Design Calculations

for

Del Pado Blvd - Iceland Remodel

WCD & ASSOCIATES

Homeowner: Rob Kerth (Iceland Skaterink)
Address: 1430 Del Paso Blvd, Sacramento, CA 95815

Client: C & L Drafting Services

Project Number: CR070722
Purpose: Structural Design for Remodel

Date: 3/9/2023
Engineer: T. Hamel

The design calculations contained herein have been prepared by or under the direction of the following Registered Civil Engineer:

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916-251-9798

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WCD		Project Title:	**Del Pado Blvd - Iceland Remodel**		
		Discipline: Structural			
Project No.:	CR070722	Originator:	T. Hamel	Date:	3/9/2023
Component:	**Table of Contents**	Checked:	W. Cullumber	Date:	3/9/2023

Table of Contents

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WCD		Project Title:	**Del Pado Blvd - Iceland Remodel**		
		Discipline: Structural			
Project No.:	CR070722	Originator:	T. Hamel	Date:	3/9/2023
Component:	**General Project Information**	Checked:	W. Cullumber	Date:	3/9/2023

Del Pado Blvd - Iceland Remodel

Design Firm	WCD & Associates
Owner	Rob Kerth (Iceland Skaterink)
Address	1430 Del Paso Blvd, Sacramento, CA 95815
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Project Approach

Typical design approach for gravity and lateral analysis. Seismic and Wind loading applied for lateral analysis. Gravity loading applied as specified in the calculations. Diaphragms are treated as flexible and simple span theory is utilized.

References

ASCE 7-16	Minimum Design Loads for Buildings and Other Structures
ACI 318-19	Building Code Requirements for Structural Concrete and Commentary
CBC 2022	California Building Code 2022
AISC	Steel Construction Manual 14th Edition
AISC 341-16	Seismic Provisions for Structural Steel Buildings
NDS 2018	National Design Standard for Wood Construction

Design Values

See Building Design by CBC Steel Buildings, Project No. C22B0182A, Dated 09/19/2022
See Foundation Design for Loading Used

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		Discipline: Structural			
Project No.:	CR070722	Originator:	T. Hamel	Date:	3/9/2023
Component:	**Buidling Loads Summary**	Checked:	W. Cullumber	Date:	3/9/2023

VERTICAL BUILDING LOADS FOR FOOTING DESIGN

FRAME NO.	COL NO. AT FRAME	DEAD LOAD, KIPS (CASE 1 + CASE2)	LIVE LOAD, KIPS (CASE 3)	SEISMIC LOAD, KIPS (CASE 12 &
1 & 7	*Col1*	10	9	1
	Col2	10	9	-1
2 - 6	*Col1*	13	17	2
	Col2	13	17	-2

FRAME NO.	COL NO. AT FRAME	FRONT TO BACK WIND LOAD				RIGHT TO LEFT WIND LOAD			
		FRONT WIND LOADS, KIPS		BACK WIND LOADS, KIPS		LEFT WIND LOADS, KIPS		RIGHT WIND LOADS, KIPS	
		CASE 9	CASE 11	CASE 8	CASE 10	CASE 5	CASE 7	CASE 4	CASE 6
1 & 7	*Col1*	-9	-15	-13	-19	-9	-14	-14	-19
	Col2	-13	-19	-9	-14	-13	-19	-8	-14
2 - 6	*Col1*	-9	-21	-15	-26	-8	-20	-16	-27
	Col2	-14	-26	-9	-21	-16	-27	-8	-20

HORIZONTAL BUILDING LOADS FOR FOOTING DESIGN

FRAME NO.	COL NO. AT FRAME	DEAD LOAD, KIPS (CASE 1 + CASE2)	LIVE LOAD, KIPS (CASE 3)	SEISMIC LOAD, KIPS (CASE 12 & CASE 13)
1 & 7	*Col1*	8	5	2
	Col2	-8	-5	2
2 - 6	*Col1*	12	15	3
	Col2	-12	-15	3

FRAME NO.	COL NO. AT FRAME	FRONT TO BACK WIND LOAD				RIGHT TO LEFT WIND LOAD			
		FRONT WIND LOADS, KIPS		BACK WIND LOADS, KIPS		LEFT WIND LOADS, KIPS		RIGHT WIND LOADS, KIPS	
		CASE 9	CASE 11	CASE 8	CASE 10	CASE 5	CASE 7	CASE 4	CASE 6
1 & 7	*Col1*	-9	-14	-9	-13	-8	-12	-11	-16
	Col2	8	13	9	13	-12	16	7	12
2 - 6	*Col1*	-10	-20	-10	-19	-8	-17	-15	-24
	Col2	9	18	10	19	16	24	8	17

BUILDING LOADS FOR ANCHORAGE DESIGN

FRAME No.	VERTICAL LOADS		HORIZONTAL LOADS	
	DEAD LOAD, KIPS (CASE 1	WIND LOAD, KIPS	DEAD LOAD, KIPS (CASE 1	WIND LOAD,
1 & 7	10	-19	8	-16
2 - 6	13	-27	12	-24

*Worst Case load for Anchorage occurs at 0.9D + 1.0W
**Wind Loads govern over Seismic

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NUCOR BUILDINGS GROUP

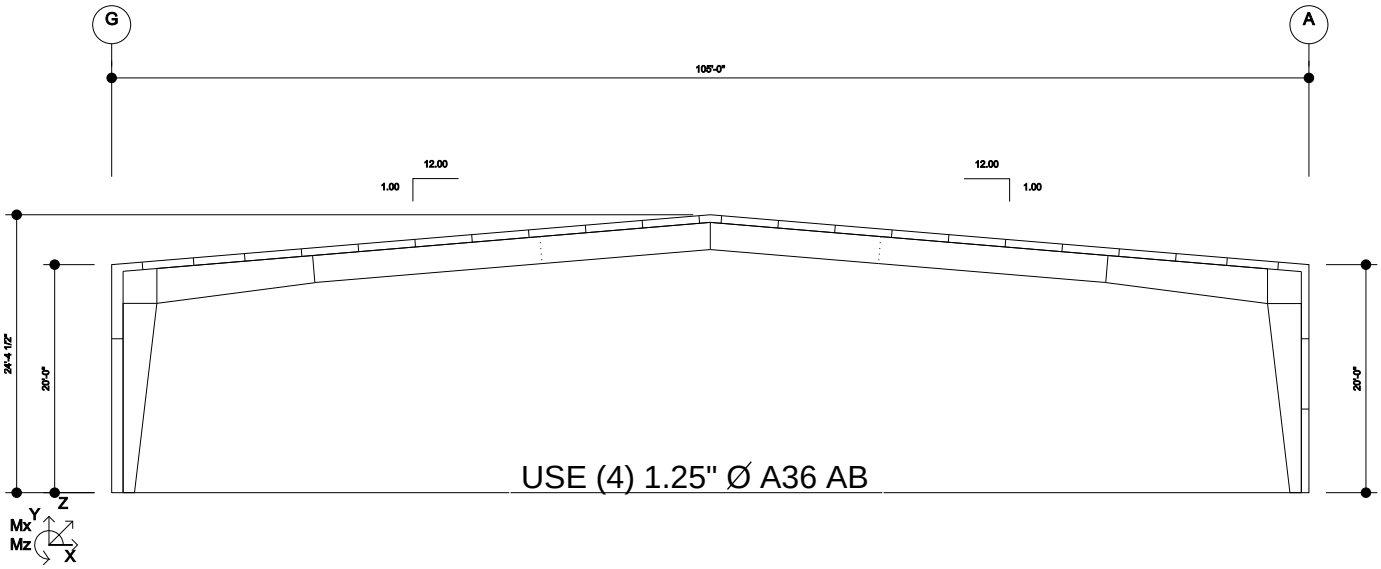
Job # : C22B0182A
File : E01.nfr
App Version : 1.6.127.0

