CK Engineering LLC.

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STRUCTURAL CALCULATIONS

Partial Lateral & Gravity Design
22-058

12/30/2022

KRIS ADDITION
9825 SE 42nd PL
Mercer Island, WA 98040
December 30, 2022

Design Criteria

Scope of Work:	Partial Lateral & Gravity Design		
Site Address:	9825 SE 42nd PL Mercer Island, WA 98040		
Number of Stories:	3	Engineer:	PK

Roof Loading

Roofing	Torch Down	2.0
Sheathing	5/8" Plywood	1.8
Insulation	Roll/Batt	3.0
Ceiling	5/8" GWB	2.8
Framing	Trusses	2.2
Miscellaneous	fixtures, mechanical, electrical, etc.	3.2
	TOTAL DEAD LOAD:	15.0 psf
	ROOF SNOW LOAD:	25.0 psf

Upper Floor Loading

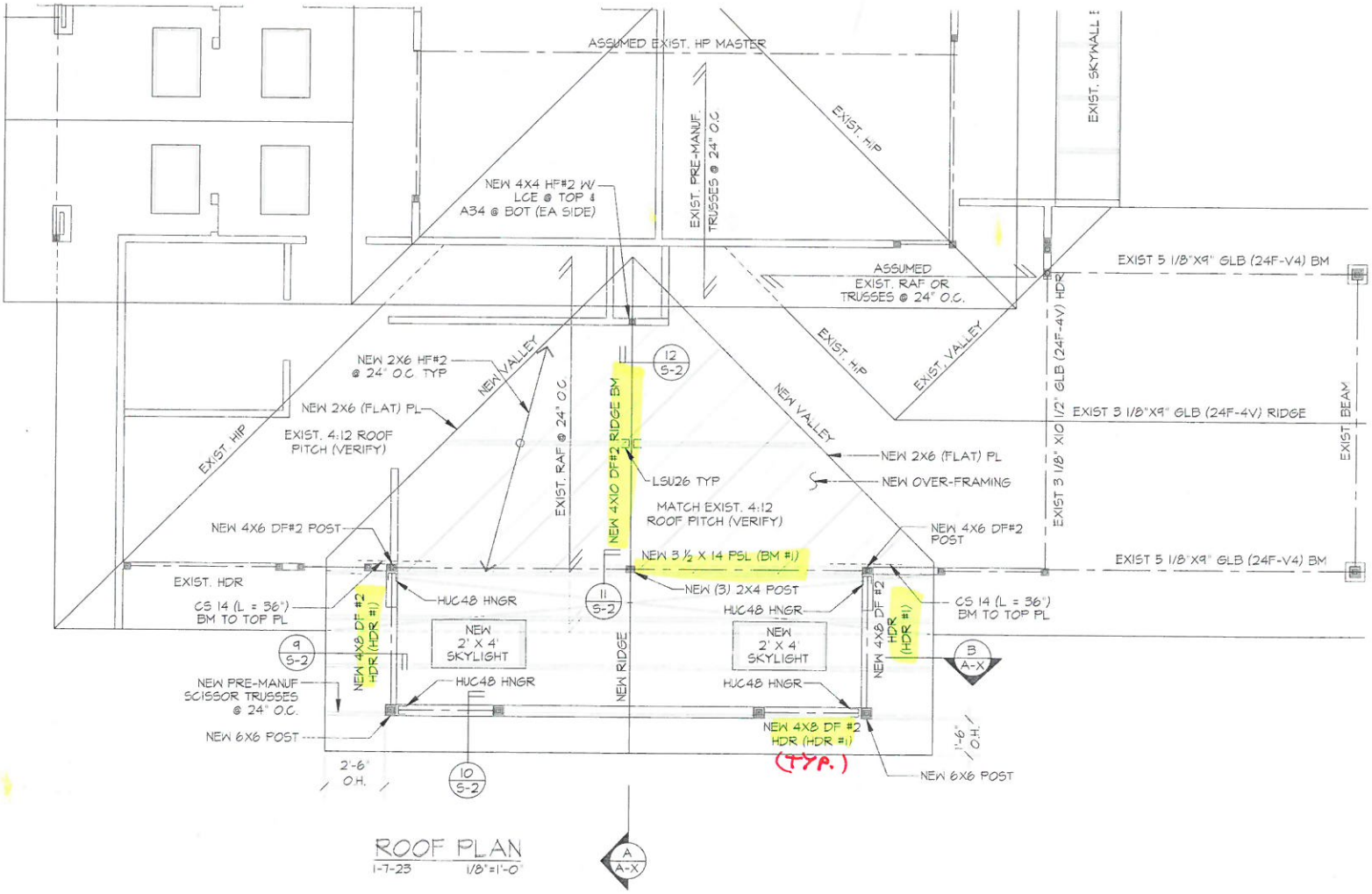
Floor Covering	Carpet/Hardwood/Tile	3.0
Sheathing	3/4" T&G	2.3
Ceiling	1/2" GWB	2.2
Joists	Solid Sawn @ 16" o/c	3.3
Beams		2.8
Miscellaneous	fixtures, mechanical, electrical, etc.	1.4
	TOTAL DEAD LOAD:	15.0 psf
	FLOOR LIVE LOAD:	40.0 psf

Main Floor Loading

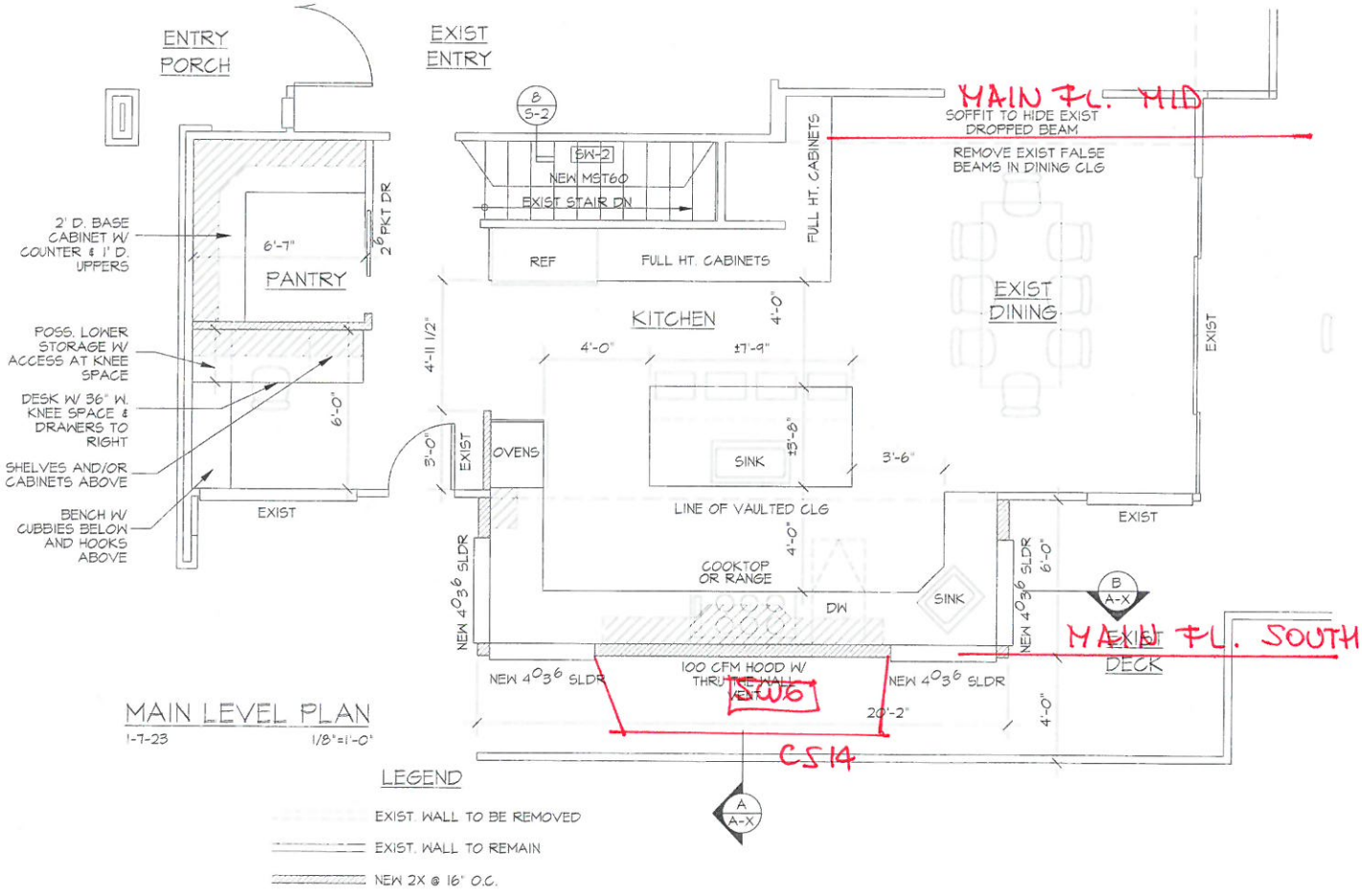
Floor Covering	Carpet/Hardwood/Tile	3.0
Sheathing	3/4" T&G	2.3
Ceiling	5/8" GWB	2.8
Joists	I-Joists	2.1
Beams		4.2
Miscellaneous	fixtures, mechanical, electrical, etc.	0.6
	TOTAL DEAD LOAD:	15.0 psf
	FLOOR LIVE LOAD:	40.0 psf

