Trygstad
ENGINEERING

CALCULATION
SECTION 1.0:
LOADING

SHEET TITLE: **DEAD LOAD SUMMARY**
PROJECT: Scharhon Addition

1.1) ESTIMATED DEADLOADS

RESIDENTIAL TRUSSED ROOF		
Roofing -	3.5	psf
1/2" plywood (O.S.B.) [O/Framir	1.8	psf
Over-Framing	2.0	psf
1/2" plywood (O.S.B.)	1.8	psf
Trusses at 24" o.c.	3.4	psf
Insulation	1.0	psf
(1) 5/8" gypsum ceiling	2.8	psf
Misc./Mech.	1.7	psf
ROOF DEAD LOAD	**18.0**	**PSF**
FUTURE P.V. AUX. LOAD	**5.0**	**PSF**

RESIDENTIAL FLOOR (NO GYPCRETE)		
floor finish	4.0	psf
3/4" plywood (O.S.B.)	2.7	psf
Joists @ 16" o.c.	2.5	psf
Insulation	1.0	psf
(1) 5/8" gypsum ceiling	2.8	psf
Misc.	2.0	psf
FLOOR DEAD LOAD	**15.0**	**PSF**

Trygstad
ENGINEERING

CALCULATION
SECTION 2.0:
ROOF FRAMING

LOADING & LABELING KEY

TYPE: B=BEAM R=RAFTER J=JOIST

BM. CALC SEQ. NO.

BEAM LABEL: 2FB08

FLOOR OR ROOF LEVEL: 2=2ND,ETC. L=LOW

LEVEL: R=ROOF F=FLOOR

LINE LOADING [PLF]

BEAM TRANSFER	WALL TRANSFER	*AT DECKS, LL=60 PSF
		"RED" = ROOF ONLY [25 S+18D+5PV]...48
		"YELLOW" = TOP FLR [40L*+15D]
		"ORANGE" = ROOF + FLR
		"BLUE" = LOWER FLOOR ONLY [40L*+15D]
		"GREEN" = MULTIPLE FLOORS

POINT LOADING [K]

- BM. LOAD (THIS LVL.)TO TRANSFER BM
- COL. LOAD TO LVL. BELOW
- COL. LOAD FROM ABV. TO TRANSFER BM
- KING POST W/IN LVL TO TRANSFER BM

Framing Notes

1. REFER TO S9.1 FOR TYPICAL FRAMING DETAILS
2. ROOF FRAMING – PREMANUFACTURED TRUSSES (PMT) OR RAFTERS PER PLAN. 2x4 ON-EDGE OUTRIGGERS (O.R.) @ 24" O.C.
3. FLOOR FRAMING – TJI JOISTS PER PLAN. BLOCKING AT BEARING AND SHEARWALLS SHALL BE PER BEARING AND SHEARWALL SCHEDULE (VERIFY EXIST. BRG. LOC.). FLOOR SHEATHING SHALL BE GLUED AND NAILED.
4. WALLS INDICATED ARE BELOW THE FRAMING LEVEL (REFER TO SYMBOL KEY FOR TYPE). SEE BEARING WALL SCHEDULE THIS SHEET
5. PLUMBING, MECHANICAL, AND ELECTRICAL SYSTEMS SHALL BE DESIGNED AND BUILT TO ACCOMMODATE 3/8" PER FLOOR WOOD SHRINKAGE.
6. SEE DETAIL 1/S9.1 FOR TYPICAL HEADER/BUNDLED STUD CONSTRUCTION.
7. SEE ARCHITECTURAL FOR DRAFTSTOP AND VENTING LOCATIONS.
8. FRAMING MEMBERS AND SHEATHING SHALL BE PER STRUCTURAL NOTES AS NOTED ON SHEET S1.1
9. ALL UNLABELED EXTERIOR WALLS ARE TO BE TYPE 'P6'; SEE SHEARWALL SCHEDULE ON SHEET S1.2
10. HANGERS INDICATED ARE AS MANUFACTURED BY SIMPSON STRONG-TIE. SEE SEC. 06103/S1.1 FOR TYPICAL HANGERS, U.N.O..
11. PROVIDE JOIST OR BLOCKING ATOP SHEARWALLS.
12. SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS AND TOP PLATE ELEVATIONS.
13. BUNDLED STUDS FROM THIS LEVEL SHALL BE CONTINUED DOWN TO FOUNDATION OR SUPPORTING BEAM. (RE: 4/S9.1)
14. ALL BEAMS AND HEADERS SHALL HAVE A MINIMUM OF (1) FULL HEIGHT STUD AT EACH END FOR BRACING TYPICAL UNLESS NOTED OTHERWISE.
15. PROVIDE MINIMUM (2) 2X BUNDLED STUDS UNDER EACH BEAM END, TYPICAL UNLESS NOTED OTHERWISE. (AT HEADERS: TRIMMER+KING=2 BUNDLED STUDS)
16. SEE DETAILS 19 & 20 ON SHEET S1.3 FOR TYPICAL CORNER FRAMING DETAILS AT HOLD DOWNS & SHEARWALLS..
17. HANGER OCCURS WHERE FLUSH BEAM HANGS TO SUPPORT BEAMS, TYP. U.N.O.

Framing Legend

- SW TYPE 'P#' PER 14/S1.2
- *EXTENDS O/OPENING (7/S1.2)
- STHD##/MST##/.... [L2 "A" SW] VERT. STRAP/ HOLD DOWN PER 10/S1.3
- UNDERLINED: EXTEND SHEATHING INTO ABUTTING WALL
- HOLD DOWN @ END OF SW ON: LEVEL & GRID
- SHEATHED WALL (SHEARWALL)
- POST IN LEVEL ABV.
- BEAM SIZE
- BEAM MATERIAL REFER TO SHT. S1.1- SEC. 06100, 06185, 06190
- 5 1/4x11 7/8 PSL FB
- BEAM LOCATION: FB – FLUSH BEAM (3/S9.1); FB(U) – FLUSH BEAM UPTURNED; FB(D) – FLUSH BEAM DOWNTURNED; DB – DROPPED BEAM (3/S9.1); HR – HEADER (1/S9.1)
- OUTLINE OF NEW ROOF OR FLR. ABOVE
- KING STUD
- TRIMMER STUD

Note:
PLANS PREPARED USING ARCHITECTURAL BACKGROUNDS RECEIVED 07/23/2024

Bearing Wall Stud Schedule

BEARING WALL TYPE	STUD SIZE AND SPACING, U.N.O.
EXTERIOR	2 X 6 AT 16" O.C., U.N.O.
INTERIOR NON-BEARING	2 X 4 AT 16 O.C.

BEARING WALL NOTES
1. SEE SHEARWALL SCHEDULE SHEET S1.2 FOR WALL SHEATHING, ADDITIONAL PLATE AND STUD REQUIREMENTS, BLOCKING AND PLATE NAILING. SEE SAWN LUMBER STRUCTURAL NOTES SHEET S1.1 FOR SPECIES AND GRADE OF WALL PLATES AND STUDS.
2. SECURE SILL PLATES TO CONCRETE WITH ⅝" DIA. ANCHOR BOLTS AT 48" ON CENTER TYPICAL UNLESS NOTED OTHERWISE. RE:S1.2. REFER TO SHEARWALL AND HOLDOWN SCHEDULE FOR ADDITIONAL ANCHOR BOLT REQUIREMENTS. WHERE PRESERVATIVE TREATED WOOD IS USED, REFER TO THAT NOTE SECTION FOR CORROSION PROTECTION REQUIREMENTS FOR CONNECTORS.
3. SEE 2/S9.1 FOR TOP PLATE SPLICE. PROVIDE ADDITIONAL CONNECTORS AT SHEARWALLS AS INDICATED ON THE PLANS.
4. ALIGN STUDS UNDER JOISTS

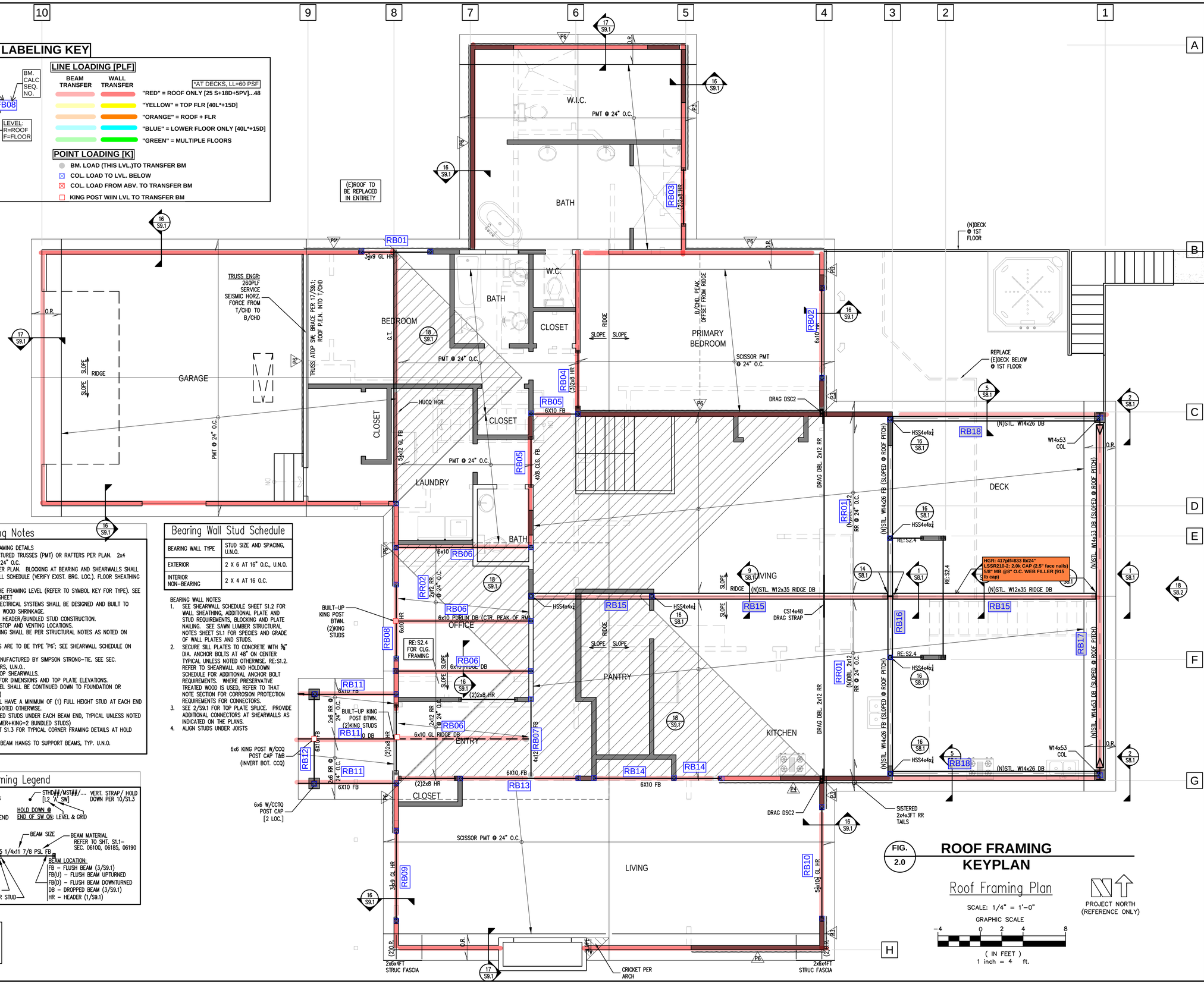


FIG. 2.0 **ROOF FRAMING KEYPLAN**

Roof Framing Plan

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

GRAPHIC SCALE
−4 0 2 4 8
(IN FEET)
1 inch = 4 ft.

PROJECT NORTH (REFERENCE ONLY)

CONSTRUCTION AND REMODELING

SCHARHON - RESIDENCE

9150 SE 54th St, Mercer Island, WA 98040

Permit check set

TE Job # 24310

Description	Date
Permit Intake	07/29/24

Tryg·stad ENGINEERING
nels@trygstadeng.com
(208)262-6884

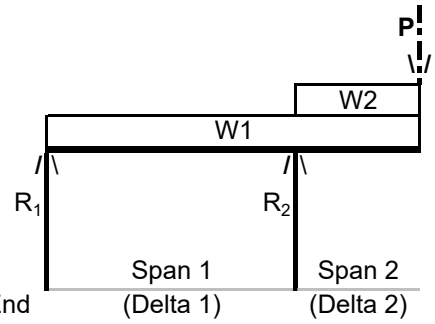
Stamp/Approval:

Sheet Name: ROOF FRAMING PLAN

Sheet No: S2.3

RR01) ROOF RAFTERS OVER LIVING ROOM

OVERHANGING CANTILEVER



Span 1 =	17.1	ft
Span 2 =	1	ft
Spacing =	24	in o.c.
Uniform Load W1 =	96	lb/ft
Add'l. Uniform Load W2 =	0	lb/ft
Concentrated Load =	0	lb @ Cantilever End

V_{max} =	824 lb	R_{1Max} =	821 lb
M_{max} =	3509 lb-ft	R_{2Max} =	920 lb

Nominal Beam Size: b = 2 in. d= 12 in. Number of Sections = 2

b_{act} = 1.50 in. d_{act} = 11.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- Y

POST?: NO

Design Stresses and Factors:

		C_L=	0.89	isture > 19%?	NO
Fv =	145 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	850 psi	Cr =	1.15	$C_{M(b)}$ =	1.00
Fc|| =	1,300 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	1.3E+06 psi	Delta1=L/	360	$C_{M(E)}$ =	1.00
Emin =	.47E+06 psi	Delta2=L/	360	Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	32.6	**145**
Fb (psi)	665	**871**
Delta1(in)	0.40	**0.57**
Delta2(in)	0.00	**0.07**

Section Properties		
	Required	Provided
A (in2)	7.6	33.8
Sx (in3)	48.4	63.3
I (1) (in4)	249.2	356.0
I (2) (in4)	5.7	356.0

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.76 inches

UNBAL. UPLIFT AT R1 = -3 LBS

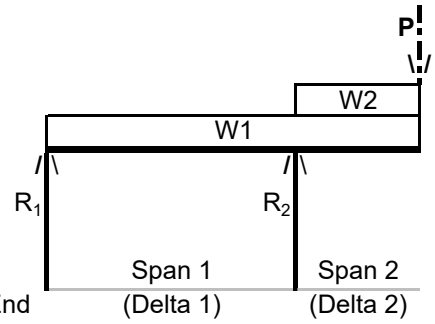
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 145 psi

USE: (2) 2 x 12 HF2 @ 24 IN. O.C.

RR02) ROOF RAFTERS OVER OFFICE AND ENTRY

OVERHANGING CANTILEVER



Span 1 =	10	ft
Span 2 =	1	ft
Spacing =	24	in o.c.
Uniform Load W1 =	96	lb/ft
Add'l. Uniform Load W2 =	0	lb/ft
Concentrated Load =	0	lb @ Cantilever End

V_{max} =	485 lb	R_{1Max} =	480 lb
M_{max} =	1200 lb-ft	R_{2Max} =	581 lb

Nominal Beam Size: b = 2 in. d= 12 in. Number of Sections = 1

b_{act} = 1.50 in. d_{act} = 11.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- Y

POST?: NO

Design Stresses and Factors:

			C_L=	0.48	isture > 19%?	NO	
Fv =	145	psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	850	psi	Cr =	1.15	$C_{M(b)}$ =	1.00	
Fc|| =	1,300	psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405	psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06	psi	Delta1=L/	360	$C_{M(E)}$ =	1.00	
Emin =	.47E+06	psi	Delta2=L/	360	Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	35.1	**145**
Fb (psi)	455	**470**
Delta1(in)	0.09	**0.33**
Delta2(in)	0.00	**0.07**

Section Properties		
	Required	Provided
A (in2)	4.1	16.9
Sx (in3)	30.6	31.6
I (1) (in4)	49.8	178.0
I (2) (in4)	3.4	178.0

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.96 inches

UNBAL. UPLIFT AT R1 = -5 LBS

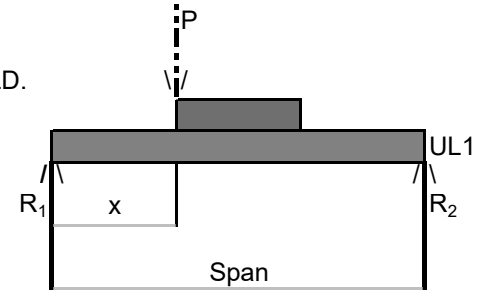
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 145 psi

USE: 2 x 12 HF2 @ 24 IN. O.C.

RB01) GRID B BEDROOM HEADER CARRYING GRID 8 GT

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 6.4 ft

	Load		
Uniform Load 1 (full span) =	0 lb/ft		
Uniform Load 2 (lbs/ft) =	627	from x = 0	3.1 feet
Sum UL1 + UL2 =	0		
Concentrated Load (lbs) =	4500	@ x = 3.1 feet	

		Reactions	
V_{max} =	3793 lb	R_1 =	3793 lb
M_{max} =	8533 lb-ft	R_2 =	2650 lb

Nominal Beam Size: b = 3.5 in. d= 9 in. Number of Sections = 1
b_{act} = 3.50 in. d_{act} = 9.00 in.

Lumber Species/Type:---------- GLB REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L =	0.98	Moisture > 19%?	N
Fv =	240 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	2,400 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	1,650 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	650 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	1.8E+06 psi	Delta = L/	360	$C_{M(E)}$ =	1.00
Emin =	.93E+06 psi			Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	180.63	**240**
Fb (psi)	2167	**2363**
Delta (in.)	0.14	**0.21**

Section Properties		
	Required	Provided
A (in2)	**23.7**	31.5
Sx (in3)	**43.3**	47.3
I (in4)	**139.5**	212.6

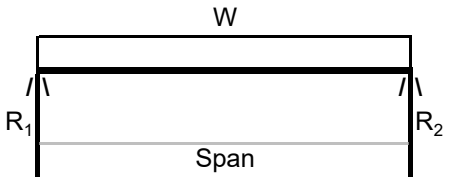
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.67 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 240 psi

USE: 3.5 x 9 IN. 24F-V4 GLB

RB02) PRIMARY BED EAST WDW DR @ GRID 4

SIMPLE SPAN - UNIFORM LOAD



Span = 8.25 ft

Uniform Load (full span), W = 617 lb/ft

V_{max} = 2545 lb
M_{max} = 5249 lb-ft

Reactions
R_1 = 2545 lb
R_2 = 2545 lb

Nominal Beam Size: b = 6 in. d= 10 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 9.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N
Post?: NO
Design Stresses and Factors:

			C_L=	0.99	Moisture > 19%?	N	
Fv =	140	psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	1,050	psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	750	psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405	psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06	psi	δ_{TOTAL}=L/	360	$C_{M(E)}$ =	1.00	
Emin =	.47E+06	psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	59.0	**140**
Fb (psi)	761	**1044**
Delta (in.)	0.13	**0.28**

Section Properties		
	Required	Provided
A (in2)	**22.04**	52.3
Sx (in3)	**60.36**	82.73
I (in4)	**179.89**	393.0

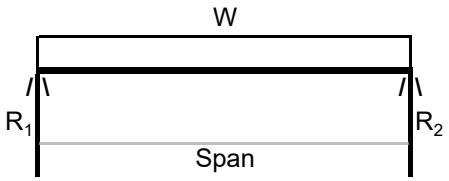
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.14 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = < Fv' = 140 psi

USE: (1) 6 x 10 HF1

RB03) GRID 5 WDW HEADER @ BATH

SIMPLE SPAN - UNIFORM LOAD



Span = 5.25 ft

Uniform Load (full span), W = 536 lb/ft

Reactions

V_{max} = 1407 lb — R_1 = 1407 lb

M_{max} = 1847 lb-ft — R_2 = 1407 lb

Nominal Beam Size: b = 2 in. d= 8 in. Number of Sections = 2

b_{act} = 1.50 in. d_{act} = 7.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

				C_L=	0.99	Moisture > 19%?	N
Fv =	145	psi		LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	850	psi		Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	1,300	psi		Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	405	psi		$CF_{(B)}$ =	1.20	$C_{M(c\perp)}$ =	1.00
E =	1.3E+06	psi		δ_{TOTAL}=L/	360	$C_{M(E)}$ =	1.00
Emin =	.47E+06	psi				Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	74.7	**145**
Fb (psi)	843	**1009**
Delta (in.)	0.07	**0.18**

Section Properties		
	Required	Provided
A (in2)	**11.21**	21.8
Sx (in3)	**21.96**	26.28
I (in4)	**40.27**	95.3

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.16 inches

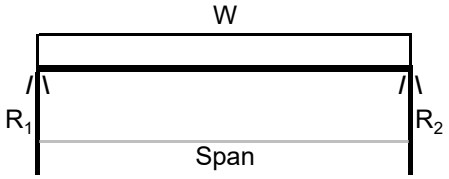
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 145 psi

USE: (2) 2 x 8 HF2

RB04) GRID 6 HEADER @ WEST END OF PRIMARY BED

SIMPLE SPAN - UNIFORM LOAD



Span = 5.1 ft

Uniform Load (full span), W = 960 lb/ft

V_{max} = 2448 lb
M_{max} = 3121 lb-ft

Reactions
R_1 = 2448 lb
R_2 = 2448 lb

Nominal Beam Size: b = 2 in. d= 8 in. Number of Sections = 3
b_{act} = 1.50 in. d_{act} = 7.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- N
Post?: NO
Design Stresses and Factors:

			C_L=	1.00	Moisture > 19%?	N	
Fv =	145	psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	850	psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	1,300	psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405	psi	$CF_{(B)}$ =	1.20	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06	psi	δ_{TOTAL}=L/	360	$C_{M(E)}$ =	1.00	
Emin =	.47E+06	psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	85.9	**145**
Fb (psi)	950	**1016**
Delta (in.)	0.08	**0.17**

Section Properties		
	Required	Provided
A (in2)	**19.32**	32.6
Sx (in3)	**36.88**	39.42
I (in4)	**66.12**	142.9

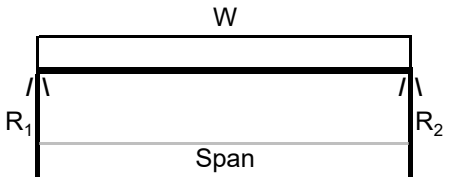
0 INCH ϕ HOLE SEC. REDUC.	
0.0	in3
0.0	in4

REQ'D END BEARING = 1.34 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = < Fv' = 145 psi

USE: (3) 2 x 8 HF2

RB05) GRID 6.5 HEADER TO LAUNDRY & HALL @ GRID C

SIMPLE SPAN - UNIFORM LOAD



Span = 4.6 ft

Uniform Load (full span), W = 465 lb/ft

V_{max} = 1070 lb
M_{max} = 1230 lb-ft

Reactions
R_1 = 1070 lb
R_2 = 1070 lb

Nominal Beam Size: b = 4 in. d= 8 in. Number of Sections = 1
b_{act} = 3.50 in. d_{act} = 7.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- N
Post?: NO
Design Stresses and Factors:

			C_L=	0.99	Moisture > 19%?	N	
Fv =	145	psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	850	psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	1,300	psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405	psi	$CF_{(B)}$ =	1.20	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06	psi	δ_{TOTAL}=L/	360	$C_{M(E)}$ =	1.00	
Emin =	.47E+06	psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	46.6	**145**
Fb (psi)	481	**1013**
Delta (in.)	0.03	**0.15**

Section Properties		
	Required	Provided
A (in2)	**8.16**	25.4
Sx (in3)	**14.57**	30.66
I (in4)	**23.50**	111.1

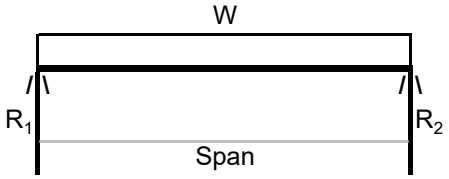
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.75 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = < Fv' = 145 psi

USE: (1) 4 x 8 HF2

RB06) PURLINS @ OFFICE @ ENTRY (4 LOC)

SIMPLE SPAN - UNIFORM LOAD



Span = 12.6 ft

Uniform Load (full span), W = 280 lb/ft

V_{max} = 1764 lb
M_{max} = 5557 lb-ft

Reactions
R_1 = 1764 lb
R_2 = 1764 lb

Nominal Beam Size: b = 6 in. d= 10 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 9.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N
Post?: NO
Design Stresses and Factors:

			C_L=	0.99	Moisture > 19%?	N	
Fv =	140	psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	1,050	psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	750	psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405	psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06	psi	δ_{TOTAL}=L/	360	$C_{M(E)}$ =	1.00	
Emin =	.47E+06	psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	44.3	**140**
Fb (psi)	806	**1040**
Delta (in.)	0.31	**0.42**

Section Properties		
	Required	Provided
A (in2)	**16.53**	52.3
Sx (in3)	**64.11**	82.73
I (in4)	**290.82**	393.0

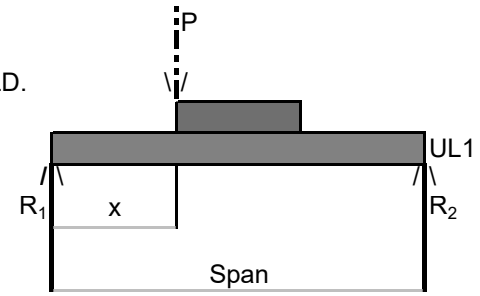
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.79 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = < Fv' = 140 psi

USE: (1) 6 x 10 HF1

RB07) SLOPED BEAM @ ENTRY CARRY RB06 RIDGE

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 7.4 ft

	Load		
Uniform Load 1 (full span) =	0 lb/ft		
Uniform Load 2 (lbs/ft) =	0	from x = 0	3.7 feet
Sum UL1 + UL2 =	0		
Concentrated Load (lbs) =	1800	@ x = 3.7 feet	

		Reactions	
V_{max} =	900 lb	R_1 =	900 lb
M_{max} =	3330 lb-ft	R_2 =	900 lb

Nominal Beam Size: b = 4 in. d= 12 in. Number of Sections = 1
b_{act} = 3.50 in. d_{act} = 11.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L =	0.98	Moisture > 19%?	N
Fv =	145 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	850 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	1,300 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.10	$C_{M(c\perp)}$ =	1.00
E =	1.3E+06 psi	Delta = L/	360	$C_{M(E)}$ =	1.00
Emin =	.47E+06 psi			Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	34.29	**145**
Fb (psi)	541	**918**
Delta (in.)	0.05	**0.25**

Section Properties		
	Required	Provided
A (in2)	**9.3**	39.4
Sx (in3)	**43.5**	73.8
I (in4)	**81.4**	415.3

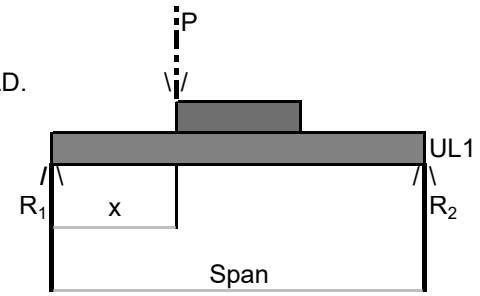
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.63 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 145 psi

USE: (1) 4 x 12 HF2

RB08) GRID 8 HEADER @ OFFICE CARRYING RB06

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 6.6 ft

	Load			
Uniform Load 1 (full span) =	370 lb/ft			
Uniform Load 2 (lbs/ft) =	0	from x =	0	3.3 feet
Sum UL1 + UL2 =	370			
Concentrated Load (lbs) =	1800	@ x =	3.3 feet	

		Reactions	
V_{max} =	2121 lb	R_1 =	2121 lb
M_{max} =	4985 lb-ft	R_2 =	2121 lb

Nominal Beam Size: b = 6 in. d= 10 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 9.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N
Fv =	140 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	1,050 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	750 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	1.3E+06 psi	Delta = L/	360	$C_{M(E)}$ =	1.00
Emin =	.47E+06 psi			Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	52.48	**140**
Fb (psi)	723	**1045**
Delta (in.)	0.07	**0.22**

Section Properties		
	Required	Provided
A (in2)	**19.6**	52.3
Sx (in3)	**57.3**	82.7
I (in4)	**120.4**	393.0

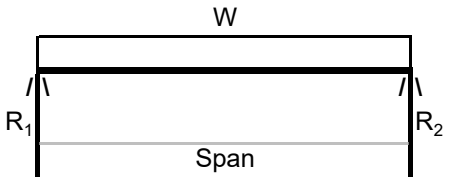
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.95 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 140 psi

USE: (1) 6 x 10 HF1

RB09) GRID 8 HEADER @ LIVING ROOM

SIMPLE SPAN - UNIFORM LOAD



Span = 8.1 ft

Uniform Load (full span), W = 1018 lb/ft

V_{max} = 4123 lb
M_{max} = 8349 lb-ft

Reactions
R_1 = 4123 lb
R_2 = 4123 lb

Nominal Beam Size: b = 3.5 in. d= 9 in. Number of Sections = 1
b_{act} = 3.50 in. d_{act} = 9.00 in.

Lumber Species/Type:---------- GLB REPETITIVE MEMBER?---------- N
Post?: NO
Design Stresses and Factors:

			C_L=	0.98	Moisture > 19%?	N	
Fv =	240	psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	2,400	psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	1,650	psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	650	psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00	
E =	1.8E+06	psi	δ_{TOTAL}=L/	360	$C_{M(E)}$ =	1.00	
Emin =	.93E+06	psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	160.0	**240**
Fb (psi)	2120	**2353**
Delta (in.)	0.26	**0.27**

Section Properties		
	Required	Provided
A (in2)	**21.00**	31.5
Sx (in3)	**42.59**	47.25
I (in4)	**202.88**	212.6

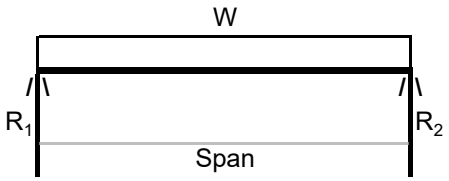
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.81 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = < Fv' = 240 psi

USE: 3.5 x 9 IN. 24F-V4 GLB

RB10) LIVING ROOM EASTERN WDW HEADER

SIMPLE SPAN - UNIFORM LOAD



Span = 10.2 ft

Uniform Load (full span), W = 1018 lb/ft

V_{max} = 5192 lb
M_{max} = 13239 lb-ft

Reactions
R_1 = 5192 lb
R_2 = 5192 lb

Nominal Beam Size: b = 5.5 in. d= 10.5 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 10.50 in.

