

**Subject:** RE: Review of Rio Del Sol Double Wall Building Permit  
**Date:** Wednesday, June 21, 2023 at 11:34:36 AM Pacific Daylight Time  
**From:** Jared Dusha  
**To:** Joe Feringa, Scott Reese, Robert Rodriguez, nazirlalani1@gmail.com  
**CC:** John Corella, David Busick, kitsnider7@gmail.com  
**Attachments:** image001.png, delta 1 revision- N&E WALL 5-18-23.pdf, 23-05-273 Perimeter Wall Drainage.pdf, CAP - Approved Detail REV1 - Rio Del Sol - RDS\_SIGNED.pdf, GSE Del Sol Supplemental Calcs Heel-In Ftg.pdf, Rio Del Sol -- Shop Drawing (Precast Cap).pdf, GSE\_23-057\_4-4-23.pdf

Hello all,

I know there have been several emails the last few days and I wanted to make sure that the milestone had been met before providing an update. We have officially submitted the Building Permit for the RDS North and East Perimeter Wall late last week and the fees were paid on Monday to complete the submittal process.

We were verbally told from GHA and Gonzales Construction (wall contractor) that the review should take 2-3 weeks to complete and receive our permit immediately following. The contractor is prepared to start construction as soon as the permit is provided and materials are delivered.

Provided we receive the permit within the next 2-3 weeks, construction will begin in Mid-July starting in the Northwest Corner of RDS on Lot 31. As prior discussed, the wall is intended to be constructed roughly 300' at a time to limit disruption to all neighbors at the same time and provide the finished wall those closest to the new homes in vertical construction. Each section should take approximately 3 weeks from start to finish with a total of 5 sections to complete.

Attached you will find the Engineering and Grading construction plans, wall construction plans/details, structural calcs, and metal/precast cap details, of which all adhere to our prior discussions and encompass the design elements that were agreed upon in our meetings.

Please feel free to reach out with any questions you may have.

We greatly look forward to getting this project into construction and appreciate all of your patience and assistance along the way.

Best Regards,

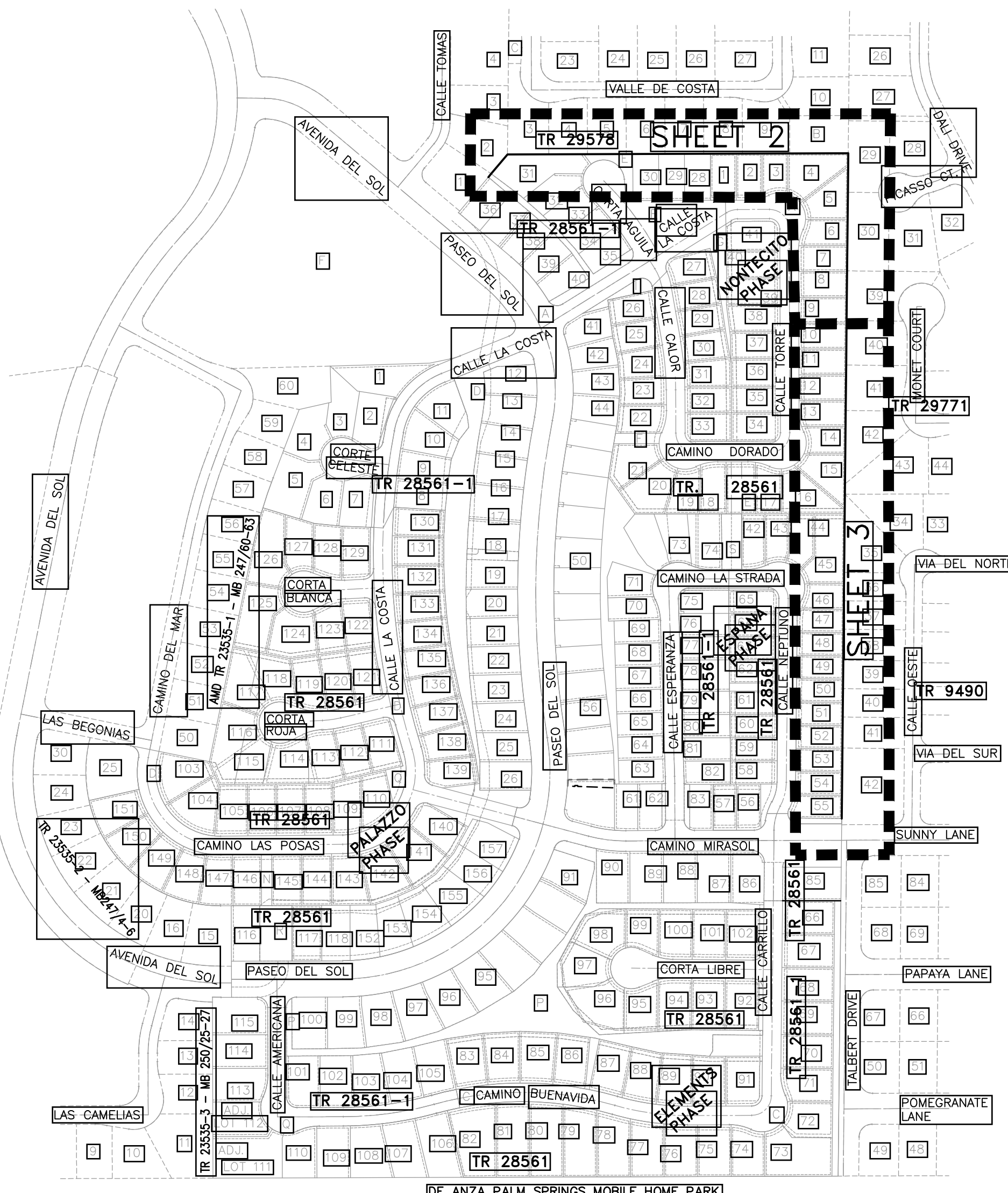
**HOLTHOMES**  
Built for the Pacific Northwest

Jared Dusha, P.E.  
Project Manager  
C: 360.949.0685  
[holthomes.com](http://holthomes.com)

**GRADING NOTES:** (EFFECTIVE JULY 1, 2018)

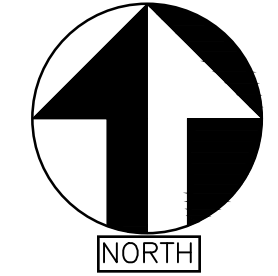
- GRADING SHALL BE IN ACCORDANCE WITH CHAPTER 18 OF CALIFORNIA BUILDING CODE, LATEST EDITION, AND/OR SOILS REPORT, PROJECT NO. 544-1208, DOC NO. 18-05-252  
DATED: MAY 23, 2018  
PREPARED BY: SLADDEN ENGINEERING  
TELEPHONE NO. (760) 863-0713
- THE SOILS ENGINEER AND THE ENGINEERING GEOLOGIST SHALL EXERCISE SUFFICIENT SUPERVISORY CONTROL DURING GRADING TO ENSURE COMPLIANCE WITH THE PLANS, SPECIFICATIONS, AND CODE WITHIN THEIR PURVIEW.
- THE DESIGN CIVIL ENGINEER SHALL EXERCISE SUFFICIENT CONTROL DURING GRADING AND CONSTRUCTION TO ENSURE COMPLIANCE WITH THE PLANS, SPECIFICATIONS, AND CODE WITHIN HIS PURVIEW.
- DURING ROUGH GRADING OPERATIONS AND PRIOR TO CONSTRUCTION OF PERMANENT DRAINAGE STRUCTURES, TEMPORARY DRAINAGE CONTROL SHALL BE PROVIDED TO PREVENT PONDING WATER AND DAMAGE TO ADJACENT PROPERTY.
- AFTER CLEARING, EXISTING GROUND SHALL BE SCARIFIED TO A MINIMUM OF 6" ON THE ENTIRE SITE OR AS RECOMMENDED BY THE SOILS REPORT.
- CUT AND FILL SLOPES SHALL BE NO STEEPER THAN 2:1.
- PADS SHALL BE COMPACTED TO A MINIMUM OF 90% RELATIVE DENSITY PER A.S.T.M. SPECIFICATIONS AND THE ABOVE- MENTIONED SOILS REPORT.
- MINIMUM BUILDING PAD DRAINAGE SHALL BE 2% DRAINAGE SWALES SHALL BE A MINIMUM OF 0.3' DEEP AND BE CONSTRUCTED A MINIMUM OF 2' FROM THE TOP OF CUT OR FILL SLOPES. THE MINIMUM SLOPE OF SWALES SHALL BE 0.50%.
- ALL FILLS SHALL BE COMPACTED TO A MINIMUM OF NINETY (90) PERCENT OF MAXIMUM DENSITY AS DETERMINED BY THE CALIFORNIA BUILDING CODE OR EQUIVALENT AS APPROVED BY THE CITY ENGINEER. FIELD DENSITY SHALL BE DETERMINED IN ACCORDANCE WITH THE CALIFORNIA BUILDING CODE, OR EQUIVALENT, AS DETERMINED BY THE CITY ENGINEER.
- ALL STREET SECTIONS ARE TENTATIVE. THE MINIMUM SECTION IS 3" A.C. OVER 4.5" CLASS II BASE. ADDITIONAL SOIL TEST(S) SHALL BE REQUIRED AFTER ROUGH GRADING TO DETERMINE EXACT SECTION REQUIREMENTS. THE CITY ENGINEER SHALL APPROVE THE FINAL STREET SECTION.
- THE CITY ENGINEER WILL REVIEW FOR APPROVAL THE FINAL STREET SECTIONS AFTER SUBMITTAL OF "R" VALUE TESTS FOR ROADWAY SUB-BASE.
- LOCATIONS OF FIELD DENSITY TESTS SHALL BE DETERMINED BY THE SOILS ENGINEER OR APPROVED TEST AGENCY AND SHALL BE SUFFICIENT IN BOTH HORIZONTAL AND VERTICAL PLACEMENT TO PROVIDE REPRESENTATIVE TESTING OF ALL FILL PLACED. TESTING IN AREAS OF A CRITICAL NATURE OF SPECIAL EMPHASIS SHALL BE IN ADDITION TO THE NORMAL REPRESENTATIVE SAMPLINGS.
- THE FINAL COMPACTION REPORT AND APPROVAL FROM THE SOILS ENGINEER SHALL CONTAIN THE TYPE OF FIELD TESTING PERFORMED. EACH TEST SHALL BE IDENTIFIED WITH THE METHOD OF OBTAINING THE IN-PLACE DENSITY AND SHALL BE SO NOTED FOR EACH TEST. SUFFICIENT MAXIMUM DENSITY DETERMINATION SHALL BE PERFORMED TO VERIFY THE ACCURACY OF THE MAXIMUM DENSITY CURVES USED BY THE FIELD TECHNICIAN.
- ALL UNDERGROUND FACILITIES, WITH LATERALS, SHALL BE IN PLACE AND INSPECTED PRIOR TO PAVING, INCLUDING BUT NOT LIMITED TO THE FOLLOWING: SEWER, WATER, ELECTRIC, GAS AND DRAINAGE. THE CURB SHALL BE "ETCHED" SHOWING ALL LATERAL LOCATIONS "S" FOR SEWER, "G" FOR GAS, ETC....
- THE FINAL UTILITY LINE BACKFILL REPORT FROM THE PROJECT SOILS ENGINEER SHALL INCLUDE AN APPROVAL STATEMENT THAT THE BACKFILL IS SUITABLE FOR THE INTENDED USE.
- BLOCK WALLS PERMITS ARE NOT PART OF THE GRADING PERMIT. SUBMIT FOR SEPARATE BUILDING PERMIT(S).
- THE CONTRACTOR IS RESPONSIBLE TO PREVENT SILT CONTAMINATION OF STORMWATER INFILTRATION FACILITIES DURING CONSTRUCTION. IMMEDIATELY PRIOR TO FINAL ACCEPTANCE OF STORM DRAINAGE RETENTION/INFILTRATION FACILITIES, THE CONTRACTOR SHALL CONDUCT, IN THE PRESENCE OF THE CITY INSPECTOR, A PERFORMANCE TEST DESIGNED TO CLEARLY DEMONSTRATE THE FUNCTIONAL ADEQUACY OF THE FACILITIES.
- THE CONTRACTOR SHALL PROVIDE WIND EROSION AND DUST CONTROL MEASURES AS REQUIRED BY THE FUGITIVE DUST CONTROL PLAN (PM-10 PLAN) APPROVED FOR THIS PROJECT.
- THE CONTRACTOR SHALL PROVIDE EROSION CONTROL MEASURES AS REQUIRED BY THE EROSION CONTROL PLAN APPROVED FOR THIS PROJECT.
- PRIOR TO THE INSTALLATION OF ANY HARD SURFACE OR THE BUILDING PAD, THE DESIGN ENGINEER OR ARCHITECT SHALL PROVIDE THE CITY ENGINEERING INSPECTOR AND THE CITY CHIEF BUILDING OFFICIAL WITH A CERTIFIED LETTER STATING THAT ALL CRITICAL AREAS OF ADA ACCESSIBILITY, PEDESTRIAN PATH-OF-TRAVEL, ADA PARKING AREAS, RAMPS, RUNS OR OTHER ASSOCIATED STRUCTURES AS REQUESTED BY THE INSPECTOR HAVE BEEN CONSTRUCTED PER PLAN AND THE ENGINEER AND/OR ARCHITECT CERTIFIES THESE ITEMS WILL MEET ALL PLAN, ADA, BUILDING CODE, CALBO OR SIMILAR CODE REQUIREMENTS.

**RIO DEL SOL  
NORTH AND EAST PERIMETER WALL PLAN**



**INDEX MAP**  
SCALE: 1"=200'

**SHEET INDEX**



**CONSTRUCTION NOTES AND QUANTITY ESTIMATE**

- (1) CONSTRUCT COMBINATION SCREEN / RETAINING WALL PER SEPARATE PERMIT 1,945 LF

**OWNER/DEVELOPER**

THE FROST GROUP  
P.O. BOX 61426  
VANCOUVER, WA 98666  
PHONE: (360) 892-0514  
NOEL HUMPHREY: (949) 374-3525  
noelhumphrey@live.com

**UTILITIES:**

ELECTRIC: SOUTHERN CALIFORNIA EDISON  
GAS: THE GAS COMPANY  
TELEPHONE: FRONTIER  
WATER: COACHELLA VALLEY WATER DISTRICT  
CABLE: COACHELLA VALLEY WATER DISTRICT  
SEWER: UNDERGROUND SERVICE ALERT  
USA:

**ENGINEER**

FOMOTOR ENGINEERING  
225 SOUTH CIVIC DRIVE, SUITE 1-5  
PALM SPRINGS, CALIFORNIA 92262  
TELEPHONE: (760) 323-1842  
FAX: (760) 323-1742  
PHILIP K. FOMOTOR, R.C.E. 47284

**SOILS ENGINEER**

SLADDEN ENGINEERING  
45090 GOLF CENTER PARKWAY, SUITE F  
INDIO, CA 92201  
PHONE: (760) 863-0713

**PRIVATE ENGINEER NOTE TO CONTRACTOR:**

1. UNAUTHORIZED CHANGES & USES: THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR UNAUTHORIZED CHANGES TO OR USE OF THESE PLANS. ALL CHANGES TO THE PLAN MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

**HOLD HARMLESS INDEMNIFICATION CLAUSE**

THE CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT, THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE CITY OF CATHEDRAL CITY, THE OWNER, AND THE PRIVATE ENGINEER HARMLESS FOR ANY AND ALL LIABILITY; REAL OR ALLEGED, IN CONNECTION WITH PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR

**EXISTING UNDERGROUND STRUCTURES:**

ALL UNDERGROUND UTILITIES OR STRUCTURES, REPORTED OR FOUND ON PUBLIC RECORDS, ARE INDICATED WITH THEIR APPROXIMATE LOCATION AND EXTENT. THE OWNER BY ACCEPTING THESE PLANS OR PROCEEDING WITH THE IMPROVEMENTS HEREON, AGREES TO ASSUME LIABILITY AND TO HOLD THE ENGINEER HARMLESS FOR ANY DAMAGES RESULTING FROM THE EXISTENCE OF UNDERGROUND UTILITIES OR STRUCTURES NOT REPORTED OR INDICATED ON PUBLIC RECORDS, OR THOSE CONSTRUCTED AT VARIANCE WITH REPORTED OR RECORD LOCATION. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR STRUCTURES SHOWN AND ANY OTHERS FOUND AT THE SITE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNERS OF ALL UTILITIES STRUCTURES CONCERNED BEFORE STARTING WORK.

**NOTICE TO CONTRACTOR:**

CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND SHALL REPORT DISCREPANCIES TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF WORK.

**TOPO BY:**

FOMOTOR ENGINEERING  
225 SOUTH CIVIC DRIVE, SUITE 1-5  
PALM SPRINGS, CALIFORNIA 92262  
TELEPHONE: (760) 323-1842  
FAX: (760) 323-1742  
PHILIP K. FOMOTOR, R.C.E. 47284

**FLOOD\_ZONE**

FLOOD INSURANCE RATE MAP PANEL 1587 OF 3805  
MAP NO: 06065C1587G EFFECTIVE DATE: AUGUST 28, 2008  
DESIGNATION: ZONE X - AREA WITH REDUCED FLOOD RISK DUE TO LEVEE

**EARTHWORK QUANTITY FOR PERMIT PURPOSES ONLY**

(CONTRACTOR TO CALCULATE HIS OWN QUANTITIES FOR BIDDING)  
RAW CUT: 0 C.Y. FILL: 0 C.Y.

**LEGEND**

- TO PROPOSED CONTOUR
- EX EXISTING CONTOUR
- EX EXISTING WALL
- PROPOSED CONCRETE
- PROPOSED RETAINING WALL
- PROPOSED DEEPEN FOOTING
- PROPOSED DEH
- PROPOSED STORM DRAIN PIPE
- PROPOSED DRAINAGE SWALE
- EX EXISTING FENCING
- PROPOSED TEMPORARY FENCING

**ABBREVIATION**

- FS FINISHED SURFACE
- TP TOP OF PAVEMENT
- TRW TOP OF RETAINING WALL
- GB GRADE BREAK
- HP HIGH POINT
- LP LOW POINT
- PA PLANTER AREA
- TC TOP OF CURB
- FL FLOWLINE
- PL PROPERTY LINE
- CB CATCH BASIN
- R/W RIGHT OF WAY
- PUE PUBLIC UTILITY EASEMENT
- (495.2) EXISTING ELEVATIONS
- WV WATER VALVE
- ETW EDGE OF TRAVEL WAY
- BW BACK OF SIDEWALK
- FG FINISH GRADE
- TW TOP OF WALL
- TF TOP OF FOOTING
- TG TOP OF GRATE
- RH RETAIN HEIGHT
- SS SANITARY SEWER
- MIN MINIMUM
- MAX MAXIMUM
- DF DEEPENED FOOTING
- DEH DEEPENED EDGE OF HARDSCAPE
- TFC TOP OF FLUSH CURB

**DIGALERT**

CALL BEFORE YOU DIG

TWO WORKING HOURS BEFORE YOU DIG

TOLL FREE 1-800-227-2600

A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

DATE	DESCRIPTION	APPR	DATE

DESIGNED BY: \_\_\_\_\_ CHECKED BY: PRK

BENCHMARK: BENCHMARK NO. PD-22-2 ELEVATION: 329.683

DESCRIPTION: BRASS DISK IN CONCRETE POST UP 0.3' STAMPED "TRV.G.O.B.M." AT INT. OF DATE PALM DRIVE AND 34TH AVENUE 45' NORTH OF 34TH AVENUE

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER COUNTY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE COUNTY.

ARMANDO J. GARCIA BALDIZONNE, PE  
CITY ENGINEER, CITY OF CATHEDRAL CITY  
R.C.E. 76102

DATE: \_\_\_\_\_

SEAL

PREPARED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

PHILIP K. FOMOTOR PE, PLS.  
R.C.E. NO. 47284

**FOMOTOR ENGINEERING**

225 S. CIVIC DRIVE, SUITE 1-5  
PALM SPRINGS, CA 92262  
(760) 323-1842 FAX (760) 323-1742

IN THE CITY OF CATHEDRAL CITY, RIVERSIDE COUNTY, CALIFORNIA

**N & E PERIMETER WALL PLAN**

FOR **TRACT 28561-1**

**RIO DEL SOL**

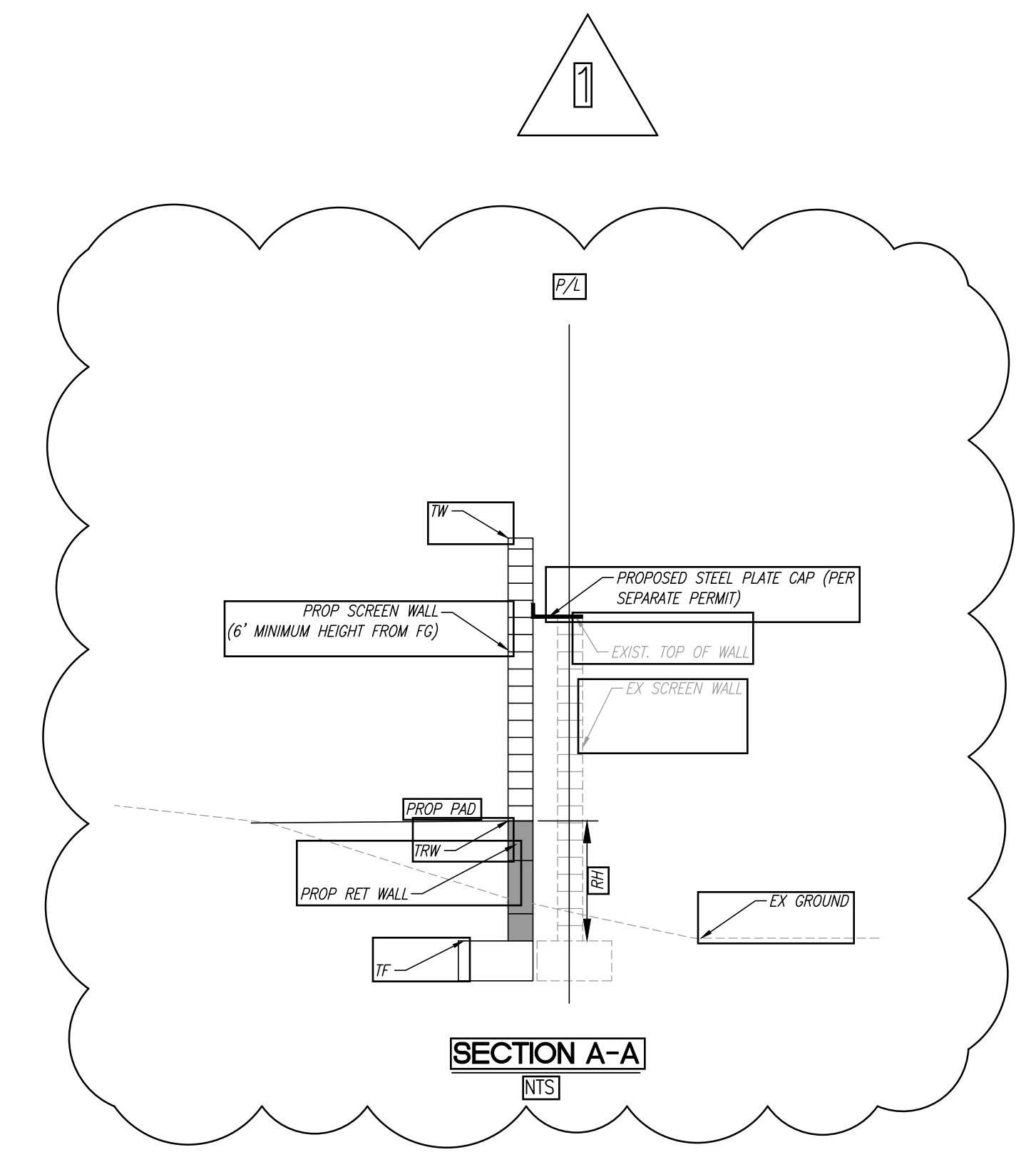
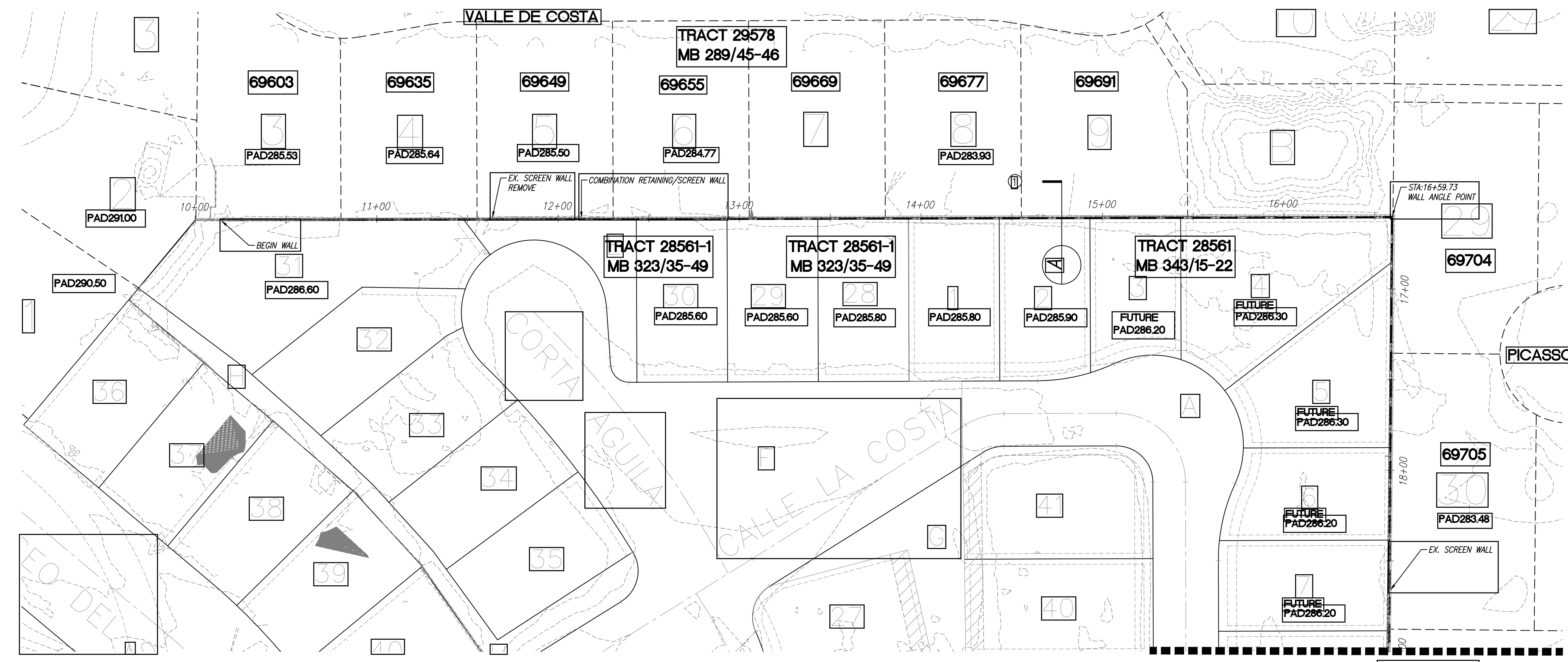
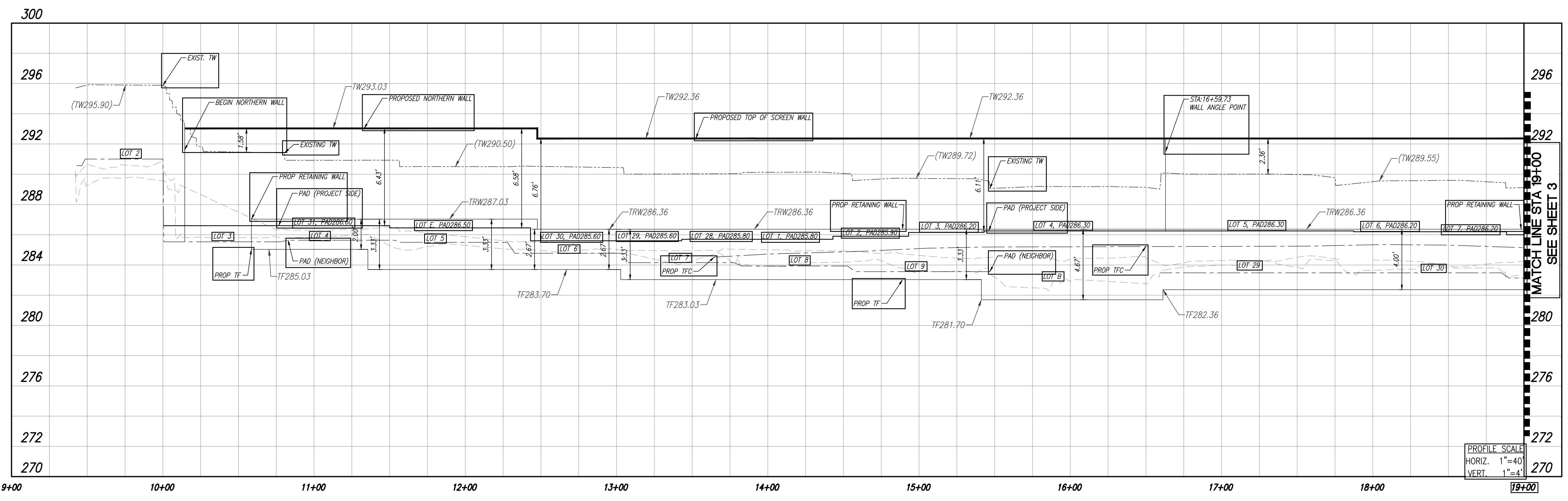
SEC. 34, T. 4S., R. 5E., S.B&M.