Job Name : Nucor Buildings Group
Designer : BG\Viviana.Perez
Date : 8/23/2022

Frame : A-2

DESIGN SUMMARY - REACTIONS BY LOAD CASE REPORT

FRAME LINE 1,7



Member	X (kips)	Y (kips)	Z (kips)	Mx (kip-ft)	Mz (kip-ft)	Member	X (kips)	Y (kips)	Z (kips)	Mx (kip-ft)	Mz (kip-ft)
LOAD CASE 1 - DEAD						LOAD CASE 2 - COLLATERAL					
COL01	5	6	0	0	0	COL01	3	4	0	0	0
COL02	-5	6	0	0	0	COL02	-3	4	0	0	0
LOAD CASE 3 - ROOF LIVE						LOAD CASE 4 - WIND CASE 1 TO RIGHT					
COL01	8	9	0	0	0	COL01	-11	-14	0	0	0
COL02	-8	9	0	0	0	COL02	7	-8	0	0	0
LOAD CASE 5 - WIND CASE 1 TO LEFT						LOAD CASE 6 - WIND CASE 2 TO RIGHT					
COL01	-8	-8	0	0	0	COL01 (GOVERNS ANCHORAGE UPLIFT)	-16	-19	0	0	0
COL02	12	-13	0	0	0	COL02	12	-14	0	0	0
LOAD CASE 7 - WIND CASE 2 TO LEFT						LOAD CASE 8 - LONG. WIND 1 TO BACK					
COL01	-12	-14	0	0	0	COL01	-9	-13	0	0	0
COL02	16	-19	0	0	0	COL02	9	-9	0	0	0
LOAD CASE 9 - LONG. WIND 1 TO FRONT						LOAD CASE 10 - LONG. WIND 2 TO BACK					
COL01	-9	-9	0	0	0	COL01	-13	-19	0	0	0
COL02	8	-13	0	0	0	COL02	13	-14	0	0	0
LOAD CASE 11 - LONG. WIND 2 TO FRONT						LOAD CASE 12 - SEISMIC TO RIGHT					
COL01	-14	-15	0	0	0	COL01	-2	-1	0	0	0
COL02	13	-19	0	0	0	COL02	-2	1	0	0	0
LOAD CASE 13 - SEISMIC TO LEFT											
COL01	2	1	0	0	0						
COL02	2	-1	0	0	0						

NOTES:
1. ALL WIND REACTIONS SHOWN IN THE TABLE ABOVE ARE BASED ON ULTIMATE DESIGN WIND SPEED AND ARE UNFACTORED.

2. SEISMIC REACTIONS ARE DUE TO BASE SHEAR. THE REDUNDANCY FACTOR AND THE OVERSTRENGTH FACTOR HAVE NOT BEEN INCLUDED IN THE REACTIONS SHOWN.

NUCOR BUILDINGS GROUP

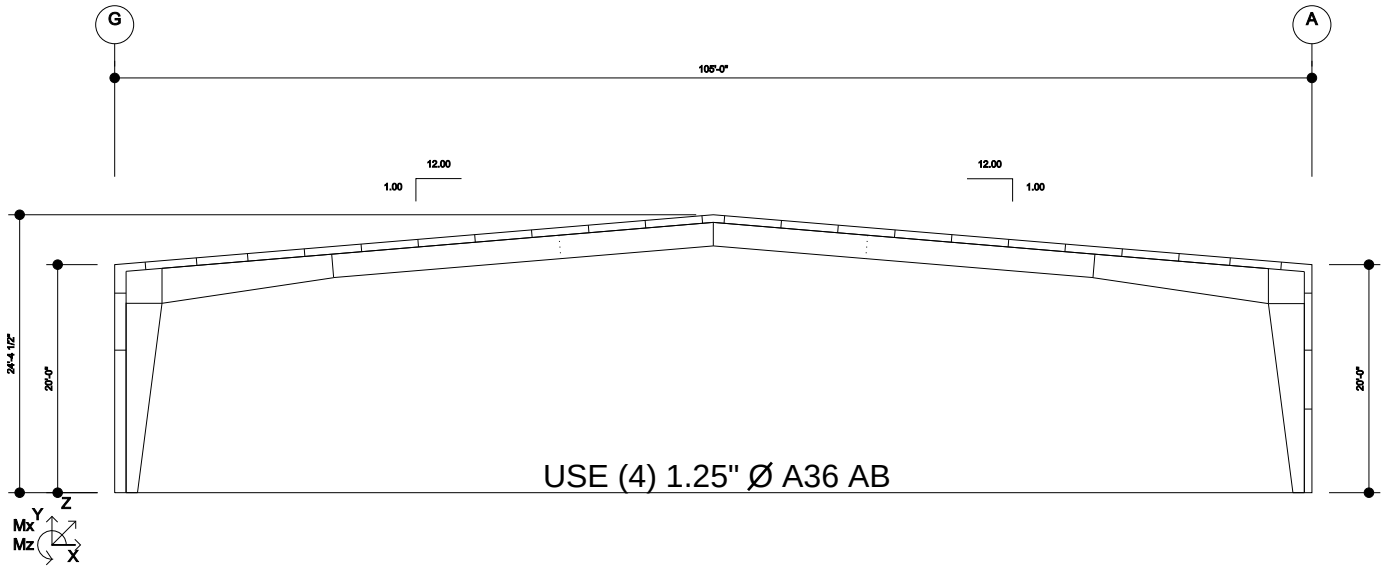
Job # : C22B0182A
File : F01a.nfr
App Version : 1.6.127.0

Job Name : Rob Kerth Iceland
Designer : BG\Viviana.Perez
Date : 8/23/2022

Frame : A-3

DESIGN SUMMARY - REACTIONS BY LOAD CASE REPORT

FRAME LINE 2-6



Member	X (kips)	Y (kips)	Z (kips)	Mx (kip-ft)	Mz (kip-ft)	Member	X (kips)	Y (kips)	Z (kips)	Mx (kip-ft)	Mz (kip-ft)
LOAD CASE 1 - DEAD						LOAD CASE 2 - COLLATERAL					
COL01	5	6	0	0	0	COL01	7	7	0	0	0
COL02	-5	6	0	0	0	COL02	-7	7	0	0	0
LOAD CASE 3 - ROOF LIVE						LOAD CASE 4 - WIND CASE 1 TO RIGHT					
COL01	15	17	0	0	0	COL01	-15	-16	0	0	0
COL02	-15	17	0	0	0	COL02	8	-8	0	0	0
LOAD CASE 5 - WIND CASE 1 TO LEFT						LOAD CASE 6 - WIND CASE 2 TO RIGHT					
COL01	-8	-8	0	0	0	COL01 (GOVERNS ANCHORAGE UPLIFT)	-24	-27	0	0	0
COL02	16	-16	0	0	0	COL02	17	-20	0	0	0
LOAD CASE 7 - WIND CASE 2 TO LEFT						LOAD CASE 8 - LONG. WIND 1 TO BACK					
COL01	-17	-20	0	0	0	COL01	-10	-15	0	0	0
COL02	24	-27	0	0	0	COL02	10	-9	0	0	0
LOAD CASE 9 - LONG. WIND 1 TO FRONT						LOAD CASE 10 - LONG. WIND 2 TO BACK					
COL01	-10	-9	0	0	0	COL01	-19	-26	0	0	0
COL02	9	-14	0	0	0	COL02	19	-21	0	0	0
LOAD CASE 11 - LONG. WIND 2 TO FRONT						LOAD CASE 12 - SEISMIC TO RIGHT					
COL01	-20	-21	0	0	0	COL01	-3	-2	0	0	0
COL02	18	-26	0	0	0	COL02	-3	2	0	0	0
LOAD CASE 13 - SEISMIC TO LEFT											
COL01	3	2	0	0	0						
COL02	3	-2	0	0	0						

NOTES:
1. ALL WIND REACTIONS SHOWN IN THE TABLE ABOVE ARE BASED ON ULTIMATE DESIGN WIND SPEED AND ARE UNFACTORED.

2. SEISMIC REACTIONS ARE DUE TO BASE SHEAR. THE REDUNDANCY FACTOR AND THE OVERSTRENGTH FACTOR HAVE NOT BEEN INCLUDED IN THE REACTIONS SHOWN.

