MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

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

CALCULATION PACKAGE

December 09, 2025

LNL Builds

2424 74th Ave SE

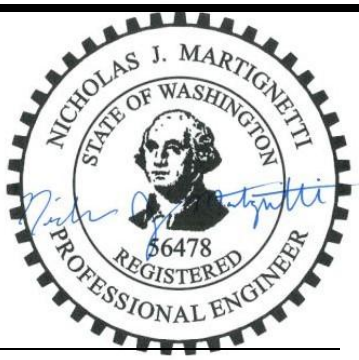
Mercer Island,
Washington

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

Prepared By:

Matthew P. Mills, E.I.T. *Project Engineer*

Nicholas J. Martignetti, P.E. *Associate Owner + San Diego Office Director*



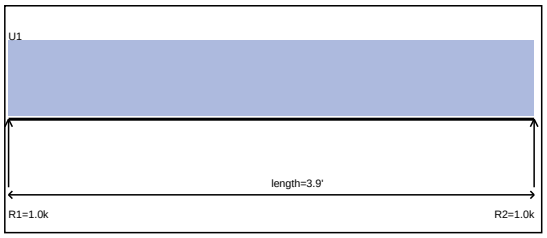
Signature, Seal & Date

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

BEAM & HEADER CALCULATIONS

M+K PROJECT #: 300-25003 - T01 - 2424 74th Ave SE
ENGINEER: Matthew Mills
Date: 12/09/2025

Description - Roof Framing Plan - H3-1 - Header



Uniform 1 = 0.46 klf (0.0'-3.9')

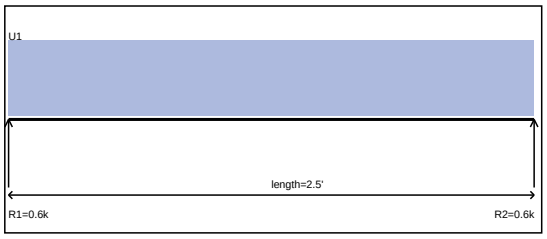
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.91k	Vall = 6.12k	Ratio = 0.15
M = 0.89k-ft	Mall = 17.89k-ft	Ratio = 0.05

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - H3-5 - Header



Uniform 1 = 0.42 klf (0.0'-2.5')

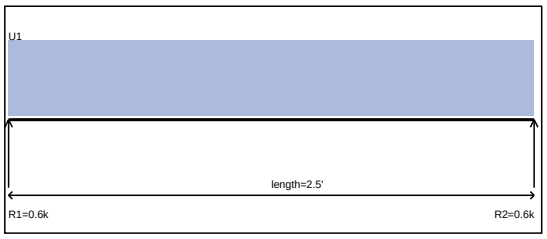
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.53k	Vall = 6.12k	Ratio = 0.09
M = 0.33k-ft	Mall = 17.89k-ft	Ratio = 0.02

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - H3-6 - Header



Uniform 1 = 0.46 klf (0.0'-2.5')

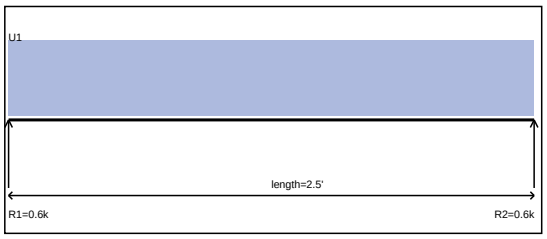
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.58k	Vall = 6.12k	Ratio = 0.09
M = 0.36k-ft	Mall = 17.89k-ft	Ratio = 0.02

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - H3-7 - Header



Uniform 1 = 0.42 klf (0.0'-2.5')

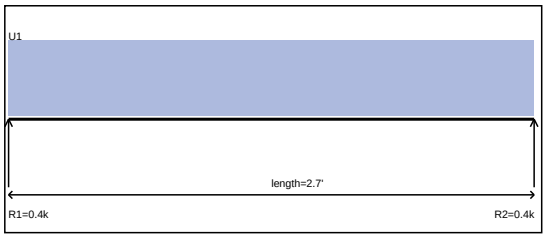
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.53k	Vall = 6.12k	Ratio = 0.09
M = 0.33k-ft	Mall = 17.89k-ft	Ratio = 0.02

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - H3-8 - Header



Uniform 1 = 0.26 klf (0.0'-2.7')

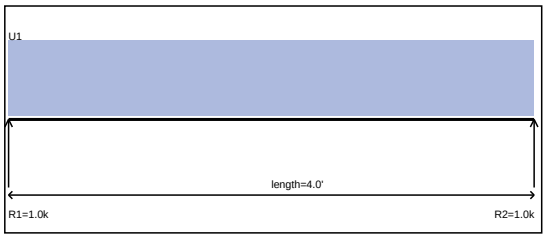
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.35k	Vall = 6.12k	Ratio = 0.06
M = 0.24k-ft	Mall = 17.89k-ft	Ratio = 0.01

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - H3-12 - Header



Uniform 1 = 0.46 klf (0.0'-4.0')

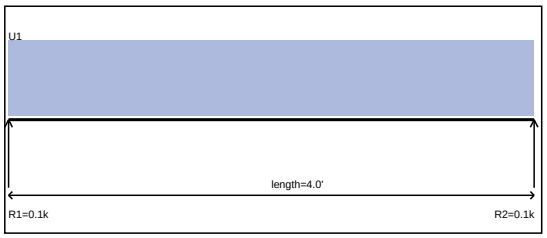
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.93k	Vall = 6.12k	Ratio = 0.15
M = 0.93k-ft	Mall = 17.89k-ft	Ratio = 0.05

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - B3-2 - Flush



Uniform 1 = 0.03 klf (0.0'-4.0')

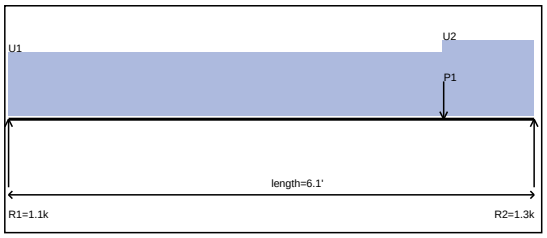
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = D Cd=0.9
△ = NA

V = 0.06k	Vall = 0 k	Ratio = 0
M = 0.15k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - Roof Framing Plan - B3-3 - Flush



Uniform 1 = 0.35 klf (0.0'-5.0') P1 = 0.19 K (5.0')

Uniform 2 = 0.42 klf (5.0'-6.1')

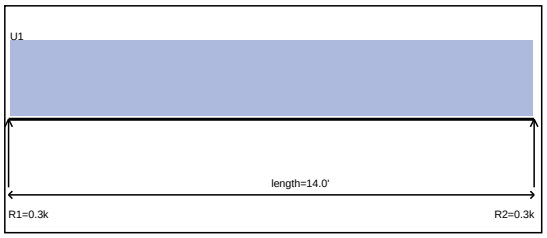
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = NA

V = 1.28k	Vall = 0 k	Ratio = 0
M = 1.50k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - Roof Framing Plan - B3-4 - Flush



Uniform 1 = 0.04 klf (0.0'-13.9')

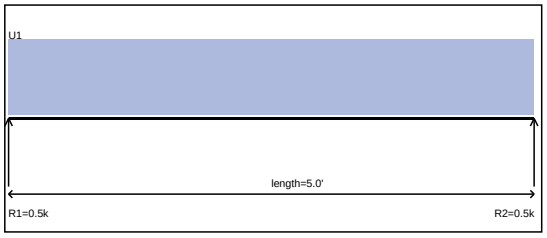
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.24k	Vall = 2.10k	Ratio = 0.12
M = 0.85k-ft	Mall = 2.20k-ft	Ratio = 0.39

Deflection
TL = 0.65" L/258 > L/240 min
DL = 0.19"
L = 0.00" L/999+ > L/360 min

1-3/4x5-1/2 LVL

Description - Roof Framing Plan - B3-7 - Flush



Uniform 1 = 0.19 klf (0.0'-5.0')

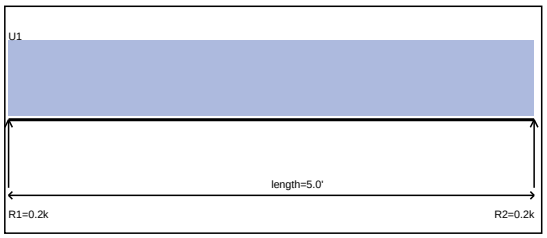
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.46k	Vall = 6.12k	Ratio = 0.08
M = 0.58k-ft	Mall = 17.89k-ft	Ratio = 0.03

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - B3-8 - Flush



Uniform 1 = 0.08 klf (0.0'-5.0')

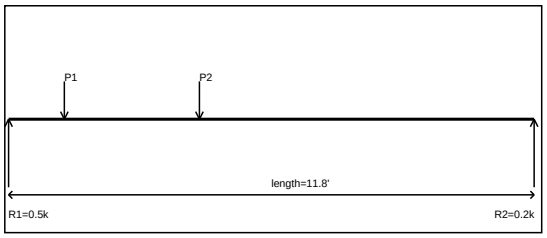
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.19k	Vall = 6.12k	Ratio = 0.03
M = 0.24k-ft	Mall = 17.89k-ft	Ratio = 0.01

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - B3-9 - Flush



P1 = 0.19 K (1.3')

P2 = 0.46 K (4.3')

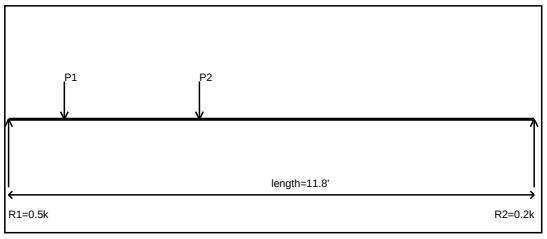
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.46k	Vall = 6.12k	Ratio = 0.08
M = 1.42k-ft	Mall = 17.89k-ft	Ratio = 0.08

Deflection
TL = 0.03" L/999+ > L/240 min
DL = 0.01"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - B3-10 - Flush



P1 = 0.19 K (1.3')

P2 = 0.46 K (4.3')

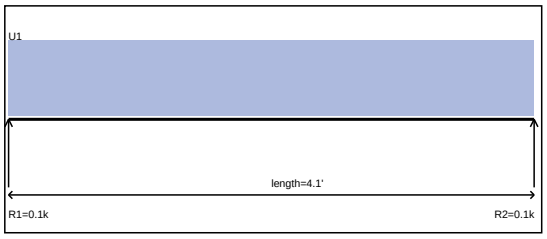
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.46k	Vall = 6.12k	Ratio = 0.08
M = 1.42k-ft	Mall = 17.89k-ft	Ratio = 0.08

Deflection
TL = 0.03" L/999+ > L/240 min
DL = 0.01"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - B3-11 - Flush



Uniform 1 = 0.03 klf (0.0'-4.1')

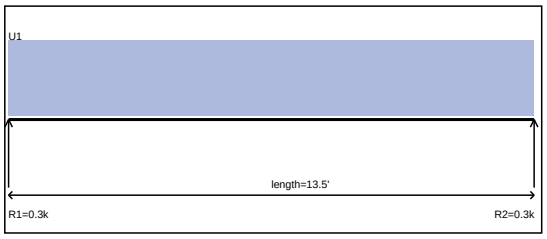
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = NA

V = 0.06k	Vall = 0 k	Ratio = 0
M = 0.06k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - Roof Framing Plan - B3-12 - Flush



Uniform 1 = 0.04 klf (0.0'-13.5')

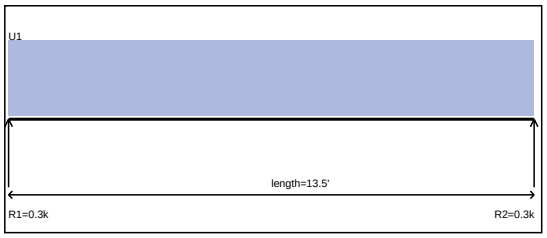
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.24k	Vall = 2.10k	Ratio = 0.11
M = 0.80k-ft	Mall = 2.20k-ft	Ratio = 0.36

Deflection
TL = 0.57" L/286 > L/240 min
DL = 0.16"
L = 0.00" L/999+ > L/360 min

1-3/4x5-1/2 LVL

Description - Roof Framing Plan - B3-13 - Flush



Uniform 1 = 0.04 klf (0.0'-13.5')

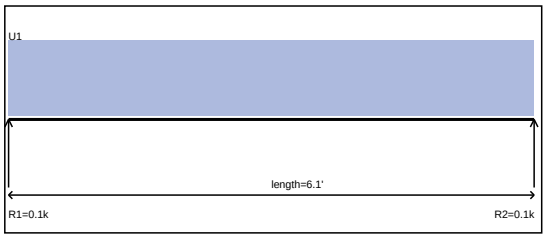
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.24k	Vall = 2.10k	Ratio = 0.11
M = 0.80k-ft	Mall = 2.20k-ft	Ratio = 0.36

Deflection
TL = 0.57" L/286 > L/240 min
DL = 0.16"
L = 0.00" L/999+ > L/360 min

1-3/4x5-1/2 LVL

Description - Roof Framing Plan - B3-14 - Flush



Uniform 1 = 0.03 klf (0.0'-6.1')

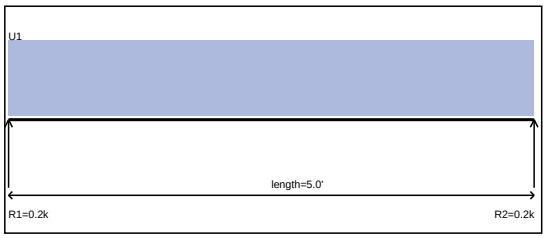
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = NA

V = 0.09k	Vall = 0 k	Ratio = 0
M = 0.05k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - Roof Framing Plan - B3-15 - Flush



Uniform 1 = 0.08 klf (0.0'-5.0')

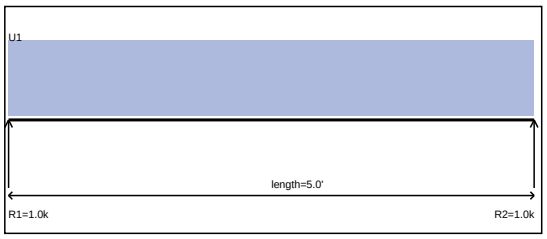
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.19k	Vall = 6.12k	Ratio = 0.03
M = 0.24k-ft	Mall = 17.89k-ft	Ratio = 0.01

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - B3-16 - Flush



Uniform 1 = 0.40 klf (0.0'-5.0')

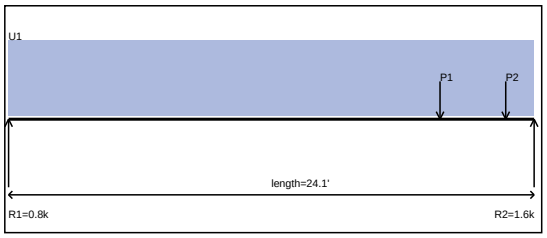
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 1.00k	Vall = 6.12k	Ratio = 0.16
M = 1.25k-ft	Mall = 17.89k-ft	Ratio = 0.07

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - B3-17 - Flush



Uniform 1 = 0.05 klf (0.0'-24.1')

P1 = 1.00 K (19.8')

P2 = 0.19 K (22.8')

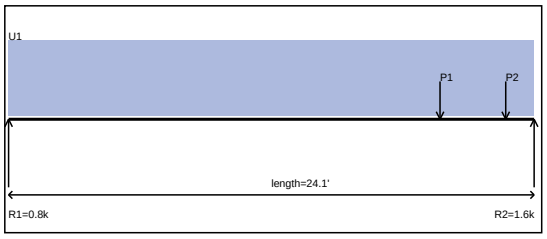
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 1.56k	Vall = 6.12k	Ratio = 0.25
M = 6.02k-ft	Mall = 17.89k-ft	Ratio = 0.34

Deflection
TL = 0.55" L/523 > L/240 min
DL = 0.16"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Roof Framing Plan - B3-18 - Flush



Uniform 1 = 0.05 klf (0.0'-24.1')

P1 = 1.00 K (19.8')

P2 = 0.19 K (22.8')

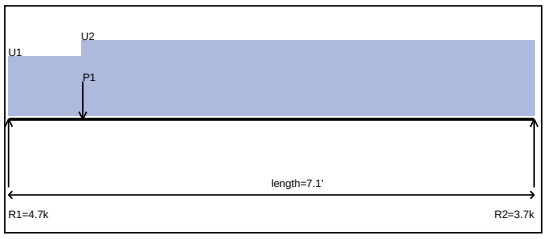
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 1.55k	Vall = 6.12k	Ratio = 0.25
M = 6.00k-ft	Mall = 17.89k-ft	Ratio = 0.34

Deflection
TL = 0.55" L/524 > L/240 min
DL = 0.16"
L = 0.00" L/999+ > L/360 min

1-3/4x16 LVL

Description - Second Floor Framing Plan - H2-3 - Header



Uniform 1 = 0.76 klf (0.0'-1.0')

P1 = 1.60 K (1.0')

Uniform 2 = 0.97 klf (1.0'-7.1')

Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + 0.75 * (L + S)) Cd=1.15
△ = (D + 0.75 * (L + S))

V = 3.38k	Vall = 4.72k	Ratio = 0.72
M = 5.65k-ft	Mall = 7.00k-ft	Ratio = 0.81

Deflection
TL = 0.08" L/999+ > L/240 min
DL = 0.03"
L = 0.03" L/999+ > L/360 min

4x12 DF #2

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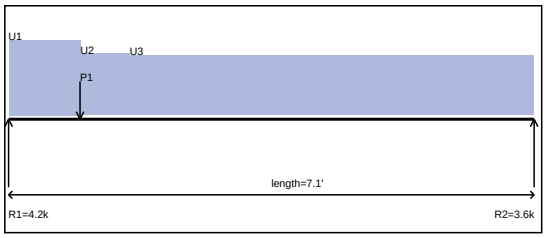
Description - Second Floor Framing Plan - H2-6 - Header



Uniform 1 = 1.21 klf (0.0'-1.0') P1 = 0.59 K (1.0')

Uniform 2 = 0.99 klf (1.0'-1.6')

Uniform 3 = 0.96 klf (1.6'-7.1')

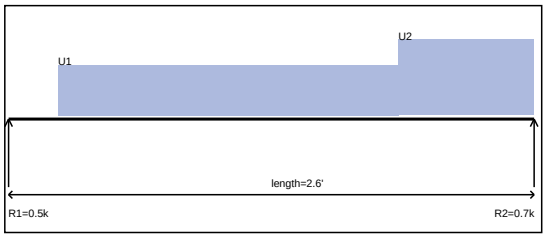
Controlling Load Combination/ Cd
V = (D + 0.75 * (L + S)) Cd=1.15
M = (D + 0.75 * (L + S)) Cd=1.15
△ = (D + 0.75 * (L + S))

V = 3.43k	Vall = 5.43k	Ratio = 0.63
M = 5.30k-ft	Mall = 7.00k-ft	Ratio = 0.76

Deflection
TL = 0.07" L/999+ > L/240 min
DL = 0.03"
L = 0.03" L/999+ > L/360 min

4x12 DF #2

Description - Second Floor Framing Plan - H2-8 - Header



Uniform 1 = 0.41 klf (0.2'-1.9')

Uniform 2 = 0.62 klf (1.9'-2.6')

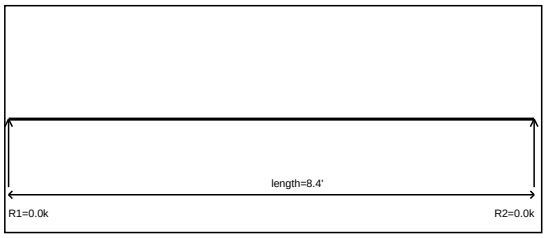
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.59k	Vall = 3.50k	Ratio = 0.17
M = 0.32k-ft	Mall = 3.44k-ft	Ratio = 0.09

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

4x8 DF #2

Description - Second Floor Framing Plan - H2-9 - Header



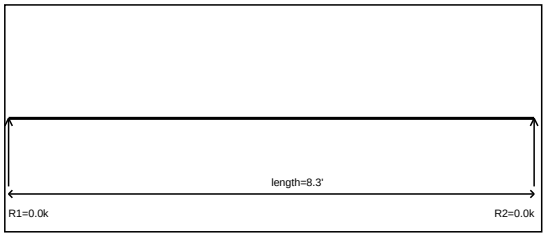
Controlling Load Combination/ Cd
V = NA Cd=1
M = NA Cd=1
△ = NA

V = 0.00k	Vall = 4.72k	Ratio = 0
M = 0.00k-ft	Mall = 6.09k-ft	Ratio = 0

Deflection
TL = 0 " L/ NA > L/240 min
DL = 0 "
L = 0 " L/ NA > L/360 min

4x12 DF #2

Description - Second Floor Framing Plan - H2-10 - Header



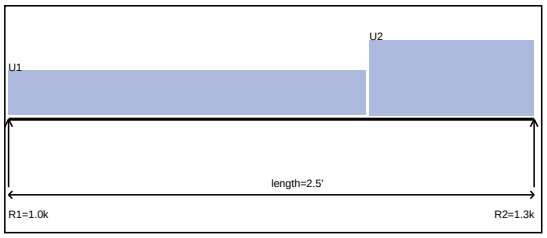
Controlling Load Combination/ Cd
V = NA Cd=1
M = NA Cd=1
△ = NA

V = 0.00k	Vall = 4.72k	Ratio = 0
M = 0.00k-ft	Mall = 6.09k-ft	Ratio = 0

Deflection
TL = 0 " L/ NA > L/240 min
DL = 0 "
L = 0 " L/ NA > L/360 min

4x12 DF #2

Description - Second Floor Framing Plan - H2-11 - Header



Uniform 1 = 0.73 klf (0.0'-1.7')

Uniform 2 = 1.23 klf (1.7'-2.5')

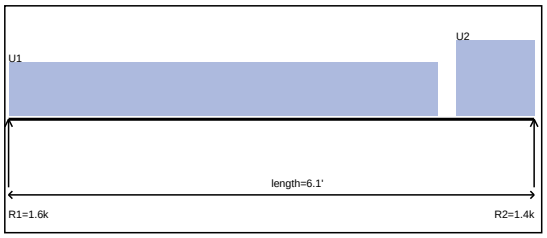
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + 0.75 * (L + S))

V = 0.91k	Vall = 3.04k	Ratio = 0.30
M = 0.48k-ft	Mall = 2.99k-ft	Ratio = 0.16

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

4x8 DF #2

Description - Second Floor Framing Plan - B2-25 - Refer to External Design



Uniform 1 = 0.52 klf (0.0'-5.0')

Uniform 2 = 0.73 klf (5.2'-6.1')

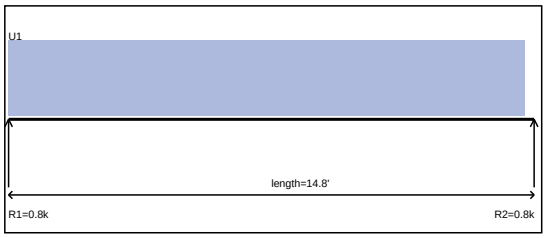
Controlling Load Combination/ Cd
V = (D + 0.75 * (L + S)) Cd=1.15
M = (D + 0.75 * (L + S)) Cd=1.15
△ = NA

V = 1.33k	Vall = 0 k	Ratio = 0
M = 2.02k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - Second Floor Framing Plan - B2-26 - Flush



Uniform 1 = 0.10 klf (0.0'-14.5')

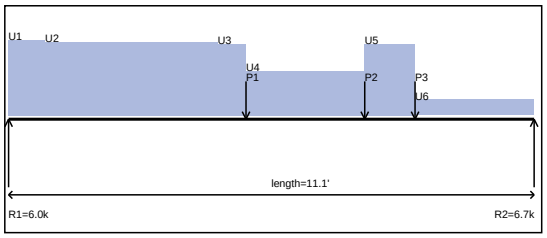
Controlling Load Combination/ Cd
V = D Cd=0.9
M = D Cd=0.9
△ = D

V = 0.74k	Vall = 10.02k	Ratio = 0.07
M = 2.72k-ft	Mall = 34.02k-ft	Ratio = 0.08

Deflection
TL = 0.03" L/999+ > L/240 min
DL = 0.03"
L = 0.00" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-27 - Refer to External Design



Uniform 1 = 1.19 klf (0.0'-0.8')
Uniform 2 = 1.15 klf (0.8'-4.4')
Uniform 3 = 1.12 klf (4.4'-5.0')
Uniform 4 = 0.70 klf (5.0'-7.5')
Uniform 5 = 1.12 klf (7.5'-8.6')
Uniform 6 = 0.25 klf (8.6'-11.1')

P1 = 0.53 K (5.0')
P2 = 0.53 K (7.5')
P3 = 3.07 K (8.6')

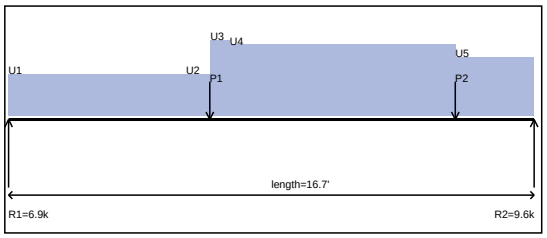
Controlling Load Combination/ Cd
V = (D + 0.75 * (L + S)) Cd=1.15
M = (D + 0.75 * (L + S)) Cd=1.15
△ = NA

V = 5.51k	Vall = 0 k	Ratio = 0
M = 11.88k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - Second Floor Framing Plan - B2-30 - Refer to External Design



Uniform 1 = 0.66 klf (0.0'-5.6')
Uniform 2 = 0.66 klf (5.6'-6.4')
Uniform 3 = 1.19 klf (6.4'-7.0')
Uniform 4 = 1.12 klf (7.0'-14.2')
Uniform 5 = 0.92 klf (14.2'-16.7')

P1 = 0.35 K (6.4')
P2 = 1.19 K (14.2')

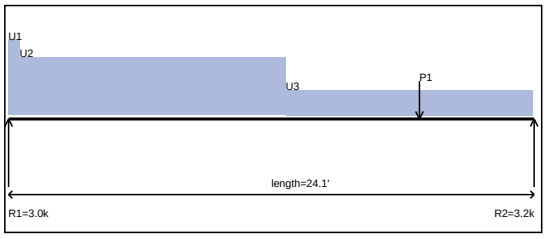
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = NA

V = 6.96k	Vall = 0 k	Ratio = 0
M = 23.73k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - Second Floor Framing Plan - B2-32 - Flush



Uniform 1 = 0.30 klf (0.0'-0.5')
Uniform 2 = 0.23 klf (0.5'-12.7')
Uniform 3 = 0.10 klf (12.7'-24.0')

P1 = 1.94 K (18.9')

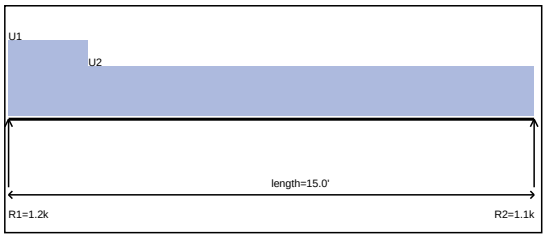
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + 0.75 * (L + S))

V = 2.85k	Vall = 17.49k	Ratio = 0.16
M = 14.37k-ft	Mall = 55.86k-ft	Ratio = 0.26

Deflection
TL = 0.34" L/842 > L/240 min
DL = 0.21"
L = 0.14" L/999+ > L/360 min

5-1/2x18 GLB

Description - Second Floor Framing Plan - B2-33 - Flush



Uniform 1 = 0.20 klf (0.0'-2.3')

Uniform 2 = 0.13 klf (2.3'-15.0')

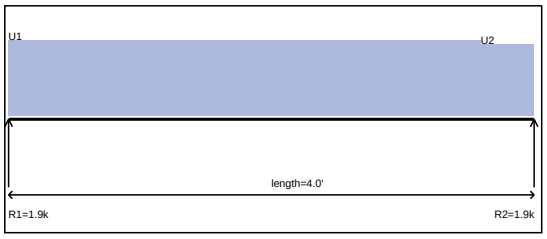
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 1.16k	Vall = 9.08k	Ratio = 0.13
M = 3.88k-ft	Mall = 20.50k-ft	Ratio = 0.19

Deflection
TL = 0.17" L/999+ > L/240 min
DL = 0.05"
L = 0.00" L/999+ > L/360 min

(2)1-3/4x11-7/8 LVL

Description - Second Floor Framing Plan - B2-34 - Flush



Uniform 1 = 0.95 klf (0.0'-3.6')

Uniform 2 = 0.90 klf (3.6'-4.0')

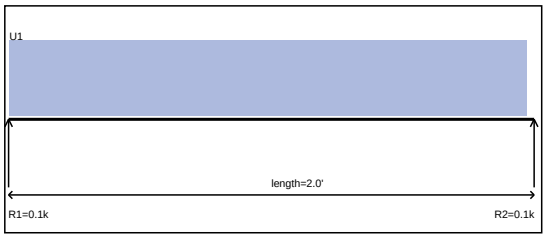
Controlling Load Combination/ Cd
V = (D + 0.75 * (L + S)) Cd=1.15
M = (D + 0.75 * (L + S)) Cd=1.15
△ = (D + 0.75 * (L + S))

V = 1.58k	Vall = 12.80k	Ratio = 0.12
M = 1.58k-ft	Mall = 43.47k-ft	Ratio = 0.04

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-35 - Flush



Uniform 1 = 0.10 klf (0.0'-2.0')

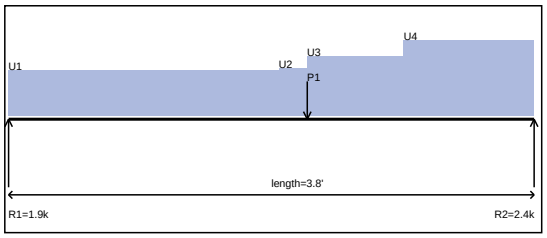
Controlling Load Combination/ Cd
V = D Cd=0.9
M = D Cd=0.9
△ = D

V = 0.10k	Vall = 10.02k	Ratio = 0.01
M = 0.05k-ft	Mall = 34.02k-ft	Ratio = 0.00

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-36 - Flush



Uniform 1 = 0.86 klf (0.0'-2.0')

P1 = 0.24 K (2.2')

Uniform 2 = 0.90 klf (2.0'-2.2')

Uniform 3 = 1.13 klf (2.2'-2.9')

Uniform 4 = 1.44 klf (2.9'-3.8')

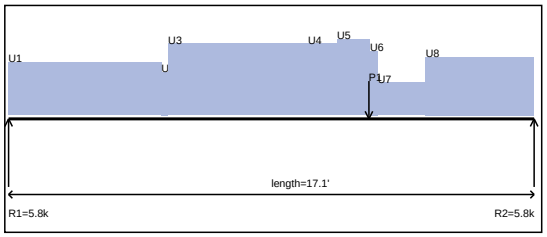
Controlling Load Combination/ Cd
V = (D + 0.75 * (L + S)) Cd=1.15
M = (D + 0.75 * (L + S)) Cd=1.15
△ = (D + 0.75 * (L + S))

V = 1.97k	Vall = 12.80k	Ratio = 0.15
M = 1.70k-ft	Mall = 43.47k-ft	Ratio = 0.04

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-37 - Refer to External Design



Uniform 1 = 0.60 klf (0.0'-5.0')

P1 = 0.10 K (11.7')

Uniform 2 = 0.49 klf (5.0'-5.2')

Uniform 3 = 0.81 klf (5.2'-9.7')

Uniform 4 = 0.81 klf (9.7'-10.7')

Uniform 5 = 0.86 klf (10.7'-11.7')

Uniform 6 = 0.73 klf (11.7'-12.0')

Uniform 7 = 0.37 klf (12.0'-13.5')

Uniform 8 = 0.66 klf (13.5'-17.1')

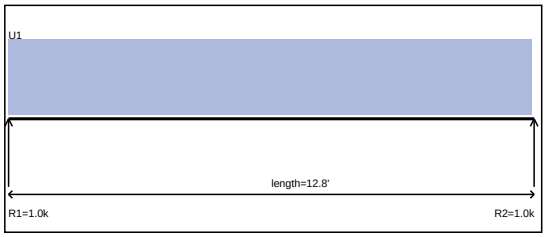
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + 0.75 * (L + S)) Cd=1.15
△ = NA

V = 4.57k	Vall = 0 k	Ratio = 0
M = 22.03k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - Second Floor Framing Plan - B2-38 - Refer to External Design



Uniform 1 = 0.15 klf (0.0'-12.8')

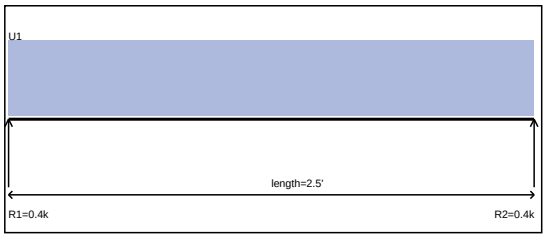
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = NA

V = 0.98k	Vall = 0 k	Ratio = 0
M = 3.14k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - Second Floor Framing Plan - B2-40 - Flush



Uniform 1 = 0.28 klf (0.0'-2.5')

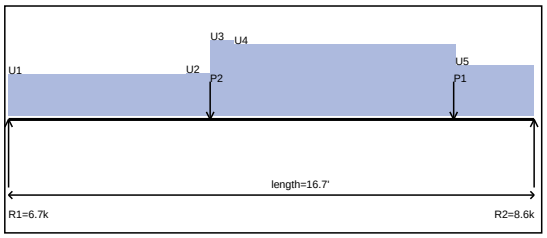
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.35k	Vall = 12.80k	Ratio = 0.03
M = 0.22k-ft	Mall = 43.47k-ft	Ratio = 0.01

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-41 - Refer to External Design



Uniform 1 = 0.66 klf (0.0'-5.6')
Uniform 2 = 0.67 klf (5.6'-6.4')
Uniform 3 = 1.19 klf (6.4'-7.2')
Uniform 4 = 1.12 klf (7.2'-14.2')
Uniform 5 = 0.79 klf (14.2'-16.7')

P1 = 0.43 K (14.2')
P2 = 0.35 K (6.4')

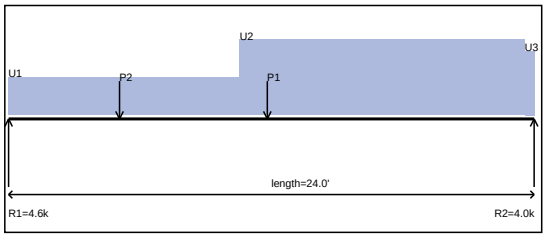
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = NA

V = 6.68k	Vall = 0 k	Ratio = 0
M = 23.37k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - Second Floor Framing Plan - B2-42 - Flush



Uniform 1 = 0.10 klf (0.0'-10.6')
Uniform 2 = 0.20 klf (10.6'-23.6')
Uniform 3 = 0.17 klf (23.6'-24.0')

P1 = 2.79 K (11.8')
P2 = 1.94 K (5.1')

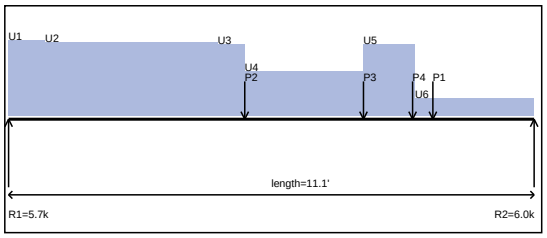
Controlling Load Combination/ Cd
V = (D + 0.75 * (L + S)) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 3.89k	Vall = 21.79k	Ratio = 0.18
M = 29.29k-ft	Mall = 74.82k-ft	Ratio = 0.39

Deflection
TL = 0.50" L/580 > L/240 min
DL = 0.24"
L = 0.11" L/999+ > L/360 min

5-1/2x19-1/2 GLB

Description - Second Floor Framing Plan - B2-43 - Refer to External Design



Uniform 1 = 1.19 klf (0.0'-0.8')

Uniform 2 = 1.15 klf (0.8'-4.4')

Uniform 3 = 1.12 klf (4.4'-5.0')

Uniform 4 = 0.70 klf (5.0'-7.5')

Uniform 5 = 1.12 klf (7.5'-8.6')

Uniform 6 = 0.28 klf (8.6'-11.1')

P1 = 0.46 K (8.9')

P2 = 0.53 K (5.0')

P3 = 0.53 K (7.5')

P4 = 1.53 K (8.5')

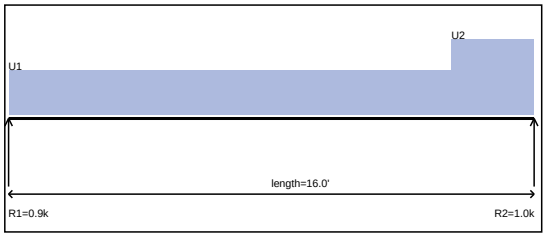
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = NA

V = 4.56k	Vall = 0 k	Ratio = 0
M = 9.34k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - Second Floor Framing Plan - B2-46 - Flush



Uniform 1 = 0.10 klf (0.0'-13.4')

Uniform 2 = 0.17 klf (13.4'-16.0')

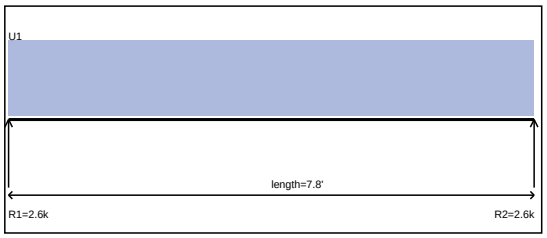
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.95k	Vall = 9.08k	Ratio = 0.10
M = 3.27k-ft	Mall = 20.50k-ft	Ratio = 0.16

Deflection
TL = 0.16" L/999+ > L/240 min
DL = 0.05"
L = 0.00" L/999+ > L/360 min

(2)1-3/4x11-7/8 LVL

Description - Second Floor Framing Plan - B2-48 - Flush



Uniform 1 = 0.66 klf (0.0'-7.8')

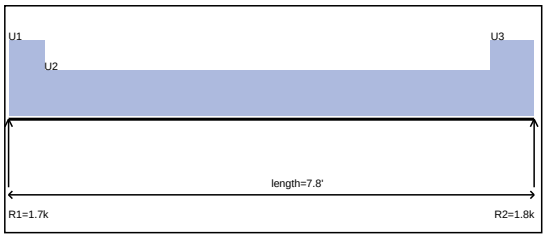
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 2.58k	Vall = 11.13k	Ratio = 0.23
M = 5.01k-ft	Mall = 37.80k-ft	Ratio = 0.13

Deflection
TL = 0.02" L/999+ > L/240 min
DL = 0.00"
L = 0.01" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-49 - Flush



Uniform 1 = 0.66 klf (0.0'-0.5')

Uniform 2 = 0.40 klf (0.5'-7.1')

Uniform 3 = 0.66 klf (7.1'-7.8')

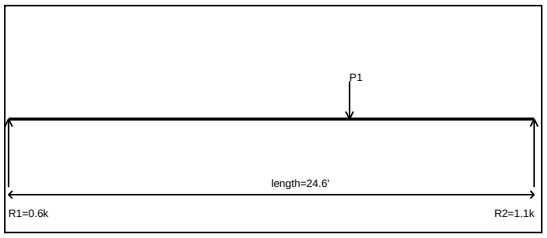
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 1.72k	Vall = 11.13k	Ratio = 0.15
M = 3.06k-ft	Mall = 37.80k-ft	Ratio = 0.08

Deflection
TL = 0.01" L/999+ > L/240 min
DL = 0.00"
L = 0.01" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-51 - Flush



