Project Number: U2784-001-181

August 28, 2018

WC3
908 West Gordon Ave. Suite #3
Layton, UT 84041

ATTENTION: **Mike Molyneux , P.E.**

REFERENCE: **Morar - SFD – Plan Review Comments 1st Review**
WC3 Project #: 218-525-099 - Weber County

Dear Mike,

The following is written in response to the plans check comments dated June 25, 2018. Our responses are limited to structural concerns only.

STRUCTURAL REVIEW COMMENTS

Comment S1: Fasteners, including nails, nuts and washers in contact with preservative treated wood shall be protected. It is not obvious that this has been indicated, please verify and include this on the drawing. (IBC 2304.10.5.1) (IRC 317.3)

Response: **See note E8 on sheet S1**

Comment S2: Sheet S1

a. Design loads: It appears that there are different seismic force resisting systems used. Please provide their corresponding V, Cs, R values. (IBC 1603.1.5)
b. Design loads: Floor dead load is shown as 28 psf. Sheet A3.2 appears to suggest 3" concrete topping. The indicated load may be below requirement. Please verify thickness gypcrete to be used. This could affect gravity and lateral design. (IBC 1604)
c. Special Inspection:

I. Please provide statement of special inspections identifying the following: (IBC 1704.3.1)

a. The materials, systems, components and work required to have special inspections
b. The type and extent of each special inspection.
c. The type and extent of each test.
d. For each type of special inspection, identification as to whether it will be continuous special inspection, periodic special inspection or performed in accordance with the notation used in the referenced standard where the inspections are defined.
e. For steel special inspections, please provide requirements from AISC 360 Chapter N. (IBC 1705.2.1)

Response:

a. Seismic criteria for each LFRS are now listed
b. Loads are updated for 3" of gypcrete (24 psf) instead of the ~2" (17psf) that was used previously. Base shear increases less than 2%. Design is unchanged. Sheet S1 now lists heavier load. Updated calculations are attached.
c. Material, systems and components are listed in item M.2 of S1 with reference to schedules on S1.2.
d. See schedule on S1.2
e. See schedule on S1.2

Comment S3: Sheet S1.2

A. Typical Truss Hangers: Cross grain bending may occur at ledger. Face nailing may also experience pull out forces. Please consider adding tension devices and blocking at suitable spacing to transfer transverse loads to the interior studs. (ASCE 7 12.11.2.2, 1.4, 12.1.3, 12.10.)

Response: **Detail is illustrative of typical hanger configurations and not all inclusive for conditions at beam/truss connections. No ledger specification is shown. Where ledgers are necessary it will be specified on applicable details.**

Comment S4: Sheet S3

A. Main Floor Framing: Detail 5/SD-1 does not appear to be applicable for the shown condition. Please verify and revise as required. (IBC 107)
B. GL-1, A: Beam information appears to be missing. Please verify and indicate on the drawing. (IBC 107)

Response:

A. Detail callout is revised to 10/SD-2 similar.
B. Beam is structural fascia, called out as typical, and shown on detail 6/SD-1.

Comment S5: Sheet SD1:

A. Detail 1
   I. Please verify that anchor bolt spacing on the plan has included consideration for restraint retaining wall condition. (IBC 1604)
   II. Please verify if continuous reinforcements are missing at anchor bolts location. Otherwise, please provide analysis for restraint condition of the retaining wall showing how the retained loads are transferred to the anchor bolts. (IBC 1604)
B. Detail 11
   I. The detail appears to show an unrestrained retaining wall. The reference to Detail 1 is for restrained condition. Please verify if the intent was for restraint condition and provide blocking at suitable spacing to transfer loads into the diaphragm. (IBC 107)
   II. Cross grain bending may occur at ledger. Please consider adding tension devices and blocking at suitable spacing to transfer transverse loads to the concrete wall. (ASCE 7 12.11.2.2, 1.4, 12.1.3, 12.10.)

Response:

A. Detail 1
   I. Attached calculations show maximum expected reactions at top of wall. Per NDS table 12E 5/8" anchor bolts with 3x sill plate are adequate for reactions. Spacings appropriate to the reactions are called out on S2 and S3. Detail 6/SD-1 is also updated.
   II. Continuous reinforcement is added.
B. Detail 11
   I. Blocking has been added to restrain wall at top
   II. Tension devices are added.

Comment S6: Special moment frame information does not appear to be complete. Please provide steel beam and column information. Please provide foundation connection detail of column. (IBC 107)

Response: **Beam and column information is shown on detail 16-SD2 as referenced on sheet S3. The moment frame columns do not extend to the foundation. They are supported by cantilevered steel beams. The beams and their connections have been designed for seismic load combinations including overstrength per ASCE 7.**

Comment S7: Special reinforced concrete shear wall information does not appear to be complete.

A. Please provide details for the special reinforced shear wall. (ACI 318 18.10)
B. At least 2 curtains of reinforcement shall be used in a wall if $h_w/l_w \geq 2.0$. Please verify and revise as required. (ACI 318 18.10.2.2)

Response:

A. No special detailing is required for the walls. The shearwalls contain no openings and are not required to have special boundary elements per 18.10.6.2 or 18.10.6.3. See RC shearwall calcs attached again here for your convenience.
B. 2 Curtains of reinforcement are now called out.

Comment S8: Sheet A3.0: Sections indicate that upper foundations may impose surcharge loads on lower foundations. Please verify that this has been considered for the design of the lower foundations. (IBC 1808.3.2)

Response: **Attached calculations show the wall to be adequate for adjacent footing loads that may be imposed. The geotechnical report also lists the substrate here as bedrock, surcharges on the wall are unlikely as the upper wall will be founded entirely on rock.**

We hope this meets your needs. If you have any questions or require additional information, please call this office at your convenience.

Very truly yours,
VECTOR STRUCTURAL ENGINEERING, LLC

8/29/18

Russell N. Emery, S.E.
Project Engineer

RNE/jba

PROJECT: Ridge Nest 14 **JOB NO.:** U2784-001-181 **SUBJECT:** GRAVITY LOADS

ROOF			Increase due to pitch	Original loading
ROOF PITCH/12		3		
MEMBRANE		1.55	1.03	1.50
19/32" PLYWOOD		1.96	1.03	1.90
FRAMING		3.00		
INSULATION		2.00		
1/2" GYPSUM CLG.		2.20		
M, E & MISC		2.30		
GREEN ROOF SYSTEM		30.00		
	DL	43.00		
	LL	20.00		
	SNOW	185.00		
SNOW INCLUDED IN LATERAL		54.0		

2ND FLOOR (WHERE OCCURS)		
FLOOR COVERING W/GYPCRETE		24.00
3/4" T&G PLYWOOD		2.30
MFG TRUSSES / FRAMING		2.00
INSULATION		1.00
1/2" GYPSUM CEILING		2.20
PARTITION		2.00
M, E & MISC.		1.50
OTHER		0.00
	DL	35.00
	LL	40.00

EXTERIOR WALLS		
STUCCO/SIDING		3.50
2x6 FRAMING W/3 PLATES		1.30
INSULATION		1.00
1/2" GYPSUM		2.20
1/2" PLYWOOD		1.50
OTHER		0.50
	DL	10.00

OVERFILL		
ASPHALT SHINGLES		4.00
1/2" PLYWOOD		1.50
RAFTERS & MISC		3.50
OTHER		0.00
	DL	9.00
	LL	20.00

TYPICAL ROOF OVERBUILD MAX SPAN TABLE

Grade	Size	Spacing (ft)	L_{max} (ft)
DFL#2	2X4	2	2.50
DFL#2	2X6	2	3.40
DFL#2	2X8	2	4.40
DFL#2	2X10	2	5.80

C_r	C_D	$C_{F,V}$	M_{allow} (ft-lb)	V_{allow} (lb)	Ctrl'g factor
1.15	1.00	1.50	385	382	Moment
1.15	1.00	1.30	824	601	LL def
1.15	1.00	1.20	1322	792	LL def
1.15	1.00	1.10	1973	1011	Moment

PROJECT: Ridge Nest 14 **JOB NO.:** U2784-001-181 **SUBJECT:** BEAMS

DESIGN LOADS:

Load Types:	Snow*I_S	Live	Dead
Roof	185	20	48
Floor		40	39
Wall			11

Add .2*S_{DS} to dead load? Yes 0.11013 =.2*S_{DS}

CRITERIA (L/)	D_{TL}	D_{LL}	D_{DL}
$A_{(BLANK)}$	240	360	
B	240	480	
C	600		800

Abbrev	GRADES		F_{bxx} (psi)	F_{vxx} (psi)	E_{xx} (psi)		g (lb/ft^3)
DFL#1	DOUGLAS FIR LARCH #1		1,000	180	1700000		31.2
DFL#2	DOUGLAS FIR LARCH #2		875	180	1600000		31.2
DF1 (5x)	Douglas Fir Larch #1 5x & Larger		1,350	170	1700000		31.2
24F-V4	Glue Laminated Timber 24F-V4 D		2,400	265	1800000		39.9
24F-V8	Glue Laminated Timber 24F-V8 D		2,400	265	1800000		39.9
LVL (1.9)	MICROLLAM LVL (1.9E)		2,600	285	1900000		41.8
LVL (2.0)	VERSA-LAM (2.0E)		2,800	285	2000000		41.8
LSL	TIMBERSTRAND LSL (1.3E)		1,700	400	1300000		41.8
PSL	PARALLAM PSL (2.0E)		2,900	290	2000000		41.8
STL36	GRADE 36 STEEL		21,600	14,400	29,000,000		490
STL46	GRADE 46 STEEL		27,700	16,500	29,000,000		490
STL50	GRADE 50 STEEL		30,000	20,000	29,000,000		490

Label	Length 'L' (ft)	Roof Trib (ft)	Floor Trib (ft)	Wall Trib (ft)	Add'l Live Load (plf)	Add'l Dead Load (plf)	Point Load From	React (A,B)	Dist 'a' (ft)	Point Live Load 'P_{LL}' (lb)	Point Dead Load 'P_{DL}' (lb)	# PLIES	Grade	Size	"BM/HDR"	D CRITERIA	C_r	C_D	$C_{F,V}$	R_a (lb)	R_b (lb)	M_{max} (ft-lb)	M_{allow} (ft-lb)	V_{max} (lb)	V_{allow} (lb)	D_{TL} (in)	$D_{TLallow}$ (in)	D_{LL} (in) (SEE COND 'C')	$D_{LLallow}$ (in) (SEE COND 'C')	1.5DL GLB Camb	Check
RB1	22.33	13											STL50	W18x46	B		1.00	1.00	1.00	34295	34295	191451	226750	29672	130320	0.832	1.117	0.652	0.744		0.88 D
RB2	22.33	10.5											STL50	W10x88	B		1.00	1.00	1.00	28267	28267	157802	282500	25980	130680	0.915	1.117	0.702	0.744		0.94 D
RB3	24.5	12.3											STL50	W18x50	B		1.00	1.00	1.00	35538	35538	217671	252500	31189	127800	1.014	1.225	0.792	0.817		0.97 D
RB4	Not Used																1.00	####	1.00	######	######	######					#####		#####		
RB5	10	13							2				STL50	W12x16	B		1.00	1.00	1.00	14600	21900	35040	50250	12777	52800	0.207	0.500	0.018	0.333		0.70 M
	Cantilevered end conditions																					@ Support	-6083	-50250		@ end	-0.023	0.200	0.002	0.133		
RB6	2	2										(2)	DFL#2	2X6	B		1.00	1.00	1.30	469	469	235	1434	254	1980	0.003	0.100	0.002	0.067		0.16 M
																	1.00	1.00	1.00												
																	1.00	1.00	1.00												
FB1	SEE ATTACHED CALCULATIONS												STL50	W18x50			1.00	1.00	1.00												
FB2	SEE ATTACHED CALCULATIONS												STL50	W18x35			1.00	1.00	1.00												
FB3	SEE ATTACHED CALCULATIONS												STL50	W18x50			1.00	1.00	1.00												
FB4	SEE ATTACHED CALCULATIONS												STL50	W18x35			1.00	1.00	1.00												
FB5	SEE ATTACHED CALCULATIONS												STL50	W10x22			1.00	1.00	1.00												
FB6	13.75	1					GT1	B	2	5947	1535		STL50	W10x17	B		1.00	1.00	1.00	592	10822	-1668	46750	7770	48480	-0.047	0.688	-0.095	0.458		0.68 D
	Cantilevered end conditions																					@ Support	-15462	-46750		@ end	0.105	0.200	0.091	0.133		
FB7	SEE ATTACHED CALCULATIONS												STL50	W12x26			1.00	1.00	1.00												
FB8	12		1	10			SEISMIC		4	3012		2	LVL (1.9)	1-3/4X20	B		1.00	1.60	1.00	117	6259	-2366	80889	3503	21280	-0.024	0.600	-0.037	0.400		0.39 D
	Cantilevered end conditions																					@ Support	-13731	-80889		@ end	0.094	0.400	0.103	0.267		
																	1.00	1.00	1.00												
GT1	7.66	1							1.5	4126	1065						1.00	1.00	1.00	-159	7481	-2165					0.383		0.255		
	Cantilevered end conditions																					@ Support	-8047			@ end		0.150		0.100		
GT2	16	2.4															1.00	1.00	1.00	4469	4469	17874					0.800		0.533		
																	1.00	1.00	1.00												
																	1.00	1.00	1.00												
																	1.00	1.00	1.00												
Deck Tru	15.5	1.6															1.00	1.00	1.00	2886	2886	11183					0.775		0.517		
Roof trus	12	1.6															1.00	1.00	1.00	2234	2234	6703					0.600		0.400		

PROJECT: Ridge Nest 14 **JOB NO.:** U2784-001-181 **SUBJECT:** LINE LOADS

Roof DL	43	psf
Seismic		
Snow	54	psf
Floor DL	35	psf
Wall DL	10	psf
Period, T	0.22	sec

Level Descriptions

Label	Height (ft)	$W_{control}$ (lb)	V_{norm} (lb)	V_{redist} (lb)	Redist Fact
Roof	25	100414	8507	11248	1.32
Upper Floor	10	68675	5818	3077	0.53
		0	0	0	1.00
		0	0	0	1.00
Total Weight (lb)		169089			
Total Base Shear (lb)		14325			

k= 1

$\Sigma w_i h_i^k$= 3197101

Estimated Total Weight in Longitudinal Direction 169089

Estimated Total Weight in Transverse Direction 169089

Percent difference in estimated weights 0.0%

Seismic Line Loads

Label	Width	Level	Direction	Number of times to include	Roof Trib (ft)	Floor Trib (ft)	Wall Trib Height (ft)	Ext Wall Length (ft)	Other Weight (lb/ft)	Total Weight (lb/ft)	Total Force (lb/ft)	Redist Factor	Revised Force (lb/ft)	Force Redist to 1
ω1	24.7	Roof	LONG	1	40		4.5	105		4072	345	1.32	456	NO
ω2	40	Roof	TRANS	1	24.7		4.5	105		2510	213	1.32	281	NO
ω3	23.3	Upper Floor	LONG	1		23.5	11	93.6		1264	107	0.53	57	NO
ω4	23.5	Upper Floor	TRANS	1		23.3	11	93.6		1254	106	0.53	56	NO
ω5	16	Upper Floor	LONG	1	23		4.5	78		2451	208	0.53	110	NO
ω6	23	Upper Floor	TRANS	1	16		4.5	78		1705	144	0.53	76	NO
ω7				1				0		0	0	1.00	0	NO
ω8				1				0		0	0	1.00	0	NO
ω9				1				0		0	0	1.00	0	NO
ω10				1				0		0	0	1.00	0	NO
ω11				1				0		0	0	1.00	0	NO
ω12				1				0		0	0	1.00	0	NO
ω13				1				0		0	0	1.00	0	NO
ω14				1				0		0	0	1.00	0	NO
ω15				1				0		0	0	1.00	0	NO
ω16				1				0		0	0	1.00	0	NO
ω17				1				0		0	0	1.00	0	NO
ω18				1				0		0	0	1.00	0	NO
ω19				1				0		0	0	1.00	0	NO
ω20				1				0		0	0	1.00	0	NO

Wind Line Loads *Surface type 'C' is flat wall and 'D' is sloped roof, 'CP1' and 'CP2' represent parapets on only one side and both sides of the structure, respectively*

Label	Roof Pitch /12	Mean Roof Height (ft)	Surface Type 1	Equiv Height Exposed (ft)	Surface Type 2	Equiv Height Exposed (ft)	Roof Angle (°)	Applied Interior Press 1 (psf)	Applied Interior Press 2 (psf)	Applied End Zone Press 1 (psf)	Applied End Zone Press 2 (psf)	Height & Exp Coeff, λ	Total Int Unif Load (plf)	Total End Zone Unif Load (plf)
ω1	3	25	C	8.5			14.0	23.16	0.00	34.83	0.00	1.35	196.83	296.04
ω2	3	25	C	5.3			14.0	23.16	0.00	34.83	0.00	1.35	121.57	182.85
ω3	3	25	C	15			14.0	23.16	0.00	34.83	0.00	1.35	347.35	522.43
ω4	3	25	C	10.5			14.0	23.16	0.00	34.83	0.00	1.35	242.41	364.59
ω5	3	15	C	6.75	D	2.5	14.0	20.76	0.00	31.22	0.00	1.21	140.10	210.71
ω6	3	15	C	10.5			14.0	20.76	0.00	31.22	0.00	1.21	217.93	327.77
ω7							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω8							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω9							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω10							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω11							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω12							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω13							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω14							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω15							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω16							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω17							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω18							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω19							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω20							0.0	0.00	0.00	0.00	0.00		0.00	0.00

PROJECT: Ridge Nest 14 **JOB NO.:** U2784-001-181 **SUBJECT:** SHEAR WALLS

$\rho_{Applied}$ =	1
Min Diaphragm Width (ft) =	16
Allowable Seismic Aspect Ratio =	3.5
Allowable Wind Aspect Ratio =	3.5
Comb. Overstrength Factors: (Ω-0.5)/1.2 =	2.08

ρ_i	Loc
1.00	1.2-1ST
1.00	1-2ND

Roof DL (psf) = 97 (includes seismic snow where occurs)
Floor DL (psf) = 35

ρ calculated in accordance with ASCE7-10 Section 12.3.4.1
No Exception in ASCE 7 12.3.4.2b met?

