

# Calculations for



Job: VIP PRODUCTS

Approved by City of Goodyear

Address: 137<sup>th</sup> AVE & AUTO CENTER DRIVE

07/01/21

21-2119 - VIP PRODUCTS

GOODYEAR, ARIZONA

(These calculations apply to the job at this address only)

Architect: BALMER ARCHITECTURAL GROUP

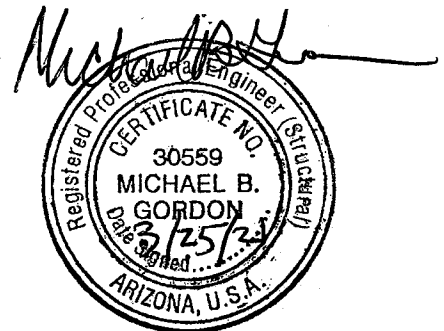
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F1 thru F24	FOUNDATION DESIGN
CU-1 thru CU7	COLUMN UPLIFT CHECK
P1 thru P46	TILT PANEL DESIGN
L1 thru L10	LATERAL
DW1 thru DW8	DOCK WALL DESIGN

GF Group  
Structural Engineers



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## DESIGN CRITERIA

Date	Job No.	Sheet No.
3-21	221031	DC1
JOB: VIP		
BY: MBG		
GF Group Structural Engineers		

Location: Goodyear, Arizona

Code: 2018 IBC

Wind: 102 MPH  
Exposure C

Seismic: Ss= 0.173 Site Class D  
S1= 0.072 Seismic Design Category "B"  
Sds= 0.185  
Sd1= 0.116

Soils: Soils Report By: Alpha Geotechnical & Materials, Inc  
Project No. 21-G-12051  
Dated: 4-Mar-21

### Building

Allowable soil bearing = 2000psf at 1'-6" below lowest adj grade on engineered fill per soils report

### Minor Structures

Allowable soil bearing = 1500psf at 1'-6" below lowest adj grade on compacted subgrade

### Materials:

#### f'c at 28 days

Concrete	Foundations	3000 psi
	Tilt panels	4000 psi
	Slab-on-grade	4000 psi
	Concrete topping on metal deck	n/a psi

*Rebar* Typical Rebar - ASTM A615 (Grade 60)  
Weldable Rebar - ASTM A706 (Grade 60) UNO

*Steel* W-beams & Channels - ASTM A992 (Fy=50ksi)  
Misc Plates & Ancles - ASTM A36 (Fy=36ksi)  
Tubes - ASTM A501 Grade B - (Fy=46ksi)  
Pipes - ASTM A53 Grade B (Fy=36ksi)  
Anchor Bolts - ASTM A307 (Fy=36ksi)  
High Strength Bolts - ASTM A325

Masonry f'm=1500psi

## DESIGN CRITERIA

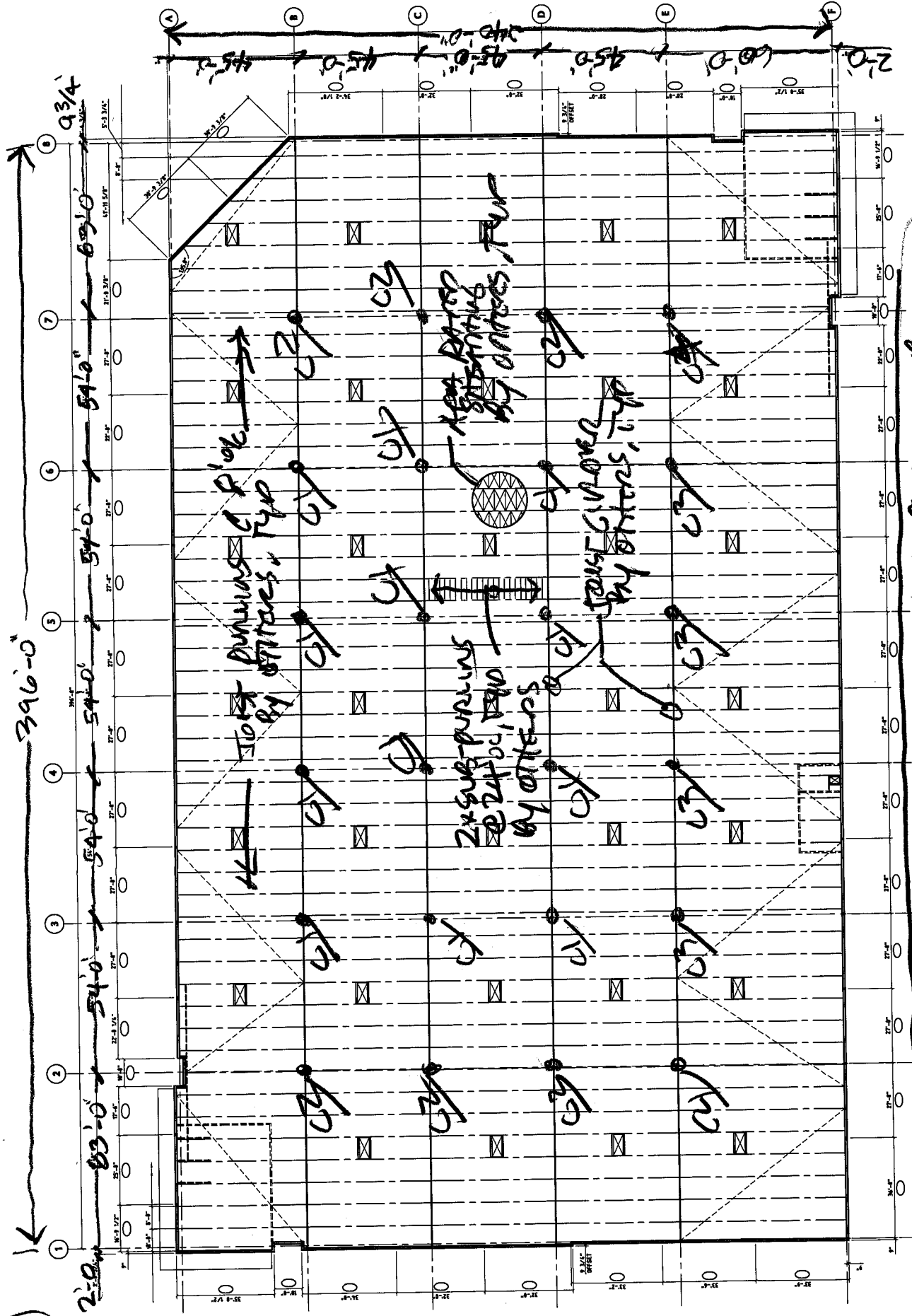
Date	Job No.
3-21	221019
JOB:	VIP
BY:	MBG
GF Group Structural En	

062

### Roof Loading:

Roofing	2.5 psf	
1/2" Plywood	1.5 psf	
2x4 sub purlins at 24"	1.1 psf	
Purlins	1.3 psf	
MP&E	2.0 psf	
Insulation	0.5 psf	
Sprinklers	2.0 psf	
Ceiling	1.0 psf	
Addn'l Mechanical	2.0 psf	
Misc	1.1 psf	
<hr/>		
<b>Dead Load</b>	15.0 psf	at purlins
Joist Girder	3.0 psf	
<hr/>		
<b>Dead Load</b>	18.0 psf	at joist girders
<b>Live Load</b>	20.0 psf	reducible per code
<b>Snow Load</b>	n/a psf	

(2)



FRAMING DENOTES AS "BY OTHERS" IS DESIGNATED BY  
THE STRUCTURES GROUP AND INCORPORATED IN PERMIT SET  
Keep Framing Diagrams / Column Keypoints

R1

Date	Job No.	Sheet No.
21-Mar	221019	4
JOB:	VIP	
BY:	MBG	
GF Group Structural Engineers		

C1

Uniform Dead Load= 18 psf  
Uniform Live Load= 12 psf

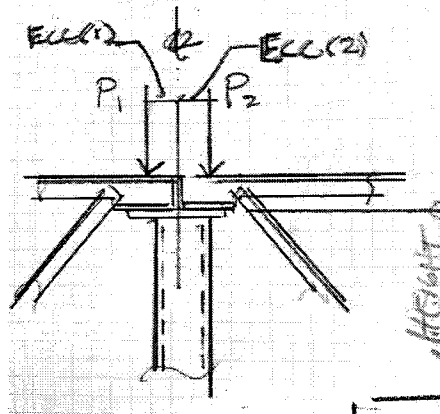
P1 girder span= 54 ft  
P1 purlin trib width= 45 ft  
P2 girder span= 54 ft  
P2 purlin trib width= 45 ft

P1 (dead)= 21.9 kips  
P1 (live)= 14.6 kips  
**P1(tot)= 36.5 kips**

P2 (dead)= 21.9 kips  
P2 (live)= 14.6 kips  
**P2(tot)= 36.5 kips**

P (dead) total = 43.7  
P (live) total = 29.2  
**P total= 72.9 kips**

Height= 35 ft  
Ecc(1)= 5 inches  
Ecc(2)= 5 inches



USE HSS 10x10x5/16  
w/ 1" x 16" SO BASE PLATE

C2

Uniform Dead Load= 18 psf  
Uniform Live Load= 12 psf

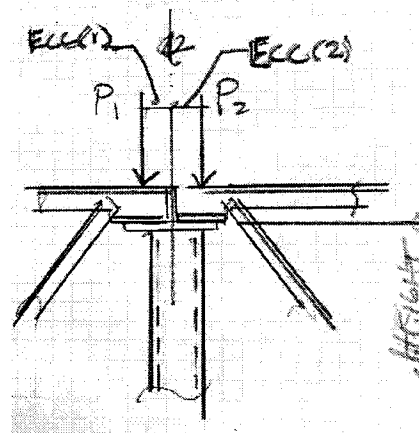
P1 girder span= 65 ft  
P1 purlin trib width= 45 ft  
P2 girder span= 54 ft  
P2 purlin trib width= 45 ft

P1 (dead)= 26.3 kips  
P1 (live)= 17.6 kips  
**P1(tot)= 43.9 kips**

P2 (dead)= 21.9 kips  
P2 (live)= 14.6 kips  
**P2(tot)= 36.5 kips**

P (dead) total = 48.2  
P (live) total = 32.1  
**P total= 80.3 kips**

Height= 35 ft  
Ecc(1)= 5 inches  
Ecc(2)= 5 inches



USE HSS 10x10x5/16  
w/ 1" x 16" SO BASE PLATE

Date	Job No.	Sheet No.
21-Mar	221019	62
JOB: VIP		
BY: MBG		
GF Group Structural Engineers		

C3

Uniform Dead Load= 18 psf  
Uniform Live Load= 12 psf

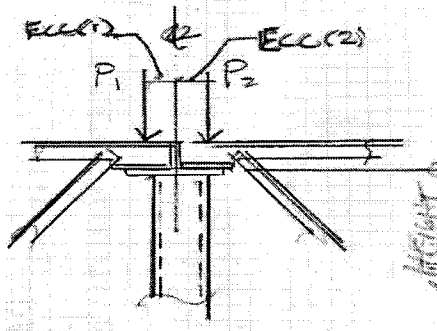
P1 girder span= 54 ft  
P1 purlin trib width= 52.5 ft  
P2 girder span= 54 ft  
P2 purlin trib width= 52.5 ft

P1 (dead)= 25.5 kips  
P1 (live)= 17.0 kips  
**P1(tot)= 42.5 kips**

P2 (dead)= 25.5 kips  
P2 (live)= 17.0 kips  
**P2(tot)= 42.5 kips**

P (dead) total = 51.0  
P (live) total = 34.0  
**P total= 85.1 kips**

Height= 34 ft  
Ecc(1)= 5 inches  
Ecc(2)= 5 inches



USE HSS10x10x5/16  
w/ 1" x 16" SB  
BRACE PL

C4

Uniform Dead Load= 18 psf  
Uniform Live Load= 12 psf

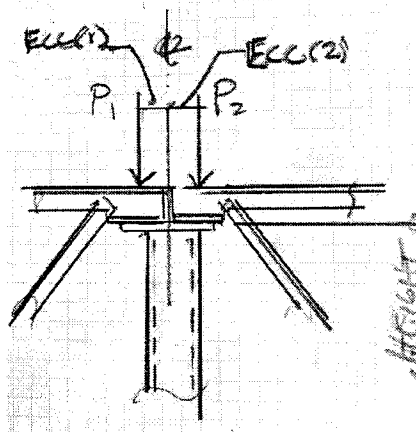
P1 girder span= 65 ft  
P1 purlin trib width= 52.5 ft  
P2 girder span= 54 ft  
P2 purlin trib width= 52.5 ft

P1 (dead)= 30.7 kips  
P1 (live)= 20.5 kips  
**P1(tot)= 51.2 kips**

P2 (dead)= 25.5 kips  
P2 (live)= 17.0 kips  
**P2(tot)= 42.5 kips**

P (dead) total = 56.2  
P (live) total = 37.5  
**P total= 93.7 kips**

Height= 35 ft  
Ecc(1)= 5 inches  
Ecc(2)= 5 inches



USE HSS10x10x5/16  
w/ 1" x 16" SB  
BRACE PL

## Steel Column

File: 221019-VIP Products.ec6

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GFG STRUCTURAL ENGINEERS

Lic. #: KW-06006285

**DESCRIPTION:** c1 - typical column -case I (Dead load and Live Load both sides)

### Code References

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

Load Combinations Used : ASCE 7-16

### General Information

Steel Section Name :	<b>HSS10x10x5/16</b>	Overall Column Height	35.0 ft
Analysis Method :	Allowable Strength	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	46.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 35.0 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 35.0 ft, K = 1.0	

### Applied Loads

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

Column self weight included : 1,412.25 lbs \* Dead Load Factor

AXIAL LOADS ...

P1: Axial Load at 35.0 ft, Xecc = -5.0 in, Yecc = 0.750 in, D = 21.90, LR = 14.60 k

P2: Axial Load at 35.0 ft, Xecc = 5.0 in, Yecc = 0.750 in, D = 21.90, LR = 14.60 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

PASS	Max. Axial+Bending Stress Ratio =	0.5695 : 1	Maximum Load Reactions ..	
	Load Combination	+D+Lr	Top along X-X	0.0 k
	Location of max.above base	34.765 ft	Bottom along X-X	0.0 k
	At maximum location values are ...		Top along Y-Y	0.1304 k
	Pa : Axial	74.412 k	Bottom along Y-Y	0.1304 k
	Pn / Omega : Allowable	142.362 k	Maximum Load Deflections ...	
	Ma-x : Applied	-4.532 k-ft	Along Y-Y	-0.1253 in at 20.436 ft above base
	Mn-x / Omega : Allowable	86.140 k-ft	for load combination : +D+Lr	
	Ma-y : Applied	0.0 k-ft	Along X-X	0.0 in at 0.0 ft above base
	Mn-y / Omega : Allowable	86.140 k-ft	for load combination :	
PASS	Maximum Shear Stress Ratio =	0.001485 : 1		
	Load Combination	+D+Lr		
	Location of max.above base	0.0 ft		
	At maximum location values are ...			
	Va : Applied	0.1304 k		
	Vn / Omega : Allowable	87.790 k		

### Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Maximum Shear Ratios					
	Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Stress Ratio	Status	Location
D Only	0.346	PASS	34.77 ft	1.66	1.00	106.60	106.60	0.001	PASS	0.00 ft
+D+Lr	0.569	PASS	34.77 ft	1.66	1.00	106.60	106.60	0.001	PASS	0.00 ft
+D+0.750Lr	0.514	PASS	34.77 ft	1.66	1.00	106.60	106.60	0.001	PASS	0.00 ft
+0.60D	0.191	PASS	0.00 ft	1.66	1.00	106.60	106.60	0.001	PASS	0.00 ft

### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
D Only	45.212					-0.078	0.078					
+D+Lr	74.412					-0.130	0.130					
+D+0.750Lr	67.112					-0.117	0.117					
+0.60D	27.127					-0.047	0.047					
Lr Only	29.200					-0.052	0.052					

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	74.412					-0.130	0.130					

## Steel Column

File: 221019-VIP Products.ec6  
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GFG STRUCTURAL ENGINEERS

Lic. #: KW-06006285

DESCRIPTION: c1 - typical column -case I (Dead load and Live Load both sides)

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
"	Minimum	27.127					-0.047	0.047					
Reaction, X-X Axis Base	Maximum	45.212					-0.078	0.078					
"	Minimum	45.212					-0.078	0.078					
Reaction, Y-Y Axis Base	Maximum	27.127					-0.047	0.047					
"	Minimum	74.412					-0.130	0.130					
Reaction, X-X Axis Top	Maximum	45.212					-0.078	0.078					
"	Minimum	45.212					-0.078	0.078					
Reaction, Y-Y Axis Top	Maximum	45.212					-0.078	0.078					
"	Minimum	29.200					-0.052	0.052					
Moment, X-X Axis Base	Maximum	45.212					-0.078	0.078					
"	Minimum	45.212					-0.078	0.078					
Moment, Y-Y Axis Base	Maximum	45.212					-0.078	0.078					
"	Minimum	45.212					-0.078	0.078					
Moment, X-X Axis Top	Maximum	45.212					-0.078	0.078					
"	Minimum	45.212					-0.078	0.078					
Moment, Y-Y Axis Top	Maximum	45.212					-0.078	0.078					
"	Minimum	45.212					-0.078	0.078					

### Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
D Only	0.0000	in	0.000	ft	-0.075	in	20.436	ft
+D+Lr	0.0000	in	0.000	ft	-0.125	in	20.436	ft
+D+0.750Lr	0.0000	in	0.000	ft	-0.113	in	20.436	ft
+0.60D	0.0000	in	0.000	ft	-0.045	in	20.436	ft
Lr Only	0.0000	in	0.000	ft	-0.050	in	20.436	ft

### Steel Section Properties : HSS10x10x5/16

Depth	=	10.000 in	Ixx	=	172.00 in^4	J	=	271.000 in^4
Design Thick	=	0.291 in	Sxx	=	34.50 in^3			
Width	=	10.000 in	Rxx	=	3.940 in			
Wall Thick	=	0.313 in	Zx	=	40.100 in^3			
Area	=	11.100 in^2	Iyy	=	172.000 in^4	C	=	54.800 in^3
Weight	=	40.350 plf	Syy	=	34.500 in^3			
			Ryy	=	3.940 in			
Ycg	=	0.000 in						



## Steel Column

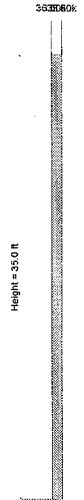
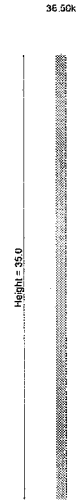
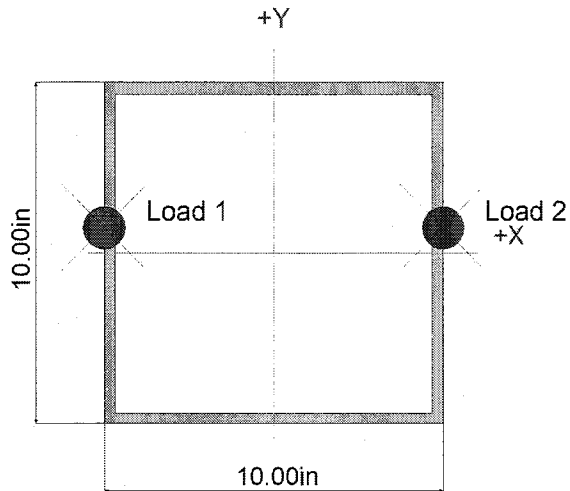
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GFG STRUCTURAL ENGINEERS

DESCRIPTION: c1 - typical column - case I (Dead load and Live Load both sides)

### Sketches



## Steel Column

File: 221019-VIP Products.ec6

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** c1 - typical column -case II (Dead load both sides/ Live load one side only)

### Code References

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

Load Combinations Used : ASCE 7-16

### General Information

Steel Section Name :	<b>HSS10x10x5/16</b>	Overall Column Height	35.0 ft
Analysis Method :	Allowable Strength	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	46.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 35.0 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 35.0 ft, K = 1.0	

### Applied Loads

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

Column self weight included : 1,412.25 lbs \* Dead Load Factor

AXIAL LOADS ...

P1: Axial Load at 35.0 ft, Xecc = -5.0 in, Yecc = 0.750 in, D = 21.90, LR = 14.60 k

P2: Axial Load at 35.0 ft, Xecc = 5.0 in, Yecc = 0.750 in, D = 21.90 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

PASS	Max. Axial+Bending Stress Ratio =	0.5199 : 1	Maximum Load Reactions ..	
	Load Combination	+D+Lr	Top along X-X	0.1738 k
	Location of max.above base	34.765 ft	Bottom along X-X	0.1738 k
	At maximum location values are ...		Top along Y-Y	0.1043 k
	Pa : Axial	59.812 k	Bottom along Y-Y	0.1043 k
	Pn / Omega : Allowable	142.362 k	Maximum Load Deflections ...	
	Ma-x : Applied	-3.626 k-ft	Along Y-Y	-0.1002 in at 20.436ft above base
	Mn-x / Omega : Allowable	86.140 k-ft	for load combination : +D+Lr	
	Ma-y : Applied	6.043 k-ft	Along X-X	0.1671 in at 20.436ft above base
	Mn-y / Omega : Allowable	86.140 k-ft	for load combination : Lr Only	
PASS	Maximum Shear Stress Ratio =	0.001980 : 1		
	Load Combination	+D+Lr		
	Location of max.above base	0.0 ft		
	At maximum location values are ...			
	Va : Applied	0.1738 k		
	Vn / Omega : Allowable	87.790 k		

### Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Maximum Shear Ratios					
	Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Stress Ratio	Status	Location
D Only	0.346	PASS	34.77 ft	1.66	1.66	106.60	106.60	0.001	PASS	0.00 ft
+D+Lr	0.520	PASS	34.77 ft	1.66	1.66	106.60	106.60	0.002	PASS	0.00 ft
+D+0.750Lr	0.476	PASS	34.77 ft	1.66	1.66	106.60	106.60	0.001	PASS	0.00 ft
+0.60D	0.191	PASS	0.00 ft	1.66	1.66	106.60	106.60	0.001	PASS	0.00 ft

### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
D Only	45.212					-0.078	0.078					
+D+Lr	59.812		-0.174	-0.174		-0.104	0.104					
+D+0.750Lr	56.162		-0.130	-0.130		-0.098	0.098					
+0.60D	27.127					-0.047	0.047					
Lr Only	14.600		-0.174	-0.174		-0.026	0.026					

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	59.812		-0.174	-0.174		-0.104	0.104					

## Steel Column

File: 221019-VIP Products.ec6

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** c1 - typical column -case II (Dead load both sides/ Live load one side only)

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
"	Minimum	14.600		-0.174	-0.174		-0.026	0.026					
Reaction, X-X Axis Base	Maximum	45.212					-0.078	0.078					
"	Minimum	14.600		-0.174	-0.174		-0.026	0.026					
Reaction, Y-Y Axis Base	Maximum	14.600		-0.174	-0.174		-0.026	0.026					
"	Minimum	59.812		-0.174	-0.174		-0.104	0.104					
Reaction, X-X Axis Top	Maximum	45.212					-0.078	0.078					
"	Minimum	14.600		-0.174	-0.174		-0.026	0.026					
Reaction, Y-Y Axis Top	Maximum	45.212					-0.078	0.078					
"	Minimum	14.600		-0.174	-0.174		-0.026	0.026					
Moment, X-X Axis Base	Maximum	45.212					-0.078	0.078					
"	Minimum	45.212					-0.078	0.078					
Moment, Y-Y Axis Base	Maximum	45.212					-0.078	0.078					
"	Minimum	45.212					-0.078	0.078					
Moment, X-X Axis Top	Maximum	45.212					-0.078	0.078					
"	Minimum	45.212					-0.078	0.078					
Moment, Y-Y Axis Top	Maximum	45.212					-0.078	0.078					
"	Minimum	45.212					-0.078	0.078					

### Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
D Only	0.0000	in	0.000	ft	-0.075	in	20.436	ft
+D+Lr	0.1671	in	20.436	ft	-0.100	in	20.436	ft
+D+0.750Lr	0.1253	in	20.436	ft	-0.094	in	20.436	ft
+0.60D	0.0000	in	0.000	ft	-0.045	in	20.436	ft
Lr Only	0.1671	in	20.436	ft	-0.025	in	20.436	ft

### Steel Section Properties : HSS10x10x5/16

Depth	=	10.000 in	Ixx	=	172.00 in^4	J	=	271.000 in^4
Design Thick	=	0.291 in	Sxx	=	34.50 in^3			
Width	=	10.000 in	Rxx	=	3.940 in			
Wall Thick	=	0.313 in	Zx	=	40.100 in^3			
Area	=	11.100 in^2	Iyy	=	172.000 in^4	C	=	54.800 in^3
Weight	=	40.350 plf	Syy	=	34.500 in^3			
			Ryy	=	3.940 in			

Ycg = 0.000 in

## Steel Column

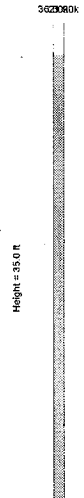
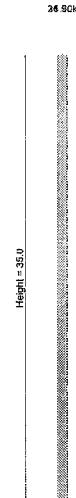
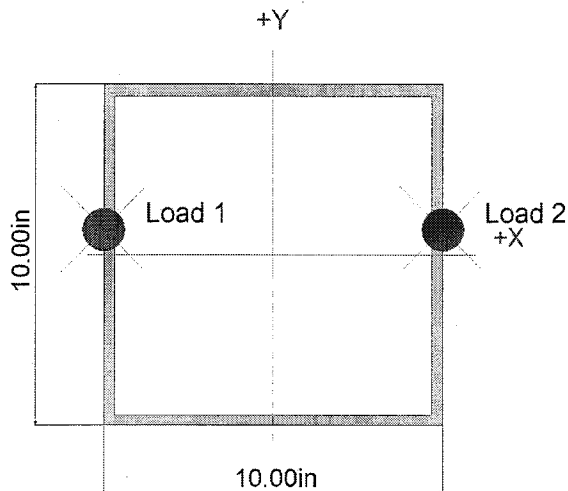
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GFG STRUCTURAL ENGINEERS

DESCRIPTION: c1 - typical column -case II (Dead load both sides/ Live load one side only)

### Sketches



## Steel Column

File: 221019-VIP Products.ec6

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** c2 - typical column -case I (Dead load and Live Load both sides)

### Code References

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

Load Combinations Used : ASCE 7-16

### General Information

Steel Section Name : **HSS10x10x5/16**  
Analysis Method : **Allowable Strength**  
Steel Stress Grade  
Fy : Steel Yield **46.0 ksi**  
E : Elastic Bending Modulus **29,000.0 ksi**

Overall Column Height **35.0 ft**  
Top & Bottom Fixity **Top & Bottom Pinned**  
Brace condition for deflection (buckling) along columns :  
X-X (width) axis :  
Unbraced Length for buckling ABOUT Y-Y Axis = 35.0 ft, K = 1.0  
Y-Y (depth) axis :  
Unbraced Length for buckling ABOUT X-X Axis = 35.0 ft, K = 1.0

### Applied Loads

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

Column self weight included : 1,412.25 lbs \* Dead Load Factor

AXIAL LOADS ...

P1: Axial Load at 35.0 ft, Xecc = -5.0 in, Yecc = 0.750 in, D = 26.30, LR = 17.60 k

P2: Axial Load at 35.0 ft, Xecc = 5.0 in, Yecc = 0.750 in, D = 21.90, LR = 14.60 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.6578 : 1**  
Load Combination **+D+Lr**  
Location of max. above base **34.765 ft**  
At maximum location values are ...  
Pa : Axial **81.812 k**  
Pn / Omega : Allowable **142.362 k**  
Ma-x : Applied **-4.991 k-ft**  
Mn-x / Omega : Allowable **86.140 k-ft**  
Ma-y : Applied **3.063 k-ft**  
Mn-y / Omega : Allowable **86.140 k-ft**

**Maximum Load Reactions ..**  
Top along X-X **0.08810 k**  
Bottom along X-X **0.08810 k**  
Top along Y-Y **0.1436 k**  
Bottom along Y-Y **0.1436 k**

**Maximum Load Deflections ...**  
Along Y-Y **-0.1380 in** at **20.436ft** above base  
for load combination : **+D+Lr**  
Along X-X **0.08467 in** at **20.436ft** above base  
for load combination : **+D+Lr**

PASS Maximum Shear Stress Ratio = **0.001635 : 1**  
Load Combination **+D+Lr**  
Location of max. above base **0.0 ft**  
At maximum location values are ...  
Va : Applied **0.1436 k**  
Vn / Omega : Allowable **87.790 k**

### Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
D Only	0.398	PASS	34.77 ft	1.66	1.66	106.60	106.60	0.001	PASS	0.00 ft	
+D+Lr	0.658	PASS	34.77 ft	1.66	1.66	106.60	106.60	0.002	PASS	0.00 ft	
+D+0.750Lr	0.593	PASS	34.77 ft	1.66	1.66	106.60	106.60	0.001	PASS	0.00 ft	
+0.60D	0.239	PASS	34.77 ft	1.66	1.66	106.60	106.60	0.001	PASS	0.00 ft	

#### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
D Only	49.612		-0.052	-0.052		-0.086	0.086					
+D+Lr	81.812		-0.088	-0.088		-0.144	0.144					
+D+0.750Lr	73.762		-0.079	-0.079		-0.129	0.129					
+0.60D	29.767		-0.031	-0.031		-0.052	0.052					
Lr Only	32.200		-0.036	-0.036		-0.058	0.058					

#### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	81.812		-0.088	-0.088		-0.144	0.144					

## Steel Column

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

DESCRIPTION: c2 - typical column -case I (Dead load and Live Load both sides)

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
"	Minimum	29.767		-0.031	-0.031		-0.052	0.052					
Reaction, X-X Axis Base	Maximum	29.767		-0.031	-0.031		-0.052	0.052					
"	Minimum	81.812		-0.088	-0.088		-0.144	0.144					
Reaction, Y-Y Axis Base	Maximum	29.767		-0.031	-0.031		-0.052	0.052					
"	Minimum	81.812		-0.088	-0.088		-0.144	0.144					
Reaction, X-X Axis Top	Maximum	29.767		-0.031	-0.031		-0.052	0.052					
"	Minimum	81.812		-0.088	-0.088		-0.144	0.144					
Reaction, Y-Y Axis Top	Maximum	49.612		-0.052	-0.052		-0.086	0.086					
"	Minimum	32.200		-0.036	-0.036		-0.058	0.058					
Moment, X-X Axis Base	Maximum	49.612			-0.052		-0.086	0.086					
"	Minimum	49.612			-0.052		-0.086	0.086					
Moment, Y-Y Axis Base	Maximum	49.612		-0.052	-0.052		-0.086	0.086					
"	Minimum	49.612		-0.052	-0.052		-0.086	0.086					
Moment, X-X Axis Top	Maximum	49.612		-0.052	-0.052		-0.086	0.086					
"	Minimum	49.612		-0.052	-0.052		-0.086	0.086					
Moment, Y-Y Axis Top	Maximum	49.612		-0.052	-0.052		-0.086	0.086					
"	Minimum	49.612		-0.052	-0.052		-0.086	0.086					

### Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
D Only	0.0503	in	20.436	ft	-0.083	in	20.436	ft
+D+Lr	0.0847	in	20.436	ft	-0.138	in	20.436	ft
+D+0.750Lr	0.0761	in	20.436	ft	-0.124	in	20.436	ft
+0.60D	0.0302	in	20.436	ft	-0.050	in	20.436	ft
Lr Only	0.0343	in	20.436	ft	-0.055	in	20.436	ft

### Steel Section Properties : HSS10x10x5/16

Depth	=	10.000 in	Ixx	=	172.00 in^4	J	=	271.000 in^4
Design Thick	=	0.291 in	Sxx	=	34.50 in^3			
Width	=	10.000 in	Rxx	=	3.940 in			
Wall Thick	=	0.313 in	Zx	=	40.100 in^3			
Area	=	11.100 in^2	Iyy	=	172.000 in^4	C	=	54.800 in^3
Weight	=	40.350 plf	Syy	=	34.500 in^3			
			Ryy	=	3.940 in			

Ycg = 0.000 in

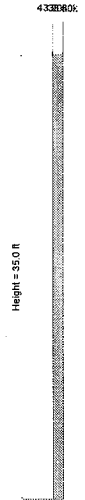
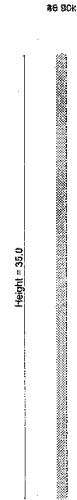
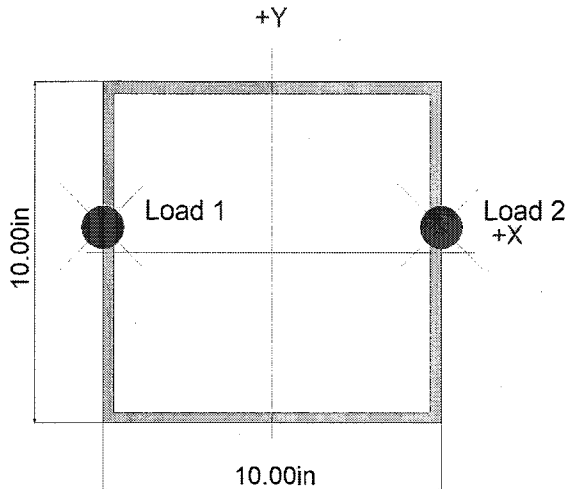
## Steel Column

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GFG STRUCTURAL ENGINEERS

DESCRIPTION: c2 - typical column -case I (Dead load and Live Load both sides)

### Sketches



## Steel Column

Lic. #: KW-06006285

File: 221019-VIP Products.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.17

GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** c2 - typical column -case II (Dead load both sides/ Live load one side only)

### Code References

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

Load Combinations Used : ASCE 7-16

### General Information

Steel Section Name :	HSS10x10x5/16	Overall Column Height	35.0 ft
Analysis Method :	Allowable Strength	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	46.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 35.0 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 35.0 ft, K = 1.0	

### Applied Loads

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

Column self weight included : 1,412.25 lbs \* Dead Load Factor

AXIAL LOADS ...

P1: Axial Load at 35.0 ft, Xecc = -5.0 in, Yecc = 0.750 in, D = 26.30, LR = 17.60 k

P2: Axial Load at 35.0 ft, Xecc = 5.0 in, Yecc = 0.750 in, D = 21.90 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

PASS	Max. Axial+Bending Stress Ratio =	0.6082 : 1	Maximum Load Reactions ..	
	Load Combination	+D+Lr	Top along X-X	0.2619 k
	Location of max.above base	34.765 ft	Bottom along X-X	0.2619 k
	At maximum location values are ...		Top along Y-Y	0.1175 k
	Pa : Axial	67.212 k	Bottom along Y-Y	0.1175 k
	Pn / Omega : Allowable	142.362 k	Maximum Load Deflections ...	
	Ma-x : Applied	-4.085 k-ft	Along Y-Y	-0.1129 in at 20.436ft above base
	Mn-x / Omega : Allowable	86.140 k-ft	for load combination : +D+Lr	
	Ma-y : Applied	9.105 k-ft	Along X-X	0.2517 in at 20.436ft above base
	Mn-y / Omega : Allowable	86.140 k-ft	for load combination : +D+Lr	
PASS	Maximum Shear Stress Ratio =	0.002983 : 1		
	Load Combination	+D+Lr		
	Location of max.above base	0.0 ft		
	At maximum location values are ...			
	Va : Applied	0.2619 k		
	Vn / Omega : Allowable	87.790 k		

### Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
D Only	0.398	PASS	34.77 ft	1.66	1.66	106.60	106.60	0.001	PASS	0.00 ft	
+D+Lr	0.608	PASS	34.77 ft	1.66	1.66	106.60	106.60	0.003	PASS	0.00 ft	
+D+0.750Lr	0.556	PASS	34.77 ft	1.66	1.66	106.60	106.60	0.002	PASS	0.00 ft	
+0.60D	0.239	PASS	34.77 ft	1.66	1.66	106.60	106.60	0.001	PASS	0.00 ft	

### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
D Only	49.612		-0.052	-0.052		-0.086	0.086					
+D+Lr	67.212		-0.262	-0.262		-0.118	0.118					
+D+0.750Lr	62.812		-0.210	-0.210		-0.110	0.110					
+0.60D	29.767		-0.031	-0.031		-0.052	0.052					
Lr Only	17.600		-0.210	-0.210		-0.031	0.031					

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	67.212		-0.262	-0.262		-0.118	0.118					



## Steel Column

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GFG STRUCTURAL ENGINEERS

Lic. #: KW-06006285

DESCRIPTION: c2 - typical column -case II (Dead load both sides/ Live load one side only)

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
"	Minimum	17.600		-0.210	-0.210		-0.031	0.031					
Reaction, X-X Axis Base	Maximum	29.767		-0.031	-0.031		-0.052	0.052					
"	Minimum	67.212		-0.262	-0.262		-0.118	0.118					
Reaction, Y-Y Axis Base	Maximum	17.600		-0.210	-0.210		-0.031	0.031					
"	Minimum	67.212		-0.262	-0.262		-0.118	0.118					
Reaction, X-X Axis Top	Maximum	29.767		-0.031	-0.031		-0.052	0.052					
"	Minimum	67.212		-0.262	-0.262		-0.118	0.118					
Reaction, Y-Y Axis Top	Maximum	49.612		-0.052	-0.052		-0.086	0.086					
"	Minimum	17.600		-0.210	-0.210		-0.031	0.031					
Moment, X-X Axis Base	Maximum	49.612			-0.052		-0.086	0.086					
"	Minimum	49.612			-0.052		-0.086	0.086					
Moment, Y-Y Axis Base	Maximum	49.612		-0.052	-0.052		-0.086	0.086					
"	Minimum	49.612		-0.052	-0.052		-0.086	0.086					
Moment, X-X Axis Top	Maximum	49.612		-0.052	-0.052		-0.086	0.086					
"	Minimum	49.612		-0.052	-0.052		-0.086	0.086					
Moment, Y-Y Axis Top	Maximum	49.612		-0.052	-0.052		-0.086	0.086					
"	Minimum	49.612		-0.052	-0.052		-0.086	0.086					

### Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
D Only	0.0503	in	20.436	ft	-0.083	in	20.436	ft
+D+Lr	0.2517	in	20.436	ft	-0.113	in	20.436	ft
+D+0.750Lr	0.2014	in	20.436	ft	-0.105	in	20.436	ft
+0.60D	0.0302	in	20.436	ft	-0.050	in	20.436	ft
Lr Only	0.2014	in	20.436	ft	-0.030	in	20.436	ft

### Steel Section Properties : HSS10x10x5/16

Depth	=	10.000 in	Ixx	=	172.00 in^4	J	=	271.000 in^4
Design Thick	=	0.291 in	Sxx	=	34.50 in^3			
Width	=	10.000 in	Rxx	=	3.940 in			
Wall Thick	=	0.313 in	Zx	=	40.100 in^3			
Area	=	11.100 in^2	Iyy	=	172.000 in^4	C	=	54.800 in^3
Weight	=	40.350 plf	Syy	=	34.500 in^3			
			Ryy	=	3.940 in			

Ycg = 0.000 in

## Steel Column

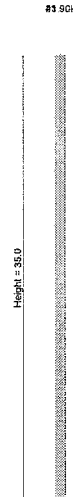
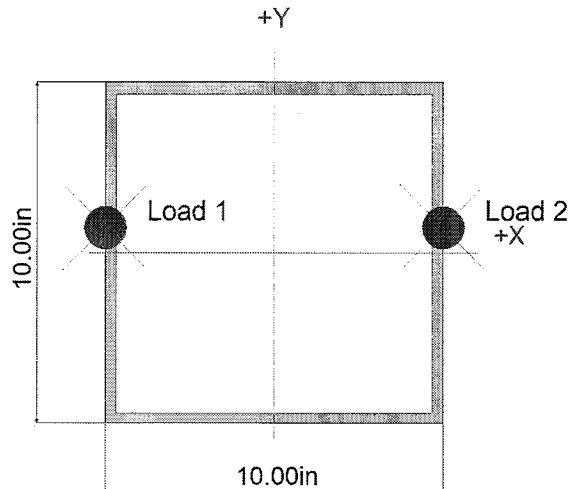
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GFG STRUCTURAL ENGINEERS

DESCRIPTION: c2 - typical column -case II (Dead load both sides/ Live load one side only)

### Sketches



## Steel Column

File: 221019-VIP Products.ec6

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** c3 - typical column -case I (Dead load and Live Load both sides)

### Code References

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

Load Combinations Used : ASCE 7-16

### General Information

Steel Section Name : **HSS10x10x5/16**  
Analysis Method : **Allowable Strength**  
Steel Stress Grade  
Fy : Steel Yield **46.0 ksi**  
E : Elastic Bending Modulus **29,000.0 ksi**

Overall Column Height **34.0 ft**  
Top & Bottom Fixity **Top & Bottom Pinned**  
Brace condition for deflection (buckling) along columns :  
X-X (width) axis :  
Unbraced Length for buckling ABOUT Y-Y Axis = 34.0 ft, K = 1.0  
Y-Y (depth) axis :  
Unbraced Length for buckling ABOUT X-X Axis = 34.0 ft, K = 1.0

### Applied Loads

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

Column self weight included : 1,371.90 lbs \* Dead Load Factor

AXIAL LOADS ...

