



May 3, 2024

STRUCTURAL CALCULATIONS
(Permit Supplement)

ADAMS RESIDENCE
8035 SE 45th Street
Mercer Island, WA 98040

Quantum Job Number: 22229.01

Prepared for:
MCFADDEN DESIGN
1914 Fifth Street
Kirkland, WA 98003

Prepared by:
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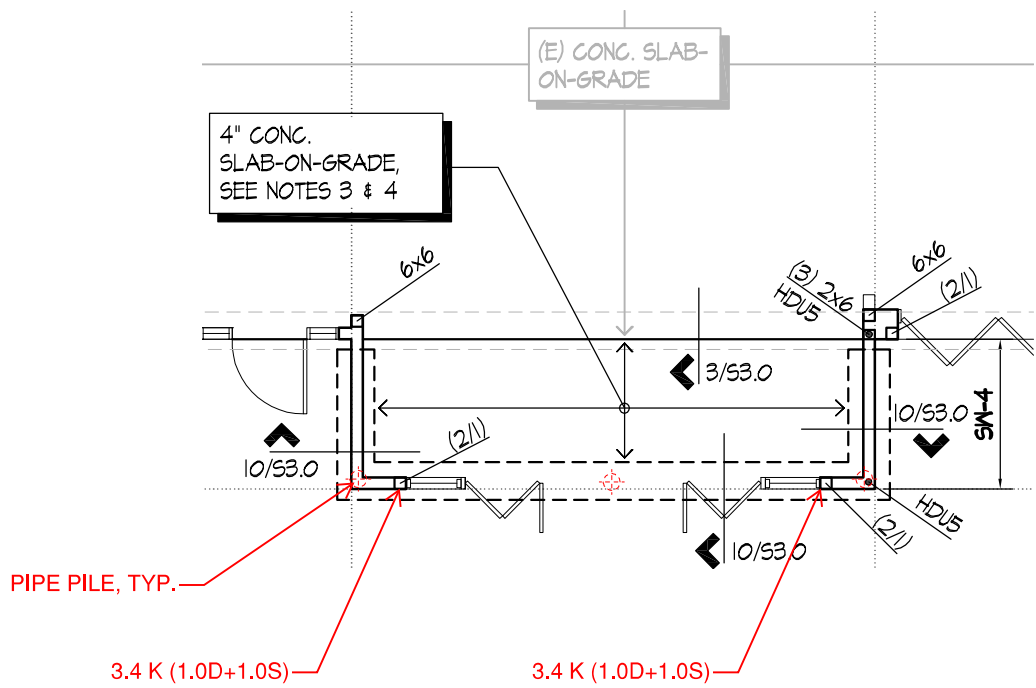
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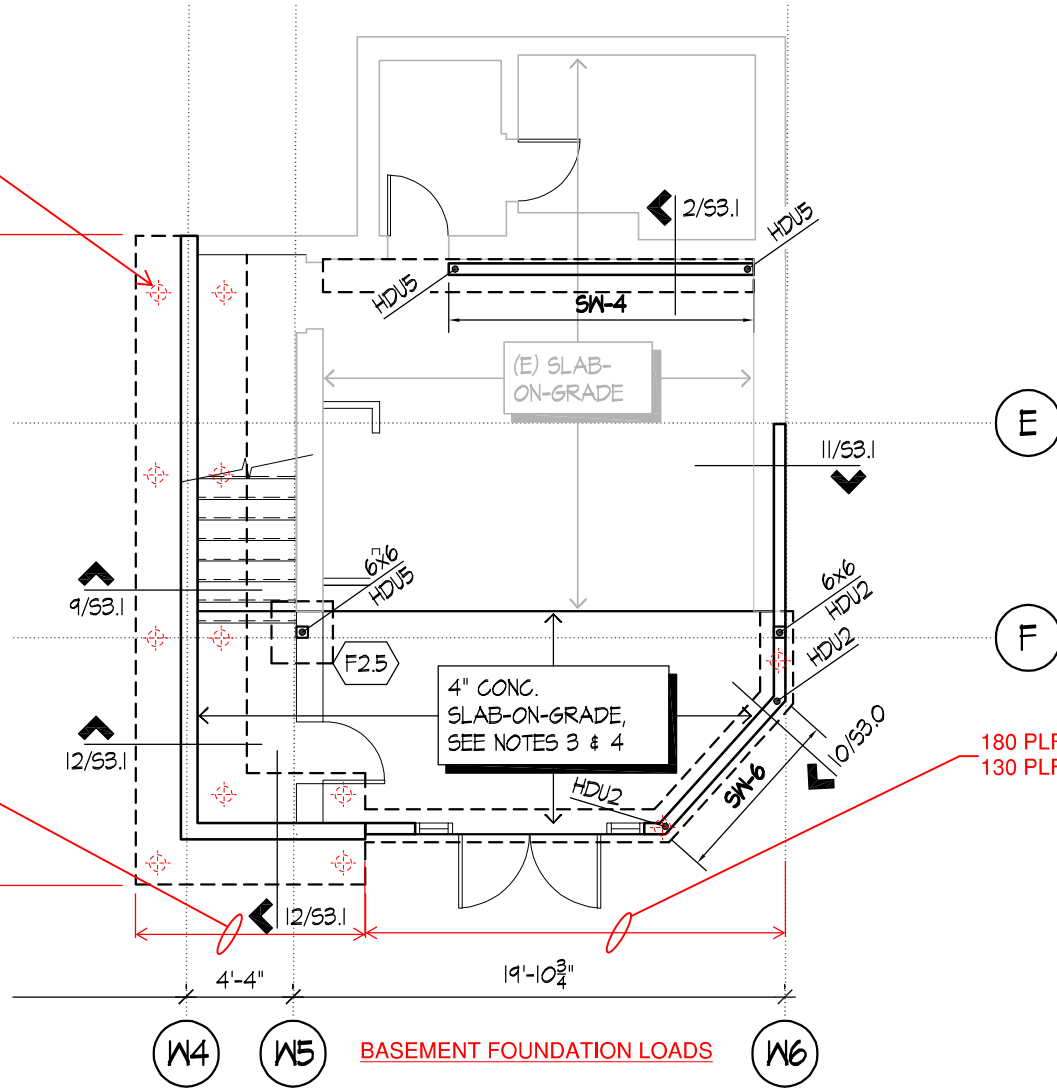
FOUNDATION DESIGN



KITCHEN FOUNDATION LOADS

PIPE PILE, TYP.

260 PLF (1.0L)
1834 PLF (1.0H)
1675 PLF (1.0D)



BASEMENT FOUNDATION LOADS

180 PLF (1.0L)
130 PLF (1.0D)

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Adams - Rev 1.ec6

LIC# : KW-06016450, Build:20.23.10.02

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Rev 1 - Stairwell Retaining Wall, 8ft

Code Reference

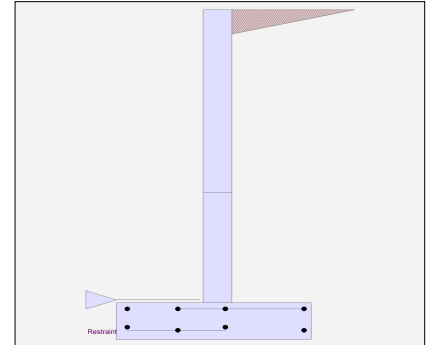
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	8.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Axial Load Applied to Stem

Axial Dead Load	=	200.0 lbs
Axial Live Load	=	260.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method	:	Uniform
Multiplier Used	=	9.000
(Multiplier used on soil density)		

Lateral Load Applied to Stem

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

Uniform Seismic Force	=	81.000
Total Seismic Force	=	729.000

Adjacent Footing Load

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

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DESCRIPTION: Rev 1 - Stairwell Retaining Wall, 8ft

Design Summary

Wall Stability Ratios

Overturning	=	1.59	OK
Slab Resists All Sliding !			
Global Stability	=	1.86	
Total Bearing Load	=	3,768 lbs	
...resultant ecc.	=	12.74 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	2,113 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,500 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,959 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	28.4 psi	OK
Footing Shear @ Heel	=	19.2 psi	OK
Allowable	=	82.2 psi	

Sliding Calcs

Lateral Sliding Force	=	1,927.8 lbs
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Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

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

Stem Construction

		2nd	Bottom		
Design Height Above Ftg	ft =	Stem OK 3.00	Stem OK 0.00		
Wall Material Above "Ht"	=	Concrete	Concrete		
Design Method	=	SD	SD	SD	SD
Thickness	=	8.00	8.00		
Rebar Size	=	# 4	# 5		
Rebar Spacing	=	14.00	12.00		
Rebar Placed at	=	Center	Edge		
Design Data					
fb/FB + fa/Fa	=	0.737	0.898		
Total Force @ Section					
Service Level	lbs =				
Strength Level	lbs =	1,105.0	2,440.0		
Moment....Actual					
Service Level	ft-# =				
Strength Level	ft-# =	2,179.2	7,370.7		
Moment....Allowable	ft-# =	2,955.7	8,206.3		
Shear....Actual					
Service Level	psi =				
Strength Level	psi =	23.0	32.9		
Shear....Allowable	psi =	82.2	82.2		
Anet (Masonry)	in2 =				
Wall Weight	psf =	100.0	100.0		
Rebar Depth 'd'	in =	4.00	6.19		

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	3,000.0	3,000.0
Fy	psi =	60,000.0	60,000.0

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DESCRIPTION: Rev 1 - Stairwell Retaining Wall, 8ft

Concrete Stem Rebar Area Details

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>
2nd Stem		
As (based on applied moment) :	0.1315 in ² /ft	
(4/3) * As :	0.1754 in ² /ft	Min Stem T&S Reinf Area 0.960 in ²
200bd/fy : 200(12)(4)/60000 :	0.16 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 :
	=====	<u>One layer of :</u> <u>Two layers of :</u>
Required Area :	0.16 in ² /ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.1714 in ² /ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.6503 in ² /ft	#6@ 27.50 in #6@ 55.00 in

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>
Bottom Stem		
As (based on applied moment) :	0.2791 in ² /ft	
(4/3) * As :	0.3721 in ² /ft	Min Stem T&S Reinf Area 0.576 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 :
	=====	<u>One layer of :</u> <u>Two layers of :</u>
Required Area :	0.2791 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 :	1.0059 in ² /ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	2.00 ft
Heel Width	=	2.50
Total Footing Width	=	4.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c =	3,000 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm.= 3.00 in

Footing Design Results

	<u>Toe</u>	<u>Heel</u>	
Factored Pressure	=	2,959	0 psf
Mu' : Upward	=	4,811	101 ft-#
Mu' : Downward	=	360	2,319 ft-#
Mu: Design	=	4,451 OK	2,219 ft-# OK
phiMn	=	11,695	13,090 ft-#
Actual 1-Way Shear	=	28.40	19.25 psi
Allow 1-Way Shear	=	82.16	82.16 psi
Toe Reinforcing	=	# 5 @ 12.00 in	
Heel Reinforcing	=	# 5 @ 12.00 in	
Key Reinforcing	=	None Spec'd	
Footing Torsion, Tu	=		0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46.29 in, #10@ 58.79 in

Heel: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46.29 in, #10@ 58.79 in

Key: No key defined

Min footing T&S reinf Area 1.17 in²
 Min footing T&S reinf Area per foot 0.26 in² /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

Cantilevered Retaining Wall

Project File: Adams - Rev 1.ec6

LIC# : KW-06016450, Build:20.23.10.02

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DESCRIPTION: Rev 1 - Stairwell Retaining Wall, 8ft

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....			RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	1,417.5	3.00	4,252.5	Soil Over HL (ab. water tbl)	1,833.3	3.58	6,569.4
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.58	6,569.4
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =	200.0	2.33	466.7
Added Lateral Load =				* Axial Live Load on Stem =	260.0	2.33	606.7
Load @ Stem Above Soil =				Soil Over Toe =			
Seismic Earth Load =	510.3	4.50	2,296.4	Surcharge Over Toe =			
=				Stem Weight(s) =	800.0	2.33	1,866.7
Total =	1,927.8	O.T.M.	6,548.9	Earth @ Stem Transitions =			
				Footing Weight =	675.0	2.25	1,518.8
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		=	1.59	Total =	3,508.3 lbs	R.M.=	10,421.5
Vertical Loads used for Soil Pressure =		3,768.3 lbs					

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

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
 Horizontal Defl @ Top of Wall (approximate only) 0.104 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.

