

STRUCTURAL CALCULATIONS:

PROJECT NO.:

18219

PROJECT NAME:

Patel Residence

PROJECT TYPE:

New Construction

PROJECT ADDRESS:

Lot 15, Ruby Hills
City of Pleasanton, CA 94566

ARCHITECT:

Arris Studio Architects
1306 Johnson Avenue
San Luis Obispo, CA 93401

PROJECT ENGINEER:

Thaddeus Holmes

DATE:

September 15, 2020

IN RESPONSE TO:

Plan Check Comments

REVIEWED

CITY OF PLEASANTON

BUILDING DIVISION

JOB COPY

PERMIT NO.: B20-1140

DATE: 12/09/2020

INITIALS: For:WC3 - LA



Job: [18219 - Patel Residence - Arris](#)

Load Sheet

ROOF LOADS

Typical Roof Live Loads	20.0 psf
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Typical Roof Dead Loads

Tile Roof	11.0 psf
1/2" Plywood	1.7 psf
Wood Framing	3.8 psf
Ceiling Framing	3.3 psf
10" Batt Insulation	0.8 psf
5/8" Gyp. Board Ceiling	2.8 psf
PV Solar System	3.0 psf
Misc. Mechanical	1.6 psf
Total Dead Load	28.0 psf

FLOOR LOADS

Typical Floor Live Loads	40.0 psf
Typical Live Loads @ Exterior Balconies	60.0 psf

Typical Floor Dead Loads

Tile Over Thinset	10.5 psf
3/4" Plywood	2.5 psf
Open Web Truss Framing	3.5 psf
10" Batt Insulation	0.8 psf
5/8" Gyp. Board Ceiling	2.8 psf
Misc. Loads	1.7 psf
Total Dead Load	22 psf

CEILING LOADS

Typical Ceiling Live Load	10.0 psf
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Typical Garage Dead Loads

Wood Framing	3.3 psf
10" Batt Insulation	0.8 psf
5/8" Gyp. Board Ceiling	2.8 psf
Misc. Loads	1.6 psf
Total Dead Load	8.5 psf

Job: 18219 - Patel Residence - Arris Studios

Wall Load Justification

Exterior Walls

7/8" Stucco	10.4 psf
15/32" Plywood	1.7 psf
6" Batt Insulation	0.5 psf
2x6 D.F. Framing	1.3 psf
5/8" Gyp. Board	2.8 psf
Misc. M-E-P	0.3 psf
Total	17.0 psf

Interior Walls

15/32" Plywood	1.7 psf
6" Batt Insulation	0.5 psf
2x6 D.F. Framing	1.3 psf
(2) Layers of 5/8" Gyp. Board	5.6 psf
Misc. M-E-P	0.3 psf
Total	9.4 psf

Seismic Partition LoadRoof Level

Wall Plate Height	12.0 ft
Total Exterior Wall Length	454.0 ft
Total Exterior Wall Area	5448.0 ft ²
Area Attributable to Seismic Loads	2724.0 ft ²
Total Interior Wall Length	294.0 ft
Total Interior Wall Area	3528.0 ft ²
Area Attributable to Seismic Loads	1764.0 ft ²
Seismic Wall Weight	62998.6 lbs
Total Square Footage	9500.0 ft ²
Seismic Load	6.6 psf

Floor Level

Wall Plate Height of Level Above	12.0 ft
Wall Plate Height of Level Below	12.0 ft
Total Exterior Wall Length	454.0 ft
Total Exterior Wall Area	5448.0 ft ²
Area Attributable to Seismic Loads	5448.0 ft ²
Total Interior Wall Length	454.0 ft
Total Interior Wall Area	5448.0 ft ²
Area Attributable to Seismic Loads	5448.0 ft ²
Seismic Wall Weight	144045.1 lbs
Total Square Footage	9500.0 ft ²
Seismic Load	15.2 psf

Job: 18219 - Patel Residence - Arris
Beam/Joist Input Data

Description:		D	L _R	L	
1r = 1 ft of roof trib	Roof	28	20	0	psf
2f = 2 ft of floor trib	Floor	21.8	0	40	psf
3c = 3 ft of ceiling trib	Ceiling	8.5	0	10	psf
4d = 4 ft of deck trib	Deck	11	0	60	psf
5w = 5 ft of wall trib	Wall	10	0	0	psf

 $S_{DS} = 1.530$
 $\Omega_0 = 2.5$
ROOF BEAMS

adVanceBeam 2.0

Member	Trib (ft)	SPAN INFO		D (plf)	L _R (plf)	L (plf)	Span/Load Type		BEAM DESIGN			
		L/X _a (ft)	L _u /X _b (ft)									
RB 1	15.5 r			434	310	0			GLB 5-1/2" x 21"			
	0.0 f			0	0	0			Force	Loc(ft)	%Max	
	0.0 c			0	0	0		Bending	-71kft	13.5	91%	
	0.0 d			0	0	0		Shear	-10.6k	0	41%	
	4.0 w			40	0	0						
	Spans							REACTIONS	Loc(ft)	M(k*ft)	Rmin	Rmax
	1	27.0	27.0	474	310	0	Simple Span	Roller 1	0	---	3,839#	10.6k
								Roller 2	27	---	3,839#	10.6k
Additional Loads							DEFLECTIONS	I / x	Defl(in)	Loc(ft)	%Max	
								Max(ASD)	---	1.23	13.5	---
								L 360	668	0.49	13.5	54%
								E W S 360	---	0.00	0.0	---
								D+L 240	264	1.23	13.5	91%
RB 2	10.0 r			280	200	0			GLB 5-1/2" x 13-1/2"			
	0.0 f			0	0	0			Force	Loc(ft)	%Max	
	0.0 c			0	0	0		Bending	-25kft	10.0	62%	
	0.0 d			0	0	0		Shear	4,900#	20	30%	
	1.0 w			10	0	0						
	Spans							REACTIONS	Loc(ft)	M(k*ft)	Rmin	Rmax
	1	20.0	20.0	290	200	0	Simple Span	Roller 1	0	---	1,740#	4,900#
								Roller 2	20	---	1,740#	4,900#
Additional Loads							DEFLECTIONS	I / x	Defl(in)	Loc(ft)	%Max	
								Max(ASD)	---	0.87	10.0	---
								L 360	677	0.35	10.0	53%
								E W S 360	---	0.00	0.0	---
								D+L 240	276	0.87	10.0	87%
RB 3 worst Case Hdr.	15.5 r			434	310	0			6x8 D.F. #1			
	0.0 f			0	0	0			Force	Loc(ft)	%Max	
	0.0 c			0	0	0		Bending	-4.1kft	3.3	65%	
	0.0 d			0	0	0		Shear	-2,548#	0	44%	
	4.0 w			40	0	0						
	Spans							REACTIONS	Loc(ft)	M(k*ft)	Rmin	Rmax
	1	6.5	6.5	474	310	0	Simple Span	Roller 1	0	---	924#	2,548#
								Roller 2	7	---	924#	2,548#
	Additional Loads							DEFLECTIONS	I / x	Defl(in)	Loc(ft)	%Max
								Max(ASD)	---	0.10	3.25	---
								L 360	1938	0.04	3.25	19%
								E W S 360	---	0.00	0.0	---
								D+L 240	766	0.10	3.25	31%

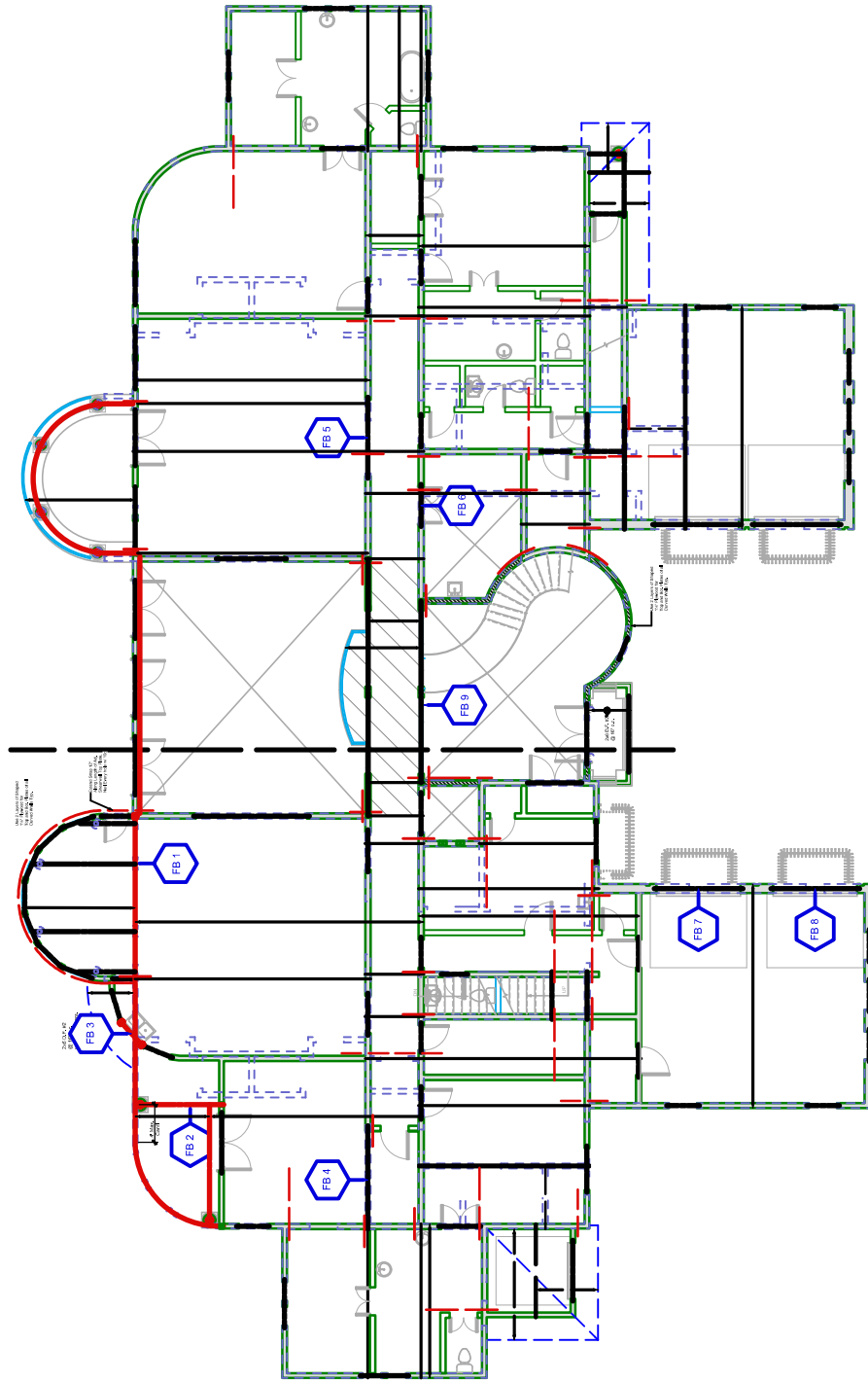
Job: 18219 - Patel Residence - Arris
Beam/Joist Input Data

Description:		D	L _R	L	
1r = 1 ft of roof trib	Roof	28	20	0	psf
2f = 2 ft of floor trib	Floor	21.8	0	40	psf
3c = 3 ft of ceiling trib	Ceiling	8.5	0	10	psf
4d = 4 ft of deck trib	Deck	11	0	60	psf
5w = 5 ft of wall trib	Wall	10	0	0	psf

 $S_{DS} = 1.530$
 $\Omega_0 = 2.5$
ROOF BEAMS
adVanceBeam 2.0

Member	Trib (ft)	SPAN INFO		D (plf)	L _R (plf)	L (plf)	Span/Load Type	BEAM DESIGN			
		L/X _a (ft)	L _u /X _b (ft)								
RB 4	17.3 r			483	345	0		HSS8X4X1/8			
	0.0 f			0	0	0		Force	Loc(ft)	%Max	
	0.0 c			0	0	0		Bending	-5.1kft	3.6	35%
	0.0 d			0	0	0		Shear	2,834#	7.25	10%
	4.0 w			40	0	0					
I								REACTIONS		Loc(ft)	R _{min}
	1	7.3	7.3	523	345	0	Simple Span	Roller	1	0	950#
								Roller	2	7	950#
Additional Loads											
								DEFLECTIONS		I / x	Defl(in)
								Max(ASD)		---	0.07
								L 360	2694	0.03	3.63
								E W S 360	---	0.00	0.0
								D+L 240	1189	0.07	3.63

[illegible]

Floor Framing Layout

Job: **18219 - Patel Residence - Arris**

Beam/Joist Input Data

Description:		D	L _R	L	L ₂	S	W	E	
1r = 1 ft of roof trib	Roof	28	20	0	0	0	0	0	psf
2f = 2 ft of floor trib	Floor	21.8	0	40	0	0	0	0	psf
3c = 3 ft of ceiling trib	Ceiling	8.5	0	10	0	0	0	0	psf
4d = 4 ft of deck trib	Deck	11	0	60	0	0	0	0	psf
5w = 5 ft of wall trib	Wall	10	0	0	0	0	0	0	psf

S_{DS} = 1.530

Q_o = 2.5

FLOOR BEAMS

adVanceBeam 2.0

Member	Trib (ft)	SPAN INFO		D	L _R	L	L ₂	S	W	E	Span/Load Type		BEAM DESIGN				
		L/X _a (ft)	L _u /X _b (ft)	(plf)	(plf)	(plf)	(plf)	(plf)	(plf)	(plf)							
FB 1	19.5 r			546	390	0	0	0	0	0			W14X43				
	17.9 f			390	0	715	0	0	0	0				Force	Loc(ft)	%Max	
	0.0 c			0	0	0	0	0	0	0			Bending	123kft	11.3	88%	
	0.0 d			0	0	0	0	0	0	0			Shear	-31.7k	11.250001	42%	
	1.0 w			10	0	0	0	0	0	0			Ω InvEW Skip Loading Considered				
	Spans											REACTIONS	Loc(ft)	M(k*ft)	Rmin	Rmax	
	1	4.3	4.3	946	390	715	0	0	0	0	Cantilever	Free	1	0	---	0	0
	2	7.0	7.0	946	390	715	0	0	0	0	Simple Span	Roller	2	4	---	-31.4k	43.5k
	3	23.5	23.5	946	390	715	0	0	0	0	Simple Span	Roller	3	11	0	-24.2k	59.1k
												Roller	4	35	0	1,553#	16.9k
Additional Loads											DEFLECTIONS	I / x	Defl _(in)	Loc(ft)	%Max		
SW 31	1	0.3								10.6k	Point Load	Max(ASD)	---	0.58	23.78	---	
SW 31	2	17.5								-10,582#	Point Load	L 360	821	0.34	23.78	44%	
Girder T.	3	4.3		2.9k	2.1k						Point Load	E W S	---	0.00	0.0	---	
Curve	4	0.0		2.0k	800#	1.6k					Point Load	D+L 240	447	0.63	23.78	54%	
FB 2	0.0 r			0	0	0	0	0	0	0			W14X22				
	1.5 f			33	0	60	0	0	0	0				Force	Loc(ft)	%Max	
	0.0 c			0	0	0	0	0	0	0			Bending	44kft	8.5	53%	
	0.0 d			0	0	0	0	0	0	0			Shear	-43.6k	8.500001	77%	
	1.0 w			10	0	0	0	0	0	0			Ω InvEW Skip Loading Considered				
	Spans											REACTIONS	Loc(ft)	M(k*ft)	Rmin	Rmax	
	1	8.5	8.5	43	0	60	0	0	0	0	Simple Span	Roller	1	0	---	-4,902#	3,759#
	2	1.0	1.0	43	0	60	0	0	0	0	Cantilever	Roller	2	9	---	-35.0k	48.9k
												Free	3	10	0	0	0
	Additional Loads											DEFLECTIONS	I / x	Defl _(in)	Loc(ft)	%Max	
FB 1	1	9.5		7.6k	4.0k	3.7k	0	0	0	19.6k	Point Load	Max(ASD)	---	-0.06	4.82	---	
												L 360	3292	-0.01	9.5	11%	
											E W S	---	0.00	0.0	---		
											D+L 240	1692	-0.02	9.5	14%		
FB 3	5.0 r			140	100	0	0	0	0	0			W8X15				
	10.0 f			218	0	400	0	0	0	0				Force	Loc(ft)	%Max	
	0.0 c			0	0	0	0	0	0	0			Bending	-31kft	1.5	90%	
	0.0 d			0	0	0	0	0	0	0			Shear	-21.0k	0	59%	
	2.0 w			20	0	0	0	0	0	0			Ω InvEW Skip Loading Considered				
	Spans											REACTIONS	Loc(ft)	M(k*ft)	Rmin	Rmax	
	1	3.0	3.0	378	100	400	0	0	0	0	Simple Span	Roller	1	0	---	4,693#	21.0k
												Roller	2	3	---	4,693#	21.0k
	Additional Loads											DEFLECTIONS	I / x	Defl _(in)	Loc(ft)	%Max	
	FB 1	1	1.5		21.2k	8.8k	16.0k				-18,501#	Point Load	Max(ASD)	---	0.03	1.5	---
												L 360	2009	0.02	1.5	18%	
											E W S	---	-2787	-0.01	1.5	---	
											D+L 240	1084	0.03	1.5	22%		


Job: 18219 - Patel Residence - Arris
Beam/Joist Input Data

Description:		D	L _R	L	L ₂	S	W	E	
1r = 1 ft of roof trib	Roof	28	20	0	0	0	0	0	psf
2f = 2 ft of floor trib	Floor	21.8	0	40	0	0	0	0	psf
3c = 3 ft of ceiling trib	Ceiling	8.5	0	10	0	0	0	0	psf
4d = 4 ft of deck trib	Deck	11	0	60	0	0	0	0	psf
5w = 5 ft of wall trib	Wall	10	0	0	0	0	0	0	psf

 $S_{DS} = 1.530$
 $\Omega_o = 2.5$

FLOOR BEAMS

adVanceBeam 2.0

Member	Trib (ft)	SPAN INFO		D	L _R	L	L ₂	S	W	E	Span/Load Type		BEAM DESIGN			
		L/X _a (ft)	L _u /X _b (ft)	(plf)	(plf)	(plf)	(plf)	(plf)	(plf)	(plf)						
FB 4	10.5 r			294	210	0	0	0	0	0			(1)-1 3/4" x 16" LVL			
	10.5 f			229	0	420	0	0	0	0			Force	Loc(ft)	%Max	
	0.0 c			0	0	0	0	0	0	0			Bending	-13kft	5.0	77%
	0.0 d			0	0	0	0	0	0	0			Shear	-5,027#	0	90%
	1.0 w			10	0	0	0	0	0	0						
	Spans											REACTIONS	Loc(ft)	M(k*ft)	Rmin	Rmax
	1	10.0	1.0	533	210	420	0	0	0	0	Simple Span	Roller 1	0	---	1,599#	5,027#
												Roller 2	10	---	1,599#	5,027#
	Additional Loads											DEFLECTIONS	I / x	Defl(in)	Loc(ft)	%Max
													Max(ASD)	---	0.19	5.0
												L 360	1011	0.12	5.0	36%
												E W S	---	0.00	0.0	---
												D+L 240	548	0.22	5.0	44%
FB 5	15.0 r			420	300	0	0	0	0	0			6x12 D.F. #1			
	15.0 f			327	0	600	0	0	0	0			Force	Loc(ft)	%Max	
	0.0 c			0	0	0	0	0	0	0			Bending	-12kft	4.1	87%
	0.0 d			0	0	0	0	0	0	0			Shear	-6,031#	0	80%
	4.0 w			40	0	0	0	0	0	0						
	Spans											REACTIONS	Loc(ft)	M(k*ft)	Rmin	Rmax
	1	8.3	8.3	787	300	600	0	0	0	0	Simple Span	Roller 1	0	---	1,948#	6,031#
												Roller 2	8	---	1,948#	6,031#
	Additional Loads											DEFLECTIONS	I / x	Defl(in)	Loc(ft)	%Max
													Max(ASD)	---	0.14	4.13
												L 360	1177	0.08	4.13	31%
												E W S	---	0.00	0.0	---
												D+L 240	628	0.16	4.13	38%
FB 6	0.0 r			0	0	0	0	0	0	0			6x8 D.F. #1			
	10.0 f			218	0	400	0	0	0	0			Force	Loc(ft)	%Max	
	0.0 c			0	0	0	0	0	0	0			Bending	-1.3kft	2.0	24%
	0.0 d			0	0	0	0	0	0	0			Shear	-1,256#	0	27%
	1.0 w			10	0	0	0	0	0	0						
	Spans											REACTIONS	Loc(ft)	M(k*ft)	Rmin	Rmax
	1	4.0	4.0	228	0	400	0	0	0	0	Simple Span	Roller 1	0	---	274#	1,256#
												Roller 2	4	---	274#	1,256#
	Additional Loads											DEFLECTIONS	I / x	Defl(in)	Loc(ft)	%Max
													Max(ASD)	---	0.01	2.0
												L 360	6445	0.01	2.0	6%
												E W S	---	0.00	0.0	---
												D+L 240	4105	0.01	2.0	6%

Job: **18219 - Patel Residence - Arris**

Beam/Joist Input Data

Description:		D	L _R	L	L ₂	S	W	E	
1r = 1 ft of roof trib	Roof	28	20	0	0	0	0	0	psf
2f = 2 ft of floor trib	Floor	21.8	0	40	0	0	0	0	psf
3c = 3 ft of ceiling trib	Ceiling	8.5	0	10	0	0	0	0	psf
4d = 4 ft of deck trib	Deck	11	0	60	0	0	0	0	psf
5w = 5 ft of wall trib	Wall	10	0	0	0	0	0	0	psf

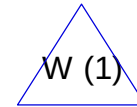
S_{DS} = 1.530

Ω₀ = 2.5

FLOOR BEAMS

adVanceBeam 2.0

Member	Trib (ft)	SPAN INFO L ₁ /X _a (ft) L ₂ /X _b (ft)	D (plf)	L _R (plf)	L (plf)	L ₂ (plf)	S (plf)	W (plf)	E (plf)	Span/Load Type		BEAM DESIGN			
FB 7	11.5 r		322	230	0	0	0	0	0			GLB 5-1/2" x 10-1/2"			
	11.5 f		251	0	460	0	0	0	0			Force	Loc(ft)	%Max	
	0.0 c		0	0	0	0	0	0	0			Bending	-20kft	5.5	64%
	0.0 d		0	0	0	0	0	0	0			Shear	12.4k	5.5	76%
	16.0 w		160	0	0	0	0	0	0			Ω InvEW Considered			
Spans											REACTIONS	Loc(ft)	M(k*ft)	R _{min}	R _{max}
1	9.0	9.0	733	230	460	0	0	0	0	Simple Span	Roller 1	0	---	-1,991#	7,297#
											Roller 2	9	---	-2,071#	7,357#
Additional Loads											DEFLECTIONS	I / x	Defl _(in)	Loc(ft)	%Max
SW6 1	3.5								9.5k	Point Load	Max(ASD)	---	0.19	4.5	---
SW7 2	5.5								-9,540#	Point Load	L 360	1013	0.11	4.5	36%
											E W S	---	0.00	0.0	---
											D+L 240	491	0.22	4.5	49%
FB 8	11.5 r		322	230	0	0	0	0	0			GLB 5-1/2" x 12"			
	11.5 f		251	0	460	0	0	0	0			Force	Loc(ft)	%Max	
	0.0 c		0	0	0	0	0	0	0			Bending	-40kft	5.5	97%
	0.0 d		0	0	0	0	0	0	0			Shear	13.1k	9	70%
	16.0 w		160	0	0	0	0	0	0			Ω InvEW Considered			
Spans											REACTIONS	Loc(ft)	M(k*ft)	R _{min}	R _{max}
1	9.0	9.0	733	230	460	0	0	0	0	Simple Span	Roller 1	0	---	-4,492#	9,767#
											Roller 2	9	---	-7,786#	13.1k
Additional Loads											DEFLECTIONS	I / x	Defl _(in)	Loc(ft)	%Max
SW6 1	5.5								9.5k	Point Load	Max(ASD)	---	0.35	4.8	---
											L 360	1512	0.07	4.5	24%
											E W S	---	0.00	0.0	---
											D+L 240	733	0.15	4.5	33%
FB 9	0.0 r		0	0	0	0	0	0	0			GLB 5-1/2" x 10-1/2"			
	4.0 f		87	0	160	0	0	0	0			Force	Loc(ft)	%Max	
	0.0 c		0	0	0	0	0	0	0			Bending	-12kft	9.5	59%
	0.0 d		0	0	0	0	0	0	0			Shear	-2,443#	0	24%
	1.0 w		10	0	0	0	0	0	0			Ω InvEW Considered			
Spans											REACTIONS	Loc(ft)	M(k*ft)	R _{min}	R _{max}
1	19.0	19.0	97	0	160	0	0	0	0	Simple Span	Roller 1	0	---	554#	2,443#
											Roller 2	19	---	554#	2,443#
Additional Loads											DEFLECTIONS	I / x	Defl _(in)	Loc(ft)	%Max
											Max(ASD)	---	0.79	9.5	---
											L 360	464	0.49	9.5	78%
											E W S	---	0.00	0.0	---
											D+L 240	289	0.79	9.5	83%



WOOD STUD DESIGN

Ver.5.0

Based on 2012 NDS & 2015 IBC

 Job: **18219 - Patel Residence - Arris**

 Stud Wall: **Bearing Wall**
 exterior

worst case

INPUT DATA:

Stud Size	
b =	1.50 in.
d =	7.25 in.

Unbraced Length (feet)	Stud Spacing (inches)	DL (plf)	Floor LL (plf)	Roof LL (plf)	E or W Pressure (psf)
24.0	16	240	0	240	15.0

Wood Proper	
Grade =	5
C _F for F _b =	1.30
C _F for F _c =	1.10
F _c =	1053 psi
[TL] F _c * =	1711 psi
[TL+W] F _c * =	1825 psi
F _b =	900 psi
E =	1600 ksi
E'min =	580 ksi
I =	47.63 in ⁴
c =	0.80

Is this a rated fire wall? (Y or N)

Y

Design Parameters & Assumptions:

- * "DL" = Dead Load, "LL" = Live Load, "TL" = Total Load, "E" = Seismic, "W" = Wind
- * Bending is due to short-term loading (wind or seismic), uniaxial only
- * Studs are laterally braced in the weak axis, and are "pinned" at top & bottom
- * Repetitive-member action (CBC 2306.2.1) has been conservatively ignored.
- * Firewalls get reduced by 22% per CBC Table 720.1(2) footnote m
- * Studs are in rated firewall and l_e/d > 33, therefore F'_c reduced to 78%

CALCULATIONS:

Defl. = $5wL^4/384EI$ = **0.82 in.** Wind load reduced by 0.42 per CBC Table 1604.3 footnote f
 I_e/d = slenderness ratio = **40**
 $F_{cE} = 0.822 * E / (I_e/d)^2$ = **302 psi**

	P	f _c	M	f _b	C _d	F _c *	n	C _p	F' _c	d/c	F' _b	d/c	(3.9-3)
D+L	320	29	0	0	1	1053	0.804	0.267	282	0.105	1170	0.000	0.011
D+L _r	640	59	0	0	1.25	1316	0.768	0.217	286	0.206	1463	0.000	0.042
D+0.75[L+L _r]	560	51	0	0	1.25	1316	0.768	0.217	286	0.180	1463	0.000	0.032
D+0.6W	320	29	864	789	1.6	1685	0.737	0.172	290	0.101	1872	0.421	0.477
D+0.75[0.6W+L+L _r]	560	51	389	355	1.6	1685	0.737	0.172	290	0.178	1872	0.190	0.260

OUTPUT DATA:

1st CHECK: [based on CBC 1604.3]	L / Defl. =	350	(240 min.)	=====>	<u>Okay</u>
2nd CHECK: [NDS 3.7.1.4]	I_e / d =	40	(50 max.)	=====>	<u>Okay</u>
3rd CHECK: [NDS 3.9.2]	f_c / F'_c =	0.21	(1.00 max.)	=====>	<u>Okay</u>
4th CHECK: [NDS 3.3.2]	f_b / F'_b =	0.42	(1.00 max.)	=====>	<u>Okay</u>
5th CHECK: [NDS 3.9.2]	$[f_c / F'_c]^2 + [f_b / (F'_b(1 - f_c / F_{cE}))]$ =	0.48	(1.00 max.)	=====>	<u>Okay</u>
2x8 studs (#2) @ 16 inches o.c. =====>					<u>OKAY!!</u>

Maximum Allowable Axial Compression of Timber Posts in 2x6 Wall (kips)



l_e (ft)	2x6	(2) 2x6	(3) 2x6	4x6	6x6	6x8	6x10	6x12
1	7.35	14.70	22.05	29.80	21.14	41.17	48.24	58.40
2	7.30	14.61	21.91	29.55	21.03	40.91	47.97	58.06
3	7.23	14.46	21.69	29.11	20.83	40.47	47.49	57.48
4	7.11	14.23	21.34	28.42	20.54	39.80	46.77	56.62
5	6.95	13.91	20.86	27.43	20.14	38.86	45.77	55.41
6	6.74	13.47	20.21	26.06	19.59	37.59	44.42	53.77
7	6.45	12.90	19.35	24.27	18.89	35.92	42.66	51.64
8	6.09	12.18	18.27	22.10	17.99	33.81	40.43	48.94
9	5.66	11.32	16.98	19.72	16.91	31.30	37.73	45.68
10	5.18	10.35	15.53	17.36	15.66	28.52	34.69	41.99
11	4.68	9.35	14.03	15.19	14.32	25.68	31.48	38.11
12	4.19	8.38	12.57	13.27	12.96	22.94	28.32	34.28
13	3.74	7.48	11.22	11.64	11.67	20.43	25.36	30.70
14	3.34	6.68	10.02	10.24	10.47	18.20	22.69	27.46
15	2.98	5.97	8.95	9.06	9.41	16.25	20.31	24.59
16	2.67	5.35	8.02	8.06	8.46	14.55	18.23	22.07
17	2.41	4.81	7.22	7.21	7.63	13.08	16.42	19.87
18	2.17	4.35	6.52	6.48	6.91	11.80	14.84	17.96
19	1.97	3.94	5.91	5.86	6.27	10.70	13.46	16.29
20	1.79	3.58	5.38	5.31	5.72	9.73	12.25	14.83
Max Load	5.16	10.31	15.47	12.03	18.91	25.78	32.66	39.53

Footnotes

1. Post design per 2015 NDS Section 3.7.
2. All 2x posts are stud grade (Stud).
3. 4x4, 4x6, and 6x6 are DF-L No. 2 Grade (Dimensional or Timber).
4. 4x8 and larger, and 6x8 and larger, are DF-L No. 1 Grade (Dimensional or Timber).
5. Posts are pin-pin connections, with sidesway prevented.
6. Loads are not calculated for posts that exceed the slenderness ratio. (3.7.1.4)
7. Max Load is limited by bearing perpendicular to grain in the top plate.

