Structural Calculations

For

12881 1116TH CERRITIOS

Submittal: For Approval

Submitted: 10/10/2022

Prepared By:

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Project No.: 2021-057

Table of Contents

PROJECT DESCRIPTION

SCOPE OF WORK

Summary:

The scope of work includes the additions on the east side and on the west side of the building. The west side single story and it is used as warehouse. The east side is a two story and it is used as office. The structural system is wood framed roof and floor with concrete tilt-up walls. The foundation system is conventional footings to match existing building.

GRAVITY LOAD RESISTING SYSTEM

Roof Framing System: The roof framing primarily consists of 2x conventional framing.

Floor Framing System: The floor framing system will consist of conventional framing with floor joists and steel beams

Foundation System: It is anticipated that the foundation system is conventional continuous

Walls: All the exterior interior walls are concrete wall.

LATERAL LOAD RESISTING SYSTEM

Lateral Resisting System: The lateral resisting system of concrete shear wall.

BASIS OF DESIGN:

CODES

2019 California Building Code

FOUNDATIONS

Soils report by: East Strata Geotechnical Services, Inc

Footing	Min. Ftg. Width.	Min. Ftg. Embed.	Allow. Bearing Pressure
Continuous Footing	15 inches	18" below grade	3000 psf
Pad Footing	24 inches	18" below grade	3000 psf

MATERIALS

CONCRETE:
Design compressive strength at 28 days shall be as follows:

Footings	f_c' = 3,000 psi
Slab on grade	f_c' = 3,000 psi
Shear wall	f_c' = 4,000 psi

REINFORCING STEEL:

(ASTM A615 Grade 60)	f_y = 60 ksi

STRUCTURAL STEEL:

Wide Flange Shapes (ASTM A992)	f_y = 50 ksi
Hollow Structural Sections (HSS) (ASTM A500 Grade B)	
Rectangular Sections	f_y = 46 ksi
Round Sections	f_y = 42 ksi
Pipe (ASTM A53 Grade B)	f_y = 35 ksi
Channels, Angles & Plates (ASTM A36, or as Indicated)	f_y = 36 ksi
Anchor Rods	
Gravity Columns (ASTM F1554 Grade 36)	f_y = 36 ksi
Lateral Columns (ASTM F1554 Grade 55)	f_y = 55 ksi
Welded connections are SMAW with E70XX electrodes	f_y = 70 ksi
High Strength Bolts	
Bearing Type (A325N, 0.5" to 1" DIA)	f_y = 120 ksi
Slip Critical Type (A325N, 0.5" to 1" DIA)	f_y = 120 ksi
Shear Studs (ASTM A108)	f_y = 65 ksi
Common Bolts (A307, Grade A)	f_y = 60 ksi

STRUCTURAL LUMBER: (Based on 2018 NDS)

2x Joists & Blocking (Repetitive member use)	Douglas Fir Larch No.2
4x Beams	Douglas Fir Larch No.1
4x header	Douglas Fir Larch No.2
6x Beams (Posts and Timbers)	Douglas Fir Larch No.1 And Better
Ledgers and Nailers (2x, 3x and 4x)	Douglas Fir Larch No.2
2x4 & 2x6 Studs (Repetitive member used)	Douglas Fir Larch Stud Grade
4x Posts	Douglas Fir Larch No.2
6x Posts	Douglas Fir Larch No.2
Top Plates	Douglas Fir Larch No.2
Sill and Sole Plates	Douglas Fir Larch No.2
Glued Laminated Timber Beams	24F-V4 simple span 24F-V8 cantilevered span

Fb= 2400 psi Fv= 265 psi E= 1,800,000 psi

Parallel Strand Lumber (PSL) - Stock Beams (18" & Less Depth)

Fb= 2900 psi Fv= 290 psi E= 2,000,000 psi

Laminated Veneer Lumber (LVL)

Fb= 2600 psi Fv= 285 psi E= 1,900,000 psi

Nailing Schedule

Per 2012 IBC Table 2304.9.1

Framing Connectors

Use ICC-ES approved framing connectors
(Simpson Strong-Tie or equal, latest catalog)

DEAD LOADS (Wood)

Flat Roof:

	Deck	Joist	Beam	Lateral	
Built-Up Roofing	3.0	3.0	3.0	3.0	psf
Plywood Sheathing	1.5	1.5	1.5	1.5	psf
Joists		2.0	2.0	2.0	psf
Wood Beams			1.0	1.0	psf
Insulation		0.5	0.5	0.5	psf
Mechanical / Electrical / Plumbing		1.2	1.2	1.2	psf
Gypsum Board Ceiling		2.8	2.8	2.8	psf
Partition Wall				5.0	psf
Miscellaneous	0.5	1.0	2.0	2.0	psf
TOTAL ROOF DEAD LOAD:	5.0	12.0	14.0	19.0	psf

Floor (Wood):

	Deck	Joist	Beam	Lateral	
Floor Finish	1.0	1.0	1.0	1.0	psf
Plywood Sheathing	2.3	2.3	2.3	2.3	psf
Joists		3.0	3.0	3.0	psf
Wood Beams			1.0	1.0	psf
Mechanical / Electrical / Plumbing		1.0	1.0	1.0	psf
Gypsum Board Ceiling		2.8	2.8	2.8	psf
Partition Wall				10.0	psf
Miscellaneous	0.7	0.9	0.9	0.9	psf
TOTAL FLOOR DEAD LOAD:	4.0	11.0	12.0	22.0	

LIVE LOADS:

Roof Live Load: = 20psf;
Light manufacturing: = 125psf

Wall Dead Load (Concrete)

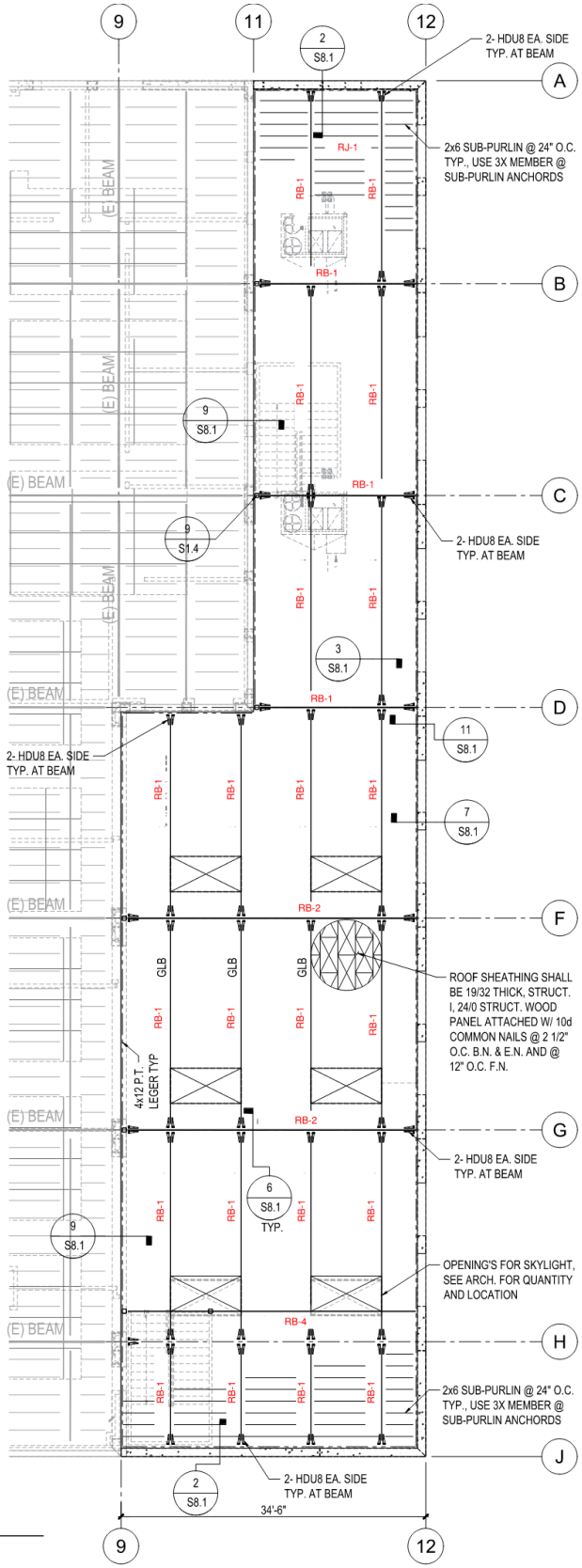
CONCRETE WALL DEAD LOAD:

	8" Conc.	10" Conc.	11.25" Conc.	
Concrete wall	100.0	125.0	150.0	psf
Furring	1.0	1.0	1.0	psf
Gupsum Board	2.8	2.8	2.8	psf
Misc	1.2	1.2	1.2	psf
TOTAL WALL DEAD LOAD:	**105.0**	**130.0**	**155.0**	**psf**

12881 1116th CERRITIOS	2021-057		
Project	Project No.		
CALCULATION SUBJECT	Hung Nguyen, S.E	10/10/22	Page: 9 / Of: 114
Subject	By	Date	

Roof Framing Design:

ROOF FRAMING PLAN



Roof Deck Design

Flat Roof Deck Design

Use ½" Plywood Decking From 2019 CBC Table 2304.7(3)

Deck Span:	S:	2	ft
Superimposed dead load:	RDL:	5	psf
Live load:	RLL:	20	psf
Uplift wind load:	Wup:	-46.5	psf
Downward wind load:	Wdown:	16	psf

Comb1: RDL + RLL =	**25**	psf	*IBC 2018 – Section 1605.3.1*
Comb2: RDL + 0.6 • Wdown =	**14.6**	psf	*IBC 2018 – Section 1605.3.1*
Comb3: RDL + 0.75 • RLL + 0.75 • (0.6 • Wdown) =	**27.2**	psf	*IBC 2018 – Section 1605.3.1*
Comb4: 0.6 • RDL + 0.6 • Wup =	**-24.9**	psf	*IBC 2018 – Section 1605.3.1*

Max deck load: D = max(Comb1,Comb2,Comb3,Comb4) = **27.2** psf

Stress Criteria:

Maximum Allowable Total Load:	40	psf	
Demand/Capacity Ratio:	**0.68**	Check:	**OK**
Maximum Allowable Live Load:	30	psf	
Demand/Capacity Ratio:	**0.67**	Check:	**OK**

TABLE 2304.7(3)
ALLOWABLE SPANS AND LOADS FOR WOOD STRUCTURAL PANEL SHEATHING AND SINGLE-FLOOR GRADES CONTINUOUS OVER TWO OR MORE SPANS WITH STRENGTH AXIS PERPENDICULAR TO SUPPORTS[a,b]

SHEATHING GRADES		ROOF[c]				FLOOR[d]
Panel span rating roof/floor span	Panel thickness (inches)	Maximum span (inches)		Load[e] (psf)		Maximum span (inches)
		With edge support[f]	Without edge support	Total load	Live load	
12/0	5/16	12	12	40	30	0
16/0	5/16, 3/8	16	16	40	30	0
20/0	5/16, 3/8	20	20	40	30	0
24/0	3/8, 7/16, 1/2	24	20[g]	40	30	0
24/16	7/16, 1/2	24	24	50	40	16
32/16	15/32, 1/2, 5/8	32	28	40	30	16[h]
40/20	19/32, 5/8, 3/4, 7/8	40	32	40	30	20[h,i]
48/24	23/32, 3/4, 7/8	48	36	45	35	24
54/32	7/8, 1	54	40	45	35	32
60/32	7/8, 1 1/8	60	48	45	35	32

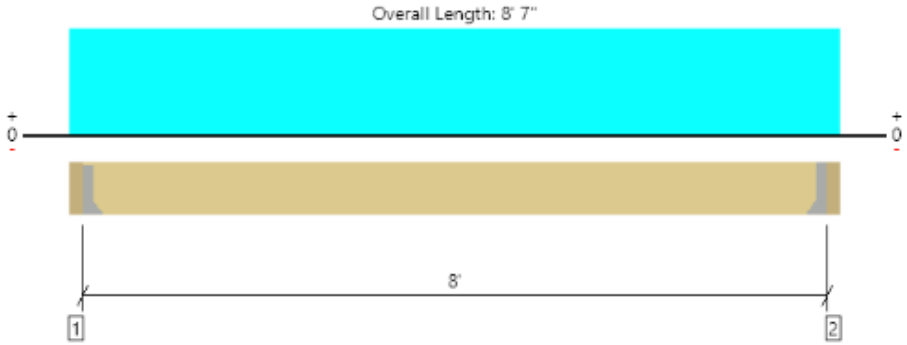
Roof Joist Design

FORTE WEB

MEMBER REPORT **PASSED**

Roof, Roof: Joist

1 piece(s) 2 x 6 DF No.2 @ 24" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	272 @ 3 1/2"	1406 (1.50")	Passed (19%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	241 @ 9"	1238	Passed (19%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	544 @ 4' 3 1/2"	1051	Passed (52%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.111 @ 4' 3 1/2"	0.400	Passed (L/866)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.188 @ 4' 3 1/2"	0.533	Passed (L/510)	--	1.0 D + 1.0 Lr (All Spans)

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0.25/12

- Deflection criteria: LL (L/240) and TL (L/180).
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- A 0.8% decrease in the moment capacity has been added to account for lateral stability.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Hanger on 5 1/2" PSL beam	3.50"	Hanger[1]	1.50"	120	172	292	See note [1]
2 - Hanger on 5 1/2" PSL beam	3.50"	Hanger[1]	1.50"	120	172	292	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	1' o/c	
Bottom Edge (Lu)	End Bearing Points	

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LRU26Z	1.94"	N/A	4-10dx1.5	5-10d	
2 - Face Mount Hanger	LRU26Z	1.94"	N/A	4-10dx1.5	5-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
1 - Uniform (PSF)	0 to 8' 7"	24"	14.0	20.0	Default Load

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Roof Beam Design

RB-1

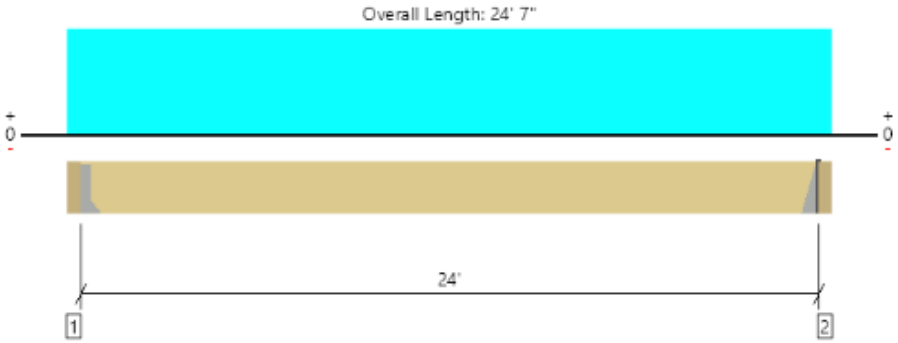
FORTE WEB

MEMBER REPORT

PASSED

Roof, Roof: Flush Beam (RB-1)

1 piece(s) 3 1/8" x 15" 24F-V4 DF Glulam



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3401 @ 3 1/2"	3401 (1.67")	Passed (100%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	3046 @ 1' 6 1/2"	10352	Passed (29%)	1.25	1.0 D + 1.0 Lr (All Spans)
Pos Moment (Ft-lbs)	20404 @ 12' 3 1/2"	28941	Passed (71%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.755 @ 12' 3 1/2"	1.200	Passed (L/381)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	1.337 @ 12' 3 1/2"	1.600	Passed (L/215)	--	1.0 D + 1.0 Lr (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 24'.
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Hanger on 15" GLB beam	3.50"	Hanger[1]	1.67"	1513	1967	3480	See note [1]
2 - Hanger on 15" GLB beam	3.50"	Hanger[1]	1.67"	1513	1967	3480	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	2' o/c	
Bottom Edge (Lu)	2' o/c	

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	HU212-2	2.50"	N/A	22-16d	10-10d	
2 - Top Mount Hanger	BA3.12X H=15	3.00"	6-10d	10-10d	8-10dx1.5	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	3 1/2" to 24' 3 1/2"	N/A	11.4	--	
1 - Uniform (PSF)	0 to 24' 7" (Front)	8'	14.0	20.0	Default Load

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

RB-2

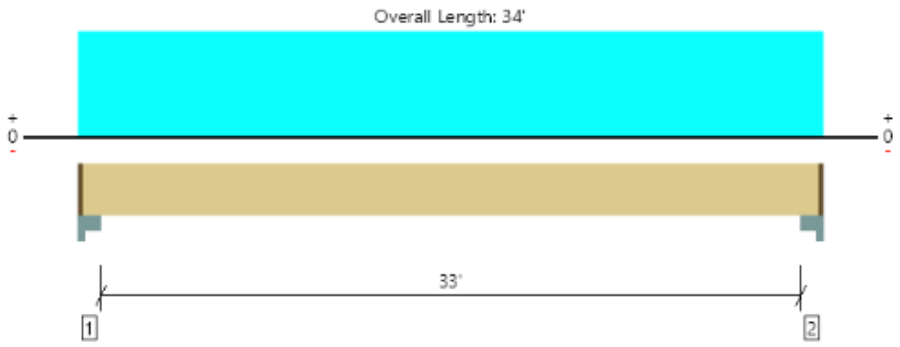
FORTE WEB

MEMBER REPORT

PASSED

Roof, Roof: Flush Beam (RB-2)

1 piece(s) 6 3/4" x 30" 24F-V4 DF Glulam



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	14619 @ 4 1/2"	20841 (4.75")	Passed (70%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	12113 @ 3'	44719	Passed (27%)	1.25	1.0 D + 1.0 Lr (All Spans)
Pos Moment (Ft-lbs)	119569 @ 17'	214597	Passed (56%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.483 @ 17'	1.663	Passed (L/826)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.870 @ 17'	2.217	Passed (L/458)	--	1.0 D + 1.0 Lr (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Critical positive moment adjusted by a volume factor of 0.85 that was calculated using length L = 33' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Column Cap - steel	6.00"	4.75"	3.33"	6544	8160	14704	1 1/4" Rim Board
2 - Column Cap - steel	6.00"	4.75"	3.33"	6544	8160	14704	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' o/c	
Bottom Edge (Lu)	8' o/c	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 33' 10 3/4"	N/A	49.2	--	
1 - Uniform (PSF)	0 to 34' (Front)	24'	14.0	20.0	Default Load

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

RB-3

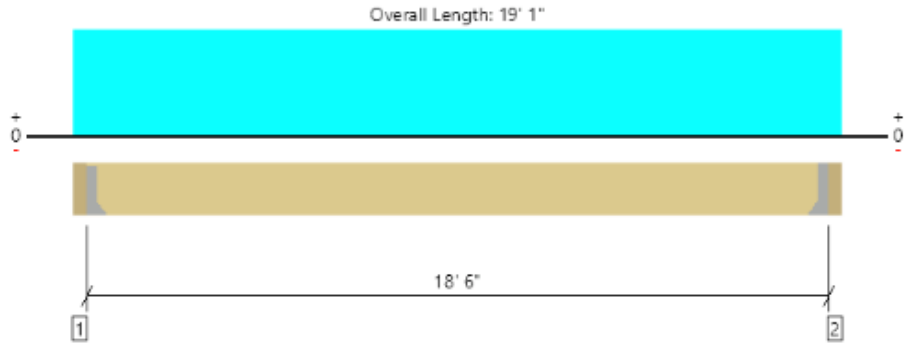
FORTE WEB

MEMBER REPORT

PASSED

Roof, Roof: Flush Beam (RB-3)

1 piece(s) 5 1/8" x 18" 24F-V4 DF Glulam



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	7755 @ 3 1/2"	7755 (2.33")	Passed (100%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	6498 @ 1' 9 1/2"	20372	Passed (32%)	1.25	1.0 D + 1.0 Lr (All Spans)
Pos Moment (Ft-lbs)	35869 @ 9' 6 1/2"	67286	Passed (53%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.282 @ 9' 6 1/2"	0.925	Passed (L/787)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.493 @ 9' 6 1/2"	1.233	Passed (L/450)	--	1.0 D + 1.0 Lr (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Critical positive moment adjusted by a volume factor of 0.97 that was calculated using length L = 18' 6".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Hanger on 18" GLB beam	3.50"	Hanger[1]	2.33"	3413	4580	7993	See note [1]
2 - Hanger on 18" GLB beam	3.50"	Hanger[1]	2.33"	3413	4580	7993	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	2' o/c	
Bottom Edge (Lu)	2' o/c	

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	UA13.5 W=5.25	2.56"	N/A	20-SDS25300	14-SDS25300	
2 - Face Mount Hanger	UA13.5 W=5.25	2.56"	N/A	20-SDS25300	14-SDS25300	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	3 1/2" to 18' 9 1/2"	N/A	22.4	--	
1 - Uniform (PSF)	0 to 19' 1" (Front)	24"	14.0	20.0	Default Load

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

RB-4

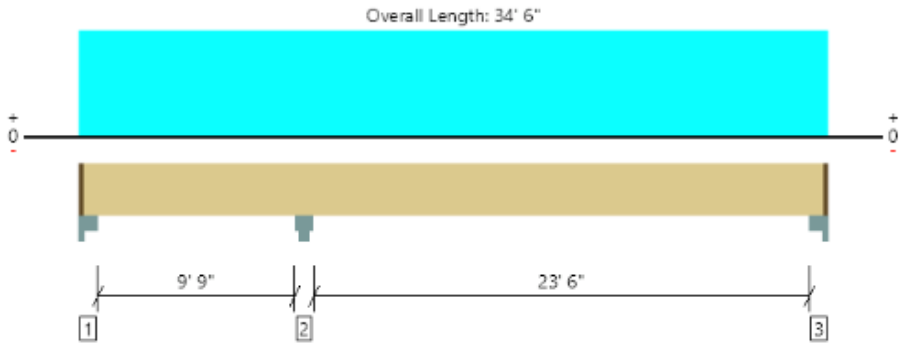
FORTE WEB

MEMBER REPORT

PASSED

Roof, Roof: Flush Beam (RB-4)

1 piece(s) 5 1/8" x 18" 24F-V4 DF Glulam



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	15564 @ 10' 4 1/2"	16656 (5.00")	Passed (93%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	7905 @ 12' 1"	20372	Passed (39%)	1.25	1.0 D + 1.0 Lr (All Spans)
Pos Moment (Ft-lbs)	29906 @ 24' 6"	66960	Passed (45%)	1.25	1.0 D + 1.0 Lr (Alt Spans)
Neg Moment (Ft-lbs)	-34051 @ 10' 4 1/2"	53074	Passed (64%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.332 @ 23' 4 7/8"	1.192	Passed (L/862)	--	1.0 D + 1.0 Lr (Alt Spans)
Total Load Defl. (in)	0.578 @ 23' 5 3/16"	1.589	Passed (L/495)	--	1.0 D + 1.0 Lr (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Critical positive moment adjusted by a volume factor of 0.97 that was calculated using length L = 19' 5 1/16".
- Critical negative moment adjusted by a volume factor of 1.00 that was calculated using length L = 14' 7 1/16".
- -870 lbs uplift at support located at 3 1/2". Strapping or other restraint may be required.
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Roof Live	Total	
1 - Column Cap - steel	5.00"	3.75"	1.50"	1	894/-870	895/-870	1 1/4" Rim Board
2 - Column Cap - steel	5.00"	5.00"	4.67"	6732	8832	15564	None
3 - Column Cap - steel	5.00"	3.75"	1.88"	2730	3613	6343	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	2' o/c	
Bottom Edge (Lu)	2' o/c	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	1 1/4" to 34' 4 3/4"	N/A	22.4	--	
1 - Uniform (PSF)	0 to 34' 6" (Front)	18'	14.0	20.0	Default Load

Weyerhaeuser Notes

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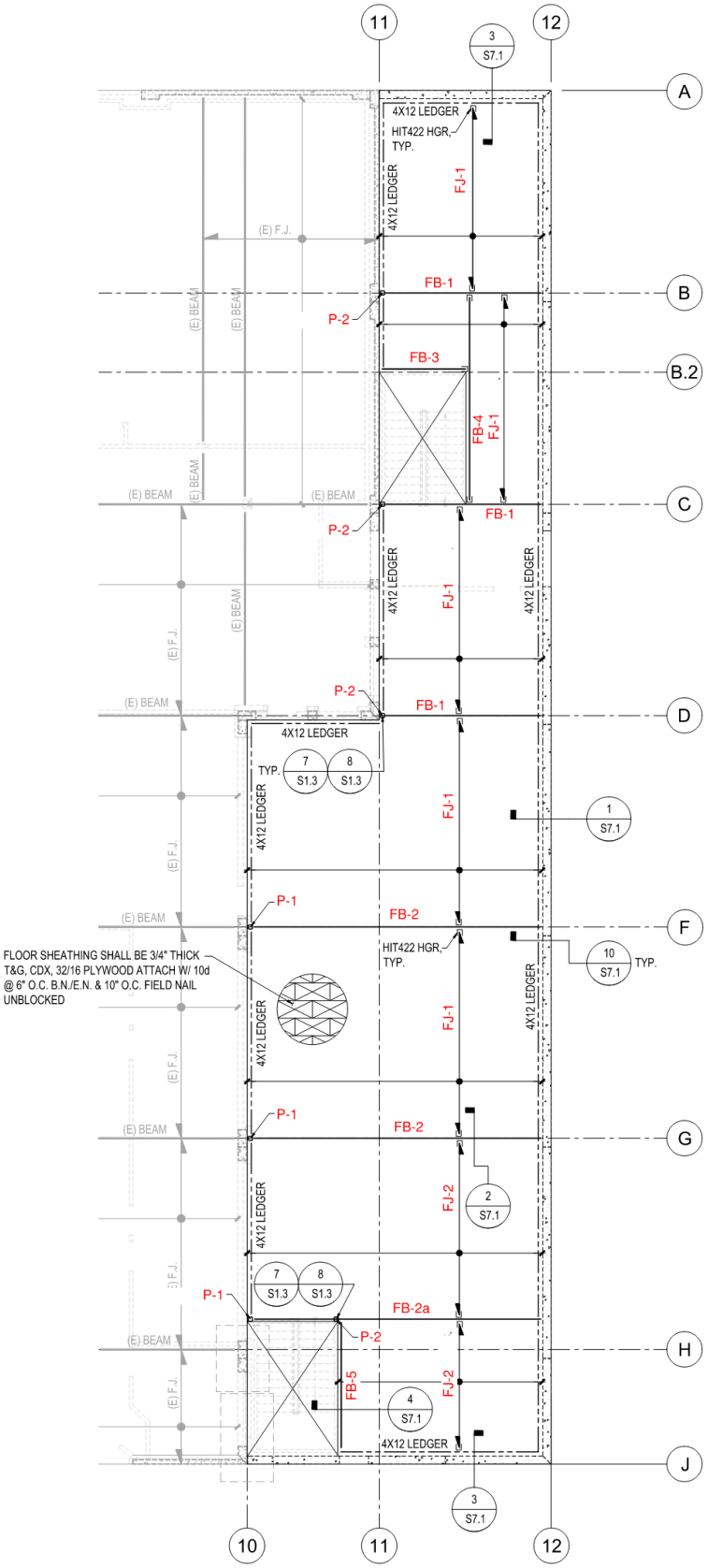
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

2nd Floor Framing Design:

2nd FLOOR FRAMING PLAN



Floor Deck Design

Use 1" Plywood Decking with tongue and groove

Deck Span:	S:	2 ft	
Superimposed dead load:	FDL:	4 psf	
Live load:	FLL:	125 psf	
Uplift wind load:	Wup:	0 psf	
Downward wind load:	Wdown:	0 psf	

Comb1: RDL + RLL =	**129** psf	*IBC 2018 – Section 1605.3.1*
Comb2: RDL + 0.6 • Wdown =	**4** psf	*IBC 2018 – Section 1605.3.1*
Comb3: RDL + 0.75 • RLL + 0.75 • (0.6 • Wdown) =	**97.75** psf	*IBC 2018 – Section 1605.3.1*
Comb4: 0.6 • RDL + 0.6 • Wup =	**2.4** psf	*IBC 2018 – Section 1605.3.1*

Max deck load: D = max(Comb1,Comb2,Comb3,Comb4) = **129** psf

Stress Criteria:

Maximum Allowable Total Load:	130 psf		
Demand/Capacity Ratio:	**0.99**	Check:	**OK**
Maximum Allowable Live Load:	130 psf		
Demand/Capacity Ratio:	**0.96**	Check:	**OK**

Floor Joist Design

FJ-1

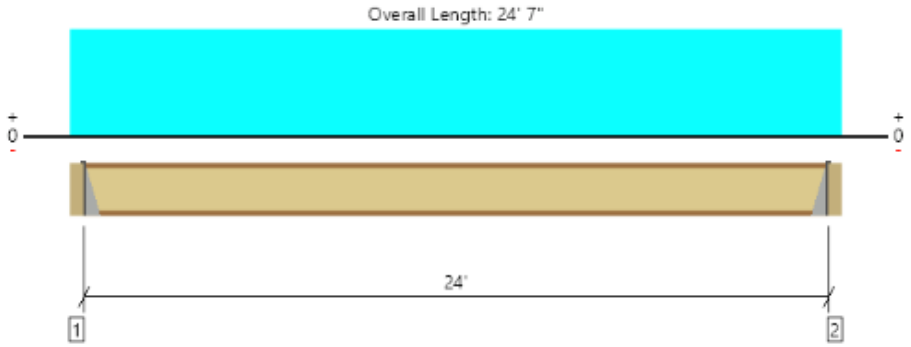
FORTE WEB

MEMBER REPORT

PASSED

Floor, Floor: Joist (FJ-1)

1 piece(s) 22" TJI® 560D @ 16" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2192 @ 3 1/2"	2345 (1.75")	Passed (93%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2192 @ 3 1/2"	3615	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	13152 @ 12' 3 1/2"	18075	Passed (73%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.530 @ 12' 3 1/2"	0.800	Passed (L/543)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.581 @ 12' 3 1/2"	1.200	Passed (L/496)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	51	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Commercial
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 22" SPF beam	3.50"	Hanger[1]	- / 1.75" [2]	197	2049	2246	See note [1], Web Stiffeners
2 - Hanger on 22" SPF beam	3.50"	Hanger[1]	- / 1.75" [2]	197	2049	2246	See note [1], Web Stiffeners

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.
- [2] Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 9" o/c	
Bottom Edge (Lu)	24' o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Top Mount Hanger	THA426	1.75"	4-16d	4-16d	6-16d	Web Stiffeners
2 - Top Mount Hanger	THA426	1.75"	4-16d	4-16d	6-16d	Web Stiffeners

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 24' 7"	16"	12.0	125.0	Default Commercial Load

FJ-2

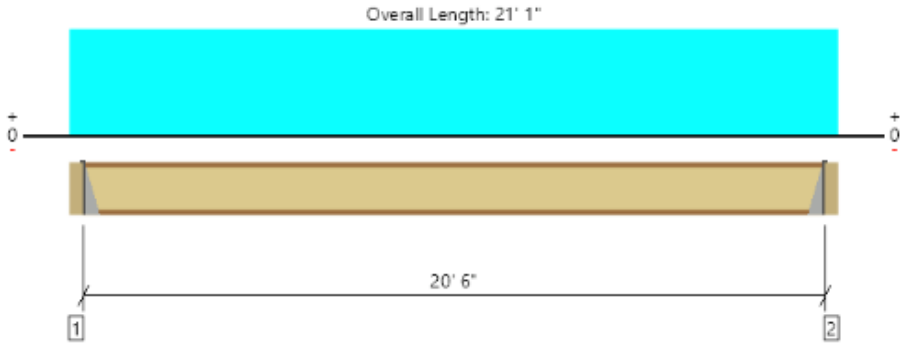
FORTE WEB

MEMBER REPORT

PASSED

Floor, Floor: Joist (FJ-2)

1 piece(s) 18" TJI® 560D @ 16" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1872 @ 3 1/2"	1872 (3.45")	Passed (100%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1872 @ 3 1/2"	3080	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	9596 @ 10' 6 1/2"	14785	Passed (65%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.446 @ 10' 6 1/2"	0.683	Passed (L/551)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.489 @ 10' 6 1/2"	1.025	Passed (L/503)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	55	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Commercial
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 18" SPF beam	3.50"	Hanger[1]	3.45" / - [2]	169	1757	1926	See note [1]
2 - Hanger on 18" SPF beam	3.50"	Hanger[1]	3.45" / - [2]	169	1757	1926	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.
- [2] Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	7' 2" o/c	
Bottom Edge (Lu)	20' 6" o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Top Mount Hanger	HB3.56/18	3.50"	6-16d	16-16d	10-16d	Web Stiffeners
2 - Top Mount Hanger	HB3.56/18	3.50"	6-16d	16-16d	10-16d	Web Stiffeners

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 21' 1"	16"	12.0	125.0	Default Commercial Load

Floor Beam Design

Multiple Simple Beam

Project File: GST Expansion.ec6

Description : Floor Beam

Steel Beam Design : FB-1

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

STEEL Section : **W12x53, Fully Braced**
Using Allowable Strength Design with ASCE 7-16 Load Combinations, Major Axis Bending

Fy = 50.0 ksi E = 29,000.0 ksi

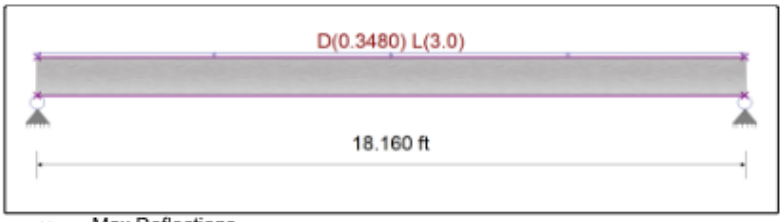
Applied Loads

Beam self weight calculated and added to loads
Unif Load: D = 0.01450, L = 0.1250 k/ft, Trib= 24.0 ft

Design Summary

Max fb/Fb Ratio = **0.721** : 1
Mu : Applied 140.200 k-ft at 9.080 ft in Span # 1
Mn / Omega : Allow 194.361 k-ft
Load Comb : +D+L

Max fv/FvRatio = **0.370** : 1
Vu : Applied 30.881 k at 0.000 ft in Span # 1
Vn / Omega : Allow 83.490 k
Load Comb : +D+L



Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	3.64		27.24				
Right Support	3.64		27.24				

Max Deflections

Transient Downward	0.599 in	Total Downward	0.679 in
Ratio	363		321
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Steel Beam Design : FB-2

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

STEEL Section : **W18x97, Fully Braced**
Using Allowable Strength Design with ASCE 7-16 Load Combinations, Major Axis Bending

Fy = 50.0 ksi E = 29,000.0 ksi

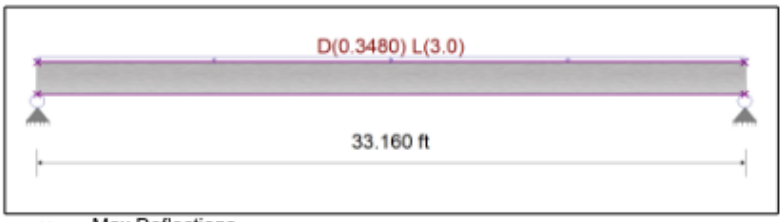
Applied Loads

Beam self weight calculated and added to loads
Unif Load: D = 0.01450, L = 0.1250 k/ft, Trib= 24.0 ft

Design Summary

Max fb/Fb Ratio = **0.899** : 1
Mu : Applied 473.509 k-ft at 16.580 ft in Span # 1
Mn / Omega : Allow 526.447 k-ft
Load Comb : +D+L

Max fv/FvRatio = **0.287** : 1
Vu : Applied 57.118 k at 0.000 ft in Span # 1
Vn / Omega : Allow 199.020 k
Load Comb : +D+L



Max Reactions (k)	D	Lr	L	S	W	E	H
Left Support	7.38		49.74				
Right Support	7.38		49.74				

Max Deflections

Transient Downward	1.617 in	Total Downward	1.857 in
Ratio	246		214
	LC: L Only		LC: +D+L
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

FB-2a

Steel Beam

Project File: GST Expansion.ec6

DESCRIPTION: FB-2a

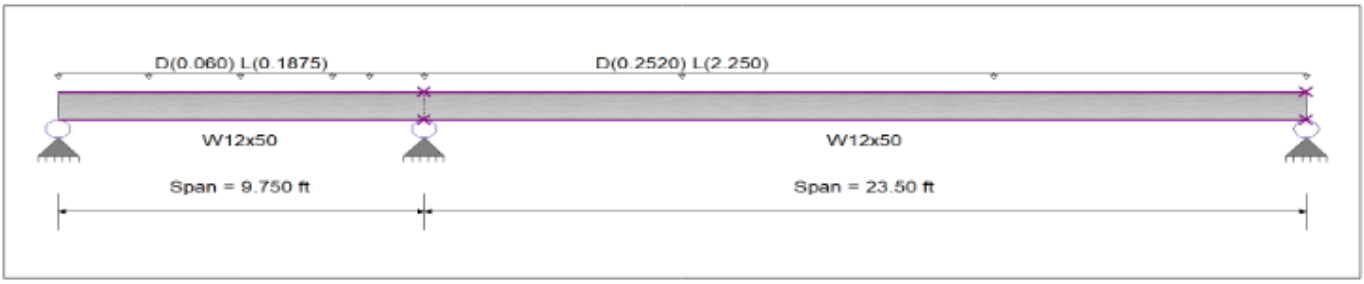
CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method :Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

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



Applied Loads

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

Beam self weight NOT internally calculated and added
Loads on all spans...
Uniform Load on ALL spans : D = 0.0140, L = 0.1250 ksf, Tributary Width = 18.0 ft

Load for Span Number 1
Uniform Load : D = 0.040, L = 0.1250 ksf, Tributary Width = 1.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.734 : 1	Maximum Shear Stress Ratio =	0.388 : 1
Section used for this span	W12x50	Section used for this span	W12x50
Ma : Applied	131.651 k-ft	Va : Applied	35.001 k
Mn / Omega : Allowable	179.391 k-ft	Vn/Omega : Allowable	90.280 k
Load Combination	+D+L	Load Combination	+D+L
		Location of maximum on span	9.750 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.752 in	Ratio =	374	>=360	Span: 2 : L Only
Max Upward Transient Deflection	-0.069 in	Ratio =	1,705	>=360	Span: 2 : L Only
Max Downward Total Deflection	0.836 in	Ratio =	337	>=180	Span: 2 : +D+L
Max Upward Total Deflection	-0.076 in	Ratio =	1545	>=180	Span: 2 : +D+L

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega	
D Only													
Dsgn. L = 9.75 ft	1	0.075	0.039	0.04	-13.38	13.38	299.58	179.39	1.00	1.00	3.53	135.42	90.28
Dsgn. L = 23.50 ft	2	0.075	0.039	11.35	-13.38	13.38	299.58	179.39	1.00	1.00	3.53	135.42	90.28
+D+L													
Dsgn. L = 9.75 ft	1	0.734	0.388		-131.65	131.65	299.58	179.39	1.00	1.00	35.00	135.42	90.28
Dsgn. L = 23.50 ft	2	0.734	0.388	113.16	-131.65	131.65	299.58	179.39	1.00	1.00	35.00	135.42	90.28
+D+0.750L													
Dsgn. L = 9.75 ft	1	0.569	0.301		-102.08	102.08	299.58	179.39	1.00	1.00	27.13	135.42	90.28
Dsgn. L = 23.50 ft	2	0.569	0.301	87.71	-102.08	102.08	299.58	179.39	1.00	1.00	27.13	135.42	90.28
+0.60D													
Dsgn. L = 9.75 ft	1	0.045	0.023	0.02	-8.03	8.03	299.58	179.39	1.00	1.00	2.12	135.42	90.28
Dsgn. L = 23.50 ft	2	0.045	0.023	6.81	-8.03	8.03	299.58	179.39	1.00	1.00	2.12	135.42	90.28

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+L	-0.0757	6.162
+D+L	2	0.8356	12.972		0.0000	6.162

Steel Beam

Project File: GST Expansion.ec6

DESCRIPTION: FB-2a

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	-0.247	61.907	23.796
Overall MINimum	-0.037	3.854	1.435
D Only	0.148	6.424	2.392
+D+L	-0.099	61.907	23.796
+D+0.750L	-0.037	48.036	18.445
+0.60D	0.089	3.854	1.435
L Only	-0.247	55.483	21.405

FB-3

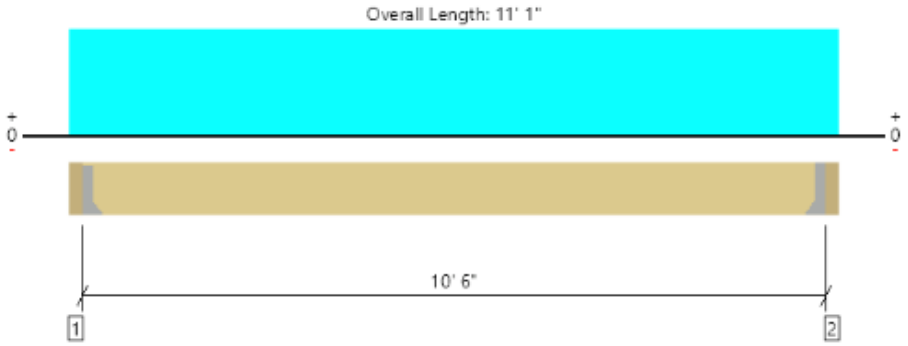
FORTE WEB

MEMBER REPORT

PASSED

Floor, Floor: Flush Beam (FB-3)

1 piece(s) 6 x 14 DF No.1



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5493 @ 3 1/2"	5493 (1.60")	Passed (100%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4316 @ 1' 5"	8415	Passed (51%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	14419 @ 5' 6 1/2"	18550	Passed (78%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.142 @ 5' 6 1/2"	0.350	Passed (L/887)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.159 @ 5' 6 1/2"	0.525	Passed (L/794)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Commercial
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- A 0.2% decrease in the moment capacity has been added to account for lateral stability.
- Lumber grading provisions must be extended over the length of the member per NDS 4.2.5.5.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 13 1/2" DF beam	3.50"	Hanger[1]	1.60"	598	5195	5793	See note [1]
2 - Hanger on 13 1/2" GLB beam	3.50"	Hanger[1]	1.60"	598	5195	5793	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	1' 7 3/16" o/c	
Bottom Edge (Lu)	End Bearing Points	

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	HGU5.50-SDS H=13	5.25"	N/A	36-SDS25212	24-SDS25212	
2 - Face Mount Hanger	HGU5.50-SDS H=13	5.25"	N/A	36-SDS25212	24-SDS25212	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3 1/2" to 10' 9 1/2"	N/A	18.8	--	
1 - Uniform (PSF)	0 to 11' 1"	7' 6"	12.0	125.0	Default Commercial Load

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

FB-4

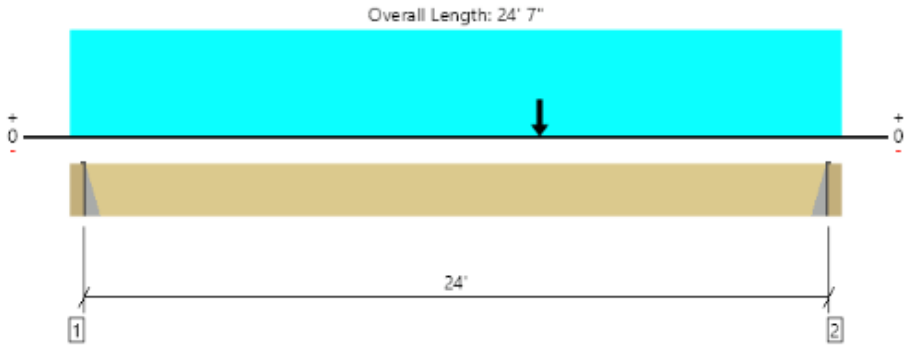
FORTE WEB

MEMBER REPORT

PASSED

Floor, Floor: Flush Beam (FB-4)

1 piece(s) 5 1/4" x 18" 2.0E Parallam® PSL



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6508 @ 24' 3 1/2"	6508 (1.98")	Passed (100%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	6138 @ 22' 9 1/2"	18270	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	49829 @ 15'	65497	Passed (76%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.810 @ 12' 9 5/16"	0.800	Passed (L/356)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.943 @ 12' 9 1/16"	1.200	Passed (L/305)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Commercial
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- A 0.2% decrease in the moment capacity has been added to account for lateral stability.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 18" DF beam	3.50"	Hanger[1]	1.58"	820	4444	5264	See note [1]
2 - Hanger on 18" DF beam	3.50"	Hanger[1]	1.98"	955	5616	6571	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	1' o/c	
Bottom Edge (Lu)	End Bearing Points	

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Top Mount Hanger	HBS.50/18	3.50"	6-16d	16-16d	10-16d	
2 - Top Mount Hanger	HGLTV5.518	6.00"	6-16d	12-16d	6-16d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3 1/2" to 24' 3 1/2"	N/A	29.5	--	
1 - Uniform (PSF)	0 to 24' 7"	1' 7"	12.0	125.0	Default Commercial Load
2 - Point (lb)	15'	N/A	598	5195	Linked from: Floor: Flush Beam (FB-3), Support 2

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

FB-5

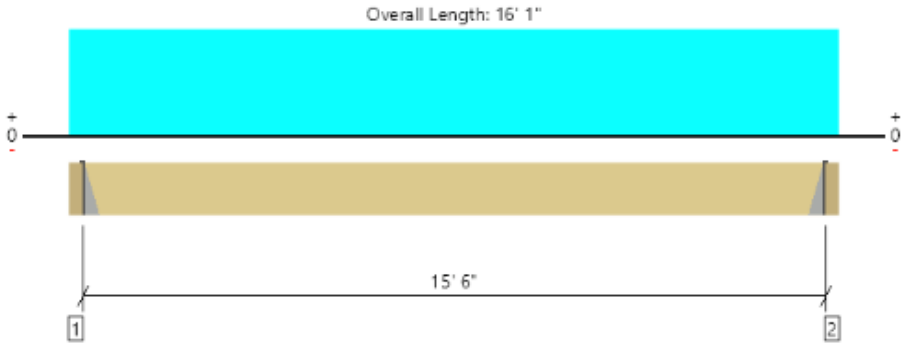
FORTE WEB

MEMBER REPORT

PASSED

Floor, Floor: Flush Beam (FB-5)

1 piece(s) 3 1/2" x 18" 2.0E Parallam® PSL



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1568 @ 3 1/2"	3281 (1.50")	Passed (48%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1264 @ 1' 9 1/2"	12180	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	6076 @ 8' 1/2"	32563	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.073 @ 8' 1/2"	0.517	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.088 @ 8' 1/2"	0.775	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Commercial
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- A 28.7% decrease in the moment capacity has been added to account for lateral stability.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 18" DF beam	3.50"	Hanger[1]	1.50"	281	1340	1621	See note [1]
2 - Hanger on 18" DF beam	3.50"	Hanger[1]	1.50"	281	1340	1621	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Top Mount Hanger	HWPH3.56 H=18	3.25"	4-16d	8-16d	12-10dx1.5	
2 - Top Mount Hanger	HWPH3.56 H=18	3.25"	4-16d	8-16d	12-10dx1.5	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3 1/2" to 15' 9 1/2"	N/A	19.6	--	
1 - Uniform (PSF)	0 to 16' 1"	1' 4"	12.0	125.0	Default Commercial Load

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Column Design

P-1

Reaction RB-2: DL = 6544 lbs, RLL = 8160 lbs.

Reaction FB-2: DL = 7380 lbs, LL = 49740 lbs.

Steel Column

Project File: GST Expansion.ec6

DESCRIPTION: Column P-1

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name : **HSS6x6x3/16**
Analysis Method : Allowable Strength
Steel Stress Grade
Fy : Steel Yield 36.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 14.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 14 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 14 ft, K = 1.0

Applied Loads

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

Column self weight included : 203.420 lbs * Dead Load Factor
AXIAL LOADS . . .
RB-2: Axial Load at 14.0 ft, D = 6.544, LR = 8.160 k
FB-2: Axial Load at 14.0 ft, D = 7.380, L = 49.740 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = 0.9698 : 1
Load Combination +D+L
Location of max.above base 0.0 ft
At maximum location values are . . .
Pa : Axial 63.867 k
Pn / Omega : Allowabl 65.854 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 15.503 k-ft
Ma-y : Applied 0.0 k-ft
Mn-y / Omega : Allowable 15.503 k-ft

PASS Maximum Shear Stress Rati 0.0 : 1
Load Combination 0.0
Location of max.above base 0.0 ft
At maximum location values are . . .
Va : Applied 0.0 k
Vn / Omega : Allowable 0.0 k

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

Maximum Load Deflections . . .
Along Y-Y 0.0 in at 0.0 ft above base
for load combination :
Along X-X 0.0 in at 0.0 ft above base
for load combination :

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
D Only	0.215	PASS	0.00 ft	1.00	1.00	70.89	70.89	0.000	PASS	0.00 ft
+D+L	0.970	PASS	0.00 ft	1.00	1.00	70.89	70.89	0.000	PASS	0.00 ft
+D+Lr	0.338	PASS	0.00 ft	1.00	1.00	70.89	70.89	0.000	PASS	0.00 ft
+D+0.750Lr+0.750L	0.874	PASS	0.00 ft	1.00	1.00	70.89	70.89	0.000	PASS	0.00 ft
+D+0.750L	0.781	PASS	0.00 ft	1.00	1.00	70.89	70.89	0.000	PASS	0.00 ft
+0.60D	0.129	PASS	0.00 ft	1.00	1.00	70.89	70.89	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	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
D Only	14.127									
+D+L	63.867									
+D+Lr	22.287									
+D+0.750Lr+0.750L	57.552									
+D+0.750L	51.432									
+0.60D	8.476									
Lr Only	8.160									
L Only	49.740									

Steel Column

Project File: GST Expansion.ec6

DESCRIPTION: Column P-1

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
Axial @ Base	Maximum	63.867									
"	Minimum	8.160									
Reaction, X-X Axis Base	Maximum	14.127									
"	Minimum	14.127									
Reaction, Y-Y Axis Base	Maximum	14.127									
"	Minimum	14.127									
Reaction, X-X Axis Top	Maximum	14.127									
"	Minimum	14.127									
Reaction, Y-Y Axis Top	Maximum	14.127									
"	Minimum	14.127									
Moment, X-X Axis Base	Maximum	14.127									
"	Minimum	14.127									
Moment, Y-Y Axis Base	Maximum	14.127									
"	Minimum	14.127									
Moment, X-X Axis Top	Maximum	14.127									
"	Minimum	14.127									
Moment, Y-Y Axis Top	Maximum	14.127									
"	Minimum	14.127									

Maximum Deflections for Load Combinations

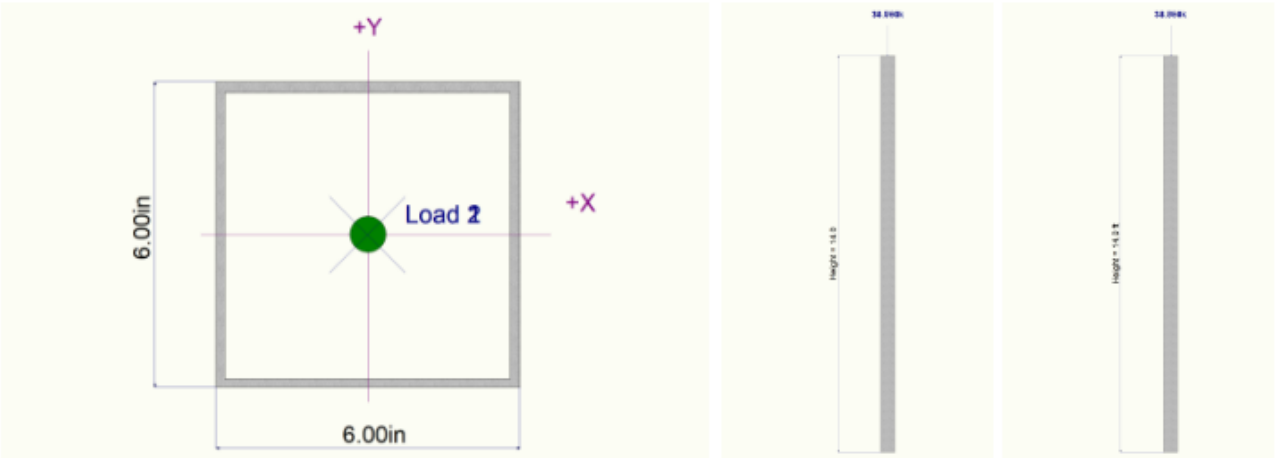
Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+Lr	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000 ft	0.000 in	0.000 ft
Lr Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000 ft	0.000 in	0.000 ft

Steel Section Properties : HSS6x6x3/16

Depth	=	6.000 in	I xx	=	22.30 in^4	J	=	35.000 in^4
Design Thick	=	0.174 in	S xx	=	7.42 in^3			
Width	=	6.000 in	R xx	=	2.370 in			
Wall Thick	=	0.187 in	Zx	=	8.630 in^3			
Area	=	3.980 in^2	I yy	=	22.300 in^4	C	=	11.800 in^3
Weight	=	14.530 plf	S yy	=	7.420 in^3			
			R yy	=	2.370 in			
Ycg	=	0.000 in						

DESCRIPTION: Column P-1

Sketches



P-2

Reaction RB-1: DL = 1513 lbs, RLL = 1967 lbs.

Reaction FB-1: DL = 3640 lbs, LL = 27240 lbs.