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

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QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Rev 1 - Stairwell Retaining Wall, 8ft

Rebar Lap & Embedment Lengths Information

Stem Design Segment: 2nd

Stem Design Height: 3.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.3a) = 17.09 in
Development length for #4 bar specified in this stem design segment = 13.15 in

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #5 bar specified in this stem design segment (25.4.2.3a) = 21.36 in
Development length for #5 bar specified in this stem design segment = 16.43 in

Hooked embedment length into footing for #5 bar specified in this stem design segment = 8.63 in
As Provided = 0.3100 in²/ft
As Required = 0.2791 in²/ft

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Cantilevered Retaining Wall

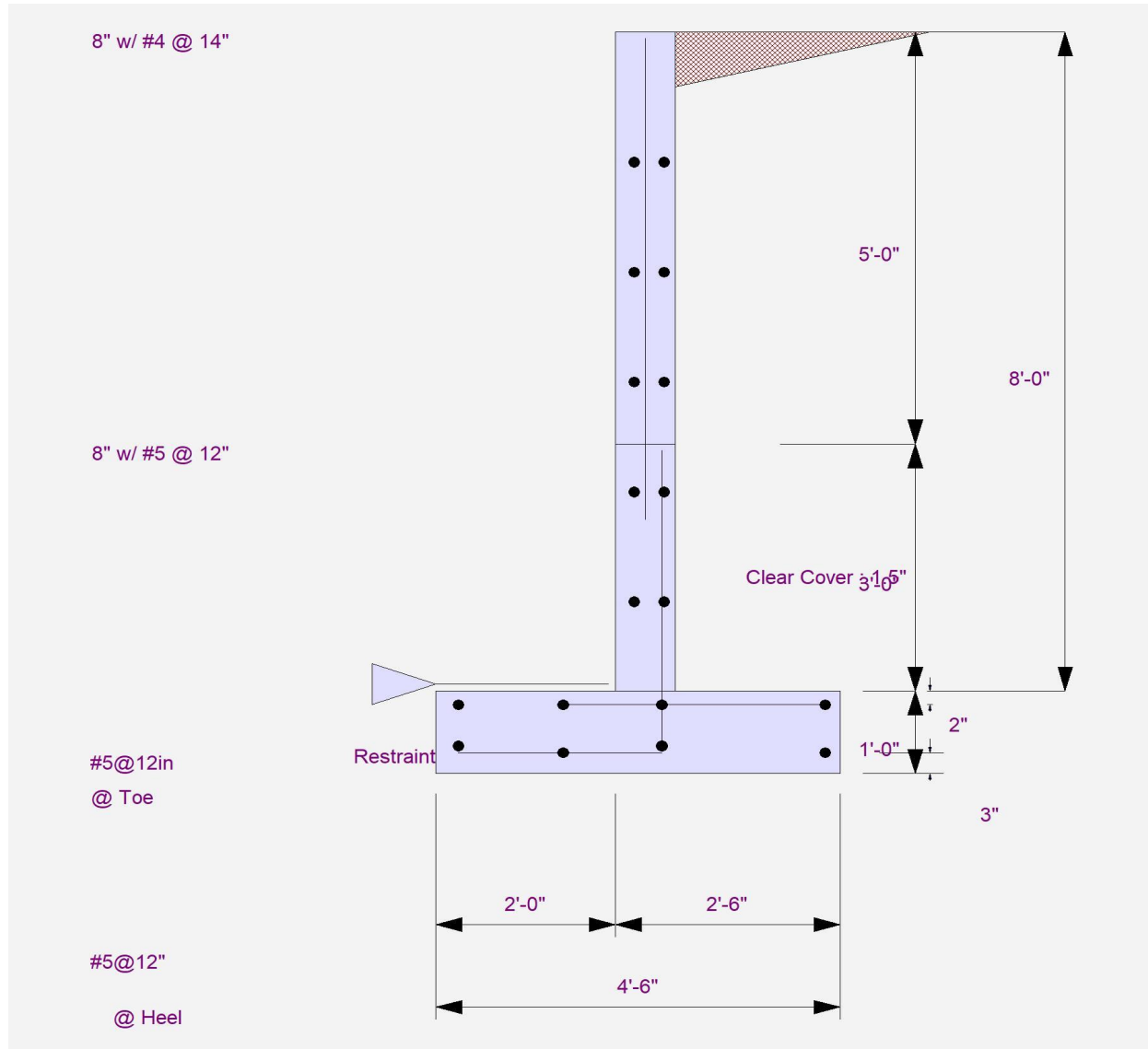
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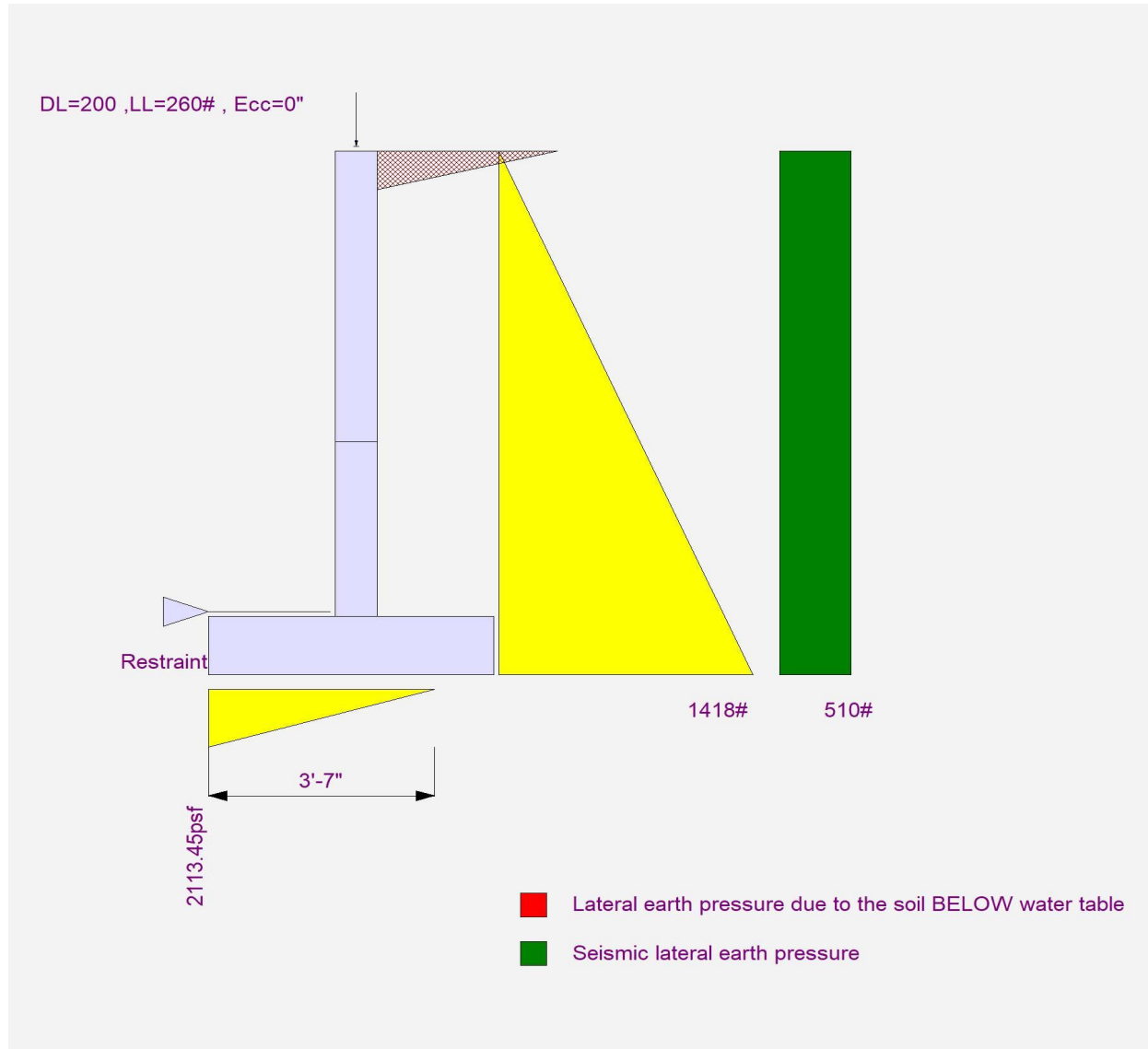
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DESCRIPTION: Rev 1 - Stairwell Retaining Wall, 8ft



Cantilevered Retaining Wall

DESCRIPTION: Rev 1 - Stairwell Retaining Wall, 8ft



Concrete Beam

Project File: Adams - Rev 1.ec6

LIC# : KW-06016450, Build:20.23.10.02

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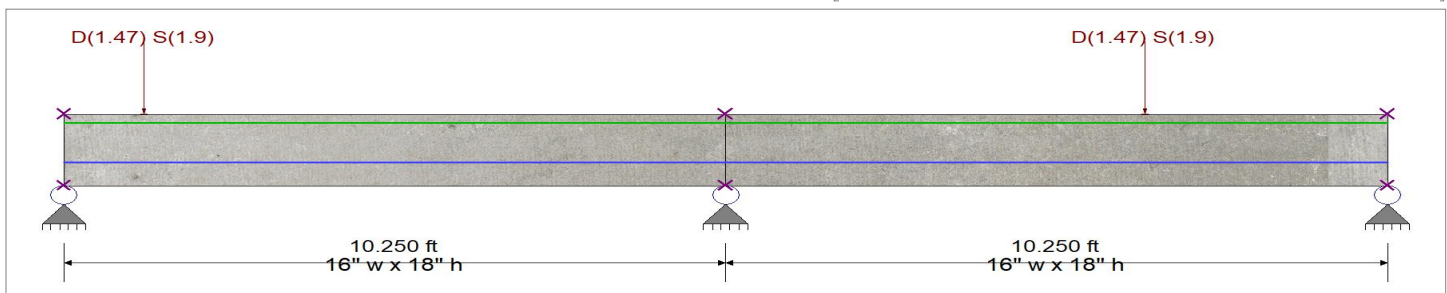
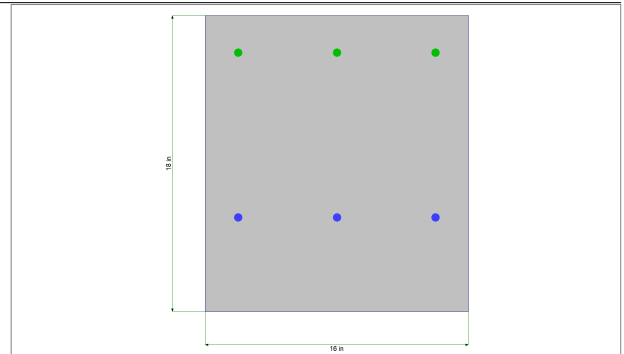
DESCRIPTION: Rev 1 - Grade Beam at Kitchen

CODE REFERENCES

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

General Information

f'_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} \cdot 7.50$	=	410.792 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	40.0 ksi
fy - Main Rebar	=	40.0 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 = 18.0 in

Span #1 Reinforcing....