P1 = 1.69 K (15.9')

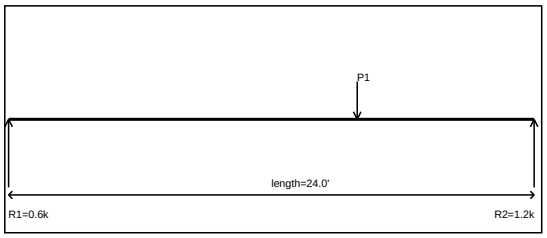
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 1.10k	Vall = 11.13k	Ratio = 0.10
M = 9.47k-ft	Mall = 37.12k-ft	Ratio = 0.26

Deflection
TL = 0.34" L/878 > L/240 min
DL = 0.07"
L = 0.27" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-52 - Flush



P1 = 1.72 K (15.9')

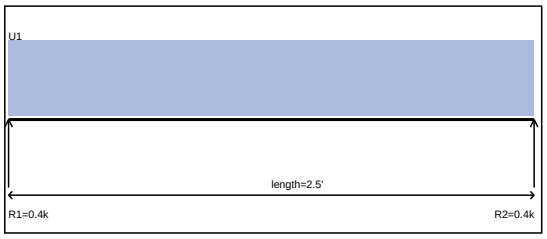
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 1.14k	Vall = 11.13k	Ratio = 0.10
M = 9.21k-ft	Mall = 37.21k-ft	Ratio = 0.25

Deflection
TL = 0.31" L/923 > L/240 min
DL = 0.06"
L = 0.25" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-56 - Flush



Uniform 1 = 0.28 klf (0.0'-2.5')

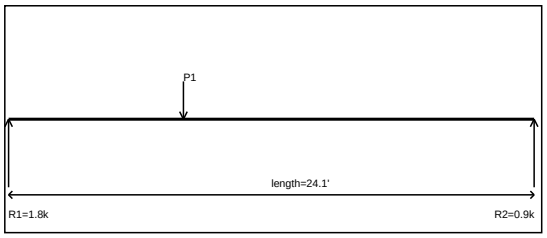
Controlling Load Combination/ Cd
V = (D + S) Cd=1.15
M = (D + S) Cd=1.15
△ = (D + S)

V = 0.35k	Vall = 12.80k	Ratio = 0.03
M = 0.22k-ft	Mall = 43.47k-ft	Ratio = 0.01

Deflection
TL = 0.00" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-57 - Flush



P1 = 2.58 K (8.0')

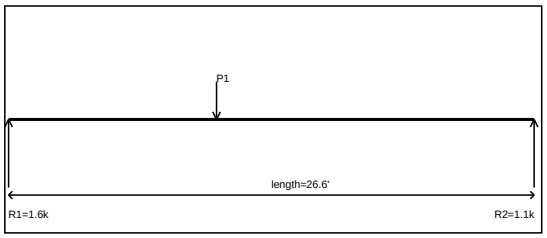
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 1.72k	Vall = 11.13k	Ratio = 0.15
M = 13.81k-ft	Mall = 37.19k-ft	Ratio = 0.37

Deflection
TL = 0.47" L/614 > L/240 min
DL = 0.09"
L = 0.38" L/767 > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-58 - Flush



P1 = 2.58 K (10.5')

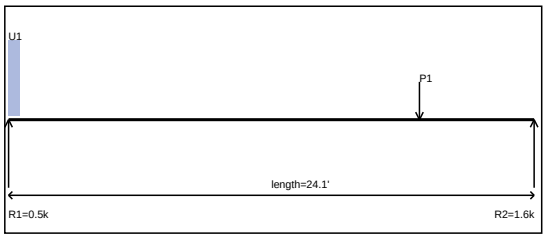
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 1.56k	Vall = 11.13k	Ratio = 0.14
M = 16.42k-ft	Mall = 36.82k-ft	Ratio = 0.45

Deflection
TL = 0.68" L/467 > L/240 min
DL = 0.14"
L = 0.55" L/584 > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-59 - Flush



Uniform 1 = 0.04 klf (0.0'-0.5')

P1 = 1.94 K (18.9')

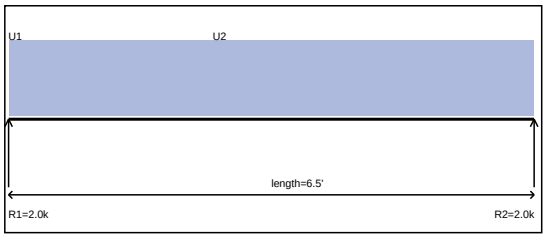
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 1.52k	Vall = 11.13k	Ratio = 0.14
M = 7.99k-ft	Mall = 37.19k-ft	Ratio = 0.21

Deflection
TL = 0.27" L/999+ > L/240 min
DL = 0.05"
L = 0.22" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-60 - Flush



Uniform 1 = 0.60 klf (0.0'-2.5')

Uniform 2 = 0.60 klf (2.5'-6.5')

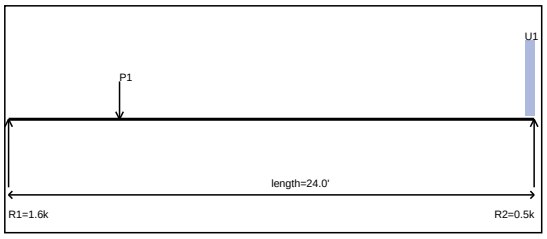
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 1.94k	Vall = 11.13k	Ratio = 0.17
M = 3.13k-ft	Mall = 37.80k-ft	Ratio = 0.08

Deflection
TL = 0.01" L/999+ > L/240 min
DL = 0.00"
L = 0.01" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-61 - Flush



Uniform 1 = 0.04 klf (23.6'-24.0')

P1 = 1.94 K (5.1')

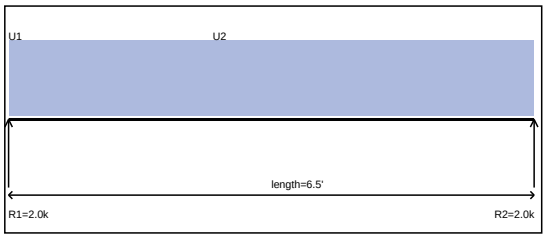
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 1.53k	Vall = 11.13k	Ratio = 0.14
M = 7.75k-ft	Mall = 37.21k-ft	Ratio = 0.21

Deflection
TL = 0.26" L/999+ > L/240 min
DL = 0.05"
L = 0.21" L/999+ > L/360 min

3-1/2x18 GLB

Description - Second Floor Framing Plan - B2-62 - Flush



Uniform 1 = 0.60 klf (0.0'-2.5')

Uniform 2 = 0.60 klf (2.5'-6.5')

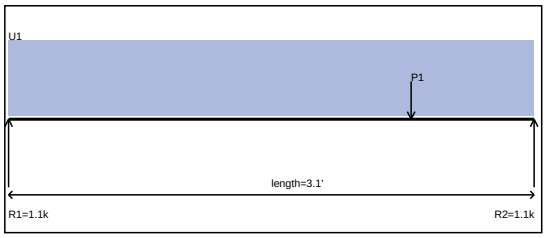
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 1.94k	Vall = 11.13k	Ratio = 0.17
M = 3.13k-ft	Mall = 37.80k-ft	Ratio = 0.08

Deflection
TL = 0.01" L/999+ > L/240 min
DL = 0.00"
L = 0.01" L/999+ > L/360 min

3-1/2x18 GLB

Description - First Floor Framing Plan - H1-1 - Header



Uniform 1 = 0.66 klf (0.0'-3.1') P1 = -0.00 K (2.4')

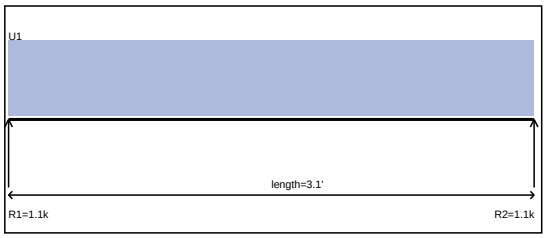
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 1.02k	Vall = 3.04k	Ratio = 0.34
M = 0.79k-ft	Mall = 2.99k-ft	Ratio = 0.26

Deflection
TL = 0.01" L/999+ > L/240 min
DL = 0.00"
L = 0.01" L/999+ > L/360 min

4x8 DF #2

Description - First Floor Framing Plan - H1-2 - Header



Uniform 1 = 0.66 klf (0.0'-3.1')

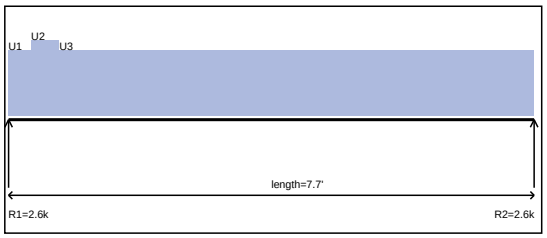
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 1.02k	Vall = 3.04k	Ratio = 0.33
M = 0.78k-ft	Mall = 2.99k-ft	Ratio = 0.26

Deflection
TL = 0.01" L/999+ > L/240 min
DL = 0.00"
L = 0.01" L/999+ > L/360 min

4x8 DF #2

Description - First Floor Framing Plan - B1-1 - Flush



Uniform 1 = 0.66 klf (0.0'-0.3')

Uniform 2 = 0.76 klf (0.3'-0.7')

Uniform 3 = 0.66 klf (0.7'-7.7')

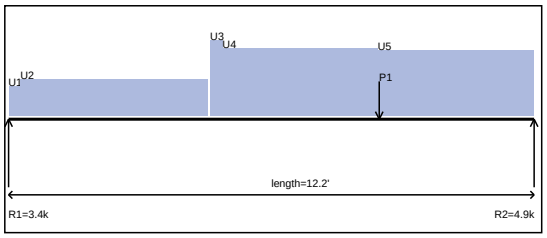
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 2.58k	Vall = 3.95k	Ratio = 0.65
M = 4.88k-ft	Mall = 8.91k-ft	Ratio = 0.55

Deflection
TL = 0.11" L/828 > L/240 min
DL = 0.02"
L = 0.09" L/999+ > L/360 min

1-3/4x11-7/8 LVL

Description - First Floor Framing Plan - B1-2 - Flush



Uniform 1 = 0.30 klf (0.0'-0.3')

Uniform 2 = 0.37 klf (0.3'-4.6')

Uniform 3 = 0.76 klf (4.7'-5.0')

Uniform 4 = 0.68 klf (5.0'-8.6')

Uniform 5 = 0.66 klf (8.6'-12.2')

P1 = 1.41 K (8.6')

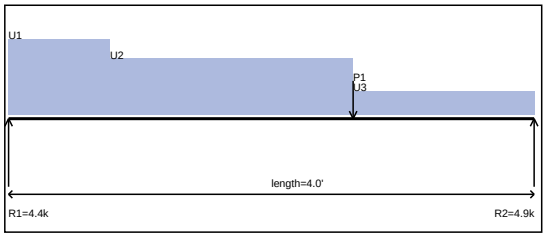
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 4.54k	Vall = 7.90k	Ratio = 0.58
M = 13.00k-ft	Mall = 17.82k-ft	Ratio = 0.73

Deflection
TL = 0.37" L/391 > L/240 min
DL = 0.10"
L = 0.28" L/531 > L/360 min

(2)1-3/4x11-7/8 LVL

Description - First Floor Framing Plan - B1-3 - Flush



Uniform 1 = 1.79 klf (0.0'-0.8')

Uniform 2 = 1.33 klf (0.8'-2.6')

Uniform 3 = 0.56 klf (2.6'-4.0')

P1 = 4.61 K (2.6')

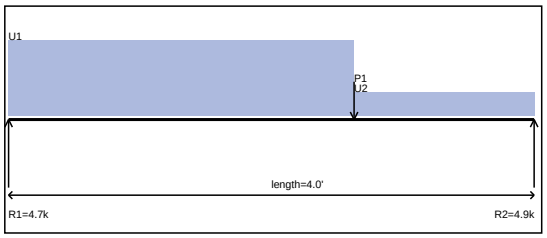
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + 0.75 * (L + S))

V = 3.99k	Vall = 7.90k	Ratio = 0.51
M = 4.92k-ft	Mall = 17.82k-ft	Ratio = 0.28

Deflection
TL = 0.02" L/999+ > L/240 min
DL = 0.01"
L = 0.01" L/999+ > L/360 min

(2)1-3/4x11-7/8 LVL

Description - First Floor Framing Plan - B1-4 - Flush



Uniform 1 = 1.77 klf (0.0'-2.6')

Uniform 2 = 0.56 klf (2.6'-4.0')

P1 = 4.16 K (2.6')

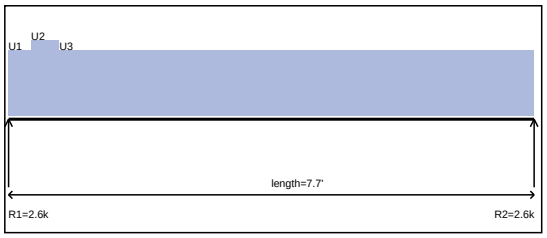
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + 0.75 * (L + S))

V = 3.79k	Vall = 3.95k	Ratio = 0.96
M = 4.62k-ft	Mall = 8.91k-ft	Ratio = 0.52

Deflection
TL = 0.03" L/999+ > L/240 min
DL = 0.01"
L = 0.02" L/999+ > L/360 min

1-3/4x11-7/8 LVL

Description - First Floor Framing Plan - B1-5 - Flush



Uniform 1 = 0.66 klf (0.0'-0.3')

Uniform 2 = 0.76 klf (0.3'-0.7')

Uniform 3 = 0.66 klf (0.7'-7.7')

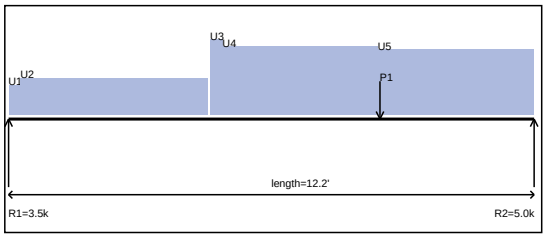
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 2.57k	Vall = 3.95k	Ratio = 0.65
M = 4.86k-ft	Mall = 8.91k-ft	Ratio = 0.55

Deflection
TL = 0.11" L/832 > L/240 min
DL = 0.02"
L = 0.09" L/999+ > L/360 min

1-3/4x11-7/8 LVL

Description - First Floor Framing Plan - B1-6 - Flush



Uniform 1 = 0.30 klf (0.0'-0.3')

Uniform 2 = 0.37 klf (0.3'-4.6')

Uniform 3 = 0.76 klf (4.7'-5.0')

Uniform 4 = 0.69 klf (5.0'-8.6')

Uniform 5 = 0.66 klf (8.6'-12.2')

P1 = 1.66 K (8.6')

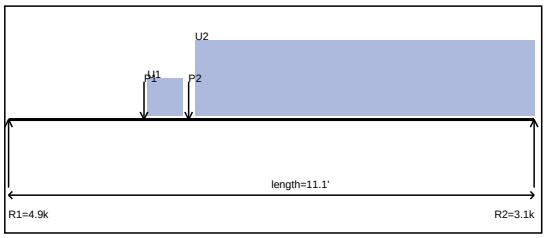
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 4.60k	Vall = 7.90k	Ratio = 0.58
M = 13.15k-ft	Mall = 17.82k-ft	Ratio = 0.74

Deflection
TL = 0.38" L/386 > L/240 min
DL = 0.10"
L = 0.28" L/529 > L/360 min

(2)1-3/4x11-7/8 LVL

Description - First Floor Framing Plan - B1-7 - Flush



Uniform 1 = 0.10 klf (2.9'-3.7')

Uniform 2 = 0.20 klf (3.9'-11.1')

P1 = 1.72 K (2.9')

P2 = 4.65 K (3.8')

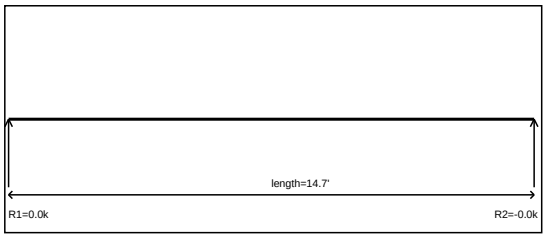
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + 0.75 * (L + S))

V = 3.95k	Vall = 7.90k	Ratio = 0.50
M = 13.62k-ft	Mall = 17.82k-ft	Ratio = 0.76

Deflection
TL = 0.34" L/394 > L/240 min
DL = 0.16"
L = 0.17" L/786 > L/360 min

(2)1-3/4x11-7/8 LVL

Description - First Floor Framing Plan - B1-9 - Refer to External Design



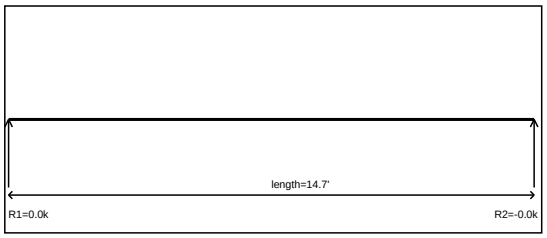
Controlling Load Combination/ Cd
V = NA Cd=1
M = NA Cd=1
△ = NA

V = 0.00k	Vall = 0 k	Ratio = 0
M = 0.00k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - First Floor Framing Plan - B1-10 - Refer to External Design



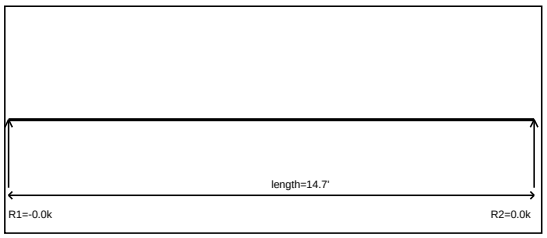
Controlling Load Combination/ Cd
V = NA Cd=1
M = NA Cd=1
△ = NA

V = 0.00k	Vall = 0 k	Ratio = 0
M = 0.00k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - First Floor Framing Plan - B1-11 - Refer to External Design



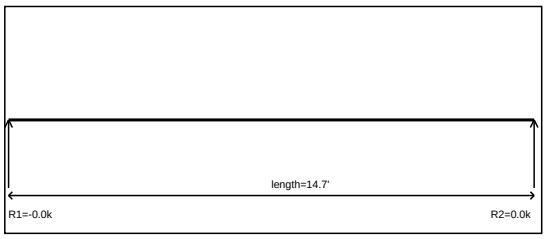
Controlling Load Combination/ Cd
V = NA Cd=1
M = NA Cd=1
△ = NA

V = 0.00k	Vall = 0 k	Ratio = 0
M = 0.00k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

Description - First Floor Framing Plan - B1-12 - Refer to External Design



Controlling Load Combination/ Cd
V = NA Cd=1
M = NA Cd=1
△ = NA

V = 0.00k	Vall = 0 k	Ratio = 0
M = 0.00k-ft	Mall = 0 k-ft	Ratio = 0

Deflection
TL = NA L/ NA > L/240 min
DL = NA
L = NA L/ NA > L/360 min

Refer to External Design

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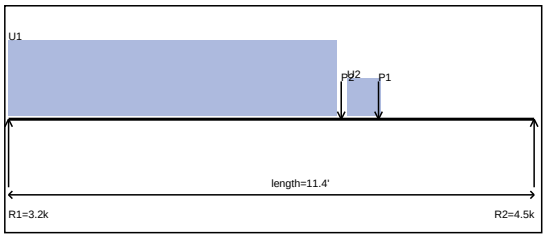
Description - First Floor Framing Plan - B1-13 - Flush



Uniform 1 = 0.20 klf (0.0'-7.1')
P1 = 1.69 K (8.0')
Uniform 2 = 0.10 klf (7.3'-8.1')
P2 = 4.36 K (7.2')

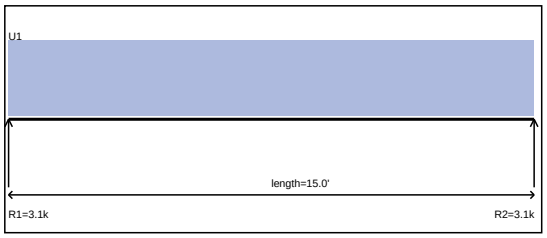
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 3.78k	Vall = 7.90k	Ratio = 0.48
M = 14.72k-ft	Mall = 17.82k-ft	Ratio = 0.83

Deflection
TL = 0.37" L/369 > L/240 min
DL = 0.17"
L = 0.20" L/684 > L/360 min

(2)1-3/4x11-7/8 LVL

Description - First Floor Framing Plan - B1-23 - Flush Top



Uniform 1 = 0.41 klf (0.0'-15.0')

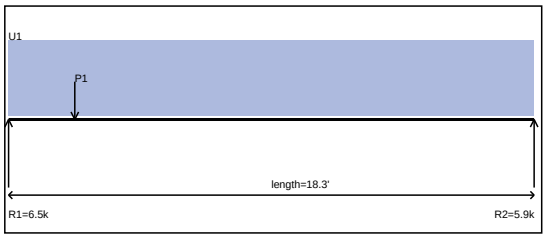
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 3.04k	Vall = 10.20k	Ratio = 0.30
M = 11.41k-ft	Mall = 20.21k-ft	Ratio = 0.56

Deflection
TL = 0.48" L/373 > L/240 min
DL = 0.07"
L = 0.41" L/435 > L/360 min

5-1/2x10-1/2 GLB

Description - First Floor Framing Plan - B1-24 - Dropped



Uniform 1 = 0.63 klf (0.0'-18.3')
P1 = 0.80 K (2.3')

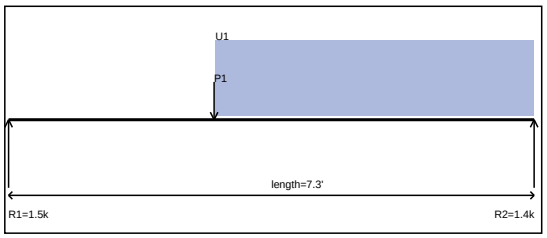
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + L)

V = 5.94k	Vall = 16.03k	Ratio = 0.37
M = 26.56k-ft	Mall = 48.66k-ft	Ratio = 0.55

Deflection
TL = 0.43" L/508 > L/240 min
DL = 0.07"
L = 0.37" L/598 > L/360 min

5-1/2x16-1/2 GLB

Description - First Floor Framing Plan - B1-25 - Flush



Uniform 1 = 0.20 klf (2.9'-7.3')
P1 = 1.88 K (2.9')

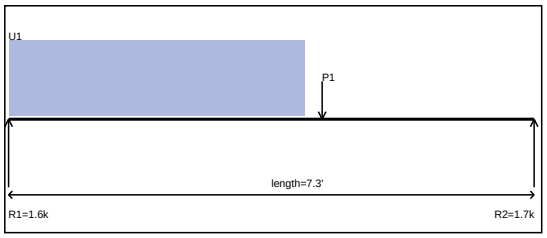
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + 0.75 * (L + S)) Cd=1.15
△ = (D + 0.75 * (L + S))

V = 1.12k	Vall = 7.90k	Ratio = 0.14
M = 3.49k-ft	Mall = 20.50k-ft	Ratio = 0.17

Deflection
TL = 0.04" L/999+ > L/240 min
DL = 0.02"
L = 0.01" L/999+ > L/360 min

(2)1-3/4x11-7/8 LVL

Description - First Floor Framing Plan - B1-27 - Flush



Uniform 1 = 0.20 klf (0.0'-4.1') P1 = 2.38 K (4.4')

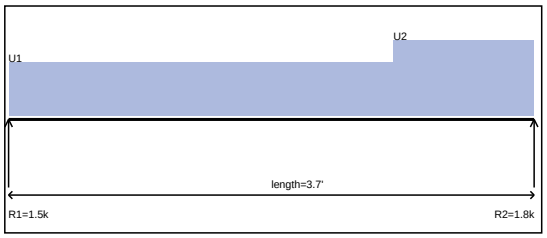
Controlling Load Combination/ Cd
V = (D + 0.75 * (L + S)) Cd=1.15
M = (D + 0.75 * (L + S)) Cd=1.15
△ = (D + 0.75 * (L + S))

V = 1.41k	Vall = 9.08k	Ratio = 0.16
M = 4.18k-ft	Mall = 20.50k-ft	Ratio = 0.20

Deflection
TL = 0.04" L/999+ > L/240 min
DL = 0.02"
L = 0.01" L/999+ > L/360 min

(2)1-3/4x11-7/8 LVL

Description - First Floor Framing Plan - B1-28 - Flush



Uniform 1 = 0.78 klf (0.0'-2.7')

Uniform 2 = 1.10 klf (2.7'-3.7')

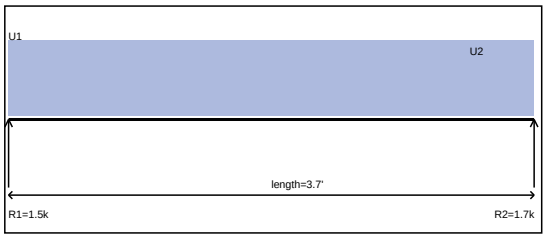
Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + 0.75 * (L + S))

V = 1.43k	Vall = 3.95k	Ratio = 0.36
M = 1.15k-ft	Mall = 8.91k-ft	Ratio = 0.13

Deflection
TL = 0.01" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

1-3/4x11-7/8 LVL

Description - First Floor Framing Plan - B1-29 - Flush



Uniform 1 = 0.78 klf (0.0'-3.7')

Uniform 2 = 0.63 klf (3.3'-3.7')

Controlling Load Combination/ Cd
V = (D + L) Cd=1
M = (D + L) Cd=1
△ = (D + 0.75 * (L + S))

V = 1.34k	Vall = 3.95k	Ratio = 0.34
M = 1.10k-ft	Mall = 8.91k-ft	Ratio = 0.12

Deflection
TL = 0.01" L/999+ > L/240 min
DL = 0.00"
L = 0.00" L/999+ > L/360 min

1-3/4x11-7/8 LVL

Wood Beam

Project File: Calcs.ec6

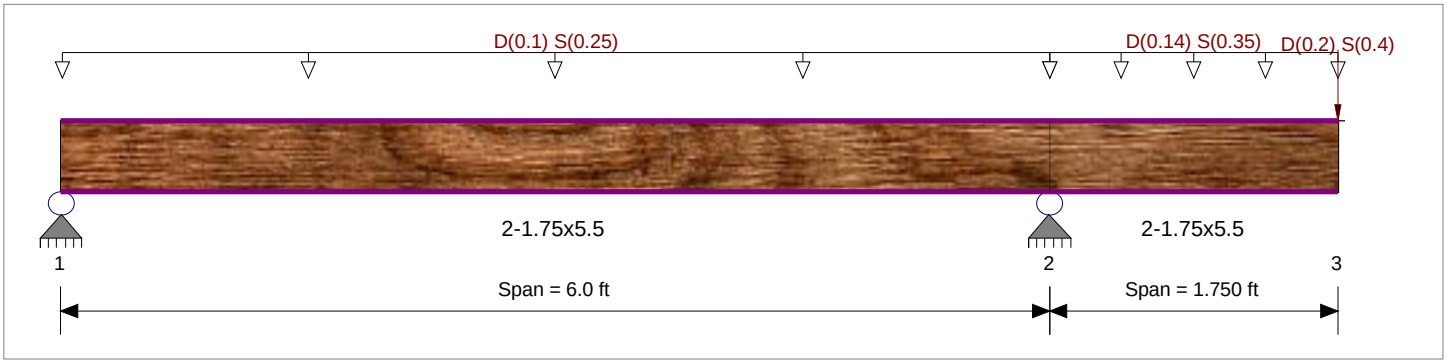
DESCRIPTION: B3-3

CODE REFERENCES

Calculations per NDS 2018, IBC 2021
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2600 psi	*E : Modulus of Elasticity*	
Load Combination :	ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2600 psi	Ebend- xx	2000 ksi
		Fc - Prll	2510 psi	Eminbend - xx	1016.535 ksi
Wood Species :	Trus Joist	Fc - Perp	750 psi		
Wood Grade :	MicroLam LVL 2.0 E	Fv	285 psi		
		Ft	1555 psi	Density	42.01 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
Load for Span Number 1
Uniform Load : D = 0.10, S = 0.250 , Tributary Width = 1.0 ft
Load for Span Number 2
Uniform Load : D = 0.140, S = 0.350 , Tributary Width = 1.0 ft
Point Load : D = 0.20, S = 0.40 k @ 1.750 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.292 : 1	Maximum Shear Stress Ratio	=	0.233 : 1
Section used for this span		2-1.75x5.5	Section used for this span		2-1.75x5.5
fb: Actual	=	972.15 psi	fv: Actual	=	76.41 psi
F'b	=	3,324.69 psi	F'v	=	327.75 psi
Load Combination		+D+0.70S	Load Combination		+D+0.70S
Location of maximum on span	=	6.000 ft	Location of maximum on span	=	6.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.027 in	Ratio =	1562	>=360	Span: 2 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.035 in	Ratio =	1192	>=240	Span: 2 : +D+0.70S
Max Upward Total Deflection	-0.001 in	Ratio =	87760	>=240	Span: 1 : D Only

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 6.0 ft	1	0.148	0.116	0.90	1.00	1.00	1.00	1.112	1.00	1.00	1.00	0.56	383.8	2,601.9	0.38	29.8	256.5
Length = 1.750 ft	2	0.148	0.116	0.90	1.00	1.00	1.00	1.112	1.00	1.00	1.00	0.56	383.8	2,601.9	0.38	29.8	256.5
+D+0.70S					1.00	1.00	1.00	1.112	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 6.0 ft	1	0.292	0.233	1.15	1.00	1.00	1.00	1.112	1.00	1.00	1.00	1.43	972.1	3,324.7	0.98	76.4	327.8

Wood Beam

Project File: Calcs.ec6

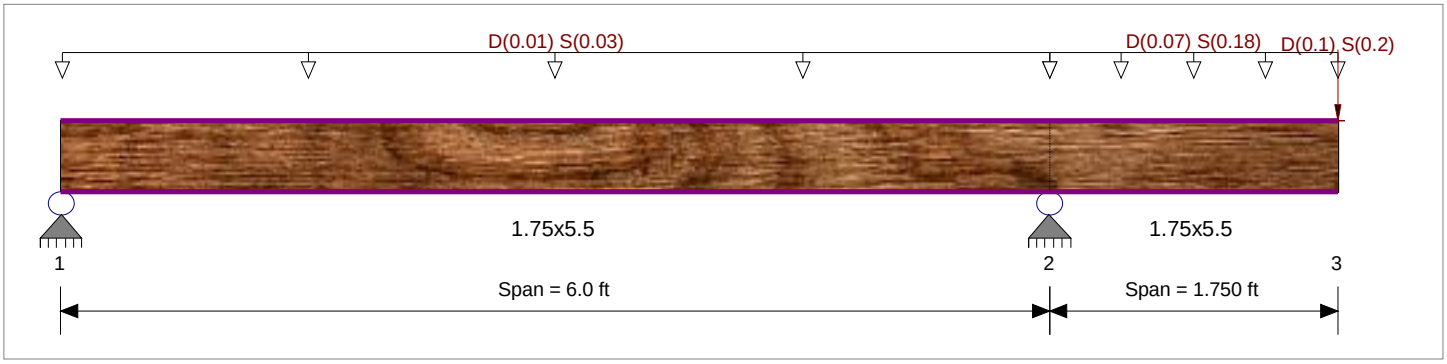
DESCRIPTION: B3-33 & B3-40 & B3-45

CODE REFERENCES

Calculations per NDS 2018, IBC 2021
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,600.0 psi	*E : Modulus of Elasticity*	
Load Combination :	ASCE 7-22 / IBC 2024 (L<=100psf)	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 :	Trus Joist	Fc - Perp	750.0 psi		
Wood Grade :	MicroLam LVL 2.0 E	Fv	285.0 psi		
		Ft	1,555.0 psi	Density	42.010 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loading
Load for Span Number 1
Uniform Load : D = 0.010, S = 0.030 , Tributary Width = 1.0 ft
Load for Span Number 2
Uniform Load : D = 0.070, S = 0.180 , Tributary Width = 1.0 ft
Point Load : D = 0.10, S = 0.20 k @ 1.750 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.296 : 1	Maximum Shear Stress Ratio	=	0.237 : 1
Section used for this span		1.75x5.5	Section used for this span		1.75x5.5
fb: Actual	=	985.29 psi	fv: Actual	=	77.69 psi
F'b	=	3,324.69 psi	F'v	=	327.75 psi
Load Combination		+D+0.70S	Load Combination		+D+0.70S
Location of maximum on span	=	6.000 ft	Location of maximum on span	=	6.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.081 in	Ratio =	516	>=360	Span: 2 : S Only
Max Upward Transient Deflection	-0.034 in	Ratio =	2090	>=360	Span: 1 : S Only
Max Downward Total Deflection	0.095 in	Ratio =	442	>=240	Span: 2 : +D+0.70S
Max Upward Total Deflection	-0.040 in	Ratio =	1782	>=240	Span: 1 : +D+0.70S

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 6.0 ft	1	0.150	0.118	0.90	1.00	1.00	1.00	1.112	1.00	1.00	1.00	0.29	389.6	2,601.9	0.19	30.3	256.5
Length = 1.750 ft	2	0.150	0.118	0.90	1.00	1.00	1.00	1.112	1.00	1.00	1.00	0.29	389.6	2,601.9	0.19	30.3	256.5
+D+0.70S					1.00	1.00	1.00	1.112	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 6.0 ft	1	0.296	0.237	1.15	1.00	1.00	1.00	1.112	1.00	1.00	1.00	0.72	985.3	3,324.7	0.50	77.7	327.8

Wood Beam

Project File: Calcs.ec6

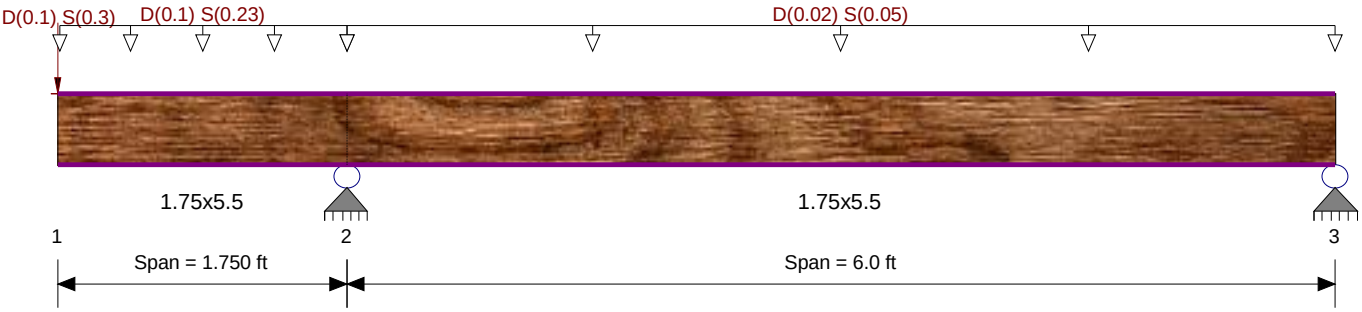
DESCRIPTION: B3-36 & B3-38

CODE REFERENCES

Calculations per NDS 2018, IBC 2021
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2600 psi	*E : Modulus of Elasticity*	
Load Combination :	ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2600 psi	Ebend- xx	2000 ksi
		Fc - Prll	2510 psi	Eminbend - xx	1016.535 ksi
Wood Species :	Trus Joist	Fc - Perp	750 psi		
Wood Grade :	MicroLam LVL 2.0 E	Fv	285 psi		
		Ft	1555 psi	Density	42.01 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loading
Load for Span Number 1
Point Load : D = 0.10, S = 0.30 k @ 0.0 ft
Uniform Load : D = 0.10, S = 0.230 , Tributary Width = 1.0 ft
Load for Span Number 2
Uniform Load : D = 0.020, S = 0.050 , Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.387 : 1	Maximum Shear Stress Ratio	=	0.311 : 1
Section used for this span		1.75x5.5	Section used for this span		1.75x5.5
fb: Actual	=	1,287.27 psi	fv: Actual	=	101.77 psi
F'b	=	3,324.69 psi	F'v	=	327.75 psi
Load Combination		+D+0.70S	Load Combination		+D+0.70S
Location of maximum on span	=	1.750 ft	Location of maximum on span	=	1.300 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.110 in	Ratio =	380	>=360	Span: 1 : S Only
Max Upward Transient Deflection	-0.044 in	Ratio =	1623	>=360	Span: 2 : S Only
Max Downward Total Deflection	0.116 in	Ratio =	360	>=240	Span: 1 : +D+0.70S
Max Upward Total Deflection	-0.046 in	Ratio =	1574	>=240	Span: 2 : +D+0.70S

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 1.750 ft	1	0.174	0.142	0.90	1.00	1.00	1.00	1.112	1.00	1.00	1.00	0.33	452.1	2,601.9	0.23	36.4	256.5
Length = 6.0 ft	2	0.174	0.069	0.90	1.00	1.00	1.00	1.112	1.00	1.00	1.00	0.33	452.1	2,601.9	0.11	17.7	256.5
+D+0.70S					1.00	1.00	1.00	1.112	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 1.750 ft	1	0.387	0.311	1.15	1.00	1.00	1.00	1.112	1.00	1.00	1.00	0.95	1,287.3	3,324.7	0.65	101.8	327.8

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B3-42

CODE REFERENCES

Calculations per NDS 2018, IBC 2021
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

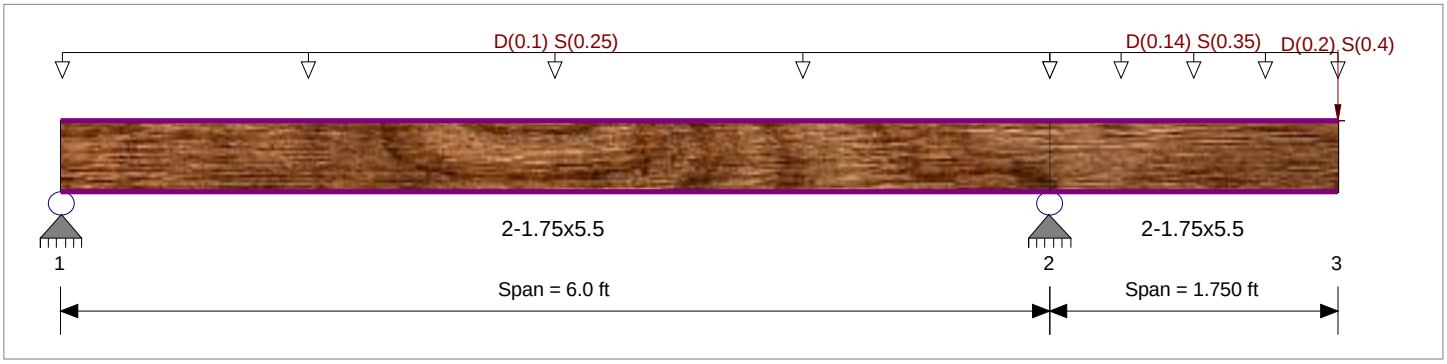
Material Properties

Analysis Method :	Allowable Stress Design
Load Combination :	ASCE 7-22 / IBC 2024 (L<=100psf)
Wood Species :	Trus Joist
Wood Grade :	MicroLam LVL 2.0 E
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling

Fb +	2,600.0 psi
Fb -	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	2,000.0 ksi
Eminbend - xx	1,016.54 ksi
Density	42.010 pcf