Steel Column

Project File: GST Expansion.ec6

DESCRIPTION: Column P-2

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name : **HSS6x6x3/16**
Analysis Method : Allowable Strength
Steel Stress Grade
Fy : Steel Yield 36.0 ksi
E : Elastic Bending Modulus 29,000.0 ksi

Overall Column Height 14.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 14 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 14 ft, K = 1.0

Applied Loads

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

Column self weight included : 203.420 lbs * Dead Load Factor
AXIAL LOADS . . .
RB-1: Axial Load at 14.0 ft, D = 1.513, LR = 1.967 k
FB-1: Axial Load at 14.0 ft, D = 3.640, L = 27.240 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = 0.4950 : 1
Load Combination +D+L
Location of max.above base 0.0 ft
At maximum location values are . . .
Pa : Axial 32.596 k
Pn / Omega : Allowabl 65.854 k
Ma-x : Applied 0.0 k-ft
Mn-x / Omega : Allowable 15.503 k-ft
Ma-y : Applied 0.0 k-ft
Mn-y / Omega : Allowable 15.503 k-ft

PASS Maximum Shear Stress Rati 0.0 : 1
Load Combination 0.0
Location of max.above base 0.0 ft
At maximum location values are . . .
Va : Applied 0.0 k
Vn / Omega : Allowable 0.0 k

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

Maximum Load Deflections . . .
Along Y-Y 0.0 in at 0.0 ft above base
for load combination :
Along X-X 0.0 in at 0.0 ft above base
for load combination :

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
D Only	0.081	PASS	0.00 ft	1.00	1.00	70.89	70.89	0.000	PASS	0.00 ft
+D+L	0.495	PASS	0.00 ft	1.00	1.00	70.89	70.89	0.000	PASS	0.00 ft
+D+Lr	0.111	PASS	0.00 ft	1.00	1.00	70.89	70.89	0.000	PASS	0.00 ft
+D+0.750Lr+0.750L	0.414	PASS	0.00 ft	1.00	1.00	70.89	70.89	0.000	PASS	0.00 ft
+D+0.750L	0.392	PASS	0.00 ft	1.00	1.00	70.89	70.89	0.000	PASS	0.00 ft
+0.60D	0.049	PASS	0.00 ft	1.00	1.00	70.89	70.89	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction k @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
D Only	5.356								
+D+L	32.596								
+D+Lr	7.323								
+D+0.750Lr+0.750L	27.262								
+D+0.750L	25.786								
+0.60D	3.214								
Lr Only	1.967								
L Only	27.240								

Steel Column

Project File: GST Expansion.ec6

DESCRIPTION: Column P-2

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 @ Top	My - End Moments @ Base	My - End Moments @ Top
Axial @ Base	Maximum	32.596									
"	Minimum	1.967									
Reaction, X-X Axis Base	Maximum	5.356									
"	Minimum	5.356									
Reaction, Y-Y Axis Base	Maximum	5.356									
"	Minimum	5.356									
Reaction, X-X Axis Top	Maximum	5.356									
"	Minimum	5.356									
Reaction, Y-Y Axis Top	Maximum	5.356									
"	Minimum	5.356									
Moment, X-X Axis Base	Maximum	5.356									
"	Minimum	5.356									
Moment, Y-Y Axis Base	Maximum	5.356									
"	Minimum	5.356									
Moment, X-X Axis Top	Maximum	5.356									
"	Minimum	5.356									
Moment, Y-Y Axis Top	Maximum	5.356									
"	Minimum	5.356									

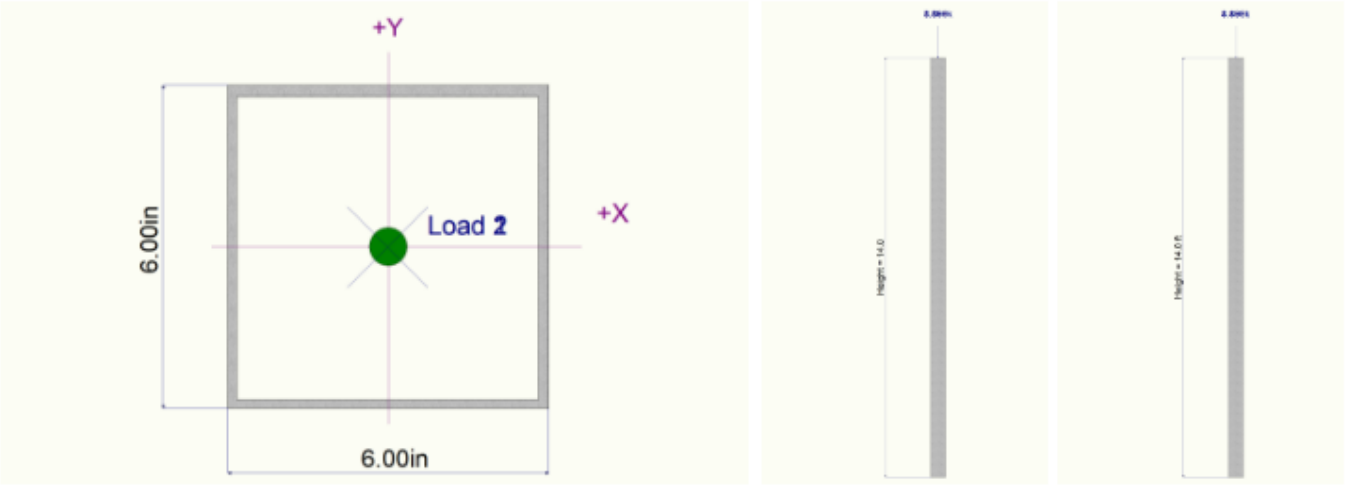
Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+Lr	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000 ft	0.000 in	0.000 ft
Lr Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000 ft	0.000 in	0.000 ft

Steel Section Properties : HSS6x6x3/16

Depth	=	6.000 in	I xx	=	22.30 in^4	J	=	35.000 in^4
Design Thick	=	0.174 in	S xx	=	7.42 in^3			
Width	=	6.000 in	R xx	=	2.370 in			
Wall Thick	=	0.187 in	Zx	=	8.630 in^3			
Area	=	3.980 in^2	I yy	=	22.300 in^4	C	=	11.800 in^3
Weight	=	14.530 plf	S yy	=	7.420 in^3			
			R yy	=	2.370 in			
Ycg	=	0.000 in						

Sketches



CONTINUOUS EXTERIOR FOOTING:

Footing @ Line A & J (1.0-2)

	Load (psf)	Tributary Width (ft)	Total Load (blf)
Roof Dead Load	14	11.5	161
Floor Dead Load	12	0	0
Roof Live Load	20	11.5	230
Floor Live Load	125	0	0
Wall Dead Load	155	31.16	4829.8
Foudation Dead Load	150	2	450
			5670.8
Soil Pressure			2000
Footing Width request			2.84 ft
Use			3 ft
			OK
Use 36" wide footing with 3-#5 Top and Bott.			

Footing @ Line A & J (9-12)

	Load (psf)	Tributary Width (ft)	Total Load (blf)
Roof Dead Load	14	11.5	161
Floor Dead Load	12	11.5	138
Roof Live Load	20	11.5	230
Floor Live Load	125	11.5	1437.5
Wall Dead Load	155	31.16	4829.8
Foudation Dead Load	150	2	450
			7246.3
Soil Pressure			2000
Footing Width request			3.62 ft
Use			4 ft
			OK
Use 48" wide footing with 4-#5 Top and Bott.			

12881 1116th CERRITIOS	2021-057		
Project	Project No.		
CALCULATION SUBJECT	Hung Nguyen, S.E	10/10/22	Page: 33 / Of: 114
Subject	By	Date	

Footing @ Line 1

	Load (psf)	Tributary Width (ft)	Total Load (blf)
Roof Dead Load	14	3	42
Floor Dead Load	12	0	0
Roof Live Load	20	3	60
Floor Live Load	125	0	0
Wall Dead Load	155	31.16	4829.8
Foudation Dead Load	150	3	675
			5606.8
Soil Pressure			2000
Footing Width request			2.80 ft
Use			3 ft
			OK
Use 36" wide footing with 3-#5 Top and Bott.			

Footing @ Line 12

	Load (psf)	Tributary Width (ft)	Total Load (blf)
Roof Dead Load	14	3	42
Floor Dead Load	12	0.67	8.04
Roof Live Load	20	3	60
Floor Live Load	125	0.67	83.75
Wall Dead Load	155	31.16	4829.8
Foudation Dead Load	150	3	675
			5698.59
Soil Pressure			2000
Footing Width request			2.85 ft
Use			3 ft
			OK
Use 36" wide footing with 3-#5 Top and Bott.			

Footing Design

PAD FOOTING:

Footing @ P-1

General Footing

Project File: GST Expansion.ec6

DESCRIPTION: FDN @ P1

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	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	=	2.0 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	=	1.0 ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	1.0 ft

Dimensions

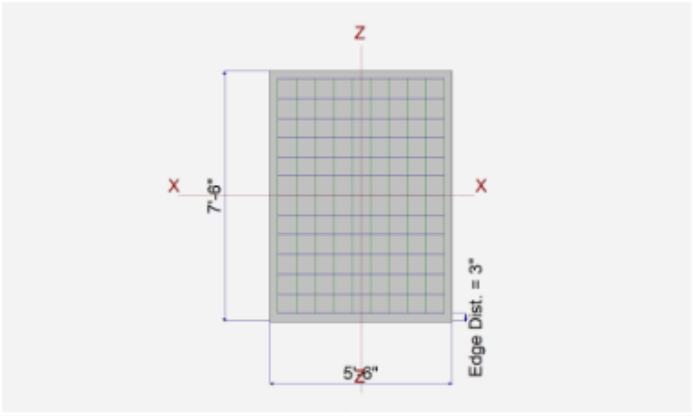
Width parallel to X-X Axis	=	5.50 ft
Length parallel to Z-Z Axis	=	7.50 ft
Footing Thickness	=	24.0 in

Pedestal dimensions...

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

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		13
Reinforcing Bar Size	=	#	5
Bars parallel to Z-Z Axis			
Number of Bars	=		10
Reinforcing Bar Size	=	#	5

Bandwidth Distribution Check (ACI 15.4.4.2)
Direction Requiring Closer Separation: Bars along X-X Axis

# Bars required within zone	84.6 %
# Bars required on each side of zone	15.4 %

Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	14.127	8.160	49.740					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

DESCRIPTION: FDN @ P1

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9465	Soil Bearing	1.893 ksf	2.0 ksf	+D+L 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	0.1873	Z Flexure (+X)	9.223 k-ft/ft	49.249 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.1873	Z Flexure (-X)	9.223 k-ft/ft	49.249 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.3325	X Flexure (+Z)	17.151 k-ft/ft	51.582 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.3325	X Flexure (-Z)	17.151 k-ft/ft	51.582 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.1278	1-way Shear (+X)	9.583 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.1278	1-way Shear (-X)	9.583 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.2613	1-way Shear (+Z)	19.601 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.2613	1-way Shear (-Z)	19.601 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.3511	2-way Punching	52.658 psi	150.0 psi	+1.20D+0.50Lr+1.60L

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	2.0	n/a	0.0	0.6875	0.6875	n/a	n/a	0.344
X-X, +D+L	2.0	n/a	0.0	1.893	1.893	n/a	n/a	0.947
X-X, +D+Lr	2.0	n/a	0.0	0.8853	0.8853	n/a	n/a	0.443
X-X, +D+0.750Lr+0.750L	2.0	n/a	0.0	1.740	1.740	n/a	n/a	0.870
X-X, +D+0.750L	2.0	n/a	0.0	1.592	1.592	n/a	n/a	0.796
X-X, +0.60D	2.0	n/a	0.0	0.4125	0.4125	n/a	n/a	0.206
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	0.6875	0.6875	0.344
Z-Z, +D+L	2.0	0.0	n/a	n/a	n/a	1.893	1.893	0.947
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	0.8853	0.8853	0.443
Z-Z, +D+0.750Lr+0.750L	2.0	0.0	n/a	n/a	n/a	1.740	1.740	0.870
Z-Z, +D+0.750L	2.0	0.0	n/a	n/a	n/a	1.592	1.592	0.796
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.4125	0.4125	0.206

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	3.371	+Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.40D	3.371	-Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D+0.50Lr+1.60L	17.151	+Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D+0.50Lr+1.60L	17.151	-Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D+1.60L	16.455	+Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D+1.60L	16.455	-Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D+1.60Lr+L	13.593	+Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D+1.60Lr+L	13.593	-Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D+1.60Lr	5.115	+Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D+1.60Lr	5.115	-Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D+L	11.368	+Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D+L	11.368	-Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D	2.890	+Z	Bottom	0.5184	AsMin	0.5636	51.582	OK

DESCRIPTION: FDN @ P1

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, +1.20D	2.890	-Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D+0.50Lr+L	12.063	+Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +1.20D+0.50Lr+L	12.063	-Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +0.90D	2.167	+Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
X-X, +0.90D	2.167	-Z	Bottom	0.5184	AsMin	0.5636	51.582	OK
Z-Z, +1.40D	1.813	-X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.40D	1.813	+X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D+0.50Lr+1.60L	9.223	-X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D+0.50Lr+1.60L	9.223	+X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D+1.60L	8.849	-X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D+1.60L	8.849	+X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D+1.60Lr+L	7.310	-X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D+1.60Lr+L	7.310	+X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D+1.60Lr	2.751	-X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D+1.60Lr	2.751	+X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D+L	6.113	-X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D+L	6.113	+X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D	1.554	-X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D	1.554	+X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D+0.50Lr+L	6.487	-X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +1.20D+0.50Lr+L	6.487	+X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +0.90D	1.165	-X	Bottom	0.5184	AsMin	0.5373	49.249	OK
Z-Z, +0.90D	1.165	+X	Bottom	0.5184	AsMin	0.5373	49.249	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	1.88 psi	1.88 psi	3.85 psi	3.85 psi	3.85 psi	75.00 psi	0.05	OK
+1.20D+0.50Lr+1.60L	9.58 psi	9.58 psi	19.60 psi	19.60 psi	19.60 psi	75.00 psi	0.26	OK
+1.20D+1.60L	9.19 psi	9.19 psi	18.81 psi	18.81 psi	18.81 psi	75.00 psi	0.25	OK
+1.20D+1.60Lr+L	7.60 psi	7.60 psi	15.54 psi	15.54 psi	15.54 psi	75.00 psi	0.21	OK
+1.20D+1.60Lr	2.86 psi	2.86 psi	5.85 psi	5.85 psi	5.85 psi	75.00 psi	0.08	OK
+1.20D+L	6.35 psi	6.35 psi	12.99 psi	12.99 psi	12.99 psi	75.00 psi	0.17	OK
+1.20D	1.62 psi	1.62 psi	3.30 psi	3.30 psi	3.30 psi	75.00 psi	0.04	OK
+1.20D+0.50Lr+L	6.74 psi	6.74 psi	13.79 psi	13.79 psi	13.79 psi	75.00 psi	0.18	OK
+0.90D	1.21 psi	1.21 psi	2.48 psi	2.48 psi	2.48 psi	75.00 psi	0.03	OK

Two-Way "Punching" Shear All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	10.35 psi	150.00 psi	0.06901	OK
+1.20D+0.50Lr+1.60L	52.66 psi	150.00 psi	0.3511	OK
+1.20D+1.60L	50.52 psi	150.00 psi	0.3368	OK
+1.20D+1.60Lr+L	41.74 psi	150.00 psi	0.2782	OK
+1.20D+1.60Lr	15.71 psi	150.00 psi	0.1047	OK
+1.20D+L	34.90 psi	150.00 psi	0.2327	OK
+1.20D	8.87 psi	150.00 psi	0.05915	OK
+1.20D+0.50Lr+L	37.04 psi	150.00 psi	0.2469	OK
+0.90D	6.65 psi	150.00 psi	0.04436	OK

Footing @ P-2

General Footing

Project File: GST Expansion.ec6

DESCRIPTION: FDN @ P2

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	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	=	2.0 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	=	1.50 ft
Allow press. increase per foot of depth	=	0.0 ksf
when footing base is below	=	1.0 ft

Increases based on footing plan dimension

Allowable pressure increase per foot of depth	=	0.0 ksf
when max. length or width is greater than	=	1.0 ft

Dimensions

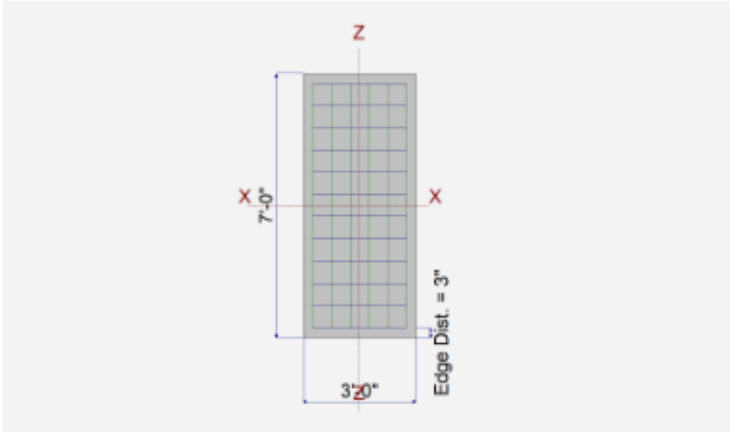
Width parallel to X-X Axis	=	3.0 ft
Length parallel to Z-Z Axis	=	7.0 ft
Footing Thickness	=	24.0 in

Pedestal dimensions...

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

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



Reinforcing

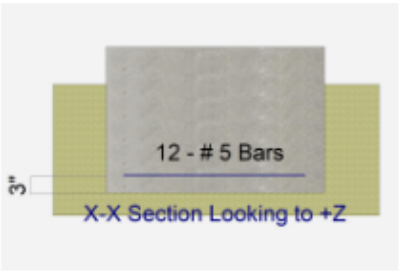
Bars parallel to X-X Axis			
Number of Bars	=		12
Reinforcing Bar Size	=	#	5
Bars parallel to Z-Z Axis			
Number of Bars	=		6
Reinforcing Bar Size	=	#	5

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

Bars along X-X Axis

# Bars required within zone	60.0 %
# Bars required on each side of zone	40.0 %



Applied Loads

		D	Lr	L	S	W	E	H	
P : Column Load	=	5.356	1.967	27.240					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

DESCRIPTION: FDN @ P2

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9210	Soil Bearing	1.842 ksf	2.0 ksf	+D+L 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	0.05607	Z Flexure (+X)	2.732 k-ft/ft	48.725 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.05607	Z Flexure (-X)	2.732 k-ft/ft	48.725 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.2630	X Flexure (+Z)	14.873 k-ft/ft	56.555 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.2630	X Flexure (-Z)	14.873 k-ft/ft	56.555 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	n/a	1-way Shear (+X)	0.0 psi	75.0 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a
PASS	0.2248	1-way Shear (+Z)	16.863 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.2248	1-way Shear (-Z)	16.863 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	n/a	2-way Punching	24.884 psi	75.0 psi	+1.20D+0.50Lr+1.60L

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	2.0	n/a	0.0	0.5450	0.5450	n/a	n/a	0.273
X-X, +D+L	2.0	n/a	0.0	1.842	1.842	n/a	n/a	0.921
X-X, +D+Lr	2.0	n/a	0.0	0.6387	0.6387	n/a	n/a	0.319
X-X, +D+0.750Lr+0.750L	2.0	n/a	0.0	1.588	1.588	n/a	n/a	0.794
X-X, +D+0.750L	2.0	n/a	0.0	1.518	1.518	n/a	n/a	0.759
X-X, +0.60D	2.0	n/a	0.0	0.3270	0.3270	n/a	n/a	0.164
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	0.5450	0.5450	0.273
Z-Z, +D+L	2.0	0.0	n/a	n/a	n/a	1.842	1.842	0.921
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	0.6387	0.6387	0.319
Z-Z, +D+0.750Lr+0.750L	2.0	0.0	n/a	n/a	n/a	1.588	1.588	0.794
Z-Z, +D+0.750L	2.0	0.0	n/a	n/a	n/a	1.518	1.518	0.759
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.3270	0.3270	0.164

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	2.187	+Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.40D	2.187	-Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D+0.50Lr+1.60L	14.873	+Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D+0.50Lr+1.60L	14.873	-Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D+1.60L	14.587	+Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D+1.60L	14.587	-Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D+1.60Lr+L	10.738	+Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D+1.60Lr+L	10.738	-Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D+1.60Lr	2.793	+Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D+1.60Lr	2.793	-Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D+L	9.820	+Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D+L	9.820	-Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D	1.875	+Z	Bottom	0.5184	AsMin	0.620	56.555	OK

DESCRIPTION: FDN @ P2

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, +1.20D	1.875	-Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D+0.50Lr+L	10.106	+Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +1.20D+0.50Lr+L	10.106	-Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +0.90D	1.406	+Z	Bottom	0.5184	AsMin	0.620	56.555	OK
X-X, +0.90D	1.406	-Z	Bottom	0.5184	AsMin	0.620	56.555	OK
Z-Z, +1.40D	0.4017	-X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.40D	0.4017	+X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D+0.50Lr+1.60L	2.732	-X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D+0.50Lr+1.60L	2.732	+X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D+1.60L	2.679	-X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D+1.60L	2.679	+X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D+1.60Lr+L	1.972	-X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D+1.60Lr+L	1.972	+X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D+1.60Lr	0.5129	-X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D+1.60Lr	0.5129	+X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D+L	1.804	-X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D+L	1.804	+X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D	0.3443	-X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D	0.3443	+X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D+0.50Lr+L	1.856	-X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +1.20D+0.50Lr+L	1.856	+X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +0.90D	0.2582	-X	Bottom	0.5184	AsMin	0.5314	48.725	OK
Z-Z, +0.90D	0.2582	+X	Bottom	0.5184	AsMin	0.5314	48.725	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.00 psi	0.00 psi	2.48 psi	2.48 psi	2.48 psi	75.00 psi	0.03	OK
+1.20D+0.50Lr+1.60L	0.00 psi	0.00 psi	16.86 psi	16.86 psi	16.86 psi	75.00 psi	0.22	OK
+1.20D+1.60L	0.00 psi	0.00 psi	16.54 psi	16.54 psi	16.54 psi	75.00 psi	0.22	OK
+1.20D+1.60Lr+L	0.00 psi	0.00 psi	12.17 psi	12.17 psi	12.17 psi	75.00 psi	0.16	OK
+1.20D+1.60Lr	0.00 psi	0.00 psi	3.17 psi	3.17 psi	3.17 psi	75.00 psi	0.04	OK
+1.20D+L	0.00 psi	0.00 psi	11.13 psi	11.13 psi	11.13 psi	75.00 psi	0.15	OK
+1.20D	0.00 psi	0.00 psi	2.13 psi	2.13 psi	2.13 psi	75.00 psi	0.03	OK
+1.20D+0.50Lr+L	0.00 psi	0.00 psi	11.46 psi	11.46 psi	11.46 psi	75.00 psi	0.15	OK
+0.90D	0.00 psi	0.00 psi	1.59 psi	1.59 psi	1.59 psi	75.00 psi	0.02	OK

Two-Way "Punching" Shear All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	3.66 psi	150.00 psi	0.02439	OK
+1.20D+0.50Lr+1.60L	24.88 psi	150.00 psi	0.1659	OK
+1.20D+1.60L	24.41 psi	150.00 psi	0.1627	OK
+1.20D+1.60Lr+L	17.97 psi	150.00 psi	0.1198	OK
+1.20D+1.60Lr	4.67 psi	150.00 psi	0.03115	OK
+1.20D+L	16.43 psi	150.00 psi	0.1095	OK
+1.20D	3.14 psi	150.00 psi	0.02091	OK
+1.20D+0.50Lr+L	16.91 psi	150.00 psi	0.1127	OK
+0.90D	2.35 psi	150.00 psi	0.01568	OK

Footing @ Line 1.0 (From Line A to Line D)

Wall dead Load

Wall DL (psf)	Assumes Wall Width (ft)	Wall Height (ft)	Total Wall DL over Pad FTG. (kips)
155	5	30	23.25

Roof Beam DL (kips)	1.51
Floor Beam DL (kips)	
Total Dead Load (kips)	24.76
Roof Beam LR (kips)	1.97
Floor Beam LL (kips)	

General Footing

Project File: GST Expansion.ec6

DESCRIPTION: FDN @ 1.0 (From A to D)

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	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	=	2.0 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	=	2.0 ft
Allow press. increase per foot of depth	=	ksf
when footing base is below	=	ft

Increases based on footing plan dimension

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

Dimensions

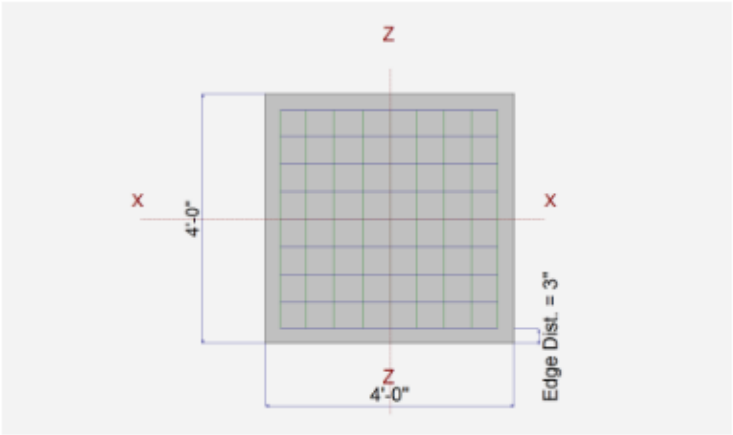
Width parallel to X-X Axis	=	4.0 ft
Length parallel to Z-Z Axis	=	4.0 ft
Footing Thickness	=	24.0 in

Pedestal dimensions...

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

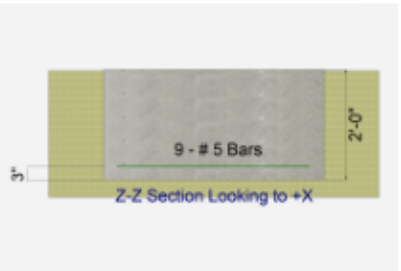
Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		9.0
Reinforcing Bar Size	=	#	5
Bars parallel to Z-Z Axis			
Number of Bars	=		9.0
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	=	24.760	1.967						k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

DESCRIPTION: FDN @ 1.0 (From A to D)

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.980	Soil Bearing	1.960 ksf	2.0 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.06841	Z Flexure (+X)	4.333 k-ft/ft	63.338 k-ft/ft	+1.40D
PASS	0.06841	Z Flexure (-X)	4.333 k-ft/ft	63.338 k-ft/ft	+1.40D
PASS	0.06841	X Flexure (+Z)	4.333 k-ft/ft	63.338 k-ft/ft	+1.40D
PASS	0.06841	X Flexure (-Z)	4.333 k-ft/ft	63.338 k-ft/ft	+1.40D
PASS	0.02751	1-way Shear (+X)	2.063 psi	75.0 psi	+1.40D
PASS	0.02751	1-way Shear (-X)	2.063 psi	75.0 psi	+1.40D
PASS	0.02751	1-way Shear (+Z)	2.063 psi	75.0 psi	+1.40D
PASS	0.02751	1-way Shear (-Z)	2.063 psi	75.0 psi	+1.40D
PASS	0.1056	2-way Punching	15.846 psi	150.0 psi	+1.40D

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	2.0	n/a	0.0	1.838	1.838	n/a	n/a	0.919
X-X, +D+Lr	2.0	n/a	0.0	1.960	1.960	n/a	n/a	0.980
X-X, +D+0.750Lr	2.0	n/a	0.0	1.930	1.930	n/a	n/a	0.965
X-X, +0.60D	2.0	n/a	0.0	1.103	1.103	n/a	n/a	0.552
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	1.838	1.838	0.919
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	1.960	1.960	0.980
Z-Z, +D+0.750Lr	2.0	0.0	n/a	n/a	n/a	1.930	1.930	0.965
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	1.103	1.103	0.552

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	4.333	+Z	Bottom	0.5184	AsMin	0.6975	63.338	OK
X-X, +1.40D	4.333	-Z	Bottom	0.5184	AsMin	0.6975	63.338	OK
X-X, +1.20D+0.50Lr	3.837	+Z	Bottom	0.5184	AsMin	0.6975	63.338	OK
X-X, +1.20D+0.50Lr	3.837	-Z	Bottom	0.5184	AsMin	0.6975	63.338	OK
X-X, +1.20D	3.714	+Z	Bottom	0.5184	AsMin	0.6975	63.338	OK
X-X, +1.20D	3.714	-Z	Bottom	0.5184	AsMin	0.6975	63.338	OK
X-X, +1.20D+1.60Lr	4.107	+Z	Bottom	0.5184	AsMin	0.6975	63.338	OK
X-X, +1.20D+1.60Lr	4.107	-Z	Bottom	0.5184	AsMin	0.6975	63.338	OK
X-X, +0.90D	2.786	+Z	Bottom	0.5184	AsMin	0.6975	63.338	OK
X-X, +0.90D	2.786	-Z	Bottom	0.5184	AsMin	0.6975	63.338	OK
Z-Z, +1.40D	4.333	-X	Bottom	0.5184	AsMin	0.6975	63.338	OK
Z-Z, +1.40D	4.333	+X	Bottom	0.5184	AsMin	0.6975	63.338	OK
Z-Z, +1.20D+0.50Lr	3.837	-X	Bottom	0.5184	AsMin	0.6975	63.338	OK
Z-Z, +1.20D+0.50Lr	3.837	+X	Bottom	0.5184	AsMin	0.6975	63.338	OK
Z-Z, +1.20D	3.714	-X	Bottom	0.5184	AsMin	0.6975	63.338	OK
Z-Z, +1.20D	3.714	+X	Bottom	0.5184	AsMin	0.6975	63.338	OK
Z-Z, +1.20D+1.60Lr	4.107	-X	Bottom	0.5184	AsMin	0.6975	63.338	OK

DESCRIPTION: FDN @ 1.0 (From A to D)

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D+1.60Lr	4.107	+X	Bottom	0.5184	AsMin	0.6975	63.338	OK
Z-Z, +0.90D	2.786	-X	Bottom	0.5184	AsMin	0.6975	63.338	OK
Z-Z, +0.90D	2.786	+X	Bottom	0.5184	AsMin	0.6975	63.338	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	2.06 psi	2.06 psi	2.06 psi	2.06 psi	2.06 psi	75.00 psi	0.03	OK
+1.20D+0.50Lr	1.83 psi	1.83 psi	1.83 psi	1.83 psi	1.83 psi	75.00 psi	0.02	OK
+1.20D	1.77 psi	1.77 psi	1.77 psi	1.77 psi	1.77 psi	75.00 psi	0.02	OK
+1.20D+1.60Lr	1.96 psi	1.96 psi	1.96 psi	1.96 psi	1.96 psi	75.00 psi	0.03	OK
+0.90D	1.33 psi	1.33 psi	1.33 psi	1.33 psi	1.33 psi	75.00 psi	0.02	OK

Two-Way "Punching" Shear All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	15.85 psi	150.00 psi	0.1056	OK
+1.20D+0.50Lr	14.03 psi	150.00 psi	0.09355	OK
+1.20D	13.58 psi	150.00 psi	0.09055	OK
+1.20D+1.60Lr	15.02 psi	150.00 psi	0.1001	OK
+0.90D	10.19 psi	150.00 psi	0.06791	OK

Footing @ Line 1.0 (From Line F to Line J)

Wall dead Load

Wall DL (psf)	Assumes Wall Width (ft)	Wall Height (ft)	Total Wall DL over Pad FTG. (kips)
155	5	30	23.25

Roof Beam DL (kips)	6.54
Floor Beam DL (kips)	
Total Dead Load (kips)	29.79
Roof Beam LR (kips)	8.16
Floor Beam LL (kips)	

General Footing

Project File: GST Expansion.ec6

DESCRIPTION: FDN @ 1.0 (From F to J)

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	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	=	2.0 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	=	2.0 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

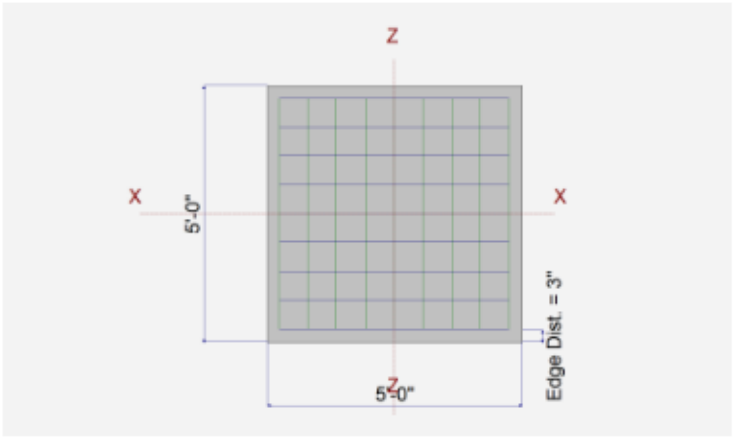
Width parallel to X-X Axis	=	5.0 ft
Length parallel to Z-Z Axis	=	5.0 ft
Footing Thickness	=	24.0 in

Pedestal dimensions...

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

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		9.0
Reinforcing Bar Size	=	#	5
Bars parallel to Z-Z Axis			
Number of Bars	=		9.0
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	=	29.790	8.160						k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

DESCRIPTION: FDN @ 1.0 (From F to J)

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9040	Soil Bearing	1.808 ksf	2.0 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1194	Z Flexure (+X)	6.101 k-ft/ft	51.083 k-ft/ft	+1.20D+1.60Lr
PASS	0.1194	Z Flexure (-X)	6.101 k-ft/ft	51.083 k-ft/ft	+1.20D+1.60Lr
PASS	0.1194	X Flexure (+Z)	6.101 k-ft/ft	51.083 k-ft/ft	+1.20D+1.60Lr
PASS	0.1194	X Flexure (-Z)	6.101 k-ft/ft	51.083 k-ft/ft	+1.20D+1.60Lr
PASS	0.07747	1-way Shear (+X)	5.810 psi	75.0 psi	+1.20D+1.60Lr
PASS	0.07747	1-way Shear (-X)	5.810 psi	75.0 psi	+1.20D+1.60Lr
PASS	0.07747	1-way Shear (+Z)	5.810 psi	75.0 psi	+1.20D+1.60Lr
PASS	0.07747	1-way Shear (-Z)	5.810 psi	75.0 psi	+1.20D+1.60Lr
PASS	0.1619	2-way Punching	24.278 psi	150.0 psi	+1.20D+1.60Lr

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	2.0	n/a	0.0	1.482	1.482	n/a	n/a	0.741
X-X, +D+Lr	2.0	n/a	0.0	1.808	1.808	n/a	n/a	0.904
X-X, +D+0.750Lr	2.0	n/a	0.0	1.726	1.726	n/a	n/a	0.863
X-X, +0.60D	2.0	n/a	0.0	0.8890	0.8890	n/a	n/a	0.445
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	1.482	1.482	0.741
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	1.808	1.808	0.904
Z-Z, +D+0.750Lr	2.0	0.0	n/a	n/a	n/a	1.726	1.726	0.863
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.8890	0.8890	0.445

Overturning Stability

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

Sliding Stability

All units k

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

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	5.213	+Z	Bottom	0.5184	AsMin	0.5580	51.083	OK
X-X, +1.40D	5.213	-Z	Bottom	0.5184	AsMin	0.5580	51.083	OK
X-X, +1.20D+0.50Lr	4.979	+Z	Bottom	0.5184	AsMin	0.5580	51.083	OK
X-X, +1.20D+0.50Lr	4.979	-Z	Bottom	0.5184	AsMin	0.5580	51.083	OK
X-X, +1.20D	4.469	+Z	Bottom	0.5184	AsMin	0.5580	51.083	OK
X-X, +1.20D	4.469	-Z	Bottom	0.5184	AsMin	0.5580	51.083	OK
X-X, +1.20D+1.60Lr	6.101	+Z	Bottom	0.5184	AsMin	0.5580	51.083	OK
X-X, +1.20D+1.60Lr	6.101	-Z	Bottom	0.5184	AsMin	0.5580	51.083	OK
X-X, +0.90D	3.351	+Z	Bottom	0.5184	AsMin	0.5580	51.083	OK
X-X, +0.90D	3.351	-Z	Bottom	0.5184	AsMin	0.5580	51.083	OK
Z-Z, +1.40D	5.213	-X	Bottom	0.5184	AsMin	0.5580	51.083	OK
Z-Z, +1.40D	5.213	+X	Bottom	0.5184	AsMin	0.5580	51.083	OK
Z-Z, +1.20D+0.50Lr	4.979	-X	Bottom	0.5184	AsMin	0.5580	51.083	OK
Z-Z, +1.20D+0.50Lr	4.979	+X	Bottom	0.5184	AsMin	0.5580	51.083	OK
Z-Z, +1.20D	4.469	-X	Bottom	0.5184	AsMin	0.5580	51.083	OK
Z-Z, +1.20D	4.469	+X	Bottom	0.5184	AsMin	0.5580	51.083	OK
Z-Z, +1.20D+1.60Lr	6.101	-X	Bottom	0.5184	AsMin	0.5580	51.083	OK

DESCRIPTION: FDN @ 1.0 (From F to J)

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
Z-Z, +1.20D+1.60Lr	6.101	+X	Bottom	0.5184	AsMin	0.5580	51.083	OK
Z-Z, +0.90D	3.351	-X	Bottom	0.5184	AsMin	0.5580	51.083	OK
Z-Z, +0.90D	3.351	+X	Bottom	0.5184	AsMin	0.5580	51.083	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	4.97 psi	4.97 psi	4.97 psi	4.97 psi	4.97 psi	75.00 psi	0.07	OK
+1.20D+0.50Lr	4.74 psi	4.74 psi	4.74 psi	4.74 psi	4.74 psi	75.00 psi	0.06	OK
+1.20D	4.26 psi	4.26 psi	4.26 psi	4.26 psi	4.26 psi	75.00 psi	0.06	OK
+1.20D+1.60Lr	5.81 psi	5.81 psi	5.81 psi	5.81 psi	5.81 psi	75.00 psi	0.08	OK
+0.90D	3.19 psi	3.19 psi	3.19 psi	3.19 psi	3.19 psi	75.00 psi	0.04	OK

Two-Way "Punching" Shear All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	20.75 psi	150.00 psi	0.1383	OK
+1.20D+0.50Lr	19.81 psi	150.00 psi	0.1321	OK
+1.20D	17.78 psi	150.00 psi	0.1186	OK
+1.20D+1.60Lr	24.28 psi	150.00 psi	0.1619	OK
+0.90D	13.34 psi	150.00 psi	0.08891	OK

Footing @ Line 12 (From Line A to Line D)

Wall dead Load

Wall DL (psf)	Assumes Wall Width (ft)	Wall Height (ft)	Total Wall DL over Pad FTG. (kips)
155	6	30	27.90

Roof Beam DL (kips)	1.51
Floor Beam DL	3.64
Total Dead Load (kips)	33.05
Roof Beam LR (kips)	1.97
Floor Beam LL (kips)	27.24

General Footing

Project File: GST Expansion.ec6

DESCRIPTION: FDN @ 12 (From A to D)

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	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	=	2.0 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	=	2.0 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

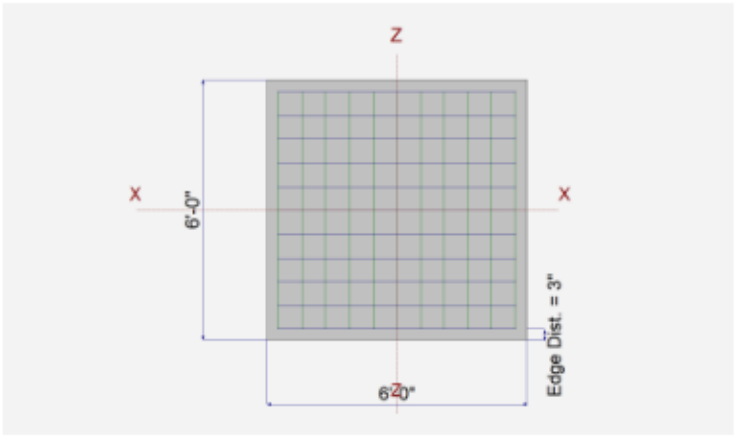
Width parallel to X-X Axis	=	6.0 ft
Length parallel to Z-Z Axis	=	6.0 ft
Footing Thickness	=	24.0 in

Pedestal dimensions...

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

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		11
Reinforcing Bar Size	=	#	5
Bars parallel to Z-Z Axis			
Number of Bars	=		11
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	=	33.050	1.970	27.240					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

DESCRIPTION: FDN @ 12 (From A to D)

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9825	Soil Bearing	1.965 ksf	2.0 ksf	+D+L 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	0.2025	Z Flexure (+X)	10.529 k-ft/ft	51.997 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.2025	Z Flexure (-X)	10.529 k-ft/ft	51.997 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.2025	X Flexure (+Z)	10.529 k-ft/ft	51.997 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.2025	X Flexure (-Z)	10.529 k-ft/ft	51.997 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.1560	1-way Shear (+X)	11.698 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.1560	1-way Shear (-X)	11.698 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.1560	1-way Shear (+Z)	11.698 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.1560	1-way Shear (-Z)	11.698 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.2897	2-way Punching	43.451 psi	150.0 psi	+1.20D+0.50Lr+1.60L

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	2.0	n/a	0.0	1.208	1.208	n/a	n/a	0.604
X-X, +D+L	2.0	n/a	0.0	1.965	1.965	n/a	n/a	0.983
X-X, +D+Lr	2.0	n/a	0.0	1.263	1.263	n/a	n/a	0.632
X-X, +D+0.750Lr+0.750L	2.0	n/a	0.0	1.817	1.817	n/a	n/a	0.909
X-X, +D+0.750L	2.0	n/a	0.0	1.776	1.776	n/a	n/a	0.888
X-X, +0.60D	2.0	n/a	0.0	0.7248	0.7248	n/a	n/a	0.362
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	1.208	1.208	0.604
Z-Z, +D+L	2.0	0.0	n/a	n/a	n/a	1.965	1.965	0.983
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	1.263	1.263	0.632
Z-Z, +D+0.750Lr+0.750L	2.0	0.0	n/a	n/a	n/a	1.817	1.817	0.909
Z-Z, +D+0.750L	2.0	0.0	n/a	n/a	n/a	1.776	1.776	0.888
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.7248	0.7248	0.362

Overturning Stability

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

All units k

Sliding Stability

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

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	5.784	+Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.40D	5.784	-Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D+0.50Lr+1.60L	10.529	+Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D+0.50Lr+1.60L	10.529	-Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D+1.60L	10.406	+Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D+1.60L	10.406	-Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D+1.60Lr+L	8.757	+Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D+1.60Lr+L	8.757	-Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D+1.60Lr	5.352	+Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D+1.60Lr	5.352	-Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D+L	8.363	+Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D+L	8.363	-Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D	4.958	+Z	Bottom	0.5184	AsMin	0.5683	51.997	OK

DESCRIPTION: FDN @ 12 (From A to D)

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, +1.20D	4.958	-Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D+0.50Lr+L	8.486	+Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +1.20D+0.50Lr+L	8.486	-Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +0.90D	3.718	+Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
X-X, +0.90D	3.718	-Z	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.40D	5.784	-X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.40D	5.784	+X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D+0.50Lr+1.60L	10.529	-X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D+0.50Lr+1.60L	10.529	+X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D+1.60L	10.406	-X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D+1.60L	10.406	+X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D+1.60Lr+L	8.757	-X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D+1.60Lr+L	8.757	+X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D+1.60Lr	5.352	-X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D+1.60Lr	5.352	+X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D+L	8.363	-X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D+L	8.363	+X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D	4.958	-X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D	4.958	+X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D+0.50Lr+L	8.486	-X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +1.20D+0.50Lr+L	8.486	+X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +0.90D	3.718	-X	Bottom	0.5184	AsMin	0.5683	51.997	OK
Z-Z, +0.90D	3.718	+X	Bottom	0.5184	AsMin	0.5683	51.997	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	6.43 psi	6.43 psi	6.43 psi	6.43 psi	6.43 psi	75.00 psi	0.09	OK
+1.20D+0.50Lr+1.60L	11.70 psi	11.70 psi	11.70 psi	11.70 psi	11.70 psi	75.00 psi	0.16	OK
+1.20D+1.60L	11.56 psi	11.56 psi	11.56 psi	11.56 psi	11.56 psi	75.00 psi	0.15	OK
+1.20D+1.60Lr+L	9.73 psi	9.73 psi	9.73 psi	9.73 psi	9.73 psi	75.00 psi	0.13	OK
+1.20D+1.60Lr	5.95 psi	5.95 psi	5.95 psi	5.95 psi	5.95 psi	75.00 psi	0.08	OK
+1.20D+L	9.29 psi	9.29 psi	9.29 psi	9.29 psi	9.29 psi	75.00 psi	0.12	OK
+1.20D	5.51 psi	5.51 psi	5.51 psi	5.51 psi	5.51 psi	75.00 psi	0.07	OK
+1.20D+0.50Lr+L	9.43 psi	9.43 psi	9.43 psi	9.43 psi	9.43 psi	75.00 psi	0.13	OK
+0.90D	4.13 psi	4.13 psi	4.13 psi	4.13 psi	4.13 psi	75.00 psi	0.06	OK

Two-Way "Punching" Shear All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	23.87 psi	150.00 psi	0.1591	OK
+1.20D+0.50Lr+1.60L	43.45 psi	150.00 psi	0.2897	OK
+1.20D+1.60L	42.94 psi	150.00 psi	0.2863	OK
+1.20D+1.60Lr+L	36.14 psi	150.00 psi	0.2409	OK
+1.20D+1.60Lr	22.09 psi	150.00 psi	0.1472	OK
+1.20D+L	34.51 psi	150.00 psi	0.2301	OK
+1.20D	20.46 psi	150.00 psi	0.1364	OK
+1.20D+0.50Lr+L	35.02 psi	150.00 psi	0.2335	OK
+0.90D	15.35 psi	150.00 psi	0.1023	OK

Footing @ Line 12 (From Line F to Line J)

Wall dead Load

Wall DL (psf)	Assumes Wall Width (ft)	Wall Height (ft)	Total Wall DL over Pad FTG. (kips)
155	8.5	30	39.53

Roof Beam DL (kips)	6.54
Floor Beam DL (kips)	7.38
Total Dead Load (kips)	53.45
Roof Beam LR (kips)	8.16
Floor Beam LL (kips)	49.74

General Footing

Project File: GST Expansion.ec6

DESCRIPTION: FDN @ 12 (From F to J)

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	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	=	2.0 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	=	2.0 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

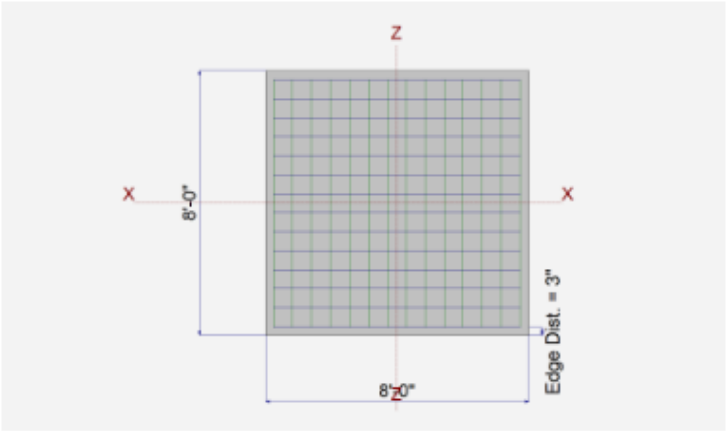
Width parallel to X-X Axis	=	8.0 ft
Length parallel to Z-Z Axis	=	8.0 ft
Footing Thickness	=	24.0 in

Pedestal dimensions...

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

Rebar Centerline to Edge of Concrete...

at Bottom of footing	=	3.0 in



Reinforcing

Bars parallel to X-X Axis			
Number of Bars	=		14
Reinforcing Bar Size	=	#	5
Bars parallel to Z-Z Axis			
Number of Bars	=		14.0
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	=	53.450	8.160	49.740					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

DESCRIPTION: FDN @ 12 (From F to J)

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9510	Soil Bearing	1.902 ksf	2.0 ksf	+D+L 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	0.3717	Z Flexure (+X)	18.476 k-ft/ft	49.708 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.3717	Z Flexure (-X)	18.476 k-ft/ft	49.708 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.3717	X Flexure (+Z)	18.476 k-ft/ft	49.708 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.3717	X Flexure (-Z)	18.476 k-ft/ft	49.708 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.2737	1-way Shear (+X)	20.528 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.2737	1-way Shear (-X)	20.528 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.2737	1-way Shear (+Z)	20.528 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.2737	1-way Shear (-Z)	20.528 psi	75.0 psi	+1.20D+0.50Lr+1.60L
PASS	0.5316	2-way Punching	79.734 psi	150.0 psi	+1.20D+0.50Lr+1.60L

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location Bottom, -Z	Top, +Z	Left, -X	Right, +X	Actual / Allow Ratio
X-X, D Only	2.0	n/a	0.0	1.125	1.125	n/a	n/a	0.563
X-X, +D+L	2.0	n/a	0.0	1.902	1.902	n/a	n/a	0.951
X-X, +D+Lr	2.0	n/a	0.0	1.253	1.253	n/a	n/a	0.627
X-X, +D+0.750Lr+0.750L	2.0	n/a	0.0	1.804	1.804	n/a	n/a	0.902
X-X, +D+0.750L	2.0	n/a	0.0	1.708	1.708	n/a	n/a	0.854
X-X, +0.60D	2.0	n/a	0.0	0.6751	0.6751	n/a	n/a	0.338
Z-Z, D Only	2.0	0.0	n/a	n/a	n/a	1.125	1.125	0.563
Z-Z, +D+L	2.0	0.0	n/a	n/a	n/a	1.902	1.902	0.951
Z-Z, +D+Lr	2.0	0.0	n/a	n/a	n/a	1.253	1.253	0.627
Z-Z, +D+0.750Lr+0.750L	2.0	0.0	n/a	n/a	n/a	1.804	1.804	0.902
Z-Z, +D+0.750L	2.0	0.0	n/a	n/a	n/a	1.708	1.708	0.854
Z-Z, +0.60D	2.0	0.0	n/a	n/a	n/a	0.6751	0.6751	0.338

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	9.354	+Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.40D	9.354	-Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D+0.50Lr+1.60L	18.476	+Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D+0.50Lr+1.60L	18.476	-Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D+1.60L	17.966	+Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D+1.60L	17.966	-Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D+1.60Lr+L	15.867	+Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D+1.60Lr+L	15.867	-Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D+1.60Lr	9.650	+Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D+1.60Lr	9.650	-Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D+L	14.235	+Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D+L	14.235	-Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D	8.018	+Z	Bottom	0.5184	AsMin	0.5425	49.708	OK

DESCRIPTION: FDN @ 12 (From F to J)

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, +1.20D	8.018	-Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D+0.50Lr+L	14.745	+Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +1.20D+0.50Lr+L	14.745	-Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +0.90D	6.013	+Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
X-X, +0.90D	6.013	-Z	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.40D	9.354	-X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.40D	9.354	+X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D+0.50Lr+1.60L	18.476	-X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D+0.50Lr+1.60L	18.476	+X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D+1.60L	17.966	-X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D+1.60L	17.966	+X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D+1.60Lr+L	15.867	-X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D+1.60Lr+L	15.867	+X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D+1.60Lr	9.650	-X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D+1.60Lr	9.650	+X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D+L	14.235	-X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D+L	14.235	+X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D	8.018	-X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D	8.018	+X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D+0.50Lr+L	14.745	-X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +1.20D+0.50Lr+L	14.745	+X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +0.90D	6.013	-X	Bottom	0.5184	AsMin	0.5425	49.708	OK
Z-Z, +0.90D	6.013	+X	Bottom	0.5184	AsMin	0.5425	49.708	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	10.39 psi	10.39 psi	10.39 psi	10.39 psi	10.39 psi	75.00 psi	0.14	OK
+1.20D+0.50Lr+1.60L	20.53 psi	20.53 psi	20.53 psi	20.53 psi	20.53 psi	75.00 psi	0.27	OK
+1.20D+1.60L	19.96 psi	19.96 psi	19.96 psi	19.96 psi	19.96 psi	75.00 psi	0.27	OK
+1.20D+1.60Lr+L	17.63 psi	17.63 psi	17.63 psi	17.63 psi	17.63 psi	75.00 psi	0.24	OK
+1.20D+1.60Lr	10.72 psi	10.72 psi	10.72 psi	10.72 psi	10.72 psi	75.00 psi	0.14	OK
+1.20D+L	15.82 psi	15.82 psi	15.82 psi	15.82 psi	15.82 psi	75.00 psi	0.21	OK
+1.20D	8.91 psi	8.91 psi	8.91 psi	8.91 psi	8.91 psi	75.00 psi	0.12	OK
+1.20D+0.50Lr+L	16.38 psi	16.38 psi	16.38 psi	16.38 psi	16.38 psi	75.00 psi	0.22	OK
+0.90D	6.68 psi	6.68 psi	6.68 psi	6.68 psi	6.68 psi	75.00 psi	0.09	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	40.37 psi	150.00 psi	0.2691	OK
+1.20D+0.50Lr+1.60L	79.73 psi	150.00 psi	0.5316	OK
+1.20D+1.60L	77.53 psi	150.00 psi	0.5169	OK
+1.20D+1.60Lr+L	68.48 psi	150.00 psi	0.4565	OK
+1.20D+1.60Lr	41.64 psi	150.00 psi	0.2776	OK
+1.20D+L	61.43 psi	150.00 psi	0.4096	OK
+1.20D	34.60 psi	150.00 psi	0.2307	OK
+1.20D+0.50Lr+L	63.63 psi	150.00 psi	0.4242	OK
+0.90D	25.95 psi	150.00 psi	0.173	OK

Stair framing:

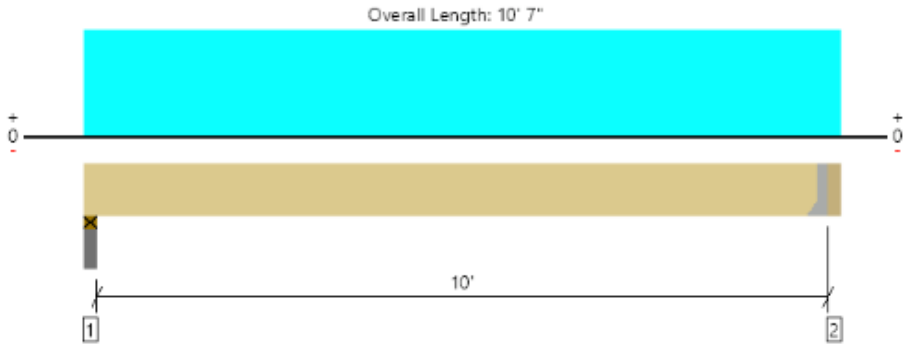
Stringer

FORTE WEB

MEMBER REPORT **PASSED**

Floor, Stair: Stringer Stair

1 piece(s) 2 x 8 DF No.2



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	381 @ 10' 3 1/2"	1406 (1.50")	Passed (27%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	336 @ 9' 8 1/4"	1305	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	965 @ 5' 2 3/4"	1183	Passed (82%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.165 @ 5' 2 3/4"	0.338	Passed (L/734)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.234 @ 5' 2 3/4"	0.506	Passed (L/520)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Commercial
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Plate on concrete - DF	3.50"	3.50"	1.50"	115	279	394	None
2 - Hanger on 7 1/4" DF beam	3.50"	Hanger[1]	1.50"	117	286	403	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	9' 1" o/c	
Bottom Edge (Lu)	10' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	LU26	1.50"	N/A	6-10dx1.5	4-10dx1.5	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 10' 3 1/2"	N/A	2.8	--	
1 - Uniform (PSF)	0 to 10' 7"	1' 4"	14.4	40.0	Default Load

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

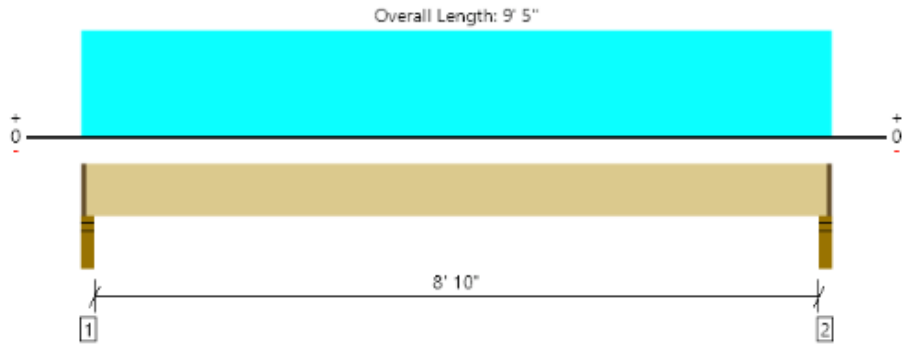
Landing Joist

FORTE WEB

MEMBER REPORT **PASSED**

Floor, Stair: Landing Joist

1 piece(s) 2 x 12 DF No.2 @ 16" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	319 @ 2 1/2"	2109 (2.25")	Passed (15%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	241 @ 1' 2 3/4"	2025	Passed (12%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	702 @ 4' 8 1/2"	1629	Passed (43%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.028 @ 4' 8 1/2"	0.225	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.036 @ 4' 8 1/2"	0.450	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Commercial
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- A 40.3% decrease in the moment capacity has been added to account for lateral stability.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - DF	3.50"	2.25"	1.50"	75	251	326	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	75	251	326	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 9' 5"	16"	12.0	40.0	Default Commercial Load

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Landing Beam.