3-#4 at 5.750 in from Bottom, from 0.0 to 10.250 ft in this span 3-#4 at 2.250 in from Top, from 0.0 to 10.250 ft in this span

Span #2 Reinforcing....

3-#4 at 5.750 in from Bottom, from 0.0 to 10.250 ft in this span 3-#4 at 2.250 in from Top, from 0.0 to 10.250 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1

Point Load : D = 1.470, S = 1.90 k @ 1.250 ft, (Roof)

Load for Span Number 2

Point Load : D = 1.470, S = 1.90 k @ 6.500 ft, (Roof)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.500 : 1		
Section used for this span	Typical Section		
Mu : Applied	11.991	k-ft	
Mn * Phi : Allowable	23.982	k-ft	
Location of maximum on span	6.485	ft	
Span # where maximum occurs	Span # 2		

Maximum Deflection

Max Downward Transient Deflection	0.002 in	Ratio =	68024	>=360.0	S Only
Max Upward Transient Deflection	0.000 in	Ratio =	0	<360.0	S Only
Max Downward Total Deflection	0.004 in	Ratio =	27707	>=180.0	Span: 2 : +D+S+H
Max Upward Total Deflection	0.000 in	Ratio =	0	<180.0	Span: 2 : +D+S+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	3.706	6.096	2.884
Max Upward from Load Combinations	3.706	6.096	2.884
Max Upward from Load Cases	2.245	4.754	1.886

Concrete Beam

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LIC#: KW-06016450, Build:20.23.10.02

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Rev 1 - Grade Beam at Kitchen

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3
+D+H	2.245	4.754	1.886
+D+L+H	2.245	4.754	1.886
+D+Lr+H	2.245	4.754	1.886
+D+S+H	3.706	6.096	2.884
+D+0.750Lr+0.750L+H	2.245	4.754	1.886
+D+0.750L+0.750S+H	3.340	5.760	2.634
+D+0.60W+H	2.245	4.754	1.886
+D+0.750Lr+0.750L+0.450W+H	2.245	4.754	1.886
+D+0.750L+0.750S+0.450W+H	3.340	5.760	2.634
+0.60D+0.60W+0.60H	1.347	2.852	1.132
+D+0.70E+0.60H	2.245	4.754	1.886
+D+0.750L+0.750S+0.5250E+H	3.340	5.760	2.634
+0.60D+0.70E+H	1.347	2.852	1.132
D Only	2.245	4.754	1.886
S Only	1.461	1.342	0.997
H Only			

Shear Stirrup Requirements

Entire Beam Span Length : $V_u < \Phi V_c / 2$, Req'd Vs = Not Req'd per 9.6.3.1, Stirrups are not required.

Detailed Shear Information

Load Combination	Span Distance 'd'		Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
	Number	(ft)	(in)	Actual							
+1.20D+1.60S+0.50W+1.60H	1	0.00	12.25	5.03	5.03	0.00	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	1	0.25	12.25	4.94	4.94	1.25	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	1	0.50	12.25	4.86	4.86	2.48	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	1	0.75	12.25	4.77	4.77	3.69	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	1	1.00	12.25	4.68	4.68	4.88	0.98	16.40	Vu < Phi*Vc / 2	16.4	0.0
+1.40D+1.60H	1	1.26	12.25	0.58	0.58	3.61	0.16	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.40D+1.60H	1	1.51	12.25	0.47	0.47	3.75	0.13	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	1.76	12.25	-0.38	0.38	5.87	0.07	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	2.01	12.25	-0.47	0.47	5.76	0.08	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	2.26	12.25	-0.56	0.56	5.63	0.10	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	2.51	12.25	-0.65	0.65	5.48	0.12	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	2.76	12.25	-0.73	0.73	5.30	0.14	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	3.01	12.25	-0.82	0.82	5.11	0.16	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	3.26	12.25	-0.91	0.91	4.89	0.19	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	3.51	12.25	-1.00	1.00	4.65	0.22	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	3.77	12.25	-1.08	1.08	4.39	0.25	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	4.02	12.25	-1.17	1.17	4.11	0.29	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	4.27	12.25	-1.26	1.26	3.80	0.34	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	4.52	12.25	-1.35	1.35	3.48	0.39	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	4.77	12.25	-1.43	1.43	3.13	0.47	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	5.02	12.25	-1.52	1.52	2.76	0.56	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	5.27	12.25	-1.61	1.61	2.37	0.69	16.10	Vu < Phi*Vc / 2	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	1	5.52	12.25	-1.69	1.69	1.95	0.89	16.30	Vu < Phi*Vc / 2	16.3	0.0
+1.20D+1.60S+0.50W+1.60H	1	5.77	12.25	-1.78	1.78	1.52	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	1	6.02	12.25	-1.87	1.87	1.06	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	1	6.28	12.25	-1.96	1.96	0.58	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	1	6.53	12.25	-2.04	2.04	0.07	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	1	6.78	15.75	-2.13	2.13	0.45	1.00	20.79	Vu < Phi*Vc / 2	20.8	0.0
+1.20D+1.60S+0.50W+1.60H	1	7.03	15.75	-2.22	2.22	1.00	1.00	20.79	Vu < Phi*Vc / 2	20.8	0.0
+1.20D+1.60S+0.50W+1.60H	1	7.28	15.75	-2.31	2.31	1.56	1.00	20.79	Vu < Phi*Vc / 2	20.8	0.0
+1.20D+1.60S+0.50W+1.60H	1	7.53	15.75	-2.39	2.39	2.15	1.00	20.79	Vu < Phi*Vc / 2	20.8	0.0
+1.20D+1.60S+0.50W+1.60H	1	7.78	15.75	-2.48	2.48	2.77	1.00	20.79	Vu < Phi*Vc / 2	20.8	0.0
+1.20D+1.60S+0.50W+1.60H	1	8.03	15.75	-2.57	2.57	3.40	0.99	20.78	Vu < Phi*Vc / 2	20.8	0.0
+1.20D+1.60S+0.50W+1.60H	1	8.28	15.75	-2.66	2.66	4.06	0.86	20.70	Vu < Phi*Vc / 2	20.7	0.0
+1.20D+1.60S+0.50W+1.60H	1	8.53	15.75	-2.74	2.74	4.73	0.76	20.70	Vu < Phi*Vc / 2	20.7	0.0
+1.20D+1.60S+0.50W+1.60H	1	8.79	15.75	-2.83	2.83	5.43	0.68	20.70	Vu < Phi*Vc / 2	20.7	0.0
+1.20D+1.60S+0.50W+1.60H	1	9.04	15.75	-2.92	2.92	6.15	0.62	20.70	Vu < Phi*Vc / 2	20.7	0.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

Project File: Adams - Rev 1.ec6

LIC#: KW-06016450, Build:20.23.10.02

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Rev 1 - Grade Beam at Kitchen