DESCRIPTION: FRAME 1 AND 7 FOOTING DESIGN (AT CORNERS) - GRAVITY CHECK

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	=	2.50	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	2,850.0	ksi
Concrete Density	=	150.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

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

Soil Design Values

Allowable Soil Bearing	=	2,000.0	ksf
Soil Density	=	120.0	pcf
Increase Bearing By Footing Weight	=	Yes	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

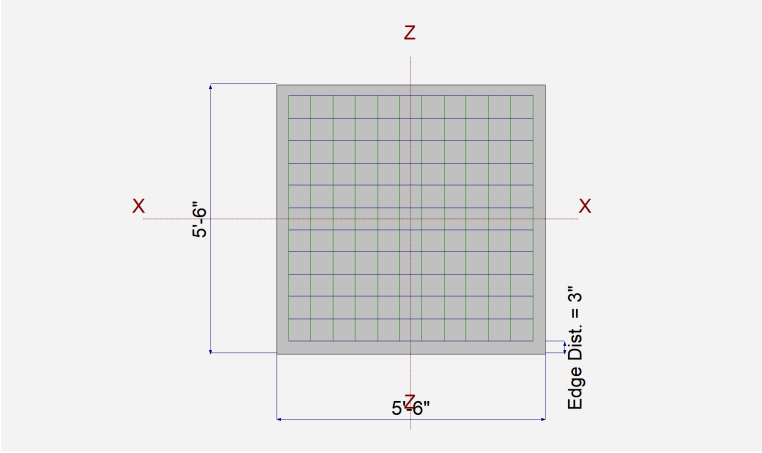
Footing base depth below soil surface	=	3.50	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

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

Dimensions

Width parallel to X-X Axis	=	5.50	ft
Length parallel to Z-Z Axis	=	5.50	ft
Footing Thickness	=	42.0	in
Load location offset from footing center...			
ex : Prll to X-X Axis	=	24.5	in
	=		in
Pedestal dimensions...			
px : parallel to X-X Axis	=		in
pz : parallel to Z-Z Axis	=		in
Height	=		in
Rebar Centerline to Edge of Concrete...			
at Bottom of footing	=	3.0	in

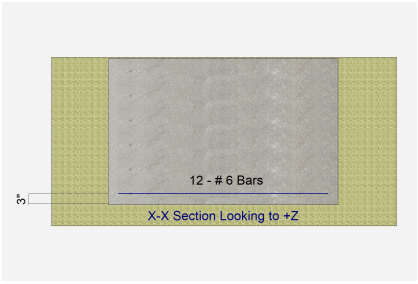


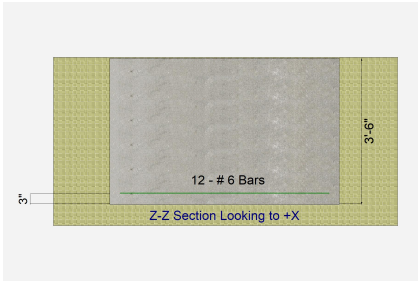
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		12
Reinforcing Bar Size	=	#	6
Bars parallel to Z-Z Axis			
Number of Bars	=		12
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	=	10.0	9.0			-19.0	1.0		k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

DESCRIPTION: FRAME 1 AND 7 FOOTING DESIGN (AT CORNERS) - GRAVITY CHECK

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.5557	Soil Bearing	5.557 ksf	10.0 ksf	+0.60D+0.60W about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	1.006	Overturning - Z-Z	54.625 k-ft	54.954 k-ft	+0.60D+0.60W
PASS	1.362	Uplift	-11.40 k	15.529 k	+0.60D+0.60W
PASS	0.004162	Z Flexure (+X)	0.6810 k-ft/ft	163.601 k-ft/ft	+1.20D+1.60Lr
PASS	0.03316	Z Flexure (-X)	5.424 k-ft/ft	163.601 k-ft/ft	+0.90D+W
PASS	0.02017	X Flexure (+Z)	3.30 k-ft/ft	163.601 k-ft/ft	+1.20D+1.60Lr
PASS	0.02017	X Flexure (-Z)	3.30 k-ft/ft	163.601 k-ft/ft	+1.20D+1.60Lr
PASS	n/a	1-way Shear (+X)	0.0 psi	75.0 psi	n/a
PASS	n/a	1-way Shear (-X)	1.643 psi	75.0 psi	+1.20D+1.60Lr
PASS	n/a	1-way Shear (+Z)	0.0 psi	75.0 psi	n/a
PASS	n/a	1-way Shear (-Z)	0.0 psi	75.0 psi	n/a
PASS	0.0	2-way Punching	0.0 psi	0.0 psi	n/a

Top reinforcing mat required (see 'Bending' tab).

Hand check required for anchor pullout.

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	10.0	n/a	0.0	0.8556	0.8556	n/a	n/a	0.086
X-X, +D+Lr	10.0	n/a	0.0	1.153	1.153	n/a	n/a	0.115
X-X, +D+0.750Lr	10.0	n/a	0.0	1.079	1.079	n/a	n/a	0.108
X-X, +D+0.60W	10.0	n/a	0.0	0.4787	0.4787	n/a	n/a	0.048
X-X, +D+0.750Lr+0.450W	10.0	n/a	0.0	0.7961	0.7961	n/a	n/a	0.080
X-X, +D+0.450W	10.0	n/a	0.0	0.5729	0.5729	n/a	n/a	0.057
X-X, +0.60D+0.60W	10.0	n/a	0.0	0.1365	0.1365	n/a	n/a	0.014
X-X, +D+0.70E	10.0	n/a	0.0	0.8787	0.8787	n/a	n/a	0.088
X-X, +D+0.5250E	10.0	n/a	0.0	0.8729	0.8729	n/a	n/a	0.087
X-X, +0.60D+0.70E	10.0	n/a	0.0	0.5365	0.5365	n/a	n/a	0.054
Z-Z, D Only	10.0	9.466	n/a	n/a	n/a	0.1267	1.585	0.159
Z-Z, +D+Lr	10.0	13.345	n/a	n/a	n/a	0.0	2.567	0.257
Z-Z, +D+0.750Lr	10.0	12.576	n/a	n/a	n/a	0.0	2.311	0.231
Z-Z, +D+0.60W	10.0	-2.369	n/a	n/a	n/a	0.5808	0.3767	0.058
Z-Z, +D+0.750Lr+0.450W	10.0	8.343	n/a	n/a	n/a	0.1984	1.394	0.139
Z-Z, +D+0.450W	10.0	2.050	n/a	n/a	n/a	0.4672	0.6786	0.068
Z-Z, +0.60D+0.60W	10.0	-32.044	n/a	n/a	n/a	5.557	0.0	0.556
Z-Z, +D+0.70E	10.0	9.862	n/a	n/a	n/a	0.09877	1.659	0.166
Z-Z, +D+0.5250E	10.0	9.765	n/a	n/a	n/a	0.1057	1.640	0.164
Z-Z, +0.60D+0.70E	10.0	10.115	n/a	n/a	n/a	0.04811	1.025	0.103

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, D Only	None	0.0 k-ft	Infinity	OK
X-X, +D+Lr	None	0.0 k-ft	Infinity	OK
X-X, +D+0.750Lr	None	0.0 k-ft	Infinity	OK
X-X, +D+0.60W	None	0.0 k-ft	Infinity	OK
X-X, +D+0.750Lr+0.450W	None	0.0 k-ft	Infinity	OK
X-X, +D+0.450W	None	0.0 k-ft	Infinity	OK
X-X, +0.60D+0.60W	None	0.0 k-ft	Infinity	OK
X-X, +D+0.70E	None	0.0 k-ft	Infinity	OK
X-X, +D+0.5250E	None	0.0 k-ft	Infinity	OK
X-X, +0.60D+0.70E	None	0.0 k-ft	Infinity	OK
Z-Z, D Only	None	91.590 k-ft	Infinity	OK
Z-Z, +D+Lr	None	134.715 k-ft	Infinity	OK

DESCRIPTION: FRAME 1 AND 7 FOOTING DESIGN (AT CORNERS) - GRAVITY CHECK

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Z-Z, +D+0.750Lr	None	123.934 k-ft	Infinity	OK
Z-Z, +D+0.60W	54.625 k-ft	91.590 k-ft	1.677	OK
Z-Z, +D+0.750Lr+0.450W	40.969 k-ft	123.934 k-ft	3.025	OK
Z-Z, +D+0.450W	40.969 k-ft	91.590 k-ft	2.236	OK
Z-Z, +0.60D+0.60W	54.625 k-ft	54.954 k-ft	1.006	OK
Z-Z, +D+0.70E	None	94.106 k-ft	Infinity	OK
Z-Z, +D+0.5250E	None	93.477 k-ft	Infinity	OK
Z-Z, +0.60D+0.70E	None	57.470 k-ft	Infinity	OK