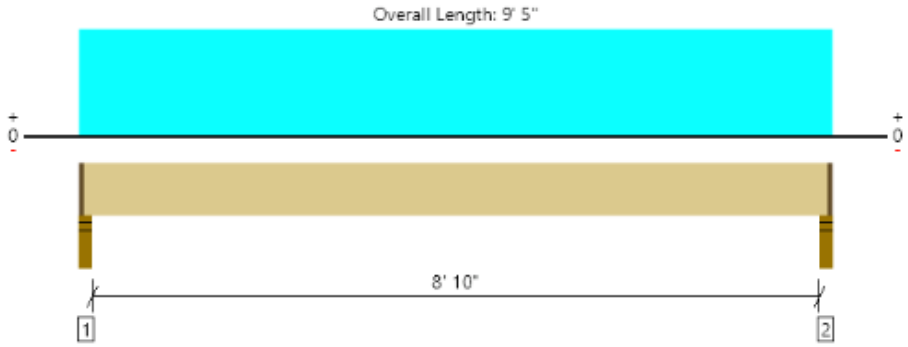
FORTE WEB

MEMBER REPORT

PASSED

Floor, Stair: Landing Beam

1 piece(s) 4 x 12 DF No.2



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1243 @ 2"	4922 (2.25")	Passed (25%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	939 @ 1' 2 3/4"	4725	Passed (20%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2784 @ 4' 8 1/2"	6046	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.046 @ 4' 8 1/2"	0.227	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.062 @ 4' 8 1/2"	0.454	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Commercial
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- A 0.7% decrease in the moment capacity has been added to account for lateral stability.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - DF	3.50"	2.25"	1.50"	328	942	1270	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	328	942	1270	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' o/c	
Bottom Edge (Lu)	4' o/c	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 9' 3 3/4"	N/A	10.0	--	
1 - Uniform (PSF)	0 to 9' 5"	5'	12.0	40.0	Default Commercial Load

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Opening framing:

Header Beam

Steel Beam

Project File: GST Expansion.ec6

DESCRIPTION: Opening Beam

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

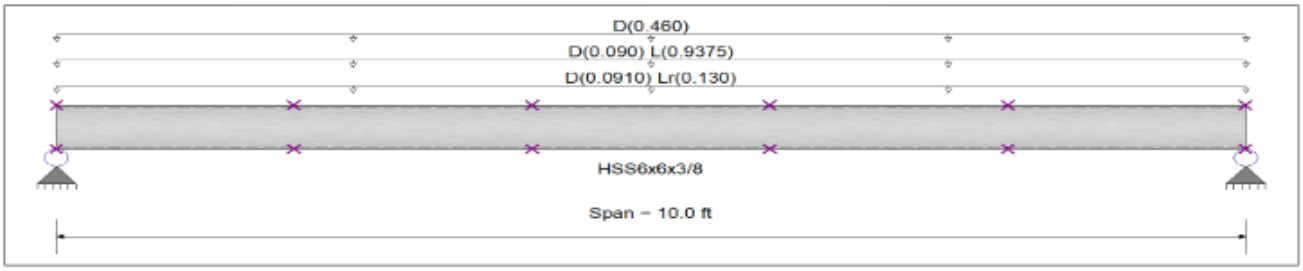
Material Properties

Analysis Method :Allowable Strength Design
Beam Bracing : Beam bracing is defined as a set spacing over all spans
Bending Axis : Major Axis Bending

Fy : Steel Yield : 36.0 ksi
E: Modulus : 29,000.0 ksi

Unbraced Lengths

First Brace starts at 2.0 ft from Left-Most support
Regular spacing of lateral supports on length of beam = 2.0 ft



Applied Loads

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

Beam self weight NOT internally calculated and added
Uniform Load : D = 0.0140, Lr = 0.020 ksf, Tributary Width = 6.50 ft, (Roof Load)

Uniform Load : D = 0.0120, L = 0.1250 ksf, Tributary Width = 7.50 ft, (Floor Load)

Uniform Load : D = 0.1150 ksf, Tributary Width = 4.0 ft, (Wall Load)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.695 : 1	Maximum Shear Stress Ratio =	0.177 : 1
Section used for this span	HSS6x6x3/8	Section used for this span	HSS6x6x3/8
Ma : Applied	19.731 k-ft	Va : Applied	7.893 k
Mn / Omega : Allowable	28.383 k-ft	Vn/Omega : Allowable	44.716 k
Load Combination	+D+L	Load Combination	+D+L
		Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.185 in	Ratio =	648	>=360
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360 Span: 1 : L Only
Max Downward Total Deflection	0.311 in	Ratio =	385	>=180 Span: 1 : +D+L
Max Upward Total Deflection	0.000 in	Ratio =	0	<180

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega	
D Only													
Dsgn. L = 2.00 ft	1	0.181	0.072	5.13		5.13	47.40	28.38	1.57	1.00	3.21	74.68	44.72
Dsgn. L = 2.00 ft	1	0.271	0.043	7.69	5.13	7.69	47.40	28.38	1.12	1.00	1.92	74.68	44.72
Dsgn. L = 2.00 ft	1	0.282	0.014	8.01	7.69	8.01	47.40	28.38	1.01	1.00	0.64	74.68	44.72
Dsgn. L = 2.00 ft	1	0.271	0.043	7.69	5.13	7.69	47.40	28.38	1.12	1.00	1.92	74.68	44.72
Dsgn. L = 2.00 ft	1	0.181	0.072	5.13		5.13	47.40	28.38	1.55	1.00	3.20	74.68	44.72
+D+L													
Dsgn. L = 2.00 ft	1	0.445	0.177	12.63		12.63	47.40	28.38	1.57	1.00	7.89	74.68	44.72
Dsgn. L = 2.00 ft	1	0.667	0.106	18.94	12.63	18.94	47.40	28.38	1.12	1.00	4.74	74.68	44.72
Dsgn. L = 2.00 ft	1	0.695	0.035	19.73	18.94	19.73	47.40	28.38	1.01	1.00	1.58	74.68	44.72
Dsgn. L = 2.00 ft	1	0.667	0.106	18.94	12.63	18.94	47.40	28.38	1.12	1.00	4.74	74.68	44.72
Dsgn. L = 2.00 ft	1	0.445	0.177	12.63		12.63	47.40	28.38	1.55	1.00	7.89	74.68	44.72
+D+Lr													
Dsgn. L = 2.00 ft	1	0.217	0.086	6.17		6.17	47.40	28.38	1.57	1.00	3.86	74.68	44.72

Steel Beam

Project File: GST Expansion.ec6

DESCRIPTION: Opening Beam

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	Summary of Moment Values Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Summary of Shear Values Va Max	VnxVnx/Omega	
Dsgn. L = 2.00 ft	1	0.326	0.052	9.25	6.17	9.25	47.40	28.38	1.12	1.00	2.31	74.68	44.72
Dsgn. L = 2.00 ft	1	0.340	0.017	9.64	9.25	9.64	47.40	28.38	1.01	1.00	0.77	74.68	44.72
Dsgn. L = 2.00 ft	1	0.326	0.052	9.25	6.17	9.25	47.40	28.38	1.12	1.00	2.31	74.68	44.72
Dsgn. L = 2.00 ft	1	0.217	0.086	6.17		6.17	47.40	28.38	1.55	1.00	3.85	74.68	44.72
+D+0.750Lr+0.750L													
Dsgn. L = 2.00 ft	1	0.406	0.161	11.53		11.53	47.40	28.38	1.57	1.00	7.21	74.68	44.72
Dsgn. L = 2.00 ft	1	0.609	0.097	17.30	11.53	17.30	47.40	28.38	1.12	1.00	4.32	74.68	44.72
Dsgn. L = 2.00 ft	1	0.635	0.032	18.02	17.30	18.02	47.40	28.38	1.01	1.00	1.44	74.68	44.72
Dsgn. L = 2.00 ft	1	0.609	0.097	17.30	11.53	17.30	47.40	28.38	1.12	1.00	4.32	74.68	44.72
Dsgn. L = 2.00 ft	1	0.406	0.161	11.53		11.53	47.40	28.38	1.55	1.00	7.21	74.68	44.72
+D+0.750L													
Dsgn. L = 2.00 ft	1	0.379	0.150	10.75		10.75	47.40	28.38	1.57	1.00	6.72	74.68	44.72
Dsgn. L = 2.00 ft	1	0.568	0.090	16.13	10.75	16.13	47.40	28.38	1.12	1.00	4.03	74.68	44.72
Dsgn. L = 2.00 ft	1	0.592	0.030	16.80	16.13	16.80	47.40	28.38	1.01	1.00	1.34	74.68	44.72
Dsgn. L = 2.00 ft	1	0.568	0.090	16.13	10.75	16.13	47.40	28.38	1.12	1.00	4.03	74.68	44.72
Dsgn. L = 2.00 ft	1	0.379	0.150	10.75		10.75	47.40	28.38	1.55	1.00	6.72	74.68	44.72
+0.60D													
Dsgn. L = 2.00 ft	1	0.108	0.043	3.08		3.08	47.40	28.38	1.57	1.00	1.92	74.68	44.72
Dsgn. L = 2.00 ft	1	0.163	0.026	4.62	3.08	4.62	47.40	28.38	1.12	1.00	1.15	74.68	44.72
Dsgn. L = 2.00 ft	1	0.169	0.009	4.81	4.62	4.81	47.40	28.38	1.01	1.00	0.38	74.68	44.72
Dsgn. L = 2.00 ft	1	0.163	0.026	4.62	3.08	4.62	47.40	28.38	1.12	1.00	1.15	74.68	44.72
Dsgn. L = 2.00 ft	1	0.108	0.043	3.08		3.08	47.40	28.38	1.55	1.00	1.92	74.68	44.72

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.3115	5.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	
Overall MAXimum	7.893	7.893	21.405
Overall MINimum	0.650	0.650	21.405
D Only	3.205	3.205	21.405
+D+L	7.893	7.893	21.405
+D+Lr	3.855	3.855	21.405
+D+0.750Lr+0.750L	7.208	7.208	21.405
+D+0.750L	6.721	6.721	21.405
+0.60D	1.923	1.923	21.405
Lr Only	0.650	0.650	21.405
L Only	4.688	4.688	21.405

Opening Column.

Steel Column

Project File: GST Expansion.ec6

DESCRIPTION: Opening Column

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Steel Section Name : **HSS6x6x3/8**

Analysis Method :	Allowable Strength
Steel Stress Grade	
Fy : Steel Yield	36.0 ksi
E : Elastic Bending Modulus	29,000.0 ksi

Overall Column Height 14.0 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 14 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 14 ft, K = 1.0

Applied Loads

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

Column self weight included : 384.720 lbs * Dead Load Factor
AXIAL LOADS . . .
Opening Beam: Axial Load at 12.0 ft, D = 3.205, LR = 0.650, L = 4.688 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = 0.06742 : 1

Load Combination	+D+L
Location of max.above base	0.0 ft
At maximum location values are . . .	
Pa : Axial	8.278 k
Pn / Omega : Allowabl	122.779 k
Ma-x : Applied	0.0 k-ft
Mn-x / Omega : Allowable	28.383 k-ft
Ma-y : Applied	0.0 k-ft
Mn-y / Omega : Allowable	28.383 k-ft

PASS Maximum Shear Stress Rati 0.0 : 1

Load Combination	0.0
Location of max.above base	0.0 ft
At maximum location values are . . .	
Va : Applied	0.0 k
Vn / Omega : Allowable	0.0 k

Maximum Load Reactions . .

Top along X-X	0.0 k
Bottom along X-X	0.0 k
Top along Y-Y	0.0 k
Bottom along Y-Y	0.0 k

Maximum Load Deflections . . .

Along Y-Y 0.0 in at 0.0 ft above base
for load combination :

Along X-X 0.0 in at 0.0 ft above base
for load combination :

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
D Only	0.029	PASS	0.00 ft	1.00	1.00	73.68	73.68	0.000	PASS	0.00 ft
+D+L	0.067	PASS	0.00 ft	1.00	1.00	73.68	73.68	0.000	PASS	0.00 ft
+D+Lr	0.035	PASS	0.00 ft	1.00	1.00	73.68	73.68	0.000	PASS	0.00 ft
+D+0.750Lr+0.750L	0.062	PASS	0.00 ft	1.00	1.00	73.68	73.68	0.000	PASS	0.00 ft
+D+0.750L	0.058	PASS	0.00 ft	1.00	1.00	73.68	73.68	0.000	PASS	0.00 ft
+0.60D	0.018	PASS	0.00 ft	1.00	1.00	73.68	73.68	0.000	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction @ Base	X-X Axis Reaction k @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
D Only	3.590								
+D+L	8.278								
+D+Lr	4.240								
+D+0.750Lr+0.750L	7.593								
+D+0.750L	7.106								
+0.60D	2.154								
Lr Only	0.650								
L Only	4.688								

Steel Column

Project File: GST Expansion.ec6

DESCRIPTION: Opening Column

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base	@ Top	Y-Y Axis Reaction @ Base	@ Top	Mx - End Moments k-ft @ Base	@ Top	My - End Moments @ Base	@ Top
Axial @ Base	Maximum	8.278								
"	Minimum	0.650								
Reaction, X-X Axis Base	Maximum	3.590								
"	Minimum	3.590								
Reaction, Y-Y Axis Base	Maximum	3.590								
"	Minimum	3.590								
Reaction, X-X Axis Top	Maximum	3.590								
"	Minimum	3.590								
Reaction, Y-Y Axis Top	Maximum	3.590								
"	Minimum	3.590								
Moment, X-X Axis Base	Maximum	3.590								
"	Minimum	3.590								
Moment, Y-Y Axis Base	Maximum	3.590								
"	Minimum	3.590								
Moment, X-X Axis Top	Maximum	3.590								
"	Minimum	3.590								
Moment, Y-Y Axis Top	Maximum	3.590								
"	Minimum	3.590								

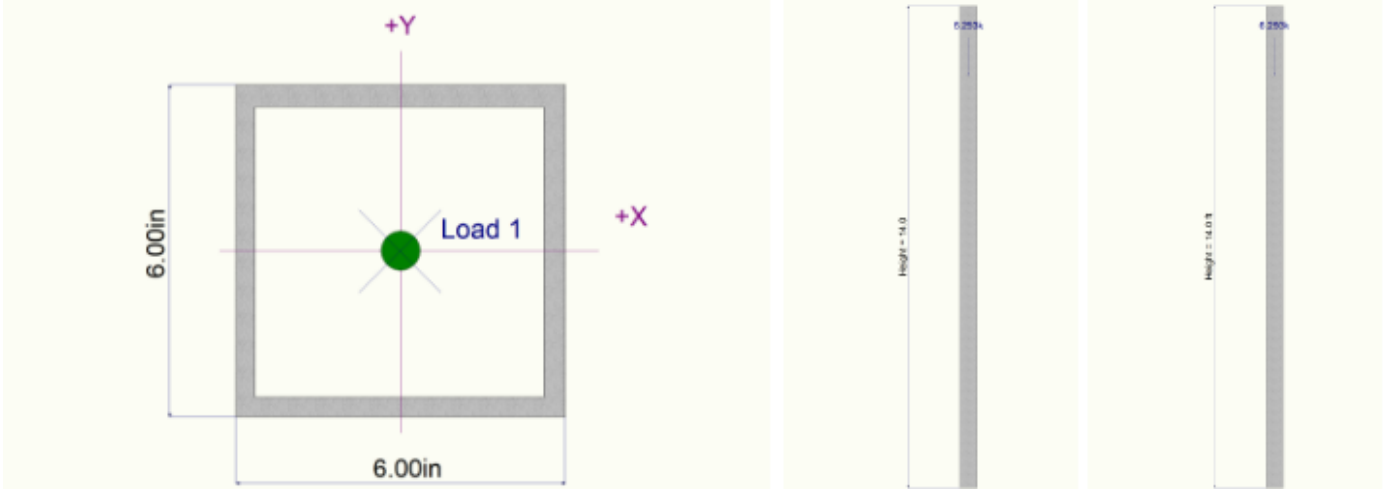
Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+Lr	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000 ft	0.000 in	0.000 ft
Lr Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000 ft	0.000 in	0.000 ft

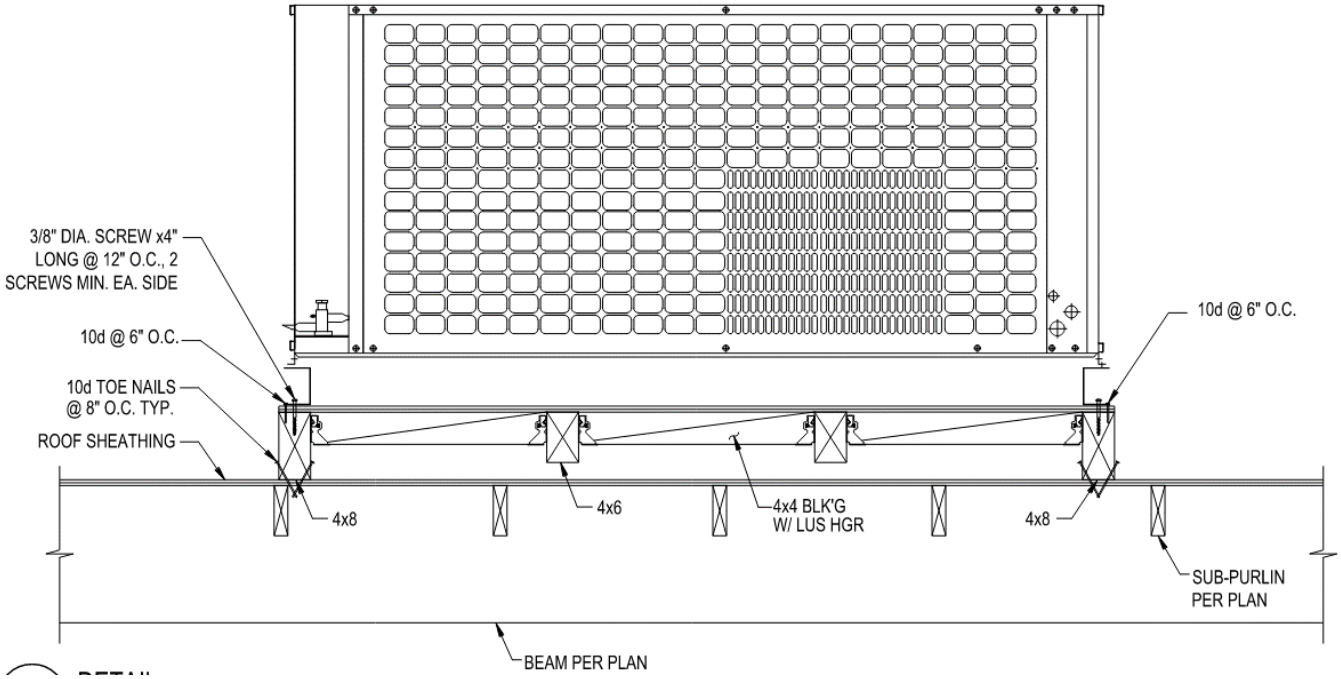
Steel Section Properties : HSS6x6x3/8

Depth	=	6.000 in	I xx	=	39.50 in^4	J	=	64.600 in^4
Design Thick	=	0.349 in	S xx	=	13.20 in^3			
Width	=	6.000 in	R xx	=	2.280 in			
Wall Thick	=	0.375 in	Zx	=	15.800 in^3			
Area	=	7.580 in^2	I yy	=	39.500 in^4	C	=	22.100 in^3
Weight	=	27.480 plf	S yy	=	13.200 in^3			
			R yy	=	2.280 in			
Ycg	=	0.000 in						

Sketches



Mechanical Framing:



Mechanical Beam

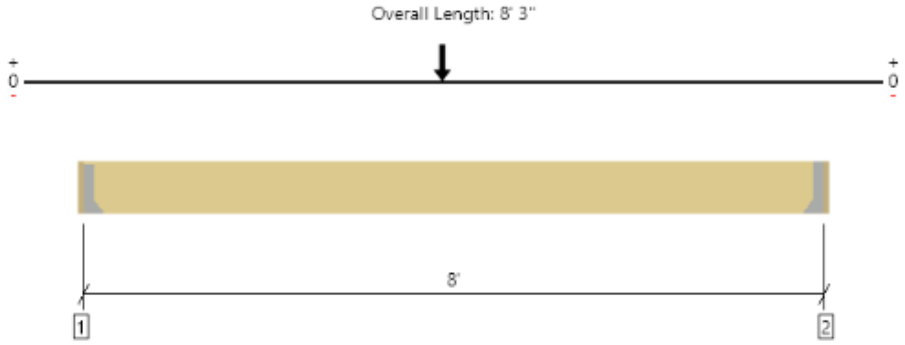
FORTEWEB

MEMBER REPORT

PASSED

Roof, Roof: Mech. Beam

1 piece(s) 4 x 8 DF No.2



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	617 @ 1 1/2"	3281 (1.50")	Passed (19%)	--	1.0 D (All Spans)
Shear (lbs)	613 @ 8 3/4"	2741	Passed (22%)	0.90	1.0 D (All Spans)
Moment (Ft-lbs)	2341 @ 4'	2666	Passed (88%)	0.90	1.0 D (All Spans)
Live Load Defl. (in)	0.000 @ 1 1/2"	0.400	Passed (L/999+)	--	1.0 D (All Spans)
Total Load Defl. (in)	0.122 @ 4' 1 3/16"	0.533	Passed (L/787)	--	1.0 D (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- A 0.9% decrease in the moment capacity has been added to account for lateral stability.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)		Accessories
	Total	Available	Required	Dead	Factored	
1 - Hanger on 7 1/4" DF beam	1.50"	Hanger[1]	1.50"	617	617	See note [1]
2 - Hanger on 7 1/4" DF beam	1.50"	Hanger[1]	1.50"	581	581	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LUS46	2.00"	N/A	4-10dx1.5	4-10d	
2 - Face Mount Hanger	LUS46	2.00"	N/A	4-10dx1.5	4-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Comments
0 - Self Weight (PLF)	1 1/2" to 8' 1 1/2"	N/A	6.4	
1 - Point (lb)	4' (Front)	N/A	1146	Default Load

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Component: RTU4 **Detail: Misc**

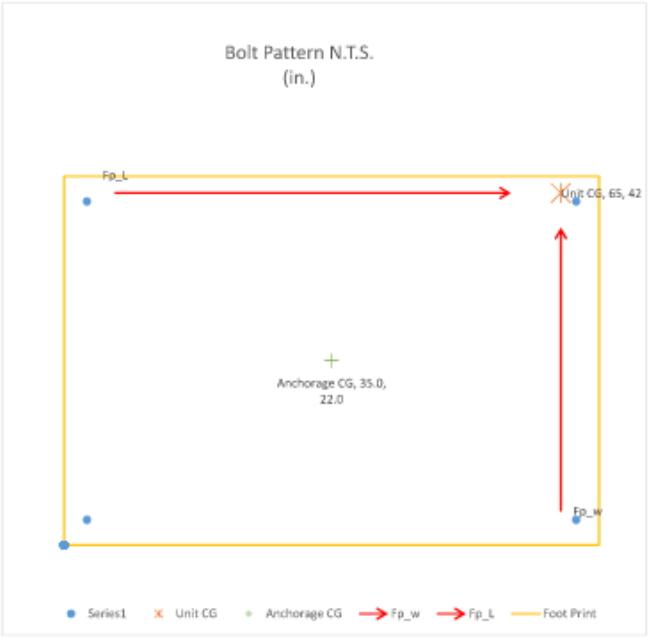
Parameters

Unit Dimensions	Value	Units
Length (Long Dimension) (L)	70	in.
Width (Short Dimension) (W)	44	in.
Height (Z)	41	in.
Weight (Wp)	1146	lb.
Height of CG (H / 2 Min.)(H_{CG})	22	in.
Length Eccentricity (10% min.)	30	in.
Width Eccentricity (10% min.)	20	in.

Seismic Parameters	Value	Units
Response Amplification Factor (a_p)	2.5	
Response Factor (R_p)	6	
Importance Factor (I_p)	1	
Seismic Amplification (Ω_0)	2	
Height of Building (h)	3.42	ft.
Component Elevation (z)	0	ft.
Short Period Spectral Acceleration (S_{DS})	1.254	g

Design Forces

Design Lateral Seismic Force (F_{Pcalc})	239.51	lb.
(F_{Pmin})	431.13	lb.
(F_{Pmax})	2299.33	lb.
Maximum Bolt Shear: $v = F_{pe} / Z$	375.61	lb.
Amplified Bolt Shear: $\Omega_0 v = \Omega_0 * F_{pe} / Z$	751.21	lb.
Maximum Uplift: 0.9D - 0.2Ev + 1.0Eh	1017.95	lb.
Amplified Uplift: 0.9D - 0.2Ev + ΩEh	1203.95	lb.



Bolt group	X (in.)	Y (in.)	Dia. (in.)	Ixx (in.^{4})	Iyy (in.^{4})	Ixy (in.^{4})	d_{max} (in.)	Angle w/ +X	Bolt shear if load acts in L Direction	Bolt shear if load acts in W Direction	Max Shear (kip)	Max tension LRFD (kips)	Max tension ASD (kips)
1	3.00	3.00	0.20	11.34	32.17	43.51	37.22	-2.61	0.0927	0.0553	0.19	1.018	0.730
2	3.00	41.00	0.20	11.34	32.17	43.51	37.22	2.61	0.1461	0.0553	0.29		
3	67.00	3.00	0.20	11.34	32.17	43.51	37.22	-0.54	0.0927	0.1878	0.38		
4	67.00	41.00	0.20	11.34	32.17	43.51	37.22	0.54	0.1461	0.1878	0.38		
Average	35.000	22.000	Totals	45.36	128.68	174.04							

Shear Load, ASD = 376/1.4 = 188 lbs

Withdrawal load, ASD = (1204 lbs/6 screw)/1.4 = 143 lbs

By inspection, 3/8" lag screw with 4" embedment is adequate.

Side Member Thickness	Lag Screw Diameter	G=0.67 Red Oak		G=0.55 Mixed Maple Southern Pine		G=0.5 Douglas Fir-Larch		G=0.49 Douglas Fir-Larch (N)		G=0.46 Douglas Fir(S) Hem-Fir(N)		G=0.43 Hem-Fir		G=0.42 Spruce-Pine-Fir		G=0.37 Redwood (open grain)		G=0.36 Eastern Softwoods Spruce-Pine-Fir(S) Western Cedars Western Woods		G=0.35 Northern Species	
t_s	D	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$	$Z_{\parallel}$	$Z_{\perp}$
in.	in.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
0.075	1/4	170	130	160	120	150	110	150	110	150	100	140	100	140	100	130	90	130	90	130	90
(14 gage)	5/16	220	160	200	140	190	130	190	130	190	130	180	120	180	120	170	110	170	110	160	100
	3/8	220	160	200	140	200	130	190	130	190	120	180	120	180	120	170	110	170	100	170	100
0.105	1/4	180	140	170	130	160	120	160	120	160	110	150	110	150	110	140	100	140	100	140	90
(12 gage)	5/16	230	170	210	150	200	140	200	140	190	130	190	130	190	120	180	110	170	110	170	110
	3/8	230	160	210	140	200	140	200	130	200	130	190	120	190	120	180	110	180	110	170	110
0.120	1/4	190	150	180	130	170	120	170	120	160	120	160	110	160	110	150	100	150	100	140	100
(11 gage)	5/16	230	170	210	150	210	140	200	140	200	140	190	130	190	130	180	120	180	120	180	110
	3/8	240	170	220	150	210	140	210	140	200	130	200	130	190	120	180	110	180	110	180	110
0.134	1/4	200	150	180	140	180	130	170	130	170	120	160	120	160	110	150	110	150	100	150	100
(10 gage)	5/16	240	180	220	160	210	150	210	140	200	140	200	130	200	130	190	120	180	120	180	120
	3/8	240	170	220	150	220	140	210	140	210	140	200	130	200	130	190	120	190	120	180	110
0.179	1/4	220	170	210	150	200	150	200	140	190	140	190	130	190	130	180	120	170	120	170	120
(7 gage)	5/16	260	190	240	170	230	160	230	160	230	150	220	150	220	150	210	130	200	130	200	130
	3/8	270	190	250	170	240	160	240	160	230	150	220	140	220	140	210	130	210	130	200	130
0.239	1/4	240	180	220	160	210	150	210	150	200	140	190	140	190	130	180	120	180	120	180	120
(3 gage)	5/16	300	220	280	190	270	180	260	180	260	170	250	160	250	160	230	150	230	150	230	140
	3/8	310	220	280	190	270	180	270	180	260	170	250	160	250	160	240	140	230	140	230	140
	7/16	420	290	390	260	380	240	370	240	360	230	350	220	350	220	330	200	330	200	320	190
	1/2	510	340	470	300	460	290	450	280	440	270	430	260	420	260	400	240	400	230	390	230
	5/8	770	490	710	430	680	400	680	400	660	380	640	370	630	360	600	330	590	330	580	320
	3/4	1110	670	1020	590	980	560	970	550	950	530	920	500	910	500	860	450	850	450	840	440
	7/8	1510	880	1390	780	1330	730	1320	710	1280	690	1250	650	1230	650	1170	590	1160	590	1140	570
	1	1940	1100	1780	960	1710	910	1700	890	1650	860	1600	820	1590	810	1500	740	1480	730	1460	710

Table 12.2A Lag Screw Reference Withdrawal Design Values, W[1]

Tabulated withdrawal design values (W) are in pounds per inch of thread penetration into side grain of wood member. Length of thread penetration in main member shall not include the length of the tapered tip (see 12.2.1.1).

Specific Gravity, G[2]	Lag Screw Diameter, D										
	1/4"	5/16"	3/8"	7/16"	1/2"	5/8"	3/4"	7/8"	1"	1-1/8"	1-1/4"
0.73	397	469	538	604	668	789	905	1016	1123	1226	1327
0.71	381	450	516	579	640	757	868	974	1077	1176	1273
0.68	357	422	484	543	600	709	813	913	1009	1103	1193
0.67	349	413	473	531	587	694	796	893	987	1078	1167
0.58	281	332	381	428	473	559	641	719	795	869	940
0.55	260	307	352	395	437	516	592	664	734	802	868
0.51	232	274	314	353	390	461	528	593	656	716	775
0.50	225	266	305	342	378	447	513	576	636	695	752
0.49	218	258	296	332	367	434	498	559	617	674	730
0.47	205	242	278	312	345	408	467	525	580	634	686
0.46	199	235	269	302	334	395	453	508	562	613	664
0.44	186	220	252	283	312	369	423	475	525	574	621
0.43	179	212	243	273	302	357	409	459	508	554	600
0.42	173	205	235	264	291	344	395	443	490	535	579
0.41	167	198	226	254	281	332	381	428	473	516	559
0.40	161	190	218	245	271	320	367	412	455	497	538
0.39	155	183	210	236	261	308	353	397	438	479	518
0.38	149	176	202	227	251	296	340	381	422	461	498
0.37	143	169	194	218	241	285	326	367	405	443	479
0.36	137	163	186	209	231	273	313	352	389	425	460
0.35	132	156	179	200	222	262	300	337	373	407	441
0.31	110	130	149	167	185	218	250	281	311	339	367

1. Tabulated withdrawal design values, W, for lag screw connections shall be multiplied by all applicable adjustment factors (see Table 11.3.1).
2. Specific gravity, G, shall be determined in accordance with Table 12.3.3A.

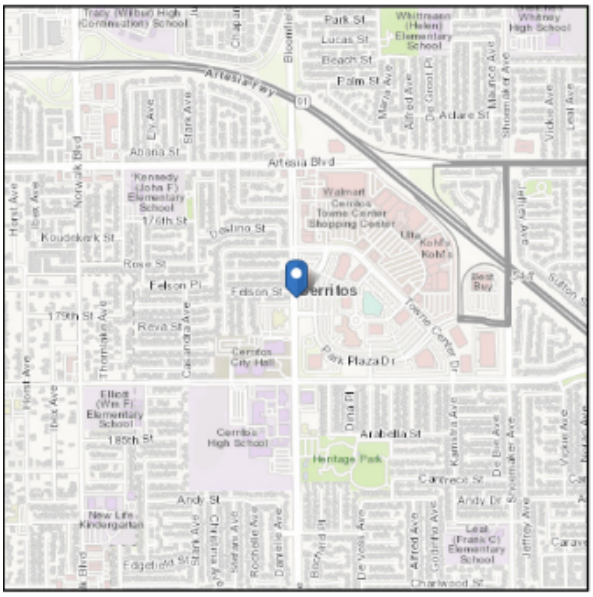
LATERAL ANALYSIS AND DESIGN :

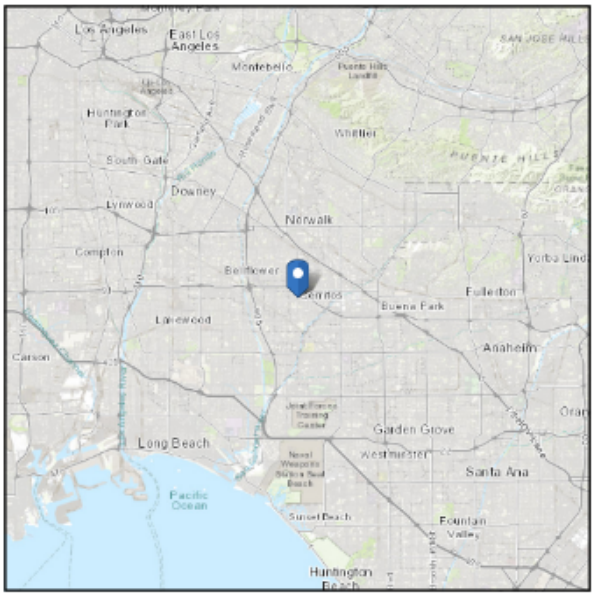
ASCE 7 Hazards Report

Address:
Cerritos
California,

Standard: ASCE/SEI 7-22
Risk Category: II
Soil Class: D - Stiff Soil

Elevation: 55.37 ft (NAVD 88)
Latitude: 33.86866
Longitude: -118.0637





Wind

Results:

Wind Speed	95 Vmph
10-year MRI	66 Vmph
25-year MRI	72 Vmph
50-year MRI	76 Vmph
100-year MRI	81 Vmph
10,000-year MRI	115 Vmph
100,000-year MRI	132 Vmph
1,000,000-year MRI	150 Vmph

Data Source: ASCE/SEI 7-22, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed: Tue Mar 29 2022

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-22 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years). Values for 10-year MRI, 25-year MRI, 50-year MRI and 100-year MRI are Service Level wind speeds, all other wind speeds are Ultimate wind speeds.

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-22 Section 26.2.

Seismic Parameters (Latitude: 33.88106350, Longitude: -118.05821870)	Site Class "D"
Mapped 0.2 Sec Period Spectral Acceleration **S_S**	1.567 g
Mapped 1.0 Sec Period Spectral Acceleration **S_1**	0.559g
Site Coefficient for Site Class "D", **F_a**	1.2
Site Coefficient for Site Class "D", **F_v**	1.741
Maximum Considered Earthquake Spectral Response Acceleration Parameter at 0.2 Second, **S_{MS}**	1.881
Maximum Considered Earthquake Spectral Response Acceleration Parameter at 1.0 Second, **S_{M1}**	0.974g
Design Spectral Response Acceleration Parameters for 0.2 sec, **S_{DS}**	1.254g
Design Spectral Response Acceleration Parameters for 1.0 Sec, **S_{D1}**	0.649g

BUILDING WEIGHT

BUILDING MASS-NORTH/SOUTH DIRECTION:

Existing Building

Component	Dead Load (psf)	Height (ft)	Length (ft)	Weight (kips)
Roof Level				
Ext. Wall	155	11	640	1091.2
Interior Walls	9	5	2400	108
Roof Load	19	23244		441.636
Ext. Trellis	150	4	164	98.4
Total				1739.236
Floor Level				
Ext. Wall	155	12	640	1190.4
Interior Walls	9	12	2400	259.2
Floor Load	22	23244		511.368
Ext. Trellis	150	4	164	98.4
Total				2059.368

New Addition East Side

Component	Dead Load (psf)	Height (ft)	Length (ft)	Weight (kips)
Roof Level				
Ext. Wall	155	11	54	92.07
Interior Walls	9	5	30	1.35
Roof Load	19	4212		80.028
Total				173.448
Floor Level				
Ext. Wall	155	12	54	100.44
Interior Walls	9	12	30	3.24
Floor Load	22	4212		92.664
Total				196.344

New Addition West Side

Component	Dead Load (psf)	Height (ft)	Length (ft)	Weight (kips)
Roof Level				
Ext. Wall	155	18	54	150.66
Interior Walls	9	0	0	0
Roof Load	19	4212		80.028
Total				230.688

BUILDING MASS-EAST/WEST DIRECTION:

Existing Building

Component	Dead Load (psf)	Height (ft)	Length (ft)	Weight (kips)
Roof Level				
Ext. Wall	155	11	640	1091.2
Interior Walls	9	5	2400	108
Roof Load	19	23244		441.636
Ext. Trellis	150	0	0	0
Total				1640.836
Floor Level				
Ext. Wall	155	12	640	1190.4
Interior Walls	9	12	2400	259.2
Floor Load	22	23244		511.368
Ext. Trellis	150	0	0	0
Total				1960.968

New Addition East Side

Component	Dead Load (psf)	Height (ft)	Length (ft)	Weight (kips)
Roof Level				
Ext. Wall	155	11	156	265.98
Interior Walls	9	5	30	1.35
Roof Load	19	4212		80.028
Total				347.358
Floor Level				
Ext. Wall	155	12	156	290.16
Interior Walls	9	12	30	3.24
Floor Load	22	4212		92.664
Total				386.064

New Addition West Side

Component	Dead Load (psf)	Height (ft)	Length (ft)	Weight (kips)
Roof Level				
Ext. Wall	155	18	156	435.24
Interior Walls	9	0	0	0
Roof Load	19	4212		80.028
Total				515.268

Seismic Base Shear

ASCE 7-16 Seismic Base Shear

Project File: GST Expansion.ec6

DESCRIPTION: Seismic Base Shear Analysis

Specific Description: Existing Building

Risk Category — Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV — *SCE 7-16, Page 4, Table 1.5-1*

Seismic Importance Factor = 1 — *ASCE 7-16, Page 5, Table 1.5-2*

USER DEFINED Ground Motion — ASCE 7-16 11.4.2

Max. Ground Motions, 5% Damping

S_S = 1.567 g, 0.2 sec response

S_1 = 0.5590 g, 1.0 sec response

For the closest datapoint grid location . . .

Latitude = 0.000 deg North

Longitude = 0.000 deg West

Site Class, Site Coeff. and Design Category

Classification: "D" : Shear Wave Velocity 600 to 1,200 ft/sec		=	**D** (By Default per 11.4.3)	*ASCE 7-16 Table 20.3-1*
Site Coefficients Fa & Fv	Fa	=	1.20	*ASCE 7-16 Table 11.4-1 & 11.4-2*
(using straight-line interpolation from table val	Fv	=	1.74	
Maximum Considered Earthquake Acceleral	S_{MS} = Fa * Ss	=	1.880	*ASCE 7-16 Eq. 11.4-1*
	S_{M1} = Fv * S1	=	0.973	*ASCE 7-16 Eq. 11.4-2*
Design Spectral Acceleration	$S_{DS} = S_{MS} * 2/3$	=	1.254	*ASCE 7-16 Eq. 11.4-3*
	$S_{D1} = S_{M1} * 2/3$	=	0.649	*ASCE 7-16 Eq. 11.4-4*
Seismic Design Category		=	**D**	*ASCE 7-16 Table 11.6-1 & -2*

Resisting System — *ASCE 7-16 Table 12.2-1*

Basic Seismic Force Resisting System . . . **Bearing Wall Systems**

1.Special reinforced concrete shear walls

Response Modification Coefficient " R " = 5.00

System Overstrength Factor " Wo " = 2.50

Deflection Amplification Factor " Cd " = 5.00

NOTE! See ASCE 7-16 for all applicable footnc

Building height Limits :

Category "A & B" Limit:	No Limit
Category "C" Limit:	No Limit
Category "D" Limit:	Limit = 160
Category "E" Limit:	Limit = 160
Category "F" Limit:	Limit = 100

Lateral Force Procedure — *ASCE 7-16 Section 12.8.2*

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-16 12.8

Determine Building Period — *Use ASCE 12.8-7*

Structure Type for Building Period Calcul: All Other Structural Systems

" Ct " value = 0.020 " hn " : Height from base to highest leve 30.0 ft

" x " value = 0.75

" Ta " Approximate fundemental period using Eq. 12.8-7 : Ta = Ct * (hn ^ x) = 0.256 sec

"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 8.000 sec

Building Period " Ta " Calculated from Approximate Method sel= 0.256

" Cs " Response Coefficient — *ASCE 7-16 Section 12.8.1.1*

S_{DS} : Short Period Design Spectral Response	=	1.254	From Eq. 12.8-2, Preliminary Cs	=	0.251
" R " : Response Modification Factor	=	5.00	From Eq. 12.8-3 & 12.8-4 , Cs need not excee	=	0.506
" I " : Seismic Importance Factor	=	1	From Eq. 12.8-5 & 12.8-6, Cs not be less than	=	0.055

Cs : Seismic Response Coefficient = = **0.2507**

ASCE 7-16 Seismic Base Shear

Project File: GST Expansion.ec6

DESCRIPTION: Seismic Base Shear Analysis

Seismic Base Shear

ASCE 7-16 Section 12.8.1

Cs = 0.2507 from 12.8.1.1

W (see Sum Wi below) = 3,601.00 k

Seismic Base Shear V = Cs * W = 902.84 k

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

" k " : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi^k)	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment
2	1,641.00	24.00	39,384.00	0.5894	532.11	532.11	0.00
1	1,960.00	14.00	27,440.00	0.4106	370.74	902.84	5,321.08

Sum Wi = 3,601.00 k Sum Wi * Hi = 66,824.00 k-ft Total Base Shear = 902.84 k

Base Moment = 17,960.9 k-ft

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
2	1,641.00	532.11	532.11	1,641.00	532.11	411.43	822.86	532.11	532.11
1	1,960.00	370.74	902.84	3,601.00	491.41	491.41	982.82	491.41	491.41

Wpx . . . . . Weight at level of diaphragm and other structure elements attached to it.

Fi . . . . . Design Lateral Force applied at the level.

Sum Fi . . . . . Sum of "Lat. Force" of current level plus all levels above

MIN Req'd Force @ Level . . . $0.20 * S_{DS} * I * Wpx$

MAX Req'd Force @ Level . . . $0.40 * S_{DS} * I * Wpx$

Fpx : Design Force @ Level . Wpx * SUM(x->n) Fi / SUM(x->n) wi, x = Current level, n = Top Level

ASCE 7-16 Seismic Base Shear

Project File: GST Expansion.ec6

DESCRIPTION: Seismic Base Shear Analysis

Specific Description: East Side Addition-North/South Direction

Risk Category

Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV — *SCE 7-16, Page 4, Table 1.5-1*

Seismic Importance Factor = 1 — *ASCE 7-16, Page 5, Table 1.5-2*

USER DEFINED Ground Motion

ASCE 7-16 11.4.2

Max. Ground Motions, 5% Damping

S_S = 1.567 g, 0.2 sec response

S_1 = 0.5590 g, 1.0 sec response

For the closest datapoint grid location . . .

Latitude = 0.000 deg North

Longitude = 0.000 deg West

Site Class, Site Coeff. and Design Category

Classification: "D" : Shear Wave Velocity 600 to 1,200 ft/sec = **D** (By Default per 11.4.3) — *ASCE 7-16 Table 20.3-1*

Site Coefficients Fa & Fv — Fa = 1.20 — *ASCE 7-16 Table 11.4-1 & 11.4-2*

(using straight-line interpolation from table val — Fv = 1.74

Maximum Considered Earthquake Acceleral

S_{MS} = Fa * Ss = 1.880 — *ASCE 7-16 Eq. 11.4-1*

S_{M1} = Fv * S1 = 0.973 — *ASCE 7-16 Eq. 11.4-2*

Design Spectral Acceleration

$S_{DS} = S_{MS} * 2/3$ = 1.254 — *ASCE 7-16 Eq. 11.4-3*

$S_{D1} = S_{M1} * 2/3$ = 0.649 — *ASCE 7-16 Eq. 11.4-4*

Seismic Design Category = **D** — *ISCE 7-16 Table 11.6-1 & -2*

Resisting System

ASCE 7-16 Table 12.2-1

Basic Seismic Force Resisting System . . . **Bearing Wall Systems**

1.Special reinforced concrete shear walls

Response Modification Coefficient " I " = 5.00

System Overstrength Factor " Wo " = 2.50

Deflection Amplification Factor " Cd " = 5.00

NOTE! See ASCE 7-16 for all applicable footnc

Building height Limits :

Category "A & B" Limit:	No Limit
Category "C" Limit:	No Limit
Category "D" Limit:	Limit = 160
Category "E" Limit:	Limit = 160
Category "F" Limit:	Limit = 100

Lateral Force Procedure

ASCE 7-16 Section 12.8.2

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-16 12.8

Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calcula All Other Structural Systems

" Ct " value = 0.020 " hn " : Height from base to highest leve 30.0 ft

" x " value = 0.75

" Ta " Approximate fundemental period using Eq. 12.8-7 : Ta = Ct * (hn ^ x) = 0.256 sec

"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 8.000 sec

Building Period " Ta " Calculated from Approximate Method sel = 0.256

" Cs " Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS} : Short Period Design Spectral Response	=	1.254	From Eq. 12.8-2, Preliminary Cs	=	0.251
" R " : Response Modification Factor	=	5.00	From Eq. 12.8-3 & 12.8-4 , Cs need not exce	=	0.506
" I " : Seismic Importance Factor	=	1	From Eq. 12.8-5 & 12.8-6, Cs not be less than	=	0.055

Cs : Seismic Response Coefficient = = **0.2507**

ASCE 7-16 Seismic Base Shear

Project File: GST Expansion.ec6

DESCRIPTION: Seismic Base Shear Analysis

Seismic Base Shear

ASCE 7-16 Section 12.8.1

Cs = 0.2507 from 12.8.1.1

W (see Sum Wi below) = 369.00 k

Seismic Base Shear V = Cs * W = 92.52 k

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

" k " : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi^k)	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment
2	173.00	24.00	4,152.00	0.6021	55.70	55.70	0.00
1	196.00	14.00	2,744.00	0.3979	36.81	92.52	557.03
Sum Wi =	369.00 k	Sum Wi * Hi =	6,896.00 k-ft		Total Base Shear =	92.52 k	
					Base Moment =	1,852.2 k-ft	

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
2	173.00	55.70	55.70	173.00	55.70	43.37	86.75	55.70	55.70
1	196.00	36.81	92.52	369.00	49.14	49.14	98.28	49.14	49.14

Wpx . . . . . Weight at level of diaphragm and other structure elements attached to it.

Fi . . . . . Design Lateral Force applied at the level.

Sum Fi . . . . . Sum of "Lat. Force" of current level plus all levels above

MIN Req'd Force @ Level . . . $0.20 * S_{DS} * I * Wpx$

MAX Req'd Force @ Level . . . $0.40 * S_{DS} * I * Wpx$

Fpx : Design Force @ Level . Wpx * SUM(x->n) Fi / SUM(x->n) wi, x = Current level, n = Top Level

ASCE 7-16 Seismic Base Shear

Project File: GST Expansion.ec6

DESCRIPTION: Seismic Base Shear Analysis

Specific Description: West Side Addition-North/South Direction

Risk Category

Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV — *SCE 7-16, Page 4, Table 1.5-1*

Seismic Importance Factor = 1 — *ASCE 7-16, Page 5, Table 1.5-2*

USER DEFINED Ground Motion

ASCE 7-16 11.4.2

Max. Ground Motions, 5% Damping

S_S = 1.567 g, 0.2 sec response

S_1 = 0.5590 g, 1.0 sec response

For the closest datapoint grid location . . .

Latitude = 0.000 deg North

Longitude = 0.000 deg West

Site Class, Site Coeff. and Design Category

Classification: "D" : Shear Wave Velocity 600 to 1,200 ft/sec		=	**D** (By Default per 11.4.3)	*ASCE 7-16 Table 20.3-1*
Site Coefficients Fa & Fv	Fa	=	1.20	*ASCE 7-16 Table 11.4-1 & 11.4-2*
(using straight-line interpolation from table val	Fv	=	1.74	
Maximum Considered Earthquake Acceleral	S_{MS} = Fa * Ss	=	1.880	*ASCE 7-16 Eq. 11.4-1*
	S_{M1} = Fv * S1	=	0.973	*ASCE 7-16 Eq. 11.4-2*
Design Spectral Acceleration	$S_{DS} = S_{MS} * 2/3$	=	1.254	*ASCE 7-16 Eq. 11.4-3*
	$S_{D1} = S_{M1} * 2/3$	=	0.649	*ASCE 7-16 Eq. 11.4-4*
Seismic Design Category		=	**D**	*ISCE 7-16 Table 11.6-1 & -2*

Resisting System

ASCE 7-16 Table 12.2-1

Basic Seismic Force Resisting System . . . **Bearing Wall Systems**

1.Special reinforced concrete shear walls

Response Modification Coefficient " I = 5.00

System Overstrength Factor " Wo " = 2.50

Deflection Amplification Factor " Cd " = 5.00

NOTE! See ASCE 7-16 for all applicable footnc

Building height Limits :

Category "A & B" Limit:	No Limit
Category "C" Limit:	No Limit
Category "D" Limit:	Limit = 160
Category "E" Limit:	Limit = 160
Category "F" Limit:	Limit = 100

Lateral Force Procedure

ASCE 7-16 Section 12.8.2

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-16 12.8

Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calcula All Other Structural Systems

" Ct " value = 0.020 " hn " : Height from base to highest leve 24.0 ft

" x " value = 0.75

" Ta " Approximate fundemental period using Eq. 12.8-7 : Ta = Ct * (hn ^ x) = 0.217 sec

"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 8.000 sec

Building Period " Ta " Calculated from Approximate Method sel = 0.217

" Cs " Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS} : Short Period Design Spectral Response	=	1.254	From Eq. 12.8-2, Preliminary Cs	=	0.251
" R " : Response Modification Factor	=	5.00	From Eq. 12.8-3 & 12.8-4 , Cs need not exce	=	0.598
" I " : Seismic Importance Factor	=	1	From Eq. 12.8-5 & 12.8-6, Cs not be less than	=	0.055

Cs : Seismic Response Coefficient = = 0.2507

ASCE 7-16 Seismic Base Shear

Project File: GST Expansion.ec6

DESCRIPTION: Seismic Base Shear Analysis

Seismic Base Shear

ASCE 7-16 Section 12.8.1

Cs = 0.2507 from 12.8.1.1

W (see Sum Wi below) = 230.00 k

Seismic Base Shear V = Cs * W = 57.67 k

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

" k " : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi^k)	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment
1	230.00	24.00	5,520.00	1.0000	57.67	57.67	0.00
Sum Wi =	230.00 k	Sum Wi * Hi =	5,520.00 k-ft		Total Base Shear =	57.67 k	
						Base Moment =	1,384.0 k-ft

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
1	230.00	57.67	57.67	230.00	57.67	57.67	115.33	57.67	57.67

Wpx . . . . . Weight at level of diaphragm and other structure elements attached to it.

Fi . . . . . Design Lateral Force applied at the level.

Sum Fi . . . . . Sum of "Lat. Force" of current level plus all levels above

MIN Req'd Force @ Level . . . $0.20 * S_{DS} * I * Wpx$

MAX Req'd Force @ Level . . $0.40 * S_{DS} * I * Wpx$

Fpx : Design Force @ Level . Wpx * SUM(x->n) Fi / SUM(x->n) wi, x = Current level, n = Top Level

ASCE 7-16 Seismic Base Shear

Project File: GST Expansion.ec6

DESCRIPTION: Seismic Base Shear Analysis

Specific Description: East Side Addition-East/West Direction

Risk Category

Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV — *SCE 7-16, Page 4, Table 1.5-1*

Seismic Importance Factor = 1 — *ASCE 7-16, Page 5, Table 1.5-2*

USER DEFINED Ground Motion

ASCE 7-16 11.4.2

Max. Ground Motions, 5% Damping

S_S = 1.567 g, 0.2 sec response

S_1 = 0.5590 g, 1.0 sec response

For the closest datapoint grid location . . .