Detailed Shear Information

Load Combination	Span Number	Distance 'd'		Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
		(ft)	(in)	Actual	Design							
+1.20D+1.60S+0.50W+1.60H	1	9.29	15.75	-3.01	3.01	6.90	0.57	20.70	Vu < Phi*Vc / 2	20.7	20.7	0.0
+1.20D+1.60S+0.50W+1.60H	1	9.54	15.75	-3.09	3.09	7.66	0.53	20.70	Vu < Phi*Vc / 2	20.7	20.7	0.0
+1.20D+1.60S+0.50W+1.60H	1	9.79	15.75	-3.18	3.18	8.45	0.49	20.70	Vu < Phi*Vc / 2	20.7	20.7	0.0
+1.20D+1.60S+0.50W+1.60H	1	10.04	15.75	-3.27	3.27	9.26	0.46	20.70	Vu < Phi*Vc / 2	20.7	20.7	0.0
+1.20D+1.60S+0.50W+1.60H	2	10.29	15.75	4.50	4.50	9.76	0.60	20.70	Vu < Phi*Vc / 2	20.7	20.7	0.0
+1.20D+1.60S+0.50W+1.60H	2	10.54	15.75	4.41	4.41	8.64	0.67	20.70	Vu < Phi*Vc / 2	20.7	20.7	0.0
+1.20D+1.60S+0.50W+1.60H	2	10.79	15.75	4.32	4.32	7.55	0.75	20.70	Vu < Phi*Vc / 2	20.7	20.7	0.0
+1.20D+1.60S+0.50W+1.60H	2	11.04	15.75	4.24	4.24	6.47	0.86	20.70	Vu < Phi*Vc / 2	20.7	20.7	0.0
+1.20D+1.60S+0.50W+1.60H	2	11.30	15.75	4.15	4.15	5.42	1.00	20.79	Vu < Phi*Vc / 2	20.8	20.8	0.0
+1.20D+1.60S+0.50W+1.60H	2	11.55	15.75	4.06	4.06	4.39	1.00	20.79	Vu < Phi*Vc / 2	20.8	20.8	0.0
+1.20D+1.60S+0.50W+1.60H	2	11.80	15.75	3.97	3.97	3.38	1.00	20.79	Vu < Phi*Vc / 2	20.8	20.8	0.0
+1.20D+1.60S+0.50W+1.60H	2	12.05	15.75	3.89	3.89	2.40	1.00	20.79	Vu < Phi*Vc / 2	20.8	20.8	0.0
+1.20D+1.60S+0.50W+1.60H	2	12.30	15.75	3.80	3.80	1.43	1.00	20.79	Vu < Phi*Vc / 2	20.8	20.8	0.0
+1.20D+1.60S+0.50W+1.60H	2	12.55	15.75	3.71	3.71	0.49	1.00	20.79	Vu < Phi*Vc / 2	20.8	20.8	0.0
+1.20D+1.60S+0.50W+1.60H	2	12.80	12.25	3.62	3.62	0.43	1.00	16.42	Vu < Phi*Vc / 2	16.4	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	2	13.05	12.25	3.54	3.54	1.33	1.00	16.42	Vu < Phi*Vc / 2	16.4	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	2	13.30	12.25	3.45	3.45	2.21	1.00	16.42	Vu < Phi*Vc / 2	16.4	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	2	13.56	12.25	3.36	3.36	3.06	1.00	16.42	Vu < Phi*Vc / 2	16.4	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	2	13.81	12.25	3.27	3.27	3.89	0.86	16.26	Vu < Phi*Vc / 2	16.3	16.3	0.0
+1.20D+1.60S+0.50W+1.60H	2	14.06	12.25	3.19	3.19	4.70	0.69	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	14.31	12.25	3.10	3.10	5.49	0.58	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	14.56	12.25	3.01	3.01	6.26	0.49	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	14.81	12.25	2.92	2.92	7.01	0.43	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	15.06	12.25	2.84	2.84	7.73	0.37	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	15.31	12.25	2.75	2.75	8.43	0.33	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	15.56	12.25	2.66	2.66	9.11	0.30	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	15.81	12.25	2.58	2.58	9.77	0.27	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	16.07	12.25	2.49	2.49	10.40	0.24	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	16.32	12.25	2.40	2.40	11.02	0.22	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	16.57	12.25	2.31	2.31	11.61	0.20	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	16.82	12.25	-2.58	2.58	11.85	0.22	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	17.07	12.25	-2.67	2.67	11.19	0.24	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	17.32	12.25	-2.75	2.75	10.51	0.27	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	17.57	12.25	-2.84	2.84	9.81	0.30	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	17.82	12.25	-2.93	2.93	9.09	0.33	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	18.07	12.25	-3.01	3.01	8.34	0.37	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	18.32	12.25	-3.10	3.10	7.57	0.42	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	18.58	12.25	-3.19	3.19	6.78	0.48	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	18.83	12.25	-3.28	3.28	5.97	0.56	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	19.08	12.25	-3.36	3.36	5.14	0.67	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60S+0.50W+1.60H	2	19.33	12.25	-3.45	3.45	4.28	0.82	16.22	Vu < Phi*Vc / 2	16.2	16.2	0.0
+1.20D+1.60S+0.50W+1.60H	2	19.58	12.25	-3.54	3.54	3.40	1.00	16.42	Vu < Phi*Vc / 2	16.4	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	2	19.83	12.25	-3.63	3.63	2.51	1.00	16.42	Vu < Phi*Vc / 2	16.4	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	2	20.08	12.25	-3.71	3.71	1.58	1.00	16.42	Vu < Phi*Vc / 2	16.4	16.4	0.0
+1.20D+1.60S+0.50W+1.60H	2	20.33	12.25	-3.80	3.80	0.64	1.00	16.42	Vu < Phi*Vc / 2	16.4	16.4	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment	Location (ft)		Bending Stress Results (k-ft)		
		Span #	along Beam	Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope						
	Span # 1	1	10.250	-9.81	36.58	0.27
	Span # 2	2	10.250	11.99	23.98	0.50
+1.40D+1.60H	Span # 1	1	10.250	-7.51	36.58	0.21
	Span # 2	2	10.250	7.03	23.98	0.29
+1.20D+0.50Lr+1.60L+1.60H	Span # 1	1	10.250	-6.44	36.58	0.18
	Span # 2	2	10.250	6.03	23.98	0.25
+1.20D+1.60L+0.50S+1.60H	Span # 1	1	10.250	-7.49	36.58	0.20

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

Project File: Adams - Rev 1.ec6

LIC# : KW-06016450, Build:20.23.10.02

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Rev 1 - Grade Beam at Kitchen

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
Span # 2	2	10.250	7.89	23.98	0.33
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	10.250	-6.44	36.58	0.18
Span # 2	2	10.250	6.03	23.98	0.25
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	10.250	-6.44	36.58	0.18
Span # 2	2	10.250	6.03	23.98	0.25
+1.20D+L+1.60S+1.60H					
Span # 1	1	10.250	-9.81	36.58	0.27
Span # 2	2	10.250	11.99	23.98	0.50
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	10.250	-9.81	36.58	0.27
Span # 2	2	10.250	11.99	23.98	0.50
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	10.250	-6.44	36.58	0.18
Span # 2	2	10.250	6.03	23.98	0.25
+1.20D+L+0.50S+W+1.60H					
Span # 1	1	10.250	-7.49	36.58	0.20
Span # 2	2	10.250	7.89	23.98	0.33
+0.90D+W+1.60H					
Span # 1	1	10.250	-4.83	36.58	0.13
Span # 2	2	10.250	4.52	23.98	0.19
+1.20D+L+0.20S+E+1.60H					
Span # 1	1	10.250	-6.86	36.58	0.19
Span # 2	2	10.250	6.77	23.98	0.28
+0.90D+E+0.90H					
Span # 1	1	10.250	-4.83	36.58	0.13
Span # 2	2	10.250	4.52	23.98	0.19

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+S+H	1	0.0017	3.368	S Only	-0.0002	8.346
+D+S+H	2	0.0044	6.004		0.0000	8.346

Concrete Beam

Project File: Adams - Rev 1.ec6

LIC# : KW-06016450, Build:20.23.10.02

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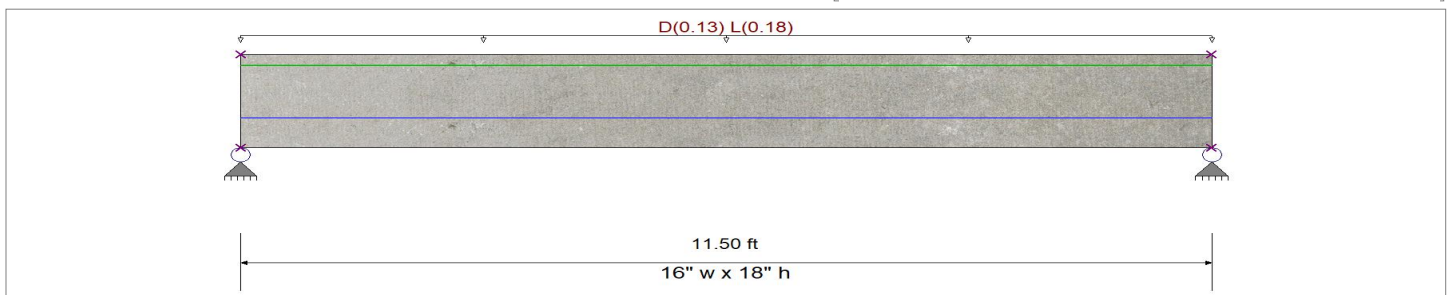
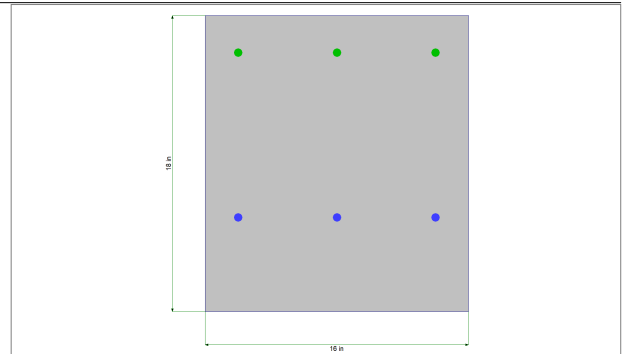
DESCRIPTION: Rev 1 - Grade Beam at Basement Door

CODE REFERENCES

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

General Information

f'_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} \cdot 7.50$	=	410.792 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	40.0 ksi
fy - Main Rebar	=	40.0 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 = 18.0 in

Span #1 Reinforcing....

3-#4 at 5.750 in from Bottom, from 0.0 to 11.50 ft in this span 3-#4 at 2.250 in from Top, from 0.0 to 11.50 ft in this sp.

Beam self weight calculated and added to loads

Load for Span Number 1

Uniform Load : D = 0.130, L = 0.180 k/ft, Tributary Width = 1.0 ft, (Deck)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.546 : 1	
Section used for this span	Typical Section	
Mu : Applied	13.093 k-ft	
Mn * Phi : Allowable	23.982 k-ft	
Location of maximum on span	5.740 ft	
Span # where maximum occurs	Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.003 in	Ratio = 47310	>=360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio = 0	<360.0	L Only
Max Downward Total Deflection	0.010 in	Ratio = 14193	>=180.0	Span: 1 : +D+L+H
Max Upward Total Deflection	0.000 in	Ratio = 0	<180.0	Span: 1 : +D+L+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	3.450	3.450
Max Upward from Load Combinations	3.450	3.450
Max Upward from Load Cases	2.415	2.415
+D+H	2.415	2.415
+D+L+H	3.450	3.450
+D+Lr+H	2.415	2.415
+D+S+H	2.415	2.415

Concrete Beam

DESCRIPTION: Rev 1 - Grade Beam at Basement Door

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+0.750Lr+0.750L+H	3.191	3.191
+D+0.750L+0.750S+H	3.191	3.191
+D+0.60W+H	2.415	2.415
+D+0.750Lr+0.750L+0.450W+H	3.191	3.191
+D+0.750L+0.750S+0.450W+H	3.191	3.191
+0.60D+0.60W+0.60H	1.449	1.449
+D+0.70E+0.60H	2.415	2.415
+D+0.750L+0.750S+0.5250E+H	3.191	3.191
+0.60D+0.70E+H	1.449	1.449
D Only	2.415	2.415
L Only	1.035	1.035
H Only		

Shear Stirrup Requirements

Entire Beam Span Length : $V_u < \Phi^*V_c / 2$, Req'd Vs = Not Req'd per 9.6.3.1, Stirrups are not required.

Detailed Shear Information

Load Combination	Span Distance 'd'		Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)	
	Number	(ft)	(in)	Actual							Design	Req'd
+1.20D+1.60L+0.50S+1.60H	1	0.00	12.25	4.55	4.55	0.00	1.00	Vu < Phi*Vc / 2	16.4	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.13	12.25	4.45	4.45	0.57	1.00	Vu < Phi*Vc / 2	16.4	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.25	12.25	4.35	4.35	1.12	1.00	Vu < Phi*Vc / 2	16.4	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.38	12.25	4.26	4.26	1.66	1.00	Vu < Phi*Vc / 2	16.4	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.50	12.25	4.16	4.16	2.19	1.00	Vu < Phi*Vc / 2	16.4	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.63	12.25	4.06	4.06	2.71	1.00	Vu < Phi*Vc / 2	16.4	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.75	12.25	3.96	3.96	3.21	1.00	Vu < Phi*Vc / 2	16.4	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.88	12.25	3.86	3.86	3.70	1.00	Vu < Phi*Vc / 2	16.4	16.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.01	12.25	3.76	3.76	4.18	0.92	16.33	Vu < Phi*Vc / 2	16.3	16.3	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.13	12.25	3.66	3.66	4.64	0.80	16.20	Vu < Phi*Vc / 2	16.2	16.2	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.26	12.25	3.56	3.56	5.10	0.71	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.38	12.25	3.46	3.46	5.54	0.64	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.51	12.25	3.36	3.36	5.97	0.57	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.63	12.25	3.26	3.26	6.38	0.52	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.76	12.25	3.16	3.16	6.79	0.48	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.89	12.25	3.06	3.06	7.18	0.44	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.01	12.25	2.96	2.96	7.56	0.40	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.14	12.25	2.86	2.86	7.92	0.37	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.26	12.25	2.76	2.76	8.28	0.34	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.39	12.25	2.66	2.66	8.62	0.32	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.51	12.25	2.56	2.56	8.95	0.29	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.64	12.25	2.46	2.46	9.26	0.27	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.77	12.25	2.36	2.36	9.56	0.25	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.89	12.25	2.26	2.26	9.86	0.23	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.02	12.25	2.17	2.17	10.13	0.22	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.14	12.25	2.07	2.07	10.40	0.20	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.27	12.25	1.97	1.97	10.65	0.19	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.39	12.25	1.87	1.87	10.89	0.17	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.52	12.25	1.77	1.77	11.12	0.16	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.64	12.25	1.67	1.67	11.34	0.15	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.77	12.25	1.57	1.57	11.54	0.14	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.90	12.25	1.47	1.47	11.73	0.13	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.02	12.25	1.37	1.37	11.91	0.12	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.15	12.25	1.27	1.27	12.08	0.11	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.27	12.25	1.17	1.17	12.23	0.10	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.40	12.25	1.07	1.07	12.37	0.09	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.52	12.25	0.97	0.97	12.50	0.08	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.65	12.25	0.87	0.87	12.61	0.07	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.78	12.25	0.77	0.77	12.72	0.06	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.90	12.25	0.67	0.67	12.81	0.05	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.03	12.25	0.57	0.57	12.89	0.05	16.10	Vu < Phi*Vc / 2	16.1	16.1	0.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