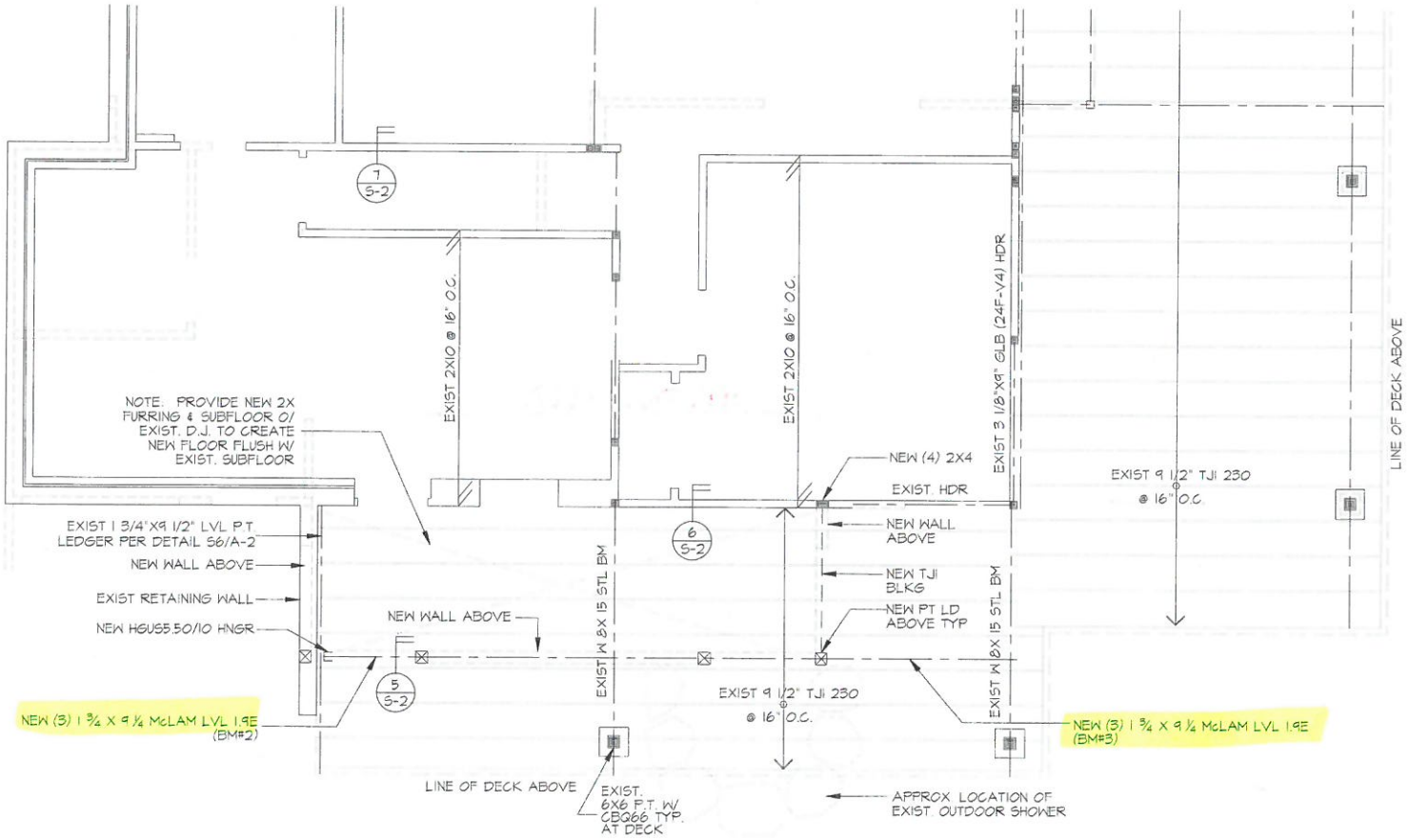
Soil Bearing Capacity:	1500 psf
Frost Depth:	18 in

PART. LATERAL & GRAVITY KEY PLANS



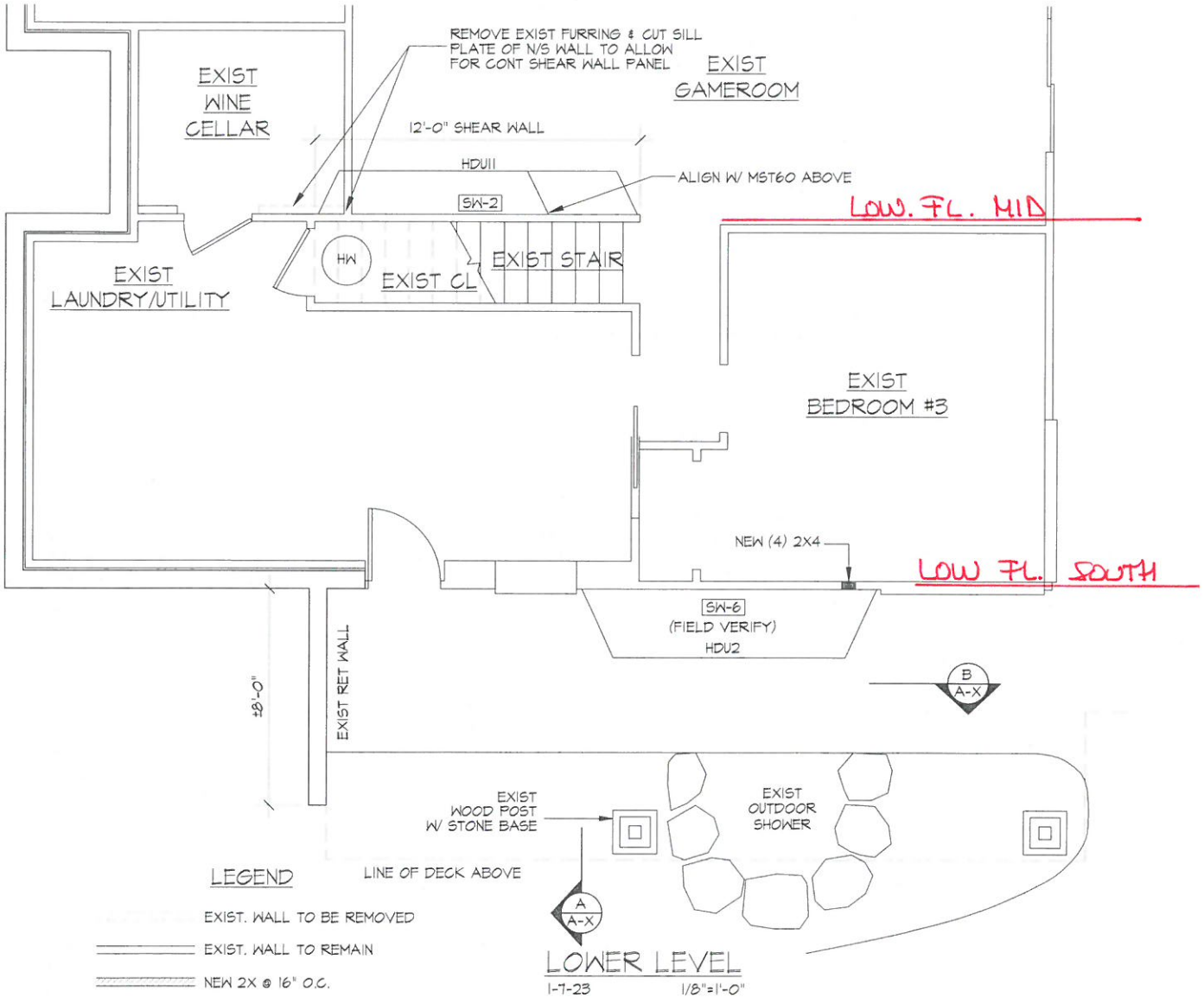
ROOF PLAN
1-7-23 1/8"=1'-0"


ENTRY PORCH
EXIST ENTRY
MAIN FL. MID
SOFFIT TO HIDE EXIST DROPPED BEAM
REMOVE EXIST FALSE BEAMS IN DINING CLG
2' D. BASE CABINET W/ COUNTER & 1' D. UPPERS
6'-7"
2"PKT DR
PANTRY
POSS. LOWER STORAGE W/ ACCESS AT KNEE SPACE
DESK W/ 36" W. KNEE SPACE & DRAWERS TO RIGHT
SHELVES AND/OR CABINETS ABOVE
BENCH W/ CUBBIES BELOW AND HOOKS ABOVE
6'-0"
EXIST
B 5-2
SW-2
NEW MST60
EXIST STAIR DN
REF
FULL HT. CABINETS
FULL HT. CABINETS
KITCHEN
4'-0"
4'-11 1/2"
4'-0"
±7'-9"
EXIST DINING
EXIST
3'-0"
EXIST
OVENS
SINK
±3'-8"
3'-6"
LINE OF VAULTED CLG
EXIST
4'-0"
COOKTOP OR RANGE
DW
SINK
NEW 4⁰3⁶ SLDR
NEW 4⁰3⁶ SLDR
6'-0"
B A-X
MAIN FL. SOUTH
EXIST DECK
NEW 4⁰3⁶ SLDR
100 CFM HOOD W/ THRU THE WALL VENT
NEW 4⁰3⁶ SLDR
20'-2"
4'-0"
W6
C514
A A-X
MAIN LEVEL PLAN
1-7-23
1/8"=1'-0"
LEGEND
EXIST. WALL TO BE REMOVED
EXIST. WALL TO REMAIN
NEW 2X @ 16" O.C.



