



MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

7220 Trade Street, Suite 295, San Diego, CA 92121 ▶ p 619-650-0010 ▶ mulhernkulp.com

CALCULATION PACKAGE

April 28, 2023

October 5, 2023 - Revised per Plan Review

Architectural Innovations

3036 67TH Ave. SE

Mercer Island, Washington

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

Prepared By:

Lillian G. Heng, P.E.

Project Engineer

Nick J. Martignetti, P.E.

Associate Owner + San Diego Office Director



Signature, Seal & Date



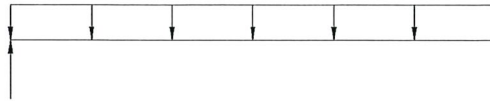
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: TYP. HEADER @ 2ND FLR

B1

PARAMETERS:

L = 5.0 FT
W = 0.483 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 1.207$ K $V_D =$ [] K < $V_{ALL} = 4.460$ K ADEQUATE
 $M_{MAX} = 1.509$ K-FT < $M_{ALL} = 5.166$ K-FT ADEQUATE
 $\Delta_{TL} = 0.010$ IN. $L/999+$ < $L/240$ ADEQUATE

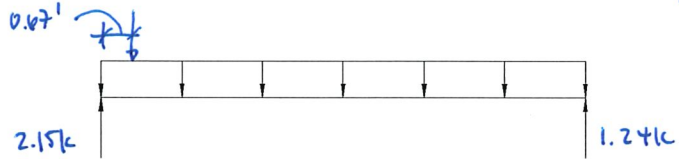
DF-L NO.2 4x10 HDR

BEAM DESCRIPTION: HEADER @ 2ND FLR w/ P.L.

B2

PARAMETERS:

L = 6.0 FT
W = 0.371 KLF
P = 1.173 K



ANALYSIS:

$R_{MAX} = 2.15$ K $V_D =$ [] K < $V_{ALL} = 4.460$ K ADEQUATE
 $M_{MAX} = 2.06$ K-FT < $M_{ALL} = 5.166$ K-FT ADEQUATE
 $\Delta_{TL} = 0.037$ IN. $L/999+$ < $L/240$ ADEQUATE

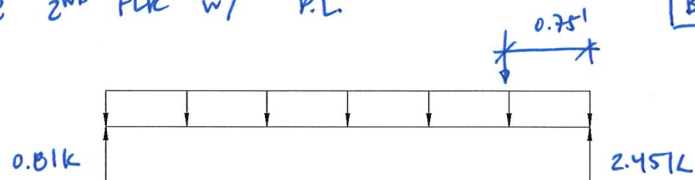
DF-L NO.2 4x10 HDR

BEAM DESCRIPTION: HEADER @ 2ND FLR w/ P.L.

B3

PARAMETERS:

L = 4.0 FT
W = 0.158 KLF
P = 2.621 K



ANALYSIS:

$R_{MAX} = 2.45$ K $V_D =$ [] K < $V_{ALL} = 4.460$ K ADEQUATE
 $M_{MAX} = 4.086$ K-FT < $M_{ALL} = 5.166$ K-FT ADEQUATE
 $\Delta_{TL} = 0.007$ IN. $L/999+$ < $L/240$ ADEQUATE

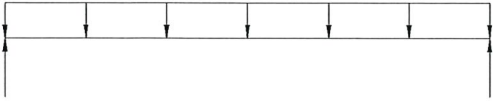
DF-L NO.2 4x10 HDR



BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: INTERIOR HDR @ 2ND FLR | 34

PARAMETERS:
 L = 2.5 FT
 W = 0.613 KLF
 P = N/A K

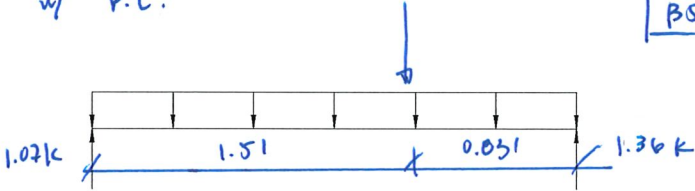


ANALYSIS:
 $R_{MAX} = 0.768$ K $V_D =$ K < $V_{ALL} = 2.657$ K ADEQUATE
 $M_{MAX} = 0.479$ K-FT < $M_{ALL} = 1.979$ K-FT ADEQUATE
 $\Delta_{TL} = 0.007$ IN. $L/999+$ < L/240 ADEQUATE

PF-L NO.2 4x6 HDR

BEAM DESCRIPTION: INT. HEADER w/ P.L. | 35

PARAMETERS:
 L = 2.33 FT
 W = 0.613 KLF
 P = 1.011 K

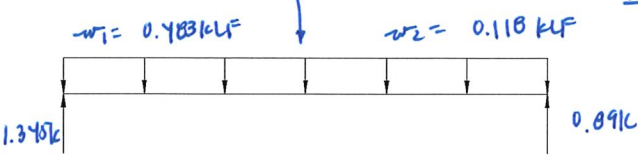


ANALYSIS:
 $R_{MAX} = 1.36$ K $V_D =$ K < $V_{ALL} = 2.657$ K ADEQUATE
 $M_{MAX} = 0.922$ K-FT < $M_{ALL} = 1.979$ K-FT ADEQUATE
 $\Delta_{TL} = 0.009$ IN. $L/999+$ < L/240 ADEQUATE

PF-L NO.2 4x6 HDR

BEAM DESCRIPTION: EXT. HDR @ 2ND FLR w/ P.L. | 36

PARAMETERS:
 L = 5.0 FT
 W = VARIES KLF
 P = 0.721 K



ANALYSIS:
 $R_{MAX} = 1.345$ K $V_D =$ K < $V_{ALL} = 4.460$ K ADEQUATE
 $M_{MAX} = 1.05$ K-FT < $M_{ALL} = 5.146$ K-FT ADEQUATE
 $\Delta_{TL} = 0.02$ IN. $L/999+$ < L/240 ADEQUATE

PF-L NO.2 4x10 HDR



BEAM & HEADER CALCULATIONS

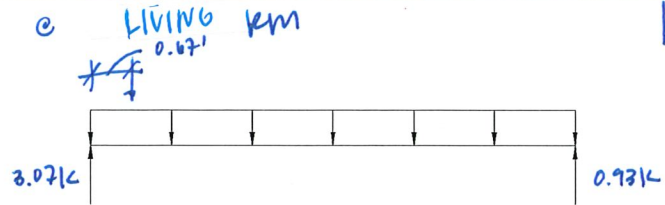
BEAM DESCRIPTION:

HEADER @ LIVING RM

B7

PARAMETERS:

L = 0.25 FT
W = 0.175 KLF
P = 2.553 K



ANALYSIS:

$R_{MAX} = 3.07$ K $V_D =$ [] K $< V_{ALL} = 4.460$ K ADEQUATE
 $M_{MAX} = 2.016$ K-FT $< M_{ALL} = 5.166$ K-FT ADEQUATE
 $\Delta_{TL} = 0.05$ IN. $L/999 \dagger < L/240$ ADEQUATE

PF-L NO.2 4x10 HDK

BEAM DESCRIPTION:

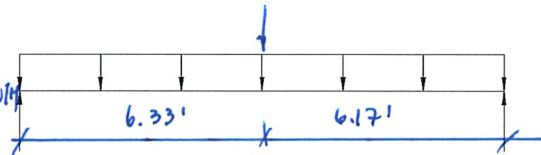
UPPER FOR FRMB - FLUSH BM NEAR ENTRY

B8

PARAMETERS:

L = 12.5 FT
W = 0.420 KLF
P = VARIES K

* SEE EMERCALL
OUTPUTS FOR
HD & OVERSTRENGTH



ANALYSIS:

$R_{MAX} = 3.1$ K $V_D =$ [] K $< V_{ALL} = 12.24$ K ADEQUATE
 $M_{MAX} = 11.1$ K-FT $< M_{ALL} = 35.78$ K-FT ADEQUATE
 $\Delta_{TL} = 0.125$ IN. $L/999 \dagger < L/240$ ADEQUATE

TJ MICROLLAM 2.0E (2) 1.75"x 16" LVL

BEAM DESCRIPTION:

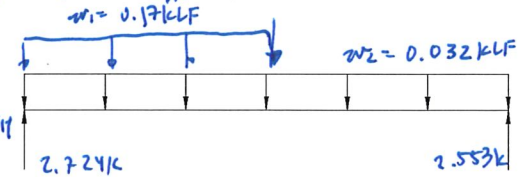
UPPER FOR FRMB - FLUSH BM IN ROOF NEAR ENTRY

B9

PARAMETERS:

L = 6.17 FT
W = VARIES KLF
P = VARIES K

* SEE EMERCALL
OUTPUTS FOR
HD & OVERSTRENGTH



ANALYSIS:

$R_{MAX} = 2.7$ K $V_D =$ [] K $< V_{ALL} = 17.024$ K ADEQUATE
 $M_{MAX} = 7.11$ K-FT $< M_{ALL} = 51.77$ K-FT ADEQUATE
 $\Delta_{TL} = 0.017$ IN. $L/999 \dagger < L/240$ ADEQUATE

TJ MICROLLAM 2.0E (2) 1.75"x 16" LVL



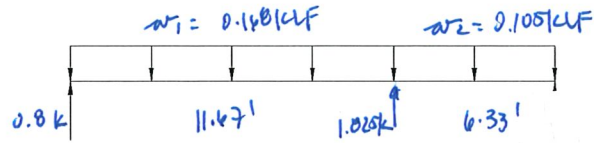
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: CANT'D FLUSH BEAM C ENTRY ROOF

B10

PARAMETERS:

L = VARIES FT
W = VARIES KLF
P = MA K



ANALYSIS:

$R_{MAX} = 1.825$ K $V_D =$ [] K $< V_{ALL} = 3.502$ K ADEQUATE
 $M_{MAX} = -210$ K-FT $< M_{ALL} = 3.438$ K-FT ADEQUATE
 $\Delta_{TL} = 0.225$ IN. $< L/240$ ADEQUATE

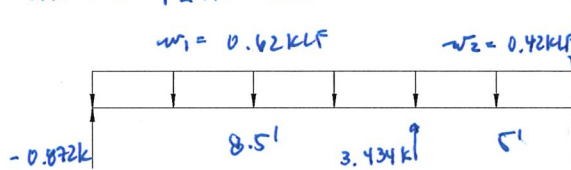
DF-L NO. 2 4x8

BEAM DESCRIPTION: UPPER FLR FRMB - CANT'D FLUSH BM

B11

PARAMETERS:

L = VARIES FT
W = VARIES KLF
P = 1.825 K



ANALYSIS:

$R_{MAX} = 3.434$ K $V_D =$ [] K $< V_{ALL} = 13.41$ K ADEQUATE
 $M_{MAX} = -9.65$ K-FT $< M_{ALL} = 23.402$ K-FT ADEQUATE
 $\Delta_{TL} = 0.252$ IN. $< L/240$ ADEQUATE

DF-DF 24F-V4 5 1/2" x 12" 64B

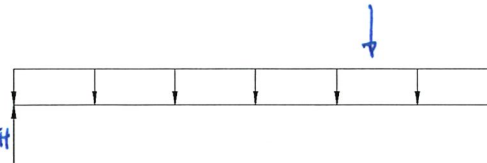
BEAM DESCRIPTION: UPPER FLR FRMB - FLUSH BM BELOW HD

B12

PARAMETERS:

L = 4.67 FT
W = 0.073 KLF
P = VARIES K

SEE ENERCALL
OUTPUT FOR
HDL & OVERSTRENGTH



ANALYSIS:

$R_{MAX} = 0.8$ K $V_D =$ [] K $< V_{ALL} = 12.24$ K ADEQUATE
 $M_{MAX} = 0.91$ K-FT $< M_{ALL} = 35.78$ K-FT ADEQUATE
 $\Delta_{TL} = 0.001$ IN. $< L/240$ ADEQUATE

TJ MICROLLAM 2.0E (2) 1.75" x 16" LVL

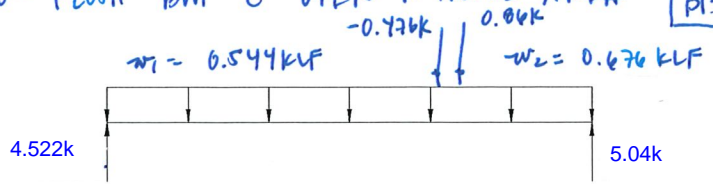


BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLOOR FRMB - FLOOR BM C OPEN TO ABOVE AREA (B13)

PARAMETERS:

L = 16.33 FT
W = VARIES KLF
P = VARIES K



ANALYSIS:

$R_{MAX} = 5.04$ K $V_D =$ [] K < $V_{ALL} = 12.24$ K ADEQUATE
 $M_{MAX} = 18.8$ K-FT < $M_{ALL} = 35.78$ K-FT ADEQUATE
 $\Delta_{TL} = 0.382$ IN. L/ 512 < L/240 ADEQUATE

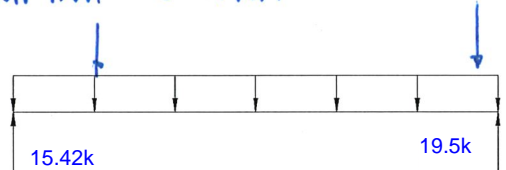
TJ MICROLLAM 2.0E (2) 1.75"x 16" LVL

BEAM DESCRIPTION: UPPER FLOOR FRMB - FLOOR BM C GREAT RM (B14)

PARAMETERS:

L = 18.5 FT
W = 1.56 KLF
P = VARIES K

* SEE ENERCALL
OUTPUT FOR
HD+ OVERSTRENGTH



ANALYSIS:

$R_{MAX} = 19.5$ K $V_D =$ [] K < $V_{ALL} = 20.405$ K ADEQUATE
 $M_{MAX} = 67.83$ K-FT < $M_{ALL} = 76.00$ K-FT ADEQUATE
 $\Delta_{TL} = 0.586$ IN. L/ 378 < L/240 ADEQUATE

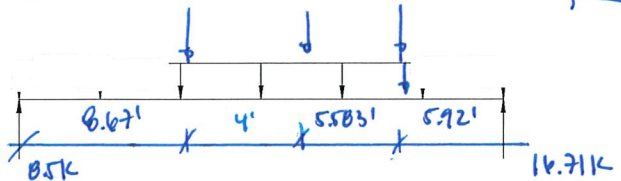
DF-DF 24F-V4 5 1/2" x 21" OUB

BEAM DESCRIPTION: UPPER FLOOR FRMB - STEEL BM C GREAT RM (B15)

PARAMETERS:

L = 24.17 FT
W = 0.161 KLF
P = VARIES K

* SEE ENERCALL
OUTPUT FOR
HD+ OVERSTRENGTH



ANALYSIS:

$R_{MAX} = 15.98$ K $V_D =$ [] K < $V_{ALL} = 102.86$ K ADEQUATE
 $M_{MAX} = 93.675$ K-FT < $M_{ALL} = 217.315$ K-FT ADEQUATE
 $\Delta_{TL} = 0.589$ IN. L/ 492 < L/240 ADEQUATE

W14x53 STEEL BM



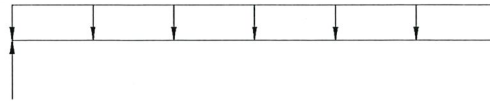
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: WINDOW HDR C GREAT RM

B17

PARAMETERS:

L = 15.75 FT
W = 0.675 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 5.32$ K $V_D =$ [] K < $V_{ALL} = 15.005$ K ADEQUATE
 $M_{MAX} = 21$ K-FT < $M_{ALL} = 38.42$ K-FT ADEQUATE
 $\Delta_{TL} = 0.46$ IN. $L/I = 410$ < $L/240$ ADEQUATE

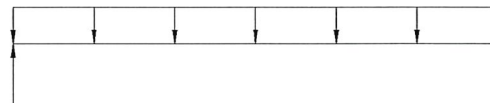
DF-DF 24F-V4 5 1/2" x 13 1/2" GLB

BEAM DESCRIPTION: SUBER HDR C BIRING

B17

PARAMETERS:

L = 12.0 FT
W = 0.084 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 0.504$ K $V_D =$ [] K < $V_{ALL} = 4.460$ K ADEQUATE
 $M_{MAX} = 1.512$ K-FT < $M_{ALL} = 5.166$ K-FT ADEQUATE
 $\Delta_{TL} = 0.106$ IN. $L/I = 9994$ < $L/240$ ADEQUATE

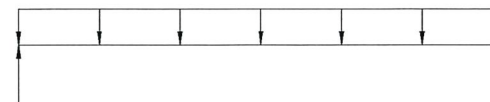
DF-L NO.2 4x10 HDR

BEAM DESCRIPTION: DROPPED BM C LOWER PECK

B17

PARAMETERS:

L = 13.67 FT
W = 0.203 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 1.39$ K $V_D =$ [] K < $V_{ALL} = 0.244$ K ADEQUATE
 $M_{MAX} = 4.74$ K-FT < $M_{ALL} = 10.166$ K-FT ADEQUATE
 $\Delta_{TL} = 0.176$ IN. $L/I = 932$ < $L/240$ ADEQUATE

DF-L NO.2 6x12



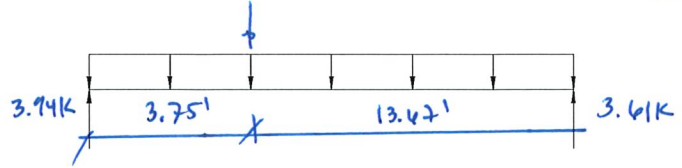
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: DROPPED BEAM @ LOWER DECK

B19

PARAMETERS:

L = 17.42 FT
W = 0.400 KLF
P = 0.578 K



ANALYSIS:

$R_{MAX} = 3.94$ K $V_D =$ [] K $< V_{ALL} = 13.4$ K ADEQUATE
 $M_{MAX} = 16.3$ K-FT $< M_{ALL} = 30.36$ K-FT ADEQUATE
 $\Delta_{TL} = 0.58$ IN. $L/359 < L/240$ ADEQUATE

DF-DF 24F-V4 5 1/2" x 12" GLUB

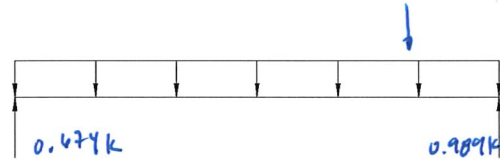
BEAM DESCRIPTION: MAIN FR FRING- FLUH RM ABOVE GARAGE

B20

PARAMETERS:

L = 23.083 FT
W = 0.037 KLF
P = VARIES K

* SEE ENERCALL FOR HD & OVERSTRENGTH OUTPUTS



ANALYSIS:

$R_{MAX} = 0.989$ K $V_D =$ [] K $< V_{ALL} = 17.02$ K ADEQUATE
 $M_{MAX} = 8.49$ K-FT $< M_{ALL} = 49.7$ K-FT ADEQUATE
 $\Delta_{TL} = 0.277$ IN. $L/999+ < L/240$ ADEQUATE

TJ MICROLLAM 2.0E (2) 1.75"x16" LVL

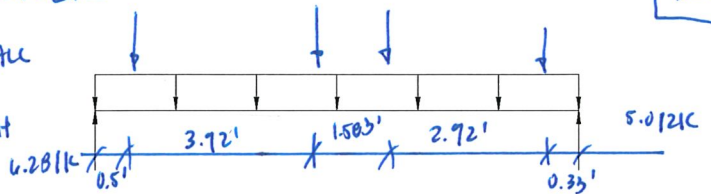
BEAM DESCRIPTION: GARAGE HEADER

B21

PARAMETERS:

L = 9.25 FT
W = 0.095 KLF
P = VARIES K

* SEE ENERCALL FOR HD & OVERSTRENGTH OUTPUTS



ANALYSIS:

$R_{MAX} = 6.281$ K $V_D =$ [] K $< V_{ALL} = 7.42$ K ADEQUATE
 $M_{MAX} = 10.07$ K-FT $< M_{ALL} = 16.8$ K-FT ADEQUATE
 $\Delta_{TL} = 0.208$ IN. $L/579 < L/240$ ADEQUATE

DF-DF 24F-V4 3 1/2" x 12" GLUB



BEAM & HEADER CALCULATIONS

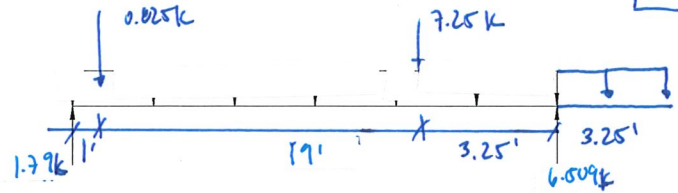
BEAM DESCRIPTION:

MAIN FRM FRMB - CANT'D FLUSH BM

B22

PARAMETERS:

L = 2.3.25 FT
W = 0.07 KLF
P = VARIES K



ANALYSIS:

$R_{MAX} = 6.51$ K $V_D =$ K < $V_{ALL} = 15.96$ K ADEQUATE
 $M_{MAX} = 20.04$ K-FT < $M_{ALL} = 46.59$ K-FT ADEQUATE
 $\Delta_{TL} = 0.46$ IN. $L/605 < L/240$ ADEQUATE

TJ MICROLLAM 2.0E (3) 1.75"x16" LVL

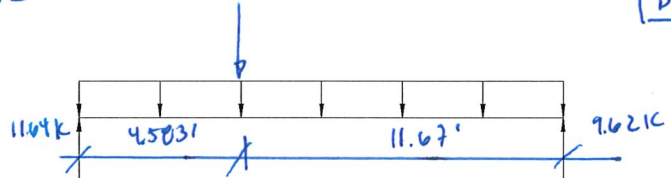
BEAM DESCRIPTION:

GARAGE HDR

B23

PARAMETERS:

L = 16.25 FT
W = VARIES KLF
P = 6.51 K



ANALYSIS:

$R_{MAX} = 11.67$ K $V_D =$ K < $V_{ALL} = 17.49$ K ADEQUATE
 $M_{MAX} = 44.94$ K-FT < $M_{ALL} = 60.11$ K-FT ADEQUATE
 $\Delta_{TL} = 0.474$ IN. $L/411 < L/240$ ADEQUATE

DF-DF 24F-V4 5 1/2" x 18" GLB

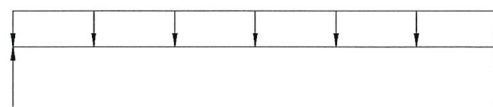
BEAM DESCRIPTION:

MAIN FRMB - FLUSH BM @ ENTRY WINDOW

B24

PARAMETERS:

L = 5.17 FT
W = 0.10 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 0.273$ K $V_D =$ K < $V_{ALL} = 10.64$ K ADEQUATE
 $M_{MAX} = 0.353$ K-FT < $M_{ALL} = 31.11$ K-FT ADEQUATE
 $\Delta_{TL} = 0.178$ IN. $L/999+ < L/240$ ADEQUATE

TJ MICROLLAM 2.0E (2) 1.75"x16" LVL

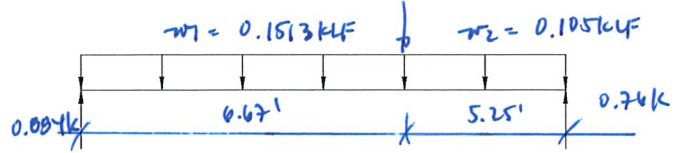


BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: MAIN FLR FRMB - FLUSH BM @ OPEN TO ABOVE B25

PARAMETERS:

L = 11.72 FT
W = VARIES KLF
P = 0.00 K



ANALYSIS:

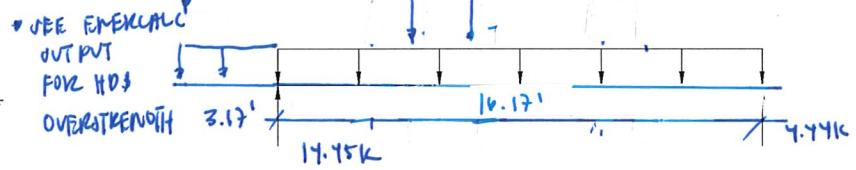
$R_{MAX} =$ 0.004 K $V_D =$ K < $V_{ALL} =$ 10.64 K ADEQUATE
 $M_{MAX} =$ 2.50 K-FT < $M_{ALL} =$ 31.11 K-FT ADEQUATE
 $\Delta_{TL} =$ 0.02 IN. $L/$ 999+ < $L/240$ ADEQUATE

TJ MICROLLAM 2.0E (2) 1.75"x16" LVL

BEAM DESCRIPTION: MAIN FLR FRMB - CANT'D FLUSH BM @ OPEN TO ABOVE B26

PARAMETERS:

L = 16.17 FT
W = 0.19 KLF
P = VARIES K



ANALYSIS:

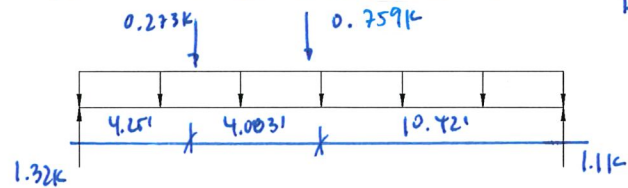
$R_{MAX} =$ 14.45 K $V_D =$ K < $V_{ALL} =$ 15.96 K ADEQUATE
 $M_{MAX} =$ 31.54 K-FT < $M_{ALL} =$ 53.67 K-FT ADEQUATE
 $\Delta_{TL} =$ 0.421 IN. $L/$ 460 < $L/240$ ADEQUATE

TJ MICROLLAM 2.0E (3) 1.75"x16" LVL

BEAM DESCRIPTION: MAIN FLR FRMB - FLUSH BM @ OPEN TO ABOVE B27

PARAMETERS:

L = 18.75 FT
W = 0.0732 KLF
P = VARIES K



ANALYSIS:

$R_{MAX} =$ 1.22 K $V_D =$ K < $V_{ALL} =$ 10.64 K ADEQUATE
 $M_{MAX} =$ 7.33 K-FT < $M_{ALL} =$ 31.11 K-FT ADEQUATE
 $\Delta_{TL} =$ 0.178 IN. $L/$ 999+ < $L/240$ ADEQUATE

TJ MICROLLAM 2.0E (2) 1.75"x16" LVL



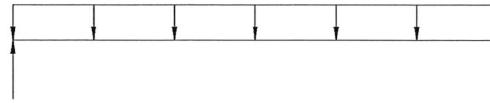
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: TYP. HDR @ BASEMENT LEVEL

B20

PARAMETERS:

L = 5.0 FT
W = 0.625 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 1.562$ K $V_D =$ [] K $< V_{ALL} = 4.460$ K ADEQUATE
 $M_{MAX} = 1.95$ K-FT $< M_{ALL} = 5.166$ K-FT ADEQUATE
 $\Delta_{TL} = 0.024$ IN. $L/999+$ $< L/240$ ADEQUATE

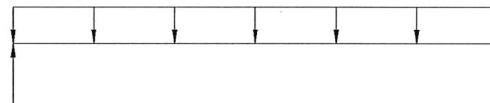
DF-L NO. 2 4x10 HDR

BEAM DESCRIPTION: INTERIOR HDR @ BASEMENT

B29

PARAMETERS:

L = 3.0 FT
W = 0.88 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 1.32$ K $V_D =$ [] K $< V_{ALL} = 3.075$ K ADEQUATE
 $M_{MAX} = 0.99$ K-FT $< M_{ALL} = 2.989$ K-FT ADEQUATE
 $\Delta_{TL} = 0.009$ IN. $L/999+$ $< L/240$ ADEQUATE

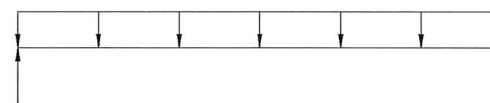
DF-L 4x8 HDR

BEAM DESCRIPTION: TYP. HDR @ MAIN FLOOR

B30

PARAMETERS:

L = 6.0 FT
W = 0.896 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 2.69$ K $V_D =$ [] K $< V_{ALL} = 4.460$ K ADEQUATE
 $M_{MAX} = 4.03$ K-FT $< M_{ALL} = 5.166$ K-FT ADEQUATE
 $\Delta_{TL} = 0.07$ IN. $L/999+$ $< L/240$ ADEQUATE

DF-L NO. 2 4x10 HDR



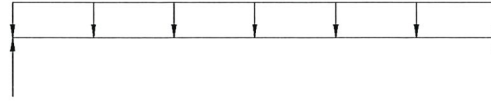
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: UPPER FLR FRMB - FLUSH BTM RM e LAUNDRY

B31

PARAMETERS:

L = 3.58 FT
W = 1.24 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 2.22$ K $V_D =$ [] K < $V_{ALL} = 4.466$ K ADEQUATE
 $M_{MAX} = 2.0$ K-FT < $M_{ALL} = 5.166$ K-FT ADEQUATE
 $\Delta_{TL} = 0.012$ IN. $L/999+$ < $L/240$ ADEQUATE

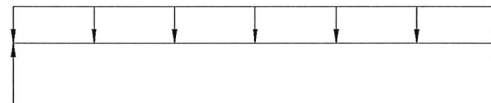
DF-L NO.2 4x10

BEAM DESCRIPTION: UPPER FLR FRMB - FLUSH BTM RM e SUPER

B32

PARAMETERS:

L = 6.0 FT
W = 0.954 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 2.00$ K $V_D =$ [] K < $V_{ALL} = 4.466$ K ADEQUATE
 $M_{MAX} = 4.29$ K-FT < $M_{ALL} = 5.166$ K-FT ADEQUATE
 $\Delta_{TL} = 0.05$ IN. $L/999+$ < $L/240$ ADEQUATE

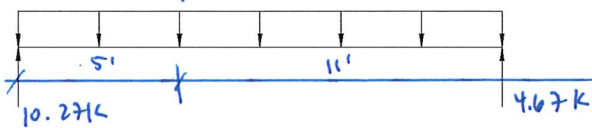
DF-L NO.2 4x10

BEAM DESCRIPTION: MAIN FLR FRMB - FLUSH RM BELOW K.A.

B33

PARAMETERS:

L = 16 FT
W = N/A KLF
P = 14.93 K



ANALYSIS:

$R_{MAX} = 10.27$ K $V_D =$ [] K < $V_{ALL} = 21.28$ K ADEQUATE
 $M_{MAX} = 51.23$ K-FT < $M_{ALL} = 62.12$ K-FT ADEQUATE
 $\Delta_{TL} = 0.438$ IN. $L/438$ < $L/240$ ADEQUATE

TJ MICROLLAM 2.0E (4) 1.75"x16" LVL

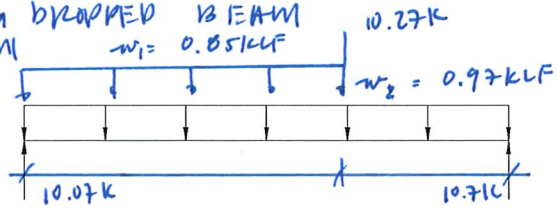


BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: MAIN FLR FRMB - A BRACKETED BEAM B34

PARAMETERS:

L = 7.003 FT
W = VARIOUS KLF
P = 10.27 K



ANALYSIS:

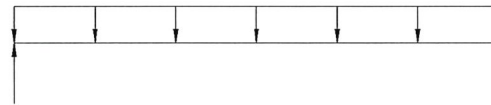
$R_{MAX} = 10.7K$ $V_D =$ $V_{ALL} = 11.13 K$ ADEQUATE
 $M_{MAX} = 24.34 K\text{-FT}$ $M_{ALL} = 37.8 K\text{-FT}$ ADEQUATE
 $\Delta_{TL} = 0.073 IN.$ $L/999+$ $L/240$ ADEQUATE

DF-PF 2F-V4 3 1/2" x 10" 6LB

BEAM DESCRIPTION: INTERIOR HDR @ BASEMENT B35

PARAMETERS:

L = 3.25 FT
W = 0.965 KLF
P = N/A K



ANALYSIS:

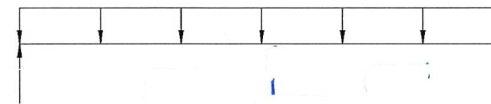
$R_{MAX} = 1.57 K$ $V_D =$ $V_{ALL} = 3.885 K$ ADEQUATE
 $M_{MAX} = 1.274 K\text{-FT}$ $M_{ALL} = 4.492 K\text{-FT}$ ADEQUATE
 $\Delta_{TL} = 0.004 IN.$ $L/999+$ $L/240$ ADEQUATE

DF-L NO.2 4XB

BEAM DESCRIPTION: MAIN FLR FRMB - DECK FLUSH RM B36

PARAMETERS:

L = 12.17 FT
W = 0.241 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 2.068 K$ $V_D =$ $V_{ALL} = 7.42 K$ ADEQUATE
 $M_{MAX} = 8.88 K\text{-FT}$ $M_{ALL} = 12.95 K\text{-FT}$ ADEQUATE
 $\Delta_{TL} = 0.52 IN.$ $L/396$ $L/240$ ADEQUATE

DF-PF 2F-V4 3 1/2" x 12" 6LB

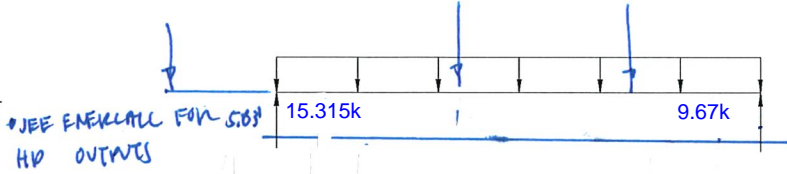


BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: MAIN FLR FRMB - LANT'D STEEL FLWJH BTM BM B37

PARAMETERS:

L = FT
W = KLF
P = K



ANALYSIS:

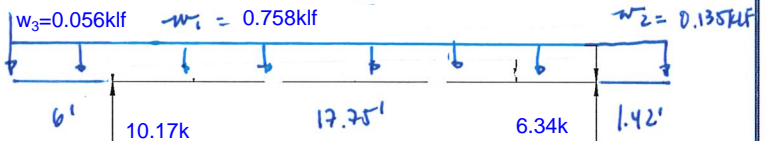
$R_{MAX} = 11.91$ K $V_D =$ K < $V_{ALL} = 70.7$ K ADEQUATE
 $M_{MAX} = 37.26$ K-FT < $M_{ALL} = 136.96$ K-FT ADEQUATE
 $\Delta_{TL} = 0.276$ IN. $L/772 < L/240$ ADEQUATE

W10 X 45 STEEL BEAM

BEAM DESCRIPTION: MAIN FLR FRMB - EDGE BEAM @ DECK B38

PARAMETERS:

L = FT
W = KLF
P = K



ANALYSIS:

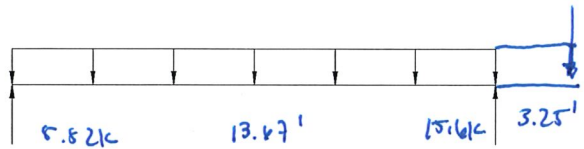
$R_{MAX} = 10.17$ K $V_D =$ K < $V_{ALL} = 17.49$ K ADEQUATE
 $M_{MAX} = 24$ K-FT < $M_{ALL} = 20.1$ K-FT ADEQUATE
 $\Delta_{TL} = 0.458$ IN. $L/464 < L/240$ ADEQUATE

DF-DF 24F-V4 5 1/2" X 15" OUB

BEAM DESCRIPTION: MAIN FLR FRMB - INTERIOR BEAM @ DECK B39

PARAMETERS:

L = FT
W = KLF
P = K



ANALYSIS:

$R_{MAX} = 15.49$ K $V_D =$ K < $V_{ALL} = 17.89$ K ADEQUATE
 $M_{MAX} = 34.52$ K-FT < $M_{ALL} = 38.75$ K-FT ADEQUATE
 $\Delta_{TL} = 0.271$ IN. $L/288 < L/240$ ADEQUATE

DF-DF 24F-V4 6.75"x15" GLB



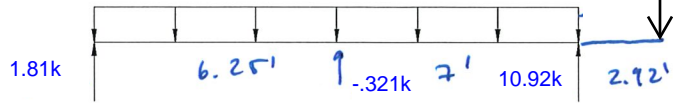
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: MAIN FLR FRMB - FLUSH BTM BM @ DECK

B40

PARAMETERS:

L = FT
W = KLF
P = K



ANALYSIS:

$R_{MAX} =$ K $V_D =$ K < $V_{ALL} =$ K ADEQUATE
 $M_{MAX} =$ K-FT < $M_{ALL} =$ K-FT ADEQUATE
 $\Delta_{TL} =$ IN. $L/$ < $L/24D$ ADEQUATE

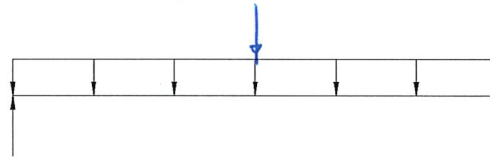
BEAM DESCRIPTION: UPPER FLR FRMB - HDR w/ HD

B41

PARAMETERS:

L = FT
W = KLF
P = K

* JEE ENEKALL
OUTPUT FOR
HD



ANALYSIS:

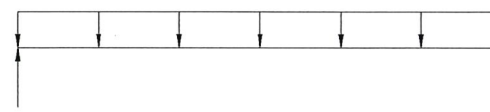
$R_{MAX} =$ K $V_D =$ K < $V_{ALL} =$ K ADEQUATE
 $M_{MAX} =$ K-FT < $M_{ALL} =$ K-FT ADEQUATE
 $\Delta_{TL} =$ IN. $L/$ < $L/24D$ ADEQUATE

BEAM DESCRIPTION: STAIR HDR

B42

PARAMETERS:

L = FT
W = KLF
P = K



ANALYSIS:

$R_{MAX} =$ K $V_D =$ K < $V_{ALL} =$ K ADEQUATE
 $M_{MAX} =$ K-FT < $M_{ALL} =$ K-FT ADEQUATE
 $\Delta_{TL} =$ IN. $L/$ < $L/24D$ ADEQUATE



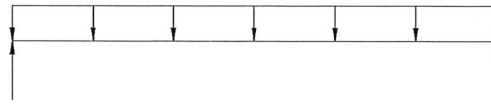
BEAM & HEADER CALCULATIONS

BEAM DESCRIPTION: MAIN FLR FRAMING - LONG PERC JOIST

B43

PARAMETERS:

L = 16.83 FT
W = 0.113 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 0.951$ K $V_D =$ K $< V_{ALL} = 2.7$ K ADEQUATE
 $M_{MAX} = 4.0$ K-FT $< M_{ALL} = 4.123$ K-FT ADEQUATE
 $\Delta_{TL} = 0.467$ IN. $L/432 < L/240$ ADEQUATE

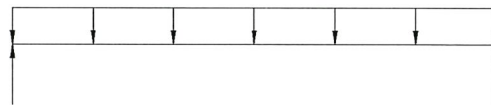
HF #2 (2) 2x12 @ 16" o.c.

