



**MULHERN+KULP**  
RESIDENTIAL STRUCTURAL ENGINEERING

7220 Trade Street, Suite 295, San Diego, CA 92121 ▶ p 619-650-0010 ▶ [mulhernkulp.com](http://mulhernkulp.com)

# CALCULATION PACKAGE

---

Revised: February 23, 2026

McCullough Architects

Highlands Builders Group

Sears Plat – Lot 3  
Mercer Island, WA

---

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

Prepared By:

**Adam J. Cervantes, E.I.T.**

*Staff Engineer II*

**Nicholas J. Martignetti, P.E.**

*Associate Owner + San Diego Office Director*



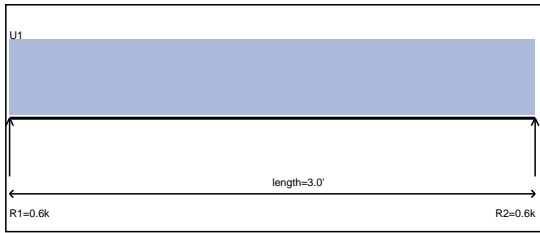
---

*Signature, Seal & Date*



**BEAM & HEADER CALCULATIONS**

Description - Roof Frmg - H3-1 - Header



Uniform 1 = 0.34 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

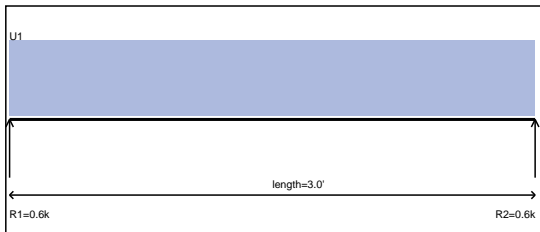
M = D+S Cd=1.15

Δ = D+S

V = 0.50k	Vall = 3.50k	Ratio = 0.14
M = 0.38k-ft	Mall = 3.44k-ft	Ratio = 0.11
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-2 - Header



Uniform 1 = 0.34 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

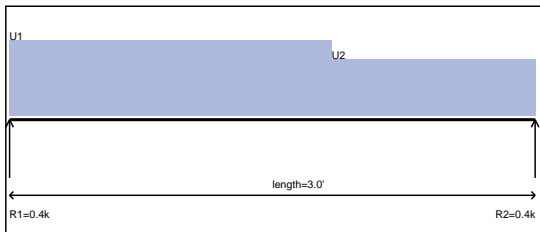
M = D+S Cd=1.15

Δ = D+S

V = 0.50k	Vall = 3.50k	Ratio = 0.14
M = 0.38k-ft	Mall = 3.44k-ft	Ratio = 0.11
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-3 - Header



Uniform 1 = 0.24 klf (0.0'-1.8')

Uniform 2 = 0.18 klf (1.8'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

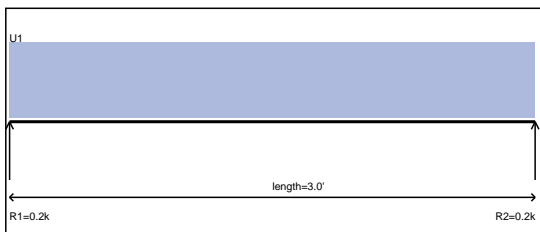
M = D+S Cd=1.15

Δ = D+S

V = 0.35k	Vall = 3.50k	Ratio = 0.10
M = 0.25k-ft	Mall = 3.44k-ft	Ratio = 0.07
Deflection		
TL = 0.00" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-4 - Header



Uniform 1 = 0.08 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

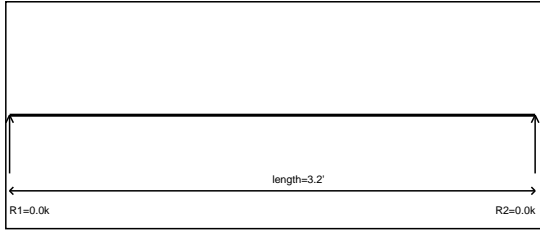
M = D+S Cd=1.15

Δ = D+S

V = 0.13k	Vall = 3.50k	Ratio = 0.04
M = 0.09k-ft	Mall = 3.44k-ft	Ratio = 0.03
Deflection		
TL = 0.00" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-5 - Header

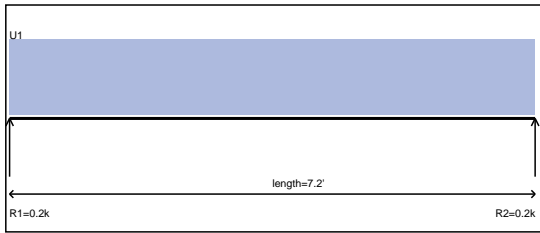


Controlling Load Combination/ Cd  
 $V = D \quad Cd=0.9$   
 $M = D \quad Cd=0.9$   
 $\Delta = 0$

V = 0.00k	Vall = 2.74k	Ratio = 0.00
M = 0.00k-ft	Mall = 2.69k-ft	Ratio = 0.00
Deflection		
TL = 0.00" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-6 - Header



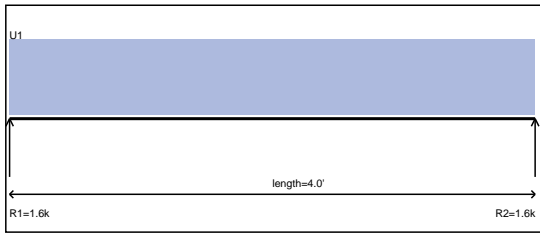
Uniform 1 = 0.04 klf (0.0'-7.2')

Controlling Load Combination/ Cd  
 $V = D+S \quad Cd=1.15$   
 $M = D+S \quad Cd=1.15$   
 $\Delta = D+S$

V = 0.13k	Vall = 3.50k	Ratio = 0.04
M = 0.23k-ft	Mall = 3.44k-ft	Ratio = 0.07
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-7 - Header



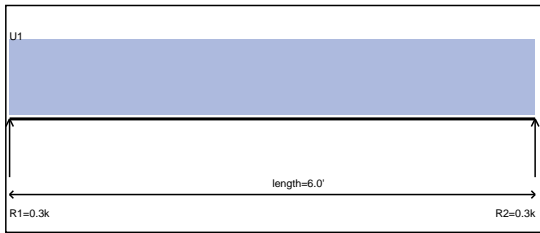
Uniform 1 = 0.77 klf (0.0'-4.0')

Controlling Load Combination/ Cd  
 $V = D+S \quad Cd=1.15$   
 $M = D+S \quad Cd=1.15$   
 $\Delta = D+S$

V = 1.53k	Vall = 3.50k	Ratio = 0.44
M = 1.53k-ft	Mall = 3.44k-ft	Ratio = 0.44
Deflection		
TL = 0.03" L/999+ > L/240 min		
DL = 0.01"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-8 - Header



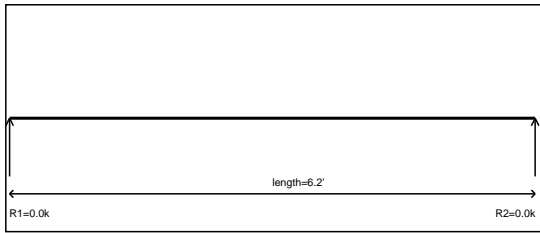
Uniform 1 = 0.08 klf (0.0'-6.0')

Controlling Load Combination/ Cd  
 $V = D+S \quad Cd=1.15$   
 $M = D+S \quad Cd=1.15$   
 $\Delta = D+S$

V = 0.25k	Vall = 3.50k	Ratio = 0.07
M = 0.38k-ft	Mall = 3.44k-ft	Ratio = 0.11
Deflection		
TL = 0.02" L/999+ > L/240 min		
DL = 0.01"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-9 - Header



Controlling Load Combination/ Cd  
 $V = D \quad Cd=0.9$   
 $M = D \quad Cd=0.9$   
 $\Delta = 0$

V = 0.00k	Vall = 2.74k	Ratio = 0.00
M = 0.00k-ft	Mall = 2.69k-ft	Ratio = 0.00
Deflection		
TL = 0.00" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-10 - Header

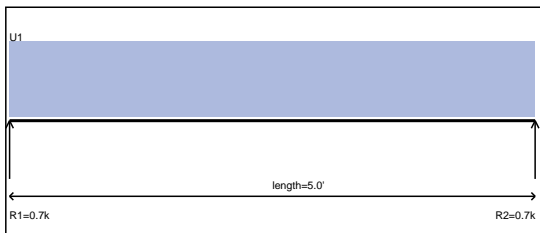


Controlling Load Combination/ Cd  
 $V = D \quad Cd=0.9$   
 $M = D \quad Cd=0.9$   
 $\Delta = 0$

V = 0.00k	Vall = 2.74k	Ratio = 0.00
M = 0.00k-ft	Mall = 2.69k-ft	Ratio = 0.00
Deflection		
TL = 0.00" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-11 - Header



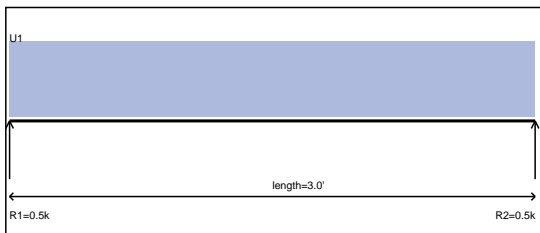
Uniform 1 = 0.27 klf (0.0'-5.0')

Controlling Load Combination/ Cd  
 $V = D+S \quad Cd=1.15$   
 $M = D+S \quad Cd=1.15$   
 $\Delta = D+S$

V = 0.68k	Vall = 3.50k	Ratio = 0.20
M = 0.86k-ft	Mall = 3.44k-ft	Ratio = 0.25
Deflection		
TL = 0.03" L/999+ > L/240 min		
DL = 0.01"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-12 - Header



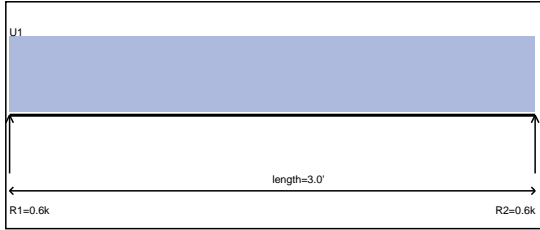
Uniform 1 = 0.27 klf (0.0'-3.0')

Controlling Load Combination/ Cd  
 $V = D+S \quad Cd=1.15$   
 $M = D+S \quad Cd=1.15$   
 $\Delta = D+S$

V = 0.41k	Vall = 3.50k	Ratio = 0.12
M = 0.31k-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 - Roof Frmg - H3-13 - Header



Uniform 1 = 0.38 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

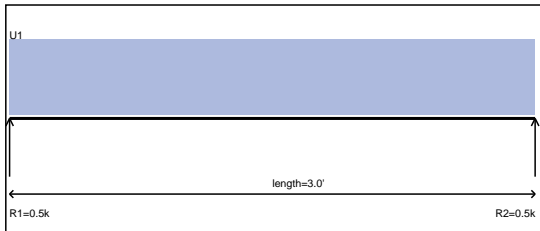
M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.57k	Vall = 3.50k	Ratio = 0.16
M = 0.42k-ft	Mall = 3.44k-ft	Ratio = 0.12
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-14 - Header



Uniform 1 = 0.27 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

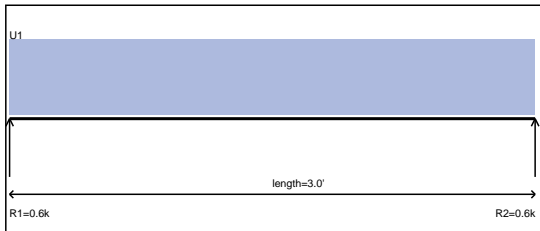
M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.41k	Vall = 3.50k	Ratio = 0.12
M = 0.31k-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 - Roof Frmg - H3-15 - Header



Uniform 1 = 0.38 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

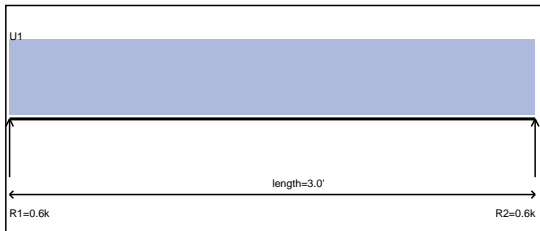
M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.57k	Vall = 3.50k	Ratio = 0.16
M = 0.42k-ft	Mall = 3.44k-ft	Ratio = 0.12
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-16 - Header



Uniform 1 = 0.38 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

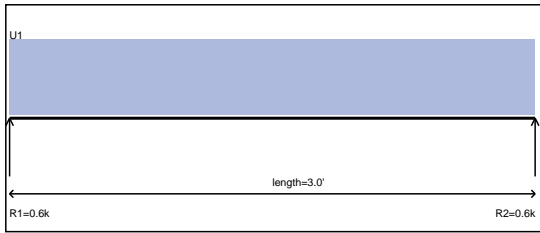
M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.57k	Vall = 3.50k	Ratio = 0.16
M = 0.42k-ft	Mall = 3.44k-ft	Ratio = 0.12
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-17 - Header



Uniform 1 = 0.38 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

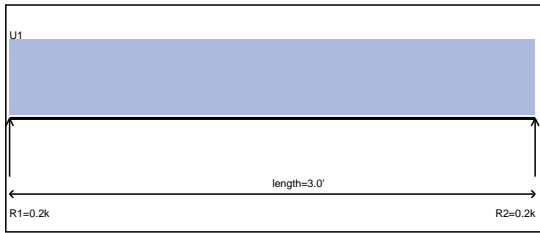
M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.57k	Vall = 3.50k	Ratio = 0.16
M = 0.42k-ft	Mall = 3.44k-ft	Ratio = 0.12
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-18 - Header



Uniform 1 = 0.08 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

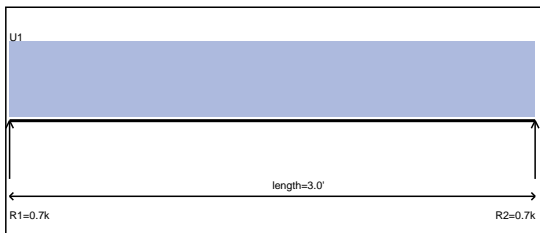
M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.13k	Vall = 3.50k	Ratio = 0.04
M = 0.09k-ft	Mall = 3.44k-ft	Ratio = 0.03
Deflection		
TL = 0.00" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-19 - Header



Uniform 1 = 0.43 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

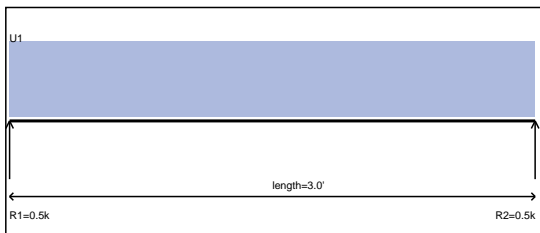
M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.65k	Vall = 3.50k	Ratio = 0.18
M = 0.48k-ft	Mall = 3.44k-ft	Ratio = 0.14
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-20 - Header



Uniform 1 = 0.28 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

M = D+S Cd=1.15

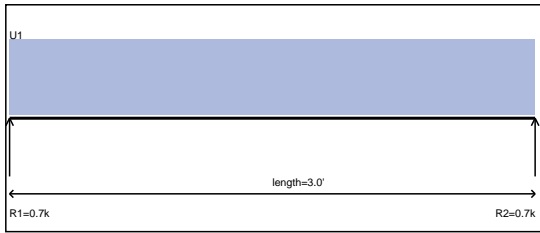
$\Delta$  = D+S

V = 0.42k	Vall = 3.50k	Ratio = 0.12
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 - Roof Frmg - H3-21 - Header



Uniform 1 = 0.43 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

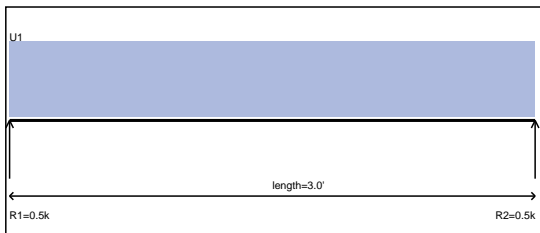
M = D+S Cd=1.15

Δ = D+S

V = 0.65k	Vall = 3.50k	Ratio = 0.18
M = 0.48k-ft	Mall = 3.44k-ft	Ratio = 0.14
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-22 - Header



Uniform 1 = 0.28 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

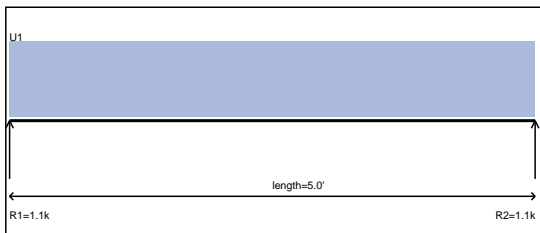
M = D+S Cd=1.15

Δ = D+S

V = 0.42k	Vall = 3.50k	Ratio = 0.12
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 - Roof Frmg - H3-23 - Header



Uniform 1 = 0.43 klf (0.0'-5.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

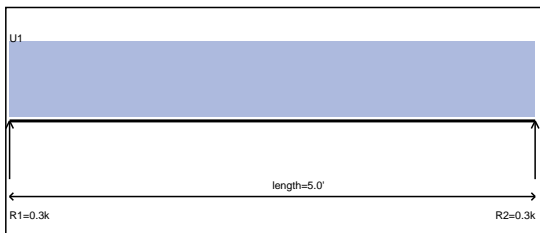
M = D+S Cd=1.15

Δ = D+S

V = 1.08k	Vall = 3.50k	Ratio = 0.31
M = 1.35k-ft	Mall = 3.44k-ft	Ratio = 0.39
Deflection		
TL = 0.04" L/999+ > L/240 min		
DL = 0.02"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-24 - Header



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

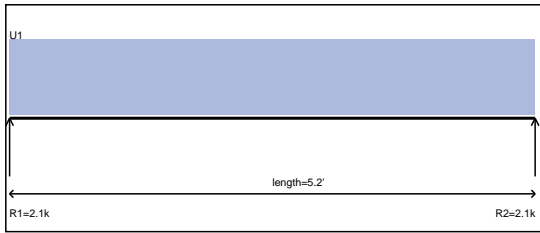
Δ = D+S

V = 0.21k	Vall = 3.50k	Ratio = 0.06
M = 0.26k-ft	Mall = 3.44k-ft	Ratio = 0.08
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2



Description - Roof Frmg - H3-25 - Header



Uniform 1 = 0.77 klf (0.0'-5.2')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

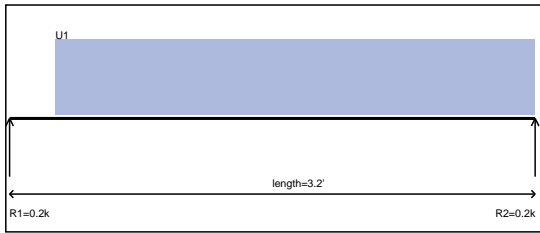
M = D+S Cd=1.15

$\Delta$  = D+S

V = 2.00k	Vall = 3.50k	Ratio = 0.57
M = 2.63k-ft	Mall = 3.44k-ft	Ratio = 0.76
Deflection		
TL = 0.09" L/739 > L/240 min		
DL = 0.03"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-26 - Header



Uniform 1 = 0.08 klf (0.3'-3.2')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

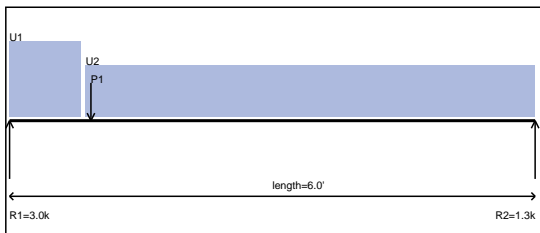
M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.13k	Vall = 3.50k	Ratio = 0.04
M = 0.10k-ft	Mall = 3.44k-ft	Ratio = 0.03
Deflection		
TL = 0.00" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-27 - Header



Uniform 1 = 0.41 klf (0.0'-0.8')

P1 = 2.44 K (0.9')

Uniform 2 = 0.28 klf (0.9'-6.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

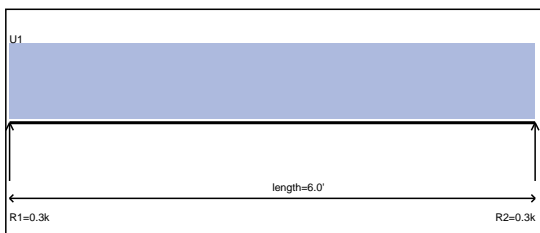
M = D+S Cd=1.15

$\Delta$  = D+S

V = 2.98k	Vall = 3.50k	Ratio = 0.85
M = 2.58k-ft	Mall = 3.44k-ft	Ratio = 0.75
Deflection		
TL = 0.10" L/702 > L/240 min		
DL = 0.04"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-28 - Header



Uniform 1 = 0.08 klf (0.0'-6.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

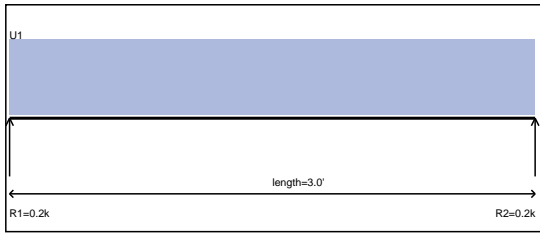
M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.25k	Vall = 3.50k	Ratio = 0.07
M = 0.38k-ft	Mall = 3.44k-ft	Ratio = 0.11
Deflection		
TL = 0.02" L/999+ > L/240 min		
DL = 0.01"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Roof Frmg - H3-29 - Header



Uniform 1 = 0.08 klf (0.0'-3.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.13k	Vall = 3.50k	Ratio = 0.04
M = 0.09k-ft	Mall = 3.44k-ft	Ratio = 0.03

Deflection

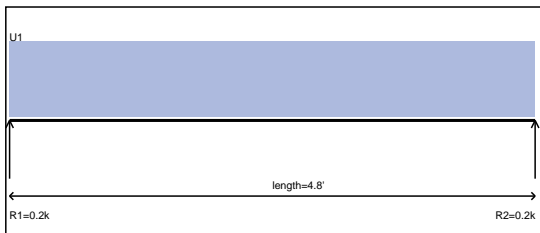
TL = 0.00" L/999+ > L/240 min

DL = 0.00"

L = 0.00" L/999+ > L/360 min

4x8 DF #2

Description - Roof Frmg - H3-30 - Header



Uniform 1 = 0.08 klf (0.0'-4.8')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.20k	Vall = 3.50k	Ratio = 0.06
M = 0.24k-ft	Mall = 3.44k-ft	Ratio = 0.07

Deflection

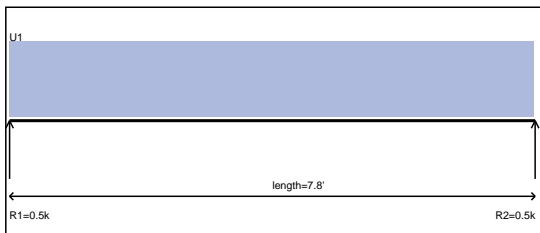
TL = 0.01" L/999+ > L/240 min

DL = 0.00"

L = 0.00" L/999+ > L/360 min

4x8 DF #2

Description - Roof Frmg - B3-1 - Flush Bottom



Uniform 1 = 0.12 klf (0.0'-7.8')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.47k	Vall = 1.60k	Ratio = 0.29
M = 0.91k-ft	Mall = 1.92k-ft	Ratio = 0.47

Deflection

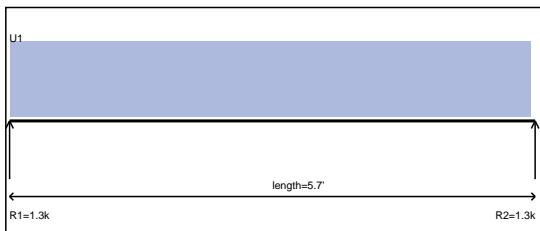
TL = 0.09" L/999+ > L/240 min

DL = 0.03"

L = 0.00" L/999+ > L/360 min

2x10 HF #2

Description - Roof Frmg - B3-2 - Flush Bottom



Uniform 1 = 0.43 klf (0.0'-5.7')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

M = D+S Cd=1.15

$\Delta$  = D+S

V = 1.24k	Vall = 3.50k	Ratio = 0.35
M = 1.78k-ft	Mall = 3.44k-ft	Ratio = 0.52

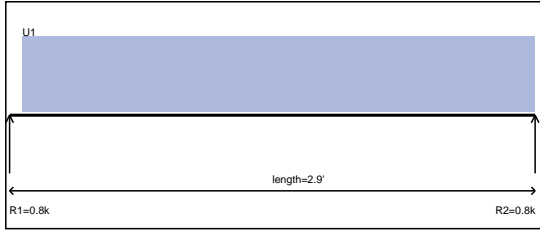
Deflection

TL = 0.07" L/999+ > L/240 min

DL = 0.03"

L = 0.00" L/999+ > L/360 min

4x8 DF #2

**Description - Upper Floor Frmg - H2-1 - Header**


Uniform 1 = 0.54 klf (0.1'-2.9')

Controlling Load Combination/ Cd

 $V = D+L \quad Cd=1$ 
 $M = D+L \quad Cd=1$ 
 $\Delta = D+L$ 

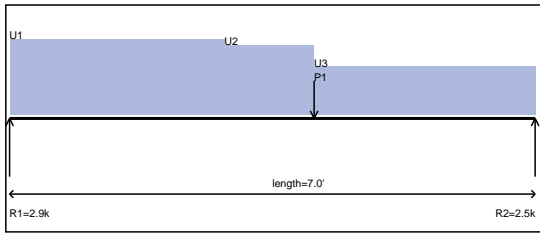
V = 0.78k	Vall = 3.04k	Ratio = 0.26
-----------	--------------	--------------

M = 0.58k-ft	Mall = 2.99k-ft	Ratio = 0.19
--------------	-----------------	--------------

Deflection

 $TL = 0.01" \quad L/999+ > L/240 \text{ min}$ 
 $DL = 0.00"$ 
 $L = 0.00" \quad L/999+ > L/360 \text{ min}$ 

4x8 DF #2

**Description - Upper Floor Frmg - H2-2 - Header**


Uniform 1 = 0.85 klf (0.0'-2.9')

 $P1 = 0.35 \text{ K} (4.1')$ 

Uniform 2 = 0.78 klf (2.9'-4.1')

Uniform 3 = 0.54 klf (4.1'-5.9')

Uniform 4 = 0.54 klf (5.9'-7.0')

Controlling Load Combination/ Cd

 $V = D+L \text{ (Main Spans)} \quad Cd=1$ 
 $M = D+L \text{ (Main Spans)} \quad Cd=1$ 
 $\Delta = D+0.75(L+S) \text{ (Main Spans)}$ 

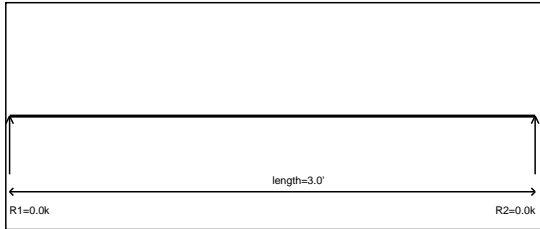
V = 2.29k	Vall = 4.64k	Ratio = 0.49
-----------	--------------	--------------

M = 3.96k-ft	Mall = 6.56k-ft	Ratio = 0.60
--------------	-----------------	--------------

Deflection

 $TL = 0.17" \quad L/482 > L/240 \text{ min}$ 
 $DL = 0.08"$ 
 $L = 0.08" \quad L/999+ > L/360 \text{ min}$ 

3-1/2x7-1/2 GLB

**Description - Upper Floor Frmg - H2-3 - Header**


Controlling Load Combination/ Cd

 $V = D \quad Cd=0.9$ 
 $M = D \quad Cd=0.9$ 
 $\Delta = 0$ 

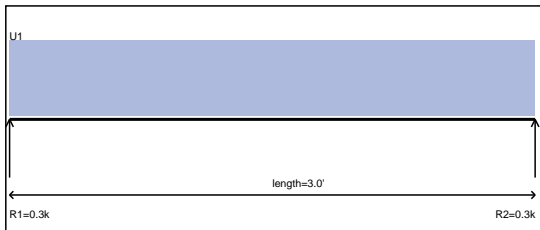
V = 0.00k	Vall = 2.74k	Ratio = 0.00
-----------	--------------	--------------

M = 0.00k-ft	Mall = 2.69k-ft	Ratio = 0.00
--------------	-----------------	--------------

Deflection

 $TL = 0.00" \quad L/999+ > L/240 \text{ min}$ 
 $DL = 0.00"$ 
 $L = 0.00" \quad L/999+ > L/360 \text{ min}$ 

4x8 DF #2

**Description - Upper Floor Frmg - H2-4 - Header**


Uniform 1 = 0.15 klf (0.0'-3.0')

Controlling Load Combination/ Cd

 $V = D+S \quad Cd=1.15$ 
 $M = D+S \quad Cd=1.15$ 
 $\Delta = D+S$ 

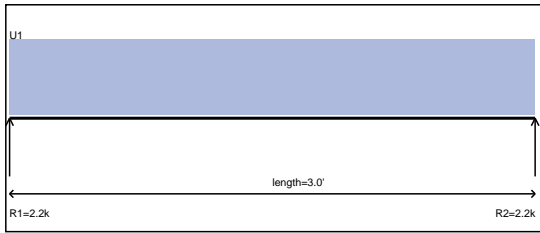
V = 0.22k	Vall = 3.50k	Ratio = 0.06
-----------	--------------	--------------

M = 0.17k-ft	Mall = 3.44k-ft	Ratio = 0.05
--------------	-----------------	--------------

Deflection

 $TL = 0.00" \quad L/999+ > L/240 \text{ min}$ 
 $DL = 0.00"$ 
 $L = 0.00" \quad L/999+ > L/360 \text{ min}$ 

4x8 DF #2

**Description - Upper Floor Frmg - H2-5 - Header**


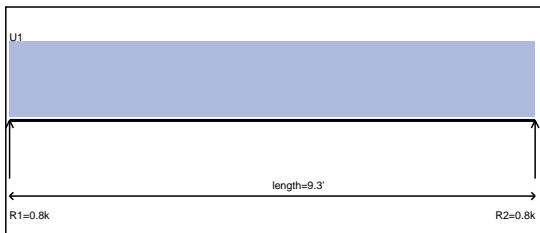
Uniform 1 = 1.40 klf (0.0'-3.0')

 Controlling Load Combination/ Cd  
 $V = D+0.75(L+S)$  Cd=1.15  
 $M = D+0.75(L+S)$  (Main Spans) Cd=1.15  
 $\Delta = D+0.75(L+S)$  (Main Spans)

V = 1.78k	Vall = 3.50k	Ratio = 0.51
M = 1.33k-ft	Mall = 3.44k-ft	Ratio = 0.39

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

4x8 DF #2

**Description - Upper Floor Frmg - H2-6 - Header**


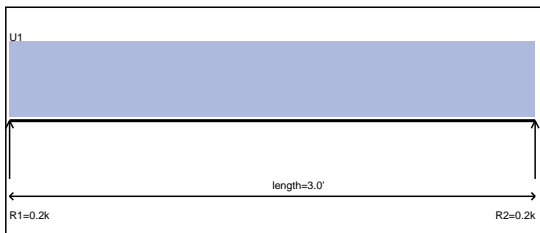
Uniform 1 = 0.17 klf (0.0'-9.3')

 Controlling Load Combination/ Cd  
 $V = D+S$  Cd=1.15  
 $M = D+S$  Cd=1.15  
 $\Delta = D+S$ 

V = 0.79k	Vall = 5.43k	Ratio = 0.14
M = 1.84k-ft	Mall = 7.00k-ft	Ratio = 0.26

 Deflection  
 TL = 0.05" L/999+ > L/240 min  
 DL = 0.02"  
 L = 0.00" L/999+ > L/360 min

4x12 DF #2

**Description - Upper Floor Frmg - H2-7 - Header**


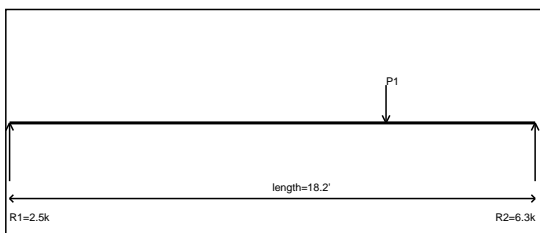
Uniform 1 = 0.10 klf (0.0'-3.0')

 Controlling Load Combination/ Cd  
 $V = D$  Cd=0.9  
 $M = D$  Cd=0.9  
 $\Delta = D$ 

V = 0.15k	Vall = 2.74k	Ratio = 0.05
M = 0.11k-ft	Mall = 2.69k-ft	Ratio = 0.04

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

4x8 DF #2

**Description - Upper Floor Frmg - H2-8 - Header**


P1 = 8.78 K (13.0')

 Controlling Load Combination/ Cd  
 $V = D+0.75(L+S)$  Cd=1.15  
 $M = D+0.75(L+S)$  Cd=1.15  
 $\Delta = D+0.75(L+S)$ 

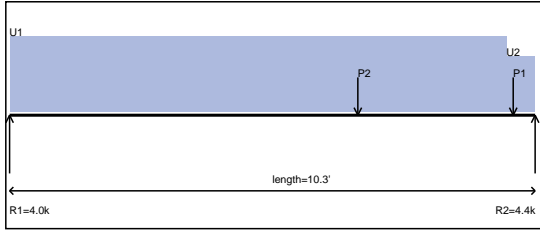
V = 5.38k	Vall = 18.44k	Ratio = 0.29
M = 27.82k-ft	Mall = 56.01k-ft	Ratio = 0.50

 Deflection  
 TL = 0.35" L/625 > L/240 min  
 DL = 0.18"  
 L = 0.07" L/999+ > L/360 min

5-1/2x16-1/2 GLB



Description - Upper Floor Frmg - H2-9 - Header



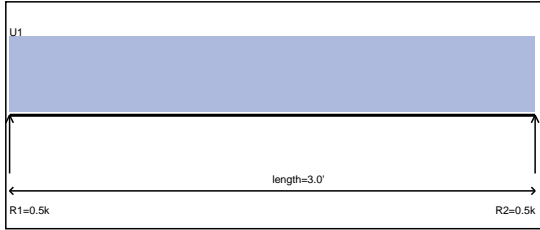
Uniform 1 = 0.74 klf (0.0'-9.8')      P1 = 0.53 K (9.9')  
Uniform 2 = 0.54 klf (9.8'-10.3')      P2 = 0.23 K (6.8')

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

V = 4.32k	Vall = 6.49k	Ratio = 0.66
M = 10.24k-ft	Mall = 12.86k-ft	Ratio = 0.80
Deflection		
TL = 0.34" L/365 > L/240 min		
DL = 0.10"		
L = 0.24" L/517 > L/360 min		

3-1/2x10-1/2 GLB

Description - Upper Floor Frmg - H2-10 - Header



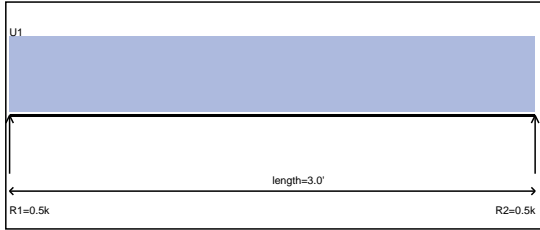
Uniform 1 = 0.29 klf (0.0'-3.0')

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

V = 0.44k	Vall = 3.50k	Ratio = 0.12
M = 0.33k-ft	Mall = 3.44k-ft	Ratio = 0.10
Deflection		
TL = 0.00" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Upper Floor Frmg - H2-11 - Header



Uniform 1 = 0.29 klf (0.0'-3.0')

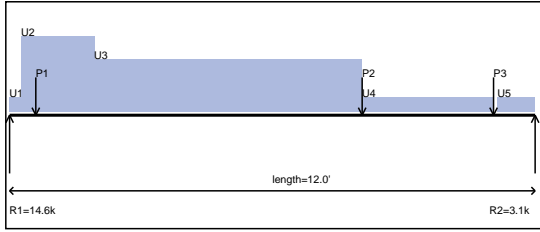
Controlling Load Combination/ Cd  
V = D+S Cd=1.15  
M = D+S Cd=1.15  
△ = D+S

V = 0.44k	Vall = 3.50k	Ratio = 0.12
M = 0.33k-ft	Mall = 3.44k-ft	Ratio = 0.10
Deflection		
TL = 0.00" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2



**Description - Upper Floor Frmg - H2-12 - Header**



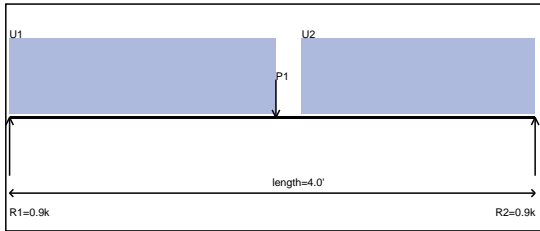
- Uniform 1 = 0.10 klf (0.0'-0.3')
  - Uniform 2 = 0.53 klf (0.3'-1.9')
  - Uniform 3 = 0.37 klf (1.9'-7.7')
  - Uniform 4 = 0.37 klf (7.7'-8.1')
  - Uniform 5 = 0.10 klf (8.1'-11.1')
  - Uniform 6 = 0.10 klf (11.1'-12.0')
- P1 = 12.73 K (0.6')  
P2 = 0.41 K (8.1')  
P3 = 0.82 K (11.1')

Controlling Load Combination/ Cd  
 $V = D+L \quad Cd=1$   
 $M = D+0.75(L+S) \quad Cd=1.15$   
 $\Delta = D+0.75(L+S)$

V = 12.20k	Vall = 70.50k	Ratio = 0.17
M = 9.63k-ft	Mall = 110.00k-ft	Ratio = 0.09
Deflection		
TL = 0.03" L/999+ > L/240 min		
DL = 0.02"		
L = 0.01" L/999+ > L/360 min		

W16x26 Steel

**Description - Upper Floor Frmg - H2-13 - Header**



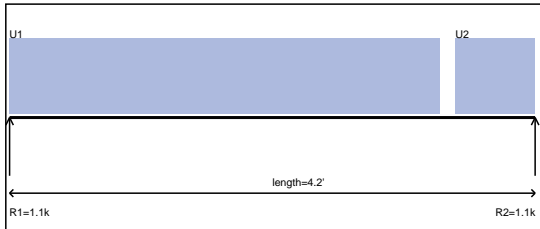
- Uniform 1 = 0.10 klf (0.0'-2.0')
  - Uniform 2 = 0.10 klf (2.2'-4.0')
- P1 = 1.30 K (2.0')

Controlling Load Combination/ Cd  
 $V = D+S \quad Cd=1.15$   
 $M = D+S \quad Cd=1.15$   
 $\Delta = D+S$

V = 0.84k	Vall = 3.50k	Ratio = 0.24
M = 1.47k-ft	Mall = 3.44k-ft	Ratio = 0.43
Deflection		
TL = 0.03" L/999+ > L/240 min		
DL = 0.01"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

**Description - Upper Floor Frmg - H2-14 - Header**



- Uniform 1 = 0.51 klf (0.0'-3.4')
- Uniform 2 = 0.51 klf (3.5'-4.2')

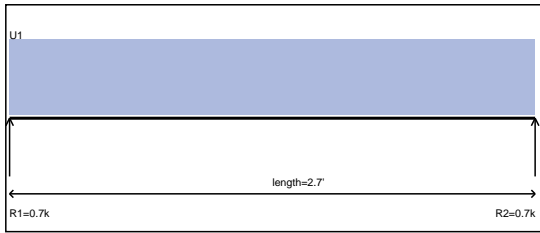
Controlling Load Combination/ Cd  
 $V = D+S \quad Cd=1.15$   
 $M = D+S \quad Cd=1.15$   
 $\Delta = D+S$

V = 1.05k	Vall = 3.50k	Ratio = 0.30
M = 1.08k-ft	Mall = 3.44k-ft	Ratio = 0.31
Deflection		
TL = 0.02" L/999+ > L/240 min		
DL = 0.01"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2



Description - Upper Floor Frmg - H2-15 - Header



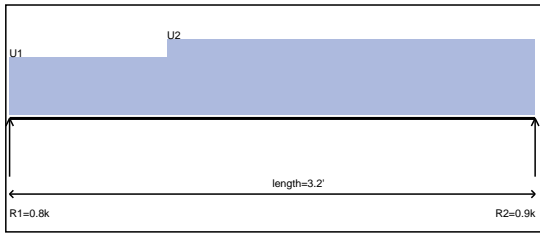
Uniform 1 = 0.48 klf (0.0'-2.7')

Controlling Load Combination/ Cd  
 V = D+L (Main Spans) Cd=1  
 M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 0.66k	Vall = 3.04k	Ratio = 0.22
M = 0.45k-ft	Mall = 2.99k-ft	Ratio = 0.15
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Upper Floor Frmg - H2-16 - Header



Uniform 1 = 0.39 klf (0.0'-0.5')

Uniform 2 = 0.39 klf (0.5'-1.0')

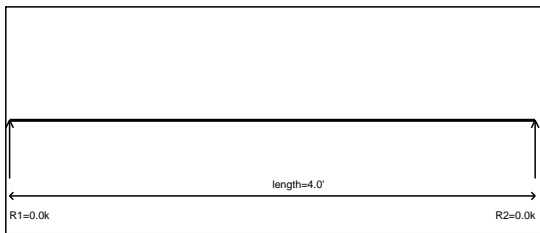
Uniform 3 = 0.51 klf (1.0'-3.2')

Controlling Load Combination/ Cd  
 V = D+S Cd=1.15  
 M = D+S Cd=1.15  
 $\Delta$  = D+S

V = 0.78k	Vall = 3.50k	Ratio = 0.22
M = 0.64k-ft	Mall = 3.44k-ft	Ratio = 0.19
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Upper Floor Frmg - H2-17 - Header

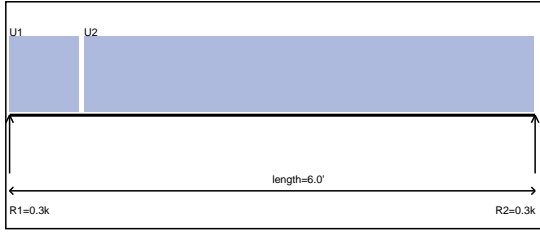


Controlling Load Combination/ Cd  
 V = D Cd=0.9  
 M = D Cd=0.9  
 $\Delta$  = 0

V = 0.00k	Vall = 2.74k	Ratio = 0.00
M = 0.00k-ft	Mall = 2.69k-ft	Ratio = 0.00
Deflection		
TL = 0.00" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

**Description - Upper Floor Frmg - H2-18 - Header**



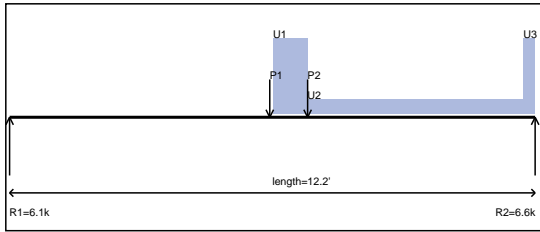
Uniform 1 = 0.10 klf (0.0'-0.8')  
Uniform 2 = 0.10 klf (0.9'-6.0')

Controlling Load Combination/ Cd  
V = D Cd=0.9  
M = D Cd=0.9  
 $\Delta = D$

V = 0.30k	Vall = 2.74k	Ratio = 0.11
M = 0.44k-ft	Mall = 2.69k-ft	Ratio = 0.17
<b>Deflection</b>		
TL = 0.02" L/999+ > L/240 min		
DL = 0.02"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

**Description - Upper Floor Frmg - H2-19 - Header**



Uniform 1 = 0.53 klf (6.1'-6.9')      P1 = 10.38 K (6.0')  
Uniform 2 = 0.10 klf (6.9'-11.9')      P2 = 1.08 K (6.9')  
Uniform 3 = 0.53 klf (11.9'-12.2')

Controlling Load Combination/ Cd  
V = D+0.75(L+S) Cd=1.15  
M = D+0.75(L+S) Cd=1.15  
 $\Delta = D+0.75(L+S)$

V = 5.60k	Vall = 70.50k	Ratio = 0.08
M = 31.16k-ft	Mall = 110.00k-ft	Ratio = 0.28
<b>Deflection</b>		
TL = 0.08" L/999+ > L/240 min		
DL = 0.04"		
L = 0.02" L/999+ > L/360 min		

W16x26 Steel

**Description - Upper Floor Frmg - H2-20 - Header**



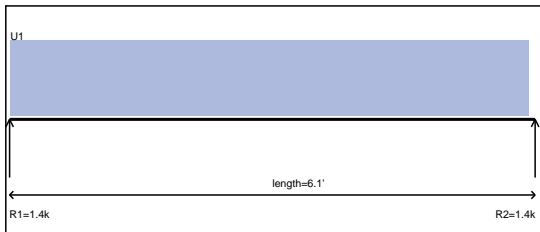
Uniform 1 = 0.18 klf (0.0'-6.1')