P1: Axial Load at 34.0 ft, Xecc = -5.0 in, Yecc = 0.750 in, D = 25.50, LR = 17.0 k

P2: Axial Load at 34.0 ft, Xecc = 5.0 in, Yecc = 0.750 in, D = 25.50, LR = 17.0 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.6360 : 1**  
Load Combination **+D+Lr**  
Location of max. above base **34.0 ft**  
At maximum location values are ...  
Pa : Axial **86.372 k**  
Pn / Omega : Allowable **148.626 k**  
Ma-x : Applied **-5.313 k-ft**  
Mn-x / Omega : Allowable **86.140 k-ft**  
Ma-y : Applied **0.0 k-ft**  
Mn-y / Omega : Allowable **86.140 k-ft**

**Maximum Load Reactions ..**  
Top along X-X **0.0 k**  
Bottom along X-X **0.0 k**  
Top along Y-Y **0.1563 k**  
Bottom along Y-Y **0.1563 k**

**Maximum Load Deflections ...**  
Along Y-Y **-0.1377 in** at **19.852 ft** above base  
for load combination : **+D+Lr**  
Along X-X **0.0 in** at **0.0 ft** above base  
for load combination :

PASS Maximum Shear Stress Ratio = **0.001780 : 1**  
Load Combination **+D+Lr**  
Location of max. above base **0.0 ft**  
At maximum location values are ...  
Va : Applied **0.1563 k**  
Vn / Omega : Allowable **87.790 k**

### Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
D Only	0.385	PASS	34.00 ft	1.66	1.00	103.55	103.55	0.001	PASS	0.00 ft	
+D+Lr	0.636	PASS	34.00 ft	1.66	1.00	103.55	103.55	0.002	PASS	0.00 ft	
+D+0.750Lr	0.573	PASS	34.00 ft	1.66	1.00	103.55	103.55	0.002	PASS	0.00 ft	
+0.60D	0.231	PASS	34.00 ft	1.66	1.00	103.55	103.55	0.001	PASS	0.00 ft	

#### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
D Only	52.372					-0.094	0.094					
+D+Lr	86.372					-0.156	0.156					
+D+0.750Lr	77.872					-0.141	0.141					
+0.60D	31.423					-0.056	0.056					
Lr Only	34.000					-0.063	0.063					

#### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	86.372					-0.156	0.156			-5.312		

C16

## Steel Column

Lic. #: KW-06006285

DESCRIPTION: c3 - typical column -case I (Dead load and Live Load both sides)

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
"	Minimum	31.423					-0.056	0.056			-1.913		
Reaction, X-X Axis Base	Maximum	52.372					-0.094	0.094			-3.188		
"	Minimum	52.372					-0.094	0.094			-3.188		
Reaction, Y-Y Axis Base	Maximum	31.423					-0.056	0.056			-1.913		
"	Minimum	86.372					-0.156	0.156			-5.312		
Reaction, X-X Axis Top	Maximum	52.372					-0.094	0.094			-3.188		
"	Minimum	52.372					-0.094	0.094			-3.188		
Reaction, Y-Y Axis Top	Maximum	52.372					-0.094	0.094			-3.188		
"	Minimum	34.000					-0.063	0.063			-2.125		
Moment, X-X Axis Base	Maximum	52.372					-0.094	0.094			-3.188		
"	Minimum	52.372					-0.094	0.094			-3.188		
Moment, Y-Y Axis Base	Maximum	52.372					-0.094	0.094					-3.188
"	Minimum	52.372					-0.094	0.094					-3.188
Moment, X-X Axis Top	Maximum	31.423					-0.056	0.056			-1.913		
"	Minimum	86.372					-0.156	0.156			-5.312		
Moment, Y-Y Axis Top	Maximum	52.372					-0.094	0.094			-3.188		
"	Minimum	52.372					-0.094	0.094			-3.188		

### Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
D Only	0.0000	in	0.000	ft	-0.083	in	19.852	ft
+D+Lr	0.0000	in	0.000	ft	-0.138	in	19.852	ft
+D+0.750Lr	0.0000	in	0.000	ft	-0.124	in	19.852	ft
+0.60D	0.0000	in	0.000	ft	-0.050	in	19.852	ft
Lr Only	0.0000	in	0.000	ft	-0.055	in	19.852	ft

### Steel Section Properties : HSS10x10x5/16

Depth	=	10.000 in	I xx	=	172.00 in^4	J	=	271.000 in^4
Design Thick	=	0.291 in	S xx	=	34.50 in^3			
Width	=	10.000 in	R xx	=	3.940 in			
Wall Thick	=	0.313 in	Zx	=	40.100 in^3			
Area	=	11.100 in^2	I yy	=	172.000 in^4	C	=	54.800 in^3
Weight	=	40.350 plf	S yy	=	34.500 in^3			
			R yy	=	3.940 in			

Ycg = 0.000 in

## Steel Column

Lic. # : KW-06006285

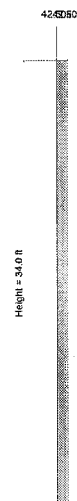
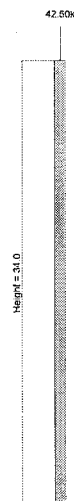
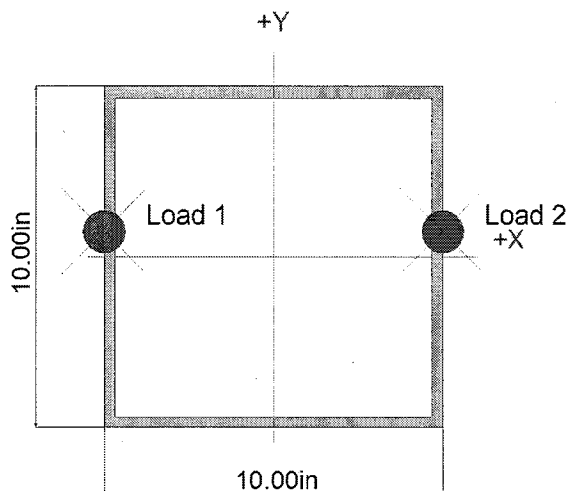
File: 221019-VIP Products.ec6

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GFG STRUCTURAL ENGINEERS

DESCRIPTION: c3 - typical column -case I (Dead load and Live Load both sides)

### Sketches



## Steel Column

Lic. #: KW-06006285

**DESCRIPTION:** c3 - typical column -case II (Dead load both sides/ Live load one side only)

### Code References

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

Load Combinations Used : ASCE 7-16

### General Information

Steel Section Name :	<b>HSS10x10x5/16</b>	Overall Column Height	34 ft
Analysis Method :	Allowable Strength	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	46.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 34 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 34 ft, K = 1.0	

### Applied Loads

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

Column self weight included : 1,371.90 lbs \* Dead Load Factor

AXIAL LOADS ...

P1: Axial Load at 34.0 ft, Xecc = -5.0 in, Yecc = 0.750 in, D = 25.50, LR = 17.0 k

P2: Axial Load at 34.0 ft, Xecc = 5.0 in, Yecc = 0.750 in, D = 25.50 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

PASS	Max. Axial+Bending Stress Ratio =	0.5837 : 1	Maximum Load Reactions ..	
	Load Combination	+D+Lr	Top along X-X	0.2083 k
	Location of max.above base	34.0 ft	Bottom along X-X	0.2083 k
	At maximum location values are ...		Top along Y-Y	0.1250 k
	Pa : Axial	69.372 k	Bottom along Y-Y	0.1250 k
	Pn / Omega : Allowable	148.626 k	Maximum Load Deflections ...	
	Ma-x : Applied	-4.250 k-ft	Along Y-Y	-0.1101 in at 19.852 ft above base
	Mn-x / Omega : Allowable	86.140 k-ft	for load combination : +D+Lr	
	Ma-y : Applied	7.083 k-ft	Along X-X	0.1836 in at 19.852 ft above base
	Mn-y / Omega : Allowable	86.140 k-ft	for load combination : Lr Only	
PASS	Maximum Shear Stress Ratio =	0.002373 : 1		
	Load Combination	+D+Lr		
	Location of max.above base	0.0 ft		
	At maximum location values are ...			
	Va : Applied	0.2083 k		
	Vn / Omega : Allowable	87.790 k		

### Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
D Only	0.385	PASS	34.00 ft	1.66	1.66	103.55	103.55	0.001	PASS	0.00 ft	
+D+Lr	0.584	PASS	34.00 ft	1.66	1.66	103.55	103.55	0.002	PASS	0.00 ft	
+D+0.750Lr	0.534	PASS	34.00 ft	1.66	1.66	103.55	103.55	0.002	PASS	0.00 ft	
+0.60D	0.231	PASS	34.00 ft	1.66	1.66	103.55	103.55	0.001	PASS	0.00 ft	

### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
D Only	52.372					-0.094	0.094					
+D+Lr	69.372		-0.208	-0.208		-0.125	0.125					
+D+0.750Lr	65.122		-0.156	-0.156		-0.117	0.117					
+0.60D	31.423					-0.056	0.056					
Lr Only	17.000		-0.208	-0.208		-0.031	0.031					

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	69.372		-0.208	-0.208		-0.125	0.125			-4.250		7.083

## Steel Column

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

DESCRIPTION: c3 - typical column -case II (Dead load both sides/ Live load one side only)

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
"	Minimum	17.000		-0.208	-0.208		-0.031	0.031			-1.063		7.083
Reaction, X-X Axis Base	Maximum	52.372					-0.094	0.094			-3.188		
"	Minimum	17.000		-0.208	-0.208		-0.031	0.031			-1.063		7.083
Reaction, Y-Y Axis Base	Maximum	17.000		-0.208	-0.208		-0.031	0.031			-1.063		7.083
"	Minimum	69.372		-0.208	-0.208		-0.125	0.125			-4.250		7.083
Reaction, X-X Axis Top	Maximum	52.372					-0.094	0.094			-3.188		
"	Minimum	17.000		-0.208	-0.208		-0.031	0.031			-1.063		7.083
Reaction, Y-Y Axis Top	Maximum	52.372					-0.094	0.094			-3.188		
"	Minimum	17.000		-0.208	-0.208		-0.031	0.031			-1.063		7.083
Moment, X-X Axis Base	Maximum	52.372					-0.094	0.094			-3.188		
"	Minimum	52.372					-0.094	0.094			-3.188		
Moment, Y-Y Axis Base	Maximum	52.372					-0.094	0.094					-3.188
"	Minimum	52.372					-0.094	0.094					-3.188
Moment, X-X Axis Top	Maximum	17.000		-0.208	-0.208		-0.031	0.031			-1.063		7.083
"	Minimum	69.372		-0.208	-0.208		-0.125	0.125			-4.250		7.083
Moment, Y-Y Axis Top	Maximum	17.000		-0.208	-0.208		-0.031	0.031			-1.063		7.083
"	Minimum	52.372					-0.094	0.094			-3.188		

### Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
D Only	0.0000	in	0.000	ft	-0.083	in	19.852	ft
+D+Lr	0.1836	in	19.852	ft	-0.110	in	19.852	ft
+D+0.750Lr	0.1377	in	19.852	ft	-0.103	in	19.852	ft
+0.60D	0.0000	in	0.000	ft	-0.050	in	19.852	ft
Lr Only	0.1836	in	19.852	ft	-0.028	in	19.852	ft

### Steel Section Properties : HSS10x10x5/16

Depth	=	10.000 in	I xx	=	172.00 in^4	J	=	271.000 in^4
Design Thick	=	0.291 in	S xx	=	34.50 in^3			
Width	=	10.000 in	R xx	=	3.940 in			
Wall Thick	=	0.313 in	Zx	=	40.100 in^3			
Area	=	11.100 in^2	I yy	=	172.000 in^4	C	=	54.800 in^3
Weight	=	40.350 plf	S yy	=	34.500 in^3			
			R yy	=	3.940 in			

Ycg = 0.000 in

## Steel Column

Lic. #: KW-06006285

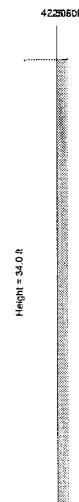
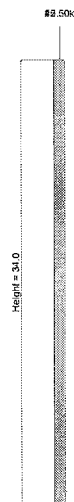
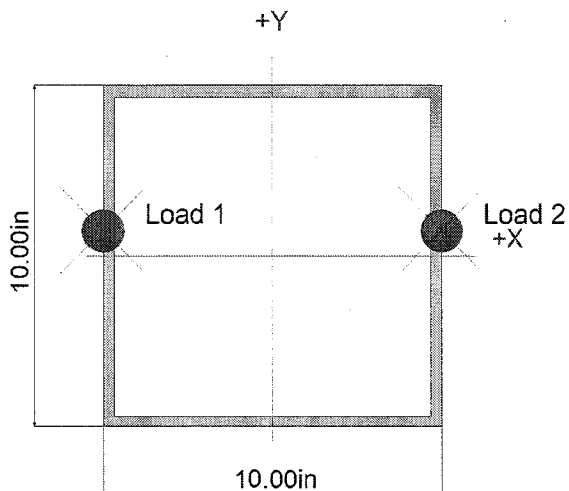
File: 221019-VIP Products.ec6

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GFG STRUCTURAL ENGINEERS

DESCRIPTION: c3 - typical column -case II (Dead load both sides/ Live load one side only)

### Sketches





## Steel Column

Lic. #: KW-06006285

**DESCRIPTION:** c4 - typical column -case I (Dead load and Live Load both sides)

### Code References

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

Load Combinations Used : ASCE 7-16

### General Information

Steel Section Name : **HSS10x10x5/16**  
Analysis Method : **Allowable Strength**  
Steel Stress Grade  
Fy : Steel Yield **46.0 ksi**  
E : Elastic Bending Modulus **29,000.0 ksi**

Overall Column Height **34.0 ft**  
Top & Bottom Fixity **Top & Bottom Pinned**  
Brace condition for deflection (buckling) along columns :  
X-X (width) axis :  
Unbraced Length for buckling ABOUT Y-Y Axis = 34.0 ft, K = 1.0  
Y-Y (depth) axis :  
Unbraced Length for buckling ABOUT X-X Axis = 34.0 ft, K = 1.0

### Applied Loads

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

Column self weight included : 1,371.90 lbs \* Dead Load Factor

AXIAL LOADS ...

P1: Axial Load at 34.0 ft, Xecc = -5.0 in, Yecc = 0.750 in, D = 30.70, LR = 20.50 k

P2: Axial Load at 34.0 ft, Xecc = 5.0 in, Yecc = 0.750 in, D = 25.50, LR = 17.0 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.7375 : 1**  
Load Combination **+D+Lr**  
Location of max.above base **34.0 ft**  
At maximum location values are ...  
Pa : Axial **95.072 k**  
Pn / Omega : Allowable **148.626 k**  
Ma-x : Applied **-5.856 k-ft**  
Mn-x / Omega : Allowable **86.140 k-ft**  
Ma-y : Applied **3.625 k-ft**  
Mn-y / Omega : Allowable **86.140 k-ft**

PASS Maximum Shear Stress Ratio = **0.001962 : 1**  
Load Combination **+D+Lr**  
Location of max.above base **0.0 ft**  
At maximum location values are ...  
Va : Applied **0.1722 k**  
Vn / Omega : Allowable **87.790 k**

#### Maximum Load Reactions ...

Top along X-X **0.1066 k**  
Bottom along X-X **0.1066 k**  
Top along Y-Y **0.1722 k**  
Bottom along Y-Y **0.1722 k**

#### Maximum Load Deflections ...

Along Y-Y **-0.1518 in** at **19.852ft** above base  
for load combination : **+D+Lr**  
Along X-X **0.09394 in** at **19.852ft** above base  
for load combination : **+D+Lr**

### Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios								Maximum Shear Ratios		
	Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry		Stress Ratio	Status	Location
D Only	0.446	PASS	34.00 ft	1.66	1.66	103.55	103.55		0.001	PASS	0.00 ft
+D+Lr	0.738	PASS	34.00 ft	1.66	1.66	103.55	103.55		0.002	PASS	0.00 ft
+D+0.750Lr	0.665	PASS	34.00 ft	1.66	1.66	103.55	103.55		0.002	PASS	0.00 ft
+0.60D	0.268	PASS	34.00 ft	1.66	1.66	103.55	103.55		0.001	PASS	0.00 ft

#### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
D Only	57.572		-0.064	-0.064		-0.103	0.103					
+D+Lr	95.072		-0.107	-0.107		-0.172	0.172					
+D+0.750Lr	85.697		-0.096	-0.096		-0.155	0.155					
+0.60D	34.543		-0.038	-0.038		-0.062	0.062					
Lr Only	37.500		-0.043	-0.043		-0.069	0.069					

#### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	95.072		-0.107	-0.107		-0.172	0.172			-5.856		3.625

## Steel Column

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GFG STRUCTURAL ENGINEERS

Lic. #: KW-06006285

DESCRIPTION: c4 - typical column -case I (Dead load and Live Load both sides)

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
"	Minimum	34.543		-0.038	-0.038		-0.062	0.062				-2.108	1.300
Reaction, X-X Axis Base	Maximum	34.543		-0.038	-0.038		-0.062	0.062				-2.108	1.300
"	Minimum	95.072		-0.107	-0.107		-0.172	0.172				-5.856	3.625
Reaction, Y-Y Axis Base	Maximum	34.543		-0.038	-0.038		-0.062	0.062				-2.108	1.300
"	Minimum	95.072		-0.107	-0.107		-0.172	0.172				-5.856	3.625
Reaction, X-X Axis Top	Maximum	34.543		-0.038	-0.038		-0.062	0.062				-2.108	1.300
"	Minimum	95.072		-0.107	-0.107		-0.172	0.172				-5.856	3.625
Reaction, Y-Y Axis Top	Maximum	57.572		-0.064	-0.064		-0.103	0.103				-3.512	2.167
"	Minimum	37.500		-0.043	-0.043		-0.069	0.069				-2.344	1.458
Moment, X-X Axis Base	Maximum	57.572			-0.064		-0.103	0.103				-3.512	2.167
"	Minimum	57.572			-0.064		-0.103	0.103				-3.512	2.167
Moment, Y-Y Axis Base	Maximum	57.572		-0.064	-0.064		-0.103	0.103				2.167	-3.512
"	Minimum	57.572		-0.064	-0.064		-0.103	0.103				2.167	-3.512
Moment, X-X Axis Top	Maximum	34.543		-0.038	-0.038		-0.062	0.062				-2.108	1.300
"	Minimum	95.072		-0.107	-0.107		-0.172	0.172				-5.856	3.625
Moment, Y-Y Axis Top	Maximum	95.072		-0.107	-0.107		-0.172	0.172				-5.856	3.625
"	Minimum	34.543		-0.038	-0.038		-0.062	0.062				-2.108	1.300

### Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
D Only	0.0561	in	19.852	ft	-0.091	in	19.852	ft
+D+Lr	0.0939	in	19.852	ft	-0.152	in	19.852	ft
+D+0.750Lr	0.0845	in	19.852	ft	-0.137	in	19.852	ft
+0.60D	0.0337	in	19.852	ft	-0.055	in	19.852	ft
Lr Only	0.0378	in	19.852	ft	-0.061	in	19.852	ft

### Steel Section Properties : HSS10x10x5/16

Depth	=	10.000 in	I xx	=	172.00 in^4	J	=	271.000 in^4
Design Thick	=	0.291 in	S xx	=	34.50 in^3			
Width	=	10.000 in	R xx	=	3.940 in			
Wall Thick	=	0.313 in	Zx	=	40.100 in^3			
Area	=	11.100 in^2	I yy	=	172.000 in^4	C	=	54.800 in^3
Weight	=	40.350 plf	S yy	=	34.500 in^3			
			R yy	=	3.940 in			

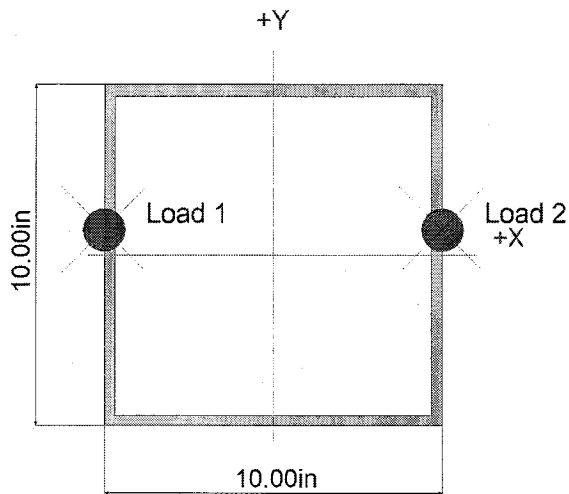
Ycg = 0.000 in

## Steel Column

Lic. #: KW-06006285

DESCRIPTION: c4 - typical column -case I (Dead load and Live Load both sides)

### Sketches



C24

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## Steel Column

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Lic. #: KW-06006285

DESCRIPTION: c4 - typical column -case II (Dead load both sides/ Live load one side only)

### Code References

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

Load Combinations Used : ASCE 7-16

### General Information

Steel Section Name :	<b>HSS10x10x5/16</b>	Overall Column Height	34.0 ft
Analysis Method :	Allowable Strength	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade		Brace condition for deflection (buckling) along columns :	
Fy : Steel Yield	46.0 ksi	X-X (width) axis :	
E : Elastic Bending Modulus	29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 34.0 ft, K = 1.0	
		Y-Y (depth) axis :	
		Unbraced Length for buckling ABOUT X-X Axis = 34.0 ft, K = 1.0	

### Applied Loads

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

Column self weight included : 1,371.90 lbs \* Dead Load Factor

AXIAL LOADS ...

P1: Axial Load at 34.0 ft, Xecc = -5.0 in, Yecc = 0.750 in, D = 30.70, LR = 20.50 k

P2: Axial Load at 34.0 ft, Xecc = 5.0 in, Yecc = 0.750 in, D = 25.50 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

PASS	Max. Axial+Bending Stress Ratio =	0.6853 : 1	Maximum Load Reactions ..	
	Load Combination	+D+Lr	Top along X-X	0.3150 k
	Location of max.above base	34.0 ft	Bottom along X-X	0.3150 k
	At maximum location values are ...		Top along Y-Y	0.1410 k
	Pa : Axial	78.072 k	Bottom along Y-Y	0.1410 k
	Pn / Omega : Allowable	148.626 k	Maximum Load Deflections ...	
	Ma-x : Applied	-4.794 k-ft	Along Y-Y	-0.1242 in at 19.852 ft above base
	Mn-x / Omega : Allowable	86.140 k-ft	for load combination : +D+Lr	
	Ma-y : Applied	10.708 k-ft	Along X-X	0.2775 in at 19.852 ft above base
	Mn-y / Omega : Allowable	86.140 k-ft	for load combination : +D+Lr	
PASS	Maximum Shear Stress Ratio =	0.003588 : 1		
	Load Combination	+D+Lr		
	Location of max.above base	0.0 ft		
	At maximum location values are ...			
	Va : Applied	0.3150 k		
	Vn / Omega : Allowable	87.790 k		

### Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios				CbX	CbY	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location						Stress Ratio	Status	Location
D Only	0.446	PASS	34.00 ft		1.66	1.66	103.55	103.55	0.001	PASS	0.00 ft
+D+Lr	0.685	PASS	34.00 ft		1.66	1.66	103.55	103.55	0.004	PASS	0.00 ft
+D+0.750Lr	0.625	PASS	34.00 ft		1.66	1.66	103.55	103.55	0.003	PASS	0.00 ft
+0.60D	0.268	PASS	34.00 ft		1.66	1.66	103.55	103.55	0.001	PASS	0.00 ft

### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
D Only	57.572		-0.064	-0.064		-0.103	0.103					
+D+Lr	78.072		-0.315	-0.315		-0.141	0.141					
+D+0.750Lr	72.947		-0.252	-0.252		-0.132	0.132					
+0.60D	34.543		-0.038	-0.038		-0.062	0.062					
Lr Only	20.500		-0.251	-0.251		-0.038	0.038					

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	78.072		-0.315	-0.315		-0.141	0.141			-4.794		10.708

## Steel Column

Lic. #: KW-06006285

DESCRIPTION: c4 - typical column -case II (Dead load both sides/ Live load one side only)

### Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
"	Minimum	20.500		-0.251	-0.251		-0.038	0.038				-1.281	8.542
Reaction, X-X Axis Base	Maximum	34.543		-0.038	-0.038		-0.062	0.062				-2.108	1.300
"	Minimum	78.072		-0.315	-0.315		-0.141	0.141				-4.794	10.708
Reaction, Y-Y Axis Base	Maximum	20.500		-0.251	-0.251		-0.038	0.038				-1.281	8.542
"	Minimum	78.072		-0.315	-0.315		-0.141	0.141				-4.794	10.708
Reaction, X-X Axis Top	Maximum	34.543		-0.038	-0.038		-0.062	0.062				-2.108	1.300
"	Minimum	78.072		-0.315	-0.315		-0.141	0.141				-4.794	10.708
Reaction, Y-Y Axis Top	Maximum	57.572		-0.064	-0.064		-0.103	0.103				-3.512	2.167
"	Minimum	20.500		-0.251	-0.251		-0.038	0.038				-1.281	8.542
Moment, X-X Axis Base	Maximum	57.572			-0.064		-0.103	0.103				-3.512	2.167
"	Minimum	57.572			-0.064		-0.103	0.103				-3.512	2.167
Moment, Y-Y Axis Base	Maximum	57.572		-0.064	-0.064		-0.103	0.103				2.167	-3.512
"	Minimum	57.572		-0.064	-0.064		-0.103	0.103				2.167	-3.512
Moment, X-X Axis Top	Maximum	20.500		-0.251	-0.251		-0.038	0.038				-1.281	8.542
"	Minimum	78.072		-0.315	-0.315		-0.141	0.141				-4.794	10.708
Moment, Y-Y Axis Top	Maximum	78.072		-0.315	-0.315		-0.141	0.141				-4.794	10.708
"	Minimum	34.543		-0.038	-0.038		-0.062	0.062				-2.108	1.300

### Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
D Only	0.0561	in	19.852	ft	-0.091	in	19.852	ft
+D+Lr	0.2775	in	19.852	ft	-0.124	in	19.852	ft
+D+0.750Lr	0.2222	in	19.852	ft	-0.116	in	19.852	ft
+0.60D	0.0337	in	19.852	ft	-0.055	in	19.852	ft
Lr Only	0.2213	in	19.852	ft	-0.033	in	19.852	ft

### Steel Section Properties : HSS10x10x5/16

Depth	=	10.000 in	I xx	=	172.00 in^4	J	=	271.000 in^4
Design Thick	=	0.291 in	S xx	=	34.50 in^3			
Width	=	10.000 in	R xx	=	3.940 in			
Wall Thick	=	0.313 in	Zx	=	40.100 in^3			
Area	=	11.100 in^2	I yy	=	172.000 in^4	C	=	54.800 in^3
Weight	=	40.350 plf	S yy	=	34.500 in^3			
			R yy	=	3.940 in			

Ycg = 0.000 in

Steel Column

Lic. # : KW-06006285

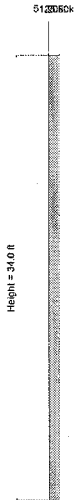
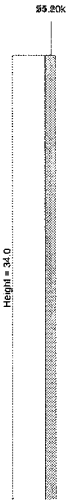
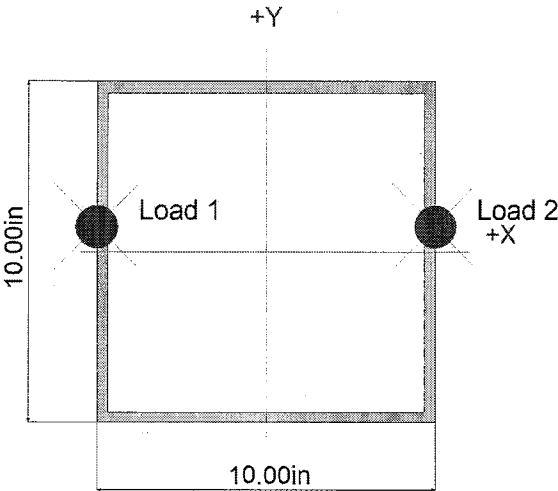
File: 221019-VIP Products.ec6

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GFG STRUCTURAL ENGINEERS

DESCRIPTION: c4 - typical column -case II (Dead load both sides/ Live load one side only)

Sketches



## Steel Base Plate

Lic. #: KW-06006285

DESCRIPTION: c1/c2/c3/c4 base plate (worst case is C4)

### Code References

Calculations per AISC Design Guide # 1, IBC 2018, CBC 2019, ASCE 7-16, AISC 360-16

Load Combination Set : ASCE 7-16

### General Information

#### Material Properties

AISC Design Method      Load Resistance Factor Design  
 Steel Plate  $F_y$                 =                36.0 ksi  
 Concrete Support  $f'_c$                 =                2.50 ksi  
 Assumed Bearing Area : Full Bearing

$\Phi_c$  : LRFD Resistance Factor                0.60

Nominal Bearing  $F_p$  per J8                4.250 ksi

### Column & Plate

#### Column Properties

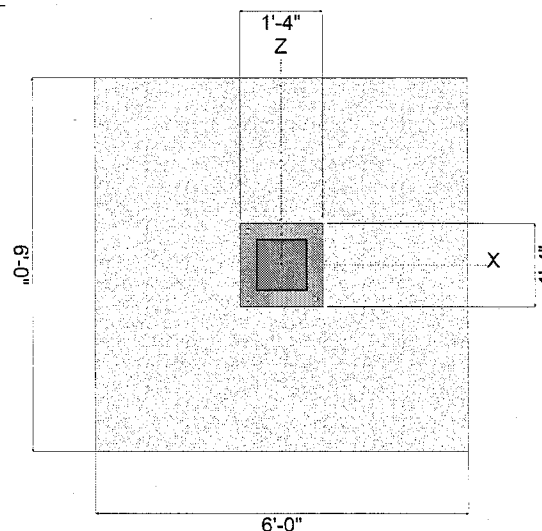
Steel Section : HSS10x10x5/16  
 Depth                10 in                Area                11.1 in<sup>2</sup>  
 Width                10 in                 $I_{xx}$                 in<sup>4</sup>  
 Flange Thickness      0.291 in                 $I_{yy}$                 in<sup>4</sup>  
 Web Thickness                in

#### Plate Dimensions

N : Length                16.0 in  
 B : Width                16.0 in  
 Thickness                1.0 in  
 Column assumed welded to base plate.

#### Support Dimensions

Width along "X"                72.0 in  
 Length along "Z"                72.0 in



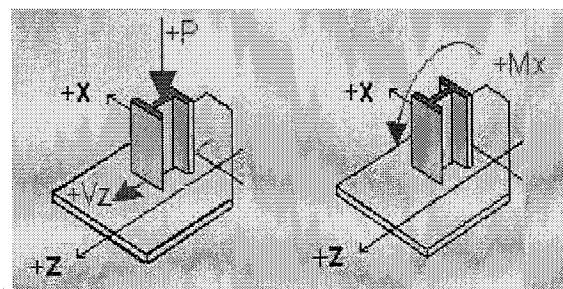
### Applied Loads

	P-Y	V-Z	M-X
D : Dead Load .....	56.20 k	k	k-ft
L : Live .....	k	k	k-ft
Lr : Roof Live .....	37.70 k	k	k-ft
S : Snow .....	k	k	k-ft
W : Wind .....	k	k	k-ft
E : Earthquake .....	k	k	k-ft
H : Lateral Earth .....	k	k	k-ft

"P" = Gravity load, "+" sign is downward.

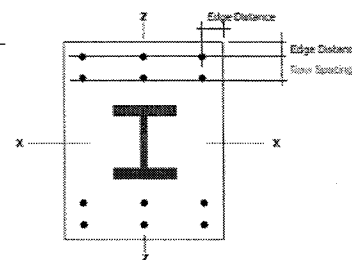
"+" Moments create higher soil pressure at +Z edge.

"+" Shears push plate towards +Z edge.



### Anchor Bolts

Anchor Bolt or Rod Description	3/4" dia
Max of Tension or Pullout Capacity.....	k
Shear Capacity.....	k
Edge distance : bolt to plate.....	1.50 in
Number of Bolts in each Row.....	2.0
Number of Bolt Rows.....	1.0



## Steel Base Plate

Lic. #: KW-06006285

DESCRIPTION: c1/c2/c3/c4 base plate (worst case is C4)

### GOVERNING DESIGN LOAD CASE SUMMARY

#### Plate Design Summary

Design Method	Load Resistance Factor Design
Governing Load Combination	+1.20D+1.60Lr
Governing Load Case Type	Axial Load Only
Governing STRESS RATIO	0.2169
Design Plate Size	1'-4" x 1'-4" x 1"
Pu : Axial .....	0.000 k
Mu : Moment .....	0.000 k-ft

Mu : Max. Moment .....	2.636 k-in
fb : Max. Bending Stress .....	7.028 ksi
Fb : Allowable :	32.400 ksi
Fy * Phi	
Bending Stress Ratio	0.217
	<b>Bending Stress OK</b>
fu : Max. Plate Bearing Stress ....	0.499 ksi
Fp : Allowable :	2.550 ksi
Bearing Stress Ratio	0.196
	<b>Bearing Stress OK</b>

### Load Comb. : +1.40D

### Axial Load Only, No Moment

#### Loading

Pu : Axial .....	78.680 k
Design Plate Height .....	16.000 in
Design Plate Width .....	16.000 in
<i>Will be different from entry if partial bearing used.</i>	
A1 : Plate Area .....	256.000 in^2
A2 : Support Area .....	5,184.000 in^2
sqrt( A2/A1 )	2.000

#### Bearing Stresses

Fp : Allowable .....	2.550 ksi
fu : Max. Bearing Pressure	0.307 ksi
<b>Stress Ratio</b> .....	<b>0.121</b>

#### Plate Bending Stresses

Mmax = Fu * L^2 / 2 .....	1.623 k-in
fb : Actual .....	4.328 ksi
Fb : Allowable .....	32.400 ksi
<b>Stress Ratio</b> .....	<b>0.134</b>

#### Distance for Moment Calculation

" m " .....	3.250 in
" n " .....	3.250 in
X .....	0.000 in^2
Lambda .....	0.000
n' .....	0.000 in
n' * Lambda .....	0.000 in
L = max(m, n, n') .....	3.250 in

### Load Comb. : +1.20D+0.50Lr

### Axial Load Only, No Moment

#### Loading

Pu : Axial .....	86.290 k
Design Plate Height .....	16.000 in
Design Plate Width .....	16.000 in
<i>Will be different from entry if partial bearing used.</i>	
A1 : Plate Area .....	256.000 in^2
A2 : Support Area .....	5,184.000 in^2
sqrt( A2/A1 )	2.000

#### Bearing Stresses

Fp : Allowable .....	2.550 ksi
fu : Max. Bearing Pressure	0.337 ksi
<b>Stress Ratio</b> .....	<b>0.132</b>

#### Plate Bending Stresses

Mmax = Fu * L^2 / 2 .....	1.780 k-in
fb : Actual .....	4.747 ksi
Fb : Allowable .....	32.400 ksi
<b>Stress Ratio</b> .....	<b>0.147</b>

#### Distance for Moment Calculation

" m " .....	3.250 in
" n " .....	3.250 in
X .....	0.000 in^2
Lambda .....	0.000
n' .....	0.000 in
n' * Lambda .....	0.000 in
L = max(m, n, n') .....	3.250 in



## Steel Base Plate

Lic. #: KW-06006285

DESCRIPTION: c1/c2/c3/c4 base plate (worst case is C4)

### Load Comb. : +1.20D

Axial Load Only, No Moment

#### Loading

Pu : Axial .....	67.440 k
Design Plate Height .....	16.000 in
Design Plate Width .....	16.000 in
<i>Will be different from entry if partial bearing used.</i>	
A1 : Plate Area .....	256.000 in^2
A2: Support Area .....	5,184.000 in^2
sqrt( A2/A1 )	2.000

#### Distance for Moment Calculation

" m " .....	3.250 in
" n " .....	3.250 in
X .....	0.000 in^2
Lambda .....	0.000
n' .....	0.000 in
n' * Lambda .....	0.000 in
L = max(m, n, n") .....	3.250 in

#### Bearing Stresses

Fp : Allowable .....	2.550 ksi
fu : Max. Bearing Pressure	0.263 ksi
Stress Ratio .....	0.103

#### Plate Bending Stresses

Mmax = Fu * L^2 / 2 .....	1.391 k-in
fb : Actual .....	3.710 ksi
Fb : Allowable .....	32.400 ksi
Stress Ratio .....	0.115

### Load Comb. : +1.20D+1.60Lr

Axial Load Only, No Moment

#### Loading

Pu : Axial .....	127.760 k
Design Plate Height .....	16.000 in
Design Plate Width .....	16.000 in
<i>Will be different from entry if partial bearing used.</i>	
A1 : Plate Area .....	256.000 in^2
A2: Support Area .....	5,184.000 in^2
sqrt( A2/A1 )	2.000

#### Distance for Moment Calculation

" m " .....	3.250 in
" n " .....	3.250 in
X .....	0.000 in^2
Lambda .....	0.000
n' .....	0.000 in
n' * Lambda .....	0.000 in
L = max(m, n, n") .....	3.250 in

#### Bearing Stresses

Fp : Allowable .....	2.550 ksi
fu : Max. Bearing Pressure	0.499 ksi
Stress Ratio .....	0.196

#### Plate Bending Stresses

Mmax = Fu * L^2 / 2 .....	2.636 k-in
fb : Actual .....	7.028 ksi
Fb : Allowable .....	32.400 ksi
Stress Ratio .....	0.217

### Load Comb. : +0.90D

Axial Load Only, No Moment

#### Loading

Pu : Axial .....	50.580 k
Design Plate Height .....	16.000 in
Design Plate Width .....	16.000 in
<i>Will be different from entry if partial bearing used.</i>	
A1 : Plate Area .....	256.000 in^2
A2: Support Area .....	5,184.000 in^2
sqrt( A2/A1 )	2.000

#### Distance for Moment Calculation

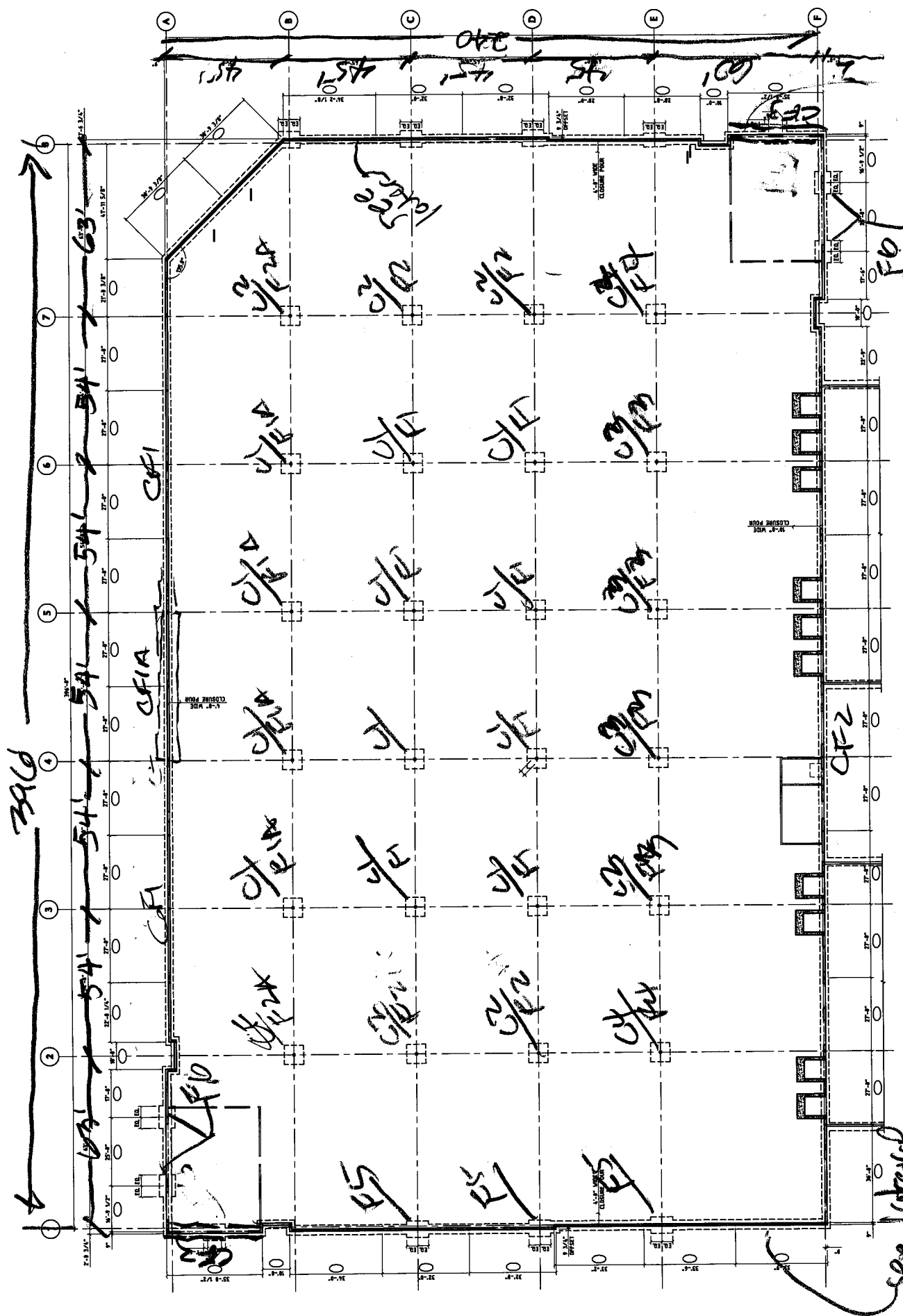
" m " .....	3.250 in
" n " .....	3.250 in
X .....	0.000 in^2
Lambda .....	0.000
n' .....	0.000 in
n' * Lambda .....	0.000 in
L = max(m, n, n") .....	3.250 in

#### Bearing Stresses

Fp : Allowable .....	2.550 ksi
fu : Max. Bearing Pressure	0.198 ksi
Stress Ratio .....	0.077

#### Plate Bending Stresses

Mmax = Fu * L^2 / 2 .....	1.043 k-in
fb : Actual .....	2.783 ksi
Fb : Allowable .....	32.400 ksi
Stress Ratio .....	0.086



# Fernstudienplan

see later  
for wall on  
line

# Foundation Design

Allowable  $P_{RG} = 2000 \text{ psf}$   
 @ 1'-6" Min Below  
 Lowest Adj. Grade

DATE 3/21/22	JOB NO. 221019	SHEET NO. OF 82
JOB: VIP		
BY: MBS		
GF Group Structural Engineers		

F1

$$\begin{aligned} P_D &= 43.7 \\ P_L &= 29.2 \\ P_T &= 72.9 \end{aligned} \quad \text{see C1}$$

USE 6'-6" SQ x 1'-2" THICK  
 w/ (8) #5 E/W  
 (see circular)

F1A

$$\begin{aligned} P_D &= 43.7 \\ P_L &= 29.2 \\ P_T &= 72.9 \end{aligned} \quad \text{see C1}$$

USE 7'-0" SQ x 1'-0" THICK  
 w/ (7) #6 E/W  
 (see circular)

F2

$$\begin{aligned} P_D &= 48.2 \\ P_L &= 32.1 \\ P_T &= 80.3 \end{aligned} \quad \text{see C2}$$

USE 7'-0" SQ x 1'-6" THICK  
 w/ (7) #6 E/W  
 (see circular)

F2A

$$\begin{aligned} P_D &= 48.2 \\ P_L &= 32.1 \\ P_T &= 80.3 \end{aligned} \quad \text{see C2}$$

USE 7'-0" SQ x 2'-4" THICK  
 w/ (8) #6 EACH WAY  
 (see circular)

# FOUNDATION DESIGN

43

$$P_0 = 51.0$$
$$R = 34.0$$

85.0

See C3

USE  $7'-0" \times 1'-6" \text{ PLUC}$   
w/ (7) #6 @ 12"  
(see enercalc)