Lumber Species/Type:---------- GLB REPETITIVE MEMBER?---------- N
Post?: NO
Design Stresses and Factors:

			C_L=	0.99	Moisture > 19%?	N	
Fv =	240	psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	2,400	psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	1,650	psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	650	psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00	
E =	1.8E+06	psi	δ_{TOTAL}=L/	360	$C_{M(E)}$ =	1.00	
Emin =	.93E+06	psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	111.7	**240**
Fb (psi)	1572	**2376**
Delta (in.)	0.26	**0.34**

Section Properties		
	Required	Provided
A (in2)	**26.88**	57.8
Sx (in3)	**66.88**	101.06
I (in4)	**405.12**	530.6

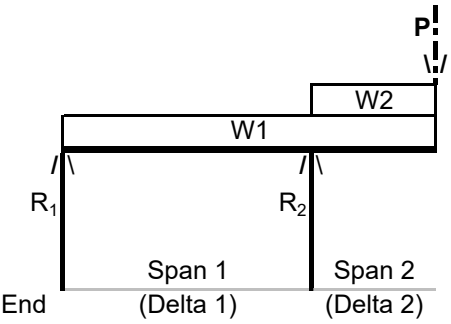
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.45 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = < Fv' = 240 psi

USE: 5.5 x 10-1/2 IN. 24F-V4 GLB

RB11) ENTRY CANOPY BEAM

OVERHANGING CANTILEVER



Span 1 =	7.5	ft
Span 2 =	1.5	ft
Uniform Load W1 =	200	lb/ft
Add'l. Uniform Load W2 =	0	lb/ft
Concentrated Load =	0	lb @ Cantilever End

V_{max} =	780 lb	R_{1Max} =	750 lb
M_{max} =	1406 lb-ft	R_{2Max} =	1080 lb

Nominal Beam Size: b = 6 in. d= 10 in. Number of Sections = 1

b_{act} = 5.50 in. d_{act} = 9.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N

POST?: NO

Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	NO
Fv =	140 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	1,050 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	750 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	1.3E+06 psi	Delta1=L/	360	$C_{M(E)}$ =	1.00
Emin =	.47E+06 psi	Delta2=L/	360	Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	17.8	**140**
Fb (psi)	204	**1044**
Delta1(in)	0.03	**0.25**
Delta2(in)	0.00	**0.10**

Section Properties		
	Required	Provided
A (in2)	6.7	52.3
Sx (in3)	16.2	82.7
I (1) (in4)	43.8	393.0
I (2) (in4)	12.9	393.0

0 INCH ϕ HOLE SEC. REDUC.	
0.0	in3
0.0	in4

REQ'D END BEARING = 0.48 inches

UNBAL. UPLIFT AT R1 = -30 LBS

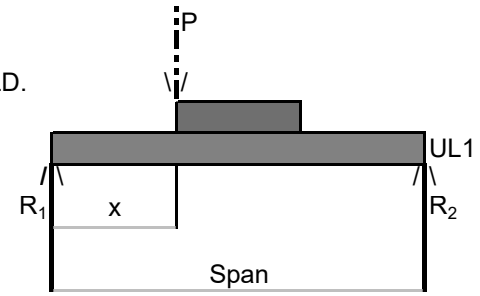
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 140 psi

USE: (1) 6 x 10 HF1

RB12) ENTRY CANOIPY CARRYING RIDGE RB11

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 8.3 ft

	Load		
Uniform Load 1 (full span) =	0 lb/ft		
Uniform Load 2 (lbs/ft) =	0	from x = 0	4.15 feet
Sum UL1 + UL2 =	0		
Concentrated Load (lbs) =	1100	@ x = 4.15	feet

		Reactions	
V_{max} =	550 lb	R_1 =	550 lb
M_{max} =	2283 lb-ft	R_2 =	550 lb

Nominal Beam Size: b = 6 in. d= 10 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 9.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N
Fv =	140 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	1,050 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	750 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	1.3E+06 psi	Delta = L/	360	$C_{M(E)}$ =	1.00
Emin =	.47E+06 psi			Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	15.79	**140**
Fb (psi)	331	**1043**
Delta (in.)	0.04	**0.28**

Section Properties		
	Required	Provided
A (in2)	**5.9**	52.3
Sx (in3)	**26.2**	82.7
I (in4)	**62.5**	393.0

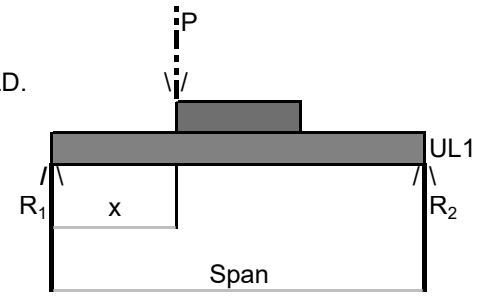
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.25 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 140 psi

USE: (1) 6 x 10 HF1

RB13) GRID G BEAM CARRYING RB07

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 10.9 ft

	Load			
Uniform Load 1 (full span) =	96 lb/ft			
Uniform Load 2 (lbs/ft) =	369	from x =	6.7	10.9 feet
Sum UL1 + UL2 =	96			
Concentrated Load (lbs) =	700	@ x =	6.7 feet	

		Reactions	
V_{max} =	2205 lb	R_1 =	1092 lb
M_{max} =	5098 lb-ft	R_2 =	2205 lb

Nominal Beam Size: b = 6 in. d= 10 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 9.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N
Fv =	140 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	1,050 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	750 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	1.3E+06 psi	Delta = L/	360	$C_{M(E)}$ =	1.00
Emin =	.47E+06 psi			Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	61.11	**140**
Fb (psi)	739	**1042**
Delta (in.)	0.18	**0.36**

Section Properties		
	Required	Provided
A (in2)	**22.8**	52.3
Sx (in3)	**58.7**	82.7
I (in4)	**198.2**	393.0

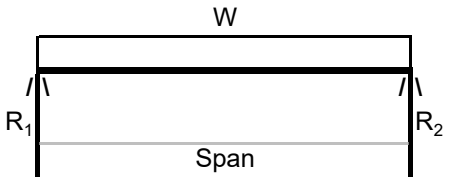
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.99 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 140 psi

USE: (1) 6 x 10 HF1

RB14) GRID G BEAM @ LVIING NORTH CLO OPENING

SIMPLE SPAN - UNIFORM LOAD



Span = 7.4 ft

Uniform Load (full span), W = 465 lb/ft

V_{max} = 1721 lb
M_{max} = 3183 lb-ft

Reactions
R_1 = 1721 lb
R_2 = 1721 lb

Nominal Beam Size: b = 6 in. d= 10 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 9.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N
Post?: NO
Design Stresses and Factors:

			C_L=	0.99	Moisture > 19%?	N	
Fv =	140	psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	1,050	psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	750	psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405	psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06	psi	δ_{TOTAL}=L/	360	$C_{M(E)}$ =	1.00	
Emin =	.47E+06	psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	38.8	**140**
Fb (psi)	462	**1044**
Delta (in.)	0.06	**0.25**

Section Properties		
	Required	Provided
A (in2)	**14.49**	52.3
Sx (in3)	**36.58**	82.73
I (in4)	**97.84**	393.0

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.77 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = < Fv' = 140 psi

USE: (1) 6 x 10 HF1

Trygstad Engineering
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Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 24310 Scharhon Remodel.ec6

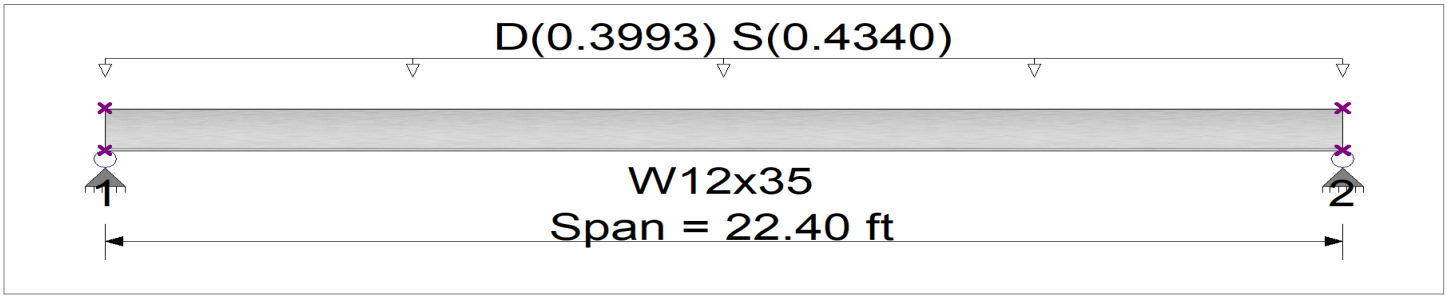
DESCRIPTION: RB15) KTICHEN RIDGE BEAM

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Completely Unbraced	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 calculated and added to loading
Uniform Load : D = 0.0230, S = 0.0250 ksf, Tributary Width = 17.360 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.869 : 1	Maximum Shear Stress Ratio =	0.110 : 1
Section used for this span	W12x35	Section used for this span	W12x35
Ma : Applied	46.292 k-ft	Va : Applied	8.267 k
Mn / Omega : Allowable	53.294 k-ft	Vn/Omega : Allowable	75.0 k
Load Combination	+D+0.70S	Load Combination	+D+0.70S
		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	0.299 in	Ratio =	899	>=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.508 in	Ratio =	529	>=180	Span: 1 : +D+0.70S
Max Upward Total Deflection	0 in	Ratio =	0	<180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega	
D Only													
Dsgn. L = 22.40 ft	1	0.511	0.065	27.24		27.24	89.00	53.29	1.00	1.00	4.86	112.50	75.00
+D+0.70S													
Dsgn. L = 22.40 ft	1	0.869	0.110	46.29		46.29	89.00	53.29	1.00	1.00	8.27	112.50	75.00
+D+0.5250S													
Dsgn. L = 22.40 ft	1	0.779	0.099	41.53		41.53	89.00	53.29	1.00	1.00	7.42	112.50	75.00
+0.60D													
Dsgn. L = 22.40 ft	1	0.307	0.039	16.34		16.34	89.00	53.29	1.00	1.00	2.92	112.50	75.00
+D+0.10S													
Dsgn. L = 22.40 ft	1	0.562	0.071	29.96		29.96	89.00	53.29	1.00	1.00	5.35	112.50	75.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.70S	1	0.5082	11.264		0.0000	0.000

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	8.266	8.266
Max Upward from Load Combinations	8.266	8.266
Max Upward from Load Cases	4.864	4.864
D Only	4.864	4.864
+D+0.70S	8.266	8.266
+D+0.5250S	7.416	7.416
+0.60D	2.918	2.918

Steel Beam

DESCRIPTION: RB15) KTICHEN RIDGE BEAM

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
+D+0.10S	5.350	5.350
S Only	4.861	4.861

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Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 24310 Scharhon Remodel.ec6

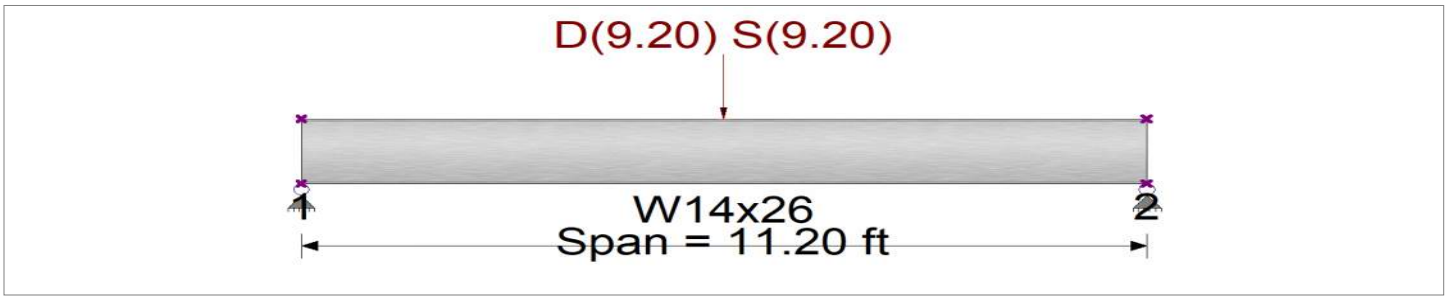
DESCRIPTION: RB16) GRID 3 BENT BEAM CARRYING RB15

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Completely Unbraced	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 calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 9.20, S = 9.20 k @ 5.60 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.556 : 1	Maximum Shear Stress Ratio =	0.112 : 1
Section used for this span	W14x26	Section used for this span	W14x26
Ma : Applied	44.200 k-ft	Va : Applied	7.966 k
Mn / Omega : Allowable	79.508 k-ft	Vn/Omega : Allowable	70.890 k
Load Combination	+D+0.70S	Load Combination	+D+0.70S
		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 =	2,043	>=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.113 in	Ratio =	1188	>=240.	Span: 1 : +D+0.70S
Max Upward Total Deflection	0 in	Ratio =	0	<240.0	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega
D Only												
Dsgn. L = 11.20 ft	1	0.329	0.067	26.17		26.17	132.68	79.45	1.31	1.00	4.75	106.34 70.89
+D+0.70S												
Dsgn. L = 11.20 ft	1	0.556	0.112	44.20		44.20	132.78	79.51	1.31	1.00	7.97	106.34 70.89
+D+0.5250S												
Dsgn. L = 11.20 ft	1	0.499	0.101	39.69		39.69	132.78	79.51	1.31	1.00	7.16	106.34 70.89
+0.60D												
Dsgn. L = 11.20 ft	1	0.198	0.040	15.70		15.70	132.68	79.45	1.31	1.00	2.85	106.34 70.89
+D+0.10S												
Dsgn. L = 11.20 ft	1	0.362	0.073	28.74		28.74	132.68	79.45	1.31	1.00	5.21	106.34 70.89

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.70S	1	0.1131	5.632		0.0000	0.000

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	7.966	7.966
Max Upward from Load Combinations	7.966	7.966
Max Upward from Load Cases	4.746	4.746
D Only	4.746	4.746
+D+0.70S	7.966	7.966
+D+0.5250S	7.161	7.161

Steel Beam

DESCRIPTION: RB16) GRID 3 BENT BEAM CARRYING RB15

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
+0.60D	2.847	2.847
+D+0.10S	5.206	5.206
S Only	4.600	4.600

Trygstad Engineering
nels@trygstadeng.com

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 24310 Scharhon Remodel.ec6

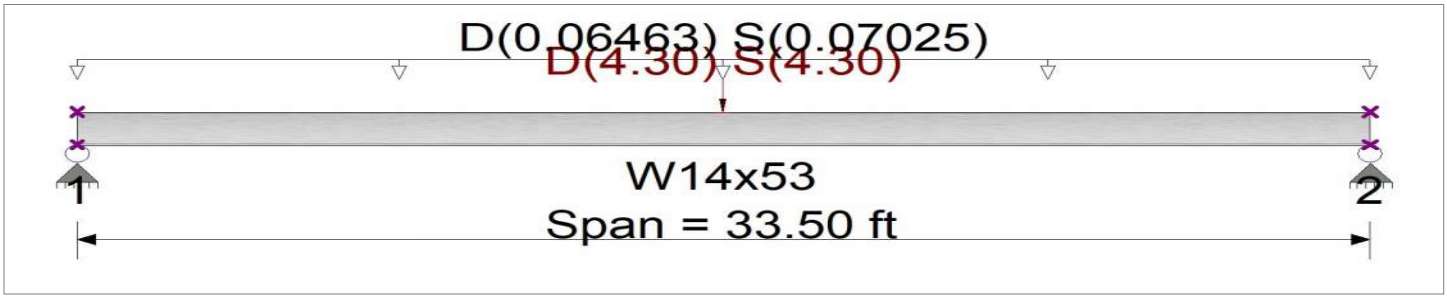
DESCRIPTION: RB17) GRID 1 BENT BEAM

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Completely Unbraced	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 calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 4.30, S = 4.30 k @ 16.750 ft
Uniform Load : D = 0.0230, S = 0.0250 ksf, Tributary Width = 2.810 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.822** : 1	Maximum Shear Stress Ratio =	**0.063** : 1
Section used for this span	**W14x53**	Section used for this span	**W14x53**
Ma : Applied	84.621 k-ft	Va : Applied	6.449 k
Mn / Omega : Allowable	102.967 k-ft	Vn/Omega : Allowable	102.860 k
Load Combination	+D+0.70S	Load Combination	+D+0.70S
		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	0.500 in	Ratio =	804	>=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.936 in	Ratio =	430	>=240.	Span: 1 : +D+0.70S
Max Upward Total Deflection	0 in	Ratio =	0	<240.0	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega
D Only												
Dsgn. L = 33.50 ft	1	0.513	0.040	52.51		52.51	171.00	102.40	1.25	1.00	4.12	154.29 102.86
+D+0.70S												
Dsgn. L = 33.50 ft	1	0.822	0.063	84.62		84.62	171.96	102.97	1.26	1.00	6.45	154.29 102.86
+D+0.5250S												
Dsgn. L = 33.50 ft	1	0.744	0.057	76.59		76.59	171.82	102.89	1.26	1.00	5.87	154.29 102.86
+0.60D												
Dsgn. L = 33.50 ft	1	0.308	0.024	31.51		31.51	171.00	102.40	1.25	1.00	2.47	154.29 102.86
+D+0.10S												
Dsgn. L = 33.50 ft	1	0.557	0.043	57.10		57.10	171.14	102.48	1.26	1.00	4.45	154.29 102.86

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.70S	1	0.9360	16.846		0.0000	0.000

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	6.449	6.449
Max Upward from Load Combinations	6.449	6.449
Max Upward from Load Cases	4.120	4.120
D Only	4.120	4.120
+D+0.70S	6.449	6.449

Steel Beam

DESCRIPTION: RB17) GRID 1 BENT BEAM

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
+D+0.5250S	5.867	5.867
+0.60D	2.472	2.472
+D+0.10S	4.453	4.453
S Only	3.327	3.327

Trygstad Engineering
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Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 24310 Scharhon Remodel.ec6

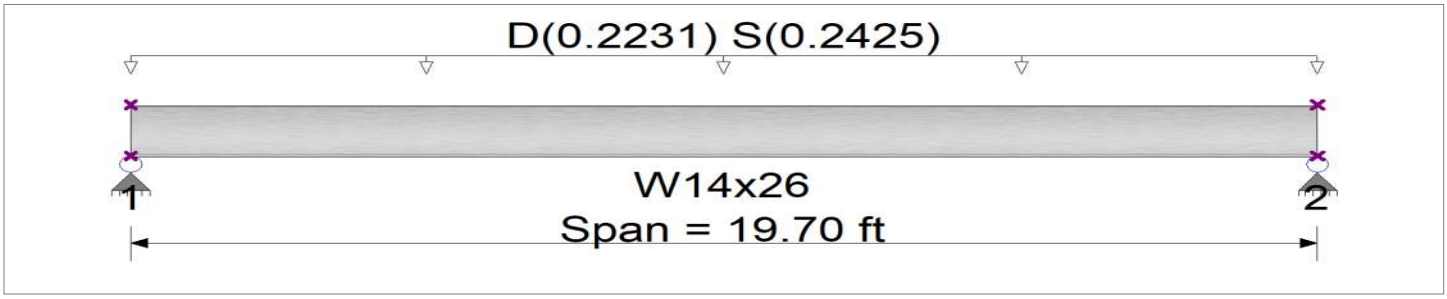
DESCRIPTION: RB18) GRID G AND C BEAM @ DECK

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Completely Unbraced	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 calculated and added to loading
Uniform Load : D = 0.0230, S = 0.0250 ksf, Tributary Width = 9.70 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.774** : 1	Maximum Shear Stress Ratio =	**0.058** : 1
Section used for this span	**W14x26**	Section used for this span	**W14x26**
Ma : Applied	20.319 k-ft	Va : Applied	4.126 k
Mn / Omega : Allowable	26.266 k-ft	Vn/Omega : Allowable	70.890 k
Load Combination	+D+0.70S	Load Combination	+D+0.70S
		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	0.116 in	Ratio =	2,034	>=360	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0	<360	n/a
Max Downward Total Deflection	0.201 in	Ratio =	1178	>=180	Span: 1 : +D+0.70S
Max Upward Total Deflection	0 in	Ratio =	0	<180	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega	
D Only													
Dsgn. L = 19.70 ft	1	0.460	0.035	12.08		12.08	43.86	26.27	1.00	1.00	2.45	106.34	70.89
+D+0.70S													
Dsgn. L = 19.70 ft	1	0.774	0.058	20.32		20.32	43.86	26.27	1.00	1.00	4.13	106.34	70.89
+D+0.5250S													
Dsgn. L = 19.70 ft	1	0.695	0.052	18.26		18.26	43.86	26.27	1.00	1.00	3.71	106.34	70.89
+0.60D													
Dsgn. L = 19.70 ft	1	0.276	0.021	7.25		7.25	43.86	26.27	1.00	1.00	1.47	106.34	70.89
+D+0.10S													
Dsgn. L = 19.70 ft	1	0.505	0.038	13.26		13.26	43.86	26.27	1.00	1.00	2.69	106.34	70.89

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.70S	1	0.2007	9.906		0.0000	0.000

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	4.126	4.126
Max Upward from Load Combinations	4.126	4.126
Max Upward from Load Cases	2.454	2.454
D Only	2.454	2.454
+D+0.70S	4.126	4.126
+D+0.5250S	3.708	3.708
+0.60D	1.472	1.472

Steel Beam

DESCRIPTION: RB18) GRID G AND C BEAM @ DECK

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
+D+0.10S	2.692	2.692
S Only	2.389	2.389

Trygstad ENGINEERING

Tryg.stad [norwegian]: *Safe Structure*

130 McGhee Rd #220
Sandpoint, ID 83864
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(208)262-6884

#24310
Structural Calculations For:

Scharhon Residence

9150 SE 54th St
Mercer Island, WA 98040

Designer: TAM Design

Design Criteria: IBC 2021 as adopted by the City of Mercer Island
Wind: Wind Speed = 100 mph, Exposure 'C', Kzt = 1.00
Seismic: Site Class D [Default], SDC = D, R = 6.5, I=1.0
Roof Rain-on-Snow Load = 25 psf
Roof Future PV Load = 5psf
Deck Live Load = 60psf
Residential Floor Live Load = 40psf

Summary:
A two-story conventional wood framed addotopm with shallow “T-shaped” concrete footing and stem walls is being proposed. The gable-end roof is to be premanufactured wood trusses engineered by others and 2x12 roof rafters. The floor will be wood dimension-lumber joists over either a basement or crawl space. The basement level is slab on grade. The LFRS system consists of wood framed shearwalls with a special steel moment frame on grid 1 (special inspection tables provided in plan set).

Trygstad
ENGINEERING

CALCULATION
SECTION 3.0:
1st FLOOR FRAMING

LOADING & LABELING KEY

TYPE: B=BEAM R=RAFTER J=JOIST

BM. CALC SEQ. NO.

BEAM LABEL: 2FB08

FLOOR OR ROOF LEVEL: 2=2ND,ETC. L=LOW

LEVEL: R=ROOF F=FLOOR

LINE LOADING [PLF]

BEAM TRANSFER	WALL TRANSFER	*AT DECKS, LL=60 PSF
		"RED" = ROOF ONLY [25 S+18D+5PV]...48
		"YELLOW" = TOP FLR [40L*+15D]
		"ORANGE" = ROOF + FLR
		"BLUE" = LOWER FLOOR ONLY [40L*+15D]
		"GREEN" = MULTIPLE FLOORS

POINT LOADING [K]

- ● BM. LOAD (THIS LVL.)TO TRANSFER BM
- ⊠ COL. LOAD TO LVL. BELOW
- ⊠ COL. LOAD FROM ABV. TO TRANSFER BM
- □ KING POST W/IN LVL TO TRANSFER BM

ADDITION & REMODEL:

- GRID B TO C: (E)HOUSE,(N)DECK O/BASEMENT ADD., (N)DECK O/EXTERIOR
- GRID C TO E: (E)HOUSE,(N)ADD. O/BASEMENT ADD., (N)DECK O/EXTERIOR
- GRID E TO F: (E)HOUSE,(N)ADD. O/BASEMENT ADD.,(N)BAY O/EXTERIOR ,(N)DECK
- GRID F TO G: (E)HOUSE, (N)ADD'N O/(N)CRAWL SPACE

Framing Notes

1. REFER TO S9.1 FOR TYPICAL FRAMING DETAILS
2. ROOF FRAMING – PREMANUFACTURED TRUSSES (PMT) OR RAFTERS PER PLAN. 2x4 ON-EDGE OUTRIGGERS (O.R.) @ 24" O.C.
3. FLOOR FRAMING – TJI JOISTS PER PLAN. BLOCKING AT BEARING AND SHEARWALLS SHALL BE PER BEARING AND SHEARWALL SCHEDULE (VERIFY EXIST. BRG. LOC.). FLOOR SHEATHING SHALL BE GLUED AND NAILED.
4. WALLS INDICATED ARE BELOW THE FRAMING LEVEL (REFER TO SYMBOL KEY FOR TYPE). SEE BEARING WALL SCHEDULE THIS SHEET
5. PLUMBING, MECHANICAL, AND ELECTRICAL SYSTEMS SHALL BE DESIGNED AND BUILT TO ACCOMMODATE 3/8" PER FLOOR WOOD SHRINKAGE.
6. SEE DETAIL 1/S9.1 FOR TYPICAL HEADER/BUNDLED STUD CONSTRUCTION.
7. SEE ARCHITECTURAL FOR DRAFTSTOP AND VENTING LOCATIONS.
8. FRAMING MEMBERS AND SHEATHING SHALL BE PER STRUCTURAL NOTES AS NOTED ON SHEET S1.1
9. ALL UNLABELED EXTERIOR WALLS ARE TO BE TYPE 'P6'; SEE SHEARWALL SCHEDULE ON SHEET S1.2
10. HANGERS INDICATED ARE AS MANUFACTURED BY SIMPSON STRONG-TIE. SEE SEC. 06103/S1.1 FOR TYPICAL HANGERS, U.N.O..
11. PROVIDE JOIST OR BLOCKING ATOP SHEARWALLS.
12. SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS AND TOP PLATE ELEVATIONS.
13. BUNDLED STUDS FROM THIS LEVEL SHALL BE CONTINUED DOWN TO FOUNDATION OR SUPPORTING BEAM. (RE: 4/S9.1)
14. ALL BEAMS AND HEADERS SHALL HAVE A MINIMUM OF (1) FULL HEIGHT STUD AT EACH END FOR BRACING TYPICAL UNLESS NOTED OTHERWISE.
15. PROVIDE MINIMUM (2) 2X BUNDLED STUDS UNDER EACH BEAM END, TYPICAL UNLESS NOTED OTHERWISE. (AT HEADERS: TRIMMER+KING=2 BUNDLED STUDS)
16. SEE DETAILS 19 & 20 ON SHEET S1.3 FOR TYPICAL CORNER FRAMING DETAILS AT HOLD DOWNS & SHEARWALLS..
17. HANGER OCCURS WHERE FLUSH BEAM HANGS TO SUPPORT BEAMS, TYP. U.N.O.

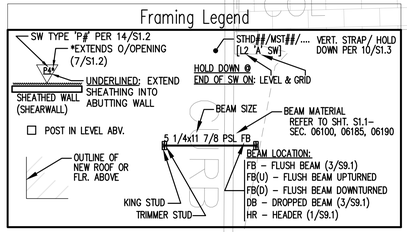
Bearing Wall Stud Schedule

BEARING WALL TYPE	STUD SIZE AND SPACING, U.N.O.
EXTERIOR	2 X 6 AT 16" O.C., U.N.O.
INTERIOR NON-BEARING	2 X 4 AT 16 O.C.

BEARING WALL NOTES

1. SEE SHEARWALL SCHEDULE SHEET S1.2 FOR WALL SHEATHING, ADDITIONAL PLATE AND STUD REQUIREMENTS, BLOCKING AND PLATE NAILING. SEE SAWN LUMBER STRUCTURAL NOTES SHEET S1.1 FOR SPECIES AND GRADE OF WALL PLATES AND STUDS.
2. SECURE SILL PLATES TO CONCRETE WITH ⅝" DIA. ANCHOR BOLTS AT 48" ON CENTER TYPICAL UNLESS NOTED OTHERWISE. RE:S1.2. REFER TO SHEARWALL AND HOLDOWN SCHEDULE FOR ADDITIONAL ANCHOR BOLT REQUIREMENTS. WHERE PRESERVATIVE TREATED WOOD IS USED, REFER TO THAT NOTE SECTION FOR CORROSION PROTECTION REQUIREMENTS FOR CONNECTORS.
3. SEE 2/S9.1 FOR TOP PLATE SPLICE. PROVIDE ADDITIONAL CONNECTORS AT SHEARWALLS AS INDICATED ON THE PLANS.
4. ALIGN STUDS UNDER JOISTS

Framing Legend



Note:
PLANS PREPARED USING ARCHITECTURAL BACKGROUNDS RECEIVED 07/23/2024

First Floor Framing Plan

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

GRAPHIC SCALE
-4 0 2 4 8
(IN FEET)
1 inch = 4 ft.

PROJECT NORTH (REFERENCE ONLY)

CONSTRUCTION AND REMODELING

SCHARHON - RESIDENCE

9150 SE 54th St, Mercer Island, WA 98040

Permit check set

TE Job # 24310

Description	Date
Permit Intake	07/29/24

Tryg·stad ENGINEERING
nels@trygstadeng.com
(208)262-6884

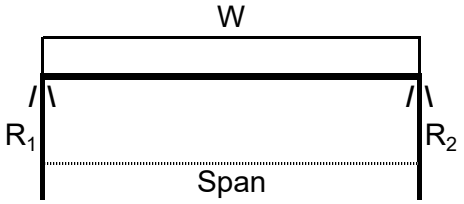
Stamp/Approval:

Sheet Name: FIRST FLOOR FRAMING PLAN

Sheet No: S2.2

FJ) 2 x 10 HF2 @ 16 IN. O.C. MAX. SPAN OF 10.44 FT (NO BRIDGING)

SIMPLE SPAN - UNIFORM LOAD



Span = 10.44 ft
Spacing = 16 in o.c.
Uniform Load (full span), W = 73 lb/ft

V_{max} = 383 lb
M_{max} = 999 lb-ft

Reactions
R_1 = 383 lb
R_2 = 383 lb

Nominal Beam Siz b = 2 in. d= 10 in. Number of Section 1
b_{act} = 1.50 in. d_{ac} 9.25 in.

Lumber Species/Type:-------- HF2 REPETITIVE MEMBER?---- Y
Post?: NO
Design Stresses and Factors:

		C_L=	0.52	Moisture > 19%?	N
Fv =	145 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	850 psi	Cr =	1.15	$C_{M(b)}$ =	1.00
Fc|| =	1,300 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥=	405 psi	$CF_{(B)}$ =	1.10	$C_{M(c\perp)}$ =	1.00
0	1.3E+06 psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00
Emin =	.47E+06 psi			Incise Ci:	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	35.3	**145**
Fb (psi)	560	**561**
Delta (in.	0.15	**0.26**

Section Properties		
	Required	Provided
A (in2)	**3.38**	13.9
Sx (in3)	**21.38**	21.39
I (in4)	**57.77**	98.9

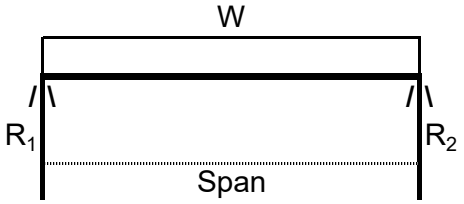
0 INCH ϕ HOLE SEC. REDUC.	
0.0	in3
0.0	in4

REQ'D END BEARING = 0.63 inches
NOTCH DEPTH = 1.25 inches
$f_{v,NOTCH}$ (Tension Face) = 55 psi < Fv' = 145 psi

USE: 2 x 10 HF2 @ 16 IN. O.C.

FJ) 2 x 10 HF2 @ 16 IN. O.C. MAX. SPAN OF 12.47 FT W/MID-SPAN BRIDGING/BLKG

SIMPLE SPAN - UNIFORM LOAD



Span = 12.47 ft
Spacing = 16 in o.c.
Uniform Load (full span), W = 73 lb/ft

V_{max} = 457 lb
M_{max} = 1425 lb-ft

Reactions
R_1 = 457 lb
R_2 = 457 lb

Nominal Beam Size: b = 2 in. d= 10 in. Number of Section 1
b_{act} = 1.50 in. d_{ac} 9.25 in.

Lumber Species/Type:-------- HF2 REPETITIVE MEMBER?---- Y
Post?: NO
Design Stresses and Factors:

		C_L=	0.74	Moisture > 19%?	N
Fv =	145 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	850 psi	Cr =	1.15	$C_{M(b)}$ =	1.00
Fc|| =	1,300 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.10	$C_{M(c\perp)}$ =	1.00
0	1.3E+06 psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00
Emin =	.47E+06 psi			Incise Ci:	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	43.3	**145**
Fb (psi)	800	**800**
Delta (in.	0.31	**0.31**

Section Properties		
	Required	Provided
A (in2)	**4.15**	13.9
Sx (in3)	**21.38**	21.39
I (in4)	**98.45**	98.9

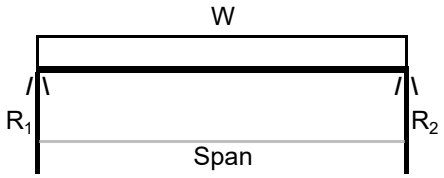
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.75 inches
NOTCH DEPTH = 1.25 inches
$f_{v,NOTCH}$ (Tension Face) = 66 psi < Fv' = 145 psi

USE: 2 x 10 HF2 @ 16 IN. O.C.

1FB01) GRID 6 BEAM BTWN. B:C CARRYING BEARING WALL

SIMPLE SPAN - UNIFORM LOAD



Span = 7.2 ft

Uniform Load (full span), W = 1097 lb/ft

V_{max} = 3949 lb

M_{max} = 7108 lb-ft

Reactions

R_1 = 3949 lb

R_2 = 3949 lb

Nominal Beam Size: b = 6 in. d= 10 in. Number of Sections = 1

b_{act} = 5.50 in. d_{act} = 9.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N		
Fv =	140 psi	LDF =	1.00	$C_{M(v)}$ =	1.00		
Fb =	1,050 psi	Cr =	1.00	$C_{M(b)}$ =	1.00		
Fc|| =	750 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00		
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00		
E =	1.3E+06 psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00		
Emin =	.47E+06 psi			Incise Ci=	1.00		

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	88.4	**140**
Fb (psi)	1031	**1044**
Delta (in.)	0.13	**0.18**

Section Properties		
	Required	Provided
A (in2)	**33.00**	52.3
Sx (in3)	**81.67**	82.73
I (in4)	**283.43**	393.0

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.77 inches

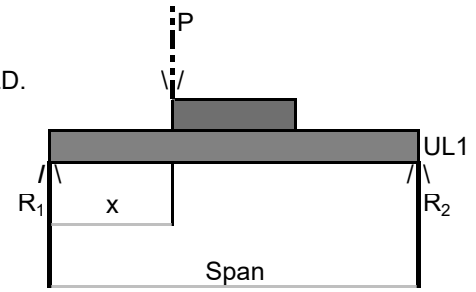
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 140 psi

USE: (1) 6 x 10 HF1

1FB02) GRID 6 BEAM SOUND OF BATHROOM

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 7.7 ft

	Load		
Uniform Load 1 (full span) =	1096.85 lb/ft		
Uniform Load 2 (lbs/ft) =	0	from x = 0	1.7 feet
Sum UL1 + UL2 = 1097			
Concentrated Load (lbs) =	3200	@ x = 1.7 feet	

		Reactions	
V_{max} =	6716 lb	R_1 =	6716 lb
M_{max} =	11068 lb-ft	R_2 =	4929 lb

Nominal Beam Size: b = 5.5 in. d= 9 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 9.00 in.

Lumber Species/Type:---------- GLB REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N
Fv =	240 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	2,400 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	1,650 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	650 psi	$CF_{(B)}$ =	1.00	$C_{M(c\|)}$ =	1.00
E =	1.8E+06 psi	Delta = L/	480	$C_{M(E)}$ =	1.00
Emin =	.93E+06 psi			Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	178.60	**240**
Fb (psi)	1789	**2385**
Delta (in.)	0.19	**0.19**

Section Properties		
	Required	Provided
A (in2)	**36.8**	49.5
Sx (in3)	**55.7**	74.3
I (in4)	**333.5**	334.1

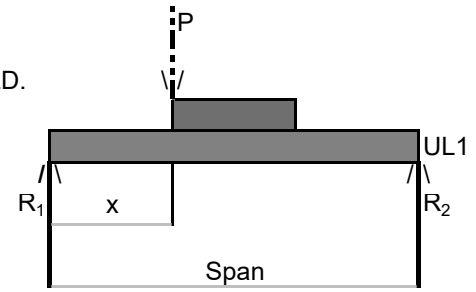
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.88 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 240 psi

USE: 5.5 x 9 IN. 24F-V4 GLB

2FB02) CEILING BM OVER BATH

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 5.5 ft

	Load		
Uniform Load 1 (full span) =	652 lb/ft		
Uniform Load 2 (lbs/ft) =	0	from x = 0	3.9 feet
Sum UL1 + UL2 = 652			
Concentrated Load (lbs) =	9000	@ x = 3.9 feet	

		Reactions	
V_{max} =	8175 lb	R_1 =	4411 lb
M_{max} =	12151 lb-ft	R_2 =	8175 lb

Nominal Beam Size: b = 5.5 in. d= 9 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 9.00 in.

Lumber Species/Type:---------- GLB REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	1.00	Moisture > 19%?	N
Fv =	240 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	2,400 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	1,650 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	650 psi	$CF_{(B)}$ =	1.00	$C_{M(c\|)}$ =	1.00
E =	1.8E+06 psi	Delta = L/	480	$C_{M(E)}$ =	1.00
Emin =	.93E+06 psi			Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	232.90	**240**
Fb (psi)	1964	**2389**
Delta (in.)	0.08	**0.14**

Section Properties		
	Required	Provided
A (in2)	**48.0**	49.5
Sx (in3)	**61.0**	74.3
I (in4)	**195.0**	334.1

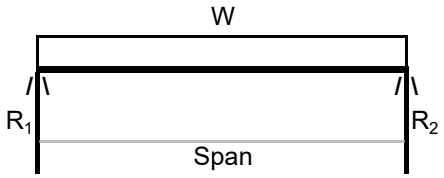
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 2.29 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 240 psi

USE: 5.5 x 9 IN. 24F-V4 GLB

1FB04) GRID C BEAM BTWN. 6.5:8

SIMPLE SPAN - UNIFORM LOAD



Span = 12.9 ft

Uniform Load (full span), W = 490 lb/ft

Reactions

V_{max} = 3161 lb — R_1 = 3161 lb

M_{max} = 10193 lb-ft — R_2 = 3161 lb

Nominal Beam Size: b = 7 in. d= 9.25 in. Number of Sections = 1

b_{act} = 7.00 in. d_{act} = 9.25 in.