LINE: 1 2ND STORY

Line Loads (plf)				Loads from above					Actual Applied Loads (plf unless noted otherwise)					Diaphragm Shear (plf)			Perf/FTAO Wall Info			
Load	Trib w (ft)	E.Z. Appl*	Span (ft)	Line	%	Location	Seis (lbs)	Wind (lbs)	ρ*Seis	Wind	E.Z. Wind	2a (ft)	E.Z. P (lb)	Drag (ft)	Seis (Load vs. Allow.)		(Not Applicable)			
ω2	4.5	Major	9		1.00	Offset			196.8	72.9	109.7	6	147	23	39	198				
ω2	17	None	34		1.00	Offset			196.8	72.9	109.7	6.8								
					1.00	Above									Wind (Load vs. Allow.)					
Plate h (ft)=						Total	**4912**	2859	Include Ω for irregularities (above)?				No		21	276				
Max opening height (ft)=						(Strength Level)														
Apply aspect ratio reduction?				#DIV/0!	Perforated SW?		No		Shear Length (ft)=					Story V (K)=	11248					
Opening elevation				Force Transfer @ Openings?			No		Wall DL (psf)=		10			Max allow. drift (in)						

Shear-Wall Length (ft)	$Roof_{DL}$ 'w' (ft)	$Floor_{DL}$ 'w' (ft)	$Other_{DL}$ 'w' (plf)	Tension From Above (lb)	Wall Type	Sill Type	Holdown Strap	HD Capacity (Stem 'w'-edge dist)	OTM (**wind**, seismic) (ft-lb)	.6*RM (ft-lb)	Aspect Ratio	Aspect Ratio Reduc.	Seis. Shear (plf)	Seis. Wall Cap. (plf)	Wind Shear (plf)	Wind Wall Cap. (plf)	Sill Plate Cap. (plf)	Tension (lb)	HD Capacity	Max Shear-Wall δ (in)
SPECIAL MOMENT FRAME PER ATTACHED CALCULATIONS																				
Add'l Comments:																			Max:	

LINE: A 2ND STORY

Line Loads (plf)				Loads from above					Actual Applied Loads (plf unless noted otherwise)					Diaphragm Shear (plf)			Perf/FTAO Wall Info			
Load	Trib w (ft)	E.Z. Appl*	Span (ft)	Line	%	Location	Seis (lbs)	Wind (lbs)	ρ*Seis	Wind	E.Z. Wind	2a (ft)	E.Z. P (lb)	Drag (ft)	Seis (Load vs. Allow.)		(Not Applicable)			
ω1	12.33	Major	24.66		1.00	Offset			319.3	118.1	177.6	6	314	26	151	198				
		None			1.00	Offset								15.5						
					1.00	Above									Wind (Load vs. Allow.)					
Plate h (ft)=	10					Total	**3937**	1770	Include Ω for irregularities (above)?				No		68	276				
Max opening height (ft)=	10																			
Apply aspect ratio reduction?	Yes			100%	Perforated SW?		No		Shear Length (ft)=		15.5			Story V (K)=	11248					
Opening elevation				Force Transfer @ Openings?			No		Wall DL (psf)=		10			Max allow. drift (in)	3					

Shear-Wall Length (ft)	$Roof_{DL}$ 'w' (ft)	$Floor_{DL}$ 'w' (ft)	$Other_{DL}$ 'w' (plf)	Tension From Above (lb)	Wall Type	Sill Type	Holdown Strap	HD Capacity (Stem 'w'-edge dist)	OTM (**wind**, seismic) (ft-lb)	.6*RM (ft-lb)	Aspect Ratio	Aspect Ratio Reduc.	Seis. Shear (plf)	Seis. Wall Cap. (plf)	Wind Shear (plf)	Wind Wall Cap. (plf)	Sill Plate Cap. (plf)	Tension (lb)	HD Capacity	Max Shear-Wall δ (in)
15.5	2				P2		CS16		39367	21193	0.65	1.00	254	380	114	520		1173	1705	0.22
Add'l Comments:																			Max:	0.22

LINE: C 2ND STORY

Line Loads (plf)				Loads from above					Actual Applied Loads (plf unless noted otherwise)					Diaphragm Shear (plf)			Perf/FTAO Wall Info			
Load	Trib w (ft)	E.Z. Appl*	Span (ft)	Line	%	Location	Seis (lbs)	Wind (lbs)	ρ*Seis	Wind	E.Z. Wind	2a (ft)	E.Z. P (lb)	Drag (ft)	Seis (Load vs. Allow.)		(Not Applicable)			
ω1	12.33	Minor	24.66		1.00	Offset			319.3	118.1	177.6	6	43	26	151	198				
		None			1.00	Offset														
					1.00	Above									Wind (Load vs. Allow.)					
Plate h (ft)=	9.5					Total	**5624**	1500	Include Ω for irregularities (above)?				No		58	276				
Max opening height (ft)=	9.5					7311 @R=5														
Apply aspect ratio reduction?	Yes			100%	Perforated SW?		No		Shear Length (ft)=					Story V (K)=	11248					
Opening elevation				Force Transfer @ Openings?			No		Wall DL (psf)=		10			Max allow. drift (in)	2.85					

Shear-Wall Length (ft)	$Roof_{DL}$ 'w' (ft)	$Floor_{DL}$ 'w' (ft)	$Other_{DL}$ 'w' (plf)	Tension From Above (lb)	Wall Type	Sill Type	Holdown Strap	HD Capacity (Stem 'w'-edge dist)	OTM (**wind**, seismic) (ft-lb)	.6*RM (ft-lb)	Aspect Ratio	Aspect Ratio Reduc.	Seis. Shear (plf)	Seis. Wall Cap. (plf)	Wind Shear (plf)	Wind Wall Cap. (plf)	Sill Plate Cap. (plf)	Tension (lb)	HD Capacity	Max Shear-Wall δ (in)
Drag beams and Special RC Shearwall see attached calcs														#VALUE!		#VALUE!				
Add'l Comments:																			Max:	

LINE: 1.2 1ST STORY

Line Loads (plf)				Loads from above					Actual Applied Loads (plf unless noted otherwise)					Diaphragm Shear (plf)			Perf/FTAO Wall Info			
Load	Trib w (ft)	E.Z. Appl*	Span (ft)	Line	%	Location	Seis (lbs)	Wind (lbs)	ρ*Seis	Wind	E.Z. Wind	2a (ft)	E.Z. P (lb)	Drag (ft)	Seis (Load vs. Allow.)		(Not Applicable)			
ω4	2.5	Major	5	1-2ND	1.00	Offset	6046	2859	56.2	145.4	218.8	6	176	36	214	294				
ω4	9.25	None	18.5		1.00	Offset			56.2	145.4	218.8	6		36	14					
					1.00	Above									Wind (Load vs. Allow.)					
Plate h (ft)=	10					Total	**6706**	4744	Include Ω for irregularities (above)?				No		94	412				
Max opening height (ft)=	10					8717 @R=5									37					
Apply aspect ratio reduction?	Yes			100%	Perforated SW?		No		Shear Length (ft)=					Story V (K)=	14325					
Opening elevation				Force Transfer @ Openings?			No		Wall DL (psf)=		10			Max allow. drift (in)	3					

Shear-Wall Length (ft)	$Roof_{DL}$ 'w' (ft)	$Floor_{DL}$ 'w' (ft)	$Other_{DL}$ 'w' (plf)	Tension From Above (lb)	Wall Type	Sill Type	Holdown Strap	HD Capacity (Stem 'w'-edge dist)	OTM (**wind**, seismic) (ft-lb)	.6*RM (ft-lb)	Aspect Ratio	Aspect Ratio Reduc.	Seis. Shear (plf)	Seis. Wall Cap. (plf)	Wind Shear (plf)	Wind Wall Cap. (plf)	Sill Plate Cap. (plf)	Tension (lb)	HD Capacity	Max Shear-Wall δ (in)
SPECIAL REINFORCED CONCRETE SHEARWALL, SEE CALCS																				
Add'l Comments:																			Max:	

PROJECT: Ridge Nest 14 **JOB NO.:** U2784-001-181 **SUBJECT:** SHEAR WALLS

$\rho_{Applied}$ =	1		
Min Diaphragm Width (ft) =	16		
Allowable Seismic Aspect Ratio =	3.5		
Allowable Wind Aspect Ratio =	3.5		
Comb. Overstrength Factors: (Ω-0.5)/1.2 =	2.08		

ρ_i	Loc
1.00	1.2-1ST
1.00	1-2ND

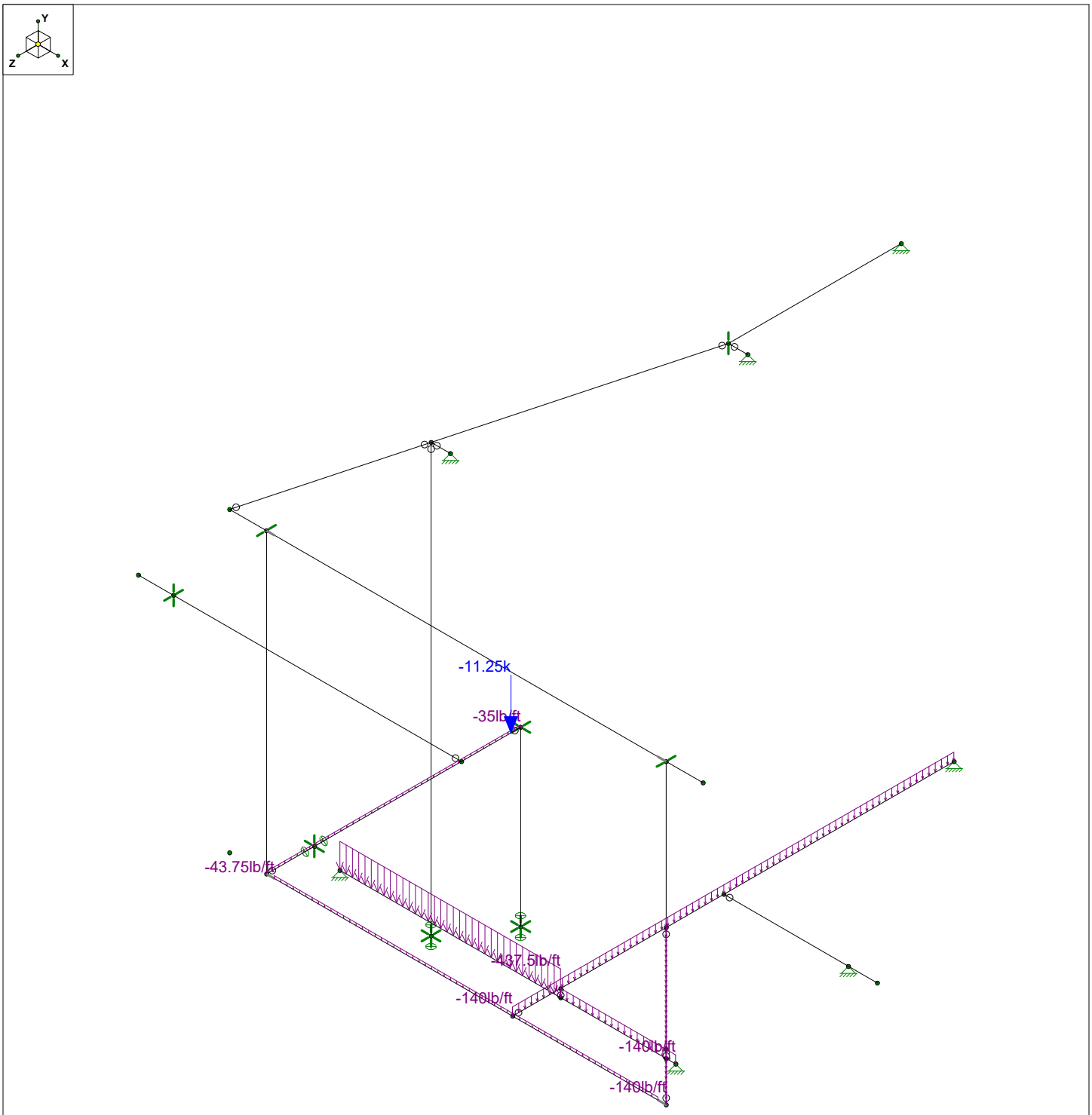
Roof DL (psf) = **97** (includes seismic snow where occurs)
Floor DL (psf) = **35**

ρ calculated in accordance with ASCE7-10 Section 12.3.4.1
No Exception in ASCE 7 12.3.4.2b met?

LINE: C 1ST STORY

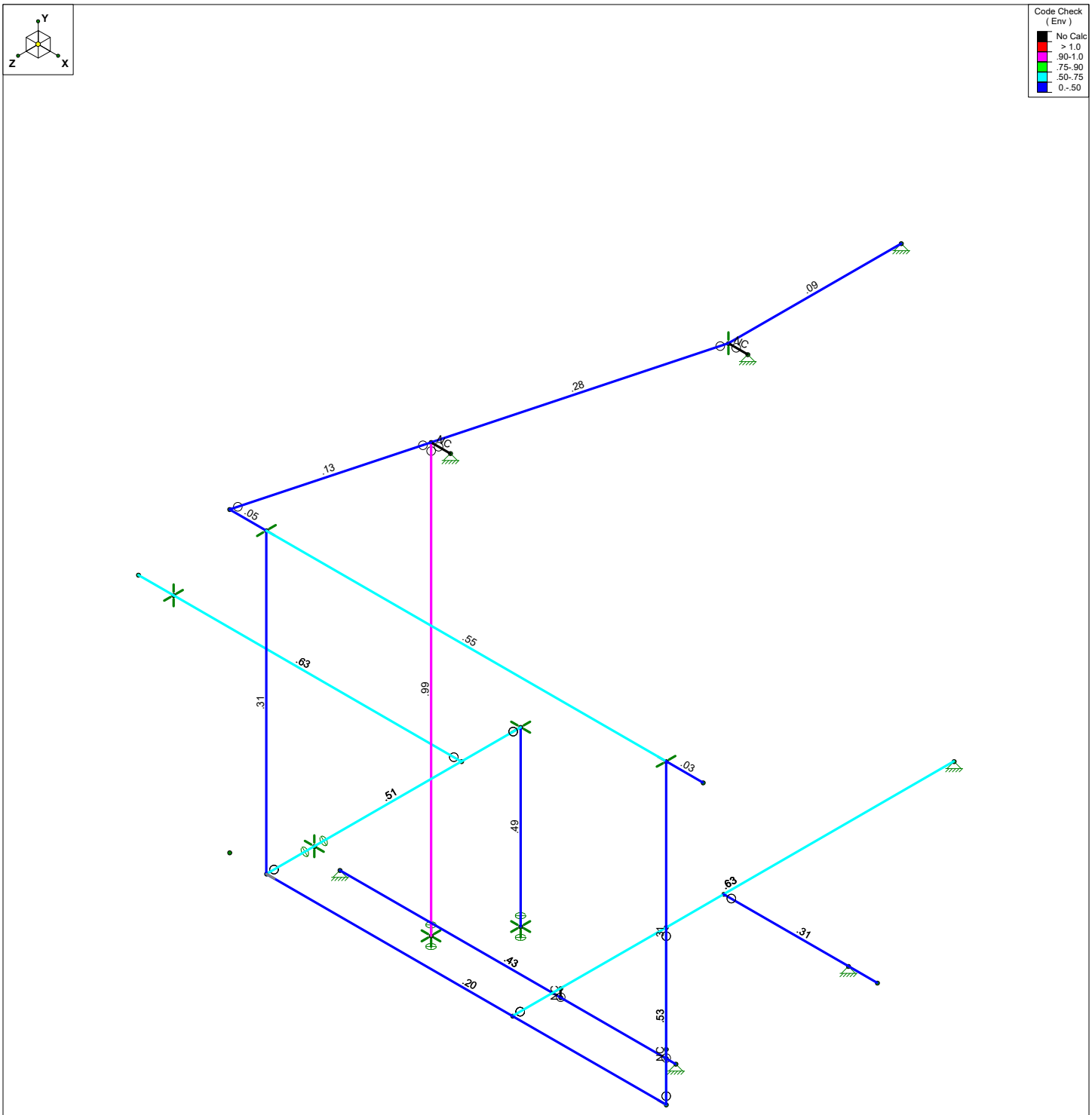
Line Loads (plf)				Loads from above					Actual Applied Loads (plf unless noted otherwise)					Diaphragm Shear (plf)			Perf/FTAO Wall Info			
Load	Trib w (ft)	E.Z. Appl*	Span (ft)	Line	%	Location	Seis (lbs)	Wind (lbs)	ρ*Seis	Wind	E.Z. Wind	2a (ft)	E.Z. P (lb)	Drag (ft)	Seis (Load vs. Allow.)		(Not Applicable)			
ω3	11.65	Minor	23.3		1.00	Offset			39.7	208.4	313.5	6	81	11	42	198				
ω5	8	Minor	16		1.00	Offset			76.9	84.1	126.4	6	48	11	56					
					1.00	Above									Wind (Load vs. Allow.)					
Plate h (ft)=	9					Total	1077	**3229**	Include Ω for irregularities (above)?				No		228	276				
Max opening height (ft)=	9														65					
Apply aspect ratio reduction?	Yes			100%	Perforated SW?		No		Shear Length (ft)=		11		Story V (K)=		14325					
Opening elevation				Force Transfer @ Openings?			No		Wall DL (psf)=		10		Max allow. drift (in)		2.7					

Shear-Wall Length (ft)	$Roof_{DL}$ 'w' (ft)	$Floor_{DL}$ 'w' (ft)	$Other_{DL}$ 'w' (plf)	Tension From Above (lb)	Wall Type	Sill Type	Holdown Strap	HD Capacity (Stem 'w'-edge dist)	OTM (**wind**, seismic) (ft-lb)	.6*RM (ft-lb)	Aspect Ratio	Aspect Ratio Reduc.	Seis. Shear (plf)	Seis. Wall Cap. (plf)	Wind Shear (plf)	Wind Wall Cap. (plf)	Sill Plate Cap. (plf)	Tension (lb)	HD Capacity	Max Shear-Wall δ (in)
11	3	1			P1	S1	HDU2		**29063**	9221	0.82	1.00	98	260	294	365	372	1804	3075	0.31
Add'l Comments:																			Max:	0.31