K41

$P_{10} = 56.2$

$$R_L \rightarrow 37.5$$
$$R_L = 93.7$$

> see C4

USE 7'-0" SQ x 2'-4" DIA  
W/ (8) #6 E/BV  
(SEE ENCL)

DATE 3/2	JOB NO. 221014	SHEET NO. OF 2
JOB: VLP BY: M36		
GF Group Structural Engineers		

# FOUNDATION DESIGN

DATE 3/21	JOB NO. 221019	SHEET NO. OF 44
JOB: VIP		
BY: MAB		
GF Group Structural Engineers		

F5

$$\begin{aligned} \text{Panel wt} &= 42.33 (.100) \times 8 = 35.9^k \\ \text{BURNER ROOM} &= \frac{65}{2} \left( \frac{60+45}{2} \right) (.018) = 30.7 \\ &= \frac{65}{2} \left( \frac{60+45}{2} \right) (.012) = 20.5^k \\ &= 87.1^k \text{ TL} \end{aligned}$$

USE 8'-0" x 6'-0" x 16" HPC  
w/ (8) #6 TRANS &  
(6) #6 LONGIT  
(see example)

F6

$$P_F = .106 \left[ \left( 31 \times \frac{10}{2} \right) + 2.5 (44.33) \right] = 28.2^k \text{ panel}$$

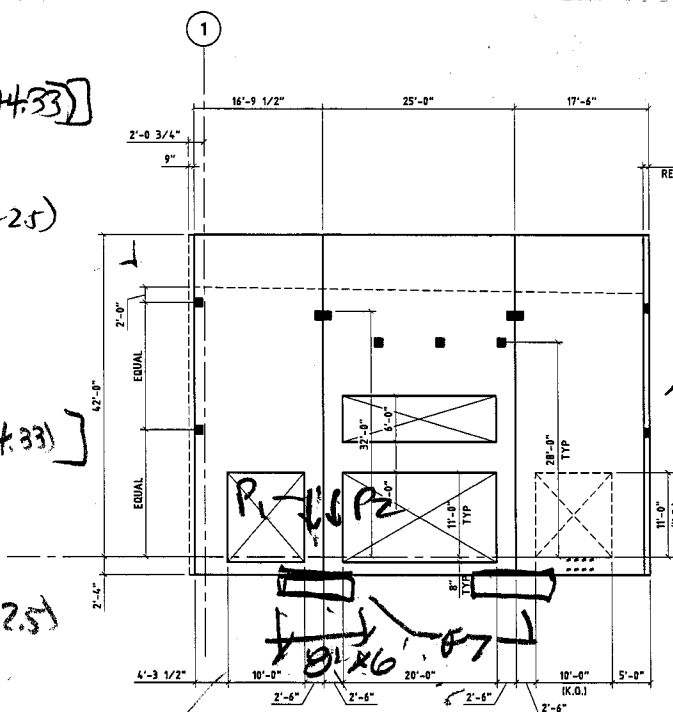
$$P_1 = \frac{45}{2} (.018 + .020) \left( \frac{10}{2} + 2.5 \right) = 6.4$$

$$P_{\text{TOT}} = 34.6$$

$$P_2 = .106 \left[ \left( 31 \times \frac{20}{2} \right) + 2.5 (44.33) \right] = 44.6$$

$$\frac{45}{2} (.018 + .020) \left( \frac{20}{2} + 2.5 \right) = 12.6$$

$$P_{\text{TOT}} = 55.3$$



$$P_{\text{TOT}} = 34.6 + 55.3 = 89.9$$

$$M = (55.3 - 34.6) \left( \frac{25}{2} \right) = 25.8$$

$$\frac{P}{A} = \frac{89.9}{10 \times 6} = 1.5$$

$$\frac{M}{S} = \frac{25.8}{\frac{1}{6}(10)(6)^2} = 0.26$$

USE 10'-0" x 6'-0" x 16" HPC  
w/ (10) #6 TRANS &  
(6) #6 LONGIT

# FOUNDATIONS

DATE 3/21	JOB NO. 221019	SHEET NO. OF 85
JOB: VIP		
BY: RMB		
GF Group Structural Engineers		

## CF1

$$\text{wall wt} = 42.33 (.106) = 4.5$$

$$\text{Roof wt} = \frac{45}{2} (.015 + .020) = \frac{0.8}{5.3}$$

$$\text{Min width} = \frac{5.3}{2.05} = 2.65' \rightarrow \text{USE } 3'-0'' \text{ WIDE FFG}$$

## CF1A 5 JAMB @ 15' KO in panels 9 & 10

$$\text{JAMB Reochment} = \left[ (29' \times \frac{15}{2}) + 5' (42.33) \right] .106 = 45.5 \text{ pms}$$

$$\left[ \frac{15}{2} + 5 \right] \left( \frac{45}{2} \right) (.015 + .020) = \frac{9.8}{P = 55.3}$$

$$\text{REQ'D Area} = \frac{55.3}{2.05} = 27.6'$$

$$\text{Effective length} = 7'$$

$$\therefore \text{Min width} = \frac{27.6}{7} = 3.95'$$

$\therefore$  USE 4'-0" WIDE FFG

## CF2

$$\text{panel wt} = 46.33 (.106) = 4.9$$

$$\text{Roof wt} = (.015 + .020) \left( \frac{60}{2} \right) = \frac{1.05}{5.95}$$

$$\text{Min FFG width} = \frac{5.95}{2.0} = 2.98 \text{ — USE } 3'-6'' \text{ WIDE FFG}$$

# FOUNDATIONS

F6

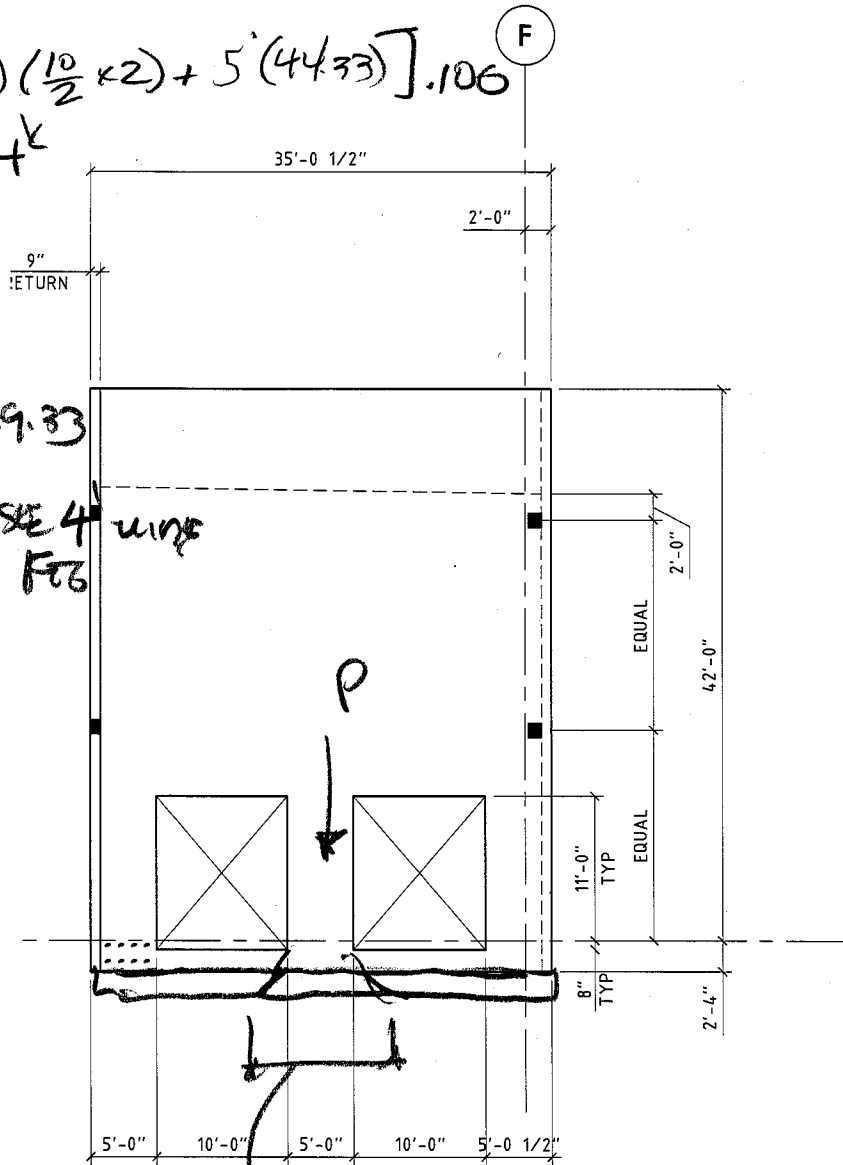
CFB

$$P_{\text{panel}} = \left[ (33') \left( \frac{10}{2} \times 2 \right) + 5' (44.33) \right] \cdot 106$$

$$= 58.4^k$$

$$R_{\text{reqd}} = \frac{58.4}{2.0^{ksc} \times 9.33}$$

$$= 3.1' - \text{USE 4' WING F6}$$



$$\text{EFFECTIVE LENGTH} = 5' + 2.37 + 2.33$$

$$= 9.67$$

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F1A

### Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

### General Information

#### Material Properties

$f'_c$ : Concrete 28 day strength	=	3.0 ksi
$f_y$ : Rebar Yield	=	60.0 ksi
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
$\phi$ Values Flexure	=	0.90
Shear	=	0.750

#### Analysis Settings

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

#### Soil Design Values

Allowable Soil Bearing	=	2.0 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

#### Increases based on footing Depth

Footing base depth below soil surface	=	0.250 ft
Allow press. increase per foot of depth when footing base is below	=	ksf

#### Increases based on footing plan dimension

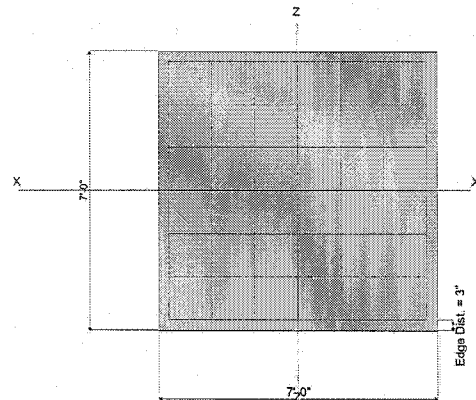
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf
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### Dimensions

Width parallel to X-X Axis	=	7.0 ft
Length parallel to Z-Z Axis	=	7.0 ft
Footing Thickness	=	18.0 in

#### Pedestal dimensions...

px : parallel to X-X Axis	=	16.0 in
pz : parallel to Z-Z Axis	=	16.0 in
Height	=	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



### Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	7.0
Reinforcing Bar Size	=	# 7
Bars parallel to Z-Z Axis	=	
Number of Bars	=	7.0
Reinforcing Bar Size	=	# 6

#### Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

n/a

# Bars required within zone

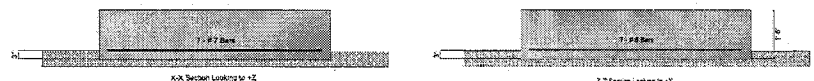
n/a

# Bars required on each side of zone

n/a

### Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	43.70	29.20				k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k





## General Footing

Lic. #: KW-06006285

DESCRIPTION: F1A

### DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.7440	Soil Bearing	1.488 ksf	2.0 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.2087	Z Flexure (+X)	8.122 k-ft/ft	38.912 k-ft/ft	+1.20D+1.60Lr
PASS	0.2087	Z Flexure (-X)	8.122 k-ft/ft	38.912 k-ft/ft	+1.20D+1.60Lr
PASS	0.2816	X Flexure (+Z)	8.122 k-ft/ft	28.846 k-ft/ft	+1.20D+1.60Lr
PASS	0.2816	X Flexure (-Z)	8.122 k-ft/ft	28.846 k-ft/ft	+1.20D+1.60Lr
PASS	0.2203	1-way Shear (+X)	18.101 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.2203	1-way Shear (-X)	18.101 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.2203	1-way Shear (+Z)	18.101 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.2203	1-way Shear (-Z)	18.101 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.2824	2-way Punching	46.403 psi	164.317 psi	+1.20D+1.60Lr

### Detailed Results

#### Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.0	n/a	0.0	0.8918	0.8918	n/a	n/a	0.446
X-X, +D+Lr	2.0	n/a	0.0	1.488	1.488	n/a	n/a	0.744
X-X, +D+0.750Lr	2.0	n/a	0.0	1.339	1.339	n/a	n/a	0.670
X-X, +0.60D	2.0	n/a	0.0	0.5351	0.5351	n/a	n/a	0.268
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	0.8918	0.8918	0.446
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	1.488	1.488	0.744
Z-Z, +D+0.750Lr	2.0	0.0	n/a	n/a	n/a	1.339	1.339	0.670
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.5351	0.5351	0.268

#### Overturing Stability

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

All units k

#### Sliding Stability

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

#### Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in <sup>2</sup>	Gvrn. As in <sup>2</sup>	Actual As in <sup>2</sup>	Phi*Mn k-ft	Status
X-X, +1.40D	5.011	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.40D	5.011	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D+0.50Lr	5.491	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D+0.50Lr	5.491	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D	4.295	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D	4.295	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D+1.60Lr	8.122	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D+1.60Lr	8.122	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +0.90D	3.221	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +0.90D	3.221	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.40D	5.011	-X	Bottom	0.3888	Min Temp %	0.60	38.912	OK
Z-Z, +1.40D	5.011	+X	Bottom	0.3888	Min Temp %	0.60	38.912	OK
Z-Z, +1.20D+0.50Lr	5.491	-X	Bottom	0.3888	Min Temp %	0.60	38.912	OK
Z-Z, +1.20D+0.50Lr	5.491	+X	Bottom	0.3888	Min Temp %	0.60	38.912	OK
Z-Z, +1.20D	4.295	-X	Bottom	0.3888	Min Temp %	0.60	38.912	OK
Z-Z, +1.20D	4.295	+X	Bottom	0.3888	Min Temp %	0.60	38.912	OK

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Project Title:  
Engineer:  
Project ID:  
Project Descr:

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GFG STRUCTURAL ENGINEERS

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F1A

### Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D+1.60Lr	8.122	-X	Bottom	0.3888	Min Temp %	0.60	38.912	OK
Z-Z, +1.20D+1.60Lr	8.122	+X	Bottom	0.3888	Min Temp %	0.60	38.912	OK
Z-Z, +0.90D	3.221	-X	Bottom	0.3888	Min Temp %	0.60	38.912	OK
Z-Z, +0.90D	3.221	+X	Bottom	0.3888	Min Temp %	0.60	38.912	OK

### One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	11.17 psi	11.17 psi	11.17 psi	11.17 psi	11.17 psi	82.16 psi	0.14	OK
+1.20D+0.50Lr	12.24 psi	12.24 psi	12.24 psi	12.24 psi	12.24 psi	82.16 psi	0.15	OK
+1.20D	9.57 psi	9.57 psi	9.57 psi	9.57 psi	9.57 psi	82.16 psi	0.12	OK
+1.20D+1.60Lr	18.10 psi	18.10 psi	18.10 psi	18.10 psi	18.10 psi	82.16 psi	0.22	OK
+0.90D	7.18 psi	7.18 psi	7.18 psi	7.18 psi	7.18 psi	82.16 psi	0.09	OK

### Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	28.63 psi	164.32psi	0.1742	OK
+1.20D+0.50Lr	31.37 psi	164.32psi	0.1909	OK
+1.20D	24.54 psi	164.32psi	0.1493	OK
+1.20D+1.60Lr	46.40 psi	164.32psi	0.2824	OK
+0.90D	18.41 psi	164.32psi	0.112	OK

## General Footing

Lic. #: KW-06006285

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GFG STRUCTURAL ENGINEERS

DESCRIPTION: F2

### Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

### General Information

#### Material Properties

$f_c$ : Concrete 28 day strength	=	3.0 ksi
$f_y$ : Rebar Yield	=	60.0 ksi
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
$\phi$ Values Flexure	=	0.90
Shear	=	0.750

#### Analysis Settings

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

#### Soil Design Values

Allowable Soil Bearing	=	2.0 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

#### Increases based on footing Depth

Footing base depth below soil surface	=	0.250 ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

#### Increases based on footing plan dimension

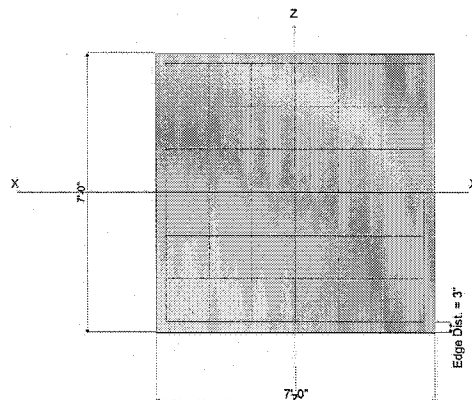
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
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### Dimensions

Width parallel to X-X Axis	=	7.0 ft
Length parallel to Z-Z Axis	=	7.0 ft
Footing Thickness	=	18.0 in

#### Pedestal dimensions...

px : parallel to X-X Axis	=	16.0 in
pz : parallel to Z-Z Axis	=	16.0 in
Height	=	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



### Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	7.0
Reinforcing Bar Size	=	# 6
Bars parallel to Z-Z Axis	=	
Number of Bars	=	7.0
Reinforcing Bar Size	=	# 6

#### Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

n/a

# Bars required within zone

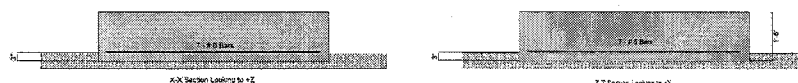
n/a

# Bars required on each side of zone

n/a

### Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	48.20	32.10				k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k



## General Footing

Lic. #: KW-06006285

DESCRIPTION: F2

### DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.8195	Soil Bearing	1.639 ksf	2.0 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.3101	Z Flexure (+X)	8.944 k-ft/ft	28.846 k-ft/ft	+1.20D+1.60Lr
PASS	0.3101	Z Flexure (-X)	8.944 k-ft/ft	28.846 k-ft/ft	+1.20D+1.60Lr
PASS	0.3101	X Flexure (+Z)	8.944 k-ft/ft	28.846 k-ft/ft	+1.20D+1.60Lr
PASS	0.3101	X Flexure (-Z)	8.944 k-ft/ft	28.846 k-ft/ft	+1.20D+1.60Lr
PASS	0.2426	1-way Shear (+X)	19.933 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.2426	1-way Shear (-X)	19.933 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.2426	1-way Shear (+Z)	19.933 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.2426	1-way Shear (-Z)	19.933 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.3110	2-way Punching	51.101 psi	164.317 psi	+1.20D+1.60Lr

### Detailed Results

#### Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xeccc	Zeccc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.0	n/a	0.0	0.9837	0.9837	n/a	n/a	0.492
X-X, +D+Lr	2.0	n/a	0.0	1.639	1.639	n/a	n/a	0.820
X-X, +D+0.750Lr	2.0	n/a	0.0	1.475	1.475	n/a	n/a	0.738
X-X, +0.60D	2.0	n/a	0.0	0.5902	0.5902	n/a	n/a	0.295
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	0.9837	0.9837	0.492
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	1.639	1.639	0.820
Z-Z, +D+0.750Lr	2.0	0.0	n/a	n/a	n/a	1.475	1.475	0.738
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.5902	0.5902	0.295

#### Overturing Stability

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

All units k

#### Sliding Stability

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

#### Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	5.527	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.40D	5.527	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D+0.50Lr	6.052	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D+0.50Lr	6.052	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D	4.737	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D	4.737	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D+1.60Lr	8.944	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D+1.60Lr	8.944	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +0.90D	3.553	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +0.90D	3.553	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.40D	5.527	-X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.40D	5.527	+X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.20D+0.50Lr	6.052	-X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.20D+0.50Lr	6.052	+X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.20D	4.737	-X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.20D	4.737	+X	Bottom	0.3888	Min Temp %	0.440	28.846	OK

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Project Title:  
Engineer:  
Project ID:  
Project Descr:

(F12)

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GFG STRUCTURAL ENGINEERS

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F2

### Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvm. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D+1.60Lr	8.944	-X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.20D+1.60Lr	8.944	+X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +0.90D	3.553	-X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +0.90D	3.553	+X	Bottom	0.3888	Min Temp %	0.440	28.846	OK

### One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	12.32 psi	12.32 psi	12.32 psi	12.32 psi	12.32 psi	82.16 psi	0.15	OK
+1.20D+0.50Lr	13.49 psi	13.49 psi	13.49 psi	13.49 psi	13.49 psi	82.16 psi	0.16	OK
+1.20D	10.56 psi	10.56 psi	10.56 psi	10.56 psi	10.56 psi	82.16 psi	0.13	OK
+1.20D+1.60Lr	19.93 psi	19.93 psi	19.93 psi	19.93 psi	19.93 psi	82.16 psi	0.24	OK
+0.90D	7.92 psi	7.92 psi	7.92 psi	7.92 psi	7.92 psi	82.16 psi	0.10	OK

### Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	31.58 psi	164.32 psi	0.1922	OK
+1.20D+0.50Lr	34.58 psi	164.32 psi	0.2104	OK
+1.20D	27.07 psi	164.32 psi	0.1647	OK
+1.20D+1.60Lr	51.10 psi	164.32 psi	0.311	OK
+0.90D	20.30 psi	164.32 psi	0.1235	OK

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F2A

### Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

### General Information

#### Material Properties

$f_c$ : Concrete 28 day strength	=	3.0 ksi
$f_y$ : Rebar Yield	=	60.0 ksi
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
$\phi$ Values Flexure	=	0.90
Shear	=	0.750

#### Analysis Settings

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

#### Soil Design Values

Allowable Soil Bearing	=	2.0 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

#### Increases based on footing Depth

Footing base depth below soil surface	=	0.250 ft
Allow press. increase per foot of depth when footing base is below	=	ksf

#### Increases based on footing plan dimension

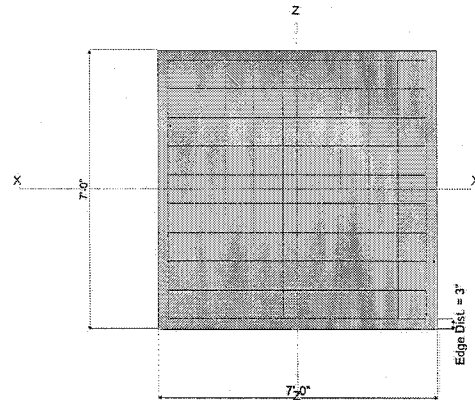
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf
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### Dimensions

Width parallel to X-X Axis	=	7.0 ft
Length parallel to Z-Z Axis	=	7.0 ft
Footing Thickness	=	28.0 in

#### Pedestal dimensions...

px : parallel to X-X Axis	=	16.0 in
pz : parallel to Z-Z Axis	=	16.0 in
Height	=	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



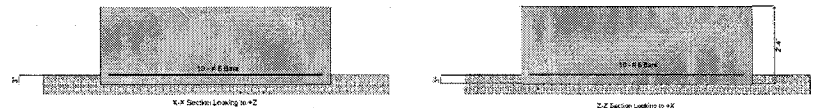
### Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	10.0
Reinforcing Bar Size	=	# 6
Bars parallel to Z-Z Axis	=	
Number of Bars	=	10.0
Reinforcing Bar Size	=	# 6

#### Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a



### Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	48.20	32.10				k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k

F14

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GFG STRUCTURAL ENGINEERS

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F2A

### DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.8195	Soil Bearing	1.639 ksf	2.0 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1297	Z Flexure (+X)	8.944 k-ft/ft	68.971 k-ft/ft	+1.20D+1.60Lr
PASS	0.1297	Z Flexure (-X)	8.944 k-ft/ft	68.971 k-ft/ft	+1.20D+1.60Lr
PASS	0.1297	X Flexure (+Z)	8.944 k-ft/ft	68.971 k-ft/ft	+1.20D+1.60Lr
PASS	0.1297	X Flexure (-Z)	8.944 k-ft/ft	68.971 k-ft/ft	+1.20D+1.60Lr
PASS	0.06962	1-way Shear (+X)	5.720 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.06962	1-way Shear (-X)	5.720 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.06962	1-way Shear (+Z)	5.720 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.06962	1-way Shear (-Z)	5.720 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.1247	2-way Punching	20.498 psi	164.317 psi	+1.20D+1.60Lr

### Detailed Results

#### Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xeccc	Zeccc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.0	n/a	0.0	0.9837	0.9837	n/a	n/a	0.492
X-X, +D+Lr	2.0	n/a	0.0	1.639	1.639	n/a	n/a	0.820
X-X, +D+0.750Lr	2.0	n/a	0.0	1.475	1.475	n/a	n/a	0.738
X-X, +0.60D	2.0	n/a	0.0	0.5902	0.5902	n/a	n/a	0.295
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	0.9837	0.9837	0.492
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	1.639	1.639	0.820
Z-Z, +D+0.750Lr	2.0	0.0	n/a	n/a	n/a	1.475	1.475	0.738
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.5902	0.5902	0.295

#### Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
--	--------------------	------------------	-----------------	--------

Footing Has NO Overturning

All units k

#### Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
---	---------------	-----------------	-----------------	--------

Footing Has NO Sliding

#### Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	5.527	+Z	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
X-X, +1.40D	5.527	-Z	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
X-X, +1.20D+0.50Lr	6.052	+Z	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
X-X, +1.20D+0.50Lr	6.052	-Z	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
X-X, +1.20D	4.737	+Z	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
X-X, +1.20D	4.737	-Z	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
X-X, +1.20D+1.60Lr	8.944	+Z	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
X-X, +1.20D+1.60Lr	8.944	-Z	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
X-X, +0.90D	3.553	+Z	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
X-X, +0.90D	3.553	-Z	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
Z-Z, +1.40D	5.527	-X	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
Z-Z, +1.40D	5.527	+X	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
Z-Z, +1.20D+0.50Lr	6.052	-X	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
Z-Z, +1.20D+0.50Lr	6.052	+X	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
Z-Z, +1.20D	4.737	-X	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
Z-Z, +1.20D	4.737	+X	Bottom	0.6048	Min Temp %	0.6286	68.971	OK

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Project Title:  
Engineer:  
Project ID:  
Project Descr:

(F15)

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GFG STRUCTURAL ENGINEERS

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F2A

### Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvm. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D+1.60Lr	8.944	-X	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
Z-Z, +1.20D+1.60Lr	8.944	+X	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
Z-Z, +0.90D	3.553	-X	Bottom	0.6048	Min Temp %	0.6286	68.971	OK
Z-Z, +0.90D	3.553	+X	Bottom	0.6048	Min Temp %	0.6286	68.971	OK

### One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	3.54 psi	3.54 psi	3.54 psi	3.54 psi	3.54 psi	82.16 psi	0.04	OK
+1.20D+0.50Lr	3.87 psi	3.87 psi	3.87 psi	3.87 psi	3.87 psi	82.16 psi	0.05	OK
+1.20D	3.03 psi	3.03 psi	3.03 psi	3.03 psi	3.03 psi	82.16 psi	0.04	OK
+1.20D+1.60Lr	5.72 psi	5.72 psi	5.72 psi	5.72 psi	5.72 psi	82.16 psi	0.07	OK
+0.90D	2.27 psi	2.27 psi	2.27 psi	2.27 psi	2.27 psi	82.16 psi	0.03	OK

### Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	12.67 psi	164.32psi	0.07709	OK
+1.20D+0.50Lr	13.87 psi	164.32psi	0.08441	OK
+1.20D	10.86 psi	164.32psi	0.06607	OK
+1.20D+1.60Lr	20.50 psi	164.32psi	0.1247	OK
+0.90D	8.14 psi	164.32psi	0.04956	OK



## General Footing

Lic. #: KW-06006285

DESCRIPTION: F3

### Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

### General Information

#### Material Properties

$f_c$ : Concrete 28 day strength	=	3.0 ksi
$f_y$ : Rebar Yield	=	60.0 ksi
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
$\phi$ Values Flexure	=	0.90
Shear	=	0.750

#### Analysis Settings

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

#### Soil Design Values

Allowable Soil Bearing	=	2.0 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

#### Increases based on footing Depth

Footing base depth below soil surface	=	0.250 ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

#### Increases based on footing plan dimension

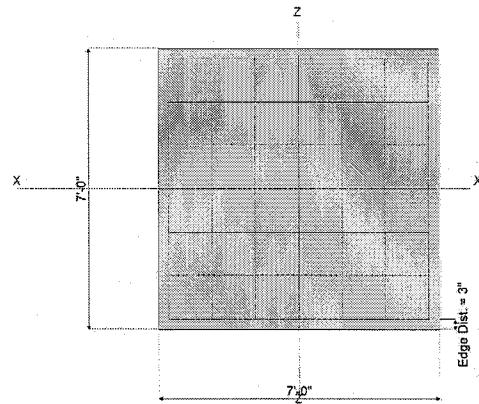
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
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### Dimensions

Width parallel to X-X Axis	=	7.0 ft
Length parallel to Z-Z Axis	=	7.0 ft
Footing Thickness	=	18.0 in

#### Pedestal dimensions...

px : parallel to X-X Axis	=	16.0 in
pz : parallel to Z-Z Axis	=	16.0 in
Height	=	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



### Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	7.0
Reinforcing Bar Size	=	# 6
Bars parallel to Z-Z Axis	=	
Number of Bars	=	7.0
Reinforcing Bar Size	=	# 6

#### Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

n/a

# Bars required within zone

n/a

# Bars required on each side of zone

n/a

### Applied Loads

		D	Lr	L	S	W	E	H
P : Column Load	=	51.0	34.0					k
OB : Overburden	=							ksf
M-xx	=							k-ft
M-zz	=							k-ft
V-x	=							k
V-z	=							k



(F17)

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GFG STRUCTURAL ENGINEERS

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F3

### DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.8675	Soil Bearing	1.735 ksf	2.0 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.3282	Z Flexure (+X)	9.468 k-ft/ft	28.846 k-ft/ft	+1.20D+1.60Lr
PASS	0.3282	Z Flexure (-X)	9.468 k-ft/ft	28.846 k-ft/ft	+1.20D+1.60Lr
PASS	0.3282	X Flexure (+Z)	9.468 k-ft/ft	28.846 k-ft/ft	+1.20D+1.60Lr
PASS	0.3282	X Flexure (-Z)	9.468 k-ft/ft	28.846 k-ft/ft	+1.20D+1.60Lr
PASS	0.2568	1-way Shear (+X)	21.102 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.2568	1-way Shear (-X)	21.102 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.2568	1-way Shear (+Z)	21.102 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.2568	1-way Shear (-Z)	21.102 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.3292	2-way Punching	54.096 psi	164.317 psi	+1.20D+1.60Lr

### Detailed Results

#### Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.0	n/a	0.0	1.041	1.041	n/a	n/a	0.521
X-X, +D+Lr	2.0	n/a	0.0	1.735	1.735	n/a	n/a	0.868
X-X, +D+0.750Lr	2.0	n/a	0.0	1.561	1.561	n/a	n/a	0.781
X-X, +0.60D	2.0	n/a	0.0	0.6245	0.6245	n/a	n/a	0.312
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	1.041	1.041	0.521
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	1.735	1.735	0.868
Z-Z, +D+0.750Lr	2.0	0.0	n/a	n/a	n/a	1.561	1.561	0.781
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.6245	0.6245	0.312

#### Overturning Stability

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

All units k

#### Sliding Stability

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

#### Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvm. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	5.848	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.40D	5.848	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D+0.50Lr	6.405	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D+0.50Lr	6.405	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D	5.013	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D	5.013	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D+1.60Lr	9.468	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +1.20D+1.60Lr	9.468	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +0.90D	3.759	+Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
X-X, +0.90D	3.759	-Z	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.40D	5.848	-X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.40D	5.848	+X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.20D+0.50Lr	6.405	-X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.20D+0.50Lr	6.405	+X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.20D	5.013	-X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.20D	5.013	+X	Bottom	0.3888	Min Temp %	0.440	28.846	OK

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Project Title:  
Engineer:  
Project ID:  
Project Descr:

(F18)

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GFG STRUCTURAL ENGINEERS

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F3

### Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D+1.60Lr	9.468	-X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +1.20D+1.60Lr	9.468	+X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +0.90D	3.759	-X	Bottom	0.3888	Min Temp %	0.440	28.846	OK
Z-Z, +0.90D	3.759	+X	Bottom	0.3888	Min Temp %	0.440	28.846	OK

### One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	13.03 psi	13.03 psi	13.03 psi	13.03 psi	13.03 psi	82.16 psi	0.16	OK
+1.20D+0.50Lr	14.28 psi	14.28 psi	14.28 psi	14.28 psi	14.28 psi	82.16 psi	0.17	OK
+1.20D	11.17 psi	11.17 psi	11.17 psi	11.17 psi	11.17 psi	82.16 psi	0.14	OK
+1.20D+1.60Lr	21.10 psi	21.10 psi	21.10 psi	21.10 psi	21.10 psi	82.16 psi	0.26	OK
+0.90D	8.38 psi	8.38 psi	8.38 psi	8.38 psi	8.38 psi	82.16 psi	0.10	OK

### Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	33.41 psi	164.32 psi	0.2033	OK
+1.20D+0.50Lr	36.59 psi	164.32 psi	0.2227	OK
+1.20D	28.64 psi	164.32 psi	0.1743	OK
+1.20D+1.60Lr	54.10 psi	164.32 psi	0.3292	OK
+0.90D	21.48 psi	164.32 psi	0.1307	OK

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F4

### Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

### General Information

#### Material Properties

$f_c$ : Concrete 28 day strength	=	3.0 ksi
$f_y$ : Rebar Yield	=	60.0 ksi
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
$\phi$ Values Flexure	=	0.90
Shear	=	0.750

#### Analysis Settings

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

#### Soil Design Values

Allowable Soil Bearing	=	2.0 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

#### Increases based on footing Depth

Footing base depth below soil surface	=	0.250 ft
Allow press. increase per foot of depth when footing base is below	=	ksf

#### Increases based on footing plan dimension

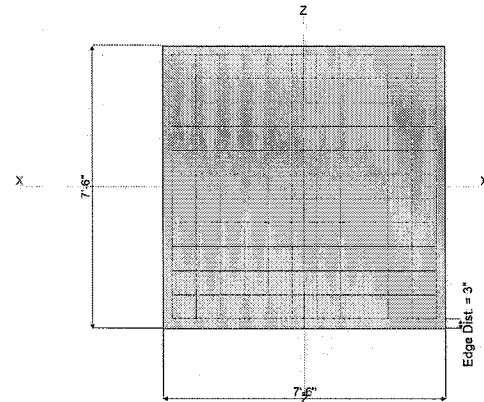
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf
	=	ft

### Dimensions

Width parallel to X-X Axis	=	7.50 ft
Length parallel to Z-Z Axis	=	7.50 ft
Footing Thickness	=	28.0 in

#### Pedestal dimensions...

px : parallel to X-X Axis	=	16.0 in
pz : parallel to Z-Z Axis	=	16.0 in
Height	=	
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



### Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	12.0
Reinforcing Bar Size	=	# 6
Bars parallel to Z-Z Axis	=	
Number of Bars	=	12.0
Reinforcing Bar Size	=	# 6

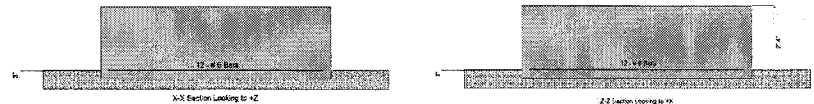
#### Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a

### Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	56.20	37.50				k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k



F20

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F4

### DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.8330	Soil Bearing	1.666 ksf	2.0 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1398	Z Flexure (+X)	10.769 k-ft/ft	77.013 k-ft/ft	+1.20D+1.60Lr
PASS	0.1398	Z Flexure (-X)	10.769 k-ft/ft	77.013 k-ft/ft	+1.20D+1.60Lr
PASS	0.1398	X Flexure (+Z)	10.769 k-ft/ft	77.013 k-ft/ft	+1.20D+1.60Lr
PASS	0.1398	X Flexure (-Z)	10.769 k-ft/ft	77.013 k-ft/ft	+1.20D+1.60Lr
PASS	0.08962	1-way Shear (+X)	7.363 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.08962	1-way Shear (-X)	7.363 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.08962	1-way Shear (+Z)	7.363 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.08962	1-way Shear (-Z)	7.363 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.1491	2-way Punching	24.506 psi	164.317 psi	+1.20D+1.60Lr

### Detailed Results

#### Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.0	n/a	0.0	0.9991	0.9991	n/a	n/a	0.500
X-X, +D+Lr	2.0	n/a	0.0	1.666	1.666	n/a	n/a	0.833
X-X, +D+0.750Lr	2.0	n/a	0.0	1.499	1.499	n/a	n/a	0.750
X-X, +0.60D	2.0	n/a	0.0	0.5995	0.5995	n/a	n/a	0.300
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	0.9991	0.9991	0.500
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	1.666	1.666	0.833
Z-Z, +D+0.750Lr	2.0	0.0	n/a	n/a	n/a	1.499	1.499	0.750
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.5995	0.5995	0.300

#### Overturing Stability

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

All units k

#### Sliding Stability

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

#### Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	6.649	+Z	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
X-X, +1.40D	6.649	-Z	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
X-X, +1.20D+0.50Lr	7.284	+Z	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
X-X, +1.20D+0.50Lr	7.284	-Z	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
X-X, +1.20D	5.699	+Z	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
X-X, +1.20D	5.699	-Z	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
X-X, +1.20D+1.60Lr	10.769	+Z	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
X-X, +1.20D+1.60Lr	10.769	-Z	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
X-X, +0.90D	4.274	+Z	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
X-X, +0.90D	4.274	-Z	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
Z-Z, +1.40D	6.649	-X	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
Z-Z, +1.40D	6.649	+X	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
Z-Z, +1.20D+0.50Lr	7.284	-X	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
Z-Z, +1.20D+0.50Lr	7.284	+X	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
Z-Z, +1.20D	5.699	-X	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
Z-Z, +1.20D	5.699	+X	Bottom	0.6048	Min Temp %	0.7040	77.013	OK

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F4

### Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D+1.60Lr	10.769	-X	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
Z-Z, +1.20D+1.60Lr	10.769	+X	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
Z-Z, +0.90D	4.274	-X	Bottom	0.6048	Min Temp %	0.7040	77.013	OK
Z-Z, +0.90D	4.274	+X	Bottom	0.6048	Min Temp %	0.7040	77.013	OK

### One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	4.55 psi	4.55 psi	4.55 psi	4.55 psi	4.55 psi	82.16 psi	0.06	OK
+1.20D+0.50Lr	4.98 psi	4.98 psi	4.98 psi	4.98 psi	4.98 psi	82.16 psi	0.06	OK
+1.20D	3.90 psi	3.90 psi	3.90 psi	3.90 psi	3.90 psi	82.16 psi	0.05	OK
+1.20D+1.60Lr	7.36 psi	7.36 psi	7.36 psi	7.36 psi	7.36 psi	82.16 psi	0.09	OK
+0.90D	2.92 psi	2.92 psi	2.92 psi	2.92 psi	2.92 psi	82.16 psi	0.04	OK

### Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	15.13 psi	164.32 psi	0.09208	OK
+1.20D+0.50Lr	16.57 psi	164.32 psi	0.1009	OK
+1.20D	12.97 psi	164.32 psi	0.07892	OK
+1.20D+1.60Lr	24.51 psi	164.32 psi	0.1491	OK
+0.90D	9.73 psi	164.32 psi	0.05919	OK

X22

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F5

### Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

### General Information

#### Material Properties

$f_c$ : Concrete 28 day strength	=	3.0 ksi
$f_y$ : Rebar Yield	=	60.0 ksi
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
$\phi$ Values Flexure	=	0.90
Shear	=	0.750

#### Analysis Settings

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

#### Soil Design Values

Allowable Soil Bearing	=	2.0 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

#### Increases based on footing Depth

Footing base depth below soil surface	=	0.250 ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

#### Increases based on footing plan dimension

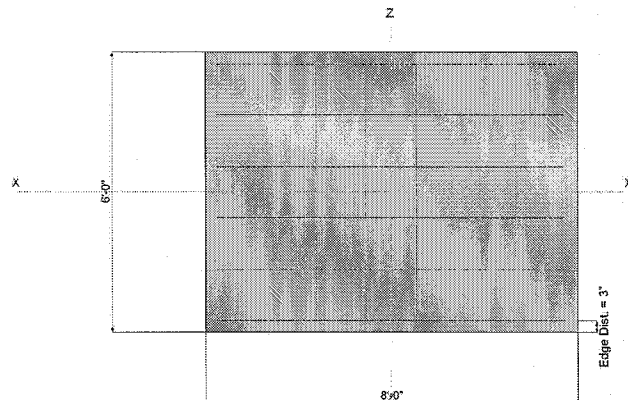
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
---	---	--------

### Dimensions

Width parallel to X-X Axis	=	8 ft
Length parallel to Z-Z Axis	=	6.0 ft
Footing Thickness	=	16.0 in

#### Pedestal dimensions...

$p_x$ : parallel to X-X Axis	=	96.0 in
$p_z$ : parallel to Z-Z Axis	=	9.0 in
Height	=	
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



### Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	6
Reinforcing Bar Size	=	# 6
Bars parallel to Z-Z Axis	=	
Number of Bars	=	8
Reinforcing Bar Size	=	# 6

#### Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

#### Bars along Z-Z Axis

# Bars required within zone	85.7 %
# Bars required on each side of zone	14.3 %

### Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	66.60	20.50				k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k

F2B

## General Footing

Lic. #: KW-06006285

DESCRIPTION: F5

### DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9075	Soil Bearing	1.815 ksf	2.0 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.0	Z Flexure (+X)	0.0 k-ft/ft	0.0 k-ft/ft	No Moment
PASS	0.0	Z Flexure (-X)	0.0 k-ft/ft	0.0 k-ft/ft	No Moment
PASS	0.3251	X Flexure (+Z)	8.090 k-ft/ft	24.886 k-ft/ft	+1.20D+1.60Lr
PASS	0.3251	X Flexure (-Z)	8.090 k-ft/ft	24.886 k-ft/ft	+1.20D+1.60Lr
PASS	n/a	1-way Shear (+X)	0.0 psi	82.158 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a
PASS	0.2858	1-way Shear (+Z)	23.483 psi	82.158 psi	+1.20D+1.60Lr
PASS	0.2858	1-way Shear (-Z)	23.483 psi	82.158 psi	+1.20D+1.60Lr
PASS	n/a	2-way Punching	13.381 psi	82.158 psi	+1.40D