Lumber Species/Type:---------- PSL REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N		
Fv =	290 psi	LDF =	1.00	$C_{M(v)}$ =	1.00		
Fb =	2,900 psi	Cr =	1.00	$C_{M(b)}$ =	1.00		
Fc|| =	2,900 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00		
Fc⊥ =	750 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00		
E =	2.0E+06 psi	δ_{TOTAL}=L/	468	$C_{M(E)}$ =	1.00		
Emin =	.10E+07 psi			Incise Ci=	1.00		

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	64.5	**290**
Fb (psi)	1225	**2879**
Delta (in.)	0.33	**0.33**

Section Properties		
	Required	Provided
A (in2)	**14.39**	64.8
Sx (in3)	**42.48**	99.82
I (in4)	**461.51**	461.7

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.60 inches

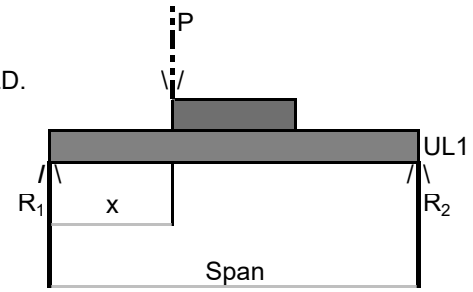
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 290 psi

USE: (1) 7 x 9.25 PSL

1FB05) GRID 6.5 CARRYIGN EAST END OF 1FB04

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 2.7 ft

	Load		
Uniform Load 1 (full span) =	0 lb/ft		
Uniform Load 2 (lbs/ft) =	0	from x = 0	0.9 feet
Sum UL1 + UL2 = 0			
Concentrated Load (lbs) =	3200	@ x = 0.9 feet	

		Reactions	
V_{max} =	2133 lb	R_1 =	2133 lb
M_{max} =	1920 lb-ft	R_2 =	1067 lb

Nominal Beam Size: b = 4 in. d= 8 in. Number of Sections = 1
b_{act} = 3.50 in. d_{act} = 7.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

				C_L=	1.00	Moisture > 19%?	N
Fv =	145	psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	850	psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	1,300	psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405	psi	$CF_{(B)}$ =	1.20	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06	psi	Delta = L/	480	$C_{M(E)}$ =	1.00	
Emin =	.47E+06	psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	126.11	**145**
Fb (psi)	751	**1016**
Delta (in.)	0.01	**0.07**

Section Properties		
	Required	Provided
A (in2)	**22.1**	25.4
Sx (in3)	**22.7**	30.7
I (in4)	**19.2**	111.1

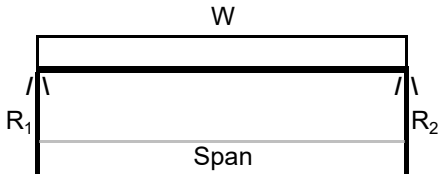
0 INCH ϕ HOLE SEC. REDUC.	
0.0	in3
0.0	in4

REQ'D END BEARING = 1.50 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 145 psi

USE: (1) 4 x 8 HF2

1FB06) GRDI C FB @ 6:6.2

SIMPLE SPAN - UNIFORM LOAD



Span = 3.75 ft

Uniform Load (full span), W = 748 lb/ft

Reactions

V_{max} = 1403 lb — R_1 = 1403 lb

M_{max} = 1315 lb-ft — R_2 = 1403 lb

Nominal Beam Size: b = 2 in. d= 10 in. Number of Sections = 2

b_{act} = 1.50 in. d_{act} = 9.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N	
Fv =	145 psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	850 psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	1,300 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.10	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06 psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00	
Emin =	.47E+06 psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	44.6	**145**
Fb (psi)	369	**926**
Delta (in.)	0.01	**0.09**

Section Properties		
	Required	Provided
A (in2)	**8.54**	27.8
Sx (in3)	**17.03**	42.78
I (in4)	**27.31**	197.9

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.15 inches

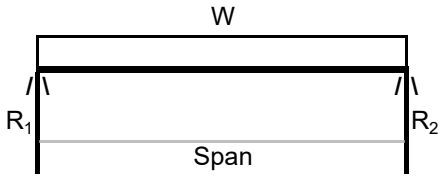
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 145 psi

USE: (2) 2 x 10 HF2

1FB07) GRID C 3:4

SIMPLE SPAN - UNIFORM LOAD



Span = 6.3 ft

Uniform Load (full span), W = 465 lb/ft

V_{max} = 1465 lb
M_{max} = 2307 lb-ft

Reactions
R_1 = 1465 lb
R_2 = 1465 lb

Nominal Beam Size: b = 4 in. d= 10 in. Number of Sections = 1
b_{act} = 3.50 in. d_{act} = 9.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- N
Post?: NO
Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N	
Fv =	145 psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	850 psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	1,300 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.20	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06 psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00	
Emin =	.47E+06 psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	51.3	**145**
Fb (psi)	555	**1007**
Delta (in.)	0.05	**0.16**

Section Properties		
	Required	Provided
A (in2)	**11.44**	32.4
Sx (in3)	**27.49**	49.91
I (in4)	**80.50**	230.8

0 INCH ϕ HOLE SEC. REDUC.	
0.0	in3
0.0	in4

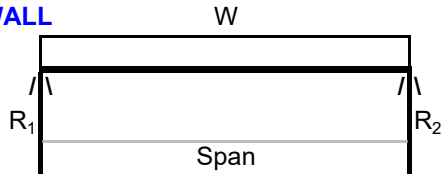
REQ'D END BEARING = 1.03 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = < Fv' = 145 psi

USE: (1) 4 x 10 HF2

1FB08) GRID C 4:4.6

USED AS DRAG BEAM FOR BASEMENT LINE C SEHARWALL

SIMPLE SPAN - UNIFORM LOAD



Span = 7.8 ft

Uniform Load (full span), W = 933 lb/ft

Reactions

V_{max} = 3639 lb — R_1 = 3639 lb

M_{max} = 7095 lb-ft — R_2 = 3639 lb

Nominal Beam Size: b = 3.5 in. d= 9.5 in. Number of Sections = 1

b_{act} = 3.50 in. d_{act} = 9.50 in.

Lumber Species/Type:---------- PSL REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

		C_L=	0.98	Moisture > 19%?	N		
Fv =	290 psi	LDF =	1.00	$C_{M(v)}$ =	1.00		
Fb =	2,900 psi	Cr =	1.00	$C_{M(b)}$ =	1.00		
Fc|| =	2,900 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00		
Fc⊥ =	750 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00		
E =	2.0E+06 psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00		
Emin =	.10E+07 psi			Incise Ci=	1.00		

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	130.8	**290**
Fb (psi)	1617	**2832**
Delta (in.)	0.16	**0.20**

Section Properties		
	Required	Provided
A (in2)	**15.00**	33.3
Sx (in3)	**30.07**	52.65
I (in4)	**199.24**	250.1

0 INCH ϕ HOLE SEC. REDUC.	
0.0	in3
0.0	in4

REQ'D END BEARING = 1.39 inches

NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 290 psi

USE: (1) 3.5 x 9.5 PSL

1FB09…REFER TO ENDERCALC OUTPUT

Trygstad Engineering
nels@trygstadeng.com

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 24310 Scharhon Remodel.ec6

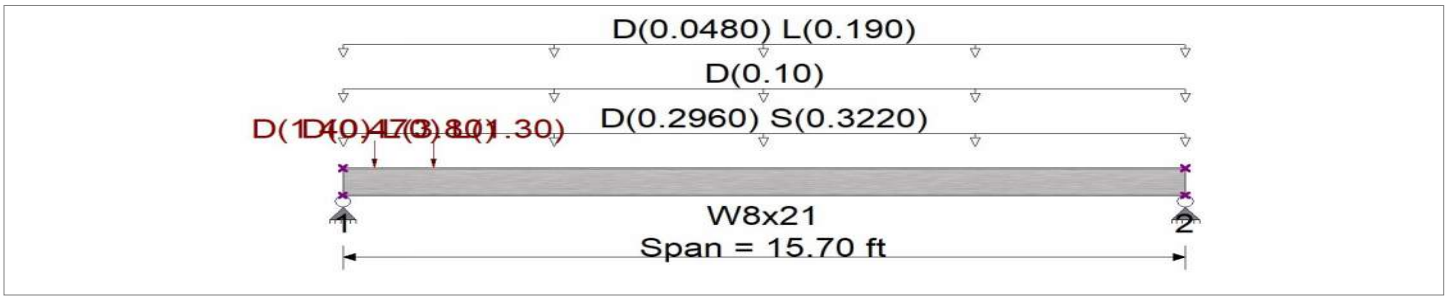
DESCRIPTION: 1FB09) GRID 4 BM BTWN. B:C

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Completely Unbraced	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 calculated and added to loading
Uniform Load : D = 0.2960, S = 0.3220 k/ft, Tributary Width = 1.0 ft
Uniform Load : D = 0.10 k/ft, Tributary Width = 1.0 ft
Uniform Load : D = 0.0480, L = 0.190 k/ft, Tributary Width = 1.0 ft
Point Load : D = 0.470, L = 1.30 k @ 1.70 ft
Point Load : D = 1.40, L = 3.80 k @ 0.60 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.904 : 1	Maximum Shear Stress Ratio =	0.283 : 1
Section used for this span	W8x21	Section used for this span	W8x21
Ma : Applied	26.495 k-ft	Va : Applied	11.721 k
Mn / Omega : Allowable	29.303 k-ft	Vn/Omega : Allowable	41.40 k
Load Combination	+D+0.750L+0.5250S	Load Combination	+D+L
		Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.202 in	Ratio =	930	>=480.	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0	<480.0	n/a
Max Downward Total Deflection	0.549 in	Ratio =	343	>=340.	Span: 1 : +D+0.750L+0.5250S
Max Upward Total Deflection	0 in	Ratio =	0	<340.0	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega
D Only												
Dsgn. L = 15.70 ft	1	0.517	0.131	15.16		15.16	48.94	29.30	1.00	1.00	5.42	62.10 41.40
+D+L												
Dsgn. L = 15.70 ft	1	0.797	0.283	23.36		23.36	48.94	29.30	1.00	1.00	11.72	62.10 41.40
+D+0.70S												
Dsgn. L = 15.70 ft	1	0.754	0.174	22.10		22.10	48.94	29.30	1.00	1.00	7.19	62.10 41.40
+D+0.750L												
Dsgn. L = 15.70 ft	1	0.727	0.245	21.30		21.30	48.94	29.30	1.00	1.00	10.14	62.10 41.40
+D+0.750L+0.5250S												
Dsgn. L = 15.70 ft	1	0.904	0.277	26.50		26.50	48.94	29.30	1.00	1.00	11.47	62.10 41.40
+0.60D												
Dsgn. L = 15.70 ft	1	0.310	0.078	9.10		9.10	48.94	29.30	1.00	1.00	3.25	62.10 41.40
+D+0.750L+0.10S												
Dsgn. L = 15.70 ft	1	0.761	0.251	22.29		22.29	48.94	29.30	1.00	1.00	10.40	62.10 41.40

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.5250S	1	0.5494	7.760		0.0000	0.000

Steel Beam

DESCRIPTION: 1FB09) GRID 4 BM BTWN. B:C

Vertical Reactions

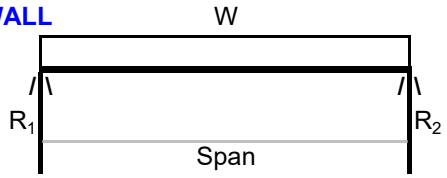
Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	11.721	6.415
Max Upward from Load Combinations	11.721	6.415
Max Upward from Load Cases	6.306	3.755
D Only	5.416	3.755
+D+L	11.721	5.532
+D+0.70S	7.185	5.524
+D+0.750L	10.145	5.088
+D+0.750L+0.5250S	11.472	6.415
+0.60D	3.250	2.253
+D+0.750L+0.10S	10.398	5.341
L Only	6.306	1.777
S Only	2.528	2.528

1FB10) GRID C HEADER @ CLOSET

USED AS DRAG BEAM FOR BASEMENT LINE C SEHARWALL

SIMPLE SPAN - UNIFORM LOAD



Span = 5.3 ft

Uniform Load (full span), W = 933 lb/ft

Reactions

V_{max} = 2472 lb — R_1 = 2472 lb

M_{max} = 3276 lb-ft — R_2 = 2472 lb

Nominal Beam Size: b = 3.5 in. d= 9.5 in. Number of Sections = 1

b_{act} = 3.50 in. d_{act} = 9.50 in.

Lumber Species/Type:---------- PSL REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

				C_L=	0.98	Moisture > 19%?	N
Fv =	290	psi		LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	2,900	psi		Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	2,900	psi		Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	750	psi		$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	2.0E+06	psi		δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00
Emin =	.10E+07	psi				Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	78.2	**290**
Fb (psi)	747	**2855**
Delta (in.)	0.03	**0.13**

Section Properties		
	Required	Provided
A (in2)	**8.97**	33.3
Sx (in3)	**13.77**	52.65
I (in4)	**62.51**	250.1

0 INCH ϕ HOLE SEC. REDUC.	
0.0	in3
0.0	in4

REQ'D END BEARING = 0.94 inches

NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 290 psi

USE: (1) 3.5 x 9.5 PSL

1FB11…REFER TO ENDERCALC OUTPUT

Trygstad Engineering
nels@trygstadeng.com

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 24310 Scharhon Remodel.ec6

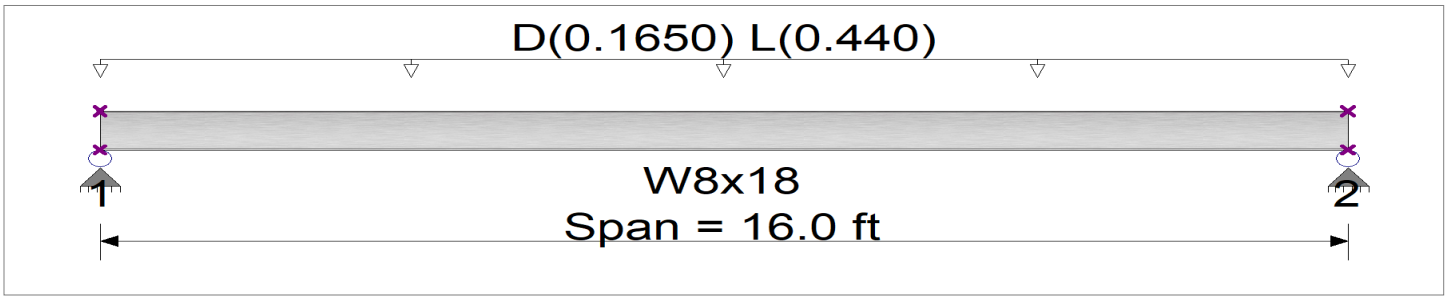
DESCRIPTION: 1FB11) GRID E BM @ 4:5.3

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Completely Unbraced	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
Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 11.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.920 : 1	Maximum Shear Stress Ratio =	0.129 : 1
Section used for this span	W8x18	Section used for this span	W8x18
Ma : Applied	19.360 k-ft	Va : Applied	4.840 k
Mn / Omega : Allowable	21.032 k-ft	Vn/Omega : Allowable	37.444 k
Load Combination	+D+L	Load Combination	+D+L
		Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.363 in	Ratio =	528	>=480.	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0	<480.0	n/a
Max Downward Total Deflection	0.499 in	Ratio =	385	>=360.	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0	<360.0	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega
D Only												
Dsgn. L = 16.00 ft	1	0.251	0.035	5.28		5.28	35.12	21.03	1.00	1.00	1.32	56.17 37.44
+D+L												
Dsgn. L = 16.00 ft	1	0.920	0.129	19.36		19.36	35.12	21.03	1.00	1.00	4.84	56.17 37.44
+D+0.750L												
Dsgn. L = 16.00 ft	1	0.753	0.106	15.84		15.84	35.12	21.03	1.00	1.00	3.96	56.17 37.44
+0.60D												
Dsgn. L = 16.00 ft	1	0.151	0.021	3.17		3.17	35.12	21.03	1.00	1.00	0.79	56.17 37.44

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.4992	8.046		0.0000	0.000

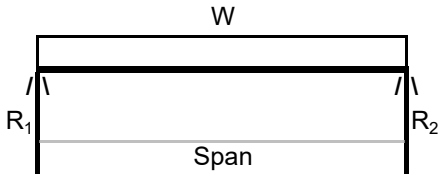
Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	4.840	4.840
Max Upward from Load Combinations	4.840	4.840
Max Upward from Load Cases	3.520	3.520
D Only	1.320	1.320
+D+L	4.840	4.840
+D+0.750L	3.960	3.960
+0.60D	0.792	0.792
L Only	3.520	3.520

1FB12) GRID E BM @ 4:5.3

SIMPLE SPAN - UNIFORM LOAD



Span = 11.3 ft

Uniform Load (full span), W = 630 lb/ft

V_{max} = 3560 lb

M_{max} = 10056 lb-ft

Reactions

R_1 = 3560 lb

R_2 = 3560 lb

Nominal Beam Size: b = 7 in. d= 9.25 in. Number of Sections = 1

b_{act} = 7.00 in. d_{act} = 9.25 in.

Lumber Species/Type:---------- PSL REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N		
Fv =	290 psi	LDF =	1.00	$C_{M(v)}$ =	1.00		
Fb =	2,900 psi	Cr =	1.00	$C_{M(b)}$ =	1.00		
Fc|| =	2,900 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00		
Fc⊥ =	750 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00		
E =	2.0E+06 psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00		
Emin =	.10E+07 psi			Incise Ci=	1.00		

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	71.2	**290**
Fb (psi)	1209	**2882**
Delta (in.)	0.25	**0.28**

Section Properties		
	Required	Provided
A (in2)	**15.90**	64.8
Sx (in3)	**41.87**	99.82
I (in4)	**409.06**	461.7

0 INCH ϕ HOLE SEC. REDUC.	
0.0	in3
0.0	in4

REQ'D END BEARING = 0.68 inches

NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 290 psi

OPTION: (1) 7 x 9.25 PSL

Trygstad Engineering
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Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 24310 Scharhon Remodel.ec6

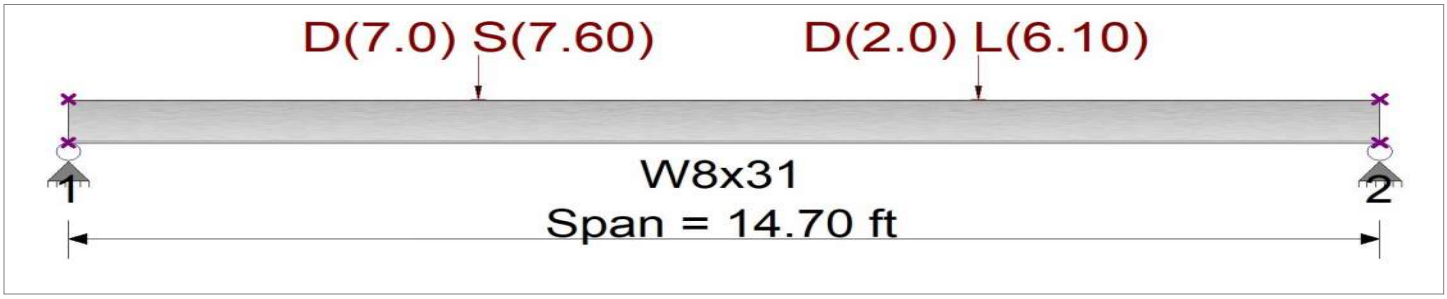
DESCRIPTION: 1FB13) GRID 5.2 @ C.5:F

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Completely Unbraced	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 calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 2.0, L = 6.10 k @ 10.20 ft
Point Load : D = 7.0, S = 7.60 k @ 4.60 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.699** : 1	Maximum Shear Stress Ratio =	**0.215** : 1
Section used for this span	**W8x31**	Section used for this span	**W8x31**
Ma : Applied	44.686 k-ft	Va : Applied	9.792 k
Mn / Omega : Allowable	63.914 k-ft	Vn/Omega : Allowable	45.60 k
Load Combination	+D+0.750L+0.5250S	Load Combination	+D+0.750L+0.5250S
		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	0.226 in	Ratio =	780	>=480.	Span: 1 : S Only
Max Upward Transient Deflection	0 in	Ratio =	0	<480.0	n/a
Max Downward Total Deflection	0.524 in	Ratio =	337	>=330.	Span: 1 : +D+0.750L+0.5250S
Max Upward Total Deflection	0 in	Ratio =	0	<330.0	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega
D Only												
Dsgn. L = 14.70 ft	1	0.401	0.124	25.63		25.63	106.74	63.91	1.00	1.00	5.65	68.40 45.60
+D+L												
Dsgn. L = 14.70 ft	1	0.561	0.176	35.85		35.85	106.74	63.91	1.00	1.00	8.04	68.40 45.60
+D+0.70S												
Dsgn. L = 14.70 ft	1	0.664	0.204	42.41		42.41	106.74	63.91	1.00	1.00	9.30	68.40 45.60
+D+0.750L												
Dsgn. L = 14.70 ft	1	0.502	0.155	32.10		32.10	106.74	63.91	1.00	1.00	7.05	68.40 45.60
+D+0.750L+0.5250S												
Dsgn. L = 14.70 ft	1	0.699	0.215	44.69		44.69	106.74	63.91	1.00	1.00	9.79	68.40 45.60
+0.60D												
Dsgn. L = 14.70 ft	1	0.241	0.074	15.38		15.38	106.74	63.91	1.00	1.00	3.39	68.40 45.60
+D+0.750L+0.10S												
Dsgn. L = 14.70 ft	1	0.540	0.166	34.50		34.50	106.74	63.91	1.00	1.00	7.57	68.40 45.60

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.5250S	1	0.5240	7.182		0.0000	0.000

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	9.792	8.229

Steel Beam

DESCRIPTION: 1FB13) GRID 5.2 @ C.5:F

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from Load Combinations	9.792	8.229
Max Upward from Load Cases	5.650	4.233
D Only	5.650	3.806
+D+L	7.517	8.039
+D+0.70S	9.305	5.471
+D+0.750L	7.050	6.981
+D+0.750L+0.5250S	9.792	8.229
+0.60D	3.390	2.284
+D+0.750L+0.10S	7.572	7.218
L Only	1.867	4.233
S Only	5.222	2.378

Trygstad Engineering
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Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 24310 Scharhon Remodel.ec6

DESCRIPTION: 1FB14) GRID 4 @ C:F

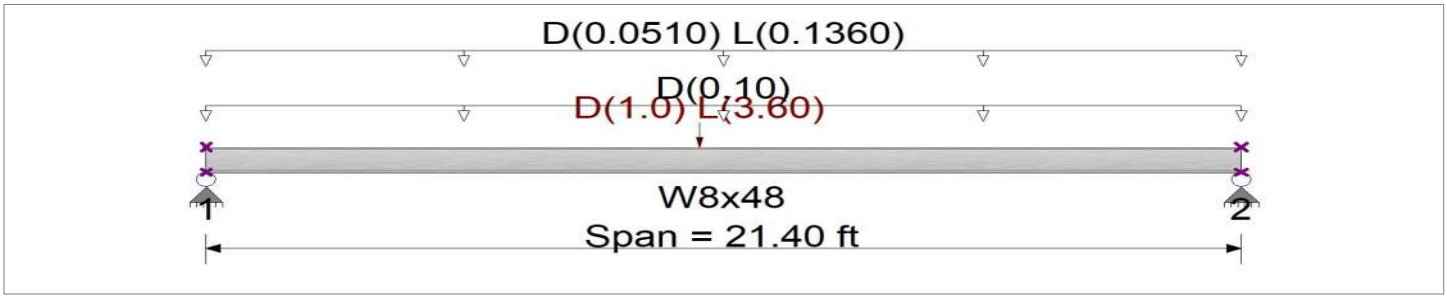
CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

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

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



Applied Loads

Service loads entered. Load Factors will be applied for calculations

Beam self weight calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 1.0, L = 3.60 k @ 10.20 ft
Uniform Load : D = 0.10 k/ft, Tributary Width = 1.0 ft
Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 3.40 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.443** : 1	Maximum Shear Stress Ratio =	**0.088** : 1
Section used for this span	**W8x48**	Section used for this span	**W8x48**
Ma : Applied	43.669 k-ft	Va : Applied	5.992 k
Mn / Omega : Allowable	98.646 k-ft	Vn/Omega : Allowable	68.0 k
Load Combination	+D+L	Load Combination	+D+L
		Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.359 in	Ratio =	714	>=480.	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0	<480.0	n/a
Max Downward Total Deflection	0.602 in	Ratio =	426	>=360.	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0	<360.0	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx Mnx/Omega Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega
D Only										
Dsgn. L = 21.40 ft	1	0.169	0.039	16.70		16.70	164.74 98.65	1.00 1.00	2.65	102.00 68.00
+D+L										
Dsgn. L = 21.40 ft	1	0.443	0.088	43.67		43.67	164.74 98.65	1.00 1.00	5.99	102.00 68.00
+D+0.750L										
Dsgn. L = 21.40 ft	1	0.374	0.076	36.93		36.93	164.74 98.65	1.00 1.00	5.16	102.00 68.00
+0.60D										
Dsgn. L = 21.40 ft	1	0.102	0.023	10.02		10.02	164.74 98.65	1.00 1.00	1.59	102.00 68.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.6022	10.639		0.0000	0.000

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	5.992	5.777
Max Upward from Load Combinations	5.992	5.777
Max Upward from Load Cases	3.339	3.171
D Only	2.653	2.606
+D+L	5.992	5.777
+D+0.750L	5.157	4.984

Steel Beam

DESCRIPTION: 1FB14) GRID 4 @ C:F

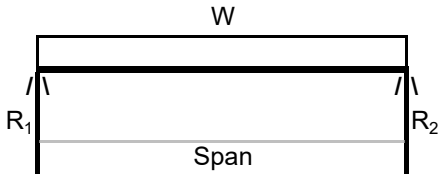
Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
+0.60D	1.592	1.564
L Only	3.339	3.171

1FB15) GRID 3 HEADER @ B.5

SIMPLE SPAN - UNIFORM LOAD



Span = 5.2 ft

Uniform Load (full span), W = 499 lb/ft

Reactions

V_{max} = 1297 lb — R_1 = 1297 lb

M_{max} = 1687 lb-ft — R_2 = 1297 lb

Nominal Beam Size: b = 2 in. d= 8 in. Number of Sections = 2

b_{act} = 1.50 in. d_{act} = 7.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N	
Fv =	145 psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	850 psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	1,300 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.20	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06 psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00	
Emin =	.47E+06 psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	68.7	**145**
Fb (psi)	770	**1009**
Delta (in.)	0.07	**0.13**

Section Properties		
	Required	Provided
A (in2)	**10.30**	21.8
Sx (in3)	**20.06**	26.28
I (in4)	**48.57**	95.3

0 INCH ϕ HOLE SEC. REDUC.	
0.0	in3
0.0	in4

REQ'D END BEARING = 1.07 inches

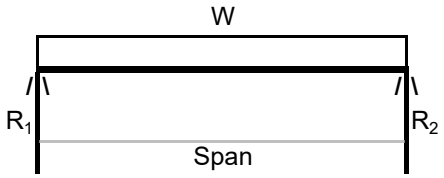
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 145 psi

USE: (2) 2 x 8 HF2

1FB16) GRID 3 HEADER @ C.5

SIMPLE SPAN - UNIFORM LOAD



Span = 6.4 ft

Uniform Load (full span), W = 539 lb/ft

Reactions

V_{max} = 1725 lb — R_1 = 1725 lb

M_{max} = 2760 lb-ft — R_2 = 1725 lb

Nominal Beam Size: b = 2 in. d= 8 in. Number of Sections = 3

b_{act} = 1.50 in. d_{act} = 7.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N	
Fv =	145 psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	850 psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	1,300 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.20	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06 psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00	
Emin =	.47E+06 psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	64.3	**145**
Fb (psi)	840	**1015**
Delta (in.)	0.11	**0.16**

Section Properties		
	Required	Provided
A (in2)	**14.47**	32.6
Sx (in3)	**32.64**	39.42
I (in4)	**97.82**	142.9

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.95 inches

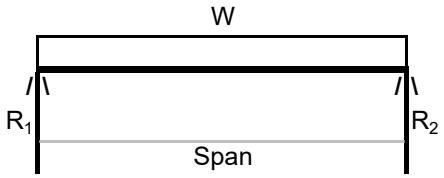
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 145 psi

USE: (3) 2 x 8 HF2

1FB17) GRID 3 HEADER @ E.5

SIMPLE SPAN - UNIFORM LOAD



Span = 5.2 ft

Uniform Load (full span), W = 308 lb/ft

Reactions

V_{max} = 801 lb — R_1 = 801 lb

M_{max} = 1041 lb-ft — R_2 = 801 lb

Nominal Beam Size: b = 2 in. d= 8 in. Number of Sections = 2

b_{act} = 1.50 in. d_{act} = 7.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N	
Fv =	145 psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	850 psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	1,300 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.20	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06 psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00	
Emin =	.47E+06 psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	42.4	**145**
Fb (psi)	475	**1009**
Delta (in.)	0.04	**0.13**

Section Properties		
	Required	Provided
A (in2)	**6.36**	21.8
Sx (in3)	**12.38**	26.28
I (in4)	**29.98**	95.3

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.66 inches

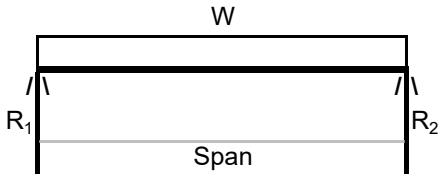
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 145 psi

USE: (2) 2 x 8 HF2

1FB18) GRID D.1 BM BTWN. 6.5:8

SIMPLE SPAN - UNIFORM LOAD



Span = 12.3 ft

Uniform Load (full span), W = 550 lb/ft

Reactions

V_{max} = 3383 lb — R_1 = 3383 lb

M_{max} = 10401 lb-ft — R_2 = 3383 lb

Nominal Beam Size: b = 7 in. d= 9.25 in. Number of Sections = 1

b_{act} = 7.00 in. d_{act} = 9.25 in.

Lumber Species/Type:---------- PSL REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

			C_L=	0.99	Moisture > 19%?	N	
Fv =	290	psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	2,900	psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	2,900	psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	750	psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00	
E =	2.0E+06	psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00	
Emin =	.10E+07	psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	68.5	**290**
Fb (psi)	1250	**2880**
Delta (in.)	0.31	**0.31**

Section Properties		
	Required	Provided
A (in2)	**15.30**	64.8
Sx (in3)	**43.33**	99.82
I (in4)	**460.56**	461.7

0 INCH ϕ HOLE SEC. REDUC.	
0.0	in3
0.0	in4

REQ'D END BEARING = 0.64 inches

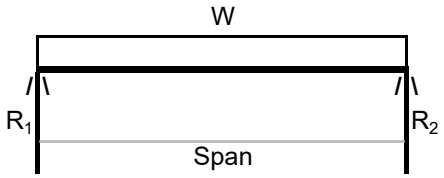
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 290 psi

USE: (1) 7 x 9.25 PSL

1FB19) GRID 6.5 @ E:F

SIMPLE SPAN - UNIFORM LOAD



Span = 10.3 ft

Uniform Load (full span), W = 406 lb/ft

Reactions

V_{max} = 2091 lb — R_1 = 2091 lb

M_{max} = 5384 lb-ft — R_2 = 2091 lb

Nominal Beam Size: b = 5.5 in. d= 9 in. Number of Sections = 1

b_{act} = 5.50 in. d_{act} = 9.00 in.

Lumber Species/Type:---------- GLB REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	N		
Fv =	240 psi	LDF =	1.00	$C_{M(v)}$ =	1.00		
Fb =	2,400 psi	Cr =	1.00	$C_{M(b)}$ =	1.00		
Fc|| =	1,650 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00		
Fc⊥ =	650 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00		
E =	1.8E+06 psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00		
Emin =	.93E+06 psi			Incise Ci=	1.00		

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	54.1	**240**
Fb (psi)	870	**2380**
Delta (in.)	0.17	**0.26**

Section Properties		
	Required	Provided
A (in2)	**11.17**	49.5
Sx (in3)	**27.15**	74.25
I (in4)	**221.82**	334.1

0 INCH ϕ HOLE SEC. REDUC.	
0.0	in3
0.0	in4

REQ'D END BEARING = 0.58 inches

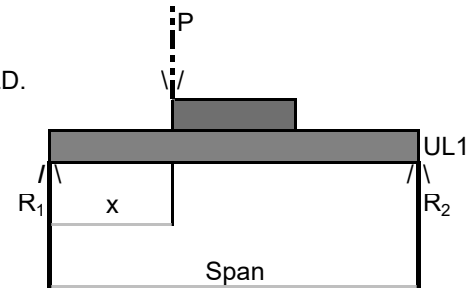
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 240 psi

USE: 5.5 x 9 IN. 24F-V4 GLB

2FB20) GRID 6.5 @F:G

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 12.4 ft

	Load			
Uniform Load 1 (full span) =	191.85	lb/ft		
Uniform Load 2 (lbs/ft) =	1800	from x =	9.5	10.5 feet
Sum UL1 + UL2 =	192			
Concentrated Load (lbs) =	900	@ x =	7.5	feet

		Reactions	
V_{max} =	3185 lb	R_1 =	1894 lb
M_{max} =	7703 lb-ft	R_2 =	3185 lb

Nominal Beam Size: b = 5.5 in. d= 9 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 9.00 in.

Lumber Species/Type:---------- GLB REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

				C_L=	0.99	Moisture > 19%?	N
Fv =	240	psi		LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	2,400	psi		Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	1,650	psi		Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	650	psi		$CF_{(B)}$ =	1.00	$C_{M(c\|)}$ =	1.00
E =	1.8E+06	psi		Delta = L/	480	$C_{M(E)}$ =	1.00
Emin =	.93E+06	psi				Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	92.17	**240**
Fb (psi)	1245	**2376**
Delta (in.)	0.30	**0.31**

Section Properties		
	Required	Provided
A (in2)	**19.0**	49.5
Sx (in3)	**38.9**	74.3
I (in4)	**323.6**	334.1

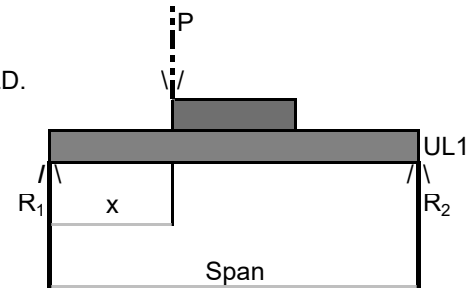
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.89 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 240 psi

USE: 5.5 x 9 IN. 24F-V4 GLB

1FB21) GRID6.5 @ C:E

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 11.4 ft

	Load		
Uniform Load 1 (full span) =	458 lb/ft		
Uniform Load 2 (lbs/ft) =	0	from x = 0	2 feet
Sum UL1 + UL2 = 458			
Concentrated Load (lbs) =	3400	@ x = 2 feet	

		Reactions	
V_{max} =	5414 lb	R_1 =	5414 lb
M_{max} =	11223 lb-ft	R_2 =	3207 lb

Nominal Beam Size: b = 7 in. d= 9.25 in. Number of Sections = 1
b_{act} = 7.00 in. d_{act} = 9.25 in.