Latitude = 0.000 deg North

Longitude = 0.000 deg West

Site Class, Site Coeff. and Design Category

Classification: "D" : Shear Wave Velocity 600 to 1,200 ft/sec = **D** (By Default per 11.4.3) — *ASCE 7-16 Table 20.3-1*

Site Coefficients Fa & Fv — Fa = 1.20, Fv = 1.74 — *ASCE 7-16 Table 11.4-1 & 11.4-2*

(using straight-line interpolation from table val

Maximum Considered Earthquake Accelerat

S_{MS} = Fa * Ss = 1.880 — *ASCE 7-16 Eq. 11.4-1*

S_{M1} = Fv * S1 = 0.973 — *ASCE 7-16 Eq. 11.4-2*

Design Spectral Acceleration

$S_{DS} = S_{MS} * 2/3$ = 1.254 — *ASCE 7-16 Eq. 11.4-3*

$S_{D1} = S_{M1} * 2/3$ = 0.649 — *ASCE 7-16 Eq. 11.4-4*

Seismic Design Category = **D** — *ASCE 7-16 Table 11.6-1 & -2*

Resisting System

ASCE 7-16 Table 12.2-1

Basic Seismic Force Resisting System . . . **Bearing Wall Systems**

1.Special reinforced concrete shear walls

Response Modification Coefficient " I " = 5.00

System Overstrength Factor " Wo " = 2.50

Deflection Amplification Factor " Cd " = 5.00

NOTE! See ASCE 7-16 for all applicable footn

Building height Limits :

Category "A & B" Limit:	No Limit
Category "C" Limit:	No Limit
Category "D" Limit:	Limit = 160
Category "E" Limit:	Limit = 160
Category "F" Limit:	Limit = 100

Lateral Force Procedure

ASCE 7-16 Section 12.8.2

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-16 12.8

Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calcul: All Other Structural Systems

" Ct " value = 0.020 — " hn " : Height from base to highest leve 24.0 ft

" x " value = 0.75

" Ta " Approximate fundemental period using Eq. 12.8-7 : Ta = Ct * (hn ^ x) = 0.217 sec

"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 8.000 sec

Building Period " Ta " Calculated from Approximate Method sel = 0.217

" Cs " Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS} : Short Period Design Spectral Response	=	1.254	From Eq. 12.8-2, Preliminary Cs	=	0.251
" R " : Response Modification Factor	=	5.00	From Eq. 12.8-3 & 12.8-4 , Cs need not exce	=	0.598
" I " : Seismic Importance Factor	=	1	From Eq. 12.8-5 & 12.8-6, Cs not be less than	=	0.055

Cs : Seismic Response Coefficient = = **0.2507**

ASCE 7-16 Seismic Base Shear

Project File: GST Expansion.ec6

DESCRIPTION: Seismic Base Shear Analysis

Seismic Base Shear

ASCE 7-16 Section 12.8.1

Cs = 0.2507 from 12.8.1.1

W (see Sum Wi below) = 733.00 k

Seismic Base Shear V = Cs * W = 183.78 k

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

" k " : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi^k)	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment
2	347.00	24.00	8,328.00	0.6065	111.46	111.46	0.00
1	386.00	14.00	5,404.00	0.3935	72.32	183.78	1,114.55

Sum Wi = 733.00 k Sum Wi * Hi = 13,732.00 k-ft Total Base Shear = 183.78 k

Base Moment = 3,687.4 k-ft

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
2	347.00	111.46	111.46	347.00	111.46	87.00	174.00	111.46	111.46
1	386.00	72.32	183.78	733.00	96.78	96.78	193.56	96.78	96.78

Wpx . . . . . Weight at level of diaphragm and other structure elements attached to it.

Fi . . . . . Design Lateral Force applied at the level.

Sum Fi . . . . . Sum of "Lat. Force" current level plus all levels above

MIN Req'd Force @ Level . . . $0.20 * S_{DS} * I * Wpx$

MAX Req'd Force @ Level . . $0.40 * S_{DS} * I * Wpx$

Fpx : Design Force @ Level . Wpx * SUM(x->n) Fi / SUM(x->n) wi, x = Current level, n = Top Level

ASCE 7-16 Seismic Base Shear

Project File: GST Expansion.ec6

DESCRIPTION: Seismic Base Shear Analysis

Specific Description: West Side Addition-East/West Direction

Risk Category

Calculations per ASCE 7-16

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV — *SCE 7-16, Page 4, Table 1.5-1*

Seismic Importance Factor = 1 — *ASCE 7-16, Page 5, Table 1.5-2*

USER DEFINED Ground Motion — ASCE 7-16 11.4.2

Max. Ground Motions, 5% Damping

S_S = 1.567 g, 0.2 sec response

S_1 = 0.5590 g, 1.0 sec response

For the closest datapoint grid location . . .

Latitude = 0.000 deg North

Longitude = 0.000 deg West

Site Class, Site Coeff. and Design Category

Classification: "D" : Shear Wave Velocity 600 to 1,200 ft/sec = **D** (By Default per 11.4.3) — *ASCE 7-16 Table 20.3-1*

Site Coefficients Fa & Fv — Fa = 1.20, Fv = 1.74 — *ASCE 7-16 Table 11.4-1 & 11.4-2*

(using straight-line interpolation from table val

Maximum Considered Earthquake Accelerat

S_{MS} = Fa * Ss = 1.880 — *ASCE 7-16 Eq. 11.4-1*

S_{M1} = Fv * S1 = 0.973 — *ASCE 7-16 Eq. 11.4-2*

Design Spectral Acceleration

$S_{DS} = S_{MS} * 2/3$ = 1.254 — *ASCE 7-16 Eq. 11.4-3*

$S_{D1} = S_{M1} * 2/3$ = 0.649 — *ASCE 7-16 Eq. 11.4-4*

Seismic Design Category = **D** — *SCE 7-16 Table 11.6-1 & -2*

Resisting System

ASCE 7-16 Table 12.2-1

Basic Seismic Force Resisting System . . . **Bearing Wall Systems**

1.Special reinforced concrete shear walls

Response Modification Coefficient " I " = 5.00

System Overstrength Factor " Wo " = 2.50

Deflection Amplification Factor " Cd " = 5.00

NOTE! See ASCE 7-16 for all applicable footnc

Building height Limits :

Category "A & B" Limit:	No Limit
Category "C" Limit:	No Limit
Category "D" Limit:	Limit = 160
Category "E" Limit:	Limit = 160
Category "F" Limit:	Limit = 100

Lateral Force Procedure

ASCE 7-16 Section 12.8.2

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-16 12.8

Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calcula All Other Structural Systems

" Ct " value = 0.020 — " hn " : Height from base to highest leve 24.0 ft

" x " value = 0.75

" Ta " Approximate fundemental period using Eq. 12.8-7 : Ta = Ct * (hn ^ x) = 0.217 sec

"TL" : Long-period transition period per ASCE 7-16 Maps 22-14 -> 22-17 8.000 sec

Building Period " Ta " Calculated from Approximate Method sel = 0.217

" Cs " Response Coefficient

ASCE 7-16 Section 12.8.1.1

S_{DS} : Short Period Design Spectral Response	=	1.254	From Eq. 12.8-2, Preliminary Cs	=	0.251
" R " : Response Modification Factor	=	5.00	From Eq. 12.8-3 & 12.8-4 , Cs need not exce	=	0.598
" I " : Seismic Importance Factor	=	1	From Eq. 12.8-5 & 12.8-6, Cs not be less than	=	0.055

Cs : Seismic Response Coefficient = = **0.2507**

ASCE 7-16 Seismic Base Shear

Project File: GST Expansion.ec6

DESCRIPTION: Seismic Base Shear Analysis

Seismic Base Shear

ASCE 7-16 Section 12.8.1

Cs = 0.2507 from 12.8.1.1

W (see Sum Wi below) = 386.00 k

Seismic Base Shear V = Cs * W = 96.78 k

Vertical Distribution of Seismic Forces

ASCE 7-16 Section 12.8.3

" k " : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi^k)	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment
1	386.00	24.00	9,264.00	1.0000	96.78	96.78	0.00

Sum Wi = 386.00 k Sum Wi * Hi = 9,264.00 k-ft Total Base Shear = 96.78 k

Base Moment = 2,322.7 k-ft

Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-16 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
1	386.00	96.78	96.78	386.00	96.78	96.78	193.56	96.78	96.78

Wpx . . . . . Weight at level of diaphragm and other structure elements attached to it.

Fi . . . . . Design Lateral Force applied at the level.

Sum Fi . . . . . Sum of "Lat. Force" of current level plus all levels above

MIN Req'd Force @ Level . . . $0.20 * S_{DS} * I * Wpx$

MAX Req'd Force @ Level . . $0.40 * S_{DS} * I * Wpx$

Fpx : Design Force @ Level . Wpx * SUM(x->n) Fi / SUM(x->n) wi, x = Current level, n = Top Level

Load Distribution: Existing Building

Roof Level

North-South Direction

Roof Load: V_{seis}= 532110 lbs

Rho = 1

V_{seis}*Rho= 532110 lbs

Roof Area 4337 ft^2

v, seismic = 122.69 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	$F_{seismic}$ (lbs)
2		78.00		27.80	266054.2
9	78.00		27.8012		266054.2
					532108.4

East-Wesst

Roof Load: V_{seis}= 532110 lbs

Rho = 1

V_{seis}*Rho= 532110 lbs

Roof Area 4337 ft^2

v, seismic = 122.69 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	$F_{seismic}$ (lbs)
A		13.90		156	266061.87
J	13.90		156		266061.87
					532123.74

Floor Level

North-South Direction

Floor Load: V_{seis}= 370740 lbs

Rho = 1

V_{seis}*Rho= 370740 lbs

Roof Area 4337 ft^2

v, seismic = 85.48 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	$F_{seismic}$ (lbs)
2		78.00		27.80	185369.5
9	78.00		27.8012		185369.5
					370738.9

East-Wesst

Floor Load: V_{seis}= 370740 lbs

Rho = 1

V_{seis}*Rho= 370740 lbs

Roof Area 4337 ft^2

v, seismic = 85.48 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	$F_{seismic}$ (lbs)
A		13.90		156	185374.79
J	13.90		156		185374.79
					370749.57

Load Distribution: New Addition East Side

Roof Level

V_{seis}*Rho= 55700 lbs

Roof Area 4337 ft^2

v, seismic = 12.84 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	$F_{seismic}$ (lbs)
9		78.00		27.80	27850
12	78.00		27.8012		27850
					55700

East-West

Roof Load: V_{seis}= 111460 lbs

Rho = 1

V_{seis}*Rho= 111460 lbs

Roof Area 4337 ft^2

v, seismic = 25.70 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	$F_{seismic}$ (lbs)
A		13.90		156	55731
J	13.90		156		55731
					111463

Floor Level

North-South Direction

Floor Load: V_{seis}= 36810 lbs

Rho = 1

V_{seis}*Rho= 36810 lbs

Roof Area 4337 ft^2

v, seismic = 8.49 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	$F_{seismic}$ (lbs)
9		78.00		27.80	18405
12	78.00		27.8012		18405
					36810

East-West

Floor Load: V_{seis}= 72320 lbs

Rho = 1

V_{seis}*Rho= 72320 lbs

Roof Area 4337 ft^2

v, seismic = 16.68 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	$F_{seismic}$ (lbs)
A		13.90		156	36160.93
J	13.90		156		36160.93
					72321.87

Load Distribution: New Addition West Side

Roof Level

North-South Direction

Roof Load: V_{seis}= 57670 lbs

Rho = 1

V_{seis}*Rho= 57670 lbs

Roof Area 4337 ft^2

v, seismic = 13.30 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	$F_{seismic}$ (lbs)
1		78.00		27.80	28835
3	78.00		27.8012		28835
					57670

East-Wesst

Roof Load: V_{seis}= 96780 lbs

Rho = 1

V_{seis}*Rho= 96780 lbs

Roof Area 4337 ft^2

v, seismic = 22.31 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	$F_{seismic}$ (lbs)
A		13.90		156	48391
J	13.90		156		48391
					96782

Wind Load:

ASCE 7-16 Wind Forces Chpt 28, Pt2 & Chpt 30, Pt2

Project File: GST Expansion.ec6

DESCRIPTION: Windload

General Design Values — Calculations per ASCE 7-16

V : Basic Wind Speed per Sect 26.5-1 or 2	**95.0** mph	
User specified minimum design pressu	16.0 psf	
Occupancy per Table 1.5-1	II	All Buildings and other structures except those listed
Exposure Category per 26.7	Exposure B	
Topographic Factor Kzt per 26.8	1.00	

Main Force Resisting System Valu

MRH : Mean Roof Height	9.0 ft	
Roof Slope Angle	0 to 5 degrees	
Lambda MWFRS: per Figure 26.	1.00	

Component & Cladding Values

Effective Wind Area of Component & Clad	10.0 ft^2
Roof pitch for cladding pressu	Flat/Hip/Gable Roof
LHD : Least Horizontal Dimension	156.0 ft
a = max (0.04 * LHD, 3, min(0.10 * LHD, 0.4*MRH))	6.24 ft
Lambda Component & Cladding : per Figur	0.82

Design Wind Pressures

Horizontal Pressures . . .

Zone: A =	16.00 psf		Zone: C =	16.00 psf	
Zone: B =	-16.00 psf		Zone: D =	-16.00 psf	

Vertical Pressures . . .

Zone: E =	-17.20 psf		Zone: G =	-16.00 psf	
Zone: F =	-16.00 psf		Zone: H =	-16.00 psf	

Overhangs . . .

Zone: Eoh =	-24.10 psf		Zone: Goh =	-18.80 psf	

ASCE 7-16 Section 28.5.4 Minimum Design Wind Loads requires that the load effects of the design wind pressures from Section 28.5.3 shall not be less than a minimum load defined by assuming the pressures, ps, for zones A and C equal to +16 psf, Zones B and D equal to +8 psf, while assuming ps for Zones E, F, G, and H are equal to 0 psf.

Component & Cladding Design Wind Pres — *Design Wind Pressure = Lambda * Kzt * Ps30 pe*

Roof Pressures	Positive	Negative	Overhang Pressures	Negative
Zone 1	16.000	-21.238 psf	Zone 1	-19.188 psf
Zone 1'	16.000	-16.000 psf	Zone 1'	-19.188 psf
Zone 2	16.000	-27.962 psf	Zone 2	-25.912 psf
Zone 2e	***	*** psf	Zone 2e	*** psf
Zone 2n	***	*** psf	Zone 2n	*** psf
Zone 2r	***	*** psf	Zone 2r	*** psf
Zone 3	16.000	-38.130 psf	Zone 3	-36.080 psf
Zone 3e	***	*** psf	Zone 3e	*** psf
Zone 3r	***	*** psf	Zone 3r	*** psf

Wall Pressures

Wall Zone 4 :	16.000	-16.000	psf
Wall Zone 5 :	16.000	-17.794	psf

'***' : There is no value in Figure 30.4-1 Tabular Values

Wind Load – East Side

Overall Wind Load

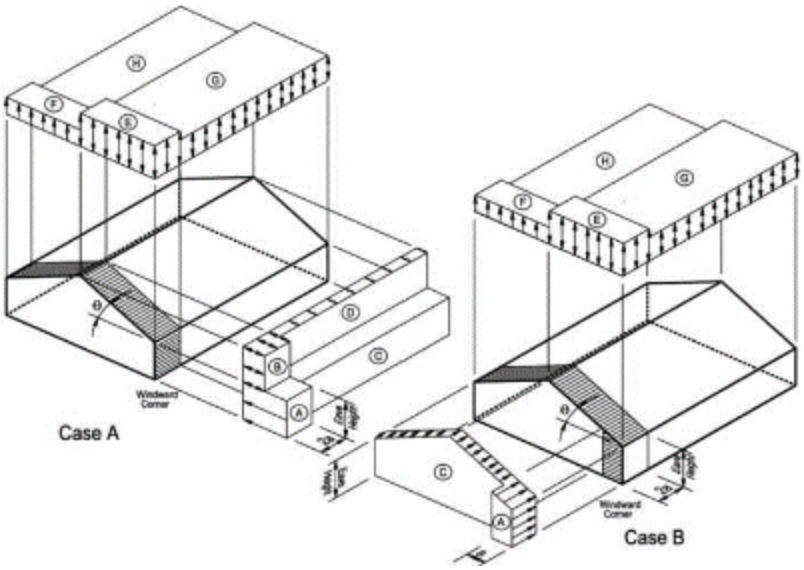
Roof Level

b =	101.5 ft
d =	156 ft
h =	10 ft
a =	6.24 ft
angle	0 degrees

Case A			
Zone	Design Wind Pressures q (psf)	Area (ft^2)	Net Forces (lbs)
A	16.00	124.80	1,996.80
B	16.00	0.00	0.00
C	16.00	890.20	14,243.20
D	16.00	0.00	0.00
			16,240.00

Case B			
Zone	Design Wind Pressures q (psf)	Area (ft^2)	Net Forces (lbs)
A	16.00	62.40	998.40
C	16.00	1,497.60	23,961.60
			24,960.00

Diagrams



Floor Level

b =	101.5 ft
d =	156 ft
h =	7 ft
a =	6.24 ft
angle	0 degrees

Case A			
Zone	Design Wind Pressures q (psf)	Area (ft^2)	Net Forces (lbs)
A	16.00	87.36	1,397.76
B	16.00	0.00	0.00
C	16.00	623.14	9,970.24
D	16.00	0.00	0.00
			11,368.00

Case B			
Zone	Design Wind Pressures q (psf)	Area (ft^2)	Net Forces (lbs)
A	16.00	43.68	698.88
C	16.00	1,048.32	16,773.12
			17,472.00

Roof Level

TRANSVERSE DIRECTION

Roof Load: V_{wind}= 16240 lbs

Roof Area 15834 ft^2

v, wind = 1.02564 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	F_{wind} (lbs)
9	67	17.25	156	156	13480.00
12	17.25		156		2760.00
					16240.00

LONGITUDINAL DIRECTION

Roof Load: V_{wind}= 24960 k

Roof Area 15834 ft^2

v, wind = 1.5764 k

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	F_{wind} (lbs)
A	78		101.5		12480.00
J		78		101.5	12480.00
					24960.00

Floor Level

TRANSVERSE DIRECTION

Roof Load: V_{wind}= 11368 lbs

Roof Area 15834 ft^2

v, wind = 0.71795 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	F_{wind} (lbs)
9	67	17.25	156	156	9436.00
12	17.25		156		1932.00
					11368.00

LONGITUDINAL DIRECTION

Roof Load: V_{wind}= 17472 k

Roof Area 15834 ft^2

v, wind = 1.1034 k

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	F_{wind} (lbs)
A	78		101.5		8736.00
J		78		101.5	8736.00
					17472.00

Wind Load – West Side

Overall Wind Load

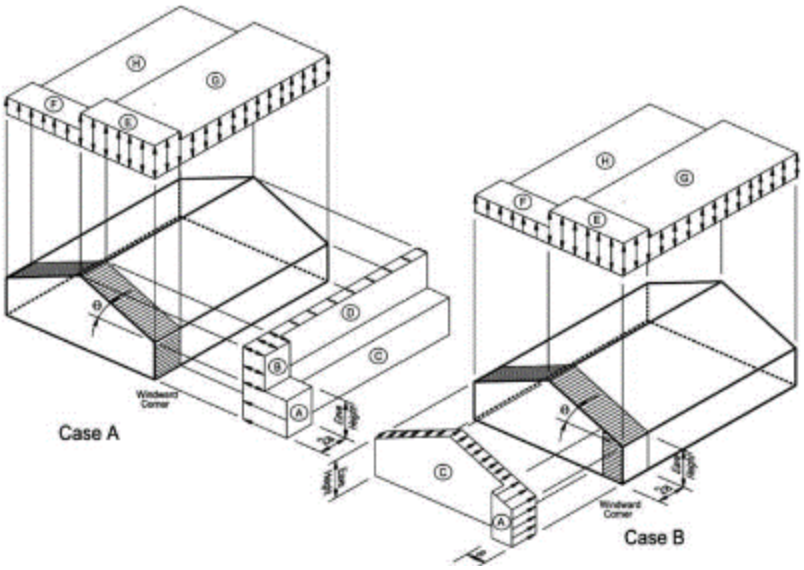
Roof Level

b =	101.5 ft
d =	156 ft
h =	17 ft
a =	6.24 ft
angle	0 degrees

Case A			
Zone	Design Wind Pressures q (psf)	Area (ft^2)	Net Forces (lbs)
A	16.00	212.16	3,394.56
B	16.00	0.00	0.00
C	16.00	1,513.34	24,213.44
D	16.00	0.00	0.00
			27,608.00

Case B			
Zone	Design Wind Pressures q (psf)	Area (ft^2)	Net Forces (lbs)
A	16.00	106.08	1,697.28
C	16.00	2,545.92	40,734.72
			42,432.00

Diagrams



Roof Level

TRANSVERSE DIRECTION

Roof Load: V_{wind}= 27608 k

Roof Area 15834 ft^2

v, wind = 1.74359 psf

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	F_{wind} (lbs)
1.0		17.25		156	4692.00
3	17.25	67	156	156	22916.00
					27608.00

LONGITUDINAL DIRECTION

Roof Load: V_{wind}= 42432 k

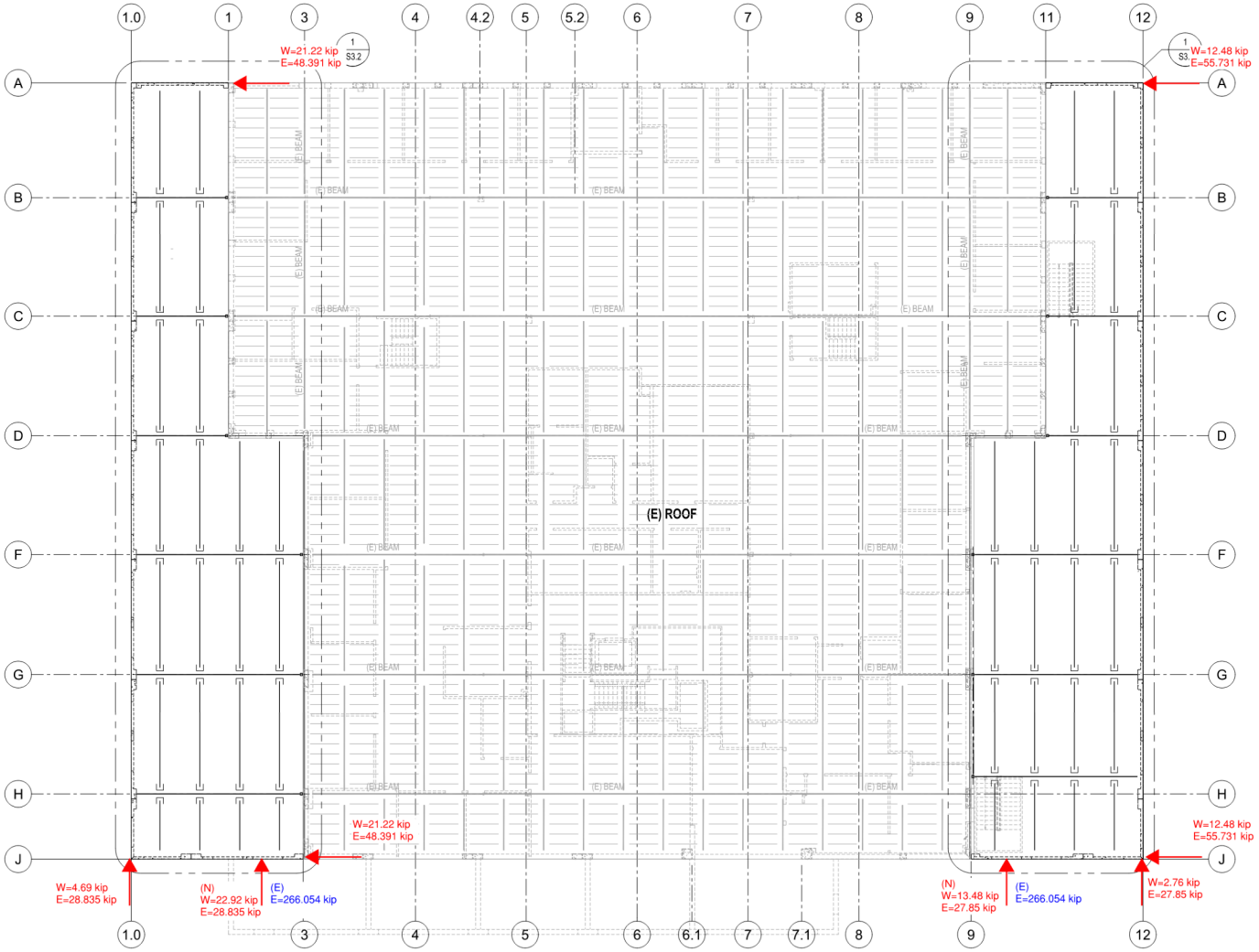
Roof Area 15834 ft^2

v, wind = 2.6798 k

Grid Line	Left Trib. Width (ft)	Right Trib. Width (ft)	Left Trib. Length (ft)	Right Trib. Length (ft)	F_{wind} (lbs)
A	78		101.5		21216.00
J		78		101.5	21216.00
					42432.00

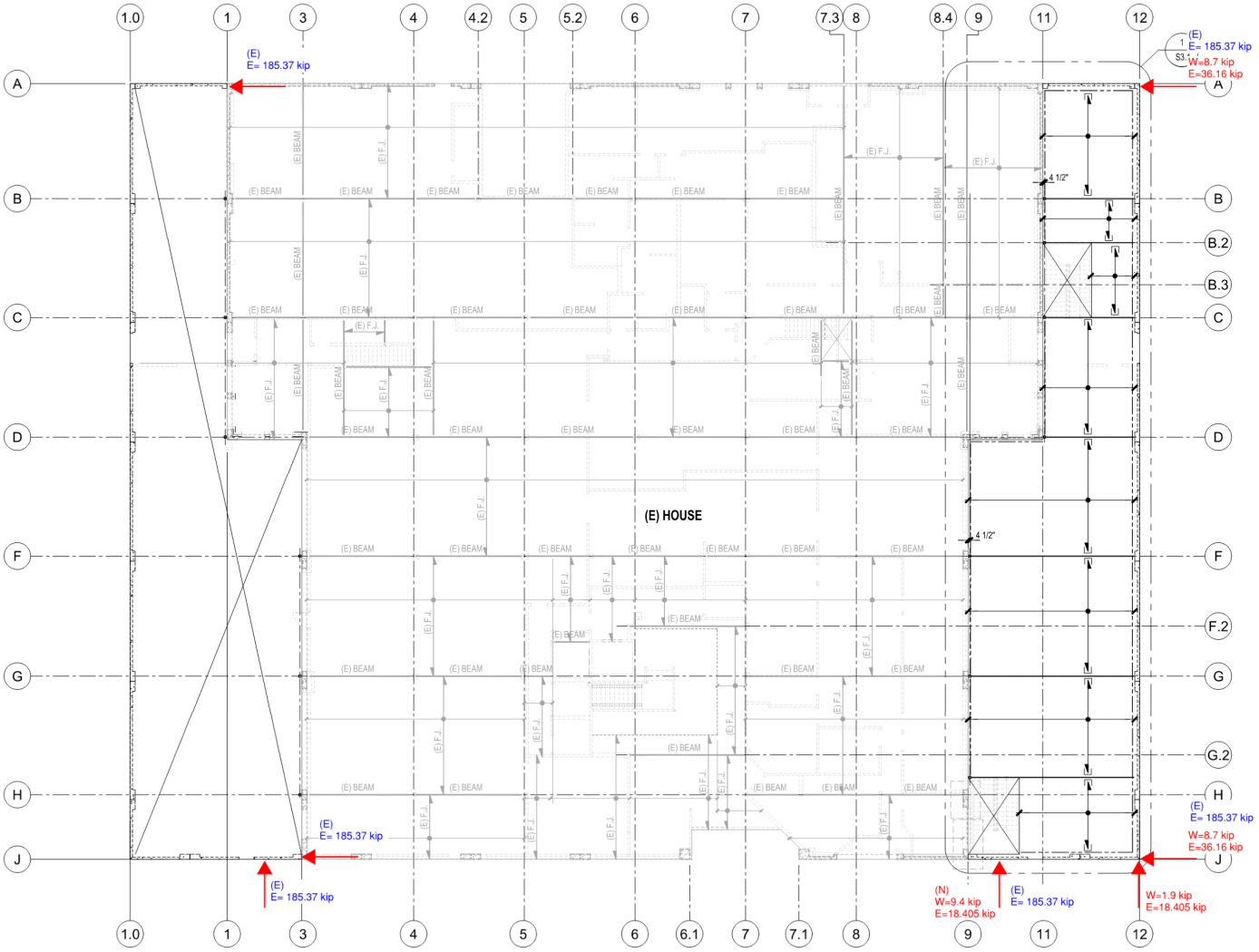
12881 1116th CERRITIOS	2021-057		
Project	Project No.		
CALCULATION SUBJECT	Hung Nguyen, S.E	10/10/22	Page: 94 Of: 114
Subject	By	Date	

Roof Level Plan



12881 1116th CERRITIOS	2021-057			
Project	Project No.			
CALCULATION SUBJECT	Hung Nguyen, S.E	10/10/22	Page: 95	Of: 114
Subject	By	Date		

Floor Level



Diaphragm Forces:

Diaphragm Forces:

From Seismic Load Development:

$C_s =$ 0.2507
$S_{DS} =$ 1.254
$I_e =$ 1.00

Building Weights:

roof $W_2 =$ 347 kips
floor $W_1 =$ 386 kips
$W_{tot} =$ 733 kips

Base Shear:

$V = C_s * W =$ 183.7631 kips

Building heights:

roof $h_2 =$ 26 ft
floor $h_1 =$ 14 ft

C_{vx} Factors:

$$C_{v2} = \frac{W_2 * h_2}{W_1 * h_1 + W_2 * h_2} = 0.625$$

$$C_{v1} = \frac{W_1 * h_1}{W_1 * h_1 + W_2 * h_2} = 0.375$$

Seismic forces: ASCE 7-16, sec. 12.8.3

F_x Loads:

$F_2 = C_{v2} * V =$ 114.9252 kips
$F_1 = C_{v1} * V =$ 68.83792 kips

Diaphragm forces: ASCE 7-16, sec. 12.10

F_{px} Loads:

$$F_{p2} = \frac{F_2}{W_2} * W_2 = 114.925 \text{ kips}$$

$$F_{p1} = \frac{F_1 + F_2}{W_1 + W_2} * W_1 = 96.770 \text{ kips}$$

$F_{p2\_min} = 0.2 * S_{Ds} * I_e * W_{p2} =$ 87.028 kips
$F_{p1\_min} = 0.2 * S_{Ds} * I_e * W_{p1} =$ 96.809 kips

$F_{p2\_max} = 0.4 * S_{Ds} * I_e * W_{p2} =$ 174.055 kips
$F_{p1\_max} = 0.4 * S_{Ds} * I_e * W_{p1} =$ 193.618 kips

$F_{p2} =$ 114.925 kips
$F_{p1} =$ 96.809 kips

Ratios to be apply to RAM Outputs for diaphragm forces:

Roof Level: $F_{p2}/F_2 =$ 1.000
Floor Level: $F_{p1}/F_1 =$ 1.406

ASD Factor: 0.7

Roof Diaphragm Shear Design

Diaphragm along N-S Direction

Flat Roof Seismic Shear; V_E = 0.7x64,770 lbs/34.5ft =1,314 plf;

Diaphragm along E-W Direction

Flat Roof Seismic Shear; V_E = 0.7x64,770 lbs/156ft =291 plf;

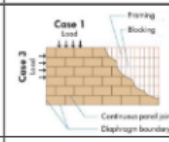
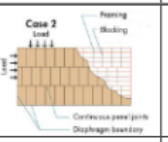
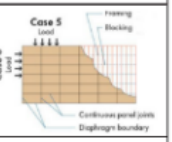
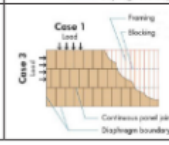
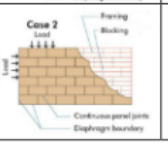
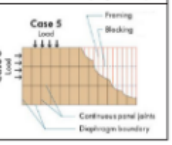
Use 10d, 19/32 Blocked Sheathing nailed @ 6" with Shear Capacity from NDS 2015 Table 4.2B

Table 4.2B Nominal Unit Shear Capacities for Wood-Frame Diaphragms

Blocked Wood Structural Panel Diaphragms Utilizing Multiple Rows of Fasteners (High Load Diaphragms)[1,2,3,4,5]

Sheathing Grade	Common Nail Size	Minimum Fastener Penetration in Framing Member or Blocking (in.)	Minimum Nominal Panel Thickness (in.)	Minimum Nominal Width of Nailed Face at Adjoining Panel Edges and Boundaries (in.)	Lines of Fasteners	A SEISMIC: Nail Spacing (in.) at diaphragm boundaries (all cases), at continuous panel edges parallel to load (Cases 3 & 4), and at all panel edges (Cases 5 & 6)										B WIND: Nail Spacing (in.) at diaphragm boundaries (all cases), at continuous panel edges parallel to load (Cases 3 & 4), and at all panel edges (Cases 5 & 6)			
						4			4			2-1/2			2-1/2				
						Nail Spacing (in.) at other panel edges (Cases 1, 2, 3, & 4)													
						6			4			4			3	6	4	4	3
						v_s (plf)	G_a (kips/in.)		v_s (plf)	G_a (kips/in.)		v_s (plf)	G_a (kips/in.)		v_s (plf)	G_a (kips/in.)		v_w (plf)	v_w (plf)	v_w (plf)	v_w (plf)
							OSB	PLY		OSB	PLY		OSB	PLY		OSB	PLY				
Structural I	10d	1-1/2	15/32	3	2	1210	40	24	1630	53	28	1750	50	27	2300	56	29	1695	2280	2450	3220
				4	2	1400	33	21	1830	48	27	2010	44	25	2580	51	28	1960	2560	2815	3610
				4	3	1750	50	27	2440	61	30	2570	59	30	2790	70	32	2450	3415	3600	3905
			19/32	3	2	1340	36	23	1760	52	29	1930	47	27	2510	54	29	1875	2465	2700	3515
				4	2	1560	29	20	1980	46	27	2220	40	25	2880	48	27	2185	2770	3110	4030
				4	3	1930	47	27	2640	60	31	2810	57	30	3580	64	32	2700	3695	3935	5010
			23/32	3	2	1460	33	22	1910	50	29	2100	45	27	2730	53	30	2045	2675	2940	3820
				4	2	1710	26	19	2140	43	27	2420	37	24	3130	45	27	2395	2995	3390	4380
				4	3	2100	45	27	2860	59	32	3050	56	31	3600	68	34	2940	4005	4270	5040
Sheathing and Single-Floor	10d	1-1/2	15/32	3	2	1050	43	21	1450	55	23	1530	53	23	2020	58	24	1470	2030	2140	2830
				4	2	1210	36	19	1630	50	22	1750	46	21	2210	55	23	1695	2280	2450	3095
				4	3	1530	53	23	2170	62	24	2260	61	24	2390	72	26	2140	3040	3165	3345
			19/32	3	2	1300	34	19	1720	49	23	1870	45	22	2450	52	23	1820	2410	2620	3430
				4	2	1510	27	16	1930	43	21	2160	37	20	2740	46	22	2115	2700	3025	3835
				4	3	1870	45	22	2580	57	24	2730	55	24	2970	68	26	2620	3610	3820	4160
			23/32	3	2	1420	30	18	1870	46	23	2040	42	22	2670	50	24	1990	2620	2855	3740
				4	2	1650	24	16	2100	40	21	2350	34	20	2890	45	23	2310	2940	3290	4045
				4	3	2040	42	22	2800	56	25	2960	53	25	3130	71	28	2855	3920	4145	4380

1. Nominal unit shear capacities shall be adjusted in accordance with 4.2.3 to determine ASD allowable unit shear capacity and LRFD factored unit resistance. For general construction requirements see 4.2.6. For specific requirements, see 4.2.7.1 for wood structural panel diaphragms. See Appendix A for common nail dimensions.
2. For species and grades of framing other than Douglas-Fir-Larch or Southern Pine, reduced nominal unit shear capacities shall be determined by multiplying the tabulated nominal unit shear capacity by the Specific Gravity Adjustment Factor = [1-(0.5-G)], where G = Specific Gravity of the framing lumber from the *NDS* (Table 12.3.3A). The Specific Gravity Adjustment Factor shall not be greater than 1.
3. Apparent shear stiffness values, G_a, are based on nail slip in framing with moisture content less than or equal to 19% at time of fabrication and panel stiffness values for diaphragms constructed with either OSB or 3-ply plywood panels. When 4-ply or 5-ply plywood panels or composite panels are used, G_a values shall be permitted to be multiplied by 1.2.
4. Where moisture content of the framing is greater than 19% at time of fabrication, G_a values shall be multiplied by 0.5.
5. Diaphragm resistance depends on the direction of continuous panel joints with respect to the loading direction and direction of framing members, and is independent of the panel orientation.

	Cases 1&3:Continuous Panel Joints Perpendicular to Framing	**Cases 2&4**: Continuous Panel Joints Parallel to Framing	**Cases 5&6**: Continuous Panel Joints Perpendicular and Parallel to Framing
Long Panel Direction Perpendicular to Supports			
Long Panel Direction Parallel to Supports[a]			

(a) Panel span rating for out-of-plane loads may be lower than the span rating with the long panel direction perpendicular to supports (See Section 3.2.2 and Section 3.2.3)

Roof Anchorage Design

ASCE Seismic Wall Anchorage

Project File: GST Expansion.ec6

DESCRIPTION: Wall Anchorage

Seismic Wall Anchorage per ASCE 7-16

Description Wall Anchorage @ along Grid 1 (Roof)

S_{DS} = 1.254 I : Importance Factor = 1.0 Wall Weight = 155.0 psf

Wall Height = 26.0 ft Parapet Height = 4.0 ft

Horiz. Spacing between anchors = 2.0 ft Tributary Height = Wall height/2 + Parapet = 17.0 ft

Out-of-Plane Force for Structural Wall Design

(For all SDCs) 0.4*SDS*I*Weight 77.748 psf **Controlling Value = 77.748** psf

10%*Weight 15.50 psf

Out-of-Plane Wall Anchorage Force

H = 26.0 ft Z = 26.0 ft Lf = 156.0 ft

Anchorage is not at roof and all diaphragms are not flexible : Yes Multiplier = 1.0

Ka = 1.0

Based on (12.11-1) = 2,643.43 lbs **Controlling Value = 2,643.43** lbs

Based on lower limit for Fp = 1,054.0 lbs

Seismic Wall Anchorage per ASCE 7-16

Description Wall Anchorage @ along Grid 12 (Roof)

S_{DS} = 1.254 I : Importance Factor = 1 Wall Weight = 155.0 psf

Wall Height = 12.0 ft Parapet Height = 4.0 ft

Horiz. Spacing between anchors = 4.0 ft Tributary Height = Wall height/2 + Parapet = 10.0 ft

Out-of-Plane Force for Structural Wall Design

(For all SDCs) 0.4*SDS*I*Weight 77.748 psf **Controlling Value = 77.748** psf

10%*Weight 15.50 psf

Out-of-Plane Wall Anchorage Force

H = 26.0 ft Z = 26.0 ft Lf = 156 ft

Anchorage is not at roof and all diaphragms are not flexible : Yes Multiplier = 1.0

Ka = 1.0

Based on (12.11-1) = 3,109.92 lbs **Controlling Value = 3,109.92** lbs

Based on lower limit for Fp = 1,240.0 lbs

Seismic Wall Anchorage per ASCE 7-16

Description Wall Anchorage @ along Grid A, D, J (Roof) West side

S_{DS} = 1.254 I : Importance Factor = 1 Wall Weight = 155.0 psf

Wall Height = 26 ft Parapet Height = 4.0 ft

Horiz. Spacing between anchors = 8.0 ft Tributary Height = Wall height/2 + Parapet = 17.0 ft

Out-of-Plane Force for Structural Wall Design

(For all SDCs) 0.4*SDS*I*Weight 77.748 psf **Controlling Value = 77.748** psf

10%*Weight 15.50 psf

ASCE Seismic Wall Anchorage

Project File: GST Expansion.ec6

DESCRIPTION: Wall Anchorage

Out-of-Plane Wall Anchorage Force

H = 26.0 ft Z = 26.0 ft Lf = 34.50 ft

Anchorage is not at roof and all diaphragms are not flexible : Yes Multiplier = 1.0

Ka = 1.0

Based on (12.11-1) = 10,573.7 lbs

Based on lower limit for Fp = 4,216.0 lbs

Controlling Value = 10,573.7 lbs

ID	Controlling Value (lbs)		Number of Anchorage	Force per anchorage (lbs)		Holdown	Allowable (lbs)	
	For Conc.	For Steel		For Conc.	For Steel		For Conc.	For Steel
Along line 1.0 Use purlin Anchor	2,078	2,493	1	2,078	2,493	MPAI32	2,885	3,205
Along line 12 Use purlin Anchor	2,444	2,933	1	2,444	2,933	MPAI32	2,885	3,205
Along line A, D, J (West side)		9,972	2		4,986	HDU4-SDS2.5		4,565
Along line A, D, J (East side)		5,867	2		2,933	HDU2-SDS2.5		3,075

SDC C-F — Allowable Tension Loads (160)

Max. Ledger Size	Model No.	Strap Length, L (in.)	Embed Length, l_e (in.)		Uncracked Concrete		Cracked Concrete		GFCMU Wall		Max. Allowable Strap Tension	Deflection at Allowable Load (in.)
			Concrete	GFCMU	Required Nails (in.)	Tension	Required Nails (in.)	Tension	Required Nails (in.)	Tension		
4x Ledger	MPAI32	33 1/2	5 1/2		(16) 0.148 x 1 1/2	2,885	(16) 0.148 x 1 1/2	2,885	(16) 0.148 x 1 1/2	2,355	3,205	0.167
	MPAI44	45 1/2	5 1/2		(16) 0.148 x 1 1/2	2,885	(16) 0.148 x 1 1/2	2,885	(24) 0.148 x 1 1/2	2,865	3,205	0.167

Roof Chord Design

Diaphragm Length	L_{MR} =	156	ft
Diaphragm Depth	D_{MR} =	34.5	ft
Max. Chord Force	F_p	1314	plf
Diapharagm moment	$M_{diaph} = F_p * L_{MR}^2/8$	3997.188	kip-ft
Chord Force	$T_{MR} = M_{diaph}/D_{MR}$	25.62	kips
Provide Chord		2-#7	
Allowable Strength	F_s	54	ksi
Required Area	$A_{s,req}$	0.4745	sq. In
Provide Area	$A_{s,prov}$	1.2	sq. In
DCR	$A_{s,req}/A_{s,prov}$ =	0.4	
Status		OK	

Floor Diaphragm Shear Design North-South Direction

Diaphragm along N-S Direction

Floor Seismic Shear; V_E = 1.4x0.7x41,350 lbs/34.5ft =1175 plf;

Diaphragm along E-W Direction

Floor Seismic Shear; V_E = 1.4x0.7x41,350 lbs/156ft =260 plf;

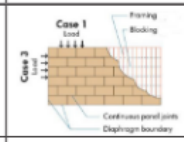
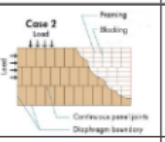
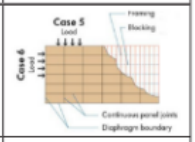
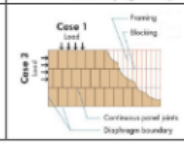
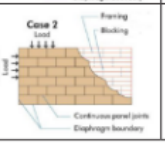
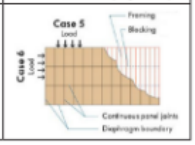
Use 10d, 15/32 Blocked Sheathing nailed @ 6" with Shear Capacity from NDS 2015 Table 4.2B

Table 4.2B Nominal Unit Shear Capacities for Wood-Frame Diaphragms

Blocked Wood Structural Panel Diaphragms Utilizing Multiple Rows of Fasteners (High Load Diaphragms)[1,2,3,4,5]

Sheathing Grade	Common Nail Size	Minimum Fastener Penetration in Framing Member or Blocking (in.)	Minimum Nominal Panel Thickness (in.)	Minimum Nominal Width of Nailed Face at Adjoining Panel Edges and Boundaries (in.)	Lines of Fasteners	A SEISMIC: Nail Spacing (in.) at diaphragm boundaries (all cases), at continuous panel edges parallel to load (Cases 3 & 4), and at all panel edges (Cases 5 & 6)										B WIND: Nail Spacing (in.) at diaphragm boundaries (all cases), at continuous panel edges parallel to load (Cases 3 & 4), and at all panel edges (Cases 5 & 6)			
						4			4			2-1/2			2-1/2				
						Nail Spacing (in.) at other panel edges (Cases 1, 2, 3, & 4)													
						6			4			4			3	6	4	4	3
						v_s (plf)	G_a (kips/in.)		v_s (plf)	G_a (kips/in.)		v_s (plf)	G_a (kips/in.)		v_s (plf)	G_a (kips/in.)		v_w (plf)	v_w (plf)	v_w (plf)	v_w (plf)
							OSB	PLY		OSB	PLY		OSB	PLY		OSB	PLY				
Structural I	10d	1-1/2	15/32	3	2	1210	40	24	1630	53	28	1750	50	27	2300	56	29	1695	2280	2450	3220
				4	2	1400	33	21	1830	48	27	2010	44	25	2580	51	28	1960	2560	2815	3610
				4	3	1750	50	27	2440	61	30	2570	59	30	2790	70	32	2450	3415	3600	3905
			19/32	3	2	1340	36	23	1760	52	29	1930	47	27	2510	54	29	1875	2465	2700	3515
				4	2	1560	29	20	1980	46	27	2220	40	25	2880	48	27	2185	2770	3110	4030
				4	3	1930	47	27	2640	60	31	2810	57	30	3580	64	32	2700	3695	3935	5010
			23/32	3	2	1460	33	22	1910	50	29	2100	45	27	2730	53	30	2045	2675	2940	3820
				4	2	1710	26	19	2140	43	27	2420	37	24	3130	45	27	2395	2995	3390	4380
				4	3	2100	45	27	2860	59	32	3050	56	31	3600	68	34	2940	4005	4270	5040
Sheathing and Single-Floor	10d	1-1/2	15/32	3	2	1050	43	21	1450	55	23	1530	53	23	2020	58	24	1470	2030	2140	2830
				4	2	1210	36	19	1630	50	22	1750	46	21	2210	55	23	1695	2280	2450	3095
				4	3	1530	53	23	2170	62	24	2260	61	24	2390	72	26	2140	3040	3165	3345
			19/32	3	2	1300	34	19	1720	49	23	1870	45	22	2450	52	23	1820	2410	2620	3430
				4	2	1510	27	16	1930	43	21	2160	37	20	2740	46	22	2115	2700	3025	3835
				4	3	1870	45	22	2580	57	24	2730	55	24	2970	68	26	2620	3610	3820	4160
			23/32	3	2	1420	30	18	1870	46	23	2040	42	22	2670	50	24	1990	2620	2855	3740
				4	2	1650	24	16	2100	40	21	2350	34	20	2890	45	23	2310	2940	3290	4045
				4	3	2040	42	22	2800	56	25	2960	53	25	3130	71	28	2855	3920	4145	4380

1. Nominal unit shear capacities shall be adjusted in accordance with 4.2.3 to determine ASD allowable unit shear capacity and LRFD factored unit resistance. For general construction requirements see 4.2.6. For specific requirements, see 4.2.7.1 for wood structural panel diaphragms. See Appendix A for common nail dimensions.
2. For species and grades of framing other than Douglas-Fir-Larch or Southern Pine, reduced nominal unit shear capacities shall be determined by multiplying the tabulated nominal unit shear capacity by the Specific Gravity Adjustment Factor = [1-(0.5-G)], where G = Specific Gravity of the framing lumber from the *NDS* (Table 12.3.3A). The Specific Gravity Adjustment Factor shall not be greater than 1.
3. Apparent shear stiffness values, G_a, are based on nail slip in framing with moisture content less than or equal to 19% at time of fabrication and panel stiffness values for diaphragms constructed with either OSB or 3-ply plywood panels. When 4-ply or 5-ply plywood panels or composite panels are used, G_a values shall be permitted to be multiplied by 1.2.
4. Where moisture content of the framing is greater than 19% at time of fabrication, G_a values shall be multiplied by 0.5.
5. Diaphragm resistance depends on the direction of continuous panel joints with respect to the loading direction and direction of framing members, and is independent of the panel orientation.

	Cases 1&3:Continuous Panel Joints Perpendicular to Framing	**Cases 2&4**: Continuous Panel Joints Parallel to Framing	**Cases 5&6**: Continuous Panel Joints Perpendicular and Parallel to Framing
Long Panel Direction Perpendicular to Supports			
Long Panel Direction Parallel to Supports[a]			

(a) Panel span rating for out-of-plane loads may be lower than the span rating with the long panel direction perpendicular to supports (See Section 3.2.2 and Section 3.2.3)

Floor Anchorage Design

Seismic Wall Anchorage per ASCE 7-16

Description Wall Anchorage @ along Grid A, D, J (Floor)

S_{DS} = 1.254 I : Importance Factor = 1 Wall Weight = 155.0 psf

Wall Height = 14.0 ft Parapet Height = 0 ft

Horiz. Spacing between anchors = 4 ft Tributary Height = Wall height/2 + Parapet = 7.0 ft

Out-of-Plane Force for Structural Wall Design

(For all SDCs) 0.4*SDS*I*Weight 77.748 psf **Controlling Value = 77.748** psf

10%*Weight 15.50 psf

Out-of-Plane Wall Anchorage Force

H = 14 ft Z = 14.0 ft Lf = 34.50 ft

Anchorage is not at roof and all diaphragms are not flexible : Yes Multiplier = 1.0

Ka = 1.0

Based on (12.11-1) = 2,176.94 lbs **Controlling Value = 2,176.94** lbs

Based on lower limit for Fp = 868.0 lbs

Seismic Wall Anchorage per ASCE 7-16

Description Wall Anchorage @ along Grid 12 (Floor)

S_{DS} = 1.254 I : Importance Factor = 1 Wall Weight = 155.0 psf

Wall Height = 14.0 ft Parapet Height = 0 ft

Horiz. Spacing between anchors = 2.670 ft Tributary Height = Wall height/2 + Parapet = 7.0 ft

Out-of-Plane Force for Structural Wall Design

(For all SDCs) 0.4*SDS*I*Weight 77.748 psf **Controlling Value = 77.748** psf

10%*Weight 15.50 psf

Out-of-Plane Wall Anchorage Force

H = 14 ft Z = 14.0 ft Lf = 156 ft

Anchorage is not at roof and all diaphragms are not flexible : Yes Multiplier = 1.0

Ka = 1.0

Based on (12.11-1) = 1,453.11 lbs **Controlling Value = 1,453.11** lbs

Based on lower limit for Fp = 579.39 lbs

ASCE Seismic Wall Anchorage

Project File: GST Expansion.ec6

DESCRIPTION: Wall Anchorage

Seismic Wall Anchorage per ASCE 7-16

Description Wall Anchorage @ along Grid A, D, J (Floor)

S_{DS} = 1.254 I : Importance Factor = 1 Wall Weight = 155.0 psf

Wall Height = 14.0 ft Parapet Height = 0 ft

Horiz. Spacing between anchors = 4 ft Tributary Height = Wall height/2 + Parapet = 7.0 ft

Out-of-Plane Force for Structural Wall Design

(For all SDCs) 0.4*SDS*I*Weight 77.748 psf **Controlling Value = 77.748** psf

10%*Weight 15.50 psf

Out-of-Plane Wall Anchorage Force

H = 14 ft Z = 14.0 ft Lf = 34.50 ft

Anchorage is not at roof and all diaphragms are not flexible : Yes Multiplier = 1.0

Ka = 1.0

Based on (12.11-1) = 2,176.94 lbs **Controlling Value = 2,176.94** lbs

Based on lower limit for Fp = 868.0 lbs

ID	Controlling Value (lbs)		Number of Anchorage	Force per anchorage (lbs)	Holdown	Allowable (lbs)		Check
	For Conc.	For Steel				For Conc.	For Steel	
Along line 12	1,142	1,371	1	1,371	PA35	1,980	3,220	OK
Along line A, D, J (East side)	1,711	2,053	1	2,053	PA35	1,980	3,220	OK

SDC C-F — Allowable Tension Loads (160)

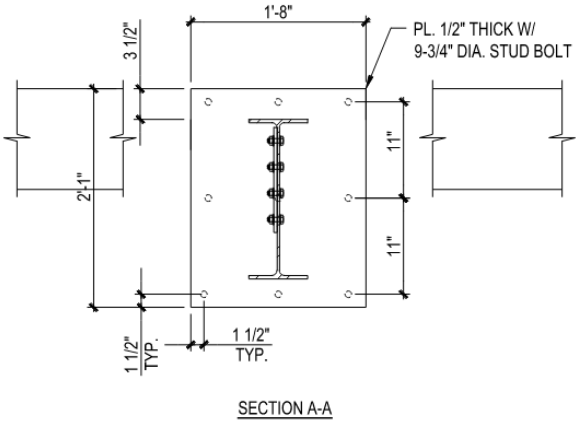
Max. Ledger Size	Model No.	Strap Length, L (in.)	Embed Length, l_e (in.)		Uncracked Concrete		Cracked Concrete		GFCMU Wall		Max. Allowable Strap Tension	Deflection at Allowable Load (in.)
			Concrete	GFCMU	Required Nails (in.)	Tension	Required Nails (in.)	Tension	Required Nails (in.)	Tension		
4x Ledger	PA18	18 1/2	4	6	(12) 0.148 x 3	2,430	(12) 0.148 x 3	1,980	(12) 0.148 x 3	1,890	3,220	0.087
	PA23	23 3/4	4	6	(14) 0.148 x 3	2,830	(12) 0.148 x 3	1,980	(16) 0.148 x 3	2,815	3,220	0.118
	PA28	29	4	6	(14) 0.148 x 3	2,830	(12) 0.148 x 3	1,980	(16) 0.148 x 3	2,815	3,935	0.085
	PA35	35	4	6	(14) 0.148 x 3	2,830	(12) 0.148 x 3	1,980	(16) 0.148 x 3	2,815	3,935	0.085

Floor Chord Design

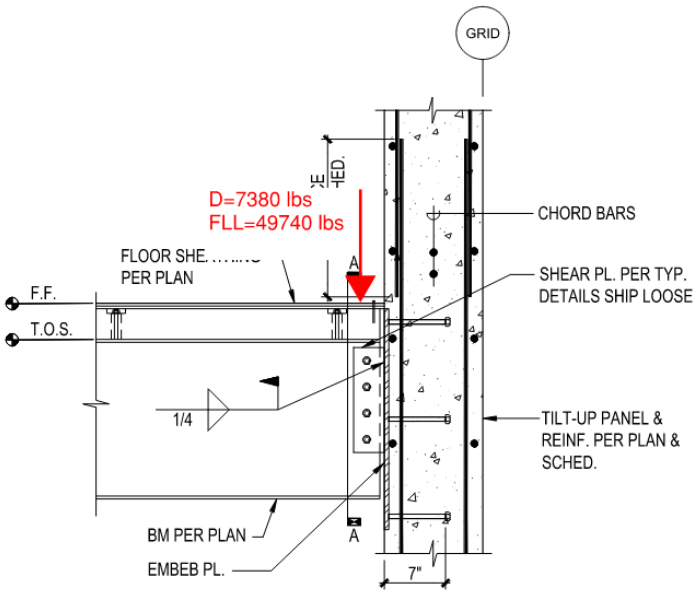
Diaphragm Length	L_{MR} =	156	ft
Diaphragm Depth	D_{MR} =	34.5	ft
Max. Chord Force	F_p	1175	plf
Diapharagm moment	$M_{diaph} = F_p * L_{MR}^2/8$	3574.35	kip-ft
Chord Force	$T_{MR} = M_{diaph}/D_{MR}$	22.91	kips
Provide Chord		2-#7	
Allowable Strength	F_s	54	ksi
Required Area	$A_{s,req}$	0.424306	sq. In
Provide Area	$A_{s,prov}$	1.2	sq. In
DCR	$A_{s,req}/A_{s,prov}$ =	0.4	
Status		OK	

12881 1116th CERRITIOS	2021-057		
Project	Project No.		
CALCULATION SUBJECT	Hung Nguyen, S.E	10/10/22	Page: 105 Of: 114
Subject	By	Date	

Connection Floor Beam To Wall.



