DESCRIPTION: Site Retaining Walls

Rebar Lap & Embedment Lengths Information

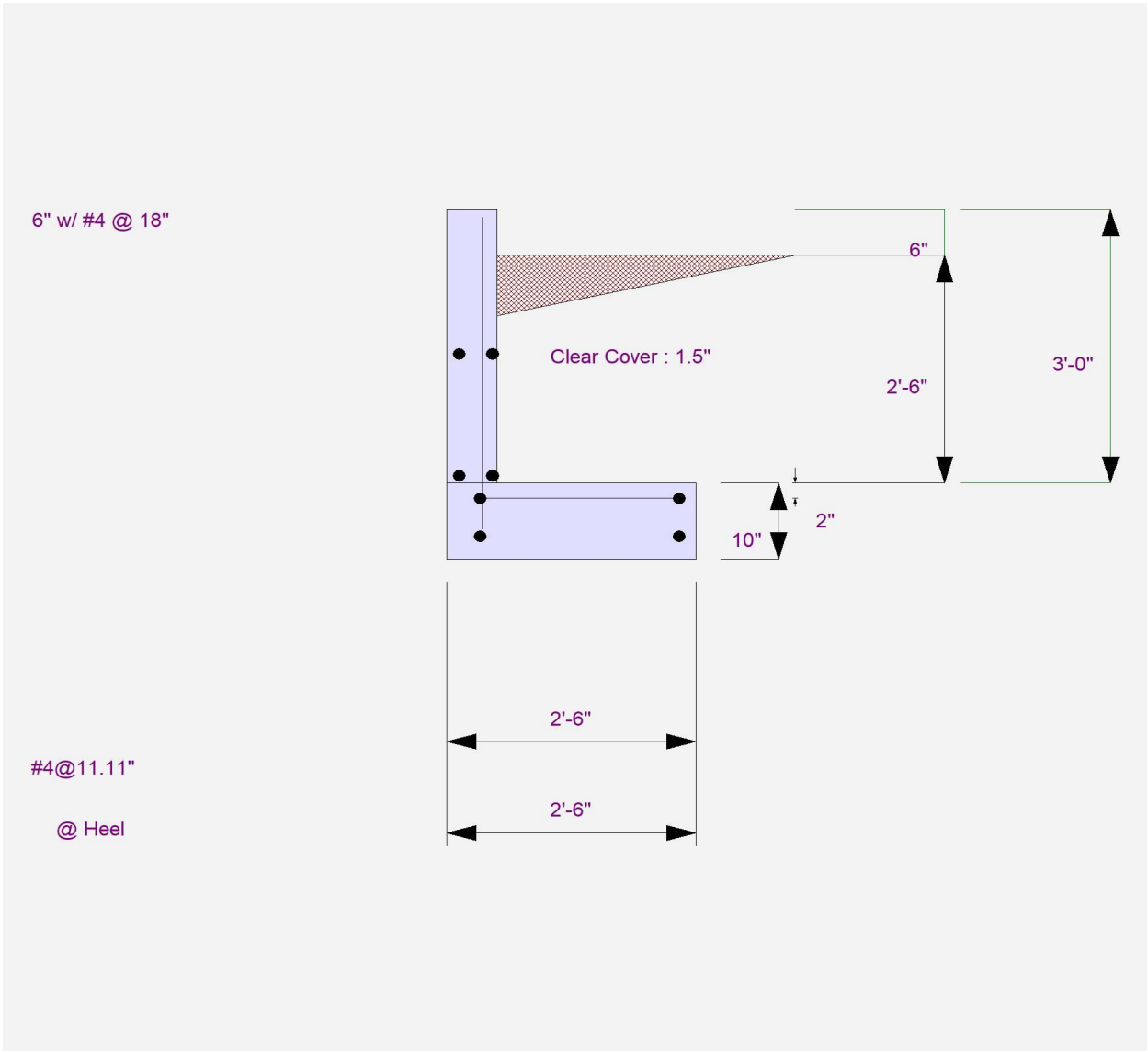
Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.3a) =	20.93 in
Development length for #4 bar specified in this stem design segment =	16.10 in
Hooked embedment length into footing for #4 bar specified in this stem design segment =	8.40 in
As Provided =	0.1333 in2/ft
As Required =	0.1296 in2/ft

Cantilevered Retaining Wall

DESCRIPTION: Site Retaining Walls



Cantilevered Retaining Wall

DESCRIPTION: Site Retaining Walls