Lumber Species/Type:---------- PSL REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?		N	
Fv =	290 psi	LDF =	1.00	$C_{M(v)}$ =	1.00		
Fb =	2,900 psi	Cr =	1.00	$C_{M(b)}$ =	1.00		
Fc|| =	2,900 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00		
Fc⊥ =	750 psi	$CF_{(B)}$ =	1.00	$C_{M(c\|)}$ =	1.00		
E =	2.0E+06 psi	Delta = L/	480	$C_{M(E)}$ =	1.00		
Emin =	.10E+07 psi			Incise Ci=	1.00		

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	117.24	**290**
Fb (psi)	1349	**2882**
Delta (in.)	0.28	**0.29**

Section Properties		
	Required	Provided
A (in2)	**26.2**	64.8
Sx (in3)	**46.7**	99.8
I (in4)	**454.0**	461.7

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.03 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 290 psi

USE: (1) 7 x 9.25 PSL

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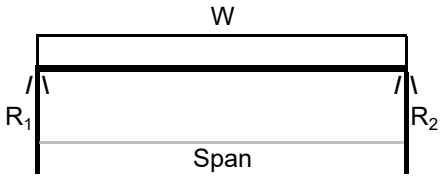
CALCULATION
SECTION 4.0:
DECK FRAMING

DJ01) DECK JOISTS

SIMPLE SPAN - UNIFORM LOAD



Span = 7.1 ft
Spacing = 16 in o.c.
Uniform Load (full span), W = 96 lb/ft

V_{max} = 341 lb
M_{max} = 605 lb-ft

Reactions
R_1 = 341 lb
R_2 = 341 lb

Nominal Beam Size: b = 2 in. d= 8 in. Number of Sections = 1
b_{act} = 1.50 in. d_{act} = 7.25 in.

Lumber Species/Type:---------- HF2 REPETITIVE MEMBER?---------- Y
Post?: NO
Design Stresses and Factors:

		C_L=	0.83	Moisture > 19%?	Y
Fv =	145 psi	LDF =	1.00	$C_{M(v)}$ =	0.97
Fb =	850 psi	Cr =	1.15	$C_{M(b)}$ =	1.00
Fc|| =	1,300 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	0.80
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.20	$C_{M(c\perp)}$ =	0.67
0	1.3E+06 psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	0.90
Emin =	.47E+06 psi			Incise Ci=	0.80

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	39.0	**112.52**
Fb (psi)	552	**783**
Delta (in.)	0.10	**0.18**

Section Properties		
	Required	Provided
A (in2)	**3.77**	10.9
Sx (in3)	**9.27**	13.14
I (in4)	**26.43**	47.6

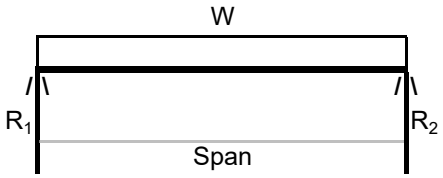
0 INCH ϕ HOLE SEC. REDUC.	
0.0	in3
0.0	in4

REQ'D END BEARING = 0.84 inches
NOTCH DEPTH = 1.25 inches
$f_{V,NOTCH}$ (Tension Face) = 69 psi < Fv' = 113 psi

USE: 2 x 8 HF2 @ 16 IN. O.C.

DB01) DECK BEAM BTWN. C:E

SIMPLE SPAN - UNIFORM LOAD



Span = 11.3 ft

Uniform Load (full span), W = 495 lb/ft

Reactions

V_{max} = 2797 lb — R_1 = 2797 lb

M_{max} = 7901 lb-ft — R_2 = 2797 lb

Nominal Beam Size: b = 6 in. d= 12 in. Number of Sections = 1

b_{act} = 5.50 in. d_{act} = 11.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

				C_L=	0.99	Moisture > 19%?	N
Fv =	140	psi	LDF =	1.00	$C_{M(v)}$ =	1.00	
Fb =	1,050	psi	Cr =	1.00	$C_{M(b)}$ =	1.00	
Fc|| =	750	psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00	
Fc⊥ =	405	psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00	
E =	1.3E+06	psi	δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00	
Emin =	.47E+06	psi			Incise Ci=	1.00	

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	55.1	**140**
Fb (psi)	782	**1039**
Delta (in.)	0.20	**0.28**

Section Properties		
	Required	Provided
A (in2)	**24.88**	63.3
Sx (in3)	**91.28**	121.23
I (in4)	**494.47**	697.1

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.26 inches

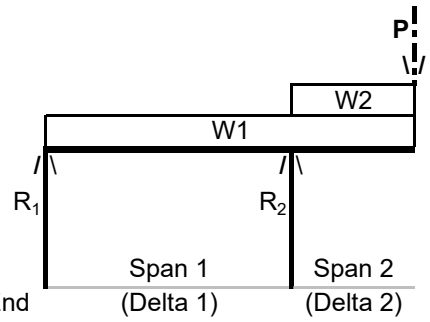
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 140 psi

USE: (1) 6 x 12 HF1

DB02) GRID 1.5 DECK BEAM BTWN. GRIDS E:F

OVERHANGING CANTILEVER



Span 1 = 8.6 ft
Span 2 = 2.7 ft

Uniform Load W1 = 544 lb/ft
Add'l. Uniform Load W2 = 0 lb/ft
Concentrated Load = 370 lb @ Cantilever End

V_{max} = 2686 lb
M_{max} = 5029 lb-ft

R_{1Max} = 2339 lb
R_{2Max} = 4525 lb

Nominal Beam Size: b = 6 in. d= 12 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 11.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	NO
Fv =	140 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	1,050 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	750 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	1.3E+06 psi	Delta1=L/	480	$C_{M(E)}$ =	1.00
Emin =	.47E+06 psi	Delta2=L/	480	Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	51.3	**140**
Fb (psi)	498	**1041**
Delta1(in)	0.07	**0.22**
Delta2(in)	0.06	**0.14**

Section Properties		
	Required	Provided
A (in2)	23.2	63.3
Sx (in3)	58.0	121.2
I (1) (in4)	239.5	697.1
I (2) (in4)	286.7	697.1

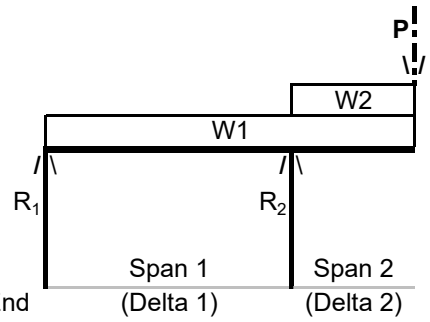
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.81 inches
UNBAL. UPLIFT AT R1 = -347 LBS
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 140 psi

USE: (1) 6 x 12 HF1

DB03) GRID2 FLOOR AND DECK BEAM BTWN. GRIDS E:F

OVERHANGING CANTILEVER



Span 1 = 8.6 ft
Span 2 = 2.7 ft

Uniform Load W1 = 405 lb/ft
Add'l. Uniform Load W2 = 0 lb/ft
Concentrated Load = 370 lb @ Cantilever End

V_{max} = 2029 lb
M_{max} = 3744 lb-ft

R_{1Max} = 1742 lb
R_{2Max} = 3493 lb

Nominal Beam Size: b = 6 in. d= 10 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 9.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	NO
Fv =	140 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	1,050 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	750 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	1.3E+06 psi	Delta1=L/	480	$C_{M(E)}$ =	1.00
Emin =	.47E+06 psi	Delta2=L/	480	Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	49.1	**140**
Fb (psi)	543	**1043**
Delta1(in)	0.10	**0.22**
Delta2(in)	0.08	**0.14**

Section Properties		
	Required	Provided
A (in2)	18.3	52.3
Sx (in3)	43.1	82.7
I (1) (in4)	178.3	393.0
I (2) (in4)	239.0	393.0

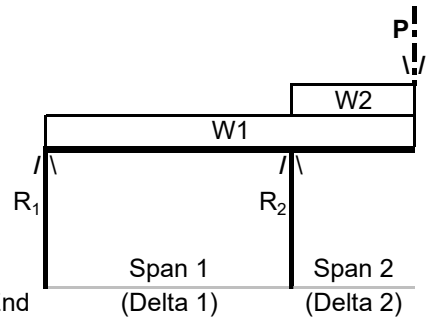
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.35 inches
UNBAL. UPLIFT AT R1 = -288 LBS
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 140 psi

USE: (1) 6 x 10 HF1

DB043) GRID 1 FLOOR AND DECK BEAM BTWN. GRIDS E:F

OVERHANGING CANTILEVER



Span 1 = 8.6 ft
Span 2 = 2.7 ft

Uniform Load W1 = 293 lb/ft
Add'l. Uniform Load W2 = 0 lb/ft
Concentrated Load = 185 lb @ Cantilever End

V_{max} = 1442 lb
M_{max} = 2709 lb-ft

R_{1Max} = 1260 lb
R_{2Max} = 2418 lb

Nominal Beam Size: b = 6 in. d= 12 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 11.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	NO
Fv =	140 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	1,050 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	750 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	1.3E+06 psi	Delta1=L/	480	$C_{M(E)}$ =	1.00
Emin =	.47E+06 psi	Delta2=L/	480	Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	27.5	**140**
Fb (psi)	268	**1041**
Delta1(in)	0.04	**0.22**
Delta2(in)	0.03	**0.14**

Section Properties		
	Required	Provided
A (in2)	12.4	63.3
Sx (in3)	31.2	121.2
I (1) (in4)	129.0	697.1
I (2) (in4)	150.6	697.1

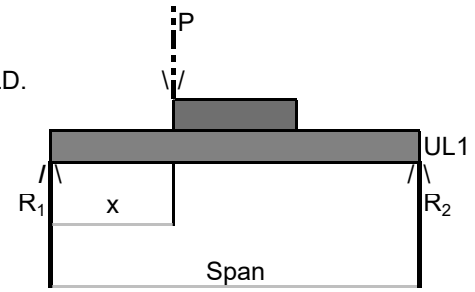
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.98 inches
UNBAL. UPLIFT AT R1 = -182 LBS
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 140 psi

USE: (1) 6 x 12 HF1

DB05) GRID E.8 BM CARRYING DB02

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 14.8 ft

	Load		
Uniform Load 1 (full span) =	0 lb/ft		
Uniform Load 2 (lbs/ft) =	0	from x = 0	7.4 feet
Sum UL1 + UL2 = 0			
Concentrated Load (lbs) =	4600	@ x = 7.4 feet	

		Reactions	
V_{max} =	2300 lb	R_1 =	2300 lb
M_{max} =	17020 lb-ft	R_2 =	2300 lb

Nominal Beam Size: b = 5.5 in. d= 12 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 12.00 in.

Lumber Species/Type:---------- GLB REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	0.98	Moisture > 19%?	N
Fv =	240 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	2,400 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	1,650 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	650 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	1.8E+06 psi	Delta = L/	474.7177	$C_{M(E)}$ =	1.00
Emin =	.93E+06 psi			Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	52.27	**240**
Fb (psi)	1547	**2356**
Delta (in.)	0.37	**0.37**

Section Properties		
	Required	Provided
A (in2)	**14.4**	66.0
Sx (in3)	**86.7**	132.0
I (in4)	**792.0**	792.0

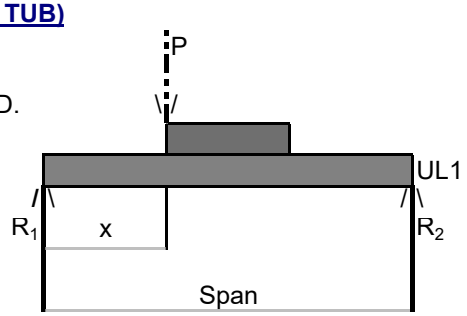
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 0.64 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 240 psi

USE: 5.5 x 12 IN. 24F-V4 GLB

DB06) GRID 2 DECK BTWN. B:B.6 (PARTIALLY CARRYING HOT TUB)

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 9.8 ft

	Load			
Uniform Load 1 (full span) =	495 lb/ft			
Uniform Load 2 (lbs/ft) =	320	from x =	2.3	9.8 feet
Sum UL1 + UL2 =	495			
Concentrated Load (lbs) =	0	@ x =	4.9 feet	

		Reactions	
V_{max} =	3907 lb	R_1 =	3344 lb
M_{max} =	9361 lb-ft	R_2 =	3907 lb

Nominal Beam Size: b = 6 in. d= 12 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 11.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	Y
Fv =	140 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	1,050 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	750 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	0.91
Fc⊥ =	405 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	0.67
E =	1.3E+06 psi	Delta = L/	480	$C_{M(E)}$ =	1.00
Emin =	.47E+06 psi			Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	81.41	**140**
Fb (psi)	927	**1040**
Delta (in.)	0.18	**0.25**

Section Properties		
	Required	Provided
A (in2)	**36.8**	63.3
Sx (in3)	**108.0**	121.2
I (in4)	**504.5**	697.1

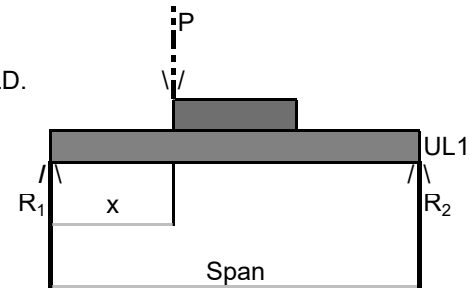
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.75 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 140 psi

USE: (1) 6 x 12 HF1

DB07) GRID 1.5 DECK BTWN. B:B.6 (CARRYING HOT TUB)

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 9.8 ft

	Load			
Uniform Load 1 (full span) =	495 lb/ft			
Uniform Load 2 (lbs/ft) =	500	from x =	2.3	9.8 feet
Sum UL1 + UL2 =	495			
Concentrated Load (lbs) =	0	@ x =	4.9 feet	

		Reactions	
V_{max} =	4741 lb	R_1 =	3860 lb
M_{max} =	11284 lb-ft	R_2 =	4741 lb

Nominal Beam Size: b = 5.5 in. d= 12 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 12.00 in.

Lumber Species/Type:---------- GLB REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	0.99	Moisture > 19%?	Y
Fv =	240 psi	LDF =	1.00	$C_{M(v)}$ =	0.88
Fb =	2,400 psi	Cr =	1.00	$C_{M(b)}$ =	0.80
Fc|| =	1,650 psi	Cv =	1.00	$C_{M(c\|\|)}$ =	0.73
Fc⊥ =	650 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	0.53
E =	1.8E+06 psi	Delta = L/	480	$C_{M(E)}$ =	0.83
Emin =	.93E+06 psi			Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	96.49	**210**
Fb (psi)	1026	**1899**
Delta (in.)	0.16	**0.25**

Section Properties		
	Required	Provided
A (in2)	**30.3**	66.0
Sx (in3)	**71.3**	132.0
I (in4)	**526.1**	792.0

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

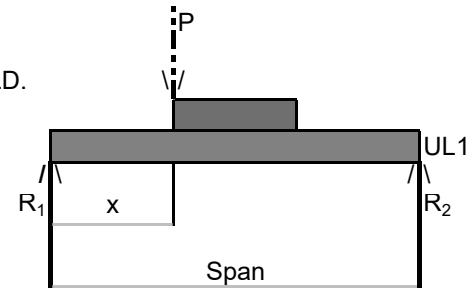
REQ'D END BEARING = 1.33 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 210 psi

USE: 5.5 x 12 IN. 24F-V4 GLB

DB08) **GRID B.6 BEAM BTWN. 1.2:3**

(SMALL CANTILEVER CONSIDERED]

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 16.9 ft

	Load			
Uniform Load 1 (full span) =	0	lb/ft		
Uniform Load 2 (lbs/ft) =	4900	from x =	6.3	7 feet
Sum UL1 + UL2 =	0			
Concentrated Load (lbs) =	5400	@ x =	13.2	feet

		Reactions	
V_{max} =	5567 lb	R_1 =	3263 lb
M_{max} =	21583 lb-ft	R_2 =	5567 lb

Nominal Beam Size: b = 5.5 in. d= 15 in. Number of Sections = 1

b_{act} = 5.50 in. d_{act} = 15.00 in.

Lumber Species/Type:---------- GLB REPETITIVE MEMBER?---------- N

POST?: NO

Design Stresses and Factors:

		C_L=	0.97	Moisture > 19%?	N
Fv =	240 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	2,400 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	1,650 psi	Cv =	0.99	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	650 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	1.8E+06 psi	Delta = L/	480	$C_{M(E)}$ =	1.00
Emin =	.93E+06 psi			Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	101.23	**240**
Fb (psi)	1256	**2309**
Delta (in.)	0.41	**0.42**

Section Properties		
	Required	Provided
A (in2)	**34.8**	82.5
Sx (in3)	**112.2**	206.3
I (in4)	**1492.2**	1546.9

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.56 inches

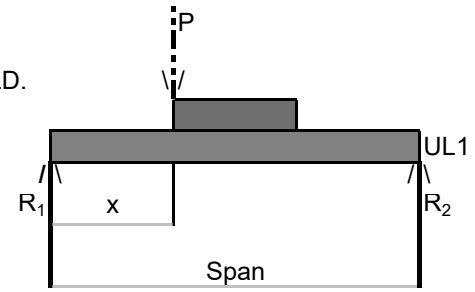
NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 240 psi

USE: 5.5 x 15 IN. 24F-V4 GLB

DB09) GRID B DECK BEAM

SIMPLE SPAN - UNIFORM LOAD/PARTIAL LOAD/CONC. LD.



Span = 16.9 ft

	Load			
Uniform Load 1 (full span) =	50	lb/ft		
Uniform Load 2 (lbs/ft) =	4000	from x =	6.3	7 feet
Sum UL1 + UL2 =	50			
Concentrated Load (lbs) =	4800	@ x =	13.2	feet

		Reactions	
V_{max} =	5273 lb	R_1 =	3172 lb
M_{max} =	20001 lb-ft	R_2 =	5273 lb

Nominal Beam Size: b = 5.5 in. d= 15 in. Number of Sections = 1
b_{act} = 5.50 in. d_{act} = 15.00 in.

Lumber Species/Type:---------- GLB REPETITIVE MEMBER?---------- N
POST?: NO
Design Stresses and Factors:

		C_L=	0.97	Moisture > 19%?	N
Fv =	240 psi	LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	2,400 psi	Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	1,650 psi	Cv =	0.99	$C_{M(c\|\|)}$ =	1.00
Fc⊥ =	650 psi	$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	1.00
E =	1.8E+06 psi	Delta = L/	480	$C_{M(E)}$ =	1.00
Emin =	.93E+06 psi			Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	94.74	**240**
Fb (psi)	1164	**2309**
Delta (in.)	0.37	**0.42**

Section Properties		
	Required	Provided
A (in2)	**32.6**	82.5
Sx (in3)	**103.9**	206.3
I (in4)	**1351.9**	1546.9

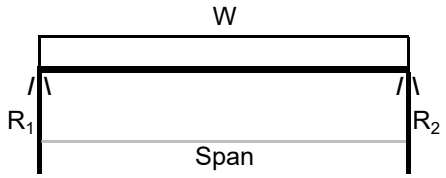
0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.48 inches
NOTCH DEPTH = 0 inches
$f_{V,NOTCH}$ (Tension Face) = N/A < Fv' = 240 psi

USE: 5.5 x 15 IN. 24F-V4 GLB

DB10) GRID 1.2 BEAM BTWN. B:B.6

SIMPLE SPAN - UNIFORM LOAD



Span = 9.8 ft

Uniform Load (full span), W = 375 lb/ft

V_{max} = 1838 lb

M_{max} = 4502 lb-ft

Reactions

R_1 = 1838 lb

R_2 = 1838 lb

Nominal Beam Size: b = 6 in. d= 12 in. Number of Sections = 1

b_{act} = 5.50 in. d_{act} = 11.50 in.

Lumber Species/Type:---------- HF1 REPETITIVE MEMBER?---------- N

Post?: NO

Design Stresses and Factors:

				C_L=	0.99	Moisture > 19%?	Y
Fv =	140	psi		LDF =	1.00	$C_{M(v)}$ =	1.00
Fb =	1,050	psi		Cr =	1.00	$C_{M(b)}$ =	1.00
Fc|| =	750	psi		Cv =	1.00	$C_{M(c\|\|)}$ =	0.91
Fc⊥ =	405	psi		$CF_{(B)}$ =	1.00	$C_{M(c\perp)}$ =	0.67
E =	1.3E+06	psi		δ_{TOTAL}=L/	480	$C_{M(E)}$ =	1.00
Emin =	.47E+06	psi				Incise Ci=	1.00

Stresses and Deflections		
	Actual	Allowable
Fv (psi)	35.1	**140**
Fb (psi)	446	**1040**
Delta (in.)	0.09	**0.25**

Section Properties		
	Required	Provided
A (in2)	**15.84**	63.3
Sx (in3)	**51.93**	121.23
I (in4)	**244.35**	697.1

0 INCH ϕ HOLE SEC. REDUC.
0.0 in3
0.0 in4

REQ'D END BEARING = 1.23 inches

NOTCH DEPTH = 0 inches

$f_{V,NOTCH}$ (Tension Face) = < Fv' = 140 psi

USE: (1) 6 x 12 HF1

Trygstad Engineering
nels@trygstadeng.com

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 24310 Scharhon Remodel.ec6

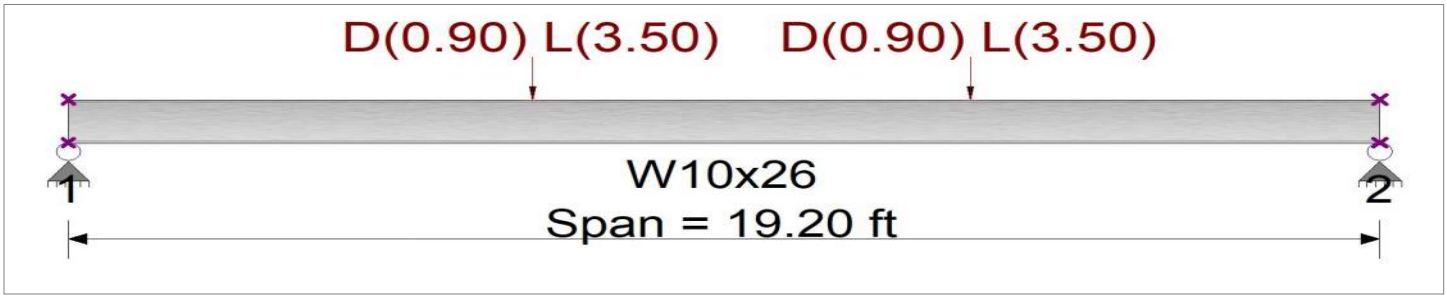
DESCRIPTION: DB11) GRID C BM. BTWN. GRIDS 1:3

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Completely Unbraced	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 calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 0.90, L = 3.50 k @ 6.80 ft
Point Load : D = 0.90, L = 3.50 k @ 13.20 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.747** : 1	Maximum Shear Stress Ratio =	**0.090** : 1
Section used for this span	**W10x26**	Section used for this span	**W10x26**
Ma : Applied	29.769 k-ft	Va : Applied	4.833 k
Mn / Omega : Allowable	39.876 k-ft	Vn/Omega : Allowable	53.560 k
Load Combination	+D+L	Load Combination	+D+L
		Location of maximum on span	19.200 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.365 in	Ratio =	631	>=480.	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0	<480.0	n/a
Max Downward Total Deflection	0.478 in	Ratio =	482	>=360.	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0	<360.0	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega
D Only												
Dsgn. L = 19.20 ft	1	0.177	0.022	6.99		6.99	66.07	39.56	1.14	1.00	1.19	80.34 53.56
+D+L												
Dsgn. L = 19.20 ft	1	0.747	0.090	29.77		29.77	66.59	39.88	1.15	1.00	4.83	80.34 53.56
+D+0.750L												
Dsgn. L = 19.20 ft	1	0.604	0.073	24.07		24.07	66.54	39.84	1.15	1.00	3.92	80.34 53.56
+0.60D												
Dsgn. L = 19.20 ft	1	0.106	0.013	4.19		4.19	66.07	39.56	1.14	1.00	0.71	80.34 53.56

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.4776	9.655		0.0000	0.000

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	4.466	4.833
Max Upward from Load Combinations	4.466	4.833
Max Upward from Load Cases	3.354	3.646
D Only	1.112	1.187
+D+L	4.466	4.833
+D+0.750L	3.628	3.921
+0.60D	0.667	0.712

Steel Beam

DESCRIPTION: DB11) GRID C BM. BTWN. GRIDS 1:3

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
L Only	3.354	3.646

Trygstad Engineering
nels@trygstadeng.com

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Beam

Project File: 24310 Scharhon Remodel.ec6

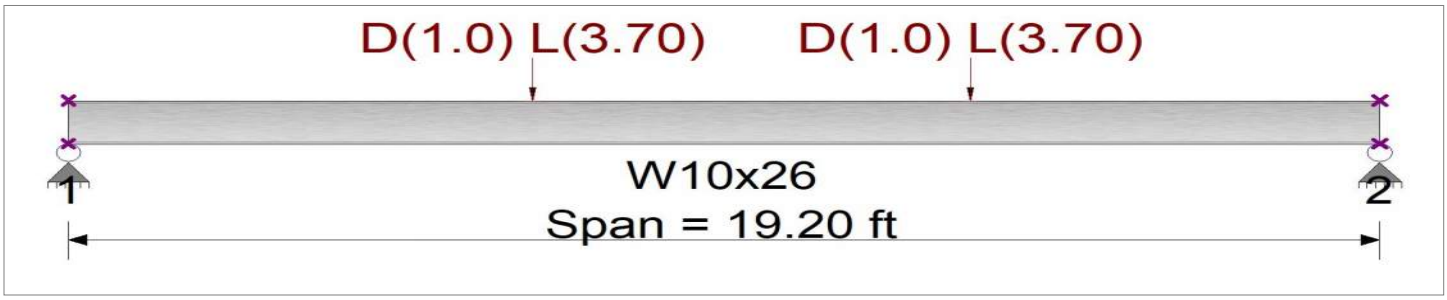
DESCRIPTION: DB12) GRID E BM. BTWN. GRIDS 1:3

CODE REFERENCES

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

Material Properties

Analysis Method :	Allowable Strength Design	Fy : Steel Yield :	50.0 ksi
Beam Bracing :	Completely Unbraced	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 calculated and added to loading
Load(s) for Span Number 1
Point Load : D = 1.0, L = 3.70 k @ 6.80 ft
Point Load : D = 1.0, L = 3.70 k @ 13.20 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.796 : 1	Maximum Shear Stress Ratio =	0.096 : 1
Section used for this span	W10x26	Section used for this span	W10x26
Ma : Applied	31.724 k-ft	Va : Applied	5.145 k
Mn / Omega : Allowable	39.876 k-ft	Vn/Omega : Allowable	53.560 k
Load Combination	+D+L	Load Combination	+D+L
		Location of maximum on span	19.200 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.385 in	Ratio =	597	>=480.	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0	<480.0	n/a
Max Downward Total Deflection	0.509 in	Ratio =	453	>=360.	Span: 1 : +D+L
Max Upward Total Deflection	0 in	Ratio =	0	<360.0	n/a

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega
D Only												
Dsgn. L = 19.20 ft	1	0.193	0.024	7.63		7.63	66.07	39.56	1.14	1.00	1.29	80.34 53.56
+D+L												
Dsgn. L = 19.20 ft	1	0.796	0.096	31.72		31.72	66.59	39.88	1.15	1.00	5.15	80.34 53.56
+D+0.750L												
Dsgn. L = 19.20 ft	1	0.645	0.078	25.70		25.70	66.54	39.84	1.15	1.00	4.18	80.34 53.56
+0.60D												
Dsgn. L = 19.20 ft	1	0.116	0.014	4.58		4.58	66.07	39.56	1.14	1.00	0.77	80.34 53.56

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.5089	9.655		0.0000	0.000

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	4.754	5.145
Max Upward from Load Combinations	4.754	5.145
Max Upward from Load Cases	3.546	3.854
D Only	1.208	1.291
+D+L	4.754	5.145
+D+0.750L	3.867	4.182
+0.60D	0.725	0.775

Steel Beam

DESCRIPTION: DB12) GRID E BM. BTWN. GRIDS 1:3

Vertical Reactions

Support notation : Far left is #: Values in KIPS

Load Combination	Support 1	Support 2
L Only	3.546	3.854

Trygstad
ENGINEERING

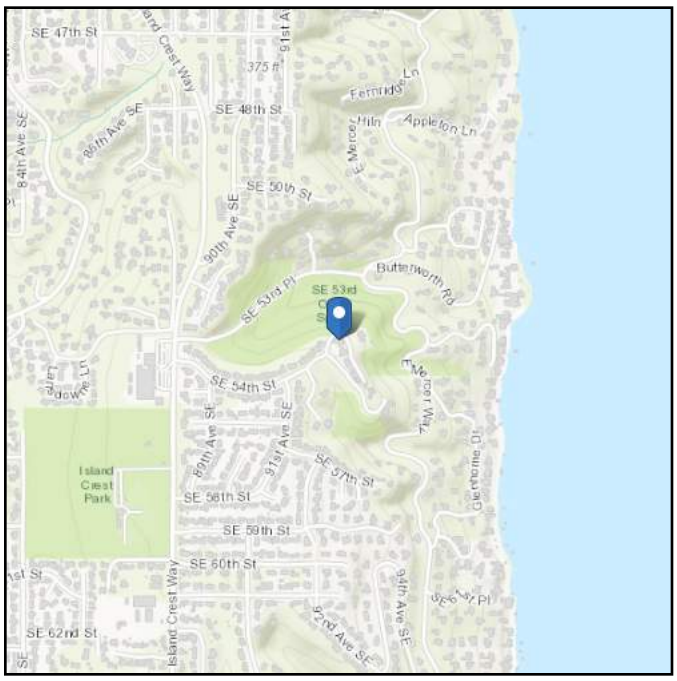
CALCULATION
SECTION 7.0:
LATERAL ENGINEERING

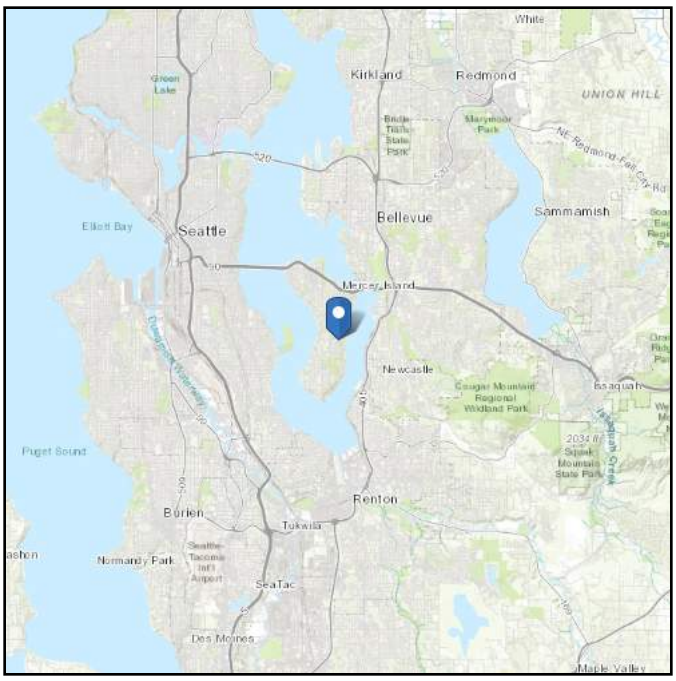
ASCE Hazards Report

Address:
9150 SE 54th St
Mercer Island, Washington
98040

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

Latitude: 47.554518
Longitude: -122.215744
Elevation: 322.36468227761173 ft (NAVD 88)





Wind

Results:

Wind Speed	98 Vmph
10-year MRI	67 Vmph
25-year MRI	74 Vmph
50-year MRI	78 Vmph
100-year MRI	83 Vmph

USE 100mph REFER TO NEXT PAGE FOR Kzt & EXP.

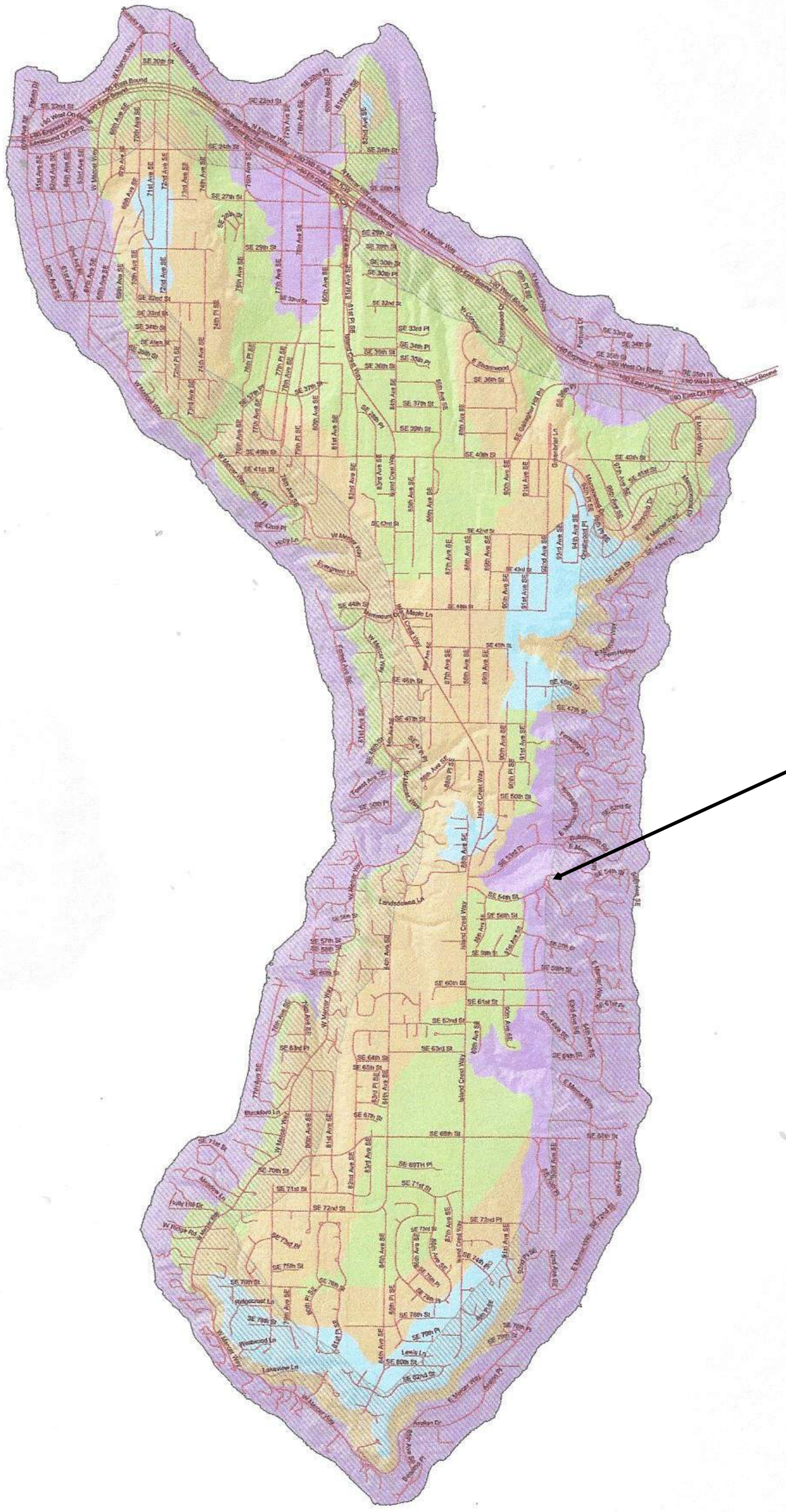
Data Source: ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Sun Jul 28 2024

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

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

Mercer Island Wind Exposure and Wind Speed-Up (Topographic Effect)

by Development Services Group (DSG), City of Mercer Island
April 2009



0 0.5 1 Kilometers 1:12,000
0 0.5 1 Miles
T N

WIND EXPOSURE CATEGORIES & WIND SPEED-UP FACTORS
(ICC Section 1609 & ASCE 7-05 Chapter 6)

It is the responsibility of the Owner (or their Design Professional) to review site conditions and determine the Kzt factor to be utilized for each specific project. The Kzt factors and wind exposure categories indicated on this map are the minimum values accepted by the City of Mercer Island without requiring the design professional to submit additional calculations and supporting topographic documentation (to verify the values utilized in their wind load determination).