SECTION A-A



Hilti PROFIS Engineering 3.0.79

www.hilti.com

Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jul 12, 2022	Date:	7/12/2022
Fastening point:			

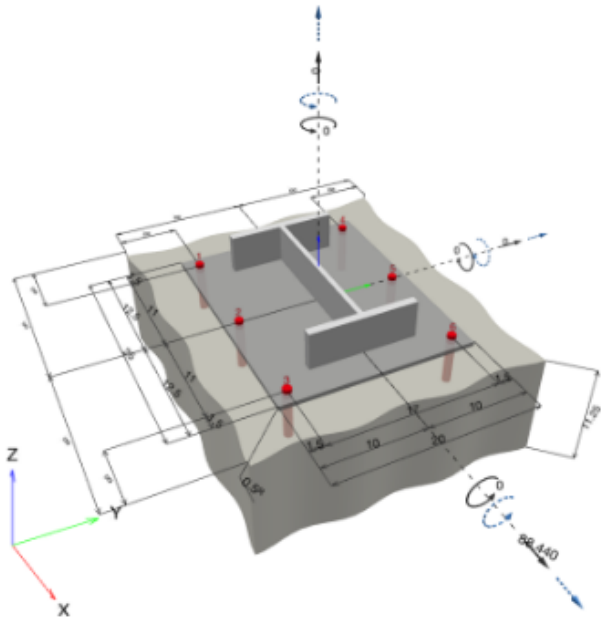
Specifier's comments:

1 Input data

Anchor type and diameter:	**Hex Head ASTM F 1554 GR. 105 7/8**
Item number:	not available
Effective embedment depth:	h_{ef} = 4.724 in.
Material:	ASTM F 1554
Evaluation Service Report:	Hilti Technical Data
Issued I Valid:	- | -
Proof:	Design Method ACI 318-14 / CIP
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 = 25.000 in. x 20.000 in. x 0.500 in.; (Recommended plate thickness: not calculated)
Profile:	W shape (AISC), W18X97; (L x W x T x FT) = 18.600 in. x 11.100 in. x 0.535 in. x 0.870 in.
Base material:	uncracked concrete, 3000, f_c' = 3,000 psi; h = 11.250 in.
Reinforcement:	tension: condition B, shear: condition B;
	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]



Hilti PROFIS Engineering 3.0.79

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Company:		Page:	2
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jul 12, 2022	Date:	7/12/2022
Fastening point:			

1.1 Unfactored loads

	Sustained load factor	Load factor f_1 or f_2	V_x [lb]	V_y [lb]	N [lb]	M_x [in.lb]	M_y [in.lb]	M_z [in.lb]
D (Dead)	1.000	-	7,380	-	-	-	-	-
F (Fluid)	1.000	-	-	-	-	-	-	-
T (Temperature)	1.000	-	-	-	-	-	-	-
L (Live)	1.000	0.500	49,740	-	-	-	-	-
H (Lateral)	1.000	-	-	-	-	-	-	-
L_r (Roof live)	1.000	-	-	-	-	-	-	-
S (Snow)	1.000	0.200	-	-	-	-	-	-
R (Rain)	-	-	-	-	-	-	-	-
W (Wind)	-	-	-	-	-	-	-	-
E (Earthquake)	-	-	-	-	-	-	-	-

1.2 Load combination and design results

1.2.1 Load combination

Load case	Load combination
Equation (16-1)	1.4 (D + F)
Equation (16-2a)	1.2 (D + F) + 1.6 (L + H) + 0.5 (L_r)
Equation (16-2b)	1.2 (D + F) + 1.6 (L + H) + 0.5 (S)
Equation (16-2c)	1.2 (D + F) + 1.6 (L + H) + 0.5 (R)
Equation (16-3a)	1.2 (D + F) + 1.6 (L_r) + 1.6 (H) + f_1L
Equation (16-3b)	1.2 (D + F) + 1.6 (S) + 1.6 (H) + f_1L
Equation (16-3c)	1.2 (D + F) + 1.6 (R) + 1.6 (H) + f_1L
Equation (16-3d)	1.2 (D + F) + 1.6 (L_r) + 1.6 (H) + (0.5 W)
Equation (16-3e)	1.2 (D + F) + 1.6 (S) + 1.6 (H) + (0.5 W)
Equation (16-3f)	1.2 (D + F) + 1.6 (R) + 1.6 (H) + (0.5 W)
Equation (16-4a)	1.2 (D + F) + 1.0 (W) + f_1L + 1.6 (H) + 0.5 (L_r)
Equation (16-4b)	1.2 (D + F) + 1.0 (W) + f_1L + 1.6 (H) + 0.5 (S)
Equation (16-4c)	1.2 (D + F) + 1.0 (W) + f_1L + 1.6 (H) + 0.5 (R)
Equation (16-5)	1.2 (D + F) + 1.0 (E) + f_1L + 1.6 (H) + f_2S
Equation (16-6)	0.9 (D) + 1.0 (W) + 1.6 (H)
Equation (16-7)	0.9 (D + F) + 1.0 (E) + 1.6 (H)

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Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jul 12, 2022	Date:	7/12/2022
Fastening point:			

1.2.2 Design results

Case	Description	Forces [lb] / Moments [in.lb]	Seismic	Max. Util. Anchor [%]
Equation (16-1)	1.4 (D + F)	N = 0; V_x = 10,332; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	9
Equation (16-2a)	1.2 (D + F) + 1.6 (L + H) + 0.5 (L_r)	N = 0; V_x = 88,440; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	74
Equation (16-2b)	1.2 (D + F) + 1.6 (L + H) + 0.5 (S)	N = 0; V_x = 88,440; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	74
Equation (16-2c)	1.2 (D + F) + 1.6 (L + H) + 0.5 (R)	N = 0; V_x = 88,440; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	74
Equation (16-3a)	1.2 (D + F) + 1.6 (L_r) + 1.6 (H) + f_1L	N = 0; V_x = 33,726; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	28
Equation (16-3b)	1.2 (D + F) + 1.6 (S) + 1.6 (H) + f_1L	N = 0; V_x = 33,726; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	28
Equation (16-3c)	1.2 (D + F) + 1.6 (R) + 1.6 (H) + f_1L	N = 0; V_x = 33,726; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	28
Equation (16-3d)	1.2 (D + F) + 1.6 (L_r) + 1.6 (H) + (0.5 W)	N = 0; V_x = 8,856; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	8
Equation (16-3e)	1.2 (D + F) + 1.6 (S) + 1.6 (H) + (0.5 W)	N = 0; V_x = 8,856; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	8
Equation (16-3f)	1.2 (D + F) + 1.6 (R) + 1.6 (H) + (0.5 W)	N = 0; V_x = 8,856; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	8
Equation (16-4a)	1.2 (D + F) + 1.0 (W) + f_1L + 1.6 (H) + 0.5 (L_r)	N = 0; V_x = 33,726; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	28
Equation (16-4b)	1.2 (D + F) + 1.0 (W) + f_1L + 1.6 (H) + 0.5 (S)	N = 0; V_x = 33,726; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	28
Equation (16-4c)	1.2 (D + F) + 1.0 (W) + f_1L + 1.6 (H) + 0.5 (R)	N = 0; V_x = 33,726; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	28
Equation (16-5)	1.2 (D + F) + 1.0 (E) + f_1L + 1.6 (H) + f_2S	N = 0; V_x = 33,726; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	28
Equation (16-6)	0.9 (D) + 1.0 (W) + 1.6 (H)	N = 0; V_x = 6,642; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	6
Equation (16-7)	0.9 (D + F) + 1.0 (E) + 1.6 (H)	N = 0; V_x = 6,642; V_y = 0; M_x = 0; M_y = 0; M_z = 0;	yes	6

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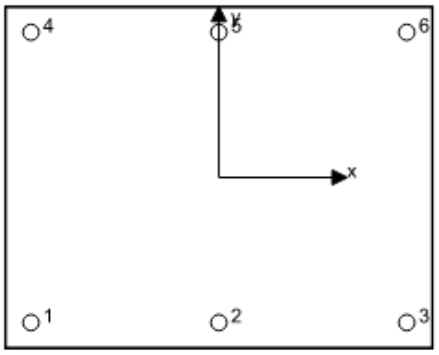
Company:		Page:	4
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jul 12, 2022	Date:	7/12/2022
Fastening point:			

2 Load case/Resulting anchor forces

Controlling load case: Equation (16-2c) 1.2 (D + F) + 1.6 (L + H) + 0.5 (R)



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

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0	14,740	14,740	0
2	0	14,740	14,740	0
3	0	14,740	14,740	0
4	0	14,740	14,740	0
5	0	14,740	14,740	0
6	0	14,740	14,740	0

max. concrete compressive strain: - [‰]
max. concrete compressive stress: - [psi]
resulting tension force in (x/y)=(0.000/0.000): 0 [lb]
resulting compression force in (x/y)=(0.000/0.000): 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*	N/A	N/A	N/A	N/A
Pullout Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Failure**	N/A	N/A	N/A	N/A
Concrete Side-Face Blowout, direction **	N/A	N/A	N/A	N/A

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

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Company:		Page:	5
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jul 12, 2022	Date:	7/12/2022
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*	14,740	22,522	66	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	88,440	120,581	74	OK
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* highest loaded anchor **anchor group (relevant anchors)

4.1 Steel Strength

$V_{sa} = 0.6\, A_{se,V}\, f_{uta}$ ACI 318-14 Eq. (17.5.1.2b)
$\phi\, V_{steel} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

Variables

$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
0.46	125,001

Calculations

V_{sa} [lb]
34,650

Results

V_{sa} [lb]	ϕ_{steel}	$\phi\, V_{sa,eq}$ [lb]	V_{ua} [lb]
34,650	0.650	22,522	14,740

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Company:		Page:	6
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jul 12, 2022	Date:	7/12/2022
Fastening point:			

4.2 Pryout Strength

$V_{cpg} = k_{cp} \left[\left(\frac{A_{Nc}}{A_{Nc0}} \right) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b \right]$ ACI 318-14 Eq. (17.5.3.1b)

$\phi V_{cpg} \geq V_{ua}$ ACI 318-14 Table 17.3.1.1

A_{Nc} see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)

$A_{Nc0} = 9 h_{ef}^2$ ACI 318-14 Eq. (17.4.2.1c)

$\Psi_{ec,N} = \left(\frac{1}{1 + \frac{2 e'_N}{3 h_{ef}}} \right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.4)

$\Psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.5b)

$\Psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0$ ACI 318-14 Eq. (17.4.2.7b)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ ACI 318-14 Eq. (17.4.2.2a)

Variables

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
2	4.724	0.000	0.000	∞

$\Psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
1.250	∞	24	1.000	3,000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\Psi_{ec1,N}$	$\Psi_{ec2,N}$	$\Psi_{ed,N}$	$\Psi_{cp,N}$	N_b [lb]
1,025.38	200.88	1.000	1.000	1.000	1.000	13,499

Results

V_{cpg} [lb]	$\phi_{concrete}$	ϕV_{cpg} [lb]	V_{ua} [lb]
172,259	0.700	120,581	88,440

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!
- 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:	7
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jul 12, 2022	Date:	7/12/2022
Fastening point:			

6 Installation data

Profile: W shape (AISC), W18X97; (L x W x T x FT) = 18.600 in. x 11.100 in. x 0.535 in. x 0.870 in.

Hole diameter in the fixture: d_f = 0.938 in.

Plate thickness (input): 0.500 in.

Recommended plate thickness: not calculated

Anchor type and diameter: Hex Head ASTM F 1554 GR. 105 7/8

Item number: not available

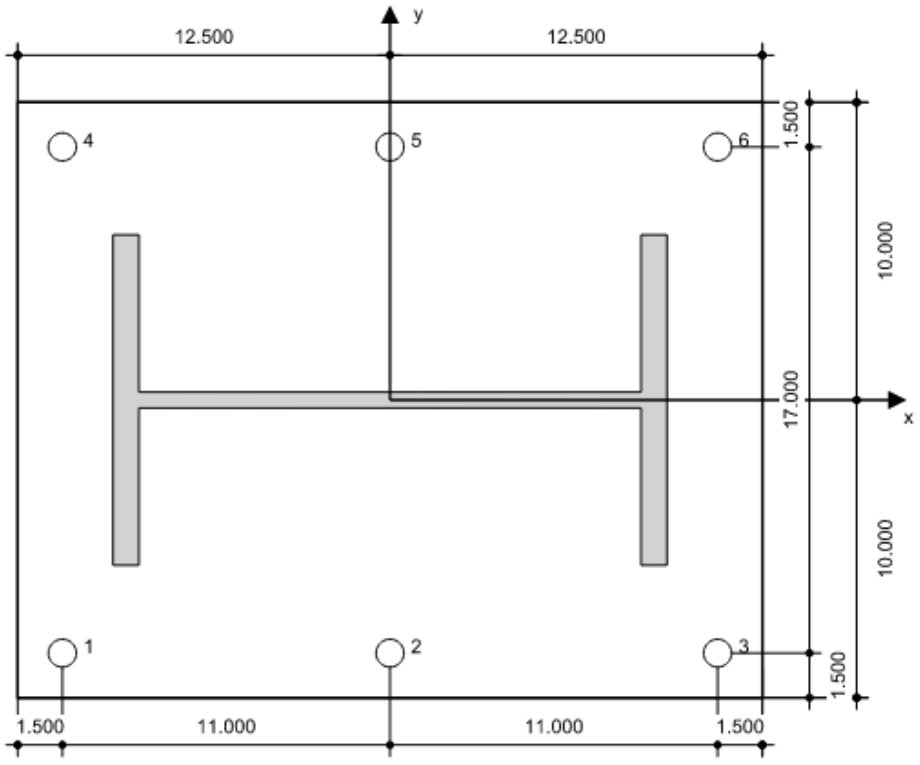
Maximum installation torque: -

Hole diameter in the base material: - in.

Hole depth in the base material: 4.724 in.

Minimum thickness of the base material: 5.776 in.

Hilti Hex Head headed stud anchor with 4.724409 in embedment, 7/8, Steel galvanized, installation per instruction for use



Coordinates Anchor [in.]

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	-11.000	-8.500	-	-	-	-
2	0.000	-8.500	-	-	-	-
3	11.000	-8.500	-	-	-	-
4	-11.000	8.500	-	-	-	-
5	0.000	8.500	-	-	-	-
6	11.000	8.500	-	-	-	-

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Company:		Page:	8
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Jul 12, 2022	Date:	7/12/2022
Fastening point:			

7 Remarks; Your Cooperation Duties

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SHEAR WALL DESIGN:

APPENDIX

CONCRETE SHEAR WALL DESIGN

SHEAR WALL AT GRIDS 3 AND 9:

Seismic force along grids 3 and 9 increase less than 10%. Therefore, the shear wall is o.k..

RAM® Elements
CONNECT Edition

Current Date: 5/11/2022 6:18 AM
Units system: English
File name: Z:\Jenh Group\OneDrive - JENH Group\Jenh Group\01 Design\01 Jenh Group Projects\2021\2021-057 GST Expansion\Calcs\Ram element\Wall Line 1_0.tup

Design Results

Tilt-Up Wall

GENERAL INFORMATION:

Global status : OK

Design code	:	ACI 318-14

Geometry:

Total height	:	31.00 [ft]
Reveal size	:	0.75 [in]
Total length	:	24.00 [ft]
Base support type	:	Continuous
Wall bottom restraint	:	Pinned

Materials:

Material	:	C 4-60
Steel tension strength (Fy)	:	60 [Kip/in2]
Concrete compressive strength (fc)	:	4 [Kip/in2]
Steel elasticity modulus (Es)	:	29000 [Kip/in2]
Concrete modulus of elasticity (E)	:	3605 [Kip/in2]
Concrete unit weight	:	0.149818 [Kip/ft3]

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]
1	26.00	11.25

Openings:

Reference	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
Lower left	15.50	0.00	6.50	8.00
Lower left	5.00	15.00	6.00	7.00
Lower left	13.00	15.00	6.00	7.00

Load conditions:

ID	Comb.	Category	Description
DL	No	DL	Dead Load
RLL	No	LLR	Roof Live Load
FLL	No	LL	Floor Live Load
Wx	No	WIND	Wind In Plane
Wz	No	WIND	Wind out of Plane
Ex	No	EQ	Seismic In Plane
Ez	No	EQ	Seismic Out of Plane
C	Yes		1.4DL
D2	Yes		1.2DL+0.5RLL+1.6FLL

D3	Yes	1.2DL+1.6RLL+0.5FLL
D4	Yes	1.2DL+1.6RLL+0.5Wx
D5	Yes	1.2DL+1.6RLL-0.5Wx
D6	Yes	1.2DL+1.6RLL+0.5Wz
D7	Yes	1.2DL+1.6RLL-0.5Wz
D8	Yes	1.2DL+0.5RLL+0.5FLL+Wx
D9	Yes	1.2DL+0.5RLL+0.5FLL-Wx
D10	Yes	1.2DL+0.5RLL+0.5FLL+Wz
D11	Yes	1.2DL+0.5RLL+0.5FLL-Wz
D12	Yes	1.363DL+0.5FLL+Ex
D13	Yes	1.363DL+0.5FLL-Ex
D14	Yes	1.363DL+0.5FLL+Ez
D15	Yes	1.363DL+0.5FLL-Ez
D16	Yes	0.9DL+Wx
D17	Yes	0.9DL-Wx
D18	Yes	0.9DL+Wz
D19	Yes	0.9DL-Wz
D20	Yes	0.737DL+Ex
D21	Yes	0.737DL-Ex
D22	Yes	0.737DL+Ez
D23	Yes	0.737DL-Ez
S1	Yes	DL
S2	Yes	DL+RLL
S3	Yes	DL+FLL
S4	Yes	DL+0.75FLL
S5	Yes	DL+0.75RLL
S6	Yes	DL+0.75RLL+0.75FLL
S7	Yes	DL+0.6Wx
S8	Yes	DL-0.6Wx
S9	Yes	DL+0.6Wz
S10	Yes	DL-0.6Wz
S11	Yes	1.12DL+0.7Ex
S12	Yes	1.12DL-0.7Ex
S13	Yes	1.12DL+0.7Ez
S14	Yes	1.12DL-0.7Ez
S15	Yes	DL+0.75RLL+0.75FLL+0.45Wx
S16	Yes	DL+0.75RLL+0.75FLL-0.45Wx
S17	Yes	DL+0.75RLL+0.75FLL+0.45Wz
S18	Yes	DL+0.75RLL+0.75FLL-0.45Wz
S19	Yes	DL+0.75FLL+0.525Ex
S20	Yes	DL+0.75FLL-0.525Ex
S21	Yes	DL+0.75FLL+0.525Ez
S22	Yes	DL+0.75FLL-0.525Ez
S23	Yes	0.6DL+0.6Wx
S24	Yes	0.6DL-0.6Wx
S25	Yes	0.6DL+0.6Wz
S26	Yes	0.6DL-0.6Wz
S27	Yes	0.48DL+0.7Ex
S28	Yes	0.48DL-0.7Ex
S29	Yes	0.48DL+0.7Ez
S30	Yes	0.48DL-0.7Ez
S31	Yes	1.09DL+0.75RLL+0.75FLL+0.525Ex
S32	Yes	1.09DL+0.75RLL+0.75FLL-0.525Ex
S33	Yes	1.09DL+0.75RLL+0.75FLL+0.525Ez
S34	Yes	1.09DL+0.75RLL+0.75FLL-0.525Ez

Consider Self Weight:

Load condition : DL

Concentrated loads:

Story	Condition	Direction	Magnitude [Kip]	Eccentricity [in]	Distance [ft]
1	Ex	Horizontal	4.98	0.00	0.00
1	DL	Horizontal	1.60	0.00	0.00
1	RLL	Horizontal	2.33	0.00	0.00
1	Wx	Horizontal	0.72	0.00	0.00

In-plane seismic weight:

Load condition	Coefficient
Ez	0.28

Distributed loads:

Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
1	DL	Vertical	0.24	0.67
1	RLL	Vertical	0.35	0.67

Out-of-plane pressure loads:

Story	Condition	Magnitude [Kip/ft2]
1	Wz	0.02

Out-of-plane parapet pressure loads:

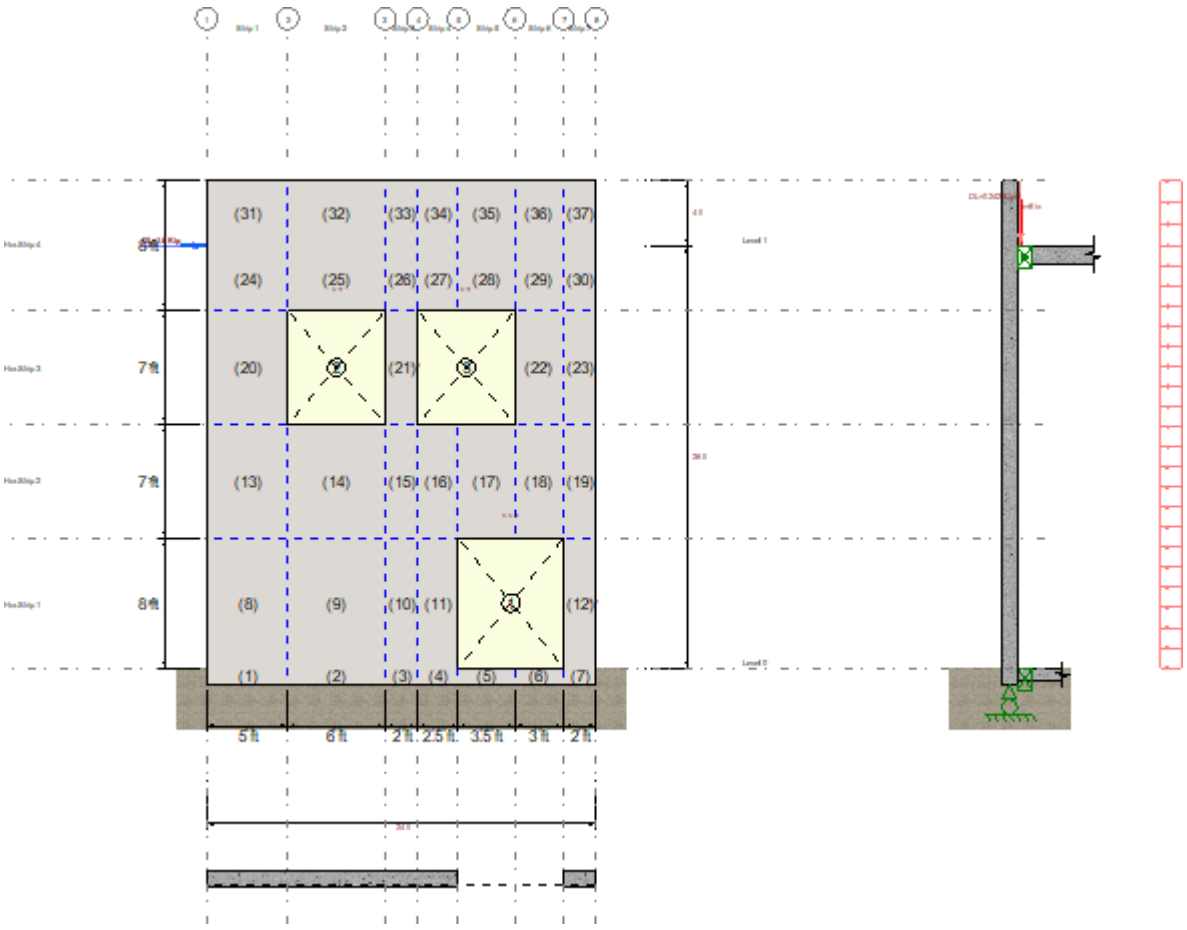
Condition	Magnitude [Kip/ft2]
Wz	0.02

Out-of-plane seismic weight:

Load condition	Coefficient
Ez	0.56

TILT-UP WALLS DESIGN:

Status : OK



Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	-1.00	5.00	1.00
2	5.00	-1.00	6.00	1.00
3	11.00	-1.00	2.00	1.00
4	13.00	-1.00	2.50	1.00
5	15.50	-1.00	3.50	1.00
6	19.00	-1.00	3.00	1.00
7	22.00	-1.00	2.00	1.00
8	0.00	0.00	5.00	8.00
9	5.00	0.00	6.00	8.00
10	11.00	0.00	2.00	8.00
11	13.00	0.00	2.50	8.00
12	22.00	0.00	2.00	8.00
13	0.00	8.00	5.00	7.00
14	5.00	8.00	6.00	7.00
15	11.00	8.00	2.00	7.00
16	13.00	8.00	2.50	7.00
17	15.50	8.00	3.50	7.00
18	19.00	8.00	3.00	7.00
19	22.00	8.00	2.00	7.00
20	0.00	15.00	5.00	7.00
21	11.00	15.00	2.00	7.00
22	19.00	15.00	3.00	7.00
23	22.00	15.00	2.00	7.00
24	0.00	22.00	5.00	4.00
25	5.00	22.00	6.00	4.00

26	11.00	22.00	2.00	4.00
27	13.00	22.00	2.50	4.00
28	15.50	22.00	3.50	4.00
29	19.00	22.00	3.00	4.00
30	22.00	22.00	2.00	4.00
31	0.00	26.00	5.00	4.00
32	5.00	26.00	6.00	4.00
33	11.00	26.00	2.00	4.00
34	13.00	26.00	2.50	4.00
35	15.50	26.00	3.50	4.00
36	19.00	26.00	3.00	4.00
37	22.00	26.00	2.00	4.00

Vertical reinforcement:

Reinforcement layers : 2

Segment	Bars	Spacing [in]	Ld [in]
1	8-#4	8.00	18.97
2	9-#4	8.00	18.97
3	3-#4	8.00	18.97
4	3-#4	12.00	18.97
5	4-#4	12.00	18.97
6	5-#4	8.00	18.97
7	3-#4	8.00	18.97
8	8-#4	8.00	18.97
9	9-#4	8.00	18.97
10	3-#4	8.00	18.97
11	3-#4	12.00	18.97
12	3-#4	8.00	18.97
13	8-#4	8.00	18.97
14	9-#4	8.00	18.97
15	3-#4	8.00	18.97
16	3-#4	12.00	18.97
17	4-#4	12.00	18.97
18	5-#4	8.00	18.97
19	3-#4	8.00	18.97
20	8-#4	8.00	18.97
21	3-#4	8.00	18.97
22	5-#4	8.00	18.97
23	3-#4	8.00	18.97
24	8-#4	8.00	18.97
25	9-#4	8.00	18.97
26	3-#4	8.00	18.97
27	3-#4	12.00	18.97
28	4-#4	12.00	18.97
29	5-#4	8.00	18.97
30	3-#4	8.00	18.97
31	8-#4	8.00	18.97
32	9-#4	8.00	18.97
33	3-#4	8.00	18.97
34	3-#4	12.00	18.97
35	4-#4	12.00	18.97
36	5-#4	8.00	18.97
37	3-#4	8.00	18.97

Vertical reinforcement

Segment	Condition	Pu [Kip]	Pu/Ag [Kip/in2]	0.06*f´c [Kip/in2]	Ratio
1	C (Top)	0.000	0.000	0.240	0.00
2	C (Top)	0.000	0.000	0.240	0.00
3	C (Top)	0.000	0.000	0.240	0.00
4	C (Top)	0.000	0.000	0.240	0.00
5	C (Top)	0.000	0.000	0.240	0.00
6	C (Top)	0.000	0.000	0.240	0.00
7	C (Top)	0.000	0.000	0.240	0.00
8	D13 (Max)	32.136	0.048	0.240	0.20
9	C (Max)	31.064	0.038	0.240	0.16
10	D12 (Max)	13.786	0.051	0.240	0.21
11	C (Max)	23.061	0.068	0.240	0.28
12	D12 (Max)	30.511	0.113	0.240	0.47
13	D13 (Max)	17.794	0.026	0.240	0.11
14	C (Max)	21.625	0.027	0.240	0.11
15	D4 (Max)	8.477	0.031	0.240	0.13
16	D12 (Max)	11.287	0.033	0.240	0.14
17	D6 (Max)	5.154	0.011	0.240	0.05
18	D7 (Max)	12.674	0.031	0.240	0.13
19	D7 (Max)	11.601	0.043	0.240	0.18
20	D15 (Max)	20.539	0.030	0.240	0.13
21	D15 (Max)	18.461	0.068	0.240	0.28
22	D14 (Max)	12.973	0.032	0.240	0.13
23	D7 (Max)	10.025	0.037	0.240	0.15
24	D5 (Max)	12.654	0.019	0.240	0.08
25	D5 (Max)	5.400	0.007	0.240	0.03
26	D4 (Max)	6.292	0.023	0.240	0.10
27	D4 (Max)	3.677	0.011	0.240	0.05
28	D4 (Max)	3.604	0.008	0.240	0.03
29	D13 (Max)	5.377	0.013	0.240	0.06
30	D6 (Max)	7.665	0.028	0.240	0.12
31	C (Top)	0.000	0.000	0.240	0.00
32	C (Top)	0.000	0.000	0.240	0.00
33	C (Top)	0.000	0.000	0.240	0.00
34	C (Top)	0.000	0.000	0.240	0.00
35	C (Top)	0.000	0.000	0.240	0.00
36	C (Top)	0.000	0.000	0.240	0.00
37	C (Top)	0.000	0.000	0.240	0.00

Intermediate results for axial-bending

Segment	Condition	Ase [in2]	a [in]	c [in]	d [in]	ϕ	Kb [Kip]
1	C (Top)	1.60	0.47	0.55	9.00	0.90	1710965.00
2	C (Top)	1.80	0.44	0.52	9.00	0.90	2053158.00
3	C (Top)	0.60	0.44	0.52	9.00	0.90	684386.10
4	C (Top)	0.60	0.35	0.42	9.00	0.90	855482.70
5	C (Top)	0.80	0.34	0.40	9.00	0.90	1197676.00
6	C (Top)	1.00	0.49	0.58	9.00	0.90	1026579.00
7	C (Top)	0.60	0.44	0.52	9.00	0.90	684386.10
8	D22 (Max)	1.75	0.54	0.64	9.00	0.90	2531.01
9	D22 (Bottom)	1.97	0.51	0.60	9.00	0.90	3037.22
10	D22 (Max)	0.67	0.53	0.62	9.00	0.90	1012.41
11	D22 (Max)	0.73	0.47	0.56	9.00	0.90	1265.51
12	D22 (Bottom)	0.75	0.62	0.73	9.00	0.90	750.05
13	D22 (Top)	1.67	0.50	0.59	9.00	0.90	2531.01
14	D15 (Max)	1.98	0.51	0.60	9.00	0.90	3037.22

15	D22 (Max)	0.64	0.49	0.58	9.00	0.90	1012.41
16	D23 (Max)	0.65	0.40	0.47	9.00	0.90	1265.51
17	D22 (Max)	0.83	0.35	0.42	9.00	0.90	1771.71
18	D22 (Top)	1.05	0.53	0.63	9.00	0.90	1518.61
19	D22 (Max)	0.65	0.50	0.59	9.00	0.90	1012.41
20	D22 (Max)	1.72	0.53	0.62	9.00	0.90	2531.01
21	D22 (Bottom)	0.70	0.56	0.66	9.00	0.90	1012.41
22	D22 (Max)	1.07	0.55	0.64	9.00	0.90	1518.61
23	D22 (Max)	0.65	0.50	0.59	9.00	0.90	1012.41
24	D14 (Max)	1.71	0.52	0.62	9.00	0.90	2531.01
25	D15 (Top)	1.84	0.46	0.54	9.00	0.90	3037.22
26	D14 (Max)	0.66	0.51	0.60	9.00	0.90	1012.41
27	D15 (Max)	0.63	0.38	0.45	9.00	0.90	1265.51
28	D15 (Max)	0.82	0.35	0.41	9.00	0.90	1771.71
29	D14 (Bottom)	1.05	0.53	0.62	9.00	0.90	1518.61
30	D22 (Bottom)	0.63	0.48	0.57	9.00	0.90	1012.41
31	C (Top)	1.60	0.47	0.55	9.00	0.90	106935.30
32	C (Top)	1.80	0.44	0.52	9.00	0.90	128322.40
33	C (Top)	0.60	0.44	0.52	9.00	0.90	42774.13
34	C (Top)	0.60	0.35	0.42	9.00	0.90	53467.67
35	C (Top)	0.80	0.34	0.40	9.00	0.90	74854.74
36	C (Top)	1.00	0.49	0.58	9.00	0.90	64161.20
37	C (Top)	0.60	0.44	0.52	9.00	0.90	42774.13

Inertias

Segment	Condition	Ig [in4]	Icr [in4]	Ie [in4]
1	C (Top)	7119.14	921.63	7119.14
2	C (Top)	8542.97	1044.85	8542.97
3	C (Top)	2847.66	348.28	2847.66
4	C (Top)	3559.57	356.43	3559.57
5	C (Top)	4983.40	477.34	4983.40
6	C (Top)	4271.48	573.07	4271.48
7	C (Top)	2847.66	348.28	2847.66
8	D22 (Max)	7119.14	991.00	7119.14
9	D22 (Bottom)	8542.97	1124.15	8542.97
10	D22 (Max)	2847.66	382.68	2847.66
11	D22 (Max)	3559.57	418.46	3559.57
12	D22 (Bottom)	2847.66	416.21	2109.70
13	D22 (Top)	7119.14	954.63	7119.14
14	D15 (Max)	8542.97	1127.43	8542.97
15	D22 (Max)	2847.66	367.93	2847.66
16	D23 (Max)	3559.57	382.72	3559.57
17	D22 (Max)	4983.40	491.24	4983.40
18	D22 (Top)	4271.48	597.82	4271.48
19	D22 (Max)	2847.66	372.47	2847.66
20	D22 (Max)	7119.14	974.46	7119.14
21	D22 (Bottom)	2847.66	395.95	2847.66
22	D22 (Max)	4271.48	605.91	4271.48
23	D22 (Max)	2847.66	371.31	2847.66
24	D14 (Max)	7119.14	973.60	7119.14
25	D15 (Top)	8542.97	1062.66	8542.97
26	D14 (Max)	2847.66	374.45	2847.66
27	D15 (Max)	3559.57	370.38	3559.57
28	D15 (Max)	4983.40	488.56	4983.40
29	D14 (Bottom)	4271.48	595.17	4271.48
30	D22 (Bottom)	2847.66	364.35	2847.66
31	C (Top)	7119.14	921.63	7119.14
32	C (Top)	8542.97	1044.85	8542.97
33	C (Top)	2847.66	348.28	2847.66
34	C (Top)	3559.57	356.43	3559.57

35	C (Top)	4983.40	477.34	4983.40
36	C (Top)	4271.48	573.07	4271.48
37	C (Top)	2847.66	348.28	2847.66

Deflection

Segment	Condition	Δu [in]
1		0.000
2		0.000
3		0.000
4		0.000
5		0.000
6		0.000
7		0.000
8	D23 (Max)	-0.221
9	D23 (Max)	-0.161
10	D23 (Max)	-0.244
11	D23 (Max)	-0.218
12	D23 (Max)	-0.455
13	D23 (Max)	0.148
14	D23 (Max)	0.013
15	D23 (Max)	0.176
16	D23 (Max)	0.047
17	D23 (Max)	0.015
18	D23 (Max)	0.158
19	D23 (Max)	0.173
20	D23 (Max)	0.148
21	D23 (Max)	0.177
22	D23 (Max)	0.158
23	D23 (Max)	0.170
24	D23 (Max)	0.075
25	D23 (Max)	-0.024
26	D23 (Max)	0.064
27	D23 (Max)	-0.024
28	D23 (Max)	-0.024
29	D23 (Max)	0.079
30	D23 (Max)	0.081
31		0.000
32		0.000
33		0.000
34		0.000
35		0.000
36		0.000
37		0.000

Combined axial flexure

Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mu [Kip*ft]	ϕ*Mn [Kip*ft]	Mu/ϕ*Mn
1	C (Top)	0.00	0.00	0.00	67.78	0.00
2	C (Top)	0.00	0.00	0.00	77.00	0.00
3	C (Top)	0.00	0.00	0.00	25.67	0.00
4	C (Top)	0.00	0.00	0.00	26.28	0.00
5	C (Top)	0.00	0.00	0.00	35.15	0.00
6	C (Top)	0.00	0.00	0.00	42.11	0.00
7	C (Top)	0.00	0.00	0.00	25.67	0.00
8	D22 (Max)	14.65	35.54	35.82	72.70	0.49
9	D22 (Bottom)	16.35	31.14	31.36	82.51	0.38

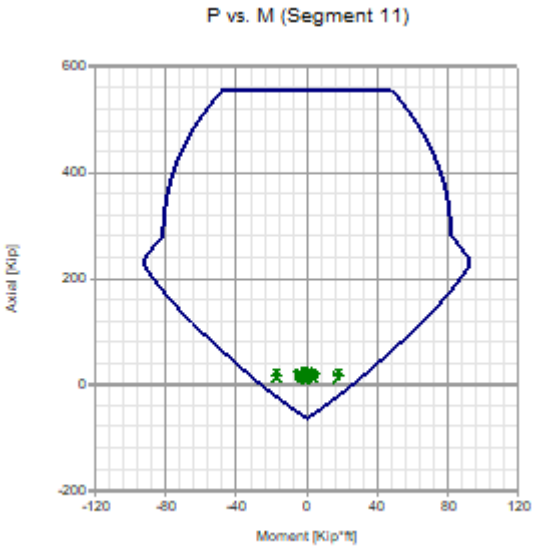
10	D22 (Max)	7.13	15.67	15.82	28.07	0.56
11	D22 (Max)	12.14	17.42	17.65	30.74	0.57
12	D22 (Bottom)	14.44	22.58	23.17	30.53	0.76
13	D22 (Top)	6.90	-24.01	-24.09	70.10	0.34
14	D15 (Max)	17.04	2.54	2.55	82.74	0.03
15	D22 (Max)	4.03	-11.31	-11.37	27.03	0.42
16	D23 (Max)	5.05	3.68	3.70	28.19	0.13
17	D22 (Max)	2.61	-1.70	-1.70	36.15	0.05
18	D22 (Top)	5.27	-15.59	-15.66	43.87	0.36
19	D22 (Max)	4.98	-11.13	-11.20	27.35	0.41
20	D22 (Max)	11.11	-24.01	-24.16	71.51	0.34
21	D22 (Bottom)	9.98	-11.31	-11.46	29.03	0.39
22	D22 (Max)	7.01	-15.60	-15.70	44.46	0.35
23	D22 (Max)	4.74	-10.98	-11.05	27.26	0.41
24	D14 (Max)	10.92	-14.02	-14.10	71.45	0.20
25	D15 (Top)	3.62	-5.10	-5.10	78.22	0.07
26	D14 (Max)	5.39	-5.54	-5.58	27.48	0.20
27	D15 (Max)	2.66	-2.12	-2.13	27.29	0.08
28	D15 (Max)	2.11	-2.97	-2.98	35.95	0.08
29	D14 (Bottom)	4.70	-9.30	-9.34	43.68	0.21
30	D22 (Bottom)	3.29	-5.54	-5.57	26.78	0.21
31	C (Top)	0.00	0.00	0.00	67.78	0.00
32	C (Top)	0.00	0.00	0.00	77.00	0.00
33	C (Top)	0.00	0.00	0.00	25.67	0.00
34	C (Top)	0.00	0.00	0.00	26.28	0.00
35	C (Top)	0.00	0.00	0.00	35.15	0.00
36	C (Top)	0.00	0.00	0.00	42.11	0.00
37	C (Top)	0.00	0.00	0.00	25.67	0.00

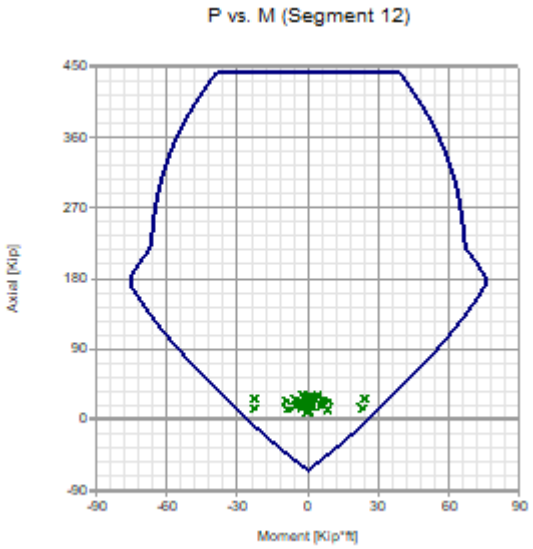
Cracking moment

Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mcr [Kip*ft]	ϕ*Mn [Kip*ft]	Mcr/ϕ*Mn
1	C (Top)	0.00	0.00	50.03	67.78	0.74
2	D23 (Bottom)	0.00	0.00	60.03	77.00	0.78
3	D23 (Bottom)	0.00	0.00	20.01	25.67	0.78
4	C (Top)	0.00	0.00	25.01	26.28	0.95
5	D23 (Bottom)	0.00	0.00	35.02	35.15	1.00
6	C (Top)	0.00	0.00	30.02	42.11	0.71
7	D23 (Bottom)	0.00	0.00	20.01	25.67	0.78
8	D20 (Top)	5.48	0.02	50.03	69.62	0.72
9	D21 (Top)	11.33	0.19	60.03	80.82	0.74
10	D21 (Top)	4.89	0.03	20.01	27.31	0.73
11	D21 (Top)	9.50	0.05	25.01	29.84	0.84
12	D21 (Top)	8.98	-0.08	20.01	28.69	0.70
13	D20 (Max)	1.86	-0.38	50.03	68.40	0.73
14	D21 (Top)	6.98	0.00	60.03	79.35	0.76
15	D21 (Max)	3.44	-0.13	20.01	26.83	0.75
16	D21 (Top)	2.14	0.00	25.01	27.09	0.92
17	D21 (Max)	1.33	0.00	35.02	35.66	0.98
18	D21 (Max)	3.28	-0.35	30.02	43.21	0.69
19	D21 (Top)	3.76	-0.14	20.01	26.93	0.74
20	D20 (Top)	5.40	-0.79	50.03	69.59	0.72
21	D21 (Max)	8.37	-0.53	20.01	28.49	0.70
22	D21 (Top)	3.90	-0.65	30.02	43.41	0.69
23	D21 (Max)	2.31	-0.20	20.01	26.45	0.76
24	D20 (Top)	3.32	-0.59	50.03	68.89	0.73
25	D20 (Max)	1.63	-0.71	60.03	77.55	0.77

26	D21 (Top)	2.02	-0.24	20.01	26.35	0.76
27	D21 (Max)	1.38	-0.30	25.01	26.80	0.93
28	D21 (Max)	0.72	-0.42	35.02	35.43	0.99
29	D20 (Top)	0.62	-0.36	30.02	42.31	0.71
30	D21 (Max)	1.48	-0.24	20.01	26.17	0.76
31	C (Top)	0.00	0.00	50.03	67.78	0.74
32	D23 (Bottom)	0.00	0.00	60.03	77.00	0.78
33	D23 (Bottom)	0.00	0.00	20.01	25.67	0.78
34	C (Top)	0.00	0.00	25.01	26.28	0.95
35	D23 (Bottom)	0.00	0.00	35.02	35.15	1.00
36	C (Top)	0.00	0.00	30.02	42.11	0.71
37	D23 (Bottom)	0.00	0.00	20.01	25.67	0.78

Interaction diagrams, P vs. M:





Axial compression

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	1108.18	0.00
2	C (Top)	0.00	1330.24	0.00
3	C (Top)	0.00	443.41	0.00
4	C (Top)	0.00	554.80	0.00
5	C (Top)	0.00	776.86	0.00
6	C (Top)	0.00	664.77	0.00
7	C (Top)	0.00	443.41	0.00
8	D13 (Bottom)	32.14	1108.18	0.03
9	C (Bottom)	31.06	1330.24	0.02
10	D12 (Bottom)	13.79	443.41	0.03
11	C (Max)	23.06	554.80	0.04
12	D12 (Bottom)	30.51	443.41	0.07
13	D13 (Bottom)	24.48	1108.18	0.02
14	C (Bottom)	21.63	1330.24	0.02
15	D4 (Bottom)	10.83	443.41	0.02
16	D12 (Bottom)	11.29	554.80	0.02
17	C (Bottom)	7.37	776.86	0.01
18	D4 (Bottom)	15.76	664.77	0.02

19	D4 (Bottom)	12.46	443.41	0.03
20	D13 (Bottom)	22.64	1108.18	0.02
21	D4 (Bottom)	20.60	443.41	0.05
22	D4 (Bottom)	15.11	664.77	0.02
23	D4 (Bottom)	10.10	443.41	0.02
24	D5 (Bottom)	12.65	1108.18	0.01
25	D5 (Bottom)	9.43	1330.24	0.01
26	D4 (Bottom)	6.29	443.41	0.01
27	D4 (Bottom)	5.36	554.80	0.01
28	D4 (Bottom)	5.95	776.86	0.01
29	D13 (Max)	5.38	664.77	0.01
30	D4 (Bottom)	7.74	443.41	0.02
31	C (Top)	0.00	1108.18	0.00
32	C (Top)	0.00	1330.24	0.00
33	C (Top)	0.00	443.41	0.00
34	C (Top)	0.00	554.80	0.00
35	C (Top)	0.00	776.86	0.00
36	C (Top)	0.00	664.77	0.00
37	C (Top)	0.00	443.41	0.00

Axial tension

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	172.80	0.00
2	C (Top)	0.00	194.40	0.00
3	C (Top)	0.00	64.80	0.00
4	C (Top)	0.00	64.80	0.00
5	C (Top)	0.00	86.40	0.00
6	C (Top)	0.00	108.00	0.00
7	C (Top)	0.00	64.80	0.00
8	C (Top)	0.00	172.80	0.00
9	C (Top)	0.00	194.40	0.00
10	C (Top)	0.00	64.80	0.00
11	C (Top)	0.00	64.80	0.00
12	C (Top)	0.00	64.80	0.00
13	C (Top)	0.00	172.80	0.00
14	C (Top)	0.00	194.40	0.00
15	C (Top)	0.00	64.80	0.00
16	C (Top)	0.00	64.80	0.00
17	C (Top)	0.00	86.40	0.00
18	C (Top)	0.00	108.00	0.00
19	C (Top)	0.00	64.80	0.00
20	C (Top)	0.00	172.80	0.00
21	C (Top)	0.00	64.80	0.00
22	C (Top)	0.00	108.00	0.00
23	C (Top)	0.00	64.80	0.00
24	C (Top)	0.00	172.80	0.00
25	C (Top)	0.00	194.40	0.00
26	C (Top)	0.00	64.80	0.00
27	C (Top)	0.00	64.80	0.00
28	C (Top)	0.00	86.40	0.00
29	C (Top)	0.00	108.00	0.00
30	C (Top)	0.00	64.80	0.00
31	C (Top)	0.00	172.80	0.00
32	C (Top)	0.00	194.40	0.00
33	C (Top)	0.00	64.80	0.00
34	C (Top)	0.00	64.80	0.00

35	C (Top)	0.00	86.40	0.00
36	C (Top)	0.00	108.00	0.00
37	C (Top)	0.00	64.80	0.00

Shear

Segment	Condition	Vu [Kip]	ϕ*Vn [Kip]	Vu/ϕ*Vn
1	C (Top)	0.000	51.229	0.00
2	C (Top)	0.000	61.475	0.00
3	C (Top)	0.000	20.492	0.00
4	C (Top)	0.000	25.614	0.00
5	C (Top)	0.000	35.860	0.00
6	C (Top)	0.000	30.737	0.00
7	C (Top)	0.000	20.492	0.00
8	D14 (Max)	6.984	51.229	0.14
9	D14 (Bottom)	5.656	61.475	0.09
10	D14 (Max)	3.004	20.492	0.15
11	D14 (Max)	3.426	25.614	0.13
12	D14 (Bottom)	4.577	20.492	0.22
13	D14 (Bottom)	3.821	51.229	0.07
14	D14 (Bottom)	1.860	61.475	0.03
15	D14 (Bottom)	1.739	20.492	0.08
16	D15 (Top)	1.211	25.614	0.05
17	D14 (Top)	0.966	35.860	0.03
18	D14 (Bottom)	3.099	30.737	0.10
19	D14 (Bottom)	0.891	20.492	0.04
20	D15 (Top)	3.071	51.229	0.06
21	D15 (Top)	1.604	20.492	0.08
22	D15 (Top)	1.930	30.737	0.06
23	D15 (Top)	1.352	20.492	0.07
24	D14 (Top)	4.814	51.229	0.09
25	D15 (Max)	2.224	61.475	0.04
26	D14 (Top)	1.908	20.492	0.09
27	D15 (Max)	0.927	25.614	0.04
28	D15 (Max)	1.297	35.860	0.04
29	D14 (Top)	3.111	30.737	0.10
30	D15 (Top)	1.984	20.492	0.10
31	C (Top)	0.000	51.229	0.00
32	C (Top)	0.000	61.475	0.00
33	C (Top)	0.000	20.492	0.00
34	C (Top)	0.000	25.614	0.00
35	C (Top)	0.000	35.860	0.00
36	C (Top)	0.000	30.737	0.00
37	C (Top)	0.000	20.492	0.00

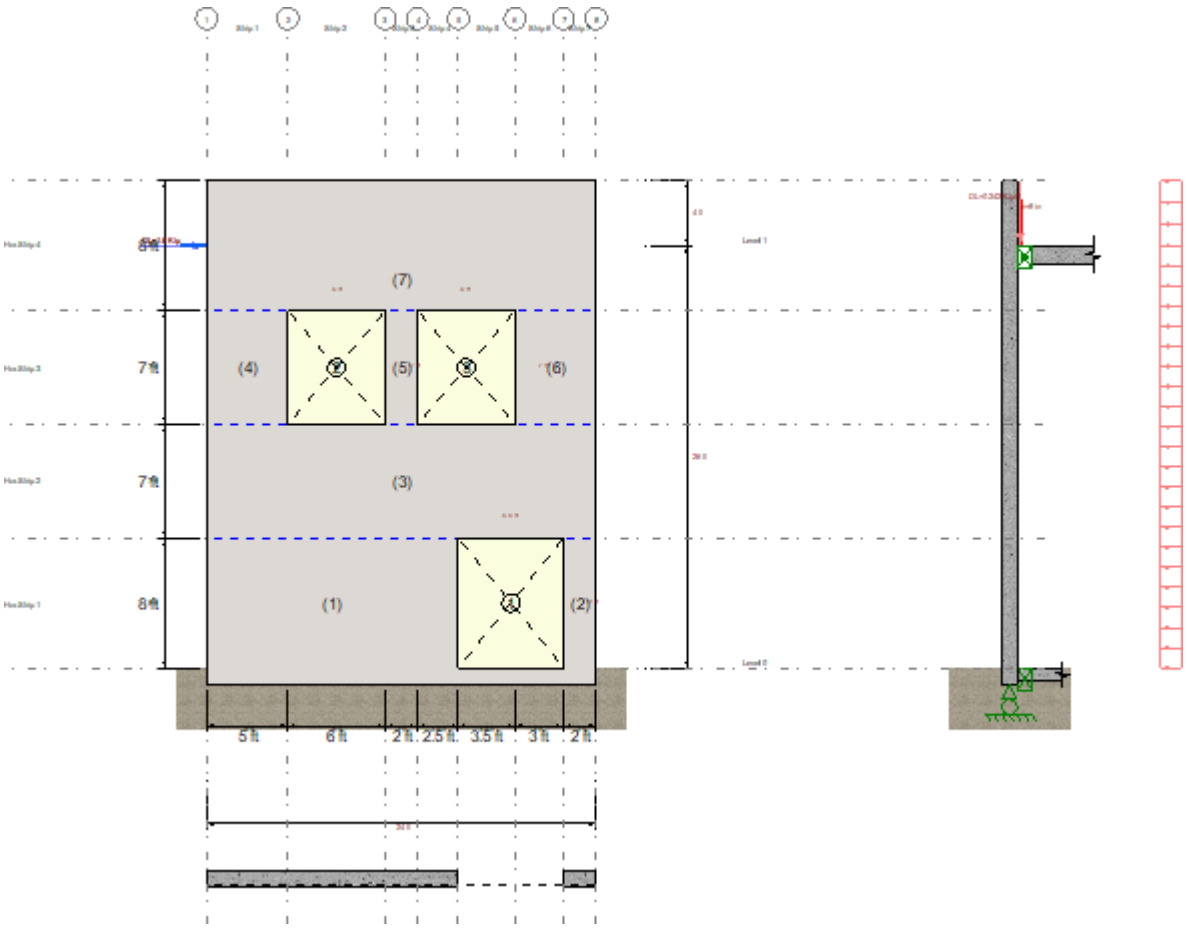
Deflection

Segment	Condition	Δs [in]	Δmax [in]	Δs/Δmax
1	S1 (Top)	0.000	0.080	0.00
2	S1 (Top)	0.000	0.080	0.00
3	S1 (Top)	0.000	0.080	0.00
4	S1 (Top)	0.000	0.080	0.00
5	S1 (Top)	0.000	0.080	0.00
6	S1 (Top)	0.000	0.080	0.00
7	S1 (Top)	0.000	0.080	0.00

8	S13 (Max)	0.121	2.080	0.06
9	S13 (Max)	0.088	2.080	0.04
10	S13 (Max)	0.133	2.080	0.06
11	S13 (Max)	0.119	2.080	0.06
12	S13 (Max)	0.580	2.080	0.28
13	S13 (Max)	0.081	2.080	0.04
14	S14 (Max)	0.007	2.080	0.00
15	S13 (Max)	0.096	2.080	0.05
16	S14 (Max)	0.025	2.080	0.01
17	S14 (Max)	0.008	2.080	0.00
18	S13 (Max)	0.089	2.080	0.04
19	S13 (Max)	0.094	2.080	0.05
20	S13 (Max)	0.082	2.080	0.04
21	S13 (Max)	0.097	2.080	0.05
22	S13 (Max)	0.089	2.080	0.04
23	S13 (Max)	0.093	2.080	0.04
24	S13 (Max)	0.048	2.080	0.02
25	S34 (Max)	0.016	2.080	0.01
26	S13 (Max)	0.048	2.080	0.02
27	S34 (Max)	0.016	2.080	0.01
28	S34 (Max)	0.016	2.080	0.01
29	S13 (Max)	0.053	2.080	0.03
30	S13 (Max)	0.048	2.080	0.02
31	S1 (Top)	0.000	0.320	0.00
32	S1 (Top)	0.000	0.320	0.00
33	S1 (Top)	0.000	0.320	0.00
34	S1 (Top)	0.000	0.320	0.00
35	S1 (Top)	0.000	0.320	0.00
36	S1 (Top)	0.000	0.320	0.00
37	S1 (Top)	0.000	0.320	0.00

