BRIAN J. SIELAFF, P.E.

STRUCTURAL ENGINEERING CALCULATIONS

FOR

WOODHOUSE: THE TIMBER FRAME COMPANY

SHANLEY RESIDENCE

OAK CREEK, COLORADO

TGE PROJECT NUMBER: 23-22846

COLORADO LICENSED
BRIAN JAMES SIELAFF
PE.0041126
PROFESSIONAL ENGINEER

04/22/2025

TABLE OF CONTENTS

1 PROJECT INFORMATION

Tamarack Grove Engineering Information:

- Company Address: 851 N Hickory Ave Suite 200. Meridian, ID 83642
- Date: 22 April 2025
- Firm Registration Number: 20151163829 for Colorado
- Engineer of Record: Brian J. Sielaff, P.E.
- Project Manager: J. Brendon Collins, E.I.
- Direct Phone: 208.908.7874
- Direct Email: Brendon.collins@tamarackgrove.com

Project Client Information:

- Company: Woodhouse: The Timber Frame Company
- Contact: Todd Mahosky
- Address: 3295 Route 549, PO Box 219, Mansfield, PA 16933
- Phone: 570-549-6232
- Logo:

Project Information:

- Name: Shanley Residence
- Address: 24660 Creek Ranch Road, Oak Creek, CO 80467
- Local Jurisdiction: Routt County
- Enforced Code Used: International Building Code 2021
- Jurisdictional Contact Information: https://www.co.routt.co.us/787/Town-of-Oak-Creek
- Scope of Work:

1. Structural calculations for full gravity/lateral load path analysis.
2. Structural calculations for timber member elements, joinery, and fastener connections associated with gravity and open wind load analysis.
3. Redlines drawings provided by Client.

2 DESIGN CRITERIA

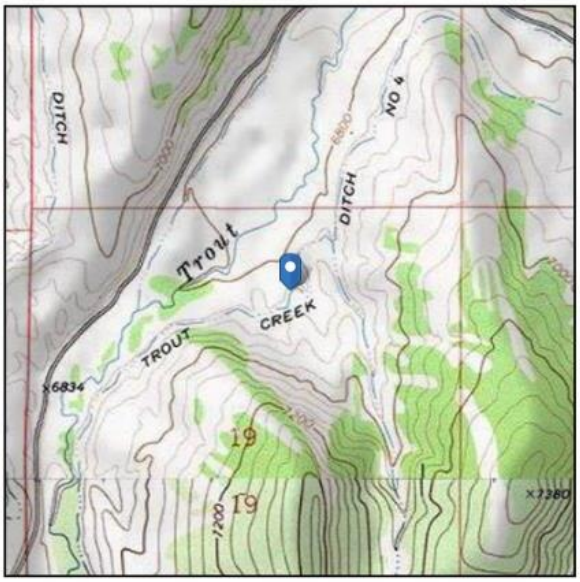
ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS

ASCE Hazards Report

Address:
24660 Creek Ranch Rd
Oak Creek, Colorado
80467

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Default (see Section 11.4.3)

Latitude: 40.380919
Longitude: -106.964393
Elevation: 6852.856952959394 ft (NAVD 88)



Wind

Results:

Wind Speed	105 Vmph
10-year MRI	76 Vmph
25-year MRI	83 Vmph
50-year MRI	87 Vmph
100-year MRI	92 Vmph

Data Source:	ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed:	Thu Feb 01 2024

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS

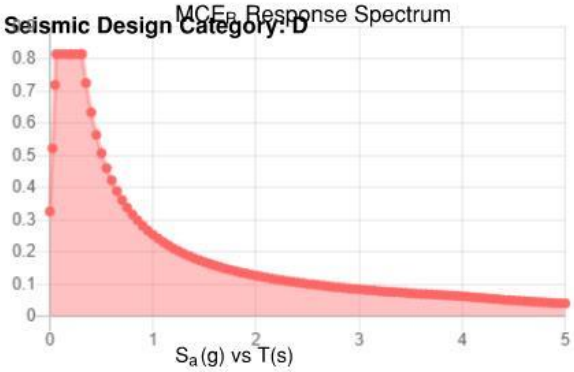
Seismic

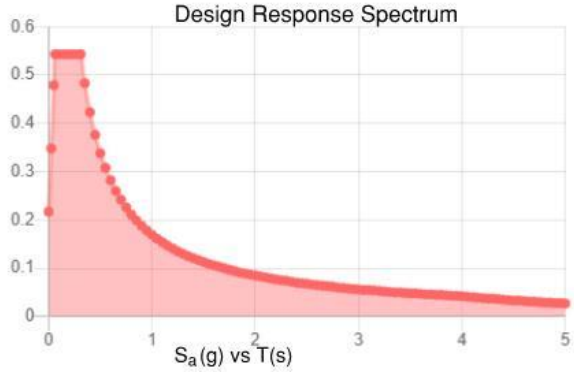
Site Soil Class: D - Default (see Section 11.4.3)

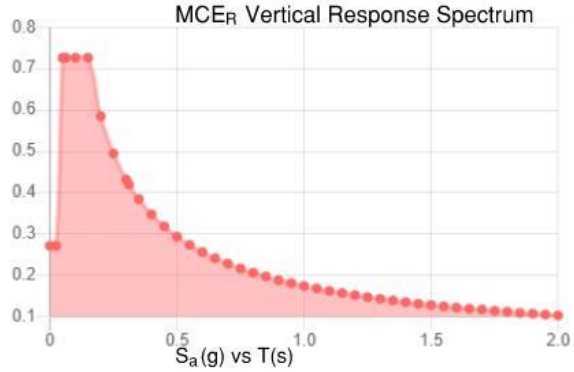
Results:

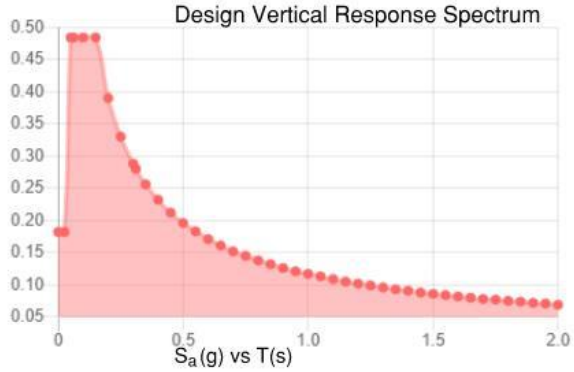
S_S :	0.628	S_{D1} :	0.169
S_1 :	0.106	T_L :	4
F_a :	1.298	PGA :	0.445
F_v :	2.387	PGA_M :	0.534
S_{MS} :	0.815	F_{PGA} :	1.2
S_{M1} :	0.254	I_e :	1
S_{DS} :	0.543	C_v :	1.114

Seismic Design Category: D









Data Accessed: **Thu Feb 01 2024**

Date Source:
USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

3 STRUCTURAL ENGINEERING CALCULATIONS

GRAVITY LOAD DESIGN CRITERIA

$DL_{roof} := 18\ psf$ — Roof dead load

$LL_{roof} := 20\ psf$ — Roof live load (IBC Table 1607.1, occupancy 26)

$DL_{floor1} := 12\ psf$ — Floor dead load

$DL_{floor} := 25\ psf$ — 2nd Floor dead load

$LL_{floor} := 40\ psf$ — Floor live load (IBC Table 1607.1, occupancy 25)

$DL_{deck} := 10\ psf$ — Deck dead load

$LL_{deck} := 1.5 \cdot LL_{floor} = 60\ psf$ — Deck live load (IBC Table 1607.1, occupancy 5)

$DL_{wall} := 12\ psf$ — Wall dead load (2x6 @ 16" O.C.+Sheathing)

$DL_{sip\_wall} := 3.95\ psf$ — SIP Wall dead load

SNOW LOAD CALCULATION

$p_g := 90.43\ psf$ — Ground snow load

$\theta := 14\ °$ — Roof slope angle, degrees

$C_e := 1.0$ — Exposure factor (ASCE Table 7.3-1, Surface B, Partially Exposed)

$C_t := 1.0$ — Thermal factor (ASCE Table 7.3-2, All structures)

$R_c := \text{"II"}$ — Risk category

$I_s := \text{if}\left(R_c = \text{"I"}, 0.8, \text{if}\left(R_c = \text{"II"}, 1.0, \text{if}\left(R_c = \text{"III"}, 1.25, 1.5\right)\right)\right) = 1$ — Snow importance factor (ASCE Table 1.5-2)

$p_f := 0.7 \cdot C_e \cdot C_t \cdot I_s \cdot p_g = 63.3\ psf$ — Flat roof snow load (ASCE sec. 7.3)

$p_m := \text{if}\left(p_g \le 20\ psf, I_s \cdot p_g, I_s \cdot 20\ psf\right) = 20\ psf$ — Minimum snow load for low-slope roofs (ASCE sec. 7.3.4)

$W_{roof} := 16\ ft$ — Horizontal distance from eave to ridge

$p_{rain} := \text{if}\left(p_g \le 20\ psf, \text{if}\left(\frac{W_{roof}}{50\ ft} < \frac{\theta}{1\ °}, 5\ psf, 0\ psf\right), 0\ psf\right) = 0\ psf$ — Rain-on-snow surcharge load (ASCE sec. 7.10)

$C_s := \text{if}\left(0\ ° \le \theta \le 30\ °, 1.0, \text{if}\left(30\ ° < \theta \le 70\ °, 1 - \frac{\theta - 30\ °}{40\ °}, 0\right)\right) = 1$ — Slope factor (ASCE sec. C7.4, Ct=1.0, All other surfaces)

$p_s := \text{if}\left(p_g \le 20\ psf, C_s \cdot p_f + p_{rain}, C_s \cdot p_f\right) = 63.3\ psf$ — Sloped roof snow load (ASCE sec. 7.4)

$p_{min} := 0\ psf$ — Minimum roof snow load by Jurisdiction (use "0 psf" if not specified)

$p_{snow} := \max\left(\text{if}\left(\theta \le 15\ ^\circ, \max\left(p_s, p_m\right), p_s\right), p_{min}\right) = 63.3\ \text{psf}$ Design roof snow load

LATERAL LOAD DESIGN CRITERIA - WIND

WIND PARAMETERS:

$V := 105\ \text{mph}$ Ultimate wind speed

$h_e := 23\ \text{ft}$ Eave height (top plate)

B Exposure category (ASCE sec. 26.7)

$h := 33\ \text{ft}$ Highest height of roof (ridge height)

$R_c = \text{"II"}$ Risk category

$\theta = 0.24$ Roof slope angle, degrees

$h_{mean} := \text{if}\left(\theta \le 10^\circ, h_e, \frac{h_e + h}{2}\right) = 28\ \text{ft}$ Mean roof height (ASCE 26.2)

$\alpha := 7$ 3-Sec gust-speed power law exponent (ASCE Table 26.11-1, Exposure B)

$z_g := 1200\ \text{ft}$ Nominal height of the atmospheric boundary (ASCE Table 26.11-1, Exposure B)

$K_z := \text{if}\left(h_{mean} \le 15\ \text{ft}, 2.01 \cdot \left(\frac{15\ \text{ft}}{z_g}\right)^{\frac{2}{\alpha}}, 2.01 \cdot \left(\frac{h_{mean}}{z_g}\right)^{\frac{2}{\alpha}}\right) = 0.69$ Velocity pressure exposure coefficient (ASCE Table 26.10-1, footnote 1)

$K_{zt} := 1.0$ Topographic factor (ASCE sec. 26.8.2)

$K_d := 0.85$ Wind directionality factor (ASCE Table 26.6-1, Buildings, MWFRS)

$K_e := 1.0$ Ground elevation factor (ASCE Table 26.9-1, footnote 3)

$q_z := 0.00256\ \frac{\text{psf}}{\text{mph}^2} \cdot K_z \cdot K_{zt} \cdot K_d \cdot K_e \cdot V^2 = 16.48\ \text{psf}$ Velocity pressure (ASCE sec. 26.10.2)

$G := 0.85$ Gust-effect factor (ASCE sec. 26.11.1, low-rise building)

$GC_{pi} := 0.18$ Internal pressure coefficient (ASCE Table 26.13-1, Enclosed building)

$C_{p\_wind} := 0.8$ Windward wall pressure coefficient (ASCE Fig. 27.3-1)

$C_{p\_roof} := -0.9$ Roof pressure coefficient (ASCE Fig. 27.3-1, worst case)

$L := 62\ \text{ft}$ Building length

$W := 44\ \text{ft}$ Building width

$\frac{W}{L} = 0.71$ Width-to-Length Ratio (1-1 Direction)

$\frac{L}{W} = 1.41$ Width-to-Length Ratio (2-2 Direction)

$C_{p\_lee\_11} := -0.5$ Leeward wall pressure coefficient, 1-1 Direction (ASCE Fig. 27.3-1, B/L<1.0)

$C_{p\_lee\_22} := -0.4$ Leeward wall pressure coefficient, 2-2 Direction (ASCE Fig. 27.3-1, L/B=3.0)

$p_{11} := q_z \cdot G \cdot \left(C_{p\_wind} - C_{p\_lee\_11}\right) = 18.21\ \text{psf}$ Design wall wind pressure in 1-1 Direction (MWFRS, ASCE sec. 27.3.1)

$p_{22} := q_z \cdot G \cdot \left(C_{p\_wind} - C_{p\_lee\_22}\right) = 16.81\ \text{psf}$ Design wall wind pressure in 2-2 Direction (MWFRS, ASCE sec. 27.3.1)

$p_{roof} := q_z \cdot G \cdot C_{p\_roof} - q_z \cdot GC_{pi} = -15.57\ \text{psf}$ Design roof wind pressure (MWFRS, ASCE sec. 27.3.1)

$p_{roof\_oh} := q_z \cdot G \cdot (C_{p\_roof} - 0.8) - q_z \cdot GC_{pi} = -26.78$ psf Design roof wind pressure (MWFRS, ASCE sec. 27.3.3)

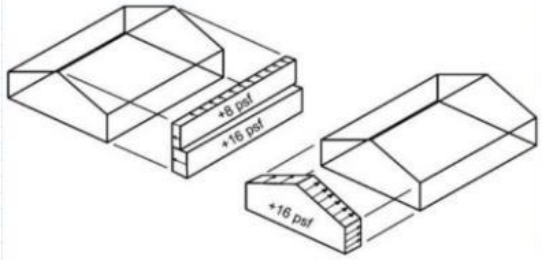


FIGURE C27.1-1. Application of Minimum Wind Load

$p_{11\_min} := 16$ psf

$p_{roof\_min} := 8$ psf Minimum design wind loads (ASCE sec. 27.1.5)

$p_{22\_min} := 16$ psf

WIND PRESSURE (COMPONENTS AND CLADDING, ASCE Ch. 30, PART 2):

$p_{cc\_wall} := -35$ psf Worst case design wall wind pressure, Zone 5 (Enercalc)

$p_{cc\_roof} := -54$ psf Worst case design roof wind pressure, Zone 2r (Enercalc)

$p_{cc\_roof\_pos} := 14$ psf Worst case design roof wind pressure, ALL ZONES(Enercalc)

LATERAL LOAD DESIGN CRITERIA - SEISMIC

SEISMIC PARAMETERS AND RESPONSE COEFFICENT CALCULATION:

D Seismic site class

$S_S := 0.628$ Spectral response acceleration parameter at short periods

$S_1 := 0.106$ Spectral response acceleration parameter at a period of 1 s

$S_{DS} := 0.543$ Design spectral response acceleration parameter at short periods

$F_v := 2.4$ Long-period site coefficient (ASCE Table 11.4-2)

$S_{D1} := \frac{2}{3} \cdot F_v \cdot S_1 = 0.17$ Design spectral response acceleration parameter at a period of 1 s (ASCE Eq. 11.4-4)

SDC := "D" Seismic design category (ASCE sec. 11.6)

$R_c :=$ "II" Risk category

$I_e := \text{if}(R_c = \text{"I"}, 1.0, \text{if}(R_c = \text{"II"}, 1.0, \text{if}(R_c = \text{"III"}, 1.25, 1.5))) = 1$ Seismic importance factor (ASCE Table 1.5-2)

$T_L := 16$ Long-period transition period

$R := 6.5$ Response modification factor (ASCE Table 12.2-1, SFRS A.15)

$C_t := 0.02$ Approximate period parameter (ASCE Table 12.8-2)

$x_1 := 0.75$ Approximate period parameter (ASCE Table 12.8-2)

$H_{struct} := h = 33\ ft$ Structural height

$T_a := C_t \cdot \left(\frac{H_{struct}}{ft}\right)^{x_1} = 0.28$ Approximate fundamental period of building (ASCE eq. 12.8-7)

$$C_{s\_avg} := \frac{S_{DS} \cdot I_e}{R} = 0.08$$

$$C_{s\_min} := \text{if}\left(S_1 \geq 0.6, \frac{0.5 \cdot S_1}{\left(\frac{R}{I_e}\right)}, \max\left(0.044 \cdot S_{DS} \cdot I_e, 0.01\right)\right) = 0.02$$

$$C_{s\_max} := \text{if}\left(T_a \leq T_L, \frac{S_{D1}}{T_a \cdot \left(\frac{R}{I_e}\right)}, \frac{S_{D1} \cdot T_L}{T_a^2 \cdot \left(\frac{R}{I_e}\right)}\right) = 0.09$$

$C_s := \max\left(min\left(C_{s\_max}, C_{s\_avg}\right), C_{s\_min}\right) = 0.084$ Design seismic response coefficient

$W_{roof} := \text{if}\left(p_{snow} \leq 30\ psf, DL_{roof}, DL_{roof} + 0.2 \cdot p_{snow}\right) = 30.66\ psf$ Effective seismic weight, roof (ASCE sec. 12.7.2)

STRUCTURAL CALCULATIONS (LATERAL)

Main House

$A_{roof} := 1878\ ft^2$

$h_{mean} = 28\ ft$ Mean roof height

Diaphragm - 1

DIAPHRAGM LOAD GENERATION - DIRECTION 1-1

$F_{p\_wind\_min\_1\_1} := L \cdot \left(p_{11\_min} \cdot \frac{h_{mean}}{2}\right) = 13888\ lbf$ Diaphragm load, wind (Minimum)

$F_{p\_wind\_1\_1} := L \cdot \left(p_{11} \cdot \frac{h_{mean}}{2}\right) = 15806.04\ lbf$ Diaphragm load, wind (1-1 Direction)

$F_{p\_wind\_max\_1\_1} := \max\left(F_{p\_wind\_min\_1\_1}, F_{p\_wind\_1\_1}\right) = 15806.04\ lbf$ Design diaphragm load (Wind)

$w_{px} := W_{roof} \cdot A_{roof} + 2 \cdot L \cdot DL_{sip\_wall} \cdot \frac{h_{mean}}{2} = 64437.06\ lbf$ Weight tributary to diaphragm

$F_{px\_1\_1} := C_s \cdot w_{px} = 5382.97\ lbf$ Diaphragm load, seismic

$F_{px\_min\_1\_1} := 0.2 \cdot S_{DS} \cdot I_e \cdot w_{px} = 6997.86\ lbf$ Diaphragm load, seismic (Minimum)

$F_{px\_max\_1\_1} := 0.4 \cdot S_{DS} \cdot I_e \cdot w_{px} = 13995.73\ lbf$ Diaphragm load, seismic (Maximum)

$F_{px\_1\_1} := \max\left(min\left(F_{px\_1\_1}, F_{px\_max\_1\_1}\right), F_{px\_min\_1\_1}\right) = 6997.864\ lbf$ Design diaphragm load (Seismic)

$Check := \text{if}\left(0.7 \cdot F_{px\_1\_1} \geq 0.6 \cdot F_{p\_wind\_max\_1\_1}, \text{"SEISMIC CONTROLS"}, \text{"WIND CONTROLS"}\right) = \text{"WIND CONTROLS"}$

$\rho := \text{if}\left(SDC = \text{"A"}, 1.0, \text{if}\left(SDC = \text{"B"}, 1.0, \text{if}\left(SDC = \text{"C"}, 1.0, 1.3\right)\right)\right) = 1.3$ Redundancy factor (ASCE sec 12.3.4)

$F_{p\_11} := \max\left(0.6 \cdot F_{p\_wind\_max\_1\_1}, 0.7 \cdot \rho \cdot F_{px\_1\_1}\right) = 9.48\ kip$ Controlling diaphragm load (Service level)

DIAPHRAGM LOAD GENERATION - DIRECTION 2-2

$F_{p\_wind\_min\_2\_2} := W \cdot \left(p_{22\_min} \cdot \frac{h_{mean}}{2}\right) = 9856\ lbf$ Diaphragm load, wind (Minimum)

$F_{p\_wind\_2\_2} := W \cdot \left(p_{22} \cdot \frac{h_{mean}}{2}\right) = 10354.33\ lbf$ Diaphragm load, wind (2-2 Direction)

$F_{p\_wind\_max\_2\_2} := \max\left(F_{p\_wind\_min\_2\_2}, F_{p\_wind\_2\_2}\right) = 10354.33\ lbf$ Design diaphragm load (Wind)

$w_{px} := W_{roof} \cdot A_{roof} + 2 \cdot W \cdot DL_{sip\_wall} \cdot \frac{h_{mean}}{2} = 62446.26\ lbf$ Weight tributary to diaphragm

$F_{px\_2\_2} := C_s \cdot w_{px} = 5216.66\ lbf$ Diaphragm load, seismic

$F_{px\_min\_2\_2} := 0.2 \cdot S_{DS} \cdot I_e \cdot w_{px} = 6781.66\ lbf$ Diaphragm load, seismic (Minimum)

$F_{px\_max\_2\_2} := 0.4 \cdot S_{DS} \cdot I_e \cdot w_{px} = 13563.33\ lbf$ Diaphragm load, seismic (Maximum)

$F_{px\_2\_2} := \max\left(min\left(F_{px\_2\_2}, F_{px\_max\_2\_2}\right), F_{px\_min\_2\_2}\right) = 6781.663\ lbf$ Design diaphragm load (Seismic)

$Check := if\left(0.7 \cdot F_{px\_2\_2} \geq 0.6 \cdot F_{p\_wind\_max\_2\_2}, \text{"SEISMIC CONTROLS"}, \text{"WIND CONTROLS"}\right) = \text{"WIND CONTROLS"}$

$\rho := if\left(SDC = \text{"A"}, 1.0, if\left(SDC = \text{"B"}, 1.0, if\left(SDC = \text{"C"}, 1.0, 1.3\right)\right)\right) = 1.3$ Redundancy factor (ASCE sec 12.3.4)

$F_{p\_22} := \max\left(0.6 \cdot F_{p\_wind\_max\_2\_2}, 0.7 \cdot \rho \cdot F_{px\_2\_2}\right) = 6.21\ kip$ Controlling diaphragm load (Service level)

DIAPHRAGM CHECK

$A_{Ratio} := \max\left(\frac{L}{W}, \frac{W}{L}\right) = 1.4$ Worst case aspect ratio

$Check := if\left(A_{Ratio} \leq 3.0, \text{"Blk'g Not Req'd"}, if\left(3.0 < A_{Ratio} \leq 4.0, \text{"Block Diaphragm"}, \text{"Shape Ratio Exceeded"}\right)\right) = \text{"Blk'g Not Req'd"}$ SDPWS Table 4.2.4

$V_{all\_11} := 475\ plf$ Diaphragm Allowable Shear in 1-1 Direction (SIP Panel)

$V_{all\_22} := 475\ plf$ Diaphragm Allowable Shear in 2-2 Direction (SIP Panel)

$V_{max\_11} := \frac{F_{p\_11}}{2 \cdot W} = 107.77\ plf$ Worst case diaphragm shear force in 1-1 direction (Service Level)

$V_{max\_22} := \frac{F_{p\_22}}{2 \cdot L} = 50.1\ plf$ Worst case diaphragm shear force in 2-2 direction (Service Level)

$Check := if\left(V_{all\_11} \geq V_{max\_11}, \text{"PASS"}, \text{"FAIL"}\right) = \text{"PASS"}$

$Check := if\left(V_{all\_22} \geq V_{max\_22}, \text{"PASS"}, \text{"FAIL"}\right) = \text{"PASS"}$

DIAPHRAGM BLOCKING CONNECTION TO DOUBLE PLATE CHECK - OPTION 1

$N := 1$ Number of A35 clips

$S := 24\ in$ Spacing of A35 clips

$F_{all} := \frac{N \cdot 560\ lbf}{S} = 280\ plf$ Allowable A35 clip Load (Simpson Catalog)

$Check := if\left(F_{all} \geq max\left(V_{max\_11}\right), \text{"PASS"}, \text{"FAIL"}\right) = \text{"PASS"}$

$Check := if\left(F_{all} \geq max\left(V_{max\_22}\right), \text{"PASS"}, \text{"FAIL"}\right) = \text{"PASS"}$

DIAPHRAGM BLOCKING CONNECTION TO DOUBLE PLATE - OPTION 2

$C_{D\_WL} := 1.60$ Load Duration Factor For Seismic/Wind (NDS Table 2.3.2)

$C_{tn} := 0.83$ Toenail Factor (NDS Section 12.5.4.2)

$S := 6\ in$ Spacing of 16d nails

$N := 1$ Number of 16d nails

$D_{nail} := 0.162\ in$ Diameter of 16d nail (NDS App. L, Table L4)

$L_{nail} := 3.5\ in$ Length of 16d nail (NDS App. L, Table L4)

$t_s := \frac{L_{nail}}{3} = 1.17\ in$ Side member thickness, Toe-nail (NDS Fig. 12A)

$p := L_{nail} \cdot cos\left(30°\right) - \frac{L_{nail}}{3} - \frac{7}{16}\ in = 1.43\ in$ Penetration of 16d Nails, Toe-nail

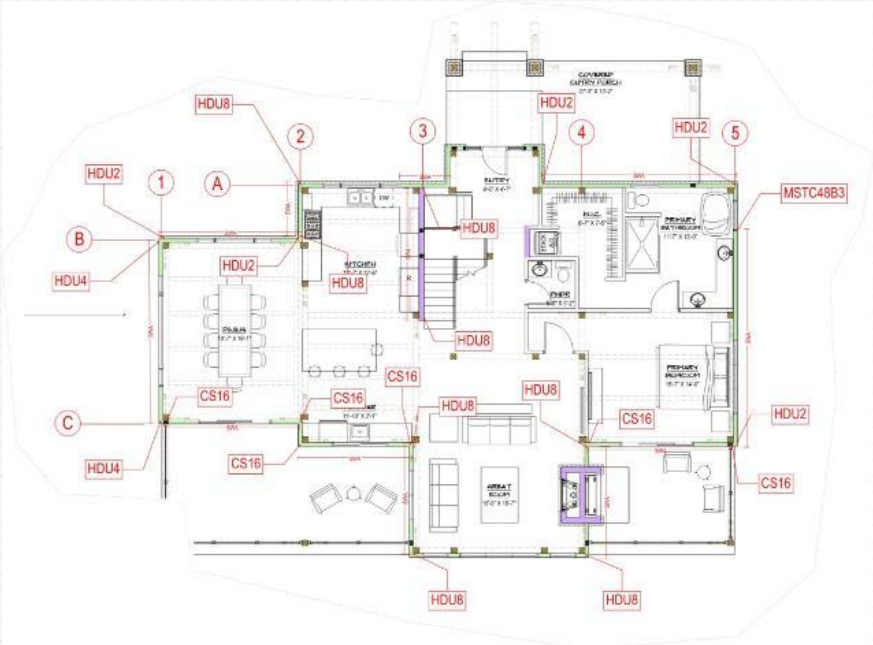
$p' := if\left(p \geq 10 \cdot D_{nail}, 1.0, if\left(6 \cdot D_{nail} \leq p < 10 \cdot D_{nail}, \frac{p}{10 \cdot D_{nail}}, \text{"Select Longer Nail"}\right)\right) = 0.88$

$Z := 141\ lbf$ Reference lateral design value (NDS Table 12N, 16d nail, DFL, ts=1 in)

$Z' := \frac{N \cdot Z \cdot p' \cdot C_{D\_WL} \cdot C_{tn}}{S} = 329.86\ plf$ Allowable nail shear capacity

$Check := if\left(Z' \geq max\left(V_{max\_11}\right), \text{"PASS"}, \text{"FAIL"}\right) = \text{"PASS"}$

$Check := if\left(Z' \geq max\left(V_{max\_22}\right), \text{"PASS"}, \text{"FAIL"}\right) = \text{"PASS"}$



SHEAR WALLS AT ROOF LEVEL

$V_{max\_11} := F_{p\_11} = 9483.63$ lbf — Story shear force in 1-1 direction (WIND - Service Level Diaphragm)

$V_{max\_22} := F_{p\_22} = 6212.6$ lbf — Story shear force in 2-2 direction (SEISMIC - Service Level Diaphragm)

SHEAR WALL - GRIDLINE 1 - PERFORATED SHEAR WALL (DIRECTION 1-1)

$L_1 := 4\ ft$ $L_2 := 4\ ft$ Pier lengths $T_{width} := 8.5\ ft$ Tributary Width

$L_{tot} := 20\ ft$ Total length of wall $h := 10.8\ ft$ Wall height

$A := 76\ ft^2$ Total area of openings $R_{SW} := 8.5\ ft$ Length Resisting Direction Force

$Check := if\left(h > 20\ ft, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$ SDPWS 4.3.5.3.7

$L_{1\_adj} := if\left(L_1 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_1} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_1} \ge 2.0, L_1 \cdot \left(\frac{2 \cdot L_1}{h}\right), L_1\right)\right)\right) = 2.963\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$L_{2\_adj} := if\left(L_2 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_2} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_2} \ge 2.0, L_2 \cdot \left(\frac{2 \cdot L_2}{h}\right), L_2\right)\right)\right) = 2.963\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$\Sigma L_i := L_{1\_adj} + L_{2\_adj} = 5.93\ ft$ Sum of perforated shear wall segments

$r := \frac{1}{\left(1 + \frac{A}{h \cdot \Sigma L_i}\right)} = 0.4571$ Sheathing area ratio (SDPWS eq. 4.3-6)

$C_o := min\left(\frac{r}{(3 - 2 \cdot r)} \cdot \frac{L_{tot}}{\Sigma L_i}, 1\right) = 0.7397$ Adjustment factor (SDPWS eq. 4.3-5)

$V := V_{max\_11} \cdot \left(\frac{R_{SW}}{L}\right) = 1300.17\ lbf$ Induced shear force in perforated shear wall

$V_{SW} := \frac{V}{C_o \cdot \Sigma L_i} = 296.6\ plf$ Maximum induced unit shear wall force (SDPWS eq. 4.3-9)

$v_{all} := 475\ plf$ Nominal unit shear wall capacity (SIP Panel)

$Check := if\left(v_{all} > 2435\ plf, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$

$Check := if\left(V_{SW} \ge v_{all}, \text{"Perforated shear wall not adequate"}, \text{"OK"}\right) = \text{"OK"}$

$w_{WL} := \left|p_{roof} \cdot T_{width}\right| = 132.37\ plf$ Roof wind load

$w_{DL} := DL_{roof} \cdot T_{width} + DL_{sip\_wall} \cdot h = 195.66\ plf$ Dead load

$T_W := \frac{0.6\ F_{p\_wind\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} + \frac{0.6 \cdot w_{WL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} = 3051.2\ lbf$ Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_S := \frac{0.7\ \rho \cdot F_{px\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{(0.6 - 0.14\ S_{DS}) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = -553.78\ lbf$ Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{all} := 3285\ lbf$ Allowable holdown force (HDU4-SDS2.5)

$Check := if\left(max\left(T_W, T_S\right) \ge T_{all}, \text{"Holdown not adequate"}, \text{"OK"}\right) = \text{"OK"}$

SHEAR WALL - GRIDLINE 2 - INDIVIDUAL FULL-HEIGHT SHEAR WALL (DIRECTION 1-1)

$L_{tot} := 6.75\ ft$ Wall length

$R_{SW} := 14\ ft$ Length Resisting Direction Force

$h := 10.8\ ft$ Wall height

$A_{Ratio} := \frac{h}{L_{tot}} = 1.6$ Worst case aspect ratio

Check := if $(A_{Ratio} \le 2$, "Blk'g Not Req'd" , if $(2 < A_{Ratio} \le 3.5$, "Blocking Req'd" , "Shape Ratio Exceeded")) = "Blk'g Not Req'd" SDPWS Table 4.3.4

$V := V_{max\_11} \cdot \left(\frac{R_{SW}}{L}\right) = 2141.46\ lbf$ Induced shear force in shear wall

$V_{SW} := \frac{V}{L_{tot}} = 317.25\ plf$ Maximum induced unit shear wall force

$v_{all} := 475\ plf$ Nominal unit shear wall capacity (SIP Panel)

Check := if $(V_{SW} \ge v_{all}$, "Shear wall not adequate" , "OK") = "OK"

$T_{width\_roof} := 7\ ft$ Roof Tributary Width

$w_{WL} := |p_{roof} \cdot T_{width\_roof}| = 109.01\ plf$ Roof wind load

$w_{DL} := DL_{roof} \cdot T_{width\_roof} + DL_{sip\_wall} \cdot h = 168.66\ plf$ Roof + Wall dead load

$$T_W := \frac{0.6\ F_{p\_wind\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} + \frac{0.6 \cdot w_{WL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} = 5132.68\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$$T_S := \frac{F_{px\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{(0.6 - 0.14\ S_{DS}) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = 2230\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{all} := 5820\ lbf$ Allowable holdown force (HDU8-SDS2.5)

Check := if $(\max(T_W, T_S) \ge T_{all}$, "Holdown not adequate" , "OK") = "OK"

SHEAR WALL - GRIDLINE 3 - INDIVIDUAL FULL-HEIGHT SHEAR WALL (DIRECTION 1-1)

$L_{tot} := 14.25\ ft$ Wall length

$R_{SW} := 16.5\ ft$ Length Resisting Direction Force

$h := 10.8\ ft$ Wall height

$A_{Ratio} := \frac{h}{L_{tot}} = 0.76$ Worst case aspect ratio

$Check := if\left(A_{Ratio} \le 2, \text{"Blk'g Not Req'd"}, if\left(2 < A_{Ratio} \le 3.5, \text{"Blocking Req'd"}, \text{"Shape Ratio Exceeded"}\right)\right) = \text{"Blk'g Not Req'd"}$ SDPWS Table 4.3.4

$V := V_{max\_11} \cdot \left(\frac{R_{SW}}{L}\right) = 2523.87\ lbf$ Induced shear force in shear wall

$V_{SW} := \frac{V}{L_{tot}} = 177.11\ plf$ Maximum induced unit shear wall force

$v_{all} := 350\ plf$ Nominal unit shear wall capacity

$Check := if\left(V_{SW} \ge v_{all}, \text{"Shear wall not adequate"}, \text{"OK"}\right) = \text{"OK"}$

$T_{width\_floor} := 7\ ft$ Roof Tributary Width

$w_{WL} := \left|p_{roof} \cdot T_{width\_roof}\right| = 109.01\ plf$ Roof wind load

$w_{DL} := DL_{floor} \cdot T_{width\_floor} + DL_{wall} \cdot h = 304.6\ plf$ Roof + Wall dead load

$$T_W := \frac{0.6\ \frac{F_{p\_wind\_1\_1}}{2} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} + \frac{0.6 \cdot w_{WL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} = 2639.03\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$$T_S := \frac{F_{px\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{(0.6 - 0.14\ S_{DS}) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = 274.27\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{all} := 3285\ lbf$ Allowable holdown force (HDU4-SDS2.5)

$Check := if\left(\max\left(T_W, T_S\right) \ge T_{all}, \text{"Holdown not adequate"}, \text{"OK"}\right) = \text{"OK"}$

SHEAR WALL - GRIDLINE 3 - PERFORATED SHEAR WALL (DIRECTION 1-1)

$L_1 := 3.1\ ft$ $L_2 := 4\ ft$ Pier lengths $T_{width} := 10\ ft$ Tributary Width

$L_{tot} := 12\ ft$ Total length of wall $h := 10.8\ ft$ Wall height

$A := 32\ ft^2$ Total area of openings $R_{SW} := 12.5\ ft$ Length Resisting Direction Force

$Check := if\left(h > 20\ ft, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$ SDPWS 4.3.5.3.7

$L_{1\_adj} := if\left(L_1 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_1} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_1} \ge 2.0, L_1 \cdot \left(\frac{2 \cdot L_1}{h}\right), L_1\right)\right)\right) = 1.78\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$L_{2\_adj} := if\left(L_2 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_2} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_2} \ge 2.0, L_2 \cdot \left(\frac{2 \cdot L_2}{h}\right), L_2\right)\right)\right) = 2.963\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$\Sigma L_i := L_{1\_adj} + L_{2\_adj} = 4.74\ ft$ Sum of perforated shear wall segments

$r := \frac{1}{\left(1 + \frac{A}{h \cdot \Sigma L_i}\right)} = 0.6155$ Sheathing area ratio (SDPWS eq. 4.3-6)

$C_o := min\left(\frac{r}{(3 - 2 \cdot r)} \cdot \frac{L_{tot}}{\Sigma L_i}, 1\right) = 0.8803$ Adjustment factor (SDPWS eq. 4.3-5)

$V := \frac{V_{max\_11}}{2} \cdot \left(\frac{R_{SW}}{L}\right) = 956.01\ lbf$ Induced shear force in perforated shear wall

$V_{SW} := \frac{V}{C_o \cdot \Sigma L_i} = 228.99\ plf$ Maximum induced unit shear wall force (SDPWS eq. 4.3-9)

$v_{all} := 475\ plf$ Nominal unit shear wall capacity (SIP Panel)

$Check := if\left(v_{all} > 2435\ plf, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$

$Check := if\left(V_{SW} \ge v_{all}, \text{"Perforated shear wall not adequate"}, \text{"OK"}\right) = \text{"OK"}$

$w_{WL} := \left|p_{roof} \cdot T_{width}\right| = 155.73\ plf$ Roof wind load

$w_{DL} := DL_{roof} \cdot T_{width} + DL_{sip\_wall} \cdot h = 222.66\ plf$ Dead load

$$T_W := \frac{0.6\ \frac{F_{p\_wind\_1\_1}}{2} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} + \frac{0.6 \cdot w_{WL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} = 2364.88\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$$T_S := \frac{0.7\ \rho \cdot F_{px\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{(0.6 - 0.14\ S_{DS}) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = 455.48\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{all} := 3285\ lbf$ Allowable holdown force (HDU4-SDS2.5)

$Check := if\left(\max\left(T_W, T_S\right) \ge T_{all}, \text{"Holdown not adequate"}, \text{"OK"}\right) = \text{"OK"}$

SHEAR WALL - GRIDLINE 4 - PERFORATED SHEAR WALL (DIRECTION 1-1)

$L_1 := 3.1\ ft$ $L_2 := 4\ ft$ Pier lengths $T_{width} := 10\ ft$ Tributary Width

$L_{tot} := 12\ ft$ Total length of wall $h := 10.8\ ft$ Wall height

$A := 33\ ft^2$ Total area of openings $R_{SW} := 10.5\ ft$ Length Resisting Direction Force

$Check := if\left(h > 20\ ft, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$ SDPWS 4.3.5.3.7

$L_{1\_adj} := if\left(L_1 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_1} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_1} \ge 2.0, L_1 \cdot \left(\frac{2 \cdot L_1}{h}\right), L_1\right)\right)\right) = 1.78\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$L_{2\_adj} := if\left(L_2 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_2} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_2} \ge 2.0, L_2 \cdot \left(\frac{2 \cdot L_2}{h}\right), L_2\right)\right)\right) = 2.963\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$\Sigma L_i := L_{1\_adj} + L_{2\_adj} = 4.74\ ft$ Sum of perforated shear wall segments

$r := \frac{1}{\left(1 + \frac{A}{h \cdot \Sigma L_i}\right)} = 0.6082$ Sheathing area ratio (SDPWS eq. 4.3-6)

$C_o := min\left(\frac{r}{(3 - 2 \cdot r)} \cdot \frac{L_{tot}}{\Sigma L_i}, 1\right) = 0.8627$ Adjustment factor (SDPWS eq. 4.3-5)

$V := V_{max\_11} \cdot \left(\frac{R_{SW}}{L}\right) = 1606.1\ lbf$ Induced shear force in perforated shear wall

$V_{SW} := \frac{V}{C_o \cdot \Sigma L_i} = 392.54\ plf$ Maximum induced unit shear wall force (SDPWS eq. 4.3-9)

$v_{all} := 475\ plf$ Nominal unit shear wall capacity (SIP Panel)

$Check := if\left(v_{all} > 2435\ plf, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$

$Check := if\left(V_{SW} \ge v_{all}, \text{"Perforated shear wall not adequate"}, \text{"OK"}\right) = \text{"OK"}$

$w_{WL} := \left|p_{roof} \cdot T_{width}\right| = 155.73\ plf$ Roof wind load

$w_{DL} := DL_{roof} \cdot T_{width} + DL_{sip\_wall} \cdot h = 222.66\ plf$ Dead load

$T_W := \frac{0.6\ F_{p\_wind\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} + \frac{0.6 \cdot w_{WL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} = 4129.01\ lbf$ Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_S := \frac{0.7\ \rho \cdot F_{px\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{(0.6 - 0.14\ S_{DS}) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = 270.6\ lbf$ Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{all} := 5820\ lbf$ Allowable holdown force (HDU8-SDS2.5)

$Check := if\left(max\left(T_W, T_S\right) \ge T_{all}, \text{"Holdown not adequate"}, \text{"OK"}\right) = \text{"OK"}$

SHEAR WALL - GRIDLINE 5 - PERFORATED SHEAR WALL (DIRECTION 1-1)

$L_1 := 12\ ft$ $L_2 := 3.5\ ft$ Pier lengths $T_{width} := 3\ ft$ Tributary Width

$L_{tot} := 23.5\ ft$ Total length of wall $h := 10.8\ ft$ Wall height

$A := 23\ ft^2$ Total area of openings $R_{SW} := 17\ ft$ Length Resisting Direction Force

$Check := if\left(h > 20\ ft, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$ SDPWS 4.3.5.3.7

$L_{1\_adj} := if\left(L_1 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_1} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_1} \ge 2.0, L_1 \cdot \left(\frac{2 \cdot L_1}{h}\right), L_1\right)\right)\right) = 12\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$L_{2\_adj} := if\left(L_2 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_2} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_2} \ge 2.0, L_2 \cdot \left(\frac{2 \cdot L_2}{h}\right), L_2\right)\right)\right) = 2.269\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$\Sigma L_i := L_{1\_adj} + L_{2\_adj} = 14.27\ ft$ Sum of perforated shear wall segments

$r := \frac{1}{\left(1 + \frac{A}{h \cdot \Sigma L_i}\right)} = 0.8701$ Sheathing area ratio (SDPWS eq. 4.3-6)

$C_o := min\left(\frac{r}{(3 - 2 \cdot r)} \cdot \frac{L_{tot}}{\Sigma L_i}, 1\right) = 1$ Adjustment factor (SDPWS eq. 4.3-5)

$V := V_{max\_11} \cdot \left(\frac{R_{SW}}{L}\right) = 2600.35\ lbf$ Induced shear force in perforated shear wall

$V_{SW} := \frac{V}{C_o \cdot \Sigma L_i} = 182.24\ plf$ Maximum induced unit shear wall force (SDPWS eq. 4.3-9)

$v_{all} := 475\ plf$ Nominal unit shear wall capacity (SIP Panel)

$Check := if\left(v_{all} > 2435\ plf, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$

$Check := if\left(V_{SW} \ge v_{all}, \text{"Perforated shear wall not adequate"}, \text{"OK"}\right) = \text{"OK"}$

$w_{WL} := \left|p_{roof} \cdot T_{width}\right| = 46.72\ plf$ Roof wind load

$w_{DL} := DL_{roof} \cdot T_{width} + DL_{sip\_wall} \cdot h = 96.66\ plf$ Dead load

$$T_W := \frac{0.6\ F_{p\_wind\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} + \frac{0.6 \cdot w_{WL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} = 1754.46\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$$T_S := \frac{0.7\ \rho \cdot F_{px\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{(0.6 - 0.14\ S_{DS}) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = 207.34\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{all} := 2214\ lbf$ Allowable holdown force (HDU2-SDS2.5) $T_{all} := 3900\ lbf$ Allowable holdown force (MSTC48B3)

$Check := if\left(max\left(T_W, T_S\right) \ge T_{all}, \text{"Holdown not adequate"}, \text{"OK"}\right) = \text{"OK"}$

SHEAR WALL - GRIDLINE A - PERFORATED SHEAR WALL (DIRECTION 2-2)

$L_1 := 10\ ft$ $L_2 := 8\ ft$ Pier lengths $T_{width} := 3\ ft$ Tributary Width

$L_{tot} := 21\ ft$ Total length of wall $h := 10.8\ ft$ Wall height

$A := 13\ ft^2$ Total area of openings $R_{SW} := 6\ ft$ Length Resisting Direction Force

$Check := if\left(h > 20\ ft, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$ SDPWS 4.3.5.3.7

$L_{1\_adj} := if\left(L_1 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_1} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_1} \ge 2.0, L_1 \cdot \left(\frac{2 \cdot L_1}{h}\right), L_1\right)\right)\right) = 10\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$L_{2\_adj} := if\left(L_2 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_2} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_2} \ge 2.0, L_2 \cdot \left(\frac{2 \cdot L_2}{h}\right), L_2\right)\right)\right) = 8\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$\Sigma L_i := L_{1\_adj} + L_{2\_adj} = 18\ ft$ Sum of perforated shear wall segments

$r := \frac{1}{\left(1 + \frac{A}{h \cdot \Sigma L_i}\right)} = 0.9373$ Sheathing area ratio (SDPWS eq. 4.3-6)

$C_o := min\left(\frac{r}{(3 - 2 \cdot r)} \cdot \frac{L_{tot}}{\Sigma L_i}, 1\right) = 0.9717$ Adjustment factor (SDPWS eq. 4.3-5)

$V := V_{max\_22} \cdot \left(\frac{R_{SW}}{W}\right) = 847.17\ lbf$ Induced shear force in perforated shear wall

$V_{SW} := \frac{V}{C_o \cdot \Sigma L_i} = 48.43\ plf$ Maximum induced unit shear wall force (SDPWS eq. 4.3-9)

$v_{all} := 475\ plf$ Nominal unit shear wall capacity (SIP Panel)

$Check := if\left(v_{all} > 2435\ plf, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$

$Check := if\left(V_{SW} \ge v_{all}, \text{"Perforated shear wall not adequate"}, \text{"OK"}\right) = \text{"OK"}$

$w_{WL} := \left|p_{roof} \cdot T_{width}\right| = 46.72\ plf$ Roof Wind load

$w_{DL} := DL_{roof} \cdot T_{width} + DL_{sip\_wall} \cdot h = 96.66\ plf$ Dead load

$$T_W := \frac{0.6\ F_{p\_wind\_2\_2} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} + \frac{0.6 \cdot w_{WL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} = 93.7\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$$T_S := \frac{0.7\ \rho \cdot F_{px\_2\_2} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{(0.6 - 0.14\ S_{DS}) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = -224.66\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{all} := 2214\ lbf$ Allowable holdown force (HDU2-SDS2.5)

$Check := if\left(max\left(T_W, T_S\right) \ge T_{all}, \text{"Holdown not adequate"}, \text{"OK"}\right) = \text{"OK"}$

SHEAR WALL - GRIDLINE B - PERFORATED SHEAR WALL (DIRECTION 2-2)

$L_1 := 4\ ft$ $L_2 := 3.25\ ft$ Pier lengths $T_{width} := 3\ ft$ Tributary Width

$L_{tot} := 15.5\ ft$ Total length of wall $h := 10.8\ ft$ Wall height

$A := 40\ ft^2$ Total area of openings $R_{SW} := 10\ ft$ Length Resisting Direction Force

$Check := if\left(h > 20\ ft, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$ SDPWS 4.3.5.3.7

$L_{1\_adj} := if\left(L_1 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_1} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_1} \ge 2.0, L_1 \cdot \left(\frac{2 \cdot L_1}{h}\right), L_1\right)\right)\right) = 2.963\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$L_{2\_adj} := if\left(L_2 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_2} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_2} \ge 2.0, L_2 \cdot \left(\frac{2 \cdot L_2}{h}\right), L_2\right)\right)\right) = 1.956\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$\Sigma L_i := L_{1\_adj} + L_{2\_adj} = 4.92\ ft$ Sum of perforated shear wall segments

$r := \frac{1}{\left(1 + \frac{A}{h \cdot \Sigma L_i}\right)} = 0.5705$ Sheathing area ratio (SDPWS eq. 4.3-6)

$C_o := min\left(\frac{r}{(3 - 2 \cdot r)} \cdot \frac{L_{tot}}{\Sigma L_i}, 1\right) = 0.9669$ Adjustment factor (SDPWS eq. 4.3-5)

$V := V_{max\_22} \cdot \left(\frac{R_{SW}}{W}\right) = 1411.95\ lbf$ Induced shear force in perforated shear wall

$V_{SW} := \frac{V}{C_o \cdot \Sigma L_i} = 296.86\ plf$ Maximum induced unit shear wall force (SDPWS eq. 4.3-9)

$v_{all} := 475\ plf$ Nominal unit shear wall capacity (SIP Panel)

$Check := if\left(v_{all} > 2435\ plf, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$

$Check := if\left(V_{SW} \ge v_{all}, \text{"Perforated shear wall not adequate"}, \text{"OK"}\right) = \text{"OK"}$

$w_{WL} := \left|p_{roof} \cdot T_{width}\right| = 46.72\ plf$ Roof Wind load

$w_{DL} := DL_{roof} \cdot T_{width} + DL_{sip\_wall} \cdot h = 96.66\ plf$ Dead load

$$T_W := \frac{0.6\ F_{p\_wind\_2\_2} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} + \frac{0.6 \cdot w_{WL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} = 2199.06\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$$T_S := \frac{0.7\ \rho \cdot F_{px\_2\_2} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{(0.6 - 0.14\ S_{DS}) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = 301.03\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{all} := 2214\ lbf$ Allowable holdown force (HDU2-SDS2.5)

$Check := if\left(max\left(T_W, T_S\right) \ge T_{all}, \text{"Holdown not adequate"}, \text{"OK"}\right) = \text{"OK"}$

SHEAR WALL - GRIDLINE C - PERFORATED SHEAR WALL (DIRECTION 2-2) WORST CASE

$L_1 := 3.75\ ft$ $L_2 := 3.1\ ft$ Pier lengths $T_{width} := 3\ ft$ Tributary Width

$L_{tot} := 12.5\ ft$ Total length of wall $h := 10.8\ ft$ Wall height

$A := 27\ ft^2$ Total area of openings $R_{SW} := 10\ ft$ Length Resisting Direction Force

$Check := if\left(h > 20\ ft, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$ SDPWS 4.3.5.3.7

$L_{1\_adj} := if\left(L_1 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_1} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_1} \ge 2.0, L_1 \cdot \left(\frac{2 \cdot L_1}{h}\right), L_1\right)\right)\right) = 2.604\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$L_{2\_adj} := if\left(L_2 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_2} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_2} \ge 2.0, L_2 \cdot \left(\frac{2 \cdot L_2}{h}\right), L_2\right)\right)\right) = 1.78\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$\Sigma L_i := L_{1\_adj} + L_{2\_adj} = 4.38\ ft$ Sum of perforated shear wall segments

$r := \frac{1}{\left(1 + \frac{A}{h \cdot \Sigma L_i}\right)} = 0.6368$ Sheathing area ratio (SDPWS eq. 4.3-6)

$C_o := min\left(\frac{r}{(3 - 2 \cdot r)} \cdot \frac{L_{tot}}{\Sigma L_i}, 1\right) = 1$ Adjustment factor (SDPWS eq. 4.3-5)

$V := \frac{V_{max\_22}}{3} \cdot \left(\frac{R_{SW}}{W}\right) = 470.65\ lbf$ Induced shear force in perforated shear wall

$V_{SW} := \frac{V}{C_o \cdot \Sigma L_i} = 107.36\ plf$ Maximum induced unit shear wall force (SDPWS eq. 4.3-9)

$v_{all} := 475\ plf$ Nominal unit shear wall capacity (SIP Panel)

$Check := if\left(v_{all} > 2435\ plf, \text{"Perforated shear wall not allowed"}, \text{"OK"}\right) = \text{"OK"}$

$Check := if\left(V_{SW} \ge v_{all}, \text{"Perforated shear wall not adequate"}, \text{"OK"}\right) = \text{"OK"}$

$w_{WL} := \left|p_{roof} \cdot T_{width}\right| = 46.72\ plf$ Roof Wind load

$w_{DL} := DL_{roof} \cdot T_{width} + DL_{sip\_wall} \cdot h = 96.66\ plf$ Dead load

$$T_W := \frac{0.6\ \frac{F_{p\_wind\_2\_2}}{3} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} + \frac{0.6 \cdot w_{WL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} = 757.2\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$$T_S := \frac{0.7\ \rho \cdot F_{px\_2\_2} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{(0.6 - 0.14\ S_{DS}) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = 543.45\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{all} := 2214\ lbf$ Allowable holdown force (CS16)

