

# Structural Engineering Calculations

1715 WESTBROOK AVE  
RETAINING WALL DESIGN



**FEBRUARY 28, 2023 (JOB NO: 2310)**

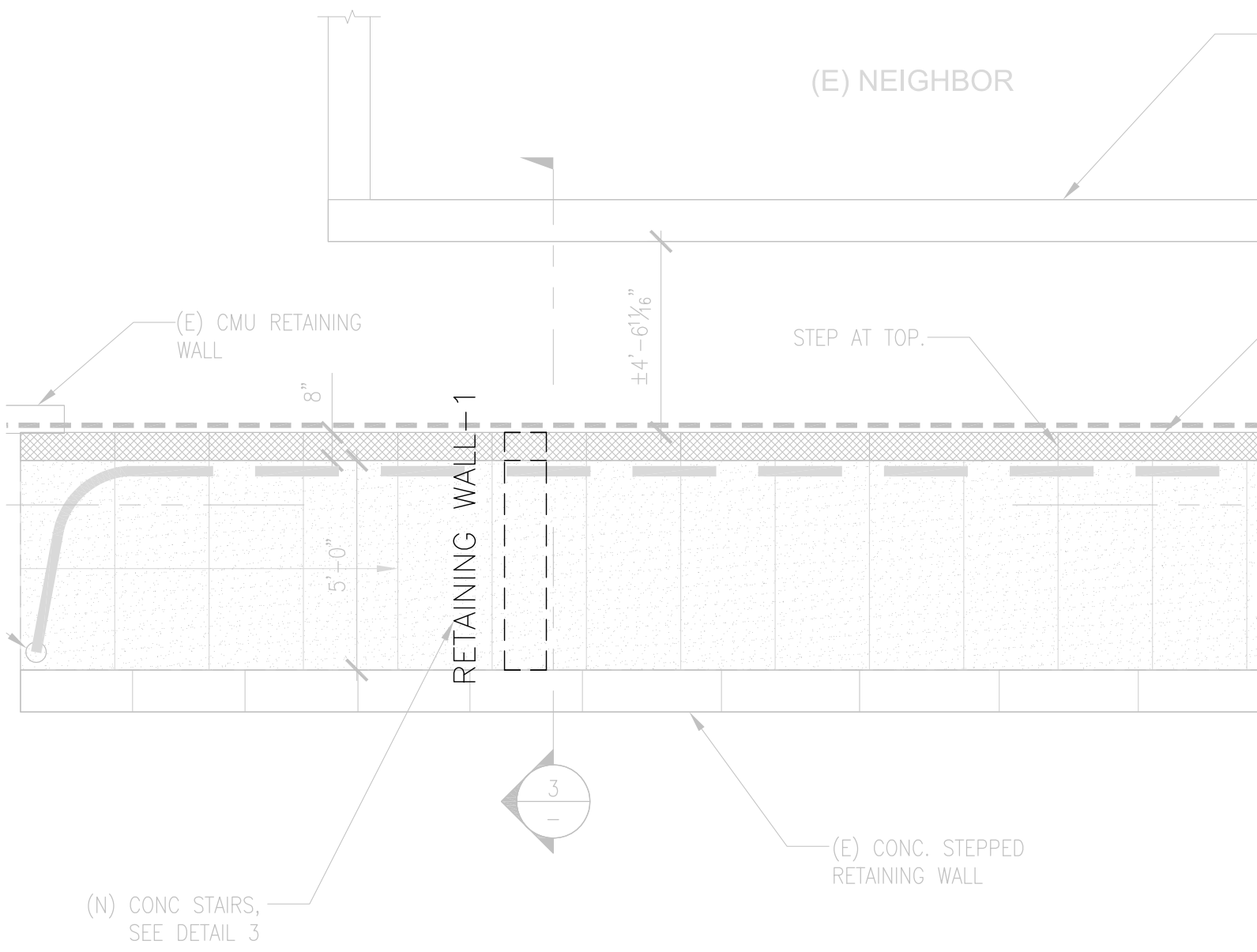
*Prepared by:*

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STRUCTURAL ENGINEERING SERVICE