Please note – The Kzt values indicated on this map are approximations based upon periodic calculations of representative samplings around Mercer Island. These values are intended for City of Mercer Island's plan review purposes only.

WIND EXPOSURE CATEGORIES:

Wind Exposure Category	
	Exposure 'C' (1500 feet from Lake)
	Exposure 'B' (all other areas)

WIND SPEED-UP (TOPOGRAPHIC EFFECT) - K_zt Factor :

K_zt Factor	
	$K_zt = 1.0$
	$K_zt = 1.3$
	$K_zt = 1.6$
	$K_zt = 1.9$

9150 SE 54TH St

PURPLE, HATCHED ZONE

Kzt=1.0, Exp. C

GENERAL NOTES FOR WIND EXPOSURE AND WIND SPEED-UP MAP

This map is the Wind Exposure Category and Wind Speed-up (Topographic Effects) Map for the City of Mercer island. This map shows the minimum wind exposure category and the minimum wind speed-up, "K_zt" factor, which will be accepted without site specific documentation and calculation.

Other wind speed phenomena may occur on Mercer Island that is not specifically indentified on this map. It is the responsibility of the Owner (or their Design Professional) to review site conditions and determine the appropriate design wind speed and exposure category for their specific project and location.

This map is for the sole use of the staff of the City of Mercer Island's Development Services Group (DSG) for the purposes of permit application evaluation. This map provides DSG staff a general assessment of Wind Exposure Category and Wind Speed-up (Topographic Effects). All areas have not been specifically evaluated and there may be locations that are not correctly represented on this map. It is the responsibility of individual property owners and map users to evaluate risk associated with their proposed development. No site-specific assessment of risk is implied or otherwise indicated by the City of Mercer Island with this map.

Information about data used for the map, references, and data limitation are all described the associated "Read Me" document. The digital version of this map is accompanied by a meta data file containing pertinent information about map construction. This data map is available on the City of Mercer Island website.

The City of Mercer Island is using guidance provided within ICC Section 1609 & ASCE 7-05 Chapter 6 regarding definitions used when creating this map.

DEFINITIONS:

K_zt factor:	The topographic effect of wind speed-up at isolated hills, ridges, and escarpments constituting abrupt changes in the general topography, located in any exposure category, that meet all of the conditions noted in ASCE 7-05 Minimum Design Loads for Buildings and Other Structures, Section 6.5.7.
Exposure B:	The wind exposure category that applies where the site in question is located a minimum of 1500 feet from the shoreline and the mean roof height is less than or equal to 30 feet per IBC 2006 section 1609.4.3.
Exposure C:	The wind exposure category that applies where the site in question is located within 1500 feet from the shoreline per IBC 2006 section 1609.4.3.
Wind Speed:	Minimum 85 mph 3-second gust per IRC Figure R301.2(4)

27 Directional Procedure, Part 1:Enclosed and Partially Enclosed Rigid Buildings. (All Heights)

27.4. MWFRS

Velocity pressure q_z = .00256 K_z K_{zt} K_d V^2 (27.3-1)

Exposure C Roof Height h = 23 feet

Roof Pitch = 6.00 :12

Exposure coefficient K_z = Section 27.3.1, shall be determined from Table 27.3-1

Topography factor K_{zt} = 1.00 26.8.2, Figure 26.8-1

Directionality factor K_d = 0.85 26.6, Table 26.6-1

Building & Structure Risk Category = II, standard IBC T-1604.5

Wind Speed V = 100 mph Fig. 26.5-1A, MRI = 700 yrs

q_z = 21.76 K_z psf

Internal Pressure Coefficient (GC_{pi}) = ± 0.18 Table 26.11-1, for Enclosed Building

Gust effect factor G = 0.85 26.9

Pressures for MWFRS p = $qGC_p - q_i(GC_{pi})$ (27.4-1)

Wall and Roof External pressure Coefficients C_p from Fig. 27.4-1

Wind Normal to Ridge (⊥ to 85) L/B = 1.00 h/L = 23/85 = 0.27 θ= 26.6

Windward wall C_p = 0.80 Windward roof C_p = -0.21

Leeward wall C_p = -0.50 for L/B = 1.00 Leeward roof C_p = -0.60

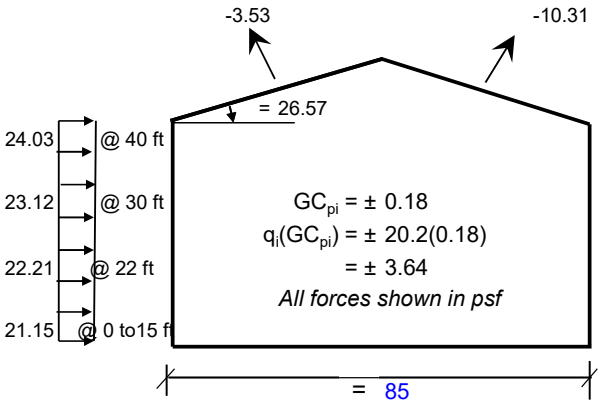
Side wall C_p = -0.70 or Roof C_p =

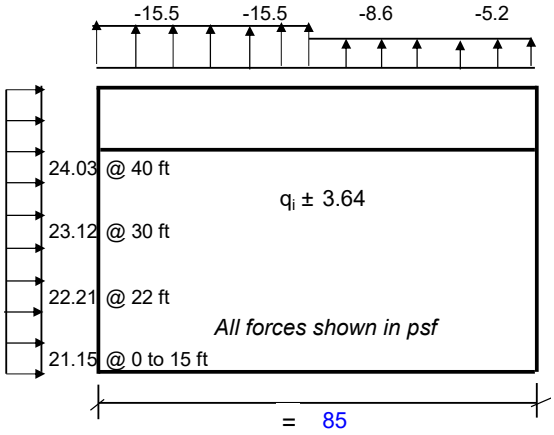
Wind Parallel to Ridge (⊥ to 85) L/B = 1.00

Windward wall C_p = 0.80 h/L = 23/85 = 0.27

Leeward wall C_p = -0.50 for L/B = 1.00 Roof C_p = -0.90 -0.90

Side wall C_p = -0.70 for dist 0 12





$p = qGC_p - q_i(GC_{pi})$ (27.4-1) For Exp C

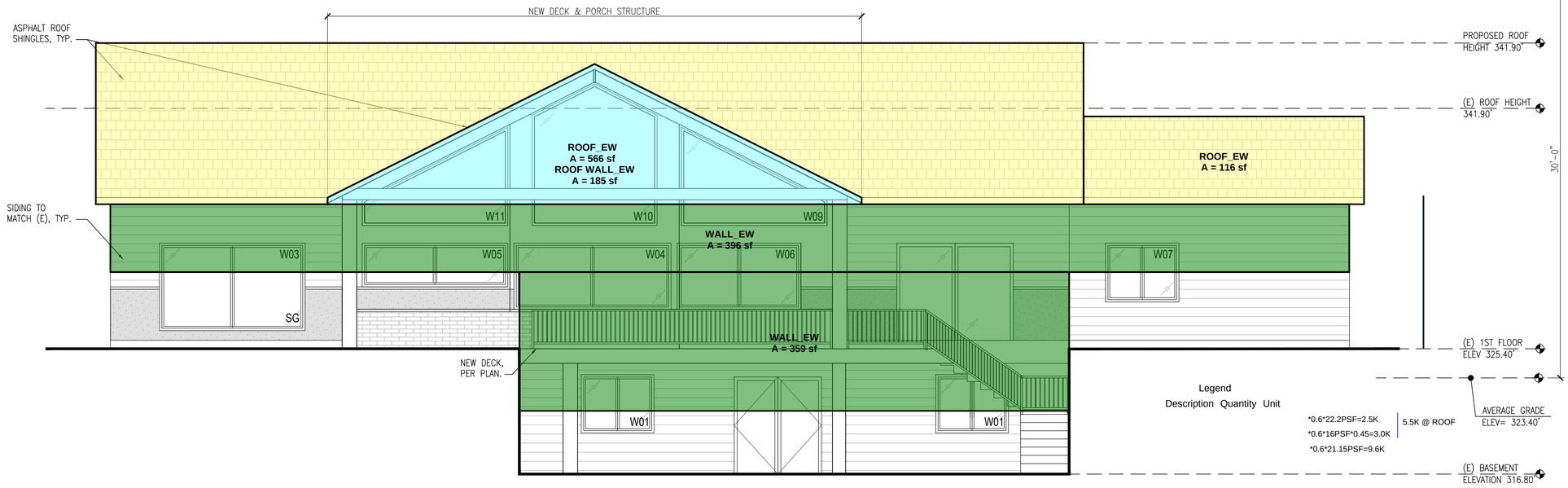
where $q = q_z$ for windward at height z $z_g = 900$ $\propto = 9.5$

$q = q_h$ for leeward wall, side wall and roof @23 ft $K_z = 2.01(z/z_g)^{2/\propto}$

$q_i = q_h$ for enclosed building @23 ft K_z (min) $= 2.01(15/z_g)^{2/\propto}$

Roof Ht, h = 23 ft				Normal to Ridge ⊥ to 85			Parallel to ridge ⊥ to 85		
	Height	K_h	q_h	C_p	q_hGC_p		C_p	q_hGC_p	
Leeward wall	all	0.929	20.21	-0.5	-8.59		-0.50	-8.59	
Side wall	all	0.929	20.21	-0.70	-12.03		-0.70	-12.03	
Roof	ww	-0.206					-0.90	-15.46	fr 0 - 11.5
	Lw	-0.600					-0.90	-15.46	fr >11.5
							-0.50	-8.59	fr 23-46
							-0.30	-5.15	fr 46

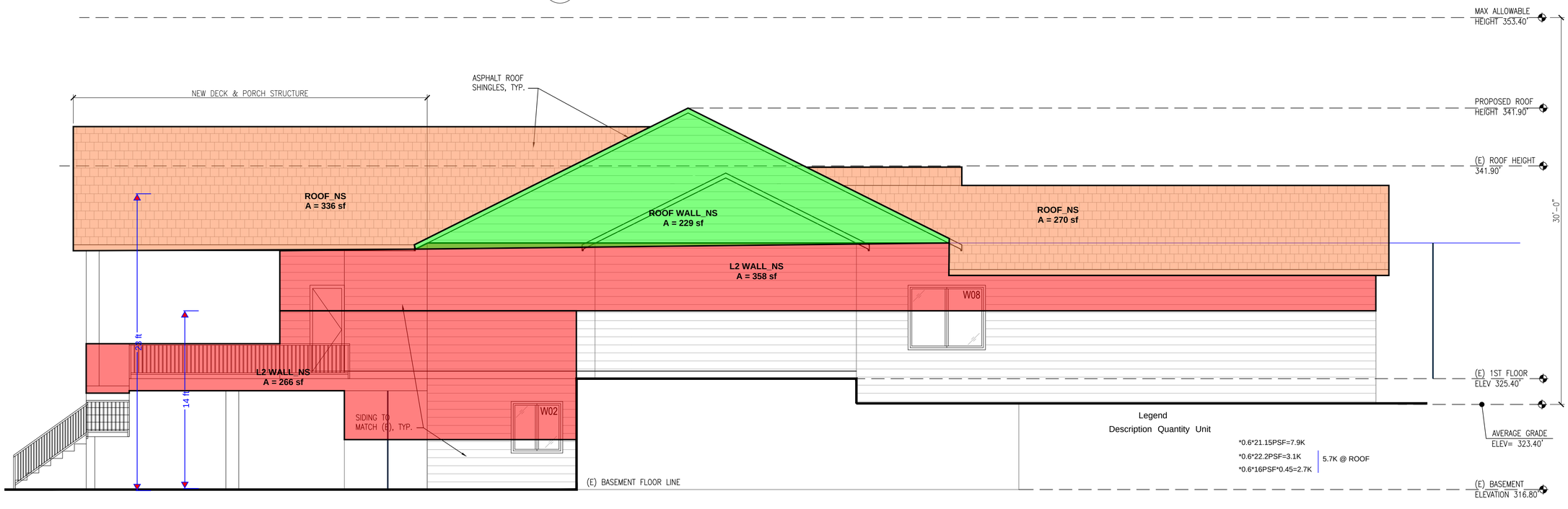
				Normal to Ridge ⊥ to 85			Parallel to ridge ⊥ to 85		
	z, Ht. (ft)	K_z	q_z	C_p	$p = q_zGC_p$	WW+LW	C_p	$p = q_zGC_p$	WW+LW
Windward wall	0 to 15	0.849	18.47	0.80	12.56	21.15	0.80	12.56	21.15
	22.0	0.920	20.02	0.80	13.62	22.21	0.80	13.62	22.21
	30.0	0.982	21.37	0.80	14.53	23.12	0.80	14.53	23.12
	40.0	1.044	22.71	0.80	15.44	24.03	0.80	15.44	24.03



B EAST ELEVATION

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

0 5 10



A NORTH ELEVATION

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

0 5 10

GRAPHIC SCALE

CONSTRUCTION
AND REMODELING

SCHARHON - RESIDENCE

Addition & Alteration
9150 SE 54th St, Mercer Island, WA 98040

Permit Set

Job # 24-028

Description	Date
Permit Intake	07/19/24

Drawn:
Stamp/Approval:

Sheet Name:

ELEVATIONS

Sheet No:

A3.3

Seismic

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

Results:

S_S :	1.444	S_{D1} :	N/A
S_1 :	0.501	T_L :	6
F_a :	1.2	PGA :	0.618
F_v :	N/A	PGA_M :	0.742
S_{MS} :	1.733	F_{PGA} :	1.2
S_{M1} :	N/A	I_e :	1
S_{DS} :	1.155	C_v :	1.389

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Sun Jul 28 2024

Date Source: USGS Seismic Design Maps

SHEET TITLE: **7.1) IBC SEISMIC OVERVIEW**
PROJECT # : **Scharhon (Job#24310)**

Step #				IBC	ASCE 7
1.	OCCUPANCY CATEGORY	TYPE =	II	Table 1604.5	Table 1.5-1
2.	IMPORTANCE FACTOR	I_E =	1.00	Section 1613.1 -> ASCE	Table 1.5-2
3.	Site Class - Per Geo. Engr.	S.C. =	D	Section 1613.3.5 Table 1613.3.3(2)	Section 11.4.2 / Ch. 20 Table 20.3-1
4.	0.2 Sec. Spectral Response	S_S =	1.4440	Figure 1613.3.1(1)	Figure 22-1
5.	1.0 Sec. Spectral Response	S_1 =	0.5010	Figure 1613.3.1(2)	Figure 22-2
6.	Site Coefficient (short period)	F_a =	1.20	Figure 1613.3.3(1)	Table 11.4-1
7.	Site Coefficient (1.0 second)	Fv =	0.00	Figure 1613.3.3(2)	Table 11.4-2
	$S_{MS} = F_a * S_S$	S_{MS} =	1.7330	EQ 16-37	EQ 11.4-1
	$S_{M1} = F_v * S_1$	S_{M1} =	0.0000	EQ 16-38	EQ 11.4-2
	$S_{DS} = 2/3 * S_{MS}$	S_{DS} =	**1.155**	EQ 16-39	EQ 11.4-3
	$S_{D1} = 2/3 * S_{M1}$	S_{D1} =	0.000	EQ 16-40	EQ 11.4-4
8.	Seismic Design Category 0.2s	SDC_S =	D	Table 1613.3.5(1)	Table 11.6-1
9.	Seismic Design Category 1.0s	SDC_1 =	C	Table 1613.3.5(2)	Table 11.6-2
10.	Seismic Design Category	SDC =	D	Max.	Max.
11.	Wood structural panels	---	---	N/A	Table 12.2-1
12.	Response Modification Coef.	R =	6.5	N/A	Table 12.2-1
13.	Overstrength Factor	Ω_0 =	2.5	N/A	Table 12.2-1
14.	Deflection Amplification Factor	C_D =	2.0	N/A	Table 12.2-1
15.	Horizontal Structural Irregularitie	---	NO	N/A	Table 12.3-1
16.	Vertical Structural Irregularities	---	NO	N/A	Table 12.3-2
17.	Permitted Procedure	Equiv. Lateral Force		---	Table 12.6-1

SHEET TITLE: **7.2) IBC EQUIVALENT LATERAL FORCE PROCEDURE PER ASCE 7**
PROJECT # : Scharhon (Job#24310)

S_{DS} =	1.16	h_n = 18.00	(ft)	
S_{D1} =	0.00	x = 0.75	ASCE 7 (Table 12.8-2)	
R =	6.5	C_t = 0.020	ASCE 7 (Table 12.8-2)	
I_E =	1.0	T = 0.175	ASCE 7 (EQ 12.8-7)	
S_1 =	0.50	k = 1	ASCE 7 (Section 12.8.3)	
		T_L = 6	ASCE 7 (Section 11.4.5: Figure 22-15)	

$C_S = S_{DS} / (R/I_E)$		0.178	W	ASCE 7 (EQ 12.8-2)
$C_S = S_{D1} / (T^*(R/I_E))$	*(for $T \leq T_L$)*	0.000	W	ASCE 7 (EQ 12.8-3) (MAX.)
$C_S = (S_{D1} * T_L)/ (T^{2*}(R/I_E))$	*(for $T \geq T_L$)*	0.000	W	ASCE 7 (EQ 12.8-4) (MAX.)
$C_S = 0.01$		0.010	W	ASCE 7 (EQ 12.8-5) (MIN.)
$C_S = (0.5\ S_1)/(R/I_E)$		0.039	W	ASCE 7 (EQ 12.8-6) (MIN.if S1> 0.6g)

CONTROLLING DESIGN BASE SHEAR = 0.178 W

VERTICAL DISTRIBUTION OF SEISMIC FORCES PER ASCE 7 SECTION 12.8.3

(EQ 12.8-11)
(EQ 12.8-12)

DIAPHR. LEVEL	Story Height	Elevation (ft)	Height h_i (ft)	Area #1 AREA (sqft)	Area #1 DL (ksf)	Area #2 AREA (sqft)	Area #2 DL (ksf)	Area #3 AREA (sqft)	Area #3 DL (ksf)	w_i (kips)	$w_i * h_i^k$ (kips)	C_{vx} = $w_x * h_x^k / \sum w_i * h_i^k$	DESIGN Vi	SUM DESIGN V	V_{wind} N-S	V_{wind} E-W
Roof	---	18.00	18.00	4372	0.023	867	0.018			116.2	2090.9	0.90	**15.91**	15.91	5.70	5.50
2nd	---	10.00	10.00	507	0.025	681	0.015			22.9	228.9	0.10	**1.74**	1.74	7.90	9.60
1st	---		0.00							0.0	0.0	0.00	**0.00**	0.00		
Ground	---	0.00														
										139.1	2319.8	1.00	**17.65**		**13.60**	**15.10**

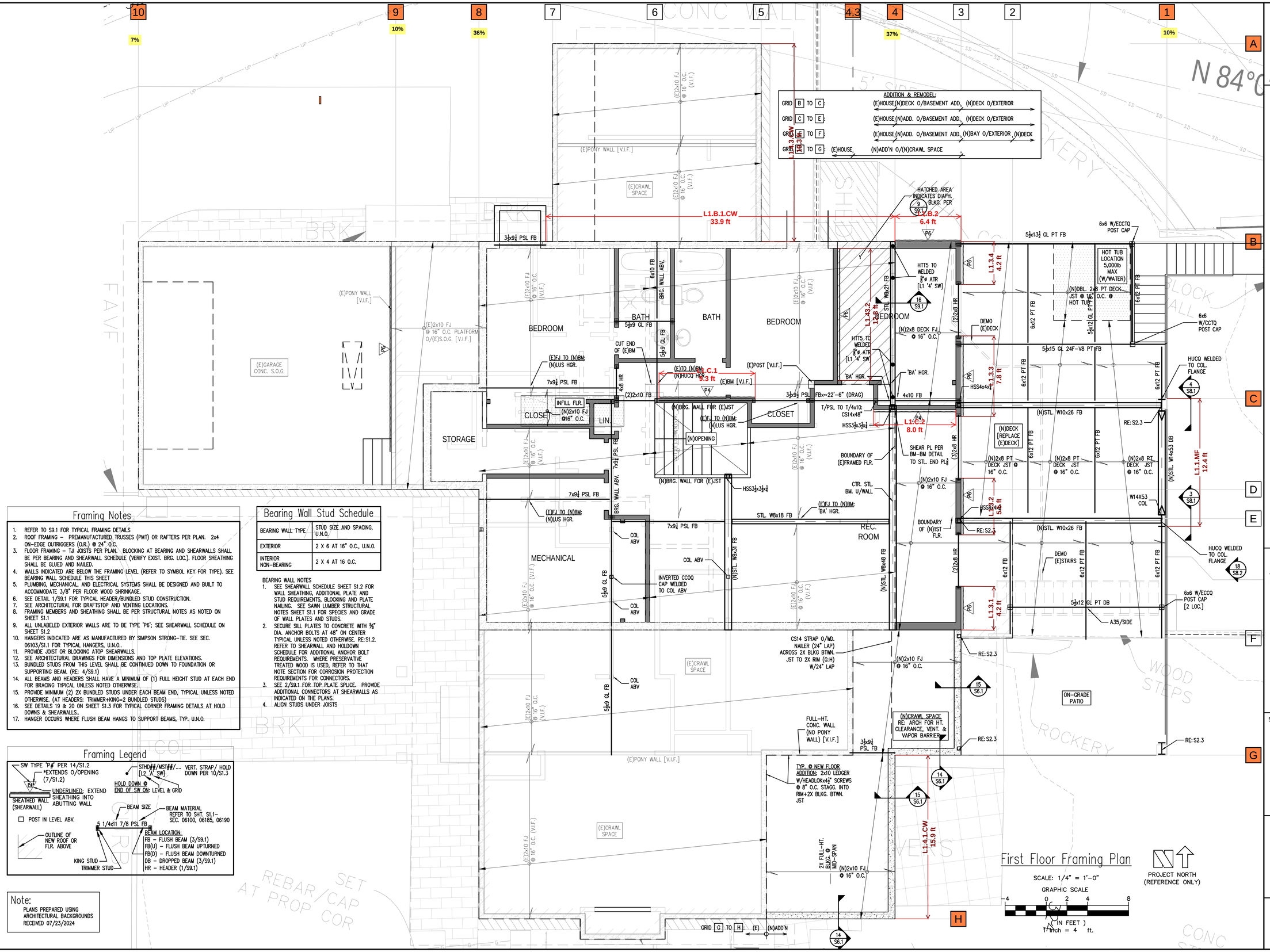
E = V = 24.72
E/1.4 = 17.65

SHEET TITLE: **7.4) NDS SHEARWALL VALUES**
PROJECT # : Scharhon (Job#24310)

SHEATHING THICKNESS	$t_{sheathing}$ =	**7/16**
NAIL SIZE	nail size =	8d Com.
STUD SPECIES	SPECIES =	**HF**
SPECIFIC GRAVITY	S.G. =	0.43
ANCOR BOLT DIAMETER	Anc. Bolt dia. =	0.625

SHEARWALL TYPE SDPW&S Table 4.3a	**Seismic**	**Wind**
$v_{nominal}$	$v_{s\ allowable}$	$v_{w\ allowable}$
(PER Table 4.3A)	modify per S. G.	modify per S. G.
0.3		inc. 40% per 2306.3

SHEARWALL TYPE SDPW&S Table 4.3a			**Seismic**	**Wind**
---	0	0	**1**	**1**
P6TN	150	2	**150**	**150**
P6	520	151	**242**	**339**
P4	760	243	**353**	**495**
P3	980	354	**456**	**638**
P2	1280	457	**595**	**833**
2P4	1520	596	**707**	**990**
2P3	1960	708	**911**	**1276**
2P2	2560	912	**1190**	**1667**
N.G.	10000	###	**9300**	**13020**



Framing Notes

1. REFER TO S9.1 FOR TYPICAL FRAMING DETAILS
2. ROOF FRAMING – PREMANUFACTURED TRUSSES (PMT) OR RAFTERS PER PLAN. 2x4 ON-EDGE OUTRIGGERS (O.R.) @ 24" O.C.
3. FLOOR FRAMING – TJI JOISTS PER PLAN. BLOCKING AT BEARING AND SHEARWALLS SHALL BE PER BEARING AND SHEARWALL SCHEDULE (VERIFY EXIST. BRG. LOC.). FLOOR SHEATHING SHALL BE GLUED AND NAILED.
4. WALLS INDICATED ARE BELOW THE FRAMING LEVEL (REFER TO SYMBOL KEY FOR TYPE). SEE BEARING WALL SCHEDULE THIS SHEET
5. PLUMBING, MECHANICAL, AND ELECTRICAL SYSTEMS SHALL BE DESIGNED AND BUILT TO ACCOMMODATE 3/8" PER FLOOR WOOD SHRINKAGE.
6. SEE DETAIL 1/S9.1 FOR TYPICAL HEADER/BUNDLED STUD CONSTRUCTION.
7. SEE ARCHITECTURAL FOR DRAFTSTOP AND VENTING LOCATIONS.
8. FRAMING MEMBERS AND SHEATHING SHALL BE PER STRUCTURAL NOTES AS NOTED ON SHEET S1.1
9. ALL UNLABELED EXTERIOR WALLS ARE TO BE TYPE 'P6'; SEE SHEARWALL SCHEDULE ON SHEET S1.2
10. HANGERS INDICATED ARE AS MANUFACTURED BY SIMPSON STRONG-TIE. SEE SEC. 06103/S1.1 FOR TYPICAL HANGERS, U.N.O..
11. PROVIDE JOIST OR BLOCKING ATOP SHEARWALLS.
12. SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS AND TOP PLATE ELEVATIONS.
13. BUNDLED STUDS FROM THIS LEVEL SHALL BE CONTINUED DOWN TO FOUNDATION OR SUPPORTING BEAM. (RE: 4/S9.1)
14. ALL BEAMS AND HEADERS SHALL HAVE A MINIMUM OF (1) FULL HEIGHT STUD AT EACH END FOR BRACING TYPICAL UNLESS NOTED OTHERWISE.
15. PROVIDE MINIMUM (2) 2X BUNDLED STUDS UNDER EACH BEAM END, TYPICAL UNLESS NOTED OTHERWISE. (AT HEADERS: TRIMMER+KING=2 BUNDLED STUDS)
16. SEE DETAILS 19 & 20 ON SHEET S1.3 FOR TYPICAL CORNER FRAMING DETAILS AT HOLD DOWNS & SHEARWALLS..
17. HANGER OCCURS WHERE FLUSH BEAM HANGS TO SUPPORT BEAMS, TYP. U.N.O.

Bearing Wall Stud Schedule

BEARING WALL TYPE	STUD SIZE AND SPACING, U.N.O.
EXTERIOR	2 X 6 AT 16" O.C., U.N.O.
INTERIOR NON-BEARING	2 X 4 AT 16 O.C.

BEARING WALL NOTES
1. SEE SHEARWALL SCHEDULE SHEET S1.2 FOR WALL SHEATHING, ADDITIONAL PLATE AND STUD REQUIREMENTS, BLOCKING AND PLATE NAILING. SEE SAWN LUMBER STRUCTURAL NOTES SHEET S1.1 FOR SPECIES AND GRADE OF WALL PLATES AND STUDS.
2. SECURE SILL PLATES TO CONCRETE WITH ⅝" DIA. ANCHOR BOLTS AT 48" ON CENTER TYPICAL UNLESS NOTED OTHERWISE. RE:S1.2. REFER TO SHEARWALL AND HOLDOWN SCHEDULE FOR ADDITIONAL ANCHOR BOLT REQUIREMENTS. WHERE PRESERVATIVE TREATED WOOD IS USED, REFER TO THAT NOTE SECTION FOR CORROSION PROTECTION REQUIREMENTS FOR CONNECTORS.
3. SEE 2/S9.1 FOR TOP PLATE SPLICE. PROVIDE ADDITIONAL CONNECTORS AT SHEARWALLS AS INDICATED ON THE PLANS.
4. ALIGN STUDS UNDER JOISTS

Framing Legend

Note:
PLANS PREPARED USING ARCHITECTURAL BACKGROUNDS RECEIVED 07/23/2024

First Floor Framing Plan
SCALE: 1/4" = 1'-0"

GRAPHIC SCALE
−4 0 2 4 8
(IN FEET)
1 inch = 4 ft.

PROJECT NORTH (REFERENCE ONLY)

CONSTRUCTION AND REMODELING

SCHARHON - RESIDENCE

9150 SE 54th St, Mercer Island, WA 98040

Permit check set

TE Job # 24310

Description	Date
Permit Intake	07/29/24

Tryg·stad ENGINEERING
nels@trygstadeng.com
(208)262-6884

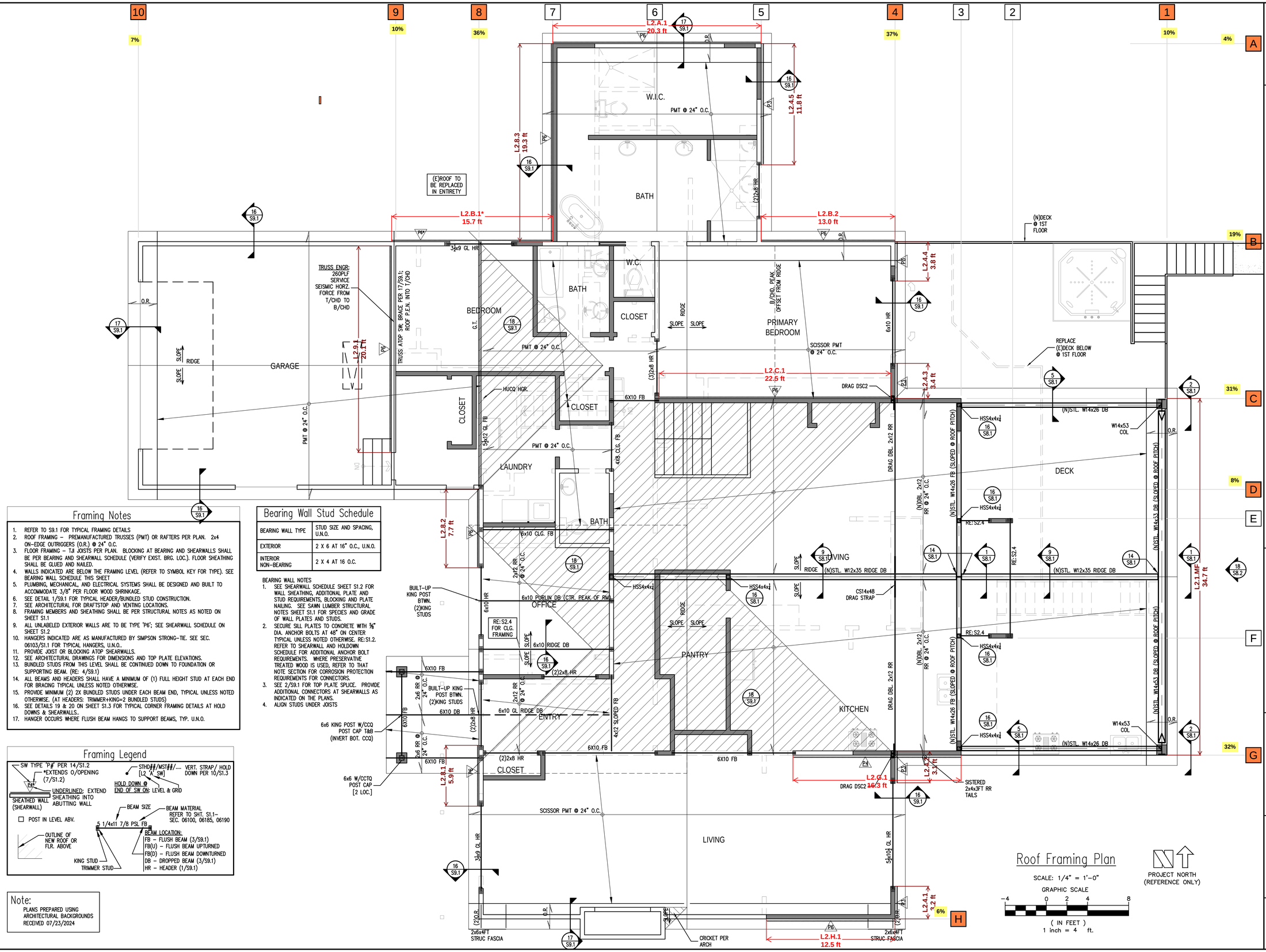
Stamp/Approval:

Sheet Name:

FIRST FLOOR FRAMING PLAN

Sheet No:

S2.2



Framing Notes

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2. ROOF FRAMING – PREMANUFACTURED TRUSSES (PMT) OR RAFTERS PER PLAN. 2x4 ON-EDGE OUTRIGGERS (O.R.) @ 24" O.C.
3. FLOOR FRAMING – TJI JOISTS PER PLAN. BLOCKING AT BEARING AND SHEARWALLS SHALL BE PER BEARING AND SHEARWALL SCHEDULE (VERIFY EXIST. BRG. LOC.). FLOOR SHEATHING SHALL BE GLUED AND NAILED.
4. WALLS INDICATED ARE BELOW THE FRAMING LEVEL (REFER TO SYMBOL KEY FOR TYPE). SEE BEARING WALL SCHEDULE THIS SHEET
5. PLUMBING, MECHANICAL, AND ELECTRICAL SYSTEMS SHALL BE DESIGNED AND BUILT TO ACCOMMODATE 3/8" PER FLOOR WOOD SHRINKAGE.
6. SEE DETAIL 1/S9.1 FOR TYPICAL HEADER/BUNDLED STUD CONSTRUCTION.
7. SEE ARCHITECTURAL FOR DRAFTSTOP AND VENTING LOCATIONS.
8. FRAMING MEMBERS AND SHEATHING SHALL BE PER STRUCTURAL NOTES AS NOTED ON SHEET S1.1
9. ALL UNLABELED EXTERIOR WALLS ARE TO BE TYPE 'P6'; SEE SHEARWALL SCHEDULE ON SHEET S1.2
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11. PROVIDE JOIST OR BLOCKING ATOP SHEARWALLS.
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15. PROVIDE MINIMUM (2) 2X BUNDLED STUDS UNDER EACH BEAM END, TYPICAL UNLESS NOTED OTHERWISE. (AT HEADERS: TRIMMER+KING=2 BUNDLED STUDS)
16. SEE DETAILS 19 & 20 ON SHEET S1.3 FOR TYPICAL CORNER FRAMING DETAILS AT HOLD DOWNS & SHEARWALLS..
17. HANGER OCCURS WHERE FLUSH BEAM HANGS TO SUPPORT BEAMS, TYP. U.N.O.

