VA: 537-21-106 | Data Center & EHRM

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Bid Documents

VAMC: #537-21-106
RDC / JPA: #22010.00

April 20, 2026

Contents

-Architectural Narrative
-Civil Narrative
-Structural Narrative
-MEP Narrative
-Exceptions Log

ARCHITECTURAL SUMMARY

VAMC Gainesville: Data Center & EHRM
VA project number: 573-21-106
Date: 01/20/2026

1. Project Scope:

1. The scope of this project is to replace all data infrastructure across the Gainesville VAMC and to build a new data center to support that upgraded system.

2. The data center building will be one story and the footprint will be approximately 3,931 SF at the location of temporary trailer 11 which will be demolished as part of this project. The primary space within the building is the 1,177 SF Data Center Room. Supporting spaces include Unpacking/Packing/Staging, Entrance Room, and Storage. Mechanical, Electrical and HAC spaces support the building as well. Additionally, a new generator will be housed in a separate Generator Room. Volume 01 of the drawings is the data center portion of the project.

3. Additionally, this project will be removing all existing equipment and cabling affiliated with the telecom rooms in all campus buildings identified in the drawing set per Volumes 02 and 03. There are 59 telecom rooms that may require architectural work. Some rooms are existing TRs being reused but most are new rooms being redesigned for the telecom equipment. In rare cases telecom enclosures are recommended and/or exceptions will be required.

2. Construction Logistics and Phasing:

1. The entire campus will be occupied while work occurs. Contractor will have to coordinate room closures and shutdowns with the COR. Most rooms on campus will be affected. Some off-hour work is anticipated for more critical spaces. See PME documents for project phasing notes.

2. The new data center will be incorporated into the EHRM project so that the system can transition seamlessly together.

3. Budget and Deduct Alternates:

1. Project cost estimate is being prepared by OCMI and will be provided along with each submittal package.
2. No deduct alternates are identified. All work being identified is essential for creating a fully functioning system.

4. Interior Design:

1. All finishes will be discussed with the VA Interior Design staff. Unpacking/Packing/Staging, Storage, HAC and Corridors are the only rooms that will have ceilings installed.
2. Flooring: Epoxy flooring per PG 18-14 ID # 1002
3. Base: Rubber base per PD 18-14 ID # 1002
4. Wall: Gyp board with paint per PD 18-14 ID # 1002
5. Ceiling: Deck above exposed in all TRs
6. Doors: Sound Rated per PD 18-14 ID # 1002
7. Door size: 3’-0” x 7’-0” per PD 18-14 ID # 1002, Conflicts with OIT Design Guide Templates-04 162021-V3.1, which requires 3’-0” x 8’-0”. Not resolved; 8’-0” is currently specified.
8. Door fire rating: OIT Design Guide Templates-04 162021-V3.1, requires a ¾ hour or more fire rated door. We have not found any requirements for the rooms to be fire rated, negating the

need for fire rated doors. The door between Electrical and Generator Rooms will be 2-hour rated consistent with the wall separation.

5. Security:

1. Force Protect is the security consultant on this project. They have reviewed and will continue to review requirements related to physical security.
2. Unscreened vehicles are required to have a standoff distance of 50' from either the data center or the back up generators. The distance is reduced to 5' for screened vehicles.
    a. An area of the existing loading dock parking lot on the east side of the bridge will need to be zoned off to ensure the stand-off distance is maintained from the data center.
    b. The building and attached generator enclosure are required to be blast rated.

6. Asbestos:

1. Terracon has provided a report for review.

7. Life Safety Code:

1. The project will follow the NFPA 101, 2024 edition.

8. Site Work:

1. Some site work required. Sidewalks will be torn up and replaced in the immediate vicinity of the building.
2. Modification to the parking area on the east side of the loading dock will be repainted.

9. Schedule:

The Data Center design schedule merged with the ongoing EHRM project (573-21-106) after SD.

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VA Gainesville EHRM

1601 SW ARCHER RD, GAINESVILLE, FL 32608

Pennoni Project No. RDCJP23010

January 20th, 2026

Civil Schematic Design Narrative

CIVIL ENGINEERING DESIGN NARRATIVE

I. Project Description
   A. The Department of Veteran Affairs is proposing a new data center at the Randall VA Medical Center 1601 SW Archer Road, Gainesville, FL. A new 4,400 SF, blast proof building will be designed with ADA accessibility. The building along with Data center usages will house back-up generator for emergency usage.
   B. Trailer 11 is to be demolished.
   C. ±8,235 LF of proposed 4" duct bank for underground telecom lines, and removal of conflicting existing lines.

II. Design Standards
   A. The site design will be in accordance with the City of Gainesville Land Development Code, and the Department of Veteran Affairs.
   B. Stormwater design shall comply with the St. Johns River Water Management District (SJRWMD) requirements.
   C. FEMA Requirements: The site lies within Flood Zone X, an area of minimal flood hazard.
   D. Work shall confirm to applicable codes and ordinances, including the federal Americans with Disabilities Act (ADA).

III. Site Circulation
   A. Pedestrian walkways and landscaping will be provided in areas affected by the demolition and renovation. Including but not limited to the area of Trailer 11 and Building 13: Generator 08.

IV. Utilities
   A. Gainesville Regional Utilities will provide domestic water and wastewater (sewer) services and will be fed from the existing service mains on site.
   B. Reclaimed water is provided by Gainesville Regional Utilities.
   C. Communication lines will be serviced by Campus Communications Group Inc, Uniti Fiber LLC, Lumen, or Gainesville Regional Utilities.
   D. Gas will be serviced by Florida Gas Transmission Company.
   E. Electric services will be provided by Gainesville Regional Utilities.

F. Drainage and stormwater from the proposed building will discharge to the existing storm sewer within the site.

STRUCTURAL CALCULATIONS

For

Gainesville VA Medical Center EHRM Infrastructure -Data Center

100% CD SUBMITAL

By

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Pennoni Project No. RDCJP23010

January 20 2026

FOR OFFICIAL USE ONLY

Pennoni		JOB NO. RDCJP23010	
		SHEET 1 OF 4	DATE:
	PROJECT: GAINESVILLE VA MEDICAL CENTER EHRM INFRASTRUCTURE – DATA CENTER	BY: YY	02/25/2025
	SUBJECT DESIGN CRITERIA	CHK'D:	

PROJECT DESCRIPTION:

The project consists of a new stand-alone one-story Data Center building with a gross area of approximately 5,000 square feet. Structural systems include:

- Composite Metal Decking and Steel Framing
- Reinforced CMU Wall
- Spread Footings

PROJECT LOCATION:

1601 SW Archer Road,
Gainesville, FL 32608

APPLICABLE BUILDING CODES:

1) Florida Building Code 8th edition, 2023
2) ASCE 7-22
3) UFC 3-301-01 Structural Engineering (October 2019)
4) Physical Security Design Manual for VA Mission Critical Facilities
5) ACI 318 Building Code Requirements for Structural Concrete
6) ACI 530 & TMS602 Building Code Requirements for Masonry structures
7) AISC Steel Construction Manual and Specification for Structural Steel Buildings

CRITERIA:

GENERAL:		
RISK CATEGORY:	IV	
WIND:		
V_{ULT} =	141	mph (3 SEC GUST)
V_{ASD} =	110	mph (3 SEC GUST)
EXPOSURE CATEGORY:	C	
BUILDING TYPE:	Enclosed	
WIND BORNE DEBRIS REGION:	No	
roof slope:	0.25	/12
Parapet Height:	4	ft (at main roof)
h:	18	ft (mean roof height, eave height for roof slopes less than 10 degrees)
L:	88	ft. (building length)
B:	45	ft. (building width)
0.4h:	7.2	ft.
0.1B:	4.5	ft.
(a) smaller of (0.4h, 0.1B):	4.5	ft.
(b) greater of (0.04B, 3 ft):	3	ft.
a:	4.5	ft [greater of (a) and (b)]
GEOTECHNICAL: (Assumed, update upon receiving the final report)		
Allowable Bearing Pressure:	2,500	psf
SOIL UNIT WEIGHT (Γ_{soil}):	110	pcf (assumed)
Estimated Total Settlement:	1	in
Estimated Differential Settlement:	0.5	in
Min. Column Footing Size:	2.5	ft
Min. Wall Footing Width:	1.5	ft
Recommended Depth To Bot. Ftg:	30	in

Compaction Requirement:	95%	of modified proctor dry density (ASTM D-1557)
Ultimate Coefficient of Sliding Friction:	0.40	
Estimated Modulus of Subgrade Reaction:	100	pci

LRFD LOAD COMBINATIONS:

1.4(D +F)	(IBC/FBC Equation 16-1)
1.2(D + F) + 1.6(L + H) + 0.5(Lr or S or R)	(IBC/FBC Equation 16-2)
1.2(D + F)+ 1.6(Lr or S or R) + 1.6H + (f1L or 0.5W)	(IBC/FBC Equation 16-3)
1.2(D + F)+ 1.0W + f_1L + 1.6H + 0.5(Lr or S or R)	(IBC/FBC Equation 16-4)
1.2(D + F)+ 1.0E + f_1L + 1.6H + f_2S	(IBC/FBC Equation 16-5)
0.9D+ 1.0W+ 1.6H	(IBC/FBC Equation 16-6)
0.9(D + F)+ 1.0E+ 1.6H	(IBC/FBC Equation 16-7)

f_1 = 1 for places of public assembly live loads in excess of100 pounds per square foot (4.79 kN/m2), and parking garages; and 0.5 for other live loads.

f_2 = 0.7 for roof configurations (such as saw tooth) that do not shed snow off the structure, and 0.2 for other roof configurations.

ASD LOAD COMBINATIONS:

D + F	(IBC/FBC Equation 16-8)
D + H + F + L	(IBC/FBC Equation 16-9)
D + H + F + (L_r or S or R)	(IBC/FBC Equation 16-10)
D + H + F+ 0.75(L) + 0.75(L_r or S or R)	(IBC/FBC Equation 16-11)
D + H + F + (0.6W or 0.7E)	(IBC/FBC Equation 16-12)
D + H + F + 0.75(0.6W) + 0.75L + 0.75(L_r or S or R)	(IBC/FBC Equation 16-13)
D + H + F + 0.75 (0.7 E) + 0.75 L + 0.75 S	(IBC/FBC Equation 16-14)
0.6D + 0.6W+H	(IBC/FBC Equation 16-15)
0.6(D + F) + 0.7E+H	(IBC/FBC Equation 16-16)

DRIFT AND DEFLECTION LIMITS

1604.3 Serviceability. (FBC)

Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections and lateral drift. See Section 12.12.1 of ASCE 7 for drift limits applicable to earthquake loading.

TABLE 1604.3

DEFLECTION LIMITS[a, b, c, h, i]

CONSTRUCTION	*L*	*S or W*[f]	*D + L*[d, g, j]
Roof members:[e]			
Supporting plaster or stucco ceiling	l/360	l/360	l/240
Supporting nonplaster ceiling	l/240	l/240	l/180
Not supporting ceiling	l/180	l/180	l/120
Members supporting screen surface			l/60
Floor members	l/360	—	l/240
Exterior walls and interior partitions:			
With plaster or stucco finishes	—	l/360	—
With other brittle finishes	—	l/240	—

With flexible finishes	—	l/120	—

f. The wind load is permitted to be taken as 0.42 times the "component and cladding" loads for the purpose of determining deflection limits herein.

WIND LOAD CASES:

ASCE 7 -2022 – FIGURE 27.3-8

1) *Full design wind pressure acting on the projected area perpendicular to each principal axis of the structure, considered separately along each principal axis. Full design pressure on side walls and roof areas for wind along each principal axis as specified in Figures 27.3-1 through 27.3-7. All pressures act simultaneously for each principal wind direction.*

A) 100% in the X direction

B) 100% in the Z direction

2) *Three-quarters of design wind pressure on the projected wall area perpendicular to each principal axis of the structures and sidewalls in conjunction with a torsional moment,* [equal to the pressure times an eccentricity equal to 15% of the dimension perpendicular to the direction the pressure is acting], *considered separately for each principal axis. Roof pressures are 75% of Case 1. All pressures and torsion act simultaneously for each principal wind direction.*

3) *Wall pressures are 75% of Case 1. The resulting pressure on any roof area defined by the two principal wind directions of Case 1 and 2 shall be 100% of the larger value of the roof pressures defined for Case 1 and 2, respectively. All pressures act simultaneously.*

A) 75% in the X direction + 75% in the X direction for wall pressures

4) *Wall pressures and torsional moment are 75% of Case 2 (wall pressures are 56.3% of Case 1. The resulting pressure on any roof area defined by the two principal wind directions of Case 1 and 2 shall be 100% of the larger value of the roof pressures defined for Case 1 and 2, respectively. All pressures and torsion act simultaneously.*

ASCE 7 -2022 – APPENDIX D BUILDINGS EXEMPTED FROM TORSIONAL WIND LOAD CASES

D.1 Scope

The torsional load cases in figure 27.3-8 (Case 2 and Case 4) need not be considered for a building meeting the conditions of Sections D.2, D.3, D.4, or D.5 if it can be shown by other means that the torsional load cases of Figure 27.3-8 do not control the design.

D.2 One- and Two-Story Buildings Meeting the Following Requirements

One-story buildings with h less than or equal to 30 ft buildings two stories or fewer framed with light-frame construction, and buildings two stories or fewer designed with flexible diaphragms are exempted.

D.4 Buildings Classified as Torsionally Regular Under Wind Load

Buildings meeting the definition of a Torsionally regular building contained in Section 26.2.

Section 26.2

A building with the MWFRS about each principal axis proportioned so that the maximum displacement at each story under Case 2, the torsional wind load case, of Figure 27.4-8, does not exceed the maximum displacement at the same location under Case 1 of Figure 27.3-8, the basic wind load case.

CONCLUSION:

The torsional wind load cases need to be considered because the building does not meet any of the exceptions in Appendix D.

DEAD LOADS:

ROOF

MEP Allowance	=	5 psf
Ceiling	=	2 psf
Rigid Insulation	=	7 psf (ASCE 7 Table C3-1)
Roofing Membrane	=	1 psf (ASCE 7 Table C3-1)
SUPERIMPOSED DEAD LOAD	=	15 psf
Composite Metal Deck (18GA) Total Depth 5 1/4"	=	45 psf
Steel Beam	=	5 psf
TOTAL DEAD LOAD	=	65 psf

LIVE LOADS:

ROOF

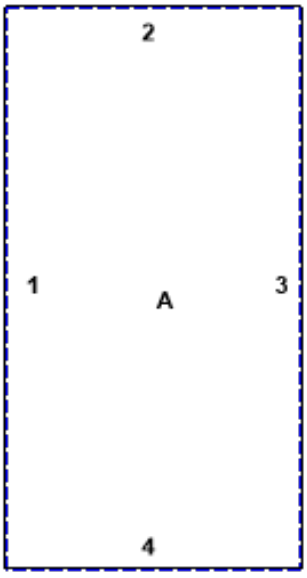
Live Roof Load = 20 psf

Gainesville VA Data Center

Title

October 02, 2024

Project Number: RDCJP23010
Prepared By: YY



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These calculations are derived from various editions of the ASCE 7 Standard (ASCE 7-98, ASCE 7-02, ASCE 7-05, ASCE 7-10, ASCE 7-16, ASCE7-22) to determine the minimum wind loads and performance goals for buildings, other structures and their nonstructural components that are subject to building code requirements. While the information presented by this program is believed to be correct, SDG, Inc. neither intends for this program to replace the sound judgment of a competent professional, having knowledge and experience in the relevant field(s) of practice, nor to substitute for the standard of care required of such a professional in interpreting and applying the results of the report provided by the WLS program.

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Signature / Stamp

Site Information

Wind Dir.	Exposure
1	C
2	C
3	C
4	C

Basic Wind Speed: 141 mph
Topography: Flat

Optional Factors

This project uses load combinations from ASCE 7.

Structure Information

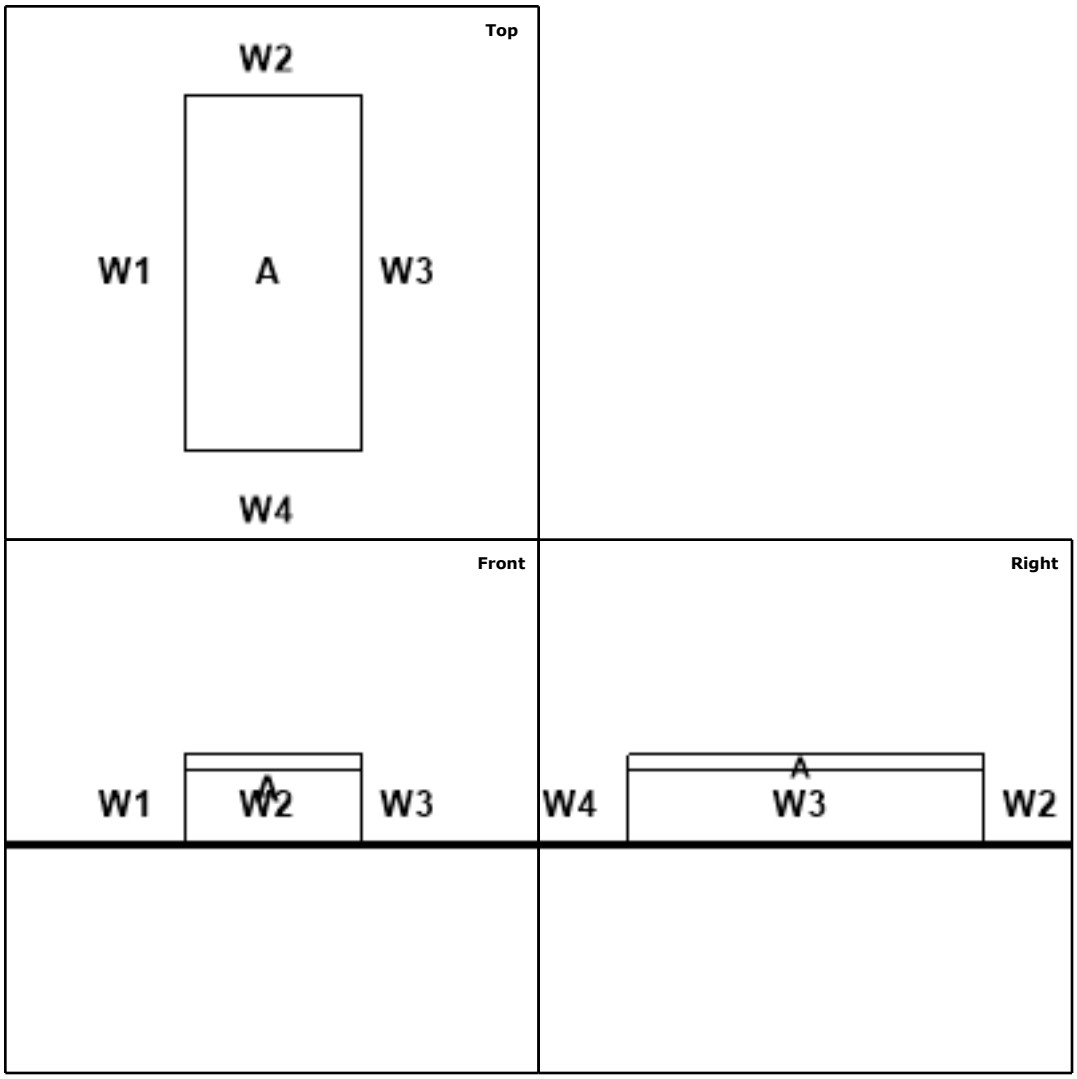
Structure Type: Building
Structure Category: IV
Enclosure Classification: Enclosed

Main Section

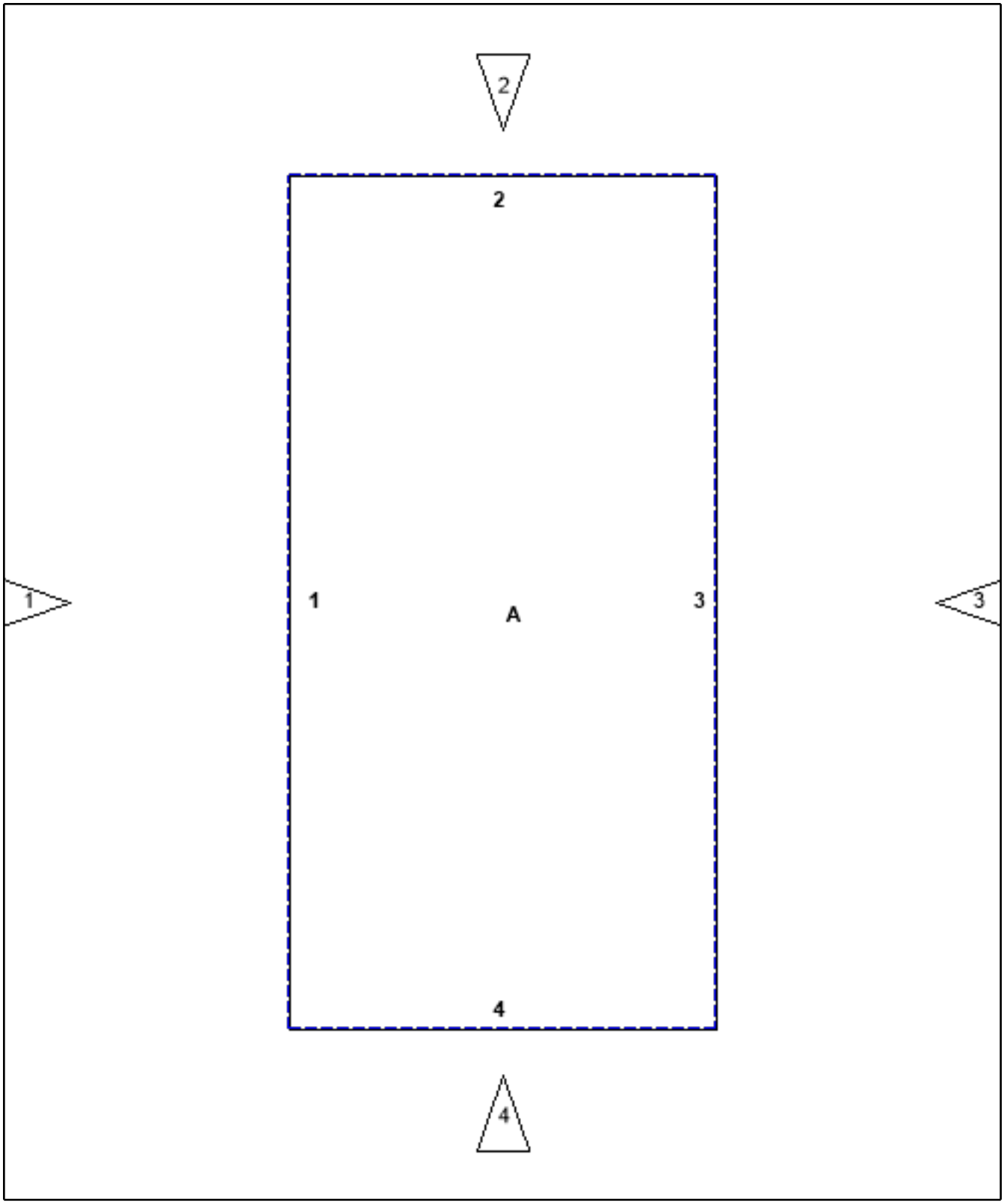
Wall	Length (ft)	Overhang (ft)
1	88.0	0.00
2	44.0	0.00
3	88.0	0.00
4	44.0	0.00

Eave Height: 18.0 ft
Parapet Height: 4.00 ft
Parapet Enclosure: Solid
Roof Shape: Monoslope

Roof	Slope (X:12)
A	0.00



Composite Drawing



Components & Cladding

Description	Wall/Roof	Surface	Zone	Span	Width	Area
RM	Roof	A	(All)	1.000 ft	1.000 ft	1.000 ft²
Joist	Roof	A	(All)	16.0 ft	5.00 ft	85.3 ft²
W1	Wall	1	(All)	0.00 ft	0.00 ft	1.00 ft²
W21	Wall	1	(All)	0.00 ft	0.00 ft	21.0 ft²
W51	Wall	1	(All)	0.00 ft	0.00 ft	51.0 ft²
W101	Wall	1	(All)	0.00 ft	0.00 ft	101 ft²
W151	Wall	1	(All)	0.00 ft	0.00 ft	151 ft²
W251	Wall	1	(All)	0.00 ft	0.00 ft	251 ft²
W501	Wall	1	(All)	0.00 ft	0.00 ft	501 ft²

ASCE 7-22 Wind Load Report

Components & Cladding

October 02, 2024

This data was calculated using the components and cladding method.

Component Description	Surface	Zone	z (ft)	q (psf)	GCp	GCpi	Ext Pres (psf)	Net w/ +GCpi (psf)	Net w/ -GCpi (psf)
RM	A	1'	18.0	44.9	0.300	0.180	11.5	4.58	18.3
			18.0	44.9	-0.900		-34.4	-41.2	-27.5
		1	18.0	44.9	0.300		11.5	4.58	18.3
			18.0	44.9	-1.70		-64.9	-71.8	-58.1
		2	18.0	44.9	1.00		38.2	31.3	45.1
			18.0	44.9	-2.30		-87.8	-94.7	-81.0
		3	18.0	44.9	1.00		38.2	31.3	45.1
			18.0	44.9	-2.30		-87.8	-94.7	-81.0
Joist	A	1'	18.0	44.9	0.207	0.180	7.90	1.03	14.8
			18.0	44.9	-0.900		-34.4	-41.2	-27.5
		1	18.0	44.9	0.207		7.90	1.03	14.8
			18.0	44.9	-1.32		-50.3	-57.2	-43.4
		2	18.0	44.9	0.836		31.9	25.0	38.8
			18.0	44.9	-1.81		-69.0	-75.9	-62.1
		3	18.0	44.9	0.836		31.9	25.0	38.8
			18.0	44.9	-1.81		-69.0	-75.9	-62.1
W1	1	4	18.0	44.9	0.900	0.180	34.4	27.5	41.2
			18.0	44.9	-0.990		-37.8	-44.7	-30.9
		5	18.0	44.9	0.900		34.4	27.5	41.2
			18.0	44.9	-1.26		-48.1	-55.0	-41.2
W21	1	4	18.0	44.9	0.849	0.180	32.4	25.5	39.3
			18.0	44.9	-0.939		-35.9	-42.7	-29.0
		5	18.0	44.9	0.849		32.4	25.5	39.3
			18.0	44.9	-1.16		-44.2	-51.1	-37.3
W51	1	4	18.0	44.9	0.788	0.180	30.1	23.2	37.0
			18.0	44.9	-0.878		-33.5	-40.4	-26.6
		5	18.0	44.9	0.788		30.1	23.2	37.0
			18.0	44.9	-1.04		-39.5	-46.4	-32.7
W101	1	4	18.0	44.9	0.740	0.180	28.3	21.4	35.2
			18.0	44.9	-0.830		-31.7	-38.6	-24.8
		5	18.0	44.9	0.740		28.3	21.4	35.2
			18.0	44.9	-0.941		-35.9	-42.8	-29.1
W151	1	4	18.0	44.9	0.713	0.180	27.2	20.3	34.1
			18.0	44.9	-0.803		-30.7	-37.5	-23.8
		5	18.0	44.9	0.713		27.2	20.3	34.1
			18.0	44.9	-0.885		-33.8	-40.7	-26.9
W251	1	4	18.0	44.9	0.678	0.180	25.9	19.0	32.8
			18.0	44.9	-0.768		-29.3	-36.2	-22.4
		5	18.0	44.9	0.678		25.9	19.0	32.8
			18.0	44.9	-0.815		-31.1	-38.0	-24.3
W501	1	4	18.0	44.9	0.630	0.180	24.1	17.2	30.9
			18.0	44.9	-0.720		-27.5	-34.4	-20.6

ASCE 7-22 Wind Load Report

Components & Cladding

October 02, 2024

This data was calculated using the components and cladding method.

Component Description	Surface	Zone	z (ft)	q (psf)	GCp	GCpi	Ext Pres (psf)	Net w/ +GCpi (psf)	Net w/ -GCpi (psf)
		5	18.0	44.9	0.630		24.1	17.2	30.9
			18.0	44.9	-0.720		-27.5	-34.4	-20.6

ASCE 7-22 Wind Load Report

Main Wind Force Resisting System - Wind Direction 1

October 02, 2024

This data was calculated using the building of all heights method.

#	Surface	z (ft)	q (psf)	G	Cp	GCpi	Ext Pres (psf)	Net w/ +GCpi (psf)	Net w/ -GCpi (psf)
1	Windward Wall	15.0	43.3	0.867	0.800	0.180	25.5	18.7	32.4
		18.0	44.9				26.5	19.6	33.4
	Parapet	22.0	46.8		1.50		59.7		
2	Side Wall	18.0	44.9	0.867	-0.700	0.180	-23.2	-30.1	-16.3
3	Leeward Wall	18.0	44.9	0.867	-0.500	0.180	-16.6	-23.4	-9.69
	Parapet	22.0	46.8		-1.00		-39.8		
4	Side Wall	18.0	44.9	0.867	-0.700	0.180	-23.2	-30.1	-16.3
A	Roof	0.00 - 9.00*	44.9	0.867	-0.900	0.180	-29.8	-36.7	-22.9
		9.00 - 18.0*	44.9				-29.8	-36.7	-22.9
		18.0 - 36.0*	44.9		-0.500		-16.6	-23.4	-9.69
		36.0 - 44.0*	44.9		-0.300		-9.94	-16.8	-3.06
		0.00 - 44.0*	44.9		-0.180		-5.96	-12.8	0.912

This is load case 1 in ASCE 7-22 Figure 27.3-8. See Figure 27.3-8 for other cases.

* Distance from windward edge.

ASCE 7-22 Wind Load Report

Main Wind Force Resisting System - Wind Direction 2

October 02, 2024

This data was calculated using the building of all heights method.

#	Surface	z (ft)	q (psf)	G	Cp	GCpi	Ext Pres (psf)	Net w/ +GCpi (psf)	Net w/ -GCpi (psf)
1	Side Wall	18.0	44.9	0.882	-0.700	0.180	-23.6	-30.5	-16.7
2	Windward Wall	15.0	43.3	0.882	0.800	0.180	26.0	19.1	32.8
		18.0	44.9				26.9	20.1	33.8
	Parapet	22.0	46.8		1.50		59.7		
3	Side Wall	18.0	44.9	0.882	-0.700	0.180	-23.6	-30.5	-16.7
4	Leeward Wall	18.0	44.9	0.882	-0.300	0.180	-10.1	-17.0	-3.23
	Parapet	22.0	46.8		-1.00		-39.8		
A	Roof	0.00 - 9.00*	44.9	0.882	-0.900	0.180	-30.3	-37.2	-23.4
		9.00 - 18.0*	44.9				-30.3	-37.2	-23.4
		18.0 - 36.0*	44.9		-0.500		-16.8	-23.7	-9.97
		36.0 - 88.0*	44.9		-0.300		-10.1	-17.0	-3.23
		0.00 - 88.0*	44.9		-0.180		-6.06	-12.9	0.812

This is load case 1 in ASCE 7-22 Figure 27.3-8. See Figure 27.3-8 for other cases.

* Distance from windward edge.

ASCE 7-22 Wind Load Report

Main Wind Force Resisting System - Wind Direction 3

October 02, 2024

This data was calculated using the building of all heights method.

#	Surface	z (ft)	q (psf)	G	Cp	GCpi	Ext Pres (psf)	Net w/ +GCpi (psf)	Net w/ -GCpi (psf)
1	Leeward Wall	18.0	44.9	0.867	-0.500	0.180	-16.6	-23.4	-9.69
	Parapet	22.0	46.8		-1.00		-39.8		
2	Side Wall	18.0	44.9	0.867	-0.700	0.180	-23.2	-30.1	-16.3
3	Windward Wall	15.0	43.3	0.867	0.800	0.180	25.5	18.7	32.4
		18.0	44.9				26.5	19.6	33.4
	Parapet	22.0	46.8		1.50		59.7		
4	Side Wall	18.0	44.9	0.867	-0.700	0.180	-23.2	-30.1	-16.3
A	Roof	0.00 - 9.00*	44.9	0.867	-0.900	0.180	-29.8	-36.7	-22.9
		9.00 - 18.0*	44.9				-29.8	-36.7	-22.9
		18.0 - 36.0*	44.9		-0.500		-16.6	-23.4	-9.69
		36.0 - 44.0*	44.9		-0.300		-9.94	-16.8	-3.06
		0.00 - 44.0*	44.9		-0.180		-5.96	-12.8	0.912

This is load case 1 in ASCE 7-22 Figure 27.3-8. See Figure 27.3-8 for other cases.

* Distance from windward edge.