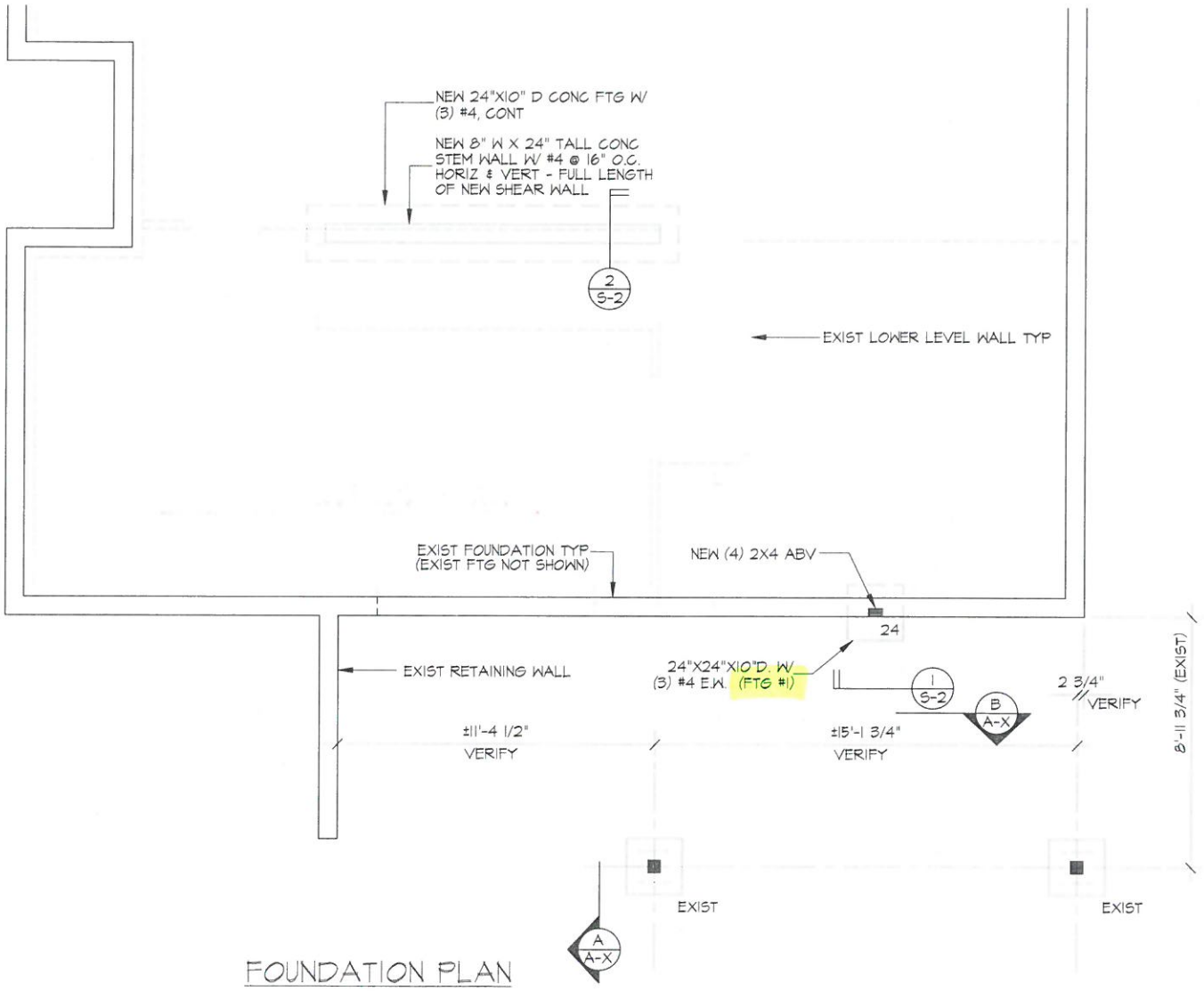
MAIN LEVEL FRAMING PLAN

1-7-23 1/8"=1'-0"



LOWER LEVEL

1-7-23 1/8"=1'-0"



FOUNDATION PLAN

Type of construction:	REMODELING	Location:	9825 SE 42nd PL
Applicable Building Codes:	IBC 2018, ASCE 7/SEI 7-16		Mercer Island, WA 98040

Work performed : **Partial Lateral & Gravity Design**

WIND DESIGN:

$P_s = \lambda I_w P_{s30} K_{zt}$

Exposure :	C	Wind Exposure Category as set forth in Section 26.7 of ASCE 7-16
Wind Speed =	85 MPH	Basic Wind Speed (LRFD) as used in Figure 28.5 of ASCE 7-16 and converted to (ASD)
P_{s30} =		Simplified design wind pressure for Exposure B, at h = 30 feet and for I = 1.0, from Figure 28.5-1
I_w =	1	Importance factor as defined in Table 1.5-2 of ASCE 7-16
λ =	1.37	Adjustment factor for building height and exposure from Figure 28.5-1 of ASCE 7-16
K_{ZT} =	1.00	Adjustment factor for increased wind speed due to a hill or escarpment from Section 26.8 of ASCE 7-16

Roof slope :

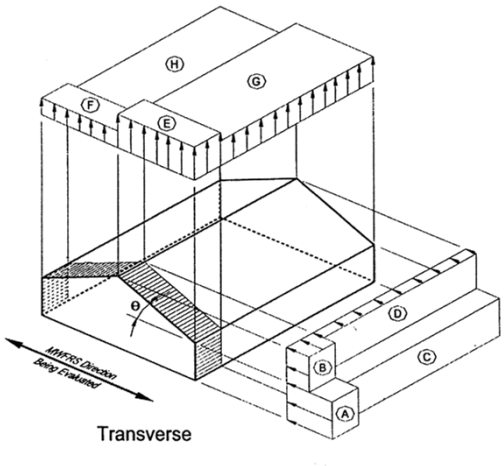
		rise		run			
Front/Rear	$\tan^{-1}$ (	4	/	12	)	= 18.4 degrees	Number of floors: 3
Left/Right	$\tan^{-1}$ (	4	/	12	)	= 18.4 degrees	
		27 ft	Mean Elevation				

0

Average uplift (F/R)=	-11.5 psf	Based on wind zones 'G' and 'H'
Average uplift (R/L)=	-11.5 psf	Based on wind zones 'G' and 'H'

	End zone of wall		End zone of roof	
	Front/Rear	Left/Right	Front/Rear	Left/Right
P_{s30} =	A = 15.4 psf	15.4 psf	B = -4.4 psf	-4.4 psf
P_s =	21.2 psf	21.2 psf	-6.0 psf	-6.0 psf

	Interior zone of wall		Interior zone of roof	
	Front/Rear	Left/Right	Front/Rear	Left/Right
P_{s30} =	C = 10.3 psf	10.3 psf	D = -2.4 psf	-2.4 psf
P_s =	14.1 psf	14.1 psf	-3.3 psf	-3.3 psf



WIND LOAD CALCULATIONS

FRONT ⟶ REAR

ΣV 3RD FLOOR =

WIND ZONE	B	D	A	C								
AVE. HEIGHT	4	4	4	4								
AVE. WIDTH	8	31	8	38								
Ps	0.00	0.00	21.16	14.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	677	2144	0	0	0	0	0	0	0	0

TOTAL 3,400 lbs Minimum net pressure controls. The calc. pressure is less than the min. net pressure, equal to 16psf(A-C), and 8psf(B-D) applied over the entire area. (ASCE 7-16 28.5.3)

ΣV 2ND FLOOR =

WIND ZONE	A	C	A	C	B	D						
AVE. HEIGHT	5	5	4	4	4	4						
AVE. WIDTH	8	38	11	55	4	17						
Ps	21.16	14.11	21.16	14.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	846	2680	931	3103	0	0	0	0	0	0	0	0

TOTAL 7,561 lbs

ΣV (1ST FLOOR) =

WIND ZONE	A	C	A	C								
AVE. HEIGHT	5	5	4	4								
AVE. WIDTH	11	55	8	46								
Ps	21.16	14.11	21.16	14.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	1164	3879	677	2596	0	0	0	0	0	0	0	0

TOTAL 8,316 lbs

WIND LOAD CALCULATIONS

LEFT ⟶ **RIGHT**

ΣV 3RD FLOOR = N.A.

WIND ZONE												
AVE. HEIGHT												
AVE. WIDTH												
Ps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL 0 lbs

ΣV 2ND FLOOR =

WIND ZONE												
AVE. HEIGHT												
AVE. WIDTH												
Ps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL 0 lbs

ΣV (1ST FLOOR) =

WIND ZONE												
AVE. HEIGHT												
AVE. WIDTH												
Ps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL 0 lbs

ρ CALCS:

3RD FLOOR CALCULATIONS:

Plate Height:	8.00 ft
Total length of Shearwall in Shortest Line:	6.00 ft
Length of Shortest Segment within Shear Line:	3.00 ft
Length of Longest Segment in Shear Line:	3.00 ft

Tributary Area: 1.0
Total Area: 2.0

ρ = 1.00
ASCE 7-16 12.3.4.2 a

2ND FLOOR CALCULATIONS:

Plate Height:	8.00 ft
Total length of Shearwall in Shortest Line:	16.00 ft
Length of Shortest Shearwall within Shear Line:	8.00 ft
Length of Longest Wall in Shear Line:	8.00 ft

Tributary Area: 1.0
Total Area: 2.0

ρ = 1.00
ASCE 7-16 12.3.4.2 b

MAIN FLOOR CALCULATIONS:

Plate Height:	8.00 ft
Total length of Shearwall in Shortest Line:	10.00 ft
Length of Shortest Shearwall within Shear Line:	4.50 ft
Length of Longest Wall in Shear Line:	5.50 ft

Tributary Area: 1.0
Total Area: 2.0

ρ = 1.00
ASCE 7-16 12.3.4.2 b

All loads in pounds per square foot

WALL DEAD LOAD =	10 psf	ROOF DEAD LOAD =	15.0 psf
FLAT ROOF SNOW LOAD =	25 psf	UPPER FLOOR D.L. =	15.0 psf
RED. S.L. (20%*S.L.) =	0	LOWER FLOOR D.L. =	15.0 psf
		FLOOR LIVE LOAD =	40.0 psf

SEISMIC DESIGN:

$E = E_h + E_v$

$E = \rho Q_{E+.2S_{DS}D}$ $\quad Q_E = V = C_sW$

ρ =	1.00		
Site Class =	D	Geotech Report	Yes
I_E =	1	Importance factor as defined in Table 11.5-1	
R =	6.5		
h_n =	30	Total height of structure	

$V = 0.7S_{DS}I_EW / R$ $\quad S_{DS} = 2/3\ S_{MS}$ $\quad Ss =$ 148.0% $\quad S_{MS} = 177.6\%$ $\quad V =$ 0.128 W

$V_{max} = S_{D1}I_EW / T_aR$ $\quad S_{MS} = (Fa)(Ss)$ $\quad Fa =$ 1.20 $\quad S_{DS} = 118.4\%$ $\quad E =$ 0.128 W

$T_a = 0.02h_n^{0.75}$ $\quad S_{D1} = 2/3\ S_{M1}$ $\quad S_1 =$ 51.0% $\quad S_{M1} = 76.5\%$

$T_a =$ 0.26 s $\quad S_{M1} = (Fv)(S_1)$ $\quad Fv =$ 1.50 $\quad S_{D1} = 51.0\%$ $\quad Cs =$ 0.128

3RD FLOOR DIAPHRAGM LOADING:

W (ROOF) =

LENGTH	WIDTH	LOAD	TOTAL
32	29	15.0	13920
44	22	15.0	14520
28	15	15.0	6300
34	3	15.0	1530
		15.0	0
Area = 2418		Sub-Total=	36270

MECHAN.