### Detailed Results

#### Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc		Zecc		Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				(in)		Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.0	n/a	0.0			1.388	1.388	n/a	n/a	0.694
X-X, +D+Lr	2.0	n/a	0.0			1.815	1.815	n/a	n/a	0.908
X-X, +D+0.750Lr	2.0	n/a	0.0			1.708	1.708	n/a	n/a	0.854
X-X, +0.60D	2.0	n/a	0.0			0.8325	0.8325	n/a	n/a	0.416
Z-Z, D Only	2.0	0.0	n/a			n/a	n/a	1.388	1.388	0.694
Z-Z, +D+Lr	2.0	0.0	n/a			n/a	n/a	1.815	1.815	0.908
Z-Z, +D+0.750Lr	2.0	0.0	n/a			n/a	n/a	1.708	1.708	0.854
Z-Z, +0.60D	2.0	0.0	n/a			n/a	n/a	0.8325	0.8325	0.416

#### Overturning Stability

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

All units k

#### Sliding Stability

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

#### Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in <sup>2</sup>	Gvrn. As in <sup>2</sup>	Actual As in <sup>2</sup>	Phi*Mn k-ft	Status
X-X, +1.40D	6.692	+Z	Bottom	0.3456	Min Temp %	0.440	24.886	OK
X-X, +1.40D	6.692	-Z	Bottom	0.3456	Min Temp %	0.440	24.886	OK
X-X, +1.20D+0.50Lr	6.472	+Z	Bottom	0.3456	Min Temp %	0.440	24.886	OK
X-X, +1.20D+0.50Lr	6.472	-Z	Bottom	0.3456	Min Temp %	0.440	24.886	OK
X-X, +1.20D	5.736	+Z	Bottom	0.3456	Min Temp %	0.440	24.886	OK
X-X, +1.20D	5.736	-Z	Bottom	0.3456	Min Temp %	0.440	24.886	OK
X-X, +1.20D+1.60Lr	8.090	+Z	Bottom	0.3456	Min Temp %	0.440	24.886	OK
X-X, +1.20D+1.60Lr	8.090	-Z	Bottom	0.3456	Min Temp %	0.440	24.886	OK
X-X, +0.90D	4.302	+Z	Bottom	0.3456	Min Temp %	0.440	24.886	OK
X-X, +0.90D	4.302	-Z	Bottom	0.3456	Min Temp %	0.440	24.886	OK
Z-Z, +1.40D	0.0	-X	Top	0.3456	Min Temp %	0.440	24.886	OK
Z-Z, +1.40D	0.0	+X	Top	0.3456	Min Temp %	0.440	24.886	OK
Z-Z, +1.20D+0.50Lr	0.0	-X	Top	0.3456	Min Temp %	0.440	24.886	OK
Z-Z, +1.20D+0.50Lr	0.0	+X	Top	0.3456	Min Temp %	0.440	24.886	OK
Z-Z, +1.20D	0.0	-X	Top	0.3456	Min Temp %	0.440	24.886	OK
Z-Z, +1.20D	0.0	+X	Top	0.3456	Min Temp %	0.440	24.886	OK



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Project Title:  
Engineer:  
Project ID:  
Project Descr:

F24

Printed: 24 MAR 2021, 5:11PM

## General Footing

File: 221019-VIP Products.ec6

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GFG STRUCTURAL ENGINEERS

Lic. #: KW-06006285

DESCRIPTION: F5

### Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D+1.60Lr	0.0	-X	Top	0.3456	Min Temp %	0.440	24.886	OK
Z-Z, +1.20D+1.60Lr	0.0	+X	Top	0.3456	Min Temp %	0.440	24.886	OK
Z-Z, +0.90D	0.0	-X	Top	0.3456	Min Temp %	0.440	24.886	OK
Z-Z, +0.90D	0.0	+X	Top	0.3456	Min Temp %	0.440	24.886	OK

### One Way Shear

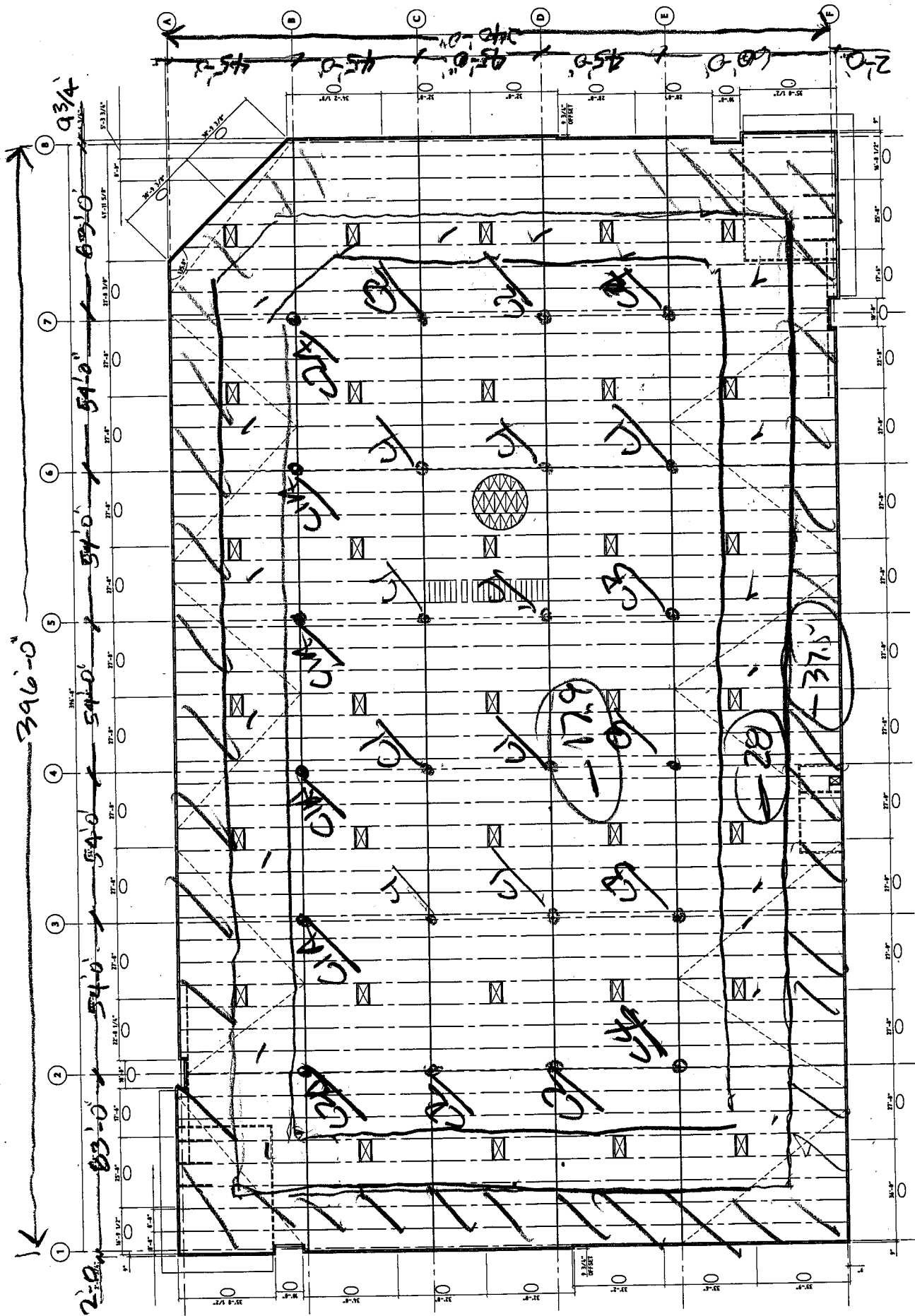
Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.00 psi	0.00 psi	19.43 psi	19.43 psi	19.43 psi	82.16 psi	0.24	OK
+1.20D+0.50Lr	0.00 psi	0.00 psi	18.79 psi	18.79 psi	18.79 psi	82.16 psi	0.23	OK
+1.20D	0.00 psi	0.00 psi	16.65 psi	16.65 psi	16.65 psi	82.16 psi	0.20	OK
+1.20D+1.60Lr	0.00 psi	0.00 psi	23.48 psi	23.48 psi	23.48 psi	82.16 psi	0.29	OK
+0.90D	0.00 psi	0.00 psi	12.49 psi	12.49 psi	12.49 psi	82.16 psi	0.15	OK

### Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	13.38 psi	97.56 psi	0.1372	OK
+1.20D+0.50Lr	13.38 psi	97.56 psi	0.1372	OK
+1.20D	13.38 psi	97.56 psi	0.1372	OK
+1.20D+1.60Lr	13.38 psi	97.56 psi	0.1372	OK
+0.90D	13.38 psi	97.56 psi	0.1372	OK

60-1



WIND UPLIFT AT COLUMNS

## Wind Analysis for Low-rise Building, Based on 2018 IBC/ASCE 7-16

## INPUT DATA

Exposure category (B, C or D, ASCE 7-16 26.7.3)

Importance factor (ASCE 7-16 Table 1.5-2)

Basic wind speed (ASCE 7-16 26.5.1 or 2018 IBC)

Topographic factor (ASCE 7-16 26.8 &amp; Table 26.8-1)

Building height to eave

Building height to ridge

Building length

Building width

Effective area of components (or Solar Panel area)

C

$I_w = 1.00$  for all Category

$V = 102$  mph, (164.15 kph)

$K_{zt} = 1$  Flat

$h_e = 35$  ft, (10.67 m)

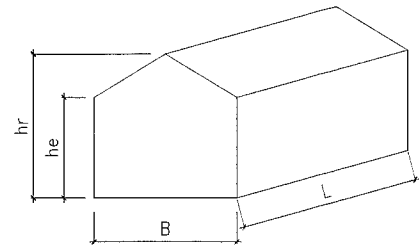
$h_r = 37$  ft, (11.28 m)

$L = 396$  ft, (120.70 m)

$B = 240$  ft, (73.15 m)

$A = 400$  ft<sup>2</sup>, <== Overhang? (Yes or No) no

( 37.21 m<sup>2</sup>)



## DESIGN SUMMARY

Max horizontal force normal to building length, L, face = 228.10 kips, (1015 kN), SD level (LRFD level), Typ.

Max horizontal force normal to building length, B, face = 145.27 kips, (646 kN)

Max total horizontal torsional load = 10045.15 ft-kips, (13619 kN-m)

Max total upward force = 1595.02 kips, (7095 kN)

## ANALYSIS

## Velocity pressure

$$q_h = 0.00256 K_z K_{zt} K_d K_e V^2 = 23.00 \text{ psf}$$

where:  $q_h$  = velocity pressure at mean roof height, h. (Eq. 26.10-1 page 268) $K_z$  = velocity pressure exposure coefficient evaluated at height, h. (Tab. 26.10-1, pg 268)

= 1.02

 $K_d$  = wind directionality factor. (Tab. 26.6-1, for building, page 266)

= 0.85

 $h$  = mean roof height

= 36.00 ft

 $K_e$  = ground elevation factor. (1.0 per Sec. 26.9, page 268)

&lt; 60 ft, [Satisfactory]

(ASCE 7-16 26.2.1)

&lt; Min (L, B), [Satisfactory]

(ASCE 7-16 26.2.2)

## Design pressures for MWFRS

$$p = q_h [(G C_{pf}) - (G C_{pi})]$$

where:  $p$  = pressure in appropriate zone. (Eq. 28.3-1, page 311). $p_{min} = 16$  psf (ASCE 7-16 28.3.4) $G C_{pf}$  = product of gust effect factor and external pressure coefficient, see table below. (Fig. 28.3-1, page 312 & 313) $G C_{pi}$  = product of gust effect factor and internal pressure coefficient. (Tab. 26.13-1, Enclosed Building, page 271)

= 0.18 or -0.18

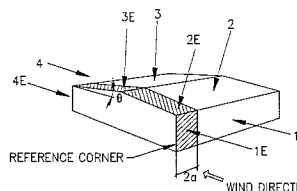
 $a$  = width of edge strips, Fig 28.3-1, page 312, MAX[ MIN(0.1B, 0.1L, 0.4h), MIN(0.04B, 0.04L), 3] = 14.40 ft

## Net Pressures (psf), Basic Load Cases

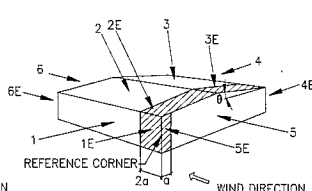
Surface	Roof angle $\theta = 0.95$			Roof angle $\theta = 0.00$		
	$G C_{pf}$	Net Pressure with		$G C_{pf}$	Net Pressure with	
		(+GC <sub>pi</sub> )	(-GC <sub>pi</sub> )		(+GC <sub>pi</sub> )	(-GC <sub>pi</sub> )
1	0.40	5.06	13.34	-0.45	-14.49	-6.21
2	-0.69	-20.01	-11.73	-0.69	-20.01	-11.73
3	-0.37	-12.65	-4.37	-0.37	-12.65	-4.37
4	-0.29	-10.81	-2.53	-0.45	-14.49	-6.21
5				0.40	5.06	13.34
6				-0.29	-10.81	-2.53
1E	0.61	9.89	18.17	-0.48	-15.18	-6.90
2E	-1.07	-28.75	-20.47	-1.07	-28.75	-20.47
3E	-0.53	-16.33	-8.05	-0.53	-16.33	-8.05
4E	-0.43	-14.03	-5.75	-0.48	-15.18	-6.90
5E				0.61	9.89	18.17
6E				-0.43	-14.03	-5.75

## Net Pressures (psf), Torsional Load Cases

Surface	Roof angle $\theta = 0.95$		
	$G C_{pf}$	Net Pressure with	
		(+GC <sub>pi</sub> )	(-GC <sub>pi</sub> )
1T	0.40	1.27	3.34
2T	-0.69	-5.00	-2.93
3T	-0.37	-3.16	-1.09
4T	-0.29	-2.70	-0.63
Roof angle $\theta = 0.00$			
Surface	$G C_{pf}$	Net Pressure with	
		(+GC <sub>pi</sub> )	(-GC <sub>pi</sub> )
5T	0.40	1.27	3.34
6T	-0.29	-2.70	-0.63

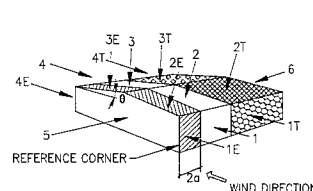


Load Case A (Transverse)

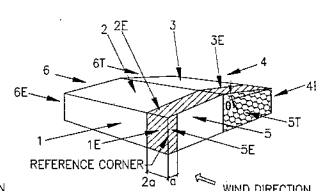


Load Case B (Longitudinal)

Basic Load Cases



Load Case A (Transverse)



Load Case B (Longitudinal)

Torsional Load Cases

CU-3

Basic Load Case A (Transverse Direction)

Surface	Area (ft <sup>2</sup> )	Pressure (k) with	
		(+GC <sub>p1</sub> )	(-GC <sub>p1</sub> )
1	12852	65.03	171.46
2	44070	-881.89	-516.97
3	44070	-557.52	-192.60
4	12852	-138.94	-32.52
1E	1008	9.97	18.32
2E	3456	-99.38	-70.76
3E	3456	-56.45	-27.83
4E	1008	-14.14	-5.80
Σ	Horiz.	221.96	221.96
	Vert.	-1595.02	-808.04
Min. wind	Horiz.	228.10	228.10
28.4.4	Vert.	-1520.64	-1520.64

Basic Load Case B (Longitudinal Direction)

Surface	Area (ft <sup>2</sup> )	Pressure (k) with	
		(+GC <sub>p1</sub> )	(-GC <sub>p1</sub> )
2	44070	-881.89	-516.97
3	44070	-557.52	-192.60
5	7629	38.60	101.77
6	7629	-82.47	-19.30
2E	3456	-99.38	-70.76
3E	3456	-56.45	-27.83
5E	1011	10.00	18.38
6E	1011	-14.19	-5.82
Σ	Horiz.	145.27	145.27
	Vert.	-1443.40	-696.91
Min. wind	Horiz.	138.24	138.24
28.4.4	Vert.	-1520.64	-1520.64

Torsional Load Case A (Transverse Direction)

Surface	Area (ft <sup>2</sup> )	Pressure (k) with		Torsion (ft-k)	
		(+GC <sub>p1</sub> )	(-GC <sub>p1</sub> )	(+GC <sub>p1</sub> )	(-GC <sub>p1</sub> )
1	5922	29.97	79.00	2751	7253
2	20307	-406.36	-238.21	-622	-364
3	20307	-256.90	-88.75	393	136
4	5922	-64.02	-14.98	5877	1375
1E	1008	9.97	18.32	1830	3363
2E	3456	-99.38	-70.76	-304	-216
3E	3456	-56.45	-27.83	173	85
4E	1008	-14.14	-5.80	2597	1064
1T	6930	8.77	23.11	-868	-2288
2T	23763	-118.88	-69.69	196	115
3T	23763	-75.16	-25.96	-124	-43
4T	6930	-18.73	-4.38	-1854	-434
Total Horiz. Torsional Load, M <sub>T</sub>				10045	10045

Torsional Load Case B (Longitudinal Direction)

Surface	Area (ft <sup>2</sup> )	Pressure (k) with		Torsion (ft-k)	
		(+GC <sub>p1</sub> )	(-GC <sub>p1</sub> )	(+GC <sub>p1</sub> )	(-GC <sub>p1</sub> )
2	44070	-881.89	-516.97	-106	-62
3	44070	-557.52	-192.60	67	23
5	3309	16.74	44.14	877	2312
6	3309	-35.77	-8.37	1873	438
2E	3456	-99.38	-70.76	316	225
3E	3456	-56.45	-27.83	-179	-88
5E	1011	10.00	18.38	1128	2073
6E	1011	-14.19	-5.82	1601	656
5T	4320	5.47	14.41	-325	-856
6T	4320	-11.68	-2.73	-694	-162
Total Horiz. Torsional Load, M <sub>T</sub>				4557.7	4557.7

**Design pressures for components and cladding**

$$p = q_h [(G C_p) - (G C_{pi})]$$

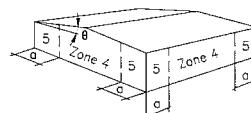
where:  $p$  = pressure on component. (Eq. 30.3-1, pg 334)

$p_{min} = 16.00$  psf (ASCE 7-16 30.2.2)

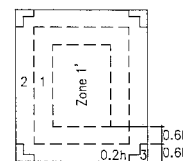
$G C_p$  = external pressure coefficient.

see table below. (ASCE 7-16 30.3.2)

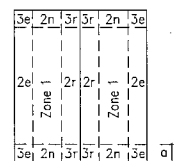
$\theta = 0.95^\circ$



Walls



Roof  $\theta \leq 7^\circ$



Roof  $\theta > 7^\circ$

Comp.	Effective Area (ft <sup>2</sup> )	Zone 1		Zone 1'		Zone 2		Zone 2e		Zone 2n		Zone 2r	
		GC <sub>p</sub>	-GC <sub>p</sub>	GC <sub>p</sub>	-GC <sub>p</sub>	GC <sub>p</sub>	-GC <sub>p</sub>	GC <sub>p</sub>	-GC <sub>p</sub>	GC <sub>p</sub>	-GC <sub>p</sub>	GC <sub>p</sub>	-GC <sub>p</sub>
	400	0.20	-1.04	0.20	-0.60	0.20	-1.45	-	-	-	-	-	-
Comp.	Effective Area (ft <sup>2</sup> )	Zone 3		Zone 3e		Zone 3r		Zone 4		Zone 5			
		GC <sub>p</sub>	-GC <sub>p</sub>	GC <sub>p</sub>	-GC <sub>p</sub>	GC <sub>p</sub>	-GC <sub>p</sub>	GC <sub>p</sub>	-GC <sub>p</sub>	GC <sub>p</sub>	-GC <sub>p</sub>		
	400	0.20	-1.50	-	-	-	-	0.65	-0.74	0.65	-0.75		

Comp. & Cladding Pressure ( psf )	Zone 1		Zone 1'		Zone 2		Zone 2e		Zone 2n		Zone 2r	
	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
	16.00	-28.06	16.00	-17.92	16.00	-37.52						
	Zone 3		Zone 3e		Zone 3r		Zone 4		Zone 5			
	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	(The Max Pressure	
	16.00	-38.70					18.99	-21.06	18.99	-21.41	38.70 psf)	

$$0.6h = 0.6(35) = 21'$$

$$\text{Zone 1}' = -17.9$$


$$\text{Zone 1} = -28$$

$$\text{Zone 2} = -37.5$$

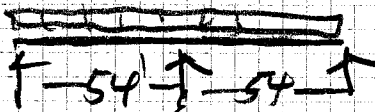
# Column Wind Uplift

DATE 3/2	JOB NO. 22104	SHEET NO. OF CW-4
JOB: ✓ HP		
BY: MRS		
GF Group Structural Engineers		

①

$w = 17.9(45) = 806 \text{ lb}$   
  
 $\text{uplift} = 806(54) = 43.5 \text{ k}$

①A



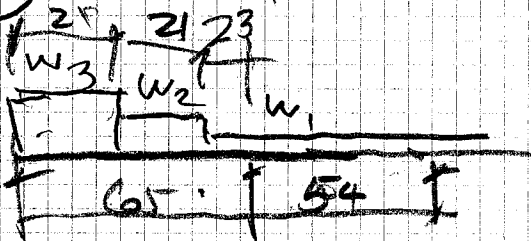
$\text{uplift} = 1.05(54) = 56.7 \text{ k}$

$$W = \frac{37.5(20)(10.5) + 28(20)(31.5) + 17.9(3)(43.5)}{45} = 647$$

$$+ \frac{45}{2}(17.9) = 403$$

$$\underline{1050}$$

①2



$w_1 = 17.9(45) = 806$   
 $w_2 = 28(45) = 1260$   
 $w_3 = 37.5(45) = 1698$

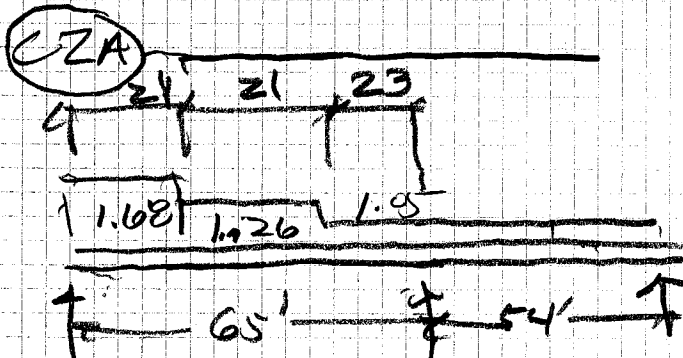
$$\text{C2 - uplift} = \frac{1.69(20)(10.5) + 1.26(20)(31.5) + 806(23)(53.5)}{65} = 3316$$

$$+ 0.806(54/2) = 21.8$$

$$\underline{556 \text{ k}}$$

# Column Wind Uplift

DATE 3/21	JOB NO. E21019	SHEET NO. OF CV-5
JOB: VIP	BY: MAB	
GF Group Structural Engineers		

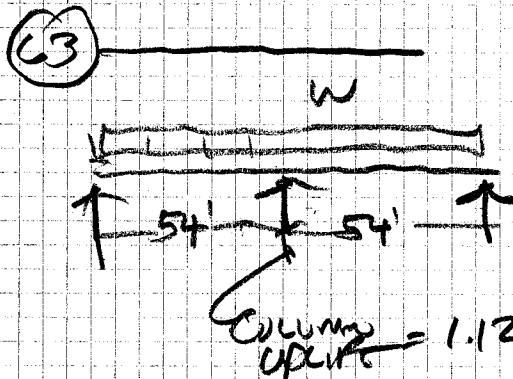


$$C2A - \text{UPLIFT} = \frac{1.69(21)(10.5) + 1.29(21)(31.5) + 1.05(23)(53.5)}{65}$$

$$= 38.4^k$$

$$+ 1.05(54/2) = 28.4$$

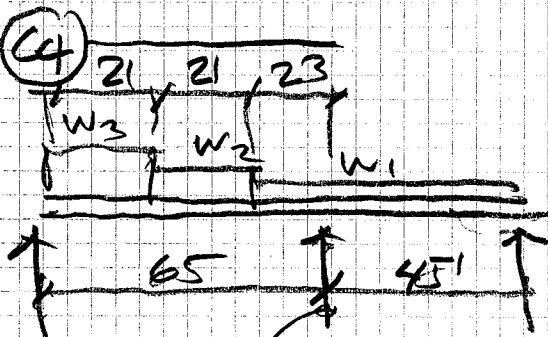
$$66.8^k$$



$$W = \frac{37.5(21)(10.5) + 28(21)(31.5) + 17.9(18)(51)}{60} = 720$$

$$+ \frac{45}{2}(17.9) = 403$$

$$1123$$



$$W_s = 37.5\left(\frac{60+45}{2}\right) = 1969$$

$$W_3 = 28\left(\frac{60+45}{2}\right) = 147$$

$$W_3 = 1.123$$

$$\text{Column Uplift} = \frac{1.969(21)(10.5) + 1.47(21)(31.5) + 1.123(23)(53.5)}{65}$$

$$= 42.9$$

$$+ 1.123(45/2) = 25.3$$

$$68.2^k$$

# Column Wind Uplift

DATE 3/21	JOB NO. 221014	SHEET NO. OF 01-6
JOB: VVP		
BY: MBS		
GF Group Structural Engineers		

(C1) Uplift = 43.5

Roof TRIB AREA =  $(45 \times 54) = 2430 \text{ ft}^2$

$P_{roof} = 2430 (.015) = 36.5$   
 $P_{col} = 2.0$

$P_{FTG} = (0.5)^2 (6.17) (0.15) = 7.4$

$P_{skch} = 0.075 (7.25)^2 = 3.9$

$P_{surl} = .055 (6.75)^2 = 2.5$

$52.3 \text{ k} > 43.5$

∴ 6'-0" sex 1'-2" thick  
Feetings ok

(C1A) Uplift = 56.7 k

Roof TRIB AREA =  $2430 \text{ ft}^2$

$P_{roof} = 36.5$

$P_{col} = 2.0$

$P_{FTG} = (7.0)^2 (1.5) (0.15) = 11.0$

$P_{skch} = (7.25)^2 (0.075) = 4.5$

$P_{surl} = 0.055 (7.25)^2 = 2.9$

$56.9 \text{ k} > 50.7$

∴ 7'-0" sex 1'-6" thick  
Feetings ok

(C2) Uplift = 55.6

Roof TRIB AREA =  $(\frac{65+54}{2}) (45) = 2679 \text{ ft}^2$

$P_{roof} = 2679 (.015) = 40.2$

$P_{col} = 2.0$

$P_{FTG} = 11.0$

$P_{skch} = 4.5$

$P_{surl} = 2.9$

$60.6 > 55.6$

∴ 7'-0" sex 1'-6" thick  
Feetings ok

# COLUMN WIND UPLIFT

DATE 3/21	JOB NO. 221014	SHEET NO. OF 6-7
JOB: VPD		
BY: MRS		
GF Group Structural Engineers		

(C2) UPLIFT = 66.8'  
 Roof TRIB AREA = 2678

$P_{roof} = 2678 (0.015) = 40.2$

$P_{col} = 2.0$

$P_{ftg} = 7^2 (.15) (2.33) = 17.1$

$P_{slab} = 4.5$

$P_{brn} = 2.9$

$66.7 \approx 66.8'$

7'-0" sq x 2'-4" thick  
 FTG OK

(C3) UPLIFT = 60.6'  
 Roof TRIB AREA =  $\left(\frac{60+45}{2}\right) (54) = 2835$

$P_{roof} = 2835 (0.015) = 42.5$

$P_{col} = 2.0$

$P_{ftg} = (7)^2 (.15) (1.5) = 11.0$

$P_{slab} = 4.5$

$P_{brn} = 2.9$

$62.9' > 60.6$

7'-0" sq x 1'-6" thick  
 FTG OK

(C4) UPLIFT = 68.2'  
 Roof TRIB AREA =  $\left(\frac{60+45}{2}\right) \left(\frac{65+54}{2}\right) = 2888$

$P_{roof} = 2888 (0.015) = 43.2$

$P_{col} = 2.0$

$P_{ftg} = 7^2 (.15) (2.33) = 17.1$

$P_{slab} = 4.5$

$P_{brn} = 2.9$

$69.7 > 68.2'$

USE 7'-0" sq x 2'-4" thick  
 FTG OK

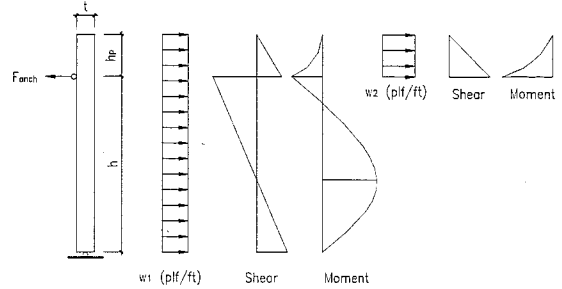


## Lateral Force for One-Story Wall Based on ASCE 7-16 &amp; 2018 IBC

## Exterior Walls

## INPUT DATA

WALL THICKNESS  $t = 9$  in, (229 mm)  
 PARAPET HEIGHT  $h_p = 5$  ft, (1.5 m)  
 WALL HEIGHT  $h = 36$  ft, (11.0 m)  
 TOTAL WALL DENSITY  $p = 145$  lbs/ft<sup>3</sup> (2321 kg/m<sup>3</sup>)  
 SEISMIC PARAMETER  $S_{DS} = 0.18$  (ASCE 7 Sec 11.4)  
 SEISMIC DESIGN CATEGORY  $SDC = B$   
 DIAPHRAGM FLEXIBLE ? (0=no, 1=yes)  $1$  Yes  
 SEISMIC IMPORTANCE FACTOR  $I_e = 1$  (ASCE 7 Tab 11.5-1)  
 WIND IMPORTANCE FACTOR  $I_w = 1.0$  (ASCE 7 Tab 1.5-2)  
 BASIC WIND SPEED  $V = 102$  mph, (164 kph), (ASCE 7 Sec 26.5.1)  
 EXPOSURE CATEGORY (B, C, D)  $C$   
 TOPOGRAPHIC FACTOR  $K_{zt} = 1$  Flat, (ASCE 7 Tab 26.8-1)



## DESIGN SUMMARY

Out-of-plane force for wall design  $w_1 = 14.5$  psf (Wind governs) , (695 N/m<sup>2</sup>)  
 Out-of-plane force for parapet design  $w_2 = 49.1$  psf (Wind governs) , (2349 N/m<sup>2</sup>)  
 Out-of-plane force for anchorage design  $F_{anch} = 524$  plf (Horizontal direction) , (7638 N/m)  
 (The governing seismic & wind forces have been reduced by 0.7 & 0.6 for ASD)

## WIND ANALYSIS

Out-of-plane wind force for wall design (ASCE 7-16 Eq. 30.3-1)

$$w_{1,wind} = 0.6q_h [(GC_p) - (GC_{pi})] = (0.00256K_h K_d K_z K_e V^2) [(GC_p) - (GC_{pi})] = 14.5 \text{ psf}$$

Where:  $K_h = 1.01$ ,  $K_d = 0.85$ ,  $GC_p = -0.88$ ,  $GC_{pi} = 0.18$   
 (mean roof  $h = 35$  ft, changeable)  $K_e = 1.00$  (corner ? y,  $TA = 300$  ft<sup>2</sup>)  
 (ASCE 7-16 26.10-1) (ASCE 7-16 30.3.2) (ASCE 7-16 Tab. 26.13-1)

Out-of-plane wind force for parapet design (ASCE 7-16 Eq. 30.8-1)

$$w_{2,wind} = 0.6q_p [(GC_p) - (GC_{pi})] = (0.00256K_h K_d K_z K_e V^2) [(GC_p) - (GC_{pi})] = 49.1 \text{ psf, (ASCE 7-16 30.8)}$$

Where:  $K_h = 1.05$ ,  $K_d = 0.85$ ,  $GC_p = -1.15$ ,  $GC_{pi} = -2.40$ ,  $GC_{pe} = 0.18$   
 (ASCE 7-16 26.10-1) (ASCE 7-16 26.10-1) (TA = 50 ft<sup>2</sup>) roof, (ASCE 7-16 30.3.2) (ASCE 7-16 Tab. 26.13-1)  
 wall, (ASCE 7-16 30.3.2)

Out-of-plane wind force for anchorage design

$$F_{anch,wind} = \frac{h}{2} w_{1,wind} + h_p \left(1 + \frac{h_p}{2h}\right) w_{2,wind} = 524 \text{ plf (Horizontal)}$$

## SEISMIC ANALYSIS

Out-of-plane seismic force for wall design (ASCE 7, Sec.12.11.1)

$$w_{1,seismic} = MAX(0.4I_{DS}W_p, 0.1W_p) = 0.10 W_p = 10.9 \text{ psf}$$

Where:  $W_p = 108.8$  psf,  $I_e = 1.0$   
 (CBC/IBC Tab 1604.5 & ASCE 7 Tab 1.5-2)

Out-of-plane seismic force for parapet design (ASCE 7, Sec. 13.3.1)

$$w_{2,seismic} = MAX \left[ 0.3S_{DS}I_pW_p, MIN \left( \frac{1.2a_pS_{DS}I_pW_p}{R_p}, 1.6S_{DS}I_pW_p \right) \right] = 0.22 W_p = 23.5 \text{ psf}$$

Where:  $a_p = 2.5$ ,  $I_p = 1.0$ ,  $R_p = 2.5$   
 (ASCE 7 Tab. 13.5-1) (ASCE 7 Sec. 13.1.3) (ASCE 7 Tab. 13.5-1)

Out-of-plane seismic force for anchorage design

For masonry or concrete under seismic design category A & B, both flexible & rigid diaphragm (ASCE 7 Sec. 12.11.2)

$$F_{anch,seismic} = MAX \left[ 0.4S_{DS}IW_p \frac{(h+h_p)^2}{2h}, 0.1W_p \frac{(h+h_p)^2}{2h}, 400S_{DS}I, F_{min} \right] = 2.57 W_p = 280 \text{ plf (Horizontal)} \\ \text{(Applicable)}$$

Where:  $F_{min} = 280$  plf  
 (ASCE 7 Sec. 12.11.2 & 11.7.3)

For seismic design category C and above, flexible diaphragm (ASCE 7 Sec. 12.11.2.1)

$$F_{anch,seismic} = MAX \left[ 0.8S_{DS}IW_p \frac{(h+h_p)^2}{2h}, 0.1W_p \frac{(h+h_p)^2}{2h}, 400S_{DS}I, F_{min} \right] = 3.36 W_p = 366 \text{ plf (Horizontal)} \\ \text{(Not applicable)}$$

For seismic design category C and above, rigid diaphragm (ASCE 7 Sec. 12.11.2 & Sec. 13.3.1)

$$F_{anch,seismic} = MAX \left\{ MAX \left[ 0.4S_{DS}I_p, MIN \left( \frac{1.2a_pS_{DS}I_p}{R_p}, 1.6S_{DS}I_p \right) \right] W_p \frac{(h+h_p)^2}{2h}, 400S_{DS}I, F_{min} \right\}$$

$= 3.36 W_p = 366$  plf (Horizontal) (Not applicable)  
 Where:  $a_p = 1.0$ ,  $R_p = 1.5$   
 (ASCE 7 Tab. 13.5-1) (1.5, ASCE 7 13.4.2 or 2.5, ASCE 7 Tab 13.5-1)

ASD level = 14.5  
 SD level = 14.5  
 $\frac{14.5}{0.6} = 24.2$   
 4  
 USE 30 psf

## Tilt Panel Design

Date	Job No.	Sheet No.
2-21	221019	P2
JOB: VIP		
BY:		
GF Group Structural Engineers		

### P1-north bearing wall

$f'_c =$  4000 psi  
Panel Thickness = 9 in  
Reveal Depth = 0.5 in  
Design Thickness = 8.5 in  
Ledger Height = 35.5 ft  
Parapet Height = 6.5 ft  
  
Roof Joist Span = 45 ft  
Uniform Dead Load = 15 psf  
Uniform Live Load = 20 psf  
Uniform Wind Load = 30 psf (sd level)  
 $w(dl) =$  0.338 klf  $ecc =$  8.00 in  
 $w(ll) =$  0.450 klf

Use: #6 VERT @ 12"  $\uparrow$

### P2-South Bearing Wall

$f'_c =$  4000 psi  
Panel Thickness = 9 in  
Reveal Depth = 0.5 in  
Design Thickness = 8.5 in  
Ledger Height = 34.5 ft  
Parapet Height = 7.5 ft  
  
Roof Joist Span = 60 ft  
Uniform Dead Load = 15 psf  
Uniform Live Load = 20 psf  
Uniform Wind Load = 30 psf (sd level)  
 $w(dl) =$  0.450 klf  $ecc =$  8.00 in  
 $w(ll) =$  0.600 klf

Use: #6 VERT @ 12"  $\uparrow$

### P3-East/West Non Brg Wall

$f'_c =$  4000 psi  
Panel Thickness = 9 in  
Reveal Depth = 0.5 in  
Design Thickness = 8.5 in  
Ledger Height = 37 ft  
Parapet Height = 5 ft  
  
Roof Joist Span = 8 ft  
Uniform Dead Load = 15 psf  
Uniform Live Load = 20 psf  
Uniform Wind Load = 30 psf (sd level)  
 $w(dl) =$  0.060 klf  $ecc =$  8.00 in  
 $w(ll) =$  0.080 klf

Use: #6 VERT @ 12"  $\uparrow$

## Tilt Panel Design

Date 3/21	Job No. 221091	Sheet No. 13
JOB: NIP		
BY:		
GF Group Structural Engineers		

### P4-2ft jamb at 12ft opening in south brg wall

$f'_c = 4000$  psi  
Panel Thickness = 9 in  
Reveal Depth = 0.5 in  
Design Thickness = 8.5 in  
Ledger Height = 34.5 ft  
Parapet Height = 7.5 ft  
  
Roof Joist Span = 60 ft  
Uniform Dead Load = 15 psf  
Uniform Live Load = 20 psf  
Uniform Wind Load = 30 psf (sd level)  
  
Opening Width (left) = 12 ft  
Opening Width (right) = 0 ft  
Jamb Width = 2 ft  
  
Load Adj Factor = 4.00  
  
 $w(dl) = 1.80$  klf     $ecc = 8.00$  in  
 $w(ll) = 2.40$  klf  
design wind load = 120.0 psf  
Concentric Dead Load = 8.4 klf

Use: (6) #6 E/F AT 4" OC  
SEE ENVELOPE

### P5- 2'-8" jamb btwn 12ft and 3.33ft openings

$f'_c = 4000$  psi  
Panel Thickness = 9 in  
Reveal Depth = 0.5 in  
Design Thickness = 8.5 in  
Ledger Height = 34.5 ft  
Parapet Height = 7.5 ft  
  
Roof Joist Span = 60 ft  
Uniform Dead Load = 15 psf  
Uniform Live Load = 20 psf  
Uniform Wind Load = 30 psf (sd level)  
  
Opening Width (left) = 12 ft  
Opening Width (right) = 3.33 ft  
Jamb Width = 2.66 ft  
  
Load Adj Factor = 3.88  
  
 $w(dl) = 1.75$  klf     $ecc = 8'$  in  
 $w(ll) = 2.33$  klf  
design wind load = 116.4 psf  
Concentric Dead Load = 8.0 klf

Use: (7) #6 E/F ROWING  
SPACED (4.57" oc)  
SEE ENVELOPE

## Tilt Panel Design

Date 3/21	Job No. 2210M	Sheet No. P4
JOB: <i>VMP</i>		
BY: <i>MMD</i>		
GF Group Structural Engineers		

### P6-2.25ft jamb at 9ft opening in south brg wall

$f'_c =$  4000 psi  
Panel Thickness = 9 in  
Reveal Depth = 0.5 in  
Design Thickness = 8.5 in  
Ledger Height = 34.5 ft  
Parapet Height = 7.5 ft  
  
Roof Joist Span = 60 ft  
Uniform Dead Load = 15 psf  
Uniform Live Load = 20 psf  
Uniform Wind Load = 30 psf (sd level)  
  
Opening Width (left) = 9 ft  
Opening Width (right) = 0 ft  
Jamb Width = 2.25 ft  
  
Load Adj Factor = 3.00  
  
 $w(dI) =$  1.35 klf     $ecc =$  8.00 in  
 $w(II) =$  1.80 klf  
design wind load = 90.0 psf  
Concentric Dead Load = 5.6 klf

Use: (5) #6 E/F Forming Spacer  
(15.4") - see envelope

### P7- 2ft jamb btwn 3.33ft and 12ft opngs in south bearing wall

$f'_c =$  4000 psi  
Panel Thickness = 9 in  
Reveal Depth = 0.5 in  
Design Thickness = 8.5 in  
Ledger Height = 34.5 ft  
Parapet Height = 7.5 ft  
  
Roof Joist Span = 60 ft  
Uniform Dead Load = 15 psf  
Uniform Live Load = 20 psf  
Uniform Wind Load = 30 psf (sd level)  
  
Opening Width (left) = 12 ft  
Opening Width (right) = 3.33 ft  
Jamb Width = 2 ft  
  
Load Adj Factor = 4.83  
  
 $w(dI) =$  2.17 klf     $ecc =$     in  
 $w(II) =$  2.90 klf  
design wind load = 145.0 psf  
Concentric Dead Load = 10.7 klf

Use: (7) #6 E/F Rebarly  
spaced (3.42")  
see envelope

## Tilt Panel Design

Date	Job No.	Sheet No.
3-21	221019	B
JOB: VIP		
BY: MBG		
GF Group Structural Engineers		

### P8-2ft jamb btwn 12ft and 3.33ft openings in south brg wall

$f'_c =$  4000 psi  
Panel Thickness = 9 in  
Reveal Depth = 0.5 in  
Design Thickness = 8.5 in  
Ledger Height = 34 ft  
Parapet Height = 5 ft  
  
Roof Joist Span = 60 ft  
Uniform Dead Load = 15 psf  
Uniform Live Load = 20 psf  
Uniform Wind Load = 30 psf (sd level)

Opening Width (left) = 12 ft  
Opening Width (right) = 3.33 ft  
Jamb Width = 2 ft

Load Adj Factor = 4.83

$w(dI) =$  2.17 klf     $ecc =$  8.00 in    Use:  
 $w(II) =$  2.90 klf  
design wind load = 145.0 psf  
Concentric Dead Load = 9.5 klf

*Repeat of P7*

### P9-4'-0" jamb at 15ft opng in north brg wall

$f'_c =$  4000 psi  
Panel Thickness = 9 in  
Reveal Depth = 0.5 in  
Design Thickness = 8.5 in  
Ledger Height = 34.5 ft  
Parapet Height = 5.5 ft

Roof Joist Span = 45 ft  
Uniform Dead Load = 15 psf  
Uniform Live Load = 20 psf  
Uniform Wind Load = 30 psf (sd level)