ASCE 7-22 Wind Load Report

Main Wind Force Resisting System - Wind Direction 4

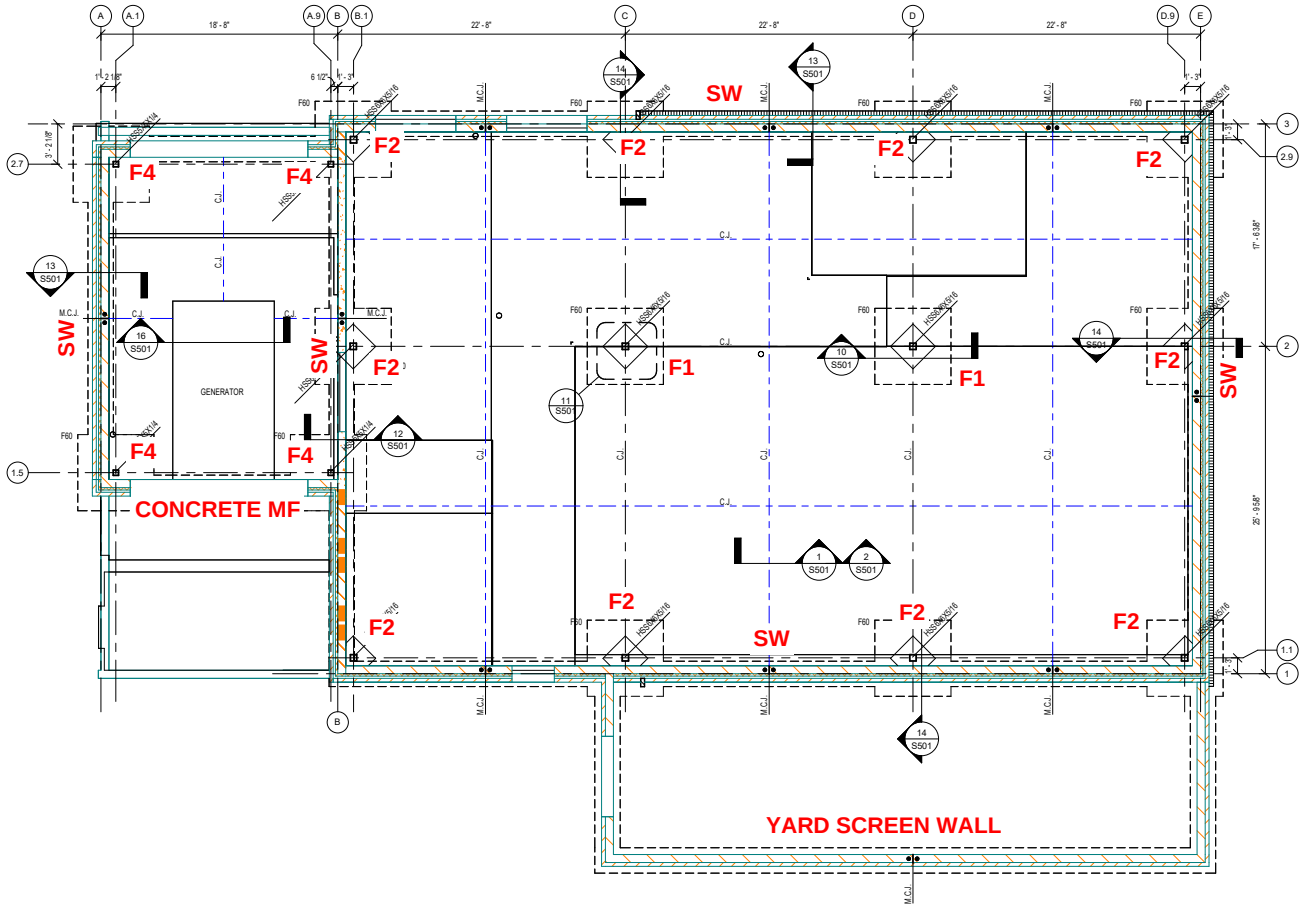
October 02, 2024

This data was calculated using the building of all heights method.

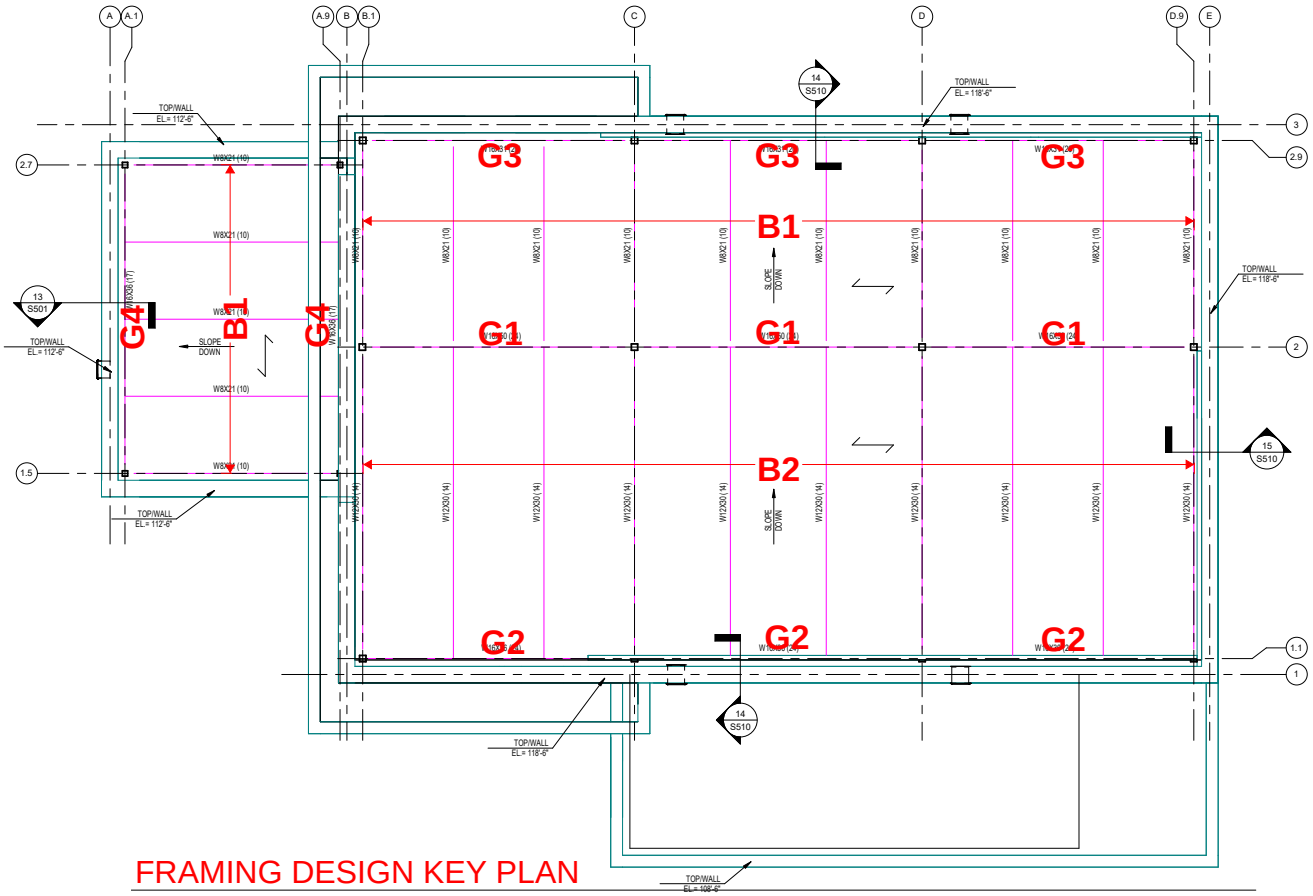
#	Surface	z (ft)	q (psf)	G	Cp	GCpi	Ext Pres (psf)	Net w/ +GCpi (psf)	Net w/ -GCpi (psf)
1	Side Wall	18.0	44.9	0.882	-0.700	0.180	-23.6	-30.5	-16.7
2	Leeward Wall	18.0	44.9	0.882	-0.300	0.180	-10.1	-17.0	-3.23
	Parapet	22.0	46.8		-1.00		-39.8		
3	Side Wall	18.0	44.9	0.882	-0.700	0.180	-23.6	-30.5	-16.7
4	Windward Wall	15.0	43.3	0.882	0.800	0.180	26.0	19.1	32.8
		18.0	44.9				26.9	20.1	33.8
	Parapet	22.0	46.8		1.50		59.7		
A	Roof	0.00 - 9.00*	44.9	0.882	-0.900	0.180	-30.3	-37.2	-23.4
		9.00 - 18.0*	44.9				-30.3	-37.2	-23.4
		18.0 - 36.0*	44.9		-0.500		-16.8	-23.7	-9.97
		36.0 - 88.0*	44.9		-0.300		-10.1	-17.0	-3.23
		0.00 - 88.0*	44.9		-0.180		-6.06	-12.9	0.812

This is load case 1 in ASCE 7-22 Figure 27.3-8. See Figure 27.3-8 for other cases.

* Distance from windward edge.



FOUNDATION DESIGN KEY PLAN



FRAMING DESIGN KEY PLAN

BEAM DESIGN

Gravity Beam Design

RAM SBeam v07.00.00
RDCJP23010 - Data Center

02/25/25 17:59:50

STEEL CODE: AISC 360-16 LRFD

SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (17.00,0.00)

Beam Size (User Selected) = W8X21 Fy = 50.0 ksi
Total Beam Length (ft) = 17.00
Distance to Adjacent Beam on Left (ft) = 8.0
Distance to Adjacent Beam on Right (ft) = 8.0

COMPOSITE PROPERTIES (Not Shored):

	Left	Right
Deck Label		
Concrete thickness (in)	3.25	3.25
Unit weight concrete (pcf)	110.00	110.00
f'c (ksi)	3.00	3.00
Decking Orientation	perpendicular	perpendicular
Decking type	VULCRAFT 2VL	VULCRAFT 2VL

beff (in)	=	51.00	Y bar(in)	=	9.26
Mnf (kip-ft)	=	210.62	Mn (kip-ft)	=	137.38
C (kips)	=	85.51	PNA (in)	=	7.56
Ieff (in4)	=	209.85	Itr (in4)	=	330.65
Stud length (in)	=	4.00	Stud diam (in)	=	0.75

Stud Capacity (kips) Qn = 17.1 Rg = 1.00 Rp = 0.60
# of studs: Max = 17 Partial = 10 Actual = 10
Number of Stud Rows = 1 Percent of Full Composite Action = 27.76
Top flange braced by decking for Composite condition.
Top flange braced by decking for Pre-composite condition.

LINE LOADS (k/ft):

Load	Dist (ft)	DL	CDL	LL	PartL	CLL
1	0.000	0.021	0.021	0.000	0.000	0.000
	17.000	0.021	0.021	0.000	0.000	0.000
2	0.000	0.520	0.360	1.080	0.000	0.160
	17.000	0.520	0.360	1.080	0.000	0.160

SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 20.21 kips 1.00Vn = 62.10 kips

MOMENTS (Ultimate):

Span	Cond	LoadCombo	Mu kip-ft	@ ft	Lb ft	Cb	Phi	Phi*Mn kip-ft
Center	PreCmp+	1.2DL+1.6LL	25.8	8.5	0.0	1.00	0.90	76.50
	Init DL	1.4DL	19.3	8.5	---	---		
	Max +	1.2DL+1.6LL	85.9	8.5	---	---	0.90	123.64
Controlling		1.2DL+1.6LL	85.9	8.5	---	---	0.90	123.64

REACTIONS (kips):

	Left	Right
Initial reaction	4.60	4.60
DL reaction	4.60	4.60
Max +LL reaction	9.18	9.18
Max +total reaction (factored)	20.21	20.21

DEFLECTIONS:								**Ratio**
Initial load (in)	at	8.50 ft	=	-0.328	L/D	=	622	
Live load (in)	at	8.50 ft	=	-0.333	L/D	=	612 > 360	0.59
Post Comp load (in)	at	8.50 ft	=	-0.383	L/D	=	533 > 240	0.45
Net Total load (in)	at	8.50 ft	=	-0.711	L/D	=	287 > 240	0.84

Gravity Beam Design

RAM SBeam v07.00.00
RDCJP23010 - Data Center

02/25/25 18:01:57

STEEL CODE: AISC 360-16 LRFD

SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (23.00,0.00)

Beam Size (User Selected) = W8X15 Fy = 50.0 ksi
Total Beam Length (ft) = 23.00
Distance to Adjacent Beam on Left (ft) = 8.0
Distance to Adjacent Beam on Right (ft) = 8.0

COMPOSITE PROPERTIES (Not Shored):

	Left	Right
Deck Label		
Concrete thickness (in)	3.25	3.25
Unit weight concrete (pcf)	110.00	110.00
f'c (ksi)	3.00	3.00
Decking Orientation	perpendicular	perpendicular
Decking type	VULCRAFT 2VL	VULCRAFT 2VL

beff (in)	=	69.00	Y bar(in)	=	10.08
Mnf (kip-ft)	=	160.47	Mn (kip-ft)	=	100.60
C (kips)	=	68.41	PNA (in)	=	6.85
Ieff (in4)	=	169.87	Itr (in4)	=	267.53
Stud length (in)	=	4.00	Stud diam (in)	=	0.75

Stud Capacity (kips) Qn = 17.1 Rg = 1.00 Rp = 0.60
# of studs: Max = 23 Partial = 8 Actual = 8
Number of Stud Rows = 1 Percent of Full Composite Action = 30.81
Top flange braced by decking for Composite condition.
Top flange braced by decking for Pre-composite condition.

LINE LOADS (k/ft):

Load	Dist (ft)	DL	CDL	LL	PartL	CLL
1	0.000	0.015	0.015	0.000	0.000	0.000
	23.000	0.015	0.015	0.000	0.000	0.000
2	0.000	0.130	0.090	0.270	0.000	0.040
	23.000	0.130	0.090	0.270	0.000	0.040

SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 6.97 kips 1.00Vn = 59.61 kips

MOMENTS (Ultimate):

Span	Cond	LoadCombo	Mu kip-ft	@ ft	Lb ft	Cb	Phi	Phi*Mn kip-ft
Center	PreCmp+	1.2DL+1.6LL	12.6	11.5	0.0	1.00	0.90	51.00
	Init DL	1.4DL	9.7	11.5	---	---		
	Max +	1.2DL+1.6LL	40.1	11.5	---	---	0.90	90.54
Controlling		1.2DL+1.6LL	40.1	11.5	---	---	0.90	90.54

REACTIONS (kips):

	Left	Right
Initial reaction	1.67	1.67
DL reaction	1.67	1.67
Max +LL reaction	3.10	3.10
Max +total reaction (factored)	6.97	6.97

DEFLECTIONS:				**Ratio**
Initial load (in)	at 11.50 ft = -0.475	L/D = 581		
Live load (in)	at 11.50 ft = -0.345	L/D = 800	> 360	0.45
Post Comp load (in)	at 11.50 ft = -0.396	L/D = 697	> 240	0.34
Net Total load (in)	at 11.50 ft = -0.872	L/D = 317	> 240	0.76

Gravity Beam Design

RAM SBeam v07.00.00
RDCJP23010 - Data Center

02/25/25 18:01:19

STEEL CODE: AISC 360-16 LRFD

SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (25.00,0.00)

Beam Size (User Selected) = W12X30 Fy = 50.0 ksi
Total Beam Length (ft) = 25.00
Distance to Adjacent Beam on Left (ft) = 8.0
Distance to Adjacent Beam on Right (ft) = 8.0

COMPOSITE PROPERTIES (Not Shored):

	Left	Right
Deck Label		
Concrete thickness (in)	3.25	3.25
Unit weight concrete (pcf)	110.00	110.00
f'c (ksi)	3.00	3.00
Decking Orientation	perpendicular	perpendicular
Decking type	VULCRAFT 2VL	VULCRAFT 2VL

beff (in)	=	75.00	Y bar(in)	=	12.66
Mnf (kip-ft)	=	375.44	Mn (kip-ft)	=	266.79
C (kips)	=	119.72	PNA (in)	=	10.75
Ieff (in4)	=	537.99	Itr (in4)	=	812.79
Stud length (in)	=	4.00	Stud diam (in)	=	0.75

Stud Capacity (kips) Qn = 17.1 Rg = 1.00 Rp = 0.60
# of studs: Max = 50 Partial = 14 Actual = 14
Number of Stud Rows = 1 Percent of Full Composite Action = 27.24
Top flange braced by decking for Composite condition.
Top flange braced by decking for Pre-composite condition.

LINE LOADS (k/ft):

Load	Dist (ft)	DL	CDL	LL	PartL	CLL
1	0.000	0.030	0.030	0.000	0.000	0.000
	25.000	0.030	0.030	0.000	0.000	0.000
2	0.000	0.520	0.360	1.080	0.000	0.160
	25.000	0.520	0.360	1.080	0.000	0.160

SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 29.85 kips 1.00Vn = 95.94 kips

MOMENTS (Ultimate):

Span	Cond	LoadCombo	Mu kip-ft	@ ft	Lb ft	Cb	Phi	Phi*Mn kip-ft
Center	PreCmp+	1.2DL+1.6LL	56.6	12.5	0.0	1.00	0.90	161.62
	Init DL	1.4DL	42.6	12.5	---	---		
	Max +	1.2DL+1.6LL	186.6	12.5	---	---	0.90	240.11
Controlling		1.2DL+1.6LL	186.6	12.5	---	---	0.90	240.11

REACTIONS (kips):

	Left	Right
Initial reaction	6.87	6.87
DL reaction	6.87	6.87
Max +LL reaction	13.50	13.50
Max +total reaction (factored)	29.85	29.85

DEFLECTIONS:				**Ratio**
Initial load (in)	at 12.50 ft = -0.497	L/D = 604		
Live load (in)	at 12.50 ft = -0.608	L/D = 493	> 360	0.73
Post Comp load (in)	at 12.50 ft = -0.699	L/D = 429	> 240	0.56
Net Total load (in)	at 12.50 ft = -1.195	L/D = 251	> 240	0.96

Gravity Beam Design

RAM SBeam v07.00.00
RDCJP23010 - Data Center

02/25/25 18:02:25

STEEL CODE: AISC 360-16 LRFD

SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (23.00,0.00)

Beam Size (User Selected) = W16X50 Fy = 50.0 ksi
Total Beam Length (ft) = 23.00
Distance to Adjacent Beam on Left (ft) = 17.0
Distance to Adjacent Beam on Right (ft) = 25.0

COMPOSITE PROPERTIES (Not Shored):

	Left	Right
Deck Label		
Concrete thickness (in)	3.25	3.25
Unit weight concrete (pcf)	110.00	110.00
f'c (ksi)	3.00	3.00
Decking Orientation	parallel	parallel
Decking type	VULCRAFT 2VL	VULCRAFT 2VL

beff (in)	=	69.00	Y bar(in)	=	14.31
Mnf (kip-ft)	=	670.37	Mn (kip-ft)	=	565.22
C (kips)	=	222.34	PNA (in)	=	14.00
Ieff (in4)	=	1332.67	Itr (in4)	=	1739.38
Stud length (in)	=	4.00	Stud diam (in)	=	0.75

Stud Capacity (kips) Qn = 17.1 Rg = 1.00 Rp = 0.75
# of studs: Full = 102 Partial = 26 Actual = 26
Number of Stud Rows = 1 Percent of Full Composite Action = 25.96
Top flange braced by decking for Composite condition.
Top flange not braced by decking for Pre-composite condition.

POINT LOADS (kips):

						Flange Bracing	
Dist (ft)	DL	CDL	LL	PartL	CLL	Top	Bottom
7.670	11.50	8.20	22.70	0.00	3.36	No	No
15.330	11.50	8.20	22.70	0.00	3.36	No	No

LINE LOADS (k/ft):

Load	Dist (ft)	DL	CDL	LL	PartL	CLL
1	0.000	0.050	0.050	0.000	0.000	0.000
	23.000	0.050	0.050	0.000	0.000	0.000

SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 50.81 kips 1.00Vn = 185.82 kips

MOMENTS (Ultimate):

Span	Cond	LoadCombo	Mu kip-ft	@ ft	Lb ft	Cb	Phi	Phi*Mn kip-ft
Center	PreCmp+	1.2DL+1.6LL	120.7	11.5	23.0	1.14	0.90	160.76
	Init DL	1.4DL	92.7	11.5	---	---		
	Max +	1.2DL+1.6LL	388.4	11.5	---	---	0.90	508.70
Controlling		1.2DL+1.6LL	387.9	15.3	---	---	0.90	470.83

REACTIONS (kips):

	Left	Right
Initial reaction	12.14	12.14
DL reaction	12.08	12.08
Max +LL reaction	22.70	22.70
Max +total reaction (factored)	50.81	50.81

DEFLECTIONS:

				Ratio
Initial load (in)	at 11.50 ft = -0.337	L/D = 820		
Live load (in)	at 11.50 ft = -0.438	L/D = 630	> 360	0.57
Post Comp load (in)	at 11.50 ft = -0.502	L/D = 550	> 240	0.44
Net Total load (in)	at 11.50 ft = -0.839	L/D = 329	> 240	0.73

Gravity Beam Design

RAM SBeam v07.00.00
RDCJP23010 - Data Center

02/25/25 18:02:55

STEEL CODE: AISC 360-16 LRFD

SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (23.00,0.00)

Beam Size (User Selected) = W16X36 Fy = 50.0 ksi
Total Beam Length (ft) = 23.00
Distance to Adjacent Beam on Left (ft) = 0.5
Distance to Adjacent Beam on Right (ft) = 25.0

COMPOSITE PROPERTIES (Not Shored):

	Left	Right
Deck Label		
Concrete thickness (in)	3.25	3.25
Unit weight concrete (pcf)	110.00	110.00
f'c (ksi)	3.00	3.00
Decking Orientation	parallel	parallel
Decking type	VULCRAFT 2VL	VULCRAFT 2VL

beff (in)	=	37.50	Y bar(in)	=	13.19
Mnf (kip-ft)	=	442.21	Mn (kip-ft)	=	373.35
C (kips)	=	119.72	PNA (in)	=	12.01
Ieff (in4)	=	851.72	Itr (in4)	=	1098.47
Stud length (in)	=	4.00	Stud diam (in)	=	0.75

Stud Capacity (kips) Qn = 17.1 Rg = 1.00 Rp = 0.75
# of studs: Full = 56 Partial = 14 Actual = 14
Number of Stud Rows = 1 Percent of Full Composite Action = 25.78
Top flange braced by decking for Composite condition.
Top flange not braced by decking for Pre-composite condition.

POINT LOADS (kips):

						Flange Bracing	
Dist (ft)	DL	CDL	LL	PartL	CLL	Top	Bottom
7.670	6.90	4.90	13.50	0.00	2.00	No	No
15.330	6.90	4.90	13.50	0.00	2.00	No	No

LINE LOADS (k/ft):

Load	Dist (ft)	DL	CDL	LL	PartL	CLL
1	0.000	0.036	0.036	0.000	0.000	0.000
	23.000	0.036	0.036	0.000	0.000	0.000

SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 30.38 kips 1.00Vn = 140.71 kips

MOMENTS (Ultimate):

Span	Cond	LoadCombo	Mu kip-ft	@ ft	Lb ft	Cb	Phi	Phi*Mn kip-ft
Center	PreCmp+	1.2DL+1.6LL	72.5	11.5	23.0	1.14	0.90	87.92
	Init DL	1.4DL	56.0	11.5	---	---		
	Max +	1.2DL+1.6LL	232.0	11.5	---	---	0.90	336.01
Controlling		1.2DL+1.6LL	72.5	11.5	23.0	1.14	0.90	87.92

REACTIONS (kips):

	Left	Right
Initial reaction	7.31	7.31
DL reaction	7.31	7.31
Max +LL reaction	13.50	13.50
Max +total reaction (factored)	30.38	30.38

DEFLECTIONS:

							Ratio
Initial load (in)	at 11.50 ft	=	-0.299	L/D = 923			
Live load (in)	at 11.50 ft	=	-0.408	L/D = 676	>	360	0.53
Post Comp load (in)	at 11.50 ft	=	-0.468	L/D = 589	>	240	0.41
Net Total load (in)	at 11.50 ft	=	-0.767	L/D = 360	>	240	0.67

Gravity Beam Design

RAM SBeam v07.00.00
RDCJP23010 - Data Center

02/25/25 18:03:25

STEEL CODE: AISC 360-16 LRFD

SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (23.00,0.00)

Beam Size (User Selected) = W16X31 Fy = 50.0 ksi
Total Beam Length (ft) = 23.00
Distance to Adjacent Beam on Left (ft) = 0.5
Distance to Adjacent Beam on Right (ft) = 17.0

COMPOSITE PROPERTIES (Not Shored):

	Left	Right
Deck Label		
Concrete thickness (in)	3.25	3.25
Unit weight concrete (pcf)	110.00	110.00
f'c (ksi)	3.00	3.00
Decking Orientation	parallel	parallel
Decking type	VULCRAFT 2VL	VULCRAFT 2VL

beff (in)	=	37.50	Y bar(in)	=	13.62
Mnf (kip-ft)	=	394.76	Mn (kip-ft)	=	329.38
C (kips)	=	119.72	PNA (in)	=	12.30
Ieff (in4)	=	751.62	Itr (in4)	=	981.81
Stud length (in)	=	4.00	Stud diam (in)	=	0.75

Stud Capacity (kips) Qn = 17.1 Rg = 1.00 Rp = 0.75
# of studs: Full = 56 Partial = 14 Actual = 14
Number of Stud Rows = 1 Percent of Full Composite Action = 25.83
Top flange braced by decking for Composite condition.
Top flange not braced by decking for Pre-composite condition.

POINT LOADS (kips):

						Flange Bracing	
Dist (ft)	DL	CDL	LL	PartL	CLL	Top	Bottom
7.670	4.60	3.26	9.20	0.00	1.36	No	No
15.330	4.60	3.26	9.20	0.00	1.36	No	No

LINE LOADS (k/ft):

Load	Dist (ft)	DL	CDL	LL	PartL	CLL
1	0.000	0.031	0.031	0.000	0.000	0.000
	23.000	0.031	0.031	0.000	0.000	0.000

SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 20.67 kips 1.00Vn = 131.18 kips

MOMENTS (Ultimate):

Span	Cond	LoadCombo	Mu kip-ft	@ ft	Lb ft	Cb	Phi	Phi*Mn kip-ft
Center	PreCmp+	1.2DL+1.6LL	49.2	11.5	23.0	1.14	0.90	51.77
	Init DL	1.4DL	37.9	11.5	---	---		
	Max +	1.2DL+1.6LL	157.7	11.5	---	---	0.90	296.44
Controlling		1.2DL+1.6LL	49.2	11.5	23.0	1.14	0.90	51.77

REACTIONS (kips):

	Left	Right
Initial reaction	4.98	4.98
DL reaction	4.96	4.96
Max +LL reaction	9.20	9.20
Max +total reaction (factored)	20.67	20.67

DEFLECTIONS:

				Ratio
Initial load (in)	at 11.50 ft = -0.242	L/D = 1142		
Live load (in)	at 11.50 ft = -0.315	L/D = 876	> 360	0.41
Post Comp load (in)	at 11.50 ft = -0.361	L/D = 765	> 240	0.31
Net Total load (in)	at 11.50 ft = -0.603	L/D = 458	> 240	0.52

Gravity Beam Design

RAM SBeam v07.00.00
RDCJP23010 - Data Center

02/25/25 18:03:56

STEEL CODE: AISC 360-16 LRFD

SPAN INFORMATION (ft): I-End (0.00,0.00) J-End (24.33,0.00)

Beam Size (User Selected) = W16X36 Fy = 50.0 ksi
Total Beam Length (ft) = 24.33
Distance to Adjacent Beam on Left (ft) = 0.5
Distance to Adjacent Beam on Right (ft) = 17.0

COMPOSITE PROPERTIES (Not Shored):

	Left	Right
Deck Label		
Concrete thickness (in)	3.25	3.25
Unit weight concrete (pcf)	110.00	110.00
f'c (ksi)	3.00	3.00
Decking Orientation	parallel	parallel
Decking type	VULCRAFT 2VL	VULCRAFT 2VL

beff (in)	=	39.49	Y bar(in)	=	13.34
Mnf (kip-ft)	=	447.61	Mn (kip-ft)	=	348.86
C (kips)	=	85.51	PNA (in)	=	10.85
Ieff (in4)	=	790.03	Itr (in4)	=	1117.15
Stud length (in)	=	4.00	Stud diam (in)	=	0.75

Stud Capacity (kips) Qn = 17.1 Rg = 1.00 Rp = 0.75
# of studs: Full = 40 Partial = 10 Actual = 10
Number of Stud Rows = 1 Percent of Full Composite Action = 26.12
Top flange braced by decking for Composite condition.
Top flange not braced by decking for Pre-composite condition.

LINE LOADS (k/ft):

Load	Dist (ft)	DL	CDL	LL	PartL	CLL
1	0.000	0.036	0.036	0.000	0.000	0.000
	24.330	0.036	0.036	0.000	0.000	0.000
2	0.000	0.585	0.405	1.215	0.000	0.180
	24.330	0.585	0.405	1.215	0.000	0.180

SHEAR (Ultimate): Max Vu (1.2DL+1.6LL) = 32.71 kips 1.00Vn = 140.71 kips

MOMENTS (Ultimate):

Span	Cond	LoadCombo	Mu kip-ft	@ ft	Lb ft	Cb	Phi	Phi*Mn kip-ft
Center	PreCmp+	1.2DL+1.6LL	60.5	12.2	24.3	1.14	0.90	80.98
	Init DL	1.4DL	45.7	12.2	---	---		
	Max +	1.2DL+1.6LL	199.0	12.2	---	---	0.90	313.97
Controlling		1.2DL+1.6LL	60.5	12.2	24.3	1.14	0.90	80.98

REACTIONS (kips):

	Left	Right
Initial reaction	7.56	7.56
DL reaction	7.56	7.56
Max +LL reaction	14.78	14.78
Max +total reaction (factored)	32.71	32.71

DEFLECTIONS:				**Ratio**
Initial load (in)	at 12.16 ft = -0.268	L/D = 1091		
Live load (in)	at 12.16 ft = -0.418	L/D = 698	> 360	0.52
Post Comp load (in)	at 12.16 ft = -0.480	L/D = 608	> 240	0.39
Net Total load (in)	at 12.16 ft = -0.748	L/D = 390	> 240	0.61

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Generator Room Concrete beam

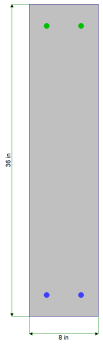
CODE REFERENCES

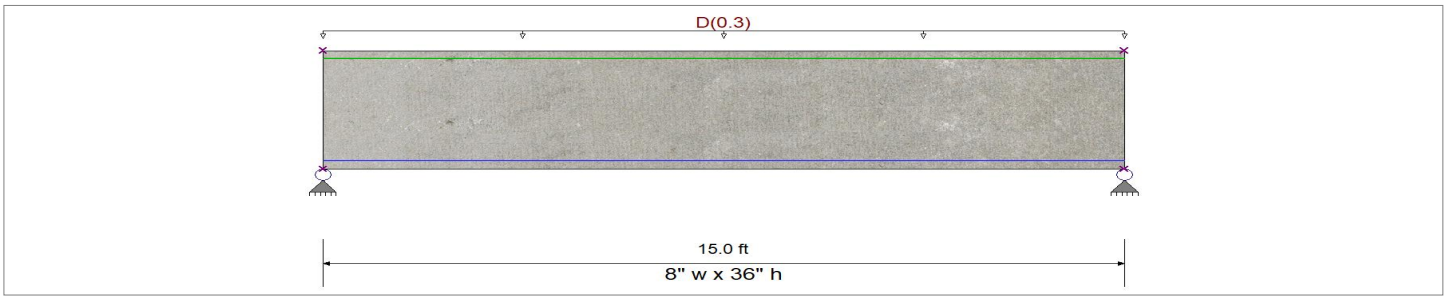
Calculations per ACI 318-19, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

General Information

f'c	= 4.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c^1/2 *7.50	= 474.342 psi		Shear :	0.750
ψ Density	= 145.0 pcf	β 1	=	0.850
λ LtWt Factor	= 1.0			
Elastic Modulus	= 3,122.0 ksi	Fy - Stirrups		60.0 ksi
fy - Main Rebar	= 60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	= 29,000.0 ksi	Stirrup Bar Size #		3
		Number of Resisting Legs Per Stirrup	=	2

Seismic Design Category = A





Cross Section & Reinforcing Details

Rectangular Section, Width = 8.0 in, Height = 36.0 in
Span #1 Reinforcing....
2-#6 at 2.50 in from Bottom, from 0.0 to 15.0 ft in this span
2-#6 at 2.50 in from Top, from 0.0 to 15.0 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.30 k/ft, Tributary Width = 1.0 ft, (CMU Wall)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.180** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	23.231	k-ft
Mn * Phi : Allowable	128.926	k-ft
Location of maximum on span	7.514	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.000 in	Ratio =	0	<360.0	
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	
Max Downward Total Deflection	0.007 in	Ratio =	26017	>=180.0	Span: 1 : D Only
Max Upward Total Deflection	0.000 in	Ratio =	0	<180.0	Span: 1 : D Only

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	4.425	4.425
Max Upward from Load Combinations	2.655	2.655
Max Upward from Load Cases	4.425	4.425
D Only	4.425	4.425
+0.60D	2.655	2.655

Shear Stirrup Requirements

Entire Beam Span Length : Vu <= Phi*lambda*sqrt(f'c)*bw*d, Req'd Vs = Not Reqd per 9.3.6.1, Stirrups are not required.