Project File: Adams - Rev 1.ec6

LIC#: KW-06016450, Build:20.23.10.02

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Rev 1 - Grade Beam at Basement Door

Detailed Shear Information

Load Combination	Span Number	Distance 'd'		Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
		(ft)	(in)	Actual	Design							
+1.20D+1.60L+0.50S+1.60H	1	5.15	12.25	0.47	0.47	12.95	0.04	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	5.28	12.25	0.37	0.37	13.00	0.03	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	5.40	12.25	0.27	0.27	13.05	0.02	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	5.53	12.25	0.17	0.17	13.07	0.01	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	5.66	12.25	0.07	0.07	13.09	0.01	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	5.78	12.25	-0.02	0.02	13.09	0.00	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	5.91	12.25	-0.12	0.12	13.08	0.01	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	6.03	12.25	-0.22	0.22	13.06	0.02	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	6.16	12.25	-0.32	0.32	13.03	0.03	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	6.28	12.25	-0.42	0.42	12.98	0.03	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	6.41	12.25	-0.52	0.52	12.92	0.04	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	6.54	12.25	-0.62	0.62	12.85	0.05	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	6.66	12.25	-0.72	0.72	12.76	0.06	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	6.79	12.25	-0.82	0.82	12.67	0.07	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	6.91	12.25	-0.92	0.92	12.56	0.07	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	7.04	12.25	-1.02	1.02	12.44	0.08	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	7.16	12.25	-1.12	1.12	12.30	0.09	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	7.29	12.25	-1.22	1.22	12.15	0.10	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	7.42	12.25	-1.32	1.32	11.99	0.11	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	7.54	12.25	-1.42	1.42	11.82	0.12	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	7.67	12.25	-1.52	1.52	11.64	0.13	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	7.79	12.25	-1.62	1.62	11.44	0.14	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	7.92	12.25	-1.72	1.72	11.23	0.16	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	8.04	12.25	-1.82	1.82	11.01	0.17	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	8.17	12.25	-1.92	1.92	10.77	0.18	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	8.30	12.25	-2.02	2.02	10.53	0.20	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	8.42	12.25	-2.12	2.12	10.27	0.21	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	8.55	12.25	-2.21	2.21	10.00	0.23	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	8.67	12.25	-2.31	2.31	9.71	0.24	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	8.80	12.25	-2.41	2.41	9.41	0.26	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	8.92	12.25	-2.51	2.51	9.10	0.28	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	9.05	12.25	-2.61	2.61	8.78	0.30	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	9.17	12.25	-2.71	2.71	8.45	0.33	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	9.30	12.25	-2.81	2.81	8.10	0.35	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	9.43	12.25	-2.91	2.91	7.74	0.38	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	9.55	12.25	-3.01	3.01	7.37	0.42	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	9.68	12.25	-3.11	3.11	6.98	0.45	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	9.80	12.25	-3.21	3.21	6.59	0.50	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	9.93	12.25	-3.31	3.31	6.18	0.55	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	10.05	12.25	-3.41	3.41	5.75	0.60	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	10.18	12.25	-3.51	3.51	5.32	0.67	16.10	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	10.31	12.25	-3.61	3.61	4.87	0.76	16.15	Vu < Phi*Vc / 2	16.1	0.0	
+1.20D+1.60L+0.50S+1.60H	1	10.43	12.25	-3.71	3.71	4.41	0.86	16.26	Vu < Phi*Vc / 2	16.3	0.0	
+1.20D+1.60L+0.50S+1.60H	1	10.56	12.25	-3.81	3.81	3.94	0.99	16.41	Vu < Phi*Vc / 2	16.4	0.0	
+1.20D+1.60L+0.50S+1.60H	1	10.68	12.25	-3.91	3.91	3.46	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0	
+1.20D+1.60L+0.50S+1.60H	1	10.81	12.25	-4.01	4.01	2.96	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0	
+1.20D+1.60L+0.50S+1.60H	1	10.93	12.25	-4.11	4.11	2.45	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0	
+1.20D+1.60L+0.50S+1.60H	1	11.06	12.25	-4.21	4.21	1.93	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0	
+1.20D+1.60L+0.50S+1.60H	1	11.19	12.25	-4.31	4.31	1.39	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0	
+1.20D+1.60L+0.50S+1.60H	1	11.31	12.25	-4.40	4.40	0.84	1.00	16.42	Vu < Phi*Vc / 2	16.4	0.0	
+1.20D+1.60L+0.50S+1.60H	1	11.44	12.25	-4.50	4.50	0.28	1.00	16.42	Vu < Phi*Vc / 2	16.4	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	11.500	13.09	23.98	0.55
+1.40D+1.60H						

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

Project File: Adams - Rev 1.ec6

LIC# : KW-06016450, Build:20.23.10.02

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Rev 1 - Grade Beam at Basement Door

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
Span # 1	1	11.500	9.72	23.98	0.41
+1.20D+0.50Lr+1.60L+1.60H Span # 1	1	11.500	13.09	23.98	0.55
+1.20D+1.60L+0.50S+1.60H Span # 1	1	11.500	13.09	23.98	0.55
+1.20D+1.60Lr+L+1.60H Span # 1	1	11.500	11.31	23.98	0.47
+1.20D+1.60Lr+0.50W+1.60H Span # 1	1	11.500	8.33	23.98	0.35
+1.20D+L+1.60S+1.60H Span # 1	1	11.500	11.31	23.98	0.47
+1.20D+1.60S+0.50W+1.60H Span # 1	1	11.500	8.33	23.98	0.35
+1.20D+0.50Lr+L+W+1.60H Span # 1	1	11.500	11.31	23.98	0.47
+1.20D+L+0.50S+W+1.60H Span # 1	1	11.500	11.31	23.98	0.47
+0.90D+W+1.60H Span # 1	1	11.500	6.25	23.98	0.26
+1.20D+L+0.20S+E+1.60H Span # 1	1	11.500	11.31	23.98	0.47
+0.90D+E+0.90H Span # 1	1	11.500	6.25	23.98	0.26

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	0.0097	5.750		0.0000	0.000

Concrete Beam

Project File: Adams - Rev 1.ec6

LIC# : KW-06016450, Build:20.23.10.02

QUANTUM CONSULTING ENGINEERS

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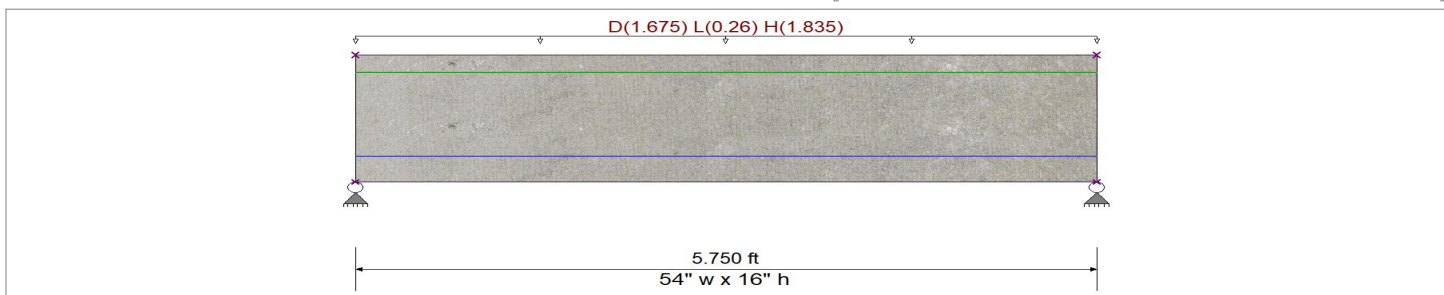
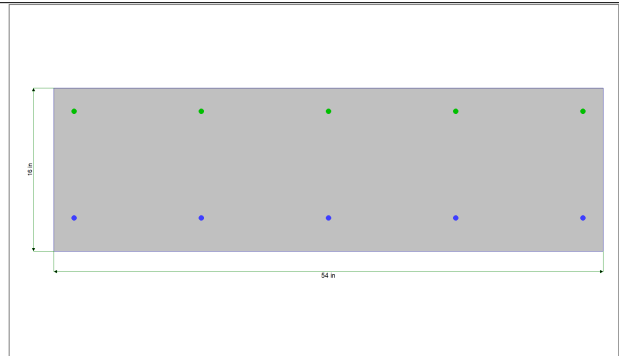
DESCRIPTION: Rev 1 - Grade Beam at West Retaining Wall

CODE REFERENCES

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

General Information

f'_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} \cdot 7.50$	=	410.792 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	40.0 ksi
f_y - Main Rebar	=	40.0 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 = 54.0 in, Height = 16.0 in

Span #1 Reinforcing....

5-#4 at 3.250 in from Bottom, from 0.0 to 5.750 ft in this span 5-#4 at 2.250 in from Top, from 0.0 to 5.750 ft in this sp.