Bearing Wall Stud Schedule

BEARING WALL TYPE	STUD SIZE AND SPACING, U.N.O.
EXTERIOR	2 X 6 AT 16" O.C., U.N.O.
INTERIOR NON-BEARING	2 X 4 AT 16 O.C.

BEARING WALL NOTES

1. SEE SHEARWALL SCHEDULE SHEET S1.2 FOR WALL SHEATHING, ADDITIONAL PLATE AND STUD REQUIREMENTS, BLOCKING AND PLATE NAILING. SEE SAWN LUMBER STRUCTURAL NOTES SHEET S1.1 FOR SPECIES AND GRADE OF WALL PLATES AND STUDS.
2. SECURE SILL PLATES TO CONCRETE WITH ⅝" DIA. ANCHOR BOLTS AT 48" ON CENTER TYPICAL UNLESS NOTED OTHERWISE. RE:S1.2. REFER TO SHEARWALL AND HOLDOWN SCHEDULE FOR ADDITIONAL ANCHOR BOLT REQUIREMENTS. WHERE PRESERVATIVE TREATED WOOD IS USED, REFER TO THAT NOTE SECTION FOR CORROSION PROTECTION REQUIREMENTS FOR CONNECTORS.
3. SEE 2/S9.1 FOR TOP PLATE SPLICE. PROVIDE ADDITIONAL CONNECTORS AT SHEARWALLS AS INDICATED ON THE PLANS.
4. ALIGN STUDS UNDER JOISTS

Framing Legend

Note:
PLANS PREPARED USING ARCHITECTURAL BACKGROUNDS RECEIVED 07/23/2024

Roof Framing Plan

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

GRAPHIC SCALE
−4 0 2 4 8
(IN FEET)
1 inch = 4 ft.

PROJECT NORTH (REFERENCE ONLY)

CONSTRUCTION AND REMODELING

SCHARHON - RESIDENCE

9150 SE 54th St, Mercer Island, WA 98040

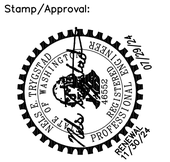
Permit check set

TE Job # 24310

Description	Date
Permit Intake	07/29/24

Tryg·stad ENGINEERING
nels@trygstadeng.com
(208)262-6884

Stamp/Approval:



Sheet Name:

ROOF FRAMING PLAN

Sheet No:

S2.3

SHEET TITLE: **7.5.1) LATERAL N-S (front to back - up/down)**
PROJECT # : Scharhon (Job#24310)

Diaph. Level: **Roof**
Direction: **N-S**
Typ. Panel Height = **10.42** ft.

Seismic V i = 15.91 kips
Sum Seismic V i = 15.91 kips

Design Wind N-S V i = 5.70 kips
Sum Wind N-S V i = 5.70 kips

1) DISTRIBUTION TO SHEAR LINES

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
		Trib %		V level		Above Line Load				V abv.		V total		Line	orm Shear, v	
Line		E	W	E [k]	W [k]	1st Line	Trib	2nd Line	Trib.	E [k]	W [k]	E [k]	W [k]	L [ft]	E [plf]	W [plf]
1		10%	10%	1.591	0.57	-	100%	-	100%	-	0	1.59	0.57	0		
4		37%	37%	5.887	2.109	-	100%	-	100%	-	0	5.89	2.11	25.3	233	83
8		36%	36%	5.728	2.052	-	100%	-	100%	-	0	5.73	2.05	32.9	174	62
9		10%	10%	1.591	0.57	-	100%	-	100%	-	0	1.59	0.57	20.1	79	28
10		7%	7%	1.114	0.399	-	100%	-	100%	-	0	1.11	0.40	0		
			0%	0	0	-	100%	-	100%	-	0	0.00	0.00	0		
			0%	0	0	-	100%	-	100%	-	0	0.00	0.00	0		
			0%	0	0	-	100%	-	100%	-	0	0.00	0.00	0		
			Σ=	15.91	5.70				Σ=	0.00	0.00	15.91	5.70			
			Balance Check:	ok	ok				Balance Check:	ok	ok	ok	ok			

2) DISTRIBUTION TO SHEARWALLS

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Line	ID	Lwall	C_0	Lwall'	H_{WALL}	E.Q. v	E.Q. V	E.Q. Amplifiers ρ	E.Q. Amplifiers 2w/h(1)	E.Q. v'	**E.Q. Type**	**Wind Type**	Wind v	Wind V
		(ft)		(ft)	(ft)	(plf)	(k)			(plf)			(plf)	(k)
REF#...														
4	L2.4.1	3.2	1.00	3.20	10.42	233	0.74		1.63	***379***	P3	P6TN	***83***	0.267
4	L2.4.2	3.1	1.00	3.10	10.42	233	0.72		1.68	***391***	P3	P6TN	***83***	0.258
4	L2.4.3	3.4	1.00	3.40	10.42	233	0.79		1.53	***357***	P3	P6TN	***83***	0.283
4	L2.4.4	3.8	1.00	3.80	10.42	233	0.88		1.37	***319***	P4	P6TN	***83***	0.317
4	L2.4.5	11.8	1.00	11.80	10.42	233	2.75		1.00	***233***	P6	P6TN	***83***	0.984
8	L2.8.1	5.9	1.00	5.90	10.42	174	1.03		1.00	***174***	P6	P6TN	***62***	0.368
8	L2.8.2	7.7	1.00	7.70	10.42	174	1.34		1.00	***174***	P6	P6TN	***62***	0.48
8	L2.8.3	19.3	1.00	19.30	10.42	174	3.36		1.00	***174***	P6	P6TN	***62***	1.204
9	L2.9.1	20.1	1.00	20.10	10.42	79	1.59		1.00	***79***	P6TN	P6TN	***28***	0.57

ρ = 1.00

(1)Table 4.3.4 AF&PA SDPWS, Footnote 1

Flr. Thk. (Add to OTM arm): 0.0 ft **E.Q. DL Uplift Factor:* 43.8% *DL Uplift Factor w/Wind:* 60.0%

3) OVERTURNING RESISTANCE

							Seismic Uplift								Wind Uplift								
				Resisted	Resisted			Reduced	Net OTM				Add'l			Reduced	Net OTM			Add'l		Max.	
Line	ID	$L_{DL\ eff.}$	w dl	ID (#1)	ID (#2)	L_{ARM}	OTM	R_{OTM}*	Level	Abv.	Total	Ω	U	U_{sum}	OTM	R_{OTM}	Level	Abv.	Total	U	U_{sum}	U_{sum}	HD
		(ft)	(klf)	Above	Above	(ft)	(kip-ft)	(kip-ft)	(kip-ft)	(kip-ft)	(kip-ft)		(k)	(kip)	(kip-ft)	(kip-ft)	(kip-ft)	(kip-ft)	(kip-ft)	(k)	(kip)	(kip)	
4	L2.4.1	5.2	0.20	-	-	2.95	7.76	1.56	6.20	0	6.20	1.00	0	**2.10**	2.78	1.83	0.95	0	0.95	0	**0.32**	**2.10**	STHD14
4	L2.4.2	5.1	0.20	-	-	2.85	7.52	1.48	6.03	0	6.03	1.00	0	**2.12**	2.69	1.74	0.95	0	0.95	0	**0.33**	**2.12**	STHD14
4	L2.4.3	5.4	0.20	-	-	3.15	8.24	1.72	6.52	0	6.52	1.00	0	**2.07**	2.95	2.02	0.93	0	0.93	0	**0.30**	**2.07**	HTT5
4	L2.4.4	5.8	0.20	-	-	3.55	9.21	2.07	7.15	0	7.15	1.00	0	**2.01**	3.30	2.42	0.88	0	0.88	0	**0.25**	**2.01**	HTT5
4	L2.4.5	13.8	0.20	-	-	11.55	28.61	15.28	13.33	0	13.33	1.00	0	**1.15**	10.25	17.91	-7.66	0	-7.66	0	**-0.66**	**1.15**	HTT5
8	L2.8.1	7.9	0.20	-	-	5.65	10.70	4.37	6.33	0	6.33	1.00	0	**1.12**	3.83	5.13	-1.29	0	-1.29	0	**-0.23**	**1.12**	HTT5
8	L2.8.2	9.7	0.20	-	-	7.45	13.97	7.01	6.96	0	6.96	1.00	0	**0.93**	5.00	8.22	-3.21	0	-3.21	0	**-0.43**	**0.93**	HTT5
8	L2.8.3	21.3	0.20	-	-	19.05	35.02	38.57	-3.56	0	-3.56	1.00	0	**-0.19**	12.54	45.22	-32.68	0	-32.68	0	**-1.72**	**-0.19**	NONE
9	L2.9.1	22.1	0.20	-	-	19.85	16.58	41.68	-25.10	0	-25.10	1.00	0	**-1.26**	5.94	48.86	-42.92	0	-42.92	0	**-2.16**	**-1.26**	NONE

Holdown Ctr. Offset from SW End: 3 in Σ= 0.00 23.87

SHEET TITLE: **7.5.2) LATERAL N-S (front to back - up/down)**
PROJECT # : Scharhon (Job#24310)

Diaph. Level: **2nd**
Direction: **N-S**
Typ. Panel Height = **8** ft.

Seismic V i = **1.7 kips** **Design Wind N-S V i =** **7.9 kips**
Sum Seismic V i = **17.7 kips** **Sum Wind N-S V i =** **13.6 kips**

1) DISTRIBUTION TO SHEAR LINES

Line	Trib % E	Trib % W	V level E [k]	V level W [k]	Above Line Load 1st Line	1st Line Trib	Above Line Load 2nd Line	2nd Line Trib.	V abv. E [k]	V abv. W [k]	V total E [k]	V total W [k]	Line L [ft]	Uniform Shear, v E [plf]	Uniform Shear, v W [plf]
1	25%	25%	0.435	1.975	1	100%	-	100%	1.59	0.57	2.03	2.55	12.4	163	205
4	0%	0%	0	0	4	50%	-	100%	2.94	1.05	2.94	1.05	0		
8	0%	0%	0	0	8	100%	-	100%	5.73	2.05	5.73	2.05	0		
9	0%	0%	0	0	9	100%	-	100%	1.59	0.57	1.59	0.57	0		
10	0%	0%	0	0	10	100%	-	100%	1.11	0.40	1.11	0.40	0		
3	50%	50%	0.871	3.95	4	25%	-	100%	1.47	0.53	2.34	4.48	21.7	108	206
43	25%	25%	0.435	1.975	4	25%	-	100%	1.47	0.53	1.91	2.50	12.8	149	195
		0%	0	0	0	100%	-	100%	0.00	0.00	0.00	0.00	0		
		Σ=	1.74	7.90				Σ=	15.91	5.70	17.65	13.60			
		Balance Check:	ok	ok				Balance Check:	ok	ok	ok	ok			

2) DISTRIBUTION TO SHEARWALLS

Line	ID	Lwall (ft)	C_0	Lwall' (ft)	H_{WALL} (ft)	E.Q. v (plf)	E.Q. V (k)	E.Q. Amplifiers ρ	E.Q. Amplifiers $2w/h^{(1)}$	E.Q. v' (plf)	E.Q. Type	Wind Type	Wind v (plf)	Wind V (k)
1	L1.1.MF	12.4	1.00	12.40	8.00	163	2.03		1.00	***163***	P6	P6	***205***	2.55
3	L1.3.1	4.2	1.00	4.20	8.00	108	0.45		1.00	***108***	P6TN	P6	***206***	0.87
3	L1.3.2	5.5	1.00	5.50	8.00	108	0.59		1.00	***108***	P6TN	P6	***206***	1.13
3	L1.3.3	7.8	1.00	7.80	8.00	108	0.84		1.00	***108***	P6TN	P6	***206***	1.61
3	L1.3.4	4.2	1.00	4.20	8.00	108	0.45		1.00	***108***	P6TN	P6	***206***	0.87
43	L1.43.2	12.8	1.00	12.80	8.00	149	1.91		1.00	***149***	P6TN	P6	***195***	2.50
								ρ =	**1.00**					

(1) Table 4.3.4 AF&PA SDPWS, Footnote 1

Flr. Thk. (Add to OTM arm): 1.0 ft **E.Q. DL Uplift Factor:* 43.8% *DL Uplift Factor w/Wind:* 60.0%

3) OVERTURNING RESISTANCE

Line	ID	$L_{DL\ eff.}$ (ft)	w dl (klf)	Resisted ID (#1) Above	Resisted ID (#2) Above	L_{ARM} (ft)	Seismic Uplift OTM (kip-ft)	Reduced R_{OTM}* (kip-ft)	Net OTM Level (kip-ft)	Net OTM Abv. (kip-ft)	Net OTM Total (kip-ft)	Add'l Ω	Add'l U (k)	U_{sum} (kip)	Wind Uplift OTM (kip-ft)	Reduced R_{OTM} (kip-ft)	Net OTM Level (kip-ft)	Net OTM Abv. (kip-ft)	Net OTM Total (kip-ft)	Add'l U (k)	U_{sum} (kip)	Max. U_{sum} (kip)	HD
1	L1.1.MF	14.4	0.20	-	-	12.15	18.24	16.75	1.49	0.00	1.49	1.00	0	**0.12**	22.91	19.64	3.26	0.00	3.26	0	**0.27**	**0.27**	NONE
3	L1.3.1	6.2	0.20	-	-	3.95	4.08	2.44	1.64	0.00	1.64	1.00	0	**0.41**	7.80	2.86	4.93	0.00	4.93	0	**1.25**	**1.25**	STHD14
3	L1.3.2	7.5	0.20	-	-	5.25	5.34	3.87	1.47	0.00	1.47	1.00	0	**0.28**	10.21	4.54	5.68	0.00	5.68	0	**1.08**	**1.08**	STHD14
3	L1.3.3	9.8	0.20	-	-	7.55	7.58	7.17	0.41	0.00	0.41	1.00	0	**0.05**	14.48	8.41	6.08	0.00	6.08	0	**0.80**	**0.80**	STHD14
3	L1.3.4	6.2	0.20	-	-	3.95	4.08	2.44	1.64	0.00	1.64	1.00	0	**0.41**	7.80	2.86	4.93	0.00	4.93	0	**1.25**	**1.25**	STHD14
43	L1.43.2	14.8	0.20	-	-	12.55	17.17	17.77	-0.61	0.00	-0.61	1.00	0	**-0.05**	22.52	20.84	1.68	0.00	1.68	0	**0.13**	**0.13**	NONE
									Σ=	0.00	6.04												

Holdown Ctr. Offset from SW End: 3 in

SHEET TITLE: **7.6.1) LATERAL E-W (side to side - left/right)**
PROJECT # : Scharhon (Job#24310)

Diaph. Level: **Roof**
Direction: **E-W**
Typ. Panel Height = **10.42** ft.

Seismic V i = 15.91 kips
Sum Seismic V i = 15.91 kips
Design Wind E-W V i = 5.50 kips
Sum Wind E-W V i = 5.50 kips

1) DISTRIBUTION TO SHEAR LINES

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
	Trib %		V level		Above Line Load				V abv.		V total		Line	Uniform Shear, v	
Line	E	W	E [k]	W [k]	1st Line	Trib	2nd Line	Trib.	E [k]	W [k]	E [k]	W [k]	L [ft]	E [plf]	W [plf]
A	4%	4%	0.636	0.22	-	100%	-	100%	-	0	0.64	0.22	20.3	31	11
B	19%	19%	3.023	1.045	-	100%	-	100%	-	0	3.02	1.05	28.7	105	36
C	31%	31%	4.933	1.705	-	100%	-	100%	-	0	4.93	1.71	22.5	219	76
D	8%	8%	1.273	0.44	-	100%	-	100%	-	0	1.27	0.44	0		
G	32%	32%	5.092	1.76	-	100%	-	100%	-	0	5.09	1.76	16.3	312	108
H	6%	6%	0.955	0.33	-	100%	-	100%	-	0	0.95	0.33	12.5	76	26
		0%	0	0	-	100%	-	100%	-	0	0.00	0.00	0		
		0%	0	0	-	100%	-	100%	-	0	0.00	0.00	0		
		Σ=	15.91	5.50				Σ=	0.00	0.00	15.91	5.50			
		Balance Check:	ok	ok				Balance Check:	ok	ok	ok	ok			

2) DISTRIBUTION TO SHEARWALLS

Line	ID	Lwall (ft)	C_0	Lwall' (ft)	H_{WALL} (ft)	E.Q. v (plf)	E.Q. V (k)	E.Q. Amplifiers ρ	E.Q. Amplifiers $2w/h^{(\perp)}$	E.Q. v' (plf)	E.Q. Type	Wind Type	Wind v (plf)	Wind V (k)
A	L2.A.1	20.3	1.00	20.30	10.42	31	0.64		1.00	***31***	P6TN	P6TN	***11***	0.22
B	L2.B.1*	15.7	1.00	15.70	10.42	105	1.65		1.00	***105***	P6TN	P6TN	***36***	0.571655
B	L2.B.2	13	1.00	13.00	10.42	105	1.37		1.00	***105***	P6TN	P6TN	***36***	0.473345
C	L2.C.1	22.5	1.00	22.50	10.42	219	4.93		1.00	***219***	P6	P6TN	***76***	1.705
G	L2.G.1	16.3	1.00	16.30	10.42	312	5.09		1.00	***312***	P4	P6TN	***108***	1.76
H	L2.H.1	12.5	1.00	12.50	10.42	76	0.95		1.00	***76***	P6TN	P6TN	***26***	0.33

ρ = **1.00**

(1) Table 4.3.4 AF&PA SDPWS, Footnote 1

Flr. Thk. (Add to OTM arm): 0.0 ft **E.Q. DL Uplift Factor:* 43.8% *DL Uplift Factor w/Wind:* 60.0%

3) OVERTURNING RESISTANCE

				Resisted	Resisted		Seismic Uplift								Wind Uplift							Max.	
Line	ID	$L_{DL\ eff.}$ (ft)	w dl (klf)	ID (#1) Above	ID (#2) Above	L_{ARM} (ft)	OTM (kip-ft)	Reduced R_{OTM} (kip-ft)	Net OTM Level (kip-ft)	Net OTM Abv. (kip-ft)	Net OTM Total (kip-ft)	Ω	Add'l U (k)	U_{sum} (kip)	OTM (kip-ft)	Reduced R_{OTM} (kip-ft)	Net OTM Level (kip-ft)	Net OTM Abv. (kip-ft)	Net OTM Total (kip-ft)	Add'l U (k)	U_{sum} (kip)	**U_{sum} (kip)**	HD
A	L2.A.1	22.3	0.20	-	-	20.05	6.63	42.47	-35.84	0	-35.84	1.00	0	**-1.79**	2.29	49.80	-47.50	0	-47.50	0	**-2.37**	**-1.79**	NONE
B	L2.B.1*	17.7	0.20	-	-	15.45	17.23	26.07	-8.84	0	-8.84	1.00	0	**-0.57**	5.96	30.57	-24.61	0	-24.61	0	**-1.59**	**-0.57**	NONE
B	L2.B.2	15.0	0.20	-	-	12.75	14.27	18.30	-4.03	0	-4.03	1.00	0	**-0.32**	4.93	21.45	-16.52	0	-16.52	0	**-1.30**	**-0.32**	NONE
C	L2.C.1	24.5	0.20	-	-	22.25	51.40	51.72	-0.32	0	-0.32	1.00	0	**-0.01**	17.77	60.64	-42.87	0	-42.87	0	**-1.93**	**-0.01**	NONE
G	L2.G.1	18.3	0.20	-	-	16.05	53.06	27.99	25.07	0	25.07	1.00	0	**1.56**	18.34	32.81	-14.47	0	-14.47	0	**-0.90**	**1.56**	CS14
H	L2.H.1	14.5	0.20	-	-	12.25	9.95	17.01	-7.06	0	-7.06	1.00	0	**-0.58**	3.44	19.94	-16.50	0	-16.50	0	**-1.35**	**-0.58**	NONE

Holdown Ctr. Offset from SW End: 3 in Σ= 0.00 #N/A

SHEET TITLE: **7.6.2) LATERAL E-W (side to side - left/right)**
PROJECT # : Scharhon (Job#24310)

Diaph. Level: **2nd**
Direction: **E-W**
Typ. Panel Height = **8** ft.

Seismic V i = 1.7 kips
Sum Seismic V i = 17.7 kips
Design Wind E-W V i = 9.6 kips
Sum Wind E-W V i = 15.1 kips

1) DISTRIBUTION TO SHEAR LINES

Line	Trib % E	Trib % W	V level E [k]	V level W [k]	Above Line Load 1st Line	Trib	2nd Line	Trib.	V abv. E [k]	V abv. W [k]	V total E [k]	V total W [k]	Line L [ft]	Uniform Shear, v E [plf]	Uniform Shear, v W [plf]
A	0%	0%	0	0	A	100%	-	100%	0.64	0.22	0.64	0.22	0		
B	20%	20%	0.348	1.92	B	100%	-	100%	3.02	1.05	3.37	2.97	40.3	84	74
C	50%	50%	0.871	4.8	C	100%	-	100%	4.93	1.71	5.80	6.51	17.3	335	376
D	0%	0%	0	0	D	100%	-	100%	1.27	0.44	1.27	0.44	0		
G	0%	0%	0	0	G	100%	-	100%	5.09	1.76	5.09	1.76	0		
H	0%	0%	0	0	H	100%	-	100%	0.95	0.33	0.95	0.33	0		
F	30%	30%	0.523	2.88		100%	-	100%	0.00	0.00	0.52	2.88	0		
		0%	0	0	0	100%	-	100%	0.00	0.00	0.00	0.00	0		
		Σ=	1.74	9.60					15.91	5.50	17.65	15.10			
		Balance Check:	ok	ok					ok	ok	ok	ok			

2) DISTRIBUTION TO SHEARWALLS

Line	ID	Lwall (ft)	C_0	Lwall' (ft)	H_{WALL} (ft)	E.Q. v (plf)	E.Q. V (k)	E.Q. Amplifiers ρ	E.Q. Amplifiers $2w/h^{(1)}$	E.Q. v' (plf)	**E.Q. Type**	**Wind Type**	Wind v (plf)	Wind V (k)
B	L1.B.1.CW	33.9	1.00	33.90	8.00	84	2.84		1.00	***84***	**P6TN**	**P6TN**	***74***	2.49
B	L1.B.2	6.4	1.00	6.40	8.00	84	0.54		1.00	***84***	**P6TN**	**P6TN**	***74***	0.47
C	L1.C.1	9.3	1.00	9.30	8.00	335	3.12		1.00	***335***	**P4**	**P4**	***376***	3.50
C	L1.C.2	8	1.00	8.00	8.00	335	2.68		1.00	***335***	**P4**	**P4**	***376***	3.01

ρ = **1.00**

(1) Table 4.3.4 AF&PA SDPWS, Footnote 1

Flr. Thk. (Add to OTM arm): 1.0 ft **E.Q. DL Uplift Factor:* 43.8% *DL Uplift Factor w/Wind:* 60.0%

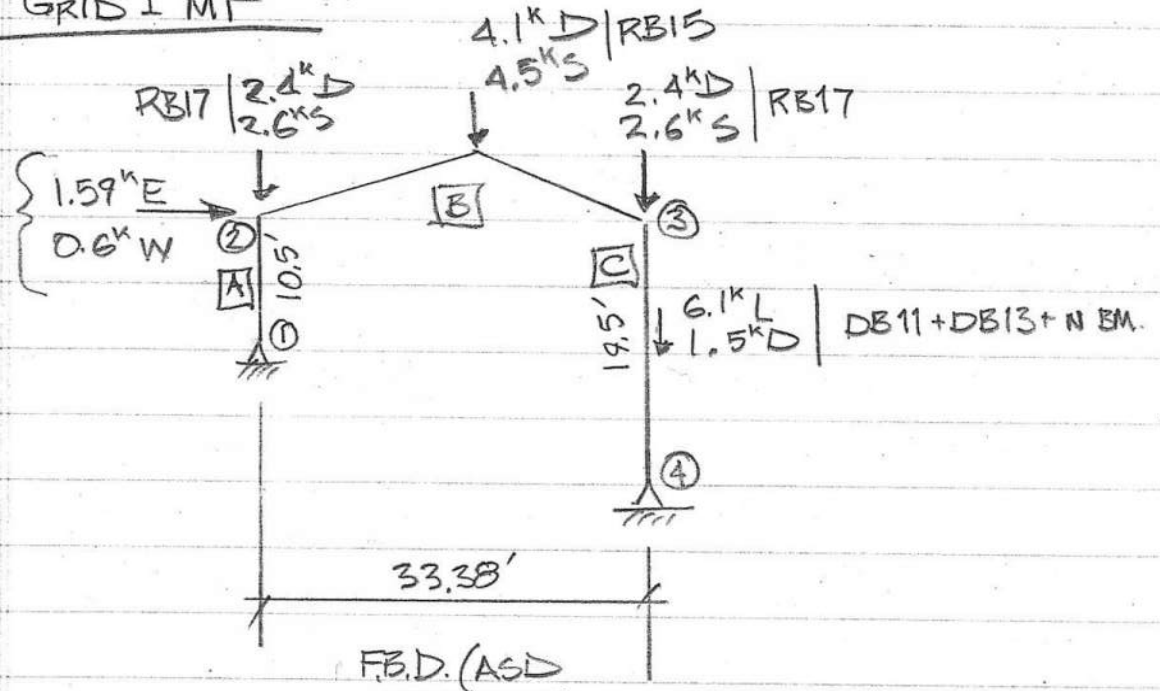
3) OVERTURNING RESISTANCE

Line	ID	$L_{DL\ eff.}$ (ft)	w dl (klf)	Resisted ID (#1) Above	Resisted ID (#2) Above	L_{ARM} (ft)	Seismic Uplift OTM (kip-ft)	Reduced R_{OTM} (kip-ft)	Net OTM Level (kip-ft)	Net OTM Abv. (kip-ft)	Net OTM Total (kip-ft)	Ω	Add'l U (k)	U_{sum} (kip)	Wind Uplift OTM (kip-ft)	Reduced R_{OTM} (kip-ft)	Net OTM Level (kip-ft)	Net OTM Abv. (kip-ft)	Net OTM Total (kip-ft)	Add'l U (k)	U_{sum} (kip)	**Max. U_{sum} (kip)**	HD
B	L1.B.1.CW	35.9	0.20	-	-	33.65	25.53	114.19	-88.66	0.00	-88.66	1.00	0	**-2.63**	22.45	133.87	-111.42	0.00	-111.42	0	**-3.31**	**-2.63**	NONE
B	L1.B.2	8.4	0.20	-	-	6.15	4.82	5.04	-0.22	0.00	-0.22	1.00	0	**-0.04**	4.24	5.91	-1.68	0.00	-1.68	0	**-0.27**	**-0.04**	NONE
C	L1.C.1	11.3	0.20	-	-	9.05	28.08	9.86	18.22	0.00	18.22	1.00	0	**2.01**	31.47	11.56	19.91	0.00	19.91	0	**2.20**	**2.20**	HTT5
C	L1.C.2	10.0	0.20	-	-	7.75	24.15	7.51	16.65	0.00	16.65	1.00	0	**2.15**	27.07	8.80	18.27	0.00	18.27	0	**2.36**	**2.36**	HTT5
									Σ=	0.00	-54.02												

Holdown Ctr. Offset from SW End: 3 in

GRID 1 MF

INPUT



F.B.D. (ASD)

LRFD

$\frac{1.59}{0.7} = 2.3^K = 2 \times 1.15\,E$

$\frac{0.6^K}{0.6} = 1.0^K = 2 \times 0.5^K W$

} SPREAD TO ② & ③

ENERCALC OUTPUT

FACTORED LOADS:

COL A_X: 24.7^K @ ④, 12.7^K @ ①

MOM. = 63.6^K @ ③

EQUIV. GRAV. ON B: $w_u = \frac{1.6(4.5) + 1.2(4.1 + 0.053 \times 33.4)}{33.4'} = 0.43\ K/LF$

→ EXCEL SPREADSHEET FOR SSMF

Joints...

Joint Label	Joint Coordinates X ft	Y ft	X Translational Restraint	Y Translational Restraint	Z Rotational Restraint	Joint Temp deg F
1	0.0	9.0			Unrestrained	0
4	33.40	0.0			Unrestrained	0
2	0.0	19.50	Unrestrained	Unrestrained	Unrestrained	0
3	33.40	19.50	Unrestrained	Unrestrained	Unrestrained	0

Members...

Member Label	Property Label	Endpoint Joints I Joint	J Joint	Member Length ft	Releases Specify Connectivity of Member Ends to Joints I End x	I End y	I End z (rotation)	J End x	J End y	J End z (rotation)
A	Column	1	2	10.500	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased
B	Beam	2	3	33.400	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased
C	Column	3	4	19.500	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased	Unreleased

Member Stress Check Data...

Member Label	Unbraced Lengths Lu : z ft	Lu : y	Slenderness Factors K : z	K : y	AISC Bending & Stability Factors Cm	Cb
A	10.500	10.500	1.00	1.00	Internal	Internal
B	33.400	33.400	1.00	1.00	Internal	Internal
C	19.500	19.500	1.00	1.00	Internal	Internal

Materials...

Member Label	Youngs ksi	Density kcf	Thermal in/degr	Yield ksi
Default	1.00	0.000	0.000000	1.00
Steel	29,000.00	0.490	0.000007	50.00
Wood	1,800.00	0.035	0.000000	0.00

Wood Material Data...

Wood, Not Defined, Density= 35.0pcf, FbT= 1000psi, FbC= 1000psi, Fv= 1000psi, Ft= 1000, Fc= 400psi, E Bend XX= 1800ksi, E BendMin XX= 1800ksi, E Beny YY= 1800ksi, E BendMin YY= 1800ksi, E Axial= 1800ksi, Species= , Grade= Any, Class=

Member Sections...

Prop Label	Group Tag	Material	Area	Depth	Width	Ixx	Iyy
Default	Group	Default	1.0 in^2	0.0 in	0.0 in	1.0 in^4	1.0 in^4
W14x53	Column	Steel	15.60 in^2	13.90 in	8.060 in	541.0 in^4	57.70 in^4
W14x53	Beam	Steel	15.60 in^2	13.90 in	8.060 in	541.0 in^4	57.70 in^4

Joint Loads....

Joint Label	Load Direction	Load Magnitude Dead	Roof Live	Live	Snow	Seismic	Wind	Earth
2	Global Y	2.40			2.60			k
2	Global X					1.150	0.50	k
3	Global Y	2.40			2.60			k
3	Global X					1.150	0.50	k

Member Point Loads....