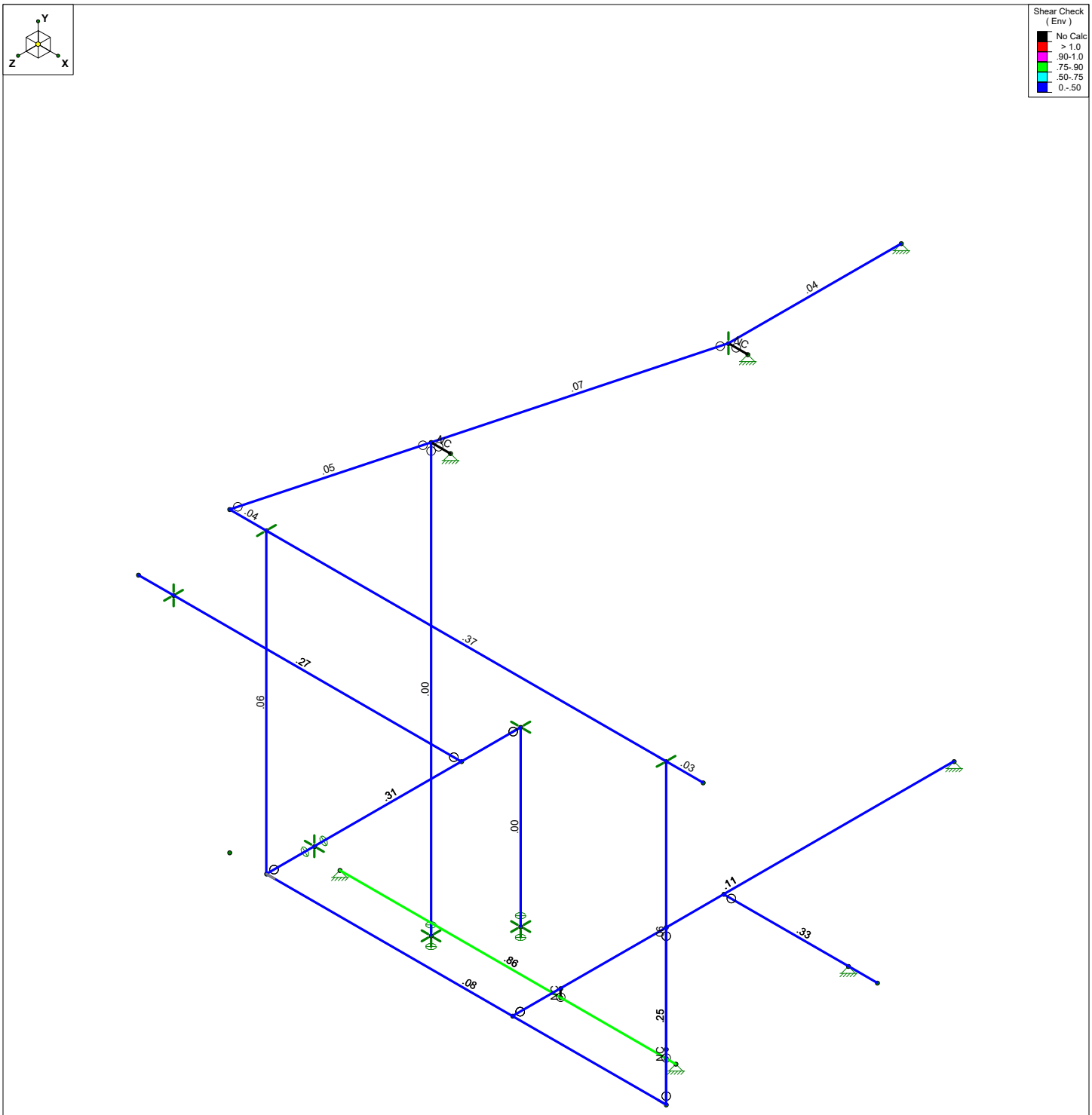
Loads: BLC 4, Floor Dead

VSE	Summit Powder Mtn	SK -
JBA		Aug 29, 2018 at 4:16 PM
U2784-001-181		Moment Frame Special -- Relocate...



Member Code Checks Displayed (Enveloped)
Results for LC 2, D

VSE	Summit Powder Mtn	SK -
JBA		Aug 29, 2018 at 4:29 PM
U2784-001-181		Moment Frame Special -- Relocate...



Member Shear Checks Displayed (Enveloped)
Results for LC 2, D

VSE	Summit Powder Mtn	SK -
JBA		Aug 29, 2018 at 4:35 PM
U2784-001-181		Moment Frame Special -- Relocate...

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
3	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	.3	.65	.527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	.3	.65	.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	.3	.65	.49	35	1.6	60	1.2
7	A1085	29000	11154	.3	.65	.49	50	1.4	65	1.3

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Gravity Colu...	HSS3.5x3.5x5	Column	RECT	A500 Gr.B Rect	Typical	3.52	5.84	5.84	9.89
2	HIGH FRAM...	W10x45	Beam	SMF Wide Flange	A992	Typical	13.3	53.4	248	1.51
3	LOW FRAM...	W10x45	Beam	SMF Wide Flange	A992	Typical	13.3	53.4	248	1.51
4	RB1	W18x46	Beam	Wide Flange	A992	Typical	13.5	22.5	712	1.22
5	RB3	W18x50	Beam	Wide Flange	A992	Typical	14.7	40.1	800	1.24
6	MF Col	W10x88	Column	SMF Wide Flange	A992	Typical	26	179	534	7.53
7	FB1	W18x50	Beam	Wide Flange	A992	Typical	14.7	40.1	800	1.24
8	FB3	W18x50	Beam	Wide Flange	A992	Typical	14.7	40.1	800	1.24
9	FB5	W10x22	Beam	Wide Flange	A992	Typical	6.49	11.4	118	.239
10	FB4	W18x35	Beam	Wide Flange	A992	Typical	10.3	15.3	510	.506
11	FB2	W18x35	Beam	Wide Flange	A992	Typical	10.3	15.3	510	.506
12	FB7	W12x26	Beam	Wide Flange	A992	Typical	7.65	17.3	204	.3
13	DRAG BM	W10x19	Beam	Wide Flange	A992	Typical	5.62	4.29	96.3	.233

Frame / HR Column Seismic Design Rule

	Label	Frame Ductility	Overstrength Reqd
1	OCBF	Minimal	Yes
2	SCBF	High	Yes
3	OMF	Minimal	Yes
4	IMF	Moderate	Yes
5	SMF	High	Yes
6	SCCS	High	Yes
7	Support	Minimal	Yes

HR Beam Seismic Design Rule

	Label	Moment Connection	Overstrength Reqd	Z Factor	Hinge Location[in]
1	OCBF	Other/None			
2	SCBF	Other/None			
3	OMF	BFP			12
4	IMF	BFP	Yes		12
5	SMF	BFP			7.25
6	SCCS	BFP			
7	Support	Other/None	Yes		

Connection Rules

	Label	Conn Type	Type	Beam Conn	Col/Girder Conn
1	Moment	Moment	Column/Beam Seismic Moment	N/A	N/A
2	Stub Connection	Moment	Column/Beam Direct Weld Moment	Bolted	N/A
3	Shear Tab Bm	Shear	Girder/Beam Shear Tab Shear	Bolted	N/A
4	Seismic Shear Tab	Shear	Beam Shear Tab Splice	N/A	N/A

Connection Rules (Continued)

	Label	Conn Type	Type	Beam Conn	Col/Girder Conn
5	Shear Tab Col	Shear	Column/Beam Shear Tab Shear	Bolted	N/A
6	Baseplate	Baseplate	Single Column Baseplate	N/A	N/A

Drift Definitions

	Type	Floor/Diaphragm	Joint Label	Elevation[ft]
1	Joint	-	N25	15.5
2	Joint	-	N24	0

Load Combinations

	Description	Sol...	PDelta	SR...	BLC	Fa...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	Serviceability																							
2	D	Yes	Y		DL	1																		
3	L	Yes	Y		LL	1	RLL	1																
4	D+L	Yes	Y		DL	1	LL	1	RLL	1														
5	WLX	Yes	Y		DL	1	LL	.5	WLX	.53														
6	S	Yes	Y		SL	1																		
7			Y		DL	1	LL	.5	WLX	-.53														
8	ELX	Yes	Y		DL	1.2...	ELX	1	LL	.5														
9			Y		DL	1.2...	ELX	-1	LL	.5														
10			Y		DL	.826	ELX	1																
11			Y		DL	.826	ELX	-1																
12																								
13	ASCE 7-10 Strength																							
14	1.4D	Yes	Y		DL	1.4																		
15	1.2D+1.6SL+.5L	Yes	Y		DL	1.2	SL	1.6	LL	.5														
16	1.2D+1.6SL+.5L+.5...	Yes	Y		DL	1.2	SL	1.6	WLX	.5														
17	1.2D+1.6SL-.5WLX	Yes	Y		DL	1.2	SL	1.6	WLX	-.5														
18	1.2D+WLX+.5SL	Yes	Y		DL	1.2	WLX	1	SL	.5														
19	1.2D-WLX+.5SL	Yes	Y		DL	1.2	WLX	-1	SL	.5														
20	1.2D+WLX+L+.5S	Yes	Y		DL	1.2	WLX	1	LL	1	SL	.5												
21	1.2D-WLX+L+.5S	Yes	Y		DL	1.2	WLX	-1	LL	1	SL	.5												
22	0.9D+WLX	Yes	Y		DL	.9	WLX	1																
23	0.9D-WLX	Yes	Y		DL	.9	WLX	-1																
24	1.2D+ELX+.5L+.37...	Yes	Y		DL	1.2	ELX	1	SL	.37	LL	.5	S...	.2										
25	1.2D-ELX+.5L+.37...	Yes	Y		DL	1.2	ELX	-1	SL	.37	LL	.5	S...	.2										
26	0.9D+ELX	Yes	Y		DL	.9	ELX	1					S...	-.2										
27	0.9D-ELX	Yes	Y		DL	.9	ELX	-1					S...	-.2										
28	1.2D+OmELX+.5L...	Yes	Y		DL	1.2	Om*...	1	SL	.37	LL	.5	S...	.2										
29	1.2D-OmELX+.5L+...	Yes	Y		DL	1.2	Om*...	-1	SL	.37	LL	.5	S...	.2										
30	0.9D+OmELX	Yes	Y		DL	.9	Om*...	1					S...	-.2										
31	0.9D-OmELX	Yes	Y		DL	.9	Om*...	-1					S...	-.2										
32	1.2D+ELZ+.5L+.37...	Yes	Y		DL	1.2	ELZ	1	SL	.37	LL	.5	S...	.2										
33	1.2D-ELZ+.5L+.37...	Yes	Y		DL	1.2	ELZ	-1	SL	.37	LL	.5	S...	.2										
34	0.9D+ELZ	Yes	Y		DL	.9	ELZ	1					S...	-.2										
35	0.9D-ELZ	Yes	Y		DL	.9	ELZ	-1					S...	-.2										
36	1.2D+.5L+OmELZ+...	Yes	Y		DL	1.2	Om*...	1	SL	.37	LL	.5	S...	.2										
37	1.2D+.5L-OmELZ+...	Yes	Y		DL	1.2	Om*...	-1	SL	.37	LL	.5	S...	.2										
38	0.9D+OmELZ	Yes	Y		DL	.9	Om*...	1					S...	-.2										
39	0.9D-OmELZ	Yes	Y		DL	.9	Om*...	-1					S...	-.2										

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N4	max	0	2	0	2	.08	17	0	2	0	2	0	2
2		min	0	2	0	2	0	3	0	2	0	2	0	2
3	N8	max	.11	25	1.87	3	.15	26	0	2	0	2	0	2
4		min	-.11	8	-8.64	16	-.37	25	0	2	0	2	0	2
5	N11	max	1.13	25	5.83	21	.12	25	0	2	0	2	0	2
6		min	-.97	26	-.88	6	-.11	26	0	2	0	2	0	2
7	N10	max	4.32	25	62.99	15	.17	17	0	2	0	2	0	2
8		min	-4.81	24	5.92	3	-.05	27	0	2	0	2	0	2
9	N12	max	.77	25	67.71	17	0	2	0	2	0	2	.03	8
10		min	-.56	26	2.43	3	0	2	0	2	0	2	-.03	17
11	N14	max	0	17	62.11	16	0	16	0	2	.03	16	0	2
12		min	0	16	0	3	0	34	0	2	0	27	0	2
13	N16	max	1.3	24	64.26	17	0	25	0	2	0	2	0	2
14		min	-1.29	25	0	3	0	5	0	2	0	2	0	2
15	N18	max	0	33	3.24	15	7.58	32	0	2	0	2	0	2
16		min	0	32	0	3	-7.19	35	0	2	0	2	0	2
17	N19	max	0	2	9.13	17	0	2	0	2	0	2	0	2
18		min	0	2	0	3	0	2	0	2	0	2	0	2
19	N21	max	0	16	.04	14	0	32	0	2	0	2	0	2
20		min	0	27	0	3	0	33	0	2	0	2	0	2
21	N22	max	0	16	.03	14	0	17	0	2	0	2	0	2
22		min	0	25	0	6	0	16	0	2	0	2	0	2
23	N25	max	0	2	0	2	0	3	0	2	0	2	0	2
24		min	0	2	0	2	-.85	16	0	2	0	2	0	2
25	N26	max	.1	26	0	2	.11	25	0	2	0	2	0	2
26		min	-.15	25	0	2	-.09	26	0	2	0	2	0	2
27	N27	max	0	25	44.23	16	0	24	0	2	0	26	0	2
28		min	0	16	-.46	3	0	25	0	2	0	25	0	2
29	N30	max	0	2	23.33	15	0	8	0	2	0	2	0	2
30		min	0	2	0	3	0	25	0	2	0	2	0	2
31	Totals:	max	4.9	27	331.99	15	7.33	34						
32		min	-4.9	8	12.51	3	-7.33	33						

Envelope Joint Reactions - Overstrength

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N4	max	0	28	0	28	.04	37	0	28	0	28	0	28
2		min	0	28	0	28	0	38	0	28	0	28	0	28
3	N8	max	.27	29	1.01	31	.7	28	0	28	0	28	0	28
4		min	-.29	28	-2.42	28	-.6	29	0	28	0	28	0	28
5	N11	max	2.68	29	5.36	29	.28	29	0	28	0	28	0	28
6		min	-2.5	30	1.59	30	-.28	30	0	28	0	28	0	28
7	N10	max	11.03	29	51.41	28	.12	37	0	28	0	28	0	28
8		min	-11.8	28	5.75	31	-.26	31	0	28	0	28	0	28
9	N12	max	1.71	29	49.46	29	0	28	0	28	0	28	.07	30
10		min	-1.5	30	3.7	30	0	28	0	28	0	28	-.07	29
11	N14	max	0	29	25.89	37	0	37	0	28	.02	28	0	28
12		min	0	28	5.48	38	0	36	0	28	-.01	31	0	28
13	N16	max	3.38	28	24.81	37	0	28	0	28	0	28	0	28
14		min	-3.1	29	7.32	31	0	38	0	28	0	28	0	28
15	N18	max	0	37	1.25	28	22.15	36	0	28	0	28	0	28
16		min	0	36	.37	30	-21.76	39	0	28	0	28	0	28
17	N19	max	0	28	5.95	36	0	28	0	28	0	28	0	28
18		min	0	28	-1.35	39	0	28	0	28	0	28	0	28
19	N21	max	0	28	.03	28	0	36	0	28	0	28	0	28

Envelope Joint Reactions - Overstrength (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
20		min	0	31	.02	38	0	37	0	28	0	28	0	28
21	N22	max	0	28	.03	28	0	37	0	28	0	28	0	28
22		min	0	29	.02	31	0	28	0	28	0	28	0	28
23	N25	max	0	28	0	28	.06	38	0	28	0	28	0	28
24		min	0	28	0	28	-.48	37	0	28	0	28	0	28
25	N26	max	.28	30	0	28	.25	29	0	28	0	28	0	28
26		min	-.32	29	0	28	-.23	30	0	28	0	28	0	28
27	N27	max	0	29	22.65	28	0	28	0	28	0	30	0	28
28		min	0	28	5.49	31	0	29	0	28	0	29	0	28
29	N30	max	0	28	8.67	28	0	28	0	28	0	28	0	28
30		min	0	28	2.41	31	0	29	0	28	0	28	0	28
31	Totals:	max	12.25	31	163.95	28	21.99	38						
32		min	-12.25	28	60.64	31	-21.99	37						

Envelope Story Drift - X-Direction, Strength

	Story (Elevation)		Story Drift[in]	Loc (Z,X)	LC	Drift Ratio (%)	Loc (Z,X)	LC	2nd/1st Ratio	Loc (Z,X)	LC
1	N25 (15.5 ft)	max	2.65	0, 1.92	24	1.42	0, 1.92	24	1.04	0, 1.92	16
2		min	-2.35	0, 1.92	27	0	0, 1.92	14	1.01	0, 1.92	35
3	N24 (0 ft)	max	.34	0, 1.92	26	NC			1.11	0, 1.92	15
4		min	-.47	0, 1.92	25	NC			.95	0, 1.92	20

Envelope AISC 14th(360-10): LRFD Steel Code Checks

	Member	Shape	Code Check	Lo...	...	She...	Lo...	Dir	...	phi*Pnc [k]	phi*Pnt [k]	phi*Mn y-y ...	phi*Mn z-z [k...	...	Eqn
1	M1	W10x88	.307	15.5	...	.059	7.67	y	...	810.24	1170	199.13	423.75	...	H1-1b
2	M2	W10x88	.312	15.5	...	.065	7.67	y	...	810.24	1170	199.13	423.75	...	H1-1b
3	M3	W10x45	.553	0	...	.373	20	y	...	477.54	598.5	76.13	205.88	...	H1-1b
4	M4	W18x50	.526	3.43	...	.252	3.43	y	...	401.21	661.5	62.25	378.75	...	H1-1b
5	M5	W18x50	.634	8.13	...	.107	7.9	y	...	561.71	661.5	62.25	192.42	...	H1-1b
6	M6	W10x22	.430	.53	...	.858	0	y	...	243.84	292.05	22.88	97.5	1	H1-1b
7	M7	W18x35	.514	10...	...	.310	10...	y	...	136.72	463.5	30.23	238.29	...	H1-1b
8	M9	W10x45	.201	0	...	.078	20	y	8	209.51	598.5	76.13	205.88	...	H1-1b
9	M10	W18x35	.312	6.46	...	.327	6.55	y	...	281.53	463.5	30.23	249.38	...	H1-1b
10	M11	W10x19	.275	7.84	...	.073	0	y	...	216.75	252.9	12.56	81	1	H1-1b
11	M12	W10x19	.093	0	...	.042	9	y	...	237.47	252.9	12.56	81	1	H1-...
12	M13	HSS3.5...	.988	0	...	.002	0	y	...	62.87	145.73	14.28	14.28	1	H1-1a
13	M14	W10x19	.127	5.31	...	.053	10...	y	...	234.32	252.9	12.56	81	1	H1-1b
14	M17	W10x45	.033	0	...	.034	0	y	...	592.74	598.5	76.13	205.88	...	H1-1b
15	M18	HSS3.5...	.487	9	...	.000	0	y	2	90.82	145.73	14.28	14.28	1	H1-1a
16	M18A	W10x45	.055	0	...	.036	0	y	...	592.74	598.5	76.13	205.88	...	H1-1b
17	M21	W12x26	.634	7.65	...	.273	0	y	...	290.01	344.25	30.64	139.5	1	H1-1b