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	1.750	+Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.40D	1.750	-Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+0.50Lr	2.063	+Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+0.50Lr	2.063	-Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D	1.50	+Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D	1.50	-Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+1.60Lr	3.30	+Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+1.60Lr	3.30	-Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+1.60Lr+0.50W	2.113	+Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+1.60Lr+0.50W	2.113	-Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+0.50W	0.3125	+Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+0.50W	0.3125	-Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+0.50Lr+W	0.3125	+Z	Top	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+0.50Lr+W	0.3125	-Z	Top	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+W	0.8750	+Z	Top	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+W	0.8750	-Z	Top	0.9072	AsMin	0.960	163.601	OK
X-X, +0.90D+W	1.250	+Z	Top	0.9072	AsMin	0.960	163.601	OK
X-X, +0.90D+W	1.250	-Z	Top	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+E	1.625	+Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +1.20D+E	1.625	-Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +0.90D+E	1.250	+Z	Bottom	0.9072	AsMin	0.960	163.601	OK
X-X, +0.90D+E	1.250	-Z	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.40D	0.3529	-X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.40D	0.3524	+X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+0.50Lr	0.4158	-X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+0.50Lr	0.4155	+X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D	0.3025	-X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D	0.3021	+X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+1.60Lr	0.6814	-X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+1.60Lr	0.6810	+X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+1.60Lr+0.50W	0.4259	-X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+1.60Lr+0.50W	0.4257	+X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+0.50W	0.06302	-X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+0.50W	0.06293	+X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+0.50Lr+W	0.06302	-X	Top	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+0.50Lr+W	0.06293	+X	Top	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+W	0.1583	-X	Top	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+W	0.1580	+X	Top	0.9072	AsMin	0.960	163.601	OK
Z-Z, +0.90D+W	5.424	-X	Top	0.9072	AsMin	0.960	163.601	OK
Z-Z, +0.90D+W	0.1185	+X	Top	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+E	0.3277	-X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +1.20D+E	0.3272	+X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +0.90D+E	0.2521	-X	Bottom	0.9072	AsMin	0.960	163.601	OK
Z-Z, +0.90D+E	0.2517	+X	Bottom	0.9072	AsMin	0.960	163.601	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.92 psi	0.00 psi	0.00 psi	0.00 psi	0.92 psi	75.00 psi	0.01	OK
+1.20D+0.50Lr	1.08 psi	0.00 psi	0.00 psi	0.00 psi	1.08 psi	75.00 psi	0.01	OK
+1.20D	0.79 psi	0.00 psi	0.00 psi	0.00 psi	0.79 psi	75.00 psi	0.01	OK
+1.20D+1.60Lr	1.64 psi	0.00 psi	0.00 psi	0.00 psi	1.64 psi	75.00 psi	0.02	OK

DESCRIPTION: FRAME 1 AND 7 FOOTING DESIGN (AT CORNERS) - GRAVITY CHECK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.20D+1.60Lr+0.50W	1.11 psi	0.00 psi	0.00 psi	0.00 psi	1.11 psi	75.00 psi	0.01	OK
+1.20D+0.50W	0.16 psi	0.00 psi	0.00 psi	0.00 psi	0.16 psi	75.00 psi	0.00	OK
+1.20D+0.50Lr+W	0.16 psi	0.00 psi	0.00 psi	0.00 psi	0.16 psi	75.00 psi	0.00	OK
+1.20D+W	0.50 psi	0.00 psi	0.00 psi	0.00 psi	0.50 psi	75.00 psi	0.01	OK
+0.90D+W	1.56 psi	0.00 psi	0.00 psi	0.00 psi	1.56 psi	75.00 psi	0.02	OK
+1.20D+E	0.85 psi	0.00 psi	0.00 psi	0.00 psi	0.85 psi	75.00 psi	0.01	OK
+0.90D+E	0.66 psi	0.00 psi	0.00 psi	0.00 psi	0.66 psi	75.00 psi	0.01	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	0.00 psi	150.00 psi	0	OK
+1.20D+0.50Lr	0.00 psi	150.00 psi	0	OK
+1.20D	0.00 psi	150.00 psi	0	OK
+1.20D+1.60Lr	0.00 psi	150.00 psi	0	OK
+1.20D+1.60Lr+0.50W	0.00 psi	150.00 psi	0	OK
+1.20D+0.50W	0.00 psi	150.00 psi	0	OK
+1.20D+0.50Lr+W	0.00 psi	150.00 psi	0	OK
+1.20D+W	0.00 psi	150.00 psi	0	OK
+0.90D+W	0.00 psi	150.00 psi	0	OK
+1.20D+E	0.00 psi	150.00 psi	0	OK
+0.90D+E	0.00 psi	150.00 psi	0	OK

DESCRIPTION: FRAME 1 AND 7 FOOTING DESIGN (AT CORNERS) - LATERAL CHECK

Code References

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

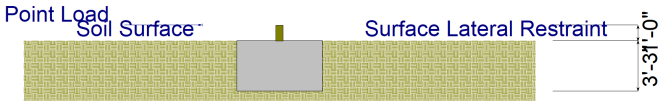
Load Combinations Used : ASCE 7-16

General Information

Pole Footing Shape	Rectangular
Pole Footing Width	66.0 in
Calculate Min. Depth for Allowable Pressures	
Lateral Restraint at Ground Surface	
Allow Passive	250.0 pcf
Max Passive	1,500.0 psf

Controlling Values

Governing Load Combination	+D+0.750Lr-0.450W
Lateral Load	15.350 k
Moment	15.350 k-ft
Restraint @ Ground Surface	
Pressure at Depth	
Actual	**796.43** psf
Allowable	**812.50** psf
Surface Retraint Force	25,386.5 lbs
Minimum Required Depth	**3.250 ft**
Footing Base Area	30.250 ft^2
Maximum Soil Pressure	0.6876 ksf



Applied Loads

Lateral Concentrated Load (k)		Lateral Distributed Loads (k		Applied Moment (kft)	Vertical Load (k)
D : Dead Load	8.0 k		k/ft	k-ft	10.0 k
Lr : Roof Live	5.0 k		k/ft	k-ft	9.0 k
L : Live	k		k/ft	k-ft	k
S : Snow	k		k/ft	k-ft	k
W : Wind	-8.0 k		k/ft	k-ft	-9.0 k
E : Earthquake	2.0 k		k/ft	k-ft	1.0 k
H : Lateral Earth	k		k/ft	k-ft	k
Load distance above ground surface	1.0 ft	TOP of Load above ground surface	ft		
		BOTTOM of Load above ground surface	ft		

Load Combination Results

	Forces @ Ground Surface		Required	Pressure at Depth		Soil Increase
Load Combination	Loads - (k)	Moments - (ft-k)	Depth - (ft)	Actual - (psf)	Allow - (psf)	Factor
D Only	8.000	8.000	2.63	636.3	656.3	1.000
+D+Lr	13.000	13.000	3.13	729.5	781.3	1.000
+D+0.750Lr	11.750	11.750	3.00	715.5	750.0	1.000
+D+0.60W	3.200	3.200	2.00	438.4	500.0	1.000
+D-0.60W	12.800	12.800	3.13	718.3	781.3	1.000
+D+0.750Lr+0.450W	8.150	8.150	2.63	648.2	656.3	1.000
+D+0.750Lr-0.450W	15.350	15.350	3.25	796.4	812.5	1.000
+D+0.450W	4.400	4.400	2.25	476.3	562.5	1.000
+D-0.450W	11.600	11.600	3.00	706.4	750.0	1.000

DESCRIPTION: FRAME 1 AND 7 FOOTING DESIGN (AT CORNERS) - LATERAL CHECK

+0.60D+0.60W	0.000	0.000	0.13	0.0	31.3	1.000
+0.60D-0.60W	9.600	9.600	2.88	636.5	718.8	1.000
+1.069D+1.750E	12.051	12.051	3.00	733.8	750.0	1.000
+1.069D-1.750E	5.051	5.051	2.25	546.8	562.5	1.000
+1.052D+1.313E	11.038	11.038	3.00	672.1	750.0	1.000
+1.052D-1.313E	5.788	5.788	2.38	562.4	593.8	1.000
+0.5311D+1.750E	7.749	7.749	2.63	616.3	656.3	1.000
+0.5311D-1.750E	0.749	0.749	1.25	262.7	312.5	1.000

DESCRIPTION: FRAME 2 - 6 FOOTING DESIGN (AT SLAB EGDE) - GRAVITY CHECK

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	=	2.50	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	2,850.0	ksi
Concrete Density	=	150.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

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

Soil Design Values

Allowable Soil Bearing	=	2,000.0	ksf
Soil Density	=	120.0	pcf
Increase Bearing By Footing Weight	=	Yes	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

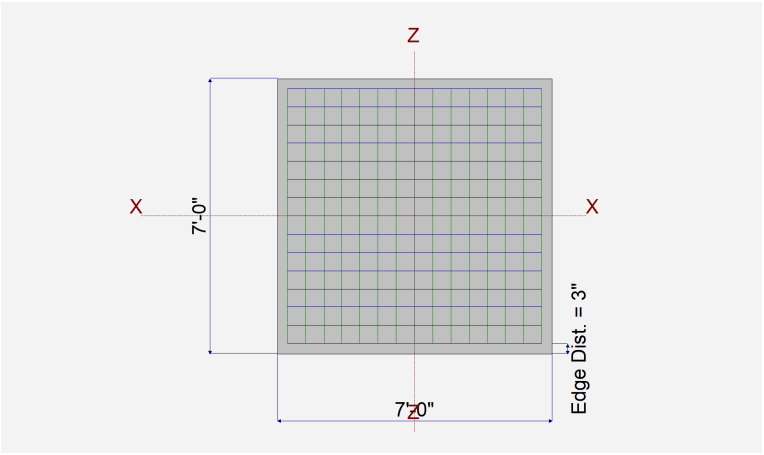
Footing base depth below soil surface	=	3.50	ft
Allow press. increase per foot of depth	=		ksf
when footing base is below	=		ft