PREPARATION DATE: 5/17/23

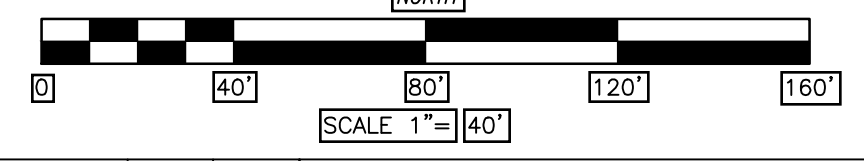
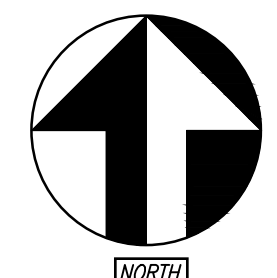
SHEET 1 OF 3 SHEETS

FILE NO. \_\_\_\_\_





MATCH LINE  
STA 19+00  
SEE SHEET 3



Ⓢ CONSTRUCT COMBINATION SCREEN / RETAINING WALL PER SEPARATE PERMIT

**DIG ALERT**  
CALL BEFORE YOU DIG  
1-800-227-2600  
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

DATE	DESCRIPTION	APPROVED BY	DATE
05/18/23	REVISION TO SECTION A-A		

BENCHMARK: [BENCHMARK NO. PD-22-2] [ELEVATION: 329.683]  
DESCRIPTION: [ROSS DISK IN CONCRETE POST UP 0.3\"/>

CITY OF CATHEDRAL CITY  
APPROVED FOR PERMITTING PURPOSE  
ARMANDO J. GARCIA BALDIZONNE, PE  
CITY ENGINEER, CITY OF CATHEDRAL CITY  
R.C.C. NO. 70702

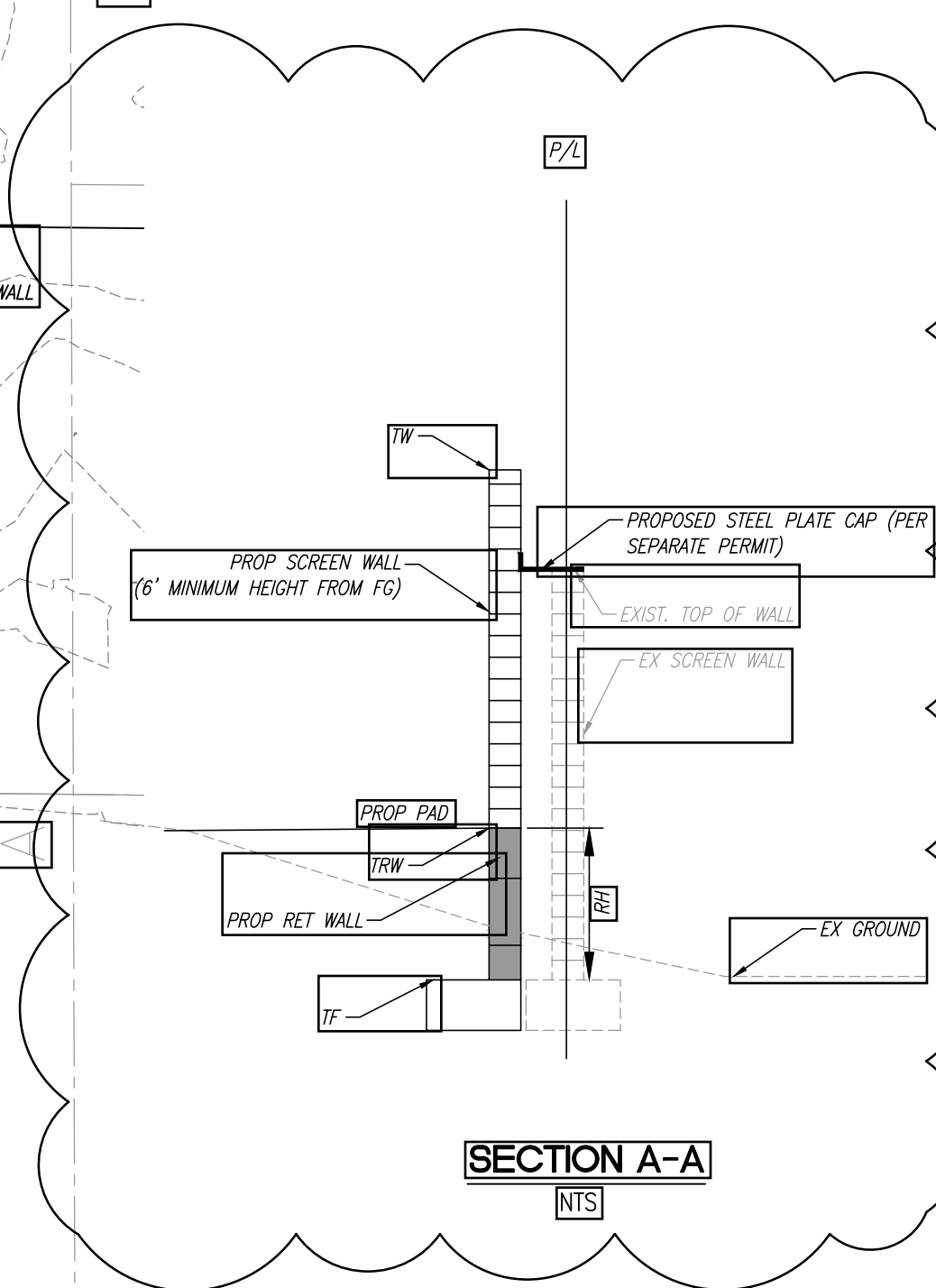
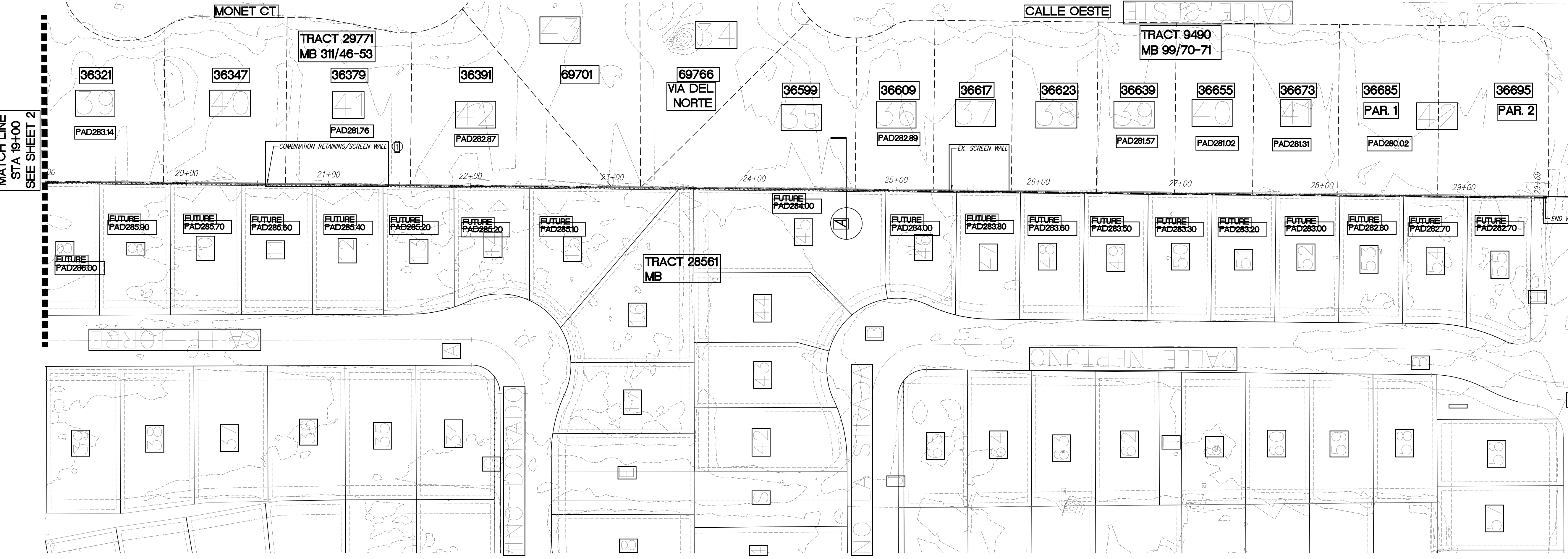
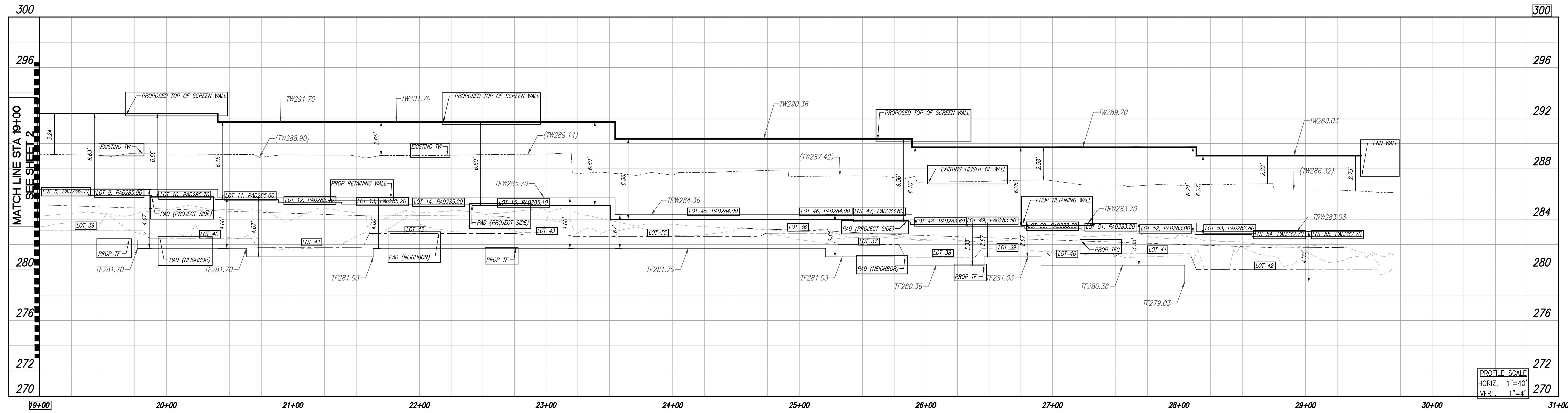
SEAL  
No. 47284

PREPARED BY:  
PHILLIP K. FOMOTOR PE., PLS.  
R.C.C. NO. 47284

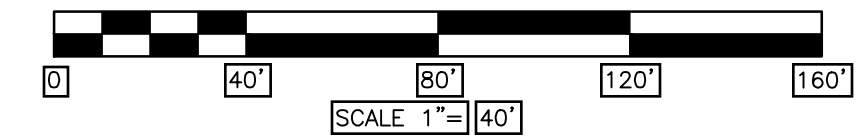
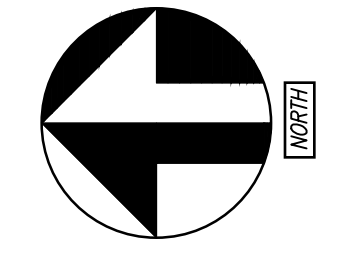
**FOMOTOR ENGINEERING**  
225 S. CIVIC DRIVE, SUITE 1-5  
PALM SPRINGS, CA 92262  
(760) 323-1842 FAX (760) 323-1742

IN THE CITY OF CATHEDRAL CITY, RIVERSIDE COUNTY, CALIFORNIA  
N & E PERIMETER WALL PLAN  
FOR  
TRACT 28561-1  
RIO DEL SOL  
SEC. 34, T. 4S., R. 5E., S.B&M.

PREPARATION DATE: 5/18/23  
SHEET  
2  
OF 3 SHEETS  
FILE NO.



Ⓜ CONSTRUCT COMBINATION SCREEN / RETAINING WALL PER SEPARATE PERMIT

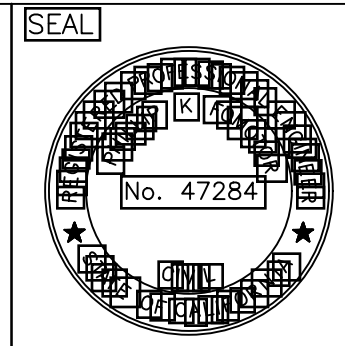


**DIG ALERT**  
 CALL BEFORE YOU DIG  
 1-800-227-2600  
 A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

DATE: 05/18/23	REVISION TO SECTION A-A
DESIGNED BY: JOM	CHECKED BY: PKF

BENCHMARK: BENCHMARK NO. PD-22-2 (ELEVATION: 329.683)  
 DESCRIPTION: BRASS DISK IN CONCRETE POST UP 0.3' STAMPED '7010 B.M.' AT JUNCTION OF DATE PALM DRIVE AND 34TH AVENUE 45' NORTH OF 34TH AVENUE.  
 THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER COUNTY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE COUNTY.

CITY OF CATHEDRAL CITY  
 APPROVED FOR PERMITTING PURPOSE  
 ARMANDO J. GARCIA BALDIZZONE, PE  
 CITY ENGINEER, CITY OF CATHEDRAL CITY  
 R.C.E. NO. 70102



PREPARED BY: PHILLIP K. FOMOTOR PE, PLS.  
 R.C.E. NO. 47284

**FOMOTOR ENGINEERING**  
 225 S. CIVIC DRIVE, SUITE 1-5  
 PALM SPRINGS, CA 92262  
 (760) 323-1842 FAX (760) 323-1742

IN THE CITY OF CATHEDRAL CITY, RIVERSIDE COUNTY, CALIFORNIA  
**N & E PERIMETER WALL PLAN**  
 FOR  
**TRACT 28561-1**  
**RIO DEL SOL**  
 SEC. 34, T. 4S., R. 5E., S.B&M.

PREPARATION DATE: 5/18/23  
 SHEET 3 OF 3 SHEETS  
 FILE NO.





# Sladden Engineering

45090 Golf Center Parkway, Suite F, Indio, CA 92201 (760) 863-0713 Fax (760) 863-0727  
6782 Stanton Avenue, Suite C, Buena Park, CA 90621 (714) 523-0952 Fax (714) 523-1369  
450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863  
www.Sladdenengineering.com

May 19, 2023

Project No. 544-1208  
23-05-273

RDS Development, LLC  
P.O. Box 61426  
Vancouver, Washington 98666

Project: The Village at Rio Del Sol  
Tract #28561 – 1  
Gerald Ford Drive West of Plumley Drive  
Cathedral City, California

Subject: Perimeter Wall Drainage

Ref: Geotechnical Engineering Report prepared by Buena Engineers, Inc. dated July 22, 1988; Project No. B7-0674-P1, Report No. 88-07-746  
Report of Observations and Testing During Rough Grading prepared by Sladden Engineering dated May 5, 2003; Project No. 522-1208, Report No. 03-04-262  
Report of Observations and Testing During Grading prepared by Sladden Engineering dated March 3, 2006; Project No. 522-1208, Report No. 06-03-217  
Geotechnical Update prepared by Sladden Engineering dated March 17, 2023; Project No. 544-1208, Report No. 23-03-157

In accordance with your request, we have reviewed the eastern and northern perimeter retaining wall details provided with respect to drainage requirements. Because the site soil is comprised primarily of free-draining fine-grained sand, we expect that excess water will rapidly infiltrate in a near vertical direction and we do not expect significant subsurface water accumulation. In our opinion, the rock/gravel backdrain system may be safely omitted. Effective waterproofing should be provided in all cases to mitigate unsightly moisture related staining and discoloration on the exposed wall face.

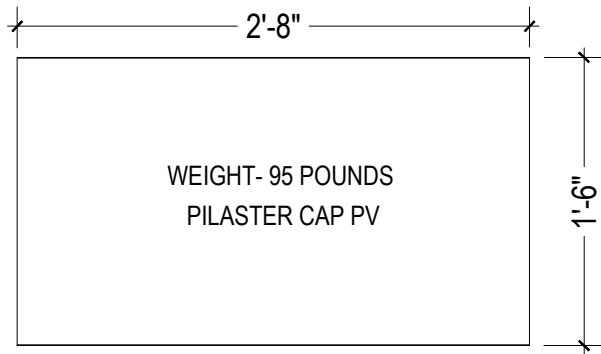
If there are any questions regarding this report or the testing summarized herein, please contact the undersigned.

Respectfully submitted  
SLADDEN ENGINEERING

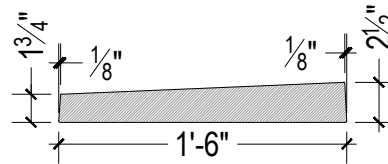
Brett L. Anderson  
Principal Engineer



Copies pdf / Addressee



PILASTER CAP PLAN

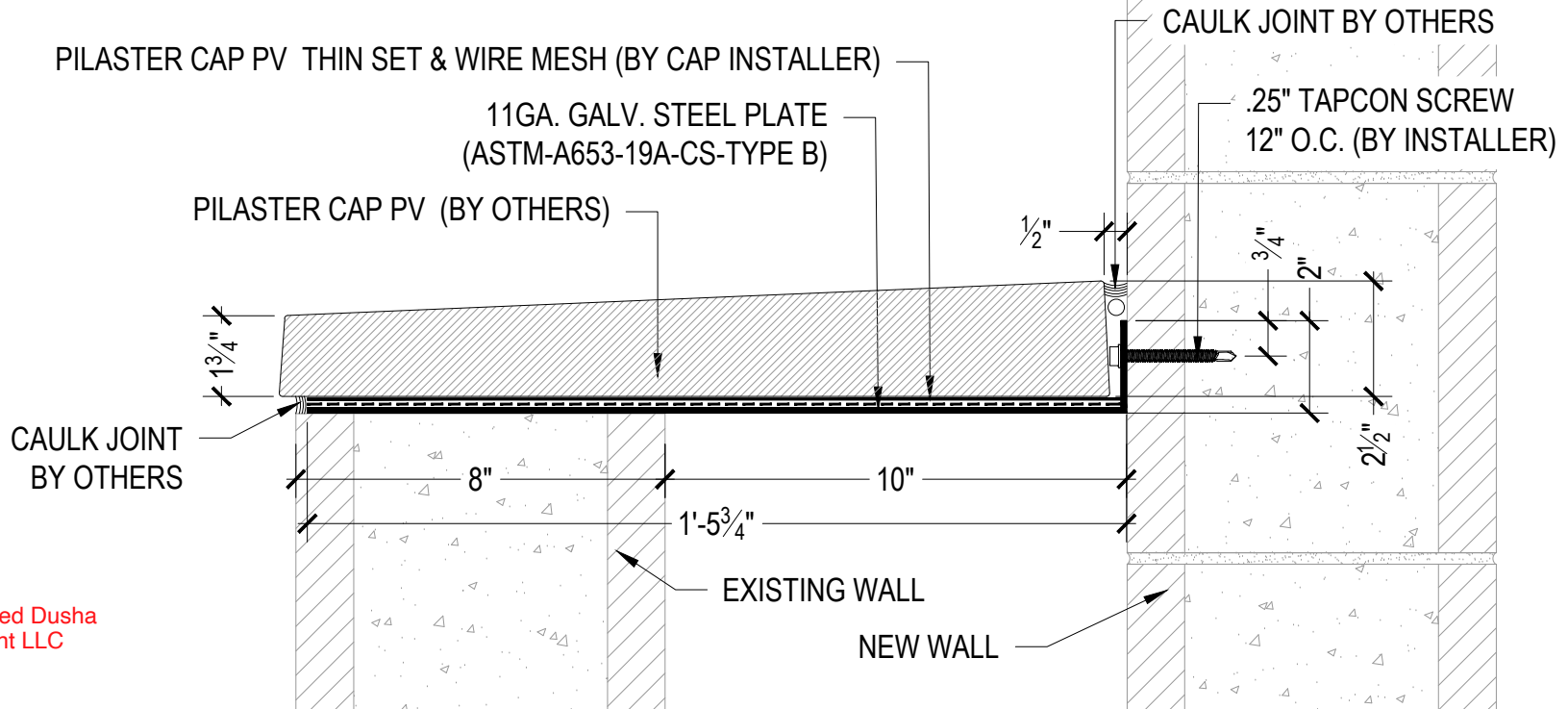


PILASTER CAP SIDE VIEW



EOR FOR STEEL  
PLATE JOINT COVER  
ONLY.

SIGNED 5/17/2023



Approved by: Jared Dusha  
RDS Development LLC  
5/17/2023



**M.H. POWELL & CO., INC.**

ARCHITECTURAL SEISMIC EXPANSION JOINT SYSTEMS

2313 YATES AVENUE | PHONE : (323) 887-0037  
 COMMERCE, CA 90040 | FAX : (323) 887-0877  
 WEB : www.mhpowell.net

**GALV. COVER**

PROJECT : RIO DEL SOL-NORTH & EAST PERIMETER WALL PROJECT # : \_\_\_\_\_  
 LOCATION : GERALD FORD DRIVE & AVENIDA DEL SOL, DATE : 05/10/2023  
 CATHEDRAL CITY, CA 92234  
 CUSTOMER : RDS DEVELOPMENT, LLC

PAGE #



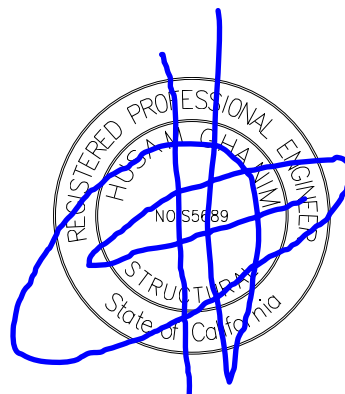
# STRUCTURAL CALCULATIONS

## The Village at Rio Del Sol, Tract 28561, Site Wall Design

ENGINEER: IVAN GARCIA  
STRUC. JOB NO. : 23-057

DATE : 4/3/2023  
OPERATOR : IVAN GARCIA

PRINCIPAL ENGINEER: Husam Ghanim



These calculations are the property of Husam Ghanim, SE. They are provided to the Building Department as an aid in understanding the associated drawings. The use of these calculations is restricted to the original use for which they were prepared and their publication is expressly limited to such use. Reuse, reproduction, or publication, by any method, in whole or part, is prohibited without the written consent of Husam Ghanim, SE.

A B C D E F G H I J K L M N **Soil and Wind** Series: 62.0002

Occupancy Group - **U** **Exposure C, 130 mph** Risk Category - **II**  
**SOIL DATA**

Geotechnical report: **Investigation prepared by Sladden Engineering, Project No. 544-1208, dated August 31, 2021**

Bearing: **1300** psf 1/3 Increase allowed for wind or seismic loading  
 Active level backfill: **35** pcf  
 At-rest backfill: **60** pcf  
 Passive: below 12" **300** pcf up to a maximum of: 3000 psf  
 Friction:  $\mu =$  **0.49**

**Safety Factors:**

Overtuning & Sliding (Active): **1.5** Retaining walls only  
 Overtuning & Sliding (Seismic): **1.1** Retaining walls only

**WIND LOADING** ASCE 7-16

Section 26.10.2

Velocity pressure  $q_h = 0.00256 \times K_z \times K_{zt} \times K_d \times K_e \times V^2$  ASCE 7 Equation (26.10-1)  
 Pressure coeff. (26.10.1, T26.10-1)  $K_z =$ 

0.85	0.85	0.85
------	------	------

  
 Topographic factor (26.8.2)  $K_{zt} =$ 

<b>1.0</b>	1.0	1.0
------------	-----	-----

  
 Dir. coeff. (26.6, T26.6-1)  $K_d =$ 

<b>0.85</b>	0.85	0.85
-------------	------	------

  
 Ground elev. Factor (26.9, T26.9-1)  $K_e =$ 

<b>1.0</b>	1.0	1.0
------------	-----	-----

  
 3-sec gust wind speed mph  $V =$ 

<b>130</b>	130	130
------------	-----	-----

Section 29.3.1

Wind Load  $WL = q_h \times G \times C_f \times A_s$  ASCE 7 Equation (29.3-1)  
 Net force coefficient (Fig. 29.3-1)  $C_f =$ 

1.40	1.40	1.40
------	------	------

  
 Gust effect factor (26.11)  $G =$ 

<b>0.85</b>	0.85	0.85
-------------	------	------

  
 Exposure Category  $C =$ 

<b>C</b>	C	C
----------	---	---

**WALL DATA**

Varying aspect ratios  
 Horizontal wall dimension ft  $B =$ 

<b>13.33</b>	<b>14.67</b>	<b>16.00</b>
--------------	--------------	--------------

  
 Height of wall ft  $h =$ 

<b>6.67</b>	<b>7.33</b>	<b>8.00</b>
-------------	-------------	-------------

  
 Aspect ratio  $B/h =$ 

2.00	2.00	2.00
------	------	------

  
 Wall area sq.ft.  $A_s =$ 

<b>1</b>	<b>1</b>	<b>1</b>
----------	----------	----------

  
 Wind pressure (strength level)  $WL =$ 

<b>37.2</b>	<b>37.2</b>	<b>37.2</b>
-------------	-------------	-------------

  
 Wind pressure (service level)  $WL =$ 

22.3	22.3	22.3
------	------	------

  
 lbs/sq.ft. lbs/sq.ft. lbs/sq.ft.





A      B      C      D      E      F      G      H      I      J      K      L      M      N

**Seismic and Summary** Series: 62.0002

**FREESTANDING WALL SEISMIC LOADING**

Assumptions: Site Class 'D', Ground-supported cantilever walls or fences

Average  $S_1 \geq 0.60g$  unless noted otherwise

MCE, 5% damped @ 1 second  $S_1 = 0.681$        $S_{D1} = 0.772$       Actual  $S_{DS} = 1.100$   
 Importance factor  $I = 1.0$        $S_s = 1.650$        $S_{DS} = 1.000$   
 Response mod. coeff. (T15.4-2)  $R = 1.25$       ( $S_{DS}$  value allowed per ASCE 7-16, Sect. 12.8.1.3)  
 Long-term period. (11.4.5)  $T_L = 8$  secs  
 Fundamental period. (15.4-6)  $T_{min} = 0.104$  secs

Min. seismic load  $(C_s)_{min} = 0.80 \times S_1 / (R / I) = 0.436$  (15.4-2)  
 Min. seismic load  $(C_s)_{min} = 0.044 \times S_{DS} \times I \geq 0.03 = 0.044$  (15.4-1)  
 Seismic load  $C_s = S_{DS} / (R / I) = 0.800$  (12.8-2)  
 Max. Seismic load  $(C_s)_{max} = S_{D1} / (T \times R / I) = 5.938 \text{ Wt}$  (12.8-3)

$C_s = 0.800$        $EQ = 0.8 \times Wt$

	inches	6		8		16"x16"	
		Wt	EQ	Wt	EQ	Wt	EQ
Nominal Masonry Unit Width	psf						
Completed Wall Weight - Wt	psf						
Factored Design - EQ	psf						
Reinforcing Spacing - S	inches						
		48	40	32.0	49	39.2	
		40	41	32.8	53	42.4	
		32	42	33.6	55	44.0	
		24	43	34.4	58	46.4	
		16	47	37.6	63	50.4	
		SOLID	58	46.4	78	62.4	164    131.2

**FREESTANDING LATERAL LOAD SUMMARY**

	inches	6			8			16"x16"		
		$W_{ASD}$	$EQ_{ASD}$	Controls	$W_{ASD}$	$EQ_{ASD}$	Controls	$W_{ASD}$	$EQ_{ASD}$	Controls
Nominal Masonry Unit width	psf									
Service Design - EQ	psf									
Service Design - W	psf									
		48	22.3	22.4	EQ	22.3	27.4	EQ		
		40	22.3	23.0	EQ	22.3	29.7	EQ		
		32	22.3	23.5	EQ	22.3	30.8	EQ		
		24	22.3	24.1	EQ	22.3	32.5	EQ		
		16	22.3	26.3	EQ	22.3	35.3	EQ		
		SOLID	22.3	32.5	EQ	22.3	43.7	EQ	22.3	91.8    EQ



⚠ This is a beta release of the new ATC Hazards by Location website. Please [contact us](#) with feedback.