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DESCRIPTION: Worst Case Pipe Column

Calculations per AISC 360-10, IBC 2015, CBC 2016, ASCE 7-10

General Information

Overall Column Height 12.0 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 = 10 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0

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

Axial Load at 12.0 ft, D = 8.70, LR = 4.50, L = 4.50, E = 21.0 k

Bending & Shear Check Results

0.2394	: 1
+D+0.70E	
0.0	ft
23.651	k
98.807	k
0.0	k-ft
17.066	k-ft
0.0	k-ft
17.066	k-ft
0.0	: 1
0.0	
0.0	ft
0.0	k
0.0	k

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

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	Maximum Axial + Bending Stress Ratios				Maximum Shear Ratios						
	Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Stress Ratio	Status	Location	
D Only	0.091	PASS	0.00 ft	1.00	1.00	64.86	64.86	0.000	PASS	0.00 ft	
+D+L	0.136	PASS	0.00 ft	1.00	1.00	64.86	64.86	0.000	PASS	0.00 ft	
+D+Lr	0.136	PASS	0.00 ft	1.00	1.00	64.86	64.86	0.000	PASS	0.00 ft	
+D+0.750Lr+0.750L	0.159	PASS	0.00 ft	1.00	1.00	64.86	64.86	0.000	PASS	0.00 ft	
+D+0.750L	0.125	PASS	0.00 ft	1.00	1.00	64.86	64.86	0.000	PASS	0.00 ft	
+0.60D	0.054	PASS	0.00 ft	1.00	1.00	64.86	64.86	0.000	PASS	0.00 ft	
+D+0.70E	0.239	PASS	0.00 ft	1.00	1.00	64.86	64.86	0.000	PASS	0.00 ft	
+D+0.750L+0.5250E	0.236	PASS	0.00 ft	1.00	1.00	64.86	64.86	0.000	PASS	0.00 ft	
+0.60D+0.70E	0.203	PASS	0.00 ft	1.00	1.00	64.86	64.86	0.000	PASS	0.00 ft	

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 @ Base @ Top	k-ft	My - End Moments @ Base @ Top
D Only	8.951						
+D+L	13.451						
+D+Lr	13.451						
+D+0.750Lr+0.750L	15.701						
+D+0.750L	12.326						
+0.60D	5.371						

Steel Column

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DESCRIPTION: Worst Case Pipe Column

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 @ Base @ Top	k-ft	My - End Moments @ Base @ Top
+D+0.70E	23.651						
+D+0.750L+0.5250E	23.351						
+0.60D+0.70E	20.071						
Lr Only	4.500						
L Only	4.500						
E Only	21.000						

Extreme Reactions

Item	Extreme Value	Axial Reaction @ Base	X-X Axis Reaction @ Base @ Top	k	Y-Y Axis Reaction @ Base @ Top	Mx - End Moments @ Base @ Top	k-ft	My - End Moments @ Base @ Top
Axial @ Base	Maximum	23.651						
"	Minimum	4.500						
Reaction, X-X Axis Base	Maximum	8.951						
"	Minimum	8.951						
Reaction, Y-Y Axis Base	Maximum	8.951						
"	Minimum	8.951						
Reaction, X-X Axis Top	Maximum	8.951						
"	Minimum	8.951						
Reaction, Y-Y Axis Top	Maximum	8.951						
"	Minimum	8.951						
Moment, X-X Axis Base	Maximum	8.951						
"	Minimum	8.951						
Moment, Y-Y Axis Base	Maximum	8.951						
"	Minimum	8.951						
Moment, X-X Axis Top	Maximum	8.951						
"	Minimum	8.951						
Moment, Y-Y Axis Top	Maximum	8.951						
"	Minimum	8.951						

Maximum Deflections for Load Combinations

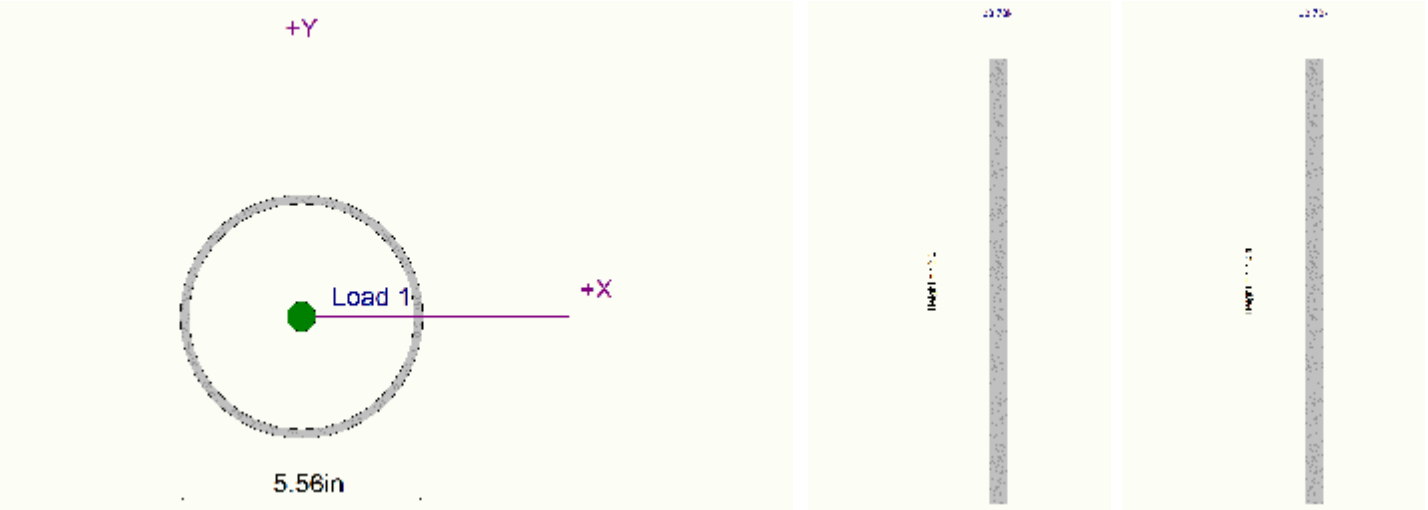
Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+Lr	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750L	0.0000 in	0.000 ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.70E	0.0000 in	0.000 ft	0.000 in	0.000 ft
+D+0.750L+0.5250E	0.0000 in	0.000 ft	0.000 in	0.000 ft
+0.60D+0.70E	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
E Only	0.0000 in	0.000 ft	0.000 in	0.000 ft

Steel Section Properties : Pipe5 x-Strong

DESCRIPTION: Worst Case Pipe Column

Steel Section Properties : Pipe5 x-Strong									
Depth	=	5.563 in	I xx	=	19.50 in^4	J	=	39.000 in^4	
			S xx	=	7.02 in^3				
Diameter	=	5.563 in	R xx	=	1.850 in				
Wall Thick	=	0.375 in	Zx	=	9.500 in^3				
Area	=	5.720 in^2	I yy	=	19.500 in^4				
Weight	=	20.912 plf	S yy	=	7.020 in^3				
			R yy	=	1.850 in				
Ycg	=	0.000 in							

Sketches



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DESCRIPTION: Worst Case HSS

Load Combinations Used : ASCE 7-16

Overall Column Height 12 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 = 10 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0

Axial Load at 12.0 ft, D = 8.90, LR = 3.70, L = 6.80 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 :				

PASS Maximum Shear Stress Ratio = **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

Load Combination	Maximum Axial + Bending Stress Ratios				Cbx	Cby	KxLx/Rx	KyLy/Ry	Maximum Shear Ratios		
	Stress Ratio	Status	Location	Stress Ratio					Status	Location	
D Only	0.120	PASS	0.00 ft	1.00	1.00	62.18	62.18	0.000	PASS	0.00 ft	
+D+L	0.210	PASS	0.00 ft	1.00	1.00	62.18	62.18	0.000	PASS	0.00 ft	
+D+Lr	0.169	PASS	0.00 ft	1.00	1.00	62.18	62.18	0.000	PASS	0.00 ft	
+D+0.750Lr+0.750L	0.224	PASS	0.00 ft	1.00	1.00	62.18	62.18	0.000	PASS	0.00 ft	
+D+0.750L	0.188	PASS	0.00 ft	1.00	1.00	62.18	62.18	0.000	PASS	0.00 ft	
+0.60D	0.072	PASS	0.00 ft	1.00	1.00	62.18	62.18	0.000	PASS	0.00 ft	

[illegible]

Steel Column

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DESCRIPTION: **Worst Case HSS**

Extreme Reactions

Item	Extreme Value	Axial Reaction	X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	16.962										
"	Minimum	3.700										
Reaction, X-X Axis Base	Maximum	9.087										
"	Minimum	9.087										
Reaction, Y-Y Axis Base	Maximum	9.087										
"	Minimum	9.087										
Reaction, X-X Axis Top	Maximum	9.087										
"	Minimum	9.087										
Reaction, Y-Y Axis Top	Maximum	9.087										
"	Minimum	9.087										
Moment, X-X Axis Base	Maximum	9.087										
"	Minimum	9.087										
Moment, Y-Y Axis Base	Maximum	9.087										
"	Minimum	9.087										
Moment, X-X Axis Top	Maximum	9.087										
"	Minimum	9.087										
Moment, Y-Y Axis Top	Maximum	9.087										
"	Minimum	9.087										

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 : HSS5x5x1/4

Depth	=	5.000	in	I xx	=	16.00	in^4	J	=	25.800	in^4
Design Thick	=	0.233	in	S xx	=	6.41	in^3				
Width	=	5.000	in	R xx	=	1.930	in				
Wall Thick	=	0.250	in	Zx	=	7.610	in^3				
Area	=	4.300	in^2	I yy	=	16.000	in^4	C	=	10.500	in^3
Weight	=	15.584	plf	S yy	=	6.410	in^3				
				R yy	=	1.930	in				

Ycg = 0.000 in

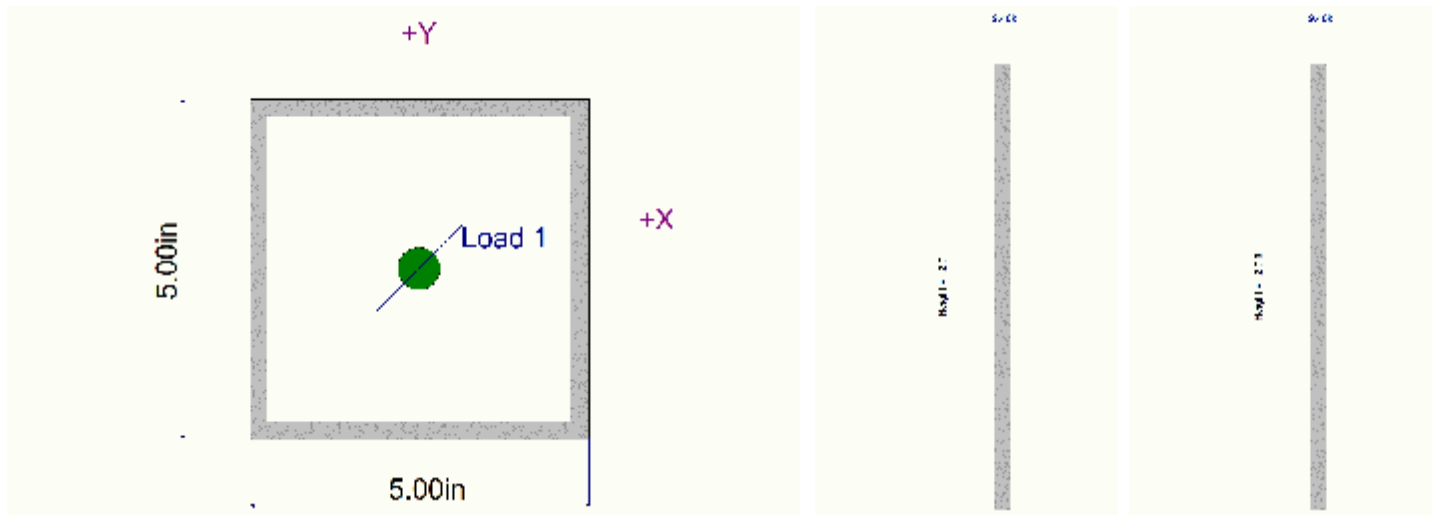
Steel Column

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DESCRIPTION: Worst Case HSS

Sketches





ASD Lateral Force Analysis
2019 CBC

Job: **18219 - Patel Residence - Arris**

SEISMIC DESIGN BASE SHEAR (STATIC)

Risk Category: II (CBC Table 1604.5)

$I_e = 1.00$ (ASCE Table 1.5-2)

$R = 6.5$ (ASCE Table 12.2-1)

$C_d = 4$ (ASCE Table 12.2-1)

$\Omega_o = 2.5$ (ASCE Table 12.2-1)
Reduced by 1/2 for flexible diaphragms
per ASCE Table 12.2-1 footnote b

SEISMIC GROUND MOTION VALUES

Latitude: 37.632359

Longitude: -121.811663

Site Classification = D

Soils Report? **No** F_a Min = 1.2 per 1613.2.3

Short Period

$S_S = 1.913$

$F_a = 1.200$ (CBC Table 1613.2.3(1))

$S_{MS} = 2.296$ (CBC Eq. 16-36)

$S_{DS} = 1.530$ (CBC Eq. 16-38)

Long Period

$S_1 = 0.600$

$F_v = 1.700$ (CBC Table 1613.2.3(2))

$S_{M1} = 1.020$ (CBC Eq. 16-37)

$S_{D1} = 0.680$ (CBC Eq. 16-39)

APPROXIMATE FUNDAMENTAL PERIOD

Building Type: All Other Structural Systems

Maximum Height = 34.0 ft

$T_a = 0.28$ sec (ASCE Eq. 12.8-7)

$T_0 = 0.09$ sec (ASCE 11.3)

$T_s = 0.44$ sec (ASCE 11.3)

$T_L = 8$ sec (ASCE Figure 22-14)

SEISMIC DESIGN CATEGORY

SDC = D

(ASCE 11.6)

SEISMIC BASE SHEAR

$C_S = 0.2354$ Govs (ASCE Eq. 12.8-2)

$C_{S\text{ MAX}} = 0.3715$ (ASCE Eq. 12.8-3 & Eq. 12.8-4)

$C_{S\text{ MIN}} = 0.0673$ (ASCE Eq. 12.8-5 & Eq. 12.8-6)

$C_S = 0.2354$

$V = 0.235 * W$



Job: **18219 - Patel Residence - Arris**

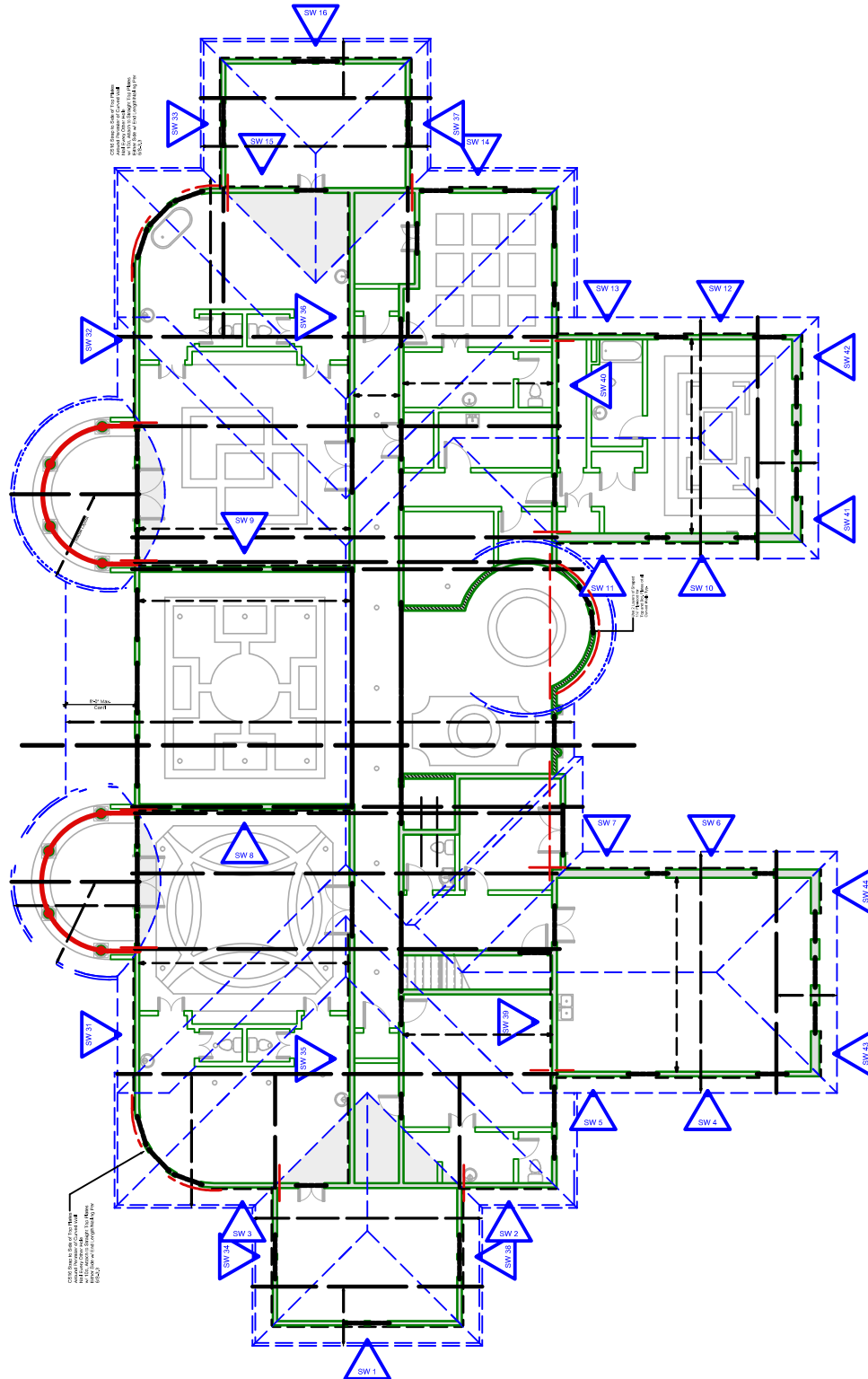
ASD Lateral Force Analysis 2019 CBC

C_s : 0.235
 k = 1.00 (ASCE Eq. 12.8-12)

VERTICAL SEISMIC FORCE DISTRIBUTION (ASCE 12.8.3)										
Level	Height (ft)	DL (psf)	PL (psf)	Floor Area (sq.ft.)	Weight (lbs)	wh^k (k-ft)	C_v (12.8-12)	Story Shear (lbs)	(psf)	% Total
Roof	30.0	28.0	10.0	9500	361000	10830.0	0.669	119392	12.6	66.9%
Main Flr	13.5	21.8	20.0	9500	397100	5360.9	0.331	59099	6.2	100.0%
Totals:					758100	16190.9	1.0	178492	18.8	

DIAPHRAGM LOADS (ASCE 12.10)											
Level	DL (psf)	NORTH-SOUTH DIRECTION					EAST-WEST DIRECTION				
		PL (psf)	(12.10-1) (psf)	Max (psf)	Min (psf)	Gov (psf)	PL (psf)	(12.10-1) (psf)	Max (psf)	Min (psf)	Gov (psf)
Roof	28	10	12.568	23.3	11.6	12.6	10	12.6	23.3	11.6	12.6
Main Flr	21.8	20	9.8	25.6	12.8	12.8	20	9.8	25.6	12.8	12.8

Upper Shearwall Layout



Job: **18219 - Patel Residence - Arris**

ASD Lateral Force Analysis 2019 CBC

Building Forces		Simple
Level	Seis. (psf)	Wind (plf)
Roof	8.8	118.5
Main Flr	4.4	150.6
Totals:		13.2 269.0

TYPE	Materials	Sides	EQ / Wind*
6	1/2" ST 1 10d @ 6"	1	340 / 476 plf
4	1/2" ST 1 10d @ 4"	1	510 / 714 plf
3	1/2" ST 1 10d @ 3"	1	665 / 931 plf
2	1/2" ST 1 10d @ 2"	1	870 / 1218 plf
44	1/2" ST 1 10d @ 4"	2	1020 / 1428 plf
22	1/2" ST 1 10d @ 2"	2.00	##### / 2436 plf

Total Force = Trib Shear + Add'l Shear

Total Shear = Total Force / Wall Length

*Per 2015 SDPWS Table 4.3A, shearwall capacities have been increased by 40% when walls are governed by wind loading.

Wall ID	Wall Len (ft)	Wall Ht. (ft)	% of Line Load	Seismic Trib Len (ft)	Seismic Trib Width (ft)	Wind Trib (ft)	Shear Seis (lbs)	Wind (lbs)	Add'l Seis (lbs)	Add'l Wind (lbs)	Wall H/L Ratio	Gov. Force (lbs)	Wall Shear (plf)	Gov Case	Type
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S-2.3 Roof Framing**NS**

SW 1	21.50	12.00	100%	26.7	9.3	9.3	2189	1105	0	0	5/9:1	2189	102 Seis	6
SW 2	11.00	12.00	61%	53.7	10.2	13.7	4830	1620	0	0	1:1	2952	268 Seis	6
SW 3	7.00	12.00	39%	53.7	10.2	13.7	4830	1620	0	0	1 5/7:1	1878	268 Seis	6
SW 4	12.00	12.00	59%	83.8	18.2	20.5	13386	2429	0	0	1:1	7836	653 Seis	3
SW 5	8.50	12.00	41%	83.8	18.2	20.5	13386	2429	0	0	1 2/5:1	5550	653 Seis	3
SW 6	10.50	12.00	24%	95.9	27.5	33.0	23198	3913	0	0	1 1/7:1	5535	527 Seis	3
SW 7	9.50	12.00	22%	95.9	27.5	33.0	23198	3913	0	0	1 1/4:1	5008	527 Seis	3
SW 8	24.00	12.00	55%	95.9	27.5	33.0	23198	3913	0	0	1/2:1	12655	527 Seis	3
SW 9	24.00	12.00	56%	95.7	24.3	29.0	20427	3432	0	0	1/2:1	11535	481 Seis	4
SW 10	8.00	12.00	19%	95.7	24.3	29.0	20427	3432	0	0	1 1/2:1	3844	481 Seis	4
SW 11	10.50	12.00	25%	95.7	24.3	29.0	20427	3432	0	0	1 1/7:1	5048	481 Seis	4
SW 12	8.00	12.00	41%	91.6	17.8	20.4	14319	2420	0	0	1 1/2:1	5875	734 Seis	2
SW 13	11.50	12.00	59%	91.6	17.8	20.4	14319	2420	0	0	1:1	8444	734 Seis	2
SW 14	6.50	12.00	45%	53.7	14.1	17.2	6633	2040	0	0	1 6/7:1	2974	457 Seis	4
SW 15	8.00	12.00	55%	53.7	14.1	17.2	6633	2040	0	0	1 1/2:1	3660	457 Seis	4
SW 16	21.50	12.00	100%	26.7	8.7	8.7	2039	1029	0	0	5/9:1	2039	95 Seis	6

EW

SW 31	17.50	12.00	50%	120.7	19.8	26.7	20987	3167	0	0	2/3:1	10493	600 Seis	3
SW 32	17.50	12.00	50%	120.7	19.8	26.7	20987	3167	0	0	2/3:1	10493	600 Seis	3
SW 33	14.50	12.00	100%	17.4	13.3	13.3	2038	1580	0	0	5/6:1	2038	141 Seis	6
SW 34	15.50	12.00	100%	18.3	13.3	13.3	2149	1580	0	0	7/9:1	2149	139 Seis	6
SW 35	28.50	12.00	50%	120.7	24.2	24.1	25636	2861	0	0	3/7:1	12818	450 Seis	4
SW 36	28.50	12.00	50%	120.7	24.2	24.1	25636	2861	0	0	3/7:1	12818	450 Seis	4
SW 37	15.00	12.00	100%	17.4	13.3	13.3	2038	1580	0	0	4/5:1	2038	136 Seis	6
SW 38	15.50	12.00	100%	18.3	13.3	13.3	2149	1580	0	0	7/9:1	2149	139 Seis	6
SW 39	15.00	12.00	44%	120.7	20.1	26.8	21380	3180	0	0	4/5:1	9433	629 Seis	3
SW 40	19.00	12.00	56%	120.7	20.1	26.8	21380	3180	0	0	5/8:1	11947	629 Seis	3
SW 41	5.00	12.00	50%	28.0	16.7	16.7	4109	1976	0	0	2 2/5:1	2054	411 Seis	4
SW 42	5.00	12.00	50%	28.0	16.7	16.7	4109	1976	0	0	2 2/5:1	2054	411 Seis	4
SW 43	5.00	12.00	50%	28.0	17.8	17.8	4375	2104	0	0	2 2/5:1	2187	437 Seis	4
SW 44	5.00	12.00	50%	28.0	17.8	17.8	4375	2104	0	0	2 2/5:1	2187	437 Seis	4

S-2.2 Floor Framing**NS**

SW 61	21.50	12.00	100%	22.1	8.0	8.0	767	1202	2189	1105	5/9:1	2956	137 Seis	6
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Job: **18219 - Patel Residence - Arris**

ASD Lateral Force Analysis 2019 CBC

Building Forces		Simple
Level	Seis. (psf)	Wind (plf)
Roof	8.8	118.5
Main Flr	4.4	150.6
Totals:		13.2 269.0

TYPE	Materials	Sides	EQ / Wind*
6	1/2" ST 1 10d @ 6"	1	340 / 476 plf
4	1/2" ST 1 10d @ 4"	1	510 / 714 plf
3	1/2" ST 1 10d @ 3"	1	665 / 931 plf
2	1/2" ST 1 10d @ 2"	1	870 / 1218 plf
44	1/2" ST 1 10d @ 4"	2	1020 / 1428 plf
22	1/2" ST 1 10d @ 2"	2.00	##### / 2436 plf

Total Force = Trib Shear + Add'l Shear

Total Shear = Total Force / Wall Length

*Per 2015 SDPWS Table 4.3A, shearwall capacities have been increased by 40% when walls are governed by wind loading.