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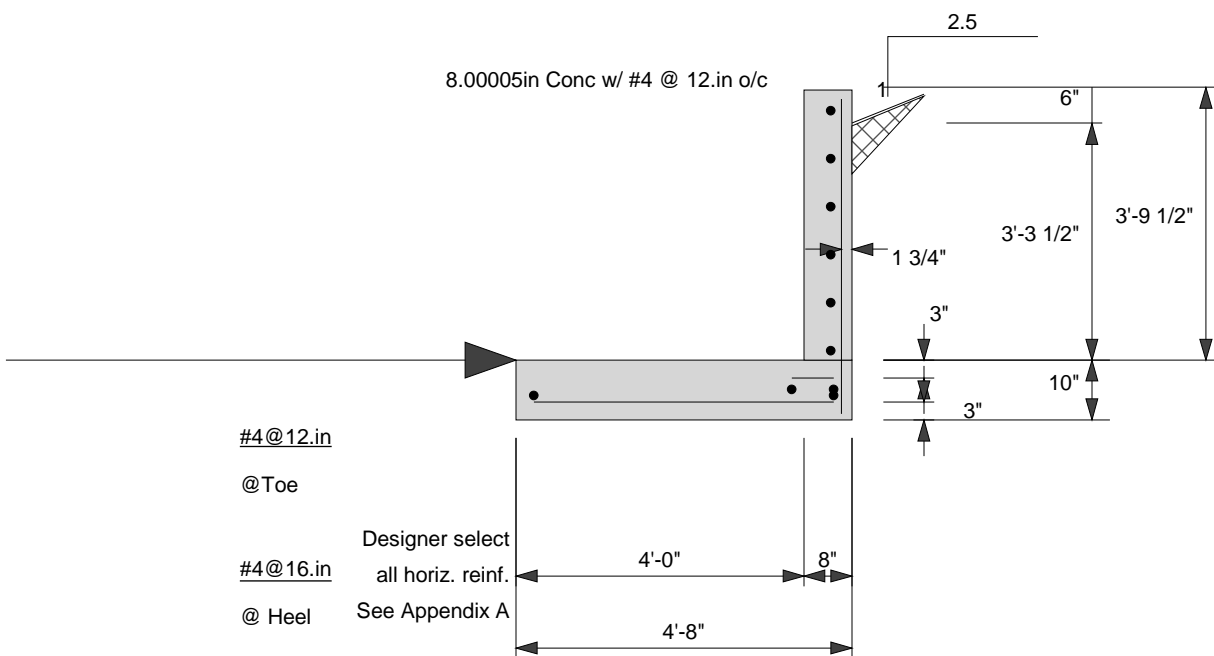
# KEY PLANS

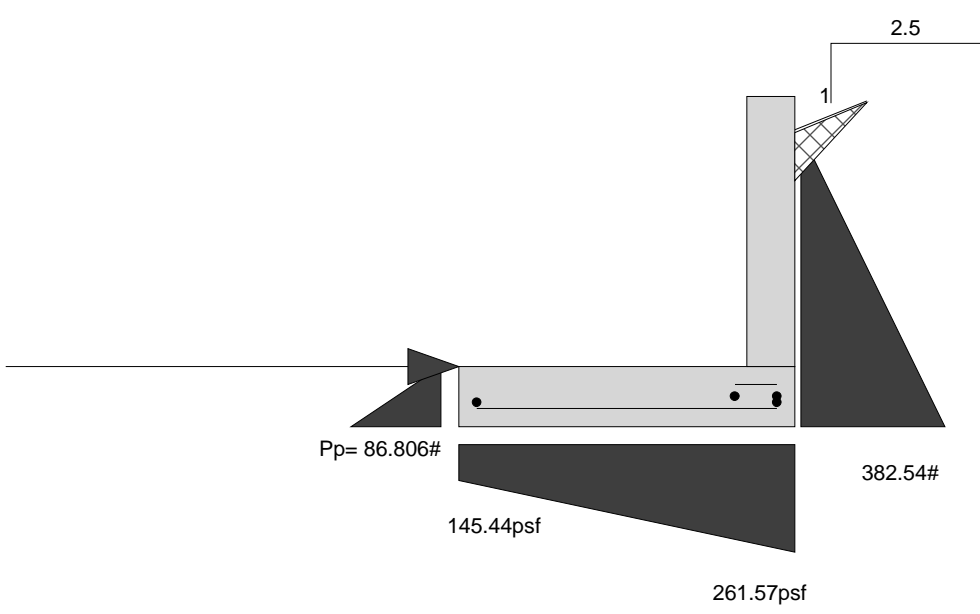


1 RETAINING WALL PLAN

0 5' 10' SCALE: 1/4" = 1'-0"

F 9H5-B-B; 'K 5@@89G÷ B





Adj Ftg Load = 817.#  
 Ecc. = -2.45in from CL

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Job #  
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Scope :

Rev: 510300  
User: KW-0603585, Ver 5.1.3, 22-Jun-1999, Win32  
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## Cantilevered Retaining Wall Design

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Description 2310 Retaining wall#1 (W/ ADJACENT FOOTING)

### Criteria

Retained Height	=	3.29 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	2.50 : 1
Height of Soil over Toe	=	0.00 in
Soil Density	=	110.00 pcf
Wind on Stem	=	0.0 psf