BEAM DESCRIPTION: MAIN FLR FRAMING - TYP. PERC JOIST

B44

PARAMETERS:

L = 5.75 FT
W = 0.093 KLF
P = N/A K



ANALYSIS:

$R_{MAX} = 0.27$ K $V_D =$ K $< V_{ALL} = 1.60$ K ADEQUATE
 $M_{MAX} = 0.384$ K-FT $< M_{ALL} = 2.577$ K-FT ADEQUATE
 $\Delta_{TL} = 0.01$ IN. $L/9991 < L/240$ ADEQUATE

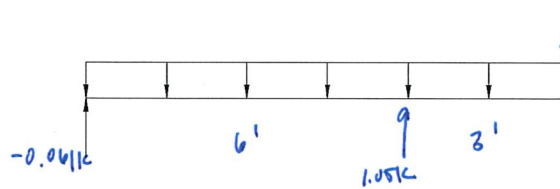
HF #2 2x12 @ 16" o.c.

BEAM DESCRIPTION: MAIN FLR FRAMING - CANT'D LVL JOISTS

B45

PARAMETERS:

L = 9 FT
W = 0.064 KLF
P = 0.410 K



ANALYSIS:

$R_{MAX} = 1.05$ K $V_D =$ K $< V_{ALL} = 1.59$ K ADEQUATE
 $M_{MAX} = -1.52$ K-FT $< M_{ALL} = 2.204$ K-FT ADEQUATE
 $\Delta_{TL} = 0.167$ IN. $L/430 < L/240$ ADEQUATE

HF #2 2x10 @ 19.2" o.c.



BEAM & HEADER CALCULATIONS

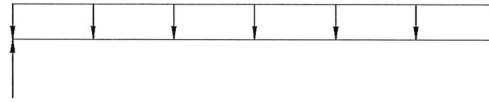
BEAM DESCRIPTION: MAIN FLYE FRMG - CANT'D FLX'G TOP BM W/ HD

1346

PARAMETERS:

L = 20.33 FT
W = KLF
P = K

* SEE EMERCALL FOR HD OUTPUT



ANALYSIS:

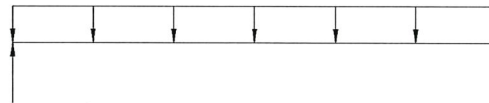
$R_{MAX} =$ K $V_D =$ K < $V_{ALL} =$ K ADEQUATE
 $M_{MAX} =$ K-FT < $M_{ALL} =$ K-FT ADEQUATE
 $\Delta_{TL} =$ IN. $L/$ < $L/240$ ADEQUATE

3) 1 3/4" x 9 1/4" LVL

BEAM DESCRIPTION:

PARAMETERS:

L = FT
W = KLF
P = K



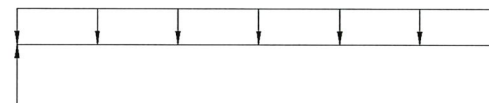
ANALYSIS:

$R_{MAX} =$ K $V_D =$ K < $V_{ALL} =$ K ADEQUATE
 $M_{MAX} =$ K-FT < $M_{ALL} =$ K-FT ADEQUATE
 $\Delta_{TL} =$ IN. $L/$ < $L/240$ ADEQUATE

BEAM DESCRIPTION:

PARAMETERS:

L = FT
W = KLF
P = K



ANALYSIS:

$R_{MAX} =$ K $V_D =$ K < $V_{ALL} =$ K ADEQUATE
 $M_{MAX} =$ K-FT < $M_{ALL} =$ K-FT ADEQUATE
 $\Delta_{TL} =$ IN. $L/$ < $L/240$ ADEQUATE

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B8 w/ HD's

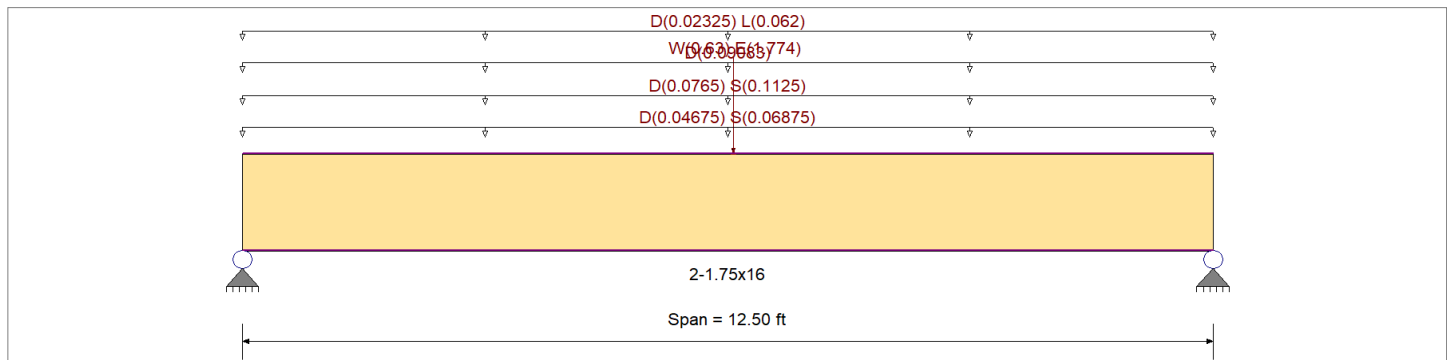
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,600.0 psi	E : Modulus of Elasticity	
Load Combination :	ASCE 7-16	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 NOT internally calculated and added

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 2.750 ft, (Lower Roof)

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 4.50 ft, (Roof)

Uniform Load : D = 0.010 ksf, Tributary Width = 9.083 ft, (Wall)

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 1.550 ft, (Floor)

Point Load : W = 0.630, E = 1.774 k @ 6.330 ft, (HD)

DESIGN SUMMARY

				Design OK	
Maximum Bending Stress Ratio	=	0.220 : 1	Maximum Shear Stress Ratio	=	0.169 : 1
Section used for this span		2-1.75x16	Section used for this span		2-1.75x16
fb: Actual	=	658.81 psi	fv: Actual	=	55.40 psi
Fb: Allowable	=	2,990.00 psi	Fv: Allowable	=	327.75 psi
Load Combination	=	+D+0.750L+0.750S	Load Combination	=	+D+0.750L+0.750S
Location of maximum on span	=	6.250ft	Location of maximum on span	=	11.177 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.052 in Ratio = 2858 >=360	Span: 1 : E Only		
Max Upward Transient Deflection		-0.052 in Ratio = 2858 >=360	Span: 1 : E Only * -1.0		
Max Downward Total Deflection		0.125 in Ratio = 1203 >=180	Span: 1 : +D+0.750L+0.750S+0.5250E		
Max Upward Total Deflection		-0.004 in Ratio = 39395 >=180	Span: 1 : +0.60D-0.70E		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.1246	6.296		0.0000	0.000

Vertical Reactions

Load Combination	Support notation : Far left is #1		Values in KIPS	
	Support 1	Support 2		
Overall MAXimum	3.083	3.095		
Overall MINimum	-0.876	-0.898		
D Only	1.483	1.483		
+D+L	1.871	1.871		
+D+S	2.616	2.616		
+D+0.750L	1.774	1.774		

7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: Architectural Innovations
Engineer: LGH
Project ID: 203-22010
Project Descr: 3036 67th Ave. SE

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B8 w/ HD's

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750L+0.750S	2.624	2.624
+D+0.60W	1.670	1.675
+D-0.60W	1.297	1.292
+D+0.750L+0.450W	1.914	1.918
+D+0.750L-0.450W	1.634	1.630
+D+0.750L+0.750S+0.450W	2.763	2.767
+D+0.750L+0.750S-0.450W	2.484	2.480
+0.60D+0.60W	1.077	1.081
+0.60D-0.60W	0.703	0.699
+D+0.70E	2.096	2.112
+D-0.70E	0.870	0.854
+D+0.750L+0.750S+0.5250E	3.083	3.095
+D+0.750L+0.750S-0.5250E	2.164	2.152
+0.60D+0.70E	1.503	1.519
+0.60D-0.70E	0.277	0.261
L Only	0.388	0.388
S Only	1.133	1.133
W Only	0.311	0.319
-W	-0.311	-0.319
E Only	0.876	0.898
E Only * -1.0	-0.876	-0.898

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B8 w/ Overstrength

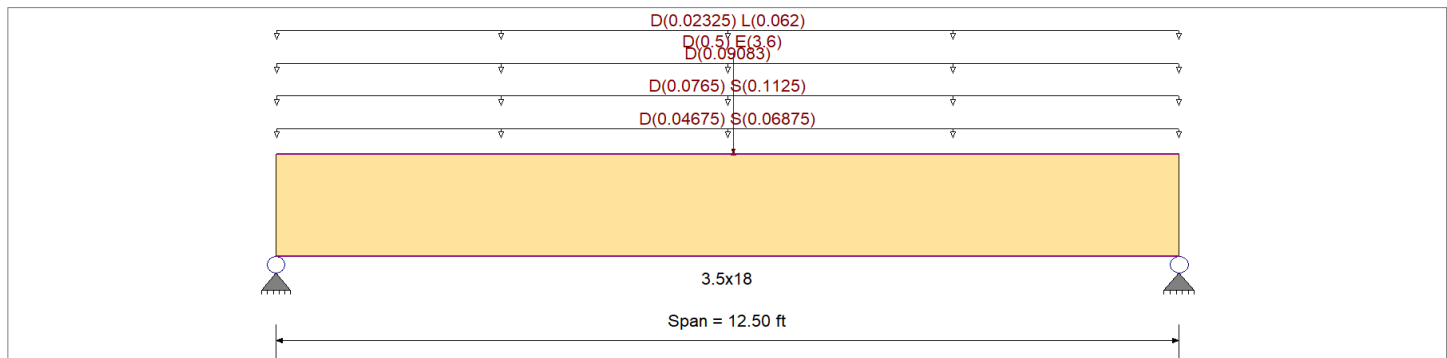
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	3,120.0 psi	E : Modulus of Elasticity
Load Combination : ASCE 7-16	Fb -	3,120.0 psi	Ebend- xx
	Fc - Prll	3,012.0 psi	Eminbend - xx
Wood Species : iLevel Truss Joist	Fc - Perp	900.0 psi	
Wood Grade : MicroLam LVL 2.0 E	Fv	342.0 psi	
	Ft	1,866.0 psi	Density
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling			42.010pcf



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 2.750 ft, (Lower Roof)

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 4.50 ft, (Roof)

Uniform Load : D = 0.010 ksf, Tributary Width = 9.083 ft, (Wall)

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 1.550 ft, (Floor)

Point Load : D = 0.50, E = 3.60 k @ 6.330 ft, (Shearwall #203)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.339 < 1	Maximum Shear Stress Ratio	=	0.209 < 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	1,692.42psi	fv: Actual	=	114.13 psi
Fb: Allowable	=	4,992.00psi	Fv: Allowable	=	547.20 psi
Load Combination		+1.131D+1.750E	Load Combination		+1.098D+0.750L+0.750S+1.313E
Location of maximum on span	=	6.341 ft	Location of maximum on span	=	11.040 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.075 in Ratio = 2005 >= 360	Span: 1 : E Only		
Max Upward Transient Deflection		-0.075 in Ratio = 2005 >= 360	Span: 1 : E Only * -1.0		
Max Downward Total Deflection		0.118 in Ratio = 1273 >= 180	Span: 1 : +D+0.750L+0.750S+0.5250E		
Max Upward Total Deflection		-0.023 in Ratio = 6522 >= 180	Span: 1 : +0.60D-0.70E		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.1178	6.296		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.803	3.834
Overall MINimum	-1.777	-1.823
D Only	1.730	1.737
+D+L	2.118	2.124
+D+S	2.863	2.869
+D+0.750L	2.021	2.027

7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: **Architectural Innovations**
Engineer: **LGH**
Project ID: **203-22010**
Project Descr: **3036 67th Ave. SE**

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B8 w/ Overstrength

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750L+0.750S	2.870	2.877
+0.60D	1.038	1.042
+D+0.70E	2.974	3.013
+D-0.70E	0.486	0.460
+D+0.750L+0.750S+0.5250E	3.803	3.834
+D+0.750L+0.750S-0.5250E	1.937	1.920
+0.60D+0.70E	2.282	2.318
+0.60D-0.70E	-0.206	-0.234
L Only	0.388	0.388
S Only	1.133	1.133
E Only	1.777	1.823
E Only * -1.0	-1.777	-1.823

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B9 w/ HD's

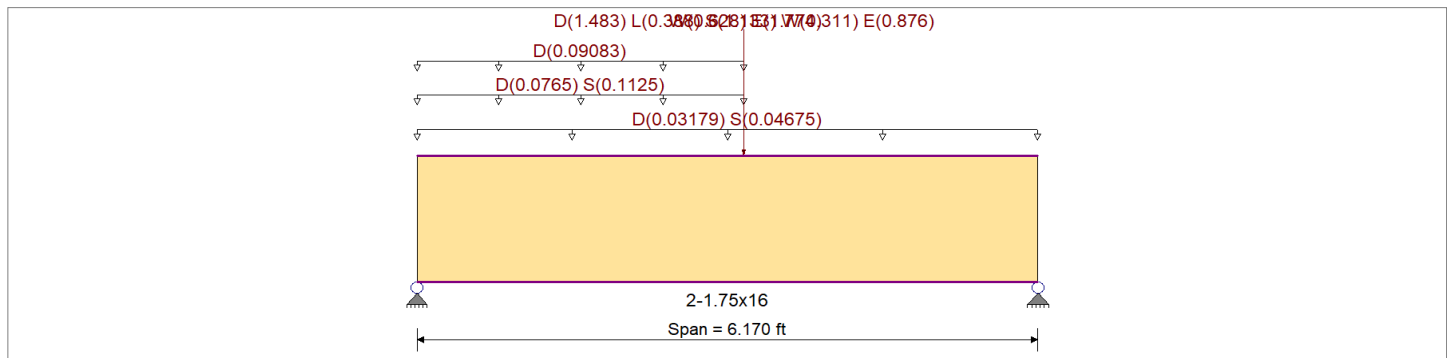
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,600.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	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 NOT internally calculated and added

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 1.870 ft, (Lower Roof)

Uniform Load : D = 0.0170, S = 0.0250 ksf, Extent = 0.0 --> 3.250 ft, Tributary Width = 4.50 ft, (Roof)

Uniform Load : D = 0.010 ksf, Extent = 0.0 --> 3.250 ft, Tributary Width = 9.083 ft, (Wall)

Point Load : W = 0.6280, E = 1.774 k @ 3.250 ft, (HD)

Point Load : D = 1.483, L = 0.3880, S = 1.133, W = 0.3110, E = 0.8760 k @ 3.250 ft, (B8)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.137 : 1	Maximum Shear Stress Ratio	=	0.144 : 1
Section used for this span		2-1.75x16	Section used for this span		2-1.75x16
fb: Actual	=	571.29psi	fv: Actual	=	65.56 psi
Fb: Allowable	=	4,160.00psi	Fv: Allowable	=	456.00 psi
Load Combination		+D+0.750L+0.750S+0.5250E	Load Combination		+D+0.750L+0.750S+0.5250E
Location of maximum on span	=	3.243ft	Location of maximum on span	=	4.841 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.009 in Ratio = 7882 >=360	Span: 1 : E Only		
Max Upward Transient Deflection		-0.009 in Ratio = 7882 >=360	Span: 1 : E Only * -1.0		
Max Downward Total Deflection		0.017 in Ratio = 4349 >=180	Span: 1 : +D+0.750L+0.750S+0.5250E		
Max Upward Total Deflection		-0.002 in Ratio = 30649 >=180	Span: 1 : +0.60D-0.70E		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.0170	3.130		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.709	2.537
Overall MINimum	-1.254	-1.396
D Only	1.201	1.022
+D+L	1.384	1.227
+D+S	2.150	1.860
+D+0.750L	1.338	1.176

7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: **Architectural Innovations**
Engineer: **LGH**
Project ID: **203-22010**
Project Descr: **3036 67th Ave. SE**

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B9 w/ HD's

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750L+0.750S	2.051	1.804
+D+0.60W	1.467	1.319
+D-0.60W	0.934	0.726
+D+0.750L+0.450W	1.538	1.398
+D+0.750L-0.450W	1.138	0.953
+D+0.750L+0.750S+0.450W	2.251	2.026
+D+0.750L+0.750S-0.450W	1.851	1.581
+0.60D+0.60W	0.987	0.910
+0.60D-0.60W	0.454	0.317
+D+0.70E	2.078	2.000
+D-0.70E	0.323	0.045
+D+0.750L+0.750S+0.5250E	2.709	2.537
+D+0.750L+0.750S-0.5250E	1.392	1.071
+0.60D+0.70E	1.598	1.591
+0.60D-0.70E	-0.158	-0.364
L Only	0.184	0.204
S Only	0.950	0.837
W Only	0.444	0.495
-W	-0.444	-0.495
E Only	1.254	1.396
E Only * -1.0	-1.254	-1.396

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

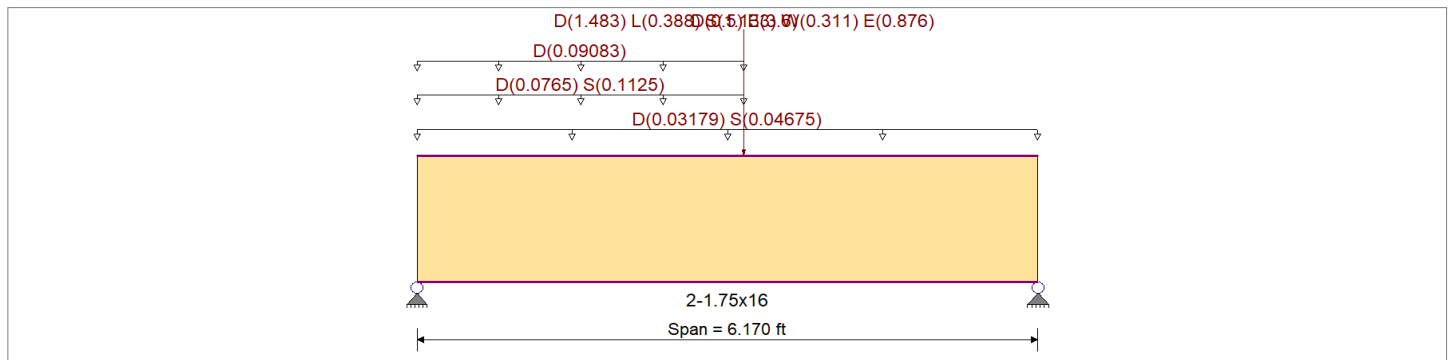
DESCRIPTION: B9 w/ Overstrength

CODE REFERENCES

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

Material Properties

Analysis Method : Allowable Stress Design	Fb +	3,120.0 psi	E : Modulus of Elasticity
Load Combination : ASCE 7-16	Fb -	3,120.0 psi	Ebend- xx
	Fc - Prll	3,012.0 psi	Eminbend - xx
Wood Species : iLevel Truss Joist	Fc - Perp	900.0 psi	
Wood Grade : MicroLam LVL 2.0 E	Fv	342.0 psi	
	Ft	1,866.0 psi	Density
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling			42.010pcf



Applied Loads

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

Beam self weight NOT internally calculated and added

- Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 1.870 ft, (Lower Roof)
- Uniform Load : D = 0.0170, S = 0.0250 ksf, Extent = 0.0 --> 3.250 ft, Tributary Width = 4.50 ft, (Roof)
- Uniform Load : D = 0.010 ksf, Extent = 0.0 --> 3.250 ft, Tributary Width = 9.083 ft, (Wall)
- Point Load : D = 0.50, E = 3.60 k @ 3.250 ft, (SW #203)
- Point Load : D = 1.483, L = 0.3880, S = 1.133, W = 0.3110, E = 0.8760 k @ 3.250 ft, (B8)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.259 : 1	Maximum Shear Stress Ratio	=	0.271 : 1
Section used for this span	=	2-1.75x16	Section used for this span	=	2-1.75x16
fb: Actual	=	1,294.41 psi	fv: Actual	=	148.20 psi
Fb: Allowable	=	4,992.00psi	Fv: Allowable	=	547.20 psi
Load Combination	=	+1.131D+1.750E	Load Combination	=	+1.131D+1.750E
Location of maximum on span	=	3.243ft	Location of maximum on span	=	4.841 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.016 in Ratio = 4666 >=360	Span: 1 : E Only		
Max Upward Transient Deflection		-0.016 in Ratio = 4666 >=360	Span: 1 : E Only * -1.0		
Max Downward Total Deflection		0.022 in Ratio = 3336 >=180	Span: 1 : +D+0.750L+0.750S+0.5250E		
Max Upward Total Deflection		-0.006 in Ratio = 12587 >=180	Span: 1 : +0.60D-0.70E		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.0222	3.130		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.399	3.305
Overall MINimum	-2.118	-2.358
D Only	1.437	1.286
+D+L	1.621	1.490
+D+S	2.387	2.123
+D+0.750L	1.575	1.439

7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: **Architectural Innovations**
Engineer: **LGH**
Project ID: **203-22010**
Project Descr: **3036 67th Ave. SE**

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B9 w/ Overstrength

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750L+0.750S	2.287	2.067
+D+0.60W	1.525	1.384
+D-0.60W	1.349	1.188
+D+0.750L+0.450W	1.641	1.513
+D+0.750L-0.450W	1.509	1.365
+D+0.750L+0.750S+0.450W	2.353	2.141
+D+0.750L+0.750S-0.450W	2.221	1.993
+0.60D+0.60W	0.951	0.870
+0.60D-0.60W	0.774	0.673
+D+0.70E	2.920	2.936
+D-0.70E	-0.046	-0.365
+D+0.750L+0.750S+0.5250E	3.399	3.305
+D+0.750L+0.750S-0.5250E	1.175	0.829
+0.60D+0.70E	2.345	2.422
+0.60D-0.70E	-0.621	-0.879
L Only	0.184	0.204
S Only	0.950	0.837
W Only	0.147	0.164
-W	-0.147	-0.164
E Only	2.118	2.358
E Only * -1.0	-2.118	-2.358

Wood Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

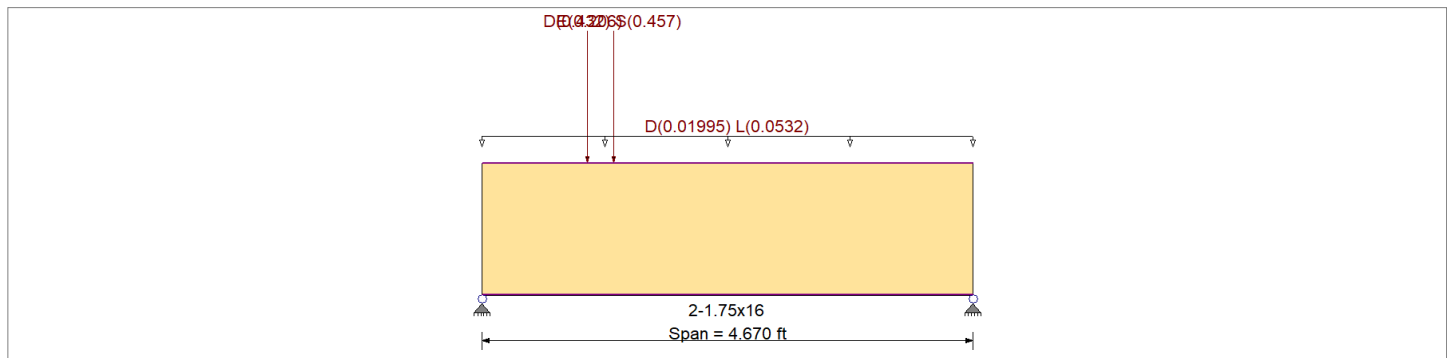
DESCRIPTION: B12 w/ HD's

CODE REFERENCES

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

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2600 psi	E : Modulus of Elasticity	
Load Combination :	ASCE 7-16	Fb -	2600 psi	Ebend- xx	2000 ksi
Wood Species :	iLevel Truss Joist	Fc - Prll	2510 psi	Eminbend - xx	1016.535 ksi
Wood Grade :	MicroLam LVL 2.0 E	Fc - Perp	750 psi		
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling	Fv	285 psi	Density	42.01 pcf
		Ft	1555 psi		



Applied Loads

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

Beam self weight NOT internally calculated and added
 Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 1.330 ft, (Floor)
 Point Load : E = 0.2060 k @ 1.0 ft, (HD)
 Point Load : D = 0.4320, S = 0.4570 k @ 1.250 ft, (B.W.A.)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.023	1	Maximum Shear Stress Ratio	=	0.022	: 1
Section used for this span		2-1.75x16		Section used for this span		2-1.75x16	
fb: Actual	=	68.63 psi		fv: Actual	=	7.17 psi	
Fb: Allowable	=	2,990.00 psi		Fv: Allowable	=	327.75 psi	
Load Combination		+D+S		Load Combination		+D+0.750L+0.750S	
Location of maximum on span	=	1.261 ft		Location of maximum on span	=	3.341 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0 in	Ratio =	0	<	360	n/a
Max Upward Transient Deflection		0 in	Ratio =	0	<	360	n/a
Max Downward Total Deflection		0.001 in	Ratio =	44780	>=	180	Span: 1 : +D+0.750L+0.750S+0.5250E
Max Upward Total Deflection		0 in	Ratio =	0	<	180	n/a

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.0013	2.130		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.792	0.370
Overall MINimum	-0.162	-0.044
D Only	0.363	0.162
+D+L	0.487	0.286
+D+S	0.698	0.285
+D+0.750L	0.456	0.255
+D+0.750L+0.750S	0.707	0.347
+0.60D	0.218	0.097

7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: Architectural Innovations
Engineer: LGH
Project ID: 203-22010
Project Descr: 3036 67th Ave. SE

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B12 w/ HD's

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.70E	0.476	0.193
+D-0.70E	0.250	0.131
+D+0.750L+0.750S+0.5250E	0.792	0.370
+D+0.750L+0.750S-0.5250E	0.622	0.324
+0.60D+0.70E	0.331	0.128
+0.60D-0.70E	0.104	0.066
L Only	0.124	0.124
S Only	0.335	0.122
E Only	0.162	0.044
E Only * -1.0	-0.162	-0.044



7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B12 w/ Overstrength

Maximum Forces & Stresses for Load Combinations

Load Combination	Span #	Max Stress Ratios									Moment Values			Shear Values		
		M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	f _v	F'v
Length = 4.670 ft	1	0.008	0.009	1.60	1.000	1.00	1.00	1.00	1.00	1.00	0.61	38.97	4608.00	0.18	4.34	508.80
+1.131D+1.750E					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 4.670 ft	1	0.068	0.065	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.96	314.70	4608.00	1.39	33.16	508.80
+1.131D-1.750E					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 4.670 ft	1	0.049	0.035	1.60	1.000	1.00	1.00	1.00	1.00	1.00	2.73	173.54	3552.00	0.74	17.70	508.80
+1.098D+0.750L+0.750S+1.3					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 4.670 ft	1	0.059	0.058	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.29	272.32	4608.00	1.25	29.65	508.80
+1.098D+0.750L+0.750S-1.31					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 4.670 ft	1	0.026	0.020	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.48	93.86	3552.00	0.43	10.28	508.80
+0.4687D+1.750E					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 4.670 ft	1	0.059	0.056	1.60	1.000	1.00	1.00	1.00	1.00	1.00	4.31	273.36	4608.00	1.19	28.37	508.80
+0.4687D-1.750E					1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 4.670 ft	1	0.060	0.043	1.60	1.000	1.00	1.00	1.00	1.00	1.00	3.38	214.88	3552.00	0.92	21.97	508.80

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.0026	2.079		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.532	0.833
Overall MINimum	-2.200	-0.600
D Only	0.992	0.334
+D+L	1.116	0.458
+D+S	1.326	0.456
+D+0.750L	1.085	0.427
+D+0.750L+0.750S	1.336	0.518
+0.60D	0.595	0.200
+D+0.70E	2.532	0.753
+D-0.70E	-0.549	-0.086
+D+0.750L+0.750S+0.5250E	2.491	0.833
+D+0.750L+0.750S-0.5250E	0.181	0.204
+0.60D+0.70E	2.135	0.620
+0.60D-0.70E	-0.945	-0.220
L Only	0.124	0.124
S Only	0.335	0.122
E Only	2.200	0.600
E Only * -1.0	-2.200	-0.600

Wood Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

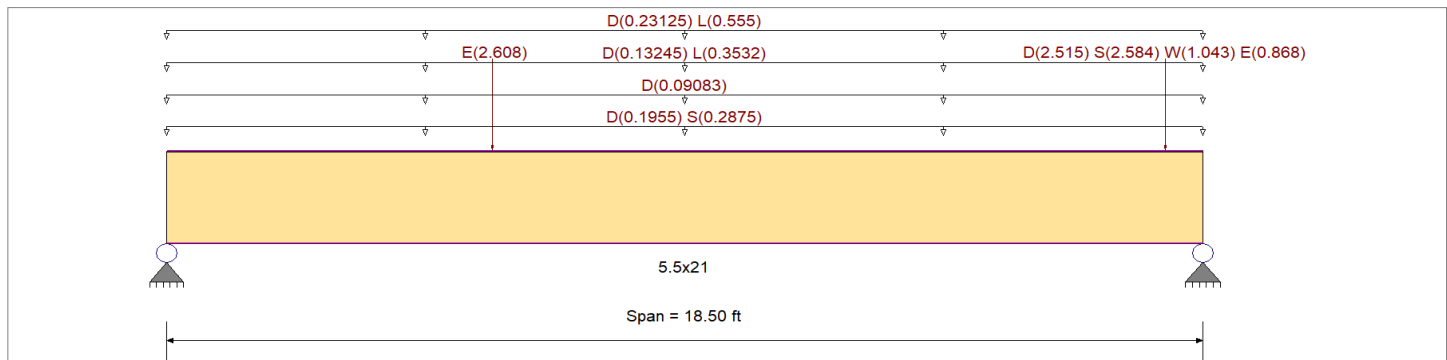
DESCRIPTION: B14 w/ HD's

CODE REFERENCES

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

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,400.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1,850.0 psi	Ebend- xx	1,800.0 ksi
	Fc - Prll	1,650.0 psi	Eminbend - xx	950.0 ksi
Wood Species : DF/DF	Fc - Perp	650.0 psi	Ebend- yy	1,600.0 ksi
Wood Grade : 24F-V4	Fv	265.0 psi	Eminbend - yy	850.0 ksi
	Ft	1,100.0 psi	Density	31.210 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 NOT internally calculated and added
 Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 11.50 ft, (Roof)
 Uniform Load : D = 0.010 ksf, Tributary Width = 9.083 ft, (Wall)
 Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 8.830 ft, (Floor)
 Uniform Load : D = 0.0250, L = 0.060 ksf, Tributary Width = 9.250 ft, (Deck)
 Point Load : D = 2.515, S = 2.584, W = 1.043, E = 0.8680 k @ 17.830 ft, (Floor G.T.)
 Point Load : E = 2.608 k @ 5.830 ft, (HD)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.878 < 1	Maximum Shear Stress Ratio =	0.825 < 1
Section used for this span	5.5x21	Section used for this span	5.5x21
fb: Actual =	2,003.95 psi	fv: Actual =	218.67 psi
Fb: Allowable =	2,282.16 psi	Fv: Allowable =	265.00 psi
Load Combination	+D+L	Load Combination	+D+L
Location of maximum on span =	9.318ft	Location of maximum on span =	18.500ft
Span # where maximum occurs =	Span # 1	Span # where maximum occurs =	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.315 in Ratio = 704 >= 360	Span: 1 : L Only	
Max Upward Transient Deflection	-0.068 in Ratio = 3280 >= 360	Span: 1 : E Only * -1.0	
Max Downward Total Deflection	0.586 in Ratio = 378 >= 180	Span: 1 : +D+0.750L+0.750S+0.5250E	
Max Upward Total Deflection	0 in Ratio = 0 < 180	n/a	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.5864	9.250		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	15.423	19.470
Overall MINimum	-1.818	-1.658
D Only	6.104	8.437
+D+L	14.505	16.838
+D+S	8.857	13.586

7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: **Architectural Innovations**
Engineer: **LGH**
Project ID: **203-22010**
Project Descr: **3036 67th Ave. SE**