Seismic Detailing - Columns

	Label	Seismic ...	Ductilit...	UC M...	LC	Slenderness ...	Panel Zone ...	Panel Zone ...	Cont. Plate...	Cont. Plate ...	SC/WB ...	SC/W...	Misc. ...
1	M1	SMF	High	.31	17	Warning	Fail (M3)	360-10: Eqn ...	Yes (M3)	360-10: Eq...	1.27 (pa...	M3	Pass
2	M2	SMF	High	.31	16	Warning	Fail (M3)	360-10: Eqn ...	Yes (M3)	360-10: Eq...	1.27 (pa...	M3	Pass
3	M18	Support	Minimal	.49	16	Pass	N/A		No	N/A	N/A	N/A	Fail

Seismic Detailing - Beams

	Label	Seis...	Ductilit...	UC ...	LC	Slenderness C...	Type	Req'd Sh...	Req'd Mome...	SC/WB R...	SC/WB Col	Span/D...	Misc. Che...
1	M3	SMF	High	.55	17	Pass	BFP	65.91	329.19	1.27	M2	23.7 (p...	Pass
2	M7	Supp...	Minimal	.51	17	Pass	Other...	N/A	N/A	N/A	N/A	N/A	Fail
3	M9	SMF	High	.2	25	Pass	BFP	37.53	312.04	1.38	M2	23.7 (p...	Pass
4	M11	Supp...	Minimal	.28	16	Pass	Other...	N/A	N/A	N/A	N/A	N/A	Fail
5	M12	Supp...	Minimal	.09	36	Pass	Other...	27.44	108.9	N/A	N/A	N/A	Fail
6	M14	Supp...	Minimal	.13	15	Pass	Other...	N/A	N/A	N/A	N/A	N/A	Pass

Global Parameters - Description:

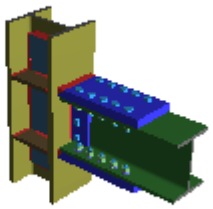
Project Title	Summit Powder Mtn
Company	VSE
Designer	JBA
Job Number	U2784-001-181
Notes	

Global Parameters - Solution:

Design Method	AISC 14th (360-10): LRFD
Bolt Group Analysis Method	Center of Rotation
Weld Analysis Method	Center of Rotation
Consider Bold Hole Deformation?	Yes
Check Weld Filler Material Matching?	Yes
Check Rotational Ductility?	Yes
Full Shear Eccentricity Considered?	No
Plastic Panel-Zone Shear Deformation Considered?	No

M3 I - M1: LRFD Results Report

Column/Beam Flange Plate Moment Connection



Material Properties:				
Column	W10x88	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W10x45	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.75x4.00x8.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi
Moment Plate	P1.50x8.00x16.50	A572 Gr.50	F_y = 50.00 ksi	F_u = 65.00 ksi
Doubler	P0.75x7.42x25.10	A36	F_y = 36.00 ksi	F_u = 58.00 ksi
Transverse Stiffener	P0.75x4.10x8.82	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	39.38 kips	*User Input Shear Load*
Moment	-108.45 kips-ft	*User Input Moment*
Axial Load	43.18 kips	*User Input Axial Force (compression)*
Puf_c	133.78 kips	*Required Flange Force (compression)*
Puf_t	90.60 kips	*Required Flange Force (tension)*
Top Column Dist	0.00 in	*User Input Top Column Dist*
Column Force	0.00 kips	*User Input Column Force*
Story Shear	0.00 kips	*User Input Story Shear*

Input Data:		
Seismic System	SMF (BFP)	*User Input Seismic System*
Gravity Shear, Vg	0.00 kips	*User Input Shear due to Gravity*
Clear Span, L	19.93 ft	*User Input Clear Span of Beam*

Governing LC: 3D - 17 - 1.2D+1.6SL-.5WLX

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Geometry Restrictions at Flange Beam				**PASS**
Shear Plate Weld at Column Limitations				**PASS**
Shear Plate Weld Strength at Column	39.38 kips	89.09 kips	**0.44**	**PASS**
Beam Web Shear Yield	39.38 kips	106.05 kips	**0.37**	**PASS**
Vert. Plate Shear Yield	39.38 kips	129.60 kips	**0.30**	**PASS**
Beam Web Shear Rupture	39.38 kips	76.53 kips	**0.51**	**PASS**
Vert. Plate Shear Rupture	39.38 kips	105.22 kips	**0.37**	**PASS**
Beam Web Block Shear	39.38 kips	114.18 kips	**0.34**	**PASS**
Vert. Plate Block Shear	39.38 kips	144.18 kips	**0.27**	**PASS**
Bolt Shear at Beam Web	39.38 kips	83.50 kips	**0.47**	**PASS**
Bolt Bearing at Beam Web	39.38 kips	83.50 kips	**0.47**	**PASS**
Bolt Bearing at Vert. Plate	39.38 kips	78.91 kips	**0.50**	**PASS**
Bolt Shear at Flange Plate	150.44 kips	278.33 kips	**0.54**	**PASS**
Bolt Bearing at Beam Flange	158.87 kips	278.33 kips	**0.57**	**PASS**
Bolt Bearing at Flange Plate	133.78 kips	278.33 kips	**0.48**	**PASS**

continued on next page...

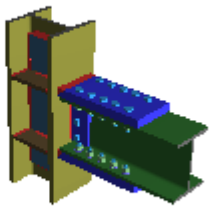
M3 I - M1: LRFD Results Report (continued):

Limit State	Required	Available	Unity Check	Result
Beam Flange Block Shear	115.69 kips	393.53 kips	**0.29**	**PASS**
Flange Plate Block Shear	90.60 kips	950.62 kips	**0.10**	**PASS**
Flange Plate Tearout	90.60 kips	946.05 kips	**0.10**	**PASS**
Flange Plate Weld Strength at Column				**PASS**
Flange Plate Tensile Yield	90.60 kips	540.00 kips	**0.17**	**PASS**
Flange Plate Tensile Rupture	90.60 kips	457.03 kips	**0.20**	**PASS**
Flange Plate Compression	133.78 kips	540.00 kips	**0.25**	**PASS**
Column Flange Bending	90.60 kips	137.83 kips	**0.66**	**PASS**
Column Web Yielding	133.78 kips	299.13 kips	**0.45**	**PASS**
Column Web Buckling	133.78 kips	963.59 kips	**0.14**	**PASS**
Column Web Crippling	133.78 kips	455.34 kips	**0.29**	**PASS**
Column Panel Zone Shear	112.19 kips	176.42 kips	**0.64**	**PASS**
Doubler Shear Buckling				**PASS**
Doubler Plate Shear Yield	0.00 kips	174.96 kips	**0.00**	**PASS**
Doubler Weld at Column Web Limitations				**PASS**
Doubler Weld Strength at Column Flange				**PASS**
Doubler Weld Strength at Column Web	0.00 kips	123.94 kips	**0.00**	**n/a**
Seismic Material and Geometry Limitations				**PASS**
Seismic Width to Thickness Ratios				**PASS**
Seismic Moment at Face of Column		***326.19 kips-ft***		
Seismic Weld Limitations				**PASS**
Seismic Flange Bolt Limitations				**PASS**
Seismic Flange Plate Limitations				**PASS**
Seismic Column-Beam Moment Ratio				**PASS**
Seismic Flange Strength				**PASS**
Seismic Beam Web Checks			**0.43**	**PASS**
Seismic Flange Bolt Shear Strength	337.44 kips	333.99 kips	**1.01**	**FAIL**
Seismic Beam Web Bolt Checks				**PASS**
Seismic Vert. Plate Checks				**PASS**
Seismic Stiffener Plate Limitations				**PASS**
Seismic Panel Zone Limitations				**PASS**
Seismic Column Panel Zone Shear	305.24 kips	196.02 kips		**N/A**
Seismic Doubler Plate Strength				**PASS**

Given that this check is comparing reduced bolt strength against the strain-hardened maximum probable moment the beam can produce, we find within 1% acceptable

M3 J - M2: LRFD Results Report

Column/Beam Flange Plate Moment Connection



Material Properties:				
Column	W10x88	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W10x45	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.75x4.00x8.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi
Moment Plate	P1.50x8.00x16.50	A572 Gr.50	F_y = 50.00 ksi	F_u = 65.00 ksi
Doubler	P0.75x7.42x25.10	A36	F_y = 36.00 ksi	F_u = 58.00 ksi
Transverse Stiffener	P0.75x4.10x8.2	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	-39.56 kips	*User Input Shear Load*
Moment	-110.18 kips-ft	*User Input Moment*
Axial Load	43.17 kips	*User Input Axial Force (compression)*
Puf_c	135.57 kips	*Required Flange Force (compression)*
Puf_t	92.40 kips	*Required Flange Force (tension)*
Top Column Dist	0.00 in	*User Input Top Column Dist*
Column Force	0.00 kips	*User Input Column Force*
Story Shear	0.00 kips	*User Input Story Shear*

Input Data:		
Seismic System	SMF (BFP)	*User Input Seismic System*
Gravity Shear, Vg	0.00 kips	*User Input Shear due to Gravity*
Clear Span, L	19.93 ft	*User Input Clear Span of Beam*

Governing LC: 3D - 16 - 1.2D+1.6SL+.5L+.5WLX

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Geometry Restrictions at Flange Beam				**PASS**
Shear Plate Weld at Column Limitations				**PASS**
Shear Plate Weld Strength at Column	39.56 kips	89.09 kips	**0.44**	**PASS**
Beam Web Shear Yield	39.56 kips	106.05 kips	**0.37**	**PASS**
Vert. Plate Shear Yield	39.56 kips	129.60 kips	**0.31**	**PASS**
Beam Web Shear Rupture	39.56 kips	76.53 kips	**0.52**	**PASS**
Vert. Plate Shear Rupture	39.56 kips	105.22 kips	**0.38**	**PASS**
Beam Web Block Shear	39.56 kips	110.08 kips	**0.36**	**PASS**
Vert. Plate Block Shear	39.56 kips	144.18 kips	**0.27**	**PASS**
Bolt Shear at Beam Web	39.56 kips	83.50 kips	**0.47**	**PASS**
Bolt Bearing at Beam Web	39.56 kips	83.50 kips	**0.47**	**PASS**
Bolt Bearing at Vert. Plate	39.56 kips	78.91 kips	**0.50**	**PASS**
Bolt Shear at Flange Plate	152.49 kips	278.33 kips	**0.55**	**PASS**
Bolt Bearing at Beam Flange	161.05 kips	278.33 kips	**0.58**	**PASS**
Bolt Bearing at Flange Plate	135.57 kips	278.33 kips	**0.49**	**PASS**

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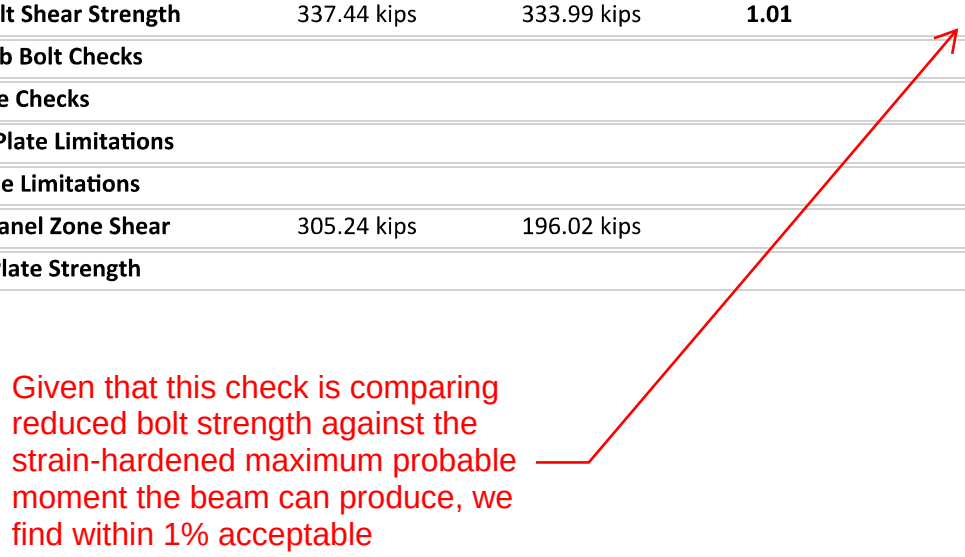
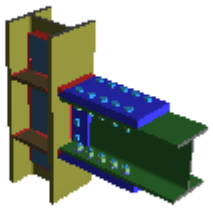
M3 J - M2: LRFD Results Report (continued):

Limit State	Required	Available	Unity Check	Result
Beam Flange Block Shear	117.88 kips	393.53 kips	**0.30**	**PASS**
Flange Plate Block Shear	92.40 kips	950.62 kips	**0.10**	**PASS**
Flange Plate Tearout	92.40 kips	946.05 kips	**0.10**	**PASS**
Flange Plate Weld Strength at Column				**PASS**
Flange Plate Tensile Yield	92.40 kips	540.00 kips	**0.17**	**PASS**
Flange Plate Tensile Rupture	92.40 kips	457.03 kips	**0.20**	**PASS**
Flange Plate Compression	135.57 kips	540.00 kips	**0.25**	**PASS**
Column Flange Bending	92.40 kips	137.83 kips	**0.67**	**PASS**
Column Web Yielding	135.57 kips	299.13 kips	**0.45**	**PASS**
Column Web Buckling	135.57 kips	963.59 kips	**0.14**	**PASS**
Column Web Crippling	135.57 kips	455.34 kips	**0.30**	**PASS**
Column Panel Zone Shear	113.98 kips	176.42 kips	**0.65**	**PASS**
Doubler Shear Buckling				**PASS**
Doubler Plate Shear Yield	0.00 kips	174.96 kips	**0.00**	**PASS**
Doubler Weld at Column Web Limitations				**PASS**
Doubler Weld Strength at Column Flange				**PASS**
Doubler Weld Strength at Column Web	0.00 kips	123.94 kips	**0.00**	**n/a**
Seismic Material and Geometry Limitations				**PASS**
Seismic Width to Thickness Ratios				**PASS**
Seismic Moment at Face of Column		***326.19 kips-ft***		
Seismic Weld Limitations				**PASS**
Seismic Flange Bolt Limitations				**PASS**
Seismic Flange Plate Limitations				**PASS**
Seismic Column-Beam Moment Ratio				**PASS**
Seismic Flange Strength				**PASS**
Seismic Beam Web Checks			**0.43**	**PASS**
Seismic Flange Bolt Shear Strength	337.44 kips	333.99 kips	**1.01**	**FAIL**
Seismic Beam Web Bolt Checks				**PASS**
Seismic Vert. Plate Checks				**PASS**
Seismic Stiffener Plate Limitations				**PASS**
Seismic Panel Zone Limitations				**PASS**
Seismic Column Panel Zone Shear	305.24 kips	196.02 kips		**N/A**
Seismic Doubler Plate Strength				**PASS**



M9 I - M1: LRFD Results Report

Column/Beam Flange Plate Moment Connection



Material Properties:				
Column	W10x88	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W10x45	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.75x4.00x8.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi
Moment Plate	P1.50x8.00x16.50	A572 Gr.50	F_y = 50.00 ksi	F_u = 65.00 ksi
Doubler	P0.75x7.42x25.10	A36	F_y = 36.00 ksi	F_u = 58.00 ksi
Transverse Stiffener	P0.75x4.10x8.82	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	10.30 kips	*User Input Shear Load*
Moment	-68.84 kips-ft	*User Input Moment*
Axial Load	26.42 kips	*User Input Axial Force (compression)*
Puf_c	84.43 kips	*Required Flange Force (compression)*
Puf_t	58.01 kips	*Required Flange Force (tension)*
Top Column Dist	0.00 in	*User Input Top Column Dist*
Column Force	26.40 kips	*User Input Column Force*
Story Shear	11.43 kips	*User Input Story Shear*

Input Data:		
Seismic System	SMF (BFP)	*User Input Seismic System*
Gravity Shear, Vg	0.00 kips	*User Input Shear due to Gravity*
Clear Span, L	19.93 ft	*User Input Clear Span of Beam*

Governing LC: 3D - 29 - 1.2D-OmELX+.5L+.37S

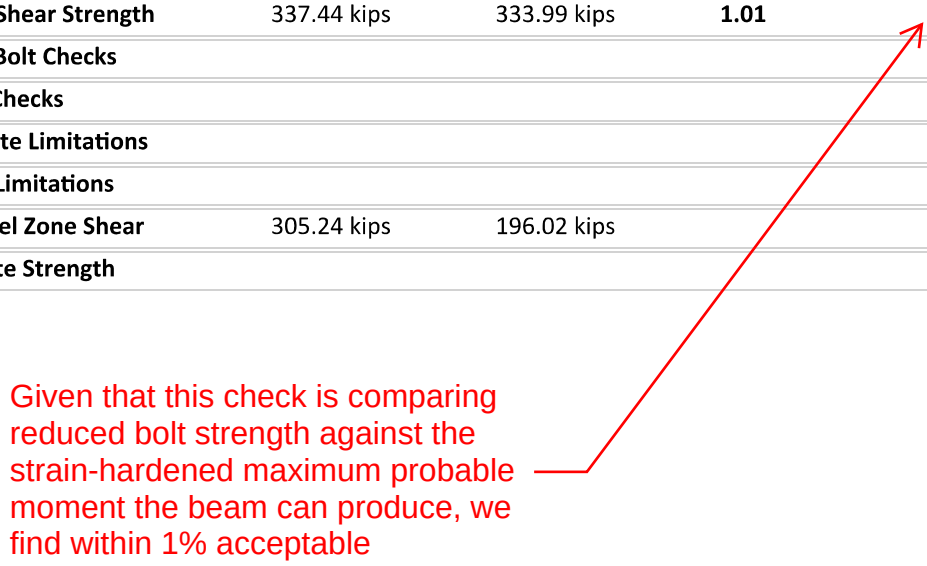
Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Geometry Restrictions at Flange Beam				**PASS**
Shear Plate Weld at Column Limitations				**PASS**
Shear Plate Weld Strength at Column	10.30 kips	89.09 kips	**0.12**	**PASS**
Beam Web Shear Yield	10.30 kips	106.05 kips	**0.10**	**PASS**
Vert. Plate Shear Yield	10.30 kips	129.60 kips	**0.08**	**PASS**
Beam Web Shear Rupture	10.30 kips	76.53 kips	**0.13**	**PASS**
Vert. Plate Shear Rupture	10.30 kips	105.22 kips	**0.10**	**PASS**
Beam Web Block Shear	10.30 kips	114.18 kips	**0.09**	**PASS**
Vert. Plate Block Shear	10.30 kips	144.18 kips	**0.07**	**PASS**
Bolt Shear at Beam Web	10.30 kips	83.50 kips	**0.12**	**PASS**
Bolt Bearing at Beam Web	10.30 kips	83.50 kips	**0.12**	**PASS**
Bolt Bearing at Vert. Plate	10.30 kips	78.91 kips	**0.13**	**PASS**
Bolt Shear at Flange Plate	95.00 kips	278.33 kips	**0.34**	**PASS**
Bolt Bearing at Beam Flange	100.35 kips	278.33 kips	**0.36**	**PASS**
Bolt Bearing at Flange Plate	84.43 kips	278.33 kips	**0.30**	**PASS**

continued on next page...