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Generator Room Concrete beam

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
+1.40D	1	0.00	33.50	6.19	6.19	0.00	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	0.16	33.50	6.06	6.06	1.00	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	0.33	33.50	5.92	5.92	1.99	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	0.49	33.50	5.79	5.79	2.95	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	0.66	33.50	5.65	5.65	3.88	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	0.82	33.50	5.52	5.52	4.80	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	0.98	33.50	5.38	5.38	5.69	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	1.15	33.50	5.25	5.25	6.57	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	1.31	33.50	5.11	5.11	7.41	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	1.48	33.50	4.98	4.98	8.24	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	1.64	33.50	4.84	4.84	9.05	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	1.80	33.50	4.71	4.71	9.83	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	1.97	33.50	4.57	4.57	10.59	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	2.13	33.50	4.43	4.43	11.33	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	2.30	33.50	4.30	4.30	12.04	1.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	2.46	33.50	4.16	4.16	12.74	0.91	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	2.62	33.50	4.03	4.03	13.41	0.84	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	2.79	33.50	3.89	3.89	14.06	0.77	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	2.95	33.50	3.76	3.76	14.68	0.71	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	3.11	33.50	3.62	3.62	15.29	0.66	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	3.28	33.50	3.49	3.49	15.87	0.61	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	3.44	33.50	3.35	3.35	16.43	0.57	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	3.61	33.50	3.22	3.22	16.97	0.53	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	3.77	33.50	3.08	3.08	17.49	0.49	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	3.93	33.50	2.95	2.95	17.98	0.46	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	4.10	33.50	2.81	2.81	18.45	0.43	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	4.26	33.50	2.67	2.67	18.90	0.39	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	4.43	33.50	2.54	2.54	19.33	0.37	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	4.59	33.50	2.40	2.40	19.73	0.34	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	4.75	33.50	2.27	2.27	20.12	0.31	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	4.92	33.50	2.13	2.13	20.48	0.29	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	5.08	33.50	2.00	2.00	20.82	0.27	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	5.25	33.50	1.86	1.86	21.13	0.25	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	5.41	33.50	1.73	1.73	21.43	0.22	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	5.57	33.50	1.59	1.59	21.70	0.20	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	5.74	33.50	1.46	1.46	21.95	0.19	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	5.90	33.50	1.32	1.32	22.18	0.17	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	6.07	33.50	1.18	1.18	22.38	0.15	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	6.23	33.50	1.05	1.05	22.56	0.13	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	6.39	33.50	0.91	0.91	22.73	0.11	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	6.56	33.50	0.78	0.78	22.86	0.10	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	6.72	33.50	0.64	0.64	22.98	0.08	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	6.89	33.50	0.51	0.51	23.08	0.06	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	7.05	33.50	0.37	0.37	23.15	0.04	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	7.21	33.50	0.24	0.24	23.20	0.03	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	7.38	33.50	0.10	0.10	23.23	0.01	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	7.54	33.50	-0.03	0.03	23.23	0.00	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	7.70	33.50	-0.17	0.17	23.21	0.02	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	7.87	33.50	-0.30	0.30	23.18	0.04	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	8.03	33.50	-0.44	0.44	23.11	0.05	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	8.20	33.50	-0.58	0.58	23.03	0.07	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	8.36	33.50	-0.71	0.71	22.93	0.09	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	8.52	33.50	-0.85	0.85	22.80	0.10	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	8.69	33.50	-0.98	0.98	22.65	0.12	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	8.85	33.50	-1.12	1.12	22.48	0.14	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	9.02	33.50	-1.25	1.25	22.28	0.16	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0
+1.40D	1	9.18	33.50	-1.39	1.39	22.07	0.18	10.25	Vu <= Phi*lambd	t Reqd pe	10.2	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Generator Room Concrete beam

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
+1.40D	1	9.34	33.50	-1.52	1.52	21.83	0.19	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	9.51	33.50	-1.66	1.66	21.57	0.21	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	9.67	33.50	-1.79	1.79	21.28	0.24	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	9.84	33.50	-1.93	1.93	20.98	0.26	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	10.00	33.50	-2.06	2.06	20.65	0.28	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	10.16	33.50	-2.20	2.20	20.30	0.30	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	10.33	33.50	-2.34	2.34	19.93	0.33	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	10.49	33.50	-2.47	2.47	19.53	0.35	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	10.66	33.50	-2.61	2.61	19.12	0.38	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	10.82	33.50	-2.74	2.74	18.68	0.41	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	10.98	33.50	-2.88	2.88	18.22	0.44	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	11.15	33.50	-3.01	3.01	17.74	0.47	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	11.31	33.50	-3.15	3.15	17.23	0.51	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	11.48	33.50	-3.28	3.28	16.70	0.55	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	11.64	33.50	-3.42	3.42	16.15	0.59	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	11.80	33.50	-3.55	3.55	15.58	0.64	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	11.97	33.50	-3.69	3.69	14.99	0.69	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	12.13	33.50	-3.83	3.83	14.37	0.74	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	12.30	33.50	-3.96	3.96	13.74	0.81	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	12.46	33.50	-4.10	4.10	13.07	0.87	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	12.62	33.50	-4.23	4.23	12.39	0.95	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	12.79	33.50	-4.37	4.37	11.69	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	12.95	33.50	-4.50	4.50	10.96	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	13.11	33.50	-4.64	4.64	10.21	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	13.28	33.50	-4.77	4.77	9.44	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	13.44	33.50	-4.91	4.91	8.65	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	13.61	33.50	-5.04	5.04	7.83	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	13.77	33.50	-5.18	5.18	6.99	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	13.93	33.50	-5.31	5.31	6.13	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	14.10	33.50	-5.45	5.45	5.25	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	14.26	33.50	-5.59	5.59	4.35	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	14.43	33.50	-5.72	5.72	3.42	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	14.59	33.50	-5.86	5.86	2.47	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	14.75	33.50	-5.99	5.99	1.50	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0
+1.40D	1	14.92	33.50	-6.13	6.13	0.51	1.00	10.25	Vu <= Phi*lambd	Reqd pe	10.2	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	15.000	23.23	128.93	0.18
+1.40D					
Span # 1	1	15.000	23.23	128.93	0.18
+1.20D					
Span # 1	1	15.000	19.91	128.93	0.15
+0.90D					
Span # 1	1	15.000	14.93	128.93	0.12

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
D Only	1	0.0069	7.500		0.0000	0.000

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Canopy Concrete beam

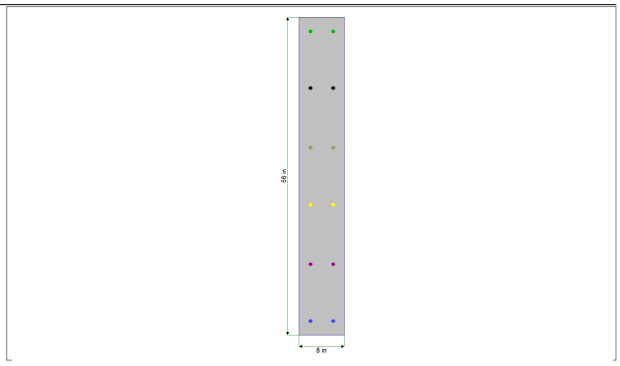
CODE REFERENCES

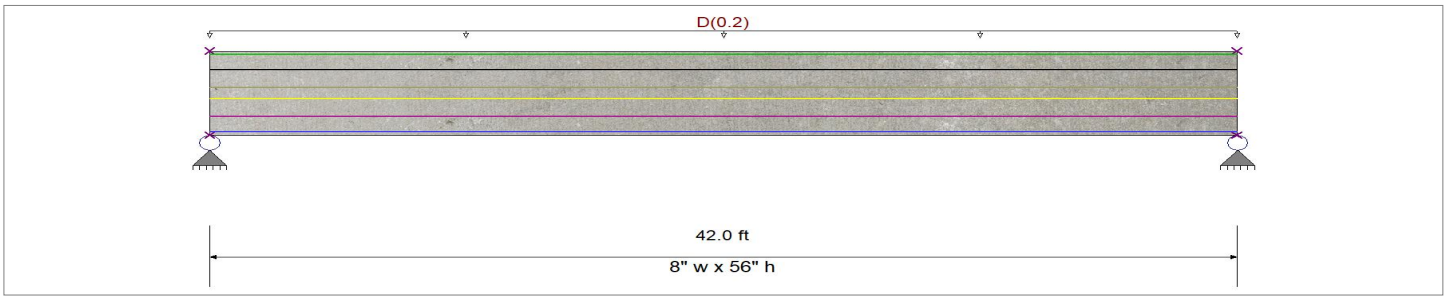
Calculations per ACI 318-19, IBC 2021, ASCE 7-16
Load Combination Set : IBC 2021

General Information

f'c	=	4.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c$^{1/2}$ *7.50	=	474.342 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		60.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2

Seismic Design Category = A





Cross Section & Reinforcing Details

Rectangular Section, Width = 8.0 in, Height = 56.0 in
Span #1 Reinforcing....

2-#5 at 2.50 in from Bottom, from 0.0 to 42.0 ft in this span
2-#5 at 12.50 in from Bottom, from 0.0 to 42.0 ft in this span
2-#5 at 24.0 in from Bottom, from 0.0 to 42.0 ft in this span
2-#5 at 2.50 in from Top, from 0.0 to 42.0 ft in this span
2-#5 at 12.50 in from Top, from 0.0 to 42.0 ft in this spa
2-#5 at 24.0 in from Top, from 0.0 to 42.0 ft in this span

Beam self weight calculated and added to loads
Load for Span Number 1
Uniform Load : D = 0.20 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	**0.475** : 1	
Section used for this span	**Typical Section**	
Mu : Applied	200.997	k-ft
Mn * Phi : Allowable	423.003	k-ft
Location of maximum on span	21.038	ft
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.000 in	Ratio =	0 <360.0	
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360.0	
Max Downward Total Deflection	0.125 in	Ratio =	4042 >=180.0	Span: 1 : D Only
Max Upward Total Deflection	0.000 in	Ratio =	0 <180.0	Span: 1 : D Only

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	13.673	13.673
Max Upward from Load Combinations	8.204	8.204
Max Upward from Load Cases	13.673	13.673
D Only	13.673	13.673
+0.60D	8.204	8.204

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Canopy Concrete beam

Shear Stirrup Requirements

Between 0.00 to 3.98 ft, Phi*Vc < Vu, Req'd Vs = 0.02531, use #3 stirrups spaced at 21.000 in
Between 4.05 to 37.95 ft, Vu <= Phi*lambda*sqrt(f'c)*bw*d, Req'd Vs = Not Reqd per 9.3.6.1, Stirrups are not required.
Between 38.02 to 41.92 ft, Phi*lambda*sqrt(f'c)*bw*d < Vu <= Phi*Vc, Req'd Vs = Min per 9.6.3.1, use #3 stirrups spaced at 21.000 in

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
+1.40D	1	0.00	43.00	19.14	19.14	0.00	1.00	32.63	Phi*lambda*sqrt	in per 9.6.	52.9	21.5
+1.40D	1	0.46	43.00	18.72	18.72	8.69	1.00	32.63	Phi*lambda*sqrt	in per 9.6.	52.9	21.5
+1.40D	1	0.92	43.00	18.31	18.31	17.19	1.00	32.63	Phi*lambda*sqrt	in per 9.6.	52.9	21.5
+1.40D	1	1.38	43.00	17.89	17.89	25.50	1.00	32.63	Phi*lambda*sqrt	in per 9.6.	52.9	21.5
+1.40D	1	1.84	43.00	17.47	17.47	33.61	1.00	32.63	Phi*lambda*sqrt	in per 9.6.	52.9	21.5
+1.40D	1	2.30	43.00	17.05	17.05	41.53	1.00	32.63	Phi*lambda*sqrt	in per 9.6.	52.9	21.5
+1.40D	1	2.75	43.00	16.63	16.63	49.26	1.00	32.63	Phi*lambda*sqrt	in per 9.6.	52.9	21.5
+1.40D	1	3.21	43.00	16.21	16.21	56.80	1.00	15.49	Phi*Vc < Vu	0.7227	35.8	21.5
+1.40D	1	3.67	43.00	15.80	15.80	64.15	0.88	15.49	Phi*Vc < Vu	0.3043	35.8	21.5
+1.40D	1	4.13	43.00	15.38	15.38	71.30	0.77	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	4.59	43.00	14.96	14.96	78.26	0.68	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	5.05	43.00	14.54	14.54	85.04	0.61	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	5.51	43.00	14.12	14.12	91.61	0.55	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	5.97	43.00	13.70	13.70	98.00	0.50	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	6.43	43.00	13.28	13.28	104.19	0.46	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	6.89	43.00	12.87	12.87	110.20	0.42	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	7.34	43.00	12.45	12.45	116.00	0.38	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	7.80	43.00	12.03	12.03	121.62	0.35	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	8.26	43.00	11.61	11.61	127.05	0.33	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	8.72	43.00	11.19	11.19	132.28	0.30	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	9.18	43.00	10.77	10.77	137.32	0.28	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	9.64	43.00	10.36	10.36	142.17	0.26	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	10.10	43.00	9.94	9.94	146.83	0.24	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	10.56	43.00	9.52	9.52	151.30	0.23	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	11.02	43.00	9.10	9.10	155.57	0.21	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	11.48	43.00	8.68	8.68	159.65	0.19	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	11.93	43.00	8.26	8.26	163.54	0.18	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	12.39	43.00	7.85	7.85	167.24	0.17	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	12.85	43.00	7.43	7.43	170.74	0.16	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	13.31	43.00	7.01	7.01	174.06	0.14	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	13.77	43.00	6.59	6.59	177.18	0.13	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	14.23	43.00	6.17	6.17	180.11	0.12	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	14.69	43.00	5.75	5.75	182.84	0.11	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	15.15	43.00	5.33	5.33	185.39	0.10	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	15.61	43.00	4.92	4.92	187.74	0.09	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	16.07	43.00	4.50	4.50	189.90	0.08	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	16.52	43.00	4.08	4.08	191.87	0.08	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	16.98	43.00	3.66	3.66	193.65	0.07	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	17.44	43.00	3.24	3.24	195.23	0.06	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	17.90	43.00	2.82	2.82	196.62	0.05	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	18.36	43.00	2.41	2.41	197.82	0.04	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	18.82	43.00	1.99	1.99	198.83	0.04	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	19.28	43.00	1.57	1.57	199.65	0.03	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	19.74	43.00	1.15	1.15	200.27	0.02	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	20.20	43.00	0.73	0.73	200.70	0.01	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	20.66	43.00	0.31	0.31	200.94	0.01	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	21.11	43.00	-0.10	0.10	200.99	0.00	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	21.57	43.00	-0.52	0.52	200.85	0.01	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	22.03	43.00	-0.94	0.94	200.51	0.02	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	22.49	43.00	-1.36	1.36	199.98	0.02	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	22.95	43.00	-1.78	1.78	199.26	0.03	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	23.41	43.00	-2.20	2.20	198.35	0.04	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	23.87	43.00	-2.62	2.62	197.25	0.05	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0
+1.40D	1	24.33	43.00	-3.03	3.03	195.95	0.06	15.49	Vu <= Phi*lambd	t Reqd per	15.5	0.0

Project Title:
Engineer:
Project ID:
Project Descr:

Concrete Beam

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Canopy Concrete beam

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
+1.40D	1	24.79	43.00	-3.45	3.45	194.46	0.06	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	25.25	43.00	-3.87	3.87	192.78	0.07	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	25.70	43.00	-4.29	4.29	190.91	0.08	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	26.16	43.00	-4.71	4.71	188.84	0.09	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	26.62	43.00	-5.13	5.13	186.59	0.10	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	27.08	43.00	-5.54	5.54	184.14	0.11	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	27.54	43.00	-5.96	5.96	181.50	0.12	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	28.00	43.00	-6.38	6.38	178.66	0.13	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	28.46	43.00	-6.80	6.80	175.64	0.14	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	28.92	43.00	-7.22	7.22	172.42	0.15	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	29.38	43.00	-7.64	7.64	169.01	0.16	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	29.84	43.00	-8.05	8.05	165.41	0.17	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	30.30	43.00	-8.47	8.47	161.62	0.19	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	30.75	43.00	-8.89	8.89	157.63	0.20	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	31.21	43.00	-9.31	9.31	153.46	0.22	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	31.67	43.00	-9.73	9.73	149.09	0.23	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	32.13	43.00	-10.15	10.15	144.53	0.25	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	32.59	43.00	-10.57	10.57	139.77	0.27	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	33.05	43.00	-10.98	10.98	134.83	0.29	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	33.51	43.00	-11.40	11.40	129.69	0.32	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	33.97	43.00	-11.82	11.82	124.36	0.34	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	34.43	43.00	-12.24	12.24	118.84	0.37	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	34.89	43.00	-12.66	12.66	113.12	0.40	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	35.34	43.00	-13.08	13.08	107.22	0.44	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	35.80	43.00	-13.49	13.49	101.12	0.48	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	36.26	43.00	-13.91	13.91	94.83	0.53	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	36.72	43.00	-14.33	14.33	88.35	0.58	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	37.18	43.00	-14.75	14.75	81.67	0.65	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	37.64	43.00	-15.17	15.17	74.81	0.73	15.49	Vu <= Phi*lambda*t	Reqd per	15.5	0.0
+1.40D	1	38.10	43.00	-15.59	15.59	67.75	0.82	15.49	Phi*Vc < Vu	0.09505	35.8	21.5
+1.40D	1	38.56	43.00	-16.00	16.00	60.50	0.95	15.49	Phi*Vc < Vu	0.5135	35.8	21.5
+1.40D	1	39.02	43.00	-16.42	16.42	53.06	1.00	32.63	Phi*lambda*sqrt	in per 9.6.3	52.9	21.5
+1.40D	1	39.48	43.00	-16.84	16.84	45.42	1.00	32.63	Phi*lambda*sqrt	in per 9.6.3	52.9	21.5
+1.40D	1	39.93	43.00	-17.26	17.26	37.60	1.00	32.63	Phi*lambda*sqrt	in per 9.6.3	52.9	21.5
+1.40D	1	40.39	43.00	-17.68	17.68	29.58	1.00	32.63	Phi*lambda*sqrt	in per 9.6.3	52.9	21.5
+1.40D	1	40.85	43.00	-18.10	18.10	21.37	1.00	32.63	Phi*lambda*sqrt	in per 9.6.3	52.9	21.5
+1.40D	1	41.31	43.00	-18.52	18.52	12.96	1.00	32.63	Phi*lambda*sqrt	in per 9.6.3	52.9	21.5
+1.40D	1	41.77	43.00	-18.93	18.93	4.37	1.00	32.63	Phi*lambda*sqrt	in per 9.6.3	52.9	21.5

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	42.000	201.00	423.00	0.48
+1.40D					
Span # 1	1	42.000	201.00	423.00	0.48
+1.20D					
Span # 1	1	42.000	172.28	423.00	0.41
+0.90D					
Span # 1	1	42.000	129.21	423.00	0.31

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft	Load Combination	Max. "+" Defl (in)	Location in Span (ft
D Only	1	0.1247	21.000		0.0000	0.000

COLUMN DESIGN

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Typical Column check w/ Blast Load Combination

Code References

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Steel Section Name : **HSS6x6x5/16**

Analysis Method :	Load Resistance Factor
Steel Stress Grade	
Fy : Steel Yield	50.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height	19.330 ft
Top & Bottom Fixity	Top & Bottom Pinned
Brace condition :	

Unbraced Length for buckling ABOUT X-X Axis = 19.330 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 19.330 ft, K = 1.0

Applied Loads

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

Column self weight included : 451.162 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 19.330 ft, Xecc = 0.60 in, Yecc = 0.60 in, D = 19.50, LR = 6.0, L = 58.80 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.7188** : 1

Load Combination	+D+0.250Lr+L
Location of max.above base	19.330 ft
At maximum location values are . . .	
Pu	80.251 k
0.9 * Pn	138.431 k
Mu-x	-3.990 k-ft
0.9 * Mn-x :	51.0 k-ft
Mu-y	-3.990 k-ft
0.9 * Mn-y :	51.0 k-ft

PASS Maximum Shear Stress Rati **0.003074** : 1

Load Combination	+D+0.250Lr+L
Location of max.above base	0.0 ft
At maximum location values are . . .	
Vu : Applied	0.2064 k
Vn * Phi : Allowable	67.138 k

Maximum Load Reactions . .

Top along X-X	0.1521 k
Bottom along X-X	0.1521 k
Top along Y-Y	0.1521 k
Bottom along Y-Y	0.1521 k

Maximum Load Deflections . . .

Along Y-Y -0.1235 in at 11.287 ft above base
for load combination : L Only

Along X-X -0.1235 in at 11.287 ft above base
for load combination : L Only

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Ry	KyLy/Rx	Maximum Shear Ratios: Stress Ratio	Status	Location
+1.40D	0.249	PASS	19.33 ft	1.66	1.66	100.42	100.42	0.001	PASS	0.00 ft
+1.20D+1.60Lr	0.300	PASS	19.33 ft	1.66	1.66	100.42	100.42	0.001	PASS	0.00 ft
+D+0.250Lr+L	0.719	PASS	19.33 ft	1.66	1.66	100.42	100.42	0.003	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments k-ft @ Base	Mx - End Moments k-ft @ Top	My - End Moments @ Base	My - End Moments @ Top
+D+Lr	25.951	0.066	0.066	-0.066	0.066				
D Only	19.951	0.050	0.050	-0.050	0.050				
Lr Only	6.000	0.016	0.016	-0.016	0.016				
L Only	58.800	0.152	0.152	-0.152	0.152				

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments k-ft @ Base	Mx - End Moments k-ft @ Top	My - End Moments @ Base	My - End Moments @ Top
Axial @ Base	Maximum	58.800	0.152	0.152	-0.152	0.152		-2.940		-2.940
"	Minimum	6.000	0.016	0.016	-0.016	0.016		-0.300		-0.300
Reaction, X-X Axis Base	Maximum	58.800	0.152	0.152	-0.152	0.152		-2.940		-2.940
"	Minimum	6.000	0.016	0.016	-0.016	0.016		-0.300		-0.300
Reaction, Y-Y Axis Base	Maximum	6.000	0.016	0.016	-0.016	0.016		-0.300		-0.300
"	Minimum	58.800	0.152	0.152	-0.152	0.152		-2.940		-2.940

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Typical Column check w/ Blast Load Combination

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
Reaction, X-X Axis Top	Maximum	58.800	0.152	0.152		-0.152	0.152		-2.940		-2.940
"	Minimum	6.000	0.016	0.016		-0.016	0.016		-0.300		-0.300
Reaction, Y-Y Axis Top	Maximum	58.800	0.152	0.152		-0.152	0.152		-2.940		-2.940
"	Minimum	6.000	0.016	0.016		-0.016	0.016		-0.300		-0.300
Moment, X-X Axis Base	Maximum	25.951		0.066		-0.066	0.066		-1.275		-1.275
"	Minimum	25.951		0.066		-0.066	0.066		-1.275		-1.275
Moment, Y-Y Axis Base	Maximum	25.951	0.066	0.066		-0.066	0.066		-1.275		-1.275
"	Minimum	25.951	0.066	0.066		-0.066	0.066		-1.275		-1.275
Moment, X-X Axis Top	Maximum	6.000	0.016	0.016		-0.016	0.016		-0.300		-0.300
"	Minimum	58.800	0.152	0.152		-0.152	0.152		-2.940		-2.940
Moment, Y-Y Axis Top	Maximum	6.000	0.016	0.016		-0.016	0.016		-0.300		-0.300
"	Minimum	58.800	0.152	0.152		-0.152	0.152		-2.940		-2.940

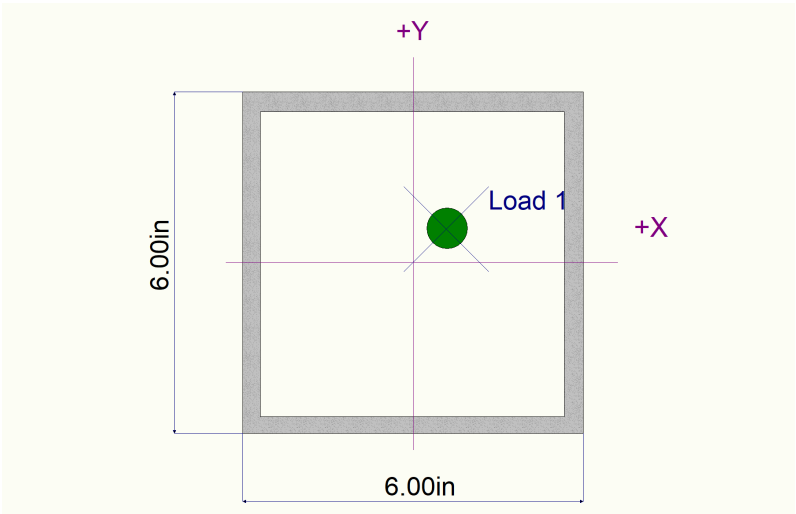
Maximum Deflections for Load Combinations

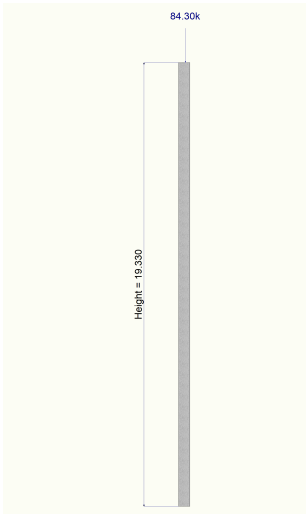
Load Combination	Max. Deflection in X dir		Distance		Max. Deflection in Y dir		Distance	
+D+Lr	-0.0536	in	11.287	ft	-0.054	in	11.287	ft
D Only	-0.0410	in	11.287	ft	-0.041	in	11.287	ft
Lr Only	-0.0126	in	11.287	ft	-0.013	in	11.287	ft
L Only	-0.1235	in	11.287	ft	-0.123	in	11.287	ft

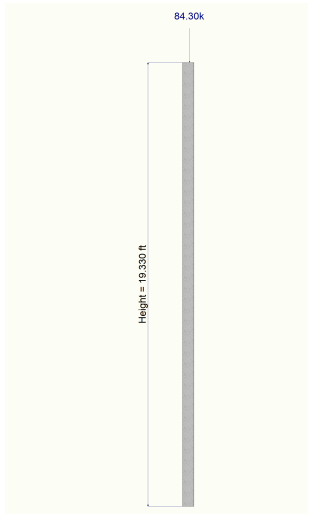
Steel Section Properties : HSS6x6x5/16

Depth	=	6.000 in	I xx	=	34.30 in^4	J	=	55.400 in^4
Design Thick	=	0.291 in	S xx	=	11.40 in^3			
Width	=	6.000 in	R xx	=	2.310 in			
Wall Thick	=	0.313 in	Zx	=	13.600 in^3			
Area	=	6.430 in^2	I yy	=	34.300 in^4	C	=	18.900 in^3
Weight	=	23.340 plf	S yy	=	11.400 in^3			
			R yy	=	2.310 in			
Ycg	=	0.000 in						

Sketches







Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Typical Column check w/ Blast Load Combination in generator room

Code References

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Steel Section Name : **HSS5x5x1/4**
Analysis Method : Load Resistance Factor
Steel Stress Grade
Fy : Steel Yield 50.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 19.330 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition :
Unbraced Length for buckling ABOUT X-X Axis = 19.330 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 19.330 ft, K = 1.0

Applied Loads

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

Column self weight included : 301.935 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 19.330 ft, Xecc = 0.50 in, Yecc = 0.50 in, D = 8.50, LR = 2.60, L = 25.50 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.6097** : 1
Load Combination +D+0.250Lr+L
Location of max.above base 19.330 ft
At maximum location values are . . .
Pu 34.952 k
0.9 * Pn 67.251 k
Mu-x -1.444 k-ft
0.9 * Mn-x : 28.538 k-ft
Mu-y -1.444 k-ft
0.9 * Mn-y : 28.538 k-ft

PASS Maximum Shear Stress Rati **0.001656** : 1
Load Combination +D+0.250Lr+L
Location of max.above base 0.0 ft
At maximum location values are . . .
Vu : Applied 0.07469 k
Vn * Phi : Allowable 45.096 k

Maximum Load Reactions . .
Top along X-X 0.05497 k
Bottom along X-X 0.05497 k
Top along Y-Y 0.05497 k
Bottom along Y-Y 0.05497 k

Maximum Load Deflections . . .
Along Y-Y -0.09567 in at 11.287 ft above base
for load combination : L Only
Along X-X -0.09567 in at 11.287 ft above base
for load combination : L Only

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Ry	KyLy/Rx	Maximum Shear Ratios: Stress Ratio	Status	Location
+1.40D	0.183	PASS	0.00 ft	1.66	1.66	120.19	120.19	0.001	PASS	0.00 ft
+1.20D+1.60Lr	0.256	PASS	19.33 ft	1.66	1.66	120.19	120.19	0.001	PASS	0.00 ft
+D+0.250Lr+L	0.610	PASS	19.33 ft	1.66	1.66	120.19	120.19	0.002	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments k-ft @ Base	Mx - End Moments k-ft @ Top	My - End Moments @ Base	My - End Moments @ Top
+D+Lr	11.402	0.024	0.024	-0.024	0.024				
D Only	8.802	0.018	0.018	-0.018	0.018				
Lr Only	2.600	0.006	0.006	-0.006	0.006				
L Only	25.500	0.055	0.055	-0.055	0.055				

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments k-ft @ Base	Mx - End Moments k-ft @ Top	My - End Moments @ Base	My - End Moments @ Top
Axial @ Base	Maximum	25.500	0.055	0.055	-0.055	0.055		-1.063		-1.063
"	Minimum	2.600	0.006	0.006	-0.006	0.006		-0.108		-0.108
Reaction, X-X Axis Base	Maximum	25.500	0.055	0.055	-0.055	0.055		-1.063		-1.063
"	Minimum	2.600	0.006	0.006	-0.006	0.006		-0.108		-0.108
Reaction, Y-Y Axis Base	Maximum	2.600	0.006	0.006	-0.006	0.006		-0.108		-0.108
"	Minimum	25.500	0.055	0.055	-0.055	0.055		-1.063		-1.063

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Typical Column check w/ Blast Load Combination in generator room

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	k	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments k-ft @ Base	Mx - End Moments k-ft @ Top	My - End Moments @ Base	My - End Moments @ Top
Reaction, X-X Axis Top	Maximum	25.500	0.055	0.055		-0.055	0.055		-1.063		-1.063
"	Minimum	2.600	0.006	0.006		-0.006	0.006		-0.108		-0.108
Reaction, Y-Y Axis Top	Maximum	25.500	0.055	0.055		-0.055	0.055		-1.063		-1.063
"	Minimum	2.600	0.006	0.006		-0.006	0.006		-0.108		-0.108
Moment, X-X Axis Base	Maximum	11.402		0.024		-0.024	0.024		-0.462		-0.462
"	Minimum	11.402		0.024		-0.024	0.024		-0.462		-0.462
Moment, Y-Y Axis Base	Maximum	11.402	0.024	0.024		-0.024	0.024		-0.462		-0.462
"	Minimum	11.402	0.024	0.024		-0.024	0.024		-0.462		-0.462
Moment, X-X Axis Top	Maximum	2.600	0.006	0.006		-0.006	0.006		-0.108		-0.108
"	Minimum	25.500	0.055	0.055		-0.055	0.055		-1.063		-1.063
Moment, Y-Y Axis Top	Maximum	2.600	0.006	0.006		-0.006	0.006		-0.108		-0.108
"	Minimum	25.500	0.055	0.055		-0.055	0.055		-1.063		-1.063

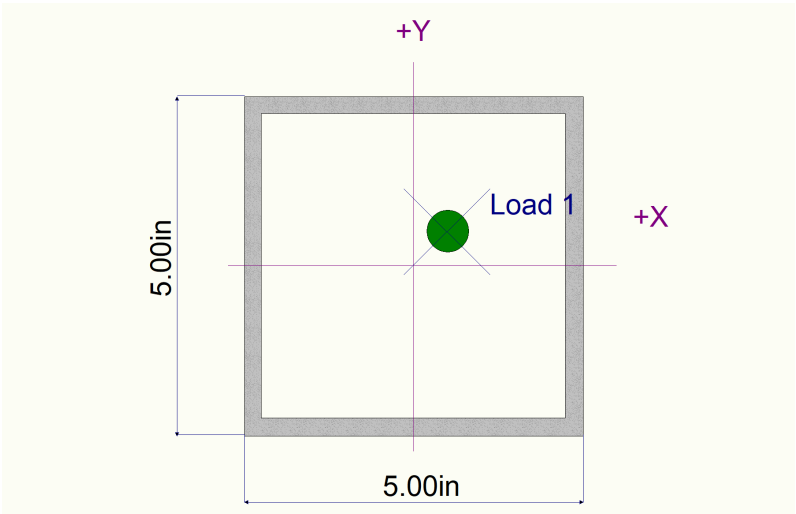
Maximum Deflections for Load Combinations

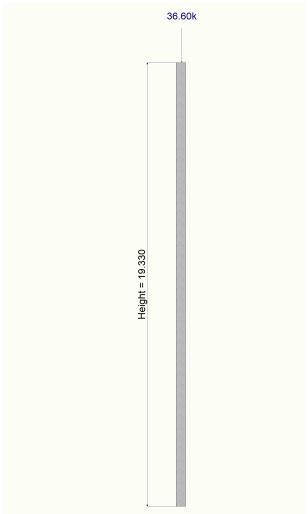
Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance
+D+Lr	-0.0416 in	11.287 ft	-0.042 in	11.287 ft
D Only	-0.0319 in	11.287 ft	-0.032 in	11.287 ft
Lr Only	-0.0098 in	11.287 ft	-0.010 in	11.287 ft
L Only	-0.0957 in	11.287 ft	-0.096 in	11.287 ft

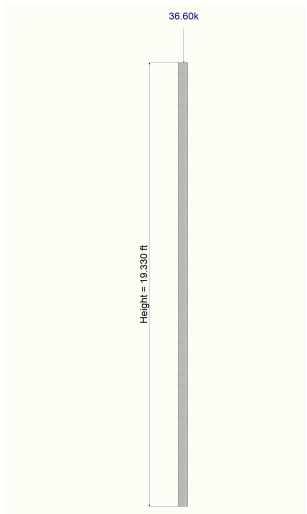
Steel Section Properties : HSS5x5x1/4

Depth	=	5.000 in	I xx	=	16.00 in^4	J	=	25.800 in^4
Design Thick	=	0.233 in	S xx	=	6.41 in^3			
Width	=	5.000 in	R xx	=	1.930 in			
Wall Thick	=	0.250 in	Zx	=	7.610 in^3			
Area	=	4.300 in^2	I yy	=	16.000 in^4	C	=	10.500 in^3
Weight	=	15.620 plf	S yy	=	6.410 in^3			
			R yy	=	1.930 in			
Ycg	=	0.000 in						

Sketches







Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Critical Column check w/ Blast Load Combination

Code References

Calculations per AISC 360-16, IBC 2021, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Steel Section Name : **HSS6x6x1/2**

Analysis Method :	Load Resistance Factor
Steel Stress Grade	
Fy : Steel Yield	50.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height	19.330 ft
Top & Bottom Fixity	Top & Bottom Pinned
Brace condition :	

Unbraced Length for buckling ABOUT X-X Axis = 19.330 ft, K = 1.0
Unbraced Length for buckling ABOUT Y-Y Axis = 19.330 ft, K = 1.0

Applied Loads

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

Column self weight included : 681.19 lbs * Dead Load Factor
AXIAL LOADS . . .
Axial Load at 19.330 ft, Xecc = 0.60 in, Yecc = 0.60 in, D = 31.40, LR = 9.70, L = 94.70 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.8041** : 1

Load Combination	+D+0.250Lr+L
Location of max.above base	19.330 ft
At maximum location values are . . .	
Pu	129.206 k
0.9 * Pn	198.70 k
Mu-x	-6.426 k-ft
0.9 * Mn-x :	74.250 k-ft
Mu-y	-6.426 k-ft
0.9 * Mn-y :	74.250 k-ft

PASS Maximum Shear Stress Rati **0.003450** : 1

Load Combination	+D+0.250Lr+L
Location of max.above base	0.0 ft
At maximum location values are . . .	
Vu : Applied	0.3325 k
Vn * Phi : Allowable	96.360 k

Maximum Load Reactions . .