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 = 0.10, S = 0.250 , Tributary Width = 1.0 ft
Load for Span Number 2
Uniform Load : D = 0.140, S = 0.350 , Tributary Width = 1.0 ft
Point Load : D = 0.20, S = 0.40 k @ 1.750 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.294 : 1	Maximum Shear Stress Ratio	=	0.235 : 1
Section used for this span		2-1.75x5.5	Section used for this span		2-1.75x5.5
fb: Actual	=	978.00 psi	fv: Actual	=	76.98 psi
F'b	=	3,324.69 psi	F'v	=	327.75 psi
Load Combination		+D+0.70S	Load Combination		+D+0.70S
Location of maximum on span	=	6.000 ft	Location of maximum on span	=	6.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.027 in	Ratio = 1562	>=360	Span: 2 : S Only
Max Upward Transient Deflection	0 in	Ratio = 0	<360	n/a
Max Downward Total Deflection	0.034 in	Ratio = 1226	>=240	Span: 2 : +D+0.70S
Max Upward Total Deflection	-0.001 in	Ratio = 134214	>=240	Span: 1 : D Only

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 6.0 ft	1	0.150	0.118	0.90	1.00	1.00	1.00	1.112	1.00	1.00	1.00	0.57	389.6	2,601.9	0.39	30.3	256.5
Length = 1.750 ft	2	0.150	0.118	0.90	1.00	1.00	1.00	1.112	1.00	1.00	1.00	0.57	389.6	2,601.9	0.39	30.3	256.5
+D+0.70S					1.00	1.00	1.00	1.112	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 6.0 ft	1	0.294	0.235	1.15	1.00	1.00	1.00	1.112	1.00	1.00	1.00	1.44	978.0	3,324.7	0.99	77.0	327.8

Wood Beam

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.25.06.05 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC, LLC 1982-2025

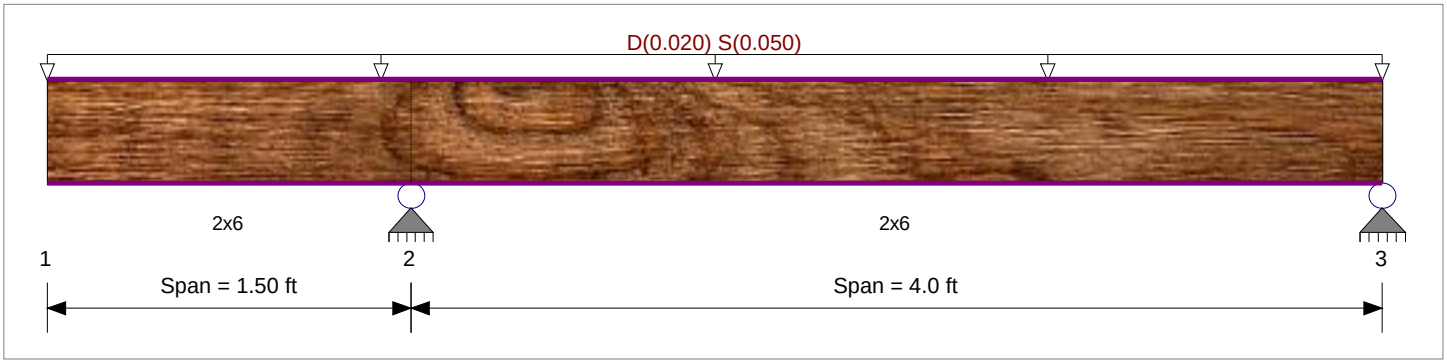
DESCRIPTION: Cant'd Eave Rafters

CODE REFERENCES

Calculations per NDS 2018, IBC 2021
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	675 psi	*E : Modulus of Elasticity*	
Load Combination :	ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	675 psi	Ebend- xx	1200 ksi
		Fc - Prll	800 psi	Eminbend - xx	440 ksi
Wood Species :	Hem Fir	Fc - Perp	405 psi		
Wood Grade :	Stud	Fv	150 psi		
		Ft	400 psi	Density	26.84 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
Loads on all spans...
Uniform Load on ALL spans : D = 0.010, S = 0.0250 ksf, Tributary Width = 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.166 : 1	Maximum Shear Stress Ratio	=	0.106 : 1
Section used for this span		2x6	Section used for this span		2x6
fb: Actual	=	128.91 psi	fv: Actual	=	18.34 psi
F'b	=	776.25 psi	F'v	=	172.50 psi
Load Combination		+D+0.70S	Load Combination		+D+0.70S
Location of maximum on span	=	2.279 ft	Location of maximum on span	=	1.500 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.008 in	Ratio =	6207	>=360	Span: 2 : S Only
Max Upward Transient Deflection	-0.004 in	Ratio =	9326	>=360	Span: 1 : S Only
Max Downward Total Deflection	0.009 in	Ratio =	5643	>=240	Span: 2 : +D+0.70S
Max Upward Total Deflection	-0.004 in	Ratio =	8478	>=240	Span: 1 : +D+0.70S

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 1.50 ft	1	0.059	0.049	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.02	35.7	607.5	0.04	6.7	135.0
Length = 4.0 ft	2	0.077	0.049	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.03	46.9	607.5	0.04	6.7	135.0
+D+0.70S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 1.50 ft	1	0.126	0.106	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.06	98.2	776.3	0.10	18.3	172.5
Length = 4.0 ft	2	0.166	0.106	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.08	128.9	776.3	0.10	18.3	172.5
+D+0.5250S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 1.50 ft	1	0.106	0.089	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.05	82.6	776.3	0.08	15.4	172.5

Wood Beam

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.25.06.05 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC, LLC 1982-2025

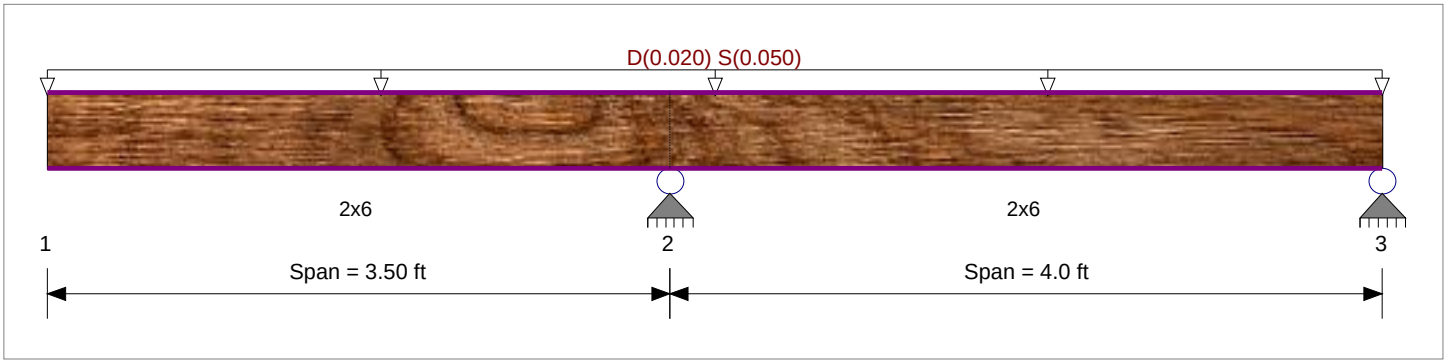
DESCRIPTION: Cant'd Eave Rafters (3'-6" overhang)

CODE REFERENCES

Calculations per NDS 2018, IBC 2021
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	675.0 psi	*E : Modulus of Elasticity*	
Load Combination :	ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	675.0 psi	Ebend- xx	1,200.0 ksi
		Fc - Prll	800.0 psi	Eminbend - xx	440.0 ksi
Wood Species :	Hem Fir	Fc - Perp	405.0 psi		
Wood Grade :	Stud	Fv	150.0 psi		
		Ft	400.0 psi	Density	26.840 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
Loads on all spans...
Uniform Load on ALL spans : D = 0.010, S = 0.0250 ksf, Tributary Width = 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.689 : 1	Maximum Shear Stress Ratio	=	0.179 : 1
Section used for this span		2x6	Section used for this span		2x6
fb: Actual	=	534.55 psi	fv: Actual	=	30.84 psi
F'b	=	776.25 psi	F'v	=	172.50 psi
Load Combination		+D+0.70S	Load Combination		+D+0.70S
Location of maximum on span	=	3.500 ft	Location of maximum on span	=	3.500 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.132 in	Ratio = 636	>=360	Span: 1 : S Only
Max Upward Transient Deflection	-0.011 in	Ratio = 4312	>=360	Span: 2 : S Only
Max Downward Total Deflection	0.145 in	Ratio = 578	>=240	Span: 1 : +D+0.70S
Max Upward Total Deflection	-0.012 in	Ratio = 3920	>=240	Span: 2 : +D+0.70S

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 3.50 ft	1	0.320	0.083	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.12	194.4	607.5	0.06	11.2	135.0
Length = 4.0 ft	2	0.320	0.083	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.12	194.4	607.5	0.06	11.2	135.0
+D+0.70S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.50 ft	1	0.689	0.179	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.34	534.5	776.3	0.17	30.8	172.5
Length = 4.0 ft	2	0.689	0.179	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.34	534.5	776.3	0.17	30.8	172.5
+D+0.5250S					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 3.50 ft	1	0.579	0.150	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.28	449.5	776.3	0.14	25.9	172.5

Wood Beam

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.24.05.02 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC INC 1983-2023

DESCRIPTION: B2-25

CODE REFERENCES

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

Material Properties

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

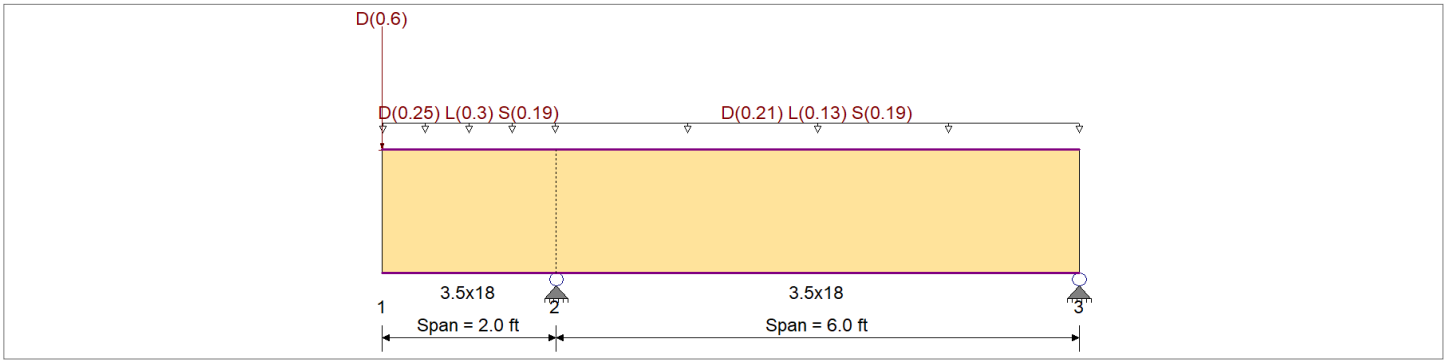
Wood Species : DF/DF
Wood Grade : 24F-V4

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

Fb +	2400 psi
Fb -	1850 psi
Fc - Prll	1650 psi
Fc - Perp	650 psi
Fv	265 psi
Ft	1100 psi

E : Modulus of Elasticity

Ebend- xx	1800 ksi
Eminbend - xx	950 ksi
Ebend- yy	1600 ksi
Eminbend - yy	850 ksi
Density	31.21 pcf



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 = 0.250, L = 0.30, S = 0.190 , Tributary Width = 1.0 ft
Point Load : D = 0.60 k @ 0.0 ft
Load for Span Number 2
Uniform Load : D = 0.210, L = 0.130, S = 0.190 , Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.080 : 1	Maximum Shear Stress Ratio	=	0.130 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	147.77 psi	fv: Actual	=	34.53 psi
F'b	=	1,850.00 psi	F'v	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	2.000 ft	Location of maximum on span	=	1.508 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.001 in	Ratio =	0 >=360	Span: 2 : S Only
Max Upward Transient Deflection	0 in	Ratio =	53738 <360	n/a
Max Downward Total Deflection	0.003 in	Ratio =	14968 >=240	Span: 1 : +D+L
Max Upward Total Deflection	-0.000 in	Ratio =	166201 >=240	Span: 2 : D Only

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.066	0.100	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.73	109.7	1,665.0	1.00	23.8	238.5
Length = 6.0 ft	2	0.066	0.100	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.73	109.7	1,665.0	0.63	23.8	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.080	0.130	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.33	147.8	1,850.0	1.45	34.5	265.0
Length = 6.0 ft	2	0.080	0.130	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.33	147.8	1,850.0	0.93	34.5	265.0

Wood Beam

Project File: Calcs.ec6

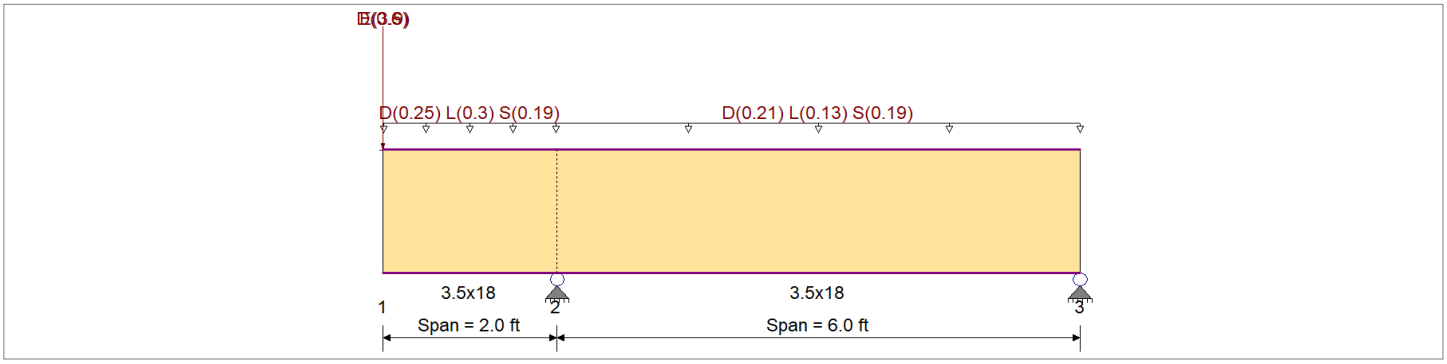
DESCRIPTION: B2-25 (overstrength) (sw#305)

CODE REFERENCES

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

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2400 psi	*E : Modulus of Elasticity*	
Load Combination :	IBC 2021	Fb -	1850 psi	Ebend- xx	1800 ksi
		Fc - Prll	1650 psi	Eminbend - xx	950 ksi
Wood Species :	DF/DF	Fc - Perp	650 psi	Ebend- yy	1600 ksi
Wood Grade :	24F-V4	Fv	265 psi	Eminbend - yy	850 ksi
		Ft	1100 psi	Density	31.21 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loading
Load for Span Number 1
Uniform Load : D = 0.250, L = 0.30, S = 0.190 , Tributary Width = 1.0 ft
Point Load : D = 0.60 k @ 0.0 ft
Point Load : E = 3.90 k @ 0.0 ft, (overstrength)
Load for Span Number 2
Uniform Load : D = 0.210, L = 0.130, S = 0.190 , Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.154 : 1	Maximum Shear Stress Ratio	=	0.209 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	456.34 psi	fv: Actual	=	88.75 psi
F'b	=	2,960.00 psi	F'v	=	424.00 psi
Load Combination		+D+0.70E	Load Combination		+D+0.70E
Location of maximum on span	=	2.000 ft	Location of maximum on span	=	1.508 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.024 in	Ratio =	6980 >=360	Span: 1 : E Only
Max Upward Transient Deflection	-0.010 in	Ratio =	2042 >=360	Span: 2 : E Only
Max Downward Total Deflection	0.019 in	Ratio =	2488 >=240	Span: 1 : +D+0.70E
Max Upward Total Deflection	-0.007 in	Ratio =	9684 >=240	Span: 2 : +D+0.70E

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.066	0.100	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.73	109.7	1,665.0	1.00	23.8	238.5
Length = 6.0 ft	2	0.066	0.100	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.73	109.7	1,665.0	0.63	23.8	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.080	0.130	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.33	147.8	1,850.0	1.45	34.5	265.0

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B2-27

CODE REFERENCES

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

Material Properties

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

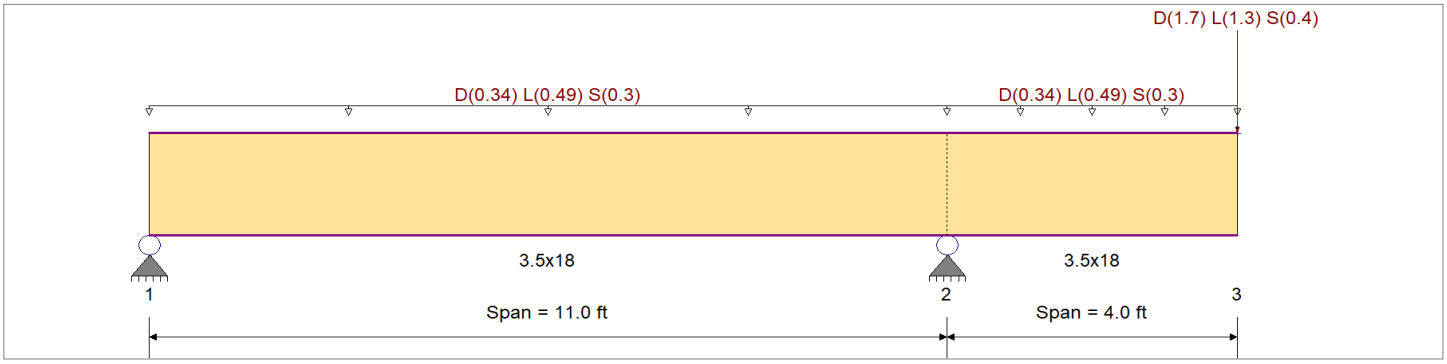
Wood Species : DF/DF
Wood Grade : 24F-V4

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

Fb +	2,400.0 psi
Fb -	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.210 pcf



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 = 0.340, L = 0.490, S = 0.30 , Tributary Width = 1.0 ft
Load for Span Number 2
Uniform Load : D = 0.340, L = 0.490, S = 0.30 , Tributary Width = 1.0 ft
Point Load : D = 1.70, L = 1.30, S = 0.40 k @ 4.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.643 : 1	Maximum Shear Stress Ratio	=	0.459 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	1,190.43 psi	fv: Actual	=	121.70 psi
F'b	=	1,850.00 psi	F'v	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	11.000 ft	Location of maximum on span	=	11.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.039 in	Ratio = 113708	>=360	Span: 2 : L Only
Max Upward Transient Deflection	-0.001 in	Ratio = 2490	>=360	Span: 1 : L Only
Max Downward Total Deflection	0.101 in	Ratio = 952	>=240	Span: 2 : +D+L
Max Upward Total Deflection	-0.009 in	Ratio = 14727	>=240	Span: 1 : D Only

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.367	0.258	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.63	611.4	1,665.0	2.59	61.6	238.5
Length = 4.0 ft	2	0.367	0.258	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.63	611.4	1,665.0	2.59	61.6	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.643	0.459	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	18.75	1,190.4	1,850.0	5.11	121.7	265.0
Length = 4.0 ft	2	0.643	0.459	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	18.75	1,190.4	1,850.0	5.11	121.7	265.0

Wood Beam

Project File: Calcs.ec6

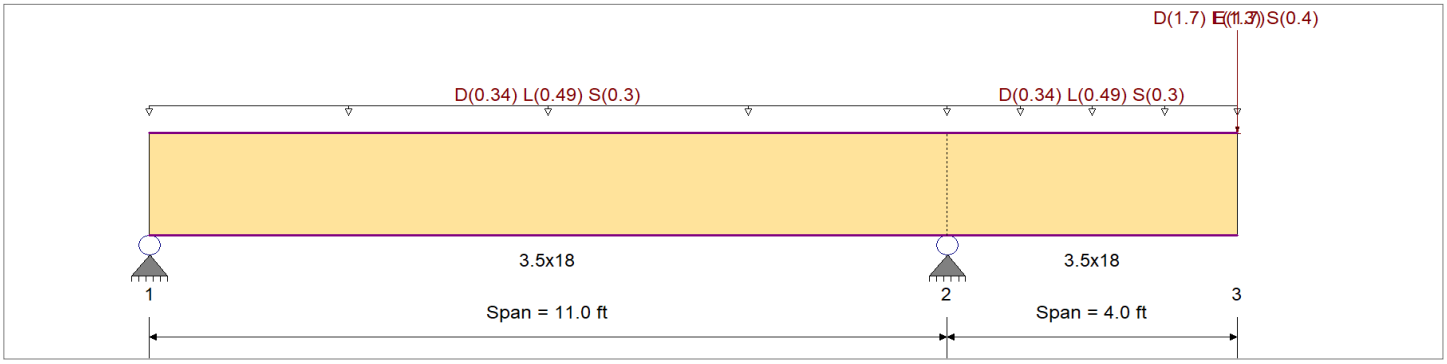
DESCRIPTION: B2-27 (overstrength) (sw#304)

CODE REFERENCES

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

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2400 psi	*E : Modulus of Elasticity*	
Load Combination :	IBC 2021	Fb -	1850 psi	Ebend- xx	1800 ksi
		Fc - Prll	1650 psi	Eminbend - xx	950 ksi
Wood Species :	DF/DF	Fc - Perp	650 psi	Ebend- yy	1600 ksi
Wood Grade :	24F-V4	Fv	265 psi	Eminbend - yy	850 ksi
		Ft	1100 psi	Density	31.21 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loading
Load for Span Number 1
Uniform Load : D = 0.340, L = 0.490, S = 0.30 , Tributary Width = 1.0 ft
Load for Span Number 2
Uniform Load : D = 0.340, L = 0.490, S = 0.30 , Tributary Width = 1.0 ft
Point Load : D = 1.70, L = 1.30, S = 0.40 k @ 4.0 ft
Point Load : E = 1.70 k @ 4.0 ft, (overstrength)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.643 : 1	Maximum Shear Stress Ratio	=	0.459 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	1,190.43 psi	fv: Actual	=	121.70 psi
F'b	=	1,850.00 psi	F'v	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	11.000 ft	Location of maximum on span	=	11.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.077 in	Ratio =	4399 >=360	Span: 2 : E Only
Max Upward Transient Deflection	-0.030 in	Ratio =	1252 >=360	Span: 1 : E Only
Max Downward Total Deflection	0.136 in	Ratio =	706 >=240	Span: 2 : +D+0.750L+0.750S+0.5250E
Max Upward Total Deflection	-0.028 in	Ratio =	4760 >=240	Span: 1 : +D+0.70E

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.367	0.258	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.63	611.4	1,665.0	2.59	61.6	238.5
Length = 4.0 ft	2	0.367	0.258	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.63	611.4	1,665.0	2.59	61.6	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.643	0.459	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	18.75	1,190.4	1,850.0	5.11	121.7	265.0

Wood Beam

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.24.05.02 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC INC 1983-2023

DESCRIPTION: B2-30

CODE REFERENCES

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

Material Properties

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

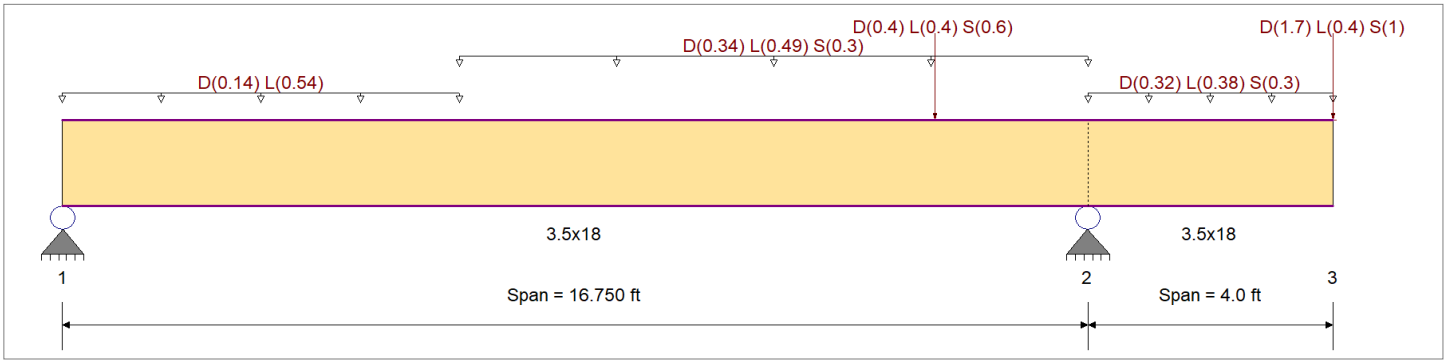
Wood Species : DF/DF
Wood Grade : 24F-V4

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

Fb +	2,400.0 psi
Fb -	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.210 pcf



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 = 0.140, L = 0.540 k/ft, Extent = 0.0 -->> 6.50 ft, Tributary Width = 1.0 ft
Uniform Load : D = 0.340, L = 0.490, S = 0.30 k/ft, Extent = 6.50 -->> 16.750 ft, Tributary Width = 1.0 ft
Point Load : D = 0.40, L = 0.40, S = 0.60 k @ 14.250 ft
Load for Span Number 2
Uniform Load : D = 0.320, L = 0.380, S = 0.30 , Tributary Width = 1.0 ft
Point Load : D = 1.70, L = 0.40, S = 1.0 k @ 4.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.585 : 1	Maximum Shear Stress Ratio	=	0.641 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	1,404.24 psi	fv: Actual	=	169.91 psi
F'b	=	2,400.00 psi	F'v	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	7.767 ft	Location of maximum on span	=	15.253 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.259 in	Ratio =	590 >=360	Span: 1 : L Only
Max Upward Transient Deflection	-0.163 in	Ratio =	775 >=360	Span: 2 : L Only
Max Downward Total Deflection	0.343 in	Ratio =	585 >=240	Span: 1 : +D+L
Max Upward Total Deflection	-0.158 in	Ratio =	604 >=240	Span: 2 : +D+L

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 16.750 ft	1	0.361	0.308	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.47	601.2	1,665.0	3.09	73.5	238.5
Length = 4.0 ft	2	0.361	0.308	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.47	601.2	1,665.0	2.54	73.5	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.750 ft	1	0.585	0.641	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	22.12	1,404.2	2,400.0	7.14	169.9	265.0

Wood Beam

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.24.05.02 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC INC 1983-2023

DESCRIPTION: B2-30 (overstrength)

CODE REFERENCES

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

Material Properties

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

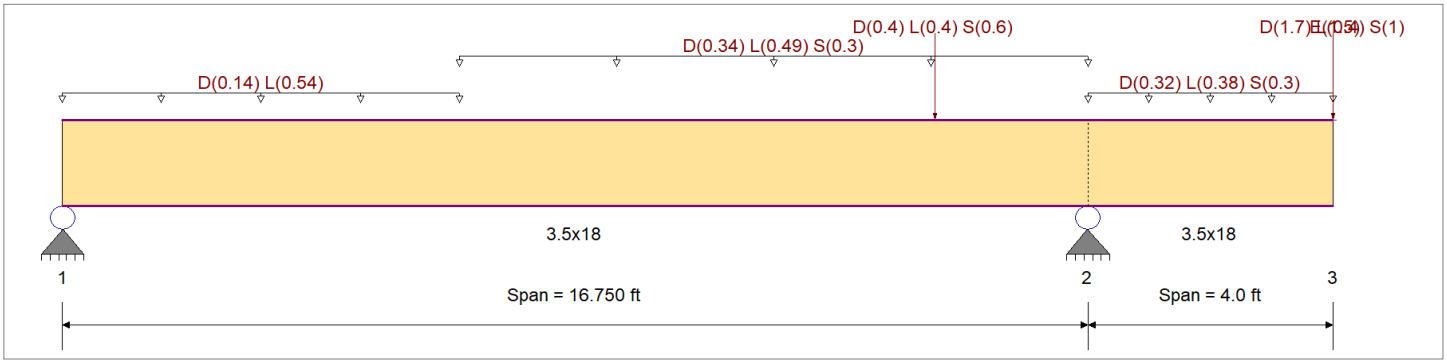
Wood Species : DF/DF
Wood Grade : 24F-V4

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

Fb +	2,400.0 psi
Fb -	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.210 pcf



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 = 0.140, L = 0.540 k/ft, Extent = 0.0 -->> 6.50 ft, Tributary Width = 1.0 ft
Uniform Load : D = 0.340, L = 0.490, S = 0.30 k/ft, Extent = 6.50 -->> 16.750 ft, Tributary Width = 1.0 ft
Point Load : D = 0.40, L = 0.40, S = 0.60 k @ 14.250 ft
Load for Span Number 2
Uniform Load : D = 0.320, L = 0.380, S = 0.30 , Tributary Width = 1.0 ft
Point Load : D = 1.70, L = 0.40, S = 1.0 k @ 4.0 ft
Point Load : E = 1.50 k @ 4.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.585 : 1	Maximum Shear Stress Ratio	=	0.641 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	1,404.24 psi	fv: Actual	=	169.91 psi
F'b	=	2,400.00 psi	F'v	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	7.767 ft	Location of maximum on span	=	15.253 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.259 in	Ratio =	590 >=360	Span: 1 : L Only
Max Upward Transient Deflection	-0.163 in	Ratio =	775 >=360	Span: 2 : L Only
Max Downward Total Deflection	0.343 in	Ratio =	585 >=240	Span: 1 : +D+L
Max Upward Total Deflection	-0.158 in	Ratio =	604 >=240	Span: 2 : +D+L

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 16.750 ft	1	0.361	0.308	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.47	601.2	1,665.0	3.09	73.5	238.5
Length = 4.0 ft	2	0.361	0.308	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	9.47	601.2	1,665.0	2.54	73.5	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B2-31 (overstrength) (sw#308)

CODE REFERENCES

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

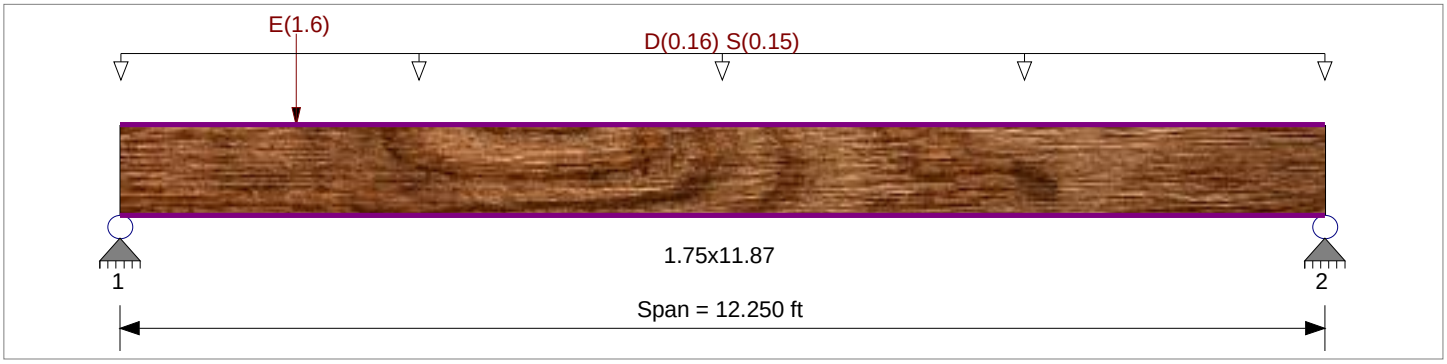
Material Properties

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 +	2,600.0 psi
Fb -	2,600.0 psi
Fc - Prll	2,510.0 psi
Fc - Perp	750.0 psi
Fv	285.0 psi
Ft	1,555.0 psi

E : Modulus of Elasticity

Ebend- xx	2,000.0 ksi
Eminbend - xx	1,016.54 ksi
Density	42.010 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.160, S = 0.150 , Tributary Width = 1.0 ft
Point Load : E = 1.60 k @ 1.80 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.578 : 1	Maximum Shear Stress Ratio	=	0.358 : 1
Section used for this span		1.75x11.87	Section used for this span		1.75x11.87
fb: Actual	=	1,729.75 psi	fv: Actual	=	117.29 psi
F'b	=	2,994.26 psi	F'v	=	327.75 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	6.125 ft	Location of maximum on span	=	11.266 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.157 in	Ratio =	939 >=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.340 in	Ratio =	432 >=240	Span: 1 : +D+0.750S+0.5250E
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 12.250 ft	1	0.388	0.240	0.90	1.00	1.00	1.00	1.001	1.00	1.00	1.00	3.11	908.8	2,343.3	0.85	61.6	256.5
+D+S					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.250 ft	1	0.578	0.358	1.15	1.00	1.00	1.00	1.001	1.00	1.00	1.00	5.93	1,729.7	2,994.3	1.63	117.3	327.8
+D+0.750S					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.250 ft	1	0.509	0.315	1.15	1.00	1.00	1.00	1.001	1.00	1.00	1.00	5.23	1,524.5	2,994.3	1.43	103.4	327.8
+0.60D					1.00	1.00	1.00	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 12.250 ft	1	0.131	0.081	1.60	1.00	1.00	1.00	1.001	1.00	1.00	1.00	1.87	545.3	4,165.9	0.51	37.0	456.0

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B2-37

CODE REFERENCES

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

Material Properties

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

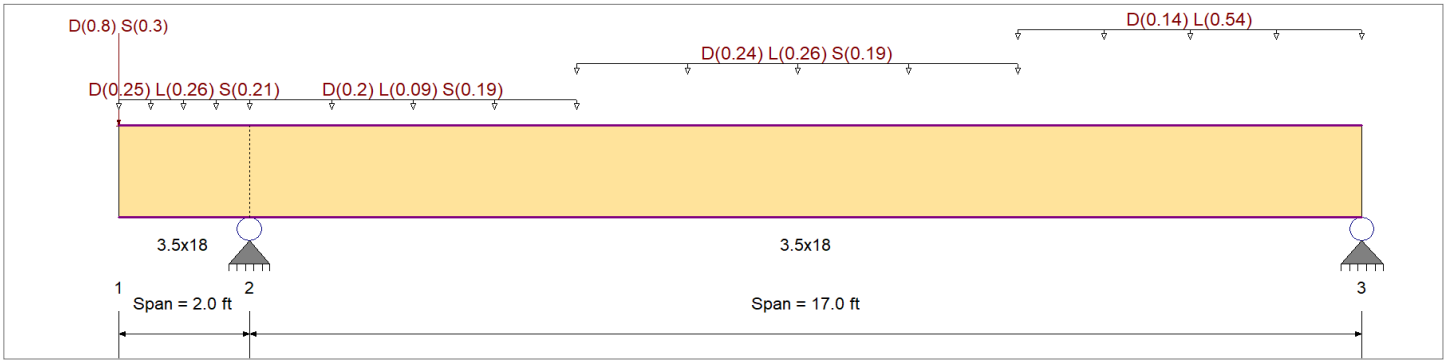
Wood Species : DF/DF
Wood Grade : 24F-V4

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

Fb +	2400 psi
Fb -	1850 psi
Fc - Prll	1650 psi
Fc - Perp	650 psi
Fv	265 psi
Ft	1100 psi

E : Modulus of Elasticity

Ebend- xx	1800 ksi
Eminbend - xx	950 ksi
Ebend- yy	1600 ksi
Eminbend - yy	850 ksi
Density	31.21 pcf



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
Point Load : D = 0.80, S = 0.30 k @ 0.0 ft
Uniform Load : D = 0.250, L = 0.260, S = 0.210 , Tributary Width = 1.0 ft
Load for Span Number 2
Uniform Load : D = 0.20, L = 0.090, S = 0.190 k/ft, Extent = 0.0 -->> 5.0 ft, Tributary Width = 1.0 ft
Uniform Load : D = 0.240, L = 0.260, S = 0.190 k/ft, Extent = 5.0 -->> 11.750 ft, Tributary Width = 1.0 ft
Uniform Load : D = 0.140, L = 0.540 k/ft, Extent = 11.750 -->> 17.0 ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.459 : 1	Maximum Shear Stress Ratio	=	0.347 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	1,102.37 psi	fv: Actual	=	92.07 psi
F'b	=	2,400.00 psi	F'v	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	9.402 ft	Location of maximum on span	=	15.575 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 2

Maximum Deflection

Max Downward Transient Deflection	0.173 in	Ratio =	822 >=360	Span: 2 : L Only
Max Upward Transient Deflection	-0.058 in	Ratio =	1182 >=360	Span: 1 : L Only
Max Downward Total Deflection	0.308 in	Ratio =	663 >=240	Span: 2 : +D+0.750L+0.750S
Max Upward Total Deflection	-0.102 in	Ratio =	468 >=240	Span: 1 : +D+0.750L+0.750S

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.081	0.172	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.13	135.1	1,665.0	1.73	41.1	238.5
Length = 17.0 ft	2	0.211	0.172	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	7.17	455.3	2,160.0	1.73	41.1	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.091	0.300	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.65	168.1	1,850.0	3.34	79.5	265.0

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B2-37 (overstrength) (sw#311)

CODE REFERENCES

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

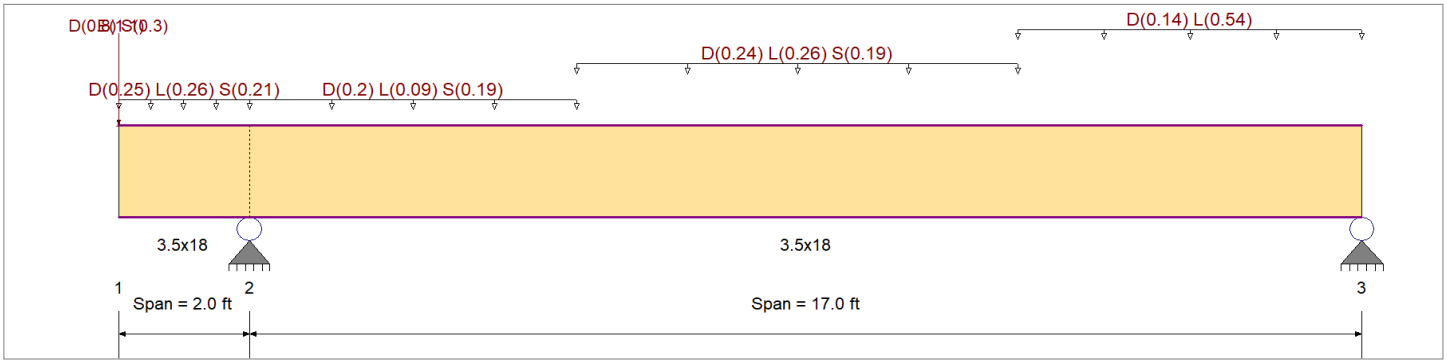
Material Properties

Analysis Method :	Allowable Stress Design
Load Combination :	IBC 2021
Wood Species :	DF/DF
Wood Grade :	24F-V4
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling

Fb +	2400 psi
Fb -	1850 psi
Fc - Prll	1650 psi
Fc - Perp	650 psi
Fv	265 psi
Ft	1100 psi

E : Modulus of Elasticity

Ebend- xx	1800 ksi
Eminbend - xx	950 ksi
Ebend- yy	1600 ksi
Eminbend - yy	850 ksi
Density	31.21 pcf



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
Point Load : D = 0.80, S = 0.30 k @ 0.0 ft
Uniform Load : D = 0.250, L = 0.260, S = 0.210 , Tributary Width = 1.0 ft
Point Load : E = 1.10 k @ 0.0 ft, (overstrength)
Load for Span Number 2
Uniform Load : D = 0.20, L = 0.090, S = 0.190 k/ft, Extent = 0.0 -->> 5.0 ft, Tributary Width = 1.0 ft
Uniform Load : D = 0.240, L = 0.260, S = 0.190 k/ft, Extent = 5.0 -->> 11.750 ft, Tributary Width = 1.0 ft
Uniform Load : D = 0.140, L = 0.540 k/ft, Extent = 11.750 -->> 17.0 ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.459 : 1	Maximum Shear Stress Ratio	=	0.347 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	1,102.37 psi	fv: Actual	=	92.07 psi
F'b	=	2,400.00 psi	F'v	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	9.402 ft	Location of maximum on span	=	15.575 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 2