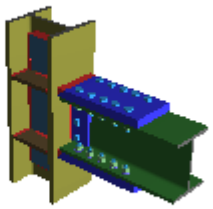
M9 I - M1: LRFD Results Report (continued):

Limit State	Required	Available	Unity Check	Result
Beam Flange Block Shear	73.93 kips	393.53 kips	**0.19**	**PASS**
Flange Plate Block Shear	58.01 kips	950.62 kips	**0.06**	**PASS**
Flange Plate Tearout	58.01 kips	946.05 kips	**0.06**	**PASS**
Flange Plate Weld Strength at Column				**PASS**
Flange Plate Tensile Yield	58.01 kips	540.00 kips	**0.11**	**PASS**
Flange Plate Tensile Rupture	58.01 kips	457.03 kips	**0.13**	**PASS**
Flange Plate Compression	84.43 kips	540.00 kips	**0.16**	**PASS**
Column Flange Bending	58.01 kips	137.83 kips	**0.42**	**PASS**
Column Web Yielding	84.43 kips	299.13 kips	**0.28**	**PASS**
Column Web Buckling	84.43 kips	963.59 kips	**0.09**	**PASS**
Column Web Crippling	84.43 kips	455.34 kips	**0.19**	**PASS**
Column Panel Zone Shear	59.79 kips	176.42 kips	**0.34**	**PASS**
Doubler Shear Buckling				**PASS**
Doubler Plate Shear Yield	0.00 kips	174.96 kips	**0.00**	**PASS**
Doubler Weld at Column Web Limitations				**PASS**
Doubler Weld Strength at Column Flange				**PASS**
Doubler Weld Strength at Column Web	0.00 kips	123.94 kips	**0.00**	**n/a**
Seismic Material and Geometry Limitations				**PASS**
Seismic Width to Thickness Ratios				**PASS**
Seismic Moment at Face of Column		***326.19 kips-ft***		
Seismic Weld Limitations				**PASS**
Seismic Flange Bolt Limitations				**PASS**
Seismic Flange Plate Limitations				**PASS**
Seismic Column-Beam Moment Ratio				**PASS**
Seismic Flange Strength				**PASS**
Seismic Beam Web Checks			**0.43**	**PASS**
Seismic Flange Bolt Shear Strength	337.44 kips	333.99 kips	**1.01**	**FAIL**
Seismic Beam Web Bolt Checks				**PASS**
Seismic Vert. Plate Checks				**PASS**
Seismic Stiffener Plate Limitations				**PASS**
Seismic Panel Zone Limitations				**PASS**
Seismic Column Panel Zone Shear	305.24 kips	196.02 kips		**N/A**
Seismic Doubler Plate Strength				**PASS**



M9 J - M2: LRFD Results Report

Column/Beam Flange Plate Moment Connection



Material Properties:				
Column	W10x88	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W10x45	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.75x4.00x8.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi
Moment Plate	P1.50x8.00x16.50	A572 Gr.50	F_y = 50.00 ksi	F_u = 65.00 ksi
Doubler	P0.75x7.42x25.10	A36	F_y = 36.00 ksi	F_u = 58.00 ksi
Transverse Stiffener	P0.75x4.10x8.82	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	-9.94 kips	*User Input Shear Load*
Moment	-65.65 kips-ft	*User Input Moment*
Axial Load	26.18 kips	*User Input Axial Force (compression)*
Puf_c	81.00 kips	*Required Flange Force (compression)*
Puf_t	54.82 kips	*Required Flange Force (tension)*
Top Column Dist	0.00 in	*User Input Top Column Dist*
Column Force	26.16 kips	*User Input Column Force*
Story Shear	11.15 kips	*User Input Story Shear*

Input Data:		
Seismic System	SMF (BFP)	*User Input Seismic System*
Gravity Shear, Vg	0.00 kips	*User Input Shear due to Gravity*
Clear Span, L	19.93 ft	*User Input Clear Span of Beam*

Governing LC: 3D - 28 - 1.2D+OmELX+.5L+.37S

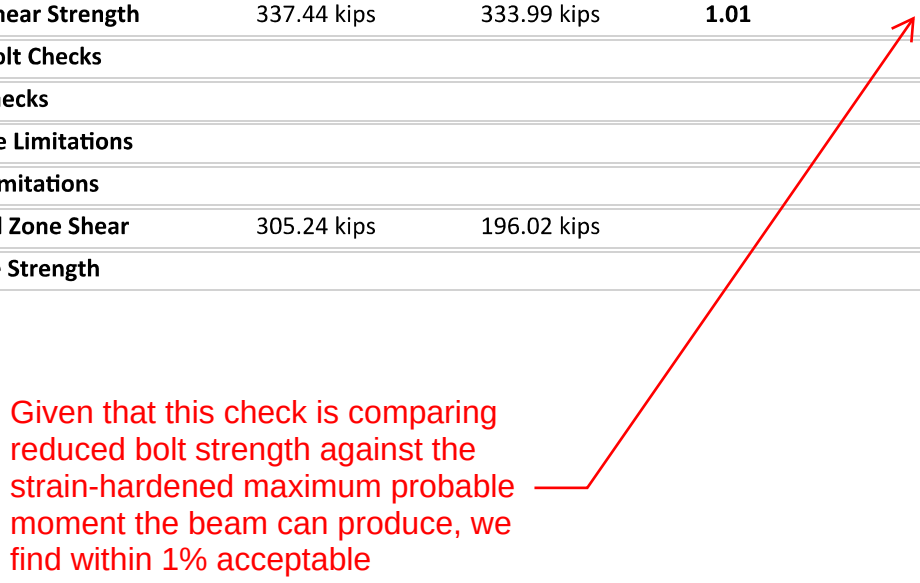
Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Geometry Restrictions at Flange Beam				**PASS**
Shear Plate Weld at Column Limitations				**PASS**
Shear Plate Weld Strength at Column	9.94 kips	89.09 kips	**0.11**	**PASS**
Beam Web Shear Yield	9.94 kips	106.05 kips	**0.09**	**PASS**
Vert. Plate Shear Yield	9.94 kips	129.60 kips	**0.08**	**PASS**
Beam Web Shear Rupture	9.94 kips	76.53 kips	**0.13**	**PASS**
Vert. Plate Shear Rupture	9.94 kips	105.22 kips	**0.09**	**PASS**
Beam Web Block Shear	9.94 kips	110.08 kips	**0.09**	**PASS**
Vert. Plate Block Shear	9.94 kips	144.18 kips	**0.07**	**PASS**
Bolt Shear at Beam Web	9.94 kips	83.50 kips	**0.12**	**PASS**
Bolt Bearing at Beam Web	9.94 kips	83.50 kips	**0.12**	**PASS**
Bolt Bearing at Vert. Plate	9.94 kips	78.91 kips	**0.13**	**PASS**
Bolt Shear at Flange Plate	91.08 kips	278.33 kips	**0.33**	**PASS**
Bolt Bearing at Beam Flange	96.19 kips	278.33 kips	**0.35**	**PASS**
Bolt Bearing at Flange Plate	81.00 kips	278.33 kips	**0.29**	**PASS**

continued on next page...

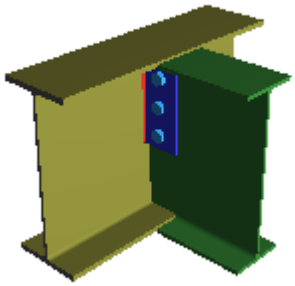
M9 J - M2: LRFD Results Report (continued):

Limit State	Required	Available	Unity Check	Result
Beam Flange Block Shear	70.01 kips	393.53 kips	**0.18**	**PASS**
Flange Plate Block Shear	54.82 kips	950.62 kips	**0.06**	**PASS**
Flange Plate Tearout	54.82 kips	946.05 kips	**0.06**	**PASS**
Flange Plate Weld Strength at Column				**PASS**
Flange Plate Tensile Yield	54.82 kips	540.00 kips	**0.10**	**PASS**
Flange Plate Tensile Rupture	54.82 kips	457.03 kips	**0.12**	**PASS**
Flange Plate Compression	81.00 kips	540.00 kips	**0.15**	**PASS**
Column Flange Bending	54.82 kips	137.83 kips	**0.40**	**PASS**
Column Web Yielding	81.00 kips	299.13 kips	**0.27**	**PASS**
Column Web Buckling	81.00 kips	963.59 kips	**0.08**	**PASS**
Column Web Crippling	81.00 kips	455.34 kips	**0.18**	**PASS**
Column Panel Zone Shear	56.76 kips	176.42 kips	**0.32**	**PASS**
Doubler Shear Buckling				**PASS**
Doubler Plate Shear Yield	0.00 kips	174.96 kips	**0.00**	**PASS**
Doubler Weld at Column Web Limitations				**PASS**
Doubler Weld Strength at Column Flange				**PASS**
Doubler Weld Strength at Column Web	0.00 kips	123.94 kips	**0.00**	**n/a**
Seismic Material and Geometry Limitations				**PASS**
Seismic Width to Thickness Ratios				**PASS**
Seismic Moment at Face of Column		***326.19 kips-ft***		
Seismic Weld Limitations				**PASS**
Seismic Flange Bolt Limitations				**PASS**
Seismic Flange Plate Limitations				**PASS**
Seismic Column-Beam Moment Ratio				**PASS**
Seismic Flange Strength				**PASS**
Seismic Beam Web Checks			**0.43**	**PASS**
Seismic Flange Bolt Shear Strength	337.44 kips	333.99 kips	**1.01**	**FAIL**
Seismic Beam Web Bolt Checks				**PASS**
Seismic Vert. Plate Checks				**PASS**
Seismic Stiffener Plate Limitations				**PASS**
Seismic Panel Zone Limitations				**PASS**
Seismic Column Panel Zone Shear	305.24 kips	196.02 kips		**N/A**
Seismic Doubler Plate Strength				**PASS**



M10 I - M5: LRFD Results Report

Girder/Beam Shear Tab Shear Connection



Material Properties:				
Girder	W18x50	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W18x35	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.31x4.00x9.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	-11.87 kips	*User Input Shear Load*
Axial Load	0.10 kips	*User Input Axial Force (compression)*

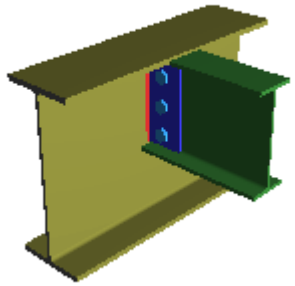
Governing LC: 3D - 15 - 1.2D+1.6SL+.5L

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Girder Weld Limitations				**PASS**
Rotational Ductility, Erection Stability				**PASS**
Beam Shear Yield	11.87 kips	142.77 kips	**0.08**	**PASS**
Plate Shear Yield	11.87 kips	60.75 kips	**0.20**	**PASS**
Beam Shear Rupture	11.87 kips	116.16 kips	**0.10**	**PASS**
Plate Shear Rupture at Beam	11.87 kips	52.00 kips	**0.23**	**PASS**
Beam Block Shear	11.87 kips	111.68 kips	**0.11**	**PASS**
Plate Block Shear	11.87 kips	59.21 kips	**0.20**	**PASS**
Lateral Stability / Stabilizer Plates	11.87 kips	291.22 kips	**0.04**	**PASS**
Plate Flexural Yield			**0.04**	**PASS**
Plate Flexural Rupture			**0.06**	**PASS**
Plate Flexural Buckling	11.87 kips	100.87 kips	**0.12**	**PASS**
Coped Beam Flexural Rupture	11.87 kips	150.61 kips	**0.08**	**PASS**
Coped Beam Lateral Torsional Buckling	11.87 kips	139.02 kips	**0.09**	**PASS**
Bolt Bearing on Beam	11.87 kips	53.68 kips	**0.22**	**PASS**
Bolt Bearing on Plate at Beam	11.87 kips	53.63 kips	**0.22**	**PASS**
Bolt Shear at Beam	11.87 kips	48.57 kips	**0.24**	**PASS**
Bolt Group Eccentricity		***0.90***		
Girder Weld Strength	11.87 kips	67.89 kips	**0.17**	**PASS**

M11 I - M16: LRFD Results Report

Girder/Beam Shear Tab Shear Connection



Material Properties:				
Girder	W18x50	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W10x19	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.38x4.00x9.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	1.14 kips	*User Input Shear Load*
Axial Load	17.19 kips	*User Input Axial Force (compression)*

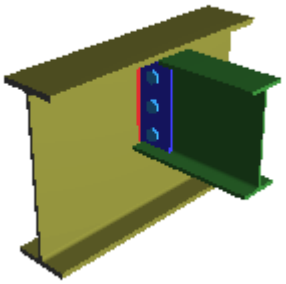
Governing LC: 3D - 36 - 1.2D+.5L+OmELZ+.37S

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Girder Weld Limitations				**PASS**
Rotational Ductility, Erection Stability				**PASS**
Beam Shear Yield	1.14 kips	68.92 kips	**0.02**	**PASS**
Plate Shear Yield	1.14 kips	72.90 kips	**0.02**	**PASS**
Beam Shear Rupture	1.14 kips	48.01 kips	**0.02**	**PASS**
Plate Shear Rupture at Beam	1.14 kips	62.40 kips	**0.02**	**PASS**
Beam Axial Yield	17.19 kips	172.46 kips	**0.10**	**PASS**
Plate Axial Yield	17.19 kips	109.35 kips	**0.16**	**PASS**
Beam Block Shear	1.14 kips	51.80 kips	**0.02**	**PASS**
Plate Block Shear	1.14 kips	71.05 kips	**0.02**	**PASS**
Compression Buckling of the Plate	17.19 kips	109.35 kips	**0.16**	**PASS**
Lateral Stability / Stabilizer Plates	17.23 kips	503.22 kips	**0.03**	**PASS**
Plate Flexural Yield			**0.17**	**PASS**
Plate Flexural Rupture			**0.07**	**PASS**
Plate Flexural Buckling			**0.18**	**PASS**
Coped Beam Flexural Rupture	1.14 kips	63.71 kips	**0.02**	**PASS**
Coped Beam Local Web Buckling	1.14 kips	58.81 kips	**0.02**	**PASS**
Bolt Bearing on Beam	17.23 kips	53.68 kips	**0.32**	**PASS**
Bolt Bearing on Plate at Beam	17.23 kips	53.68 kips	**0.32**	**PASS**
Bolt Shear at Beam	17.23 kips	48.01 kips	**0.36**	**PASS**
Bolt Group Eccentricity		***0.89***		
Girder Weld Strength	17.23 kips	88.18 kips	**0.20**	**PASS**

M11 J - M15: LRFD Results Report

Girder/Beam Shear Tab Shear Connection



Material Properties:

Girder	W18x46	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W10x19	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.38x4.00x9.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:

Shear Load	-3.17 kips	*User Input Shear Load*
Axial Load	-7.00 kips	*User Input Axial Force (tension)*

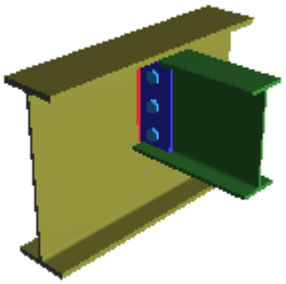
Governing LC: 3D - 37 - 1.2D+.5L-OmELZ+.37S

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Girder Weld Limitations				**PASS**
Rotational Ductility, Erection Stability				**PASS**
Beam Shear Yield	3.17 kips	68.92 kips	**0.05**	**PASS**
Plate Shear Yield	3.17 kips	72.90 kips	**0.04**	**PASS**
Beam Shear Rupture	3.17 kips	48.01 kips	**0.07**	**PASS**
Plate Shear Rupture at Beam	3.17 kips	62.40 kips	**0.05**	**PASS**
Beam Axial Yield	7.00 kips	172.46 kips	**0.04**	**PASS**
Plate Axial Yield	7.00 kips	109.35 kips	**0.06**	**PASS**
Beam Tension Rupture	7.00 kips	154.84 kips	**0.05**	**PASS**
Plate Tension Rupture at Beam	7.00 kips	103.99 kips	**0.07**	**PASS**
Beam Block Shear	3.17 kips	82.87 kips	**0.04**	**PASS**
Plate Block Shear	3.17 kips	71.05 kips	**0.04**	**PASS**
Beam Tearout	7.00 kips	67.34 kips	**0.10**	**PASS**
Plate Tearout on Plate at Beam	7.00 kips	93.63 kips	**0.07**	**PASS**
Lateral Stability / Stabilizer Plates	7.68 kips	503.22 kips	**0.02**	**PASS**
Plate Flexural Yield			**0.04**	**PASS**
Plate Flexural Rupture			**0.04**	**PASS**
Plate Flexural Buckling	3.17 kips	60.52 kips	**0.05**	**PASS**
Coped Beam Flexural Rupture	3.17 kips	68.15 kips	**0.05**	**PASS**
Coped Beam Local Web Buckling	3.17 kips	62.91 kips	**0.05**	**PASS**
Bolt Bearing on Beam	7.68 kips	53.68 kips	**0.14**	**PASS**
Bolt Bearing on Plate at Beam	7.68 kips	53.68 kips	**0.14**	**PASS**
Bolt Shear at Beam	7.68 kips	47.09 kips	**0.16**	**PASS**
Bolt Group Eccentricity		***0.88***		
Girder Weld Strength	18011.21 lbs/ft	117576.70 lbs/ft	**0.15**	**PASS**