ℹ The ATC Hazards by Location website will not be updated to support ASCE 7-22. [Find out why.](#)

## ATC Hazards by Location

### Search Information

Coordinates:	33.7848, -116.4455
Elevation:	279 ft
Timestamp:	2023-02-02T20:28:49.830Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	II
Site Class:	D



### Basic Parameters

Name	Value	Description
$S_S$	1.65	$MCE_R$ ground motion (period=0.2s)
$S_1$	0.681	$MCE_R$ ground motion (period=1.0s)
$S_{MS}$	1.65	Site-modified spectral acceleration value
$S_{M1}$	* null	Site-modified spectral acceleration value
$S_{DS}$	1.1	Numeric seismic design value at 0.2s SA
$S_{D1}$	* null	Numeric seismic design value at 1.0s SA

\* See Section 11.4.8

### Additional Information

Name	Value	Description
SDC	* null	Seismic design category
$F_a$	1	Site amplification factor at 0.2s
$F_v$	* null	Site amplification factor at 1.0s
$CR_S$	0.906	Coefficient of risk (0.2s)
$CR_1$	0.888	Coefficient of risk (1.0s)
PGA	0.72	$MCE_G$ peak ground acceleration
$F_{PGA}$	1.1	Site amplification factor at PGA
$PGA_M$	0.792	Site modified peak ground acceleration
$T_L$	8	Long-period transition period (s)
$S_sRT$	1.955	Probabilistic risk-targeted ground motion (0.2s)
$S_sUH$	2.158	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
$S_sD$	1.65	Factored deterministic acceleration value (0.2s)
$S_1RT$	0.76	Probabilistic risk-targeted ground motion (1.0s)
$S_1UH$	0.856	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
$S_1D$	0.681	Factored deterministic acceleration value (1.0s)
PGAd	0.72	Factored deterministic acceleration value (PGA)

\* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. [Find out why.](#)

### Disclaimer

Hazard loads are provided by the U.S. Geological Survey [Seismic Design Web Services](#).





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION:** 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)

**Code Reference**

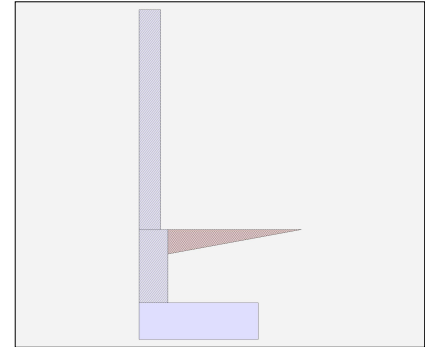
Calculations per IBC 2021 1807.3, ASCE 7-16

**Criteria**

Retained Height	=	2.00 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

**Soil Data**

Allow Soil Bearing	=	1,600.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing  Soil Friction	=	0.490
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	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

**Lateral Load Applied to Stem**

Lateral Load	=	0.0 #/ft
...Height to Top	=	8.00 ft
...Height to Bottom	=	2.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	37.2 psf (Strength 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Design Summary**

**Wall Stability Ratios**

Overturning	=	1.52	OK
Sliding	=	2.78	OK
Global Stability	=	4.37	
Total Bearing Load	=	1,342 lbs	
...resultant ecc.	=	9.96 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,557 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	1,600 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,179 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	6.2 psi	OK
Footing Shear @ Heel	=	2.5 psi	OK
Allowable	=	75.0 psi	

**Sliding Calcs**

Lateral Sliding Force	=	291.4 lbs	
less 100% Passive Force	=	187.5 lbs	
less 100% Friction Force	=	623.7 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

Vertical component of active lateral soil pressure IS considered in the calculation of soil bearing pressures.

**Load Factors**

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

**Stem Construction**

**Design Height Above Ftg**

ft =

Wall Material Above "Ht"

Design Method

Thickness

Rebar Size

Rebar Spacing

Rebar Placed at

**Design Data**

fb/FB + fa/Fa

**Total Force @ Section**

Service Level

Strength Level

**Moment....Actual**

Service Level

Strength Level

Moment.....Allowable

**Shear....Actual**

Service Level

Strength Level

Shear.....Allowable

Anet (Masonry)

Wall Weight

Rebar Depth 'd'

**Masonry Data**

f'm

Fy

Solid Grouting

Modular Ratio 'n'

Equiv. Solid Thick.

Masonry Block Type

Masonry Design Method

**Concrete Data**

f'c

Fy

**2nd**

**Bottom**

Stem OK

2.00

Masonry

SD

6.00

# 4

40.00

Center

5.13 i

0.927

0.711

lbs =

223.2

335.2

ft-# =

669.6

1,190.7

ft-# =

721.9

1,672.8

psi =

15.9

3.7

psi =

69.7

69.7

in2 =

14.03

91.50

psf =

41.0

78.0

in =

2.81

5.13

psi =

1,500

1,500

psi =

60,000

60,000

=

No

Yes

=

21.48

21.48

in =

3.25

7.63

=

SD

psi =

psi =

SD SD



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Footing Data**

Toe Width	=	0.00 ft
Heel Width	=	2.75
Total Footing Width	=	2.75
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
$f'_c$	=	2,500 psi
$F_y$	=	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	= 2,179	0 psf
$\mu_u$ : Upward	= 0	202 ft-#
$\mu_u$ : Downward	= 0	1,118 ft-#
$\mu_u$ : Design	= 0 OK	916 ft-# OK
$\phi M_n$	= OK - Flush	2,500
Actual 1-Way Shear	= 6.17	2.50 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= Flush toe condition. No reinforcing required.	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	
Footing Torsion, $T_u$	=	0.00 ft-lbs
Footing Allow. Torsion, $\phi T_u$	=	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Flush toe condition. No reinforcing required.

Heel:  $\phi M_n = \phi * 5 * \lambda * \sqrt{f'_c} * S_m$

Key: No key defined

Min footing T&S reinf Area	0.71	in <sup>2</sup>
Min footing T&S reinf Area per foot	0.26	in <sup>2</sup> /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: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**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)	157.5	1.00	157.5	Soil Over HL (ab. water tbl)	458.3	1.71	783.0
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.71	783.0
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 =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	133.9	6.00	803.5	Soil Over Toe =			
				Surcharge Over Toe =			
				Stem Weight(s) =	402.0	0.28	113.5
				Earth @ Stem Transitions =			
<b>Total</b>	<b>= 291.4</b>	<b>O.T.M. =</b>	<b>961.0</b>	Footing Weight =	412.5	1.38	567.2
				Key Weight =			
				Vert. Component =			
<b>Resisting/Overturning Ratio</b>		<b>= 1.52</b>		<b>Total =</b>	<b>1,272.8 lbs</b>	<b>R.M. =</b>	<b>1,463.7</b>
Vertical Loads used for Soil Pressure =		1,342.4 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

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

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

**Tilt**

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

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci  
Horizontal Defl @ Top of Wall (approximate only) 0.126 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.





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Rebar Lap & Embedment Lengths Information**

Stem Design Segment: 2nd

Stem Design Height: 2.00 ft above top of footing

$K_{cover}=5.375$ ,  $K_{spacing}=40$ ,  $K_{diam}=4.5$ , and  $K_{min}=4.5$

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) =

20.00 in

Development length for #4 bar specified in this stem design segment =

12.00 in

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

$K_{cover}=2.245$ ,  $K_{spacing}=32$ ,  $K_{diam}=4.5$ , and  $K_{min}=2.245$

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) =

22.43 in

Development length for #4 bar specified in this stem design segment =

22.43 in

Hooked embedment length into footing for #4 bar specified in this stem design segment =

8.40 in

As Provided =

0.0750 in<sup>2</sup>/ft

As Required =

0.0536 in<sup>2</sup>/ft



**Cantilevered Retaining Wall**

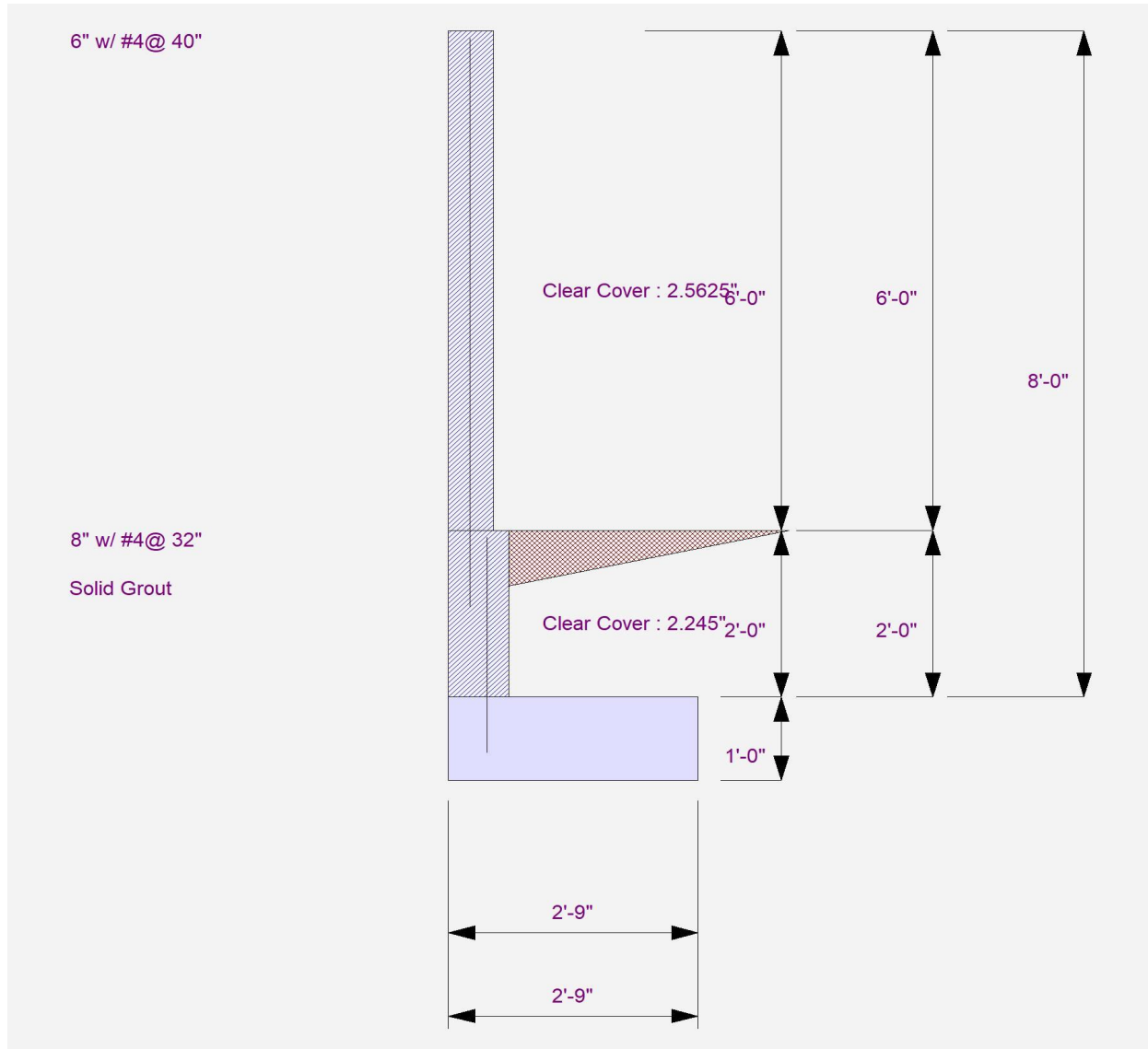
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**





**Cantilevered Retaining Wall**

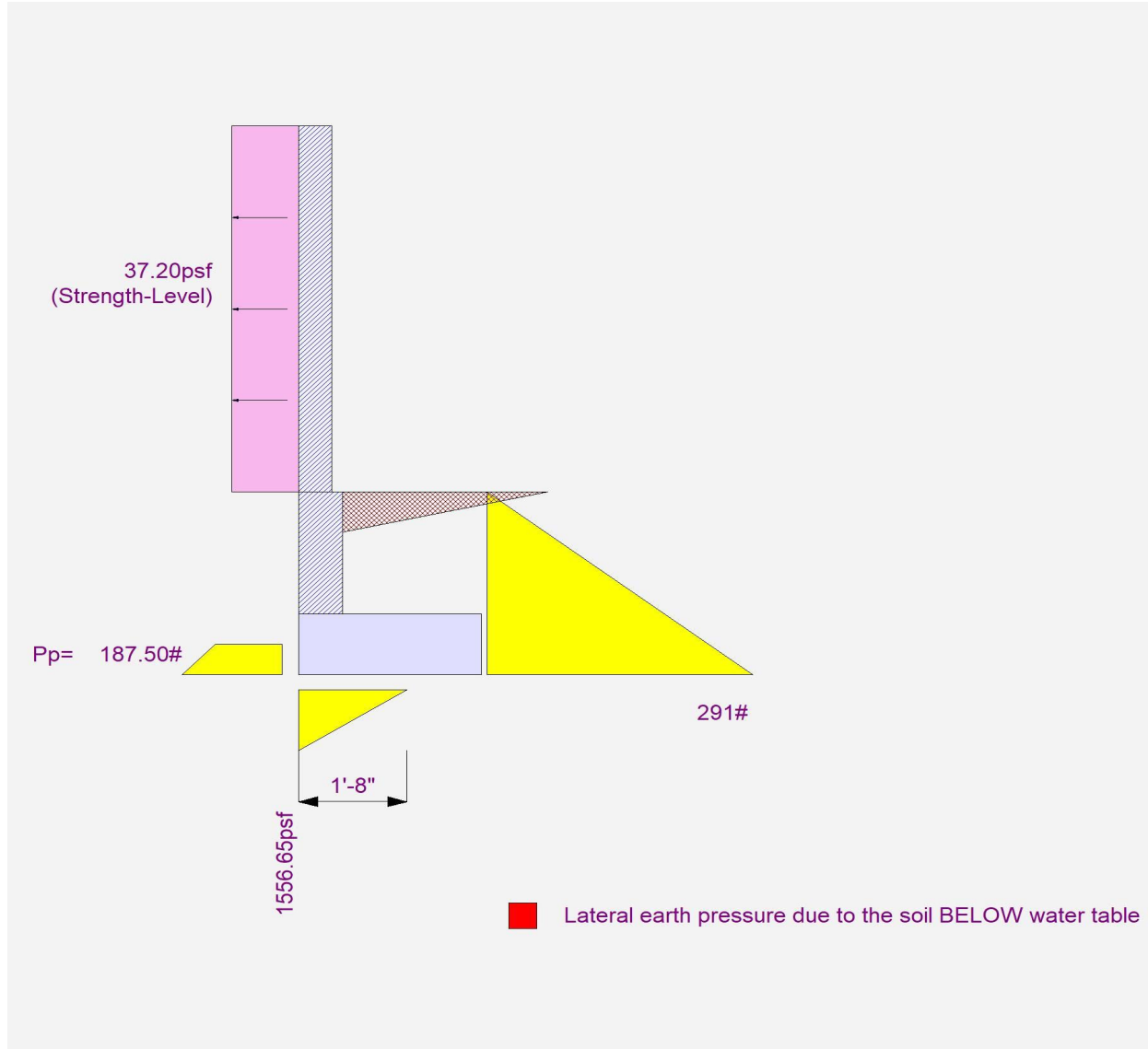
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION:** 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)

**Code Reference**

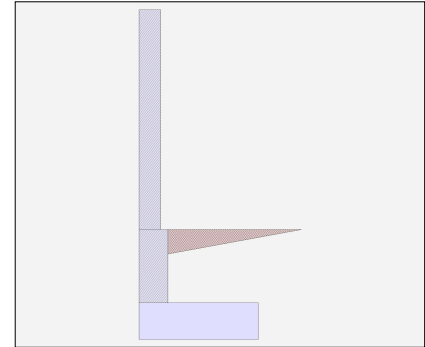
Calculations per IBC 2021 1807.3, ASCE 7-16

**Criteria**

Retained Height	=	2.00 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

**Soil Data**

Allow Soil Bearing	=	1,600.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing  Soil Friction	=	0.490
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	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

**Lateral Load Applied to Stem**

Lateral Load	=	32.0 #/ft
...Height to Top	=	8.00 ft
...Height to Bottom	=	2.00 ft
Load Type	=	Seismic (E) (Strength Level)
Wind on Exposed Stem	=	0.0 psf (Strength 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Design Summary**

**Wall Stability Ratios**

Overturning	=	1.52	OK
Sliding	=	2.78	OK
Global Stability	=	4.37	
Total Bearing Load	=	1,342 lbs	
...resultant ecc.	=	9.99 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,563 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	1,600 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,188 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	6.2 psi	OK
Footing Shear @ Heel	=	2.5 psi	OK
Allowable	=	75.0 psi	

**Sliding Calcs**

Lateral Sliding Force	=	291.9 lbs	
less 100% Passive Force	=	187.5 lbs	
less 100% Friction Force	=	623.7 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

Vertical component of active lateral soil pressure IS considered in the calculation of soil bearing pressures.

**Load Factors**

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

**Stem Construction**

**Design Height Above Ftg**

ft =	Stem OK	Stem OK		
	2.00	0.00		
Wall Material Above "Ht"	=	Masonry	Masonry	
Design Method	=	SD	SD	SD SD
Thickness	=	6.00	8.00	
Rebar Size	=	# 4	# 4	
Rebar Spacing	=	40.00	32.00	
Rebar Placed at	=	Center	5.13 i	

**Design Data**

fb/FB + fa/Fa	=	0.797	0.618
---------------	---	-------	-------

**Total Force @ Section**

Service Level	lbs =		
Strength Level	lbs =	192.0	304.0

**Moment....Actual**

Service Level	ft-# =		
Strength Level	ft-# =	576.0	1,034.7
Moment.....Allowable	ft-# =	721.9	1,672.8

**Shear....Actual**

Service Level	psi =		
Strength Level	psi =	13.7	3.3
Shear.....Allowable	psi =	69.7	69.7
Anet (Masonry)	in2 =	14.03	91.50
Wall Weight	psf =	41.0	78.0
Rebar Depth 'd'	in =	2.81	5.13

**Masonry Data**

f'm	psi =	1,500	1,500
Fy	psi =	60,000	60,000
Solid Grouting	=	No	Yes
Modular Ratio 'n'	=	21.48	21.48
Equiv. Solid Thick.	in =	3.25	7.63
Masonry Block Type	=		
Masonry Design Method	=	SD	

**Concrete Data**

f'c	psi =	
Fy	psi =	



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Footing Data**

Toe Width	=	0.00 ft
Heel Width	=	2.75
Total Footing Width	=	2.75
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
$f_c$	=	2,500 psi
$F_y$	=	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	= 2,188	0 psf
$\mu_u$ : Upward	= 0	199 ft-#
$\mu_u$ : Downward	= 0	1,118 ft-#
$\mu_u$ : Design	= 0 OK	918 ft-# OK
$\phi M_n$	= OK - Flush	2,500
Actual 1-Way Shear	= 6.17	2.53 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= Flush toe condition. No reinforcing required.	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	
Footing Torsion, $T_u$	=	0.00 ft-lbs
Footing Allow. Torsion, $\phi T_u$	=	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Flush toe condition. No reinforcing required.

Heel:  $\phi M_n = \phi * 5 * \lambda * \sqrt{f_c} * S_m$

Key: No key defined

Min footing T&S reinf Area	0.71	in <sup>2</sup>
Min footing T&S reinf Area per foot	0.26	in <sup>2</sup> /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: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**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)	157.5	1.00	157.5	Soil Over HL (ab. water tbl)	458.3	1.71	783.0
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.71	783.0
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 =			
Added Lateral Load =	134.4	6.00	806.4	* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =			
				Surcharge Over Toe =			
				Stem Weight(s) =	402.0	0.28	113.5
				Earth @ Stem Transitions =			
<b>Total</b>	= 291.9	<b>O.T.M.</b>	= 963.9	Footing Weight =	412.5	1.38	567.2
				Key Weight =			
				Vert. Component =			
<b>Resisting/Overturning Ratio</b>		=	<b>1.52</b>	<b>Total =</b>	<b>1,272.8 lbs</b>	<b>R.M.=</b>	<b>1,463.7</b>
Vertical Loads used for Soil Pressure =		1,342.4 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

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

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

**Tilt**

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

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci  
Horizontal Defl @ Top of Wall (approximate only) 0.126 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.



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION: 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Rebar Lap & Embedment Lengths Information**

Stem Design Segment: 2nd

Stem Design Height: 2.00 ft above top of footing

$K_{cover}=5.375$ ,  $K_{spacing}=40$ ,  $K_{diam}=4.5$ , and  $K_{min}=4.5$

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 20.00 in

Development length for #4 bar specified in this stem design segment = 12.00 in

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

$K_{cover}=2.245$ ,  $K_{spacing}=32$ ,  $K_{diam}=4.5$ , and  $K_{min}=2.245$

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 22.43 in

Development length for #4 bar specified in this stem design segment = 22.43 in

Hooked embedment length into footing for #4 bar specified in this stem design segment = 8.40 in

As Provided = 0.0750 in<sup>2</sup>/ft

As Required = 0.0466 in<sup>2</sup>/ft





**Cantilevered Retaining Wall**

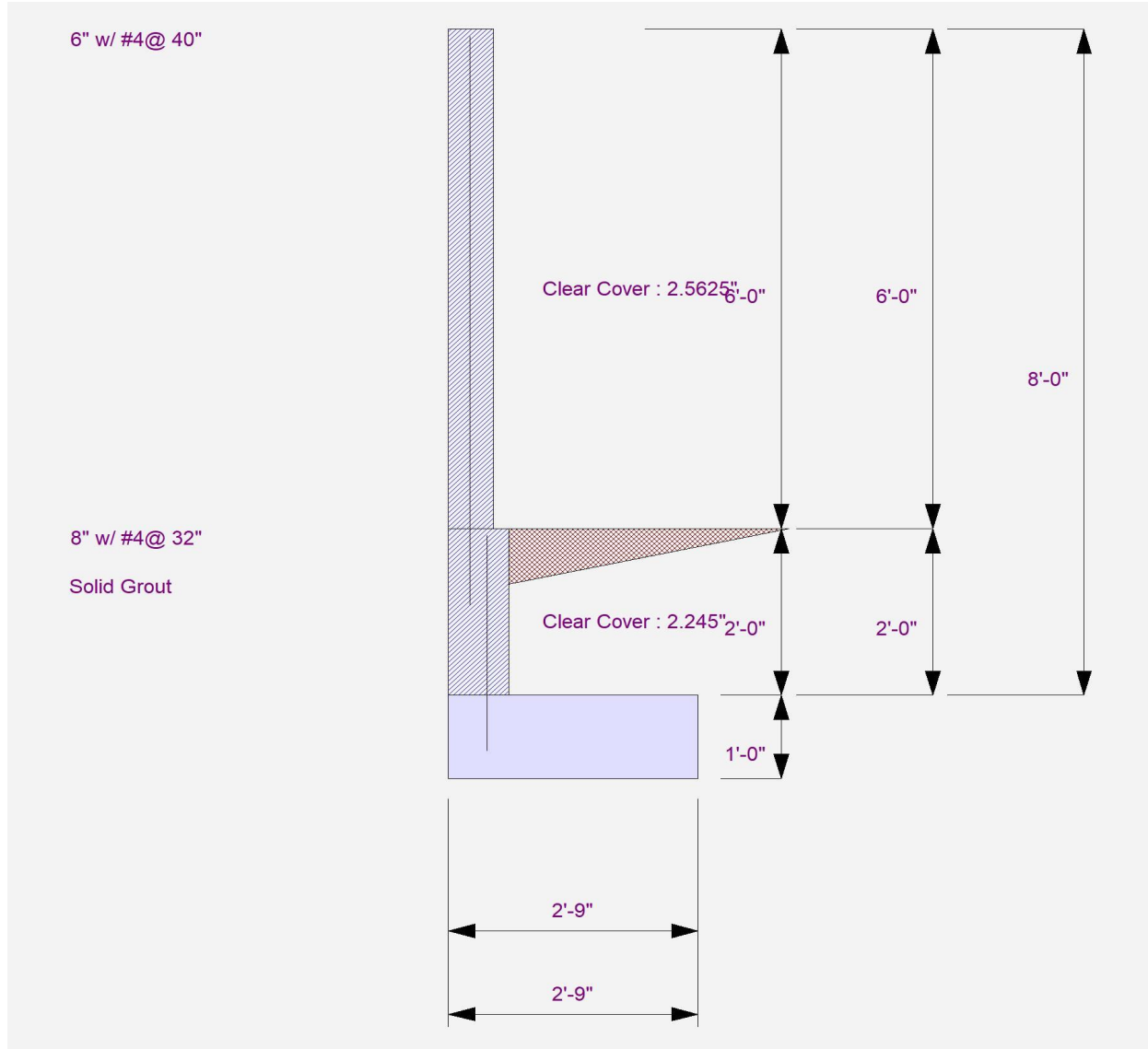
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION: 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**



**Cantilevered Retaining Wall**

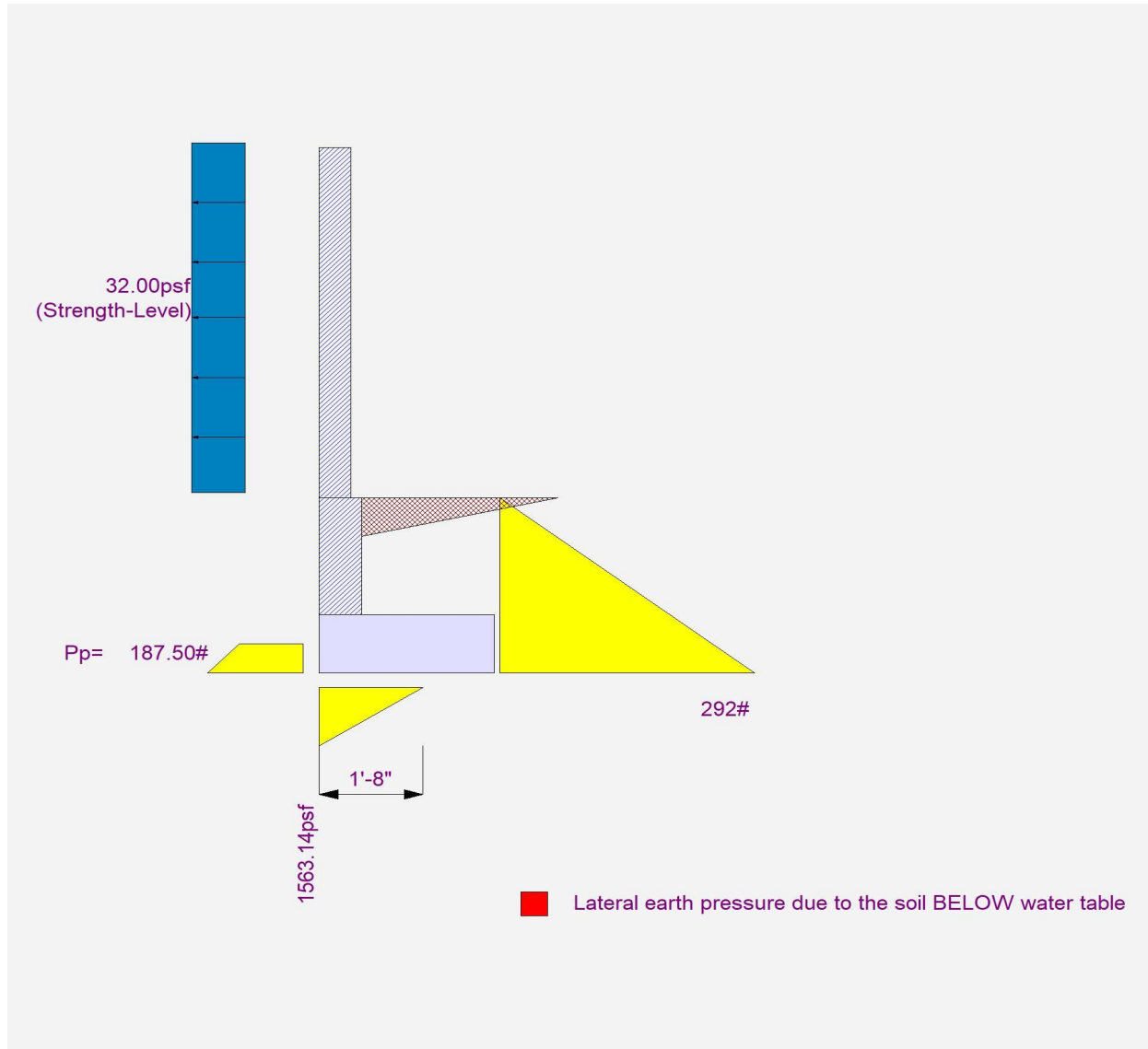
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION:** 2'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION:** 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)

**Code Reference**

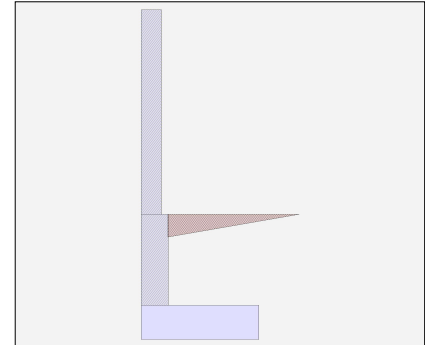
Calculations per IBC 2021 1807.3, ASCE 7-16

**Criteria**

Retained Height	=	2.67 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

**Soil Data**

Allow Soil Bearing	=	1,600.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing  Soil Friction	=	0.490
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	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

**Lateral Load Applied to Stem**

Lateral Load	=	0.0 #/ft
...Height to Top	=	8.67 ft
...Height to Bottom	=	2.67 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	37.2 psf (Strength 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Design Summary**

**Wall Stability Ratios**

Overturning	=	1.66	OK
Sliding	=	2.57	OK
Global Stability	=	3.85	
Total Bearing Load	=	1,658 lbs	
...resultant ecc.	=	9.18 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,492 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	1,600 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,088 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	6.2 psi	OK
Footing Shear @ Heel	=	1.6 psi	OK
Allowable	=	75.0 psi	

**Sliding Calcs**

Lateral Sliding Force	=	369.6 lbs	
less 100% Passive Force	=	187.5 lbs	
less 100% Friction Force	=	761.5 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 considered in the calculation of soil bearing pressures.