$Check := if\left(max\left(T_W, T_S\right) \ge T_{all}, \text{"Holdown not adequate"}, \text{"OK"}\right) = \text{"OK"}$

CHECK SILL ATTACHMENT

OPTION 1 - Toenail

$C_{D\_WL} := 1.60$ Load Duration Factor For Seismic/Wind (NDS Table 2.3.2)

$C_{tn} := 0.83$ Toenail Factor (NDS Section 12.5.4.2)

$S := 4\ in$ Spacing of 16d nails

$N := 1$ Number of 16d nails

$D_{nail} := 0.162\ in$ Diameter of 16d nail (NDS App. L, Table L4)

$L_{nail} := 3.5\ in$ Length of 16d nail (NDS App. L, Table L4)

$t_s := \frac{L_{nail}}{3} = 1.17\ in$ Side member thickness, Toe-nail (NDS Fig. 12A)

$p := L_{nail} \cdot \cos(30°) - \frac{L_{nail}}{3} - \frac{7}{16}\ in = 1.43\ in$ Penetration of 16d Nails, Toe-nail

$p' := \text{if}\left(p \geq 10 \cdot D_{nail}, 1.0, \text{if}\left(6 \cdot D_{nail} \leq p < 10 \cdot D_{nail}, \frac{p}{10 \cdot D_{nail}}, \text{"Select Longer Nail"}\right)\right) = 0.88$

$Z := 141\ lbf$ Reference lateral design value (NDS Table 12N, 16d nail, DFL, ts=1 in)

$Z' := \frac{N \cdot Z \cdot p' \cdot C_{D\_WL} \cdot C_{tn}}{S} = 494.79\ plf$ Allowable nail shear capacity

$Check := \text{if}\left(Z' \geq \max(v_{all}), \text{"PASS"}, \text{"FAIL"}\right) = \text{"PASS"}$

OPTION 2 - Nail

$S := 4\ in$ Spacing of 16d nails

$Z := 120\ lbf$ Reference lateral design value (NDS Table 12N, 16d nail, SPF, ts=1-1/2 in)

$D_{nail} := 0.162\ in$ Diameter of 16d nail (NDS App. L, Table L4)

$L_{nail} := 3.5\ in$ Length of 16d nails (NDS App. L, Table L4)

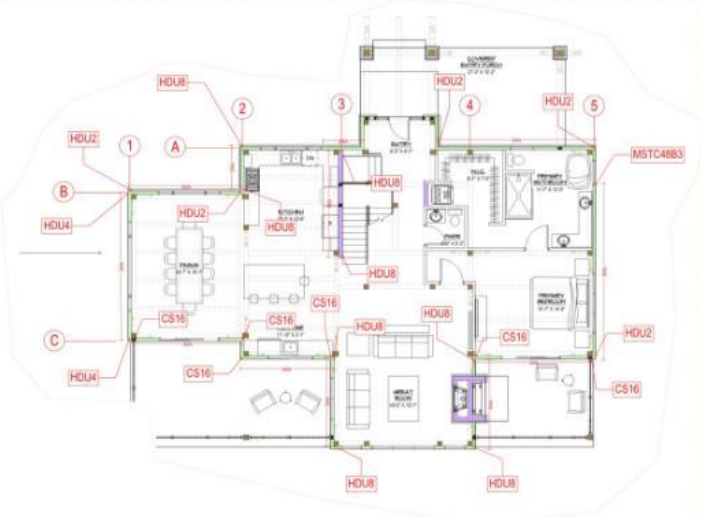
$p := L_{nail} - 1.5\ in = 2\ in$ Penetration of 16d nails

$p' := \text{if}\left(p \geq 10 \cdot D_{nail}, 1.0, \text{if}\left(6 \cdot D_{nail} \leq p < 10 \cdot D_{nail}, \frac{p}{10 \cdot D_{nail}}, \text{"Select Longer Nail"}\right)\right) = 1$

$Z' := \frac{C_{D\_WL} \cdot Z \cdot p'}{S} = 576\ plf$ Allowable connection capacity

$Check := \text{if}\left(Z' \geq \max(v_{all}), \text{"PASS"}, \text{"FAIL"}\right) = \text{"PASS"}$

Main House 1st Floor



$A_{floor} := 1880\ ft^2$ Floor area

$L := 62\ ft$

$W := 44\ ft$

DIAPHRAGM LOAD GENERATION - DIRECTION 1-1

$F_{p\_wind\_min\_1\_1} := L \cdot \left(p_{11\_min} \cdot \frac{h_{mean}}{2}\right) = 13888\ lbf$ Diaphragm load, wind (Minimum)

$F_{p\_wind\_1\_1} := L \cdot \left(p_{11} \cdot \frac{h_{mean}}{2}\right) = 15806.04\ lbf$ Diaphragm load, wind (1-1 Direction)

$F_{p\_wind\_max\_1\_1} := \max\left(F_{p\_wind\_min\_1\_1}, F_{p\_wind\_1\_1}\right) = 15806.04\ lbf$ Design diaphragm load (Wind)

$w_{px} := DL_{floor} \cdot A_{floor} + 2 \cdot L \cdot DL_{wall} \cdot \frac{h_{mean}}{2} = 67832\ lbf$ Weight tributary to diaphragm

$F_{px\_1\_1} := C_s \cdot w_{px} = 5666.58\ lbf$ Diaphragm load, seismic

$F_{px\_min\_1\_1} := 0.2 \cdot S_{DS} \cdot I_e \cdot w_{px} = 7366.56\ lbf$ Diaphragm load, seismic (Minimum)

$F_{px\_max\_1\_1} := 0.4 \cdot S_{DS} \cdot I_e \cdot w_{px} = 14733.11\ lbf$ Diaphragm load, seismic (Maximum)

$F_{px\_1\_1} := \max\left(min\left(F_{px\_1\_1}, F_{px\_max\_1\_1}\right), F_{px\_min\_1\_1}\right) = 7366.555\ lbf$ Design diaphragm load (Seismic)

$Check := \text{if}\left(0.7 \cdot F_{px\_1\_1} \geq 0.6 \cdot F_{p\_wind\_max\_1\_1}, \text{"SEISMIC CONTROLS"}, \text{"WIND CONTROLS"}\right) = \text{"WIND CONTROLS"}$

$\rho := \text{if}\left(SDC = \text{"A"}, 1.0, \text{if}\left(SDC = \text{"B"}, 1.0, \text{if}\left(SDC = \text{"C"}, 1.0, 1.3\right)\right)\right) = 1.3$ Redundancy factor (ASCE sec 12.3.4)

$F_{p\_11} := \max\left(0.6 \cdot F_{p\_wind\_max\_1\_1}, 0.7 \cdot \rho \cdot F_{px\_1\_1}\right) = 9.48\ kip$ Controlling diaphragm load (Service level)

DIAPHRAGM LOAD GENERATION - DIRECTION 2-2

$F_{p\_wind\_min\_2\_2} := W \cdot \left(p_{22\_min} \cdot \frac{h_{mean}}{2}\right) = 9856\ lbf$ Diaphragm load, wind (Minimum)

$F_{p\_wind\_2\_2} := W \cdot \left(p_{22} \cdot \frac{h_{mean}}{2}\right) = 10354.33\ lbf$ Diaphragm load, wind (2-2 Direction)

$F_{p\_wind\_max\_2\_2} := \max\left(F_{p\_wind\_min\_2\_2}, F_{p\_wind\_2\_2}\right) = 10354.33\ lbf$ Design diaphragm load (Wind)

$w_{px} := DL_{floor} \cdot A_{floor} + 2 \cdot W \cdot DL_{wall} \cdot \frac{h_{mean}}{2} = 61784\ lbf$ Weight tributary to diaphragm

$F_{px\_2\_2} := C_s \cdot w_{px} = 5161.34\ lbf$ Diaphragm load, seismic

$F_{px\_min\_2\_2} := 0.2 \cdot S_{DS} \cdot I_e \cdot w_{px} = 6709.74\ lbf$ Diaphragm load, seismic (Minimum)

$F_{px\_max\_2\_2} := 0.4 \cdot S_{DS} \cdot I_e \cdot w_{px} = 13419.48\ lbf$ Diaphragm load, seismic (Maximum)

$F_{px\_2\_2} := \max\left(min\left(F_{px\_2\_2}, F_{px\_max\_2\_2}\right), F_{px\_min\_2\_2}\right) = 6709.742\ lbf$ Design diaphragm load (Seismic)

$Check := if\left(0.7 \cdot \rho \cdot F_{px\_2\_2} \geq 0.6 \cdot F_{p\_wind\_max\_2\_2}, \text{"SEISMIC CONTROLS"}, \text{"WIND CONTROLS"}\right) = \text{"WIND CONTROLS"}$

$\rho := if\left(SDC = \text{"A"}, 1.0, if\left(SDC = \text{"B"}, 1.0, if\left(SDC = \text{"C"}, 1.0, 1.3\right)\right)\right) = 1.3$ Redundancy factor (ASCE sec 12.3.4)

$F_{p\_22} := \max\left(0.6 \cdot F_{p\_wind\_max\_2\_2}, 0.7 \cdot \rho \cdot F_{px\_2\_2}\right) = 6.21\ kip$ Controlling diaphragm load (Service level)

DIAPHRAGM CHECK

$L = 62\ ft$ Diaphragm length

$W = 44\ ft$ Diaphragm depth

$A_{Ratio} := \max\left(\frac{L}{W}, \frac{W}{L}\right) = 1.4$ Worst case aspect ratio

$Check := if\left(A_{Ratio} \leq 3.0, \text{"Blk'g Not Req'd"}, if\left(3.0 < A_{Ratio} \leq 4.0, \text{"Block Diaphragm"}, \text{"Shape Ratio Exceeded"}\right)\right) = \text{"Blk'g Not Req'd"}$ SDPWS Table 4.2.4

$Check := if\left(\frac{W}{L} \leq 1.5, \text{"Open Front OK"}, \text{"Open Front NOT OK"}\right) = \text{"Open Front OK"}$ SDPWS Sec. 4.2.5.2

$\Omega_{ASD} := 2$ ASD reduction factor (SDPWS sec. 4.2.3)

$V_{all\_11} := \frac{670\ plf}{\Omega_{ASD}} = 335\ plf$ Unblocked Diaphragm Allowable Shear in 1-1 Direction (NDS SDPWS Table 4.2C, 15/32" Panel)

$V_{all\_22} := \frac{505\ plf}{\Omega_{ASD}} = 252.5\ plf$ Unblocked Diaphragm Allowable Shear in 2-2 Direction (NDS SDPWS Table 4.2C, 15/32" Panel)

$V_{max\_11} := \frac{F_{p\_11}}{2 \cdot W} = 107.77\ plf$ Worst case diaphragm shear force in 1-1 direction (Service Level)

$V_{max\_22} := \frac{F_{p\_22}}{2 \cdot L} = 50.1\ plf$ Worst case diaphragm shear force in 2-2 direction (Service Level)

$G := 0.42$ Specific gravity of framing member (NDS Table 12.3.3A, SPF)

$SGAF := min(1-(0.5-G), 1) = 0.92$ Specific gravity adjustment factor (SDPWS Table 4.2C, footnote 2)

$Check := if(SGAF \cdot V_{all\_11} \geq V_{max\_11}, \text{"PASS"}, \text{"FAIL"}) = \text{"PASS"}$

$Check := if(SGAF \cdot V_{all\_22} \geq V_{max\_22}, \text{"PASS"}, \text{"FAIL"}) = \text{"PASS"}$

CHORD CHECK

$F_{chord} := max\left(\frac{F_{p\_11} \cdot L}{8 \cdot W}, \frac{F_{p\_22} \cdot W}{8 \cdot L}\right) = 1670.41\ lbf$ Max chord force

$C_{D\_WL} := 1.60$ Load duration factor for seismic/wind (NDS Table 2.3.2)

$F_t := 450\ psi$ Reference tension parallel to grain design value (NDS Supp. Table 4A, SPF #1/#2)

$F_c := 1150\ psi$ Reference compression parallel to grain design value (NDS Supp. Table 4A, SPF #1/#2)

$C_{f\_t} := 1.3$ Size factor, tension (NDS Supp. Table 4A, 2X6)

$C_{f\_c} := 1.1$ Size factor, compression (NDS Supp. Table 4A, 2X6)

$F_t' := F_t \cdot C_{D\_WL} \cdot C_{f\_t} = 936\ psi$ Allowable tension capacity (NDS Table 4.3.1)

$F_c' := F_c \cdot C_{D\_WL} \cdot C_{f\_c} = 2024\ psi$ Allowable bearing capacity (NDS Table 4.3.1, NDS Sec. 3.10.1)

$A_{2x6} := 8.25\ in^2$ Area of section, 2X6

$f_{t\_c} := \frac{F_{chord}}{A_{2x6}} = 202.47\ psi$ Tensile/Compressive stress

$Check := if(F_t' \geq f_{t\_c}, \text{"PASS"}, \text{"FAIL"}) = \text{"PASS"}$

$Check := if(F_c' \geq f_{t\_c}, \text{"PASS"}, \text{"FAIL"}) = \text{"PASS"}$

$N := 14$ Number of 16d nails at splice

$Z := 120\ lbf$ Reference lateral design value (NDS Table 12N, 16d nail, SPF, ts=1-1/2 in)

$D_{nail} := 0.162\ in$ Diameter of 16d nail (NDS App. L, Table L4)

$L_{nail} := 3.5\ in$ Length of 16d nails (NDS App. L, Table L4)

$p := L_{nail} - 1.5\ in = 2\ in$ Penetration of 16d nails

$p' := if\left(p \geq 10 \cdot D_{nail}, 1.0, if\left(6 \cdot D_{nail} \leq p < 10 \cdot D_{nail}, \frac{p}{10 \cdot D_{nail}}, \text{"Select Longer Nail"}\right)\right) = 1$

$Z' := C_{D\_WL} \cdot Z \cdot N \cdot p' = 2688\ lbf$ Allowable connection capacity

$F_{all} := 4690\ lbf$ Allowable CMSTC16 Load (Simpson Catalog)

$Check := if(Z' \geq F_{chord}, "PASS", "FAIL") = "PASS"$

$Check := if(F_{all} \geq F_{chord}, "PASS", "FAIL") = "PASS"$

DIAPHRAGM BLOCKING CONNECTION TO DOUBLE PLATE CHECK - OPTION 1

$N := 1$ Number of A35 clips

$S := 24\ in$ Spacing of A35 clips

$F_{all} := \frac{N \cdot 560\ lbf}{S} = 280\ plf$ Allowable A35 clip Load (Simpson Catalog)

$Check := if(F_{all} \geq V_{max\_11}, "PASS", "FAIL") = "PASS"$

$Check := if(F_{all} \geq V_{max\_22}, "PASS", "FAIL") = "PASS"$

DIAPHRAGM BLOCKING CONNECTION TO DOUBLE PLATE - OPTION 2

$C_{D\_WL} := 1.60$ Load Duration Factor For Seismic/Wind (NDS Table 2.3.2)

$C_{tn} := 0.83$ Toenail Factor (NDS Section 12.5.4.2)

$S := 6\ in$ Spacing of 16d nails

$N := 1$ Number of 16d nails

$D_{nail} := 0.162\ in$ Diameter of 16d nail (NDS App. L, Table L4)

$L_{nail} := 3.5\ in$ Length of 16d nail (NDS App. L, Table L4)

$t_s := \frac{L_{nail}}{3} = 1.17\ in$ Side member thickness, Toe-nail (NDS Fig. 12A)

$p := L_{nail} \cdot \cos(30°) - \frac{L_{nail}}{3} - \frac{7}{16}\ in = 1.43\ in$ Penetration of 16d Nails, Toe-nail

$p' := if\left(p \geq 10 \cdot D_{nail}, 1.0, if\left(6 \cdot D_{nail} \leq p < 10 \cdot D_{nail}, \frac{p}{10 \cdot D_{nail}}, "Select\ Longer\ Nail"\right)\right) = 0.88$

$Z := 141\ lbf$ Reference lateral design value (NDS Table 12N, 16d nail, DFL, ts=1 in)

$Z' := \frac{N \cdot Z \cdot p' \cdot C_{D\_WL} \cdot C_{tn}}{S} = 329.86\ plf$ Allowable nail shear capacity

$Check := if(Z' \geq V_{max\_11}, "PASS", "FAIL") = "PASS"$

$Check := if(Z' \geq V_{max\_22}, "PASS", "FAIL") = "PASS"$

SHEAR WALLS AT FLOOR LEVEL

$V_{max\_11} := F_{p\_11} = 9483.63$ lbf — Story shear force in 1-1 direction (Service Level)

$V_{max\_22} := F_{p\_22} = 6212.6$ lbf — Story shear force in 2-2 direction (Service Level)

SHEAR WALL - GRIDLINE 3 - INDIVIDUAL FULL-HEIGHT SHEAR WALL (DIRECTION 1-1)

$L_{tot} := 14.25\ ft$ Wall length

$R_{SW} := 16.5\ ft$ Length Resisting Direction Force

$h := 10\ ft$ Wall height

$A_{Ratio} := \frac{h}{L_{tot}} = 0.7$ Worst case aspect ratio

Check := if $(A_{Ratio} \le 2$, "Blk'g Not Req'd" , if $(2 < A_{Ratio} \le 3.5$, "Blocking Req'd" , "Shape Ratio Exceeded"$)) =$ "Blk'g Not Req'd" SDPWS Table 4.3.4

$V := \frac{V_{max\_11}}{2} \cdot \left(\frac{R_{SW}}{L}\right) = 1261.93\ lbf$ Induced shear force in shear wall

$V_{SW} := \frac{V}{L_{tot}} = 88.56\ plf$ Maximum induced unit shear wall force

$v_{all} := 475\ plf$ Nominal unit shear wall capacity (SIP Panel)

Check := if $(V_{SW} \ge v_{all}$, "Shear wall not adequate" , "OK"$) =$ "OK"

$T_{width\_floor} := 7\ ft$ Roof Tributary Width

$w_{WL} := |p_{roof} \cdot T_{width\_roof}| = 109.01\ plf$ Roof wind load

$w_{DL} := DL_{floor} \cdot T_{width\_floor} + DL_{wall} \cdot h = 295\ plf$ Roof + Wall dead load

$$T_W := \frac{0.6\ \frac{F_{p\_wind\_1\_1}}{2} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} = 2490.67\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$$T_S := \frac{F_{px\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{(0.6 - 0.14\ S_{DS}) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = 274.42\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{above} := 2364\ lbf$ Holdown Force from Wall Above

$T_{all} := 5820\ lbf$ Allowable holdown force (HDU8-SDS2.5)

Check := if $(\max(T_W + T_{above}, T_S + T_{above}) \ge T_{all}$, "Holdown not adequate" , "OK"$) =$ "OK"

CHECK SILL ATTACHMENT

$Z := 590\ lbf$ Reference Lateral Design Value (NDS Table 12E, 1/2", SPF, ts=1-1/2 in)

$Z' := C_{D\_WL} \cdot Z = 944\ lbf$ Allowable Anchor Bolt Capacity

$S := \frac{Z'}{V_{SW}} = 127.92\ in$ Required Spacing of Sill Plate Anchorage

SHEAR WALL - GRIDLINE 3 - INDIVIDUAL FULL-HEIGHT SHEAR WALL (DIRECTION 1-1)

$L_{tot} := 12\ ft$ Wall length

$R_{SW} := 16.6\ ft$ Length Resisting Direction Force

$h := 10\ ft$ Wall height

$A_{Ratio} := \frac{h}{L_{tot}} = 0.83$ Worst case aspect ratio

Check := if $(A_{Ratio} \le 2$, "Blk'g Not Req'd" , if $(2 < A_{Ratio} \le 3.5$, "Blocking Req'd" , "Shape Ratio Exceeded"$)) =$ "Blk'g Not Req'd" SDPWS Table 4.3.4

$V := \frac{V_{max\_11}}{2} \cdot \left(\frac{R_{SW}}{L}\right) = 1269.58\ lbf$ Induced shear force in shear wall

$V_{SW} := \frac{V}{L_{tot}} = 105.8\ plf$ Maximum induced unit shear wall force

$v_{all} := 475\ plf$ Nominal unit shear wall capacity (SIP Panel)

Check := if $(V_{SW} \ge v_{all}$, "Shear wall not adequate" , "OK"$) =$ "OK"

$T_{width\_roof} := 3\ ft$ Roof Tributary Width

$w_{WL} := |p_{roof} \cdot T_{width\_roof}| = 46.72\ plf$ Roof wind load

$w_{DL} := DL_{roof} \cdot T_{width\_roof} + DL_{sip\_wall} \cdot h = 93.5\ plf$ Roof + Wall dead load

$$T_W := \frac{0.6\ \frac{F_{p\_wind\_1\_1}}{2} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} + \frac{0.6 \cdot w_{WL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} = 2834.56\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$$T_S := \frac{F_{px\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{(0.6 - 0.14\ S_{DS}) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = 1349.66\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{above} := 2364\ lbf$ Holdown Force from Wall Above

$T_{all} := 5820\ lbf$ Allowable holdown force (HDU8-SDS2.5)

Check := if $(\max(T_W + T_{above}, T_S + T_{above}) \ge T_{all}$, "Holdown not adequate" , "OK"$) =$ "OK"

CHECK SILL ATTACHMENT

$Z := 590\ lbf$ Reference Lateral Design Value (NDS Table 12E, 1/2", SPF, ts=1-1/2 in)

$Z' := C_{D\_WL} \cdot Z = 944\ lbf$ Allowable Anchor Bolt Capacity

$S := \frac{Z'}{V_{SW}} = 107.07\ in$ Required Spacing of Sill Plate Anchorage

SHEAR WALL - GRIDLINE 3.5 - INDIVIDUAL FULL-HEIGHT SHEAR WALL (DIRECTION 1-1)

$L_{tot} := 20\ ft$ Wall length

$R_{SW} := 10\ ft$ Length Resisting Direction Force

$h := 10\ ft$ Wall height

$A_{Ratio} := \frac{h}{L_{tot}} = 0.5$ Worst case aspect ratio

$Check := if\left(A_{Ratio} \le 2, \text{"Blk'g Not Req'd"}, if\left(2 < A_{Ratio} \le 3.5, \text{"Blocking Req'd"}, \text{"Shape Ratio Exceeded"}\right)\right) = \text{"Blk'g Not Req'd"}$ SDPWS Table 4.3.4

$V := V_{max\_11} \cdot \left(\frac{R_{SW}}{L}\right) = 1529.62\ lbf$ Induced shear force in shear wall

$V_{SW} := \frac{V}{L_{tot}} = 76.48\ plf$ Maximum induced unit shear wall force

$v_{all} := 350\ plf$ Nominal unit shear wall capacity (SIP Panel)

$Check := if\left(V_{SW} \ge v_{all}, \text{"Shear wall not adequate"}, \text{"OK"}\right) = \text{"OK"}$

$T_{width\_floor} := 7\ ft$ Roof Tributary Width

$w_{WL} := \left|p_{roof} \cdot T_{width\_roof}\right| = 46.72\ plf$ Roof wind load

$w_{DL} := DL_{floor} \cdot T_{width\_floor} + DL_{wall} \cdot h = 295\ plf$ Roof + Wall dead load

$$T_W := \frac{0.6\ F_{p\_wind\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{\left(\Sigma L_i\right)^2}{2}}{C_o \cdot \Sigma L_i} = 3101.29\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$$T_S := \frac{F_{px\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{\left(0.6 - 0.14\ S_{DS}\right) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = -951.66\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{all} := 3285\ lbf$ Allowable holdown force (HDU4-SDS2.5)

$Check := if\left(\max\left(T_W, T_S\right) \ge T_{all}, \text{"Holdown not adequate"}, \text{"OK"}\right) = \text{"OK"}$

CHECK SILL ATTACHMENT

$Z := 590\ lbf$ Reference Lateral Design Value (NDS Table 12E, 1/2", SPF, ts=1-1/2 in)

$Z' := C_{D\_WL} \cdot Z = 944\ lbf$ Allowable Anchor Bolt Capacity

$S := \frac{Z'}{V_{SW}} = 148.12\ in$ Required Spacing of Sill Plate Anchorage

SHEAR WALL - GRIDLINE 4 - PERFORATED SHEAR WALL (DIRECTION 1-1)

$L_1 := 4.5\ ft$ $L_2 := 5\ ft$ Pier lengths $T_{width} := 10\ ft$ Tributary Width

$L_{tot} := 12\ ft$ Total length of wall $h := 10\ ft$ Wall height

$A := 24\ ft^2$ Total area of openings $R_{SW} := 10.5\ ft$ Length Resisting Direction Force

$Check := if(h > 20\ ft, \text{"Perforated shear wall not allowed"}, \text{"OK"}) = \text{"OK"}$ SDPWS 4.3.5.3.7

$L_{1\_adj} := if\left(L_1 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_1} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_1} \ge 2.0, L_1 \cdot \left(\frac{2 \cdot L_1}{h}\right), L_1\right)\right)\right) = 4.05\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$L_{2\_adj} := if\left(L_2 \le 0\ ft, \text{"Segment not allowed"}, if\left(\frac{h}{L_2} \ge 3.5, \text{"Aspect ratio not allowed"}, if\left(\frac{h}{L_2} \ge 2.0, L_2 \cdot \left(\frac{2 \cdot L_2}{h}\right), L_2\right)\right)\right) = 5\ ft$ Adjusted pier length (SDPWS sec. 4.3.4.3)

$\Sigma L_i := L_{1\_adj} + L_{2\_adj} = 9.05\ ft$ Sum of perforated shear wall segments

$r := \frac{1}{\left(1 + \frac{A}{h \cdot \Sigma L_i}\right)} = 0.7904$ Sheathing area ratio (SDPWS eq. 4.3-6)

$C_o := min\left(\frac{r}{(3 - 2 \cdot r)} \cdot \frac{L_{tot}}{\Sigma L_i}, 1\right) = 0.7385$ Adjustment factor (SDPWS eq. 4.3-5)

$V := V_{max\_11} \cdot \left(\frac{R_{SW}}{L}\right) = 1606.1\ lbf$ Induced shear force in perforated shear wall

$V_{SW} := \frac{V}{C_o \cdot \Sigma L_i} = 240.32\ plf$ Maximum induced unit shear wall force (SDPWS eq. 4.3-9)

$v_{all} := 475\ plf$ Nominal unit shear wall capacity (SIP Panel)

$Check := if(v_{all} > 2435\ plf, \text{"Perforated shear wall not allowed"}, \text{"OK"}) = \text{"OK"}$

$Check := if(V_{SW} \ge v_{all}, \text{"Perforated shear wall not adequate"}, \text{"OK"}) = \text{"OK"}$

$w_{DL} := DL_{roof} \cdot T_{width} + DL_{sip\_wall} \cdot h = 219.5\ plf$ Dead load

$$T_W := \frac{0.6\ F_{p\_wind\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{C_o \cdot \Sigma L_i} + \frac{0.6 \cdot \left|p_{roof} \cdot T_{width}\right| \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} - \frac{0.6 \cdot w_{DL} \cdot \frac{(\Sigma L_i)^2}{2}}{C_o \cdot \Sigma L_i} = 2168.78\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$$T_S := \frac{0.7\ \rho \cdot F_{px\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) \cdot h}{L_{tot}} - \frac{(0.6 - 0.14\ S_{DS}) \cdot w_{DL} \cdot \frac{L_{tot}^2}{2}}{L_{tot}} = 255.99\ lbf$$

Required holdown capacity (Service level, SDPWS eq. 4.3-8)

$T_{above} := 4129\ lbf$ Holdown Force from Wall Above

$T_{all} := 8030\ lbf$ Allowable holdown force (HDU11-SDS2.5)

$Check := if(max(T_W + T_{above}, T_S + T_{above}) \ge T_{all}, \text{"Holdown not adequate"}, \text{"OK"}) = \text{"OK"}$

CHECK SILL ATTACHMENT

$Z := 590\ lbf$ Reference Lateral Design Value (NDS Table 12E, 1/2", SPF, ts=1-1/2 in)

$Z' := C_{D\_WL} \cdot Z = 944\ lbf$ Allowable Anchor Bolt Capacity

$S := \frac{Z'}{V_{SW}} = 47.14\ in$ Required Spacing of Sill Plate Anchorage

SHEAR WALL - GRIDLINE 5 - PORTAL FRAME (DIRECTION 1-1)

$L_{tot} := 27\ ft$ Wall length

$R_{SW} := 10\ ft$ Length Resisting Direction Force

$h := 10\ ft$ Wall height

$V := F_{px\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) = 1188.15\ lbf$ Induced shear force in shear wall (Seismic)

$V := F_{p\_wind\_max\_1\_1} \cdot \left(\frac{R_{SW}}{L}\right) = 2549.36\ lbf$ Induced shear force in shear wall (Wind)

$V_{SW} := \frac{V}{L_{tot}} = 94.42\ plf$ Maximum induced unit shear wall force

$T_{width\_floor} := 7\ ft$ Tributary Width

CHECK SILL ATTACHMENT

OPTION 1 - Toenail

$C_{D\_WL} := 1.60$ Load Duration Factor For Seismic/Wind (NDS Table 2.3.2)

$C_{tn} := 0.83$ Toenail Factor (NDS Section 12.5.4.2)

$S := 3\ in$ Spacing of 16d nails

$N := 1$ Number of 16d nails

$D_{nail} := 0.162\ in$ Diameter of 16d nail (NDS App. L, Table L4)

$L_{nail} := 3.5\ in$ Length of 16d nail (NDS App. L, Table L4)

$t_s := \frac{L_{nail}}{3} = 1.17\ in$ Side member thickness, Toe-nail (NDS Fig. 12A)

$p := L_{nail} \cdot \cos(30°) - \frac{L_{nail}}{3} - \frac{7}{16}\ in = 1.43\ in$ Penetration of 16d Nails, Toe-nail

$$p' := \text{if}\left(p \geq 10 \cdot D_{nail}, 1.0, \text{if}\left(6 \cdot D_{nail} \leq p < 10 \cdot D_{nail}, \frac{p}{10 \cdot D_{nail}}, \text{"Select Longer Nail"}\right)\right) = 0.88$$

$Z := 141\ lbf$ Reference lateral design value (NDS Table 12N, 16d nail, DFL, ts=1 in)

$Z' := \frac{N \cdot Z \cdot p' \cdot C_{D\_WL} \cdot C_{tn}}{S} = 659.72\ plf$ Allowable nail shear capacity

OPTION 2 - Nail

$S := 4\ in$ Spacing of 16d nails

$Z := 120\ lbf$ Reference lateral design value (NDS Table 12N, 16d nail, SPF, ts=1-1/2 in)

$D_{nail} := 0.162\ in$ Diameter of 16d nail (NDS App. L, Table L4)

$L_{nail} := 3.5\ in$ Length of 16d nails (NDS App. L, Table L4)

$p := L_{nail} - 1.5\ in = 2\ in$ Penetration of 16d nails

$$p' := \text{if}\left(p \geq 10 \cdot D_{nail}, 1.0, \text{if}\left(6 \cdot D_{nail} \leq p < 10 \cdot D_{nail}, \frac{p}{10 \cdot D_{nail}}, \text{"Select Longer Nail"}\right)\right) = 1$$

$Z' := \frac{C_{D\_WL} \cdot Z \cdot p'}{S} = 576\ plf$ Allowable connection capacity

Pile Capacity for Grade Beam Worst Case

$D := 15\ ft$	Depth of Pier	$A_{skin} := 4000\ psf$	Allowable Skin Friction on Bedrock
$W_{conc} := 150\ pcf$	Weight of Concrete	$A_{bearing} := 40000\ psf$	Allowable End Bearing
$d := 14\ in$	Diameter of Pier		

$$P_{capacity} := \pi \cdot d \cdot A_{skin} \cdot (5\ ft) + \frac{1}{4}\pi \cdot d^2 \cdot A_{bearing} - W_{conc} \cdot \frac{1}{4}\pi \cdot d^2 \cdot D = 113659\ lbf$$

Total Capacity of Pier

$P := 93.4\ kip$ Worst Case Point Load

Check: $P_{capacity} \geq P = 1$ **1 = OK, 0 = N.G.**

4 SOFTWARE PRINTOUTS (ENERCALC)

Tamarack Grove Engineering
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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Printed: 10 MAY 2024, 9:54AM

Wood Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

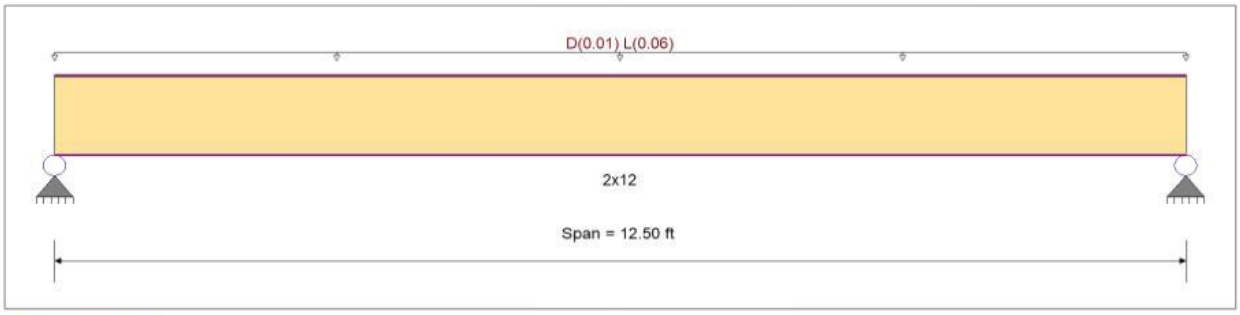
DESCRIPTION: 2x12 P.T. Deck Joists

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	875 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	875 psi	Ebend- xx	1400 ksi
		Fc - Prll	1150 psi	Eminbend - xx	510 ksi
Wood Species :	Spruce-Pine-Fir	Fc - Perp	425 psi		
Wood Grade :	No.1/No.2	Fv	135 psi		
		Ft	450 psi	Density	26.22 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling			Repetitive Member Stress Increase	



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.010, L = 0.060 , Tributary Width = 1.0 ft, (Deck Loading)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.672 : 1	Maximum Shear Stress Ratio	=	0.321 : 1
Section used for this span		2x12	Section used for this span		2x12
fb: Actual	=	541.28 psi	fv: Actual	=	34.67 psi
F'b	=	805.00 psi	F'v	=	108.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	6.250 ft	Location of maximum on span	=	11.588 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.140 in	Ratio =	1071 >=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.171 in	Ratio =	879 >=180	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0 <180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.134	0.064	0.90	1.00	1.00	1.00	1.000	1.00	0.80	1.15	0.26	96.8	724.5	0.07	6.2	97.2
+D+L					1.00	1.00	1.00	1.000	1.00	0.80	1.15			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.672	0.321	1.00	1.00	1.00	1.00	1.000	1.00	0.80	1.15	1.43	541.3	805.0	0.39	34.7	108.0
+D+0.750L					1.00	1.00	1.00	1.000	1.00	0.80	1.15			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.427	0.204	1.25	1.00	1.00	1.00	1.000	1.00	0.80	1.15	1.13	430.2	1,006.3	0.31	27.6	135.0
+0.60D					1.00	1.00	1.00	1.000	1.00	0.80	1.15			0.0	0.00	0.0	0.0
Length = 12.50 ft	1	0.045	0.022	1.60	1.00	1.00	1.00	1.000	1.00	0.80	1.15	0.15	58.1	1,288.0	0.04	3.7	172.8

Tamarack Grove Engineering
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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Printed: 10 MAY 2024, 9:54AM

Wood Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

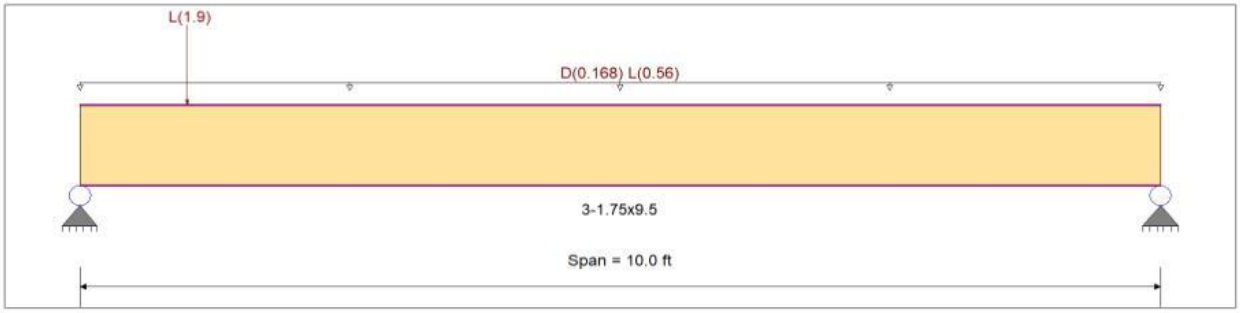
DESCRIPTION: First Floor, Mid-Span Lvl (Worst Case)

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,600.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	2,600.0 psi	Ebend- xx	2,000.0 ksi
		Fc - Prll	2,510.0 psi	Eminbend - xx	1,016.54 ksi
Wood Species :	iLevel Truss Joist	Fc - Perp	750.0 psi		
Wood Grade :	MicroLam LVL 2.0 E	Fv	285.0 psi		
		Ft	1,555.0 psi	Density	42.010 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.0120, L = 0.040 ksf, Tributary Width = 14.0 ft
Point Load : L = 1.90 k @ 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.581 : 1	Maximum Shear Stress Ratio	=	0.512 : 1
Section used for this span		3-1.75x9.5	Section used for this span		3-1.75x9.5
fb: Actual	=	1,558.52 psi	fv: Actual	=	145.97 psi
F'b	=	2,683.93 psi	F'v	=	285.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	4.745 ft	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	0.196 in	Ratio =	611 >=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.251 in	Ratio =	477 >=240	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 10.0 ft	1	0.144	0.091	0.90	1.00	1.00	1.00	1.032	1.00	1.00	1.00	2.28	346.8	2,415.5	0.77	23.2	256.5
+D+L					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.0 ft	1	0.581	0.512	1.00	1.00	1.00	1.00	1.032	1.00	1.00	1.00	10.26	1,558.5	2,683.9	4.85	146.0	285.0
+D+0.750L					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.0 ft	1	0.374	0.324	1.25	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.26	1,255.4	3,354.9	3.83	115.3	356.3
+0.60D					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.0 ft	1	0.048	0.031	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.37	208.1	4,294.3	0.46	13.9	456.0

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Printed: 10 MAY 2024, 9:54AM

Wood Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

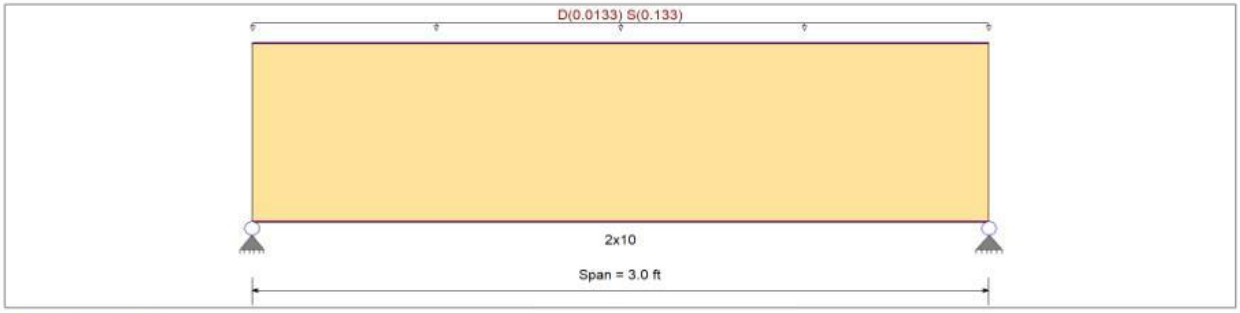
DESCRIPTION: 2x6 Exterior Roof Sleepers

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	875.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	875.0 psi	Ebend- xx	1,400.0 ksi
		Fc - Prll	1,150.0 psi	Eminbend - xx	510.0 ksi
Wood Species :	Spruce-Pine-Fir	Fc - Perp	425.0 psi		
Wood Grade :	No.1/No.2	Fv	135.0 psi		
		Ft	450.0 psi	Density	26.220 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling			Repetitive Member Stress Increase	



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.010, S = 0.10 ksf, Tributary Width = 1.330 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.074 : 1	Maximum Shear Stress Ratio	=	0.076 : 1
Section used for this span		2x10	Section used for this span		2x10
fb: Actual	=	93.93 psi	fv: Actual	=	11.80 psi
F'b	=	1,272.91 psi	F'v	=	155.25 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	1.500 ft	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	0.002 in	Ratio =	20451	>=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.002 in	Ratio =	18276	>=180	Span: 1 : +D+S
Max Upward Total Deflection	0 in	Ratio =	0	<180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 3.0 ft	1	0.010	0.010	0.90	1.00	1.00	1.00	1.100	1.00	1.00	1.15	0.02	10.0	996.2	0.01	1.3	121.5
+D+S					1.00	1.00	1.00	1.100	1.00	1.00	1.15			0.0	0.00	0.0	0.0
Length = 3.0 ft	1	0.074	0.076	1.15	1.00	1.00	1.00	1.100	1.00	1.00	1.15	0.17	93.9	1,272.9	0.11	11.8	155.3
+D+0.750S					1.00	1.00	1.00	1.100	1.00	1.00	1.15			0.0	0.00	0.0	0.0
Length = 3.0 ft	1	0.057	0.059	1.15	1.00	1.00	1.00	1.100	1.00	1.00	1.15	0.13	72.9	1,272.9	0.08	9.2	155.3
+0.60D					1.00	1.00	1.00	1.100	1.00	1.00	1.15			0.0	0.00	0.0	0.0
Length = 3.0 ft	1	0.003	0.003	1.60	1.00	1.00	1.00	1.100	1.00	1.00	1.15	0.01	6.0	1,771.0	0.01	0.8	216.0

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Printed: 10 MAY 2024, 9:54AM

Wood Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

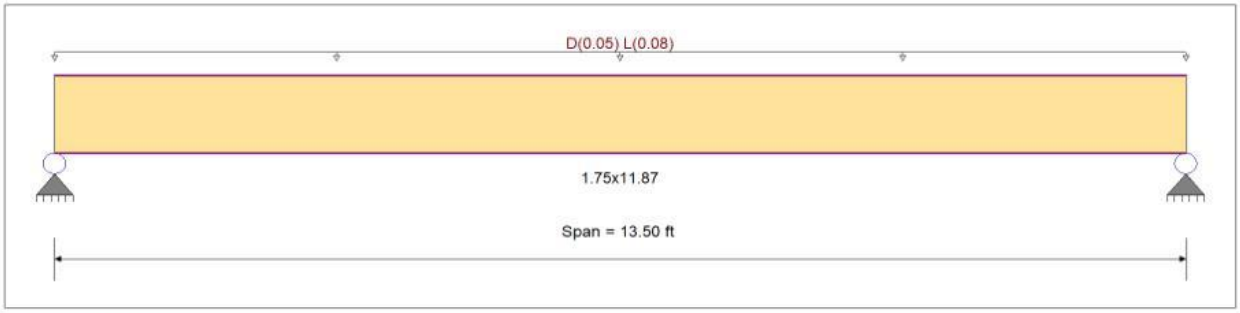
DESCRIPTION: LVL 1st Floor Stair Header

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,600.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	2,600.0 psi	Ebend- xx	2,000.0 ksi
		Fc - Prll	2,510.0 psi	Eminbend - xx	1,016.54 ksi
Wood Species :	iLevel Truss Joist	Fc - Perp	750.0 psi		
Wood Grade :	MicroLam LVL 2.0 E	Fv	285.0 psi		
		Ft	1,555.0 psi	Density	42.010 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.347 : 1	Maximum Shear Stress Ratio	=	0.199 : 1
Section used for this span		1.75x11.87	Section used for this span		1.75x11.87
fb: Actual	=	904.36 psi	fv: Actual	=	56.61 psi
F'b	=	2,603.71 psi	F'v	=	285.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	6.750 ft	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	0.123 in	Ratio =	1315 >=480	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0 <480	n/a
Max Downward Total Deflection	0.209 in	Ratio =	773 >=360	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0 <360	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 13.451 ft	1	0.159	0.091	0.90	1.00	1.00	1.00	1.001	1.00	1.00	1.00	1.28	372.6	2,343.3	0.32	23.3	256.5
Length = 0.04927 ft	1	0.002	0.091	0.90	1.00	1.00	1.00	1.001	1.00	1.00	1.00	0.02	5.4	2,343.3	0.32	23.3	256.5
+D+L					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.451 ft	1	0.347	0.199	1.00	1.00	1.00	1.00	1.001	1.00	1.00	1.00	3.10	904.4	2,603.7	0.78	56.6	285.0
Length = 0.04927 ft	1	0.005	0.199	1.00	1.00	1.00	1.00	1.001	1.00	1.00	1.00	0.05	13.2	2,603.7	0.78	56.6	285.0
+D+0.750L					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.451 ft	1	0.237	0.136	1.25	1.00	1.00	1.00	1.001	1.00	1.00	1.00	2.64	771.4	3,254.6	0.67	48.3	356.3
Length = 0.04927 ft	1	0.003	0.136	1.25	1.00	1.00	1.00	1.001	1.00	1.00	1.00	0.04	11.2	3,254.6	0.67	48.3	356.3
+0.60D					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Printed: 10 MAY 2024, 9:54AM

Wood Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

DESCRIPTION: LVL 1st Floor Stair Header

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
Length = 13.451 ft	1	0.054	0.031	1.60	1.00	1.00	1.00	1.001	1.00	1.00	1.00	0.77	223.6	4,165.9	0.19	14.0	456.0
Length = 0.04927 ft	1	0.001	0.031	1.60	1.00	1.00	1.00	1.001	1.00	1.00	1.00	0.01	3.3	4,165.9	0.19	14.0	456.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.2094	6.799		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.918	0.918
Max Upward from Load Combinations	0.918	0.918
Max Upward from Load Cases	0.540	0.540
D Only	0.378	0.378
+D+L	0.918	0.918
+D+0.750L	0.783	0.783
+0.60D	0.227	0.227
L Only	0.540	0.540

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Project Descr:

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Wood Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING

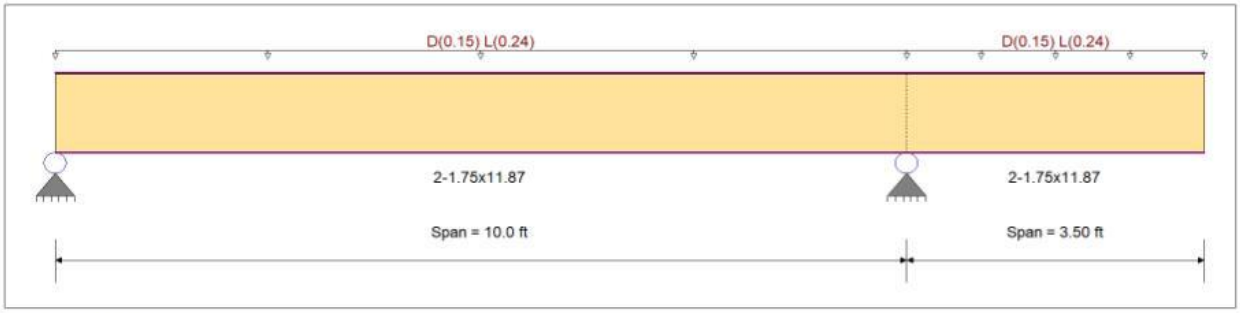
DESCRIPTION: LVL 1st Floor Stair Header (Cant.)

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,600.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	2,600.0 psi	Ebend- xx	2,000.0 ksi
		Fc - Prll	2,510.0 psi	Eminbend - xx	1,016.54 ksi
Wood Species :	iLevel Truss Joist	Fc - Perp	750.0 psi		
Wood Grade :	MicroLam LVL 2.0 E	Fv	285.0 psi		
		Ft	1,555.0 psi	Density	42.010 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load for Span Number 1
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 6.0 ft, (Floor Loading)
Load for Span Number 2
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 6.0 ft, (Floor Loading)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.217 : 1	Maximum Shear Stress Ratio	=	0.237 : 1
Section used for this span		2-1.75x11.87	Section used for this span		2-1.75x11.87
fb: Actual	=	564.61 psi	fv: Actual	=	67.67 psi
F'b	=	2,603.71 psi	F'v	=	285.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	4.413 ft	Location of maximum on span	=	9.050 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.040 in	Ratio =	3034 >=480	Span: 1 : L Only
Max Upward Transient Deflection	-0.024 in	Ratio =	3552 >=480	Span: 2 : L Only
Max Downward Total Deflection	0.066 in	Ratio =	1810 >=360	Span: 1 : +D+L
Max Upward Total Deflection	-0.040 in	Ratio =	2120 >=360	Span: 2 : +D+L

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 10.0 ft	1	0.097	0.106	0.90	1.00	1.00	1.00	1.001	1.00	1.00	1.00	1.56	227.6	2,343.3	0.76	27.3	256.5
Length = 3.50 ft	2	0.062	0.106	0.90	1.00	1.00	1.00	1.001	1.00	1.00	1.00	0.99	144.9	2,343.3	0.41	27.3	256.5
+D+L					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.0 ft	1	0.217	0.237	1.00	1.00	1.00	1.00	1.001	1.00	1.00	1.00	3.87	564.6	2,603.7	1.88	67.7	285.0
Length = 3.50 ft	2	0.138	0.237	1.00	1.00	1.00	1.00	1.001	1.00	1.00	1.00	2.46	359.3	2,603.7	1.01	67.7	285.0
+D+0.750L					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.0 ft	1	0.148	0.162	1.25	1.00	1.00	1.00	1.001	1.00	1.00	1.00	3.29	480.4	3,254.6	1.60	57.6	356.3

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

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Wood Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING

DESCRIPTION: LVL 1st Floor Stair Header (Cant.)