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B14 w/ HD's

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750L	12.404	14.737
+D+0.750L+0.750S	14.469	18.600
+D+0.60W	6.127	9.040
+D-0.60W	6.081	7.834
+D+0.750L+0.450W	12.421	15.190
+D+0.750L-0.450W	12.388	14.285
+D+0.750L+0.750S+0.450W	14.486	19.052
+D+0.750L+0.750S-0.450W	14.452	18.147
+0.60D+0.60W	3.685	5.665
+0.60D-0.60W	3.640	4.459
+D+0.70E	7.376	9.598
+D-0.70E	4.832	7.276
+D+0.750L+0.750S+0.5250E	15.423	19.470
+D+0.750L+0.750S-0.5250E	13.515	17.729
+0.60D+0.70E	4.935	6.223
+0.60D-0.70E	2.390	3.901
L Only	8.401	8.401
S Only	2.753	5.150
W Only	0.038	1.005
-W	-0.038	-1.005
E Only	1.818	1.658
E Only * -1.0	-1.818	-1.658

Wood Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

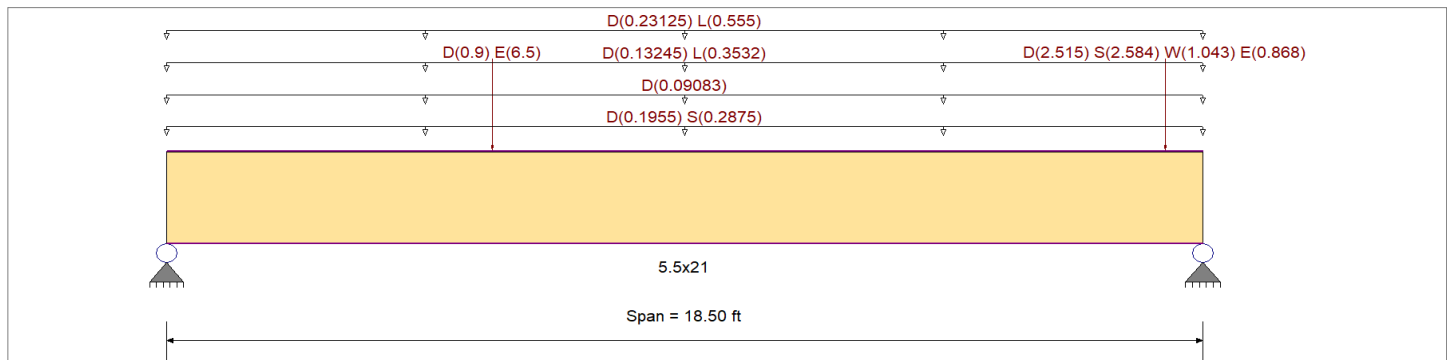
DESCRIPTION: B14 w/ Overstrength

CODE REFERENCES

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

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,880.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	2,220.0 psi	Ebend- xx	1,800.0 ksi
	Fc - Prll	1,980.0 psi	Eminbend - xx	950.0 ksi
Wood Species : DF/DF	Fc - Perp	780.0 psi	Ebend- yy	1,600.0 ksi
Wood Grade : 24F-V4	Fv	318.0 psi	Eminbend - yy	850.0 ksi
	Ft	1,320.0 psi	Density	31.210 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 NOT internally calculated and added

- Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 11.50 ft, (Roof)
- Uniform Load : D = 0.010 ksf, Tributary Width = 9.083 ft, (Wall)
- Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 8.830 ft, (Floor)
- Uniform Load : D = 0.0250, L = 0.060 ksf, Tributary Width = 9.250 ft, (Deck)
- Point Load : D = 2.515, S = 2.584, W = 1.043, E = 0.8680 k @ 17.830 ft, (Floor G.T.)
- Point Load : D = 0.90, E = 6.50 k @ 5.830 ft, (SW #202)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.760 : 1	Maximum Shear Stress Ratio =	0.699 : 1
Section used for this span	5.5x21	Section used for this span	5.5x21
fb: Actual =	2,082.10psi	fv: Actual =	222.35 psi
Fb: Allowable =	2,738.59psi	Fv: Allowable =	318.00 psi
Load Combination	+D+L	Load Combination	+D+L
Location of maximum on span =	9.115ft	Location of maximum on span =	18.500 ft
Span # where maximum occurs =	Span # 1	Span # where maximum occurs =	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.315 in Ratio = 704 >=360	Span: 1 : L Only	
Max Upward Transient Deflection	-0.165 in Ratio = 1348 >=360	Span: 1 : E Only * -1.0	
Max Downward Total Deflection	0.659 in Ratio = 336 >=180	Span: 1 : +D+0.750L+0.750S+0.5250E	
Max Upward Total Deflection	0 in Ratio = 0 <180	n/a	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.6590	9.182		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	17.439	20.398
Overall MINimum	-4.483	-2.885
D Only	6.720	8.720
+D+L	15.121	17.121
+D+S	9.473	13.870

7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: **Architectural Innovations**
 Engineer: **LGH**
 Project ID: **203-22010**
 Project Descr: **3036 67th Ave. SE**

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B14 w/ Overstrength

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750L	13.021	15.021
+D+0.750L+0.750S	15.086	18.883
+D+0.60W	6.743	9.323
+D-0.60W	6.698	8.117
+D+0.750L+0.450W	13.038	15.473
+D+0.750L-0.450W	13.004	14.569
+D+0.750L+0.750S+0.450W	15.103	19.336
+D+0.750L+0.750S-0.450W	15.069	18.431
+0.60D+0.60W	4.055	5.835
+0.60D-0.60W	4.009	4.629
+D+0.70E	9.858	10.740
+D-0.70E	3.582	6.701
+D+0.750L+0.750S+0.5250E	17.439	20.398
+D+0.750L+0.750S-0.5250E	12.732	17.369
+0.60D+0.70E	7.170	7.252
+0.60D-0.70E	0.894	3.213
L Only	8.401	8.401
S Only	2.753	5.150
W Only	0.038	1.005
-W	-0.038	-1.005
E Only	4.483	2.885
E Only * -1.0	-4.483	-2.885

7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Steel Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B15 w/ HD's

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega Cb	Rm	Va Max	Vnx	Vnx/Omega	
Dsgn. L = 24.17 ft	24.17 ft	1	0.181	0.065	39.35		39.35	362.92	217.32	1.00	1.00	6.74	154.29	102.86
+D+0.750L+0.750S+0.5250E														
Dsgn. L = 24.17 ft	24.17 ft	1	0.387	0.140	84.08		84.08	362.92	217.32	1.00	1.00	14.36	154.29	102.86
+0.60D+0.70E														
Dsgn. L = 24.17 ft	24.17 ft	1	0.112	0.040	24.23		24.23	362.92	217.32	1.00	1.00	4.11	154.29	102.86

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.5458	12.707		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	8.214	14.361
Overall MINimum	0.228	0.251
D Only	4.076	6.562
+D+L	7.762	13.815
+D+S	5.749	9.532
+D+0.750L	6.840	12.002
+D+0.750L+0.750S	8.095	14.229
+0.60D	2.446	3.937
+D+0.70E	4.236	6.737
+D+0.750L+0.750S+0.5250E	8.214	14.361
+0.60D+0.70E	2.605	4.113
L Only	3.685	7.254
S Only	1.673	2.970
E Only	0.228	0.251

7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: **Architectural Innovations**
 Engineer: **LGH**
 Project ID: **203-22010**
 Project Descr: **3036 67th Ave. SE**

Steel Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B15 w/ HD's

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 24.17 ft	1		0.323	0.117	70.12		70.12	362.92	217.32	1.00	1.00	12.00	154.29	102.86
+D+0.750L+0.750S+0.450W														
Dsgn. L = 24.17 ft	1		0.383	0.138	83.31		83.31	362.92	217.32	1.00	1.00	14.23	154.29	102.86
+0.60D+0.60W														
Dsgn. L = 24.17 ft	1		0.105	0.038	22.81		22.81	362.92	217.32	1.00	1.00	3.94	154.29	102.86
+D+0.70E														
Dsgn. L = 24.17 ft	1		0.238	0.087	51.75		51.75	362.92	217.32	1.00	1.00	8.90	154.29	102.86
+D+0.750L+0.750S+0.5250E														
Dsgn. L = 24.17 ft	1		0.431	0.155	93.67		93.67	362.92	217.32	1.00	1.00	15.98	154.29	102.86
+0.60D+0.70E														
Dsgn. L = 24.17 ft	1		0.168	0.061	36.59		36.59	362.92	217.32	1.00	1.00	6.28	154.29	102.86

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.5893	12.776		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	8.664	15.984
Overall MINimum	0.001	0.003
D Only	4.076	6.562
+D+L	7.762	13.815
+D+S	5.749	9.532
+D+0.750L	6.840	12.002
+D+0.750L+0.750S	8.095	14.229
+D+0.60W	4.077	6.563
+D+0.750L+0.450W	6.841	12.003
+D+0.750L+0.750S+0.450W	8.095	14.231
+0.60D+0.60W	2.446	3.939
+D+0.70E	4.835	8.901
+D+0.750L+0.750S+0.5250E	8.664	15.984
+0.60D+0.70E	3.205	6.276
L Only	3.685	7.254
S Only	1.673	2.970
W Only	0.001	0.003
E Only	1.084	3.342

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

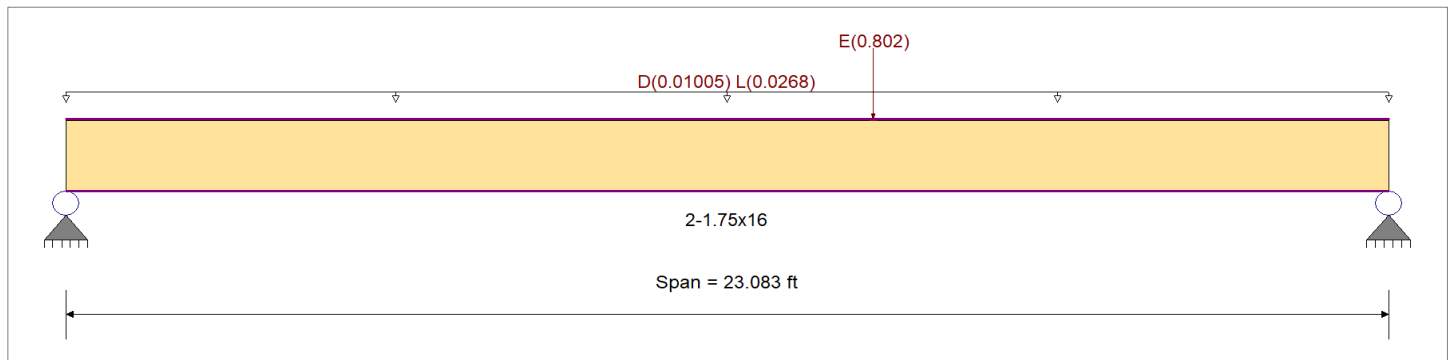
DESCRIPTION: B20 w/ HD's

CODE REFERENCES

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

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,600.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	2,600.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	2,510.0 psi	Eminbend - xx	1,016.54ksi
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	42.010pcf
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 NOT internally calculated and added
 Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 0.670 ft, (Floor)
 Point Load : E = 0.8020 k @ 14.083 ft, (HD)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.082 1	Maximum Shear Stress Ratio	=	0.036 : 1
Section used for this span		2-1.75x16	Section used for this span		2-1.75x16
fb: Actual	=	339.22psi	fv: Actual	=	10.14 psi
Fb: Allowable	=	4,160.00psi	Fv: Allowable	=	285.00 psi
Load Combination	=	+D+0.750L+0.5250E	Load Combination	=	+D+L
Location of maximum on span	=	14.069ft	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		0.140 in Ratio = 1977 >=360	Span: 1 : E Only		
Max Upward Transient Deflection		-0.140 in Ratio = 1977 >=360	Span: 1 : E Only * -1.0		
Max Downward Total Deflection		0.154 in Ratio = 1793 >=180	Span: 1 : +D+0.750L+0.5250E		
Max Upward Total Deflection		-0.082 in Ratio = 3381 >=180	Span: 1 : +0.60D-0.70E		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.5250E	1	0.1544	11.963		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.512	0.605
Overall MINimum	-0.313	-0.489
D Only	0.116	0.116
+D+L	0.425	0.425
+D+0.750L	0.348	0.348
+0.60D	0.070	0.070
+D+0.70E	0.335	0.459
+D-0.70E	-0.103	-0.227
+D+0.750L+0.5250E	0.512	0.605

7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: **Architectural Innovations**
Engineer: **LGH**
Project ID: **203-22010**
Project Descr: **3036 67th Ave. SE**

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B20 w/ HD's

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750L-0.5250E	0.184	0.091
+0.60D+0.70E	0.288	0.412
+0.60D-0.70E	-0.149	-0.273
L Only	0.309	0.309
E Only	0.313	0.489
E Only * -1.0	-0.313	-0.489

Wood Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

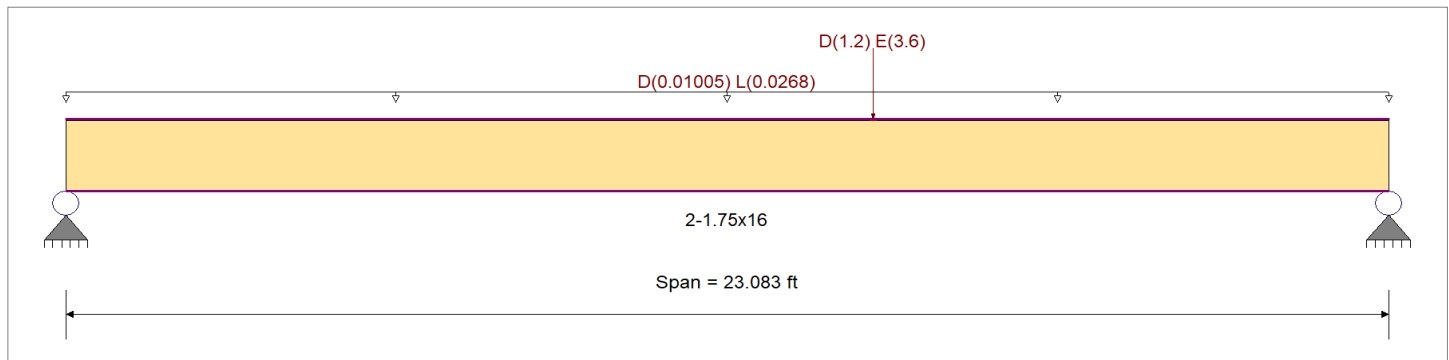
DESCRIPTION: B20 w/ Overstrength

CODE REFERENCES

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

Material Properties

Analysis Method : Allowable Stress Design	Fb +	3,120.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	3,120.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	3,012.0 psi	Eminbend - xx	1,016.54ksi
Wood Species : iLevel Truss Joist	Fc - Perp	900.0 psi		
Wood Grade : MicroLam LVL 2.0 E	Fv	342.0 psi		
	Ft	1,866.0 psi	Density	42.010pcf
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 NOT internally calculated and added
 Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 0.670 ft, (Floor)
 Point Load : D = 1.20, E = 3.60 k @ 14.083 ft, (SW #104)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.688 < 1	Maximum Shear Stress Ratio	=	0.234 < 1
Section used for this span	=	2-1.75x16	Section used for this span	=	2-1.75x16
fb: Actual	=	3,433.33psi	fv: Actual	=	128.27 psi
Fb: Allowable	=	4,992.00psi	Fv: Allowable	=	547.20 psi
Load Combination	=	+1.131D+1.750E	Load Combination	=	+1.131D+1.750E
Location of maximum on span	=	14.069ft	Location of maximum on span	=	21.819 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.629 in Ratio = 440 >=360	Span: 1 : E Only		
Max Upward Transient Deflection		-0.629 in Ratio = 440 >=360	Span: 1 : E Only * -1.0		
Max Downward Total Deflection		0.676 in Ratio = 409 >=180	Span: 1 : +D+0.70E		
Max Upward Total Deflection		-0.298 in Ratio = 928 >=180	Span: 1 : +0.60D-0.70E		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.70E	1	0.6765	12.300		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.566	2.386
Overall MINimum	-1.404	-2.196
D Only	0.584	0.848
+D+L	0.893	1.157
+D+0.750L	0.816	1.080
+0.60D	0.350	0.509
+D+0.70E	1.566	2.386
+D-0.70E	-0.399	-0.689
+D+0.750L+0.5250E	1.553	2.233

7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: Architectural Innovations
Engineer: LGH
Project ID: 203-22010
Project Descr: 3036 67th Ave. SE

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B20 w/ Overstrength

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750L-0.5250E	0.079	-0.073
+0.60D+0.70E	1.333	2.046
+0.60D-0.70E	-0.632	-1.029
L Only	0.309	0.309
E Only	1.404	2.196
E Only * -1.0	-1.404	-2.196



7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B21 w/ HD's

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios								Moment Values			Shear Values			
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v
Length = 9.0 ft	1	0.509	0.380	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	9.83	1,404.34	2760.00	3.25	115.90	304.75
+D+0.750L					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 9.0 ft	1	0.461	0.355	1.25	1.000	1.00	1.00	1.00	1.00	1.00	1.00	9.68	1,382.44	3000.00	3.29	117.66	331.25
+D+0.750L+0.750S					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 9.0 ft	1	0.645	0.490	1.15	1.000	1.00	1.00	1.00	1.00	1.00	1.00	12.47	1,781.19	2760.00	4.18	149.33	304.75
+D+0.60W					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 9.0 ft	1	0.225	0.172	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	6.04	863.03	3840.00	2.04	72.94	424.00
+D+0.750L+0.450W					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 9.0 ft	1	0.358	0.276	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	9.63	1,375.21	3840.00	3.28	117.11	424.00
+D+0.750L+0.750S+0.450W					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 9.0 ft	1	0.462	0.351	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	12.42	1,773.96	3840.00	4.17	148.79	424.00
+0.60D+0.60W					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 9.0 ft	1	0.134	0.103	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	3.60	513.96	3840.00	1.22	43.47	424.00
+D+0.70E					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 9.0 ft	1	0.249	0.195	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	6.69	956.41	3840.00	2.32	82.78	424.00
+D+0.750L+0.750S+0.5250E					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 9.0 ft	1	0.480	0.368	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	12.89	1,842.06	3840.00	4.37	156.17	424.00
+0.60D+0.70E					1.000	1.00	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 9.0 ft	1	0.159	0.126	1.60	1.000	1.00	1.00	1.00	1.00	1.00	1.00	4.27	609.93	3840.00	1.49	53.31	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.2081	4.533		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	7.652	6.072
Overall MINimum	-0.493	1.161
D Only	4.102	2.601
+D+L	6.281	5.012
+D+S	6.657	4.005
+D+0.750L	5.736	4.409
+D+0.750L+0.750S	7.652	5.462
+D+0.60W	3.806	2.903
+D+0.750L+0.450W	5.514	4.636
+D+0.750L+0.750S+0.450W	7.430	5.689
+0.60D+0.60W	2.165	1.863
+D+0.70E	4.023	3.414
+D+0.750L+0.750S+0.5250E	7.593	6.072
+0.60D+0.70E	2.382	2.373
L Only	2.179	2.411
S Only	2.555	1.404
W Only	-0.493	0.504
E Only	-0.112	1.161

7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Steel Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B15 w/ Overstrength

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values					Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega Cb	Rm	Va Max	Vnx	Vnx/Omega	
+1.098D+0.750L+0.750S+1.313E	Dsgn. L = 24.17 ft	1	0.327	0.094	71.07		71.07	362.92	217.32	1.00	1.00	9.66	154.29	102.86
+0.4687D+1.750E	Dsgn. L = 24.17 ft	1	0.472	0.160	102.50		102.50	362.92	217.32	1.00	1.00	16.46	154.29	102.86
	Dsgn. L = 24.17 ft	1	0.218	0.054	47.31		47.31	362.92	217.32	1.00	1.00	5.56	154.29	102.86

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.5772	12.707		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	8.417	14.649
Overall MINimum	1.380	1.520
D Only	3.674	6.183
+D+L	7.359	13.437
+D+S	5.346	9.153
+D+0.750L	6.438	11.623
+D+0.750L+0.750S	7.692	13.851
+0.60D	2.204	3.710
+D+0.70E	4.640	7.247
+D+0.750L+0.750S+0.5250E	8.417	14.649
+0.60D+0.70E	3.170	4.774
L Only	3.685	7.254
S Only	1.673	2.970
E Only	1.380	1.520

7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Steel Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B15 w/ Overstrength

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 24.17 ft	24.17 ft	1	0.328	0.117	71.18		71.18	362.92	217.32	1.00	1.00	12.03	154.29	102.86
+D+0.750L+0.750S+0.450W														
Dsgn. L = 24.17 ft	24.17 ft	1	0.388	0.139	84.37		84.37	362.92	217.32	1.00	1.00	14.26	154.29	102.86
+0.60D+0.60W														
Dsgn. L = 24.17 ft	24.17 ft	1	0.107	0.038	23.34		23.34	362.92	217.32	1.00	1.00	3.94	154.29	102.86
+1.131D+1.750E														
Dsgn. L = 24.17 ft	24.17 ft	1	0.372	0.133	80.79		80.79	362.92	217.32	1.00	1.00	13.65	154.29	102.86
+1.098D+0.750L+0.750S+1.313E														
Dsgn. L = 24.17 ft	24.17 ft	1	0.533	0.190	115.74		115.74	362.92	217.32	1.00	1.00	19.56	154.29	102.86
+0.4687D+1.750E														
Dsgn. L = 24.17 ft	24.17 ft	1	0.253	0.090	54.90		54.90	362.92	217.32	1.00	1.00	9.28	154.29	102.86

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.5864	12.845		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	8.277	16.124
Overall MINimum	-0.009	-0.029
D Only	3.656	6.601
+D+L	7.342	13.854
+D+S	5.329	9.571
+D+0.750L	6.420	12.041
+D+0.750L+0.750S	7.675	14.268
+D+0.60W	3.651	6.583
+D+0.750L+0.450W	6.416	12.028
+D+0.750L+0.750S+0.450W	7.671	14.256
+0.60D+0.60W	2.188	3.943
+D+0.70E	4.459	9.075
+D+0.750L+0.750S+0.5250E	8.277	16.124
+0.60D+0.70E	2.997	6.435
L Only	3.685	7.254
S Only	1.673	2.970
W Only	-0.009	-0.029
E Only	1.147	3.535

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

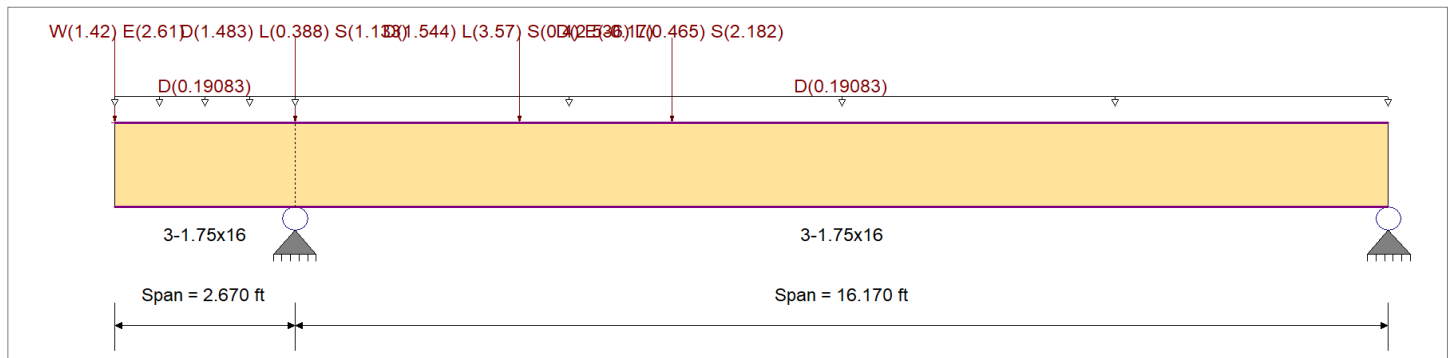
DESCRIPTION: B26 w/ HD's

CODE REFERENCES

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

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,600.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	2,600.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	2,510.0 psi	Eminbend - xx	1,016.54ksi
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	42.010pcf
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 NOT internally calculated and added

Load for Span Number 1

Point Load : W = 1.420, E = 2.610 k @ 0.0 ft, (HD)
 Uniform Load : D = 0.010 ksf, Tributary Width = 19.083 ft, (Wall)
 Point Load : D = 1.483, L = 0.3880, S = 1.133 k @ 2.670 ft, (B8)

Load for Span Number 2

Point Load : D = 1.544, L = 3.570, S = 0.40, E = -0.170 k @ 3.330 ft, (P.A.)
 Uniform Load : D = 0.010 ksf, Tributary Width = 19.083 ft, (Wall)
 Point Load : D = 2.536, L = 0.4650, S = 2.182 k @ 5.583 ft, (B13)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.565	1	Maximum Shear Stress Ratio	=	0.462	: 1
Section used for this span		3-1.75x16		Section used for this span		3-1.75x16	
fb: Actual	=	1,689.86psi		fv: Actual	=	131.59 psi	
Fb: Allowable	=	2,990.00psi		Fv: Allowable	=	285.00 psi	
Load Combination	=	+D+0.750L+0.750S		Load Combination	=	+D+L	
Location of maximum on span	=	5.601 ft		Location of maximum on span	=	2.670 ft	
Span # where maximum occurs	=	Span # 2		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.059 in	Ratio = 1082 >=360	Span: 2 : L Only			
Max Upward Transient Deflection		-0.069 in	Ratio = 934 >=360	Span: 2 : E Only			
Max Downward Total Deflection		0.394 in	Ratio = 492 >=239	Span: 2 : +D+0.750L+0.750S-0.5250E			
Max Upward Total Deflection		-0.238 in	Ratio = 268 >=239	Span: 1 : +D+0.750L+0.750S-0.5250E			

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+0.750L+0.750S-0.5250E	-0.2383	0.000
+D+0.750L+0.750S-0.5250E	2	0.3939	7.498		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum		12.794	4.238
Overall MINimum		-2.906	0.466

7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B26 w/ HD's

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
D Only		6.464	2.694
+D+L		9.991	3.590
+D+S		9.343	3.530
+D+0.750L		9.109	3.366
+D+0.750L+0.750S		11.269	3.993
+D+0.60W		7.457	2.554
+D-0.60W		5.471	2.835
+D+0.750L+0.450W		9.854	3.261
+D+0.750L-0.450W		8.365	3.472
+D+0.750L+0.750S+0.450W		12.013	3.887
+D+0.750L+0.750S-0.450W		10.524	4.098
+0.60D+0.60W		4.871	1.476
+0.60D-0.60W		2.886	1.757
+D+0.70E		8.498	2.368
+D-0.70E		4.430	3.021
+D+0.750L+0.750S+0.5250E		12.794	3.748
+D+0.750L+0.750S-0.5250E		9.743	4.238
+0.60D+0.70E		5.913	1.290
+0.60D-0.70E		1.844	1.943
L Only		3.527	0.896
S Only		2.879	0.836
W Only		1.654	-0.234
-W		-1.654	0.234
E Only		2.906	-0.466
E Only * -1.0		-2.906	0.466

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B26 w/ Overstrength

CODE REFERENCES

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

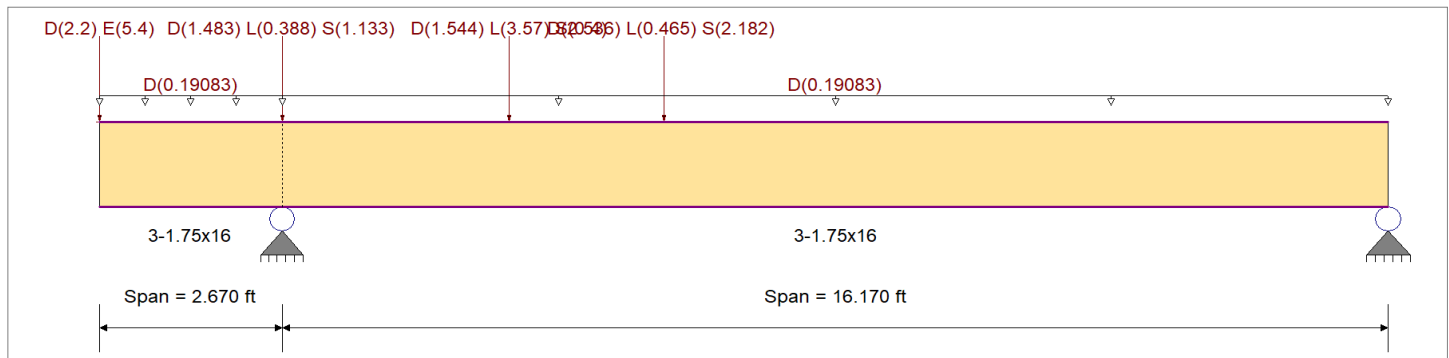
Material Properties

Analysis Method : Allowable Stress Design
 Load Combination : ASCE 7-16

Wood Species : iLevel Truss Joist
 Wood Grade : MicroLam LVL 2.0 E

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	3,120.0 psi	E : Modulus of Elasticity	
Fb -	3,120.0 psi	Ebend- xx	2,000.0ksi
Fc - Prll	3,012.0 psi	Eminbend - xx	1,016.54ksi
Fc - Perp	900.0 psi		
Fv	342.0 psi		
Ft	1,866.0 psi	Density	42.010pcf



Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Point Load : D = 2.20, E = 5.40 k @ 0.0 ft, (SW #111)
 Uniform Load : D = 0.010 ksf, Tributary Width = 19.083 ft, (Wall)
 Point Load : D = 1.483, L = 0.3880, S = 1.133 k @ 2.670 ft, (B8)

Load for Span Number 2

Point Load : D = 1.544, L = 3.570, S = 0.40 k @ 3.330 ft, (P.A.)
 Uniform Load : D = 0.010 ksf, Tributary Width = 19.083 ft, (Wall)
 Point Load : D = 2.536, L = 0.4650, S = 2.182 k @ 5.583 ft, (B13)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.445	1	Maximum Shear Stress Ratio	=	0.404	: 1
Section used for this span		3-1.75x16		Section used for this span		3-1.75x16	
fb: Actual	=	2,220.56psi		fv: Actual	=	138.08 psi	
Fb: Allowable	=	4,992.00psi		Fv: Allowable	=	342.00 psi	
Load Combination		+1.098D+0.750L+0.750S-1.313E		Load Combination		+D+L	
Location of maximum on span	=	5.601ft		Location of maximum on span	=	2.670ft	
Span # where maximum occurs	=	Span # 2		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.117 in	Ratio = 548 >= 360	Span: 2 : E Only * -1.0			
Max Upward Transient Deflection		-0.117 in	Ratio = 548 >= 360	Span: 2 : E Only			
Max Downward Total Deflection		0.376 in	Ratio = 516 >= 180	Span: 2 : +D+0.750L+0.750S-0.5250E			
Max Upward Total Deflection		-0.221 in	Ratio = 288 >= 180	Span: 2 : +0.60D+0.70E			

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+0.750L+0.750S-0.5250E	-0.2210	0.000
+D+0.750L+0.750S-0.5250E	2	0.3757	7.498		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum		17.135	4.098
Overall MINimum		-6.292	0.892

7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: Architectural Innovations
Engineer: LGH
Project ID: 203-22010
Project Descr: 3036 67th Ave. SE

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B26 w/ Overstrength

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
D Only		9.027	2.331
+D+L		12.554	3.227
+D+S		11.906	3.167
+D+0.750L		11.673	3.003
+D+0.750L+0.750S		13.832	3.630
+0.60D		5.416	1.399
+D+0.70E		13.431	1.707
+D-0.70E		4.623	2.955
+D+0.750L+0.750S+0.5250E		17.135	3.162
+D+0.750L+0.750S-0.5250E		10.529	4.098
+0.60D+0.70E		9.820	0.775
+0.60D-0.70E		1.012	2.023
L Only		3.527	0.896
S Only		2.879	0.836
E Only		6.292	-0.892
E Only * -1.0		-6.292	0.892

Steel Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B37 w/ HD's

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

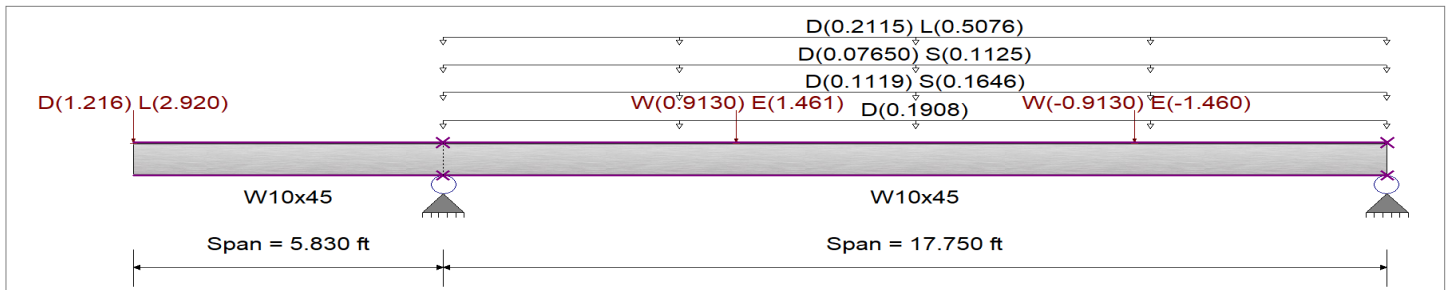
Analysis Method : Allowable Strength Design

Fy : Steel Yield : 50.0 ksi

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

E: Modulus : 29,000.0 ksi

Bending Axis : Major Axis Bending



Applied Loads

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

Beam self weight NOT internally calculated and added

Load(s) for Span Number 1

Point Load : D = 1.216, L = 2.920 k @ 0.0 ft, (B36)

Load(s) for Span Number 2

Point Load : W = 0.9130, E = 1.461 k @ 5.50 ft, (HD)

Point Load : W = -0.9130, E = -1.460 k @ 13.0 ft, (HD)

Uniform Load : D = 0.010 ksf, Tributary Width = 19.083 ft, (Wall)

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 6.585 ft, (Roof)

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 4.50 ft, (Roof)

Uniform Load : D = 0.0250, L = 0.060 ksf, Tributary Width = 8.460 ft, (Deck)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.272 : 1	Maximum Shear Stress Ratio =	0.168 : 1
Section used for this span	W10x45	Section used for this span	W10x45
Ma : Applied	37.261 k-ft	Va : Applied	11.909 k
Mn / Omega : Allowable	136.976 k-ft	Vn/Omega : Allowable	70.70 k
Load Combination	+D+0.750L+0.750S-0.5250E	Load Combination	+D+0.750L+0.750S+0.5250E
Span # where maximum occurs	Span # 2	Location of maximum on span	5.830 ft
		Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.087 in Ratio = 2,459 >=	Span: 2 : S Only	
Max Upward Transient Deflection	-0.090 in Ratio = 1,546 >=	Span: 2 : S Only	
Max Downward Total Deflection	0.276 in Ratio = 772 >=	Span: 2 : +D+0.750L+0.750S+0.5250E	
Max Upward Total Deflection	-0.205 in Ratio = 682 >=	Span: 2 : +D+S	

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values					Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega Cb	Rm	Va Max	Vnx	Vnx/Omega	
D Only														
Dsgn. L =	5.83 ft	1	0.052	0.080		-7.09	7.09	228.75	136.98	1.00	1.00	5.64	106.05	70.70
Dsgn. L =	17.75 ft	2	0.145	0.080	19.86	-7.09	19.86	228.75	136.98	1.00	1.00	5.64	106.05	70.70
+D+L														
Dsgn. L =	5.83 ft	1	0.176	0.157		-24.11	24.11	228.75	136.98	1.00	1.00	11.11	106.05	70.70