Controlling Load Combination/ Cd  
V = D+S Cd=1.15  
M = D+S Cd=1.15  
 $\Delta = D+S$

V = 0.55k	Vall = 3.50k	Ratio = 0.16
M = 0.84k-ft	Mall = 3.44k-ft	Ratio = 0.24
<b>Deflection</b>		
TL = 0.04" L/999+ > L/240 min		
DL = 0.01"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

**Description - Upper Floor Frmg - H2-21 - Header**



Uniform 1 = 0.46 klf (0.0'-6.0')

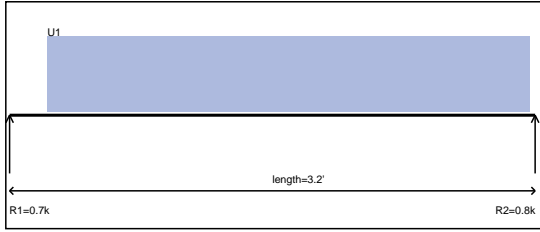
Controlling Load Combination/ Cd  
V = D+L (Main Spans) Cd=1  
M = D+L (Main Spans) Cd=1  
 $\Delta = D+L$  (Main Spans)

V = 1.40k	Vall = 3.04k	Ratio = 0.46
M = 2.12k-ft	Mall = 2.99k-ft	Ratio = 0.71
<b>Deflection</b>		
TL = 0.09" L/827 > L/240 min		
DL = 0.04"		
L = 0.05" L/999+ > L/360 min		

4x8 DF #2



Description - Upper Floor Frmg - H2-22 - Header



Uniform 1 = 0.46 klf (0.2'-3.2')

Controlling Load Combination/ Cd

$V = D+L \quad Cd=1$

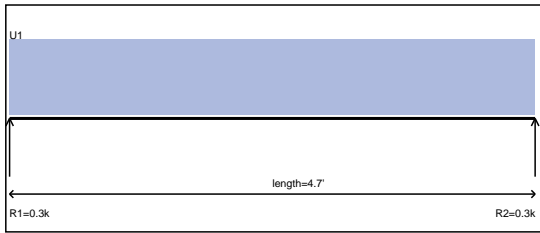
$M = D+L \quad Cd=1$

$\Delta = D+L$

V = 0.72k	Vall = 3.04k	Ratio = 0.24
M = 0.60k-ft	Mall = 2.99k-ft	Ratio = 0.20
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.01" L/999+ > L/360 min		

4x8 DF #2

Description - Upper Floor Frmg - H2-23 - Header



Uniform 1 = 0.09 klf (0.0'-4.7')

Controlling Load Combination/ Cd

$V = D+S \quad Cd=1.15$

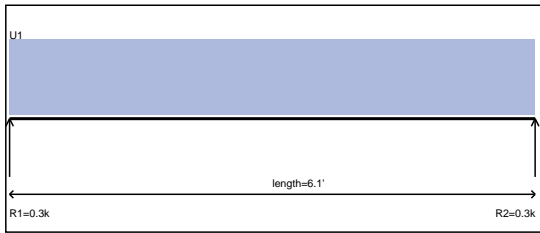
$M = D+S \quad Cd=1.15$

$\Delta = D+S$

V = 0.22k	Vall = 3.50k	Ratio = 0.06
M = 0.27k-ft	Mall = 3.44k-ft	Ratio = 0.08
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2

Description - Upper Floor Frmg - H2-24 - Header



Uniform 1 = 0.09 klf (0.0'-6.1')

Controlling Load Combination/ Cd

$V = D+S \quad Cd=1.15$

$M = D+S \quad Cd=1.15$

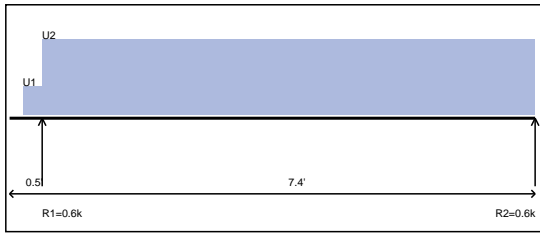
$\Delta = D+S$

V = 0.29k	Vall = 3.50k	Ratio = 0.08
M = 0.44k-ft	Mall = 3.44k-ft	Ratio = 0.13
Deflection		
TL = 0.02" L/999+ > L/240 min		
DL = 0.01"		
L = 0.00" L/999+ > L/360 min		

4x8 DF #2



**Description - Upper Floor Frmg - B2-1 - Flush**



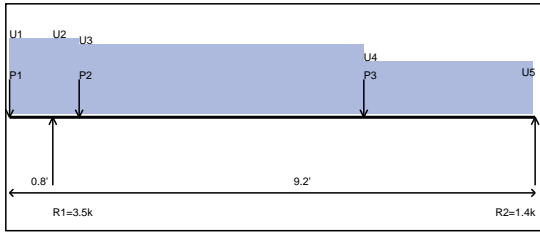
Uniform 1 = 0.06 klf (0.2'-0.5')  
Uniform 2 = 0.16 klf (0.5'-7.9')

Controlling Load Combination/ Cd  
V = (D + L) Cd=1  
M = (D + L) Cd=1  
 $\Delta = 0$

V = 0.58k	Vall = 0 k	Ratio = 0	
M = 1.08k-ft	Mall = 0 k-ft	Ratio = 0	
Deflection (Cantilevered End)		Deflection (Back Span)	
TL = NA	2L/999+ > 2L/240 min	TL = NA	L/999+ > L/240 min
DL = NA		DL = NA	
L = NA	2L/999+ > 2L/360 min	L = NA	L/999+ > L/360 min

Refer to External Design

**Description - Upper Floor Frmg - B2-2 - Flush**



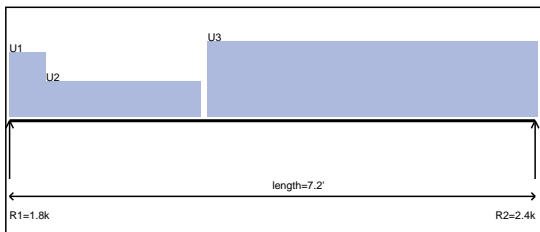
Uniform 1 = 0.36 klf (0.0'-0.8')      P1 = 1.79 K (0.0')  
Uniform 2 = 0.36 klf (0.8'-1.3')      P2 = 0.13 K (1.3')  
Uniform 3 = 0.33 klf (1.3'-6.7')      P3 = 0.13 K (6.7')  
Uniform 4 = 0.25 klf (6.7'-9.9')  
Uniform 5 = 0.18 klf (9.7'-9.9')

Controlling Load Combination/ Cd  
V = (D + S) Cd=1.15  
M = (D + S) Cd=1.15  
 $\Delta = D$

V = 1.67k	Vall = 0 k	Ratio = 0	
M = 3.52k-ft	Mall = 0 k-ft	Ratio = 0	
Deflection (Cantilevered End)		Deflection (Back Span)	
TL = NA	2L/999+ > 2L/240 min	TL = NA	L/999+ > L/240 min
DL = NA		DL = NA	
L = NA	2L/999+ > 2L/360 min	L = NA	L/999+ > L/360 min

Refer to External Design

**Description - Upper Floor Frmg - B2-3 - Flush**



Uniform 1 = 0.60 klf (0.0'-0.5')  
Uniform 2 = 0.33 klf (0.5'-2.6')  
Uniform 3 = 0.70 klf (2.7'-7.2')

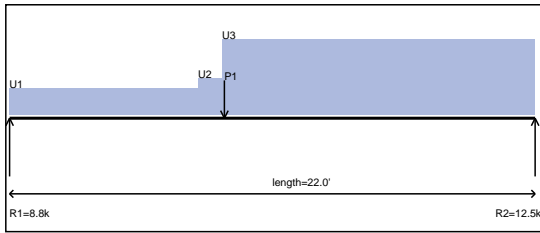
Controlling Load Combination/ Cd  
V = D+L Cd=1  
M = D+L (Main Spans) Cd=1  
 $\Delta = D+L$  (Main Spans)

V = 2.20k	Vall = 11.13k	Ratio = 0.20
M = 3.63k-ft	Mall = 37.80k-ft	Ratio = 0.10
Deflection		
TL = 0.02"	L/999+ > L/240 min	
DL = 0.01"		
L = 0.01"	L/999+ > L/360 min	

3-1/2x18 GLB



**Description - Upper Floor Frmg - B2-4 - Dropped**



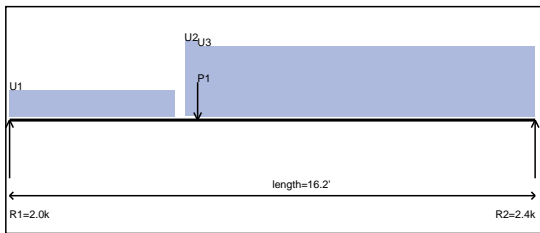
Uniform 1 = 0.41 klf (0.0'-7.9')      P1 = 2.00 K (9.0')  
 Uniform 2 = 0.57 klf (7.9'-8.9')  
 Uniform 3 = 1.17 klf (8.9'-22.0')

Controlling Load Combination/ Cd  
 V = D+0.75(L+S) Cd=1.15  
 M = D+0.75(L+S) Cd=1.15  
 $\Delta$  = D+0.75(L+S)

V = 10.57k	Vall = 25.14k	Ratio = 0.42
M = 56.22k-ft	Mall = 99.06k-ft	Ratio = 0.57
Deflection		
TL = 0.53" L/495 > L/240 min		
DL = 0.27"		
L = 0.14" L/999+ > L/360 min		

5-1/2x22-1/2 GLB

**Description - Upper Floor Frmg - B2-5 - Flush**



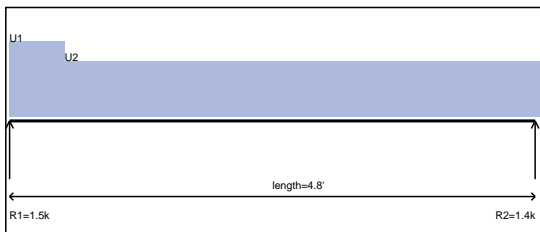
Uniform 1 = 0.10 klf (0.0'-5.1')      P1 = 0.93 K (5.8')  
 Uniform 2 = 0.29 klf (5.4'-5.8')  
 Uniform 3 = 0.27 klf (5.8'-16.2')

Controlling Load Combination/ Cd  
 V = D+S Cd=1.15  
 M = D+S Cd=1.15  
 $\Delta$  = D+S

V = 2.23k	Vall = 12.80k	Ratio = 0.17
M = 9.29k-ft	Mall = 43.47k-ft	Ratio = 0.21
Deflection		
TL = 0.15" L/999+ > L/240 min		
DL = 0.10"		
L = 0.02" L/999+ > L/360 min		

3-1/2x18 GLB

**Description - Upper Floor Frmg - B2-6 - Flush**



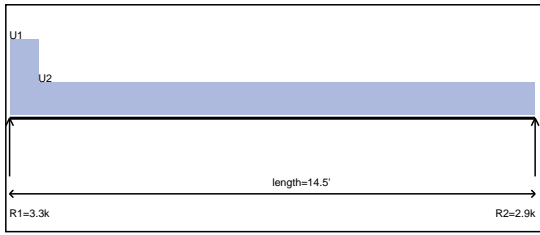
Uniform 1 = 0.76 klf (0.0'-0.5')  
 Uniform 2 = 0.56 klf (0.5'-4.8')

Controlling Load Combination/ Cd  
 V = D+L (Main Spans) Cd=1  
 M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 1.41k	Vall = 11.13k	Ratio = 0.13
M = 1.58k-ft	Mall = 37.80k-ft	Ratio = 0.04
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

3-1/2x18 GLB

**Description - Upper Floor Frmg - B2-7 - Flush Bottom**



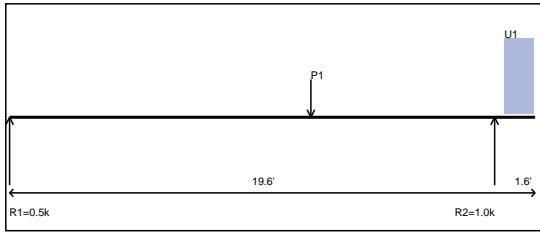
Uniform 1 = 0.90 klf (0.0'-0.8')  
Uniform 2 = 0.39 klf (0.8'-14.5')

Controlling Load Combination/ Cd  
V = D+S Cd=1.15  
M = D+S Cd=1.15  
 $\Delta$  = D+S

V = 2.93k	Vall = 9.60k	Ratio = 0.31
M = 10.26k-ft	Mall = 24.45k-ft	Ratio = 0.42
Deflection		
TL = 0.31" L/561 > L/240 min		
DL = 0.13"		
L = 0.00" L/999+ > L/360 min		

3-1/2x13-1/2 GLB

**Description - Upper Floor Frmg - B2-8 - Flush**



P1 = 1.33 K (12.2')

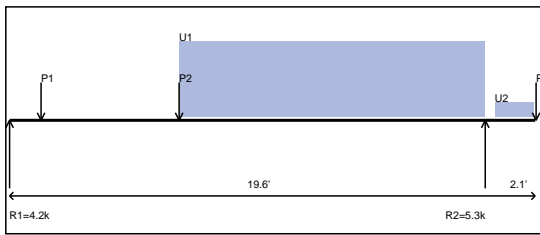
Uniform 1 = 0.10 klf (20.0'-21.2')

Controlling Load Combination/ Cd  
V = (D + L) Cd=1  
M = (D + L) Cd=1  
 $\Delta$  = D

V = 0.82k	Vall = 0 k	Ratio = 0
M = 6.08k-ft	Mall = 0 k-ft	Ratio = 0
Deflection (Cantilevered End)		
TL = NA 2L/999+ > 2L/240 min		
DL = NA		
L = NA 2L/999+ > 2L/360 min		
Deflection (Back Span)		
TL = NA L/999+ > L/240 min		
DL = NA		
L = NA L/999+ > L/360 min		

Refer to External Design

**Description - Upper Floor Frmg - B2-9 - Flush**



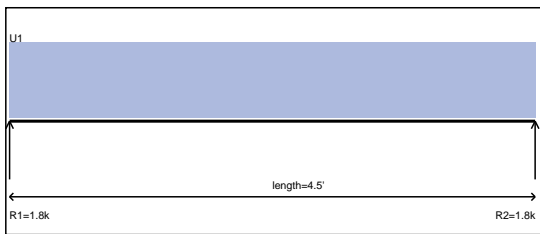
Uniform 1 = 0.53 klf (7.0'-19.6') P1 = 1.24 K (1.3')  
Uniform 2 = 0.10 klf (20.0'-21.6') P2 = 1.24 K (7.0')  
P3 = 0.71 K (21.7')

Controlling Load Combination/ Cd  
V = (D + S) Cd=1.15  
M = (D + S) Cd=1.15  
 $\Delta$  = 0

V = 5.05k	Vall = 0 k	Ratio = 0
M = 23.66k-ft	Mall = 0 k-ft	Ratio = 0
Deflection (Cantilevered End)		
TL = NA 2L/999+ > 2L/240 min		
DL = NA		
L = NA 2L/999+ > 2L/360 min		
Deflection (Back Span)		
TL = NA L/999+ > L/240 min		
DL = NA		
L = NA L/999+ > L/360 min		

Refer to External Design

**Description - Upper Floor Frmg - B2-10 - Flush**



Uniform 1 = 0.77 klf (0.0'-4.5')

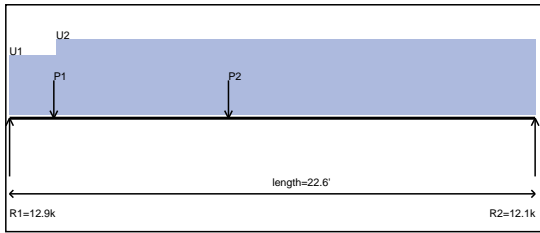
Controlling Load Combination/ Cd  
V = D+L (Main Spans) Cd=1  
M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 1.71k	Vall = 11.13k	Ratio = 0.15
M = 1.92k-ft	Mall = 37.80k-ft	Ratio = 0.05
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

3-1/2x18 GLB



**Description - Upper Floor Frmg - B2-11 - Flush Bottom**



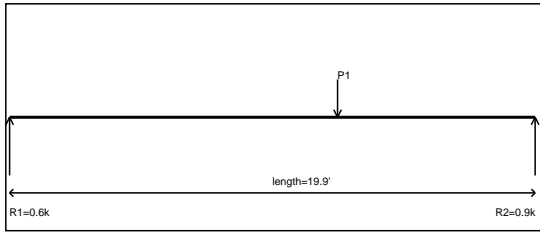
Uniform 1 = 0.72 klf (0.0'-2.0')      P1 = 0.50 K (1.9')  
Uniform 2 = 0.92 klf (2.0'-22.6')      P2 = 4.10 K (9.4')

Controlling Load Combination/ Cd  
V = D+L (Main Spans) Cd=1  
M = D+L (Main Spans) Cd=1  
Δ = D+L (Main Spans)

V = 11.50k	Vall = 87.50k	Ratio = 0.13
M = 67.69k-ft	Mall = 135.00k-ft	Ratio = 0.50
Deflection		
TL = 0.56" L/484 > L/240 min		
DL = 0.21"		
L = 0.35" L/785 > L/360 min		

W16x31 Steel

**Description - Upper Floor Frmg - B2-12 - Flush**



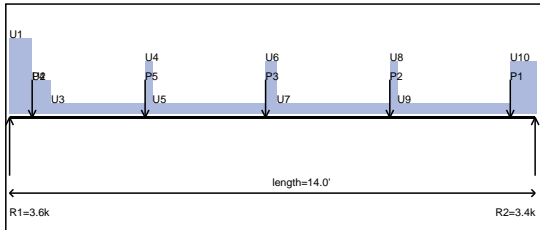
P1 = 1.42 K (12.4')

Controlling Load Combination/ Cd  
V = D+L Cd=1  
M = D+L Cd=1  
Δ = D+L

V = 0.88k	Vall = 11.13k	Ratio = 0.08
M = 6.58k-ft	Mall = 37.80k-ft	Ratio = 0.17
Deflection		
TL = 0.12" L/999+ > L/240 min		
DL = 0.04"		
L = 0.09" L/999+ > L/360 min		

3-1/2x18 GLB

**Description - Upper Floor Frmg - B2-13 - Flush**



Uniform 1 = 0.69 klf (0.0'-0.6')      P1 = 0.57 K (13.3')  
Uniform 2 = 0.31 klf (0.6'-1.1')      P2 = 1.14 K (10.1')  
Uniform 3 = 0.10 klf (1.1'-3.6')      P3 = 1.14 K (6.8')  
Uniform 4 = 0.48 klf (3.6'-3.8')      P4 = 0.57 K (0.6')  
Uniform 5 = 0.10 klf (3.8'-6.8')      P5 = 1.14 K (3.6')  
Uniform 6 = 0.48 klf (6.8'-7.1')  
Uniform 7 = 0.10 klf (7.1'-10.1')  
Uniform 8 = 0.48 klf (10.1'-10.3')  
Uniform 9 = 0.10 klf (10.3'-13.3')  
Uniform 10 = 0.48 klf (13.3'-14.0')

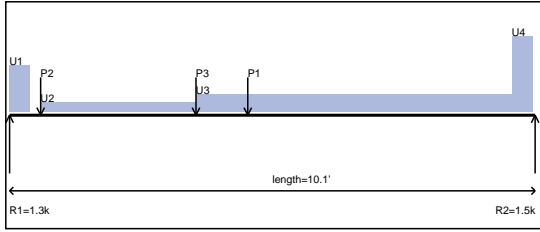
Controlling Load Combination/ Cd  
V = (D + S) Cd=1.15  
M = (D + S) Cd=1.15  
Δ = 0

V = 3.59k	Vall = 0 k	Ratio = 0
M = 11.78k-ft	Mall = 0 k-ft	Ratio = 0
Deflection		
TL = NA L/999+ > L/240 min		
DL = NA		
L = NA L/999+ > L/360 min		

Refer to External Design



**Description - Upper Floor Frmg - B2-14 - Flush**



- Uniform 1 = 0.48 klf (0.0'-0.4')      P1 = 0.47 K (4.6')
- Uniform 2 = 0.10 klf (0.6'-3.6')      P2 = 0.13 K (0.6')
- Uniform 3 = 0.18 klf (3.6'-9.7')      P3 = 0.13 K (3.6')
- Uniform 4 = 0.78 klf (9.7'-10.1')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

M = D+S Cd=1.15

Δ = D+S

V = 1.26k	Vall = 20.11k	Ratio = 0.06
M = 3.52k-ft	Mall = 68.31k-ft	Ratio = 0.05

Deflection

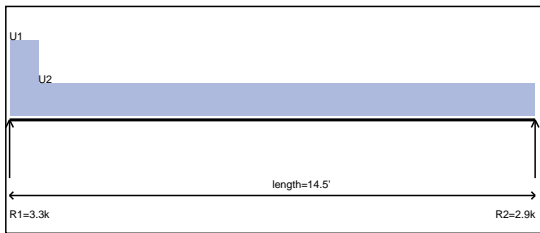
TL = 0.02" L/999+ > L/240 min

DL = 0.01"

L = 0.00" L/999+ > L/360 min

5-1/2x18 GLB

**Description - Upper Floor Frmg - B2-15 - Flush Bottom**



- Uniform 1 = 0.90 klf (0.0'-0.8')
- Uniform 2 = 0.39 klf (0.8'-14.5')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

M = D+S Cd=1.15

Δ = D+S

V = 2.93k	Vall = 9.60k	Ratio = 0.31
M = 10.26k-ft	Mall = 24.45k-ft	Ratio = 0.42

Deflection

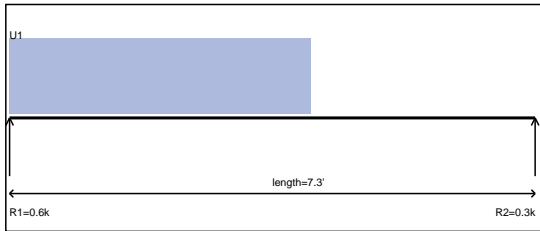
TL = 0.31" L/561 > L/240 min

DL = 0.13"

L = 0.00" L/999+ > L/360 min

3-1/2x13-1/2 GLB

**Description - Upper Floor Frmg - B2-16 - Flush**



- Uniform 1 = 0.18 klf (0.0'-4.2')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

M = D+S Cd=1.15

Δ = D+S

V = 0.55k	Vall = 20.11k	Ratio = 0.03
M = 0.82k-ft	Mall = 68.31k-ft	Ratio = 0.01

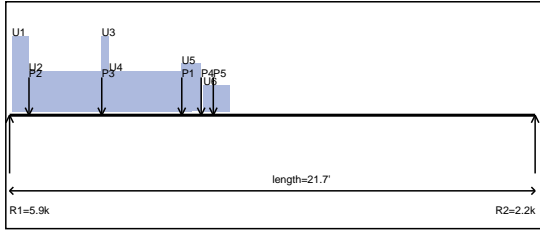
Deflection

TL = 0.00" L/999+ > L/240 min

DL = 0.00"

L = 0.00" L/999+ > L/360 min

5-1/2x18 GLB

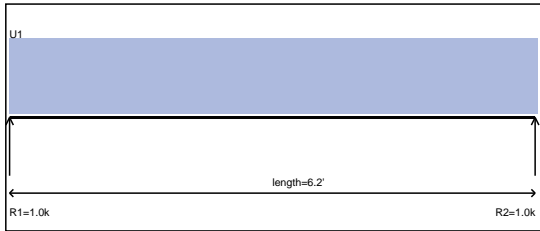
**Description - Upper Floor Frmg - B2-17 - Flush**


- |                                  |                    |
|----------------------------------|--------------------|
| Uniform 1 = 0.60 klf (0.1'-0.8') | P1 = 0.43 K (7.1') |
| Uniform 2 = 0.32 klf (0.8'-3.8') | P2 = 0.43 K (0.8') |
| Uniform 3 = 0.60 klf (3.8'-4.1') | P3 = 0.85 K (3.8') |
| Uniform 4 = 0.32 klf (4.1'-7.5') | P4 = 1.42 K (7.9') |
| Uniform 5 = 0.38 klf (7.1'-7.9') | P5 = 1.72 K (8.4') |
| Uniform 6 = 0.21 klf (8.0'-9.1') |                    |

5-1/2x18 GLB

Controlling Load Combination/ Cd  
 $V = D+0.75(L+S)$  Cd=1.15  
 $M = D+0.75(L+S)$  Cd=1.15  
 $\Delta = D+0.75(L+S)$

$V = 5.12k$	$V_{all} = 20.11k$	Ratio = 0.25
$M = 24.24k-ft$	$M_{all} = 64.93k-ft$	Ratio = 0.37
<b>Deflection</b>		
TL = 0.36" L/718 > L/240 min		
DL = 0.19"		
L = 0.10" L/999+ > L/360 min		

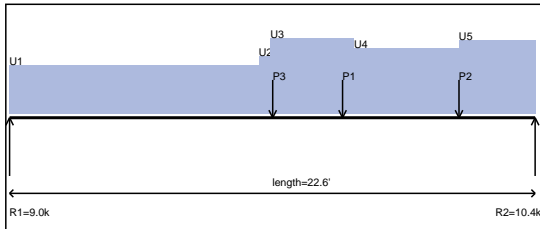
**Description - Upper Floor Frmg - B2-18 - Flush Bottom**


- Uniform 1 = 0.29 klf (0.0'-6.2')

4x10 DF #2

Controlling Load Combination/ Cd  
 $V = D+S$  Cd=1.15  
 $M = D+S$  Cd=1.15  
 $\Delta = D+S$

$V = 0.90k$	$V_{all} = 4.47k$	Ratio = 0.20
$M = 1.39k-ft$	$M_{all} = 5.17k-ft$	Ratio = 0.27
<b>Deflection</b>		
TL = 0.03" L/999+ > L/240 min		
DL = 0.01"		
L = 0.00" L/999+ > L/360 min		

**Description - Upper Floor Frmg - B2-19 - Flush Bottom**


- |                                    |                     |
|------------------------------------|---------------------|
| Uniform 1 = 0.49 klf (0.0'-10.7')  | P1 = 0.21 K (14.3') |
| Uniform 2 = 0.58 klf (10.7'-11.2') | P2 = 0.21 K (19.3') |
| Uniform 3 = 0.76 klf (11.2'-14.8') | P3 = 5.27 K (11.3') |
| Uniform 4 = 0.66 klf (14.8'-19.3') |                     |
| Uniform 5 = 0.74 klf (19.3'-22.6') |                     |

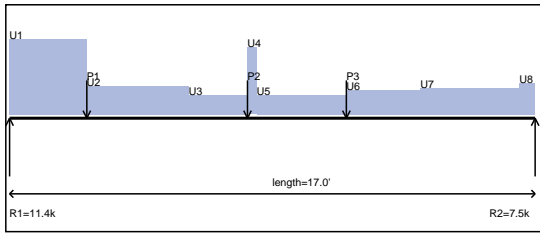
W16x31 Steel

Controlling Load Combination/ Cd  
 $V = D+L$  Cd=1  
 $M = D+0.75(L+S)$  (Main Spans) Cd=1.15  
 $\Delta = D+0.75(L+S)$  (Main Spans)

$V = 7.83k$	$V_{all} = 87.50k$	Ratio = 0.09
$M = 59.66k-ft$	$M_{all} = 135.00k-ft$	Ratio = 0.44
<b>Deflection</b>		
TL = 0.46" L/593 > L/240 min		
DL = 0.23"		
L = 0.18" L/999+ > L/360 min		



**Description - Upper Floor Frmg - B2-20 - Flush**



- Uniform 1 = 1.22 klf (0.0'-2.5')      P1 = 2.01 K (2.5')
- Uniform 2 = 0.46 klf (2.5'-5.8')      P2 = 7.79 K (7.7')
- Uniform 3 = 0.31 klf (5.8'-7.7')      P3 = 0.13 K (10.9')
- Uniform 4 = 1.08 klf (7.7'-8.0')
- Uniform 5 = 0.31 klf (8.0'-10.9')
- Uniform 6 = 0.39 klf (10.9'-13.3')
- Uniform 7 = 0.42 klf (13.3'-16.5')
- Uniform 8 = 0.51 klf (16.5'-17.0')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

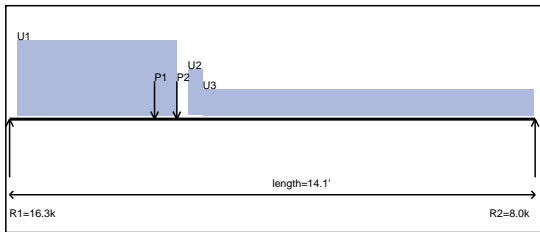
M = D+S Cd=1.15

Δ = D+S

V = 10.13k	Vall = 20.11k	Ratio = 0.50
M = 47.20k-ft	Mall = 66.53k-ft	Ratio = 0.71
Deflection		
TL = 0.48" L/430 > L/240 min		
DL = 0.23"		
L = 0.05" L/999+ > L/360 min		

5-1/2x18 GLB

**Description - Upper Floor Frmg - B2-22 - Flush**



- Uniform 1 = 0.51 klf (0.2'-4.5')      P1 = 1.30 K (3.9')
- Uniform 2 = 0.31 klf (4.8'-5.2')      P2 = 19.03 K (4.5')
- Uniform 3 = 0.18 klf (5.2'-14.1')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

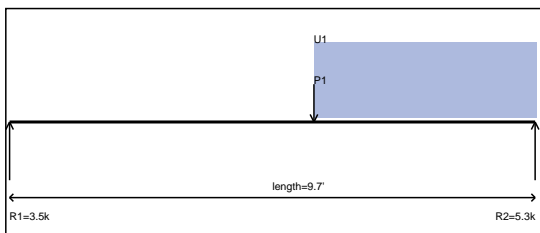
M = D+S Cd=1.15

Δ = D+S

V = 14.86k	Vall = 20.11k	Ratio = 0.74
M = 61.48k-ft	Mall = 67.77k-ft	Ratio = 0.91
Deflection		
TL = 0.41" L/416 > L/240 min		
DL = 0.20"		
L = 0.04" L/999+ > L/360 min		

5-1/2x18 GLB

**Description - Upper Floor Frmg - B2-24 - Flush**



- Uniform 1 = 0.30 klf (5.6'-9.7')      P1 = 7.48 K (5.6')

Controlling Load Combination/ Cd

V = D+S Cd=1.15

M = D+S Cd=1.15

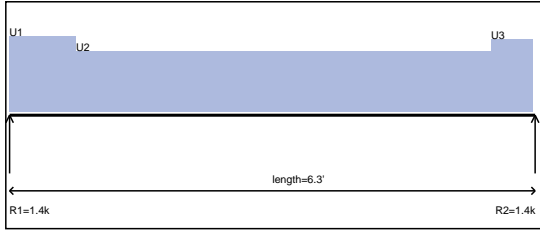
Δ = D+S

V = 4.81k	Vall = 12.80k	Ratio = 0.38
M = 17.06k-ft	Mall = 43.47k-ft	Ratio = 0.39
Deflection		
TL = 0.10" L/999+ > L/240 min		
DL = 0.05"		
L = 0.01" L/999+ > L/360 min		

3-1/2x18 GLB



**Description - Upper Floor Frmg - B2-25 - Flush**



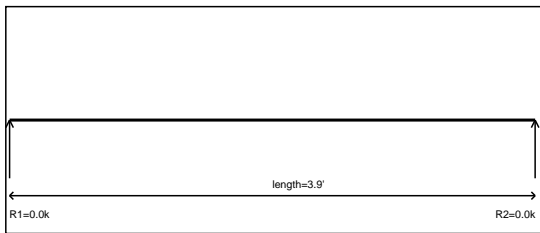
Uniform 1 = 0.50 klf (0.0'-0.8')  
 Uniform 2 = 0.40 klf (0.8'-5.8')  
 Uniform 3 = 0.48 klf (5.8'-6.3')

Controlling Load Combination/ Cd  
 V = D+L (Main Spans) Cd=1  
 M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 1.33k	Vall = 11.13k	Ratio = 0.12
M = 2.00k-ft	Mall = 37.80k-ft	Ratio = 0.05
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 - Upper Floor Frmg - B2-26 - Flush**

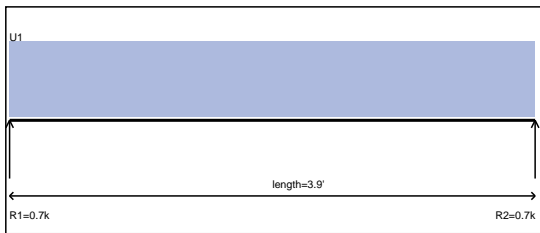


Controlling Load Combination/ Cd  
 V = D Cd=0.9  
 M = D Cd=0.9  
 $\Delta$  = 0

V = 0.00k	Vall = 10.02k	Ratio = 0.00
M = 0.00k-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 - Main Floor Frmg - B1-1 - Dropped**



Uniform 1 = 0.34 klf (0.0'-3.9')

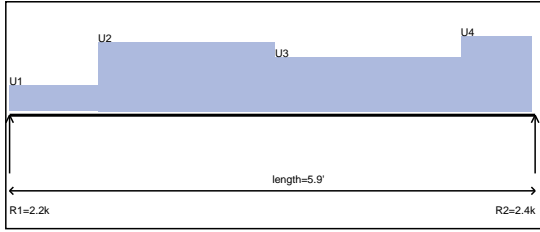
Controlling Load Combination/ Cd  
 V = D+L Cd=1  
 M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 0.65k	Vall = 3.88k	Ratio = 0.17
M = 0.64k-ft	Mall = 4.49k-ft	Ratio = 0.14
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.01" L/999+ > L/360 min		

4x10 DF #2



**Description - Main Floor Frmg - B1-2 - Dropped**



- Uniform 1 = 0.34 klf (0.0'-1.0')
- Uniform 2 = 0.91 klf (1.0'-3.0')
- Uniform 3 = 0.71 klf (3.0'-5.1')
- Uniform 4 = 0.99 klf (5.1'-5.9')

Controlling Load Combination/ Cd

V = D+L Cd=1

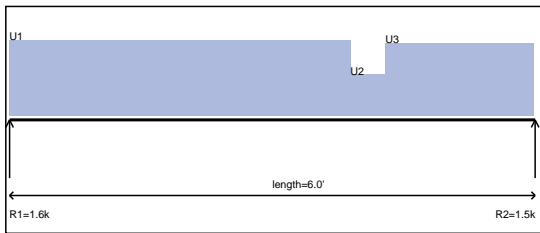
M = D+L (Main Spans) Cd=1

△ = D+L (Main Spans)

V = 2.40k	Vall = 3.88k	Ratio = 0.62
M = 3.49k-ft	Mall = 4.49k-ft	Ratio = 0.78
Deflection		
TL = 0.07" L/982 > L/240 min		
DL = 0.02"		
L = 0.05" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-3 - Dropped**



- Uniform 1 = 0.51 klf (0.0'-3.9')
- Uniform 2 = 0.28 klf (3.9'-4.3')
- Uniform 3 = 0.49 klf (4.3'-6.0')

Controlling Load Combination/ Cd

V = D+L (Main Spans) Cd=1

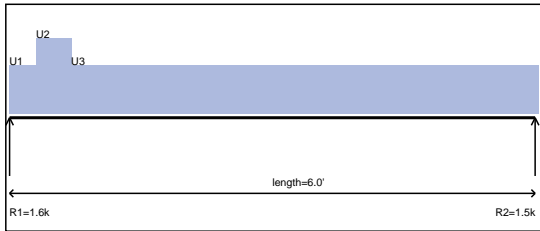
M = D+L (Main Spans) Cd=1

△ = D+L (Main Spans)

V = 1.49k	Vall = 3.88k	Ratio = 0.38
M = 2.19k-ft	Mall = 4.49k-ft	Ratio = 0.49
Deflection		
TL = 0.05" L/999+ > L/240 min		
DL = 0.01"		
L = 0.04" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-4 - Dropped**



- Uniform 1 = 0.49 klf (0.0'-0.3')
- Uniform 2 = 0.76 klf (0.3'-0.7')
- Uniform 3 = 0.49 klf (0.7'-6.0')

Controlling Load Combination/ Cd

V = D+L (Main Spans) Cd=1

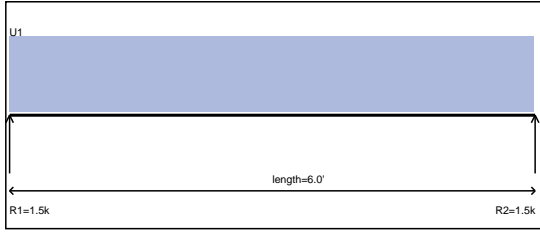
M = D+L (Main Spans) Cd=1

△ = D+L (Main Spans)

V = 1.56k	Vall = 3.88k	Ratio = 0.40
M = 2.20k-ft	Mall = 4.49k-ft	Ratio = 0.49
Deflection		
TL = 0.05" L/999+ > L/240 min		
DL = 0.01"		
L = 0.04" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-5 - Dropped**



Uniform 1 = 0.49 klf (0.0'-6.0')

Controlling Load Combination/ Cd

V = D+L Cd=1

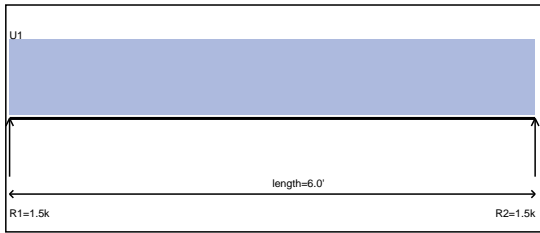
M = D+L (Main Spans) Cd=1

△ = D+L (Main Spans)

V = 1.47k	Vall = 3.88k	Ratio = 0.38
M = 2.21k-ft	Mall = 4.49k-ft	Ratio = 0.49
Deflection		
TL = 0.05" L/999+ > L/240 min		
DL = 0.01"		
L = 0.04" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-6 - Dropped**



Uniform 1 = 0.49 klf (0.0'-6.0')

Controlling Load Combination/ Cd

V = D+L (Main Spans) Cd=1

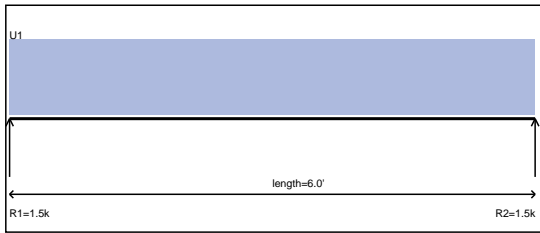
M = D+L (Main Spans) Cd=1

△ = D+L (Main Spans)

V = 1.47k	Vall = 3.88k	Ratio = 0.38
M = 2.20k-ft	Mall = 4.49k-ft	Ratio = 0.49
Deflection		
TL = 0.05" L/999+ > L/240 min		
DL = 0.01"		
L = 0.04" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-7 - Dropped**



Uniform 1 = 0.49 klf (0.0'-6.0')

Controlling Load Combination/ Cd

V = D+L (Main Spans) Cd=1

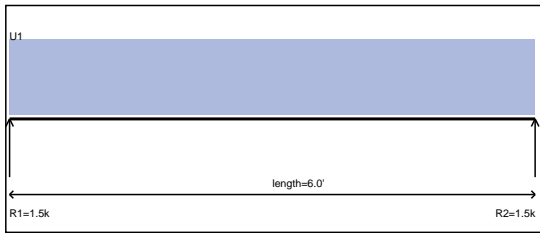
M = D+L (Main Spans) Cd=1

△ = D+L (Main Spans)

V = 1.47k	Vall = 3.88k	Ratio = 0.38
M = 2.20k-ft	Mall = 4.49k-ft	Ratio = 0.49
Deflection		
TL = 0.05" L/999+ > L/240 min		
DL = 0.01"		
L = 0.04" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-8 - Dropped**



Uniform 1 = 0.49 klf (0.0'-6.0')

Controlling Load Combination/ Cd

V = D+L (Main Spans) Cd=1

M = D+L (Main Spans) Cd=1

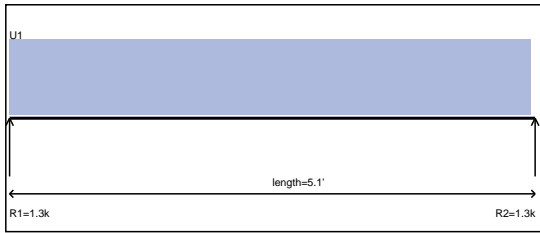
△ = D+L (Main Spans)

V = 1.47k	Vall = 3.88k	Ratio = 0.38
M = 2.20k-ft	Mall = 4.49k-ft	Ratio = 0.49
Deflection		
TL = 0.05" L/999+ > L/240 min		
DL = 0.01"		
L = 0.04" L/999+ > L/360 min		

4x10 DF #2



**Description - Main Floor Frmg - B1-9 - Dropped**



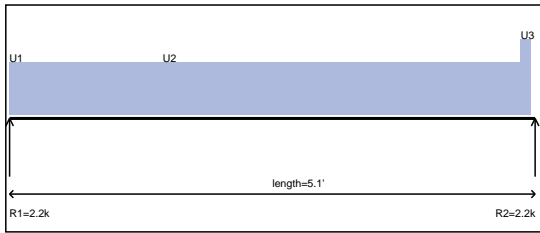
Uniform 1 = 0.49 klf (0.0'-5.1')

Controlling Load Combination/ Cd  
 V = D+L (Main Spans) Cd=1  
 M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 1.26k	Vall = 3.88k	Ratio = 0.32
M = 1.62k-ft	Mall = 4.49k-ft	Ratio = 0.36
Deflection		
TL = 0.03" L/999+ > L/240 min		
DL = 0.01"		
L = 0.02" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-10 - Dropped**



Uniform 1 = 0.82 klf (0.0'-1.5')

Uniform 2 = 0.82 klf (1.5'-5.0')

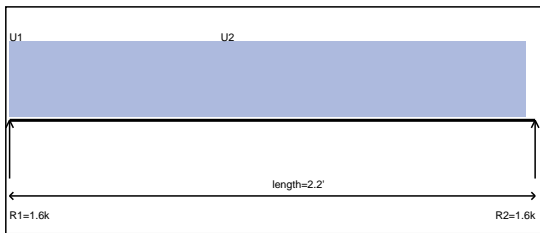
Uniform 3 = 1.18 klf (5.0'-5.1')

Controlling Load Combination/ Cd  
 V = D+L Cd=1  
 M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 2.11k	Vall = 3.88k	Ratio = 0.54
M = 2.69k-ft	Mall = 4.49k-ft	Ratio = 0.60
Deflection		
TL = 0.05" L/999+ > L/240 min		
DL = 0.02"		
L = 0.03" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-11 - Dropped**



Uniform 1 = 1.35 klf (0.0'-0.9')

Uniform 2 = 1.35 klf (0.9'-2.2')

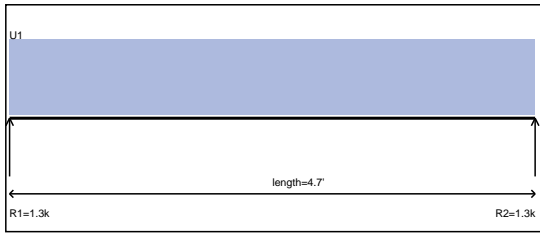
Controlling Load Combination/ Cd  
 V = D+L (Main Spans) Cd=1  
 M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 1.51k	Vall = 3.88k	Ratio = 0.39
M = 0.85k-ft	Mall = 4.49k-ft	Ratio = 0.19
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x10 DF #2



**Description - Main Floor Frmg - B1-12 - Dropped**



Controlling Load Combination/ Cd

V = D+L Cd=1

M = D+L (Main Spans) Cd=1

△ = D+L (Main Spans)

V = 1.27k	Vall = 3.88k	Ratio = 0.33
-----------	--------------	--------------

M = 1.49k-ft	Mall = 4.49k-ft	Ratio = 0.33
--------------	-----------------	--------------

Deflection

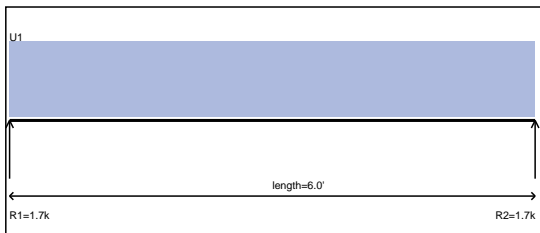
TL = 0.02" L/999+ > L/240 min

DL = 0.00"

L = 0.02" L/999+ > L/360 min

4x10 DF #2

**Description - Main Floor Frmg - B1-13 - Dropped**



Controlling Load Combination/ Cd

V = D+L (Main Spans) Cd=1

M = D+L (Main Spans) Cd=1

△ = D+L (Main Spans)

V = 1.62k	Vall = 3.88k	Ratio = 0.42
-----------	--------------	--------------

M = 2.42k-ft	Mall = 4.49k-ft	Ratio = 0.54
--------------	-----------------	--------------

Deflection

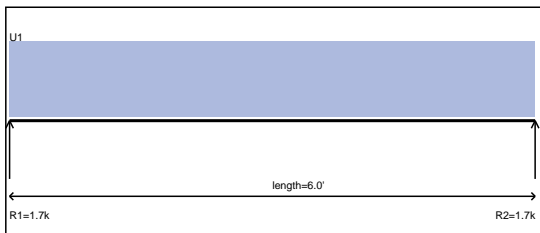
TL = 0.05" L/999+ > L/240 min

DL = 0.01"