Increases based on footing plan dimension

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

Dimensions

Width parallel to X-X Axis	=	7.0	ft
Length parallel to Z-Z Axis	=	7.0	ft
Footing Thickness	=	42.0	in
Load location offset from footing center...			
ez : Prll to Z-Z Axis	=	33.5	in
	=		in
Pedestal dimensions...			
px : parallel to X-X Axis	=		in
pz : parallel to Z-Z Axis	=		in
Height	=		in
Rebar Centerline to Edge of Concrete...			
at Bottom of footing	=	3.0	in

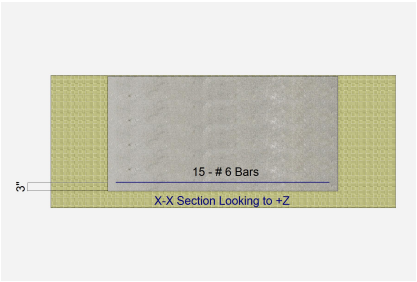


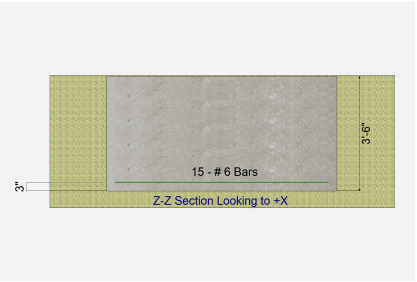
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		15
Reinforcing Bar Size	=	#	6
Bars parallel to Z-Z Axis			
Number of Bars	=		15
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	=	13.0	17.0			-27.0	2.0		k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

DESCRIPTION: FRAME 2 - 6 FOOTING DESIGN (AT SLAB EGDE) - GRAVITY CHECK

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.3739	Soil Bearing	3.739 ksf	10.0 ksf	+0.60D+0.60W about X-X axis
PASS	1.012	Overturning - X-X	101.925 k-ft	103.098 k-ft	+0.60D+0.60W
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	1.434	Uplift	-16.20 k	23.235 k	+0.60D+0.60W
PASS	0.03328	Z Flexure (+X)	5.350 k-ft/ft	160.765 k-ft/ft	+1.20D+1.60Lr
PASS	0.03328	Z Flexure (-X)	5.350 k-ft/ft	160.765 k-ft/ft	+1.20D+1.60Lr
PASS	0.00460	X Flexure (+Z)	0.7396 k-ft/ft	160.765 k-ft/ft	+1.20D+1.60Lr
PASS	0.05817	X Flexure (-Z)	9.352 k-ft/ft	160.765 k-ft/ft	+0.90D+W
PASS	0.006968	1-way Shear (+X)	0.5226 psi	75.0 psi	+1.20D+1.60Lr
PASS	n/a	1-way Shear (-X)	0.5226 psi	75.0 psi	+1.20D+1.60Lr
PASS	n/a	1-way Shear (+Z)	0.0 psi	75.0 psi	n/a
PASS	0.04052	1-way Shear (-Z)	3.039 psi	75.0 psi	+0.90D+W
PASS	0.0	2-way Punching	0.0 psi	0.0 psi	n/a

Top reinforcing mat required (see 'Bending' tab).

Hand check required for anchor pullout.

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	10.0	n/a	11.246	0.1618	1.419	n/a	n/a	0.142
X-X, +D+Lr	10.0	n/a	18.035	0.0	2.642	n/a	n/a	0.264
X-X, +D+0.750Lr	10.0	n/a	16.758	0.0	2.318	n/a	n/a	0.232
X-X, +D+0.60W	10.0	n/a	-4.759	0.6144	0.3050	n/a	n/a	0.061
X-X, +D+0.750Lr+0.450W	10.0	n/a	11.586	0.1451	1.460	n/a	n/a	0.146
X-X, +D+0.450W	10.0	n/a	1.072	0.5013	0.5834	n/a	n/a	0.058
X-X, +0.60D+0.60W	10.0	n/a	-40.0	3.739	0.0	n/a	n/a	0.374
X-X, +D+0.70E	10.0	n/a	12.022	0.1227	1.515	n/a	n/a	0.152
X-X, +D+0.5250E	10.0	n/a	11.833	0.1325	1.491	n/a	n/a	0.149
X-X, +0.60D+0.70E	10.0	n/a	12.511	0.05798	0.9475	n/a	n/a	0.095
Z-Z, D Only	10.0	0.0	n/a	n/a	n/a	0.7903	0.7903	0.079
Z-Z, +D+Lr	10.0	0.0	n/a	n/a	n/a	1.137	1.137	0.114
Z-Z, +D+0.750Lr	10.0	0.0	n/a	n/a	n/a	1.051	1.051	0.105
Z-Z, +D+0.60W	10.0	0.0	n/a	n/a	n/a	0.4597	0.4597	0.046
Z-Z, +D+0.750Lr+0.450W	10.0	0.0	n/a	n/a	n/a	0.8026	0.8026	0.080
Z-Z, +D+0.450W	10.0	0.0	n/a	n/a	n/a	0.5423	0.5423	0.054
Z-Z, +0.60D+0.60W	10.0	0.0	n/a	n/a	n/a	0.1436	0.1436	0.014
Z-Z, +D+0.70E	10.0	0.0	n/a	n/a	n/a	0.8189	0.8189	0.082
Z-Z, +D+0.5250E	10.0	0.0	n/a	n/a	n/a	0.8117	0.8117	0.081
Z-Z, +0.60D+0.70E	10.0	0.0	n/a	n/a	n/a	0.5028	0.5028	0.050

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
X-X, D Only	None	171.829 k-ft	Infinity	OK
X-X, +D+Lr	None	278.788 k-ft	Infinity	OK
X-X, +D+0.750Lr	None	252.048 k-ft	Infinity	OK
X-X, +D+0.60W	101.925 k-ft	171.829 k-ft	1.686	OK
X-X, +D+0.750Lr+0.450W	76.444 k-ft	252.048 k-ft	3.297	OK
X-X, +D+0.450W	76.444 k-ft	171.829 k-ft	2.248	OK
X-X, +0.60D+0.60W	101.925 k-ft	103.098 k-ft	1.012	OK
X-X, +D+0.70E	None	178.435 k-ft	Infinity	OK
X-X, +D+0.5250E	None	176.784 k-ft	Infinity	OK
X-X, +0.60D+0.70E	None	109.704 k-ft	Infinity	OK
Z-Z, D Only	None	0.0 k-ft	Infinity	OK
Z-Z, +D+Lr	None	0.0 k-ft	Infinity	OK

DESCRIPTION: FRAME 2 - 6 FOOTING DESIGN (AT SLAB EGDE) - GRAVITY CHECK

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Z-Z, +D+0.750Lr	None	0.0 k-ft	Infinity	OK
Z-Z, +D+0.60W	None	0.0 k-ft	Infinity	OK
Z-Z, +D+0.750Lr+0.450W	None	0.0 k-ft	Infinity	OK
Z-Z, +D+0.450W	None	0.0 k-ft	Infinity	OK
Z-Z, +0.60D+0.60W	None	0.0 k-ft	Infinity	OK
Z-Z, +D+0.70E	None	0.0 k-ft	Infinity	OK
Z-Z, +D+0.5250E	None	0.0 k-ft	Infinity	OK
Z-Z, +0.60D+0.70E	None	0.0 k-ft	Infinity	OK