Steel Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B37 w/ HD's

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+S	Dsgn. L = 17.75 ft	2	0.234	0.157	32.04	-24.11	32.04	228.75	136.98	1.00	1.00	11.11	106.05	70.70
	Dsgn. L = 5.83 ft	1	0.052	0.115		-7.09	7.09	228.75	136.98	1.00	1.00	8.10	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.224	0.115	30.73	-7.09	30.73	228.75	136.98	1.00	1.00	8.10	106.05	70.70
+D+0.750L	Dsgn. L = 5.83 ft	1	0.145	0.138		-19.86	19.86	228.75	136.98	1.00	1.00	9.74	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.212	0.138	28.97	-19.86	28.97	228.75	136.98	1.00	1.00	9.74	106.05	70.70
+D+0.750L+0.750S	Dsgn. L = 5.83 ft	1	0.145	0.164		-19.86	19.86	228.75	136.98	1.00	1.00	11.59	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.270	0.164	37.05	-19.86	37.05	228.75	136.98	1.00	1.00	11.59	106.05	70.70
+D+0.60W	Dsgn. L = 5.83 ft	1	0.052	0.083		-7.09	7.09	228.75	136.98	1.00	1.00	5.87	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.146	0.083	19.93	-7.09	19.93	228.75	136.98	1.00	1.00	5.87	106.05	70.70
+D-0.60W	Dsgn. L = 5.83 ft	1	0.052	0.077		-7.09	7.09	228.75	136.98	1.00	1.00	5.41	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.146	0.077	19.95	-7.09	19.95	228.75	136.98	1.00	1.00	5.41	106.05	70.70
+D+0.750L+0.450W	Dsgn. L = 5.83 ft	1	0.145	0.140		-19.86	19.86	228.75	136.98	1.00	1.00	9.91	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.211	0.140	28.88	-19.86	28.88	228.75	136.98	1.00	1.00	9.91	106.05	70.70
+D+0.750L-0.450W	Dsgn. L = 5.83 ft	1	0.145	0.135		-19.86	19.86	228.75	136.98	1.00	1.00	9.57	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.213	0.135	29.12	-19.86	29.12	228.75	136.98	1.00	1.00	9.57	106.05	70.70
+D+0.750L+0.750S+0.450W	Dsgn. L = 5.83 ft	1	0.145	0.166		-19.86	19.86	228.75	136.98	1.00	1.00	11.76	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.270	0.166	37.00	-19.86	37.00	228.75	136.98	1.00	1.00	11.76	106.05	70.70
+D+0.750L+0.750S-0.450W	Dsgn. L = 5.83 ft	1	0.145	0.161		-19.86	19.86	228.75	136.98	1.00	1.00	11.41	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.271	0.161	37.14	-19.86	37.14	228.75	136.98	1.00	1.00	11.41	106.05	70.70
+0.60D+0.60W	Dsgn. L = 5.83 ft	1	0.031	0.051		-4.25	4.25	228.75	136.98	1.00	1.00	3.62	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.088	0.051	12.05	-4.25	12.05	228.75	136.98	1.00	1.00	3.62	106.05	70.70
+0.60D-0.60W	Dsgn. L = 5.83 ft	1	0.031	0.045		-4.25	4.25	228.75	136.98	1.00	1.00	3.15	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.088	0.045	12.06	-4.25	12.06	228.75	136.98	1.00	1.00	3.15	106.05	70.70
+D+0.70E	Dsgn. L = 5.83 ft	1	0.052	0.086		-7.09	7.09	228.75	136.98	1.00	1.00	6.07	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.147	0.086	20.14	-7.09	20.14	228.75	136.98	1.00	1.00	6.07	106.05	70.70
+D-0.70E	Dsgn. L = 5.83 ft	1	0.052	0.074		-7.09	7.09	228.75	136.98	1.00	1.00	5.21	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.147	0.075	20.17	-7.09	20.17	228.75	136.98	1.00	1.00	5.28	106.05	70.70
+D+0.750L+0.750S+0.5250E	Dsgn. L = 5.83 ft	1	0.145	0.168		-19.86	19.86	228.75	136.98	1.00	1.00	11.91	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.270	0.168	37.00	-19.86	37.00	228.75	136.98	1.00	1.00	11.91	106.05	70.70
+D+0.750L+0.750S-0.5250E	Dsgn. L = 5.83 ft	1	0.145	0.159		-19.86	19.86	228.75	136.98	1.00	1.00	11.26	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.272	0.159	37.26	-19.86	37.26	228.75	136.98	1.00	1.00	11.26	106.05	70.70
+0.60D+0.70E	Dsgn. L = 5.83 ft	1	0.031	0.054		-4.25	4.25	228.75	136.98	1.00	1.00	3.82	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.090	0.054	12.39	-4.25	12.39	228.75	136.98	1.00	1.00	3.82	106.05	70.70
+0.60D-0.70E	Dsgn. L = 5.83 ft	1	0.031	0.042		-4.25	4.25	228.75	136.98	1.00	1.00	2.95	106.05	70.70
	Dsgn. L = 17.75 ft	2	0.091	0.047	12.42	-4.25	12.42	228.75	136.98	1.00	1.00	3.34	106.05	70.70

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+S	-0.2052	0.000
+D+0.750L+0.750S+0.5250E	2	0.2759	9.230		0.0000	0.000

Vertical Reactions

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum		15.315	9.671
Overall MINimum		-0.386	0.386

Support notation : Far left is #1

Values in KIPS

7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Steel Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B37 w/ HD's

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
D Only		6.859	4.844
+D+L		15.243	8.390
+D+S		9.318	7.303
+D+0.750L		13.147	7.503
+D+0.750L+0.750S		14.991	9.348
+D+0.60W		7.090	4.612
+D-0.60W		6.627	5.075
+D+0.750L+0.450W		13.320	7.330
+D+0.750L-0.450W		12.973	7.677
+D+0.750L+0.750S+0.450W		15.165	9.174
+D+0.750L+0.750S-0.450W		14.818	9.521
+0.60D+0.60W		4.347	2.675
+0.60D-0.60W		3.884	3.138
+D+0.70E		7.291	4.412
+D-0.70E		6.426	5.275
+D+0.750L+0.750S+0.5250E		15.315	9.024
+D+0.750L+0.750S-0.5250E		14.667	9.671
+0.60D+0.70E		4.547	2.475
+0.60D-0.70E		3.683	3.338
L Only		8.384	3.546
S Only		2.459	2.459
W Only		0.386	-0.386
-W		-0.386	0.386
E Only		0.618	-0.617
E Only * -1.0		-0.618	0.617



7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Wood Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

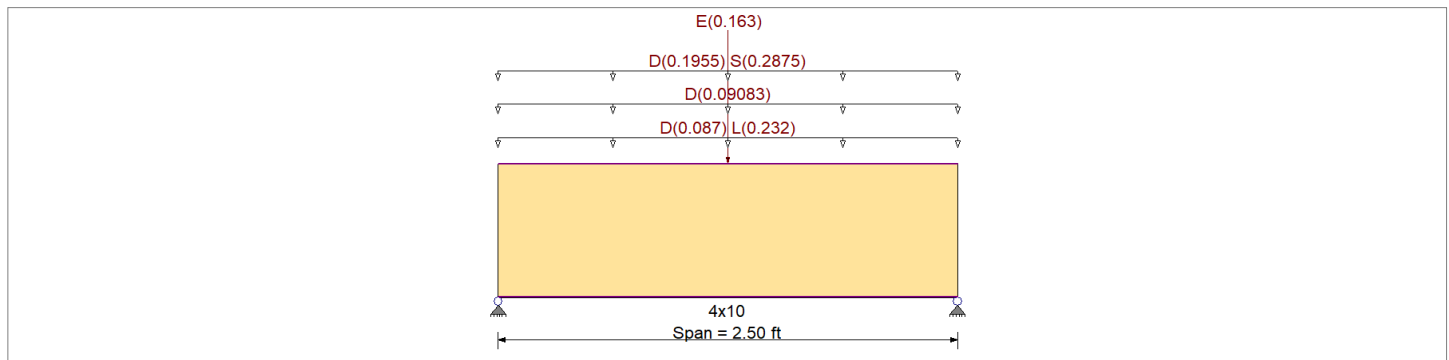
DESCRIPTION: B41 w/ HD's

CODE REFERENCES

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

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	900.0 psi	Ebend- xx	1,600.0ksi
	Fc - Prll	1,350.0 psi	Eminbend - xx	580.0ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade : No.2	Fv	180.0 psi		
	Ft	575.0 psi	Density	31.210pcf
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 NOT internally calculated and added

Point Load : E = 0.1630 k @ 1.250 ft, (HD)

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 5.80 ft, (Floor)

Uniform Load : D = 0.010 ksf, Tributary Width = 9.083 ft, (Wall)

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 11.50 ft, (Roof)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.115 : 1	Maximum Shear Stress Ratio =	0.083 : 1
Section used for this span	4x10	Section used for this span	4x10
fb: Actual =	143.31 psi	fv: Actual =	17.09 psi
Fb: Allowable =	1,242.00 psi	Fv: Allowable =	207.00 psi
Load Combination	+D+0.750L+0.750S	Load Combination	+D+0.750L+0.750S
Location of maximum on span =	1.250ft	Location of maximum on span =	0.000ft
Span # where maximum occurs =	Span # 1	Span # where maximum occurs =	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0 in	Ratio =	0 < 360 n/a
Max Upward Transient Deflection	0 in	Ratio =	0 < 360 n/a
Max Downward Total Deflection	0.002 in	Ratio =	15328 >= 180
Max Upward Total Deflection	0 in	Ratio =	0 < 180 n/a
		Span: 1 :	+D+0.750L+0.750S+0.5250E

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios								Moment Values			Shear Values					
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	fv	F'v		
D Only																			
Length = 2.50 ft	1		0.072	0.052	0.90	1.200	1.00	1.00	1.00	1.00	1.00	0.29	70.12	972.00	0.00	0.00	0.00	0.00	162.00
+D+L																			
Length = 2.50 ft	1		0.105	0.075	1.00	1.200	1.00	1.00	1.00	1.00	1.00	0.47	113.70	1080.00	0.00	0.00	0.00	0.00	180.00
+D+S																			
Length = 2.50 ft	1		0.100	0.072	1.15	1.200	1.00	1.00	1.00	1.00	1.00	0.52	124.13	1242.00	0.00	0.00	0.00	0.00	207.00
+D+0.750L																			
Length = 2.50 ft	1		0.076	0.055	1.25	1.200	1.00	1.00	1.00	1.00	1.00	0.43	102.81	1350.00	0.00	0.00	0.00	0.00	225.00
+D+0.750L+0.750S																			
Length = 2.50 ft	1		0.115	0.083	1.15	1.200	1.00	1.00	1.00	1.00	1.00	0.60	143.31	1242.00	0.00	0.00	0.00	0.00	207.00



7220 Trade Street, Suite 350
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B41 w/ HD's

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	M	fb	F'b	V	f _v	F'v	
+0.60D						1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	0.00
Length = 2.50 ft	1		0.024	0.017	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.17	42.07	1728.00	0.11	5.02	288.00	
+D+0.70E						1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 2.50 ft	1		0.051	0.038	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.36	87.27	1728.00	0.24	11.01	288.00	
+D-0.70E						1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 2.50 ft	1		0.031	0.020	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.22	54.03	1728.00	0.12	5.72	288.00	
+D+0.750L+0.750S+0.5250E						1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 2.50 ft	1		0.090	0.066	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.65	156.17	1728.00	0.41	19.08	288.00	
+D+0.750L+0.750S-0.5250E						1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 2.50 ft	1		0.076	0.052	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.54	130.74	1728.00	0.33	15.11	288.00	
+0.60D+0.70E						1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 2.50 ft	1		0.034	0.027	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.25	59.22	1728.00	0.17	7.66	288.00	
+0.60D-0.70E						1.200	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00	
Length = 2.50 ft	1		0.015	0.009	1.60	1.200	1.00	1.00	1.00	1.00	1.00	0.11	26.68	1728.00	0.06	2.64	288.00	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.0020	1.259		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.996	0.996
Overall MINimum	-0.082	-0.082
D Only	0.467	0.467
+D+L	0.757	0.757
+D+S	0.826	0.826
+D+0.750L	0.684	0.684
+D+0.750L+0.750S	0.954	0.954
+0.60D	0.280	0.280
+D+0.70E	0.524	0.524
+D-0.70E	0.410	0.410
+D+0.750L+0.750S+0.5250E	0.996	0.996
+D+0.750L+0.750S-0.5250E	0.911	0.911
+0.60D+0.70E	0.337	0.337
+0.60D-0.70E	0.223	0.223
L Only	0.290	0.290
S Only	0.359	0.359
E Only	0.082	0.082
E Only * -1.0	-0.082	-0.082

Wood Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

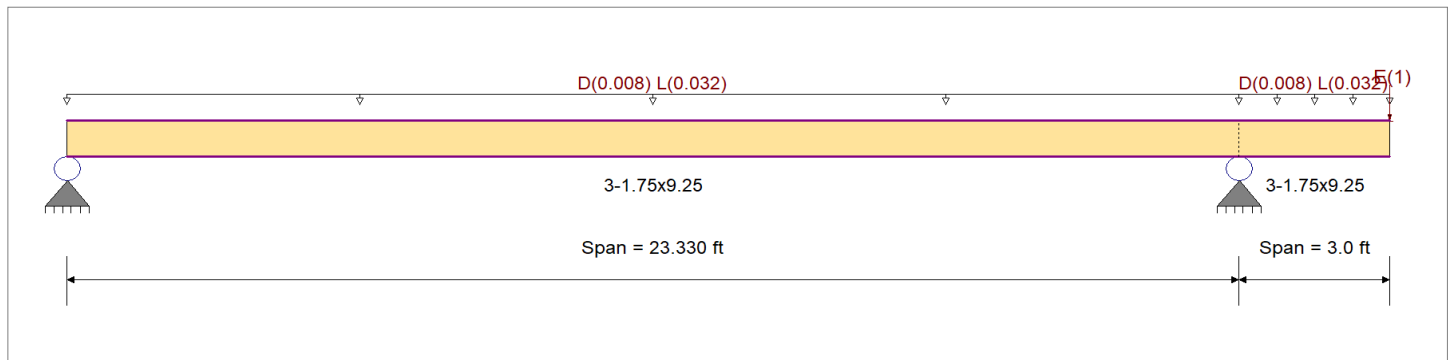
DESCRIPTION: B46 w/ HD

CODE REFERENCES

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

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,600.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	2,600.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	2,510.0 psi	Eminbend - xx	1,016.54ksi
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	42.010pcf
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 = 0.010, L = 0.040 ksf, Tributary Width = 0.80 ft, (Floor)
 Load for Span Number 2
 Uniform Load : D = 0.010, L = 0.040 ksf, Tributary Width = 0.80 ft, (Floor)
 Point Load : E = 1.0 k @ 3.0 ft, (HD)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.220 : 1	Maximum Shear Stress Ratio	=	0.066 : 1
Section used for this span		3-1.75x9.25	Section used for this span		3-1.75x9.25
fb: Actual	=	571.33psi	fv: Actual	=	18.75 psi
Fb: Allowable	=	2,600.00psi	Fv: Allowable	=	285.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	11.469ft	Location of maximum on span	=	22.678 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.298 in Ratio =	938 >=360	Span: 1 : L Only	
Max Upward Transient Deflection		-0.118 in Ratio =	612 >=360	Span: 2 : L Only	
Max Downward Total Deflection		0.566 in Ratio =	494 >=180	Span: 2 : +0.60D+0.70E	
Max Upward Total Deflection		-0.273 in Ratio =	262 >=180	Span: 2 : +D+0.750L-0.5250E	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L-0.5250E	1	0.5658	12.121		0.0000	0.000
	2	0.0000	12.121	+D+0.750L-0.5250E	-0.2730	3.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	0.621	1.278	
Overall MINimum	0.129	-1.129	
D Only	0.254	0.329	
+D+L	0.621	0.805	
+D+0.750L	0.530	0.686	

7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: Architectural Innovations
Engineer: LGH
Project ID: 203-22010
Project Descr: 3036 67th Ave. SE

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B46 w/ HD

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
+0.60D	0.153	0.198	
+D+0.70E	0.164	1.119	
+D-0.70E	0.344	-0.461	
+D+0.750L+0.5250E	0.462	1.278	
+D+0.750L-0.5250E	0.597	0.093	
+0.60D+0.70E	0.063	0.988	
+0.60D-0.70E	0.243	-0.592	
L Only	0.367	0.475	
E Only	-0.129	1.129	
E Only * -1.0	0.129	-1.129	

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

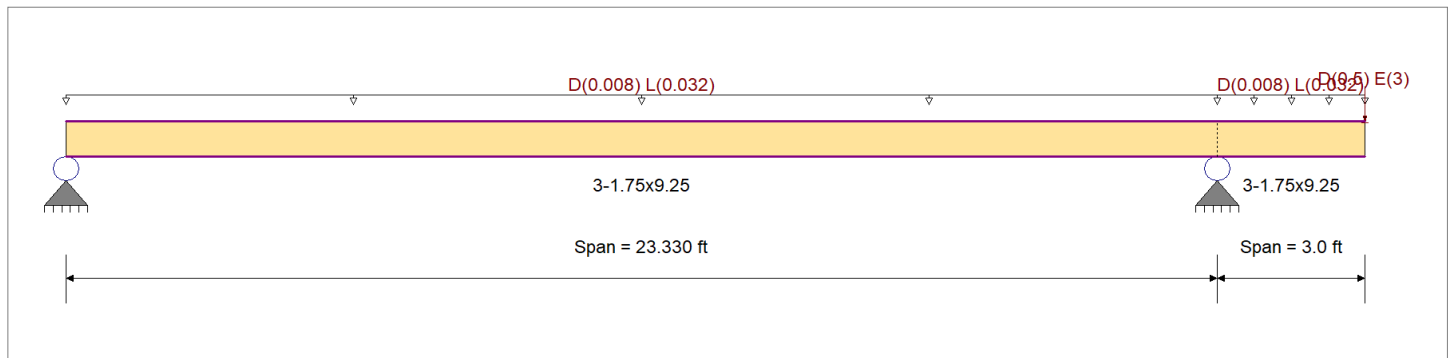
DESCRIPTION: B46 w/ Overstrength

CODE REFERENCES

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

Material Properties

Analysis Method : Allowable Stress Design	Fb +	3,120.0 psi	E : Modulus of Elasticity
Load Combination : ASCE 7-16	Fb -	3,120.0 psi	Ebend- xx
	Fc - Prll	3,012.0 psi	Eminbend - xx
Wood Species : iLevel Truss Joist	Fc - Perp	900.0 psi	
Wood Grade : MicroLam LVL 2.0 E	Fv	342.0 psi	
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling	Ft	1,866.0 psi	Density
			42.010pcf



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 = 0.010, L = 0.040 ksf, Tributary Width = 0.80 ft, (Floor)

Load for Span Number 2

Uniform Load : D = 0.010, L = 0.040 ksf, Tributary Width = 0.80 ft, (Floor)

Point Load : D = 0.50, E = 3.0 k @ 3.0 ft, (SW #106)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.564 : 1	Maximum Shear Stress Ratio	=	0.331 : 1
Section used for this span		3-1.75x9.25	Section used for this span		3-1.75x9.25
fb: Actual	=	2,814.56psi	fv: Actual	=	181.37 psi
Fb: Allowable	=	4,992.00psi	Fv: Allowable	=	547.20 psi
Load Combination		+1.131D+1.750E	Load Combination		+1.131D+1.750E
Location of maximum on span	=	23.330ft	Location of maximum on span	=	23.330ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.298 in Ratio = 938 >=360	Span: 1 : L Only		
Max Upward Transient Deflection		-0.118 in Ratio = 612 >=360	Span: 2 : L Only		
Max Downward Total Deflection		0.431 in Ratio = 166 >=120	Span: 2 : +D+0.70E		
Max Upward Total Deflection		-0.403 in Ratio = 178 >=120	Span: 2 : +0.60D-0.70E		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L-0.5250E	1	0.7087	12.382		0.0000	0.000
+D+0.70E	2	0.4308	3.000		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	0.668	-3.386	
Overall MINimum	0.386	-3.386	
D Only	0.190	0.894	
+D+L	0.557	1.369	
+D+0.750L	0.465	1.250	

7220 Trade Street, Suite 350
San Diego, CA 92121
(619) 650-0010
mulhernkulp.com

Project Title: Architectural Innovations
Engineer: LGH
Project ID: 203-22010
Project Descr: 3036 67th Ave. SE

Wood Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.22.3.16

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2022

DESCRIPTION: B46 w/ Overstrength

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
+0.60D	0.114	0.536	
+D+0.70E	-0.080	3.264	
+D-0.70E	0.460	-1.476	
+D+0.750L+0.5250E	0.263	3.028	
+D+0.750L-0.5250E	0.668	-0.527	
+0.60D+0.70E	-0.156	2.906	
+0.60D-0.70E	0.384	-1.834	
L Only	0.367	0.475	
E Only	-0.386	3.386	
E Only * -1.0	0.386	-3.386	



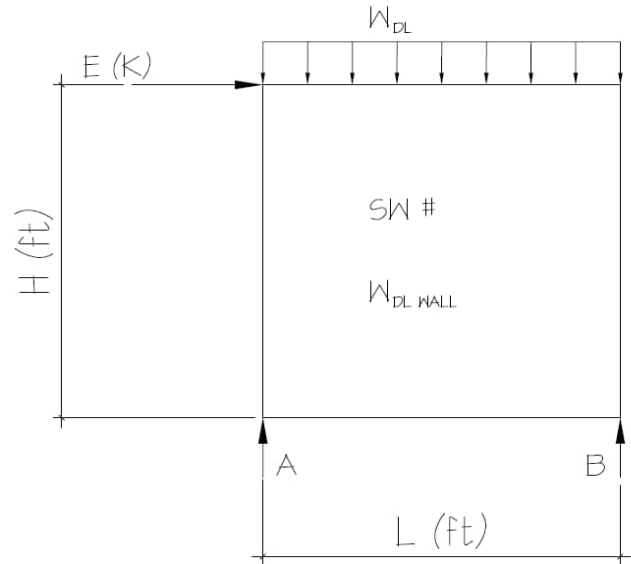
Overstrength Calculations

Wall Description/SW #:

202

Parameters:

L = 6.0 ft
H = 9.1 ft
E = 1.60 k
W_{DLWall} = 0.09 kl f
W_{DL} = 0.195 kl f
Ω₀ = 2.5 (ASCE TABLE 12.2.1 FOOTNOTE G)
SDS = 0.938



analysis:

$$E_{mh} = \Omega_0 * E = 4.00 \text{ K} \quad E_v = 0.2 * SDS * DL = 0.321 \text{ K}$$

$$E_m = E_{mh} + E_v = 4.321 \text{ K}$$

$$E_m = E_{mh} - E_v = 3.679 \text{ K}$$

$$E_m (\text{max}) = \sum M_A = 0 = 4.32(9.1) + 0.2852(6)(3) - R_b(6) \quad R_B = 0.9DL + 6.5E$$

$$R_a = 0.9DL - 6.5E$$

$$E_m (\text{min}) = \sum M_A = 0 = 3.68(9.1) + 0.2852(6)(3) - R_b(6) \quad R_B = 0.9DL + 5.6E$$

$$R_a = 0.9DL - 5.6E$$

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stress permitted to be increased by 1.2

see following beam calcs for load application



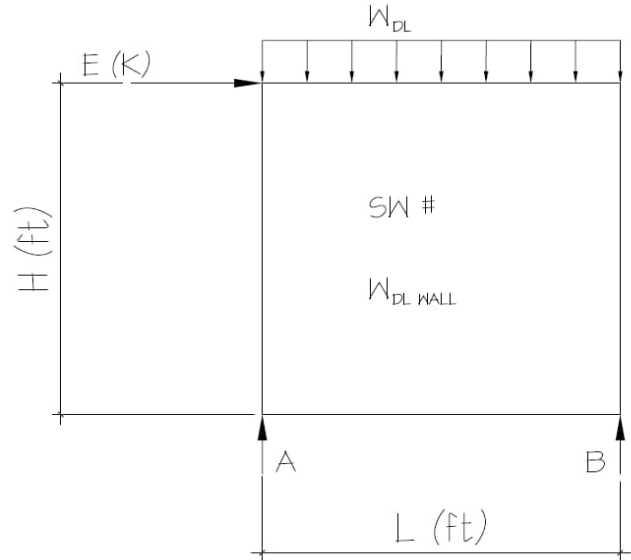
Overstrength Calculations

Wall Description/SW #:

203

Parameters:

L = 6.8 ft
H = 9.1 ft
E = 0.98 k
 W_{DLWall} = 0.09 kl f
 W_{DL} = 0.071 kl f
 Ω_0 = 2.5 (ASCE TABLE 12.2.1 FOOTNOTE G)
SDS = 0.938



analysis:

$E_{mh} = \Omega_0 * E = 2.44$ K $E_v = 0.2 * SDS * DL = 0.204$ K
 $E_m = E_{mh} + E_v = 2.644$ K
 $E_m = E_{mh} - E_v = 2.236$ K

$E_m (max) = \sum M_A = 0 = 2.64(9.1) + 0.16117(6.75)(3.375) - R_b(6.75)$ $R_b = 0.5DL + 3.6E$
 $R_a = 0.5DL - 3.6E$

$E_m (min) = \sum M_A = 0 = 2.24(9.1) + 0.16117(6.75)(3.375) - R_b(6.75)$ $R_b = 0.5DL + 3.0E$
 $R_a = 0.5DL - 3.0E$

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stress permitted to be increased by 1.2

see following beam calcs for load application



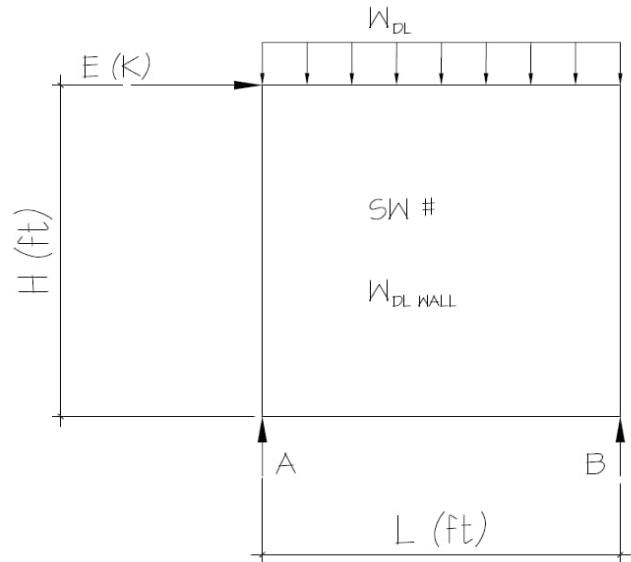
Overstrength Calculations

Wall Description/SW #:

204

Parameters:

L =	11.0	ft
H =	9.1	ft
E =	0.62	k
W_{DLWall} =	0.09	klf
W_{DL} =	0.076	klf
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE G)
SDS =	0.938	



analysis:

$E_{mh} = \Omega_0 * E =$	1.56	K	$E_v = 0.2 * SDS * DL =$	0.343	K
$E_m = E_{mh} + E_v$			$E_m = E_{mh} + E_v =$	1.898	K
$E_m = E_{mh} - E_v$			$E_m = E_{mh} - E_v =$	1.212	K

$E_m (max) = \sum M_A = 0 =$	$1.90(9.1) + 0.1662(11)(5.5) - R_b(11)$	$R_b =$	$0.9DL + 1.6E$
		$R_a =$	$0.9DL - 1.6E$
$E_m (min) = \sum M_A = 0 =$	$1.21(9.1) + 0.1662(11)(5.5) - R_b(11)$	$R_b =$	$0.9DL + 1.0E$
		$R_a =$	$0.9DL - 1.0E$

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stress permitted to be increased by 1.2

see following beam calcs for load application



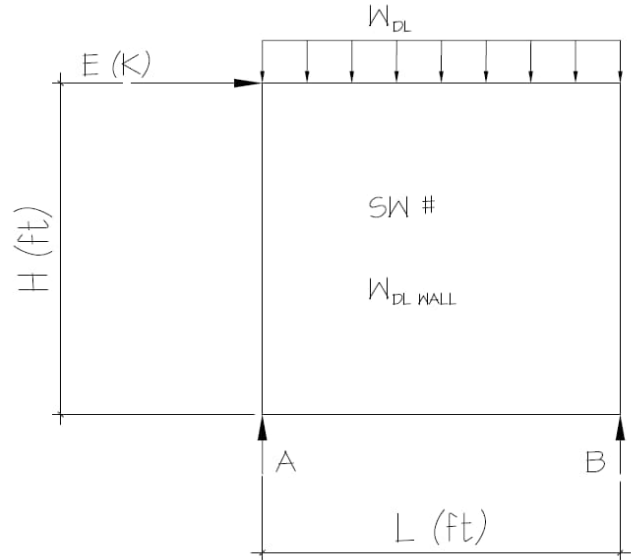
Overstrength Calculations

Wall Description/SW #:

205

Parameters:

L = 9.6 ft
 H = 9.1 ft
 E = 0.53 k
 W_{DLWall} = 0.09 kl f
 W_{DL} = 0.076 kl f
 Ω₀ = 2.5 (ASCE TABLE 12.2.1 FOOTNOTE G)
 SDS = 0.938



analysis:

E_{mh} = Ω₀ * E = 1.31 K E_v = 0.2 * SDS * DL = 0.299 K
 E_m = E_{mh} + E_v E_m = E_{mh} + E_v = 1.611 K
 E_m = E_{mh} - E_v E_m = E_{mh} - E_v = 1.014 K

E_m (max) = ΣM_A = 0 = 1.61(9.1) + 0.1662(9.583)(4.7915) - R_b(9.583) R_B = 0.8DL + 1.5E
 R_a = 0.8DL - 1.5E

E_m (min) = ΣM_A = 0 = 1.01(9.1) + 0.1662(9.583)(4.7915) - R_b(9.583) R_B = 0.8DL + 1.0E
 R_a = 0.8DL - 1.0E

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stress permitted to be increased by 1.2

see following beam
calcs for load
application



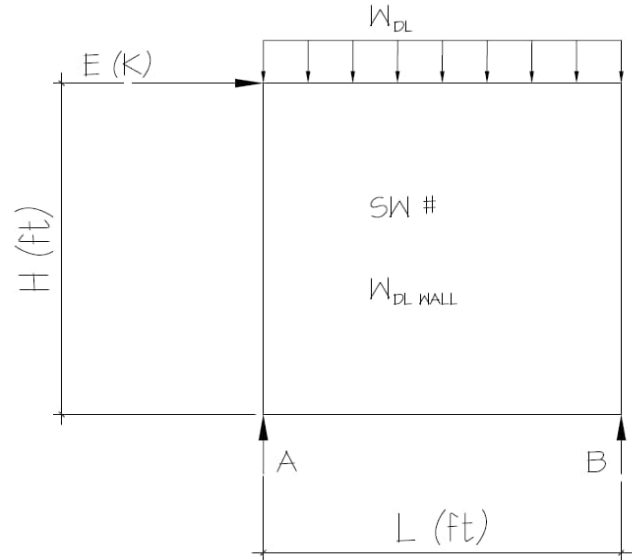
Overstrength Calculations

Wall Description/SW #:

207

Parameters:

L =	5.5	ft
H =	9.1	ft
E =	0.64	k
W_{DLWall} =	0.09	klf
W_{DL} =	0.080	klf
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE G)
SDS =	0.938	



analysis:

$E_{mh} = \Omega_0 * E =$	1.59	K	$E_v = 0.2 * SDS * DL =$	0.175	K
$E_m = E_{mh} + E_v$			$E_m = E_{mh} + E_v =$	1.763	K
$E_m = E_{mh} - E_v$			$E_m = E_{mh} - E_v =$	1.412	K

$E_m (max) = \sum M_A = 0 =$	$1.76(9.1) + 0.17(5.5)(2.75) - R_b(5.5)$	$R_b =$	$0.5DL + 2.9E$
		$R_a =$	$0.5DL - 2.9E$
$E_m (min) = \sum M_A = 0 =$	$1.41(9.1) + 0.17(5.5)(2.75) - R_b(5.5)$	$R_b =$	$0.5DL + 2.3E$
		$R_a =$	$0.5DL - 2.3E$

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stress permitted to be increased by 1.2

see following beam
calcs for load
application



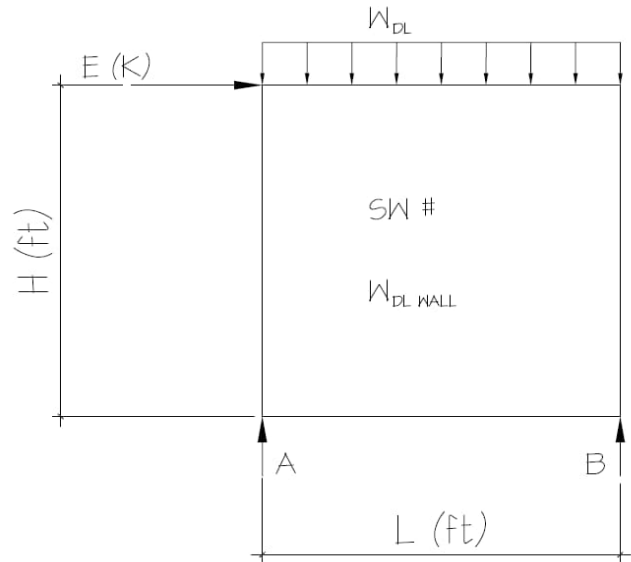
Overstrength Calculations

Wall Description/SW #:

210

Parameters:

L = 12.3 ft
H = 9.1 ft
E = 1.41 k
 W_{DLWall} = 0.09 kl f
 W_{DL} = 0.034 kl f
 Ω_0 = 2.5 (ASCE TABLE 12.2.1 FOOTNOTE G)
SDS = 0.938



analysis:

$E_{mh} = \Omega_0 * E = 3.53$ K $E_v = 0.2 * SDS * DL = 0.285$ K
 $E_m = E_{mh} + E_v = 3.810$ K
 $E_m = E_{mh} - E_v = 3.240$ K

$E_m (max) = \sum M_A = 0 = 3.81(9.1) + 0.1242(12.25)(6.125) - R_b(12.25)$ $R_b = 0.8DL + 2.8E$
 $R_a = 0.8DL - 2.8E$

$E_m (min) = \sum M_A = 0 = 3.24(9.1) + 0.1242(12.25)(6.125) - R_b(12.25)$ $R_b = 0.8DL + 2.4E$
 $R_a = 0.8DL - 2.4E$

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stress permitted to be increased by 1.2

see following beam
calcs for load
application



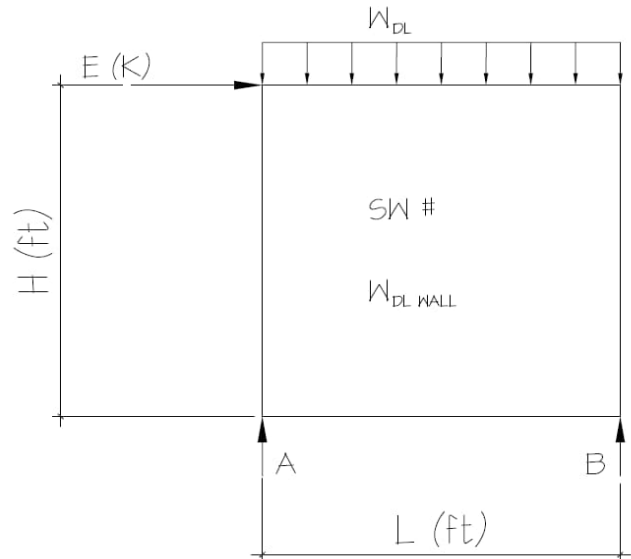
Overstrength Calculations

Wall Description/SW #:

104

Parameters:

L =	11.2	ft
H =	9.1	ft
E =	1.60	k
W_{DLWall} =	0.09	klf
W_{DL} =	0.128	klf
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNOTE G)
SDS =	0.938	



analysis:

$E_{mh} = \Omega_0 * E =$	4.00	K	$E_v = 0.2 * SDS * DL =$	0.457	K
$E_m = E_{mh} + E_v$			$E_m = E_{mh} + E_v =$	4.457	K
$E_m = E_{mh} - E_v$			$E_m = E_{mh} - E_v =$	3.543	K

$E_m (max) = \sum M_A = 0 =$	$4.46(9.1) + 0.218(11.17)(5.585) - R_b(11.17)$	$R_b =$	$1.2DL + 3.6E$
		$R_a =$	$1.2DL - 3.6E$
$E_m (min) = \sum M_A = 0 =$	$3.54(9.1) + 0.218(11.17)(5.585) - R_b(11.17)$	$R_b =$	$1.2DL + 2.9E$
		$R_a =$	$1.2DL - 2.9E$

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stress permitted to be increased by 1.2

see following beam
calcs for load
application



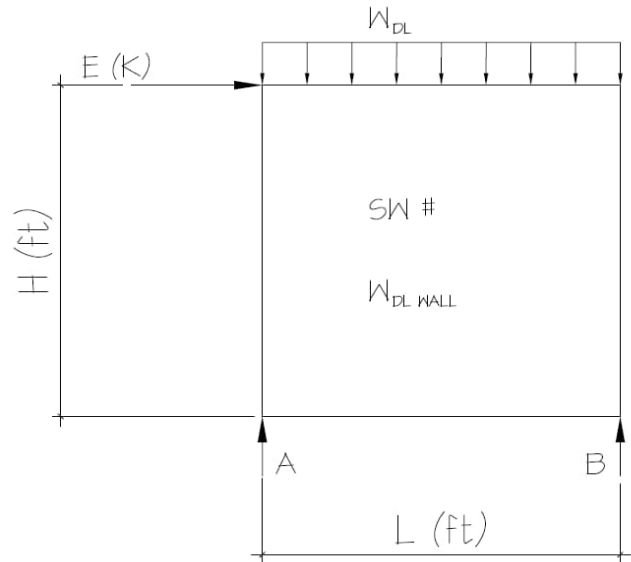
Overstrength Calculations

Wall Description/SW #:

106

Parameters:

L = 5.5 ft
H = 9.1 ft
E = 0.66 k
W_{DLWall} = 0.09 kl f
W_{DL} = 0.084 kl f
Ω₀ = 2.5 (ASCE TABLE 12.2.1 FOOTNOTE G)
SDS = 0.938



analysis:

$E_{mh} = \Omega_0 * E = 1.65$ K $E_v = 0.2 * SDS * DL = 0.180$ K
 $E_m = E_{mh} + E_v = 1.830$ K
 $E_m = E_{mh} - E_v = 1.470$ K

$E_m (\max) = \sum M_A = 0 = 1.83(9.1) + 0.174(5.5)(2.75) - R_b(5.5)$ $R_b = 0.5DL + 3.0E$
 $R_a = 0.5DL - 3.0E$

$E_m (\min) = \sum M_A = 0 = 1.47(9.1) + 0.174(5.5)(2.75) - R_b(5.5)$ $R_b = 0.5DL + 2.4E$
 $R_a = 0.5DL - 2.4E$

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stress permitted to be increased by 1.2

see following beam
calcs for load
application

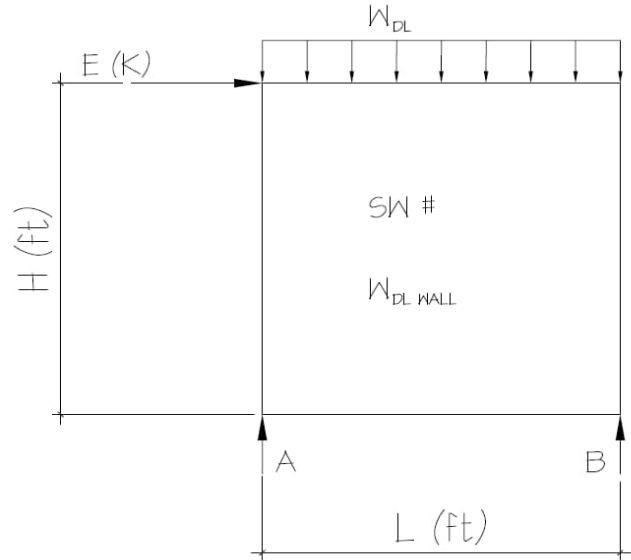


Overstrength Calculations

Wall Description/SW #: 111

Parameters:

- L = 19.0 ft
- H = 9.1 ft
- E = 4.15 k
- W_{DLWall} = 0.09 kl f
- W_{DL} = 0.145 kl f
- Ω_0 = 2.5 (ASCE TABLE 12.2.1 FOOTNOTE G)
- SDS = 0.938



analysis:

$E_{mh} = \Omega_0 * E = 10.38$ K $E_v = 0.2 * SDS * DL = 0.838$ K
 $E_m = E_{mh} + E_v = 11.213$ K
 $E_m = E_{mh} - E_v = 9.537$ K

$E_m (max) = \sum M_A = 0 = 11.21(9.1) + 0.235(19)(9.5) - R_b(19)$ $R_b = 2.2DL + 5.4E$
 $R_a = 2.2DL - 5.4E$

$E_m (min) = \sum M_A = 0 = 9.54(9.1) + 0.235(19)(9.5) - R_b(19)$ $R_b = 2.2DL + 4.6E$
 $R_a = 2.2DL - 4.6E$

check beams for axial forces shown using load combos per section 12.4.3.1 (asd)

allowable stress permitted to be increased by 1.2

see following beam calcs for load application

SYMBOLS AND LEGEND

FAN - DIRECT VENT TO OUTSIDE
 -BATHROOMS/LAUNDRY 30 CFM MIN.
 -KITCHEN EXHAUST HOOD TO BE MIN. OF 100CFM. IF EXHAUST HOOD EXCEEDS 400 CFM MAKE UP AIR MUST BE PROVIDED PER SECTION M1023.6.

WHOLE-HOUSE FAN ON TIMER SYSTEMS TO CONFORM TO IRC, M1025.4. FAN SIZE PER PLAN. TIMER TO BE LOCATED AT THE FAN WITH A MANUAL OVERRIDE SWITCH AT THE FAN LOCATION. TIMER TO BE SET TO RUN 50% IN EACH 4-HOUR SEGMENT. FRESH AIR TO BE PROVIDED BY THE FORCED AIR SYSTEM DUCTS PER SECTION M1025.4.1.

R314.2.3. A HEAT DETECTOR OR HEAT ALARM RATED FOR THE AMBIENT OUTDOOR TEMPERATURES AND HUMIDITY SHALL BE INSTALLED IN NEW GARAGES THAT ARE ATTACHED TO OR LOCATED UNDER NEW AND EXISTING DWELLINGS PER SECTION R314.2.3

THERMOSTAT # 50" ABOVE FLOOR

110V SMOKE ALARM PER I.R.C. R314 WITH BATTERY BACKUP INTERCONNECTED USE A COMBINATION SMOKE/CARBON MONOXIDE ALARM WHEN NOTED

MECHANICAL, PLUMBING, AND ELECTRICAL SYSTEM FOR UNITS: PER DIV. 15.16 SEE SHEET A1

FURN

WH

A. PROVIDE 6" DIAMETER FRESH AIR INTAKE FROM OUTSIDE TO RETURN AIR FLENUM AT FURNACE WITH MOTORIZED FLOW DAMPERS.
B. PROVIDE THERMAL EXPANSION TANK AT WATER HEATER.
C. STRAP WATER HEATER TO FRAMING TOP AND BOTTOM.
D. PROVIDE PRESSURE RELIEF LINE PLUMBED TO OUTSIDE.

FLOOR PLAN KEY NOTES

P-1 OCCUPANCY SEPARATION: APPLY (1) LAYER OF 1/2" G.W.B. TO GARAGE SIDE OF RESIDENCE ATTIC SPACES. 4 TO ALL BEAMS & POSTS SUPPORTING A FLOOR-CEILING ASSEMBLY. APPLY (1) LAYER OF 1/2" TYPE 'X' G.W.B. TO GARAGE CEILING WHEN UNDER HABITABLE ROOMS. DUCTS THROUGH WALL OR CEILING COMMON TO HOUSE SHALL HAVE MINIMUM 26 GAUGE STEEL. SEE DIV. 05022.6.A. SHEET A-1.

P-2 1 3/8" MIN. SELF CLOSING SOLID WOOD CORE, HONEY-COMB CORE STEEL, OR 20-MINUTE FIRE RATED DOOR W/ SELF-CLOSER. SEE DIV. 05022.6.B. SHEET A-1.

P-3 SAFETY GLAZING PER I.R.C. SECTION R308
 A. WINDOWS WITHIN 18" OF FLOOR
 B. WINDOWS WITHIN A 24" ARC OF DOORS
 C. WINDOWS AT TUBS AND SHOWERS
 D. GLAZING IN DOORS
 E. WITHIN STAIRWELLS
 F. LESS THAN 60" HORIZ. FROM THE BOT. STAIR TREAD NOSING, 4 BOT. EDGE OF GLAZING IS LESS THAN 36" ABV. LANDING/WALKING SURFACE
 SEE DIV. 05022.6 SHEET A-1

FLOOR PLAN KEY NOTES

P-4 STAIR ASSEMBLY NOTES: PER I.R.C. SECTION R3015 AND DETAIL 12/D2.
 A. HEADROOM MIN. 6'-8" WIDTH MIN. 3'-0".
 B. TREADS 10" MIN. DEPTH AND MIN. WIDTH OF 36" ABOVE HANDRAIL HEIGHT, RISERS 7 1/4" MAX. HT. TREAD NOSING TO BE MINIMUM 3/4" AND A MAXIMUM OF 1/4" ON STAIRS W/ SOLID RISERS.
 C. HANDRAIL MIN. 34" TO MAX 38" ABOVE TREAD NOSING. HANDRAIL TYPE I CIRCULAR TO HAVE 1 1/4" MIN. TO 2" MAX. CROSS SECTION DIMENSION AND 1 1/2" MIN. CLEAR FROM WALL. RETURN RAIL ENDS. HANDRAILS SHALL BE STRONG ENOUGH TO RESIST A 200# P.L. IN ANY DIRECTION PER I.R.C. TABLE R3021.
 D. INSTALL FIRE BLOCKING BETWEEN STRINGERS AT THE TOP AND BOTTOM OF EACH RUN PER I.R.C. SECTION R3021.1.
 E. COVER USABLE SPACE UNDER STAIR W/ 1/2" G.W.B. PER I.R.C. SECTION R3021.1.
 F. INTERMEDIATE BALUSTERS SHALL BE SPACED W/ LESS THAN 4" BETWEEN BALUSTERS.
 G. PROVIDE STAIRWAY ILLUMINATION PER I.R.C. SECTION R3021.6.
 SEE DIV. 05022.6 SHEET A-1.

FLOOR PLAN KEY NOTES

P-5 EGRESS WINDOW PER I.R.C. SECTION R310 SEE DIV. 05022 SHEET A-1

P-6 IGNITERS FOR GAS FIRED APPLIANCES IN GARAGE TO BE 18" MIN. ABOVE TOP OF SLAB. SEE DIV. 15 SHEET A-1

P-7 COVER WALLS ADJACENT TO TUBS AND SHOWERS WITH NON-ABSORBENT MATERIAL TO 12" ABOVE DRAIN INLETS, PER I.R.C. SECTION 307.2. SEE DIV. 05250 SHEET A-1

P-8 (2) LAYERS OF FLOOR SHEATHING OVER FRAMING.

P-9 1 3/4" MAX. RISER WITH 10" MIN. RUN, IF MORE THAN (3) RISERS, HANDRAIL REQUIRED PER I.R.C. SECTION R301.8. SEE DIV. 05022.1 SHEET A-1

P-10 36"x48" CRAWL SPACE ACCESS. INSULATE AND WEATHER STRIP. SEE DIV. 05022.1 SHEET A-1

P-11 22"x30" ATTIC SPACE ACCESS W/ 30" HEAD CLEARANCE. INSULATE AND WEATHER STRIP. SEE DIV. 05022.2 SHEET A-1

P-12 FLOOR MATERIAL BREAK LINE

FLOOR PLAN KEY NOTES

P-13 WALL LINE ABOVE

P-14 WALL LINE BELOW

P-15 FIREPLACE ASSEMBLY NOTES:
 A. DIRECT VENT FIREPLACES, INSTALL PER MFG. SPECIFICATIONS. SHALL CONFORM TO I.R.C. REQUIREMENTS. SEE DIV. 05022.8 SHEET A-1
 B. ZERO CLEARANCE FIREPLACES SHALL CONFORM TO I.R.C. REQUIREMENTS. SEE DIV. 05022.8 SHEET A-1
 C. HEARTH SHALL CONFORM TO I.R.C. REQUIREMENTS. SEE DIV. 05022.8 AND 9 SHEET A-1
 D. FIRE-BLOCK OPENINGS AROUND PENETRATIONS AT EACH FLOOR PER I.R.C. SECTION R102.13.

P-16 SEE SITE PLAN FOR EXTENT OF WALKS AND DRIVEWAYS

P-17 3" DIAMETER STEEL POST

FLOOR PLAN KEY NOTES

P-18 42" GUARDRAIL PER I.R.C. SECTION R312.4 TABLE R301.5 AT STAIRS SLOPES AT 34" ABOVE STAIR NOSING. CONTRACTOR TO VERIFY TO INSPECTOR THAT ALL GUARDRAILS ARE CAPABLE OF RESISTING 200LB LOAD ON TOP RAIL IN ANY DIRECTION PER R301.5.

P-19 1" VENT FOR MECHANICAL, 1" CLEARANCE ALL SIDES PER I.R.C. SECTION R102.5.3. SEE DIV. 15 SHEET A-1

P-20 PLANT SHELF

P-21 UPPER AND LOWER LINEN CABINETS

P-22 SOFFIT AREA

P-23 INTEGRATED MAKE UP AIR

P-24 2x6 STUDS W/ R-21 INSUL. MIN.

GENERAL PLAN NOTES

- SEE SHEET A-1 FOR ALL GENERAL NOTES AND REQUIREMENTS.
- ENERGY AND AIR QUALITY INFORMATION SEE DIV. 11 SHEET A-1
- SEE BUILDING ELEVATION FOR WINDOW OPERATION SEE DIV. 8 SHEET A-1
- SEE TYP. MATERIALS LIST ON SECTION SHEET
- SEE SHEET A-1 FOR ALL NOTES AND REQUIREMENTS CONCERNING MECHANICAL, PLUMBING, AND ELECTRICAL.

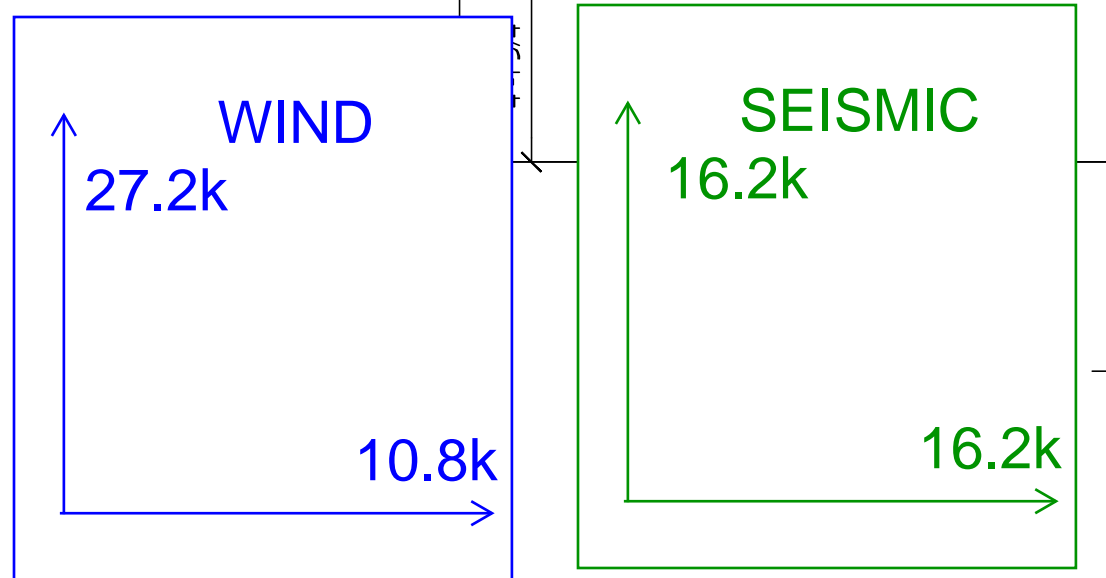
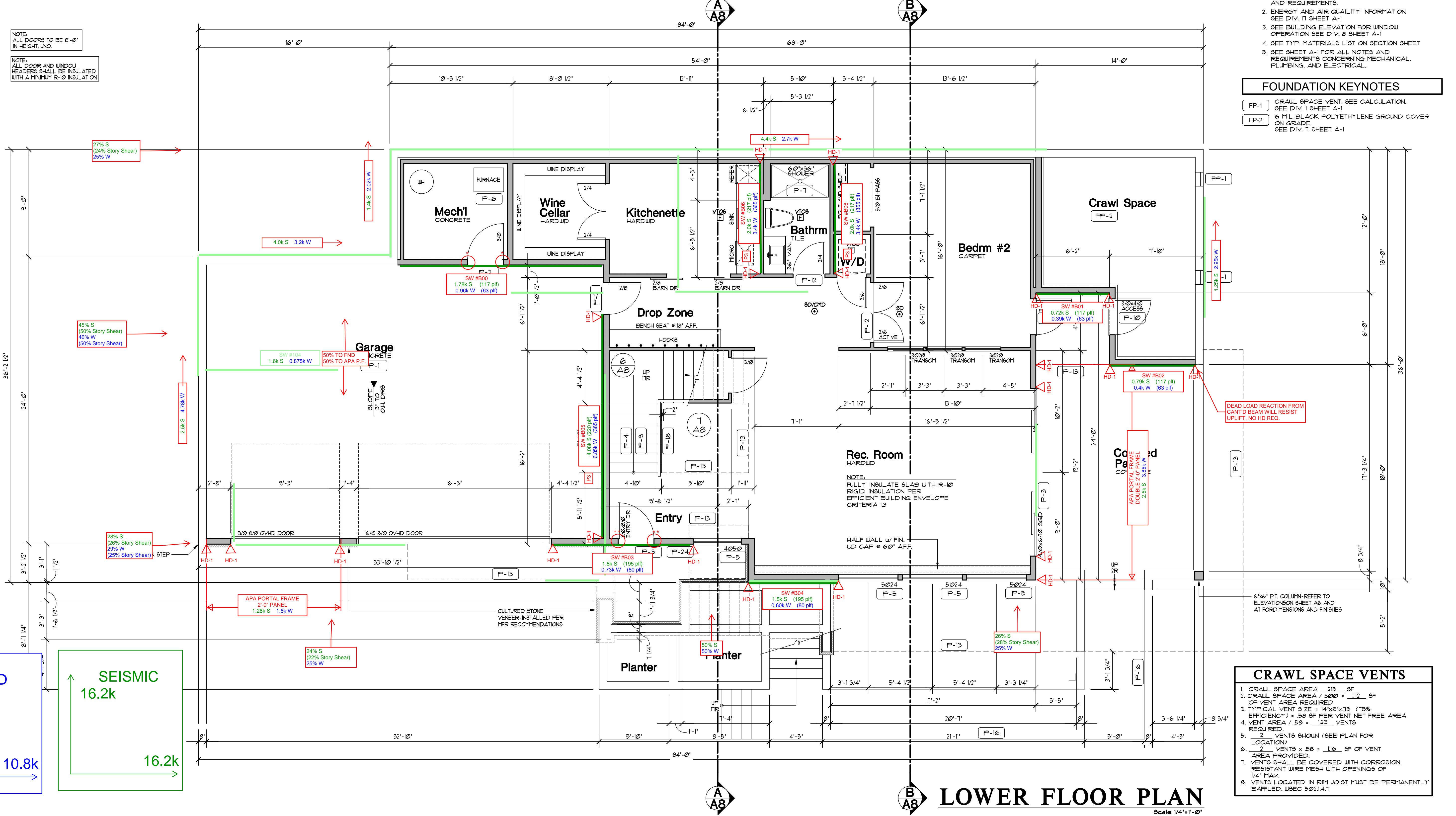
FOUNDATION KEYNOTES

FP-1 CRAWL SPACE VENT. SEE CALCULATION. SEE DIV. 1 SHEET A-1

FP-2 6" MIL BLACK POLYETHYLENE GROUND COVER ON GRADE. SEE DIV. 1 SHEET A-1

NOTE: ALL DOORS TO BE 8'-0" IN HEIGHT, UNO.

NOTE: ALL DOOR AND WINDOW HEADERS SHALL BE INSULATED WITH A MINIMUM R-10 INSULATION.



INDICATES SHEAR WALL ABOVE

CRAWL SPACE VENTS

- CRAWL SPACE AREA = 215 SF
- CRAWL SPACE AREA / 3020 = .71 SF OF VENT AREA REQUIRED
- TYPICAL VENT SIZE = 14"x8"x15" (75% EFFICIENCY) = 58 SF PER VENT NET FREE AREA
- VENT AREA / 58 = 1.23 VENTS REQUIRED.
- 2 VENTS SHOWN (SEE PLAN FOR LOCATION)
- 2 VENTS x 58 = 116 SF OF VENT AREA PROVIDED.
- VENTS SHALL BE COVERED WITH CORROSION RESISTANT WIRE MESH WITH OPENINGS OF 1/4" MAX.
- VENTS LOCATED IN RIM JOIST MUST BE PERMANENTLY BAFFLED. USE C 5021.4.1

DATE: 10/22/22
 BY: [Signature]
 CHECKED: [Signature]
 PERMIT SET

Buchan Homes Westview Plan
 Permit no. 2210-120
 Mercer Island, WA
 3036 67th Ave SE
 THIS DRAWING IS © COPYRIGHTED ARCHITECTURAL INNOVATIONS, P.S. ALL RIGHTS RESERVED.

ARCHITECTURAL INNOVATIONS, P.S.
 Forward Thinking Design Solutions For Your Environment
 14311 SE 16th St
 Bellevue, WA 98007
 1-800-888-4517
 www.kapichonchance.com

TITLE

JOB NO.: 21076.05
 STARTING NO.: 21076.03

SHEET

A2

LOWER FLOOR PLAN
 Scale 1/4"=1'-0"

SYMBOLS AND LEGEND

	FAN - DIRECT VENT TO OUTSIDE - BATHROOMS/LAUNDRY 30 CFM MIN. - KITCHEN EXHAUST HOOD TO BE MIN. OF 100CFM. IF EXHAUST HOOD EXCEEDS 400 CFM MAKE UP AIR MUST BE PROVIDED PER SECTION M1503.6.		THERMOSTAT @ 5'-0" ABOVE FLOOR
	WHOLE-HOUSE FAN ON TIMER SYSTEMS TO CONFORM TO IRC, M1503.4. FAN SIZE PER PLAN. TIMER TO BE LOCATED AT THE FAN WITH A MANUAL OVERRIDE SWITCH AT THE FAN LOCATION. TIMER TO BE SET TO RUN 50% IN EACH 4-HOUR SEGMENT. FRESH AIR TO BE PROVIDED BY THE FORCED AIR SYSTEM DUCTS PER SECTION M1503.4.1.		MECHANICAL, PLUMBING, AND ELECTRICAL SYSTEM FOR UNITS. PER DIV. 15.16 SEE SHEET A-1
	R314.2.3. A HEAT DETECTOR OR HEAT ALARM RATED FOR THE AMBIENT OUTDOOR TEMPERATURES AND HUMIDITY SHALL BE INSTALLED IN NEW GARAGES THAT ARE ATTACHED TO OR LOCATED UNDER NEW AND EXISTING DWELLINGS PER SECTION R314.2.3		FURN

FLOOR PLAN KEY NOTES

P-1	OCCUPANCY SEPARATION: APPLY (1) LAYER OF 1/2" Gypsum BOARD TO GARAGE SIDE OF RESIDENCE ATTIC SPACES. 4 TO ALL BEAMS & POSTS SUPPORTING A FLOOR-CEILING ASSEMBLY. APPLY (1) LAYER OF 1/2" TYPE 'X' Gypsum BOARD TO GARAGE CEILING WHEN UNDER HABITABLE ROOMS. DUCTS THROUGH WALL OR CEILING COMMON TO HOUSE SHALL HAVE MINIMUM 26 GAUGE STEEL. SEE DIV. 01022.6.A SHEET A-1.
P-2	1 3/4" MIN. SELF CLOSING SOLID WOOD CORE, HONEY-COMB CORE STEEL, OR 20-MINUTE FIRE RATED DOOR W/ SELF-CLOSER. SEE DIV. 01022.6.B SHEET A-1.
P-3	SAFETY GLAZING PER I.R.C. SECTION R308 A. WINDOWS WITHIN 18' OF FLOOR B. WINDOWS WITHIN A 24" ARC OF DOORS C. WINDOWS AT TUBS AND SHOWERS D. GLAZING IN DOORS E. WITHIN STAIRWELLS F. LESS THAN 60° HORIZ. FROM THE BOT. STAIR TREAD NOSING, 4 BOT. EDGE OF GLAZING IS LESS THAN 36" ABV. LANDING/WALKING SURFACE SEE DIV. 01022.6 SHEET A-1

FLOOR PLAN KEY NOTES

P-4	STAIR ASSEMBLY NOTES: PER I.R.C. SECTION R301.5 AND DETAIL 12/D2 A. HEADROOM MIN. 6'-8" WIDTH MIN. 3'-0" B. TREADS 10" MIN. DEPTH AND MIN. WIDTH OF 36" MAX. HANDRAIL HEIGHT, RISERS 7 1/4" MAX. HT. TREAD NOSING TO BE MINIMUM 3/4" AND A MAXIMUM OF 1/4" ON STAIRS W/ SOLID RISERS. C. HANDRAIL MIN. 34" TO MAX 38" ABOVE TREAD NOSING. HANDRAIL TYPE I CIRCULAR TO HAVE 1 1/4" MIN. TO 2" MAX. CROSS SECTION DIMENSION AND 1 1/2" MIN. CLEAR FROM WALL. RETURN RAIL ENDS. HANDRAILS SHALL BE STRONG ENOUGH TO RESIST A 200 LB. P.L. IN ANY DIRECTION PER I.R.C. TABLE R302.1. D. INSTALL FIRE BLOCKING BETWEEN STRINGERS AT THE TOP AND BOTTOM OF EACH RUN PER I.R.C. SECTION R302.11. E. COVER USABLE SPACE UNDER STAIR W/ 1/2" Gypsum BOARD PER I.R.C. SECTION R302.1. F. INTERMEDIATE BALUSTERS SHALL BE SPACED W/ LESS THAN 4" BETWEEN BALUSTERS. G. PROVIDE STAIRWAY ILLUMINATION PER I.R.C. SECTION R302.6. SEE DIV. 01022.6 SHEET A-1.
-----	--

FLOOR PLAN KEY NOTES

P-5	EGRESS WINDOW PER I.R.C. SECTION R310 SEE DIV. 01022.6 SHEET A-1
P-6	IGNITERS FOR GAS FIRED APPLIANCES IN GARAGE TO BE 18" MIN. ABOVE TOP OF SLAB. SEE DIV. 15 SHEET A-1
P-7	COVER WALLS ADJACENT TO TUBS AND SHOWERS WITH NON-ABSORBENT MATERIAL TO 12" ABOVE DRAIN INLETS. PER I.R.C. SECTION 307.2. SEE DIV. 01022.6 SHEET A-1
P-8	(2) LAYERS OF FLOOR SHEATHING OVER FRAMING.
P-9	3/4" MAX. RISER WITH 10" MIN. RUN. IF MORE THAN SECTION R301.5. SEE DIV. 01022.1 SHEET A-1
P-10	36"x48" CRUIAL SPACE ACCESS. INSULATE AND WEATHER STRIP. SEE DIV. 01022.1 SHEET A-1
P-11	22"x30" ATTIC SPACE ACCESS W/ 30" HEAD CLEARANCE. INSULATE AND WEATHER STRIP. SEE DIV. 01022.2 SHEET A-1
P-12	FLOOR MATERIAL BREAK LINE

FLOOR PLAN KEY NOTES

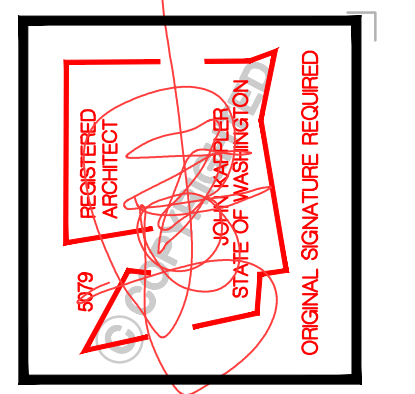
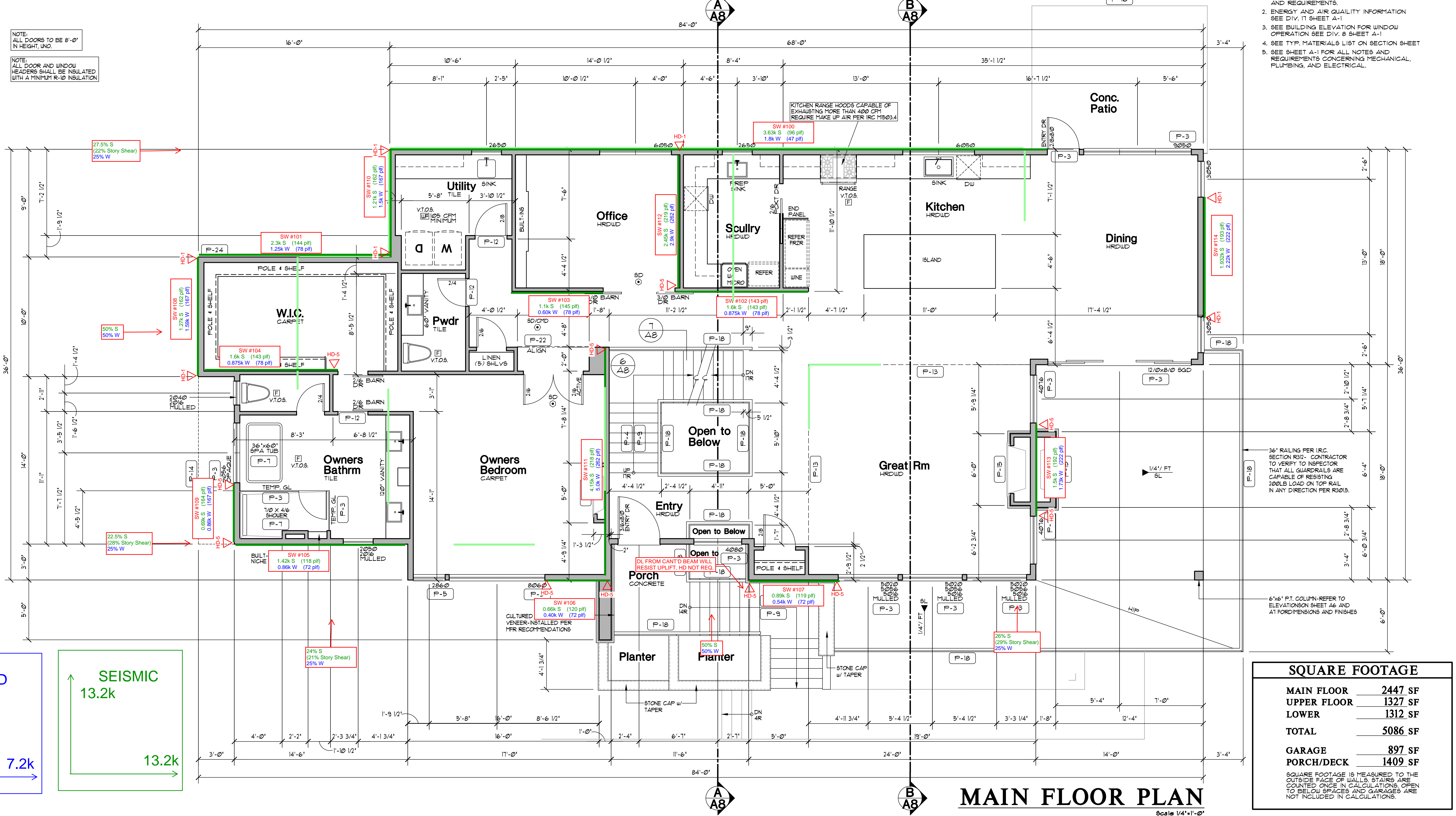
P-13	WALL LINE ABOVE
P-14	WALL LINE BELOW
P-15	FIREPLACE ASSEMBLY NOTES: A. DIRECT VENT FIREPLACES, INSTALL PER MFG. SPECIFICATIONS. SHALL CONFORM TO I.R.C. REQUIREMENTS. SEE DIV. 01022.8 SHEET A-1 B. ZERO CLEARANCE FIREPLACES SHALL CONFORM TO I.R.C. REQUIREMENTS. SEE DIV. 01022.8 SHEET A-1 C. HEARTH SHALL CONFORM TO I.R.C. REQUIREMENTS. SEE DIV. 01022.8 AND 9 SHEET A-1 D. FIRE-BLOCK OPENINGS AROUND PENETRATIONS AT EACH FLOOR PER I.R.C. SECTION R1003.13.
P-16	SEE SITE PLAN FOR EXTENT OF WALKS AND DRIVEWAYS
P-17	3" DIAMETER STEEL POST

FLOOR PLAN KEY NOTES

P-18	42" GUARDRAIL PER I.R.C. SECTION R312.4 TABLE R301.5 AT STAIRS SLOPES AT 34" ABOVE STAIR NOSING. CONTRACTOR TO VERIFY TO INSPECTOR THAT ALL GUARDRAILS ARE CAPABLE OF RESISTING 200LB LOAD ON TOP RAIL IN ANY DIRECTION PER R301.5.
P-19	18" VENT FOR MECHANICAL, 1" CLEARANCE ALL SIDES PER I.R.C. SECTION R1003.3. SEE DIV. 15 SHEET A-1
P-20	PLANT SHELF
P-21	UPPER AND LOWER LINEN CABINETS
P-22	SOFFIT AREA
P-23	INTEGRATED MAKE UP AIR
P-24	2x6 STUDS W/ R-21 INSUL. MIN.

GENERAL PLAN NOTES

- SEE SHEET A-1 FOR ALL GENERAL NOTES AND REQUIREMENTS.
- ENERGY AND AIR QUALITY INFORMATION SEE DIV. 11 SHEET A-1
- SEE BUILDING ELEVATION FOR WINDOW OPERATION SEE DIV. 8 SHEET A-1
- SEE TYP. MATERIALS LIST ON SECTION SHEET
- SEE SHEET A-1 FOR ALL NOTES AND REQUIREMENTS CONCERNING MECHANICAL, PLUMBING, AND ELECTRICAL.