Load for Span Number 1

Uniform Load : D = 1.675, L = 0.260, H = 1.835 k/ft, Tributary Width = 1.0 ft, (Retaining Wall)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.512 : 1
Section used for this span	Typical Section
Mu : Applied	22.160 k-ft
Mn * Phi : Allowable	43.257 k-ft
Location of maximum on span	2.880 ft
Span # where maximum occurs	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.000 in	Ratio =	0 < 360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0 < 360.0	H Only
Max Downward Total Deflection	0.002 in	Ratio =	42835 >= 180.0	Span: 1 : +D+L+H
Max Upward Total Deflection	0.000 in	Ratio =	0 < 180.0	Span: 1 : +D+L+H

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	10.839	10.839
Max Upward from Load Combinations	10.839	10.839
Max Upward from Load Cases	5.276	5.276
+D+H	10.091	10.091
+D+L+H	10.839	10.839
+D+Lr+H	10.091	10.091
+D+S+H	10.091	10.091
+D+0.750Lr+0.750L+H	10.652	10.652

Concrete Beam

DESCRIPTION: Rev 1 - Grade Beam at West Retaining Wall

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
+D+0.750L+0.750S+H	10.652	10.652
+D+0.60W+H	10.091	10.091
+D+0.750Lr+0.750L+0.450W+H	10.652	10.652
+D+0.750L+0.750S+0.450W+H	10.652	10.652
+0.60D+0.60W+0.60H	6.055	6.055
+D+0.70E+0.60H	7.981	7.981
+D+0.750L+0.750S+0.5250E+H	10.652	10.652
+0.60D+0.70E+H	8.165	8.165
D Only	4.816	4.816
L Only	0.747	0.747
H Only	5.276	5.276

Shear Stirrup Requirements

Entire Beam Span Length : $V_u < \Phi V_c / 2$, Req'd Vs = Not Req'd per 9.6.3.1, Stirrups are not required.

Detailed Shear Information

Load Combination	Span Distance 'd'		Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)		
	Number	(ft)	(in)	Actual							Design	Req'd	Req'd
+1.20D+1.60L+0.50S+1.60H	1	0.00	12.75	15.42	15.42	0.00	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.06	12.75	15.08	15.08	0.96	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.13	12.75	14.74	14.74	1.90	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.19	12.75	14.40	14.40	2.81	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.25	12.75	14.07	14.07	3.71	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.31	12.75	13.73	13.73	4.58	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.38	12.75	13.39	13.39	5.43	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.44	12.75	13.06	13.06	6.26	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.50	12.75	12.72	12.72	7.07	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.57	12.75	12.38	12.38	7.86	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.63	12.75	12.05	12.05	8.63	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.69	12.75	11.71	11.71	9.38	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.75	12.75	11.37	11.37	10.10	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.82	12.75	11.04	11.04	10.80	1.00	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.88	12.75	10.70	10.70	11.49	0.99	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.94	12.75	10.36	10.36	12.15	0.91	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.01	12.75	10.02	10.02	12.79	0.83	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.07	12.75	9.69	9.69	13.41	0.77	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.13	12.75	9.35	9.35	14.01	0.71	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.19	12.75	9.01	9.01	14.58	0.66	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.26	12.75	8.68	8.68	15.14	0.61	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.32	12.75	8.34	8.34	15.67	0.57	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.38	12.75	8.00	8.00	16.19	0.53	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.45	12.75	7.67	7.67	16.68	0.49	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.51	12.75	7.33	7.33	17.15	0.45	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.57	12.75	6.99	6.99	17.60	0.42	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.63	12.75	6.65	6.65	18.03	0.39	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.70	12.75	6.32	6.32	18.44	0.36	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.76	12.75	5.98	5.98	18.82	0.34	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.82	12.75	5.64	5.64	19.19	0.31	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.89	12.75	5.31	5.31	19.53	0.29	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.95	12.75	4.97	4.97	19.86	0.27	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.01	12.75	4.63	4.63	20.16	0.24	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.07	12.75	4.30	4.30	20.44	0.22	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.14	12.75	3.96	3.96	20.70	0.20	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.20	12.75	3.62	3.62	20.94	0.18	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.26	12.75	3.29	3.29	21.15	0.17	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.33	12.75	2.95	2.95	21.35	0.15	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.39	12.75	2.61	2.61	21.52	0.13	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.45	12.75	2.27	2.27	21.68	0.11	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.51	12.75	1.94	1.94	21.81	0.09	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.58	12.75	1.60	1.60	21.92	0.08	56.57	Vu < Phi*Vc / 2	Not Req'd	pe	56.6	0.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

Project File: Adams - Rev 1.ec6

LIC#: KW-06016450, Build:20.23.10.02

QUANTUM CONSULTING ENGINEERS

(c) ENERCALC INC 1983-2023

DESCRIPTION: Rev 1 - Grade Beam at West Retaining Wall

Detailed Shear Information

Load Combination	Span Number	Distance 'd'		Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	
		(ft)	(in)	Actual	Design								
+1.20D+1.60L+0.50S+1.60H	1	2.64	12.75	1.26	1.26	22.01	0.06	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.70	12.75	0.93	0.93	22.08	0.04	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.77	12.75	0.59	0.59	22.13	0.03	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.83	12.75	0.25	0.25	22.15	0.01	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.89	12.75	-0.08	0.08	22.16	0.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.95	12.75	-0.42	0.42	22.14	0.02	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.02	12.75	-0.76	0.76	22.11	0.04	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.08	12.75	-1.10	1.10	22.05	0.05	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.14	12.75	-1.43	1.43	21.97	0.07	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.20	12.75	-1.77	1.77	21.87	0.09	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.27	12.75	-2.11	2.11	21.75	0.10	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.33	12.75	-2.44	2.44	21.60	0.12	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.39	12.75	-2.78	2.78	21.44	0.14	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.46	12.75	-3.12	3.12	21.25	0.16	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.52	12.75	-3.45	3.45	21.05	0.17	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.58	12.75	-3.79	3.79	20.82	0.19	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.64	12.75	-4.13	4.13	20.57	0.21	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.71	12.75	-4.46	4.46	20.30	0.23	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.77	12.75	-4.80	4.80	20.01	0.25	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.83	12.75	-5.14	5.14	19.70	0.28	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.90	12.75	-5.48	5.48	19.36	0.30	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.96	12.75	-5.81	5.81	19.01	0.32	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.02	12.75	-6.15	6.15	18.63	0.35	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.08	12.75	-6.49	6.49	18.24	0.38	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.15	12.75	-6.82	6.82	17.82	0.41	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.21	12.75	-7.16	7.16	17.38	0.44	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.27	12.75	-7.50	7.50	16.92	0.47	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.34	12.75	-7.83	7.83	16.44	0.51	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.40	12.75	-8.17	8.17	15.93	0.54	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.46	12.75	-8.51	8.51	15.41	0.59	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.52	12.75	-8.85	8.85	14.86	0.63	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.59	12.75	-9.18	9.18	14.30	0.68	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.65	12.75	-9.52	9.52	13.71	0.74	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.71	12.75	-9.86	9.86	13.10	0.80	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.78	12.75	-10.19	10.19	12.47	0.87	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.84	12.75	-10.53	10.53	11.82	0.95	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.90	12.75	-10.87	10.87	11.15	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.96	12.75	-11.20	11.20	10.46	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.03	12.75	-11.54	11.54	9.74	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.09	12.75	-11.88	11.88	9.00	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.15	12.75	-12.21	12.21	8.25	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.22	12.75	-12.55	12.55	7.47	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.28	12.75	-12.89	12.89	6.67	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.34	12.75	-13.23	13.23	5.85	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.40	12.75	-13.56	13.56	5.01	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.47	12.75	-13.90	13.90	4.14	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.53	12.75	-14.24	14.24	3.26	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.59	12.75	-14.57	14.57	2.36	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.66	12.75	-14.91	14.91	1.43	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.72	12.75	-15.25	15.25	0.48	1.00	56.57	Vu < Phi*Vc / 2	Reqd	pe	56.6	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	5.750	22.16	43.26	0.51
+1.40D+1.60H						
Span # 1		1	5.750	21.83	43.26	0.50
+1.20D+0.50Lr+1.60L+1.60H						

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

Project File: Adams - Rev 1.ec6

LIC# : KW-06016450, Build:20.23.10.02

QUANTUM CONSULTING ENGINEERS

(c) ENERCALC INC 1983-2023

DESCRIPTION: Rev 1 - Grade Beam at West Retaining Wall

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
Span # 1	1	5.750	22.16	43.26	0.51
+1.20D+1.60L+0.50S+1.60H Span # 1	1	5.750	22.16	43.26	0.51
+1.20D+1.60Lr+L+1.60H Span # 1	1	5.750	21.52	43.26	0.50
+1.20D+1.60Lr+0.50W+1.60H Span # 1	1	5.750	20.44	43.26	0.47
+1.20D+L+1.60S+1.60H Span # 1	1	5.750	21.52	43.26	0.50
+1.20D+1.60S+0.50W+1.60H Span # 1	1	5.750	20.44	43.26	0.47
+1.20D+0.50Lr+L+W+1.60H Span # 1	1	5.750	21.52	43.26	0.50
+1.20D+L+0.50S+W+1.60H Span # 1	1	5.750	21.52	43.26	0.50
+0.90D+W+1.60H Span # 1	1	5.750	18.36	43.26	0.42
+1.20D+L+0.20S+E+1.60H Span # 1	1	5.750	21.52	43.26	0.50
+0.90D+E+0.90H Span # 1	1	5.750	13.06	43.26	0.30

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	0.0016	2.875		0.0000	0.000

Concrete Beam

Project File: Adams - Rev 1.ec6

LIC# : KW-06016450, Build:20.23.10.02

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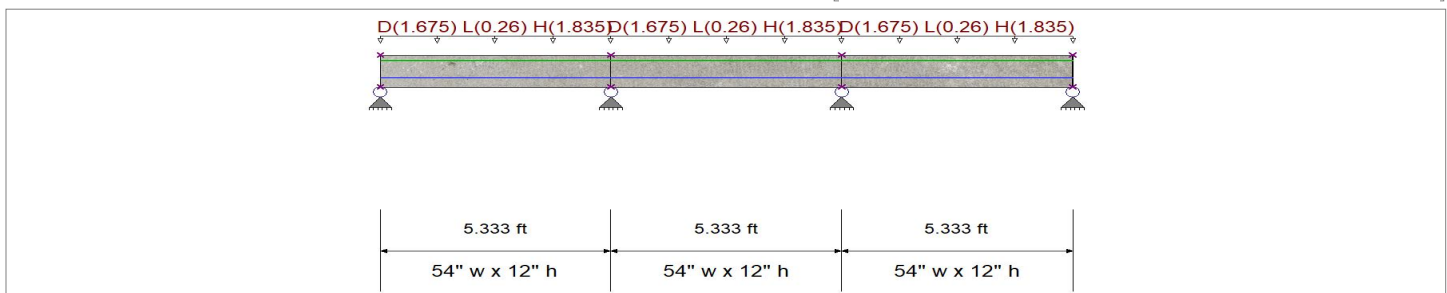
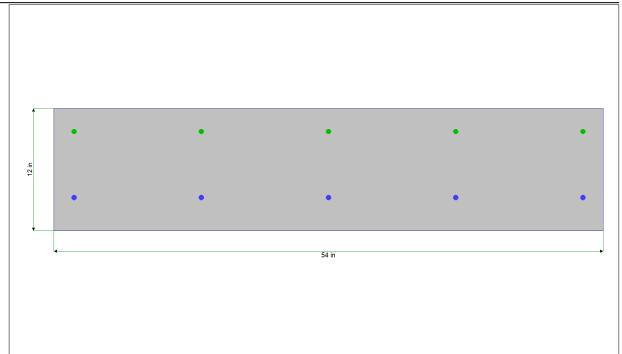
DESCRIPTION: Rev 1 - Grade Beam at North Retaining Wall

CODE REFERENCES

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

General Information

f'_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} \cdot 7.50$	=	410.792 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups	=	40.0 ksi
fy - Main Rebar	=	40.0 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 = 54.0 in, Height = 12.0 in

Span #1 Reinforcing....