Maximum Deflection

Max Downward Transient Deflection	0.173 in	Ratio =	822 >=360	Span: 2 : L Only
Max Upward Transient Deflection	-0.058 in	Ratio =	1182 >=360	Span: 1 : L Only
Max Downward Total Deflection	0.308 in	Ratio =	663 >=240	Span: 2 : +D+0.750L+0.750S
Max Upward Total Deflection	-0.102 in	Ratio =	468 >=240	Span: 1 : +D+0.750L+0.750S

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 2.0 ft	1	0.081	0.172	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.13	135.1	1,665.0	1.73	41.1	238.5
Length = 17.0 ft	2	0.211	0.172	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	7.17	455.3	2,160.0	1.73	41.1	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0

Wood Beam

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.24.05.02 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC INC 1983-2023

DESCRIPTION: B2-41

CODE REFERENCES

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

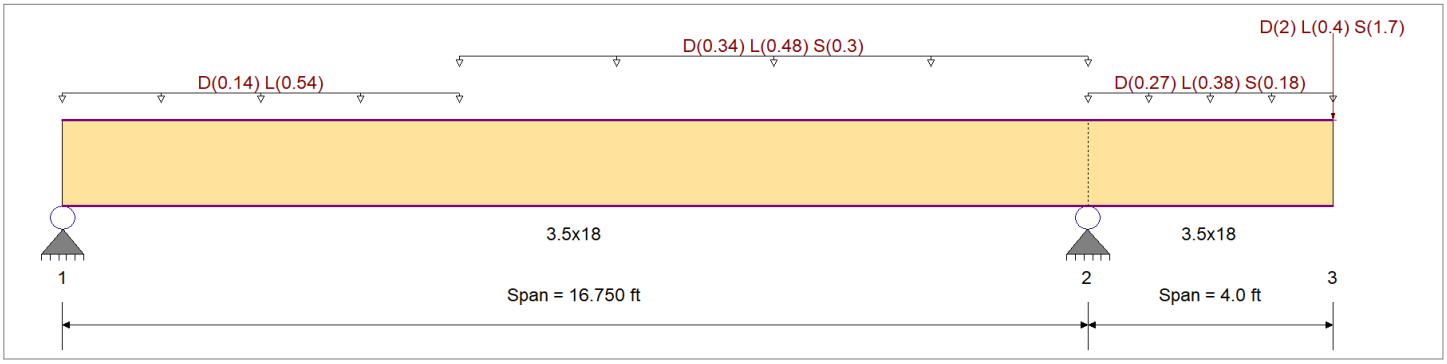
Material Properties

Analysis Method :	Allowable Stress Design
Load Combination :	ASCE 7-16
Wood Species :	DF/DF
Wood Grade :	24F-V4
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling

Fb +	2400 psi
Fb -	1850 psi
Fc - Prll	1650 psi
Fc - Perp	650 psi
Fv	265 psi
Ft	1100 psi

E : Modulus of Elasticity

Ebend- xx	1800 ksi
Eminbend - xx	950 ksi
Ebend- yy	1600 ksi
Eminbend - yy	850 ksi
Density	31.21 pcf



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 = 0.140, L = 0.540 k/ft, Extent = 0.0 -->> 6.50 ft, Tributary Width = 1.0 ft
Uniform Load : D = 0.340, L = 0.480, S = 0.30 k/ft, Extent = 6.50 -->> 16.750 ft, Tributary Width = 1.0 ft
Load for Span Number 2
Uniform Load : D = 0.270, L = 0.380, S = 0.180 , Tributary Width = 1.0 ft
Point Load : D = 2.0, L = 0.40, S = 1.70 k @ 4.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.595 : 1	Maximum Shear Stress Ratio	=	0.579 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	1,265.35 psi	fv: Actual	=	153.51 psi
F'b	=	2,127.50 psi	F'v	=	265.00 psi
Load Combination		+D+0.750L+0.750S	Load Combination		+D+L
Location of maximum on span	=	16.750 ft	Location of maximum on span	=	15.253 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.246 in	Ratio =	642 >=360	Span: 1 : L Only
Max Upward Transient Deflection	-0.149 in	Ratio =	818 >=360	Span: 2 : L Only
Max Downward Total Deflection	0.312 in	Ratio =	643 >=240	Span: 1 : +D+L
Max Upward Total Deflection	-0.123 in	Ratio =	782 >=240	Span: 2 : +D+L

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 16.750 ft	1	0.392	0.279	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	10.27	652.0	1,665.0	2.79	66.5	238.5
Length = 4.0 ft	2	0.392	0.279	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	10.27	652.0	1,665.0	2.71	66.5	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.750 ft	1	0.545	0.579	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	20.61	1,308.4	2,400.0	6.45	153.5	265.0

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B2-41 (overstrength) (sw#313)

CODE REFERENCES

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

Material Properties

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

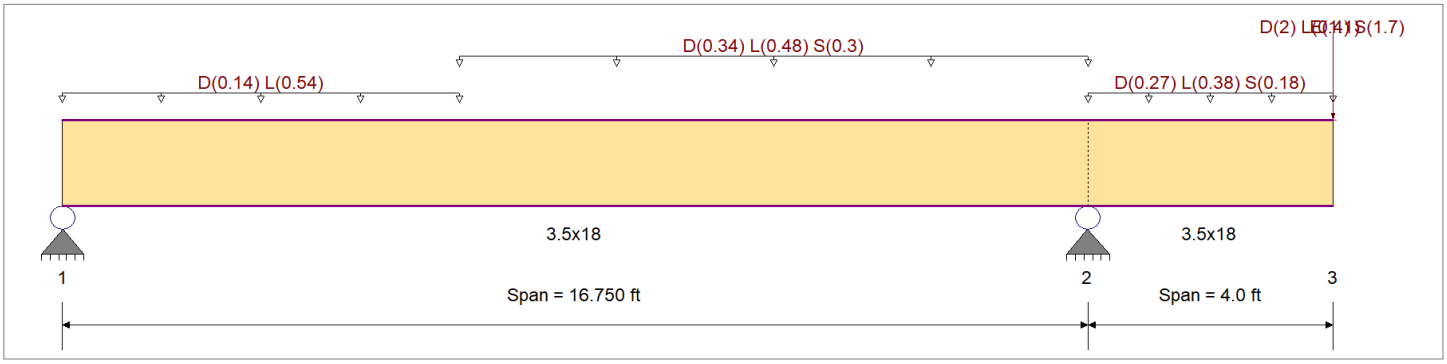
Wood Species : DF/DF
Wood Grade : 24F-V4

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

Fb +	2,400.0 psi
Fb -	1,850.0 psi
Fc - Prll	1,650.0 psi
Fc - Perp	650.0 psi
Fv	265.0 psi
Ft	1,100.0 psi

E : Modulus of Elasticity

Ebend- xx	1,800.0 ksi
Eminbend - xx	950.0 ksi
Ebend- yy	1,600.0 ksi
Eminbend - yy	850.0 ksi
Density	31.210 pcf



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 = 0.140, L = 0.540 k/ft, Extent = 0.0 -->> 6.50 ft, Tributary Width = 1.0 ft
Uniform Load : D = 0.340, L = 0.480, S = 0.30 k/ft, Extent = 6.50 -->> 16.750 ft, Tributary Width = 1.0 ft
Load for Span Number 2
Uniform Load : D = 0.270, L = 0.380, S = 0.180 , Tributary Width = 1.0 ft
Point Load : D = 2.0, L = 0.40, S = 1.70 k @ 4.0 ft
Point Load : E = 1.10 k @ 4.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.595 : 1	Maximum Shear Stress Ratio	=	0.579 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	1,265.35 psi	fv: Actual	=	153.51 psi
F'b	=	2,127.50 psi	F'v	=	265.00 psi
Load Combination		+D+0.750L+0.750S	Load Combination		+D+L
Location of maximum on span	=	16.750 ft	Location of maximum on span	=	15.253 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.246 in	Ratio =	642 >=360	Span: 1 : L Only
Max Upward Transient Deflection	-0.149 in	Ratio =	818 >=360	Span: 2 : L Only
Max Downward Total Deflection	0.312 in	Ratio =	643 >=240	Span: 1 : +D+L
Max Upward Total Deflection	-0.123 in	Ratio =	782 >=240	Span: 2 : +D+L

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 16.750 ft	1	0.392	0.279	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	10.27	652.0	1,665.0	2.79	66.5	238.5
Length = 4.0 ft	2	0.392	0.279	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	10.27	652.0	1,665.0	2.71	66.5	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 16.750 ft	1	0.545	0.579	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	20.61	1,308.4	2,400.0	6.45	153.5	265.0

Wood Beam

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.24.05.02 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC INC 1983-2023

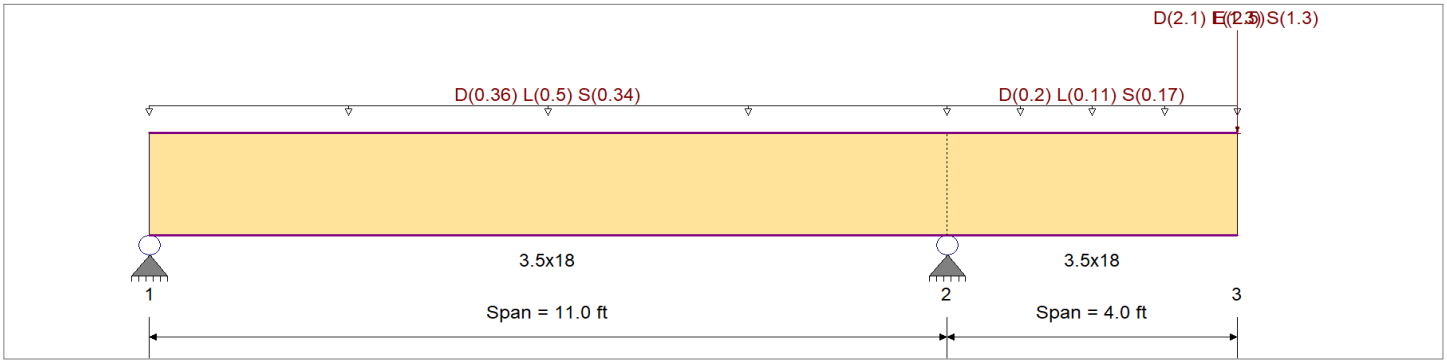
DESCRIPTION: B2-43 (overstrength) (sw#317)

CODE REFERENCES

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

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2400 psi	*E : Modulus of Elasticity*	
Load Combination :	IBC 2021	Fb -	1850 psi	Ebend- xx	1800 ksi
		Fc - Prll	1650 psi	Eminbend - xx	950 ksi
Wood Species :	DF/DF	Fc - Perp	650 psi	Ebend- yy	1600 ksi
Wood Grade :	24F-V4	Fv	265 psi	Eminbend - yy	850 ksi
		Ft	1100 psi	Density	31.21 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loading
Load for Span Number 1
Uniform Load : D = 0.360, L = 0.50, S = 0.340 , Tributary Width = 1.0 ft
Load for Span Number 2
Uniform Load : D = 0.20, L = 0.110, S = 0.170 , Tributary Width = 1.0 ft
Point Load : D = 2.10, L = 1.30, S = 1.30 k @ 4.0 ft
Point Load : E = 2.50 k @ 4.0 ft, (overstrength)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.585 : 1	Maximum Shear Stress Ratio	=	0.455 : 1
Section used for this span		3.5x18	Section used for this span		3.5x18
fb: Actual	=	1,243.76 psi	fv: Actual	=	138.59 psi
F'b	=	2,127.50 psi	F'v	=	304.75 psi
Load Combination		+D+0.750L+0.750S	Load Combination		+D+0.750L+0.750S
Location of maximum on span	=	11.000 ft	Location of maximum on span	=	9.525 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.113 in	Ratio =	2991 >=360	Span: 2 : E Only
Max Upward Transient Deflection	-0.044 in	Ratio =	850 >=360	Span: 1 : E Only
Max Downward Total Deflection	0.152 in	Ratio =	632 >=240	Span: 2 : +D+0.750L+0.750S+0.5250E
Max Upward Total Deflection	-0.037 in	Ratio =	3531 >=240	Span: 1 : +D+0.70E

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_V	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.385	0.263	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	10.11	641.9	1,665.0	2.63	62.7	238.5
Length = 4.0 ft	2	0.385	0.263	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	10.11	641.9	1,665.0	2.63	62.7	238.5
+D+L					1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.556	0.448	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	16.19	1,027.9	1,850.0	4.99	118.8	265.0

Wood Beam

Project File: Calcs.ec6

DESCRIPTION: B1-11 & 12

CODE REFERENCES

Calculations per NDS 2018, IBC 2021
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

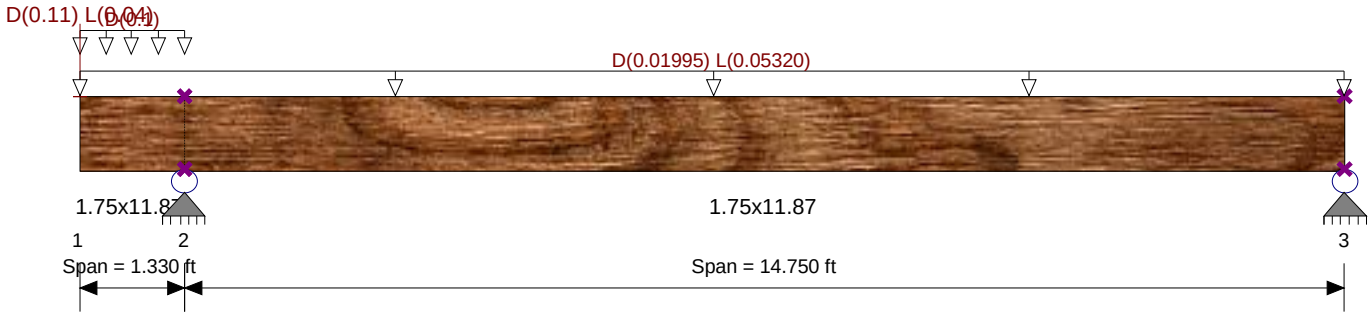
Material Properties

Analysis Method :	Allowable Stress Design
Load Combination :	ASCE 7-22 / IBC 2024 (L<=100psf)
Wood Species :	Trus Joist
Wood Grade :	MicroLam LVL 2.0 E
Beam Bracing :	Completely Unbraced

Fb +	2600 psi
Fb -	2600 psi
Fc - Prll	2510 psi
Fc - Perp	750 psi
Fv	285 psi
Ft	1555 psi

E : Modulus of Elasticity

Ebend- xx	2000 ksi
Eminbend - xx	1016.535 ksi
Density	42.01 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Loads on all spans...
Uniform Load on ALL spans : D = 0.0150, L = 0.040 ksf, Tributary Width = 1.330 ft
Load for Span Number 1
Uniform Load : D = 0.10 , Tributary Width = 1.0 ft
Point Load : D = 0.110, L = 0.040 k @ 0.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.615 : 1	Maximum Shear Stress Ratio	=	0.134 : 1
Section used for this span		1.75x11.87	Section used for this span		1.75x11.87
fb: Actual	=	577.37 psi	fv: Actual	=	38.27 psi
F'b	=	939.44 psi	F'v	=	285.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	7.663 ft	Location of maximum on span	=	1.330 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.112 in	Ratio = 1578	>=360	Span: 2 : L Only
Max Upward Transient Deflection	-0.031 in	Ratio = 1030	>=360	Span: 1 : L Only
Max Downward Total Deflection	0.157 in	Ratio = 1128	>=240	Span: 2 : +D+L
Max Upward Total Deflection	-0.041 in	Ratio = 780	>=240	Span: 1 : +D+L

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 1.330 ft	1	0.033	0.066	0.90	1.00	1.00	0.98	1.001	1.00	1.00	1.00	0.26	75.2	2,306.7	0.24	17.0	256.5
Length = 14.750 ft	2	0.182	0.052	0.90	1.00	1.00	0.40	1.001	1.00	1.00	1.00	0.58	170.5	934.9	0.18	13.3	256.5
+D+L					1.00	1.00	0.40	1.001	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 1.330 ft	1	0.041	0.134	1.00	1.00	1.00	0.98	1.001	1.00	1.00	1.00	0.36	104.5	2,557.1	0.53	38.3	285.0

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PROJECT NAME: 2424 74TH AVE

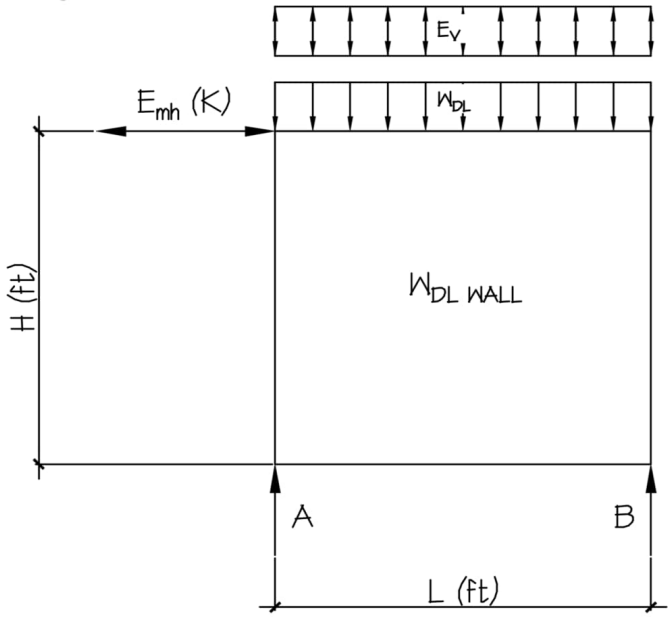
M&K PROJECT #: 300-25003
ENGINEER: MPM
DATE: 11-SEP-25

OVERSTRENGTH CALCULATIONS

WALL DESCRIPTION/SW #: SW #301

PARAMETERS:

L =	33.8	FT
H =	8.5	FT
E =	0.60	K (ASD)
W_{DLWALL} =	0.10	KLF
W_{DL} =	0.080	KLF
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNI
SDS =	1.114	



ANALYSIS:

E (UNFACTORED) = 0.86

$E_{MH} = \Omega_0 * E$ = 2.14 K

$E_V = 0.2*SDS*DL$ = 0.040 KLF

E_M (MAX) $= \sum M_A = 0 =$ 2.14(8.5) + (0.040104)(33.8)(16.9) - R_B(33.8)

R_B = 1.2E

R_A = 0.1E

E_M (MIN) $= \sum M_A = 0 =$ 2.14(8.5) - (0.040104)(33.8)(16.9) - R_B(33.8)

R_B = -0.1E

R_A = -1.2E

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

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PROJECT NAME: 2424 74TH AVE

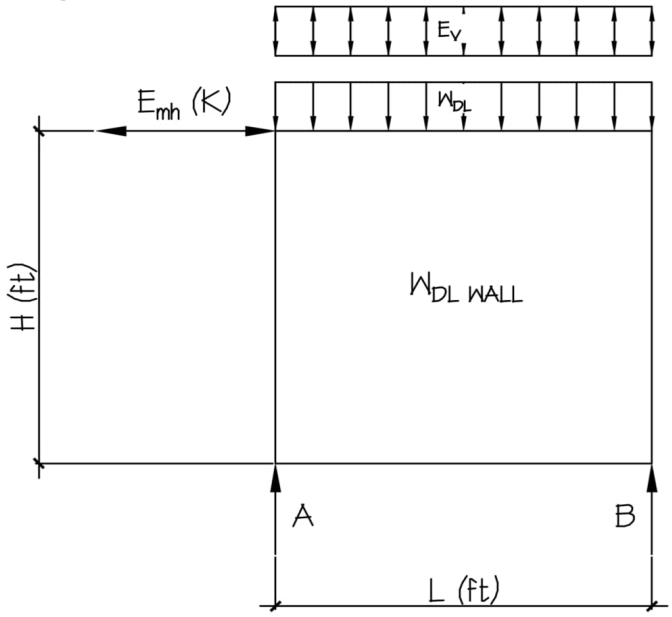
M&K PROJECT #: 300-25003
ENGINEER: MPM
DATE: 11-SEP-25

OVERSTRENGTH CALCULATIONS

WALL DESCRIPTION/SW #: SW #302

PARAMETERS:

L =	14.3	FT
H =	8.5	FT
E =	0.60	K (ASD)
W_{DLWALL} =	0.10	KLF
W_{DL} =	0.060	KLF
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNI
SDS =	1.114	



ANALYSIS:

E (UNFACTORED) = 0.86

$E_{MH} = \Omega_0 * E$ = 2.14 K

$E_V = 0.2*SDS*DL$ = 0.036 KLF

E_M (MAX) $= \sum M_A = 0$ = 2.14(8.5) + (0.035648)(14.25)(7.125) - R_B(14.25)

R_B = 1.5E

R_A = -1.0E

E_M (MIN) $= \sum M_A = 0$ = 2.14(8.5) - (0.035648)(14.25)(7.125) - R_B(14.25)

R_B = 1.0E

R_A = -1.5E

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

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PROJECT NAME: 2424 74TH AVE

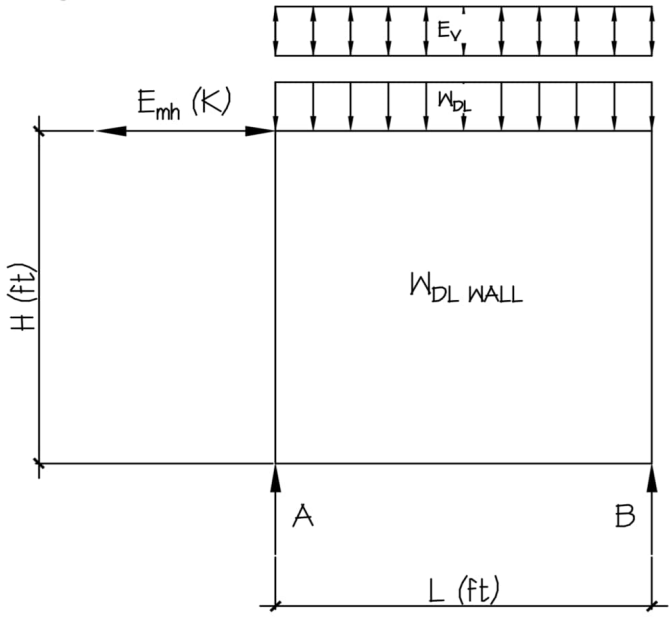
M&K PROJECT #: 300-25003
ENGINEER: MPM
DATE: 11-SEP-25

OVERSTRENGTH CALCULATIONS

WALL DESCRIPTION/SW #: SW #304

PARAMETERS:

L =	29.0	FT
H =	8.5	FT
E =	1.10	K (ASD)
W_{DLWALL} =	0.10	KLF
W_{DL} =	0.060	KLF
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNI
SDS =	1.114	



ANALYSIS:

E (UNFACTORED) = 1.57

$E_{MH} = \Omega_0 * E$ = 3.93 K

$E_V = 0.2*SDS*DL$ = 0.036 KLF

E_M (MAX) $= \sum M_A = 0 =$ 3.93(8.5) + (0.035648)(29)(14.5) - R_B(29)

R_B = 1.7E

R_A = -0.6E

E_M (MIN) $= \sum M_A = 0 =$ 3.93(8.5) - (0.035648)(29)(14.5) - R_B(29)

R_B = 0.6E

R_A = -1.7E

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

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PROJECT NAME: 2424 74TH AVE

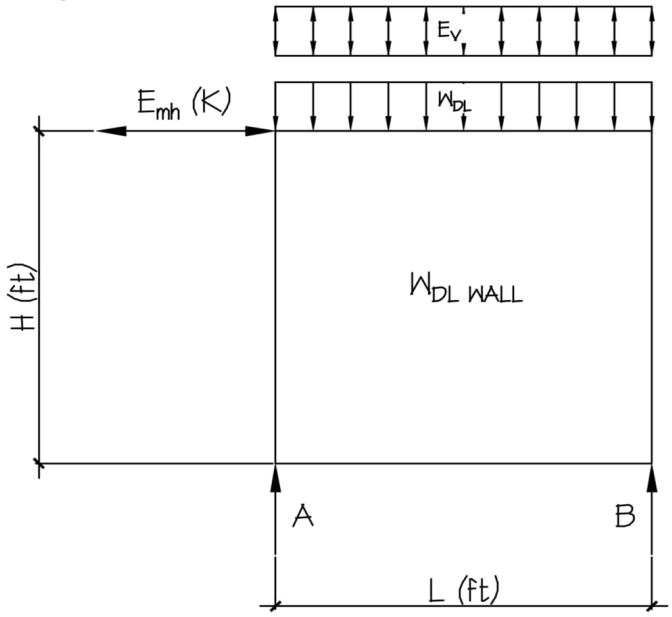
M&K PROJECT #: 300-25003
ENGINEER: MPM
DATE: 11-SEP-25

OVERSTRENGTH CALCULATIONS

WALL DESCRIPTION/SW #: SW #305

PARAMETERS:

L =	8.0	FT
H =	8.5	FT
E =	1.00	K (ASD)
W_{DLWALL} =	0.10	KLF
W_{DL} =	0.000	KLF
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNI
SDS =	1.114	



ANALYSIS:

E (UNFACTORED) = 1.43

$E_{MH} = \Omega_0 * E$ = 3.57 K

$E_V = 0.2*SDS*DL$ = 0.022 KLF

E_M (MAX) $= \sum M_A = 0 =$ 3.57(8.5) + (0.02228)(8)(4) - R_B(8)

R_B = 3.9E

R_A = -3.7E

E_M (MIN) $= \sum M_A = 0 =$ 3.57(8.5) - (0.02228)(8)(4) - R_B(8)

R_B = 3.7E

R_A = -3.9E

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

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PROJECT NAME: 2424 74TH AVE

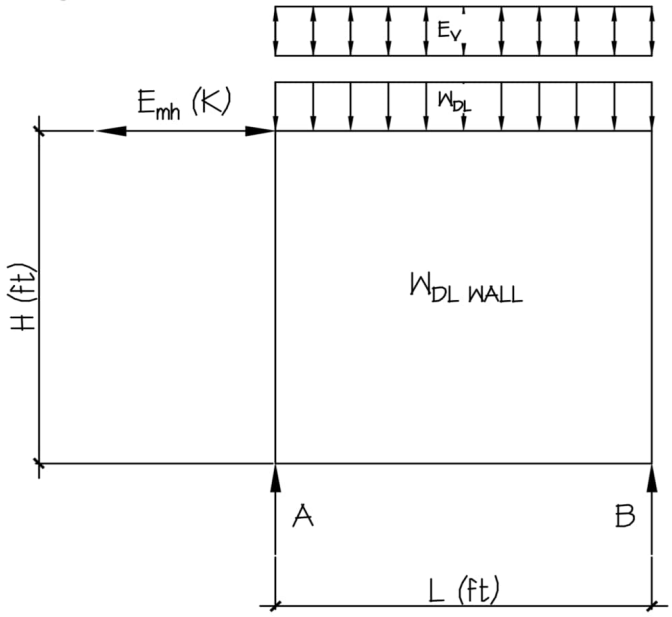
M&K PROJECT #: 300-25003
ENGINEER: MPM
DATE: 11-SEP-25

OVERSTRENGTH CALCULATIONS

WALL DESCRIPTION/SW #: SW #308

PARAMETERS:

L =	14.3	FT
H =	8.5	FT
E =	0.70	K (ASD)
W_{DLWALL} =	0.10	KLF
W_{DL} =	0.000	KLF
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNI
SDS =	1.114	



ANALYSIS:

E (UNFACTORED) = 1.00

$E_{MH} = \Omega_0 * E$ = 2.50 K

$E_V = 0.2*SDS*DL$ = 0.022 KLF

E_M (MAX) $= \sum M_A = 0 =$ 2.50(8.5) + (0.02228)(14.25)(7.125) - R_B(14.25)

R_B = 1.6E

R_A = -1.3E

E_M (MIN) $= \sum M_A = 0 =$ 2.50(8.5) - (0.02228)(14.25)(7.125) - R_B(14.25)

R_B = 1.3E

R_A = -1.6E

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

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PROJECT NAME: 2424 74TH AVE

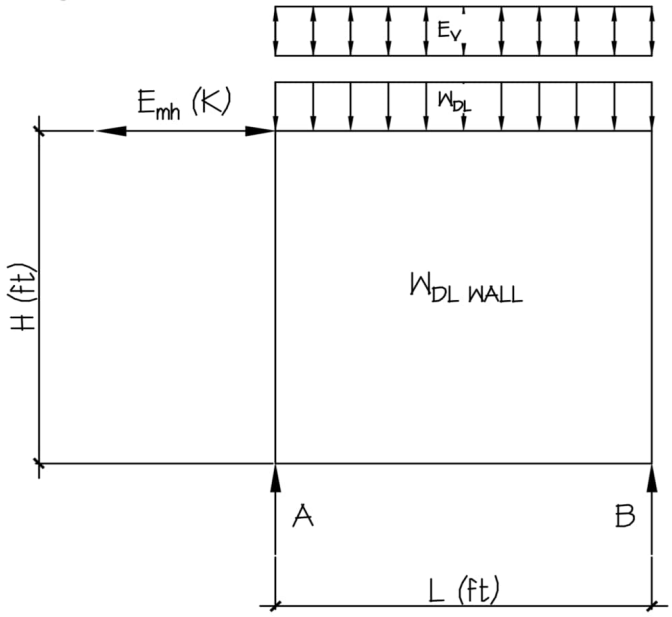
M&K PROJECT #: 300-25003
ENGINEER: MPM
DATE: 11-SEP-25

OVERSTRENGTH CALCULATIONS

WALL DESCRIPTION/SW #: SW #309

PARAMETERS:

L =	32.3	FT
H =	8.5	FT
E =	1.20	K (ASD)
W_{DLWALL} =	0.10	KLF
W_{DL} =	0.060	KLF
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNI
SDS =	1.114	



ANALYSIS:

E (UNFACTORED) = 1.71

$E_{MH} = \Omega_0 * E$ = 4.29 K

$E_V = 0.2*SDS*DL$ = 0.036 KLF

E_M (MAX) $= \sum M_A = 0 =$ 4.29(8.5) + (0.035648)(32.25)(16.125) - R_B(32.25)

R_B = 1.7E

R_A = -0.6E

E_M (MIN) $= \sum M_A = 0 =$ 4.29(8.5) - (0.035648)(32.25)(16.125) - R_B(32.25)

R_B = 0.6E

R_A = -1.7E

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

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PROJECT NAME: 2424 74TH AVE

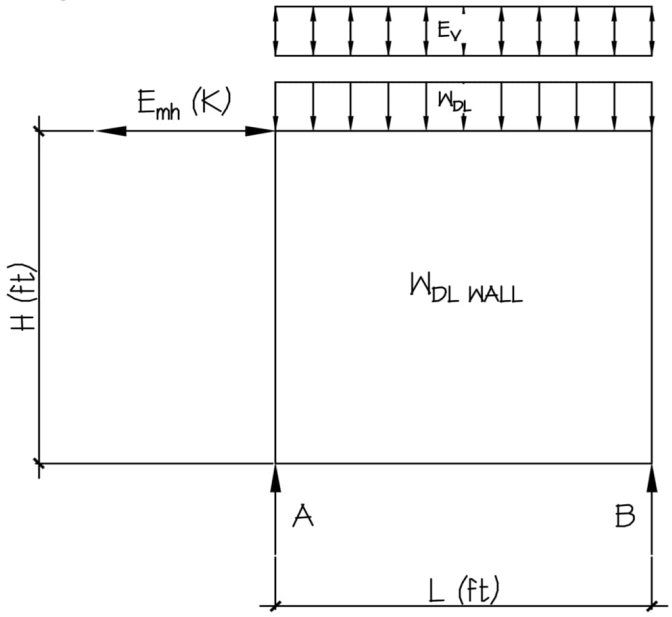
M&K PROJECT #: 300-25003
ENGINEER: MPM
DATE: 11-SEP-25

OVERSTRENGTH CALCULATIONS

WALL DESCRIPTION/SW #: SW #311

PARAMETERS:

L =	13.7	FT
H =	8.5	FT
E =	0.40	K (ASD)
W_{DLWALL} =	0.10	KLF
W_{DL} =	0.070	KLF
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNI
SDS =	1.114	



ANALYSIS:

E (UNFACTORED) = 0.57

$E_{MH} = \Omega_0 * E$ = 1.43 K

$E_V = 0.2*SDS*DL$ = 0.038 KLF

E_M (MAX) $= \sum M_A = 0 =$ 1.43(8.5) + (0.037876)(13.7)(6.85) - R_B(13.7)

R_B = 1.1E

R_A = -0.6E

E_M (MIN) $= \sum M_A = 0 =$ 1.43(8.5) - (0.037876)(13.7)(6.85) - R_B(13.7)

R_B = 0.6E

R_A = -1.1E

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

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PROJECT NAME: 2424 74TH AVE

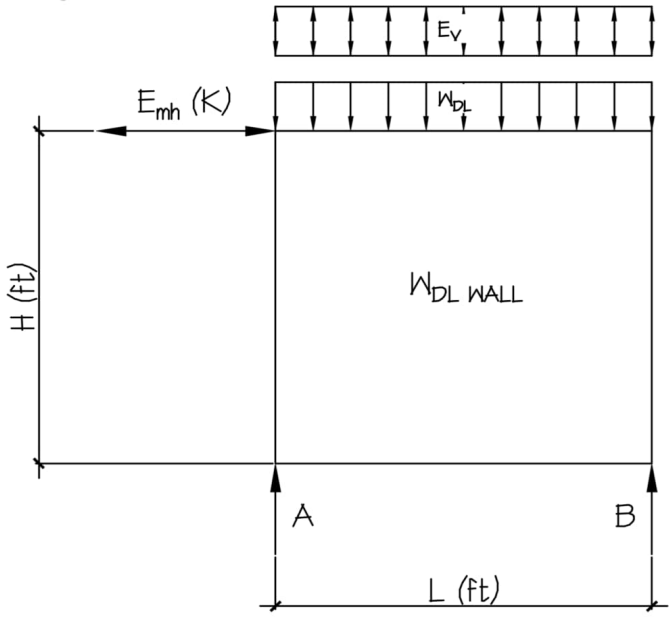
M&K PROJECT #: 300-25003
ENGINEER: MPM
DATE: 11-SEP-25

OVERSTRENGTH CALCULATIONS

WALL DESCRIPTION/SW #: SW #313

PARAMETERS:

L =	14.3	FT
H =	8.5	FT
E =	0.40	K (ASD)
W_{DLWALL} =	0.10	KLF
W_{DL} =	0.060	KLF
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNI
SDS =	1.114	



ANALYSIS:

E (UNFACTORED) = 0.57

$E_{MH} = \Omega_0 * E$ = 1.43 K

$E_V = 0.2*SDS*DL$ = 0.036 KLF

E_M (MAX) $= \sum M_A = 0 =$ 1.43(8.5) + (0.035648)(14.25)(7.125) - R_B(14.25)

R_B = 1.1E

R_A = -0.6E

E_M (MIN) $= \sum M_A = 0 =$ 1.43(8.5) - (0.035648)(14.25)(7.125) - R_B(14.25)

R_B = 0.6E

R_A = -1.1E

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

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PROJECT NAME: 2424 74TH AVE

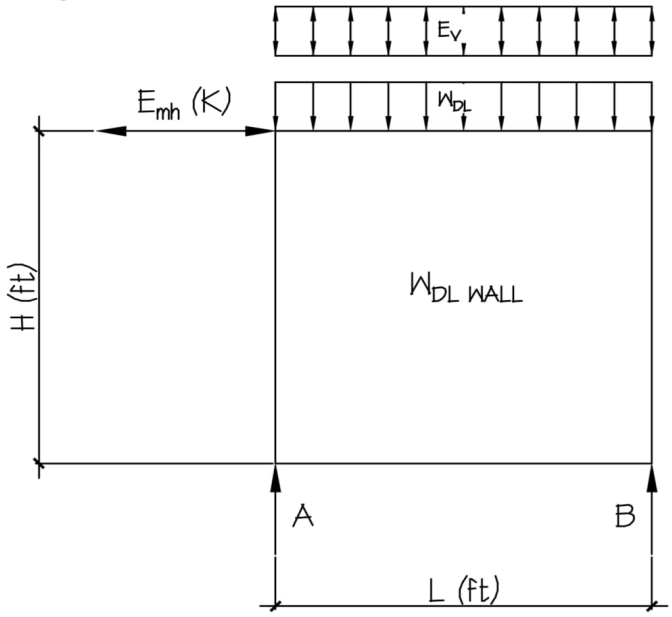
M&K PROJECT #: 300-25003
ENGINEER: MPM
DATE: 11-SEP-25

OVERSTRENGTH CALCULATIONS

WALL DESCRIPTION/SW #: SW #317

PARAMETERS:

L =	13.1	FT
H =	8.5	FT
E =	1.00	K (ASD)
W_{DLWALL} =	0.10	KLF
W_{DL} =	0.000	KLF
Ω_0 =	2.5	(ASCE TABLE 12.2.1 FOOTNI
SDS =	1.114	



ANALYSIS:

E (UNFACTORED) = 1.43

$E_{MH} = \Omega_0 * E$ = 3.57 K

$E_V = 0.2*SDS*DL$ = 0.022 KLF

E_M (MAX) $= \sum M_A = 0 =$ 3.57(8.5) + (0.02228)(13.1)(6.55) - R_B(13.1)

R_B = 2.5E

R_A = -2.2E

E_M (MIN) $= \sum M_A = 0 =$ 3.57(8.5) - (0.02228)(13.1)(6.55) - R_B(13.1)

R_B = 2.2E

R_A = -2.5E

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

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Wind Shear Wall Calculations

LNL Builds

2424 74th Ave SE

Mercer Island, WA

Parameters:

Single Family Home

Design Wind Speed: 100 MPH

Wind Exposure Category: C

Seismic Design Category: D

Code & Design Standard: 2021 IRC Ch. 1609, ASCE 7-16 Ch. 26-30

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

Nick J. Martignetti, P.E., Project Manager

Matthew P. Mills, Project Engineer

UNIT 1

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

WIND DESIGN SUMMARY PER ASCE 7-16

M+K PROJECT #: 300-25003
ENGINEER: MPM

PARAMETERS:

WIND SPEED	100
EXPOSURE CATEGORY	C
RISK CATEGORY	II
WIND DIRECTIONALITY FACTOR, K_D	0.85
TOPOGRAPHIC FACTOR, K_{zt}	1.00
GUST FACTOR, G	0.85
GROUND ELEV. ABOVE SEA LEVEL [FT]	0
DESIGN TYPE	ASD 0.60

ROOF GEOMETRY:

TRANS. ROOF PITCH	0.0	:12
LONG. ROOF PITCH	0.0	:12
MEAN ROOF HEIGHT, H	28.58	FT

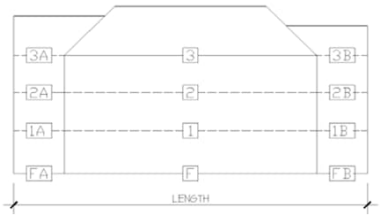
BUILDING GEOMETRY:

LENGTH	58	FT
WIDTH	28	FT
NUMBER OF STORIES	3	

TRANSVERSE DIRECTION (PERPENDICULAR TO MAIN RIDGE LINE)

TRIBUTARY DESIGN AREAS:

DIAPHRAGM LEVEL	FLOOR-TO-FLOOR HEIGHT		SECTION A	SECTION O	SECTION B	
3	9.5 FT	ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	393	0	SQ FT
2	10.67 FT	ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	555	0	SQ FT
1	10 FT	ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	96	0	SQ FT
FND		ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	0	0	SQ FT



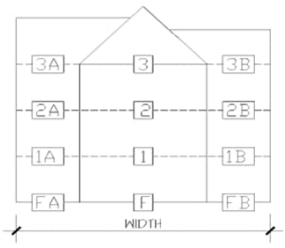
TRIBUTARY DESIGN LOADS: (0.6W)

	SECTION A	SECTION O	SECTION B	
STORY SHEAR	0.00	5.55	0.00	KIPS
TOTAL SHEAR	0.00	5.55	0.00	KIPS
		5.55		KIPS
STORY SHEAR	0.00	7.47	0.00	KIPS
TOTAL SHEAR	0.00	13.02	0.00	KIPS
		13.02		KIPS
STORY SHEAR	0.00	1.24	0.00	KIPS
TOTAL SHEAR	0.00	14.26	0.00	KIPS
		14.26		KIPS
STORY SHEAR	0.00	0.00	0.00	KIPS
TOTAL SHEAR	0.00	14.26	0.00	KIPS
		14.26		KIPS

LONGITUDINAL DIRECTION (PARALLEL TO MAIN RIDGE LINE)

TRIBUTARY DESIGN AREAS:

DIAPHRAGM LEVEL	FLOOR-TO-FLOOR HEIGHT		SECTION A	SECTION O	SECTION B	
3	9.5 FT	ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	223	0	SQ FT
2	10.67 FT	ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	271	0	SQ FT
1	10 FT	ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	290	0	SQ FT
FND		ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	0	0	SQ FT



TRIBUTARY DESIGN LOADS: (0.6W)

	SECTION A	SECTION O	SECTION B	
STORY SHEAR	0.00	2.66	0.00	KIPS
TOTAL SHEAR	0.00	2.66	0.00	KIPS
		2.66		KIPS
STORY SHEAR	0.00	3.05	0.00	KIPS
TOTAL SHEAR	0.00	5.71	0.00	KIPS
		5.71		KIPS
STORY SHEAR	0.00	3.11	0.00	KIPS
TOTAL SHEAR	0.00	8.83	0.00	KIPS
		8.83		KIPS
STORY SHEAR	0.00	0.00	0.00	KIPS
TOTAL SHEAR	0.00	8.83	0.00	KIPS
		8.83		KIPS

UNIT 2

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

WIND DESIGN SUMMARY PER ASCE 7-16

M+K PROJECT #: 300-25003
ENGINEER: MPM

PARAMETERS:

WIND SPEED	100
EXPOSURE CATEGORY	C
RISK CATEGORY	II
WIND DIRECTIONALITY FACTOR, K_D	0.85
TOPOGRAPHIC FACTOR, K_{zt}	1.00
GUST FACTOR, G	0.85
GROUND ELEV. ABOVE SEA LEVEL [FT]	0
DESIGN TYPE	ASD

0.60

ROOF GEOMETRY:

TRANS. ROOF PITCH	0.0	:12
LONG. ROOF PITCH	0.0	:12
MEAN ROOF HEIGHT, H	28.58	FT

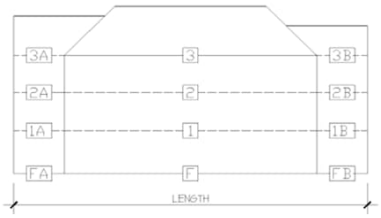
BUILDING GEOMETRY:

LENGTH	58	FT
WIDTH	28	FT
NUMBER OF STORIES	3	

TRANSVERSE DIRECTION (PERPENDICULAR TO MAIN RIDGE LINE)

TRIBUTARY DESIGN AREAS:

DIAPHRAGM LEVEL	FLOOR-TO-FLOOR HEIGHT		SECTION A	SECTION O	SECTION B	
3	9.5 FT	ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	300	0	SQ FT
2	10.67 FT	ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	520	0	SQ FT
1	10 FT	ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	101	0	SQ FT
FND		ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	0	0	SQ FT



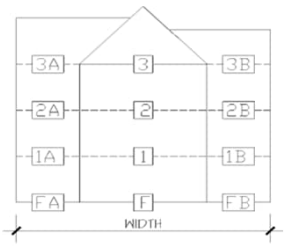
TRIBUTARY DESIGN LOADS: (0.6W)

	SECTION A	SECTION O	SECTION B	
STORY SHEAR	0.00	4.24	0.00	KIPS
TOTAL SHEAR	0.00	4.24	0.00	KIPS
		4.24		KIPS
STORY SHEAR	0.00	7.00	0.00	KIPS
TOTAL SHEAR	0.00	11.24	0.00	KIPS
		11.24		KIPS
STORY SHEAR	0.00	1.31	0.00	KIPS
TOTAL SHEAR	0.00	12.54	0.00	KIPS
		12.54		KIPS
STORY SHEAR	0.00	0.00	0.00	KIPS
TOTAL SHEAR	0.00	12.54	0.00	KIPS
		12.54		KIPS

LONGITUDINAL DIRECTION (PARALLEL TO MAIN RIDGE LINE)

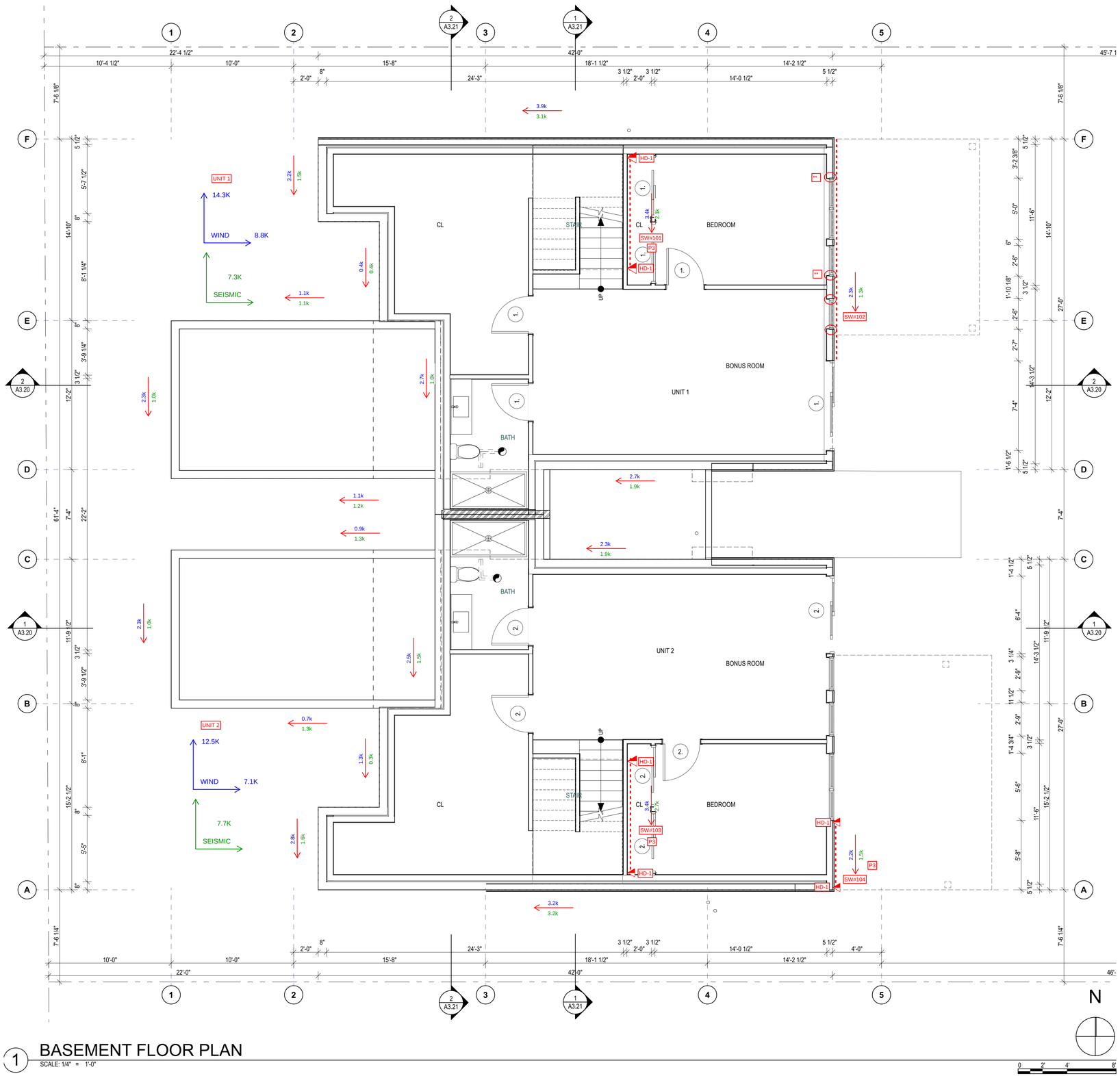
TRIBUTARY DESIGN AREAS:

DIAPHRAGM LEVEL	FLOOR-TO-FLOOR HEIGHT		SECTION A	SECTION O	SECTION B	
3	9.5 FT	ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	74	0	SQ FT
2	10.67 FT	ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	289	0	SQ FT
1	10 FT	ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	272	0	SQ FT
FND		ROOF SURFACE	0	0	0	SQ FT
		WALL SURFACE	0	0	0	SQ FT



TRIBUTARY DESIGN LOADS: (0.6W)

	SECTION A	SECTION O	SECTION B	
STORY SHEAR	0.00	0.88	0.00	KIPS
TOTAL SHEAR	0.00	0.88	0.00	KIPS
		0.88		KIPS
STORY SHEAR	0.00	3.25	0.00	KIPS
TOTAL SHEAR	0.00	4.14	0.00	KIPS
		4.14		KIPS
STORY SHEAR	0.00	2.92	0.00	KIPS
TOTAL SHEAR	0.00	7.06	0.00	KIPS
		7.06		KIPS
STORY SHEAR	0.00	0.00	0.00	KIPS
TOTAL SHEAR	0.00	7.06	0.00	KIPS
		7.06		KIPS



1 BASEMENT FLOOR PLAN

SCALE: 1/4" = 1'-0"

PLAN NOTES

1. PROPERTY LINE
2. ROOF/DECK ABOVE
3. PEDESTRIAN ACCESS
4. PROVIDE BICYCLE PARKING PER SMC 23.54.015.K. REFER TO A1.10 FOR SHORT-TERM AND LONG-TERM LOCATIONS AND COMPLIANCE CALCULATIONS.
5. STRUCTURE ABOVE, TYP
6. STRUCTURE BELOW, TYP
7. PROVIDE WHOLE HOUSE EXHAUST FAN WITH A NOISE RATING OF SONE 1.0 OR LESS THAT MEETS THE REQUIREMENTS OF SRC M1505.4. SEE A0.00 WHOLE HOUSE VENTILATION NOTE.
8. PROVIDE ENVIRONMENTAL AIR EXHAUST OUTLETS AT FAN LOCATIONS. THEY SHALL BE PROVIDED A MIN OF 3 FEET FROM OPERABLE OPENINGS INTO THE BUILDING AND PROPERTY LINES PER SMC 501.3.
9. PER SRC TABLE M1505.4.4, AT KITCHENS, PROVIDE 100 CFM LOCAL EXHAUST FAN AT 0.25 W.G. OR GREATER, TO RUN INTERMITTENTLY.
10. PROVIDE GUARDRAIL AT MIN 36" A.F.F. PER SRC R312.1.2. OPENINGS SHALL BE 4" MAX PER SRC R312.1.3, TYP. REFER TO STRUCTURAL DRAWINGS 11/S4.3 FOR CONNECTION DETAIL AT EXTERIOR ATTACHMENTS TO THE STRUCTURE. AT ALL EXTERIOR LOCATIONS PROVIDE CONNECTION THROUGH VERTICAL WALL SURFACE ONLY, DO NOT PROVIDE CONNECTION THROUGH ROOF MEMBRANE OR PARAPET CAP OR OTHER FLASHING AT TOP OF WALL.
11. PROVIDE HANDRAIL AT 34" - 38" ABOVE TREAD PER SRC R311.7.8.1, 1 1/4" MIN - 1 1/2" MAX GRASP DIMENSION PER SRC R311.7.8.5, 1 1/2" CLEARANCE BETWEEN WALL AND HANDRAIL PER SRC R311.7.8.3 AND CONTINUITY PER R311.7.8.4, TYP.
12. PROVIDE (2) 1-HOUR WALLS BETWEEN DWELLING UNITS PER SRC R302.2.3. SEE W50, W51, AND W56 ON SHEET A8.00
13. PROVIDE 6'-8" MIN VERTICAL CLEARANCE TO FINISH AT ALL STAIRS PER SRC R311.7.2, TYP.
14. PER SRC R302.7, PROVIDE MIN 1/2" GYPSUM BOARD BENEATH STAIR AT ACCESSIBLE SPACE, TYP.
15. PROVIDE (1) LAYER 5/8" EXTERIOR TYPE 'X' GWB AT OVERHANG, TYP FOR 1-HOUR PROTECTION.
16. PROVIDE NON-COMBUSTIBLE STEEL CANOPY PROVIDED BY OTHERS OVER ENTRY DOOR FOR WEATHER PROTECTION, TYP. CANOPY TO PROJECT NO CLOSER THAN 3-FEET TO ANY PROPERTY LINE, PER SMC
17. PROVIDE WOOD-FRAMED CANOPY PROJECTION ABOVE; TO PROJECT NO CLOSER THAN 3-FEET TO ANY PROPERTY LINE, PER SMC 23.45.518H.1. PAINT PER ELEVATIONS.
18. SIGHT TRIANGLE PER SMC 23.54.030.G
19. PROVIDE SHORING FOR EXCAVATION ADJACENT TO PROPERTY LINE, PER STRUCTURAL.
20. VEHICULAR ENTRY.
21. PROVIDE ROOF OVERHANG ABOVE, TYP, PER SMC 23.45.518.H
22. MIN 1/2" GYPSUM WALLBOARD WRAPPING WALLS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
23. TREE PROTECTION AREA, REFER TO PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
24. TREE DRIP LINE, REFER TO TREE PROTECTION PLAN, SHEET A1.10, PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16

X1.
X2. MIN 1/2" GYPSUM WALLBOARD WRAPPING POSTS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X3. MIN 1/2" GYPSUM WALLBOARD WRAPPING BEAMS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X4. MIN 1/2" GYPSUM WALLBOARD WRAPPING WALLS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X5. PROVIDE PLANTER, REFER TO L1 FOR PLANTING SCHEDULE.
X6.
X7. PROVIDE UNDER FLOOR VENT PER SRC R408. OPENING SHALL BE _" X _"
X8. PROVIDE 1'-6" X 2'-0" MIN CRAWL SPACE ACCESS HATCH PER SRC R408.4. PANEL TO ALIGN WITH FLOOR SUBSTRATE TO ALLOW FOR A SEAMLESS FLOOR FINISH.
X9. TREE PROTECTION AREA, REFER TO PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
X10. TREE DRIP LINE, REFER TO TREE PROTECTION PLAN, SHEET A1.10, PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
X11. PROPOSED DISTURBED AREA WITHIN TREE PROTECTION AREA, PER ARBORIST REPORT, SHEET A0.16.
X12. PLUMBING WASTE STACK
X13. RESTORE CURB CUT PER SDOT STANDARDS
X14. PROVIDE 10-FOOT NEW CURB CUT, PER SMC 23.54.030.F.1.B FOR DRIVEWAY ACCESS TO WOONERF AND UNIT PARKING
X15. HRV NOTE
X16.
X17. PROVIDE CANOPY, TYP., PER SMC 23.45.018.H
X18. ASSUMED PROPERTY LINE PER FUTURE UNIT LOT SUBDIVISION
X19. DUCTLESS HEAT PUMP CONDENSER

PLAN LEGEND

DOOR DESIGNATION 1.1

WINDOW DESIGNATION 1.1 — 3'-0" WINDOW WIDTH, 5'-0" WINDOW HEIGHT

XX / X.X DETAIL NUMBER / SHEET NUMBER

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 X 4 FRAMING

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 x 6 FRAMING

CAST-IN-PLACE CONCRETE WALL

PROVIDE (1) LAYER 5/8" EXTERIOR GWB AT OVERHANG

PROVIDE CMU WALL

W/D WASHING/ DRYER MACHINE (COMBO)

W WASHING MACHINE

D CLOTHES DRYER

XX / X.X SECTION MARKER

HWH ON-DEMAND HOT WATER HEATER

SD SRC R314 AND SFC 907.2.10.2: SMOKE ALARMS SHALL BE INSTALLED IN THE FOLLOWING LOCATIONS;
1. IN EACH SLEEPING ROOM
2. OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS.
3. ON EACH ADDITIONAL STORY OF THE DWELLING INCLUDING BASEMENTS BUT NOT INCLUDING CRAWL SPACES.
4. PER SFC 907.2.10 AND SRC R314.3 SMOKE ALARMS SHALL BE INSTALLED 20' MIN FROM KITCHEN APPLIANCES OR 10' MIN WITH AN ALARM-SILENCING SWITCH; 3' MIN FROM BATHROOM DOORS
5. SMOKE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

SD SW SMOKE ALARM WITH SWITCH, PER ITEM 4 ABOVE

HD HEAT DETECTOR/HEAT ALARM PER IRC R314.2.1. SHALL BE CONNECTED TO AN ALARM THAT IS INSTALLED IN THE DWELLING PER R314.4.1

FAN LOCATION (SRC TABLE M 1505.4.4(1) AND SMC TABLE 403.4.7)
1. AT BATHROOMS AND LAUNDRY, PROVIDE 50 CFM FAN W/ TIMER AT 0.25 W.G. OR GREATER
2. AT KITCHENS, PROVIDE 100 CFM FAN AT 0.25 W.G. OR GREATER
3. VENT ALL EXHAUST FANS TO THE OUTSIDE
4. EXHAUST DUCTS ARE TO BE CONST. OF SMOOTH BORE NONCOMBUSTIBLE MATERIAL AND ARE TO BE INSUL. AS REQUIRED PER WSEC.

CO SRC R315 AND 2021 SFC 915: AN APPROVED CARBON MONOXIDE ALARM SHALL BE INSTALLED OUTSIDE OF EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS IN DWELLING UNITS AND ON EACH LEVEL OF THE DWELLING. SINGLE STATION CARBON MONOXIDE ALARMS SHALL BE LISTED AS COMPLYING WITH UL 2075.
SRC R315.5. CARBON MONOXIDE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

FLOOR STEP DOWN

SOFFIT STEP DOWN

TYPICAL STAIR

PROVIDE MIN. 3'-0" LANDING WHERE OCCURS

PROVIDE 6'-8" CLEARANCE, MIN.
DIR. OF TRAVEL
HANDRAIL (WHERE REQ'D)
UP
15R. @ 7 3/4"
14T. @ 11"
3'-0" MIN. WIDTH

RISE AND TREAD DIMENSIONS (7 3/4" RISE, MAX. 10" TREAD, MIN.)
PROVIDE MAX. 12'-0" VERTICAL RISE
PROVIDE GUARDRAIL (WHERE REQ'D)

Architect of Record

b9 architects
400 E Pine Street
Suite 215
Seattle, WA 98122
206.297.1284
www.b9architects.com

Project:

2424 74TH AVE SE

Location:

2424 74TH AVE SE
Mercer Island, WA 98040

SDCI Number:
####

Professional Stamp

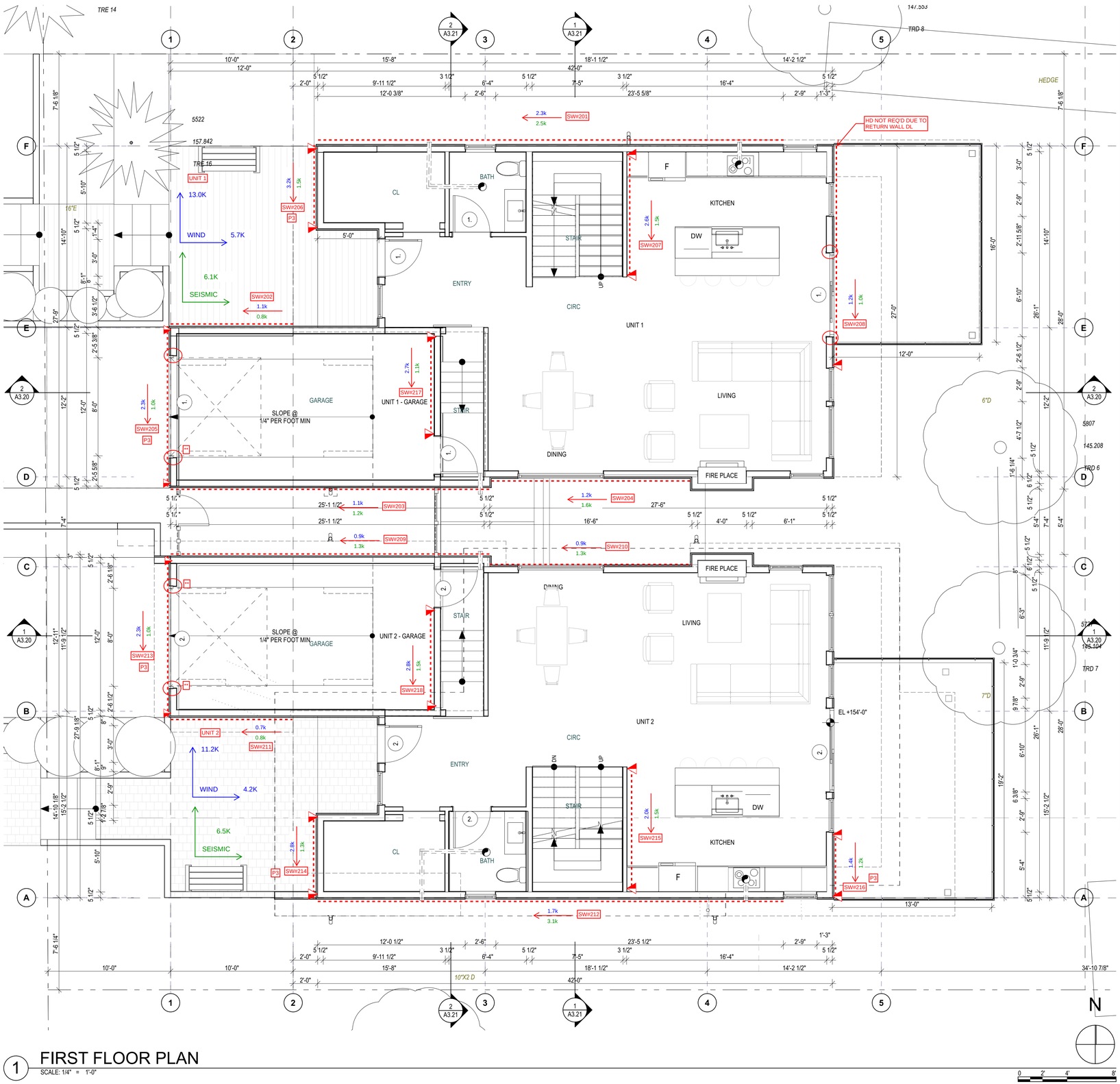
Issue ID	Issue Name	Issue Date

City Stamp

Basement Floor Plan

A2.01

© 2025 b9 architects



1 FIRST FLOOR PLAN

SCALE: 1/4" = 1'-0"

PLAN NOTES

1. PROPERTY LINE
2. ROOF/DECK ABOVE
3. PEDESTRIAN ACCESS
4. PROVIDE BICYCLE PARKING PER SMC 23.54.015.K. REFER TO A1.10 FOR SHORT-TERM AND LONG-TERM LOCATIONS AND COMPLIANCE CALCULATIONS.
5. STRUCTURE ABOVE, TYP.
6. STRUCTURE BELOW, TYP
7. PROVIDE WHOLE HOUSE EXHAUST FAN WITH A NOISE RATING OF SONE 1.0 OR LESS THAT MEETS THE REQUIREMENTS OF SRC M1505.4. SEE A0.00 WHOLE HOUSE VENTILATION NOTE.
8. PROVIDE ENVIRONMENTAL AIR EXHAUST OUTLETS AT FAN LOCATIONS. THEY SHALL BE PROVIDED A MIN OF 3 FEET FROM OPERABLE OPENINGS INTO THE BUILDING AND PROPERTY LINES PER SMC 501.3.
9. PER SRC TABLE M1505.4.4, AT KITCHENS, PROVIDE 100 CFM LOCAL EXHAUST FAN AT 0.25 W.G. OR GREATER, TO RUN INTERMITTENTLY.
10. PROVIDE GUARDRAIL AT MIN 36" A.F.F. PER SRC R312.1.2. OPENINGS SHALL BE 4" MAX PER SRC R312.1.3, TYP. REFER TO STRUCTURAL DRAWINGS 11/S4.3 FOR CONNECTION DETAIL AT EXTERIOR ATTACHMENTS TO THE STRUCTURE. AT ALL EXTERIOR LOCATIONS PROVIDE CONNECTION THROUGH VERTICAL WALL SURFACE ONLY, DO NOT PROVIDE CONNECTION THROUGH ROOF MEMBRANE OR PARAPET CAP OR OTHER FLASHING AT TOP OF WALL.
11. PROVIDE HANDRAIL AT 34" - 38" ABOVE TREAD PER SRC R311.7.8.1, 1 1/4" MIN - 1 1/2" MAX GRASP DIMENSION PER SRC R311.7.8.5, 1 1/2" CLEARANCE BETWEEN WALL AND HANDRAIL PER SRC R311.7.8.3 AND CONTINUITY PER R311.7.8.4, TYP.
12. PROVIDE (2) 1-HOUR WALLS BETWEEN DWELLING UNITS PER SRC R302.2.3. SEE W50, W51, AND W56 ON SHEET A8.00
13. PROVIDE 6'-8" MIN VERTICAL CLEARANCE TO FINISH AT ALL STAIRS PER SRC R311.7.2, TYP.
14. PER SRC R302.7, PROVIDE MIN 1/2" GYPSUM BOARD BENEATH STAIR AT ACCESSIBLE SPACE, TYP.
15. PROVIDE (1) LAYER 5/8" EXTERIOR TYPE 'X' GWB AT OVERHANG, TYP FOR 1-HOUR PROTECTION.
16. PROVIDE NON-COMBUSTIBLE STEEL CANOPY PROVIDED BY OTHERS OVER ENTRY DOOR FOR WEATHER PROTECTION, TYP. CANOPY TO PROJECT NO CLOSER THAN 3-FEET TO ANY PROPERTY LINE, PER SMC 23.45.518H.1. PAINT PER ELEVATIONS.
17. PROVIDE WOOD-FRAMED CANOPY PROJECTION ABOVE; TO PROJECT NO CLOSER THAN 3-FEET TO ANY PROPERTY LINE, PER SMC 23.45.518H.1. PAINT PER ELEVATIONS.
18. SIGHT TRIANGLE PER SMC 23.54.030.G
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X3. MIN 1/2" GYPSUM WALLBOARD WRAPPING BEAMS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X4. MIN 1/2" GYPSUM WALLBOARD WRAPPING WALLS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X5. PROVIDE PLANTER, REFER TO L1 FOR PLANTING SCHEDULE.
X6.
X7. PROVIDE UNDER FLOOR VENT PER SRC R408. OPENING SHALL BE _" X _"
X8. PROVIDE 1'-6" X 2'-0" MIN CRAWL SPACE ACCESS HATCH PER SRC R408.4. PANEL TO ALIGN WITH FLOOR SUBSTRATE TO ALLOW FOR A SEAMLESS FLOOR FINISH.
X9. TREE PROTECTION AREA, REFER TO PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
X10. TREE DRIP LINE, REFER TO TREE PROTECTION PLAN, SHEET A1.10, PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
X11. PROPOSED DISTURBED AREA WITHIN TREE PROTECTION AREA, PER ARBORIST REPORT, SHEET A0.16.
X12. PLUMBING WASTE STACK
X13. RESTORE CURB CUT PER SDOT STANDARDS
X14. PROVIDE 10-FOOT NEW CURB CUT, PER SMC 23.54.030.F.1.B FOR DRIVEWAY ACCESS TO WOONERF AND UNIT PARKING
X15. HRV NOTE
X16.
X17. PROVIDE CANOPY, TYP., PER SMC 23.45.018.H
X18. ASSUMED PROPERTY LINE PER FUTURE UNIT LOT SUBDIVISION
X19. DUCTLESS HEAT PUMP CONDENSER

PLAN LEGEND

DOOR DESIGNATION 1.1

WINDOW DESIGNATION 1.1 — 3'-0" WINDOW WIDTH, 5'-0" WINDOW HEIGHT

XX / X.X DETAIL NUMBER / SHEET NUMBER

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 X 4 FRAMING

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 x 6 FRAMING

CAST-IN-PLACE CONCRETE WALL

PROVIDE (1) LAYER 5/8" EXTERIOR GWB AT OVERHANG

PROVIDE CMU WALL

W/D WASHING/ DRYER MACHINE (COMBO)

W WASHING MACHINE

D CLOTHES DRYER

XX / X.X SECTION MARKER

HWH ON-DEMAND HOT WATER HEATER

SD SRC R314 AND SFC 907.2.10.2: SMOKE ALARMS SHALL BE INSTALLED IN THE FOLLOWING LOCATIONS;
1. IN EACH SLEEPING ROOM
2. OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS.
3. ON EACH ADDITIONAL STORY OF THE DWELLING INCLUDING BASEMENTS BUT NOT INCLUDING CRAWL SPACES.
4. PER SFC 907.2.10 AND SRC R314.3 SMOKE ALARMS SHALL BE: INSTALLED 20' MIN FROM KITCHEN APPLIANCES OR 10' MIN WITH AN ALARM-SILENCING SWITCH; 3' MIN FROM BATHROOM DOORS
5. SMOKE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

SD SW SMOKE ALARM WITH SWITCH, PER ITEM 4 ABOVE

HD HEAT DETECTOR/HEAT ALARM PER IRC R314.2.1. SHALL BE CONNECTED TO AN ALARM THAT IS INSTALLED IN THE DWELLING PER R314.4.1

FAN LOCATION (SRC TABLE M 1505.4.4(1) AND SMC TABLE 403.4.7)
1. AT BATHROOMS AND LAUNDRY, PROVIDE 50 CFM FAN W/ TIMER AT 0.25 W.G. OR GREATER
2. AT KITCHENS, PROVIDE 100 CFM FAN AT 0.25 W.G. OR GREATER
3. VENT ALL EXHAUST FANS TO THE OUTSIDE
4. EXHAUST DUCTS ARE TO BE CONST. OF SMOOTH BORE NONCOMBUSTIBLE MATERIAL AND ARE TO BE INSUL. AS REQUIRED PER WSEC.

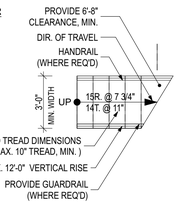
CO SRC R315 AND 2021 SFC 915: AN APPROVED CARBON MONOXIDE ALARM SHALL BE INSTALLED OUTSIDE OF EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS IN DWELLING UNITS AND ON EACH LEVEL OF THE DWELLING. SINGLE STATION CARBON MONOXIDE ALARMS SHALL BE LISTED AS COMPLYING WITH UL 2075.
SRC R315.5, CARBON MONOXIDE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

FLOOR STEP DOWN

SOFFIT STEP DOWN

TYPICAL STAIR

PROVIDE MIN. 3'-0" LANDING WHERE OCCURS



Architect of Record

b9 architects
400 E Pine Street
Suite 215
Seattle, WA 98122
206.297.1284
www.b9architects.com

Project:
2424 74TH AVE SE

Location:
2424 74TH AVE SE
Mercer Island, WA 98040

SDCI Number:
####

Professional Stamp

Issue ID	Issue Name	Issue Date

City Stamp

First Floor Plan

A2.02

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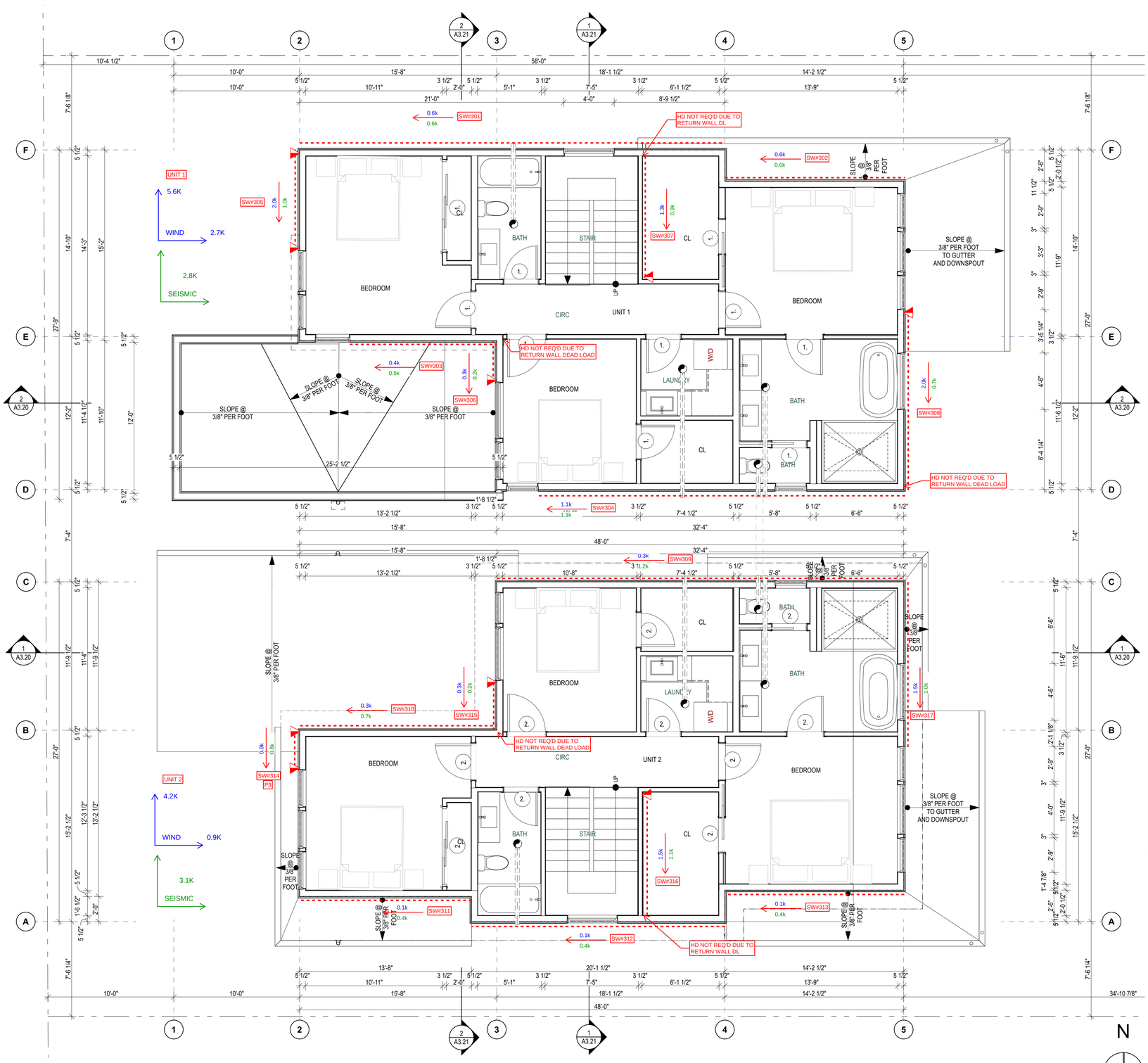

4 SECOND FLOOR PLAN

SCALE: 1/4" = 1'-0"

PLAN NOTES

1. PROPERTY LINE
2. ROOF/DECK ABOVE
3. PEDESTRIAN ACCESS
4. PROVIDE BICYCLE PARKING PER SMC 23.54.015.K. REFER TO A1.10 FOR SHORT-TERM AND LONG-TERM LOCATIONS AND COMPLIANCE CALCULATIONS.
5. STRUCTURE ABOVE, TYP
6. STRUCTURE BELOW, TYP
7. PROVIDE WHOLE HOUSE EXHAUST FAN WITH A NOISE RATING OF SONE 1.0 OR LESS THAT MEETS THE REQUIREMENTS OF SRC M1505.4. SEE A0.00 WHOLE HOUSE VENTILATION NOTE.
8. PROVIDE ENVIRONMENTAL AIR EXHAUST OUTLETS AT FAN LOCATIONS. THEY SHALL BE PROVIDED A MIN OF 3 FEET FROM OPERABLE OPENINGS INTO THE BUILDING AND PROPERTY LINES PER SMC 501.3.
9. PER SRC TABLE M1505.4.4, AT KITCHENS, PROVIDE 100 CFM LOCAL EXHAUST FAN AT 0.25 W.G. OR GREATER, TO RUN INTERMITTENTLY.
10. PROVIDE GUARDRAIL AT MIN 36" A.F.F. PER SRC R312.1.2. OPENINGS SHALL BE 4" MAX PER SRC R312.1.3, TYP. REFER TO STRUCTURAL DRAWINGS 11/S4.3 FOR CONNECTION DETAIL AT EXTERIOR ATTACHMENTS TO THE STRUCTURE. AT ALL EXTERIOR LOCATIONS PROVIDE CONNECTION THROUGH VERTICAL WALL SURFACE ONLY, DO NOT PROVIDE CONNECTION THROUGH ROOF MEMBRANE OR PARAPET CAP OR OTHER FLASHING AT TOP OF WALL.
11. PROVIDE HANDRAIL AT 34" - 38" ABOVE TREAD PER SRC R311.7.8.1, 1 1/4" MIN - 1 1/2" MAX GRASP DIMENSION PER SRC R311.7.8.5, 1 1/2" CLEARANCE BETWEEN WALL AND HANDRAIL PER SRC R311.7.8.3 AND CONTINUITY PER R311.7.8.4, TYP.
12. PROVIDE (2) 1-HOUR WALLS BETWEEN DWELLING UNITS PER SRC R302.2.3. SEE W50, W51, AND W56 ON SHEET A8.00
13. PROVIDE 6'-8" MIN VERTICAL CLEARANCE TO FINISH AT ALL STAIRS PER SRC R311.7.2, TYP.
14. PER SRC R302.7, PROVIDE MIN 1/2" GYPSUM BOARD BENEATH STAIR AT ACCESSIBLE SPACE, TYP.
15. PROVIDE (1) LAYER 5/8" EXTERIOR TYPE 'X' GWB AT OVERHANG, TYP FOR 1-HOUR PROTECTION.
16. PROVIDE NON-COMBUSTIBLE STEEL CANOPY PROVIDED BY OTHERS OVER ENTRY DOOR FOR WEATHER PROTECTION, TYP. CANOPY TO PROJECT NO CLOSER THAN 3-FEET TO ANY PROPERTY LINE, PER SMC
17. PROVIDE WOOD-FRAMED CANOPY PROJECTION ABOVE; TO PROJECT NO CLOSER THAN 3-FEET TO ANY PROPERTY LINE, PER SMC 23.45.518H.1. PAINT PER ELEVATIONS.
18. SIGHT TRIANGLE PER SMC 23.54.030.G
19. PROVIDE SHORING FOR EXCAVATION ADJACENT TO PROPERTY LINE, PER STRUCTURAL.
20. VEHICULAR ENTRY.
21. PROVIDE ROOF OVERHANG ABOVE, TYP, PER SMC 23.45.518.H
22. MIN 1/2" GYPSUM WALLBOARD WRAPPING WALLS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
23. TREE PROTECTION AREA, REFER TO PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
24. TREE DRIP LINE, REFER TO TREE PROTECTION PLAN, SHEET A1.10, PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16