Date	By	Description
10/22/22	REY	PERMIT SET

Buchan Homes
Westview Plan
Permit no. 2210-120
Mercer Island, WA
3036 67th Ave SE
THIS DRAWING IS © COPYRIGHTED ARCHITECTURAL INNOVATIONS, P.S. ALL RIGHTS RESERVED

ARCHITECTURAL INNOVATIONS, P.S.
Forward Thinking Design Solutions For Your Environment
14311 SE 16th St
Bellevue, WA 98007
1-800-888-4517
www.kapichan.com

TITLE	
JOB NO.	21076.05
STARTING NO.	21076.03

SHEET
A3

SQUARE FOOTAGE

MAIN FLOOR	2447 SF
UPPER FLOOR	1327 SF
LOWER	1312 SF
TOTAL	5086 SF
GARAGE	897 SF
PORCH/DECK	1409 SF

SQUARE FOOTAGE IS MEASURED TO THE OUTSIDE FACE OF WALLS. STAIRS ARE COUNTED ONCE IN ANY CALCULATIONS. OPEN TO BELOW SPACES AND GARAGES ARE NOT INCLUDED IN CALCULATIONS.

MAIN FLOOR PLAN
Scale 1/4"=1'-0"

SYMBOLS AND LEGEND

FAN - DIRECT VENT TO OUTSIDE
 - BATHROOMS/LAUNDRY 90 CFM MIN.
 - KITCHEN EXHAUST HOOD TO BE MIN. OF 100CFM. IF EXHAUST HOOD EXCEEDS 400 CFM MAKE UP AIR MUST BE PROVIDED PER SECTION M1803.6.

WHOLE-HOUSE FAN ON TIMER SYSTEMS TO CONFORM TO IRC, M1805.4. FAN SIZE PER PLAN. TIMER TO BE LOCATED AT THE FAN WITH A MANUAL OVERRIDE SWITCH AT THE FAN LOCATION. TIMER TO BE SET TO RUN 50% IN EACH 4-HOUR SEGMENT. FRESH AIR TO BE PROVIDED BY THE FORCED AIR SYSTEM DUCTS PER SECTION M1805.4.1.

R314.2.3. A HEAT DETECTOR OR HEAT ALARM RATED FOR THE AMBIENT OUTDOOR TEMPERATURES AND HUMIDITY SHALL BE INSTALLED IN NEW GARAGES THAT ARE ATTACHED TO OR LOCATED UNDER NEW AND EXISTING DWELLINGS PER SECTION R314.2.3

THERMOSTAT @ 5'-0" ABOVE FLOOR

110V SMOKE ALARM PER I.R.C. R314 WITH BATTERY BACKUP INTERCONNECTED USE A COMBINATION SMOKE/CARBON MONOXIDE ALARM WHEN NOTED

MECHANICAL, PLUMBING, AND ELECTRICAL SYSTEM FOR UNITS. PER DIV. 15.16 SEE SHEET A1

FURN

3" DIA. FRESH AIR INTAKE FROM OUTSIDE TO RETURN AIR FLENUM AT FURNACE WITH MOTORIZED FLOW DAMPERS.

PROVIDE THERMAL EXPANSION TANK AT WATER HEATER

STRAP WATER HEATER TO FRAMING TOP AND BOTTOM.

PROVIDE PRESSURE RELIEF LINE PLUMBED TO OUTSIDE.

FLOOR PLAN KEY NOTES

P-1 OCCUPANCY SEPARATION: APPLY (1) LAYER OF 1/2" G.W.B. TO GARAGE SIDE OF RESIDENCE ATTIC SPACES. 4 TO ALL BEAMS & POSTS SUPPORTING A FLOOR-CEILING ASSEMBLY. APPLY (1) LAYER OF 1/2" TYPE 'X' G.W.B. TO GARAGE CEILING WHEN UNDER HABITABLE ROOMS. DUCTS THROUGH WALL OR CEILING COMMON TO HOUSE SHALL HAVE MINIMUM 26 GAUGE STEEL. SEE DIV. 0502.6.A. SHEET A-1.

P-2 1 3/4" MIN. SELF CLOSING SOLID WOOD CORE, HONEY-COMB CORE STEEL, OR 20-MINUTE FIRE RATED DOOR W/ SELF-CLOSER. SEE DIV. 0502.6.B. SHEET A-1.

P-3 SAFETY GLAZING PER I.R.C. SECTION R308

A. WINDOWS WITHIN 18" OF FLOOR

B. WINDOWS WITHIN A 24" ARC OF DOORS

C. WINDOWS AT TUBS AND SHOWERS

D. GLAZING IN DOORS

E. WITHIN STAIRWELLS

F. LESS THAN 60" HORIZ. FROM THE BOT. STAIR TREAD NOSING, 4 BOT. EDGE OF GLAZING IS LESS THAN 36" ABV. LANDING/WALKING SURFACE. SEE DIV. 0502.6 SHEET A-1.

FLOOR PLAN KEY NOTES

P-4 STAIR ASSEMBLY NOTES: PER I.R.C. SECTION R301.5 AND DETAIL 12/D2.

A. HEADROOM MIN. 6'-8". WIDTH MIN. 3'-0".

B. TREADS 10" MIN. DEPTH AND MIN. WIDTH OF 36" ABOVE HANDRAIL HEIGHT, RISERS 7 1/4" MAX. HT. TREAD NOSING TO BE MINIMUM 3/4" AND A MAXIMUM OF 1/4" ON STAIRS W/ SOLID RISERS.

C. HANDRAIL MIN. 34" TO MAX 38" ABOVE TREAD NOSING. HANDRAIL TYPE I CIRCULAR TO HAVE 1 1/4" MIN. TO 2" MAX. CROSS SECTION DIMENSION AND 1 1/2" MIN. CLEAR FROM WALL. RETURN RAIL ENDS. HANDRAILS SHALL BE STRONG ENOUGH TO RESIST A 200# P.L. IN ANY DIRECTION PER I.R.C. TABLE R302.1.

D. INSTALL FIRE BLOCKING BETWEEN STRINGERS AT THE TOP AND BOTTOM OF EACH RUN PER I.R.C. SECTION R302.11.

E. COVER USABLE SPACE UNDER STAIR W/ 1/2" G.W.B. PER I.R.C. SECTION R302.1.

F. INTERMEDIATE BALUSTERS SHALL BE SPACED W/ LESS THAN 4" BETWEEN BALUSTERS.

G. PROVIDE STAIRWAY ILLUMINATION PER I.R.C. SECTION R302.6. SEE DIV. 0502.6 SHEET A-1.

FLOOR PLAN KEY NOTES

P-5 EGRESS WINDOW PER I.R.C. SECTION R310 SEE DIV. 0502.0 SHEET A-1

P-6 IGNITERS FOR GAS FIRED APPLIANCES IN GARAGE TO BE 18" MIN. ABOVE TOP OF SLAB. SEE DIV. 15 SHEET A-1

P-7 COVER WALLS ADJACENT TO TUBS AND SHOWERS WITH NON-ABSORBENT MATERIAL TO 12" ABOVE DRAIN INLETS. PER I.R.C. SECTION 307.2. SEE DIV. 0502.0 SHEET A-1

P-8 (2) LAYERS OF FLOOR SHEATHING OVER FRAMING.

P-9 1 3/4" MAX. RISER WITH 10" MIN. RUN. IF MORE THAN (3) RISERS, HANDRAIL REQUIRED PER I.R.C. SECTION R301.5. SEE DIV. 0502.1 SHEET A-1

P-10 36"x48" CRUISE SPACE ACCESS. INSULATE AND WEATHER STRIP. SEE DIV. 0502.1 SHEET A-1

P-11 22"x30" ATTIC SPACE ACCESS W/ 30" HEAD CLEARANCE. INSULATE AND WEATHER STRIP. SEE DIV. 0502.2 SHEET A-1

P-12 FLOOR MATERIAL BREAK LINE

FLOOR PLAN KEY NOTES

P-13 WALL LINE ABOVE

P-14 WALL LINE BELOW

P-15 FIREPLACE ASSEMBLY NOTES:

A. DIRECT VENT FIREPLACES, INSTALL PER MFG. SPECIFICATIONS. SHALL CONFORM TO I.R.C. REQUIREMENTS. SEE DIV. 0502.2 SHEET A-1

B. ZERO CLEARANCE FIREPLACES SHALL CONFORM TO I.R.C. REQUIREMENTS. SEE DIV. 0502.2 SHEET A-1

C. HEARTH SHALL CONFORM TO I.R.C. REQUIREMENTS. SEE DIV. 0502.2 AND 9 SHEET A-1

D. FIRE-BLOCK OPENINGS AROUND PENETRATIONS AT EACH FLOOR PER I.R.C. SECTION R1002.13.

P-16 SEE SITE PLAN FOR EXTENT OF WALKS AND DRIVEWAYS

P-17 3" DIAMETER STEEL POST

FLOOR PLAN KEY NOTES

P-18 42" GUARDRAIL PER I.R.C. SECTION R312.4 TABLE R301.5 AT STAIRS SLOPES AT 34" ABOVE STAIR NOSING. CONTRACTOR TO VERIFY TO INSPECTOR THAT ALL GUARDRAILS ARE CAPABLE OF RESISTING 200LB LOAD ON TOP RAIL IN ANY DIRECTION PER R301.5.

P-19 1" VENT FOR MECHANICAL, 1" CLEARANCE ALL SIDES PER I.R.C. SECTION R1002.3. SEE DIV. 15 SHEET A-1

P-20 PLANT SHELF

P-21 UPPER AND LOWER LINEN CABINETS

P-22 SOFFIT AREA

P-23 INTEGRATED MAKE UP AIR

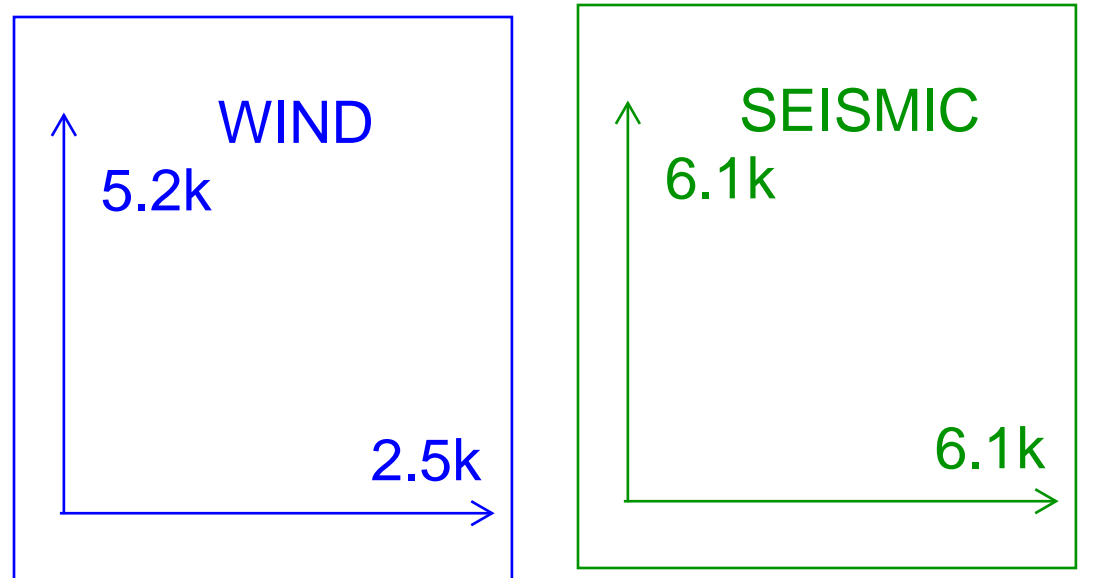
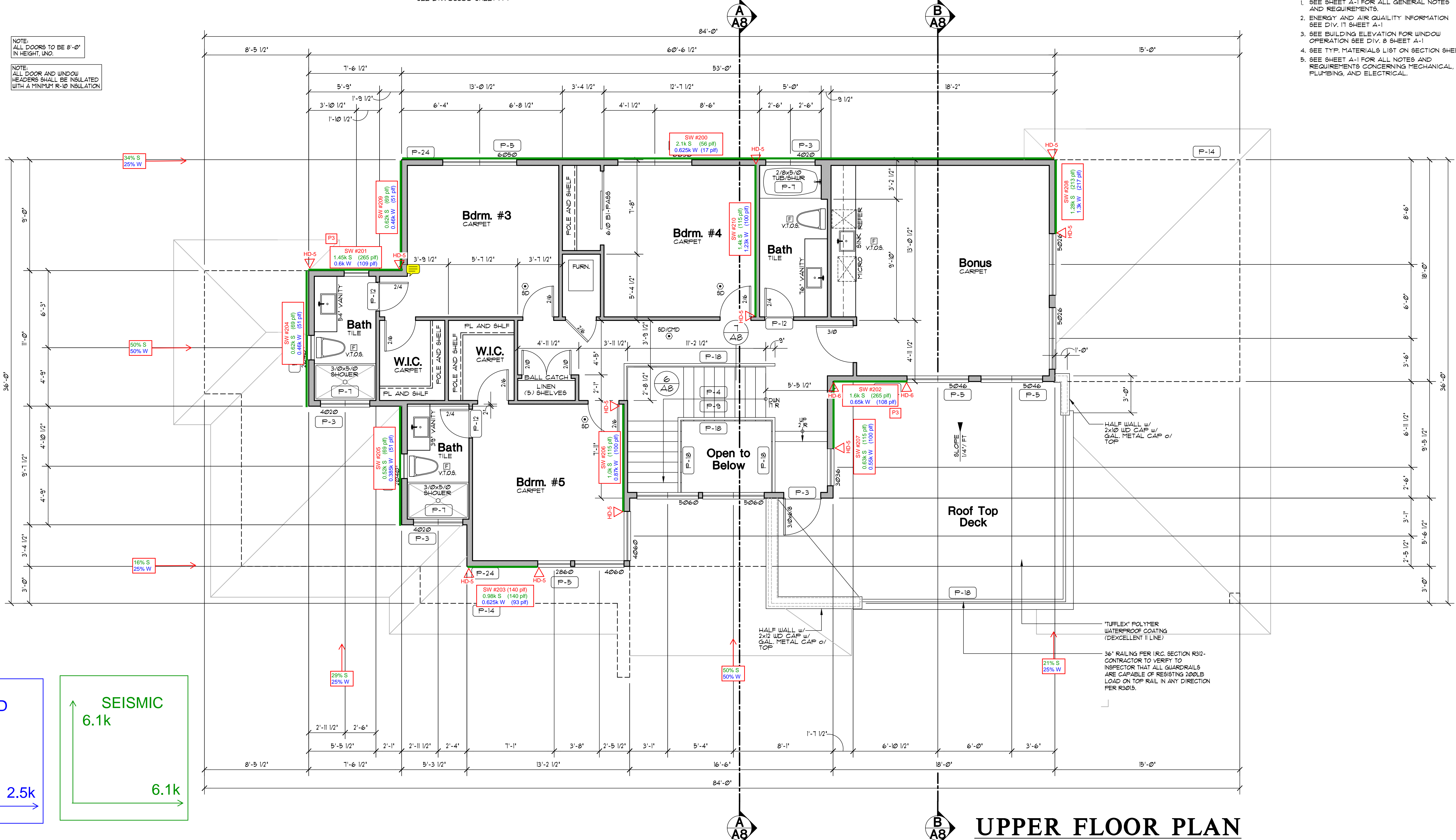
P-24 2x6 STUDS W/ R-21 INSUL. MIN.

GENERAL PLAN NOTES

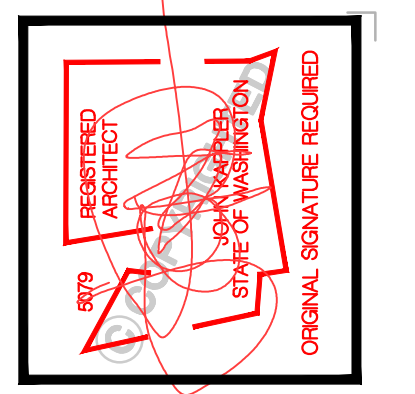
- SEE SHEET A-1 FOR ALL GENERAL NOTES AND REQUIREMENTS.
- ENERGY AND AIR QUALITY INFORMATION SEE DIV. 11 SHEET A-1
- SEE BUILDING ELEVATION FOR WINDOW OPERATION SEE DIV. 8 SHEET A-1
- SEE TYP. MATERIALS LIST ON SECTION SHEET
- SEE SHEET A-1 FOR ALL NOTES AND REQUIREMENTS CONCERNING MECHANICAL, PLUMBING, AND ELECTRICAL.

NOTE: ALL DOORS TO BE 8'-0" IN HEIGHT, UNO.

NOTE: ALL DOOR AND WINDOW HEADERS SHALL BE INSULATED WITH A MINIMUM R-10 INSULATION



UPPER FLOOR PLAN
 Scale 1/4"=1'-0"



Date	By	Description
10/12/22	REV	PERMIT SET

Buchan Homes
Westview Plan
 Permit no. 2210-120
 Mercer Island, WA
 3036 67th Ave SE
 THIS DRAWING IS © COPYRIGHTED ARCHITECTURAL INNOVATIONS, P.S. ALL RIGHTS RESERVED

ARCHITECTURAL INNOVATIONS, P.S.
 Forward Thinking Design Solutions For Your Environment
 14311 SE 16th St
 Bellevue, WA 98007
 1-800-888-4517
 www.kapellarchitect.com

TITLE	
JOB NO.:	21076.05
STARTING NO.:	21076.03

SHEET
A4

Architectural Innovations

3036 67th Ave SE

Mercer Island, WA

Seismic Shear Wall Calculations

Reviewed By: NJM

May 4, 2022

Parameters:

Single Family Home

Design Wind Speed: 100 MPH

wind Exposure Category: C

Seismic Design Category: D

Code & Design Standard: 2018 IBC Ch. 1609, ASCE 7-16 Ch. 26-30



MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SEISMIC CALCULATION - ASCE 7-16

Seismic Design Category:

User Inputs:

Site Class	D
Spectral Response Acceleration 0.2 sec, S_s	1.407
Spectral Response Acceleration 1.0 sec, S₁	0.490
Occupancy Category	II

Variables:

Site coefficient, F _a	1.00
Site coefficient, F _v	1.81

Calculated Values:

Maximum spectral response acceleration, S_{ms}	1.407
Maximum spectral response acceleration, S_{m1}	0.887
Design spectral response acceleration, S_{ds}	0.938
Design spectral response acceleration, S_{d1}	0.591
Seismic Design Category (short term)	D
Seismic Design Category (1.0 second term)	D

Building period Determination:

User Inputs:

Building period coefficient, C_t	0.020
Long-Period Trans Period, T_L (sec)	6
Ht. abv base to highest level, h _n	30

Calculated Values:

Approximate Fundamental Period, T _a	0.255
T ₀	0.126
T _s	0.630
Spectral Response Acc., S _a (g)	0.938

Site Class Assumption

No	Per ASCE 7-16 Section 11.4.3 the Site Class may be assumed to be D
----	--

Equivalent lateral force procedure

Dead Load Calculation:

Level	Story Ht. (ft.)	Area (ft ²)	Dead Load (psf)	DL of ext wall trib. to level (kips)	Total Level DL
1	10.2	3022	15	11.2	57 k
2	10.5	3300	16	13.1	65 k
3	9.1	1945	17	5.5	39 k
4	0.0	0	0	0.0	0 k
5	0.0	0	0	0.0	0 k
6	0.0	0	0	0.0	0 k
7	0.0	0	0	0.0	0 k
8	0.0	0	0	0.0	0 k
9	0.0	0	0	0.0	0 k
10	0.0	0	0	0.0	0 k
11	0.0	0	0	0.0	0 k
12	0.0	0	0	0.0	0 k
13	0.0	0	0	0.0	0 k
14	0.0	0	0	0.0	0 k
15	0.0	0	0	0.0	0 k
16	0.0	0	0	0.0	0 k
17	0.0	0	0	0.0	0 k
18	0.0	0	0	0.0	0 k
19	0.0	0	0	0.0	0 k
20	0.0	0	0	0.0	0 k

Total Dead Load Of Structure = 161 Kips

Seismic Response Coefficient:

	Transverse	Longitudinal
Response modification factor, R	6.5	6.5
Occupancy Importance Factor, I_e	1.00	1.00
Seismic Response Coefficient, C_s	0.144	0.144

Base Shears:

Ultimate Loads

x 0.7 =

Allowable Loads

Transverse	Longitudinal	Transverse	Longitudinal
23 k	23 k	16.2 k	16.2 k

Story Shear Calculation:

Distribution exponent, **1.00**

Ultimate Loads

x 0.7 =

Allowable Loads

Level	Vert. Dist. Factor, C_{vx}	Ultimate Loads		Allowable Loads			
		Transverse Story Shear, F _x	Longitudinal Story Shear, F _y	Transverse Story Shear, F _x	Longitudinal Story Shear, F _y	Transverse Story Shear, F _x	Longitudinal Story Shear, F _y
1	0.187	4.3 k	4.3 k	3.0 k	16.2 k	3.0 k	16.2 k
2	0.440	10.2 k	10.2 k	7.1 k	13.2 k	7.1 k	13.2 k
3	0.373	8.6 k	8.6 k	6.1 k	6.1 k	6.1 k	6.1 k
4	0.000	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
5	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
6	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
7	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
8	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
9	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
10	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
11	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
12	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
13	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
14	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
15	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
16	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
17	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
18	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
19	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k
20	0.00	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k	0.0 k



Shearwall Design Summary

Shearwall 200: 2nd - Back Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 201: 2nd - Back Ext. Wall @ Bathroom

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)



Shearwall Design Summary

Shearwall 202: 2nd - Front Ext. Wall @ Deck

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON MSTC40 STRAP TIE (12" END LENGTH)

Shearwall 203: 2nd - Front Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)



Shearwall Design Summary

Shearwall 204: 2nd - Side Ext. Wall @ Bath

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 205: 2nd - Side Ext. Wall @ Bath

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 206: 2nd - Interior Wall @ Stairs

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 207: 2nd - Side Ext. Wall @ Stairs

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)



Shearwall Design Summary

Shearwall 208: 2nd - Side Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 209: 2nd - Side Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 210: 2nd - Int. Wall @ Bdrm/ Bath

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall xxx: - Not Used

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs > Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

PO - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
#DIV/O!

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 100: 1st - Back Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 101: 1st - Back Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN



Shearwall Design Summary

Shearwall 102: 1st - Interior Wall @ Kitchen

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 103: 1st - Interior Wall @ Hall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 104: 1st - Interior Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 105: 1st - Front Ext. Wall @ Bath

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 106: 1st - Front Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 107: 1st - Front Ext Wall @ Closet

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)



Shearwall Design Summary

Shearwall 108: 1st - Side Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 109: 1st - Side Ext. Wall @ Bedroom

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)



Shearwall Design Summary

Shearwall 110: 1st - Side Ext. Wall @ Bath

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 111: 1st - Interior Wall @ Stairs

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON MSTC40 STRAP TIE (12" END LENGTH)



Shearwall Design Summary

Shearwall 112: 1st - Interior Wall @ Kitchen

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 113: 1st - Side Ext. Wall @ Chimney

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)



Shearwall Design Summary

Shearwall 114: 1st - Side Ext. Wall @ Dining

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall xxx: - Not Used

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs > Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
#DIV/O!

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall I **XXX:** - Not Used

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs Allowable Shearwall Capacity lbs
**#DIV/0!**

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
#DIV/0!

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall I **B00:** - Interior Wall @ Garage

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs Allowable Shearwall Capacity lbs
1780 < **3645**

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall B01: - Back Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall B02: - Back Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN



Shearwall Design Summary

Shearwall B03: - Front Ext. Wall @ Entry

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall B04: - Front Ext. Wall @ Front Room

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN



Shearwall Design Summary

Shearwall B05: - Int. Wall @ Garage

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall B06: - Int. Wall @ Bath

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Architectural Innovations

3036 67th Ave SE

Mercer Island, WA

Wind Shear Wall Calculations

Reviewed By: NJM

May 4, 2022

Parameters:

Single Family Home

Design Wind Speed: 100 MPH

wind Exposure Category: C

Seismic Design Category: D

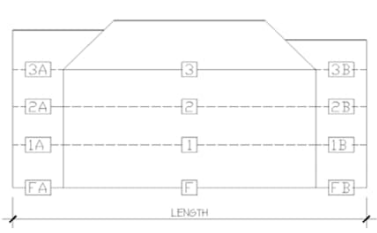
Code & Design Standard: 2018 IBC Ch. 1609, ASCE 7-16 Ch. 26-30




MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Wind Design Summary per ASCE 7-16

Parameters:			Roof Geometry:			Building Geometry:		
Wind Speed	100		Trans. Roof Pitch	0.3	:12	length	84	ft
Exposure Category	C		Long. Roof Pitch	0.3	:12	Width	36	ft
Risk Category	II		Mean Roof Height, H	29.75	ft	Number of stories	3	
Wind Directionality Factor, K_d	0.85							
Topographic Factor, K_{zt}	1.00							
Gust Factor, G	0.85							
Ground El. Above Sea Level [ft]	0							
Design Type	ASD	0.60						

Transverse Direction (Perpendicular to Main Ridge Line)											
<i>Diaphragm Level</i>	<i>Floor-to-Floor Height</i>		Tributary Design Areas:				Tributary Design Loads: (0.6W)				
			<i>Section</i>				<i>Section</i>				
			A	O	B		A	O	B		
3	9.083 ft	Roof Surface	0	0	0	sq ft	Story Shear	0.00	5.21	0.00	kips
		Wall surface	0	368	0	sq ft	Total Shear	0.00	5.21	0.00	kips
								5.21			kips
2	10.5 ft	Roof Surface	0	0	0	sq ft	Story Shear	0.00	10.61	0.00	kips
		Wall surface	0	785.83	0	sq ft	Total Shear	0.00	15.82	0.00	kips
								15.82			kips
1	10.17 ft	Roof Surface	0	0	0	sq ft	Story Shear	0.00	11.36	0.00	kips
		Wall surface	0	875.5	0	sq ft	Total Shear	0.00	27.18	0.00	kips
								27.18			kips
FND		Roof Surface	0	0	0	sq ft	Story Shear	0.00	0.00	0.00	kips
		Wall surface	0	0	0	sq ft	Total Shear	0.00	27.18	0.00	kips
								27.18			kips

Longitudinal Direction (Parallel to Main Ridge Line)											
<i>Diaphragm Level</i>	<i>Floor-to-Floor Height</i>		Tributary Design Areas:				Tributary Design Loads: (0.6W)				
			<i>Section</i>				<i>Section</i>				
			A	O	B		A	O	B		
3	9.083 ft	Roof Surface	0	0	0	sq ft	Story Shear	0.00	2.43	0.00	kips
		Wall surface	0	206.314	0	sq ft	Total Shear	0.00	2.43	0.00	kips
								2.43			kips
2	10.5 ft	Roof Surface	0	0	0	sq ft	Story Shear	0.00	4.70	0.00	kips
		Wall surface	0	421.7	0	sq ft	Total Shear	0.00	7.13	0.00	kips
								7.13			kips
1	10.17 ft	Roof Surface	0	0	0	sq ft	Story Shear	0.00	3.64	0.00	kips
		Wall surface	0	343	0	sq ft	Total Shear	0.00	10.78	0.00	kips
								10.78			kips
FND		Roof Surface	0	0	0	sq ft	Story Shear	0.00	0.00	0.00	kips
		Wall surface	0	0	0	sq ft	Total Shear	0.00	10.78	0.00	kips
								10.78			kips



Shearwall Design Summary

Shearwall 200: 2nd - Back Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 201: 2nd - Back Ext. Wall @ Bathroom

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 202: 2nd - Front Ext. Wall @ Deck

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 203: 2nd - Front Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)



Shearwall Design Summary

Shearwall 204: 2nd - Side Ext. Wall @ Bath

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 205: 2nd - Side Ext. Wall @ Bath

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 206: 2nd - Interior Wall @ Stairs

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 207: 2nd - Side Ext. Wall @ Stairs

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 208: 2nd - Side Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 209: 2nd - Side Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 210: 2nd - Int. Wall @ Bdrm/ Bath

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall xxx: - Not Used

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs > Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
#DIV/O!

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 100: 1st - Back Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 101: 1st - Back Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 102: 1st - Interior Wall @ Kitchen

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 103: 1st - Interior Wall @ Hall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 104: 1st - Interior Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 105: 1st - Front Ext. Wall @ Bath

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 106: 1st - Front Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall 107: 1st - Front Ext Wall @ Closet

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall 108: 1st - Side Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 109: 1st - Side Ext. Wall @ Bedroom

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)



Shearwall Design Summary

Shearwall 110: 1st - Side Ext. Wall @ Bath

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 111: 1st - Interior Wall @ Stairs

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON MSTC40 STRAP TIE (12" END LENGTH)



Shearwall Design Summary

Shearwall 112: 1st - Interior Wall @ Kitchen

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 113: 1st - Side Ext. Wall @ Chimney

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)



Shearwall Design Summary

Shearwall 114: 1st - Side Ext. Wall @ Dining

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall xxx: - Not Used

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs > Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
#DIV/O!

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall I **XXX:** - Not Used

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P0 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - UNBLOCKED
#DIV/O!

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall I **B00:** - Interior Wall @ Garage

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall B01: - Back Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall B02: - Back Ext. Wall

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall B03: - Front Ext. Wall @ Entry

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required

Shearwall B04: - Front Ext. Wall @ Front Room

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P1 - 1-side 7/16" OSB
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

No Hold down Required



Shearwall Design Summary

Shearwall B05: - Int. Wall @ Garage

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall B06: - Int. Wall @ Bath

Shearwall Properties:

Wall height, H ft. Max wall opening ht, H_c ft.
Wall Length, L ft. Qualifying Wall Length, L ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall lbs < Allowable Shearwall Capacity lbs

Shearwall Assembly Specification

P3 - 1-side 7/16" OSB
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked
ADEQUATE

Overturning Evaluation:

Resistive DL plf Overturning Moment k-ft Hold Down Design Load lbs
DL at ends of wall lbs Resistive Moment k-ft Hold down Capacity lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Use menu item **Settings > Printing & Title Block**
to set these five lines of information
for your program.

Project Name/Number : retaining wal
Title **Basement Retaining Wall**
Dsgnr: **LGH**
Description....
Typ. **Basement Wall**

Page : 1
Date: 26 MAY 2022

This Wall in File: p:\client files\203 - architectural innovations\2022\22010 - 3036 67th ave. se -

RetainPro (c) 1987-2019, Build 11.20.03.31
License : KW-06059959
License To : **MULHERN & KULP STRUCTURAL ENGINEERING INC**

Cantilevered Retaining Wall

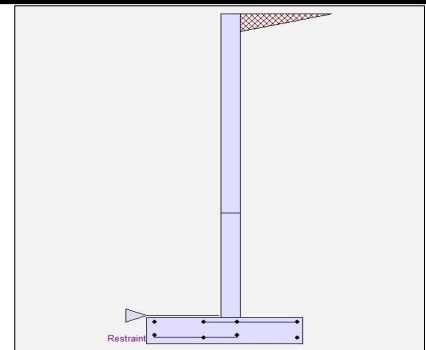
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	11.58 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,667.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing Soil Friction	=	0.300
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 psf
Used for Sliding & Overturning		

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	=	0.0 psf (Service Level)

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	=	Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method	:	Uniform
Multiplier Used	=	8.000
(Multiplier used on soil density)		
Uniform Seismic Force	=	100.640
Total Seismic Force	=	1,266.051

Design Summary

Wall Stability Ratios

Overturning	=	1.33 Ratio < 1.5!
Slab Resists All Sliding !		
Total Bearing Load	=	5,822 lbs
...resultant ecc.	=	16.51 in
Soil Pressure @ Toe	=	2,454 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,667 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	3,436 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	42.8 psi OK
Footing Shear @ Heel	=	47.0 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	3,655.7 lbs
-----------------------	---	-------------

Stem Construction

	3rd	2nd	Bottom
Design Height Above Ftg	ft = 11.58	4.00	0.00
Wall Material Above "Ht"	Concrete	Concrete	Concrete
Design Method	LRFD	LRFD	LRFD
Thickness	= 8.00	8.00	8.00
Rebar Size	= # 5	# 5	# 6
Rebar Spacing	= 12.00	12.00	6.00
Rebar Placed at	= 6.5 in	6.5 in	6.5 in

Design Data

fb/FB + fa/Fa	=	0.000	0.812	0.982
Total Force @ Section				
Service Level	lbs =			
Strength Level	lbs =		2,371.6	4,920.1
Moment....Actual				
Service Level	ft-# =			
Strength Level	ft-# =		6,956.1	21,240.9
Moment....Allowable	ft-# =	8,557.2	8,557.2	21,627.9
Shear.....Actual				
Service Level	psi =			
Strength Level	psi =		30.4	63.1
Shear.....Allowable	psi =	75.0	75.0	75.0
Anet (Masonry)	in2 =			
Rebar Depth 'd'	in =	6.50	6.50	6.50

Masonry Data

f'm	psi =			
Fs	psi =			
Solid Grouting	=			
Modular Ratio 'n'	=			
Wall Weight	psf =	100.0	100.0	100.0
Short Term Factor	=			
Equiv. Solid Thick.	=			
Masonry Block Type	=	Medium Weight		
Masonry Design Method	=	ASD		

Concrete Data

f'c	psi =	2,500.0	2,500.0	2,500.0
Fy	psi =	60,000.0	60,000.0	60,000.0

Vertical component of active lateral soil pressure IS considered in the calculation of soil bearing pressures.

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Use menu item **Settings > Printing & Title Block**
to set these five lines of information
for your program.

Project Name/Number : retaining wal

Title **Basement Retaining Wall**

Dsgnr: **LGH**

Description....

Typ. **Basement Wall**

Page : 2
Date: 26 MAY 2022

This Wall in File: p:\client files\203 - architectural innovations\2022\22010 - 3036 67th ave. se -

RetainPro (c) 1987-2019, Build 11.20.03.31

License : KW-06059959

License To : **MULHERN & KULP STRUCTURAL ENGINEERING INC**

Cantilevered Retaining Wall

Code: IBC 2018, ACI 318-14, TMS 402-16

Concrete Stem Rebar Area Details

3rd Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.000 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.000 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 0.00 in #4@ 0.00 in
Provided Area :	0.31 in2/ft	#5@ 0.00 in #5@ 0.00 in
Maximum Area :	0.8805 in2/ft	#6@ 0.00 in #6@ 0.00 in

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.2501 in2/ft	
(4/3) * As :	0.3334 in2/ft	Min Stem T&S Reinf Area 1.455 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.26 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.31 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8805 in2/ft	#6@ 27.50 in #6@ 55.00 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.7636 in2/ft	
(4/3) * As :	1.0182 in2/ft	Min Stem T&S Reinf Area 0.768 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.7636 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.88 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8805 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	2.50 ft
Heel Width	=	2.75
Total Footing Width	=	5.25
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm.= 3.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	3,436	0 psf
Mu' : Upward	=	100,195	30 ft-#
Mu' : Downward	=	6,750	7,783 ft-#
Mu: Design	=	7,787	7,753 ft-#
Actual 1-Way Shear	=	42.76	47.02 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 5 @ 13.19 in	
Heel Reinforcing	=	# 5 @ 14.35 in	
Key Reinforcing	=	None Spec'd	
Footing Torsion, Tu	=		0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 8.51 in, #5@ 13.19 in, #6@ 18.72 in, #7@ 25.53 in, #8@ 33.61 in, #9@ 42
Heel: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
Key: No key defined

Min footing T&S reinf Area	1.36	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : retaining wal
Title Basement Retaining Wall
Dsgnr: LGH
Description....
Typ. Basement Wall

Page : 3
Date: 26 MAY 2022

This Wall in File: p:\client files\203 - architectural innovations\2022\22010 - 3036 67th ave. se -

RetainPro (c) 1987-2019, Build 11.20.03.31
License : KW-06059959
License To : MULHERN & KULP STRUCTURAL ENGINEERING INC

Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	2,769.5	4.19	11,613.4	Soil Over HL (ab. water tbl)	2,653.8	4.21	11,167.9
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		4.21	11,167.9
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =			
Seismic Earth Load =	886.2	6.29	5,574.4	Surcharge Over Toe =			
=				Stem Weight(s) =	1,158.0	2.83	3,281.0
Total =	3,655.7	O.T.M.	= 17,187.8	Earth @ Stem Transitions =			
				Footing Weight =	787.5	2.63	2,067.2
				Key Weight =			
				Vert. Component =	1,222.5	5.25	6,418.1
Resisting/Overturning Ratio			= 1.33	Total =	5,821.8 lbs	R.M.=	22,934.2
Vertical Loads used for Soil Pressure =		5,821.8	lbs				

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.150 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.