Wall ID	Wall Len (ft)	Wall Ht. (ft)	% of Line Load	Seismic Trib Len (ft)	Seismic Trib Width (ft)	Wind Trib (ft)	Shear Seis (lbs)	Wind (lbs)	Add'l Seis (lbs)	Add'l Wind (lbs)	Wall H/L Ratio	Gov. Force (lbs)	Wall Shear (plf)	Gov Case	Type
SW 62	9.00	12.00	100%	11.9	6.1	6.1	317	922	0	0	1 1/3:1	922	102	Wind	6
SW 63	10.50	12.00	55%	49.8	11.4	14.5	2463	2189	6704	1960	1 1/7:1	5066	482	Seis	4
SW 64	8.50	12.00	45%	49.8	11.4	14.5	2463	2189	6704	1960	1 2/5:1	4101	483	Seis	4
SW 65	12.00	12.00	34%	84.3	15.7	18.3	5747	2757	12904	2324	1:1	6304	525	Seis	3
SW 66	8.50	12.00	24%	84.3	15.7	18.3	5747	2757	12904	2324	1 2/5:1	4465	525	Seis	3
SW 67	15.00	12.00	42%	84.3	15.7	18.3	5747	2757	13386	2429	4/5:1	8084	539	Seis	3
SW 68	3.50	12.00	13%	91.5	18.8	32.8	7503	4938	23198	3913	3 3/7:1	4056	1159	Seis	22
SW 69	6.00	12.00	23%	91.5	18.8	32.8	7503	4938	23198	3913	2:1	6951	1158	Seis	22
SW 70	6.00	12.00	23%	91.5	18.8	32.8	7503	4938	23198	3913	2:1	6951	1158	Seis	22
SW 71	6.00	12.00	23%	91.5	18.8	32.8	7503	4938	23198	3913	2:1	6951	1158	Seis	22
SW 72	5.00	12.00	19%	91.5	18.8	20.6	7503	3108	23198	3913	2 2/5:1	5793	1159	Seis	22
SW 73	8.50	12.00	50%	43.1	9.5	20.6	1787	3108	11439	1922	1 2/5:1	6613	778	Seis	2
SW 74	8.50	12.00	50%	43.1	9.5	4.3	1787	647	11439	1922	1 2/5:1	6613	778	Seis	2
SW 75	7.00	12.00	100%	35.8	4.3	9.6	670	1442	8988	1510	1 5/7:1	9658	1380	Seis	22
SW 76	12.50	12.00	100%	89.1	8.7	19.3	3361	2904	0	0	1:1	3361	269	Seis	6
SW 77	24.00	12.00	61%	85.0	16.4	19.3	6073	2904	13890	2347	1/2:1	12129	505	Seis	4
SW 78	8.00	12.00	20%	85.0	16.4	19.3	6073	2904	13890	2347	1 1/2:1	4042	505	Seis	4
SW 79	7.50	12.00	19%	85.0	16.4	16.3	6073	2449	13890	2347	1 3/5:1	3791	505	Seis	4
SW 80	12.00	12.00	56%	55.3	13.3	16.3	3193	2449	7063	2113	1:1	5724	477	Seis	4
SW 81	9.50	12.00	44%	55.3	13.3	7.7	3193	1153	7063	2113	1 1/4:1	4532	477	Seis	4
SW 82	21.50	12.00	100%	22.2	7.7	7.7	742	1153	2039	1029	5/9:1	2780	129	Seis	6
EW															
SW 91	1.00	12.00	14%	115.9	15.6	24.6	7864	3701	20987	3167	12:1	4123	4123	Seis	A
SW 92	1.00	12.00	14%	115.9	15.6	24.6	7864	3701	20987	3167	12:1	4123	4123	Seis	A
SW 93	1.00	12.00	14%	115.9	15.6	24.6	7864	3701	20987	3167	12:1	4123	4123	Seis	A
SW 94	1.00	12.00	14%	115.9	15.6	24.6	7864	3701	20987	3167	12:1	4123	4123	Seis	A
SW 95	1.00	12.00	14%	115.9	15.6	24.6	7864	3701	20987	3167	12:1	4123	4123	Seis	A
SW 96	1.00	12.00	14%	115.9	15.6	24.6	7864	3701	20987	3167	12:1	4123	4123	Seis	A
SW 97	1.00	12.00	14%	115.9	15.6	24.6	7864	3701	20987	3167	12:1	4123	4123	Seis	A
SW 98	14.50	12.00	100%	15.0	11.1	11.1	726	1674	2038	1580	5/6:1	2764	191	Seis	6
SW 99	15.50	12.00	100%	16.1	11.0	11.0	771	1651	2149	1580	7/9:1	2920	188	Seis	6
SW 100	10.50	12.00	19%	116.0	12.5	15.3	6292	2309	25636	2861	1 1/7:1	6153	586	Seis	3
SW 101	13.50	12.00	25%	116.0	12.5	15.3	6292	2309	25636	2861	8/9:1	7909	586	Seis	3
SW 102	8.50	12.00	16%	116.0	12.5	15.3	6292	2309	25636	2861	1 2/5:1	4981	586	Seis	3
SW 103	8.50	12.00	16%	116.0	12.5	15.3	6292	2309	25636	2861	1 2/5:1	4981	586	Seis	3
SW 104	13.50	12.00	25%	116.0	12.5	15.3	6292	2309	25636	2861	8/9:1	7909	586	Seis	3
SW 105	9.50	12.00	22%	115.4	8.1	10.2	4046	1533	0	0	1 1/4:1	873	92	Seis	6

Job: **18219 - Patel Residence - Arris**

ASD Lateral Force Analysis 2019 CBC

Building Forces		Simple
Level	Seis. (psf)	Wind (plf)
Roof	8.8	118.5
Main Flr	4.4	150.6
Totals:		13.2 269.0

TYPE	Materials	Sides	EQ / Wind*
6	1/2" ST 1 10d @ 6"	1	340 / 476 plf
4	1/2" ST 1 10d @ 4"	1	510 / 714 plf
3	1/2" ST 1 10d @ 3"	1	665 / 931 plf
2	1/2" ST 1 10d @ 2"	1	870 / 1218 plf
44	1/2" ST 1 10d @ 4"	2	1020 / 1428 plf
22	1/2" ST 1 10d @ 2"	2.00	##### / 2436 plf

Total Force = Trib Shear + Add'l Shear

Total Shear = Total Force / Wall Length

*Per 2015 SDPWS Table 4.3A, shearwall capacities have been increased by 40% when walls are governed by wind loading.

Wall ID	Wall Len (ft)	Wall Ht. (ft)	% of Line Load	Seismic Trib		Wind Trib	Shear		Add'l		Wall H/L Ratio	Gov. Force (lbs)	Wall Shear (plf)	Gov Case	Type
				Len (ft)	Width (ft)	(ft)	Seis (lbs)	Wind (lbs)	Seis (lbs)	Wind (lbs)					
SW 106	11.00	12.00	25%	115.4	8.1	10.2	4046	1533	0	0	1:1	1011	92 Seis	6	
SW 107	9.00	12.00	20%	115.4	8.1	10.2	4046	1533	0	0	1 1/3:1	827	92 Seis	6	
SW 108	14.50	12.00	33%	115.4	8.1	10.2	4046	1533	0	0	5/6:1	1333	92 Seis	6	
SW 109	15.00	12.00	100%	15.0	11.1	22.2	726	3347	2038	1580	4/5:1	4927	328 Wind	6	
SW 110	6.50	12.00	100%	16.0	11.1	11.1	775	1674	2149	1580	1 6/7:1	2923	450 Seis	4	
SW 111	13.50	12.00	100%	48.2	12.0	25.9	2518	3906	9407	1399	8/9:1	11925	883 Seis	44	
SW 112	27.50	12.00	100%	47.1	11.7	12.3	2396	1855	11973	1781	3/7:1	14369	522 Seis	3	
SW 113	10.00	12.00	100%	43.5	10.0	14.3	1901	2155	11973	1781	1 1/5:1	13873	1387 Seis	22	
SW 114	8.50	12.00	100%	24.0	15.5	15.5	1621	2334	9407	1399	1 2/5:1	11028	1297 Seis	22	
SW 115	5.00	12.00	50%	24.0	14.1	14.1	1472	2120	4109	1976	2 2/5:1	2790	558 Seis	3	
SW 116	5.00	12.00	50%	24.0	14.1	14.1	1472	2120	4109	1976	2 2/5:1	2790	558 Seis	3	
SW 117	5.00	12.00	50%	24.2	15.4	15.4	1623	2321	4375	2104	2 2/5:1	2999	600 Seis	3	
SW 118	5.00	12.00	50%	24.2	15.4	15.4	1623	2321	4375	2104	2 2/5:1	2999	600 Seis	3	



Job: [Example](#)

Description of Variables:	L	Length of wall	Pl	Left point load
	H	Height of wall	Px	Point load at Xp
	v	Unit shear on wall	Pr	Right point load
	Wt	Unit weight of wall	Xp	Location of Px
	Wdl	Dead load on wall	Wx	Location of Wall Above

Seismic: $HD = (Mot - 0.90Mr) / L$ (CBC 1605.3.2)

Wind: $HD = (Mot - 0.67Mr) / L$ (CBC 1605.3.2)

Wall ID	L (ft)	H (ft)	v (plf)	Wt (psf)	Wdl (plf)	Pl (lbs)	Px (lbs)	Pr (lbs)	Xp (ft)	Wall Above	Strap(s) Above	Gov. Case
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UPPER LEVEL

NS

1	3.50	8.00	183	10	30	0	0	0	0	0	N/A	Wind
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EW

11	7.50	8.00	185	10	156	1500	0	0	0	0	N/A	Wind
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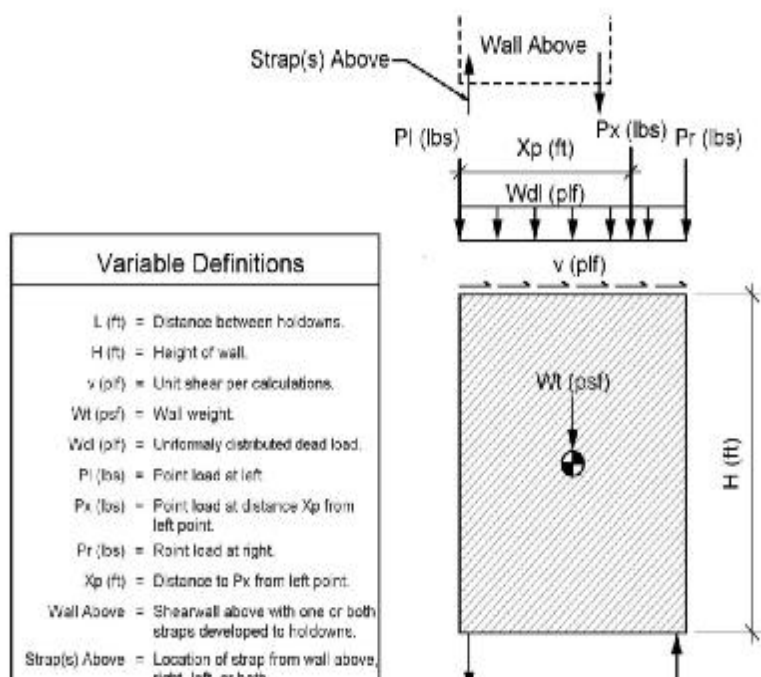
LOWER LEVEL

NS

21	7.50	8.00	305	10	87	0	0	3000	0	1	Right	Wind
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EW

31	7.50	8.00	452	10	30	0	0	0	0	11	Both	Wind
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Job: 18219 - Patel Residence - Arris
ASD Lateral Force Analysis 2019 CBC

Description of Variables:	L	Length of wall	PI	Left point load
	H	Height of wall	Px	Point load at Xp
	v	Unit shear on wall	Pr	Right point load
	Wt	Unit weight of wall	Xp	Location of Px
	Wdl	Dead load on wall	Wx	Location of Wall Above

 Seismic: $HD = (p0.7M_{OT} - (0.6-0. (CBC 1605.3.2) \quad (ASCE 12.4.2.3)$

 Wind: $HD = (0.6MOT - 0.6M_R) (CBC 1605.3.2) \quad (ASCE 2.4.1)$

Wall ID	L (ft)	H (ft)	V (lbs)	Wt (psf)	Wdl (plf)	PI (lbs)	Px (lbs)	Pr (lbs)	Xp (ft)	Wall Above	Aligned Sides	Gov. Case
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S-2.3 Roof Framing
NS

SW 1	21.00	12.00	2189	10	98	0	0	0	0.00	0	N/A	Seis
SW 2	10.50	12.00	2952	10	210	0	0	0	0.00	0	N/A	Seis
SW 3	6.50	12.00	1878	10	210	0	0	0	0.00	0	N/A	Seis
SW 4	11.50	12.00	7836	10	308	0	0	0	0.00	0	N/A	Seis
SW 5	8.00	12.00	5550	10	308	0	0	0	0.00	0	N/A	Seis
SW 6	10.00	12.00	5535	10	308	0	0	0	0.00	0	N/A	Seis
SW 7	9.00	12.00	5008	10	308	0	0	500	0.00	0	N/A	Seis
SW 8	23.50	12.00	12655	10	56	0	0	0	0.00	0	N/A	Seis
SW 9	23.50	12.00	11535	10	56	0	0	0	0.00	0	N/A	Seis
SW 10	7.50	12.00	3844	10	308	0	0	0	0.00	0	N/A	Seis
SW 11	10.00	12.00	5048	10	308	500	0	0	0.00	0	N/A	Seis
SW 12	7.50	12.00	5875	10	308	0	0	0	0.00	0	N/A	Seis
SW 13	11.00	12.00	8444	10	308	0	0	0	0.00	0	N/A	Seis
SW 14	6.00	12.00	2974	10	210	0	0	0	0.00	0	N/A	Seis
SW 15	7.50	12.00	3660	10	210	0	0	0	0.00	0	N/A	Seis
SW 16	21.00	12.00	2039	10	98	0	0	0	0.00	0	N/A	Seis

EW

SW 31	17.00	12.00	10493	10	336	0	0	0	0.00	0	N/A	Seis
SW 32	17.00	12.00	10493	10	336	0	0	0	0.00	0	N/A	Seis
SW 33	14.00	12.00	2038	10	280	0	0	0	0.00	0	N/A	Seis
SW 34	15.00	12.00	2149	10	280	0	0	0	0.00	0	N/A	Seis
SW 35	28.00	12.00	12818	10	56	0	0	0	0.00	0	N/A	Seis
SW 36	28.00	12.00	12818	10	56	0	0	0	0.00	0	N/A	Seis
SW 37	14.50	12.00	2038	10	280	0	0	0	0.00	0	N/A	Seis
SW 38	15.00	12.00	2149	10	280	0	0	0	0.00	0	N/A	Seis
SW 39	14.50	12.00	9433	10	238	0	0	0	0.00	0	N/A	Seis
SW 40	18.50	12.00	11947	10	238	0	0	0	0.00	0	N/A	Seis
SW 41	4.50	12.00	2054	10	98	0	0	0	0.00	0	N/A	Seis
SW 42	4.50	12.00	2054	10	98	0	0	0	0.00	0	N/A	Seis

SW 43	4.50	12.00	2187	10	98	0	0	0	0.00	0	N/A	Seis
SW 44	4.50	12.00	2187	10	98	0	0	0	0.00	0	N/A	Seis
S-2.2 Floor Framing												
NS												
SW 61	21.00	12.00	2956	10	174	0	0	0	0.00	SW 1	Both	Seis
SW 62	8.50	12.00	922	10	168	0	0	0	0.00	0	N/A	Wind
SW 63	10.00	12.00	5066	10	140	0	0	0	0.00	SW 2	Both	Seis
SW 64	8.00	12.00	4101	10	174	0	0	0	0.00	0	N/A	Seis
SW 65	11.50	12.00	6304	10	240	0	0	0	0.00	SW 4	Both	Seis
SW 66	8.00	12.00	4465	10	240	0	0	0	0.00	SW 5	Both	Seis
SW 67	14.50	12.00	8084	10	33	500	0	500	0.00	0	N/A	Seis
SW 68	3.00	12.00	4056	10	33	3038	0	3038	0.00	0	N/A	Seis
SW 69	5.50	12.00	6951	10	33	3038	0	900	0.00	SW 7	Right	Seis
SW 70	5.50	12.00	6951	10	33	0	0	0	0.00	0	N/A	Seis
SW 71	5.50	12.00	6951	10	33	0	0	0	0.00	0	N/A	Seis
SW 72	4.50	12.00	5793	10	33	0	0	0	0.00	0	N/A	Seis
SW 73	8.00	12.00	6613	10	33	0	0	0	0.00	SW 9	Left	Seis
SW 74	8.00	12.00	6613	10	33	0	0	0	0.00	SW 9	Right	Seis
SW 75	6.50	12.00	9658	10	44	1000	0	0	0.00	SW 11	Left	Seis
SW 76	12.00	12.00	3361	10	33	0	0	0	0.00	0	N/A	Seis
SW 77	23.50	12.00	12129	10	33	0	0	0	0.00	0	N/A	Seis
SW 78	7.50	12.00	4042	10	240	0	0	0	0.00	SW 12	Both	Seis
SW 79	7.00	12.00	3791	10	240	0	0	0	0.00	SW 13	Left	Seis
SW 80	11.50	12.00	5724	10	33	0	0	0	0.00	SW 14	Right	Seis
SW 81	9.00	12.00	4532	10	164	0	0	0	0.00	SW 15	Right	Seis
SW 82	21.00	12.00	2780	10	164	0	0	0	0.00	SW 16	Both	Seis
EW												
SW 91	0.50	12.00	4123	10	30	0	0	0	0.00	0	N/A	Seis
SW 92	0.50	12.00	4123	10	30	0	0	0	0.00	0	N/A	Seis
SW 93	0.50	12.00	4123	10	30	0	0	0	0.00	0	N/A	Seis
SW 94	0.50	12.00	4123	10	30	0	0	0	0.00	0	N/A	Seis
SW 95	0.50	12.00	4123	10	30	0	0	0	0.00	0	N/A	Seis
SW 96	0.50	12.00	4123	10	30	0	0	0	0.00	0	N/A	Seis
SW 97	0.50	12.00	4123	10	30	0	0	0	0.00	0	N/A	Seis
SW 98	14.00	12.00	3253	10	30	0	0	0	0.00	SW 33	Both	Wind
SW 99	15.00	12.00	3231	10	30	0	0	0	0.00	SW 34	Both	Wind
SW 100	10.00	12.00	6153	10	30	0	0	0	0.00	0	N/A	Seis
SW 101	13.00	12.00	7909	10	30	0	0	0	0.00	0	N/A	Seis
SW 102	8.00	12.00	4981	10	30	0	0	0	0.00	0	N/A	Seis
SW 103	8.00	12.00	4981	10	30	0	0	0	0.00	SW 36	Right	Seis
SW 104	13.00	12.00	7909	10	30	0	0	0	0.00	SW 36	Left	Seis
SW 105	9.00	12.00	873	10	30	0	0	0	0.00	0	N/A	Seis
SW 106	10.50	12.00	1011	10	30	0	0	0	0.00	0	N/A	Seis
SW 107	8.50	12.00	827	10	30	0	0	0	0.00	0	N/A	Seis
SW 108	14.00	12.00	1333	10	30	0	0	0	0.00	0	N/A	Seis
SW 109	14.50	12.00	4927	10	30	0	0	0	0.00	SW 37	Both	Wind
SW 110	6.00	12.00	3253	10	30	0	0	0	0.00	SW 38	Left	Wind
SW 111	13.00	12.00	11925	10	30	0	0	0	0.00	0	N/A	Seis
SW 112	27.00	12.00	14369	10	30	0	0	0	0.00	0	N/A	Seis
SW 113	9.50	12.00	13873	10	30	0	0	0	0.00	0	N/A	Seis
SW 114	8.00	12.00	11028	10	30	0	0	0	0.00	0	N/A	Seis
SW 115	4.50	12.00	2790	10	30	0	0	0	0.00	SW 41	Both	Seis
SW 116	4.50	12.00	2790	10	30	0	0	0	0.00	SW 42	Both	Seis

SW 117	4.50	12.00	2999	10	30	0	0	0	0.00	SW 43 Both	Seis
SW 118	4.50	12.00	2999	10	30	0	0	0	0.00	SW 44 Both	Seis


Job: 18219 - Patel Residence - Arris
ASD Lateral Force Analysis 2019 CBC

Description	Mot	Overturing Moment
of Variables:	Mr Left	Resisting Moment about the Left side of the wall
	Mr Right	Resisting Moment about the Right side of the wall
	HD Left	Hold down force on the left side of the wall
	HD Right	Hold down force on the right side of the wall

Seismic: $HD = (\rho 0.7M_{OT} - (0.6 - 0.14 \cdot S_{DS})M_R) / L$ (ASCE 12.4.2.3)

Wind: $HD = (0.6MOT - 0.6M_R) / L$ (ASCE 2.4.1)

Wall	M _{OT}	M _{R Left}	M _{R Right}	HD Left	HD Right	Gov.	Use Left	Use Right
ID	(lb-ft)	(lb-ft)	(lb-ft)	(lb)	(lb)			

S-2.3 Roof Framing

NS

SW 1	37522	49214	49214	347	347	Seis	OK	OK
SW 2	50597	19058	19058	2673	2673	Seis	H DU4	H DU4
SW 3	32200	7508	7508	3022	3022	Seis	H DU4	H DU4
SW 4	134332	29532	29532	7186	7186	Seis	H DU8	H DU8
SW 5	95139	14552	14552	7623	7623	Seis	H DU8	H DU8
SW 6	94887	22470	22470	5775	5775	Seis	H DU8	H DU8
SW 7	85860	18297	22797	5894	5701	Seis	H DU8	H DU8
SW 8	216936	49632	49632	5647	5647	Seis	H DU8	H DU8
SW 9	197745	49632	49632	5076	5076	Seis	H DU8	H DU8
SW 10	65903	12840	12840	5491	5491	Seis	H DU8	H DU8
SW 11	86529	27470	22470	4997	5190	Seis	H DU8	H DU8
SW 12	100718	12840	12840	8740	8740	Seis	H DU11	H DU11
SW 13	144756	27071	27071	8262	8262	Seis	H DU11	H DU11
SW 14	50978	6435	6435	5534	5534	Seis	H DU8	H DU8
SW 15	62736	9900	9900	5346	5346	Seis	H DU8	H DU8
SW 16	34948	49214	49214	261	261	Seis	OK	OK

EW

SW 31	179886	67830	67830	5868	5868	Seis	H DU8	H DU8
SW 32	179886	67830	67830	5868	5868	Seis	H DU8	CMST14
SW 33	34929	40600	40600	628	628	Seis	H DU4	H DU4
SW 34	36835	46500	46500	523	523	Seis	H DU4	H DU4
SW 35	219740	70224	70224	4526	4526	Seis	H DU4	H DU4
SW 36	219740	70224	70224	4526	4526	Seis	H DU4	H DU4
SW 37	34929	43500	43500	529	529	Seis	H DU4	H DU4
SW 38	36835	46500	46500	523	523	Seis	H DU4	H DU4
SW 39	161703	38933	38933	6771	6771	Seis	H DU8	H DU8
SW 40	204804	62919	62919	6437	6437	Seis	H DU8	H DU8
SW 41	35218	2453	2453	5268	5268	Seis	H DU8	H DU8

SW 42	35218	2453	2453	5268	5268	Seis	HDU8	HDU8
SW 43	37498	2453	2453	5623	5623	Seis	HDU8	HDU8
SW 44	37498	2453	2453	5623	5623	Seis	HDU8	HDU8

S-2.2 Floor Framing

NS

SW 61	50667	66461	66461	815	815	Seis	HDU4	HDU4
SW 62	18444	11016	11016	524	524	Wind	HDU4	HDU4
SW 63	86839	13650	13650	8225	8225	Seis	HDU11	HDU11
SW 64	70307	10010	10010	5669	5669	Seis	HDU8	HDU8
SW 65	108067	24826	24826	12931	12931	Seis	HDU14	HDU14
SW 66	76542	12233	12233	13731	13731	Seis	HDU14	HDU14
SW 67	138576	23856	23856	6055	6055	Seis	HDU8	HDU8
SW 68	69526	9917	9917	14948	14948	Seis	HD19	HD19
SW 69	119157	19231	7470	13817	20342	Seis	HDU14	HD19
SW 70	119157	2520	2520	14989	14989	Seis	HD19	HD19
SW 71	119157	2520	2520	14989	14989	Seis	HD19	HD19
SW 72	99315	1718	1718	15302	15302	Seis	HD19	HD19
SW 73	113364	5192	5192	14745	9669	Seis	HD19	HDU11
SW 74	113364	5192	5192	9669	14745	Seis	HDU11	HD19
SW 75	165560	10222	3722	22220	17609	Seis	HD19	HD19
SW 76	57618	11453	11453	2993	2993	Seis	HDU4	HDU4
SW 77	207933	43061	43061	5487	5487	Seis	HDU8	HDU8
SW 78	69300	10794	10794	14653	14653	Seis	HD19	HD19
SW 79	64988	9445	9445	14241	5978	Seis	HDU14	HDU8
SW 80	98126	10536	10536	5619	11153	Seis	HDU8	HDU11
SW 81	77695	12120	12120	5524	10870	Seis	HDU8	HDU11
SW 82	47661	64000	64000	674	674	Seis	HDU4	HDU4

EW

SW 91	70677	38	38	98919	98919	Seis	Per. Manu	Per. Manu
SW 92	70677	38	38	98919	98919	Seis	Per. Manu	Per. Manu
SW 93	70677	38	38	98919	98919	Seis	Per. Manu	Per. Manu
SW 94	70677	38	38	98919	98919	Seis	Per. Manu	Per. Manu
SW 95	70677	38	38	98919	98919	Seis	Per. Manu	Per. Manu
SW 96	70677	38	38	98919	98919	Seis	Per. Manu	Per. Manu
SW 97	70677	38	38	98919	98919	Seis	Per. Manu	Per. Manu
SW 98	65067	15225	15225	2764	2764	Wind	HDU4	HDU4
SW 99	64620	17438	17438	2410	2410	Wind	HDU4	HDU4
SW 100	105474	7875	7875	7079	7079	Seis	HDU8	HDU8
SW 101	135578	13163	13163	6910	6910	Seis	HDU8	HDU8
SW 102	85387	5100	5100	7225	7225	Seis	HDU8	HDU8
SW 103	85387	5100	5100	7225	11751	Seis	HDU8	HDU14
SW 104	135578	13163	13163	11436	6910	Seis	HDU14	HDU8
SW 105	14973	6413	6413	890	890	Seis	HDU4	HDU4
SW 106	17338	8663	8663	838	838	Seis	HDU4	HDU4
SW 107	14183	5738	5738	908	908	Seis	HDU4	HDU4
SW 108	22852	15225	15225	723	723	Seis	HDU4	HDU4
SW 109	98540	16313	16313	3932	3932	Wind	HDU4	HDU4
SW 110	65067	2925	2925	6737	6214	Wind	HDU8	HDU8
SW 111	204421	13163	13163	10617	10617	Seis	HDU11	HDU11
SW 112	246318	55688	55688	5590	5590	Seis	HDU8	HDU8
SW 113	237831	7125	7125	17235	17235	Seis	HD19	HD19

SW 114	189051	5100	5100	16296	16296	Seis	HD19	HD19
SW 115	47831	1688	1688	12564	12564	Seis	HDU14	HDU14
SW 116	47831	1688	1688	12564	12564	Seis	HDU14	HDU14
SW 117	51407	1688	1688	13475	13475	Seis	HDU14	HDU14
SW 118	51407	1688	1688	13475	13475	Seis	HDU14	HDU14

Steel Beam

Lic. # : KW-06006695

Licensee : ASHLEY & VANCE ENGINEERING INC.