Top along X-X	0.2450 k
Bottom along X-X	0.2450 k
Top along Y-Y	0.2450 k
Bottom along Y-Y	0.2450 k

Maximum Load Deflections . . .

Along Y-Y -0.1412 in at 11.287 ft above base
for load combination : L Only

Along X-X -0.1412 in at 11.287 ft above base
for load combination : L Only

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios: Stress Ratio	Status	Location	Cbx	Cby	KxLx/Ry	KyLy/Rx	Maximum Shear Ratios: Stress Ratio	Status	Location
+1.40D	0.279	PASS	19.33 ft	1.66	1.66	104.02	104.02	0.001	PASS	0.00 ft
+1.20D+1.60Lr	0.336	PASS	19.33 ft	1.66	1.66	104.02	104.02	0.001	PASS	0.00 ft
+D+0.250Lr+L	0.804	PASS	19.33 ft	1.66	1.66	104.02	104.02	0.003	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments k-ft @ Base	Mx - End Moments k-ft @ Top	My - End Moments @ Base	My - End Moments @ Top
+D+Lr	41.781	0.106	0.106	-0.106	0.106				
D Only	32.081	0.081	0.081	-0.081	0.081				
Lr Only	9.700	0.025	0.025	-0.025	0.025				
L Only	94.700	0.245	0.245	-0.245	0.245				

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	X-X Axis Reaction @ Top	Y-Y Axis Reaction @ Base	Y-Y Axis Reaction @ Top	Mx - End Moments k-ft @ Base	Mx - End Moments k-ft @ Top	My - End Moments @ Base	My - End Moments @ Top
Axial @ Base	Maximum	94.700	0.245	0.245	-0.245	0.245		-4.735		-4.735
"	Minimum	9.700	0.025	0.025	-0.025	0.025		-0.485		-0.485
Reaction, X-X Axis Base	Maximum	94.700	0.245	0.245	-0.245	0.245		-4.735		-4.735
"	Minimum	9.700	0.025	0.025	-0.025	0.025		-0.485		-0.485
Reaction, Y-Y Axis Base	Maximum	9.700	0.025	0.025	-0.025	0.025		-0.485		-0.485
"	Minimum	94.700	0.245	0.245	-0.245	0.245		-4.735		-4.735

Project Title:
Engineer:
Project ID:
Project Descr:

Steel Column

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Critical Column check w/ Blast Load Combination

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	k	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
Reaction, X-X Axis Top	Maximum	94.700	0.245	0.245		-0.245	0.245		-4.735		-4.735
"	Minimum	9.700	0.025	0.025		-0.025	0.025		-0.485		-0.485
Reaction, Y-Y Axis Top	Maximum	94.700	0.245	0.245		-0.245	0.245		-4.735		-4.735
"	Minimum	9.700	0.025	0.025		-0.025	0.025		-0.485		-0.485
Moment, X-X Axis Base	Maximum	41.781		0.106		-0.106	0.106		-2.055		-2.055
"	Minimum	41.781		0.106		-0.106	0.106		-2.055		-2.055
Moment, Y-Y Axis Base	Maximum	41.781	0.106	0.106		-0.106	0.106		-2.055		-2.055
"	Minimum	41.781	0.106	0.106		-0.106	0.106		-2.055		-2.055
Moment, X-X Axis Top	Maximum	9.700	0.025	0.025		-0.025	0.025		-0.485		-0.485
"	Minimum	94.700	0.245	0.245		-0.245	0.245		-4.735		-4.735
Moment, Y-Y Axis Top	Maximum	9.700	0.025	0.025		-0.025	0.025		-0.485		-0.485
"	Minimum	94.700	0.245	0.245		-0.245	0.245		-4.735		-4.735

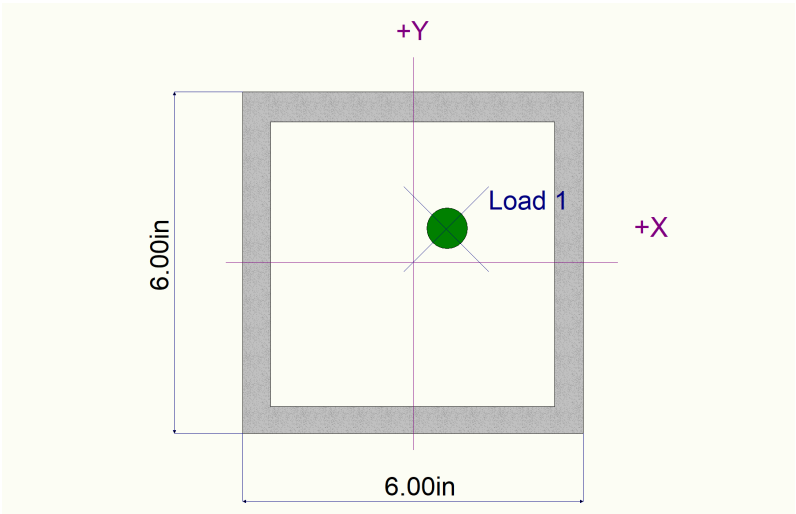
Maximum Deflections for Load Combinations

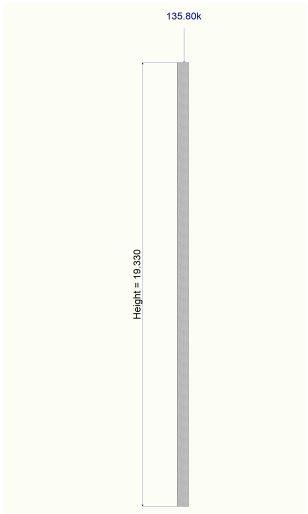
Load Combination	Max. Deflection in X dir		Distance		Max. Deflection in Y dir		Distance	
+D+Lr	-0.0613	in	11.287	ft	-0.061	in	11.287	ft
D Only	-0.0468	in	11.287	ft	-0.047	in	11.287	ft
Lr Only	-0.0145	in	11.287	ft	-0.014	in	11.287	ft
L Only	-0.1412	in	11.287	ft	-0.141	in	11.287	ft

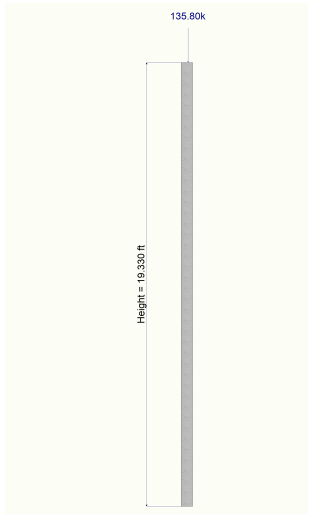
Steel Section Properties : HSS6x6x1/2

Depth	=	6.000 in	I xx	=	48.30 in^4	J	=	81.100 in^4
Design Thick	=	0.465 in	S xx	=	16.10 in^3			
Width	=	6.000 in	R xx	=	2.230 in			
Wall Thick	=	0.500 in	Zx	=	19.800 in^3			
Area	=	9.740 in^2	I yy	=	48.300 in^4	C	=	28.100 in^3
Weight	=	35.240 plf	S yy	=	16.100 in^3			
			R yy	=	2.230 in			
Ycg	=	0.000 in						

Sketches







WALL DESIGN

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: TYP. 8" CMU WALL

Code References

Calculations per TMS 402-16, IBC 2021, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Calculations per TMS 402-16, IBC 2021, ASCE 7-16

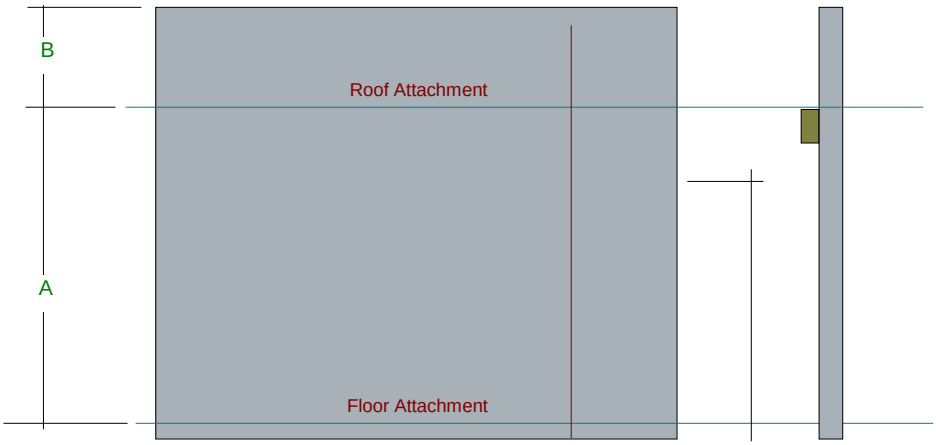
Construction Type : Grouted Hollow Concrete Masonry

F'm	=	2.0 ksi	Nom. Wall Thickness	8	in	Temp Diff across thickness	=	deg F
Fy - Yield	=	60.0 ksi	Actual Thickness	7.625	in	Min Allow Out-of-plane Defl Ra	=	0.0
Fr - Rupture	=	61.0 psi	Rebar "d" distance	3.8125	in			
Em = f'm *	=	900.0	Lower Level Rebar . . .			Minimum Vertical Steel %	=	0.0020
Max % of ρ bal.	=	0.009501	Bar Size	# 6				
Grout Density	=	140 pcf	Bar Spacing	16	in			
Block Weight		Normal Weight						
Wall Weight	=	86.0 psf						
		Wall is Solid Grouted						

One-Story Wall Dimensions

A	Clear Height	=	18.0 ft
B	Parapet height	=	ft

Wall Support Condition Top & Bottom Pinned



Lateral Loads

Wind Loads :
Full area WIND load 44.0 psf

Seismic Loads :
Wall Weight Seismic Load Input Method : Direct entry of Lateral Wall Weight
Seismic Wall Lateral Load psf

Fp 1.0 = 0.0 psf

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: TYP. 8" CMU 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+W	Maximum Bending Stress Rat	0.3943		
	Max Mu	1.859 k-ft	Phi * Mn	4.715 k-ft
PASS Service Deflection Check W Only	Actual Defl. Ratio L/ Max. Deflection	204 1.059 in	Allowable Defl. Ratio	150.0
PASS Axial Load Check +1.20D+W	Max Pu / Ag Location	10.820 psi 8.70 ft	Max. Allow. Defl. 0.2 * f'm	1.440 in 400.0 psi
Reinforcing Limit Check	Actual As/bd	0.007213	Max Allow As/bd	0.009503

Maximum Reactions *for Load Combination...*

Top Horizontal	W Only	0.3960 k
Base Horizontal	W Only	0.3960 k
Vertical Reaction	+D+0.450W	1.548 k

Design Maximum Combinations - Moments

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	0.2*f'm*b*t k	Moment Values Mcr k-ft	Mu k-ft	Phi	Phi Mn k-ft	As in^2	As Ratio	0.6 * rho bal	Bar 'd'
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
+1.20D+0.50W at 8.40 to 9.00	0.991	36.624	0.59	0.91	0.90	4.73	0.330	0.0072	0.0092	0.00
+1.20D+W at 8.40 to 9.00	0.991	36.624	0.59	1.86	0.90	4.73	0.330	0.0072	0.0092	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00
+0.90D+W at 8.40 to 9.00	0.743	36.624	0.59	1.84	0.90	4.67	0.330	0.0072	0.0092	0.00
	0.000	0.000	0.00	0.00	0.00	0.00	0.000	0.0000	0.0000	0.00

Design Maximum Combinations - Deflections

Results reported for "Strip Width" = 12 in.

Load Combination	Axial Load Pu k	Moment Values Mcr k-ft	Mactual k-ft	Stiffness I gross in^4	I cracked in^4	I effective in^4	Deflections Deflection in	Defl. Ratio
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+D+0.60W at 8.40 to 9.00	0.826	0.59	1.10	443.30	43.10	44.989	0.449	481.2
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+D+0.450W at 8.40 to 9.00	0.826	0.59	0.81	443.30	43.10	49.471	0.202	1,068.9
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
+0.60D+0.60W at 8.40 to 9.00	0.495	0.59	1.08	443.30	42.61	44.560	0.443	487.1
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0
W Only at 9.00 to 9.60	0.000	0.59	1.78	443.30	41.87	42.218	1.059	204.0
	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.0

Reactions - Vertical & Horizontal

Load Combination	Base Horizontal	Top Horizontal	Vertical @ Wall Base
D Only	0.0 k	0.00 k	1.548 k
+D+0.60W	0.2 k	0.24 k	1.548 k
+D+0.70E	0.0 k	0.00 k	1.548 k
+D+0.450W	0.2 k	0.18 k	1.548 k
+D+0.5250E	0.0 k	0.00 k	1.548 k
+0.60D+0.60W	0.2 k	0.24 k	0.929 k
+0.60D+0.70E	0.0 k	0.00 k	0.929 k
W Only	0.4 k	0.40 k	0.000 k

Project Title:
Engineer:
Project ID:
Project Descr:

Masonry Slender Wall

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: TYP. 8" CMU WALL

E Only	0.0 k	0.00 k	0.000 k

RAM Elements **Pennoni**

Current Date: 2/25/2025 6:14 PM
Units system: English
File name: U:\Accounts\RDCJP\RDCJP23010 - Gainesville VA EHRM Design Infrastruct\ANALYTICAL\CALCULATIONS\RAM Element\Shear Wall (SW1) Design.msw

Design Results
Masonry wall

General Information

Global status : OK

Design code	:	TMS 402-16 SD

Materials:

Material	:	CMU 2.0-60
Mortar type	:	Port/Mort - M/S
Grouting type	:	Full grouting
Masonry compression strength (F`m)	:	2 [Kip/in2]
Steel tension strength (fy)	:	60 [Kip/in2]
Steel allowable tension strength (Fs)	:	24 [Kip/in2]
Steel elasticity modulus (Es)	:	29000 [Kip/in2]
Masonry elasticity modulus (Em)	:	1800 [Kip/in2]
Masonry unit weight	:	0.135 [Kip/ft3]

Geometry

Total height	:	23.33 [ft]
Total length	:	43.33 [ft]
Foundation type	:	Continuous
Wall bottom restraint	:	Pinned
Column bottom restraint	:	Fixed
Rigidity elements	:	None

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]	Effective unit weight [Kip/ft3]
1	19.33	7.63	0.14

Load Conditions

ID	Comb.	Category	Description
DL	No	DL	Dead Load
LLr	No	LLR	Roof Live Load
B	No	LL	Blast Load
SM1	Yes		DL
DM1	Yes		DL
D1	Yes		1.4DL
D5	Yes		1.2DL+1.6LLr
D6	Yes		DL+0.25LLr+B

Loads

Concentrated loads:

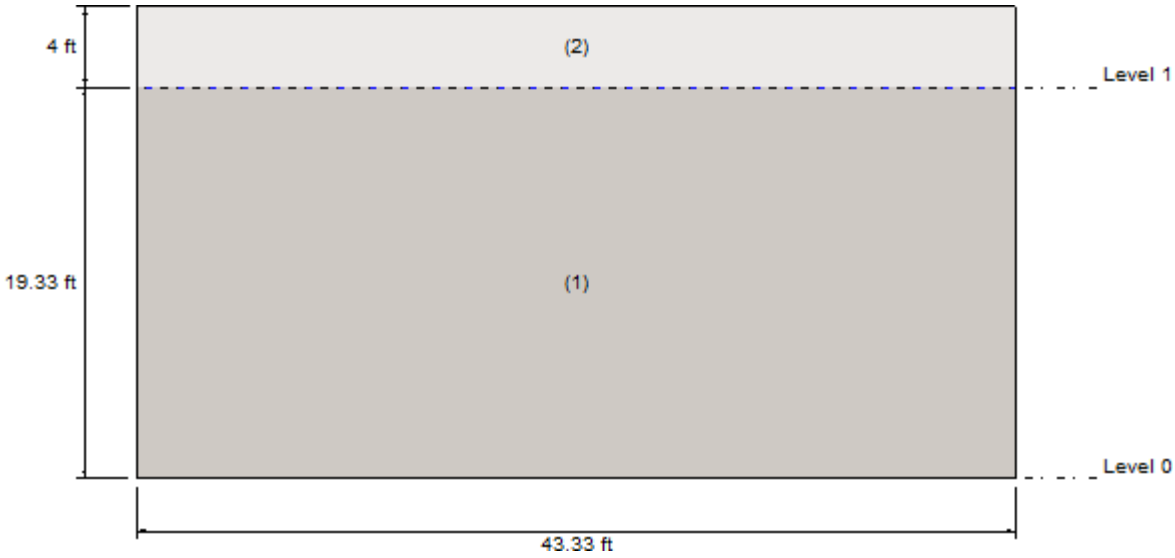
Story	Condition	Direction	Magnitude [Kip]	Eccentricity [in]	Distance [ft]
1	B	Horizontal	100.60	0.00	0.00

Distributed loads:

Consider self weight : DL

Bearing Wall Design

Status : OK



Geometry

Level	Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
0	1	0.00	0.00	43.33	19.33
1	2	0.00	19.33	43.33	4.00

Vertical reinforcement

Segment	Bars	Spacing [in]	Ld [in]
1	33-#6	16.00	63.77
2	33-#6	16.00	63.77

Combined axial flexure

Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mu [Kip*ft]	ϕMn [Kip*ft]	Ratio
1	DM1(Top)	18.49	0.00	0.00	216.57	0.00
2	DM1(Top)	3.73	0.00	0.00	213.14	0.00

Flexural reinforcement area

Segment	Condition	Pu [Kip]	As [in2]	Asmax [in2]	Ratio
1	DM1(Top)	0.00	14.30	18.67	0.00
2	DM1(Top)	0.00	14.30	18.67	0.00

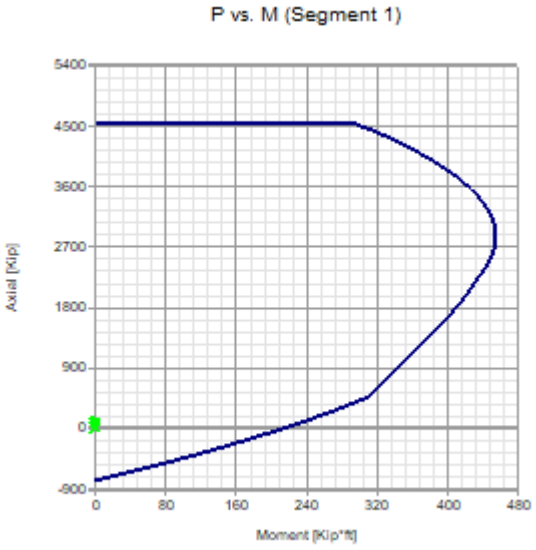
Intermediate results for axial-bending

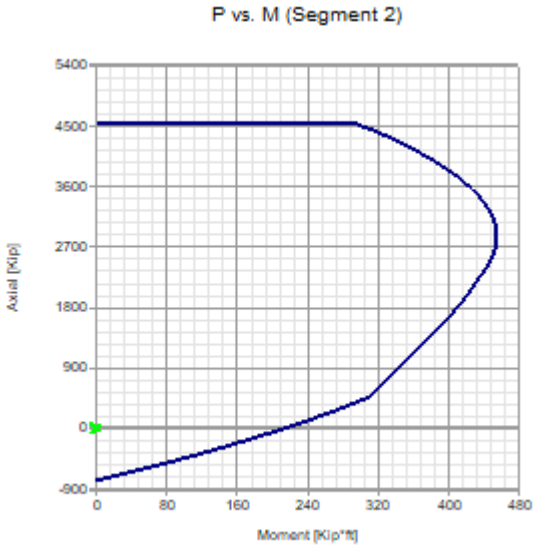
Segment	Condition	c [in]	d [in]	Mcr [Kip*ft]
1	DM1(Top)	1.32	3.81	1.79
2	DM1(Top)	1.30	3.81	1.58

Inertias

Segment	Condition	Ig [in4]	Icr [in4]
1	DM1(Top)	444.19	46.08
2	DM1(Top)	444.19	45.49

Interaction diagrams, P vs. M





Axial compression

Segment	Condition	Pu [Kip]	ϕPn [Kip]	Ratio
1	D1(Bottom)	116.29	2011.95	0.06
2	D6(Top)	18.60	4443.51	0.00

Axial stress

Segment	Condition	Pu [Kip]	Pu/Ag [Kip/in2]	Fn [Kip/in2]	Ratio
1	D1(Bottom)	116.29	0.03	0.10	0.29
2	D6(Top)	18.60	0.00	0.40	0.01

Shear

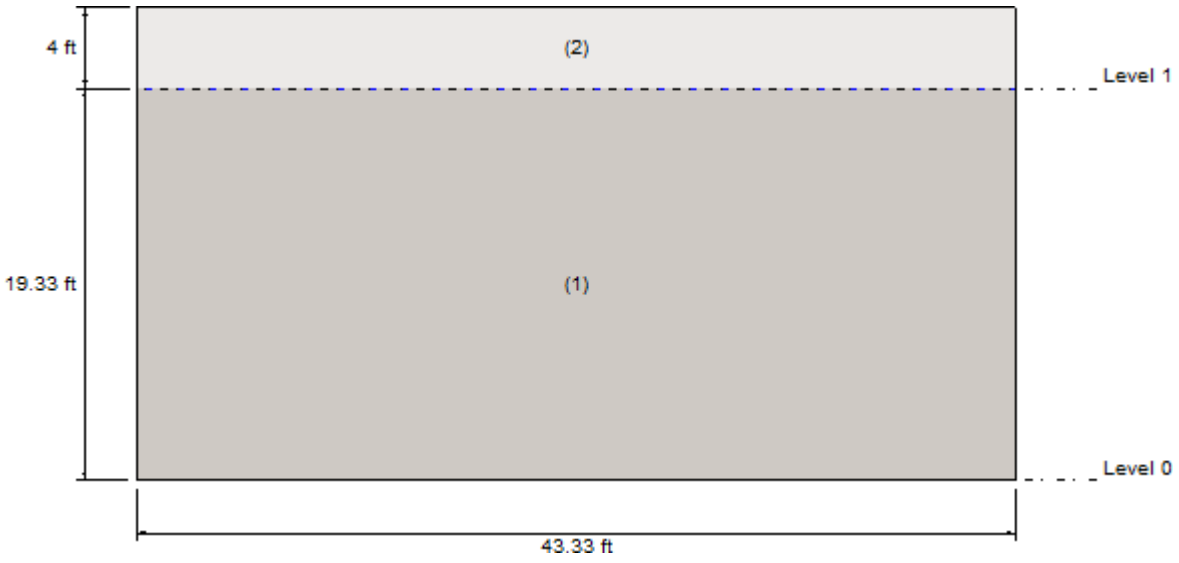
Segment	Condition	Vu [Kip]	ϕVn [Kip]	Ratio
1	DM1(Top)	0.00	6.64	0.00
2	DM1(Top)	0.00	6.57	0.00

Deflection

Segment	Condition	δs [in]	δmax [in]	δs/δmax
1	SM1(Top)	0.00	1.62	0.00
2	SM1(Top)	0.00	0.34	0.00

Shear Wall Design

Status : OK



Geometry

Level	Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
0	1	0.00	0.00	43.33	19.33
1	2	0.00	19.33	43.33	4.00

Reinforcement

	Vertical reinforcement			Horizontal reinforcement		
Segment	Bars	Spacing [in]	Ld [in]	Bars	Spacing [in]	Ld [in]
1	33-#6	16.00	63.77	--	0.00	0.00
2	33-#6	16.00	63.77	--	0.00	0.00

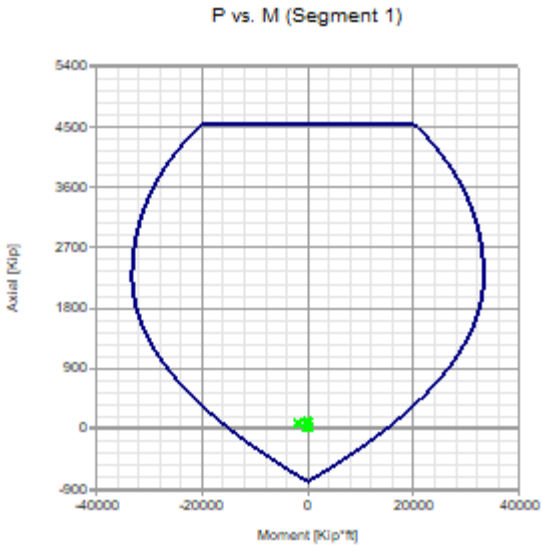
Combined axial flexure

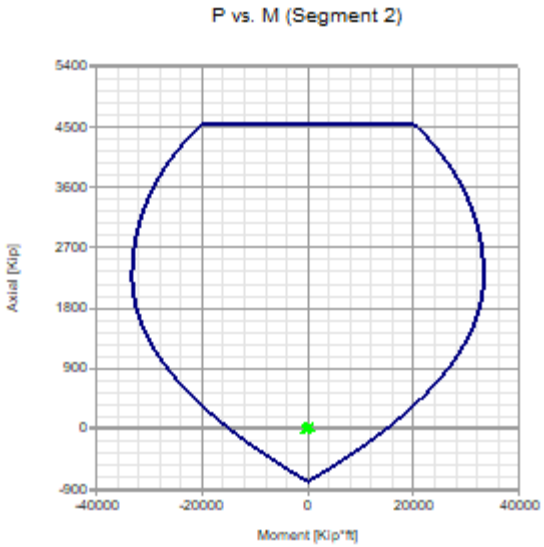
Segment	Condition	Pu [Kip]	Mu [Kip*ft]	ϕMn [Kip*ft]	Ratio
1	D6(Bottom)	83.45	-1837.37	16152.84	0.11
2	D6(Bottom)	-10.09	-438.99	14666.51	0.03

Flexural reinforcement area

Segment	Condition	Pu [Kip]	As [in2]	Asmax [in2]	Ratio
1	D6(Bottom)	0.00	14.52	331.25	0.04
2	D6(Top)	0.00	14.52	331.09	0.04

Interaction diagrams, P vs. M





Axial compression

Segment	Condition	Pu [Kip]	ϕPn [Kip]	Ratio	
1	D1(Bottom)	116.29	2011.83	0.06	
2	D6(Max)	23.60	4443.26	0.01	

Shear

Segment	Condition	Vu [Kip]	ϕVn [Kip]	Ratio	
1	D6(Bottom)	100.86	473.77	0.21	
2	D6(Max)	7.42	319.78	0.02	

Notes

* Pu = Factored axial load
* Pn = Nominal compression strength
* δ = Moment magnification factor
* Mu = Factored total flexural moment
* Mua = Factored flexural moment from analysis
* Mn = Nominal moment strength
* Mcr = Nominal cracking moment
* ft = Stress due to flexural tension
* fc = Stress due to flexural compression
* Fn = Nominal stress
* Vu = Factored shear force
* Vn = Nominal shear strength
* Vf = Nominal shear friction strength
* δs = Calculated deflection
* δmax = Maximum allowable deflection
* ld = Embedment length
* Ag = Gross cross sectional area of a member
* As = Effective cross sectional area of reinforcement
* c = Distance from the fiber of maximum compressive strain to the neutral axis
* d = Distance from the extreme compression fiber to centroid of tension reinforcement

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: SCREEN WALL

Code Reference

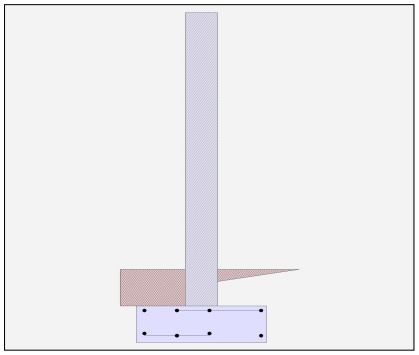
Calculations per IBC 2021 1807.3, ASCE 7-16

Criteria

Retained Height	=	1.33 ft
Wall height above soil	=	9.33 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	16.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
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 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	41.0 psf

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		Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: SCREEN WALL

Design Summary

Wall Stability Ratios

Overturning	=	1.38	Ratio < 1.5!
Sliding	=	3.56	OK
Global Stability	=	5.26	

Total Bearing Load	=	1,240	lbs
...resultant ecc.	=	17.36	in
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,495	psf OK
Soil Pressure @ Heel	=	0	psf OK
Allowable	=	2,000	psf
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,093	psf
ACI Factored @ Heel	=	0	psf
Footing Shear @ Toe	=	6.7	psi OK
Footing Shear @ Heel	=	3.9	psi OK
Allowable	=	82.2	psi

Sliding Calcs

Lateral Sliding Force	=	354.0	lbs
less 100% Passive Force	-	763.9	lbs
less 100% Friction Force	-	496.0	lbs
Added Force Req'd	=	0.0	lbs OK
....for 1.5 Stability	=	0.0	lbs OK