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
Length = 3.50 ft	2	0.094	0.162	1.25	1.00	1.00	1.00	1.001	1.00	1.00	1.00	2.10	305.7	3,254.6	0.86	57.6	356.3
+0.60D					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.0 ft	1	0.033	0.036	1.60	1.00	1.00	1.00	1.001	1.00	1.00	1.00	0.94	136.6	4,165.9	0.45	16.4	456.0
Length = 3.50 ft	2	0.021	0.036	1.60	1.00	1.00	1.00	1.001	1.00	1.00	1.00	0.60	86.9	4,165.9	0.25	16.4	456.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0663	4.749		0.0000	0.000
	2	0.0000	4.749	+D+L	-0.0396	3.500

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	1.764	3.664	
Max Upward from Load Combinations	1.764	3.664	
Max Upward from Load Cases	1.053	2.187	
D Only	0.711	1.477	
+D+L	1.764	3.664	
+D+0.750L	1.501	3.118	
+0.60D	0.427	0.886	
L Only	1.053	2.187	

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Project Descr:

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Wood Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

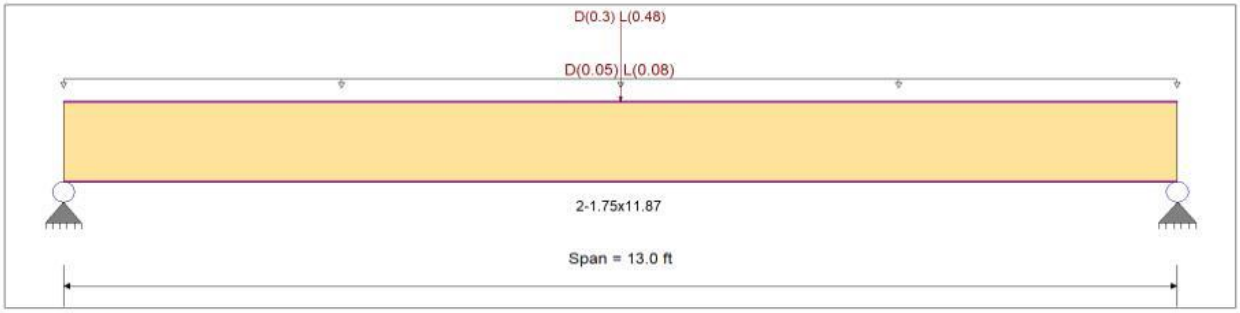
DESCRIPTION: 1st Floor Stair Header (At Entry Parallel to Framing)

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,600.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	2,600.0 psi	Ebend- xx	2,000.0 ksi
		Fc - Prll	2,510.0 psi	Eminbend - xx	1,016.54 ksi
Wood Species :	iLevel Truss Joist	Fc - Perp	750.0 psi		
Wood Grade :	MicroLam LVL 2.0 E	Fv	285.0 psi		
		Ft	1,555.0 psi	Density	42.010 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 2.0 ft, (Floor Loading)
Point Load : D = 0.30, L = 0.480 k @ 6.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.310 : 1	Maximum Shear Stress Ratio	=	0.149 : 1
Section used for this span		2-1.75x11.87	Section used for this span		2-1.75x11.87
fb: Actual	=	807.80 psi	fv: Actual	=	42.55 psi
F'b	=	2,603.71 psi	F'v	=	285.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	6.500 ft	Location of maximum on span	=	12.051 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.092 in	Ratio =	1695 >=480	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0 <480	n/a
Max Downward Total Deflection	0.158 in	Ratio =	990 >=360	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0 <360	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 13.0 ft	1	0.142	0.070	0.90	1.00	1.00	1.00	1.001	1.00	1.00	1.00	2.29	333.7	2,343.3	0.49	17.9	256.5
+D+L					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.0 ft	1	0.310	0.149	1.00	1.00	1.00	1.00	1.001	1.00	1.00	1.00	5.54	807.8	2,603.7	1.18	42.5	285.0
+D+0.750L					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.0 ft	1	0.212	0.102	1.25	1.00	1.00	1.00	1.001	1.00	1.00	1.00	4.72	689.3	3,254.6	1.01	36.4	356.3
+0.60D					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.0 ft	1	0.048	0.023	1.60	1.00	1.00	1.00	1.001	1.00	1.00	1.00	1.37	200.2	4,165.9	0.30	10.7	456.0

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

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Wood Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING

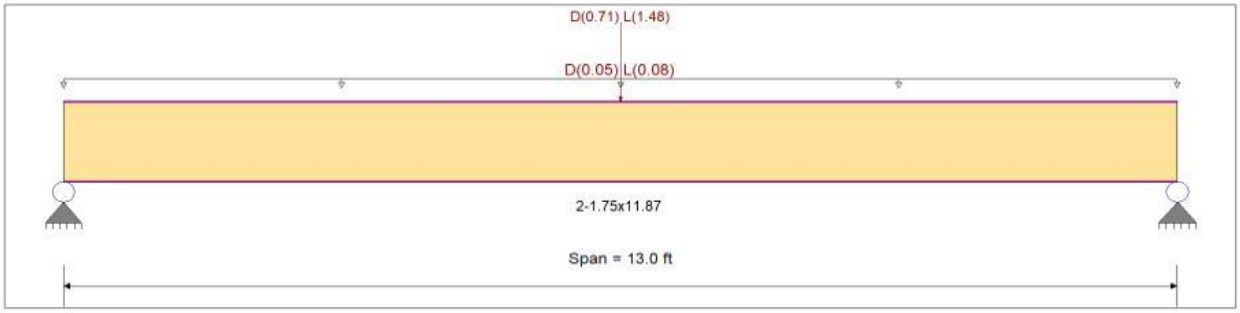
DESCRIPTION: 1st Floor Stair Header (Under Balcony Parallel to Framing)

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,600.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	2,600.0 psi	Ebend- xx	2,000.0 ksi
		Fc - Prll	2,510.0 psi	Eminbend - xx	1,016.54 ksi
Wood Species :	iLevel Truss Joist	Fc - Perp	750.0 psi		
Wood Grade :	MicroLam LVL 2.0 E	Fv	285.0 psi		
		Ft	1,555.0 psi	Density	42.010 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 2.0 ft, (Floor Loading)
Point Load : D = 0.710, L = 1.480 k @ 6.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.567 : 1	Maximum Shear Stress Ratio	=	0.239 : 1
Section used for this span		2-1.75x11.87	Section used for this span		2-1.75x11.87
fb: Actual	=	1,476.30 psi	fv: Actual	=	67.99 psi
F'b	=	2,603.71 psi	F'v	=	285.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	6.500 ft	Location of maximum on span	=	12.051 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.173 in	Ratio =	899 >=480	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0 <480	n/a
Max Downward Total Deflection	0.272 in	Ratio =	572 >=360	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0 <360	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 13.0 ft	1	0.225	0.098	0.90	1.00	1.00	1.00	1.001	1.00	1.00	1.00	3.62	528.1	2,343.3	0.70	25.3	256.5
+D+L					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.0 ft	1	0.567	0.239	1.00	1.00	1.00	1.00	1.001	1.00	1.00	1.00	10.12	1,476.3	2,603.7	1.88	68.0	285.0
+D+0.750L					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.0 ft	1	0.381	0.161	1.25	1.00	1.00	1.00	1.001	1.00	1.00	1.00	8.49	1,239.2	3,254.6	1.59	57.3	356.3
+0.60D					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 13.0 ft	1	0.076	0.033	1.60	1.00	1.00	1.00	1.001	1.00	1.00	1.00	2.17	316.8	4,165.9	0.42	15.2	456.0

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

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Wood Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING

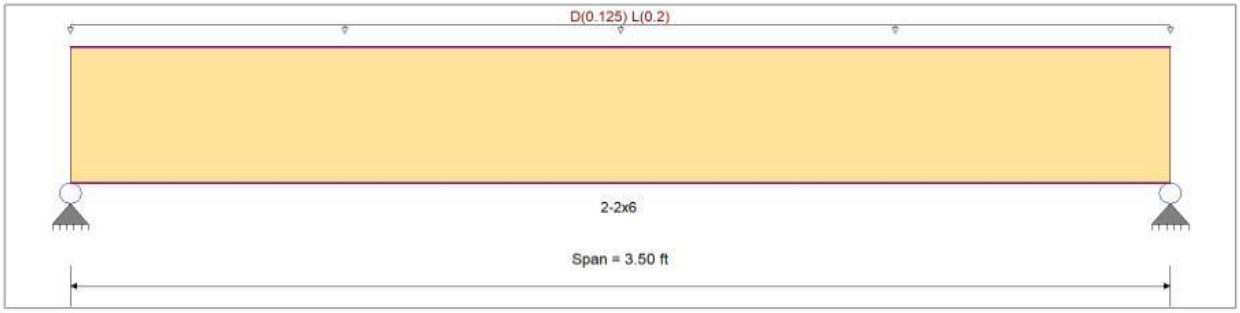
DESCRIPTION: Basement Header (In 2x Load Bearing Walls -Worst Case)

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,600.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	2,600.0 psi	Ebend- xx	2,000.0 ksi
		Fc - Prll	2,510.0 psi	Eminbend - xx	1,016.54 ksi
Wood Species :	iLevel Truss Joist	Fc - Perp	750.0 psi		
Wood Grade :	MicroLam LVL 2.0 E	Fv	285.0 psi		
		Ft	1,555.0 psi	Density	42.010 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 5.0 ft, (Floor Loading)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.154 : 1	Maximum Shear Stress Ratio	=	0.137 : 1
Section used for this span		2-2x6	Section used for this span		2-2x6
fb: Actual	=	400.68 psi	fv: Actual	=	39.07 psi
F'b	=	2,600.00 psi	F'v	=	285.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	1.750 ft	Location of maximum on span	=	3.053 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.008 in	Ratio =	5143 >=480	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0 <480	n/a
Max Downward Total Deflection	0.013 in	Ratio =	3119 >=360	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0 <360	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 3.50 ft	1	0.067	0.060	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.20	157.7	2,340.0	0.17	15.4	256.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.50 ft	1	0.154	0.137	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.51	400.7	2,600.0	0.43	39.1	285.0
+D+0.750L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.50 ft	1	0.105	0.093	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.43	339.9	3,250.0	0.36	33.1	356.3
+0.60D					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.50 ft	1	0.023	0.020	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.12	94.6	4,160.0	0.10	9.2	456.0

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Printed: 10 MAY 2024, 9:54AM

Wood Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

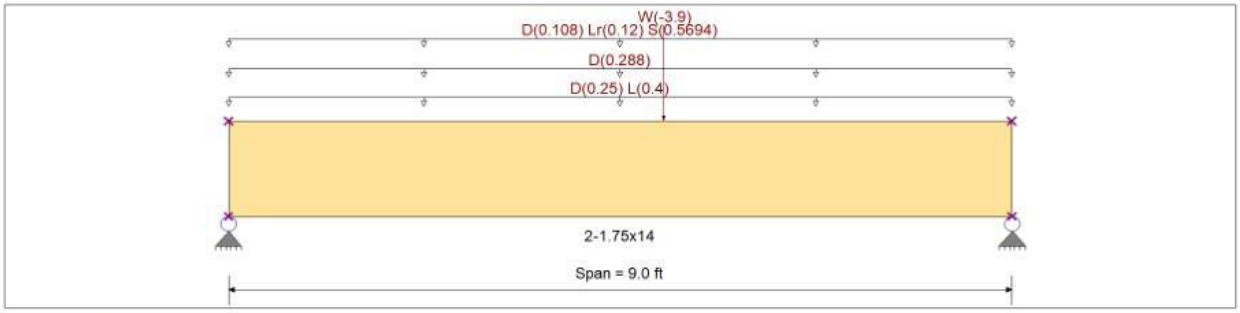
DESCRIPTION: Portal Frame LvL (Worst Case)

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,600.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2021	Fb -	2,600.0 psi	Ebend- xx	2,000.0 ksi
		Fc - Prll	2,510.0 psi	Eminbend - xx	1,016.54 ksi
Wood Species :	iLevel Truss Joist	Fc - Perp	750.0 psi		
Wood Grade :	MicroLam LVL 2.0 E	Fv	285.0 psi		
		Ft	1,555.0 psi	Density	42.010 pcf
Beam Bracing :	Completely Unbraced				



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 10.0 ft, (Floor Loading)
Uniform Load : D = 0.0120 ksf, Tributary Width = 24.0 ft, (Wall Loading)
Uniform Load : D = 0.0180, Lr = 0.020, S = 0.09490 ksf, Tributary Width = 6.0 ft, (Roof Loading)
Point Load : W = -3.90 k @ 5.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.536 : 1	Maximum Shear Stress Ratio	=	0.434 : 1
Section used for this span		2-1.75x14	Section used for this span		2-1.75x14
fb: Actual	=	1,474.31 psi	fv: Actual	=	142.29 psi
F'b	=	2,751.41 psi	F'v	=	327.75 psi
Load Combination		+D+0.750L+0.750S	Load Combination		+D+0.750L+0.750S
Location of maximum on span	=	4.500 ft	Location of maximum on span	=	7.850 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.053 in	Ratio =	2044	>=480	Span: 1 : S Only
Max Upward Transient Deflection	-0.063 in	Ratio =	1707	>=480	Span: 1 : W Only
Max Downward Total Deflection	0.129 in	Ratio =	839	>=360	Span: 1 : +D+0.750L+0.750S
Max Upward Total Deflection	-0.001 in	Ratio =	74715	>=360	Span: 1 : +0.60D+0.60W

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 9.0 ft	1	0.319	0.264	0.90	1.00	1.00	0.96	0.979	1.00	1.00	1.00	6.69	701.7	2,201.5	2.21	67.7	256.5
+D+L					1.00	1.00	0.96	0.979	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 9.0 ft	1	0.464	0.382	1.00	1.00	1.00	0.95	0.979	1.00	1.00	1.00	10.74	1,126.8	2,426.8	3.55	108.7	285.0
+D+Lr					1.00	1.00	0.95	0.979	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 9.0 ft	1	0.280	0.225	1.25	1.00	1.00	0.93	0.979	1.00	1.00	1.00	7.90	829.2	2,957.0	2.61	80.0	356.3
+D+S					1.00	1.00	0.93	0.979	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 9.0 ft	1	0.475	0.385	1.15	1.00	1.00	0.94	0.979	1.00	1.00	1.00	12.45	1,306.8	2,751.4	4.12	126.1	327.8

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

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Wood Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

DESCRIPTION: Portal Frame LvL (Worst Case)

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
+D+0.750Lr+0.750L					1.00	1.00	0.94	0.979	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 9.0 ft	1	0.377	0.302	1.25	1.00	1.00	0.93	0.979	1.00	1.00	1.00	10.63	1,116.1	2,957.0	3.52	107.7	356.3
+D+0.750L+0.750S					1.00	1.00	0.93	0.979	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 9.0 ft	1	0.536	0.434	1.15	1.00	1.00	0.94	0.979	1.00	1.00	1.00	14.05	1,474.3	2,751.4	4.65	142.3	327.8
+D+0.60W					1.00	1.00	0.94	0.979	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 9.0 ft	1	0.083	0.092	1.60	1.00	1.00	0.88	0.979	1.00	1.00	1.00	2.82	296.5	3,583.9	1.37	41.8	456.0
+D+0.750Lr+0.750L+0.450W					1.00	1.00	0.88	0.979	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 9.0 ft	1	0.217	0.184	1.60	1.00	1.00	0.88	0.979	1.00	1.00	1.00	7.41	778.1	3,583.9	2.74	83.8	456.0
+D+0.750L+0.750S+0.450W					1.00	1.00	0.88	0.979	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 9.0 ft	1	0.315	0.260	1.60	1.00	1.00	0.88	0.979	1.00	1.00	1.00	10.76	1,128.9	3,583.9	3.87	118.4	456.0
+0.60D+0.60W					1.00	1.00	0.88	0.979	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 9.0 ft	1	0.036	0.083	1.60	1.00	1.00	0.88	0.979	1.00	1.00	1.00	1.23	129.0	3,583.9	1.24	37.8	456.0
+0.60D					1.00	1.00	0.88	0.979	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 9.0 ft	1	0.117	0.089	1.60	1.00	1.00	0.88	0.979	1.00	1.00	1.00	4.01	421.0	3,583.9	1.33	40.6	456.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.1287	4.533		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	6.243	6.243
Max Upward from Load Combinations	6.243	6.243
Max Upward from Load Cases	2.971	2.971
Max Downward from all Load Conditio	-1.733	-2.167
Max Downward from Load Cases (Resis	-1.733	-2.167
D Only	2.971	2.971
+D+L	4.771	4.771
+D+Lr	3.511	3.511
+D+S	5.534	5.534
+D+0.750Lr+0.750L	4.726	4.726
+D+0.750L+0.750S	6.243	6.243
+D+0.60W	1.931	1.671
+D+0.750Lr+0.750L+0.450W	3.946	3.751
+D+0.750L+0.750S+0.450W	5.463	5.268
+0.60D+0.60W	0.743	0.483
+0.60D	1.783	1.783
Lr Only	0.540	0.540
L Only	1.800	1.800
S Only	2.562	2.562
W Only	-1.733	-2.167

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Printed: 10 MAY 2024, 9:54AM

Wood Column

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING

DESCRIPTION: Stud Pack in Garage

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Analysis Method	Allowable Stress Design		
End Fixities	Top & Bottom Pinned		
Overall Column Height	10 ft		
(Used for non-slender calculations)			
Wood Species	Southern Pine		
Wood Grade	Standard: 2"-4" Thick: 4" Wide		
Fb +	475.0 psi	Fv	175.0 psi
Fb -	475.0 psi	Ft	275.0 psi
Fc - Prll	1,300.0 psi	Density	34.330 pcf
Fc - Perp	565.0 psi		

E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial
Basic	1,200.0	1,200.0	1,200.0 ksi
Minimum	440.0	440.0	

Wood Section Name	3-2x6		
Wood Grading/Manuf.	Graded Lumber		
Wood Member Type	Sawn		
Exact Width	4.50 in	Allow Stress Modification Factors	
Exact Depth	5.50 in	Cf or Cv for Bending	1.0
Area	24.750 in^2	Cf or Cv for Compressio	1.0
Ix	62.391 in^4	Cf or Cv for Tension	1.0
Iy	41.766 in^4	Cm : Wet Use Factor	1.0
		Ct : Temperature Fact	1.0
		Cfu : Flat Use Factor	1.0
		Kf : Built-up columns	1.0 NDS 15.3.2
		Use Cr : Repetitive ?	No

Brace condition for deflection (buckling) along columns :
X-X (width) axis : Fully braced against buckling ABOUT Y-Y Axis
Y-Y (depth) axis : Unbraced Length for buckling ABOUT X-X Axis = 8 ft, K

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 59.005 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 10.0 ft, D = 4.70 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.2361 : 1**

Load Combination	D Only
Governing NDS Forumla	Comp Only, fc/Fc'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	4.759 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	814.31 psi

PASS Maximum Shear Stress Ratio = **0.0 : 1**

Load Combination	+0.60D
Location of max.above base	10.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	280.0 psi

Maximum SERVICE Lateral Load Reactions . .

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Lateral Deflections . . .

Along Y-Y 0.0 in at 0.0 ft above base
for load combination : n/a
Along X-X 0.0 in at 0.0 ft above base
for load combination : n/a

Other Factors used to calculate allowable stresses . . .

Bending Compression Tension

Load Combination Results

Load Combination	C_D	C_P	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Maximum Shear Ratios: Stress Ratio	Status	Location
D Only	0.900	0.696	0.2361	PASS	0.0 ft	0.0	PASS	10.0 ft
+0.60D	1.600	0.481	0.1152	PASS	0.0 ft	0.0	PASS	10.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Axial Reaction @ Base	My - End Moments k-ft @ Base	@ Top	Mx - End Moments @ Base	@ Top
D Only					4.759				
+0.60D					2.855				

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Project Descr:

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Wood Column

Project File: 23-22846.ec6

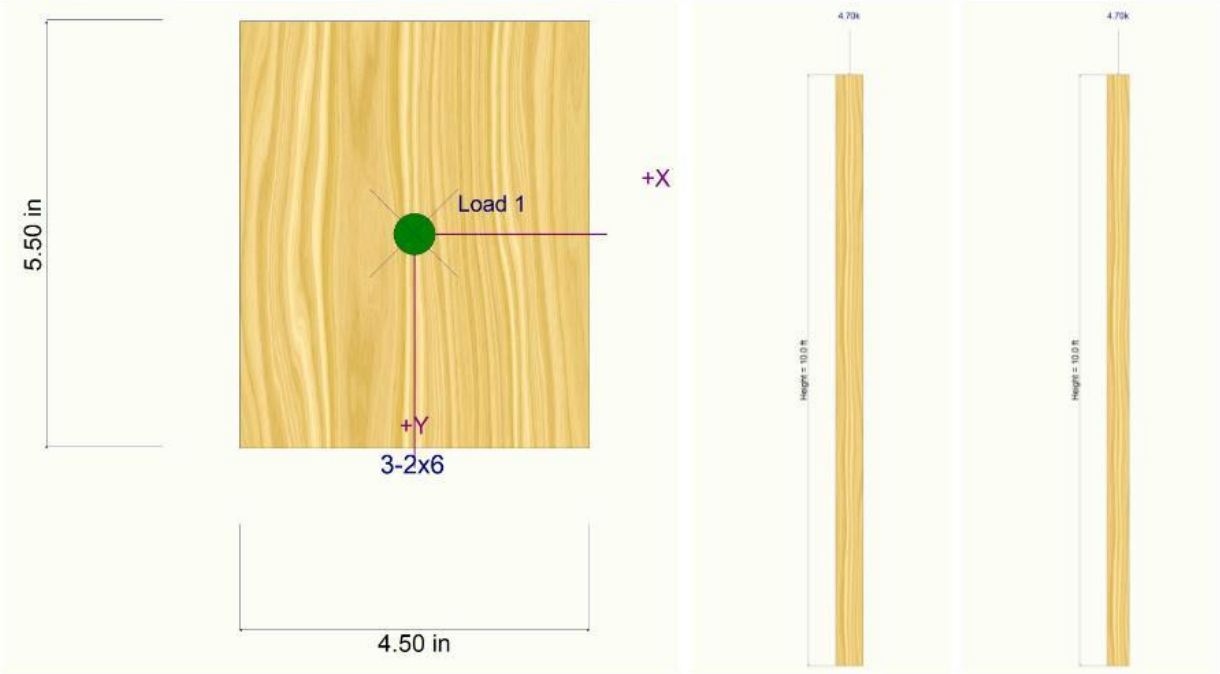
LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

DESCRIPTION: Stud Pack in Garage

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000ft	0.000 in	0.000 ft

Sketches



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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

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Steel Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

DESCRIPTION: Basement Steel Beam A

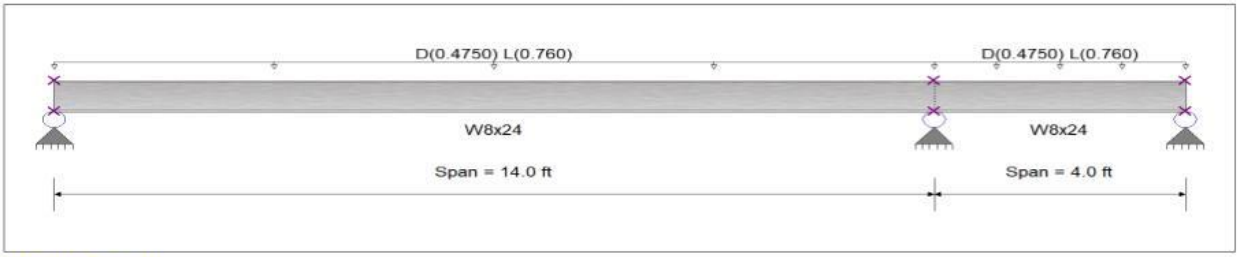
CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method :Allowable Strength Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load for Span Number 1
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 19.0 ft

Load for Span Number 2
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 19.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.426 : 1	Maximum Shear Stress Ratio =	0.272 : 1
Section used for this span	W8x24	Section used for this span	W8x24
Ma : Applied	24.550 k-ft	Va : Applied	10.567 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+L	Load Combination	+D+L
		Location of maximum on span	14.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.146 in	Ratio =	1,146	>=480.	Span: 2 : L Only
Max Upward Transient Deflection	-0.009 in	Ratio =	5,161	>=480.	Span: 2 : L Only
Max Downward Total Deflection	0.243 in	Ratio =	692	>=360.	Span: 2 : +D+L
Max Upward Total Deflection	-0.015 in	Ratio =	3116	>=360.	Span: 2 : +D+L

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only													
Dsgn. L = 14.00 ft	1	0.169	0.108	7.84	-9.73	9.73	96.25	57.63	1.53	1.00	4.19	58.29	38.86
Dsgn. L = 4.00 ft	2	0.169	0.088		-9.73	9.73	96.25	57.63	1.88	1.00	3.43	58.29	38.86
+D+L													
Dsgn. L = 14.00 ft	1	0.426	0.272	19.79	-24.55	24.55	96.25	57.63	1.53	1.00	10.57	58.29	38.86
Dsgn. L = 4.00 ft	2	0.426	0.223		-24.55	24.55	96.25	57.63	1.88	1.00	8.66	58.29	38.86
+D+0.750L													
Dsgn. L = 14.00 ft	1	0.362	0.231	16.80	-20.85	20.85	96.25	57.63	1.53	1.00	8.97	58.29	38.86
Dsgn. L = 4.00 ft	2	0.362	0.189		-20.85	20.85	96.25	57.63	1.88	1.00	7.35	58.29	38.86
+0.60D													
Dsgn. L = 14.00 ft	1	0.101	0.065	4.71	-5.84	5.84	96.25	57.63	1.53	1.00	2.51	58.29	38.86
Dsgn. L = 4.00 ft	2	0.101	0.053		-5.84	5.84	96.25	57.63	1.88	1.00	2.06	58.29	38.86

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.2427	6.272		0.0000	0.000
	2	0.0000	6.272	+D+L	-0.0154	1.632

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Printed: 10 MAY 2024, 9:55AM

Steel Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

DESCRIPTION: Basement Steel Beam B

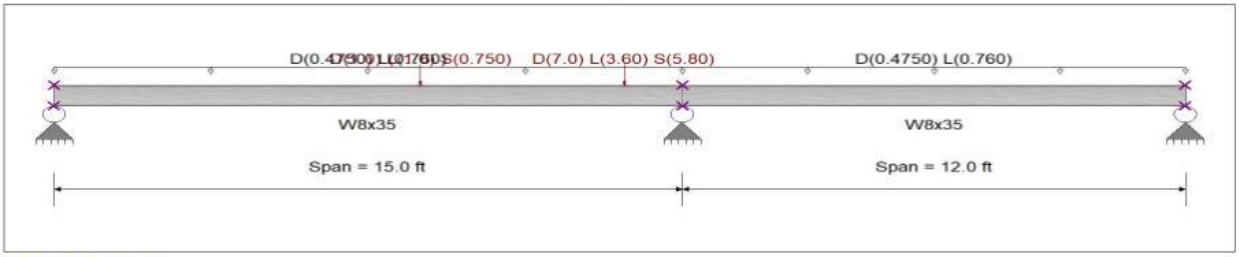
CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Load for Span Number 1
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 19.0 ft

Point Load : D = 7.0, L = 3.60, S = 5.80 k @ 13.60 ft

Point Load : D = 1.0, L = 1.0, S = 0.750 k @ 8.750 ft

Load for Span Number 2
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 19.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = 0.466 : 1
Section used for this span W8x35
Ma : Applied 40.337 k-ft
Mn / Omega : Allowable 86.577 k-ft
Load Combination +D+L+H, LL Comb Run (LL)
Span # where maximum occurs Span # 1

Maximum Shear Stress Ratio = 0.492 : 1
Section used for this span W8x35
Va : Applied 24.766 k
Vn/Omega : Allowable 50.344 k
Load Combination +D+0.750L+0.750S+H, LL Comb Run (LL)
Location of maximum on span 15.000 ft
Span # where maximum occurs Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.196 in	Ratio =	916	>=480.	Span: 2 : L Only, LL Comb Run (L*)
Max Upward Transient Deflection	-0.070 in	Ratio =	2,068	>=480.	Span: 2 : L Only, LL Comb Run (L*)
Max Downward Total Deflection	0.330 in	Ratio =	546	>=360.	Span: 2 : +D+L+H, LL Comb Run (L*)
Max Upward Total Deflection	-0.088 in	Ratio =	1631	>=360.	Span: 2 : +D+L+H, LL Comb Run (L*)

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+H													
Dsgn. L = 15.00 ft	1	0.212	0.238	13.21	-18.36	18.36	144.58	86.58	1.55	1.00	11.98	75.52	50.34
Dsgn. L = 12.00 ft	2	0.212	0.091	2.30	-18.36	18.36	144.58	86.58	3.00	1.00	4.59	75.52	50.34
+D+L+H, LL Comb Run (*L)													
Dsgn. L = 15.00 ft	1	0.282	0.246	10.46	-24.44	24.44	144.58	86.58	2.29	1.00	12.38	75.52	50.34
Dsgn. L = 12.00 ft	2	0.282	0.192	12.27	-24.44	24.44	144.58	86.58	2.17	1.00	9.66	75.52	50.34
+D+L+H, LL Comb Run (L*)													
Dsgn. L = 15.00 ft	1	0.396	0.449	32.34	-34.26	34.26	144.58	86.58	1.27	1.00	22.59	75.52	50.34
Dsgn. L = 12.00 ft	2	0.396	0.117	0.04	-34.26	34.26	144.58	86.58	2.39	1.00	5.91	75.52	50.34
+D+L+H, LL Comb Run (LL)													
Dsgn. L = 15.00 ft	1	0.466	0.457	29.52	-40.34	40.34	144.58	86.58	1.56	1.00	22.99	75.52	50.34
Dsgn. L = 12.00 ft	2	0.466	0.218	7.14	-40.34	40.34	144.58	86.58	2.92	1.00	10.98	75.52	50.34

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Printed: 10 MAY 2024, 9:55AM

Steel Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

DESCRIPTION: Basement Steel Beam C

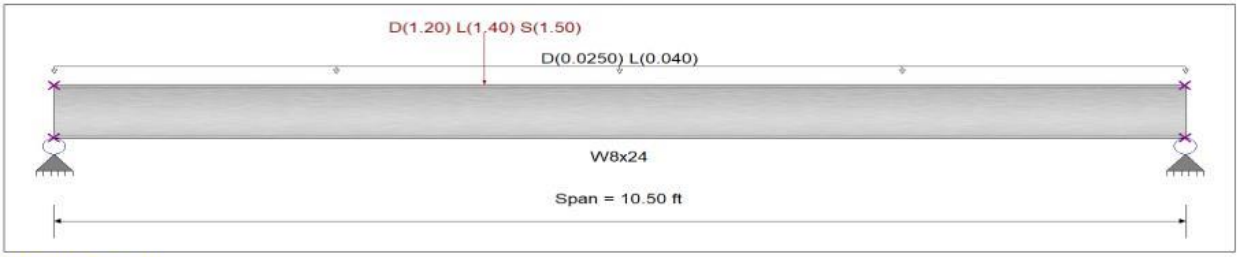
CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 1.0 ft

Point Load : D = 1.20, L = 1.40, S = 1.50 k @ 4.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.162 : 1	Maximum Shear Stress Ratio =	0.064 : 1
Section used for this span	W8x24	Section used for this span	W8x24
Ma : Applied	9.362 k-ft	Va : Applied	2.504 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 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	0.027 in	Ratio =	4,628	>=480.	
Max Upward Transient Deflection	0.000 in	Ratio =	0	<480.0	Span: 1 : L Only
Max Downward Total Deflection	0.064 in	Ratio =	1980	>=360.	Span: 1 : +D+0.750L+0.750S
Max Upward Total Deflection	0.000 in	Ratio =	0	<360.0	

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values						Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	VnxVnx/Omega
D Only												
Dsgn. L = 10.50 ft	1	0.062	0.026	3.60		3.60	96.25	57.63	1.33	1.00	1.00	58.29	38.86
+D+L												
Dsgn. L = 10.50 ft	1	0.131	0.053	7.58		7.58	96.25	57.63	1.34	1.00	2.08	58.29	38.86
+D+S												
Dsgn. L = 10.50 ft	1	0.127	0.050	7.31		7.31	96.25	57.63	1.37	1.00	1.93	58.29	38.86
+D+0.750L												
Dsgn. L = 10.50 ft	1	0.114	0.047	6.58		6.58	96.25	57.63	1.34	1.00	1.81	58.29	38.86
+D+0.750L+0.750S												
Dsgn. L = 10.50 ft	1	0.162	0.064	9.36		9.36	96.25	57.63	1.36	1.00	2.50	58.29	38.86
+0.60D												
Dsgn. L = 10.50 ft	1	0.037	0.015	2.16		2.16	96.25	57.63	1.33	1.00	0.60	58.29	38.86

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.0636	4.950		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	2.504	1.700

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Printed: 10 MAY 2024, 9:55AM

Steel Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

DESCRIPTION: Basement Steel Beam D

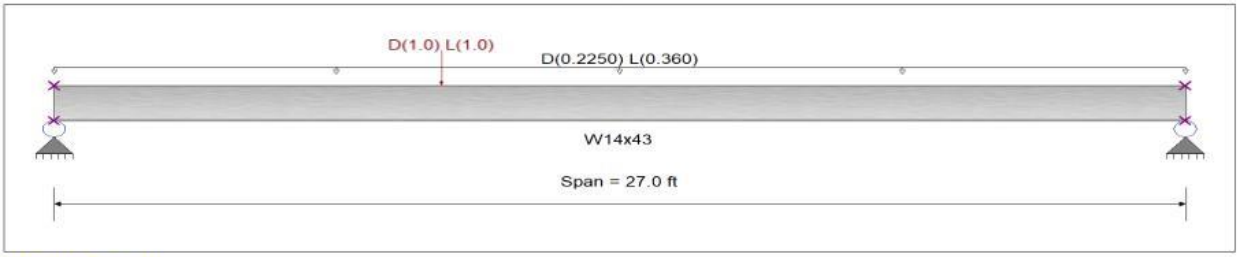
CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 9.0 ft

Point Load : D = 1.0, L = 1.0 k @ 9.250 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.810 : 1	Maximum Shear Stress Ratio =	0.117 : 1
Section used for this span	W14x43	Section used for this span	W14x43
Ma : Applied	66.850 k-ft	Va : Applied	9.793 k
Mn / Omega : Allowable	82.574 k-ft	Vn/Omega : Allowable	83.570 k
Load Combination	+D+L	Load Combination	+D+L
		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	0.398 in	Ratio =	813	>=480.	
Max Upward Transient Deflection	0.000 in	Ratio =	0	<480.0	Span: 1 : L Only
Max Downward Total Deflection	0.707 in	Ratio =	458	>=360.	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in	Ratio =	0	<360.0	

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values						Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	VnxVnx/Omega
D Only												
Dsgn. L = 27.00 ft	1	0.354	0.051	29.27		29.27	138.14	82.72	1.15	1.00	4.28	125.36	83.57
+D+L												
Dsgn. L = 27.00 ft	1	0.810	0.117	66.85		66.85	137.90	82.57	1.14	1.00	9.79	125.36	83.57
+D+0.750L												
Dsgn. L = 27.00 ft	1	0.696	0.101	57.45		57.45	137.90	82.57	1.14	1.00	8.41	125.36	83.57
+0.60D												
Dsgn. L = 27.00 ft	1	0.212	0.031	17.56		17.56	138.14	82.72	1.15	1.00	2.57	125.36	83.57

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.7074	13.346		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	9.793	9.163
Max Upward from Load Combinations	9.793	9.163
Max Upward from Load Cases	5.517	5.203
D Only	4.275	3.961
+D+L	9.793	9.163

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Printed: 10 MAY 2024, 9:55AM

Steel Beam

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

DESCRIPTION: Basement Steel Beam E

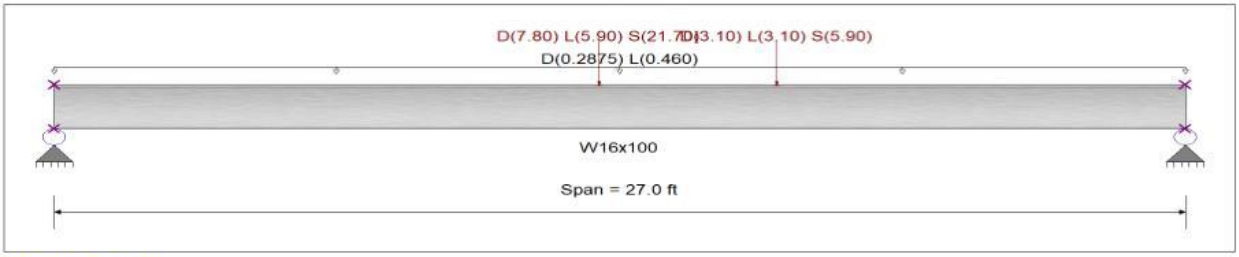
CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Completely Unbraced
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E: Modulus : 29,000.0 ksi



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading
Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 11.50 ft

Point Load : D = 7.80, L = 5.90, S = 21.70 k @ 13.0 ft

Point Load : D = 3.10, L = 3.10, S = 5.90 k @ 17.250 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.693 : 1	Maximum Shear Stress Ratio =	0.150 : 1
Section used for this span	W16x100	Section used for this span	W16x100
Ma : Applied	304.644 k-ft	Va : Applied	29.904 k
Mn / Omega : Allowable	439.375 k-ft	Vn/Omega : Allowable	198.90 k
Load Combination	+D+0.750L+0.750S	Load Combination	+D+0.750L+0.750S
		Location of maximum on span	27.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.443 in	Ratio =	730	>=480.	
Max Upward Transient Deflection	0.000 in	Ratio =	0	<480.0	Span: 1 : S Only
Max Downward Total Deflection	0.817 in	Ratio =	396	>=360.	Span: 1 : +D+0.750L+0.750S
Max Upward Total Deflection	0.000 in	Ratio =	0	<360.0	

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values						Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	VnxVnx/Omega
D Only												
Dsgn. L = 27.00 ft	1	0.237	0.055	102.30		102.30	720.29	431.31	1.23	1.00	10.97	298.35	198.90
+D+L												
Dsgn. L = 27.00 ft	1	0.464	0.111	198.43		198.43	714.43	427.80	1.22	1.00	22.00	298.35	198.90
+D+S												
Dsgn. L = 27.00 ft	1	0.619	0.127	275.96		275.96	744.88	446.04	1.27	1.00	25.18	298.35	198.90
+D+0.750L												
Dsgn. L = 27.00 ft	1	0.407	0.097	174.40		174.40	715.60	428.50	1.22	1.00	19.24	298.35	198.90
+D+0.750L+0.750S												
Dsgn. L = 27.00 ft	1	0.693	0.150	304.64		304.64	733.76	439.38	1.25	1.00	29.90	298.35	198.90
+0.60D												
Dsgn. L = 27.00 ft	1	0.142	0.033	61.38		61.38	720.29	431.31	1.23	1.00	6.58	298.35	198.90

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.8172	13.577		0.0000	0.000

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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

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Steel Column

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

DESCRIPTION: Basement Column (Worst Case)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Steel Section Name : **Pipe3-1/2STD**
Analysis Method : Allowable Strength
Steel Stress Grade
Fy : Steel Yield 36.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 10.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Fully braced against buckling ABOUT Y-Y Axis
Y-Y (depth) axis :
Fully braced against buckling ABOUT X-X Axis

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 91.20 lbs * Dead Load Factor
AXIAL LOADS . . .
Basement Loading: Axial Load at 10.0 ft, D = 20.0, L = 30.0 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.9295** : 1
Load Combination +D+L
Location of max.above base 0.0 ft
At maximum location values are . . .
Pa : Axial 50.091 k
Pn / Omega : Allowabl 53.892 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 5.443 k-ft
Ma-y : Applied 0.0 k-ft
Mn-y / Omega : Allowable 5.443 k-ft

PASS Maximum Shear Stress Rati **0.0** : 1
Load Combination 0.0
Location of max.above base 0.0 ft
At maximum location values are . . .
Va : Applied 0.0 k
Vn / Omega : Allowable 0.0 k

Maximum Load Reactions . .
Top along X-X 0.0 k
Bottom along X-X 0.0 k
Top along Y-Y 0.0 k
Bottom along Y-Y 0.0 k

Maximum Load Deflections . . .
Along Y-Y 0.0 in at 0.0ft above base
for load combination :
Along X-X 0.0 in at 0.0ft 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

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	k	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments @ Base	Mx - End Moments @ Top	k-ft	My - End Moments @ Base	My - End Moments @ Top

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	k	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments @ Base	Mx - End Moments @ Top	k-ft	My - End Moments @ Base	My - End Moments @ Top

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance

Steel Section Properties : Pipe3-1/2STD

Steel Section Properties : Pipe3-1/2STD

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Steel Column

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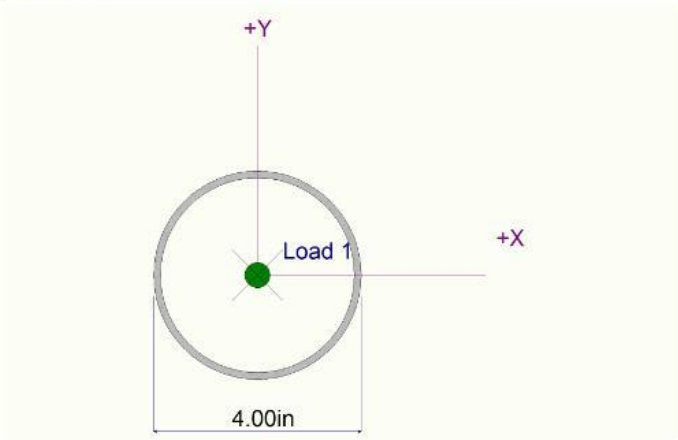
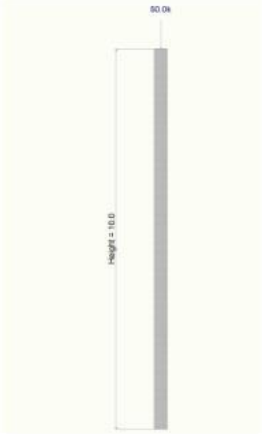
LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

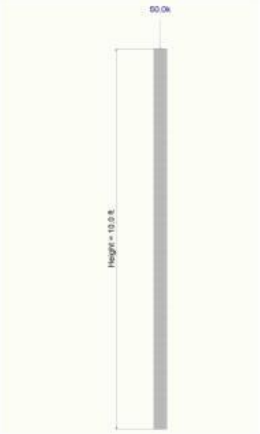
DESCRIPTION: Basement Column (Worst Case)

Depth	=	4.000 in	I xx	=	4.52 in^4		J	=	9.040 in^4
			S xx	=	2.26 in^3				
Diameter	=	4.000 in	R xx	=	1.340 in				
Wall Thick	=	0.227 in	Zx	=	3.030 in^3				
Area	=	2.500 in^2	I yy	=	4.520 in^4				
Weight	=	9.120 plf	S yy	=	2.260 in^3				
			R yy	=	1.340 in				
Ycg	=	0.000 in							

Sketches







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Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Printed: 13 MAY 2024, 3:30PM

Steel Column

Project File: 23-22846.ec6

LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

DESCRIPTION: Basement Steel Column (Worst Case)

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Steel Section Name : **HSS4x4x1/4**
Analysis Method : Allowable Strength
Steel Stress Grade , A53, Grade B, Fy = 35 ksi, Carbon Steel
Fy : Steel Yield 36 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 9.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 9.0 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 9.0 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 109.890 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 9.0 ft, D = 10.970, L = 11.030, S = 14.220 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.5390** : 1
Load Combination +D+0.750L+0.750S
Location of max.above base 0.0 ft
At maximum location values are . . .
Pa : Axial 30.017 k
Pn / Omega : Allowabl 55.692 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 8.425 k-ft
Ma-y : Applied 0.0 k-ft
Mn-y / Omega : Allowable 8.425 k-ft

PASS Maximum Shear Stress Rati **0.0** : 1
Load Combination 0.0
Location of max.above base 0.0 ft
At maximum location values are . . .
Va : Applied 0.0 k
Vn / Omega : Allowable 0.0 k

Maximum Load Reactions . .
Top along X-X 0.0 k
Bottom along X-X 0.0 k
Top along Y-Y 0.0 k
Bottom along Y-Y 0.0 k

Maximum Load Deflections . . .
Along Y-Y 0.0 in at 0.0ft above base
for load combination :
Along X-X 0.0 in at 0.0ft 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	0.199	PASS	0.00 ft	1.00	1.00	71.05	71.05	0.000	PASS	0.00 ft
+D+L	0.397	PASS	0.00 ft	1.00	1.00	71.05	71.05	0.000	PASS	0.00 ft
+D+S	0.454	PASS	0.00 ft	1.00	1.00	71.05	71.05	0.000	PASS	0.00 ft
+D+0.750L	0.347	PASS	0.00 ft	1.00	1.00	71.05	71.05	0.000	PASS	0.00 ft
+D+0.750L+0.750S	0.539	PASS	0.00 ft	1.00	1.00	71.05	71.05	0.000	PASS	0.00 ft
+0.60D	0.119	PASS	0.00 ft	1.00	1.00	71.05	71.05	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	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments @ Base	k-ft @ Top	My - End Moments @ Base	@ Top
D Only	11.080									
+D+L	22.110									
+D+S	25.300									
+D+0.750L	19.352									
+D+0.750L+0.750S	30.017									
+0.60D	6.648									
L Only	11.030									
S Only	14.220									

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Project Descr:

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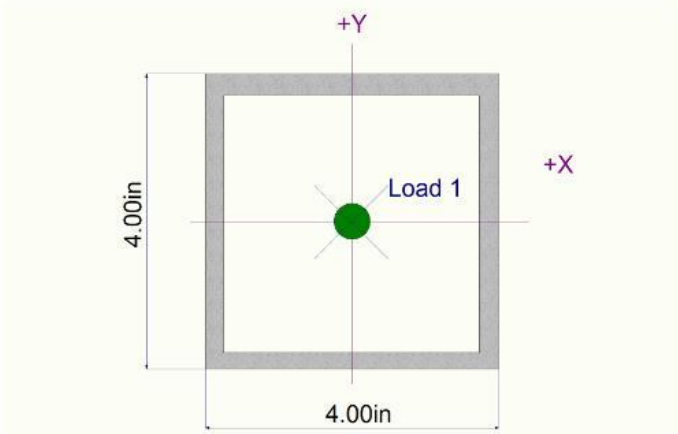
Steel Column

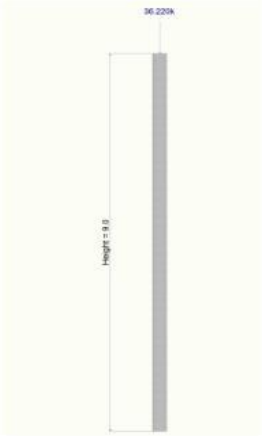
Project File: 23-22846.ec6

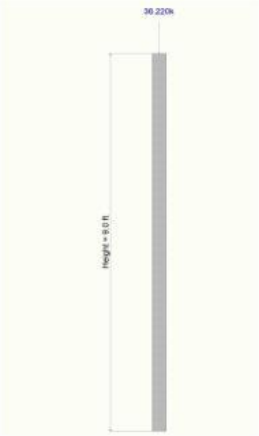
LIC# : KW-06013705, Build:20.23.2.14 TAMARACK GROVE ENGINEERING (c) ENERCALC INC 1983-2022

DESCRIPTION: Basement Steel Column (Worst Case)

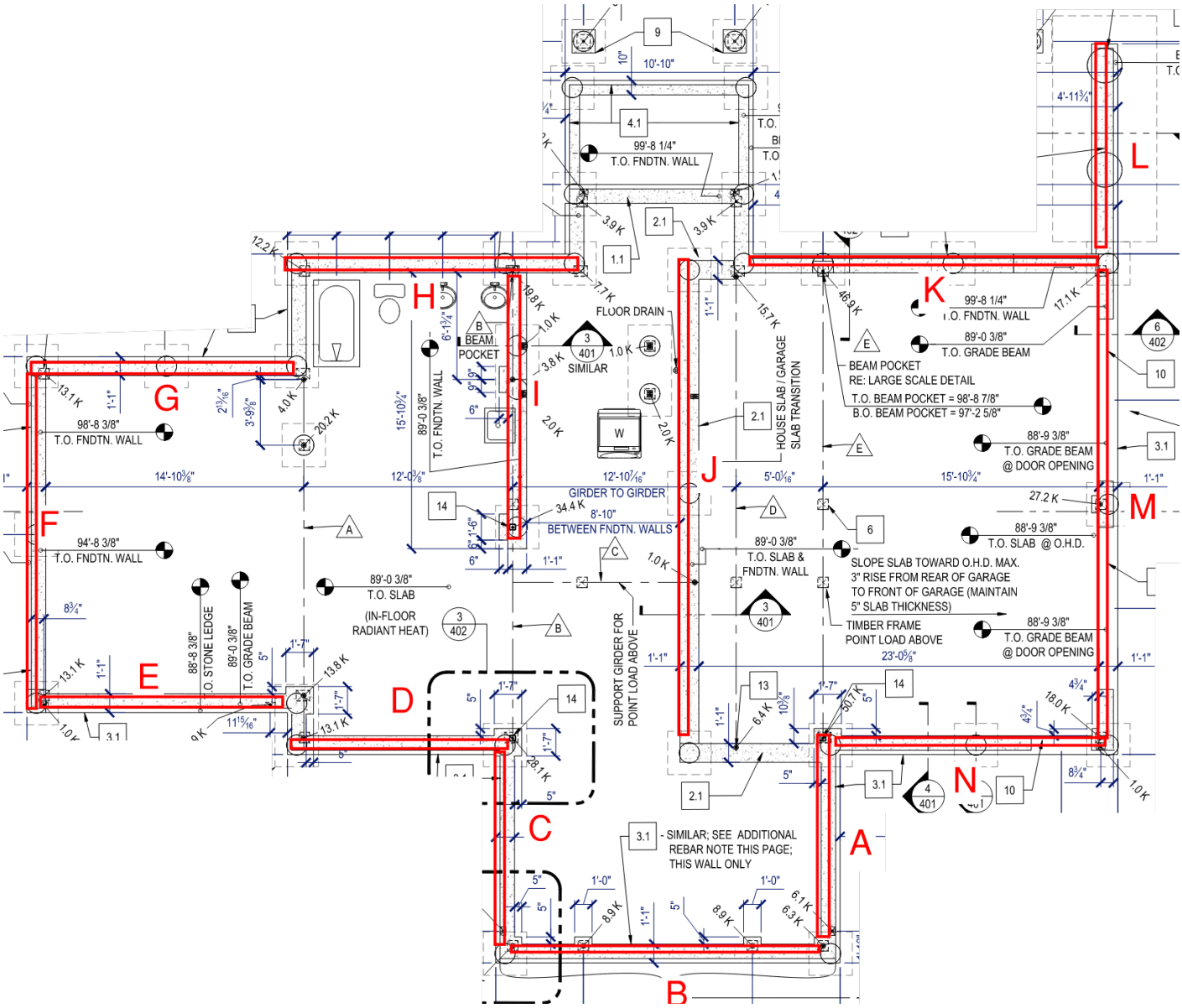
Sketches







GRADE BEAM MAP



Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM A

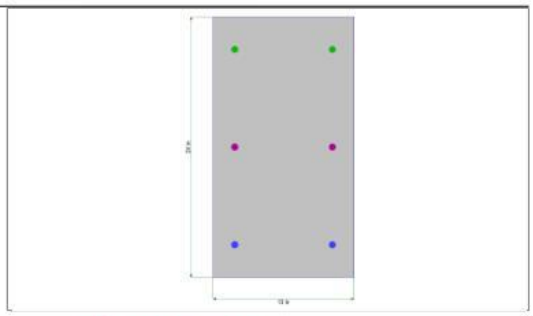
CODE REFERENCES

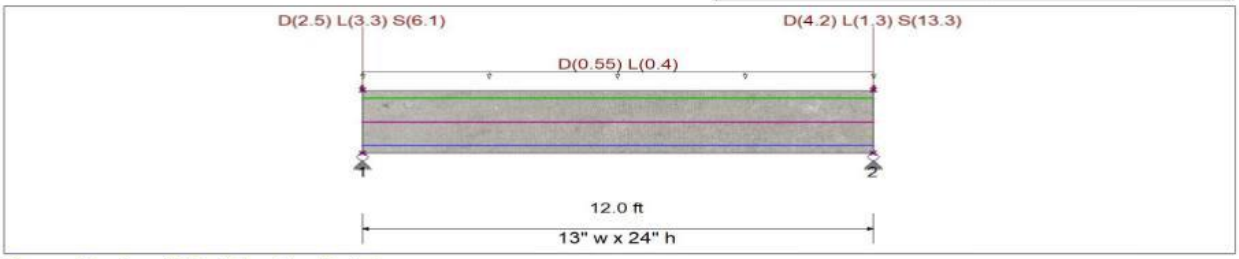
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c 1/2	=	375.0 psi		Shear :	0.750
ψ Density	=	150.0 pcf	β 1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus =		3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =		60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =		29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup =		2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 12.0 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 12.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 12.0 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.550, L = 0.40 k/ft, Tributary Width = 1.0 ft, (Line loads)
Point Load : D = 2.50, L = 3.30, S = 6.10 k @ 0.0 ft, (Point Load)
Point Load : D = 4.20, L = 1.30, S = 13.30 k @ 12.0 ft, (Point Load)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.360** : 1
Section used for this span **Typical Section**
Mu : Applied 30.430 k-ft
Mn * Phi : Allowable 84.513 k-ft
Location of maximum on span 6.011 ft
Span # where maximum occurs Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.004 in	Ratio =	36076	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.013 in	Ratio =	11318	>=240.0	Span: 1 : +D+L+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+0.750L+0.750S+0.5250E+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	16.600	22.749
Max Upward from Load Combinations	16.600	22.749
Max Upward from Load Cases	7.750	13.299
+D+H	7.750	9.450

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM A

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+L+H	13.450	13.150
+D+Lr+H	7.750	9.450
+D+S+H	13.851	22.749
+D+0.750Lr+0.750L+H	12.025	12.225
+D+0.750L+0.750S+H	16.600	22.200
+D+0.60W+H	7.750	9.450
+D+0.750Lr+0.750L+0.450W+H	12.025	12.225
+D+0.750L+0.750S+0.450W+H	16.600	22.200
+0.60D+0.60W+0.60H	4.650	5.670
+D+0.750L+0.750S+0.70E+H	16.600	22.200
+D+0.750L+0.750S+0.5250E+H	16.600	22.200
+0.60D+0.70E+0.60H	4.650	5.670
D Only	7.750	9.450
L Only	5.700	3.700
S Only	6.100	13.299
H Only		