Description : Brace Beam @ Clear Story

CODE REFERENCES

Calculations per AISC 360-10, IBC 2015, CBC 2016, ASCE 7-10

Load Combination Set : ASCE 7-10

Material Properties

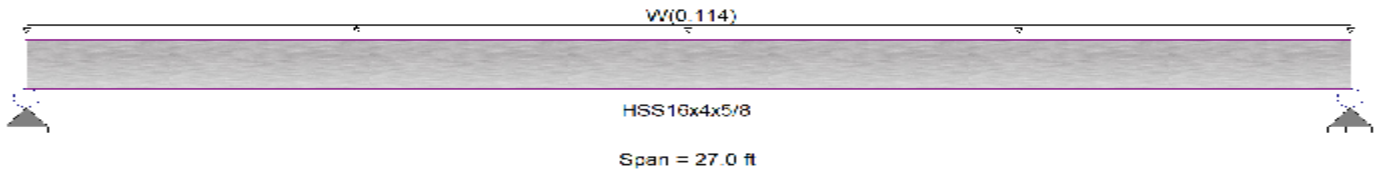
Analysis Method : Allowable Strength Design

Fy : Steel Yield : 46.0 ksi

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

E : Modulus : 29,000.0 ksi

Bending Axis : Minor Axis Bending



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : W = 0.00950 ksf, Tributary Width = 12.0 ft, (Wid)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.084 : 1	Maximum Shear Stress Ratio =	0.021 : 1
Section used for this span	HSS16x4x5/8	Section used for this span	HSS16x4x5/8
Ma : Applied	6.233 k-ft	Va : Applied	0.9234 k
Mn / Omega : Allowable	74.601 k-ft	Vn/Omega : Allowable	43.344 k
Load Combination	+D+0.60W+H	Load Combination	+D+0.60W+H
Location of maximum on span	13.500 ft	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	0.871 in	Ratio =	371 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.524 in	Ratio =	619 >=240
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stress Ratios		Summary of Moment Values							Summary of Shear Values		
Segment Length	Span #	M	V	Mmax +	Mmax -	Ma Max	Mny	Mny/Omega	Cb	Rm	Va Max	Vny	Vny/Omega
+D+H													
Dsgn. L = 27.00 ft	1		0.000				124.58	74.60	1.00	1.00	-0.00	72.38	43.34
+D+L+H													
Dsgn. L = 27.00 ft	1		0.000				124.58	74.60	1.00	1.00	-0.00	72.38	43.34
+D+Lr+H													
Dsgn. L = 27.00 ft	1		0.000				124.58	74.60	1.00	1.00	-0.00	72.38	43.34
+D+S+H													
Dsgn. L = 27.00 ft	1		0.000				124.58	74.60	1.00	1.00	-0.00	72.38	43.34
+D+0.750Lr+0.750L+H													
Dsgn. L = 27.00 ft	1		0.000				124.58	74.60	1.00	1.00	-0.00	72.38	43.34
+D+0.750L+0.750S+H													
Dsgn. L = 27.00 ft	1		0.000				124.58	74.60	1.00	1.00	-0.00	72.38	43.34
+D+0.60W+H													
Dsgn. L = 27.00 ft	1	0.084	0.021	6.23		6.23	124.58	74.60	1.00	1.00	0.92	72.38	43.34
+D+0.70E+H													
Dsgn. L = 27.00 ft	1		0.000				124.58	74.60	1.00	1.00	-0.00	72.38	43.34
+D+0.750Lr+0.750L+0.450W+H													
Dsgn. L = 27.00 ft	1	0.063	0.016	4.67		4.67	124.58	74.60	1.00	1.00	0.69	72.38	43.34
+D+0.750L+0.750S+0.450W+H													
Dsgn. L = 27.00 ft	1	0.063	0.016	4.67		4.67	124.58	74.60	1.00	1.00	0.69	72.38	43.34
+D+0.750L+0.750S+0.5250E+H													
Dsgn. L = 27.00 ft	1		0.000				124.58	74.60	1.00	1.00	-0.00	72.38	43.34
+0.60D+0.60W+0.60H													
Dsgn. L = 27.00 ft	1	0.084	0.021	6.23		6.23	124.58	74.60	1.00	1.00	0.92	72.38	43.34

Steel Beam

Lic. # : KW-06006695

Licensee : ASHLEY & VANCE ENGINEERING INC.

Description : Brace Beam @ Clear Story

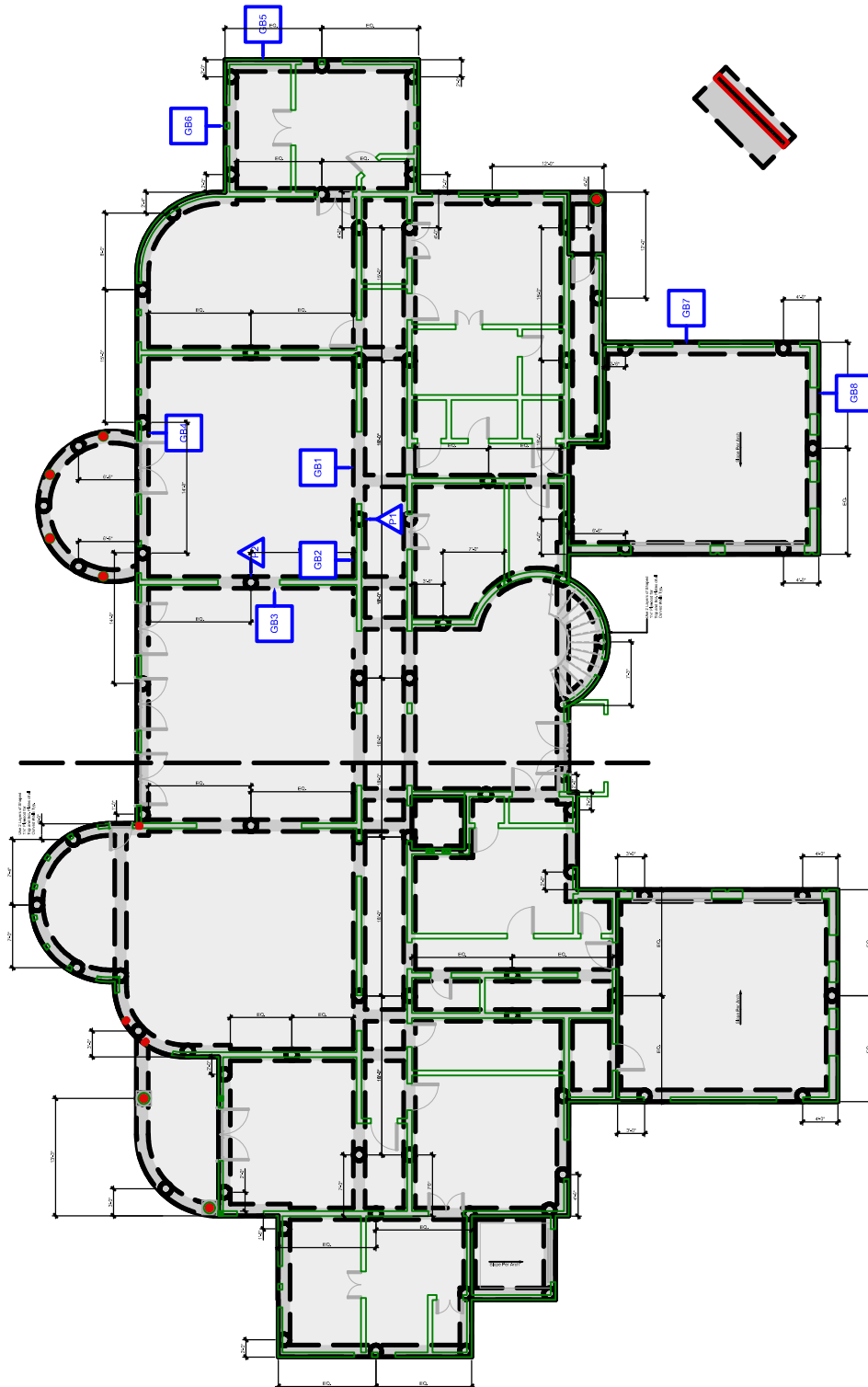
Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+0.60D+0.70E+0.60H														
Dsgn. L = 27.00 ft		1		0.000				124.58	74.60	1.00	1.00	-0.00	72.38	43.34

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
W Only	1	0.8728	13.577		0.0000	0.000

Vertical Reactions

Load Combination	Support 1	Support 2
Overall MAXimum	1.539	1.539
Overall MINimum	0.693	0.693
+D+H		
+D+L+H		
+D+Lr+H		
+D+S+H		
+D+0.750Lr+0.750L+H		
+D+0.750L+0.750S+H		
+D+0.60W+H	0.923	0.923
+D+0.70E+H		
+D+0.750Lr+0.750L+0.450W+H	0.693	0.693
+D+0.750L+0.750S+0.450W+H	0.693	0.693
+D+0.750L+0.750S+0.5250E+H		
+0.60D+0.60W+0.60H	0.923	0.923
+0.60D+0.70E+0.60H		
D Only		
Lr Only		
L Only		
S Only		
W Only	1.539	1.539
E Only		
H Only		

Foundation Layout

Concrete Beam

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DESCRIPTION: GB 1

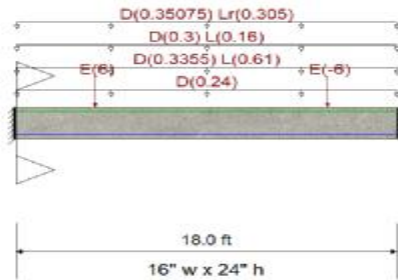
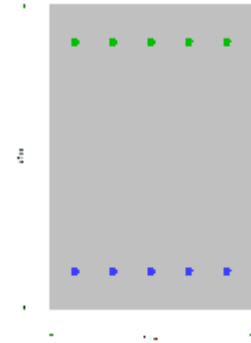
CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10

Load Combination Set : ASCE 7-10

Material Properties

f'_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} * 7.50$	=	375.0 psi		Shear :	0.750
γ Density	=	145.0 pcf	b_1	=	0.850
I LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	F_y - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	2



Cross Section & Reinforcing Details

Rectangular Section, Width = 16.0 in, Height = 24.0 in

Span #1 Reinforcing....

5-#5 at 3.0 in from Bottom, from 0.0 to 18.0 ft in this span

5-#5 at 3.0 in from Top, from 0.0 to 18.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.010 ksf, Tributary Width = 24.0 ft, (Wall Above)

Uniform Load : D = 0.0220, L = 0.040 ksf, Tributary Width = 15.250 ft, (Floor Framing)

Uniform Load : D = 0.0750, L = 0.040 ksf, Tributary Width = 4.0 ft, (Floor Slab)

Uniform Load : D = 0.0230, Lr = 0.020 ksf, Tributary Width = 15.250 ft, (Roof Framing)

Point Load : E = 6.0 k @ 3.750 ft, (SW 100)

Point Load : E = -6.0 k @ 14.750 ft, (SW 101)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.655 : 1	Maximum Deflection		
Section used for this span		Typical Section	Max Downward Transient Deflection	0.006 in	Ratio = 34189 >=360.0
μ_u : Applied		-89.640 k-ft	Max Upward Transient Deflection	0.000 in	Ratio = 0 <360.0
$M_n * \phi$: Allowable		136.845 k-ft	Max Downward Total Deflection	0.023 in	Ratio = 9286 >=180.0
Location of maximum on span		0.000 ft	Max Upward Total Deflection	0.000 in	Ratio = 0 <180.0
Span # where maximum occurs		Span # 1			

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	21.873	21.908
Overall MINimum	2.745	2.745
+D+H	14.516	14.516
+D+L+H	21.446	21.446
+D+Lr+H	17.261	17.261
+D+S+H	14.516	14.516
+D+0.750Lr+0.750L+H	21.772	21.772

Concrete Beam

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 ASHLEY & VANCE ENGINEERING INC.

Lic. #: KW-06006695

DESCRIPTION: GB 1

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+0.750L+0.750S+H	19.714	19.714
+D+0.60W+H	14.516	14.516
+D+0.70E+H	17.871	11.162
+D-0.70E+H	11.149	17.884
+D+0.750Lr+0.750L+0.450W+H	21.772	21.772
+D+0.750L+0.750S+0.450W+H	19.714	19.714
+D+0.750L+0.750S+0.5250E+H	21.873	17.554
+D+0.750L+0.750S-0.5250E+H	17.520	21.908
+0.60D+0.60W+0.60H	8.710	8.710
+0.60D+0.70E+0.60H	12.077	5.342
+0.60D-0.70E+0.60H	5.342	12.077
D Only	14.516	14.516
Lr Only	2.745	2.745
L Only	6.930	6.930
E Only	4.811	-4.811
E Only * -1.0	-4.811	4.811
H Only		

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	0.00	21.00	29.88	29.88	89.64	0.58	25.64	PhiVc < Vu	4.245	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.20	21.00	29.23	29.23	83.83	0.61	25.71	PhiVc < Vu	3.514	39.6	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.39	21.00	28.57	28.57	78.14	0.64	25.80	PhiVc < Vu	2.774	39.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.59	21.00	27.92	27.92	72.58	0.67	25.90	PhiVc < Vu	2.024	39.8	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.79	21.00	27.27	27.27	67.16	0.71	26.01	PhiVc < Vu	1.262	39.9	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.98	21.00	26.61	26.61	61.86	0.75	26.13	PhiVc < Vu	0.4861	40.0	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.18	21.00	25.96	25.96	56.68	0.80	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.38	21.00	25.31	25.31	51.64	0.86	26.43	PhiVc/2 < Vu <=	Min 9.6.3.1	40.3	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.57	21.00	24.66	24.66	46.73	0.92	26.62	PhiVc/2 < Vu <=	Min 9.6.3.1	40.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.77	21.00	24.00	24.00	41.94	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.97	21.00	23.41	23.41	31.46	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.16	21.00	22.89	22.89	26.90	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.36	21.00	22.37	22.37	22.45	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.56	21.00	21.85	21.85	18.10	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.75	21.00	21.33	21.33	13.85	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.95	21.00	20.81	20.81	9.71	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.15	21.00	20.29	20.29	5.66	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.34	21.00	19.77	19.77	1.72	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.54	21.00	19.25	19.25	2.12	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.74	21.00	18.73	18.73	5.85	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.93	21.00	16.82	16.82	2.22	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.13	21.00	16.16	16.16	5.47	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.33	21.00	15.51	15.51	8.58	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.52	21.00	14.86	14.86	11.57	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.72	21.00	14.21	14.21	14.43	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.92	21.00	13.55	13.55	17.16	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.11	21.00	12.90	12.90	19.76	1.00	26.85	Vu < PhiVc/2	lot Reqd 9.6.	26.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.31	21.00	12.25	12.25	22.24	0.96	26.74	Vu < PhiVc/2	lot Reqd 9.6.	26.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.51	21.00	11.59	11.59	24.58	0.83	26.34	Vu < PhiVc/2	lot Reqd 9.6.	26.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.70	21.00	10.94	10.94	26.80	0.71	26.02	Vu < PhiVc/2	lot Reqd 9.6.	26.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.90	21.00	10.29	10.29	28.88	0.62	25.75	Vu < PhiVc/2	lot Reqd 9.6.	25.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.10	21.00	9.63	9.63	30.84	0.55	25.53	Vu < PhiVc/2	lot Reqd 9.6.	25.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.30	21.00	8.98	8.98	32.67	0.48	25.34	Vu < PhiVc/2	lot Reqd 9.6.	25.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.49	21.00	8.33	8.33	34.38	0.42	25.17	Vu < PhiVc/2	lot Reqd 9.6.	25.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.69	21.00	7.67	7.67	35.95	0.37	25.03	Vu < PhiVc/2	lot Reqd 9.6.	25.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.89	21.00	7.02	7.02	37.40	0.33	24.89	Vu < PhiVc/2	lot Reqd 9.6.	24.9	0.0	0.0

Concrete Beam

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DESCRIPTION: GB 1

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
												Req'd	Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	7.08	21.00	6.37	6.37	38.71	0.29	24.78	Vu < PhiVc/2	lot Req'd 9.6.	24.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.28	21.00	5.74	5.74	29.16	0.34	24.94	Vu < PhiVc/2	lot Req'd 9.6.	24.9	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.48	21.00	5.22	5.22	30.24	0.30	24.82	Vu < PhiVc/2	lot Req'd 9.6.	24.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.67	21.00	4.70	4.70	31.21	0.26	24.71	Vu < PhiVc/2	lot Req'd 9.6.	24.7	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.87	21.00	4.18	4.18	32.09	0.23	24.60	Vu < PhiVc/2	lot Req'd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	8.07	21.00	3.66	3.66	32.86	0.19	24.51	Vu < PhiVc/2	lot Req'd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	8.26	21.00	3.14	3.14	33.53	0.16	24.42	Vu < PhiVc/2	lot Req'd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	8.46	21.00	2.62	2.62	34.09	0.13	24.33	Vu < PhiVc/2	lot Req'd 9.6.	24.3	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	8.66	21.00	2.10	2.10	34.56	0.11	24.25	Vu < PhiVc/2	lot Req'd 9.6.	24.2	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	8.85	21.00	1.58	1.58	34.92	0.08	24.17	Vu < PhiVc/2	lot Req'd 9.6.	24.2	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.05	21.00	-1.32	1.32	36.23	0.06	24.13	Vu < PhiVc/2	lot Req'd 9.6.	24.1	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.25	21.00	-1.84	1.84	35.92	0.09	24.20	Vu < PhiVc/2	lot Req'd 9.6.	24.2	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.44	21.00	-2.36	2.36	35.51	0.12	24.28	Vu < PhiVc/2	lot Req'd 9.6.	24.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.64	21.00	-2.88	2.88	34.99	0.14	24.36	Vu < PhiVc/2	lot Req'd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.84	21.00	-3.40	3.40	34.37	0.17	24.44	Vu < PhiVc/2	lot Req'd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.03	21.00	-3.92	3.92	33.65	0.20	24.53	Vu < PhiVc/2	lot Req'd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.23	21.00	-4.44	4.44	32.83	0.24	24.63	Vu < PhiVc/2	lot Req'd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.43	21.00	-4.96	4.96	31.91	0.27	24.73	Vu < PhiVc/2	lot Req'd 9.6.	24.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.62	21.00	-5.48	5.48	30.88	0.31	24.84	Vu < PhiVc/2	lot Req'd 9.6.	24.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.82	21.00	-6.04	6.04	39.32	0.27	24.72	Vu < PhiVc/2	lot Req'd 9.6.	24.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	11.02	21.00	-6.69	6.69	38.07	0.31	24.83	Vu < PhiVc/2	lot Req'd 9.6.	24.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	11.21	21.00	-7.35	7.35	36.69	0.35	24.96	Vu < PhiVc/2	lot Req'd 9.6.	25.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	11.41	21.00	-8.00	8.00	35.18	0.40	25.10	Vu < PhiVc/2	lot Req'd 9.6.	25.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	11.61	21.00	-8.65	8.65	33.54	0.45	25.25	Vu < PhiVc/2	lot Req'd 9.6.	25.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	11.80	21.00	-9.31	9.31	31.78	0.51	25.43	Vu < PhiVc/2	lot Req'd 9.6.	25.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.00	21.00	-9.96	9.96	29.88	0.58	25.64	Vu < PhiVc/2	lot Req'd 9.6.	25.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.20	21.00	-10.61	10.61	27.86	0.67	25.88	Vu < PhiVc/2	lot Req'd 9.6.	25.9	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.39	21.00	-11.27	11.27	25.70	0.77	26.17	Vu < PhiVc/2	lot Req'd 9.6.	26.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.59	21.00	-11.92	11.92	23.42	0.89	26.53	Vu < PhiVc/2	lot Req'd 9.6.	26.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.79	21.00	-12.57	12.57	21.02	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.98	21.00	-13.23	13.23	18.48	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	13.18	21.00	-13.88	13.88	15.81	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	13.38	21.00	-14.53	14.53	13.02	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	13.57	21.00	-15.18	15.18	10.09	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	13.77	21.00	-15.84	15.84	7.04	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	13.97	21.00	-16.49	16.49	3.86	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	14.16	21.00	-17.14	17.14	0.55	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	14.36	21.00	-17.80	17.80	2.88	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	14.56	21.00	-18.45	18.45	6.45	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	14.75	21.00	-20.03	20.03	1.85	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	14.95	21.00	-20.55	20.55	5.84	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	15.15	21.00	-21.07	21.07	9.93	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	15.34	21.00	-21.59	21.59	14.13	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	15.54	21.00	-22.11	22.11	18.43	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	15.74	21.00	-22.63	22.63	22.83	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	15.93	21.00	-23.15	23.15	27.33	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	16.13	21.00	-23.68	23.68	39.60	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	16.33	21.00	-24.33	24.33	44.32	0.96	26.73	PhiVc/2 < Vu <=	Min 9.6.3.1	40.6	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	16.52	21.00	-24.98	24.98	49.17	0.89	26.52	PhiVc/2 < Vu <=	Min 9.6.3.1	40.4	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	16.72	21.00	-25.63	25.63	54.15	0.83	26.35	PhiVc/2 < Vu <=	Min 9.6.3.1	40.2	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	16.92	21.00	-26.29	26.29	59.25	0.78	26.20	PhiVc < Vu	0.09149	40.1	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	17.11	21.00	-26.94	26.94	64.49	0.73	26.06	PhiVc < Vu	0.8763	39.9	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	17.31	21.00	-27.59	27.59	69.85	0.69	25.95	PhiVc < Vu	1.645	39.8	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	17.51	21.00	-28.25	28.25	75.35	0.66	25.85	PhiVc < Vu	2.40	39.7	10.5	10.0

Concrete Beam

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DESCRIPTION: GB 1

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	17.70	21.00	-28.90	28.90	80.97	0.62	25.76	PhiVc < Vu	3.145	39.6	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	17.90	21.00	-29.55	29.55	86.72	0.60	25.67	PhiVc < Vu	3.880	39.5	10.5 10.0

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	18.000	-89.64	136.84	0.66
+1.40D+1.60H					
Span # 1	1	18.000	-60.97	136.84	0.45
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	18.000	-89.64	136.84	0.66
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	18.000	-85.52	136.84	0.62
+1.20D+1.60Lr+0.50L+1.60H					
Span # 1	1	18.000	-75.83	136.84	0.55
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	18.000	-65.43	136.84	0.48
+1.20D+0.50L+1.60S+1.60H					
Span # 1	1	18.000	-62.65	136.84	0.46
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	18.000	-52.26	136.84	0.38
+1.20D+0.50Lr+0.50L+W+1.60H					
Span # 1	1	18.000	-66.77	136.84	0.49
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	18.000	-62.65	136.84	0.46
+1.401D+0.50L+0.20S+E+1.60H					
Span # 1	1	18.000	-82.63	136.84	0.60
+1.401D+0.50L+0.20S-E+1.60H					
Span # 1	1	18.000	-80.80	136.84	0.59
+0.90D+W+0.90H					
Span # 1	1	18.000	-39.19	136.84	0.29
+0.6988D+E+0.90H					
Span # 1	1	18.000	-41.65	136.84	0.30
+0.6988D-E+0.90H					
Span # 1	1	18.000	-39.81	136.84	0.29

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+0.750Lr+0.750L+0.450W+H	1	0.0233	9.000		0.0000	0.000

Concrete Beam

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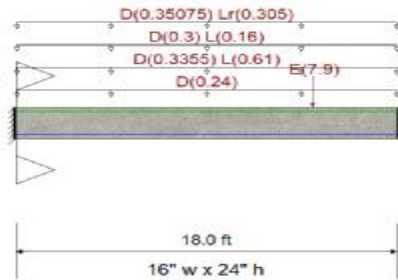
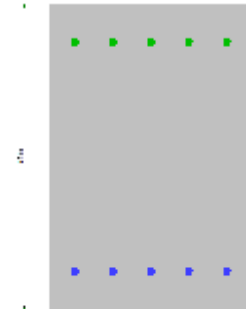
DESCRIPTION: GB 2

CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10
 Load Combination Set : ASCE 7-10

Material Properties

f'_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} * 7.50$	=	375.0 psi		Shear :	0.750
γ Density	=	145.0 pcf	b_1	=	0.850
I LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	F_y - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	2



Cross Section & Reinforcing Details

Rectangular Section, Width = 16.0 in, Height = 24.0 in

Span #1 Reinforcing....

5-#5 at 3.0 in from Bottom, from 0.0 to 18.0 ft in this span

5-#5 at 3.0 in from Top, from 0.0 to 18.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : $D = 0.010$ ksf, Tributary Width = 24.0 ft, (Wall Above)

Uniform Load : $D = 0.0220$, $L = 0.040$ ksf, Tributary Width = 15.250 ft, (Floor Framing)

Uniform Load : $D = 0.0750$, $L = 0.040$ ksf, Tributary Width = 4.0 ft, (Floor Slab)

Uniform Load : $D = 0.0230$, $L_r = 0.020$ ksf, Tributary Width = 15.250 ft, (Roof Framing)

Point Load : $E = 7.90$ k @ 14.0 ft, (SW 71)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.662 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.006 in Ratio = 34189 >=360.0
M_u : Applied	-90.531 k-ft	Max Upward Transient Deflection	0.000 in Ratio = 0 <360.0
$M_n * \phi$: Allowable	136.845 k-ft	Max Downward Total Deflection	0.023 in Ratio = 9286 >=180.0
Location of maximum on span	18.000 ft	Max Upward Total Deflection	0.000 in Ratio = 0 <180.0
Span # where maximum occurs	Span # 1		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	21.772	23.008
Overall MINimum	-0.997	2.745
+D+H	14.516	14.516
+D+L+H	21.446	21.446
+D+Lr+H	17.261	17.261
+D+S+H	14.516	14.516
+D+0.750Lr+0.750L+H	21.772	21.772
+D+0.750L+0.750S+H	19.714	19.714

Concrete Beam

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DESCRIPTION: GB 2

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+0.60W+H	14.516	14.516
+D+0.70E+H	15.338	19.224
+D-0.70E+H	13.818	9.684
+D+0.750Lr+0.750L+0.450W+H	21.772	21.772
+D+0.750L+0.750S+0.450W+H	19.714	19.714
+D+0.750L+0.750S+0.5250E+H	20.567	23.008
+D+0.750L+0.750S-0.5250E+H	19.087	16.193
+0.60D+0.60W+0.60H	8.710	8.710
+0.60D+0.70E+0.60H	9.408	13.542
+0.60D-0.70E+0.60H	8.012	3.878
D Only	14.516	14.516
Lr Only	2.745	2.745
L Only	6.930	6.930
E Only	0.997	6.903
E Only * -1.0	-0.997	-6.903
H Only		

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	0.00	21.00	29.88	29.88	89.64	0.58	25.64	PhiVc < Vu	4.245	39.5	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.20	21.00	29.23	29.23	83.83	0.61	25.71	PhiVc < Vu	3.514	39.6	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.39	21.00	28.57	28.57	78.14	0.64	25.80	PhiVc < Vu	2.774	39.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.59	21.00	27.92	27.92	72.58	0.67	25.90	PhiVc < Vu	2.024	39.8	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.79	21.00	27.27	27.27	67.16	0.71	26.01	PhiVc < Vu	1.262	39.9	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.98	21.00	26.61	26.61	61.86	0.75	26.13	PhiVc < Vu	0.4861	40.0	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.18	21.00	25.96	25.96	56.68	0.80	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.38	21.00	25.31	25.31	51.64	0.86	26.43	PhiVc/2 < Vu <=	Min 9.6.3.1	40.3	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.57	21.00	24.66	24.66	46.73	0.92	26.62	PhiVc/2 < Vu <=	Min 9.6.3.1	40.5	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.77	21.00	24.00	24.00	41.94	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.97	21.00	23.35	23.35	37.28	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.16	21.00	22.70	22.70	32.75	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.36	21.00	22.04	22.04	28.35	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.56	21.00	21.39	21.39	24.08	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.75	21.00	20.74	20.74	19.94	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.95	21.00	20.08	20.08	15.92	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.15	21.00	19.43	19.43	12.04	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.34	21.00	18.78	18.78	8.28	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.54	21.00	18.12	18.12	4.65	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.74	21.00	17.47	17.47	1.15	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.93	21.00	16.82	16.82	2.22	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.13	21.00	16.16	16.16	5.47	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.33	21.00	15.51	15.51	8.58	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.52	21.00	14.86	14.86	11.57	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.72	21.00	14.21	14.21	14.43	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.92	21.00	13.55	13.55	17.16	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.11	21.00	12.90	12.90	19.76	1.00	26.85	Vu < PhiVc/2	lot Reqd 9.6.	26.8	0.0 0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.31	21.00	12.25	12.25	22.24	0.96	26.74	Vu < PhiVc/2	lot Reqd 9.6.	26.7	0.0 0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.51	21.00	11.59	11.59	24.58	0.83	26.34	Vu < PhiVc/2	lot Reqd 9.6.	26.3	0.0 0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.70	21.00	10.94	10.94	26.80	0.71	26.02	Vu < PhiVc/2	lot Reqd 9.6.	26.0	0.0 0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.90	21.00	10.29	10.29	28.88	0.62	25.75	Vu < PhiVc/2	lot Reqd 9.6.	25.8	0.0 0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.10	21.00	9.63	9.63	30.84	0.55	25.53	Vu < PhiVc/2	lot Reqd 9.6.	25.5	0.0 0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.30	21.00	8.98	8.98	32.67	0.48	25.34	Vu < PhiVc/2	lot Reqd 9.6.	25.3	0.0 0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.49	21.00	8.33	8.33	34.38	0.42	25.17	Vu < PhiVc/2	lot Reqd 9.6.	25.2	0.0 0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.69	21.00	7.67	7.67	35.95	0.37	25.03	Vu < PhiVc/2	lot Reqd 9.6.	25.0	0.0 0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.89	21.00	7.02	7.02	37.40	0.33	24.89	Vu < PhiVc/2	lot Reqd 9.6.	24.9	0.0 0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.08	21.00	6.37	6.37	38.71	0.29	24.78	Vu < PhiVc/2	lot Reqd 9.6.	24.8	0.0 0.0