X1.
X2. MIN 1/2" GYPSUM WALLBOARD WRAPPING POSTS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X3. MIN 1/2" GYPSUM WALLBOARD WRAPPING BEAMS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X4. MIN 1/2" GYPSUM WALLBOARD WRAPPING WALLS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X5. PROVIDE PLANTER, REFER TO L1 FOR PLANTING SCHEDULE.
X6.
X7. PROVIDE UNDER FLOOR VENT PER SRC R408. OPENING SHALL BE _" X _" _"
X8. PROVIDE 1'-6" X 2'-0" MIN CRAWL SPACE ACCESS HATCH PER SRC R408.4. PANEL TO ALIGN WITH FLOOR SUBSTRATE TO ALLOW FOR A SEAMLESS FLOOR FINISH.
X9. TREE PROTECTION AREA, REFER TO PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
X10. TREE DRIP LINE, REFER TO TREE PROTECTION PLAN, SHEET A1.10, PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
X11. PROPOSED DISTURBED AREA WITHIN TREE PROTECTION AREA, PER ARBORIST REPORT, SHEET A0.16.
X12. PLUMBING WASTE STACK
X13. RESTORE CURB CUT PER SDOT STANDARDS
X14. PROVIDE 10-FOOT NEW CURB CUT, PER SMC 23.54.030.F.1.B FOR DRIVEWAY ACCESS TO WOONERF AND UNIT PARKING
X15. HRV NOTE
X16.
X17. PROVIDE CANOPY, TYP., PER SMC 23.45.018.H
X18. ASSUMED PROPERTY LINE PER FUTURE UNIT LOT SUBDIVISION
X19. DUCTLESS HEAT PUMP CONDENSER

PLAN LEGEND

- DOOR DESIGNATION (1.1)
- WINDOW DESIGNATION (1.1) 3'-0" WINDOW WIDTH, 5'-0" WINDOW HEIGHT
- XX / X.X DETAIL NUMBER / SHEET NUMBER
- 1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 X 4 FRAMING
- 1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 x 6 FRAMING
- CAST-IN-PLACE CONCRETE WALL
- PROVIDE (1) LAYER 5/8" EXTERIOR GWB AT OVERHANG
- PROVIDE CMU WALL
- W/D WASHING/ DRYER MACHINE (COMBO)
- W WASHING MACHINE
- D CLOTHES DRYER
- XX / X.X SECTION MARKER
- HWH ON-DEMAND HOT WATER HEATER
- SD SRC R314 AND SFC 907.2.10.2: SMOKE ALARMS SHALL BE INSTALLED IN THE FOLLOWING LOCATIONS;
  1. IN EACH SLEEPING ROOM
  2. OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS.
  3. ON EACH ADDITIONAL STORY OF THE DWELLING INCLUDING BASEMENTS BUT NOT INCLUDING CRAWL SPACES.
  4. PER SFC 907.2.10 AND SRC R314.3 SMOKE ALARMS SHALL BE: INSTALLED 20' MIN FROM KITCHEN APPLIANCES OR 10' MIN WITH AN ALARM-SILENCING SWITCH; 3' MIN FROM BATHROOM DOORS
  5. SMOKE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.
- SD SW SMOKE ALARM WITH SWITCH, PER ITEM 4 ABOVE
- HD HEAT DETECTOR/HEAT ALARM PER IRC R314.2.1. SHALL BE CONNECTED TO AN ALARM THAT IS INSTALLED IN THE DWELLING PER R314.4.1
- FAN LOCATION (SRC TABLE M 1505.4.4(1) AND SMC TABLE 403.4.7)
  1. AT BATHROOMS AND LAUNDRY, PROVIDE 50 CFM FAN W/ TIMER AT 0.25 W.G. OR GREATER
  2. AT KITCHENS, PROVIDE 100 CFM FAN AT 0.25 W.G. OR GREATER
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- CO SRC R315 AND 2021 SFC 915: AN APPROVED CARBON MONOXIDE ALARM SHALL BE INSTALLED OUTSIDE OF EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS IN DWELLING UNITS AND ON EACH LEVEL OF THE DWELLING. SINGLE STATION CARBON MONOXIDE ALARMS SHALL BE LISTED AS COMPLYING WITH UL 2075.
  SRC R315.5, CARBON MONOXIDE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.
- FLOOR STEP DOWN
- SOFFIT STEP DOWN

TYPICAL STAIR

PROVIDE MIN. 3'-0" LANDING WHERE OCCURS

PROVIDE 6'-8" CLEARANCE, MIN.
DIR. OF TRAVEL
HANDRAIL (WHERE REQ'D)
UP
15R. @ 7 3/4"
14T. @ 11"
3'-0" MIN. WIDTH

RISE AND TREAD DIMENSIONS (7 3/4" RISE, MAX. 10" TREAD, MIN.)
PROVIDE MAX. 12'-0" VERTICAL RISE
PROVIDE GUARDRAIL (WHERE REQ'D)

Architect of Record

b9 architects
400 E Pine Street
Suite 215
Seattle, WA 98122
206.297.1284
www.b9architects.com

Project:
2424 74TH AVE SE

Location:
2424 74TH AVE SE
Mercer Island, WA 98040

SDCI Number:
####

Professional Stamp

Issue ID	Issue Name	Issue Date

City Stamp

Second Floor Plan

A2.03

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MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 301: 3rd - Unit 1 - North Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_o	4.5	ft.		
Wall Length, L	33.8	ft.	Qualifying Wall Length, L	29.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
600 lbs	<	9990 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	210	plf	Overturning Moment	5.1	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	300	lbs	Resistive Moment	117.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 302: 3rd - Unit 1 - North Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	14.3	ft.	Qualifying Wall Length, L	14.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
600 lbs	<	4785 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	210	plf	Overturning Moment	5.1	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	300	lbs	Resistive Moment	23.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 303: 3rd - Unit 1 - Wall at Garage

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	11.7	ft.	Qualifying Wall Length, L	11.7	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
400 lbs	<	3929 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	180	plf	Overturning Moment	3.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	11.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 304: 3rd - Unit 1 - South Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	3.0	ft.		
Wall Length, L	29.0	ft.	Qualifying Wall Length, L	26.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1100 lbs	<	8899 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	230	plf	Overturning Moment	9.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	87.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 305: 3rd - Unit 1 - Front Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	8.0	ft.	Qualifying Wall Length, L	8.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2000 lbs	<	2686 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	100	plf	Overturning Moment	17.0	k-ft	Hold Down Design Load	1765	lbs
DL at ends of wall	0	lbs	Resistive Moment	2.9	k-ft	Holdown Capacity	2655	lbs

Hold-down Specification

SIMPSON MSTC40 STRAP TIE (12" END LENGTH)

Shearwall 306: 3rd - Unit 1 - Front Wall at Garage

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	3.3	ft.	Qualifying Wall Length, L	3.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
300 lbs	<	1028 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	110	plf	Overturning Moment	2.6	k-ft	Hold Down Design Load	609	lbs
DL at ends of wall	0	lbs	Resistive Moment	0.5	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 307: 3rd - Unit 1 - Int Wall at Stairs

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	9.8	ft.	Qualifying Wall Length, L	9.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1300 lbs	<	3291 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	100	plf	Overturning Moment	11.1	k-ft	Hold Down Design Load	327	lbs
DL at ends of wall	400	lbs	Resistive Moment	7.8	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 308: 3rd - Unit 1 - Rear Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	6.0	ft.		
Wall Length, L	14.3	ft.	Qualifying Wall Length, L	9.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2000 lbs	<	3291 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	100	plf	Overturning Moment	17.0	k-ft	Hold Down Design Load	545	lbs
DL at ends of wall	0	lbs	Resistive Moment	9.2	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 309: 3rd - Unit 2 - North Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	4.0	ft.		
Wall Length, L	32.3	ft.	Qualifying Wall Length, L	29.9	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
300 lbs	<	10040 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	240	plf	Overturning Moment	2.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	124.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 310: 3rd - Unit 2 - North Wall @ Garage

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	15.7	ft.	Qualifying Wall Length, L	15.7	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
300 lbs	<	5272 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	170	plf	Overturning Moment	2.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	24.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 311: 3rd - Unit 2 - South Wall @ Bedroom

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	13.7	ft.	Qualifying Wall Length, L	13.7	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
100 lbs	<	4600 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	170	plf	Overturning Moment	0.9	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	300	lbs	Resistive Moment	18.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 312: 3rd - Unit 2 - South Wall @ Stair

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	4.5	ft.		
Wall Length, L	20.1	ft.	Qualifying Wall Length, L	16.1	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
100 lbs	<	5406 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	240	plf	Overturning Moment	0.9	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	300	lbs	Resistive Moment	49.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 300-25003
ENGINEER: MPM

SHEARWALL 313: 3RD - UNIT 2 - SOUTH WALL @ BEDROOM

SHEARWALL PROPERTIES:

WALL HEIGHT, H	8.5	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	14.3	FT.	QUALIFYING WALL LENGTH, L	14.3	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
100 LBS	<	4785 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	220	PLF	OVERTURNING MOMENT	0.9	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	300	LBS	RESISTIVE MOMENT	24.0	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 314: 3RD - UNIT 2 - FRONT WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	8.5	FT.	MAX WALL OPENING HT, Hc	0.0	FT.		
WALL LENGTH, L	3.1	FT.	QUALIFYING WALL LENGTH, L	3.1	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
900 LBS	<	944 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	100	PLF	OVERTURNING MOMENT	7.7	K-FT	HOLD DOWN DESIGN LOAD	2328	LBS
DL AT ENDS OF WALL	0	LBS	RESISTIVE MOMENT	0.4	K-FT	HOLDOWN CAPACITY	2655	LBS

HOLD-DOWN SPECIFICATION

SIMPSON MSTC40 STRAP TIE (12" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 300-25003
ENGINEER: MPM

SHEARWALL 315: 3RD - UNIT 2 - FRONT WALL @ GARAGE

SHEARWALL PROPERTIES:

WALL HEIGHT, H	8.5	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	4.0	FT.	QUALIFYING WALL LENGTH, L	4.0	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
300 LBS	<	1322 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	110	PLF	OVERTURNING MOMENT	2.6	K-FT	HOLD DOWN DESIGN LOAD	440	LBS
DL AT ENDS OF WALL	0	LBS	RESISTIVE MOMENT	0.8	K-FT	HOLDOWN CAPACITY	2655	LBS

HOLD-DOWN SPECIFICATION

SIMPSON MSTC40 STRAP TIE (12" END LENGTH)

SHEARWALL 316: 3RD - UNIT 2 - INT STAIR WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	8.5	FT.	MAX WALL OPENING HT, Hc	0.0	FT.		
WALL LENGTH, L	9.8	FT.	QUALIFYING WALL LENGTH, L	9.8	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1500 LBS	<	3291 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	100	PLF	OVERTURNING MOMENT	12.8	K-FT	HOLD DOWN DESIGN LOAD	860	LBS
DL AT ENDS OF WALL	0	LBS	RESISTIVE MOMENT	4.3	K-FT	HOLDOWN CAPACITY	1705	LBS

HOLD-DOWN SPECIFICATION

SIMPSON CS16 STRAP TIE (14" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 317: 3rd - Unit 2 - Rear Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	6.0	ft.		
Wall Length, L	13.1	ft.	Qualifying Wall Length, L	8.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1500 lbs	<	2770 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	100	plf	Overturning Moment	12.8	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	640	lbs	Resistive Moment	15.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 201: 2nd - Unit 1 - North Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	4.5	ft.		
Wall Length, L	38.0	ft.	Qualifying Wall Length, L	35.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2300 lbs	<	11921 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	350	plf	Overturning Moment	22.2	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	227.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 202: 2nd - Unit 1 - Garage North Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	10.0	ft.	Qualifying Wall Length, L	10.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1100 lbs	<	3358 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	170	plf	Overturning Moment	10.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	440	lbs	Resistive Moment	11.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 203: 2nd - Unit 1 - Garage South Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	26.0	ft.	Qualifying Wall Length, L	26.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1100 lbs	<	8731 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	170	plf	Overturning Moment	10.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	61.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 204: 2nd - Unit 1 - Dining Room South Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, H_c	4.0	ft.		
Wall Length, L	16.5	ft.	Qualifying Wall Length, L	9.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1200 lbs	<	3190 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	460	plf	Overturning Moment	11.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	56.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 205: 2nd - Unit 1 - Garage Front Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	7.0	ft.		
Wall Length, L	12.9	ft.	Qualifying Wall Length, L	5.0	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2300 lbs	<	2713 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	100	plf	Overturning Moment	22.2	k-ft	Hold Down Design Load	442	lbs
DL at ends of wall	780	lbs	Resistive Moment	16.5	k-ft	Holdown Capacity	4935	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 206: 2nd - Unit 1 - Front Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	6.8	ft.	Qualifying Wall Length, L	6.8	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
3200 lbs	<	4254 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	100	plf	Overturning Moment	30.9	k-ft	Hold Down Design Load	3543	lbs
DL at ends of wall	820	lbs	Resistive Moment	7.0	k-ft	Holdown Capacity	4935	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 207: 2nd - Unit 1 - Int Wall at Stairs

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	10.3	ft.	Qualifying Wall Length, L	10.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2600 lbs	<	3442 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	200	plf	Overturning Moment	36.7	k-ft	Hold Down Design Load	2658	lbs
DL at ends of wall	0	lbs	Resistive Moment	9.5	k-ft	Holdown Capacity	5850	lbs

Hold-down Specification

SIMPSON MSTC66 STRAP TIE (24" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 208: 2nd - Unit 1 - Rear Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, H_c	8.0	ft.		
Wall Length, L	18.1	ft.	Qualifying Wall Length, L	8.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2200 lbs	<	2577 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	110	plf	Overturning Moment	21.3	k-ft	Hold Down Design Load	279	lbs
DL at ends of wall	0	lbs	Resistive Moment	16.2	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 209: 2nd - Unit 2 - North Garage Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	26.0	ft.	Qualifying Wall Length, L	26.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
900 lbs	<	8731 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	170	plf	Overturning Moment	8.7	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	61.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 210: 2nd - Unit 2 - North Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, H_c	4.0	ft.		
Wall Length, L	16.5	ft.	Qualifying Wall Length, L	9.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
900 lbs	<	3190 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	420	plf	Overturning Moment	8.7	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	57.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 211: 2nd - Unit 2 - Garage South Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	10.0	ft.	Qualifying Wall Length, L	10.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
700 lbs	<	3358 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	170	plf	Overturning Moment	6.8	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	440	lbs	Resistive Moment	11.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 300-25003
ENGINEER: MPM

SHEARWALL 212: 2ND - UNIT 2 - SOUTH WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	9.7	FT.	MAX WALL OPENING HT, H_c	4.5	FT.		
WALL LENGTH, L	38.0	FT.	QUALIFYING WALL LENGTH, L	35.5	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1700 LBS	<	11921 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	200	PLF	OVERTURNING MOMENT	16.4	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	0	LBS	RESISTIVE MOMENT	130.0	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 213: 2ND - UNIT 2 - GARAGE FRONT WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	9.7	FT.	MAX WALL OPENING HT, Hc	7.0	FT.		
WALL LENGTH, L	12.9	FT.	QUALIFYING WALL LENGTH, L	5.0	FT.	SHEARWALL ASSEMBLY	P3

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
2300 LBS	<	2713 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	100	PLF	OVERTURNING MOMENT	22.2	K-FT	HOLD DOWN DESIGN LOAD	532	LBS
DL AT ENDS OF WALL	680	LBS	RESISTIVE MOMENT	15.4	K-FT	HOLDOWN CAPACITY	4935	LBS

HOLD-DOWN SPECIFICATION

SIMPSON STHD14RJ HOLDOWN

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 300-25003
ENGINEER: MPM

SHEARWALL 214: 2ND - UNIT 2 - FRONT WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	9.7	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	6.8	FT.	QUALIFYING WALL LENGTH, L	6.8	FT.	SHEARWALL ASSEMBLY	P3

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
2800 LBS	<	4254 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	100	PLF	OVERTURNING MOMENT	27.1	K-FT	HOLD DOWN DESIGN LOAD	3348	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	4.5	K-FT	HOLDOWN CAPACITY	4935	LBS

HOLD-DOWN SPECIFICATION

SIMPSON STHD14RJ HOLDOWN

SHEARWALL 215: 2ND - UNIT 2 - INT STAIR WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	9.7	FT.	MAX WALL OPENING HT, Hc	0.0	FT.		
WALL LENGTH, L	10.2	FT.	QUALIFYING WALL LENGTH, L	10.2	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
2000 LBS	<	3425 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	200	PLF	OVERTURNING MOMENT	32.6	K-FT	HOLD DOWN DESIGN LOAD	2279	LBS
DL AT ENDS OF WALL	0	LBS	RESISTIVE MOMENT	9.4	K-FT	HOLDOWN CAPACITY	2655	LBS

HOLD-DOWN SPECIFICATION

SIMPSON MSTC40 STRAP TIE (12" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 300-25003
ENGINEER: MPM

SHEARWALL 216: 2ND - UNIT 2 - REAR WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	9.7	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	5.3	FT.	QUALIFYING WALL LENGTH, L	5.3	FT.	SHEARWALL ASSEMBLY	P3

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1400 LBS	<	3359 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	150	PLF	OVERTURNING MOMENT	13.5	K-FT	HOLD DOWN DESIGN LOAD	2180	LBS
DL AT ENDS OF WALL	0	LBS	RESISTIVE MOMENT	1.9	K-FT	HOLDOWN CAPACITY	2655	LBS

HOLD-DOWN SPECIFICATION

SIMPSON MSTC40 STRAP TIE (12" END LENGTH)

SHEARWALL 217: 2ND - UNIT 1 - INT GARAGE WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	8.3	FT.	MAX WALL OPENING HT, Hc	0.0	FT.		
WALL LENGTH, L	8.4	FT.	QUALIFYING WALL LENGTH, L	8.4	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
2700 LBS	<	2821 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	110	PLF	OVERTURNING MOMENT	22.5	K-FT	HOLD DOWN DESIGN LOAD	2262	LBS
DL AT ENDS OF WALL	0	LBS	RESISTIVE MOMENT	3.5	K-FT	HOLDOWN CAPACITY	4935	LBS

HOLD-DOWN SPECIFICATION

SIMPSON STHD14RJ HOLDOWN

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 218: 2nd - Unit 2 - Int Garage Wall

Shearwall Properties:

Wall height, H	8.3	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	8.4	ft.	Qualifying Wall Length, L	8.4	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2800 lbs	<	2821 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	110	plf	Overturning Moment	23.3	k-ft	Hold Down Design Load	2361	lbs
DL at ends of wall	0	lbs	Resistive Moment	3.5	k-ft	Holdown Capacity	4935	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 101: 1st - Unit 1 - Int Wall at Stairs

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	9.6	ft.	Qualifying Wall Length, L	9.6	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
3400 lbs	<	6050 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	300	plf	Overturning Moment	65.0	k-ft	Hold Down Design Load	4752	lbs
DL at ends of wall	800	lbs	Resistive Moment	19.4	k-ft	Holdown Capacity	4935	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 102: 1st - Unit 1 - Rear Wall

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, H_c	8.0	ft.		
Wall Length, L	18.1	ft.	Qualifying Wall Length, L	8.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2300 lbs	<	2577 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	260	plf	Overturning Moment	42.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	44.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 103: 1st - Unit 2 - Int Stair Wall

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	9.6	ft.	Qualifying Wall Length, L	9.6	ft.	Shearwall Assembly	P3

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
3400 lbs	<	6050 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	300	plf	Overturning Moment	61.3	k-ft	Hold Down Design Load	4729	lbs
DL at ends of wall	400	lbs	Resistive Moment	15.9	k-ft	Holdown Capacity	4935	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Seismic Shear Wall Calculations

LNL Builds

2424 74th Ave SE

Mercer Island, WA

Parameters:

Single Family Home

Design Wind Speed: 100 MPH

Wind Exposure Category: C

Seismic Design Category: D

Code & Design Standard: 2021 IRC Ch. 1609, ASCE 7-16 Ch. 26-30

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

Nick J. Martignetti, P.E., Project Manager

Matthew P. Mills, Project Engineer

UNIT 1

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SEISMIC CALCULATION - ASCE 7-16

M+K PROJECT #: 300-25003
ENGINEER: MPM

SEISMIC DESIGN CATEGORY:

USER INPUTS:

SITE CLASS	D
SPECTRAL RESPONSE ACCELERATION 0.2 SEC, S_S	1.392
SPECTRAL RESPONSE ACCELERATION 1.0 SEC, S_1	0.485
OCCUPANCY CATEGORY	II

VARIABLES:

SITE COEFFICIENT, FA	1.20
SITE COEFFICIENT, FV	1.82

CALCULATED VALUES:

MAXIMUM SPECTRAL RESPONSE ACCELERATION, S_{MS}	1.670
MAXIMUM SPECTRAL RESPONSE ACCELERATION, S_{M1}	0.880
DESIGN SPECTRAL RESPONSE ACCELERATION, S_{DS}	1.114
DESIGN SPECTRAL RESPONSE ACCELERATION, S_{D1}	0.587
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	0.257
T_0	0.105
T_S	0.527
SPECTRAL RESPONSE ACC., S_A (G)	1.114

SITE CLASS ASSUMPTION

YES — 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	10.0	1170	10	7.6	19 K
2	10.7	1593	10	10.3	26 K
3	9.5	1097	10	4.1	15 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

TOTAL DEAD LOAD OF STRUCTURE 61 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	0.171	0.171

BASE SHEARS:

ULTIMATE LOADS				x 0.7 =	ALLOWABLE LOADS			
TRANSVERSE		LONGITUDINAL			TRANSVERSE		LONGITUDINAL	
10	K	10	K		7.3	K	7.3	K

STORY SHEAR CALCULATION:

DISTRIBUTION EXPONENT, k: 1.00

		ULTIMATE LOADS				x 0.7 =	ALLOWABLE LOADS					
		TRANSVERSE		LONGITUDINAL			TRANSVERSE			LONGITUDINAL		
LEVEL	VERT. DIST. FACTOR, C_{VX}	STORY SHEAR, F_x		STORY SHEAR, F_x			STORY SHEAR, F_x		Σ STORY SHEAR	STORY SHEAR, F_x		Σ STORY SHEAR
1	0.162	1.7	K	1.7	K		1.2	K	7.3 K	1.2	K	7.3 K
2	0.456	4.7	K	4.7	K		3.3	K	6.1 K	3.3	K	6.1 K
3	0.382	4.0	K	4.0	K		2.8	K	2.8 K	2.8	K	2.8 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

UNIT 2

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SEISMIC CALCULATION - ASCE 7-16

M+K PROJECT #: 300-25003
ENGINEER: MPM

SEISMIC DESIGN CATEGORY:

USER INPUTS:

SITE CLASS	D
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3	9.5	1313	10	4.1	17 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
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TOTAL DEAD LOAD OF STRUCTURE 64 KIPS

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OCCUPANCY IMPORTANCE FACTOR, I_E	1.00	1.00
SEISMIC RESPONSE COEFFICIENT, C_s	0.171	0.171

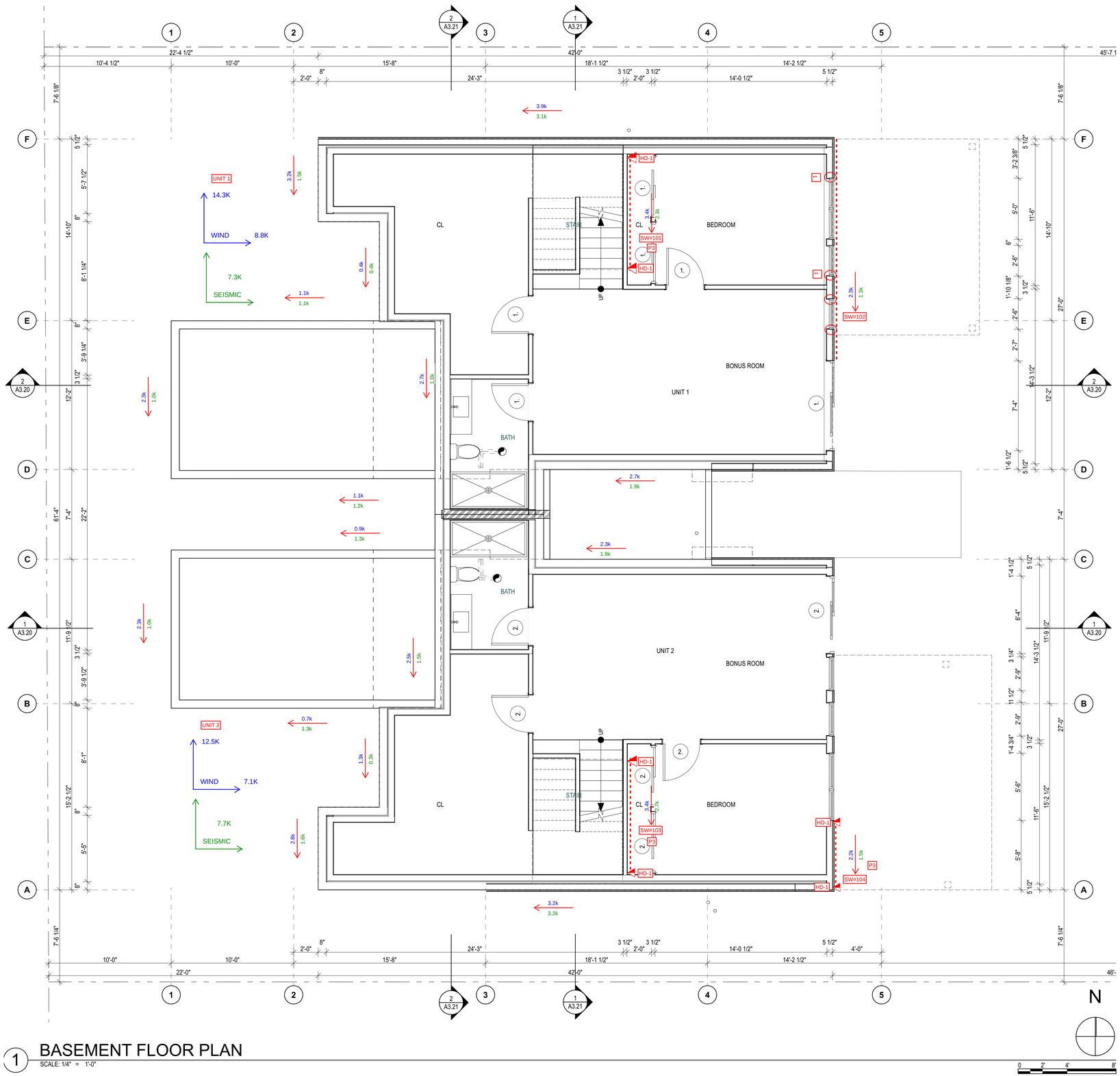
BASE SHEARS:

ULTIMATE LOADS				x 0.7 =	ALLOWABLE LOADS			
TRANSVERSE		LONGITUDINAL			TRANSVERSE		LONGITUDINAL	
11	K	11	K		7.7	K	7.7	K

STORY SHEAR CALCULATION:

DISTRIBUTION EXPONENT, k: 1.00

		ULTIMATE LOADS				x 0.7 =	ALLOWABLE LOADS					
		TRANSVERSE		LONGITUDINAL			TRANSVERSE			LONGITUDINAL		
LEVEL	VERT. DIST. FACTOR, C_{VX}	STORY SHEAR, F_x		STORY SHEAR, F_x			STORY SHEAR, F_x		Σ STORY SHEAR	STORY SHEAR, F_x		Σ STORY SHEAR
1	0.150	1.7	K	1.7	K		1.2	K	7.7 K	1.2	K	7.7 K
2	0.445	4.9	K	4.9	K		3.4	K	6.5 K	3.4	K	6.5 K
3	0.405	4.5	K	4.5	K		3.1	K	3.1 K	3.1	K	3.1 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



1 BASEMENT FLOOR PLAN

SCALE: 1/4" = 1'-0"

PLAN NOTES

1. PROPERTY LINE
2. ROOF/DECK ABOVE
3. PEDESTRIAN ACCESS
4. PROVIDE BICYCLE PARKING PER SMC 23.54.015.K. REFER TO A1.10 FOR SHORT-TERM AND LONG-TERM LOCATIONS AND COMPLIANCE CALCULATIONS.
5. STRUCTURE ABOVE, TYP
6. STRUCTURE BELOW, TYP
7. PROVIDE WHOLE HOUSE EXHAUST FAN WITH A NOISE RATING OF SONE 1.0 OR LESS THAT MEETS THE REQUIREMENTS OF SRC M1505.4. SEE A0.00 WHOLE HOUSE VENTILATION NOTE.
8. PROVIDE ENVIRONMENTAL AIR EXHAUST OUTLETS AT FAN LOCATIONS. THEY SHALL BE PROVIDED A MIN OF 3 FEET FROM OPERABLE OPENINGS INTO THE BUILDING AND PROPERTY LINES PER SMC 501.3.
9. PER SRC TABLE M1505.4.4, AT KITCHENS, PROVIDE 100 CFM LOCAL EXHAUST FAN AT 0.25 W.G. OR GREATER, TO RUN INTERMITTENTLY.
10. PROVIDE GUARDRAIL AT MIN 36" A.F.F. PER SRC R312.1.2. OPENINGS SHALL BE 4" MAX PER SRC R312.1.3, TYP. REFER TO STRUCTURAL DRAWINGS 11/S4.3 FOR CONNECTION DETAIL AT EXTERIOR ATTACHMENTS TO THE STRUCTURE. AT ALL EXTERIOR LOCATIONS PROVIDE CONNECTION THROUGH VERTICAL WALL SURFACE ONLY, DO NOT PROVIDE CONNECTION THROUGH ROOF MEMBRANE OR PARAPET CAP OR OTHER FLASHING AT TOP OF WALL.
11. PROVIDE HANDRAIL AT 34" - 38" ABOVE TREAD PER SRC R311.7.8.1, 1 1/4" MIN - 1 1/2" MAX GRASP DIMENSION PER SRC R311.7.8.5, 1 1/2" CLEARANCE BETWEEN WALL AND HANDRAIL PER SRC R311.7.8.3 AND CONTINUITY PER R311.7.8.4, TYP.
12. PROVIDE (2) 1-HOUR WALLS BETWEEN DWELLING UNITS PER SRC R302.2.3. SEE W50, W51, AND W56 ON SHEET A8.00
13. PROVIDE 6'-8" MIN VERTICAL CLEARANCE TO FINISH AT ALL STAIRS PER SRC R311.7.2, TYP.
14. PER SRC R302.7, PROVIDE MIN 1/2" GYPSUM BOARD BENEATH STAIR AT ACCESSIBLE SPACE, TYP.
15. PROVIDE (1) LAYER 5/8" EXTERIOR TYPE 'X' GWB AT OVERHANG, TYP FOR 1-HOUR PROTECTION.
16. PROVIDE NON-COMBUSTIBLE STEEL CANOPY PROVIDED BY OTHERS OVER ENTRY DOOR FOR WEATHER PROTECTION, TYP. CANOPY TO PROJECT NO CLOSER THAN 3-FEET TO ANY PROPERTY LINE, PER SMC
17. PROVIDE WOOD-FRAMED CANOPY PROJECTION ABOVE; TO PROJECT NO CLOSER THAN 3-FEET TO ANY PROPERTY LINE, PER SMC 23.45.518H.1. PAINT PER ELEVATIONS.
18. SIGHT TRIANGLE PER SMC 23.54.030.G
19. PROVIDE SHORING FOR EXCAVATION ADJACENT TO PROPERTY LINE, PER STRUCTURAL.
20. VEHICULAR ENTRY.
21. PROVIDE ROOF OVERHANG ABOVE, TYP, PER SMC 23.45.518.H
22. MIN 1/2" GYPSUM WALLBOARD WRAPPING WALLS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
23. TREE PROTECTION AREA, REFER TO PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
24. TREE DRIP LINE, REFER TO TREE PROTECTION PLAN, SHEET A1.10, PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16

X1.
X2. MIN 1/2" GYPSUM WALLBOARD WRAPPING POSTS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X3. MIN 1/2" GYPSUM WALLBOARD WRAPPING BEAMS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X4. MIN 1/2" GYPSUM WALLBOARD WRAPPING WALLS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X5. PROVIDE PLANTER, REFER TO L1 FOR PLANTING SCHEDULE.
X6.
X7. PROVIDE UNDER FLOOR VENT PER SRC R408. OPENING SHALL BE _" X _"
X8. PROVIDE 1'-6" X 2'-0" MIN CRAWL SPACE ACCESS HATCH PER SRC R408.4. PANEL TO ALIGN WITH FLOOR SUBSTRATE TO ALLOW FOR A SEAMLESS FLOOR FINISH.
X9. TREE PROTECTION AREA, REFER TO PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
X10. TREE DRIP LINE, REFER TO TREE PROTECTION PLAN, SHEET A1.10, PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
X11. PROPOSED DISTURBED AREA WITHIN TREE PROTECTION AREA, PER ARBORIST REPORT, SHEET A0.16.
X12. PLUMBING WASTE STACK
X13. RESTORE CURB CUT PER SDOT STANDARDS
X14. PROVIDE 10-FOOT NEW CURB CUT, PER SMC 23.54.030.F.1.B FOR DRIVEWAY ACCESS TO WOONERF AND UNIT PARKING
X15. HRV NOTE
X16.
X17. PROVIDE CANOPY, TYP., PER SMC 23.45.018.H
X18. ASSUMED PROPERTY LINE PER FUTURE UNIT LOT SUBDIVISION
X19. DUCTLESS HEAT PUMP CONDENSER

PLAN LEGEND

DOOR DESIGNATION 1.1

WINDOW DESIGNATION 1.1 — 3'-0" WINDOW WIDTH, 5'-0" WINDOW HEIGHT

XX / X.X DETAIL NUMBER / SHEET NUMBER

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 X 4 FRAMING

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 x 6 FRAMING

CAST-IN-PLACE CONCRETE WALL

PROVIDE (1) LAYER 5/8" EXTERIOR GWB AT OVERHANG

PROVIDE CMU WALL

W/D WASHING/ DRYER MACHINE (COMBO)

W WASHING MACHINE

D CLOTHES DRYER

XX / X.X SECTION MARKER

HWH ON-DEMAND HOT WATER HEATER

SD SRC R314 AND SFC 907.2.10.2: SMOKE ALARMS SHALL BE INSTALLED IN THE FOLLOWING LOCATIONS;
1. IN EACH SLEEPING ROOM
2. OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS.
3. ON EACH ADDITIONAL STORY OF THE DWELLING INCLUDING BASEMENTS BUT NOT INCLUDING CRAWL SPACES.
4. PER SFC 907.2.10 AND SRC R314.3 SMOKE ALARMS SHALL BE INSTALLED 20' MIN FROM KITCHEN APPLIANCES OR 10' MIN WITH AN ALARM-SILENCING SWITCH; 3' MIN FROM BATHROOM DOORS
5. SMOKE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

SD SW SMOKE ALARM WITH SWITCH, PER ITEM 4 ABOVE

HD HEAT DETECTOR/HEAT ALARM PER IRC R314.2.1. SHALL BE CONNECTED TO AN ALARM THAT IS INSTALLED IN THE DWELLING PER R314.4.1

FAN LOCATION (SRC TABLE M 1505.4.4(1) AND SMC TABLE 403.4.7)
1. AT BATHROOMS AND LAUNDRY, PROVIDE 50 CFM FAN W/ TIMER AT 0.25 W.G. OR GREATER
2. AT KITCHENS, PROVIDE 100 CFM FAN AT 0.25 W.G. OR GREATER
3. VENT ALL EXHAUST FANS TO THE OUTSIDE
4. EXHAUST DUCTS ARE TO BE CONST. OF SMOOTH BORE NONCOMBUSTIBLE MATERIAL AND ARE TO BE INSUL. AS REQUIRED PER WSEC.