W (FLOOR) =

LENGTH	WIDTH	LOAD	TOTAL
		15.0	0
		15.0	0
		15.0	0
		15.0	0
		15.0	0
Area = 0		Sub-Total=	0

W (WALL) =

LENGTH	TRIB. HT.	LOAD	TOTAL
120	4	10.0	4800
210	4	10.0	8400
		10.0	0
		10.0	0
		10.0	0
Area = 1320		Sub-Total=	13200

TOTAL = 49470 lb

2ND FLOOR DIAPHRAGM LOADING:

W (ROOF) =

LENGTH	WIDTH	LOAD	TOTAL
57	18	15.0	15390
21	17	15.0	5355
		15.0	0
		15.0	0
		15.0	0
Area = 1383		Sub-Total=	20745

W (FLOOR) =

LENGTH	WIDTH	LOAD	TOTAL
1537	1	15.0	23055
		15.0	0
		15.0	0
		15.0	0
		15.0	0
Area = 1537		Sub-Total=	23055

W (WALL) =

LENGTH	TRIB. HT.	LOAD	TOTAL
120	8	10.0	9600
210	8	10.0	16800
80	4	10.0	3200
		10.0	0
		10.0	0
Area = 2960		Sub-Total=	29600

TOTAL = 73400 lb

1ST FLOOR DIAPHRAGM LOADING:

W (ROOF) =

LENGTH	WIDTH	LOAD	TOTAL
		15.0	0
		15.0	0
		15.0	0
		15.0	0
		15.0	0
Area = 0		Sub-Total=	0

W (FLOOR) =

LENGTH	WIDTH	LOAD	TOTAL
1998	1	15.0	29970
		15.0	0
		15.0	0
		15.0	0
		15.0	0
Area = 1998		Sub-Total=	29970

W (WALL) =

LENGTH	TRIB. HT.	LOAD	TOTAL
100	8	10.0	8000
100	8	10.0	8000
		10.0	0
		10.0	0
		10.0	0
Area = 1600		Sub-Total=	16000

TOTAL = 45970 lb

V (3RD FLOOR) = .128 x 49470 lb = 6308 lbs

V (2ND FLOOR) = .128 x 73400 lb = 9359 lbs

V (1ST FLOOR) = .128 x 45970 lb = 5862 lbs

REDISTRIBUTE:

ΣV x ρ	height	ΣV x height
6308 lb	26	164003
9359 lb	17	159104
5862 lb	8	46892
TOTAL = 21528 lb		TOTAL = 369999

$$E\ (3RD) = \frac{\Sigma V \times height \times \Sigma V\ TOTAL}{\Sigma V \times height\ TOTAL} = 9543 \text{ lbs}$$

$$E\ (2ND) = \frac{\Sigma V \times height \times \Sigma V\ TOTAL}{\Sigma V \times height\ TOTAL} = 9257 \text{ lbs}$$

$$E\ (1ST) = \frac{\Sigma V \times height \times \Sigma V\ TOTAL}{\Sigma V \times height\ TOTAL} = 2728 \text{ lbs}$$

SUMMARY:

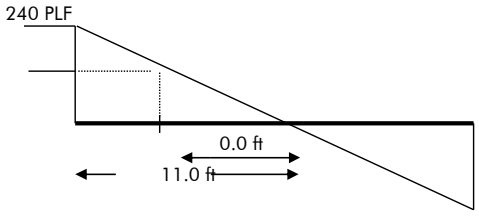
	WIND (front-rear)	WIND (left-right)	SEISMIC
ΣV (3RD) =	3400 lbs	lbs	9543 lbs
ΣV (2ND) =	7561 lbs	0 lbs	9257 lbs
ΣV (MAIN) =	8316 lbs	0 lbs	2728 lbs
TOTAL =	19277 lbs	lbs	21528 lbs

DIAPHRAGM SHEAR:

Total diaphragm length = 35.0 ft Sub-diaphragm length = 19.0 ft
Diaphragm width = 22.0 ft ΣV (3RD) = 9,543 lbs

$$v = \frac{\Sigma V(roof)}{(2)(width)} = \frac{5180\ lb}{44\ ft} = 118\ PLF$$

IBC Table 2306.3.1 ⟶ 240 PLF



USE 15/32 CDX ROOF SHEATHING OR 3/4 T&G CDX SUBFLOORING w/8d AT 6 in o/c(PANEL EDGE), END 8d AT 12in o/c(PANEL FIELD)

CHORD:

Sub-diaphragm length = 19.0 ft Total-diaphragm length = 35.0 ft
Sub-diaphragm width = 22.0 ft

$$T = \frac{M}{B} = \frac{\Sigma V \times (\text{diaphragm length})}{8 \times (\text{diaphragm width})} = \frac{5180 \times 19\ ft}{8 \times 22\ ft} = 559\ lbs$$

Top Plate Size: 2x6 Species/Grade: HF #2

Area = 8.25 in^2 F_t = 525 psi
Load duration (C_D) = 1.33 $T_{allowable}$ = Area x C_D x F_t = 5,761 lbs

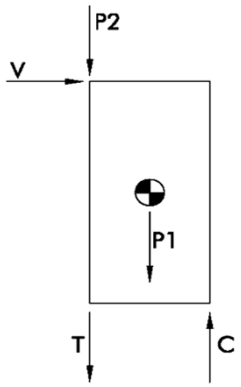
Since T allowable is greater than T applied, OK.

SHEAR CAPACITY OF 10d COMMON NAIL = 102 lbs 102 x Cd x p = 136 lbs 2018 NDS

$$\#\ OF\ NAILS\ PER\ 4\ FT\ SPLICE = \frac{559\ lbs}{136\ lbs} = 4$$

USE 2x6 HF #2 TOP PLATE W/ (8) 10d COMMON NAILS PER SPLICE.

Lateral Calculation Key



V = Shear, plf
H = Height of shearwall
L = Length of shearwall
P1 = Weight of shearwall and connected framing
P2 = Weight of adjacent wall

T = V x H - 0.5P1 - P2 = Tension reaction to be resisted by holdown
C = V x H + 0.5P1 = Compression reaction

ASD Basic Load Combinations

For calculation of tension and compression forces in compliance with ASCE 7-16 2.4.1

Tension Equations (Uplift)

7. 0.6D + W
8. $(0.6 - 0.14S_{DS})D + E$ → 0.43 D + E

*8. $(0.6 - 0.14S_{DS})D + 2.5\ E$ → 0.43 D + 2.5 E

Compression Equations

5. D + W
5. $(1 + 0.14S_{DS})D + E$ → 1.17 D + E
6. D + 0.75W + 0.75L + 0.75S
6. $(1.0 + 0.105S_{DS})D + 0.75E + 0.75L + 0.75S$ → 1.12 D + 0.75 E + 0.75 L + 0.75 S

*5. $(1 + 0.14S_{DS})D + 2.5E$ → 1.17 D + 2.5 E
*6. $(1.0 + 0.105S_{DS})D + 1.875E + 0.75L + 0.75S$ → 1.12 D +1.875 E + 0.75 L + 0.75 S

** Equations include overstrength factor.*

Note: The 0.7 factor for Earthquake loading has already been incorporated into the calculation of the lateral design force E_h, but not E_v. Therefore this factor has been omitted from equations 5, 6 and 8 where appropriate.

UPPER FL. SOUTH (REACTIONS ONLY)

SHEARWALL

Floor Info

Upper	Floor Level, e.g. Upper, Main, Lower		WIND		SEISMIC
Ft-Rr	Load Direction, e.g. Left-Right, Front-Rear		Tributary Width (Upper Floor)		Tributary Area (Upper Floor)
	(For Left Wall, Use Front-Rear Load Direction)	9.0	tributary width	9.0	tributary area
CDX	Sheathing type	46.0	total width	46.0	total area
	Values in accordance with AF&PA SDPWS-2015		Tributary Width (Main Floor)		Tributary Area (Main Floor)
Roof	Resisting Dead Load	1.0	tributary width	1.0	tributary area
	(e.g. Roof, Upper Floor, Main Floor)	2.0	total width	2.0	total area
20.00 ft	Total Length of Shearwalls		Tributary Width (Lower Floor)		Tributary Area (Lower Floor)
		1.0	tributary width	1.0	tributary area
		2.0	total width	2.0	total area

V(from upper)=	3400 lb	9543 lb	Height of Shearwall =	8.0 ft	Weight of Shearwall = 10.0 lbs
V(from main)=	0 lb	0 lb	Length of Shearwall =	20.0 ft	Tributary width for dead load = 1.0 ft
V(from lower)=	0 lb	0 lb	Aspect Ratio OK		Length of adjoining wall = 1.0 ft
Σ (Wind) =	3,400 lb	Σ (Smc) = 9,543 lb	Use alternate R factor for seismic?	No	
v =	33 PLF	v = 93 PLF			

SDPWS, Table 4.3A → 0.93 x 242 = 225 PLF → USE SW6

Seismic controls shearwall design

C_{TOTAL} =	(floor above) + (this floor) =		+ 523 lbs	= 523 lbs	Seismic controls
T_{TOTAL} =	(floor above) + (this floor) =		+ 293 lbs	= 293 lbs	Load case 8 controls - Seismic

Seismic controls holdown design

Where overstrength factor is applicable, use this value for E in equations 5, 6, and 8: E= 747 lbs

NO HOLDOWNS REQUIRED: OK

MAIN FLOOR MID (STAIR CASE)

SHEARWALL

Floor Info

Main	Floor Level, e.g. Upper, Main, Lower		WIND		SEISMIC
Ft-Rr	Load Direction, e.g. Left-Right, Front-Rear		Tributary Width (Upper Floor)		Tributary Area (Upper Floor)
	(For Left Wall, Use Front-Rear Load Direction)	9.0	tributary width	9.0	tributary area
CDX	Sheathing type	46.0	total width	46.0	total area
	Values in accordance with AF&PA SDPWS-2015		Tributary Width (Main Floor)		Tributary Area (Main Floor)
Roof	Resisting Dead Load	19.0	tributary width	19.0	tributary area
	(e.g. Roof, Upper Floor, Main Floor)	66.0	total width	66.0	total area
9.40 ft	Total Length of Shearwalls		Tributary Width (Lower Floor)		Tributary Area (Lower Floor)
		1.0	tributary width	1.0	tributary area
		2.0	total width	2.0	total area