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

Load Factors

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

Stem Construction

		Bottom		
		Stem OK		
Design Height Above Ftg	ft =	0.00		
Wall Material Above "Ht"	=	Masonry		
Design Method	=	ASD	SD	SD
Thickness	=	12.00		
Rebar Size	=	# 5		
Rebar Spacing	=	16.00		
Rebar Placed at	=	Edge		
Design Data				
fb/FB + fa/Fa	=	**0.432**		
Total Force @ Section				
Service Level	lbs =	260.7		
Strength Level	lbs =			
Moment....Actual				
Service Level	ft-# =	1,391.3		
Strength Level	ft-# =			
Moment.....Allowable	=	3,219.0		
Shear.....Actual				
Service Level	psi =	1.9		
Strength Level	psi =			
Shear.....Allowable	psi =	50.3		
Anet (Masonry)	in2 =	139.50		
Wall Weight	psf =	0.0		
Rebar Depth 'd'	in =	9.00		

Masonry Data

f'm	psi =	2,000
Fs	psi =	20,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	16.11
Equiv. Solid Thick.	in =	11.63
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	
Fy	psi =	

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: SCREEN WALL

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	2.50
Total Footing Width	=	4.00
Footing Thickness	=	16.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 3,000 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0009
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	2,093	0	psf
Mu' : Upward	=	1,645	0	ft-#
Mu' : Downward	=	624	624	ft-#
Mu: Design	=	1,021 OK	624	ft-# OK
phiMn	=	13,036	35,031	ft-#
Actual 1-Way Shear	=	6.72	3.85	psi
Allow 1-Way Shear	=	82.16	82.16	psi
Toe Reinforcing	=	# 5 @ 16.00 in		
Heel Reinforcing	=	# 7 @ 12.00 in		
Key Reinforcing	=	None Spec'd		
Footing Torsion, Tu	=		0.00	ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00	ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 13.88 in, #5@ 21.52 in, #6@ 30.55 in, #7@ 41.66 in, #8@ 54.86 in, #9@ 69.44 in, #10@ 88.19 in

Heel: #4@ 13.88 in, #5@ 21.52 in, #6@ 30.55 in, #7@ 41.66 in, #8@ 54.86 in, #9@ 69.44 in, #10@ 88.19 in

Key: No key defined

Min footing T&S reinf Area 0.69 in2
Min footing T&S reinf Area per foot 0.17 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 13.89 in	#4@ 27.78 in
#5@ 21.53 in	#5@ 43.06 in
#6@ 30.56 in	#6@ 61.11 in

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: SCREEN WALL

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	124.4	0.89	110.6			
HL Act Pres (be water tbl)						
Hydrostatic Force						
Buoyant Force =						
Surcharge over Heel =						
Surcharge Over Toe =						
Adjacent Footing Load =						
Added Lateral Load =						
Load @ Stem Above Soil =	229.6	7.33	1,683.6			
=						
Soil Over HL (ab. water tbl)				219.9	3.25	714.8
Soil Over HL (bel. water tbl)					3.25	714.8
Water Table						
Sloped Soil Over Heel =						
Surcharge Over Heel =						
Adjacent Footing Load =						
Axial Dead Load on Stem =						
* Axial Live Load on Stem =						
Soil Over Toe =				220.0	0.75	165.0
Surcharge Over Toe =						
Stem Weight(s) =						
Earth @ Stem Transitions =						
Footing Weight =				800.0	2.00	1,600.0
Key Weight =						
Vert. Component =						
Total =	354.0	**O.T.M.** =	1,794.1	**Total =** 1,239.9 lbs	**R.M.=**	2,479.8

Resisting/Overturning Ratio = **1.38**

Vertical Loads used for Soil Pressure = 1,239.9 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.111	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

DESCRIPTION: SCREEN WALL

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing
Calculated Rebar Stress, fs = 8644.00 psi

Lap Splice length for #5 bar specified in this stem design segment (25.4.2.4a) =	25.00 in
Development length for #5 bar specified in this stem design segment =	12.00 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	6.39 in
As Provided =	0.2325 in2/ft
As Required =	0.1034 in2/ft

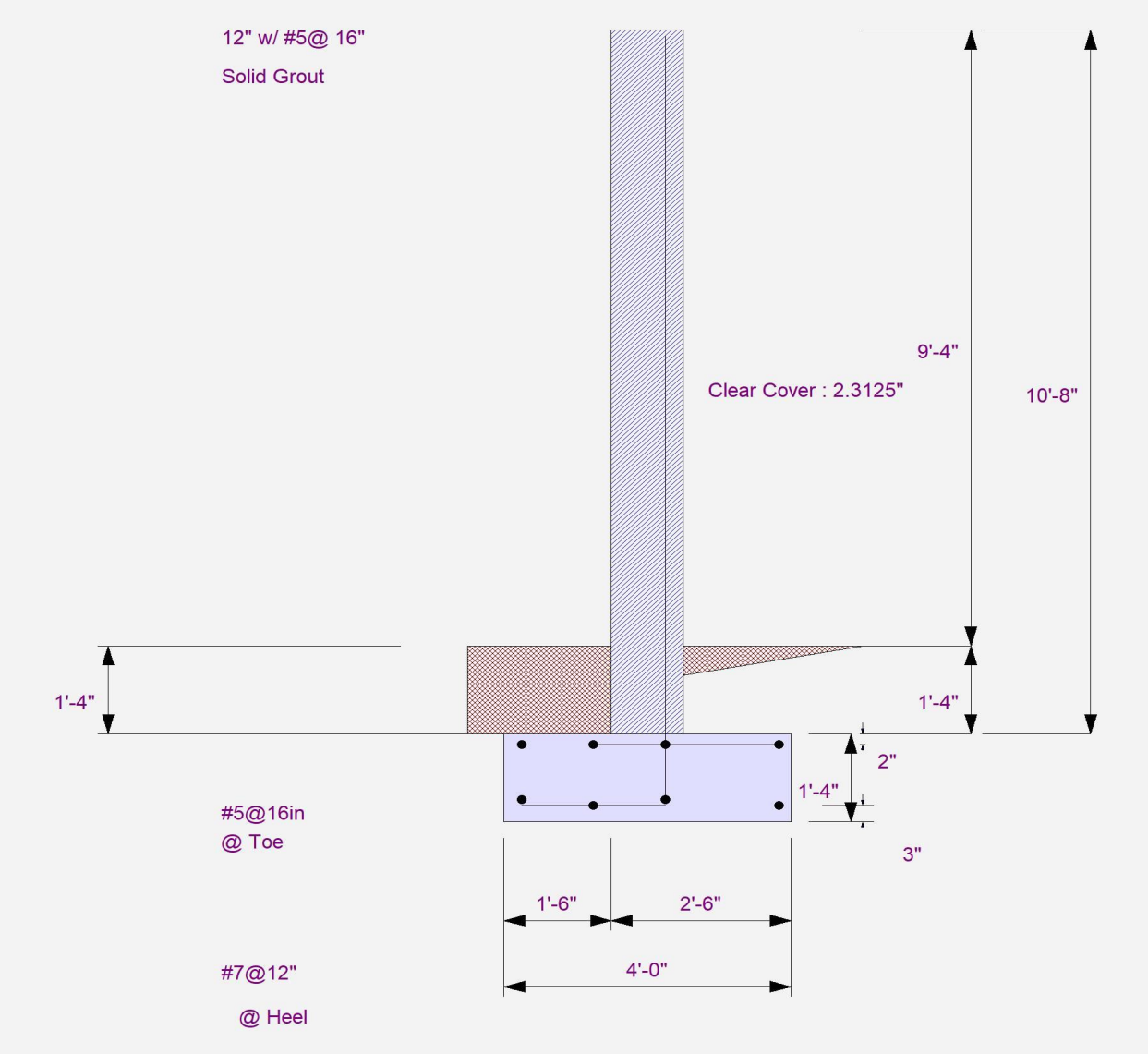
Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: SCREEN WALL



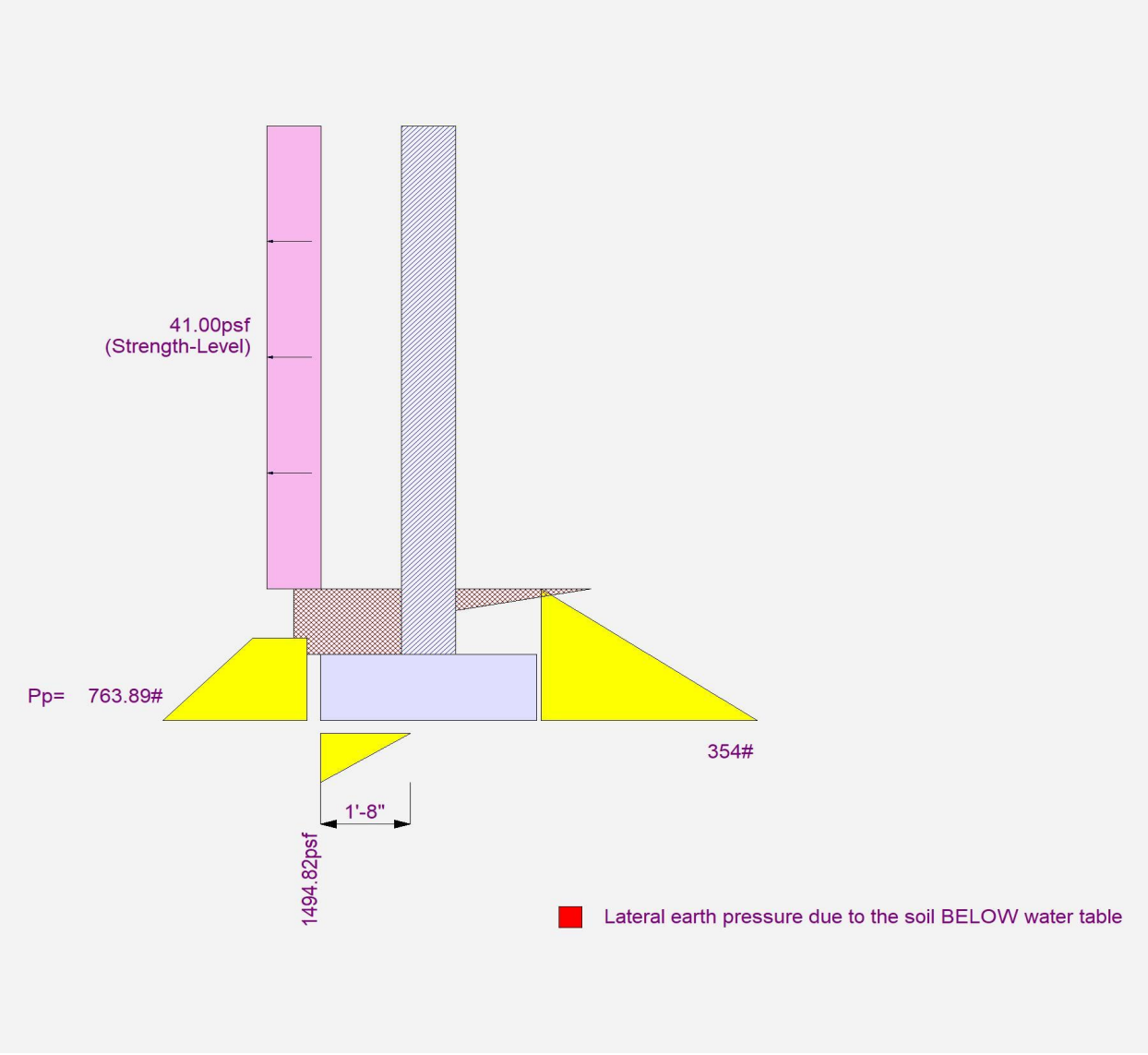
Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: SCREEN WALL



Cantilevered Retaining Wall

DESCRIPTION: Site Retaining Wall

Code Reference

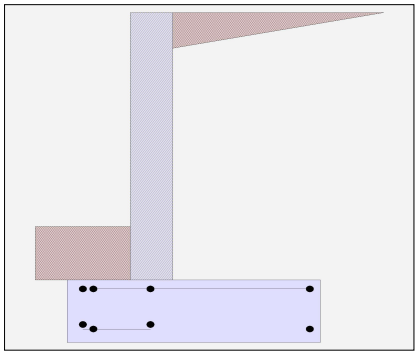
Calculations per IBC 2021 1807.3, ASCE 7-16

Criteria

Retained Height	=	5.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	12.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	100.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
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 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	50.0 psf

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		Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Cantilevered Retaining Wall

DESCRIPTION: Site Retaining Wall

Design Summary

Wall Stability Ratios			
Overturning	=	2.92	OK
Sliding	=	1.62	OK
Global Stability	=	3.16	
Total Bearing Load	=	2,327 lbs	
...resultant ecc.	=	4.51 in	
Eccentricity within middle third			
Soil Pressure @ Toe	=	909 psf	OK
Soil Pressure @ Heel	=	254 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,273 psf	
ACI Factored @ Heel	=	355 psf	
Footing Shear @ Toe	=	6.1 psi	OK
Footing Shear @ Heel	=	6.9 psi	OK
Allowable	=	82.2 psi	
Sliding Calcs			
Lateral Sliding Force	=	861.7 lbs	
less 100% Passive Force	-	461.8 lbs	
less 100% Friction Force	-	930.7 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

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

Load Factors

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

Stem Construction

		Bottom		
		Ratio > 1.0		
Design Height Above Ftg	ft =	0.00		
Wall Material Above "Ht"	=	Masonry		
Design Method	=	ASD	SD	SD
Thickness	=	8.00		
Rebar Size	=	# 5		
Rebar Spacing	=	24.00		
Rebar Placed at	=	Center		
Design Data				
fb/FB + fa/Fa	=	**1.262**		
Total Force @ Section				
Service Level	lbs =	596.6		
Strength Level	lbs =			
Moment....Actual				
Service Level	ft-# =	1,126.9		
Strength Level	ft-# =			
Moment.....Allowable	=	892.9		
Shear.....Actual				
Service Level	psi =	6.5		
Strength Level	psi =			
Shear.....Allowable	psi =	50.3		
Anet (Masonry)	in2 =	91.50		
Wall Weight	psf =	0.0		
Rebar Depth 'd'	in =	3.81		
Masonry Data				
f'm	psi =	2,000		
Fs	psi =	20,000		
Solid Grouting	=	Yes		
Modular Ratio 'n'	=	16.11		
Equiv. Solid Thick.	in =	7.63		
Masonry Block Type	=			
Masonry Design Method	=	ASD		
Concrete Data				
f'c	psi =			
Fy	psi =			

Cantilevered Retaining Wall

DESCRIPTION: Site Retaining Wall

Footing Data

Toe Width	=	1.00 ft
Heel Width	=	3.00
Total Footing Width	=	4.00
Footing Thickness	=	14.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 3,000 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0009
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	1,273	355 psf	
Mu' : Upward	=	598	1,453 ft-#	
Mu' : Downward	=	228	3,204 ft-#	
Mu: Design	=	370 OK	1,751 ft-#	OK
phiMn	=	7,349	10,399 ft-#	
Actual 1-Way Shear	=	6.13	6.88 psi	
Allow 1-Way Shear	=	82.16	82.16 psi	
Toe Reinforcing	=	# 5 @ 24.00 in		
Heel Reinforcing	=	# 4 @ 12.00 in		
Key Reinforcing	=	None Spec'd		
Footing Torsion, Tu	=	0.00 ft-lbs		
Footing Allow. Torsion, phi Tu	=	0.00 ft-lbs		

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 15.87 in, #5@ 24.60 in, #6@ 34.92 in, #7@ 47.61 in, #8@ 62.69 in, #9@ 79.36 in, #10@ 100.79 in

Heel: #4@ 15.87 in, #5@ 24.60 in, #6@ 34.92 in, #7@ 47.61 in, #8@ 62.69 in, #9@ 79.36 in, #10@ 100.79 in

Key: No key defined

Min footing T&S reinf Area	1.21	in2
Min footing T&S reinf Area per foot	0.30	in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 7.94 in	#4@ 15.87 in
#5@ 12.30 in	#5@ 24.60 in
#6@ 17.46 in	#6@ 34.92 in

Cantilevered Retaining Wall

DESCRIPTION: Site Retaining Wall

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		665.5	2.06	1,367.9	Soil Over HL (ab. water tbl)	1,283.3	2.83	3,636.1
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		2.83	3,636.1
Hydrostatic Force					Water Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=	196.2	3.08	605.0	Surcharge Over Heel	= 233.3	2.83	661.1
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	=		6.17		Soil Over Toe	= 110.0	0.50	55.0
	=				Surcharge Over Toe	=		
					Stem Weight(s)	=		
					Earth @ Stem Transitions	=		
					Footing Weight	= 700.0	2.00	1,400.0
					Key Weight	=		
					Vert. Component	=		
Total	=	861.7	**O.T.M.** =	1,972.9	**Total =**	2,326.7 lbs	**R.M.=**	5,752.2

Resisting/Overturning Ratio = **2.92**

Vertical Loads used for Soil Pressure = 2,326.7 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.032	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

DESCRIPTION: Site Retaining Wall

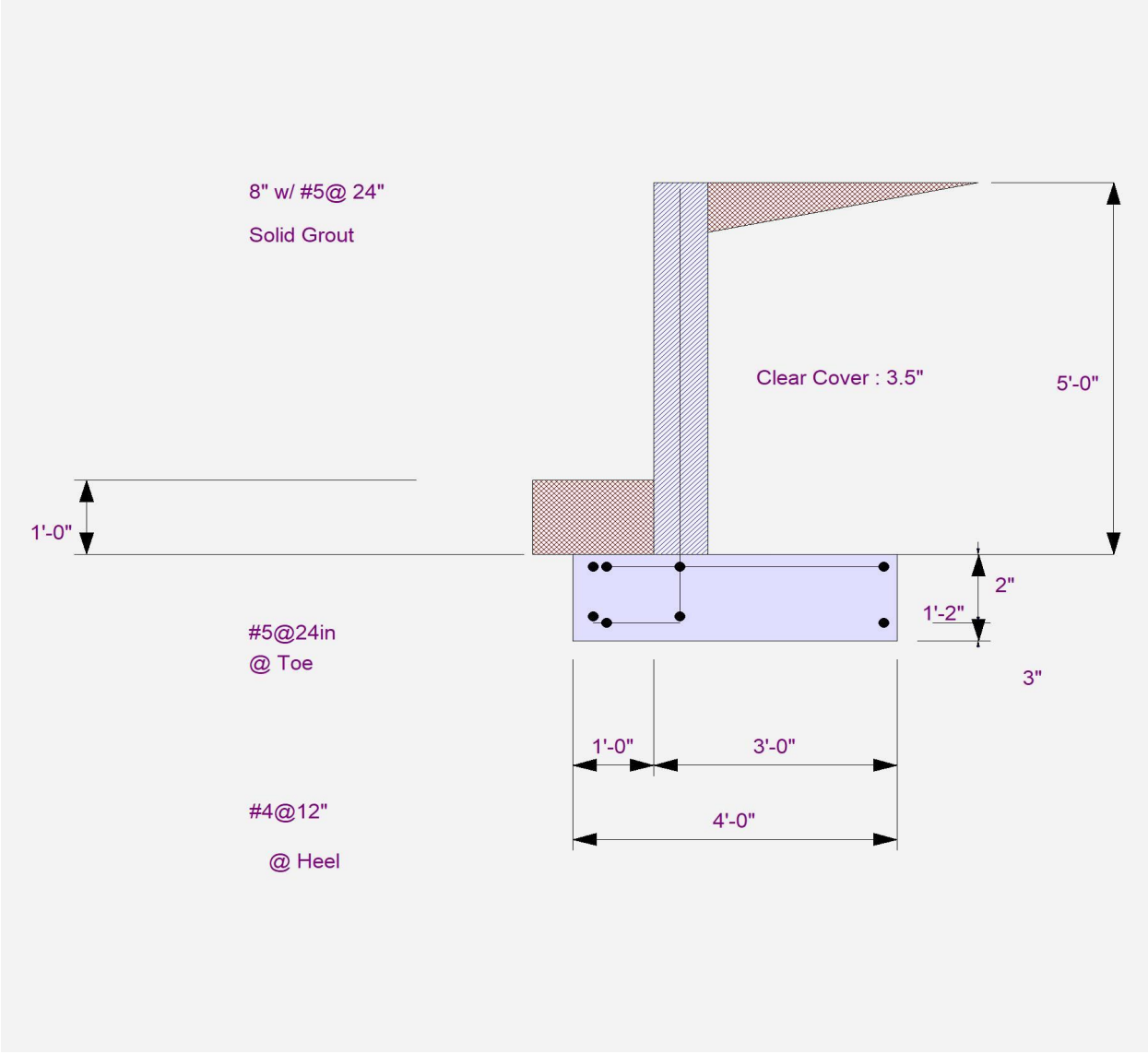
Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing
Calculated Rebar Stress, fs = 25241.96 psi

Lap Splice length for #5 bar specified in this stem design segment (25.4.2.4a) =	47.33 in
Development length for #5 bar specified in this stem design segment =	47.33 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	6.39 in
As Provided =	0.1550 in2/ft
As Required =	0.2005 in2/ft

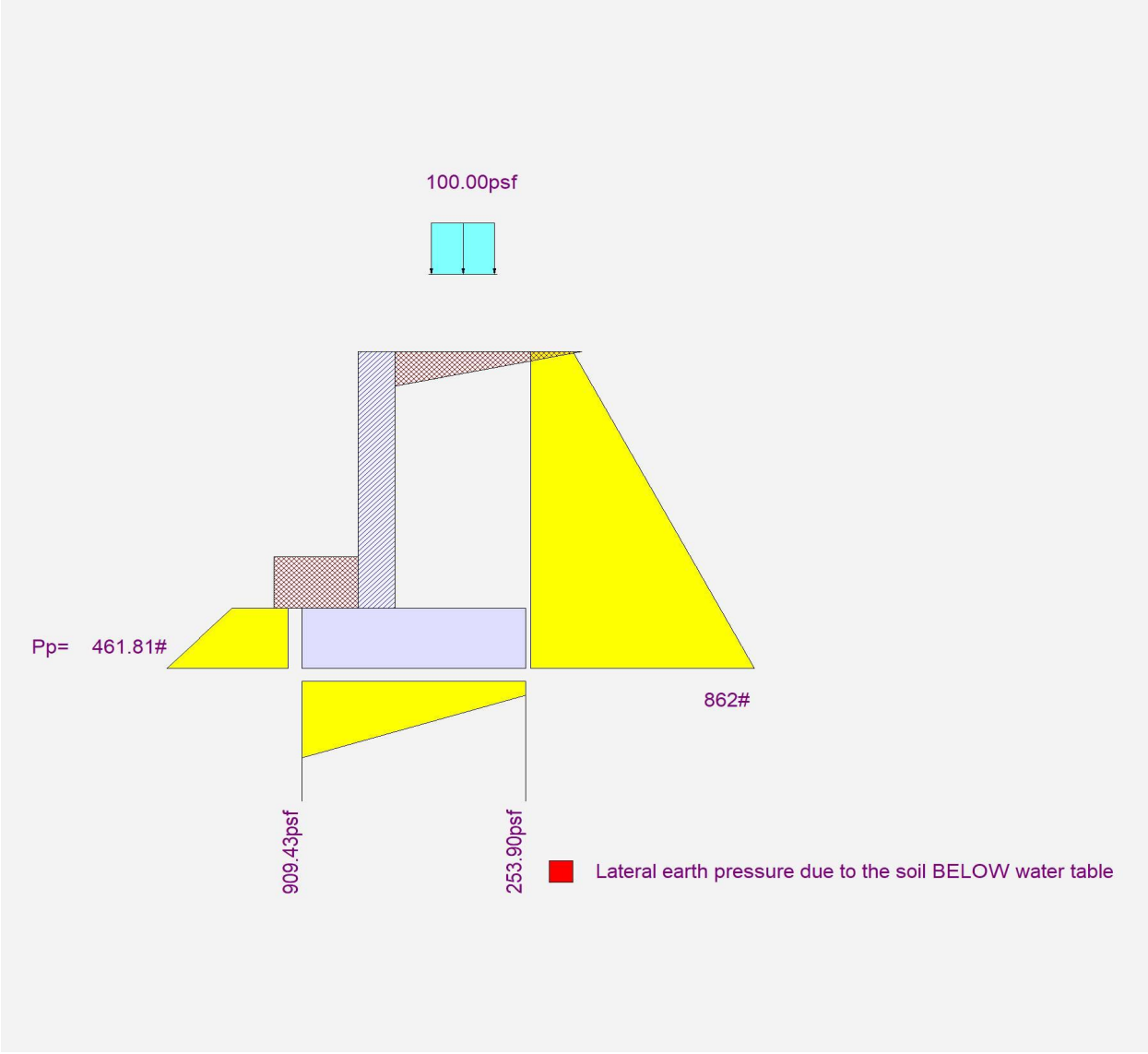
Cantilevered Retaining Wall

DESCRIPTION: Site Retaining Wall



Cantilevered Retaining Wall

DESCRIPTION: Site Retaining Wall



FOOTING DESIGN

Project Title:
Engineer:
Project ID:
Project Descr:

Wall Footing

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Wall Footing

Code References

Calculations per ACI 318-19, IBC 2021, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
AutoCalc Footing Weight as DL :		Yes

Soil Design Values

Allowable Soil Bearing	=	2.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

Reference Depth below Surface	=	ft
Allow. Pressure Increase per foot of depth	=	ksf
when base footing is below	=	ft

Increases based on footing Width

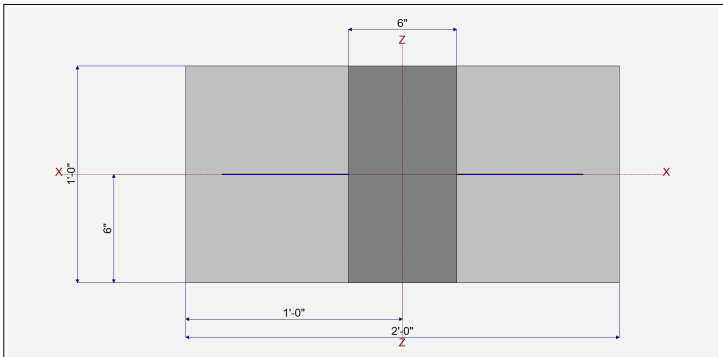
Allow. Pressure Increase per foot of width	=	ksf
when footing is wider than	=	ft

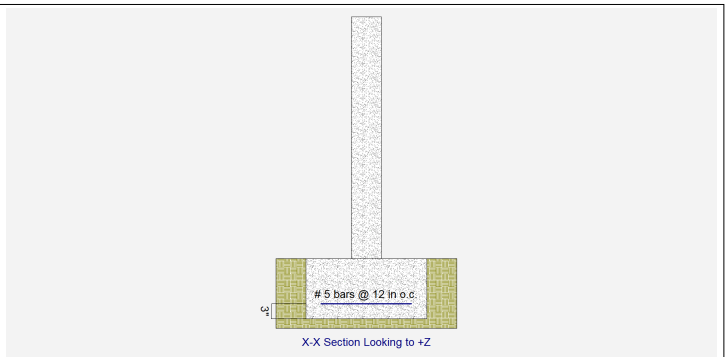
Adjusted Allowable Bearing Pressure = 2.50 ksf

Dimensions

Footing Width	=	2.0 ft	Footing Thickness	=	12.0 in	Bars along X-X Axis	
Wall Thickness	=	6.0 in	Rebar Centerline to Edge of Concrete...			Bar spacing	= 12.00
Wall center offset from center of footing	=	0 in	at Bottom of footing	=	3.0 in	Reinforcing Bar Size	= # 5

Reinforcing





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	2.60							k
OB : Overburden	=								ksf
V-x	=								k
M-zz	=								k-ft

Vx applied = in above top of footing

Project Title:
Engineer:
Project ID:
Project Descr:

Wall Footing

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: Wall Footing

DESIGN SUMMARY

Design OK

	Factor of Safety	Item	Applied	Capacity	Governing Load Combination
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	Uplift	0.0 k	0.0 k	No Uplift

	Utilization Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.5780	Soil Bearing	1.445 ksf	2.50 ksf	D Only
PASS	0.04690	Z Flexure (+X)	0.5690 k-ft	12.131 k-ft	+1.40D
PASS	0.03350	Z Flexure (-X)	0.4064 k-ft	12.131 k-ft	D Only
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

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Actual Soil Bearing Stress -X	Actual Soil Bearing Stress +X	Actual / Allowable Ratio
, D Only	2.50 ksf	0.0 in	1.445 ksf	1.445 ksf	0.578

Overturning Stability

Units : k-ft

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

Sliding Stability

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

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
, +1.40D	0.569	-X	Bottom	0.2592	Min Temp %	0.31	12.131	OK
, +1.40D	0.569	+X	Bottom	0.2592	Min Temp %	0.31	12.131	OK
, +1.20D	0.4877	-X	Bottom	0.2592	Min Temp %	0.31	12.131	OK
, +1.20D	0.4877	+X	Bottom	0.2592	Min Temp %	0.31	12.131	OK
, D Only	0.4064	-X	Bottom	0.2592	Min Temp %	0.31	12.131	OK
, D Only	0.4064	+X	Bottom	0.2592	Min Temp %	0.31	12.131	OK

One Way Shear

Units : k

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D	0 psi	0 psi	0 psi	82.158 psi	0	OK
D Only	0 psi	0 psi	0 psi	82.158 psi	0	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: F1

Code References

Calculations per ACI 318-19, IBC 2021, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

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

Soil Design Values

Allowable Soil Bearing	=	2.50	ksf
Soil Density	=	110.0	pcf
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	=	2.750	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

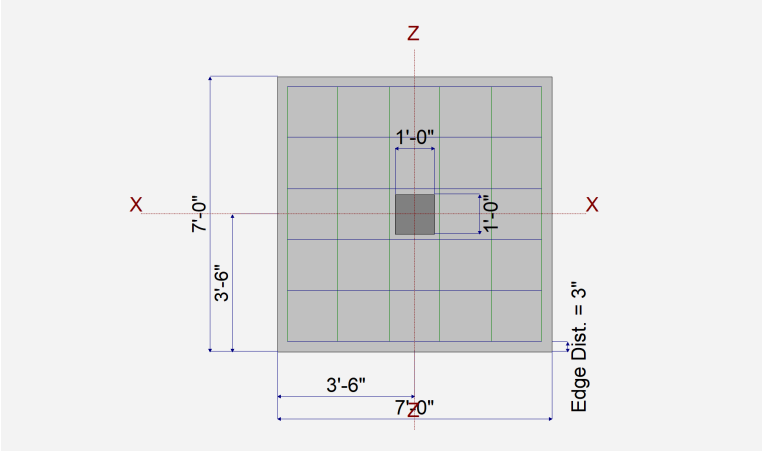
Width parallel to X-X Axis	=	7.0 ft
Length parallel to Z-Z Axis	=	7.0 ft
Footing Thickness	=	17.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	12.0 in
pz : parallel to Z-Z Axis	=	12.0 in
Height	=	0.10 in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



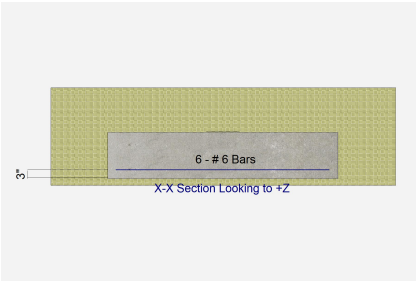
Reinforcing

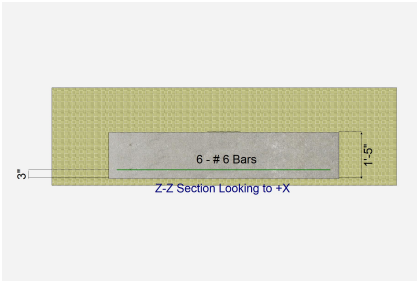
Bars parallel to X-X Axis			
Number of Bars	=		6.0
Reinforcing Bar Size	=	#	6
Bars parallel to Z-Z Axis			
Number of Bars	=		6.0
Reinforcing Bar Size	=	#	6

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	=	31.40	9.70	94.70					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: F1

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.8796	Soil Bearing	2.199 ksf	2.50 ksf	+D+0.250Lr+0.60L 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	0.5097	Z Flexure (+X)	11.790 k-ft/ft	23.132 k-ft/ft	+D+0.250Lr+L
PASS	0.5097	Z Flexure (-X)	11.790 k-ft/ft	23.132 k-ft/ft	+D+0.250Lr+L
PASS	0.5097	X Flexure (+Z)	11.790 k-ft/ft	23.132 k-ft/ft	+D+0.250Lr+L
PASS	0.5097	X Flexure (-Z)	11.790 k-ft/ft	23.132 k-ft/ft	+D+0.250Lr+L
PASS	0.3455	1-way Shear (+X)	28.383 psi	82.158 psi	+D+0.250Lr+L
PASS	0.3455	1-way Shear (-X)	28.383 psi	82.158 psi	+D+0.250Lr+L
PASS	0.3455	1-way Shear (+Z)	28.383 psi	82.158 psi	+D+0.250Lr+L
PASS	0.3455	1-way Shear (-Z)	28.383 psi	82.158 psi	+D+0.250Lr+L
PASS	0.4883	2-way Punching	80.236 psi	164.317 psi	+D+0.250Lr+L