Concrete Beam

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DESCRIPTION: GB 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
												Req'd	Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	7.28	21.00	5.71	5.71	39.90	0.25	24.67	Vu < PhiVc/2	lot Req'd 9.6.	24.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.48	21.00	5.06	5.06	40.96	0.22	24.57	Vu < PhiVc/2	lot Req'd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	7.67	21.00	4.51	4.51	35.56	0.22	24.58	Vu < PhiVc/2	lot Req'd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	7.87	21.00	3.99	3.99	36.40	0.19	24.50	Vu < PhiVc/2	lot Req'd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.07	21.00	3.47	3.47	37.13	0.16	24.42	Vu < PhiVc/2	lot Req'd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.26	21.00	2.95	2.95	37.76	0.14	24.34	Vu < PhiVc/2	lot Req'd 9.6.	24.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.46	21.00	2.43	2.43	38.29	0.11	24.26	Vu < PhiVc/2	lot Req'd 9.6.	24.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.66	21.00	1.91	1.91	38.72	0.09	24.19	Vu < PhiVc/2	lot Req'd 9.6.	24.2	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.85	21.00	1.39	1.39	39.04	0.06	24.12	Vu < PhiVc/2	lot Req'd 9.6.	24.1	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	9.05	21.00	-1.13	1.13	32.14	0.06	24.12	Vu < PhiVc/2	lot Req'd 9.6.	24.1	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	9.25	21.00	-1.65	1.65	31.87	0.09	24.20	Vu < PhiVc/2	lot Req'd 9.6.	24.2	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	9.44	21.00	-2.17	2.17	31.50	0.12	24.29	Vu < PhiVc/2	lot Req'd 9.6.	24.3	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	9.64	21.00	-2.69	2.69	31.02	0.15	24.38	Vu < PhiVc/2	lot Req'd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	9.84	21.00	-3.21	3.21	30.44	0.18	24.48	Vu < PhiVc/2	lot Req'd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	10.03	21.00	-3.73	3.73	29.76	0.22	24.58	Vu < PhiVc/2	lot Req'd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	10.23	21.00	-4.25	4.25	28.97	0.26	24.69	Vu < PhiVc/2	lot Req'd 9.6.	24.7	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	10.43	21.00	-4.77	4.77	28.08	0.30	24.80	Vu < PhiVc/2	lot Req'd 9.6.	24.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.62	21.00	-5.39	5.39	40.45	0.23	24.62	Vu < PhiVc/2	lot Req'd 9.6.	24.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.82	21.00	-6.04	6.04	39.32	0.27	24.72	Vu < PhiVc/2	lot Req'd 9.6.	24.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	11.02	21.00	-6.69	6.69	38.07	0.31	24.83	Vu < PhiVc/2	lot Req'd 9.6.	24.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	11.21	21.00	-7.35	7.35	36.69	0.35	24.96	Vu < PhiVc/2	lot Req'd 9.6.	25.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	11.41	21.00	-8.00	8.00	35.18	0.40	25.10	Vu < PhiVc/2	lot Req'd 9.6.	25.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	11.61	21.00	-8.65	8.65	33.54	0.45	25.25	Vu < PhiVc/2	lot Req'd 9.6.	25.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	11.80	21.00	-9.31	9.31	31.78	0.51	25.43	Vu < PhiVc/2	lot Req'd 9.6.	25.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.00	21.00	-9.96	9.96	29.88	0.58	25.64	Vu < PhiVc/2	lot Req'd 9.6.	25.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.20	21.00	-10.61	10.61	27.86	0.67	25.88	Vu < PhiVc/2	lot Req'd 9.6.	25.9	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.39	21.00	-11.27	11.27	25.70	0.77	26.17	Vu < PhiVc/2	lot Req'd 9.6.	26.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.59	21.00	-11.92	11.92	23.42	0.89	26.53	Vu < PhiVc/2	lot Req'd 9.6.	26.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.79	21.00	-12.57	12.57	21.02	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	12.98	21.00	-13.23	13.23	18.48	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	13.18	21.00	-13.88	13.88	15.81	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	13.38	21.00	-14.53	14.53	13.02	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	13.57	21.00	-15.18	15.18	10.09	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	13.77	21.00	-15.84	15.84	7.04	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	13.97	21.00	-16.49	16.49	3.86	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	14.16	21.00	-20.56	20.56	7.81	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	14.36	21.00	-21.08	21.08	3.71	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	14.56	21.00	-21.60	21.60	0.49	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	14.75	21.00	-22.12	22.12	4.79	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	14.95	21.00	-22.64	22.64	9.19	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	15.15	21.00	-23.16	23.16	13.70	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	15.34	21.00	-23.68	23.68	18.31	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	15.54	21.00	-24.20	24.20	23.02	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	15.74	21.00	-24.72	24.72	27.83	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	15.93	21.00	-25.24	25.24	32.74	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	16.13	21.00	-25.77	25.77	37.76	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	16.33	21.00	-26.29	26.29	42.88	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	16.52	21.00	-26.81	26.81	48.10	0.98	26.77	PhiVc < Vu	0.03150	40.6	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	16.72	21.00	-27.33	27.33	53.43	0.90	26.54	PhiVc < Vu	0.7848	40.4	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	16.92	21.00	-27.85	27.85	58.85	0.83	26.35	PhiVc < Vu	1.50	40.2	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	17.11	21.00	-28.37	28.37	64.38	0.77	26.18	PhiVc < Vu	2.186	40.0	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	17.31	21.00	-28.89	28.89	70.01	0.72	26.04	PhiVc < Vu	2.849	39.9	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	17.51	21.00	-29.41	29.41	75.75	0.68	25.91	PhiVc < Vu	3.493	39.8	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	17.70	21.00	-29.93	29.93	81.58	0.64	25.81	PhiVc < Vu	4.122	39.7	10.5	10.0

Concrete Beam

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DESCRIPTION: GB 2

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd Suggest
+1.401D+0.50L+0.20S+E+1.60H	1	17.90	21.00	-30.45	30.45	87.52	0.61	25.71	PhiVc < Vu	4.739	39.6	10.5 10.0

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	18.000	-90.53	136.84	0.66
+1.40D+1.60H					
Span # 1	1	18.000	-60.97	136.84	0.45
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	18.000	-89.64	136.84	0.66
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	18.000	-85.52	136.84	0.62
+1.20D+1.60Lr+0.50L+1.60H					
Span # 1	1	18.000	-75.83	136.84	0.55
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	18.000	-65.43	136.84	0.48
+1.20D+0.50L+1.60S+1.60H					
Span # 1	1	18.000	-62.65	136.84	0.46
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	18.000	-52.26	136.84	0.38
+1.20D+0.50Lr+0.50L+W+1.60H					
Span # 1	1	18.000	-66.77	136.84	0.49
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	18.000	-62.65	136.84	0.46
+1.401D+0.50L+0.20S+E+1.60H					
Span # 1	1	18.000	-90.53	136.84	0.66
+1.401D+0.50L+0.20S-E+1.60H					
Span # 1	1	18.000	-65.95	136.84	0.48
+0.90D+W+0.90H					
Span # 1	1	18.000	-39.19	136.84	0.29
+0.6988D+E+0.90H					
Span # 1	1	18.000	-49.55	136.84	0.36
+0.6988D-E+0.90H					
Span # 1	1	18.000	-24.97	136.84	0.18

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+0.750Lr+0.750L+0.450W+H	1	0.0233	9.000		0.0000	0.000

Concrete Beam

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DESCRIPTION: GB 3

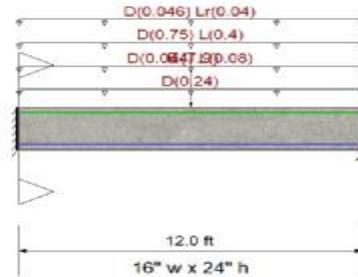
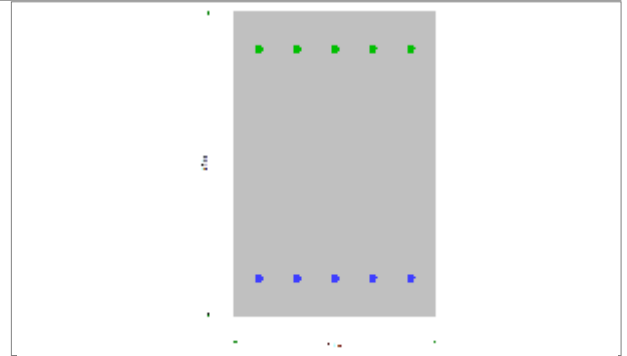
CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10

Load Combination Set : ASCE 7-10

Material Properties

f'_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} * 7.50$	=	375.0 psi		Shear :	0.750
γ Density	=	145.0 pcf	b_1	=	0.850
I LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	F_y - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	2



Cross Section & Reinforcing Details

Rectangular Section, Width = 16.0 in, Height = 24.0 in

Span #1 Reinforcing....

5-#5 at 3.0 in from Bottom, from 0.0 to 12.0 ft in this span

5-#5 at 3.0 in from Top, from 0.0 to 12.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.010 ksf, Tributary Width = 24.0 ft, (Wall Above)

Uniform Load : D = 0.0220, L = 0.040 ksf, Tributary Width = 2.0 ft, (Floor Framing)

Uniform Load : D = 0.0750, L = 0.040 ksf, Tributary Width = 10.0 ft, (Floor Slab)

Uniform Load : D = 0.0230, Lr = 0.020 ksf, Tributary Width = 2.0 ft, (Roof Framing)

Point Load : E = 7.90 k @ 6.0 ft, (SW 71)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.432 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.004 in Ratio = 37725 >=360.
M_u : Applied	-59.086 k-ft	Max Upward Transient Deflection	0.000 in Ratio = 0 <360.0
$M_n * \phi$: Allowable	136.845 k-ft	Max Downward Total Deflection	0.008 in Ratio = 17661 >=180.
Location of maximum on span	0.000 ft	Max Upward Total Deflection	0.000 in Ratio = 0 <180.0
Span # where maximum occurs	Span # 1		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	16.551	9.516
Overall MINimum	0.300	0.180
+D+H	11.000	6.600
+D+L+H	14.600	8.760
+D+Lr+H	11.300	6.780
+D+S+H	11.000	6.600
+D+0.750Lr+0.750L+H	13.925	8.355
+D+0.750L+0.750S+H	13.700	8.220

Concrete Beam

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DESCRIPTION: GB 3

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+0.60W+H	11.000	6.600
+D+0.70E+H	14.802	8.328
+D-0.70E+H	7.198	4.872
+D+0.750Lr+0.750L+0.450W+H	13.925	8.355
+D+0.750L+0.750S+0.450W+H	13.700	8.220
+D+0.750L+0.750S+0.5250E+H	16.551	9.516
+D+0.750L+0.750S-0.5250E+H	10.849	6.924
+0.60D+0.60W+0.60H	6.600	3.960
+0.60D+0.70E+0.60H	10.402	5.688
+0.60D-0.70E+0.60H	2.798	2.232
D Only	11.000	6.600
Lr Only	0.300	0.180
L Only	3.600	2.160
E Only	5.431	2.469
E Only * -1.0	-5.431	-2.469
H Only		

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd Suggest
+1.401D+0.50L+0.20S+E+1.60H	1	0.00	21.00	22.64	22.64	59.09	0.67	25.89	PhiVc/2 < Vu <=	Min 9.6.3.1	39.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.13	21.00	22.34	22.34	56.14	0.70	25.96	PhiVc/2 < Vu <=	Min 9.6.3.1	39.8	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.26	21.00	22.04	22.04	53.23	0.72	26.05	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.39	21.00	21.74	21.74	50.35	0.76	26.14	PhiVc/2 < Vu <=	Min 9.6.3.1	40.0	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.52	21.00	21.44	21.44	47.52	0.79	26.23	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.66	21.00	21.14	21.14	44.73	0.83	26.34	PhiVc/2 < Vu <=	Min 9.6.3.1	40.2	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.79	21.00	20.84	20.84	41.98	0.87	26.46	PhiVc/2 < Vu <=	Min 9.6.3.1	40.3	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.92	21.00	20.54	20.54	39.26	0.92	26.60	PhiVc/2 < Vu <=	Min 9.6.3.1	40.5	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.05	21.00	20.24	20.24	36.59	0.97	26.75	PhiVc/2 < Vu <=	Min 9.6.3.1	40.6	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.18	21.00	19.94	19.94	33.96	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.31	21.00	19.63	19.63	31.36	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.44	21.00	19.33	19.33	28.81	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.57	21.00	19.03	19.03	26.29	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.70	21.00	18.73	18.73	23.81	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.84	21.00	18.43	18.43	21.38	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.97	21.00	18.13	18.13	18.98	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.10	21.00	17.83	17.83	16.62	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.23	21.00	17.53	17.53	14.30	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.36	21.00	17.23	17.23	12.03	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.49	21.00	16.93	16.93	9.79	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.62	21.00	16.62	16.62	7.59	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.75	21.00	16.32	16.32	5.43	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.89	21.00	16.02	16.02	3.30	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.02	21.00	15.72	15.72	1.22	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.15	21.00	15.42	15.42	0.82	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.28	21.00	15.12	15.12	2.82	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.41	21.00	14.82	14.82	4.79	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.54	21.00	14.52	14.52	6.71	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.67	21.00	14.22	14.22	8.59	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.80	21.00	13.92	13.92	10.44	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.93	21.00	13.61	13.61	12.24	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5 10.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.07	21.00	13.31	13.31	14.01	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0 0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.20	21.00	13.01	13.01	15.74	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0 0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.33	21.00	12.71	12.71	17.42	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0 0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.46	21.00	12.41	12.41	19.07	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0 0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.59	21.00	12.11	12.11	20.68	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0 0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.72	21.00	11.81	11.81	22.25	0.93	26.64	Vu < PhiVc/2	lot Req'd 9.6.	26.6	0.0 0.0

Concrete Beam

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DESCRIPTION: GB 3

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
												Req'd	Suggest
+1.401D+0.50L+0.20S+E+1.60H	1	4.85	21.00	11.51	11.51	23.77	0.85	26.40	Vu < PhiVc/2	lot Req'd 9.6.	26.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.98	21.00	11.21	11.21	25.26	0.78	26.20	Vu < PhiVc/2	lot Req'd 9.6.	26.2	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.11	21.00	10.91	10.91	26.71	0.71	26.02	Vu < PhiVc/2	lot Req'd 9.6.	26.0	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.25	21.00	10.60	10.60	28.12	0.66	25.86	Vu < PhiVc/2	lot Req'd 9.6.	25.9	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.38	21.00	10.30	10.30	29.50	0.61	25.72	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.51	21.00	10.00	10.00	30.83	0.57	25.59	Vu < PhiVc/2	lot Req'd 9.6.	25.6	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.64	21.00	9.70	9.70	32.12	0.53	25.48	Vu < PhiVc/2	lot Req'd 9.6.	25.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.77	21.00	9.40	9.40	33.37	0.49	25.37	Vu < PhiVc/2	lot Req'd 9.6.	25.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.90	21.00	9.10	9.10	34.58	0.46	25.28	Vu < PhiVc/2	lot Req'd 9.6.	25.3	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.03	21.00	5.84	5.84	6.04	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.16	21.00	5.54	5.54	6.78	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.30	21.00	5.23	5.23	7.49	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.43	21.00	4.93	4.93	8.15	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.56	21.00	4.63	4.63	8.78	0.92	26.62	Vu < PhiVc/2	lot Req'd 9.6.	26.6	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.69	21.00	4.33	4.33	9.37	0.81	26.29	Vu < PhiVc/2	lot Req'd 9.6.	26.3	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.82	21.00	4.03	4.03	9.92	0.71	26.01	Vu < PhiVc/2	lot Req'd 9.6.	26.0	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.95	21.00	3.73	3.73	10.43	0.63	25.76	Vu < PhiVc/2	lot Req'd 9.6.	25.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.08	21.00	3.43	3.43	10.90	0.55	25.54	Vu < PhiVc/2	lot Req'd 9.6.	25.5	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.21	21.00	3.13	3.13	11.33	0.48	25.34	Vu < PhiVc/2	lot Req'd 9.6.	25.3	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.34	21.00	2.83	2.83	11.72	0.42	25.17	Vu < PhiVc/2	lot Req'd 9.6.	25.2	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.48	21.00	2.53	2.53	12.07	0.37	25.00	Vu < PhiVc/2	lot Req'd 9.6.	25.0	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	7.61	21.00	-2.71	2.71	34.07	0.14	24.35	Vu < PhiVc/2	lot Req'd 9.6.	24.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	7.74	21.00	-3.01	3.01	33.70	0.16	24.39	Vu < PhiVc/2	lot Req'd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	7.87	21.00	-3.32	3.32	33.28	0.17	24.45	Vu < PhiVc/2	lot Req'd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.00	21.00	-3.62	3.62	32.83	0.19	24.50	Vu < PhiVc/2	lot Req'd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.13	21.00	-3.92	3.92	32.33	0.21	24.56	Vu < PhiVc/2	lot Req'd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.26	21.00	-4.22	4.22	31.80	0.23	24.61	Vu < PhiVc/2	lot Req'd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.39	21.00	-4.52	4.52	31.23	0.25	24.68	Vu < PhiVc/2	lot Req'd 9.6.	24.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.52	21.00	-4.82	4.82	30.61	0.28	24.74	Vu < PhiVc/2	lot Req'd 9.6.	24.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.66	21.00	-5.12	5.12	29.96	0.30	24.81	Vu < PhiVc/2	lot Req'd 9.6.	24.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.79	21.00	-5.42	5.42	29.27	0.32	24.88	Vu < PhiVc/2	lot Req'd 9.6.	24.9	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.92	21.00	-5.72	5.72	28.54	0.35	24.96	Vu < PhiVc/2	lot Req'd 9.6.	25.0	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.05	21.00	-6.02	6.02	27.77	0.38	25.04	Vu < PhiVc/2	lot Req'd 9.6.	25.0	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.18	21.00	-6.33	6.33	26.96	0.41	25.13	Vu < PhiVc/2	lot Req'd 9.6.	25.1	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.31	21.00	-6.63	6.63	26.11	0.44	25.23	Vu < PhiVc/2	lot Req'd 9.6.	25.2	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.44	21.00	-6.93	6.93	25.22	0.48	25.34	Vu < PhiVc/2	lot Req'd 9.6.	25.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.57	21.00	-7.23	7.23	24.29	0.52	25.45	Vu < PhiVc/2	lot Req'd 9.6.	25.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.70	21.00	-7.53	7.53	23.32	0.56	25.58	Vu < PhiVc/2	lot Req'd 9.6.	25.6	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.84	21.00	-7.83	7.83	22.32	0.61	25.72	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.97	21.00	-8.13	8.13	21.27	0.67	25.88	Vu < PhiVc/2	lot Req'd 9.6.	25.9	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.10	21.00	-8.43	8.43	20.18	0.73	26.06	Vu < PhiVc/2	lot Req'd 9.6.	26.1	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.23	21.00	-8.73	8.73	19.06	0.80	26.27	Vu < PhiVc/2	lot Req'd 9.6.	26.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.36	21.00	-9.03	9.03	17.89	0.88	26.51	Vu < PhiVc/2	lot Req'd 9.6.	26.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.49	21.00	-9.34	9.34	16.69	0.98	26.78	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.62	21.00	-9.64	9.64	15.45	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.75	21.00	-9.94	9.94	14.16	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.89	21.00	-10.24	10.24	12.84	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.02	21.00	-10.54	10.54	11.48	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.15	21.00	-10.84	10.84	10.07	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.28	21.00	-11.14	11.14	8.63	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.41	21.00	-11.44	11.44	7.15	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.54	21.00	-11.74	11.74	5.63	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.67	21.00	-12.04	12.04	4.07	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.80	21.00	-12.35	12.35	2.47	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0	0.0

Concrete Beam

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DESCRIPTION: GB 3

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd Suggest
+1.401D+0.50L+0.20S+E+1.60H	1	11.93	21.00	-12.65	12.65	0.83	1.00	26.85	Vu < PhiVc/2	lot Req'd 9.6.	26.8	0.0 0.0

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	12.000	-59.09	136.84	0.43
+1.40D+1.60H					
Span # 1	1	12.000	-36.96	136.84	0.27
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	12.000	-45.86	136.84	0.34
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	12.000	-45.50	136.84	0.33
+1.20D+1.60Lr+0.50L+1.60H					
Span # 1	1	12.000	-37.15	136.84	0.27
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	12.000	-32.83	136.84	0.24
+1.20D+0.50L+1.60S+1.60H					
Span # 1	1	12.000	-36.00	136.84	0.26
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	12.000	-31.68	136.84	0.23
+1.20D+0.50Lr+0.50L+W+1.60H					
Span # 1	1	12.000	-36.36	136.84	0.27
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	12.000	-36.00	136.84	0.26
+1.401D+0.50L+0.20S+E+1.60H					
Span # 1	1	12.000	-59.09	136.84	0.43
+1.401D+0.50L+0.20S-E+1.60H					
Span # 1	1	12.000	-23.54	136.84	0.17
+0.90D+W+0.90H					
Span # 1	1	12.000	-23.76	136.84	0.17
+0.6988D+E+0.90H					
Span # 1	1	12.000	-36.22	136.84	0.26
+0.6988D-E+0.90H					
Span # 1	1	12.000	-5.55	136.84	0.04

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+0.750L+0.750S+0.5250E+H	1	0.0082	6.787		0.0000	0.000

Concrete Beam

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DESCRIPTION: GB 4

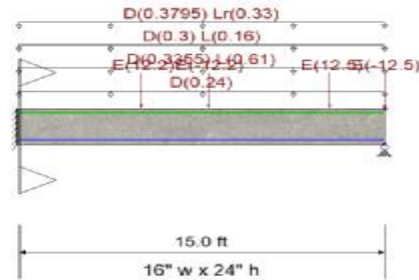
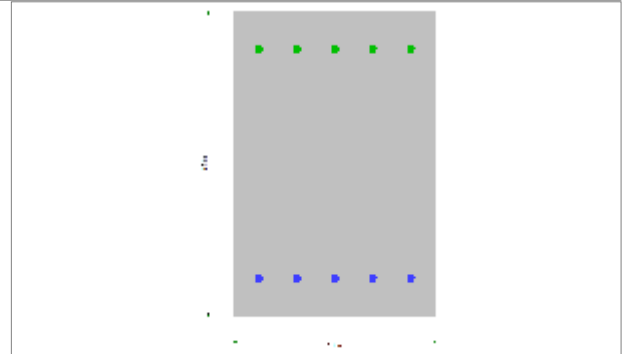
CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10

Load Combination Set : ASCE 7-10

Material Properties

f'_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} * 7.50$	=	375.0 psi		Shear :	0.750
γ Density	=	145.0 pcf	b_1	=	0.850
I LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	F_y - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	2



Cross Section & Reinforcing Details

Rectangular Section, Width = 16.0 in, Height = 24.0 in

Span #1 Reinforcing....

5-#5 at 3.0 in from Bottom, from 0.0 to 15.0 ft in this span

5-#5 at 3.0 in from Top, from 0.0 to 15.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.010 ksf, Tributary Width = 24.0 ft, (Wall Above)

Uniform Load : D = 0.0220, L = 0.040 ksf, Tributary Width = 15.250 ft, (Floor Framing)

Uniform Load : D = 0.0750, L = 0.040 ksf, Tributary Width = 4.0 ft, (Floor Slab)

Uniform Load : D = 0.0230, Lr = 0.020 ksf, Tributary Width = 16.50 ft, (Roof Framing)

Point Load : E = 12.20 k @ 5.0 ft, (SW 95)

Point Load : E = -12.20 k @ 7.750 ft, (SW 95)

Point Load : E = 12.50 k @ 12.750 ft, (SW 96)

Point Load : E = -12.50 k @ 15.0 ft, (SW 96)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.692 : 1
Section used for this span	Typical Section
Mu : Applied	-94.696 k-ft
Mn * Phi : Allowable	136.845 k-ft
Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1

Maximum Deflection	
Max Downward Transient Deflection	0.006 in Ratio = 28405 >=360.
Max Upward Transient Deflection	0.000 in Ratio = 0 <360.0
Max Downward Total Deflection	0.023 in Ratio = 7806 >=180.
Max Upward Total Deflection	0.000 in Ratio = 0 <180.0

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	22.948	15.185
Overall MINimum	3.094	1.856
+D+H	15.391	9.234
+D+L+H	22.178	13.997

Concrete Beam

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DESCRIPTION: GB 4

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+Lr+H	18.418	11.157
+D+S+H	15.391	9.234
+D+0.750Lr+0.750L+H	22.632	14.368
+D+0.750L+0.750S+H	20.561	12.726
+D+0.60W+H	15.391	9.234
+D+0.70E+H	18.838	5.787
+D-0.70E+H	11.872	12.753
+D+0.750Lr+0.750L+0.450W+H	22.632	14.368
+D+0.750L+0.750S+0.450W+H	20.561	12.726
+D+0.750L+0.750S+0.5250E+H	22.948	10.340
+D+0.750L+0.750S-0.5250E+H	18.103	15.185
+0.60D+0.60W+0.60H	9.234	5.541
+0.60D+0.70E+0.60H	12.753	2.022
+0.60D-0.70E+0.60H	5.716	9.059
D Only	15.391	9.234
Lr Only	3.094	1.856
L Only	7.219	4.331
E Only	5.027	-5.027
E Only * -1.0	-5.027	5.027
H Only		

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
				Actual	Design							Req'd	Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	0.00	21.00	31.57	31.57	94.70	0.58	25.64	PhiVc < Vu	5.930	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.16	21.00	31.01	31.01	89.57	0.61	25.70	PhiVc < Vu	5.313	39.6	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.33	21.00	30.46	30.46	84.53	0.63	25.77	PhiVc < Vu	4.689	39.6	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.49	21.00	29.91	29.91	79.58	0.66	25.85	PhiVc < Vu	4.058	39.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.66	21.00	29.36	29.36	74.72	0.69	25.94	PhiVc < Vu	3.419	39.8	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.82	21.00	28.81	28.81	69.95	0.72	26.03	PhiVc < Vu	2.771	39.9	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.98	21.00	28.25	28.25	65.28	0.76	26.14	PhiVc < Vu	2.112	40.0	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.15	21.00	27.70	27.70	60.69	0.80	26.26	PhiVc < Vu	1.440	40.1	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.31	21.00	27.15	27.15	56.19	0.85	26.40	PhiVc < Vu	0.7526	40.3	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.48	21.00	26.60	26.60	51.79	0.90	26.55	PhiVc < Vu	0.04579	40.4	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.64	21.00	26.05	26.05	47.47	0.96	26.73	PhiVc/2 < Vu <=	Min 9.6.3.1	40.6	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.80	21.00	25.49	25.49	43.25	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.97	21.00	24.94	24.94	39.11	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.13	21.00	24.48	24.48	30.99	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.30	21.00	24.04	24.04	27.02	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.46	21.00	23.60	23.60	23.11	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.62	21.00	23.16	23.16	19.28	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.79	21.00	22.72	22.72	15.52	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.95	21.00	22.28	22.28	11.83	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.11	21.00	21.84	21.84	8.22	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.28	21.00	21.40	21.40	4.67	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.44	21.00	20.96	20.96	1.20	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.61	21.00	20.52	20.52	2.20	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.77	21.00	20.08	20.08	5.53	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.93	21.00	19.64	19.64	8.78	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.10	21.00	19.20	19.20	11.96	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.26	21.00	18.76	18.76	15.08	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.43	21.00	18.32	18.32	18.11	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.59	21.00	17.88	17.88	21.08	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.75	21.00	17.44	17.44	23.97	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.92	21.00	16.99	16.99	26.80	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	5.08	21.00	18.70	18.70	6.93	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	5.25	21.00	18.26	18.26	9.96	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0