SHEAR WALL DESIGN:

Status : OK



Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]	Classification
1	0.00	0.00	15.50	8.00	Shear wall
2	22.00	0.00	2.00	8.00	Column
3	0.00	8.00	24.00	7.00	Shear wall
4	0.00	15.00	5.00	7.00	Shear wall
5	11.00	15.00	2.00	7.00	Column
6	19.00	15.00	5.00	7.00	Shear wall
7	0.00	22.00	24.00	4.00	Shear wall

Reinforcement:

Reinforcement layers : 2

	Vertical reinforcement			Horizontal reinforcement		
Segment	**Bars**	**Spacing [in]**	**Ld [in]**	**Bars**	**Spacing [in]**	**Ld [in]**
1	8-#4	8.00	18.97	6-#4	18.00	24.67
	9-#4	8.00	18.97	6-#4	18.00	24.67
	3-#4	8.00	18.97	6-#4	18.00	24.67
	3-#4	12.00	18.97	6-#4	18.00	24.67
2	3-#4	8.00	18.97	6-#4	18.00	24.67
3	8-#4	8.00	18.97	5-#4	18.00	24.67
	9-#4	8.00	18.97	5-#4	18.00	24.67
	3-#4	8.00	18.97	5-#4	18.00	24.67

	3-#4	12.00	18.97	5-#4	18.00	24.67
	4-#4	12.00	18.97	5-#4	18.00	24.67
	5-#4	8.00	18.97	5-#4	18.00	24.67
	3-#4	8.00	18.97	5-#4	18.00	24.67
4	8-#4	8.00	18.97	5-#4	18.00	24.67
5	3-#4	8.00	18.97	5-#4	18.00	24.67
6	5-#4	8.00	18.97	5-#4	18.00	24.67
	3-#4	8.00	18.97	5-#4	18.00	24.67
7	8-#4	8.00	18.97	3-#4	18.00	24.67
	9-#4	8.00	18.97	3-#4	18.00	24.67
	3-#4	8.00	18.97	3-#4	18.00	24.67
	3-#4	12.00	18.97	3-#4	18.00	24.67
	4-#4	12.00	18.97	3-#4	18.00	24.67
	5-#4	8.00	18.97	3-#4	18.00	24.67
	3-#4	8.00	18.97	3-#4	18.00	24.67

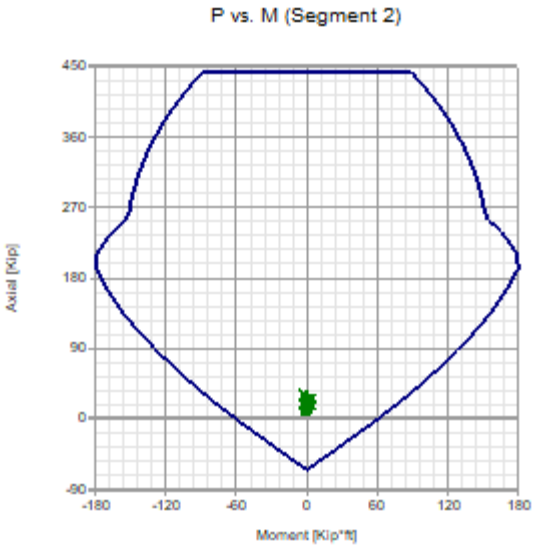
Intermediate results for axial-bending

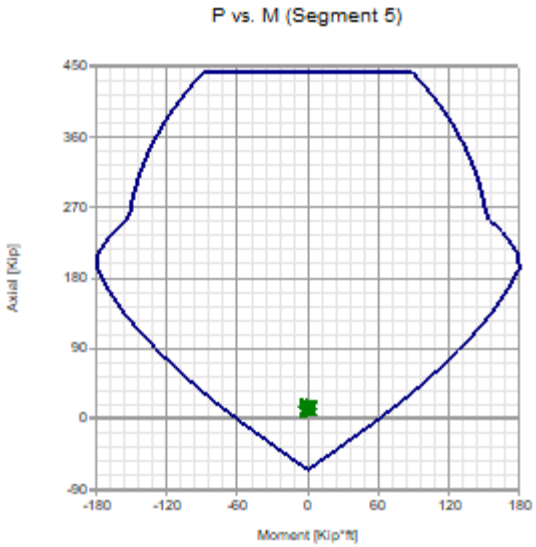
Segment	Condition	c [in]	d [in]
1	D12 (Bottom)	18.79	148.80
2	D12 (Top)	2.63	19.20
3	D12 (Bottom)	27.39	230.40
4	D12 (Bottom)	6.09	48.00
5	D12 (Top)	2.21	19.20
6	D12 (Top)	6.17	48.00
7	D12 (Bottom)	25.81	230.40

Combined axial flexure

Segment	Condition	Pu [Kip]	Mu [Kip*ft]	ϕ*Mn [Kip*ft]	Mu/ϕ*Mn
1	D12 (Bottom)	89.18	-159.55	3962.41	0.04
2	D12 (Top)	27.45	4.06	83.68	0.05
3	D12 (Bottom)	92.88	-128.83	9114.97	0.01
4	D12 (Bottom)	18.44	-20.85	436.48	0.05
5	D12 (Top)	15.96	3.62	74.28	0.05
6	D12 (Top)	16.98	8.76	445.13	0.02
7	D12 (Bottom)	44.63	-28.58	8619.23	0.00

Interaction diagrams, P vs. M:





Axial compression

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	D13 (Bottom)	96.79	3436.64	0.03
2	D12 (Bottom)	30.51	443.41	0.07
3	C (Bottom)	95.40	5321.68	0.02
4	D13 (Bottom)	22.64	1108.18	0.02
5	D4 (Bottom)	20.60	443.41	0.05
6	D4 (Bottom)	25.20	1108.18	0.02
7	D7 (Bottom)	52.54	5321.68	0.01

Axial tension

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	496.80	0.00
2	C (Top)	0.00	64.80	0.00
3	C (Top)	0.00	756.00	0.00
4	C (Top)	0.00	172.80	0.00
5	C (Top)	0.00	64.80	0.00
6	C (Top)	0.00	172.80	0.00
7	C (Top)	0.00	756.00	0.00

Shear

Segment	Condition	Vu [Kip]	ϕ*Vn [Kip]	Vu/ϕ*Vn
1	D12 (Bottom)	6.298	293.368	0.02
2	D12 (Top)	0.863	34.048	0.03
3	D12 (Top)	7.161	645.252	0.01
4	D12 (Bottom)	4.204	132.944	0.03
5	D12 (Top)	1.028	37.040	0.03
6	D12 (Top)	1.928	135.074	0.01
7	D12 (Top)	7.161	640.083	0.01

STABILITY RESULTS:

Status : OK

Global stability:

Safety factor : 1

Condition	Position	RM [Kip*ft]	OTM [Kip*ft]	FS
S30	Left corner	-521.64	250.25	2.08
S29	Right corner	549.00	-270.22	2.03

Notes:

* Pu = Axial load
* Pn = Nominal axial load
* Mua = Moment at section
* Mu = Magnified moment at section
* Mcr = Cracking moment at section
* Mn = Maximum nominal moment
* Vu = Design shear force
* Vn = Nominal shear force

RAM® Elements
CONNECT Edition

Current Date: 5/11/2022 6:16 AM
Units system: English
File name: Z:\Jenh Group\OneDrive - JENH Group\Jenh Group\01 Design\01 Jenh Group Projects\2021\2021-057 GST Expansion\Calcs\Ram element\Wall Line 12.tup

Design Results

Tilt-Up Wall

GENERAL INFORMATION:

Global status : OK

Design code	:	ACI 318-14

Geometry:

Total height	:	31.00 [ft]
Reveal size	:	0.75 [in]
Total length	:	24.00 [ft]
Base support type	:	Continuous
Wall bottom restraint	:	Pinned

Materials:

Material	:	C 4-60
Steel tension strength (Fy)	:	60 [Kip/in2]
Concrete compressive strength (fc)	:	4 [Kip/in2]
Steel elasticity modulus (Es)	:	29000 [Kip/in2]
Concrete modulus of elasticity (E)	:	3605 [Kip/in2]
Concrete unit weight	:	0.149818 [Kip/ft3]

Number of stories: 2

Story	Story height [ft]	Wall thickness [in]
1	14.00	9.25
2	12.00	11.25

Openings:

Reference	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
Lower left	15.50	0.00	6.50	8.00
Lower left	5.00	15.00	6.00	7.00
Lower left	13.00	15.00	6.00	7.00

Load conditions:

ID	Comb.	Category	Description
DL	No	DL	Dead Load
RLL	No	LLR	Roof Live Load
FLL	No	LL	Floor Live Load
Wx	No	WIND	Wind In Plane
Wz	No	WIND	Wind out of Plane
Ex	No	EQ	Seismic In Plane
Ez	No	EQ	Seismic Out of Plane
C	Yes		1.4DL

D2	Yes	1.2DL+0.5RLL+1.6FLL
D3	Yes	1.2DL+1.6RLL+0.5FLL
D4	Yes	1.2DL+1.6RLL+0.5Wx
D5	Yes	1.2DL+1.6RLL-0.5Wx
D6	Yes	1.2DL+1.6RLL+0.5Wz
D7	Yes	1.2DL+1.6RLL-0.5Wz
D8	Yes	1.2DL+0.5RLL+0.5FLL+Wx
D9	Yes	1.2DL+0.5RLL+0.5FLL-Wx
D10	Yes	1.2DL+0.5RLL+0.5FLL+Wz
D11	Yes	1.2DL+0.5RLL+0.5FLL-Wz
D12	Yes	1.363DL+0.5FLL+Ex
D13	Yes	1.363DL+0.5FLL-Ex
D14	Yes	1.363DL+0.5FLL+Ez
D15	Yes	1.363DL+0.5FLL-Ez
D16	Yes	0.9DL+Wx
D17	Yes	0.9DL-Wx
D18	Yes	0.9DL+Wz
D19	Yes	0.9DL-Wz
D20	Yes	0.737DL+Ex
D21	Yes	0.737DL-Ex
D22	Yes	0.737DL+Ez
D23	Yes	0.737DL-Ez
S1	Yes	DL
S2	Yes	DL+RLL
S3	Yes	DL+FLL
S4	Yes	DL+0.75FLL
S5	Yes	DL+0.75RLL
S6	Yes	DL+0.75RLL+0.75FLL
S7	Yes	DL+0.6Wx
S8	Yes	DL-0.6Wx
S9	Yes	DL+0.6Wz
S10	Yes	DL-0.6Wz
S11	Yes	1.12DL+0.7Ex
S12	Yes	1.12DL-0.7Ex
S13	Yes	1.12DL+0.7Ez
S14	Yes	1.12DL-0.7Ez
S15	Yes	DL+0.75RLL+0.75FLL+0.45Wx
S16	Yes	DL+0.75RLL+0.75FLL-0.45Wx
S17	Yes	DL+0.75RLL+0.75FLL+0.45Wz
S18	Yes	DL+0.75RLL+0.75FLL-0.45Wz
S19	Yes	DL+0.75FLL+0.525Ex
S20	Yes	DL+0.75FLL-0.525Ex
S21	Yes	DL+0.75FLL+0.525Ez
S22	Yes	DL+0.75FLL-0.525Ez
S23	Yes	0.6DL+0.6Wx
S24	Yes	0.6DL-0.6Wx
S25	Yes	0.6DL+0.6Wz
S26	Yes	0.6DL-0.6Wz
S27	Yes	0.48DL+0.7Ex
S28	Yes	0.48DL-0.7Ex
S29	Yes	0.48DL+0.7Ez
S30	Yes	0.48DL-0.7Ez
S31	Yes	1.09DL+0.75RLL+0.75FLL+0.525Ex
S32	Yes	1.09DL+0.75RLL+0.75FLL-0.525Ex
S33	Yes	1.09DL+0.75RLL+0.75FLL+0.525Ez
S34	Yes	1.09DL+0.75RLL+0.75FLL-0.525Ez

Consider Self Weight:

Load condition : DL

Concentrated loads:

Story	Condition	Direction	Magnitude [Kip]	Eccentricity [in]	Distance [ft]
1	Ex	Horizontal	1.59	0.00	0.00
1	DL	Horizontal	1.40	0.00	0.00
1	RLL	Horizontal	7.60	0.00	0.00
1	Wx	Horizontal	0.29	0.00	0.00
2	Ex	Horizontal	4.80	0.00	0.00
2	DL	Horizontal	1.63	0.00	0.00
2	RLL	Horizontal	2.33	0.00	0.00
2	Wx	Horizontal	0.42	0.00	0.00

In-plane seismic weight:

Load condition	Coefficient
Ez	0.28

Distributed loads:

Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
1	DL	Vertical	0.24	0.67
1	RLL	Vertical	0.35	0.67

Out-of-plane pressure loads:

Story	Condition	Magnitude [Kip/ft2]
1	Wz	0.02

Out-of-plane parapet pressure loads:

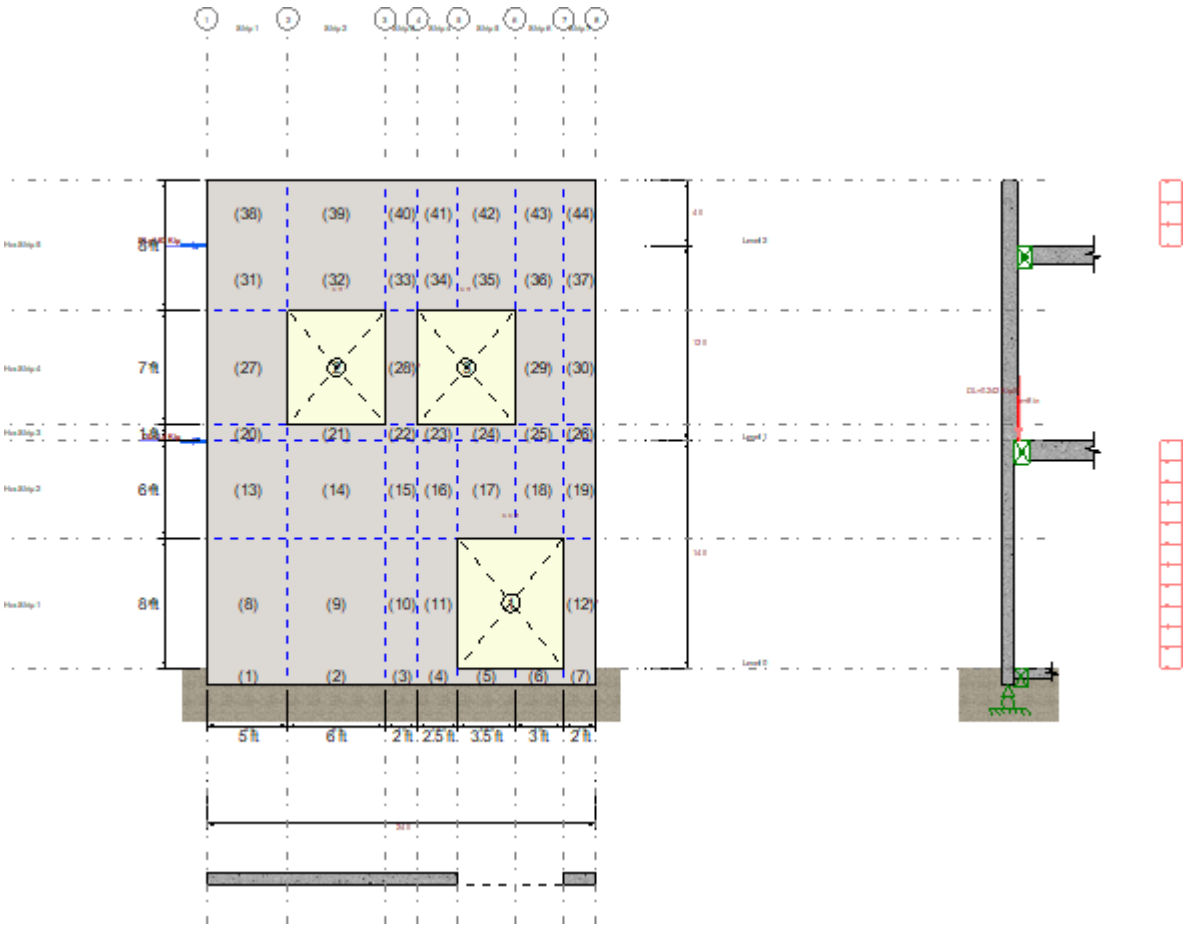
Condition	Magnitude [Kip/ft2]
Wz	0.02

Out-of-plane seismic weight:

Load condition	Coefficient
Ez	0.56

TILT-UP WALLS DESIGN:

Status : OK



Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	-1.00	5.00	1.00
2	5.00	-1.00	6.00	1.00
3	11.00	-1.00	2.00	1.00
4	13.00	-1.00	2.50	1.00
5	15.50	-1.00	3.50	1.00
6	19.00	-1.00	3.00	1.00
7	22.00	-1.00	2.00	1.00
8	0.00	0.00	5.00	8.00
9	5.00	0.00	6.00	8.00
10	11.00	0.00	2.00	8.00
11	13.00	0.00	2.50	8.00
12	22.00	0.00	2.00	8.00
13	0.00	8.00	5.00	6.00
14	5.00	8.00	6.00	6.00
15	11.00	8.00	2.00	6.00
16	13.00	8.00	2.50	6.00
17	15.50	8.00	3.50	6.00
18	19.00	8.00	3.00	6.00
19	22.00	8.00	2.00	6.00
20	0.00	14.00	5.00	1.00
21	5.00	14.00	6.00	1.00
22	11.00	14.00	2.00	1.00
23	13.00	14.00	2.50	1.00
24	15.50	14.00	3.50	1.00
25	19.00	14.00	3.00	1.00

26	22.00	14.00	2.00	1.00
27	0.00	15.00	5.00	7.00
28	11.00	15.00	2.00	7.00
29	19.00	15.00	3.00	7.00
30	22.00	15.00	2.00	7.00
31	0.00	22.00	5.00	4.00
32	5.00	22.00	6.00	4.00
33	11.00	22.00	2.00	4.00
34	13.00	22.00	2.50	4.00
35	15.50	22.00	3.50	4.00
36	19.00	22.00	3.00	4.00
37	22.00	22.00	2.00	4.00
38	0.00	26.00	5.00	4.00
39	5.00	26.00	6.00	4.00
40	11.00	26.00	2.00	4.00
41	13.00	26.00	2.50	4.00
42	15.50	26.00	3.50	4.00
43	19.00	26.00	3.00	4.00
44	22.00	26.00	2.00	4.00

Vertical reinforcement:

Reinforcement layers : 2

Segment	**Bars**	**Spacing** [in]	**Ld** [in]
1	5-#4	12.00	18.97
2	6-#4	12.00	18.97
3	2-#4	18.00	18.97
4	3-#4	12.00	18.97
5	4-#4	12.00	18.97
6	3-#4	16.00	18.97
7	2-#4	18.00	18.97
8	5-#4	12.00	18.97
9	6-#4	12.00	18.97
10	2-#4	18.00	18.97
11	3-#4	12.00	18.97
12	2-#4	18.00	18.97
13	5-#4	12.00	18.97
14	6-#4	12.00	18.97
15	2-#4	18.00	18.97
16	3-#4	12.00	18.97
17	4-#4	12.00	18.97
18	3-#4	16.00	18.97
19	2-#4	18.00	18.97
20	8-#4	8.00	18.97
21	9-#4	8.00	18.97
22	3-#4	8.00	18.97
23	3-#4	12.00	18.97
24	4-#4	12.00	18.97
25	5-#4	8.00	18.97
26	3-#4	8.00	18.97
27	8-#4	8.00	18.97
28	3-#4	8.00	18.97
29	5-#4	8.00	18.97
30	3-#4	8.00	18.97
31	8-#4	8.00	18.97
32	9-#4	8.00	18.97
33	3-#4	8.00	18.97
34	3-#4	12.00	18.97
35	4-#4	12.00	18.97
36	5-#4	8.00	18.97

37	3-#4	8.00	18.97
38	8-#4	8.00	18.97
39	9-#4	8.00	18.97
40	3-#4	8.00	18.97
41	3-#4	12.00	18.97
42	4-#4	12.00	18.97
43	5-#4	8.00	18.97
44	3-#4	8.00	18.97

Vertical reinforcement

Segment	Condition	Pu [Kip]	Pu/Ag [Kip/in2]	0.06*f´c [Kip/in2]	Ratio
1	C (Top)	0.000	0.000	0.240	0.00
2	C (Top)	0.000	0.000	0.240	0.00
3	C (Top)	0.000	0.000	0.240	0.00
4	C (Top)	0.000	0.000	0.240	0.00
5	C (Top)	0.000	0.000	0.240	0.00
6	C (Top)	0.000	0.000	0.240	0.00
7	C (Top)	0.000	0.000	0.240	0.00
8	D13 (Max)	27.746	0.050	0.240	0.21
9	C (Max)	30.340	0.046	0.240	0.19
10	D4 (Max)	13.438	0.061	0.240	0.25
11	D4 (Max)	21.890	0.079	0.240	0.33
12	D7 (Max)	30.913	0.139	0.240	0.58
13	D13 (Max)	16.740	0.030	0.240	0.13
14	D15 (Max)	21.983	0.033	0.240	0.14
15	D15 (Max)	9.684	0.044	0.240	0.18
16	D6 (Max)	13.695	0.049	0.240	0.21
17	D14 (Max)	6.366	0.016	0.240	0.07
18	D4 (Max)	9.448	0.028	0.240	0.12
19	D4 (Max)	14.941	0.067	0.240	0.28
20	D13 (Max)	16.512	0.024	0.240	0.10
21	D13 (Max)	9.482	0.012	0.240	0.05
22	C (Max)	8.289	0.031	0.240	0.13
23	D4 (Max)	5.778	0.017	0.240	0.07
24	C (Max)	2.837	0.006	0.240	0.03
25	D12 (Max)	12.565	0.031	0.240	0.13
26	D12 (Max)	7.535	0.028	0.240	0.12
27	D13 (Max)	19.781	0.029	0.240	0.12
28	C (Max)	15.816	0.059	0.240	0.24
29	D12 (Max)	14.321	0.035	0.240	0.15
30	D12 (Max)	7.152	0.026	0.240	0.11
31	D13 (Max)	9.404	0.014	0.240	0.06
32	D13 (Max)	2.423	0.003	0.240	0.01
33	C (Max)	4.464	0.017	0.240	0.07
34	C (Max)	1.798	0.005	0.240	0.02
35	D12 (Max)	1.765	0.004	0.240	0.02
36	D13 (Max)	5.406	0.013	0.240	0.06
37	D12 (Max)	4.472	0.017	0.240	0.07
38	C (Top)	0.000	0.000	0.240	0.00
39	C (Top)	0.000	0.000	0.240	0.00
40	C (Top)	0.000	0.000	0.240	0.00
41	C (Top)	0.000	0.000	0.240	0.00
42	C (Top)	0.000	0.000	0.240	0.00
43	C (Top)	0.000	0.000	0.240	0.00
44	C (Top)	0.000	0.000	0.240	0.00

Intermediate results for axial-bending

Segment	Condition	Ase [in2]	a [in]	c [in]	d [in]	ϕ	Kb [Kip]
1	C (Top)	1.00	0.29	0.35	7.00	0.90	951062.00
2	C (Top)	1.20	0.29	0.35	7.00	0.90	1141274.00
3	C (Top)	0.40	0.29	0.35	7.00	0.90	380424.80
4	C (Top)	0.60	0.35	0.42	7.00	0.90	475531.00
5	C (Top)	0.80	0.34	0.40	7.00	0.90	665743.40
6	C (Top)	0.60	0.29	0.35	7.00	0.90	570637.20
7	C (Top)	0.40	0.29	0.35	7.00	0.90	380424.80
8	D22 (Bottom)	1.13	0.35	0.42	7.00	0.90	4852.36
9	D22 (Bottom)	1.38	0.36	0.42	7.00	0.90	5822.83
10	D22 (Bottom)	0.47	0.37	0.44	7.00	0.90	1940.94
11	D22 (Bottom)	0.72	0.46	0.54	7.00	0.90	2426.18
12	D22 (Bottom)	0.55	0.46	0.54	7.00	0.90	1940.94
13	D15 (Top)	1.12	0.35	0.41	7.00	0.90	4852.36
14	D22 (Bottom)	1.33	0.34	0.40	7.00	0.90	5822.83
15	D22 (Max)	0.46	0.36	0.42	7.00	0.90	1940.94
16	D22 (Max)	0.66	0.41	0.48	7.00	0.90	2426.18
17	D15 (Top)	0.85	0.37	0.43	7.00	0.90	3396.65
18	D15 (Max)	0.68	0.35	0.42	7.00	0.90	2911.41
19	D23 (Top)	0.46	0.37	0.43	7.00	0.90	1940.94
20	D14 (Max)	1.75	0.54	0.63	9.00	0.90	11881.70
21	D14 (Max)	1.90	0.48	0.56	9.00	0.90	14258.04
22	D14 (Top)	0.68	0.54	0.64	9.00	0.90	4752.68
23	D14 (Max)	0.65	0.40	0.47	9.00	0.90	5940.85
24	D14 (Max)	0.83	0.36	0.42	9.00	0.90	8317.19
25	D14 (Max)	1.12	0.58	0.68	9.00	0.90	7129.02
26	D14 (Bottom)	0.67	0.53	0.62	9.00	0.90	4752.68
27	D14 (Bottom)	1.79	0.56	0.66	9.00	0.90	11881.70
28	D22 (Bottom)	0.69	0.54	0.64	9.00	0.90	4752.68
29	D14 (Bottom)	1.13	0.60	0.70	9.00	0.90	7129.02
30	D14 (Max)	0.67	0.52	0.61	9.00	0.90	4752.68
31	D22 (Top)	1.63	0.48	0.57	9.00	0.90	11881.70
32	D22 (Top)	1.81	0.45	0.52	9.00	0.90	14258.04
33	D22 (Top)	0.62	0.46	0.54	9.00	0.90	4752.68
34	D23 (Max)	0.61	0.36	0.43	9.00	0.90	5940.85
35	D23 (Max)	0.81	0.34	0.40	9.00	0.90	8317.19
36	D22 (Top)	1.02	0.50	0.59	9.00	0.90	7129.02
37	D22 (Max)	0.61	0.46	0.54	9.00	0.90	4752.68
38	C (Top)	1.60	0.47	0.55	7.00	0.90	59441.38
39	C (Top)	1.80	0.44	0.52	7.00	0.90	71329.65
40	C (Top)	0.60	0.44	0.52	7.00	0.90	23776.55
41	C (Top)	0.60	0.35	0.42	7.00	0.90	29720.69
42	C (Top)	0.80	0.34	0.40	7.00	0.90	41608.96
43	C (Top)	1.00	0.49	0.58	7.00	0.90	35664.83
44	C (Top)	0.60	0.44	0.52	7.00	0.90	23776.55

Inertias

Segment	Condition	Ig [in4]	Icr [in4]	Ie [in4]
1	C (Top)	3957.27	357.00	3957.27
2	C (Top)	4748.72	428.40	4748.72
3	C (Top)	1582.91	142.80	1582.91
4	C (Top)	1978.63	210.00	1978.63
5	C (Top)	2770.09	281.58	2770.09
6	C (Top)	2374.36	214.20	2374.36
7	C (Top)	1582.91	142.80	1582.91
8	D22 (Bottom)	3957.27	396.51	3957.27

9	D22 (Bottom)	4748.72	480.62	4748.72
10	D22 (Bottom)	1582.91	164.25	1582.91
11	D22 (Bottom)	1978.63	244.05	1978.63
12	D22 (Bottom)	1582.91	185.96	1582.91
13	D15 (Top)	3957.27	394.07	3957.27
14	D22 (Bottom)	4748.72	467.49	4748.72
15	D22 (Max)	1582.91	159.93	1582.91
16	D22 (Max)	1978.63	226.76	1978.63
17	D15 (Top)	2770.09	294.85	2770.09
18	D15 (Max)	2374.36	238.47	2374.36
19	D23 (Top)	1582.91	161.76	1582.91
20	D14 (Max)	7119.14	988.35	7119.14
21	D14 (Max)	8542.97	1089.75	8542.97
22	D14 (Top)	2847.66	387.07	2847.66
23	D14 (Max)	3559.57	381.97	3559.57
24	D14 (Max)	4983.40	492.02	4983.40
25	D14 (Max)	4271.48	624.54	4271.48
26	D14 (Bottom)	2847.66	381.69	2847.66
27	D14 (Bottom)	7119.14	1006.11	7119.14
28	D22 (Bottom)	2847.66	388.27	2847.66
29	D14 (Bottom)	4271.48	632.92	4271.48
30	D14 (Max)	2847.66	379.88	2847.66
31	D22 (Top)	7119.14	934.93	7119.14
32	D22 (Top)	8542.97	1050.49	8542.97
33	D22 (Top)	2847.66	355.78	2847.66
34	D23 (Max)	3559.57	361.42	3559.57
35	D23 (Max)	4983.40	481.30	4983.40
36	D22 (Top)	4271.48	580.53	4271.48
37	D22 (Max)	2847.66	354.49	2847.66
38	C (Top)	3957.27	538.26	3957.27
39	C (Top)	4748.72	611.55	4748.72
40	C (Top)	1582.91	203.85	1582.91
41	C (Top)	1978.63	210.00	1978.63
42	C (Top)	2770.09	281.58	2770.09
43	C (Top)	2374.36	334.20	2374.36
44	C (Top)	1582.91	203.85	1582.91

Deflection

Segment	**Condition**	**Δu** [in]
1		0.000
2		0.000
3		0.000
4		0.000
5		0.000
6		0.000
7		0.000
8	D23 (Max)	0.010
9	D23 (Max)	0.012
10	D23 (Max)	0.011
11	D23 (Max)	0.015
12	D23 (Max)	0.012
13	D23 (Max)	-0.018
14	D23 (Max)	0.012
15	D23 (Max)	0.011
16	D23 (Max)	0.015
17	D23 (Max)	-0.009
18	D23 (Max)	-0.015
19	D23 (Max)	-0.021
20	D23 (Max)	-0.006
21	D23 (Max)	-0.003

22	D23 (Max)	-0.012
23	D23 (Max)	-0.005
24	D23 (Max)	-0.003
25	D23 (Max)	-0.006
26	D23 (Max)	-0.008
27	D23 (Max)	0.003
28	D23 (Max)	-0.012
29	D23 (Max)	0.002
30	D23 (Max)	0.004
31	D23 (Max)	-0.004
32	D23 (Max)	-0.004
33	D23 (Max)	0.004
34	D23 (Max)	-0.004
35	D23 (Max)	-0.004
36	D23 (Max)	-0.004
37	D23 (Max)	-0.004
38		0.000
39		0.000
40		0.000
41		0.000
42		0.000
43		0.000
44		0.000

Combined axial flexure

Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mu [Kip*ft]	ϕ*Mn [Kip*ft]	Mu/ϕ*Mn
1	C (Top)	0.00	0.00	0.00	35.57	0.00
2	C (Top)	0.00	0.00	0.00	42.69	0.00
3	C (Top)	0.00	0.00	0.00	14.23	0.00
4	C (Top)	0.00	0.00	0.00	20.84	0.00
5	C (Top)	0.00	0.00	0.00	27.99	0.00
6	C (Top)	0.00	0.00	0.00	21.34	0.00
7	C (Top)	0.00	0.00	0.00	14.23	0.00
8	D22 (Bottom)	12.06	5.01	5.03	39.06	0.13
9	D22 (Bottom)	15.97	7.42	7.45	47.29	0.16
10	D22 (Bottom)	6.60	2.44	2.45	16.12	0.15
11	D22 (Bottom)	11.18	3.53	3.55	23.94	0.15
12	D22 (Bottom)	13.68	2.37	2.40	18.10	0.13
13	D15 (Top)	11.30	-5.56	-5.58	38.85	0.14
14	D22 (Bottom)	11.89	-4.63	-4.65	46.15	0.10
15	D22 (Max)	5.24	-1.52	-1.52	15.74	0.10
16	D22 (Max)	5.39	-2.50	-2.51	22.34	0.11
17	D15 (Top)	4.17	-2.21	-2.22	29.15	0.08
18	D15 (Max)	7.41	-2.94	-2.95	23.49	0.13
19	D23 (Top)	5.81	-2.58	-2.59	15.90	0.16
20	D14 (Max)	14.08	5.71	5.72	72.51	0.08
21	D14 (Max)	9.18	3.54	3.54	80.10	0.04
22	D14 (Top)	8.07	4.50	4.51	28.39	0.16
23	D14 (Max)	4.90	2.20	2.20	28.14	0.08
24	D14 (Max)	2.76	1.92	1.92	36.20	0.05
25	D14 (Max)	11.09	3.03	3.04	45.83	0.07
26	D14 (Bottom)	6.92	2.89	2.90	28.00	0.10
27	D14 (Bottom)	17.92	4.47	4.48	73.80	0.06
28	D22 (Bottom)	8.33	4.24	4.25	28.47	0.15
29	D14 (Bottom)	12.96	2.99	3.00	46.45	0.06
30	D14 (Max)	6.54	1.89	1.89	27.87	0.07
31	D22 (Top)	2.77	3.15	3.15	68.71	0.05
32	D22 (Top)	1.14	3.78	3.78	77.39	0.05

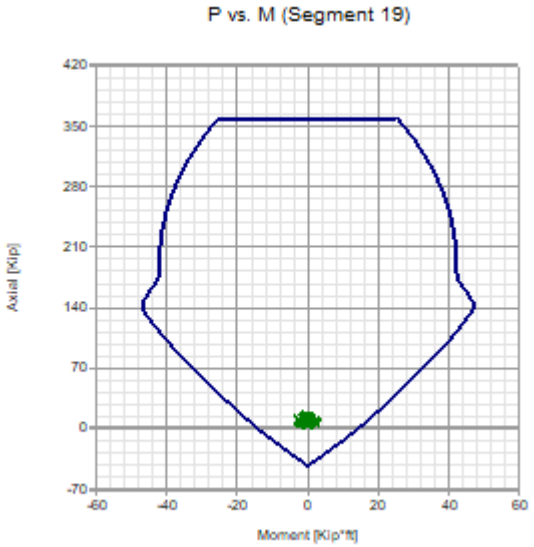
33	D22 (Top)	1.53	1.26	1.26	26.18	0.05
34	D23 (Max)	0.95	-1.57	-1.58	26.64	0.06
35	D23 (Max)	0.74	-2.20	-2.21	35.44	0.06
36	D22 (Top)	1.57	1.89	1.89	42.63	0.04
37	D22 (Max)	1.26	1.26	1.26	26.09	0.05
38	C (Top)	0.00	0.00	0.00	53.41	0.00
39	C (Top)	0.00	0.00	0.00	60.61	0.00
40	C (Top)	0.00	0.00	0.00	20.20	0.00
41	C (Top)	0.00	0.00	0.00	20.84	0.00
42	C (Top)	0.00	0.00	0.00	27.99	0.00
43	C (Top)	0.00	0.00	0.00	33.12	0.00
44	C (Top)	0.00	0.00	0.00	20.20	0.00

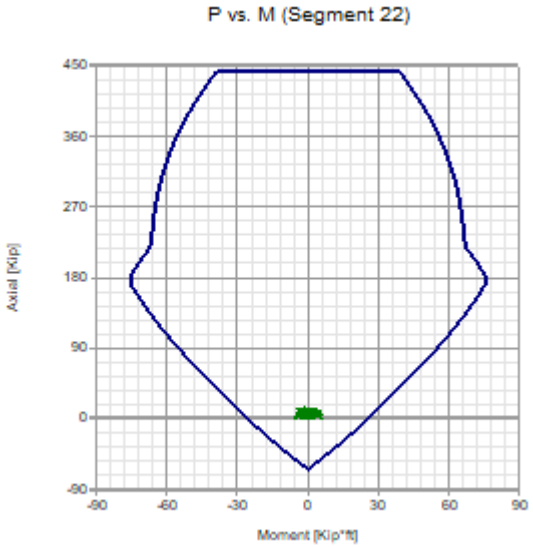
Cracking moment

Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mcr [Kip*ft]	ϕ*Mn [Kip*ft]	Mcr/ϕ*Mn
1	D23 (Bottom)	0.00	0.00	33.82	35.57	0.95
2	D23 (Bottom)	0.00	0.00	40.59	42.69	0.95
3	D23 (Bottom)	0.00	0.00	13.53	14.23	0.95
4	C (Top)	0.00	0.00	16.91	20.84	0.81
5	C (Top)	0.00	0.00	23.68	27.99	0.85
6	D23 (Bottom)	0.00	0.00	20.29	21.34	0.95
7	D23 (Bottom)	0.00	0.00	13.53	14.23	0.95
8	D20 (Top)	3.22	-0.10	33.82	36.58	0.92
9	D20 (Top)	11.50	-0.19	40.59	46.05	0.88
10	D21 (Top)	4.56	-0.07	13.53	15.55	0.87
11	D21 (Top)	8.55	-0.15	16.91	23.21	0.73
12	D21 (Top)	8.09	-0.10	13.53	16.54	0.82
13	D20 (Top)	0.67	-0.26	33.82	35.78	0.95
14	D20 (Top)	8.43	-0.52	40.59	45.19	0.90
15	D21 (Top)	3.54	-0.17	13.53	15.27	0.89
16	D21 (Top)	2.42	-0.15	16.91	21.51	0.79
17	D21 (Top)	1.83	-0.29	23.68	28.50	0.83
18	D21 (Top)	2.76	-0.16	20.29	22.19	0.91
19	D21 (Top)	4.01	-0.05	13.53	15.40	0.88
20	D20 (Max)	3.73	0.37	50.03	69.03	0.72
21	D20 (Top)	4.06	0.00	60.03	78.37	0.77
22	D21 (Max)	4.18	0.33	20.01	27.08	0.74
23	D21 (Top)	1.62	0.00	25.01	26.89	0.93
24	D21 (Top)	1.07	0.00	35.02	35.56	0.98
25	D21 (Max)	3.66	0.28	30.02	43.33	0.69
26	D21 (Top)	2.93	0.18	20.01	26.65	0.75
27	D20 (Top)	4.22	0.17	50.03	69.20	0.72
28	D20 (Top)	6.76	0.05	20.01	27.95	0.72
29	D21 (Top)	3.47	0.14	30.02	43.27	0.69
30	D21 (Top)	1.48	0.06	20.01	26.17	0.76
31	D20 (Top)	2.29	0.00	50.03	68.55	0.73
32	D20 (Max)	0.83	0.00	60.03	77.28	0.78
33	D20 (Top)	1.52	0.00	20.01	26.18	0.76
34	D20 (Top)	0.95	0.00	25.01	26.64	0.94
35	D21 (Max)	0.35	0.00	35.02	35.29	0.99
36	D20 (Top)	1.36	0.00	30.02	42.56	0.71
37	D21 (Top)	0.65	0.00	20.01	25.89	0.77
38	C (Top)	0.00	0.00	33.82	53.41	0.63
39	D23 (Bottom)	0.00	0.00	40.59	60.61	0.67
40	D23 (Bottom)	0.00	0.00	13.53	20.20	0.67
41	C (Top)	0.00	0.00	16.91	20.84	0.81

42	C (Top)	0.00	0.00	23.68	27.99	0.85
43	C (Top)	0.00	0.00	20.29	33.12	0.61
44	D23 (Bottom)	0.00	0.00	13.53	20.20	0.67

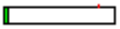
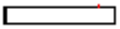
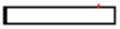
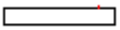
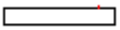
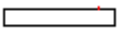
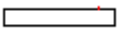
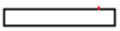
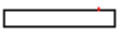
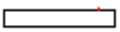
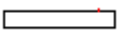
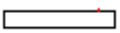
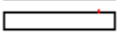
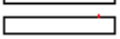
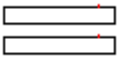
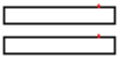
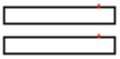
Interaction diagrams, P vs. M:



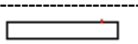
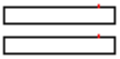
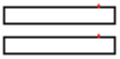
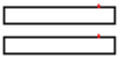
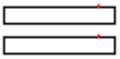
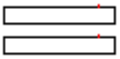
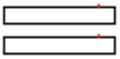
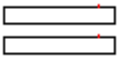
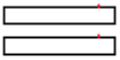
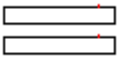
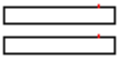
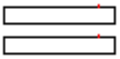
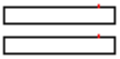
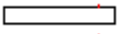
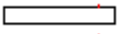
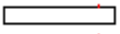
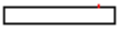
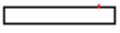
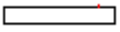
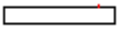
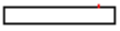
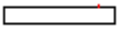


Axial compression

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	898.14	0.00
2	C (Top)	0.00	1077.77	0.00
3	C (Top)	0.00	359.26	0.00
4	C (Top)	0.00	448.72	0.00
5	C (Top)	0.00	628.35	0.00
6	C (Top)	0.00	538.89	0.00
7	C (Top)	0.00	359.26	0.00
8	D13 (Max)	27.75	898.14	0.03
9	C (Bottom)	30.34	1077.77	0.03
10	D4 (Max)	13.44	359.26	0.04
11	D4 (Max)	21.89	448.72	0.05
12	D4 (Bottom)	32.23	359.26	0.09
13	D13 (Bottom)	21.45	898.14	0.02
14	C (Bottom)	22.58	1077.77	0.02
15	D4 (Bottom)	11.22	359.26	0.03
16	D4 (Bottom)	13.78	448.72	0.03
17	D4 (Bottom)	8.46	628.35	0.01
18	D4 (Bottom)	11.94	538.89	0.02
19	D4 (Max)	14.94	359.26	0.04
20	D13 (Bottom)	17.45	1108.18	0.02
21	D13 (Bottom)	9.48	1330.24	0.01
22	C (Bottom)	8.68	443.41	0.02
23	D4 (Max)	5.78	554.80	0.01
24	C (Max)	2.84	776.86	0.00
25	D12 (Bottom)	13.13	664.77	0.02
26	D12 (Bottom)	7.53	443.41	0.02
27	D13 (Bottom)	19.78	1108.18	0.02

28	C (Bottom)	15.82	443.41	0.04	
29	D12 (Max)	14.32	664.77	0.02	
30	D12 (Bottom)	7.15	443.41	0.02	
31	D13 (Max)	9.40	1108.18	0.01	
32	D13 (Bottom)	7.00	1330.24	0.01	
33	C (Bottom)	4.46	443.41	0.01	
34	C (Bottom)	3.76	554.80	0.01	
35	D12 (Bottom)	4.43	776.86	0.01	
36	D13 (Max)	5.41	664.77	0.01	
37	D12 (Max)	4.47	443.41	0.01	
38	C (Top)	0.00	896.02	0.00	
39	C (Top)	0.00	1075.65	0.00	
40	C (Top)	0.00	358.55	0.00	
41	C (Top)	0.00	448.72	0.00	
42	C (Top)	0.00	628.35	0.00	
43	C (Top)	0.00	537.47	0.00	
44	C (Top)	0.00	358.55	0.00	

Axial tension

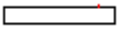
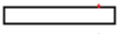
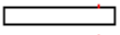
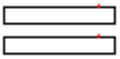
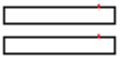
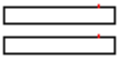
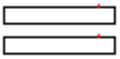
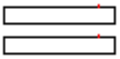
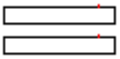
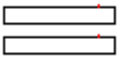
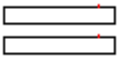
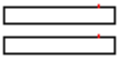
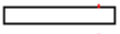
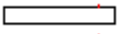
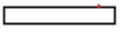
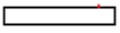
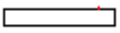
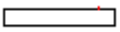
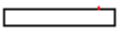
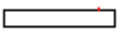
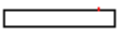
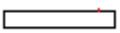
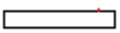
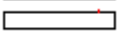
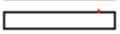
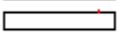
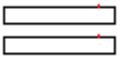
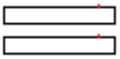
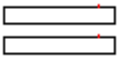
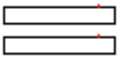
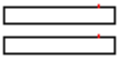
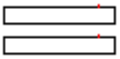
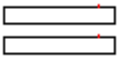
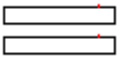
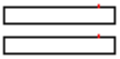
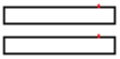
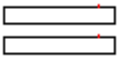
Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn	
1	C (Top)	0.00	108.00	0.00	
2	C (Top)	0.00	129.60	0.00	
3	C (Top)	0.00	43.20	0.00	
4	C (Top)	0.00	64.80	0.00	
5	C (Top)	0.00	86.40	0.00	
6	C (Top)	0.00	64.80	0.00	
7	C (Top)	0.00	43.20	0.00	
8	C (Top)	0.00	108.00	0.00	
9	C (Top)	0.00	129.60	0.00	
10	C (Top)	0.00	43.20	0.00	
11	C (Top)	0.00	64.80	0.00	
12	C (Top)	0.00	43.20	0.00	
13	C (Top)	0.00	108.00	0.00	
14	C (Top)	0.00	129.60	0.00	
15	C (Top)	0.00	43.20	0.00	
16	C (Top)	0.00	64.80	0.00	
17	C (Top)	0.00	86.40	0.00	
18	C (Top)	0.00	64.80	0.00	
19	C (Top)	0.00	43.20	0.00	
20	C (Top)	0.00	172.80	0.00	
21	C (Top)	0.00	194.40	0.00	
22	C (Top)	0.00	64.80	0.00	
23	C (Top)	0.00	64.80	0.00	
24	C (Top)	0.00	86.40	0.00	
25	C (Top)	0.00	108.00	0.00	
26	C (Top)	0.00	64.80	0.00	
27	C (Top)	0.00	172.80	0.00	
28	C (Top)	0.00	64.80	0.00	
29	C (Top)	0.00	108.00	0.00	
30	C (Top)	0.00	64.80	0.00	
31	C (Top)	0.00	172.80	0.00	
32	C (Top)	0.00	194.40	0.00	
33	C (Top)	0.00	64.80	0.00	
34	C (Top)	0.00	64.80	0.00	
35	C (Top)	0.00	86.40	0.00	
36	C (Top)	0.00	108.00	0.00	

37	C (Top)	0.00	64.80	0.00
38	C (Top)	0.00	172.80	0.00
39	C (Top)	0.00	194.40	0.00
40	C (Top)	0.00	64.80	0.00
41	C (Top)	0.00	64.80	0.00
42	C (Top)	0.00	86.40	0.00
43	C (Top)	0.00	108.00	0.00
44	C (Top)	0.00	64.80	0.00

Shear

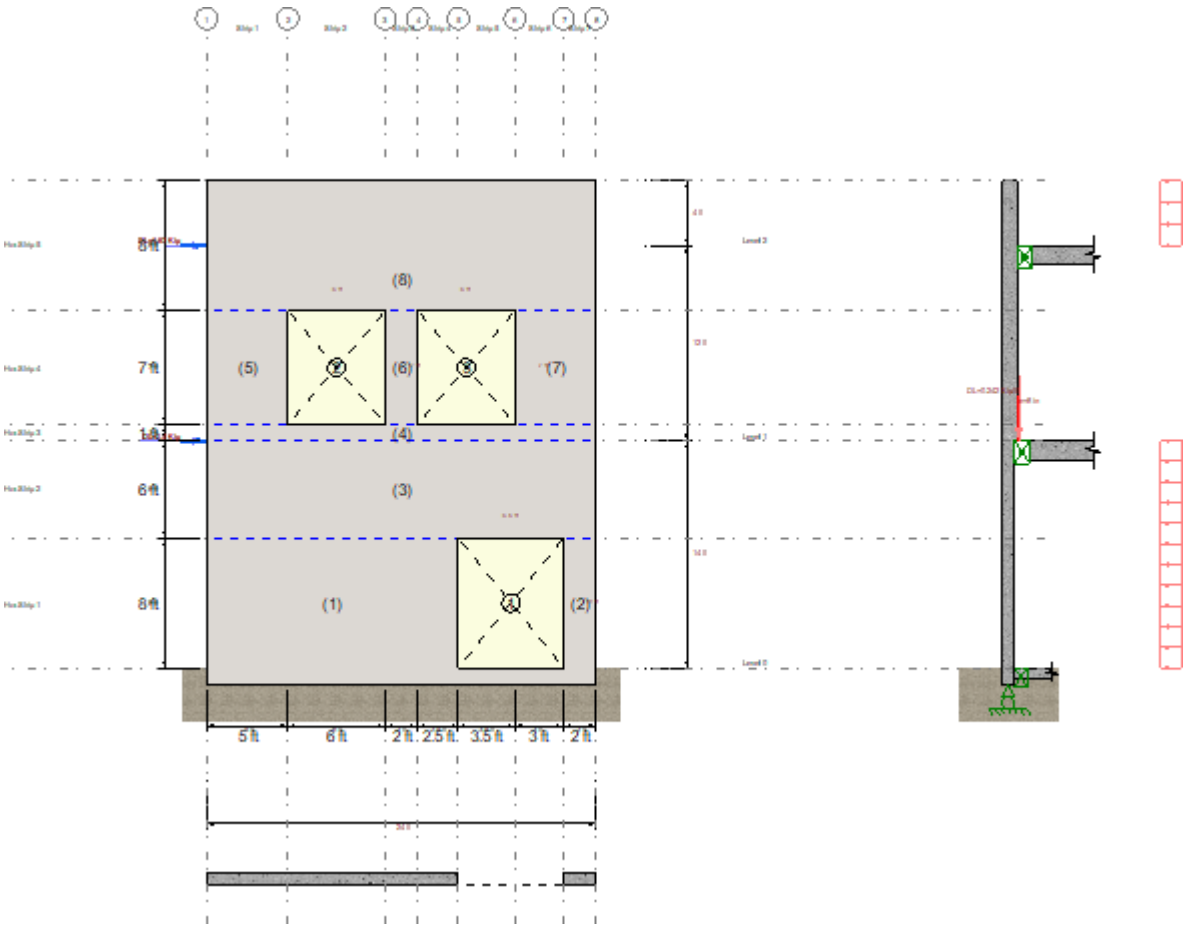
Segment	Condition	Vu [Kip]	ϕ*Vn [Kip]	Vu/ϕ*Vn
1	C (Top)	0.000	39.845	0.00
2	C (Top)	0.000	47.814	0.00
3	C (Top)	0.000	15.938	0.00
4	C (Top)	0.000	19.922	0.00
5	C (Top)	0.000	27.891	0.00
6	C (Top)	0.000	23.907	0.00
7	C (Top)	0.000	15.938	0.00
8	D14 (Bottom)	2.309	39.845	0.06
9	D14 (Bottom)	3.113	47.814	0.07
10	D14 (Bottom)	1.030	15.938	0.06
11	D14 (Bottom)	1.436	19.922	0.07
12	D14 (Bottom)	1.043	15.938	0.07
13	D15 (Max)	2.336	39.845	0.06
14	D15 (Top)	2.540	47.814	0.05
15	D15 (Top)	0.855	15.938	0.05
16	D15 (Top)	1.203	19.922	0.06
17	D15 (Max)	1.051	27.891	0.04
18	D15 (Max)	1.075	23.907	0.04
19	D14 (Top)	1.086	15.938	0.07
20	D15 (Max)	1.573	51.229	0.03
21	D14 (Max)	3.804	61.475	0.06
22	D14 (Max)	3.342	20.492	0.16
23	D14 (Max)	2.317	25.614	0.09
24	D14 (Bottom)	2.072	35.860	0.06
25	D6 (Bottom)	0.497	30.737	0.02
26	D14 (Bottom)	1.084	20.492	0.05
27	D14 (Bottom)	2.210	51.229	0.04
28	D14 (Max)	1.336	20.492	0.07
29	D14 (Max)	1.314	30.737	0.04
30	D14 (Bottom)	0.926	20.492	0.05
31	D15 (Max)	2.067	51.229	0.04
32	D14 (Top)	1.894	61.475	0.03
33	D15 (Top)	0.914	20.492	0.04
34	D14 (Top)	0.789	25.614	0.03
35	D14 (Top)	1.105	35.860	0.03
36	D15 (Top)	1.176	30.737	0.04
37	D15 (Top)	0.871	20.492	0.04
38	C (Top)	0.000	39.845	0.00
39	C (Top)	0.000	47.814	0.00
40	C (Top)	0.000	15.938	0.00
41	C (Top)	0.000	19.922	0.00
42	C (Top)	0.000	27.891	0.00
43	C (Top)	0.000	23.907	0.00
44	C (Top)	0.000	15.938	0.00

Deflection

Segment	Condition	Δs [in]	Δmax [in]	Δs/Δmax	
1	S1 (Top)	0.000	0.080	0.00	
2	S1 (Top)	0.000	0.080	0.00	
3	S1 (Top)	0.000	0.080	0.00	
4	S1 (Top)	0.000	0.080	0.00	
5	S1 (Top)	0.000	0.080	0.00	
6	S1 (Top)	0.000	0.080	0.00	
7	S1 (Top)	0.000	0.080	0.00	
8	S13 (Max)	0.005	1.120	0.00	
9	S13 (Max)	0.007	1.120	0.01	
10	S13 (Max)	0.007	1.120	0.01	
11	S13 (Max)	0.009	1.120	0.01	
12	S13 (Max)	0.008	1.120	0.01	
13	S14 (Max)	0.010	1.120	0.01	
14	S13 (Max)	0.007	1.120	0.01	
15	S13 (Max)	0.007	1.120	0.01	
16	S13 (Max)	0.009	1.120	0.01	
17	S34 (Max)	0.006	1.120	0.01	
18	S14 (Max)	0.009	1.120	0.01	
19	S14 (Max)	0.011	1.120	0.01	
20	S13 (Max)	0.004	0.960	0.00	
21	S13 (Max)	0.002	0.960	0.00	
22	S13 (Max)	0.008	0.960	0.01	
23	S13 (Max)	0.003	0.960	0.00	
24	S13 (Max)	0.002	0.960	0.00	
25	S13 (Max)	0.004	0.960	0.00	
26	S13 (Max)	0.005	0.960	0.01	
27	S13 (Max)	0.003	0.960	0.00	
28	S13 (Max)	0.008	0.960	0.01	
29	S13 (Max)	0.004	0.960	0.00	
30	S13 (Max)	0.003	0.960	0.00	
31	S13 (Max)	0.002	0.960	0.00	
32	S30 (Max)	0.002	0.960	0.00	
33	S14 (Max)	0.002	0.960	0.00	
34	S30 (Max)	0.002	0.960	0.00	
35	S30 (Max)	0.002	0.960	0.00	
36	S13 (Max)	0.002	0.960	0.00	
37	S13 (Max)	0.002	0.960	0.00	
38	S1 (Top)	0.000	0.320	0.00	
39	S1 (Top)	0.000	0.320	0.00	
40	S1 (Top)	0.000	0.320	0.00	
41	S1 (Top)	0.000	0.320	0.00	
42	S1 (Top)	0.000	0.320	0.00	
43	S1 (Top)	0.000	0.320	0.00	
44	S1 (Top)	0.000	0.320	0.00	