Shear Stirrup Requirements

Between 0.00 to 0.87 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 0.90 to 11.10 ft, Ties Not Req'd, Stirrups are not required.
Between 11.13 to 11.98 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+L+1.60S+1.60H	1	0.00	21.00	24.76	Yes	10.50	20.48	13.20	33.68	0.735	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.13	21.00	9.92	No	10.50	20.48	13.20	33.68	0.295	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.26	21.00	9.70	No	10.50	20.48	13.20	33.68	0.288	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.39	21.00	9.48	No	10.50	20.48	13.20	33.68	0.281	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.52	21.00	9.25	No	10.50	20.48	13.20	33.68	0.275	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.66	21.00	9.03	No	10.50	20.48	13.20	33.68	0.268	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.79	21.00	8.81	No	10.50	20.48	13.20	33.68	0.262	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.92	21.00	8.59	No	N/A	8.65	0.00	8.65	0.993	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.05	21.00	8.37	No	N/A	8.65	0.00	8.65	0.968	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.18	21.00	8.15	No	N/A	8.65	0.00	8.65	0.942	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.31	21.00	7.92	No	N/A	8.65	0.00	8.65	0.916	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.44	21.00	7.70	No	N/A	8.65	0.00	8.65	0.891	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.57	21.00	7.48	No	N/A	8.65	0.00	8.65	0.865	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.70	21.00	7.26	No	N/A	8.65	0.00	8.65	0.839	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.84	21.00	7.04	No	N/A	8.65	0.00	8.65	0.814	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.97	21.00	6.82	No	N/A	8.65	0.00	8.65	0.788	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.10	21.00	6.59	No	N/A	8.65	0.00	8.65	0.763	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.23	21.00	6.37	No	N/A	8.65	0.00	8.65	0.737	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.36	21.00	6.15	No	N/A	8.65	0.00	8.65	0.711	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.49	21.00	5.93	No	N/A	8.65	0.00	8.65	0.686	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.62	21.00	5.71	No	N/A	8.65	0.00	8.65	0.660	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.75	21.00	5.49	No	N/A	8.65	0.00	8.65	0.634	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.89	21.00	5.26	No	N/A	8.65	0.00	8.65	0.609	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.02	21.00	5.04	No	N/A	8.65	0.00	8.65	0.583	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.15	21.00	4.82	No	N/A	8.65	0.00	8.65	0.558	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.28	21.00	4.60	No	N/A	8.65	0.00	8.65	0.532	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.41	21.00	4.38	No	N/A	8.65	0.00	8.65	0.506	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.54	21.00	4.16	No	N/A	8.65	0.00	8.65	0.481	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.67	21.00	3.93	No	N/A	8.65	0.00	8.65	0.455	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.80	21.00	3.71	No	N/A	8.65	0.00	8.65	0.429	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.93	21.00	3.49	No	N/A	8.65	0.00	8.65	0.404	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.07	21.00	3.27	No	N/A	8.65	0.00	8.65	0.378	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.20	21.00	3.05	No	N/A	8.65	0.00	8.65	0.352	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.33	21.00	2.83	No	N/A	8.65	0.00	8.65	0.327	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.46	21.00	2.60	No	N/A	8.65	0.00	8.65	0.301	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.59	21.00	2.38	No	N/A	8.65	0.00	8.65	0.276	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.72	21.00	2.16	No	N/A	8.65	0.00	8.65	0.250	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.85	21.00	1.94	No	N/A	8.65	0.00	8.65	0.224	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.98	21.00	1.72	No	N/A	8.65	0.00	8.65	0.199	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.11	21.00	1.50	No	N/A	8.65	0.00	8.65	0.173	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.25	21.00	1.27	No	N/A	8.65	0.00	8.65	0.147	Eqn (c)	Ties Not Req'd

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM A

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L+0.50S+1.60H		5.38	21.00	1.05	No	N/A	8.65	0.00	8.65	0.122	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.51	21.00	0.83	No	N/A	8.65	0.00	8.65	0.096	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.64	21.00	0.61	No	N/A	8.65	0.00	8.65	0.071	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.77	21.00	0.39	No	N/A	8.65	0.00	8.65	0.045	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.90	21.00	0.17	No	N/A	8.65	0.00	8.65	0.019	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		6.03	21.00	-0.06	No	N/A	8.65	0.00	8.65	0.006	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		6.16	21.00	-0.28	No	N/A	8.65	0.00	8.65	0.032	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		6.30	21.00	-0.50	No	N/A	8.65	0.00	8.65	0.058	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		6.43	21.00	-0.72	No	N/A	8.65	0.00	8.65	0.083	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		6.56	21.00	-0.94	No	N/A	8.65	0.00	8.65	0.109	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		6.69	21.00	-1.16	No	N/A	8.65	0.00	8.65	0.135	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		6.82	21.00	-1.39	No	N/A	8.65	0.00	8.65	0.160	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		6.95	21.00	-1.61	No	N/A	8.65	0.00	8.65	0.186	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		7.08	21.00	-1.83	No	N/A	8.65	0.00	8.65	0.211	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		7.21	21.00	-2.05	No	N/A	8.65	0.00	8.65	0.237	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		7.34	21.00	-2.27	No	N/A	8.65	0.00	8.65	0.263	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		7.48	21.00	-2.49	No	N/A	8.65	0.00	8.65	0.288	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		7.61	21.00	-2.72	No	N/A	8.65	0.00	8.65	0.314	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		7.74	21.00	-2.94	No	N/A	8.65	0.00	8.65	0.340	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		7.87	21.00	-3.16	No	N/A	8.65	0.00	8.65	0.365	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		8.00	21.00	-3.38	No	N/A	8.65	0.00	8.65	0.391	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		8.13	21.00	-3.60	No	N/A	8.65	0.00	8.65	0.417	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		8.26	21.00	-3.82	No	N/A	8.65	0.00	8.65	0.442	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		8.39	21.00	-4.04	No	N/A	8.65	0.00	8.65	0.468	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		8.52	21.00	-4.27	No	N/A	8.65	0.00	8.65	0.493	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		8.66	21.00	-4.49	No	N/A	8.65	0.00	8.65	0.519	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		8.79	21.00	-4.71	No	N/A	8.65	0.00	8.65	0.545	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		8.92	21.00	-4.93	No	N/A	8.65	0.00	8.65	0.570	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		9.05	21.00	-5.15	No	N/A	8.65	0.00	8.65	0.596	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		9.18	21.00	-5.37	No	N/A	8.65	0.00	8.65	0.622	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		9.31	21.00	-5.60	No	N/A	8.65	0.00	8.65	0.647	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		9.44	21.00	-5.82	No	N/A	8.65	0.00	8.65	0.673	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		9.57	21.00	-6.04	No	N/A	8.65	0.00	8.65	0.698	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		9.70	21.00	-6.26	No	N/A	8.65	0.00	8.65	0.724	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		9.84	21.00	-6.48	No	N/A	8.65	0.00	8.65	0.750	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		9.97	21.00	-6.70	No	N/A	8.65	0.00	8.65	0.775	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		10.10	21.00	-6.93	No	N/A	8.65	0.00	8.65	0.801	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		10.23	21.00	-7.15	No	N/A	8.65	0.00	8.65	0.827	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		10.36	21.00	-7.37	No	N/A	8.65	0.00	8.65	0.852	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		10.49	21.00	-7.59	No	N/A	8.65	0.00	8.65	0.878	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		10.62	21.00	-7.81	No	N/A	8.65	0.00	8.65	0.904	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		10.75	21.00	-8.03	No	N/A	8.65	0.00	8.65	0.929	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		10.89	21.00	-8.26	No	N/A	8.65	0.00	8.65	0.955	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		11.02	21.00	-8.48	No	N/A	8.65	0.00	8.65	0.980	Eqn (c)	Ties Not Req'd
+1.20D+0.50Lr+1.60L+1.60H		11.15	21.00	-8.70	No	10.50	20.48	13.20	33.68	0.258	Eqn (a)	Max spacing per T9.7.6.
+1.20D+0.50Lr+1.60L+1.60H		11.28	21.00	-8.92	No	10.50	20.48	13.20	33.68	0.265	Eqn (a)	Max spacing per T9.7.6.
+1.20D+0.50Lr+1.60L+1.60H		11.41	21.00	-9.14	No	10.50	20.48	13.20	33.68	0.271	Eqn (a)	Max spacing per T9.7.6.
+1.20D+0.50Lr+1.60L+1.60H		11.54	21.00	-9.36	No	10.50	20.48	13.20	33.68	0.278	Eqn (a)	Max spacing per T9.7.6.
+1.20D+0.50Lr+1.60L+1.60H		11.67	21.00	-9.59	No	10.50	20.48	13.20	33.68	0.285	Eqn (a)	Max spacing per T9.7.6.
+1.20D+0.50Lr+1.60L+1.60H		11.80	21.00	-9.81	No	10.50	20.48	13.20	33.68	0.291	Eqn (a)	Max spacing per T9.7.6.
+1.20D+0.50Lr+1.60L+1.60H		11.93	21.00	-10.03	No	10.50	20.48	13.20	33.68	0.298	Eqn (a)	Max spacing per T9.7.6.

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	12.000	30.43	84.51	0.36
+1.40D+1.60H					
Span # 1	1	12.000	22.05	84.51	0.26
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	12.000	30.43	84.51	0.36
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	12.000	30.43	84.51	0.36
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	12.000	26.11	84.51	0.31
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	12.000	18.90	84.51	0.22

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM A

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.20D+L+1.60S+1.60H					
Span # 1	1	12.000	26.12	84.51	0.31
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	12.000	18.92	84.51	0.22
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	12.000	26.11	84.51	0.31
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	12.000	22.51	84.51	0.27
+0.90D+W+1.60H					
Span # 1	1	12.000	14.18	84.51	0.17
+0.90D+L+0.20S+E+1.60H					
Span # 1	1	12.000	21.38	84.51	0.25
+0.90D+E+0.90H					
Span # 1	1	12.000	14.18	84.51	0.17

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+L+H	0.0127	6.000		0.0000	0.000

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM J

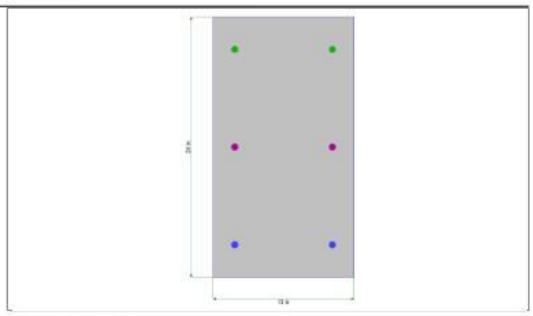
CODE REFERENCES

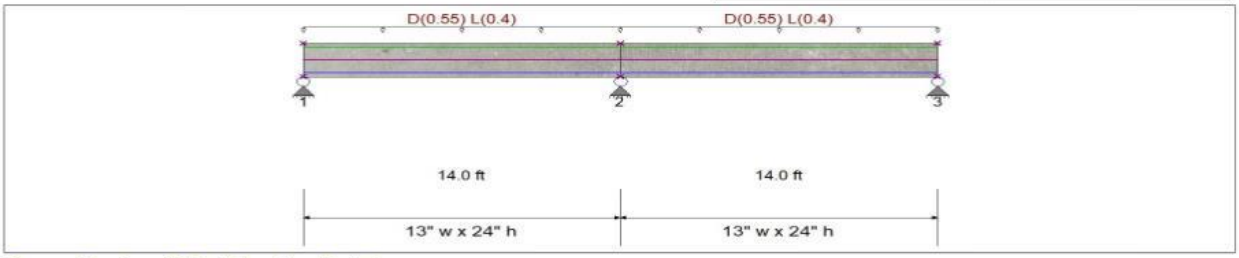
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	= 2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c $^{1/2}$	= 375.0 psi		Shear :	0.750
ψ Density	= 150.0 pcf	β_1	=	0.850
λ LtWt Factor	= 1.0			
Elastic Modulus =	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =	60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =	29,000.0 ksi	Stirrup Bar Size #		3
		Number of Resisting Legs Per Stirrup =		2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 14.0 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 14.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 14.0 ft in this span
Span #2 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 14.0 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 14.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 14.0 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.550, L = 0.40 k/ft, Tributary Width = 1.0 ft, (Line loads)
Load for Span Number 2
Uniform Load : D = 0.550, L = 0.40 k/ft, Tributary Width = 1.0 ft, (Line loads)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.490** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	-41.405	k-ft
Mn * Phi : Allowable	84.513	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 2	

Maximum Deflection

Max Downward Transient Deflection	0.003 in	Ratio =	54707	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.011 in	Ratio =	15572	>=240.0	Span: 2 : +D+L+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 2 : +D+L+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	6.870	21.959	6.870

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM J

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Max Upward from Load Combinations	6.870	21.959	6.870
Max Upward from Load Cases	4.594	15.312	4.594
+D+H	4.594	15.312	4.594
+D+L+H	6.870	21.959	6.870
+D+Lr+H	4.594	15.312	4.594
+D+S+H	4.594	15.312	4.594
+D+0.750Lr+0.750L+H	6.218	20.463	6.218
+D+0.750L+0.750S+H	6.218	20.463	6.218
+D+0.60W+H	4.594	15.312	4.594
+D+0.750Lr+0.750L+0.450W+H	6.218	20.463	6.218
+D+0.750L+0.750S+0.450W+H	6.218	20.463	6.218
+0.60D+0.60W+0.60H	2.756	9.187	2.756
+D+0.750L+0.750S+0.70E+H	6.218	20.463	6.218
+D+0.750L+0.750S+0.5250E+H	6.218	20.463	6.218
+0.60D+0.70E+0.60H	2.756	9.187	2.756
D Only	4.594	15.312	4.594
L Only	2.100	7.000	2.100
H Only			

Shear Stirrup Requirements

Between 0.00 to 0.11 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 0.17 to 10.34 ft, Ties Not Req'd, Stirrups are not required.
Between 10.40 to 17.60 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 17.66 to 27.83 ft, Ties Not Req'd, Stirrups are not required.
Between 27.89 to 27.94 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L+0.50S+1.60H		0.00	21.00	8.87	No	10.50	20.48	13.20	33.68	0.263	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.34	21.00	8.29	No	N/A	8.65	0.00	8.65	0.959	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		0.69	21.00	7.71	No	N/A	8.65	0.00	8.65	0.892	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.03	21.00	7.13	No	N/A	8.65	0.00	8.65	0.825	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.37	21.00	6.55	No	N/A	8.65	0.00	8.65	0.758	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.71	21.00	5.98	No	N/A	8.65	0.00	8.65	0.691	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.06	21.00	5.40	No	N/A	8.65	0.00	8.65	0.624	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.40	21.00	4.82	No	N/A	8.65	0.00	8.65	0.557	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.74	21.00	4.24	No	N/A	8.65	0.00	8.65	0.490	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.09	21.00	3.66	No	N/A	8.65	0.00	8.65	0.423	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.43	21.00	3.08	No	N/A	8.65	0.00	8.65	0.356	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.77	21.00	2.50	No	N/A	8.65	0.00	8.65	0.289	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.11	21.00	1.92	No	N/A	8.65	0.00	8.65	0.222	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.46	21.00	1.34	No	N/A	8.65	0.00	8.65	0.155	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.80	21.00	0.76	No	N/A	8.65	0.00	8.65	0.088	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.14	21.00	0.18	No	N/A	8.65	0.00	8.65	0.021	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.49	21.00	-0.40	No	N/A	8.65	0.00	8.65	0.046	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.83	21.00	-0.98	No	N/A	8.65	0.00	8.65	0.113	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.17	21.00	-1.56	No	N/A	8.65	0.00	8.65	0.180	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.51	21.00	-2.14	No	N/A	8.65	0.00	8.65	0.247	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.86	21.00	-2.72	No	N/A	8.65	0.00	8.65	0.314	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.20	21.00	-3.30	No	N/A	8.65	0.00	8.65	0.381	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.54	21.00	-3.87	No	N/A	8.65	0.00	8.65	0.448	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.89	21.00	-4.45	No	N/A	8.65	0.00	8.65	0.515	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.23	21.00	-5.03	No	N/A	8.65	0.00	8.65	0.582	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.57	21.00	-5.61	No	N/A	8.65	0.00	8.65	0.649	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.91	21.00	-6.19	No	N/A	8.65	0.00	8.65	0.716	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.26	21.00	-6.77	No	N/A	8.65	0.00	8.65	0.783	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.60	21.00	-7.35	No	N/A	8.65	0.00	8.65	0.850	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.94	21.00	-7.93	No	N/A	8.65	0.00	8.65	0.917	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.29	21.00	-8.51	No	N/A	8.65	0.00	8.65	0.984	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.63	21.00	-9.09	No	10.50	20.48	13.20	33.68	0.270	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		10.97	21.00	-9.67	No	10.50	20.48	13.20	33.68	0.287	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		11.31	21.00	-10.25	Yes	10.50	20.48	13.20	33.68	0.304	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		11.66	21.00	-10.83	Yes	10.50	20.48	13.20	33.68	0.322	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		12.00	21.00	-11.41	Yes	10.50	20.48	13.20	33.68	0.339	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		12.34	21.00	-11.99	Yes	10.50	20.48	13.20	33.68	0.356	Eqn (a)	Max spacing per T9.7.6.

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM J

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L+0.50S+1.60H	1	12.69	21.00	-12.57	Yes	10.50	20.48	13.20	33.68	0.373	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	1	13.03	21.00	-13.15	Yes	10.50	20.48	13.20	33.68	0.390	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	1	13.37	21.00	-13.73	Yes	10.50	20.48	13.20	33.68	0.408	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	1	13.71	21.00	-14.30	Yes	10.50	20.48	13.20	33.68	0.425	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	14.06	21.00	14.69	Yes	10.50	20.48	13.20	33.68	0.436	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	14.40	21.00	14.11	Yes	10.50	20.48	13.20	33.68	0.419	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	14.74	21.00	13.53	Yes	10.50	20.48	13.20	33.68	0.402	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	15.09	21.00	12.95	Yes	10.50	20.48	13.20	33.68	0.385	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	15.43	21.00	12.37	Yes	10.50	20.48	13.20	33.68	0.367	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	15.77	21.00	11.79	Yes	10.50	20.48	13.20	33.68	0.350	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	16.11	21.00	11.21	Yes	10.50	20.48	13.20	33.68	0.333	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	16.46	21.00	10.63	Yes	10.50	20.48	13.20	33.68	0.316	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	16.80	21.00	10.06	No	10.50	20.48	13.20	33.68	0.299	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	17.14	21.00	9.48	No	10.50	20.48	13.20	33.68	0.281	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	17.49	21.00	8.90	No	10.50	20.48	13.20	33.68	0.264	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	17.83	21.00	8.32	No	N/A	8.65	0.00	8.65	0.962	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	18.17	21.00	7.74	No	N/A	8.65	0.00	8.65	0.895	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	18.51	21.00	7.16	No	N/A	8.65	0.00	8.65	0.828	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	18.86	21.00	6.58	No	N/A	8.65	0.00	8.65	0.761	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	19.20	21.00	6.00	No	N/A	8.65	0.00	8.65	0.694	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	19.54	21.00	5.42	No	N/A	8.65	0.00	8.65	0.627	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	19.89	21.00	4.84	No	N/A	8.65	0.00	8.65	0.560	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	20.23	21.00	4.26	No	N/A	8.65	0.00	8.65	0.493	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	20.57	21.00	3.68	No	N/A	8.65	0.00	8.65	0.426	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	20.91	21.00	3.10	No	N/A	8.65	0.00	8.65	0.359	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	21.26	21.00	2.52	No	N/A	8.65	0.00	8.65	0.292	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	21.60	21.00	1.94	No	N/A	8.65	0.00	8.65	0.225	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	21.94	21.00	1.36	No	N/A	8.65	0.00	8.65	0.158	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	22.29	21.00	0.78	No	N/A	8.65	0.00	8.65	0.091	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	22.63	21.00	0.21	No	N/A	8.65	0.00	8.65	0.024	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	22.97	21.00	-0.37	No	N/A	8.65	0.00	8.65	0.043	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	23.31	21.00	-0.95	No	N/A	8.65	0.00	8.65	0.110	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	23.66	21.00	-1.53	No	N/A	8.65	0.00	8.65	0.177	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	24.00	21.00	-2.11	No	N/A	8.65	0.00	8.65	0.244	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	24.34	21.00	-2.69	No	N/A	8.65	0.00	8.65	0.311	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	24.69	21.00	-3.27	No	N/A	8.65	0.00	8.65	0.378	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	25.03	21.00	-3.85	No	N/A	8.65	0.00	8.65	0.445	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	25.37	21.00	-4.43	No	N/A	8.65	0.00	8.65	0.512	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	25.71	21.00	-5.01	No	N/A	8.65	0.00	8.65	0.579	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	26.06	21.00	-5.59	No	N/A	8.65	0.00	8.65	0.646	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	26.40	21.00	-6.17	No	N/A	8.65	0.00	8.65	0.713	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	26.74	21.00	-6.75	No	N/A	8.65	0.00	8.65	0.780	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	27.09	21.00	-7.33	No	N/A	8.65	0.00	8.65	0.847	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	27.43	21.00	-7.91	No	N/A	8.65	0.00	8.65	0.914	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	27.77	21.00	-8.49	No	N/A	8.65	0.00	8.65	0.981	Eqn (c)	Ties Not Req'd

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	14.000	-40.56	84.51	0.48
Span # 2	2	14.000	-41.40	84.51	0.49
+1.40D+1.60H					
Span # 1	1	14.000	-29.40	84.51	0.35
Span # 2	2	14.000	-30.01	84.51	0.36
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	14.000	-40.56	84.51	0.48
Span # 2	2	14.000	-41.40	84.51	0.49
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	14.000	-40.56	84.51	0.48
Span # 2	2	14.000	-41.40	84.51	0.49
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	14.000	-34.80	84.51	0.41
Span # 2	2	14.000	-35.52	84.51	0.42
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	14.000	-25.20	84.51	0.30
Span # 2	2	14.000	-25.72	84.51	0.30

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM J

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.20D+L+1.60S+1.60H					
Span # 1	1	14.000	-34.80	84.51	0.41
Span # 2	2	14.000	-35.52	84.51	0.42
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	14.000	-25.20	84.51	0.30
Span # 2	2	14.000	-25.72	84.51	0.30
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	14.000	-34.80	84.51	0.41
Span # 2	2	14.000	-35.52	84.51	0.42
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	14.000	-30.00	84.51	0.35
Span # 2	2	14.000	-30.62	84.51	0.36
+0.90D+W+1.60H					
Span # 1	1	14.000	-18.90	84.51	0.22
Span # 2	2	14.000	-19.29	84.51	0.23
+0.90D+L+0.20S+E+1.60H					
Span # 1	1	14.000	-28.50	84.51	0.34
Span # 2	2	14.000	-29.09	84.51	0.34
+0.90D+E+0.90H					
Span # 1	1	14.000	-18.90	84.51	0.22
Span # 2	2	14.000	-19.29	84.51	0.23

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+L+H	0.0108	6.200		0.0000	0.000
2	+D+L+H	0.0108	7.800		0.0000	0.000

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM C

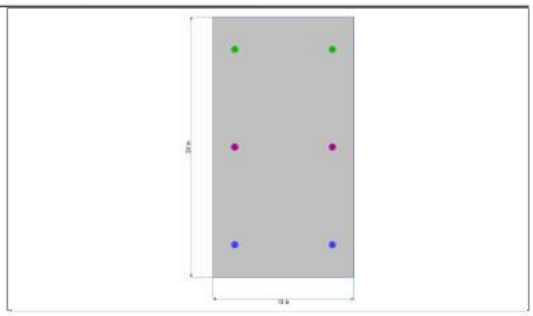
CODE REFERENCES

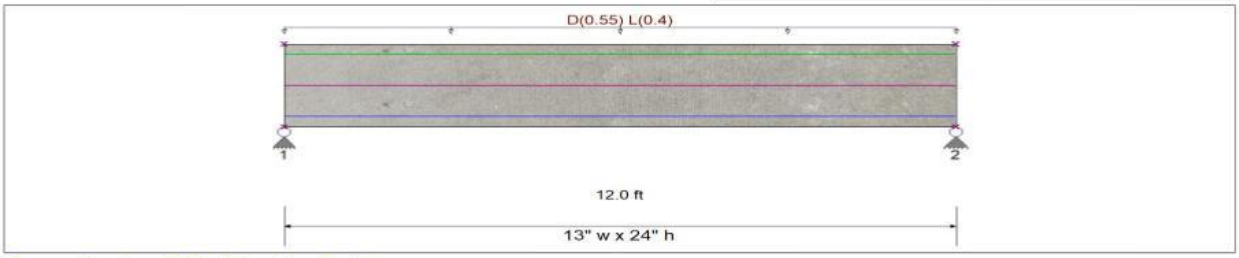
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c 1/2	=	375.0 psi		Shear :	0.750
ψ Density	=	150.0 pcf	β 1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus =		3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =		60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =		29,000.0 ksi	Stirrup Bar Size #		3
Number of Resisting Legs Per Stirrup =					2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 12.0 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 12.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 12.0 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.550, L = 0.40 k/ft, Tributary Width = 1.0 ft, (Line loads)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.360** : 1

Section used for this span	**Typical Section**	
Mu : Applied	30.420	k-ft
Mn * Phi : Allowable	84.513	k-ft
Location of maximum on span	6.011	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.004 in	Ratio =	36088	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.013 in	Ratio =	11321	>=240.0	Span: 1 : +D+L+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+L+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	7.650	7.650
Max Upward from Load Combinations	7.650	7.650
Max Upward from Load Cases	5.250	5.250
+D+H	5.250	5.250
+D+L+H	7.650	7.650
+D+Lr+H	5.250	5.250

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM C

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+S+H	5.250	5.250
+D+0.750Lr+0.750L+H	7.050	7.050
+D+0.750L+0.750S+H	7.050	7.050
+D+0.60W+H	5.250	5.250
+D+0.750Lr+0.750L+0.450W+H	7.050	7.050
+D+0.750L+0.750S+0.450W+H	7.050	7.050
+0.60D+0.60W+0.60H	3.150	3.150
+D+0.750L+0.750S+0.70E+H	7.050	7.050
+D+0.750L+0.750S+0.5250E+H	7.050	7.050
+0.60D+0.70E+0.60H	3.150	3.150
D Only	5.250	5.250
L Only	2.400	2.400
H Only		

Shear Stirrup Requirements

Between 0.00 to 0.87 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 0.90 to 11.10 ft, Ties Not Req'd, Stirrups are not required.
Between 11.13 to 11.98 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L+0.50S+1.60H		0.00	21.00	10.14	No	10.50	20.48	13.20	33.68	0.301	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.13	21.00	9.92	No	10.50	20.48	13.20	33.68	0.295	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.26	21.00	9.70	No	10.50	20.48	13.20	33.68	0.288	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.39	21.00	9.48	No	10.50	20.48	13.20	33.68	0.281	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.52	21.00	9.25	No	10.50	20.48	13.20	33.68	0.275	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.66	21.00	9.03	No	10.50	20.48	13.20	33.68	0.268	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.79	21.00	8.81	No	10.50	20.48	13.20	33.68	0.262	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.92	21.00	8.59	No	N/A	8.65	0.00	8.65	0.993	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.05	21.00	8.37	No	N/A	8.65	0.00	8.65	0.968	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.18	21.00	8.15	No	N/A	8.65	0.00	8.65	0.942	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.31	21.00	7.92	No	N/A	8.65	0.00	8.65	0.916	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.44	21.00	7.70	No	N/A	8.65	0.00	8.65	0.891	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.57	21.00	7.48	No	N/A	8.65	0.00	8.65	0.865	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.70	21.00	7.26	No	N/A	8.65	0.00	8.65	0.839	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.84	21.00	7.04	No	N/A	8.65	0.00	8.65	0.814	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.97	21.00	6.82	No	N/A	8.65	0.00	8.65	0.788	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.10	21.00	6.59	No	N/A	8.65	0.00	8.65	0.763	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.23	21.00	6.37	No	N/A	8.65	0.00	8.65	0.737	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.36	21.00	6.15	No	N/A	8.65	0.00	8.65	0.711	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.49	21.00	5.93	No	N/A	8.65	0.00	8.65	0.686	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.62	21.00	5.71	No	N/A	8.65	0.00	8.65	0.660	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.75	21.00	5.49	No	N/A	8.65	0.00	8.65	0.634	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.89	21.00	5.26	No	N/A	8.65	0.00	8.65	0.609	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.02	21.00	5.04	No	N/A	8.65	0.00	8.65	0.583	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.15	21.00	4.82	No	N/A	8.65	0.00	8.65	0.558	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.28	21.00	4.60	No	N/A	8.65	0.00	8.65	0.532	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.41	21.00	4.38	No	N/A	8.65	0.00	8.65	0.506	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.54	21.00	4.16	No	N/A	8.65	0.00	8.65	0.481	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.67	21.00	3.93	No	N/A	8.65	0.00	8.65	0.455	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.80	21.00	3.71	No	N/A	8.65	0.00	8.65	0.429	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.93	21.00	3.49	No	N/A	8.65	0.00	8.65	0.404	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.07	21.00	3.27	No	N/A	8.65	0.00	8.65	0.378	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.20	21.00	3.05	No	N/A	8.65	0.00	8.65	0.352	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.33	21.00	2.83	No	N/A	8.65	0.00	8.65	0.327	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.46	21.00	2.60	No	N/A	8.65	0.00	8.65	0.301	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.59	21.00	2.38	No	N/A	8.65	0.00	8.65	0.276	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.72	21.00	2.16	No	N/A	8.65	0.00	8.65	0.250	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.85	21.00	1.94	No	N/A	8.65	0.00	8.65	0.224	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.98	21.00	1.72	No	N/A	8.65	0.00	8.65	0.199	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.11	21.00	1.50	No	N/A	8.65	0.00	8.65	0.173	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.25	21.00	1.27	No	N/A	8.65	0.00	8.65	0.147	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.38	21.00	1.05	No	N/A	8.65	0.00	8.65	0.122	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.51	21.00	0.83	No	N/A	8.65	0.00	8.65	0.096	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.64	21.00	0.61	No	N/A	8.65	0.00	8.65	0.070	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.77	21.00	0.39	No	N/A	8.65	0.00	8.65	0.045	Eqn (c)	Ties Not Req'd

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM C

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L+0.50S+1.60H		5.90	21.00	0.17	No	N/A	8.65	0.00	8.65	0.019	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.03	21.00	-0.06	No	N/A	8.65	0.00	8.65	0.006	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.16	21.00	-0.28	No	N/A	8.65	0.00	8.65	0.032	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.30	21.00	-0.50	No	N/A	8.65	0.00	8.65	0.058	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.43	21.00	-0.72	No	N/A	8.65	0.00	8.65	0.083	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.56	21.00	-0.94	No	N/A	8.65	0.00	8.65	0.109	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.69	21.00	-1.16	No	N/A	8.65	0.00	8.65	0.135	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.82	21.00	-1.39	No	N/A	8.65	0.00	8.65	0.160	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.95	21.00	-1.61	No	N/A	8.65	0.00	8.65	0.186	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.08	21.00	-1.83	No	N/A	8.65	0.00	8.65	0.211	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.21	21.00	-2.05	No	N/A	8.65	0.00	8.65	0.237	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.34	21.00	-2.27	No	N/A	8.65	0.00	8.65	0.263	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.48	21.00	-2.49	No	N/A	8.65	0.00	8.65	0.288	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.61	21.00	-2.72	No	N/A	8.65	0.00	8.65	0.314	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.74	21.00	-2.94	No	N/A	8.65	0.00	8.65	0.340	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.87	21.00	-3.16	No	N/A	8.65	0.00	8.65	0.365	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.00	21.00	-3.38	No	N/A	8.65	0.00	8.65	0.391	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.13	21.00	-3.60	No	N/A	8.65	0.00	8.65	0.417	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.26	21.00	-3.82	No	N/A	8.65	0.00	8.65	0.442	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.39	21.00	-4.04	No	N/A	8.65	0.00	8.65	0.468	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.52	21.00	-4.27	No	N/A	8.65	0.00	8.65	0.493	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.66	21.00	-4.49	No	N/A	8.65	0.00	8.65	0.519	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.79	21.00	-4.71	No	N/A	8.65	0.00	8.65	0.545	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.92	21.00	-4.93	No	N/A	8.65	0.00	8.65	0.570	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.05	21.00	-5.15	No	N/A	8.65	0.00	8.65	0.596	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.18	21.00	-5.37	No	N/A	8.65	0.00	8.65	0.622	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.31	21.00	-5.60	No	N/A	8.65	0.00	8.65	0.647	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.44	21.00	-5.82	No	N/A	8.65	0.00	8.65	0.673	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.57	21.00	-6.04	No	N/A	8.65	0.00	8.65	0.698	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.70	21.00	-6.26	No	N/A	8.65	0.00	8.65	0.724	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.84	21.00	-6.48	No	N/A	8.65	0.00	8.65	0.750	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.97	21.00	-6.70	No	N/A	8.65	0.00	8.65	0.775	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.10	21.00	-6.93	No	N/A	8.65	0.00	8.65	0.801	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.23	21.00	-7.15	No	N/A	8.65	0.00	8.65	0.827	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.36	21.00	-7.37	No	N/A	8.65	0.00	8.65	0.852	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.49	21.00	-7.59	No	N/A	8.65	0.00	8.65	0.878	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.62	21.00	-7.81	No	N/A	8.65	0.00	8.65	0.904	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.75	21.00	-8.03	No	N/A	8.65	0.00	8.65	0.929	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.89	21.00	-8.26	No	N/A	8.65	0.00	8.65	0.955	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		11.02	21.00	-8.48	No	N/A	8.65	0.00	8.65	0.980	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		11.15	21.00	-8.70	No	10.50	20.48	13.20	33.68	0.258	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		11.28	21.00	-8.92	No	10.50	20.48	13.20	33.68	0.265	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		11.41	21.00	-9.14	No	10.50	20.48	13.20	33.68	0.271	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		11.54	21.00	-9.36	No	10.50	20.48	13.20	33.68	0.278	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		11.67	21.00	-9.59	No	10.50	20.48	13.20	33.68	0.285	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		11.80	21.00	-9.81	No	10.50	20.48	13.20	33.68	0.291	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		11.93	21.00	-10.03	No	10.50	20.48	13.20	33.68	0.298	Eqn (a)	Max spacing per T9.7.6.

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	12.000	30.42	84.51	0.36
+1.40D+1.60H					
Span # 1	1	12.000	22.05	84.51	0.26
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	12.000	30.42	84.51	0.36
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	12.000	30.42	84.51	0.36
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	12.000	26.10	84.51	0.31
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	12.000	18.90	84.51	0.22
+1.20D+L+1.60S+1.60H					
Span # 1	1	12.000	26.10	84.51	0.31
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	12.000	18.90	84.51	0.22

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM C

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	12.000	26.10	84.51	0.31
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	12.000	22.50	84.51	0.27
+0.90D+W+1.60H					
Span # 1	1	12.000	14.17	84.51	0.17
+0.90D+L+0.20S+E+1.60H					
Span # 1	1	12.000	21.37	84.51	0.25
+0.90D+E+0.90H					
Span # 1	1	12.000	14.17	84.51	0.17

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+L+H	0.0127	6.000		0.0000	0.000

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM B

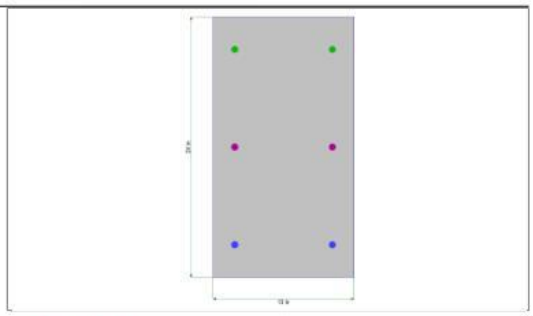
CODE REFERENCES

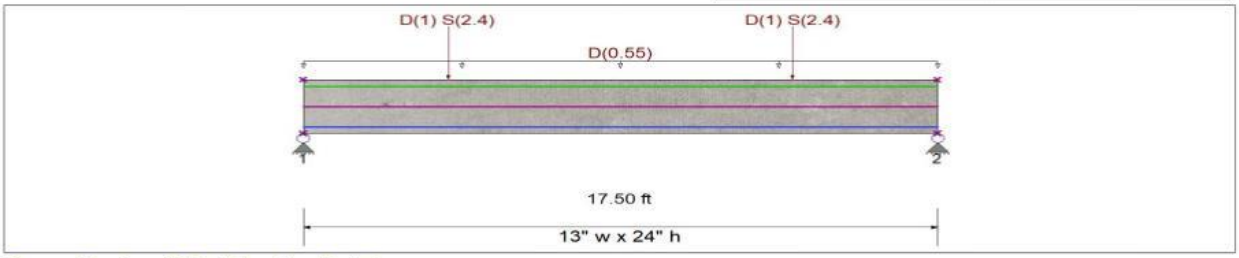
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c 1/2	=	375.0 psi		Shear :	0.750
ψ Density	=	150.0 pcf	β 1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus =		3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =		60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =		29,000.0 ksi	Stirrup Bar Size #		3
Number of Resisting Legs Per Stirrup =					2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 17.50 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 17.50 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 17.50 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.550 k/ft, Tributary Width = 1.0 ft, (Line loads)
Point Load : D = 1.0, S = 2.40 k @ 4.0 ft, (Point Load)
Point Load : D = 1.0, S = 2.40 k @ 13.50 ft, (Point Load)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.714** : 1
Section used for this span **Typical Section**
Mu : Applied 60.355 k-ft
Mn * Phi : Allowable 84.513 k-ft
Location of maximum on span 8.734 ft
Span # where maximum occurs Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.013 in	Ratio =	16623	>=360.0	S Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	S Only
Max Downward Total Deflection	0.247 in	Ratio =	849	>=240.0	Span: 1 : +D+S+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+S+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	11.056	11.056
Max Upward from Load Combinations	11.056	11.056
Max Upward from Load Cases	8.656	8.656
+D+H	8.656	8.656

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM B

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+L+H	8.656	8.656
+D+Lr+H	8.656	8.656
+D+S+H	11.056	11.056
+D+0.750Lr+0.750L+H	8.656	8.656
+D+0.750L+0.750S+H	10.456	10.456
+D+0.60W+H	8.656	8.656
+D+0.750Lr+0.750L+0.450W+H	8.656	8.656
+D+0.750L+0.750S+0.450W+H	10.456	10.456
+0.60D+0.60W+0.60H	5.194	5.194
+D+0.750L+0.750S+0.70E+H	10.456	10.456
+D+0.750L+0.750S+0.5250E+H	10.456	10.456
+0.60D+0.70E+0.60H	5.194	5.194
D Only	8.656	8.656
S Only	2.400	2.400
H Only		

Shear Stirrup Requirements

Between 0.00 to 3.98 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 4.02 to 13.48 ft, Ties Not Req'd, Stirrups are not required.
Between 13.52 to 17.47 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60S+0.50W+1.60H		0.00	21.00	14.23	Yes	10.50	20.48	13.20	33.68	0.422	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		0.19	21.00	14.03	Yes	10.50	20.48	13.20	33.68	0.417	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		0.38	21.00	13.83	Yes	10.50	20.48	13.20	33.68	0.411	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		0.57	21.00	13.63	Yes	10.50	20.48	13.20	33.68	0.405	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		0.77	21.00	13.42	Yes	10.50	20.48	13.20	33.68	0.399	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		0.96	21.00	13.22	Yes	10.50	20.48	13.20	33.68	0.393	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		1.15	21.00	13.02	Yes	10.50	20.48	13.20	33.68	0.387	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		1.34	21.00	12.82	Yes	10.50	20.48	13.20	33.68	0.381	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		1.53	21.00	12.62	Yes	10.50	20.48	13.20	33.68	0.375	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		1.72	21.00	12.42	Yes	10.50	20.48	13.20	33.68	0.369	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		1.91	21.00	12.22	Yes	10.50	20.48	13.20	33.68	0.363	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		2.10	21.00	12.02	Yes	10.50	20.48	13.20	33.68	0.357	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		2.30	21.00	11.82	Yes	10.50	20.48	13.20	33.68	0.351	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		2.49	21.00	11.62	Yes	10.50	20.48	13.20	33.68	0.345	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		2.68	21.00	11.42	Yes	10.50	20.48	13.20	33.68	0.339	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		2.87	21.00	11.22	Yes	10.50	20.48	13.20	33.68	0.333	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		3.06	21.00	11.01	Yes	10.50	20.48	13.20	33.68	0.327	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		3.25	21.00	10.81	Yes	10.50	20.48	13.20	33.68	0.321	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		3.44	21.00	10.61	Yes	10.50	20.48	13.20	33.68	0.315	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		3.63	21.00	10.41	Yes	10.50	20.48	13.20	33.68	0.309	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		3.83	21.00	10.21	No	10.50	20.48	13.20	33.68	0.303	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	4.02	21.00	5.80	No	N/A	8.65	0.00	8.65	0.671	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.21	21.00	5.56	No	N/A	8.65	0.00	8.65	0.644	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.40	21.00	5.33	No	N/A	8.65	0.00	8.65	0.616	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.59	21.00	5.10	No	N/A	8.65	0.00	8.65	0.589	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.78	21.00	4.86	No	N/A	8.65	0.00	8.65	0.562	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.97	21.00	4.63	No	N/A	8.65	0.00	8.65	0.535	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.16	21.00	4.39	No	N/A	8.65	0.00	8.65	0.508	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.36	21.00	4.16	No	N/A	8.65	0.00	8.65	0.481	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.55	21.00	3.92	No	N/A	8.65	0.00	8.65	0.454	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.74	21.00	3.69	No	N/A	8.65	0.00	8.65	0.427	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.93	21.00	3.46	No	N/A	8.65	0.00	8.65	0.400	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	6.12	21.00	3.22	No	N/A	8.65	0.00	8.65	0.373	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	6.31	21.00	2.99	No	N/A	8.65	0.00	8.65	0.345	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	6.50	21.00	2.75	No	N/A	8.65	0.00	8.65	0.318	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	6.69	21.00	2.52	No	N/A	8.65	0.00	8.65	0.291	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	6.89	21.00	2.28	No	N/A	8.65	0.00	8.65	0.264	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	7.08	21.00	2.05	No	N/A	8.65	0.00	8.65	0.237	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	7.27	21.00	1.82	No	N/A	8.65	0.00	8.65	0.210	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	7.46	21.00	1.58	No	N/A	8.65	0.00	8.65	0.183	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	7.65	21.00	1.35	No	N/A	8.65	0.00	8.65	0.156	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	7.84	21.00	1.11	No	N/A	8.65	0.00	8.65	0.129	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	8.03	21.00	0.88	No	N/A	8.65	0.00	8.65	0.102	Eqn (c)	Ties Not Req'd

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM B

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.40D+1.60H	1	8.22	21.00	0.64	No	N/A	8.65	0.00	8.65	0.075	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	8.42	21.00	0.41	No	N/A	8.65	0.00	8.65	0.047	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	8.61	21.00	0.18	No	N/A	8.65	0.00	8.65	0.020	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	8.80	21.00	-0.06	No	N/A	8.65	0.00	8.65	0.007	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	8.99	21.00	-0.29	No	N/A	8.65	0.00	8.65	0.034	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	9.18	21.00	-0.53	No	N/A	8.65	0.00	8.65	0.061	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	9.37	21.00	-0.76	No	N/A	8.65	0.00	8.65	0.088	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	9.56	21.00	-1.00	No	N/A	8.65	0.00	8.65	0.115	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	9.75	21.00	-1.23	No	N/A	8.65	0.00	8.65	0.142	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	9.95	21.00	-1.46	No	N/A	8.65	0.00	8.65	0.169	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	10.14	21.00	-1.70	No	N/A	8.65	0.00	8.65	0.196	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	10.33	21.00	-1.93	No	N/A	8.65	0.00	8.65	0.224	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	10.52	21.00	-2.17	No	N/A	8.65	0.00	8.65	0.251	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	10.71	21.00	-2.40	No	N/A	8.65	0.00	8.65	0.278	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	10.90	21.00	-2.64	No	N/A	8.65	0.00	8.65	0.305	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	11.09	21.00	-2.87	No	N/A	8.65	0.00	8.65	0.332	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	11.28	21.00	-3.10	No	N/A	8.65	0.00	8.65	0.359	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	11.48	21.00	-3.34	No	N/A	8.65	0.00	8.65	0.386	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	11.67	21.00	-3.57	No	N/A	8.65	0.00	8.65	0.413	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	11.86	21.00	-3.81	No	N/A	8.65	0.00	8.65	0.440	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	12.05	21.00	-4.04	No	N/A	8.65	0.00	8.65	0.467	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	12.24	21.00	-4.28	No	N/A	8.65	0.00	8.65	0.494	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	12.43	21.00	-4.51	No	N/A	8.65	0.00	8.65	0.522	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	12.62	21.00	-4.74	No	N/A	8.65	0.00	8.65	0.549	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	12.81	21.00	-4.98	No	N/A	8.65	0.00	8.65	0.576	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	13.01	21.00	-5.21	No	N/A	8.65	0.00	8.65	0.603	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	13.20	21.00	-5.45	No	N/A	8.65	0.00	8.65	0.630	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	13.39	21.00	-5.68	No	N/A	8.65	0.00	8.65	0.657	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		13.58	21.00	-10.11	No	10.50	20.48	13.20	33.68	0.300	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		13.77	21.00	-10.31	Yes	10.50	20.48	13.20	33.68	0.306	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		13.96	21.00	-10.51	Yes	10.50	20.48	13.20	33.68	0.312	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		14.15	21.00	-10.71	Yes	10.50	20.48	13.20	33.68	0.318	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		14.34	21.00	-10.91	Yes	10.50	20.48	13.20	33.68	0.324	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		14.54	21.00	-11.11	Yes	10.50	20.48	13.20	33.68	0.330	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		14.73	21.00	-11.32	Yes	10.50	20.48	13.20	33.68	0.336	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		14.92	21.00	-11.52	Yes	10.50	20.48	13.20	33.68	0.342	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		15.11	21.00	-11.72	Yes	10.50	20.48	13.20	33.68	0.348	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		15.30	21.00	-11.92	Yes	10.50	20.48	13.20	33.68	0.354	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		15.49	21.00	-12.12	Yes	10.50	20.48	13.20	33.68	0.360	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		15.68	21.00	-12.32	Yes	10.50	20.48	13.20	33.68	0.366	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		15.87	21.00	-12.52	Yes	10.50	20.48	13.20	33.68	0.372	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		16.07	21.00	-12.72	Yes	10.50	20.48	13.20	33.68	0.378	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		16.26	21.00	-12.92	Yes	10.50	20.48	13.20	33.68	0.384	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		16.45	21.00	-13.12	Yes	10.50	20.48	13.20	33.68	0.390	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		16.64	21.00	-13.32	Yes	10.50	20.48	13.20	33.68	0.396	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		16.83	21.00	-13.52	Yes	10.50	20.48	13.20	33.68	0.402	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		17.02	21.00	-13.73	Yes	10.50	20.48	13.20	33.68	0.408	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		17.21	21.00	-13.93	Yes	10.50	20.48	13.20	33.68	0.414	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		17.40	21.00	-14.13	Yes	10.50	20.48	13.20	33.68	0.420	Eqn (a)	Max spacing per T9.7.6.