Concrete Beam

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DESCRIPTION: GB 4

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
												Req'd	Suggest
+1.401D+0.50L+0.20S-E+1.60H	1	5.41	21.00	17.82	17.82	12.92	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	5.57	21.00	17.38	17.38	15.80	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	5.74	21.00	16.94	16.94	18.61	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	5.90	21.00	16.50	16.50	21.35	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.07	21.00	16.06	16.06	24.02	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.23	21.00	15.62	15.62	26.62	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.39	21.00	15.18	15.18	29.15	0.91	26.59	PhiVc/2 < Vu <=	Min 9.6.3.1	40.4	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.56	21.00	14.74	14.74	31.60	0.82	26.31	PhiVc/2 < Vu <=	Min 9.6.3.1	40.2	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.72	21.00	14.30	14.30	33.98	0.74	26.08	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.89	21.00	13.86	13.86	36.29	0.67	25.88	PhiVc/2 < Vu <=	Min 9.6.3.1	39.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.05	21.00	13.42	13.42	38.52	0.61	25.71	PhiVc/2 < Vu <=	Min 9.6.3.1	39.6	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.21	21.00	12.98	12.98	40.69	0.56	25.56	PhiVc/2 < Vu <=	Min 9.6.3.1	39.4	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.38	21.00	12.54	12.54	42.78	0.51	25.43	Vu < PhiVc/2	lot Reqd 9.6.	25.4	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.54	21.00	12.10	12.10	44.80	0.47	25.31	Vu < PhiVc/2	lot Reqd 9.6.	25.3	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.70	21.00	11.66	11.66	46.74	0.44	25.21	Vu < PhiVc/2	lot Reqd 9.6.	25.2	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.87	21.00	9.07	9.07	31.71	0.50	25.40	Vu < PhiVc/2	lot Reqd 9.6.	25.4	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	8.03	21.00	8.63	8.63	33.16	0.46	25.26	Vu < PhiVc/2	lot Reqd 9.6.	25.3	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	8.20	21.00	8.19	8.19	34.54	0.42	25.15	Vu < PhiVc/2	lot Reqd 9.6.	25.1	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	8.36	21.00	7.75	7.75	35.84	0.38	25.04	Vu < PhiVc/2	lot Reqd 9.6.	25.0	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	8.52	21.00	7.31	7.31	37.08	0.35	24.94	Vu < PhiVc/2	lot Reqd 9.6.	24.9	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	8.69	21.00	6.87	6.87	38.24	0.31	24.85	Vu < PhiVc/2	lot Reqd 9.6.	24.9	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	8.85	21.00	6.43	6.43	39.33	0.29	24.77	Vu < PhiVc/2	lot Reqd 9.6.	24.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	9.02	21.00	5.99	5.99	40.35	0.26	24.70	Vu < PhiVc/2	lot Reqd 9.6.	24.7	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	9.18	21.00	5.55	5.55	41.29	0.24	24.62	Vu < PhiVc/2	lot Reqd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	9.34	21.00	5.11	5.11	42.17	0.21	24.56	Vu < PhiVc/2	lot Reqd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	9.51	21.00	-5.38	5.38	41.95	0.22	24.59	Vu < PhiVc/2	lot Reqd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	9.67	21.00	-5.82	5.82	41.03	0.25	24.66	Vu < PhiVc/2	lot Reqd 9.6.	24.7	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	9.84	21.00	-6.26	6.26	40.04	0.27	24.74	Vu < PhiVc/2	lot Reqd 9.6.	24.7	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	10.00	21.00	-6.71	6.71	38.98	0.30	24.81	Vu < PhiVc/2	lot Reqd 9.6.	24.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	10.16	21.00	-7.15	7.15	37.84	0.33	24.90	Vu < PhiVc/2	lot Reqd 9.6.	24.9	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	10.33	21.00	-7.59	7.59	36.63	0.36	24.99	Vu < PhiVc/2	lot Reqd 9.6.	25.0	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	10.49	21.00	-8.03	8.03	35.35	0.40	25.09	Vu < PhiVc/2	lot Reqd 9.6.	25.1	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	10.66	21.00	-8.47	8.47	34.00	0.44	25.21	Vu < PhiVc/2	lot Reqd 9.6.	25.2	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	10.82	21.00	-8.91	8.91	32.58	0.48	25.33	Vu < PhiVc/2	lot Reqd 9.6.	25.3	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	10.98	21.00	-9.35	9.35	31.08	0.53	25.47	Vu < PhiVc/2	lot Reqd 9.6.	25.5	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	11.15	21.00	-9.79	9.79	29.51	0.58	25.63	Vu < PhiVc/2	lot Reqd 9.6.	25.6	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	11.31	21.00	-10.23	10.23	27.87	0.64	25.81	Vu < PhiVc/2	lot Reqd 9.6.	25.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	11.48	21.00	-10.67	10.67	26.16	0.71	26.01	Vu < PhiVc/2	lot Reqd 9.6.	26.0	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	11.64	21.00	-11.11	11.11	24.38	0.80	26.26	Vu < PhiVc/2	lot Reqd 9.6.	26.3	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	11.80	21.00	-11.55	11.55	22.52	0.90	26.55	Vu < PhiVc/2	lot Reqd 9.6.	26.5	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	11.97	21.00	-11.99	11.99	20.59	1.00	26.85	Vu < PhiVc/2	lot Reqd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	12.13	21.00	-12.43	12.43	18.59	1.00	26.85	Vu < PhiVc/2	lot Reqd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	12.30	21.00	-12.87	12.87	16.52	1.00	26.85	Vu < PhiVc/2	lot Reqd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	12.46	21.00	-13.31	13.31	14.37	1.00	26.85	Vu < PhiVc/2	lot Reqd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	12.62	21.00	-13.75	13.75	12.15	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	12.79	21.00	-16.64	16.64	43.38	0.67	25.89	PhiVc/2 < Vu <=	Min 9.6.3.1	39.8	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	12.95	21.00	-17.08	17.08	40.62	0.74	26.08	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	13.11	21.00	-17.52	17.52	37.78	0.81	26.30	PhiVc/2 < Vu <=	Min 9.6.3.1	40.2	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	13.28	21.00	-17.96	17.96	34.88	0.90	26.56	PhiVc/2 < Vu <=	Min 9.6.3.1	40.4	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	13.44	21.00	-18.40	18.40	31.90	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	13.61	21.00	-18.84	18.84	28.84	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	13.77	21.00	-19.28	19.28	25.72	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	13.93	21.00	-19.72	19.72	22.52	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	14.10	21.00	-20.16	20.16	19.26	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0

Concrete Beam

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DESCRIPTION: GB 4

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd Suggest	
+1.401D+0.50L+0.20S+E+1.60H	1	14.26	21.00	-20.60	20.60	15.91	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	14.43	21.00	-21.04	21.04	12.50	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	14.59	21.00	-21.48	21.48	9.02	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	14.75	21.00	-21.92	21.92	5.46	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	14.92	21.00	-22.36	22.36	1.83	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	15.000	-94.70	136.84	0.69
+1.40D+1.60H					
Span # 1	1	15.000	-64.64	136.84	0.47
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	15.000	-94.70	136.84	0.69
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	15.000	-90.06	136.84	0.66
+1.20D+1.60Lr+0.50L+1.60H					
Span # 1	1	15.000	-81.08	136.84	0.59
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	15.000	-70.26	136.84	0.51
+1.20D+0.50L+1.60S+1.60H					
Span # 1	1	15.000	-66.23	136.84	0.48
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	15.000	-55.41	136.84	0.40
+1.20D+0.50Lr+0.50L+W+1.60H					
Span # 1	1	15.000	-70.87	136.84	0.52
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	15.000	-66.23	136.84	0.48
+1.401D+0.50L+0.20S+E+1.60H					
Span # 1	1	15.000	-89.26	136.84	0.65
+1.401D+0.50L+0.20S-E+1.60H					
Span # 1	1	15.000	-61.79	136.84	0.45
+0.90D+W+0.90H					
Span # 1	1	15.000	-41.55	136.84	0.30
+0.6988D+E+0.90H					
Span # 1	1	15.000	-46.00	136.84	0.34
+0.6988D-E+0.90H					
Span # 1	1	15.000	24.93	136.84	0.18

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+0.750Lr+0.750L+0.450W+H	1	0.0231	8.484		0.0000	0.000

Concrete Beam

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DESCRIPTION: GB 5

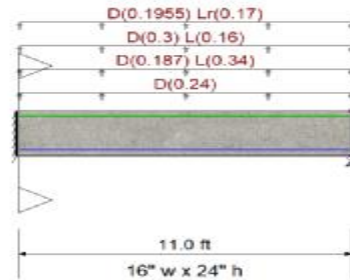
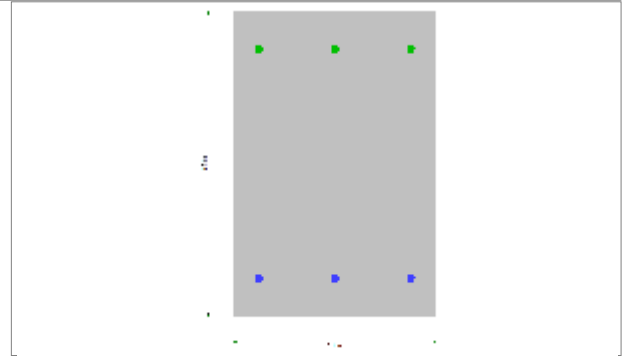
CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10

Load Combination Set : ASCE 7-10

Material Properties

f'_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} * 7.50$	=	375.0 psi		Shear :	0.750
γ Density	=	145.0 pcf	b_1	=	0.850
I LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	2



Cross Section & Reinforcing Details

Rectangular Section, Width = 16.0 in, Height = 24.0 in

Span #1 Reinforcing....

3-#5 at 3.0 in from Bottom, from 0.0 to 11.0 ft in this span

3-#5 at 3.0 in from Top, from 0.0 to 11.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.010 ksf, Tributary Width = 24.0 ft, (Wall Above)

Uniform Load : D = 0.0220, L = 0.040 ksf, Tributary Width = 8.50 ft, (Floor Framing)

Uniform Load : D = 0.0750, L = 0.040 ksf, Tributary Width = 4.0 ft, (Floor Slab)

Uniform Load : D = 0.0230, Lr = 0.020 ksf, Tributary Width = 8.50 ft, (Roof Framing)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.433 : 1	Maximum Deflection		
Section used for this span		Typical Section	Max Downward Transient Deflection	0.001 in	Ratio = 110922 >=360.0
M_u : Applied		-37.147 k-ft	Max Upward Transient Deflection	0.000 in	Ratio = 0 <360.0
$M_n * \phi$: Allowable		85.821 k-ft	Max Downward Total Deflection	0.004 in	Ratio = 30613 >=180.0
Location of maximum on span		0.000 ft	Max Upward Total Deflection	0.000 in	Ratio = 0 <180.0
Span # where maximum occurs		Span # 1			

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	12.455	7.473
Overall MINimum	1.169	0.701
+D+H	9.000	5.400
+D+L+H	12.438	7.463
+D+Lr+H	10.169	6.102
+D+S+H	9.000	5.400
+D+0.750Lr+0.750L+H	12.455	7.473
+D+0.750L+0.750S+H	11.579	6.947
+D+0.60W+H	9.000	5.400

Concrete Beam

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DESCRIPTION: GB 5

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+0.70E+H	9.000	5.400
+D-0.70E+H	9.000	5.400
+D+0.750Lr+0.750L+0.450W+H	12.455	7.473
+D+0.750L+0.750S+0.450W+H	11.579	6.947
+D+0.750L+0.750S+0.5250E+H	11.579	6.947
+D+0.750L+0.750S-0.5250E+H	11.579	6.947
+0.60D+0.60W+0.60H	5.400	3.240
+0.60D+0.70E+0.60H	5.400	3.240
+0.60D-0.70E+0.60H	5.400	3.240
D Only	9.000	5.400
Lr Only	1.169	0.701
L Only	3.437	2.063
H Only		

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	0.00	21.00	16.88	16.88	37.15	0.80	25.33	PhiVc/2 < Vu <=	Min 9.6.3.1	39.2	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.12	21.00	16.59	16.59	35.13	0.83	25.38	PhiVc/2 < Vu <=	Min 9.6.3.1	39.2	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.24	21.00	16.29	16.29	33.16	0.86	25.44	PhiVc/2 < Vu <=	Min 9.6.3.1	39.3	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.36	21.00	16.00	16.00	31.22	0.90	25.50	PhiVc/2 < Vu <=	Min 9.6.3.1	39.4	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.48	21.00	15.70	15.70	29.31	0.94	25.57	PhiVc/2 < Vu <=	Min 9.6.3.1	39.4	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.60	21.00	15.41	15.41	27.44	0.98	25.65	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.72	21.00	15.11	15.11	25.61	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.84	21.00	14.82	14.82	23.81	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.96	21.00	14.52	14.52	22.04	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.08	21.00	14.23	14.23	20.32	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.20	21.00	13.93	13.93	18.62	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.32	21.00	13.64	13.64	16.97	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.44	21.00	13.34	13.34	15.34	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.56	21.00	13.05	13.05	13.76	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.68	21.00	12.75	12.75	12.21	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.80	21.00	12.46	12.46	10.69	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	1.92	21.00	12.16	12.16	9.21	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.04	21.00	11.87	11.87	7.77	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.16	21.00	11.57	11.57	6.36	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.28	21.00	11.28	11.28	4.99	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.40	21.00	10.98	10.98	3.65	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.52	21.00	10.68	10.68	2.35	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.64	21.00	10.39	10.39	1.08	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.77	21.00	10.09	10.09	0.15	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	2.89	21.00	9.80	9.80	1.35	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.01	21.00	9.50	9.50	2.51	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.13	21.00	9.21	9.21	3.63	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.25	21.00	8.91	8.91	4.72	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.37	21.00	8.62	8.62	5.78	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.49	21.00	8.32	8.32	6.79	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.61	21.00	8.03	8.03	7.78	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.73	21.00	7.73	7.73	8.72	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.85	21.00	7.44	7.44	9.64	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	3.97	21.00	7.14	7.14	10.51	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.09	21.00	6.85	6.85	11.35	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.21	21.00	6.55	6.55	12.16	0.94	25.58	Vu < PhiVc/2	lot Reqd 9.6.	25.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.33	21.00	6.26	6.26	12.93	0.85	25.42	Vu < PhiVc/2	lot Reqd 9.6.	25.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.45	21.00	5.96	5.96	13.66	0.76	25.27	Vu < PhiVc/2	lot Reqd 9.6.	25.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.57	21.00	5.67	5.67	14.36	0.69	25.14	Vu < PhiVc/2	lot Reqd 9.6.	25.1	0.0	0.0

Concrete Beam

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DESCRIPTION: GB 5

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
												Req'd	Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	4.69	21.00	5.37	5.37	15.02	0.63	25.03	Vu < PhiVc/2	lot Reqd 9.6.	25.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.81	21.00	5.07	5.07	15.65	0.57	24.93	Vu < PhiVc/2	lot Reqd 9.6.	24.9	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.93	21.00	4.78	4.78	16.24	0.51	24.84	Vu < PhiVc/2	lot Reqd 9.6.	24.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.05	21.00	4.48	4.48	16.80	0.47	24.75	Vu < PhiVc/2	lot Reqd 9.6.	24.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.17	21.00	4.19	4.19	17.32	0.42	24.68	Vu < PhiVc/2	lot Reqd 9.6.	24.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.29	21.00	3.89	3.89	17.81	0.38	24.61	Vu < PhiVc/2	lot Reqd 9.6.	24.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.41	21.00	3.60	3.60	18.26	0.34	24.54	Vu < PhiVc/2	lot Reqd 9.6.	24.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.53	21.00	3.30	3.30	18.67	0.31	24.48	Vu < PhiVc/2	lot Reqd 9.6.	24.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.65	21.00	3.01	3.01	19.05	0.28	24.42	Vu < PhiVc/2	lot Reqd 9.6.	24.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.77	21.00	2.71	2.71	19.40	0.24	24.37	Vu < PhiVc/2	lot Reqd 9.6.	24.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.89	21.00	2.42	2.42	19.71	0.21	24.31	Vu < PhiVc/2	lot Reqd 9.6.	24.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.01	21.00	2.12	2.12	19.98	0.19	24.26	Vu < PhiVc/2	lot Reqd 9.6.	24.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.13	21.00	1.83	1.83	20.22	0.16	24.22	Vu < PhiVc/2	lot Reqd 9.6.	24.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.25	21.00	1.53	1.53	20.42	0.13	24.17	Vu < PhiVc/2	lot Reqd 9.6.	24.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.37	21.00	1.24	1.24	20.58	0.11	24.12	Vu < PhiVc/2	lot Reqd 9.6.	24.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.49	21.00	0.94	0.94	20.72	0.08	24.08	Vu < PhiVc/2	lot Reqd 9.6.	24.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.61	21.00	0.65	0.65	20.81	0.05	24.03	Vu < PhiVc/2	lot Reqd 9.6.	24.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.73	21.00	0.35	0.35	20.87	0.03	23.99	Vu < PhiVc/2	lot Reqd 9.6.	24.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.85	21.00	0.06	0.06	20.89	0.00	23.95	Vu < PhiVc/2	lot Reqd 9.6.	23.9	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.97	21.00	-0.24	0.24	20.88	0.02	23.98	Vu < PhiVc/2	lot Reqd 9.6.	24.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.09	21.00	-0.54	0.54	20.84	0.04	24.02	Vu < PhiVc/2	lot Reqd 9.6.	24.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.21	21.00	-0.83	0.83	20.75	0.07	24.06	Vu < PhiVc/2	lot Reqd 9.6.	24.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.33	21.00	-1.13	1.13	20.64	0.10	24.11	Vu < PhiVc/2	lot Reqd 9.6.	24.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.45	21.00	-1.42	1.42	20.48	0.12	24.15	Vu < PhiVc/2	lot Reqd 9.6.	24.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.57	21.00	-1.72	1.72	20.30	0.15	24.20	Vu < PhiVc/2	lot Reqd 9.6.	24.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.69	21.00	-2.01	2.01	20.07	0.18	24.25	Vu < PhiVc/2	lot Reqd 9.6.	24.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.81	21.00	-2.31	2.31	19.81	0.20	24.30	Vu < PhiVc/2	lot Reqd 9.6.	24.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.93	21.00	-2.60	2.60	19.52	0.23	24.35	Vu < PhiVc/2	lot Reqd 9.6.	24.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.05	21.00	-2.90	2.90	19.19	0.26	24.40	Vu < PhiVc/2	lot Reqd 9.6.	24.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.17	21.00	-3.19	3.19	18.82	0.30	24.46	Vu < PhiVc/2	lot Reqd 9.6.	24.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.30	21.00	-3.49	3.49	18.42	0.33	24.52	Vu < PhiVc/2	lot Reqd 9.6.	24.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.42	21.00	-3.78	3.78	17.98	0.37	24.58	Vu < PhiVc/2	lot Reqd 9.6.	24.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.54	21.00	-4.08	4.08	17.51	0.41	24.65	Vu < PhiVc/2	lot Reqd 9.6.	24.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.66	21.00	-4.37	4.37	17.00	0.45	24.73	Vu < PhiVc/2	lot Reqd 9.6.	24.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.78	21.00	-4.67	4.67	16.46	0.50	24.81	Vu < PhiVc/2	lot Reqd 9.6.	24.8	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.90	21.00	-4.96	4.96	15.88	0.55	24.89	Vu < PhiVc/2	lot Reqd 9.6.	24.9	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.02	21.00	-5.26	5.26	15.26	0.60	24.99	Vu < PhiVc/2	lot Reqd 9.6.	25.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.14	21.00	-5.55	5.55	14.61	0.67	25.10	Vu < PhiVc/2	lot Reqd 9.6.	25.1	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.26	21.00	-5.85	5.85	13.93	0.73	25.22	Vu < PhiVc/2	lot Reqd 9.6.	25.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.38	21.00	-6.15	6.15	13.21	0.81	25.36	Vu < PhiVc/2	lot Reqd 9.6.	25.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.50	21.00	-6.44	6.44	12.45	0.91	25.52	Vu < PhiVc/2	lot Reqd 9.6.	25.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.62	21.00	-6.74	6.74	11.66	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.74	21.00	-7.03	7.03	10.83	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.86	21.00	-7.33	7.33	9.97	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.98	21.00	-7.62	7.62	9.07	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.10	21.00	-7.92	7.92	8.14	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.22	21.00	-8.21	8.21	7.17	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.34	21.00	-8.51	8.51	6.16	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.46	21.00	-8.80	8.80	5.12	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.58	21.00	-9.10	9.10	4.05	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.70	21.00	-9.39	9.39	2.93	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.82	21.00	-9.69	9.69	1.79	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.94	21.00	-9.98	9.98	0.60	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Concrete Beam

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DESCRIPTION: GB 5

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	11.000	-37.15	85.82	0.43
+1.40D+1.60H					
Span # 1	1	11.000	-27.72	85.82	0.32
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	11.000	-37.15	85.82	0.43
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	11.000	-35.86	85.82	0.42
+1.20D+1.60Lr+0.50L+1.60H					
Span # 1	1	11.000	-31.66	85.82	0.37
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	11.000	-27.88	85.82	0.32
+1.20D+0.50L+1.60S+1.60H					
Span # 1	1	11.000	-27.54	85.82	0.32
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	11.000	-23.76	85.82	0.28
+1.20D+0.50Lr+0.50L+W+1.60H					
Span # 1	1	11.000	-28.83	85.82	0.34
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	11.000	-27.54	85.82	0.32
+1.401D+0.50L+0.20S+E+1.60H					
Span # 1	1	11.000	-31.53	85.82	0.37
+1.401D+0.50L+0.20S-E+1.60H					
Span # 1	1	11.000	-31.53	85.82	0.37
+0.90D+W+0.90H					
Span # 1	1	11.000	-17.82	85.82	0.21
+0.6988D+E+0.90H					
Span # 1	1	11.000	-13.84	85.82	0.16
+0.6988D-E+0.90H					
Span # 1	1	11.000	-13.84	85.82	0.16

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+0.750Lr+0.750L+0.450W+H	1	0.0043	6.402		0.0000	0.000

Concrete Beam

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DESCRIPTION: GB 6

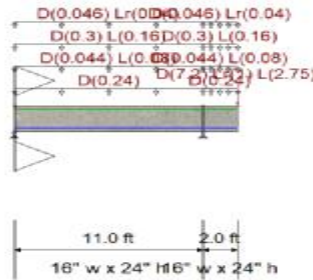
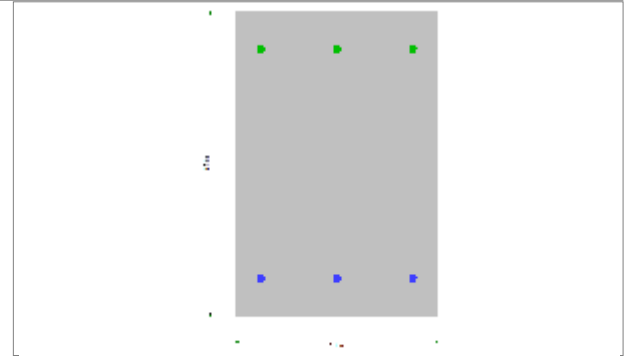
CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10

Load Combination Set : ASCE 7-10

Material Properties

f'_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2}$	=	375.0 psi		Shear :	0.750
γ Density	=	145.0 pcf	b_1	=	0.850
I LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	F_y - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	2



Cross Section & Reinforcing Details

Rectangular Section, Width = 16.0 in, Height = 24.0 in

Span #1 Reinforcing....

3-#5 at 3.0 in from Bottom, from 0.0 to 11.0 ft in this span

3-#5 at 3.0 in from Top, from 0.0 to 11.0 ft in this span

Span #2 Reinforcing....

3-#5 at 3.0 in from Bottom, from 0.0 to 2.0 ft in this span

3-#5 at 3.0 in from Top, from 0.0 to 2.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.010 ksf, Tributary Width = 24.0 ft, (Wall Above)

Uniform Load : D = 0.0220, L = 0.040 ksf, Tributary Width = 2.0 ft, (Floor Framing)

Uniform Load : D = 0.0750, L = 0.040 ksf, Tributary Width = 4.0 ft, (Floor Slab)

Uniform Load : D = 0.0230, Lr = 0.020 ksf, Tributary Width = 2.0 ft, (Roof Framing)

Load for Span Number 2

Uniform Load : D = 0.010 ksf, Tributary Width = 24.0 ft, (Wall Above)

Uniform Load : D = 0.0220, L = 0.040 ksf, Tributary Width = 2.0 ft, (Floor Framing)

Uniform Load : D = 0.0750, L = 0.040 ksf, Tributary Width = 4.0 ft, (Floor Slab)

Uniform Load : D = 0.0230, Lr = 0.020 ksf, Tributary Width = 2.0 ft, (Roof Framing)

Point Load : D = 7.20, Lr = 1.0, L = 2.750 k @ 2.0 ft, (GB 5)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.353 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.000 in Ratio = 0 < 360.0
M_u : Applied	-30.317 k-ft	Max Upward Transient Deflection	0.000 in Ratio = 0 < 360.0
M_n * Φ : Allowable	85.821 k-ft	Max Downward Total Deflection	0.002 in Ratio = 27626 >= 180.0
Location of maximum on span	0.000 ft	Max Upward Total Deflection	0.000 in Ratio = 0 < 180.0
Span # where maximum occurs	Span # 2		

Concrete Beam

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DESCRIPTION: GB 6

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	4.875	21.412	
Overall MINimum	0.031	1.489	
+D+H	4.098	16.318	
+D+L+H	4.875	21.412	
+D+Lr+H	4.129	17.807	
+D+S+H	4.098	16.318	
+D+0.750Lr+0.750L+H	4.704	21.255	
+D+0.750L+0.750S+H	4.681	20.138	
+D+0.60W+H	4.098	16.318	
+D+0.70E+H	4.098	16.318	
+D-0.70E+H	4.098	16.318	
+D+0.750Lr+0.750L+0.450W+H	4.704	21.255	
+D+0.750L+0.750S+0.450W+H	4.681	20.138	
+D+0.750L+0.750S+0.5250E+H	4.681	20.138	
+D+0.750L+0.750S-0.5250E+H	4.681	20.138	
+0.60D+0.60W+0.60H	2.459	9.791	
+0.60D+0.70E+0.60H	2.459	9.791	
+0.60D-0.70E+0.60H	2.459	9.791	
D Only	4.098	16.318	
Lr Only	0.031	1.489	
L Only	0.777	5.093	
H Only			

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	0.00	21.00	6.18	6.18	0.00	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.27	21.00	5.74	5.74	1.60	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	0.54	21.00	5.30	5.30	3.09	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	0.81	21.00	4.88	4.88	4.45	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	1.08	21.00	4.47	4.47	5.71	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	1.35	21.00	4.05	4.05	6.86	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	1.62	21.00	3.63	3.63	7.89	0.81	25.35	Vu < PhiVc/2	lot Req'd 9.6.	25.3	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	1.89	21.00	3.22	3.22	8.81	0.64	25.05	Vu < PhiVc/2	lot Req'd 9.6.	25.1	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	2.16	21.00	2.80	2.80	9.63	0.51	24.83	Vu < PhiVc/2	lot Req'd 9.6.	24.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	2.42	21.00	2.39	2.39	10.32	0.40	24.65	Vu < PhiVc/2	lot Req'd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	2.69	21.00	1.97	1.97	10.91	0.32	24.49	Vu < PhiVc/2	lot Req'd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	2.96	21.00	1.55	1.55	11.39	0.24	24.36	Vu < PhiVc/2	lot Req'd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	3.23	21.00	1.14	1.14	11.75	0.17	24.24	Vu < PhiVc/2	lot Req'd 9.6.	24.2	0.0	0.0
+1.40D+1.60H	1	3.50	21.00	0.75	0.75	11.37	0.12	24.14	Vu < PhiVc/2	lot Req'd 9.6.	24.1	0.0	0.0
+1.40D+1.60H	1	3.77	21.00	0.37	0.37	11.52	0.06	24.04	Vu < PhiVc/2	lot Req'd 9.6.	24.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.04	21.00	-0.39	0.39	11.70	0.06	24.04	Vu < PhiVc/2	lot Req'd 9.6.	24.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.31	21.00	-0.82	0.82	11.53	0.12	24.16	Vu < PhiVc/2	lot Req'd 9.6.	24.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.58	21.00	-1.26	1.26	11.25	0.20	24.28	Vu < PhiVc/2	lot Req'd 9.6.	24.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	4.85	21.00	-1.70	1.70	10.85	0.27	24.42	Vu < PhiVc/2	lot Req'd 9.6.	24.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.12	21.00	-2.14	2.14	10.34	0.36	24.57	Vu < PhiVc/2	lot Req'd 9.6.	24.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.39	21.00	-2.57	2.57	9.70	0.46	24.75	Vu < PhiVc/2	lot Req'd 9.6.	24.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.66	21.00	-3.01	3.01	8.95	0.59	24.97	Vu < PhiVc/2	lot Req'd 9.6.	25.0	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	5.93	21.00	-3.45	3.45	8.08	0.75	25.24	Vu < PhiVc/2	lot Req'd 9.6.	25.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.20	21.00	-3.89	3.89	7.09	0.96	25.61	Vu < PhiVc/2	lot Req'd 9.6.	25.6	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.47	21.00	-4.32	4.32	5.99	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	6.73	21.00	-4.76	4.76	4.76	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.00	21.00	-5.20	5.20	3.42	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.27	21.00	-5.64	5.64	1.96	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.54	21.00	-6.07	6.07	0.39	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	7.81	21.00	-6.51	6.51	1.31	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.08	21.00	-6.95	6.95	3.12	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0