Member Label	Load Direction	Distance from "I" Joint	Load Magnitude Dead	Roof Live	Live	Snow	Seismic	Wind	Earth
B	Global Y	16.7 ft	4.10			4.50			k
C	Global Y	9 ft	1.50		6.10				k

Stress/Strength Load Combinations

ASCE 7-16

Load Combination Description	Lambda	Load Combination Factors Dead	0.2*Sds* Seismic	Roof Live	Live	Snow	Wind	Seismic	Rho	Earth
+1.40D+1.60H	0.6	1.40								1.60

Stress/Strength Load Combinations

ASCE 7-16

Load Combination Description	Lambda	Load Combination Factors								
		Dead	0.2*Sds* Seismic	Roof Live	Live	Snow	Wind	Seismic	Rho	Earth
+1.20D+0.50Lr+1.60L+1.60H	0.8	1.20		0.50	1.60					1.60
+1.20D+1.60L+0.50S+1.60H	0.8	1.20			1.60	0.50				1.60
+1.20D+1.60Lr+L+1.60H	0.8	1.20		1.60	1.0					1.60
+1.20D+1.60Lr+0.50W+1.60H	0.8	1.20		1.60			0.50			1.60
+1.20D+L+1.60S+1.60H	0.8	1.20			1.0	1.60				1.60
+1.20D+1.60S+0.50W+1.60H	0.8	1.20				1.60	0.50			1.60
+1.20D+0.50Lr+L+W+1.60H	1	1.20		0.50	1.0		1.0			1.60
+1.20D+L+0.50S+W+1.60H	1	1.20			1.0	0.50	1.0			1.60
+0.90D+W+0.90H	1	0.90					1.0			0.90
+1.20D+L+0.20S+E+1.60H	0.8	1.20			1.0	0.20		1.0		1.60
+0.90D+E+0.90H	0.6	0.90						1.0		0.90

Reaction Load Combinations

ASCE 7-16

Load Combination Description	Load Combination Factors						
	Dead	Roof Live	Live	Snow	Wind	Seismic	Earth
+D+H	1.0						1.0
+D+L+H	1.0		1.0				1.0
+D+Lr+H	1.0	1.0					1.0
+D+S+H	1.0			1.0			1.0
+D+0.750Lr+0.750L+H	1.0	0.750	0.750				1.0
+D+0.750L+0.750S+H	1.0		0.750	0.750			1.0
+D+0.60W+H	1.0				0.60		1.0
+D+0.750Lr+0.750L+0.450W+H	1.0	0.750	0.750		0.450		1.0
+D+0.750L+0.750S+0.450W+H	1.0		0.750	0.750	0.450		1.0
+0.60D+0.60W+0.60H	0.60				0.60		0.60
+D+0.70E+H	1.0					0.70	1.0
+D+0.750L+0.750S+0.5250E+H	1.0		0.750	0.750		0.5250	1.0
+0.60D+0.70E+0.60H	0.60					0.70	0.60
D Only	1.0						
Lr Only		1.0					
L Only			1.0				
S Only				1.0			
W Only					1.0		
E Only						1.0	
H Only							1.0

Deflection Load Combinations

ASCE 7-16

Load Combination Description	Load Combination Factors						
	Dead	Roof Live	Live	Snow	Wind	Seismic	Earth
+D+H	1.0						1.0
+D+L+H	1.0		1.0				1.0
+D+Lr+H	1.0	1.0					1.0
+D+S+H	1.0			1.0			1.0
+D+0.750Lr+0.750L+H	1.0	0.750	0.750				1.0
+D+0.750L+0.750S+H	1.0		0.750	0.750			1.0
+D+0.60W+H	1.0				0.60		1.0
+D+0.750Lr+0.750L+0.450W+H	1.0	0.750	0.750		0.450		1.0
+D+0.750L+0.750S+0.450W+H	1.0		0.750	0.750	0.450		1.0
+0.60D+0.60W+0.60H	0.60				0.60		0.60
+D+0.70E+H	1.0					0.70	1.0
+D+0.750L+0.750S+0.5250E+H	1.0		0.750	0.750		0.5250	1.0
+0.60D+0.70E+0.60H	0.60					0.70	0.60
D Only	1.0						
Lr Only		1.0					
L Only			1.0				
S Only				1.0			
W Only					1.0		
E Only						1.0	
H Only							1.0

Extreme Joint Displacements

Only Load Combinations giving maximum values are listed

Joint Label		Joint Displacements X in	Y in	Z Radians
1	Max	0.0	0.0	0.001145
		+0.750L+0.750S+0.5250E	+D+S	+D+S
1	Min	0.0	0.0	-0.002094
		L Only	L Only	E Only
4	Max	0.0	0.0	0.001750
		E Only	+D+0.750L+0.750S	+D+S
4	Min	0.0	0.0	-0.001323
		+D+S	E Only	E Only
2	Max	0.2277	0.002463	0.002003
		E Only	+D+S	+D+S
2	Min	-0.1803	0.0	-0.001233
		+D+S	L Only	E Only
3	Max	0.2282	0.006081	.0000030
		E Only	+D+0.750L+0.750S	L Only
3	Min	-0.1788	-0.000457	-0.001208
		+D+S	E Only	+D+S

Extreme Joint Reactions

Only Load Combinations giving maximum values are listed

Joint Label		Joint Reactions X k	Y k	Z k-ft
1	Max	0.000392	-0.000106	
		L Only	L Only	
	Min	-2.367	-8.843	
		+0.750L+0.750S+0.5250E	+D+S	
4	Max	1.695	0.8841	
		+D+S	E Only	
	Min	-0.5977	-14.559	
		E Only	+D+0.750L+0.750S	
2	Max			
	Min			
3	Max			
	Min			

Extreme Member End Forces

Only Load Combinations giving maximum values are listed

Member Label		Member " I " End Forces Axial k	Shear k	Moment k-ft	Member " J " End Forces Axial k	Shear k	Moment k-ft
A	Max	-2.925	2.849	0.0	12.648	0.9749	29.916
		+0.90D-E	+1.20D+L+0.20S+E	+1.20D+1.60L	+1.20D+1.60S+0.50W	+0.90D-E	+1.20D+L+0.20S+E
A	Min	-12.648	-0.9749	0.0	2.925	-2.849	-10.236
		+1.20D+1.60S+0.50W	+0.90D-E	+1.20D+L	+0.90D-E	+1.20D+L+0.20S+E	+0.90D-E
B	Max	-0.1751	-0.7649	10.236	2.509	-1.157	46.584
		+0.90D-E	+0.90D-E	+0.90D-E	+1.20D+1.60S+0.50W	+0.90D+E	+1.20D+L+1.60S
B	Min	-2.509	-5.608	-29.916	0.1751	-6.704	2.528
		+1.20D+1.60S+0.50W	+1.20D+1.60S+0.50W	+1.20D+L+0.20S+E	+0.90D-E	+1.20D+L+1.60S	+0.90D+E
C	Max	-3.317	-0.1296	-2.528	21.644	2.389	0.0
		+0.90D+E	+0.90D+E	+0.90D+E	+1.20D+L+1.60S	+1.20D+L+1.60S	+0.90D+E
C	Min	-13.744	-2.389	-46.584	4.667	0.1296	0.0
		+1.20D+L+1.60S	+1.20D+L+1.60S	+1.20D+L+1.60S	+0.90D+E	+0.90D+E	+1.20D+L+1.60S

2D Frame

Project File: 24310 Scharhon Remodel.ec6

Extreme Member Forces

Only Load Combinations giving maximum values are listed

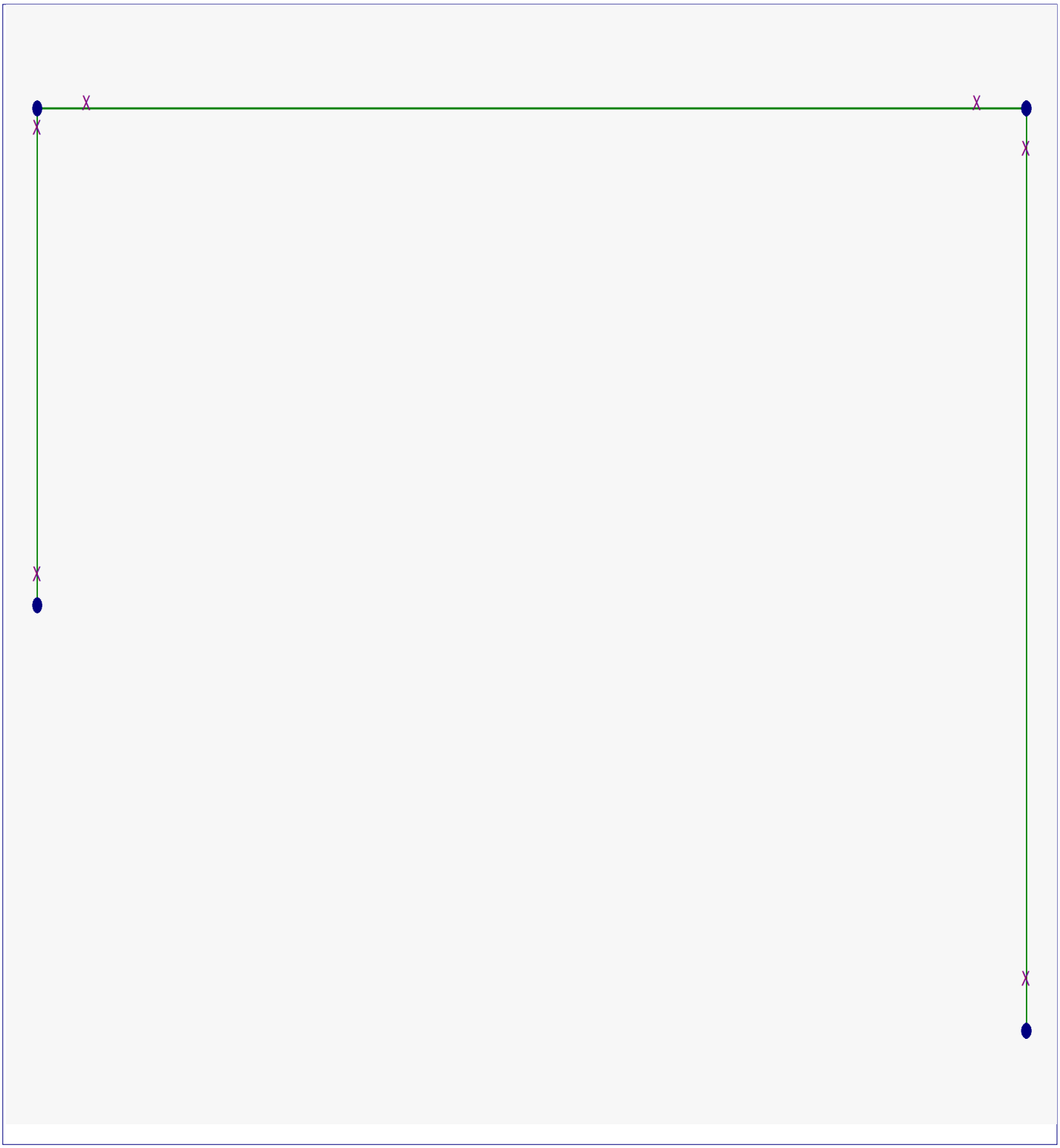
Mmbr Label	Axial	Dist from "I" Joint	Moment	Dist from "I" Joint	Shear	Dist from "I" Joint
A	12.648 k	0.0 ft	10.236 k-ft	10.50 ft	2.849 k	0.0 ft
Max	*+1.20D+1.60S+0.50W*		*+0.90D-E*		*+1.20D+L+0.20S+E*	
A	2.925 k	0.0 ft	-29.916 k-ft	10.50 ft	-0.9749 k	0.0 ft
Min	*+0.90D-E*		*+1.20D+L+0.20S+E*		*+0.90D-E*	
B	2.509 k	0.0 ft	63.522 k-ft	16.359 ft	6.704 k	17.041 ft
Max	*+1.20D+1.60S+0.50W*		*+1.20D+L+1.60S*		*+1.20D+L+1.60S*	
B	0.1751 k	0.0 ft	-46.584 k-ft	33.40 ft	-5.608 k	0.0 ft
Min	*+0.90D-E*		*+1.20D+L+1.60S*		*+1.20D+1.60S+0.50W*	
C	21.644 k	9.153 ft	-0.05159 k-ft	19.102 ft	-0.1296 k	0.0 ft
Max	*+1.20D+L+1.60S*		*+0.90D+E*		*+0.90D+E*	
C	3.317 k	0.0 ft	-46.584 k-ft	0.0 ft	-2.389 k	0.0 ft
Min	*+0.90D+E*		*+1.20D+L+1.60S*		*+1.20D+L+1.60S*	

Member Stress Checks...

Stress Checks per AISC 360-16 & NDS 2018

Member Label	Section Label	Material	Max. Axial + Bending Stress Ratios				Max. Shear Stress Ratios			
			Load Combination	Ratio	Status	Dist (ft)	Load Combination	Ratio	Status	Dist (ft)
A	Column	Steel	+1.20D+1.60S+0.50W	0.106	PASS	10.50	+1.20D+L+0.20S+E	0.018	PASS	0.00
B	Beam	Steel	+1.20D+L+1.60S	0.517	PASS	16.36	+1.20D+L+1.60S	0.043	PASS	17.04
C	Column	Steel	+1.20D+L+1.60S	0.216	PASS	0.00	+1.20D+L+1.60S	0.015	PASS	0.00

2D Frame



PROJECT : Scharhon Grid 1 Roof | PAGE :
CLIENT : TAM Design | DESIGN BY : NET
JOB NO. : 24310 DATE : 7/29/2024 | REVIEW BY :

Seismic Design for Special Moment Resisting Frames Based on AISC Seismic - LRFD

INPUT DATA & DESIGN SUMMARY

COLUMN SECTION = > **W14X53**

A	d	t_w	b_f	t_f	S_x	I_x	r_x	r_y	Z_x	k
15.6	13.9	0.37	8.06	0.66	77.8	541	5.89	1.92	87	1.25

BEAM SECTION = > **W14X53**

A	d	t_w	b_f	t_f	S_x	I_x	r_x	r_y	Z_x	k
15.6	13.9	0.37	8.06	0.66	77.8	541	5.89	1.92	87	1.25

STRUCTURAL STEEL YIELD STRESS F_y = **50** ksi

THE FACTOR GRAVITY LOAD ON THE BEAM w_u = **0.43** klf

THE FACTOR AXIAL LOAD ON THE COLUMN P_u = **24.7** kips

BEAM LENGTH BETWEEN COL. CENTERS L = **33.4** ft

AVERAGE STORY HEIGHT OF ABOVE & BELOW h = **19.5** ft

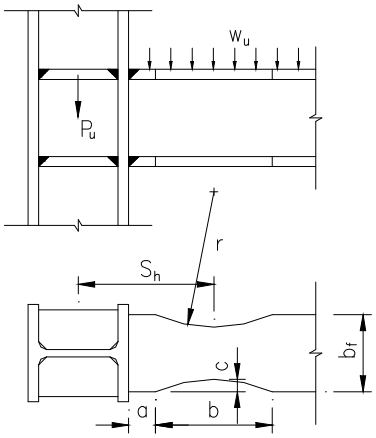
REDUCED SECTION DIMENSIONS a = **6** in, [0.5~0.75b_f]

b = **10** in, [0.65~0.85d_b]

c = **1** in, [< 0.25b_f]

THE SMRF DESIGN IS ADEQUATE.

(Continuity column stiffeners 11/16 x 6 with 1/4" fillet weld to web & CP to flanges. A doubler plate is required with thickness of 3/8 in.)



ANALYSIS

$r = (4c^2 + b^2) / 8c$ = 13.0 in

$S_h = d_c/2 + a + b/2$ = 18.0 in

CHECK BEAM LOCAL BUCKLING LIMITATIONS (AISC Seismic 02 Tab. I-8-1)

$b_f / (2t_f)$ = 6.11 < $0.3 (E_s / F_y)^{0.5}$ = 7.22 **[Satisfactory]**

[$52 / (F_y)^{0.5}$ for AISC Seismic 97, Tab. I-9-1]

Where E_s = 29000 ksi

h / t_w = 30.81 < $2.45 (E_s / F_y)^{0.5}$ = 59.00 **[Satisfactory]**

[$418 / (F_y)^{0.5}$ for FEMA Sec. 3.3.1.2]

CHECK COLUMN LOCAL BUCKING LIMITATIONS (AISC Seismic 02 Tab. I-8-1)

$b_f / (2t_f)$ = 6.11 < $0.3 (E_s / F_y)^{0.5}$ = 7.22 **[Satisfactory]**

[$52 / (F_y)^{0.5}$ for AISC Seismic 97, Tab. I-9-1]

h / t_w = 30.81 <

$3.14(E_s/F_y)^{0.5}(1-1.54P_u/\phi_bP_y)$ = 71.52 , for $P_u/\phi_bP_y < 0.125$

[$520 / (F_y)^{0.5}(1-1.54P_u/\phi_bP_y)$ for AISC Seismic 97, Tab. I-9-1]

$1.12(E_s/F_y)^{0.5}(2.33-P_u/\phi_bP_y)$ = N/A , for $P_u/\phi_bP_y > 0.125$

{ MAX[$191 / (F_y)^{0.5}(2.33-P_u/\phi_bP_y)$, $253 / (F_y)^{0.5}$] for AISC Seismic 97, Tab. I-9-1}

[Satisfactory] Where ϕ_b = 0.9 , $P_y = F_yA$ = 780 kips

CHECK BEAM - COLUMN RATIO REQUIREMENT (AISC Seismic 02 Sec. 9.6, Pg. 16)

$\Sigma M_{pc}^* / (\Sigma M_{pb}^*)$ = 1.70 > 1.00 **[Satisfactory]**

Where $\Sigma M_{pc}^* = N_c Z_c (F_{yc} - P_u / A_g)$ = 703 ft-kips

N_c = 2 , (if only one column below, input 1)

$\Sigma M_{pb}^* = N_b (M_{RBS} + M_v)$ = 413 ft-kips, at center of column

N_b = 1 , (if double side connection of beams, input 2)

$M_v = V_{RBS} S_h = [2M_{RBS} /(L-2S_h)+w_u(L-2S_h)/2] S_h$ = 46 ft-kips

$M_{RBS} = C_{pr}R_yF_{yb} Z_{RBS}$ = 367 ft-kips

R_y = 1.1 (AISC Seismic Tab. I-6-1)

$Z_{RBS} = Z_b - 2c\, t_f (d - t_f)$ = 70 in^3

C_{pr} = 1.15 (FEMA Sec. 3.5.5.1)

CHECK BENDING MOMENT AT THE COLUMN FACE (FEMA Sec. 3.5.5.1)

$M_f = M_{RBS} + [2M_{RBS} / (L - 2S_h) + w_u(L - 2S_h)/2] (a + b/2)$

= 395 ft-kips < $R_yF_{yb} Z_b$ = 399 ft-kips **[Satisfactory]**

CHECK CONTINUITY PLATE REQUIREMENT (FEMA Sec. 3.3.3.1)

$t_{cf} = MIN\{ b_{bf} / 6 , 0.4[1.8b_{bf}\, t_{bf} (F_{yb}R_{yb}) / (F_{yb}R_{yb})]^{0.5} \}$ = 1.24 in > actual t_{cf}

(The continuity plates required.)

$t_{st} = t_{bf}$ for interior connection, or (t_{bf} /2) for exterior connection = 0.66 in, USE 0.69 in, (11/16 in)

b_{st} = 6 in < $95 / (F_{yst})^{0.5}\, t_{st}$ = 10.89 in, (LRFD Sec. K1.9)

[Satisfactory]

$\phi_c P_{n,st} = \phi_c F_{cr} A =$		357.0	kips					
Where	$\phi_c =$	0.85				$h_{st} = d_c - 2k =$	11.4	
	$K =$	0.75				$K h_{st} / r_{st}$ < 200	(LRFD B2)	**[Satisfactory]**
	$I = t_{st} (2b_{st} + t_{wc})^3 / 12 =$	108	in^4			$\lambda_c =$ 0.031	(LRFD E2-4, Pg 6-47)	
	$A = 2b_{st}t_{st} + 25(t_{wc})^2 =$	12	in^2			$F_{cr} =$ 35.99	ksi (LRFD Sec.E2, Pg 6-47)	
	$r_{st} = (I / A)^{0.5} =$	3.05	in			$F_{yst} =$ 36	kips, plate yield stress	
$P_{u,st} = R_{yb} F_{yb} b_{fb} t_{fb} =$		292.6	kips	**<**	$\phi_c P_{n,st}$	**[Satisfactory]**		

(Cont'd)

The best fillet weld size (LRFD Sec.J2.2b)

w = 1/4 in > w_{MIN} = 0.1875 in

< w_{MAX} = 0.25 in

[Satisfactory]

The required weld length between A36 continuity plates and column web (FEMA Fig 3-6)

$L_w = 0.6 t_{st} L_{nst} F_y / [(2)\ \phi\ F_w\ (0.707\ w)]$ = (0.6875 x 8.4) x 36 / [(2) 0.75 (0.6x70)(0.707x1/4)] = 7.92 in

Where $L_{net} = d_c - 2(k_c + 1.5)$ = 8.4 **<** $2(L_{net} - 0.5)$ **[Satisfactory]**

(Use complete joint penetration groove welds between continuity plates & column flanges.)

CHECK PANEL ZONE THICKNESS REQUIREMENT (AISC Sec. 9.3 & FEMA Sec. 3.3.3.2)

$t_{ReqD} = MAX\ (t_1, t_2)$ = 0.74 in

$t_1 = C_y\ M_c\ (h - d_b)\ /\ [0.9\ (0.6)\ F_{yc}\ R_{yc}\ d_c\ (d_b - t_{fb})\ h]$ = 0.74 in

Where $C_y = S_b / (C_{pr}\ Z_{RBS})$ = 0.87

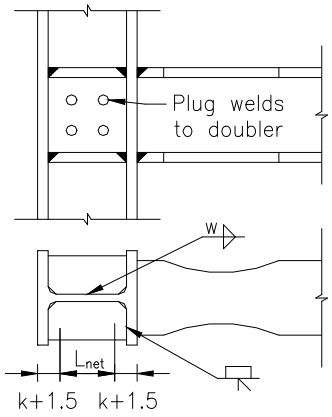
$S_b = 2I_b / d_b$ = 70 in^2

$I_b = I_x - (2\ c\ t_{fb})(0.5 d_b - 0.5 t_{fb})^2$ = 483 in^4

$M_c = \Sigma M_{pb}^*$ = 413 ft-kips

$t_2 = (d_z + w_z) / 90 = (d_b - 2t_{st} + d_c - 2k) / 90$ = 0.27 in

Since t_{wc} = 0.37 in < t_{ReqD}, a doubler plate is required with thickness of 3/8 in.



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2. AISC: "Manual of Steel construction, LRFD, 2th", American Institute of Steel Construction, 1998.
3. Alan Williams: "Seismic and Wind Forces, Structural Design Examples", International Code Council, 2003.
4. SEAOC: "2000 IBC Structural/Seismic Design Manual - Volume 3", International Code Council, 2003.
5. AISC: "Seismic Provisions for Structural Steel Buildings", American Institute of Steel Construction, May 1, 2002.

Trygstad
ENGINEERING

CALCULATION
SECTION 8.0:
FOUNDATION ENGINEERING

LOADING & LABELING KEY

TYPE: B=BEAM R=RAFTER J=JOIST

BM. CALC SEQ. NO.

BEAM LABEL: 2FB08

FLOOR OR ROOF LEVEL: 2=2ND,ETC. L=LOW

LEVEL: R=ROOF F=FLOOR

LINE LOADING [PLF]

BEAM TRANSFER	WALL TRANSFER	*AT DECKS, LL=60 PSF
		"RED" = ROOF ONLY [25 S+18D+5PV]...48
		"YELLOW" = TOP FLR [40L*+15D]
		"ORANGE" = ROOF + FLR
		"BLUE" = LOWER FLOOR ONLY [40L*+15D]
		"GREEN" = MULTIPLE FLOORS

POINT LOADING [K]

- BM. LOAD (THIS LVL.)TO TRANSFER BM
- COL. LOAD TO LVL. BELOW
- COL. LOAD FROM ABV. TO TRANSFER BM
- KING POST W/IN LVL TO TRANSFER BM

10 9 8 7 6 5 4 3 2 1

A B C D E F G H

N 84°00

(E) CRAWLSPACE ABOVE

(E)FTG [V.I.F.]

HTT5 W/8"ø ATR [L1 '5' SW]

(E)6" CONC. STEM WALL (V.I.F.)

V.I.F. (E)ANCHOR BOLTS MATCH MIN. SHEARWALL REQ'T ABV.; ADD 8"ø x6" TITEN HD AS DIRECT AB SUBSTITUTE AS NECESSARY

WDW. WELL PER ARCH: PREFAB OR (N)6" C.I.P. CONC. STEM WALL W/#4 BARS @ 18" O.C. E.W., CTR. IN WALL; BEND VERT. BARS INTO BOT. OF 8" PAD

(E)8" CONC. STEM WALLx36" MIN. HT. (V.I.F.)

(N)8" CONC. STEM WALL W/#5 BARS @ 18" O.C. E.W., CTR. IN WALL; BEND VERT. BARS INTO FTG., ALT. TAILS

(E)CONC. FTG.; 8" MIN. THK. (V.I.F.)

12" MIN. (V.I.F.)

18" MIN. (V.I.F.)

(E) GARAGE SLAB ON GRADE ABOVE

(E) SLAB ON GRADE

(E) CRAWLSPACE ABOVE

(E) SLAB ON GRADE

SLAB ON GRADE

4" CONC. S.O.G. W/ 6/6 X W1.4/W1.4 W.W.F. SLOPE PER ARCHITECT

STHD14 [L1 '4' SW]

STHD14 [LO '3' SW]

HTT5 [LO 'C' SW]

HTT5 W/8"ø ATR [L1 '8' SW]

HTT5 W/8"ø ATR [L1 'G' SW]

4.9k (exist)

10.9k

RE: S2.3

RE: S2.2

14.3k [LO '3' SW]

8.3k

4.8k

5.8k

9.5k

12.9K

7.6k

1.7k

4.9k

8.9k (checks OT)

15.1k (checks OT)

WORST-CASE

1018plf R
100plf W
358plf L1
600plf F
2076plf TOTAL

< (18/12)*1500=2250plf capacity

465plf R
100plf W
798plf L1
50plf W
200plf F
1613plf TOTAL

B/(N)FTG. TO ALIGN @ ELEV. OF B/(E)FTG.

STEP FTG. PER 4/S6.1

V.I.F. LOC. OF ROCKERY IS BEYOND NEW FOOTING

V.I.F. (E)ANCHOR BOLTS MATCH MIN. PER 'P4' SHEARWALL REQUIREMENTS; ADD 8"ø x6" TITEN HD AS DIRECT AB SUBSTITUTE AS NECESSARY

(N)CRAWL SPACE RE: ARCH FOR HT. CLEARANCE, VENT. & VAPOR BARRIER

B/FTG @ 319.0 EL

3'-0"

FOUNDATION SCHEDULE

MARK	DEPTH	WIDTH	LENGTH	REINFORCING
F1.5	10"	1'-6"	CONT.	(2) #4B CONT.
F1.5A	15"	1'-6"	CONT.	(2) #4T&B CONT.
F2.0	10"	2'-0"	CONT.	(3) #4B CONT.
F18	10"	1'-6"	1'-6"	(2) #4B E/W
F24	10"	2'-0"	2'-0"	(3) #4B E/W.
F36	10"	3'-0"	3'-0"	(4) #4B E/W.
F48	10"	4'-0"	4'-0"	(5) #4B E/W.

Foundation Notes

1. ALL SOIL BEARING SURFACES ARE SUBJECT TO INSPECTION AND APPROVAL BY THE GEOTECHNICAL ENGINEER PRIOR TO REINFORCING AND CONCRETE PLACEMENT.
2. CENTER INTERIOR FOOTINGS ON WALLS OR COLUMNS TYPICAL U.N.O.
3. SEE ARCHITECTURAL PLANS FOR DIMENSIONS.
4. NEW FOUNDATION WALLS TO BE 8" THICK TYPICAL U.N.O. W/#5 VERTS @ 18" O.C. BENT INTO FOOTINGS (ALT.) & #5 HORZ. BARS @ 18" O.C.; CENTER STL. IN STEM WALL. REFER TO DETAIL 9/S6.1
5. PROVIDE 4" DIAMETER PERFORATED FOOTING DRAINS AT PERIMETER OF FOUNDATIONS TYPICAL, CONNECT PER CIVIL. PROVIDE 4" DIAMETER TIGHTLINES FOR DOWNSPOUTS, CONNECT PER CIVIL.
6. FOR V.I.F. (VERIFY IN FIELD) CALLOUTS ON EXISTING FOOTINGS, THE CONTRACTOR MAY DIG TO EXPOSE FOOTING HEEL OR DRILL IN S.O.G. TO PROBE FOR THICKNESS & WIDTH (OR NON-DESTRUCTIVE SCAN BY SPECIAL INSPECTOR); IT MAY BE ASSUMED THAT EXISTING FOOTING IS CENTERED BELOW FOUNDATION WALL.

Framing Legend

S — FTG. STEP PER 4/S6.1

Note:
PLANS PREPARED USING ARCHITECTURAL BACKGROUNDS RECEIVED 07/23/2024

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

Foundation Plan

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

GRAPHIC SCALE

-4 0 2 4 8

(IN FEET)

1 inch = 4 ft.

PROJECT NORTH (REFERENCE ONLY)

CONSTRUCTION AND REMODELING

SCHARHON - RESIDENCE

9150 SE 54th St, Mercer Island, WA 98040

Permit check set

TE Job # 24310

Description	Date
Permit Intake	07/29/24

Tryg·stad ENGINEERING
nels@trygstadeng.com
(208)262-6884

Stamp/Approval:

NELS P. TRYGSTAD 19555 REGISTERED PROFESSIONAL ENGINEER STATE OF WASHINGTON 4/25/24

Sheet Name:

FOUNDATION PLAN

Sheet No:

S2.1

Cantilevered Retaining Wall

Lic. # : KW-06002997 — C.T. ENGINEERING

DESCRIPTION: Standard short Crawl Space (1'5" max. backfill, no passive, 6" stem, 18"X10" footing)

Calculations per ACI 318-08, ACI 530-08, IBC 2009, CBC 2010, ASCE 7-10

Criteria

Retained Height	=	1.42 ft
Wall height above soil	=	0.67 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft
Vertical component of active Lateral soil pressure options:		
NOT USED for Soil Pressure.		
NOT USED for Sliding Resistance.		
NOT USED for Overturning Resistance.		

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
Toe Active Pressure	=	35.0 psf/ft
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Friction Coeff btwn Ftg & Soil	=	0.300
Soil height to ignore for passive pressure	=	0.00 in

Design Summary

Wall Stability Ratios

Overturning	=	5.64	OK
Sliding	=	1.66	OK
Total Bearing Load	=	421 lbs	
...resultant ecc.	=	0.68 in	
Soil Pressure @ Toe	=	345 psf	OK
Soil Pressure @ Heel	=	217 psf	OK
Allowable	=	1,500 psf	

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	414 psf	
ACI Factored @ Heel	=	260 psf	
Footing Shear @ Toe	=	0.0 psi	OK
Footing Shear @ Heel	=	1.9 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	76.3 lbs	
less 0 % Passive Force	= -	0.0 lbs	
less 100% Friction Force	= -	126.0 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 : 1 Stability	=	0.0 lbs	OK

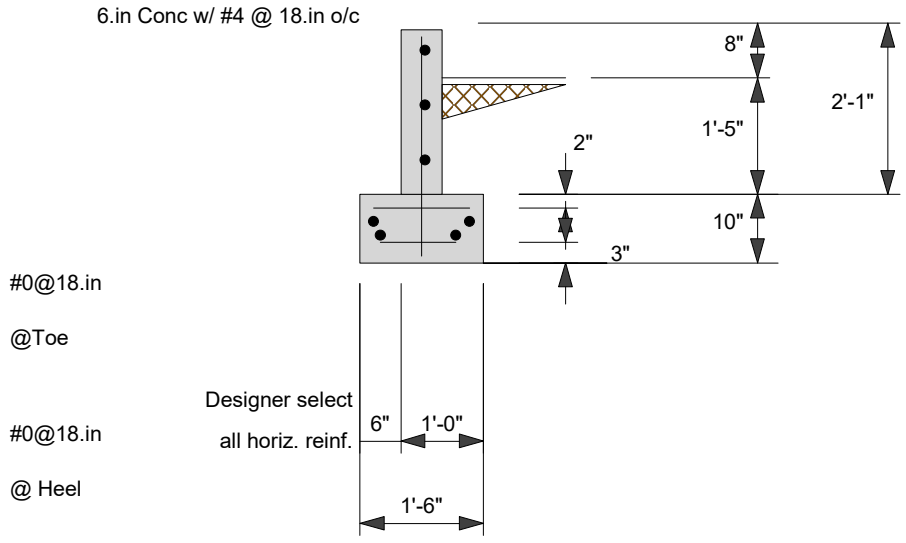
Load Factors

Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Top Stem

		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	in =	6.00
Rebar Size	=	# 4
Rebar Spacing	in =	18.00
Rebar Placed at	=	Center
Design Data		
fb/FB + fa/Fa	=	0.016
Total Force @ Section	lbs =	56.1
Moment....Actual	ft-l =	26.4
Moment.....Allowable	ft-l =	1,705.6
Shear.....Actual	psi =	1.6
Shear.....Allowable	psi =	75.0
Wall Weight	psf =	75.0
Rebar Depth 'd'	in =	3.00
Lap splice if above	in =	18.72
Lap splice if below	in =	6.00
Hook embed into footing	in =	6.00
Concrete Data		
f'c	psi =	2,500.0
Fy	psi =	



Cantilevered Retaining Wall

Lic. # : KW-06002997 — C.T. ENGINEERING

DESCRIPTION: Standard short Crawl Space (1'5" max. backfill, no passive, 6" stem, 18"X10" footing)

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	1.00
Total Footing Width	=	1.50
Footing Thickness	=	10.00 in
Key Width	=	12.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	2.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	414	260 psf
Mu' : Upward	=	0	0 ft-lb
Mu' : Downward	=	0	0 ft-lb
Mu: Design	=	26	26 ft-lb
Actual 1-Way Shear	=	0.00	1.87 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	None Spec'd	
Heel Reinforcing	=	None Spec'd	
Key Reinforcing	=	None Spec'd	

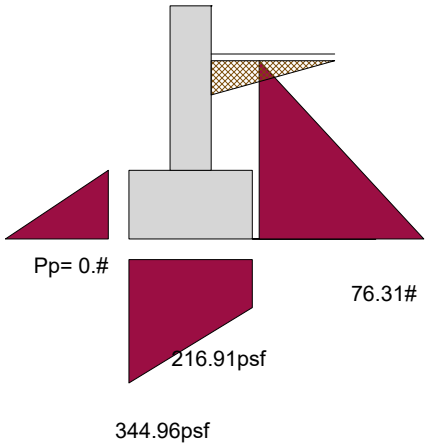
Other Acceptable Sizes & Spacings
Toe: Not req'd, Mu < S * Fr
Heel: Not req'd, Mu < S * Fr
Key: Not req'd, Mu < S * Fr

Summary of Overturning & Resisting Forces & Moments

		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-lb			.....RESISTING..... Force lbs	Distance ft	Moment ft-lb
Heel Active Pressure	=	88.5	0.75	66.3	Soil Over Heel	=	77.8	1.25	97.3
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Toe Active Pressure	=	-12.2	0.28	-3.4	Surcharge Over Heel	=			
Surcharge Over Toe	=				Adjacent Footing Load	=			
Adjacent Footing Load	=				Axial Dead Load on Stem	=			
Added Lateral Load	=				* Axial Live Load on Stem	=			
Load @ Stem Above Soil	=				Soil Over Toe	=			
					Surcharge Over Toe	=			
					Stem Weight(s)	=	156.1	0.75	117.1
					Earth @ Stem Transitions	=			
					Footing Weight	=	187.5	0.75	140.6
					Key Weight	=		2.50	
					Vert. Component	=			
Total	=	76.3	O.T.M. =	62.9	Total	=	421.4 lbs	R.M. =	355.0

Resisting/Overturning Ratio = 5.64
Vertical Loads used for Soil Pressure = 421.4 lbs

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



General Footing

Lic. # : KW-06002997

Description : F2.5: 30"x30" Footing with 1500psf ASBP

General Information

Calculations per ACI 318-08, IBC 2009, CBC 2010, ASCE 7-05

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.	=	0.00140
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
Include Pedestal Weight as DL	:	No

Soil Design Values

Allowable Soil Bearing	=	1.50	ksf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	0.0	ft
Allowable pressure increase per foot of deptl	=	0.0	ksf
when footing base is below	=	0.0	ft

Increases based on footing plan dimension

Allowable pressure increase per foot of dept	=	0.0	ksf
when maximum length or width is greater	=	0.0	ft

Dimensions

Width parallel to X-X Axis	=	2.50	ft
Length parallel to Z-Z Axis	=	2.50	ft
Footing Thickness	=	10.0	in

Load location offset from footing center...

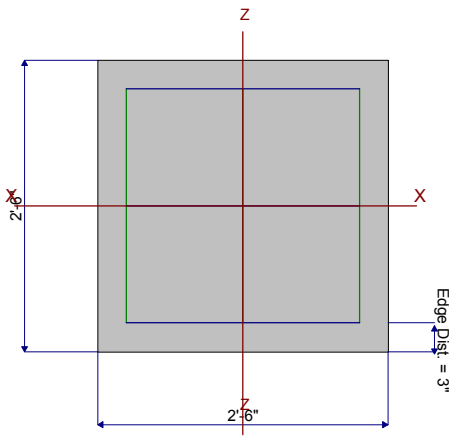
ex : parallel to X-X Axis	=	0	in
ez : parallel to Z-Z Axis	=	0	in

Pedestal dimensions...

px : parallel to X-X Axis	=	0.0	in
pz : parallel to Z-Z Axis	=	0.0	in
Height	=	0.0	in

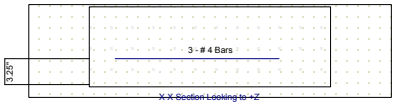
Rebar Centerline to Edge of Concrete..