L = 0.04" L/999+ > L/360 min

4x10 DF #2

**Description - Main Floor Frmg - B1-14 - Dropped**



Controlling Load Combination/ Cd

V = D+L (Main Spans) Cd=1

M = D+L (Main Spans) Cd=1

△ = D+L (Main Spans)

V = 1.62k	Vall = 3.88k	Ratio = 0.42
-----------	--------------	--------------

M = 2.42k-ft	Mall = 4.49k-ft	Ratio = 0.54
--------------	-----------------	--------------

Deflection

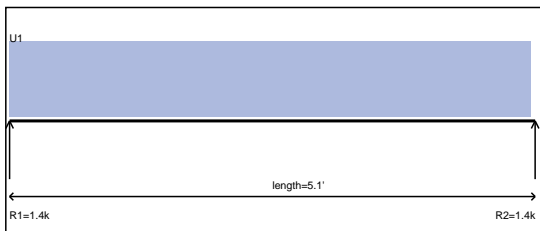
TL = 0.05" L/999+ > L/240 min

DL = 0.01"

L = 0.04" L/999+ > L/360 min

4x10 DF #2

**Description - Main Floor Frmg - B1-15 - Dropped**



Controlling Load Combination/ Cd

V = D+L (Main Spans) Cd=1

M = D+L (Main Spans) Cd=1

△ = D+L (Main Spans)

V = 1.38k	Vall = 3.88k	Ratio = 0.36
-----------	--------------	--------------

M = 1.78k-ft	Mall = 4.49k-ft	Ratio = 0.40
--------------	-----------------	--------------

Deflection

TL = 0.03" L/999+ > L/240 min

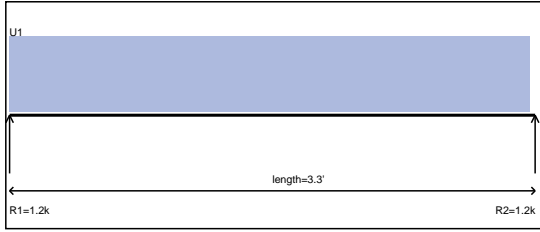
DL = 0.01"

L = 0.02" L/999+ > L/360 min

4x10 DF #2



**Description - Main Floor Frmg - B1-16 - Dropped**



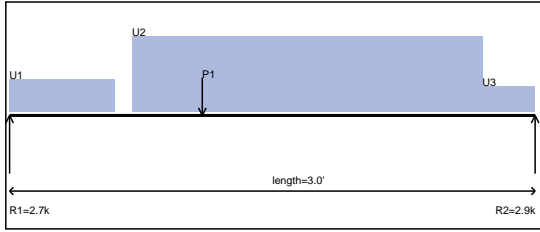
Uniform 1 = 0.69 klf (0.0'-3.3')

Controlling Load Combination/ Cd  
 V = D+L (Main Spans) Cd=1  
 M = D+L (Main Spans) Cd=1  
 Δ = D+L (Main Spans)

V = 1.15k	Vall = 3.88k	Ratio = 0.30
M = 0.96k-ft	Mall = 4.49k-ft	Ratio = 0.21
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.01" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-17 - Dropped**



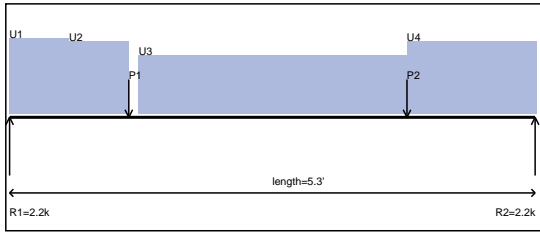
Uniform 1 = 0.69 klf (0.0'-0.6')      P1 = 1.72 K (1.1')  
 Uniform 2 = 1.60 klf (0.7'-2.7')  
 Uniform 3 = 0.54 klf (2.7'-3.0')

Controlling Load Combination/ Cd  
 V = D+L (Main Spans) Cd=1  
 M = D+L (Main Spans) Cd=1  
 Δ = D+L (Main Spans)

V = 2.85k	Vall = 3.88k	Ratio = 0.73
M = 2.67k-ft	Mall = 4.49k-ft	Ratio = 0.59
Deflection		
TL = 0.02" L/999+ > L/240 min		
DL = 0.01"		
L = 0.02" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-18 - Dropped**



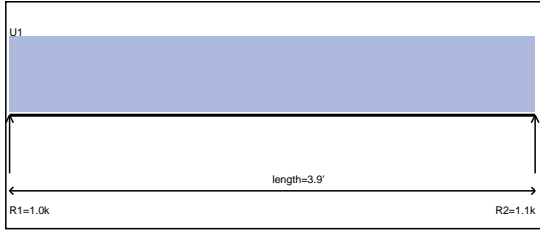
Uniform 1 = 0.86 klf (0.0'-0.6')      P1 = 0.21 K (1.2')  
 Uniform 2 = 0.82 klf (0.6'-1.2')      P2 = 0.21 K (4.0')  
 Uniform 3 = 0.67 klf (1.3'-4.0')  
 Uniform 4 = 0.82 klf (4.0'-5.3')

Controlling Load Combination/ Cd  
 V = D+L Cd=1  
 M = D+L (Main Spans) Cd=1  
 Δ = D+L (Main Spans)

V = 2.15k	Vall = 3.88k	Ratio = 0.55
M = 2.68k-ft	Mall = 4.49k-ft	Ratio = 0.60
Deflection		
TL = 0.05" L/999+ > L/240 min		
DL = 0.02"		
L = 0.03" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-19 - Dropped**



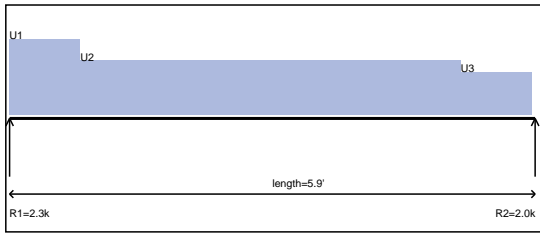
Uniform 1 = 0.51 klf (0.0'-3.9')

Controlling Load Combination/ Cd  
V = D+L Cd=1  
M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 0.99k	Vall = 3.88k	Ratio = 0.26
M = 0.97k-ft	Mall = 4.49k-ft	Ratio = 0.22
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.01" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-20 - Dropped**



Uniform 1 = 0.95 klf (0.0'-0.8')

Uniform 2 = 0.68 klf (0.8'-5.1')

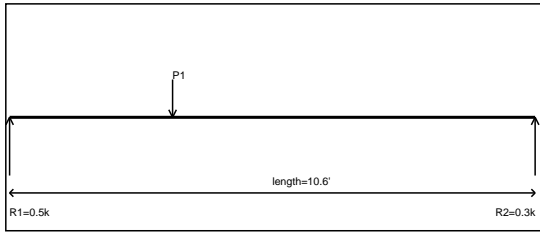
Uniform 3 = 0.54 klf (5.1'-5.9')

Controlling Load Combination/ Cd  
V = D+L (Main Spans) Cd=1  
M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 2.18k	Vall = 3.88k	Ratio = 0.56
M = 2.98k-ft	Mall = 4.49k-ft	Ratio = 0.66
Deflection		
TL = 0.06" L/999+ > L/240 min		
DL = 0.02"		
L = 0.05" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-21 - Flush**



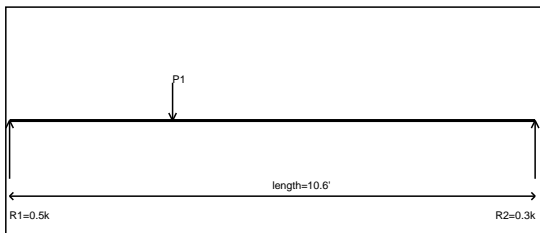
P1 = 0.66 K (3.3')

Controlling Load Combination/ Cd  
V = D+L Cd=1  
M = D+L Cd=1  
 $\Delta$  = D+L

V = 0.46k	Vall = 1.33k	Ratio = 0.34
M = 1.50k-ft	Mall = 3.00k-ft	Ratio = 0.50
Deflection		
TL = 0.15" L/836 > L/240 min		
DL = 0.04"		
L = 0.11" L/999+ > L/360 min		

9-1/2" TJI 210 I-Joists

**Description - Main Floor Frmg - B1-22 - Flush**



P1 = 0.66 K (3.3')

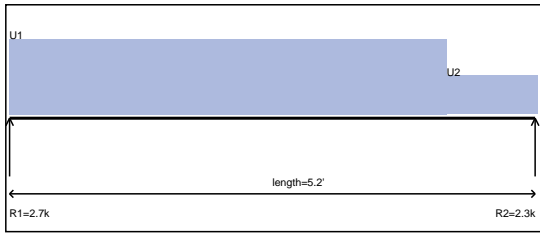
Controlling Load Combination/ Cd  
V = D+L Cd=1  
M = D+L Cd=1  
 $\Delta$  = D+L

V = 0.46k	Vall = 1.33k	Ratio = 0.34
M = 1.50k-ft	Mall = 3.00k-ft	Ratio = 0.50
Deflection		
TL = 0.15" L/836 > L/240 min		
DL = 0.04"		
L = 0.11" L/999+ > L/360 min		

9-1/2" TJI 210 I-Joists



**Description - Main Floor Frmg - B1-23 - Dropped**



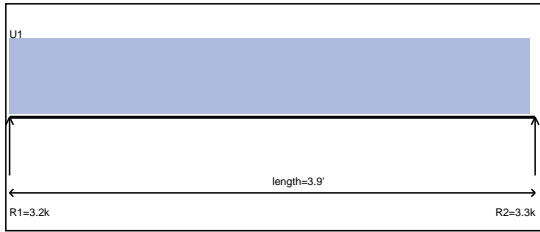
Uniform 1 = 1.03 klf (0.0'-4.3')  
Uniform 2 = 0.53 klf (4.3'-5.2')

Controlling Load Combination/ Cd  
V = D+L (Main Spans) Cd=1  
M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 2.53k	Vall = 3.88k	Ratio = 0.65
M = 3.23k-ft	Mall = 4.49k-ft	Ratio = 0.72
Deflection		
TL = 0.05" L/999+ > L/240 min		
DL = 0.02"		
L = 0.03" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-24 - Dropped**



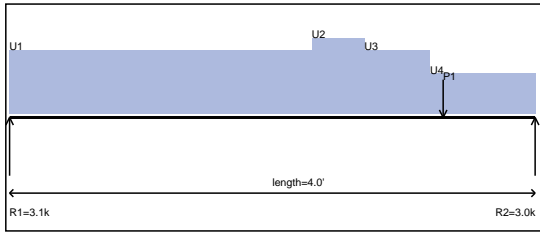
Uniform 1 = 1.60 klf (0.0'-3.9')

Controlling Load Combination/ Cd  
V = D+L (Main Spans) Cd=1  
M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 3.15k	Vall = 3.88k	Ratio = 0.81
M = 3.10k-ft	Mall = 4.49k-ft	Ratio = 0.69
Deflection		
TL = 0.04" L/999+ > L/240 min		
DL = 0.01"		
L = 0.02" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-25 - Dropped**



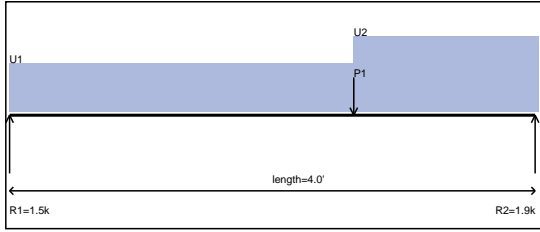
Uniform 1 = 1.48 klf (0.0'-2.3')      P1 = 0.44 K (3.3')  
Uniform 2 = 1.75 klf (2.3'-2.7')  
Uniform 3 = 1.48 klf (2.7'-3.2')  
Uniform 4 = 0.93 klf (3.2'-4.0')

Controlling Load Combination/ Cd  
V = D+L (Main Spans) Cd=1  
M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 3.02k	Vall = 3.88k	Ratio = 0.78
M = 3.09k-ft	Mall = 4.49k-ft	Ratio = 0.69
Deflection		
TL = 0.04" L/999+ > L/240 min		
DL = 0.01"		
L = 0.03" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-26 - Dropped**



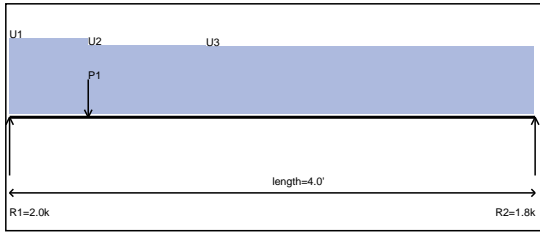
Uniform 1 = 0.60 klf (0.0'-2.6')      P1 = 0.46 K (2.6')  
 Uniform 2 = 0.93 klf (2.6'-4.0')

Controlling Load Combination/ Cd  
 V = D+L Cd=1  
 M = D+L (Main Spans) Cd=1  
 Δ = D+L (Main Spans)

V = 1.86k	Vall = 3.88k	Ratio = 0.48
M = 1.70k-ft	Mall = 4.49k-ft	Ratio = 0.38
Deflection		
TL = 0.02" L/999+ > L/240 min		
DL = 0.01"		
L = 0.01" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-27 - Dropped**



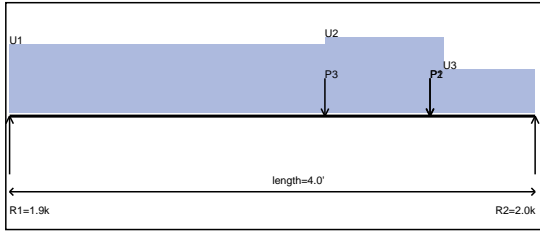
Uniform 1 = 0.93 klf (0.0'-0.6')      P1 = 0.24 K (0.6')  
 Uniform 2 = 0.84 klf (0.6'-1.5')  
 Uniform 3 = 0.83 klf (1.5'-4.0')

Controlling Load Combination/ Cd  
 V = D+L (Main Spans) Cd=1  
 M = D+L (Main Spans) Cd=1  
 Δ = D+L (Main Spans)

V = 1.93k	Vall = 3.88k	Ratio = 0.50
M = 1.75k-ft	Mall = 4.49k-ft	Ratio = 0.39
Deflection		
TL = 0.02" L/999+ > L/240 min		
DL = 0.01"		
L = 0.01" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-28 - Dropped**



Uniform 1 = 0.83 klf (0.0'-2.4')      P1 = 0.28 K (3.2')  
 Uniform 2 = 0.92 klf (2.4'-3.3')      P2 = 0.10 K (3.2')  
 Uniform 3 = 0.53 klf (3.3'-4.0')      P3 = 0.24 K (2.4')

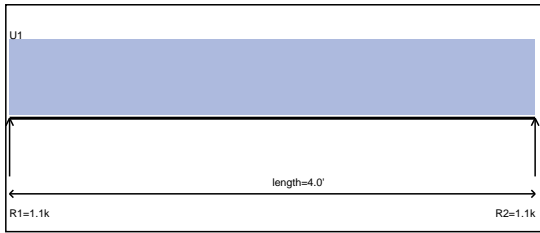
Controlling Load Combination/ Cd  
 V = D+L Cd=1  
 M = D+L (Main Spans) Cd=1  
 Δ = D+L (Main Spans)

V = 1.97k	Vall = 3.88k	Ratio = 0.51
M = 2.03k-ft	Mall = 4.49k-ft	Ratio = 0.45
Deflection		
TL = 0.02" L/999+ > L/240 min		
DL = 0.01"		
L = 0.02" L/999+ > L/360 min		

4x10 DF #2



**Description - Main Floor Frmg - B1-29 - Dropped**



Uniform 1 = 0.53 klf (0.0'-4.0')

Controlling Load Combination/ Cd

V = D+L Cd=1

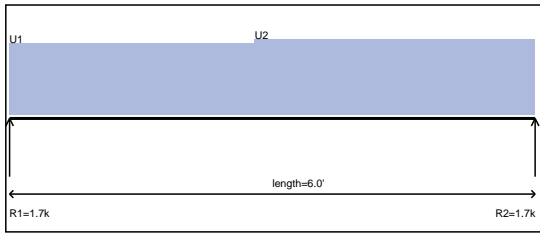
M = D+L (Main Spans) Cd=1

$\Delta$  = D+L (Main Spans)

V = 1.06k	Vall = 3.88k	Ratio = 0.27
M = 1.06k-ft	Mall = 4.49k-ft	Ratio = 0.24
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.01" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-30 - Dropped**



Uniform 1 = 0.53 klf (0.0'-2.8')

Uniform 2 = 0.56 klf (2.8'-6.0')

Controlling Load Combination/ Cd

V = D+L Cd=1

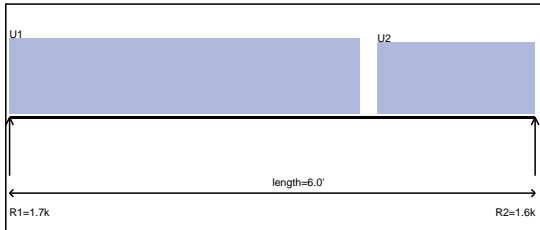
M = D+L (Main Spans) Cd=1

$\Delta$  = D+L (Main Spans)

V = 1.66k	Vall = 3.88k	Ratio = 0.43
M = 2.46k-ft	Mall = 4.49k-ft	Ratio = 0.55
Deflection		
TL = 0.05" L/999+ > L/240 min		
DL = 0.01"		
L = 0.04" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-31 - Dropped**



Uniform 1 = 0.56 klf (0.0'-4.0')

Uniform 2 = 0.53 klf (4.2'-6.0')

Controlling Load Combination/ Cd

V = D+L (Main Spans) Cd=1

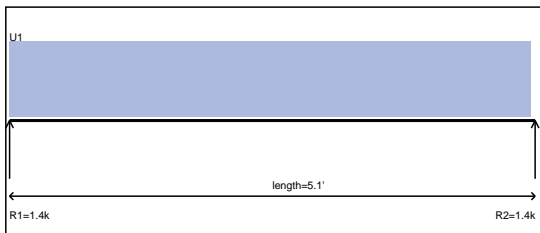
M = D+L (Main Spans) Cd=1

$\Delta$  = D+L (Main Spans)

V = 1.63k	Vall = 3.88k	Ratio = 0.42
M = 2.39k-ft	Mall = 4.49k-ft	Ratio = 0.53
Deflection		
TL = 0.05" L/999+ > L/240 min		
DL = 0.01"		
L = 0.04" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-32 - Dropped**



Uniform 1 = 0.53 klf (0.0'-5.1')

Controlling Load Combination/ Cd

V = D+L (Main Spans) Cd=1

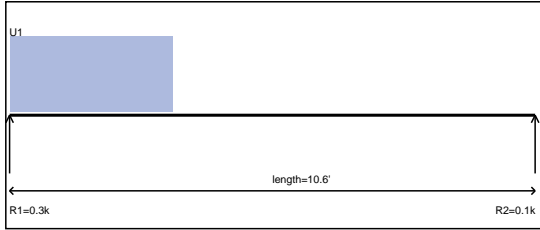
M = D+L (Main Spans) Cd=1

$\Delta$  = D+L (Main Spans)

V = 1.36k	Vall = 3.88k	Ratio = 0.35
M = 1.75k-ft	Mall = 4.49k-ft	Ratio = 0.39
Deflection		
TL = 0.03" L/999+ > L/240 min		
DL = 0.01"		
L = 0.02" L/999+ > L/360 min		

4x10 DF #2

**Description - Main Floor Frmg - B1-33 - Flush**



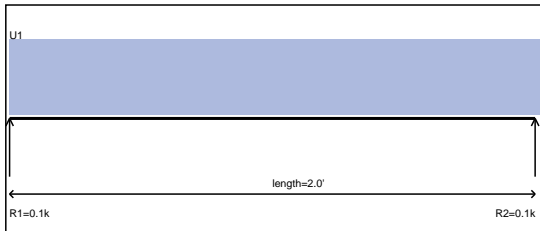
Uniform 1 = 0.10 klf (0.0'-3.3')

Controlling Load Combination/ Cd  
V = D Cd=0.9  
M = D Cd=0.9  
 $\Delta = D$

V = 0.28k	Vall = 5.69k	Ratio = 0.05
M = 0.39k-ft	Mall = 10.27k-ft	Ratio = 0.04
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.01"		
L = 0.00" L/999+ > L/360 min		

(2)1-3/4x9-1/2 LVL

**Description - Main Floor Frmg - B1-34 - Flush**



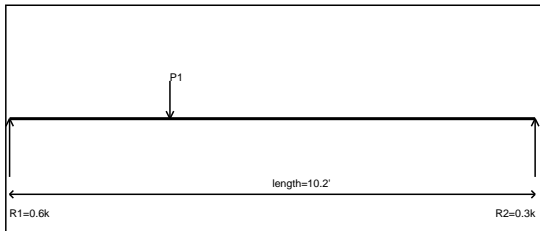
Uniform 1 = 0.10 klf (0.0'-2.0')

Controlling Load Combination/ Cd  
V = D Cd=0.9  
M = D Cd=0.9  
 $\Delta = D$

V = 0.10k	Vall = 5.69k	Ratio = 0.02
M = 0.05k-ft	Mall = 10.27k-ft	Ratio = 0.00
Deflection		
TL = 0.00" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

(2)1-3/4x9-1/2 LVL

**Description - Main Floor Frmg - B1-35 - Flush**



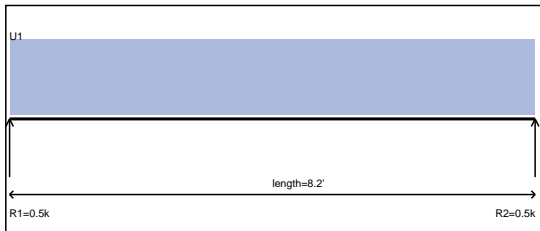
P1 = 0.78 K (3.1')

Controlling Load Combination/ Cd  
V = D+L Cd=1  
M = D+L Cd=1  
 $\Delta = D+L$

V = 0.54k	Vall = 3.16k	Ratio = 0.17
M = 1.67k-ft	Mall = 5.70k-ft	Ratio = 0.29
Deflection		
TL = 0.10" L/999+ > L/240 min		
DL = 0.02"		
L = 0.08" L/999+ > L/360 min		

1-3/4x9-1/2 LVL

**Description - Main Floor Frmg - B1-36 - Flush**



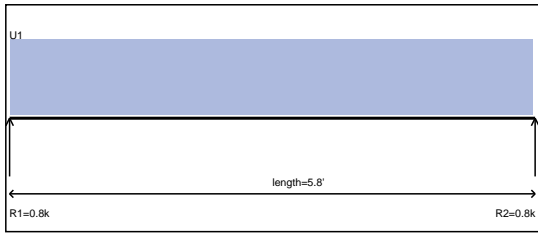
Uniform 1 = 0.10 klf (0.0'-8.2')

Controlling Load Combination/ Cd  
V = D Cd=0.9  
M = D Cd=0.9  
 $\Delta = D$

V = 0.41k	Vall = 5.69k	Ratio = 0.07
M = 0.84k-ft	Mall = 10.27k-ft	Ratio = 0.08
Deflection		
TL = 0.02" L/999+ > L/240 min		
DL = 0.02"		
L = 0.00" L/999+ > L/360 min		

(2)1-3/4x9-1/2 LVL

**Description - Main Floor Frmg - B1-37 - Flush**



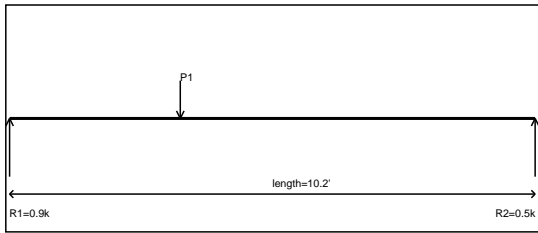
Uniform 1 = 0.27 klf (0.0'-5.8')

Controlling Load Combination/ Cd  
V = D+L (Main Spans) Cd=1  
M = D+L (Main Spans) Cd=1  
 $\Delta$  = D+L (Main Spans)

V = 0.78k	Vall = 3.16k	Ratio = 0.25
M = 1.13k-ft	Mall = 5.70k-ft	Ratio = 0.20
Deflection		
TL = 0.04"	L/999+ > L/240 min	
DL = 0.01"		
L = 0.03"	L/999+ > L/360 min	

1-3/4x9-1/2 LVL

**Description - Main Floor Frmg - B1-38 - Flush**



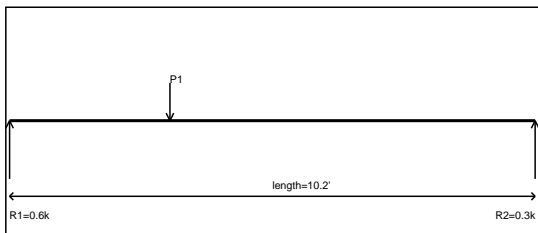
P1 = 1.34 K (3.3')

Controlling Load Combination/ Cd  
V = D+L Cd=1  
M = D+L Cd=1  
 $\Delta$  = D+L

V = 0.91k	Vall = 1.33k	Ratio = 0.68
M = 2.96k-ft	Mall = 3.00k-ft	Ratio = 0.99
Deflection		
TL = 0.28"	L/431 > L/240 min	
DL = 0.08"		
L = 0.20"	L/607 > L/360 min	

9-1/2" TJI 210 I-Joists

**Description - Main Floor Frmg - B1-40 - Flush**



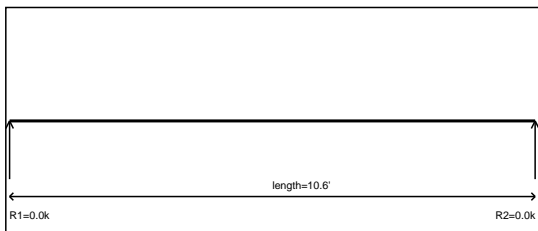
P1 = 0.78 K (3.1')

Controlling Load Combination/ Cd  
V = D+L Cd=1  
M = D+L Cd=1  
 $\Delta$  = D+L

V = 0.54k	Vall = 3.16k	Ratio = 0.17
M = 1.67k-ft	Mall = 5.70k-ft	Ratio = 0.29
Deflection		
TL = 0.10"	L/999+ > L/240 min	
DL = 0.02"		
L = 0.08"	L/999+ > L/360 min	

1-3/4x9-1/2 LVL

**Description - Main Floor Frmg - B1-43 - Refer to External Design**



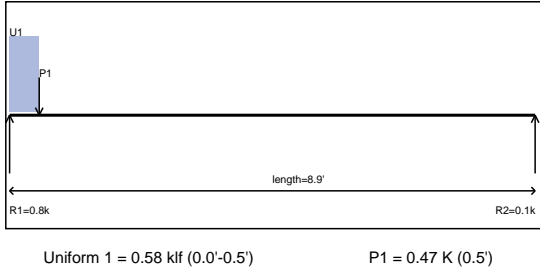
Controlling Load Combination/ Cd  
V = NA Cd=1  
M = NA Cd=1  
 $\Delta$  = 0

V = 0.00k	Vall = 0 k	Ratio = 0
M = 0.00k-ft	Mall = 0 k-ft	Ratio = 0
Deflection		
TL = NA	L/999+ > L/240 min	
DL = NA		
L = NA	L/999+ > L/360 min	

Refer to External Design



Description - Main Floor Frmg - B1-44 - Flush



Controlling Load Combination/ Cd

V = D+S Cd=1.15

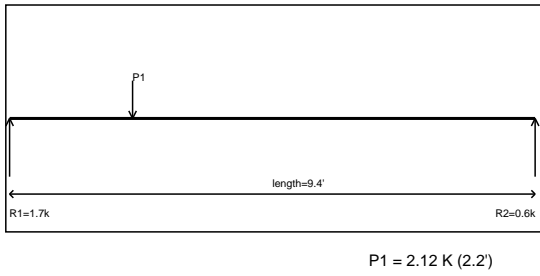
M = D+S Cd=1.15

$\Delta$  = D+S

V = 0.72k	Vall = 4.47k	Ratio = 0.16
M = 0.28k-ft	Mall = 5.17k-ft	Ratio = 0.05
Deflection		
TL = 0.01" L/999+ > L/240 min		
DL = 0.00"		
L = 0.00" L/999+ > L/360 min		

4x10 DF #2

Description - Main Floor Frmg - B1-45 - Flush



Controlling Load Combination/ Cd

V = D+0.75(L+S) Cd=1.15

M = D+0.75(L+S) Cd=1.15

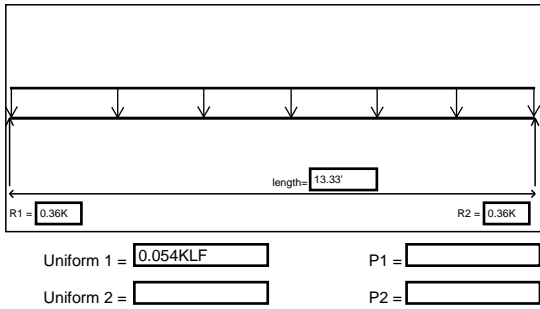
$\Delta$  = D+0.75(L+S)

V = 1.41k	Vall = 1.53k	Ratio = 0.92
M = 3.06k-ft	Mall = 3.45k-ft	Ratio = 0.89
Deflection		
TL = 0.24" L/461 > L/240 min		
DL = 0.13"		
L = 0.07" L/999+ > L/360 min		

9-1/2" TJI 210 I-Joists



Description - [B2-13] WIND BM. (OUT OF PLANE) @ STAIRS



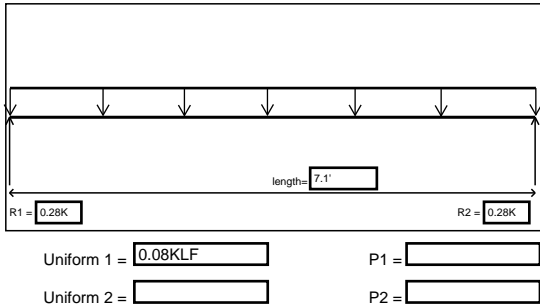
Controlling Load Combination/ Cd  
 V =  Cd = 1.6  
 M =  Cd = 1.6  
 Δ =

V = 0.36K Vall = 28.0K Ratio = 0.01  
 M = 1.20K-FT Mall = 29.0K-FT Ratio = 0.04

Deflection  
 TL = 0.085" L/999+ > L/180 min  
 DL =   
 L =

5 1/2"x18" GLB

Description - TYP FLR JOIST @ FLUSH SHOWER - UPPER FLR



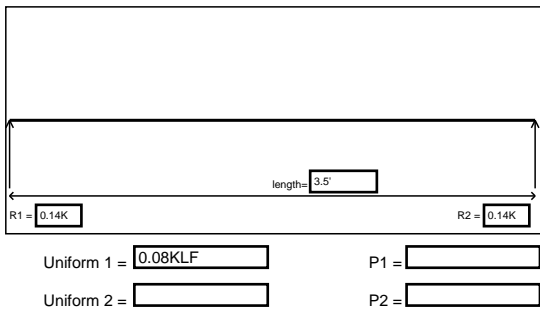
Controlling Load Combination/ Cd  
 V = D+L Cd = 1.0  
 M = D+L Cd = 1.0  
 Δ = D+L

V = 0.28K Vall = 1.69K Ratio = 0.17  
 M = 0.50K-FT Mall = 2.58K-FT Ratio = 0.19

Deflection  
 TL = 0.020" L/999+ > L/360 min  
 DL = 0.007"  
 L = 0.013" L/999+ > L/360 min

2x12 HF#2 @ 16" O.C.

Description - TYP FLR JOIST @ FLUSH SHOWER - MAIN FLR



Controlling Load Combination/ Cd  
 V = D+L Cd = 1.0  
 M = D+L Cd = 1.0  
 Δ = D+L

V = 0.14K Vall = 0.83K Ratio = 0.17  
 M = 0.13K-FT Mall = 0.80K-FT Ratio = 0.16

Deflection  
 TL = 0.010 L/999+ > L/240 min  
 DL = 0.003"  
 L = 0.007" L/999+ > L/360 min

2x6 HF#2 @ 16" O.C.

Description -



Controlling Load Combination/ Cd  
 V =  Cd =   
 M =  Cd =   
 Δ =

V =  Vall =  Ratio =   
 M =  Mall =  Ratio =

Deflection  
 TL =   
 DL =   
 L =

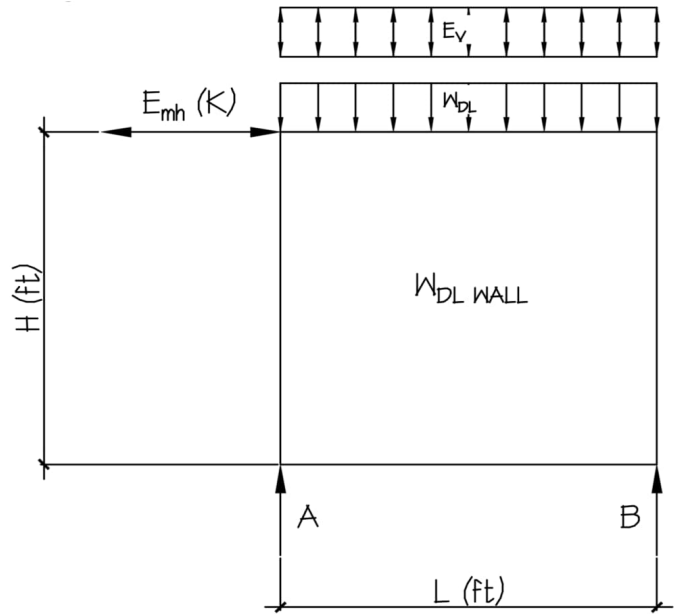


### Overstrength Calculations

Wall Description/SW #: 202

Parameters:

- L = 17.0 ft
- H = 9.1 ft
- E = 1.30 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.172 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTN)
- SDS = 1.177



analysis:

$E$  (unfactored) = 1.86

$E_{mh} = \Omega_0 * E = 4.64$  K       $E_v = 0.2 * SDS * DL = 0.064$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 4.64(9.1) + (0.0640288)(17)(8.5) - R_b(17)$        $R_B = 3.0E$   
 $R_A = -1.9E$

$E_m$  (min) =  $\sum M_A = 0 = 4.64(9.1) - (0.0640288)(17)(8.5) - R_b(17)$        $R_B = 1.9E$   
 $R_A = -3.0E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application

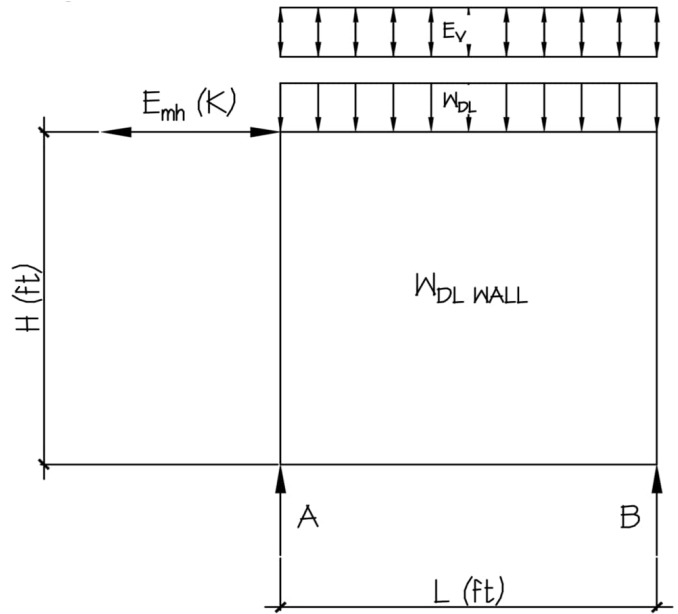


### Overstrength Calculations

Wall Description/SW #: 203

Parameters:

- L = 11.2 ft
- H = 9.1 ft
- E = 0.70 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.034 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTING)
- SDS = 1.177



analysis:

$E$  (unfactored) = 1.00

$E_{mh} = \Omega_0 * E = 2.50$  K       $E_v = 0.2 * SDS * DL = 0.032$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 2.50(9.1) + (0.0315436)(11.2)(5.6) - R_b(11.2)$        $R_B = 2.2E$   
 $R_a = -1.9E$

$E_m$  (min) =  $\sum M_A = 0 = 2.50(9.1) - (0.0315436)(11.2)(5.6) - R_b(11.2)$        $R_B = 1.9E$   
 $R_a = -2.2E$

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

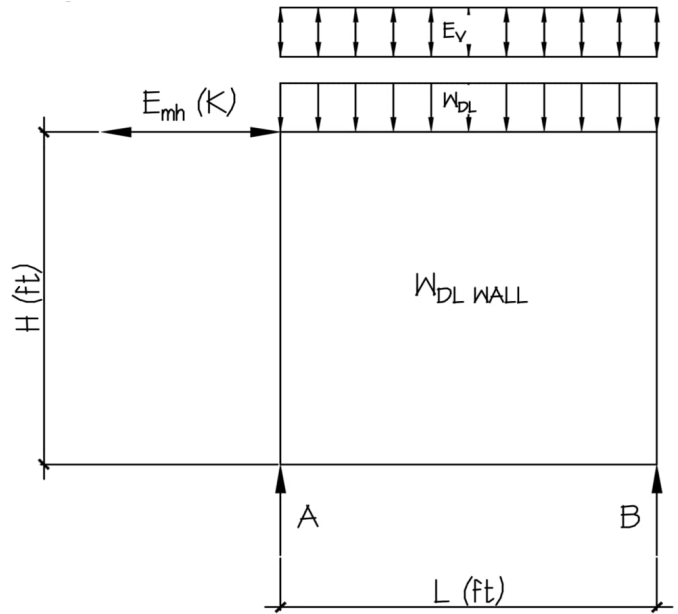


### Overstrength Calculations

Wall Description/SW #: 205

Parameters:

- L = 6.5 ft
- H = 9.1 ft
- E = 0.25 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.034 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTN)
- SDS = 1.177



analysis:

$E$  (unfactored) = 0.36

$E_{mh} = \Omega_0 * E = 0.89$  K       $E_v = 0.2 * SDS * DL = 0.032$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 0.89(9.1) + (0.0315436)(6.5)(3.25) - R_b(6.5)$        $R_B = 1.4E$   
 $R_A = -1.1E$

$E_m$  (min) =  $\sum M_A = 0 = 0.89(9.1) - (0.0315436)(6.5)(3.25) - R_b(6.5)$        $R_B = 1.1E$   
 $R_A = -1.4E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application

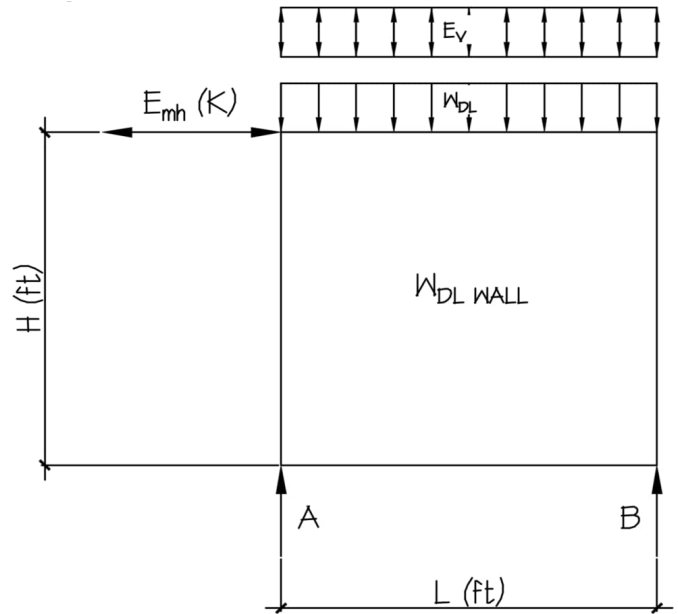


### Overstrength Calculations

Wall Description/SW #: 206

Parameters:

- L = 13.0 ft
- H = 9.1 ft
- E = 1.00 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.140 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTING)
- SDS = 1.177



analysis:

E (unfactored) = 1.43

$E_{mh} = \Omega_0 * E = 3.57$  K       $E_v = 0.2 * SDS * DL = 0.056$  KLF

$E_m (max) = \sum M_A = 0 = 3.57(9.1) + (0.056496)(13.04)(6.52) - R_b(13.04)$

$R_B = 2.9E$

$R_a = -2.1E$

$E_m (min) = \sum M_A = 0 = 3.57(9.1) - (0.056496)(13.04)(6.52) - R_b(13.04)$

$R_B = 2.1E$

$R_a = -2.9E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application

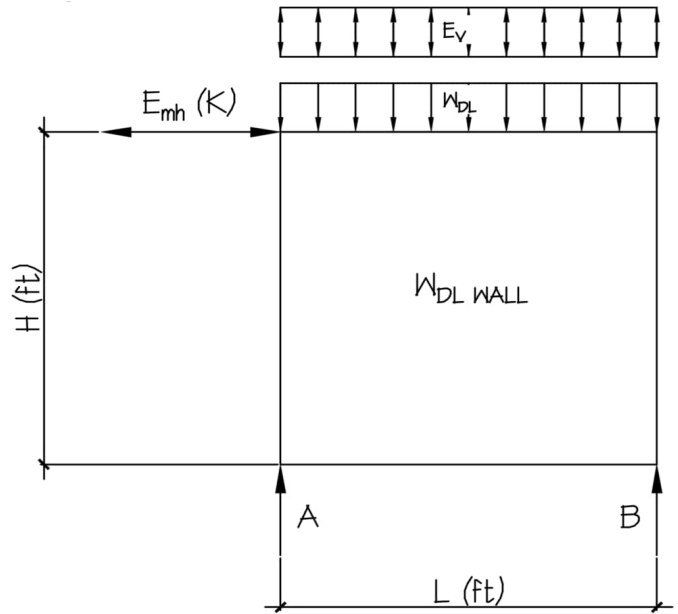


### Overstrength Calculations

Wall Description/SW #: 208

Parameters:

- L = 19.4 ft
- H = 9.1 ft
- E = 1.35 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.172 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTING)
- SDS = 1.177



analysis:

$E$  (unfactored) = 1.93

$E_{mh} = \Omega_0 * E = 4.82$  K       $E_v = 0.2 * SDS * DL = 0.064$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 4.82(9.1) + (0.0640288)(19.4)(9.7) - R_b(19.4)$        $R_B = 2.9E$   
 $R_A = -1.6E$

$E_m$  (min) =  $\sum M_A = 0 = 4.82(9.1) - (0.0640288)(19.4)(9.7) - R_b(19.4)$        $R_B = 1.6E$   
 $R_A = -2.9E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application

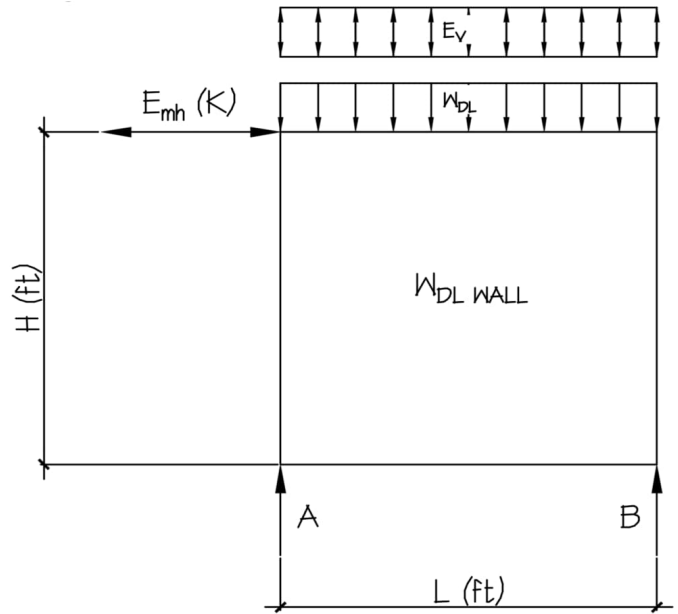


### Overstrength Calculations

Wall Description/SW #: 211

Parameters:

- L = 16.6 ft
- H = 10.0 ft
- E = 1.00 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.034 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTN)
- SDS = 1.177



analysis:

$E$  (unfactored) = 1.43

$E_{mh} = \Omega_0 * E = 3.57$  K       $E_v = 0.2 * SDS * DL = 0.032$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 3.57(10.0) + (0.0315436)(16.6)(8.3) - R_b(16.6)$        $R_B = 2.4E$   
 $R_a = -1.9E$

$E_m$  (min) =  $\sum M_A = 0 = 3.57(10.0) - (0.0315436)(16.6)(8.3) - R_b(16.6)$        $R_B = 1.9E$   
 $R_a = -2.4E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application