**Load Factors**

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

**Stem Construction**

**Design Height Above Ftg**

ft =	Stem OK	Stem OK		
	2.67	0.00		
Wall Material Above "Ht"	=	Masonry	Masonry	
Design Method	=	SD	SD	SD SD
Thickness	=	6.00	8.00	
Rebar Size	=	# 4	# 4	
Rebar Spacing	=	40.00	32.00	
Rebar Placed at	=	Center	5.13 i	

**Design Data**

fb/FB + fa/Fa	=	<b>0.927</b>	<b>0.862</b>
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**Total Force @ Section**

Service Level	lbs =		
Strength Level	lbs =	223.2	422.8

**Moment....Actual**

Service Level	ft-# =		
Strength Level	ft-# =	669.6	1,443.2
Moment.....Allowable	ft-# =	721.9	1,672.8

**Shear.....Actual**

Service Level	psi =		
Strength Level	psi =	15.9	4.6
Shear.....Allowable	psi =	69.7	69.7
Anet (Masonry)	in2 =	14.03	91.50
Wall Weight	psf =	41.0	78.0
Rebar Depth 'd'	in =	2.81	5.13

**Masonry Data**

f'm	psi =	1,500	1,500
Fy	psi =	60,000	60,000
Solid Grouting	=	No	Yes
Modular Ratio 'n'	=	21.48	21.48
Equiv. Solid Thick.	in =	3.25	7.63
Masonry Block Type	=		
Masonry Design Method	=	SD	

**Concrete Data**

f'c	psi =	
Fy	psi =	



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Footing Data**

Toe Width	=	0.00 ft
Heel Width	=	2.92
Total Footing Width	=	2.92
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
$f_c$	=	2,500 psi
$F_y$	=	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	= 2,088	0 psf
$\mu_u$ : Upward	= 0	475 ft-#
$\mu_u$ : Downward	= 0	1,552 ft-#
$\mu_u$ : Design	= 0 OK	1,076 ft-# OK
$\phi M_n$	= OK - Flush	2,500
Actual 1-Way Shear	= 6.17	1.61 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= Flush toe condition. No reinforcing required.	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	
Footing Torsion, $T_u$	=	0.00 ft-lbs
Footing Allow. Torsion, $\phi T_u$	=	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Flush toe condition. No reinforcing required.

Heel:  $\phi M_n = \phi * 5 * \lambda * \sqrt{f_c} * S_m$

Key: No key defined

Min footing T&S reinf Area	0.76	in <sup>2</sup>
Min footing T&S reinf Area per foot	0.26	in <sup>2</sup> /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: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**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)	235.7	1.22	288.3	Soil Over HL (ab. water tbl)	661.8	1.79	1,186.8
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.79	1,186.8
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 =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	133.9	6.67	893.2	Soil Over Toe =			
				Surcharge Over Toe =			
				Stem Weight(s) =	454.3	0.29	130.9
				Earth @ Stem Transitions =			
<b>Total</b>	<b>= 369.6</b>	<b>O.T.M. =</b>	<b>1,181.6</b>	Footing Weight =	438.0	1.46	639.5
				Key Weight =			
				Vert. Component =			
<b>Resisting/Overturning Ratio</b>		<b>= 1.66</b>		<b>Total =</b>	<b>1,554.1 lbs</b>	<b>R.M. =</b>	<b>1,957.2</b>
Vertical Loads used for Soil Pressure =		1,658.1 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

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

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

**Tilt**

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

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci  
Horizontal Defl @ Top of Wall (approximate only) 0.123 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.



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Rebar Lap & Embedment Lengths Information**

Stem Design Segment: 2nd

Stem Design Height: 2.67 ft above top of footing

K\_cover=5.375, K\_spacing=40, K\_diam=4.5, and K\_min=4.5

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) =

20.00 in

Development length for #4 bar specified in this stem design segment =

12.00 in

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

K\_cover=2.245, K\_spacing=32, K\_diam=4.5, and K\_min=2.245

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) =

22.43 in

Development length for #4 bar specified in this stem design segment =

22.43 in

Hooked embedment length into footing for #4 bar specified in this stem design segment =

8.40 in

As Provided =

0.0750 in2/ft

As Required =

0.0650 in2/ft



**Cantilevered Retaining Wall**

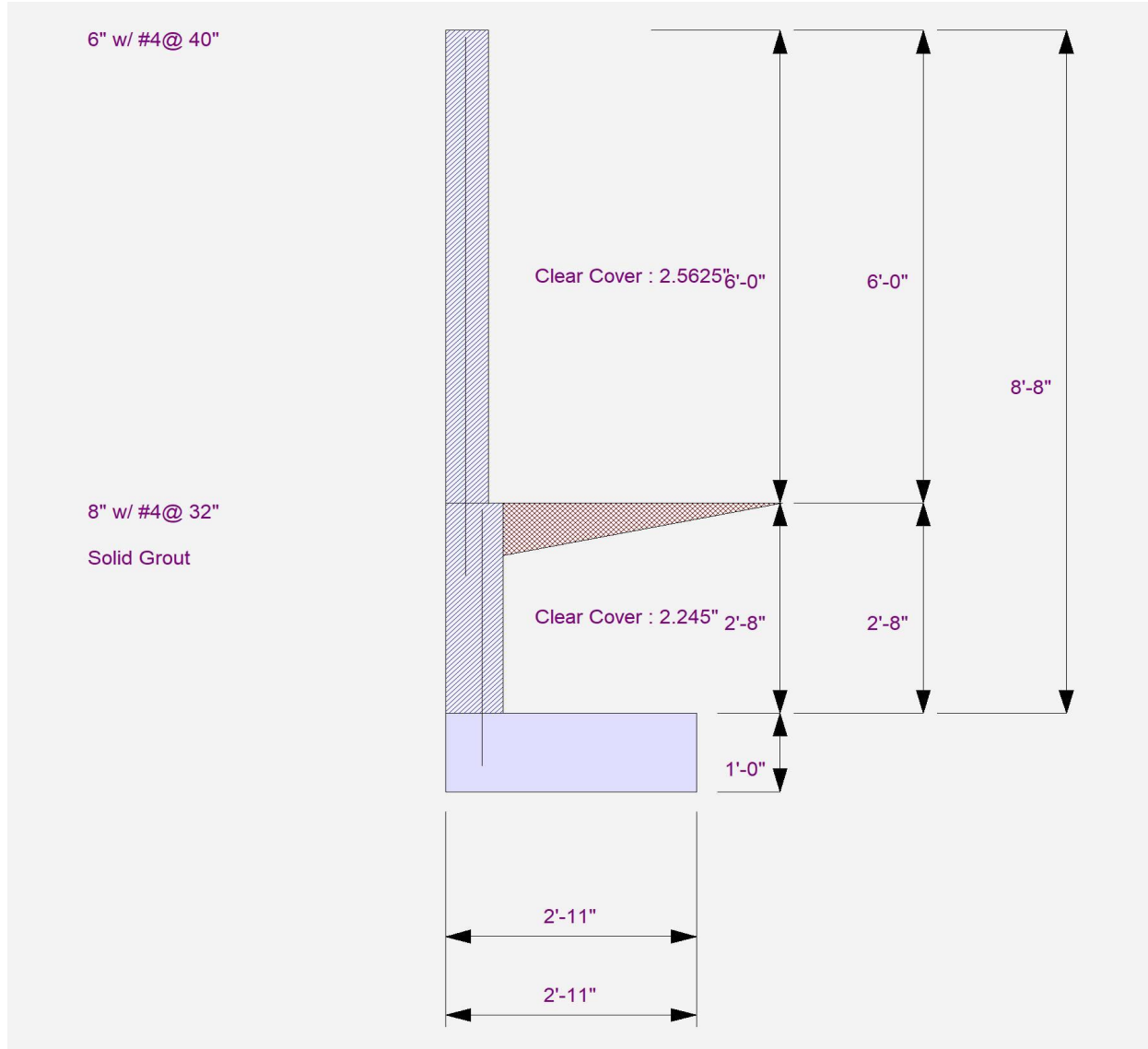
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

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**DESCRIPTION: 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**



**Cantilevered Retaining Wall**

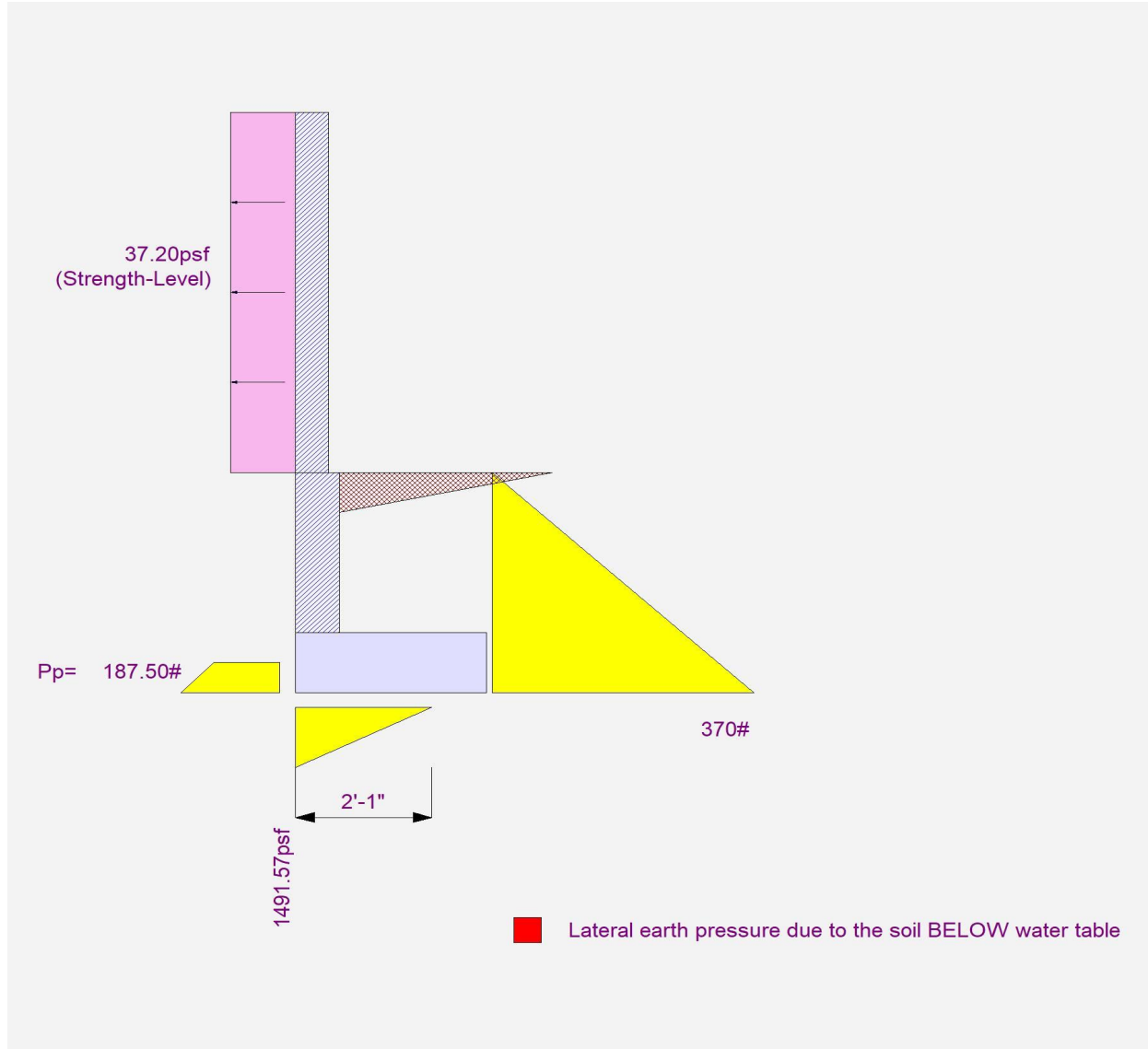
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

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**DESCRIPTION: 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION:** 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)

**Code Reference**

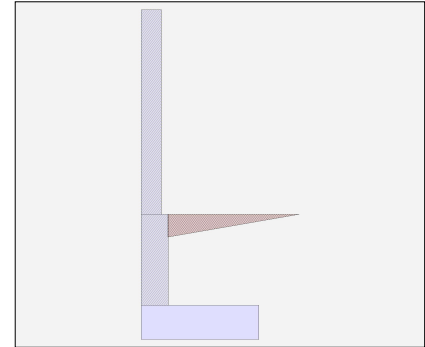
Calculations per IBC 2021 1807.3, ASCE 7-16

**Criteria**

Retained Height	=	2.67 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

**Soil Data**

Allow Soil Bearing	=	1,600.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing  Soil Friction	=	0.490
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	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

**Lateral Load Applied to Stem**

Lateral Load	=	32.0 #/ft
...Height to Top	=	8.67 ft
...Height to Bottom	=	2.67 ft
Load Type	=	Seismic (E) (Strength Level)
Wind on Exposed Stem	=	0.0 psf (Strength 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Design Summary**

**Wall Stability Ratios**

Overturning	=	1.65	OK
Sliding	=	2.56	OK
Global Stability	=	3.85	
Total Bearing Load	=	1,658 lbs	
...resultant ecc.	=	9.21 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,496 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	1,600 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,094 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	6.2 psi	OK
Footing Shear @ Heel	=	1.6 psi	OK
Allowable	=	75.0 psi	

**Sliding Calcs**

Lateral Sliding Force	=	370.1 lbs	
less 100% Passive Force	=	187.5 lbs	
less 100% Friction Force	=	761.5 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 considered in the calculation of soil bearing pressures.

**Load Factors**

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

**Stem Construction**

**Design Height Above Ftg**

ft =	Stem OK	Stem OK		
	2.67	0.00		
Wall Material Above "Ht"	=	Masonry	Masonry	
Design Method	=	SD	SD	SD SD
Thickness	=	6.00	8.00	
Rebar Size	=	# 4	# 4	
Rebar Spacing	=	40.00	32.00	
Rebar Placed at	=	Center	5.13 i	

**Design Data**

fb/FB + fa/Fa	=	0.797	0.756
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**Total Force @ Section**

Service Level	lbs =		
Strength Level	lbs =	192.0	391.6

**Moment....Actual**

Service Level	ft-# =		
Strength Level	ft-# =	576.0	1,266.3
Moment.....Allowable	ft-# =	721.9	1,672.8

**Shear.....Actual**

Service Level	psi =		
Strength Level	psi =	13.7	4.3
Shear.....Allowable	psi =	69.7	69.7
Anet (Masonry)	in2 =	14.03	91.50
Wall Weight	psf =	41.0	78.0
Rebar Depth 'd'	in =	2.81	5.13

**Masonry Data**

f'm	psi =	1,500	1,500
Fy	psi =	60,000	60,000
Solid Grouting	=	No	Yes
Modular Ratio 'n'	=	21.48	21.48
Equiv. Solid Thick.	in =	3.25	7.63
Masonry Block Type	=		
Masonry Design Method	=	SD	

**Concrete Data**

f'c	psi =	
Fy	psi =	





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Footing Data**

Toe Width	=	0.00 ft
Heel Width	=	2.92
Total Footing Width	=	2.92
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
$f'_c$ =	2,500 psi	$F_y$ = 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	= 2,094	0 psf
$\mu_u$ : Upward	= 0	472 ft-#
$\mu_u$ : Downward	= 0	1,552 ft-#
$\mu_u$ : Design	= 0 OK	1,080 ft-# OK
$\phi M_n$	= OK - Flush	2,500
Actual 1-Way Shear	= 6.17	1.64 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= Flush toe condition. No reinforcing required.	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	
Footing Torsion, $T_u$	=	0.00 ft-lbs
Footing Allow. Torsion, $\phi T_u$	=	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Flush toe condition. No reinforcing required.

Heel:  $\phi M_n = \phi * 5 * \lambda * \sqrt{f'_c} * S_m$

Key: No key defined

Min footing T&S reinf Area	0.76	in <sup>2</sup>
Min footing T&S reinf Area per foot	0.26	in <sup>2</sup> /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: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**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)	235.7	1.22	288.3	Soil Over HL (ab. water tbl)	661.8	1.79	1,186.8
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.79	1,186.8
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 =			
Added Lateral Load =	134.4	6.67	896.4	* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =			
				Surcharge Over Toe =			
				Stem Weight(s) =	454.3	0.29	130.9
				Earth @ Stem Transitions =			
<b>Total</b>	<b>= 370.1</b>	<b>O.T.M. =</b>	<b>1,184.8</b>	Footing Weight =	438.0	1.46	639.5
				Key Weight =			
				Vert. Component =			
<b>Resisting/Overturning Ratio</b>		<b>= 1.65</b>		<b>Total =</b>	<b>1,554.1 lbs</b>	<b>R.M. =</b>	<b>1,957.2</b>
Vertical Loads used for Soil Pressure =		1,658.1 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

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

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

**Tilt**

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

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci  
Horizontal Defl @ Top of Wall (approximate only) 0.123 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.



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION: 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Rebar Lap & Embedment Lengths Information**

Stem Design Segment: 2nd

Stem Design Height: 2.67 ft above top of footing

$K_{cover}=5.375$ ,  $K_{spacing}=40$ ,  $K_{diam}=4.5$ , and  $K_{min}=4.5$

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 20.00 in

Development length for #4 bar specified in this stem design segment = 12.00 in

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

$K_{cover}=2.245$ ,  $K_{spacing}=32$ ,  $K_{diam}=4.5$ , and  $K_{min}=2.245$

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 22.43 in

Development length for #4 bar specified in this stem design segment = 22.43 in

Hooked embedment length into footing for #4 bar specified in this stem design segment = 8.40 in

As Provided = 0.0750 in/ft

As Required = 0.0570 in/ft



**Cantilevered Retaining Wall**

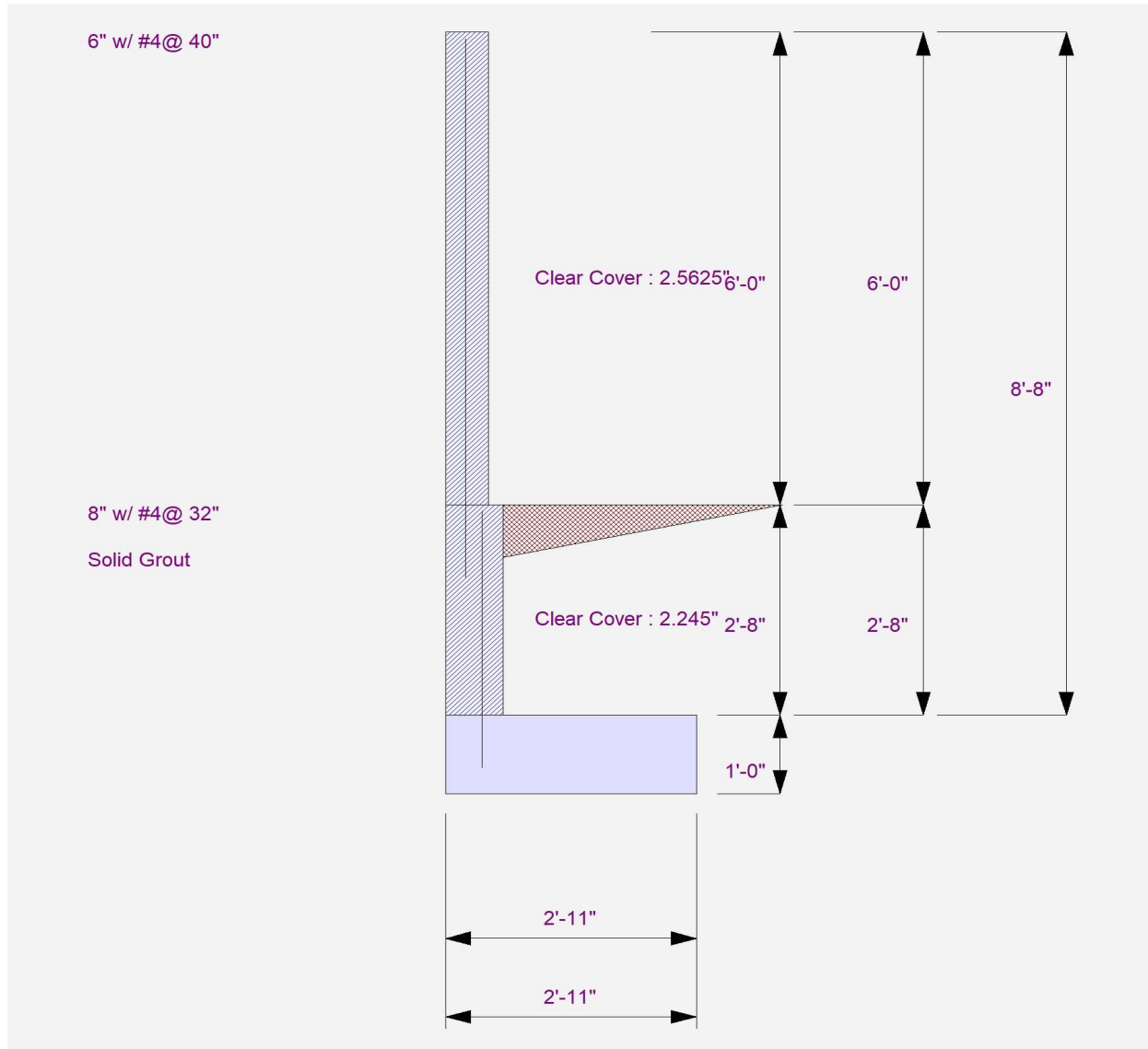
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION: 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**



**Cantilevered Retaining Wall**

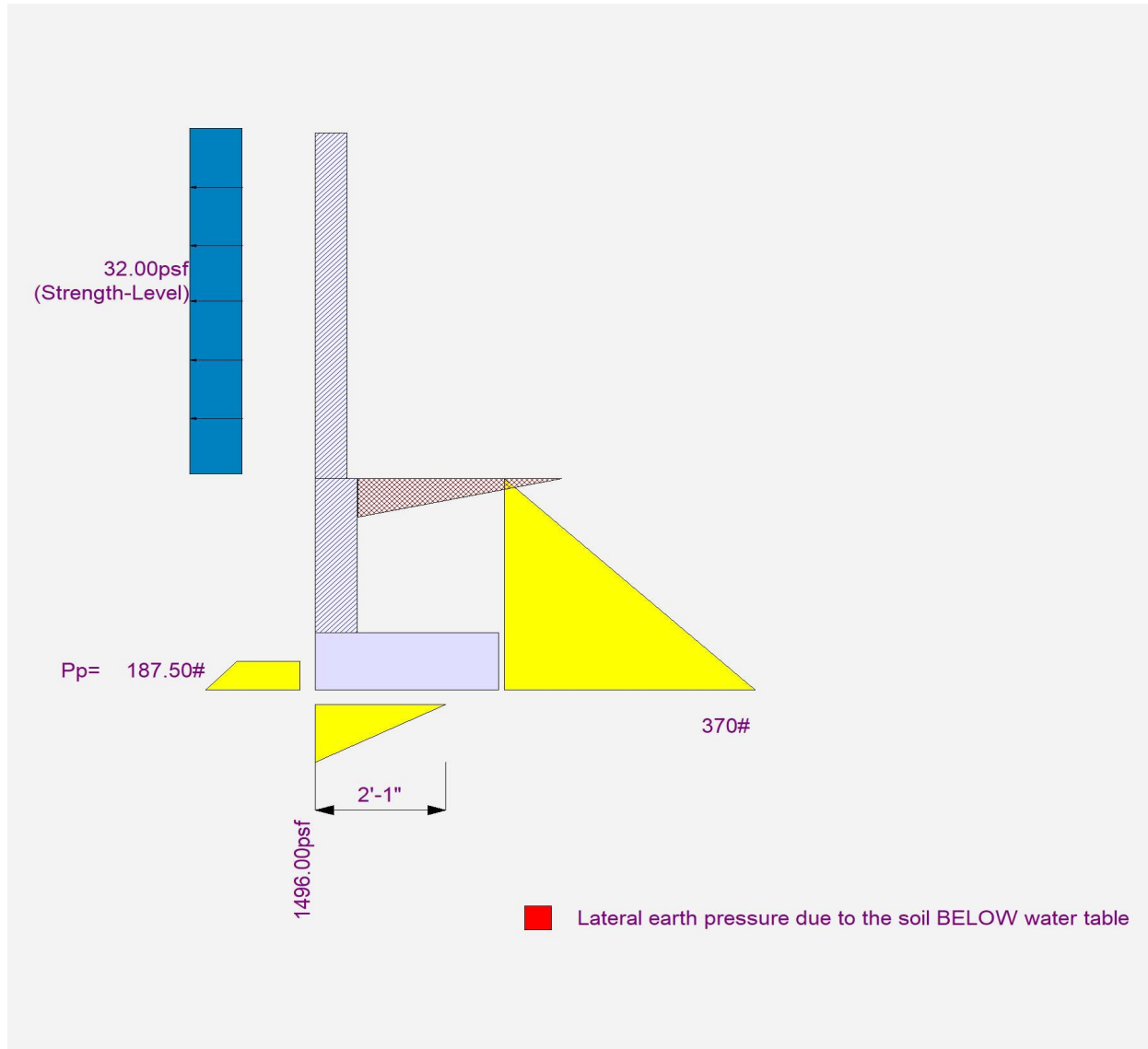
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION:** 2'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION:** 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)

**Code Reference**

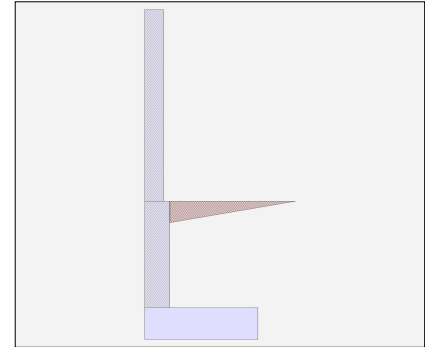
Calculations per IBC 2021 1807.3, ASCE 7-16

**Criteria**

Retained Height	=	3.33 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

**Soil Data**

Allow Soil Bearing	=	1,900.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing  Soil Friction	=	0.490
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	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

**Lateral Load Applied to Stem**

Lateral Load	=	0.0 #/ft
...Height to Top	=	9.33 ft
...Height to Bottom	=	3.33 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	37.2 psf (Strength 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Design Summary**

**Wall Stability Ratios**

Overturning	=	1.64	OK
Sliding	=	2.33	OK
Global Stability	=	3.41	
Total Bearing Load	=	1,955 lbs	
...resultant ecc.	=	8.92 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,596 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	1,900 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,234 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	6.2 psi	OK
Footing Shear @ Heel	=	1.5 psi	OK
Allowable	=	75.0 psi	

**Sliding Calcs**

Lateral Sliding Force	=	462.0 lbs	
less 100% Passive Force	=	187.5 lbs	
less 100% Friction Force	=	887.1 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 considered in the calculation of soil bearing pressures.