Opening Width (left) = 15 ft  
Opening Width (right) = 0 ft  
Jamb Width = 4 ft

Load Adj Factor = 2.88

$w(dI) =$  0.97 klf     $ecc =$     in  
 $w(II) =$  1.29 klf  
design wind load = 86.3 psf  
Concentric Dead Load = 4.8 klf

Use: (8) #6 E/F C 6" (see enercalc)

## Tilt Panel Design

Date	Job No.	Sheet No.
3-21	221019	Pb
JOB: VIP		
BY: MBG		
GF Group Structural Engineers		

### P10-1.5ft jamb at 3.33ft openings in south brg wall

$f'c =$  4000 psi  
Panel Thickness = 9 in  
Reveal Depth = 0.5 in  
Design Thickness = 8.5 in  
Ledger Height = 34.5 ft  
Parapet Height = 6.5 ft  
  
Roof Joist Span = 60 ft  
Uniform Dead Load = 15 psf  
Uniform Live Load = 20 psf  
Uniform Wind Load = 30 psf (sd level)  
  
Opening Width (left) = 3.33 ft  
Opening Width (right) = 0 ft  
Jamb Width = 1.5 ft  
  
Load Adj Factor = 2.11  
  
 $w(dl) =$  0.95 klf  $ecc = 8.00$  in  
 $w(l) =$  1.27 klf  
design wind load = 63.3 psf  
Concentric Dead Load = 3.0 klf

Use:

(3) #6 E/F AT 6" oc  
(see enercalc)

### P11-2.5ft jamb at 20ft openings in south brg wall with wall braces at 28ft

$f'c =$  4000 psi  
Panel Thickness = 9 in  
Reveal Depth = 0.5 in  
Design Thickness = 8.5 in  
Ledger Height = 34.5 ft  
Parapet Height = 5.5 ft  
  
Roof Joist Span = 60 ft  
Uniform Dead Load = 15 psf  
Uniform Live Load = 20 psf  
Uniform Wind Load = 30 psf (sd level)  
  
Opening Width (left) = 20 ft  
Opening Width (right) = 0 ft  
Jamb Width = 2.5 ft  
  
Load Adj Factor = 5.00  
  
 $w(dl) =$  2.25 klf  $ecc = 8.00$  in  
 $w(l) =$  3.00 klf  
design wind load = 150.0 psf  
Concentric Dead Load = 10.2 klf

Use:

USE (7) #6 E/F EVENLY  
SPACED (4.7" oc)  
(see enercalc)

## Tilt Panel Design

Date	Job No.	Sheet No.
3-21	221019	27
JOB: VIP		
BY: MBG		
GF Group Structural Engineers		

### P12

$f'_c =$  4000 psi  
Panel Thickness = 9 in  
Reveal Depth = 0.5 in  
Design Thickness = 8.5 in  
Ledger Height = 35 ft  
Parapet Height = 6 ft  
  
Joist Span 1 = 60 ft  
Joist Span 2 = 45 ft  
Girder Span = 65 ft  
Uniform Dead Load = 18 psf  
Uniform Live Load = 12 psf  
Uniform Wind Load = 30 psf (sd level)  
Pier Width = 4 ft  
 $w(dl) =$  7.68 klf  $ecc =$  in  
 $w(ll) =$  5.12 klf

Use: (8) #6 E/F AT 6" oc  
(see enclosure)

X

$f'_c =$  psi  
Panel Thickness = in  
Reveal Depth = in  
Design Thickness = #VALUE! in  
Ledger Height = ft  
Parapet Height = ft  
  
Joist Span 1 = ft  
Joist Span 2 = ft  
Girder Span = ft  
Uniform Dead Load = psf  
Uniform Live Load = psf  
Uniform Wind Load = psf (sd level)  
Pier Width = ft  
 $w(dl) =$  #VALUE! klf  $ecc =$  in Use:  
 $w(ll) =$  #VALUE! klf

## Concrete Slender Wall

Lic. #: KW-06006285

DESCRIPTION: P1 North Bearing Wall

### Code References

Calculations per ACI 318-14 Sec 11.8, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

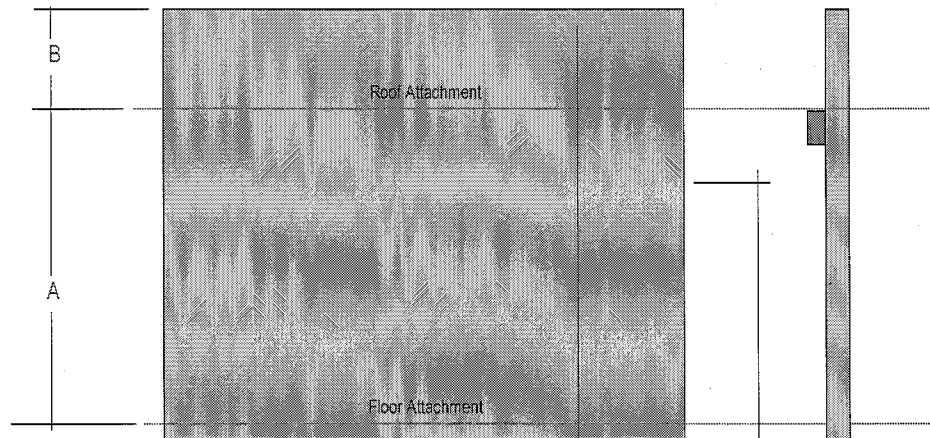
### General Information

$f'_c$ : Concrete 28 day strength	=	4.0 ksi	Wall Thickness	8.50 in	Temp Diff across thickness	=	deg F
$F_y$ : Rebar Yield	=	60.0 ksi	Rebar at wall center		Min Allow Out-of-Plane Defl Ratio = $L/$		0.0
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi	Rebar "d" distance	4.250 in	Min allow As/bd	=	0.00250
$\lambda$ : Lt Wt Conc Factor	=	1.0	Lower Level Rebar ...		Using Stiff. Reduction Factor per ACI R.10.12.3		
$F_r$ : Rupture Modulus	=	316.228 psi	Bar Size	# 6			
Max Allow As/bd	=	0.01806	Bar Spacing	12.0 in			
Max $P_u/A_g = f'_c *$	=	0.060					
Concrete Density	=	144.0 pcf					
Width of Design Strip	=	12.0 in					

### One-Story Wall Dimensions

A Clear Height	=	35.50 ft
B Parapet height	=	4.0 ft

Wall Support Condition Top & Bottom Pinned



### Vertical Loads

Vertical Uniform Loads ... (Applied per foot of Strip Width)

Ledger Load	Eccentricity	8.0 in	DL : Dead	0.3380	Lr : Roof Live	0.450	Lf : Floor Live	S : Snow	W : Wind
Concentric Load									k/ft

### Lateral Loads

Wind Loads :

Full area WIND load	30.0 psf
---------------------	----------

Seismic Loads :

Wall Weight Seismic Load Input Method : ASCE seismic factors entered

SDS Value per ASCE 12.11.1  $S_{DS} * I = 0.20$

$F_p = \text{Wall Wt.} * 0.080 = 8.160 \text{ psf}$



## Concrete Slender Wall

Lic. #: KW-06006285

File: 221019-VIP Products.ec6  
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.17

GFG STRUCTURAL ENGINEERS

DESCRIPTION: P1 North Bearing Wall

### DESIGN SUMMARY

### Results reported for "Strip Width" of 12.0 in

Governing Load Combination ...		Actual Values ...		Allowable Values ...	
PASS	Moment Capacity Check +1.20D+0.50Lr+W	Maximum Bending Stress Ratio = <b>0.8395</b>			
		Max Mu	7.298 k-ft	Phi * Mn	8.692 k-ft
PASS	Service Deflection Check +D+0.60W	Actual Defl. Ratio L/	908	Allowable Defl. Ratio	150.0
		Max. Deflection	0.4694 in		
PASS	Axial Load Check +1.20D+0.50Lr+W	Max Pu / Ag	33.703 psi	Max. Allow. Defl.	2.840 in
		Location	17.158 ft	0.06 * fc	240.0 psi
PASS	Reinforcing Limit Check	Actual As/bd	0.008627	Max Allow As/bd	0.01806
Maximum Reactions ... for Load Combination....					
		Top Horizontal	W Only		0.6593 k
		Base Horizontal	W Only		0.5257 k
		Vertical Reaction	+D+Lr		4.817 k

### Design Maximum Combinations - Moments

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Phi	Moment Values		As Ratio	0.6 * rho bal
	Pu k	0.06*f'c*b*t k				Phi Mn k-ft	As in^2		
+1.40D at 34.32 to 35.50	0.000	24.480	3.81	0.32	0.90	7.77	0.440	0.0086	0.0181
+1.20D+0.50Lr at 34.32 to 35.50	0.000	24.480	3.81	0.42	0.90	7.77	0.440	0.0086	0.0181
+1.20D at 34.32 to 35.50	0.000	24.480	3.81	0.27	0.90	7.77	0.440	0.0086	0.0181
+1.20D+1.60Lr at 34.32 to 35.50	0.000	24.480	3.81	0.75	0.90	7.77	0.440	0.0086	0.0181
+1.20D+1.60Lr+0.50W at 17.75 to 18.93	3.788	24.480	3.81	2.82	0.90	8.78	0.440	0.0086	0.0181
+1.20D+0.50W at 17.75 to 18.93	3.068	24.480	3.81	2.54	0.90	8.59	0.440	0.0086	0.0181
+1.20D+0.50Lr+W at 16.57 to 17.75	3.438	24.480	3.81	7.30	0.90	8.69	0.440	0.0086	0.0181
+1.20D+W at 15.38 to 16.57	3.357	24.480	3.81	6.93	0.90	8.67	0.440	0.0086	0.0181
+0.90D+W at 16.57 to 17.75	2.409	24.480	3.81	6.12	0.90	8.42	0.440	0.0086	0.0181
+1.20D+E at 17.75 to 18.93	3.068	24.480	3.81	1.45	0.90	8.59	0.440	0.0086	0.0181
+1.20D-E at 15.38 to 16.57	3.357	24.480	3.81	1.17	0.90	8.67	0.440	0.0086	0.0181
+0.90D+E at 17.75 to 18.93	2.301	24.480	3.81	1.40	0.90	8.39	0.440	0.0086	0.0181
+0.90D-E at 16.57 to 17.75	2.409	24.480	3.81	1.19	0.90	8.42	0.440	0.0086	0.0181

### Design Maximum Combinations - Deflections

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Moment Values		Stiffness		Deflections	
	Pu k		Mcr k-ft	Mactual k-ft	I gross in^4	I cracked in^4	I effective in^4	Deflection in
D Only at 20.12 to 21.30	2.315		3.81	0.14	614.13	51.46	460.594	0.023
+D+Lr at 20.12 to 21.30	2.765		3.81	0.32	614.13	52.09	460.594	0.053
+D+0.750Lr at 20.12 to 21.30	2.653		3.81	0.27	614.13	51.93	460.594	0.045
+D+0.60W at 17.75 to 18.93	2.556		3.81	2.97	614.13	51.80	460.594	0.469
+D-0.60W at 16.57 to 17.75	2.677		3.81	2.74	614.13	51.97	460.594	0.426
+D+0.750Lr+0.450W at 17.75 to 18.93	2.894		3.81	2.39	614.13	52.26	460.594	0.381
+D+0.750Lr-0.450W at 16.57 to 17.75	3.015		3.81	1.92	614.13	52.41	460.594	0.294
+D+0.450W at 17.75 to 18.93	2.557		3.81	2.26	614.13	51.80	460.594	0.358
+D-0.450W at 16.57 to 17.75	2.677		3.81	2.03	614.13	51.97	460.594	0.314
+0.60D+0.60W at 16.57 to 17.75	1.606		3.81	2.88	614.13	50.49	460.594	0.454
+0.60D-0.60W at 16.57 to 17.75	1.606		3.81	2.75	614.13	50.49	460.594	0.429
+D+0.70E at 17.75 to 18.93	2.557		3.81	1.02	614.13	51.80	460.594	0.164
+D-0.70E at 16.57 to 17.75	2.677		3.81	0.79	614.13	51.97	460.594	0.120
+D+0.5250E at 17.75 to 18.93	2.557		3.81	0.80	614.13	51.80	460.594	0.129

GF Group Structural Engineers  
9375 E. Shea Blvd., #100  
Scottsdale, AZ 85260

Project Title:  
Engineer:  
Project ID:  
Project Descr:

P10

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## Concrete Slender Wall

File: 221019-VIP Products.ec6

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** P1 North Bearing Wall

+D-0.5250E at 16.57 to 17.75	2.677	3.81	0.57	614.13	51.97	460.594	0.085	5,022.9
+0.60D+0.70E at 17.75 to 18.93	1.534	3.81	0.96	614.13	50.40	460.594	0.153	2,781.2
+0.60D-0.70E at 16.57 to 17.75	1.606	3.81	0.83	614.13	50.49	460.594	0.127	3,347.2

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal		Top Horizontal		Vertical @ Wall Base	
D Only	0.0	k	0.01	k	4.367	k
+D+Lr	0.0	k	0.01	k	4.817	k
+D+0.750Lr	0.0	k	0.01	k	4.704	k
+D+0.60W	0.3	k	0.39	k	4.367	k
+D-0.60W	0.3	k	0.40	k	4.367	k
+D+0.750Lr+0.450W	0.2	k	0.29	k	4.704	k
+D+0.750Lr-0.450W	0.2	k	0.31	k	4.704	k
+D+0.450W	0.2	k	0.29	k	4.367	k
+D-0.450W	0.2	k	0.30	k	4.367	k

GF Group Structural Engineers  
9375 E. Shea Blvd., #100  
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Project Title:  
Engineer:  
Project ID:  
Project Descr:

P11

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## Concrete Slender Wall

File: 221019-VIP Products.ecb

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

DESCRIPTION: P1 North Bearing Wall

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
+0.60D+0.60W	0.3 k	0.39 k	2.620 k
+0.60D-0.60W	0.3 k	0.40 k	2.620 k
+D+0.70E	0.1 k	0.12 k	4.367 k
+D-0.70E	0.1 k	0.13 k	4.367 k
+D+0.5250E	0.1 k	0.09 k	4.367 k
+D-0.5250E	0.1 k	0.10 k	4.367 k
+0.60D+0.70E	0.1 k	0.12 k	2.620 k
+0.60D-0.70E	0.1 k	0.13 k	2.620 k
Lr Only	0.0 k	0.01 k	0.450 k
W Only	0.5 k	0.66 k	0.000 k
-W	0.5 k	0.66 k	0.000 k
E Only	0.1 k	0.18 k	0.000 k
E Only *-1.0	0.1 k	0.18 k	0.000 k

## Concrete Slender Wall

Lic. #: KW-06006285

DESCRIPTION: P2 South Bearing Wall

### Code References

Calculations per ACI 318-14 Sec 11.8, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

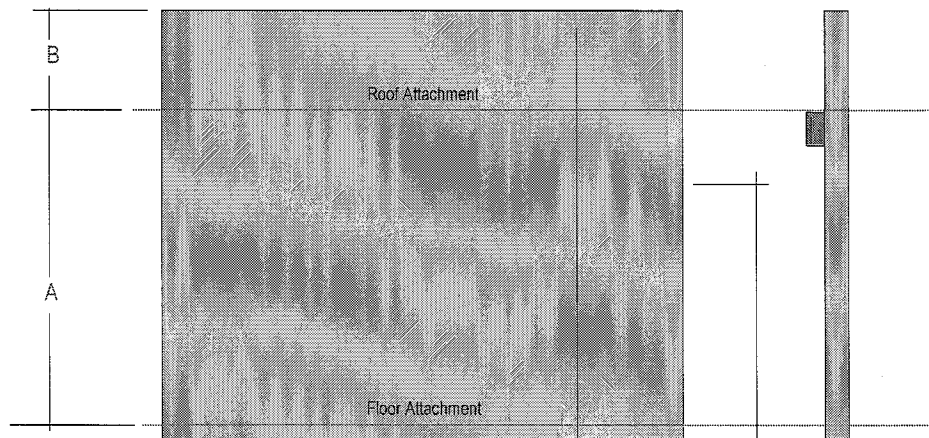
### General Information

$f'_c$ : Concrete 28 day strength	=	4.0 ksi	Wall Thickness	8.50 in	Temp Diff across thickness	=	deg F
$F_y$ : Rebar Yield	=	60.0 ksi	Rebar at wall center		Min Allow Out-of-Plane Defl Ratio = $L/$	0.0	
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi	Rebar "d" distance	4.250 in	Min allow $A_s/bd$	=	0.00250
$\lambda$ : Lt Wt Conc Factor	=	1.0	Lower Level Rebar ...		Using Stiff. Reduction Factor per ACI R.10.12.3		
$F_r$ : Rupture Modulus	=	316.228 psi	Bar Size	# 6			
Max Allow $A_s/bd$	=	0.01806	Bar Spacing	12.0 in			
Max $P_u/A_g = f'_c *$	=	0.060					
Concrete Density	=	144.0 pcf					
Width of Design Strip	=	12.0 in					

### One-Story Wall Dimensions

A Clear Height	=	34.50 ft
B Parapet height	=	4.0 ft

Wall Support Condition Top & Bottom Pinned



### Vertical Loads

Vertical Uniform Loads ... (Applied per foot of Strip Width)

Ledger Load	Eccentricity	8.0 in	DL : Dead	0.450	Lr : Roof Live	0.60	Lf : Floor Live	S : Snow	W : Wind
Concentric Load									k/ft

### Lateral Loads

Wind Loads :

Full area WIND load	30.0 psf
---------------------	----------

Seismic Loads :

Wall Weight Seismic Load Input Method : ASCE seismic factors entered

SDS Value per ASCE 12.11.1  $S_{DS} * I = .2$

$F_p = \text{Wall Wt.} * 0.080 = 8.160 \text{ psf}$

## Concrete Slender Wall

Lic. #: KW-06006285

DESCRIPTION: P2 South Bearing Wall

### DESIGN SUMMARY

### Results reported for "Strip Width" of 12.0 in

Governing Load Combination ...	Actual Values ...	Allowable Values ...
PASS Moment Capacity Check +1.20D+0.50Lr+W	Maximum Bending Stress Ratio = <b>0.7916</b> Max Mu 6.911 k-ft	Phi * Mn 8.730 k-ft
PASS Service Deflection Check +D+0.60W	Actual Defl. Ratio L/ 973 Max. Deflection 0.4256 in	Allowable Defl. Ratio 150.0
PASS Axial Load Check +1.20D+0.50Lr+W	Max Pu / Ag 35.115 psi Location 16.675 ft	Max. Allow. Defl. 2.760 in 0.06 * f <sub>c</sub> 240.0 psi
PASS Reinforcing Limit Check	Actual As/bd 0.008627	Max Allow As/bd 0.01806

### Maximum Reactions ... for Load Combination....

Top Horizontal	W Only	0.6445 k
Base Horizontal	W Only	0.5105 k
Vertical Reaction	+D+Lr	4.977 k

### Design Maximum Combinations - Moments

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Phi	Moment Values			0.6 * rho bal
	Pu k	0.06*f <sub>c</sub> *b*t k				Phi Mn k-ft	As in <sup>2</sup>	As Ratio	
+1.40D at 33.35 to 34.50	0.000	24.480	3.81	0.42	0.90	7.77	0.440	0.0086	0.0181
+1.20D+0.50Lr at 33.35 to 34.50	0.000	24.480	3.81	0.56	0.90	7.77	0.440	0.0086	0.0181
+1.20D at 33.35 to 34.50	0.000	24.480	3.81	0.36	0.90	7.77	0.440	0.0086	0.0181
+1.20D+1.60Lr at 33.35 to 34.50	0.000	24.480	3.81	1.00	0.90	7.77	0.440	0.0086	0.0181
+1.20D+1.60Lr+0.50W at 18.40 to 19.55	3.960	24.480	3.81	2.83	0.90	8.83	0.440	0.0086	0.0181
+1.20D+0.50W at 17.25 to 18.40	3.141	24.480	3.81	2.45	0.90	8.61	0.440	0.0086	0.0181
+1.20D+0.50Lr+W at 16.10 to 17.25	3.582	24.480	3.81	6.91	0.90	8.73	0.440	0.0086	0.0181
+1.20D+W at 16.10 to 17.25	3.282	24.480	3.81	6.46	0.90	8.65	0.440	0.0086	0.0181
+0.90D+W at 16.10 to 17.25	2.461	24.480	3.81	5.73	0.90	8.43	0.440	0.0086	0.0181
+1.20D+E at 17.25 to 18.40	3.141	24.480	3.81	1.42	0.90	8.61	0.440	0.0086	0.0181
+1.20D-E at 14.95 to 16.10	3.423	24.480	3.81	1.05	0.90	8.69	0.440	0.0086	0.0181
+0.90D+E at 17.25 to 18.40	2.356	24.480	3.81	1.36	0.90	8.41	0.440	0.0086	0.0181
+0.90D-E at 14.95 to 16.10	2.567	24.480	3.81	1.08	0.90	8.46	0.440	0.0086	0.0181

### Design Maximum Combinations - Deflections

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load	Moment Values		Stiffness			Deflections	
	Pu k	Mcr k-ft	Mactual k-ft	I gross in^4	I cracked in^4	I effective in^4	Deflection in	Defl. Ratio
D Only at 19.55 to 20.70	2.383	3.81	0.18	614.13	51.57	460.594	0.028	14,637.3
+D+Lr at 19.55 to 20.70	2.983	3.81	0.42	614.13	52.38	460.594	0.066	6,227.1
+D+0.750Lr at 19.55 to 20.70	2.833	3.81	0.36	614.13	52.17	460.594	0.057	7,278.4
+D+0.60W at 17.25 to 18.40	2.618	3.81	2.84	614.13	51.88	460.594	0.426	972.7
+D-0.60W at 16.10 to 17.25	2.735	3.81	2.54	614.13	52.04	460.594	0.371	1,116.5
+D+0.750Lr+0.450W at 17.25 to 18.40	3.068	3.81	2.35	614.13	52.50	460.594	0.356	1,162.7
+D+0.750Lr-0.450W at 16.10 to 17.25	3.185	3.81	1.73	614.13	52.64	460.594	0.245	1,687.3
+D+0.450W at 17.25 to 18.40	2.618	3.81	2.17	614.13	51.88	460.594	0.326	1,269.3
+D-0.450W at 16.10 to 17.25	2.735	3.81	1.87	614.13	52.04	460.594	0.271	1,526.1
+0.60D+0.60W at 17.25 to 18.40	1.570	3.81	2.74	614.13	50.45	460.594	0.409	1,011.9
+0.60D-0.60W at 16.10 to 17.25	1.641	3.81	2.57	614.13	50.54	460.594	0.377	1,098.8
+D+0.70E at 17.25 to 18.40	2.618	3.81	1.01	614.13	51.88	460.594	0.154	2,686.7
+D-0.70E at 16.10 to 17.25	2.735	3.81	0.70	614.13	52.04	460.594	0.099	4,180.1
+D+0.5250E at 17.25 to 18.40	2.618	3.81	0.80	614.13	51.88	460.594	0.123	3,378.5

GF Group Structural Engineers  
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Scottsdale, AZ 85260

Project Title:  
Engineer:  
Project ID:  
Project Descr:

P13

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## Concrete Slender Wall

File: 221019-VIP Products.ec6

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

### DESCRIPTION: P2 South Bearing Wall

+D-0.5250E at 16.10 to 17.25	2.735	3.81	0.49	614.13	52.04	460.594	0.067	6,137.2
+0.60D+0.70E at 17.25 to 18.40	1.571	3.81	0.94	614.13	50.45	460.594	0.141	2,933.9
+0.60D-0.70E at 16.10 to 17.25	1.641	3.81	0.75	614.13	50.54	460.594	0.109	3,815.0

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.01 k	4.377 k
+D+Lr	0.0 k	0.02 k	4.977 k
+D+0.750Lr	0.0 k	0.02 k	4.827 k
+D+0.60W	0.3 k	0.38 k	4.377 k
+D-0.60W	0.3 k	0.40 k	4.377 k
+D+0.750Lr+0.450W	0.2 k	0.27 k	4.827 k
+D+0.750Lr-0.450W	0.2 k	0.31 k	4.827 k
+D+0.450W	0.2 k	0.28 k	4.377 k
+D-0.450W	0.2 k	0.30 k	4.377 k

GF Group Structural Engineers  
9375 E. Shea Blvd., #100  
Scottsdale, AZ 85260

Project Title:  
Engineer:  
Project ID:  
Project Descr:

P14

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## Concrete Slender Wall

File: 221019-VIP Products.ec6

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

DESCRIPTION: P2 South Bearing Wall

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
+0.60D+0.60W	0.3 k	0.38 k	2.626 k
+0.60D-0.60W	0.3 k	0.39 k	2.626 k
+D+0.70E	0.1 k	0.11 k	4.377 k
+D-0.70E	0.1 k	0.13 k	4.377 k
+D+0.5250E	0.1 k	0.08 k	4.377 k
+D-0.5250E	0.1 k	0.10 k	4.377 k
+0.60D+0.70E	0.1 k	0.12 k	2.626 k
+0.60D-0.70E	0.1 k	0.13 k	2.626 k
Lr Only	0.0 k	0.01 k	0.600 k
W Only	0.5 k	0.64 k	0.000 k
-W	0.5 k	0.64 k	0.000 k
E Only	0.1 k	0.18 k	0.000 k
E Only *-1.0	0.1 k	0.18 k	0.000 k

## Concrete Slender Wall

Lic. #: KW-06006285

DESCRIPTION: P3 East/West Non Bearing Wall

### Code References

Calculations per ACI 318-14 Sec 11.8, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

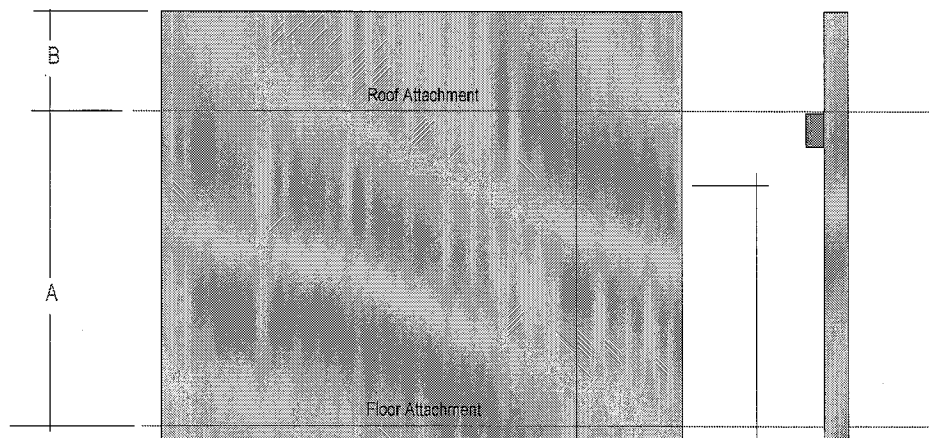
### General Information

$f'_c$ : Concrete 28 day strength	=	4.0 ksi	Wall Thickness	8.50 in	Temp Diff across thickness	=	deg F
$F_y$ : Rebar Yield	=	60.0 ksi	Rebar at wall center		Min Allow Out-of-Plane Defl Ratio = $L/$		0.0
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi	Rebar "d" distance	4.250 in	Min allow $A_s/bd$	=	0.00250
$\lambda$ : Lt Wt Conc Factor	=	1.0	Lower Level Rebar ...		Using Stiff. Reduction Factor per ACI R.10.12.3		
$F_r$ : Rupture Modulus	=	316.228 psi	Bar Size	# 6			
Max Allow $A_s/bd$	=	0.01806	Bar Spacing	12.0 in			
Max $P_u/A_g = f'_c *$	=	0.060					
Concrete Density	=	144.0 pcf					
Width of Design Strip	=	12.0 in					

### One-Story Wall Dimensions

A Clear Height	=	37.0 ft
B Parapet height	=	4.0 ft

Wall Support Condition Top & Bottom Pinned



### Vertical Loads

Vertical Uniform Loads ... (Applied per foot of Strip Width)			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity	8.0 in	0.060	0.080			k/ft
Concentric Load							k/ft

### Lateral Loads

Wind Loads :		Seismic Loads :	
Full area WIND load	30.0 psf	Wall Weight Seismic Load Input Method :	ASCE seismic factors entered
		SDS Value per ASCE 12.11.1	$S_{DS} * I = .2$
		$F_p = \text{Wall Wt.} * 0.080 =$	8.160 psf



## Concrete Slender Wall

Lic. #: KW-06006285

DESCRIPTION: P3 East/West Non Bearing Wall

### DESIGN SUMMARY

### Results reported for "Strip Width" of 12.0 in

Governing Load Combination . . .		Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +1.20D+0.50Lr+W	Maximum Bending Stress Ratio = <b>0.8751</b>			
		Max Mu	7.509 k-ft	Phi * Mn	8.581 k-ft
PASS	Service Deflection Check +D+0.60W	Actual Defl. Ratio L/	832	Allowable Defl. Ratio	150.0
		Max. Deflection	0.5337 in		
PASS	Axial Load Check +1.20D+0.50Lr+W	Max Pu / Ag	31.056 psi	Max. Allow. Defl.	2.960 in
		Location	16.650 ft	0.06 * fc	240.0 psi
PASS	Reinforcing Limit Check	Actual As/bd	0.008627	Max Allow As/bd	0.01806

### Maximum Reactions . . . for Load Combination....

Top Horizontal	W Only	0.6815 k
Base Horizontal	W Only	0.5485 k
Vertical Reaction	+D+Lr	4.322 k

### Design Maximum Combinations - Moments

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Phi	Moment Values			0.6 * rho bal
	Pu k	0.06*fc*b*t k				Phi Mn k-ft	As in^2	As Ratio	
+1.40D at 35.77 to 37.00	0.000	24.480	3.81	0.06	0.90	7.77	0.440	0.0086	0.0181
+1.20D+0.50Lr at 35.77 to 37.00	0.000	24.480	3.81	0.07	0.90	7.77	0.440	0.0086	0.0181
+1.20D at 35.77 to 37.00	0.000	24.480	3.81	0.05	0.90	7.77	0.440	0.0086	0.0181
+1.20D+1.60Lr at 35.77 to 37.00	0.000	24.480	3.81	0.13	0.90	7.77	0.440	0.0086	0.0181
+1.20D+1.60Lr+0.50W at 17.27 to 18.50	3.105	24.480	3.81	2.68	0.90	8.60	0.440	0.0086	0.0181
+1.20D+0.50W at 17.27 to 18.50	2.977	24.480	3.81	2.63	0.90	8.57	0.440	0.0086	0.0181
+1.20D+0.50Lr+W at 16.03 to 17.27	3.168	24.480	3.81	7.53	0.90	8.62	0.440	0.0086	0.0181
+1.20D+W at 16.03 to 17.27	3.128	24.480	3.81	7.46	0.90	8.61	0.440	0.0086	0.0181
+0.90D+W at 17.27 to 18.50	2.233	24.480	3.81	6.63	0.90	8.37	0.440	0.0086	0.0181
+1.20D+E at 17.27 to 18.50	2.977	24.480	3.81	1.44	0.90	8.57	0.440	0.0086	0.0181
+1.20D-E at 17.27 to 18.50	2.977	24.480	3.81	1.40	0.90	8.57	0.440	0.0086	0.0181
+0.90D+E at 17.27 to 18.50	2.233	24.480	3.81	1.42	0.90	8.37	0.440	0.0086	0.0181
+0.90D-E at 17.27 to 18.50	2.233	24.480	3.81	1.39	0.90	8.37	0.440	0.0086	0.0181

### Design Maximum Combinations - Deflections

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Moment Values		Stiffness		Deflections	
	Pu k		Mcr k-ft	Mactual k-ft	I gross in^4	I cracked in^4	I effective in^4	Deflection in
D Only at 20.97 to 22.20	2.103		3.81	0.02	614.13	51.17	460.594	0.004
+D+Lr at 20.97 to 22.20	2.183		3.81	0.06	614.13	51.29	460.594	0.010
+D+0.750Lr at 20.97 to 22.20	2.163		3.81	0.05	614.13	51.27	460.594	0.009
+D+0.60W at 17.27 to 18.50	2.481		3.81	3.13	614.13	51.69	460.594	0.534
+D-0.60W at 17.27 to 18.50	2.481		3.81	3.09	614.13	51.69	460.594	0.525
+D+0.750Lr+0.450W at 17.27 to 18.50	2.541		3.81	2.37	614.13	51.77	460.594	0.406
+D+0.750Lr-0.450W at 17.27 to 18.50	2.541		3.81	2.29	614.13	51.77	460.594	0.389
+D+0.450W at 17.27 to 18.50	2.481		3.81	2.35	614.13	51.69	460.594	0.401
+D-0.450W at 17.27 to 18.50	2.481		3.81	2.31	614.13	51.69	460.594	0.393
+0.60D+0.60W at 17.27 to 18.50	1.488		3.81	3.08	614.13	50.34	460.594	0.525
+0.60D-0.60W at 17.27 to 18.50	1.488		3.81	3.05	614.13	50.34	460.594	0.520
+D+0.70E at 17.27 to 18.50	2.481		3.81	1.01	614.13	51.69	460.594	0.172
+D-0.70E at 17.27 to 18.50	2.481		3.81	0.97	614.13	51.69	460.594	0.164
+D+0.5250E at 17.27 to 18.50	2.481		3.81	0.76	614.13	51.69	460.594	0.130

## Concrete Slender Wall

Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** P3 East/West Non Bearing Wall

+D-0.5250E at 17.27 to 18.50	2.481	3.81	0.72	614.13	51.69	460.594	0.122	3,644.0
+0.60D+0.70E at 17.27 to 18.50	1.488	3.81	0.98	614.13	50.34	460.594	0.168	2,638.8
+0.60D-0.70E at 17.27 to 18.50	1.488	3.81	0.96	614.13	50.34	460.594	0.163	2,718.9

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal		Top Horizontal		Vertical @ Wall Base	
D Only	0.0	k	0.00	k	4.242	k
+D+Lr	0.0	k	0.00	k	4.322	k
+D+0.750Lr	0.0	k	0.00	k	4.302	k
+D+0.60W	0.3	k	0.41	k	4.242	k
+D-0.60W	0.3	k	0.41	k	4.242	k
+D+0.750Lr+0.450W	0.2	k	0.31	k	4.302	k
+D+0.750Lr-0.450W	0.2	k	0.31	k	4.302	k
+D+0.450W	0.2	k	0.31	k	4.242	k
+D-0.450W	0.2	k	0.31	k	4.242	k

GF Group Structural Engineers  
9375 E. Shea Blvd., #100  
Scottsdale, AZ 85260

Project Title:  
Engineer:  
Project ID:  
Project Descr:

P13

Printed: 18 FEB 2021, 7:08AM

## Concrete Slender Wall

File: 221019-VIP Products.ec6

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GFG STRUCTURAL ENGINEERS

Lic. # : KW-06006285

DESCRIPTION: P3 East/West Non Bearing Wall

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
+0.60D+0.60W	0.3 k	0.41 k	2.545 k
+0.60D-0.60W	0.3 k	0.41 k	2.545 k
+D+0.70E	0.1 k	0.13 k	4.242 k
+D-0.70E	0.1 k	0.13 k	4.242 k
+D+0.5250E	0.1 k	0.10 k	4.242 k
+D-0.5250E	0.1 k	0.10 k	4.242 k
+0.60D+0.70E	0.1 k	0.13 k	2.545 k
+0.60D-0.70E	0.1 k	0.13 k	2.545 k
Lr Only	0.0 k	0.00 k	0.080 k
W Only	0.5 k	0.68 k	0.000 k
-W	0.5 k	0.68 k	0.000 k
E Only	0.1 k	0.19 k	0.000 k
E Only *-1.0	0.1 k	0.19 k	0.000 k

## Concrete Slender Wall

Lic. #: KW-06006285

DESCRIPTION: P4 - 2ft jamb at 12ft opening in South Bearing Wall

### Code References

Calculations per ACI 318-14 Sec 11.8, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

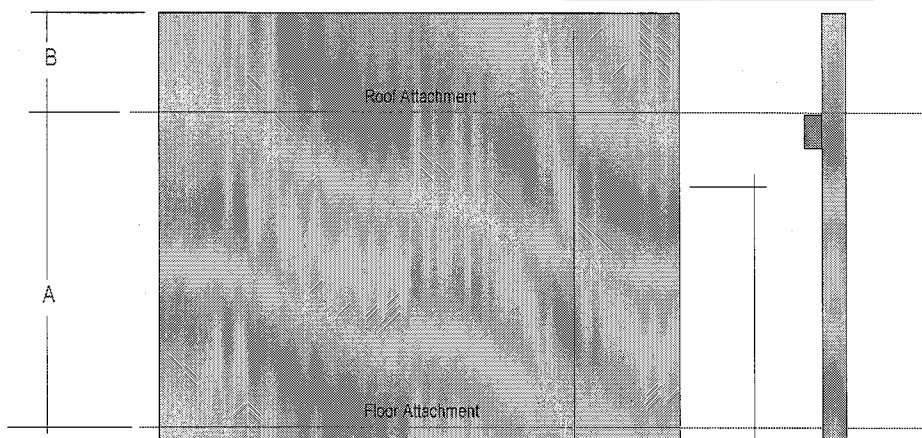
### General Information

$f'_c$ : Concrete 28 day strength	=	4.0 ksi	Wall Thickness	8.50 in	Temp Diff across thickness	=	deg F
$F_y$ : Rebar Yield	=	60.0 ksi	Rebar at each face		Min Allow Out-of-Plane Defl Ratio = $L/$		0.0
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi	Rebar "d" distance	1.50 in	Min allow $A_s/bd$	=	0.00250
$\lambda$ : Lt Wt Conc Factor	=	1.0	Lower Level Rebar ...		Using Stiff. Reduction Factor per ACI R.10.12.3		
$F_r$ : Rupture Modulus	=	316.228 psi	Bar Size	#	Compression in rebar ignored for strength		
Max Allow $A_s/bd$	=	0.01806	Bar Spacing	6			
Max $P_u/A_g = f'_c *$	=	0.060		4 in			
Concrete Density	=	144.0 pcf					
Width of Design Strip	=	12.0 in					

### One-Story Wall Dimensions

A Clear Height	=	34.50 ft
B Parapet height	=	4.0 ft

Wall Support Condition Top & Bottom Pinned



### Vertical Loads

Vertical Uniform Loads ... (Applied per foot of Strip Width)			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity	8.0 in	1.8	2.4			k/ft
Concentric Load							k/ft
Vertical Concentrated Loads ... (Applied to full "Strip Width")			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Beam Load #1	Eccentricity	in	8.4				k
	Dist. from Base	18 ft					

### Lateral Loads

Wind Loads :		Seismic Loads :	
Full area WIND load	120 psf	Wall Weight Seismic Load Input Method :	ASCE seismic factors entered
		SDS Value per ASCE 12.11.1	$S_{DS} * I = .2$
		$F_p = \text{Wall Wt.} * 0.080 =$	8.160 psf

## Concrete Slender Wall

Lic. # : KW-06006285

DESCRIPTION: P4 - 2ft jamb at 12ft opening in South Bearing Wall

### DESIGN SUMMARY

### Results reported for "Strip Width" of 12.0 in

Governing Load Combination ...		Actual Values ...		Allowable Values ...	
PASS	Moment Capacity Check +1.20D+0.50Lr+W	Maximum Bending Stress Ratio = <b>0.6166</b>			
		Max Mu	22.698 k-ft	Phi * Mn	36.814 k-ft
PASS	Service Deflection Check +D+0.60W	Actual Defl. Ratio L/	166	Allowable Defl. Ratio	150.0
		Max. Deflection	2.50 in		
PASS	Axial Load Check +1.20D+0.50Lr+W	Max Pu / Ag	158.644 psi	Max. Allow. Defl.	2.760 in
		Location	16.675 ft	0.06 * fc	240.0 psi
PASS	Reinforcing Limit Check	Actual As/bd	0.01571	Max Allow As/bd	0.01806
Maximum Reactions ... for Load Combination....					
		Top Horizontal	W Only		2.578 k
		Base Horizontal	W Only		2.042 k
		Vertical Reaction	+D+Lr		16.527 k

### Design Maximum Combinations - Moments

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Phi	Moment Values		As Ratio	0.6 * rho bal
	Pu k	0.06*fc*b*t k				Phi Mn k-ft	As in^2		
+1.40D at 33.35 to 34.50	0.000	24.480	3.81	1.68	0.90	35.81	1.320	0.0157	0.0181
+1.20D+0.50Lr at 33.35 to 34.50	0.000	24.480	3.81	2.24	0.90	35.81	1.320	0.0157	0.0181
+1.20D at 33.35 to 34.50	0.000	24.480	3.81	1.44	0.90	35.81	1.320	0.0157	0.0181
+1.20D+1.60Lr at 33.35 to 34.50	0.000	24.480	3.81	4.00	0.90	35.81	1.320	0.0157	0.0181
+1.20D+1.60Lr+0.50W at 17.25 to 18.40	8.601	24.480	3.81	13.98	0.90	37.24	1.320	0.0157	0.0181
+1.20D+0.50W at 16.10 to 17.25	14.982	24.480	3.81	11.32	0.90	38.20	1.320	0.0157	0.0181
+1.20D+0.50Lr+W at 16.10 to 17.25	16.182	24.480	3.81	22.81	0.90	38.38	1.320	0.0157	0.0181
+1.20D+W at 16.10 to 17.25	14.982	24.480	3.81	21.79	0.90	38.20	1.320	0.0157	0.0181
+0.90D+W at 16.10 to 17.25	11.236	24.480	3.81	20.54	0.90	37.64	1.320	0.0157	0.0181
+1.20D+E at 19.55 to 20.70	4.479	24.480	3.81	2.23	0.90	36.57	1.320	0.0157	0.0181
+1.20D-E at 33.35 to 34.50	0.000	24.480	3.81	1.51	0.90	35.81	1.320	0.0157	0.0181
+0.90D+E at 19.55 to 20.70	3.360	24.480	3.81	1.93	0.90	36.39	1.320	0.0157	0.0181
+0.90D-E at 33.35 to 34.50	0.000	24.480	3.81	1.15	0.90	35.81	1.320	0.0157	0.0181