Use menu item **Settings > Printing & Title Block**
to set these five lines of information
for your program.

Project Name/Number : retaining wal

Title **Garage Retaining Wall**

Dsgnr: **LGH**

Description....

9' Retaining Wall

Page : 1
Date: 26 MAY 2022

This Wall in File: p:\client files\203 - architectural innovations\2022\22010 - 3036 67th ave. se -

RetainPro (c) 1987-2019, Build 11.20.03.31

License : KW-06059959

License To : **MULHERN & KULP STRUCTURAL ENGINEERING INC**

Cantilevered Retaining Wall

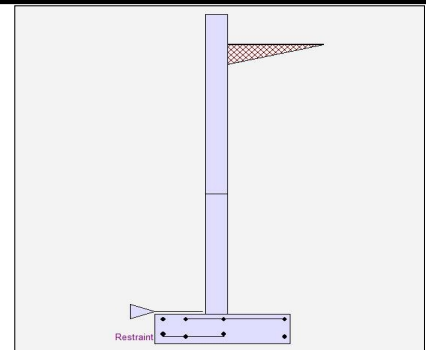
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	1.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,667.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing Soil Friction	=	0.300
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 psf
Used for Sliding & Overturning		

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	=	0.0 psf (Service Level)

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		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method : Uniform		
Multiplier Used	=	8.000
(Multiplier used on soil density)		
Uniform Seismic Force	=	80.000
Total Seismic Force	=	800.000

Design Summary

Wall Stability Ratios

Overturning	=	1.36 Ratio < 1.5!
Slab Resists All Sliding !		
Total Bearing Load	=	4,187 lbs
...resultant ecc.	=	13.16 in
Soil Pressure @ Toe	=	2,519 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,667 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	3,527 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	22.0 psi OK
Footing Shear @ Heel	=	31.2 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	2,310.0 lbs
-----------------------	---	-------------

Stem Construction

Design Height Above Ftg

ft =	Stem OK	Stem OK	Stem OK
Wall Material Above "Ht"	=	Concrete	Concrete
Design Method	=	LRFD	LRFD
Thickness	=	8.00	8.00
Rebar Size	=	# 5	# 5
Rebar Spacing	=	16.00	16.00
Rebar Placed at	=	6.5 in	6.5 in

Design Data

fb/FB + fa/Fa	=	0.000	0.332	0.806
---------------	---	-------	-------	-------

Total Force @ Section

Service Level	lbs =			
Strength Level	lbs =		1,100.0	2,988.0

Moment....Actual

Service Level	ft-# =			
Strength Level	ft-# =		2,166.7	10,044.0
Moment....Allowable	ft-# =	6,513.6	6,513.6	12,453.1

Shear.....Actual

Service Level	psi =			
Strength Level	psi =		14.1	38.3
Shear.....Allowable	psi =	75.0	75.0	75.0
Anet (Masonry)	in2 =			
Rebar Depth 'd'	in =	6.50	6.50	6.50

Masonry Data

f'm	psi =			
Fs	psi =			
Solid Grouting	=			
Modular Ratio 'n'	=			
Wall Weight	psf =	100.0	100.0	100.0
Short Term Factor	=			
Equiv. Solid Thick.	=			
Masonry Block Type	=	Medium Weight		
Masonry Design Method	=	ASD		

Concrete Data

f'c	psi =	2,500.0	2,500.0	2,500.0
Fy	psi =	60,000.0	60,000.0	60,000.0

Vertical component of active lateral soil pressure IS considered in the calculation of soil bearing pressures.

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Use menu item **Settings > Printing & Title Block**
to set these five lines of information
for your program.

Project Name/Number : retaining wal

Title **Garage Retaining Wall**

Dsgnr: **LGH**

Description....

9' Retaining Wall

Page : 2
Date: 26 MAY 2022

This Wall in File: p:\client files\203 - architectural innovations\2022\22010 - 3036 67th ave. se -

RetainPro (c) 1987-2019, Build 11.20.03.31

License : KW-06059959

License To : **MULHERN & KULP STRUCTURAL ENGINEERING INC**

Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Concrete Stem Rebar Area Details

3rd Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.000 in2	
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.000 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 0.00 in	#4@ 0.00 in
Provided Area :	0.2325 in2/ft	#5@ 0.00 in	#5@ 0.00 in
Maximum Area :	0.8805 in2/ft	#6@ 0.00 in	#6@ 0.00 in

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0779 in2/ft		
(4/3) * As :	0.1039 in2/ft	Min Stem T&S Reinf Area 1.152 in2	
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2325 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8805 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.3611 in2/ft		
(4/3) * As :	0.4815 in2/ft	Min Stem T&S Reinf Area 0.768 in2	
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.3611 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.465 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8805 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	2.50
Total Footing Width	=	4.00
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm.= 3.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	3,527	0 psf
Mu' : Upward	=	38,832	35 ft-#
Mu' : Downward	=	2,430	4,565 ft-#
Mu: Design	=	3,034	4,530 ft-#
Actual 1-Way Shear	=	21.98	31.15 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 5 @ 13.19 in	
Heel Reinforcing	=	# 5 @ 14.35 in	
Key Reinforcing	=	None Spec'd	
Footing Torsion, Tu	=		0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
Heel: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
Key: No key defined

Min footing T&S reinf Area	1.04	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:	If two layers of horizontal bars:	
#4@ 9.26 in	#4@ 18.52 in	
#5@ 14.35 in	#5@ 28.70 in	
#6@ 20.37 in	#6@ 40.74 in	

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : retaining wal
Title Garage Retaining Wall
Dsgnr: LGH
Description....
9' Retaining Wall

Page : 3
Date: 26 MAY 2022

This Wall in File: p:\client files\203 - architectural innovations\2022\22010 - 3036 67th ave. se -

RetainPro (c) 1987-2019, Build 11.20.03.31
License : KW-06059959
License To : MULHERN & KULP STRUCTURAL ENGINEERING INC

Cantilevered Retaining Wall

Code: IBC 2018, ACI 318-14, TMS 402-16

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	1,750.0	3.33	5,833.3	Soil Over HL (ab. water tbl)	1,815.0	3.08	5,596.3
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.08	5,596.3
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =			
Seismic Earth Load =	560.0	5.00	2,800.0	Surcharge Over Toe =			
=				Stem Weight(s) =	1,000.0	1.83	1,833.3
Total =	2,310.0	O.T.M.	= 8,633.3	Earth @ Stem Transitions =			
				Footing Weight =	600.0	2.00	1,200.0
				Key Weight =			
				Vert. Component =	772.5	4.00	3,089.9
Resisting/Overturing Ratio		=	1.36	Total =	4,187.5 lbs	R.M.=	11,719.5
Vertical Loads used for Soil Pressure =		4,187.5 lbs					

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.175 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.

Use menu item **Settings > Printing & Title Block**
to set these five lines of information
for your program.

Project Name/Number : retaining wal

Title Site Retaining Wall

Dsgnr: LGH

Description...

Site Retaining Wall

Page : 1
Date: 26 MAY 2022

This Wall in File: p:\client files\203 - architectural innovations\2022\22010 - 3036 67th ave. se -

RetainPro (c) 1987-2019, Build 11.20.03.31

License : KW-06059959

License To : MULHERN & KULP STRUCTURAL ENGINEERING INC

Cantilevered Retaining Wall

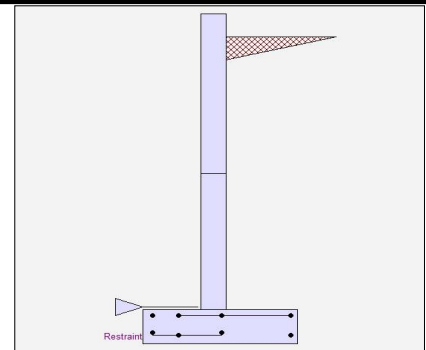
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	8.00 ft
Wall height above soil	=	0.67 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,667.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Footings Soil Friction	=	0.300
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 psf
Used for Sliding & Overturning		

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	=	0.0 psf (Service Level)

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		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method	: Uniform
Multiplier Used	= 8.000 (Multiplier used on soil density)

Uniform Seismic Force	=	72.000
Total Seismic Force	=	648.000

Design Summary

Wall Stability Ratios

Overturning	=	1.63 OK
Slab Resists All Sliding !		

Total Bearing Load	=	3,706 lbs
...resultant ecc.	=	8.52 in

Soil Pressure @ Toe	=	1,592 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,667 psf
Soil Pressure Less Than Allowable		

ACI Factored @ Toe	=	2,229 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	14.1 psi OK
Footing Shear @ Heel	=	21.3 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	1,871.1 lbs
-----------------------	---	-------------

Stem Construction

Design Height Above Ftg

	3rd	2nd	Bottom
ft =	8.67	4.00	0.00
Wall Material Above "Ht"	Concrete	Concrete	Concrete
Design Method	LRFD	LRFD	LRFD
Thickness	8.00	8.00	8.00
Rebar Size	# 5	# 5	# 5
Rebar Spacing	16.00	16.00	8.00
Rebar Placed at	6.5 in	6.5 in	6.5 in

Design Data

fb/FB + fa/Fa	=	0.000	0.180	0.568
---------------	---	-------	-------	-------

Total Force @ Section

Service Level	lbs =			
Strength Level	lbs =		736.0	2,368.0

Moment....Actual

Service Level	ft-# =			
Strength Level	ft-# =		1,173.3	7,082.7
Moment....Allowable	ft-# =	6,513.6	6,513.6	12,453.1

Shear.....Actual

Service Level	psi =			
Strength Level	psi =		9.4	30.4
Shear.....Allowable	psi =	75.0	75.0	75.0
Anet (Masonry)	in2 =			
Rebar Depth 'd'	in =	6.50	6.50	6.50

Masonry Data

f'm	psi =			
Fs	psi =			
Solid Grouting	=			
Modular Ratio 'n'	=			
Wall Weight	psf =	100.0	100.0	100.0
Short Term Factor	=			
Equiv. Solid Thick.	=			
Masonry Block Type	=	Medium Weight		
Masonry Design Method	=	ASD		

Concrete Data

f'c	psi =	2,500.0	2,500.0	2,500.0
Fy	psi =	60,000.0	60,000.0	60,000.0

Vertical component of active lateral soil pressure IS considered in the calculation of soil bearing pressures.

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Use menu item **Settings > Printing & Title Block**
to set these five lines of information
for your program.

Project Name/Number : retaining wal

Title Site Retaining Wall

Dsgnr: LGH

Description....

Site Retaining Wall

Page : 2
Date: 26 MAY 2022

This Wall in File: p:\client files\203 - architectural innovations\2022\22010 - 3036 67th ave. se -

RetainPro (c) 1987-2019, Build 11.20.03.31

License : KW-06059959

License To : MULHERN & KULP STRUCTURAL ENGINEERING INC

Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Concrete Stem Rebar Area Details

3rd Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.000 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.000 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 0.00 in #4@ 0.00 in
Provided Area :	0.2325 in2/ft	#5@ 0.00 in #5@ 0.00 in
Maximum Area :	0.8805 in2/ft	#6@ 0.00 in #6@ 0.00 in

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.0422 in2/ft	
(4/3) * As :	0.0562 in2/ft	Min Stem T&S Reinf Area 0.897 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.2325 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8805 in2/ft	#6@ 27.50 in #6@ 55.00 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.2546 in2/ft	
(4/3) * As :	0.3395 in2/ft	Min Stem T&S Reinf Area 0.768 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.26 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.465 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8805 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	2.50
Total Footing Width	=	4.00
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm.= 3.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	2,229	0 psf
Mu' : Upward	=	26,203	474 ft-#
Mu' : Downward	=	2,430	3,913 ft-#
Mu: Design	=	1,981	3,439 ft-#
Actual 1-Way Shear	=	14.13	21.33 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 5 @ 8.00 in	
Heel Reinforcing	=	# 5 @ 14.35 in	
Key Reinforcing	=	None Spec'd	
Footing Torsion, Tu	=		0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
Heel: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
Key: No key defined

Min footing T&S reinf Area	1.04	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : retaining wal

Title Site Retaining Wall

Dsgnr: LGH

Description....

Site Retaining Wall

Page : 3
Date: 26 MAY 2022

This Wall in File: p:\client files\203 - architectural innovations\2022\22010 - 3036 67th ave. se -

RetainPro (c) 1987-2019, Build 11.20.03.31

License : KW-06059959

License To : MULHERN & KULP STRUCTURAL ENGINEERING INC

Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	1,417.5	3.00	4,252.5	Soil Over HL (ab. water tbl)	1,613.3	3.08	4,974.4
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.08	4,974.4
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =			
Seismic Earth Load =	453.6	4.50	2,041.2	Surcharge Over Toe =			
=				Stem Weight(s) =	867.0	1.83	1,589.5
Total =	1,871.1	O.T.M.	= 6,293.7	Earth @ Stem Transitions =			
				Footing Weight =	600.0	2.00	1,200.0
				Key Weight =			
				Vert. Component =	625.7	4.00	2,502.8
				Total =	3,706.0 lbs	R.M.=	10,266.8

Resisting/Overtuning Ratio

= **1.63**
Vertical Loads used for Soil Pressure = 3,706.0 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.096 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.

Use menu item **Settings > Printing & Title Block** to set these five lines of information for your program.

Project Name/Number : retaining wal

Title Site Retaining Wall

Dsgnr: LGH

Description....

12'-2" Site Retaining Wall

Page : 1
Date: 26 MAY 2022

This Wall in File: P:\Client Files\203 - Architectural Innovations\2022\22010 - 3036 67th Ave. SE -

RetainPro (c) 1987-2019, Build 11.20.03.31

License : KW-06059959

License To : MULHERN & KULP STRUCTURAL ENGINEERING INC

Cantilevered Retaining Wall

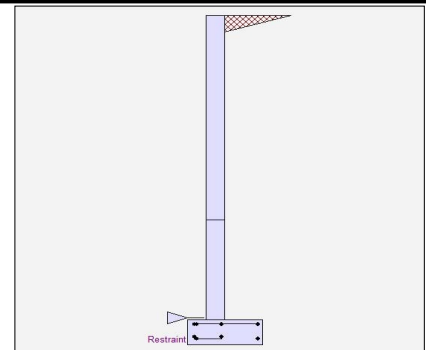
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	12.17 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing Soil Friction	=	0.300
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 psf
Used for Sliding & Overturning		

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	=	0.0 psf (Service Level)

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		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Design Summary

Wall Stability Ratios

Overturning = 0.67 UNSTABLE!
Slab Resists All Sliding !

Total Bearing Load	=	4,742 lbs
...resultant ecc.	=	31.60 in

Soil Pressure @ Toe	=	0 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		

ACI Factored @ Toe	=	0 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	0.1 psi OK
Footing Shear @ Heel	=	39.7 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	3,035.4 lbs
-----------------------	---	-------------

Vertical component of active lateral soil pressure IS considered in the calculation of soil bearing pressures.

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

Design Height Above Ftg

ft =	12.17	4.00	0.00	
Wall Material Above "Ht"	=	Concrete	Concrete	Concrete
Design Method	=	LRFD	LRFD	LRFD
Thickness	=	8.00	8.00	8.00
Rebar Size	=	# 5	# 5	# 6
Rebar Spacing	=	12.00	12.00	6.00
Rebar Placed at	=	6.5 in	6.5 in	6.5 in

Design Data

fb/FB + fa/Fa	=	0.000	0.594	0.777
---------------	---	-------	-------	-------

Total Force @ Section

Service Level	lbs =			
Strength Level	lbs =		1,869.0	4,147.0

Moment....Actual

Service Level	ft-# =			
Strength Level	ft-# =		5,089.8	16,823.2
Moment....Allowable	ft-# =	8,557.2	8,557.2	21,627.9

Shear....Actual

Service Level	psi =			
Strength Level	psi =		24.0	53.2
Shear....Allowable	psi =	75.0	75.0	75.0

Anet (Masonry)	in2 =			
Rebar Depth 'd'	in =	6.50	6.50	6.50

Masonry Data

f'm	psi =			
Fs	psi =			
Solid Grouting	=			
Modular Ratio 'n'	=			
Wall Weight	psf =	100.0	100.0	100.0
Short Term Factor	=			
Equiv. Solid Thick.	=			
Masonry Block Type	=	Medium Weight		
Masonry Design Method	=	ASD		

Concrete Data

f'c	psi =	2,500.0	2,500.0	2,500.0
Fy	psi =	60,000.0	60,000.0	60,000.0

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : retaining wal

Title Site Retaining Wall

Dsgnr: LGH

Description....

12'-2" Site Retaining Wall

Page : 2
Date: 26 MAY 2022

This Wall in File: P:\Client Files\203 - Architectural Innovations\2022\22010 - 3036 67th Ave. SE -

RetainPro (c) 1987-2019, Build 11.20.03.31

License : KW-06059959

License To : MULHERN & KULP STRUCTURAL ENGINEERING INC

Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Concrete Stem Rebar Area Details

3rd Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.000 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.000 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 0.00 in #4@ 0.00 in
Provided Area :	0.31 in2/ft	#5@ 0.00 in #5@ 0.00 in
Maximum Area :	0.8805 in2/ft	#6@ 0.00 in #6@ 0.00 in
<hr/>		
2nd Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.183 in2/ft	
(4/3) * As :	0.244 in2/ft	Min Stem T&S Reinf Area 1.569 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.244 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.31 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8805 in2/ft	#6@ 27.50 in #6@ 55.00 in
<hr/>		
Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.6048 in2/ft	
(4/3) * As :	0.8064 in2/ft	Min Stem T&S Reinf Area 0.768 in2
200bd/fy : 200(12)(6.5)/60000 :	0.26 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.6048 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.88 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8805 in2/ft	#6@ 27.50 in #6@ 55.00 in

12'-2" SITE RETAINING WALL LOCATED AT ENTRY WILL HAVE A
CONT. SLAB (SEE PLAN). THE ENTIRE ENTRY STAIR RETAINING
WALL & FOUNDATION WILL ACT AS ONCE COMPONENT.

Concrete Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

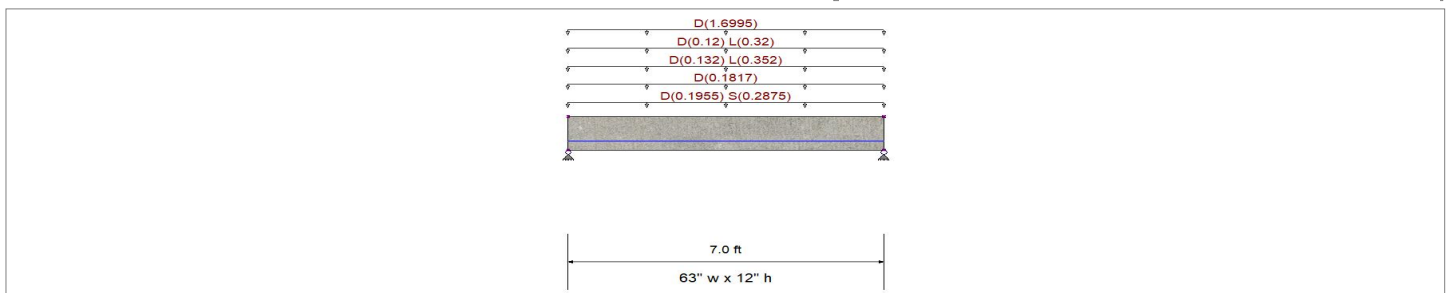
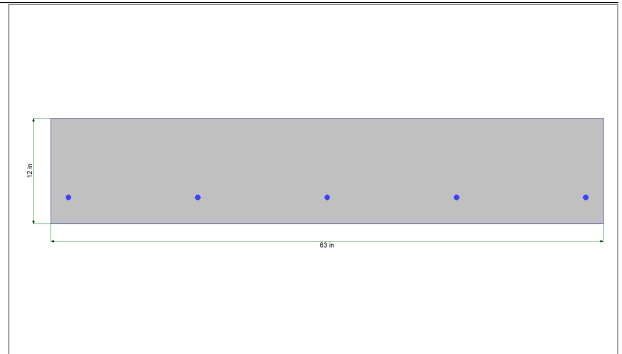
DESCRIPTION: East Grade Beam

CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

General Information

f'_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} * 7.50$	=	375.0 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
		Number of Resisting Legs Per Stirrup =			2



Cross Section & Reinforcing Details

Rectangular Section, Width = 63.0 in, Height = 12.0 in
Span #1 Reinforcing....
5-#5 at 3.0 in from Bottom, from 0.0 to 7.0 ft in this span

Load for Span Number 1

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 11.50 ft, (Roof)
Uniform Load : D = 0.010 ksf, Tributary Width = 18.170 ft, (Wall)
Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 8.80 ft, (Floor)
Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 8.0 ft, (Main Floor)
Uniform Load : D = 0.150 ksf, Tributary Width = 11.330 ft, (Basement Concrete Wall)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.407 : 1
Section used for this span	Typical Section
Mu : Applied	24.582 k-ft
Mn * Phi : Allowable	60.352 k-ft
Location of maximum on span	3.494 ft
Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.001 in	Ratio =	65555	>=360.0	S Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.006 in	Ratio =	14451	>=180.0	Span: 1 : +D+0.750L+0.750S
Max Upward Total Deflection	0.000 in	Ratio =	0	<180.0	Span: 1 : +D+0.750L+0.750S

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	10.669	10.669
Max Upward from Load Combinations	10.669	10.669
Max Upward from Load Cases	8.150	8.150



7220 Trade Street, Suite 295
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Concrete Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

DESCRIPTION: East Grade Beam

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
D Only	8.150	8.150
+D+L	10.502	10.502
+D+S	9.157	9.157
+D+0.750L	9.914	9.914
+D+0.750L+0.750S	10.669	10.669
+0.60D	4.890	4.890
L Only	2.352	2.352
S Only	1.006	1.006

Shear Stirrup Requirements

Entire Beam Span Length : $V_u < \Phi V_c / 2$, Req'd Vs = Not Req'd per 9.6.3.1, Stirrups are not required.

Detailed Shear Information

Load Combination	Span Number	Distance 'd' (ft)	Distance 'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
				Actual	Design							
+1.20D+1.60L+0.50S	1	0.00	9.00	14.05	14.05	0.00	1.00	43.31	$V_u < \Phi V_c / 2$	Not Req'd	43.3	0.0
+1.20D+1.60L+0.50S	1	0.08	9.00	13.74	13.74	1.06	1.00	43.31	$V_u < \Phi V_c / 2$	Not Req'd	43.3	0.0
+1.20D+1.60L+0.50S	1	0.15	9.00	13.43	13.43	2.10	1.00	43.31	$V_u < \Phi V_c / 2$	Not Req'd	43.3	0.0
+1.20D+1.60L+0.50S	1	0.23	9.00	13.13	13.13	3.12	1.00	43.31	$V_u < \Phi V_c / 2$	Not Req'd	43.3	0.0
+1.20D+1.60L+0.50S	1	0.31	9.00	12.82	12.82	4.11	1.00	43.31	$V_u < \Phi V_c / 2$	Not Req'd	43.3	0.0
+1.20D+1.60L+0.50S	1	0.38	9.00	12.51	12.51	5.08	1.00	43.31	$V_u < \Phi V_c / 2$	Not Req'd	43.3	0.0
+1.20D+1.60L+0.50S	1	0.46	9.00	12.20	12.20	6.02	1.00	43.31	$V_u < \Phi V_c / 2$	Not Req'd	43.3	0.0
+1.20D+1.60L+0.50S	1	0.54	9.00	11.90	11.90	6.95	1.00	43.31	$V_u < \Phi V_c / 2$	Not Req'd	43.3	0.0
+1.20D+1.60L+0.50S	1	0.61	9.00	11.59	11.59	7.85	1.00	43.31	$V_u < \Phi V_c / 2$	Not Req'd	43.3	0.0
+1.20D+1.60L+0.50S	1	0.69	9.00	11.28	11.28	8.72	0.97	43.22	$V_u < \Phi V_c / 2$	Not Req'd	43.2	0.0
+1.20D+1.60L+0.50S	1	0.77	9.00	10.98	10.98	9.57	0.86	42.90	$V_u < \Phi V_c / 2$	Not Req'd	42.9	0.0
+1.20D+1.60L+0.50S	1	0.84	9.00	10.67	10.67	10.40	0.77	42.63	$V_u < \Phi V_c / 2$	Not Req'd	42.6	0.0
+1.20D+1.60L+0.50S	1	0.92	9.00	10.36	10.36	11.20	0.69	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	0.99	9.00	10.06	10.06	11.99	0.63	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.07	9.00	9.75	9.75	12.74	0.57	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.15	9.00	9.44	9.44	13.48	0.53	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.22	9.00	9.13	9.13	14.19	0.48	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.30	9.00	8.83	8.83	14.87	0.45	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.38	9.00	8.52	8.52	15.54	0.41	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.45	9.00	8.21	8.21	16.18	0.38	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.53	9.00	7.91	7.91	16.79	0.35	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.61	9.00	7.60	7.60	17.39	0.33	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.68	9.00	7.29	7.29	17.96	0.30	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.76	9.00	6.99	6.99	18.50	0.28	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.84	9.00	6.68	6.68	19.03	0.26	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.91	9.00	6.37	6.37	19.53	0.24	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	1.99	9.00	6.06	6.06	20.00	0.23	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.07	9.00	5.76	5.76	20.45	0.21	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.14	9.00	5.45	5.45	20.88	0.20	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.22	9.00	5.14	5.14	21.29	0.18	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.30	9.00	4.84	4.84	21.67	0.17	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.37	9.00	4.53	4.53	22.03	0.15	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.45	9.00	4.22	4.22	22.36	0.14	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.52	9.00	3.91	3.91	22.67	0.13	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.60	9.00	3.61	3.61	22.96	0.12	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.68	9.00	3.30	3.30	23.22	0.11	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.75	9.00	2.99	2.99	23.47	0.10	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.83	9.00	2.69	2.69	23.68	0.09	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.91	9.00	2.38	2.38	23.88	0.07	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	2.98	9.00	2.07	2.07	24.05	0.06	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	3.06	9.00	1.77	1.77	24.19	0.05	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	3.14	9.00	1.46	1.46	24.32	0.04	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	3.21	9.00	1.15	1.15	24.42	0.04	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	3.29	9.00	0.84	0.84	24.49	0.03	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0
+1.20D+1.60L+0.50S	1	3.37	9.00	0.54	0.54	24.55	0.02	42.53	$V_u < \Phi V_c / 2$	Not Req'd	42.5	0.0



7220 Trade Street, Suite 295
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Concrete Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

DESCRIPTION: East Grade Beam

Detailed Shear Information

Load Combination	Span Number	Distance 'd' (ft)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
											Req'd	Req'd
+1.20D+1.60L+0.50S	1	3.44	9.00	0.23	0.23	24.58	0.01	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	3.52	9.00	-0.08	0.08	24.58	0.00	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	3.60	9.00	-0.38	0.38	24.56	0.01	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	3.67	9.00	-0.69	0.69	24.52	0.02	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	3.75	9.00	-1.00	1.00	24.46	0.03	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	3.83	9.00	-1.30	1.30	24.37	0.04	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	3.90	9.00	-1.61	1.61	24.26	0.05	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	3.98	9.00	-1.92	1.92	24.12	0.06	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.05	9.00	-2.23	2.23	23.96	0.07	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.13	9.00	-2.53	2.53	23.78	0.08	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.21	9.00	-2.84	2.84	23.58	0.09	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.28	9.00	-3.15	3.15	23.35	0.10	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.36	9.00	-3.45	3.45	23.10	0.11	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.44	9.00	-3.76	3.76	22.82	0.12	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.51	9.00	-4.07	4.07	22.52	0.14	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.59	9.00	-4.38	4.38	22.20	0.15	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.67	9.00	-4.68	4.68	21.85	0.16	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.74	9.00	-4.99	4.99	21.48	0.17	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.82	9.00	-5.30	5.30	21.09	0.19	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.90	9.00	-5.60	5.60	20.67	0.20	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	4.97	9.00	-5.91	5.91	20.23	0.22	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.05	9.00	-6.22	6.22	19.77	0.24	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.13	9.00	-6.52	6.52	19.28	0.25	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.20	9.00	-6.83	6.83	18.77	0.27	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.28	9.00	-7.14	7.14	18.23	0.29	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.36	9.00	-7.45	7.45	17.68	0.32	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.43	9.00	-7.75	7.75	17.09	0.34	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.51	9.00	-8.06	8.06	16.49	0.37	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.58	9.00	-8.37	8.37	15.86	0.40	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.66	9.00	-8.67	8.67	15.21	0.43	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.74	9.00	-8.98	8.98	14.53	0.46	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.81	9.00	-9.29	9.29	13.84	0.50	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.89	9.00	-9.59	9.59	13.11	0.55	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	5.97	9.00	-9.90	9.90	12.37	0.60	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	6.04	9.00	-10.21	10.21	11.60	0.66	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	6.12	9.00	-10.52	10.52	10.80	0.73	42.53	Vu < Phi*Vc / 2	Reqd per	42.5	0.0
+1.20D+1.60L+0.50S	1	6.20	9.00	-10.82	10.82	9.99	0.81	42.76	Vu < Phi*Vc / 2	Reqd per	42.8	0.0
+1.20D+1.60L+0.50S	1	6.27	9.00	-11.13	11.13	9.15	0.91	43.05	Vu < Phi*Vc / 2	Reqd per	43.1	0.0
+1.20D+1.60L+0.50S	1	6.35	9.00	-11.44	11.44	8.29	1.00	43.31	Vu < Phi*Vc / 2	Reqd per	43.3	0.0
+1.20D+1.60L+0.50S	1	6.43	9.00	-11.74	11.74	7.40	1.00	43.31	Vu < Phi*Vc / 2	Reqd per	43.3	0.0
+1.20D+1.60L+0.50S	1	6.50	9.00	-12.05	12.05	6.49	1.00	43.31	Vu < Phi*Vc / 2	Reqd per	43.3	0.0
+1.20D+1.60L+0.50S	1	6.58	9.00	-12.36	12.36	5.56	1.00	43.31	Vu < Phi*Vc / 2	Reqd per	43.3	0.0
+1.20D+1.60L+0.50S	1	6.66	9.00	-12.67	12.67	4.60	1.00	43.31	Vu < Phi*Vc / 2	Reqd per	43.3	0.0
+1.20D+1.60L+0.50S	1	6.73	9.00	-12.97	12.97	3.62	1.00	43.31	Vu < Phi*Vc / 2	Reqd per	43.3	0.0
+1.20D+1.60L+0.50S	1	6.81	9.00	-13.28	13.28	2.61	1.00	43.31	Vu < Phi*Vc / 2	Reqd per	43.3	0.0
+1.20D+1.60L+0.50S	1	6.89	9.00	-13.59	13.59	1.59	1.00	43.31	Vu < Phi*Vc / 2	Reqd per	43.3	0.0
+1.20D+1.60L+0.50S	1	6.96	9.00	-13.89	13.89	0.53	1.00	43.31	Vu < Phi*Vc / 2	Reqd per	43.3	0.0

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	7.000	24.58	60.35	0.41
+1.40D					
Span # 1	1	7.000	19.97	60.35	0.33
+1.20D+1.60L					
Span # 1	1	7.000	23.70	60.35	0.39
+1.20D+1.60L+0.50S					
Span # 1	1	7.000	24.58	60.35	0.41



7220 Trade Street, Suite 295
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: **Architectural Innovations**
 Engineer: **LGH**
 Project ID: **203-22010**
 Project Descr: **3036 67th Ave. SE**

Concrete Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

DESCRIPTION: East Grade Beam

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
+1.20D+0.50L Span # 1	1	7.000	19.17	60.35	0.32
+1.20D Span # 1	1	7.000	17.12	60.35	0.28
+1.20D+0.50L+1.60S Span # 1	1	7.000	21.99	60.35	0.36
+1.20D+1.60S Span # 1	1	7.000	19.93	60.35	0.33
+1.20D+0.50L+0.50S Span # 1	1	7.000	20.05	60.35	0.33
+1.20D+0.50L+0.70S Span # 1	1	7.000	20.41	60.35	0.34
+0.90D Span # 1	1	7.000	12.84	60.35	0.21

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+0.750L+0.750S	1	0.0058	3.500		0.0000	0.000

Concrete Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

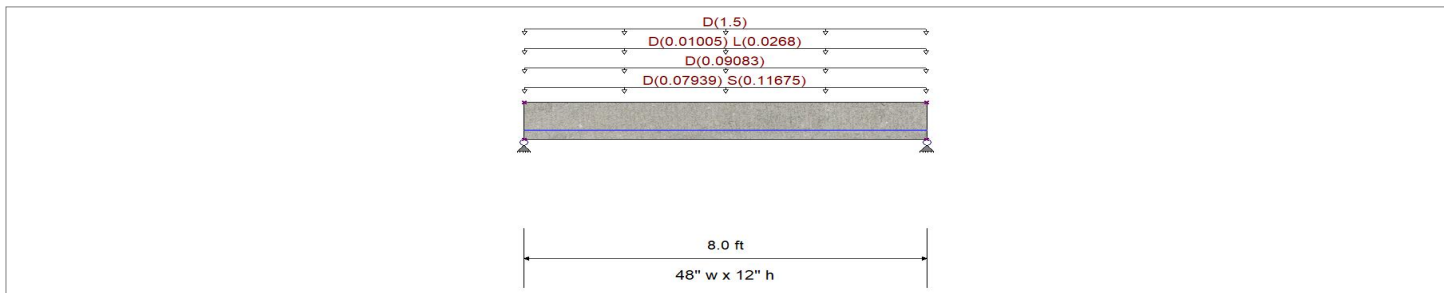
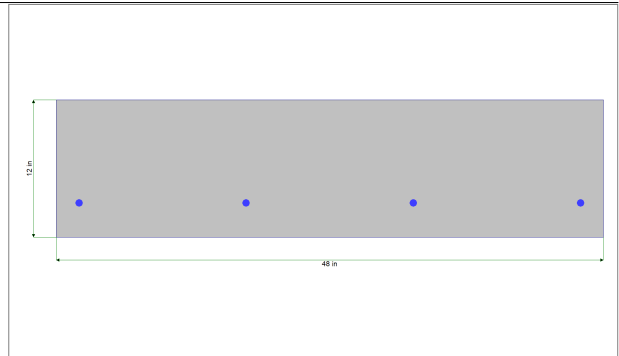
DESCRIPTION: North Grade Beam

CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

General Information

f'_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} * 7.50$	=	375.0 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup =	=	2



Cross Section & Reinforcing Details

Rectangular Section, Width = 48.0 in, Height = 12.0 in
Span #1 Reinforcing....
4-#5 at 3.0 in from Bottom, from 0.0 to 8.0 ft in this span

Load for Span Number 1

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 4.670 ft, (Roof)
Uniform Load : D = 0.010 ksf, Tributary Width = 9.083 ft, (Wall)
Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 0.670 ft, (Main Floor)
Uniform Load : D = 0.150 ksf, Tributary Width = 10.0 ft, (Basement Concrete Wall)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.391 : 1
Section used for this span	Typical Section
Mu : Applied	18.819 k-ft
Mn * Phi : Allowable	48.185 k-ft
Location of maximum on span	4.007 ft
Span # where maximum occurs	Span # 1

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	S Only
Max Downward Total Deflection	0.008 in	Ratio =	12512 >=180.0	Span: 1 : +D+S
Max Upward Total Deflection	0.000 in	Ratio =	0 <180.0	Span: 1 : +D+S

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	7.188	7.188
Max Upward from Load Combinations	7.188	7.188
Max Upward from Load Cases	6.721	6.721
D Only	6.721	6.721



Concrete Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

DESCRIPTION: North Grade Beam

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+L	6.828	6.828
+D+S	7.188	7.188
+D+0.750L	6.801	6.801
+D+0.750L+0.750S	7.152	7.152
+0.60D	4.033	4.033
L Only	0.107	0.107
S Only	0.467	0.467

Shear Stirrup Requirements

Entire Beam Span Length : $V_u < \Phi V_c / 2$, Req'd Vs = Not Req'd per 9.6.3.1, Stirrups are not required.