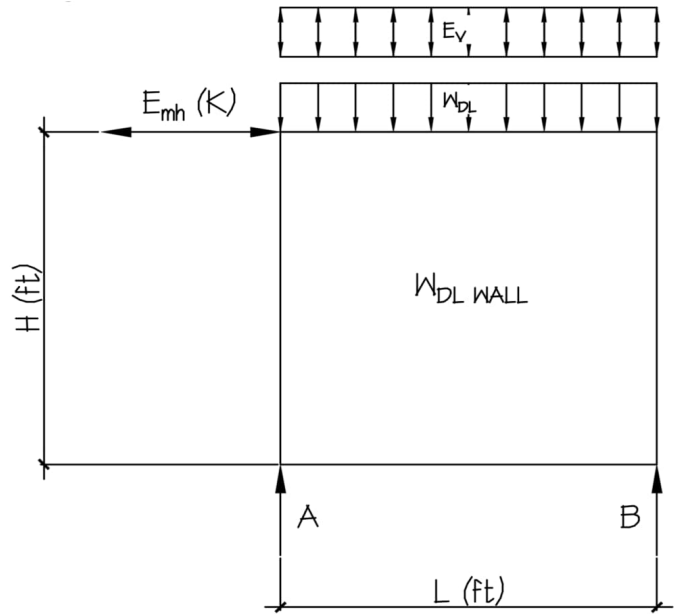


### Overstrength Calculations

Wall Description/SW #: 212

Parameters:

- L = 6.5 ft
- H = 9.1 ft
- E = 0.30 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.034 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTN)
- SDS = 1.177



analysis:

$E$  (unfactored) = 0.43

$E_{mh} = \Omega_0 * E = 1.07$  K       $E_v = 0.2 * SDS * DL = 0.032$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 1.07(9.1) + (0.0315436)(6.5)(3.25) - R_b(6.5)$        $R_B = 1.6E$   
 $R_A = -1.4E$

$E_m$  (min) =  $\sum M_A = 0 = 1.07(9.1) - (0.0315436)(6.5)(3.25) - R_b(6.5)$        $R_B = 1.4E$   
 $R_A = -1.6E$

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

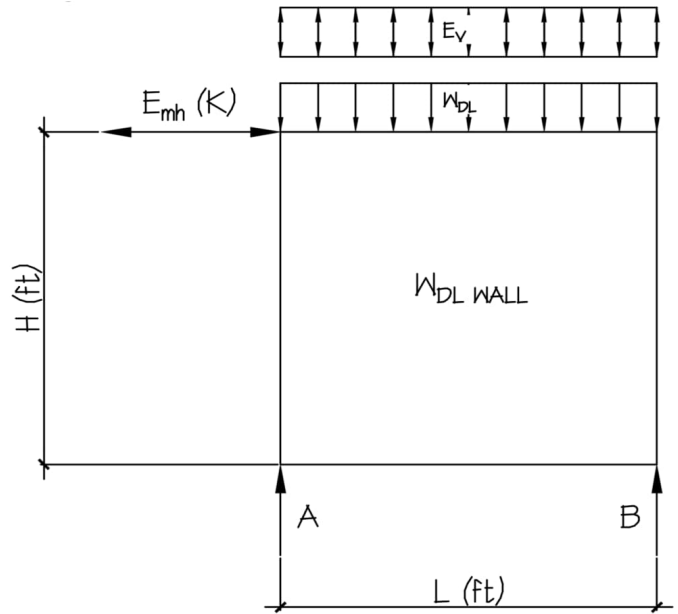


### Overstrength Calculations

Wall Description/SW #: 213

Parameters:

- L = 18.5 ft
- H = 9.1 ft
- E = 2.30 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.068 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTN)
- SDS = 1.177



analysis:

$E$  (unfactored) = 3.29

$E_{mh} = \Omega_0 * E = 8.21$  K       $E_v = 0.2 * SDS * DL = 0.040$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 8.21(9.1) + (0.0395472)(18.5)(9.25) - R_b(18.5)$        $R_B = 4.4E$   
 $R_a = -3.7E$

$E_m$  (min) =  $\sum M_A = 0 = 8.21(9.1) - (0.0395472)(18.5)(9.25) - R_b(18.5)$        $R_B = 3.7E$   
 $R_a = -4.4E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application

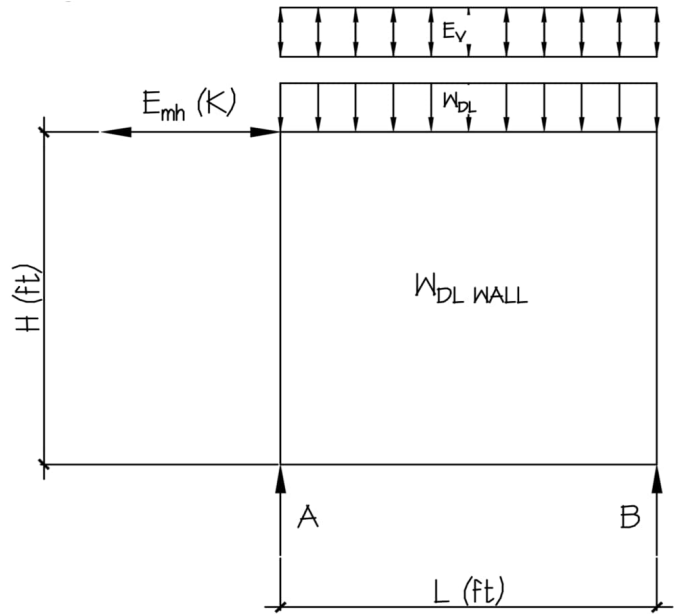


### Overstrength Calculations

Wall Description/SW #: 214

Parameters:

- L = 4.3 ft
- H = 9.1 ft
- E = 0.25 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.080 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTN)
- SDS = 1.177



analysis:

$E$  (unfactored) = 0.36

$E_{mh} = \Omega_0 * E = 0.89$  K       $E_v = 0.2 * SDS * DL = 0.042$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 0.89(9.1) + (0.042372)(4.3)(2.15) - R_b(4.3)$        $R_B = 2.0E$   
 $R_a = -1.8E$

$E_m$  (min) =  $\sum M_A = 0 = 0.89(9.1) - (0.042372)(4.3)(2.15) - R_b(4.3)$        $R_B = 1.8E$   
 $R_a = -2.0E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application

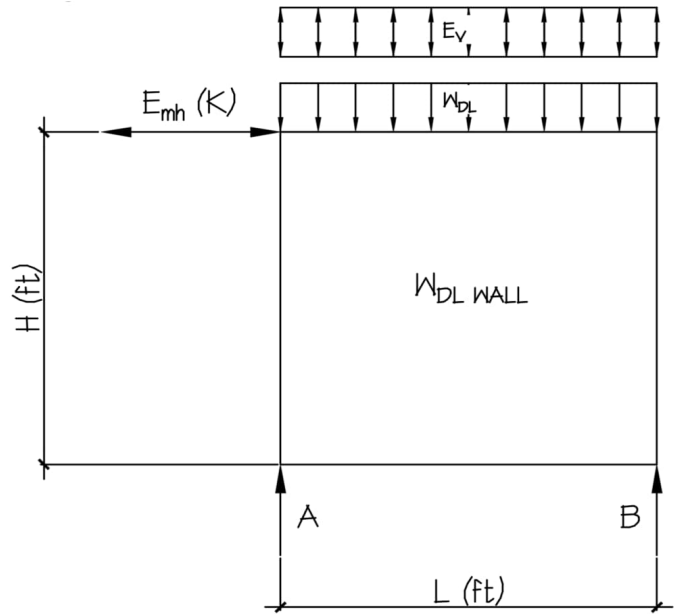


### Overstrength Calculations

Wall Description/SW #: 215

Parameters:

- L = 12.5 ft
- H = 9.1 ft
- E = 1.25 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.180 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTING)
- SDS = 1.177



analysis:

$E$  (unfactored) = 1.79

$E_{mh} = \Omega_0 * E = 4.46$  K       $E_v = 0.2 * SDS * DL = 0.066$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 4.46(9.1) + (0.065912)(12.5)(6.25) - R_b(12.5)$        $R_B = 3.7E$   
 $R_a = -2.8E$

$E_m$  (min) =  $\sum M_A = 0 = 4.46(9.1) - (0.065912)(12.5)(6.25) - R_b(12.5)$        $R_B = 2.8E$   
 $R_a = -3.7E$

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

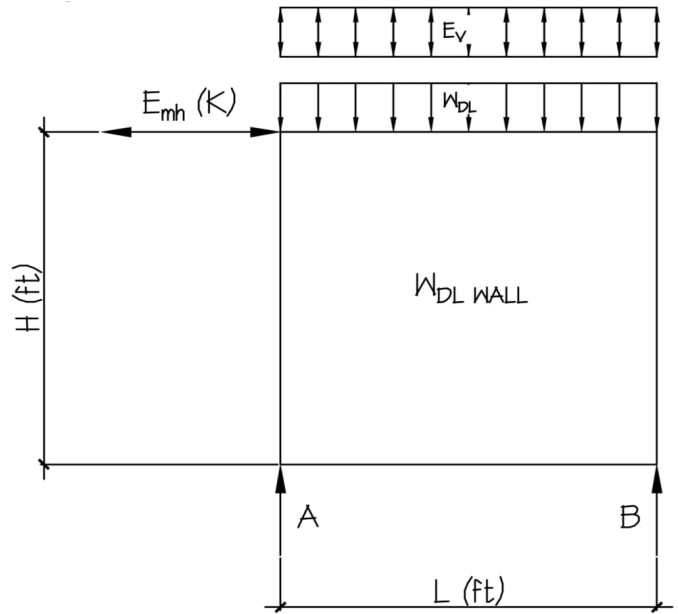


### Overstrength Calculations

Wall Description/SW #: 103

Parameters:

- L = 10.5 ft
- H = 11.0 ft
- E = 1.40 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.180 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTN)
- SDS = 1.177



analysis:

$E$  (unfactored) = 2.00

$E_{mh} = \Omega_0 * E = 5.00$  K       $E_v = 0.2 * SDS * DL = 0.066$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 5.00(11.0) + (0.065912)(10.5)(5.25) - R_b(10.5)$        $R_B = 5.6E$   
 $R_a = -4.9E$

$E_m$  (min) =  $\sum M_A = 0 = 5.00(11.0) - (0.065912)(10.5)(5.25) - R_b(10.5)$        $R_B = 4.9E$   
 $R_a = -5.6E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application

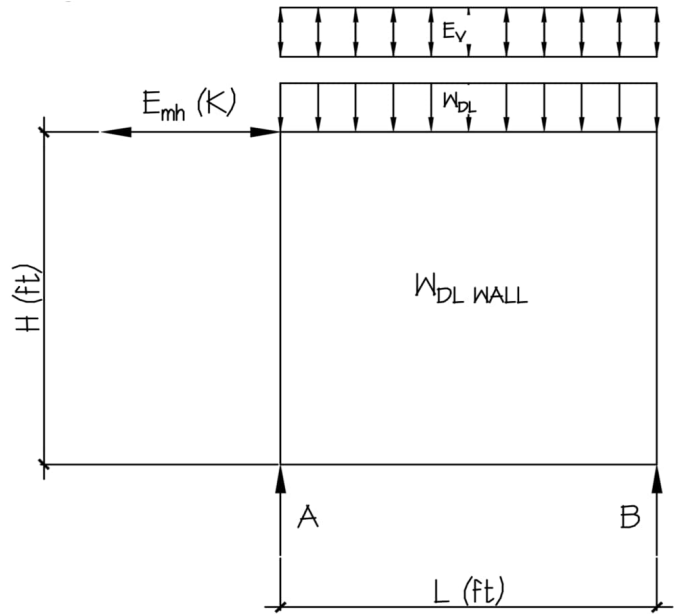


### Overstrength Calculations

Wall Description/SW #: 104

Parameters:

- L = 15.2 ft
- H = 11.0 ft
- E = 2.00 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.143 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTN)
- SDS = 1.177



analysis:

$E$  (unfactored) = 2.86

$E_{mh} = \Omega_0 * E = 7.14$  K       $E_v = 0.2 * SDS * DL = 0.057$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 7.14(11.0) + (0.0572022)(15.2)(7.6) - R_b(15.2)$        $R_B = 5.6E$   
 $R_A = -4.7E$

$E_m$  (min) =  $\sum M_A = 0 = 7.14(11.0) - (0.0572022)(15.2)(7.6) - R_b(15.2)$        $R_B = 4.7E$   
 $R_A = -5.6E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application

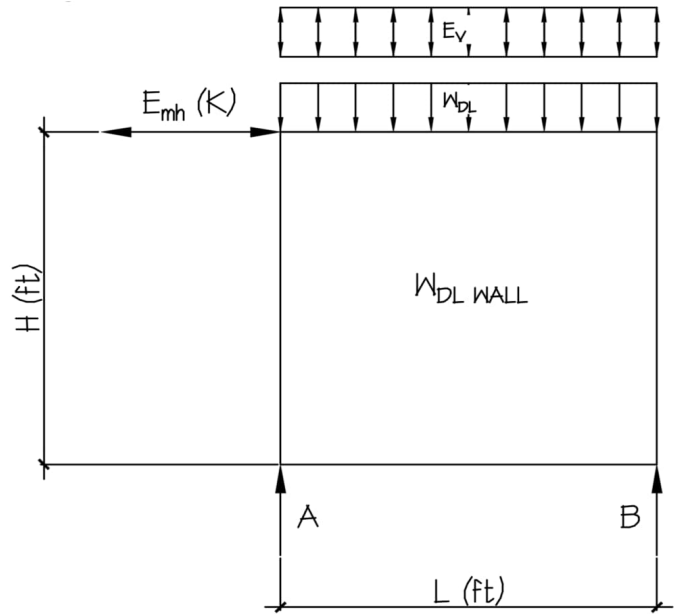


### Overstrength Calculations

Wall Description/SW #: 109

Parameters:

- L = 14.5 ft
- H = 11.0 ft
- E = 2.20 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.270 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTN)
- SDS = 1.177



analysis:

$E$  (unfactored) = 3.14

$E_{mh} = \Omega_0 * E = 7.86$  K       $E_v = 0.2 * SDS * DL = 0.087$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 7.86(11.0) + (0.087098)(14.5)(7.25) - R_b(14.5)$        $R_B = 6.6E$   
 $R_A = -5.3E$

$E_m$  (min) =  $\sum M_A = 0 = 7.86(11.0) - (0.087098)(14.5)(7.25) - R_b(14.5)$        $R_B = 5.3E$   
 $R_A = -6.6E$

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

allowable stress permitted to be increased by 1.2

see following beam calcs for load application

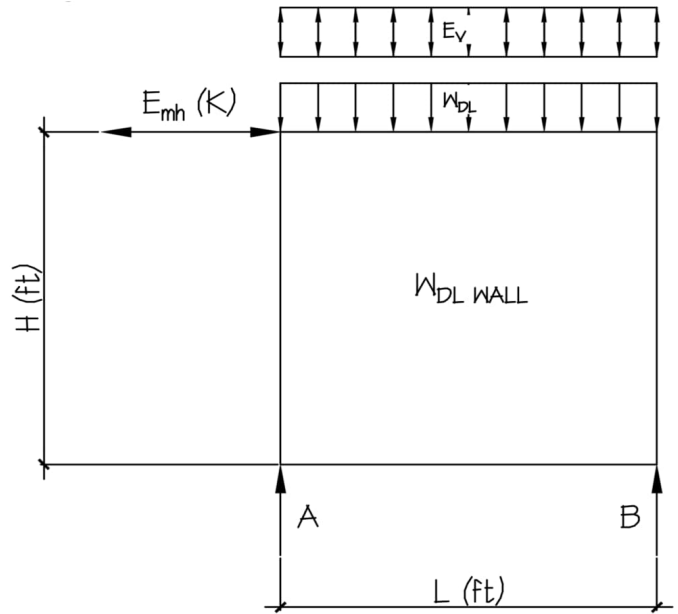


### Overstrength Calculations

Wall Description/SW #: 112

Parameters:

- L = 14.0 ft
- H = 11.0 ft
- E = 3.80 k (ASD)
- $W_{DLWall}$  = 0.10 klf
- $W_{DL}$  = 0.450 klf
- $\Omega_0$  = 2.5 (ASCE TABLE 12.2.1 FOOTN)
- SDS = 1.177



analysis:

$E$  (unfactored) = 5.43

$E_{mh} = \Omega_0 * E = 13.57$  K       $E_v = 0.2 * SDS * DL = 0.129$  KLF

$E_m$  (max) =  $\sum M_A = 0 = 13.57(11.0) + (0.12947)(14)(7) - R_b(14)$        $R_B = 11.6E$   
 $R_A = -9.8E$

$E_m$  (min) =  $\sum M_A = 0 = 13.57(11.0) - (0.12947)(14)(7) - R_b(14)$        $R_B = 9.8E$   
 $R_A = -11.6E$

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

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B1-33] (SW #104)

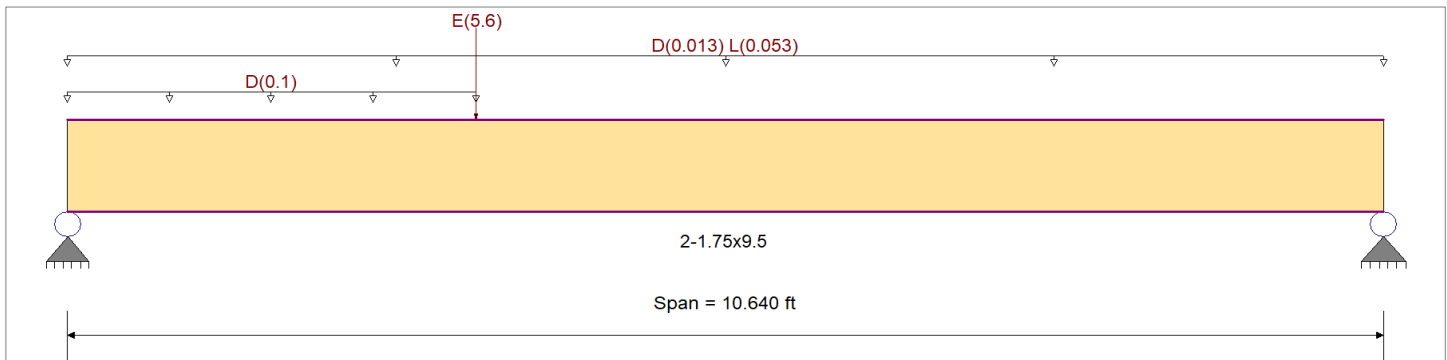
## CODE REFERENCES

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

Load Combination Set : ASCE 7-16

## Material Properties

Analysis Method : Allowable Stress Design	Fb +	3,120.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	3,120.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	3,012.0 psi	Eminbend - xx	1,016.54ksi
Wood Species : Trus Joist	Fc - Perp	900.0 psi		
Wood Grade : MicroLam LVL 2.0 E	Fv	342.0 psi		
	Ft	1,866.0 psi	Density	42.010pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



## Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

Uniform Load : D = 0.10 k/ft, Extent = 0.0 --> 3.30 ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.0130, L = 0.0530, Tributary Width = 1.0 ft

Point Load : E = 5.60 k @ 3.30 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.427 : 1</b>	<b>Maximum Shear Stress Ratio</b>	=	<b>0.252 : 1</b>
Section used for this span	=	<b>2-1.75x9.5</b>	Section used for this span	=	<b>2-1.75x9.5</b>
fb: Actual	=	2,202.94psi	fv: Actual	=	137.64 psi
F'b	=	5,153.15psi	F'v	=	547.20 psi
Load Combination	=	+1.140D+0.70E	Load Combination	=	+1.140D+0.70E
Location of maximum on span	=	3.301ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection		0.401 in Ratio =	318 >=153	Span: 1 : E Only	
Max Upward Transient Deflection		0 in Ratio =	0 <153	n/a	
Max Downward Total Deflection		0.306 in Ratio =	416 >=210	Span: 1 : +D+0.70E+0.60H	
Max Upward Total Deflection		0 in Ratio =	0 <210	n/a	

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v		
+D+H	Length = 10.640 ft	1	0.051	0.045	0.90	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.65	148.3	2,898.6	0.00	0.00	0.0	0.0	0.0
+D+L+H	Length = 10.640 ft	1	0.096	0.072	1.00	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.36	310.2	3,220.7	0.00	0.00	0.0	0.0	0.0
+D+Lr+H	Length = 10.640 ft	1	0.037	0.032	1.25	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.65	148.3	4,025.9	0.00	0.00	0.0	0.0	0.0
+D+S+H	Length = 10.640 ft	1	0.040	0.035	1.15	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.65	148.3	3,703.8	0.00	0.00	0.0	0.0	0.0

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B1-33] (SW #104)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sub>b</sub>	V	fv	F <sub>v</sub>
+D+0.750Lr+0.750L+H	Length = 10.640 ft	1	0.067	0.051	1.25	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.18	268.3	4,025.9	0.48	21.9	427.5
+D+0.750L+0.750S+H	Length = 10.640 ft	1	0.072	0.056	1.15	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.18	268.3	3,703.8	0.48	21.9	393.3
+D+0.60W+H	Length = 10.640 ft	1	0.029	0.025	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.65	148.3	5,153.2	0.30	13.7	547.2
+D+0.750Lr+0.750L+0.450W+	Length = 10.640 ft	1	0.052	0.040	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.18	268.3	5,153.2	0.48	21.9	547.2
+D+0.750L+0.750S+0.450W+i	Length = 10.640 ft	1	0.052	0.040	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.18	268.3	5,153.2	0.48	21.9	547.2
+0.60D+0.60W+0.60H	Length = 10.640 ft	1	0.017	0.015	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.39	89.0	5,153.2	0.18	8.2	547.2
+D+0.70E+0.60H	Length = 10.640 ft	1	0.423	0.248	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	9.57	2,182.2	5,153.2	3.01	135.7	547.2
+D-0.70E+0.60H	Length = 10.640 ft	1	0.366	0.223	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.27	1,885.6	5,153.2	2.70	122.0	547.2
+D+0.750L+0.750S+0.5250E+	Length = 10.640 ft	1	0.346	0.207	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	7.82	1,783.5	5,153.2	2.51	113.4	547.2
+D+0.750L+0.750S-0.5250E+i	Length = 10.640 ft	1	0.246	0.161	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	5.56	1,267.4	5,153.2	1.95	87.8	547.2
+0.60D+0.70E+H	Length = 10.640 ft	1	0.412	0.238	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	9.31	2,122.9	5,153.2	2.89	130.2	547.2
+0.60D-0.70E+H	Length = 10.640 ft	1	0.377	0.223	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.53	1,944.9	5,153.2	2.70	122.0	547.2
+1.140D+0.70E	Length = 10.640 ft	1	0.427	0.252	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	9.66	2,202.9	5,153.2	3.05	137.6	547.2
+1.140D-0.70E	Length = 10.640 ft	1	0.362	0.223	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.18	1,864.9	5,153.2	2.70	122.0	547.2
+1.105D+0.750L+0.750S+0.52	Length = 10.640 ft	1	0.349	0.210	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	7.89	1,799.0	5,153.2	2.55	114.8	547.2
+1.105D+0.750L+0.750S-0.52i	Length = 10.640 ft	1	0.243	0.161	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	5.49	1,251.8	5,153.2	1.95	87.8	547.2
+0.460D+0.70E	Length = 10.640 ft	1	0.408	0.234	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	9.22	2,102.1	5,153.2	2.84	128.3	547.2
+0.460D-0.70E	Length = 10.640 ft	1	0.381	0.223	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.62	1,965.7	5,153.2	2.70	122.0	547.2

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
E Only	1	0.4010	4.815		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	3.863	1.737
Max Upward from Load Combinations	3.104	1.388
Max Upward from Load Cases	3.863	1.737
Max Downward from all Load Conditio	-3.863	-1.737
Max Downward from Load Combinations	-2.464	-1.113
Max Downward from Load Cases (Resis	-3.863	-1.737
+D+H	0.400	0.172

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC#: KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B1-33] (SW #112)

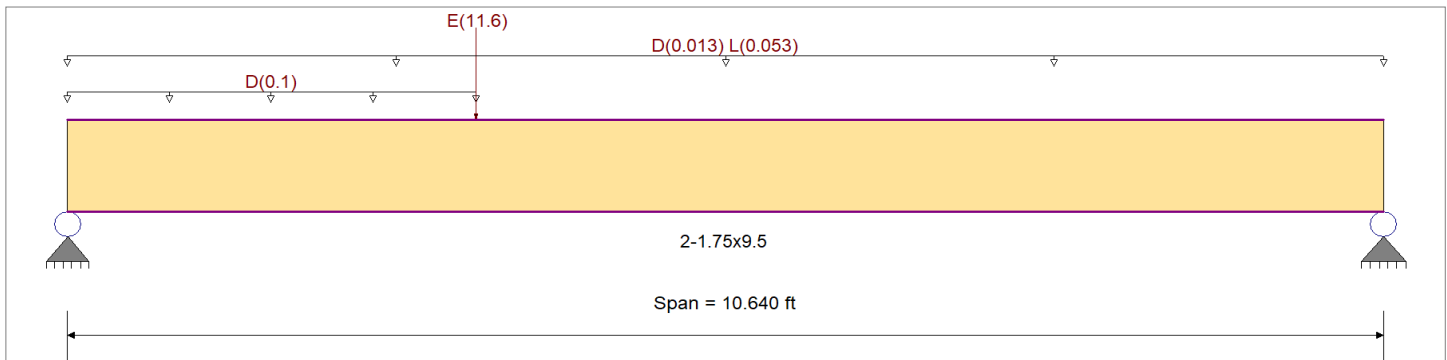
## CODE REFERENCES

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

Load Combination Set : ASCE 7-16

## Material Properties

Analysis Method : Allowable Stress Design	Fb +	3,120.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	3,120.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	3,012.0 psi	Eminbend - xx	1,016.54ksi
Wood Species : Trus Joist	Fc - Perp	900.0 psi		
Wood Grade : MicroLam LVL 2.0 E	Fv	342.0 psi		
	Ft	1,866.0 psi	Density	42.010pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



## Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

Uniform Load : D = 0.10 k/ft, Extent = 0.0 --> 3.30 ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.0130, L = 0.0530, Tributary Width = 1.0 ft

Point Load : E = 11.60 k @ 3.30 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.850</b> : 1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.490</b> : 1
Section used for this span	=	<b>2-1.75x9.5</b>	Section used for this span	=	<b>2-1.75x9.5</b>
fb: Actual	=	4,382.11 psi	fv: Actual	=	268.35 psi
F'b	=	5,153.15 psi	F'v	=	547.20 psi
Load Combination	=	+1.140D+0.70E	Load Combination	=	+1.140D+0.70E
Location of maximum on span	=	3.301ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection	0.831 in	Ratio = 153	>=153	Span: 1 : E Only	
Max Upward Transient Deflection	0 in	Ratio = 0	<153	n/a	
Max Downward Total Deflection	0.607 in	Ratio = 210	>=210	Span: 1 : +D+0.70E+0.60H	
Max Upward Total Deflection	0 in	Ratio = 0	<210	n/a	

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v	
+D+H	Length = 10.640 ft	1	0.051	0.045	0.90	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.65	148.3	2,898.6	0.0	0.00	0.0	0.0
+D+L+H	Length = 10.640 ft	1	0.096	0.072	1.00	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.36	310.2	3,220.7	0.0	0.00	0.0	0.0
+D+Lr+H	Length = 10.640 ft	1	0.037	0.032	1.25	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.65	148.3	4,025.9	0.0	0.00	0.0	0.0
+D+S+H	Length = 10.640 ft	1	0.040	0.035	1.15	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.65	148.3	3,703.8	0.0	0.00	0.0	0.0

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B1-33] (SW #112)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values					
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sub>b</sub>	V	fv	F <sub>v</sub>		
+D+0.750Lr+0.750L+H	Length = 10.640 ft	1	0.067	0.051	1.25	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.18	268.3	4,025.9	0.00	0.00	0.0	0.0	427.5
+D+0.750L+0.750S+H	Length = 10.640 ft	1	0.072	0.056	1.15	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.18	268.3	3,703.8	0.00	0.00	0.0	0.0	393.3
+D+0.60W+H	Length = 10.640 ft	1	0.029	0.025	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.65	148.3	5,153.2	0.00	0.00	0.0	0.0	547.2
+D+0.750Lr+0.750L+0.450W+	Length = 10.640 ft	1	0.052	0.040	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.18	268.3	5,153.2	0.00	0.00	0.0	0.0	547.2
+D+0.750L+0.750S+0.450W+	Length = 10.640 ft	1	0.052	0.040	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.18	268.3	5,153.2	0.00	0.00	0.0	0.0	547.2
+0.60D+0.60W+0.60H	Length = 10.640 ft	1	0.017	0.015	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.39	89.0	5,153.2	0.00	0.00	0.0	0.0	547.2
+D+0.70E+0.60H	Length = 10.640 ft	1	0.846	0.487	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	19.13	4,361.4	5,153.2	5.91	266.4	547.2	0.0	0.0
+D-0.70E+0.60H	Length = 10.640 ft	1	0.789	0.462	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	17.83	4,064.8	5,153.2	5.60	252.7	547.2	0.0	0.0
+D+0.750L+0.750S+0.5250E+	Length = 10.640 ft	1	0.663	0.386	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	14.99	3,417.8	5,153.2	4.69	211.4	547.2	0.0	0.0
+D+0.750L+0.750S-0.5250E+	Length = 10.640 ft	1	0.563	0.340	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	12.73	2,901.8	5,153.2	4.12	185.9	547.2	0.0	0.0
+0.60D+0.70E+H	Length = 10.640 ft	1	0.835	0.477	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	18.87	4,302.0	5,153.2	5.78	260.9	547.2	0.0	0.0
+0.60D-0.70E+H	Length = 10.640 ft	1	0.800	0.462	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	18.09	4,124.1	5,153.2	5.60	252.7	547.2	0.0	0.0
+1.140D+0.70E	Length = 10.640 ft	1	0.850	0.490	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	19.22	4,382.1	5,153.2	5.95	268.4	547.2	0.0	0.0
+1.140D-0.70E	Length = 10.640 ft	1	0.785	0.462	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	17.74	4,044.0	5,153.2	5.60	252.7	547.2	0.0	0.0
+1.105D+0.750L+0.750S+0.52	Length = 10.640 ft	1	0.666	0.389	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	15.06	3,433.4	5,153.2	4.72	212.8	547.2	0.0	0.0
+1.105D+0.750L+0.750S-0.52	Length = 10.640 ft	1	0.560	0.340	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	12.66	2,886.2	5,153.2	4.12	185.9	547.2	0.0	0.0
+0.460D+0.70E	Length = 10.640 ft	1	0.831	0.473	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	18.78	4,281.3	5,153.2	5.74	259.0	547.2	0.0	0.0
+0.460D-0.70E	Length = 10.640 ft	1	0.804	0.462	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	18.18	4,144.9	5,153.2	5.60	252.7	547.2	0.0	0.0

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
E Only	1	0.8306	4.815		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	8.002	3.598
Max Upward from Load Combinations	6.001	2.690
Max Upward from Load Cases	8.002	3.598
Max Downward from all Load Conditions	-8.002	-3.598
Max Downward from Load Combinations	-5.362	-2.415
Max Downward from Load Cases (Resis	-8.002	-3.598
+D+H	0.400	0.172

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B1-43] (SW #103)

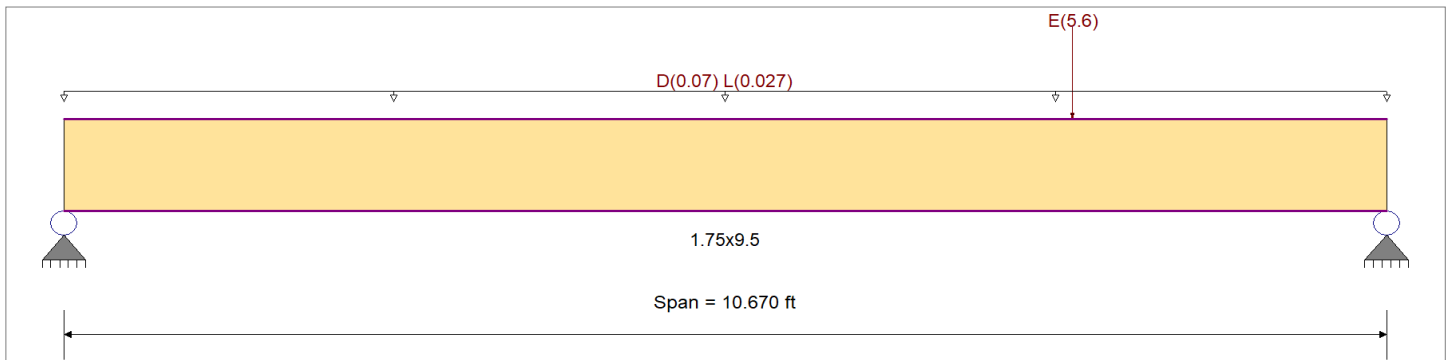
## CODE REFERENCES

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

Load Combination Set : ASCE 7-16

## Material Properties

Analysis Method : Allowable Stress Design	Fb +	3,120.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	3,120.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	3,012.0 psi	Eminbend - xx	1,016.54ksi
Wood Species : Trus Joist	Fc - Perp	900.0 psi		
Wood Grade : MicroLam LVL 2.0 E	Fv	342.0 psi		
	Ft	1,866.0 psi	Density	42.010pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



## Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.070, L = 0.0270, Tributary Width = 1.0 ft

Point Load : E = 5.60 k @ 8.140 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.747</b> : 1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.557</b> : 1
Section used for this span		<b>1.75x9.5</b>	Section used for this span		<b>1.75x9.5</b>
fb: Actual	=	3,849.34psi	fv: Actual	=	304.90 psi
F'b	=	5,153.15psi	F'v	=	547.20 psi
Load Combination		+1.140D+0.70E	Load Combination		+1.140D+0.70E
Location of maximum on span	=	8.139ft	Location of maximum on span	=	9.891 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection		0.659 in	Ratio =	<b>194</b> >=151	Span: 1 : E Only
Max Upward Transient Deflection		0 in	Ratio =	<b>0</b> <151	n/a
Max Downward Total Deflection		0.548 in	Ratio =	<b>233</b> >=189	Span: 1 : +D+0.70E+0.60H
Max Upward Total Deflection		0 in	Ratio =	<b>0</b> <189	n/a

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v		
+D+H	Length = 10.670 ft	1	0.168	0.100	0.90	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.07	485.6	2,898.6	0.0	0.00	0.0	0.0	307.8
+D+L+H	Length = 10.670 ft	1	0.205	0.122	1.00	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.45	660.8	3,220.7	0.0	0.00	0.0	0.0	342.0
+D+Lr+H	Length = 10.670 ft	1	0.121	0.072	1.25	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.07	485.6	4,025.9	0.0	0.00	0.0	0.0	427.5
+D+S+H	Length = 10.670 ft	1	0.131	0.078	1.15	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.07	485.6	3,703.8	0.0	0.00	0.0	0.0	393.3
+D+0.750Lr+0.750L+H						1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.0	0.00	0.0	0.0	0.0

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B1-43] (SW #103)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sup>b</sup>	V	fv
Length = 10.670 ft	1	0.153	0.091	1.25	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.35	617.0	4,025.9	0.43	39.1	427.5
+D+0.750L+0.750S+H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.167	0.099	1.15	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.35	617.0	3,703.8	0.43	39.1	393.3
+D+0.60W+H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.094	0.056	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.07	485.6	5,153.2	0.34	30.8	547.2
+D+0.750Lr+0.750L+0.450W+					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.120	0.071	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.35	617.0	5,153.2	0.43	39.1	547.2
+D+0.750L+0.750S+0.450W+					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.120	0.071	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.35	617.0	5,153.2	0.43	39.1	547.2
+0.60D+0.60W+0.60H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.057	0.034	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.64	291.4	5,153.2	0.20	18.5	547.2
+D+0.70E+0.60H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.737	0.549	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.34	3,800.1	5,153.2	3.33	300.6	547.2
+D-0.70E+0.60H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.601	0.458	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	6.79	3,097.2	5,153.2	2.78	250.6	547.2
+D+0.750L+0.750S+0.5250E+					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.589	0.441	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	6.65	3,033.1	5,153.2	2.68	241.5	547.2
+D+0.750L+0.750S-0.5250E+					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.415	0.325	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	4.69	2,139.9	5,153.2	1.97	178.0	547.2
+0.60D+0.70E+H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.710	0.527	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.03	3,659.5	5,153.2	3.20	288.3	547.2
+0.60D-0.70E+H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.628	0.472	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	7.10	3,237.8	5,153.2	2.86	258.3	547.2
+1.140D+0.70E					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.747	0.557	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.44	3,849.3	5,153.2	3.38	304.9	547.2
+1.140D-0.70E					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.591	0.453	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	6.69	3,048.0	5,153.2	2.75	247.9	547.2
+1.105D+0.750L+0.750S+0.52					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.596	0.447	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	6.73	3,070.0	5,153.2	2.71	244.7	547.2
+1.105D+0.750L+0.750S-0.52					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.408	0.322	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	4.61	2,103.0	5,153.2	1.95	176.0	547.2
+0.460D+0.70E					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.701	0.519	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	7.92	3,610.3	5,153.2	3.15	284.0	547.2
+0.460D-0.70E					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.638	0.477	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	7.21	3,287.0	5,153.2	2.89	261.0	547.2

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
E Only	1	0.6588	5.997		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.329	4.272
Max Upward from Load Combinations	1.329	3.390
Max Upward from Load Cases	1.328	4.272
Max Downward from all Load Conditions	-1.328	-4.272
Max Downward from Load Combinations	-0.690	-2.751
Max Downward from Load Cases (Resis)	-1.328	-4.272
+D+H	0.399	0.399
+D+L+H	0.543	0.543
+D+Lr+H	0.399	0.399

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B1-43] (SW #104)

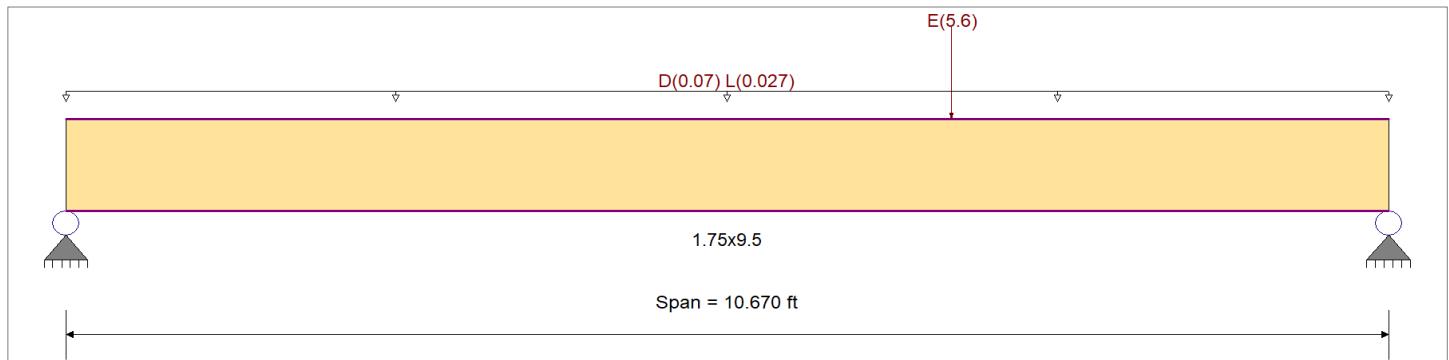
## CODE REFERENCES

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

Load Combination Set : ASCE 7-16

## Material Properties

Analysis Method : Allowable Stress Design	Fb +	3,120.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	3,120.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	3,012.0 psi	Eminbend - xx	1,016.54ksi
Wood Species : Trus Joist	Fc - Perp	900.0 psi		
Wood Grade : MicroLam LVL 2.0 E	Fv	342.0 psi		
	Ft	1,866.0 psi	Density	42.010pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



## Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.070, L = 0.0270 , Tributary Width = 1.0 ft

Point Load : E = 5.60 k @ 7.140 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.913</b> : 1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.497</b> : 1
Section used for this span		<b>1.75x9.5</b>	Section used for this span		<b>1.75x9.5</b>
fb: Actual	=	4,704.34psi	fv: Actual	=	271.75 psi
F'b	=	5,153.15psi	F'v	=	547.20 psi
Load Combination	=	+1.140D+0.70E	Load Combination	=	+1.140D+0.70E
Location of maximum on span	=	7.126ft	Location of maximum on span	=	9.891 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection	0.843 in	Ratio = 151 >=151	Span: 1 : E Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <151	n/a		
Max Downward Total Deflection	0.677 in	Ratio = 189 >=189	Span: 1 : +D+0.70E+0.60H		
Max Upward Total Deflection	0 in	Ratio = 0 <189	n/a		

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v		
+D+H	Length = 10.670 ft	1	0.168	0.100	0.90	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.07	485.6	2,898.6	0.0	0.00	0.0	0.0	307.8
+D+L+H	Length = 10.670 ft	1	0.205	0.122	1.00	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.45	660.8	3,220.7	0.0	0.00	0.0	0.0	342.0
+D+Lr+H	Length = 10.670 ft	1	0.121	0.072	1.25	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.07	485.6	4,025.9	0.0	0.00	0.0	0.0	427.5
+D+S+H	Length = 10.670 ft	1	0.131	0.078	1.15	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.07	485.6	3,703.8	0.0	0.00	0.0	0.0	393.3
+D+0.750Lr+0.750L+H						1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.0	0.00	0.0	0.0	0.0

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B1-43] (SW #104)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sub>b</sub>	V	fv
Length = 10.670 ft	1	0.153	0.091	1.25	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.35	617.0	4,025.9	0.43	39.1	427.5
+D+0.750L+0.750S+H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.167	0.099	1.15	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.35	617.0	3,703.8	0.43	39.1	393.3
+D+0.60W+H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.094	0.056	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.07	485.6	5,153.2	0.34	30.8	547.2
+D+0.750Lr+0.750L+0.450W+					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.120	0.071	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.35	617.0	5,153.2	0.43	39.1	547.2
+D+0.750L+0.750S+0.450W+i					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.120	0.071	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.35	617.0	5,153.2	0.43	39.1	547.2
+0.60D+0.60W+0.60H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.057	0.034	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.64	291.4	5,153.2	0.20	18.5	547.2
+D+0.70E+0.60H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.901	0.489	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	10.19	4,644.0	5,153.2	2.96	267.4	547.2
+D-0.70E+0.60H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.734	0.410	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.30	3,782.3	5,153.2	2.49	224.3	547.2
+D+0.750L+0.750S+0.5250E+					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.719	0.396	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.13	3,707.3	5,153.2	2.40	216.6	547.2
+D+0.750L+0.750S-0.5250E+i					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.507	0.296	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	5.73	2,612.5	5,153.2	1.79	161.8	547.2
+0.60D+0.70E+H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.868	0.466	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	9.81	4,471.7	5,153.2	2.83	255.1	547.2
+0.60D-0.70E+H					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.767	0.419	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.67	3,954.7	5,153.2	2.54	229.3	547.2
+1.140D+0.70E					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.913	0.497	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	10.32	4,704.3	5,153.2	3.01	271.8	547.2
+1.140D-0.70E					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.722	0.407	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.16	3,722.0	5,153.2	2.47	222.6	547.2
+1.105D+0.750L+0.750S+0.52					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.728	0.402	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.23	3,752.5	5,153.2	2.44	219.8	547.2
+1.105D+0.750L+0.750S-0.52					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.498	0.293	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	5.63	2,567.2	5,153.2	1.78	160.5	547.2
+0.460D+0.70E					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.856	0.458	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	9.68	4,411.4	5,153.2	2.78	250.8	547.2
+0.460D-0.70E					1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 10.670 ft	1	0.779	0.422	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	8.81	4,015.0	5,153.2	2.56	231.0	547.2

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
E Only	1	0.8426	5.841		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.853	3.747
Max Upward from Load Combinations	1.696	3.022
Max Upward from Load Cases	1.853	3.747
Max Downward from all Load Conditions	-1.853	-3.747
Max Downward from Load Combinations	-1.057	-2.384
Max Downward from Load Cases (Resis)	-1.853	-3.747
+D+H	0.399	0.399
+D+L+H	0.543	0.543
+D+Lr+H	0.399	0.399

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B1-44] (SW #103)

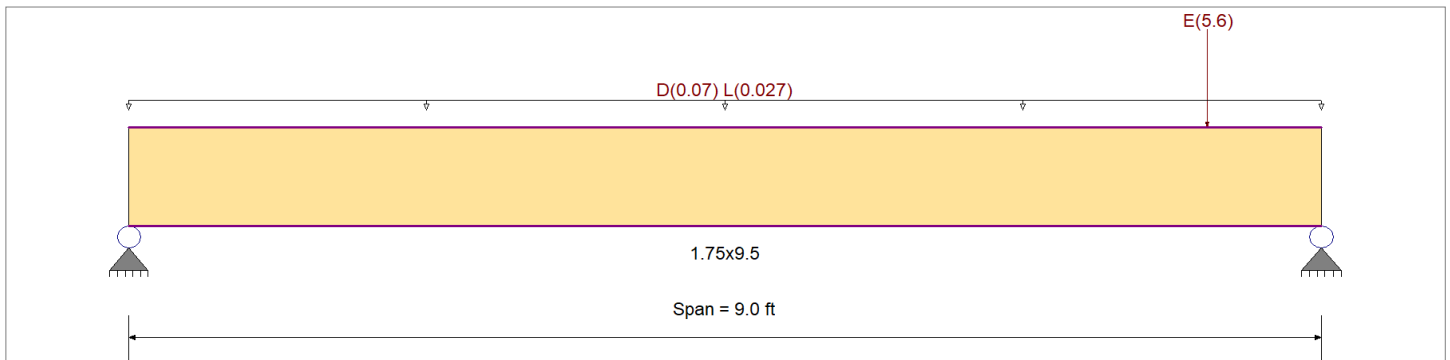
## CODE REFERENCES

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

Load Combination Set : ASCE 7-16

## Material Properties

Analysis Method : Allowable Stress Design	Fb +	3,120.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	3,120.0 psi	Ebend- xx	2,000.0 ksi
	Fc - Prll	3,012.0 psi	Eminbend - xx	1,016.54 ksi
Wood Species : Trus Joist	Fc - Perp	900.0 psi		
Wood Grade : MicroLam LVL 2.0 E	Fv	342.0 psi		
	Ft	1,866.0 psi	Density	42.010 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



## Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.070, L = 0.0270 , Tributary Width = 1.0 ft

Point Load : E = 5.60 k @ 8.140 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.296</b> : 1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.637</b> : 1
Section used for this span		<b>1.75x9.5</b>	Section used for this span		<b>1.75x9.5</b>
fb: Actual	=	1,525.36psi	fv: Actual	=	348.46 psi
F'b	=	5,153.15psi	F'v	=	547.20 psi
Load Combination	=	+1.140D+0.70E	Load Combination	=	+1.140D+0.70E
Location of maximum on span	=	8.113ft	Location of maximum on span	=	8.212 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection	0.171 in	Ratio = 630 >=151	Span: 1 : E Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <151	n/a		
Max Downward Total Deflection	0.164 in	Ratio = 660 >=189	Span: 1 : +D+0.70E+0.60H		
Max Upward Total Deflection	0 in	Ratio = 0 <189	n/a		

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v	
+D+H	Length = 9.0 ft	1	0.119	0.081	0.90	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.76	345.5	2,898.6	0.0	0.00	0.0	0.0
+D+L+H	Length = 9.0 ft	1	0.146	0.100	1.00	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.03	470.1	3,220.7	0.0	0.00	0.0	0.0
+D+Lr+H	Length = 9.0 ft	1	0.086	0.059	1.25	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.76	345.5	4,025.9	0.0	0.00	0.0	0.0
+D+S+H	Length = 9.0 ft	1	0.093	0.064	1.15	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.76	345.5	3,703.8	0.0	0.00	0.0	0.0
+D+0.750Lr+0.750L+H						1.00	1.00	1.00	1.032	1.00	1.00	1.00			0.0	0.00	0.0	0.0	0.0

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B1-44] (SW #103)

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sub>b</sub>	V	fv	F <sub>v</sub>
Length = 9.0 ft	1		0.109	0.074	1.25	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.96	439.0	4,025.9	0.35	31.8	427.5
+D+0.750L+0.750S+H															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.119	0.081	1.15	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.96	439.0	3,703.8	0.35	31.8	393.3
+D+0.60W+H															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.067	0.046	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.76	345.5	5,153.2	0.28	25.1	547.2
+D+0.750Lr+0.750L+0.450W+															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.085	0.058	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.96	439.0	5,153.2	0.35	31.8	547.2
+D+0.750L+0.750S+0.450W+i															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.085	0.058	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.96	439.0	5,153.2	0.35	31.8	547.2
+0.60D+0.60W+0.60H															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.040	0.027	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	0.45	207.3	5,153.2	0.17	15.0	547.2
+D+0.70E+0.60H															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.293	0.630	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	3.31	1,508.2	5,153.2	3.82	345.0	547.2
+D-0.70E+0.60H															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.245	0.540	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	2.77	1,262.7	5,153.2	3.27	295.3	547.2
+D+0.750L+0.750S+0.5250E+															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.234	0.497	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	2.64	1,204.4	5,153.2	3.01	271.8	547.2
+D+0.750L+0.750S-0.5250E+i															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.172	0.381	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.94	884.4	5,153.2	2.31	208.6	547.2
+0.60D+0.70E+H															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.283	0.612	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	3.20	1,459.1	5,153.2	3.71	334.9	547.2
+0.60D-0.70E+H															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.255	0.558	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	2.88	1,311.8	5,153.2	3.38	305.1	547.2
+1.140D+0.70E															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.296	0.637	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	3.35	1,525.4	5,153.2	3.86	348.5	547.2
+1.140D-0.70E															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.242	0.533	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	2.73	1,245.5	5,153.2	3.23	291.8	547.2
+1.105D+0.750L+0.750S+0.52															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.238	0.501	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	2.69	1,226.3	5,153.2	3.04	274.4	547.2
+1.105D+0.750L+0.750S-0.52															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.169	0.377	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	1.91	872.0	5,153.2	2.28	206.0	547.2
+0.460D+0.70E															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.280	0.606	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	3.16	1,441.9	5,153.2	3.67	331.4	547.2
+0.460D-0.70E															0.0	0.00	0.0	0.0
Length = 9.0 ft	1		0.258	0.564	1.60	1.00	1.00	1.00	1.032	1.00	1.00	1.00	2.92	1,328.9	5,153.2	3.42	308.6	547.2

## Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
E Only	1	0.1714	5.190		0.0000	0.000

## Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.711	5.065
Max Upward from Load Combinations	0.711	3.882
Max Upward from Load Cases	0.535	5.065
Max Downward from all Load Conditions	-0.535	-5.065
Max Downward from Load Combinations	-0.172	-3.343
Max Downward from Load Cases (Resis)	-0.535	-5.065
+D+H	0.337	0.337
+D+L+H	0.458	0.458
+D+Lr+H	0.337	0.337

## Steel Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [H2-19] (SW#203)

## CODE REFERENCES

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

Load Combination Set : IBC 2021

## Material Properties

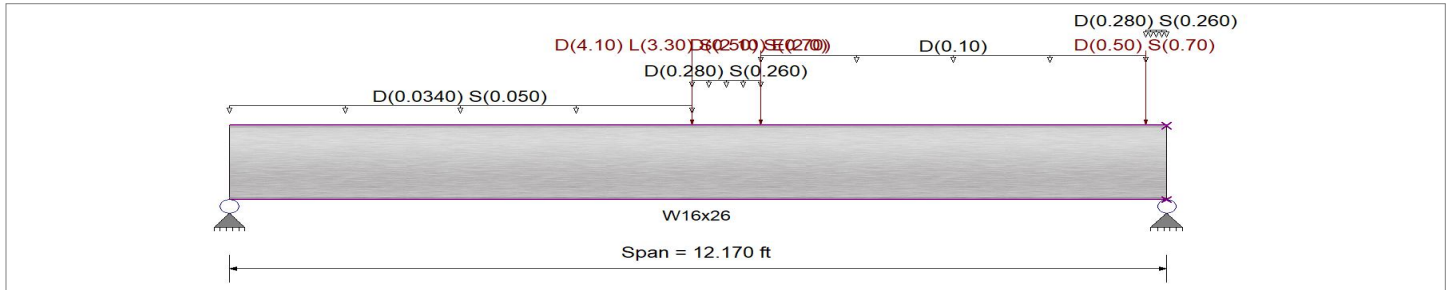
Analysis Method : Allowable Strength Design

Fy : Steel Yield : 50.0 ksi

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

E: Modulus : 29,000.0 ksi

Bending Axis : Major Axis Bending



## Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Uniform Load : D = 0.0340, S = 0.050 k/ft, Extent = 0.0 --> 6.0 ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.280, S = 0.260 k/ft, Extent = 6.0 --> 6.90 ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.10 k/ft, Extent = 6.90 --> 11.90 ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.280, S = 0.260 k/ft, Extent = 11.90 --> 12.170 ft, Tributary Width = 1.0 ft

Point Load : D = 4.10, L = 3.30, S = 2.10, E = 2.0 k @ 6.0 ft

Point Load : D = 0.50, S = 0.70 k @ 6.90 ft

Point Load : D = 0.50, S = 0.70 k @ 11.90 ft

## DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio =	<b>0.302 : 1</b>	Maximum Shear Stress Ratio =	<b>0.099 : 1</b>
Section used for this span	<b>W16x26</b>	Section used for this span	<b>W16x26</b>
Ma : Applied	33.275 k-ft	Va : Applied	6.964 k
Mn / Omega : Allowable	110.279 k-ft	Vn/Omega : Allowable	70.509 k
Load Combination	+D+0.750L+0.750S+0.5250E	Load Combination	+D+0.750L+0.750S+0.5250E
Span # where maximum occurs	Span # 1	Location of maximum on span	12.170 ft
		Span # where maximum occurs	Span # 1
<b>Maximum Deflection</b>			
Max Downward Transient Deflection	0.025 in	Ratio = <b>5,929</b>	>=360
Max Upward Transient Deflection	0 in	Ratio = <b>0</b>	<360
Max Downward Total Deflection	0.084 in	Ratio = <b>1738</b>	>=180
Max Upward Total Deflection	0 in	Ratio = <b>0</b>	<180
		Span: 1 : L Only	
		Span: 1 : +D+0.750L+0.750S+0.5250E	

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
D Only														
Dsgn. L =	12.17 ft	1	0.141	0.049	15.52		15.52	184.17	110.28	1.00	1.00	3.44	117.75	70.51
+D+L														
Dsgn. L =	12.17 ft	1	0.232	0.072	25.53		25.53	184.17	110.28	1.00	1.00	5.07	117.75	70.51
+D+S														
Dsgn. L =	12.17 ft	1	0.226	0.083	24.93		24.93	184.17	110.28	1.00	1.00	5.82	117.75	70.51

**Steel Beam**

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN &amp; KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [H2-19] (SW#203)**Maximum Forces & Stresses for Load Combinations**

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values					Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega Cb	Rm	Va Max	Vnx	Vnx/Omega	
+D+0.750L	Dsgn. L = 12.17 ft	1	0.209	0.066	23.03		23.03	184.17	110.28	1.00	1.00	4.66	117.75	70.51
+D+0.750L+0.750S	Dsgn. L = 12.17 ft	1	0.273	0.091	30.09		30.09	184.17	110.28	1.00	1.00	6.45	117.75	70.51
+D+0.70E	Dsgn. L = 12.17 ft	1	0.179	0.059	19.77		19.77	184.17	110.28	1.00	1.00	4.13	117.75	70.51
+D+0.750L+0.750S+0.5250E	Dsgn. L = 12.17 ft	1	0.302	0.099	33.27		33.27	184.17	110.28	1.00	1.00	6.96	117.75	70.51
+0.60D	Dsgn. L = 12.17 ft	1	0.084	0.029	9.31		9.31	184.17	110.28	1.00	1.00	2.06	117.75	70.51
+0.60D+0.70E	Dsgn. L = 12.17 ft	1	0.123	0.039	13.56		13.56	184.17	110.28	1.00	1.00	2.75	117.75	70.51

**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.0840	6.120		0.0000	0.000

**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	5.770	6.964
Max Upward from Load Combinations	5.770	6.964
Max Upward from Load Cases	2.693	3.439
D Only	2.693	3.439
+D+L	4.366	5.066
+D+S	4.413	5.823
+D+0.750L	3.948	4.659
+D+0.750L+0.750S	5.238	6.447
+D+0.70E	3.403	4.129
+D+0.750L+0.750S+0.5250E	5.770	6.964
+0.60D	1.616	2.063
+0.60D+0.70E	2.326	2.753
L Only	1.673	1.627
S Only	1.720	2.384
E Only	1.014	0.986



## Steel Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

### DESCRIPTION: [H2-12] (UPLIFT)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values					Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega Cb	Rm	Va Max	Vnx	Vnx/Omega	
+D+S	Dsgn. L = 12.17 ft	1	0.085	0.176	9.40		9.40	184.17	110.28	1.00	1.00	12.43	117.75	70.51
+D+0.750L	Dsgn. L = 12.17 ft	1	0.105	0.111	11.54		11.54	184.17	110.28	1.00	1.00	7.80	117.75	70.51
+D+0.750L+0.750S	Dsgn. L = 12.17 ft	1	0.079	0.152	8.69		8.69	184.17	110.28	1.00	1.00	10.69	117.75	70.51
+D+0.70E	Dsgn. L = 12.17 ft	1	0.111	0.176	12.21		12.21	184.17	110.28	1.00	1.00	12.43	117.75	70.51
+D+0.750L+0.750S+0.5250E	Dsgn. L = 12.17 ft	1	0.045	0.073	4.98		4.98	184.17	110.28	1.00	1.00	5.12	117.75	70.51
+0.60D	Dsgn. L = 12.17 ft	1	0.099	0.172	10.91		10.91	184.17	110.28	1.00	1.00	12.15	117.75	70.51
+0.60D+0.70E	Dsgn. L = 12.17 ft	1	0.037	0.047	4.04		4.04	184.17	110.28	1.00	1.00	3.29	117.75	70.51
	Dsgn. L = 12.17 ft	1	0.022	0.041	2.44		2.44	184.17	110.28	1.00	1.00	2.93	117.75	70.51

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.0382	5.807		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	12.430	3.286
Max Upward from Load Combinations	12.430	3.286
Max Upward from Load Cases	6.940	1.910
Max Downward from all Load Conditions (Resisti	-0.526	-1.008
Max Downward from Load Cases (Resisting Uplli	-0.526	-1.008
D Only	5.488	1.910
+D+L	12.428	2.270
+D+S	7.804	3.286
+D+0.750L	10.693	2.180
+D+0.750L+0.750S	12.430	3.212
+D+0.70E	5.120	1.204
+D+0.750L+0.750S+0.5250E	12.154	2.683
+0.60D	3.293	1.146
+0.60D+0.70E	2.925	0.440
L Only	6.940	0.360
S Only	2.315	1.377
E Only	-0.526	-1.008

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B2-1] CANT'D FLUSH BM. @ BA1 TUB BUMPOUT

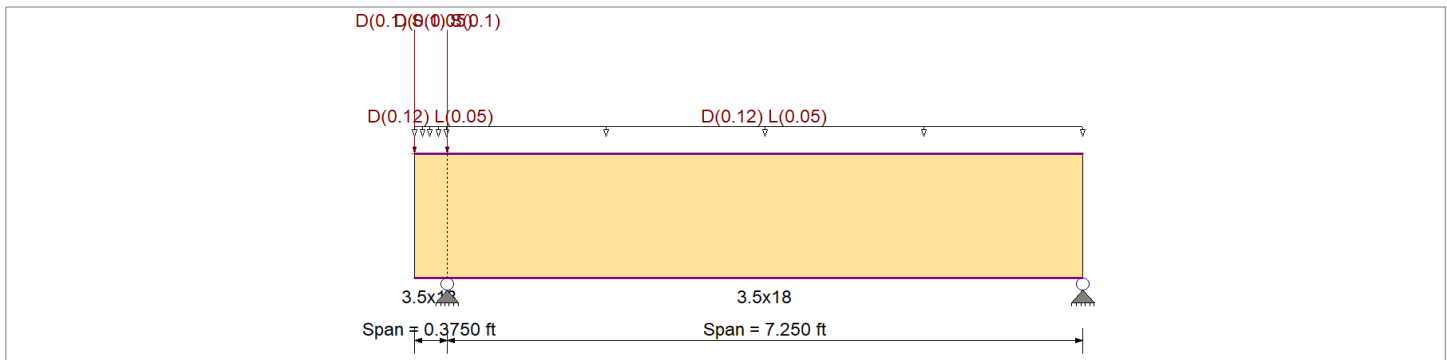
### CODE REFERENCES

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

Load Combination Set : IBC 2021

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2400 psi	E : Modulus of Elasticity	
Load Combination : IBC 2021	Fb -	1850 psi	Ebend- xx	1800ksi
	Fc - Prll	1650 psi	Eminbend - xx	950ksi
Wood Species : DF/DF	Fc - Perp	650 psi	Ebend- yy	1600ksi
Wood Grade : 24F-V4	Fv	265 psi	Eminbend - yy	850ksi
	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 NOT internally calculated and added

Load for Span Number 1

Point Load : D = 0.10, S = 0.050 k @ 0.0 ft

Uniform Load : D = 0.120, L = 0.050 , Tributary Width = 1.0 ft

Load for Span Number 2

Uniform Load : D = 0.120, L = 0.050 , Tributary Width = 1.0 ft

Point Load : D = 0.10, S = 0.10 k @ 0.0 ft

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.029</b> : 1	Maximum Shear Stress Ratio	=	<b>0.033</b> : 1
Section used for this span		<b>3.5x18</b>	Section used for this span		<b>3.5x18</b>
fb: Actual	=	69.35psi	fv: Actual	=	8.77 psi
F'b	=	2,400.00psi	F'v	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	3.645ft	Location of maximum on span	=	0.375 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection		0.001 in Ratio = <b>85491</b> >=360	Span: 2 : L Only		
Max Upward Transient Deflection		0 in Ratio = <b>0</b> <360	n/a		
Max Downward Total Deflection		0.003 in Ratio = <b>25668</b> >=180	Span: 2 : +D+L		
Max Upward Total Deflection		-0.001 in Ratio = <b>16520</b> >=180	Span: 1 : +D+L		

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v	
D Only																			
	Length = 0.3750 ft	1	0.002	0.026	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.05	2.9	1,665.0	0.00	0.00	0.0	0.0
	Length = 7.250 ft	2	0.023	0.026	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.77	48.6	2,160.0	0.26	6.2	238.5	238.5
+D+L																			
	Length = 0.3750 ft	1	0.002	0.033	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.05	3.1	1,850.0	0.37	8.8	265.0	265.0
	Length = 7.250 ft	2	0.029	0.033	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.09	69.4	2,400.0	0.37	8.8	265.0	265.0

## Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

### DESCRIPTION: [B2-1] CANT'D FLUSH BM. @ BA1 TUB BUMPOUT

#### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v
+D+S						1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 0.3750 ft	1		0.002	0.021	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.06	4.1	2,127.5	0.26	6.3	304.8
Length = 7.250 ft	2		0.017	0.021	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.76	48.0	2,760.0	0.26	6.3	304.8
+D+0.750L						1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 0.3750 ft	1		0.001	0.025	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.05	3.1	2,312.5	0.34	8.1	331.3
Length = 7.250 ft	2		0.021	0.025	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.01	64.2	3,000.0	0.34	8.1	331.3
+D+0.750L+0.750S						1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 0.3750 ft	1		0.002	0.027	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.06	4.0	2,127.5	0.34	8.2	304.8
Length = 7.250 ft	2		0.023	0.027	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.00	63.7	2,760.0	0.34	8.2	304.8
+0.60D						1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 0.3750 ft	1		0.001	0.009	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.03	1.8	2,960.0	0.16	3.7	424.0
Length = 7.250 ft	2		0.008	0.009	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.46	29.2	3,840.0	0.16	3.7	424.0

#### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
S Only	1	0.0000	0.369	+D+L	-0.0005	0.000
+D+L	2	0.0034	3.645		0.0000	0.000

#### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions		0.951	0.609
Max Upward from Load Combinations		0.951	0.609
Max Upward from Load Cases		0.686	0.429
Max Downward from all Load Conditio			-0.003
Max Downward from Load Cases (Resis			-0.003
D Only		0.686	0.429
+D+L		0.887	0.609
+D+S		0.839	0.426
+D+0.750L		0.837	0.564
+D+0.750L+0.750S		0.951	0.562
+0.60D		0.412	0.257
L Only		0.200	0.181
S Only		0.153	-0.003

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-2] CANT'D FLUSH BM. @ MUD/PDR1

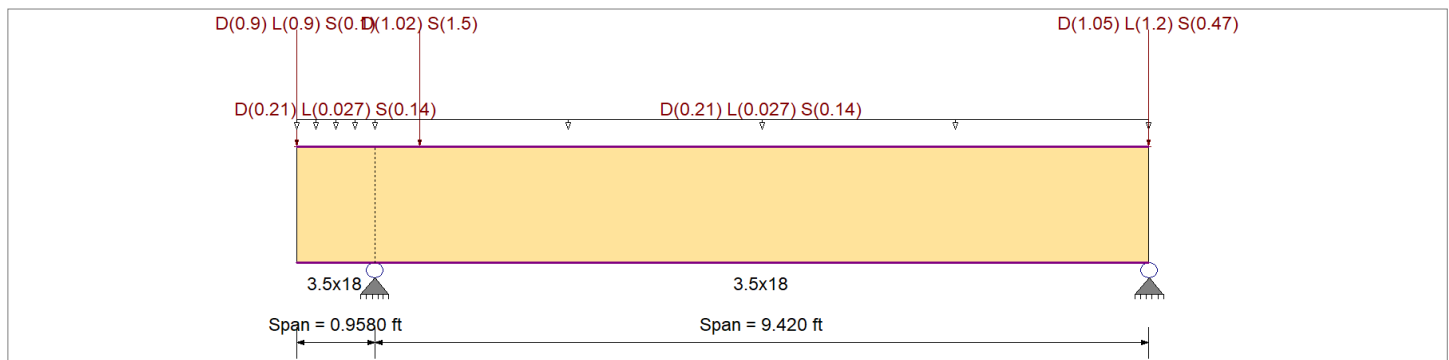
## CODE REFERENCES

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

Load Combination Set : IBC 2021

## Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,400.0 psi	E : Modulus of Elasticity	
Load Combination :	IBC 2021	Fb -	1,850.0 psi	Ebend- xx	1,800.0ksi
		Fc - Prll	1,650.0 psi	Eminbend - xx	950.0ksi
Wood Species :	DF/DF	Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Wood Grade :	24F-V4	Fv	265.0 psi	Eminbend - yy	850.0ksi
		Ft	1,100.0 psi	Density	31.210pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



## Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Point Load : D = 0.90, L = 0.90, S = 0.10 k @ 0.0 ft

Uniform Load : D = 0.210, L = 0.0270, S = 0.140, Tributary Width = 1.0 ft

Load for Span Number 2

Uniform Load : D = 0.210, L = 0.0270, S = 0.140, Tributary Width = 1.0 ft

Point Load : D = 1.020, S = 1.50 k @ 0.550 ft

Point Load : D = 1.050, L = 1.20, S = 0.470 k @ 9.420 ft

## DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.092</b>	1	Maximum Shear Stress Ratio	=	<b>0.182</b>	1
Section used for this span		<b>3.5x18</b>		Section used for this span		<b>3.5x18</b>	
fb: Actual	=	255.05psi		fv: Actual	=	48.26 psi	
F'b	=	2,760.00psi		F'v	=	265.00 psi	
Load Combination		+D+S		Load Combination		+D+L	
Location of maximum on span	=	4.631ft		Location of maximum on span	=	0.958 ft	
Span # where maximum occurs	=	Span # 2		Span # where maximum occurs	=	Span # 1	
<b>Maximum Deflection</b>							
Max Downward Transient Deflection		0.010 in	Ratio = 10994 >=360	Span: 2 : S Only			
Max Upward Transient Deflection		-0.004 in	Ratio = 6350 >=360	Span: 2 : L Only			
Max Downward Total Deflection		0.021 in	Ratio = 5316 >=180	Span: 2 : +D+S			
Max Upward Total Deflection		-0.007 in	Ratio = 3454 >=180	Span: 1 : +D+S			

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CL <sub>x</sub>	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v		
D Only																				
	Length = 0.9580 ft	1	0.037	0.110	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.96	60.9	1,665.0		0.00	0.0	0.0	238.5
	Length = 9.420 ft	2	0.063	0.110	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.13	135.5	2,160.0		0.72	26.2	238.5	
+D+L																				
	Length = 0.9580 ft	1	0.063	0.182	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.83	116.4	1,850.0		2.03	48.3	265.0	

## Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

### DESCRIPTION: [B2-2] CANT'D FLUSH BM. @ MUD/PDR1

#### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v
	Length = 9.420 ft	2	0.054	0.182	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.03	129.0	2,400.0	0.90	48.3	265.0
+D+S									1.00	1.00	1.00	1.00			0.0	0.00	0.0	0.0
	Length = 0.9580 ft	1	0.033	0.104	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.12	71.0	2,127.5	1.34	31.8	304.8
	Length = 9.420 ft	2	0.092	0.104	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	4.02	255.1	2,760.0	1.16	31.8	304.8
+D+0.750L									1.00	1.00	1.00	1.00			0.0	0.00	0.0	0.0
	Length = 0.9580 ft	1	0.044	0.129	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.61	102.5	2,312.5	1.80	42.8	331.3
	Length = 9.420 ft	2	0.043	0.129	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.05	130.4	3,000.0	0.86	42.8	331.3
+D+0.750L+0.750S									1.00	1.00	1.00	1.00			0.0	0.00	0.0	0.0
	Length = 0.9580 ft	1	0.052	0.154	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.73	110.1	2,127.5	1.97	46.9	304.8
	Length = 9.420 ft	2	0.079	0.154	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.45	218.8	2,760.0	1.14	46.9	304.8
+0.60D									1.00	1.00	1.00	1.00			0.0	0.00	0.0	0.0
	Length = 0.9580 ft	1	0.012	0.037	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.58	36.5	2,960.0	0.66	15.7	424.0
	Length = 9.420 ft	2	0.021	0.037	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.28	81.3	3,840.0	0.43	15.7	424.0

#### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+S	-0.0067	0.000
+D+S	2	0.0213	4.736		0.0000	0.000

#### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions		5.754	3.823
Max Upward from Load Combinations		5.754	3.823
Max Upward from Load Cases		3.152	1.997
D Only		3.152	1.997
+D+L		4.298	3.231
+D+S		5.475	3.197
+D+0.750L		4.012	2.923
+D+0.750L+0.750S		5.754	3.823
+0.60D		1.891	1.198
L Only		1.146	1.234
S Only		2.323	1.200

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-2] (SW#208)

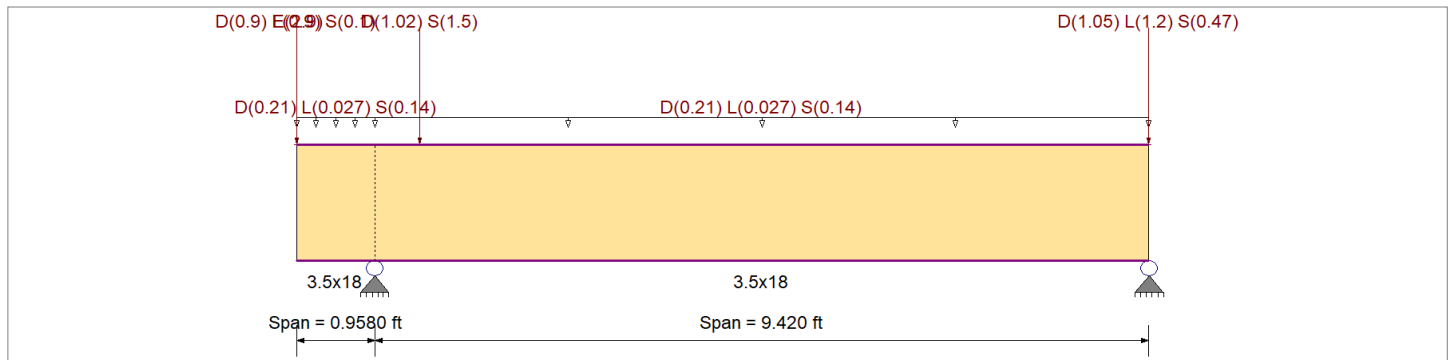
## CODE REFERENCES

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

Load Combination Set : IBC 2021

## Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,400.0 psi	E : Modulus of Elasticity	
Load Combination : IBC 2021	Fb -	1,850.0 psi	Ebend- xx	1,800.0 ksi
	Fc - Prll	1,650.0 psi	Eminbend - xx	950.0 ksi
Wood Species : DF/DF	Fc - Perp	650.0 psi	Ebend- yy	1,600.0 ksi
Wood Grade : 24F-V4	Fv	265.0 psi	Eminbend - yy	850.0 ksi
	Ft	1,100.0 psi	Density	31.210 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



## Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Point Load : D = 0.90, L = 0.90, S = 0.10 k @ 0.0 ft

Uniform Load : D = 0.210, L = 0.0270, S = 0.140, Tributary Width = 1.0 ft

Point Load : E = 2.90 k @ 0.0 ft

Load for Span Number 2

Uniform Load : D = 0.210, L = 0.0270, S = 0.140, Tributary Width = 1.0 ft

Point Load : D = 1.020, S = 1.50 k @ 0.550 ft

Point Load : D = 1.050, L = 1.20, S = 0.470 k @ 9.420 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.092</b>	1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.196</b>	: 1
Section used for this span		<b>3.5x18</b>		Section used for this span		<b>3.5x18</b>	
fb: Actual	=	255.05 psi		fv: Actual	=	83.18 psi	
F'b	=	2,760.00 psi		F'v	=	424.00 psi	
Load Combination		+D+S		Load Combination		+D+0.750L+0.750S+0.5250E	
Location of maximum on span	=	4.631 ft		Location of maximum on span	=	0.958 ft	
Span # where maximum occurs	=	Span # 2		Span # where maximum occurs	=	Span # 1	
<b>Maximum Deflection</b>							
Max Downward Transient Deflection		0.005 in	Ratio = 4422	>=360		Span: 2 : S Only	
Max Upward Transient Deflection		-0.004 in	Ratio = 6350	>=360		Span: 2 : E Only	
Max Downward Total Deflection		0.021 in	Ratio = 5316	>=180		Span: 2 : +D+S	
Max Upward Total Deflection		-0.007 in	Ratio = 3454	>=180		Span: 2 : +0.60D+0.70E	

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v		
D Only																				
	Length = 9.9580 ft	1	0.037	0.110	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.96	60.9	1,665.0		1.10	26.2	238.5	
	Length = 9.420 ft	2	0.063	0.110	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.13	135.5	2,160.0		0.72	26.2	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: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B2-2] (SW#208)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sub>b</sub>	V	f <sub>v</sub>	F <sub>v</sub>
Length = 0.9580 ft	1		0.063	0.182	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.83	116.4	1,850.0	2.03	48.3	265.0
Length = 9.420 ft	2		0.054	0.182	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.03	129.0	2,400.0	0.90	48.3	265.0
+D+S															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.033	0.104	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.12	71.0	2,127.5	1.34	31.8	304.8
Length = 9.420 ft	2		0.092	0.104	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	4.02	255.1	2,760.0	1.16	31.8	304.8
+D+0.750L															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.044	0.129	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.61	102.5	2,312.5	1.80	42.8	331.3
Length = 9.420 ft	2		0.043	0.129	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.05	130.4	3,000.0	0.86	42.8	331.3
+D+0.750L+0.750S															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.052	0.154	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.73	110.1	2,127.5	1.97	46.9	304.8
Length = 9.420 ft	2		0.079	0.154	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.45	218.8	2,760.0	1.14	46.9	304.8
+D+0.70E															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.062	0.176	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.90	184.3	2,960.0	3.13	74.6	424.0
Length = 9.420 ft	2		0.062	0.176	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.90	184.3	2,960.0	0.93	74.6	424.0
+D+0.750L+0.750S+0.5250E															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.068	0.196	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.19	202.7	2,960.0	3.49	83.2	424.0
Length = 9.420 ft	2		0.068	0.196	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.19	202.7	2,960.0	1.30	83.2	424.0
+0.60D															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.012	0.037	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.58	36.5	2,960.0	0.66	15.7	424.0
Length = 9.420 ft	2		0.021	0.037	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.28	81.3	3,840.0	0.43	15.7	424.0
+0.60D+0.70E															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.054	0.151	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.52	160.0	2,960.0	2.69	64.1	424.0
Length = 9.420 ft	2		0.054	0.151	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.52	160.0	2,960.0	0.64	64.1	424.0

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+S	-0.0067	0.000
+D+S	2	0.0213	4.736		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions		7.431	3.823
Max Upward from Load Combinations		7.431	3.823
Max Upward from Load Cases		3.195	1.997
Max Downward from all Load Conditions			-0.295
Max Downward from Load Cases (Resis)			-0.295
D Only		3.152	1.997
+D+L		4.298	3.231
+D+S		5.475	3.197
+D+0.750L		4.012	2.923
+D+0.750L+0.750S		5.754	3.823
+D+0.70E		5.389	1.790
+D+0.750L+0.750S+0.5250E		7.431	3.668
+0.60D		1.891	1.198
+0.60D+0.70E		4.128	0.992
L Only		1.146	1.234
S Only		2.323	1.200
E Only		3.195	-0.295

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-2] (SW#212)

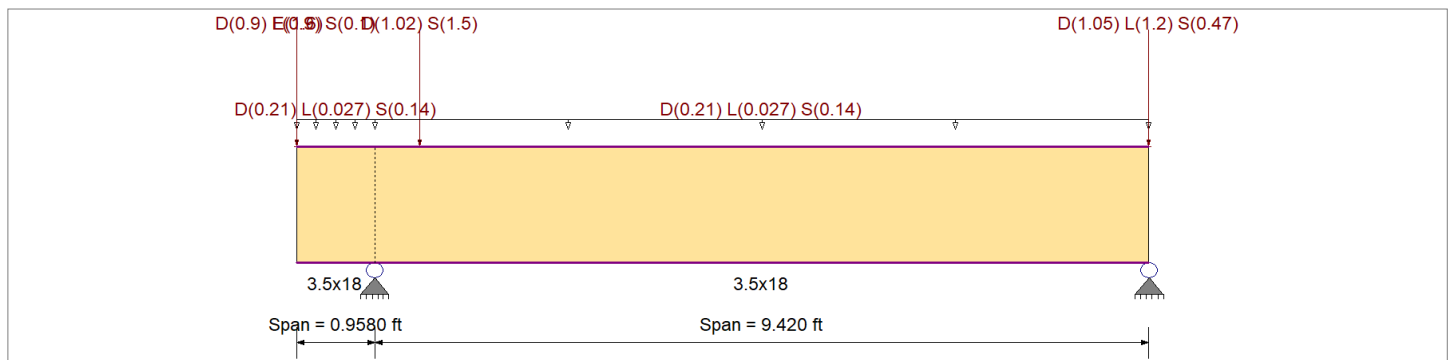
## CODE REFERENCES

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

Load Combination Set : IBC 2021

## Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,400.0 psi	E : Modulus of Elasticity	
Load Combination :	IBC 2021	Fb -	1,850.0 psi	Ebend- xx	1,800.0ksi
		Fc - Prll	1,650.0 psi	Eminbend - xx	950.0ksi
Wood Species :	DF/DF	Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Wood Grade :	24F-V4	Fv	265.0 psi	Eminbend - yy	850.0ksi
		Ft	1,100.0 psi	Density	31.210pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



## Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Point Load : D = 0.90, L = 0.90, S = 0.10 k @ 0.0 ft

Uniform Load : D = 0.210, L = 0.0270, S = 0.140, Tributary Width = 1.0 ft

Point Load : E = 1.60 k @ 0.0 ft

Load for Span Number 2

Uniform Load : D = 0.210, L = 0.0270, S = 0.140, Tributary Width = 1.0 ft

Point Load : D = 1.020, S = 1.50 k @ 0.550 ft

Point Load : D = 1.050, L = 1.20, S = 0.470 k @ 9.420 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.092</b>	1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.182</b>	: 1
Section used for this span		<b>3.5x18</b>		Section used for this span		<b>3.5x18</b>	
fb: Actual	=	255.05psi		fv: Actual	=	48.26 psi	
F'b	=	2,760.00psi		F'v	=	265.00 psi	
Load Combination		+D+S		Load Combination		+D+L	
Location of maximum on span	=	4.631ft		Location of maximum on span	=	0.958 ft	
Span # where maximum occurs	=	Span # 2		Span # where maximum occurs	=	Span # 1	
<b>Maximum Deflection</b>							
Max Downward Transient Deflection		0.003 in	Ratio =	8016	>=	360	Span: 2 : S Only
Max Upward Transient Deflection		-0.004 in	Ratio =	6350	>=	360	Span: 2 : E Only
Max Downward Total Deflection		0.021 in	Ratio =	5316	>=	180	Span: 2 : +D+S
Max Upward Total Deflection		-0.007 in	Ratio =	3454	>=	180	Span: 1 : +D+S

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v		
D Only																				
	Length = 9.9580 ft	1	0.037	0.110	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.96	60.9	1,665.0		0.00	0.0	0.0	238.5
	Length = 9.420 ft	2	0.063	0.110	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.13	135.5	2,160.0		0.72	26.2	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: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B2-2] (SW#212)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sub>b</sub>	V	f <sub>v</sub>	F <sub>v</sub>
Length = 0.9580 ft	1		0.063	0.182	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.83	116.4	1,850.0	2.03	48.3	265.0
Length = 9.420 ft	2		0.054	0.182	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.03	129.0	2,400.0	0.90	48.3	265.0
+D+S															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.033	0.104	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.12	71.0	2,127.5	1.34	31.8	304.8
Length = 9.420 ft	2		0.092	0.104	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	4.02	255.1	2,760.0	1.16	31.8	304.8
+D+0.750L															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.044	0.129	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.61	102.5	2,312.5	1.80	42.8	331.3
Length = 9.420 ft	2		0.043	0.129	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.05	130.4	3,000.0	0.86	42.8	331.3
+D+0.750L+0.750S															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.052	0.154	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.73	110.1	2,127.5	1.97	46.9	304.8
Length = 9.420 ft	2		0.079	0.154	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.45	218.8	2,760.0	1.14	46.9	304.8
+D+0.70E															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.044	0.125	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.03	129.0	2,960.0	2.22	52.9	424.0
Length = 9.420 ft	2		0.044	0.125	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.03	129.0	2,960.0	0.84	52.9	424.0
+D+0.750L+0.750S+0.5250E															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.054	0.158	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.54	161.2	2,960.0	2.81	66.9	424.0
Length = 9.420 ft	2		0.051	0.158	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.07	194.9	3,840.0	1.23	66.9	424.0
+0.60D															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.012	0.037	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.58	36.5	2,960.0	0.66	15.7	424.0
Length = 9.420 ft	2		0.021	0.037	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.28	81.3	3,840.0	0.43	15.7	424.0
+0.60D+0.70E															0.0	0.00	0.0	0.0
Length = 0.9580 ft	1		0.035	0.100	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.65	104.6	2,960.0	1.78	42.4	424.0
Length = 9.420 ft	2		0.035	0.100	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.65	104.6	2,960.0	0.55	42.4	424.0

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+S	-0.0067	0.000
+D+S	2	0.0213	4.736		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions		6.680	3.823
Max Upward from Load Combinations		6.680	3.823
Max Upward from Load Cases		3.152	1.997
Max Downward from all Load Conditions			-0.163
Max Downward from Load Cases (Resis)			-0.163
D Only		3.152	1.997
+D+L		4.298	3.231
+D+S		5.475	3.197
+D+0.750L		4.012	2.923
+D+0.750L+0.750S		5.754	3.823
+D+0.70E		4.386	1.883
+D+0.750L+0.750S+0.5250E		6.680	3.737
+0.60D		1.891	1.198
+0.60D+0.70E		3.125	1.084
L Only		1.146	1.234
S Only		2.323	1.200
E Only		1.763	-0.163

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-4] (SW#206)

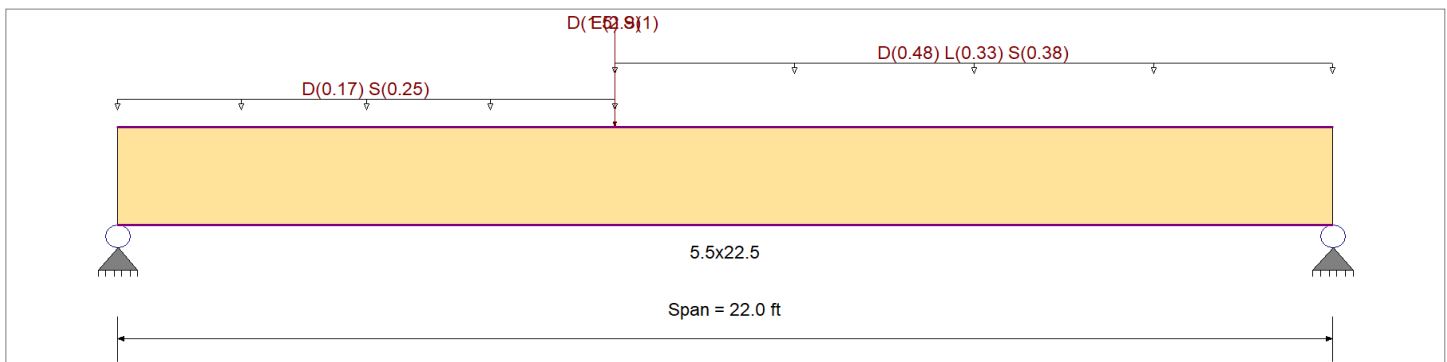
## CODE REFERENCES

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

Load Combination Set : ASCE 7-16

## Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,880.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	2,220.0 psi	Ebend- xx	1,800.0 ksi
	Fc - Prll	1,980.0 psi	Eminbend - xx	950.0 ksi
Wood Species : DF/DF	Fc - Perp	780.0 psi	Ebend- yy	1,600.0 ksi
Wood Grade : 24F - V4	Fv	318.0 psi	Eminbend - yy	850.0 ksi
	Ft	1,320.0 psi	Density	31.210 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



## Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

Uniform Load : D = 0.170, S = 0.250 k/ft, Extent = 0.0 --> 9.0 ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.480, L = 0.330, S = 0.380 k/ft, Extent = 9.0 --> 22.0 ft, Tributary Width = 1.0 ft

Point Load : D = 1.50, S = 1.0 k @ 9.0 ft

Point Load : E = 2.90 k @ 9.0 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.503</b> : 1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.306</b> : 1
Section used for this span		<b>5.5x22.5</b>	Section used for this span		<b>5.5x22.5</b>
fb: Actual	=	1,545.79psi	fv: Actual	=	111.85 psi
F'b	=	3,073.99psi	F'v	=	365.70 psi
Load Combination		+D+0.750L+0.750S+H	Load Combination		+D+0.750L+0.750S+H
Location of maximum on span	=	11.241 ft	Location of maximum on span	=	20.153 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection	0.227 in	Ratio = 1161 >=360	Span: 1 : S Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360			n/a
Max Downward Total Deflection	0.602 in	Ratio = 438 >=300	Span: 1 : +D+0.750L+0.750S+0.5250E+H		
Max Upward Total Deflection	0 in	Ratio = 0 <300			n/a

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v	
+D+H	Length = 22.0 ft	1	0.335	0.198	0.90	1.00	1.00	0.928	1.00	1.00	1.00	31.14	805.2	2,405.7	0.0	0.00	0.0	0.0	286.2
+D+L+H	Length = 22.0 ft	1	0.432	0.270	1.00	1.00	1.00	0.928	1.00	1.00	1.00	44.61	1,153.5	2,673.0	0.0	0.00	0.0	0.0	318.0
+D+Lr+H	Length = 22.0 ft	1	0.241	0.143	1.25	1.00	1.00	0.928	1.00	1.00	1.00	31.14	805.2	3,341.3	0.0	0.00	0.0	0.0	397.5
+D+S+H						1.00	1.00	1.00	0.928	1.00	1.00			0.0	0.00	0.0	0.0	0.0	

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B2-4] (SW#206)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sup>b</sup>	V	f <sub>v</sub>	F <sup>v</sup>
Length = 22.0 ft	1		0.471	0.276	1.15	1.00	1.00	1.00	0.928	1.00	1.00	1.00	56.02	1,448.6	3,074.0	8.33	101.0	365.7
+D+0.750Lr+0.750L+H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.319	0.198	1.25	1.00	1.00	1.00	0.928	1.00	1.00	1.00	41.21	1,065.6	3,341.3	6.49	78.7	397.5
+D+0.750L+0.750S+H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.503	0.306	1.15	1.00	1.00	1.00	0.928	1.00	1.00	1.00	59.78	1,545.8	3,074.0	9.23	111.9	365.7
+D+0.60W+H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.188	0.112	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	31.14	805.2	4,276.9	4.68	56.8	508.8
+D+0.750Lr+0.750L+0.450W+						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.249	0.155	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	41.21	1,065.6	4,276.9	6.49	78.7	508.8
+D+0.750L+0.750S+0.450W+l						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.361	0.220	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	59.78	1,545.8	4,276.9	9.23	111.9	508.8
+0.60D+0.60W+0.60H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.113	0.067	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	18.68	483.1	4,276.9	2.81	34.1	508.8
+D+0.70E+0.60H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.248	0.131	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	41.02	1,060.8	4,276.9	5.51	66.8	508.8
+D-0.70E+0.60H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.137	0.092	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	22.61	584.7	4,276.9	3.85	46.7	508.8
+D+0.750L+0.750S+0.5250E+						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.403	0.235	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	66.65	1,723.4	4,276.9	9.85	119.4	508.8
+D+0.750L+0.750S-0.5250E+l						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.322	0.205	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	53.29	1,377.9	4,276.9	8.61	104.3	508.8

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E+H	1	0.6020	11.161		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	8.973	11.770
Max Upward from Load Combinations	8.973	11.770
Max Upward from Load Cases	4.242	5.618
+D+H	4.242	5.618
+D+L+H	5.510	8.640
+D+Lr+H	4.242	5.618
+D+S+H	8.082	9.968
+D+0.750Lr+0.750L+H	5.193	7.885
+D+0.750L+0.750S+H	8.073	11.147
+D+0.60W+H	4.242	5.618
+D+0.750Lr+0.750L+0.450W+H	5.193	7.885
+D+0.750L+0.750S+0.450W+H	8.073	11.147
+0.60D+0.60W+0.60H	2.545	3.371
+D+0.70E+0.60H	5.442	6.448
+D+0.750L+0.750S+0.5250E+H	8.973	11.770
+0.60D+0.70E+H	3.745	4.201
D Only	4.242	5.618
L Only	1.268	3.023
S Only	3.840	4.350
E Only	1.714	1.186
H Only		