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	0.3010	+Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.40D	0.3017	-Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+0.50Lr	0.3989	+Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+0.50Lr	0.3988	-Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D	0.2580	+Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D	0.2586	-Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+1.60Lr	0.7396	+Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+1.60Lr	0.7392	-Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+1.60Lr+0.50W	0.4887	+Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+1.60Lr+0.50W	0.4894	-Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+0.50W	0.03473	+Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+0.50W	0.03481	-Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+0.50Lr+W	0.04796	+Z	Top	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+0.50Lr+W	0.04808	-Z	Top	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+W	0.1580	+Z	Top	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+W	0.1584	-Z	Top	0.9072	AsMin	0.9429	160.765	OK
X-X, +0.90D+W	0.1185	+Z	Top	0.9072	AsMin	0.9429	160.765	OK
X-X, +0.90D+W	9.352	-Z	Top	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+E	0.2911	+Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +1.20D+E	0.2918	-Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +0.90D+E	0.2266	+Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
X-X, +0.90D+E	0.2271	-Z	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.40D	2.275	-X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.40D	2.275	+X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+0.50Lr	3.013	-X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+0.50Lr	3.013	+X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D	1.950	-X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D	1.950	+X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+1.60Lr	5.350	-X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+1.60Lr	5.350	+X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+1.60Lr+0.50W	3.663	-X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+1.60Lr+0.50W	3.663	+X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+0.50W	0.2625	-X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+0.50W	0.2625	+X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+0.50Lr+W	0.3625	-X	Top	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+0.50Lr+W	0.3625	+X	Top	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+W	1.425	-X	Top	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+W	1.425	+X	Top	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +0.90D+W	1.913	-X	Top	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +0.90D+W	1.913	+X	Top	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+E	2.20	-X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +1.20D+E	2.20	+X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +0.90D+E	1.713	-X	Bottom	0.9072	AsMin	0.9429	160.765	OK
Z-Z, +0.90D+E	1.713	+X	Bottom	0.9072	AsMin	0.9429	160.765	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.22 psi	0.22 psi	0.87 psi	0.00 psi	0.87 psi	75.00 psi	0.01	OK
+1.20D+0.50Lr	0.29 psi	0.29 psi	1.15 psi	0.00 psi	1.15 psi	75.00 psi	0.02	OK
+1.20D	0.19 psi	0.19 psi	0.75 psi	0.00 psi	0.75 psi	75.00 psi	0.01	OK
+1.20D+1.60Lr	0.52 psi	0.52 psi	2.14 psi	0.00 psi	2.14 psi	75.00 psi	0.03	OK

DESCRIPTION: FRAME 2 - 6 FOOTING DESIGN (AT SLAB EGDE) - GRAVITY CHECK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.20D+1.60Lr+0.50W	0.36 psi	0.36 psi	1.42 psi	0.00 psi	1.42 psi	75.00 psi	0.02	OK
+1.20D+0.50W	0.03 psi	0.03 psi	0.10 psi	0.00 psi	0.10 psi	75.00 psi	0.00	OK
+1.20D+0.50Lr+W	0.04 psi	0.04 psi	0.14 psi	0.00 psi	0.14 psi	75.00 psi	0.00	OK
+1.20D+W	0.14 psi	0.14 psi	0.62 psi	0.00 psi	0.62 psi	75.00 psi	0.01	OK
+0.90D+W	0.19 psi	0.19 psi	3.04 psi	0.00 psi	3.04 psi	75.00 psi	0.04	OK
+1.20D+E	0.21 psi	0.21 psi	0.84 psi	0.00 psi	0.84 psi	75.00 psi	0.01	OK
+0.90D+E	0.17 psi	0.17 psi	0.65 psi	0.00 psi	0.65 psi	75.00 psi	0.01	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	0.00 psi	150.00 psi	0	OK
+1.20D+0.50Lr	0.00 psi	150.00 psi	0	OK
+1.20D	0.00 psi	150.00 psi	0	OK
+1.20D+1.60Lr	0.00 psi	150.00 psi	0	OK
+1.20D+1.60Lr+0.50W	0.00 psi	150.00 psi	0	OK
+1.20D+0.50W	0.00 psi	150.00 psi	0	OK
+1.20D+0.50Lr+W	0.00 psi	150.00 psi	0	OK
+1.20D+W	0.00 psi	150.00 psi	0	OK
+0.90D+W	0.00 psi	150.00 psi	0	OK
+1.20D+E	0.00 psi	150.00 psi	0	OK
+0.90D+E	0.00 psi	150.00 psi	0	OK

DESCRIPTION: FRAME 2 - 6 FOOTING DESIGN (AT SLAB EGDE) - LATERAL CHECK

Code References

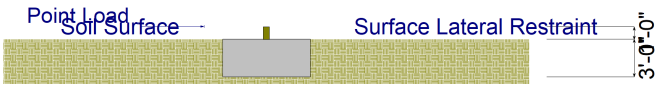
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Pole Footing Shape	Rectangular
Pole Footing Width	84.0 in
Calculate Min. Depth for Allowable Pressures	
Lateral Restraint at Ground Surface	
Allow Passive	250.0 pcf
Max Passive	1,500.0 psf

Controlling Values

Governing Load Combination	+D+0.750Lr-0.450W
Lateral Load	15.350 k
Moment	15.350 k-ft
Restraint @ Ground Surface	
Pressure at Depth	
Actual	**734.41** psf
Allowable	**750.0** psf
Surface Retraint Force	26,222.9 lbs
Minimum Required Depth	**3.0 ft**
Footing Base Area	49.0 ft^2
Maximum Soil Pressure	0.4245 ksf



Applied Loads

Lateral Concentrated Load (k)		Lateral Distributed Loads (k		Applied Moment (kft)	Vertical Load (k)
D : Dead Load	8.0 k		k/ft	k-ft	10.0 k
Lr : Roof Live	5.0 k		k/ft	k-ft	9.0 k
L : Live	k		k/ft	k-ft	k
S : Snow	k		k/ft	k-ft	k
W : Wind	-8.0 k		k/ft	k-ft	-9.0 k
E : Earthquake	2.0 k		k/ft	k-ft	1.0 k
H : Lateral Earth	k		k/ft	k-ft	k
Load distance above ground surface	1.0 ft	TOP of Load above ground surface	ft		
		BOTTOM of Load above ground surface	ft		

Load Combination Results

	Forces @ Ground Surface		Required	Pressure at Depth		Soil Increase
Load Combination	Loads - (k)	Moments - (ft-k)	Depth - (ft)	Actual - (psf)	Allow - (psf)	Factor
D Only	8.000	8.000	2.50	551.2	625.0	1.000
+D+Lr	13.000	13.000	2.88	677.2	718.8	1.000
+D+0.750Lr	11.750	11.750	2.75	669.0	687.5	1.000
+D+0.60W	3.200	3.200	1.88	391.9	468.8	1.000
+D-0.60W	12.800	12.800	2.88	666.8	718.8	1.000
+D+0.750Lr+0.450W	8.150	8.150	2.50	561.5	625.0	1.000
+D+0.750Lr-0.450W	15.350	15.350	3.00	734.4	750.0	1.000
+D+0.450W	4.400	4.400	2.00	473.7	500.0	1.000
+D-0.450W	11.600	11.600	2.75	660.5	687.5	1.000

DESCRIPTION: FRAME 2 - 6 FOOTING DESIGN (AT SLAB EGDE) - LATERAL CHECK

+0.60D+0.60W	0.000	0.000	0.13	0.0	31.3	1.000
+0.60D-0.60W	9.600	9.600	2.63	599.9	656.3	1.000
+1.069D+1.750E	12.051	12.051	2.75	686.2	687.5	1.000
+1.069D-1.750E	5.051	5.051	2.13	481.7	531.3	1.000
+1.052D+1.313E	11.038	11.038	2.75	628.5	687.5	1.000
+1.052D-1.313E	5.788	5.788	2.25	492.3	562.5	1.000
+0.5311D+1.750E	7.749	7.749	2.38	591.5	593.8	1.000
+0.5311D-1.750E	0.749	0.749	1.13	254.8	281.3	1.000

FT2 ANCHORAGE CALC

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Cast-in-place
Material: AB
Diameter (inch): 0.750
Effective Embedment depth, h_{ef} (inch): 10.000
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 12.25
C_{min} (inch): 4.50
S_{min} (inch): 4.50

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 42.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: No
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 13.00 x 10.00 x 0.25