### Design Maximum Combinations - Deflections

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Moment Values		I gross in^4	Stiffness		Deflections	
	Pu k		Mcr k-ft	Mactual k-ft		I cracked in^4	I effective in^4	Deflection in	Defl. Ratio
D Only at 19.55 to 20.70	3.733		3.81	0.77	614.13	341.27	460.594	0.121	3,432.1
+D+Lr at 18.40 to 19.55	6.250		3.81	1.78	614.13	345.64	460.594	0.291	1,424.3
+D+0.750Lr at 18.40 to 19.55	5.650		3.81	1.51	614.13	344.62	460.594	0.247	1,675.4
+D+0.60W at 17.25 to 18.40	3.967		3.81	12.67	614.13	341.67	341.674	2.500	165.6
+D-0.60W at 16.10 to 17.25	12.485		3.81	11.34	614.13	356.28	356.280	2.170	190.8
+D+0.750Lr+0.450W at 17.25 to 18.40	5.768		3.81	10.76	614.13	344.82	344.821	2.126	194.7
+D+0.750Lr-0.450W at 16.10 to 17.25	14.285		3.81	7.87	614.13	359.31	359.313	1.445	286.6
+D+0.450W at 17.25 to 18.40	3.967		3.81	9.68	614.13	341.67	341.674	1.911	216.6
+D-0.450W at 16.10 to 17.25	12.485		3.81	8.33	614.13	356.28	356.280	1.578	262.3
+0.60D+0.60W at 17.25 to 18.40	2.380		3.81	11.69	614.13	338.90	338.903	2.332	177.5
+0.60D-0.60W at 16.10 to 17.25	7.491		3.81	10.96	614.13	347.80	347.801	2.144	193.1
+D+0.70E at 17.25 to 18.40	3.967		3.81	1.61	614.13	341.67	460.594	0.255	1,623.6
+D-0.70E at 10.35 to 11.50	13.071		3.81	0.36	614.13	357.28	460.594	0.024	17,036.5
+D+0.5250E at 17.25 to 18.40	3.967		3.81	1.38	614.13	341.67	460.594	0.221	1,872.7

## Concrete Slender Wall

Lic. #: KW-06006285

DESCRIPTION: P4 - 2ft jamb at 12ft opening in South Bearing Wall

+D-0.5250E at 25.30 to 26.45	3.146	3.81	0.46	614.13	340.26	460.594	0.030	13,942.2
+0.60D+0.70E at 17.25 to 18.40	2.380	3.81	1.28	614.13	338.90	460.594	0.199	2,083.7
+0.60D-0.70E at 14.95 to 16.10	7.561	3.81	0.52	614.13	347.96	460.594	0.063	6,522.4

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.03 k	14.127 k
+D+Lr	0.1 k	0.07 k	16.527 k
+D+0.750Lr	0.1 k	0.06 k	15.927 k
+D+0.60W	1.2 k	1.58 k	14.127 k
+D-0.60W	1.1 k	1.64 k	14.127 k
+D+0.750Lr+0.450W	0.9 k	1.15 k	15.927 k
+D+0.750Lr-0.450W	0.8 k	1.27 k	15.927 k
+D+0.450W	0.9 k	1.17 k	14.127 k
+D-0.450W	0.8 k	1.24 k	14.127 k
+0.60D+0.60W	1.2 k	1.56 k	8.476 k
+0.60D-0.60W	1.2 k	1.60 k	8.476 k
+D+0.70E	0.1 k	0.09 k	14.127 k
+D-0.70E	0.1 k	0.16 k	14.127 k
+D+0.5250E	0.1 k	0.06 k	14.127 k
+D-0.5250E	0.0 k	0.13 k	14.127 k
+0.60D+0.70E	0.1 k	0.10 k	8.476 k
+0.60D-0.70E	0.1 k	0.14 k	8.476 k
Lr Only	0.0 k	0.05 k	2.400 k
W Only	2.0 k	2.58 k	0.000 k
-W	2.0 k	2.58 k	0.000 k
E Only	0.1 k	0.18 k	0.000 k
E Only *-1.0	0.1 k	0.18 k	0.000 k

## Concrete Slender Wall

Lic. #: KW-06006285

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GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** P5 - 2.67ft jamb btwn 3.33ft and 12ft opening in South Bearing Wall

### Code References

Calculations per ACI 318-14 Sec 11.8, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

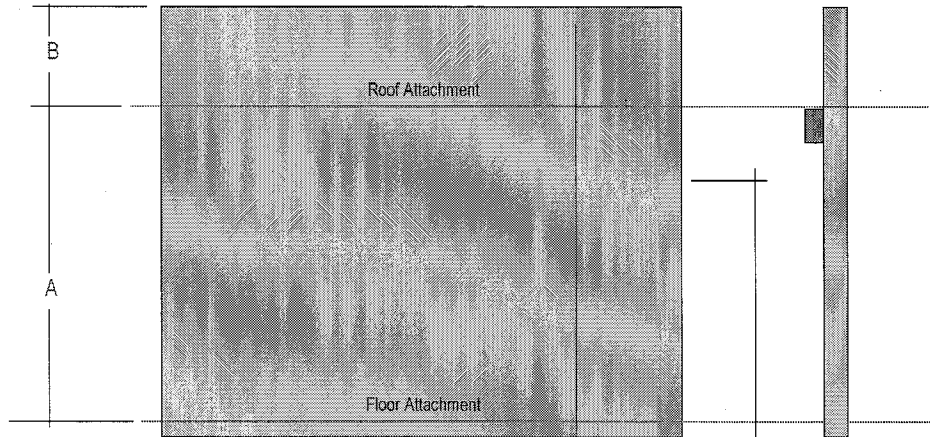
### General Information

$f'_c$ : Concrete 28 day strength	=	4.0 ksi	Wall Thickness	8.50 in	Temp Diff across thickness	=		deg F
$F_y$ : Rebar Yield	=	60.0 ksi	Rebar at each face		Min Allow Out-of-Plane Defl Ratio = $L/$		0.0	
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi	Rebar "d" distance	1.50 in	Min allow $A_s/bd$	=	0.00250	
$\lambda$ : Lt Wt Conc Factor	=	1.0	Lower Level Rebar ...		Using Stiff. Reduction Factor per ACI R.10.12.3			
$F_r$ : Rupture Modulus	=	316.228 psi	Bar Size	# 6	Compression in rebar ignored for strength			
Max Allow $A_s/bd$	=	0.01806	Bar Spacing	4.570 in				
Max $P_u/Ag = f'_c *$	=	0.060						
Concrete Density	=	144.0 pcf						
Width of Design Strip	=	12.0 in						

### One-Story Wall Dimensions

A Clear Height	=	34.50 ft
B Parapet height	=	4.0 ft

Wall Support Condition Top & Bottom Pinned



### Vertical Loads

Vertical Uniform Loads ... (Applied per foot of Strip Width)			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity	8.0 in	1.750	2.330			k/ft
Concentric Load							k/ft
Vertical Concentrated Loads ... (Applied to full "Strip Width")			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Beam Load #1	Eccentricity	in	8.0				k
	Dist. from Base	18.0 ft					

### Lateral Loads

Wind Loads :		Seismic Loads :	
Full area WIND load	116.40 psf	Wall Weight Seismic Load Input Method :	ASCE seismic factors entered
		SDS Value per ASCE 12.11.1	$S_{DS} * I = 0.20$
$F_p = \text{Wall Wt.} * 0.080$	=	8.160 psf	

## Concrete Slender Wall

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Lic. #: KW-D6006285

GFG STRUCTURAL ENGINEERS

DESCRIPTION: P5 - 2.67ft jamb btwn 3.33ft and 12ft opening in South Bearing Wall

### DESIGN SUMMARY

### Results reported for "Strip Width" of 12.0 in

Governing Load Combination . . .		Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +1.20D+0.50Lr+W	Maximum Bending Stress Ratio = <b>0.6703</b>			
		Max Mu	22.165 k-ft	Phi * Mn	33.068 k-ft
PASS	Service Deflection Check +D+0.60W	Actual Defl. Ratio L/	155	Allowable Defl. Ratio	150.0
		Max. Deflection	2.667 in		
PASS	Axial Load Check +1.20D+0.50Lr+W	Max Pu / Ag	153.007 psi	Max. Allow. Defl.	2.760 in
		Location	16.675 ft	0.06 * fc	240.0 psi
PASS	Reinforcing Limit Check	Actual As/bd	0.01375	Max Allow As/bd	0.01806
Maximum Reactions . . . for Load Combination....					
		Top Horizontal	W Only		2.50 k
		Base Horizontal	W Only		1.981 k
		Vertical Reaction	+D+Lr		16.007 k

### Design Maximum Combinations - Moments

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Moment Values				0.6 * rho bal
	Pu k	0.06*f'c*b*t k			Phi	Phi Mn k-ft	As in^2	As Ratio	
+1.40D at 33.35 to 34.50	0.000	24.480	3.81	1.63	0.90	31.98	1.155	0.0138	0.0181
+1.20D+0.50Lr at 33.35 to 34.50	0.000	24.480	3.81	2.18	0.90	31.98	1.155	0.0138	0.0181
+1.20D at 33.35 to 34.50	0.000	24.480	3.81	1.40	0.90	31.98	1.155	0.0138	0.0181
+1.20D+1.60Lr at 33.35 to 34.50	0.000	24.480	3.81	3.89	0.90	31.98	1.155	0.0138	0.0181
+1.20D+1.60Lr+0.50W at 17.25 to 18.40	8.429	24.480	3.81	13.68	0.90	33.52	1.155	0.0138	0.0181
+1.20D+0.50W at 16.10 to 17.25	14.442	24.480	3.81	11.05	0.90	34.55	1.155	0.0138	0.0181
+1.20D+0.50Lr+W at 16.10 to 17.25	15.607	24.480	3.81	22.28	0.90	34.74	1.155	0.0138	0.0181
+1.20D+W at 16.10 to 17.25	14.442	24.480	3.81	21.26	0.90	34.55	1.155	0.0138	0.0181
+0.90D+W at 16.10 to 17.25	10.831	24.480	3.81	20.01	0.90	33.94	1.155	0.0138	0.0181
+1.20D+E at 19.55 to 20.70	4.419	24.480	3.81	2.19	0.90	32.80	1.155	0.0138	0.0181
+1.20D-E at 33.35 to 34.50	0.000	24.480	3.81	1.47	0.90	31.98	1.155	0.0138	0.0181
+0.90D+E at 19.55 to 20.70	3.315	24.480	3.81	1.91	0.90	32.60	1.155	0.0138	0.0181
+0.90D-E at 33.35 to 34.50	0.000	24.480	3.81	1.12	0.90	31.98	1.155	0.0138	0.0181

### Design Maximum Combinations - Deflections

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values		I gross in^4	Stiffness		Deflections	
		Mcr k-ft	Mactual k-ft		I cracked in^4	I effective in^4	Deflection in	Defl. Ratio
D Only at 19.55 to 20.70	3.683	3.81	0.75	614.13	311.80	460.594	0.117	3,540.7
+D+Lr at 18.40 to 19.55	6.130	3.81	1.72	614.13	316.33	460.594	0.281	1,472.3
+D+0.750Lr at 19.55 to 20.70	5.430	3.81	1.53	614.13	315.10	460.594	0.239	1,731.1
+D+0.60W at 17.25 to 18.40	3.917	3.81	12.40	614.13	312.28	312.284	2.667	155.2
+D-0.60W at 16.10 to 17.25	12.035	3.81	11.10	614.13	327.16	327.164	2.314	178.9
+D+0.750Lr+0.450W at 17.25 to 18.40	5.665	3.81	10.56	614.13	315.52	315.516	2.273	182.1
+D+0.750Lr-0.450W at 16.10 to 17.25	13.782	3.81	7.71	614.13	330.29	330.286	1.535	269.7
+D+0.450W at 17.25 to 18.40	3.917	3.81	9.48	614.13	312.28	312.285	2.039	203.0
+D-0.450W at 16.10 to 17.25	12.035	3.81	8.14	614.13	327.16	327.164	1.674	247.4
+0.60D+0.60W at 17.25 to 18.40	2.350	3.81	11.40	614.13	309.32	309.323	2.486	166.5
+0.60D-0.60W at 16.10 to 17.25	7.221	3.81	10.68	614.13	318.38	318.377	2.285	181.2
+D+0.70E at 17.25 to 18.40	3.917	3.81	1.59	614.13	312.28	460.594	0.251	1,650.4
+D-0.70E at 11.50 to 12.65	12.504	3.81	0.37	614.13	327.98	460.594	0.027	15,381.5
+D+0.5250E at 17.25 to 18.40	3.917	3.81	1.36	614.13	312.28	460.594	0.217	1,907.4



GF Group Structural Engineers  
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Project Title:  
Engineer:  
Project ID:  
Project Descr:

P24

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## Concrete Slender Wall

File: 221019-VIP Products.ec6

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GFG STRUCTURAL ENGINEERS

Lic. #: KW-06006285

**DESCRIPTION:** P5 - 2.67ft jamb btwn 3.33ft and 12ft opening in South Bearing Wall

+D-0.5250E at 25.30 to 26.45	3.096	3.81	0.43	614.13	310.69	460.594	0.027	15,414.9
+0.60D+0.70E at 17.25 to 18.40	2.350	3.81	1.26	614.13	309.32	460.594	0.196	2,107.9
+0.60D-0.70E at 14.95 to 16.10	7.291	3.81	0.53	614.13	318.53	460.594	0.065	6,353.9

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal		Top Horizontal		Vertical @ Wall Base	
D Only	0.0	k	0.03	k	13.677	k
+D+Lr	0.1	k	0.07	k	16.007	k
+D+0.750Lr	0.1	k	0.06	k	15.425	k
+D+0.60W	1.2	k	1.53	k	13.677	k
+D-0.60W	1.1	k	1.59	k	13.677	k
+D+0.750Lr+0.450W	0.9	k	1.11	k	15.424	k
+D+0.750Lr-0.450W	0.8	k	1.23	k	15.424	k
+D+0.450W	0.9	k	1.14	k	13.677	k
+D-0.450W	0.8	k	1.20	k	13.677	k
+0.60D+0.60W	1.2	k	1.52	k	8.206	k
+0.60D-0.60W	1.1	k	1.55	k	8.206	k
+D+0.70E	0.1	k	0.10	k	13.677	k
+D-0.70E	0.1	k	0.16	k	13.677	k
+D+0.5250E	0.1	k	0.06	k	13.677	k
+D-0.5250E	0.0	k	0.13	k	13.677	k
+0.60D+0.70E	0.1	k	0.11	k	8.206	k
+0.60D-0.70E	0.1	k	0.14	k	8.206	k
Lr Only	0.0	k	0.05	k	2.330	k
W Only	2.0	k	2.50	k	0.000	k
-W	2.0	k	2.50	k	0.000	k
E Only	0.1	k	0.18	k	0.000	k
E Only *-1.0	0.1	k	0.18	k	0.000	k

## Concrete Slender Wall

File: 221019-VIP Products.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.17

Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** P6 - 2.25ft jamb btwn 9ft opening in South Bearing Wall

### Code References

Calculations per ACI 318-14 Sec 11.8, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

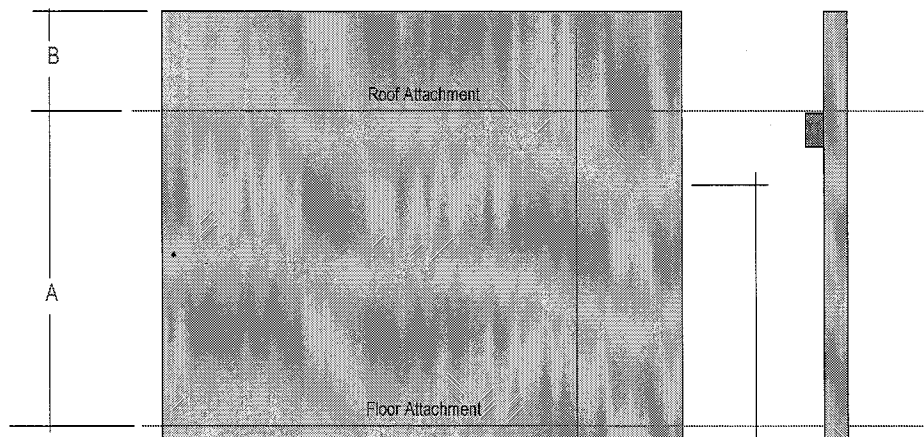
### General Information

f'c : Concrete 28 day strength	=	4.0 ksi	Wall Thickness	8.50 in	Temp Diff across thickness	=	deg F
Fy : Rebar Yield	=	60.0 ksi	Rebar at each face		Min Allow Out-of-Plane Defl Ratio = L/	0.0	
Ec : Concrete Elastic Modulus	=	3,122.0 ksi	Rebar "d" distance	1.50 in	Min allow As/bd	=	0.00250
$\lambda$ : Lt Wt Conc Factor	=	1.0	Lower Level Rebar ...		Using Stiff. Reduction Factor per ACI R.10.12.3		
Fr : Rupture Modulus	=	316.228 psi	Bar Size	#	Compression in rebar ignored for strength		
Max Allow As/bd	=	0.01806	Bar Spacing	5.4 in			
Max Pu/Ag = f'c *	=	0.060					
Concrete Density	=	144.0 pcf					
Width of Design Strip	=	12.0 in					

### One-Story Wall Dimensions

A Clear Height	=	34.50 ft
B Parapet height	=	4.0 ft

Wall Support Condition Top & Bottom Pinned



### Vertical Loads

Vertical Uniform Loads ... (Applied per foot of Strip Width)			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity	8.0 in	1.320	1.760			k/ft
Concentric Load							k/ft
Vertical Concentrated Loads ... (Applied to full "Strip Width")			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Beam Load #1	Eccentricity	in	5.40				k
	Dist. from Base	18.0 ft					

### Lateral Loads

Wind Loads :		Seismic Loads :	
Full area WIND load	87.90 psf	Wall Weight Seismic Load Input Method :	ASCE seismic factors entered
		SDS Value per ASCE 12.11.1	$S_{DS} * I = 0.20$
		Fp = Wall Wt. * 0.080	= 8.160 psf

## Concrete Slender Wall

Lic. #: KW-06006285

DESCRIPTION: P6 - 2.25ft jamb btwn 9ft opening in South Bearing Wall

### DESIGN SUMMARY

### Results reported for "Strip Width" of 12.0 in

Governing Load Combination . . .		Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +1.20D+0.50Lr+W	Maximum Bending Stress Ratio = <b>0.5634</b>			
		Max Mu	16.158 k-ft	Phi * Mn	28.681 k-ft
PASS	Service Deflection Check +D+0.60W	Actual Defl. Ratio L/	187	Allowable Defl. Ratio	150.0
		Max. Deflection	2.218 in		
PASS	Axial Load Check +1.20D+0.50Lr+W	Max Pu / Ag	114.565 psi	Max. Allow. Defl.	2.760 in
		Location	16.675 ft	0.06 * fc	240.0 psi
PASS	Reinforcing Limit Check	Actual As/bd	0.01164	Max Allow As/bd	0.01806

### Maximum Reactions . . . for Load Combination....

Top Horizontal	W Only	1.888 k
Base Horizontal	W Only	1.496 k
Vertical Reaction	+D+Lr	12.407 k

### Design Maximum Combinations - Moments

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Moment Values			As Ratio	0.6 * rho bal
	Pu k	0.06*fc*b*t k			Phi	Phi Mn k-ft	As in^2		
+1.40D at 33.35 to 34.50	0.000	24.480	3.81	1.23	0.90	27.64	0.978	0.0116	0.0181
+1.20D+0.50Lr at 33.35 to 34.50	0.000	24.480	3.81	1.64	0.90	27.64	0.978	0.0116	0.0181
+1.20D at 33.35 to 34.50	0.000	24.480	3.81	1.06	0.90	27.64	0.978	0.0116	0.0181
+1.20D+1.60Lr at 33.35 to 34.50	0.000	24.480	3.81	2.93	0.90	27.64	0.978	0.0116	0.0181
+1.20D+1.60Lr+0.50W at 17.25 to 18.40	7.001	24.480	3.81	9.84	0.90	29.07	0.978	0.0116	0.0181
+1.20D+0.50W at 16.10 to 17.25	10.806	24.480	3.81	8.07	0.90	29.81	0.978	0.0116	0.0181
+1.20D+0.50Lr+W at 16.10 to 17.25	11.686	24.480	3.81	16.22	0.90	29.98	0.978	0.0116	0.0181
+1.20D+W at 16.10 to 17.25	10.806	24.480	3.81	15.56	0.90	29.81	0.978	0.0116	0.0181
+0.90D+W at 16.10 to 17.25	8.104	24.480	3.81	14.77	0.90	29.29	0.978	0.0116	0.0181
+1.20D+E at 19.55 to 20.70	3.903	24.480	3.81	1.92	0.90	28.45	0.978	0.0116	0.0181
+1.20D-E at 33.35 to 34.50	0.000	24.480	3.81	1.12	0.90	27.64	0.978	0.0116	0.0181
+0.90D+E at 18.40 to 19.55	3.033	24.480	3.81	1.71	0.90	28.27	0.978	0.0116	0.0181
+0.90D-E at 13.80 to 14.95	8.315	24.480	3.81	0.88	0.90	29.33	0.978	0.0116	0.0181

### Design Maximum Combinations - Deflections

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values		I gross in^4	Stiffness I cracked in^4	I effective in^4	Deflections	
		Mcr k-ft	Mactual k-ft				Deflection in	Defl. Ratio
D Only at 19.55 to 20.70	3.253	3.81	0.55	614.13	276.87	460.594	0.086	4,791.2
+D+Lr at 19.55 to 20.70	5.013	3.81	1.32	614.13	280.41	460.594	0.206	2,007.1
+D+0.750Lr at 19.55 to 20.70	4.573	3.81	1.12	614.13	279.52	460.594	0.176	2,355.1
+D+0.60W at 17.25 to 18.40	3.487	3.81	9.19	614.13	277.29	277.294	2.218	186.6
+D-0.60W at 16.10 to 17.25	9.005	3.81	8.21	614.13	288.31	288.310	1.920	215.6
+D+0.750Lr+0.450W at 17.25 to 18.40	4.808	3.81	7.77	614.13	280.02	280.017	1.876	220.7
+D+0.750Lr-0.450W at 16.10 to 17.25	10.325	3.81	5.65	614.13	290.95	290.947	1.222	338.8
+D+0.450W at 17.25 to 18.40	3.487	3.81	7.01	614.13	277.29	277.294	1.676	247.1
+D-0.450W at 16.10 to 17.25	9.005	3.81	6.01	614.13	288.31	288.310	1.357	305.0
+0.60D+0.60W at 17.25 to 18.40	2.092	3.81	8.51	614.13	274.47	274.474	2.082	198.9
+0.60D-0.60W at 16.10 to 17.25	5.403	3.81	7.97	614.13	281.16	281.160	1.910	216.7
+D+0.70E at 17.25 to 18.40	3.487	3.81	1.39	614.13	277.29	460.594	0.217	1,903.5
+D-0.70E at 13.80 to 14.95	9.239	3.81	0.47	614.13	288.80	460.594	0.050	8,226.9
+D+0.5250E at 17.25 to 18.40	3.487	3.81	1.16	614.13	277.29	460.594	0.184	2,244.3

## Concrete Slender Wall

Lic. #: KW-06006285

**DESCRIPTION:** P6 - 2.25ft jamb btwn 9ft opening in South Bearing Wall

+D-0.5250E at 11.50 to 12.65	9.474	3.81	0.27	614.13	289.30	460.594	0.019	21,405.6
+0.60D+0.70E at 17.25 to 18.40	2.093	3.81	1.15	614.13	274.47	460.594	0.178	2,330.1
+0.60D-0.70E at 14.95 to 16.10	5.473	3.81	0.61	614.13	281.31	460.594	0.080	5,197.9

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal		Top Horizontal		Vertical @ Wall Base	
D Only	0.0	k	0.02	k	10.647	k
+D+Lr	0.1	k	0.06	k	12.407	k
+D+0.750Lr	0.0	k	0.05	k	11.967	k
+D+0.60W	0.9	k	1.15	k	10.647	k
+D-0.60W	0.8	k	1.19	k	10.647	k
+D+0.750Lr+0.450W	0.7	k	0.83	k	11.967	k
+D+0.750Lr-0.450W	0.6	k	0.92	k	11.967	k
+D+0.450W	0.7	k	0.86	k	10.647	k
+D-0.450W	0.6	k	0.90	k	10.647	k
+0.60D+0.60W	0.9	k	1.14	k	6.388	k
+0.60D-0.60W	0.9	k	1.17	k	6.388	k
+D+0.70E	0.1	k	0.10	k	10.647	k
+D-0.70E	0.1	k	0.15	k	10.647	k
+D+0.5250E	0.1	k	0.07	k	10.647	k
+D-0.5250E	0.0	k	0.12	k	10.647	k
+0.60D+0.70E	0.1	k	0.11	k	6.388	k
+0.60D-0.70E	0.1	k	0.14	k	6.388	k
Lr Only	0.0	k	0.03	k	1.760	k
W Only	1.5	k	1.89	k	0.000	k
-W	1.5	k	1.89	k	0.000	k
E Only	0.1	k	0.18	k	0.000	k
E Only *-1.0	0.1	k	0.18	k	0.000	k

## Concrete Slender Wall

File: 221019-VIP Products.ecb  
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GFG STRUCTURAL ENGINEERS

Lic. #: KVV-06006285

**DESCRIPTION:** P7 - 2ft jamb btwn 3.33ft and 12ft openings in South Bearing Wall

### Code References

Calculations per ACI 318-14 Sec 11.8, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

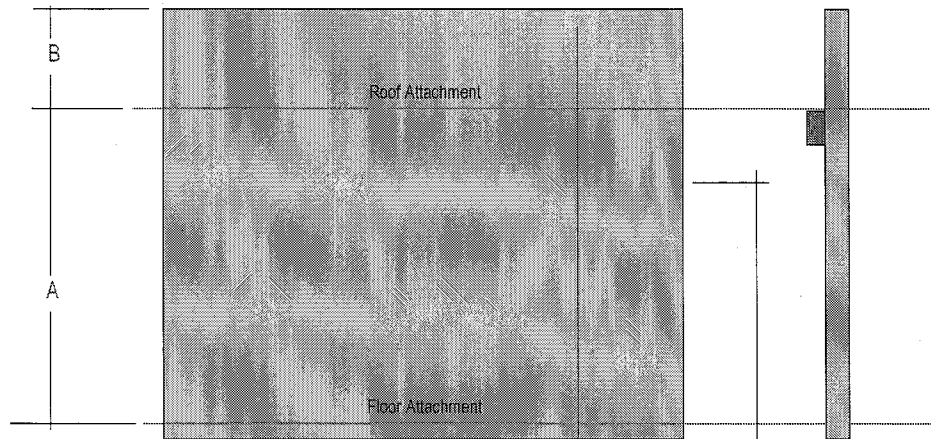
### General Information

$f'_c$ : Concrete 28 day strength	=	4.0 ksi	Wall Thickness	8.50 in	Temp Diff across thickness	=	deg F
$F_y$ : Rebar Yield	=	60.0 ksi	Rebar at each face		Min Allow Out-of-Plane Defl Ratio =	L/	0.0
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi	Rebar "d" distance	1.50 in	Min allow $A_s/bd$	=	0.00250
$\lambda$ : Lt Wt Conc Factor	=	1.0	Lower Level Rebar ...		Using Stiff. Reduction Factor per ACI R.10.12.3		
$F_r$ : Rupture Modulus	=	316.228 psi	Bar Size	# 6	Compression in rebar ignored for strength		
Max Allow $A_s/bd$	=	0.01806	Bar Spacing	3.420 in			
Max $P_u/A_g = f'_c *$	=	0.060					
Concrete Density	=	144.0 pcf					
Width of Design Strip	=	12.0 in					

### One-Story Wall Dimensions

A Clear Height	=	34.50 ft
B Parapet height	=	4.0 ft

Wall Support Condition Top & Bottom Pinned



### Vertical Loads

Vertical Uniform Loads ... (Applied per foot of Strip Width)			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity	8.0 in	2.170	2.90			k/ft
Concentric Load							k/ft
Vertical Concentrated Loads ... (Applied to full "Strip Width")			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Beam Load #1	Eccentricity	in	10.70				k
	Dist. from Base	18.0 ft					

### Lateral Loads

Wind Loads :		Seismic Loads :	
Full area WIND load	145.0 psf	Wall Weight Seismic Load Input Method :	ASCE seismic factors entered
		SDS Value per ASCE 12.11.1	$S_{DS} * I = 0.20$
		$F_p = \text{Wall Wt.} * 0.080$	$= 8.160 \text{ psf}$

## Concrete Slender Wall

File: 221019-VIPProducts.ec6  
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GFG STRUCTURAL ENGINEERS

Lic. #: KW-06006285

DESCRIPTION: P7 - 2ft jamb btwn 3.33ft and 12ft openings in South Bearing Wall

### DESIGN SUMMARY

### Results reported for "Strip Width" of 12.0 in

Governing Load Combination ...		Actual Values ...		Allowable Values ...	
PASS	Moment Capacity Check +1.20D+0.50Lr+W	Maximum Bending Stress Ratio = <b>0.6732</b>			
		Max Mu	28.066 k-ft	Phi * Mn	41.692 k-ft
PASS	Service Deflection Check +D+0.60W	Actual Defl. Ratio L/	151	Allowable Defl. Ratio	150.0
		Max. Deflection	2.748 in		
PASS	Axial Load Check +1.20D+0.50Lr+W	Max Pu / Ag	192.507 psi	Max. Allow. Defl.	2.760 in
		Location	16.675 ft	0.06 * f <sub>c</sub>	240.0 psi
FAIL	Reinforcing Limit Check	Actual As/bd	0.01838	Max Allow As/bd	0.01806

### Maximum Reactions ... for Load Combination....

Top Horizontal	W Only	3.115 k
Base Horizontal	W Only	2.468 k
Vertical Reaction	+D+Lr	19.697 k

### Design Maximum Combinations - Moments

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Phi	Moment Values			0.6 * rho bal
	Pu k	0.06*f <sub>c</sub> *b*t k				Phi Mn k-ft	As in <sup>2</sup>	As Ratio	
+1.40D at 33.35 to 34.50	0.000	24.480	3.81	2.03	0.90	40.74	1.544	0.0184	0.0181
+1.20D+0.50Lr at 33.35 to 34.50	0.000	24.480	3.81	2.70	0.90	40.74	1.544	0.0184	0.0181
+1.20D at 33.35 to 34.50	0.000	24.480	3.81	1.74	0.90	40.74	1.544	0.0184	0.0181
+1.20D+1.60Lr at 33.35 to 34.50	0.000	24.480	3.81	4.83	0.90	40.74	1.544	0.0184	0.0181
+1.20D+1.60Lr+0.50W at 17.25 to 18.40	9.845	24.480	3.81	17.43	0.90	42.12	1.544	0.0184	0.0181
+1.20D+0.50W at 16.10 to 17.25	18.186	24.480	3.81	13.97	0.90	43.14	1.544	0.0184	0.0181
+1.20D+0.50Lr+W at 16.10 to 17.25	19.636	24.480	3.81	28.23	0.90	43.31	1.544	0.0184	0.0181
+1.20D+W at 16.10 to 17.25	18.186	24.480	3.81	26.87	0.90	43.14	1.544	0.0184	0.0181
+0.90D+W at 16.10 to 17.25	13.639	24.480	3.81	25.19	0.90	42.60	1.544	0.0184	0.0181
+1.20D+E at 20.70 to 21.85	4.783	24.480	3.81	2.48	0.90	41.43	1.544	0.0184	0.0181
+1.20D-E at 33.35 to 34.50	0.000	24.480	3.81	1.80	0.90	40.74	1.544	0.0184	0.0181
+0.90D+E at 19.55 to 20.70	3.693	24.480	3.81	2.11	0.90	41.28	1.544	0.0184	0.0181
+0.90D-E at 33.35 to 34.50	0.000	24.480	3.81	1.37	0.90	40.74	1.544	0.0184	0.0181

### Design Maximum Combinations - Deflections

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values		I gross in <sup>4</sup>	Stiffness I cracked in <sup>4</sup>	I effective in <sup>4</sup>	Deflections	
		Mcr k-ft	M actual k-ft				Deflection in	Defl. Ratio
D Only at 18.40 to 19.55	4.220	3.81	0.90	614.13	379.09	460.594	0.148	2,794.4
+D+Lr at 18.40 to 19.55	7.120	3.81	2.21	614.13	383.71	460.594	0.360	1,148.7
+D+0.750Lr at 18.40 to 19.55	6.395	3.81	1.87	614.13	382.51	460.594	0.306	1,354.2
+D+0.60W at 17.25 to 18.40	4.337	3.81	15.47	614.13	379.28	379.283	2.748	150.7
+D-0.60W at 16.10 to 17.25	15.155	3.81	13.85	614.13	396.25	396.250	2.392	173.1
+D+0.750Lr+0.450W at 17.25 to 18.40	6.512	3.81	13.19	614.13	382.70	382.702	2.349	176.3
+D+0.750Lr-0.450W at 16.10 to 17.25	17.330	3.81	9.66	614.13	399.54	399.535	1.608	257.5
+D+0.450W at 17.25 to 18.40	4.337	3.81	11.82	614.13	379.28	379.283	2.104	196.7
+D-0.450W at 16.10 to 17.25	15.155	3.81	10.18	614.13	396.25	396.250	1.744	237.4
+0.60D+0.60W at 17.25 to 18.40	2.602	3.81	14.22	614.13	376.53	376.527	2.557	161.9
+0.60D-0.60W at 16.10 to 17.25	9.093	3.81	13.32	614.13	386.84	386.843	2.353	175.9
+D+0.70E at 17.25 to 18.40	4.337	3.81	1.79	614.13	379.28	460.594	0.285	1,451.7
+D-0.70E at 26.45 to 27.60	3.399	3.81	0.60	614.13	377.80	460.594	0.027	15,120.1
+D+0.5250E at 18.40 to 19.55	4.220	3.81	1.59	614.13	379.09	460.594	0.251	1,651.4

## Concrete Slender Wall

File: 221019-VIP Products.ec6

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GFG STRUCTURAL ENGINEERS

Lic. # : KW-06006285

**DESCRIPTION:** P7 - 2ft jamb btwn 3.33ft and 12ft openings in South Bearing Wall

+D-0.5250E at 23.00 to 24.15	3.751	3.81	0.49	614.13	378.30	460.594	0.052	7,957.1
+0.60D+0.70E at 17.25 to 18.40	2.602	3.81	1.37	614.13	376.53	460.594	0.215	1,922.9
+0.60D-0.70E at 13.80 to 14.95	9.234	3.81	0.47	614.13	387.06	460.594	0.051	8,098.3

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal		Top Horizontal		Vertical @ Wall Base	
D Only	0.0	k	0.04	k	16.797	k
+D+Lr	0.1	k	0.09	k	19.697	k
+D+0.750Lr	0.1	k	0.07	k	18.972	k
+D+0.60W	1.4	k	1.91	k	16.797	k
+D-0.60W	1.4	k	1.99	k	16.797	k
+D+0.750Lr+0.450W	1.1	k	1.39	k	18.972	k
+D+0.750Lr-0.450W	1.0	k	1.54	k	18.972	k
+D+0.450W	1.1	k	1.43	k	16.797	k
+D-0.450W	1.0	k	1.50	k	16.797	k
+0.60D+0.60W	1.5	k	1.89	k	10.078	k
+0.60D-0.60W	1.4	k	1.94	k	10.078	k
+D+0.70E	0.1	k	0.09	k	16.797	k
+D-0.70E	0.1	k	0.16	k	16.797	k
+D+0.5250E	0.1	k	0.06	k	16.797	k
+D-0.5250E	0.0	k	0.13	k	16.797	k
+0.60D+0.70E	0.1	k	0.10	k	10.078	k
+0.60D-0.70E	0.1	k	0.15	k	10.078	k
Lr Only	0.1	k	0.06	k	2.900	k
W Only	2.5	k	3.11	k	0.000	k
-W	2.5	k	3.11	k	0.000	k
E Only	0.1	k	0.18	k	0.000	k
E Only *-1.0	0.1	k	0.18	k	0.000	k

## Concrete Slender Wall

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** P8 - 2ft jamb btwn 12ft and 3.33ft openings in South Bearing Wall

### Code References

Calculations per ACI 318-14 Sec 11.8, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

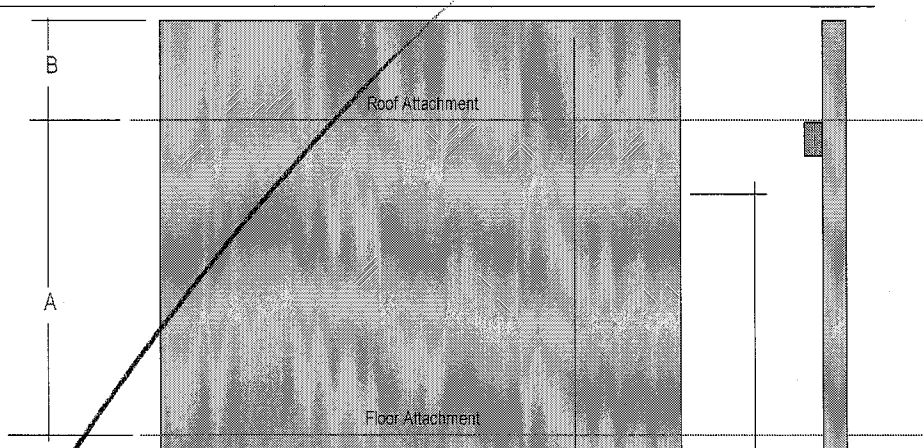
### General Information

f'c : Concrete 28 day strength	=	4.0 ksi	Wall Thickness	8.50 in	Temp Diff across thickness	=	deg F
Fy : Rebar Yield	=	60.0 ksi	Rebar at each face		Min Allow Out-of-Plane Defl Ratio = L/		0.0
Ec : Concrete Elastic Modulus	=	3,122.0 ksi	Rebar "d" distance	1.50 in			
$\lambda$ : Lt Wt Conc Factor	=	1.0	Lower Level Rebar ...		Min allow As/bd	=	0.00250
Fr : Rupture Modulus	=	316.228 psi	Bar Size	# 6	Using Stiff. Reduction Factor per ACI R.10.12.3		
Max Allow As/bd	=	0.01806	Bar Spacing	3.42 in	Compression in rebar ignored for strength		
Max Pu/Ag = f'c *	=	0.060					
Concrete Density	=	144.0 pcf					
Width of Design Strip	=	12.0 in					

### One-Story Wall Dimensions

A Clear Height	=	34 ft
B Parapet height	=	5 ft

Wall Support Condition Top & Bottom Pinned



### Vertical Loads

Vertical Uniform Loads ... (Applied per foot of Strip Width)			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity	8.0 in	2.17	2.9			k/ft
Concentric Load							k/ft
Vertical Concentrated Loads ... (Applied to full "Strip Width")			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Beam Load #1	Eccentricity	18.0 ft	10.7				k
	Dist. from Base						

### Lateral Loads

Wind Loads :		Seismic Loads :	
Full area WIND load	145 psf	Wall Weight Seismic Load Input Method :	ASCE seismic factors entered
		SDS Value per ASCE 12.11.1	$S_{DS} * I = 0.20$
		Fp = Wall Wt. * 0.080	= 8.160 psf



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## Concrete Slender Wall

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GFG STRUCTURAL ENGINEERS

Lic. #: KW-06006285

DESCRIPTION: P8 - 2ft jamb btwn 12ft and 3.33ft openings in South Bearing Wall

### DESIGN SUMMARY

### Results reported for "Strip Width" of 12.0 in

Governing Load Combination . . .		Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +1.20D+0.50Lr+W	Maximum Bending Stress Ratio = <b>0.6403</b>			
		Max Mu	26.704 k-ft	Phi * Mn	41.705 k-ft
PASS	Service Deflection Check +D+0.60W	Actual Defl. Ratio L/	161	Allowable Defl. Ratio	150.0
		Max. Deflection	2.538 in		
PASS	Axial Load Check +1.20D+0.50Lr+W	Max Pu / Ag	193.387 psi	Max. Allow. Defl.	2.720 in
		Location	16.433 ft	0.06 * fc	240.0 psi
FAIL	Reinforcing Limit Check	Actual As/bd	0.01838	Max Allow As/bd	0.01806
Maximum Reactions . . . for Load Combination....					
		Top Horizontal	W Only		3.243 k
		Base Horizontal	W Only		2.412 k
		Vertical Reaction	+D+Lr		19.748 k

### Design Maximum Combinations - Moments

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Phi	Moment Values		As Ratio	0.6 * rho bal
	Pu k	0.06*f'c*b*t k				Phi Mn k-ft	As in^2		
+1.40D at 32.87 to 34.00	0.000	24.480	3.81	2.03	0.90	40.74	1.544	0.0184	0.0181
+1.20D+0.50Lr at 32.87 to 34.00	0.000	24.480	3.81	2.70	0.90	40.74	1.544	0.0184	0.0181
+1.20D at 32.87 to 34.00	0.000	24.480	3.81	1.74	0.90	40.74	1.544	0.0184	0.0181
+1.20D+1.60Lr at 32.87 to 34.00	0.000	24.480	3.81	4.83	0.90	40.74	1.544	0.0184	0.0181
+1.20D+1.60Lr+0.50W at 17.00 to 18.13	9.937	24.480	3.81	16.65	0.90	42.13	1.544	0.0184	0.0181
+1.20D+0.50W at 15.87 to 17.00	18.275	24.480	3.81	13.32	0.90	43.15	1.544	0.0184	0.0181
+1.20D+0.50Lr+W at 15.87 to 17.00	19.725	24.480	3.81	26.87	0.90	43.32	1.544	0.0184	0.0181
+1.20D+W at 15.87 to 17.00	18.276	24.480	3.81	25.58	0.90	43.15	1.544	0.0184	0.0181
+0.90D+W at 15.87 to 17.00	13.707	24.480	3.81	24.00	0.90	42.61	1.544	0.0184	0.0181
+1.20D+E at 20.40 to 21.53	4.881	24.480	3.81	2.41	0.90	41.45	1.544	0.0184	0.0181
+1.20D-E at 32.87 to 34.00	0.000	24.480	3.81	1.84	0.90	40.74	1.544	0.0184	0.0181
+0.90D+E at 19.27 to 20.40	3.765	24.480	3.81	2.04	0.90	41.29	1.544	0.0184	0.0181
+0.90D-E at 32.87 to 34.00	0.000	24.480	3.81	1.40	0.90	40.74	1.544	0.0184	0.0181