5-#4 at 3.250 in from Bottom, from 0.0 to 5.333 ft in this span 5-#4 at 2.250 in from Top, from 0.0 to 5.333 ft in this sp.

Span #2 Reinforcing....

5-#4 at 3.250 in from Bottom, from 0.0 to 5.333 ft in this span 5-#4 at 2.250 in from Top, from 0.0 to 5.333 ft in this sp.

Span #3 Reinforcing....

5-#4 at 3.250 in from Bottom, from 0.0 to 5.333 ft in this span 5-#4 at 2.250 in from Top, from 0.0 to 5.333 ft in this sp.

Load for Span Number 1

Uniform Load : D = 1.675, L = 0.260, H = 1.835 k/ft, Tributary Width = 1.0 ft, (Retaining Wall)

Load for Span Number 2

Uniform Load : D = 1.675, L = 0.260, H = 1.835 k/ft, Tributary Width = 1.0 ft, (Retaining Wall)

Load for Span Number 3

Uniform Load : D = 1.675, L = 0.260, H = 1.835 k/ft, Tributary Width = 1.0 ft, (Retaining Wall)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.409 : 1
Section used for this span	Typical Section
Mu : Applied	-15.250 k-ft
Mn * Phi : Allowable	37.257 k-ft
Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 3

Maximum Deflection

Max Downward Transient Deflection	0.000 in	Ratio =	0 <360.0	L Only
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360.0	H Only
Max Downward Total Deflection	0.001 in	Ratio =	42972 >=180.0	Span: 3 : +D+L+H
Max Upward Total Deflection	0.000 in	Ratio =	0 <180.0	Span: 3 : +D+L+H

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

Project File: Adams - Rev 1.ec6

LIC# : KW-06016450, Build:20.23.10.02

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Rev 1 - Grade Beam at North Retaining Wall

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4
Max Upward from all Load Conditions	8.042	22.116	22.116	8.042
Max Upward from Load Combinations	8.042	22.116	22.116	8.042
Max Upward from Load Cases	3.914	10.765	10.765	3.914
+D+H	7.488	20.591	20.591	7.488
+D+L+H	8.042	22.116	22.116	8.042
+D+Lr+H	7.488	20.591	20.591	7.488
+D+S+H	7.488	20.591	20.591	7.488
+D+0.750Lr+0.750L+H	7.904	21.735	21.735	7.904
+D+0.750L+0.750S+H	7.904	21.735	21.735	7.904
+D+0.60W+H	7.488	20.591	20.591	7.488
+D+0.750Lr+0.750L+0.450W+H	7.904	21.735	21.735	7.904
+D+0.750L+0.750S+0.450W+H	7.904	21.735	21.735	7.904
+0.60D+0.60W+0.60H	4.493	12.354	12.354	4.493
+D+0.70E+0.60H	5.922	16.285	16.285	5.922
+D+0.750L+0.750S+0.5250E+H	7.904	21.735	21.735	7.904
+0.60D+0.70E+H	6.058	16.660	16.660	6.058
D Only	3.573	9.826	9.826	3.573
L Only	0.555	1.525	1.525	0.555
H Only	3.914	10.765	10.765	3.914

Shear Stirrup Requirements

Entire Beam Span Length : $V_u < \Phi^*V_c / 2$, Req'd Vs = Not Req'd per 9.6.3.1, Stirrups are not required.

Detailed Shear Information

Load Combination	Span Distance 'd'		Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in)		
	Number	(ft)	(in)	Actual							Design	Req'd	Req'd
+1.20D+1.60L+0.50S+1.60H	1	0.00	8.75	11.44	11.44	0.00	1.00	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.21	8.75	10.29	10.29	2.32	1.00	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.43	8.75	9.15	9.15	4.39	1.00	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.64	8.75	8.01	8.01	6.22	0.94	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.85	8.75	6.86	6.86	7.81	0.64	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.07	8.75	5.72	5.72	9.15	0.46	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.28	8.75	4.58	4.58	10.25	0.33	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.49	8.75	3.43	3.43	11.10	0.23	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.71	8.75	2.29	2.29	11.71	0.14	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.92	8.75	1.14	1.14	12.08	0.07	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.13	8.75	0.00	0.00	12.20	0.00	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.35	8.75	-1.14	1.14	12.08	0.07	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.56	8.75	-2.29	2.29	11.71	0.14	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.77	8.75	-3.43	3.43	11.10	0.23	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.99	8.75	-4.58	4.58	10.25	0.33	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.20	8.75	-5.72	5.72	9.15	0.46	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.41	8.75	-6.86	6.86	7.81	0.64	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.63	8.75	-8.01	8.01	6.22	0.94	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.84	8.75	-9.15	9.15	4.39	1.00	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.05	8.75	-10.29	10.29	2.32	1.00	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.27	8.75	-11.44	11.44	0.00	1.00	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.48	9.75	-12.58	12.58	2.56	1.00	43.26	Vu < Phi*Vc / 2	Not Req'd	pe	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.69	9.75	-13.73	13.73	5.37	1.00	43.26	Vu < Phi*Vc / 2	Not Req'd	pe	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.91	9.75	-14.87	14.87	8.42	1.00	43.26	Vu < Phi*Vc / 2	Not Req'd	pe	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.12	9.75	-16.01	16.01	11.71	1.00	43.26	Vu < Phi*Vc / 2	Not Req'd	pe	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	5.33	9.75	14.30	14.30	15.25	0.76	43.26	Vu < Phi*Vc / 2	Not Req'd	pe	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	5.55	9.75	13.15	13.15	12.32	0.87	43.26	Vu < Phi*Vc / 2	Not Req'd	pe	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	5.76	9.75	12.01	12.01	9.64	1.00	43.26	Vu < Phi*Vc / 2	Not Req'd	pe	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	5.97	9.75	10.87	10.87	7.20	1.00	43.26	Vu < Phi*Vc / 2	Not Req'd	pe	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	6.19	9.75	9.72	9.72	5.00	1.00	43.26	Vu < Phi*Vc / 2	Not Req'd	pe	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	6.40	9.75	8.58	8.58	3.05	1.00	43.26	Vu < Phi*Vc / 2	Not Req'd	pe	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	6.61	9.75	7.43	7.43	1.34	1.00	43.26	Vu < Phi*Vc / 2	Not Req'd	pe	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	6.83	8.75	6.29	6.29	0.12	1.00	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.04	8.75	5.15	5.15	1.34	1.00	38.82	Vu < Phi*Vc / 2	Not Req'd	pe	38.8	0.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

Project File: Adams - Rev 1.ec6

LIC#: KW-06016450, Build:20.23.10.02

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Rev 1 - Grade Beam at North Retaining Wall

Detailed Shear Information

Load Combination	Span Number	Distance 'd'		Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd
		(ft)	(in)	Actual	Design							
+1.20D+1.60L+0.50S+1.60H	2	7.25	8.75	4.00	4.00	2.32	1.00	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.47	8.75	2.86	2.86	3.05	0.68	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.68	8.75	1.72	1.72	3.54	0.35	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	2	7.89	8.75	0.57	0.57	3.78	0.11	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.11	8.75	-0.57	0.57	3.78	0.11	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.32	8.75	-1.72	1.72	3.54	0.35	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.53	8.75	-2.86	2.86	3.05	0.68	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.75	8.75	-4.00	4.00	2.32	1.00	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	2	8.96	8.75	-5.15	5.15	1.34	1.00	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.17	8.75	-6.29	6.29	0.12	1.00	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.39	9.75	-7.43	7.43	1.34	1.00	43.26	Vu < Phi*Vc / 2	43.3	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.60	9.75	-8.58	8.58	3.05	1.00	43.26	Vu < Phi*Vc / 2	43.3	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	9.81	9.75	-9.72	9.72	5.00	1.00	43.26	Vu < Phi*Vc / 2	43.3	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.03	9.75	-10.87	10.87	7.20	1.00	43.26	Vu < Phi*Vc / 2	43.3	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.24	9.75	-12.01	12.01	9.64	1.00	43.26	Vu < Phi*Vc / 2	43.3	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.45	9.75	-13.15	13.15	12.32	0.87	43.26	Vu < Phi*Vc / 2	43.3	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	3	10.67	9.75	17.16	17.16	15.25	0.91	43.26	Vu < Phi*Vc / 2	43.3	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	3	10.88	9.75	16.01	16.01	11.71	1.00	43.26	Vu < Phi*Vc / 2	43.3	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	3	11.09	9.75	14.87	14.87	8.42	1.00	43.26	Vu < Phi*Vc / 2	43.3	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	3	11.31	9.75	13.73	13.73	5.37	1.00	43.26	Vu < Phi*Vc / 2	43.3	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	3	11.52	9.75	12.58	12.58	2.56	1.00	43.26	Vu < Phi*Vc / 2	43.3	43.3	0.0
+1.20D+1.60L+0.50S+1.60H	3	11.73	8.75	11.44	11.44	0.00	1.00	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	11.95	8.75	10.29	10.29	2.32	1.00	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.16	8.75	9.15	9.15	4.39	1.00	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.37	8.75	8.01	8.01	6.22	0.94	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.59	8.75	6.86	6.86	7.81	0.64	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	12.80	8.75	5.72	5.72	9.15	0.46	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.01	8.75	4.58	4.58	10.25	0.33	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.23	8.75	3.43	3.43	11.10	0.23	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.44	8.75	2.29	2.29	11.71	0.14	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.65	8.75	1.14	1.14	12.08	0.07	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	13.87	8.75	-0.00	0.00	12.20	0.00	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.08	8.75	-1.14	1.14	12.08	0.07	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.29	8.75	-2.29	2.29	11.71	0.14	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.51	8.75	-3.43	3.43	11.10	0.23	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.72	8.75	-4.58	4.58	10.25	0.33	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	14.93	8.75	-5.72	5.72	9.15	0.46	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.15	8.75	-6.86	6.86	7.81	0.64	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.36	8.75	-8.01	8.01	6.22	0.94	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.57	8.75	-9.15	9.15	4.39	1.00	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	15.79	8.75	-10.29	10.29	2.32	1.00	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0
+1.20D+1.60L+0.50S+1.60H	3	16.00	8.75	-11.44	11.44	0.00	1.00	38.82	Vu < Phi*Vc / 2	38.8	38.8	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment	Location (ft)		Bending Stress Results (k-ft)		
		Span #	along Beam	Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope						
	Span # 1	1	5.333	-14.64	37.26	0.39
	Span # 2	2	5.333	-15.25	37.26	0.41
	Span # 3	3	5.333	-15.25	37.26	0.41
+1.40D+1.60H						
	Span # 1	1	5.333	-14.42	37.26	0.39
	Span # 2	2	5.333	-15.02	37.26	0.40
	Span # 3	3	5.333	-15.02	37.26	0.40
+1.20D+0.50Lr+1.60L+1.60H						
	Span # 1	1	5.333	-14.64	37.26	0.39
	Span # 2	2	5.333	-15.25	37.26	0.41
	Span # 3	3	5.333	-15.25	37.26	0.41
+1.20D+1.60L+0.50S+1.60H						
	Span # 1	1	5.333	-14.64	37.26	0.39