Detailed Shear Information

Load Combination	Span Number	Distance 'd' (ft)	(in)	Vu (k) Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
+1.40D	1	0.00	9.00	9.41	9.41	0.00	1.00	33.11	$V_u < \Phi V_c / 2$	Not Req'd per	33.1	0.0
+1.40D	1	0.09	9.00	9.20	9.20	0.81	1.00	33.11	$V_u < \Phi V_c / 2$	Not Req'd per	33.1	0.0
+1.40D	1	0.17	9.00	9.00	9.00	1.61	1.00	33.11	$V_u < \Phi V_c / 2$	Not Req'd per	33.1	0.0
+1.40D	1	0.26	9.00	8.79	8.79	2.39	1.00	33.11	$V_u < \Phi V_c / 2$	Not Req'd per	33.1	0.0
+1.40D	1	0.35	9.00	8.59	8.59	3.15	1.00	33.11	$V_u < \Phi V_c / 2$	Not Req'd per	33.1	0.0
+1.40D	1	0.44	9.00	8.38	8.38	3.89	1.00	33.11	$V_u < \Phi V_c / 2$	Not Req'd per	33.1	0.0
+1.40D	1	0.52	9.00	8.18	8.18	4.61	1.00	33.11	$V_u < \Phi V_c / 2$	Not Req'd per	33.1	0.0
+1.40D	1	0.61	9.00	7.97	7.97	5.32	1.00	33.11	$V_u < \Phi V_c / 2$	Not Req'd per	33.1	0.0
+1.40D	1	0.70	9.00	7.76	7.76	6.01	0.97	33.03	$V_u < \Phi V_c / 2$	Not Req'd per	33.0	0.0
+1.40D	1	0.79	9.00	7.56	7.56	6.68	0.85	32.75	$V_u < \Phi V_c / 2$	Not Req'd per	32.8	0.0
+1.40D	1	0.87	9.00	7.35	7.35	7.33	0.75	32.53	$V_u < \Phi V_c / 2$	Not Req'd per	32.5	0.0
+1.40D	1	0.96	9.00	7.15	7.15	7.96	0.67	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	1.05	9.00	6.94	6.94	8.58	0.61	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	1.14	9.00	6.74	6.74	9.18	0.55	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	1.22	9.00	6.53	6.53	9.76	0.50	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	1.31	9.00	6.32	6.32	10.32	0.46	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	1.40	9.00	6.12	6.12	10.86	0.42	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	1.49	9.00	5.91	5.91	11.39	0.39	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	1.57	9.00	5.71	5.71	11.90	0.36	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	1.66	9.00	5.50	5.50	12.39	0.33	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	1.75	9.00	5.30	5.30	12.86	0.31	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	1.84	9.00	5.09	5.09	13.31	0.29	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	1.92	9.00	4.88	4.88	13.75	0.27	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	2.01	9.00	4.68	4.68	14.17	0.25	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	2.10	9.00	4.47	4.47	14.57	0.23	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	2.19	9.00	4.27	4.27	14.95	0.21	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	2.27	9.00	4.06	4.06	15.31	0.20	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	2.36	9.00	3.86	3.86	15.66	0.18	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	2.45	9.00	3.65	3.65	15.99	0.17	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	2.54	9.00	3.45	3.45	16.30	0.16	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	2.62	9.00	3.24	3.24	16.59	0.15	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	2.71	9.00	3.03	3.03	16.86	0.13	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	2.80	9.00	2.83	2.83	17.12	0.12	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	2.89	9.00	2.62	2.62	17.36	0.11	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	2.97	9.00	2.42	2.42	17.58	0.10	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	3.06	9.00	2.21	2.21	17.78	0.09	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	3.15	9.00	2.01	2.01	17.96	0.08	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	3.23	9.00	1.80	1.80	18.13	0.07	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	3.32	9.00	1.59	1.59	18.28	0.07	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	3.41	9.00	1.39	1.39	18.41	0.06	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	3.50	9.00	1.18	1.18	18.52	0.05	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	3.58	9.00	0.98	0.98	18.62	0.04	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	3.67	9.00	0.77	0.77	18.69	0.03	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	3.76	9.00	0.57	0.57	18.75	0.02	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	3.85	9.00	0.36	0.36	18.79	0.01	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0
+1.40D	1	3.93	9.00	0.15	0.15	18.81	0.01	32.40	$V_u < \Phi V_c / 2$	Not Req'd per	32.4	0.0



7220 Trade Street, Suite 295
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Concrete Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

DESCRIPTION: North Grade Beam

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	
				Actual	Design								
+1.40D	1	4.02	9.00	-0.05	0.05	18.82	0.00	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	4.11	9.00	-0.26	0.26	18.80	0.01	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	4.20	9.00	-0.46	0.46	18.77	0.02	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	4.28	9.00	-0.67	0.67	18.72	0.03	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	4.37	9.00	-0.87	0.87	18.66	0.04	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	4.46	9.00	-1.08	1.08	18.57	0.04	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	4.55	9.00	-1.29	1.29	18.47	0.05	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	4.63	9.00	-1.49	1.49	18.35	0.06	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	4.72	9.00	-1.70	1.70	18.21	0.07	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	4.81	9.00	-1.90	1.90	18.05	0.08	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	4.90	9.00	-2.11	2.11	17.87	0.09	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	4.98	9.00	-2.31	2.31	17.68	0.10	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	5.07	9.00	-2.52	2.52	17.47	0.11	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	5.16	9.00	-2.73	2.73	17.24	0.12	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	5.25	9.00	-2.93	2.93	16.99	0.13	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	5.33	9.00	-3.14	3.14	16.73	0.14	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	5.42	9.00	-3.34	3.34	16.44	0.15	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	5.51	9.00	-3.55	3.55	16.14	0.16	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	5.60	9.00	-3.75	3.75	15.82	0.18	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	5.68	9.00	-3.96	3.96	15.49	0.19	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	5.77	9.00	-4.16	4.16	15.13	0.21	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	5.86	9.00	-4.37	4.37	14.76	0.22	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	5.95	9.00	-4.58	4.58	14.37	0.24	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	6.03	9.00	-4.78	4.78	13.96	0.26	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	6.12	9.00	-4.99	4.99	13.53	0.28	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	6.21	9.00	-5.19	5.19	13.09	0.30	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	6.30	9.00	-5.40	5.40	12.62	0.32	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	6.38	9.00	-5.60	5.60	12.14	0.35	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	6.47	9.00	-5.81	5.81	11.64	0.37	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	6.56	9.00	-6.02	6.02	11.13	0.41	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	6.64	9.00	-6.22	6.22	10.59	0.44	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	6.73	9.00	-6.43	6.43	10.04	0.48	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	6.82	9.00	-6.63	6.63	9.47	0.53	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	6.91	9.00	-6.84	6.84	8.88	0.58	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	6.99	9.00	-7.04	7.04	8.27	0.64	32.40	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	7.08	9.00	-7.25	7.25	7.65	0.71	32.43	Vu < Phi*Vc / 2	∅t	Reqd per	32.4	0.0
+1.40D	1	7.17	9.00	-7.46	7.46	7.00	0.80	32.64	Vu < Phi*Vc / 2	∅t	Reqd per	32.6	0.0
+1.40D	1	7.26	9.00	-7.66	7.66	6.34	0.91	32.89	Vu < Phi*Vc / 2	∅t	Reqd per	32.9	0.0
+1.40D	1	7.34	9.00	-7.87	7.87	5.66	1.00	33.11	Vu < Phi*Vc / 2	∅t	Reqd per	33.1	0.0
+1.40D	1	7.43	9.00	-8.07	8.07	4.97	1.00	33.11	Vu < Phi*Vc / 2	∅t	Reqd per	33.1	0.0
+1.40D	1	7.52	9.00	-8.28	8.28	4.25	1.00	33.11	Vu < Phi*Vc / 2	∅t	Reqd per	33.1	0.0
+1.40D	1	7.61	9.00	-8.48	8.48	3.52	1.00	33.11	Vu < Phi*Vc / 2	∅t	Reqd per	33.1	0.0
+1.40D	1	7.69	9.00	-8.69	8.69	2.77	1.00	33.11	Vu < Phi*Vc / 2	∅t	Reqd per	33.1	0.0
+1.40D	1	7.78	9.00	-8.90	8.90	2.00	1.00	33.11	Vu < Phi*Vc / 2	∅t	Reqd per	33.1	0.0
+1.40D	1	7.87	9.00	-9.10	9.10	1.21	1.00	33.11	Vu < Phi*Vc / 2	∅t	Reqd per	33.1	0.0
+1.40D	1	7.96	9.00	-9.31	9.31	0.41	1.00	33.11	Vu < Phi*Vc / 2	∅t	Reqd per	33.1	0.0

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	18.82	48.18	0.39
+1.40D	Span # 1	1	8.000	18.82	48.18	0.39
+1.20D+1.60L	Span # 1	1	8.000	16.47	48.18	0.34
+1.20D+1.60L+0.50S	Span # 1	1	8.000	16.94	48.18	0.35
+1.20D+0.50L						



7220 Trade Street, Suite 295
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: **Architectural Innovations**
 Engineer: **LGH**
 Project ID: **203-22010**
 Project Descr: **3036 67th Ave. SE**

Concrete Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

DESCRIPTION: North Grade Beam

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
Span # 1	1	8.000	16.24	48.18	0.34
+1.20D Span # 1	1	8.000	16.13	48.18	0.33
+1.20D+0.50L+1.60S Span # 1	1	8.000	17.73	48.18	0.37
+1.20D+1.60S Span # 1	1	8.000	17.62	48.18	0.37
+1.20D+0.50L+0.50S Span # 1	1	8.000	16.70	48.18	0.35
+1.20D+0.50L+0.70S Span # 1	1	8.000	16.89	48.18	0.35
+0.90D Span # 1	1	8.000	12.10	48.18	0.25

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+S	1	0.0077	4.000		0.0000	0.000

Concrete Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

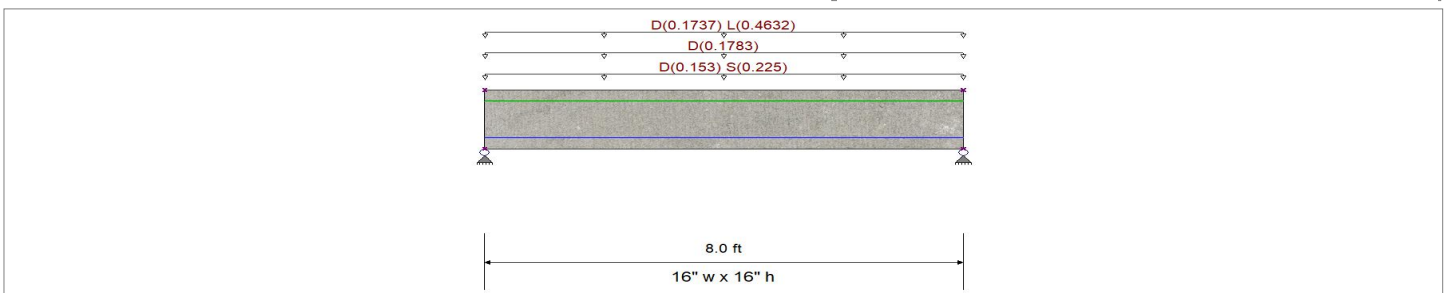
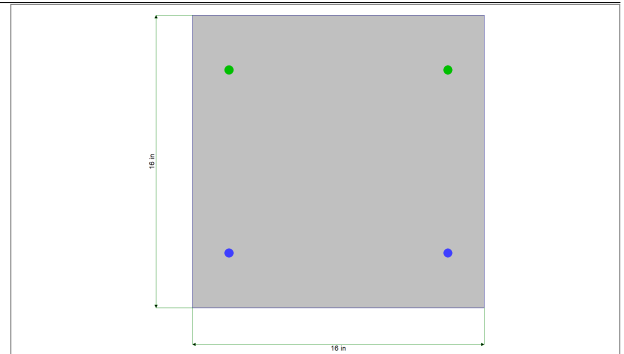
DESCRIPTION: West Grade Beam

CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

General Information

f'_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} * 7.50$	=	375.0 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
		Number of Resisting Legs Per Stirrup =			2



Cross Section & Reinforcing Details

Rectangular Section, Width = 16.0 in, Height = 16.0 in

Span #1 Reinforcing....

2-#4 at 3.0 in from Bottom, from 0.0 to 8.0 ft in this span

2-#4 at 3.0 in from Top, from 0.0 to 8.0 ft in this span

Load for Span Number 1

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 9.0 ft, (Roof)

Uniform Load : D = 0.010 ksf, Tributary Width = 17.830 ft, (Wall)

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 11.580 ft, (Main Floor)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.445	: 1
Section used for this span	Typical Section	
Mu : Applied	11.677	k-ft
Mn * Phi : Allowable	26.259	k-ft
Location of maximum on span	3.993	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.003 in	Ratio =	38355	>=360.0	S Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.006 in	Ratio =	17398	>=180.0	Span: 1 : +D+0.750L+0.750S
Max Upward Total Deflection	0.000 in	Ratio =	0	<180.0	Span: 1 : +D+0.750L+0.750S

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	4.085	4.085
Max Upward from Load Combinations	4.085	4.085
Max Upward from Load Cases	2.020	2.020
D Only	2.020	2.020
+D+L	3.873	3.873



Concrete Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

DESCRIPTION: West Grade Beam

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+S	2.920	2.920
+D+0.750L	3.410	3.410
+D+0.750L+0.750S	4.085	4.085
+0.60D	1.212	1.212
L Only	1.853	1.853
S Only	0.900	0.900

Shear Stirrup Requirements

Entire Beam Span Length : $V_u < \Phi V_c / 2$, Req'd Vs = Not Req'd per 9.6.3.1, Stirrups are not required.

Detailed Shear Information

Load Combination	Span Number	Distance 'd' (ft)	(in)	Vu (k) Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	
+1.20D+1.60L+0.50S	1	0.00	13.00	5.84	5.84	0.00	1.00	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	0.09	13.00	5.71	5.71	0.50	1.00	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	0.17	13.00	5.58	5.58	1.00	1.00	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	0.26	13.00	5.46	5.46	1.48	1.00	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	0.35	13.00	5.33	5.33	1.95	1.00	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	0.44	13.00	5.20	5.20	2.41	1.00	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	0.52	13.00	5.07	5.07	2.86	1.00	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	0.61	13.00	4.95	4.95	3.30	1.00	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	0.70	13.00	4.82	4.82	3.73	1.00	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	0.79	13.00	4.69	4.69	4.14	1.00	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	0.87	13.00	4.56	4.56	4.55	1.00	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	0.96	13.00	4.43	4.43	4.94	0.97	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	1.05	13.00	4.31	4.31	5.32	0.88	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	1.14	13.00	4.18	4.18	5.69	0.80	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	1.22	13.00	4.05	4.05	6.05	0.73	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	1.31	13.00	3.92	3.92	6.40	0.66	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	1.40	13.00	3.80	3.80	6.74	0.61	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	1.49	13.00	3.67	3.67	7.07	0.56	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	1.57	13.00	3.54	3.54	7.38	0.52	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	1.66	13.00	3.41	3.41	7.68	0.48	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	1.75	13.00	3.29	3.29	7.98	0.45	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	1.84	13.00	3.16	3.16	8.26	0.41	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	1.92	13.00	3.03	3.03	8.53	0.38	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.01	13.00	2.90	2.90	8.79	0.36	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.10	13.00	2.78	2.78	9.04	0.33	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.19	13.00	2.65	2.65	9.27	0.31	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.27	13.00	2.52	2.52	9.50	0.29	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.36	13.00	2.39	2.39	9.72	0.27	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.45	13.00	2.27	2.27	9.92	0.25	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.54	13.00	2.14	2.14	10.11	0.23	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.62	13.00	2.01	2.01	10.29	0.21	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.71	13.00	1.88	1.88	10.46	0.19	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.80	13.00	1.75	1.75	10.62	0.18	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.89	13.00	1.63	1.63	10.77	0.16	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.97	13.00	1.50	1.50	10.91	0.15	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.06	13.00	1.37	1.37	11.03	0.13	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.15	13.00	1.24	1.24	11.15	0.12	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.23	13.00	1.12	1.12	11.25	0.11	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.32	13.00	0.99	0.99	11.34	0.09	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.41	13.00	0.86	0.86	11.42	0.08	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.50	13.00	0.73	0.73	11.49	0.07	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.58	13.00	0.61	0.61	11.55	0.06	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.67	13.00	0.48	0.48	11.60	0.04	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.76	13.00	0.35	0.35	11.63	0.03	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.85	13.00	0.22	0.22	11.66	0.02	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.93	13.00	0.10	0.10	11.67	0.01	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.02	13.00	-0.03	0.03	11.68	0.00	15.60	$V_u < \Phi V_c / 2$	∅	Req'd per	15.6	0.0



7220 Trade Street, Suite 295
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Concrete Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

DESCRIPTION: West Grade Beam

Detailed Shear Information

Load Combination	Span Number	Distance 'd'		Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
		(ft)	(in)	Actual	Design							
+1.20D+1.60L+0.50S	1	4.11	13.00	-0.16	0.16	11.67	0.01	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	4.20	13.00	-0.29	0.29	11.65	0.03	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	4.28	13.00	-0.41	0.41	11.62	0.04	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	4.37	13.00	-0.54	0.54	11.58	0.05	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	4.46	13.00	-0.67	0.67	11.52	0.06	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	4.55	13.00	-0.80	0.80	11.46	0.08	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	4.63	13.00	-0.93	0.93	11.38	0.09	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	4.72	13.00	-1.05	1.05	11.30	0.10	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	4.81	13.00	-1.18	1.18	11.20	0.11	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	4.90	13.00	-1.31	1.31	11.09	0.13	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	4.98	13.00	-1.44	1.44	10.97	0.14	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	5.07	13.00	-1.56	1.56	10.84	0.16	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	5.16	13.00	-1.69	1.69	10.70	0.17	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	5.25	13.00	-1.82	1.82	10.54	0.19	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	5.33	13.00	-1.95	1.95	10.38	0.20	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	5.42	13.00	-2.07	2.07	10.20	0.22	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	5.51	13.00	-2.20	2.20	10.02	0.24	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	5.60	13.00	-2.33	2.33	9.82	0.26	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	5.68	13.00	-2.46	2.46	9.61	0.28	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	5.77	13.00	-2.58	2.58	9.39	0.30	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	5.86	13.00	-2.71	2.71	9.16	0.32	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	5.95	13.00	-2.84	2.84	8.92	0.35	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	6.03	13.00	-2.97	2.97	8.66	0.37	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	6.12	13.00	-3.09	3.09	8.40	0.40	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	6.21	13.00	-3.22	3.22	8.12	0.43	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	6.30	13.00	-3.35	3.35	7.83	0.46	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	6.38	13.00	-3.48	3.48	7.53	0.50	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	6.47	13.00	-3.61	3.61	7.22	0.54	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	6.56	13.00	-3.73	3.73	6.90	0.59	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	6.64	13.00	-3.86	3.86	6.57	0.64	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	6.73	13.00	-3.99	3.99	6.23	0.69	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	6.82	13.00	-4.12	4.12	5.87	0.76	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	6.91	13.00	-4.24	4.24	5.51	0.83	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	6.99	13.00	-4.37	4.37	5.13	0.92	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	7.08	13.00	-4.50	4.50	4.74	1.00	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	7.17	13.00	-4.63	4.63	4.35	1.00	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	7.26	13.00	-4.75	4.75	3.94	1.00	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	7.34	13.00	-4.88	4.88	3.51	1.00	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	7.43	13.00	-5.01	5.01	3.08	1.00	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	7.52	13.00	-5.14	5.14	2.64	1.00	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	7.61	13.00	-5.26	5.26	2.18	1.00	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	7.69	13.00	-5.39	5.39	1.72	1.00	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	7.78	13.00	-5.52	5.52	1.24	1.00	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	7.87	13.00	-5.65	5.65	0.75	1.00	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	7.96	13.00	-5.77	5.77	0.25	1.00	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment	Location (ft) Span # along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
	Span # 1	1 8.000	11.68	26.26	0.44
+1.40D	Span # 1	1 8.000	5.66	26.26	0.22
+1.20D+1.60L	Span # 1	1 8.000	10.78	26.26	0.41
+1.20D+1.60L+0.50S	Span # 1	1 8.000	11.68	26.26	0.44
+1.20D+0.50L	Span # 1	1 8.000	6.70	26.26	0.26



7220 Trade Street, Suite 295
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: **Architectural Innovations**
 Engineer: **LGH**
 Project ID: **203-22010**
 Project Descr: **3036 67th Ave. SE**

Concrete Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

DESCRIPTION: West Grade Beam

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
+1.20D Span # 1	1	8.000	4.85	26.26	0.18
+1.20D+0.50L+1.60S Span # 1	1	8.000	9.58	26.26	0.36
+1.20D+1.60S Span # 1	1	8.000	7.73	26.26	0.29
+1.20D+0.50L+0.50S Span # 1	1	8.000	7.60	26.26	0.29
+1.20D+0.50L+0.70S Span # 1	1	8.000	7.96	26.26	0.30
+0.90D Span # 1	1	8.000	3.64	26.26	0.14

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+0.750L+0.750S	1	0.0055	4.000		0.0000	0.000

Concrete Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

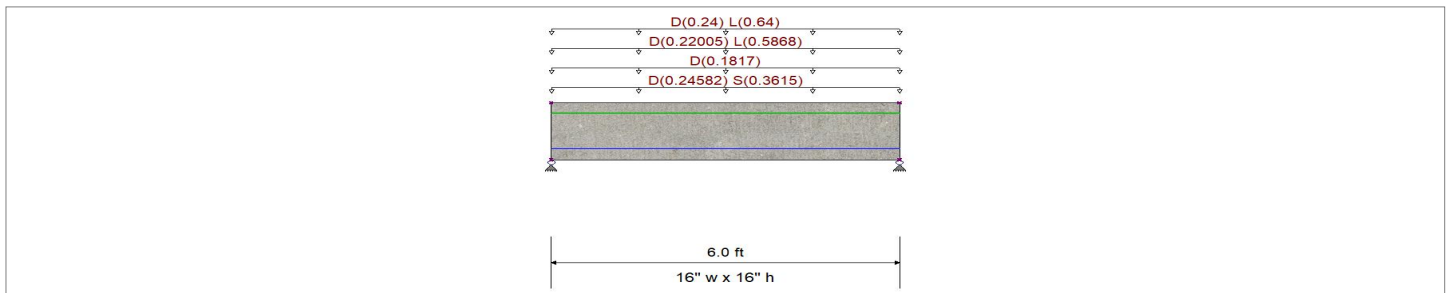
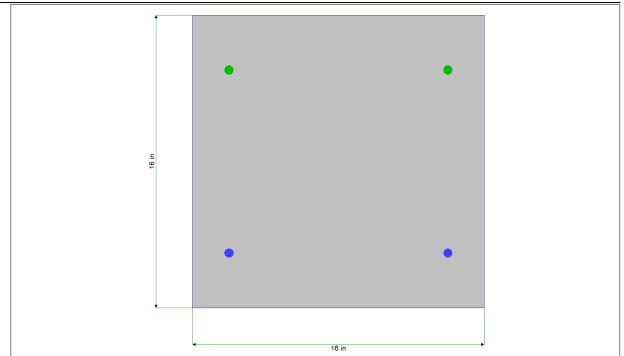
DESCRIPTION: Interior Grade Beam

CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2021

General Information

f'_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} * 7.50$	=	375.0 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	2



Cross Section & Reinforcing Details

Rectangular Section, Width = 16.0 in, Height = 16.0 in

Span #1 Reinforcing....

2-#4 at 3.0 in from Bottom, from 0.0 to 6.0 ft in this span

2-#4 at 3.0 in from Top, from 0.0 to 6.0 ft in this span

Load for Span Number 1

Uniform Load : D = 0.0170, S = 0.0250 ksf, Tributary Width = 14.460 ft, (Roof)

Uniform Load : D = 0.010 ksf, Tributary Width = 18.170 ft, (Wall)

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 14.670 ft, (Upper Floor)

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 16.0 ft, (Main Floor)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.550 : 1
Section used for this span	Typical Section
Mu : Applied	14.439 k-ft
Mn * Phi : Allowable	26.259 k-ft
Location of maximum on span	2.995 ft
Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.002 in	Ratio =	34327	>=360.0	S Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	L Only
Max Downward Total Deflection	0.004 in	Ratio =	19917	>=180.0	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in	Ratio =	0	<180.0	Span: 1 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	6.343	6.343
Max Upward from Load Combinations	6.343	6.343
Max Upward from Load Cases	3.680	3.680
D Only	2.663	2.663



7220 Trade Street, Suite 295
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Concrete Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

DESCRIPTION: Interior Grade Beam

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+L	6.343	6.343
+D+S	3.747	3.747
+D+0.750L	5.423	5.423
+D+0.750L+0.750S	6.236	6.236
+0.60D	1.598	1.598
L Only	3.680	3.680
S Only	1.084	1.084

Shear Stirrup Requirements

Between 0.00 to 0.57 ft, $\Phi^i V_c / 2 < V_u \leq \Phi^i V_c$, Req'd Vs = Min per 9.6.3.1, use #3 stirrups spaced at 6.000 in
 Between 0.58 to 5.42 ft, $V_u < \Phi^i V_c / 2$, Req'd Vs = Not Req'd per 9.6.3.1, Stirrups are not required.
 Between 5.43 to 5.99 ft, $\Phi^i V_c / 2 < V_u \leq \Phi^i V_c$, Req'd Vs = Min per 9.6.3.1, use #3 stirrups spaced at 6.000 in

Detailed Shear Information

Load Combination	Span		Vu (k)	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
	Number	Distance 'd' (ft)								
+1.20D+1.60L+0.50S	1	0.00	9.63	9.63	0.00	15.60	Phi*Vc / 2 < Vu	29.9	29.9	6.5
+1.20D+1.60L+0.50S	1	0.07	9.42	9.42	0.62	15.60	Phi*Vc / 2 < Vu	29.9	29.9	6.5
+1.20D+1.60L+0.50S	1	0.13	9.21	9.21	1.23	15.60	Phi*Vc / 2 < Vu	29.9	29.9	6.5
+1.20D+1.60L+0.50S	1	0.20	8.99	8.99	1.83	15.60	Phi*Vc / 2 < Vu	29.9	29.9	6.5
+1.20D+1.60L+0.50S	1	0.26	8.78	8.78	2.41	15.60	Phi*Vc / 2 < Vu	29.9	29.9	6.5
+1.20D+1.60L+0.50S	1	0.33	8.57	8.57	2.98	15.60	Phi*Vc / 2 < Vu	29.9	29.9	6.5
+1.20D+1.60L+0.50S	1	0.39	8.36	8.36	3.54	15.60	Phi*Vc / 2 < Vu	29.9	29.9	6.5
+1.20D+1.60L+0.50S	1	0.46	8.15	8.15	4.08	15.60	Phi*Vc / 2 < Vu	29.9	29.9	6.5
+1.20D+1.60L+0.50S	1	0.52	7.94	7.94	4.61	15.60	Phi*Vc / 2 < Vu	29.9	29.9	6.5
+1.20D+1.60L+0.50S	1	0.59	7.73	7.73	5.12	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	0.66	7.52	7.52	5.62	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	0.72	7.31	7.31	6.11	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	0.79	7.10	7.10	6.58	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	0.85	6.89	6.89	7.04	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	0.92	6.68	6.68	7.48	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	0.98	6.47	6.47	7.92	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.05	6.26	6.26	8.33	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.11	6.05	6.05	8.74	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.18	5.84	5.84	9.13	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.25	5.63	5.63	9.50	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.31	5.42	5.42	9.87	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.38	5.21	5.21	10.21	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.44	5.00	5.00	10.55	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.51	4.79	4.79	10.87	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.57	4.58	4.58	11.18	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.64	4.37	4.37	11.47	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.70	4.16	4.16	11.75	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.77	3.95	3.95	12.01	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.84	3.73	3.73	12.27	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.90	3.52	3.52	12.50	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	1.97	3.31	3.31	12.73	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.03	3.10	3.10	12.94	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.10	2.89	2.89	13.13	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.16	2.68	2.68	13.32	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.23	2.47	2.47	13.49	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.30	2.26	2.26	13.64	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.36	2.05	2.05	13.78	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.43	1.84	1.84	13.91	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.49	1.63	1.63	14.02	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.56	1.42	1.42	14.12	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.62	1.21	1.21	14.21	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.69	1.00	1.00	14.28	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.75	0.79	0.79	14.34	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0
+1.20D+1.60L+0.50S	1	2.82	0.58	0.58	14.39	15.60	Vu < Phi*Vc / 2	15.6	15.6	0.0



7220 Trade Street, Suite 295
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: Architectural Innovations
 Engineer: LGH
 Project ID: 203-22010
 Project Descr: 3036 67th Ave. SE

Concrete Beam

Project File: Beams.ec6

LIC#: KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

DESCRIPTION: Interior Grade Beam

Detailed Shear Information

Load Combination	Span Number	Distance 'd'		Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
		(ft)	(in)	Actual	Design							
+1.20D+1.60L+0.50S	1	2.89	13.00	0.37	0.37	14.42	0.03	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	2.95	13.00	0.16	0.16	14.44	0.01	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.02	13.00	-0.05	0.05	14.44	0.00	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.08	13.00	-0.26	0.26	14.43	0.02	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.15	13.00	-0.47	0.47	14.40	0.04	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.21	13.00	-0.68	0.68	14.37	0.05	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.28	13.00	-0.89	0.89	14.31	0.07	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.34	13.00	-1.10	1.10	14.25	0.08	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.41	13.00	-1.32	1.32	14.17	0.10	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.48	13.00	-1.53	1.53	14.08	0.12	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.54	13.00	-1.74	1.74	13.97	0.13	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.61	13.00	-1.95	1.95	13.85	0.15	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.67	13.00	-2.16	2.16	13.71	0.17	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.74	13.00	-2.37	2.37	13.57	0.19	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.80	13.00	-2.58	2.58	13.40	0.21	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.87	13.00	-2.79	2.79	13.23	0.23	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	3.93	13.00	-3.00	3.00	13.04	0.25	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.00	13.00	-3.21	3.21	12.83	0.27	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.07	13.00	-3.42	3.42	12.62	0.29	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.13	13.00	-3.63	3.63	12.39	0.32	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.20	13.00	-3.84	3.84	12.14	0.34	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.26	13.00	-4.05	4.05	11.88	0.37	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.33	13.00	-4.26	4.26	11.61	0.40	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.39	13.00	-4.47	4.47	11.32	0.43	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.46	13.00	-4.68	4.68	11.02	0.46	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.52	13.00	-4.89	4.89	10.71	0.49	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.59	13.00	-5.10	5.10	10.38	0.53	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.66	13.00	-5.31	5.31	10.04	0.57	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.72	13.00	-5.52	5.52	9.69	0.62	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.79	13.00	-5.73	5.73	9.32	0.67	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.85	13.00	-5.94	5.94	8.93	0.72	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.92	13.00	-6.15	6.15	8.54	0.78	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	4.98	13.00	-6.36	6.36	8.13	0.85	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	5.05	13.00	-6.58	6.58	7.70	0.92	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	5.11	13.00	-6.79	6.79	7.26	1.00	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	5.18	13.00	-7.00	7.00	6.81	1.00	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	5.25	13.00	-7.21	7.21	6.35	1.00	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	5.31	13.00	-7.42	7.42	5.87	1.00	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	5.38	13.00	-7.63	7.63	5.37	1.00	15.60	Vu < Phi*Vc / 2	Req'd per	15.6	0.0
+1.20D+1.60L+0.50S	1	5.44	13.00	-7.84	7.84	4.87	1.00	15.60	Phi*Vc / 2 < Vu	lin per 9.6.:	29.9	6.5
+1.20D+1.60L+0.50S	1	5.51	13.00	-8.05	8.05	4.35	1.00	15.60	Phi*Vc / 2 < Vu	lin per 9.6.:	29.9	6.5
+1.20D+1.60L+0.50S	1	5.57	13.00	-8.26	8.26	3.81	1.00	15.60	Phi*Vc / 2 < Vu	lin per 9.6.:	29.9	6.5
+1.20D+1.60L+0.50S	1	5.64	13.00	-8.47	8.47	3.26	1.00	15.60	Phi*Vc / 2 < Vu	lin per 9.6.:	29.9	6.5
+1.20D+1.60L+0.50S	1	5.70	13.00	-8.68	8.68	2.70	1.00	15.60	Phi*Vc / 2 < Vu	lin per 9.6.:	29.9	6.5
+1.20D+1.60L+0.50S	1	5.77	13.00	-8.89	8.89	2.12	1.00	15.60	Phi*Vc / 2 < Vu	lin per 9.6.:	29.9	6.5
+1.20D+1.60L+0.50S	1	5.84	13.00	-9.10	9.10	1.53	1.00	15.60	Phi*Vc / 2 < Vu	lin per 9.6.:	29.9	6.5
+1.20D+1.60L+0.50S	1	5.90	13.00	-9.31	9.31	0.93	1.00	15.60	Phi*Vc / 2 < Vu	lin per 9.6.:	29.9	6.5
+1.20D+1.60L+0.50S	1	5.97	13.00	-9.52	9.52	0.31	1.00	15.60	Phi*Vc / 2 < Vu	lin per 9.6.:	29.9	6.5

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	6.000	14.44	26.26	0.55
+1.40D					
Span # 1	1	6.000	5.59	26.26	0.21
+1.20D+1.60L					
Span # 1	1	6.000	13.63	26.26	0.52
+1.20D+1.60L+0.50S					



7220 Trade Street, Suite 295
 San Diego, CA 92121
 (619) 650-0010
 mulhernkulp.com

Project Title: **Architectural Innovations**
 Engineer: **LGH**
 Project ID: **203-22010**
 Project Descr: **3036 67th Ave. SE**

Concrete Beam

Project File: Beams.ec6

LIC# : KW-06017913, Build:20.23.08.01

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

DESCRIPTION: Interior Grade Beam

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
Span # 1	1	6.000	14.44	26.26	0.55
+1.20D+0.50L	Span # 1	6.000	7.55	26.26	0.29
+1.20D	Span # 1	6.000	4.79	26.26	0.18
+1.20D+0.50L+1.60S	Span # 1	6.000	10.16	26.26	0.39
+1.20D+1.60S	Span # 1	6.000	7.40	26.26	0.28
+1.20D+0.50L+0.50S	Span # 1	6.000	8.37	26.26	0.32
+1.20D+0.50L+0.70S	Span # 1	6.000	8.69	26.26	0.33
+0.90D	Span # 1	6.000	3.59	26.26	0.14

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+L	1	0.0036	3.000		0.0000	0.000