### Design Maximum Combinations - Deflections

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values		I gross in^4	Stiffness I cracked in^4	I effective in^4	Deflections	
		Mcr k-ft	Mactual k-ft				Deflection in	Defl. Ratio
D Only at 18.13 to 19.27	4.298	3.81	0.90	614.13	379.25	460.594	0.144	2,842.5
+D+Lr at 18.13 to 19.27	7.198	3.81	2.20	614.13	383.87	460.594	0.349	1,170.0
+D+0.750Lr at 18.13 to 19.27	6.473	3.81	1.87	614.13	382.67	460.594	0.296	1,378.8
+D+0.60W at 17.00 to 18.13	4.414	3.81	14.75	614.13	379.35	379.352	2.538	160.8
+D-0.60W at 15.87 to 17.00	15.230	3.81	13.14	614.13	396.31	396.314	2.192	186.1
+D+0.750Lr+0.450W at 17.00 to 18.13	6.589	3.81	12.61	614.13	382.86	382.863	2.175	187.6
+D+0.750Lr-0.450W at 15.87 to 17.00	17.405	3.81	9.10	614.13	399.69	399.694	1.463	278.9
+D+0.450W at 17.00 to 18.13	4.414	3.81	11.28	614.13	379.35	379.352	1.944	209.9
+D-0.450W at 15.87 to 17.00	15.230	3.81	9.65	614.13	396.31	396.314	1.598	255.3
+0.60D+0.60W at 15.87 to 17.00	9.138	3.81	13.61	614.13	386.88	386.882	2.362	172.8
+0.60D-0.60W at 15.87 to 17.00	9.138	3.81	12.68	614.13	386.88	386.883	2.163	188.6
+D+0.70E at 17.00 to 18.13	4.414	3.81	1.75	614.13	379.35	460.594	0.270	1,512.6
+D-0.70E at 26.07 to 27.20	3.489	3.81	0.64	614.13	377.88	460.594	0.031	13,123.9
+D+0.5250E at 18.13 to 19.27	4.298	3.81	1.56	614.13	379.25	460.594	0.238	1,714.3

## Concrete Slender Wall

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**DESCRIPTION:** P8 - 2ft jamb btwn 12ft and 3.33ft openings in South Bearing Wall

+D-0.5250E at 22.67 to 23.80	3.836	3.81	0.52	614.13	378.46	460.594	0.055	7,448.5
+0.60D+0.70E at 17.00 to 18.13	2.648	3.81	1.33	614.13	376.57	460.594	0.203	2,014.0
+0.60D-0.70E at 13.60 to 14.73	9.276	3.81	0.43	614.13	387.10	460.594	0.044	9,339.2

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal		Top Horizontal		Vertical @ Wall Base	
D Only	0.0	k	0.04	k	16.848	k
+D+Lr	0.1	k	0.09	k	19.748	k
+D+0.750Lr	0.1	k	0.08	k	19.023	k
+D+0.60W	1.4	k	1.98	k	16.848	k
+D-0.60W	1.3	k	2.06	k	16.848	k
+D+0.750Lr+0.450W	1.1	k	1.44	k	19.023	k
+D+0.750Lr-0.450W	1.0	k	1.59	k	19.023	k
+D+0.450W	1.1	k	1.48	k	16.848	k
+D-0.450W	1.0	k	1.55	k	16.848	k
+0.60D+0.60W	1.4	k	1.97	k	10.109	k
+0.60D-0.60W	1.4	k	2.01	k	10.109	k
+D+0.70E	0.1	k	0.09	k	16.848	k
+D-0.70E	0.1	k	0.17	k	16.848	k
+D+0.5250E	0.1	k	0.06	k	16.848	k
+D-0.5250E	0.0	k	0.14	k	16.848	k
+0.60D+0.70E	0.1	k	0.11	k	10.109	k
+0.60D-0.70E	0.1	k	0.15	k	10.109	k
Lr Only	0.1	k	0.06	k	2.900	k
W Only	2.4	k	3.24	k	0.000	k
-W	2.4	k	3.24	k	0.000	k
E Only	0.1	k	0.18	k	0.000	k
E Only *-1.0	0.1	k	0.18	k	0.000	k

## Concrete Slender Wall

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GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** P9 - 4ft jamb at 15ftopng in North Bearing Wall

### Code References

Calculations per ACI 318-14 Sec 11.8, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

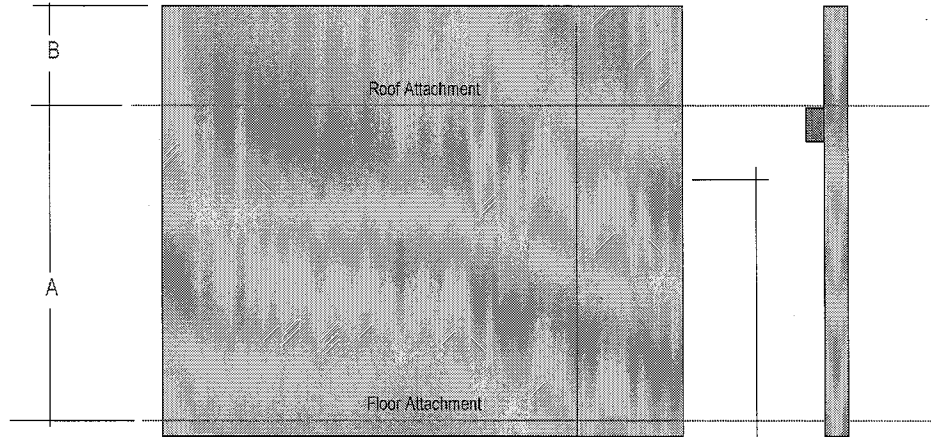
### General Information

$f'_c$ : Concrete 28 day strength	=	4.0 ksi	Wall Thickness	8.50 in	Temp Diff across thickness	=	deg F
$F_y$ : Rebar Yield	=	60.0 ksi	Rebar at each face		Min Allow Out-of-Plane Defl Ratio = $L/$		0.0
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi	Rebar "d" distance	1.50 in	Min allow $A_s/bd$	=	0.00250
$\lambda$ : Lt Wt Conc Factor	=	1.0	Lower Level Rebar ...		Using Stiff. Reduction Factor per ACI R.10.12.3		
$F_r$ : Rupture Modulus	=	316.228 psi	Bar Size	#	6	Compression in rebar ignored for strength	
Max Allow $A_s/bd$	=	0.01806	Bar Spacing		6 in		
Max $P_u/A_g = f'_c *$	=	0.060					
Concrete Density	=	144.0 pcf					
Width of Design Strip	=	12.0 in					

### One-Story Wall Dimensions

A Clear Height	=	34.5 ft
B Parapet height	=	5.0 ft

Wall Support Condition Top & Bottom Pinned



### Vertical Loads

Vertical Uniform Loads ... (Applied per foot of Strip Width)			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity	8.0 in	.97	1.29			k/ft
Concentric Load							k/ft
Vertical Concentrated Loads ... (Applied to full "Strip Width")			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Beam Load #1	Eccentricity	in	4.8				k
	Dist. from Base	18.0 ft					

### Lateral Loads

Wind Loads :		Seismic Loads :	
Full area WIND load	86.3 psf	Wall Weight Seismic Load Input Method :	ASCE seismic factors entered
		SDS Value per ASCE 12.11.1	$S_{DS} * I = 0.20$
		$F_p = \text{Wall Wt.} * 0.080 =$	8.160 psf

## Concrete Slender Wall

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GFG STRUCTURAL ENGINEERS

DESCRIPTION: P9 - 4ft jamb at 15ftopng in North Bearing Wall

### DESIGN SUMMARY

### Results reported for "Strip Width" of 12.0 in

Governing Load Combination ...		Actual Values ...		Allowable Values ...	
PASS	Moment Capacity Check +1.20D+0.50Lr+W	Maximum Bending Stress Ratio = <b>0.5814</b>			
		Max Mu	15.20 k-ft	Phi * Mn	26.144 k-ft
PASS	Service Deflection Check +D+0.60W	Actual Defl. Ratio L/	183	Allowable Defl. Ratio	150.0
		Max. Deflection	2.258 in		
PASS	Axial Load Check +1.20D+0.50Lr+W	Max Pu / Ag	102.285 psi	Max. Allow. Defl.	2.760 in
		Location	16.675 ft	0.06 * fc	240.0 psi
PASS	Reinforcing Limit Check	Actual As/bd	0.01048	Max Allow As/bd	0.01806

### Maximum Reactions . . . for Load Combination....

Top Horizontal	W Only	1.951 k
Base Horizontal	W Only	1.457 k
Vertical Reaction	+D+Lr	11.089 k

### Design Maximum Combinations - Moments

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Phi	Moment Values			0.6 * rho bal
	Pu k	0.06*f'c*b*t k				Phi Mn k-ft	As in^2	As Ratio	
+1.40D at 33.35 to 34.50	0.000	24.480	3.81	0.91	0.90	25.16	0.880	0.0105	0.0181
+1.20D+0.50Lr at 33.35 to 34.50	0.000	24.480	3.81	1.21	0.90	25.16	0.880	0.0105	0.0181
+1.20D at 33.35 to 34.50	0.000	24.480	3.81	0.78	0.90	25.16	0.880	0.0105	0.0181
+1.20D+1.60Lr at 33.35 to 34.50	0.000	24.480	3.81	2.15	0.90	25.16	0.880	0.0105	0.0181
+1.20D+1.60Lr+0.50W at 17.25 to 18.40	5.951	24.480	3.81	8.85	0.90	26.44	0.880	0.0105	0.0181
+1.20D+0.50W at 16.10 to 17.25	9.788	24.480	3.81	7.61	0.90	27.24	0.880	0.0105	0.0181
+1.20D+0.50Lr+W at 16.10 to 17.25	10.433	24.480	3.81	15.28	0.90	27.37	0.880	0.0105	0.0181
+1.20D+W at 16.10 to 17.25	9.788	24.480	3.81	14.80	0.90	27.24	0.880	0.0105	0.0181
+0.90D+W at 16.10 to 17.25	7.341	24.480	3.81	14.11	0.90	26.74	0.880	0.0105	0.0181
+1.20D+E at 18.40 to 19.55	3.747	24.480	3.81	1.71	0.90	25.98	0.880	0.0105	0.0181
+1.20D-E at 13.80 to 14.95	10.070	24.480	3.81	0.88	0.90	27.30	0.880	0.0105	0.0181
+0.90D+E at 18.40 to 19.55	2.810	24.480	3.81	1.56	0.90	25.77	0.880	0.0105	0.0181
+0.90D-E at 13.80 to 14.95	7.552	24.480	3.81	0.95	0.90	26.78	0.880	0.0105	0.0181

### Design Maximum Combinations - Deflections

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values		I gross in^4	Stiffness I cracked in^4	I effective in^4	Deflections	
		Mcr k-ft	Mactual k-ft				Deflection in	Defl. Ratio
D Only at 19.55 to 20.70	3.005	3.81	0.40	614.13	256.30	460.594	0.063	6,562.8
+D+Lr at 19.55 to 20.70	4.295	3.81	0.96	614.13	259.08	460.594	0.149	2,770.6
+D+0.750Lr at 19.55 to 20.70	3.972	3.81	0.82	614.13	258.40	460.594	0.128	3,245.2
+D+0.60W at 17.25 to 18.40	3.239	3.81	8.73	614.13	256.80	256.798	2.258	183.3
+D-0.60W at 16.10 to 17.25	8.157	3.81	8.03	614.13	267.13	267.128	2.021	204.9
+D+0.750Lr+0.450W at 17.25 to 18.40	4.207	3.81	7.18	614.13	258.84	258.836	1.847	224.1
+D+0.750Lr-0.450W at 16.10 to 17.25	9.124	3.81	5.65	614.13	269.09	270.830	1.328	311.8
+D+0.450W at 17.25 to 18.40	3.239	3.81	6.63	614.13	256.80	256.798	1.692	244.7
+D-0.450W at 16.10 to 17.25	8.157	3.81	5.91	614.13	267.13	267.128	1.429	289.6
+0.60D+0.60W at 16.10 to 17.25	4.894	3.81	8.18	614.13	260.31	260.311	2.136	193.8
+0.60D-0.60W at 16.10 to 17.25	4.894	3.81	7.76	614.13	260.31	260.312	1.999	207.1
+D+0.70E at 17.25 to 18.40	3.239	3.81	1.23	614.13	256.80	460.594	0.191	2,167.5
+D-0.70E at 14.95 to 16.10	8.274	3.81	0.55	614.13	267.34	460.594	0.068	6,044.9
+D+0.5250E at 17.25 to 18.40	3.239	3.81	1.01	614.13	256.80	460.594	0.159	2,606.6

## Concrete Slender Wall

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**DESCRIPTION:** P9 - 4ft jamb at 15ftopng in North Bearing Wall

+D-0.5250E at 13.80 to 14.95	8.391	3.81	0.35	614.13	267.63	460.594	0.037	11,204.6
+0.60D+0.70E at 17.25 to 18.40	1.944	3.81	1.06	614.13	254.07	460.594	0.161	2,565.0
+0.60D-0.70E at 16.10 to 17.25	4.894	3.81	0.65	614.13	260.31	460.594	0.090	4,621.7

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal		Top Horizontal		Vertical @ Wall Base	
D Only	0.0	k	0.02	k	9.799	k
+D+Lr	0.0	k	0.04	k	11.089	k
+D+0.750Lr	0.0	k	0.04	k	10.767	k
+D+0.60W	0.9	k	1.19	k	9.799	k
+D-0.60W	0.8	k	1.22	k	9.799	k
+D+0.750Lr+0.450W	0.7	k	0.87	k	10.766	k
+D+0.750Lr-0.450W	0.6	k	0.94	k	10.766	k
+D+0.450W	0.6	k	0.89	k	9.799	k
+D-0.450W	0.6	k	0.92	k	9.799	k
+0.60D+0.60W	0.9	k	1.18	k	5.879	k
+0.60D-0.60W	0.8	k	1.20	k	5.879	k
+D+0.70E	0.1	k	0.11	k	9.799	k
+D-0.70E	0.1	k	0.15	k	9.799	k
+D+0.5250E	0.1	k	0.08	k	9.799	k
+D-0.5250E	0.1	k	0.12	k	9.799	k
+0.60D+0.70E	0.1	k	0.12	k	5.879	k
+0.60D-0.70E	0.1	k	0.14	k	5.879	k
Lr Only	0.0	k	0.02	k	1.290	k
W Only	1.5	k	1.95	k	0.000	k
-W	1.5	k	1.95	k	0.000	k
E Only	0.1	k	0.18	k	0.000	k
E Only * -1.0	0.1	k	0.18	k	0.000	k

## Concrete Slender Wall

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Lic. #: KW-06006285

**DESCRIPTION:** P10 - 1.33ft jamb at 3.33ft opng in South Bearing Wall

### Code References

Calculations per ACI 318-14 Sec 11.8, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

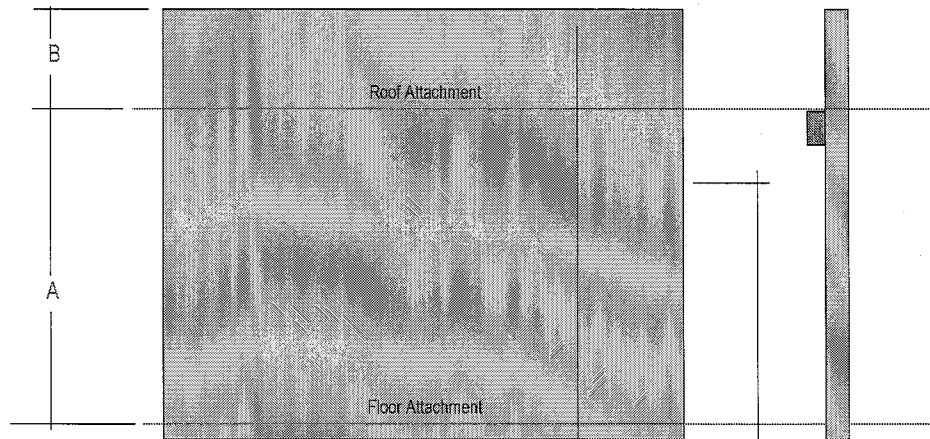
### General Information

$f'_c$ : Concrete 28 day strength	=	4.0 ksi	Wall Thickness	8.50 in	Temp Diff across thickness	=	deg F
$F_y$ : Rebar Yield	=	60.0 ksi	Rebar at each face		Min Allow Out-of-Plane Defl Ratio = $L/$		0.0
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi	Rebar "d" distance	1.50 in	Min allow $A_s/bd$	=	0.00250
$\lambda$ : Lt Wt Conc Factor	=	1.0	Lower Level Rebar ...		Using Stiff. Reduction Factor per ACI R.10.12.3		
$F_r$ : Rupture Modulus	=	316.228 psi	Bar Size	# 6	Compression in rebar ignored for strength		
Max Allow $A_s/bd$	=	0.01806	Bar Spacing	6.0 in			
Max $P_u/A_g = f'_c *$	=	0.060					
Concrete Density	=	144.0 pcf					
Width of Design Strip	=	12.0 in					

### One-Story Wall Dimensions

A Clear Height	=	34.50 ft
B Parapet height	=	5.0 ft

Wall Support Condition Top & Bottom Pinned



### Vertical Loads

Vertical Uniform Loads ... (Applied per foot of Strip Width)			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity	8.0 in	.95	1.27			k/ft
Concentric Load							k/ft
Vertical Concentrated Loads ... (Applied to full "Strip Width")			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Beam Load #1	Eccentricity	in	3				k
	Dist. from Base	18.0 ft					

### Lateral Loads

Wind Loads :		Seismic Loads :	
Full area WIND load	63.3 psf	Wall Weight Seismic Load Input Method :	ASCE seismic factors entered
		SDS Value per ASCE 12.11.1	$S_{DS} * I = 0.20$
		$F_p = \text{Wall Wt.} * 0.080 =$	8.160 psf

## Concrete Slender Wall

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GFG STRUCTURAL ENGINEERS

DESCRIPTION: P10 - 1.33ft jamb at 3.33ft opng in South Bearing Wall

### DESIGN SUMMARY

### Results reported for "Strip Width" of 12.0 in

Governing Load Combination . . .		Actual Values . . .		Allowable Values . . .	
PASS	Moment Capacity Check +1.20D+0.50Lr+W	Maximum Bending Stress Ratio = <b>0.4225</b>			
		Max Mu	11.043 k-ft	Phi * Mn	26.136 k-ft
PASS	Service Deflection Check +D+0.60W	Actual Defl. Ratio L/l	256	Allowable Defl. Ratio	150.0
		Max. Deflection	1.616 in		
PASS	Axial Load Check +1.20D+0.50Lr+W	Max Pu / Ag	80.776 psi	Max. Allow. Defl.	2.760 in
		Location	16.675 ft	0.06 * fc	240.0 psi
PASS	Reinforcing Limit Check	Actual As/bd	0.01048	Max Allow As/bd	0.01806
Maximum Reactions . . . for Load Combination....					
		Top Horizontal	W Only		1.431 k
		Base Horizontal	W Only		1.069 k
		Vertical Reaction	+D+Lr		9.249 k

### Design Maximum Combinations - Moments

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Phi	Moment Values			0.6 * rho bal
	Pu k	0.06*f'c*b*t k				Phi Mn k-ft	As in^2	As Ratio	
+1.40D at 33.35 to 34.50	0.000	24.480	3.81	0.89	0.90	25.16	0.880	0.0105	0.0181
+1.20D+0.50Lr at 33.35 to 34.50	0.000	24.480	3.81	1.18	0.90	25.16	0.880	0.0105	0.0181
+1.20D at 33.35 to 34.50	0.000	24.480	3.81	0.76	0.90	25.16	0.880	0.0105	0.0181
+1.20D+1.60Lr at 33.35 to 34.50	0.000	24.480	3.81	2.11	0.90	25.16	0.880	0.0105	0.0181
+1.20D+1.60Lr+0.50W at 17.25 to 18.40	5.895	24.480	3.81	6.63	0.90	26.43	0.880	0.0105	0.0181
+1.20D+0.50W at 16.10 to 17.25	7.604	24.480	3.81	5.51	0.90	26.79	0.880	0.0105	0.0181
+1.20D+0.50Lr+W at 16.10 to 17.25	8.239	24.480	3.81	11.08	0.90	26.92	0.880	0.0105	0.0181
+1.20D+W at 16.10 to 17.25	7.604	24.480	3.81	10.68	0.90	26.79	0.880	0.0105	0.0181
+0.90D+W at 16.10 to 17.25	5.703	24.480	3.81	10.23	0.90	26.39	0.880	0.0105	0.0181
+1.20D+E at 18.40 to 19.55	3.723	24.480	3.81	1.68	0.90	25.97	0.880	0.0105	0.0181
+1.20D-E at 13.80 to 14.95	7.886	24.480	3.81	0.88	0.90	26.85	0.880	0.0105	0.0181
+0.90D+E at 18.40 to 19.55	2.792	24.480	3.81	1.54	0.90	25.77	0.880	0.0105	0.0181
+0.90D-E at 13.80 to 14.95	5.914	24.480	3.81	0.95	0.90	26.44	0.880	0.0105	0.0181

### Design Maximum Combinations - Deflections

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Moment Values		I gross in^4	Stiffness		Deflections	
	Pu k		Mcr k-ft	Mactual k-ft		I cracked in^4	I effective in^4	Deflection in	Defl. Ratio
D Only at 19.55 to 20.70	2.985		3.81	0.39	614.13	256.27	460.594	0.061	6,770.3
+D+Lr at 19.55 to 20.70	4.255		3.81	0.93	614.13	258.96	460.594	0.145	2,851.0
+D+0.750Lr at 19.55 to 20.70	3.937		3.81	0.79	614.13	258.29	460.594	0.124	3,340.2
+D+0.60W at 17.25 to 18.40	3.219		3.81	6.34	614.13	256.77	256.772	1.616	256.2
+D-0.60W at 16.10 to 17.25	6.337		3.81	5.65	614.13	263.35	266.583	1.370	302.3
+D+0.750Lr+0.450W at 17.25 to 18.40	4.172		3.81	5.32	614.13	258.79	276.062	1.328	311.9
+D+0.750Lr-0.450W at 16.10 to 17.25	7.289		3.81	3.70	614.13	265.29	460.594	0.523	791.5
+D+0.450W at 17.25 to 18.40	3.219		3.81	4.82	614.13	256.77	302.680	1.151	359.5
+D-0.450W at 16.10 to 17.25	6.337		3.81	4.05	614.13	263.35	399.184	0.741	559.0
+0.60D+0.60W at 16.10 to 17.25	3.802		3.81	5.96	614.13	257.98	257.985	1.522	272.0
+0.60D-0.60W at 16.10 to 17.25	3.802		3.81	5.56	614.13	257.98	265.956	1.369	302.4
+D+0.70E at 17.25 to 18.40	3.219		3.81	1.21	614.13	256.77	460.594	0.188	2,207.7
+D-0.70E at 14.95 to 16.10	6.454		3.81	0.55	614.13	263.57	460.594	0.069	6,014.3
+D+0.5250E at 17.25 to 18.40	3.219		3.81	0.99	614.13	256.77	460.594	0.156	2,658.3

## Concrete Slender Wall

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**DESCRIPTION:** P10 - 1.33ft jamb at 3.33ft opng in South Bearing Wall

+D-0.5250E at 13.80 to 14.95	6.571	3.81	0.35	614.13	263.85	460.594	0.038	10,999.7
+0.60D+0.70E at 17.25 to 18.40	1.932	3.81	1.04	614.13	254.05	460.594	0.160	2,594.6
+0.60D-0.70E at 16.10 to 17.25	3.802	3.81	0.65	614.13	257.98	460.594	0.090	4,617.2

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal		Top Horizontal		Vertical @ Wall Base	
D Only	0.0	k	0.02	k	7.979	k
+D+Lr	0.0	k	0.04	k	9.249	k
+D+0.750Lr	0.0	k	0.04	k	8.932	k
+D+0.60W	0.6	k	0.86	k	7.979	k
+D-0.60W	0.6	k	0.89	k	7.979	k
+D+0.750Lr+0.450W	0.5	k	0.62	k	8.931	k
+D+0.750Lr-0.450W	0.4	k	0.69	k	8.932	k
+D+0.450W	0.5	k	0.64	k	7.979	k
+D-0.450W	0.5	k	0.67	k	7.979	k
+0.60D+0.60W	0.6	k	0.86	k	4.787	k
+0.60D-0.60W	0.6	k	0.88	k	4.787	k
+D+0.70E	0.1	k	0.11	k	7.979	k
+D-0.70E	0.1	k	0.15	k	7.979	k
+D+0.5250E	0.1	k	0.08	k	7.979	k
+D-0.5250E	0.1	k	0.12	k	7.979	k
+0.60D+0.70E	0.1	k	0.12	k	4.787	k
+0.60D-0.70E	0.1	k	0.14	k	4.787	k
Lr Only	0.0	k	0.02	k	1.270	k
W Only	1.1	k	1.43	k	0.000	k
-W	1.1	k	1.43	k	0.000	k
E Only	0.1	k	0.18	k	0.000	k
E Only *-1.0	0.1	k	0.18	k	0.000	k



## Concrete Slender Wall

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** P11 - 2.5ft jamb at 20ft opng in South Bearing Wall with wall braces at 28ft

### Code References

Calculations per ACI 318-14 Sec 11.8, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

### General Information

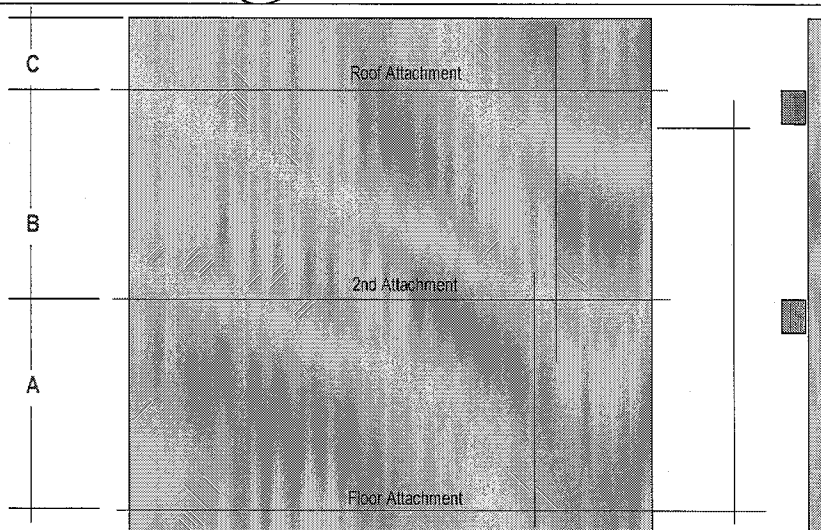
$f'_c$ : Concrete 28 day strength	=	4.0 ksi	Wall Thickness	8.50 in	Temp Diff across thickness	=	deg F
$F_y$ : Rebar Yield	=	60.0 ksi	Rebar at each face		Min Allow Out-of-Plane Defl Ratio =	L/	0.0
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi	Rebar "d" distance	1.50 in	Min allow $A_s/bd$	=	0.00250
$\lambda$ : Lt Wt Conc Factor	=	1.0	Lower Level Rebar ...		Using Stiff. Reduction Factor per ACI R.10.12.3		
$F_r$ : Rupture Modulus	=	316.228 psi	Bar Size	# 6	Compression in rebar ignored for strength		
Max Allow $A_s/bd$	=	0.01806	Bar Spacing	4.7 in			
Max $P_u/Ag = f'_c *$	=	0.060	Upper Level Rebar ...				
Concrete Density	=	144.0 pcf	Bar Size	# 6			
Width of Design Strip	=	12.0 in	Bar Spacing	4.7 in			

### Two-Story Wall Dimensions

A 1st Story Height	=	28 ft
B 2nd Story Height	=	6.5 ft
C Parapet height	=	4 ft

Wall Support Condition Top & Bottom Pinned

Initial Lateral Disp. @ Top Support in



### Vertical Loads

Vertical Uniform Loads ... (Applied per foot of Strip Width)			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Ledger Load	Eccentricity	8.0 in	2.25	3			k/ft
Concentric Load							k/ft
Vertical Concentrated Loads ... (Applied to full "Strip Width")			DL : Dead	Lr : Roof Live	Lf : Floor Live	S : Snow	W : Wind
Beam Load #1	Eccentricity	in	10.2				k
	Dist. from Base	18.0 ft					

### Lateral Loads

Wind Loads :

Full area WIND load 150 psf

Seismic Loads :

Wall Weight Seismic Load Input Method : ASCE seismic factors entered

SDS Value per ASCE 12.11.1  $S_{DS} * I = 0.20$

$F_p = \text{Wall Wt.} * 0.080 = 8.160 \text{ psf}$

## Concrete Slender Wall

Lic. #: KW-06006285

DESCRIPTION: P11 - 2.5ft jamb at 20ft opng in South Bearing Wall with wall braces at 28ft

### DESIGN SUMMARY

### Results reported for "Strip Width" of 12.0 in

Governing Load Combination ...		Actual Values ...		Allowable Values ...	
PASS	Moment Capacity Check +1.20D+0.50Lr+W	Maximum Bending Stress Ratio =	0.3909		
		Max Mu	-12.607 k-ft	Phi * Mn	32.254 k-ft
PASS	Service Deflection Check +D-0.60W	Actual Defl. Ratio L/	486	Allowable Defl. Ratio	150.0
		Max. Deflection	-0.6910 in		
PASS	Axial Load Check +1.20D+0.50Lr+W	Max Pu / Ag	53.870 psi	Max. Allow. Defl.	0.520 in
		Location	28.108 ft	0.06 * f <sub>c</sub>	240.0 psi
PASS	Reinforcing Limit Check	Actual As/bd	0.01337	Max Allow As/bd	0.01806

### Maximum Reactions ... for Load Combination....

Top Horizontal	+D+0.750Lr+0.450W	0.7684 k
Base Horizontal	W Only	1.683 k
Mid-Ht Horizontal	W Only	4.617 k
Vertical Reaction	+D+Lr	19.377 k

### Design Maximum Combinations - Moments

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Phi	Moment Values		As in <sup>2</sup>	As Ratio	0.6 * rho bal
	Pu k	0.06*f <sub>c</sub> *b*t k				Phi Mn k-ft	As in <sup>2</sup>			
+1.40D at 34.28 to 34.50	0.000	24.480	0.00	2.10	0.90	31.21	1.123	0.0134	0.0181	
+1.20D+0.50Lr at 34.28 to 34.50	0.000	24.480	0.00	2.80	0.90	31.21	1.123	0.0134	0.0181	
+1.20D at 34.28 to 34.50	0.000	24.480	0.00	1.80	0.90	31.21	1.123	0.0134	0.0181	
+1.20D+1.60Lr at 34.28 to 34.50	0.000	24.480	0.00	5.00	0.90	31.21	1.123	0.0134	0.0181	
+1.20D+1.60Lr+0.50W at 28.00 to 28.22	8.788	24.480	0.00	6.57	0.90	32.85	1.123	0.0134	0.0181	
+1.20D+0.50W at 28.00 to 28.22	3.988	24.480	0.00	6.20	0.90	31.97	1.123	0.0134	0.0181	
+1.20D+0.50Lr+W at 28.00 to 28.22	5.495	24.480	0.00	12.61	0.90	32.25	1.123	0.0134	0.0181	
+1.20D+W at 28.00 to 28.22	3.994	24.480	0.00	12.42	0.90	31.98	1.123	0.0134	0.0181	
+0.90D+W at 28.00 to 28.22	2.998	24.480	0.00	12.23	0.90	31.79	1.123	0.0134	0.0181	
+1.20D+E at 34.28 to 34.50	0.000	24.480	0.00	1.73	0.90	31.21	1.123	0.0134	0.0181	
+1.20D-E at 34.28 to 34.50	0.000	24.480	0.00	1.87	0.90	31.21	1.123	0.0134	0.0181	
+0.90D+E at 34.28 to 34.50	0.000	24.480	0.00	1.28	0.90	31.21	1.123	0.0134	0.0181	
+0.90D-E at 34.28 to 34.50	0.000	24.480	0.00	1.42	0.90	31.21	1.123	0.0134	0.0181	

### Design Maximum Combinations - Deflections

### Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values		I gross in <sup>4</sup>	Stiffness		Deflections	
		Mcr k-ft	Mactual k-ft		I cracked in <sup>4</sup>	I effective in <sup>4</sup>	Deflection in	Defl. Ratio
D Only at 15.87 to 16.80	14.759	3.81	0.12	614.13	326.38	460.594	0.013	26,434.7
+D+Lr at 15.87 to 16.80	17.759	3.81	0.29	614.13	331.79	460.594	0.030	11,309.5
+D+0.750Lr at 15.87 to 16.80	17.009	3.81	0.25	614.13	330.44	460.594	0.025	13,200.7
+D+0.60W at 12.13 to 13.07	15.139	3.81	6.03	614.13	327.03	327.027	0.671	501.1
+D-0.60W at 12.13 to 13.07	15.139	3.81	6.14	614.13	327.03	327.027	0.691	486.3
+D+0.750Lr+0.450W at 12.13 to 13.07	17.389	3.81	4.50	614.13	331.08	371.021	0.463	725.5
+D+0.750Lr-0.450W at 12.13 to 13.07	17.389	3.81	4.78	614.13	331.08	350.957	0.514	653.4
+D+0.450W at 12.13 to 13.07	15.139	3.81	4.51	614.13	327.03	368.025	0.474	708.6
+D-0.450W at 12.13 to 13.07	15.139	3.81	4.63	614.13	327.03	358.687	0.497	675.8
+0.60D+0.60W at 12.13 to 13.07	9.084	3.81	5.84	614.13	315.96	315.956	0.674	498.4
+0.60D-0.60W at 12.13 to 13.07	9.084	3.81	5.91	614.13	315.96	315.956	0.686	489.9
+D+0.70E at 11.20 to 12.13	15.235	3.81	0.30	614.13	327.21	460.594	0.021	15,967.6
+D-0.70E at 13.07 to 14.00	15.044	3.81	0.48	614.13	326.85	460.594	0.045	7,492.6
+D+0.5250E at 10.27 to 11.20	15.330	3.81	0.21	614.13	327.39	460.594	0.013	25,838.5

## Concrete Slender Wall

Lic. #: KW-06006285

**DESCRIPTION:** P11 - 2.5ft jamb at 20ft opng in South Bearing Wall with wall braces at 28ft

+D-0.5250E at 13.07 to 14.00	15.044	3.81	0.39	614.13	326.85	460.594	0.037	9,152.7
+0.60D+0.70E at 11.20 to 12.13	9.141	3.81	0.33	614.13	316.10	460.594	0.025	13,378.8
+0.60D-0.70E at 13.07 to 14.00	9.027	3.81	0.44	614.13	315.89	460.594	0.039	8,525.3

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Mid Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.267 k	0.26 k	16.377 k
+D+Lr	0.0 k	0.622 k	0.61 k	19.377 k
+D+0.750Lr	0.0 k	0.533 k	0.52 k	18.627 k
+D+0.60W	1.0 k	3.095 k	0.61 k	16.377 k
+D-0.60W	1.0 k	2.591 k	0.11 k	16.377 k
+D+0.750Lr+0.450W	0.7 k	2.640 k	0.77 k	18.627 k
+D+0.750Lr-0.450W	0.7 k	1.621 k	0.23 k	18.627 k
+D+0.450W	0.7 k	2.372 k	0.51 k	16.377 k
+D-0.450W	0.7 k	1.868 k	0.01 k	16.377 k
+0.60D+0.60W	1.0 k	2.965 k	0.49 k	9.826 k
+0.60D-0.60W	1.0 k	2.664 k	0.19 k	9.826 k
+D+0.70E	0.1 k	0.441 k	0.28 k	16.377 k
+D-0.70E	0.1 k	0.093 k	0.24 k	16.377 k
+D+0.5250E	0.0 k	0.398 k	0.27 k	16.377 k
+D-0.5250E	0.1 k	0.137 k	0.25 k	16.377 k
+0.60D+0.70E	0.1 k	0.333 k	0.17 k	9.826 k
+0.60D-0.70E	0.1 k	0.010 k	0.14 k	9.826 k
Lr Only	0.0 k	0.360 k	0.35 k	3.000 k
W Only	1.7 k	4.617 k	0.53 k	0.000 k
-W	1.7 k	4.617 k	0.53 k	0.000 k
E Only	0.1 k	0.240 k	0.02 k	0.000 k
E Only *-1.0	0.1 k	0.240 k	0.02 k	0.000 k

## Concrete Slender Wall

Lic. #: KW-06006285

DESCRIPTION: P12-4ft pier at joist girder bearing on East/West Wall

### Code References

Calculations per ACI 318-14 Sec 11.8, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

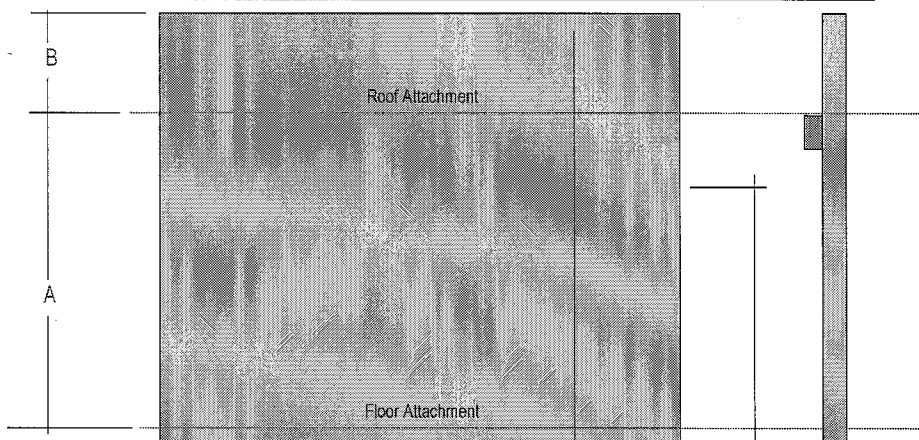
### General Information

$f'_c$ : Concrete 28 day strength	=	4.0 ksi	Wall Thickness	8.50 in	Temp Diff across thickness	=	deg F
$F_y$ : Rebar Yield	=	60.0 ksi	Rebar at each face		Min Allow Out-of-Plane Defl Ratio = $L/$		0.0
$E_c$ : Concrete Elastic Modulus	=	3,122.0 ksi	Rebar "d" distance	1.50 in	Min allow $A_s/bd$	=	0.00250
$\lambda$ : Lt Wt Conc Factor	=	1.0	Lower Level Rebar ...		Using Stiff. Reduction Factor per ACI R.10.12.3		
$F_r$ : Rupture Modulus	=	316.228 psi	Bar Size	# 6	Compression in rebar ignored for strength		
Max Allow $A_s/bd$	=	0.01806	Bar Spacing	6 in			
Max $P_u/A_g = f'_c *$	=	0.060					
Concrete Density	=	144.0 pcf					
Width of Design Strip	=	12.0 in					

### One-Story Wall Dimensions

A Clear Height	=	36 ft
B Parapet height	=	4.0 ft

Wall Support Condition Top & Bottom Pinned



### Vertical Loads

Vertical Uniform Loads ... (Applied per foot of Strip Width)

Ledger Load	Eccentricity	8.0 in	DL : Dead	7.68	Lr : Roof Live	5.12	Lf : Floor Live	S : Snow	W : Wind
Concentric Load									k/ft

### Lateral Loads

Wind Loads :

Full area WIND load 30.0 psf

Seismic Loads :

Wall Weight Seismic Load Input Method : ASCE seismic factors entered

SDS Value per ASCE 12.11.1  $S_{DS} * I =$  0.20

$F_p = \text{Wall Wt.} * 0.080 =$  8.160 psf

## Concrete Slender Wall

Lic. #: KW-06006285

**DESCRIPTION:** P12-4ft pier at joist girder bearing on East/West Wall

### DESIGN SUMMARY

Results reported for "Strip Width" of 12.0 in

Governing Load Combination ...		Actual Values ...		Allowable Values ...	
PASS	Moment Capacity Check +1.20D+1.60Lr+0.50W	Maximum Bending Stress Ratio = <b>0.5502</b>			
		Max Mu	16.028 k-ft	Phi * Mn	29.134 k-ft
PASS	Service Deflection Check +D+0.750Lr+0.450W	Actual Defl. Ratio L/	168	Allowable Defl. Ratio	150.0
		Max. Deflection	2.572 in		
PASS	Axial Load Check +1.20D+1.60Lr+0.50W	Max Pu / Ag	191.319 psi	Max. Allow. Defl.	2.880 in
		Location	23.40 ft	0.06 * f <sub>c</sub>	240.0 psi
PASS	Reinforcing Limit Check	Actual As/bd	0.01048	Max Allow As/bd	0.01806

Maximum Reactions ... for Load Combination...