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	17.500	60.36	84.51	0.71
+1.40D+1.60H					
Span # 1	1	17.500	52.49	84.51	0.62
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	17.500	45.00	84.51	0.53
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	17.500	49.80	84.51	0.59
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	17.500	45.00	84.51	0.53
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	17.500	45.00	84.51	0.53
+1.20D+L+1.60S+1.60H					
Span # 1	1	17.500	60.36	84.51	0.71

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM B

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	17.500	60.36	84.51	0.71
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	17.500	45.00	84.51	0.53
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	17.500	49.80	84.51	0.59
+0.90D+W+1.60H					
Span # 1	1	17.500	33.75	84.51	0.40
+0.90D+L+0.20S+E+1.60H					
Span # 1	1	17.500	35.67	84.51	0.42
+0.90D+E+0.90H					
Span # 1	1	17.500	33.75	84.51	0.40

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+S+H	0.2472	8.750		0.0000	0.000

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM D

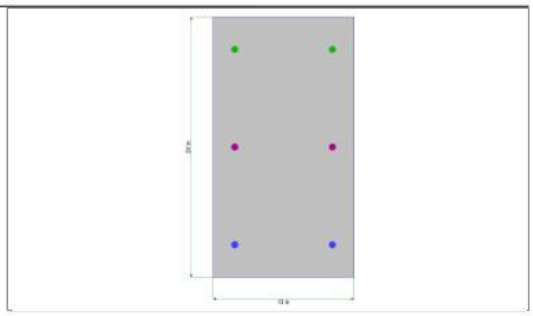
CODE REFERENCES

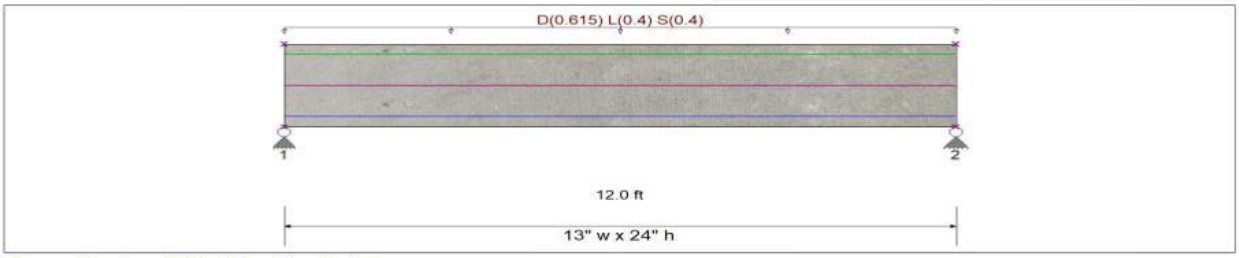
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c 1/2	=	375.0 psi		Shear :	0.750
ψ Density	=	150.0 pcf	β 1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus =		3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =		60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =		29,000.0 ksi	Stirrup Bar Size #		3
Number of Resisting Legs Per Stirrup =					2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 12.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 12.0 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 12.0 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.6150, L = 0.40, S = 0.40 k/ft, Tributary Width = 1.0 ft, (Line loads)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.462** : 1

Section used for this span	**Typical Section**	
Mu : Applied	39.024	k-ft
Mn * Phi : Allowable	84.513	k-ft
Location of maximum on span	6.011	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.004 in	Ratio =	36088	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.019 in	Ratio =	7560	>=240.0	Span: 1 : +D+0.750L+0.750S+0.5250E+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+0.750L+0.750S+0.5250E+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	9.240	9.240
Max Upward from Load Combinations	9.240	9.240
Max Upward from Load Cases	5.640	5.640
+D+H	5.640	5.640
+D+L+H	8.040	8.040
+D+Lr+H	5.640	5.640

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM D

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+S+H	8.040	8.040
+D+0.750Lr+0.750L+H	7.440	7.440
+D+0.750L+0.750S+H	9.240	9.240
+D+0.60W+H	5.640	5.640
+D+0.750Lr+0.750L+0.450W+H	7.440	7.440
+D+0.750L+0.750S+0.450W+H	9.240	9.240
+0.60D+0.60W+0.60H	3.384	3.384
+D+0.750L+0.750S+0.70E+H	9.240	9.240
+D+0.750L+0.750S+0.5250E+H	9.240	9.240
+0.60D+0.70E+0.60H	3.384	3.384
D Only	5.640	5.640
L Only	2.400	2.400
S Only	2.400	2.400
H Only		

Shear Stirrup Requirements

Between 0.00 to 2.01 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 2.03 to 9.97 ft, Ties Not Req'd, Stirrups are not required.
Between 9.99 to 11.98 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+L+1.60S+1.60H	1	0.00	21.00	13.01	Yes	10.50	20.48	13.20	33.68	0.386	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.13	21.00	12.72	Yes	10.50	20.48	13.20	33.68	0.378	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.26	21.00	12.44	Yes	10.50	20.48	13.20	33.68	0.369	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.39	21.00	12.16	Yes	10.50	20.48	13.20	33.68	0.361	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.52	21.00	11.87	Yes	10.50	20.48	13.20	33.68	0.353	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.66	21.00	11.59	Yes	10.50	20.48	13.20	33.68	0.344	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.79	21.00	11.30	Yes	10.50	20.48	13.20	33.68	0.336	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.92	21.00	11.02	Yes	10.50	20.48	13.20	33.68	0.327	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.05	21.00	10.73	Yes	10.50	20.48	13.20	33.68	0.319	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.18	21.00	10.45	Yes	10.50	20.48	13.20	33.68	0.310	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.31	21.00	10.16	No	10.50	20.48	13.20	33.68	0.302	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.44	21.00	9.88	No	10.50	20.48	13.20	33.68	0.293	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.57	21.00	9.60	No	10.50	20.48	13.20	33.68	0.285	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.70	21.00	9.31	No	10.50	20.48	13.20	33.68	0.277	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.84	21.00	9.03	No	10.50	20.48	13.20	33.68	0.268	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.97	21.00	8.74	No	10.50	20.48	13.20	33.68	0.260	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	2.10	21.00	8.46	No	N/A	8.65	0.00	8.65	0.978	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.23	21.00	8.17	No	N/A	8.65	0.00	8.65	0.945	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.36	21.00	7.89	No	N/A	8.65	0.00	8.65	0.912	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.49	21.00	7.61	No	N/A	8.65	0.00	8.65	0.880	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.62	21.00	7.32	No	N/A	8.65	0.00	8.65	0.847	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.75	21.00	7.04	No	N/A	8.65	0.00	8.65	0.814	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.89	21.00	6.75	No	N/A	8.65	0.00	8.65	0.781	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.02	21.00	6.47	No	N/A	8.65	0.00	8.65	0.748	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.15	21.00	6.18	No	N/A	8.65	0.00	8.65	0.715	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.28	21.00	5.90	No	N/A	8.65	0.00	8.65	0.682	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.41	21.00	5.62	No	N/A	8.65	0.00	8.65	0.649	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.54	21.00	5.33	No	N/A	8.65	0.00	8.65	0.617	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.67	21.00	5.05	No	N/A	8.65	0.00	8.65	0.584	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.80	21.00	4.76	No	N/A	8.65	0.00	8.65	0.551	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.93	21.00	4.48	No	N/A	8.65	0.00	8.65	0.518	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.07	21.00	4.19	No	N/A	8.65	0.00	8.65	0.485	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.20	21.00	3.91	No	N/A	8.65	0.00	8.65	0.452	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.33	21.00	3.63	No	N/A	8.65	0.00	8.65	0.419	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.46	21.00	3.34	No	N/A	8.65	0.00	8.65	0.386	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.59	21.00	3.06	No	N/A	8.65	0.00	8.65	0.353	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.72	21.00	2.77	No	N/A	8.65	0.00	8.65	0.321	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.85	21.00	2.49	No	N/A	8.65	0.00	8.65	0.288	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.98	21.00	2.20	No	N/A	8.65	0.00	8.65	0.255	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.11	21.00	1.92	No	N/A	8.65	0.00	8.65	0.222	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.25	21.00	1.63	No	N/A	8.65	0.00	8.65	0.189	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.38	21.00	1.35	No	N/A	8.65	0.00	8.65	0.156	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.51	21.00	1.07	No	N/A	8.65	0.00	8.65	0.123	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.64	21.00	0.78	No	N/A	8.65	0.00	8.65	0.090	Eqn (c)	Ties Not Req'd

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM D

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+L+1.60S+1.60H	1	5.77	21.00	0.50	No	N/A	8.65	0.00	8.65	0.058	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.90	21.00	0.21	No	N/A	8.65	0.00	8.65	0.025	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.03	21.00	-0.07	No	N/A	8.65	0.00	8.65	0.008	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.16	21.00	-0.36	No	N/A	8.65	0.00	8.65	0.041	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.30	21.00	-0.64	No	N/A	8.65	0.00	8.65	0.074	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.43	21.00	-0.92	No	N/A	8.65	0.00	8.65	0.107	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.56	21.00	-1.21	No	N/A	8.65	0.00	8.65	0.140	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.69	21.00	-1.49	No	N/A	8.65	0.00	8.65	0.173	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.82	21.00	-1.78	No	N/A	8.65	0.00	8.65	0.206	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.95	21.00	-2.06	No	N/A	8.65	0.00	8.65	0.238	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	7.08	21.00	-2.35	No	N/A	8.65	0.00	8.65	0.271	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	7.21	21.00	-2.63	No	N/A	8.65	0.00	8.65	0.304	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	7.34	21.00	-2.91	No	N/A	8.65	0.00	8.65	0.337	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	7.48	21.00	-3.20	No	N/A	8.65	0.00	8.65	0.370	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	7.61	21.00	-3.48	No	N/A	8.65	0.00	8.65	0.403	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	7.74	21.00	-3.77	No	N/A	8.65	0.00	8.65	0.436	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	7.87	21.00	-4.05	No	N/A	8.65	0.00	8.65	0.469	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.00	21.00	-4.34	No	N/A	8.65	0.00	8.65	0.501	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.13	21.00	-4.62	No	N/A	8.65	0.00	8.65	0.534	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.26	21.00	-4.90	No	N/A	8.65	0.00	8.65	0.567	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.39	21.00	-5.19	No	N/A	8.65	0.00	8.65	0.600	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.52	21.00	-5.47	No	N/A	8.65	0.00	8.65	0.633	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.66	21.00	-5.76	No	N/A	8.65	0.00	8.65	0.666	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.79	21.00	-6.04	No	N/A	8.65	0.00	8.65	0.699	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.92	21.00	-6.33	No	N/A	8.65	0.00	8.65	0.732	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.05	21.00	-6.61	No	N/A	8.65	0.00	8.65	0.765	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.18	21.00	-6.89	No	N/A	8.65	0.00	8.65	0.797	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.31	21.00	-7.18	No	N/A	8.65	0.00	8.65	0.830	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.44	21.00	-7.46	No	N/A	8.65	0.00	8.65	0.863	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.57	21.00	-7.75	No	N/A	8.65	0.00	8.65	0.896	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.70	21.00	-8.03	No	N/A	8.65	0.00	8.65	0.929	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.84	21.00	-8.32	No	N/A	8.65	0.00	8.65	0.962	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.97	21.00	-8.60	No	N/A	8.65	0.00	8.65	0.995	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	10.10	21.00	-8.89	No	10.50	20.48	13.20	33.68	0.264	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	10.23	21.00	-9.17	No	10.50	20.48	13.20	33.68	0.272	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	10.36	21.00	-9.45	No	10.50	20.48	13.20	33.68	0.281	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	10.49	21.00	-9.74	No	10.50	20.48	13.20	33.68	0.289	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	10.62	21.00	-10.02	No	10.50	20.48	13.20	33.68	0.298	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	10.75	21.00	-10.31	Yes	10.50	20.48	13.20	33.68	0.306	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	10.89	21.00	-10.59	Yes	10.50	20.48	13.20	33.68	0.315	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	11.02	21.00	-10.88	Yes	10.50	20.48	13.20	33.68	0.323	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	11.15	21.00	-11.16	Yes	10.50	20.48	13.20	33.68	0.331	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	11.28	21.00	-11.44	Yes	10.50	20.48	13.20	33.68	0.340	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	11.41	21.00	-11.73	Yes	10.50	20.48	13.20	33.68	0.348	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	11.54	21.00	-12.01	Yes	10.50	20.48	13.20	33.68	0.357	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	11.67	21.00	-12.30	Yes	10.50	20.48	13.20	33.68	0.365	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	11.80	21.00	-12.58	Yes	10.50	20.48	13.20	33.68	0.374	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	11.93	21.00	-12.87	Yes	10.50	20.48	13.20	33.68	0.382	Eqn (a)	Max spacing per T9.7.6.

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	12.000	39.02	84.51	0.46
+1.40D+1.60H					
Span # 1	1	12.000	23.69	84.51	0.28
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	12.000	31.82	84.51	0.38
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	12.000	35.42	84.51	0.42
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	12.000	27.50	84.51	0.33
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	12.000	20.30	84.51	0.24
+1.20D+L+1.60S+1.60H					
Span # 1	1	12.000	39.02	84.51	0.46
+1.20D+1.60S+0.50W+1.60H					

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM D

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 1 +1.20D+0.50Lr+L+W+1.60H	1	12.000	31.82	84.51	0.38
Span # 1 +1.20D+0.50L+0.50S+W+1.60H	1	12.000	27.50	84.51	0.33
Span # 1 +0.90D+W+1.60H	1	12.000	27.50	84.51	0.33
Span # 1 +0.90D+L+0.20S+E+1.60H	1	12.000	15.23	84.51	0.18
Span # 1 +0.90D+E+0.90H	1	12.000	23.87	84.51	0.28
Span # 1	1	12.000	15.23	84.51	0.18

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+0.750L+0.750S+0.5250E+H	0.0190	6.000		0.0000	0.000

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM E

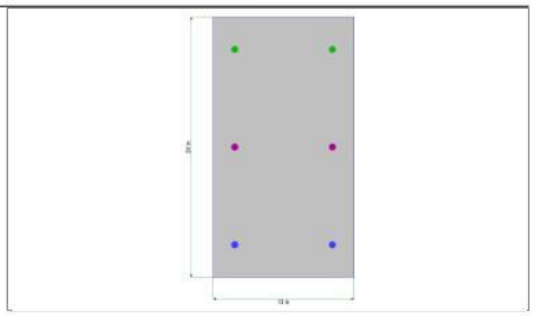
CODE REFERENCES

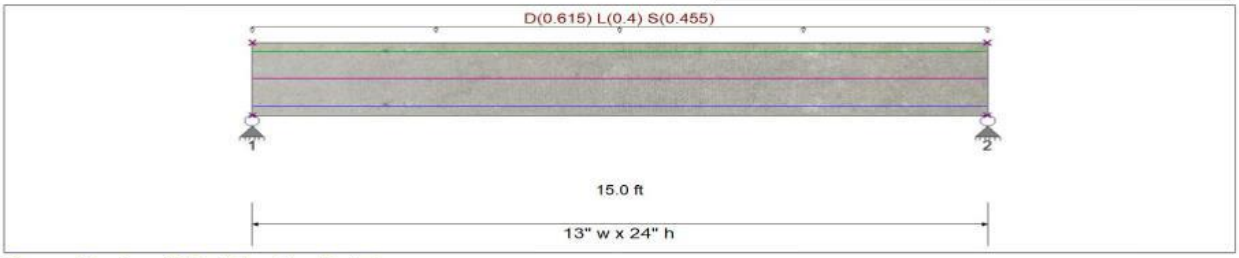
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c $^{1/2}$	=	375.0 psi		Shear :	0.750
ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus =		3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =		60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =		29,000.0 ksi	Stirrup Bar Size #		3
Number of Resisting Legs Per Stirrup =					2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 15.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 15.0 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 15.0 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.6150, L = 0.40, S = 0.4550 k/ft, Tributary Width = 1.0 ft, (Line loads)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.751** : 1

Section used for this span	**Typical Section**	
Mu : Applied	63.450	k-ft
Mn * Phi : Allowable	84.513	k-ft
Location of maximum on span	7.514	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.011 in	Ratio =	16243	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	S Only
Max Downward Total Deflection	0.151 in	Ratio =	1192	>=240.0	Span: 1 : +D+0.750L+0.750S+0.5250E+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+0.750L+0.750S+0.5250E+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	11.859	11.859
Max Upward from Load Combinations	11.859	11.859
Max Upward from Load Cases	7.050	7.050
+D+H	7.050	7.050
+D+L+H	10.050	10.050
+D+Lr+H	7.050	7.050

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM E

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+S+H	10.462	10.463
+D+0.750Lr+0.750L+H	9.300	9.300
+D+0.750L+0.750S+H	11.859	11.859
+D+0.60W+H	7.050	7.050
+D+0.750Lr+0.750L+0.450W+H	9.300	9.300
+D+0.750L+0.750S+0.450W+H	11.859	11.859
+0.60D+0.60W+0.60H	4.230	4.230
+D+0.750L+0.750S+0.70E+H	11.859	11.859
+D+0.750L+0.750S+0.5250E+H	11.859	11.859
+0.60D+0.70E+0.60H	4.230	4.230
D Only	7.050	7.050
L Only	3.000	3.000
S Only	3.412	3.413
H Only		

Shear Stirrup Requirements

Between 0.00 to 3.66 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 3.69 to 11.31 ft, Ties Not Req'd, Stirrups are not required.
Between 11.34 to 14.97 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+L+1.60S+1.60H	1	0.00	21.00	16.92	Yes	10.50	20.48	13.20	33.68	0.502	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.16	21.00	16.55	Yes	10.50	20.48	13.20	33.68	0.491	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.33	21.00	16.18	Yes	10.50	20.48	13.20	33.68	0.480	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.49	21.00	15.81	Yes	10.50	20.48	13.20	33.68	0.470	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.66	21.00	15.44	Yes	10.50	20.48	13.20	33.68	0.459	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.82	21.00	15.07	Yes	10.50	20.48	13.20	33.68	0.448	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.98	21.00	14.70	Yes	10.50	20.48	13.20	33.68	0.437	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.15	21.00	14.33	Yes	10.50	20.48	13.20	33.68	0.426	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.31	21.00	13.96	Yes	10.50	20.48	13.20	33.68	0.415	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.48	21.00	13.59	Yes	10.50	20.48	13.20	33.68	0.404	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.64	21.00	13.22	Yes	10.50	20.48	13.20	33.68	0.393	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.80	21.00	12.85	Yes	10.50	20.48	13.20	33.68	0.382	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.97	21.00	12.48	Yes	10.50	20.48	13.20	33.68	0.371	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	2.13	21.00	12.11	Yes	10.50	20.48	13.20	33.68	0.360	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	2.30	21.00	11.74	Yes	10.50	20.48	13.20	33.68	0.349	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	2.46	21.00	11.37	Yes	10.50	20.48	13.20	33.68	0.338	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	2.62	21.00	11.00	Yes	10.50	20.48	13.20	33.68	0.327	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	2.79	21.00	10.63	Yes	10.50	20.48	13.20	33.68	0.316	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	2.95	21.00	10.26	Yes	10.50	20.48	13.20	33.68	0.305	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	3.11	21.00	9.89	No	10.50	20.48	13.20	33.68	0.294	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	3.28	21.00	9.52	No	10.50	20.48	13.20	33.68	0.283	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	3.44	21.00	9.15	No	10.50	20.48	13.20	33.68	0.272	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	3.61	21.00	8.78	No	10.50	20.48	13.20	33.68	0.261	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	3.77	21.00	8.41	No	N/A	8.65	0.00	8.65	0.973	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.93	21.00	8.04	No	N/A	8.65	0.00	8.65	0.930	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.10	21.00	7.67	No	N/A	8.65	0.00	8.65	0.887	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.26	21.00	7.30	No	N/A	8.65	0.00	8.65	0.845	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.43	21.00	6.93	No	N/A	8.65	0.00	8.65	0.802	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.59	21.00	6.56	No	N/A	8.65	0.00	8.65	0.759	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.75	21.00	6.19	No	N/A	8.65	0.00	8.65	0.716	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.92	21.00	5.82	No	N/A	8.65	0.00	8.65	0.674	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.08	21.00	5.46	No	N/A	8.65	0.00	8.65	0.631	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.25	21.00	5.09	No	N/A	8.65	0.00	8.65	0.588	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.41	21.00	4.72	No	N/A	8.65	0.00	8.65	0.545	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.57	21.00	4.35	No	N/A	8.65	0.00	8.65	0.503	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.74	21.00	3.98	No	N/A	8.65	0.00	8.65	0.460	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.90	21.00	3.61	No	N/A	8.65	0.00	8.65	0.417	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.07	21.00	3.24	No	N/A	8.65	0.00	8.65	0.374	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.23	21.00	2.87	No	N/A	8.65	0.00	8.65	0.331	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.39	21.00	2.50	No	N/A	8.65	0.00	8.65	0.289	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.56	21.00	2.13	No	N/A	8.65	0.00	8.65	0.246	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.72	21.00	1.76	No	N/A	8.65	0.00	8.65	0.203	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	6.89	21.00	1.39	No	N/A	8.65	0.00	8.65	0.160	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	7.05	21.00	1.02	No	N/A	8.65	0.00	8.65	0.118	Eqn (c)	Ties Not Req'd

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM E

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+L+1.60S+1.60H	1	7.21	21.00	0.65	No	N/A	8.65	0.00	8.65	0.075	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	7.38	21.00	0.28	No	N/A	8.65	0.00	8.65	0.032	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	7.54	21.00	-0.09	No	N/A	8.65	0.00	8.65	0.011	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	7.70	21.00	-0.46	No	N/A	8.65	0.00	8.65	0.053	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	7.87	21.00	-0.83	No	N/A	8.65	0.00	8.65	0.096	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.03	21.00	-1.20	No	N/A	8.65	0.00	8.65	0.139	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.20	21.00	-1.57	No	N/A	8.65	0.00	8.65	0.182	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.36	21.00	-1.94	No	N/A	8.65	0.00	8.65	0.225	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.52	21.00	-2.31	No	N/A	8.65	0.00	8.65	0.267	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.69	21.00	-2.68	No	N/A	8.65	0.00	8.65	0.310	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	8.85	21.00	-3.05	No	N/A	8.65	0.00	8.65	0.353	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.02	21.00	-3.42	No	N/A	8.65	0.00	8.65	0.396	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.18	21.00	-3.79	No	N/A	8.65	0.00	8.65	0.438	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.34	21.00	-4.16	No	N/A	8.65	0.00	8.65	0.481	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.51	21.00	-4.53	No	N/A	8.65	0.00	8.65	0.524	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.67	21.00	-4.90	No	N/A	8.65	0.00	8.65	0.567	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	9.84	21.00	-5.27	No	N/A	8.65	0.00	8.65	0.609	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	10.00	21.00	-5.64	No	N/A	8.65	0.00	8.65	0.652	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	10.16	21.00	-6.01	No	N/A	8.65	0.00	8.65	0.695	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	10.33	21.00	-6.38	No	N/A	8.65	0.00	8.65	0.738	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	10.49	21.00	-6.75	No	N/A	8.65	0.00	8.65	0.781	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	10.66	21.00	-7.12	No	N/A	8.65	0.00	8.65	0.823	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	10.82	21.00	-7.49	No	N/A	8.65	0.00	8.65	0.866	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	10.98	21.00	-7.86	No	N/A	8.65	0.00	8.65	0.909	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	11.15	21.00	-8.23	No	N/A	8.65	0.00	8.65	0.952	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	11.31	21.00	-8.60	No	N/A	8.65	0.00	8.65	0.994	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	11.48	21.00	-8.97	No	10.50	20.48	13.20	33.68	0.266	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	11.64	21.00	-9.34	No	10.50	20.48	13.20	33.68	0.277	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	11.80	21.00	-9.71	No	10.50	20.48	13.20	33.68	0.288	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	11.97	21.00	-10.08	No	10.50	20.48	13.20	33.68	0.299	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	12.13	21.00	-10.45	Yes	10.50	20.48	13.20	33.68	0.310	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	12.30	21.00	-10.82	Yes	10.50	20.48	13.20	33.68	0.321	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	12.46	21.00	-11.19	Yes	10.50	20.48	13.20	33.68	0.332	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	12.62	21.00	-11.56	Yes	10.50	20.48	13.20	33.68	0.343	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	12.79	21.00	-11.93	Yes	10.50	20.48	13.20	33.68	0.354	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	12.95	21.00	-12.30	Yes	10.50	20.48	13.20	33.68	0.365	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	13.11	21.00	-12.67	Yes	10.50	20.48	13.20	33.68	0.376	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	13.28	21.00	-13.04	Yes	10.50	20.48	13.20	33.68	0.387	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	13.44	21.00	-13.41	Yes	10.50	20.48	13.20	33.68	0.398	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	13.61	21.00	-13.78	Yes	10.50	20.48	13.20	33.68	0.409	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	13.77	21.00	-14.15	Yes	10.50	20.48	13.20	33.68	0.420	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	13.93	21.00	-14.52	Yes	10.50	20.48	13.20	33.68	0.431	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	14.10	21.00	-14.89	Yes	10.50	20.48	13.20	33.68	0.442	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	14.26	21.00	-15.26	Yes	10.50	20.48	13.20	33.68	0.453	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	14.43	21.00	-15.63	Yes	10.50	20.48	13.20	33.68	0.464	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	14.59	21.00	-16.00	Yes	10.50	20.48	13.20	33.68	0.475	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	14.75	21.00	-16.37	Yes	10.50	20.48	13.20	33.68	0.486	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	14.92	21.00	-16.74	Yes	10.50	20.48	13.20	33.68	0.497	Eqn (a)	Max spacing per T9.7.6.

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	15.000	63.45	84.51	0.75
+1.40D+1.60H					
Span # 1	1	15.000	37.01	84.51	0.44
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	15.000	49.72	84.51	0.59
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	15.000	56.12	84.51	0.66
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	15.000	42.97	84.51	0.51
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	15.000	31.72	84.51	0.38
+1.20D+L+1.60S+1.60H					
Span # 1	1	15.000	63.45	84.51	0.75
+1.20D+1.60S+0.50W+1.60H					

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM E

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 1 +1.20D+0.50Lr+L+W+1.60H	1	15.000	52.20	84.51	0.62
Span # 1 +1.20D+0.50L+0.50S+W+1.60H	1	15.000	42.97	84.51	0.51
Span # 1 +0.90D+W+1.60H	1	15.000	43.75	84.51	0.52
Span # 1 +0.90D+L+0.20S+E+1.60H	1	15.000	23.79	84.51	0.28
Span # 1 +0.90D+E+0.90H	1	15.000	37.60	84.51	0.44
Span # 1	1	15.000	23.79	84.51	0.28

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+0.750L+0.750S+0.5250E+H	0.1510	7.500		0.0000	0.000

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM F

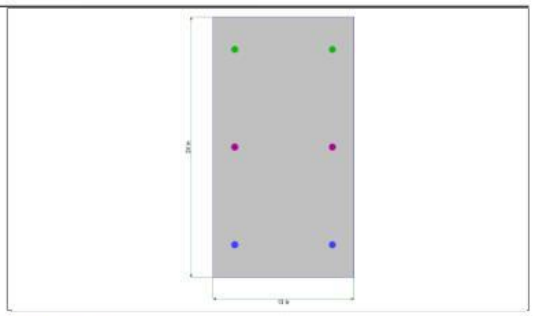
CODE REFERENCES

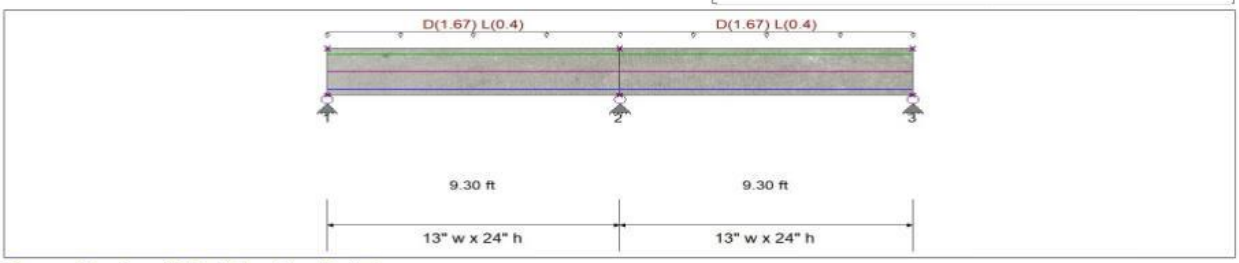
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	= 2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c $^{1/2}$	= 375.0 psi		Shear :	0.750
ψ Density	= 150.0 pcf	β_1	=	0.850
λ LtWt Factor	= 1.0			
Elastic Modulus =	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =	60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =	29,000.0 ksi	Stirrup Bar Size #		3
		Number of Resisting Legs Per Stirrup =		2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 9.30 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 9.30 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 9.30 ft in this span
Span #2 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 9.30 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 9.30 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 9.30 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 1.670, L = 0.40 k/ft, Tributary Width = 1.0 ft, (Line loads)
Load for Span Number 2
Uniform Load : D = 1.670, L = 0.40 k/ft, Tributary Width = 1.0 ft, (Line loads)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.388** : 1
Section used for this span **Typical Section**
Mu : Applied -32.801 k-ft
Mn * Phi : Allowable 84.513 k-ft
Location of maximum on span 0.000 ft
Span # where maximum occurs Span # 2

Maximum Deflection

Max Downward Transient Deflection	0.000 in	Ratio =	0 <360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360.0	L Only
Max Downward Total Deflection	0.004 in	Ratio =	31170 >=240.0	Span: 2 : +D+L+H
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0	Span: 2 : +D+L+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	8.353	27.842	8.353

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM F

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Max Upward from Load Combinations	8.353	27.842	8.353
Max Upward from Load Cases	6.958	23.192	6.958
+D+H	6.958	23.192	6.958
+D+L+H	8.353	27.842	8.353
+D+Lr+H	6.958	23.192	6.958
+D+S+H	6.958	23.192	6.958
+D+0.750Lr+0.750L+H	8.004	26.679	8.004
+D+0.750L+0.750S+H	8.004	26.679	8.004
+D+0.60W+H	6.958	23.192	6.958
+D+0.750Lr+0.750L+0.450W+H	8.004	26.679	8.004
+D+0.750L+0.750S+0.450W+H	8.004	26.679	8.004
+0.60D+0.60W+0.60H	4.175	13.915	4.175
+D+0.750L+0.750S+0.70E+H	8.004	26.679	8.004
+D+0.750L+0.750S+0.5250E+H	8.004	26.679	8.004
+0.60D+0.70E+0.60H	4.175	13.915	4.175
D Only	6.958	23.192	6.958
L Only	1.395	4.650	1.395
H Only			

Shear Stirrup Requirements

Between 0.00 to 0.61 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 0.65 to 6.30 ft, Ties Not Req'd, Stirrups are not required.
Between 6.34 to 12.26 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 12.30 to 17.95 ft, Ties Not Req'd, Stirrups are not required.
Between 17.99 to 18.56 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L+0.50S+1.60H		0.00	21.00	10.58	Yes	10.50	20.48	13.20	33.68	0.314	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.23	21.00	9.89	No	10.50	20.48	13.20	33.68	0.294	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.46	21.00	9.20	No	10.50	20.48	13.20	33.68	0.273	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.68	21.00	8.51	No	N/A	8.65	0.00	8.65	0.984	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		0.91	21.00	7.82	No	N/A	8.65	0.00	8.65	0.904	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.14	21.00	7.13	No	N/A	8.65	0.00	8.65	0.824	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.37	21.00	6.44	No	N/A	8.65	0.00	8.65	0.744	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.59	21.00	5.74	No	N/A	8.65	0.00	8.65	0.664	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.82	21.00	5.05	No	N/A	8.65	0.00	8.65	0.584	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.05	21.00	4.36	No	N/A	8.65	0.00	8.65	0.504	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.28	21.00	3.67	No	N/A	8.65	0.00	8.65	0.425	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.51	21.00	2.98	No	N/A	8.65	0.00	8.65	0.345	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.73	21.00	2.29	No	N/A	8.65	0.00	8.65	0.265	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.96	21.00	1.60	No	N/A	8.65	0.00	8.65	0.185	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.19	21.00	0.91	No	N/A	8.65	0.00	8.65	0.105	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.42	21.00	0.22	No	N/A	8.65	0.00	8.65	0.025	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.64	21.00	-0.48	No	N/A	8.65	0.00	8.65	0.055	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.87	21.00	-1.17	No	N/A	8.65	0.00	8.65	0.135	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.10	21.00	-1.86	No	N/A	8.65	0.00	8.65	0.215	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.33	21.00	-2.55	No	N/A	8.65	0.00	8.65	0.295	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.56	21.00	-3.24	No	N/A	8.65	0.00	8.65	0.375	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.78	21.00	-3.93	No	N/A	8.65	0.00	8.65	0.455	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.01	21.00	-4.62	No	N/A	8.65	0.00	8.65	0.534	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.24	21.00	-5.31	No	N/A	8.65	0.00	8.65	0.614	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.47	21.00	-6.00	No	N/A	8.65	0.00	8.65	0.694	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.69	21.00	-6.69	No	N/A	8.65	0.00	8.65	0.774	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.92	21.00	-7.39	No	N/A	8.65	0.00	8.65	0.854	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.15	21.00	-8.08	No	N/A	8.65	0.00	8.65	0.934	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.38	21.00	-8.77	No	10.50	20.48	13.20	33.68	0.260	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		6.60	21.00	-9.46	No	10.50	20.48	13.20	33.68	0.281	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		6.83	21.00	-10.15	No	10.50	20.48	13.20	33.68	0.301	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		7.06	21.00	-10.84	Yes	10.50	20.48	13.20	33.68	0.322	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		7.29	21.00	-11.53	Yes	10.50	20.48	13.20	33.68	0.342	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		7.52	21.00	-12.22	Yes	10.50	20.48	13.20	33.68	0.363	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		7.74	21.00	-12.91	Yes	10.50	20.48	13.20	33.68	0.383	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		7.97	21.00	-13.60	Yes	10.50	20.48	13.20	33.68	0.404	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		8.20	21.00	-14.30	Yes	10.50	20.48	13.20	33.68	0.425	Eqn (a)	Max spacing per T9.7.6.

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM F

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L+0.50S+1.60H	1	8.43	21.00	-14.99	Yes	10.50	20.48	13.20	33.68	0.445	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	1	8.65	21.00	-15.68	Yes	10.50	20.48	13.20	33.68	0.466	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	1	8.88	21.00	-16.37	Yes	10.50	20.48	13.20	33.68	0.486	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	1	9.11	21.00	-17.06	Yes	10.50	20.48	13.20	33.68	0.507	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	9.34	21.00	17.52	Yes	10.50	20.48	13.20	33.68	0.520	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	9.57	21.00	16.83	Yes	10.50	20.48	13.20	33.68	0.500	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	9.79	21.00	16.14	Yes	10.50	20.48	13.20	33.68	0.479	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	10.02	21.00	15.45	Yes	10.50	20.48	13.20	33.68	0.459	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	10.25	21.00	14.76	Yes	10.50	20.48	13.20	33.68	0.438	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	10.48	21.00	14.06	Yes	10.50	20.48	13.20	33.68	0.418	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	10.70	21.00	13.37	Yes	10.50	20.48	13.20	33.68	0.397	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	10.93	21.00	12.68	Yes	10.50	20.48	13.20	33.68	0.377	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	11.16	21.00	11.99	Yes	10.50	20.48	13.20	33.68	0.356	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	11.39	21.00	11.30	Yes	10.50	20.48	13.20	33.68	0.336	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	11.62	21.00	10.61	Yes	10.50	20.48	13.20	33.68	0.315	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	11.84	21.00	9.92	No	10.50	20.48	13.20	33.68	0.295	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	12.07	21.00	9.23	No	10.50	20.48	13.20	33.68	0.274	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	12.30	21.00	8.54	No	N/A	8.65	0.00	8.65	0.987	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	12.53	21.00	7.85	No	N/A	8.65	0.00	8.65	0.907	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	12.75	21.00	7.15	No	N/A	8.65	0.00	8.65	0.827	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	12.98	21.00	6.46	No	N/A	8.65	0.00	8.65	0.748	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	13.21	21.00	5.77	No	N/A	8.65	0.00	8.65	0.668	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	13.44	21.00	5.08	No	N/A	8.65	0.00	8.65	0.588	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	13.67	21.00	4.39	No	N/A	8.65	0.00	8.65	0.508	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	13.89	21.00	3.70	No	N/A	8.65	0.00	8.65	0.428	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	14.12	21.00	3.01	No	N/A	8.65	0.00	8.65	0.348	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	14.35	21.00	2.32	No	N/A	8.65	0.00	8.65	0.268	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	14.58	21.00	1.63	No	N/A	8.65	0.00	8.65	0.188	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	14.80	21.00	0.94	No	N/A	8.65	0.00	8.65	0.108	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	15.03	21.00	0.24	No	N/A	8.65	0.00	8.65	0.028	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	15.26	21.00	-0.45	No	N/A	8.65	0.00	8.65	0.052	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	15.49	21.00	-1.14	No	N/A	8.65	0.00	8.65	0.132	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	15.72	21.00	-1.83	No	N/A	8.65	0.00	8.65	0.211	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	15.94	21.00	-2.52	No	N/A	8.65	0.00	8.65	0.291	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	16.17	21.00	-3.21	No	N/A	8.65	0.00	8.65	0.371	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	16.40	21.00	-3.90	No	N/A	8.65	0.00	8.65	0.451	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	16.63	21.00	-4.59	No	N/A	8.65	0.00	8.65	0.531	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	16.85	21.00	-5.28	No	N/A	8.65	0.00	8.65	0.611	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	17.08	21.00	-5.97	No	N/A	8.65	0.00	8.65	0.691	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	17.31	21.00	-6.67	No	N/A	8.65	0.00	8.65	0.771	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	17.54	21.00	-7.36	No	N/A	8.65	0.00	8.65	0.851	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	17.76	21.00	-8.05	No	N/A	8.65	0.00	8.65	0.931	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	17.99	21.00	-8.74	No	10.50	20.48	13.20	33.68	0.259	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	18.22	21.00	-9.43	No	10.50	20.48	13.20	33.68	0.280	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	18.45	21.00	-10.12	No	10.50	20.48	13.20	33.68	0.301	Eqn (a)	Max spacing per T9.7.6.

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	9.300	-32.13	84.51	0.38
Span # 2	2	9.300	-32.80	84.51	0.39
+1.40D+1.60H					
Span # 1	1	9.300	-29.58	84.51	0.35
Span # 2	2	9.300	-30.20	84.51	0.36
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	9.300	-32.13	84.51	0.38
Span # 2	2	9.300	-32.80	84.51	0.39
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	9.300	-32.13	84.51	0.38
Span # 2	2	9.300	-32.80	84.51	0.39
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	9.300	-29.59	84.51	0.35
Span # 2	2	9.300	-30.21	84.51	0.36
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	9.300	-25.36	84.51	0.30
Span # 2	2	9.300	-25.88	84.51	0.31

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM F

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.20D+L+1.60S+1.60H					
Span # 1	1	9.300	-29.59	84.51	0.35
Span # 2	2	9.300	-30.21	84.51	0.36
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	9.300	-25.36	84.51	0.30
Span # 2	2	9.300	-25.88	84.51	0.31
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	9.300	-29.59	84.51	0.35
Span # 2	2	9.300	-30.21	84.51	0.36
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	9.300	-27.47	84.51	0.33
Span # 2	2	9.300	-28.04	84.51	0.33
+0.90D+W+1.60H					
Span # 1	1	9.300	-19.02	84.51	0.23
Span # 2	2	9.300	-19.41	84.51	0.23
+0.90D+L+0.20S+E+1.60H					
Span # 1	1	9.300	-23.25	84.51	0.28
Span # 2	2	9.300	-23.74	84.51	0.28
+0.90D+E+0.90H					
Span # 1	1	9.300	-19.02	84.51	0.23
Span # 2	2	9.300	-19.41	84.51	0.23

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+L+H	0.0036	3.853		0.0000	0.000
2	+D+L+H	0.0036	5.447		0.0000	0.000

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM G

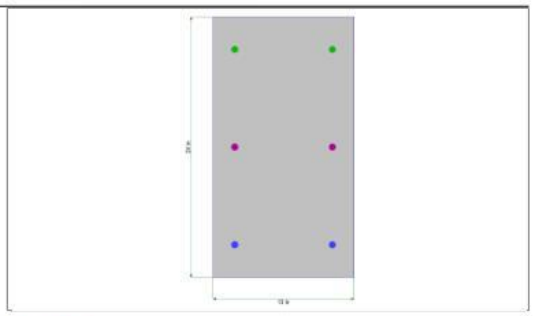
CODE REFERENCES

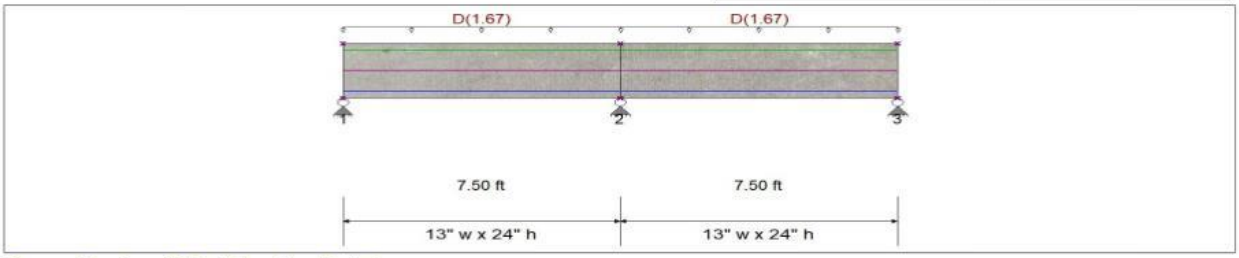
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c $^{1/2}$	=	375.0 psi		Shear :	0.750
ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus =		3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =		60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =		29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup =		2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 7.50 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 7.50 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 7.50 ft in this span
Span #2 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 7.50 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 7.50 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 7.50 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 1.670 k/ft, Tributary Width = 1.0 ft, (Line loads)
Load for Span Number 2
Uniform Load : D = 1.670 k/ft, Tributary Width = 1.0 ft, (Line loads)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.232** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	-19.638	k-ft
Mn * Phi : Allowable	84.513	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 2	

Maximum Deflection

Max Downward Transient Deflection	0.000 in	Ratio =	0 <360.0	
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360.0	
Max Downward Total Deflection	0.001 in	Ratio =	71345 >=240.0	Span: 2 : D Only
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0	Span: 2 : D Only

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	5.611	18.703	5.611

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM G

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Max Upward from Load Combinations	5.611	18.703	5.611
Max Upward from Load Cases	5.611	18.703	5.611
+D+H	5.611	18.703	5.611
+D+L+H	5.611	18.703	5.611
+D+Lr+H	5.611	18.703	5.611
+D+S+H	5.611	18.703	5.611
+D+0.750Lr+0.750L+H	5.611	18.703	5.611
+D+0.750L+0.750S+H	5.611	18.703	5.611
+D+0.60W+H	5.611	18.703	5.611
+D+0.750Lr+0.750L+0.450W+H	5.611	18.703	5.611
+D+0.750L+0.750S+0.450W+H	5.611	18.703	5.611
+0.60D+0.60W+0.60H	3.367	11.222	3.367
+D+0.750L+0.750S+0.70E+H	5.611	18.703	5.611
+D+0.750L+0.750S+0.5250E+H	5.611	18.703	5.611
+0.60D+0.70E+0.60H	3.367	11.222	3.367
D Only	5.611	18.703	5.611
H Only			

Shear Stirrup Requirements

Between 0.00 to 5.91 ft, Ties Not Req'd, Stirrups are not required.
Between 5.94 to 9.06 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 9.09 to 14.97 ft, Ties Not Req'd, Stirrups are not required.

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.40D+1.60H	1	0.00	21.00	7.86	No	N/A	8.65	0.00	8.65	0.908	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	0.18	21.00	7.34	No	N/A	8.65	0.00	8.65	0.849	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	0.37	21.00	6.83	No	N/A	8.65	0.00	8.65	0.790	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	0.55	21.00	6.32	No	N/A	8.65	0.00	8.65	0.730	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	0.73	21.00	5.80	No	N/A	8.65	0.00	8.65	0.671	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	0.92	21.00	5.29	No	N/A	8.65	0.00	8.65	0.612	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	1.10	21.00	4.78	No	N/A	8.65	0.00	8.65	0.552	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	1.29	21.00	4.26	No	N/A	8.65	0.00	8.65	0.493	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	1.47	21.00	3.75	No	N/A	8.65	0.00	8.65	0.434	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	1.65	21.00	3.24	No	N/A	8.65	0.00	8.65	0.375	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	1.84	21.00	2.73	No	N/A	8.65	0.00	8.65	0.315	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	2.02	21.00	2.21	No	N/A	8.65	0.00	8.65	0.256	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	2.20	21.00	1.70	No	N/A	8.65	0.00	8.65	0.197	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	2.39	21.00	1.19	No	N/A	8.65	0.00	8.65	0.137	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	2.57	21.00	0.67	No	N/A	8.65	0.00	8.65	0.078	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	2.76	21.00	0.16	No	N/A	8.65	0.00	8.65	0.019	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	2.94	21.00	-0.35	No	N/A	8.65	0.00	8.65	0.041	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	3.12	21.00	-0.87	No	N/A	8.65	0.00	8.65	0.100	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	3.31	21.00	-1.38	No	N/A	8.65	0.00	8.65	0.159	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	3.49	21.00	-1.89	No	N/A	8.65	0.00	8.65	0.219	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	3.67	21.00	-2.40	No	N/A	8.65	0.00	8.65	0.278	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	3.86	21.00	-2.92	No	N/A	8.65	0.00	8.65	0.337	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.04	21.00	-3.43	No	N/A	8.65	0.00	8.65	0.397	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.22	21.00	-3.94	No	N/A	8.65	0.00	8.65	0.456	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.41	21.00	-4.46	No	N/A	8.65	0.00	8.65	0.515	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.59	21.00	-4.97	No	N/A	8.65	0.00	8.65	0.575	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.78	21.00	-5.48	No	N/A	8.65	0.00	8.65	0.634	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.96	21.00	-6.00	No	N/A	8.65	0.00	8.65	0.693	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.14	21.00	-6.51	No	N/A	8.65	0.00	8.65	0.753	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.33	21.00	-7.02	No	N/A	8.65	0.00	8.65	0.812	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.51	21.00	-7.53	No	N/A	8.65	0.00	8.65	0.871	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.69	21.00	-8.05	No	N/A	8.65	0.00	8.65	0.931	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.88	21.00	-8.56	No	N/A	8.65	0.00	8.65	0.990	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	6.06	21.00	-9.07	No	10.50	20.48	13.20	33.68	0.269	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	6.24	21.00	-9.59	No	10.50	20.48	13.20	33.68	0.285	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	6.43	21.00	-10.10	No	10.50	20.48	13.20	33.68	0.300	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	6.61	21.00	-10.61	Yes	10.50	20.48	13.20	33.68	0.315	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	6.80	21.00	-11.13	Yes	10.50	20.48	13.20	33.68	0.330	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	6.98	21.00	-11.64	Yes	10.50	20.48	13.20	33.68	0.346	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	7.16	21.00	-12.15	Yes	10.50	20.48	13.20	33.68	0.361	Eqn (a)	Max spacing per T9.7.6.

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM G

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.40D+1.60H	1	7.35	21.00	-12.66	Yes	10.50	20.48	13.20	33.68	0.376	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	7.53	21.00	13.01	Yes	10.50	20.48	13.20	33.68	0.386	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	7.71	21.00	12.49	Yes	10.50	20.48	13.20	33.68	0.371	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	7.90	21.00	11.98	Yes	10.50	20.48	13.20	33.68	0.356	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	8.08	21.00	11.47	Yes	10.50	20.48	13.20	33.68	0.341	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	8.27	21.00	10.95	Yes	10.50	20.48	13.20	33.68	0.325	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	8.45	21.00	10.44	Yes	10.50	20.48	13.20	33.68	0.310	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	8.63	21.00	9.93	No	10.50	20.48	13.20	33.68	0.295	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	8.82	21.00	9.42	No	10.50	20.48	13.20	33.68	0.280	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	9.00	21.00	8.90	No	10.50	20.48	13.20	33.68	0.264	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	9.18	21.00	8.39	No	N/A	8.65	0.00	8.65	0.970	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	9.37	21.00	7.88	No	N/A	8.65	0.00	8.65	0.911	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	9.55	21.00	7.36	No	N/A	8.65	0.00	8.65	0.852	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	9.73	21.00	6.85	No	N/A	8.65	0.00	8.65	0.792	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	9.92	21.00	6.34	No	N/A	8.65	0.00	8.65	0.733	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	10.10	21.00	5.82	No	N/A	8.65	0.00	8.65	0.674	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	10.29	21.00	5.31	No	N/A	8.65	0.00	8.65	0.614	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	10.47	21.00	4.80	No	N/A	8.65	0.00	8.65	0.555	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	10.65	21.00	4.29	No	N/A	8.65	0.00	8.65	0.496	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	10.84	21.00	3.77	No	N/A	8.65	0.00	8.65	0.436	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	11.02	21.00	3.26	No	N/A	8.65	0.00	8.65	0.377	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	11.20	21.00	2.75	No	N/A	8.65	0.00	8.65	0.318	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	11.39	21.00	2.23	No	N/A	8.65	0.00	8.65	0.258	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	11.57	21.00	1.72	No	N/A	8.65	0.00	8.65	0.199	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	11.76	21.00	1.21	No	N/A	8.65	0.00	8.65	0.140	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	11.94	21.00	0.69	No	N/A	8.65	0.00	8.65	0.080	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	12.12	21.00	0.18	No	N/A	8.65	0.00	8.65	0.021	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	12.31	21.00	-0.33	No	N/A	8.65	0.00	8.65	0.038	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	12.49	21.00	-0.84	No	N/A	8.65	0.00	8.65	0.098	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	12.67	21.00	-1.36	No	N/A	8.65	0.00	8.65	0.157	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	12.86	21.00	-1.87	No	N/A	8.65	0.00	8.65	0.216	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	13.04	21.00	-2.38	No	N/A	8.65	0.00	8.65	0.276	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	13.22	21.00	-2.90	No	N/A	8.65	0.00	8.65	0.335	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	13.41	21.00	-3.41	No	N/A	8.65	0.00	8.65	0.394	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	13.59	21.00	-3.92	No	N/A	8.65	0.00	8.65	0.454	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	13.78	21.00	-4.44	No	N/A	8.65	0.00	8.65	0.513	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	13.96	21.00	-4.95	No	N/A	8.65	0.00	8.65	0.572	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	14.14	21.00	-5.46	No	N/A	8.65	0.00	8.65	0.632	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	14.33	21.00	-5.97	No	N/A	8.65	0.00	8.65	0.691	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	14.51	21.00	-6.49	No	N/A	8.65	0.00	8.65	0.750	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	14.69	21.00	-7.00	No	N/A	8.65	0.00	8.65	0.810	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	14.88	21.00	-7.51	No	N/A	8.65	0.00	8.65	0.869	Eqn (c)	Ties Not Req'd

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	7.500	-19.24	84.51	0.23
Span # 2	2	7.500	-19.64	84.51	0.23
+1.40D+1.60H					
Span # 1	1	7.500	-19.24	84.51	0.23
Span # 2	2	7.500	-19.64	84.51	0.23
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	7.500	-16.49	84.51	0.20
Span # 2	2	7.500	-16.83	84.51	0.20
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	7.500	-16.49	84.51	0.20
Span # 2	2	7.500	-16.83	84.51	0.20
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	7.500	-16.49	84.51	0.20
Span # 2	2	7.500	-16.83	84.51	0.20
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	7.500	-16.49	84.51	0.20
Span # 2	2	7.500	-16.83	84.51	0.20
+1.20D+L+1.60S+1.60H					
Span # 1	1	7.500	-16.49	84.51	0.20
Span # 2	2	7.500	-16.83	84.51	0.20

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM G

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	7.500	-16.49	84.51	0.20
Span # 2	2	7.500	-16.83	84.51	0.20
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	7.500	-16.49	84.51	0.20
Span # 2	2	7.500	-16.83	84.51	0.20
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	7.500	-16.49	84.51	0.20
Span # 2	2	7.500	-16.83	84.51	0.20
+0.90D+W+1.60H					
Span # 1	1	7.500	-12.37	84.51	0.15
Span # 2	2	7.500	-12.62	84.51	0.15
+0.90D+L+0.20S+E+1.60H					
Span # 1	1	7.500	-12.37	84.51	0.15
Span # 2	2	7.500	-12.62	84.51	0.15
+0.90D+E+0.90H					
Span # 1	1	7.500	-12.37	84.51	0.15
Span # 2	2	7.500	-12.62	84.51	0.15

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	D Only	0.0013	3.107		0.0000	0.000
2	D Only	0.0013	4.393		0.0000	0.000

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM H

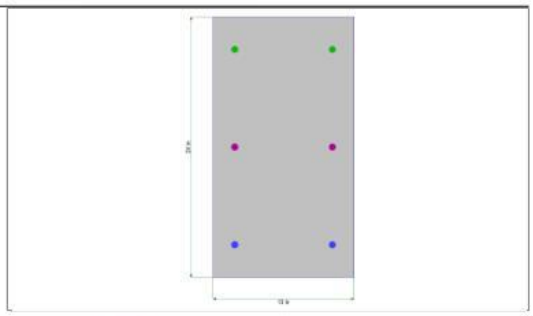
CODE REFERENCES

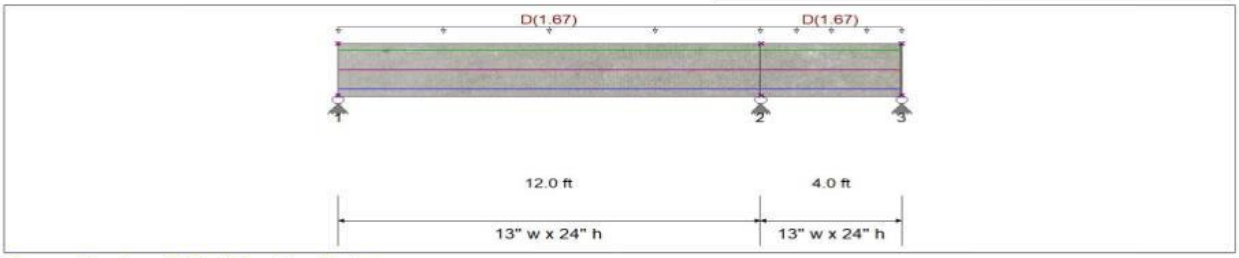
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c $^{1/2}$	=	375.0 psi		Shear :	0.750
ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus =		3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =		60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =		29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup =		2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 12.0 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 12.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 12.0 ft in this span
Span #2 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 4.0 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 4.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 4.0 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 1.670 k/ft, Tributary Width = 1.0 ft, (Line loads)
Load for Span Number 2
Uniform Load : D = 1.670 k/ft, Tributary Width = 1.0 ft, (Line loads)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.463** : 1
Section used for this span **Typical Section**
Mu : Applied -39.102 k-ft
Mn * Phi : Allowable 84.513 k-ft
Location of maximum on span 0.000 ft
Span # where maximum occurs Span # 2

Maximum Deflection

Max Downward Transient Deflection	0.000 in	Ratio =	0 <360.0	
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360.0	
Max Downward Total Deflection	0.011 in	Ratio =	13256 >=240.0	
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0	Span: 2 : D Only

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	9.669	25.166	

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Max Upward from Load Combinations	9.669	25.166	
Max Upward from Load Cases	9.669	25.166	
Max Downward from all Load Conditions (Resisting Uplift)			-2.914
Max Downward from Load Combinations (Resisting Uplift)			-2.914
Max Downward from Load Cases (Resisting Uplift)			-2.914
+D+H	9.669	25.166	-2.914
+D+L+H	9.669	25.166	-2.914
+D+Lr+H	9.669	25.166	-2.914
+D+S+H	9.669	25.166	-2.914
+D+0.750Lr+0.750L+H	9.669	25.166	-2.914
+D+0.750L+0.750S+H	9.669	25.166	-2.914
+D+0.60W+H	9.669	25.166	-2.914
+D+0.750Lr+0.750L+0.450W+H	9.669	25.166	-2.914
+D+0.750L+0.750S+0.450W+H	9.669	25.166	-2.914
+0.60D+0.60W+0.60H	5.786	15.162	-1.795
+D+0.750L+0.750S+0.70E+H	9.669	25.166	-2.914
+D+0.750L+0.750S+0.5250E+H	9.669	25.166	-2.914
+0.60D+0.70E+0.60H	5.786	15.162	-1.795
D Only	9.669	25.166	-2.914
H Only			

Shear Stirrup Requirements

Between 0.00 to 1.71 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 1.76 to 7.89 ft, Ties Not Req'd, Stirrups are not required.
Between 7.93 to 14.40 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 14.42 to 15.98 ft, Ties Not Req'd, Stirrups are not required.

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.40D+1.60H	1	0.00	21.00	13.50	Yes	10.50	20.48	13.20	33.68	0.401	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	0.29	21.00	12.68	Yes	10.50	20.48	13.20	33.68	0.377	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	0.59	21.00	11.86	Yes	10.50	20.48	13.20	33.68	0.352	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	0.88	21.00	11.04	Yes	10.50	20.48	13.20	33.68	0.328	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	1.18	21.00	10.22	No	10.50	20.48	13.20	33.68	0.303	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	1.47	21.00	9.40	No	10.50	20.48	13.20	33.68	0.279	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	1.76	21.00	8.57	No	N/A	8.65	0.00	8.65	0.992	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	2.06	21.00	7.75	No	N/A	8.65	0.00	8.65	0.897	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	2.35	21.00	6.93	No	N/A	8.65	0.00	8.65	0.802	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	2.64	21.00	6.11	No	N/A	8.65	0.00	8.65	0.707	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	2.94	21.00	5.29	No	N/A	8.65	0.00	8.65	0.612	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	3.23	21.00	4.47	No	N/A	8.65	0.00	8.65	0.517	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	3.53	21.00	3.65	No	N/A	8.65	0.00	8.65	0.422	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	3.82	21.00	2.83	No	N/A	8.65	0.00	8.65	0.327	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.11	21.00	2.01	No	N/A	8.65	0.00	8.65	0.232	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.41	21.00	1.19	No	N/A	8.65	0.00	8.65	0.137	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	4.70	21.00	0.37	No	N/A	8.65	0.00	8.65	0.042	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.00	21.00	-0.45	No	N/A	8.65	0.00	8.65	0.053	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.29	21.00	-1.27	No	N/A	8.65	0.00	8.65	0.147	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.58	21.00	-2.10	No	N/A	8.65	0.00	8.65	0.242	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	5.88	21.00	-2.92	No	N/A	8.65	0.00	8.65	0.337	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	6.17	21.00	-3.74	No	N/A	8.65	0.00	8.65	0.432	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	6.47	21.00	-4.56	No	N/A	8.65	0.00	8.65	0.527	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	6.76	21.00	-5.38	No	N/A	8.65	0.00	8.65	0.622	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	7.05	21.00	-6.20	No	N/A	8.65	0.00	8.65	0.717	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	7.35	21.00	-7.02	No	N/A	8.65	0.00	8.65	0.812	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	7.64	21.00	-7.84	No	N/A	8.65	0.00	8.65	0.907	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	1	7.93	21.00	-8.66	No	10.50	20.48	13.20	33.68	0.257	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	8.23	21.00	-9.48	No	10.50	20.48	13.20	33.68	0.282	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	8.52	21.00	-10.30	Yes	10.50	20.48	13.20	33.68	0.306	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	8.82	21.00	-11.12	Yes	10.50	20.48	13.20	33.68	0.330	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	9.11	21.00	-11.95	Yes	10.50	20.48	13.20	33.68	0.355	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	9.40	21.00	-12.77	Yes	10.50	20.48	13.20	33.68	0.379	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	9.70	21.00	-13.59	Yes	10.50	20.48	13.20	33.68	0.403	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	9.99	21.00	-14.41	Yes	10.50	20.48	13.20	33.68	0.428	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	10.29	21.00	-15.23	Yes	10.50	20.48	13.20	33.68	0.452	Eqn (a)	Max spacing per T9.7.6.