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-4] (SW#211)

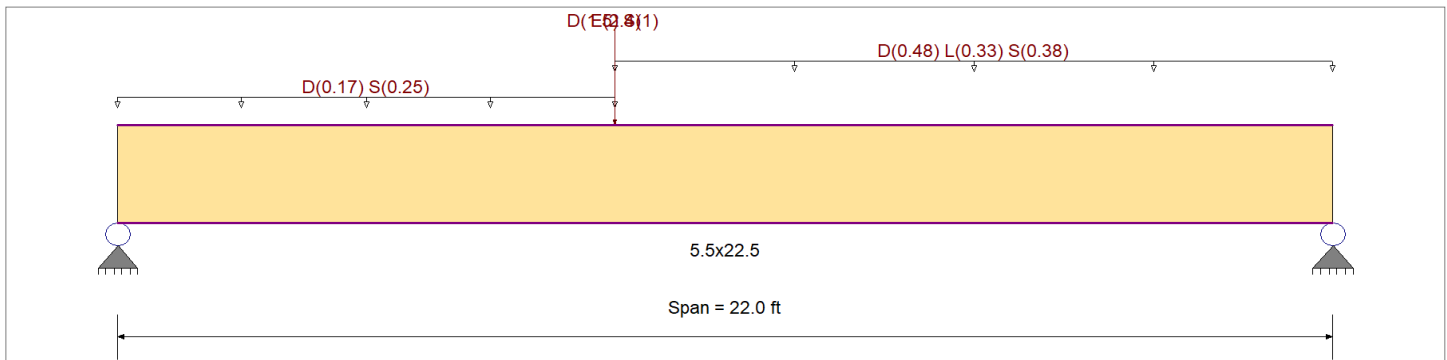
## CODE REFERENCES

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

Load Combination Set : ASCE 7-16

## Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,880.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	2,220.0 psi	Ebend- xx	1,800.0 ksi
	Fc - Prll	1,980.0 psi	Eminbend - xx	950.0 ksi
Wood Species : DF/DF	Fc - Perp	780.0 psi	Ebend- yy	1,600.0 ksi
Wood Grade : 24F - V4	Fv	318.0 psi	Eminbend - yy	850.0 ksi
	Ft	1,320.0 psi	Density	31.210 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



## Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

Uniform Load : D = 0.170, S = 0.250 k/ft, Extent = 0.0 --> 9.0 ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.480, L = 0.330, S = 0.380 k/ft, Extent = 9.0 --> 22.0 ft, Tributary Width = 1.0 ft

Point Load : D = 1.50, S = 1.0 @ 9.0 ft

Point Load : E = 2.40 k @ 9.0 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.503</b> : 1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.306</b> : 1
Section used for this span		<b>5.5x22.5</b>	Section used for this span		<b>5.5x22.5</b>
fb: Actual	=	1,545.79psi	fv: Actual	=	111.85 psi
F'b	=	3,073.99psi	F'v	=	365.70 psi
Load Combination		+D+0.750L+0.750S+H	Load Combination		+D+0.750L+0.750S+H
Location of maximum on span	=	11.241 ft	Location of maximum on span	=	20.153 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection	0.227 in	Ratio = 1161 >=360	Span: 1 : S Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360			n/a
Max Downward Total Deflection	0.592 in	Ratio = 446 >=300	Span: 1 : +D+0.750L+0.750S+0.5250E+H		
Max Upward Total Deflection	0 in	Ratio = 0 <300			n/a

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CL <sub>x</sub>	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v		
+D+H	Length = 22.0 ft	1	0.335	0.198	0.90	1.00	1.00	1.00	0.928	1.00	1.00	1.00	31.14	805.2	2,405.7	0.0	0.00	0.0	0.0	286.2
+D+L+H	Length = 22.0 ft	1	0.432	0.270	1.00	1.00	1.00	1.00	0.928	1.00	1.00	1.00	44.61	1,153.5	2,673.0	0.0	0.00	0.0	0.0	318.0
+D+Lr+H	Length = 22.0 ft	1	0.241	0.143	1.25	1.00	1.00	1.00	0.928	1.00	1.00	1.00	31.14	805.2	3,341.3	0.0	0.00	0.0	0.0	397.5
+D+S+H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0	0.0	

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B2-4] (SW#211)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sup>b</sup>	V	f <sub>v</sub>	F <sup>v</sup>
Length = 22.0 ft	1		0.471	0.276	1.15	1.00	1.00	1.00	0.928	1.00	1.00	1.00	56.02	1,448.6	3,074.0	8.33	101.0	365.7
+D+0.750Lr+0.750L+H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.319	0.198	1.25	1.00	1.00	1.00	0.928	1.00	1.00	1.00	41.21	1,065.6	3,341.3	6.49	78.7	397.5
+D+0.750L+0.750S+H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.503	0.306	1.15	1.00	1.00	1.00	0.928	1.00	1.00	1.00	59.78	1,545.8	3,074.0	9.23	111.9	365.7
+D+0.60W+H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.188	0.112	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	31.14	805.2	4,276.9	4.68	56.8	508.8
+D+0.750Lr+0.750L+0.450W+						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.249	0.155	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	41.21	1,065.6	4,276.9	6.49	78.7	508.8
+D+0.750L+0.750S+0.450W+l						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.361	0.220	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	59.78	1,545.8	4,276.9	9.23	111.9	508.8
+0.60D+0.60W+0.60H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.113	0.067	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	18.68	483.1	4,276.9	2.81	34.1	508.8
+D+0.70E+0.60H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.237	0.128	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	39.22	1,014.2	4,276.9	5.37	65.1	508.8
+D-0.70E+0.60H						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.145	0.095	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	23.98	620.2	4,276.9	3.99	48.4	508.8
+D+0.750L+0.750S+0.5250E+						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.396	0.232	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	65.44	1,692.1	4,276.9	9.74	118.1	508.8
+D+0.750L+0.750S-0.5250E+l						1.00	1.00	1.00	0.928	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 22.0 ft	1		0.329	0.208	1.60	1.00	1.00	1.00	0.928	1.00	1.00	1.00	54.38	1,406.1	4,276.9	8.71	105.6	508.8

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E+H	1	0.5917	11.161		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	8.817	11.663
Max Upward from Load Combinations	8.817	11.663
Max Upward from Load Cases	4.242	5.618
+D+H	4.242	5.618
+D+L+H	5.510	8.640
+D+Lr+H	4.242	5.618
+D+S+H	8.082	9.968
+D+0.750Lr+0.750L+H	5.193	7.885
+D+0.750L+0.750S+H	8.073	11.147
+D+0.60W+H	4.242	5.618
+D+0.750Lr+0.750L+0.450W+H	5.193	7.885
+D+0.750L+0.750S+0.450W+H	8.073	11.147
+0.60D+0.60W+0.60H	2.545	3.371
+D+0.70E+0.60H	5.235	6.305
+D+0.750L+0.750S+0.5250E+H	8.817	11.663
+0.60D+0.70E+H	3.538	4.058
D Only	4.242	5.618
L Only	1.268	3.023
S Only	3.840	4.350
E Only	1.418	0.982
H Only		

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B2-8] CANT'D FLUSH BM. @ KITCHEN/FLUSH ENTRY SHOWER

### CODE REFERENCES

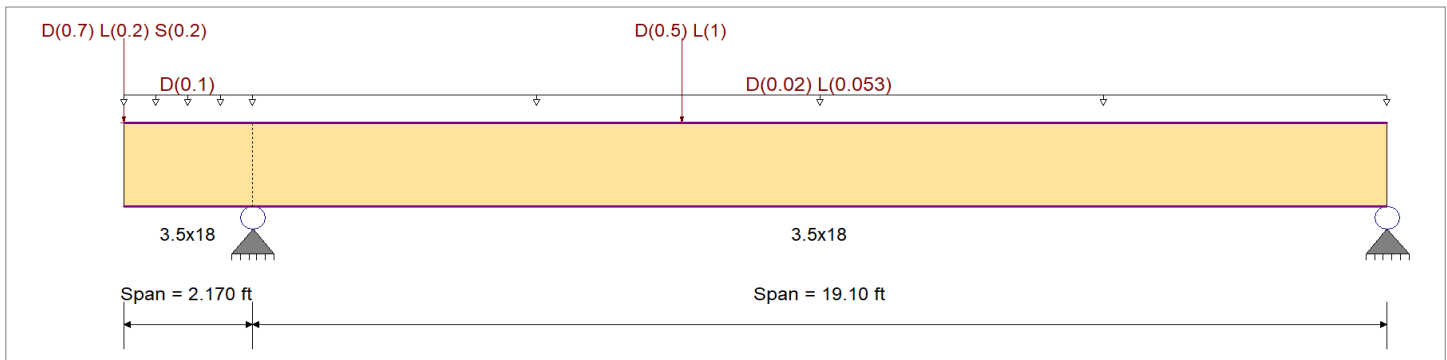
Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : IBC 2021

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,400.0 psi	E : Modulus of Elasticity
Load Combination : IBC 2021	Fb -	1,850.0 psi	Ebend- xx
	Fc - Prll	1,650.0 psi	Eminbend - xx
Wood Species : DF/DF	Fc - Perp	650.0 psi	Ebend- yy
Wood Grade : 24F-V4	Fv	265.0 psi	Eminbend - yy
	Ft	1,100.0 psi	Density
			31.210 pcf

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



### Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Point Load : D = 0.70, L = 0.20, S = 0.20 k @ 0.0 ft

Uniform Load : D = 0.10, Tributary Width = 1.0 ft

Load for Span Number 2

Uniform Load : D = 0.020, L = 0.0530, Tributary Width = 1.0 ft

Point Load : D = 0.50, L = 1.0 k @ 7.230 ft

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.225</b> : 1	Maximum Shear Stress Ratio	=	<b>0.147</b> : 1
Section used for this span		<b>3.5x18</b>	Section used for this span		<b>3.5x18</b>
fb: Actual	=	539.99psi	fv: Actual	=	38.93 psi
F'b	=	2,400.00psi	F'v	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	7.256ft	Location of maximum on span	=	2.170 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection		0.123 in	Ratio =	<b>1866</b> >=360	Span: 2 : L Only
Max Upward Transient Deflection		-0.043 in	Ratio =	<b>1196</b> >=360	Span: 2 : S Only
Max Downward Total Deflection		0.158 in	Ratio =	<b>1454</b> >=180	Span: 2 : +D+L
Max Upward Total Deflection		-0.050 in	Ratio =	<b>1048</b> >=180	Span: 1 : +D+L

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CL <sub>x</sub>	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v	
D Only																			
	Length = 2.170 ft	1	0.067	0.085	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.75	111.4	1,665.0	0.85	20.2	238.5	0.0
	Length = 19.10 ft	2	0.059	0.085	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.01	127.8	2,160.0	0.56	20.2	238.5	0.0
+D+L																			
	Length = 2.170 ft	1	0.075	0.147	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.19	138.9	1,850.0	1.63	38.9	265.0	0.0
	Length = 19.10 ft	2	0.225	0.147	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	8.50	540.0	2,400.0	1.63	38.9	265.0	0.0

## Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

### DESCRIPTION: [B2-8] CANT'D FLUSH BM. @ KITCHEN/FLUSH ENTRY SHOWER

#### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v
+D+S						1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.170 ft	1		0.065	0.082	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.19	138.9	2,127.5	1.05	25.0	304.8
Length = 19.10 ft	2		0.065	0.082	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.19	138.9	2,127.5	0.59	25.0	304.8
+D+0.750L						1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.170 ft	1		0.057	0.098	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.08	132.1	2,312.5	1.37	32.5	331.3
Length = 19.10 ft	2		0.146	0.098	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	6.88	436.9	3,000.0	1.37	32.5	331.3
+D+0.750L+0.750S						1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.170 ft	1		0.072	0.108	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.41	152.7	2,127.5	1.38	33.0	304.8
Length = 19.10 ft	2		0.154	0.108	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	6.68	424.1	2,760.0	1.38	33.0	304.8
+0.60D						1.00	1.00	1.00	1.000	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.170 ft	1		0.023	0.029	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.05	66.8	2,960.0	0.51	12.1	424.0
Length = 19.10 ft	2		0.020	0.029	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.21	76.7	3,840.0	0.34	12.1	424.0

#### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+L	-0.0496	0.000
+D+L	2	0.1575	9.390		0.0000	0.000

#### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions		2.861	1.150
Max Upward from Load Combinations		2.861	1.150
Max Upward from Load Cases		1.511	0.862
Max Downward from all Load Conditio			-0.023
Max Downward from Load Cases (Resis			-0.023
D Only		1.511	0.288
+D+L		2.861	1.150
+D+S		1.733	0.266
+D+0.750L		2.523	0.935
+D+0.750L+0.750S		2.690	0.918
+0.60D		0.906	0.173
L Only		1.350	0.862
S Only		0.223	-0.023

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-9] CANT'D FLUSH BM. @ KITCHEN @ B.W.A.

## CODE REFERENCES

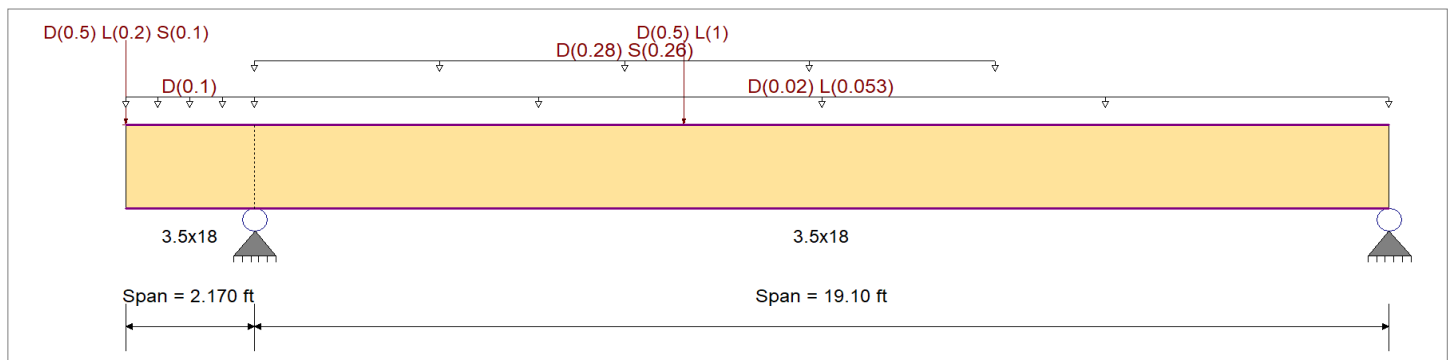
Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : IBC 2021

## Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,400.0 psi	E : Modulus of Elasticity
Load Combination : IBC 2021	Fb -	1,850.0 psi	Ebend- xx
	Fc - Prll	1,650.0 psi	Eminbend - xx
Wood Species : DF/DF	Fc - Perp	650.0 psi	Ebend- yy
Wood Grade : 24F-V4	Fv	265.0 psi	Eminbend - yy
	Ft	1,100.0 psi	Density
			31.210pcf

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



## Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Point Load : D = 0.50, L = 0.20, S = 0.10 k @ 0.0 ft

Uniform Load : D = 0.10, Tributary Width = 1.0 ft

Load for Span Number 2

Uniform Load : D = 0.020, L = 0.0530, Tributary Width = 1.0 ft

Point Load : D = 0.50, L = 1.0 k @ 7.230 ft

Uniform Load : D = 0.280, S = 0.260 k/ft, Extent = 0.0 -->> 12.460 ft, Tributary Width = 1.0 ft

## DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.542</b>	1	Maximum Shear Stress Ratio	=	<b>0.362</b>	: 1
Section used for this span		<b>3.5x18</b>		Section used for this span		<b>3.5x18</b>	
fb: Actual	=	1,496.31 psi		fv: Actual	=	110.27 psi	
F'b	=	2,760.00 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	=	7.789ft		Location of maximum on span	=	2.170 ft	
Span # where maximum occurs	=	Span # 2		Span # where maximum occurs	=	Span # 1	
<b>Maximum Deflection</b>							
Max Downward Transient Deflection		0.186 in	Ratio =	<b>1234</b>	>=	360	Span: 2 : S Only
Max Upward Transient Deflection		-0.070 in	Ratio =	<b>748</b>	>=	360	Span: 1 : S Only
Max Downward Total Deflection		0.475 in	Ratio =	<b>482</b>	>=	180	Span: 2 : +D+0.750L+0.750S
Max Upward Total Deflection		-0.172 in	Ratio =	<b>302</b>	>=	180	Span: 1 : +D+0.750L+0.750S

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CL <sub>x</sub>	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v	
D Only																			
	Length = 2.170 ft	1	0.050	0.247	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.32	83.8	1,665.0		0.00	0.0	0.0
	Length = 19.10 ft	2	0.355	0.247	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	12.07	766.3	2,160.0		2.47	58.9	238.5
+D+L																			
	Length = 2.170 ft	1	0.060	0.318	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.75	111.4	1,850.0		3.54	84.4	265.0

## Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-9] CANT'D FLUSH BM. @ KITCHEN @ B.W.A.

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values		
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv
Length = 19.10 ft	2	0.488	0.318	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	18.46	1,172.1	2,400.0	3.54	84.4	265.0
+D+S								1.00	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.170 ft	1	0.046	0.334	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.54	97.6	2,127.5	4.28	101.9	304.8
Length = 19.10 ft	2	0.485	0.334	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	21.10	1,339.8	2,760.0	4.28	101.9	304.8
+D+0.750L								1.00	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.170 ft	1	0.045	0.236	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.65	104.5	2,312.5	3.28	78.0	331.3
Length = 19.10 ft	2	0.357	0.236	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	16.84	1,069.5	3,000.0	3.28	78.0	331.3
+D+0.750L+0.750S								1.00	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.170 ft	1	0.054	0.362	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.81	114.8	2,127.5	4.63	110.3	304.8
Length = 19.10 ft	2	0.542	0.362	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	23.57	1,496.3	2,760.0	4.63	110.3	304.8
+0.60D								1.00	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 2.170 ft	1	0.017	0.083	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.79	50.3	2,960.0	1.48	35.3	424.0
Length = 19.10 ft	2	0.120	0.083	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	7.24	459.8	3,840.0	1.48	35.3	424.0

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+0.750L+0.750S	-0.1716	0.000
+D+0.750L+0.750S	2	0.4750	9.283		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions		6.372	2.880
Max Upward from Load Combinations		6.372	2.880
Max Upward from Load Cases		3.639	1.449
D Only		3.639	1.449
+D+L		4.989	2.311
+D+S		5.933	2.494
+D+0.750L		4.651	2.096
+D+0.750L+0.750S		6.372	2.880
+0.60D		2.183	0.869
L Only		1.350	0.862
S Only		2.294	1.045

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-9] (SW#215)

## CODE REFERENCES

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

Load Combination Set : IBC 2021

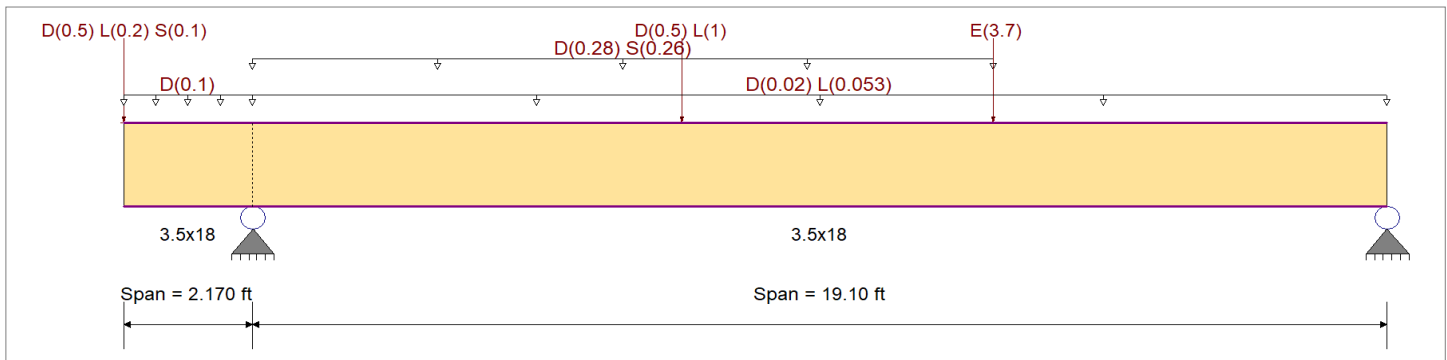
## Material Properties

Analysis Method : Allowable Stress Design  
Load Combination : IBC 2021

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

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

Fb +	2,400.0 psi	E : Modulus of Elasticity	
Fb -	1,850.0 psi	Ebend- xx	1,800.0 ksi
Fc - Prll	1,650.0 psi	Eminbend - xx	950.0 ksi
Fc - Perp	650.0 psi	Ebend- yy	1,600.0 ksi
Fv	265.0 psi	Eminbend - yy	850.0 ksi
Ft	1,100.0 psi	Density	31.210 pcf



## Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Point Load : D = 0.50, L = 0.20, S = 0.10 k @ 0.0 ft

Uniform Load : D = 0.10, Tributary Width = 1.0 ft

Load for Span Number 2

Uniform Load : D = 0.020, L = 0.0530, Tributary Width = 1.0 ft

Point Load : D = 0.50, L = 1.0 k @ 7.230 ft

Uniform Load : D = 0.280, S = 0.260 k/ft, Extent = 0.0 -->> 12.460 ft, Tributary Width = 1.0 ft

Point Load : E = 3.70 k @ 12.460 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.542</b>	1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.362</b>	: 1
Section used for this span		<b>3.5x18</b>		Section used for this span		<b>3.5x18</b>	
fb: Actual	=	1,496.31 psi		fv: Actual	=	110.27 psi	
F'b	=	2,760.00 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	=	7.789ft		Location of maximum on span	=	2.170 ft	
Span # where maximum occurs	=	Span # 2		Span # where maximum occurs	=	Span # 1	
<b>Maximum Deflection</b>							
Max Downward Transient Deflection		0.270 in	Ratio =	850	>=	360	Span: 2 : E Only
Max Upward Transient Deflection		-0.084 in	Ratio =	618	>=	360	Span: 1 : E Only
Max Downward Total Deflection		0.615 in	Ratio =	372	>=	180	Span: 2 : +D+0.750L+0.750S+0.5250E
Max Upward Total Deflection		-0.216 in	Ratio =	240	>=	180	Span: 1 : +D+0.750L+0.750S+0.5250E

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v		
D Only																				
	Length = 2.170 ft	1	0.050	0.247	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.32	83.8	1,665.0		0.00	0.0	0.0	238.5
	Length = 19.10 ft	2	0.355	0.247	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	12.07	766.3	2,160.0		2.47	58.9	58.9	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	0.0

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B2-9] (SW#215)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sub>b</sub>	V	f <sub>v</sub>	F <sub>v</sub>
Length = 2.170 ft	1		0.060	0.318	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.75	111.4	1,850.0	3.54	84.4	265.0
Length = 19.10 ft	2		0.488	0.318	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	18.46	1,172.1	2,400.0	3.54	84.4	265.0
+D+S															0.0	0.00	0.0	0.0
Length = 2.170 ft	1		0.046	0.334	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.54	97.6	2,127.5	4.28	101.9	304.8
Length = 19.10 ft	2		0.485	0.334	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	21.10	1,339.8	2,760.0	4.28	101.9	304.8
+D+0.750L															0.0	0.00	0.0	0.0
Length = 2.170 ft	1		0.045	0.236	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.65	104.5	2,312.5	3.28	78.0	331.3
Length = 19.10 ft	2		0.357	0.236	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	16.84	1,069.5	3,000.0	3.28	78.0	331.3
+D+0.750L+0.750S															0.0	0.00	0.0	0.0
Length = 2.170 ft	1		0.054	0.362	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.81	114.8	2,127.5	4.63	110.3	304.8
Length = 19.10 ft	2		0.542	0.362	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	23.57	1,496.3	2,760.0	4.63	110.3	304.8
+D+0.70E															0.0	0.00	0.0	0.0
Length = 2.170 ft	1		0.028	0.189	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.32	83.8	2,960.0	3.37	80.3	424.0
Length = 19.10 ft	2		0.342	0.189	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	20.69	1,313.5	3,840.0	3.37	80.3	424.0
+D+0.750L+0.750S+0.5250E															0.0	0.00	0.0	0.0
Length = 2.170 ft	1		0.039	0.298	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.81	114.8	2,960.0	5.31	126.3	424.0
Length = 19.10 ft	2		0.484	0.298	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	29.27	1,858.6	3,840.0	5.31	126.3	424.0
+0.60D															0.0	0.00	0.0	0.0
Length = 2.170 ft	1		0.017	0.083	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.79	50.3	2,960.0	1.48	35.3	424.0
Length = 19.10 ft	2		0.120	0.083	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	7.24	459.8	3,840.0	1.48	35.3	424.0
+0.60D+0.70E															0.0	0.00	0.0	0.0
Length = 2.170 ft	1		0.017	0.134	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.79	50.3	2,960.0	2.38	56.8	424.0
Length = 19.10 ft	2		0.276	0.143	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	16.72	1,061.5	3,840.0	2.54	60.5	424.0

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+0.750L+0.750S+0.5250E	-0.2158	0.000
+D+0.750L+0.750S+0.5250E	2	0.6146	9.497		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions		7.047	4.147
Max Upward from Load Combinations		7.047	4.147
Max Upward from Load Cases		3.639	2.414
D Only		3.639	1.449
+D+L		4.989	2.311
+D+S		5.933	2.494
+D+0.750L		4.651	2.096
+D+0.750L+0.750S		6.372	2.880
+D+0.70E		4.539	3.139
+D+0.750L+0.750S+0.5250E		7.047	4.147
+0.60D		2.183	0.869
+0.60D+0.70E		3.084	2.559
L Only		1.350	0.862
S Only		2.294	1.045
E Only		1.286	2.414

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-14] (SW#205)

## CODE REFERENCES

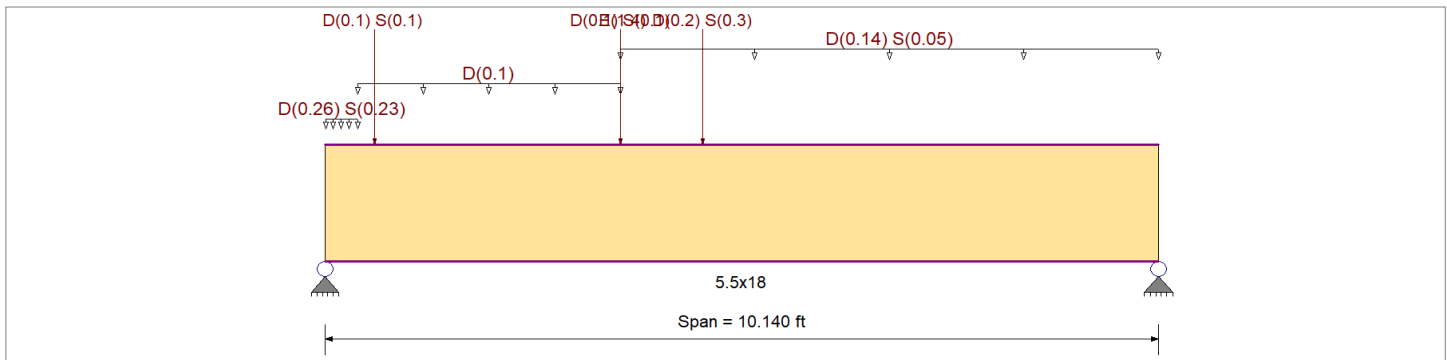
Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

## Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,880.0 psi	E : Modulus of Elasticity
Load Combination : ASCE 7-16	Fb -	2,220.0 psi	Ebend- xx
	Fc - Prll	1,980.0 psi	Eminbend - xx
Wood Species : DF/DF	Fc - Perp	780.0 psi	Ebend- yy
Wood Grade : 24F - V4	Fv	318.0 psi	Eminbend - yy
	Ft	1,320.0 psi	Density
			31.210pcf

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



## Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

- Uniform Load : D = 0.260, S = 0.230 k/ft, Extent = 0.0 --> 0.40 ft, Tributary Width = 1.0 ft
- Uniform Load : D = 0.10 k/ft, Extent = 0.40 --> 3.60 ft, Tributary Width = 1.0 ft
- Uniform Load : D = 0.140, S = 0.050 k/ft, Extent = 3.60 --> 10.140 ft, Tributary Width = 1.0 ft
- Point Load : D = 0.20, S = 0.30 k @ 4.60 ft
- Point Load : D = 0.10, S = 0.10 k @ 0.60 ft
- Point Load : D = 0.10, S = 0.10 k @ 3.60 ft
- Point Load : E = 1.40 k @ 3.60 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.050</b> : 1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.042</b> : 1
Section used for this span		<b>5.5x18</b>	Section used for this span		<b>5.5x18</b>
fb: Actual	=	165.84psi	fv: Actual	=	15.37 psi
F'b	=	3,312.00psi	F'v	=	365.70 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	4.589ft	Location of maximum on span	=	8.660 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection		0.010 in	Ratio =	12397	>=360
Max Upward Transient Deflection		0 in	Ratio =	0	<360
Max Downward Total Deflection		0.019 in	Ratio =	6482	>=300
Max Upward Total Deflection		0 in	Ratio =	0	<300

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v		
+D+H																				
	Length = 10.140 ft	1	0.041	0.036	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.65	107.2	2,592.0	0.69	10.4	286.2	0.0	0.0
+D+L+H																				
	Length = 10.140 ft	1	0.037	0.033	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.65	107.2	2,880.0	0.69	10.4	318.0	0.0	0.0

## Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-14] (SW#205)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sub>b</sub>	V	fv	F <sub>v</sub>
+D+Lr+H	Length = 10.140 ft	1	0.030	0.026	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.65	107.2	3,600.0	0.69	10.4	397.5
+D+S+H	Length = 10.140 ft	1	0.050	0.042	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	4.10	165.8	3,312.0	1.01	15.4	365.7
+D+0.750Lr+0.750L+H	Length = 10.140 ft	1	0.030	0.026	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.65	107.2	3,600.0	0.69	10.4	397.5
+D+0.750L+0.750S+H	Length = 10.140 ft	1	0.046	0.039	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.74	151.2	3,312.0	0.93	14.1	365.7
+D+0.60W+H	Length = 10.140 ft	1	0.023	0.020	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.65	107.2	4,608.0	0.69	10.4	508.8
+D+0.750Lr+0.750L+0.450W+	Length = 10.140 ft	1	0.023	0.020	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.65	107.2	4,608.0	0.69	10.4	508.8
+D+0.750L+0.750S+0.450W+i	Length = 10.140 ft	1	0.033	0.028	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	3.74	151.2	4,608.0	0.93	14.1	508.8
+0.60D+0.60W+0.60H	Length = 10.140 ft	1	0.014	0.012	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.59	64.3	4,608.0	0.41	6.2	508.8
+D+0.70E+0.60H	Length = 10.140 ft	1	0.041	0.039	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	4.68	189.1	4,608.0	1.32	20.0	508.8
+D-0.70E+0.60H	Length = 10.140 ft	1	0.009	0.020	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.04	41.9	4,608.0	0.67	10.2	508.8
+D+0.750L+0.750S+0.5250E+	Length = 10.140 ft	1	0.046	0.042	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	5.19	209.7	4,608.0	1.41	21.3	508.8
+D+0.750L+0.750S-0.5250E+i	Length = 10.140 ft	1	0.021	0.022	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.00	2.35	94.8	4,608.0	0.75	11.4	508.8

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E+H	1	0.0188	4.959		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.893	1.488
Max Upward from Load Combinations	1.893	1.488
Max Upward from Load Cases	1.031	0.926
+D+H	1.031	0.926
+D+L+H	1.031	0.926
+D+Lr+H	1.031	0.926
+D+S+H	1.549	1.327
+D+0.750Lr+0.750L+H	1.031	0.926
+D+0.750L+0.750S+H	1.419	1.227
+D+0.60W+H	1.031	0.926
+D+0.750Lr+0.750L+0.450W+H	1.031	0.926
+D+0.750L+0.750S+0.450W+H	1.419	1.227
+0.60D+0.60W+0.60H	0.618	0.556
+D+0.70E+0.60H	1.663	1.274
+D+0.750L+0.750S+0.5250E+H	1.893	1.488
+0.60D+0.70E+H	1.251	0.904
D Only	1.031	0.926
S Only	0.518	0.401
E Only	0.903	0.497
H Only		

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-16] (SW#213)

## CODE REFERENCES

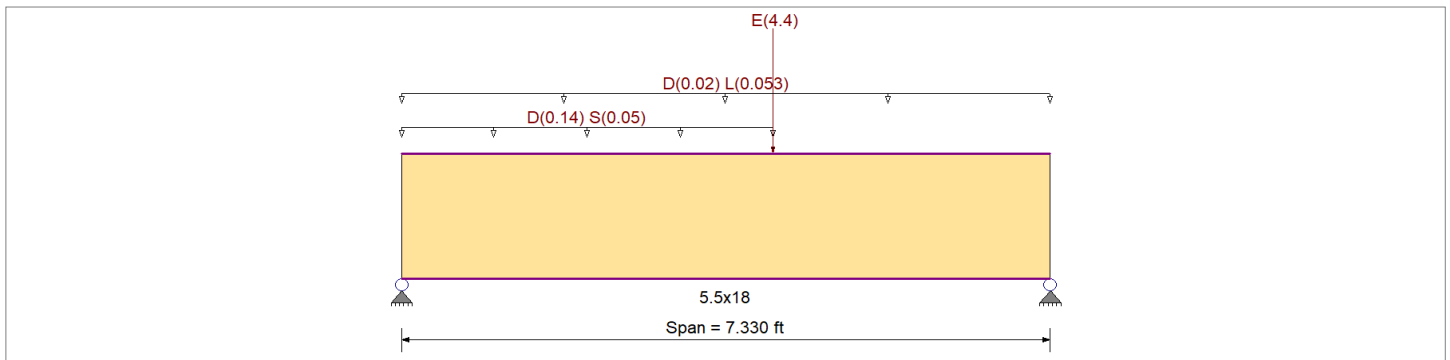
Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

## Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,880.0 psi	<i>E : Modulus of Elasticity</i>
Load Combination : ASCE 7-16	Fb -	2,220.0 psi	Ebend- xx
	Fc - Prll	1,980.0 psi	Eminbend - xx
Wood Species : DF/DF	Fc - Perp	780.0 psi	Ebend- yy
Wood Grade : 24F - V4	Fv	318.0 psi	Eminbend - yy
	Ft	1,320.0 psi	Density
			31.210 pcf

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



## Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

Uniform Load : D = 0.140, S = 0.050 k/ft, Extent = 0.0 -->> 4.20 ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.020, L = 0.0530, Tributary Width = 1.0 ft

Point Load : E = 4.40 k @ 4.20 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.055 : 1</b>	<b>Maximum Shear Stress Ratio</b>	=	<b>0.060 : 1</b>
Section used for this span		<b>5.5x18</b>	Section used for this span		<b>5.5x18</b>
fb: Actual	=	255.50psi	fv: Actual	=	30.65 psi
F'b	=	4,608.00psi	F'v	=	508.80 psi
Load Combination		+D+0.70E+0.60H	Load Combination		+D+0.70E+0.60H
Location of maximum on span	=	4.200ft	Location of maximum on span	=	5.832 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection		0.013 in	Ratio =	6941	>=360
Max Upward Transient Deflection		0 in	Ratio =	0	<360
Max Downward Total Deflection		0.011 in	Ratio =	8302	>=300
Max Upward Total Deflection		0 in	Ratio =	0	<300

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v		
+D+H	Length = 7.330 ft	1	0.014	0.016	0.90	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.90	36.4	2,592.0	0.00	0.00	0.0	0.0	286.2
+D+L+H	Length = 7.330 ft	1	0.018	0.020	1.00	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.25	50.5	2,880.0	0.00	0.00	0.0	0.0	318.0
+D+Lr+H	Length = 7.330 ft	1	0.010	0.011	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	0.90	36.4	3,600.0	0.00	0.00	0.0	0.0	397.5
+D+S+H	Length = 7.330 ft	1	0.014	0.016	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.12	45.4	3,312.0	0.00	0.00	0.0	0.0	365.7

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B2-16] (SW#213)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sub>b</sub>	V	f <sub>v</sub>	F <sub>v</sub>
+D+0.750Lr+0.750L+H	Length = 7.330 ft	1	0.013	0.015	1.25	1.00	1.00	1.00	1.000	1.00	1.00	1.00	1.16	47.0	3,600.0	0.39	5.8	397.5
+D+0.750L+0.750S+H	Length = 7.330 ft	1	0.016	0.018	1.15	1.00	1.00	1.00	1.000	1.00	1.00	1.33	53.7	3,312.0	0.44	6.7	365.7	
+D+0.60W+H	Length = 7.330 ft	1	0.008	0.009	1.60	1.00	1.00	1.00	1.000	1.00	1.00	0.90	36.4	4,608.0	0.30	4.5	508.8	
+D+0.750Lr+0.750L+0.450W+	Length = 7.330 ft	1	0.010	0.011	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.16	47.0	4,608.0	0.39	5.8	508.8	
+D+0.750L+0.750S+0.450W+	Length = 7.330 ft	1	0.012	0.013	1.60	1.00	1.00	1.00	1.000	1.00	1.00	1.33	53.7	4,608.0	0.44	6.7	508.8	
+0.60D+0.60W+0.60H	Length = 7.330 ft	1	0.005	0.005	1.60	1.00	1.00	1.00	1.000	1.00	1.00	0.54	21.8	4,608.0	0.18	2.7	508.8	
+D+0.70E+0.60H	Length = 7.330 ft	1	0.055	0.060	1.60	1.00	1.00	1.00	1.000	1.00	1.00	6.32	255.5	4,608.0	2.02	30.7	508.8	
+D-0.70E+0.60H	Length = 7.330 ft	1	0.054	0.047	1.60	1.00	1.00	1.00	1.000	1.00	1.00	4.72	190.9	3,552.0	1.57	23.9	508.8	
+D+0.750L+0.750S+0.5250E+	Length = 7.330 ft	1	0.047	0.051	1.60	1.00	1.00	1.00	1.000	1.00	1.00	5.35	216.0	4,608.0	1.71	26.0	508.8	
+D+0.750L+0.750S-0.5250E+	Length = 7.330 ft	1	0.033	0.037	1.60	1.00	1.00	1.00	1.000	1.00	1.00	2.94	118.8	3,552.0	1.24	18.7	508.8	

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
E Only	1	0.0127	3.852		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.887	2.521
Max Upward from Load Combinations	1.887	2.085
Max Upward from Load Cases	1.879	2.521
+D+H	0.571	0.320
+D+L+H	0.766	0.515
+D+Lr+H	0.571	0.320
+D+S+H	0.721	0.381
+D+0.750Lr+0.750L+H	0.717	0.466
+D+0.750L+0.750S+H	0.830	0.511
+D+0.60W+H	0.571	0.320
+D+0.750Lr+0.750L+0.450W+H	0.717	0.466
+D+0.750L+0.750S+0.450W+H	0.830	0.511
+0.60D+0.60W+0.60H	0.343	0.192
+D+0.70E+0.60H	1.887	2.085
+D+0.750L+0.750S+0.5250E+H	1.816	1.835
+0.60D+0.70E+H	1.658	1.957
D Only	0.571	0.320
L Only	0.194	0.194
S Only	0.150	0.060
E Only	1.879	2.521
H Only		

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-17] (SW#205)

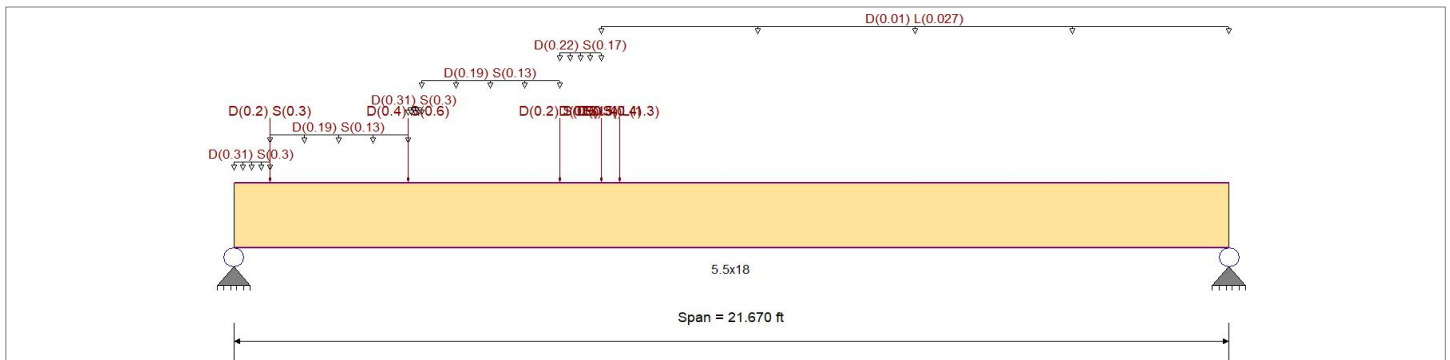
## CODE REFERENCES

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

Load Combination Set : ASCE 7-16

## Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,880.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination :	ASCE 7-16	Fb -	2,220.0 psi	Ebend- xx	1,800.0 ksi
		Fc - Prll	1,980.0 psi	Eminbend - xx	950.0 ksi
Wood Species :	DF/DF	Fc - Perp	780.0 psi	Ebend- yy	1,600.0 ksi
Wood Grade :	24F - V4	Fv	318.0 psi	Eminbend - yy	850.0 ksi
		Ft	1,320.0 psi	Density	31.210 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



## Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

- Uniform Load : D = 0.310, S = 0.30 k/ft, Extent = 0.0 --> 0.80 ft, Tributary Width = 1.0 ft
- Uniform Load : D = 0.190, S = 0.130 k/ft, Extent = 0.80 --> 3.80 ft, Tributary Width = 1.0 ft
- Uniform Load : D = 0.310, S = 0.30 k/ft, Extent = 3.80 --> 4.10 ft, Tributary Width = 1.0 ft
- Uniform Load : D = 0.190, S = 0.130 k/ft, Extent = 4.10 --> 7.10 ft, Tributary Width = 1.0 ft
- Uniform Load : D = 0.220, S = 0.170 k/ft, Extent = 7.10 --> 8.0 ft, Tributary Width = 1.0 ft
- Uniform Load : D = 0.010, L = 0.0270 k/ft, Extent = 8.0 --> 21.670 ft, Tributary Width = 1.0 ft
- Point Load : D = 0.20, S = 0.30 k @ 0.80 ft
- Point Load : D = 0.40, S = 0.60 k @ 3.80 ft
- Point Load : D = 0.20, S = 0.30 k @ 7.10 ft
- Point Load : D = 0.90, S = 0.40 k @ 8.0 ft
- Point Load : D = 0.50, L = 1.30 k @ 8.0 ft
- Point Load : E = 1.40 k @ 8.0 ft

## DESIGN SUMMARY

				<b>Design OK</b>	
<b>Maximum Bending Stress Ratio</b>	=	<b>0.333</b> : 1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.187</b> : 1
Section used for this span		<b>5.5x18</b>	Section used for this span		<b>5.5x18</b>
fb: Actual	=	1,048.17 psi	fv: Actual	=	68.52 psi
F'b	=	3,148.11 psi	F'v	=	365.70 psi
Load Combination		+D+0.750L+0.750S+H	Load Combination		+D+0.750L+0.750S+H
Location of maximum on span	=	8.067ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection	0.120 in	Ratio = 2173 >=360	Span: 1 : S Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360	n/a		
Max Downward Total Deflection	0.447 in	Ratio = 581 >=300	Span: 1 : +D+0.750L+0.750S+0.5250E+H		
Max Upward Total Deflection	0 in	Ratio = 0 <300	n/a		