Top Horizontal	W Only	0.6667 k
Base Horizontal	W Only	0.5333 k
Vertical Reaction	+D+Lr	16.880 k

### Design Maximum Combinations - Moments

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load		Mcr k-ft	Mu k-ft	Phi	Moment Values		As in <sup>2</sup>	As Ratio	0.6 * rho bal
	Pu k	0.06*f <sub>c</sub> *b*t k				Phi Mn k-ft				
+1.40D at 34.80 to 36.00	0.000	24.480	3.81	7.17	0.90	25.16		0.880	0.0105	0.0181
+1.20D+0.50Lr at 33.60 to 34.80	12.561	24.480	3.81	7.88	0.90	27.80		0.880	0.0105	0.0181
+1.20D at 34.80 to 36.00	0.000	24.480	3.81	6.14	0.90	25.16		0.880	0.0105	0.0181
+1.20D+1.60Lr at 27.60 to 28.80	18.928	24.480	3.81	12.73	0.90	29.02		0.880	0.0105	0.0181
+1.20D+1.60Lr+0.50W at 22.80 to 24.00	19.515	24.480	3.81	16.03	0.90	29.13		0.880	0.0105	0.0181
+1.20D+0.50W at 22.80 to 24.00	11.322	24.480	3.81	8.05	0.90	27.55		0.880	0.0105	0.0181
+1.20D+0.50Lr+W at 20.40 to 21.60	14.175	24.480	3.81	13.37	0.90	28.12		0.880	0.0105	0.0181
+1.20D+W at 20.40 to 21.60	11.615	24.480	3.81	11.05	0.90	27.61		0.880	0.0105	0.0181
+0.90D+W at 20.40 to 21.60	8.711	24.480	3.81	9.07	0.90	27.02		0.880	0.0105	0.0181
+1.20D+E at 26.40 to 27.60	10.881	24.480	3.81	6.85	0.90	27.46		0.880	0.0105	0.0181
+1.20D-E at 34.80 to 36.00	0.000	24.480	3.81	6.21	0.90	25.16		0.880	0.0105	0.0181
+0.90D+E at 26.40 to 27.60	8.161	24.480	3.81	5.10	0.90	26.91		0.880	0.0105	0.0181
+0.90D-E at 34.80 to 36.00	0.000	24.480	3.81	4.67	0.90	25.16		0.880	0.0105	0.0181

### Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values		I gross in <sup>4</sup>	Stiffness I cracked in <sup>4</sup>	I effective in <sup>4</sup>	Deflections	
		Mcr k-ft	Mactual k-ft				Deflection in	Defl. Ratio
D Only at 21.60 to 22.80	9.557	3.81	3.78	614.13	270.03	460.594	0.795	543.2
+D+Lr at 19.20 to 20.40	14.921	3.81	7.14	614.13	280.91	280.914	1.983	217.8
+D+0.750Lr at 19.20 to 20.40	13.641	3.81	6.15	614.13	278.31	278.311	1.708	253.0
+D+0.60W at 18.00 to 19.20	9.924	3.81	7.17	614.13	270.77	270.765	2.064	209.3
+D-0.60W at 27.60 to 28.80	8.945	3.81	2.25	614.13	268.73	460.594	0.138	3,141.7
+D+0.750Lr+0.450W at 19.20 to 20.40	13.642	3.81	9.23	614.13	278.31	278.311	2.572	168.0
+D+0.750Lr-0.450W at 22.80 to 24.00	13.274	3.81	3.93	614.13	277.58	428.237	0.784	550.8
+D+0.450W at 19.20 to 20.40	9.802	3.81	6.37	614.13	270.48	270.477	1.797	240.4
+D-0.450W at 24.00 to 25.20	9.312	3.81	1.86	614.13	269.52	460.594	0.241	1,795.3
+0.60D+0.60W at 19.20 to 20.40	5.881	3.81	5.20	614.13	262.37	284.199	1.443	299.4
+0.60D-0.60W at 14.40 to 15.60	6.175	3.81	1.59	614.13	263.01	460.594	0.183	2,356.6
+D+0.70E at 20.40 to 21.60	9.679	3.81	4.88	614.13	270.26	307.746	1.275	338.8
+D-0.70E at 21.60 to 22.80	9.557	3.81	2.69	614.13	270.03	460.594	0.485	891.3
+D+0.5250E at 20.40 to 21.60	9.679	3.81	4.57	614.13	270.26	331.575	1.166	370.4

GF Group Structural Engineers  
9375 E. Shea Blvd., #100  
Scottsdale, AZ 85260

Project Title:  
Engineer:  
Project ID:  
Project Descr:

P45

Printed: 24 MAR 2021, 6:05PM

## Concrete Slender Wall

File: 221019-VIP Products.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.17

Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

**DESCRIPTION:** P12-4ft pier at joist girder bearing on East/West Wall

+D-0.5250E at 21.60 to 22.80	9.557	3.81	2.95	614.13	270.03	460.594	0.545	792.7
+0.60D+0.70E at 19.20 to 20.40	5.881	3.81	2.82	614.13	262.37	460.594	0.487	887.6
+0.60D-0.70E at 22.80 to 24.00	5.661	3.81	1.27	614.13	261.89	460.594	0.182	2,380.1

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.1 k	0.14 k	11.760 k
+D+Lr	0.2 k	0.23 k	16.880 k
+D+0.750Lr	0.2 k	0.20 k	15.600 k
+D+0.60W	0.5 k	0.27 k	11.760 k
+D-0.60W	0.2 k	0.54 k	11.760 k
+D+0.750Lr+0.450W	0.4 k	0.10 k	15.600 k
+D+0.750Lr-0.450W	0.0 k	0.51 k	15.600 k
+D+0.450W	0.4 k	0.17 k	11.760 k
+D-0.450W	0.1 k	0.44 k	11.760 k

GF Group Structural Engineers  
9375 E. Shea Blvd., #100  
Scottsdale, AZ 85260

Project Title:  
Engineer:  
Project ID:  
Project Descr:

ptc

Printed: 24 MAR 2021, 6:05PM

## Concrete Slender Wall

File: 221019-VIP Products.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.17

Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

DESCRIPTION: P12-4ft pier at joist girder bearing on East/West Wall

### Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
+0.60D+0.60W	0.4 k	0.32 k	7.056 k
+0.60D-0.60W	0.2 k	0.49 k	7.056 k
+D+0.70E	0.2 k	0.01 k	11.760 k
+D-0.70E	0.0 k	0.27 k	11.760 k
+D+0.5250E	0.2 k	0.04 k	11.760 k
+D-0.5250E	0.1 k	0.23 k	11.760 k
+0.60D+0.70E	0.2 k	0.04 k	7.056 k
+0.60D-0.70E	0.0 k	0.21 k	7.056 k
Lr Only	0.1 k	0.09 k	5.120 k
W Only	0.5 k	0.67 k	0.000 k
-W	0.5 k	0.67 k	0.000 k
E Only	0.1 k	0.18 k	0.000 k
E Only *-1.0	0.1 k	0.18 k	0.000 k

## Lateral

Lateral force resisting system consists of bearing wall system with a flexible plywood diaphragm and ordinary precast shear walls

Date	Job No.
JOB:	
GF Group Structural En	

(4)

## Seismic

Ss= 0.173 g      Cs = 0.062 Wp  
S1= 0.072 g  
Sms = 0.278 g  
Sm1 = 0.174 g  
Fa = 1.6  
Fv = 2.4  
Sds = 0.185 g  
Sd1 = 0.116 g  
Site Class D  
I = 1.00  
R = 3.0

SEISMIC  
Roof WT =  $(360 \times 240)(0.018) = 1555^k$   
N/S walls =  $.106(24')(360) \times 2 = 1831^k$   
E/W walls =  $.106(24')(240) \times 2 = 1221^k$   
 $W_{tot} = 0.062(4607) = 286^k$  WT 4607

Diaphragm Load

$W_{nf} = \frac{(1555 + 1831)}{360} \times 0.062 = 0.58^k$  < 0.734^k  
WIND governs

$W_{E/W} = \frac{(1555 + 1221)}{240} \times 0.062 = 0.72^k$

## Wind

Risk Category II

Wind Speed 102 mph (3-sec gust)

Exposure C

Avg Deck Ht = 35.5 ft

Avg Parapet Ht = 41 ft

$q_z = 0.00256 K_z K_{zt} K_d K_e V^2$

qd = 23.0 psf @ 35.5 ft

qp = 23.7 psf @ 41 ft

$\alpha = 9.5$

Zg = 900 ft

Kzd = 1.02 at roof deck

Kzp = 1.05 at parapet

Kzt = 1.0

Kd = 0.85

Ke = 1.0

Table 26.11-1

Table 26.11-1

Table 26.10-1

Table 26.10-1

Section 26.8.2

Section 26.6-1

Section 26.9

SEISMIC  
Governs  
FOR DIAPHRAGM  
 $W_{ASD} = 0.72(0.7) = 504$   
 $W_{ASD} = 734(0.6) = 440$

SEISMIC governs

Building Length (L) = 396 ft

Building Width (B) = 240 ft

a = (0.1xB) = 24 ft

a = (0.4 x HT) = 14.2 ft

2a = 28.4 ft

Gp<sub>pi</sub> = 0.18

Zone 1E = 18.0 psf      Windward

Zone 4E = 5.8 psf      Leeward

Zone 1 = 13.4 psf      Windward

Zone 4 = 2.5 psf      Leeward

Parapet<sub>windward</sub> = 35.6 psf

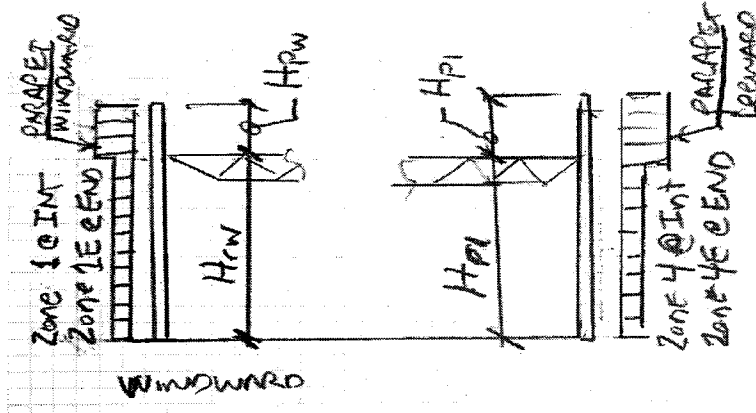
Parapet<sub>leeward</sub> = 23.7 psf

SEISMIC



Date	Job No.	Sheet No.
3-21	221019	22
JOB: VIP		
BY: MBG		
GF Group Structural Engineers		

## Diaphragm Load



### Windward

Ledger Ht ( $H_{rw}$ ) = 33.5 ft

Parapet Ht ( $H_{pw}$ ) = 7.5 ft

### Leeward

Ledger Ht ( $H_{rl}$ ) = 34.5 ft

Parapet Ht ( $H_{pl}$ ) = 6.5 ft

Zone 1E = 18.0 psf Windward

Zone 4E = 5.8 psf Leeward

Zone 1 = 13.4 psf Windward

Zone 4 = 2.5 psf Leeward

Parapet<sub>windward</sub> = 35.6 psf

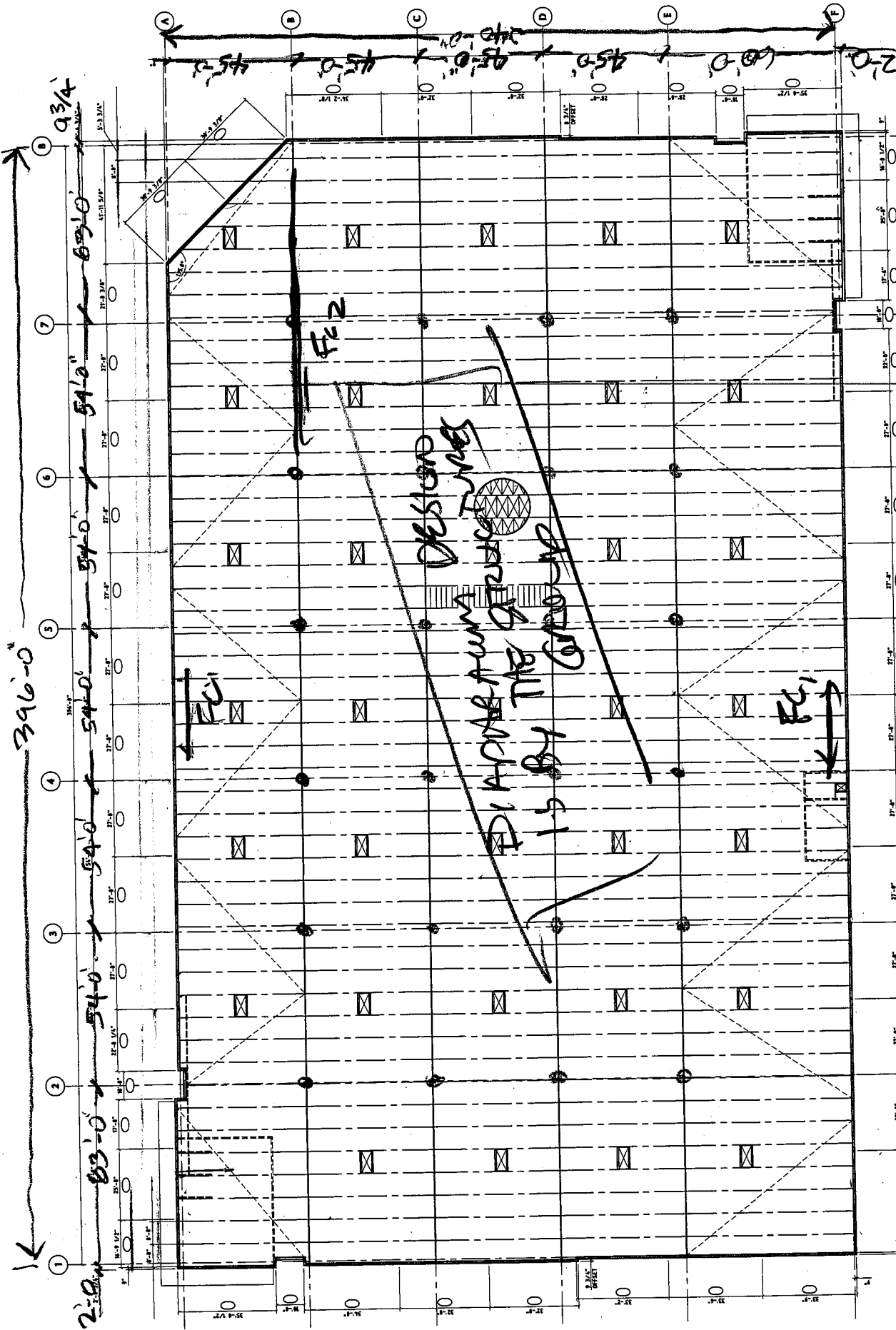
Parapet<sub>leeward</sub> = 23.7 psf

### Interior Zone

	winward	+	leeward	
Wint =	521	+	213	= 734 plf (sd level)
	313		128	= 440 plf (asd level)

### End Zone

	winward	+	leeward	
Wend =	598	+	268	= 866 plf (sd level)
	359		161	= 520 plf (asd level)



9866

340

280

64140

149450

13

DATE 3/21	JOB NO. 221019	SHEET NO. OF 14
JOB: VIP		
BY: MBS		
GF Group Structural Engineers		

LATERAL (N/S)

KNOWN  $F_{L1}$

$$W_{NLG} = \frac{149 \text{ k} \times 2}{396} = 0.753 \text{ k/f}$$

$$\therefore F_{L1} = \frac{0.753 (396)^2}{8 \times 240} = 61.5 \text{ k}$$

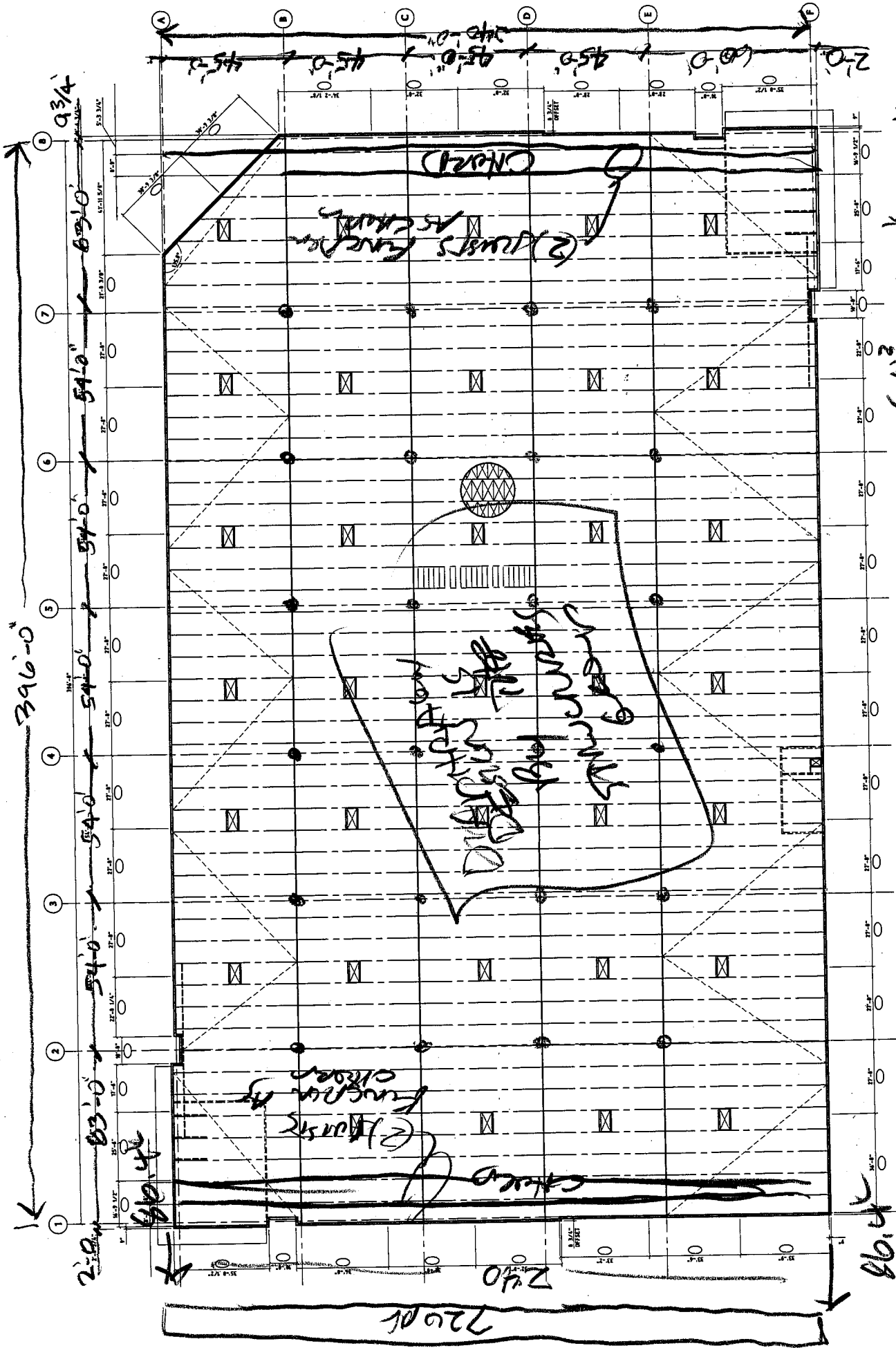
$$A_{S_{REQ}} = \frac{61.5}{0.9 \times 60} = 1.14 \text{ in}^2$$

USE (3) #6 ( $A_s = 1.32 > 1.14$ )

KNOWN  $F_{L2}$

$$F_{L2} = \frac{149(47) - .866(28)(33) - .734(19)^2}{240 - 45} = 31 \text{ k}$$

LEAST GUARANTEED  
FUNCTIONS AS  
CRITERION - DESIGN BY STRUCTURAL GROUP



$$\text{CHANG} \approx \frac{720(24)^2}{8 \times 320} = 13.6' = 6.8' / \text{unit}$$

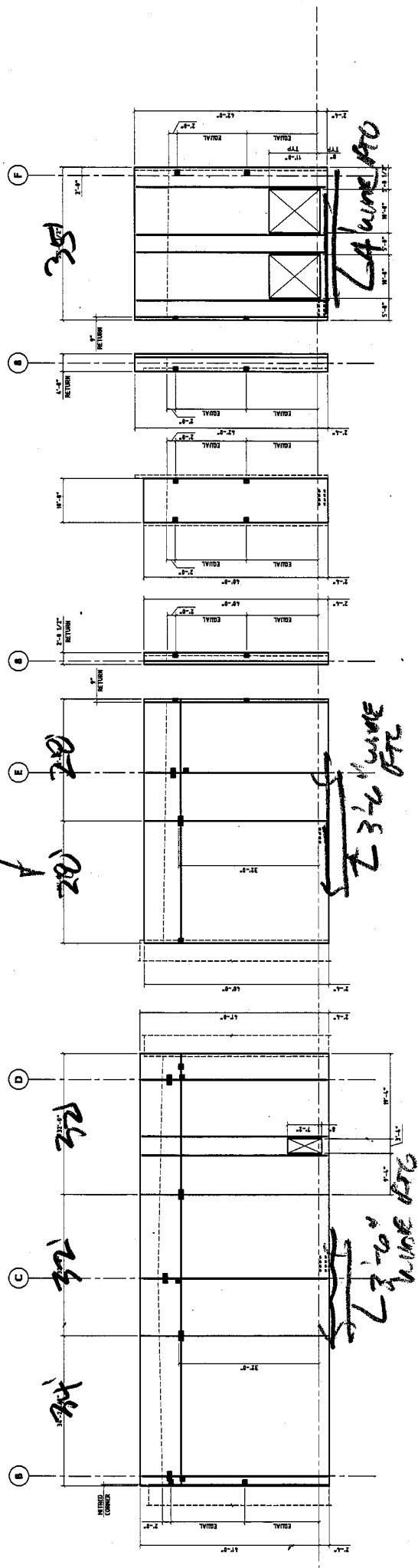
TYPICAL OF THE  
 THREE QUARTERS

LATERAL (E/W)

$$F/\text{pov} = \frac{149}{6} = 24.83$$

ending of Shear the by inspection

west-coast



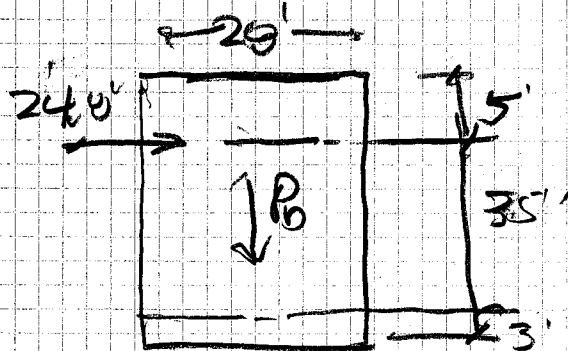
East ~~Africa~~ ~~South~~ ~~Africa~~

26

# LATERAL Shearwall

DATE 3/21	JOB NO. 221019	SHEET NO. OF 17
JOB: VMD		
BY: MMB		
GF Group Structural Engineers		

## EAST WALL



$$P_b = (43)(106 \text{ ksf})(28) = 127 \text{ k}$$

$$M_{br} = 24.8(38) = 942$$

## OTICAL STABILITY (0.6D + 0.6W)

$$P = 0.6(127) = 76.2 \text{ k}$$

$$M_{br} = 942(0.6) = 562$$

$$M_R = 76.2(28/2) = 1066 > 562$$

## SOIL BRG (0.6D + 0.6W)

$$q = \frac{1066 - 562}{76.2} = 6.61 < 28/3 \therefore f_b = \frac{2/3(76.2)}{0.61 \times 3.5} = 2.2 < 2.0(\frac{4}{3})$$

1.3'-6" WIDE  
ATG OK

## SOIL BRG (D + 0.6W)

$$P = 127 \text{ k}$$

$$M_R = 127(28/2) = 1778$$

$$M_{br} = 562$$

$$a = \frac{1778 - 562}{127} = 9.6 > \frac{28}{3}$$

$$\therefore f_b = \frac{127}{3.5 \times 28} + \frac{562}{\frac{1}{6}(3.5 \times 28)^2} = 1.3 + 1.22 = 2.52 < 2.0(\frac{4}{3})$$

1.3'-6" WIDE  
ATG OK

WEST WAR PLAY BY  
COMPANION TO EAST WAR



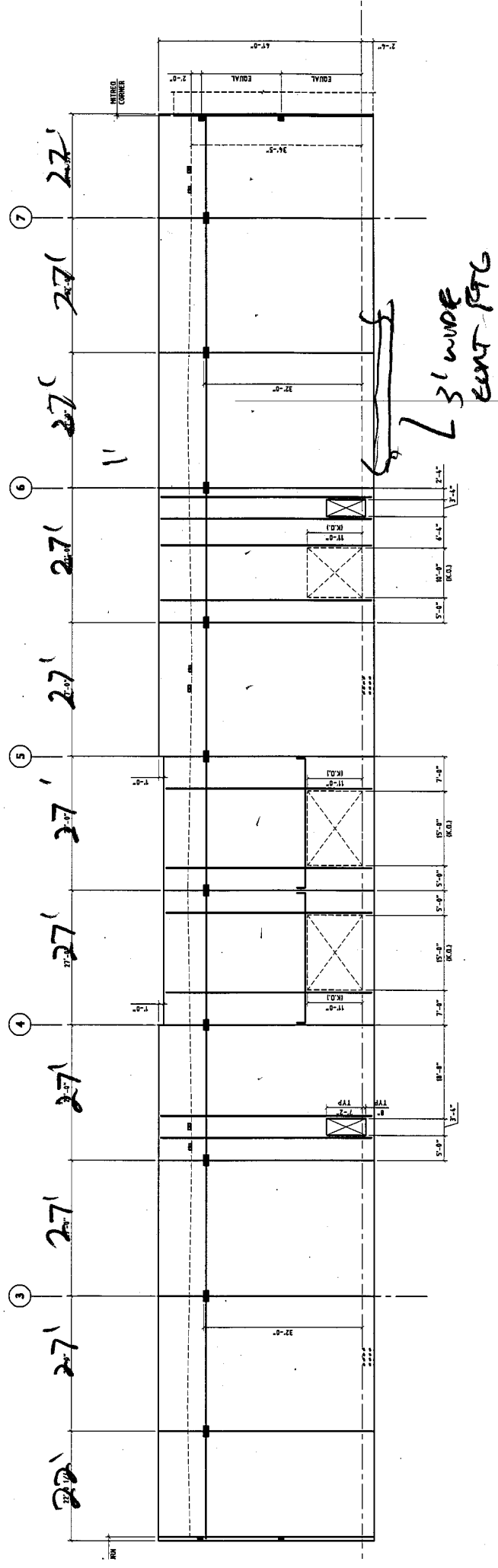
28

Force Base Shear (conservatively apply e. of ledger)

$$F_{TOT} = \frac{248^k}{2} = 124^k \text{ - Distribute by lengths}$$

$$F_{27} = \frac{27}{287}(124) = 11.6^k$$

$$F_{22} = \frac{22}{287}(124) = 9.5^k \text{ - shortest panel governs}$$



NEARLY SATISFACTORY

(SOUTH WALL OKAY BY COMPENSATION)



# Lateral Shearwall

DATE 3/21	JOB NO. 221014	SHEET NO. OF 40
JOB: VJP		
BY: MBB		
GF Group Structural Engineers		

MORTAR WALL

CHECK 22' wall (worst case)

$$P_0 = (43.33)(22)(.106) + \frac{45}{2}(.015)(22) = 108 \text{ k}$$

$$M_{BT} = 9.5 \text{ k}(37') = 351$$

$$M_R = 108(22/2) = 1188$$

Stability (0.6D + 0.7E)

$$0.7M_{BT} = 246$$

$$0.6M_R = 713 > 246 \text{ OK}$$

SOIL BRG (0.6D + 0.7E)

$$Q = \frac{713 - 246}{0.6(108)} = 7.2 < 22/3$$

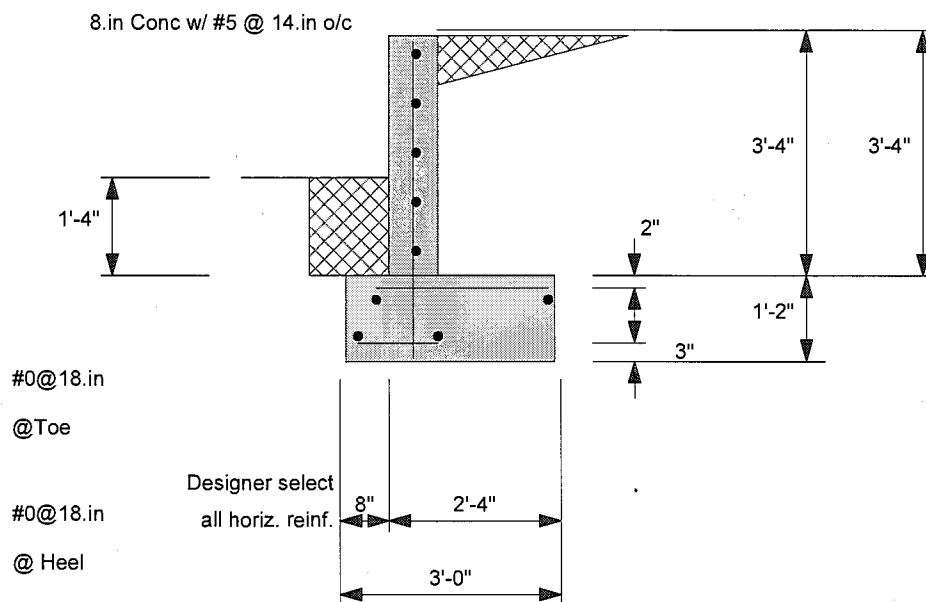
$$f_0 = \frac{2/3(0.6)(108)}{7.2 \times 3} = 2.0 \text{ ksf} < 2.0(4/3) \therefore 3' \text{ WIDE FTG OK}$$

SOIL BRG (D + 0.7E)

$$f_0 = \frac{108}{3.0 \times 22} + \frac{246}{\frac{1}{6}(3)(22)^2} = 1.63 + 1.02 = 2.65 \approx 2.0(4/3)$$

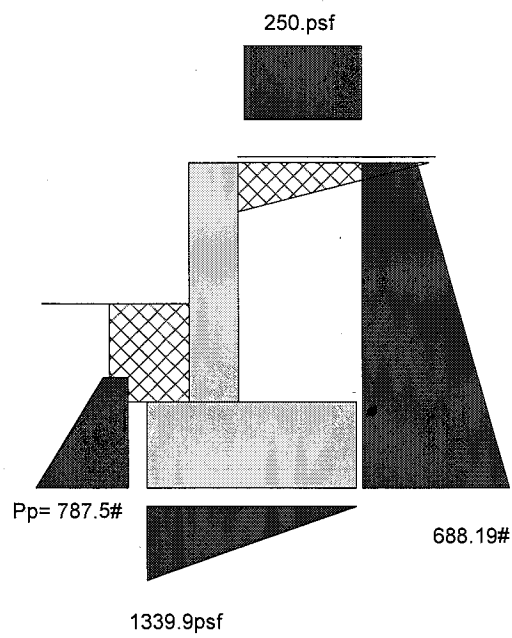
\therefore 3' WIDE FTG OK

DW-1



3'-4" dock wall

DW-2



3'-4" Deck water

## Cantilevered Retaining Wall

Lic. #: KW-06006285

**DESCRIPTION:** 3.33ft dock ramp wall

Calculations per ACI 318-14, TMS 402-16, IBC 2018,  
CBC 2019, ASCE 7-16

Criteria		
Retained Height	=	3.33 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	16.00 in
Water height over heel	=	0.0 ft
Vertical component of active		
Lateral soil pressure options:		
NOT USED for Soil Pressure.		
NOT USED for Sliding Resistance.		
NOT USED for Overturning Resistance.		

Soil Data		
Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	40.0 psf/ft
Toe Active Pressure	=	40.0 psf/ft
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Friction Coeff btwn Ftg & Soil	=	0.350
Soil height to ignore	=	12.00 in
for passive pressure		

Surcharge Loads		
Surcharge Over Heel	=	250.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Lateral Load Applied to Stem		
Lateral Load	=	0.0 plf
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft

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

Axial Load Applied to Stem		
Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Wind on Exposed Stem = 0.0 psf

### Design Summary

Wall Stability Ratios		
Overturning	=	2.38 OK
Sliding	=	2.15 OK
Total Bearing Load		
...resultant ecc.	=	1,982 lbs 6.16 in
Soil Pressure @ Toe		
Soil Pressure @ Heel	=	1,340 psf OK 0 psf OK
Allowable	=	1,500 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,608 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	0.0 psi OK
Footing Shear @ Heel	=	12.7 psi OK
Allowable	=	75.0 psi
Sliding Calcs (Vertical Component NOT Used)		
Lateral Sliding Force	=	688.2 lbs
less 100% Passive Force	= -	787.5 lbs
less 100% Friction Force	= -	690.9 lbs
Added Force Req'd	=	0.0 lbs OK
...for 1.5 : 1 Stability	=	0.0 lbs OK

Load Factors		
Dead Load		1.200
Live Load		1.600
Earth, H		1.600
Wind, W		1.600
Seismic, E		1.000

### Stem Construction

Design Height Above Ftg		
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	in =	8.00
Rebar Size	=	# 5
Rebar Spacing	in =	14.00
Rebar Placed at	=	Center
Design Data		
fb/FB + fa/Fa	=	0.263
Total Force @ Section	lbs =	782.3
Moment....Actual	ft-lb =	1,175.1
Moment....Allowable	ft-lb =	4,470.4
Shear....Actual	psi =	16.3
Shear....Allowable	psi =	82.2
Wall Weight	psf =	100.0
Rebar Depth 'd'	in =	4.00
Lap splice if above	in =	21.36
Lap splice if below	in =	10.50
Hook embed into footing	in =	10.50

Concrete Data		
fc	psi =	3,000.0
Fy	psi =	

### Top Stem

Stem OK

## Cantilevered Retaining Wall

Lic. #: KW-06006285

DESCRIPTION: 3.33ft dock ramp wall

### Footing Dimensions & Strengths

Toe Width	=	0.67 ft
Heel Width	=	2.33
Total Footing Width	=	3.00
Footing Thickness	=	14.00 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	@ Btm. = 3.00 in

### Footing Design Results

	Toe	Heel
Factored Pressure	= 1,608	0 psf
Mu' : Upward	= 330	0 ft-lb
Mu' : Downward	= 86	0 ft-lb
Mu: Design	= 244	1,175 ft-lb
Actual 1-Way Shear	= 0.00	12.67 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

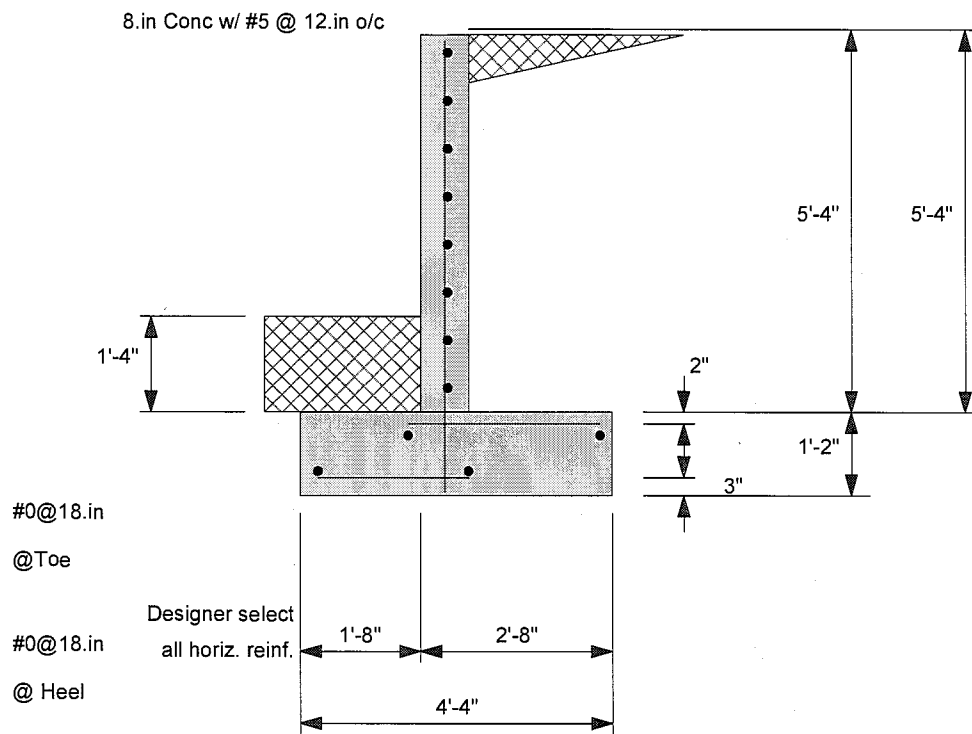
Toe: Not req'd, Mu < S \* Fr  
Heel: Not req'd, Mu < S \* Fr  
Key: No key defined

### Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				.....RESISTING.....			
Item	Force lbs	Distance ft	Moment ft-lb		Force lbs	Distance ft	Moment ft-lb
Heel Active Pressure	= 404.4	1.50	606.2	Soil Over Heel	= 610.4	2.17	1,322.0
Surcharge over Heel	= 408.8	2.25	919.1	Sloped Soil Over Heel	=		
Toe Active Pressure	= -125.0	0.83	-104.2	Surcharge Over Heel	= 416.6	2.17	902.3
Surcharge Over Toe	=			Adjacent Footing Load	=		
Adjacent Footing Load	=			Axial Dead Load on Stem	=		
Added Lateral Load	=			* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=			Soil Over Toe	= 97.7	0.33	32.5
				Surcharge Over Toe	=		
				Stem Weight(s)	= 333.0	1.00	332.8
				Earth @ Stem Transitions	=		
				Footing Weight	= 524.8	1.50	787.0
				Key Weight	=		
				Vert. Component	=		
Total	= 688.2	O.T.M. =	1,421.1				
Resisting/Overturning Ratio		=	2.38				
Vertical Loads used for Soil Pressure =		1,982.5	lbs				

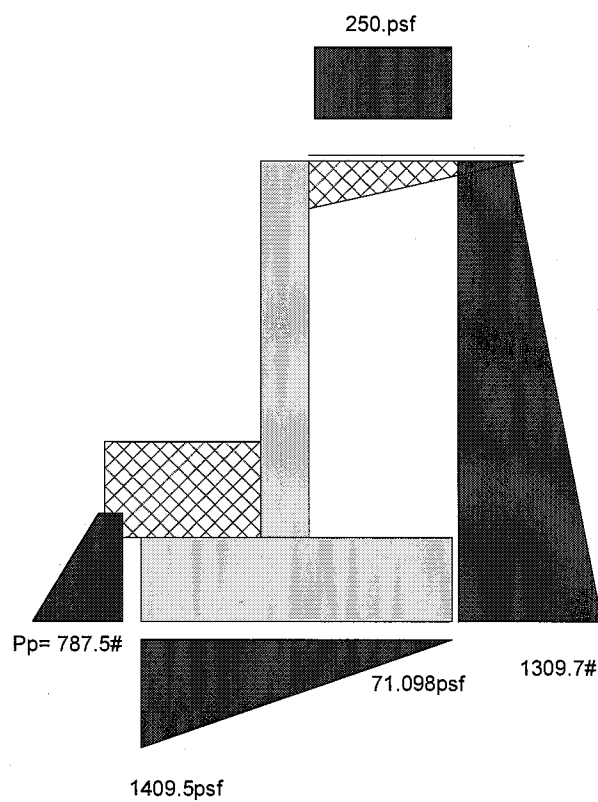
\* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

DW-5



5'-4" dock wall

DWG



5'-4" diameter

## Cantilevered Retaining Wall

Lic. #: KW-06006285

DESCRIPTION: 5.33ft dock ramp wall

Calculations per ACI 318-14, TMS 402-16, IBC 2018,  
CBC 2019, ASCE 7-16

### Criteria

Retained Height	=	5.33 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	16.00 in
Water height over heel	=	0.0 ft
Vertical component of active		
Lateral soil pressure options:		
NOT USED for Soil Pressure.		
NOT USED for Sliding Resistance.		
NOT USED for Overturning Resistance.		

### Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	40.0 psf/ft
Toe Active Pressure	=	40.0 psf/ft
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Friction Coeff btwn Ftg & Soil	=	0.350
Soil height to ignore		
for passive pressure	=	12.00 in

### Surcharge Loads

Surcharge Over Heel	=	250.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

### Axial Load Applied to Stem

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

### Lateral Load Applied to Stem

Lateral Load	=	0.0 plf
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft

### Adjacent Footing Load

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

Wind on Exposed Stem = 0.0 psf

### Design Summary

#### Wall Stability Ratios

Overturning	=	2.34 OK
Sliding	=	1.46 Ratio < 1.5!

Total Bearing Load	=	3,213 lbs
...resultant ecc.	=	7.85 in

Soil Pressure @ Toe	=	1,409 psf OK
Soil Pressure @ Heel	=	71 psf OK
Allowable	=	1,500 psf
Soil Pressure Less Than Allowable		

ACI Factored @ Toe	=	1,691 psf
ACI Factored @ Heel	=	85 psf
Footing Shear @ Toe	=	6.9 psi OK
Footing Shear @ Heel	=	19.1 psi OK
Allowable	=	75.0 psi

#### Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	1,309.7 lbs
less 100% Passive Force	=	- 787.5 lbs
less 100% Friction Force	=	- 1,120.6 lbs
Added Force Req'd	=	0.0 lbs OK
...for 1.5 : 1 Stability	=	52.6 lbs NG

### Load Factors

Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

### Stem Construction

#### Design Height Above Ftg

Wall Material Above "Ht"	=	Concrete
Thickness	=	8.00 in
Rebar Size	=	# 5
Rebar Spacing	=	12.00 in
Rebar Placed at	=	Center

#### Design Data

fb/FB + fa/Fa	=	0.709
Total Force @ Section	lbs =	1,627.5
Moment....Actual	ft-lb =	3,656.0
Moment....Allowable	ft-lb =	5,154.8
Shear....Actual	psi =	33.9
Shear....Allowable	psi =	82.2
Wall Weight	psf =	100.0
Rebar Depth 'd'	in =	4.00
Lap splice if above	in =	21.36
Lap splice if below	in =	10.50
Hook embed into footing	in =	10.50

#### Concrete Data

f'c	psi =	3,000.0
Fy	psi =	

### Top Stem

Stem OK



## Cantilevered Retaining Wall

File: 221019-VIP Products.ec6

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Lic. #: KW-06006285

GFG STRUCTURAL ENGINEERS

DESCRIPTION: 5.33ft dock ramp wall

### Footing Dimensions & Strengths

Toe Width	=	1.67 ft
Heel Width	=	2.67
Total Footing Width	=	4.34
Footing Thickness	=	14.00 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	@ Btm. = 3.00 in

### Footing Design Results

	Toe	Heel
Factored Pressure	= 1,691	85 psf
Mu' : Upward	= 2,071	0 ft-lb
Mu' : Downward	= 538	2,636 ft-lb
Mu: Design	= 1,533	2,636 ft-lb
Actual 1-Way Shear	= 6.94	19.07 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

#### Other Acceptable Sizes & Spacings

Toe: Not req'd, Mu < S \* Fr

Heel: Not req'd, Mu < S \* Fr

Key: No key defined

### Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				.....RESISTING.....					
Item		Force lbs	Distance ft	Moment ft-lb		Force lbs	Distance ft	Moment ft-lb	
Heel Active Pressure	=	844.1	2.17	1,828.0	Soil Over Heel	=	1,174.6	3.34	3,921.1
Surcharge over Heel	=	590.6	3.25	1,918.5	Sloped Soil Over Heel	=			
Toe Active Pressure	=	-125.0	0.83	-104.2	Surcharge Over Heel	=	500.8	3.34	1,671.9
Surcharge Over Toe	=				Adjacent Footing Load	=			
Adjacent Footing Load	=				Axial Dead Load on Stem	=			
Added Lateral Load	=				* Axial Live Load on Stem	=			
Load @ Stem Above Soil	=				Soil Over Toe	=	244.9	0.84	204.5
					Surcharge Over Toe	=			
					Stem Weight(s)	=	533.0	2.00	1,067.8
					Earth @ Stem Transitions	=			
					Footing Weight	=	759.5	2.17	1,648.1
					Key Weight	=			
					Vert. Component	=			
Total	=	1,309.7	O.T.M.	=	3,642.3				
Resisting/Overturning Ratio				=	2.34				
Vertical Loads used for Soil Pressure	=		3,212.8	lbs					

\* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.