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM H

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.40D+1.60H	1	10.58	21.00	-16.05	Yes	10.50	20.48	13.20	33.68	0.477	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	10.87	21.00	-16.87	Yes	10.50	20.48	13.20	33.68	0.501	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	11.17	21.00	-17.69	Yes	10.50	20.48	13.20	33.68	0.525	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	11.46	21.00	-18.51	Yes	10.50	20.48	13.20	33.68	0.550	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	1	11.76	21.00	-19.33	Yes	10.50	20.48	13.20	33.68	0.574	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	12.02	21.00	15.32	Yes	10.50	20.48	13.20	33.68	0.455	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	12.11	21.00	15.04	Yes	10.50	20.48	13.20	33.68	0.447	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	12.21	21.00	14.77	Yes	10.50	20.48	13.20	33.68	0.439	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	12.31	21.00	14.50	Yes	10.50	20.48	13.20	33.68	0.430	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	12.41	21.00	14.22	Yes	10.50	20.48	13.20	33.68	0.422	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	12.51	21.00	13.95	Yes	10.50	20.48	13.20	33.68	0.414	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	12.60	21.00	13.67	Yes	10.50	20.48	13.20	33.68	0.406	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	12.70	21.00	13.40	Yes	10.50	20.48	13.20	33.68	0.398	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	12.80	21.00	13.13	Yes	10.50	20.48	13.20	33.68	0.390	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	12.90	21.00	12.85	Yes	10.50	20.48	13.20	33.68	0.382	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	13.00	21.00	12.58	Yes	10.50	20.48	13.20	33.68	0.374	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	13.09	21.00	12.31	Yes	10.50	20.48	13.20	33.68	0.365	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	13.19	21.00	12.03	Yes	10.50	20.48	13.20	33.68	0.357	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	13.29	21.00	11.76	Yes	10.50	20.48	13.20	33.68	0.349	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	13.39	21.00	11.49	Yes	10.50	20.48	13.20	33.68	0.341	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	13.49	21.00	11.21	Yes	10.50	20.48	13.20	33.68	0.333	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	13.58	21.00	10.94	Yes	10.50	20.48	13.20	33.68	0.325	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	13.68	21.00	10.66	Yes	10.50	20.48	13.20	33.68	0.317	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	13.78	21.00	10.39	Yes	10.50	20.48	13.20	33.68	0.309	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	13.88	21.00	10.12	No	10.50	20.48	13.20	33.68	0.300	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	13.98	21.00	9.84	No	10.50	20.48	13.20	33.68	0.292	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	14.07	21.00	9.57	No	10.50	20.48	13.20	33.68	0.284	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	14.17	21.00	9.30	No	10.50	20.48	13.20	33.68	0.276	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	14.27	21.00	9.02	No	10.50	20.48	13.20	33.68	0.268	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	14.37	21.00	8.75	No	10.50	20.48	13.20	33.68	0.260	Eqn (a)	Max spacing per T9.7.6.
+1.40D+1.60H	2	14.47	21.00	8.48	No	N/A	8.65	0.00	8.65	0.980	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	14.56	21.00	8.20	No	N/A	8.65	0.00	8.65	0.949	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	14.66	21.00	7.93	No	N/A	8.65	0.00	8.65	0.917	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	14.76	21.00	7.66	No	N/A	8.65	0.00	8.65	0.885	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	14.86	21.00	7.38	No	N/A	8.65	0.00	8.65	0.854	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	14.96	21.00	7.11	No	N/A	8.65	0.00	8.65	0.822	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	15.05	21.00	6.83	No	N/A	8.65	0.00	8.65	0.790	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	15.15	21.00	6.56	No	N/A	8.65	0.00	8.65	0.759	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	15.25	21.00	6.29	No	N/A	8.65	0.00	8.65	0.727	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	15.35	21.00	6.01	No	N/A	8.65	0.00	8.65	0.695	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	15.44	21.00	5.74	No	N/A	8.65	0.00	8.65	0.664	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	15.54	21.00	5.47	No	N/A	8.65	0.00	8.65	0.632	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	15.64	21.00	5.19	No	N/A	8.65	0.00	8.65	0.601	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	15.74	21.00	4.92	No	N/A	8.65	0.00	8.65	0.569	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	15.84	21.00	4.65	No	N/A	8.65	0.00	8.65	0.537	Eqn (c)	Ties Not Req'd
+1.40D+1.60H	2	15.93	21.00	4.37	No	N/A	8.65	0.00	8.65	0.506	Eqn (c)	Ties Not Req'd

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	12.000	-38.12	84.51	0.45
Span # 2	2	4.000	-39.10	84.51	0.46
+1.40D+1.60H					
Span # 1	1	12.000	-38.12	84.51	0.45
Span # 2	2	4.000	-39.10	84.51	0.46
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	12.000	-32.68	84.51	0.39
Span # 2	2	4.000	-33.52	84.51	0.40
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	12.000	-32.68	84.51	0.39
Span # 2	2	4.000	-33.52	84.51	0.40
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	12.000	-32.68	84.51	0.39
Span # 2	2	4.000	-33.52	84.51	0.40
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	12.000	-32.68	84.51	0.39

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM H

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 2	2	4.000	-33.52	84.51	0.40
+1.20D+L+1.60S+1.60H					
Span # 1	1	12.000	-32.68	84.51	0.39
Span # 2	2	4.000	-33.52	84.51	0.40
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	12.000	-32.68	84.51	0.39
Span # 2	2	4.000	-33.52	84.51	0.40
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	12.000	-32.68	84.51	0.39
Span # 2	2	4.000	-33.52	84.51	0.40
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	12.000	-32.68	84.51	0.39
Span # 2	2	4.000	-33.52	84.51	0.40
+0.90D+W+1.60H					
Span # 1	1	12.000	-24.51	84.51	0.29
Span # 2	2	4.000	-25.14	84.51	0.30
+0.90D+L+0.20S+E+1.60H					
Span # 1	1	12.000	-24.51	84.51	0.29
Span # 2	2	4.000	-25.14	84.51	0.30
+0.90D+E+0.90H					
Span # 1	1	12.000	-24.51	84.51	0.29
Span # 2	2	4.000	-25.14	84.51	0.30

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	D Only	0.0109	5.314	D Only	-0.0001	12.057
2		0.0000	5.314	D Only	-0.0008	1.543

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
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Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM I

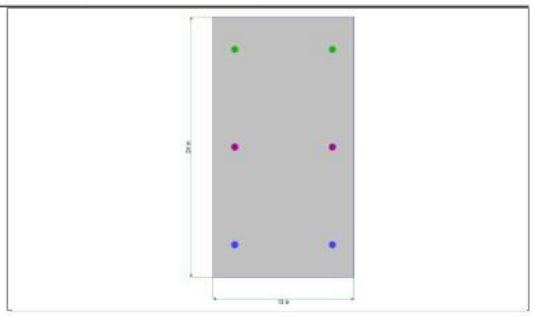
CODE REFERENCES

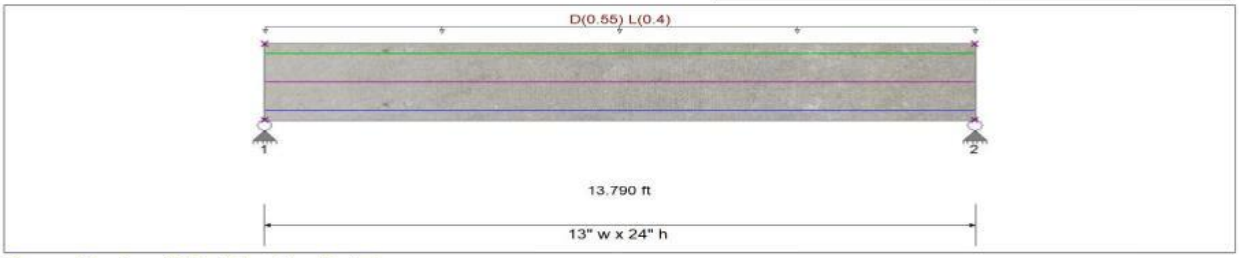
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c $^{1/2}$	=	375.0 psi		Shear :	0.750
ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus =		3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =		60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =		29,000.0 ksi	Stirrup Bar Size #		3
Number of Resisting Legs Per Stirrup =					2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 13.790 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 13.790 ft in this spa
2-#5 at 12.0 in from Bottom, from 0.0 to 13.790 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.550, L = 0.40 k/ft, Tributary Width = 1.0 ft, (Line loads)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = **0.475** : 1

Section used for this span	**Typical Section**	
Mu : Applied	40.172	k-ft
Mn * Phi : Allowable	84.513	k-ft
Location of maximum on span	6.908	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.007 in	Ratio =	23780	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.039 in	Ratio =	4233	>=240.0	Span: 1 : +D+L+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+L+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	8.791	8.791
Max Upward from Load Combinations	8.791	8.791
Max Upward from Load Cases	6.033	6.033
+D+H	6.033	6.033
+D+L+H	8.791	8.791
+D+Lr+H	6.033	6.033

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
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Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM I

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+S+H	6.033	6.033
+D+0.750Lr+0.750L+H	8.102	8.102
+D+0.750L+0.750S+H	8.102	8.102
+D+0.60W+H	6.033	6.033
+D+0.750Lr+0.750L+0.450W+H	8.102	8.102
+D+0.750L+0.750S+0.450W+H	8.102	8.102
+0.60D+0.60W+0.60H	3.620	3.620
+D+0.750L+0.750S+0.70E+H	8.102	8.102
+D+0.750L+0.750S+0.5250E+H	8.102	8.102
+0.60D+0.70E+0.60H	3.620	3.620
D Only	6.033	6.033
L Only	2.758	2.758
H Only		

Shear Stirrup Requirements

Between 0.00 to 1.76 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 1.78 to 12.01 ft, Ties Not Req'd, Stirrups are not required.
Between 12.03 to 13.76 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L+0.50S+1.60H		0.00	21.00	11.65	Yes	10.50	20.48	13.20	33.68	0.346	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.15	21.00	11.40	Yes	10.50	20.48	13.20	33.68	0.338	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.30	21.00	11.14	Yes	10.50	20.48	13.20	33.68	0.331	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.45	21.00	10.89	Yes	10.50	20.48	13.20	33.68	0.323	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.60	21.00	10.63	Yes	10.50	20.48	13.20	33.68	0.316	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.75	21.00	10.38	Yes	10.50	20.48	13.20	33.68	0.308	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.90	21.00	10.12	No	10.50	20.48	13.20	33.68	0.301	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		1.05	21.00	9.87	No	10.50	20.48	13.20	33.68	0.293	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		1.21	21.00	9.61	No	10.50	20.48	13.20	33.68	0.286	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		1.36	21.00	9.36	No	10.50	20.48	13.20	33.68	0.278	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		1.51	21.00	9.11	No	10.50	20.48	13.20	33.68	0.270	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		1.66	21.00	8.85	No	10.50	20.48	13.20	33.68	0.263	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		1.81	21.00	8.60	No	N/A	8.65	0.00	8.65	0.994	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.96	21.00	8.34	No	N/A	8.65	0.00	8.65	0.965	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.11	21.00	8.09	No	N/A	8.65	0.00	8.65	0.935	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.26	21.00	7.83	No	N/A	8.65	0.00	8.65	0.906	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.41	21.00	7.58	No	N/A	8.65	0.00	8.65	0.876	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.56	21.00	7.32	No	N/A	8.65	0.00	8.65	0.847	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.71	21.00	7.07	No	N/A	8.65	0.00	8.65	0.817	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.86	21.00	6.81	No	N/A	8.65	0.00	8.65	0.788	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.01	21.00	6.56	No	N/A	8.65	0.00	8.65	0.758	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.16	21.00	6.30	No	N/A	8.65	0.00	8.65	0.729	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.32	21.00	6.05	No	N/A	8.65	0.00	8.65	0.700	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.47	21.00	5.79	No	N/A	8.65	0.00	8.65	0.670	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.62	21.00	5.54	No	N/A	8.65	0.00	8.65	0.641	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.77	21.00	5.29	No	N/A	8.65	0.00	8.65	0.611	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.92	21.00	5.03	No	N/A	8.65	0.00	8.65	0.582	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.07	21.00	4.78	No	N/A	8.65	0.00	8.65	0.552	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.22	21.00	4.52	No	N/A	8.65	0.00	8.65	0.523	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.37	21.00	4.27	No	N/A	8.65	0.00	8.65	0.493	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.52	21.00	4.01	No	N/A	8.65	0.00	8.65	0.464	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.67	21.00	3.76	No	N/A	8.65	0.00	8.65	0.434	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.82	21.00	3.50	No	N/A	8.65	0.00	8.65	0.405	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.97	21.00	3.25	No	N/A	8.65	0.00	8.65	0.376	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.12	21.00	2.99	No	N/A	8.65	0.00	8.65	0.346	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.27	21.00	2.74	No	N/A	8.65	0.00	8.65	0.317	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.43	21.00	2.48	No	N/A	8.65	0.00	8.65	0.287	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.58	21.00	2.23	No	N/A	8.65	0.00	8.65	0.258	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.73	21.00	1.97	No	N/A	8.65	0.00	8.65	0.228	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.88	21.00	1.72	No	N/A	8.65	0.00	8.65	0.199	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.03	21.00	1.46	No	N/A	8.65	0.00	8.65	0.169	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.18	21.00	1.21	No	N/A	8.65	0.00	8.65	0.140	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.33	21.00	0.96	No	N/A	8.65	0.00	8.65	0.110	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.48	21.00	0.70	No	N/A	8.65	0.00	8.65	0.081	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.63	21.00	0.45	No	N/A	8.65	0.00	8.65	0.052	Eqn (c)	Ties Not Req'd

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM I

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L+0.50S+1.60H		6.78	21.00	0.19	No	N/A	8.65	0.00	8.65	0.022	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.93	21.00	-0.06	No	N/A	8.65	0.00	8.65	0.007	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.08	21.00	-0.32	No	N/A	8.65	0.00	8.65	0.037	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.23	21.00	-0.57	No	N/A	8.65	0.00	8.65	0.066	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.38	21.00	-0.83	No	N/A	8.65	0.00	8.65	0.096	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.54	21.00	-1.08	No	N/A	8.65	0.00	8.65	0.125	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.69	21.00	-1.34	No	N/A	8.65	0.00	8.65	0.155	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.84	21.00	-1.59	No	N/A	8.65	0.00	8.65	0.184	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.99	21.00	-1.85	No	N/A	8.65	0.00	8.65	0.214	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.14	21.00	-2.10	No	N/A	8.65	0.00	8.65	0.243	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.29	21.00	-2.36	No	N/A	8.65	0.00	8.65	0.272	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.44	21.00	-2.61	No	N/A	8.65	0.00	8.65	0.302	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.59	21.00	-2.87	No	N/A	8.65	0.00	8.65	0.331	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.74	21.00	-3.12	No	N/A	8.65	0.00	8.65	0.361	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.89	21.00	-3.37	No	N/A	8.65	0.00	8.65	0.390	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.04	21.00	-3.63	No	N/A	8.65	0.00	8.65	0.420	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.19	21.00	-3.88	No	N/A	8.65	0.00	8.65	0.449	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.34	21.00	-4.14	No	N/A	8.65	0.00	8.65	0.479	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.49	21.00	-4.39	No	N/A	8.65	0.00	8.65	0.508	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.65	21.00	-4.65	No	N/A	8.65	0.00	8.65	0.538	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.80	21.00	-4.90	No	N/A	8.65	0.00	8.65	0.567	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.95	21.00	-5.16	No	N/A	8.65	0.00	8.65	0.596	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.10	21.00	-5.41	No	N/A	8.65	0.00	8.65	0.626	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.25	21.00	-5.67	No	N/A	8.65	0.00	8.65	0.655	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.40	21.00	-5.92	No	N/A	8.65	0.00	8.65	0.685	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.55	21.00	-6.18	No	N/A	8.65	0.00	8.65	0.714	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.70	21.00	-6.43	No	N/A	8.65	0.00	8.65	0.744	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.85	21.00	-6.69	No	N/A	8.65	0.00	8.65	0.773	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		11.00	21.00	-6.94	No	N/A	8.65	0.00	8.65	0.803	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		11.15	21.00	-7.20	No	N/A	8.65	0.00	8.65	0.832	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		11.30	21.00	-7.45	No	N/A	8.65	0.00	8.65	0.862	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		11.45	21.00	-7.70	No	N/A	8.65	0.00	8.65	0.891	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		11.60	21.00	-7.96	No	N/A	8.65	0.00	8.65	0.920	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		11.76	21.00	-8.21	No	N/A	8.65	0.00	8.65	0.950	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		11.91	21.00	-8.47	No	N/A	8.65	0.00	8.65	0.979	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		12.06	21.00	-8.72	No	10.50	20.48	13.20	33.68	0.259	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		12.21	21.00	-8.98	No	10.50	20.48	13.20	33.68	0.267	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		12.36	21.00	-9.23	No	10.50	20.48	13.20	33.68	0.274	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		12.51	21.00	-9.49	No	10.50	20.48	13.20	33.68	0.282	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		12.66	21.00	-9.74	No	10.50	20.48	13.20	33.68	0.289	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		12.81	21.00	-10.00	No	10.50	20.48	13.20	33.68	0.297	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		12.96	21.00	-10.25	Yes	10.50	20.48	13.20	33.68	0.304	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		13.11	21.00	-10.51	Yes	10.50	20.48	13.20	33.68	0.312	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		13.26	21.00	-10.76	Yes	10.50	20.48	13.20	33.68	0.320	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		13.41	21.00	-11.02	Yes	10.50	20.48	13.20	33.68	0.327	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		13.56	21.00	-11.27	Yes	10.50	20.48	13.20	33.68	0.335	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		13.71	21.00	-11.53	Yes	10.50	20.48	13.20	33.68	0.342	Eqn (a)	Max spacing per T9.7.6.

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	13.790	40.17	84.51	0.48
+1.40D+1.60H					
Span # 1	1	13.790	29.12	84.51	0.34
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	13.790	40.17	84.51	0.48
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	13.790	40.17	84.51	0.48
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	13.790	34.47	84.51	0.41
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	13.790	24.96	84.51	0.30
+1.20D+L+1.60S+1.60H					
Span # 1	1	13.790	34.47	84.51	0.41
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	13.790	24.96	84.51	0.30

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM I

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	13.790	34.47	84.51	0.41
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	13.790	29.71	84.51	0.35
+0.90D+W+1.60H					
Span # 1	1	13.790	18.72	84.51	0.22
+0.90D+L+0.20S+E+1.60H					
Span # 1	1	13.790	28.23	84.51	0.33
+0.90D+E+0.90H					
Span # 1	1	13.790	18.72	84.51	0.22

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+L+H	0.0391	6.895		0.0000	0.000

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM K

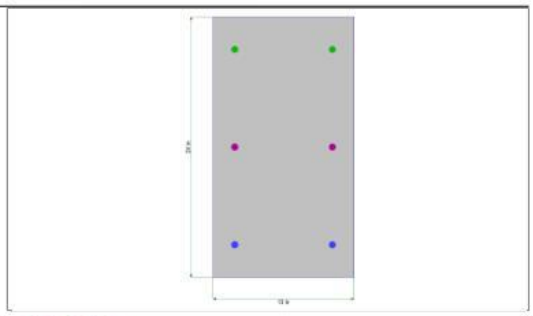
CODE REFERENCES

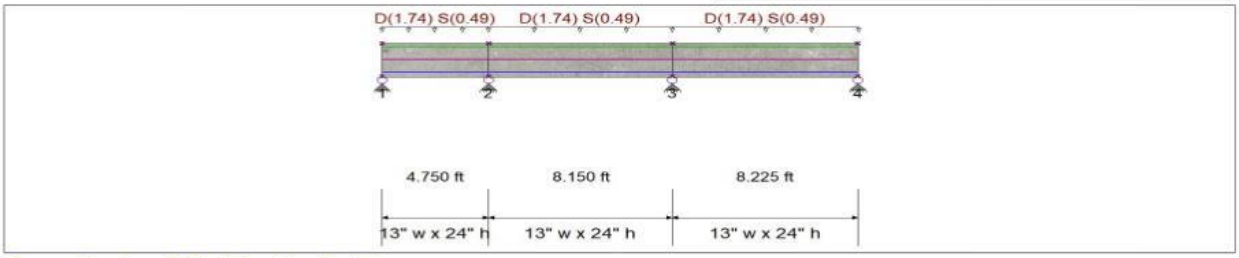
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c $^{1/2}$	=	375.0 psi		Shear :	0.750
ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus =		3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =		60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =		29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup =		2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in

Span #1 Reinforcing....
- 2-#5 at 3.0 in from Bottom, from 0.0 to 4.750 ft in this span
- 2-#5 at 12.0 in from Bottom, from 0.0 to 4.750 ft in this span
- 2-#5 at 3.0 in from Top, from 0.0 to 4.750 ft in this span

Span #2 Reinforcing....
- 2-#5 at 3.0 in from Bottom, from 0.0 to 8.150 ft in this span
- 2-#5 at 12.0 in from Bottom, from 0.0 to 8.150 ft in this span
- 2-#5 at 3.0 in from Top, from 0.0 to 8.150 ft in this span

Span #3 Reinforcing....
- 2-#5 at 3.0 in from Bottom, from 0.0 to 8.225 ft in this span
- 2-#5 at 12.0 in from Bottom, from 0.0 to 8.225 ft in this span
- 2-#5 at 3.0 in from Top, from 0.0 to 8.225 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1
Uniform Load : D = 1.740, S = 0.490 k/ft, Tributary Width = 1.0 ft, (Line loads)

Load for Span Number 2
Uniform Load : D = 1.740, S = 0.490 k/ft, Tributary Width = 1.0 ft, (Line loads)

Load for Span Number 3
Uniform Load : D = 1.740, S = 0.490 k/ft, Tributary Width = 1.0 ft, (Line loads)

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM K

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.286** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	-24.131	k-ft
Mn * Phi : Allowable	84.513	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 3	

Maximum Deflection

Max Downward Transient Deflection	0.000 in	Ratio =	0	<360.0	S Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	S Only
Max Downward Total Deflection	0.003 in	Ratio =	36233	>=240.0	Span: 3 : +D+S+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 3 : +D+S+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
Max Upward from all Load Conditions	3.945	17.521	24.299	8.209
Max Upward from Load Combinations	3.945	17.521	24.299	8.209
Max Upward from Load Cases	3.188	14.161	19.639	6.635
+D+H	3.188	14.161	19.639	6.635
+D+L+H	3.188	14.161	19.639	6.635
+D+Lr+H	3.188	14.161	19.639	6.635
+D+S+H	3.945	17.521	24.299	8.209
+D+0.750Lr+0.750L+H	3.188	14.161	19.639	6.635
+D+0.750L+0.750S+H	3.756	16.681	23.134	7.816
+D+0.60W+H	3.188	14.161	19.639	6.635
+D+0.750Lr+0.750L+0.450W+H	3.188	14.161	19.639	6.635
+D+0.750L+0.750S+0.450W+H	3.756	16.681	23.134	7.816
+0.60D+0.60W+0.60H	1.913	8.497	11.783	3.981
+D+0.750L+0.750S+0.70E+H	3.756	16.681	23.134	7.816
+D+0.750L+0.750S+0.5250E+H	3.756	16.681	23.134	7.816
+0.60D+0.70E+0.60H	1.913	8.497	11.783	3.981
D Only	3.188	14.161	19.639	6.635
S Only	0.757	3.360	4.660	1.574
H Only				

Shear Stirrup Requirements

Between 0.00 to 4.18 ft, Ties Not Req'd, Stirrups are not required.
Between 4.21 to 5.73 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 5.78 to 11.00 ft, Ties Not Req'd, Stirrups are not required.
Between 11.05 to 15.26 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 15.31 to 20.52 ft, Ties Not Req'd, Stirrups are not required.
Between 20.58 to 21.07 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60S+0.50W+1.60H		0.00	21.00	5.04	No	N/A	8.65	0.00	8.65	0.582	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		0.19	21.00	4.42	No	N/A	8.65	0.00	8.65	0.511	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		0.38	21.00	3.80	No	N/A	8.65	0.00	8.65	0.439	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		0.57	21.00	3.18	No	N/A	8.65	0.00	8.65	0.367	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		0.76	21.00	2.56	No	N/A	8.65	0.00	8.65	0.296	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		0.95	21.00	1.94	No	N/A	8.65	0.00	8.65	0.224	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		1.14	21.00	1.32	No	N/A	8.65	0.00	8.65	0.152	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		1.33	21.00	0.70	No	N/A	8.65	0.00	8.65	0.081	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		1.52	21.00	0.08	No	N/A	8.65	0.00	8.65	0.009	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		1.71	21.00	-0.54	No	N/A	8.65	0.00	8.65	0.063	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		1.90	21.00	-1.16	No	N/A	8.65	0.00	8.65	0.134	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		2.09	21.00	-1.78	No	N/A	8.65	0.00	8.65	0.206	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		2.28	21.00	-2.40	No	N/A	8.65	0.00	8.65	0.278	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		2.47	21.00	-3.02	No	N/A	8.65	0.00	8.65	0.349	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		2.66	21.00	-3.64	No	N/A	8.65	0.00	8.65	0.421	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		2.85	21.00	-4.26	No	N/A	8.65	0.00	8.65	0.493	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		3.04	21.00	-4.88	No	N/A	8.65	0.00	8.65	0.564	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		3.23	21.00	-5.50	No	N/A	8.65	0.00	8.65	0.636	Eqn (c)	Ties Not Req'd

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM K

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60S+0.50W+1.60H		3.42	21.00	-6.12	No	N/A	8.65	0.00	8.65	0.708	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		3.61	21.00	-6.74	No	N/A	8.65	0.00	8.65	0.779	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		3.80	21.00	-7.36	No	N/A	8.65	0.00	8.65	0.851	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		3.99	21.00	-7.98	No	N/A	8.65	0.00	8.65	0.923	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		4.18	21.00	-8.60	No	N/A	8.65	0.00	8.65	0.994	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		4.37	21.00	-9.22	No	10.50	20.48	13.20	33.68	0.274	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		4.56	21.00	-9.84	No	10.50	20.48	13.20	33.68	0.292	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		4.75	21.00	11.91	Yes	10.50	20.48	13.20	33.68	0.354	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		5.08	21.00	10.85	Yes	10.50	20.48	13.20	33.68	0.322	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		5.40	21.00	9.78	No	10.50	20.48	13.20	33.68	0.291	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		5.73	21.00	8.72	No	10.50	20.48	13.20	33.68	0.259	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		6.05	21.00	7.66	No	N/A	8.65	0.00	8.65	0.886	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		6.38	21.00	6.59	No	N/A	8.65	0.00	8.65	0.763	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		6.71	21.00	5.53	No	N/A	8.65	0.00	8.65	0.640	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		7.03	21.00	4.47	No	N/A	8.65	0.00	8.65	0.517	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		7.36	21.00	3.40	No	N/A	8.65	0.00	8.65	0.394	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		7.68	21.00	2.34	No	N/A	8.65	0.00	8.65	0.271	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		8.01	21.00	1.28	No	N/A	8.65	0.00	8.65	0.148	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		8.34	21.00	0.21	No	N/A	8.65	0.00	8.65	0.025	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		8.66	21.00	-0.85	No	N/A	8.65	0.00	8.65	0.098	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		8.99	21.00	-1.91	No	N/A	8.65	0.00	8.65	0.221	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		9.31	21.00	-2.98	No	N/A	8.65	0.00	8.65	0.344	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		9.64	21.00	-4.04	No	N/A	8.65	0.00	8.65	0.467	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		9.97	21.00	-5.10	No	N/A	8.65	0.00	8.65	0.590	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		10.29	21.00	-6.17	No	N/A	8.65	0.00	8.65	0.713	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		10.62	21.00	-7.23	No	N/A	8.65	0.00	8.65	0.836	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		10.94	21.00	-8.29	No	N/A	8.65	0.00	8.65	0.959	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		11.27	21.00	-9.36	No	10.50	20.48	13.20	33.68	0.278	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		11.60	21.00	-10.42	Yes	10.50	20.48	13.20	33.68	0.309	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		11.92	21.00	-11.48	Yes	10.50	20.48	13.20	33.68	0.341	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		12.25	21.00	-12.55	Yes	10.50	20.48	13.20	33.68	0.373	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		12.57	21.00	-13.61	Yes	10.50	20.48	13.20	33.68	0.404	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		12.90	21.00	16.35	Yes	10.50	20.48	13.20	33.68	0.485	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		13.23	21.00	15.28	Yes	10.50	20.48	13.20	33.68	0.454	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		13.56	21.00	14.20	Yes	10.50	20.48	13.20	33.68	0.422	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		13.89	21.00	13.13	Yes	10.50	20.48	13.20	33.68	0.390	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		14.22	21.00	12.06	Yes	10.50	20.48	13.20	33.68	0.358	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		14.55	21.00	10.98	Yes	10.50	20.48	13.20	33.68	0.326	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		14.87	21.00	9.91	No	10.50	20.48	13.20	33.68	0.294	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		15.20	21.00	8.84	No	10.50	20.48	13.20	33.68	0.262	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		15.53	21.00	7.76	No	N/A	8.65	0.00	8.65	0.898	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		15.86	21.00	6.69	No	N/A	8.65	0.00	8.65	0.774	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		16.19	21.00	5.62	No	N/A	8.65	0.00	8.65	0.650	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		16.52	21.00	4.54	No	N/A	8.65	0.00	8.65	0.525	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		16.85	21.00	3.47	No	N/A	8.65	0.00	8.65	0.401	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		17.18	21.00	2.40	No	N/A	8.65	0.00	8.65	0.277	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		17.51	21.00	1.32	No	N/A	8.65	0.00	8.65	0.153	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		17.84	21.00	0.25	No	N/A	8.65	0.00	8.65	0.029	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		18.16	21.00	-0.82	No	N/A	8.65	0.00	8.65	0.095	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		18.49	21.00	-1.90	No	N/A	8.65	0.00	8.65	0.219	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		18.82	21.00	-2.97	No	N/A	8.65	0.00	8.65	0.343	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		19.15	21.00	-4.04	No	N/A	8.65	0.00	8.65	0.467	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		19.48	21.00	-5.12	No	N/A	8.65	0.00	8.65	0.592	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		19.81	21.00	-6.19	No	N/A	8.65	0.00	8.65	0.716	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		20.14	21.00	-7.26	No	N/A	8.65	0.00	8.65	0.840	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		20.47	21.00	-8.33	No	N/A	8.65	0.00	8.65	0.964	Eqn (c)	Ties Not Req'd
+1.20D+1.60S+0.50W+1.60H		20.80	21.00	-9.41	No	10.50	20.48	13.20	33.68	0.279	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60S+0.50W+1.60H		21.13	21.00	-10.48	Yes	10.50	20.48	13.20	33.68	0.311	Eqn (a)	Max spacing per T9.7.6.

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	4.750	-12.55	84.51	0.15
Span # 2	2	8.150	-23.34	84.51	0.28
Span # 3	3	8.225	-24.13	84.51	0.29
+1.40D+1.60H					

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM K

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 1	1	4.750	-11.12	84.51	0.13
Span # 2	2	8.150	-20.68	84.51	0.24
Span # 3	3	8.225	-21.39	84.51	0.25
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	4.750	-9.53	84.51	0.11
Span # 2	2	8.150	-17.73	84.51	0.21
Span # 3	3	8.225	-18.33	84.51	0.22
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	4.750	-10.47	84.51	0.12
Span # 2	2	8.150	-19.48	84.51	0.23
Span # 3	3	8.225	-20.14	84.51	0.24
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	4.750	-9.53	84.51	0.11
Span # 2	2	8.150	-17.73	84.51	0.21
Span # 3	3	8.225	-18.33	84.51	0.22
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	4.750	-9.53	84.51	0.11
Span # 2	2	8.150	-17.73	84.51	0.21
Span # 3	3	8.225	-18.33	84.51	0.22
+1.20D+L+1.60S+1.60H					
Span # 1	1	4.750	-12.55	84.51	0.15
Span # 2	2	8.150	-23.34	84.51	0.28
Span # 3	3	8.225	-24.13	84.51	0.29
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	4.750	-12.55	84.51	0.15
Span # 2	2	8.150	-23.34	84.51	0.28
Span # 3	3	8.225	-24.13	84.51	0.29
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	4.750	-9.53	84.51	0.11
Span # 2	2	8.150	-17.73	84.51	0.21
Span # 3	3	8.225	-18.33	84.51	0.22
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	4.750	-10.47	84.51	0.12
Span # 2	2	8.150	-19.48	84.51	0.23
Span # 3	3	8.225	-20.14	84.51	0.24
+1.20D+0.50L+0.70S+W+E+1.60H					
Span # 1	1	4.750	-10.85	84.51	0.13
Span # 2	2	8.150	-20.18	84.51	0.24
Span # 3	3	8.225	-20.87	84.51	0.25
+1.20D+L+0.20S+E+1.60H					
Span # 1	1	4.750	-9.91	84.51	0.12
Span # 2	2	8.150	-18.43	84.51	0.22
Span # 3	3	8.225	-19.06	84.51	0.23
+0.90D+E+0.90H					
Span # 1	1	4.750	-7.15	84.51	0.08
Span # 2	2	8.150	-13.30	84.51	0.16
Span # 3	3	8.225	-13.75	84.51	0.16

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+S+H	0.0001	1.615	+D+S+H	-0.0000	4.085
2	+D+S+H	0.0010	3.749	+D+S+H	-0.0001	7.661
3	+D+S+H	0.0027	4.771		0.0000	7.661

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM M

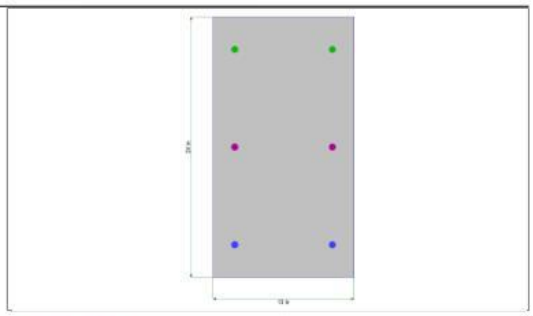
CODE REFERENCES

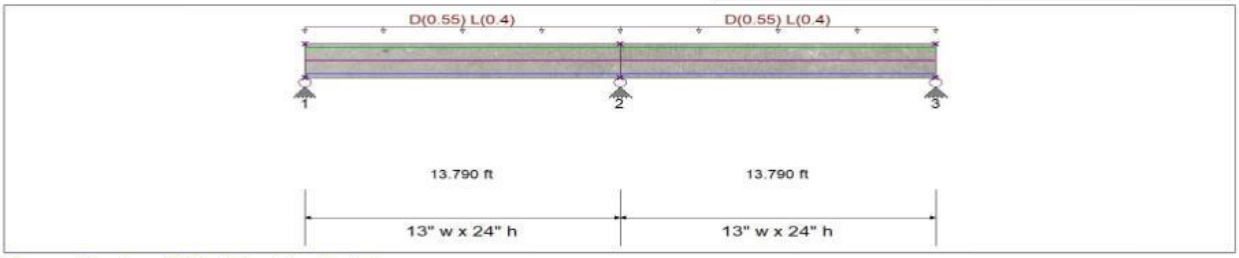
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c $^{1/2}$	=	375.0 psi		Shear :	0.750
ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus =		3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =		60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =		29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup =		2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 13.790 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 13.790 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 13.790 ft in this spa
Span #2 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 13.790 ft in this span
2-#5 at 12.0 in from Bottom, from 0.0 to 13.790 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 13.790 ft in this spa

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.550, L = 0.40 k/ft, Tributary Width = 1.0 ft, (Line loads)
Load for Span Number 2
Uniform Load : D = 0.550, L = 0.40 k/ft, Tributary Width = 1.0 ft, (Line loads)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.475** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	-40.172	k-ft
Mn * Phi : Allowable	84.513	k-ft
Location of maximum on span	0.000	ft
Span # where maximum occurs	Span # 2	

Maximum Deflection

Max Downward Transient Deflection	0.003 in	Ratio =	57245	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.010 in	Ratio =	16665	>=240.0	Span: 2 : +D+L+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 2 : +D+L+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	6.727	21.711	6.727

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM M

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Max Upward from Load Combinations	6.727	21.711	6.727
Max Upward from Load Cases	4.525	15.083	4.525
+D+H	4.525	15.083	4.525
+D+L+H	6.727	21.711	6.727
+D+Lr+H	4.525	15.083	4.525
+D+S+H	4.525	15.083	4.525
+D+0.750Lr+0.750L+H	6.076	20.254	6.076
+D+0.750L+0.750S+H	6.076	20.254	6.076
+D+0.60W+H	4.525	15.083	4.525
+D+0.750Lr+0.750L+0.450W+H	6.076	20.254	6.076
+D+0.750L+0.750S+0.450W+H	6.076	20.254	6.076
+0.60D+0.60W+0.60H	2.715	9.050	2.715
+D+0.750L+0.750S+0.70E+H	6.076	20.254	6.076
+D+0.750L+0.750S+0.5250E+H	6.076	20.254	6.076
+0.60D+0.70E+0.60H	2.715	9.050	2.715
D Only	4.525	15.083	4.525
L Only	2.069	6.895	2.069
H Only			

Shear Stirrup Requirements

Between 0.00 to 0.00 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 0.06 to 10.24 ft, Ties Not Req'd, Stirrups are not required.
Between 10.30 to 17.28 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 17.34 to 27.52 ft, Ties Not Req'd, Stirrups are not required.

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L+0.50S+1.60H		0.00	21.00	8.74	No	10.50	20.48	13.20	33.68	0.260	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		0.34	21.00	8.17	No	N/A	8.65	0.00	8.65	0.945	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		0.68	21.00	7.60	No	N/A	8.65	0.00	8.65	0.879	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.01	21.00	7.03	No	N/A	8.65	0.00	8.65	0.813	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.35	21.00	6.46	No	N/A	8.65	0.00	8.65	0.747	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		1.69	21.00	5.89	No	N/A	8.65	0.00	8.65	0.681	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.03	21.00	5.31	No	N/A	8.65	0.00	8.65	0.615	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.36	21.00	4.74	No	N/A	8.65	0.00	8.65	0.549	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		2.70	21.00	4.17	No	N/A	8.65	0.00	8.65	0.483	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.04	21.00	3.60	No	N/A	8.65	0.00	8.65	0.417	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.38	21.00	3.03	No	N/A	8.65	0.00	8.65	0.351	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		3.71	21.00	2.46	No	N/A	8.65	0.00	8.65	0.285	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.05	21.00	1.89	No	N/A	8.65	0.00	8.65	0.219	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.39	21.00	1.32	No	N/A	8.65	0.00	8.65	0.153	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		4.73	21.00	0.75	No	N/A	8.65	0.00	8.65	0.087	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.07	21.00	0.18	No	N/A	8.65	0.00	8.65	0.021	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.40	21.00	-0.39	No	N/A	8.65	0.00	8.65	0.045	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		5.74	21.00	-0.96	No	N/A	8.65	0.00	8.65	0.111	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.08	21.00	-1.53	No	N/A	8.65	0.00	8.65	0.177	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.42	21.00	-2.10	No	N/A	8.65	0.00	8.65	0.243	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		6.75	21.00	-2.68	No	N/A	8.65	0.00	8.65	0.309	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.09	21.00	-3.25	No	N/A	8.65	0.00	8.65	0.375	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.43	21.00	-3.82	No	N/A	8.65	0.00	8.65	0.441	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		7.77	21.00	-4.39	No	N/A	8.65	0.00	8.65	0.507	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.11	21.00	-4.96	No	N/A	8.65	0.00	8.65	0.573	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.44	21.00	-5.53	No	N/A	8.65	0.00	8.65	0.639	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		8.78	21.00	-6.10	No	N/A	8.65	0.00	8.65	0.705	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.12	21.00	-6.67	No	N/A	8.65	0.00	8.65	0.771	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.46	21.00	-7.24	No	N/A	8.65	0.00	8.65	0.837	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		9.79	21.00	-7.81	No	N/A	8.65	0.00	8.65	0.903	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.13	21.00	-8.38	No	N/A	8.65	0.00	8.65	0.969	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H		10.47	21.00	-8.95	No	10.50	20.48	13.20	33.68	0.266	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		10.81	21.00	-9.52	No	10.50	20.48	13.20	33.68	0.283	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		11.14	21.00	-10.09	No	10.50	20.48	13.20	33.68	0.300	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		11.48	21.00	-10.67	Yes	10.50	20.48	13.20	33.68	0.317	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		11.82	21.00	-11.24	Yes	10.50	20.48	13.20	33.68	0.334	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		12.16	21.00	-11.81	Yes	10.50	20.48	13.20	33.68	0.351	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H		12.50	21.00	-12.38	Yes	10.50	20.48	13.20	33.68	0.368	Eqn (a)	Max spacing per T9.7.6.

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM M

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+1.60L+0.50S+1.60H	1	12.83	21.00	-12.95	Yes	10.50	20.48	13.20	33.68	0.385	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	1	13.17	21.00	-13.52	Yes	10.50	20.48	13.20	33.68	0.401	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	1	13.51	21.00	-14.09	Yes	10.50	20.48	13.20	33.68	0.418	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	13.85	21.00	14.47	Yes	10.50	20.48	13.20	33.68	0.430	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	14.18	21.00	13.90	Yes	10.50	20.48	13.20	33.68	0.413	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	14.52	21.00	13.33	Yes	10.50	20.48	13.20	33.68	0.396	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	14.86	21.00	12.76	Yes	10.50	20.48	13.20	33.68	0.379	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	15.20	21.00	12.19	Yes	10.50	20.48	13.20	33.68	0.362	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	15.53	21.00	11.62	Yes	10.50	20.48	13.20	33.68	0.345	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	15.87	21.00	11.05	Yes	10.50	20.48	13.20	33.68	0.328	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	16.21	21.00	10.48	Yes	10.50	20.48	13.20	33.68	0.311	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	16.55	21.00	9.90	No	10.50	20.48	13.20	33.68	0.294	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	16.89	21.00	9.33	No	10.50	20.48	13.20	33.68	0.277	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	17.22	21.00	8.76	No	10.50	20.48	13.20	33.68	0.260	Eqn (a)	Max spacing per T9.7.6.
+1.20D+1.60L+0.50S+1.60H	2	17.56	21.00	8.19	No	N/A	8.65	0.00	8.65	0.947	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	17.90	21.00	7.62	No	N/A	8.65	0.00	8.65	0.881	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	18.24	21.00	7.05	No	N/A	8.65	0.00	8.65	0.815	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	18.57	21.00	6.48	No	N/A	8.65	0.00	8.65	0.749	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	18.91	21.00	5.91	No	N/A	8.65	0.00	8.65	0.683	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	19.25	21.00	5.34	No	N/A	8.65	0.00	8.65	0.617	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	19.59	21.00	4.77	No	N/A	8.65	0.00	8.65	0.551	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	19.93	21.00	4.20	No	N/A	8.65	0.00	8.65	0.485	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	20.26	21.00	3.63	No	N/A	8.65	0.00	8.65	0.419	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	20.60	21.00	3.06	No	N/A	8.65	0.00	8.65	0.353	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	20.94	21.00	2.49	No	N/A	8.65	0.00	8.65	0.287	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	21.28	21.00	1.91	No	N/A	8.65	0.00	8.65	0.221	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	21.61	21.00	1.34	No	N/A	8.65	0.00	8.65	0.155	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	21.95	21.00	0.77	No	N/A	8.65	0.00	8.65	0.089	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	22.29	21.00	0.20	No	N/A	8.65	0.00	8.65	0.023	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	22.63	21.00	-0.37	No	N/A	8.65	0.00	8.65	0.043	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	22.96	21.00	-0.94	No	N/A	8.65	0.00	8.65	0.109	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	23.30	21.00	-1.51	No	N/A	8.65	0.00	8.65	0.175	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	23.64	21.00	-2.08	No	N/A	8.65	0.00	8.65	0.241	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	23.98	21.00	-2.65	No	N/A	8.65	0.00	8.65	0.307	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	24.32	21.00	-3.22	No	N/A	8.65	0.00	8.65	0.373	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	24.65	21.00	-3.79	No	N/A	8.65	0.00	8.65	0.439	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	24.99	21.00	-4.36	No	N/A	8.65	0.00	8.65	0.505	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	25.33	21.00	-4.93	No	N/A	8.65	0.00	8.65	0.571	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	25.67	21.00	-5.51	No	N/A	8.65	0.00	8.65	0.637	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	26.00	21.00	-6.08	No	N/A	8.65	0.00	8.65	0.703	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	26.34	21.00	-6.65	No	N/A	8.65	0.00	8.65	0.769	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	26.68	21.00	-7.22	No	N/A	8.65	0.00	8.65	0.835	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	27.02	21.00	-7.79	No	N/A	8.65	0.00	8.65	0.901	Eqn (c)	Ties Not Req'd
+1.20D+1.60L+0.50S+1.60H	2	27.35	21.00	-8.36	No	N/A	8.65	0.00	8.65	0.967	Eqn (c)	Ties Not Req'd

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	13.790	-39.36	84.51	0.47
Span # 2	2	13.790	-40.17	84.51	0.48
+1.40D+1.60H					
Span # 1	1	13.790	-28.53	84.51	0.34
Span # 2	2	13.790	-29.12	84.51	0.34
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	13.790	-39.36	84.51	0.47
Span # 2	2	13.790	-40.17	84.51	0.48
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	13.790	-39.36	84.51	0.47
Span # 2	2	13.790	-40.17	84.51	0.48
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	13.790	-33.77	84.51	0.40
Span # 2	2	13.790	-34.47	84.51	0.41
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	13.790	-24.45	84.51	0.29
Span # 2	2	13.790	-24.96	84.51	0.30
+1.20D+L+1.60S+1.60H					

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: GRADE BEAM M

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 1	1	13.790	-33.77	84.51	0.40
Span # 2	2	13.790	-34.47	84.51	0.41
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	13.790	-24.45	84.51	0.29
Span # 2	2	13.790	-24.96	84.51	0.30
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	13.790	-33.77	84.51	0.40
Span # 2	2	13.790	-34.47	84.51	0.41
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	13.790	-29.11	84.51	0.34
Span # 2	2	13.790	-29.71	84.51	0.35
+0.90D+W+1.60H					
Span # 1	1	13.790	-18.34	84.51	0.22
Span # 2	2	13.790	-18.72	84.51	0.22
+0.90D+L+0.20S+E+1.60H					
Span # 1	1	13.790	-27.65	84.51	0.33
Span # 2	2	13.790	-28.23	84.51	0.33
+0.90D+E+0.90H					
Span # 1	1	13.790	-18.34	84.51	0.22
Span # 2	2	13.790	-18.72	84.51	0.22

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+L+H	0.0099	6.107		0.0000	0.000
2	+D+L+H	0.0099	7.683		0.0000	0.000

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Typical Concrete Grade Beam (At Retaining Wall)

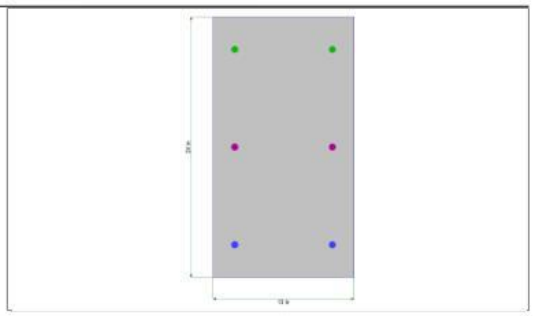
CODE REFERENCES

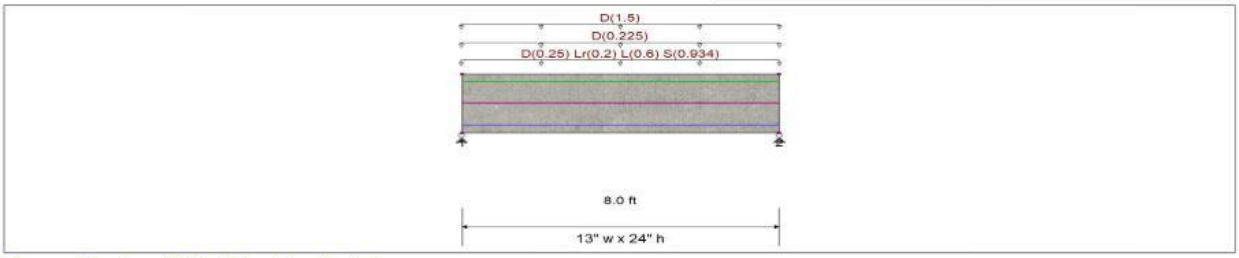
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-16

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 * λ * f'c $^{1/2}$	=	375.0 psi		Shear :	0.750
ψ Density	=	150.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus =		3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar =		60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar =		29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup =		2

Seismic Design Category = C





Cross Section & Reinforcing Details

Rectangular Section, Width = 13.0 in, Height = 24.0 in
Span #1 Reinforcing....
2-#5 at 3.0 in from Bottom, from 0.0 to 8.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 8.0 ft in this span
2-#5 at 12.0 in from Top, from 0.0 to 8.0 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.0250, Lr = 0.020, L = 0.060, S = 0.09340 ksf, Tributary Width = 10.0 ft, (Floor Loading)

Uniform Load : D = 0.0150 ksf, Tributary Width = 15.0 ft, (Wall Loading)
Uniform Load : D = 0.150 ksf, Tributary Width = 10.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.460** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	38.835	k-ft
Mn * Phi : Allowable	84.513	k-ft
Location of maximum on span	3.993	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.002 in	Ratio =	52161	>=360.0	Lr Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	S Only
Max Downward Total Deflection	0.008 in	Ratio =	11589	>=240.0	Span: 1 : +D+0.750L+0.750S+0.5250E+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+0.750L+0.750S+0.5250E+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	13.802	13.802
Max Upward from Load Combinations	13.802	13.802

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Typical Concrete Grade Beam (At Retaining Wall)

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from Load Cases	9.200	9.200
+D+H	9.200	9.200
+D+L+H	11.600	11.600
+D+Lr+H	10.000	10.000
+D+S+H	12.936	12.936
+D+0.750Lr+0.750L+H	11.600	11.600
+D+0.750L+0.750S+H	13.802	13.802
+D+0.60W+H	9.200	9.200
+D+0.750Lr+0.750L+0.450W+H	11.600	11.600
+D+0.750L+0.750S+0.450W+H	13.802	13.802
+0.60D+0.60W+0.60H	5.520	5.520
+D+0.750L+0.750S+0.70E+H	13.802	13.802
+D+0.750L+0.750S+0.5250E+H	13.802	13.802
+0.60D+0.70E+0.60H	5.520	5.520
D Only	9.200	9.200
Lr Only	0.800	0.800
L Only	2.400	2.400
S Only	3.736	3.736
H Only		