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+Lr	2.50	n/a	0.0	1.188	1.188	n/a	n/a	0.475
X-X, +D+0.250Lr+0.60L	2.50	n/a	0.0	2.199	2.199	n/a	n/a	0.880
Z-Z, +D+Lr	2.50	0.0	n/a	n/a	n/a	1.188	1.188	0.475
Z-Z, +D+0.250Lr+0.60L	2.50	0.0	n/a	n/a	n/a	2.199	2.199	0.880

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	4.018	+Z	Bottom	0.3672	AsMin	0.3771	23.132	OK
X-X, +1.40D	4.018	-Z	Bottom	0.3672	AsMin	0.3771	23.132	OK
X-X, +1.20D+1.60Lr	4.870	+Z	Bottom	0.3672	AsMin	0.3771	23.132	OK
X-X, +1.20D+1.60Lr	4.870	-Z	Bottom	0.3672	AsMin	0.3771	23.132	OK
X-X, +D+0.250Lr+L	11.790	+Z	Bottom	0.3672	AsMin	0.3771	23.132	OK
X-X, +D+0.250Lr+L	11.790	-Z	Bottom	0.3672	AsMin	0.3771	23.132	OK
Z-Z, +1.40D	4.018	-X	Bottom	0.3672	AsMin	0.3771	23.132	OK
Z-Z, +1.40D	4.018	+X	Bottom	0.3672	AsMin	0.3771	23.132	OK
Z-Z, +1.20D+1.60Lr	4.870	-X	Bottom	0.3672	AsMin	0.3771	23.132	OK
Z-Z, +1.20D+1.60Lr	4.870	+X	Bottom	0.3672	AsMin	0.3771	23.132	OK
Z-Z, +D+0.250Lr+L	11.790	-X	Bottom	0.3672	AsMin	0.3771	23.132	OK
Z-Z, +D+0.250Lr+L	11.790	+X	Bottom	0.3672	AsMin	0.3771	23.132	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	9.67 psi	9.67 psi	9.67 psi	9.67 psi	9.67 psi	82.16 psi	0.12	OK
+1.20D+1.60Lr	11.72 psi	11.72 psi	11.72 psi	11.72 psi	11.72 psi	82.16 psi	0.14	OK
+D+0.250Lr+L	28.38 psi	28.38 psi	28.38 psi	28.38 psi	28.38 psi	82.16 psi	0.35	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: F1

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	27.35 psi	164.32 psi	0.1664	OK
+1.20D+1.60Lr	33.14 psi	164.32 psi	0.2017	OK
+D+0.250Lr+L	80.24 psi	164.32 psi	0.4883	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: F2

Code References

Calculations per ACI 318-19, IBC 2021, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

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

Soil Design Values

Allowable Soil Bearing	=	2.50	ksf
Soil Density	=	110.0	pcf
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	=	2.50	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

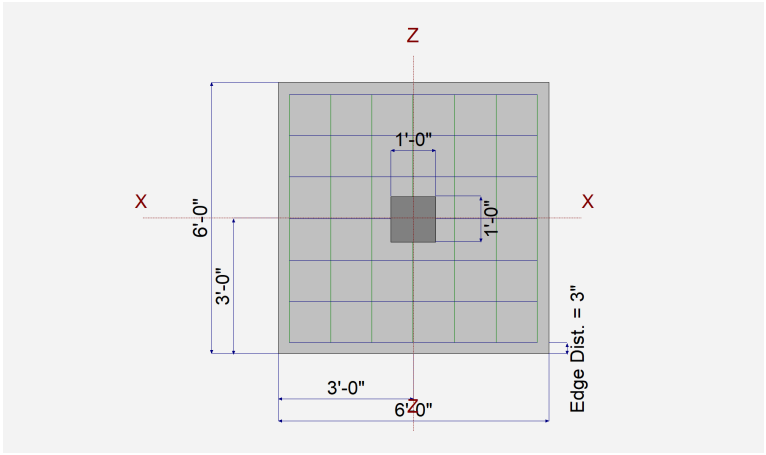
Width parallel to X-X Axis	=	6.0 ft
Length parallel to Z-Z Axis	=	6.0 ft
Footing Thickness	=	14.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	12.0 in
pz : parallel to Z-Z Axis	=	12.0 in
Height	=	0.10 in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in

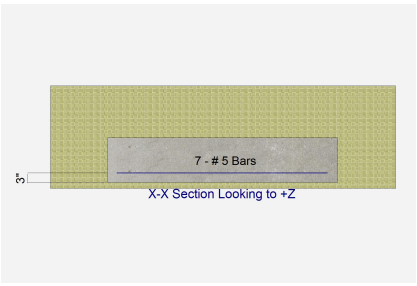


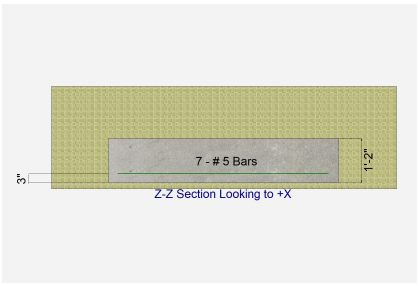
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		7.0
Reinforcing Bar Size	=	#	5
Bars parallel to Z-Z Axis			
Number of Bars	=		7.0
Reinforcing Bar Size	=	#	5

Bandwidth Distribution Check (ACI 15.4.4.2)

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





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	35.10	6.0	58.80					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: F2

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9232	Soil Bearing	2.308 ksf	2.50 ksf	+D+0.250Lr+0.60L 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	0.4772	Z Flexure (+X)	8.268 k-ft/ft	17.325 k-ft/ft	+D+0.250Lr+L
PASS	0.4772	Z Flexure (-X)	8.268 k-ft/ft	17.325 k-ft/ft	+D+0.250Lr+L
PASS	0.4772	X Flexure (+Z)	8.268 k-ft/ft	17.325 k-ft/ft	+D+0.250Lr+L
PASS	0.4772	X Flexure (-Z)	8.268 k-ft/ft	17.325 k-ft/ft	+D+0.250Lr+L
PASS	0.3806	1-way Shear (+X)	31.270 psi	82.158 psi	+D+0.250Lr+L
PASS	0.3806	1-way Shear (-X)	31.270 psi	82.158 psi	+D+0.250Lr+L
PASS	0.3806	1-way Shear (+Z)	31.270 psi	82.158 psi	+D+0.250Lr+L
PASS	0.3806	1-way Shear (-Z)	31.270 psi	82.158 psi	+D+0.250Lr+L
PASS	0.5142	2-way Punching	84.486 psi	164.317 psi	+D+0.250Lr+L

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+Lr	2.50	n/a	0.0	1.453	1.453	n/a	n/a	0.581
X-X, +D+0.250Lr+0.60L	2.50	n/a	0.0	2.308	2.308	n/a	n/a	0.923
Z-Z, +D+Lr	2.50	0.0	n/a	n/a	n/a	1.453	1.453	0.581
Z-Z, +D+0.250Lr+0.60L	2.50	0.0	n/a	n/a	n/a	2.308	2.308	0.923

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	4.248	+Z	Bottom	0.3024	AsMin	0.3617	17.325	OK
X-X, +1.40D	4.248	-Z	Bottom	0.3024	AsMin	0.3617	17.325	OK
X-X, +1.20D+1.60Lr	4.474	+Z	Bottom	0.3024	AsMin	0.3617	17.325	OK
X-X, +1.20D+1.60Lr	4.474	-Z	Bottom	0.3024	AsMin	0.3617	17.325	OK
X-X, +D+0.250Lr+L	8.268	+Z	Bottom	0.3024	AsMin	0.3617	17.325	OK
X-X, +D+0.250Lr+L	8.268	-Z	Bottom	0.3024	AsMin	0.3617	17.325	OK
Z-Z, +1.40D	4.248	-X	Bottom	0.3024	AsMin	0.3617	17.325	OK
Z-Z, +1.40D	4.248	+X	Bottom	0.3024	AsMin	0.3617	17.325	OK
Z-Z, +1.20D+1.60Lr	4.474	-X	Bottom	0.3024	AsMin	0.3617	17.325	OK
Z-Z, +1.20D+1.60Lr	4.474	+X	Bottom	0.3024	AsMin	0.3617	17.325	OK
Z-Z, +D+0.250Lr+L	8.268	-X	Bottom	0.3024	AsMin	0.3617	17.325	OK
Z-Z, +D+0.250Lr+L	8.268	+X	Bottom	0.3024	AsMin	0.3617	17.325	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	16.06 psi	16.06 psi	16.06 psi	16.06 psi	16.06 psi	82.16 psi	0.20	OK
+1.20D+1.60Lr	16.92 psi	16.92 psi	16.92 psi	16.92 psi	16.92 psi	82.16 psi	0.21	OK
+D+0.250Lr+L	31.27 psi	31.27 psi	31.27 psi	31.27 psi	31.27 psi	82.16 psi	0.38	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: F2

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	43.40 psi	164.32 psi	0.2641	OK
+1.20D+1.60Lr	45.72 psi	164.32 psi	0.2782	OK
+D+0.250Lr+L	84.49 psi	164.32 psi	0.5142	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: F3

Code References

Calculations per ACI 318-19, IBC 2021, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0	ksi
fy : Rebar Yield	=	60.0	ksi
Ec : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

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

Soil Design Values

Allowable Soil Bearing	=	2.50	ksf
Soil Density	=	110.0	pcf
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	=	2.420	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

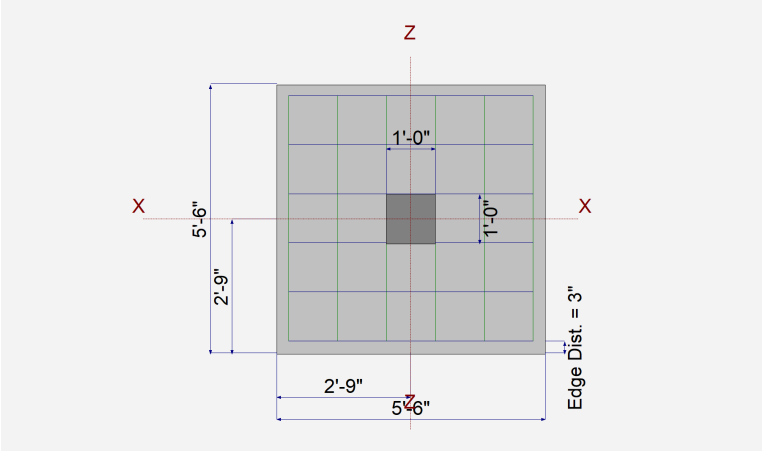
Width parallel to X-X Axis	=	5.50 ft
Length parallel to Z-Z Axis	=	5.50 ft
Footing Thickness	=	13.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	12.0 in
pz : parallel to Z-Z Axis	=	12.0 in
Height	=	0.10 in

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in

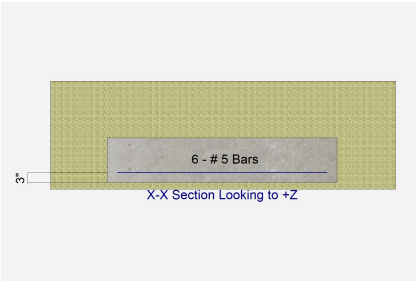


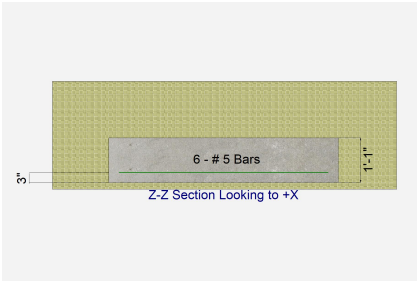
Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		6.0
Reinforcing Bar Size	=	#	5
Bars parallel to Z-Z Axis			
Number of Bars	=		6.0
Reinforcing Bar Size	=	#	5

Bandwidth Distribution Check (ACI 15.4.4.2)

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





Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	29.10	4.20	40.60					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

DESCRIPTION: F3

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.8404	Soil Bearing	2.101 ksf	2.50 ksf	+D+0.250Lr+0.60L 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	0.4015	Z Flexure (+X)	5.908 k-ft/ft	14.714 k-ft/ft	+D+0.250Lr+L
PASS	0.4015	Z Flexure (-X)	5.908 k-ft/ft	14.714 k-ft/ft	+D+0.250Lr+L
PASS	0.4015	X Flexure (+Z)	5.908 k-ft/ft	14.714 k-ft/ft	+D+0.250Lr+L
PASS	0.4015	X Flexure (-Z)	5.908 k-ft/ft	14.714 k-ft/ft	+D+0.250Lr+L
PASS	0.3385	1-way Shear (+X)	27.813 psi	82.158 psi	+D+0.250Lr+L
PASS	0.3385	1-way Shear (-X)	27.813 psi	82.158 psi	+D+0.250Lr+L
PASS	0.3385	1-way Shear (+Z)	27.813 psi	82.158 psi	+D+0.250Lr+L
PASS	0.3385	1-way Shear (-Z)	27.813 psi	82.158 psi	+D+0.250Lr+L
PASS	0.4318	2-way Punching	70.956 psi	164.317 psi	+D+0.250Lr+L

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+Lr	2.50	n/a	0.0	1.40	1.40	n/a	n/a	0.560
X-X, +D+0.250Lr+0.60L	2.50	n/a	0.0	2.101	2.101	n/a	n/a	0.840
Z-Z, +D+Lr	2.50	0.0	n/a	n/a	n/a	1.40	1.40	0.560
Z-Z, +D+0.250Lr+0.60L	2.50	0.0	n/a	n/a	n/a	2.101	2.101	0.840

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	3.392	+Z	Bottom	0.2808	AsMin	0.3382	14.714	OK
X-X, +1.40D	3.392	-Z	Bottom	0.2808	AsMin	0.3382	14.714	OK
X-X, +1.20D+1.60Lr	3.470	+Z	Bottom	0.2808	AsMin	0.3382	14.714	OK
X-X, +1.20D+1.60Lr	3.470	-Z	Bottom	0.2808	AsMin	0.3382	14.714	OK
X-X, +D+0.250Lr+L	5.908	+Z	Bottom	0.2808	AsMin	0.3382	14.714	OK
X-X, +D+0.250Lr+L	5.908	-Z	Bottom	0.2808	AsMin	0.3382	14.714	OK
Z-Z, +1.40D	3.392	-X	Bottom	0.2808	AsMin	0.3382	14.714	OK
Z-Z, +1.40D	3.392	+X	Bottom	0.2808	AsMin	0.3382	14.714	OK
Z-Z, +1.20D+1.60Lr	3.470	-X	Bottom	0.2808	AsMin	0.3382	14.714	OK
Z-Z, +1.20D+1.60Lr	3.470	+X	Bottom	0.2808	AsMin	0.3382	14.714	OK
Z-Z, +D+0.250Lr+L	5.908	-X	Bottom	0.2808	AsMin	0.3382	14.714	OK
Z-Z, +D+0.250Lr+L	5.908	+X	Bottom	0.2808	AsMin	0.3382	14.714	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	15.97 psi	15.97 psi	15.97 psi	15.97 psi	15.97 psi	82.16 psi	0.19	OK
+1.20D+1.60Lr	16.33 psi	16.33 psi	16.33 psi	16.33 psi	16.33 psi	82.16 psi	0.20	OK
+D+0.250Lr+L	27.81 psi	27.81 psi	27.81 psi	27.81 psi	27.81 psi	82.16 psi	0.34	OK

Project Title:
Engineer:
Project ID:
Project Descr:

General Footing

Project File: RDCJP23010.ec6

LIC# : KW-06015394, Build:20.23.07.20 PENNONI & ASSOCIATES, INC. (c) ENERCALC INC 1983-2023

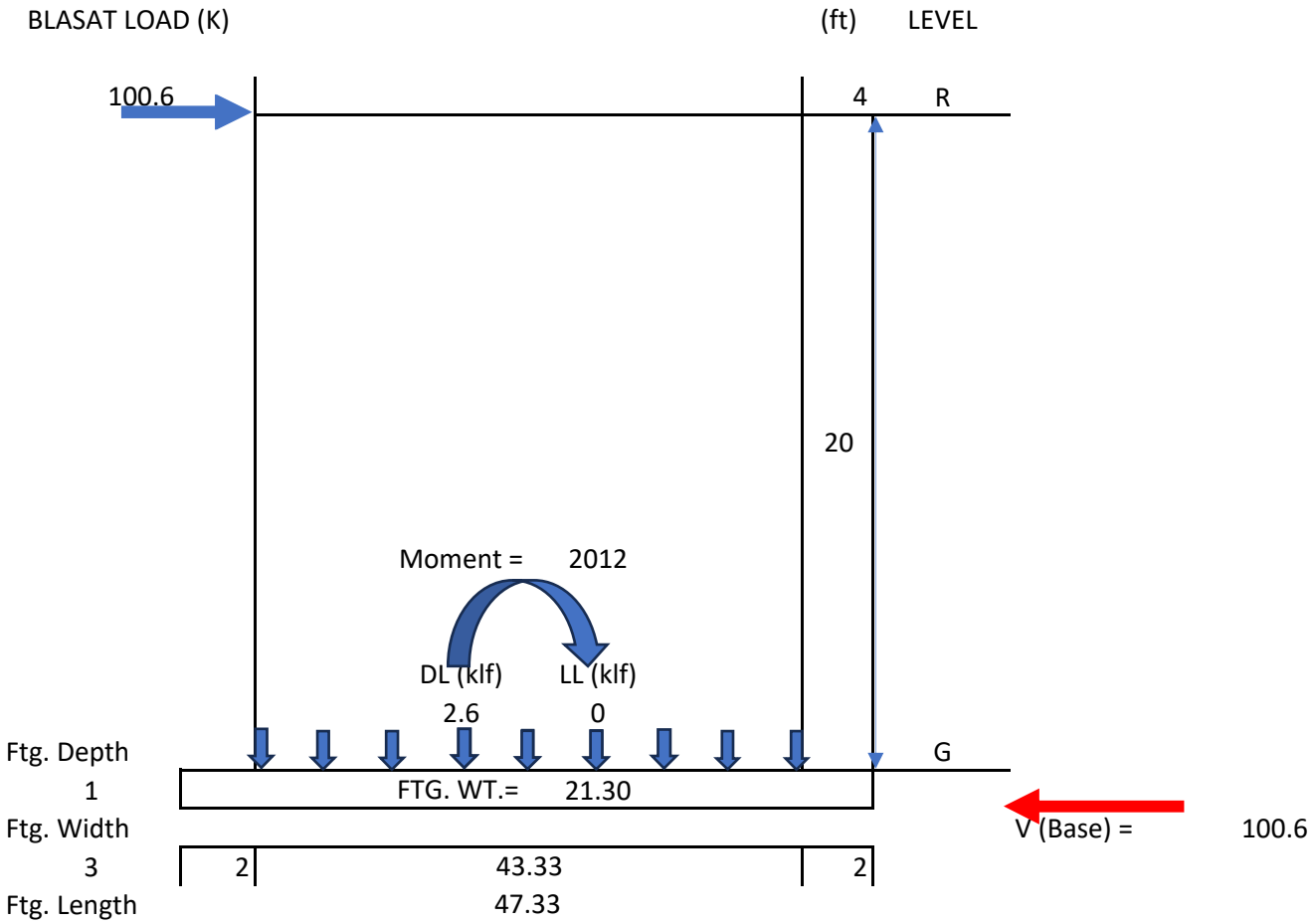
DESCRIPTION: F3

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	40.74 psi	164.32 psi	0.2479	OK
+1.20D+1.60Lr	41.67 psi	164.32 psi	0.2536	OK
+D+0.250Lr+L	70.96 psi	164.32 psi	0.4318	OK

(SW1) (Allowable Soil Bearing Capacity = 2.5 ksf)



PRESSURE: (1.0D+0.6B) Soil Bearing Pressure: 2.5 KSF

$$= \frac{133.96}{141.99} + \frac{7243.20}{6720.39}$$

$$= 0.94 + 1.08$$

$$= 2.02 \text{ ksf}$$ Y

Overturning: (0.88D+0.6W)

Moment (applied) =	1207.20	k*ft	
Moment (resisted) =	2850.15	k*ft	Y

SLIDING: (0.88D+0.6W)

Moment (applied) =	60.36	k*ft	
Moment (resisted) =	36.13	k*ft	N

BOT/STEEL: (1.0D+0.25L+1.0B)

$$= \frac{133.96}{141.99} + \frac{12072.00}{6720.39}$$

$$= 0.94 + 1.80$$

$$= 2.74 \text{ ksf}$$

CONNECTION DESIGN

RAM Connection **Pennoni**

Current Date: 2/25/2025 6:13 PM
Units system: English

Steel Connections Results

Connection: 1 - Pinned BP

Family:	Column - Base (CB)
Type:	Base plate
Description:	Column base

Design code: AISC 360-22 LRFD, ACI 318-08

Demands

Description	Pu [kip]	Mu22 [kip*ft]	Mu33 [kip*ft]	Vu2 [kip]	Vu3 [kip]	Load type
DL	-31.40	0.00	0.00	0.00	0.00	Design
LLr	-9.70	0.00	0.00	0.00	0.00	Design
B	-94.70	0.00	0.00	0.00	0.00	Design
D1	-43.96	0.00	0.00	0.00	0.00	Design
D2	-53.20	0.00	0.00	0.00	0.00	Design
D3	-128.53	0.00	0.00	0.00	0.00	Design

Design calculations

Design for major axis
Base plate (AISC 360-22 LRFD)

Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
Base plate						
Distance from anchor to edge	[in]	1.12	0.25	--	✔	
Weld size	[1/16in]	4	3	--	✔	table J2.4

Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Concrete base						
Axial bearing	[Kip/in2]	4.42	0.89	D3	**0.20**	DG1 3.1.1
Base plate						
Flexural yielding (bearing interface)	[Kip*ft/ft]	4.56	4.43	D3	**0.97**	DG1 Sec 3.1.2
Flexural yielding (tension interface)	[Kip*ft/ft]	4.56	0.00	DL	**0.00**	DG1 Eq. 3.3.13

Column						
Weld capacity	[Kip/ft]	100.23	0.00	DL	**0.00**	Sec. J2.4
Elastic method weld shear and axial capacity	[Kip/ft]	66.82	0.00	DL	**0.00**	Sec. J2.4
Ratio	**0.97**					

Anchors

Geometric Considerations

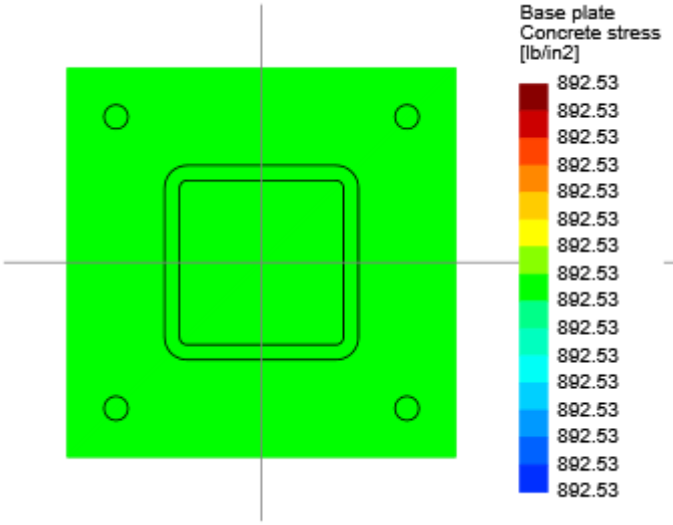
Dimensions	Unit	Value	Min.	Max.	Sta.	References
Anchors						
Anchor spacing	[in]	9.00	3.00	--	✔	Sec. D.8.1
Concrete cover	[in]	43.12	3.00	--	✔	Sec. 7.7.1
Effective length	[in]	12.49	--	23.51	✔	

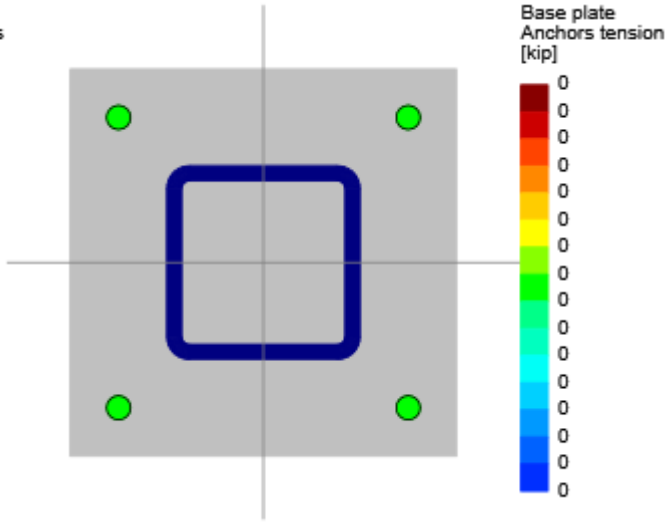
Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Anchor tension	[Kip]	14.55	0.00	DL	**0.00**	Eq. D-3
Breakout of anchor in tension	[Kip]	55.69	0.00	DL	**0.00**	Sec. D.4.1.1
Pullout of anchor in tension	[Kip]	20.51	0.00	DL	**0.00**	Sec. D.4.1.1
Anchor shear	[Kip]	7.57	0.00	DL	**0.00**	Eq. D-20
Breakout of anchor in shear	[Kip]	69.15	0.00	DL	**0.00**	Sec. D.4.1.1
Pryout of anchor in shear	[Kip]	111.38	0.00	DL	**0.00**	Sec. D.4.1.1
Ratio	**0.00**					
Global critical strength ratio	**0.97**					

Major axis

Maximum compression (D3)



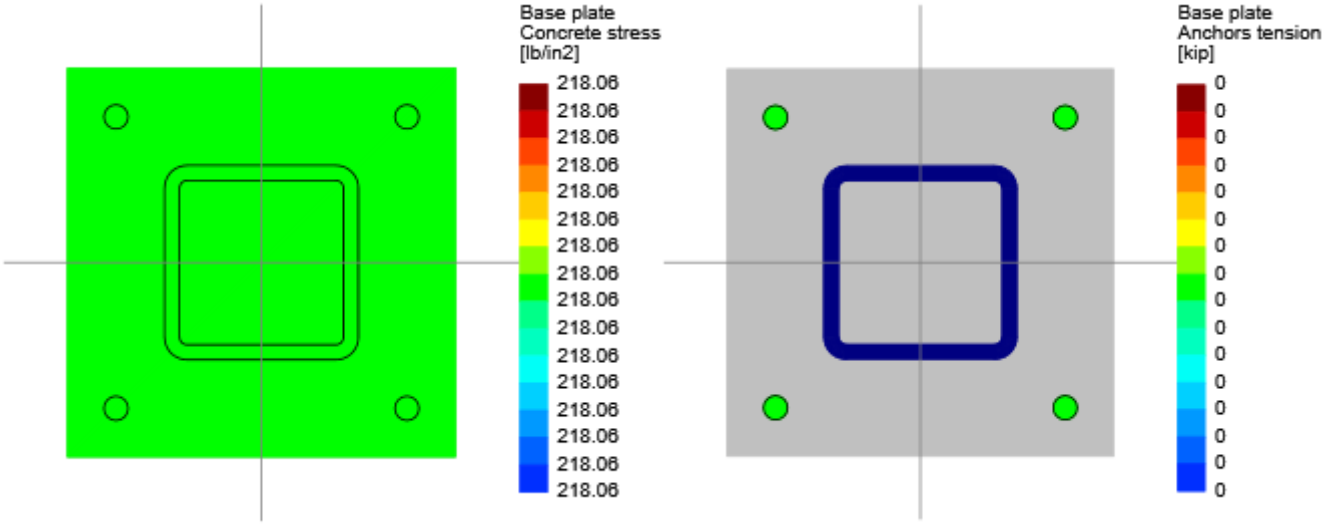


Maximum bearing pressure	892.53	[lb/in2]
Minimum bearing pressure	892.53	[lb/in2]
Maximum anchor tension	0.00	[kip]
Minimum anchor tension	0.00	[kip]
Neutral axis angle	0.00	[deg]
Neutral axis location	1.2E31	[in]
Bearing length	12.00	[in]

Anchors tensions

Anchor	Transverse [in]	Longitudinal [in]	Shear [kip]	Tension [kip]
1	-4.50	-4.50	0.00	0.00
2	-4.50	4.50	0.00	0.00
3	4.50	4.50	0.00	0.00
4	4.50	-4.50	0.00	0.00

Maximum tension (DL)



Maximum bearing pressure	218.06	[lb/in2]
Minimum bearing pressure	218.06	[lb/in2]
Maximum anchor tension	0.00	[kip]
Minimum anchor tension	0.00	[kip]
Neutral axis angle	0.00	[deg]
Neutral axis location	1.2E31	[in]
Bearing length	12.00	[in]

Anchors tensions

Anchor	Transverse [in]	Longitudinal [in]	Shear [kip]	Tension [kip]
1	-4.50	-4.50	0.00	0.00
2	-4.50	4.50	0.00	0.00
3	4.50	4.50	0.00	0.00
4	4.50	-4.50	0.00	0.00

RAM Connection **Pennoni**

Current Date: 10/15/2025 3:05 PM
Units system: English
File name: U:\Accounts\RDCJP\RDCJP23010 - Gainesville VA EHRM Design Infrastruct\ANALYTICAL\CALCULATIONS\RAM Connection\Base Connection.rcnx

Steel Connections Results

Connection: 2 - Pinned BP

Family: Column - Base (CB)
Type: Base plate
Description: Column base

Design code: AISC 360-22 LRFD, ACI 318-08

Demands

Description	Pu [kip]	Mu22 [kip*ft]	Mu33 [kip*ft]	Vu2 [kip]	Vu3 [kip]	Load type
DL	-8.50	0.00	0.00	0.00	0.00	Design
LLr	-2.60	0.00	0.00	0.00	0.00	Design
B	-25.80	0.00	0.00	0.00	0.00	Design
D1	-11.90	0.00	0.00	0.00	0.00	Design
D2	-14.36	0.00	0.00	0.00	0.00	Design
D3	-34.95	0.00	0.00	0.00	0.00	Design
D4	-17.55	0.00	0.00	0.00	0.00	Design

Design calculations

Design for major axis
Base plate (AISC 360-22 LRFD)

Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
Base plate						
Distance from anchor to edge	[in]	1.12	0.25	--	✔	
Weld size	[1/16in]	4	3	--	✔	table J2.4

Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Concrete base						
Axial bearing	[Kip/in2]	4.42	0.56	D3	**0.13**	DG1 3.1.1
Base plate						
Flexural yielding (bearing interface)	[Kip*ft/ft]	4.56	1.09	D3	**0.24**	DG1 Sec 3.1.2
Flexural yielding (tension interface)	[Kip*ft/ft]	4.56	1.21	D3	**0.27**	DG1 Eq. 3.3.13

Column						
Weld capacity	[Kip/ft]	100.23	3.95	D3	**0.04**	HSS Manual p. 7-10
Elastic method weld shear and axial capacity	[Kip/ft]	66.82	0.00	DL	**0.00**	Sec. J2.4
Ratio	**0.27**					

Anchors

Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
Anchors						
Anchor spacing	[in]	9.00	3.00	--	✔	Sec. D.8.1
Concrete cover	[in]	43.12	3.00	--	✔	Sec. 7.7.1
Effective length	[in]	12.49	--	23.51	✔	

Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Anchor tension	[Kip]	14.55	1.65	D3	**0.11**	Eq. D-3
Breakout of anchor in tension	[Kip]	55.69	1.65	D3	**0.03**	Sec. D.4.1.1
Breakout of group of anchors in tension	[Kip]	64.06	1.83	D3	**0.03**	Sec. D.4.1.1
Pullout of anchor in tension	[Kip]	20.51	1.65	D3	**0.08**	Sec. D.4.1.1
Anchor shear	[Kip]	7.57	0.00	DL	**0.00**	Eq. D-20
Breakout of anchor in shear	[Kip]	69.15	0.00	DL	**0.00**	Sec. D.4.1.1
Pryout of anchor in shear	[Kip]	111.38	0.00	DL	**0.00**	Sec. D.4.1.1
Ratio	**0.11**					

Design for minor axis

Base plate (AISC 360-22 LRFD)

Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
Base plate						
Distance from anchor to edge	[in]	1.12	0.25	--	✔	
Weld size	[1/16in]	4	3	--	✔	table J2.4

Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Concrete base						
Axial bearing	[Kip/in2]	4.42	0.56	D3	**0.13**	DG1 3.1.1
Base plate						
Flexural yielding (bearing interface)	[Kip*ft/ft]	4.56	1.09	D3	**0.24**	DG1 Sec 3.1.2
Flexural yielding (tension interface)	[Kip*ft/ft]	4.56	1.21	D3	**0.27**	DG1 Eq. 3.3.13
Column						
Weld capacity	[Kip/ft]	100.23	3.95	D3	**0.04**	HSS Manual p. 7-10
Elastic method weld shear and axial capacity	[Kip/ft]	66.82	0.00	DL	**0.00**	Sec. J2.4