### Soil Data

Allow Soil Bearing	=	1,500.0 pcf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	45.0
Toe Active Pressure	=	45.0
Passive Pressure	=	250.0
Water height over heel	=	0.0 ft
Footing  Soil Frictior	=	0.300
Soil height to ignore for passive pressure	=	0.00 in

### Footing Strengths & Dimensions

f'c	=	3,000 psi	Fy	=	60 psi
Min. As %	=			=	0.0018
Toe Width	=	4.00 ft			
Heel Width	=	0.67			
Total Footing Width	=	4.67			
Footing Thickness	=	10.00 in			
Key Width	=	0.00 in			
Key Depth	=	0.00 in			
Key Distance from Toe	=	0.00 ft			
Cover @ Top	=	3.00 in	@ Btm.	=	3.00 in

### Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
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

### Adjacent Footing Load

Adjacent Footing Load	=	817.0 lbs
Footing Width	=	1.00 ft
Eccentricity	=	2.45 in
Wall to Ftg CL Dist	=	5.80 ft
Footing Type	=	Line Load
Base Above/Below Soil at Back of Wall	=	-2.0 ft

### 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

Total Bearing Load	=	950 lbs
...resultant ecc.	=	2.66 in
Soil Pressure @ Toe	=	145 psf OK
Soil Pressure @ Heel	=	262 psf OK
Allowable Soil Pressure Less Than Allowable	=	1,500 psf
ACI Factored @ Toe	=	247 psf
ACI Factored @ Heel	=	445 psf
Footing Shear @ Toe	=	6.4 psi OK
Footing Shear @ Heel	=	0.0 psi OK
Allowable	=	93.1 psi
Wall Stability Ratios		
Overturning	=	5.65 OK
Sliding	=	0.97 UNSTABLE!
Sliding Calcs	Slab Resists All Sliding !	
Lateral Sliding Force	=	369.2 lbs

### Stem Construction

Design height	ft =	0.00	Stem OK
Wall Material Above "Ht"	=	Concrete	
Thickness	=	8.00	
Rebar Size	=	# 4	
Rebar Spacing	=	12.00	
Rebar Placed at	=	Edge	
Design Data			
fb/FB + fa/Fa	=	0.084	
Total Force @ Section	lbs =	414.0	
Moment....Actual	ft-# =	454.0	
Moment.....Allowable	=	5,412.6	
Shear.....Actual	psi =	5.5	
Shear.....Allowable	psi =	85.0	
Bar Develop ABOVE Ht.	in =	18.72	
Bar Lap/Hook BELOW Ht.	in =	6.00	
Wall Weight	=	96.7	
Rebar Depth 'd'	in =	6.25	

### Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Special Inspection	=	
Modular Ratio 'n'	=	
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight

### Concrete Data

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

### Other Acceptable Sizes & Spacings

Toe: Not req'd, Mu < S \* Fr  
Heel: Not req'd, Mu < S \* Fr  
Key: No key defined

### Footing Design Results

	Toe	Heel
Factored Pressure	= 247	445 psf
Mu' : Upward	= 0	0 ft-#
Mu' : Downward	= 0	0 ft-#
Mu: Design	= 454	0 ft-#
Actual 1-Way Shear	= 6.45	0.00 psi
Allow 1-Way Shear	= 93.11	0.00 psi
Toe Reinforcing	= # 4 @ 12.00 in	
Heel Reinforcing	= # 4 @ 16.00 in	
Key Reinforcing	= # 4 @ 16.00 in	



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**Description**      2310 Retaining wall#1 (W/ ADJACENT FOOTING)

### Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....				.....RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
Heel Active Pressure =	382.5	1.37	525.8	Soil Over Heel =		4.67	
Toe Active Pressure =	-15.6	0.28	-4.3	Sloped Soil Over Heel =		4.67	
Surcharge Over Toe =				Surcharge Over Heel =			
Adjacent Footing Load =	2.3	0.23	0.5	Adjacent Footing Load =			
Added Lateral Load =				Axial Dead Load on Stem =		0.00	
Load @ Stem Above Soil =				Soil Over Toe =			
SeismicLoad =				Surcharge Over Toe =			
				Stem Weight(s) =			
<b>Total</b> =	369.2	<b>O.T.M. =</b>	522.0	Earth @ Stem Transitions =	366.4	4.33	1,587.6
<b>Resisting/Overturning Ratio</b>		<b>=</b>	<b>5.65</b>	Footing Weight =	583.3	2.33	1,361.1
Vertical Loads used for Soil Pressure =		949.7	lbs	Key Weight =			
Vertical component of active pressure NOT used for soil pressure				Vert. Component =			
				<b>Total =</b>	949.7	<b>lbs R.M. =</b>	2,948.7

THE END