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B2-17] (SW#205)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values				
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sup>b</sup>	V	f <sub>v</sub>	F <sup>v</sup>	
+D+H	Length = 21.670 ft	1	0.238	0.137	0.90	1.00	1.00	1.00	0.951	1.00	1.00	1.00	14.54	587.3	2,463.7	0.00	0.00	0.0	0.0
+D+L+H	Length = 21.670 ft	1	0.325	0.167	1.00	1.00	1.00	1.00	0.951	1.00	1.00	1.00	22.05	890.9	2,737.5	0.00	0.00	0.0	0.0
+D+Lr+H	Length = 21.670 ft	1	0.172	0.099	1.25	1.00	1.00	1.00	0.951	1.00	1.00	1.00	14.54	587.3	3,421.9	0.00	0.00	0.0	0.0
+D+S+H	Length = 21.670 ft	1	0.288	0.176	1.15	1.00	1.00	1.00	0.951	1.00	1.00	1.00	22.45	907.0	3,148.1	0.00	0.00	0.0	0.0
+D+0.750Lr+0.750L+H	Length = 21.670 ft	1	0.238	0.125	1.25	1.00	1.00	1.00	0.951	1.00	1.00	1.00	20.14	813.6	3,421.9	0.00	0.00	0.0	0.0
+D+0.750L+0.750S+H	Length = 21.670 ft	1	0.333	0.187	1.15	1.00	1.00	1.00	0.951	1.00	1.00	1.00	25.94	1,048.2	3,148.1	0.00	0.00	0.0	0.0
+D+0.60W+H	Length = 21.670 ft	1	0.134	0.077	1.60	1.00	1.00	1.00	0.951	1.00	1.00	1.00	14.54	587.3	4,380.0	0.00	0.00	0.0	0.0
+D+0.750Lr+0.750L+0.450W+	Length = 21.670 ft	1	0.186	0.098	1.60	1.00	1.00	1.00	0.951	1.00	1.00	1.00	20.14	813.6	4,380.0	0.00	0.00	0.0	0.0
+D+0.750L+0.750S+0.450W+	Length = 21.670 ft	1	0.239	0.135	1.60	1.00	1.00	1.00	0.951	1.00	1.00	1.00	25.94	1,048.2	4,380.0	0.00	0.00	0.0	0.0
+0.60D+0.60W+0.60H	Length = 21.670 ft	1	0.080	0.046	1.60	1.00	1.00	1.00	0.951	1.00	1.00	1.00	8.72	352.4	4,380.0	0.00	0.00	0.0	0.0
+D+0.70E+0.60H	Length = 21.670 ft	1	0.180	0.096	1.60	1.00	1.00	1.00	0.951	1.00	1.00	1.00	19.47	786.9	4,380.0	0.00	0.00	0.0	0.0
+D-0.70E+0.60H	Length = 21.670 ft	1	0.089	0.059	1.60	1.00	1.00	1.00	0.951	1.00	1.00	1.00	9.61	388.3	4,380.0	0.00	0.00	0.0	0.0
+D+0.750L+0.750S+0.5250E+	Length = 21.670 ft	1	0.273	0.148	1.60	1.00	1.00	1.00	0.951	1.00	1.00	1.00	29.64	1,197.6	4,380.0	0.00	0.00	0.0	0.0
+D+0.750L+0.750S-0.5250E+	Length = 21.670 ft	1	0.206	0.121	1.60	1.00	1.00	1.00	0.951	1.00	1.00	1.00	22.30	900.9	4,380.0	0.00	0.00	0.0	0.0

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E+H	1	0.4470	10.044		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	6.049	2.566
Max Upward from Load Combinations	6.049	2.566
Max Upward from Load Cases	3.187	1.294
+D+H	3.187	1.294
+D+L+H	4.100	2.050
+D+Lr+H	3.187	1.294
+D+S+H	5.472	1.872
+D+0.750Lr+0.750L+H	3.872	1.861
+D+0.750L+0.750S+H	5.585	2.295
+D+0.60W+H	3.187	1.294
+D+0.750Lr+0.750L+0.450W+H	3.872	1.861
+D+0.750L+0.750S+0.450W+H	5.585	2.295
+0.60D+0.60W+0.60H	1.912	0.776
+D+0.70E+0.60H	3.805	1.655
+D+0.750L+0.750S+0.5250E+H	6.049	2.566
+0.60D+0.70E+H	2.531	1.138
D Only	3.187	1.294



**Steel Beam**

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN &amp; KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-19] (SW#203)**Maximum Forces & Stresses for Load Combinations**

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values					Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+S	Dsgn. L = 22.56 ft	1	0.346	0.086	46.62		46.62	225.00	134.73	1.00	1.00	7.50	131.18	87.45
+D+0.750L	Dsgn. L = 22.56 ft	1	0.297	0.074	39.98		39.98	225.00	134.73	1.00	1.00	6.44	131.18	87.45
+D+0.750L+0.750S	Dsgn. L = 22.56 ft	1	0.308	0.076	41.49		41.49	225.00	134.73	1.00	1.00	6.68	131.18	87.45
+D+0.70E	Dsgn. L = 22.56 ft	1	0.385	0.095	51.89		51.89	225.00	134.73	1.00	1.00	8.35	131.18	87.45
+D+0.750L+0.750S+0.5250E	Dsgn. L = 22.56 ft	1	0.258	0.057	34.77		34.77	225.00	134.73	1.00	1.00	4.98	131.18	87.45
+0.60D	Dsgn. L = 22.56 ft	1	0.433	0.102	58.38		58.38	225.00	134.73	1.00	1.00	8.92	131.18	87.45
+0.60D+0.70E	Dsgn. L = 22.56 ft	1	0.116	0.029	15.67		15.67	225.00	134.73	1.00	1.00	2.53	131.18	87.45
	Dsgn. L = 22.56 ft	1	0.181	0.038	24.33		24.33	225.00	134.73	1.00	1.00	3.30	131.18	87.45

**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.4539	11.473		0.0000	0.000

**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	7.520	8.924
Max Upward from Load Combinations	7.520	8.924
Max Upward from Load Cases	3.736	4.213
D Only	3.219	4.213
+D+L	6.955	7.499
+D+S	4.450	6.437
+D+0.750L	6.021	6.677
+D+0.750L+0.750S	6.944	8.345
+D+0.70E	3.988	4.984
+D+0.750L+0.750S+0.5250E	7.520	8.924
+0.60D	1.932	2.528
+0.60D+0.70E	2.700	3.299
L Only	3.736	3.286
S Only	1.230	2.224
E Only	1.098	1.102



## Steel Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-19] (SW#214)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values					Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+S	Dsgn. L = 22.56 ft	1	0.346	0.086	46.62		46.62	225.00	134.73	1.00	1.00	7.50	131.18	87.45
+D+0.750L	Dsgn. L = 22.56 ft	1	0.297	0.074	39.98		39.98	225.00	134.73	1.00	1.00	6.44	131.18	87.45
+D+0.750L+0.750S	Dsgn. L = 22.56 ft	1	0.308	0.076	41.49		41.49	225.00	134.73	1.00	1.00	6.68	131.18	87.45
+D+0.70E	Dsgn. L = 22.56 ft	1	0.385	0.095	51.89		51.89	225.00	134.73	1.00	1.00	8.35	131.18	87.45
+D+0.750L+0.750S+0.5250E	Dsgn. L = 22.56 ft	1	0.252	0.056	33.99		33.99	225.00	134.73	1.00	1.00	4.91	131.18	87.45
+0.60D	Dsgn. L = 22.56 ft	1	0.429	0.101	57.79		57.79	225.00	134.73	1.00	1.00	8.87	131.18	87.45
+0.60D+0.70E	Dsgn. L = 22.56 ft	1	0.116	0.029	15.67		15.67	225.00	134.73	1.00	1.00	2.53	131.18	87.45
	Dsgn. L = 22.56 ft	1	0.175	0.037	23.54		23.54	225.00	134.73	1.00	1.00	3.23	131.18	87.45

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E	1	0.4499	11.473		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	7.468	8.871
Max Upward from Load Combinations	7.468	8.871
Max Upward from Load Cases	3.736	4.213
D Only	3.219	4.213
+D+L	6.955	7.499
+D+S	4.450	6.437
+D+0.750L	6.021	6.677
+D+0.750L+0.750S	6.944	8.345
+D+0.70E	3.918	4.914
+D+0.750L+0.750S+0.5250E	7.468	8.871
+0.60D	1.932	2.528
+0.60D+0.70E	2.630	3.229
L Only	3.736	3.286
S Only	1.230	2.224
E Only	0.998	1.002

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-22] (SW#202)

## CODE REFERENCES

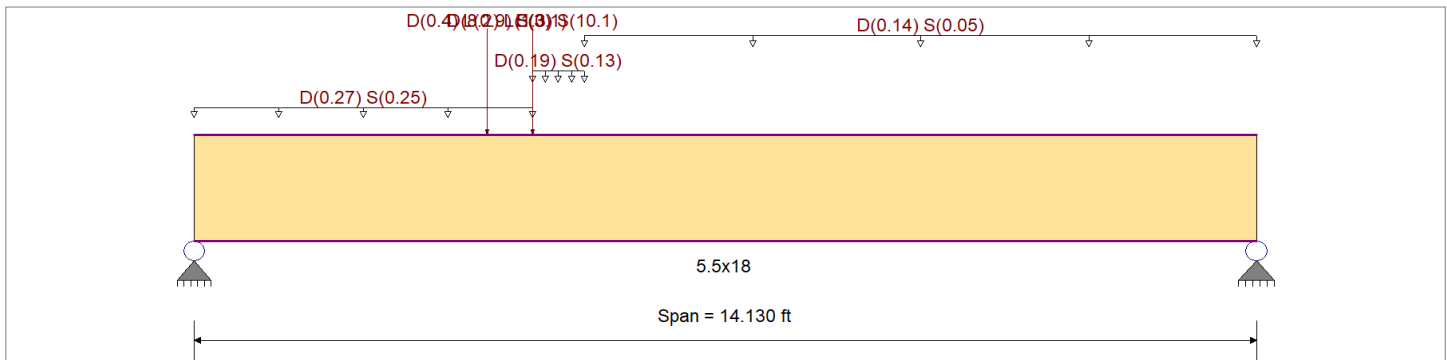
Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

## Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,880.0 psi	<i>E : Modulus of Elasticity</i>
Load Combination : ASCE 7-16	Fb -	2,220.0 psi	Ebend- xx
	Fc - Prll	1,980.0 psi	Eminbend - xx
Wood Species : DF/DF	Fc - Perp	780.0 psi	Ebend- yy
Wood Grade : 24F - V4	Fv	318.0 psi	Eminbend - yy
	Ft	1,320.0 psi	Density
			31.210pcf

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



## Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

- Uniform Load : D = 0.270, S = 0.250 k/ft, Extent = 0.0 --> 4.50 ft, Tributary Width = 1.0 ft
- Uniform Load : D = 0.190, S = 0.130 k/ft, Extent = 4.50 --> 5.20 ft, Tributary Width = 1.0 ft
- Uniform Load : D = 0.140, S = 0.050 k/ft, Extent = 5.20 --> 14.130 ft, Tributary Width = 1.0 ft
- Point Load : D = 0.40, L = 0.90, S = 0.10 k @ 3.90 ft
- Point Load : D = 8.20, L = 1.30, S = 10.10 k @ 4.50 ft
- Point Load : E = 3.0 k @ 4.50 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.792</b>	1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.614</b>	1
Section used for this span		<b>5.5x18</b>		Section used for this span		<b>5.5x18</b>	
fb: Actual	=	2,602.41 psi		fv: Actual	=	224.64 psi	
F'b	=	3,285.66 psi		F'v	=	365.70 psi	
Load Combination		+D+S+H		Load Combination		+D+S+H	
Location of maximum on span	=	4.487ft		Location of maximum on span	=	0.000 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
<b>Maximum Deflection</b>							
Max Downward Transient Deflection		0.200 in	Ratio =	<b>848</b>	>=360	Span: 1 : S Only	
Max Upward Transient Deflection		0 in	Ratio =	<b>0</b>	<360	n/a	
Max Downward Total Deflection		0.394 in	Ratio =	<b>430</b>	>=300	Span: 1 : +D+0.750L+0.750S+0.5250E+H	
Max Upward Total Deflection		0 in	Ratio =	<b>0</b>	<300	n/a	

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CL <sub>x</sub>	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v	
+D+H	Length = 14.130 ft	1	0.481	0.376	0.90	1.00	1.00	1.00	0.992	1.00	1.00	1.00	30.63	1,237.7	2,571.4	0.0	0.00	0.0	0.0
+D+L+H	Length = 14.130 ft	1	0.523	0.411	1.00	1.00	1.00	1.00	0.992	1.00	1.00	1.00	37.00	1,495.1	2,857.1	0.0	0.00	0.0	0.0
+D+Lr+H					1.00	1.00	1.00	1.00	0.992	1.00	1.00	1.00				0.0	0.00	0.0	0.0

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B2-22] (SW#202)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>v</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v
Length = 14.130 ft	1		0.347	0.271	1.25	1.00	1.00	1.00	0.992	1.00	1.00	1.00	30.63	1,237.7	3,571.4	7.10	107.5	397.5
+D+S+H						1.00	1.00	1.00	0.992	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.130 ft	1		0.792	0.614	1.15	1.00	1.00	1.00	0.992	1.00	1.00	1.00	64.41	2,602.4	3,285.7	14.83	224.6	365.7
+D+0.750Lr+0.750L+H						1.00	1.00	1.00	0.992	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.130 ft	1		0.401	0.315	1.25	1.00	1.00	1.00	0.992	1.00	1.00	1.00	35.41	1,430.7	3,571.4	8.25	125.0	397.5
+D+0.750L+0.750S+H						1.00	1.00	1.00	0.992	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.130 ft	1		0.747	0.582	1.15	1.00	1.00	1.00	0.992	1.00	1.00	1.00	60.74	2,454.3	3,285.7	14.05	212.8	365.7
+D+0.60W+H						1.00	1.00	1.00	0.992	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.130 ft	1		0.271	0.211	1.60	1.00	1.00	1.00	0.992	1.00	1.00	1.00	30.63	1,237.7	4,571.3	7.10	107.5	508.8
+D+0.750Lr+0.750L+0.450W+						1.00	1.00	1.00	0.992	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.130 ft	1		0.313	0.246	1.60	1.00	1.00	1.00	0.992	1.00	1.00	1.00	35.41	1,430.7	4,571.3	8.25	125.0	508.8
+D+0.750L+0.750S+0.450W+						1.00	1.00	1.00	0.992	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.130 ft	1		0.537	0.418	1.60	1.00	1.00	1.00	0.992	1.00	1.00	1.00	60.74	2,454.3	4,571.3	14.05	212.8	508.8
+0.60D+0.60W+0.60H						1.00	1.00	1.00	0.992	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.130 ft	1		0.162	0.127	1.60	1.00	1.00	1.00	0.992	1.00	1.00	1.00	18.38	742.6	4,571.3	4.26	64.5	508.8
+D+0.70E+0.60H						1.00	1.00	1.00	0.992	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.130 ft	1		0.327	0.254	1.60	1.00	1.00	1.00	0.992	1.00	1.00	1.00	37.05	1,497.1	4,571.3	8.53	129.2	508.8
+D-0.70E+0.60H						1.00	1.00	1.00	0.992	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.130 ft	1		0.214	0.169	1.60	1.00	1.00	1.00	0.992	1.00	1.00	1.00	24.21	978.2	4,571.3	5.67	85.9	508.8
+D+0.750L+0.750S+0.5250E+						1.00	1.00	1.00	0.992	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.130 ft	1		0.579	0.450	1.60	1.00	1.00	1.00	0.992	1.00	1.00	1.00	65.56	2,648.8	4,571.3	15.12	229.1	508.8
+D+0.750L+0.750S-0.5250E+						1.00	1.00	1.00	0.992	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 14.130 ft	1		0.494	0.386	1.60	1.00	1.00	1.00	0.992	1.00	1.00	1.00	55.93	2,259.7	4,571.3	12.97	196.6	508.8

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E+H	1	0.3941	6.498		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	15.837	7.786
Max Upward from Load Combinations	15.837	7.786
Max Upward from Load Cases	8.103	3.968
+D+H	7.534	3.968
+D+L+H	9.071	4.630
+D+Lr+H	7.534	3.968
+D+S+H	15.636	7.728
+D+0.750Lr+0.750L+H	8.687	4.465
+D+0.750L+0.750S+H	14.764	7.285
+D+0.60W+H	7.534	3.968
+D+0.750Lr+0.750L+0.450W+H	8.687	4.465
+D+0.750L+0.750S+0.450W+H	14.764	7.285
+0.60D+0.60W+0.60H	4.520	2.381
+D+0.70E+0.60H	8.965	4.637
+D+0.750L+0.750S+0.5250E+H	15.837	7.786
+0.60D+0.70E+H	5.951	3.049
D Only	7.534	3.968
L Only	1.538	0.662
S Only	8.103	3.760
E Only	2.045	0.955
H Only		

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-24] (SW #202)

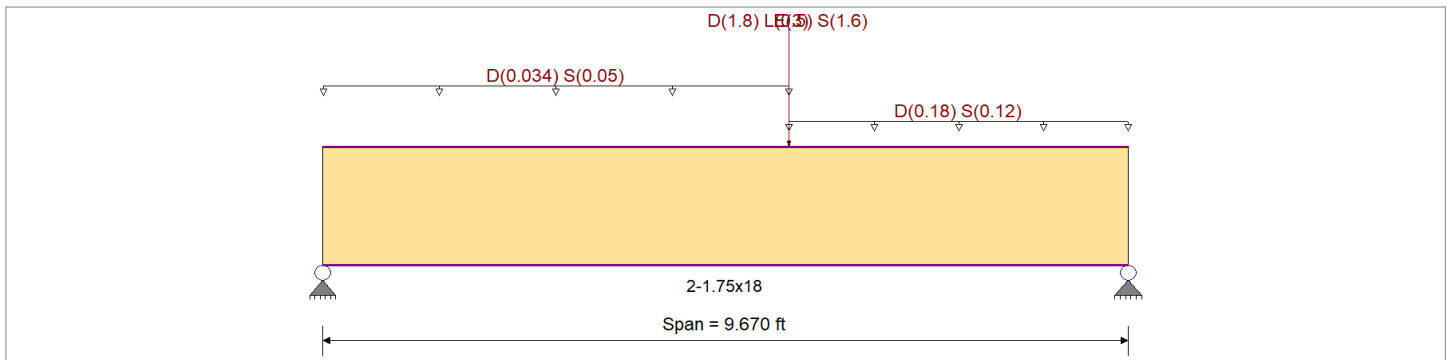
## CODE REFERENCES

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

Load Combination Set : ASCE 7-16

## Material Properties

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



## Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

Uniform Load : D = 0.180, S = 0.120 k/ft, Extent = 5.60 --> 9.670 ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.0340, S = 0.050 k/ft, Extent = 0.0 --> 5.60 ft, Tributary Width = 1.0 ft

Point Load : D = 1.80, L = 0.50, S = 1.60 k @ 5.60 ft

Point Load : E = 3.0 k @ 5.60 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.191</b> : 1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.163</b> : 1
Section used for this span		<b>2-1.75x18</b>	Section used for this span		<b>2-1.75x18</b>
fb: Actual	=	901.10psi	fv: Actual	=	63.96 psi
F'b	=	4,724.18psi	F'v	=	393.30 psi
Load Combination		+1.105D+0.750L+0.750S+0.5250E	Load Combination		+D+S+H
Location of maximum on span	=	5.611 ft	Location of maximum on span	=	8.188 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection		0.028 in Ratio = 4157 >=360	Span: 1 : E Only		
Max Upward Transient Deflection		0 in Ratio = 0 <360	n/a		
Max Downward Total Deflection		0.056 in Ratio = 2085 >=300	Span: 1 : +D+0.750L+0.750S+0.5250E+H		
Max Upward Total Deflection		0 in Ratio = 0 <300	n/a		

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v	
+D+H	Length = 9.670 ft	1	0.132	0.114	0.90	1.00	1.00	1.00	0.946	1.00	1.00	1.00	5.53	351.0	2,657.3	0.0	0.00	0.0	0.0
+D+L+H	Length = 9.670 ft	1	0.144	0.123	1.00	1.00	1.00	1.00	0.946	1.00	1.00	1.00	6.70	425.7	2,952.6	1.76	41.9	342.0	0.0
+D+Lr+H	Length = 9.670 ft	1	0.095	0.082	1.25	1.00	1.00	1.00	0.946	1.00	1.00	1.00	5.53	351.0	3,690.8	1.47	35.0	427.5	0.0
+D+S+H						1.00	1.00	1.00	0.946	1.00	1.00	1.00			0.0	0.00	0.0	0.0	0.0

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## DESCRIPTION: [B2-24] (SW #202)

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sub>b</sub>	V	fv	F <sub>v</sub>
Length = 9.670 ft	1		0.191	0.163	1.15	1.00	1.00	1.00	0.946	1.00	1.00	1.00	10.20	647.3	3,395.5	2.69	64.0	393.3
+D+0.750Lr+0.750L+H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.110	0.094	1.25	1.00	1.00	1.00	0.946	1.00	1.00	1.00	6.41	407.0	3,690.8	1.69	40.2	427.5
+D+0.750L+0.750S+H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.185	0.157	1.15	1.00	1.00	1.00	0.946	1.00	1.00	1.00	9.91	629.2	3,395.5	2.60	61.9	393.3
+D+0.60W+H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.074	0.064	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	5.53	351.0	4,724.2	1.47	35.0	547.2
+D+0.750Lr+0.750L+0.450W+															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.086	0.073	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	6.41	407.0	4,724.2	1.69	40.2	547.2
+D+0.750L+0.750S+0.450W+i															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.133	0.113	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	9.91	629.2	4,724.2	2.60	61.9	547.2
+0.60D+0.60W+0.60H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.045	0.038	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	3.32	210.6	4,724.2	0.88	21.0	547.2
+D+0.70E+0.60H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.141	0.117	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	10.46	664.4	4,724.2	2.69	64.0	547.2
+D-0.70E+0.60H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.010	0.011	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	0.76	48.2	4,724.2	0.26	6.1	547.2
+D+0.750L+0.750S+0.5250E+															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.183	0.153	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	13.61	864.2	4,724.2	3.51	83.6	547.2
+D+0.750L+0.750S-0.5250E+i															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.083	0.073	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	6.21	394.2	4,724.2	1.69	40.2	547.2
+0.60D+0.70E+H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.111	0.091	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	8.25	524.0	4,724.2	2.10	50.0	547.2
+0.60D-0.70E+H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.022	0.028	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	1.62	102.8	4,724.2	0.64	15.2	547.2
+1.140D+0.70E															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.151	0.126	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	11.24	713.6	4,724.2	2.89	68.9	547.2
+1.140D-0.70E															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.019	0.020	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	1.40	88.9	4,724.2	0.46	11.0	547.2
+1.105D+0.750L+0.750S+0.52															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.191	0.160	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	14.19	901.1	4,724.2	3.67	87.3	547.2
+1.105D+0.750L+0.750S-0.52															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.091	0.080	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	6.79	431.0	4,724.2	1.84	43.9	547.2
+0.460D+0.70E															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.101	0.082	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	7.48	474.9	4,724.2	1.89	45.1	547.2
+0.460D-0.70E															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.032	0.034	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	2.39	151.9	4,724.2	0.77	18.4	547.2

### Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E+H	1	0.0556	5.082		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	2.688	3.939
Max Upward from Load Combinations	2.688	3.939
Max Upward from Load Cases	1.263	1.765
Max Downward from all Load Conditio	-1.263	-1.737
Max Downward from Load Combinations	-0.202	-0.157
Max Downward from Load Cases (Resis	-1.263	-1.737

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-24] (SW #214)

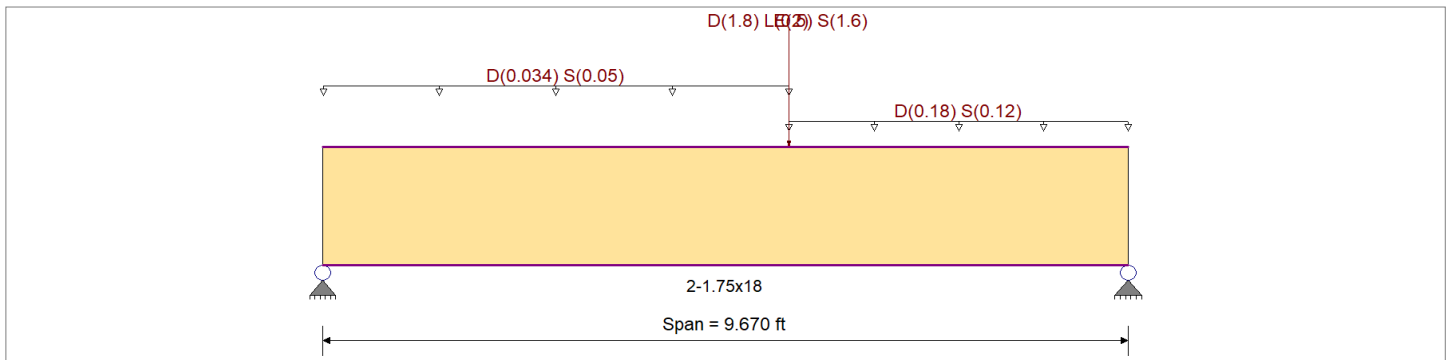
## CODE REFERENCES

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

Load Combination Set : ASCE 7-16

## Material Properties

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



## Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

Uniform Load : D = 0.180, S = 0.120 k/ft, Extent = 5.60 --> 9.670 ft, Tributary Width = 1.0 ft

Uniform Load : D = 0.0340, S = 0.050 k/ft, Extent = 0.0 --> 5.60 ft, Tributary Width = 1.0 ft

Point Load : D = 1.80, L = 0.50, S = 1.60 k @ 5.60 ft

Point Load : E = 2.0 k @ 5.60 ft

## DESIGN SUMMARY

**Design OK**

<b>Maximum Bending Stress Ratio</b>	=	<b>0.191</b> : 1	<b>Maximum Shear Stress Ratio</b>	=	<b>0.163</b> : 1
Section used for this span		<b>2-1.75x18</b>	Section used for this span		<b>2-1.75x18</b>
fb: Actual	=	647.31 psi	fv: Actual	=	63.96 psi
F'b	=	3,395.50 psi	F'v	=	393.30 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	5.611 ft	Location of maximum on span	=	8.188 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection		0.019 in Ratio = 6003 >= 360	Span: 1 : S Only		
Max Upward Transient Deflection		0 in Ratio = 0 < 360	n/a		
Max Downward Total Deflection		0.051 in Ratio = 2286 >= 300	Span: 1 : +D+0.750L+0.750S+0.5250E+H		
Max Upward Total Deflection		0 in Ratio = 0 < 300	n/a		

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F'b	V	fv	F'v	
+D+H	Length = 9.670 ft	1	0.132	0.114	0.90	1.00	1.00	1.00	0.946	1.00	1.00	1.00	5.53	351.0	2,657.3	0.0	0.00	0.0	0.0
+D+L+H	Length = 9.670 ft	1	0.144	0.123	1.00	1.00	1.00	1.00	0.946	1.00	1.00	1.00	6.70	425.7	2,952.6	1.76	41.9	342.0	0.0
+D+Lr+H	Length = 9.670 ft	1	0.095	0.082	1.25	1.00	1.00	1.00	0.946	1.00	1.00	1.00	5.53	351.0	3,690.8	1.47	35.0	427.5	0.0
+D+S+H						1.00	1.00	1.00	0.946	1.00	1.00	1.00			0.0	0.00	0.0	0.0	0.0

# Wood Beam

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

**DESCRIPTION:** [B2-24] (SW #214)

## Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios									Moment Values			Shear Values			
			M	V	CD	CM	C <sub>t</sub>	CLx	C <sub>F</sub>	C <sub>fu</sub>	C <sub>i</sub>	C <sub>r</sub>	M	fb	F <sub>b</sub>	V	fv	F <sub>v</sub>
Length = 9.670 ft	1		0.191	0.163	1.15	1.00	1.00	1.00	0.946	1.00	1.00	1.00	10.20	647.3	3,395.5	2.69	64.0	393.3
+D+0.750Lr+0.750L+H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.110	0.094	1.25	1.00	1.00	1.00	0.946	1.00	1.00	1.00	6.41	407.0	3,690.8	1.69	40.2	427.5
+D+0.750L+0.750S+H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.185	0.157	1.15	1.00	1.00	1.00	0.946	1.00	1.00	1.00	9.91	629.2	3,395.5	2.60	61.9	393.3
+D+0.60W+H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.074	0.064	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	5.53	351.0	4,724.2	1.47	35.0	547.2
+D+0.750Lr+0.750L+0.450W+															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.086	0.073	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	6.41	407.0	4,724.2	1.69	40.2	547.2
+D+0.750L+0.750S+0.450W+i															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.133	0.113	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	9.91	629.2	4,724.2	2.60	61.9	547.2
+0.60D+0.60W+0.60H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.045	0.038	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	3.32	210.6	4,724.2	0.88	21.0	547.2
+D+0.70E+0.60H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.119	0.099	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	8.82	560.0	4,724.2	2.28	54.3	547.2
+D-0.70E+0.60H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.030	0.029	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	2.24	142.1	4,724.2	0.66	15.7	547.2
+D+0.750L+0.750S+0.5250E+															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.166	0.140	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	12.38	785.9	4,724.2	3.21	76.4	547.2
+D+0.750L+0.750S-0.5250E+i															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.100	0.087	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	7.44	472.5	4,724.2	1.99	47.4	547.2
+0.60D+0.70E+H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.089	0.074	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	6.61	419.5	4,724.2	1.69	40.3	547.2
+0.60D-0.70E+H															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.003	0.010	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	0.26	16.4	4,724.2	0.23	5.6	547.2
+1.140D+0.70E															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.129	0.108	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	9.59	609.1	4,724.2	2.49	59.2	547.2
+1.140D-0.70E															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.040	0.038	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	3.01	191.3	4,724.2	0.87	20.6	547.2
+1.105D+0.750L+0.750S+0.52															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.174	0.146	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	12.96	822.8	4,724.2	3.36	80.0	547.2
+1.105D+0.750L+0.750S-0.52!															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.108	0.093	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	8.02	509.4	4,724.2	2.15	51.1	547.2
+0.460D+0.70E															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.078	0.065	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	5.83	370.4	4,724.2	1.49	35.4	547.2
+0.460D-0.70E															0.0	0.00	0.0	0.0
Length = 9.670 ft	1		0.010	0.016	1.60	1.00	1.00	1.00	0.946	1.00	1.00	1.00	0.75	47.4	4,724.2	0.37	8.8	547.2

## Overall Maximum Deflections

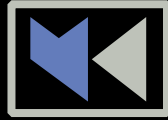
Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S+0.5250E+H	1	0.0508	5.082		0.0000	0.000

## Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	2.467	3.635
Max Upward from Load Combinations	2.467	3.635
Max Upward from Load Cases	1.136	1.765
Max Downward from all Load Conditio	-0.842	-1.158
Max Downward from Load Cases (Resis	-0.842	-1.158
+D+H	1.136	1.765



**MULHERN+KULP**  
RESIDENTIAL STRUCTURAL ENGINEERING

# Seismic Shear Wall Calculations

McCullough Architects

## Sears Plat - Lot 3

*Mercer Island, WA*

*Parameters:*

*Single Family Home*

*Design Wind Speed: 100 MPH*

*Wind Exposure Category: B*

*Seismic Design Category: D*

*Code & Design Standard: 2021 IBC Ch. 1613, ASCE 7-16 Ch. 11-12*

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

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

Adam J. Cervantes E.I.T. Staff Engineer II



**SEISMIC CALCULATION - ASCE 7-16**

M+K Project #: 244-25015  
Engineer: AJC

**Seismic Design Category:**

User Inputs:

Site Class	D
Spectral Response Acceleration 0.2 sec, <b>S<sub>s</sub></b>	1.471
Spectral Response Acceleration 1.0 sec, <b>S<sub>1</sub></b>	0.508
Occupancy Category	II

Variables:

Site coefficient, <b>F<sub>a</sub></b>	1.20
Site coefficient, <b>F<sub>v</sub></b>	1.79

Calculated Values:

Maximum spectral response acceleration, <b>S<sub>ms</sub></b>	1.765
Maximum spectral response acceleration, <b>S<sub>m1</sub></b>	0.910
Design spectral response acceleration, <b>S<sub>ds</sub></b>	1.177
Design spectral response acceleration, <b>S<sub>d1</sub></b>	0.607
Seismic Design Category (short term)	D
Seismic Design Category (1.0 second term)	D

**Building period Determination:**

User Inputs:

Building period coefficient, <b>C<sub>t</sub></b>	0.020
Long-Period Trans Period, <b>T<sub>L</sub></b> (sec)	6
Ht. abv base to highest level, <b>h<sub>n</sub></b>	22

Calculated Values:

Approximate Fundamental Period, <b>T<sub>a</sub></b>	0.201
<b>T<sub>0</sub></b>	0.103
<b>T<sub>s</sub></b>	0.516
Spectral Response Acc., <b>S<sub>s</sub></b> (g)	1.177

**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 <sup>2</sup> )	Dead Load (psf)	DL of ext wall / trib. to level (kips)	Total level DL
1	12.6	3456	15	14.1	66 k
2	9.1	2267	17	6.6	45 k
3	0.0	0	0	0.0	0 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** = 111 Kips

Seismic Response Coefficient:

	Transverse	Longitudinal
Response modification factor, <b>R</b>	6.5	6.5
Occupancy Importance Factor, <b>I<sub>e</sub></b>	1.00	1.00
Seismic Response Coefficient, <b>C<sub>s</sub></b>	0.181	0.181

Base Shears:

	Ultimate Loads		x 0.7 =	Allowable Loads	
	Transverse	Longitudinal		Transverse	Longitudinal
	20 k	20 k		14.1 k	14.1 k

Story Shear Calculation:

Distribution exponent, **n** = 1.00

Level	Vert. Dist. Factor, <b>C<sub>vt</sub></b>	Ultimate Loads		x 0.7 =	Allowable Loads			
		Transverse Story Shear, <b>F<sub>x</sub></b>	Longitudinal Story Shear, <b>F<sub>y</sub></b>		Transverse Story Shear, <b>F<sub>x</sub></b>	Longitudinal Story Shear, <b>F<sub>y</sub></b>	Transverse Story Shear, <b>F<sub>x</sub></b>	Longitudinal Story Shear, <b>F<sub>y</sub></b>
1	0.459	9.2 k	9.2 k		6.5 k	14.1 k	6.5 k	14.1 k
2	0.541	10.9 k	10.9 k		7.6 k	7.6 k	7.6 k	7.6 k
3	0.000	0.0 k	0.0 k		0.0 k	0.0 k	0.0 k	0.0 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

GROSS FLOOR AREA	
STAIRS:	130 SF
MAIN LEVEL:	2,812 SF
UPPER LEVEL:	2,053 SF
TOTAL PROPOSED:	4,995 SF
TOTAL ALLOWED:	4,999 SF

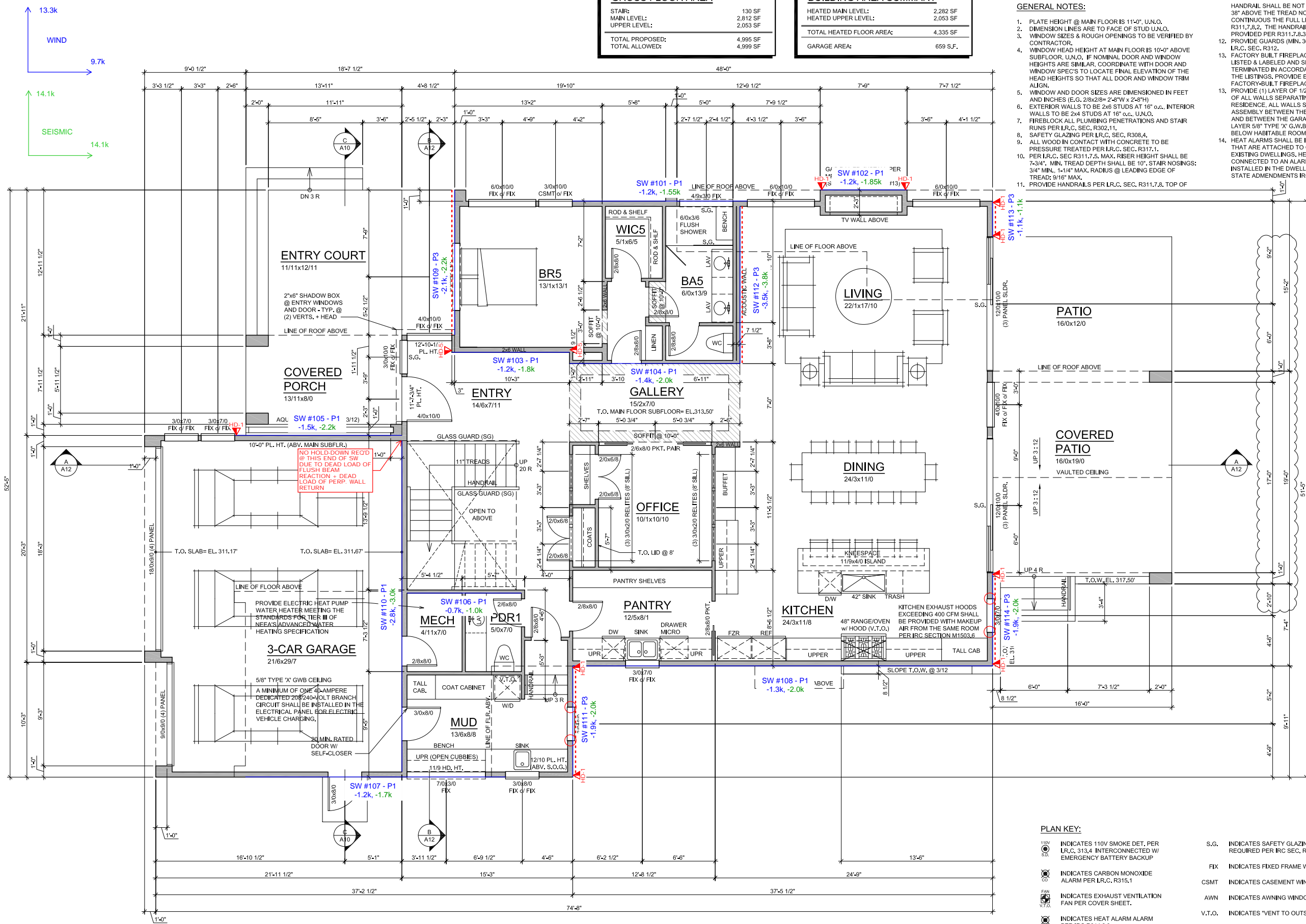
BUILDING AREA SUMMARY	
HEATED MAIN LEVEL:	2,282 SF
HEATED UPPER LEVEL:	2,053 SF
TOTAL HEATED FLOOR AREA:	4,335 SF
GARAGE AREA:	659 S.F.

**GENERAL NOTES:**

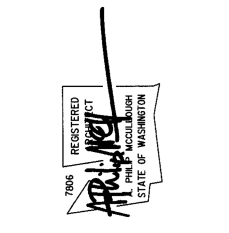
- PLATE HEIGHT @ MAIN FLOOR IS 11'-0", U.N.O.
- DIMENSION LINES ARE TO FACE OF STUD U.N.O.
- WINDOW SIZES & ROUGH OPENINGS TO BE VERIFIED BY CONTRACTOR.
- WINDOW HEAD HEIGHT AT MAIN FLOOR IS 10'-0" ABOVE SUBFLOOR, U.N.O. IF NOMINAL DOOR AND WINDOW HEIGHTS ARE SIMILAR, COORDINATE WITH DOOR AND WINDOW SPEC'S TO LOCATE FINAL ELEVATION OF THE HEAD HEIGHTS SO THAT ALL DOOR AND WINDOW TRIM ALIGN.
- WINDOW AND DOOR SIZES ARE DIMENSIONED IN FEET AND INCHES (E.G. 2/8x2/8= 2'-8" x 2'-8")
- EXTERIOR WALLS TO BE 2x6 STUDS AT 16" o.c., INTERIOR WALLS TO BE 2x4 STUDS AT 16" o.c., U.N.O.
- FIREBLOCK ALL PLUMBING PENETRATIONS AND STAIR RUNS PER I.R.C. SEC. R302.11.
- SAFETY GLAZING PER I.R.C. SEC. R308.4.
- ALL WOOD IN CONTACT WITH CONCRETE TO BE PRESSURE TREATED PER I.R.C. SEC. R317.1.
- PER I.R.C. SEC R311.7.5, MAX. RISER HEIGHT SHALL BE 7-3/4", MIN. TREAD DEPTH SHALL BE 10", STAIR NOSINGS: 3/4" MIN. 1-1/4" MAX. RADIUS @ LEADING EDGE OF TREAD; 9/16" MAX.
- PROVIDE HANDRAILS PER I.R.C. SEC. R311.7.8, TOP OF
- FACTORY BUILT FIREPLACES & CHIMNEYS SHALL BE LISTED & LABELED AND SHALL BE INSTALLED & TERMINATED IN ACCORDANCE TO THE CONDITIONS OF THE LISTINGS. PROVIDE EXTERIOR AIR SUPPLY TO ANY FACTORY-BUILT FIREPLACE PER I.R.C. SEC R1006.
- PROVIDE (1) LAYER OF 1/2" G.W.B. AT THE GARAGE SIDE OF ALL WALLS SEPARATING THE GARAGE FROM THE RESIDENCE. ALL WALLS SUPPORTING A FLOOR CEILING ASSEMBLY BETWEEN THE GARAGE AND RESIDENCE AND BETWEEN THE GARAGE AND ITS ATTIC. PROVIDE (1) LAYER 5/8" TYPE 'X' G.W.B. TO GARAGE CEILING F BELOW HABITABLE ROOMS.
- HEAT ALARMS SHALL BE INSTALLED IN NEW GARAGES THAT ARE ATTACHED TO OR LOCATED UNDER NEW AND EXISTING DWELLINGS. HEAT ALARMS SHALL BE CONNECTED TO AN ALARM OR A SMOKE ALARM THAT IS INSTALLED IN THE DWELLING PER 2018 WASHINGTON STATE ADMINISTRATIVE CODES IRC R314.2.3

**McCULLOUGH ARCHITECTS**  
 5601 - 6th Ave South, #317  
 Seattle, WA, 98108  
 206.443.1181  
 mccullougharchitects.com

UNPUBLISHED WORK 2025 © McCullough Architects



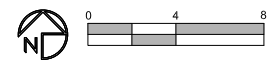
Date:	2025.07.17
Job No:	24-008
Project No:	
Drawn:	
Approved:	
Owner:	



**SEARS PLAT - LOT 3**  
 Mercer Island  
 Washington  
 98040

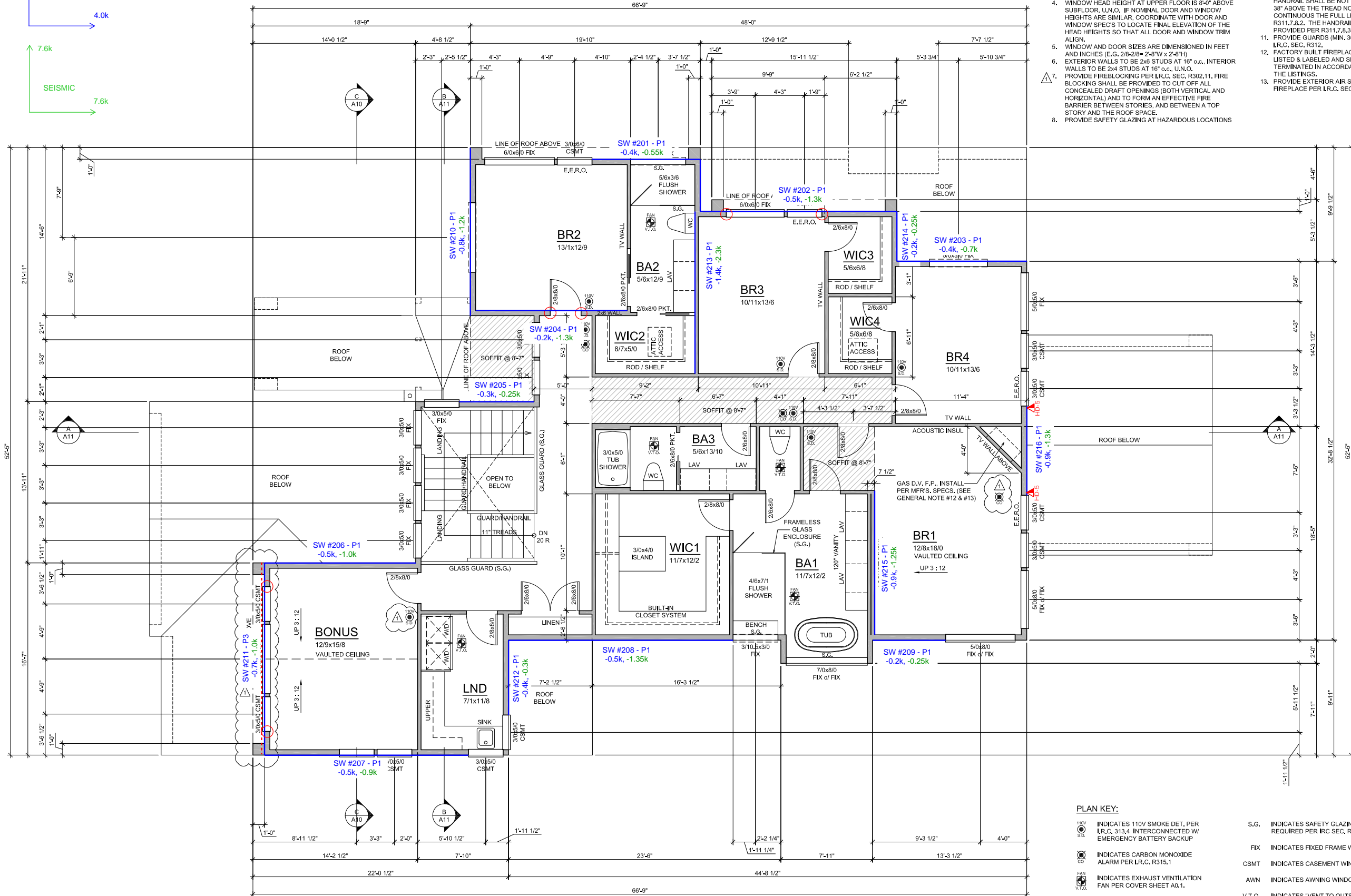
PRELIMINARY Main Floor Plan  
**A5**

**MAIN FLOOR PLAN**  
 SCALE: 1/4" = 1'-0"



**PLAN KEY:**

	INDICATES 110V SMOKE DET. PER I.R.C. 313.4 INTERCONNECTED W/ EMERGENCY BATTERY BACKUP		INDICATES SAFETY GLAZING REQUIRED PER IRC SEC. R308.4
	INDICATES CARBON MONOXIDE ALARM PER I.R.C. R315.1		INDICATES FIXED FRAME WINDOW
	INDICATES EXHAUST VENTILATION FAN PER COVER SHEET.		INDICATES CASEMENT WINDOW
	INDICATES HEAT ALARM ALARM PER IRC R314.2.3		INDICATES AWNING WINDOW
			INDICATES 'VENT TO OUTSIDE'



**GENERAL NOTES:**

1. PLATE HEIGHT @ UPPER FLOOR IS 9'-1", U.N.O.
2. DIMENSION LINES ARE TO FACE OF STUD U.N.O.
3. WINDOW SIZES & ROUGH OPENINGS TO BE VERIFIED BY CONTRACTOR.
4. WINDOW HEAD HEIGHT AT UPPER FLOOR IS 8'-0" ABOVE SUBFLOOR, U.N.O. IF NOMINAL DOOR AND WINDOW HEIGHTS ARE SIMILAR, COORDINATE WITH DOOR AND WINDOW SPEC'S TO LOCATE FINAL ELEVATION OF THE HEAD HEIGHTS SO THAT ALL DOOR AND WINDOW TRIM ALIGN.
5. WINDOW AND DOOR SIZES ARE DIMENSIONED IN FEET AND INCHES (E.G. 2/8-2/8= 2'-8"W x 2'-8"H)
6. EXTERIOR WALLS TO BE 2x6 STUDS AT 16" o.c., INTERIOR WALLS TO BE 2x4 STUDS AT 16" o.c., U.N.O.
7. PROVIDE FIREBLOCKING PER I.R.C. SEC. R302.11. FIRE BLOCKING SHALL BE PROVIDED TO CUT OFF ALL CONCEALED DRAFT OPENINGS (BOTH VERTICAL AND HORIZONTAL) AND TO FORM AN EFFECTIVE FIRE BARRIER BETWEEN STORIES, AND BETWEEN A TOP STORY AND THE ROOF SPACE.
8. PROVIDE SAFETY GLAZING AT HAZARDOUS LOCATIONS
9. PER I.R.C. SEC. R308.4.
10. PER I.R.C. SEC R311.7.5, MAX. RISER HEIGHT SHALL BE 7'-3/4", MIN. TREAD DEPTH SHALL BE 10", STAIR NOSINGS: 3/4" MIN., 1-1/4" MAX. RADIUS @ LEADING EDGE OF TREAD; 9/16" MAX.
11. PROVIDE HANDRAILS PER I.R.C. SEC. R311.7.8. TOP OF HANDRAIL SHALL BE NOT LESS THAN 34" OR MORE THAN 38" ABOVE THE TREAD NOSINGS. HANDRAILS SHALL BE CONTINUOUS THE FULL LENGTH OF THE FLIGHT PER R311.7.8.2. THE HANDRAIL GRIP-SIZE SHALL BE PROVIDED PER R311.7.8.3.
12. PROVIDE GUARDS (MIN. 36" HEIGHT) IN LOCATIONS PER I.R.C. SEC. R312.
13. FACTORY BUILT FIREPLACES & CHIMNEYS SHALL BE LISTED & LABELED AND SHALL BE INSTALLED & TERMINATED IN ACCORDANCE TO THE CONDITIONS OF THE LISTINGS.
14. PROVIDE EXTERIOR AIR SUPPLY TO ANY FACTORY-BUILT FIREPLACE PER I.R.C. SEC R1006.