V(from upper)=	3400 lb	9543 lb	Height of Shearwall =	8.0 ft	Weight of Shearwall = 10.0 lbs
V(from main)=	7561 lb	9257 lb	Length of Shearwall =	9.4 ft	Tributary width for dead load = 1.0 ft
V(from lower)=	0 lb	0 lb	Aspect Ratio OK		Length of adjoining wall = 1.0 ft
Σ (Wind) =	10,961 lb	Σ (Smc) = 18,800 lb	Use alternate R factor for seismic?	No	
v =	302 PLF	v = 482 PLF			

3x framing required per IBC

SDPWS, Table 4.3A → 0.93 x 595 = 553 PLF → USE SW2

Seismic controls shearwall design

C_{TOTAL} =	(floor above) + (this floor) =	523	+ 2700 lbs	= 3223 lbs	Seismic controls
T_{TOTAL} =	(floor above) + (this floor) =	293	+ 3622 lbs	= 3915 lbs	Load case 8 controls - Seismic

Seismic controls holdown design

Where overstrength factor is applicable, use this value for E in equations 5, 6, and 8: E= 3857 lbs

USE SIMPSON DESIGNED HOLDOWN: MST60

OR AT FOUNDATION / INTERIOR WALLS USE: HDU8-SDS2.5

MAIN FLOOR SOUTH (KITCHEN)

SHEARWALL

Floor Info

Main	Floor Level, e.g. Upper, Main, Lower		WIND		SEISMIC
Ft-Rr	Load Direction, e.g. Left-Right, Front-Rear		Tributary Width (Upper Floor)		Tributary Area (Upper Floor)
	(For Left Wall, Use Front-Rear Load Direction)	0.0	tributary width	0.0	tributary area
CDX	Sheathing type	2.0	total width	2.0	total area
	Values in accordance with AF&PA SDPWS-2015		Tributary Width (Main Floor)		Tributary Area (Main Floor)
Roof	Resisting Dead Load	10.0	tributary width	10.0	tributary area
	(e.g. Roof, Upper Floor, Main Floor)	66.0	total width	66.0	total area
7.00 ft	Total Length of Shearwalls		Tributary Width (Lower Floor)		Tributary Area (Lower Floor)
		1.0	tributary width	1.0	tributary area
		2.0	total width	2.0	total area

V(from upper)=	3400 lb	9543 lb	Height of Shearwall =	9.0 ft	Weight of Shearwall = 10.0 lbs
V(from main)=	7561 lb	9257 lb	Length of Shearwall =	7.0 ft	Tributary width for dead load = 1.0 ft
V(from lower)=	0 lb	0 lb	Aspect Ratio OK		Length of adjoining wall = 1.0 ft
Σ (Wind) =	10,961 lb	Σ (Smc) = 18,800 lb	Use alternate R factor for seismic?	No	
v =	164 PLF	v = 200 PLF			

SDPWS, Table 4.3A → 0.93 x 242 = 225 PLF → USE SW6

Seismic controls shearwall design

C_{TOTAL} =	(floor above) + (this floor) =		+ 1473 lbs	= 1473 lbs	Wind controls
T_{TOTAL} =	(floor above) + (this floor) =		+ 1598 lbs	= 1598 lbs	Load case 8 controls - Seismic

Seismic controls holdown design

HDU2

Where overstrength factor is applicable, use this value for E in equations 5, 6, and 8: E= 1803 lbs

USE SIMPSON DESIGNED HOLDOWN: CS14

OR AT FOUNDATION / INTERIOR WALLS USE: LSTHD8/RJ

LOWER FLOOR MID (STAIR CASE)

SHEARWALL

Floor Info

Lower	Floor Level, e.g. Upper, Main, Lower
Ft-Rr	Load Direction, e.g. Left-Right, Front-Rear
	(For Left Wall, Use Front-Rear Load Direction)
CDX	Sheathing type
	Values in accordance with AF&PA SDPWS-2015
M/FL	Resisting Dead Load
	(e.g. Roof, Upper Floor, Main Floor)
12.00 ft	Total Length of Shearwalls

WIND

Tributary Width (Upper Floor): 9.0 tributary width; 46.0 total width
Tributary Width (Main Floor): 19.0 tributary width; 66.0 total width
Tributary Width (Lower Floor): 1.0 tributary width; 2.0 total width

SEISMIC

Tributary Area (Upper Floor): 9.0 tributary area; 46.0 total area
Tributary Area (Main Floor): 19.0 tributary area; 66.0 total area
Tributary Area (Lower Floor): 1.0 tributary area; 2.0 total area

V(from upper)=	3400 lb		9543 lb
V(from main)=	7561 lb		9257 lb
V(from lower)=	8316 lb		2728 lb
Σ (Wind) =	19,277 lb	Σ (Smc) =	21,528 lb
v **=**	583 PLF	***v*** **=**	491 PLF

Height of Shearwall = 8.0 ft
Length of Shearwall = 12.0 ft
Aspect Ratio OK
Use alternate R factor for seismic? No

Weight of Shearwall = 10.0 lbs
Tributary width for dead load = 1.0 ft
Length of adjoining wall = 1.0 ft

3x framing required per IBC

SDPWS, Table 4.3A → 0.93 x 595 = 553 PLF → USE SW2

Seismic controls shearwall design

C_{TOTAL} =	(floor above) + (this floor) =	3223	+	4667 lbs	=	7890 lbs	Wind controls
T_{TOTAL} =	(floor above) + (this floor) =	3915	+	4268 lbs	=	8183 lbs	Load case 8 controls - Wind

Seismic controls holdown design

Where overstrength factor is applicable, use this value for E in equations 5, 6, and 8: E= 3931 lbs

USE SIMPSON DESIGNED HOLDOWN: CMST12
OR AT FOUNDATION / INTERIOR WALLS USE: HDU11-SDS2.5

LOWE FLOOR SOUTH(BDRM#3)

SHEARWALL

Floor Info

Lower	Floor Level, e.g. Upper, Main, Lower
Ft-Rr	Load Direction, e.g. Left-Right, Front-Rear
	(For Left Wall, Use Front-Rear Load Direction)
CDX	Sheathing type
	Values in accordance with AF&PA SDPWS-2015
M/FL	Resisting Dead Load
	(e.g. Roof, Upper Floor, Main Floor)
11.00 ft	Total Length of Shearwalls

WIND

Tributary Width (Upper Floor): 0.0 tributary width; 2.0 total width
Tributary Width (Main Floor): 10.0 tributary width; 66.0 total width
Tributary Width (Lower Floor): 7.0 tributary width; 51.0 total width

SEISMIC

Tributary Area (Upper Floor): 0.0 tributary area; 2.0 total area
Tributary Area (Main Floor): 10.0 tributary area; 66.0 total area
Tributary Area (Lower Floor): 7.0 tributary area; 51.0 total area

V(from upper)=	3400 lb		9543 lb
V(from main)=	7561 lb		9257 lb
V(from lower)=	8316 lb		2728 lb
Σ (Wind) =	19,277 lb	Σ (Smc) =	21,528 lb
v **=**	208 PLF	***v*** **=**	162 PLF

Height of Shearwall = 8.0 ft
Length of Shearwall = 11.0 ft
Aspect Ratio OK
Use alternate R factor for seismic? No

Weight of Shearwall = 10.0 lbs
Tributary width for dead load = 1.0 ft
Length of adjoining wall = 1.0 ft

SDPWS, Table 4.3A → 0.93 x 242 = 225 PLF → USE SW6

Seismic controls shearwall design

C_{TOTAL} =	(floor above) + (this floor) =		+	1663 lbs	=	1663 lbs	Wind controls
T_{TOTAL} =	(floor above) + (this floor) =		+	1293 lbs	=	1293 lbs	Load case 8 controls - Wind

Wind controls holdown design

Where overstrength factor is applicable, use this value for E in equations 5, 6, and 8: E= 1292 lbs

HDU2
USE SIMPSON DESIGNED HOLDOWN: CS14
OR AT FOUNDATION / INTERIOR WALLS USE: LSTHD8/RJ

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 22-058.ec6

LIC# : KW-06016495, Build:20.22.10.25 CK Engineering LLC (c) ENERCALC INC 1983-2022

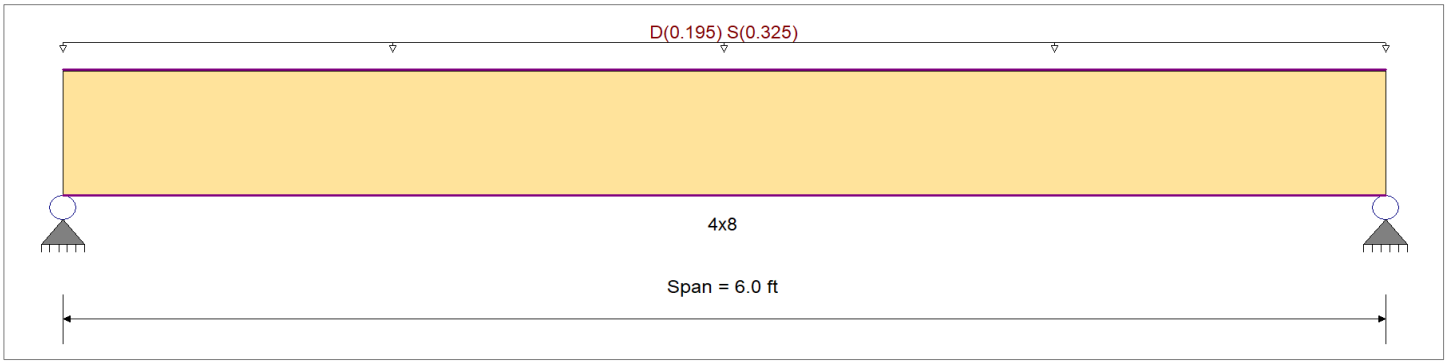
DESCRIPTION: HDR#1

CODE REFERENCES

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

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	875.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2018	Fb -	875.0 psi	Ebend- xx	1,300.0 ksi
		Fc - Prll	600.0 psi	Eminbend - xx	470.0 ksi
Wood Species :	Douglas Fir-Larch (North)	Fc - Perp	625.0 psi		
Wood Grade :	No.2	Fv	170.0 psi		
		Ft	425.0 psi	Density	30.590 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 = 0.0150, S = 0.0250 ksf, Tributary Width = 13.0 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.707 : 1	Maximum Shear Stress Ratio	=	0.383 : 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	925.30 psi	fv: Actual	=	74.81 psi
F'b	=	1,308.13 psi	F'v	=	195.50 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	3.000 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.066 in	Ratio =	1091 >=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.107 in	Ratio =	675 >=240	Span: 1 : +D+S
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 6.0 ft	1	0.345	0.186	0.90	1.00	1.00	1.00	1.300	1.00	1.00	1.00	0.90	352.9	1,023.8	0.48	28.5	153.0
+D+S					1.00	1.00	1.00	1.300	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 6.0 ft	1	0.707	0.383	1.15	1.00	1.00	1.00	1.300	1.00	1.00	1.00	2.36	925.3	1,308.1	1.27	74.8	195.5
+D+0.750S					1.00	1.00	1.00	1.300	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 6.0 ft	1	0.598	0.323	1.15	1.00	1.00	1.00	1.300	1.00	1.00	1.00	2.00	782.2	1,308.1	1.07	63.2	195.5
+0.60D					1.00	1.00	1.00	1.300	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 6.0 ft	1	0.116	0.063	1.60	1.00	1.00	1.00	1.300	1.00	1.00	1.00	0.54	211.8	1,820.0	0.29	17.1	272.0