Ratio	0.27

Anchors

Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
Anchors						
Anchor spacing	[in]	9.00	3.00	--	✔	Sec. D.8.1
Concrete cover	[in]	43.12	3.00	--	✔	Sec. 7.7.1
Effective length	[in]	12.49	--	23.51	✔	

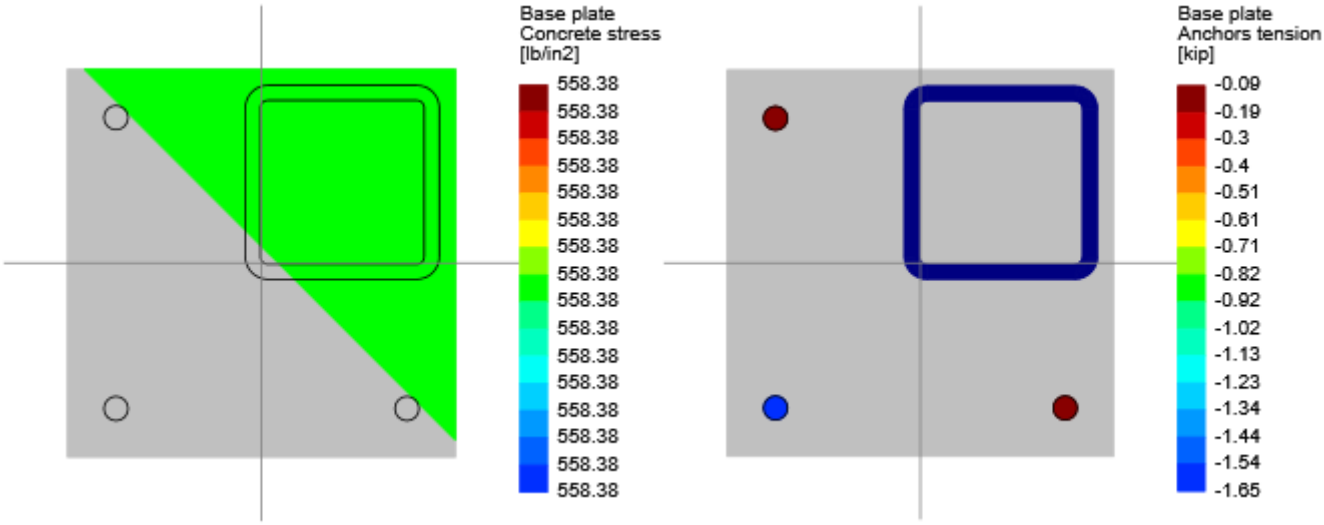
Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Anchor tension	[Kip]	14.55	1.65	D3	**0.11**	Eq. D-3
Breakout of anchor in tension	[Kip]	55.69	1.65	D3	**0.03**	Sec. D.4.1.1
Breakout of group of anchors in tension	[Kip]	64.06	1.83	D3	**0.03**	Sec. D.4.1.1
Pullout of anchor in tension	[Kip]	20.51	1.65	D3	**0.08**	Sec. D.4.1.1
Anchor shear	[Kip]	7.57	0.00	DL	**0.00**	Eq. D-20
Breakout of anchor in shear	[Kip]	69.15	0.00	DL	**0.00**	Sec. D.4.1.1
Pryout of anchor in shear	[Kip]	111.38	0.00	DL	**0.00**	Sec. D.4.1.1
Ratio	**0.11**					

Global critical strength ratio	**0.27**

Biaxial

Maximum compression and tension (D3)



Maximum bearing pressure	558.38	[lb/in2]
Minimum bearing pressure	558.38	[lb/in2]
Maximum anchor tension	1.65	[kip]
Minimum anchor tension	0.09	[kip]
Neutral axis angle	-45.00	[deg]
Neutral axis location	8.12	[in]

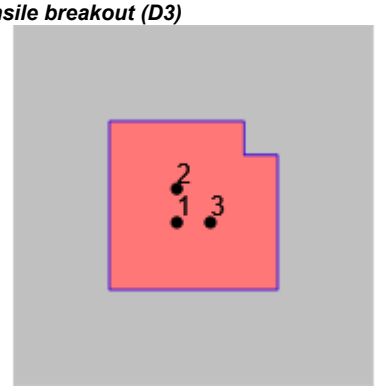
Bearing length	8.12	[in]

Anchors tensions

Anchor	Transverse [in]	Longitudinal [in]	Shear [kip]	Tension [kip]
1	-4.50	-4.50	0.00	1.65
2	-4.50	4.50	0.00	0.09
3	4.50	-4.50	0.00	0.09

Major axis

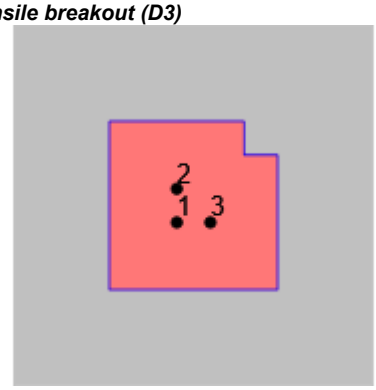
Results for tensile breakout (D3)



Group	Area [in2]	Tension [kip]	Anchors
1	1944.00	1.83	1, 2, 3

Minor axis

Results for tensile breakout (D3)



Group	Area [in2]	Tension [kip]	Anchors
1	1944.00	1.83	1, 2, 3

Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 3, 2025	Date:	2/3/2025
Fastening point:			

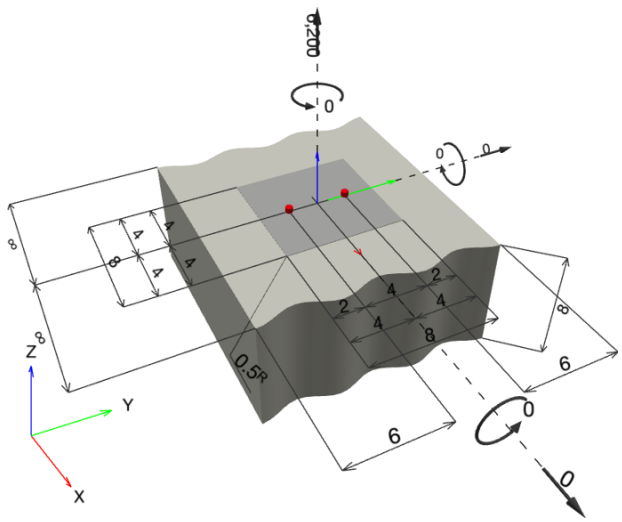
Specifier's comments:

1 Input data

Anchor type and diameter:	**AWS D1.1 GR. B 1/2**
Item number:	not available
Specification text:	∅ 1/2 in AWS D1.1 GR. B with 4 in nominal embedment depth per Technical data , cast in place installation per MPII
Effective embedment depth:	h_{ef} = 4.000 in.
Material:	
Evaluation Service Report:	Hilti Technical Data
Issued I Valid:	- | -
Proof:	Design Method ACI 318-19 / CIP
Shear edge breakout verification:	Row closest to edge (Case 3 only from ACI 318-19 Fig. R.17.7.2.1b)
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.500 in.
Anchor plate[R] :	l_x x l_y x t = 8.000 in. x 8.000 in. x 0.500 in.; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	uncracked concrete, 4000, f_c' = 4,000 psi; h = 8.000 in.
Reinforcement:	tension: not present, shear: not present; edge reinforcement: none or < No. 4 bar

[R] - The anchor calculation is based on a rigid anchor plate assumption.

Geometry [in.] & Loading [lb, in.lb]



Input data and results must be checked for conformity with the existing conditions and for plausibility!
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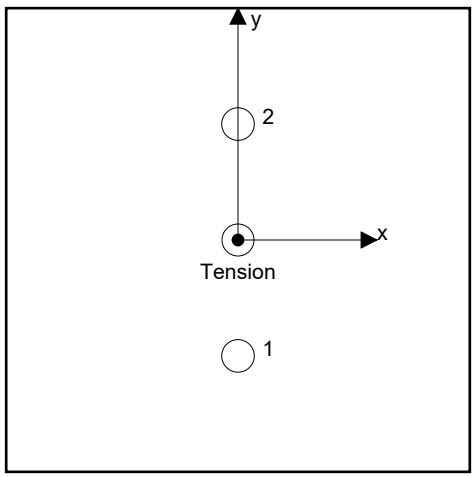
Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 3, 2025	Date:	2/3/2025
Fastening point:			

1.1 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
1	Combination 1	N = 6,200; V_x = 0; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	no	44

2 Load case/Resulting anchor forces



Anchor reactions [lb]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	3,100	0	0	0
2	3,100	0	0	0

Max. concrete compressive strain: - [‰]
Max. concrete compressive stress: - [psi]
Resulting tension force in (x/y)=(0.000/0.000): 6,200 [lb]
Resulting compression force in (x/y)=(-/-): 0 [lb]

Anchor forces are calculated based on the assumption of a rigid anchor plate.

3 Tension load

	Load N_{ua} [lb]	Capacity ϕ N_n [lb]	Utilization $\beta_N = N_{ua}/\phi$ N_n	Status
Steel Strength*	3,100	9,555	33	OK
Pullout Strength*	3,100	18,471	17	OK
Concrete Breakout Failure**	6,200	14,167	44	OK
Concrete Side-Face Blowout, direction **	N/A	N/A	N/A	N/A

* highest loaded anchor **anchor group (anchors in tension)

Input data and results must be checked for conformity with the existing conditions and for plausibility!
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Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 3, 2025	Date:	2/3/2025
Fastening point:			

3.1 Steel Strength

$N_{sa} = A_{se,N} f_{uta}$ ACI 318-19 Eq. (17.6.1.2)
$\phi N_{sa} \geq N_{ua}$ ACI 318-19 Table 17.5.2

Variables

$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
0.20	65,000

Calculations

N_{sa} [lb]
12,740

Results

N_{sa} [lb]	ϕ_{steel}	ϕN_{sa} [lb]	N_{ua} [lb]
12,740	0.750	9,555	3,100

3.2 Pullout Strength

$N_{pN} = \psi_{c,p} N_p$ ACI 318-19 Eq. (17.6.3.1)
$N_p = 8 A_{brg} f'_c$ ACI 318-19 Eq. (17.6.3.2.2a)
$\phi N_{pN} \geq N_{ua}$ ACI 318-19 Table 17.5.2

Variables

$\psi_{c,p}$	A_{brg} [in.^{2}]	λ_a	f'_c [psi]
1.400	0.59	1.000	4,000

Calculations

N_p [lb]
18,848

Results

N_{pn} [lb]	$\phi_{concrete}$	ϕN_{pn} [lb]	N_{ua} [lb]
26,387	0.700	18,471	3,100

Input data and results must be checked for conformity with the existing conditions and for plausibility!
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Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 3, 2025	Date:	2/3/2025
Fastening point:			

3.3 Concrete Breakout Failure

$N_{cbg} = \left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ec,N}\ \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b$ — ACI 318-19 Eq. (17.6.2.1b)

$\phi\ N_{cbg} \geq N_{ua}$ — ACI 318-19 Table 17.5.2

A_{Nc} see ACI 318-19, Section 17.6.2.1, Fig. R 17.6.2.1(b)

$A_{Nc0} = 9\ h_{ef}^2$ — ACI 318-19 Eq. (17.6.2.1.4)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2\ e'_N}{3\ h_{ef}}}\right) \leq 1.0$ — ACI 318-19 Eq. (17.6.2.3.1)

$\psi_{ed,N} = 0.7 + 0.3\left(\frac{c_{a,min}}{1.5h_{ef}}\right) \leq 1.0$ — ACI 318-19 Eq. (17.6.2.4.1b)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5h_{ef}}{c_{ac}}\right) \leq 1.0$ — ACI 318-19 Eq. (17.6.2.6.1b)

$N_b = k_c\ \lambda_a\ \sqrt{f'_c}\ h_{ef}^{1.5}$ — ACI 318-19 Eq. (17.6.2.2.1)

Variables

h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
4.000	0.000	0.000	6.000	1.250

c_{ac} [in.]	k_c	λ_a	f'_c [psi]
-	24	1.000	4,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
192.00	144.00	1.000	1.000	1.000	1.000	12,143

Results

N_{cbg} [lb]	$\phi_{concrete}$	$\phi\ N_{cbg}$ [lb]	N_{ua} [lb]
20,239	0.700	14,167	6,200

Input data and results must be checked for conformity with the existing conditions and for plausibility!
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Company:		Page:	5
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 3, 2025	Date:	2/3/2025
Fastening point:			

4 Shear load

	Load V_{ua} [lb]	Capacity ϕ V_n [lb]	Utilization $\beta_V = V_{ua}/\phi$ V_n	Status
Steel Strength*	N/A	N/A	N/A	N/A
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength*	N/A	N/A	N/A	N/A
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* highest loaded anchor **anchor group (relevant anchors)
When the input edge distance is set to "infinity", edge breakout verification is not performed in that direction

5 Warnings

- The anchor design methods in PROFIS Engineering require rigid anchor plates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Engineering calculates the minimum required anchor plate thickness with CBFEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid anchor plate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- The equations presented in this report are based on imperial units. When inputs are displayed in metric units, the user should be aware that the equations remain in their imperial format.
- Condition A applies where the potential concrete failure surfaces are crossed by supplementary reinforcement proportioned to tie the potential concrete failure prism into the structural member. Condition B applies where such supplementary reinforcement is not provided, or where pullout or pryout strength governs.
- For additional information about ACI 318 strength design provisions, please go to https://submittals.us.hilti.com/PROFISAnchorDesignGuide/

Fastening meets the design criteria!

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Company:		Page:	6
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Feb 3, 2025	Date:	2/3/2025
Fastening point:			

6 Installation data

Profile: no profile

Hole diameter in the fixture: d_f = 0.562 in.

Plate thickness (input): 0.500 in.

Recommended plate thickness: not calculated

Anchor type and diameter: AWS D1.1 GR. B 1/2

Item number: not available

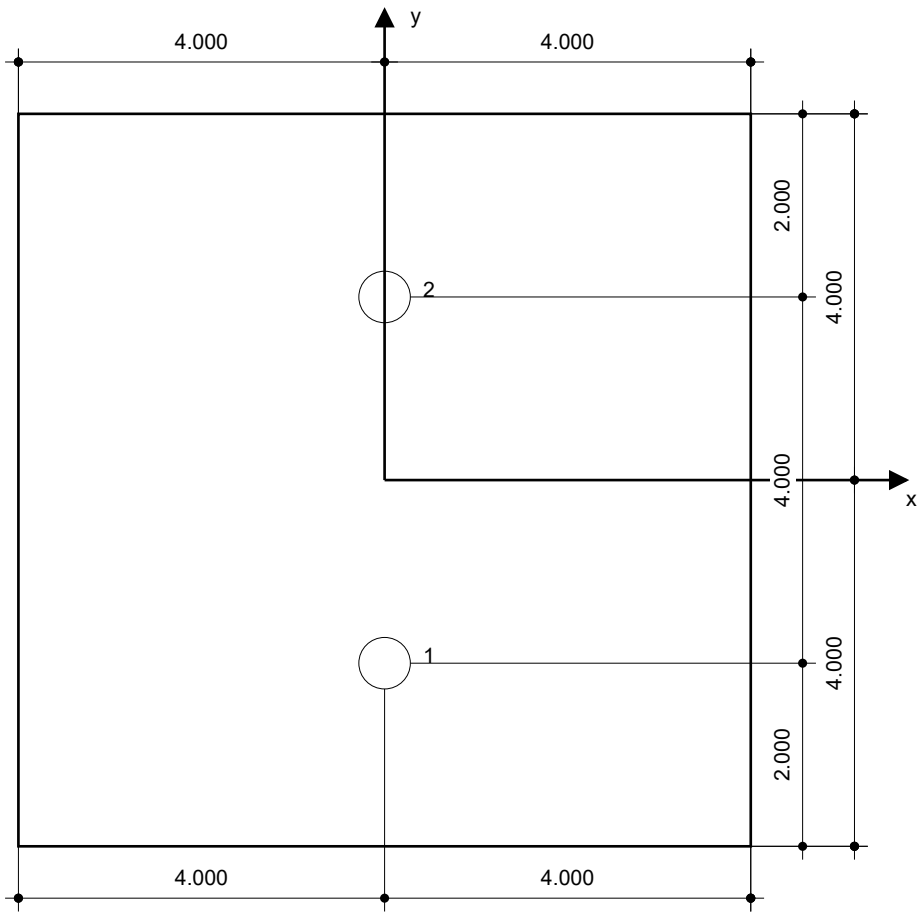
Maximum installation torque: -

Hole diameter in the base material: - in.

Hole depth in the base material: 4.000 in.

Minimum thickness of the base material: 4.813 in.

⌀ 1/2 in AWS D1.1 GR. B with 4 in nominal embedment depth per Technical data , cast in place installation per MPII



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	0.000	-2.000	-	-	6.000	10.000
2	0.000	2.000	-	-	10.000	6.000

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7 Remarks; Your Cooperation Duties

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2 PROJECT OVERVIEW

The scope of this project is to upgrade the facility infrastructure to support the new Electronic Health Record Modernization (EHRM) system in accordance with the VA OEHRM Site Infrastructure Requirements and Infrastructure Standard for Telecommunications Spaces V3.1. The detailed scope can be broken into four major components:

1. Project Coordination

This project will include coordination with design drawings from other concurrent projects on site to ensure the proper preparation for the EHRM system. Known projects include demolition of building T1B, construction of Administration Building 10, and the construction of a new Data Center.

2. Data Center

The new data center will be located in the current location of existing Trailer 11. Trailer 11 will be removed in its entirety to allow space for a new data center building to be constructed.

3. Redundant Fiber Optic Backbone

As part of this project, redundant fiber backbones will be run from the new data center to each telecom room on campus. The pathways will be diverse and as much as possible will not enter on the same side of the buildings.

4. Telecom Rooms

There are approximately 58 telecom rooms currently throughout all of the buildings on campus. These rooms have a variety of deficiencies from the OIT standards including space, HVAC, and power. The VA OEHRM Site Infrastructure Requirements and Infrastructure Standard for Telecommunications Spaces V3.1 requires a telecom room on every floor within a building.

As a part of this project, as many deficient telecom rooms as possible will be relocated to a room that is sized per the ISTS guidelines in proximity to the existing telecom room. Additionally, new telecom rooms will be created for floors and areas which are not presently served by a telecom room, or which are further than the 270’ distance limitation for station cable. It is understood that in some areas, it will not be possible to allocate space per the OIT guidelines. In those areas, the design team will work with the VA to maximize the space allocated, minimize cable distances, and apply for waivers. The design team will work with VA personnel to determine existing rooms and spaces that can be converted into telecom rooms.

4. Data Drops and Station Cable

As part of the EHRM upgrades, all existing VA network Cat 3, Cat 5, Cat 5e, and Cat 6 station cables will be upgraded to Cat6A. Existing POTS telephone, nurse call, access control, SSTV, PA, medical WAP, and all other systems cabling that is not VA network cabling, is not included in the cabling upgrade and is to remain as installed. Replacement of VA network cabling will involve replacing network data jacks throughout the campus with Cat6A compatible jacks, adding network data drops in offices and treatment areas which are presently missing them, and providing new station network cable from network patch panels to the data jacks. New cable pathways, including cable tray, conduit and j-hooks will be provided where possible in existing ceilings. Existing ceilings in buildings throughout campus are quite constricted and full of existing utilities. Wherever possible, existing pathways will be reused. Existing network Cat 6 cabling found during site investigations has been noted and replacement of this cable, with Cat 6A cabling, has been confirmed to be included in this project by the VA.

3 STRUCTURAL

3.1 Telecom Ductbank Penetrations

The telecom duct banks will penetrate the existing building foundation walls and/or slabs for buildings 1-Main Hospital and IT Addition, 11-Animal Research, 12-CLC, 14-Education Building, 20-Boiler Plant Building, 28-MRI Building, 29-Generator Building, 30-Fisher House, (3) Parking Garages, the tunnel north of Building 12, and trailers BT01A, BT02, BT03, BT04, BT05, BT06, BT07, BT08, BT09, and BT10, approximately (38) locations. Directions regarding the conditions at each penetration are provided on the structural site drawings. These are based on limited on site field exploration and original construction documentation. Limited information on the trailers is available and documentation provided for Trailer T2 was used as the basis for all trailers.

4 FIRE SUPPRESSION

4.1 General

The fire suppression scope for the project includes providing appropriate fire protection for the telecom rooms and for the data center as required. The data center will be a new building located in place of an existing trailer type building. The data center will be protected by an automatic sprinkler system and a clean agent gaseous extinguishing system per the VA Fire Protection Design Manual (VAFPDM) §6.3 and designed in accordance with NFPA 13, NFPA 75, NFPA 2001, and the VAFPDM.

4.2 Fire Suppression Systems

Sprinkler Systems

VA occupied buildings are required to have sprinkler protection in addition to the data center per the VAFPDM §6.1.B.1 and NFPA 13 §9.1.1. A wet pipe automatic sprinkler system in accordance with NFPA 13, except as indicated in the VA Fire Protection Design Manual, will be provided to protect all areas associated with this project. Existing automatic sprinkler systems will be reconfigured as required for the renovated and new telecom rooms. A new automatic sprinkler system will be installed for the new data center.

Sprinkler systems will be hydraulically calculated by the fire sprinkler contractor according to the VAFPDM §6.1.G by any design approach allowed by NFPA 13, except that the Special Design Approach shall not be used in health care. Pipe schedule systems shall not be used.

Fire flows shall be available as required by NFPA 13 for the required occupancy classification.

Sprinkler densities shall comply with NFPA 13 and VA specification section 21 13 13.

Sprinkler zones shall coincide with all smoke zone boundaries within healthcare occupancies.

Quick response Factory Mutual (FM) approved sprinklers shall be installed in all telecommunication rooms, except where specifically prohibited or noted elsewhere in the VAFPDM. Standard response, fusible link, FM approved, sprinklers are required in telecommunications spaces with an ANSI/TIA-942-B planned rating of 2 or 3 per the VAPDDM §6.1.K, Exception 6. Since the new data center is considered a Core Data Center according to the VA Infrastructure Standard for Telecommunication Spaces (VAISTS) §2.4, Table 3 and an ANSI/TIA-942-B planned rating of 3, standard response, fusible link, sprinklers will be used.

Clean Agent Gaseous Systems

The project includes fire suppression requirements for the new NFPA 75 compliant data center. In addition to the required wet pipe automatic sprinkler system serving the data center, a clean agent

gaseous extinguishing system is required to also be utilized. The clean agent system and required detection system shall be designed according to NFPA 75 and NFPA 2001.

Clean agent extinguishing media shall be one of the three approved VA clean agents: FM200 (HFC-227ea) (Halocarbon), Inergen (IG-541) (Inert Gas), and Novec 1230 (FK-5-1-12) (Halocarbon). The Environmental Protection Agency (EPA) is currently phasing down the use of FM200 which started January 1, 200 and 3M is voluntarily phasing out Novec 1230 by the end of 2025. Therefore, it is recommended that the new data center clean agent system use Inergen. Extinguishing concentrations for the hazard in the space which is defined as a Class C (energized electrical) hazard. The clean agent design concentrations are as follows according to VAFPDM §6.3.A: FM200: 9%; Inergen: 41.9%; Novec 1230: 6.1%.

The clean agent system shall be initiated by the Very Early Warning Fire Detection (VEWFD) system provided for this space.

The clean agent system shall have its own control / releasing panel. The system will be provided with abort switches and manual releases adjacent to the egress points. The system will discharge following a delay timer for either the VEWFD reaching the required threshold or someone initiating the manual release. Manual release switches are double-action and are unique in appearance to fire alarm manual pull stations. Abort switches are a dead-man type and will pause the release timer.

For local notification, the clean agent system will be provided with horn strobe devices. The horns will be silenced if the building fire alarm system is activated. The strobes shall remain active following a building fire alarm announcement. The horn/strobes will activate at the pre-alarm threshold of the VEWFD. The strobes will only activate if the manual release is initiated.

The enclosure will likely require some form of venting, which will be finalized in future stages of the design.

4.3 Applications

New Telecom Rooms

In spaces that are newly converted to telecom rooms, the existing sprinkler system will be modified to meet the telecom room requirements above. This will typically require removing existing ceiling-mounted pendants, providing a head layout that provides required coverage, installing new branch piping with upturned heads, and replacing quick action sprinkler head with standard response head with protective cages.

Existing Telecom Rooms

In existing telecom rooms, the existing sprinkler system can remain. Verify if any conditions are found that deviate from the OIT requirements listed above. In some cases, branch piping may need to be relocated to accommodate other utilities. Coordinate with telecom, mechanical and other disciplines.

Building 14 Telecom Room

Building 14 is currently not sprinklered. According to the Fire Protection Design Manual (section 3.7.C) fire sprinklers are not required if the building is not sprinklered. No fire sprinklers will be added to this area. All other life safety requirements shall be observed.

5 PLUMBING

PROJECT SCOPE

The scope of plumbing work for this project consists of rerouting existing piping where necessary to accommodate the new telecommunications rooms. Additionally, condensate from the fan coil units and other mechanical equipment generating cold water condensate will be collected and directed to the nearest storm water drainage system. Draining piping shall be sloped in accordance with the IPC Table 710.1 (1).

5.1 General

The scope of plumbing work for this project consists of connecting to the existing utilities currently serving Trailer 11. Piping shall be rerouted where necessary to accommodate the new data center. The new facility plumbing systems and fixtures will be designed to meet the requirements of the latest versions of the VA Plumbing Design Manual, the VA Physical Security and Resiliency Design Manual, the International Energy Conservation Code, and the International Plumbing Code. Routing piping in the data center server room shall be prohibited except for those systems serving the data center.

5.2 Domestic Water Service

A new 1-inch domestic cold-water main will be connected to the municipal water source to the data center. A new water entrance to the building will be provided with a new reduced pressure zone backflow preventer installed inside the mechanical room. Piping shall be copper tube, ASTM B88, Type K or L, drawn piping. Insulation shall be closed-cell foam molded insulation to maintain water temperatures outside the range for legionella growth (below 68°F).

VHA Directive 1061 for legionella prevention does not pertain to the data center as it is a non-medical building without sleeping quarters.

5.3 Domestic Hot Water

A point-of-use electric instantaneous water heater for HAC closet. Piping shall be copper tube, ASTM B88, Type K or L, drawn piping. Insulation shall be closed-cell foam molded insulation for energy efficiency.

5.4 Storm and Condensate

Storm drainage shall consist of downspouts along the north side of the roof. Overflow scuppers will be installed along the roof perimeter.

Condensate from all mechanical equipment generating cold water condensate will be collected and discharged to floor drains.

5.5 Sanitary Waste and Vent

Sanitary waste from all plumbing fixtures will be collected and discharged to a new 2" sanitary main serving the building. Connect to campus waste main with a double clean-out. Piping shall be cast iron no-hub with heavy-duty stainless-steel couplings. All cast iron piping shall conform to CISPI standards and bear the cast iron soil pipe institute markings.

5.6 Plumbing Fixtures

Provide a mop sink in the data center HAC. Floor drains will be installed in the data center mechanical room.

6 MECHANICAL

TELECOM ROOMS

Telecom rooms shall be designed as TR Class B spaces with a space temperature range from 61°F to 81°F dry-bulb, and relative humidity of 30 to 60% noncondensing. Environmental monitoring sensors shall be installed within 6' of any racks with active equipment. Continuous thermal load is assumed to not exceed 5 KW per rack or cabinet in accordance with the VA Infrastructure Standard for Telecommunications Spaces Version 3.1, two racks equal 7KW, three racks equal 8.5 KW, and four racks equal 10 KW. The thermostat shall be located on the opposite wall of the air conditioning unit per the VA Infrastructure Standard for Telecommunications Spaces Version 3.1 Design Guide.

Where possible, the telecom rooms will be served from the central air handler in the department with a dedicated VAV box. The local air distribution may need to be modified or rebalanced to provide the necessary CFM.

Where the central air handler does not have sufficient capacity, or the telecom room is not situated close enough to the mechanical room, a computer room air conditioning unit (CRAC) will be provided. The telecommunications room cooling systems will utilize a floor-mounted CRAC connected to the existing chilled water distribution system in the building or a remote DX condensing unit. The basis of design equipment manufacturer shall be Liebert DataMate. These systems will be equipped with integral controls, space temperature sensor, space humidity sensor, supply air temperature sensor, and auxiliary drain pan moisture sensor to be monitored for trending and alarm purposes at the central Engineering Control Center. Chilled water will be run from existing lines in the walls.

The schedules specify the 24 MBH (2-ton) model of the Liebert DataMate CRAC, because that is the smallest size offered for CRAC-style equipment. However, this unit, or equivalent submitted equipment, will have the turndown capability to match the load in smaller server rooms.

In certain rooms where there is not space along the perimeter for a floor-mounted unit, a minisplit unit or a suspended CRAC unit (Liebert Minimate or equivalent) will be provided. DX condensing units will be located on the nearest roof.

The VA HVAC Design Manual for OIT Satellite Telecommunications Room (TR) requires positive pressure room air balance. To maintain positive pressure, where a CRAC is installed, a wall-mounted supply grille will be provided from a terminal unit connected to the central air handling unit.

In building 28, a new room will be built for a telecom enclosure inside the cryogen storage room. A minisplit unit will be provided to cool and heat the space.

DATA CENTER

The data center shall be designed for a temperature range of 72°F to 81°F. Relative humidity shall be less than 60%, noncondensing.

Computational Fluid Dynamics (CFD) modeling was used for sizing. Two (2) identical computer room air conditioning units (CRAC) shall be provided at opposite ends of the data center sized for N+1 redundancy per the VA standards. They shall be installed on 24" floor stands. The CRAC units shall provide supply air at 72°F with a 20°F ΔT while maintaining rack inlet temperatures between 72°F and 81°F in computer rooms. Rack face inlet temperature shall be monitored using a three-sensor temperature average 2 inches from the IT equipment inlets per the VA Infrastructure Standard. The basis of design CRAC units shall be Liebert DS direct expansion cooling system.

Exhaust Air System

A ceiling-mounted exhaust fan will be provided to serve housekeeping aid closet.

Outside Air

Outdoor air ventilation quantities will be provided to meet the requirements of the VA HVAC design manual, ASHRAE 62.1, or the minimum amount of airflow required to maintain building pressure; whichever is greater. Outside air ductwork shall be routed from a roof hood to the air handling unit mixing box. Motorized dampers will be 24V actuators for the air handling outdoor ductwork. Motorized dampers shall open to outdoor air setpoint and shall close on unit shutdown.

Climatic and Room Design Conditions

The below conditions are from the VA HVAC Design Manual Climatic Data. Climatic conditions for Gainesville, Florida:

- Summer (cooling): 93.4°F dry-bulb (0.4% Cooling) / 76.4°F wet-bulb (0.4% Evaporation)
- Winter (heating): 29.6°F (99.6% Heating)

Air Distribution System Design Criteria for Support Spaces

- Supply Ductwork (Main / Upstream of Terminal Units):
    - Insulated single-wall ductwork
    - Material: Galvanized Steel
    - Sizing Criteria:
        - Max Velocity = 2,500 FPM
        - Max Pressure = 0.20 in. wc. / 100 ft.
- Supply Ductwork (Downstream of Terminal Units):
    - Insulated single wall ductwork
    - Material: Galvanized Steel
    - Sizing Criteria:
        - Max Velocity = 1,500 FPM

        - Max Pressure = 0.08 in. wc. / 100 ft.
- Return Ductwork:
    - Fully ducted from air handling unit to space.
    - Insulated single wall ductwork
    - Material: Galvanized Steel
    - Sizing Criteria:
        - Max Velocity = 1,500 FPM
        - Max Pressure = 0.08 in. wc. / 100 ft.
- Outside and Exhaust Ductwork:
    - Single wall ductwork
    - Material: Galvanized Steel
- Sizing Criteria:
    - Max Velocity = 1,500 FPM
    - Max Pressure = 0.08 in. wc. / 100 ft.

Generator Ventilation and Exhaust

The emergency generator is proposed to be located internal to the building and ventilation will be required for both non-operating and operating conditions. The electrical engineer is proposing a packaged unit, approximately 350kW in size, with a unit-mounted radiator.

- The manufacturers fan airflow rate for the unit mounted radiator is 15,400 CFM.
- The combustion air flow rate is approximately 1,165 CFM.
- The total air flow rate for operating conditions will be 15,400 CFM + 1,165 CFM, or 16,565 CFM.

The non-operating ventilation conditions of the space are defined in the HVAC Design Manual and are presented below for reference. Cooling and heating will be provided from a VAV box with electric reheat.