M14 I - M15: LRFD Results Report

Girder/Beam Shear Tab Shear Connection



Material Properties:				
Girder	W18x46	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W10x19	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.38x4.00x9.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	0.77 kips	*User Input Shear Load*
Axial Load	7.11 kips	*User Input Axial Force (compression)*

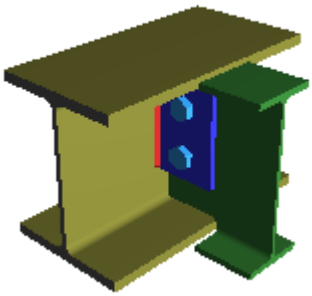
Governing LC: 3D - 36 - 1.2D+.5L+OmELZ+.37S

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Girder Weld Limitations				**PASS**
Rotational Ductility, Erection Stability				**PASS**
Beam Shear Yield	0.77 kips	68.92 kips	**0.01**	**PASS**
Plate Shear Yield	0.77 kips	72.90 kips	**0.01**	**PASS**
Beam Shear Rupture	0.77 kips	48.01 kips	**0.02**	**PASS**
Plate Shear Rupture at Beam	0.77 kips	62.40 kips	**0.01**	**PASS**
Beam Axial Yield	7.11 kips	172.46 kips	**0.04**	**PASS**
Plate Axial Yield	7.11 kips	109.35 kips	**0.06**	**PASS**
Beam Block Shear	0.77 kips	51.80 kips	**0.01**	**PASS**
Plate Block Shear	0.77 kips	71.05 kips	**0.01**	**PASS**
Compression Buckling of the Plate	7.11 kips	109.35 kips	**0.06**	**PASS**
Lateral Stability / Stabilizer Plates	7.15 kips	503.22 kips	**0.01**	**PASS**
Plate Flexural Yield			**0.03**	**PASS**
Plate Flexural Rupture			**0.01**	**PASS**
Plate Flexural Buckling			**0.08**	**PASS**
Coped Beam Flexural Rupture	0.77 kips	68.15 kips	**0.01**	**PASS**
Coped Beam Local Web Buckling	0.77 kips	62.91 kips	**0.01**	**PASS**
Bolt Bearing on Beam	7.15 kips	53.68 kips	**0.13**	**PASS**
Bolt Bearing on Plate at Beam	7.15 kips	53.68 kips	**0.13**	**PASS**
Bolt Shear at Beam	7.15 kips	49.49 kips	**0.14**	**PASS**
Bolt Group Eccentricity		***0.92***		
Girder Weld Strength	7.15 kips	88.18 kips	**0.08**	**PASS**

M14 J - M18A: LRFD Results Report

Girder/Beam Shear Tab Shear Connection



Material Properties:				
Girder	W10x45	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W10x19	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.38x4.00x6.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	-3.78 kips	*User Input Shear Load*
Axial Load	0.00 kips	*User Input Axial Force*

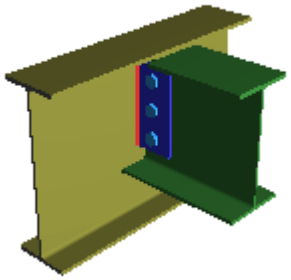
Governing LC: 3D - 15 - 1.2D+1.6SL+.5L

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Girder Weld Limitations				**PASS**
Rotational Ductility, Erection Stability				**PASS**
Beam Shear Yield	3.78 kips	58.95 kips	**0.06**	**PASS**
Plate Shear Yield	3.78 kips	48.60 kips	**0.08**	**PASS**
Beam Shear Rupture	3.78 kips	44.68 kips	**0.08**	**PASS**
Plate Shear Rupture at Beam	3.78 kips	41.60 kips	**0.09**	**PASS**
Beam Block Shear	3.78 kips	48.72 kips	**0.08**	**PASS**
Plate Block Shear	3.78 kips	52.83 kips	**0.07**	**PASS**
Lateral Stability / Stabilizer Plates	3.78 kips	335.48 kips	**0.01**	**PASS**
Plate Flexural Yield			**0.01**	**PASS**
Plate Flexural Rupture			**0.01**	**PASS**
Plate Flexural Buckling	3.78 kips	56.50 kips	**0.07**	**PASS**
Coped Beam Flexural Rupture	3.78 kips	28.80 kips	**0.13**	**PASS**
Coped Beam Lateral Torsional Buckling	3.78 kips	26.58 kips	**0.14**	**PASS**
Bolt Bearing on Beam	3.78 kips	35.78 kips	**0.11**	**PASS**
Bolt Bearing on Plate at Beam	3.78 kips	35.78 kips	**0.11**	**PASS**
Bolt Shear at Beam	3.78 kips	29.23 kips	**0.13**	**PASS**
Bolt Group Eccentricity		***0.82***		
Girder Weld Strength	3.78 kips	46.58 kips	**0.08**	**PASS**

M21 I - M7: LRFD Results Report

Girder/Beam Shear Tab Shear Connection



Material Properties:				
Girder	W18x35	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W12x26	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.38x4.00x9.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	22.98 kips	*User Input Shear Load*
Axial Load	0.00 kips	*User Input Axial Force*

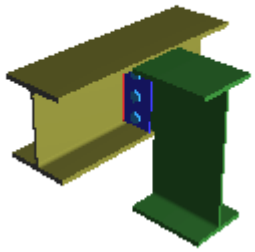
Governing LC: 3D - 15 - 1.2D+1.6SL+.5L

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Girder Weld Limitations				**PASS**
Rotational Ductility, Erection Stability				**PASS**
Beam Shear Yield	22.98 kips	77.21 kips	**0.30**	**PASS**
Plate Shear Yield	22.98 kips	72.90 kips	**0.32**	**PASS**
Beam Shear Rupture	22.98 kips	57.62 kips	**0.40**	**PASS**
Plate Shear Rupture at Beam	22.98 kips	62.40 kips	**0.37**	**PASS**
Beam Block Shear	22.98 kips	50.95 kips	**0.45**	**PASS**
Plate Block Shear	22.98 kips	71.05 kips	**0.32**	**PASS**
Lateral Stability / Stabilizer Plates	22.98 kips	503.22 kips	**0.05**	**PASS**
Plate Flexural Yield			**0.11**	**PASS**
Plate Flexural Rupture			**0.14**	**PASS**
Plate Flexural Buckling	22.98 kips	121.05 kips	**0.19**	**PASS**
Coped Beam Flexural Rupture	22.98 kips	98.47 kips	**0.23**	**PASS**
Coped Beam Local Web Buckling	22.98 kips	90.90 kips	**0.25**	**PASS**
Bolt Bearing on Beam	22.98 kips	53.68 kips	**0.43**	**PASS**
Bolt Bearing on Plate at Beam	22.98 kips	53.68 kips	**0.43**	**PASS**
Bolt Shear at Beam	22.98 kips	48.57 kips	**0.47**	**PASS**
Bolt Group Eccentricity		***0.90***		
Girder Weld Strength	22.98 kips	81.47 kips	**0.28**	**PASS**

M5 I - M9: LRFD Results Report

Girder/Beam Shear Tab Shear Connection



Material Properties:				
Girder	W10x45	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W18x50	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.31x4.00x8.03	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	5.29 kips	*User Input Shear Load*
Axial Load	-0.04 kips	*User Input Axial Force (tension)*

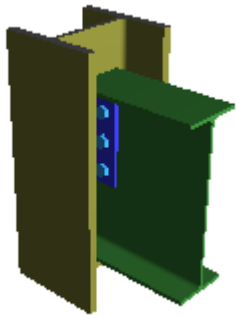
Governing LC: 3D - 4 - D+L

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Girder Weld Limitations				**PASS**
Rotational Ductility, Erection Stability				**PASS**
Beam Shear Yield	5.29 kips	83.92 kips	**0.06**	**PASS**
Plate Shear Yield	5.29 kips	54.20 kips	**0.10**	**PASS**
Beam Shear Rupture	5.29 kips	54.57 kips	**0.10**	**PASS**
Plate Shear Rupture at Beam	5.29 kips	44.08 kips	**0.12**	**PASS**
Beam Block Shear	5.29 kips	67.43 kips	**0.08**	**PASS**
Plate Block Shear	5.29 kips	55.56 kips	**0.10**	**PASS**
Lateral Stability / Stabilizer Plates	5.29 kips	259.83 kips	**0.02**	**PASS**
Plate Flexural Yield			**0.01**	**PASS**
Plate Flexural Rupture			**0.02**	**PASS**
Plate Flexural Buckling	5.29 kips	37.32 kips	**0.14**	**PASS**
Coped Beam Flexural Rupture	5.29 kips	41.10 kips	**0.13**	**PASS**
Coped Beam Lateral Torsional Buckling	5.29 kips	37.94 kips	**0.14**	**PASS**
Bolt Bearing on Beam	5.29 kips	53.68 kips	**0.10**	**PASS**
Bolt Bearing on Plate at Beam	5.29 kips	49.55 kips	**0.11**	**PASS**
Bolt Shear at Beam	5.29 kips	38.26 kips	**0.14**	**PASS**
Bolt Group Eccentricity		***0.71***		
Girder Weld Strength	5.29 kips	58.72 kips	**0.09**	**PASS**

M7 J - M1: LRFD Results Report

Column/Beam Shear Tab Shear Connection



Material Properties:				
Column	W10x88	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W18x35	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.38x3.50x9.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	47.51 kips	*User Input Shear Load*
Axial Load	0.03 kips	*User Input Axial Force (compression)*

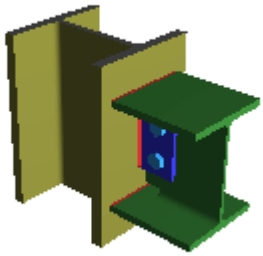
Governing LC: 3D - 17 - 1.2D+1.6SL-.5WLX

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Column Weld Limitations				**PASS**
Rotational Ductility, Erection Stability				**PASS**
Beam Shear Yield	47.51 kips	159.30 kips	**0.30**	**PASS**
Plate Shear Yield	47.51 kips	72.90 kips	**0.65**	**PASS**
Beam Shear Rupture	47.51 kips	132.28 kips	**0.36**	**PASS**
Plate Shear Rupture at Beam	47.51 kips	62.40 kips	**0.76**	**PASS**
Beam Block Shear	47.51 kips	104.98 kips	**0.45**	**PASS**
Plate Block Shear	47.51 kips	62.89 kips	**0.76**	**PASS**
Lateral Stability / Stabilizer Plates	47.51 kips	503.22 kips	**0.09**	**PASS**
Plate Flexural Yield			**0.46**	**PASS**
Plate Flexural Rupture			**0.62**	**PASS**
Plate Flexural Buckling	47.51 kips	121.05 kips	**0.39**	**PASS**
Bolt Bearing on Beam	47.51 kips	67.59 kips	**0.70**	**PASS**
Bolt Bearing on Plate at Beam	47.51 kips	66.47 kips	**0.71**	**PASS**
Bolt Shear at Beam	47.51 kips	61.16 kips	**0.78**	**PASS**
Bolt Group Eccentricity		***0.90***		
Weld at Column	47.51 kips	81.47 kips	**0.58**	**PASS**

M17 I - M2: LRFD Results Report

Column/Beam Direct Weld Moment Connection



Material Properties:				
Column	W10x88	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W10x45	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.38x3.50x6.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	3.60 kips	*User Input Shear Load*
Moment	-6.81 kips-ft	*User Input Moment*
Axial Load	0.00 kips	*User Input Axial Force*
Puf_c	8.62 kips	*Required Flange Force (compression)*
Puf_t	8.62 kips	*Required Flange Force (tension)*
Top Column Dist	0.00 in	*User Input Top Column Dist*
Column Force	0.00 kips	*User Input Column Force*
Story Shear	0.00 kips	*User Input Story Shear*

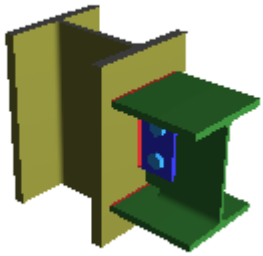
Governing LC: 3D - 15 - 1.2D+1.6SL+.5L

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Column Weld Limitations				**PASS**
Flange Weld Limitations				**PASS**
Beam Web Shear Yield	3.60 kips	77.28 kips	**0.05**	**PASS**
Plate Shear Yield	3.60 kips	48.60 kips	**0.07**	**PASS**
Beam Web Shear Rupture	3.60 kips	57.43 kips	**0.06**	**PASS**
Plate Shear Rupture	3.60 kips	41.60 kips	**0.09**	**PASS**
Beam Block Shear	3.60 kips	50.76 kips	**0.07**	**PASS**
Plate Block Shear at Beam	3.60 kips	44.67 kips	**0.08**	**PASS**
Bolt Bearing at Beam Web	3.60 kips	35.78 kips	**0.10**	**PASS**
Bolt Bearing at Shear Plate	3.60 kips	35.78 kips	**0.10**	**PASS**
Bolt Shear at Beam Web	3.60 kips	35.78 kips	**0.10**	**PASS**
Column Weld Strength	3.60 kips	58.79 kips	**0.06**	**PASS**
Flange Weld Strength	8.62 kips	67.37 kips	**0.13**	**PASS**
Beam Flange Tensile Yield	8.62 kips	223.76 kips	**0.04**	**PASS**
Beam Flange Tensile Rupture	8.62 kips	242.40 kips	**0.04**	**PASS**
Beam Flange Compression	8.62 kips	223.76 kips	**0.04**	**PASS**
Column Flange Bending	8.62 kips	137.83 kips	**0.06**	**PASS**
Column Web Yielding	8.62 kips	123.37 kips	**0.07**	**PASS**
Column Web Buckling	8.62 kips	368.27 kips	**0.02**	**PASS**
Column Web Crippling	8.62 kips	177.08 kips	**0.05**	**PASS**
Column Panel Zone Shear	8.62 kips	176.42 kips	**0.05**	**PASS**

M18A I - M1: LRFD Results Report

Column/Beam Direct Weld Moment Connection



Material Properties:				
Column	W10x88	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Beam	W10x45	A992	F_y = 50.00 ksi	F_u = 65.00 ksi
Plate	P0.38x3.50x6.00	A36	F_y = 36.00 ksi	F_u = 58.00 ksi

Input Data:		
Shear Load	3.80 kips	*User Input Shear Load*
Moment	-7.20 kips-ft	*User Input Moment*
Axial Load	0.00 kips	*User Input Axial Force (compression)*
Puf_c	9.12 kips	*Required Flange Force (compression)*
Puf_t	9.12 kips	*Required Flange Force (tension)*
Top Column Dist	0.00 in	*User Input Top Column Dist*
Column Force	0.00 kips	*User Input Column Force*
Story Shear	0.00 kips	*User Input Story Shear*

Governing LC: 3D - 16 - 1.2D+1.6SL+.5L+.5WLX

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
Geometry Restrictions at Beam				**PASS**
Column Weld Limitations				**PASS**
Flange Weld Limitations				**PASS**
Beam Web Shear Yield	3.80 kips	77.28 kips	**0.05**	**PASS**
Plate Shear Yield	3.80 kips	48.60 kips	**0.08**	**PASS**
Beam Web Shear Rupture	3.80 kips	57.43 kips	**0.07**	**PASS**
Plate Shear Rupture	3.80 kips	41.60 kips	**0.09**	**PASS**
Beam Block Shear	3.80 kips	50.76 kips	**0.07**	**PASS**
Plate Block Shear at Beam	3.80 kips	44.67 kips	**0.09**	**PASS**
Bolt Bearing at Beam Web	3.80 kips	35.78 kips	**0.11**	**PASS**
Bolt Bearing at Shear Plate	3.80 kips	35.78 kips	**0.11**	**PASS**
Bolt Shear at Beam Web	3.80 kips	35.78 kips	**0.11**	**PASS**
Column Weld Strength	3.80 kips	58.79 kips	**0.06**	**PASS**
Flange Weld Strength	9.12 kips	67.37 kips	**0.14**	**PASS**
Beam Flange Tensile Yield	9.12 kips	223.76 kips	**0.04**	**PASS**
Beam Flange Tensile Rupture	9.12 kips	242.40 kips	**0.04**	**PASS**
Beam Flange Compression	9.12 kips	223.76 kips	**0.04**	**PASS**
Column Flange Bending	9.12 kips	137.83 kips	**0.07**	**PASS**
Column Web Yielding	9.12 kips	123.37 kips	**0.07**	**PASS**
Column Web Buckling	9.12 kips	368.27 kips	**0.02**	**PASS**
Column Web Crippling	9.12 kips	177.08 kips	**0.05**	**PASS**
Column Panel Zone Shear	9.12 kips	176.42 kips	**0.05**	**PASS**

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Restrained Retaining Wall

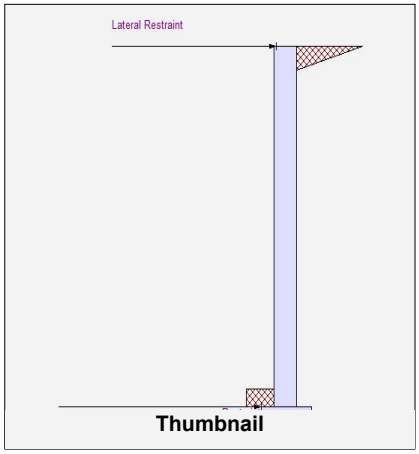
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	10.00 ft
Wall height above soil	=	0.00 ft
Total Wall Height	=	10.00 ft
Top Support Height	=	10.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in