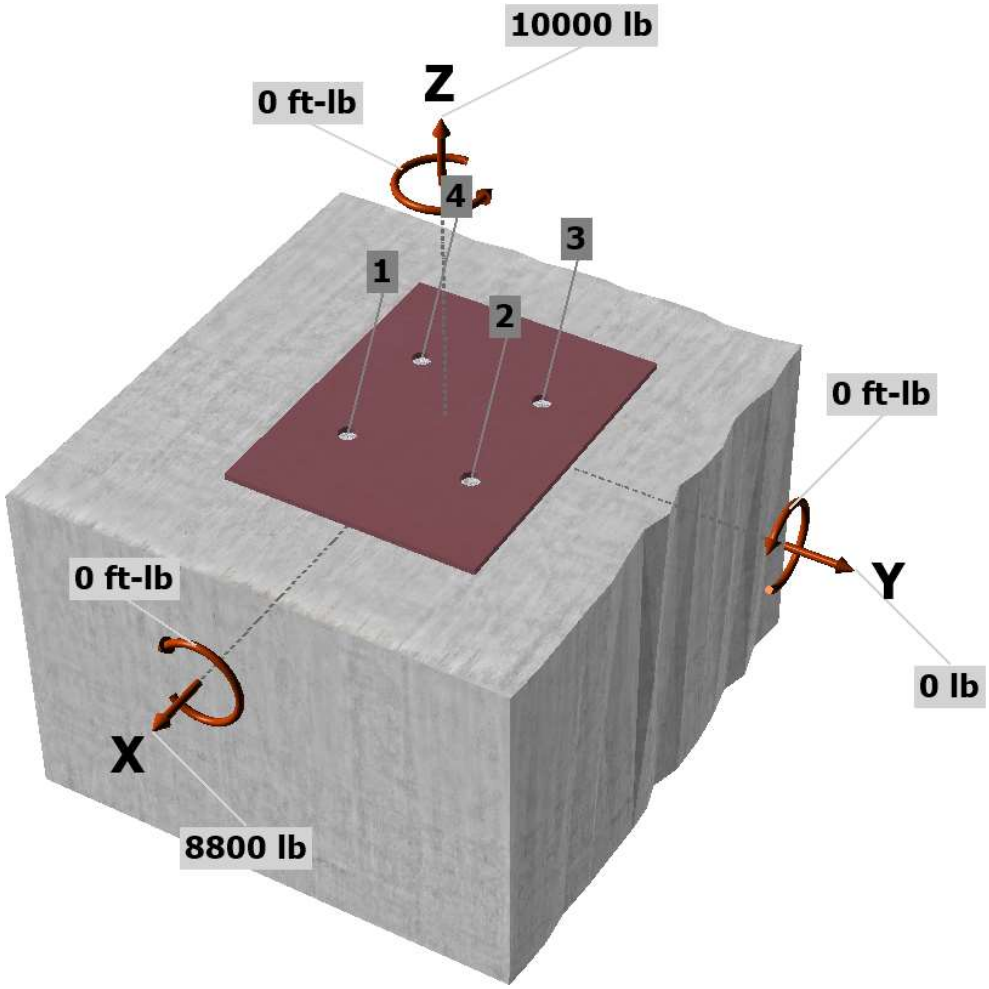
Recommended Anchor
Anchor Name: PAB Pre-Assembled Anchor Bolt - PAB6 (3/4"Ø)

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

Strength level loads:

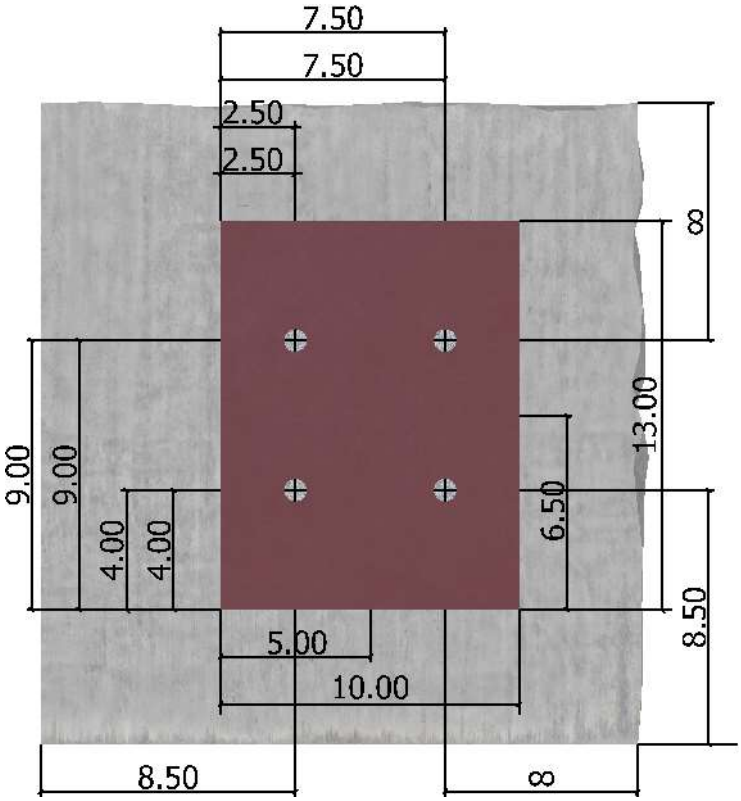
N_{ua} [lb]: 10000
V_{uax} [lb]: 8800
V_{uay} [lb]: 0
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



FT2 ANCHORAGE CALC

<Figure 2>

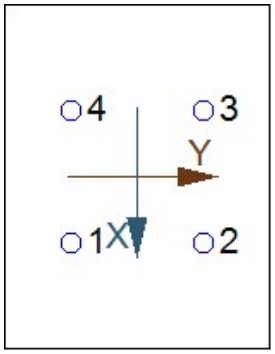


3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	2500.0	2200.0	0.0	2200.0
2	2500.0	2200.0	0.0	2200.0
3	2500.0	2200.0	0.0	2200.0
4	2500.0	2200.0	0.0	2200.0
Sum	10000.0	8800.0	0.0	8800.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 10000
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
19370	0.75	14528

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
24.0	1.00	2500	10.000	37947

$\phi N_{cbg} = \phi (A_{Nc} / A_{Nco}) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1b)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
877.64	900.00	8.50	1.000	0.870	1.00	1.000	37947	0.70	22536

6. Pullout Strength of Anchor in Tension (Sec. 17.4.3)

$\phi N_{pn} = \phi \Psi_{c,P} N_p = \phi \Psi_{c,P} 8 A_{brg} f'_c$ (Sec. 17.3.1, Eq. 17.4.3.1 & 17.4.3.4)

$\Psi_{c,P}$	A_{brg} (in^2)	f'_c (psi)	ϕ	ϕN_{pn} (lb)
1.0	3.53	2500	0.70	49476

8. Steel Strength of Anchor in Shear (Sec. 17.5.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
11625	1.0	0.65	7556

9. Concrete Breakout Strength of Anchor in Shear (Sec. 17.5.2)

Shear perpendicular to edge in x-direction:

$V_{bx} = \min\left|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}\right|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
6.00	0.750	1.00	2500	13.50	22321

$\phi V_{cbgx} = \phi\,(A_{Vc} / A_{Vco})\,\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. 17.3.1 & Eq. 17.5.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
683.44	820.13	1.000	0.826	1.000	1.000	22321	0.70	10754

Shear parallel to edge in y-direction:

$V_{bx} = \min\left|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}\right|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
6.00	0.750	1.00	2500	8.50	11152

$\phi V_{cbgy} = \phi\,(2)(A_{Vc} / A_{Vco})\,\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. 17.3.1, 17.5.2.1(c) & Eq. 17.5.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgy} (lb)
334.69	325.13	1.000	1.000	1.000	1.000	11152	0.70	16072

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.5.3)

$\phi V_{cpg} = \phi k_{cp}N_{cbg} = \phi k_{cp}(A_{Nc} / A_{Nco})\,\Psi_{ec,N}\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$ (Sec. 17.3.1 & Eq. 17.5.3.1b)

k_{cp}	A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cpg} (lb)
2.0	877.64	900.00	1.000	0.870	1.000	1.000	37947	0.70	45072

11. Results

Interaction of Tensile and Shear Forces (Sec. R17.6)

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	2500	14528	0.17	Pass
Concrete breakout	**10000**	**22536**	**0.44**	**Pass (Governs)**
Pullout	2500	49476	0.05	Pass

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	2200	7556	0.29	Pass
T Concrete breakout x+	**8800**	**10754**	**0.82**	**Pass (Governs)**
|| Concrete breakout y-	**4400**	**16072**	**0.27**	**Pass (Governs)**
Pryout	8800	45072	0.20	Pass

Interaction check	$(N_{ua}/\phi N_{ua})^{5/3}$	$(V_{ua}/\phi V_{ua})^{5/3}$	Combined Ratio	Permissible	Status
Sec. R17.6	0.26	0.72	97.4%	1.0	Pass

PAB6 (3/4"Ø) with hef = 10.000 inch meets the selected design criteria.

12. Warnings

- Designer must exercise own judgement to determine if this design is suitable.