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 22-058.ec6

LIC# : KW-06016495, Build:20.22.10.25 CK Engineering LLC (c) ENERCALC INC 1983-2022

DESCRIPTION: HDR#1

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.1066	3.022		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	1.576	1.576
Max Upward from Load Combinations	1.576	1.576
Max Upward from Load Cases	0.975	0.975
D Only	0.601	0.601
+D+S	1.576	1.576
+D+0.750S	1.332	1.332
+0.60D	0.361	0.361
S Only	0.975	0.975

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 22-058.ec6

LIC# : KW-06016495, Build:20.22.10.25 CK Engineering LLC (c) ENERCALC INC 1983-2022

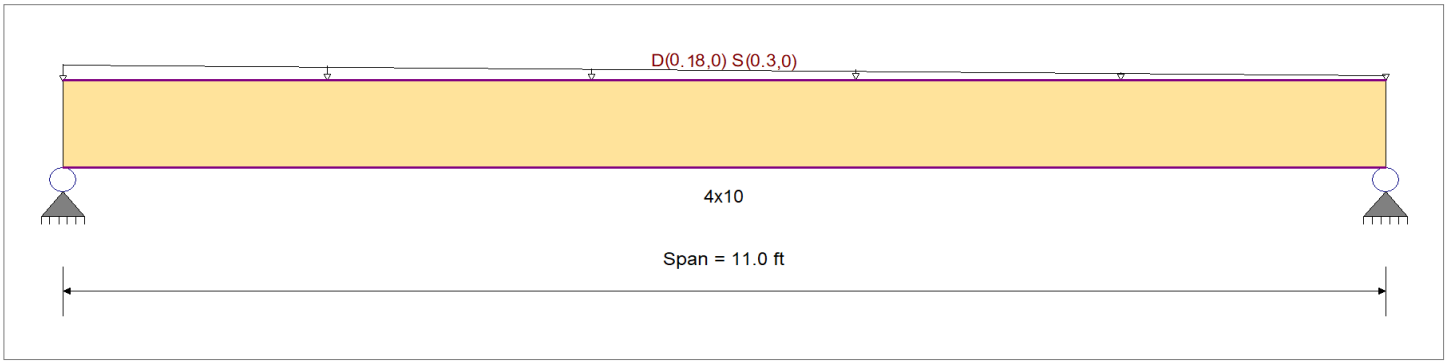
DESCRIPTION: RIDGE BEAM

CODE REFERENCES

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

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	875 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2018	Fb -	875 psi	Ebend- xx	1300 ksi
		Fc - Prll	600 psi	Eminbend - xx	470 ksi
Wood Species :	Douglas Fir-Larch (North)	Fc - Perp	625 psi		
Wood Grade :	No.2	Fv	170 psi		
		Ft	425 psi	Density	30.59 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
Varying Uniform Load : D= 0.0150->0.0, S= 0.0250->0.0 ksf, Extent = 0.0 -->> 11.0 ft, Trib Width = 12.0 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.762 : 1	Maximum Shear Stress Ratio	=	0.341 : 1
Section used for this span		4x10	Section used for this span		4x10
fb: Actual	=	920.21 psi	fv: Actual	=	66.68 psi
F'b	=	1,207.50 psi	F'v	=	195.50 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	4.657 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.166 in	Ratio =	795 >=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.273 in	Ratio =	483 >=240	Span: 1 : +D+S
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.381	0.170	0.90	1.00	1.00	1.00	1.200	1.00	1.00	1.00	1.50	360.4	945.0	0.56	25.9	153.0
+D+S					1.00	1.00	1.00	1.200	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.762	0.341	1.15	1.00	1.00	1.00	1.200	1.00	1.00	1.00	3.83	920.2	1,207.5	1.44	66.7	195.5
+D+0.750S					1.00	1.00	1.00	1.200	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.646	0.289	1.15	1.00	1.00	1.00	1.200	1.00	1.00	1.00	3.25	780.2	1,207.5	1.22	56.5	195.5
+0.60D					1.00	1.00	1.00	1.200	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.129	0.057	1.60	1.00	1.00	1.00	1.200	1.00	1.00	1.00	0.90	216.2	1,680.0	0.34	15.6	272.0

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 22-058.ec6

LIC# : KW-06016495, Build:20.22.10.25 CK Engineering LLC (c) ENERCALC INC 1983-2022

DESCRIPTION: RIDGE BEAM

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.2732	5.299		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	1.798	0.918
Max Upward from Load Combinations	1.798	0.918
Max Upward from Load Cases	1.100	0.550
D Only	0.698	0.368
+D+S	1.798	0.918
+D+0.750S	1.523	0.780
+0.60D	0.419	0.221
S Only	1.100	0.550

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 22-058.ec6

LIC# : KW-06016495, Build:20.22.10.25 CK Engineering LLC (c) ENERCALC INC 1983-2022

DESCRIPTION: BM#1

CODE REFERENCES

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

Material Properties

Analysis Method : Allowable Stress Design
Load Combination IBC 2018

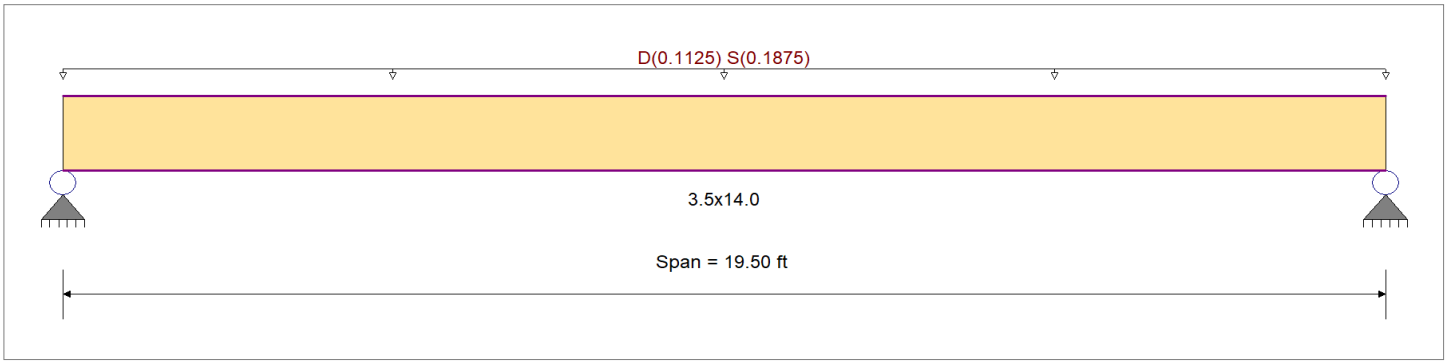
Wood Species : iLevel Truss Joist
Wood Grade : Parallam PSL 2.0E

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

Fb +	2,900.0 psi
Fb -	2,900.0 psi
Fc - Prll	2,900.0 psi
Fc - Perp	750.0 psi
Fv	290.0 psi
Ft	2,025.0 psi

E : Modulus of Elasticity

Ebend- xx	2,000.0 ksi
Eminbend - xx	1,016.54 ksi
Density	45.070 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.0150, S = 0.0250 ksf, Tributary Width = 7.50 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.480 : 1	Maximum Shear Stress Ratio	=	0.249 : 1
Section used for this span		3.5x14.0	Section used for this span		3.5x14.0
fb: Actual	=	1,573.12 psi	fv: Actual	=	83.13 psi
F'b	=	3,278.42 psi	F'v	=	333.50 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	9.750 ft	Location of maximum on span	=	18.361 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.383 in	Ratio =	610 >=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.645 in	Ratio =	362 >=240	Span: 1 : +D+S
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 19.50 ft	1	0.249	0.129	0.90	1.00	1.00	1.00	0.983	1.00	1.00	1.00	6.08	637.7	2,565.7	1.10	33.7	261.0
+D+S					1.00	1.00	1.00	0.983	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 19.50 ft	1	0.480	0.249	1.15	1.00	1.00	1.00	0.983	1.00	1.00	1.00	14.99	1,573.1	3,278.4	2.72	83.1	333.5
+D+0.750S					1.00	1.00	1.00	0.983	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 19.50 ft	1	0.409	0.212	1.15	1.00	1.00	1.00	0.983	1.00	1.00	1.00	12.76	1,339.3	3,278.4	2.31	70.8	333.5
+0.60D					1.00	1.00	1.00	0.983	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 19.50 ft	1	0.084	0.044	1.60	1.00	1.00	1.00	0.983	1.00	1.00	1.00	3.65	382.6	4,561.3	0.66	20.2	464.0

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 22-058.ec6

LIC# : KW-06016495, Build:20.22.10.25 CK Engineering LLC (c) ENERCALC INC 1983-2022