CO SRC R315 AND 2021 SFC 915: AN APPROVED CARBON MONOXIDE ALARM SHALL BE INSTALLED OUTSIDE OF EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS IN DWELLING UNITS AND ON EACH LEVEL OF THE DWELLING. SINGLE STATION CARBON MONOXIDE ALARMS SHALL BE LISTED AS COMPLYING WITH UL 2075.
SRC R315.5. CARBON MONOXIDE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

FLOOR STEP DOWN

SOFFIT STEP DOWN

TYPICAL STAIR

PROVIDE MIN. 3'-0" LANDING WHERE OCCURS

PROVIDE 6'-8" CLEARANCE, MIN.
DIR. OF TRAVEL
HANDRAIL (WHERE REQ'D)
UP
15R. @ 7 3/4"
14T. @ 11"
3'-0" MIN. WIDTH

RISE AND TREAD DIMENSIONS (7 3/4" RISE, MAX. 10" TREAD, MIN.)
PROVIDE MAX. 12'-0" VERTICAL RISE
PROVIDE GUARDRAIL (WHERE REQ'D)

Architect of Record

b9 architects
400 E Pine Street
Suite 215
Seattle, WA 98122
206.297.1284
www.b9architects.com

Project:

2424 74TH AVE SE

Location:

2424 74TH AVE SE
Mercer Island, WA 98040

SDCI Number:
####

Professional Stamp

Issue ID	Issue Name	Issue Date

City Stamp

Basement Floor Plan

A2.01

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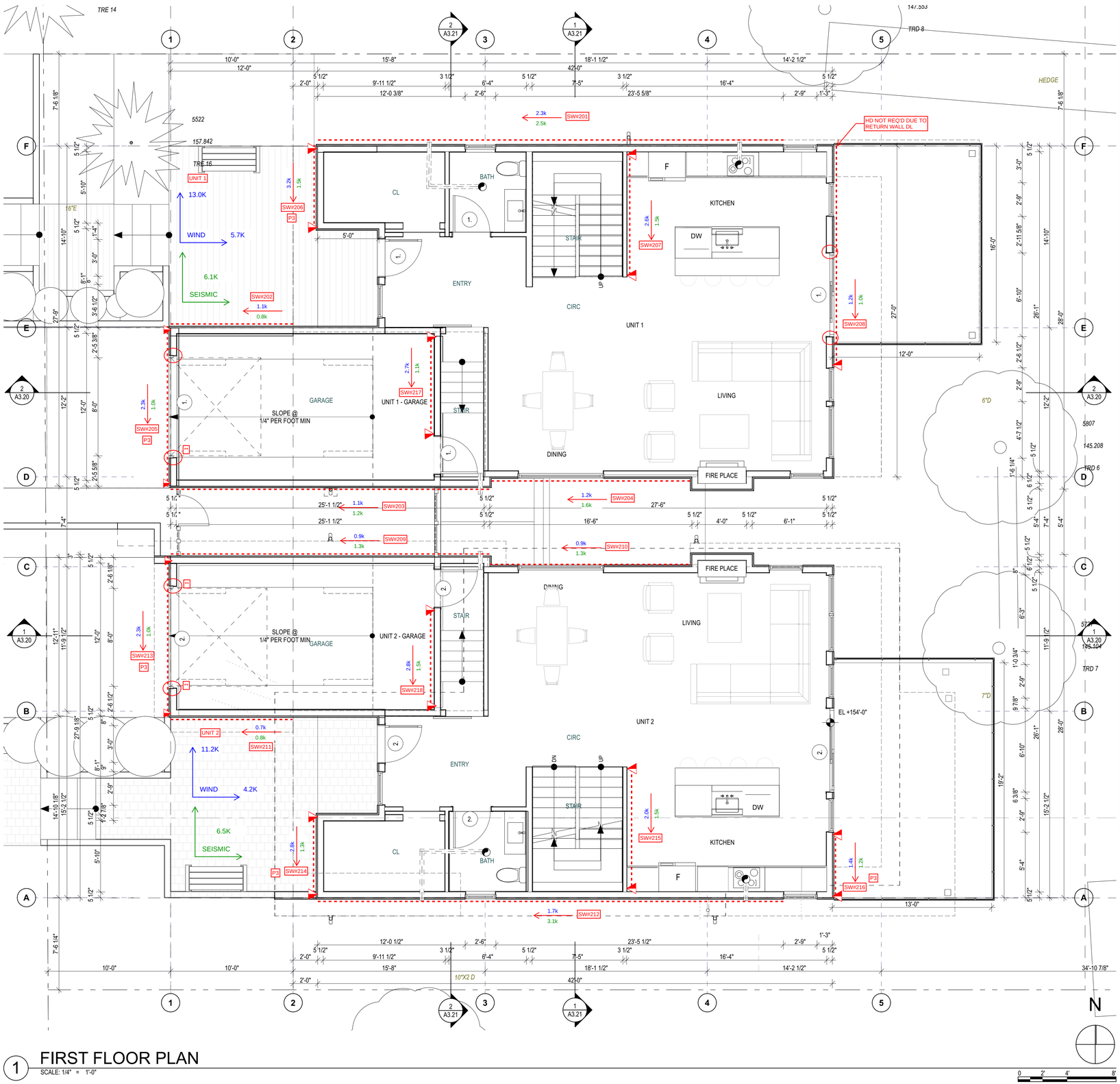

1 FIRST FLOOR PLAN

SCALE: 1/4" = 1'-0"

PLAN NOTES

1. PROPERTY LINE
2. ROOF/DECK ABOVE
3. PEDESTRIAN ACCESS
4. PROVIDE BICYCLE PARKING PER SMC 23.54.015.K. REFER TO A1.10 FOR SHORT-TERM AND LONG-TERM LOCATIONS AND COMPLIANCE CALCULATIONS.
5. STRUCTURE ABOVE, TYP.
6. STRUCTURE BELOW, TYP
7. PROVIDE WHOLE HOUSE EXHAUST FAN WITH A NOISE RATING OF SONE 1.0 OR LESS THAT MEETS THE REQUIREMENTS OF SRC M1505.4. SEE A0.00 WHOLE HOUSE VENTILATION NOTE.
8. PROVIDE ENVIRONMENTAL AIR EXHAUST OUTLETS AT FAN LOCATIONS. THEY SHALL BE PROVIDED A MIN OF 3 FEET FROM OPERABLE OPENINGS INTO THE BUILDING AND PROPERTY LINES PER SMC 501.3.
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11. PROVIDE HANDRAIL AT 34" - 38" ABOVE TREAD PER SRC R311.7.8.1, 1 1/4" MIN - 1 1/2" MAX GRASP DIMENSION PER SRC R311.7.8.5, 1 1/2" CLEARANCE BETWEEN WALL AND HANDRAIL PER SRC R311.7.8.3 AND CONTINUITY PER R311.7.8.4, TYP.
12. PROVIDE (2) 1-HOUR WALLS BETWEEN DWELLING UNITS PER SRC R302.2.3. SEE W50, W51, AND W56 ON SHEET A8.00
13. PROVIDE 6'-8" MIN VERTICAL CLEARANCE TO FINISH AT ALL STAIRS PER SRC R311.7.2, TYP.
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16. PROVIDE NON-COMBUSTIBLE STEEL CANOPY PROVIDED BY OTHERS OVER ENTRY DOOR FOR WEATHER PROTECTION, TYP. CANOPY TO PROJECT NO CLOSER THAN 3-FEET TO ANY PROPERTY LINE, PER SMC 23.45.518H.1. PAINT PER ELEVATIONS.
17. PROVIDE WOOD-FRAMED CANOPY PROJECTION ABOVE; TO PROJECT NO CLOSER THAN 3-FEET TO ANY PROPERTY LINE, PER SMC 23.45.518H.1. PAINT PER ELEVATIONS.
18. SIGHT TRIANGLE PER SMC 23.54.030.G
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X6.
X7. PROVIDE UNDER FLOOR VENT PER SRC R408. OPENING SHALL BE _" X _"
X8. PROVIDE 1'-6" X 2'-0" MIN CRAWL SPACE ACCESS HATCH PER SRC R408.4. PANEL TO ALIGN WITH FLOOR SUBSTRATE TO ALLOW FOR A SEAMLESS FLOOR FINISH.
X9. TREE PROTECTION AREA, REFER TO PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
X10. TREE DRIP LINE, REFER TO TREE PROTECTION PLAN, SHEET A1.10, PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
X11. PROPOSED DISTURBED AREA WITHIN TREE PROTECTION AREA, PER ARBORIST REPORT, SHEET A0.16.
X12. PLUMBING WASTE STACK
X13. RESTORE CURB CUT PER SDOT STANDARDS
X14. PROVIDE 10-FOOT NEW CURB CUT, PER SMC 23.54.030.F.1.B FOR DRIVEWAY ACCESS TO WOONERF AND UNIT PARKING
X15. HRV NOTE
X16.
X17. PROVIDE CANOPY, TYP., PER SMC 23.45.018.H
X18. ASSUMED PROPERTY LINE PER FUTURE UNIT LOT SUBDIVISION
X19. DUCTLESS HEAT PUMP CONDENSER

PLAN LEGEND

DOOR DESIGNATION 1.1

WINDOW DESIGNATION 1.1 — 3'-0" WINDOW WIDTH, 5'-0" WINDOW HEIGHT

XX / X.X DETAIL NUMBER / SHEET NUMBER

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 X 4 FRAMING

1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 x 6 FRAMING

CAST-IN-PLACE CONCRETE WALL

PROVIDE (1) LAYER 5/8" EXTERIOR GWB AT OVERHANG

PROVIDE CMU WALL

W/D WASHING/ DRYER MACHINE (COMBO)

W WASHING MACHINE

D CLOTHES DRYER

XX / X.X SECTION MARKER

HWH ON-DEMAND HOT WATER HEATER

SD SRC R314 AND SFC 907.2.10.2: SMOKE ALARMS SHALL BE INSTALLED IN THE FOLLOWING LOCATIONS;
1. IN EACH SLEEPING ROOM
2. OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS.
3. ON EACH ADDITIONAL STORY OF THE DWELLING INCLUDING BASEMENTS BUT NOT INCLUDING CRAWL SPACES.
4. PER SFC 907.2.10 AND SRC R314.3 SMOKE ALARMS SHALL BE: INSTALLED 20' MIN FROM KITCHEN APPLIANCES OR 10' MIN WITH AN ALARM-SILENCING SWITCH; 3' MIN FROM BATHROOM DOORS
5. SMOKE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

SD SW SMOKE ALARM WITH SWITCH, PER ITEM 4 ABOVE

HD HEAT DETECTOR/HEAT ALARM PER IRC R314.2.1. SHALL BE CONNECTED TO AN ALARM THAT IS INSTALLED IN THE DWELLING PER R314.4.1

FAN LOCATION (SRC TABLE M 1505.4.4(1) AND SMC TABLE 403.4.7)
1. AT BATHROOMS AND LAUNDRY, PROVIDE 50 CFM FAN W/ TIMER AT 0.25 W.G. OR GREATER
2. AT KITCHENS, PROVIDE 100 CFM FAN AT 0.25 W.G. OR GREATER
3. VENT ALL EXHAUST FANS TO THE OUTSIDE
4. EXHAUST DUCTS ARE TO BE CONST. OF SMOOTH BORE NONCOMBUSTIBLE MATERIAL AND ARE TO BE INSUL. AS REQUIRED PER WSEC.

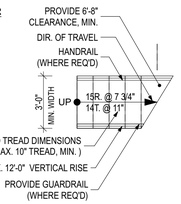
CO SRC R315 AND 2021 SFC 915: AN APPROVED CARBON MONOXIDE ALARM SHALL BE INSTALLED OUTSIDE OF EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS IN DWELLING UNITS AND ON EACH LEVEL OF THE DWELLING. SINGLE STATION CARBON MONOXIDE ALARMS SHALL BE LISTED AS COMPLYING WITH UL 2075.
SRC R315.5, CARBON MONOXIDE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.

FLOOR STEP DOWN

SOFFIT STEP DOWN

TYPICAL STAIR

PROVIDE MIN. 3'-0" LANDING WHERE OCCURS



Architect of Record

b9 architects
400 E Pine Street
Suite 215
Seattle, WA 98122
206.297.1284
www.b9architects.com

Project:
2424 74TH AVE SE

Location:
2424 74TH AVE SE
Mercer Island, WA 98040

SDCI Number:
####

Professional Stamp

Issue ID	Issue Name	Issue Date

City Stamp

First Floor Plan

A2.02

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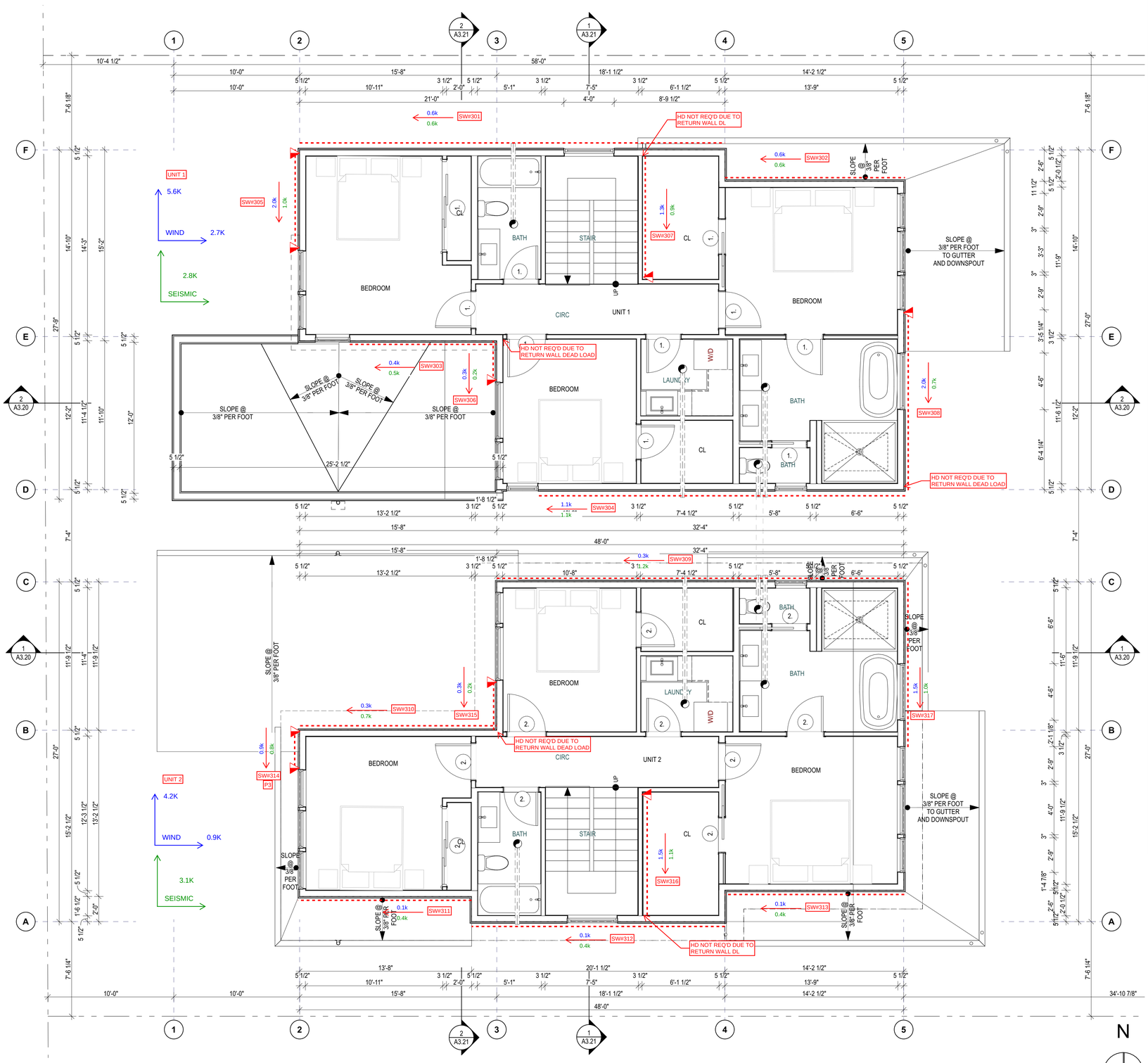

4 SECOND FLOOR PLAN

SCALE: 1/4" = 1'-0"

PLAN NOTES

1. PROPERTY LINE
2. ROOF/DECK ABOVE
3. PEDESTRIAN ACCESS
4. PROVIDE BICYCLE PARKING PER SMC 23.54.015.K. REFER TO A1.10 FOR SHORT-TERM AND LONG-TERM LOCATIONS AND COMPLIANCE CALCULATIONS.
5. STRUCTURE ABOVE, TYP
6. STRUCTURE BELOW, TYP
7. PROVIDE WHOLE HOUSE EXHAUST FAN WITH A NOISE RATING OF SONE 1.0 OR LESS THAT MEETS THE REQUIREMENTS OF SRC M1505.4. SEE A0.00 WHOLE HOUSE VENTILATION NOTE.
8. PROVIDE ENVIRONMENTAL AIR EXHAUST OUTLETS AT FAN LOCATIONS. THEY SHALL BE PROVIDED A MIN OF 3 FEET FROM OPERABLE OPENINGS INTO THE BUILDING AND PROPERTY LINES PER SMC 501.3.
9. PER SRC TABLE M1505.4.4, AT KITCHENS, PROVIDE 100 CFM LOCAL EXHAUST FAN AT 0.25 W.G. OR GREATER, TO RUN INTERMITTENTLY.
10. PROVIDE GUARDRAIL AT MIN 36" A.F.F. PER SRC R312.1.2. OPENINGS SHALL BE 4" MAX PER SRC R312.1.3, TYP. REFER TO STRUCTURAL DRAWINGS 11/S4.3 FOR CONNECTION DETAIL AT EXTERIOR ATTACHMENTS TO THE STRUCTURE. AT ALL EXTERIOR LOCATIONS PROVIDE CONNECTION THROUGH VERTICAL WALL SURFACE ONLY, DO NOT PROVIDE CONNECTION THROUGH ROOF MEMBRANE OR PARAPET CAP OR OTHER FLASHING AT TOP OF WALL.
11. PROVIDE HANDRAIL AT 34" - 38" ABOVE TREAD PER SRC R311.7.8.1, 1 1/4" MIN - 1 1/2" MAX GRASP DIMENSION PER SRC R311.7.8.5, 1 1/2" CLEARANCE BETWEEN WALL AND HANDRAIL PER SRC R311.7.8.3 AND CONTINUITY PER R311.7.8.4, TYP.
12. PROVIDE (2) 1-HOUR WALLS BETWEEN DWELLING UNITS PER SRC R302.2.3. SEE W50, W51, AND W56 ON SHEET A8.00
13. PROVIDE 6'-8" MIN VERTICAL CLEARANCE TO FINISH AT ALL STAIRS PER SRC R311.7.2, TYP.
14. PER SRC R302.7, PROVIDE MIN 1/2" GYPSUM BOARD BENEATH STAIR AT ACCESSIBLE SPACE, TYP.
15. PROVIDE (1) LAYER 5/8" EXTERIOR TYPE 'X' GWB AT OVERHANG, TYP FOR 1-HOUR PROTECTION.
16. PROVIDE NON-COMBUSTIBLE STEEL CANOPY PROVIDED BY OTHERS OVER ENTRY DOOR FOR WEATHER PROTECTION, TYP. CANOPY TO PROJECT NO CLOSER THAN 3-FEET TO ANY PROPERTY LINE, PER SMC
17. PROVIDE WOOD-FRAMED CANOPY PROJECTION ABOVE; TO PROJECT NO CLOSER THAN 3-FEET TO ANY PROPERTY LINE, PER SMC 23.45.518H.1. PAINT PER ELEVATIONS.
18. SIGHT TRIANGLE PER SMC 23.54.030.G
19. PROVIDE SHORING FOR EXCAVATION ADJACENT TO PROPERTY LINE, PER STRUCTURAL.
20. VEHICULAR ENTRY.
21. PROVIDE ROOF OVERHANG ABOVE, TYP, PER SMC 23.45.518.H
22. MIN 1/2" GYPSUM WALLBOARD WRAPPING WALLS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
23. TREE PROTECTION AREA, REFER TO PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
24. TREE DRIP LINE, REFER TO TREE PROTECTION PLAN, SHEET A1.10, PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16

X1.
X2. MIN 1/2" GYPSUM WALLBOARD WRAPPING POSTS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X3. MIN 1/2" GYPSUM WALLBOARD WRAPPING BEAMS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X4. MIN 1/2" GYPSUM WALLBOARD WRAPPING WALLS SUPPORTING GARAGE OR COMMON AREA PER SRC R302.6
X5. PROVIDE PLANTER, REFER TO L1 FOR PLANTING SCHEDULE.
X6.
X7. PROVIDE UNDER FLOOR VENT PER SRC R408. OPENING SHALL BE _" X _" _"
X8. PROVIDE 1'-6" X 2'-0" MIN CRAWL SPACE ACCESS HATCH PER SRC R408.4. PANEL TO ALIGN WITH FLOOR SUBSTRATE TO ALLOW FOR A SEAMLESS FLOOR FINISH.
X9. TREE PROTECTION AREA, REFER TO PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
X10. TREE DRIP LINE, REFER TO TREE PROTECTION PLAN, SHEET A1.10, PLOT PLAN, SHEET A1.10, AND ARBORIST REPORT, SHEET A0.16
X11. PROPOSED DISTURBED AREA WITHIN TREE PROTECTION AREA, PER ARBORIST REPORT, SHEET A0.16.
X12. PLUMBING WASTE STACK
X13. RESTORE CURB CUT PER SDOT STANDARDS
X14. PROVIDE 10-FOOT NEW CURB CUT, PER SMC 23.54.030.F.1.B FOR DRIVEWAY ACCESS TO WOONERF AND UNIT PARKING
X15. HRV NOTE
X16.
X17. PROVIDE CANOPY, TYP., PER SMC 23.45.018.H
X18. ASSUMED PROPERTY LINE PER FUTURE UNIT LOT SUBDIVISION
X19. DUCTLESS HEAT PUMP CONDENSER

PLAN LEGEND

- DOOR DESIGNATION (1.1)
- WINDOW DESIGNATION (1.1) 3'-0" WINDOW WIDTH, 5'-0" WINDOW HEIGHT
- XX / X.X DETAIL NUMBER / SHEET NUMBER
- 1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 X 4 FRAMING
- 1-HOUR FIRE-RESISTANCE RATED CONSTRUCTION 2 x 6 FRAMING
- CAST-IN-PLACE CONCRETE WALL
- PROVIDE (1) LAYER 5/8" EXTERIOR GWB AT OVERHANG
- PROVIDE CMU WALL
- W/D WASHING/ DRYER MACHINE (COMBO)
- W WASHING MACHINE
- D CLOTHES DRYER
- XX / X.X SECTION MARKER
- HWH ON-DEMAND HOT WATER HEATER
- SD SRC R314 AND SFC 907.2.10.2: SMOKE ALARMS SHALL BE INSTALLED IN THE FOLLOWING LOCATIONS;
  1. IN EACH SLEEPING ROOM
  2. OUTSIDE EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS.
  3. ON EACH ADDITIONAL STORY OF THE DWELLING INCLUDING BASEMENTS BUT NOT INCLUDING CRAWL SPACES.
  4. PER SFC 907.2.10 AND SRC R314.3 SMOKE ALARMS SHALL BE: INSTALLED 20' MIN FROM KITCHEN APPLIANCES OR 10' MIN WITH AN ALARM-SILENCING SWITCH; 3' MIN FROM BATHROOM DOORS
  5. SMOKE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.
- SD SW SMOKE ALARM WITH SWITCH, PER ITEM 4 ABOVE
- HD HEAT DETECTOR/HEAT ALARM PER IRC R314.2.1. SHALL BE CONNECTED TO AN ALARM THAT IS INSTALLED IN THE DWELLING PER R314.4.1
- FAN LOCATION (SRC TABLE M 1505.4.4(1) AND SMC TABLE 403.4.7)
  1. AT BATHROOMS AND LAUNDRY, PROVIDE 50 CFM FAN W/ TIMER AT 0.25 W.G. OR GREATER
  2. AT KITCHENS, PROVIDE 100 CFM FAN AT 0.25 W.G. OR GREATER
  3. VENT ALL EXHAUST FANS TO THE OUTSIDE
  4. EXHAUST DUCTS ARE TO BE CONST. OF SMOOTH BORE NONCOMBUSTIBLE MATERIAL AND ARE TO BE INSUL. AS REQUIRED PER WSEC.
- CO SRC R315 AND 2021 SFC 915: AN APPROVED CARBON MONOXIDE ALARM SHALL BE INSTALLED OUTSIDE OF EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS IN DWELLING UNITS AND ON EACH LEVEL OF THE DWELLING. SINGLE STATION CARBON MONOXIDE ALARMS SHALL BE LISTED AS COMPLYING WITH UL 2075.
  SRC R315.5, CARBON MONOXIDE ALARMS REQUIRED TO BE INSTALLED, HARDWIRED AND INTERCONNECTED, TYP.
- FLOOR STEP DOWN
- SOFFIT STEP DOWN

TYPICAL STAIR

PROVIDE MIN. 3'-0" LANDING WHERE OCCURS

PROVIDE 6'-8" CLEARANCE, MIN.
DIR. OF TRAVEL
HANDRAIL (WHERE REQ'D)
UP
15R. @ 7 3/4"
14T. @ 11"
3'-0" MIN. WIDTH

RISE AND TREAD DIMENSIONS (7 3/4" RISE, MAX. 10" TREAD, MIN.)
PROVIDE MAX. 12'-0" VERTICAL RISE
PROVIDE GUARDRAIL (WHERE REQ'D)

Architect of Record

b9 architects
400 E Pine Street
Suite 215
Seattle, WA 98122
206.297.1284
www.b9architects.com

Project:
2424 74TH AVE SE

Location:
2424 74TH AVE SE
Mercer Island, WA 98040

SDCI Number:
####

Professional Stamp

Issue ID	Issue Name	Issue Date

City Stamp

Second Floor Plan

A2.03

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MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 301: 3rd - Unit 1 - North Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_o	4.5	ft.		
Wall Length, L	33.8	ft.	Qualifying Wall Length, L	29.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
600 lbs	<	7136 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	210	plf	Overturning Moment	5.1	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	300	lbs	Resistive Moment	86.7	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 302: 3rd - Unit 1 - North Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	14.3	ft.	Qualifying Wall Length, L	14.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
600 lbs	<	3418 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	210	plf	Overturning Moment	5.1	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	300	lbs	Resistive Moment	17.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 303: 3rd - Unit 1 - Wall at Garage

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	11.7	ft.	Qualifying Wall Length, L	11.7	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
500 lbs	<	2806 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	180	plf	Overturning Moment	4.3	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	8.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 304: 3rd - Unit 1 - South Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	3.0	ft.		
Wall Length, L	29.0	ft.	Qualifying Wall Length, L	26.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1100 lbs	<	6356 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	230	plf	Overturning Moment	9.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	64.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 305: 3rd - Unit 1 - Front Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	8.0	ft.	Qualifying Wall Length, L	8.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	1919 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	100	plf	Overturning Moment	8.5	k-ft	Hold Down Design Load	796	lbs
DL at ends of wall	0	lbs	Resistive Moment	2.1	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 306: 3rd - Unit 1 - Front Wall at Garage

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	3.3	ft.	Qualifying Wall Length, L	3.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
200 lbs	<	735 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	110	plf	Overturning Moment	1.7	k-ft	Hold Down Design Load	394	lbs
DL at ends of wall	0	lbs	Resistive Moment	0.4	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 307: 3rd - Unit 1 - Int Wall at Stairs

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	9.8	ft.	Qualifying Wall Length, L	9.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
900 lbs	<	2351 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	100	plf	Overturning Moment	7.7	k-ft	Hold Down Design Load	188	lbs
DL at ends of wall	400	lbs	Resistive Moment	5.8	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 308: 3rd - Unit 1 - Rear Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	6.0	ft.		
Wall Length, L	14.3	ft.	Qualifying Wall Length, L	9.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
700 lbs	<	2351 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	100	plf	Overturning Moment	6.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	6.8	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 309: 3rd - Unit 2 - North Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	4.0	ft.		
Wall Length, L	32.3	ft.	Qualifying Wall Length, L	29.9	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1200 lbs	<	7172 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	240	plf	Overturning Moment	10.2	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	92.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 310: 3rd - Unit 2 - North Wall @ Garage

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	15.7	ft.	Qualifying Wall Length, L	15.7	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
700 lbs	<	3766 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	170	plf	Overturning Moment	6.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	18.1	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 311: 3rd - Unit 2 - South Wall @ Bedroom

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	13.7	ft.	Qualifying Wall Length, L	13.7	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
400 lbs	<	3286 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	170	plf	Overturning Moment	3.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	300	lbs	Resistive Moment	13.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 312: 3rd - Unit 2 - South Wall @ Stair

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	4.5	ft.		
Wall Length, L	20.1	ft.	Qualifying Wall Length, L	16.1	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
400 lbs	<	3862 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	240	plf	Overturning Moment	3.4	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	300	lbs	Resistive Moment	36.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 300-25003
ENGINEER: MPM

SHEARWALL 313: 3RD - UNIT 2 - SOUTH WALL @ BEDROOM

SHEARWALL PROPERTIES:

WALL HEIGHT, H	8.5	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	14.3	FT.	QUALIFYING WALL LENGTH, L	14.3	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
400 LBS	<	3418 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	220	PLF	OVERTURNING MOMENT	3.4	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	300	LBS	RESISTIVE MOMENT	17.7	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 314: 3RD - UNIT 2 - FRONT WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	8.5	FT.	MAX WALL OPENING HT, Hc	0.0	FT.		
WALL LENGTH, L	3.1	FT.	QUALIFYING WALL LENGTH, L	3.1	FT.	SHEARWALL ASSEMBLY	P3

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
800 LBS	<	1266 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	100	PLF	OVERTURNING MOMENT	6.8	K-FT	HOLD DOWN DESIGN LOAD	2090	LBS
DL AT ENDS OF WALL	0	LBS	RESISTIVE MOMENT	0.3	K-FT	HOLDOWN CAPACITY	2655	LBS

HOLD-DOWN SPECIFICATION

SIMPSON MSTC40 STRAP TIE (12" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 315: 3rd - Unit 2 - Front Wall @ Garage

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	4.0	ft.	Qualifying Wall Length, L	4.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
200 lbs	<	944 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	110	plf	Overturning Moment	1.7	k-ft	Hold Down Design Load	278	lbs
DL at ends of wall	0	lbs	Resistive Moment	0.6	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

Shearwall 316: 3rd - Unit 2 - Int Stair Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	9.8	ft.	Qualifying Wall Length, L	9.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1100 lbs	<	2351 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	100	plf	Overturning Moment	9.4	k-ft	Hold Down Design Load	628	lbs
DL at ends of wall	0	lbs	Resistive Moment	3.2	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 317: 3rd - Unit 2 - Rear Wall

Shearwall Properties:

Wall height, H	8.5	ft.	Max wall opening ht, H_c	6.0	ft.		
Wall Length, L	13.1	ft.	Qualifying Wall Length, L	8.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	1979 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	100	plf	Overturning Moment	8.5	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	640	lbs	Resistive Moment	11.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 201: 2nd - Unit 1 - North Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	4.5	ft.		
Wall Length, L	38.0	ft.	Qualifying Wall Length, L	35.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2500 lbs	<	8515 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	350	plf	Overturning Moment	24.2	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	168.3	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 202: 2nd - Unit 1 - Garage North Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	10.0	ft.	Qualifying Wall Length, L	10.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
800 lbs	<	2399 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	170	plf	Overturning Moment	7.7	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	440	lbs	Resistive Moment	8.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 203: 2nd - Unit 1 - Garage South Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	26.0	ft.	Qualifying Wall Length, L	26.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1200 lbs	<	6236 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	170	plf	Overturning Moment	11.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	45.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 204: 2nd - Unit 1 - Dining Room South Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, H_c	4.0	ft.		
Wall Length, L	16.5	ft.	Qualifying Wall Length, L	9.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1600 lbs	<	2279 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	460	plf	Overturning Moment	15.5	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	41.7	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 205: 2nd - Unit 1 - Garage Front Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	7.0	ft.		
Wall Length, L	12.9	ft.	Qualifying Wall Length, L	5.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	1033 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	100	plf	Overturning Moment	9.7	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	780	lbs	Resistive Moment	12.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 206: 2nd - Unit 1 - Front Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	6.8	ft.	Qualifying Wall Length, L	6.8	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1500 lbs	<	1619 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	100	plf	Overturning Moment	14.5	k-ft	Hold Down Design Load	1378	lbs
DL at ends of wall	820	lbs	Resistive Moment	5.2	k-ft	Holdown Capacity	3695	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 207: 2nd - Unit 1 - Int Wall at Stairs

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	10.3	ft.	Qualifying Wall Length, L	10.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1500 lbs	<	2459 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	200	plf	Overturning Moment	22.5	k-ft	Hold Down Design Load	1513	lbs
DL at ends of wall	0	lbs	Resistive Moment	7.0	k-ft	Holdown Capacity	1705	lbs

Hold-down Specification

SIMPSON CS16 STRAP TIE (14" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 208: 2nd - Unit 1 - Rear Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, H_c	8.0	ft.		
Wall Length, L	18.1	ft.	Qualifying Wall Length, L	8.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	1841 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	110	plf	Overturning Moment	9.7	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	12.0	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 209: 2nd - Unit 2 - North Garage Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	26.0	ft.	Qualifying Wall Length, L	26.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1300 lbs	<	6236 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	170	plf	Overturning Moment	12.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	45.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 210: 2nd - Unit 2 - North Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, H_c	4.0	ft.		
Wall Length, L	16.5	ft.	Qualifying Wall Length, L	9.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1300 lbs	<	2279 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	420	plf	Overturning Moment	12.6	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	400	lbs	Resistive Moment	42.5	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 211: 2nd - Unit 2 - Garage South Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	10.0	ft.	Qualifying Wall Length, L	10.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
800 lbs	<	2399 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	170	plf	Overturning Moment	7.7	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	440	lbs	Resistive Moment	8.6	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 212: 2nd - Unit 2 - South Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, H_c	4.5	ft.		
Wall Length, L	38.0	ft.	Qualifying Wall Length, L	35.5	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
3100 lbs	<	8515 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	200	plf	Overturning Moment	30.0	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	0	lbs	Resistive Moment	96.2	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

Shearwall 213: 2nd - Unit 2 - Garage Front Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, Hc	7.0	ft.		
Wall Length, L	12.9	ft.	Qualifying Wall Length, L	5.0	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1000 lbs	<	1033 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	100	plf	Overturning Moment	9.7	k-ft	Hold Down Design Load	0	lbs
DL at ends of wall	680	lbs	Resistive Moment	11.4	k-ft	Holdown Capacity	0	lbs

Hold-down Specification

No Holdown Required

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 300-25003
ENGINEER: MPM

SHEARWALL 214: 2ND - UNIT 2 - FRONT WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	9.7	FT.	MAX WALL OPENING HT, H_c	0.0	FT.		
WALL LENGTH, L	6.8	FT.	QUALIFYING WALL LENGTH, L	6.8	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1300 LBS	<	1619 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	100	PLF	OVERTURNING MOMENT	12.6	K-FT	HOLD DOWN DESIGN LOAD	1371	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	3.3	K-FT	HOLDOWN CAPACITY	3695	LBS

HOLD-DOWN SPECIFICATION

SIMPSON STHD14RJ HOLDOWN

SHEARWALL 215: 2ND - UNIT 2 - INT STAIR WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	9.7	FT.	MAX WALL OPENING HT, Hc	0.0	FT.		
WALL LENGTH, L	10.2	FT.	QUALIFYING WALL LENGTH, L	10.2	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1500 LBS	<	2447 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	200	PLF	OVERTURNING MOMENT	24.2	K-FT	HOLD DOWN DESIGN LOAD	1697	LBS
DL AT ENDS OF WALL	0	LBS	RESISTIVE MOMENT	6.9	K-FT	HOLDOWN CAPACITY	2655	LBS

HOLD-DOWN SPECIFICATION

SIMPSON MSTC40 STRAP TIE (12" END LENGTH)

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 216: 2nd - Unit 2 - Rear Wall

Shearwall Properties:

Wall height, H	9.7	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	5.3	ft.	Qualifying Wall Length, L	5.3	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1200 lbs	<	1278 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	150	plf	Overturning Moment	11.6	k-ft	Hold Down Design Load	1911	lbs
DL at ends of wall	0	lbs	Resistive Moment	1.4	k-ft	Holdown Capacity	2655	lbs

Hold-down Specification

SIMPSON MSTC40 STRAP TIE (12" END LENGTH)

Shearwall 217: 2nd - Unit 1 - Int Garage Wall

Shearwall Properties:

Wall height, H	8.3	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	8.4	ft.	Qualifying Wall Length, L	8.4	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1100 lbs	<	2015 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	110	plf	Overturning Moment	9.2	k-ft	Hold Down Design Load	783	lbs
DL at ends of wall	0	lbs	Resistive Moment	2.6	k-ft	Holdown Capacity	3695	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

Shearwall Design Summary

M+K Project #: 300-25003
Engineer: MPM

Shearwall 218: 2nd - Unit 2 - Int Garage Wall

Shearwall Properties:

Wall height, H	8.3	ft.	Max wall opening ht, H_c	0.0	ft.		
Wall Length, L	8.4	ft.	Qualifying Wall Length, L	8.4	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
1500 lbs	<	2015 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	110	plf	Overturning Moment	12.5	k-ft	Hold Down Design Load	1180	lbs
DL at ends of wall	0	lbs	Resistive Moment	2.6	k-ft	Holdown Capacity	3695	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

Shearwall 101: 1st - Unit 1 - Int Wall at Stairs

Shearwall Properties:

Wall height, H	9.0	ft.	Max wall opening ht, Hc	0.0	ft.		
Wall Length, L	9.6	ft.	Qualifying Wall Length, L	9.6	ft.	Shearwall Assembly	P1

Capacity Evaluation:

Total Shear load on Wall		Allowable Shearwall Capacity
2100 lbs	<	2303 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	300	plf	Overturning Moment	40.0	k-ft	Hold Down Design Load	2673	lbs
DL at ends of wall	800	lbs	Resistive Moment	14.3	k-ft	Holdown Capacity	3695	lbs

Hold-down Specification

SIMPSON STHD14RJ HOLDOWN

MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

SHEARWALL DESIGN SUMMARY

M+K PROJECT #: 300-25003
ENGINEER: MPM

SHEARWALL 102: 1ST - UNIT 1 - REAR WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	9.0	FT.	MAX WALL OPENING HT, H_c	8.0	FT.		
WALL LENGTH, L	18.1	FT.	QUALIFYING WALL LENGTH, L	8.5	FT.	SHEARWALL ASSEMBLY	P1

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
1300 LBS	<	1841 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	260	PLF	OVERTURNING MOMENT	21.4	K-FT	HOLD DOWN DESIGN LOAD	0	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	33.2	K-FT	HOLDOWN CAPACITY	0	LBS

HOLD-DOWN SPECIFICATION

NO HOLDOWN REQUIRED

SHEARWALL 103: 1ST - UNIT 2 - INT STAIR WALL

SHEARWALL PROPERTIES:

WALL HEIGHT, H	9.0	FT.	MAX WALL OPENING HT, Hc	0.0	FT.		
WALL LENGTH, L	9.6	FT.	QUALIFYING WALL LENGTH, L	9.6	FT.	SHEARWALL ASSEMBLY	P3

CAPACITY EVALUATION:

TOTAL SHEAR LOAD ON WALL		ALLOWABLE SHEARWALL CAPACITY
2700 LBS	<	4321 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	300	PLF	OVERTURNING MOMENT	47.1	K-FT	HOLD DOWN DESIGN LOAD	3682	LBS
DL AT ENDS OF WALL	400	LBS	RESISTIVE MOMENT	11.8	K-FT	HOLDOWN CAPACITY	3695	LBS

HOLD-DOWN SPECIFICATION

SIMPSON STHD14RJ HOLDOWN

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 5'-4" Max Unbalanced Fill (Site Wall)

Code Reference

Calculations per IBC 2021, ACI 318-19, TMS 402-16

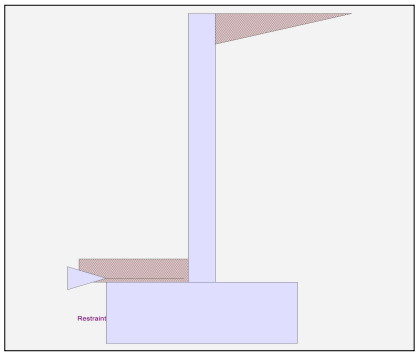
HELICAL PILES RESISTING LATERAL BEARING PRESSURE

Criteria

Retained Height	=	5.83 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Earth Pressure Seismic Load

Method : Uniform

Multiplier Used (Multiplier used on soil density)	=	7.000
Uniform Seismic Force	=	50.143
Total Seismic Force	=	359.193

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 5'-4" Max Unbalanced Fill (Site Wall)

Design Summary

Wall Stability Ratios

Overturning	=	2.00	OK
Slab Resists All Sliding !			
Global Stability	=	2.26	

Total Bearing Load	=	2,578	lbs
...resultant ecc.	=	6.85	in
Eccentricity within middle third			
Soil Pressure @ Toe	=	1,457	psf OK
Soil Pressure @ Heel	=	16	psf OK
Allowable	=	2,000	psf
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,727	psf
ACI Factored @ Heel	=	19	psf
Footing Shear @ Toe	=	3.5	psi OK
Footing Shear @ Heel	=	9.4	psi OK
Allowable	=	75.0	psi

Sliding Calcs

Lateral Sliding Force	=	1,149.4	lbs

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

Load Factors

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

Stem Construction

		Bottom			
		Stem OK			
Design Height Above Ftg	ft =	0.00			
Wall Material Above "Ht"	=	Concrete			
Design Method	=	SD	SD	SD	SD
Thickness	=	6.00			
Rebar Size	=	# 5			
Rebar Spacing	=	16.00			
Rebar Placed at	=	Edge			

Design Data

fb/FB + fa/Fa	=	**0.659**
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	1,244.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	2,701.6
Moment.....Allowable	=	4,094.1
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	24.8
Shear.....Allowable	psi =	50.0
Anet (Masonry)	in2 =	
Wall Weight	psf =	75.0
Rebar Depth 'd'	in =	4.19

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

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

Cantilevered Retaining Wall

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.25.06.05 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC, LLC 1982-2025

DESCRIPTION: 5'-4" Max Unbalanced Fill (Site Wall)

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1552 in2/ft		
0.0018bh : 0.0018(12)(6) :	0.1296 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1552 in2/ft	#4@ 18.52 in	#4@ 37.04 in
Provided Area :	0.2325 in2/ft	#5@ 28.70 in	#5@ 57.41 in
Maximum Area :	0.5673 in2/ft	#6@ 40.74 in	#6@ 81.48 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	2.00
Total Footing Width	=	3.50
Footing Thickness	=	16.00 in

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	1,727	19	psf
Mu' : Upward	=	1,668	296	ft-#
Mu' : Downward	=	344	2,087	ft-#
Mu: Design	=	1,324	1,792	ft-#
φ Mn	=	4,900	4,900	ft-#
Actual 1-Way Shear	=	3.51	9.35	psi
Allow 1-Way Shear	=	40.00	40.00	psi

Toe Reinforcing = None Spec'd
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, φ Tn = 0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: phiMn = phi*5*lambda*sqrt(fc)*Sm

Heel: phiMn = phi*5*lambda*sqrt(fc)*Sm

Key: No key defined

Min footing T&S reinf Area 1.21 in2
Min footing T&S reinf Area per foot 0.35 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 6.94 in	#4@ 13.89 in
#5@ 10.76 in	#5@ 21.53 in
#6@ 15.28 in	#6@ 30.56 in