FT3 ANCHORAGE CALC

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Cast-in-place
Material: AB
Diameter (inch): 0.750
Effective Embedment depth, h_{ef} (inch): 10.000
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 12.25
C_{min} (inch): 4.50
S_{min} (inch): 4.50

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 42.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: No
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 13.00 x 10.00 x 0.25

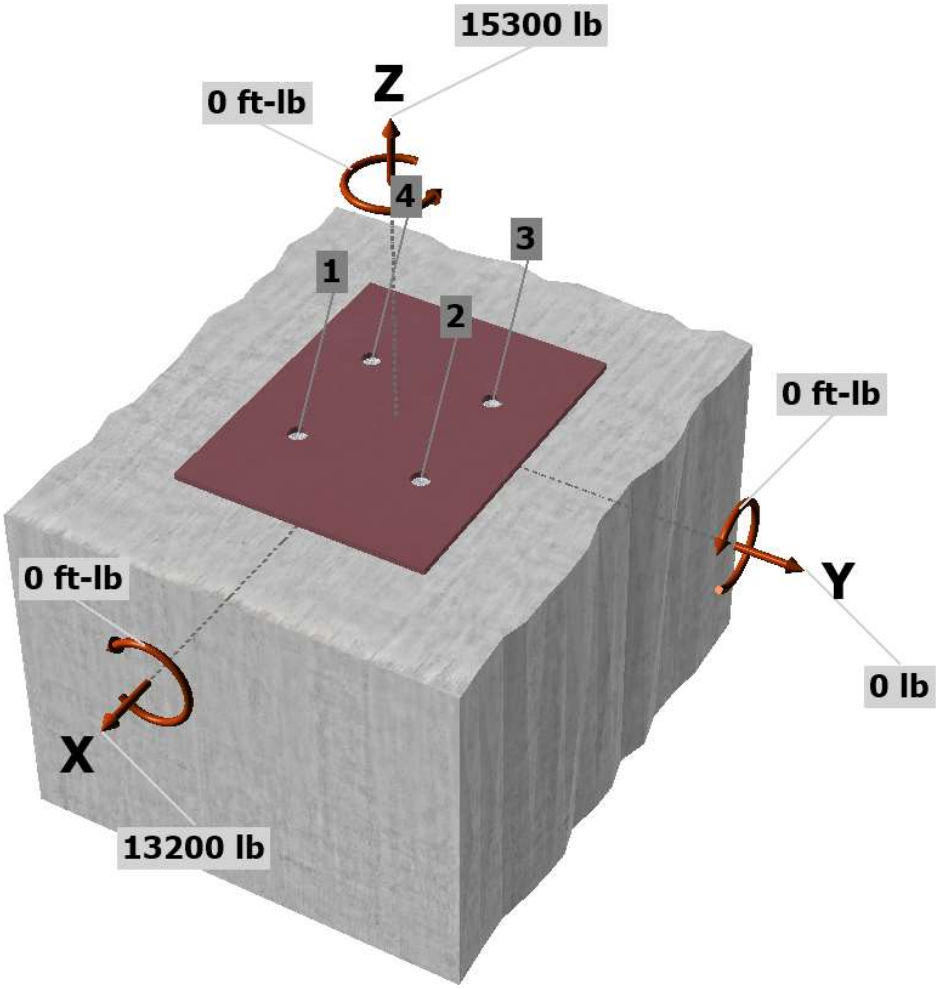
Recommended Anchor
Anchor Name: PAB Pre-Assembled Anchor Bolt - PAB6 (3/4"Ø)

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

Strength level loads:

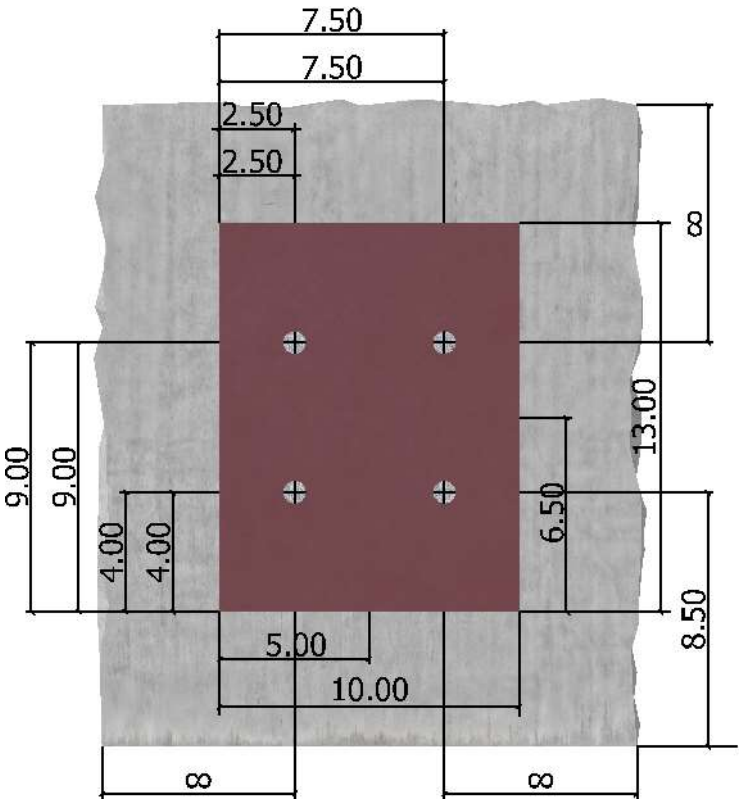
N_{ua} [lb]: 15300
V_{uax} [lb]: 13200
V_{uay} [lb]: 0
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



FT3 ANCHORAGE CALC

<Figure 2>

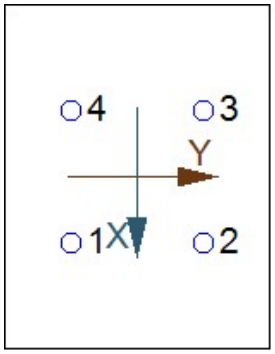


3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	3825.0	3300.0	0.0	3300.0
2	3825.0	3300.0	0.0	3300.0
3	3825.0	3300.0	0.0	3300.0
4	3825.0	3300.0	0.0	3300.0
Sum	15300.0	13200.0	0.0	13200.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 15300
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
19370	0.75	14528

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
24.0	1.00	2500	10.000	37947

$\phi N_{cbg} = \phi (A_{Nc} / A_{Nco}) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1b)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
1103.53	900.00	8.50	1.000	0.870	1.00	1.000	37947	0.70	28336

6. Pullout Strength of Anchor in Tension (Sec. 17.4.3)

$\phi N_{pn} = \phi \Psi_{c,P} N_p = \phi \Psi_{c,P} 8 A_{brg} f'_c$ (Sec. 17.3.1, Eq. 17.4.3.1 & 17.4.3.4)

$\Psi_{c,P}$	A_{brg} (in^2)	f'_c (psi)	ϕ	ϕN_{pn} (lb)
1.0	3.53	2500	0.70	49476

8. Steel Strength of Anchor in Shear (Sec. 17.5.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
11625	1.0	0.65	7556

9. Concrete Breakout Strength of Anchor in Shear (Sec. 17.5.2)

Shear perpendicular to edge in x-direction:

$V_{bx} = \min|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5};\ 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
6.00	0.750	1.00	2500	13.50	22321

$\phi V_{cbgx} = \phi\,(A_{Vc} / A_{Vco})\,\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. 17.3.1 & Eq. 17.5.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
921.38	820.13	1.000	1.000	1.000	1.000	22321	0.70	17554

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.5.3)

$\phi V_{cpg} = \phi k_{cp}N_{cbg} = \phi k_{cp}(A_{Nc} / A_{Nco})\,\Psi_{ec,N}\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$ (Sec. 17.3.1 & Eq. 17.5.3.1b)

k_{cp}	A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cpg} (lb)
2.0	1103.53	900.00	1.000	0.870	1.000	1.000	37947	0.70	56672

11. Results

Interaction of Tensile and Shear Forces (Sec. R17.6)

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	3825	14528	0.26	Pass
Concrete breakout	**15300**	**28336**	**0.54**	**Pass (Governs)**
Pullout	3825	49476	0.08	Pass

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	3300	7556	0.44	Pass
T Concrete breakout x+	**13200**	**17554**	**0.75**	**Pass (Governs)**
Pryout	13200	56672	0.23	Pass

Interaction check	$(N_{ua}/\phi N_{ua})^{5/3}$	$(V_{ua}/\phi V_{ua})^{5/3}$	Combined Ratio	Permissible	Status
Sec. R17.6	0.36	0.62	98.0%	1.0	Pass

PAB6 (3/4"Ø) with hef = 10.000 inch meets the selected design criteria.

12. Warnings

- Designer must exercise own judgement to determine if this design is suitable.