DESCRIPTION: BM#1

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.6447	9.821		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	3.075	3.075
Max Upward from Load Combinations	3.075	3.075
Max Upward from Load Cases	1.828	1.828
D Only	1.246	1.246
+D+S	3.075	3.075
+D+0.750S	2.617	2.617
+0.60D	0.748	0.748
S Only	1.828	1.828

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 22-058.ec6

LIC# : KW-06016495, Build:20.22.10.25 CK Engineering LLC (c) ENERCALC INC 1983-2022

DESCRIPTION: BM#2

CODE REFERENCES

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

Material Properties

Analysis Method : Allowable Stress Design
Load Combination IBC 2018

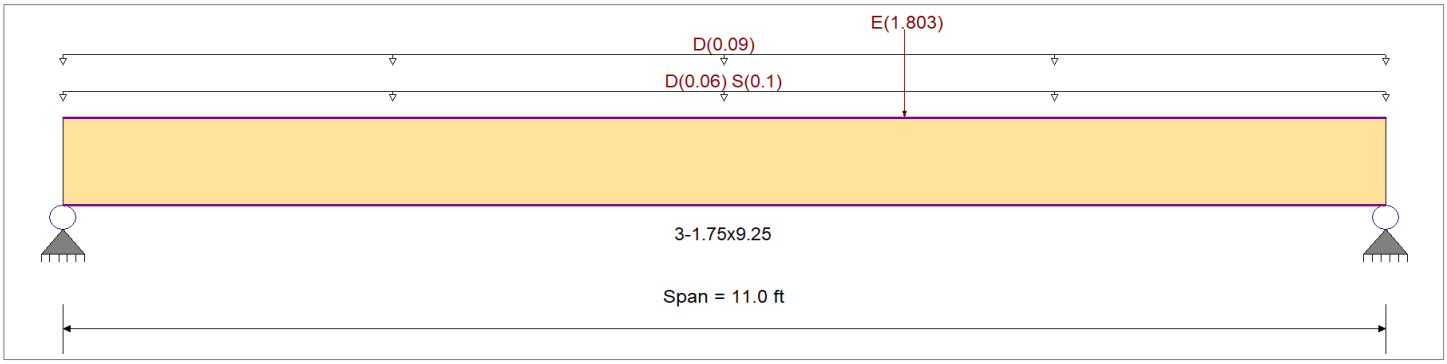
Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

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

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

E : Modulus of Elasticity

Ebend- xx	1,900.0 ksi
Eminbend - xx	965.71 ksi
Density	42.010 pcf



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.0150, S = 0.0250 ksf, Tributary Width = 4.0 ft, (ROOF)
Uniform Load : D = 0.010 ksf, Tributary Width = 9.0 ft, (WALL)
Point Load : E = 1.803 k @ 7.0 ft, (SW6)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.875 : 1	Maximum Shear Stress Ratio	=	0.415 : 1
Section used for this span		3-1.75x9.25	Section used for this span		3-1.75x9.25
fb: Actual	=	3,770.19 psi	fv: Actual	=	189.25 psi
F'b	=	4,309.90 psi	F'v	=	456.00 psi
Load Combination		+1.166D+4.550E	Load Combination		+1.166D+4.550E
Location of maximum on span	=	6.985 ft	Location of maximum on span	=	10.237 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.119 in	Ratio =	1104 >=360	Span: 1 : E Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.183 in	Ratio =	721 >=240	Span: 1 : +D+0.750S+0.5250E
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.164	0.094	0.90	1.00	1.00	1.00	1.036	1.00	1.00	1.00	2.48	398.0	2,424.3	0.78	24.0	256.5
+D+S					1.00	1.00	1.00	1.036	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.207	0.118	1.15	1.00	1.00	1.00	1.036	1.00	1.00	1.00	4.00	640.4	3,097.7	1.25	38.7	327.8
+D+0.750S					1.00	1.00	1.00	1.036	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.187	0.107	1.15	1.00	1.00	1.00	1.036	1.00	1.00	1.00	3.62	579.8	3,097.7	1.13	35.0	327.8
+1.166D+4.550E					1.00	1.00	1.00	1.036	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.875	0.415	1.60	1.00	1.00	1.00	1.036	1.00	1.00	1.00	23.52	3,770.2	4,309.9	6.13	189.3	456.0
+1.124D+0.750S+3.413E					1.00	1.00	1.00	1.036	1.00	1.00	1.00			0.0	0.00	0.0	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 22-058.ec6

LIC# : KW-06016495, Build:20.22.10.25 CK Engineering LLC (c) ENERCALC INC 1983-2022

DESCRIPTION: BM#2

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
Length = 11.0 ft	1	0.717	0.349	1.60	1.00	1.00	1.00	1.036	1.00	1.00	1.00	19.27	3,088.4	4,309.9	5.15	158.9	456.0
+0.60D					1.00	1.00	1.00	1.036	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.055	0.032	1.60	1.00	1.00	1.00	1.036	1.00	1.00	1.00	1.49	238.8	4,309.9	0.47	14.4	456.0
+0.4342D+4.550E					1.00	1.00	1.00	1.036	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 11.0 ft	1	0.812	0.376	1.60	1.00	1.00	1.00	1.036	1.00	1.00	1.00	21.84	3,500.3	4,309.9	5.56	171.7	456.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750S+0.5250E	1	0.1829	5.661		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	1.660	1.918
Max Upward from Load Combinations	1.660	1.918
Max Upward from Load Cases	0.903	1.147
D Only	0.903	0.903
+D+S	1.453	1.453
+D+0.750S	1.315	1.315
+D+0.70E	1.362	1.706
+D+0.750S+0.5250E	1.660	1.918
+0.60D	0.542	0.542
+0.60D+0.70E	1.001	1.345
S Only	0.550	0.550
E Only	0.656	1.147

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 22-058.ec6

LIC# : KW-06016495, Build:20.22.10.25 CK Engineering LLC (c) ENERCALC INC 1983-2022

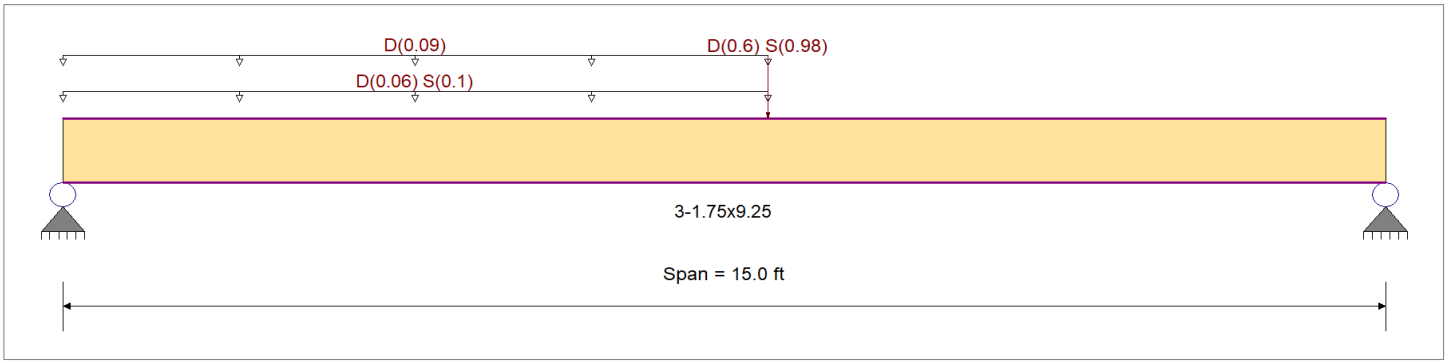
DESCRIPTION: BM#3

CODE REFERENCES

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

Material Properties

Analysis Method :	Allowable Stress Design	Fb +	2,600.0 psi	*E : Modulus of Elasticity*	
Load Combination	IBC 2018	Fb -	2,600.0 psi	Ebend- xx	1,900.0 ksi
		Fc - Prll	2,510.0 psi	Eminbend - xx	965.71 ksi
Wood Species :	iLevel Truss Joist	Fc - Perp	750.0 psi		
Wood Grade :	MicroLam LVL 1.9 E	Fv	285.0 psi		
		Ft	1,555.0 psi	Density	42.010 pcf
Beam Bracing :	Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loading
Load for Span Number 1
Uniform Load : D = 0.0150, S = 0.0250 ksf, Extent = 0.0 -->> 8.0 ft, Tributary Width = 4.0 ft, (ROOF)
Uniform Load : D = 0.010 ksf, Extent = 0.0 -->> 8.0 ft, Tributary Width = 9.0 ft, (WALL)
Point Load : D = 0.60, S = 0.980 k @ 8.0 ft, (HDR@1)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.519 : 1	Maximum Shear Stress Ratio	=	0.199 : 1
Section used for this span		3-1.75x9.25	Section used for this span		3-1.75x9.25
fb: Actual	=	1,607.21 psi	fv: Actual	=	65.11 psi
F'b	=	3,097.74 psi	F'v	=	327.75 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	7.993 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.277 in	Ratio =	649 >=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.557 in	Ratio =	322 >=240	Span: 1 : +D+S
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios										Moment Values			Shear Values		
Segment Length	Span #	M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	M	fb	F'b	V	fv	F'v
D Only														0.0	0.00	0.0	0.0
Length = 15.0 ft	1	0.323	0.137	0.90	1.00	1.00	1.00	1.036	1.00	1.00	1.00	4.88	782.7	2,424.3	1.14	35.2	256.5
+D+S					1.00	1.00	1.00	1.036	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.0 ft	1	0.519	0.199	1.15	1.00	1.00	1.00	1.036	1.00	1.00	1.00	10.03	1,607.2	3,097.7	2.11	65.1	327.8
+D+0.750S					1.00	1.00	1.00	1.036	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.0 ft	1	0.452	0.176	1.15	1.00	1.00	1.00	1.036	1.00	1.00	1.00	8.74	1,400.8	3,097.7	1.87	57.6	327.8
+1.166D					1.00	1.00	1.00	1.036	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.0 ft	1	0.212	0.090	1.60	1.00	1.00	1.00	1.036	1.00	1.00	1.00	5.69	912.5	4,309.9	1.33	41.1	456.0

Project Title:
Engineer:
Project ID:
Project Descr:

Wood Beam

Project File: 22-058.ec6

LIC# : KW-06016495, Build:20.22.10.25 CK Engineering LLC (c) ENERCALC INC 1983-2022