Soil Data

Allow Soil Bearing	=	5,000.0 psf
Equivalent Fluid Pressure Method		
At-rest Heel Pressure	=	55.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density	=	110.00 pcf
Footing||Soil Frictior	=	0.450
Soil height to ignore for passive pressure	=	12.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
>>>Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
Used for Sliding & Overturning

Axial Load Applied to Stem

Axial Dead Load	=	200.0 lbs
Axial Live Load	=	800.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Stem Weight Seismic Load

Uniform Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	0.0 psf

K_h Soil Density Multiplier = 0.200 g — Added seismic per unit area = 0.0 psf

F_p / W_p Weight Multiplier = 0.000 g — Added seismic per unit area = 0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	1,150.0 lbs
Footing Width	=	1.80 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	6.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Total Bearing Load	=	2,818 lbs	
...resultant ecc.	=	1.44 in	
Soil Pressure @ Toe	=	1,698 psf	OK
Soil Pressure @ Heel	=	1,698 psf	OK
Allowable	=	5,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	3,199 psf	
ACI Factored @ Heel	=	1,261 psf	
Footing Shear @ Toe	=	0.1 psi	OK
Footing Shear @ Heel	=	0.4 psi	OK
Allowable	=	75.0 psi	
Reaction at Top	=	1,029.1 lbs	
Reaction at Bottom	=	2,456.2 lbs	

Sliding Calcs
Lateral Sliding Force = 2,456.2 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2012,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Concrete Stem Construction

Thickness = 8.00 in — Fy = 60,000 psi
Wall Weight = 100.0 psf — f'c = 3,000 psi
Stem is FREE to rotate at top of footing

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
	Stem OK	Stem OK	Stem OK
Design Height Above Ftg =	10.00 ft	4.26 ft	0.00 ft
Rebar Size =	# 4	# 4	# 4
Rebar Spacing =	6.00 in	6.00 in	6.00 in
Rebar Placed at =	Center	Center	Edge
Rebar Depth 'd' =	4.00 in	4.00 in	5.50 in
Design Data			
fb/FB + fa/Fa =	0.000	0.937	0.000
Mu....Actual =	0.0 ft-#	6,085.7 ft-#	0.0 ft-#
Mn * Phi.....Allowable =	6,492.0 ft-#	6,492.0 ft-#	9,192.0 ft-#
Shear Force @ this height =	1,580.1 lbs		3,078.8 lbs
Shear.....Actual =	32.92 psi		46.65 psi
Shear.....Allowable =	82.16 psi		82.16 psi

Other Acceptable Sizes & Spacings:

Toe: None Spec'd	-or-	Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel: None Spec'd	-or-	Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined	-or-	No key defined

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Restrained Retaining Wall

Code: IBC 2012,ACI 318-11,ACI 530-11

Concrete Stem Rebar Area Details

Top Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 1.920 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.6503 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Mmax Between Ends	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.3674 in2/ft		
(4/3) * As :	0.4898 in2/ft	Min Stem T&S Reinf Area 1.103 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.3674 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.6503 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Base Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.817 in2	
200bd/fy : 200(12)(5.5)/60000 :	0.22 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8941 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Strengths & Dimensions

Toe Width	=	0.50 ft
Heel Width	=	1.16
Total Footing Width	=	1.66
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top = 2.00 in @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	3,199	1,261	psf
Mu' : Upward	=	371	179	ft-#
Mu' : Downward	=	27	181	ft-#
Mu: Design	=	344	2	ft-#
Actual 1-Way Shear	=	0.12	0.45	psi
Allow 1-Way Shear	=	75.00	75.00	psi

Min footing T&S reinf Area 0.36 in2
Min footing T&S reinf Area per foot 0.22 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 11.11 in	#4@ 22.22 in
#5@ 17.22 in	#5@ 34.44 in
#6@ 24.44 in	#6@ 48.89 in

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Summary of Forces on Footing : Slab RESISTS sliding, stem is PINNED at footing

Forces acting on footing soil pressure

(taking moments about front of footing to find eccentricity)

Surcharge Over Heel	=	lbs	ft		ft-#
Axial Dead Load on Stem	=	200.0 lbs	0.83 ft		166.0 ft-#
Soil Over Toe	=	27.3 lbs	0.25 ft		6.8 ft-#
Adjacent Footing Load	=	37.1 lbs	1.46 ft		54.2 ft-#
Surcharge Over Toe	=	lbs	ft		ft-#
Stem Weight	=	1,000.0 lbs	0.83 ft		830.0 ft-#
Soil Over Heel	=	546.3 lbs	1.41 ft		771.2 ft-#
Footing Weight	=	207.5 lbs	0.83 ft		172.2 ft-#
Total Vertical Force	=	2,818.2 lbs	Moment =		2,000.5 ft-#

Net Mom. at Stem/Ftg Interface = 338.7 ft-#

Allow. Mom. @ Stem/Ftg Interface = 5,745.0 ft-#

Allow. Mom. Exceeds Applied Mom.? Yes

Therefore Uniform Soil Pressure = 1,697.7 psf

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

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Restrained Retaining Wall

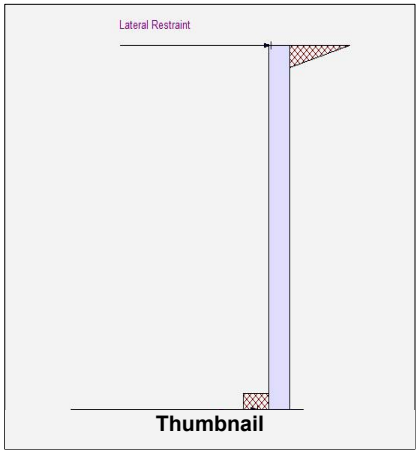
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	11.00 ft
Wall height above soil	=	0.00 ft
Total Wall Height	=	11.00 ft
Top Support Height	=	11.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in

Soil Data

Allow Soil Bearing	=	5,000.0 psf
Equivalent Fluid Pressure Method		
At-rest Heel Pressure	=	55.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density	=	110.00 pcf
Footing||Soil Frictior	=	0.450
Soil height to ignore for passive pressure	=	12.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
>>>Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
Used for Sliding & Overturning

Axial Load Applied to Stem

Axial Dead Load	=	200.0 lbs
Axial Live Load	=	800.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Stem Weight Seismic Load

Uniform Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	0.0 psf

K_h Soil Density Multiplier = 0.200 g — Added seismic per unit area = 0.0 psf

F_p / W_p Weight Multiplier = 0.000 g — Added seismic per unit area = 0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	1,150.0 lbs
Footing Width	=	1.80 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	6.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Total Bearing Load	=	2,980 lbs	
...resultant ecc.	=	1.23 in	
Soil Pressure @ Toe	=	1,795 psf	OK
Soil Pressure @ Heel	=	1,795 psf	OK
Allowable	=	5,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	3,214 psf	
ACI Factored @ Heel	=	1,480 psf	
Footing Shear @ Toe	=	0.1 psi	OK
Footing Shear @ Heel	=	0.8 psi	OK
Allowable	=	75.0 psi	
Reaction at Top	=	1,213.7 lbs	
Reaction at Bottom	=	2,897.6 lbs	

Sliding Calcs
Lateral Sliding Force = 2,897.6 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2012,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Concrete Stem Construction

Thickness = 8.00 in — Fy = 60,000 psi
Wall Weight = 100.0 psf — f'c = 3,000 psi
Stem is FREE to rotate at top of footing

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
	Stem OK	Stem OK	Stem OK
Design Height Above Ftg =	11.00 ft	4.68 ft	0.00 ft
Rebar Size =	# 5	# 5	# 5
Rebar Spacing =	6.00 in	6.00 in	6.00 in
Rebar Placed at =	Center	Center	Edge
Rebar Depth 'd' =	4.00 in	4.00 in	5.50 in
Design Data			
fb/FB + fa/Fa =	0.000	0.846	0.000
Mu....Actual =	0.0 ft-#	7,999.8 ft-#	0.0 ft-#
Mn * Phi.....Allowable =	9,459.0 ft-#	9,459.0 ft-#	13,644.0 ft-#
Shear Force @ this height =	1,880.2 lbs		3,705.4 lbs
Shear.....Actual =	39.17 psi		56.14 psi
Shear.....Allowable =	82.16 psi		82.16 psi

Other Acceptable Sizes & Spacings:

Toe: None Spec'd -or- Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel: None Spec'd -or- Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined -or- No key defined

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Concrete Stem Rebar Area Details

Top Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 2.112 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.62 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.6503 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Mmax Between Ends	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.4829 in2/ft		
(4/3) * As :	0.6439 in2/ft	Min Stem T&S Reinf Area 1.213 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.4829 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.62 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.6503 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Base Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.899 in2	
200bd/fy : 200(12)(5.5)/60000 :	0.22 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.62 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8941 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Strengths & Dimensions

Toe Width	=	0.50 ft
Heel Width	=	1.16
Total Footing Width	=	1.66
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top = 2.00 in @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	3,214	1,480	psf
Mu' : Upward	=	375	204	ft-#
Mu' : Downward	=	27	198	ft-#
Mu: Design	=	348	-6	ft-#
Actual 1-Way Shear	=	0.12	0.76	psi
Allow 1-Way Shear	=	75.00	75.00	psi

Min footing T&S reinf Area 0.36 in2
Min footing T&S reinf Area per foot 0.22 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 11.11 in	#4@ 22.22 in
#5@ 17.22 in	#5@ 34.44 in
#6@ 24.44 in	#6@ 48.89 in

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Restrained Retaining Wall

Code: IBC 2012,ACI 318-11,ACI 530-11

Summary of Forces on Footing : Slab RESISTS sliding, stem is PINNED at footing

Forces acting on footing soil pressure

(taking moments about front of footing to find eccentricity)

Surcharge Over Heel	=	lbs	ft		ft-#
Axial Dead Load on Stem	=	200.0 lbs	0.83 ft		166.0 ft-#
Soil Over Toe	=	27.3 lbs	0.25 ft		6.8 ft-#
Adjacent Footing Load	=	44.3 lbs	1.41 ft		62.5 ft-#
Surcharge Over Toe	=	lbs	ft		ft-#
Stem Weight	=	1,100.0 lbs	0.83 ft		913.0 ft-#
Soil Over Heel	=	601.0 lbs	1.41 ft		848.4 ft-#
Footing Weight	=	207.5 lbs	0.83 ft		172.2 ft-#
Total Vertical Force	=	2,980.1 lbs	Moment =		2,168.9 ft-#

Net Mom. at Stem/Ftg Interface = 304.6 ft-#

Allow. Mom. @ Stem/Ftg Interface = 8,527.5 ft-#

Allow. Mom. Exceeds Applied Mom.? Yes

Therefore Uniform Soil Pressure = 1,795.2 psf

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

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Restrained Retaining Wall

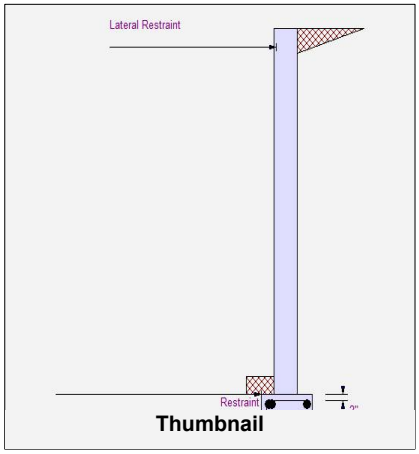
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	10.00 ft
Wall height above soil	=	0.00 ft
Total Wall Height	=	10.00 ft
Top Support Height	=	9.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in

Soil Data

Allow Soil Bearing	=	5,000.0 psf
Equivalent Fluid Pressure Method		
At-rest Heel Pressure	=	55.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density	=	110.00 pcf
Footing||Soil Frictior	=	0.450
Soil height to ignore for passive pressure	=	12.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
>>>Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
Used for Sliding & Overturning

Axial Load Applied to Stem

Axial Dead Load	=	200.0 lbs
Axial Live Load	=	800.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Stem Weight Seismic Load

Uniform Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	0.0 psf

K_h Soil Density Multiplier = 0.200 g — Added seismic per unit area = 0.0 psf

F_p / W_p Weight Multiplier = 0.000 g — Added seismic per unit area = 0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	1.80 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	6.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Total Bearing Load	=	2,823 lbs	
...resultant ecc.	=	1.54 in	
Soil Pressure @ Toe	=	1,700 psf	OK
Soil Pressure @ Heel	=	1,700 psf	OK
Allowable	=	5,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	3,269 psf	
ACI Factored @ Heel	=	1,198 psf	
Footing Shear @ Toe	=	0.5 psi	OK
Footing Shear @ Heel	=	0.0 psi	OK
Allowable	=	75.0 psi	
Reaction at Top	=	962.8 lbs	
Reaction at Bottom	=	2,362.6 lbs	

Sliding Calcs
Lateral Sliding Force = 2,362.6 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2012,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Concrete Stem Construction

Thickness = 8.00 in — Fy = 60,000 psi
Wall Weight = 100.0 psf — f'c = 3,000 psi
Stem is FREE to rotate at top of footing

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
	Stem OK	Stem OK	Stem OK
Design Height Above Ftg =	9.50 ft	4.12 ft	0.00 ft
Rebar Size =	# 4	# 4	# 4
Rebar Spacing =	6.00 in	6.00 in	6.00 in
Rebar Placed at =	Center	Center	Edge
Rebar Depth 'd' =	4.00 in	4.00 in	5.50 in
Design Data			
fb/FB + fa/Fa =	0.000	0.820	0.000
Mu....Actual =	1.8 ft-#	5,324.8 ft-#	0.0 ft-#
Mn * Phi.....Allowable =	6,492.0 ft-#	6,492.0 ft-#	9,192.0 ft-#
Shear Force @ this height =	1,532.9 lbs		2,856.1 lbs
Shear.....Actual =	31.93 psi		43.27 psi
Shear.....Allowable =	82.16 psi		82.16 psi

Other Acceptable Sizes & Spacings:

Toe: # 7 @ 18.00 in	-or-	Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel:# 6 @ 16.00 in	-or-	Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined	-or-	No key defined

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Concrete Stem Rebar Area Details

Top Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0001 in2/ft		
(4/3) * As :	0.0001 in2/ft	Min Stem T&S Reinf Area 1.824 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.6503 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Mmax Between Ends	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.3214 in2/ft		
(4/3) * As :	0.4286 in2/ft	Min Stem T&S Reinf Area 1.033 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.3214 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.6503 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Base Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.791 in2	
200bd/fy : 200(12)(5.5)/60000 :	0.22 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8941 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Strengths & Dimensions

Toe Width	=	0.50 ft
Heel Width	=	1.16
Total Footing Width	=	1.66
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top = 2.00 in @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	3,269	1,198	psf
Mu' : Upward	=	378	173	ft-#
Mu' : Downward	=	30	185	ft-#
Mu: Design	=	347	12	ft-#
Actual 1-Way Shear	=	0.51	0.03	psi
Allow 1-Way Shear	=	75.00	75.00	psi

Min footing T&S reinf Area 0.43 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

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Restrained Retaining Wall

Code: IBC 2012,ACI 318-11,ACI 530-11

Summary of Forces on Footing : Slab RESISTS sliding, stem is PINNED at footing

Forces acting on footing soil pressure

(taking moments about front of footing to find eccentricity)

Surcharge Over Heel	=	lbs	ft		ft-#
Axial Dead Load on Stem	=	200.0 lbs	0.83 ft	166.0	ft-#
Soil Over Toe	=	27.3 lbs	0.25 ft	6.8	ft-#
Adjacent Footing Load	=	lbs	ft		ft-#
Surcharge Over Toe	=	lbs	ft		ft-#
Stem Weight	=	1,000.0 lbs	0.83 ft	830.0	ft-#
Soil Over Heel	=	546.3 lbs	1.41 ft	771.2	ft-#
Footing Weight	=	249.0 lbs	0.83 ft	206.7	ft-#
Total Vertical Force	=	2,822.7 lbs	Moment =	1,980.7	ft-#

Net Mom. at Stem/Ftg Interface = 362.1 ft-#

Allow. Mom. @ Stem/Ftg Interface = 5,745.0 ft-#

Allow. Mom. Exceeds Applied Mom.? Yes

Therefore Uniform Soil Pressure = 1,700.4 psf

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

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Restrained Retaining Wall

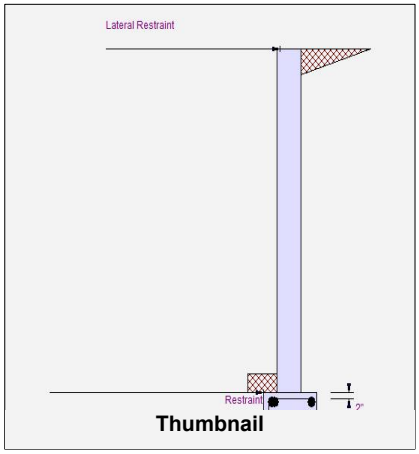
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	0.00 ft
Total Wall Height	=	9.00 ft
Top Support Height	=	9.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in

Soil Data

Allow Soil Bearing	=	5,000.0 psf
Equivalent Fluid Pressure Method		
At-rest Heel Pressure	=	55.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density	=	110.00 pcf
Footing||Soil Frictior	=	0.450
Soil height to ignore for passive pressure	=	12.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
>>>Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
Used for Sliding & Overturning

Axial Load Applied to Stem

Axial Dead Load	=	200.0 lbs
Axial Live Load	=	800.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Stem Weight Seismic Load

Uniform Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	0.0 psf

K_h Soil Density Multiplier = 0.200 g Added seismic per unit area = 0.0 psf

F_p / W_p Weight Multiplier = 0.000 g Added seismic per unit area = 0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	1.80 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	6.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Total Bearing Load	=	2,668 lbs	
...resultant ecc.	=	1.77 in	
Soil Pressure @ Toe	=	1,607 psf	OK
Soil Pressure @ Heel	=	1,607 psf	OK
Allowable	=	5,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	3,253 psf	
ACI Factored @ Heel	=	989 psf	
Footing Shear @ Toe	=	0.5 psi	OK
Footing Shear @ Heel	=	0.2 psi	OK
Allowable	=	75.0 psi	
Reaction at Top	=	741.5 lbs	
Reaction at Bottom	=	2,007.5 lbs	

Sliding Calcs
Lateral Sliding Force = 2,007.5 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2012,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Concrete Stem Construction

Thickness = 8.00 in Fy = 60,000 psi
Wall Weight = 100.0 psf f'c = 3,000 psi
Stem is FREE to rotate at top of footing