**PLAN KEY:**

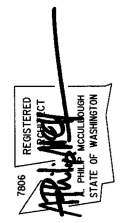
- 110V S.D. INDICATES 110V SMOKE DET. PER I.R.C. 313.4 INTERCONNECTED W/ EMERGENCY BATTERY BACKUP
- INDICATES CARBON MONOXIDE ALARM PER I.R.C. R315.1
- FAN V.T.O. INDICATES EXHAUST VENTILATION FAN PER COVER SHEET A0.1.
- INDICATES HEAT ALARM ALARM PER IRC R314.2.3
- S.G. INDICATES SAFETY GLAZING REQUIRED PER IRC SEC. R308.4
- FIX INDICATES FIXED FRAME WINDOW
- CSMT INDICATES CASEMENT WINDOW
- AWN INDICATES AWNING WINDOW
- V.T.O. INDICATES 'VENT TO OUTSIDE'



**UPPER FLOOR PLAN**

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

Date:	2025.10.22
Job No:	24-008
Project No:	
Drawn:	
Approved:	
Owner:	



**7418 - 78TH AVE. SE**  
 Mercer Island  
 Washington  
 98040



Shearwall Design Summary

M+K Project #: 244-25015

Engineer: AJC

Shearwall 201: 2nd - Side Ext. Wall @ BR2/BA2

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
 Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

Shearwall 202: 2nd - Side Ext. Wall @ BR3/WIC3

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
 Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



**Shearwall 203:** 2nd - Side Ext. Wall @ BR4

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 204:** 2nd - Side Int. Wall @ BR2

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



**Shearwall 205:** 2nd - Side Ext. Wall @ Stairs

**Shearwall Properties:**

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

**Capacity Evaluation:**

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

**Shearwall Assembly Specification**

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

**Overturning Evaluation:**

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

**Hold-down Specification**

**No Hold down Required**

**Shearwall 206:** 2nd - Side Ext. Wall @ Bonus

**Shearwall Properties:**

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

**Capacity Evaluation:**

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

**Shearwall Assembly Specification**

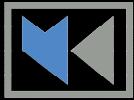
P1 - 1-side 7/16" OSB  
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked  
**ADEQUATE**

**Overturning Evaluation:**

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

**Hold-down Specification**

**No Hold down Required**



**Shearwall 207:** 2nd - Side Ext. Wall @ Bonus/LND

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 208:** 2nd - Side Ext. Wall @ Linen/WIC1

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 209:** 2nd - Side Ext. Wall @ BR1

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 210:** 2nd - Front Ext. Wall @ BR2

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 211:** 2nd - Front Ext. Wall @ Bonus

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 212:** 2nd - Rear Ext. Wall @ LND

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 213:** 2nd - Rear Ext./Int. Wall @ BA2

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 214:** 2nd - Rear Ext. Wall @ WIC3

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 215:** 2nd - Front Int. Wall @ BA1

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 216:** 2nd - Rear Ext. Wall @ BR1/BR4

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**SIMPSON CS16 STRAP TIE (14" END LENGTH)**



**Shearwall 101:** 1st - Side Ext. Wall @ BR5/WIC5/BA5/Living

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 102:** 1st - Side Ext. Wall @ Living Fireplace

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**SIMPSON STHD14RJ HOLDOWN**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 103:** 1st - Side Int. Wall @ BR5

**Shearwall Properties:**

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

**Capacity Evaluation:**

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

**Shearwall Assembly Specification**

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

**Overturning Evaluation:**

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

**Hold-down Specification**

**SIMPSON CS16 STRAP TIE (14" END LENGTH)**

**Shearwall 104:** 1st - Side Int. Wall @ BA5

**Shearwall Properties:**

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

**Capacity Evaluation:**

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

**Shearwall Assembly Specification**

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

**Overturning Evaluation:**

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

**Hold-down Specification**

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 105:** 1st - Side Ext. Wall @ Garage/Porch

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**SIMPSON STHD14RJ HOLDOWN**

**Shearwall 106:** 1st - Side Int. Wall @ Mech/PDR1

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 107:** 1st - Side Ext. Wall @ Garage

**Shearwall Properties:**

Wall height, H	<input type="text" value="12.0"/> ft.	Max wall opening ht, H <sub>c</sub>	<input type="text" value="8.0"/> ft.	Shearwall Assembly	<input type="text" value="P1"/>
Wall Length, L	<input type="text" value="24.2"/> ft.	Qualifying Wall Length, L	<input type="text" value="14.2"/> ft.		

**Capacity Evaluation:**

Total Shear Load on Wall	<input type="text" value="1700"/> lbs	<	Allowable Shearwall Capacity	<input type="text" value="3406"/> 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	<input type="text" value="305"/> pl f	Overturning Moment	<input type="text" value="20.4"/> k-ft	Hold Down Design Load	<input type="text" value="0"/> lbs
DL at ends of wall	<input type="text" value="300"/> lbs	Resistive Moment	<input type="text" value="63.1"/> k-ft	Hold down Capacity	<input type="text" value="0"/> lbs

**Hold-down Specification**

**No Hold down Required**

**Shearwall 108:** 1st - Side Ext. Wall @ Pantry/Kitchen

**Shearwall Properties:**

Wall height, H	<input type="text" value="11.0"/> ft.	Max wall opening ht, H <sub>c</sub>	<input type="text" value="7.0"/> ft.	Shearwall Assembly	<input type="text" value="P1"/>
Wall Length, L	<input type="text" value="37.5"/> ft.	Qualifying Wall Length, L	<input type="text" value="34.5"/> ft.		

**Capacity Evaluation:**

Total Shear Load on Wall	<input type="text" value="2000"/> lbs	<	Allowable Shearwall Capacity	<input type="text" value="8265"/> 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	<input type="text" value="505"/> pl f	Overturning Moment	<input type="text" value="22.0"/> k-ft	Hold Down Design Load	<input type="text" value="0"/> lbs
DL at ends of wall	<input type="text" value="900"/> lbs	Resistive Moment	<input type="text" value="253.3"/> k-ft	Hold down Capacity	<input type="text" value="0"/> lbs

**Hold-down Specification**

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 109:** 1st - Front Ext. Wall @ BR5

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 110:** 1st - Rear Int. Wall @ Garage

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 111:** 1st - Rear Ext. Wall @ Mud

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**SIMPSON STHD14RJ HOLDDOWN**

**Shearwall 112:** 1st - Front Int. Wall @ Living

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



**Shearwall 113:** 1st - Rear Ext. Wall @ Living

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**SIMPSON STHD14RJ HOLDOWN**

**Shearwall 114:** 1st - Rear Ext. Wall @ Dining

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

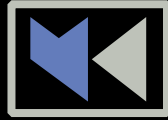
P3 - 1-side 7/16" OSB  
fastened w/ 8d nails at 3"o.c. panel edges & 12"o.c. panel field - edges blocked  
**ADEQUATE**

Overturning Evaluation:

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

Hold-down Specification

**SIMPSON STHD14RJ HOLDOWN**



**MULHERN+KULP**  
RESIDENTIAL STRUCTURAL ENGINEERING

# Wind Shear Wall Calculations

McCullough Architects

## Sears Plat - Lot 3

*Mercer Island, WA*

*Parameters:*

*Single Family Home*

*Design Wind Speed: 100 MPH*

*Wind Exposure Category: B*

*Seismic Design Category: D*

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

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

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

Adam J. Cervantes E.I.T. Staff Engineer II



**WIND DESIGN SUMMARY PER ASCE 7-16**

M+K Project #: 244-25015  
Engineer: AJC

**Parameters:**

Wind Speed	100
Exposure Category	B
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	5.0	:12
Long. Roof Pitch	3.0	:12
Mean Roof Height, H	26.37	ft

**Building Geometry:**

length	52	ft
Width	92	ft
Number of stories	2	

**Transverse Direction (Perpendicular to Main Ridge Line)**

Diaphragm Level	Floor-to-Floor Height	Roof Surface	Tributary Design Areas:			sq ft	Tributary Design Loads: (0.6W)			kips	
			Section A	O	B		Section A	O	B		
2	9.08 ft	Roof Surface	0	249	0	sq ft	Story Shear	0.00	3.95	0.00	kips
		Wall surface	0	287	0	sq ft	Total Shear	0.00	3.95	0.00	kips
1	12.56 ft	Roof Surface	0	19	0	sq ft	Story Shear	0.00	5.76	0.00	kips
		Wall surface	0	590	0	sq ft	Total Shear	0.00	9.71	0.00	kips
FND		Roof Surface	0	0	0	sq ft	Story Shear	0.00	0.00	0.00	kips
		Wall surface	0	0	0	sq ft	Total Shear	0.00	9.71	0.00	kips

**Longitudinal Direction (Parallel to Main Ridge Line)**

Diaphragm Level	Floor-to-Floor Height	Roof Surface	Tributary Design Areas:			sq ft	Tributary Design Loads: (0.6W)			kips	
			Section A	O	B		Section A	O	B		
2	9.08 ft	Roof Surface	0	159	0	sq ft	Story Shear	0.00	5.31	0.00	kips
		Wall surface	0	474	0	sq ft	Total Shear	0.00	5.31	0.00	kips
1	12.56 ft	Roof Surface	0	163	0	sq ft	Story Shear	0.00	7.98	0.00	kips
		Wall surface	0	750	0	sq ft	Total Shear	0.00	13.30	0.00	kips
FND		Roof Surface	0	0	0	sq ft	Story Shear	0.00	0.00	0.00	kips
		Wall surface	0	0	0	sq ft	Total Shear	0.00	13.30	0.00	kips

GROSS FLOOR AREA	
STAIRS:	130 SF
MAIN LEVEL:	2,812 SF
UPPER LEVEL:	2,053 SF
TOTAL PROPOSED:	4,995 SF
TOTAL ALLOWED:	4,999 SF

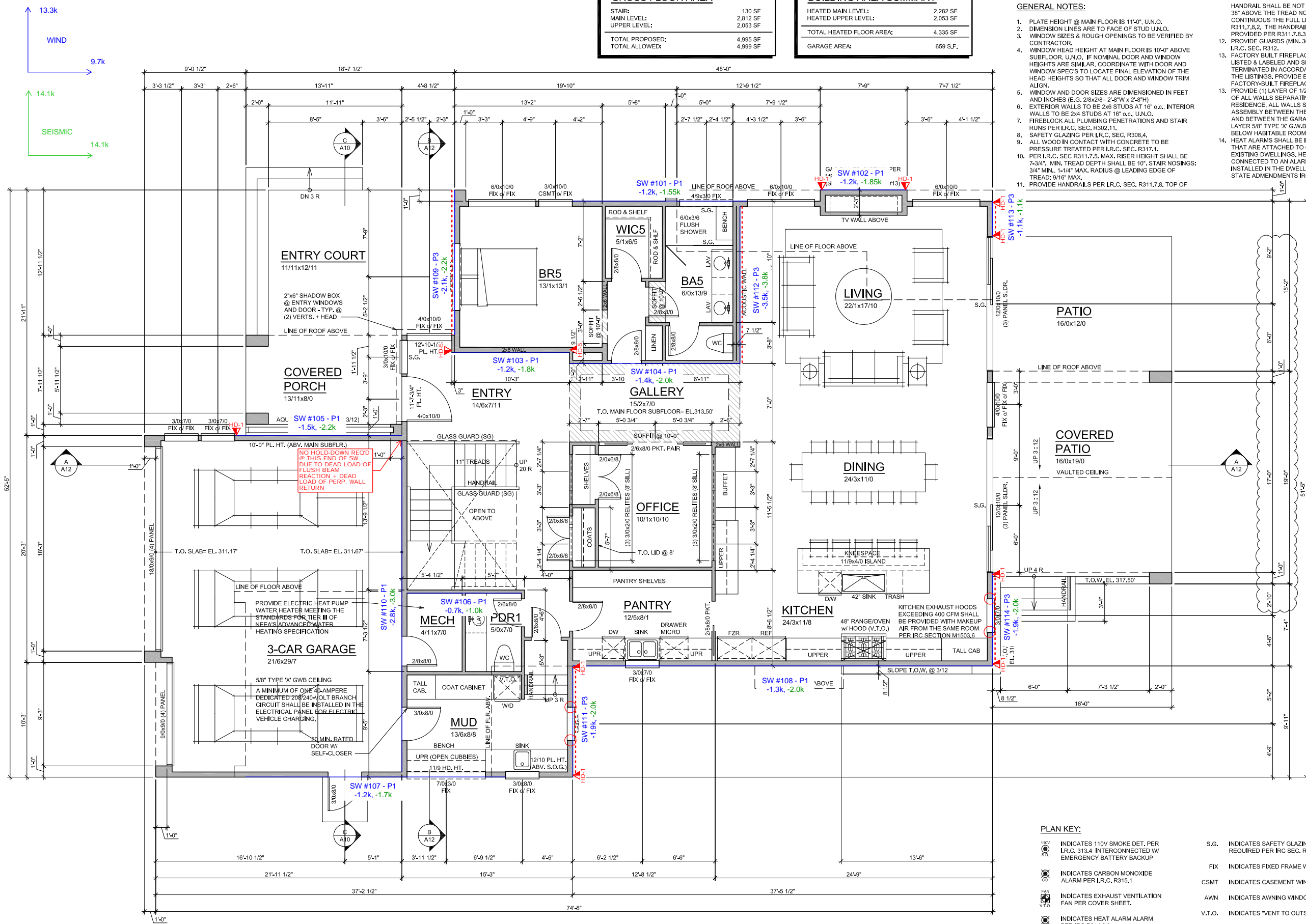
BUILDING AREA SUMMARY	
HEATED MAIN LEVEL:	2,282 SF
HEATED UPPER LEVEL:	2,053 SF
TOTAL HEATED FLOOR AREA:	4,335 SF
GARAGE AREA:	659 S.F.

**GENERAL NOTES:**

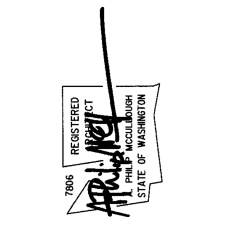
- PLATE HEIGHT @ MAIN FLOOR IS 11'-0", U.N.O.
- DIMENSION LINES ARE TO FACE OF STUD U.N.O.
- WINDOW SIZES & ROUGH OPENINGS TO BE VERIFIED BY CONTRACTOR.
- WINDOW HEAD HEIGHT AT MAIN FLOOR IS 10'-0" ABOVE SUBFLOOR, U.N.O. IF NOMINAL DOOR AND WINDOW HEIGHTS ARE SIMILAR, COORDINATE WITH DOOR AND WINDOW SPEC'S TO LOCATE FINAL ELEVATION OF THE HEAD HEIGHTS SO THAT ALL DOOR AND WINDOW TRIM ALIGN.
- WINDOW AND DOOR SIZES ARE DIMENSIONED IN FEET AND INCHES (E.G. 2/8x2/8= 2'-8" x 2'-8")
- EXTERIOR WALLS TO BE 2x6 STUDS AT 16" o.c., INTERIOR WALLS TO BE 2x4 STUDS AT 16" o.c., U.N.O.
- FIREBLOCK ALL PLUMBING PENETRATIONS AND STAIR RUNS PER I.R.C. SEC. R302.11.
- SAFETY GLAZING PER I.R.C. SEC. R308.4.
- ALL WOOD IN CONTACT WITH CONCRETE TO BE PRESSURE TREATED PER I.R.C. SEC. R317.1.
- PER I.R.C. SEC R311.7.5, MAX. RISER HEIGHT SHALL BE 7-3/4", MIN. TREAD DEPTH SHALL BE 10", STAIR NOSINGS: 3/4" MIN. 1-1/4" MAX. RADIUS @ LEADING EDGE OF TREAD; 9/16" MAX.
- PROVIDE HANDRAILS PER I.R.C. SEC. R311.7.8, TOP OF
- FACTORY BUILT FIREPLACES & CHIMNEYS SHALL BE LISTED & LABELED AND SHALL BE INSTALLED & TERMINATED IN ACCORDANCE TO THE CONDITIONS OF THE LISTINGS. PROVIDE EXTERIOR AIR SUPPLY TO ANY FACTORY-BUILT FIREPLACE PER I.R.C. SEC R1006.
- PROVIDE (1) LAYER OF 1/2" G.W.B. AT THE GARAGE SIDE OF ALL WALLS SEPARATING THE GARAGE FROM THE RESIDENCE. ALL WALLS SUPPORTING A FLOOR CEILING ASSEMBLY BETWEEN THE GARAGE AND RESIDENCE AND BETWEEN THE GARAGE AND ITS ATTIC. PROVIDE (1) LAYER 5/8" TYPE 'X' G.W.B. TO GARAGE CEILING F BELOW HABITABLE ROOMS.
- HEAT ALARMS SHALL BE INSTALLED IN NEW GARAGES THAT ARE ATTACHED TO OR LOCATED UNDER NEW AND EXISTING DWELLINGS. HEAT ALARMS SHALL BE CONNECTED TO AN ALARM OR A SMOKE ALARM THAT IS INSTALLED IN THE DWELLING PER 2018 WASHINGTON STATE ADMINISTRATIVE CODES IRC R314.2.3

**McCULLOUGH ARCHITECTS**  
 5601 - 6th Ave South, #317  
 Seattle, WA, 98108  
 206.443.1181  
 mccullougharchitects.com

UNPUBLISHED WORK 2025 © McCullough Architects



Date:	2025.07.17
Job No:	24-008
Project No:	
Drawn:	
Approved:	
Owner:	



**SEARS PLAT - LOT 3**  
 Mercer Island  
 Washington  
 98040

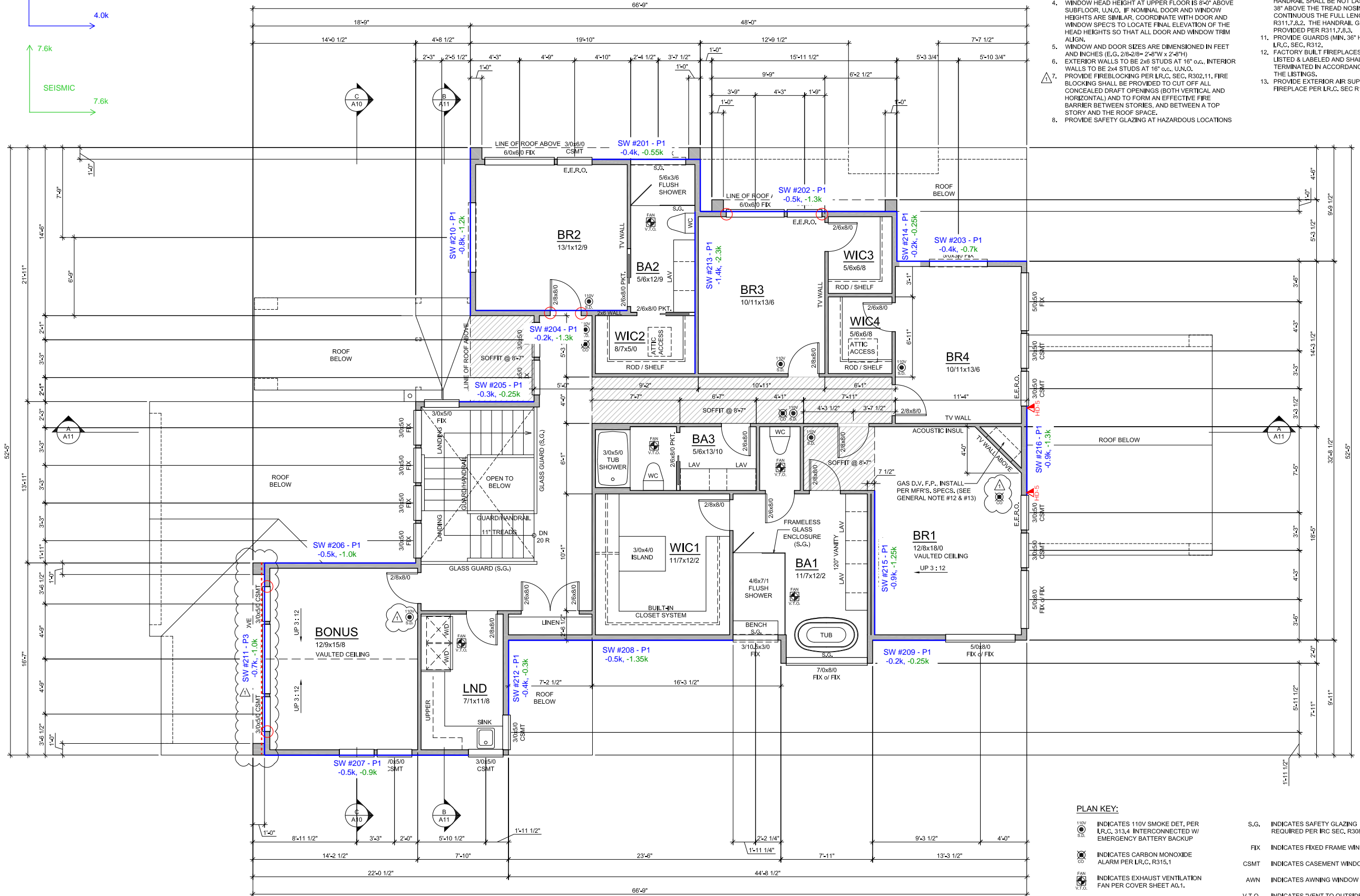
PRELIMINARY Main Floor Plan  
**A5**

**MAIN FLOOR PLAN**  
 SCALE: 1/4" = 1'-0"



**PLAN KEY:**

	INDICATES 110V SMOKE DET. PER I.R.C. 313.4 INTERCONNECTED W/ EMERGENCY BATTERY BACKUP		INDICATES SAFETY GLAZING REQUIRED PER IRC SEC. R308.4
	INDICATES CARBON MONOXIDE ALARM PER I.R.C. R315.1		INDICATES FIXED FRAME WINDOW
	INDICATES EXHAUST VENTILATION FAN PER COVER SHEET.		INDICATES CASEMENT WINDOW
	INDICATES HEAT ALARM ALARM PER IRC R314.2.3		INDICATES AWNING WINDOW
			INDICATES 'VENT TO OUTSIDE'

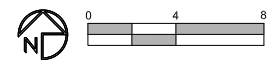


**GENERAL NOTES:**

1. PLATE HEIGHT @ UPPER FLOOR IS 9'-1", U.N.O.
2. DIMENSION LINES ARE TO FACE OF STUD U.N.O.
3. WINDOW SIZES & ROUGH OPENINGS TO BE VERIFIED BY CONTRACTOR.
4. WINDOW HEAD HEIGHT AT UPPER FLOOR IS 8'-0" ABOVE SUBFLOOR, U.N.O. IF NOMINAL DOOR AND WINDOW HEIGHTS ARE SIMILAR, COORDINATE WITH DOOR AND WINDOW SPEC'S TO LOCATE FINAL ELEVATION OF THE HEAD HEIGHTS SO THAT ALL DOOR AND WINDOW TRIM ALIGN.
5. WINDOW AND DOOR SIZES ARE DIMENSIONED IN FEET AND INCHES (E.G. 2/8-2/8= 2'-8"W x 2'-8"H)
6. EXTERIOR WALLS TO BE 2x6 STUDS AT 16" o.c., INTERIOR WALLS TO BE 2x4 STUDS AT 16" o.c., U.N.O.
7. PROVIDE FIREBLOCKING PER I.R.C. SEC. R302.11. FIRE BLOCKING SHALL BE PROVIDED TO CUT OFF ALL CONCEALED DRAFT OPENINGS (BOTH VERTICAL AND HORIZONTAL) AND TO FORM AN EFFECTIVE FIRE BARRIER BETWEEN STORIES, AND BETWEEN A TOP STORY AND THE ROOF SPACE.
8. PROVIDE SAFETY GLAZING AT HAZARDOUS LOCATIONS
9. PER I.R.C. SEC. R308.4.
10. PER I.R.C. SEC R311.7.5, MAX. RISER HEIGHT SHALL BE 7'-3/4", MIN. TREAD DEPTH SHALL BE 10", STAIR NOSINGS: 3/4" MIN., 1-1/4" MAX. RADIUS @ LEADING EDGE OF TREAD; 9/16" MAX.
11. PROVIDE HANDRAILS PER I.R.C. SEC. R311.7.8. TOP OF HANDRAIL SHALL BE NOT LESS THAN 34" OR MORE THAN 38" ABOVE THE TREAD NOSINGS. HANDRAILS SHALL BE CONTINUOUS THE FULL LENGTH OF THE FLIGHT PER R311.7.8.2. THE HANDRAIL GRIP-SIZE SHALL BE PROVIDED PER R311.7.8.3.
12. PROVIDE GUARDS (MIN. 36" HEIGHT) IN LOCATIONS PER I.R.C. SEC. R312.
13. FACTORY BUILT FIREPLACES & CHIMNEYS SHALL BE LISTED & LABELED AND SHALL BE INSTALLED & TERMINATED IN ACCORDANCE TO THE CONDITIONS OF THE LISTINGS.
14. PROVIDE EXTERIOR AIR SUPPLY TO ANY FACTORY-BUILT FIREPLACE PER I.R.C. SEC R1006.

**PLAN KEY:**

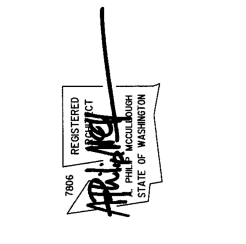
- INDICATES 110V SMOKE DET. PER I.R.C. 313.4 INTERCONNECTED W/ EMERGENCY BATTERY BACKUP
- INDICATES SAFETY GLAZING REQUIRED PER IRC SEC. R308.4
- INDICATES CARBON MONOXIDE ALARM PER I.R.C. R315.1
- INDICATES EXHAUST VENTILATION FAN PER COVER SHEET A0.1.
- INDICATES HEAT ALARM ALARM PER IRC R314.2.3
- INDICATES FIXED FRAME WINDOW
- INDICATES CASEMENT WINDOW
- INDICATES AWNING WINDOW
- INDICATES 'VENT TO OUTSIDE'



**UPPER FLOOR PLAN**

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

Date:	2025.10.22
Job No:	24-008
Project No:	
Drawn:	
Approved:	
Owner:	



**7418 - 78TH AVE. SE**  
 Mercer Island  
 Washington  
 98040



Shearwall Design Summary

M+K Project #: 244-25015  
Engineer: AJC

Shearwall 201: 2nd - Side Ext. Wall @ BR2/BA2

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

Shearwall 202: 2nd - Side Ext. Wall @ BR3/WIC3

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 203:** 2nd - Side Ext. Wall @ BR4

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 204:** 2nd - Side Int. Wall @ BR2

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 205:** 2nd - Side Ext. Wall @ Stairs

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 206:** 2nd - Side Ext. Wall @ Bonus

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

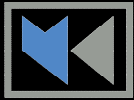
P1 - 1-side 7/16" OSB  
fastened w/ 8d nails at 6"o.c. panel edges & 12"o.c. panel field - edges blocked  
**ADEQUATE**

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



**Shearwall 207:** 2nd - Side Ext. Wall @ Bonus/LND

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 208:** 2nd - Side Ext. Wall @ Linen/WIC1

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 209:** 2nd - Side Ext. Wall @ BR1

**Shearwall Properties:**

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

**Capacity Evaluation:**

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

**Shearwall Assembly Specification**

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

**Overturning Evaluation:**

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

**Hold-down Specification**

**No Hold down Required**

**Shearwall 210:** 2nd - Front Ext. Wall @ BR2

**Shearwall Properties:**

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

**Capacity Evaluation:**

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

**Shearwall Assembly Specification**

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

**Overturning Evaluation:**

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

**Hold-down Specification**

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 211:** 2nd - Front Ext. Wall @ Bonus

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 212:** 2nd - Rear Ext. Wall @ LND

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 213:** 2nd - Rear Ext./Int. Wall @ BA2

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 214:** 2nd - Rear Ext. Wall @ WIC3

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 215:** 2nd - Front Int. Wall @ BA1

**Shearwall Properties:**

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

**Capacity Evaluation:**

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

**Shearwall Assembly Specification**

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

**Overturning Evaluation:**

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

**Hold-down Specification**

**No Hold down Required**

**Shearwall 216:** 2nd - Rear Ext. Wall @ BR1/BR4

**Shearwall Properties:**

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

**Capacity Evaluation:**

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

**Shearwall Assembly Specification**

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

**Overturning Evaluation:**

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

**Hold-down Specification**

**No Hold down Required**



**Shearwall 101:** 1st - Side Ext. Wall @ BR5/WIC5/BA5/Living

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 102:** 1st - Side Ext. Wall @ Living Fireplace

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**SIMPSON STHD14RJ HOLDOWN**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 103:** 1st - Side Int. Wall @ BR5

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**

**Shearwall 104:** 1st - Side Int. Wall @ BA5

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 105:** 1st - Side Ext. Wall @ Garage/Porch

**Shearwall Properties:**

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

**Capacity Evaluation:**

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

**Shearwall Assembly Specification**

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

**Overturning Evaluation:**

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

**Hold-down Specification**

**No Hold down Required**

**Shearwall 106:** 1st - Side Int. Wall @ Mech/PDR1

**Shearwall Properties:**

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

**Capacity Evaluation:**

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

**Shearwall Assembly Specification**

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

**Overturning Evaluation:**

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

**Hold-down Specification**

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 107:** 1st - Side Ext. Wall @ Garage

Shearwall Properties:

Wall height, H	<input type="text" value="12.0"/> ft.	Max wall opening ht, H <sub>c</sub>	<input type="text" value="8.0"/> ft.	Shearwall Assembly	<input type="text" value="P1"/>
Wall Length, L	<input type="text" value="24.2"/> ft.	Qualifying Wall Length, L	<input type="text" value="14.2"/> ft.		

Capacity Evaluation:

Total Shear Load on Wall	<input type="text" value="1200"/> lbs	<	Allowable Shearwall Capacity	<input type="text" value="4768"/> 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	<input type="text" value="305"/> pl f	Overturning Moment	<input type="text" value="14.4"/> k-ft	Hold Down Design Load	<input type="text" value="0"/> lbs
DL at ends of wall	<input type="text" value="300"/> lbs	Resistive Moment	<input type="text" value="87.0"/> k-ft	Hold down Capacity	<input type="text" value="0"/> lbs

Hold-down Specification

**No Hold down Required**

**Shearwall 108:** 1st - Side Ext. Wall @ Pantry/Kitchen

Shearwall Properties:

Wall height, H	<input type="text" value="11.0"/> ft.	Max wall opening ht, H <sub>c</sub>	<input type="text" value="7.0"/> ft.	Shearwall Assembly	<input type="text" value="P1"/>
Wall Length, L	<input type="text" value="37.5"/> ft.	Qualifying Wall Length, L	<input type="text" value="34.5"/> ft.		

Capacity Evaluation:

Total Shear Load on Wall	<input type="text" value="1300"/> lbs	<	Allowable Shearwall Capacity	<input type="text" value="11572"/> 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	<input type="text" value="505"/> pl f	Overturning Moment	<input type="text" value="14.3"/> k-ft	Hold Down Design Load	<input type="text" value="0"/> lbs
DL at ends of wall	<input type="text" value="900"/> lbs	Resistive Moment	<input type="text" value="349.2"/> k-ft	Hold down Capacity	<input type="text" value="0"/> lbs

Hold-down Specification

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 109:** 1st - Front Ext. Wall @ BR5

Shearwall Properties:

Wall height, H	<input type="text" value="11.0"/> ft.	Max wall opening ht, H <sub>c</sub>	<input type="text" value="3.0"/> ft.	Shearwall Assembly	<input type="text" value="P3"/>
Wall Length, L	<input type="text" value="14.5"/> ft.	Qualifying Wall Length, L	<input type="text" value="8.5"/> ft.		

Capacity Evaluation:

Total Shear Load on Wall	<input type="text" value="2100"/> lbs	<	Allowable Shearwall Capacity	<input type="text" value="5357"/> 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	<input type="text" value="370"/> plf	Overturning Moment	<input type="text" value="30.4"/> k-ft	Hold Down Design Load	<input type="text" value="0"/> lbs
DL at ends of wall	<input type="text" value="1200"/> lbs	Resistive Moment	<input type="text" value="50.7"/> k-ft	Hold down Capacity	<input type="text" value="0"/> lbs

Hold-down Specification

**No Hold down Required**

**Shearwall 110:** 1st - Rear Int. Wall @ Garage

Shearwall Properties:

Wall height, H	<input type="text" value="11.0"/> ft.	Max wall opening ht, H <sub>c</sub>	<input type="text" value="8.0"/> ft.	Shearwall Assembly	<input type="text" value="P1"/>
Wall Length, L	<input type="text" value="29.6"/> ft.	Qualifying Wall Length, L	<input type="text" value="23.9"/> ft.		

Capacity Evaluation:

Total Shear Load on Wall	<input type="text" value="2800"/> lbs	<	Allowable Shearwall Capacity	<input type="text" value="7797"/> 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	<input type="text" value="240"/> plf	Overturning Moment	<input type="text" value="30.8"/> k-ft	Hold Down Design Load	<input type="text" value="0"/> lbs
DL at ends of wall	<input type="text" value="1200"/> lbs	Resistive Moment	<input type="text" value="126.4"/> k-ft	Hold down Capacity	<input type="text" value="0"/> lbs

Hold-down Specification

**No Hold down Required**



**Shearwall 111:** 1st - Rear Ext. Wall @ Mud

**Shearwall Properties:**

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

**Capacity Evaluation:**

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

**Shearwall Assembly Specification**

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

**Overturning Evaluation:**

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

**Hold-down Specification**

**SIMPSON STHD14RJ HOLDDOWN**

**Shearwall 112:** 1st - Front Int. Wall @ Living

**Shearwall Properties:**

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

**Capacity Evaluation:**

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

**Shearwall Assembly Specification**

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

**Overturning Evaluation:**

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

**Hold-down Specification**

**No Hold down Required**



*Shearwall Design Summary*

M+K Project #: 244-25015  
Engineer: AJC

**Shearwall 113:** 1st - Rear Ext. Wall @ Living

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**SIMPSON STHD14RJ HOLDOWN**

**Shearwall 114:** 1st - Rear Ext. Wall @ Dining

Shearwall Properties:

Wall height, H  ft. Max wall opening ht, H<sub>c</sub>  ft.  
Wall Length, L  ft. Qualifying Wall Length, L  ft. Shearwall Assembly

Capacity Evaluation:

Total Shear Load on Wall  lbs < Allowable Shearwall Capacity  lbs

Shearwall Assembly Specification

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

Overturning Evaluation:

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

Hold-down Specification

**SIMPSON STHD14RJ HOLDOWN**

# Cantilevered Retaining Wall

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## Code Reference

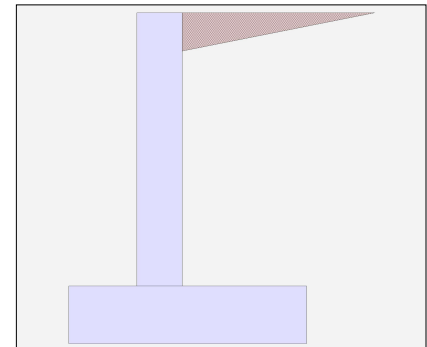
Calculations per IBC 2021 1807.3, CBC 2019, ASCE 7-16

### Criteria

Retained Height	=	4.75 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water table above bottom of footing	=	0.0 ft

### Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	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	=	0.0 psf (Strength Level)

### Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

# Cantilevered Retaining Wall

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## Design Summary

### Wall Stability Ratios

Overturning	=	4.44	OK
Sliding	=	1.53	OK
Global Stability	=	2.22	
Total Bearing Load	=	2,213 lbs	
...resultant ecc.	=	0.33 in	
Eccentricity within middle third			
Soil Pressure @ Toe	=	663 psf	OK
Soil Pressure @ Heel	=	602 psf	OK
Allowable	=	1,500 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	821 psf	
ACI Factored @ Heel	=	746 psf	
Footing Shear @ Toe	=	1.5 psi	OK
Footing Shear @ Heel	=	4.0 psi	OK
Allowable	=	82.2 psi	

### Sliding Calcs

Lateral Sliding Force	=	578.6 lbs	
less 100% Passive Force	=	0.0 lbs	
less 100% Friction Force	=	885.3 lbs	
Added Force Req'd	=	0.0 lbs	OK
...for 1.5 Stability	=	0.0 lbs	OK

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

### Load Factors

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

## Stem Construction

### Design Height Above Ftg

ft =	Stem OK		
	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	=	0.161
---------------	---	-------

### Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	631.8

### Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	1,000.3

Moment.....Allowable	=	6,186.6
----------------------	---	---------

### Shear.....Actual

Service Level	psi =	
Strength Level	psi =	8.5

Shear.....Allowable	psi =	75.0
---------------------	-------	------

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

# Cantilevered Retaining Wall

Project File: beam calcs with overstrength.ec6

LIC#: KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

## Concrete Stem Rebar Area Details

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>	
Bottom Stem			
As (based on applied moment) :	0.0379 in2/ft		
(4/3) * As :	0.0505 in2/ft	Min Stem T&S Reinf Area 0.912 in2	
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	=====	<u>One layer of :</u>	<u>Two layers of :</u>
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2325 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8382 in2/ft	#6@ 27.50 in	#6@ 55.00 in

## Footing Data

Toe Width	=	1.00 ft
Heel Width	=	2.50
Total Footing Width	=	3.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 3,000 psi	Fy =	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top 2.00	@ Btm.=	3.00 in

## Footing Design Results

	<u>Toe</u>	<u>Heel</u>	
Factored Pressure	= 821	746 psf	
Mu' : Upward	= 407	1,275 ft-#	
Mu' : Downward	= 90	2,105 ft-#	
Mu: Design	= 317 OK	830 ft-#	OK
phiMn	= 2,739	2,739 ft-#	
Actual 1-Way Shear	= 1.55	4.04 psi	
Allow 1-Way Shear	= 43.82	43.82 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, phi Tu	=	0.00 ft-lbs	

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

### Other Acceptable Sizes & Spacings

Toe:  $\phi M_n = \phi * 5 * \lambda * \sqrt{f_c} * S_m$

Heel:  $\phi M_n = \phi * 5 * \lambda * \sqrt{f_c} * S_m$

Key: No key defined

Min footing T&S reinf Area 0.91 in2  
Min footing T&S reinf Area per foot 0.26 in2 /ft

### If one layer of horizontal bars:

#4@ 9.26 in  
#5@ 14.35 in  
#6@ 20.37 in

### If two layers of horizontal bars:

#4@ 18.52 in  
#5@ 28.70 in  
#6@ 40.74 in



## Cantilevered Retaining Wall

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

---

### Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #5 bar specified in this stem design segment (25.4.2.3a) = 23.40 in

Development length for #5 bar specified in this stem design segment = 18.00 in

Hooked embedment length into footing for #5 bar specified in this stem design segment = 9.59 in

As Provided = 0.2325 in<sup>2</sup>/ft

As Required = 0.1728 in<sup>2</sup>/ft

# Cantilevered Retaining Wall

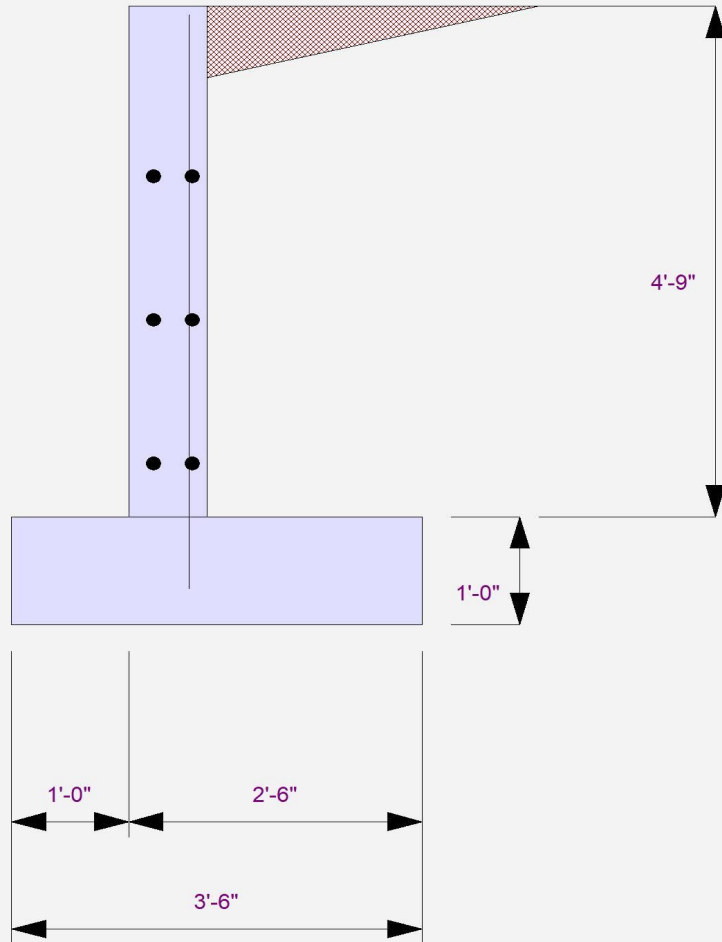
Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

8" w/ #5 @ 16"



# Cantilevered Retaining Wall

Project File: beam calcs with overstrength.ec6

LIC# : KW-06017913, Build:20.24.02.03

MULHERN & KULP STRUCTURAL ENGINEERING INC

(c) ENERCALC INC 1983-2023