Shear Stirrup Requirements

Between 0.00 to 2.21 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in
Between 2.23 to 5.77 ft, Ties Not Req'd, Stirrups are not required.
Between 5.79 to 7.99 ft, Max spacing per T9.7.6.2.2, use #3 stirrups spaced at 10 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+L+1.60S+1.60H	1	0.00	21.00	19.42	Yes	10.50	20.48	13.20	33.68	0.577	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.09	21.00	18.99	Yes	10.50	20.48	13.20	33.68	0.564	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.17	21.00	18.57	Yes	10.50	20.48	13.20	33.68	0.551	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.26	21.00	18.14	Yes	10.50	20.48	13.20	33.68	0.539	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.35	21.00	17.72	Yes	10.50	20.48	13.20	33.68	0.526	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.44	21.00	17.30	Yes	10.50	20.48	13.20	33.68	0.514	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.52	21.00	16.87	Yes	10.50	20.48	13.20	33.68	0.501	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.61	21.00	16.45	Yes	10.50	20.48	13.20	33.68	0.488	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.70	21.00	16.02	Yes	10.50	20.48	13.20	33.68	0.476	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.79	21.00	15.60	Yes	10.50	20.48	13.20	33.68	0.463	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.87	21.00	15.17	Yes	10.50	20.48	13.20	33.68	0.451	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	0.96	21.00	14.75	Yes	10.50	20.48	13.20	33.68	0.438	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.05	21.00	14.32	Yes	10.50	20.48	13.20	33.68	0.425	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.14	21.00	13.90	Yes	10.50	20.48	13.20	33.68	0.413	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.22	21.00	13.48	Yes	10.50	20.48	13.20	33.68	0.400	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.31	21.00	13.05	Yes	10.50	20.48	13.20	33.68	0.388	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.40	21.00	12.63	Yes	10.50	20.48	13.20	33.68	0.375	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.49	21.00	12.20	Yes	10.50	20.48	13.20	33.68	0.362	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.57	21.00	11.78	Yes	10.50	20.48	13.20	33.68	0.350	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.66	21.00	11.35	Yes	10.50	20.48	13.20	33.68	0.337	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.75	21.00	10.93	Yes	10.50	20.48	13.20	33.68	0.325	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.84	21.00	10.50	Yes	10.50	20.48	13.20	33.68	0.312	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	1.92	21.00	10.08	No	10.50	20.48	13.20	33.68	0.299	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	2.01	21.00	9.66	No	10.50	20.48	13.20	33.68	0.287	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	2.10	21.00	9.23	No	10.50	20.48	13.20	33.68	0.274	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	2.19	21.00	8.81	No	10.50	20.48	13.20	33.68	0.262	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	2.27	21.00	8.38	No	N/A	8.65	0.00	8.65	0.969	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.36	21.00	7.96	No	N/A	8.65	0.00	8.65	0.920	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.45	21.00	7.53	No	N/A	8.65	0.00	8.65	0.871	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.54	21.00	7.11	No	N/A	8.65	0.00	8.65	0.822	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.62	21.00	6.68	No	N/A	8.65	0.00	8.65	0.773	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.71	21.00	6.26	No	N/A	8.65	0.00	8.65	0.724	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.80	21.00	5.84	No	N/A	8.65	0.00	8.65	0.675	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.89	21.00	5.41	No	N/A	8.65	0.00	8.65	0.626	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	2.97	21.00	4.99	No	N/A	8.65	0.00	8.65	0.577	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.06	21.00	4.56	No	N/A	8.65	0.00	8.65	0.528	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.15	21.00	4.14	No	N/A	8.65	0.00	8.65	0.479	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.23	21.00	3.71	No	N/A	8.65	0.00	8.65	0.429	Eqn (c)	Ties Not Req'd

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Typical Concrete Grade Beam (At Retaining Wall)

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)	Av, min Req'd?	Spacing Req'd (in)	Φ Vc (k)	Φ Vs (k)	Φ Vn (k)	Vu / Φ Vn	Vc Eqn (T22.5.5.1)	Spacing Provision
+1.20D+L+1.60S+1.60H	1	3.32	21.00	3.29	No	N/A	8.65	0.00	8.65	0.380	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.41	21.00	2.86	No	N/A	8.65	0.00	8.65	0.331	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.50	21.00	2.44	No	N/A	8.65	0.00	8.65	0.282	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.58	21.00	2.02	No	N/A	8.65	0.00	8.65	0.233	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.67	21.00	1.59	No	N/A	8.65	0.00	8.65	0.184	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.76	21.00	1.17	No	N/A	8.65	0.00	8.65	0.135	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.85	21.00	0.74	No	N/A	8.65	0.00	8.65	0.086	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	3.93	21.00	0.32	No	N/A	8.65	0.00	8.65	0.037	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.02	21.00	-0.11	No	N/A	8.65	0.00	8.65	0.012	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.11	21.00	-0.53	No	N/A	8.65	0.00	8.65	0.061	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.20	21.00	-0.95	No	N/A	8.65	0.00	8.65	0.110	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.28	21.00	-1.38	No	N/A	8.65	0.00	8.65	0.160	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.37	21.00	-1.80	No	N/A	8.65	0.00	8.65	0.209	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.46	21.00	-2.23	No	N/A	8.65	0.00	8.65	0.258	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.55	21.00	-2.65	No	N/A	8.65	0.00	8.65	0.307	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.63	21.00	-3.08	No	N/A	8.65	0.00	8.65	0.356	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.72	21.00	-3.50	No	N/A	8.65	0.00	8.65	0.405	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.81	21.00	-3.93	No	N/A	8.65	0.00	8.65	0.454	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.90	21.00	-4.35	No	N/A	8.65	0.00	8.65	0.503	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	4.98	21.00	-4.77	No	N/A	8.65	0.00	8.65	0.552	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.07	21.00	-5.20	No	N/A	8.65	0.00	8.65	0.601	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.16	21.00	-5.62	No	N/A	8.65	0.00	8.65	0.650	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.25	21.00	-6.05	No	N/A	8.65	0.00	8.65	0.699	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.33	21.00	-6.47	No	N/A	8.65	0.00	8.65	0.749	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.42	21.00	-6.90	No	N/A	8.65	0.00	8.65	0.798	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.51	21.00	-7.32	No	N/A	8.65	0.00	8.65	0.847	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.60	21.00	-7.75	No	N/A	8.65	0.00	8.65	0.896	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.68	21.00	-8.17	No	N/A	8.65	0.00	8.65	0.945	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.77	21.00	-8.59	No	N/A	8.65	0.00	8.65	0.994	Eqn (c)	Ties Not Req'd
+1.20D+L+1.60S+1.60H	1	5.86	21.00	-9.02	No	10.50	20.48	13.20	33.68	0.268	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	5.95	21.00	-9.44	No	10.50	20.48	13.20	33.68	0.280	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	6.03	21.00	-9.87	No	10.50	20.48	13.20	33.68	0.293	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	6.12	21.00	-10.29	Yes	10.50	20.48	13.20	33.68	0.306	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	6.21	21.00	-10.72	Yes	10.50	20.48	13.20	33.68	0.318	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	6.30	21.00	-11.14	Yes	10.50	20.48	13.20	33.68	0.331	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	6.38	21.00	-11.57	Yes	10.50	20.48	13.20	33.68	0.343	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	6.47	21.00	-11.99	Yes	10.50	20.48	13.20	33.68	0.356	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	6.56	21.00	-12.41	Yes	10.50	20.48	13.20	33.68	0.369	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	6.64	21.00	-12.84	Yes	10.50	20.48	13.20	33.68	0.381	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	6.73	21.00	-13.26	Yes	10.50	20.48	13.20	33.68	0.394	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	6.82	21.00	-13.69	Yes	10.50	20.48	13.20	33.68	0.406	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	6.91	21.00	-14.11	Yes	10.50	20.48	13.20	33.68	0.419	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	6.99	21.00	-14.54	Yes	10.50	20.48	13.20	33.68	0.432	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	7.08	21.00	-14.96	Yes	10.50	20.48	13.20	33.68	0.444	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	7.17	21.00	-15.39	Yes	10.50	20.48	13.20	33.68	0.457	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	7.26	21.00	-15.81	Yes	10.50	20.48	13.20	33.68	0.469	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	7.34	21.00	-16.23	Yes	10.50	20.48	13.20	33.68	0.482	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	7.43	21.00	-16.66	Yes	10.50	20.48	13.20	33.68	0.495	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	7.52	21.00	-17.08	Yes	10.50	20.48	13.20	33.68	0.507	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	7.61	21.00	-17.51	Yes	10.50	20.48	13.20	33.68	0.520	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	7.69	21.00	-17.93	Yes	10.50	20.48	13.20	33.68	0.533	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	7.78	21.00	-18.36	Yes	10.50	20.48	13.20	33.68	0.545	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	7.87	21.00	-18.78	Yes	10.50	20.48	13.20	33.68	0.558	Eqn (a)	Max spacing per T9.7.6.
+1.20D+L+1.60S+1.60H	1	7.96	21.00	-19.21	Yes	10.50	20.48	13.20	33.68	0.570	Eqn (a)	Max spacing per T9.7.6.

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	8.000	38.84	84.51	0.46
+1.40D+1.60H					
Span # 1	1	8.000	25.76	84.51	0.30
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	8.000	30.56	84.51	0.36
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	8.000	33.50	84.51	0.40
+1.20D+1.60Lr+L+1.60H					

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Concrete Beam

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Typical Concrete Grade Beam (At Retaining Wall)

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 1 +1.20D+1.60Lr+0.50W+1.60H	1	8.000	29.44	84.51	0.35
Span # 1 +1.20D+L+1.60S+1.60H	1	8.000	24.64	84.51	0.29
Span # 1 +1.20D+1.60S+0.50W+1.60H	1	8.000	38.84	84.51	0.46
Span # 1 +1.20D+0.50Lr+L+W+1.60H	1	8.000	34.04	84.51	0.40
Span # 1 +1.20D+0.50L+0.50S+W+1.60H	1	8.000	27.68	84.51	0.33
Span # 1 +0.90D+W+1.60H	1	8.000	28.22	84.51	0.33
Span # 1 +0.90D+L+0.20S+E+1.60H	1	8.000	16.56	84.51	0.20
Span # 1 +0.90D+E+0.90H	1	8.000	22.85	84.51	0.27
Span # 1	1	8.000	16.56	84.51	0.20

Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
1	+D+0.750L+0.750S+0.5250E+H	0.0083	4.000		0.0000	0.000

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Restrained Retaining Wall

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Basement Retaining Wall

Code References

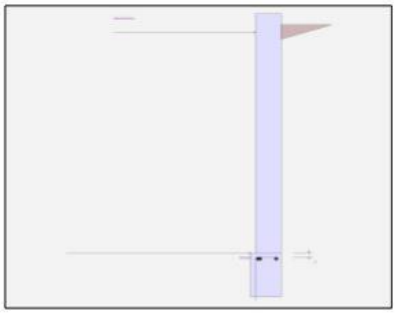
Calculations per IBC 2021, ACI 318-14

Criteria

Retained Height	=	10.50 ft
Wall height above soil	=	0.50 ft
Total Wall Height	=	11.0 ft
Top Support Height	=	10.0 ft
Slope Behind Wall	=	
Height of Soil over Toe	=	in

Soil Data

Allow Soil Bearing	=	3,000.0 psf
Equivalent Fluid Pressure Method		
At-Rest Heel Pressure	=	60.0 psf/ft
	=	0.0 psf/ft
Passive Pressure	=	250.0 psf/ft
Soil Density	=	110 pcf
Footing||Soil Frictior	=	0.4 psf
Soil height to ignore for passive pressure	=	12 in



Surcharge Loads

Surcharge Over Heel	=	psf
>>>Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	500.0 lbs
Axial Live Load	=	500.0 lbs
Axial Load Eccentricity	=	in

Uniform Lateral Load Applied to Stem

Lateral Load	=	#/ft
...Height to Top	=	ft
...Height to Bottom	=	ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	0.00 psf (Strength Level)
Wind acts left-to-right toward retention side.		

Adjacent Footing Load

Adjacent Footing Load	=	lbs
Footing Width	=	ft
Eccentricity	=	in
Wall to Ftg CL Dist	=	ft
Footing Type		Spread Footing
Base Above/Below Soil at Back of Wall	=	ft
Poisson's Ratio	=	0.3
Added seismic per unit area	=	0.0 psf

Earth Pressure Seismic Load

K_h Soil Density Multiplier = 0.2 g

Design Summary

Total Bearing Load	=	2,700.0 lbs
...resultant ecc.	=	0.0 in
Soil Pressure @ Toe	=	2,492.31 psf OK
Soil Pressure @ Heel	=	2,492.31 psf OK
Allowable	=	psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	0.0 psf
ACI Factored @ Heel	=	0.0 psf
Footing Shear @ Toe	=	0.0 psi OK
Footing Shear @ Heel	=	0.0 psi OK
Allowable	=	82.158 psi
Reaction at Top	=	717.93 lbs
Reaction at Bottom	=	3,967.32 lbs

Sliding Calcs
Lateral Sliding Force = 3,967.32 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Concrete Stem Construction

Thickness	=	10.00 in	Fy	=	60000 psi
Wall Weight	=	125.0 psf	f'c	=	4,500.0 psi

Stem is FIXED to top of footing

		@ Top Support	Mmax Between Top & Base	@ Base of Wall
		Stem OK	Stem OK	Stem OK
Design Height Above Ftg	=	10.0 ft	5.622 ft	0.00 ft
Rebar Size	=	# 5	# 5	# 5
Rebar Spacing	=	12.00 in	12.00 in	12.00 in
Rebar Placed at	=	Edge	Edge	Edge
Rebar Depth 'd'	=	7.688 in	8.188 in	7.688 in
Design Data				
fb/FB + fa/Fa	=	0.000	0.286	0.670
Mu....Actual	=	2.0 ft-#	3,187.67 ft-#	6,999.13 ft-#
Mn * Phi.....Allowable	=	10,440.6 ft-#	11,138.1 ft-#	10,440.6 ft-#
Shear Force @ this height	=	1,140.29 lbs		4,139.71 lbs
Shear.....Actual	=	12.361 psi		44.875 psi
Shear.....Allowable	=	60.287 psi		60.287 psi

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Restrained Retaining Wall

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Basement Retaining Wall

Footing Strengths & Dimensions

Toe Width	=	0.250 ft
Heel Width	=	0.8333
Total Footing Width	=	1.083
Footing Thickness	=	24.0 in

f'c = 3,000 psi Fy = 60000 psi
Footing Concrete Density = 150 pcf
Min. As % = 0.0018
Cover @ Top = 2 in @ Btm.= 3 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	0.0	0.0	psf
Mu' : Upward	=	0.0		ft-#
Mu' : Downward	=	0.0		ft-#
Mu: Design	=	0	0	ft-#
Actual 1-Way Shear	=	0.0	0.0	psi
Allow 1-Way Shear	=	35.389	34.837	psi

Other Acceptable Sizes & Spacings:

Toe: # 5 @ 12.00 in -or- #4@ 4.62 in, #5@ 7.17 in, #6@ 10.18 in, #7@ 13.88
Heel:# 5 @ 12.00 in -or- #4@ 4.62 in, #5@ 7.17 in, #6@ 10.18 in, #7@ 13.88

Min footing T&S reinf Area 0.56 in2
Min footing T&S reinf Area per foot 0.52 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 4.63 in	#4@ 9.26 in
#5@ 7.18 in	#5@ 14.35 in
#6@ 10.19 in	#6@ 20.37 in

Summary of Forces on Footing : Slab RESISTS sliding, stem is FIXED at footing

Forces acting on footing for soil pressure

>>> Sliding Forces are restrained by the adjacent slab

Load & Moment Summary For Footing : For Soil Pressure Calcs

Moment @ Top of Footing Applied from Stem	=			-4,374.46 ft-#
Surcharge Over Heel	=	0.0 lbs	0.0 ft	0.0 ft-#
Adjacent Footing Load	=	0.0 lbs	0.0 ft	0.0 ft-#
Axial Dead Load on Stem	=	1,000.0 lbs	0.6667 ft	666.67 ft-#
Soil Over Toe	=	0.0 lbs	0.0 ft	0.0 ft-#
Surcharge Over Toe	=	0.0 lbs	0.0 ft	0.0 ft-#
Stem Weight	=	1,375.0 lbs	0.6667 ft	916.67 ft-#
Soil Over Heel	=	0.0 lbs	1.083 ft	0.0 ft-#
Footing Weight	=	325.0 lbs	0.5417 ft	176.042 ft-#
Total Vertical Force	=	2,700.0 lbs	Base Moment =	-2,615.08 ft-#

Stem is specified to be fixed to footing, and top restraint is assumed to react out any tendency for moment at the footing/soil interface, so uniform soil pressure is assumed.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Restrained Retaining Wall

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Basement Retaining Wall

Rebar Lap & Embedment Lengths Information

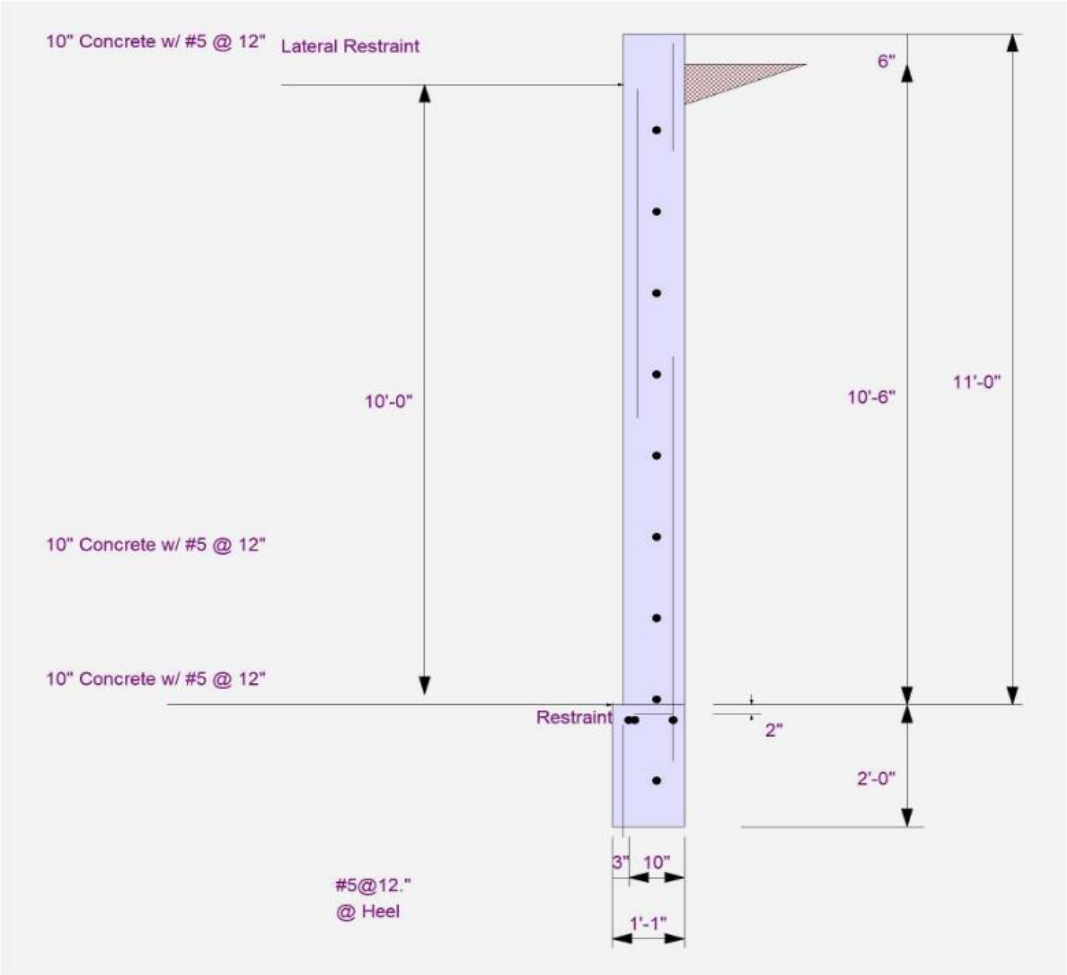
Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Restrained Retaining Wall

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Basement Retaining Wall



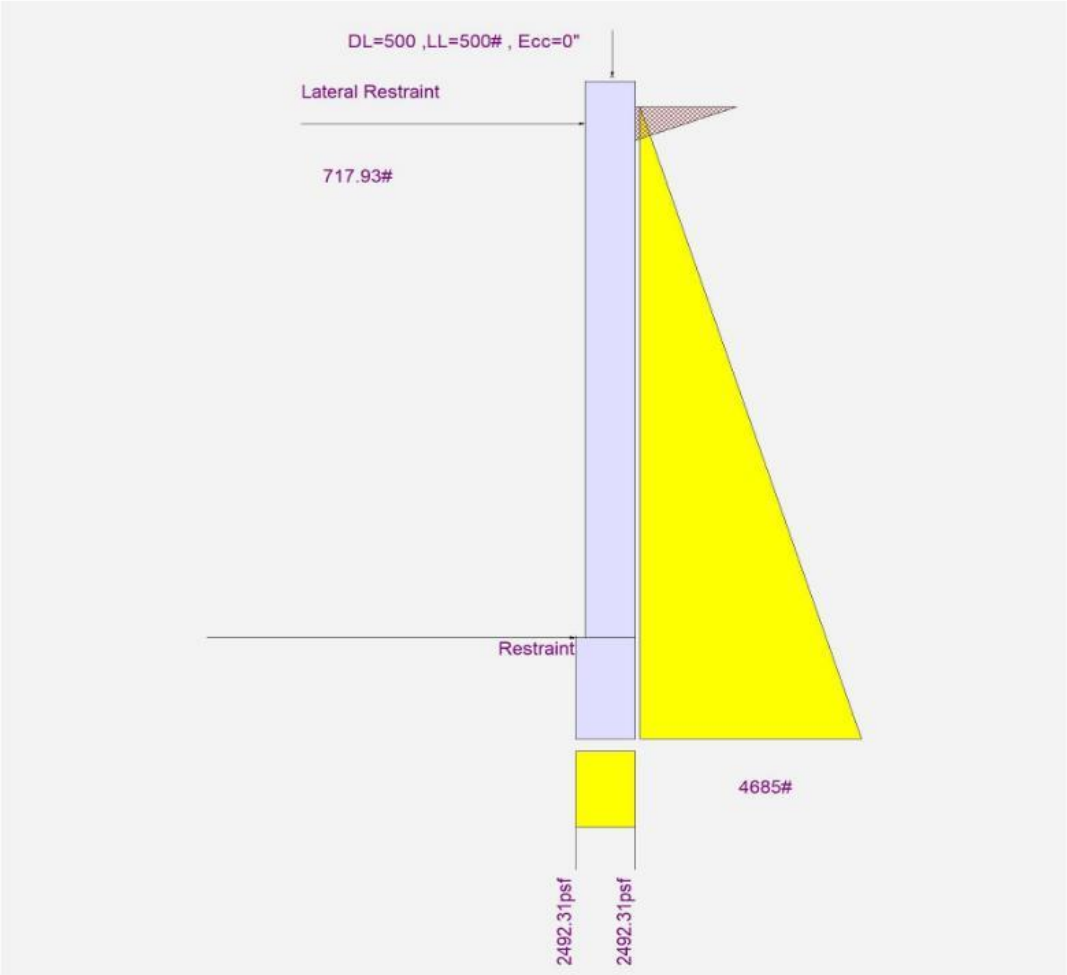
Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Restrained Retaining Wall

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Basement Retaining Wall



Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Cantilevered Retaining Wall

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Retinaing Wall Behind Garage

Code Reference

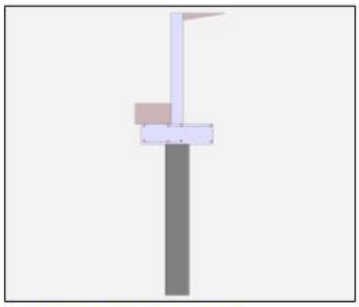
Calculations per IBC 2021, ACI 318-19, TMS 402-16

Criteria

Retained Height	=	11.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	24.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 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

Stem Weight Seismic Load

F_p / W_p Weight Multiplier	=	0.200 g
Added seismic base force		231.0 lbs

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Cantilevered Retaining Wall

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Retinaing Wall Behind Garage

Design Summary

See Pier design results.

Vertical component of active lateral soil pressure IS NOT 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	SD	SD
Thickness	=	12.00		
Rebar Size	=	# 5		
Rebar Spacing	=	8.00		
Rebar Placed at	=	Edge		
Design Data				
fb/FB + fa/Fa	=	**0.945**		
Total Force @ Section				
Service Level	lbs =			
Strength Level	lbs =	5,170.0		
Moment....Actual				
Service Level	ft-# =			
Strength Level	ft-# =	19,561.7		
Moment.....Allowable	=	20,679.5		
Shear.....Actual				
Service Level	psi =			
Strength Level	psi =	42.3		
Shear.....Allowable	psi =	62.5		
Anet (Masonry)	in2 =			
Wall Weight	psf =	150.0		
Rebar Depth 'd'	in =	10.19		
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 =	4,500.0		
Fy	psi =	60,000.0		

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Cantilevered Retaining Wall

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Retinaing Wall Behind Garage

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.4401 in2/ft		
0.0018bh : 0.0018(12)(12) :	0.2592 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.4401 in2/ft	#4@ 8.33 in	#4@ 16.67 in
Provided Area :	0.465 in2/ft	#5@ 12.92 in	#5@ 25.83 in
Maximum Area :	2.4111 in2/ft	#6@ 18.33 in	#6@ 36.67 in

Footing Data

Toe Width	=	2.50 ft
Heel Width	=	3.50
Total Footing Width	=	6.00
Footing Thickness	=	24.00 in

f'c = 4,500 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	=	8,585	0	psf
Mu' : Upward	=	17,076	0	ft-#
Mu' : Downward	=	1,950	5,663	ft-#
Mu: Design	=	15,126	5,663	ft-#
φ Mn	=	42,653	44,745	ft-#
Actual 1-Way Shear	=	20.56	17.56	psi
Allow 1-Way Shear	=	49.61	48.84	psi

Toe Reinforcing = # 5 @ 8.00 in
Heel Reinforcing = # 5 @ 8.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 60,122.50 ft-lbs
Footing Allow. Torsion, φ Tn = 65,203.74 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 4.62 in, #5@ 7.17 in, #6@ 10.18 in, #7@ 13.88 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Heel: #4@ 4.62 in, #5@ 7.17 in, #6@ 10.18 in, #7@ 13.88 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Key:

Min footing T&S reinf Area 3.11 in2
Min footing T&S reinf Area per foot 0.52 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 4.63 in	#4@ 9.26 in
#5@ 7.18 in	#5@ 14.35 in
#6@ 10.19 in	#6@ 20.37 in

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Cantilevered Retaining Wall

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Retinaing Wall Behind Garage

Pier Data

Vert. Load from Wall	8,461.7	plf
Lateral Load from Wall	4,456.0	plf
Added Lateral at Top of Pier	0.0	lbs
End Soil Bearing Allow	40,000	psf
Pier Skin Friction	900.0	psf
Allow. Passive Pressure	250	pcf
Apply S.F. to Allow. Passive	1	
Actual Passive Pressure	250.00	pcf
Max. Allow. Passive Pressure	250	psf
Dia. Mult. for Pass. Resistance	1.00	
Footing Toe to C.L. Pier	3.00	ft
Ecc. Of Vert. Load to C.L. Pier	-0.62	ft
Load Factor for Pier Design	1.0	
Pier Spacing	6.00	ft
f'c	4,500	psi
Fy	60,000	psi

Pier Design Results

☒ Lateral Support at Top of Pier

Diameter Used	24.00	in
Effective Embed. Required	10.07	ft
Ignore Pass. Pres. @ Pier Top *	0.00	ft
Total Embedment Required	10.07	ft
Effective Embedment Used	15.0	ft
Total Embedment Used	15.00	ft
Location of point of Inflection	1/6	
☒ Apply Skin Friction Ignore :	5.00	ft
No. of Bars (Circular)	7	
Size of Rebar	#6	
Applied Moment at Pier Top	120,245	ft-lbs
Pier Design Mu	94,258	ft-lbs
Design Pier Mom., φ Mn	104,763	ft-lbs
Applied Shear at Pier Top	0	lbs
Factored Shear in Pier	16,033	lbs
Actual Shear, Vu	52.90	psi
Allow. Shear, φ vn	56.09	psi
Total Vert. Load to Pier	42,150.0	lbs
Total Vertical Capacity	182,117	lbs
Axial Stress, fa	93.22	psi

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		4,225.0	4.33	18,308.3
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	=			
	=			
Seismic Stem Self Wt		231.0	7.50	1,732.5
Total	=	4,456.0	**O.T.M.** =	20,040.8

		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Soil Over HL (ab. water tbl)		3,025.0	4.75	14,368.8
Soil Over HL (bel. water tbl)			4.75	14,368.8
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	=	550.0	1.25	687.5
Surcharge Over Toe	=			
Stem Weight(s)	=	1,650.0	3.00	4,950.0
Earth @ Stem Transitions	=			
Footing Weight	=	1,800.0	3.00	5,400.0
Key Weight	=			
Vert. Component	=			
Total =		7,025.0 lbs	**R.M.=**	25,406.3

Pier foundation used. Forces and moments displayed are applied at top of pier.

* 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 NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Cantilevered Retaining Wall

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Retinaing Wall Behind Garage

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)	0.312	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.

Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Cantilevered Retaining Wall

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Retinaing Wall Behind Garage

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #5 bar specified in this stem design segment (25.4.2.4a) =	17.44 in
Development length for #5 bar specified in this stem design segment =	13.42 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	6.00 in
As Provided =	0.4650 in2/ft
As Required =	0.4401 in2/ft

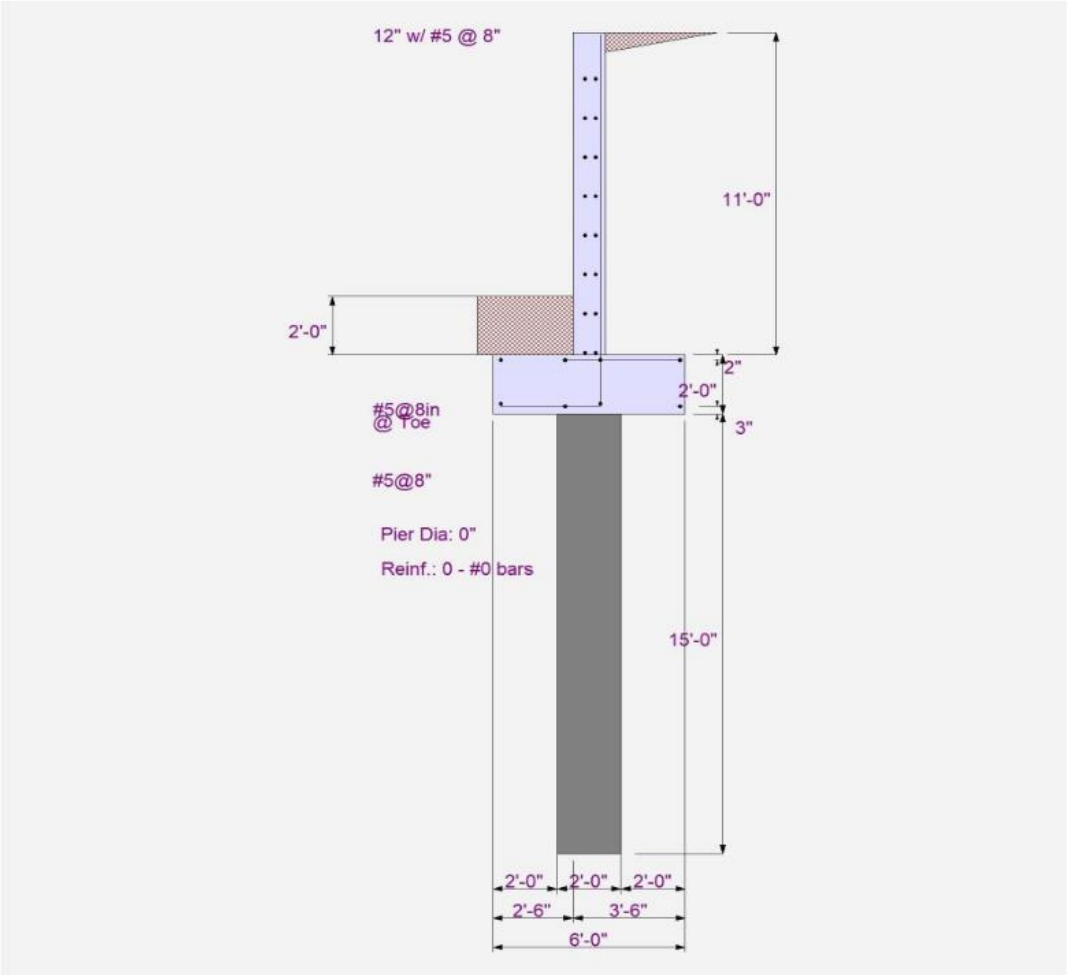
Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Cantilevered Retaining Wall

Project File: 23-22846 Foundations.ec6

LIC# : KW-06013705, Build:20.25.03.24 TAMARACK GROVE ENGINEERING (c) ENERCALC, LLC 1982-2025

DESCRIPTION: Retinaing Wall Behind Garage



Project Title: Shanley Residence
Engineer: JBC
Project ID: 23-22846
Project Descr:

Cantilevered Retaining Wall

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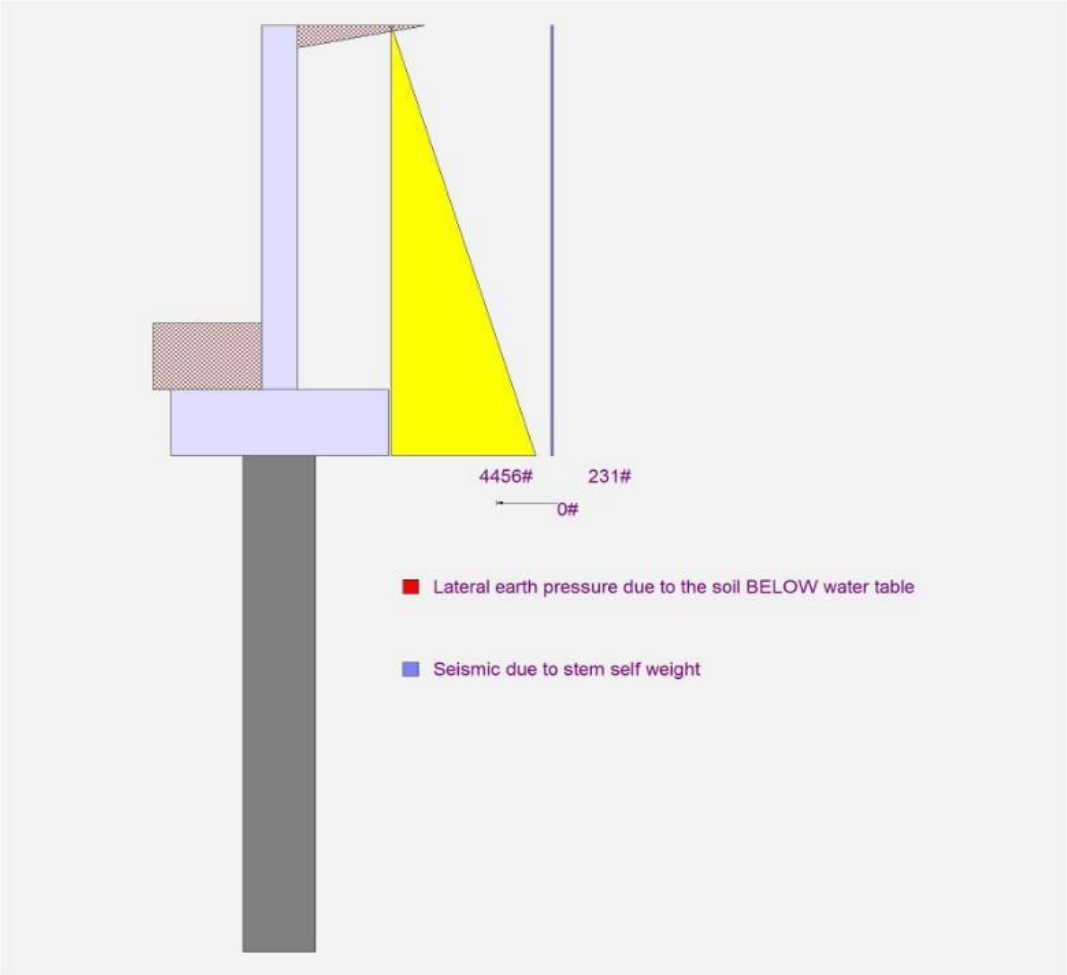
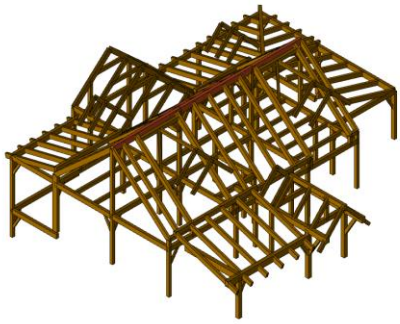
DESCRIPTION: Retinaing Wall Behind Garage



5 SOFTWARE PRINTOUTS (RISA)

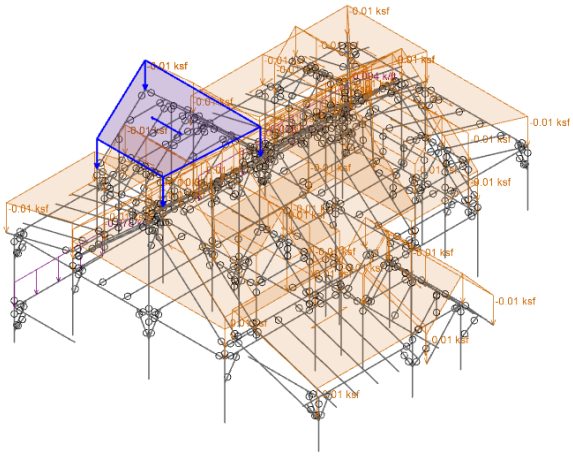
5.1 MEMBER SPECIES, SIZE, AND GRADE SUMMARY

Member	*Size*	*Material*	*Worst Case Axial (kips)*	*Worst Case Shear (kips)*
Exterior KP	7.25X7.25FS	Southern Pine #1	0.2	0
Exterior TC 8x12	7.25X7.25FS	Southern Pine #1	3.75	1.2
Exterior Hip 8x16	7.25X15.25FS	Southern Pine #1	-1	7.8
Exterior Beam 8x14	7.25X13.25FS	Southern Pine #1	-1.5	6.2
Exterior Beam 8x12	7.25X11.25FS	Southern Pine #1	-1.1	4.9
Exterior Plate 10x14	9.25X13.25FS	Southern Pine #1	-0.52	3.58
Exterior Brace 4x6	3.5X5.5FS	Southern Pine #1	8.2	0
Exterior Post 8x8	7.25X7.25FS	Southern Pine #1	18.4	0
Interior Large Post	7.25X13.25FS	DF #1	10.1 (-0.67)	0.46
Interior Post	7.25X7.25FS	DF #1	29.48 (-8.42)	2.8
Interior Plate	7.25X11.25FS	DF #1	-4.5	7.1
Interior Floor Joist	5.5X9.25FS	DF #1	-0.37	2
Interior Medium Post	7.25X9.25FS	DF #1	17.73 (-1.9)	1.8
Interior Ridge	7.25X15FS	Glulam	1	7.3
Interior Brace	5.5X7.5FS	DF #1	4	0
Interior Rafter	5.5X11.25FS	DF #1	3.9 (-2.5)	4
Exterior Beam 10x16	9.25X15.25FS	Southern Pine #1	-2.8	1.3
Exterior Rafter 6x12	5.5X11.25FS	Southern Pine #1	-2.7	3.4
Exterior Ridge 8x12	7.25X11.25FS	Southern Pine #1	0.10	2.4
Exterior Post 8x10	7.25X9.25FS	Southern Pine #1	12.7 (-0.96)	1.6
Exterior Post 10x10	9.25X9.25FS	Southern Pine #1	17.6 (-1.1)	2.5
Exterior Ledger	5.25X9.25FS	Southern Pine #1	-2.8	0
Exterior Brace South	5.25X7.25FS	Southern Pine #1	9.7	0
Exterior BC	7.25X11.25FS	Southern Pine #1	-2.9	0.17
Tie	7.25X9.25FS	DF #1	0.4	0.07
Large Bent Rafter	7.25X13.25FS	DF #1	-4.7	4.1
Bent Rafter	7.25X11.25FS	DF #1	7 (-4.7)	0.1
Collar	5.25X9.25FS	DF #1	-3.2	0.04
Large Top Plate	7.25X11.25FS	DF #1	-2.7	16.7
Top Plate	7.25X9.25FS	DF #1	1.8	1.5
Valley	7.25X11.25FS	DF #1	-4.1	2.8
Brace	3.5X5.25FS	DF #1	4	0
Dormer Header	7.25X9.25FS	DF #1	-3.8	1.5
Dormer Valley	5.25X7.25FS	DF #1	2	1.2
Dormer Rafter	5.25X9.25FS	DF #1	3.2	1.3
Interior Plate Large	7.25X13.25FS	DF #1	-3.1	1.6

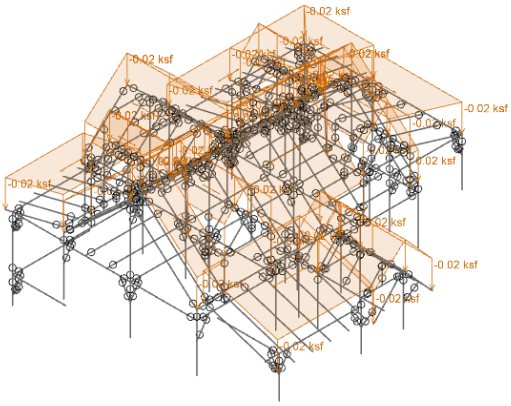


5.2 LOAD COMBINATIONS

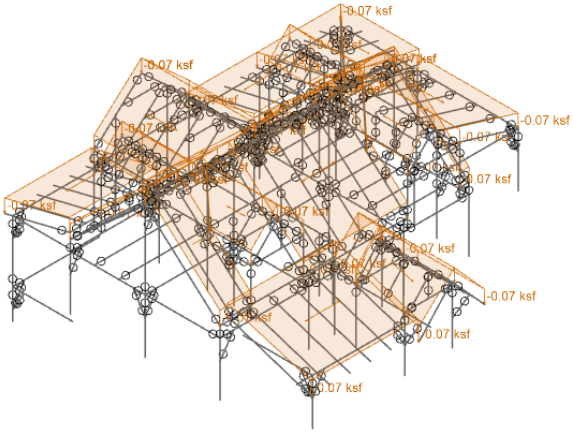
	Description	Solve	P-Delta	SRSS	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	ASCE ASD 1	✓			DL	1										
2	ASCE ASD 2	✓			DL	1	LL	1	LLS	1						
3	ASCE ASD 3 (a)	✓			DL	1	RLL	1								
4	ASCE ASD 3 (b)	✓			DL	1	SL	1	SLN	1						
5	ASCE ASD 4 (a)	✓			DL	1	LL	0.75	LLS	0.75	RLL	0.75				
6	ASCE ASD 4 (b)	✓			DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75		
7	ASCE ASD 5 (a)	✓			DL	1	WL	0.6								
8	ASCE ASD 6 (a)	✓			DL	1	WL	0.45	LL	0.75	LLS	0.75	RLL	0.75		
9	ASCE ASD 6 (b)	✓			DL	1	WL	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
10	ASCE ASD 6 (c)	✓			DL	1	WL	0.45	LL	0.75	LLS	0.75				
11	ASCE ASD 7	✓			DL	0.6	WL	0.6								



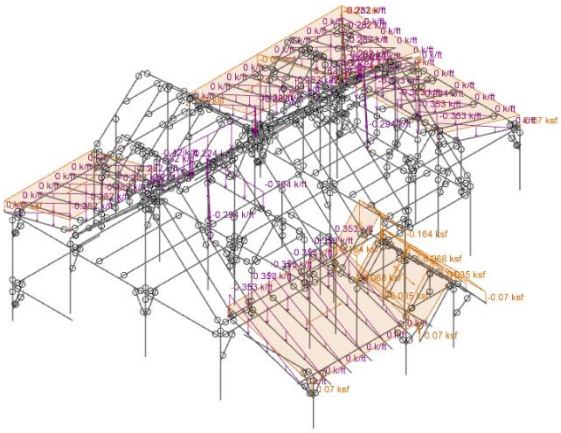
Applied Dead Load



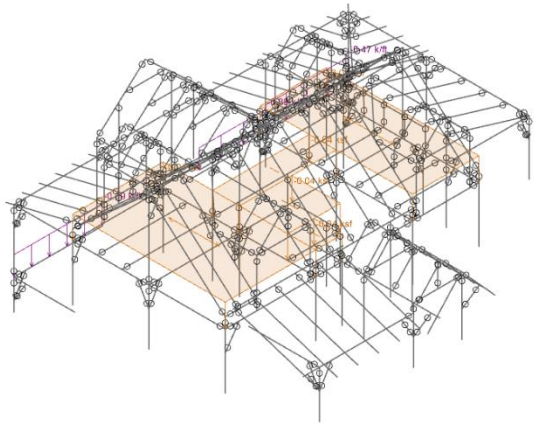
Applied Roof Live Load



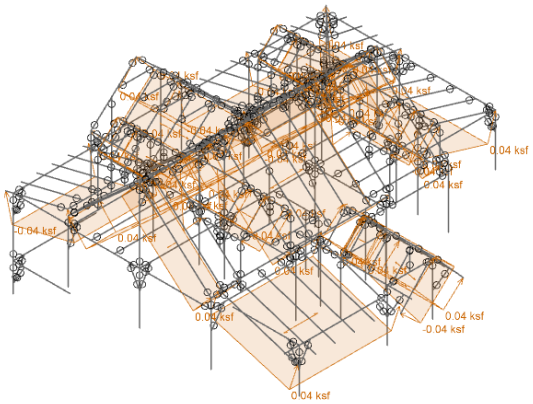
Applied Snow Load



Applied Snow Drift Load

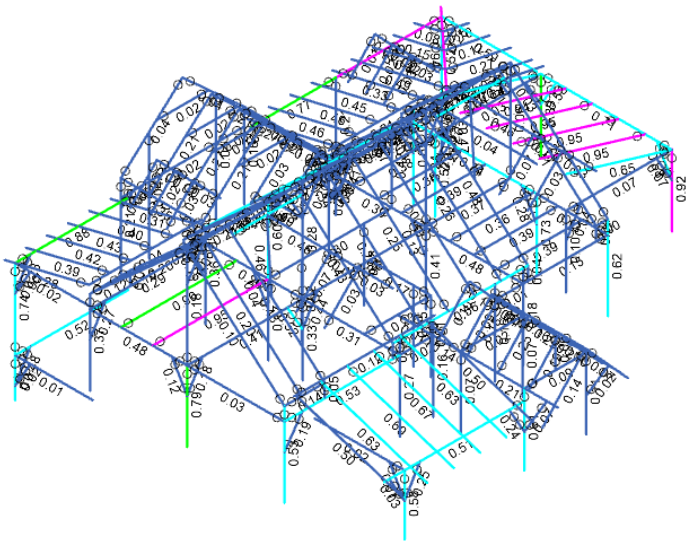


Applied Floor Live Load

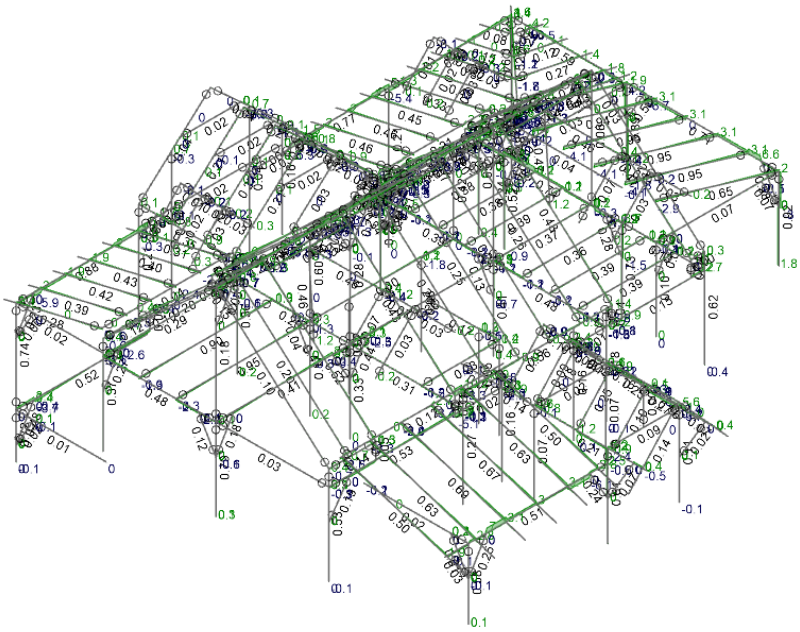


Applied Wind Load (Worst Case)

5.3 MOMENT BENDING CAPACITY CHECK

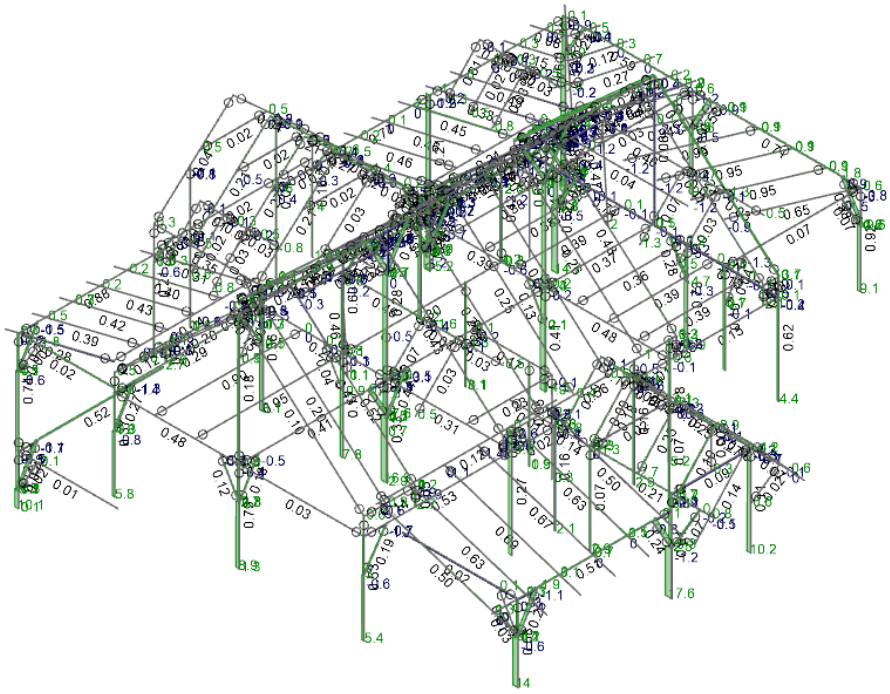


5.4 MAXIMUM MEMBER SHEAR FORCE – "Y" DIRECTION



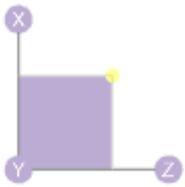
5.5 MAXIMUM MEMBER AXIAL FORCE

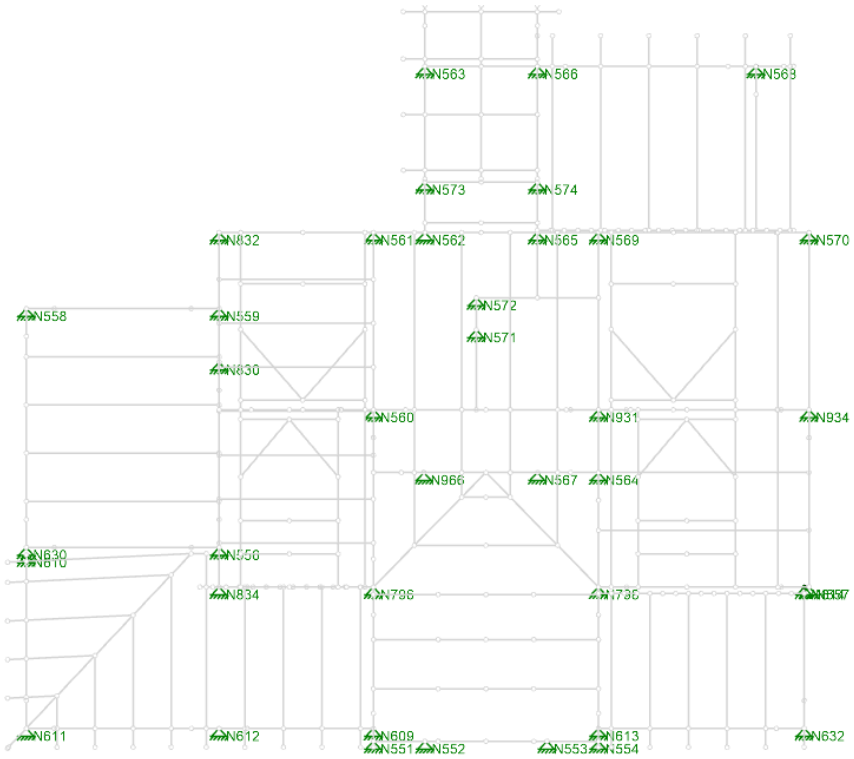
- (Compression = GREEN, Tension = BLUE)