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Concrete Beam

Project File: Adams - Rev 1.ec6

LIC# : KW-06016450, Build:20.23.10.02

QUANTUM CONSULTING ENGINEERS

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DESCRIPTION: Rev 1 - Grade Beam at North Retaining Wall

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft)		
			Mu : Max	Phi*Mnx	Stress Ratio
Span # 2	2	5.333	-15.25	37.26	0.41
Span # 3	3	5.333	-15.25	37.26	0.41
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	5.333	-14.22	37.26	0.38
Span # 2	2	5.333	-14.81	37.26	0.40
Span # 3	3	5.333	-14.81	37.26	0.40
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	5.333	-13.51	37.26	0.36
Span # 2	2	5.333	-14.07	37.26	0.38
Span # 3	3	5.333	-14.07	37.26	0.38
+1.20D+L+1.60S+1.60H					
Span # 1	1	5.333	-14.22	37.26	0.38
Span # 2	2	5.333	-14.81	37.26	0.40
Span # 3	3	5.333	-14.81	37.26	0.40
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	5.333	-13.51	37.26	0.36
Span # 2	2	5.333	-14.07	37.26	0.38
Span # 3	3	5.333	-14.07	37.26	0.38
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	5.333	-14.22	37.26	0.38
Span # 2	2	5.333	-14.81	37.26	0.40
Span # 3	3	5.333	-14.81	37.26	0.40
+1.20D+L+0.50S+W+1.60H					
Span # 1	1	5.333	-14.22	37.26	0.38
Span # 2	2	5.333	-14.81	37.26	0.40
Span # 3	3	5.333	-14.81	37.26	0.40
+0.90D+W+1.60H					
Span # 1	1	5.333	-12.14	37.26	0.33
Span # 2	2	5.333	-12.64	37.26	0.34
Span # 3	3	5.333	-12.64	37.26	0.34
+1.20D+L+0.20S+E+1.60H					
Span # 1	1	5.333	-14.22	37.26	0.38
Span # 2	2	5.333	-14.81	37.26	0.40
Span # 3	3	5.333	-14.81	37.26	0.40
+0.90D+E+0.90H					
Span # 1	1	5.333	-8.63	37.26	0.23
Span # 2	2	5.333	-8.98	37.26	0.24
Span # 3	3	5.333	-8.98	37.26	0.24

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	0.0015	2.453	+D+L+H	-0.0000	5.440
+D+L+H	2	0.0001	2.667	+D+L+H	-0.0001	4.800
+D+L+H	3	0.0015	2.880		0.0000	4.800



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E-mail:			

1. Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General

Design method: ACI 318-19
Units: Imperial units

Anchor Information:

Anchor type: Cast-in-place
Material: F1554 Grade 36
Diameter (inch): 0.625
Effective Embedment depth, h_{ef} (inch): 8.000
Anchor category: -
Anchor ductility: Yes
 h_{min} (inch): 9.38
 C_{min} (inch): 3.75
 S_{min} (inch): 3.75

Base Material

Concrete: Normal-weight
Concrete thickness, h (inch): 14.00
State: Cracked
Compressive strength, f'_c (psi): 3000
 $\Psi_{c,v}$: 1.0
Reinforcement condition: Supplementary reinforcement not present
Supplemental edge reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: No
Build-up grout pad: No

Recommended Anchor

Anchor Name: Heavy Hex Bolt - 5/8"Ø Heavy Hex Bolt, F1554 Gr. 36





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Phone:			
E-mail:			

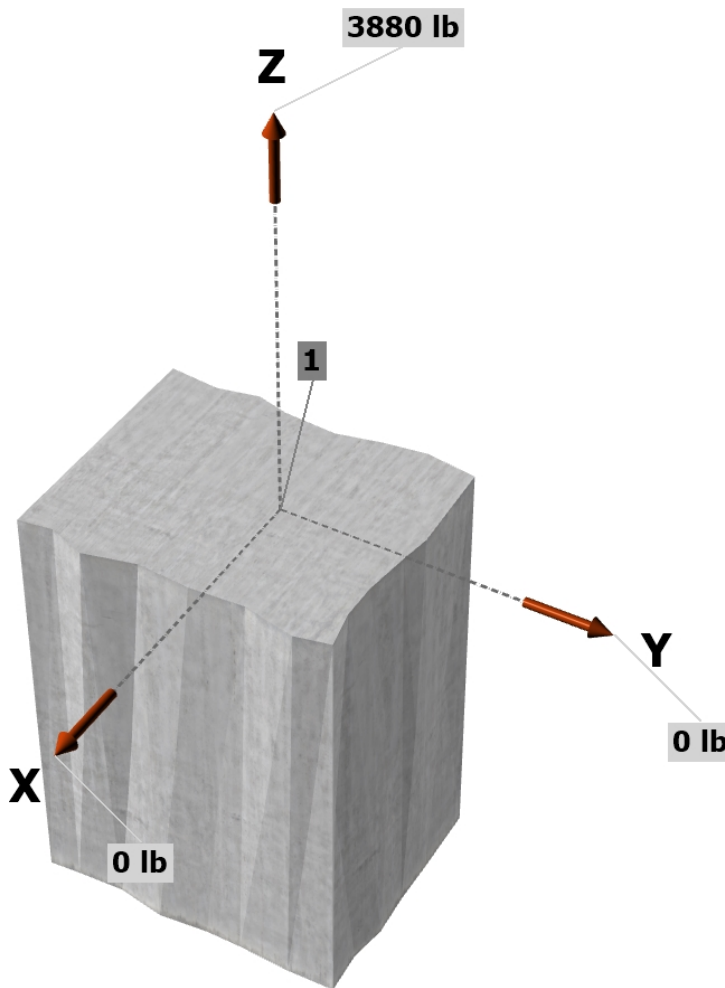
Load and Geometry

Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: Not applicable
Ductility section for tension: 17.10.5.2 not applicable
Ductility section for shear: 17.10.6.2 not applicable
 Ω_0 factor: not set
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

Strength level loads:

N_{ua} [lb]: 3880
 V_{uax} [lb]: 0
 V_{uay} [lb]: 0

<Figure 1>

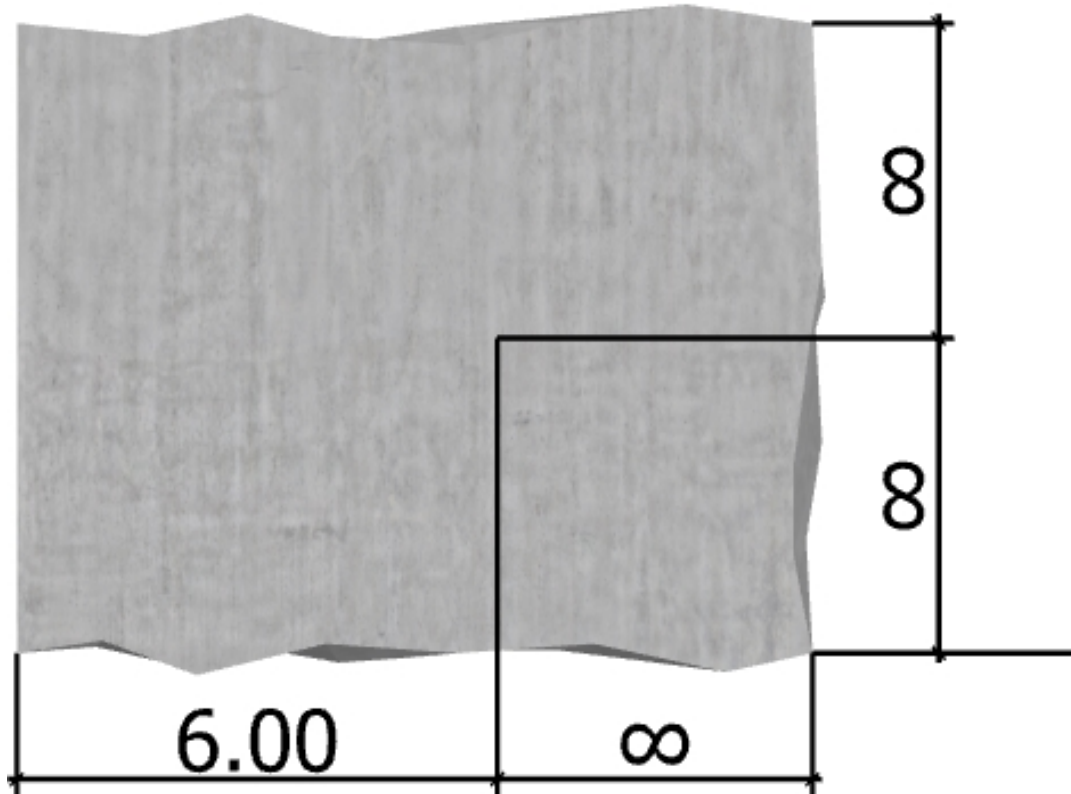


Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.



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<Figure 2>





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3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2 + (V_{uay})^2}$ (lb)
1	3880.0	0.0	0.0	0.0
Sum	3880.0	0.0	0.0	0.0

Maximum concrete compression strain (%): 0.00
 Maximum concrete compression stress (psi): 0
 Resultant tension force (lb): 3880
 Resultant compression force (lb): 0
 Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
 Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

4. Steel Strength of Anchor in Tension (Sec. 17.6.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
13100	0.75	9825

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.6.2)

$$N_b = k_c \lambda_a \sqrt{f_c} h_{ef}^{1.5} \text{ (Eq. 17.6.2.2.1)}$$

k_c	λ_a	f_c (psi)	h_{ef} (in)	N_b (lb)
24.0	1.00	3000	8.000	29745

$$0.75 \phi N_{cb} = 0.75 \phi (A_{Nc} / A_{Nco}) \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b \text{ (Sec. 17.5.1.2 \& Eq. 17.6.2.1a)}$$

A_{Nc} (in ²)	A_{Nco} (in ²)	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	$0.75 \phi N_{cb}$ (lb)
432.00	576.00	6.00	0.850	1.00	1.000	29745	0.70	9955

6. Pullout Strength of Anchor in Tension (Sec. 17.6.3)

$$0.75 \phi N_{pn} = 0.75 \phi \Psi_{c,P} N_p = 0.75 \phi \Psi_{c,P} 8 A_{brg} f_c \text{ (Sec. 17.5.1.2, Eq. 17.6.3.1 \& 17.6.3.2.2a)}$$

$\Psi_{c,P}$	A_{brg} (in ²)	f_c (psi)	ϕ	$0.75 \phi N_{pn}$ (lb)
1.0	0.67	3000	0.70	8455



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11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	3880	9825	0.39	Pass
Concrete breakout	3880	9955	0.39	Pass
Pullout	3880	8455	0.46	Pass (Governs)

5/8"Ø Heavy Hex Bolt, F1554 Gr. 36 with hef = 8.000 inch meets the selected design criteria.

12. Warnings

- Per designer input, the tensile component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor tensile force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.5.2 for tension need not be satisfied – designer to verify.

- Per designer input, the shear component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor shear force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.6.2 for shear need not be satisfied – designer to verify.

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