SHEAR WALL DESIGN:

Status : OK



Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]	Classification
1	0.00	0.00	15.50	8.00	Shear wall
2	22.00	0.00	2.00	8.00	Pier
3	0.00	8.00	24.00	6.00	Shear wall
4	0.00	14.00	24.00	1.00	Shear wall
5	0.00	15.00	5.00	7.00	Shear wall
6	11.00	15.00	2.00	7.00	Column
7	19.00	15.00	5.00	7.00	Shear wall
8	0.00	22.00	24.00	4.00	Shear wall

Reinforcement:

Reinforcement layers : 2

	Vertical reinforcement			Horizontal reinforcement		
Segment	**Bars**	**Spacing [in]**	**Ld [in]**	**Bars**	**Spacing [in]**	**Ld [in]**
1	5-#4	12.00	18.97	6-#4	18.00	24.67
	6-#4	12.00	18.97	6-#4	18.00	24.67
	2-#4	18.00	18.97	6-#4	18.00	24.67
	3-#4	12.00	18.97	6-#4	18.00	24.67
2	2-#4	18.00	18.97	6-#4	18.00	24.67
3	5-#4	12.00	18.97	4-#4	18.00	24.67
	6-#4	12.00	18.97	4-#4	18.00	24.67

	2-#4	18.00	18.97	4-#4	18.00	24.67
	3-#4	12.00	18.97	4-#4	18.00	24.67
	4-#4	12.00	18.97	4-#4	18.00	24.67
	3-#4	16.00	18.97	4-#4	18.00	24.67
	2-#4	18.00	18.97	4-#4	18.00	24.67
4	8-#4	8.00	18.97	1-#4	18.00	24.67
	9-#4	8.00	18.97	1-#4	18.00	24.67
	3-#4	8.00	18.97	1-#4	18.00	24.67
	3-#4	12.00	18.97	1-#4	18.00	24.67
	4-#4	12.00	18.97	1-#4	18.00	24.67
	5-#4	8.00	18.97	1-#4	18.00	24.67
	3-#4	8.00	18.97	1-#4	18.00	24.67
5	8-#4	8.00	18.97	5-#4	18.00	24.67
6	3-#4	8.00	18.97	5-#4	18.00	24.67
7	5-#4	8.00	18.97	5-#4	18.00	24.67
	3-#4	8.00	18.97	5-#4	18.00	24.67
8	8-#4	8.00	18.97	3-#4	18.00	24.67
	9-#4	8.00	18.97	3-#4	18.00	24.67
	3-#4	8.00	18.97	3-#4	18.00	24.67
	3-#4	12.00	18.97	3-#4	18.00	24.67
	4-#4	12.00	18.97	3-#4	18.00	24.67
	5-#4	8.00	18.97	3-#4	18.00	24.67
	3-#4	8.00	18.97	3-#4	18.00	24.67

Intermediate results for axial-bending

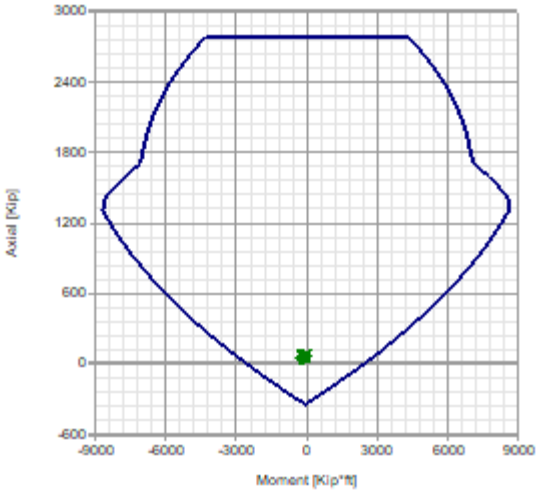
Segment	Condition	c [in]	d [in]
1	D4 (Bottom)	17.32	148.80
2	D4 (Top)	2.39	19.20
3	D4 (Bottom)	25.85	230.40
4	D12 (Bottom)	26.23	230.40
5	D12 (Bottom)	6.02	48.00
6	D12 (Top)	2.09	19.20
7	D12 (Top)	6.09	48.00
8	D12 (Bottom)	25.55	230.40

Combined axial flexure

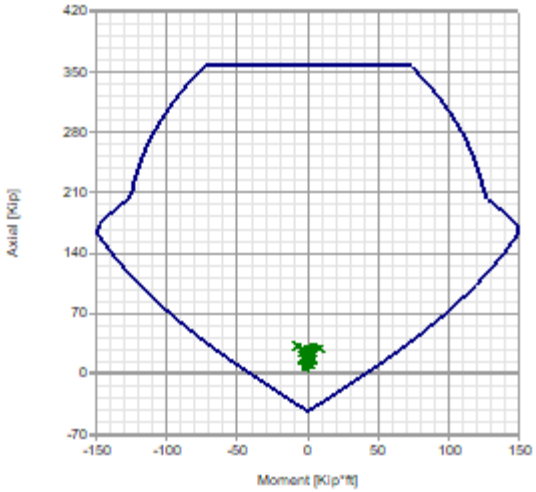
Segment	Condition	Pu [Kip]	Mu [Kip*ft]	ϕ*Mn [Kip*ft]	Mu/ϕ*Mn
1	D4 (Bottom)	77.89	-268.86	3084.10	0.09
2	D4 (Top)	30.02	8.51	66.98	0.13
3	D4 (Bottom)	90.71	-189.84	7034.11	0.03
4	D12 (Bottom)	57.39	-84.20	8750.34	0.01
5	D12 (Bottom)	16.07	-19.87	431.83	0.05
6	D12 (Top)	12.61	3.34	71.36	0.05
7	D12 (Top)	14.79	12.16	440.83	0.03
8	D12 (Bottom)	36.72	-28.03	8537.88	0.00

Interaction diagrams, P vs. M:

P vs. M (Segment 1)



P vs. M (Segment 2)



Axial compression

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	D13 (Bottom)	88.95	2783.89	0.03
2	D4 (Bottom)	32.23	359.26	0.09
3	D7 (Bottom)	90.71	4310.38	0.02
4	C (Bottom)	58.95	5321.68	0.01
5	D13 (Bottom)	19.78	1108.18	0.02
6	C (Bottom)	15.82	443.41	0.04
7	D12 (Bottom)	21.47	1108.18	0.02
8	C (Bottom)	37.71	5321.68	0.01

Axial tension

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	345.60	0.00
2	C (Top)	0.00	43.20	0.00
3	C (Top)	0.00	540.00	0.00
4	C (Top)	0.00	756.00	0.00
5	C (Top)	0.00	172.80	0.00
6	C (Top)	0.00	64.80	0.00
7	C (Top)	0.00	172.80	0.00
8	C (Top)	0.00	756.00	0.00

Shear

Segment	Condition	Vu [Kip]	ϕ*Vn [Kip]	Vu/ϕ*Vn
1	D4 (Top)	17.820	373.363	0.05
2	D4 (Top)	2.059	33.268	0.06
3	D4 (Top)	19.879	574.624	0.03
4	D12 (Top)	7.022	644.064	0.01
5	D12 (Bottom)	3.951	130.477	0.03

6	D12 (Top)	0.958	36.894	0.03
7	D12 (Top)	2.112	115.239	0.02
8	D12 (Top)	7.022	638.895	0.01

STABILITY RESULTS:

Status : OK

Global stability:

Safety factor : 1

Condition	Position	RM [Kip*ft]	OTM [Kip*ft]	FS
S30	Left corner	-491.33	227.71	2.16
S29	Right corner	500.49	-257.46	1.94

Notes:

* Pu = Axial load
* Pn = Nominal axial load
* Mua = Moment at section
* Mu = Magnified moment at section
* Mcr = Cracking moment at section
* Mn = Maximum nominal moment
* Vu = Design shear force
* Vn = Nominal shear force

RAM® Elements
CONNECT Edition

Current Date: 5/11/2022 6:25 AM
Units system: English
File name: Z:\Jenh Group\OneDrive - JENH Group\Jenh Group\01 Design\01 Jenh Group Projects\2021\2021-057 GST Expansion\Calcs\Ram element\Wall Line A (1_0-1).tup

Design Results

Tilt-Up Wall

GENERAL INFORMATION:

Global status : Warnings in design

Design code	:	ACI 318-14

Geometry:

Total height	:	31.00 [ft]
Reveal size	:	0.75 [in]
Total length	:	19.50 [ft]
Base support type	:	Continuous
Wall bottom restraint	:	Pinned

Materials:

Material	:	C 4-60
Steel tension strength (Fy)	:	60 [Kip/in2]
Concrete compressive strength (fc)	:	4 [Kip/in2]
Steel elasticity modulus (Es)	:	29000 [Kip/in2]
Concrete modulus of elasticity (E)	:	3605 [Kip/in2]
Concrete unit weight	:	0.149818 [Kip/ft3]

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]
1	26.00	11.25

Load conditions:

ID	Comb.	Category	Description
DL	No	DL	Dead Load
RLL	No	LLR	Roof Live Load
FLL	No	LL	Floor Live Load
Wx	No	WIND	Wind In Plane
Wz	No	WIND	Wind out of Plane
Ex	No	EQ	Seismic In Plane
Ez	No	EQ	Seismic Out of Plane
C	Yes		1.4DL
D2	Yes		1.2DL+0.5RLL+1.6FLL
D3	Yes		1.2DL+1.6RLL+0.5FLL
D4	Yes		1.2DL+1.6RLL+0.5Wx
D5	Yes		1.2DL+1.6RLL-0.5Wx
D6	Yes		1.2DL+1.6RLL+0.5Wz
D7	Yes		1.2DL+1.6RLL-0.5Wz
D8	Yes		1.2DL+0.5RLL+0.5FLL+Wx
D9	Yes		1.2DL+0.5RLL+0.5FLL-Wx
D10	Yes		1.2DL+0.5RLL+0.5FLL+Wz
D11	Yes		1.2DL+0.5RLL+0.5FLL-Wz
D12	Yes		1.363DL+0.5FLL+Ex

D13	Yes	1.363DL+0.5FLL-Ex
D14	Yes	1.363DL+0.5FLL+Ez
D15	Yes	1.363DL+0.5FLL-Ez
D16	Yes	0.9DL+Wx
D17	Yes	0.9DL-Wx
D18	Yes	0.9DL+Wz
D19	Yes	0.9DL-Wz
D20	Yes	0.737DL+Ex
D21	Yes	0.737DL-Ex
D22	Yes	0.737DL+Ez
D23	Yes	0.737DL-Ez
S1	Yes	DL
S2	Yes	DL+RLL
S3	Yes	DL+FLL
S4	Yes	DL+0.75FLL
S5	Yes	DL+0.75RLL
S6	Yes	DL+0.75RLL+0.75FLL
S7	Yes	DL+0.6Wx
S8	Yes	DL-0.6Wx
S9	Yes	DL+0.6Wz
S10	Yes	DL-0.6Wz
S11	Yes	1.12DL+0.7Ex
S12	Yes	1.12DL-0.7Ex
S13	Yes	1.12DL+0.7Ez
S14	Yes	1.12DL-0.7Ez
S15	Yes	DL+0.75RLL+0.75FLL+0.45Wx
S16	Yes	DL+0.75RLL+0.75FLL-0.45Wx
S17	Yes	DL+0.75RLL+0.75FLL+0.45Wz
S18	Yes	DL+0.75RLL+0.75FLL-0.45Wz
S19	Yes	DL+0.75FLL+0.525Ex
S20	Yes	DL+0.75FLL-0.525Ex
S21	Yes	DL+0.75FLL+0.525Ez
S22	Yes	DL+0.75FLL-0.525Ez
S23	Yes	0.6DL+0.6Wx
S24	Yes	0.6DL-0.6Wx
S25	Yes	0.6DL+0.6Wz
S26	Yes	0.6DL-0.6Wz
S27	Yes	0.48DL+0.7Ex
S28	Yes	0.48DL-0.7Ex
S29	Yes	0.48DL+0.7Ez
S30	Yes	0.48DL-0.7Ez
S31	Yes	1.09DL+0.75RLL+0.75FLL+0.525Ex
S32	Yes	1.09DL+0.75RLL+0.75FLL-0.525Ex
S33	Yes	1.09DL+0.75RLL+0.75FLL+0.525Ez
S34	Yes	1.09DL+0.75RLL+0.75FLL-0.525Ez

Consider Self Weight:

Load condition : DL

Concentrated loads:

Story	Condition	Direction	Magnitude [Kip]	Eccentricity [in]	Distance [ft]
1	Ex	Horizontal	54.40	0.00	0.00
1	DL	Horizontal	0.92	0.00	0.00
1	RLL	Horizontal	1.32	0.00	0.00
1	Wx	Horizontal	21.22	0.00	0.00

In-plane seismic weight:

Load condition	Coefficient
Ez	0.28

Distributed loads:

Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
1	DL	Vertical	0.17	0.67
1	RLL	Vertical	0.24	0.67

Out-of-plane pressure loads:

Story	Condition	Magnitude [Kip/ft2]
1	Wz	0.02

Out-of-plane parapet pressure loads:

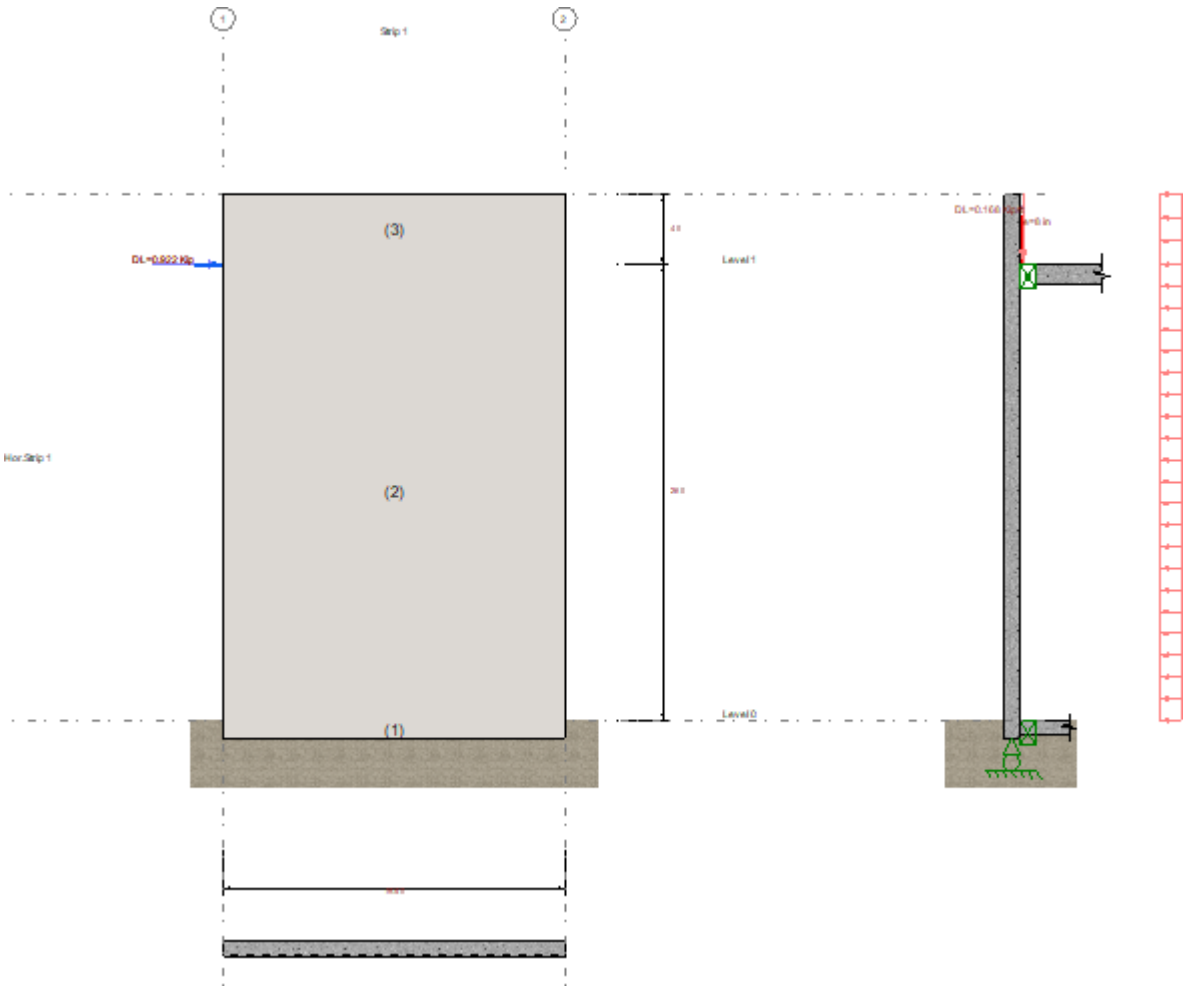
Condition	Magnitude [Kip/ft2]
Wz	0.02

Out-of-plane seismic weight:

Load condition	Coefficient
Ez	0.56

TILT-UP WALLS DESIGN:

Status : OK



Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	-1.00	19.50	1.00
2	0.00	0.00	19.50	26.00
3	0.00	26.00	19.50	4.00

Vertical reinforcement:

Reinforcement layers : 2

Segment	Bars	Spacing [in]	Ld [in]
1	29-#4	8.00	18.97
2	29-#4	8.00	18.97
3	29-#4	8.00	18.97

Vertical reinforcement

Segment	Condition	Pu [Kip]	Pu/Ag [Kip/in2]	0.06*f´c [Kip/in2]	Ratio
1	C (Top)	0.000	0.000	0.240	0.00
2	D7 (Max)	67.292	0.026	0.240	0.11
3	C (Top)	0.000	0.000	0.240	0.00

Intermediate results for axial-bending

Segment	Condition	Ase [in2]	a [in]	c [in]	d [in]	ϕ	Kb [Kip]
1	C (Top)	5.80	0.44	0.51	9.00	0.90	6672765.00
2	D22 (Bottom)	6.46	0.52	0.61	9.00	0.90	9870.95
3	C (Top)	5.80	0.44	0.51	9.00	0.90	417047.80

Inertias

Segment	Condition	Ig [in4]	Icr [in4]	Ie [in4]
1	C (Top)	27764.65	3370.06	27764.65
2	D22 (Bottom)	27764.65	3675.17	27764.65
3	C (Top)	27764.65	3370.06	27764.65

Deflection

Segment	Condition	Δu [in]
1		0.000
2	D23 (Max)	0.110
3		0.000

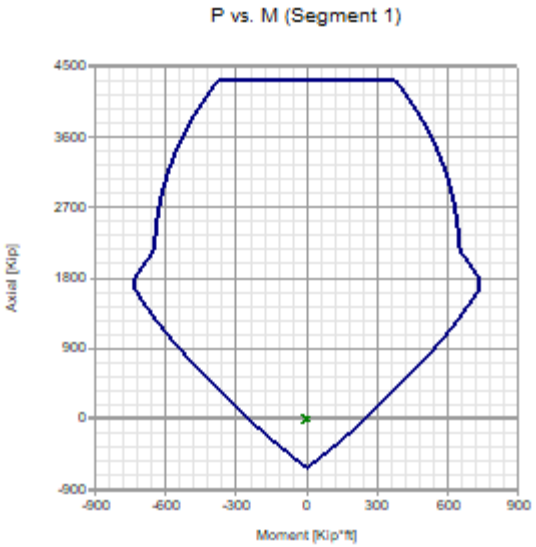
Combined axial flexure

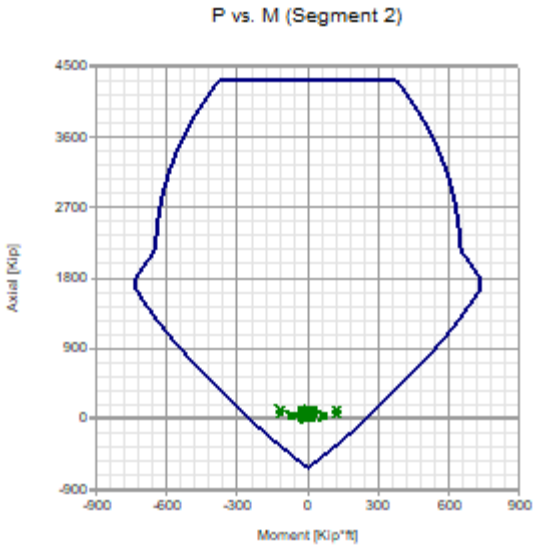
Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mu [Kip*ft]	ϕ*Mn [Kip*ft]	Mu/ϕ*Mn
1	C (Top)	0.00	0.00	0.00	248.45	0.00
2	D22 (Bottom)	62.95	117.26	118.27	269.66	0.44
3	C (Top)	0.00	0.00	0.00	248.45	0.00

Cracking moment

Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mcr [Kip*ft]	ϕ*Mn [Kip*ft]	Mcr/ϕ*Mn
1	D23 (Bottom)	0.00	0.00	195.11	248.45	0.79
2	D20 (Top)	10.51	-1.61	195.11	251.99	0.77
3	D23 (Bottom)	0.00	0.00	195.11	248.45	0.79

Interaction diagrams, P vs. M:





Axial compression

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	4323.47	0.00
2	C (Bottom)	119.59	4323.47	0.03
3	C (Top)	0.00	4323.47	0.00

Axial tension

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	626.40	0.00
2	C (Top)	0.00	626.40	0.00
3	C (Top)	0.00	626.40	0.00

Shear

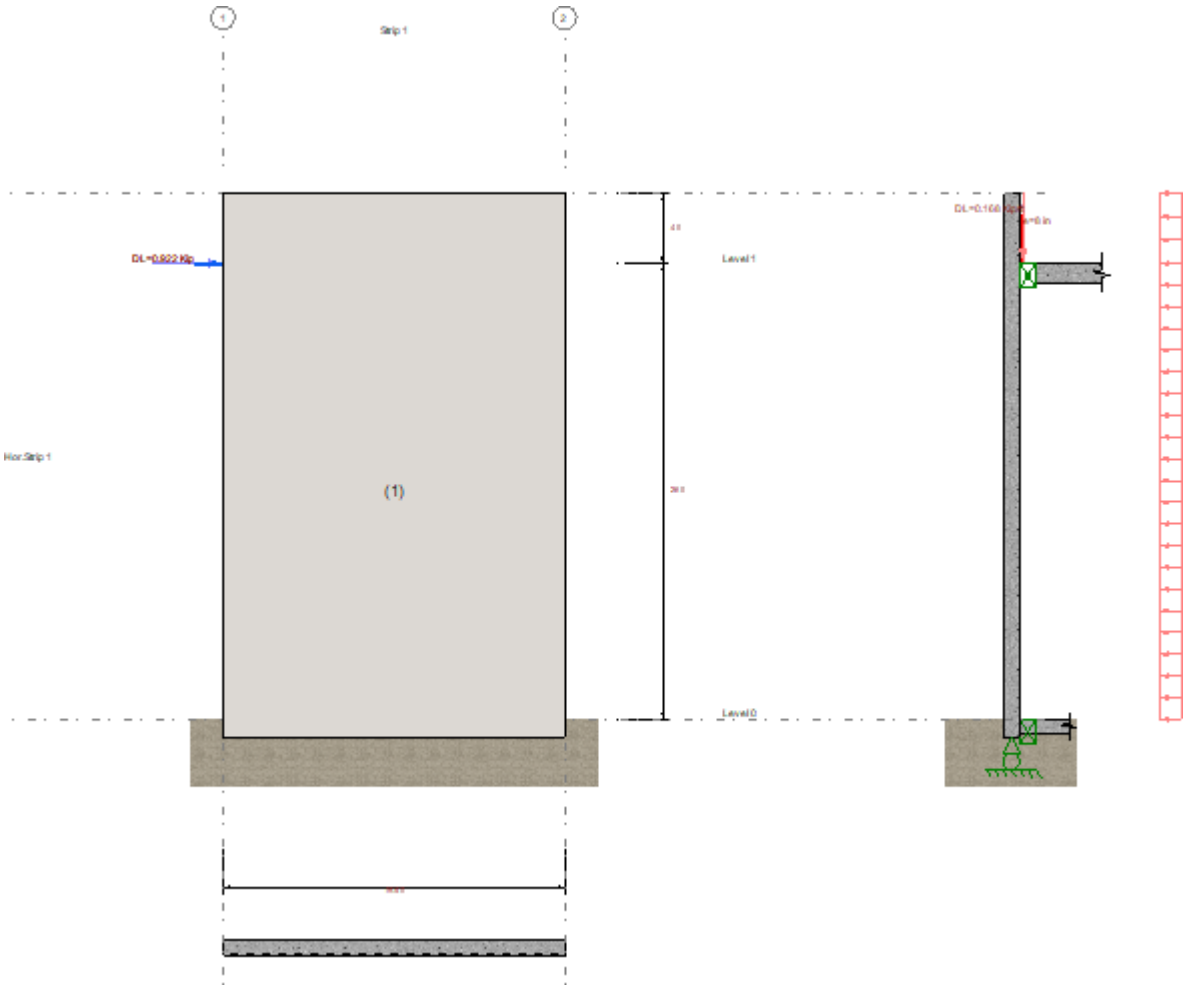
Segment	Condition	Vu [Kip]	ϕ*Vn [Kip]	Vu/ϕ*Vn
1	C (Top)	0.000	199.793	0.00
2	D14 (Bottom)	24.215	199.793	0.12
3	C (Top)	0.000	199.793	0.00

Deflection

Segment	Condition	Δs [in]	Δmax [in]	Δs/Δmax
1	S1 (Top)	0.000	0.080	0.00
2	S13 (Max)	0.060	2.080	0.03
3	S1 (Top)	0.000	0.320	0.00

SHEAR WALL DESIGN:

Status : OK



Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]	Classification
1	0.00	0.00	19.50	26.00	Shear wall

Reinforcement:

Reinforcement layers : 2

Segment	Vertical reinforcement Bars	Spacing [in]	Ld [in]	Horizontal reinforcement Bars	Spacing [in]	Ld [in]
1	29-#4	8.00	18.97	18-#4	18.00	24.67

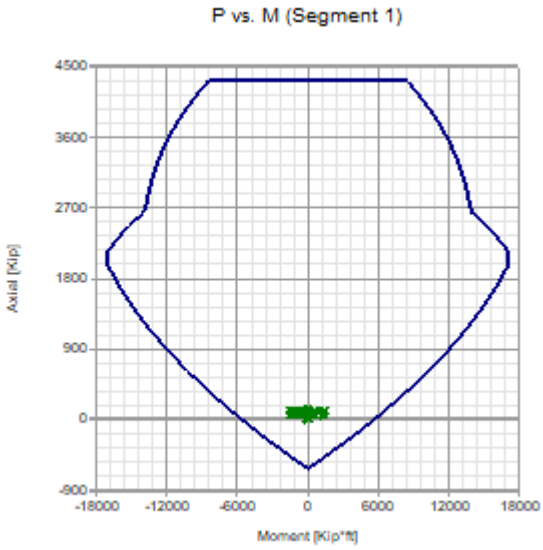
Intermediate results for axial-bending

Segment	Condition	c [in]	d [in]
1	D20 (Bottom)	22.22	187.20

Combined axial flexure

Segment	Condition	Pu [Kip]	Mu [Kip*ft]	ϕ*Mn [Kip*ft]	Mu/ϕ*Mn
1	D20 (Bottom)	62.95	-1431.61	6140.60	0.23

Interaction diagrams, P vs. M:



Axial compression

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Bottom)	119.59	4323.47	0.03

Axial tension

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	626.40	0.00

Shear

Segment	Condition	Vu [Kip]	ϕ*Vn [Kip]	Vu/ϕ*Vn
1	D20 (Bottom)	55.080	406.129	0.14

STABILITY RESULTS:

Status : Warnings in design
- The overturning safety factor is smaller than the allowable value

Global stability:

Safety factor : 1

Condition	Position	RM [Kip*ft]	OTM [Kip*ft]	FS
S28	Left corner	-424.19	990.08	0.43
S27	Right corner	412.68	-1001.59	0.41

Notes:

* Pu = Axial load
* Pn = Nominal axial load
* Mua = Moment at section
* Mu = Magnified moment at section
* Mcr = Cracking moment at section
* Mn = Maximum nominal moment
* Vu = Design shear force
* Vn = Nominal shear force

RAM® Elements
CONNECT Edition

Current Date: 5/11/2022 6:45 AM
Units system: English
File name: Z:\Jenh Group\OneDrive - JENH Group\Jenh Group\01 Design\01 Jenh Group Projects\2021\2021-057 GST Expansion\Calcs\Ram element\Wall Line A (11-12).tup

Design Results

Tilt-Up Wall

GENERAL INFORMATION:

Global status : Warnings in design

Design code	:	ACI 318-14

Geometry:

Total height	:	31.00 [ft]
Reveal size	:	0.75 [in]
Total length	:	19.50 [ft]
Base support type	:	Continuous
Wall bottom restraint	:	Pinned

Materials:

Material	:	C 4-60
Steel tension strength (Fy)	:	60 [Kip/in2]
Concrete compressive strength (fc)	:	4 [Kip/in2]
Steel elasticity modulus (Es)	:	29000 [Kip/in2]
Concrete modulus of elasticity (E)	:	3605 [Kip/in2]
Concrete unit weight	:	0.149818 [Kip/ft3]

Number of stories: 2

Story	Story height [ft]	Wall thickness [in]
1	14.00	11.25
2	12.00	11.25

Load conditions:

ID	Comb.	Category	Description
DL	No	DL	Dead Load
RLL	No	LLR	Roof Live Load
FLL	No	LL	Floor Live Load
Wx	No	WIND	Wind In Plane
Wz	No	WIND	Wind out of Plane
Ex	No	EQ	Seismic In Plane
Ez	No	EQ	Seismic Out of Plane
C	Yes		1.4DL
D2	Yes		1.2DL+0.5RLL+1.6FLL
D3	Yes		1.2DL+1.6RLL+0.5FLL
D4	Yes		1.2DL+1.6RLL+0.5Wx
D5	Yes		1.2DL+1.6RLL-0.5Wx
D6	Yes		1.2DL+1.6RLL+0.5Wz
D7	Yes		1.2DL+1.6RLL-0.5Wz
D8	Yes		1.2DL+0.5RLL+0.5FLL+Wx
D9	Yes		1.2DL+0.5RLL+0.5FLL-Wx
D10	Yes		1.2DL+0.5RLL+0.5FLL+Wz
D11	Yes		1.2DL+0.5RLL+0.5FLL-Wz

D12	Yes	1.363DL+0.5FLL+Ex
D13	Yes	1.363DL+0.5FLL-Ex
D14	Yes	1.363DL+0.5FLL+Ez
D15	Yes	1.363DL+0.5FLL-Ez
D16	Yes	0.9DL+Wx
D17	Yes	0.9DL-Wx
D18	Yes	0.9DL+Wz
D19	Yes	0.9DL-Wz
D20	Yes	0.737DL+Ex
D21	Yes	0.737DL-Ex
D22	Yes	0.737DL+Ez
D23	Yes	0.737DL-Ez
S1	Yes	DL
S2	Yes	DL+RLL
S3	Yes	DL+FLL
S4	Yes	DL+0.75FLL
S5	Yes	DL+0.75RLL
S6	Yes	DL+0.75RLL+0.75FLL
S7	Yes	DL+0.6Wx
S8	Yes	DL-0.6Wx
S9	Yes	DL+0.6Wz
S10	Yes	DL-0.6Wz
S11	Yes	1.12DL+0.7Ex
S12	Yes	1.12DL-0.7Ex
S13	Yes	1.12DL+0.7Ez
S14	Yes	1.12DL-0.7Ez
S15	Yes	DL+0.75RLL+0.75FLL+0.45Wx
S16	Yes	DL+0.75RLL+0.75FLL-0.45Wx
S17	Yes	DL+0.75RLL+0.75FLL+0.45Wz
S18	Yes	DL+0.75RLL+0.75FLL-0.45Wz
S19	Yes	DL+0.75FLL+0.525Ex
S20	Yes	DL+0.75FLL-0.525Ex
S21	Yes	DL+0.75FLL+0.525Ez
S22	Yes	DL+0.75FLL-0.525Ez
S23	Yes	0.6DL+0.6Wx
S24	Yes	0.6DL-0.6Wx
S25	Yes	0.6DL+0.6Wz
S26	Yes	0.6DL-0.6Wz
S27	Yes	0.48DL+0.7Ex
S28	Yes	0.48DL-0.7Ex
S29	Yes	0.48DL+0.7Ez
S30	Yes	0.48DL-0.7Ez
S31	Yes	1.09DL+0.75RLL+0.75FLL+0.525Ex
S32	Yes	1.09DL+0.75RLL+0.75FLL-0.525Ex
S33	Yes	1.09DL+0.75RLL+0.75FLL+0.525Ez
S34	Yes	1.09DL+0.75RLL+0.75FLL-0.525Ez

Consider Self Weight:

Load condition : DL

Concentrated loads:

Story	Condition	Direction	Magnitude [Kip]	Eccentricity [in]	Distance [ft]
1	Ex	Horizontal	259.00	0.00	0.00
1	DL	Horizontal	0.79	0.00	0.00
1	FLL	Horizontal	4.30	0.00	0.00
1	Wx	Horizontal	8.70	0.00	0.00
2	Ex	Horizontal	62.60	0.00	0.00
2	DL	Horizontal	0.79	0.00	0.00
2	RLL	Horizontal	1.32	0.00	0.00

2	Wx	Horizontal	12.48	0.00	0.00

In-plane seismic weight:

Load condition	Coefficient
Ez	0.28

Distributed loads:

Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
2	DL	Vertical	0.17	0.67
2	RLL	Vertical	0.24	0.67
1	DL	Vertical	0.14	0.67
1	FLL	Vertical	0.78	0.67

Out-of-plane pressure loads:

Story	Condition	Magnitude [Kip/ft2]
1	Wz	0.02

Out-of-plane parapet pressure loads:

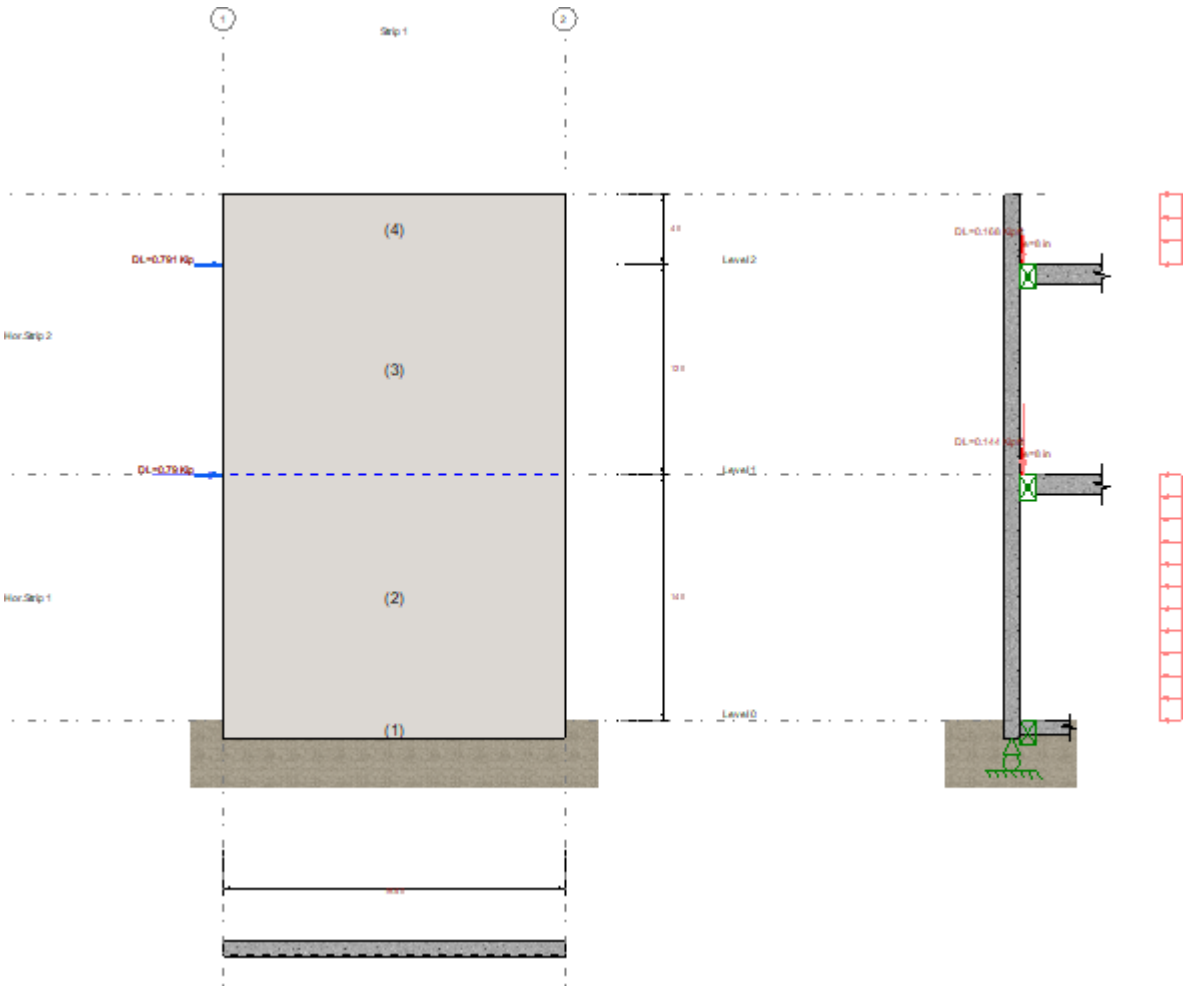
Condition	Magnitude [Kip/ft2]
Wz	0.02

Out-of-plane seismic weight:

Load condition	Coefficient
Ez	0.56

TILT-UP WALLS DESIGN:

Status : OK



Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	-1.00	19.50	1.00
2	0.00	0.00	19.50	14.00
3	0.00	14.00	19.50	12.00
4	0.00	26.00	19.50	4.00

Vertical reinforcement:

Reinforcement layers : 2

Segment	Bars	Spacing [in]	Ld [in]
1	29-#4	8.00	18.97
2	29-#4	8.00	18.97
3	29-#4	8.00	18.97
4	29-#4	8.00	18.97

Vertical reinforcement

Segment	Condition	Pu [Kip]	Pu/Ag [Kip/in2]	0.06*f´c [Kip/in2]	Ratio
1	C (Top)	0.000	0.000	0.240	0.00
2	D14 (Max)	101.758	0.039	0.240	0.16
3	D14 (Max)	64.163	0.024	0.240	0.10
4	C (Top)	0.000	0.000	0.240	0.00

Intermediate results for axial-bending

Segment	Condition	Ase [in2]	a [in]	c [in]	d [in]	ϕ	Kb [Kip]
1	C (Top)	5.80	0.44	0.51	9.00	0.90	6672765.00
2	D15 (Top)	6.59	0.53	0.63	9.00	0.90	34044.72
3	D14 (Max)	6.47	0.52	0.61	9.00	0.90	46338.65
4	C (Top)	5.80	0.44	0.51	9.00	0.90	417047.80

Inertias

Segment	Condition	Ig [in4]	Icr [in4]	Ie [in4]
1	C (Top)	27764.65	3370.06	27764.65
2	D15 (Top)	27764.65	3735.13	27764.65
3	D14 (Max)	27764.65	3680.90	27764.65
4	C (Top)	27764.65	3370.06	27764.65

Deflection

Segment	Condition	Δu [in]
1		0.000
2	D23 (Max)	0.007
3	D23 (Max)	0.003
4		0.000

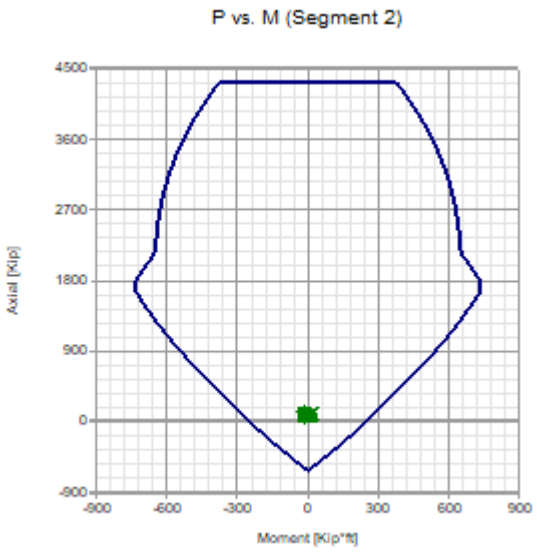
Combined axial flexure

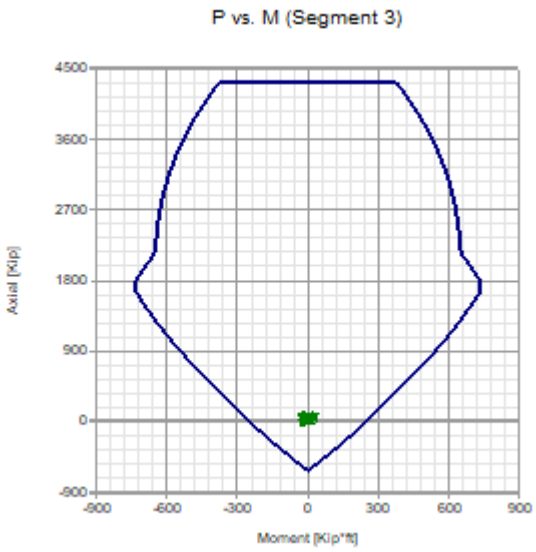
Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mu [Kip*ft]	ϕ*Mn [Kip*ft]	Mu/ϕ*Mn
1	C (Top)	0.00	0.00	0.00	248.45	0.00
2	D15 (Top)	75.66	-27.20	-27.28	273.94	0.10
3	D14 (Max)	64.16	28.38	28.43	270.07	0.11
4	C (Top)	0.00	0.00	0.00	248.45	0.00

Cracking moment

Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mcr [Kip*ft]	ϕ*Mn [Kip*ft]	Mcr/ϕ*Mn
1	D23 (Bottom)	0.00	0.00	195.11	248.45	0.79
2	D20 (Top)	36.80	-0.31	195.11	260.85	0.75
3	D20 (Top)	10.51	-1.61	195.11	251.99	0.77
4	D23 (Bottom)	0.00	0.00	195.11	248.45	0.79

Interaction diagrams, P vs. M:





Axial compression

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	4323.47	0.00
2	D2 (Bottom)	132.55	4323.47	0.03
3	C (Bottom)	65.90	4323.47	0.02
4	C (Top)	0.00	4323.47	0.00

Axial tension

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	626.40	0.00
2	C (Top)	0.00	626.40	0.00
3	C (Top)	0.00	626.40	0.00
4	C (Top)	0.00	626.40	0.00

Shear

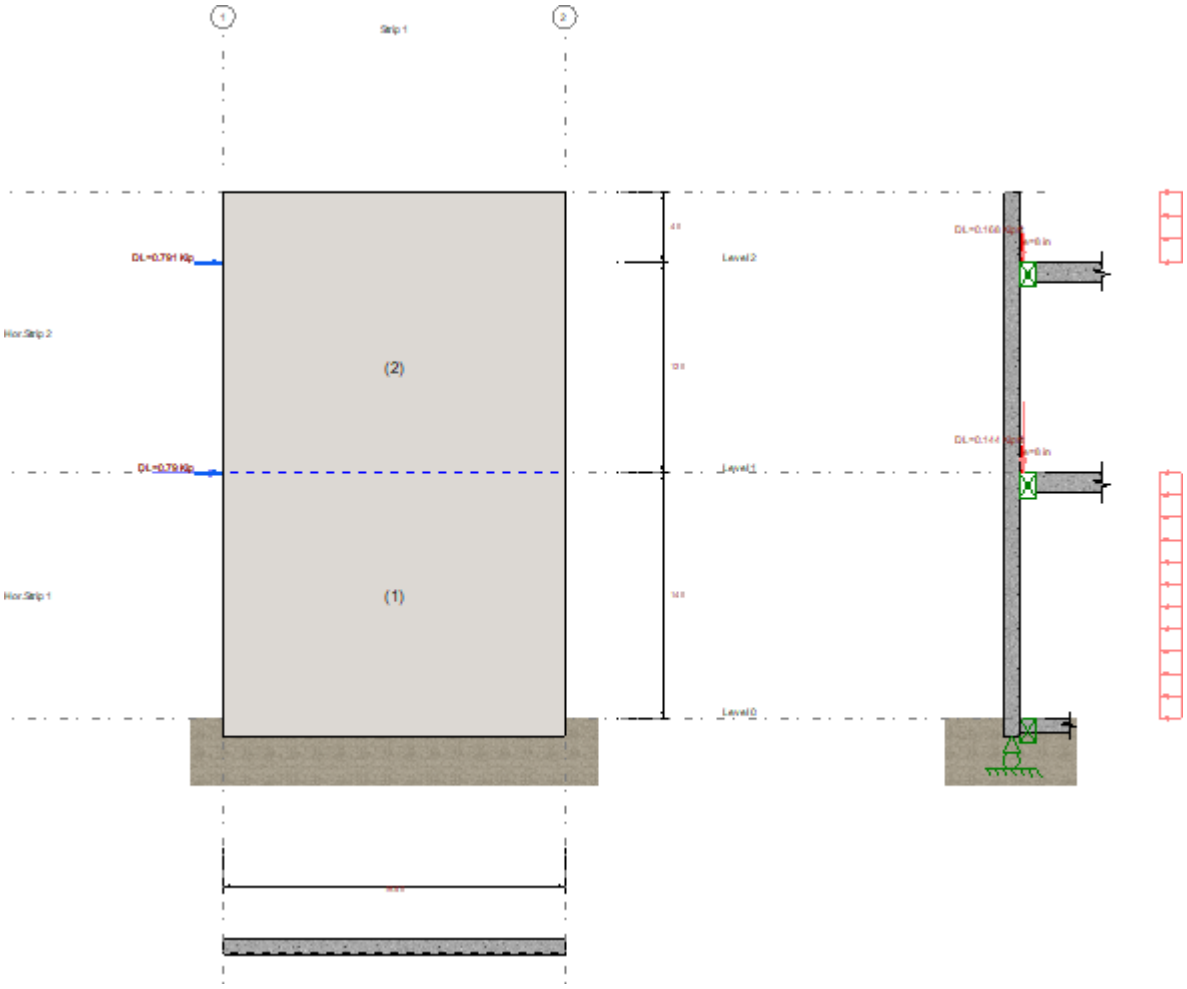
Segment	Condition	Vu [Kip]	ϕ*Vn [Kip]	Vu/ϕ*Vn
1	C (Top)	0.000	199.793	0.00
2	D15 (Top)	11.185	199.793	0.06
3	D14 (Bottom)	10.831	199.793	0.05
4	C (Top)	0.000	199.793	0.00

Deflection

Segment	Condition	Δs [in]	Δmax [in]	Δs/Δmax
1	S1 (Top)	0.000	0.080	0.00
2	S13 (Max)	0.004	1.120	0.00
3	S33 (Max)	0.005	0.960	0.00
4	S1 (Top)	0.000	0.320	0.00

SHEAR WALL DESIGN:

Status : OK



Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]	Classification
1	0.00	0.00	19.50	14.00	Shear wall
2	0.00	14.00	19.50	12.00	Shear wall

Reinforcement:

Reinforcement layers : 2

Segment	Vertical reinforcement Bars	Spacing [in]	Ld [in]	Horizontal reinforcement Bars	Spacing [in]	Ld [in]
1	29-#4	8.00	18.97	14-#4	12.00	24.67
2	29-#4	8.00	18.97	9-#4	16.00	24.67

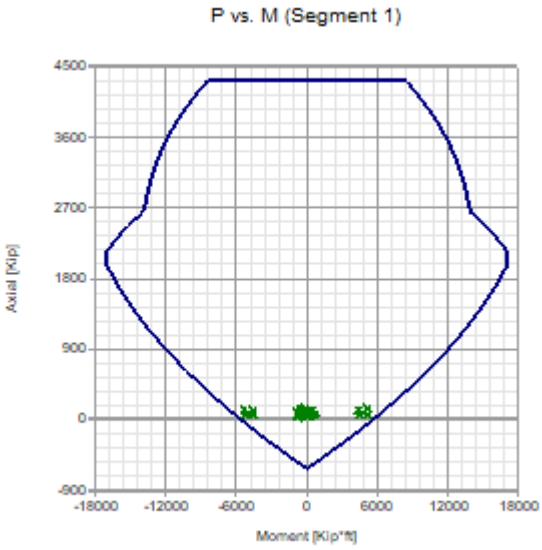
Intermediate results for axial-bending

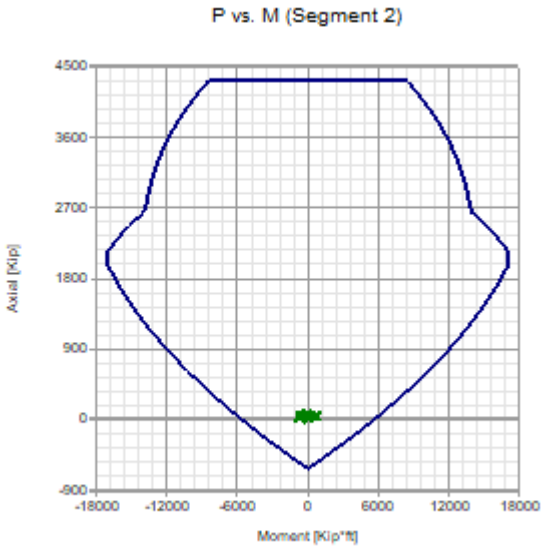
Segment	Condition	c [in]	d [in]
1	D20 (Bottom)	22.29	187.20
2	D20 (Bottom)	21.30	187.20

Combined axial flexure

Segment	Condition	Pu [Kip]	Mu [Kip*ft]	ϕ*Mn [Kip*ft]	Mu/ϕ*Mn
1	D20 (Bottom)	65.02	-5274.22	6157.88	0.86
2	D20 (Bottom)	34.69	-757.67	5904.69	0.13

Interaction diagrams, P vs. M:





Axial compression

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	D2 (Bottom)	132.55	4323.47	0.03
2	C (Bottom)	65.90	4323.47	0.02

Axial tension

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	626.40	0.00
2	C (Top)	0.00	626.40	0.00

Shear

Segment	Condition	Vu [Kip]	ϕ*Vn [Kip]	Vu/ϕ*Vn
1	D12 (Top)	325.905	621.807	0.52
2	D12 (Top)	63.678	543.172	0.12

STABILITY RESULTS:

Status : Warnings in design
- The overturning safety factor is smaller than the allowable value

Global stability:

Safety factor : 1

Condition	Position	RM [Kip*ft]	OTM [Kip*ft]	FS
S28	Left corner	-441.01	3677.52	0.12
S27	Right corner	425.83	-3692.70	0.12

Notes:

* Pu = Axial load
* Pn = Nominal axial load
* Mua = Moment at section
* Mu = Magnified moment at section
* Mcr = Cracking moment at section
* Mn = Maximum nominal moment
* Vu = Design shear force
* Vn = Nominal shear force

RAM® Elements
CONNECT Edition

Current Date: 5/11/2022 6:30 AM
Units system: English
File name: Z:\Jenh Group\OneDrive - JENH Group\Jenh Group\01 Design\01 Jenh Group Projects\2021\2021-057 GST Expansion\Calcs\Ram element\Wall Line J (1_0-3).tup

Design Results

Tilt-Up Wall

GENERAL INFORMATION:

Global status : Warnings in design

Design code	:	ACI 318-14

Geometry:

Total height	:	31.00 [ft]
Reveal size	:	0.75 [in]
Total length	:	22.42 [ft]
Base support type	:	Continuous
Wall bottom restraint	:	Pinned

Materials:

Material	:	C 4-60
Steel tension strength (Fy)	:	60 [Kip/in2]
Concrete compressive strength (fc)	:	4 [Kip/in2]
Steel elasticity modulus (Es)	:	29000 [Kip/in2]
Concrete modulus of elasticity (E)	:	3605 [Kip/in2]
Concrete unit weight	:	0.149818 [Kip/ft3]

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]
1	26.00	11.25

Openings:

Reference	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
Lower left	10.75	0.00	3.00	7.16

Load conditions:

ID	Comb.	Category	Description
DL	No	DL	Dead Load
RLL	No	LLR	Roof Live Load
FLL	No	LL	Floor Live Load
Wx	No	WIND	Wind In Plane
Wz	No	WIND	Wind out of Plane
Ex	No	EQ	Seismic In Plane
Ez	No	EQ	Seismic Out of Plane
C	Yes		1.4DL
D2	Yes		1.2DL+0.5RLL+1.6FLL
D3	Yes		1.2DL+1.6RLL+0.5FLL
D4	Yes		1.2DL+1.6RLL+0.5Wx