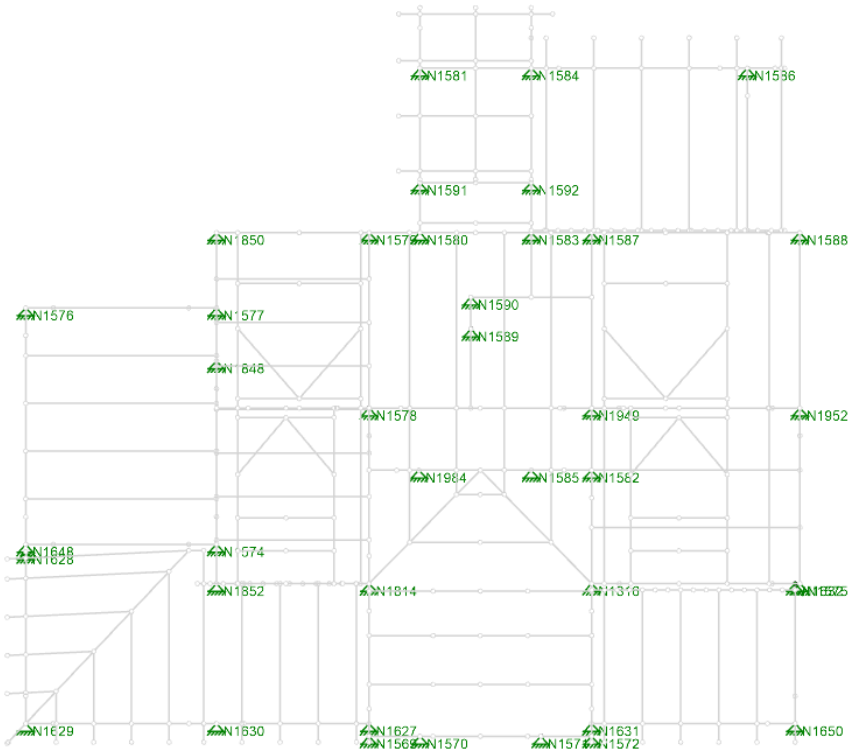
5.6 POST BASE REACTION

Case 1 (Wind Downward)

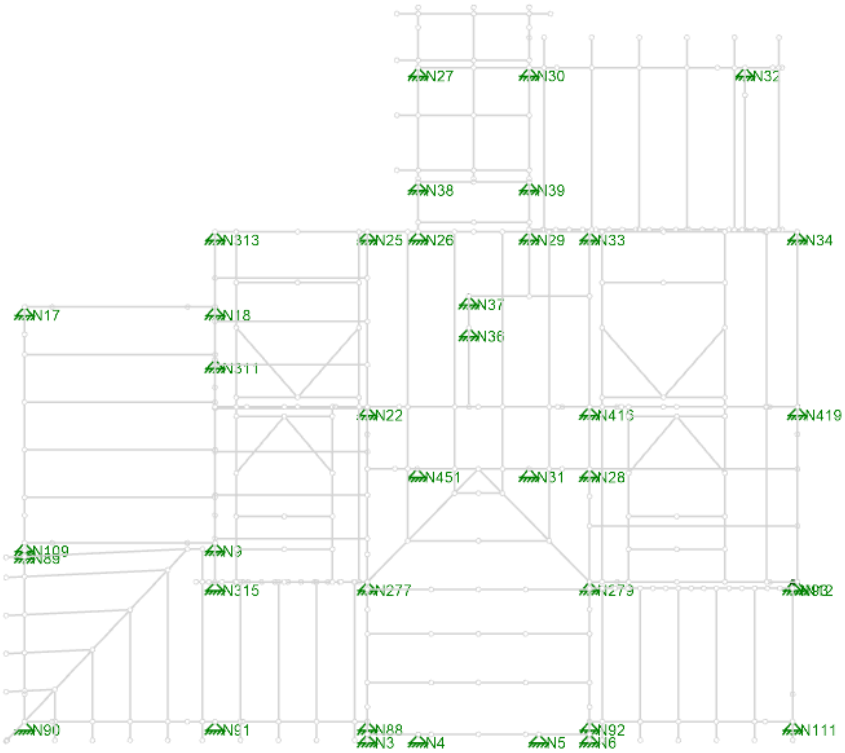




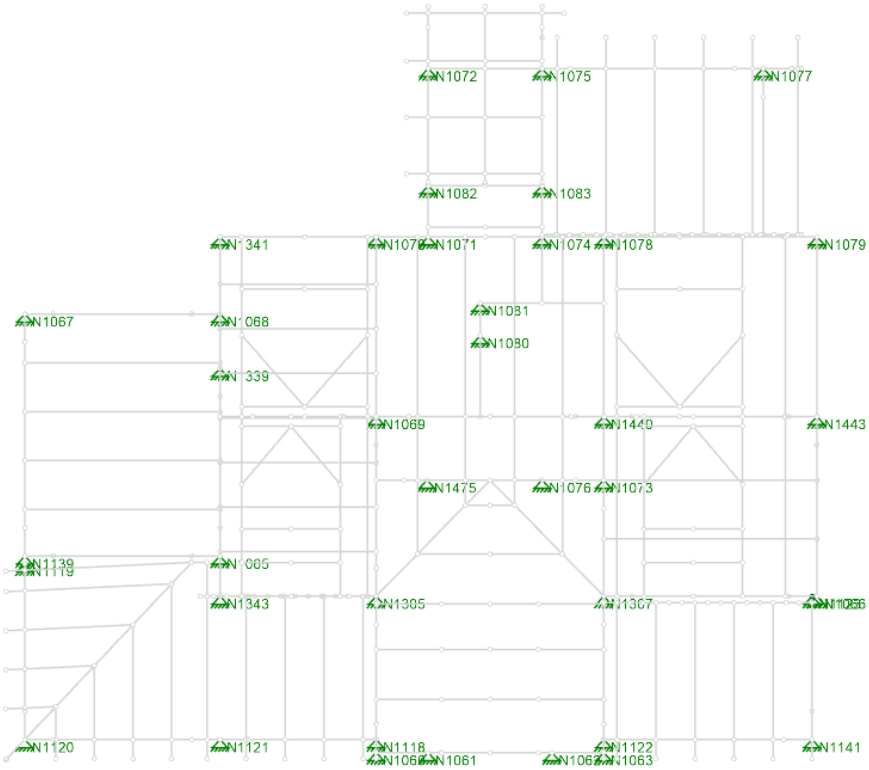
Case 2 (Wind Downward + Snow Drift)



Case 3 (Wind Upward)



Case 4 (Wind Upward + Snow Drift)



RISA A NEMETSCHEK COMPANY

Company : TGE
Designer : BM
Job Number : 23-22846
Model Name : Shanley

5/13/2024
3:04:00 PM
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Load Combinations

	Description	Solve	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	ASCE ASD 1		DL	1										
2	ASCE ASD 2		DL	1	LL	1	LLS	1						
3	ASCE ASD 3 (a)		DL	1	RLL	1								
4	ASCE ASD 3 (b)		DL	1	SL	1	SLN	1						
5	ASCE ASD 4 (a)		DL	1	LL	0.75	LLS	0.75	RLL	0.75				
6	ASCE ASD 4 (b)		DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75		
7	ASCE ASD 5 (a)		DL	1	WL	0.6								
8	ASCE ASD 6 (a)		DL	1	WL	0.45	LL	0.75	LLS	0.75	RLL	0.75		
9	ASCE ASD 6 (b)		DL	1	WL	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
10	ASCE ASD 6 (c)		DL	1	WL	0.45	LL	0.75	LLS	0.75				
11	ASCE ASD 7		DL	0.6	WL	0.6								
12	Deflection 1		DL	1										
13	Deflection 2		LL	1										
14	Deflection 3		DL	1	LL	1								
15	IBC 16-1		DL	1.4										
16	IBC 16-2 (a)		DL	1.2	LL	1.6	LLS	1.6	RLL	0.5				
17	IBC 16-2 (b)		DL	1.2	LL	1.6	LLS	1.6	SL	0.5	SLN	0.5		
18	IBC 16-2 (c)		DL	1.2	LL	1.6	LLS	1.6						
19	IBC 16-3 (a)		DL	1.2	RLL	1.6	LL	0.5	LLS	1				
20	IBC 16-3 (c)		DL	1.2	SL	1.6	SLN	1.6	LL	0.5	LLS	1		
21	Dead Load Only	Yes	DL	1										
22	Snow Load Only	Yes			SL	1								
23	Live Load Only	Yes					LL	1						
24	Wind Load Only	Yes							WL	1				

Node Reactions

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
0	21	N89	0.027	0.096	0	0	0	0
1	21	N90	0.098	3.413	0.364	0	0	0
2	21	N91	0	3.482	-0.065	0	0	0
3	21	N88	0	0.399	-0.17	0	0	0
4	21	N109	0.272	1.633	0.016	0	0	0
5	21	N9	0.208	3.179	-0.042	0	0	0
6	21	N111	0.061	2.607	-0.576	0	0	0
7	21	N92	0	0.586	0.462	0	0	0
8	21	N93	-0.053	0.081	0	0	0	0
9	21	N4	-0.003	0.967	-0.003	0	0	0
10	21	N5	0.003	0.964	-0.002	0	0	0
11	21	N3	0.071	0.738	-0.003	0	0	0
12	21	N6	0.108	0.899	0.006	0	0	0
13	21	N27	0.066	2.001	0	0	0	0
14	21	N30	0.046	3.27	0.312	0	0	0
15	21	N32	-0.05	2.606	-0.292	0	0	0
16	21	N34	0.027	2.528	-0.238	0	0	0
17	21	N17	-0.271	1.692	0.063	0	0	0
18	21	N18	-0.001	1.298	0.007	0	0	0
19	21	N39	0	0.519	0	0	0	0
20	21	N22	-0.148	7.13	-0.001	0	0	0
21	21	N25	0.015	2.578	0.005	0	0	0
22	21	N26	0.013	1.283	0.004	0	0	0
23	21	N28	0.003	3.126	0.001	0	0	0
24	21	N29	-0.007	0.652	0.035	0	0	0
25	21	N31	0	0.115	0	0	0	0
26	21	N33	-0.004	4	0.033	0	0	0

RISA A NEMETSCHEK COMPANY

Company : TGE
Designer : BM
Job Number : 23-22846
Model Name : Shanley

5/13/2024
3:04:00 PM
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Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
27	21	N36	0	0.787	0	0	0	0
28	21	N37	0	0.138	0	0	0	0
29	21	N38	0	0.51	0	0	0	0
30	21	N277	0.106	3.532	0.019	0	0	0
31	21	N279	-0.093	4.244	0.259	0	0	0
32	21	N311	-0.193	2.023	0	0	0	0
33	21	N313	0.091	2.076	0.008	0	0	0
34	21	N315	-0.098	0.254	0.005	0	0	0
35	21	N416	0	7.801	0.018	0	0	0
36	21	N419	-0.1	4.043	-0.134	0	0	0
37	21	N451	0	1.249	0	0	0	0
38	21	N12	-0.02	2.919	-0.463	0	0	0
39	21	N551	0.071	0.738	-0.003	0	0	0
40	21	N552	-0.003	0.967	-0.003	0	0	0
41	21	N553	0.003	0.964	-0.002	0	0	0
42	21	N554	0.108	0.899	0.006	0	0	0
43	21	N556	0.208	3.179	-0.042	0	0	0
44	21	N557	-0.02	2.916	-0.462	0	0	0
45	21	N558	-0.271	1.692	0.063	0	0	0
46	21	N559	-0.001	1.298	0.007	0	0	0
47	21	N560	-0.148	7.13	-0.001	0	0	0
48	21	N561	0.015	2.578	0.005	0	0	0
49	21	N562	0.013	1.282	0.004	0	0	0
50	21	N563	0.066	2.001	0	0	0	0
51	21	N564	0.003	3.126	0.001	0	0	0
52	21	N565	-0.007	0.652	0.035	0	0	0
53	21	N566	0.046	3.27	0.312	0	0	0
54	21	N567	0	0.115	0	0	0	0
55	21	N568	-0.05	2.606	-0.292	0	0	0
56	21	N569	-0.004	4	0.033	0	0	0
57	21	N570	0.027	2.528	-0.238	0	0	0
58	21	N571	0	0.787	0	0	0	0
59	21	N572	0	0.138	0	0	0	0
60	21	N573	0	0.51	0	0	0	0
61	21	N574	0	0.519	0	0	0	0
62	21	N609	0	0.399	-0.17	0	0	0
63	21	N610	0.027	0.096	0	0	0	0
64	21	N611	0.098	3.413	0.364	0	0	0
65	21	N612	0	3.482	-0.065	0	0	0
66	21	N613	0	0.586	0.462	0	0	0
67	21	N614	-0.053	0.081	0	0	0	0
68	21	N630	0.272	1.633	0.016	0	0	0
69	21	N632	0.061	2.607	-0.576	0	0	0
70	21	N796	0.106	3.532	0.019	0	0	0
71	21	N798	-0.093	4.247	0.259	0	0	0
72	21	N830	-0.193	2.023	0	0	0	0
73	21	N832	0.091	2.076	0.008	0	0	0
74	21	N834	-0.098	0.254	0.005	0	0	0
75	21	N931	0	7.803	0.018	0	0	0
76	21	N934	-0.1	4.041	-0.134	0	0	0
77	21	N966	0	1.249	0	0	0	0
78	21	N1060	0.071	0.738	-0.003	0	0	0
79	21	N1061	-0.003	0.967	-0.003	0	0	0
80	21	N1062	0.003	0.964	-0.002	0	0	0
81	21	N1063	0.108	0.899	0.006	0	0	0

RISA A NEMETSCHEK COMPANY

Company : TGE
Designer : BM
Job Number : 23-22846
Model Name : Shanley

5/13/2024
3:04:00 PM
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Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
82	21	N1065	0.207	3.179	-0.042	0	0	0
83	21	N1066	-0.02	2.916	-0.462	0	0	0
84	21	N1067	-0.271	1.692	0.063	0	0	0
85	21	N1068	-0.001	1.298	0.007	0	0	0
86	21	N1069	-0.148	7.13	-0.001	0	0	0
87	21	N1070	0.015	2.578	0.005	0	0	0
88	21	N1071	0.013	1.282	0.004	0	0	0
89	21	N1072	0.066	2.001	0	0	0	0
90	21	N1073	0.003	3.126	0.001	0	0	0
91	21	N1074	-0.007	0.652	0.035	0	0	0
92	21	N1075	0.046	3.27	0.312	0	0	0
93	21	N1076	0	0.115	0	0	0	0
94	21	N1077	-0.05	2.606	-0.292	0	0	0
95	21	N1078	-0.004	4	0.033	0	0	0
96	21	N1079	0.027	2.528	-0.238	0	0	0
97	21	N1080	0	0.787	0	0	0	0
98	21	N1081	0	0.138	0	0	0	0
99	21	N1082	0	0.51	0	0	0	0
100	21	N1083	0	0.519	0	0	0	0
101	21	N1118	0	0.399	-0.293	0	0	0
102	21	N1119	0.024	0.096	0	0	0	0
103	21	N1120	0.097	3.293	0.361	0	0	0
104	21	N1121	0	3.569	-0.067	0	0	0
105	21	N1122	0	0.586	0.462	0	0	0
106	21	N1123	-0.053	0.081	0	0	0	0
107	21	N1139	0.272	1.633	0.016	0	0	0
108	21	N1141	0.061	2.607	-0.576	0	0	0
109	21	N1305	0.106	3.532	0.019	0	0	0
110	21	N1307	-0.093	4.247	0.259	0	0	0
111	21	N1339	-0.193	2.023	0	0	0	0
112	21	N1341	0.091	2.076	0.008	0	0	0
113	21	N1343	-0.098	0.254	0.005	0	0	0
114	21	N1440	0	7.803	0.018	0	0	0
115	21	N1443	-0.1	4.041	-0.134	0	0	0
116	21	N1475	0	1.249	0	0	0	0
117	21	N1569	0.071	0.738	-0.003	0	0	0
118	21	N1570	-0.003	0.967	-0.003	0	0	0
119	21	N1571	0.003	0.964	-0.002	0	0	0
120	21	N1572	0.108	0.899	0.006	0	0	0
121	21	N1574	0.207	3.179	-0.042	0	0	0
122	21	N1575	-0.02	2.916	-0.462	0	0	0
123	21	N1576	-0.271	1.692	0.063	0	0	0
124	21	N1577	-0.001	1.298	0.007	0	0	0
125	21	N1578	-0.148	7.132	-0.001	0	0	0
126	21	N1579	0.015	2.578	0.005	0	0	0
127	21	N1580	0.013	1.282	0.004	0	0	0
128	21	N1581	0.066	2.001	0	0	0	0
129	21	N1582	0.003	3.126	0.001	0	0	0
130	21	N1583	-0.007	0.652	0.035	0	0	0
131	21	N1584	0.046	3.27	0.312	0	0	0
132	21	N1585	0	0.115	0	0	0	0
133	21	N1586	-0.05	2.606	-0.292	0	0	0
134	21	N1587	-0.004	4	0.033	0	0	0
135	21	N1588	0.027	2.528	-0.238	0	0	0
136	21	N1589	0	0.787	0	0	0	0

RISA A NEMETSCHEK COMPANY

Company : TGE
Designer : BM
Job Number : 23-22846
Model Name : Shanley

5/13/2024
3:04:00 PM
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Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
137	21	N1590	0	0.138	0	0	0	0
138	21	N1591	0	0.51	0	0	0	0
139	21	N1592	0	0.519	0	0	0	0
140	21	N1627	0	0.399	-0.293	0	0	0
141	21	N1628	0.024	0.096	0	0	0	0
142	21	N1629	0.097	3.293	0.361	0	0	0
143	21	N1630	0	3.569	-0.067	0	0	0
144	21	N1631	0	0.586	0.462	0	0	0
145	21	N1632	-0.053	0.081	0	0	0	0
146	21	N1648	0.272	1.633	0.016	0	0	0
147	21	N1650	0.061	2.607	-0.576	0	0	0
148	21	N1814	0.106	3.533	0.019	0	0	0
149	21	N1816	-0.093	4.247	0.259	0	0	0
150	21	N1848	-0.193	2.023	0	0	0	0
151	21	N1850	0.091	2.076	0.008	0	0	0
152	21	N1852	-0.098	0.254	0.005	0	0	0
153	21	N1949	0	7.803	0.018	0	0	0
154	21	N1952	-0.1	4.041	-0.134	0	0	0
155	21	N1984	0	1.249	0	0	0	0
156	21	COG (ft):	X: 98.384	Y: 14.235	Z: 109.069			
157	22	N89	0.383	-0.018	0	0	0	0
158	22	N90	0.044	6.934	0.039	0	0	0
159	22	N91	0	6.086	0.018	0	0	0
160	22	N88	0	-0.022	0.406	0	0	0
161	22	N109	1.106	4.993	-0.072	0	0	0
162	22	N9	0.578	6.771	-0.078	0	0	0
163	22	N111	0.028	4.045	-0.024	0	0	0
164	22	N92	0	-0.008	-0.409	0	0	0
165	22	N93	-0.031	-0.014	0	0	0	0
166	22	N4	-0.005	2.426	-0.018	0	0	0
167	22	N5	0.005	2.393	-0.013	0	0	0
168	22	N3	0.325	2.152	-0.008	0	0	0
169	22	N6	0.386	2.469	0.024	0	0	0
170	22	N27	0.181	6.059	0.001	0	0	0
171	22	N30	0.124	10.92	1.283	0	0	0
172	22	N32	-0.024	7.885	-1.208	0	0	0
173	22	N34	0.063	5.706	-0.55	0	0	0
174	22	N17	-1.104	5.184	0.07	0	0	0
175	22	N18	-0.003	1.403	0.068	0	0	0
176	22	N39	0	1.043	0	0	0	0
177	22	N22	-0.29	20.442	-0.003	0	0	0
178	22	N25	0.021	5.67	0.03	0	0	0
179	22	N26	0.026	4.924	0.027	0	0	0
180	22	N28	0.036	5.917	0.002	0	0	0
181	22	N29	-0.02	3.21	0.066	0	0	0
182	22	N31	0	-0.699	0	0	0	0
183	22	N33	-0.011	8.789	0.07	0	0	0
184	22	N36	0	0.079	0	0	0	0
185	22	N37	0	0.017	0	0	0	0
186	22	N38	0	0.981	0	0	0	0
187	22	N277	0.018	10.633	0.06	0	0	0
188	22	N279	-0.46	13.275	0.56	0	0	0
189	22	N311	-0.498	5.03	0	0	0	0
190	22	N313	0.237	5.173	0.015	0	0	0
191	22	N315	-0.284	0.426	0.013	0	0	0

RISA A NEMETSCHEK COMPANY

Company : TGE
Designer : BM
Job Number : 23-22846
Model Name : Shanley

5/13/2024
3:04:00 PM
Checked By : BC

Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
192	22	N416	0.001	21.695	-0.115	0	0	0
193	22	N419	-0.07	7.943	-0.105	0	0	0
194	22	N451	0	1.515	0	0	0	0
195	22	N12	-0.137	6.457	-1.571	0	0	0
196	22	N551	0.325	2.152	-0.007	0	0	0
197	22	N552	-0.005	2.426	-0.018	0	0	0
198	22	N553	0.005	2.392	-0.013	0	0	0
199	22	N554	0.386	2.47	0.024	0	0	0
200	22	N556	0.578	6.771	-0.078	0	0	0
201	22	N557	-0.137	6.44	-1.568	0	0	0
202	22	N558	-1.104	5.184	0.07	0	0	0
203	22	N559	-0.003	1.403	0.068	0	0	0
204	22	N560	-0.29	20.443	-0.003	0	0	0
205	22	N561	0.021	5.67	0.03	0	0	0
206	22	N562	0.026	4.923	0.027	0	0	0
207	22	N563	0.181	6.059	0.001	0	0	0
208	22	N564	0.036	5.917	0.002	0	0	0
209	22	N565	-0.02	3.21	0.066	0	0	0
210	22	N566	0.124	10.92	1.283	0	0	0
211	22	N567	0	-0.699	0	0	0	0
212	22	N568	-0.024	7.885	-1.208	0	0	0
213	22	N569	-0.011	8.789	0.069	0	0	0
214	22	N570	0.062	5.705	-0.55	0	0	0
215	22	N571	0	0.079	0	0	0	0
216	22	N572	0	0.017	0	0	0	0
217	22	N573	0	0.981	0	0	0	0
218	22	N574	0	1.043	0	0	0	0
219	22	N609	0	-0.022	0.406	0	0	0
220	22	N610	0.383	-0.018	0	0	0	0
221	22	N611	0.044	6.934	0.039	0	0	0
222	22	N612	0	6.086	0.018	0	0	0
223	22	N613	0	-0.008	-0.409	0	0	0
224	22	N614	-0.031	-0.014	0	0	0	0
225	22	N630	1.106	4.992	-0.072	0	0	0
226	22	N632	0.028	4.045	-0.024	0	0	0
227	22	N796	0.018	10.635	0.06	0	0	0
228	22	N798	-0.46	13.291	0.559	0	0	0
229	22	N830	-0.498	5.03	0	0	0	0
230	22	N832	0.237	5.173	0.015	0	0	0
231	22	N834	-0.284	0.427	0.013	0	0	0
232	22	N931	0.001	21.705	-0.115	0	0	0
233	22	N934	-0.07	7.933	-0.105	0	0	0
234	22	N966	0	1.515	0	0	0	0
235	22	N1060	-0.008	-0.045	0.001	0	0	0
236	22	N1061	0	-0.012	-0.001	0	0	0
237	22	N1062	0	-0.014	-0.001	0	0	0
238	22	N1063	-0.006	-0.003	0.001	0	0	0
239	22	N1065	0.674	11.476	-0.018	0	0	0
240	22	N1066	-0.02	0.43	-0.113	0	0	0
241	22	N1067	-1.535	7.451	-0.007	0	0	0
242	22	N1068	0	3.42	-0.013	0	0	0
243	22	N1069	-0.21	5.976	0	0	0	0
244	22	N1070	0.052	1.067	0.065	0	0	0
245	22	N1071	0.04	1.573	0.067	0	0	0
246	22	N1072	0.078	8.24	0	0	0	0

RISA A NEMETSCHEK COMPANY

Company : TGE
Designer : BM
Job Number : 23-22846
Model Name : Shanley

5/13/2024
3:04:00 PM
Checked By : BC

Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
247	22	N1073	-0.022	3.239	0	0	0	0
248	22	N1074	-0.012	1.433	-0.047	0	0	0
249	22	N1075	-0.057	14.353	1.712	0	0	0
250	22	N1076	0	-0.536	0	0	0	0
251	22	N1077	-0.046	11.433	-1.596	0	0	0
252	22	N1078	-0.004	1.346	-0.048	0	0	0
253	22	N1079	0.02	0.562	-0.125	0	0	0
254	22	N1080	0	0.031	0	0	0	0
255	22	N1081	0	0.006	0	0	0	0
256	22	N1082	0	2.28	0	0	0	0
257	22	N1083	0	2.416	0	0	0	0
258	22	N1118	0	-0.03	-0.055	0	0	0
259	22	N1119	0.616	-0.028	0	0	0	0
260	22	N1120	0.068	10.535	0.046	0	0	0
261	22	N1121	-0.001	8.731	0.014	0	0	0
262	22	N1122	0	-0.012	-0.587	0	0	0
263	22	N1123	-0.046	-0.021	0	0	0	0
264	22	N1139	1.535	7.476	-0.005	0	0	0
265	22	N1141	0.042	6.156	-0.036	0	0	0
266	22	N1305	0.175	3.657	0.021	0	0	0
267	22	N1307	-0.015	3.435	0.079	0	0	0
268	22	N1339	-0.681	6.829	0	0	0	0
269	22	N1341	0.283	2.283	0.007	0	0	0
270	22	N1343	-0.305	-0.881	0.011	0	0	0
271	22	N1440	0	4.612	-0.021	0	0	0
272	22	N1443	0.014	1.64	-0.019	0	0	0
273	22	N1475	0	1.127	0	0	0	0
274	22	N1569	-0.008	-0.045	0.001	0	0	0
275	22	N1570	0	-0.012	-0.001	0	0	0
276	22	N1571	0	-0.014	-0.001	0	0	0
277	22	N1572	-0.006	-0.003	0.001	0	0	0
278	22	N1574	0.674	11.476	-0.018	0	0	0
279	22	N1575	-0.02	0.43	-0.113	0	0	0
280	22	N1576	-1.535	7.451	-0.007	0	0	0
281	22	N1577	0	3.42	-0.013	0	0	0
282	22	N1578	-0.21	5.976	0	0	0	0
283	22	N1579	0.052	1.067	0.065	0	0	0
284	22	N1580	0.04	1.573	0.067	0	0	0
285	22	N1581	0.078	8.241	0	0	0	0
286	22	N1582	-0.022	3.239	0	0	0	0
287	22	N1583	-0.012	1.433	-0.047	0	0	0
288	22	N1584	-0.057	14.353	1.712	0	0	0
289	22	N1585	0	-0.536	0	0	0	0
290	22	N1586	-0.046	11.433	-1.596	0	0	0
291	22	N1587	-0.004	1.346	-0.048	0	0	0
292	22	N1588	0.02	0.562	-0.125	0	0	0
293	22	N1589	0	0.031	0	0	0	0
294	22	N1590	0	0.006	0	0	0	0
295	22	N1591	0	2.28	0	0	0	0
296	22	N1592	0	2.416	0	0	0	0
297	22	N1627	0	-0.03	-0.055	0	0	0
298	22	N1628	0.616	-0.028	0	0	0	0
299	22	N1629	0.068	10.535	0.046	0	0	0
300	22	N1630	-0.001	8.731	0.014	0	0	0
301	22	N1631	0	-0.012	-0.587	0	0	0

RISA A NEMETSCHEK COMPANY

Company : TGE
Designer : BM
Job Number : 23-22846
Model Name : Shanley

5/13/2024
3:04:00 PM
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Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
302	22	N1632	-0.046	-0.021	0	0	0	0
303	22	N1648	1.535	7.476	-0.005	0	0	0
304	22	N1650	0.042	6.156	-0.036	0	0	0
305	22	N1814	0.175	3.657	0.021	0	0	0
306	22	N1816	-0.015	3.435	0.079	0	0	0
307	22	N1848	-0.681	6.829	0	0	0	0
308	22	N1850	0.283	2.283	0.007	0	0	0
309	22	N1852	-0.305	-0.881	0.011	0	0	0
310	22	N1949	0	4.612	-0.021	0	0	0
311	22	N1952	0.014	1.64	-0.019	0	0	0
312	22	N1984	0	1.127	0	0	0	0
313	22	COG (ft):	X: 99.931	Y: 15.643	Z: 100.599			
314	23	N89	0.004	0.002	0	0	0	0
315	23	N90	-0.004	3.345	1.443	0	0	0
316	23	N91	0	6.765	-0.325	0	0	0
317	23	N88	0	1.612	-1.118	0	0	0
318	23	N109	0	0.017	0.014	0	0	0
319	23	N9	0.151	2.677	0.011	0	0	0
320	23	N111	-0.018	3.886	-2.252	0	0	0
321	23	N92	0	2.346	2.25	0	0	0
322	23	N93	0.018	0.009	0	0	0	0
323	23	N4	-0.004	0.001	0.004	0	0	0
324	23	N5	0.004	0.013	0.004	0	0	0
325	23	N3	-0.014	-0.089	-0.002	0	0	0
326	23	N6	0.04	0.096	-0.002	0	0	0
327	23	N27	0	0	0	0	0	0
328	23	N30	0	0	0	0	0	0
329	23	N32	0	0	0	0	0	0
330	23	N34	0.021	2.21	-0.293	0	0	0
331	23	N17	0.001	0.084	0.064	0	0	0
332	23	N18	0	1.371	0.062	0	0	0
333	23	N39	0	0	0	0	0	0
334	23	N22	-0.123	3.574	0	0	0	0
335	23	N25	0.015	1.885	-0.003	0	0	0
336	23	N26	0.01	-0.078	-0.005	0	0	0
337	23	N28	-0.004	3.055	0.001	0	0	0
338	23	N29	-0.004	-0.929	0.046	0	0	0
339	23	N31	0	0.474	0	0	0	0
340	23	N33	-0.006	4.432	0.039	0	0	0
341	23	N36	0	1.124	0	0	0	0
342	23	N37	0	0.197	0	0	0	0
343	23	N38	0	0	0	0	0	0
344	23	N277	0.183	1.287	0.008	0	0	0
345	23	N279	0.052	1.275	0.167	0	0	0
346	23	N311	-0.122	1.291	0	0	0	0
347	23	N313	0.052	0.874	0.01	0	0	0
348	23	N315	-0.051	-0.3	0.007	0	0	0
349	23	N416	0	5.869	0.187	0	0	0
350	23	N419	-0.226	4.267	-0.37	0	0	0
351	23	N451	0	1.406	0	0	0	0
352	23	N12	0.04	1.959	-0.131	0	0	0
353	23	N551	-0.014	-0.089	-0.002	0	0	0
354	23	N552	-0.004	0.001	0.004	0	0	0
355	23	N553	0.004	0.013	0.004	0	0	0
356	23	N554	0.04	0.096	-0.002	0	0	0

RISA A NEMETSCHEK COMPANY

Company : TGE
Designer : BM
Job Number : 23-22846
Model Name : Shanley

5/13/2024
3:04:00 PM
Checked By : BC

Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
357	23	N556	0.151	2.677	0.011	0	0	0
358	23	N557	0.04	1.959	-0.131	0	0	0
359	23	N558	0.001	0.084	0.064	0	0	0
360	23	N559	0	1.371	0.062	0	0	0
361	23	N560	-0.123	3.574	0	0	0	0
362	23	N561	0.015	1.885	-0.003	0	0	0
363	23	N562	0.01	-0.078	-0.005	0	0	0
364	23	N563	0	0	0	0	0	0
365	23	N564	-0.004	3.055	0.001	0	0	0
366	23	N565	-0.004	-0.929	0.046	0	0	0
367	23	N566	0	0	0	0	0	0
368	23	N567	0	0.474	0	0	0	0
369	23	N568	0	0	0	0	0	0
370	23	N569	-0.006	4.432	0.039	0	0	0
371	23	N570	0.021	2.21	-0.293	0	0	0
372	23	N571	0	1.124	0	0	0	0
373	23	N572	0	0.197	0	0	0	0
374	23	N573	0	0	0	0	0	0
375	23	N574	0	0	0	0	0	0
376	23	N609	0	1.612	-1.118	0	0	0
377	23	N610	0.004	0.002	0	0	0	0
378	23	N611	-0.004	3.345	1.443	0	0	0
379	23	N612	0	6.765	-0.325	0	0	0
380	23	N613	0	2.346	2.25	0	0	0
381	23	N614	0.018	0.009	0	0	0	0
382	23	N630	0	0.017	0.014	0	0	0
383	23	N632	-0.018	3.886	-2.252	0	0	0
384	23	N796	0.183	1.287	0.008	0	0	0
385	23	N798	0.052	1.275	0.167	0	0	0
386	23	N830	-0.122	1.291	0	0	0	0
387	23	N832	0.052	0.874	0.01	0	0	0
388	23	N834	-0.051	-0.3	0.007	0	0	0
389	23	N931	0	5.869	0.187	0	0	0
390	23	N934	-0.226	4.267	-0.37	0	0	0
391	23	N966	0	1.406	0	0	0	0
392	23	N1060	-0.014	-0.089	-0.002	0	0	0
393	23	N1061	-0.004	0.001	0.004	0	0	0
394	23	N1062	0.004	0.013	0.004	0	0	0
395	23	N1063	0.04	0.096	-0.002	0	0	0
396	23	N1065	0.151	2.677	0.011	0	0	0
397	23	N1066	0.04	1.959	-0.131	0	0	0
398	23	N1067	0.001	0.084	0.064	0	0	0
399	23	N1068	0	1.371	0.062	0	0	0
400	23	N1069	-0.123	3.574	0	0	0	0
401	23	N1070	0.015	1.885	-0.003	0	0	0
402	23	N1071	0.01	-0.078	-0.005	0	0	0
403	23	N1072	0	0	0	0	0	0
404	23	N1073	-0.004	3.055	0.001	0	0	0
405	23	N1074	-0.004	-0.929	0.046	0	0	0
406	23	N1075	0	0	0	0	0	0
407	23	N1076	0	0.474	0	0	0	0
408	23	N1077	0	0	0	0	0	0
409	23	N1078	-0.006	4.432	0.039	0	0	0
410	23	N1079	0.021	2.21	-0.293	0	0	0
411	23	N1080	0	1.124	0	0	0	0

RISA A NEMETSCHEK COMPANY

Company : TGE
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Job Number : 23-22846
Model Name : Shanley

5/13/2024
3:04:00 PM
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Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
412	23	N1081	0	0.197	0	0	0	0
413	23	N1082	0	0	0	0	0	0
414	23	N1083	0	0	0	0	0	0
415	23	N1118	0	1.612	-1.119	0	0	0
416	23	N1119	0.004	0.002	0	0	0	0
417	23	N1120	-0.004	3.344	1.443	0	0	0
418	23	N1121	0	6.766	-0.325	0	0	0
419	23	N1122	0	2.346	2.25	0	0	0
420	23	N1123	0.018	0.009	0	0	0	0
421	23	N1139	0	0.017	0.014	0	0	0
422	23	N1141	-0.018	3.886	-2.252	0	0	0
423	23	N1305	0.183	1.287	0.008	0	0	0
424	23	N1307	0.052	1.275	0.167	0	0	0
425	23	N1339	-0.122	1.291	0	0	0	0
426	23	N1341	0.052	0.874	0.01	0	0	0
427	23	N1343	-0.051	-0.3	0.007	0	0	0
428	23	N1440	0	5.869	0.187	0	0	0
429	23	N1443	-0.226	4.267	-0.37	0	0	0
430	23	N1475	0	1.406	0	0	0	0
431	23	N1569	-0.014	-0.089	-0.002	0	0	0
432	23	N1570	-0.004	0.001	0.004	0	0	0
433	23	N1571	0.004	0.013	0.004	0	0	0
434	23	N1572	0.04	0.096	-0.002	0	0	0
435	23	N1574	0.151	2.677	0.011	0	0	0
436	23	N1575	0.04	1.959	-0.131	0	0	0
437	23	N1576	0.001	0.084	0.064	0	0	0
438	23	N1577	0	1.371	0.062	0	0	0
439	23	N1578	-0.123	3.574	0	0	0	0
440	23	N1579	0.015	1.885	-0.003	0	0	0
441	23	N1580	0.01	-0.078	-0.005	0	0	0
442	23	N1581	0	0	0	0	0	0
443	23	N1582	-0.004	3.055	0.001	0	0	0
444	23	N1583	-0.004	-0.929	0.046	0	0	0
445	23	N1584	0	0	0	0	0	0
446	23	N1585	0	0.474	0	0	0	0
447	23	N1586	0	0	0	0	0	0
448	23	N1587	-0.006	4.432	0.039	0	0	0
449	23	N1588	0.021	2.21	-0.293	0	0	0
450	23	N1589	0	1.124	0	0	0	0
451	23	N1590	0	0.197	0	0	0	0
452	23	N1591	0	0	0	0	0	0
453	23	N1592	0	0	0	0	0	0
454	23	N1627	0	1.612	-1.119	0	0	0
455	23	N1628	0.004	0.002	0	0	0	0
456	23	N1629	-0.004	3.344	1.443	0	0	0
457	23	N1630	0	6.766	-0.325	0	0	0
458	23	N1631	0	2.346	2.25	0	0	0
459	23	N1632	0.018	0.009	0	0	0	0
460	23	N1648	0	0.017	0.014	0	0	0
461	23	N1650	-0.018	3.886	-2.252	0	0	0
462	23	N1814	0.183	1.287	0.008	0	0	0
463	23	N1816	0.052	1.275	0.167	0	0	0
464	23	N1848	-0.122	1.291	0	0	0	0
465	23	N1850	0.052	0.874	0.01	0	0	0
466	23	N1852	-0.051	-0.3	0.007	0	0	0

RISA A NEMETSCHEK COMPANY

Company : TGE
Designer : BM
Job Number : 23-22846
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5/13/2024
3:04:00 PM
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Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
467	23	N1949	0	5.869	0.187	0	0	0
468	23	N1952	-0.226	4.267	-0.37	0	0	0
469	23	N1984	0	1.406	0	0	0	0
470	23	COG (ft):	X: 93.267	Y: 7.756	Z: 110.162			
471	24	N89	-0.221	0.01	0	0	0	0
472	24	N90	-0.025	-3.943	-0.022	0	0	0
473	24	N91	0	-3.572	-0.01	0	0	0
474	24	N88	0	0.013	-0.236	0	0	0
475	24	N109	-0.551	-2.305	0.171	0	0	0
476	24	N9	-0.302	-3.845	0.174	0	0	0
477	24	N111	-0.016	-2.366	0.014	0	0	0
478	24	N92	0	0.005	0.241	0	0	0
479	24	N93	0.018	0.008	0	0	0	0
480	24	N4	0.013	-0.736	-0.001	0	0	0
481	24	N5	-0.013	-0.746	-0.001	0	0	0
482	24	N3	-0.174	-1.208	0.001	0	0	0
483	24	N6	-0.345	-1.767	0	0	0	0
484	24	N27	-0.084	-2.362	0.001	0	0	0
485	24	N30	-0.089	-5.095	-0.649	0	0	0
486	24	N32	-0.002	-3.569	0.795	0	0	0
487	24	N34	0.011	-3.467	0.504	0	0	0
488	24	N17	0.553	-2.044	0.369	0	0	0
489	24	N18	0.002	-1.368	0.37	0	0	0
490	24	N39	0	-0.387	0	0	0	0
491	24	N22	0.118	-3.889	0.004	0	0	0
492	24	N25	0.029	-3.028	0.056	0	0	0
493	24	N26	-0.036	-3.233	0.055	0	0	0
494	24	N28	-0.295	-3.749	-0.001	0	0	0
495	24	N29	0.056	-2.312	-0.024	0	0	0
496	24	N31	0	0.496	0	0	0	0
497	24	N33	0.024	-4.83	-0.04	0	0	0
498	24	N36	0	0.238	0	0	0	0
499	24	N37	0	-0.101	0	0	0	0
500	24	N38	0	-0.39	0	0	0	0
501	24	N277	-0.239	-5.458	-0.002	0	0	0
502	24	N279	-0.059	-6.941	-0.299	0	0	0
503	24	N311	0.225	-2.424	0	0	0	0
504	24	N313	-0.089	-2.618	-0.001	0	0	0
505	24	N315	0.132	-0.423	0.014	0	0	0
506	24	N416	-0.001	-2.989	0.344	0	0	0
507	24	N419	-0.135	-1.866	0.285	0	0	0
508	24	N451	0	-1.076	0	0	0	0
509	24	N12	0.037	-4.041	0.861	0	0	0
510	24	N551	0.083	0.574	-0.001	0	0	0
511	24	N552	-0.006	0.349	0	0	0	0
512	24	N553	0.006	0.354	0	0	0	0
513	24	N554	0.164	0.839	0	0	0	0
514	24	N556	0.144	1.827	-0.083	0	0	0
515	24	N557	-0.017	1.912	-0.408	0	0	0
516	24	N558	-0.263	0.971	-0.175	0	0	0
517	24	N559	-0.001	0.65	-0.176	0	0	0
518	24	N560	-0.056	1.848	-0.002	0	0	0
519	24	N561	-0.014	1.439	-0.026	0	0	0
520	24	N562	0.017	1.535	-0.026	0	0	0
521	24	N563	0.04	1.122	0	0	0	0

RISA A NEMETSCHEK COMPANY

Company : TGE
Designer : BM
Job Number : 23-22846
Model Name : Shanley

5/13/2024
3:04:00 PM
Checked By : BC

Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
522	24	N564	0.14	1.781	0	0	0	0
523	24	N565	-0.027	1.098	0.011	0	0	0
524	24	N566	0.042	2.42	0.308	0	0	0
525	24	N567	0	-0.236	0	0	0	0
526	24	N568	0.001	1.695	-0.378	0	0	0
527	24	N569	-0.011	2.294	0.019	0	0	0
528	24	N570	-0.005	1.647	-0.239	0	0	0
529	24	N571	0	-0.113	0	0	0	0
530	24	N572	0	0.048	0	0	0	0
531	24	N573	0	0.185	0	0	0	0
532	24	N574	0	0.184	0	0	0	0
533	24	N609	0	-0.006	0.112	0	0	0
534	24	N610	0.105	-0.005	0	0	0	0
535	24	N611	0.012	1.873	0.01	0	0	0
536	24	N612	0	1.697	0.005	0	0	0
537	24	N613	0	-0.002	-0.114	0	0	0
538	24	N614	-0.009	-0.004	0	0	0	0
539	24	N630	0.261	1.095	-0.081	0	0	0
540	24	N632	0.008	1.124	-0.007	0	0	0
541	24	N796	0.114	2.593	0.001	0	0	0
542	24	N798	0.028	3.303	0.142	0	0	0
543	24	N830	-0.107	1.151	0	0	0	0
544	24	N832	0.042	1.243	0.001	0	0	0
545	24	N834	-0.063	0.201	-0.007	0	0	0
546	24	N931	0	1.424	-0.163	0	0	0
547	24	N934	0.064	0.882	-0.135	0	0	0
548	24	N966	0	0.511	0	0	0	0
549	24	N1060	-0.174	-1.208	0.001	0	0	0
550	24	N1061	0.013	-0.736	-0.001	0	0	0
551	24	N1062	-0.013	-0.746	-0.001	0	0	0
552	24	N1063	-0.345	-1.767	0	0	0	0
553	24	N1065	-0.302	-3.845	0.174	0	0	0
554	24	N1066	0.036	-4.026	0.859	0	0	0
555	24	N1067	0.553	-2.044	0.369	0	0	0
556	24	N1068	0.002	-1.368	0.37	0	0	0
557	24	N1069	0.118	-3.89	0.004	0	0	0
558	24	N1070	0.029	-3.029	0.056	0	0	0
559	24	N1071	-0.036	-3.233	0.055	0	0	0
560	24	N1072	-0.084	-2.362	0.001	0	0	0
561	24	N1073	-0.295	-3.749	-0.001	0	0	0
562	24	N1074	0.056	-2.312	-0.024	0	0	0
563	24	N1075	-0.089	-5.095	-0.649	0	0	0
564	24	N1076	0	0.496	0	0	0	0
565	24	N1077	-0.002	-3.569	0.795	0	0	0
566	24	N1078	0.024	-4.83	-0.04	0	0	0
567	24	N1079	0.011	-3.467	0.504	0	0	0
568	24	N1080	0	0.238	0	0	0	0
569	24	N1081	0	-0.101	0	0	0	0
570	24	N1082	0	-0.39	0	0	0	0
571	24	N1083	0	-0.387	0	0	0	0
572	24	N1118	0	0.013	0.019	0	0	0
573	24	N1119	-0.215	0.01	0	0	0	0
574	24	N1120	-0.024	-3.733	-0.015	0	0	0
575	24	N1121	0	-3.754	-0.005	0	0	0
576	24	N1122	0	0.005	0.241	0	0	0

RISA A NEMETSCHEK COMPANY

Company : TGE
Designer : BM
Job Number : 23-22846
Model Name : Shanley

5/13/2024
3:04:00 PM
Checked By : BC

Node Reactions (Continued)

	LC	Node Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
577	24	N1123	0.018	0.008	0	0	0	0
578	24	N1139	-0.551	-2.305	0.171	0	0	0
579	24	N1141	-0.016	-2.366	0.014	0	0	0
580	24	N1305	-0.239	-5.46	-0.002	0	0	0
581	24	N1307	-0.059	-6.953	-0.299	0	0	0
582	24	N1339	0.225	-2.423	0	0	0	0
583	24	N1341	-0.089	-2.618	-0.001	0	0	0
584	24	N1343	0.132	-0.423	0.014	0	0	0
585	24	N1440	-0.001	-2.998	0.344	0	0	0
586	24	N1443	-0.135	-1.858	0.285	0	0	0
587	24	N1475	0	-1.075	0	0	0	0
588	24	N1569	0.082	0.574	-0.001	0	0	0
589	24	N1570	-0.006	0.349	0	0	0	0
590	24	N1571	0.006	0.354	0	0	0	0
591	24	N1572	0.164	0.839	0	0	0	0
592	24	N1574	0.143	1.827	-0.083	0	0	0
593	24	N1575	-0.017	1.912	-0.408	0	0	0
594	24	N1576	-0.263	0.971	-0.175	0	0	0
595	24	N1577	-0.001	0.65	-0.176	0	0	0
596	24	N1578	-0.056	1.855	-0.002	0	0	0
597	24	N1579	-0.014	1.438	-0.026	0	0	0
598	24	N1580	0.017	1.535	-0.026	0	0	0
599	24	N1581	0.04	1.122	0	0	0	0
600	24	N1582	0.14	1.781	0	0	0	0
601	24	N1583	-0.027	1.098	0.011	0	0	0
602	24	N1584	0.042	2.42	0.308	0	0	0
603	24	N1585	0	-0.235	0	0	0	0
604	24	N1586	0.001	1.695	-0.378	0	0	0
605	24	N1587	-0.011	2.294	0.019	0	0	0
606	24	N1588	-0.005	1.647	-0.239	0	0	0
607	24	N1589	0	-0.113	0	0	0	0
608	24	N1590	0	0.048	0	0	0	0
609	24	N1591	0	0.185	0	0	0	0
610	24	N1592	0	0.184	0	0	0	0
611	24	N1627	0	-0.006	-0.009	0	0	0
612	24	N1628	0.102	-0.005	0	0	0	0
613	24	N1629	0.011	1.773	0.007	0	0	0
614	24	N1630	0	1.783	0.002	0	0	0
615	24	N1631	0	-0.002	-0.114	0	0	0
616	24	N1632	-0.009	-0.004	0	0	0	0
617	24	N1648	0.261	1.095	-0.081	0	0	0
618	24	N1650	0.008	1.124	-0.007	0	0	0
619	24	N1814	0.113	2.594	0.001	0	0	0
620	24	N1816	0.028	3.303	0.142	0	0	0
621	24	N1848	-0.107	1.151	0	0	0	0
622	24	N1850	0.042	1.243	0.001	0	0	0
623	24	N1852	-0.063	0.201	-0.007	0	0	0
624	24	N1949	0	1.424	-0.163	0	0	0
625	24	N1952	0.064	0.883	-0.135	0	0	0
626	24	N1984	0	0.511	0	0	0	0
627	24	COG (ft):	X: -111.82	Y: 16.655	Z: 108.242			

6 SOFTWARE PRINTOUTS (EXCEL)

Wood Peg Capacity Calculation			
Per TFEC 2009-01 (incorporated into TFEC 1-2010 Standard for Design of Timber Frame Structures)			
Input			
Peg diameter	D	1	in.
Specific Gravity - Peg	Gp	0.73	
Specific Gravity - Timber	Gt	0.5	
Tenon / mortise width	Lm	2	in.
Mortise side wall thickness	Ls	2	in.
Max. angle of load to grain	Theta	90	deg.
Calculations			
	Fe par	3148.5	psi
	Fe perp	2575.8	psi
	Fe theta	2575.8	psi
Tenon dowel bearing	Fem	3148.5	psi
Mortise dowel bearing	Fes	2575.8	psi
Dowel shear strength	Fyv	2105.2	psi
Bending yield strength - peg	Fyb	17413.3	psi
Constants	Re	1.222	
	k3	1.570	
	Ktheta	1.250	
	Rd(Im,Is)	5	
	Rd(IIIs)	4	
	Rd(V)	3.5	
Yield Mode Values	Z (Im)	1259	lbs.
	Z (Is)	2061	lbs.
	Z (IIIs)	1534	lbs.
	Z (V)	945	lbs.
Nominal Design Capacity	Z	945	lbs.
Load Duration Factor	Cd	1.15	
Allowable Design Capacity	Z'	**1087**	lbs.

TENSION ROD CALCULATION

Wood design values per supplement NDS
Steel design values per AISC 14th Edition

Variable	Value	Definition	Units
F_u	58	Tensile stress of structural steel	ksi
F_y	27	Allowable shear stress of structural steel	ksi
Bolt Size	7/8		
A_s	0.462	Bolt tensile stress area	in^2
AS_s	1.43	Bolt thread stripping area	in^2
AS_n	2.03	Internal bolt thread stripping area	in^2
Species	Douglas Fir-Larch #1		
F_b	1,350	Bending strength of timber	psi
F_t	675	Tension of timber parallel to grain	psi
F_v	170	Shear of timber parallel to grain	psi
F_{cL}	625	Compressive strength of timber perpendicular to grain	psi
F_{cll}	925	Compressive strength of timber parallel to grain	psi
E	1,600	Modulus of elasticity of timber	ksi
C_d	1.15	Load duration factor	
T	3,300	Maximum tension load (RISA)	lbs

Bearing Plate size (washer)

F_{cc}	625.00	psi - Bearing capacity w/ duraction factor	$C_d * F_{cll}$
A	5.28	in^2 - Bearing plate area required	$\frac{T}{F_{cc}}$
W	4.25	in - width of bearing plate	
A_p	18.06	in^2 - Bearing plate area	$W * W$
	GOOD		

Use 4.25" x 4.25" bearing plate or larger.

Rod Specifications

F_{ts}	21.75	ksi - Tension area capacity	$0.375 * F_u$
A_r	0.152	in^2 - Minimum area of rod	$\frac{T}{F_{ts}}$
D_r	**0.44**	in - Diameter of rod	$\sqrt{\frac{4 * A_r}{\pi}}$

Use 7/8" diameter rod or larger.

V_{plane}	16.88	in^2 - Shear plane area required	$\frac{T}{F_v * C_d}$
V_L	**3.97**	in - Mimimum length of shear plane in wood	$\frac{V_{plane}}{W}$

Make rod minimum 4" long from end of timber.

Nut Specifications

T_{all}	26,796	lbf - Allowable tension in rod	$A_s * F_u$
V_{all}	38,610	lbf - Allowable shear in rod	$AS_s * F_y$
l_{thread}	0.09	in - Required thread length	$\frac{T}{V_{all}}$
V_{all_int}	27,405	lbf/in - Allowable shear of initial thread	$AS_n * \frac{F_y}{2}$
l_{thread_nut}	0.12	in - Rquired thread length beyong initial thread	$\frac{T}{V_{all\_int}}$
FS	2	Factor of safety	
L_{thread}	**0.24**	in - Minimum thread engagement	$FS * l_{thread\_nut}$