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 6'-6" Max Unbalanced Fill

Code References

Calculations per IBC 2021, ACI 318-19, TMS 402-16

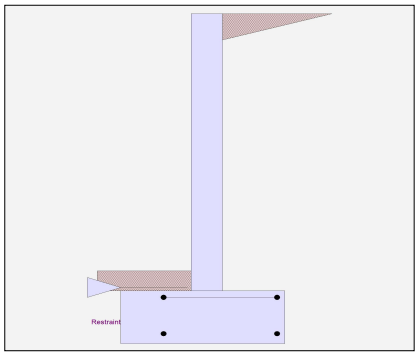
HELICAL PILES RESISTING LATERAL BEARING PRESSURE

Criteria

Retained Height	=	7.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	42.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 6'-6" Max Unbalanced Fill

Design Summary

Wall Stability Ratios

Overturning	=	1.85	OK
Slab Resists All Sliding !			
Global Stability	=	1.46	

Total Bearing Load	=	3,080 lbs	
...resultant ecc.	=	7.65 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,846 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	4,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,105 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	4.5 psi	OK
Footing Shear @ Heel	=	12.6 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	1,458.3 lbs	

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

Load Factors

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

Stem Construction

		Bottom		
		Stem OK		
Design Height Above Ftg	ft =	0.00		
Wall Material Above "Ht"	=	Concrete		
Design Method	=	SD	SD	SD
Thickness	=	8.00		
Rebar Size	=	# 5		
Rebar Spacing	=	16.00		
Rebar Placed at	=	Edge		
Design Data				
fb/FB + fa/Fa	=	**0.620**		
Total Force @ Section				
Service Level	lbs =			
Strength Level	lbs =	1,646.4		
Moment....Actual				
Service Level	ft-# =			
Strength Level	ft-# =	3,841.6		
Moment.....Allowable	=	6,186.6		
Shear.....Actual				
Service Level	psi =			
Strength Level	psi =	22.2		
Shear.....Allowable	psi =	43.9		
Anet (Masonry)	in2 =			
Wall Weight	psf =	100.0		
Rebar Depth 'd'	in =	6.19		

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

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

DESCRIPTION: 6'-6" Max Unbalanced Fill

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1455 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@ 13.89 in	#4@ 27.78 in
Provided Area :	0.2325 in2/ft	#5@ 21.53 in	#5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in	#6@ 61.11 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	2.00
Total Footing Width	=	3.50
Footing Thickness	=	16.00 in

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	2,105	0	psf
Mu' : Upward	=	2,014	169	ft-#
Mu' : Downward	=	344	2,252	ft-#
Mu: Design	=	1,669	2,084	ft-#
φ Mn	=	4,900	27,496	ft-#
Actual 1-Way Shear	=	4.45	12.55	psi
Allow 1-Way Shear	=	40.00	42.44	psi

Toe Reinforcing = None Spec'd
Heel Reinforcing = # 5 @ 8.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, φ Tn = 0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: phiMn = phi*5*lambda*sqrt(fc)*Sm

Heel: #4@ 6.94 in, #5@ 10.76 in, #6@ 15.27 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Key: No key defined

Min footing T&S reinf Area 1.21 in2
Min footing T&S reinf Area per foot 0.35 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 6.94 in	#4@ 13.89 in
#5@ 10.76 in	#5@ 21.53 in
#6@ 15.28 in	#6@ 30.56 in

Cantilevered Retaining Wall

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.25.06.05 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC, LLC 1982-2025

DESCRIPTION: 6'-6" Max Unbalanced Fill (w/ Seismic)

Code References

Calculations per IBC 2021, ACI 318-19, TMS 402-16

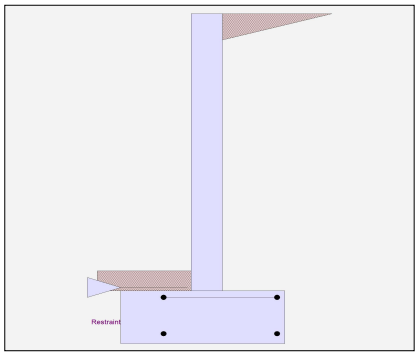
HELICAL PILES RESISTING LATERAL BEARING PRESSURE

Criteria

Retained Height	=	7.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	5,333.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	42.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Earth Pressure Seismic Load

Method : Uniform

Multiplier Used (Multiplier used on soil density)	=	8.000
Uniform Seismic Force	=	66.667
Total Seismic Force	=	555.556

Cantilevered Retaining Wall

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.25.06.05 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC, LLC 1982-2025

DESCRIPTION: 6'-6" Max Unbalanced Fill (w/ Seismic)

Design Summary

1.1 FOR SEISMIC LOADING

Wall Stability Ratios

Overturning	=	1.32	Ratio < 1.5!
Slab Resists All Sliding !			
Global Stability	=	1.46	

Total Bearing Load	=	3,080 lbs	
...resultant ecc.	=	13.97 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	3,503 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	5,333 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	3,995 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	8.6 psi	OK
Footing Shear @ Heel	=	15.2 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	1,847.2 lbs

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

Load Factors

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

Stem Construction

		Bottom		
		Stem OK		
Design Height Above Ftg	ft =	0.00		
Wall Material Above "Ht"	=	Concrete		
Design Method	=	SD	SD	SD
Thickness	=	8.00		
Rebar Size	=	# 5		
Rebar Spacing	=	16.00		
Rebar Placed at	=	Edge		
Design Data				
fb/FB + fa/Fa	=	**0.884**		
Total Force @ Section				
Service Level	lbs =			
Strength Level	lbs =	2,113.1		
Moment....Actual				
Service Level	ft-# =			
Strength Level	ft-# =	5,474.9		
Moment.....Allowable	=	6,186.6		
Shear.....Actual				
Service Level	psi =			
Strength Level	psi =	28.5		
Shear.....Allowable	psi =	43.9		
Anet (Masonry)	in2 =			
Wall Weight	psf =	100.0		
Rebar Depth 'd'	in =	6.19		

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

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

DESCRIPTION: 6'-6" Max Unbalanced Fill (w/ Seismic)

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.2073 in2/ft		
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.2073 in2/ft	#4@ 13.89 in	#4@ 27.78 in
Provided Area :	0.2325 in2/ft	#5@ 21.53 in	#5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in	#6@ 61.11 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	2.00
Total Footing Width	=	3.50
Footing Thickness	=	16.00 in

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	3,995	0	psf
Mu' : Upward	=	3,217	0	ft-#
Mu' : Downward	=	344	2,252	ft-#
Mu: Design	=	2,872	2,252	ft-#
φ Mn	=	4,900	27,496	ft-#
Actual 1-Way Shear	=	8.58	15.22	psi
Allow 1-Way Shear	=	40.00	42.44	psi

Toe Reinforcing = None Spec'd
Heel Reinforcing = # 5 @ 8.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, φ Tn = 0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: phiMn = phi*5*lambda*sqrt(fc)*Sm

Heel: #4@ 6.94 in, #5@ 10.76 in, #6@ 15.27 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Key: No key defined

Min footing T&S reinf Area 1.21 in2
Min footing T&S reinf Area per foot 0.35 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 6.94 in	#4@ 13.89 in
#5@ 10.76 in	#5@ 21.53 in
#6@ 15.28 in	#6@ 30.56 in

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 8'-6" Max Unbalanced Fill

Code Reference

Calculations per IBC 2021, ACI 318-19, TMS 402-16

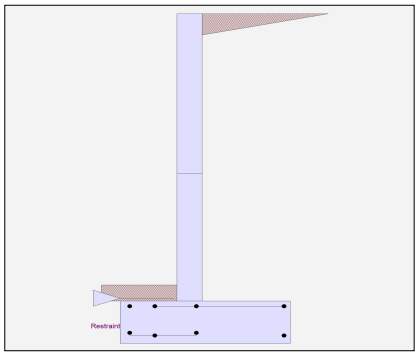
HELICAL PILES RESISTING LATERAL BEARING PRESSURE

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	42.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 8'-6" Max Unbalanced Fill

Design Summary

Wall Stability Ratios

Overturning	=	1.99	OK
Slab Resists All Sliding !			
Global Stability	=	1.40	
Total Bearing Load	=	5,070 lbs	
...resultant ecc.	=	8.86 in	
Eccentricity within middle third			
Soil Pressure @ Toe	=	2,236 psf	OK
Soil Pressure @ Heel	=	17 psf	OK
Allowable	=	4,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,589 psf	
ACI Factored @ Heel	=	20 psf	
Footing Shear @ Toe	=	6.5 psi	OK
Footing Shear @ Heel	=	19.4 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	2,242.3 lbs

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

Load Factors

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

Stem Construction

		2nd	Bottom		
		Stem OK	Stem OK		
Design Height Above Ftg	ft =	4.00	0.00		
Wall Material Above "Ht"	=	Concrete	Concrete		
Design Method	=	SD	SD	SD	SD
Thickness	=	8.00	8.00		
Rebar Size	=	# 5	# 5		
Rebar Spacing	=	16.00	8.00		
Rebar Placed at	=	Edge	Edge		
Design Data					
fb/FB + fa/Fa	=	**0.226**	**0.691**		
Total Force @ Section					
Service Level	lbs =				
Strength Level	lbs =	840.0	2,721.6		
Moment....Actual					
Service Level	ft-# =				
Strength Level	ft-# =	1,400.0	8,164.8		
Moment.....Allowable	ft-# =	6,186.6	11,799.2		
Shear.....Actual					
Service Level	psi =				
Strength Level	psi =	11.3	36.7		
Shear.....Allowable	psi =	43.9	55.3		
Anet (Masonry)	in2 =				
Wall Weight	psf =	100.0	100.0		
Rebar Depth 'd'	in =	6.19	6.19		

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

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

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 8'-6" Max Unbalanced Fill

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.053 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@ 13.89 in	#4@ 27.78 in
Provided Area :	0.2325 in2/ft	#5@ 21.53 in	#5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in	#6@ 61.11 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.3092 in2/ft		
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.3092 in2/ft	#4@ 13.89 in	#4@ 27.78 in
Provided Area :	0.465 in2/ft	#5@ 21.53 in	#5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in	#6@ 61.11 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	3.00
Total Footing Width	=	4.50
Footing Thickness	=	16.00 in

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	2,589	20	psf
Mu' : Upward	=	2,592	1,262	ft-#
Mu' : Downward	=	344	7,163	ft-#
Mu: Design	=	2,247	5,901	ft-#
φ Mn	=	25,404	27,496	ft-#
Actual 1-Way Shear	=	6.51	19.36	psi
Allow 1-Way Shear	=	43.53	42.44	psi

Toe Reinforcing = # 5 @ 8.00 in
Heel Reinforcing = # 5 @ 8.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, φ Tn = 0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 6.94 in, #5@ 10.76 in, #6@ 15.27 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Heel: #4@ 6.94 in, #5@ 10.76 in, #6@ 15.27 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Key: No key defined

Min footing T&S reinf Area 1.56 in2
Min footing T&S reinf Area per foot 0.35 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 6.94 in	#4@ 13.89 in
#5@ 10.76 in	#5@ 21.53 in
#6@ 15.28 in	#6@ 30.56 in

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 8'-6" Max Unbalanced Fill (w/ Seismic)

Code Reference

Calculations per IBC 2021, ACI 318-19, TMS 402-16

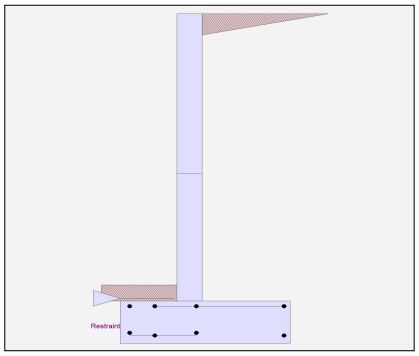
HELICAL PILES RESISTING LATERAL BEARING PRESSURE

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	5,333.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	42.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 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 (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		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	=	82.667
Total Seismic Force	=	854.222

Cantilevered Retaining Wall

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.25.06.05 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC, LLC 1982-2025

DESCRIPTION: 8'-6" Max Unbalanced Fill (w/ Seismic)

Design Summary

1.1 FOR SEISMIC LOADING

Wall Stability Ratios

Overturning	=	1.42	Ratio < 1.5!
Slab Resists All Sliding !			
Global Stability	=	1.40	
Total Bearing Load	=	5,070 lbs	
...resultant ecc.	=	16.18 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	3,748 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	5,333 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	4,339 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	11.1 psi	OK
Footing Shear @ Heel	=	27.8 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	2,840.3 lbs

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

Load Factors

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

Stem Construction

		2nd	Bottom		
		Stem OK	Stem OK		
Design Height Above Ftg	ft =	4.00	0.00		
Wall Material Above "Ht"	=	Concrete	Concrete		
Design Method	=	SD	SD	SD	SD
Thickness	=	8.00	8.00		
Rebar Size	=	# 5	# 5		
Rebar Spacing	=	16.00	8.00		
Rebar Placed at	=	Edge	Edge		
Design Data					
fb/FB + fa/Fa	=	**0.393**	**0.975**		
Total Force @ Section					
Service Level	lbs =				
Strength Level	lbs =	1,253.3	3,465.6		
Moment....Actual					
Service Level	ft-# =				
Strength Level	ft-# =	2,433.3	11,512.8		
Moment.....Allowable	ft-# =	6,186.6	11,799.2		
Shear.....Actual					
Service Level	psi =				
Strength Level	psi =	16.9	46.7		
Shear.....Allowable	psi =	43.9	55.3		
Anet (Masonry)	in2 =				
Wall Weight	psf =	100.0	100.0		
Rebar Depth 'd'	in =	6.19	6.19		

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

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

DESCRIPTION: 8'-6" Max Unbalanced Fill (w/ Seismic)

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0921 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@ 13.89 in	#4@ 27.78 in
Provided Area :	0.2325 in2/ft	#5@ 21.53 in	#5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in	#6@ 61.11 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.4359 in2/ft		
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.4359 in2/ft	#4@ 13.89 in	#4@ 27.78 in
Provided Area :	0.465 in2/ft	#5@ 21.53 in	#5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in	#6@ 61.11 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	3.00
Total Footing Width	=	4.50
Footing Thickness	=	16.00 in

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	4,339	0	psf
Mu' : Upward	=	3,979	42	ft-#
Mu' : Downward	=	344	7,163	ft-#
Mu: Design	=	3,635	7,122	ft-#
φ Mn	=	25,404	27,496	ft-#
Actual 1-Way Shear	=	11.13	27.80	psi
Allow 1-Way Shear	=	43.53	42.44	psi

Toe Reinforcing = # 5 @ 8.00 in
Heel Reinforcing = # 5 @ 8.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, φ Tn = 0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 6.94 in, #5@ 10.76 in, #6@ 15.27 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Heel: #4@ 6.94 in, #5@ 10.76 in, #6@ 15.27 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Key: No key defined

Min footing T&S reinf Area 1.56 in2
Min footing T&S reinf Area per foot 0.35 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 6.94 in	#4@ 13.89 in
#5@ 10.76 in	#5@ 21.53 in
#6@ 15.28 in	#6@ 30.56 in

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 10' Max Unbalanced Fill

Code References

Calculations per IBC 2021, ACI 318-19, TMS 402-16

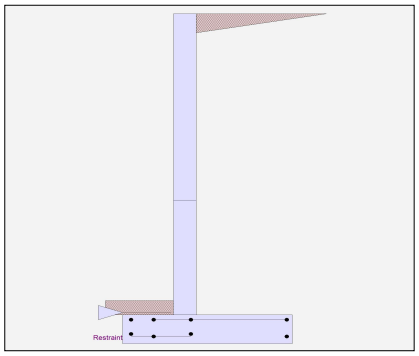
HELICAL PILES RESISTING LATERAL BEARING PRESSURE

Criteria

Retained Height	=	10.50 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	42.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 10' Max Unbalanced Fill

Design Summary

Wall Stability Ratios

Overturning	=	1.97	OK
Slab Resists All Sliding !			
Global Stability	=	1.25	

Total Bearing Load	=	6,242	lbs
...resultant ecc.	=	10.05	in
Eccentricity outside middle third			
Soil Pressure @ Toe	=	2,503	psf OK
Soil Pressure @ Heel	=	0	psf OK
Allowable	=	4,000	psf
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,894	psf
ACI Factored @ Heel	=	0	psf
Footing Shear @ Toe	=	18.6	psi OK
Footing Shear @ Heel	=	33.9	psi OK
Allowable	=	75.0	psi

Sliding Calcs

Lateral Sliding Force	=	2,777.3	lbs

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

Load Factors

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

Stem Construction

		2nd	Bottom		
		Stem OK	Stem OK		
Design Height Above Ftg	ft =	4.00	0.00		
Wall Material Above "Ht"	=	Concrete	Concrete		
Design Method	=	SD	SD	SD	SD
Thickness	=	8.00	8.00		
Rebar Size	=	# 5	# 5		
Rebar Spacing	=	12.00	6.00		
Rebar Placed at	=	Edge	Edge		
Design Data					
fb/FB + fa/Fa	=	**0.378**	**0.851**		
Total Force @ Section					
Service Level	lbs =				
Strength Level	lbs =	1,419.6	3,704.4		
Moment....Actual					
Service Level	ft-# =				
Strength Level	ft-# =	3,075.8	12,965.4		
Moment.....Allowable	ft-# =	8,121.3	15,222.0		
Shear.....Actual					
Service Level	psi =				
Strength Level	psi =	19.1	49.9		
Shear.....Allowable	psi =	48.3	60.9		
Anet (Masonry)	in2 =				
Wall Weight	psf =	100.0	100.0		
Rebar Depth 'd'	in =	6.19	6.19		

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

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

DESCRIPTION: 10' Max Unbalanced Fill

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1165 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@ 13.89 in	#4@ 27.78 in
Provided Area :	0.31 in2/ft	#5@ 21.53 in	#5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in	#6@ 61.11 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.4909 in2/ft		
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.4909 in2/ft	#4@ 13.89 in	#4@ 27.78 in
Provided Area :	0.62 in2/ft	#5@ 21.53 in	#5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in	#6@ 61.11 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	3.50
Total Footing Width	=	5.00
Footing Thickness	=	12.00 in

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	2,894	0	psf
Mu' : Upward	=	2,930	2,170	ft-#
Mu' : Downward	=	277	11,213	ft-#
Mu: Design	=	2,653	9,043	ft-#
φ Mn	=	22,203	24,993	ft-#
Actual 1-Way Shear	=	18.60	33.93	psi
Allow 1-Way Shear	=	54.35	52.41	psi

Toe Reinforcing = # 5 @ 6.00 in
Heel Reinforcing = # 5 @ 6.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, φ Tn = 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@ 18 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Heel: #4@ 8.22 in, #5@ 12.74 in, #6@ 18 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Key: No key defined

Min footing T&S reinf Area 1.30 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

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 10' Max Unbalanced Fill (w/ Seismic)

Code Reference

Calculations per IBC 2021, ACI 318-19, TMS 402-16

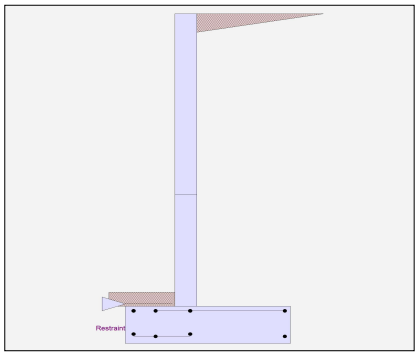
HELICAL PILES RESISTING LATERAL BEARING PRESSURE

Criteria

Retained Height	=	10.50 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	5,333.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	42.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 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 (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		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	=	94.667
Total Seismic Force	=	1,120.222

Cantilevered Retaining Wall

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.25.06.05 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC, LLC 1982-2025

DESCRIPTION: 10' Max Unbalanced Fill (w/ Seismic)

Design Summary

1.1 FOR SEISMIC LOADING

Wall Stability Ratios

Overturning	=	1.35	Ratio < 1.5!
Slab Resists All Sliding !			
Global Stability	=	1.33	

Total Bearing Load	=	6,556 lbs	
...resultant ecc.	=	19.51 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	5,001 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	5,333 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	5,773 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	15.1 psi	OK
Footing Shear @ Heel	=	38.4 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	3,724.7 lbs

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

Load Factors

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

Stem Construction

		2nd	Bottom		
		Stem OK	Ratio > 1.0		
Design Height Above Ftg	ft =	4.00	0.00		
Wall Material Above "Ht"	=	Concrete	Concrete		
Design Method	=	SD	SD	SD	SD
Thickness	=	8.00	8.00		
Rebar Size	=	# 5	# 6		
Rebar Spacing	=	12.00	6.00		
Rebar Placed at	=	Edge	Edge		
Design Data					
fb/FB + fa/Fa	=	**0.624**	**1.001**		
Total Force @ Section					
Service Level	lbs =				
Strength Level	lbs =	2,034.9	4,698.4		
Moment....Actual					
Service Level	ft-# =				
Strength Level	ft-# =	5,075.6	18,183.9		
Moment.....Allowable	ft-# =	8,121.3	18,162.9		
Shear.....Actual					
Service Level	psi =				
Strength Level	psi =	27.4	69.6		
Shear.....Allowable	psi =	48.3	70.6		
Anet (Masonry)	in2 =				
Wall Weight	psf =	100.0	100.0		
Rebar Depth 'd'	in =	6.19	5.63		

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

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

DESCRIPTION: 10' Max Unbalanced Fill (w/ Seismic)

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1922 in2/ft		
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1922 in2/ft	#4@ 13.89 in	#4@ 27.78 in
Provided Area :	0.31 in2/ft	#5@ 21.53 in	#5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in	#6@ 61.11 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.7615 in2/ft		
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.7615 in2/ft	#4@ 13.89 in	#4@ 27.78 in
Provided Area :	0.88 in2/ft	#5@ 21.53 in	#5@ 43.06 in
Maximum Area :	0.762 in2/ft	#6@ 30.56 in	#6@ 61.11 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	3.50
Total Footing Width	=	5.00
Footing Thickness	=	16.00 in

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	5,773	0	psf
Mu' : Upward	=	5,256	35	ft-#
Mu' : Downward	=	344	11,744	ft-#
Mu: Design	=	4,912	11,709	ft-#
φ Mn	=	45,895	25,953	ft-#
Actual 1-Way Shear	=	15.10	38.40	psi
Allow 1-Way Shear	=	53.93	41.73	psi

Toe Reinforcing = # 6 @ 6.00 in
Heel Reinforcing = # 6 @ 12.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, φ Tn = 0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 6.94 in, #5@ 10.76 in, #6@ 15.27 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Heel: #4@ 6.94 in, #5@ 10.76 in, #6@ 15.27 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Key: No key defined

Min footing T&S reinf Area 1.73 in2
Min footing T&S reinf Area per foot 0.35 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 6.94 in	#4@ 13.89 in
#5@ 10.76 in	#5@ 21.53 in
#6@ 15.28 in	#6@ 30.56 in

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 14' Max Unbalanced Fill

Code Reference

Calculations per IBC 2021, ACI 318-19, TMS 402-16

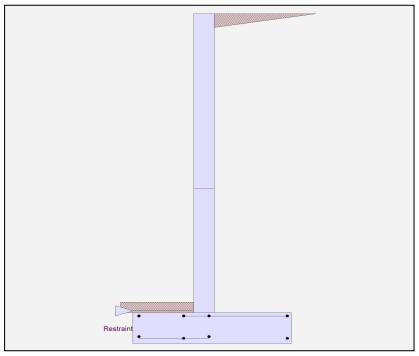
HELICAL PILES RESISTING LATERAL BEARING PRESSURE

Criteria

Retained Height	=	14.50 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	42.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 14' Max Unbalanced Fill

Design Summary

Wall Stability Ratios

Overturning	=	1.70	OK
Slab Resists All Sliding !			
Global Stability	=	1.11	

Total Bearing Load	=	10,567	lbs
...resultant ecc.	=	16.23	in
Eccentricity outside middle third			
Soil Pressure @ Toe	=	3,713	psf OK
Soil Pressure @ Heel	=	0	psf OK
Allowable	=	4,000	psf
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	4,164	psf
ACI Factored @ Heel	=	0	psf
Footing Shear @ Toe	=	24.7	psi OK
Footing Shear @ Heel	=	44.3	psi OK
Allowable	=	75.0	psi

Sliding Calcs

Lateral Sliding Force	=	5,376.0	lbs

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

Load Factors

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

Stem Construction

		2nd	Bottom		
		Stem OK	Stem OK		
Design Height Above Ftg	ft =	6.00	0.00		
Wall Material Above "Ht"	=	Concrete	Concrete		
Design Method	=	SD	SD	SD	SD
Thickness	=	10.00	10.00		
Rebar Size	=	# 5	# 7		
Rebar Spacing	=	8.00	4.00		
Rebar Placed at	=	Edge	Edge		
Design Data					
fb/FB + fa/Fa	=	**0.430**	**0.775**		
Total Force @ Section					
Service Level	lbs =				
Strength Level	lbs =	2,427.6	7,064.4		
Moment....Actual					
Service Level	ft-# =				
Strength Level	ft-# =	6,878.2	34,144.6		
Moment.....Allowable	ft-# =	15,984.2	44,051.9		
Shear.....Actual					
Service Level	psi =				
Strength Level	psi =	24.7	77.8		
Shear.....Allowable	psi =	50.4	81.2		
Anet (Masonry)	in2 =				
Wall Weight	psf =	125.0	125.0		
Rebar Depth 'd'	in =	8.19	7.56		

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

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

DESCRIPTION: 14' Max Unbalanced Fill

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1942 in2/ft		
0.0018bh : 0.0018(12)(10) :	0.216 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.216 in2/ft	#4@ 11.11 in	#4@ 22.22 in
Provided Area :	0.465 in2/ft	#5@ 17.22 in	#5@ 34.44 in
Maximum Area :	1.1092 in2/ft	#6@ 24.44 in	#6@ 48.89 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	1.0475 in2/ft		
0.0018bh : 0.0018(12)(10) :	0.216 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	1.0475 in2/ft	#4@ 11.11 in	#4@ 22.22 in
Provided Area :	1.8 in2/ft	#5@ 17.22 in	#5@ 34.44 in
Maximum Area :	1.0245 in2/ft	#6@ 24.44 in	#6@ 48.89 in

Footing Data

Toe Width	=	2.50 ft
Heel Width	=	4.00
Total Footing Width	=	6.50
Footing Thickness	=	18.00 in

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	4,164	0	psf
Mu' : Upward	=	11,106	1,599	ft-#
Mu' : Downward	=	1,050	21,610	ft-#
Mu: Design	=	10,056	20,011	ft-#
φ Mn	=	100,803	83,588	ft-#
Actual 1-Way Shear	=	24.74	44.34	psi
Allow 1-Way Shear	=	65.27	57.50	psi

Toe Reinforcing = # 7 @ 4.00 in
Heel Reinforcing = # 6 @ 4.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, φ Tn = 0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 6.17 in, #5@ 9.56 in, #6@ 13.58 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Heel: #4@ 6.14 in, #5@ 9.52 in, #6@ 13.51 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Key: No key defined

Min footing T&S reinf Area 2.53 in2
Min footing T&S reinf Area per foot 0.39 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 6.17 in	#4@ 12.35 in
#5@ 9.57 in	#5@ 19.14 in
#6@ 13.58 in	#6@ 27.16 in

Cantilevered Retaining Wall

Project File: Calcs.ec6

DESCRIPTION: 14' Max Unbalanced Fill (w/ Sismic)

Code Reference

Calculations per IBC 2021, ACI 318-19, TMS 402-16

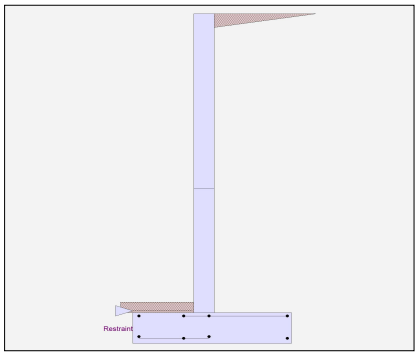
HELICAL PILES RESISTING LATERAL BEARING PRESSURE

Criteria

Retained Height	=	14.50 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	9,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	42.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

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

Earth Pressure Seismic Load

Method : Uniform

Multiplier Used	=	8.000
(Multiplier used on soil density)		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Uniform Seismic Force	=	128.000
Total Seismic Force	=	2,048.000

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

Cantilevered Retaining Wall

Project File: Calcs.ec6

LIC# : KW-06017913, Build:20.25.06.05 MULHERN & KULP STRUCTURAL ENGINEERING INC (c) ENERCALC, LLC 1982-2025

DESCRIPTION: 14' Max Unbalanced Fill (w/ Sismic)

Design Summary

Wall Stability Ratios

Overturning	=	1.21	Ratio < 1.5!
Slab Resists All Sliding !			
Global Stability	=	1.11	

Total Bearing Load	=	10,567	lbs
...resultant ecc.	=	29.26	in
Eccentricity outside middle third			
Soil Pressure @ Toe	=	8,677	psf OK
Soil Pressure @ Heel	=	0	psf OK
Allowable	=	9,000	psf
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	9,730	psf
ACI Factored @ Heel	=	0	psf
Footing Shear @ Toe	=	50.4	psi OK
Footing Shear @ Heel	=	55.3	psi OK
Allowable	=	75.0	psi

Sliding Calcs

Lateral Sliding Force	=	6,809.6	lbs

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

Load Factors

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

Stem Construction

		2nd	Bottom		
		Stem OK	Shear NG!		
Design Height Above Ftg	ft =	6.00	0.00		
Wall Material Above "Ht"	=	Concrete	Concrete		
Design Method	=	SD	SD	SD	SD
Thickness	=	10.00	10.00		
Rebar Size	=	# 5	# 7		
Rebar Spacing	=	8.00	4.00		
Rebar Placed at	=	Edge	Edge		
Design Data					
fb/FB + fa/Fa	=	**0.719**	**1.080**		
Total Force @ Section					
Service Level	lbs =				
Strength Level	lbs =	3,515.6	8,920.4		
Moment....Actual					
Service Level	ft-# =				
Strength Level	ft-# =	11,502.2	47,600.6		
Moment.....Allowable	ft-# =	15,984.2	44,051.9		
Shear.....Actual					
Service Level	psi =				
Strength Level	psi =	35.8	98.3		
Shear.....Allowable	psi =	50.4	81.2		
Anet (Masonry)	in2 =				
Wall Weight	psf =	125.0	125.0		
Rebar Depth 'd'	in =	8.19	7.56		

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

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

DESCRIPTION: 14' Max Unbalanced Fill (w/ Sismic)

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.3248 in2/ft		
0.0018bh : 0.0018(12)(10) :	0.216 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.3248 in2/ft	#4@ 11.11 in	#4@ 22.22 in
Provided Area :	0.465 in2/ft	#5@ 17.22 in	#5@ 34.44 in
Maximum Area :	1.1092 in2/ft	#6@ 24.44 in	#6@ 48.89 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	1.4603 in2/ft		
0.0018bh : 0.0018(12)(10) :	0.216 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	1.4603 in2/ft	#4@ 11.11 in	#4@ 22.22 in
Provided Area :	1.8 in2/ft	#5@ 17.22 in	#5@ 34.44 in
Maximum Area :	1.0245 in2/ft	#6@ 24.44 in	#6@ 48.89 in

Footing Data

Toe Width	=	2.50 ft
Heel Width	=	4.00
Total Footing Width	=	6.50
Footing Thickness	=	18.00 in

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	9,730	0	psf
Mu' : Upward	=	20,002	0	ft-#
Mu' : Downward	=	1,050	21,610	ft-#
Mu: Design	=	18,952	21,610	ft-#
φ Mn	=	100,803	83,588	ft-#
Actual 1-Way Shear	=	50.42	55.28	psi
Allow 1-Way Shear	=	65.27	57.50	psi

Toe Reinforcing = # 7 @ 4.00 in
Heel Reinforcing = # 6 @ 4.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, φ Tn = 0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 6.06 in, #5@ 9.39 in, #6@ 13.33 in, #7@ 18 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Heel: #4@ 5.69 in, #5@ 8.81 in, #6@ 12.51 in, #7@ 17.07 in, #8@ 18 in, #9@ 18 in, #10@ 18 in

Key: No key defined

Min footing T&S reinf Area 2.53 in2
Min footing T&S reinf Area per foot 0.39 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 6.17 in	#4@ 12.35 in
#5@ 9.57 in	#5@ 19.14 in
#6@ 13.58 in	#6@ 27.16 in

Concrete Beam

Project File: Calcs.ec6

DESCRIPTION: Grade Beam #1

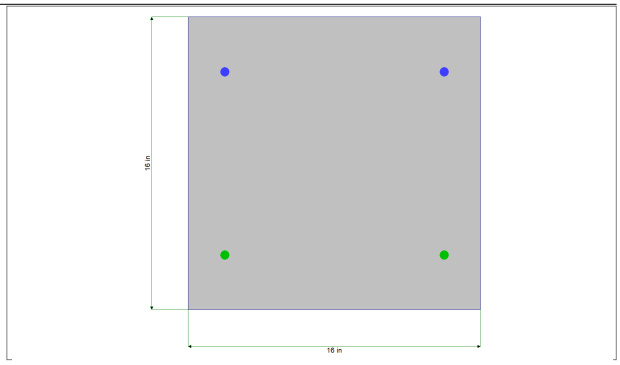
CODE REFERENCES

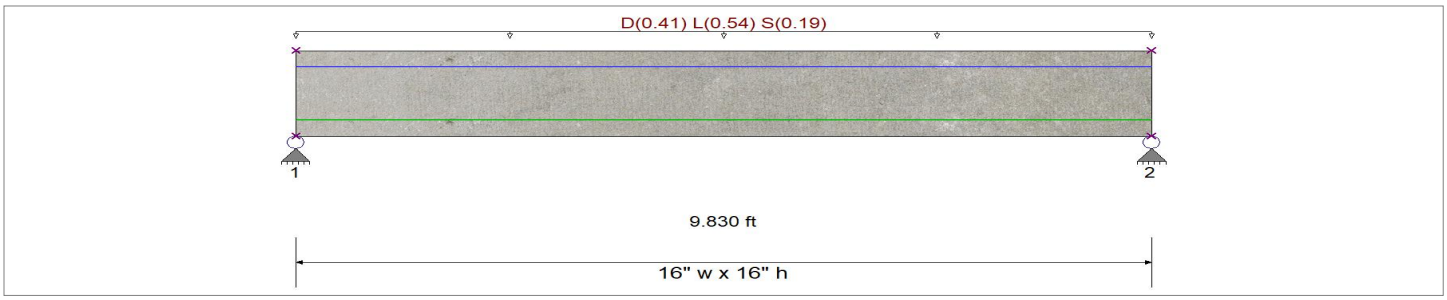
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 *λ * f'c$^{1/2}$	=	375.0 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2

Seismic Design Category = A





Cross Section & Reinforcing Details

Rectangular Section, Width = 16.0 in, Height = 16.0 in
Span #1 Reinforcing....
2-#4 at 3.0 in from Top, from 0.0 to 9.830 ft in this span
2-#4 at 3.0 in from Bottom, from 0.0 to 9.830 ft in this s

Load for Span Number 1
Uniform Load : D = 0.410, L = 0.540, S = 0.190 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Maximum Bending Stress Ratio =	**0.650** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	17.067	k-ft
Mn * Phi : Allowable	26.259	k-ft
Location of maximum on span	4.906	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.007 in	Ratio =	17734 >=360.0	S Only
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360.0	L Only
Max Downward Total Deflection	0.012 in	Ratio =	10080 >=240.0	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in	Ratio =	0 <240.0	Span: 1 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	4.669	4.669
Max Upward from Load Combinations	4.669	4.669
Max Upward from Load Cases	2.654	2.654
D Only	2.015	2.015
+D+L	4.669	4.669
+D+0.70S	2.669	2.669
+D+0.750L	4.006	4.006
+D+0.750L+0.5250S	4.496	4.496

Concrete Beam

Project File: Calcs.ec6

DESCRIPTION: Grade Beam #2

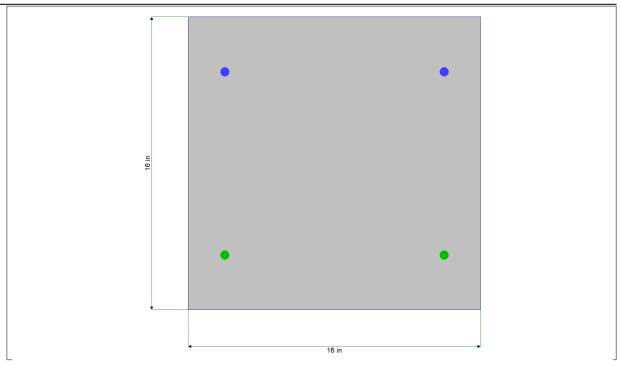
CODE REFERENCES

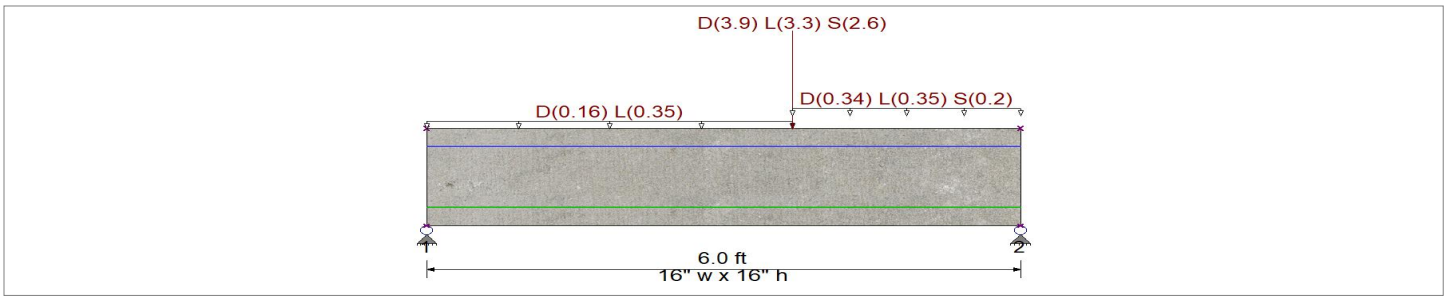
Calculations per ACI 318-19, IBC 2021
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

General Information

f'c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
fr =7.5 *λ * f'c$^{1/2}$	=	375.0 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2

Seismic Design Category = A





Cross Section & Reinforcing Details

Rectangular Section, Width = 16.0 in, Height = 16.0 in
Span #1 Reinforcing....
2-#4 at 3.0 in from Top, from 0.0 to 6.0 ft in this span
2-#4 at 3.0 in from Bottom, from 0.0 to 6.0 ft in this spa

Load for Span Number 1

Uniform Load : D = 0.160, L = 0.350 k/ft, Extent = 0.0 -->> 3.70 ft, Tributary Width = 1.0 ft
Point Load : D = 3.90, L = 3.30, S = 2.60 k @ 3.70 ft
Uniform Load : D = 0.340, L = 0.350, S = 0.20 k/ft, Extent = 3.70 -->> 6.0 ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Maximum Bending Stress Ratio =	**0.718** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	18.861	k-ft
Mn * Phi : Allowable	26.259	k-ft
Location of maximum on span	3.694	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.002 in	Ratio =	36095	>=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 =	17319	>=240.0	Span: 1 : +D+0.750L+0.5250S
Max Upward Total Deflection	0.000 in	Ratio =	0	<240.0	Span: 1 : +D+L

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	4.369	6.570
Max Upward from Load Combinations	4.369	6.570
Max Upward from Load Cases	2.315	3.220
D Only	2.054	3.220