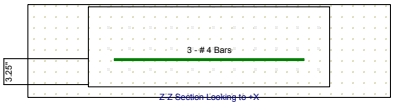
at Bottom of footing	=	3.250	in



Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=	3.0	
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	=	0.0	0.0	8.60	0.0	0.0	0.0	0.0	k
OB : Overburden	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ksf
M-xx	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
M-zz	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
V-x	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k
V-z	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k

General Footing

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ENERCALC, INC. 1983-2011, Build:6.11.5.3, Ver:6.11.5.3

Lic. # : KW-06002997

Description : F2.5: 30"x30" Footing with 1500psf ASBP

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9980	Soil Bearing	1.497 ksf	1.50 ksf	+D+L+H
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	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.3640	Z Flexure (+X)	1.720 k-ft	4.724 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.3640	Z Flexure (-X)	1.720 k-ft	4.724 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.3640	X Flexure (+Z)	1.720 k-ft	4.724 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.3640	X Flexure (-Z)	1.720 k-ft	4.724 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2537	1-way Shear (+X)	19.026 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2537	1-way Shear (-X)	19.026 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2537	1-way Shear (+Z)	19.026 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2537	1-way Shear (-Z)	19.026 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.4775	2-way Punching	71.622 psi	150.0 psi	+1.20D+0.50Lr+1.60L+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc	Actual Soil Bearing Stress +Z	+Z	-X	-X	Actual / Allowable Ratio
X-X, +D	1.50	n/a	0.0	0.1208	0.1208	n/a	n/a	0.081
X-X, +D+L+H	1.50	n/a	0.0	1.497	1.497	n/a	n/a	0.998
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	1.153	1.153	n/a	n/a	0.769
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	1.153	1.153	n/a	n/a	0.769
X-X, +D+0.750Lr+0.750L+0.750W+H	1.50	n/a	0.0	1.153	1.153	n/a	n/a	0.769
X-X, +D+0.750L+0.750S+0.750W+H	1.50	n/a	0.0	1.153	1.153	n/a	n/a	0.769
X-X, +D+0.750Lr+0.750L+0.5250E+H	1.50	n/a	0.0	1.153	1.153	n/a	n/a	0.769
X-X, +D+0.750L+0.750S+0.5250E+H	1.50	n/a	0.0	1.153	1.153	n/a	n/a	0.769
Z-Z, +D	1.50	0.0	n/a	n/a	n/a	0.1208	0.1208	0.081
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	1.497	1.497	0.998
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	1.153	1.153	0.769
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	1.153	1.153	0.769
Z-Z, +D+0.750Lr+0.750L+0.750W+H	1.50	0.0	n/a	n/a	n/a	1.153	1.153	0.769
Z-Z, +D+0.750L+0.750S+0.750W+H	1.50	0.0	n/a	n/a	n/a	1.153	1.153	0.769
Z-Z, +D+0.750Lr+0.750L+0.5250E+H	1.50	0.0	n/a	n/a	n/a	1.153	1.153	0.769
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.50	0.0	n/a	n/a	n/a	1.153	1.153	0.769

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status

Footing Has NO Overturning

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0	+Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.40D	0	-Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	1.72	+Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	1.72	-Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+1.60L+0.50S+1.60H	1.72	+Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+1.60L+0.50S+1.60H	1.72	-Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+1.60Lr+0.50L	0.5374	+Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+1.60Lr+0.50L	0.5374	-Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+0.50L+1.60S	0.5374	+Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+0.50L+1.60S	0.5374	-Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+0.50Lr+0.50L+1.60W	0.5374	+Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+0.50Lr+0.50L+1.60W	0.5374	-Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+0.50L+0.50S+1.60W	0.5374	+Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+0.50L+0.50S+1.60W	0.5374	-Z	Bottom	0.22	Bending	0.24	4.724	OK
X-X, +1.20D+0.50L+0.20S+E	0.5374	+Z	Bottom	0.22	Bending	0.24	4.724	OK

General Footing

Lic. # : KW-06002997

Description : F2.5: 30"x30" Footing with 1500psf ASBP

X-X, +1.20D+0.50L+0.20S+E	0.5374	-Z	Bottom	0.22	Bending	0.24	4.724	OK

General Footing

Lic. # : KW-06002997

Description : F2.5: 30"x30" Footing with 1500psf ASBP

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.40D	0	-X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.40D	0	+X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	1.72	-X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	1.72	+X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	1.72	-X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	1.72	+X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+1.60Lr+0.50L	0.5374	-X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+1.60Lr+0.50L	0.5374	+X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+0.50L+1.60S	0.5374	-X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+0.50L+1.60S	0.5374	+X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+0.50Lr+0.50L+1.60W	0.5374	-X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+0.50Lr+0.50L+1.60W	0.5374	+X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+0.50L+0.50S+1.60W	0.5374	-X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+0.50L+0.50S+1.60W	0.5374	+X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+0.50L+0.20S+E	0.5374	-X	Bottom	0.22	Bending	0.24	4.724	OK
Z-Z, +1.20D+0.50L+0.20S+E	0.5374	+X	Bottom	0.22	Bending	0.24	4.724	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0 psi	0 psi	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	19.026 psi	19.026 psi	19.026 psi	19.026 psi	19.026 psi	75 psi	0.2537	OK
+1.20D+1.60L+0.50S+1.60H	19.026 psi	19.026 psi	19.026 psi	19.026 psi	19.026 psi	75 psi	0.2537	OK
+1.20D+1.60Lr+0.50L	5.946 psi	5.946 psi	5.946 psi	5.946 psi	5.946 psi	75 psi	0.07928	OK
+1.20D+0.50L+1.60S	5.946 psi	5.946 psi	5.946 psi	5.946 psi	5.946 psi	75 psi	0.07928	OK
+1.20D+0.50Lr+0.50L+1.60W	5.946 psi	5.946 psi	5.946 psi	5.946 psi	5.946 psi	75 psi	0.07928	OK
+1.20D+0.50L+0.50S+1.60W	5.946 psi	5.946 psi	5.946 psi	5.946 psi	5.946 psi	75 psi	0.07928	OK
+1.20D+0.50L+0.20S+E	5.946 psi	5.946 psi	5.946 psi	5.946 psi	5.946 psi	75 psi	0.07928	OK

Punching Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	0 psi	150 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	71.622 psi	150 psi	0.4775	OK
+1.20D+1.60L+0.50S+1.60H	71.622 psi	150 psi	0.4775	OK
+1.20D+1.60Lr+0.50L	22.382 psi	150 psi	0.1492	OK
+1.20D+0.50L+1.60S	22.382 psi	150 psi	0.1492	OK
+1.20D+0.50Lr+0.50L+1.60W	22.382 psi	150 psi	0.1492	OK
+1.20D+0.50L+0.50S+1.60W	22.382 psi	150 psi	0.1492	OK
+1.20D+0.50L+0.20S+E	22.382 psi	150 psi	0.1492	OK

General Footing

Lic. # : KW-06002997

Description : F3.0: 36"x36" Footing with 1500psf ASBP

General Information

Calculations per ACI 318-08, IBC 2009, CBC 2010, ASCE 7-05

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.	=	0.00140
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
Include Pedestal Weight as DL	:	No

Soil Design Values

Allowable Soil Bearing	=	1.50	ksf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

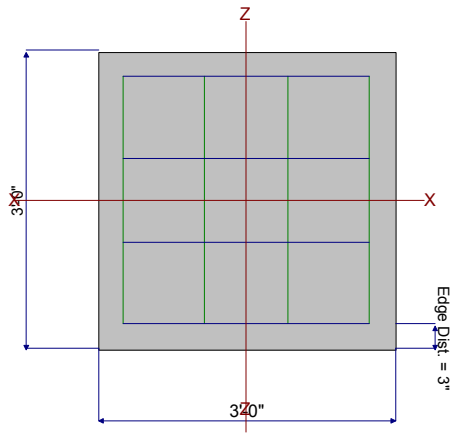
Footing base depth below soil surface	=	0.0	ft
Allowable pressure increase per foot of deptl	=	0.0	ksf
when footing base is below	=	0.0	ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depl	=	0.0	ksf
when maximum length or width is greater	=	0.0	ft

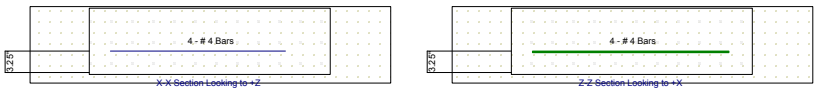
Dimensions

Width parallel to X-X Axis	=	3.0	ft
Length parallel to Z-Z Axis	=	3.0	ft
Footing Thickness	=	10.0	in
Load location offset from footing center...			
ex : parallel to X-X Axis	=	0	in
ez : parallel to Z-Z Axis	=	0	in
Pedestal dimensions...			
px : parallel to X-X Axis	=	0.0	in
pz : parallel to Z-Z Axis	=	0.0	in
Height	=	0.0	in
Rebar Centerline to Edge of Concrete..			
at Bottom of footing	=	3.250	in



Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=	4.0	
Reinforcing Bar Size	=	# 4	
Bars parallel to Z-Z Axis			
Number of Bars	=	4.0	
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	=	0.0	0.0	12.40	0.0	0.0	0.0	0.0	k
OB : Overburden	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ksf
M-xx	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
M-zz	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
V-x	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k
V-z	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k

General Footing

File: g:\Nels\Calc Catalog\nels std calc catalog.ec6
ENERCALC, INC. 1983-2011, Build:6.11.5.3, Ver:6.11.5.3

Lic. # : KW-06002997

Description : F3.0: 36"x36" Footing with 1500psf ASBP

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9993	Soil Bearing	1.499 ksf	1.50 ksf	+D+L+H
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	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.4739	Z Flexure (+X)	2.480 k-ft	5.233 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.4739	Z Flexure (-X)	2.480 k-ft	5.233 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.4739	X Flexure (+Z)	2.480 k-ft	5.233 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.4739	X Flexure (-Z)	2.480 k-ft	5.233 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.3338	1-way Shear (+X)	25.038 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.3338	1-way Shear (-X)	25.038 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.3338	1-way Shear (+Z)	25.038 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.3338	1-way Shear (-Z)	25.038 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.6967	2-way Punching	104.51 psi	150.0 psi	+1.20D+0.50Lr+1.60L+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc	Actual Soil Bearing Stress +Z	+Z	-X	-X	Actual / Allowable Ratio
X-X, +D	1.50	n/a	0.0	0.1208	0.1208	n/a	n/a	0.081
X-X, +D+L+H	1.50	n/a	0.0	1.499	1.499	n/a	n/a	0.999
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	1.154	1.154	n/a	n/a	0.769
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	1.154	1.154	n/a	n/a	0.769
X-X, +D+0.750Lr+0.750L+0.750W+H	1.50	n/a	0.0	1.154	1.154	n/a	n/a	0.769
X-X, +D+0.750L+0.750S+0.750W+H	1.50	n/a	0.0	1.154	1.154	n/a	n/a	0.769
X-X, +D+0.750Lr+0.750L+0.5250E+H	1.50	n/a	0.0	1.154	1.154	n/a	n/a	0.769
X-X, +D+0.750L+0.750S+0.5250E+H	1.50	n/a	0.0	1.154	1.154	n/a	n/a	0.769
Z-Z, +D	1.50	0.0	n/a	n/a	n/a	0.1208	0.1208	0.081
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	1.499	1.499	0.999
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	1.154	1.154	0.769
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	1.154	1.154	0.769
Z-Z, +D+0.750Lr+0.750L+0.750W+H	1.50	0.0	n/a	n/a	n/a	1.154	1.154	0.769
Z-Z, +D+0.750L+0.750S+0.750W+H	1.50	0.0	n/a	n/a	n/a	1.154	1.154	0.769
Z-Z, +D+0.750Lr+0.750L+0.5250E+H	1.50	0.0	n/a	n/a	n/a	1.154	1.154	0.769
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.50	0.0	n/a	n/a	n/a	1.154	1.154	0.769

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status

Footing Has NO Overturning

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0	+Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.40D	0	-Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	2.48	+Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	2.48	-Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+1.60L+0.50S+1.60H	2.48	+Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+1.60L+0.50S+1.60H	2.48	-Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+1.60Lr+0.50L	0.7749	+Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+1.60Lr+0.50L	0.7749	-Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+0.50L+1.60S	0.7749	+Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+0.50L+1.60S	0.7749	-Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+0.50Lr+0.50L+1.60W	0.7749	+Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+0.50Lr+0.50L+1.60W	0.7749	-Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+0.50L+0.50S+1.60W	0.7749	+Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+0.50L+0.50S+1.60W	0.7749	-Z	Bottom	0.22	Bending	0.27	5.233	OK
X-X, +1.20D+0.50L+0.20S+E	0.7749	+Z	Bottom	0.22	Bending	0.27	5.233	OK

General Footing

Lic. # : KW-06002997

Description : F3.0: 36"x36" Footing with 1500psf ASBP

X-X, +1.20D+0.50L+0.20S+E	0.7749	-Z	Bottom	0.22	Bending	0.27	5.233	OK

General Footing

Lic. # : KW-06002997

Description : F3.0: 36"x36" Footing with 1500psf ASBP

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.40D	0	-X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.40D	0	+X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	2.48	-X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	2.48	+X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	2.48	-X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	2.48	+X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+1.60Lr+0.50L	0.7749	-X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+1.60Lr+0.50L	0.7749	+X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+0.50L+1.60S	0.7749	-X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+0.50L+1.60S	0.7749	+X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+0.50Lr+0.50L+1.60W	0.7749	-X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+0.50Lr+0.50L+1.60W	0.7749	+X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+0.50L+0.50S+1.60W	0.7749	-X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+0.50L+0.50S+1.60W	0.7749	+X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+0.50L+0.20S+E	0.7749	-X	Bottom	0.22	Bending	0.27	5.233	OK
Z-Z, +1.20D+0.50L+0.20S+E	0.7749	+X	Bottom	0.22	Bending	0.27	5.233	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0 psi	0 psi	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	25.038 psi	25.038 psi	25.038 psi	25.038 psi	25.038 psi	75 psi	0.3338	OK
+1.20D+1.60L+0.50S+1.60H	25.038 psi	25.038 psi	25.038 psi	25.038 psi	25.038 psi	75 psi	0.3338	OK
+1.20D+1.60Lr+0.50L	7.824 psi	7.824 psi	7.824 psi	7.824 psi	7.824 psi	75 psi	0.1043	OK
+1.20D+0.50L+1.60S	7.824 psi	7.824 psi	7.824 psi	7.824 psi	7.824 psi	75 psi	0.1043	OK
+1.20D+0.50Lr+0.50L+1.60W	7.824 psi	7.824 psi	7.824 psi	7.824 psi	7.824 psi	75 psi	0.1043	OK
+1.20D+0.50L+0.50S+1.60W	7.824 psi	7.824 psi	7.824 psi	7.824 psi	7.824 psi	75 psi	0.1043	OK
+1.20D+0.50L+0.20S+E	7.824 psi	7.824 psi	7.824 psi	7.824 psi	7.824 psi	75 psi	0.1043	OK

Punching Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	0 psi	150 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	104.51 psi	150 psi	0.6967	OK
+1.20D+1.60L+0.50S+1.60H	104.51 psi	150 psi	0.6967	OK
+1.20D+1.60Lr+0.50L	32.658 psi	150 psi	0.2177	OK
+1.20D+0.50L+1.60S	32.658 psi	150 psi	0.2177	OK
+1.20D+0.50Lr+0.50L+1.60W	32.658 psi	150 psi	0.2177	OK
+1.20D+0.50L+0.50S+1.60W	32.658 psi	150 psi	0.2177	OK
+1.20D+0.50L+0.20S+E	32.658 psi	150 psi	0.2177	OK

General Footing

File = G:\MAIL\Nels\Calc Catalog\nels std calc catalog.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.29

Lic. # : KW-06002997

Description : F4.0: 48"x48" Footing with 1500psf ASBP

Code References

Calculations per ACI 318-05, IBC 2006, CBC 2007, ASCE 7-05
Load Combinations Used : 2006 IBC & ASCE 7-05

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
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	0.0	ft
Allow press. increase per foot of depth	=	0.0	ksf
when footing base is below	=	0.0	ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	0.0	ksf
when max. length or width is greater than	=	0.0	ft

Dimensions

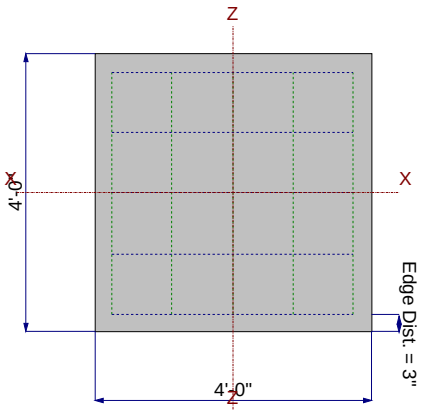
Width parallel to X-X Axis	=	4.0	ft
Length parallel to Z-Z Axis	=	4.0	ft
Footing Thickness	=	10.0	in

Pedestal dimensions...

px : parallel to X-X Axis	=	3.50	in
pz : parallel to Z-Z Axis	=	3.50	in
Height	=	0.0	in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.250	in

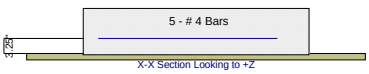


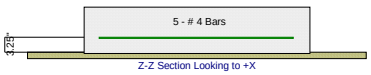
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		5
Reinforcing Bar Size	=	#	4
Bars parallel to Z-Z Axis			
Number of Bars	=		5
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	=	0.0	0.0	22.10	0.0	0.0	0.0	0.0	k
OB : Overburden	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ksf
M-xx	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
M-zz	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
V-x	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k
V-z	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k

General Footing

File = G:\MAIL\Nels\Calc Catalog\nels std calc catalog.ec6
ENERCALC, INC. 1983-2017, Build:6.17.3.29, Ver:6.17.3.29

Lic. # : KW-06002997

Description : F4.0: 48"x48" Footing with 1500psf ASBP

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9207	Soil Bearing	1.381 ksf	1.50 ksf	L Only 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	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.7728	Z Flexure (+X)	3.799 k-ft	4.915 k-ft	+1.60L
PASS	0.7728	Z Flexure (-X)	3.799 k-ft	4.915 k-ft	+1.60L
PASS	0.7728	X Flexure (+Z)	3.799 k-ft	4.915 k-ft	+1.60L
PASS	0.7728	X Flexure (-Z)	3.799 k-ft	4.915 k-ft	+1.60L
PASS	0.4608	1-way Shear (+X)	34.560 psi	75.0 psi	+1.60L
PASS	0.4608	1-way Shear (-X)	34.560 psi	75.0 psi	+1.60L
PASS	0.4608	1-way Shear (+Z)	34.560 psi	75.0 psi	+1.60L
PASS	0.4608	1-way Shear (-Z)	34.560 psi	75.0 psi	+1.60L
PASS	0.8177	2-way Punching	122.658 psi	150.0 psi	+1.60L

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,	1.50	n/a	0.0	0.0	0.0	n/a	n/a	0.000
X-X, L Only	1.50	n/a	0.0	1.381	1.381	n/a	n/a	0.921
X-X, +0.750L	1.50	n/a	0.0	1.036	1.036	n/a	n/a	0.691
Z-Z,	1.50	0.0	n/a	n/a	n/a	0.0	0.0	0.000
Z-Z, L Only	1.50	0.0	n/a	n/a	n/a	1.381	1.381	0.921
Z-Z, +0.750L	1.50	0.0	n/a	n/a	n/a	1.036	1.036	0.691

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status

Footing Has NO Overturning

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,	0.0	+Z	Bottom	0.216	Min Temp %	0.250	4.915	OK
X-X,	0.0	-Z	Bottom	0.216	Min Temp %	0.250	4.915	OK
X-X, +1.60L	3.799	+Z	Bottom	0.216	Min Temp %	0.250	4.915	OK
X-X, +1.60L	3.799	-Z	Bottom	0.216	Min Temp %	0.250	4.915	OK
X-X, +0.50L	1.187	+Z	Bottom	0.216	Min Temp %	0.250	4.915	OK
X-X, +0.50L	1.187	-Z	Bottom	0.216	Min Temp %	0.250	4.915	OK
Z-Z,	0.0	-X	Bottom	0.216	Min Temp %	0.250	4.915	OK
Z-Z,	0.0	+X	Bottom	0.216	Min Temp %	0.250	4.915	OK
Z-Z, +1.60L	3.799	-X	Bottom	0.216	Min Temp %	0.250	4.915	OK
Z-Z, +1.60L	3.799	+X	Bottom	0.216	Min Temp %	0.250	4.915	OK
Z-Z, +0.50L	1.187	-X	Bottom	0.216	Min Temp %	0.250	4.915	OK
Z-Z, +0.50L	1.187	+X	Bottom	0.216	Min Temp %	0.250	4.915	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	0.00
+1.60L	34.56 psi	34.56 psi	34.56 psi	34.56 psi	34.56 psi	75.00 psi	0.46	0.00
+0.50L	10.80 psi	10.80 psi	10.80 psi	10.80 psi	10.80 psi	75.00 psi	0.14	0.00

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
	0.00 psi	150.00 psi	0	OK
+1.60L	122.66 psi	150.00 psi	0.8177	OK
+0.50L	38.33 psi	150.00 psi	0.2555	OK

General Footing

Lic. # : KW-06002997

DESCRIPTION: F4.5: 54"x54" Footing with 1500psf ASBP

Code References

Calculations per ACI 318-05, IBC 2006, CBC 2007, ASCE 7-05
Load Combinations Used : 2006 IBC & ASCE 7-05

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
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
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

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

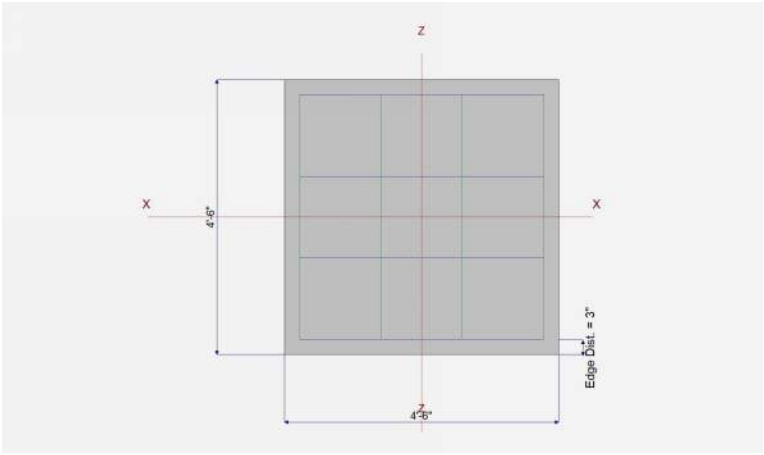
Width parallel to X-X Axis	=	4.50 ft
Length parallel to Z-Z Axis	=	4.50 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	3.50 in
pz : parallel to Z-Z Axis	=	3.50 in
Height	=	in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.250 in

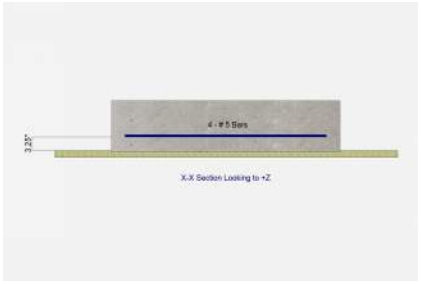


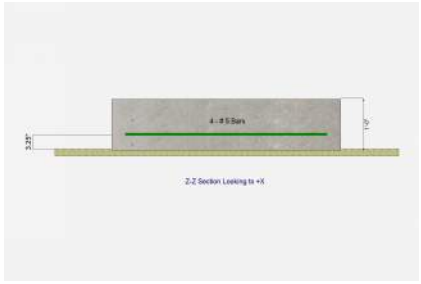
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		4.0
Reinforcing Bar Size	=	#	5
Bars parallel to Z-Z Axis			
Number of Bars	=		4.0
Reinforcing Bar Size	=	#	5

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	=			30.375					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

General Footing

Lic. # : KW-06002997

DESCRIPTION: F4.5: 54"x54" Footing with 1500psf ASBP

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	1.0	Soil Bearing	1.50 ksf	1.50 ksf	L Only 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	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.7531	Z Flexure (+X)	5.313 k-ft/ft	7.055 k-ft/ft	+1.60L
PASS	0.7531	Z Flexure (-X)	5.313 k-ft/ft	7.055 k-ft/ft	+1.60L
PASS	0.7531	X Flexure (+Z)	5.313 k-ft/ft	7.055 k-ft/ft	+1.60L
PASS	0.7531	X Flexure (-Z)	5.313 k-ft/ft	7.055 k-ft/ft	+1.60L
PASS	0.4251	1-way Shear (+X)	31.886 psi	75.0 psi	+1.60L
PASS	0.4251	1-way Shear (-X)	31.886 psi	75.0 psi	+1.60L
PASS	0.4251	1-way Shear (+Z)	31.886 psi	75.0 psi	+1.60L
PASS	0.4251	1-way Shear (-Z)	31.886 psi	75.0 psi	+1.60L
PASS	0.7191	2-way Punching	107.867 psi	150.0 psi	+1.60L

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,	1.50	n/a	0.0	0.0	0.0	n/a	n/a	0.000
X-X, L Only	1.50	n/a	0.0	1.50	1.50	n/a	n/a	1.000
X-X, +0.750L	1.50	n/a	0.0	1.125	1.125	n/a	n/a	0.750
Z-Z,	1.50	0.0	n/a	n/a	n/a	0.0	0.0	0.000
Z-Z, L Only	1.50	0.0	n/a	n/a	n/a	1.50	1.50	1.000
Z-Z, +0.750L	1.50	0.0	n/a	n/a	n/a	1.125	1.125	0.750

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status

Footing Has NO Overturning

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,	0.0	+Z	Bottom	0.2592	Min Temp %	0.2756	7.055	OK
X-X,	0.0	-Z	Bottom	0.2592	Min Temp %	0.2756	7.055	OK
X-X, +1.60L	5.313	+Z	Bottom	0.2592	Min Temp %	0.2756	7.055	OK
X-X, +1.60L	5.313	-Z	Bottom	0.2592	Min Temp %	0.2756	7.055	OK
X-X, +0.50L	1.660	+Z	Bottom	0.2592	Min Temp %	0.2756	7.055	OK
X-X, +0.50L	1.660	-Z	Bottom	0.2592	Min Temp %	0.2756	7.055	OK
Z-Z,	0.0	-X	Bottom	0.2592	Min Temp %	0.2756	7.055	OK
Z-Z,	0.0	+X	Bottom	0.2592	Min Temp %	0.2756	7.055	OK
Z-Z, +1.60L	5.313	-X	Bottom	0.2592	Min Temp %	0.2756	7.055	OK
Z-Z, +1.60L	5.313	+X	Bottom	0.2592	Min Temp %	0.2756	7.055	OK
Z-Z, +0.50L	1.660	-X	Bottom	0.2592	Min Temp %	0.2756	7.055	OK
Z-Z, +0.50L	1.660	+X	Bottom	0.2592	Min Temp %	0.2756	7.055	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.60L	31.89 psi	31.89 psi	31.89 psi	31.89 psi	31.89 psi	75.00 psi	0.43	OK
+0.50L	9.96 psi	9.96 psi	9.96 psi	9.96 psi	9.96 psi	75.00 psi	0.13	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
	0.00 psi	150.00 psi	0	OK
+1.60L	107.87 psi	150.00 psi	0.7191	OK
+0.50L	33.71 psi	150.00 psi	0.2247	OK

General Footing

File: g:\Nels\Calc Catalog\nels std calc catalog.ec6
ENERCALC, INC. 1983-2011, Build:6.11.5.3, Ver:6.11.5.3

Lic. # : KW-06002997

Description : F2.0: 24"x24" Footing with 1500psf ASBP

General Information

Calculations per ACI 318-08, IBC 2009, CBC 2010, ASCE 7-05

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.	=	0.00140
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
Include Pedestal Weight as DL	:	No

Soil Design Values

Allowable Soil Bearing	=	1.50	ksf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	0.0	ft
Allowable pressure increase per foot of deptl	=	0.0	ksf
when footing base is below	=	0.0	ft

Increases based on footing plan dimension

Allowable pressure increase per foot of dept	=	0.0	ksf
when maximum length or width is greater	=	0.0	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

Load location offset from footing center...

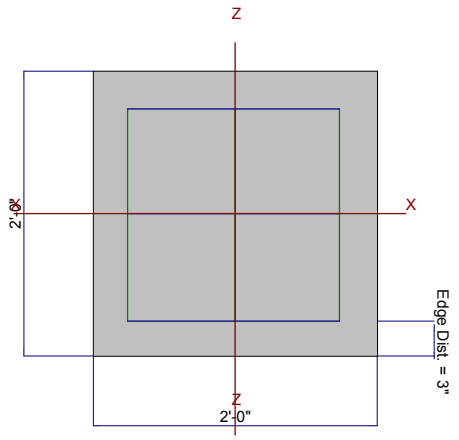
ex : parallel to X-X Axis	=	0	in
ez : parallel to Z-Z Axis	=	0	in

Pedestal dimensions...

px : parallel to X-X Axis	=	0.0	in
pz : parallel to Z-Z Axis	=	0.0	in
Height	=	0.0	in

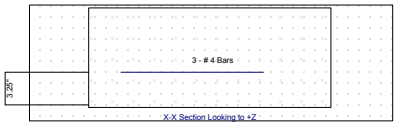
Rebar Centerline to Edge of Concrete..

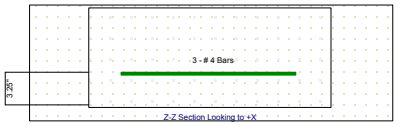
at Bottom of footing	=	3.250	in



Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=	3.0	
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	=	0.0	0.0	5.50	0.0	0.0	0.0	0.0	k
OB : Overburden	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ksf
M-xx	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
M-zz	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k-ft
V-x	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k
V-z	=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	k

General Footing

File: g:\Nels\Calc Catalog\nels std calc catalog.ec6
ENERCALC, INC. 1983-2011, Build:6.11.5.3, Ver:6.11.5.3

Lic. # : KW-06002997

Description : F2.0: 24"x24" Footing with 1500psf ASBP

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9973	Soil Bearing	1.496 ksf	1.50 ksf	+D+L+H
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	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1876	Z Flexure (+X)	1.10 k-ft	5.863 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1876	Z Flexure (-X)	1.10 k-ft	5.863 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1876	X Flexure (+Z)	1.10 k-ft	5.863 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1876	X Flexure (-Z)	1.10 k-ft	5.863 k-ft	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1545	1-way Shear (+X)	11.588 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1545	1-way Shear (-X)	11.588 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1545	1-way Shear (+Z)	11.588 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.1545	1-way Shear (-Z)	11.588 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.2967	2-way Punching	44.50 psi	150.0 psi	+1.20D+0.50Lr+1.60L+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc	Actual Soil Bearing Stress +Z	+Z	-X	-X	Actual / Allowable Ratio
X-X, +D	1.50	n/a	0.0	0.1208	0.1208	n/a	n/a	0.081
X-X, +D+L+H	1.50	n/a	0.0	1.496	1.496	n/a	n/a	0.997
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	1.152	1.152	n/a	n/a	0.768
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	1.152	1.152	n/a	n/a	0.768
X-X, +D+0.750Lr+0.750L+0.750W+H	1.50	n/a	0.0	1.152	1.152	n/a	n/a	0.768
X-X, +D+0.750L+0.750S+0.750W+H	1.50	n/a	0.0	1.152	1.152	n/a	n/a	0.768
X-X, +D+0.750Lr+0.750L+0.5250E+H	1.50	n/a	0.0	1.152	1.152	n/a	n/a	0.768
X-X, +D+0.750L+0.750S+0.5250E+H	1.50	n/a	0.0	1.152	1.152	n/a	n/a	0.768
Z-Z, +D	1.50	0.0	n/a	n/a	n/a	0.1208	0.1208	0.081
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	1.496	1.496	0.997
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	1.152	1.152	0.768
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	1.152	1.152	0.768
Z-Z, +D+0.750Lr+0.750L+0.750W+H	1.50	0.0	n/a	n/a	n/a	1.152	1.152	0.768
Z-Z, +D+0.750L+0.750S+0.750W+H	1.50	0.0	n/a	n/a	n/a	1.152	1.152	0.768
Z-Z, +D+0.750Lr+0.750L+0.5250E+H	1.50	0.0	n/a	n/a	n/a	1.152	1.152	0.768
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.50	0.0	n/a	n/a	n/a	1.152	1.152	0.768

Overturning Stability

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

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0	+Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.40D	0	-Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	1.1	+Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	1.1	-Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+1.60L+0.50S+1.60H	1.1	+Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+1.60L+0.50S+1.60H	1.1	-Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+1.60Lr+0.50L	0.3437	+Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+1.60Lr+0.50L	0.3437	-Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+0.50L+1.60S	0.3437	+Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+0.50L+1.60S	0.3437	-Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+0.50Lr+0.50L+1.60W	0.3437	+Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+0.50Lr+0.50L+1.60W	0.3437	-Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+0.50L+0.50S+1.60W	0.3437	+Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+0.50L+0.50S+1.60W	0.3437	-Z	Bottom	0.22	Bending	0.3	5.863	OK
X-X, +1.20D+0.50L+0.20S+E	0.3437	+Z	Bottom	0.22	Bending	0.3	5.863	OK

General Footing

Lic. # : KW-06002997

Description : F2.0: 24"x24" Footing with 1500psf ASBP

X-X, +1.20D+0.50L+0.20S+E	0.3437	-Z	Bottom	0.22	Bending	0.3	5.863	OK

General Footing

Lic. # : KW-06002997

Description : F2.0: 24"x24" Footing with 1500psf ASBP

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.40D	0	-X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.40D	0	+X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	1.1	-X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	1.1	+X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	1.1	-X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	1.1	+X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+1.60Lr+0.50L	0.3437	-X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+1.60Lr+0.50L	0.3437	+X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+0.50L+1.60S	0.3437	-X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+0.50L+1.60S	0.3437	+X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+0.50Lr+0.50L+1.60W	0.3437	-X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+0.50Lr+0.50L+1.60W	0.3437	+X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+0.50L+0.50S+1.60W	0.3437	-X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+0.50L+0.50S+1.60W	0.3437	+X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+0.50L+0.20S+E	0.3437	-X	Bottom	0.22	Bending	0.3	5.863	OK
Z-Z, +1.20D+0.50L+0.20S+E	0.3437	+X	Bottom	0.22	Bending	0.3	5.863	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0 psi	0 psi	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	11.588 psi	11.588 psi	11.588 psi	11.588 psi	11.588 psi	75 psi	0.1545	OK
+1.20D+1.60L+0.50S+1.60H	11.588 psi	11.588 psi	11.588 psi	11.588 psi	11.588 psi	75 psi	0.1545	OK
+1.20D+1.60Lr+0.50L	3.621 psi	3.621 psi	3.621 psi	3.621 psi	3.621 psi	75 psi	0.04829	OK
+1.20D+0.50L+1.60S	3.621 psi	3.621 psi	3.621 psi	3.621 psi	3.621 psi	75 psi	0.04829	OK
+1.20D+0.50Lr+0.50L+1.60W	3.621 psi	3.621 psi	3.621 psi	3.621 psi	3.621 psi	75 psi	0.04829	OK
+1.20D+0.50L+0.50S+1.60W	3.621 psi	3.621 psi	3.621 psi	3.621 psi	3.621 psi	75 psi	0.04829	OK
+1.20D+0.50L+0.20S+E	3.621 psi	3.621 psi	3.621 psi	3.621 psi	3.621 psi	75 psi	0.04829	OK

Punching Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	0 psi	150 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	44.5 psi	150 psi	0.2967	OK
+1.20D+1.60L+0.50S+1.60H	44.5 psi	150 psi	0.2967	OK
+1.20D+1.60Lr+0.50L	13.906 psi	150 psi	0.09271	OK
+1.20D+0.50L+1.60S	13.906 psi	150 psi	0.09271	OK
+1.20D+0.50Lr+0.50L+1.60W	13.906 psi	150 psi	0.09271	OK
+1.20D+0.50L+0.50S+1.60W	13.906 psi	150 psi	0.09271	OK
+1.20D+0.50L+0.20S+E	13.906 psi	150 psi	0.09271	OK