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
	Stem OK	Stem OK	Stem OK
Design Height Above Ftg =	9.00 ft	3.83 ft	0.00 ft
Rebar Size =	# 4	# 4	# 4
Rebar Spacing =	6.00 in	6.00 in	6.00 in
Rebar Placed at =	Center	Center	Edge
Rebar Depth 'd' =	4.00 in	4.00 in	5.50 in
Design Data			
fb/FB + fa/Fa =	0.000	0.634	0.000
Mu....Actual =	0.0 ft-#	4,115.4 ft-#	0.0 ft-#
Mn * Phi.....Allowable =	6,492.0 ft-#	6,492.0 ft-#	9,192.0 ft-#
Shear Force @ this height =	1,188.0 lbs		2,376.0 lbs
Shear.....Actual =	24.75 psi		36.00 psi
Shear.....Allowable =	82.16 psi		82.16 psi

Other Acceptable Sizes & Spacings:

Toe: # 7 @ 18.00 in	-or-	Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel:# 6 @ 16.00 in	-or-	Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined	-or-	No key defined

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Concrete Stem Rebar Area Details

Top Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 1.728 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.6503 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Mmax Between Ends	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.2484 in2/ft		
(4/3) * As :	0.3312 in2/ft	Min Stem T&S Reinf Area 0.992 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.2484 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.6503 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Base Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.736 in2	
200bd/fy : 200(12)(5.5)/60000 :	0.22 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8941 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Strengths & Dimensions

Toe Width	=	0.50 ft
Heel Width	=	1.16
Total Footing Width	=	1.66
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top = 2.00 in @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	3,253	989	psf
Mu' : Upward	=	373	150	ft-#
Mu' : Downward	=	30	169	ft-#
Mu: Design	=	343	19	ft-#
Actual 1-Way Shear	=	0.51	0.17	psi
Allow 1-Way Shear	=	75.00	75.00	psi

Min footing T&S reinf Area 0.43 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:
#4@ 9.26 in
#5@ 14.35 in
#6@ 20.37 in

If two layers of horizontal bars:
#4@ 18.52 in
#5@ 28.70 in
#6@ 40.74 in

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Restrained Retaining Wall

Code: IBC 2012,ACI 318-11,ACI 530-11

Summary of Forces on Footing : Slab RESISTS sliding, stem is PINNED at footing

Forces acting on footing soil pressure

(taking moments about front of footing to find eccentricity)

Surcharge Over Heel	=	lbs	ft		ft-#
Axial Dead Load on Stem	=	200.0 lbs	0.83 ft	166.0	ft-#
Soil Over Toe	=	27.3 lbs	0.25 ft	6.8	ft-#
Adjacent Footing Load	=	lbs	ft		ft-#
Surcharge Over Toe	=	lbs	ft		ft-#
Stem Weight	=	900.0 lbs	0.83 ft	747.0	ft-#
Soil Over Heel	=	491.7 lbs	1.41 ft	694.1	ft-#
Footing Weight	=	249.0 lbs	0.83 ft	206.7	ft-#
Total Vertical Force	=	2,668.0 lbs	Moment =	1,820.6	ft-#

Net Mom. at Stem/Ftg Interface = 393.9 ft-#

Allow. Mom. @ Stem/Ftg Interface = 5,745.0 ft-#

Allow. Mom. Exceeds Applied Mom.? Yes

Therefore Uniform Soil Pressure = 1,607.2 psf

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

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Restrained Retaining Wall

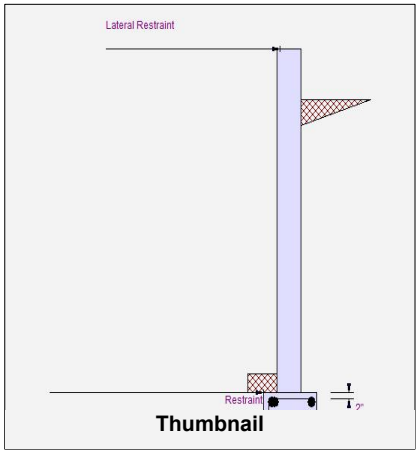
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	7.67 ft
Wall height above soil	=	1.33 ft
Total Wall Height	=	9.00 ft
Top Support Height	=	9.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in

Soil Data

Allow Soil Bearing	=	5,000.0 psf
Equivalent Fluid Pressure Method		
At-rest Heel Pressure	=	55.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density	=	110.00 pcf
Footing||Soil Frictior	=	0.450
Soil height to ignore for passive pressure	=	12.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
>>>Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
Used for Sliding & Overturning

Axial Load Applied to Stem

Axial Dead Load	=	200.0 lbs
Axial Live Load	=	800.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Stem Weight Seismic Load

Uniform Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	0.0 psf

K_h Soil Density Multiplier = 0.200 g — Added seismic per unit area = 0.0 psf

F_p / W_p Weight Multiplier = 0.000 g — Added seismic per unit area = 0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	1.80 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	6.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Total Bearing Load	=	2,595 lbs	
...resultant ecc.	=	2.02 in	
Soil Pressure @ Toe	=	1,563 psf	OK
Soil Pressure @ Heel	=	1,563 psf	OK
Allowable	=	5,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	3,326 psf	
ACI Factored @ Heel	=	812 psf	
Footing Shear @ Toe	=	0.5 psi	OK
Footing Shear @ Heel	=	0.0 psi	OK
Allowable	=	75.0 psi	
Reaction at Top	=	458.4 lbs	
Reaction at Bottom	=	1,607.2 lbs	

Sliding Calcs
Lateral Sliding Force = 1,607.2 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2012,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Concrete Stem Construction

Thickness = 8.00 in — Fy = 60,000 psi
Wall Weight = 100.0 psf — f'c = 3,000 psi
Stem is FREE to rotate at top of footing

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
	Stem OK	Stem OK	Stem OK
Design Height Above Ftg	9.00 ft	3.61 ft	0.00 ft
Rebar Size	# 4	# 4	# 4
Rebar Spacing	6.00 in	6.00 in	6.00 in
Rebar Placed at	Center	Center	Edge
Rebar Depth 'd'	4.00 in	4.00 in	5.50 in
Design Data			
fb/FB + fa/Fa	0.000	0.459	0.000
Mu....Actual	0.0 ft-#	2,980.9 ft-#	0.0 ft-#
Mn * Phi.....Allowable	6,492.0 ft-#	6,492.0 ft-#	9,192.0 ft-#
Shear Force @ this height	735.1 lbs		1,852.7 lbs
Shear.....Actual	15.31 psi		28.07 psi
Shear.....Allowable	82.16 psi		82.16 psi

Other Acceptable Sizes & Spacings:

Toe: # 7 @ 18.00 in	-or-	Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel:# 6 @ 16.00 in	-or-	Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined	-or-	No key defined

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Restrained Retaining Wall

Code: IBC 2012,ACI 318-11,ACI 530-11

Concrete Stem Rebar Area Details

Top Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 1.728 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.6503 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Mmax Between Ends	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1799 in2/ft		
(4/3) * As :	0.2399 in2/ft	Min Stem T&S Reinf Area 1.034 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1799 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.6503 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Base Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.694 in2	
200bd/fy : 200(12)(5.5)/60000 :	0.22 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8941 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Strengths & Dimensions

Toe Width	=	0.50 ft
Heel Width	=	1.16
Total Footing Width	=	1.66
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top = 2.00 in @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	3,326	812	psf
Mu' : Upward	=	379	131	ft-#
Mu' : Downward	=	30	147	ft-#
Mu: Design	=	349	16	ft-#
Actual 1-Way Shear	=	0.51	0.02	psi
Allow 1-Way Shear	=	75.00	75.00	psi

Min footing T&S reinf Area 0.43 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

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Restrained Retaining Wall

Code: IBC 2012,ACI 318-11,ACI 530-11

Summary of Forces on Footing : Slab RESISTS sliding, stem is PINNED at footing

Forces acting on footing soil pressure

(taking moments about front of footing to find eccentricity)

Surcharge Over Heel	=	lbs	ft		ft-#
Axial Dead Load on Stem	=	200.0 lbs	0.83 ft	166.0	ft-#
Soil Over Toe	=	27.3 lbs	0.25 ft	6.8	ft-#
Adjacent Footing Load	=	lbs	ft		ft-#
Surcharge Over Toe	=	lbs	ft		ft-#
Stem Weight	=	899.9 lbs	0.83 ft	746.9	ft-#
Soil Over Heel	=	419.0 lbs	1.41 ft	591.5	ft-#
Footing Weight	=	249.0 lbs	0.83 ft	206.7	ft-#
Total Vertical Force	=	2,595.2 lbs	Moment =	1,717.8	ft-#

Net Mom. at Stem/Ftg Interface = 436.2 ft-#

Allow. Mom. @ Stem/Ftg Interface = 5,745.0 ft-#

Allow. Mom. Exceeds Applied Mom.? Yes

Therefore Uniform Soil Pressure = 1,563.4 psf

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

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Restrained Retaining Wall

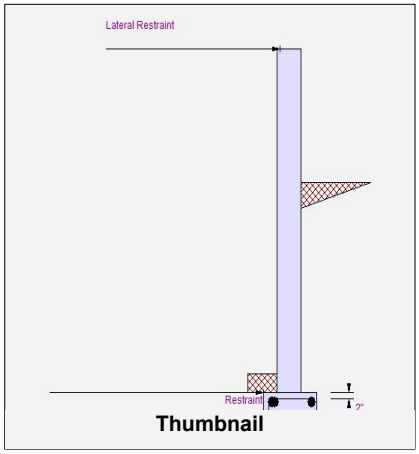
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	5.50 ft
Wall height above soil	=	3.50 ft
Total Wall Height	=	9.00 ft
Top Support Height	=	9.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in

Soil Data

Allow Soil Bearing	=	5,000.0 psf
Equivalent Fluid Pressure Method		
At-rest Heel Pressure	=	55.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density	=	110.00 pcf
Footing||Soil Frictior	=	0.450
Soil height to ignore for passive pressure	=	12.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
>>>Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
Used for Sliding & Overturning

Axial Load Applied to Stem

Axial Dead Load	=	200.0 lbs
Axial Live Load	=	800.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Stem Weight Seismic Load

Uniform Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	0.0 psf

K_h Soil Density Multiplier = 0.200 g — Added seismic per unit area = 0.0 psf

F_p / W_p Weight Multiplier = 0.000 g — Added seismic per unit area = 0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	1.80 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	6.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Total Bearing Load	=	2,477 lbs	
...resultant ecc.	=	2.45 in	
Soil Pressure @ Toe	=	1,492 psf	OK
Soil Pressure @ Heel	=	1,492 psf	OK
Allowable	=	5,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	3,445 psf	
ACI Factored @ Heel	=	521 psf	
Footing Shear @ Toe	=	0.5 psi	OK
Footing Shear @ Heel	=	0.2 psi	OK
Allowable	=	75.0 psi	
Reaction at Top	=	168.5 lbs	
Reaction at Bottom	=	992.4 lbs	

Sliding Calcs
Lateral Sliding Force = 992.4 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2012,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Concrete Stem Construction

Thickness = 8.00 in — Fy = 60,000 psi
Wall Weight = 100.0 psf — f'c = 3,000 psi
Stem is FREE to rotate at top of footing

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
	Stem OK	Stem OK	Stem OK
Design Height Above Ftg =	9.00 ft	3.04 ft	0.00 ft
Rebar Size =	# 4	# 4	# 4
Rebar Spacing =	6.00 in	6.00 in	6.00 in
Rebar Placed at =	Center	Center	Edge
Rebar Depth 'd' =	4.00 in	4.00 in	5.50 in
Design Data			
fb/FB + fa/Fa =	0.000	0.215	0.000
Mu....Actual =	0.0 ft-#	1,397.6 ft-#	0.0 ft-#
Mn * Phi.....Allowable =	6,492.0 ft-#	6,492.0 ft-#	9,192.0 ft-#
Shear Force @ this height =	271.1 lbs		1,059.9 lbs
Shear.....Actual =	5.65 psi		16.06 psi
Shear.....Allowable =	82.16 psi		82.16 psi

Other Acceptable Sizes & Spacings:

Toe: # 7 @ 18.00 in	-or-	Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel:# 6 @ 16.00 in	-or-	Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined	-or-	No key defined

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Concrete Stem Rebar Area Details

Top Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 1.728 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.6503 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Mmax Between Ends	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0844 in2/ft		
(4/3) * As :	0.1125 in2/ft	Min Stem T&S Reinf Area 1.145 in2	
200bd/fy : 200(12)(4)/60000 :	0.16 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.6503 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Base Support	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0 in2/ft		
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.583 in2	
200bd/fy : 200(12)(5.5)/60000 :	0.22 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8941 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Strengths & Dimensions

Toe Width	=	0.50 ft
Heel Width	=	1.16
Total Footing Width	=	1.66
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top = 2.00 in @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	3,445	521	psf
Mu' : Upward	=	389	100	ft-#
Mu' : Downward	=	30	112	ft-#
Mu: Design	=	359	11	ft-#
Actual 1-Way Shear	=	0.51	0.23	psi
Allow 1-Way Shear	=	75.00	75.00	psi

Min footing T&S reinf Area 0.43 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

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Restrained Retaining Wall

Code: IBC 2012,ACI 318-11,ACI 530-11

Summary of Forces on Footing : Slab RESISTS sliding, stem is PINNED at footing

Forces acting on footing soil pressure

(taking moments about front of footing to find eccentricity)

Surcharge Over Heel	=	lbs	ft		ft-#
Axial Dead Load on Stem	=	200.0 lbs	0.83 ft	166.0	ft-#
Soil Over Toe	=	27.3 lbs	0.25 ft	6.8	ft-#
Adjacent Footing Load	=	lbs	ft		ft-#
Surcharge Over Toe	=	lbs	ft		ft-#
Stem Weight	=	900.0 lbs	0.83 ft	747.0	ft-#
Soil Over Heel	=	300.5 lbs	1.41 ft	424.2	ft-#
Footing Weight	=	249.0 lbs	0.83 ft	206.7	ft-#
Total Vertical Force	=	2,476.8 lbs	Moment =	1,550.6	ft-#

Net Mom. at Stem/Ftg Interface = 505.1 ft-#

Allow. Mom. @ Stem/Ftg Interface = 5,745.0 ft-#

Allow. Mom. Exceeds Applied Mom.? Yes

Therefore Uniform Soil Pressure = 1,492.0 psf

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Special RC Shear Wall Checks per 18.10 (C-2ND)

$f'c := 2500$ $f_y := 60 \cdot ksi$ $\lambda := 1$ $d_b := .5\ in$ $\beta_1 := .85$

$t_w := 8\ in$ $l_w := 8\ ft$ $h_w := 8\ ft$ $\frac{h_w}{l_w} = 1$ $\alpha_c := 3$

$A_{cv} := l_w \cdot h_w = 64\ ft^2$

$\rho_{wmin} := .0025$

$A_{req} := \frac{t_w \cdot 12\ in \cdot \rho_{wmin}}{\left(\frac{\pi \cdot d_b^{\,2}}{4}\right)} = 1.222$ bars/ft

$s := 9\ in$

$\rho_w := \frac{\frac{12\ in}{s} \cdot \frac{\pi \cdot d_b^{\,2}}{4}}{t_w \cdot 12\ in} = 0.0027$

$V_u := 7232\ lbf = 7.232\ kip$

$V_n := A_{cv} \cdot \left(\alpha_c \cdot \lambda \cdot \sqrt{f'c} \cdot psi + \rho_w \cdot f_y\right) = 2890\ kip$

$2 \cdot A_{cv} \cdot \lambda \cdot \sqrt{f'c} \cdot psi = 922\ kip$ Greater than Vu, two curtains of reinf. not req. per 18.10.2.2

$S_{xw} := \frac{t_w \cdot l_w^{\,2}}{6} = 7.111\ ft^3$

$\sigma := \frac{V_u \cdot h_w}{S_{xw}} = 56.5\ psi$

$0.2 \cdot f'c \cdot psi = 500\ psi$ sigma<0.2f'c, no special boundary elements required

$T_w := \frac{V_u \cdot h_w}{l_w} = 7.232\ kip$

$A_{boundary} := \frac{T_w}{f_y \cdot .9} = 0.134\ in^2$

Special RC Shear Wall Checks per 18.10 (1.2-1ST)

$t_w := 8\ in$ $l_w := 3\ ft + 10\ in$ $h_w := 9\ ft$ $\frac{h_w}{l_w} = 2.348$ $\alpha_c := 2$

$A_{cv} := l_w \cdot h_w = 34.5\ ft^2$ $A_s := .6 \cdot in^2$

$\rho_{wmin} := .0025$

$A_{req} := \frac{t_w \cdot 12\ in \cdot \rho_{wmin}}{\left(\frac{\pi \cdot d_b^{\,2}}{4}\right)} = 1.222$ bars/ft

$s := 9\ in$

$\rho_w := \frac{\frac{12\ in}{s} \cdot \frac{2\ \pi \cdot d_b^{\,2}}{4}}{t_w \cdot 12\ in} = 0.0055$

$V_u := 8513\ lbf = 8.513\ kip$

$V_n := A_{cv} \cdot \left(\alpha_c \cdot \lambda \cdot \sqrt{f'c} \cdot psi + \rho_w \cdot f_y\right) = 2123\ kip$

$2 \cdot A_{cv} \cdot \lambda \cdot \sqrt{f'c} \cdot psi = 497\ kip$ Greater than Vu, two curtains of reinf. not req. per 18.10.2.2, Two curtains are required per 10.10.2.2

$c := \frac{A_s \cdot f_y}{\beta_1 \cdot .85 \cdot f'c \cdot psi \cdot t_w} = 2.491\ in$

$\delta_u := 0.005 \cdot h_w$

$\frac{l_w}{600\left(1.5\ \frac{\delta_u}{h_w}\right)} = 10.222\ in$ Greater than c, no special boundary elements required per 18.10.6.2

$S_{xw} := \frac{t_w \cdot l_w^{\,2}}{6} = 1.633\ ft^3$

$\sigma := \frac{V_u \cdot h_w}{S_{xw}} = 325.876\ psi$

$0.2 \cdot f'c \cdot psi = 500\ psi$ sigma<0.2f'c, no special boundary elements required per 18.10.6.3

$T_w := \frac{V_u \cdot h_w}{l_w} = 19.987\ kip$

$A_{boundary} := \frac{T_w}{f_y \cdot .9} = 0.37\ in^2$