HVAC Design Manual May 1, 2023

NON PATIENT ROOMS - MISCELLANEOUS AREAS - ROOM DATA SHEET

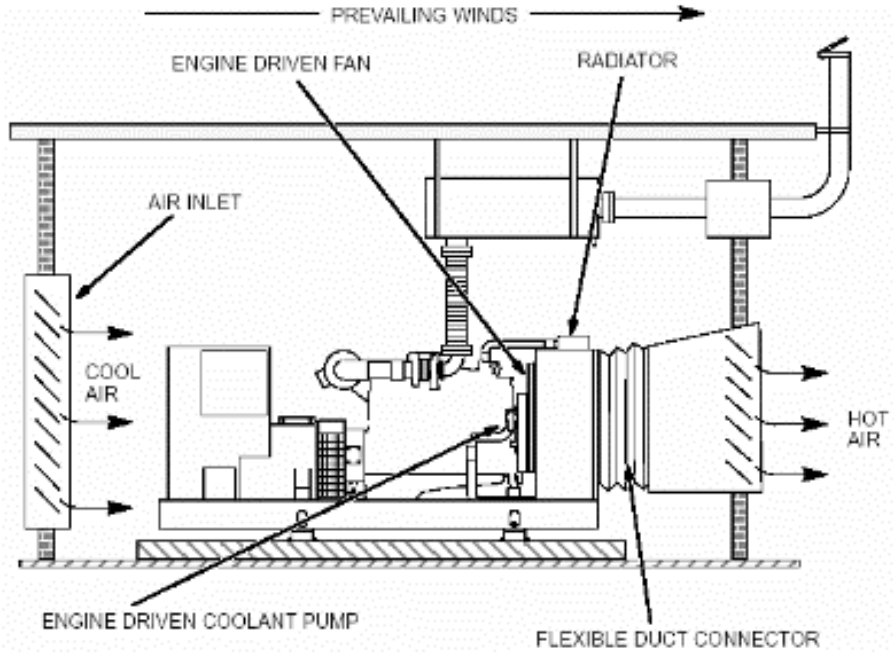
ROOM NAME	INDOOR TEMPERATURE				INDOOR RELATIVE HUMIDITY		MIN TOTAL ACH	MIN OA ACH	ROOM AIR	MAX NOISE LEVEL NC	ROOM AIR BALANCE	INDIVIDUAL ROOM CONTROL	
	COOLING		HEATING		% RH	% RH			RETURN EXHAUST G EXHAUST S			TEMP	FLOW
	F	C	F	C	MAX	MIN							
Standby Generator Room	80	29	40	18	NA	NA	4	NA	Return	NA	(o)	Yes	CV

Note 1 - Design Requirements
Design requirements listed above are for when the engine is not operating. During engine operation, exhaust air is required and room air balance is negative. During operation, room temperature shall not exceed maximum ambient temperature recommended by engine manufacturer.

During operation of the generator, the engine mounted radiator fan will provide all room and engine ventilation. This approach is consistent with packaged engine generator air-on-core temperature management when air movement is from alternator to radiator. The maximum permitted static pressure loss of the ductwork, dampers, louvers, etc. is 0.5 in H20 and is based on the BOD Kohler package.

In general, air intake and exhaust will be blast-rated wall louvers, compliant with PSRDM standards. Per the owner's direction, no sound attenuation will be provided at the generator louvers.

Air will then travel across the engine block and into the radiator. The fan will discharge (exhaust) through the exhaust louver. The intake and discharge will be located on opposite faces of the building to prevent exhaust recirculation.



Emergency Generator System – Fuel Systems

Fuel will be stored in an above ground fuel tank in the generator room. The 300-gallon tank was selected because it is the largest that can practically fit in the room. A minimum of 8 hours of power is required by the owner. A 350 kW diesel generator will consume approximately 26.5 gallons per hour. (The usable capacity is between 90% full and the minimum fill level.)

A fuel fill station with pumps will be installed on the exterior of the building.

Piping for the fuel system will be a double-wall, class 'a', drainable, dryable, testable, system with steel conduit. A supply, return, and overflow piping will be provided in a single conduit. The piping will be routed underground, from the fill station to the engine room tank. The piping is estimated, based on Ultra-low Sulphur Diesel (ULSD), will be a 1-inch supply, 1-inch return, and a 1-1/2-inch overflow.

7 ELECTRICAL

TELECOM ROOMS

ELECTRICAL DISTRIBUTION:

Normal and critical power branch circuits will be supplied to serve each telecom room, as directed by the station Electric Shop. Each network rack in all telecom rooms shall be provided with a 5KW, rack mounted UPS to serve the A side (critical power).

Each network rack in all telecom rooms, regardless of total rack quantity in the TR, shall be provided with two (2) rack mounted vertical PDUs. A Side (UPS power) PDU shall be grey in color and B Side PDU shall be Black (normal Power) in color.

Power Distribution will be per OIT IS Appendix B Sheets 23 and 24 depending on configuration with some site specific modifications.

It should be noted that due to distribution limitations within the Gainesville VAMC deviations from the above, which aligns with national standards, may occur and have been discussed with HEFP and the station.

All grounding will comply with ANSI/NECA/BICSI 607-D. Each telecom room shall be equipped with a telecommunications ground bar, connected to the building grounding system through the Telecommunication Bonding Backbone. Rack busbars shall be bonded to the busbar within the telecommunications space using a Telecommunications Equipment Bonding Conductor (TEBC). This will be a minimum size of #6 AWG.

SHORT CIRCUIT, COORDINATION AND VOLTAGE DROP:

Above Group currently utilizes “SKM” Power System Analysis Software for short circuit calculations, coordination of overcurrent protection, and voltage drop calculations required during design. These calculations will be provided at upcoming review submissions. All power distribution will be properly sized for short circuit fault conditions. All breakers will be fully coordinated (to 0.1 seconds in accordance with NEC 517 and NFPA 99) to allow proper tripping progression.

WIRING CONFIGURATIONS AND METHODS:

In general, the basis of design for all building feeder and branch circuit wiring shall be installed in metal non-flexible raceway systems with copper wiring within, excluding lighting fixture whips and connection to vibrating equipment. All branch circuit wiring shall be installed overhead with specific applications permitted for in-slab installation, i.e., floor boxes. All fittings shall be compression type; set screw fittings are not acceptable.

Type MC cable is not acceptable for use.

MISCELLANEOUS BRANCH POWER REQUIREMENTS:

Receptacles - Layouts will be provided which will comply with NFPA-70, and will meet the needs of all end-user requirements. Receptacle devices will be ivory, 20 amp. Lighting devices will be ivory. Each wiring device (light switches and receptacles) will have stainless steel engraved cover plates (via laser etching) to indicate the circuit and panel from which it is served. Receptacles shall be mounted with ground pin in the up position.

Occupancy control for receptacles will not be provided.

Branch circuiting for receptacles shall comply with the more stringent requirements of either NFPA 70 (National Electrical Code) or VA PG 18-10. No more than six receptacles shall be installed on a single branch circuit for general use.

Wet or damp areas will have ground fault protection type devices. Devices subject to intrusion of water or where located on the exterior of the building will have weatherproof "in use" covers and shall be listed as weather resistant devices.

Direct connections to equipment will be provided when specifically required by the manufacturer. Flexible connections will be provided for rotation or vibrating equipment.

Feeders and branch circuits shall be sized so that branch circuit voltage drop is limited to 3% and feeder circuit voltage drop is limited to 2% at full load. All 120V circuits shall be supplied with dedicated neutrals.

EQUIPMENT REQUIREMENTS:

Fusible and non-fusible safety switches shall be heavy duty type.

LIGHTING:

Lighting shall be provided throughout telecommunications spaces. General area lighting will be designed with LED sources. General area lighting will operate at 120 volts. Luminaires will have a CCT of 3500 degrees Kelvin and a minimum CRI of 80.

The lighting will be designed in accordance with the VA's Lighting Design Manual and will achieve the minimum lighting levels listed therein.

LIGHTING CONTROLS:

Occupancy/vacancy dual technology sensors with Manual-ON functionality in all telecom rooms will be provided. These sensors will be integrated into wall mounted switches.

CONTRACT SPECIFICATIONS AND DRAWINGS:

All articles, products, materials, fixtures, forms or types of construction covered in the specifications will be required to meet or exceed all applicable standards of manufacture, testing, performance,

capabilities, procedures and installation according to the requirements of ANSI, NEMA, IEEE, and NEC referenced documents where indicated and the manufacturer's recommended practices.

LISTING BY AN ACCEPTED LISTING AGENCY:

All materials and equipment will be listed by an accepted listing agency as conforming to its standards in every case where such a standard has been established for that particular type of material or equipment.

MAINTENANCE AND OPERATING INSTRUCTIONS:

The contract documents will require that the electrical contractor prepare a complete manual of maintenance and operating instructions for delivery to the owner covering all electrical equipment and systems furnished and installed by him on the project, including a listing of local service representatives/contacts.

DATA CENTER

The data center will be construction in accordance with all VA TIL requirements including, but not limited to the standards listed below:

- PG-18-10, Design Manuals:
  - VA Electrical Design Manual
  - VA Lighting Design Manual
  - Infrastructure Standard for Telecom Spaces (ISTS)
  - Medium Data Center (within OIT Design Guide Template V3.1)
- PG-18-3, Design and Construction Procedures
- CAD: National CAD Standard, VHA Application Guide
- ANSI C2, National Electrical Safety Code
- IEEE 141, Recommended Practice for Electrical Power and Distribution for Industrial Plants
- IEEE 142, Recommended Practice for Grounding of Industrial and Commercial Power Systems
- NFPA 70, National Electrical Code
- IES Handbook, Illuminating Engineering Society Handbook

The new data center will be constructed in place of the existing trailer 11. All existing telecom, electrical, and fire alarm devices, conduit, and wiring will be removed in their entirety to accommodate this construction. Care must be taken to protect the surrounding utilities underground.

The VA requires N+1 facility power for Campus Support Centers. The new data center will meet this requirement with a new feed from the main hospital and generator power as described below:

It should be noted that all breakers shall be provided with visible trip windows. Basis of design is Square D or equal.

Based on the layout of the data center and actual usage load calculated Above Group has determined that, including a 15% growth factor, 80kW of UPS power is required for the data center. However, based on the BOD UPS system, a 100kW frame UPS was selected to allow for any future unknown growth and to achieve redundant N+1 hot swappable power units within the UPS. While the battery capacity of this UPS is 10 minutes at full load only 80kW at 10 minute run time will be specified on day 1.

Normal Service and Distribution

The normal, commercial service for the data center will originate from Electrical Room D089-1, Main Switchgear B (MSGR B) utilizing an existing space in the lineup section #10, Bucket #2. It should be noted this may be modified to a different bucket at the time of construction. This is a 480/277V, 3 phase, 4 wire line up and a new Square D, MasterPact MTZ, LSIG, fully adjustable power circuit breaker will be provided for this existing space. This breaker will be an 800-amp frame breaker that will be set at 800A trip. (3) new 4” Aluminum RMC conduits will be provided from this line up through the pipe basement of the main hospital, through a connector tunnel to the CLC, out of the tunnel to the new data center. Where the conduits are in direct contact with concrete, the earth, or other reactive surface the conduits

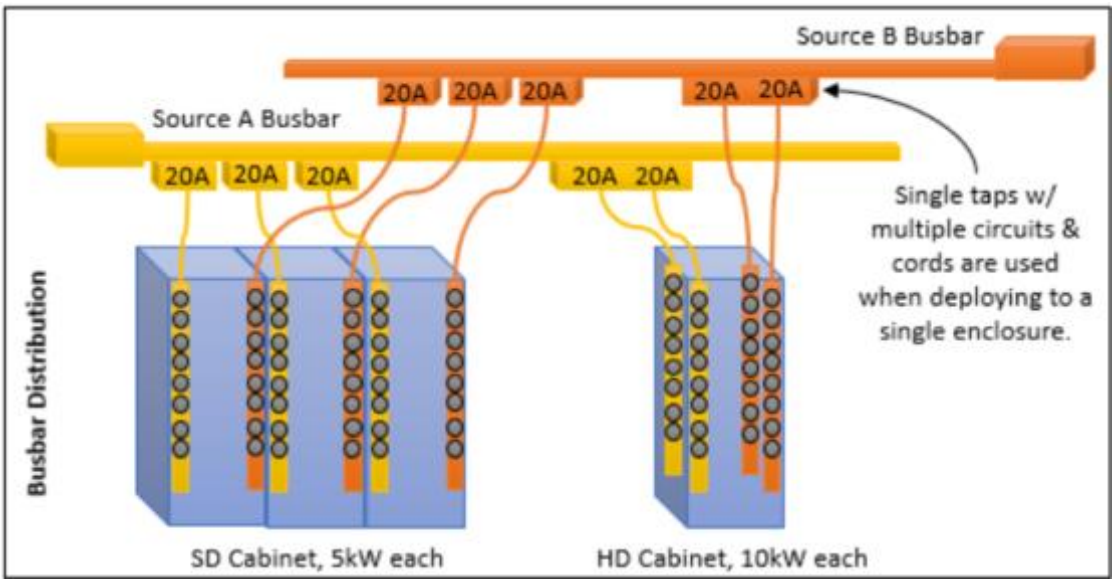
must be properly sleeved, taped, or transitioned using UL listed products such as 3M Vinyl Corrosion Tape. The distribution shall be as shown on the drawings. Emergency Service and Distribution

The new generator will be located indoors within the data center building. It will sit on a 4" house keeping pad with inertia base. The generator will be a diesel, 350kW, 480/277V, 4W, WYE generator with integral control panel. The generator (basis of design) shall be a Kohler 350REOZJC with 5M4027 alternator with 2200 peak starting KVA. The generator shall be provided with all additional accessories such as a battery charger with best battery selector, jacket heater, and onboard fuel oil pump. Refer to the mechanical portion of this narrative for description of the fuel oil system, cooling system, and muffler. This generator shall feed into the electrical distribution system per the drawings.

UPS Units and Data Center Cabinet Power Distribution

The VA requires a 2N UPS redundancy for data centers which will entail (2) modular UPS Systems. The UPS shall be dual conversion (inverter preferred), provided with a maintenance bypass cabinet, distribution cabinet . The UPS will be 100kVA, single input, 480V, 3 phase, 3W + Ground, input with a 208V, 3 phase, 4W output. The UPS shall have N+1 internal components in a modular, hot swappable, fashion. The batteries shall be provided with a BMS (battery management system). Battery system shall be VRLA. Basis of design is Eaton 93PM per VA TIL. Refer to overall note above regarding sizing.

The racks will be served via overhead electrical bus bars fed from each UPS distribution cabinets. Each row will have an 'A' and 'B' path fed from either UPS. Each rack/enclosure shall receive a single 20A bustap with a L21-20R receptacle from both the A bus and the B bus. Refer to the diagram below. The load shall be distributed so that each UPS is supporting only 50% of the load during normal operation. Bus shall be Starline or equal. Network racks and server enclosures will be provided with a rack grounding busbar.



SHORT CIRCUIT, COORDINATION AND VOLTAGE DROP:

Above Group currently utilizes “SKM” Power System Analysis Software for short circuit calculations, coordination of overcurrent protection, and voltage drop calculations required during design. These calculations will be provided at upcoming review submissions. All power distribution will be properly sized for short circuit fault conditions. All breakers will be fully coordinated (to 0.1 seconds in accordance with NEC 517 and NFPA 99) to allow proper tripping progression.

ELECTRICAL GROUNDING AND LIGHTNING PROTECTION REQUIREMENTS:

The building will be provided with a new grounding and lighting protection system. A new UL listed lightning protection system shall be provided on the exterior of the building.

All main distribution panels and the triple switch shall be provided with integral SPD units.

A new grounding electrode will be provided at the service entrance. However, as the building is fed from the main hospital the neutral and ground bus shall be isolated and not connected.

New main ground bars will be provided in the data center to accommodate the connection of the grounding and bonding system within the data center as described above.

8 COMMUNICATION

FIBER OPTIC CABLE

An “A core” path and “B core” path of fiber optic cable shall be provided from the data center to each telecom room. For interior only fiber routing, each core path will consist of a 24-strand OM4 and 12-strand OS1 fiber optic cable. Where routed outside buildings, each core path will consist of 24-strand OS2 fiber optic cable. Exterior fiber optic cable shall be loose tube, gel filled 9/125 micron indoor/outdoor rated OS2 fiber optic cable. Concrete encased duct banks for fiber optic cabling will be designed and routed in coordination with the civil engineering design. Fiber optic cable routing inside of buildings shall be above accessible ceiling by the use of flexible innerduct supported by a J-hook system. Where fiber optic cabling is routed exposed or above hard ceilings, fiber optic cable shall be in schedule 40 PVC conduit.

NETWORK DROPS AND STATION CABLE:

New network outlets and access control device locations will be provided in the locations of existing outlets throughout the hospital, additional areas required by VA design standards, and other specific user requirements to be coordinated as part of the design development user group meetings. All existing VA network outlets that are Cat 3, Cat 5, Cat 5 or Cat 6 will be replaced with Cat6A network outlets in the same location. Standard density work area outlets will consist of two 8P8C interfaces. High Density work area outlets will consist of four 8P8C interfaces. Existing POTS telephone, nurse call, access control, SSTV, PA, medical WAP, and all other systems cabling that is not VA network cabling, is not included in the cabling upgrade and is to remain as installed.

New network horizontal cables will be Cat 6A UTP. New cabling will be routed overhead by use of new J-hook and cable tray systems, and existing pathways where possible. New cable tray is indicated on the drawings where there is sufficient physical space to provide new tray. The horizontal distance for the permanent link station cable is limited to 295’ with 16’ reserved for stranded patch cabling.

TELECOM ROOMS

The new IT rooms and racks will be sized to accommodate all new required horizontal connections for network work area outlets, per VA Infrastructure Standard for Telecommunication Spaces. All equipment will be mounted in racks; there will be no wall field in the new TRs.

Each telecom room will serve a floor area which provides network cabling to not exceed 295’. See diamond area floor plans in support of new telecom room locations.

There will be a fiber cassette enclosure equipped with fiber cassettes for each of the Core-A and Core-B fiber optic cables terminated in each telecom room. Refer to construction documents for specifics of equipment. Fiber optic cabling to be terminated using fusion splices to the pigtails of the splice cassettes. The cassette will be mounted in a fiber patch panel in one of the racks in the room. Fiber optic cables shall connect from the fiber patch panel to the first data switch in each rack.

48 port Cat 6A patch panels shall be installed in network racks in all telecom rooms. The number of patch panels per room will be based on cable counts for replacement and new work area outlets. Network switches will be furnished by the VA and be installed in networks racks in each room. The basis of design network switch shall be Cisco 3850.

All racks shall be provided with horizontal cable management except where the angled patch panels are utilized. A ladder style cable tray shall be routed vertically on the wall of the telecom room. Basket style cable tray shall be routed horizontally throughout the telecom room. Refer to construction documents for sizes of cable trays.

Rooms will be provided with door hardware security per SDO 218 and Appendix B. Additionally motion activated cameras will be supplied in the rooms for additional security and visibility.

DATA CENTER

All campus backbone fiber will be routed to the new data center location and will terminate in the Main Distribution Area (MDA) racks. The MDA should consist of redundant A-Core and B-Core sides in order to terminate the redundant fiber optic backbone cables.

A new structured cabling system will be provided in the new data center.

Fiber and copper UTP patch equipment shall be provided in the racks in the data center and include fiber breakout boxes, UTP Cat 6A patch panels, cable management, and fiber cassettes with MPO connectors. Fiber optic cables within the data center to be pre-terminated, no field terminations permitted for fiber optic cables originating and terminating in data center.

The new data center will be connected to the existing service provider equipment in the existing entrance room.

9 FIRE DETECTION AND ALARM

The fire detection and alarm scope for the project includes providing fire alarm notification and detection where required in areas displaced by construction of new telecommunications rooms. A new fire alarm system is also included for the new data center building; see drawings for details.

A fire alarm system is required by NFPA 101 and shall be designed to meet the requirements contained in NFPA 72 and the VA Fire Protection Design Manual.

The fire alarm system shall not be combined with any other system. All fire alarm wiring shall be installed in raceway separate from all other systems.

Initiating Device Circuits (IDC) shall be class B. Signaling Line Circuits (SLC) shall be Class B. Notification Appliance Circuits (NAC) shall be Class B. Communication between building fire alarm control units shall be Class X.

Notification shall be via electronic speakers and strobes. Spacing and location of speakers and strobes shall be compliant with the ABA (Architectural Barriers Act), NFPA 72 and project design documents.

Visual signals shall be provided via multi-candela, field selectable strobe lights utilizing high-intensity, white xenon flash tube with a clear plastic lens marked “fire” for fire alarm events. The body of the strobe shall match in color to the existing strobes in each respective building. All strobes shall be UL 1971 compliant as well as ADA compliant. If more than a single strobe can be viewed from any location, all strobes shall be synchronized to flash simultaneously within the continuous area.

RDC JPA
ARCHITECTURE

Exceptions List

Project:	Gainesville VAMC - EHRM & Data Center
Project #:	VA: 537-21-106 | RDC/JPA: 22010
Date:	01/20/2026

Item #	Sheet Ref.	Building Number	Room Number	Infrastructure System	Standard Reference	Deficiency	Action	Reason	Explanation	Date	Reviewed by CAM	Reviewed by HEFP	Reviewed by DCIE
1 VOID	A1.B	1	FB28K-1	Space	Infrastructure Standards for Telecommunications Spaces - Version 3.1 requires 80 sq ft TRs with dimensions 8' x10' for nonclinical spaces to ensure 3' clearance around all sides of equipment racks.	FB28K-1 requires 1 Network Rack, thus minimum requirement is 80 sq ft with 8'x10' dimensions. Existing room FB28K-1 is 80 sq ft with 12'x6'8" dimensions.	Existing equipment, racks, and horizontal cabling to remain as installed. Provide new fiber optic connection to maintain network connection until building decommissioning.	Building is scheduled for demolition within the next 5 years.	Replacement/relocation of network equipment in this building would not see a return on investment for the cost based on the short duration it would be used before building demolition. **UPDATE 5/1/25** The VA is no longer anticipating demolishing the FG wing. A/E must provide coverage in this area.	4/4/2023 UPDATE 9/23/2024 **UPDATE** 5/1/2025			
2 VOID	A1.B	1	FB14-1	Space	Infrastructure Standards for Telecommunications Spaces - Version 3.1 requires 80 sq ft TRs with dimensions 8' x10' for nonclinical spaces to ensure 3' clearance around all sides of equipment racks.	FB14-1 requires 2 Network Racks, thus minimum requirement is 100 sq ft with 8'x10' dimensions. Existing room FB14-1 is 65 sq ft with 8'x8' dimensions.	Existing equipment, racks, and horizontal cabling to remain as installed. Provide new fiber optic connection to maintain network connection until building decommissioning.	Building is scheduled for demolition within the next 5 years.	Replacement/relocation of network equipment in this building would not see a return on investment for the cost based on the short duration it would be used before building demolition. **UPDATE 5/1/25** The VA is no longer anticipating demolishing the FG wing. A/E must provide coverage in this area.	4/4/2023 UPDATE 9/23/2024 **UPDATE** 5/1/2025			
3 VOID	A1.1	1	G161-1	Space	Infrastructure Standards for Telecommunications Spaces - Version 3.1 requires 170 sq ft TRs for clinical spaces. However, due to existing space and structural constraints, HEFP SEP requires at a minimum, only 100 sq ft TRs for clinical spaces in existing buildings plus 20sq ft for every additional rack over quantity of 2.	G161-1 requires 3 network racks, thus minimum requirements is 120 sq ft. Existing room is 105 sq ft.	Existing equipment, racks, and horizontal cabling to remain as installed. Provide new fiber optic connection to maintain network connection until building decommissioning	Building is scheduled for demolition within the next 5 years.	Replacement/relocation of network equipment in this building would not see a return on investment for the cost based on the short duration it would be used before building demolition. **UPDATE 5/1/25** The VA is no longer anticipating demolishing the FG wing. A/E must provide coverage in this area.	4/4/2023 UPDATE 9/23/2024 **UPDATE** 5/1/2025			

4 VOID	A1.1	1	F122-1	Space	Infrastructure Standards for Telecommunications Spaces - Version 3.1 requires 170 sq ft TRs for clinical spaces. However, due to existing space and structural constraints, HEFP SEP requires at a minimum, only 100 sq ft TRs for clinical spaces in existing buildings plus 20sq ft for every additional rack over quantity of 2.	F122-1 requires 2 network racks, thus minimum requirements is 100 sq ft. Existing room is 89 sq ft.	Existing equipment, racks, and horizontal cabling to remain as installed. Provide new fiber optic connection to maintain network connection until building decommissioning	Building is scheduled for demolition within the next 5 years.	Replacement/relocation of network equipment in this building would not see a return on investment for the cost based on the short duration it would be used before building demolition. **UPDATE 5/1/25** The VA is no longer anticipating demolishing the FG wing. A/E must provide coverage in this area.	4/4/2023 UPDATE 9/23/2024 **UPDATE** 5/1/2025			
5 VOID SEE RFI #4	A-141	1	E458A-1	Space	Infrastructure Standards for Telecommunications Spaces - Version 3.1 requires 170 sq ft TRs for clinical spaces. However, due to existing space and structural constraints, HEFP SEP requires at a minimum, only 100 sq ft TRs for clinical spaces in existing buildings.	E458A-1-1 requires 2 Network Racks, thus minimum requirement is 100 sq ft. Existing room E458A-1-1 is only 93 sqft.	Utilize existing data room at 93 sq ft with dimensions of 11'10"x7'10".	Room cannot be expanded due to being adjacent to an occupied lab space and a toilet room.	Existing room dimensions are sufficient to facilitate (2) new racks with minimum spacing of 3' clear on (3) sides and 1' clear on (1) side of line up.	4/4/2023			
6 VOID SEE RFI #5	A-151	1	J527-1	Space	Infrastructure Standards for Telecommunications Spaces - Version 3.1 requires 170 sq ft TRs for clinical spaces. HEFP SEP requires at a minimum, only 100 sq ft TRs for clinical spaces in existing buildings.	J527-1 contains 2 Network Racks, thus minimum requirement is 100 sq ft with 10'x10' dimensions. Existing room J527-1 is 126 sq ft with only 18'10"x6'7" dimensions. Does not meet minimum dimension of 8'.	Utilize existing data room at 126 sq ft with dimensions of 18'10"x6'7".	Room cannot be expanded due to being adjacent to an electrical room, a laundry room, and a toilet room. Other nearby rooms are patient bedrooms.	Existing room dimensions are sufficient to facilitate (2) new racks with minimum spacing of 3' clear on (3) sides and 1' clear on (1) side of line up.	4/4/2023			
7	A1.8	28	Lower level	Space	Infrastructure Standards for Telecommunications Spaces - Version 3.1 requires 80 sq ft TRs with dimensions 8' x10' for nonclinical spaces to ensure 3' clearance around all sides of equipment racks.	204-28 contains 1 Network Rack, thus minimum requirement is 80 sq ft with 10'x8' dimensions. Existing room 204-28 is 15 sq ft.	Remove existing network equipment and abandon existing data room 204-28. Feed mechanical and electrical spaces from telecom room on upper level. *See RFI #11.*	Room cannot be expanded. All adjacent spaces are mechanical or electrical spaces.	Mechanical and electrical spaces located on the upper floor of building 28 have very minimal network requirements. Existing network connections can be serviced from floor below. **UPDATE 5/2/2025** Mechanical and electrical spaces located on the upper floor of building 28 have very minimal network requirements. Existing network connections on lower level can be serviced from *floor above* .	4/4/2023 UPDATE 9/23/2024 **UPDATE** 5/2/2025			
8	A1.8	30	Second Floor	Space	Infrastructure Standards for Telecommunications Spaces - Version 3.1 requires 80 sq ft TRs with dimensions 8' x10' for nonclinical spaces to ensure 3' clearance around all sides of equipment racks.	117-T4 requires 1 network rack, thus minimum requirements is 80 sq ft. There is no existing data room on the second floor.	Connect all required data outlets on second floor to network equipment located on the ground floor.	The second floor is comprised of all bedrooms and hallways. There is no available space to utilize for a new data closet.	Building is currently configured with a single data closet on the ground floor. New data equipment will be installed on the ground floor to serve the entire building. **UPDATE 5/2/2025** Building is currently configured with a single data closet on the ground floor. *See RFI 12.*	4/4/2023 UPDATE 9/23/2024 **UPDATE** 5/2/2025			

9	A600	EHRM	ALL	Doors		Doors have a 7ft tall opening instead of the required 8 ft tall opening.	Doors have a 7ft tall opening instead of the required 8 ft tall opening.	Telecom rooms are located in areas where removing the ceiling is not possible to fit a taller frame. Doors included: A030A-1 A132-1 210-1 A241-1 A305-1 A341-1 A402-1 A441-1 A502-1 A543-1 B050C-1 C085A-1 D304-1 E154-1 E261-1 E303-1 E357A-1 E448-1 E503-1 E571A-1 EB51A-1 H133-1 H235-1 H335-1 H435-1 H519-1 J142-1 J227-1 J327-1 J427-1 J527-1 117-11 110-12 247-12 347-12 122-14 **UPDATE:** A306-28 C259-1 FB23B-1 FB28L-1 FB28L-2 DB97-1	VA requested that A/E use 7 ft doors when an 8ft door would conflict with existing conditions.	9/23/2024 **UPDATE** 9/11/2025			
10		Trailers	TRs	Space	Infrastructure Standards for Telecommunications Spaces requires 80 sq ft TRs with dimensions 8' x10' for nonclinical spaces to ensure 3' clearance around all sides of equipment racks.		Existing equipment, racks, and horizontal cabling to remain as installed. Provide new fiber optic connection to maintain network connection until building decommissioning.	Trailers are temporary.	Replacement/relocation of network equipment in the temporary trailers would not see a return on investment.	9/23/2024			

11	A1.8	28	202-28	Space	Infrastructure Standards for Telecommunications Spaces requires 80 sq ft TRs with dimensions 8' x10' for nonclinical spaces to ensure 3' clearance around all sides of equipment racks.		Build a TE inside the Croygen Storage room (202-28) at the plan south-west corner on the west wall. **UPDATE:** The VA requested a TR be built within the Croygen Storage RM. The room will not be large enough to ensure 3x3x3x3 ft on all sides of the rack.	Room cannot be expanded. All adjacent spaces are mechanical or electrical spaces. No other room inside the building could be taken.	This solution would provide a new rack in a space with proper clearances. This rack would also provide for the floor below. See RFI #7. **UPDATE:** A small room will be built in the Croygen Storage room and a wall mounted rack will be installed in the new room.	5/2/2025 **UPDATE** 9/10/2025			
12	A1.8	30	105-30	Space	Infrastructure Standards for Telecommunications Spaces requires 80 sq ft TRs with dimensions 8' x10' for nonclinical spaces to ensure 3' clearance around all sides of equipment racks.		Maintain the existing TE and run new utilities to existing cabinets.	There is no room for a TR in any other space of the Fisher House (B30). The best option is to reuse the existing TE.	Leave the existing TE as it is. Run new utilites to the existing TE. See RFI #8	5/2/2025			
13	A1.1 & A1.1.1	1	D304-1	Space	ISTS	Telecom room D304-1 is approximately 7' -4 1/4" x 19' - 5 1/4" . This narrow space requires an arrangement of the racks that is not typical.	The two racks will have a 3x3x3x1 clearnce and the two will arranged so that one is in front of the other and separated by a shared 3ft clearance.	The narrow room requires this arrangement to work and still maintain a 3x3x3x1 ft clearace for both racks.	This space was the only area provided to the A/E to use that satisfied the diamond diagram requirements in this portion of the facility.	8/28/2025			
14	A1.B & A1.B.2	1	DB97-1	Space	ISTS	Telecom room DB97-1 is being built under a separate contract. The room does not meet the ISTS space requirements.	The local station does not support issuing a change order to remove the TR from the scope of the other contract. A/E will use the provided TR anyway.	All design alternatives to using this TR still require an exception since they will break other requirements outlined in the ISTS.	Alternative options considered were: 1) Splitting the TR into two rooms that cover the same area. 2) Moving some of the racks into another room in a separate building (E) to cover part of the area	8/28/2025			
15	A1.3 & A1.3.1	1	A305-1	Space	ISTS	The TR will not have the 3x3x3x3 ft clearance on all sides of the rack.	There will be 3x3x3x1 ft clearance with the 1 ft being on the side of a rack.	The rack(s) required for the area do not fit with the CRAC unit in the space while also maintaining 3ft clearance on all sides.		9/10/2025			
16	A1.6 & A1.2 & A1.2.1	1 & 12	.10-12A210-1	Mechanical	DA15	The TR will not have the 3x3x3x3 ft clearance on all sides of the rack.	Per DA 15, the A/E is opting to icool the space with a mini-split and record the deficiency for doing so.	A CRAC unit will not permit clearance to move around the racks.		9/10/2025			

17	A1.1 & A1.1.2	1	G161-1	Space	ISTS	The TR will not have the 3x3x3x3 ft clearance on all sides of the rack.	There will be 3x3x3x1 ft clearance with the 1 ft being on the side of a rack.	An existing rack limits the space within the room and prevents a 3ft clearance on one side.		10/2/2025			