**Load Factors**

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

**Stem Construction**

**Design Height Above Ftg**

ft =	Stem OK	Stem OK		
	3.33	0.00		
Wall Material Above "Ht"	=	Masonry	Masonry	
Design Method	=	SD	SD	SD SD
Thickness	=	6.00	8.00	
Rebar Size	=	# 4	# 4	
Rebar Spacing	=	40.00	24.00	
Rebar Placed at	=	Center	5.13 i	

**Design Data**

fb/FB + fa/Fa	=	<b>0.927</b>	<b>0.797</b>
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**Total Force @ Section**

Service Level	lbs =		
Strength Level	lbs =	223.2	533.7

**Moment....Actual**

Service Level	ft-# =		
Strength Level	ft-# =	669.6	1,757.5
Moment.....Allowable	ft-# =	721.9	2,204.3

**Shear.....Actual**

Service Level	psi =		
Strength Level	psi =	15.9	5.8
Shear.....Allowable	psi =	69.7	69.7
Anet (Masonry)	in2 =	14.03	91.50
Wall Weight	psf =	41.0	78.0
Rebar Depth 'd'	in =	2.81	5.13

**Masonry Data**

f'm	psi =	1,500	1,500
Fy	psi =	60,000	60,000
Solid Grouting	=	No	Yes
Modular Ratio 'n'	=	21.48	21.48
Equiv. Solid Thick.	in =	3.25	7.63
Masonry Block Type	=		
Masonry Design Method	=	SD	

**Concrete Data**

f'c	psi =	
Fy	psi =	



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Footing Data**

Toe Width	=	0.00 ft
Heel Width	=	3.00
Total Footing Width	=	3.00
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
$f'_c$ =	2,500 psi	$F_y$ = 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	= 2,234	0 psf
$\mu_u$ : Upward	= 0	675 ft-#
$\mu_u$ : Downward	= 0	1,928 ft-#
$\mu_u$ : Design	= 0 OK	1,252 ft-# OK
$\phi M_n$	= OK - Flush	2,500
Actual 1-Way Shear	= 6.17	1.51 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= Flush toe condition. No reinforcing required.	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	
Footing Torsion, $T_u$	=	0.00 ft-lbs
Footing Allow. Torsion, $\phi T_u$	=	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Flush toe condition. No reinforcing required.

Heel:  $\phi M_n = \phi * 5 * \lambda * \sqrt{f'_c} * S_m$

Key: No key defined

Min footing T&S reinf Area	0.78	in <sup>2</sup>
Min footing T&S reinf Area per foot	0.26	in <sup>2</sup> /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: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**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)	328.1	1.44	473.6	Soil Over HL (ab. water tbl)	854.7	1.83	1,567.0
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.83	1,567.0
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 =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	133.9	7.33	981.6	Soil Over Toe =			
				Surcharge Over Toe =			
				Stem Weight(s) =	505.7	0.29	148.1
				Earth @ Stem Transitions =			
<b>Total</b>	<b>= 462.0</b>	<b>O.T.M. =</b>	<b>1,455.2</b>	Footing Weight =	450.0	1.50	675.0
				Key Weight =			
				Vert. Component =			
<b>Resisting/Overturning Ratio</b>		<b>= 1.64</b>		<b>Total =</b>	<b>1,810.4 lbs</b>	<b>R.M. =</b>	<b>2,390.0</b>
Vertical Loads used for Soil Pressure =		1,955.3 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

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

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

**Tilt**

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

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci  
Horizontal Defl @ Top of Wall (approximate only) 0.138 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.



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Rebar Lap & Embedment Lengths Information**

Stem Design Segment: 2nd

Stem Design Height: 3.33 ft above top of footing

$K_{cover}=5.375$ ,  $K_{spacing}=40$ ,  $K_{diam}=4.5$ , and  $K_{min}=4.5$

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) =

20.00 in

Development length for #4 bar specified in this stem design segment =

12.00 in

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

$K_{cover}=2.245$ ,  $K_{spacing}=24$ ,  $K_{diam}=4.5$ , and  $K_{min}=2.245$

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) =

22.43 in

Development length for #4 bar specified in this stem design segment =

22.43 in

Hooked embedment length into footing for #4 bar specified in this stem design segment =

8.40 in

As Provided =

0.1000 in<sup>2</sup>/ft

As Required =

0.0791 in<sup>2</sup>/ft



**Cantilevered Retaining Wall**

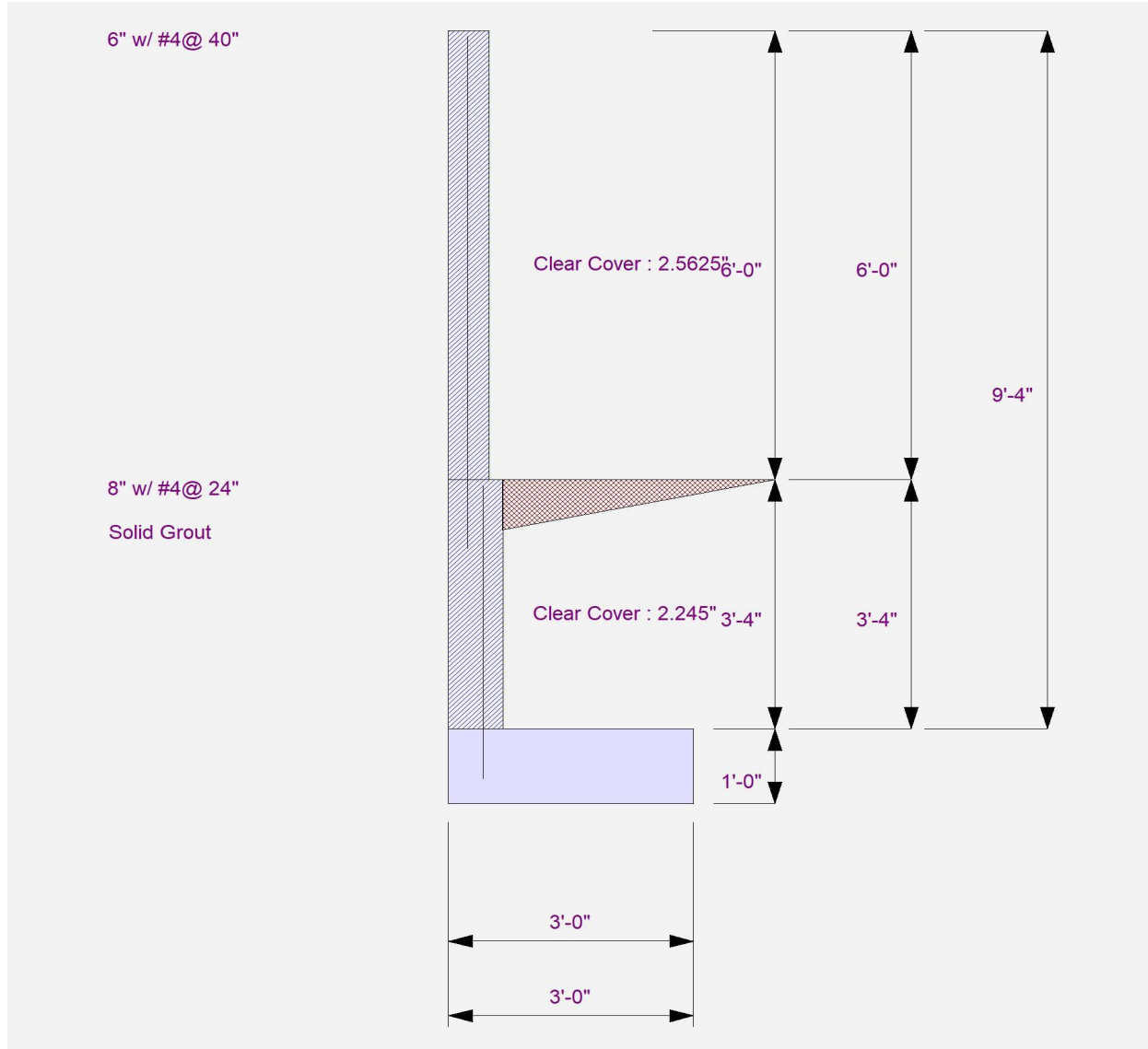
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

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**DESCRIPTION: 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**



**Cantilevered Retaining Wall**

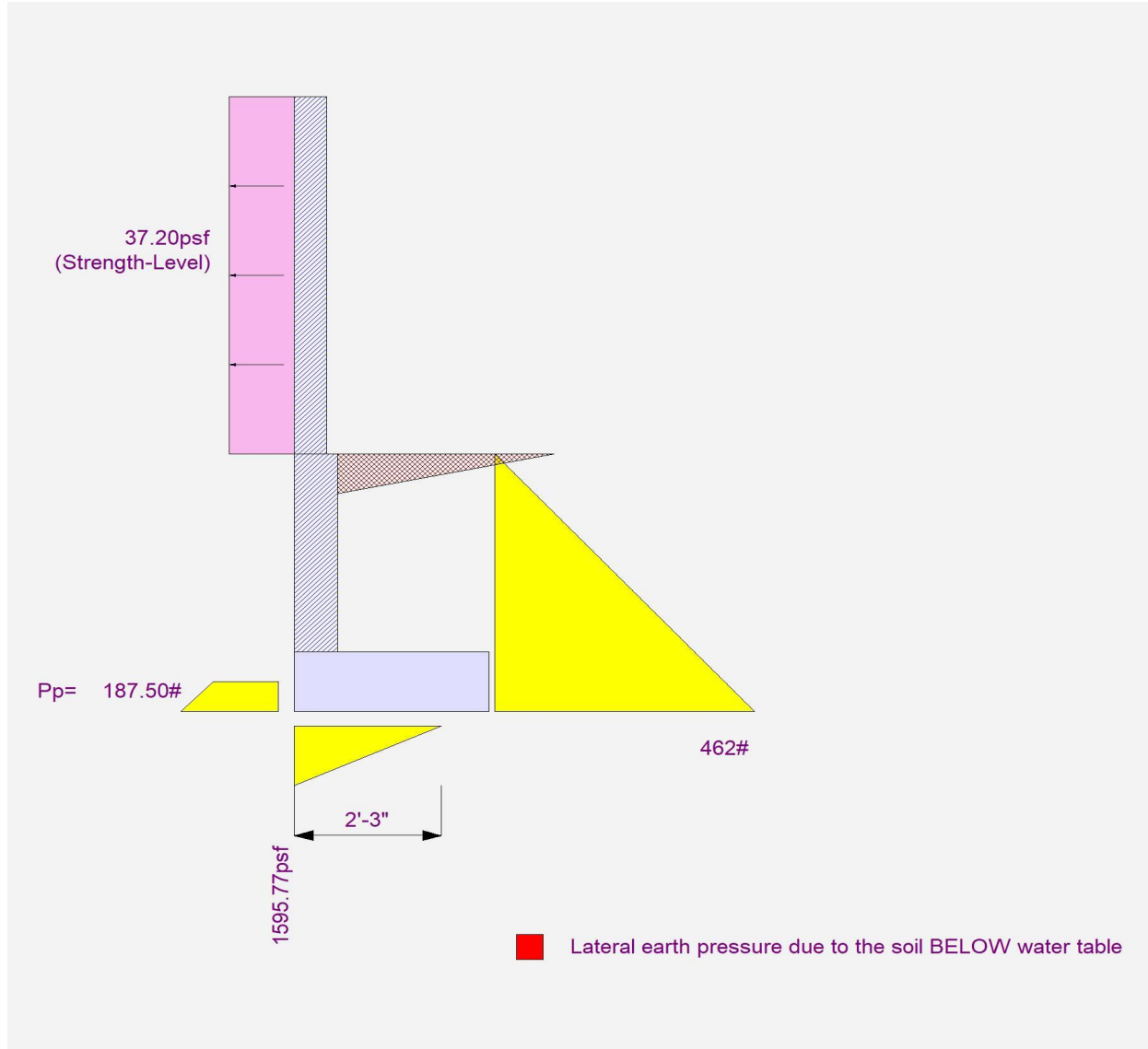
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

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**DESCRIPTION: 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**







**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION:** 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)

**Code Reference**

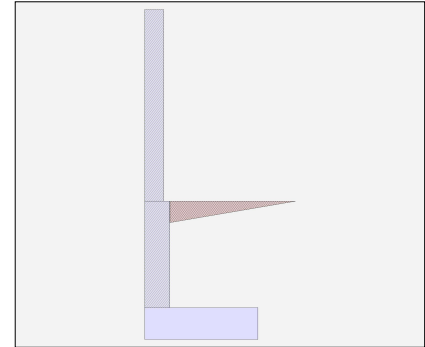
Calculations per IBC 2021 1807.3, ASCE 7-16

**Criteria**

Retained Height	=	3.33 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

**Soil Data**

Allow Soil Bearing	=	1,900.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing  Soil Friction	=	0.490
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	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

**Lateral Load Applied to Stem**

Lateral Load	=	32.0 #/ft
...Height to Top	=	9.33 ft
...Height to Bottom	=	3.33 ft
Load Type	=	Seismic (E) (Strength Level)
Wind on Exposed Stem	=	0.0 psf (Strength 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Design Summary**

**Wall Stability Ratios**

Overturning	=	1.64	OK
Sliding	=	2.32	OK
Global Stability	=	3.41	
Total Bearing Load	=	1,955 lbs	
...resultant ecc.	=	8.95 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,600 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	1,900 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,240 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	6.2 psi	OK
Footing Shear @ Heel	=	1.5 psi	OK
Allowable	=	75.0 psi	

**Sliding Calcs**

Lateral Sliding Force	=	462.5 lbs	
less 100% Passive Force	-	187.5 lbs	
less 100% Friction Force	= -	887.1 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 considered in the calculation of soil bearing pressures.

**Load Factors**

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

**Stem Construction**

**Design Height Above Ftg**

ft =	Stem OK	Stem OK		
	3.33	0.00		
Wall Material Above "Ht"	=	Masonry	Masonry	
Design Method	=	SD	SD	SD SD
Thickness	=	6.00	8.00	
Rebar Size	=	# 4	# 4	
Rebar Spacing	=	40.00	24.00	
Rebar Placed at	=	Center	5.13 i	

**Design Data**

fb/FB + fa/Fa	=	0.797	0.707
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**Total Force @ Section**

Service Level	lbs =		
Strength Level	lbs =	192.0	502.5

**Moment....Actual**

Service Level	ft-# =		
Strength Level	ft-# =	576.0	1,560.0
Moment.....Allowable	ft-# =	721.9	2,204.3

**Shear.....Actual**

Service Level	psi =		
Strength Level	psi =	13.7	5.5
Shear.....Allowable	psi =	69.7	69.7
Anet (Masonry)	in2 =	14.03	91.50
Wall Weight	psf =	41.0	78.0
Rebar Depth 'd'	in =	2.81	5.13

**Masonry Data**

f'm	psi =	1,500	1,500
Fy	psi =	60,000	60,000
Solid Grouting	=	No	Yes
Modular Ratio 'n'	=	21.48	21.48
Equiv. Solid Thick.	in =	3.25	7.63
Masonry Block Type	=		
Masonry Design Method	=	SD	

**Concrete Data**

f'c	psi =	
Fy	psi =	



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Footing Data**

Toe Width	=	0.00 ft
Heel Width	=	3.00
Total Footing Width	=	3.00
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
$f'_c$ =	2,500 psi	$F_y$ = 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	= 2,240	0 psf
$\mu_u$ : Upward	= 0	671 ft-#
$\mu_u$ : Downward	= 0	1,928 ft-#
$\mu_u$ : Design	= 0 OK	1,256 ft-# OK
$\phi M_n$	= OK - Flush	2,500
Actual 1-Way Shear	= 6.17	1.54 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= Flush toe condition. No reinforcing required.	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	
Footing Torsion, $T_u$	=	0.00 ft-lbs
Footing Allow. Torsion, $\phi T_u$	=	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Flush toe condition. No reinforcing required.

Heel:  $\phi M_n = \phi * 5 * \lambda * \sqrt{f'_c} * S_m$

Key: No key defined

Min footing T&S reinf Area	0.78	in <sup>2</sup>
Min footing T&S reinf Area per foot	0.26	in <sup>2</sup> /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: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**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)	328.1	1.44	473.6	Soil Over HL (ab. water tbl)	854.7	1.83	1,567.0
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.83	1,567.0
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 =			
Added Lateral Load =	134.4	7.33	985.2	* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =			
				Surcharge Over Toe =			
				Stem Weight(s) =	505.7	0.29	148.1
				Earth @ Stem Transitions =			
<b>Total</b>	<b>= 462.5</b>	<b>O.T.M. =</b>	<b>1,458.7</b>	Footing Weight =	450.0	1.50	675.0
				Key Weight =			
				Vert. Component =			
<b>Resisting/Overturning Ratio</b>		<b>= 1.64</b>		<b>Total =</b>	<b>1,810.4 lbs</b>	<b>R.M. =</b>	<b>2,390.0</b>
Vertical Loads used for Soil Pressure =		1,955.3 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

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

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

**Tilt**

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

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci  
Horizontal Defl @ Top of Wall (approximate only) 0.138 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.



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Rebar Lap & Embedment Lengths Information**

Stem Design Segment: 2nd

Stem Design Height: 3.33 ft above top of footing

K\_cover=5.375, K\_spacing=40, K\_diam=4.5, and K\_min=4.5

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) =

20.00 in

Development length for #4 bar specified in this stem design segment =

12.00 in

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

K\_cover=2.245, K\_spacing=24, K\_diam=4.5, and K\_min=2.245

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) =

22.43 in

Development length for #4 bar specified in this stem design segment =

22.43 in

Hooked embedment length into footing for #4 bar specified in this stem design segment =

8.40 in

As Provided =

0.1000 in<sup>2</sup>/ft

As Required =

0.0702 in<sup>2</sup>/ft



**Cantilevered Retaining Wall**

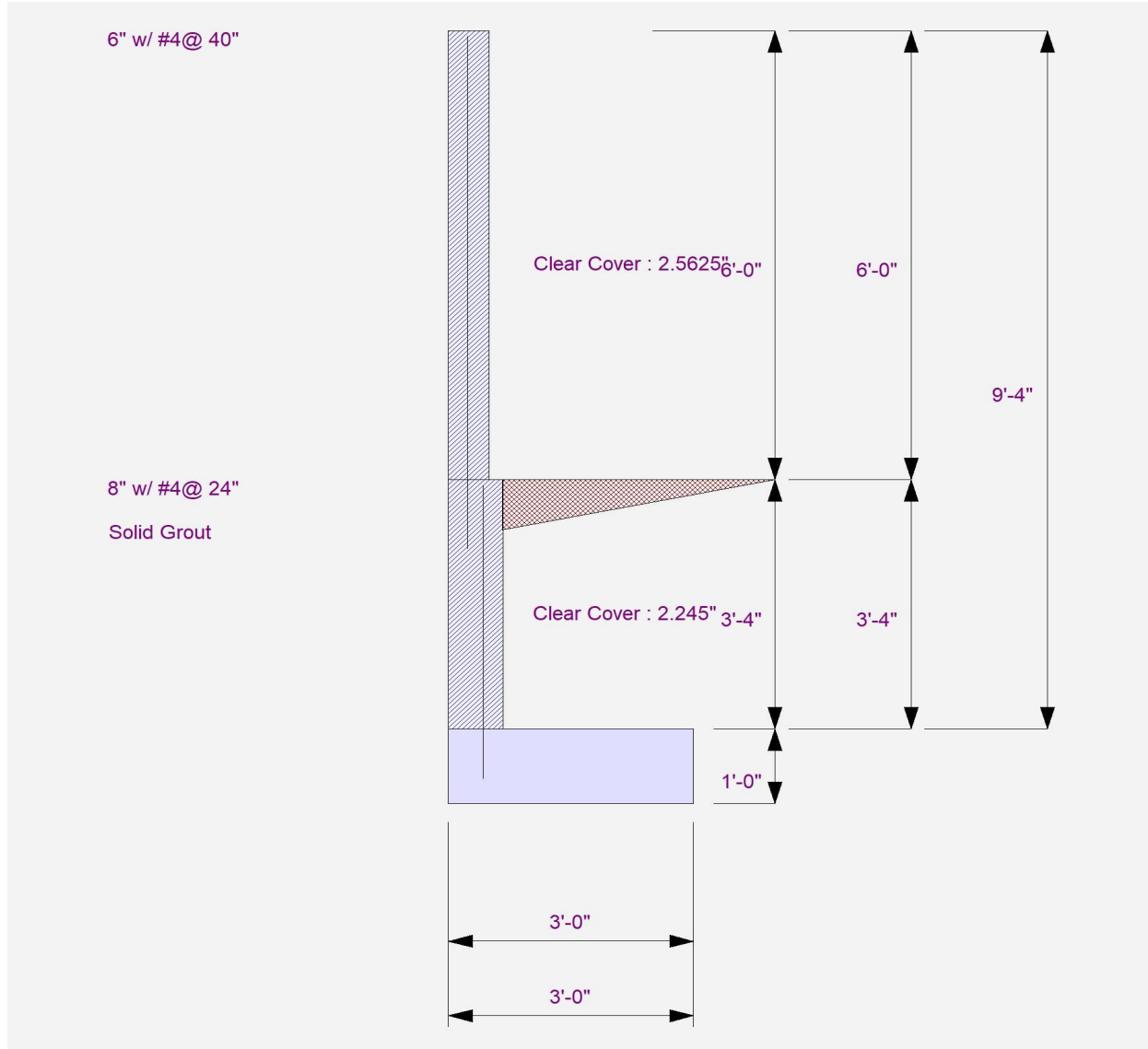
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**



**Cantilevered Retaining Wall**

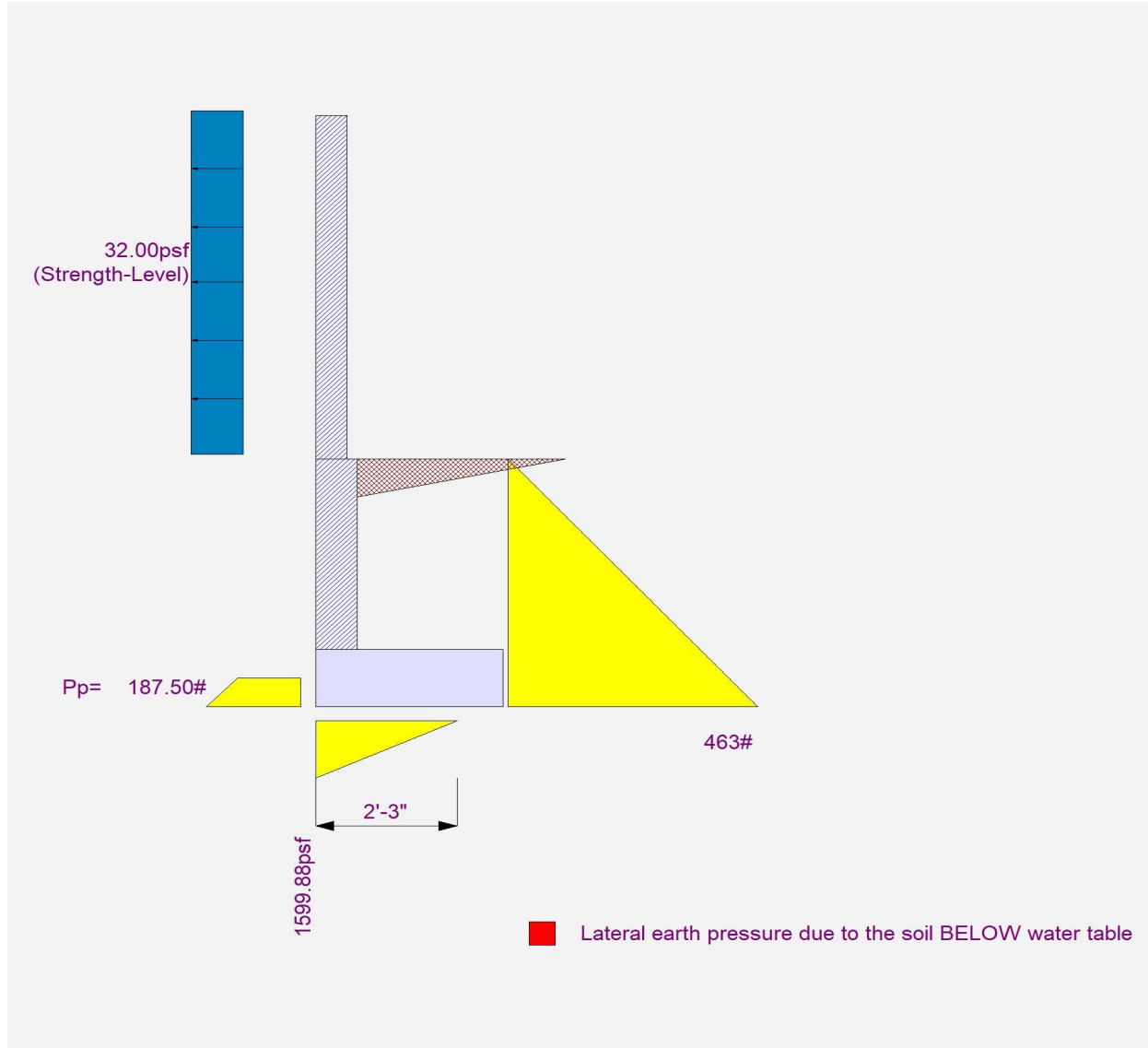
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION:** 3'-4" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)







**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION:** 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)

**Code Reference**

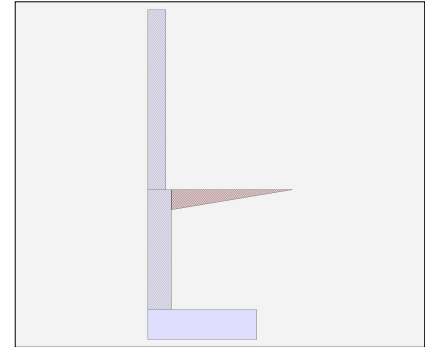
Calculations per IBC 2021 1807.3, ASCE 7-16

**Criteria**

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

**Soil Data**

Allow Soil Bearing	=	1,900.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing  Soil Friction	=	0.490
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	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

**Lateral Load Applied to Stem**

Lateral Load	=	0.0 #/ft
...Height to Top	=	10.00 ft
...Height to Bottom	=	4.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	37.2 psf (Strength 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Design Summary**

**Wall Stability Ratios**

Overturning	=	1.59	OK
Sliding	=	2.11	OK
Global Stability	=	3.07	
Total Bearing Load	=	2,275 lbs	
...resultant ecc.	=	8.91 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,740 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	1,900 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,436 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	6.2 psi	OK
Footing Shear @ Heel	=	1.6 psi	OK
Allowable	=	75.0 psi	

**Sliding Calcs**

Lateral Sliding Force	=	571.4 lbs	
less 100% Passive Force	=	187.5 lbs	
less 100% Friction Force	=	1,020.1 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 considered in the calculation of soil bearing pressures.