Concrete Beam

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DESCRIPTION: GB 6

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
												Req'd	Suggest
+1.20D+0.50Lr+1.60L+1.60H	1	8.35	21.00	-7.39	7.39	5.05	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.62	21.00	-7.82	7.82	7.10	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	8.89	21.00	-8.26	8.26	9.27	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.16	21.00	-8.70	8.70	11.55	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.43	21.00	-9.14	9.14	13.95	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.70	21.00	-9.57	9.57	16.47	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	9.97	21.00	-10.01	10.01	19.11	0.92	25.54	Vu < PhiVc/2	lot Req'd 9.6.	25.5	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.24	21.00	-10.45	10.45	21.87	0.84	25.40	Vu < PhiVc/2	lot Req'd 9.6.	25.4	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.51	21.00	-10.89	10.89	24.74	0.77	25.28	Vu < PhiVc/2	lot Req'd 9.6.	25.3	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	1	10.78	21.00	-11.32	11.32	27.73	0.71	25.19	Vu < PhiVc/2	lot Req'd 9.6.	25.2	0.0	0.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.01	21.00	16.77	16.77	30.18	0.97	25.64	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.06	21.00	16.70	16.70	29.36	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.11	21.00	16.62	16.62	28.54	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.16	21.00	16.54	16.54	27.73	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.20	21.00	16.46	16.46	26.92	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.25	21.00	16.38	16.38	26.12	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.30	21.00	16.30	16.30	25.32	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.35	21.00	16.22	16.22	24.52	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.40	21.00	16.14	16.14	23.73	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.45	21.00	16.06	16.06	22.94	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.50	21.00	15.98	15.98	22.16	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.55	21.00	15.90	15.90	21.38	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.60	21.00	15.82	15.82	20.60	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.64	21.00	15.74	15.74	19.83	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.69	21.00	15.66	15.66	19.06	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.74	21.00	15.58	15.58	18.29	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.79	21.00	15.50	15.50	17.53	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.84	21.00	15.42	15.42	16.78	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.89	21.00	15.34	15.34	16.02	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.94	21.00	15.26	15.26	15.27	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	11.99	21.00	15.18	15.18	14.53	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.04	21.00	15.10	15.10	13.78	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.09	21.00	15.02	15.02	13.05	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.13	21.00	14.95	14.95	12.31	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.18	21.00	14.87	14.87	11.58	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.23	21.00	14.79	14.79	10.86	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.28	21.00	14.71	14.71	10.13	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.33	21.00	14.63	14.63	9.42	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.38	21.00	14.55	14.55	8.70	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.43	21.00	14.47	14.47	7.99	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.48	21.00	14.39	14.39	7.28	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.53	21.00	14.31	14.31	6.58	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.58	21.00	14.23	14.23	5.88	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.62	21.00	14.15	14.15	5.19	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.67	21.00	14.07	14.07	4.50	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.72	21.00	13.99	13.99	3.81	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.77	21.00	13.91	13.91	3.13	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.82	21.00	13.83	13.83	2.45	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.87	21.00	13.75	13.75	1.77	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.92	21.00	13.67	13.67	1.10	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.20D+0.50Lr+1.60L+1.60H	2	12.97	21.00	13.59	13.59	0.43	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
				Mu : Max	Phi*Mnx	Stress Ratio

Concrete Beam

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Lic. #: KW-06006695

DESCRIPTION: GB 6

MAXimum BENDING Envelope

Span # 1	1	11.000	-29.79	85.82	0.35
Span # 2	2	2.000	-30.32	85.82	0.35
+1.40D+1.60H					
Span # 1	1	11.000	-22.55	85.82	0.26
Span # 2	2	2.000	-23.00	85.82	0.27
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	11.000	-29.79	85.82	0.35
Span # 2	2	2.000	-30.32	85.82	0.35
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	11.000	-28.76	85.82	0.34
Span # 2	2	2.000	-29.28	85.82	0.34
+1.20D+1.60Lr+0.50L+1.60H					
Span # 1	1	11.000	-25.58	85.82	0.30
Span # 2	2	2.000	-26.03	85.82	0.30
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	11.000	-22.63	85.82	0.26
Span # 2	2	2.000	-23.04	85.82	0.27
+1.20D+0.50L+1.60S+1.60H					
Span # 1	1	11.000	-22.28	85.82	0.26
Span # 2	2	2.000	-22.70	85.82	0.26
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	11.000	-19.33	85.82	0.23
Span # 2	2	2.000	-19.71	85.82	0.23
+1.20D+0.50Lr+0.50L+W+1.60H					
Span # 1	1	11.000	-23.31	85.82	0.27
Span # 2	2	2.000	-23.74	85.82	0.28
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	11.000	-22.28	85.82	0.26
Span # 2	2	2.000	-22.70	85.82	0.26
+1.401D+0.50L+0.20S+E+1.60H					
Span # 1	1	11.000	-25.52	85.82	0.30
Span # 2	2	2.000	-26.01	85.82	0.30
+1.401D+0.50L+0.20S-E+1.60H					
Span # 1	1	11.000	-25.52	85.82	0.30
Span # 2	2	2.000	-26.01	85.82	0.30
+0.90D+W+0.90H					
Span # 1	1	11.000	-14.50	85.82	0.17
Span # 2	2	2.000	-14.78	85.82	0.17
+0.6988D+E+0.90H					
Span # 1	1	11.000	-11.26	85.82	0.13
Span # 2	2	2.000	-11.48	85.82	0.13
+0.6988D-E+0.90H					
Span # 1	1	11.000	-11.26	85.82	0.13
Span # 2	2	2.000	-11.48	85.82	0.13

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+L+H	1	0.0023	4.243	L Only	-0.0002	9.900
+D+0.750Lr+0.750L+0.450W+H	2	0.0017	2.000		0.0000	9.900

Concrete Beam

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DESCRIPTION: GB 7

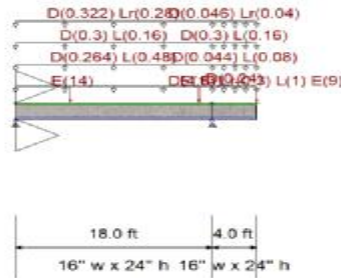
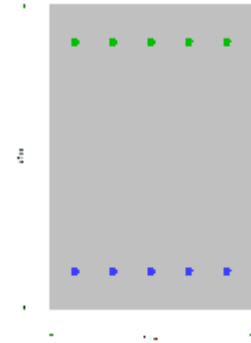
CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10

Load Combination Set : ASCE 7-10

Material Properties

f'_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} * 7.50$	=	375.0 psi		Shear :	0.750
γ Density	=	145.0 pcf	b_1	=	0.850
I LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	F_y - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	2



Cross Section & Reinforcing Details

Rectangular Section, Width = 16.0 in, Height = 24.0 in

Span #1 Reinforcing....

5-#5 at 3.0 in from Bottom, from 0.0 to 18.0 ft in this span

Span #2 Reinforcing....

4-#5 at 3.0 in from Bottom, from 0.0 to 4.0 ft in this span

5-#5 at 3.0 in from Top, from 0.0 to 18.0 ft in this span

4-#5 at 3.0 in from Top, from 0.0 to 4.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.010 ksf, Tributary Width = 0.0 ft, (Wall Above)

Uniform Load : D = 0.0220, L = 0.040 ksf, Tributary Width = 12.0 ft, (Floor Framing)

Uniform Load : D = 0.0750, L = 0.040 ksf, Tributary Width = 4.0 ft, (Floor Slab)

Uniform Load : D = 0.0230, Lr = 0.020 ksf, Tributary Width = 14.0 ft, (Roof Framing)

Point Load : E = 14.0 k @ 5.0 ft, (SW 77)

Point Load : E = 13.0 k @ 16.750 ft, (SW 76)

Load for Span Number 2

Uniform Load : D = 0.010 ksf, Tributary Width = 24.0 ft, (Wall Above)

Uniform Load : D = 0.0220, L = 0.040 ksf, Tributary Width = 2.0 ft, (Floor Framing)

Uniform Load : D = 0.0750, L = 0.040 ksf, Tributary Width = 4.0 ft, (Floor Slab)

Uniform Load : D = 0.0230, Lr = 0.020 ksf, Tributary Width = 2.0 ft, (Roof Framing)

Point Load : D = 4.60, Lr = 0.30, L = 1.0, E = 9.0 k @ 4.0 ft, (GB 5)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.750 : 1	Maximum Deflection		
Section used for this span		Typical Section	Max Downward Transient Deflection	0.027 in	Ratio = 7861 >=360.
μ : Applied		102.620 k-ft	Max Upward Transient Deflection	-0.014 in	Ratio = 7088 >=360.
$M_n * \phi$: Allowable		136.845 k-ft	Max Downward Total Deflection	0.143 in	Ratio = 1509 >=180.
Location of maximum on span		5.584 ft	Max Upward Total Deflection	-0.060 in	Ratio = 1604 >=180.
Span # where maximum occurs		Span # 1			

Concrete Beam

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DESCRIPTION: GB 7

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	18.786	41.799	
Overall MINimum	-0.322	2.705	
+D+H	9.980	21.595	
+D+L+H	15.411	29.643	
+D+Lr+H	12.416	24.659	
+D+S+H	9.980	21.595	
+D+0.750Lr+0.750L+H	15.880	29.929	
+D+0.750L+0.750S+H	14.054	27.631	
+D+0.60W+H	9.980	21.595	
+D+0.70E+H	16.290	40.485	
+D-0.70E+H	3.670	2.705	
+D+0.750Lr+0.750L+0.450W+H	15.880	29.929	
+D+0.750L+0.750S+0.450W+H	14.054	27.631	
+D+0.750L+0.750S+0.5250E+H	18.786	41.799	
+D+0.750L+0.750S-0.5250E+H	9.321	13.464	
+0.60D+0.60W+0.60H	5.988	12.957	
+0.60D+0.70E+0.60H	12.298	31.847	
+0.60D-0.70E+0.60H	-0.322	-5.933	
D Only	9.980	21.595	
Lr Only	2.436	3.064	
L Only	5.431	8.049	
E Only	9.014	26.986	
E Only * -1.0	-9.014	-26.986	
H Only			

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
												Req'd	Suggest
+1.401D+0.50L+0.20S+E+1.60H	1	0.00	21.00	25.71	25.71	0.00	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.44	21.00	24.79	24.79	11.13	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.88	21.00	23.86	23.86	21.85	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.32	21.00	22.93	22.93	32.17	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.76	21.00	22.01	22.01	42.07	0.92	26.60	PhiVc/2 < Vu <=	Min 9.6.3.1	40.5	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.20	21.00	21.08	21.08	51.57	0.72	26.02	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.64	21.00	20.15	20.15	60.65	0.58	25.63	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.09	21.00	19.22	19.22	69.33	0.49	25.35	PhiVc/2 < Vu <=	Min 9.6.3.1	39.2	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.53	21.00	18.30	18.30	77.60	0.41	25.14	PhiVc/2 < Vu <=	Min 9.6.3.1	39.0	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.97	21.00	17.37	17.37	85.46	0.36	24.97	PhiVc/2 < Vu <=	Min 9.6.3.1	38.8	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.41	21.00	16.44	16.44	92.92	0.31	24.84	PhiVc/2 < Vu <=	Min 9.6.3.1	38.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.85	21.00	15.52	15.52	99.96	0.27	24.73	PhiVc/2 < Vu <=	Min 9.6.3.1	38.6	10.5	10.0
+1.401D+0.50L+0.20S-E+1.60H	1	5.29	21.00	10.56	10.56	15.28	1.00	26.85	Vu < PhiVc/2	lot Reqd 9.6.	26.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	5.73	21.00	9.63	9.63	19.74	0.85	26.42	Vu < PhiVc/2	lot Reqd 9.6.	26.4	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.17	21.00	8.71	8.71	23.78	0.64	25.80	Vu < PhiVc/2	lot Reqd 9.6.	25.8	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	6.61	21.00	7.78	7.78	27.41	0.50	25.38	Vu < PhiVc/2	lot Reqd 9.6.	25.4	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.05	21.00	6.85	6.85	30.63	0.39	25.08	Vu < PhiVc/2	lot Reqd 9.6.	25.1	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.49	21.00	5.92	5.92	33.45	0.31	24.84	Vu < PhiVc/2	lot Reqd 9.6.	24.8	0.0	0.0
+0.6988D+E+0.90H	1	7.93	21.00	-5.07	5.07	57.78	0.15	24.39	Vu < PhiVc/2	lot Reqd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.38	21.00	-5.90	5.90	94.34	0.11	24.26	Vu < PhiVc/2	lot Reqd 9.6.	24.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.82	21.00	-6.83	6.83	91.53	0.13	24.32	Vu < PhiVc/2	lot Reqd 9.6.	24.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.26	21.00	-7.76	7.76	88.32	0.15	24.39	Vu < PhiVc/2	lot Reqd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.70	21.00	-8.68	8.68	84.70	0.18	24.46	Vu < PhiVc/2	lot Reqd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.14	21.00	-9.61	9.61	80.66	0.21	24.55	Vu < PhiVc/2	lot Reqd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.58	21.00	-10.54	10.54	76.22	0.24	24.64	Vu < PhiVc/2	lot Reqd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.02	21.00	-11.46	11.46	71.37	0.28	24.76	Vu < PhiVc/2	lot Reqd 9.6.	24.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.46	21.00	-12.39	12.39	66.12	0.33	24.89	Vu < PhiVc/2	lot Reqd 9.6.	24.9	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.90	21.00	-13.32	13.32	60.45	0.39	25.06	PhiVc/2 < Vu <=	Min 9.6.3.1	38.9	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	12.34	21.00	-14.25	14.25	54.37	0.46	25.27	PhiVc/2 < Vu <=	Min 9.6.3.1	39.1	10.5	10.0

Concrete Beam

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DESCRIPTION: GB 7

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
												Req'd	Suggest
+1.401D+0.50L+0.20S+E+1.60H	1	12.78	21.00	-15.17	15.17	47.89	0.55	25.55	PhiVc/2 < Vu <=	Min 9.6.3.1	39.4	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	13.22	21.00	-16.10	16.10	41.00	0.69	25.94	PhiVc/2 < Vu <=	Min 9.6.3.1	39.8	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	13.67	21.00	-17.03	17.03	33.69	0.88	26.51	PhiVc/2 < Vu <=	Min 9.6.3.1	40.4	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	14.11	21.00	-17.95	17.95	25.98	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	14.55	21.00	-18.88	18.88	17.86	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	14.99	21.00	-19.81	19.81	9.34	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	15.43	21.00	-20.74	20.74	0.40	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	15.87	21.00	-21.66	21.66	8.95	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	16.31	21.00	-22.59	22.59	18.70	1.00	26.85	PhiVc/2 < Vu <=	Min 9.6.3.1	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	16.75	21.00	-36.52	36.52	28.87	1.00	26.85	PhiVc < Vu	9.671	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	17.19	21.00	-37.44	37.44	45.18	1.00	26.85	PhiVc < Vu	10.599	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	17.63	21.00	-38.37	38.37	61.89	1.00	26.85	PhiVc < Vu	11.526	40.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	18.02	21.00	22.10	22.10	75.76	0.51	25.13	PhiVc/2 < Vu <=	Min 9.6.3.1	39.0	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	18.11	21.00	21.95	21.95	73.61	0.52	25.15	PhiVc/2 < Vu <=	Min 9.6.3.1	39.0	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	18.21	21.00	21.80	21.80	71.46	0.53	25.18	PhiVc/2 < Vu <=	Min 9.6.3.1	39.0	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	18.31	21.00	21.64	21.64	69.34	0.55	25.21	PhiVc/2 < Vu <=	Min 9.6.3.1	39.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	18.41	21.00	21.49	21.49	67.22	0.56	25.24	PhiVc/2 < Vu <=	Min 9.6.3.1	39.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	18.51	21.00	21.34	21.34	65.13	0.57	25.27	PhiVc/2 < Vu <=	Min 9.6.3.1	39.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	18.60	21.00	21.19	21.19	63.04	0.59	25.31	PhiVc/2 < Vu <=	Min 9.6.3.1	39.2	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	18.70	21.00	21.04	21.04	60.97	0.60	25.34	PhiVc/2 < Vu <=	Min 9.6.3.1	39.2	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	18.80	21.00	20.89	20.89	58.92	0.62	25.38	PhiVc/2 < Vu <=	Min 9.6.3.1	39.2	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	18.90	21.00	20.74	20.74	56.88	0.64	25.42	PhiVc/2 < Vu <=	Min 9.6.3.1	39.3	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	19.00	21.00	20.59	20.59	54.86	0.66	25.47	PhiVc/2 < Vu <=	Min 9.6.3.1	39.3	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	19.09	21.00	20.43	20.43	52.85	0.68	25.51	PhiVc/2 < Vu <=	Min 9.6.3.1	39.4	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	19.19	21.00	20.28	20.28	50.85	0.70	25.56	PhiVc/2 < Vu <=	Min 9.6.3.1	39.4	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	19.29	21.00	20.13	20.13	48.87	0.72	25.62	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	19.39	21.00	19.98	19.98	46.91	0.75	25.67	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	19.49	21.00	19.83	19.83	44.96	0.77	25.73	PhiVc/2 < Vu <=	Min 9.6.3.1	39.6	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	19.58	21.00	19.68	19.68	43.03	0.80	25.80	PhiVc/2 < Vu <=	Min 9.6.3.1	39.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	19.68	21.00	19.53	19.53	41.11	0.83	25.87	PhiVc/2 < Vu <=	Min 9.6.3.1	39.7	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	19.78	21.00	19.38	19.38	39.20	0.86	25.95	PhiVc/2 < Vu <=	Min 9.6.3.1	39.8	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	19.88	21.00	19.22	19.22	37.31	0.90	26.04	PhiVc/2 < Vu <=	Min 9.6.3.1	39.9	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	19.98	21.00	19.07	19.07	35.43	0.94	26.13	PhiVc/2 < Vu <=	Min 9.6.3.1	40.0	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	20.07	21.00	18.92	18.92	33.57	0.99	26.23	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	20.17	21.00	18.77	18.77	31.73	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	20.27	21.00	18.62	18.62	29.90	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	20.37	21.00	18.47	18.47	28.08	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	20.47	21.00	18.32	18.32	26.28	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	20.56	21.00	18.16	18.16	24.49	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	20.66	21.00	18.01	18.01	22.72	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	20.76	21.00	17.86	17.86	20.96	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	20.86	21.00	17.71	17.71	19.22	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	20.96	21.00	17.56	17.56	17.49	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	21.05	21.00	17.41	17.41	15.78	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	21.15	21.00	17.26	17.26	14.08	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	21.25	21.00	17.11	17.11	12.40	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	21.35	21.00	16.95	16.95	10.73	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	21.44	21.00	16.80	16.80	9.08	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	21.54	21.00	16.65	16.65	7.44	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	21.64	21.00	16.50	16.50	5.81	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	21.74	21.00	16.35	16.35	4.20	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	21.84	21.00	16.20	16.20	2.61	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	2	21.93	21.00	16.05	16.05	1.03	1.00	26.27	PhiVc/2 < Vu <=	Min 9.6.3.1	40.1	10.5	10.0

Maximum Forces & Stresses for Load Combinations

Concrete Beam

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DESCRIPTION: GB 7

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	18.000	102.62	136.84	0.75
Span # 2	2	4.000	-76.13	111.45	0.68
+1.40D+1.60H					
Span # 1	1	18.000	54.78	136.84	0.40
Span # 2	2	4.000	-37.14	111.45	0.33
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	18.000	88.97	136.84	0.65
Span # 2	2	4.000	-42.07	111.45	0.38
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	18.000	83.70	136.84	0.61
Span # 2	2	4.000	-41.31	111.45	0.37
+1.20D+1.60Lr+0.50L+1.60H					
Span # 1	1	18.000	75.27	136.84	0.55
Span # 2	2	4.000	-37.23	111.45	0.33
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	18.000	63.78	136.84	0.47
Span # 2	2	4.000	-34.27	111.45	0.31
+1.20D+0.50L+1.60S+1.60H					
Span # 1	1	18.000	58.43	136.84	0.43
Span # 2	2	4.000	-34.79	111.45	0.31
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	18.000	46.96	136.84	0.34
Span # 2	2	4.000	-31.84	111.45	0.29
+1.20D+0.50Lr+0.50L+W+1.60H					
Span # 1	1	18.000	63.69	136.84	0.47
Span # 2	2	4.000	-35.55	111.45	0.32
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	18.000	58.43	136.84	0.43
Span # 2	2	4.000	-34.79	111.45	0.31
+1.401D+0.50L+0.20S+E+1.60H					
Span # 1	1	18.000	102.62	136.84	0.75
Span # 2	2	4.000	-76.13	111.45	0.68
+1.401D+0.50L+0.20S-E+1.60H					
Span # 1	1	18.000	41.79	136.84	0.31
Span # 2	2	4.000	-4.14	111.45	0.04
+0.90D+W+0.90H					
Span # 1	1	18.000	35.22	136.84	0.26
Span # 2	2	4.000	-23.88	111.45	0.21
+0.6988D+E+0.90H					
Span # 1	1	18.000	68.78	136.84	0.50
Span # 2	2	4.000	-54.53	111.45	0.49
+0.6988D-E+0.90H					
Span # 1	1	18.000	-21.29	136.84	0.16
Span # 2	2	4.000	17.45	111.45	0.16

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+0.750L+0.750S+0.5250E+H	1	0.1431	7.971	+D+0.750L+0.750S+0.5250E+H	-0.0010	18.057
	2	0.0000	7.971	+D+0.750L+0.750S+0.5250E+H	-0.0598	4.000

Concrete Beam

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DESCRIPTION: GB 8

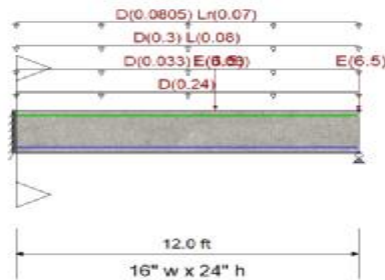
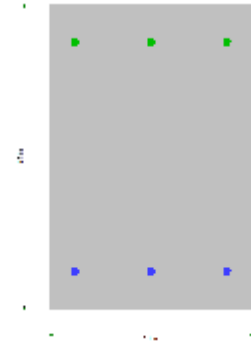
CODE REFERENCES

Calculations per ACI 318-14, IBC 2015, CBC 2016, ASCE 7-10

Load Combination Set : ASCE 7-10

Material Properties

f'_c	=	2.50 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} * 7.50$	=	375.0 psi		Shear :	0.750
γ Density	=	145.0 pcf	b_1	=	0.850
I LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	F_y - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #	=	3
			Number of Resisting Legs Per Stirrup	=	2



Cross Section & Reinforcing Details

Rectangular Section, Width = 16.0 in, Height = 24.0 in

Span #1 Reinforcing....

3-#5 at 3.0 in from Bottom, from 0.0 to 12.0 ft in this span

3-#5 at 3.0 in from Top, from 0.0 to 12.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.010 ksf, Tributary Width = 24.0 ft, (Wall Above)

Uniform Load : D = 0.0220, L = 0.040 ksf, Tributary Width = 1.50 ft, (Floor Framing)

Uniform Load : D = 0.0750, L = 0.020 ksf, Tributary Width = 4.0 ft, (Floor Slab)

Uniform Load : D = 0.0230, Lr = 0.020 ksf, Tributary Width = 3.50 ft, (Roof Framing)

Point Load : E = 6.50 k @ 7.0 ft, (SW 116)

Point Load : E = 6.50 k @ 12.0 ft, (SW 116)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.477 : 1	Maximum Deflection	
Section used for this span	Typical Section	Max Downward Transient Deflection	0.003 in Ratio = 43528 >=360.
μ_u : Applied	-40.926 k-ft	Max Upward Transient Deflection	0.000 in Ratio = 0 <360.0
$M_n * \phi$: Allowable	85.821 k-ft	Max Downward Total Deflection	0.006 in Ratio = 24734 >=180.
Location of maximum on span	0.000 ft	Max Upward Total Deflection	0.000 in Ratio = 0 <180.0
Span # where maximum occurs	Span # 1		

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	10.598	11.101
Overall MINimum	0.525	0.315
+D+H	7.801	4.681
+D+L+H	8.851	5.311
+D+Lr+H	8.326	4.996
+D+S+H	7.801	4.681
+D+0.750Lr+0.750L+H	8.982	5.390

Concrete Beam

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DESCRIPTION: GB 8

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+0.750L+0.750S+H	8.589	5.153
+D+0.60W+H	7.801	4.681
+D+0.70E+H	10.481	11.101
+D-0.70E+H	5.122	-1.740
+D+0.750Lr+0.750L+0.450W+H	8.982	5.390
+D+0.750L+0.750S+0.450W+H	8.589	5.153
+D+0.750L+0.750S+0.5250E+H	10.598	9.969
+D+0.750L+0.750S-0.5250E+H	6.579	0.338
+0.60D+0.60W+0.60H	4.681	2.808
+0.60D+0.70E+0.60H	7.360	9.229
+0.60D-0.70E+0.60H	2.001	-3.612
D Only	7.801	4.681
Lr Only	0.525	0.315
L Only	1.050	0.630
E Only	3.828	9.172
E Only * -1.0	-3.828	-9.172
H Only		

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.401D+0.50L+0.20S+E+1.60H	1	0.00	21.00	15.28	15.28	40.93	0.65	25.08	PhiVc/2 < Vu <=	Min 9.6.3.1	38.9	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.13	21.00	15.08	15.08	38.93	0.68	25.12	PhiVc/2 < Vu <=	Min 9.6.3.1	39.0	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.26	21.00	14.88	14.88	36.97	0.70	25.17	PhiVc/2 < Vu <=	Min 9.6.3.1	39.0	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.39	21.00	14.68	14.68	35.03	0.73	25.22	PhiVc/2 < Vu <=	Min 9.6.3.1	39.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.52	21.00	14.48	14.48	33.12	0.77	25.27	PhiVc/2 < Vu <=	Min 9.6.3.1	39.1	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.66	21.00	14.28	14.28	31.23	0.80	25.34	PhiVc/2 < Vu <=	Min 9.6.3.1	39.2	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.79	21.00	14.08	14.08	29.37	0.84	25.40	PhiVc/2 < Vu <=	Min 9.6.3.1	39.3	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	0.92	21.00	13.88	13.88	27.54	0.88	25.48	PhiVc/2 < Vu <=	Min 9.6.3.1	39.3	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.05	21.00	13.68	13.68	25.73	0.93	25.56	PhiVc/2 < Vu <=	Min 9.6.3.1	39.4	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.18	21.00	13.48	13.48	23.95	0.99	25.66	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.31	21.00	13.28	13.28	22.19	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.44	21.00	13.08	13.08	20.47	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.57	21.00	12.88	12.88	18.76	1.00	25.68	PhiVc/2 < Vu <=	Min 9.6.3.1	39.5	10.5	10.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.70	21.00	12.68	12.68	17.09	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.84	21.00	12.48	12.48	15.44	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	1.97	21.00	12.28	12.28	13.81	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.10	21.00	12.08	12.08	12.22	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.23	21.00	11.88	11.88	10.65	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.36	21.00	11.68	11.68	9.10	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.49	21.00	11.48	11.48	7.58	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.62	21.00	11.28	11.28	6.09	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.75	21.00	11.08	11.08	4.62	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	2.89	21.00	10.88	10.88	3.19	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.02	21.00	10.68	10.68	1.77	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.15	21.00	10.48	10.48	0.38	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.28	21.00	10.28	10.28	0.98	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.41	21.00	10.08	10.08	2.31	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.54	21.00	9.88	9.88	3.62	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.67	21.00	9.68	9.68	4.90	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.80	21.00	9.47	9.47	6.16	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	3.93	21.00	9.27	9.27	7.39	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.07	21.00	9.07	9.07	8.59	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.20	21.00	8.87	8.87	9.77	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.33	21.00	8.67	8.67	10.92	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.46	21.00	8.47	8.47	12.04	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.59	21.00	8.27	8.27	13.14	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0