D5	Yes	1.2DL+1.6RLL-0.5Wx
D6	Yes	1.2DL+1.6RLL+0.5Wz
D7	Yes	1.2DL+1.6RLL-0.5Wz
D8	Yes	1.2DL+0.5RLL+0.5FLL+Wx
D9	Yes	1.2DL+0.5RLL+0.5FLL-Wx
D10	Yes	1.2DL+0.5RLL+0.5FLL+Wz
D11	Yes	1.2DL+0.5RLL+0.5FLL-Wz
D12	Yes	1.363DL+0.5FLL+Ex
D13	Yes	1.363DL+0.5FLL-Ex
D14	Yes	1.363DL+0.5FLL+Ez
D15	Yes	1.363DL+0.5FLL-Ez
D16	Yes	0.9DL+Wx
D17	Yes	0.9DL-Wx
D18	Yes	0.9DL+Wz
D19	Yes	0.9DL-Wz
D20	Yes	0.737DL+Ex
D21	Yes	0.737DL-Ex
D22	Yes	0.737DL+Ez
D23	Yes	0.737DL-Ez
S1	Yes	DL
S2	Yes	DL+RLL
S3	Yes	DL+FLL
S4	Yes	DL+0.75FLL
S5	Yes	DL+0.75RLL
S6	Yes	DL+0.75RLL+0.75FLL
S7	Yes	DL+0.6Wx
S8	Yes	DL-0.6Wx
S9	Yes	DL+0.6Wz
S10	Yes	DL-0.6Wz
S11	Yes	1.12DL+0.7Ex
S12	Yes	1.12DL-0.7Ex
S13	Yes	1.12DL+0.7Ez
S14	Yes	1.12DL-0.7Ez
S15	Yes	DL+0.75RLL+0.75FLL+0.45Wx
S16	Yes	DL+0.75RLL+0.75FLL-0.45Wx
S17	Yes	DL+0.75RLL+0.75FLL+0.45Wz
S18	Yes	DL+0.75RLL+0.75FLL-0.45Wz
S19	Yes	DL+0.75FLL+0.525Ex
S20	Yes	DL+0.75FLL-0.525Ex
S21	Yes	DL+0.75FLL+0.525Ez
S22	Yes	DL+0.75FLL-0.525Ez
S23	Yes	0.6DL+0.6Wx
S24	Yes	0.6DL-0.6Wx
S25	Yes	0.6DL+0.6Wz
S26	Yes	0.6DL-0.6Wz
S27	Yes	0.48DL+0.7Ex
S28	Yes	0.48DL-0.7Ex
S29	Yes	0.48DL+0.7Ez
S30	Yes	0.48DL-0.7Ez
S31	Yes	1.09DL+0.75RLL+0.75FLL+0.525Ex
S32	Yes	1.09DL+0.75RLL+0.75FLL-0.525Ex
S33	Yes	1.09DL+0.75RLL+0.75FLL+0.525Ez
S34	Yes	1.09DL+0.75RLL+0.75FLL-0.525Ez

Consider Self Weight:

Load condition : DL

Concentrated loads:

Story	Condition	Direction	Magnitude [Kip]	Eccentricity [in]	Distance [ft]
1	Ex	Horizontal	35.40	0.00	0.00
1	DL	Horizontal	0.92	0.00	0.00
1	RLL	Horizontal	1.32	0.00	0.00
1	Wx	Horizontal	13.80	0.00	0.00

In-plane seismic weight:

Load condition	Coefficient
Ez	0.28

Distributed loads:

Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
1	DL	Vertical	0.17	0.67
1	RLL	Vertical	0.24	0.67

Out-of-plane pressure loads:

Story	Condition	Magnitude [Kip/ft2]
1	Wz	0.02

Out-of-plane parapet pressure loads:

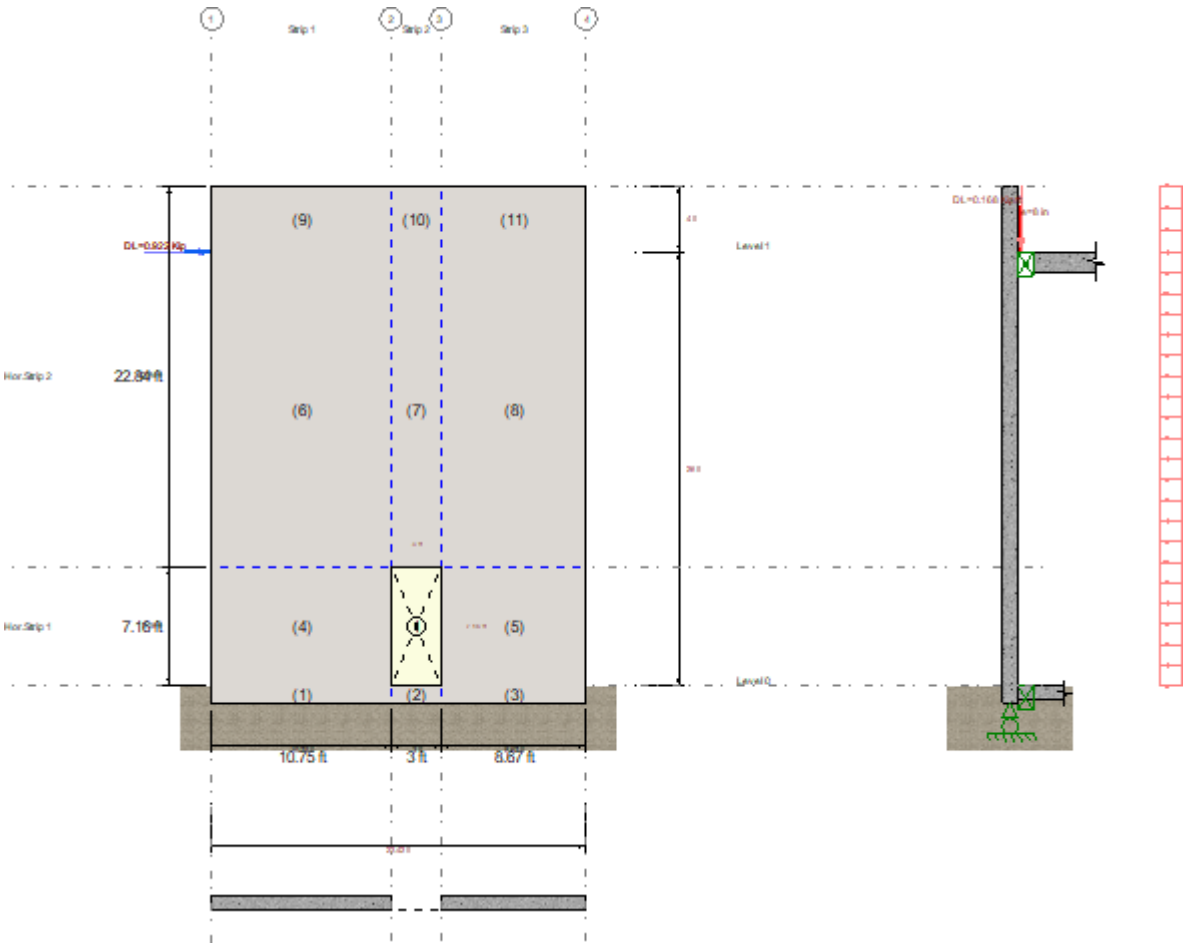
Condition	Magnitude [Kip/ft2]
Wz	0.02

Out-of-plane seismic weight:

Load condition	Coefficient
Ez	0.56

TILT-UP WALLS DESIGN:

Status : OK



Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	-1.00	10.75	1.00
2	10.75	-1.00	3.00	1.00
3	13.75	-1.00	8.67	1.00
4	0.00	0.00	10.75	7.16
5	13.75	0.00	8.67	7.16
6	0.00	7.16	10.75	18.84
7	10.75	7.16	3.00	18.84
8	13.75	7.16	8.67	18.84
9	0.00	26.00	10.75	4.00
10	10.75	26.00	3.00	4.00
11	13.75	26.00	8.67	4.00

Vertical reinforcement:

Reinforcement layers : 2

Segment	Bars	Spacing [in]	Ld [in]
1	16-#4	8.00	18.97
2	5-#4	8.00	18.97
3	13-#4	8.00	18.97
4	16-#4	8.00	18.97
5	13-#4	8.00	18.97

6	16-#4	8.00	18.97
7	5-#4	8.00	18.97
8	13-#4	8.00	18.97
9	16-#4	8.00	18.97
10	5-#4	8.00	18.97
11	13-#4	8.00	18.97

Vertical reinforcement

Segment	Condition	Pu [Kip]	Pu/Ag [Kip/in2]	0.06*f´c [Kip/in2]	Ratio
1	C (Top)	0.000	0.000	0.240	0.00
2	C (Top)	0.000	0.000	0.240	0.00
3	C (Top)	0.000	0.000	0.240	0.00
4	D13 (Max)	98.437	0.068	0.240	0.28
5	D12 (Max)	89.192	0.076	0.240	0.32
6	D7 (Max)	35.914	0.025	0.240	0.10
7	D15 (Max)	5.913	0.015	0.240	0.06
8	D7 (Max)	32.005	0.027	0.240	0.11
9	C (Top)	0.000	0.000	0.240	0.00
10	C (Top)	0.000	0.000	0.240	0.00
11	C (Top)	0.000	0.000	0.240	0.00

Intermediate results for axial-bending

Segment	Condition	Ase [in2]	a [in]	c [in]	d [in]	ϕ	Kb [Kip]
1	C (Top)	3.20	0.44	0.52	9.00	0.90	3678576.00
2	C (Top)	1.00	0.49	0.58	9.00	0.90	1026579.00
3	C (Top)	2.60	0.44	0.52	9.00	0.90	2966814.00
4	D22 (Bottom)	3.59	0.52	0.62	9.00	0.90	5441.68
5	D22 (Bottom)	2.94	0.53	0.63	9.00	0.90	4388.78
6	D22 (Max)	3.37	0.48	0.56	9.00	0.90	5441.68
7	D22 (Max)	1.03	0.52	0.61	9.00	0.90	1518.61
8	D22 (Max)	2.75	0.48	0.57	9.00	0.90	4388.78
9	C (Top)	3.20	0.44	0.52	9.00	0.90	229911.00
10	C (Top)	1.00	0.49	0.58	9.00	0.90	64161.20
11	C (Top)	2.60	0.44	0.52	9.00	0.90	185425.90

Inertias

Segment	Condition	Ig [in4]	Icr [in4]	Ie [in4]
1	C (Top)	15306.15	1859.17	15306.15
2	C (Top)	4271.48	573.07	4271.48
3	C (Top)	12344.59	1509.29	12344.59
4	D22 (Bottom)	15306.15	2040.93	15306.15
5	D22 (Bottom)	12344.59	1666.20	12344.59
6	D22 (Max)	15306.15	1940.48	15306.15
7	D22 (Max)	4271.48	588.17	4271.48
8	D22 (Max)	12344.59	1578.36	12344.59
9	C (Top)	15306.15	1859.17	15306.15
10	C (Top)	4271.48	573.07	4271.48
11	C (Top)	12344.59	1509.29	12344.59

Deflection

Segment	Condition	Δu [in]
1		0.000
2		0.000
3		0.000
4	D23 (Max)	-0.202
5	D23 (Max)	-0.207
6	D23 (Max)	0.116
7	D23 (Max)	0.100
8	D23 (Max)	0.118
9		0.000
10		0.000
11		0.000

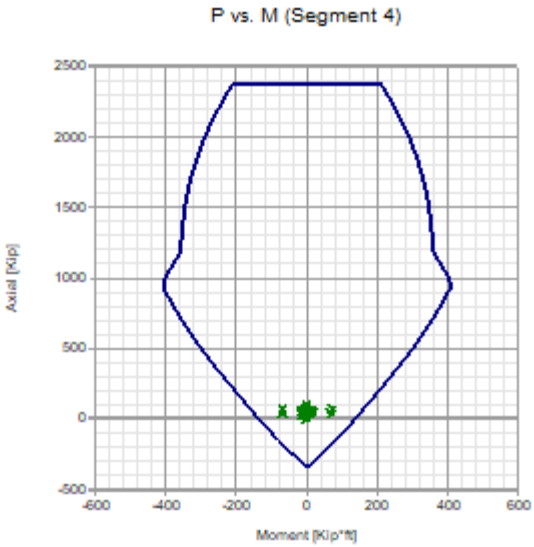
Combined axial flexure

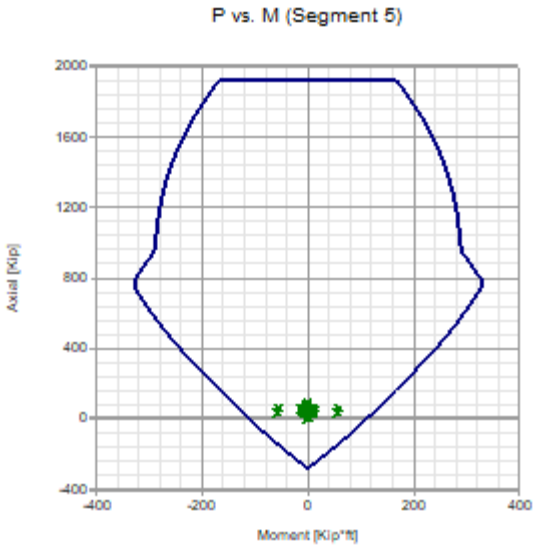
Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mu [Kip*ft]	ϕ*Mn [Kip*ft]	Mu/ϕ*Mn
1	C (Top)	0.00	0.00	0.00	137.06	0.00
2	C (Top)	0.00	0.00	0.00	42.11	0.00
3	C (Top)	0.00	0.00	0.00	111.23	0.00
4	D22 (Bottom)	37.58	68.81	69.45	149.72	0.46
5	D22 (Bottom)	32.58	56.98	57.55	122.21	0.47
6	D22 (Max)	16.59	-40.21	-40.38	142.65	0.28
7	D22 (Max)	3.20	-9.70	-9.73	43.18	0.23
8	D22 (Max)	14.13	-32.81	-32.95	115.99	0.28
9	C (Top)	0.00	0.00	0.00	137.06	0.00
10	C (Top)	0.00	0.00	0.00	42.11	0.00
11	C (Top)	0.00	0.00	0.00	111.23	0.00

Cracking moment

Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mcr [Kip*ft]	ϕ*Mn [Kip*ft]	Mcr/ϕ*Mn
1	C (Top)	0.00	0.00	107.56	137.06	0.78
2	C (Top)	0.00	0.00	30.02	42.11	0.71
3	C (Top)	0.00	0.00	86.75	111.23	0.78
4	D20 (Top)	0.69	0.04	107.56	137.29	0.78
5	D21 (Top)	-2.77	0.03	86.75	110.30	0.79
6	D20 (Max)	-10.90	-0.89	107.56	133.39	0.81
7	D21 (Max)	-0.57	-0.25	30.02	41.92	0.72
8	D21 (Top)	-10.49	-0.72	86.75	107.70	0.81
9	C (Top)	0.00	0.00	107.56	137.06	0.78
10	C (Top)	0.00	0.00	30.02	42.11	0.71
11	C (Top)	0.00	0.00	86.75	111.23	0.78

Interaction diagrams, P vs. M:





Axial compression

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	2383.44	0.00
2	C (Top)	0.00	664.77	0.00
3	C (Top)	0.00	1922.20	0.00
4	D13 (Bottom)	98.44	2383.44	0.04
5	D12 (Max)	89.19	1922.20	0.05
6	D13 (Bottom)	67.07	2383.44	0.03
7	D12 (Bottom)	12.16	664.77	0.02
8	D12 (Bottom)	57.94	1922.20	0.03
9	C (Top)	0.00	2383.44	0.00
10	C (Top)	0.00	664.77	0.00
11	C (Top)	0.00	1922.20	0.00

Axial tension

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	345.60	0.00
2	C (Top)	0.00	108.00	0.00
3	C (Top)	0.00	280.80	0.00
4	C (Top)	0.00	345.60	0.00
5	D21 (Top)	2.77	280.80	0.01
6	D20 (Max)	10.90	345.60	0.03
7	D21 (Top)	0.57	108.00	0.01
8	D21 (Max)	10.49	280.80	0.04
9	C (Top)	0.00	345.60	0.00
10	C (Top)	0.00	108.00	0.00
11	C (Top)	0.00	280.80	0.00

Shear

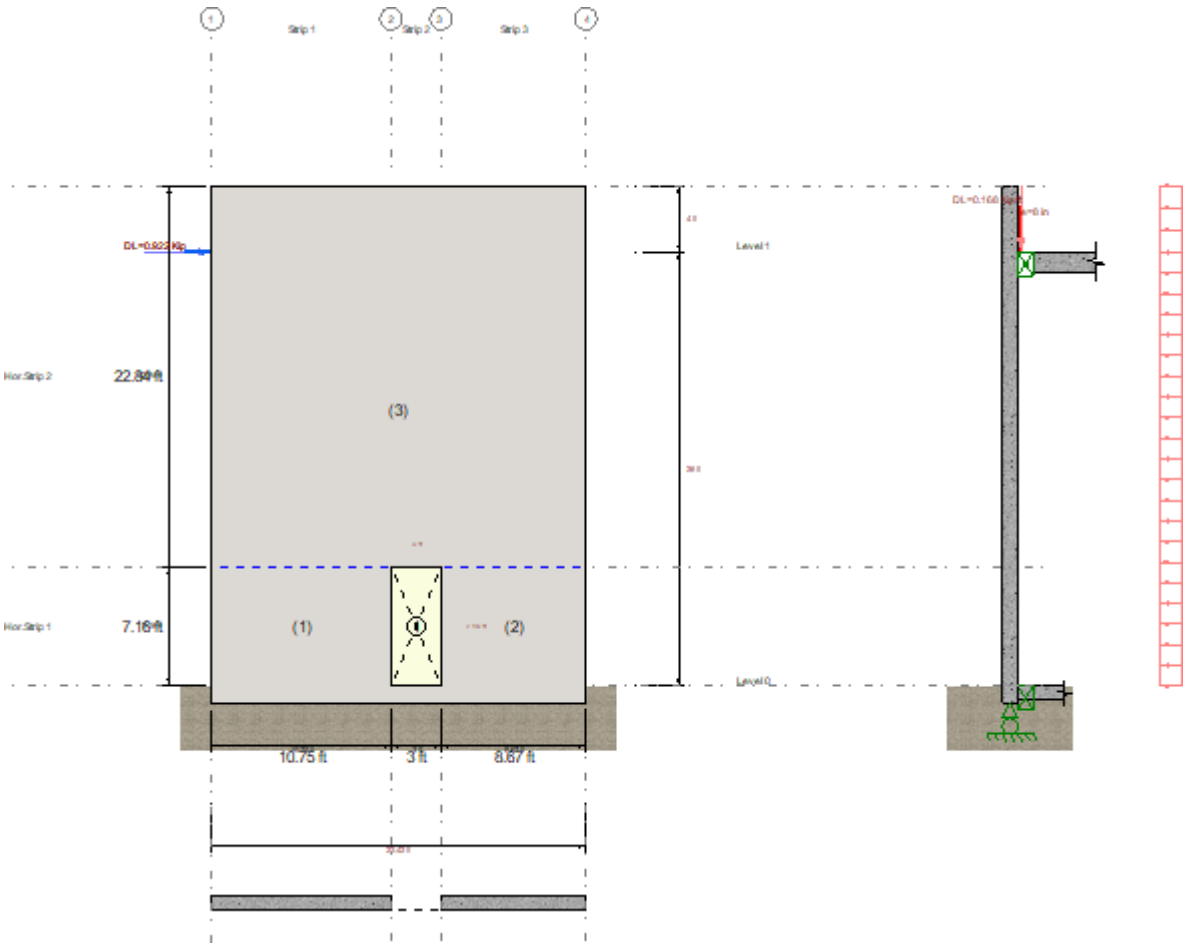
Segment	Condition	Vu [Kip]	ϕ*Vn [Kip]	Vu/ϕ*Vn
1	C (Top)	0.000	110.142	0.00
2	C (Top)	0.000	30.737	0.00
3	C (Top)	0.000	88.831	0.00
4	D14 (Bottom)	14.234	110.142	0.13
5	D14 (Bottom)	11.795	88.831	0.13
6	D15 (Top)	9.034	110.142	0.08
7	D15 (Top)	2.358	30.737	0.08
8	D15 (Top)	7.326	88.831	0.08
9	C (Top)	0.000	110.142	0.00
10	C (Top)	0.000	30.737	0.00
11	C (Top)	0.000	88.831	0.00

Deflection

Segment	Condition	Δs [in]	Δmax [in]	Δs/Δmax
1	S1 (Top)	0.000	0.080	0.00
2	S1 (Top)	0.000	0.080	0.00
3	S1 (Top)	0.000	0.080	0.00
4	S13 (Max)	0.108	2.080	0.05
5	S13 (Max)	0.111	2.080	0.05
6	S13 (Max)	0.063	2.080	0.03
7	S13 (Max)	0.055	2.080	0.03
8	S13 (Max)	0.064	2.080	0.03
9	S1 (Top)	0.000	0.320	0.00
10	S1 (Top)	0.000	0.320	0.00
11	S1 (Top)	0.000	0.320	0.00

SHEAR WALL DESIGN:

Status : OK



Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]	Classification
1	0.00	0.00	10.75	7.16	Shear wall
2	13.75	0.00	8.67	7.16	Shear wall
3	0.00	7.16	22.42	18.84	Shear wall

Reinforcement:

Reinforcement layers : 2

	Vertical reinforcement			Horizontal reinforcement		
Segment	**Bars**	**Spacing [in]**	**Ld [in]**	**Bars**	**Spacing [in]**	**Ld [in]**
1	16-#4	8.00	18.97	5-#4	18.00	24.67
2	13-#4	8.00	18.97	5-#4	18.00	24.67
3	16-#4	8.00	18.97	13-#4	18.00	24.67
	5-#4	8.00	18.97	13-#4	18.00	24.67
	13-#4	8.00	18.97	13-#4	18.00	24.67

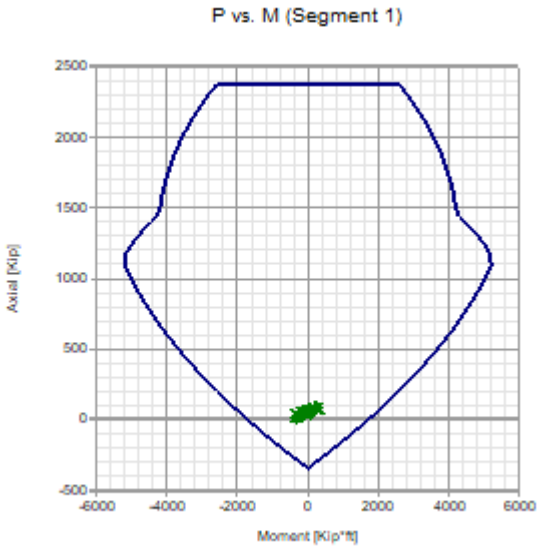
Intermediate results for axial-bending

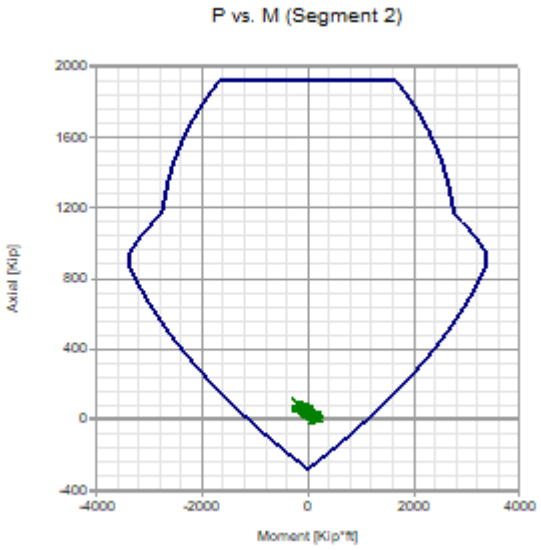
Segment	Condition	c [in]	d [in]
1	D20 (Bottom)	11.31	103.20
2	D21 (Bottom)	9.05	83.23
3	D20 (Bottom)	25.54	215.23

Combined axial flexure

Segment	Condition	Pu [Kip]	Mu [Kip*ft]	ϕ*Mn [Kip*ft]	Mu/ϕ*Mn
1	D20 (Bottom)	8.64	-360.74	1750.19	0.21
2	D21 (Bottom)	3.64	198.63	1135.75	0.17
3	D20 (Bottom)	55.76	-679.44	8118.83	0.08

Interaction diagrams, P vs. M:





Axial compression

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	D13 (Bottom)	98.44	2383.44	0.04
2	D12 (Bottom)	89.19	1922.20	0.05
3	C (Bottom)	105.93	4970.41	0.02

Axial tension

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	345.60	0.00
2	D21 (Top)	2.77	280.80	0.01
3	C (Top)	0.00	734.40	0.00

Shear

Segment	Condition	Vu [Kip]	ϕ*Vn [Kip]	Vu/ϕ*Vn
1	D20 (Bottom)	20.524	197.805	0.10
2	D12 (Bottom)	16.179	179.425	0.09
3	D12 (Top)	36.657	597.605	0.06

STABILITY RESULTS:

Status : Warnings in design
- The overturning safety factor is smaller than the allowable value

Global stability:

Safety factor : 1

Condition	Position	RM [Kip*ft]	OTM [Kip*ft]	FS
S28	Left corner	-539.30	644.28	0.84
S27	Right corner	530.80	-655.79	0.81

Notes:

* Pu = Axial load
* Pn = Nominal axial load
* Mua = Moment at section
* Mu = Magnified moment at section
* Mcr = Cracking moment at section
* Mn = Maximum nominal moment
* Vu = Design shear force
* Vn = Nominal shear force

RAM® Elements
CONNECT Edition

Current Date: 5/11/2022 6:37 AM
Units system: English
File name: Z:\Jenh Group\OneDrive - JENH Group\Jenh Group\01 Design\01 Jenh Group Projects\2021\2021-057 GST Expansion\Calcs\Ram element\Wall Line J (9-12).tup

Design Results

Tilt-Up Wall

GENERAL INFORMATION:

Global status : Warnings in design

Design code	:	ACI 318-14

Geometry:

Total height	:	31.00 [ft]
Reveal size	:	0.75 [in]
Total length	:	22.42 [ft]
Base support type	:	Continuous
Wall bottom restraint	:	Pinned

Materials:

Material	:	C 4-60
Steel tension strength (Fy)	:	60 [Kip/in2]
Concrete compressive strength (fc)	:	4 [Kip/in2]
Steel elasticity modulus (Es)	:	29000 [Kip/in2]
Concrete modulus of elasticity (E)	:	3605 [Kip/in2]
Concrete unit weight	:	0.149818 [Kip/ft3]

Number of stories: 2

Story	Story height [ft]	Wall thickness [in]
1	14.00	9.25
2	12.00	11.25

Openings:

Reference	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
Lower left	10.75	0.00	3.00	7.16

Load conditions:

ID	Comb.	Category	Description
DL	No	DL	Dead Load
RLL	No	LLR	Roof Live Load
FLL	No	LL	Floor Live Load
Wx	No	WIND	Wind In Plane
Wz	No	WIND	Wind out of Plane
Ex	No	EQ	Seismic In Plane
Ez	No	EQ	Seismic Out of Plane
C	Yes		1.4DL
D2	Yes		1.2DL+0.5RLL+1.6FLL
D3	Yes		1.2DL+1.6RLL+0.5FLL

D4	Yes	1.2DL+1.6RLL+0.5Wx
D5	Yes	1.2DL+1.6RLL-0.5Wx
D6	Yes	1.2DL+1.6RLL+0.5Wz
D7	Yes	1.2DL+1.6RLL-0.5Wz
D8	Yes	1.2DL+0.5RLL+0.5FLL+Wx
D9	Yes	1.2DL+0.5RLL+0.5FLL-Wx
D10	Yes	1.2DL+0.5RLL+0.5FLL+Wz
D11	Yes	1.2DL+0.5RLL+0.5FLL-Wz
D12	Yes	1.363DL+0.5FLL+Ex
D13	Yes	1.363DL+0.5FLL-Ex
D14	Yes	1.363DL+0.5FLL+Ez
D15	Yes	1.363DL+0.5FLL-Ez
D16	Yes	0.9DL+Wx
D17	Yes	0.9DL-Wx
D18	Yes	0.9DL+Wz
D19	Yes	0.9DL-Wz
D20	Yes	0.737DL+Ex
D21	Yes	0.737DL-Ex
D22	Yes	0.737DL+Ez
D23	Yes	0.737DL-Ez
S1	Yes	DL
S2	Yes	DL+RLL
S3	Yes	DL+FLL
S4	Yes	DL+0.75FLL
S5	Yes	DL+0.75RLL
S6	Yes	DL+0.75RLL+0.75FLL
S7	Yes	DL+0.6Wx
S8	Yes	DL-0.6Wx
S9	Yes	DL+0.6Wz
S10	Yes	DL-0.6Wz
S11	Yes	1.12DL+0.7Ex
S12	Yes	1.12DL-0.7Ex
S13	Yes	1.12DL+0.7Ez
S14	Yes	1.12DL-0.7Ez
S15	Yes	DL+0.75RLL+0.75FLL+0.45Wx
S16	Yes	DL+0.75RLL+0.75FLL-0.45Wx
S17	Yes	DL+0.75RLL+0.75FLL+0.45Wz
S18	Yes	DL+0.75RLL+0.75FLL-0.45Wz
S19	Yes	DL+0.75FLL+0.525Ex
S20	Yes	DL+0.75FLL-0.525Ex
S21	Yes	DL+0.75FLL+0.525Ez
S22	Yes	DL+0.75FLL-0.525Ez
S23	Yes	0.6DL+0.6Wx
S24	Yes	0.6DL-0.6Wx
S25	Yes	0.6DL+0.6Wz
S26	Yes	0.6DL-0.6Wz
S27	Yes	0.48DL+0.7Ex
S28	Yes	0.48DL-0.7Ex
S29	Yes	0.48DL+0.7Ez
S30	Yes	0.48DL-0.7Ez
S31	Yes	1.09DL+0.75RLL+0.75FLL+0.525Ex
S32	Yes	1.09DL+0.75RLL+0.75FLL-0.525Ex
S33	Yes	1.09DL+0.75RLL+0.75FLL+0.525Ez
S34	Yes	1.09DL+0.75RLL+0.75FLL-0.525Ez

Consider Self Weight:

Load condition : DL

Concentrated loads:

Story	Condition	Direction	Magnitude [Kip]	Eccentricity [in]	Distance [ft]
1	Ex	Horizontal	168.00	0.00	0.00
1	DL	Horizontal	0.92	0.00	0.00
1	FLL	Horizontal	1.32	0.00	0.00
1	Wx	Horizontal	0.01	0.00	0.00
2	Ex	Horizontal	40.70	0.00	0.00
2	DL	Horizontal	0.91	0.00	0.00
2	RLL	Horizontal	1.50	0.00	0.00
2	Wx	Horizontal	8.11	0.00	0.00

In-plane seismic weight:

Load condition	Coefficient
Ez	0.28

Distributed loads:

Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
2	DL	Vertical	0.17	0.67
2	RLL	Vertical	0.24	0.67
1	DL	Vertical	0.14	0.67
1	FLL	Vertical	0.78	0.67

Out-of-plane pressure loads:

Story	Condition	Magnitude [Kip/ft2]
1	Wz	0.02

Out-of-plane parapet pressure loads:

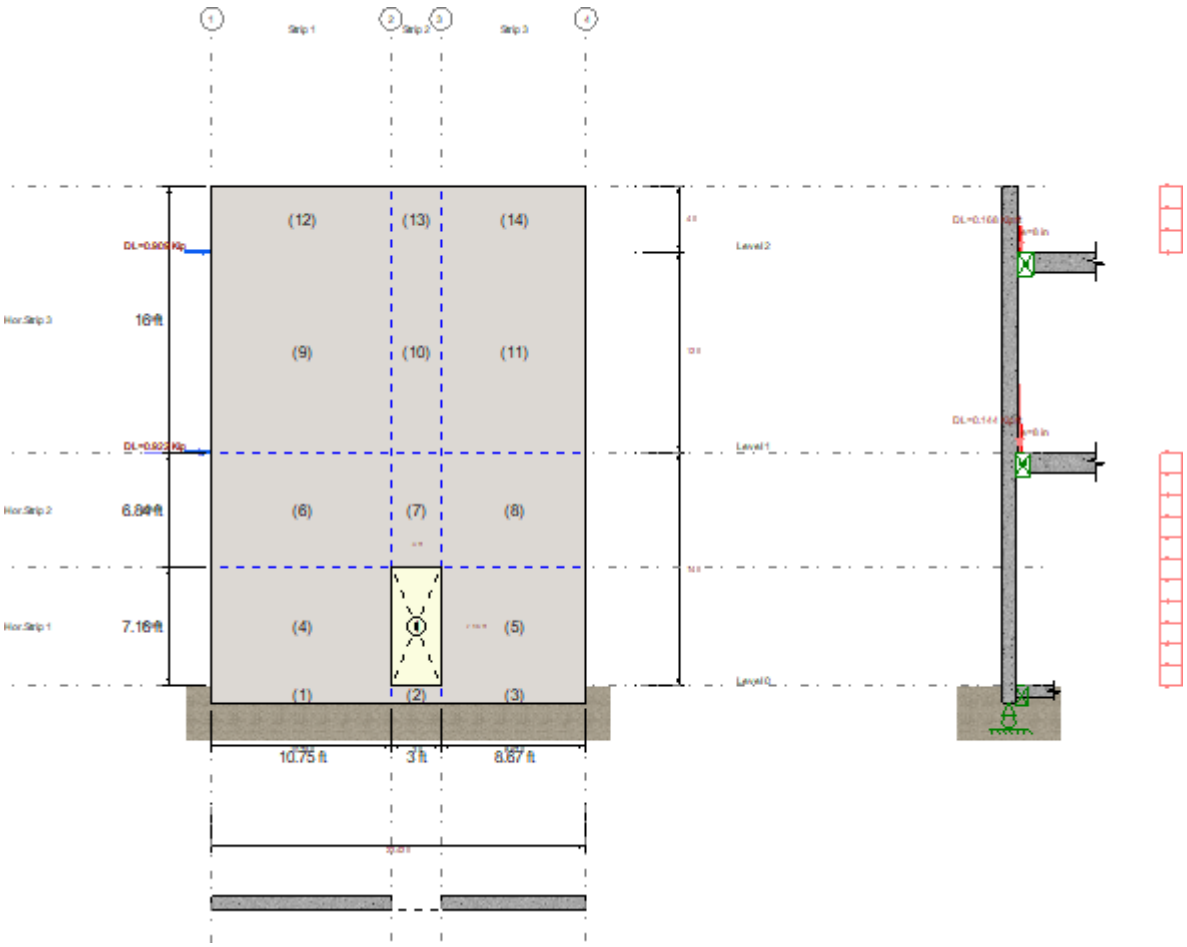
Condition	Magnitude [Kip/ft2]
Wz	0.02

Out-of-plane seismic weight:

Load condition	Coefficient
Ez	0.56

TILT-UP WALLS DESIGN:

Status : OK



Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	-1.00	10.75	1.00
2	10.75	-1.00	3.00	1.00
3	13.75	-1.00	8.67	1.00
4	0.00	0.00	10.75	7.16
5	13.75	0.00	8.67	7.16
6	0.00	7.16	10.75	6.84
7	10.75	7.16	3.00	6.84
8	13.75	7.16	8.67	6.84
9	0.00	14.00	10.75	12.00
10	10.75	14.00	3.00	12.00
11	13.75	14.00	8.67	12.00
12	0.00	26.00	10.75	4.00
13	10.75	26.00	3.00	4.00
14	13.75	26.00	8.67	4.00

Vertical reinforcement:

Reinforcement layers : 2

Segment	Bars	Spacing [in]	Ld [in]
1	16-#4	8.00	18.97
2	3-#4	16.00	18.97
3	13-#4	8.00	18.97
4	16-#4	8.00	18.97
5	13-#4	8.00	18.97
6	16-#4	8.00	18.97
7	3-#4	16.00	18.97
8	13-#4	8.00	18.97
9	16-#4	8.00	18.97
10	5-#4	8.00	18.97
11	13-#4	8.00	18.97
12	16-#4	8.00	18.97
13	5-#4	8.00	18.97
14	13-#4	8.00	18.97

Vertical reinforcement

Segment	Condition	Pu [Kip]	Pu/Ag [Kip/in2]	0.06*f´c [Kip/in2]	Ratio
1	C (Top)	0.000	0.000	0.240	0.00
2	C (Top)	0.000	0.000	0.240	0.00
3	C (Top)	0.000	0.000	0.240	0.00
4	D13 (Max)	188.373	0.158	0.240	0.66
5	D12 (Max)	181.175	0.188	0.240	0.78
6	D13 (Max)	120.362	0.101	0.240	0.42
7	D12 (Max)	9.932	0.030	0.240	0.12
8	D12 (Max)	112.703	0.117	0.240	0.49
9	D13 (Max)	65.675	0.045	0.240	0.19
10	D12 (Max)	11.758	0.029	0.240	0.12
11	D12 (Max)	57.123	0.049	0.240	0.20
12	C (Top)	0.000	0.000	0.240	0.00
13	C (Top)	0.000	0.000	0.240	0.00
14	C (Top)	0.000	0.000	0.240	0.00

Intermediate results for axial-bending

Segment	Condition	Ase [in2]	a [in]	c [in]	d [in]	ϕ	Kb [Kip]
1	C (Top)	3.20	0.44	0.52	7.00	0.90	2044783.00
2	C (Top)	0.60	0.29	0.35	7.00	0.90	570637.20
3	C (Top)	2.60	0.44	0.52	7.00	0.90	1649142.00
4	D22 (Bottom)	3.59	0.52	0.61	7.00	0.90	10432.57
5	D22 (Bottom)	2.95	0.53	0.62	7.00	0.90	8413.99
6	D15 (Top)	3.67	0.53	0.63	7.00	0.90	10432.57
7	D15 (Top)	0.68	0.35	0.42	7.00	0.90	2911.41
8	D15 (Top)	3.01	0.55	0.64	7.00	0.90	8413.99
9	D14 (Bottom)	3.57	0.52	0.61	9.00	0.90	25545.66
10	D14 (Bottom)	1.09	0.56	0.66	9.00	0.90	7129.02
11	D14 (Bottom)	2.91	0.52	0.62	9.00	0.90	20602.87
12	C (Top)	3.20	0.44	0.52	7.00	0.90	127799.00
13	C (Top)	1.00	0.49	0.58	7.00	0.90	35664.83
14	C (Top)	2.60	0.44	0.52	7.00	0.90	103071.30

Inertias

Segment	Condition	Ig [in4]	Icr [in4]	Ie [in4]
1	C (Top)	8508.12	1088.46	8508.12
2	C (Top)	2374.36	214.20	2374.36
3	C (Top)	6861.90	883.41	6861.90
4	D22 (Bottom)	8508.12	1189.16	8508.12
5	D22 (Bottom)	6861.90	972.73	6861.90
6	D15 (Top)	8508.12	1207.97	8508.12
7	D15 (Top)	2374.36	237.76	2374.36
8	D15 (Top)	6861.90	988.37	6861.90
9	D14 (Bottom)	15306.15	2030.07	15306.15
10	D14 (Bottom)	4271.48	614.21	4271.48
11	D14 (Bottom)	12344.59	1652.49	12344.59
12	C (Top)	8508.12	1088.46	8508.12
13	C (Top)	2374.36	334.20	2374.36
14	C (Top)	6861.90	883.41	6861.90

Deflection

Segment	Condition	Δu [in]
1		0.000
2		0.000
3		0.000
4	D23 (Max)	0.010
5	D23 (Max)	0.010
6	D23 (Max)	-0.019
7	D23 (Max)	-0.017
8	D23 (Max)	-0.019
9	D23 (Max)	0.004
10	D23 (Max)	0.004
11	D23 (Max)	0.004
12		0.000
13		0.000
14		0.000

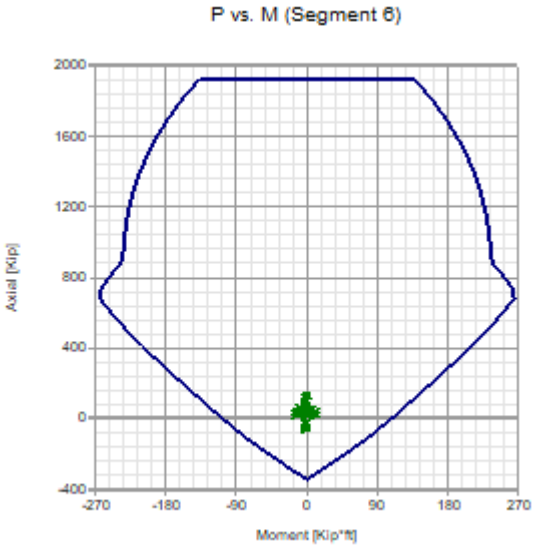
Combined axial flexure

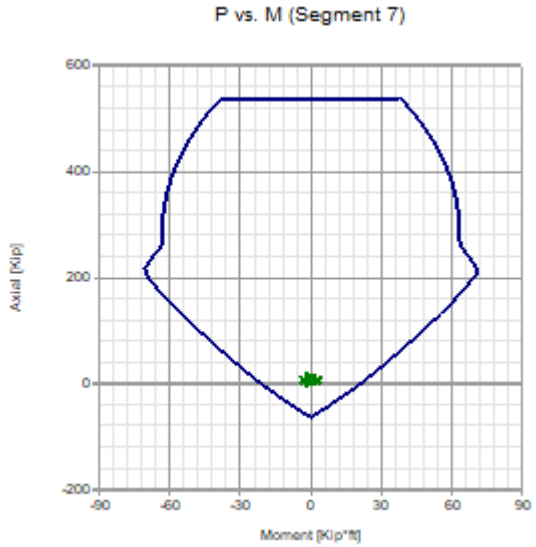
Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mu [Kip*ft]	ϕ*Mn [Kip*ft]	Mu/ϕ*Mn
1	C (Top)	0.00	0.00	0.00	107.86	0.00
2	C (Top)	0.00	0.00	0.00	21.34	0.00
3	C (Top)	0.00	0.00	0.00	87.55	0.00
4	D22 (Bottom)	35.49	10.32	10.36	117.32	0.09
5	D22 (Bottom)	31.67	8.39	8.43	95.91	0.09
6	D15 (Top)	42.35	-13.35	-13.42	119.06	0.11
7	D15 (Top)	7.19	-3.35	-3.36	23.43	0.14
8	D15 (Top)	37.44	-10.80	-10.87	97.37	0.11
9	D14 (Bottom)	35.28	15.02	15.05	148.95	0.10
10	D14 (Bottom)	8.82	3.77	3.77	45.07	0.08
11	D14 (Bottom)	29.67	12.17	12.20	121.22	0.10
12	C (Top)	0.00	0.00	0.00	107.86	0.00
13	C (Top)	0.00	0.00	0.00	33.12	0.00
14	C (Top)	0.00	0.00	0.00	87.55	0.00

Cracking moment

Segment	Condition	Pu [Kip]	Mua [Kip*ft]	Mcr [Kip*ft]	ϕ*Mn [Kip*ft]	Mcr/ϕ*Mn
1	D23 (Bottom)	0.00	0.00	72.72	107.86	0.67
2	D23 (Bottom)	0.00	0.00	20.29	21.34	0.95
3	D23 (Bottom)	0.00	0.00	58.65	87.55	0.67
4	D20 (Top)	-89.35	-0.04	72.72	83.38	0.87
5	D21 (Top)	-91.90	-0.03	58.65	62.19	0.94
6	D20 (Max)	-57.37	-0.12	72.72	92.14	0.79
7	D21 (Max)	0.70	-0.04	20.29	21.56	0.94
8	D21 (Max)	-57.04	-0.10	58.65	71.93	0.82
9	D20 (Top)	-24.64	-0.89	107.56	128.76	0.84
10	D21 (Max)	-1.84	-0.25	30.02	41.49	0.72
11	D21 (Top)	-22.22	-0.71	86.75	103.75	0.84
12	D23 (Bottom)	0.00	0.00	72.72	107.86	0.67
13	C (Top)	0.00	0.00	20.29	33.12	0.61
14	D23 (Bottom)	0.00	0.00	58.65	87.55	0.67

Interaction diagrams, P vs. M:





Axial compression

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	1927.30	0.00
2	C (Top)	0.00	538.89	0.00
3	C (Top)	0.00	1554.32	0.00
4	D13 (Max)	188.37	1927.30	0.10
5	D12 (Bottom)	181.18	1554.32	0.12
6	D13 (Bottom)	131.91	1927.30	0.07
7	D12 (Bottom)	13.15	538.89	0.02
8	D12 (Bottom)	122.02	1554.32	0.08
9	D13 (Bottom)	65.68	2383.44	0.03
10	D12 (Bottom)	11.76	664.77	0.02
11	D12 (Max)	57.12	1922.20	0.03
12	C (Top)	0.00	1927.30	0.00
13	C (Top)	0.00	537.47	0.00

14	C (Top)	0.00	1554.32	0.00

Axial tension

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	C (Top)	0.00	345.60	0.00
2	C (Top)	0.00	64.80	0.00
3	C (Top)	0.00	280.80	0.00
4	D20 (Top)	89.35	345.60	0.26
5	D21 (Top)	91.90	280.80	0.33
6	D20 (Max)	57.37	345.60	0.17
7	C (Top)	0.00	64.80	0.00
8	D21 (Max)	57.04	280.80	0.20
9	D20 (Top)	24.64	345.60	0.07
10	D21 (Top)	1.84	108.00	0.02
11	D21 (Max)	22.22	280.80	0.08
12	C (Top)	0.00	345.60	0.00
13	C (Top)	0.00	108.00	0.00
14	C (Top)	0.00	280.80	0.00

Shear

Segment	Condition	Vu [Kip]	ϕ*Vn [Kip]	Vu/ϕ*Vn
1	C (Top)	0.000	85.666	0.00
2	C (Top)	0.000	23.907	0.00
3	C (Top)	0.000	69.091	0.00
4	D14 (Bottom)	4.955	85.666	0.06
5	D14 (Bottom)	4.022	69.091	0.06
6	D15 (Top)	5.195	85.666	0.06
7	D15 (Max)	1.156	23.907	0.05
8	D15 (Top)	4.203	69.091	0.06
9	D14 (Bottom)	5.919	110.142	0.05
10	D14 (Bottom)	1.616	30.737	0.05
11	D14 (Bottom)	4.779	88.831	0.05
12	C (Top)	0.000	85.666	0.00
13	C (Top)	0.000	23.907	0.00
14	C (Top)	0.000	69.091	0.00

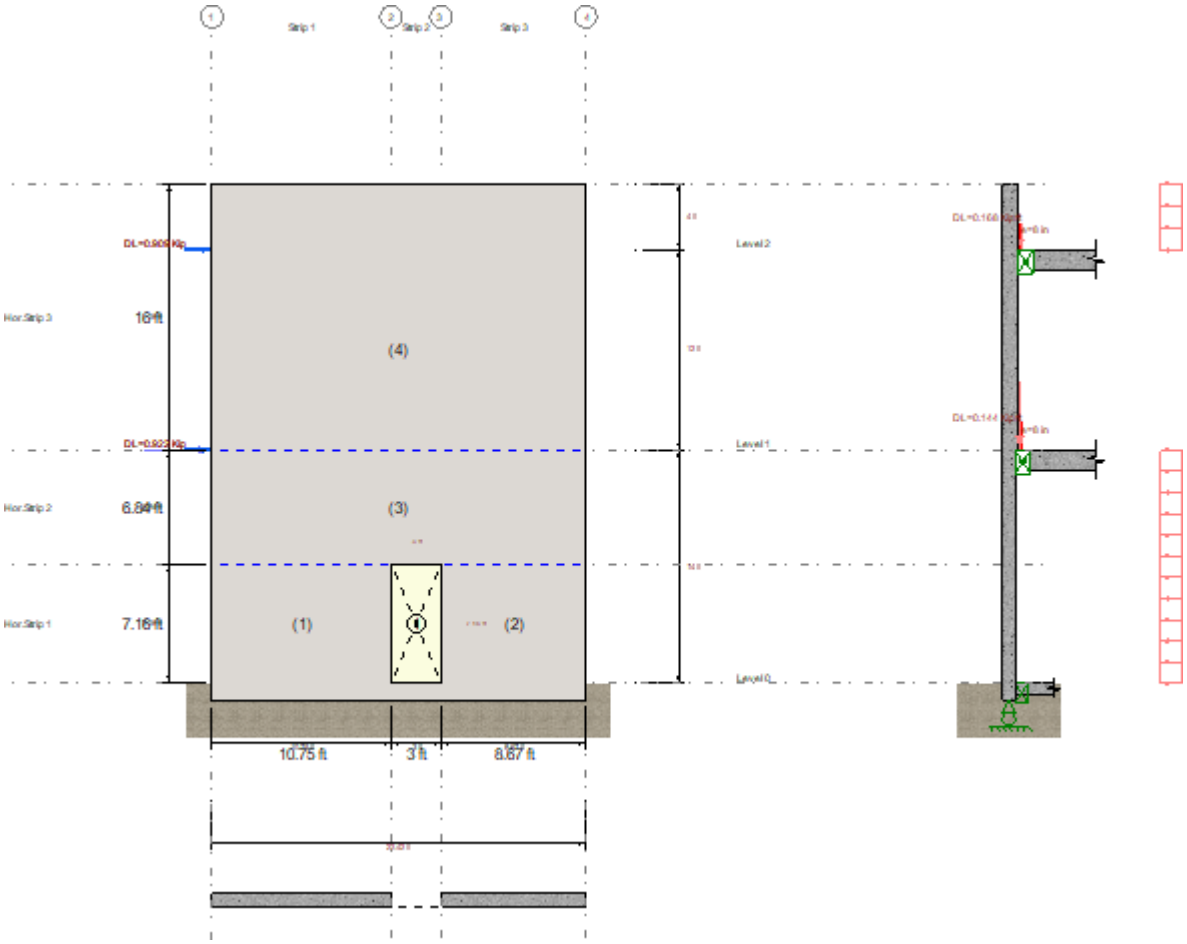
Deflection

Segment	Condition	Δs [in]	Δmax [in]	Δs/Δmax
1	S1 (Top)	0.000	0.080	0.00
2	S1 (Top)	0.000	0.080	0.00
3	S1 (Top)	0.000	0.080	0.00
4	S13 (Max)	0.005	1.120	0.00
5	S13 (Max)	0.005	1.120	0.00
6	S14 (Max)	0.010	1.120	0.01
7	S14 (Max)	0.009	1.120	0.01
8	S14 (Max)	0.010	1.120	0.01
9	S33 (Max)	0.005	0.960	0.00
10	S33 (Max)	0.004	0.960	0.00
11	S33 (Max)	0.005	0.960	0.00

12	S1 (Top)	0.000	0.320	0.00
13	S1 (Top)	0.000	0.320	0.00
14	S1 (Top)	0.000	0.320	0.00

SHEAR WALL DESIGN:

Status : OK



Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]	Classification
1	0.00	0.00	10.75	7.16	Shear wall
2	13.75	0.00	8.67	7.16	Shear wall
3	0.00	7.16	22.42	6.84	Shear wall
4	0.00	14.00	22.42	12.00	Shear wall

Reinforcement:

Reinforcement layers : 2

Segment	Vertical reinforcement Bars	Spacing [in]	Ld [in]	Horizontal reinforcement Bars	Spacing [in]	Ld [in]
1	16-#4	8.00	18.97	5-#4	18.00	24.67
2	13-#4	8.00	18.97	5-#4	18.00	24.67
3	16-#4	8.00	18.97	5-#4	18.00	24.67
	3-#4	16.00	18.97	5-#4	18.00	24.67
	13-#4	8.00	18.97	5-#4	18.00	24.67
4	16-#4	8.00	18.97	9-#4	16.00	24.67
	5-#4	8.00	18.97	9-#4	16.00	24.67
	13-#4	8.00	18.97	9-#4	16.00	24.67

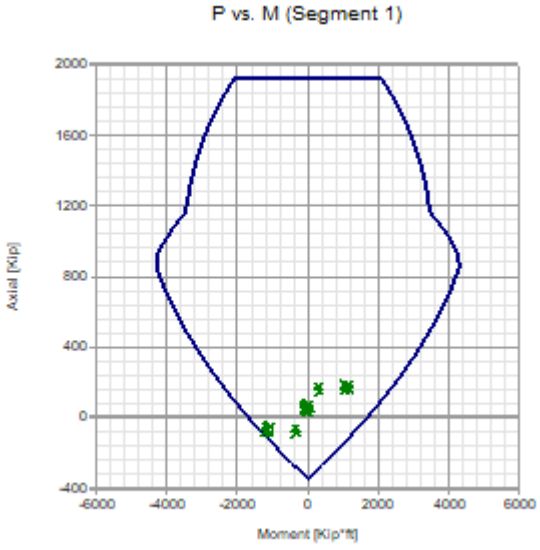
Intermediate results for axial-bending

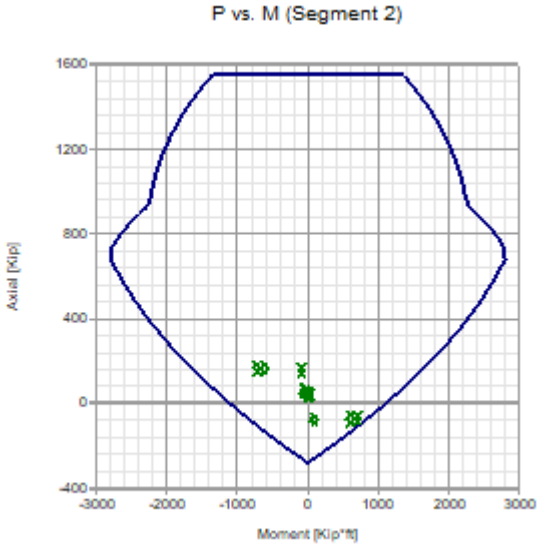
Segment	Condition	c [in]	d [in]
1	D20 (Bottom)	10.01	103.20
2	D21 (Bottom)	7.41	83.23
3	D20 (Bottom)	29.05	215.23
4	D20 (Bottom)	25.02	215.23

Combined axial flexure

Segment	Condition	Pu [Kip]	Mu [Kip*ft]	ϕ*Mn [Kip*ft]	Mu/ϕ*Mn
1	D20 (Bottom)	-82.81	-1200.92	1308.34	0.92
2	D21 (Bottom)	-86.63	711.05	786.60	0.90
3	D20 (Bottom)	55.32	-1931.43	7506.99	0.26
4	D20 (Bottom)	39.89	-496.09	7966.43	0.06

Interaction diagrams, P vs. M:





Axial compression

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	D13 (Bottom)	188.37	1927.30	0.10
2	D12 (Bottom)	181.18	1554.32	0.12
3	D2 (Bottom)	120.75	4020.50	0.03
4	C (Bottom)	75.77	4970.41	0.02

Axial tension

Segment	Condition	Pu [Kip]	ϕ*Pn [Kip]	Pu/ϕ*Pn
1	D20 (Top)	89.35	345.60	0.26
2	D21 (Top)	91.90	280.80	0.33
3	C (Top)	0.00	691.20	0.00
4	C (Top)	0.00	734.40	0.00

Shear

Segment	Condition	Vu [Kip]	ϕ*Vn [Kip]	Vu/ϕ*Vn
1	D20 (Top)	121.783	239.224	0.51
2	D21 (Bottom)	86.389	183.601	0.47
3	D20 (Top)	210.049	533.218	0.39
4	D12 (Top)	41.939	624.509	0.07

STABILITY RESULTS:

Status : Warnings in design
- The overturning safety factor is smaller than the allowable value

Global stability:

Safety factor : 1

Condition	Position	RM [Kip*ft]	OTM [Kip*ft]	FS
S28	Left corner	-520.67	2387.14	0.22
S27	Right corner	505.61	-2404.68	0.21

Notes:

* Pu = Axial load
* Pn = Nominal axial load
* Mua = Moment at section
* Mu = Magnified moment at section
* Mcr = Cracking moment at section
* Mn = Maximum nominal moment
* Vu = Design shear force
* Vn = Nominal shear force