**Load Factors**

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

**Stem Construction**

**Design Height Above Ftg**

ft =	Stem OK	Stem OK		
	4.00	4.00		
Wall Material Above "Ht"	=	Masonry	Masonry	
Design Method	=	SD	SD	SD SD
Thickness	=	6.00	8.00	
Rebar Size	=	# 4	# 4	
Rebar Spacing	=	40.00	24.00	
Rebar Placed at	=	Center	5.13 i	

**Design Data**

fb/FB + fa/Fa	=	<b>0.927</b>	<b>0.979</b>
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**Total Force @ Section**

Service Level	lbs =		
Strength Level	lbs =	223.2	671.2

**Moment....Actual**

Service Level	ft-# =		
Strength Level	ft-# =	669.6	2,159.7
Moment.....Allowable	ft-# =	721.9	2,204.3

**Shear.....Actual**

Service Level	psi =		
Strength Level	psi =	15.9	7.3
Shear.....Allowable	psi =	69.7	69.7
Anet (Masonry)	in2 =	14.03	91.50
Wall Weight	psf =	41.0	78.0
Rebar Depth 'd'	in =	2.81	5.13

**Masonry Data**

f'm	psi =	1,500	1,500
Fy	psi =	60,000	60,000
Solid Grouting	=	No	Yes
Modular Ratio 'n'	=	21.48	21.48
Equiv. Solid Thick.	in =	3.25	7.63
Masonry Block Type	=		
Masonry Design Method	=	SD	

**Concrete Data**

f'c	psi =	
Fy	psi =	



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Footing Data**

Toe Width	=	0.00 ft
Heel Width	=	3.08
Total Footing Width	=	3.08
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
$f_c$	=	2,500 psi
$F_y$	=	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	= 2,436	0 psf
$\mu_u$ : Upward	= 0	873 ft-#
$\mu_u$ : Downward	= 0	2,347 ft-#
$\mu_u$ : Design	= 0 OK	1,474 ft-# OK
$\phi M_n$	= OK - Flush	2,500
Actual 1-Way Shear	= 6.17	1.60 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= Flush toe condition. No reinforcing required.	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	
Footing Torsion, $T_u$	=	0.00 ft-lbs
Footing Allow. Torsion, $\phi T_u$	=	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Flush toe condition. No reinforcing required.

Heel:  $\phi M_n = \phi * 5 * \lambda * \sqrt{f_c} * S_m$

Key: No key defined

Min footing T&S reinf Area	0.80	in <sup>2</sup>
Min footing T&S reinf Area per foot	0.26	in <sup>2</sup> /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: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**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)	437.5	1.67	729.2	Soil Over HL (ab. water tbl)	1,061.9	1.87	1,989.2
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.87	1,989.2
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 =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	133.9	8.00	1,071.4	Soil Over Toe =			
				Surcharge Over Toe =			
				Stem Weight(s) =	558.0	0.30	165.5
				Earth @ Stem Transitions =			
<b>Total</b>	<b>= 571.4</b>	<b>O.T.M. =</b>	<b>1,800.5</b>	Footing Weight =	462.0	1.54	711.5
				Key Weight =			
				Vert. Component =			
<b>Resisting/Overturning Ratio</b>		<b>= 1.59</b>		<b>Total =</b>	<b>2,081.9 lbs</b>	<b>R.M. =</b>	<b>2,866.2</b>
Vertical Loads used for Soil Pressure =		2,275.0 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

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

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

**Tilt**

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

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci  
Horizontal Defl @ Top of Wall (approximate only) 0.157 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.



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Rebar Lap & Embedment Lengths Information**

Stem Design Segment: 2nd

Stem Design Height: 4.00 ft above top of footing

K\_cover=5.375, K\_spacing=40, K\_diam=4.5, and K\_min=4.5

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 20.00 in

Development length for #4 bar specified in this stem design segment = 12.00 in

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Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

K\_cover=2.245, K\_spacing=24, K\_diam=4.5, and K\_min=2.245

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 22.43 in

Development length for #4 bar specified in this stem design segment = 22.43 in

Hooked embedment length into footing for #4 bar specified in this stem design segment = 8.40 in

As Provided = 0.1000 in<sup>2</sup>/ft

As Required = 0.0972 in<sup>2</sup>/ft



**Cantilevered Retaining Wall**

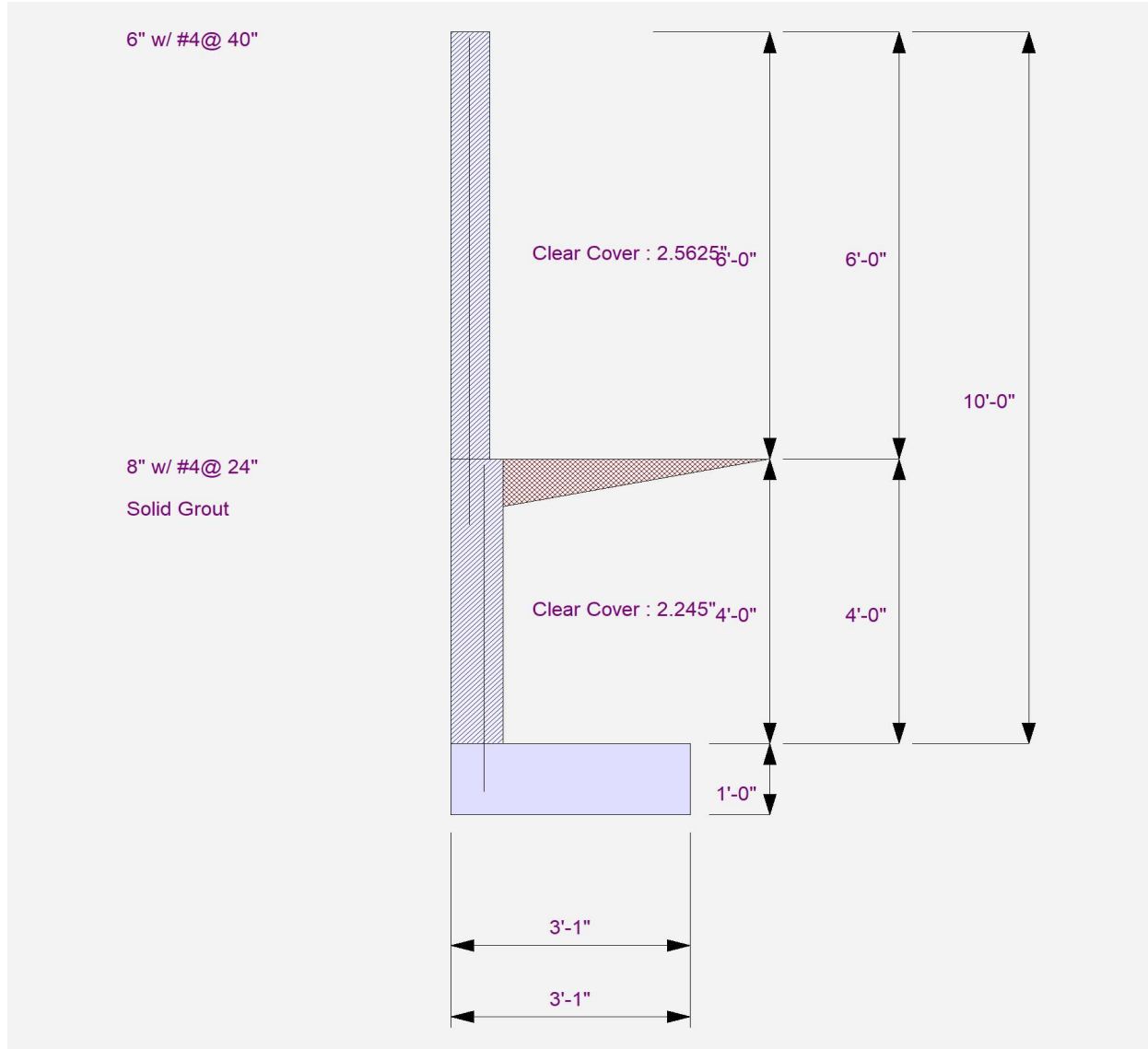
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION: 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**



**Cantilevered Retaining Wall**

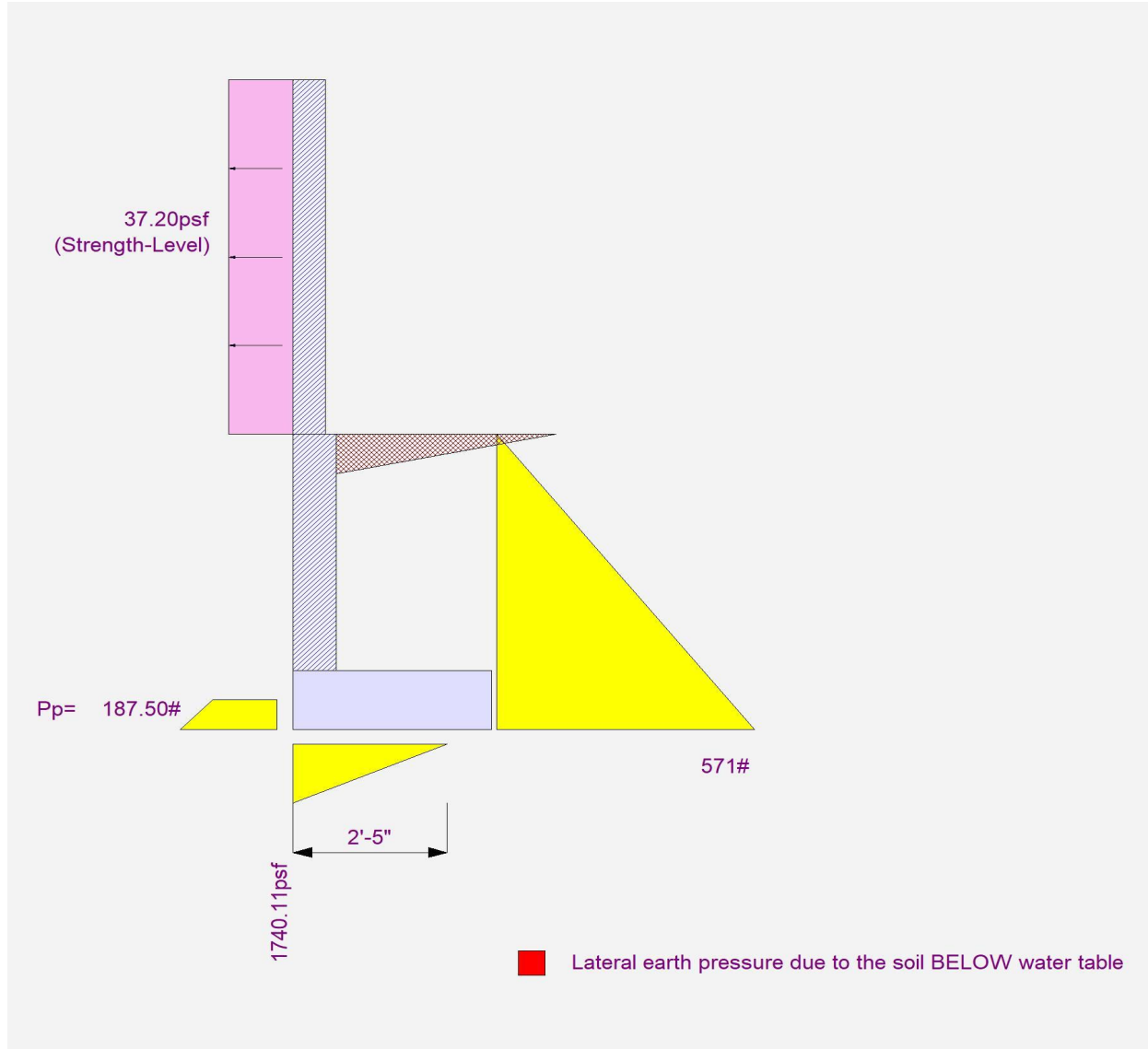
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION:** 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION:** 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)

**Code Reference**

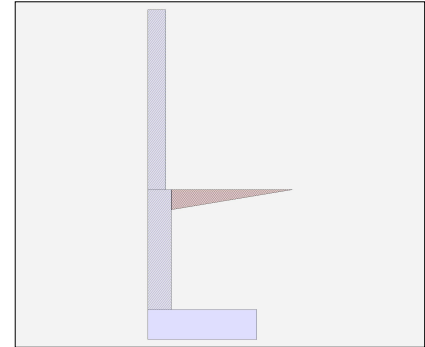
Calculations per IBC 2021 1807.3, ASCE 7-16

**Criteria**

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

**Soil Data**

Allow Soil Bearing	=	1,900.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing  Soil Friction	=	0.490
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	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

**Lateral Load Applied to Stem**

Lateral Load	=	32.0 #/ft
...Height to Top	=	10.00 ft
...Height to Bottom	=	4.00 ft
Load Type	=	Seismic (E) (Strength Level)
Wind on Exposed Stem	=	0.0 psf (Strength 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Design Summary**

**Wall Stability Ratios**

Overturning	=	1.59	OK
Sliding	=	2.11	OK
Global Stability	=	3.07	
Total Bearing Load	=	2,275 lbs	
...resultant ecc.	=	8.93 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,744 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	1,900 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,442 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	6.2 psi	OK
Footing Shear @ Heel	=	1.6 psi	OK
Allowable	=	75.0 psi	

**Sliding Calcs**

Lateral Sliding Force	=	571.9 lbs	
less 100% Passive Force	=	187.5 lbs	
less 100% Friction Force	=	1,020.1 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 considered in the calculation of soil bearing pressures.

**Load Factors**

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

**Stem Construction**

**Design Height Above Ftg**

ft =	Stem OK	Stem OK		
	4.00	4.00		
Wall Material Above "Ht"	=	Masonry	Masonry	
Design Method	=	SD	SD	SD SD
Thickness	=	6.00	8.00	
Rebar Size	=	# 4	# 4	
Rebar Spacing	=	40.00	24.00	
Rebar Placed at	=	Center	5.13 i	

**Design Data**

fb/FB + fa/Fa	=	0.797	0.880
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**Total Force @ Section**

Service Level	lbs =		
Strength Level	lbs =	192.0	640.0

**Moment....Actual**

Service Level	ft-# =		
Strength Level	ft-# =	576.0	1,941.3
Moment.....Allowable	ft-# =	721.9	2,204.3

**Shear.....Actual**

Service Level	psi =		
Strength Level	psi =	13.7	7.0
Shear.....Allowable	psi =	69.7	69.7
Anet (Masonry)	in2 =	14.03	91.50
Wall Weight	psf =	41.0	78.0
Rebar Depth 'd'	in =	2.81	5.13

**Masonry Data**

f'm	psi =	1,500	1,500
Fy	psi =	60,000	60,000
Solid Grouting	=	No	Yes
Modular Ratio 'n'	=	21.48	21.48
Equiv. Solid Thick.	in =	3.25	7.63
Masonry Block Type	=		
Masonry Design Method	=	SD	

**Concrete Data**

f'c	psi =	
Fy	psi =	



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Footing Data**

Toe Width	=	0.00 ft
Heel Width	=	3.08
Total Footing Width	=	3.08
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
$f'_c$ =	2,500 psi	$F_y$ = 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	= 2,442	0 psf
$\mu_u$ : Upward	= 0	868 ft-#
$\mu_u$ : Downward	= 0	2,347 ft-#
$\mu_u$ : Design	= 0 OK	1,478 ft-# OK
$\phi M_n$	= OK - Flush	2,500
Actual 1-Way Shear	= 6.17	1.62 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= Flush toe condition. No reinforcing required.	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	
Footing Torsion, $T_u$	=	0.00 ft-lbs
Footing Allow. Torsion, $\phi T_u$	=	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Flush toe condition. No reinforcing required.

Heel:  $\phi M_n = \phi * 5 * \lambda * \sqrt{f'_c} * S_m$

Key: No key defined

Min footing T&S reinf Area	0.80	in <sup>2</sup>
Min footing T&S reinf Area per foot	0.26	in <sup>2</sup> /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: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**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)	437.5	1.67	729.2	Soil Over HL (ab. water tbl)	1,061.9	1.87	1,989.2
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.87	1,989.2
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 =			
Added Lateral Load =	134.4	8.00	1,075.2	* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =			
				Surcharge Over Toe =			
				Stem Weight(s) =	558.0	0.30	165.5
				Earth @ Stem Transitions =			
<b>Total</b>	<b>= 571.9</b>	<b>O.T.M. =</b>	<b>1,804.4</b>	Footing Weight =	462.0	1.54	711.5
				Key Weight =			
				Vert. Component =			
<b>Resisting/Overturning Ratio</b>		<b>= 1.59</b>		<b>Total =</b>	<b>2,081.9 lbs</b>	<b>R.M. =</b>	<b>2,866.2</b>
Vertical Loads used for Soil Pressure =		2,275.0 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

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

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

**Tilt**

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

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci  
Horizontal Defl @ Top of Wall (approximate only) 0.157 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.



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Rebar Lap & Embedment Lengths Information**

Stem Design Segment: 2nd

Stem Design Height: 4.00 ft above top of footing

$K_{cover}=5.375$ ,  $K_{spacing}=40$ ,  $K_{diam}=4.5$ , and  $K_{min}=4.5$

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 20.00 in

Development length for #4 bar specified in this stem design segment = 12.00 in

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

$K_{cover}=2.245$ ,  $K_{spacing}=24$ ,  $K_{diam}=4.5$ , and  $K_{min}=2.245$

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 22.43 in

Development length for #4 bar specified in this stem design segment = 22.43 in

Hooked embedment length into footing for #4 bar specified in this stem design segment = 8.40 in

As Provided = 0.1000 in<sup>2</sup>/ft

As Required = 0.0874 in<sup>2</sup>/ft



**Cantilevered Retaining Wall**

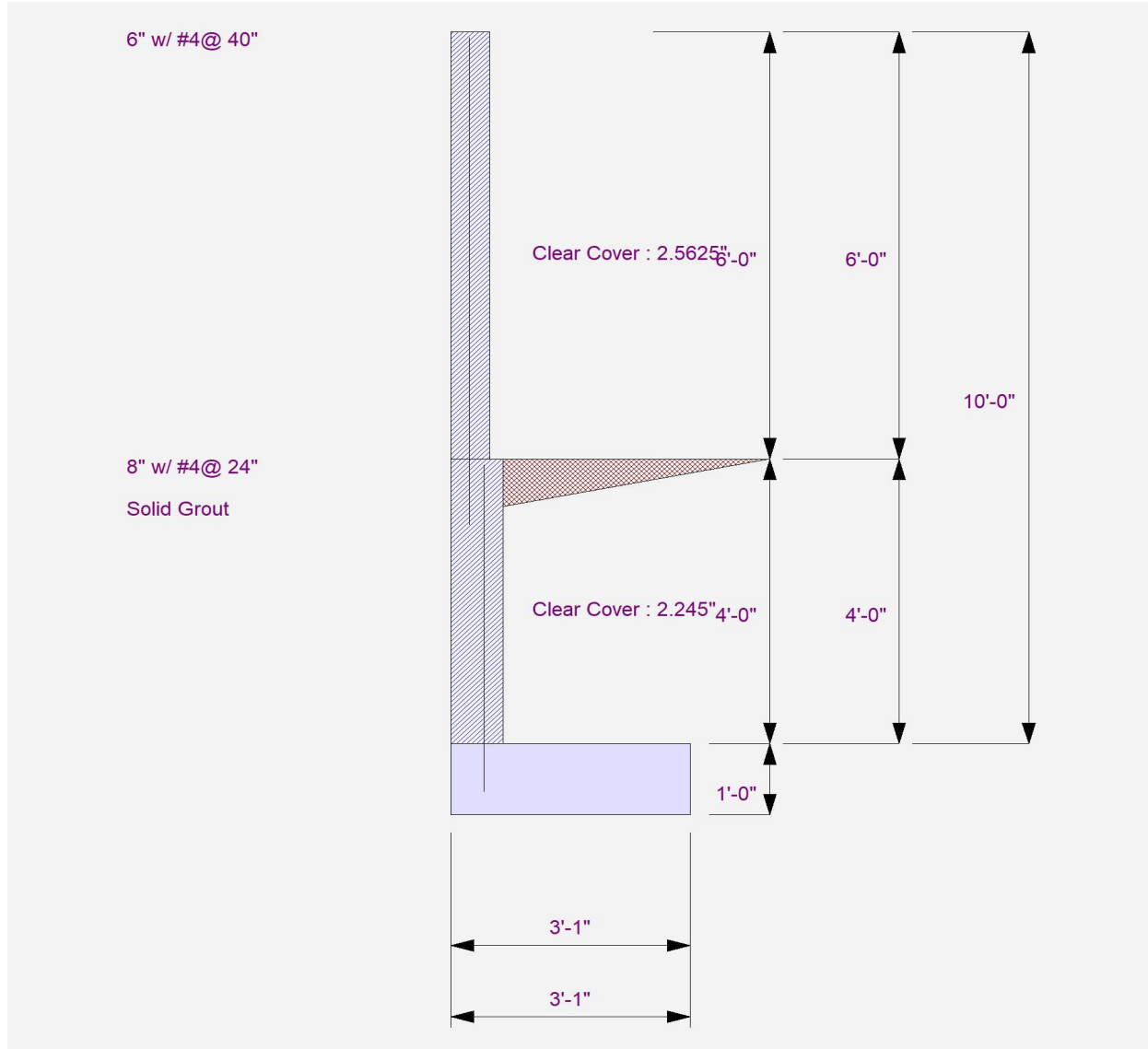
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION: 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**



**Cantilevered Retaining Wall**

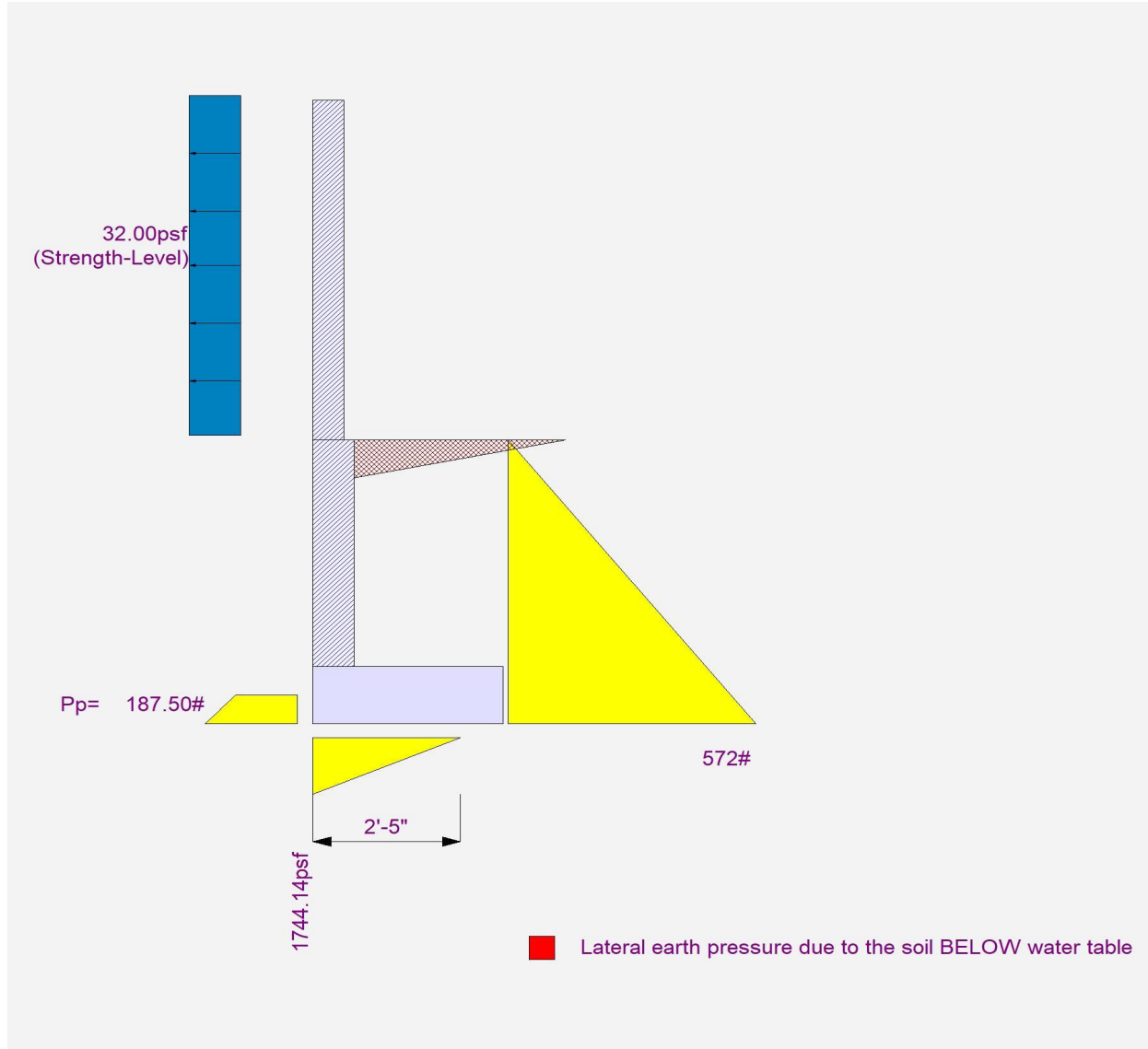
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION:** 4'-0" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION:** 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)

**Code Reference**

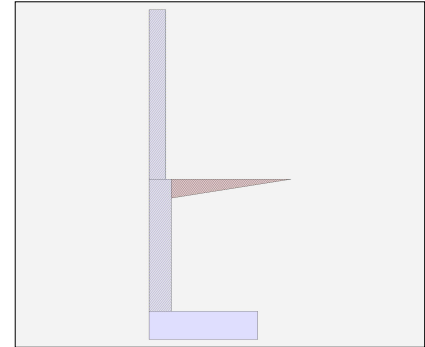
Calculations per IBC 2021 1807.3, ASCE 7-16

**Criteria**

Retained Height	=	4.67 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

**Soil Data**

Allow Soil Bearing	=	1,900.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing  Soil Friction	=	0.490
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	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

**Lateral Load Applied to Stem**

Lateral Load	=	0.0 #/ft
...Height to Top	=	10.67 ft
...Height to Bottom	=	4.67 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem	=	37.2 psf (Strength 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Design Summary**

**Wall Stability Ratios**

Overturning	=	1.61	OK
Sliding	=	1.98	OK
Global Stability	=	2.84	
Total Bearing Load	=	2,673 lbs	
...resultant ecc.	=	8.83 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,818 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	1,900 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,545 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	6.2 psi	OK
Footing Shear @ Heel	=	1.2 psi	OK
Allowable	=	75.0 psi	

**Sliding Calcs**

Lateral Sliding Force	=	696.5 lbs	
less 100% Passive Force	=	187.5 lbs	
less 100% Friction Force	=	1,188.2 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 considered in the calculation of soil bearing pressures.