DESCRIPTION: BM#3

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	CD	CM	C_t	CLx	C_F	Cfu	C_i	C_r	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+1.124D+0.750S					1.00	1.00	1.00	1.036	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.0 ft	1	0.348	0.136	1.60	1.00	1.00	1.00	1.036	1.00	1.00	1.00	9.35	1,498.0	4,309.9	2.01	62.0	456.0
+0.60D					1.00	1.00	1.00	1.036	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.0 ft	1	0.109	0.046	1.60	1.00	1.00	1.00	1.036	1.00	1.00	1.00	2.93	469.6	4,309.9	0.68	21.1	456.0
+0.4342D					1.00	1.00	1.00	1.036	1.00	1.00	1.00			0.0	0.00	0.0	0.0
Length = 15.0 ft	1	0.079	0.034	1.60	1.00	1.00	1.00	1.036	1.00	1.00	1.00	2.12	339.9	4,309.9	0.50	15.3	456.0

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.5573	7.391		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	2.310	1.482
Max Upward from Load Combinations	2.310	1.482
Max Upward from Load Cases	1.266	0.746
D Only	1.266	0.746
+D+S	2.310	1.482
+D+0.750S	2.049	1.298
+0.60D	0.760	0.448
S Only	1.044	0.736

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: 22-058.ec6

DESCRIPTION: FTNG#1

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50	ksi
fy : Rebar Yield	=	40.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Soil Design Values

Allowable Soil Bearing	=	1.50	ksf
Soil Density	=	110.0	pcf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	150.0	pcf
Soil/Concrete Friction Coeff.	=	0.250	

Increases based on footing Depth

Footing base depth below soil surface	=	ft
Allow press. increase per foot of depth	=	ksf
when footing base is below	=	ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	ft

Dimensions

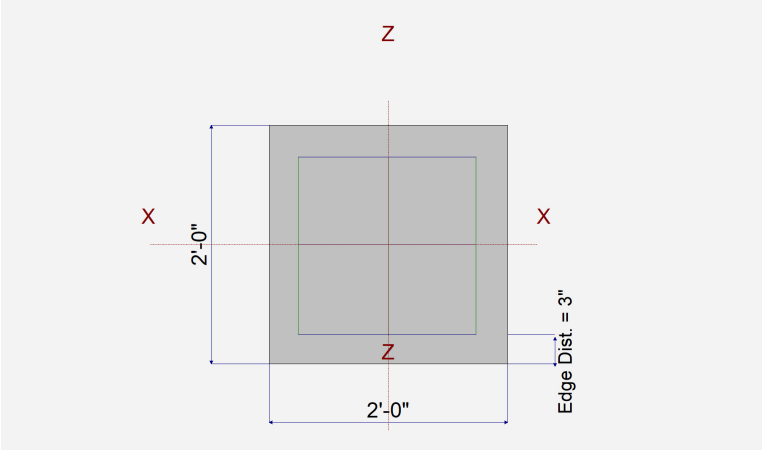
Width parallel to X-X Axis	=	2.0 ft
Length parallel to Z-Z Axis	=	2.0 ft
Footing Thickness	=	10.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	in
pz : parallel to Z-Z Axis	=	in
Height	=	in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in

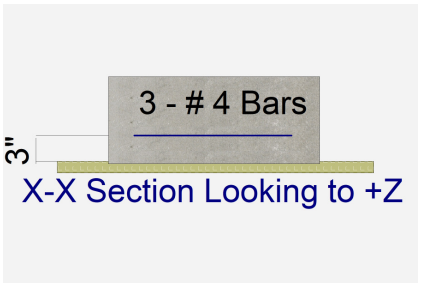


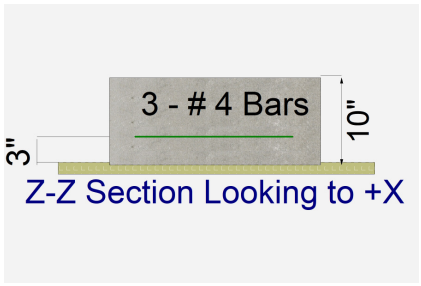
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		3
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		3.0
Reinforcing Bar Size	=	#	4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	1.250			1.830				k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: 22-058.ec6

DESCRIPTION: FTNG#1

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.5939	Soil Bearing	0.8908 ksf	1.50 ksf	+D+S about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.09091	Z Flexure (+X)	0.5535 k-ft/ft	6.088 k-ft/ft	+1.20D+1.60S
PASS	0.09091	Z Flexure (-X)	0.5535 k-ft/ft	6.088 k-ft/ft	+1.20D+1.60S
PASS	0.09091	X Flexure (+Z)	0.5535 k-ft/ft	6.088 k-ft/ft	+1.20D+1.60S
PASS	0.09091	X Flexure (-Z)	0.5535 k-ft/ft	6.088 k-ft/ft	+1.20D+1.60S
PASS	0.07380	1-way Shear (+X)	5.535 psi	75.0 psi	+1.20D+1.60S
PASS	0.07380	1-way Shear (-X)	5.535 psi	75.0 psi	+1.20D+1.60S
PASS	0.07380	1-way Shear (+Z)	5.535 psi	75.0 psi	+1.20D+1.60S
PASS	0.07380	1-way Shear (-Z)	5.535 psi	75.0 psi	+1.20D+1.60S
PASS	0.1371	2-way Punching	20.559 psi	150.0 psi	+1.20D+1.60S

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	1.50	n/a	0.0	0.4333	0.4333	n/a	n/a	0.289
X-X, +D+S	1.50	n/a	0.0	0.8908	0.8908	n/a	n/a	0.594
X-X, +D+0.750S	1.50	n/a	0.0	0.7765	0.7765	n/a	n/a	0.518
X-X, +0.60D	1.50	n/a	0.0	0.260	0.260	n/a	n/a	0.173
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.4333	0.4333	0.289
Z-Z, +D+S	1.50	0.0	n/a	n/a	n/a	0.8908	0.8908	0.594
Z-Z, +D+0.750S	1.50	0.0	n/a	n/a	n/a	0.7765	0.7765	0.518
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.260	0.260	0.173

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturning				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0.2188	+Z	Bottom	0.2160	AsMin	0.30	6.088	OK
X-X, +1.40D	0.2188	-Z	Bottom	0.2160	AsMin	0.30	6.088	OK
X-X, +1.20D	0.1875	+Z	Bottom	0.2160	AsMin	0.30	6.088	OK
X-X, +1.20D	0.1875	-Z	Bottom	0.2160	AsMin	0.30	6.088	OK
X-X, +1.20D+0.50S	0.3019	+Z	Bottom	0.2160	AsMin	0.30	6.088	OK
X-X, +1.20D+0.50S	0.3019	-Z	Bottom	0.2160	AsMin	0.30	6.088	OK
X-X, +1.20D+1.60S	0.5535	+Z	Bottom	0.2160	AsMin	0.30	6.088	OK
X-X, +1.20D+1.60S	0.5535	-Z	Bottom	0.2160	AsMin	0.30	6.088	OK
X-X, +1.20D+0.70S	0.3476	+Z	Bottom	0.2160	AsMin	0.30	6.088	OK
X-X, +1.20D+0.70S	0.3476	-Z	Bottom	0.2160	AsMin	0.30	6.088	OK
X-X, +0.90D	0.1406	+Z	Bottom	0.2160	AsMin	0.30	6.088	OK
X-X, +0.90D	0.1406	-Z	Bottom	0.2160	AsMin	0.30	6.088	OK
Z-Z, +1.40D	0.2188	-X	Bottom	0.2160	AsMin	0.30	6.088	OK
Z-Z, +1.40D	0.2188	+X	Bottom	0.2160	AsMin	0.30	6.088	OK
Z-Z, +1.20D	0.1875	-X	Bottom	0.2160	AsMin	0.30	6.088	OK
Z-Z, +1.20D	0.1875	+X	Bottom	0.2160	AsMin	0.30	6.088	OK
Z-Z, +1.20D+0.50S	0.3019	-X	Bottom	0.2160	AsMin	0.30	6.088	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: 22-058.ec6

DESCRIPTION: FTNG#1

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D+0.50S	0.3019	+X	Bottom	0.2160	AsMin	0.30	6.088	OK
Z-Z, +1.20D+1.60S	0.5535	-X	Bottom	0.2160	AsMin	0.30	6.088	OK
Z-Z, +1.20D+1.60S	0.5535	+X	Bottom	0.2160	AsMin	0.30	6.088	OK
Z-Z, +1.20D+0.70S	0.3476	-X	Bottom	0.2160	AsMin	0.30	6.088	OK
Z-Z, +1.20D+0.70S	0.3476	+X	Bottom	0.2160	AsMin	0.30	6.088	OK
Z-Z, +0.90D	0.1406	-X	Bottom	0.2160	AsMin	0.30	6.088	OK
Z-Z, +0.90D	0.1406	+X	Bottom	0.2160	AsMin	0.30	6.088	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	2.19 psi	2.19 psi	2.19 psi	2.19 psi	2.19 psi	75.00 psi	0.03	OK
+1.20D	1.88 psi	1.88 psi	1.88 psi	1.88 psi	1.88 psi	75.00 psi	0.03	OK
+1.20D+0.50S	3.02 psi	3.02 psi	3.02 psi	3.02 psi	3.02 psi	75.00 psi	0.04	OK
+1.20D+1.60S	5.54 psi	5.54 psi	5.54 psi	5.54 psi	5.54 psi	75.00 psi	0.07	OK
+1.20D+0.70S	3.48 psi	3.48 psi	3.48 psi	3.48 psi	3.48 psi	75.00 psi	0.05	OK
+0.90D	1.41 psi	1.41 psi	1.41 psi	1.41 psi	1.41 psi	75.00 psi	0.02	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	8.13 psi	150.00 psi	0.05417	OK
+1.20D	6.96 psi	150.00 psi	0.04643	OK
+1.20D+0.50S	11.21 psi	150.00 psi	0.07475	OK
+1.20D+1.60S	20.56 psi	150.00 psi	0.1371	OK
+1.20D+0.70S	12.91 psi	150.00 psi	0.08608	OK
+0.90D	5.22 psi	150.00 psi	0.03482	OK