Concrete Beam

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DESCRIPTION: GB 8

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
												Req'd	Suggest
+1.401D+0.50L+0.20S+E+1.60H	1	4.72	21.00	8.07	8.07	14.21	0.99	25.67	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.85	21.00	7.87	7.87	15.26	0.90	25.51	Vu < PhiVc/2	lot Reqd 9.6.	25.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	4.98	21.00	7.67	7.67	16.28	0.82	25.38	Vu < PhiVc/2	lot Reqd 9.6.	25.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.11	21.00	7.47	7.47	17.27	0.76	25.26	Vu < PhiVc/2	lot Reqd 9.6.	25.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.25	21.00	7.27	7.27	18.24	0.70	25.16	Vu < PhiVc/2	lot Reqd 9.6.	25.2	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.38	21.00	7.07	7.07	19.18	0.65	25.07	Vu < PhiVc/2	lot Reqd 9.6.	25.1	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.51	21.00	6.87	6.87	20.09	0.60	24.98	Vu < PhiVc/2	lot Reqd 9.6.	25.0	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.64	21.00	6.67	6.67	20.98	0.56	24.91	Vu < PhiVc/2	lot Reqd 9.6.	24.9	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.77	21.00	6.47	6.47	21.84	0.52	24.84	Vu < PhiVc/2	lot Reqd 9.6.	24.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	5.90	21.00	6.27	6.27	22.68	0.48	24.78	Vu < PhiVc/2	lot Reqd 9.6.	24.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	6.03	21.00	6.07	6.07	23.48	0.45	24.73	Vu < PhiVc/2	lot Reqd 9.6.	24.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	6.16	21.00	5.87	5.87	24.27	0.42	24.68	Vu < PhiVc/2	lot Reqd 9.6.	24.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	6.30	21.00	5.67	5.67	25.02	0.40	24.63	Vu < PhiVc/2	lot Reqd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	6.43	21.00	5.47	5.47	25.75	0.37	24.59	Vu < PhiVc/2	lot Reqd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	6.56	21.00	5.27	5.27	26.46	0.35	24.55	Vu < PhiVc/2	lot Reqd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	6.69	21.00	5.07	5.07	27.14	0.33	24.51	Vu < PhiVc/2	lot Reqd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	6.82	21.00	4.87	4.87	27.79	0.31	24.47	Vu < PhiVc/2	lot Reqd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	6.95	21.00	4.67	4.67	28.41	0.29	24.44	Vu < PhiVc/2	lot Reqd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.08	21.00	3.31	3.31	2.19	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.21	21.00	3.11	3.11	2.61	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.34	21.00	2.91	2.91	3.00	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S-E+1.60H	1	7.48	21.00	2.71	2.71	3.37	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	7.61	21.00	-2.83	2.83	27.20	0.18	24.26	Vu < PhiVc/2	lot Reqd 9.6.	24.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	7.74	21.00	-3.04	3.04	26.82	0.20	24.29	Vu < PhiVc/2	lot Reqd 9.6.	24.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	7.87	21.00	-3.24	3.24	26.41	0.21	24.31	Vu < PhiVc/2	lot Reqd 9.6.	24.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.00	21.00	-3.44	3.44	25.97	0.23	24.34	Vu < PhiVc/2	lot Reqd 9.6.	24.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.13	21.00	-3.64	3.64	25.50	0.25	24.38	Vu < PhiVc/2	lot Reqd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.26	21.00	-3.84	3.84	25.01	0.27	24.41	Vu < PhiVc/2	lot Reqd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.39	21.00	-4.04	4.04	24.50	0.29	24.44	Vu < PhiVc/2	lot Reqd 9.6.	24.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.52	21.00	-4.24	4.24	23.96	0.31	24.48	Vu < PhiVc/2	lot Reqd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.66	21.00	-4.44	4.44	23.39	0.33	24.52	Vu < PhiVc/2	lot Reqd 9.6.	24.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.79	21.00	-4.64	4.64	22.79	0.36	24.56	Vu < PhiVc/2	lot Reqd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	8.92	21.00	-4.84	4.84	22.17	0.38	24.61	Vu < PhiVc/2	lot Reqd 9.6.	24.6	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.05	21.00	-5.04	5.04	21.52	0.41	24.65	Vu < PhiVc/2	lot Reqd 9.6.	24.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.18	21.00	-5.24	5.24	20.85	0.44	24.71	Vu < PhiVc/2	lot Reqd 9.6.	24.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.31	21.00	-5.44	5.44	20.15	0.47	24.76	Vu < PhiVc/2	lot Reqd 9.6.	24.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.44	21.00	-5.64	5.64	19.42	0.51	24.83	Vu < PhiVc/2	lot Reqd 9.6.	24.8	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.57	21.00	-5.84	5.84	18.67	0.55	24.89	Vu < PhiVc/2	lot Reqd 9.6.	24.9	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.70	21.00	-6.04	6.04	17.89	0.59	24.97	Vu < PhiVc/2	lot Reqd 9.6.	25.0	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.84	21.00	-6.24	6.24	17.09	0.64	25.05	Vu < PhiVc/2	lot Reqd 9.6.	25.1	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	9.97	21.00	-6.44	6.44	16.25	0.69	25.15	Vu < PhiVc/2	lot Reqd 9.6.	25.1	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.10	21.00	-6.64	6.64	15.40	0.75	25.26	Vu < PhiVc/2	lot Reqd 9.6.	25.3	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.23	21.00	-6.84	6.84	14.51	0.82	25.38	Vu < PhiVc/2	lot Reqd 9.6.	25.4	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.36	21.00	-7.04	7.04	13.60	0.91	25.52	Vu < PhiVc/2	lot Reqd 9.6.	25.5	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.49	21.00	-7.24	7.24	12.66	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.62	21.00	-7.44	7.44	11.70	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.75	21.00	-7.64	7.64	10.71	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	10.89	21.00	-7.84	7.84	9.70	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.02	21.00	-8.04	8.04	8.66	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.15	21.00	-8.24	8.24	7.59	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.28	21.00	-8.44	8.44	6.49	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.41	21.00	-8.64	8.64	5.37	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.54	21.00	-8.84	8.84	4.23	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.67	21.00	-9.04	9.04	3.05	1.00	25.68	Vu < PhiVc/2	lot Reqd 9.6.	25.7	0.0	0.0

Concrete Beam

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DESCRIPTION: GB 8

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu Actual	(k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd Suggest
+1.401D+0.50L+0.20S+E+1.60H	1	11.80	21.00	-9.25	9.25	1.85	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0 0.0
+1.401D+0.50L+0.20S+E+1.60H	1	11.93	21.00	-9.45	9.45	0.63	1.00	25.68	Vu < PhiVc/2	lot Req'd 9.6.	25.7	0.0 0.0

Maximum Forces & Stresses for Load Combinations

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	12.000	-40.93	85.82	0.48
+1.40D+1.60H					
Span # 1	1	12.000	-26.21	85.82	0.31
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	12.000	-27.13	85.82	0.32
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	12.000	-26.50	85.82	0.31
+1.20D+1.60Lr+0.50L+1.60H					
Span # 1	1	12.000	-25.74	85.82	0.30
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	12.000	-24.48	85.82	0.29
+1.20D+0.50L+1.60S+1.60H					
Span # 1	1	12.000	-23.73	85.82	0.28
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	12.000	-22.47	85.82	0.26
+1.20D+0.50Lr+0.50L+W+1.60H					
Span # 1	1	12.000	-24.36	85.82	0.28
+1.20D+0.50L+0.50S+W+1.60H					
Span # 1	1	12.000	-23.73	85.82	0.28
+1.401D+0.50L+0.20S+E+1.60H					
Span # 1	1	12.000	-40.93	85.82	0.48
+1.401D+0.50L+0.20S-E+1.60H					
Span # 1	1	12.000	-14.06	85.82	0.16
+0.90D+W+0.90H					
Span # 1	1	12.000	-16.85	85.82	0.20
+0.6988D+E+0.90H					
Span # 1	1	12.000	-26.51	85.82	0.31
+0.6988D-E+0.90H					
Span # 1	1	12.000	-6.08	85.82	0.07

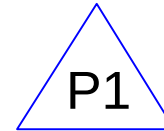
Overall Maximum Deflections

Load Combination	Span	Max. "+" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+0.70E+H	1	0.0058	6.984		0.0000	0.000



Job: **18219 - Patel Residence - Arris**

Friction Pile Calculation - 2019 CBC



INPUTS

Frictional Resistance, $f = 600$ psf (per Soils Report)
 Maximum Load, $P = 44,000$ lbf (2- GB 1)

DESIGN

Diameter, $D = 16$ in.
 Embedment, $E = 20$ ft.

LONGITUDINAL REINFORCEMENT (CBC 1810.3.9.4.2)

$$0.005A_g < A_{st} < 0.08A_g \text{ (ACI 318-11 10.9.1)}$$

$$A_{st,min.} > 1.01 \text{ in.}^2$$

$$A_{st,max.} < 16.08 \text{ in.}^2$$

Choose: **(6) #6**

Min. Length of Reinf.

10 ft. <--- Governs
 10 ft. <--- Governs
 4 ft.

Bars must extend from top for the following length: **10.0 ft.**

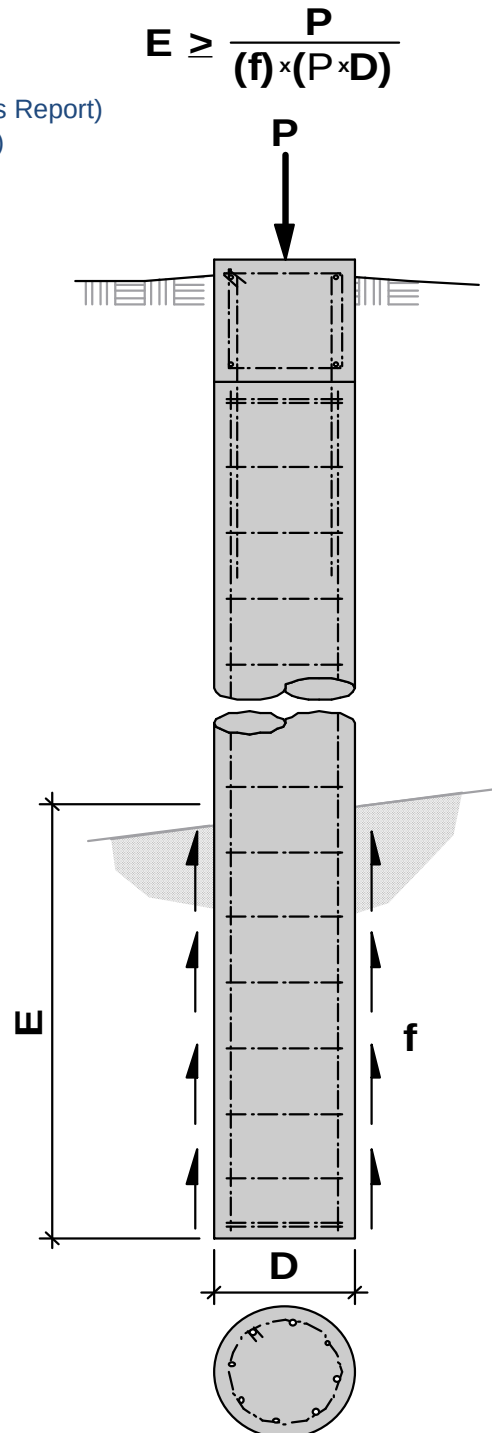
TRANSVERSE REINFORCEMENT (CBC 1810.3.9.4.2)

Min. Spacing of Ties

9 in.
 8 in. <--- Governs
 12 in.

Tie spacing shall not exceed: **8 in.**

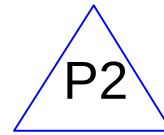
Minimum Tie Size--> **#3 bars**





Job: **18219 - Patel Residence - Arris**

Friction Pile Calculation - 2019 CBC



INPUTS

Frictional Resistance, $f = 600$ psf (per Soils Report)
Maximum Load, $P = 34,000$ lbf (2-GB3)

DESIGN

Diameter, $D = 16$ in.
Embedment, $E = 16$ ft.

LONGITUDINAL REINFORCEMENT (CBC 1810.3.9.4.2)

$0.005A_g < A_{st} < 0.08A_g$ (ACI 318-11 10.9.1)

$A_{st,min.} > 1.01$ in.²

$A_{st,max.} < 16.08$ in.²

Choose: **(6) #6**

Min. Length of Reinf.

8 ft.
10 ft. <--- Governs
4 ft.

Bars must extend from top for the following length: **10.0 ft.**

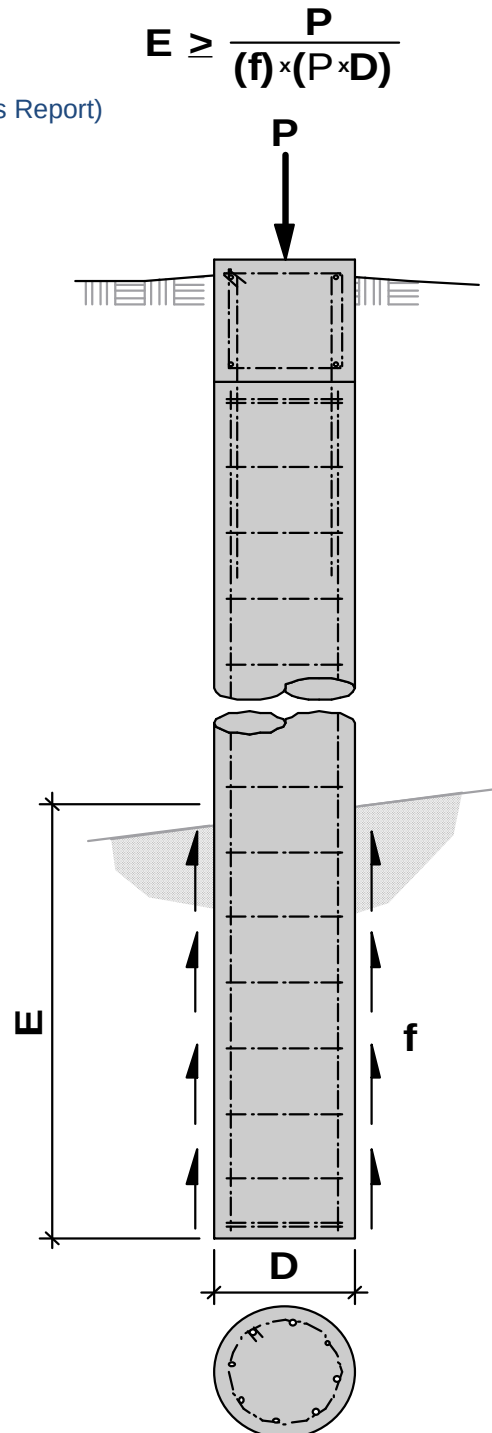
TRANSVERSE REINFORCEMENT (CBC 1810.3.9.4.2)

Min. Spacing of Ties

9 in.
8 in. <--- Governs
12 in.

Tie spacing shall not exceed: **8 in.**

Minimum Tie Size--> **#3 bars**



$$E \geq \frac{P}{(f) \times (P \times D)}$$

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Criteria

Retained Height	=	10.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	3.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	115.00 pcf
Soil Density, Toe	=	115.00 pcf
Footing Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	12.00 in

**Surcharge Loads**

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

Lateral Load Applied to Stem

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

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary**Wall Stability Ratios**

Overturning	=	2.57 OK
Sliding	=	1.67 OK

Total Bearing Load	=	4,532 lbs
...resultant ecc.	=	18.87 in

Soil Pressure @ Toe	=	1,567 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,500 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	2,194 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	46.6 psi OK
Footing Shear @ Heel	=	33.4 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	3,211.1 lbs
less 100% Passive Force	=	- 3,600.0 lbs
less 100% Friction Force	=	- 1,776.8 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

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

Load Factors

Building Code	CBC 2019,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction**Bottom**

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	12.00
Rebar Size	=	# 5
Rebar Spacing	=	8.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.661
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Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	4,000.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	13,333.3
Moment.....Allowable	=	20,169.2

Shear.....Actual

Service Level	psi =	
Strength Level	psi =	32.7
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	10.19

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	150.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

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Cantilevered Retaining Wall

Code: CBC 2019,ACI 318-14,TMS 402-16

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.3002 in2/ft	
(4/3) * As :	0.4003 in2/ft	Min Stem T&S Reinf Area 2.880 in2
200bd/fy : 200(12)(10.1875)/60000 :	0.4075 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.288 in2/ft
0.0018bh : 0.0018(12)(12) :	0.2592 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.4003 in2/ft	#4@ 8.33 in #4@ 16.67 in
Provided Area :	0.465 in2/ft	#5@ 12.92 in #5@ 25.83 in
Maximum Area :	1.3801 in2/ft	#6@ 18.33 in #6@ 36.67 in

Footing Data

Toe Width	=	5.00 ft
Heel Width	=	2.00
Total Footing Width	=	7.00
Footing Thickness	=	12.00 in
Key Width	=	12.00 in
Key Depth	=	42.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm.= 3.00 in

Footing Design Results

	<u>Toe</u>	<u>Heel</u>
Factored Pressure	= 2,194	0 psf
Mu' : Upward	= 234,277	0 ft-#
Mu' : Downward	= 37,350	3,021 ft-#
Mu: Design	= 16,411	3,021 ft-#
Actual 1-Way Shear	= 46.62	33.41 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= # 5 @ 8.00 in	
Heel Reinforcing	= # 5 @ 12.00 in	
Key Reinforcing	= # 5 @ 8.00 in	
Footing Torsion, Tu	=	0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 5.38 in, #5@ 8.34 in, #6@ 11.84 in, #7@ 16.15 in, #8@ 21.26 in, #9@ 26.
 Heel: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
 Key: #4@ 5.58 in, #5@ 8.66 in, #6@ 12.29 in, #7@ 16.76 in, #

Min footing T&S reinf Area	1.81	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:	If two layers of horizontal bars:	
#4@ 9.26 in	#4@ 18.52 in	
#5@ 14.35 in	#5@ 28.70 in	
#6@ 20.37 in	#6@ 40.74 in	

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Cantilevered Retaining Wall

Code: CBC 2019,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....				RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	3,211.1	3.67	12,130.9	Soil Over HL (ab. water tbl)	1,150.0	6.50	7,475.0
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		6.50	7,475.0
Hydrostatic Force				Watre Table			
Buoyant Force	=			Sloped Soil Over Heel	= 19.2	6.67	127.8
Surcharge over Heel	=			Surcharge Over Heel	=		
Surcharge Over Toe	=			Adjacent Footing Load	=		
Adjacent Footing Load	=			Axial Dead Load on Stem	=		
Added Lateral Load	=			* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=			Soil Over Toe	= 287.5	2.50	718.8
	=			Surcharge Over Toe	=		
				Stem Weight(s)	= 1,500.0	5.50	8,250.0
				Earth @ Stem Transitions	=		
				Footing Weight	= 1,050.0	3.50	3,675.0
				Key Weight	= 525.0	0.50	262.5
				Vert. Component	= 1,391.1	7.00	9,738.0

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt**Horizontal Deflection at Top of Wall due to settlement of soil**

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.062 in

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

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Cantilevered Retaining Wall

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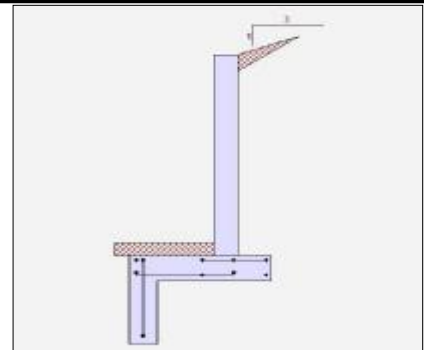
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Criteria

Retained Height	=	8.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	3.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	115.00 pcf
Soil Density, Toe	=	115.00 pcf
Footings Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	12.00 in

**Surcharge Loads**

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

Lateral Load Applied to Stem

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

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary**Wall Stability Ratios**

Overturning	=	2.33 OK
Sliding	=	1.61 OK

Total Bearing Load	=	3,397 lbs
...resultant ecc.	=	15.91 in

Soil Pressure @ Toe	=	1,929 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,500 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	2,701 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	34.8 psi OK
Footing Shear @ Heel	=	26.8 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	2,203.8 lbs
less 100% Passive Force	= -	2,250.0 lbs
less 100% Friction Force	= -	1,305.5 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

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

Load Factors

Building Code	CBC 2019,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction**Bottom**

Design Height Above Ftg	ft =	Stem OK 0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	10.00
Rebar Size	=	# 5
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.625
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Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	2,560.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	6,826.7
Moment.....Allowable	=	10,911.3

Shear.....Actual

Service Level	psi =	
Strength Level	psi =	26.1
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	8.19

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	125.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

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Cantilevered Retaining Wall

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Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.1928 in2/ft	
(4/3) * As :	0.2571 in2/ft	Min Stem T&S Reinf Area 1.920 in2
200bd/fy : 200(12)(8.1875)/60000 :	0.3275 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.240 in2/ft
0.0018bh : 0.0018(12)(10) :	0.216 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.2571 in2/ft	#4@ 10.00 in #4@ 20.00 in
Provided Area :	0.31 in2/ft	#5@ 15.50 in #5@ 31.00 in
Maximum Area :	1.1092 in2/ft	#6@ 22.00 in #6@ 44.00 in

Footing Data

Toe Width	=	3.00 ft
Heel Width	=	2.00
Total Footing Width	=	5.00
Footing Thickness	=	12.00 in
Key Width	=	12.00 in
Key Depth	=	30.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm.= 3.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	2,701	0 psf
Mu' : Upward	=	104,434	0 ft-#
Mu' : Downward	=	13,446	2,680 ft-#
Mu: Design	=	7,582	2,680 ft-#
Actual 1-Way Shear	=	34.83	26.81 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 5 @ 12.00 in	
Heel Reinforcing	=	# 5 @ 12.00 in	
Key Reinforcing	=	# 5 @ 12.00 in	
Footing Torsion, Tu	=		0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 8.73 in, #5@ 13.54 in, #6@ 19.22 in, #7@ 26.21 in, #8@ 34.52 in, #9@ 43
 Heel: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
 Key: #4@ 10 in, #5@ 15.5 in, #6@ 18 in, #7@ 18 in, #8@ 18 in

Min footing T&S reinf Area	1.30	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in

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Cantilevered Retaining Wall

Code: CBC 2019,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....				RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	2,203.8	3.00	6,897.0	Soil Over HL (ab. water tbl)	1,073.3	4.42	4,740.6
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		4.42	4,740.6
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =	26.1	4.61	120.3
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =	172.5	1.50	258.8
				Surcharge Over Toe =			
				Stem Weight(s) =	1,000.0	3.42	3,416.7
				Earth @ Stem Transitions=			
				Footing Weight =	750.0	2.50	1,875.0
				Key Weight =	375.0	0.50	187.5
				Vert. Component =	954.7	5.00	4,773.7
Total	= 2,203.8	O.T.M. =	6,611.3	Total =	4,351.7 lbs	R.M.=	15,372.4
Resisting/Overturning Ratio		= 2.33		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			
Vertical Loads used for Soil Pressure =		3,396.9 lbs					

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt**Horizontal Deflection at Top of Wall due to settlement of soil**

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.086 in

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

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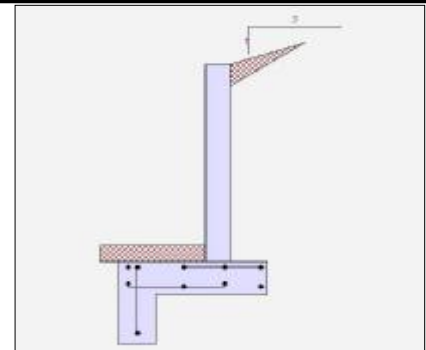
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Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	3.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	115.00 pcf
Soil Density, Toe	=	115.00 pcf
Footings Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	12.00 in

**Surcharge Loads**

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

Lateral Load Applied to Stem

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

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary**Wall Stability Ratios**

Overturning	=	2.50 OK
Sliding	=	1.53 OK

Total Bearing Load	=	2,262 lbs
...resultant ecc.	=	11.27 in

Soil Pressure @ Toe	=	1,428 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,500 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	1,999 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	19.3 psi OK
Footing Shear @ Heel	=	17.1 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	1,343.6 lbs
less 100% Passive Force	= -	1,200.0 lbs
less 100% Friction Force	= -	853.2 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

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

Load Factors

Building Code	CBC 2019,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction**Bottom**

Design Height Above Ftg	ft =	Stem OK 0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 5
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.354
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Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	1,440.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	2,880.0
Moment.....Allowable	=	8,121.3

Shear.....Actual

Service Level	psi =	
Strength Level	psi =	19.4
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	6.19

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	100.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

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Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1091 in ² /ft		
(4/3) * As :	0.1454 in ² /ft	Min Stem T&S Reinf Area 1.152 in ²	
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in ² /ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in ² /ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in ² /ft	Horizontal Reinforcing Options :	
	=====	One layer of : Two layers of :	
Required Area :	0.1728 in ² /ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.31 in ² /ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8382 in ² /ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	2.33 ft
Heel Width	=	1.66
Total Footing Width	=	3.99
Footing Thickness	=	12.00 in
Key Width	=	12.00 in
Key Depth	=	18.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm.= 3.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	1,999	0 psf
Mu' : Upward	=	49,145	1 ft-#
Mu' : Downward	=	8,111	1,437 ft-#
Mu: Design	=	3,419	1,437 ft-#
Actual 1-Way Shear	=	19.32	17.07 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 5 @ 12.00 in	
Heel Reinforcing	=	# 5 @ 12.00 in	
Key Reinforcing	=	# 5 @ 12.00 in	
Footing Torsion, Tu	=		0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
 Heel: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
 Key: #4@ 9.25 in, #5@ 14.35 in, #6@ 18 in, #7@ 18 in, #8@ 18

Min footing T&S reinf Area	1.03	in ²
Min footing T&S reinf Area per foot	0.26	in ² /ft
If one layer of horizontal bars:		
#4@ 9.26 in		
#5@ 14.35 in		
#6@ 20.37 in		
If two layers of horizontal bars:		
#4@ 18.52 in		
#5@ 28.70 in		
#6@ 40.74 in		

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Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....				RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	1,343.6	2.33	3,283.4	Soil Over HL (ab. water tbl)	685.4	3.49	2,394.3
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.49	2,394.3
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =	18.9	3.66	69.2
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =	134.0	1.17	156.1
				Surcharge Over Toe =			
				Stem Weight(s) =	600.0	2.66	1,598.0
				Earth @ Stem Transitions=			
Total	= 1,343.6	O.T.M. =	3,135.1	Footing Weight =	598.5	2.00	1,194.0
Resisting/Overturning Ratio		= 2.50		Key Weight =	225.0	0.50	112.5
Vertical Loads used for Soil Pressure =		2,261.8 lbs		Vert. Component =	582.1	3.99	2,322.6
				Total =	2,843.9 lbs	R.M.=	7,846.7

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

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
 Horizontal Defl @ Top of Wall (approximate only) 0.060 in

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

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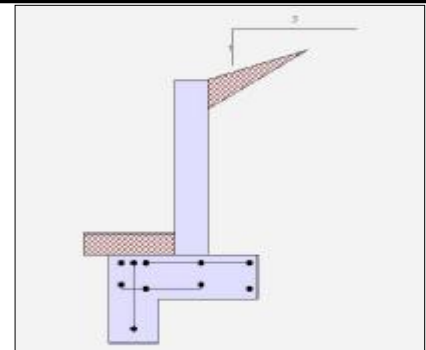
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Criteria

Retained Height	=	4.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	3.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	115.00 pcf
Soil Density, Toe	=	115.00 pcf
Footings Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	12.00 in

**Surcharge Loads**

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

Lateral Load Applied to Stem

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

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary**Wall Stability Ratios**

Overturning	=	3.02 OK
Sliding	=	1.89 OK

Total Bearing Load	=	1,551 lbs
...resultant ecc.	=	6.59 in

Soil Pressure @ Toe	=	1,093 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,500 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	1,530 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	6.6 psi OK
Footing Shear @ Heel	=	9.2 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	710.5 lbs
less 100% Passive Force	= -	787.5 lbs
less 100% Friction Force	= -	557.6 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

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

Load Factors

Building Code	CBC 2019,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction**Bottom**

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.157
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Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	640.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	853.3
Moment.....Allowable	=	5,412.6

Shear.....Actual

Service Level	psi =	
Strength Level	psi =	8.5
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	6.25

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	100.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

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Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.032 in ² /ft	
(4/3) * As :	0.0426 in ² /ft	Min Stem T&S Reinf Area 0.768 in ²
200bd/fy : 200(12)(6.25)/60000 :	0.25 in ² /ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in ² /ft
0.0018bh : 0.0018(12)(8) :	0.1728 in ² /ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.1728 in ² /ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.2 in ² /ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8467 in ² /ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	1.33 ft
Heel Width	=	1.66
Total Footing Width	=	2.99
Footing Thickness	=	12.00 in
Key Width	=	12.00 in
Key Depth	=	12.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm.= 3.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	1,530	0 psf
Mu' : Upward	=	13,702	54 ft-#
Mu' : Downward	=	2,643	865 ft-#
Mu: Design	=	922	812 ft-#
Actual 1-Way Shear	=	6.65	9.22 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 5 @ 12.00 in	
Heel Reinforcing	=	# 5 @ 12.00 in	
Key Reinforcing	=	# 5 @ 12.00 in	
Footing Torsion, Tu	=		0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
 Heel: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
 Key: #4@ 9.25 in, #5@ 14.35 in, #6@ 18 in, #7@ 18 in, #8@ 18

Min footing T&S reinf Area	0.78	in ²
Min footing T&S reinf Area per foot	0.26	in ² /ft
If one layer of horizontal bars:		
#4@ 9.26 in		
#5@ 14.35 in		
#6@ 20.37 in		
If two layers of horizontal bars:		
#4@ 18.52 in		
#5@ 28.70 in		
#6@ 40.74 in		

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Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....				RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	710.5	1.67	1,262.6	Soil Over HL (ab. water tbl)	456.9	2.49	1,139.3
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.49	1,139.3
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =	18.9	2.66	50.3
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =	76.5	0.67	50.9
				Surcharge Over Toe =			
				Stem Weight(s) =	400.0	1.66	665.3
				Earth @ Stem Transitions=			
				Footing Weight =	448.5	1.50	670.5
				Key Weight =	150.0	0.50	75.0
				Vert. Component =	307.8	2.99	920.4
Total	= 710.5	O.T.M. =	1,184.2	Total =	1,858.6 lbs	R.M.=	3,571.6
Resisting/Overturning Ratio		= 3.02					
Vertical Loads used for Soil Pressure =		1,550.8 lbs					

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

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.041 in

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