**Load Factors**

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

**Stem Construction**

**Design Height Above Ftg**

ft =	Stem OK	Stem OK		
	4.67	0.00		
Wall Material Above "Ht"	=	Masonry	Masonry	
Design Method	=	SD	SD	SD SD
Thickness	=	6.00	8.00	
Rebar Size	=	# 4	# 4	
Rebar Spacing	=	40.00	16.00	
Rebar Placed at	=	Center	5.13 i	

**Design Data**

fb/FB + fa/Fa	=	0.927	0.824
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**Total Force @ Section**

Service Level	lbs =		
Strength Level	lbs =	223.2	833.8

**Moment....Actual**

Service Level	ft-# =		
Strength Level	ft-# =	669.6	2,662.5
Moment.....Allowable	ft-# =	721.9	3,228.4

**Shear.....Actual**

Service Level	psi =		
Strength Level	psi =	15.9	9.1
Shear.....Allowable	psi =	69.7	69.7
Anet (Masonry)	in2 =	14.03	91.50
Wall Weight	psf =	41.0	78.0
Rebar Depth 'd'	in =	2.81	5.13

**Masonry Data**

f'm	psi =	1,500	1,500
Fy	psi =	60,000	60,000
Solid Grouting	=	No	Yes
Modular Ratio 'n'	=	21.48	21.48
Equiv. Solid Thick.	in =	3.25	7.63
Masonry Block Type	=		
Masonry Design Method	=	SD	

**Concrete Data**

f'c	psi =	
Fy	psi =	





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Footing Data**

Toe Width	=	0.00 ft
Heel Width	=	3.25
Total Footing Width	=	3.25
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 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	= 2,545	0 psf
Mu' : Upward	= 0	1,275 ft-#
Mu' : Downward	= 0	3,000 ft-#
Mu: Design	= 0 OK	1,726 ft-# OK
phiMn	= OK - Flush	2,500
Actual 1-Way Shear	= 6.17	1.23 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	=	Flush toe condition. No reinforcing required.
Heel Reinforcing	=	None Spec'd
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: Flush toe condition. No reinforcing required.

Heel:  $\phi Mn = \phi * 5 * \lambda * \sqrt{f'c} * S_m$

Key: No key defined

Min footing T&S reinf Area	0.84	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: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**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)	562.6	1.89	1,063.3	Soil Over HL (ab. water tbl)	1,327.1	1.96	2,598.8
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.96	2,598.8
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 =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	133.9	8.67	1,161.1	Soil Over Toe =			
				Surcharge Over Toe =			
				Stem Weight(s) =	610.3	0.30	182.9
				Earth @ Stem Transitions =			
<b>Total</b>	<b>= 696.5</b>	<b>O.T.M. =</b>	<b>2,224.4</b>	Footing Weight =	487.5	1.63	792.2
				Key Weight =			
				Vert. Component =			
<b>Resisting/Overturning Ratio</b>		<b>= 1.61</b>		<b>Total =</b>	<b>2,424.8 lbs</b>	<b>R.M. =</b>	<b>3,573.9</b>
Vertical Loads used for Soil Pressure =		2,673.2 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

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

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

**Tilt**

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

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci  
Horizontal Defl @ Top of Wall (approximate only) 0.166 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.



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**

**Rebar Lap & Embedment Lengths Information**

Stem Design Segment: 2nd

Stem Design Height: 4.67 ft above top of footing

$K_{cover}=5.375$ ,  $K_{spacing}=40$ ,  $K_{diam}=4.5$ , and  $K_{min}=4.5$

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 20.00 in

Development length for #4 bar specified in this stem design segment = 12.00 in

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

$K_{cover}=2.245$ ,  $K_{spacing}=16$ ,  $K_{diam}=4.5$ , and  $K_{min}=2.245$

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 22.43 in

Development length for #4 bar specified in this stem design segment = 22.43 in

Hooked embedment length into footing for #4 bar specified in this stem design segment = 8.40 in

As Provided = 0.1500 in<sup>2</sup>/ft

As Required = 0.1198 in<sup>2</sup>/ft



**Cantilevered Retaining Wall**

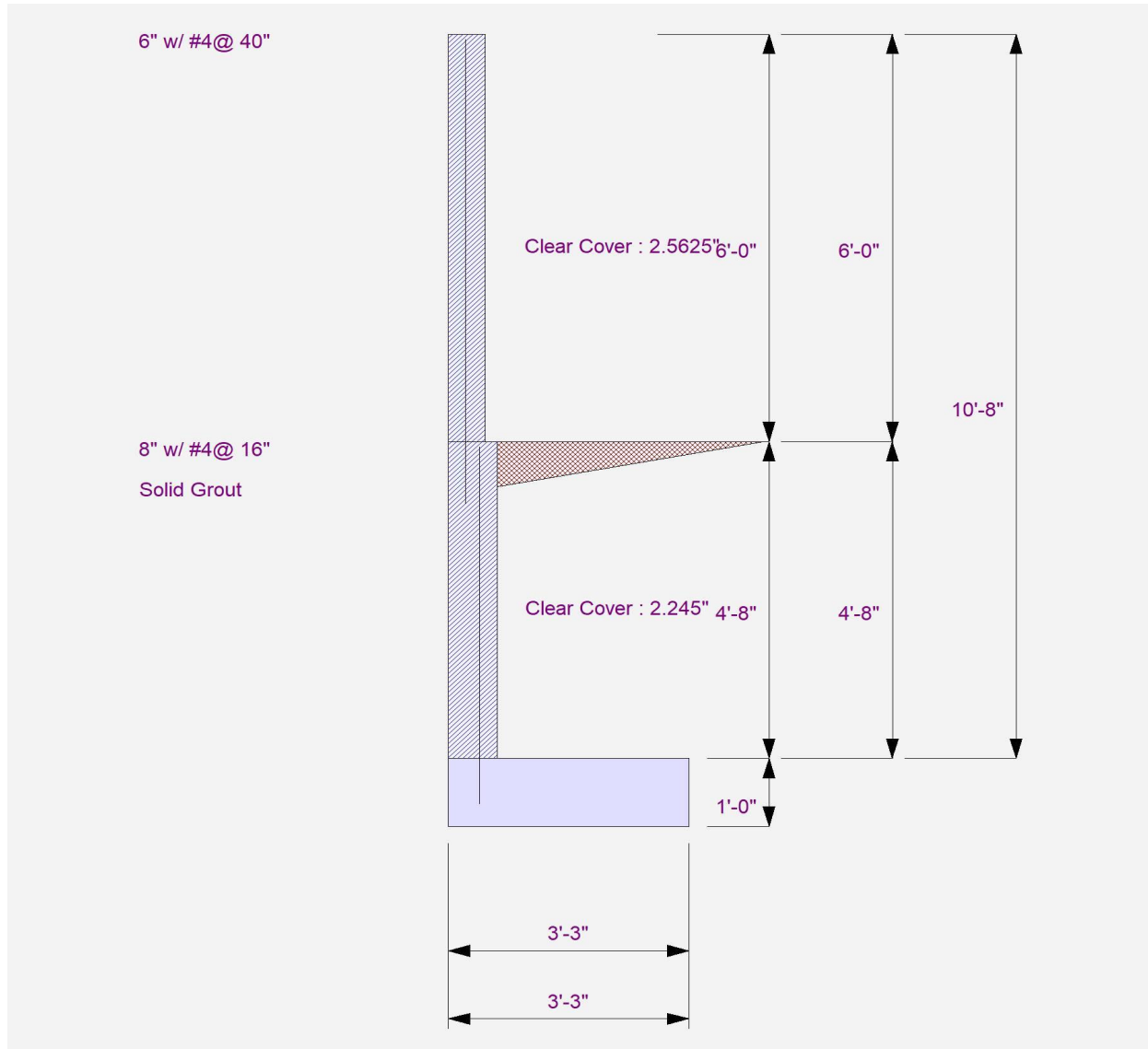
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION: 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)**



**Cantilevered Retaining Wall**

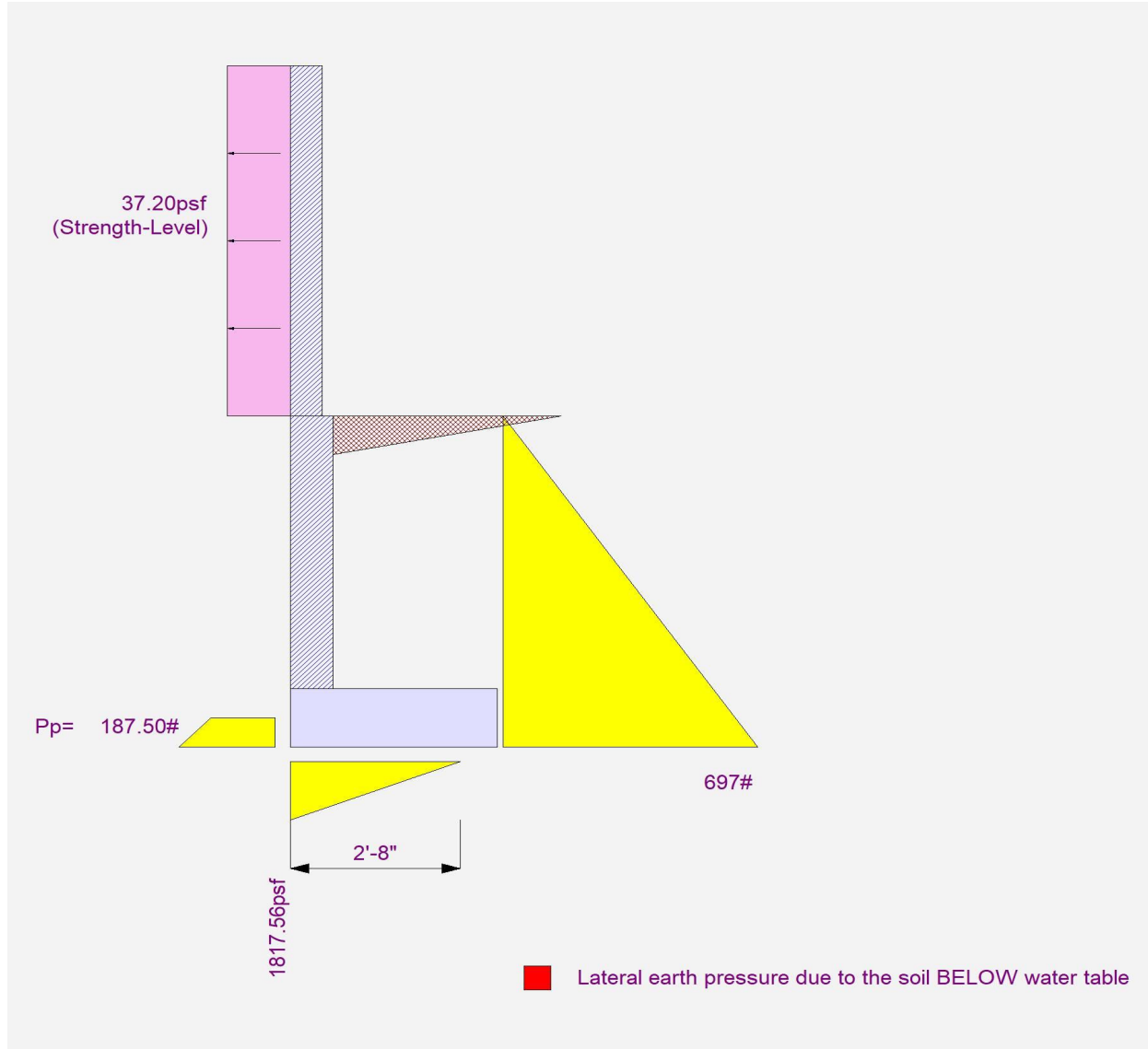
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION:** 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Wind Loading)





**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION:** 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)

**Code Reference**

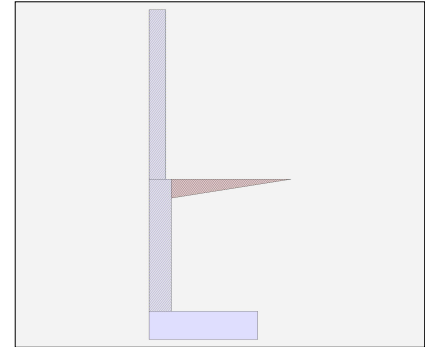
Calculations per IBC 2021 1807.3, ASCE 7-16

**Criteria**

Retained Height	=	4.67 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

**Soil Data**

Allow Soil Bearing	=	1,900.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing  Soil Friction	=	0.490
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	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

**Lateral Load Applied to Stem**

Lateral Load	=	32.0 #/ft
...Height to Top	=	10.67 ft
...Height to Bottom	=	4.67 ft
Load Type	=	Seismic (E) (Strength Level)
Wind on Exposed Stem	=	0.0 psf (Strength 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Design Summary**

**Wall Stability Ratios**

Overturning	=	1.60	OK
Sliding	=	1.97	OK
Global Stability	=	2.84	
Total Bearing Load	=	2,673 lbs	
...resultant ecc.	=	8.85 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,821 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	1,900 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,550 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	6.2 psi	OK
Footing Shear @ Heel	=	1.2 psi	OK
Allowable	=	75.0 psi	

**Sliding Calcs**

Lateral Sliding Force	=	697.0 lbs	
less 100% Passive Force	=	187.5 lbs	
less 100% Friction Force	=	1,188.2 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 considered in the calculation of soil bearing pressures.

**Load Factors**

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

**Stem Construction**

**Design Height Above Ftg**

Wall Material Above "Ht"

Design Method

Thickness

Rebar Size

Rebar Spacing

Rebar Placed at

**Design Data**

fb/FB + fa/Fa

**Total Force @ Section**

Service Level

Strength Level

**Moment....Actual**

Service Level

Strength Level

Moment.....Allowable

**Shear....Actual**

Service Level

Strength Level

Shear.....Allowable

Anet (Masonry)

Wall Weight

Rebar Depth 'd'

**Masonry Data**

f'm

Fy

Solid Grouting

Modular Ratio 'n'

Equiv. Solid Thick.

Masonry Block Type

Masonry Design Method

**Concrete Data**

f'c

Fy

**2nd**

**Bottom**

Stem OK

Stem OK

4.67

0.00

Masonry

Masonry

SD

SD

SD

SD

6.00

8.00

# 4

# 4

40.00

16.00

Center

5.13 i

0.797

0.750

lbs =

192.0

802.6

ft-# =

576.0

2,423.2

721.9

3,228.4

psi =

13.7

8.8

69.7

69.7

14.03

91.50

41.0

78.0

2.81

5.13

psi =

1,500

60,000

60,000

= No

Yes

21.48

21.48

in =

3.25

7.63

=

=

SD

psi =

psi =



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Footing Data**

Toe Width	=	0.00 ft
Heel Width	=	3.25
Total Footing Width	=	3.25
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 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	= 2,550	0 psf
Mu' : Upward	= 0	1,270 ft-#
Mu' : Downward	= 0	3,000 ft-#
Mu: Design	= 0 OK	1,731 ft-# OK
phiMn	= OK - Flush	2,500
Actual 1-Way Shear	= 6.17	1.25 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	=	Flush toe condition. No reinforcing required.
Heel Reinforcing	=	None Spec'd
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: Flush toe condition. No reinforcing required.

Heel:  $\phi M_n = \phi \lambda^5 \sqrt{f_c} S_m$

Key: No key defined

Min footing T&S reinf Area	0.84	in <sup>2</sup>
Min footing T&S reinf Area per foot	0.26	in <sup>2</sup> /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: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

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**DESCRIPTION: 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**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)	562.6	1.89	1,063.3	Soil Over HL (ab. water tbl)	1,327.1	1.96	2,598.8	
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.96	2,598.8	
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 =				
Added Lateral Load =	134.4	8.67	1,165.2	* Axial Live Load on Stem =				
Load @ Stem Above Soil =				Soil Over Toe =				
				Surcharge Over Toe =				
				Stem Weight(s) =	610.3	0.30	182.9	
				Earth @ Stem Transitions =				
<b>Total</b>	=	697.0	<b>O.T.M. =</b>	2,228.6	Footing Weight =	487.5	1.63	792.2
				Key Weight =				
				Vert. Component =				
<b>Resisting/Overturning Ratio</b>			=	<b>1.60</b>	<b>Total =</b>	2,424.8 lbs	<b>R.M.=</b>	3,573.9
Vertical Loads used for Soil Pressure =		2,673.2	lbs					

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

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

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

**Tilt**

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

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci  
Horizontal Defl @ Top of Wall (approximate only) 0.166 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.



**Cantilevered Retaining Wall**

Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

HUSAM GHANIM

(c) ENERCALC INC 1983-2022

**DESCRIPTION: 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**

**Rebar Lap & Embedment Lengths Information**

Stem Design Segment: 2nd

Stem Design Height: 4.67 ft above top of footing

K\_cover=5.375, K\_spacing=40, K\_diam=4.5, and K\_min=4.5

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 20.00 in

Development length for #4 bar specified in this stem design segment = 12.00 in

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

K\_cover=2.245, K\_spacing=16, K\_diam=4.5, and K\_min=2.245

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 22.43 in

Development length for #4 bar specified in this stem design segment = 22.43 in

Hooked embedment length into footing for #4 bar specified in this stem design segment = 8.40 in

As Provided = 0.1500 in<sup>2</sup>/ft

As Required = 0.1091 in<sup>2</sup>/ft



**Cantilevered Retaining Wall**

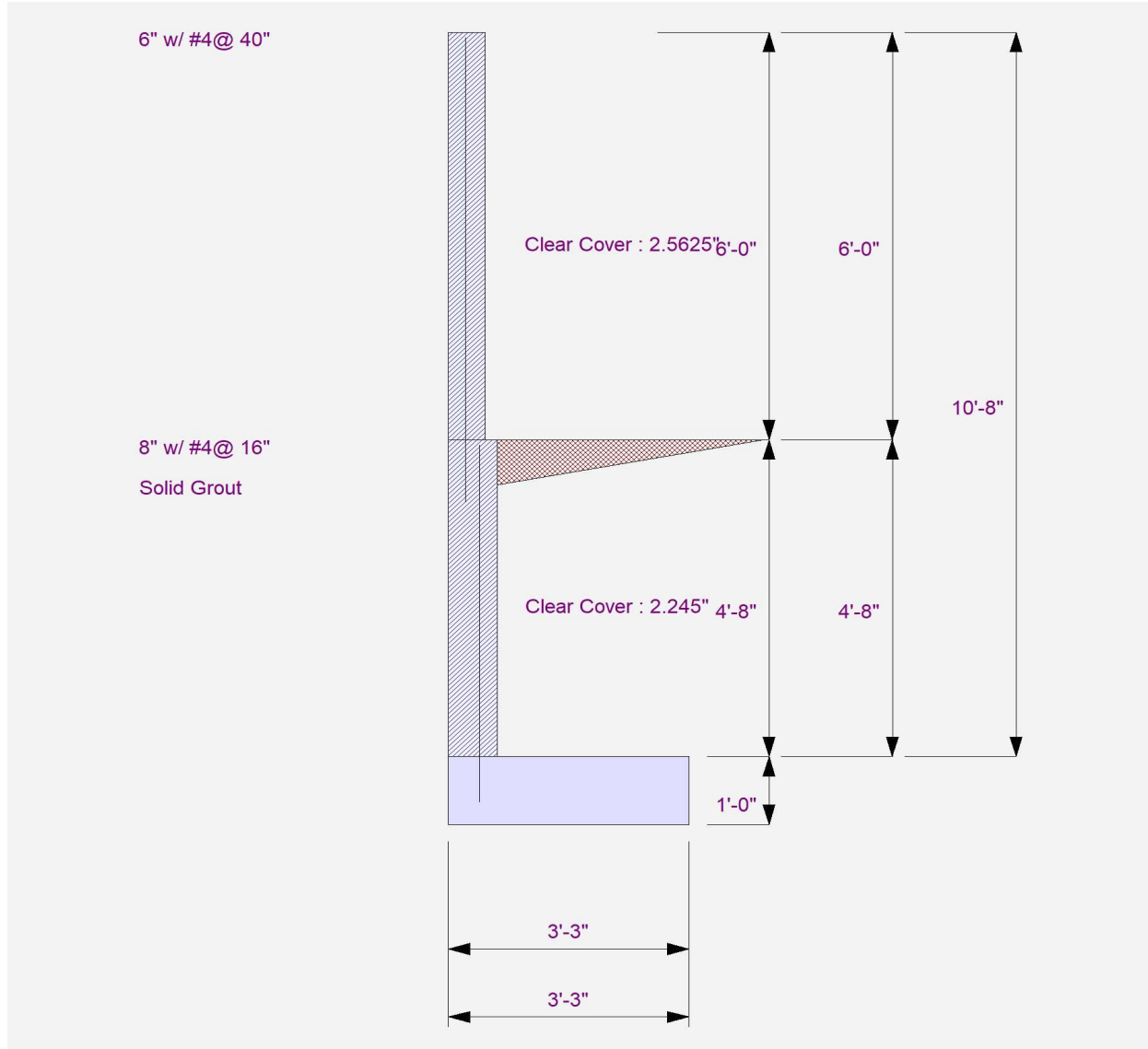
Project File: 23-057 Retaining with Fence - Heel-In Ftg..ec6

LIC# : KW-06019219, Build:20.23.2.14

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**DESCRIPTION: 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)**



**Cantilevered Retaining Wall**

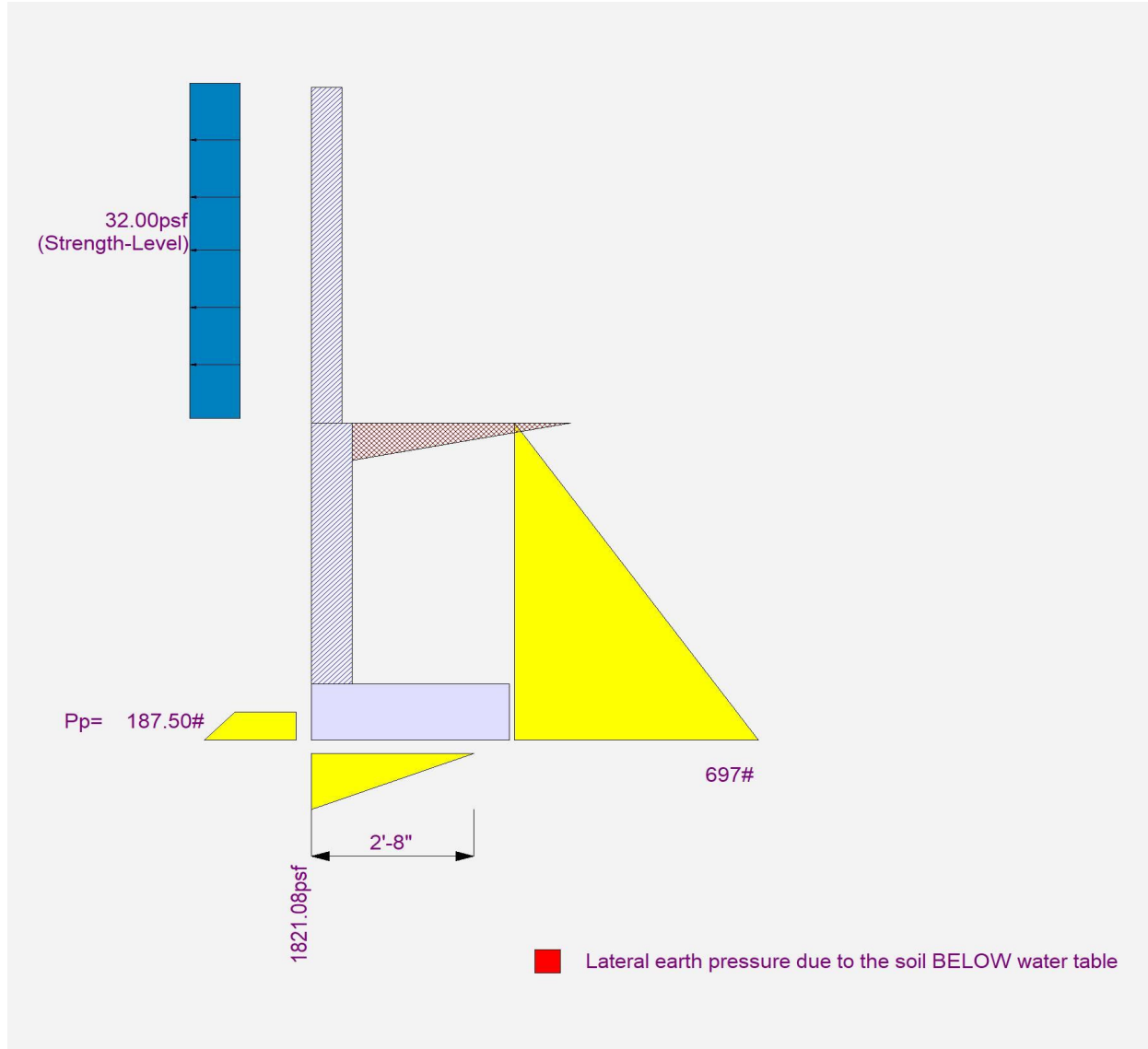
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LIC# : KW-06019219, Build:20.23.2.14

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**DESCRIPTION:** 4'-8" Ret. Wall w/ 6'-0" CMU Fence (Seismic Loading)



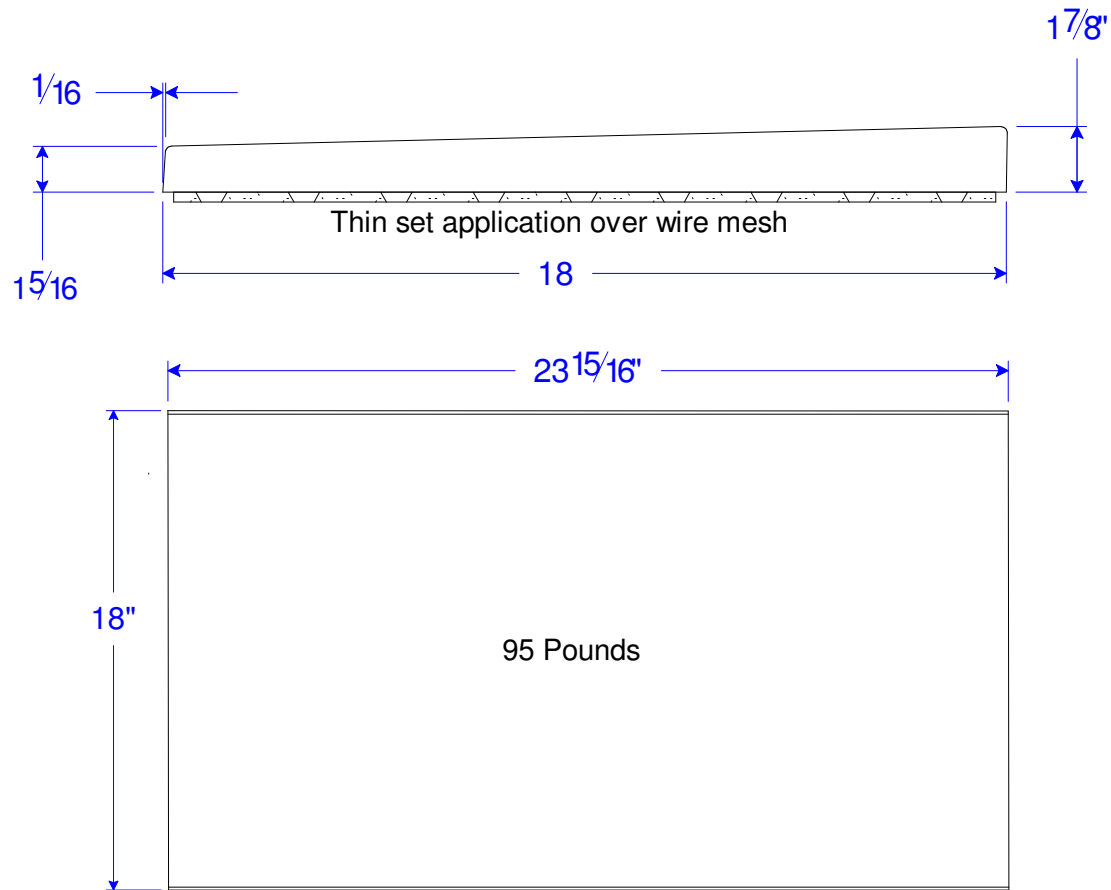


Seawright Custom Precast, Inc.

85-610 Grapefruit Blvd.  
 Coachella, CA 92236  
 760/398-1515  
 760/398-1008 fax

Field Cutting May Be  
 Required-Pieces To Be  
 Cut To Fit

1/4" Draft  
 Typical



Pilaster cap PV 18"W x 32"L x 2.5"T

A signature or an Architect's stamp will be considered approval of all dimensions, colors and textures unless specific corrections are noted. SCPC is not responsible for field verification of dimensions. All dimensions to be verified by others. Shop drawings must be signed before we will make molds.

JOB #	23-131.	CUSTOMER	Noel Humphrey @ RDS Development .						
JOB NAME	Rio Del Sol.	Engineer	Nasssib Chaar - M.H. Powell & Co., Inc..	COLOR	Standard Grey.				
DESCRIPTION	SM 23-18 18" W x 2.5" H x 32" L.			TEXTURE	Low Void.				
DATE DRAWN	5/8/23.	REVISION #	.	REVISED DATE	.	SHEET NO.	1.	OF	1.

APPROVED BY \_\_\_\_\_ Date \_\_\_\_\_



<p><b>DESIGN CRITERIA:</b></p> <ol style="list-style-type: none"> <li>DESIGN CRITERIA PER 2022 CBC AND GEOTECHNICAL RECOMMENDATIONS</li> <li>ALLOWABLE SOIL BEARING PRESSURE = 1300 PSF</li> <li>ALLOWABLE SOIL PASSIVE PRESSURE = 300 PCF</li> <li>COEFFICIENT OF FRICTION = 0.49</li> <li>LEVEL ACTIVE PRESSURE = 35 PCF</li> <li>AT-REST PRESSURE = 60 PCF</li> <li>MASONRY COMPRESSIVE STRENGTH, f<sub>m</sub> = 1500 PSI. SPECIAL INSPECTION NOT REQUIRED PER CBC SECTION 1704.2 EXCEPTION 2, "U" OCCUPANCY.</li> </ol> <p><b>LOADING:</b></p> <ol style="list-style-type: none"> <li>SEISMIC, 5% DAMPING @ 1 SECOND ACCELERATION C<sub>s</sub> = 0.800W<sub>L</sub></li> <li>DESIGN WIND = EXP. C @ 130 MPH</li> </ol> <p><b>GEOTECHNICAL NOTES:</b></p> <ol style="list-style-type: none"> <li>GEOTECHNICAL INVESTIGATION: SLADDEN ENGINEERING, PROJECT No. 544-1208, AUGUST 31, 2021.</li> <li>FOUNDATION MATERIAL: APPROVED FILL PER GEOTECHNICAL INVESTIGATION.</li> <li>MINIMUM FOUNDED DEPTH OF FOOTINGS: BELOW ROUGH PAD GRADE 12" BELOW LOWEST ADJACENT FINISHED GRADE 12"</li> <li>FOUNDING OF FOOTINGS &amp; SLABS: ON APPROVED COMPACTED SOILS AS NOTED IN GEOTECHNICAL INVESTIGATION.</li> </ol> <p><b>CONSTRUCTION NOTES:</b></p> <ol style="list-style-type: none"> <li>REINFORCING STEEL SHALL BE DEFORMED AND CONFORM TO ASTM A615 GRADE 60. PROVIDE SPLICES (LAPS) OF 48 BAR DIAMETERS OR 24 INCHES, WHICHEVER IS GREATER. CENTER VERTICAL BARS IN CELLS, U.I.O. SEE DETAIL (1)</li> <li>JOINT REINFORCEMENT ("LADDER" TYPE) SHALL BE COLD-DRAWN STEEL WIRE CONFORMING TO ASTM A951. PROVIDE MINIMUM 6 INCH LAP SPLICES.</li> <li>PROVIDE NORMAL WEIGHT CONCRETE (145 PCF) WITH PROVEN SHRINKAGE CHARACTERISTICS OF LESS THAN 0.05%, ATTAINING MINIMUM COMPRESSIVE STRENGTH OF 2,500 PSI AT 28 DAYS.</li> <li>CONCRETE MUST BE CAST DIRECTLY AGAINST UNDISTURBED SOIL, U.I.O. BY SOILS REPORT.</li> <li>MASONRY UNITS SHALL CONFORM TO ASTM C90. ANGELUS BLOCK PRECISION, SPLIT FACE, BURNISHED, OR SHOTBLAST, WITH OR WITHOUT MORTARLESS HEAD JOINTS (TONGUE-AND-GROOVE), OR ANGELUS BLOCK SLUMPSTONE SHALL BE USED.</li> <li>MORTAR SHALL BE SPEC MIX TYPE S PREBLENDED MASONRY MORTAR AS MANUFACTURED BY E-Z MIX INC., CONFORMING TO PROPORTIONS AND REQUIREMENTS OF ASTM C270, OR SPEC MIX IWR MASONRY MORTAR AS MANUFACTURED BY E-Z MIX INC., CONFORMING TO PROPERTY REQUIREMENTS OF ASTM C270. MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS SHALL BE 2000psi.</li> <li>GROUT SHALL CONFORM TO ASTM C476, WITH AN 8-11 INCH SLUMP, AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 2000psi.</li> <li>FIRST COURSE MAY BE WET-SET 1 1/2 INCHES MAX. WHILE CONCRETE IS PLASTIC.</li> <li>CONCRETE BLOCK SHALL BE LAID IN RUNNING BOND PATTERN WITH VERTICAL CONTINUITY OF THE CELLS U.N.O.</li> <li>VERTICAL CONTROL JOINTS SHALL BE SPACED AT A MAXIMUM OF 40'-0" o.c. OR 20'-0" o.c. IF WALL IS TO BE STUCCO COATED OR MORTAR WASHED SEE DETAIL (2)</li> <li>GROUT ALL CELLS WITH REINFORCEMENT U.I.O.</li> <li>INSPECTIONS: A. AFTER FOOTING IS READY FOR CONCRETE AND ALL FOOTING REINFORCING IS TIED IN PLACE. B. AFTER VERTICAL REINFORCEMENT IS IN PLACE AND CELLS ARE READY FOR GROUT.</li> <li>FOR TYPICAL REINFORCING AT WALL INTERSECTIONS SEE DETAIL (4)</li> <li>FOR TYPICAL FOOTING STEP SEE DETAIL (5)</li> <li>FOR TYPICAL DRAINAGE BLOCK-OUT SEE DETAIL (5)</li> <li>CLEAR (CLR.) OR CENTERLINE WHERE REFERENCED TO VERTICAL REINFORCING PER DETAIL (6)</li> <li>RETAINING WALL BACKFILL SHOULD CONSIST OF SANDY SOILS THAT MUST MEET AT LEAST ONE OF THE FOLLOWING CRITERIA: A. A SAND EQUIVALENT (SE) OF 30 OR GREATER PER CALIFORNIA TEST METHOD (CTM) 217, OR B. A MAXIMUM OF 35 PERCENT FINES (PASSING THE NO. 200 SIEVE) PER AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) D 421/422 AND AN EXPANSION INDEX OF 20 OR LESS. RETAINING WALL BACKFILL SHOULD ALSO BE LIMITED TO FILL MATERIAL NOT EXCEEDING 3 INCHES IN GREATEST DIMENSION. SEE GEOTECHNICAL INVESTIGATION FOR ADDITIONAL RECOMMENDATIONS.</li> <li>SEE SOILS REPORT FOR THE HORIZONTAL LIMITS OF SAND BACKFILL REQUIRED.</li> <li>WALLS HAVE NOT BEEN DESIGNED FOR SURCHARGE RESULTING FROM VEHICULAR TRAFFIC OR ADJACENT FOOTINGS U.I.O.</li> <li>EXCAVATION FOR WALL/ FOUNDATION SHALL NOT UNDERMINE ANY ADJACENT STRUCTURES. TEMPORARY SHORING AND STABILIZATION OF ADJACENT STRUCTURES SHALL BE PROVIDED BY THE CONTRACTOR AS REQUIRED</li> </ol>	<p><b>CONCRETE AND REINFORCING NOTES (CODE CHAPTER 19):</b></p> <ol style="list-style-type: none"> <li>CONTRACTOR TO PROVIDE CONCRETE MIX DESIGNS FROM AN APPROVED LABORATORY OR FROM THE CONCRETE SUPPLIER PREPARED UNDER THE SUPERVISION OF, SIGNED, AND SEALED BY A CALIFORNIA REGISTERED ARCHITECT, CIVIL OR STRUCTURAL ENGINEER.</li> <li>REINFORCEMENT: A) DETAILING, FABRICATION AND PLACING: SHALL CONFORM TO ACI315 AND ACI318. CERTIFICATION AND TESTING OF REINFORCING STEEL SHALL BE IN ACCORDANCE WITH THE PROVISIONS OF ASTM STANDARDS. B) MINIMUM CONCRETE COVER: CAST AGAINST &amp; EXPOSED TO EARTH 3" EXPOSED TO EARTH OR WEATHER 2" NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND: SLABS, WALLS, JOISTS 3/4" BEAMS, COLUMNS (TIES, STIRRUPS, SPIRALS) 1-1/2" C) CHAIRS, SPACERS AND PLATES: AS REQUIRED TO MAINTAIN CONCRETE COVER. D) VERTICAL REINFORCEMENT: SHALL BE DOWELED TO SUPPORTING MEMBERS WITH THE SAME SIZE AND SPACING OF REINFORCEMENT AS SHOWN IN THE DRAWINGS AND GENERAL NOTES. E) SPACING: CLEAR DISTANCE BETWEEN PARALLEL REINFORCEMENT IN A LAYER SHALL NOT BE LESS THAN 1-1/2 TIMES THE NOMINAL DIAMETER OF THE REINFORCEMENT, OR 1-1/3 TIMES MAXIMUM SIZE AGGREGATE, NOR LESS THAN 1-1/2". F) TACK WELDING, WELDING, HEATING OR CUTTING OF BARS: NOT PERMITTED UON. G) SPLICES (STANDARD LAPS): AS SCHEDULED, 40 DIAMETERS OR 24 INCHES WHICHEVER IS GREATER UON ON DRAWINGS. STAGGER BOTTOM SPLICES AT LEAST 5'-0" FROM SPLICES IN OTHER BOTTOM REINFORCEMENT. STAGGER SPLICES FOR TOP REINFORCEMENT SIMILARLY.</li> <li>PIPES, SLEEVES AND DUCTS: NOT TO BE PLACED IN WALLS, BEAMS, SLABS, FOOTINGS OR COLUMNS UNLESS SPECIFICALLY DETAILED.</li> <li>ADMIXTURES: REVIEWED BY THE ENGINEER OF RECORD. CALCIUM CHLORIDE OR ADDED CHLORIDES ARE NOT PERMITTED. FLY ASH SHALL NOT BE PERMITTED IN CONCRETE MIXTURES.</li> <li>CONSTRUCTION JOINTS: ACI 360R, 1/4-INCH AMPLITUDE MINIMUM OR KEYED JOINTS PER PLAN. LOCATION OF JOINTS TO BE REVIEWED BY THE ENGINEER OF RECORD PRIOR TO PLACEMENT OF REINFORCEMENT.</li> <li>CONCRETE CURING: ACI 302.1R, CONCRETE SHALL BE MAINTAINED IN A MOIST CONDITION FOR A MINIMUM OF FIVE DAYS AFTER ITS PLACEMENT. FOR CONCRETE OTHER THAN SLAB ON GRADE, APPROVED CURING COMPOUNDS MAY BE USED IN LIEU OF MOIST CURING, IF APPROVED BY THE OWNER AND ARCHITECT.</li> <li>VIBRATION: ALL CONCRETE SHALL BE CONSOLIDATED WITH MECHANICAL VIBRATORS IN ACCORDANCE WITH GENERAL PROVISIONS OUTLINED IN ACI 309R.</li> </ol> <p><b>STRUCTURAL STEEL</b></p> <ol style="list-style-type: none"> <li>STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS. PLATES AND BARS - ASTM A36, F<sub>y</sub>=36 ksi, F<sub>u</sub>=58 ksi.</li> <li>FASTENERS FOR STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS: NUTS - ASTM A563 WASHERS - ASTM F436 THREADED RODS - ASTM F1554, GRADE 36.</li> </ol> <p><b>GENERAL</b></p> <ol style="list-style-type: none"> <li>ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE DRAWINGS AND SPECIFICATIONS.</li> <li>THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE WORK OF ALL TRADES AND SHALL CHECK ALL DIMENSIONS BEFORE COMMENCING WORK AND REPORT ANY DISCREPANCIES.</li> <li>THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY OF THE BUILDING DURING CONSTRUCTION AND SHALL PROVIDE ADEQUATE SHORING, BRACING AND GUYS DURING CONSTRUCTION. SAFETY AND BRACING REQUIREMENTS SHALL BE IN ACCORDANCE WITH ALL NATIONAL, STATE AND LOCAL SAFETY ORDINANCES.</li> <li>THE CONTRACTOR SHALL BECOME FAMILIAR WITH AND COMPLY WITH ALL OF THE GENERAL PROVISIONS OF IBC CHAPTER 33 FOR ALL BUILDING AND SITE WORK, DEMOLITION AND CONSTRUCTION.</li> <li>IN ALL CASES WHERE A CONFLICT MAY OCCUR, SUCH AS BETWEEN ITEMS COVERED IN STRUCTURAL SPECIFICATIONS AND NOTES ON THE DRAWINGS OR BETWEEN GENERAL NOTES AND SPECIFIC DETAILS, THE ENGINEER OF RECORD SHALL BE NOTIFIED AND HE WILL INTERPRET THE INTENT OF THE CONTRACT DOCUMENTS PRIOR TO INSTALLATION OF THAT PORTION OF WORK.</li> <li>SIMILAR WORK: WHERE CONSTRUCTION DETAILS ARE NOT SHOWN OR NOTED FOR ANY PART OF THE WORK, SUCH DETAILS SHALL BE THE SAME AS FOR SIMILAR WORK SHOWN ON THE DRAWINGS.</li> <li>PIPES, DUCTS, SLEEVES, CHASES, ETC.: SHALL NOT BE PLACED IN SLABS, BEAMS, OR WALLS UNLESS SPECIFICALLY SHOWN OR NOTED NOR SHALL ANY STRUCTURAL MEMBER BE CUT FOR PIPES, DUCTS, ETC., UNLESS SPECIFICALLY SHOWN. OBTAIN PRIOR WRITTEN APPROVAL FOR INSTALLATION OF ANY ADDITIONAL PIPES, DUCTS, ETC.</li> <li>LOCATE AND PROTECT UNDERGROUND OR CONCEALED CONDUIT, PLUMBING OR OTHER UTILITIES WHERE NEW WORK IS BEING PERFORMED. IDENTIFY AND LOCATE ANY SUBTERRANEAN UTILITIES PRIOR TO ANY EXCAVATION.</li> <li>THE CONTRACT DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE AND DO NOT INDICATE METHODS, PROCEDURES OR SEQUENCE OF CONSTRUCTION. TAKE NECESSARY PRECAUTIONS TO MAINTAIN AND ENSURE THE INTEGRITY OF THE STRUCTURE DURING CONSTRUCTION. NEITHER THE OWNER NOR ARCHITECT/ENGINEER WILL ENFORCE SAFETY MEASURES OR REGULATIONS. CONTRACTOR SHALL DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING AND BRACING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.</li> <li>PROPRIETARY COMPONENTS, MATERIALS, CHEMICAL, EPOXY AND WEDGE ANCHORS AND SHOT PINS SHALL BE EXACTLY AS CALLED FOR IN THESE DRAWINGS. ANY DEVIATIONS SHALL BE APPROVED OR DISAPPROVED BY THE ENGINEER OF RECORD AT THE EXPENSE OF THE ENTITY REQUESTING THE SUBSTITUTION PRIOR TO INSTALLATION.</li> <li>THE CONTRACTOR SHALL BE ULTIMATELY RESPONSIBLE FOR COORDINATION AND ASSEMBLY OF ALL PARTS OF THE CONSTRUCTION DEPICTED HEREIN. THE CONTRACTOR SHALL PERFORM ANY CONSTRUCTABILITY REVIEW OR COORDINATION DRAWINGS NECESSARY TO IDENTIFY CONSTRUCTABILITY PROBLEMS PRIOR TO CONSTRUCTION.</li> </ol>	<h1>NOT USED</h1>
	<p><b>DESIGN CRITERIA:</b></p> <ol style="list-style-type: none"> <li>DESIGN CRITERIA PER 2022 CBC AND GEOTECHNICAL RECOMMENDATIONS</li> <li>ALLOWABLE SOIL BEARING PRESSURE = 1300 PSF</li> <li>ALLOWABLE SOIL PASSIVE PRESSURE = 300 PCF</li> <li>COEFFICIENT OF FRICTION = 0.49</li> <li>LEVEL ACTIVE PRESSURE = 35 PCF</li> <li>AT-REST PRESSURE = 60 PCF</li> <li>MASONRY COMPRESSIVE STRENGTH, f<sub>m</sub> = 1500 PSI. SPECIAL INSPECTION NOT REQUIRED PER CBC SECTION 1704.2 EXCEPTION 2, "U" OCCUPANCY.</li> </ol> <p><b>LOADING:</b></p> <ol style="list-style-type: none"> <li>SEISMIC, 5% DAMPING @ 1 SECOND ACCELERATION C<sub>s</sub> = 0.800W<sub>L</sub></li> <li>DESIGN WIND = EXP. 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MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS SHALL BE 2000psi.</li> <li>GROUT SHALL CONFORM TO ASTM C476, WITH AN 8-11 INCH SLUMP, AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 2000psi.</li> <li>FIRST COURSE MAY BE WET-SET 1 1/2 INCHES MAX. WHILE CONCRETE IS PLASTIC.</li> <li>CONCRETE BLOCK SHALL BE LAID IN RUNNING BOND PATTERN WITH VERTICAL CONTINUITY OF THE CELLS U.N.O.</li> <li>VERTICAL CONTROL JOINTS SHALL BE SPACED AT A MAXIMUM OF 40'-0" o.c. OR 20'-0" o.c. IF WALL IS TO BE STUCCO COATED OR MORTAR WASHED SEE DETAIL (2)</li> <li>GROUT ALL CELLS WITH REINFORCEMENT U.I.O.</li> <li>INSPECTIONS: A. AFTER FOOTING IS READY FOR CONCRETE AND ALL FOOTING REINFORCING IS TIED IN PLACE. B. AFTER VERTICAL REINFORCEMENT IS IN PLACE AND CELLS ARE READY FOR GROUT.</li> <li>FOR TYPICAL REINFORCING AT WALL INTERSECTIONS SEE DETAIL (4)</li> <li>FOR TYPICAL FOOTING STEP SEE DETAIL (5)</li> <li>FOR TYPICAL DRAINAGE BLOCK-OUT SEE DETAIL (5)</li> <li>CLEAR (CLR.) OR CENTERLINE WHERE REFERENCED TO VERTICAL REINFORCING PER DETAIL (6)</li> <li>RETAINING WALL BACKFILL SHOULD CONSIST OF SANDY SOILS THAT MUST MEET AT LEAST ONE OF THE FOLLOWING CRITERIA: A. A SAND EQUIVALENT (SE) OF 30 OR GREATER PER CALIFORNIA TEST METHOD (CTM) 217, OR B. A MAXIMUM OF 35 PERCENT FINES (PASSING THE NO. 200 SIEVE) PER AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) D 421/422 AND AN EXPANSION INDEX OF 20 OR LESS. RETAINING WALL BACKFILL SHOULD ALSO BE LIMITED TO FILL MATERIAL NOT EXCEEDING 3 INCHES IN GREATEST DIMENSION. SEE GEOTECHNICAL INVESTIGATION FOR ADDITIONAL RECOMMENDATIONS.</li> <li>SEE SOILS REPORT FOR THE HORIZONTAL LIMITS OF SAND BACKFILL REQUIRED.</li> <li>WALLS HAVE NOT BEEN DESIGNED FOR SURCHARGE RESULTING FROM VEHICULAR TRAFFIC OR ADJACENT FOOTINGS U.I.O.</li> <li>EXCAVATION FOR WALL/ FOUNDATION SHALL NOT UNDERMINE ANY ADJACENT STRUCTURES. TEMPORARY SHORING AND STABILIZATION OF ADJACENT STRUCTURES SHALL BE PROVIDED BY THE CONTRACTOR AS REQUIRED</li> </ol>	<p><b>CONCRETE AND REINFORCING NOTES (CODE CHAPTER 19):</b></p> <ol style="list-style-type: none"> <li>CONTRACTOR TO PROVIDE CONCRETE MIX DESIGNS FROM AN APPROVED LABORATORY OR FROM THE CONCRETE SUPPLIER PREPARED UNDER THE SUPERVISION OF, SIGNED, AND SEALED BY A CALIFORNIA REGISTERED ARCHITECT, CIVIL OR STRUCTURAL ENGINEER.</li> <li>REINFORCEMENT: A) DETAILING, FABRICATION AND PLACING: SHALL CONFORM TO ACI315 AND ACI318. CERTIFICATION AND TESTING OF REINFORCING STEEL SHALL BE IN ACCORDANCE WITH THE PROVISIONS OF ASTM STANDARDS. B) MINIMUM CONCRETE COVER: CAST AGAINST &amp; EXPOSED TO EARTH 3" EXPOSED TO EARTH OR WEATHER 2" NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND: SLABS, WALLS, JOISTS 3/4" BEAMS, COLUMNS (TIES, STIRRUPS, SPIRALS) 1-1/2" C) CHAIRS, SPACERS AND PLATES: AS REQUIRED TO MAINTAIN CONCRETE COVER. D) VERTICAL REINFORCEMENT: SHALL BE DOWELED TO SUPPORTING MEMBERS WITH THE SAME SIZE AND SPACING OF REINFORCEMENT AS SHOWN IN THE DRAWINGS AND GENERAL NOTES. E) SPACING: CLEAR DISTANCE BETWEEN PARALLEL REINFORCEMENT IN A LAYER SHALL NOT BE LESS THAN 1-1/2 TIMES THE NOMINAL DIAMETER OF THE REINFORCEMENT, OR 1-1/3 TIMES MAXIMUM SIZE AGGREGATE, NOR LESS THAN 1-1/2". F) TACK WELDING, WELDING, HEATING OR CUTTING OF BARS: NOT PERMITTED UON. G) SPLICES (STANDARD LAPS): AS SCHEDULED, 40 DIAMETERS OR 24 INCHES WHICHEVER IS GREATER UON ON DRAWINGS. STAGGER BOTTOM SPLICES AT LEAST 5'-0" FROM SPLICES IN OTHER BOTTOM REINFORCEMENT. STAGGER SPLICES FOR TOP REINFORCEMENT SIMILARLY.</li> <li>PIPES, SLEEVES AND DUCTS: NOT TO BE PLACED IN WALLS, BEAMS, SLABS, FOOTINGS OR COLUMNS UNLESS SPECIFICALLY DETAILED.</li> <li>ADMIXTURES: REVIEWED BY THE ENGINEER OF RECORD. CALCIUM CHLORIDE OR ADDED CHLORIDES ARE NOT PERMITTED. FLY ASH SHALL NOT BE PERMITTED IN CONCRETE MIXTURES.</li> <li>CONSTRUCTION JOINTS: ACI 360R, 1/4-INCH AMPLITUDE MINIMUM OR KEYED JOINTS PER PLAN. LOCATION OF JOINTS TO BE REVIEWED BY THE ENGINEER OF RECORD PRIOR TO PLACEMENT OF REINFORCEMENT.</li> <li>CONCRETE CURING: ACI 302.1R, CONCRETE SHALL BE MAINTAINED IN A MOIST CONDITION FOR A MINIMUM OF FIVE DAYS AFTER ITS PLACEMENT. FOR CONCRETE OTHER THAN SLAB ON GRADE, APPROVED CURING COMPOUNDS MAY BE USED IN LIEU OF MOIST CURING, IF APPROVED BY THE OWNER AND ARCHITECT.</li> <li>VIBRATION: ALL CONCRETE SHALL BE CONSOLIDATED WITH MECHANICAL VIBRATORS IN ACCORDANCE WITH GENERAL PROVISIONS OUTLINED IN ACI 309R.</li> </ol> <p><b>STRUCTURAL STEEL</b></p> <ol style="list-style-type: none"> <li>STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS. PLATES AND BARS - ASTM A36, F<sub>y</sub>=36 ksi, F<sub>u</sub>=58 ksi.</li> <li>FASTENERS FOR STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS: NUTS - ASTM A563 WASHERS - ASTM F436 THREADED RODS - ASTM F1554, GRADE 36.</li> </ol> <p><b>GENERAL</b></p> <ol style="list-style-type: none"> <li>ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE DRAWINGS AND SPECIFICATIONS.</li> <li>THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE WORK OF ALL TRADES AND SHALL CHECK ALL DIMENSIONS BEFORE COMMENCING WORK AND REPORT ANY DISCREPANCIES.</li> <li>THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY OF THE BUILDING DURING CONSTRUCTION AND SHALL PROVIDE ADEQUATE SHORING, BRACING AND GUYS DURING CONSTRUCTION. SAFETY AND BRACING REQUIREMENTS SHALL BE IN ACCORDANCE WITH ALL NATIONAL, STATE AND LOCAL SAFETY ORDINANCES.</li> <li>THE CONTRACTOR SHALL BECOME FAMILIAR WITH AND COMPLY WITH ALL OF THE GENERAL PROVISIONS OF IBC CHAPTER 33 FOR ALL BUILDING AND SITE WORK, DEMOLITION AND CONSTRUCTION.</li> <li>IN ALL CASES WHERE A CONFLICT MAY OCCUR, SUCH AS BETWEEN ITEMS COVERED IN STRUCTURAL SPECIFICATIONS AND NOTES ON THE DRAWINGS OR BETWEEN GENERAL NOTES AND SPECIFIC DETAILS, THE ENGINEER OF RECORD SHALL BE NOTIFIED AND HE WILL INTERPRET THE INTENT OF THE CONTRACT DOCUMENTS PRIOR TO INSTALLATION OF THAT PORTION OF WORK.</li> <li>SIMILAR WORK: WHERE CONSTRUCTION DETAILS ARE NOT SHOWN OR NOTED FOR ANY PART OF THE WORK, SUCH DETAILS SHALL BE THE SAME AS FOR SIMILAR WORK SHOWN ON THE DRAWINGS.</li> <li>PIPES, DUCTS, SLEEVES, CHASES, ETC.: SHALL NOT BE PLACED IN SLABS, BEAMS, OR WALLS UNLESS SPECIFICALLY SHOWN OR NOTED NOR SHALL ANY STRUCTURAL MEMBER BE CUT FOR PIPES, DUCTS, ETC., UNLESS SPECIFICALLY SHOWN. OBTAIN PRIOR WRITTEN APPROVAL FOR INSTALLATION OF ANY ADDITIONAL PIPES, DUCTS, ETC.</li> <li>LOCATE AND PROTECT UNDERGROUND OR CONCEALED CONDUIT, PLUMBING OR OTHER UTILITIES WHERE NEW WORK IS BEING PERFORMED. IDENTIFY AND LOCATE ANY SUBTERRANEAN UTILITIES PRIOR TO ANY EXCAVATION.</li> <li>THE CONTRACT DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE AND DO NOT INDICATE METHODS, PROCEDURES OR SEQUENCE OF CONSTRUCTION. TAKE NECESSARY PRECAUTIONS TO MAINTAIN AND ENSURE THE INTEGRITY OF THE STRUCTURE DURING CONSTRUCTION. NEITHER THE OWNER NOR ARCHITECT/ENGINEER WILL ENFORCE SAFETY MEASURES OR REGULATIONS. CONTRACTOR SHALL DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING AND BRACING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.</li> <li>PROPRIETARY COMPONENTS, MATERIALS, CHEMICAL, EPOXY AND WEDGE ANCHORS AND SHOT PINS SHALL BE EXACTLY AS CALLED FOR IN THESE DRAWINGS. ANY DEVIATIONS SHALL BE APPROVED OR DISAPPROVED BY THE ENGINEER OF RECORD AT THE EXPENSE OF THE ENTITY REQUESTING THE SUBSTITUTION PRIOR TO INSTALLATION.</li> <li>THE CONTRACTOR SHALL BE ULTIMATELY RESPONSIBLE FOR COORDINATION AND ASSEMBLY OF ALL PARTS OF THE CONSTRUCTION DEPICTED HEREIN. THE CONTRACTOR SHALL PERFORM ANY CONSTRUCTABILITY REVIEW OR COORDINATION DRAWINGS NECESSARY TO IDENTIFY CONSTRUCTABILITY PROBLEMS PRIOR TO CONSTRUCTION.</li> </ol>

<p><b>DETAIL</b></p>	-	-
<p><b>DETAIL</b></p>	-	-
<p><b>DETAIL</b></p>	-	-
<p><b>REBAR LOCATION DETAIL</b></p> <p>NOTE: FOR SIDEYARD RETURN WALLS WHERE DRAINAGE SWALE OCCURS, A 1/2 BLK. MAY BE LEFT OUT AT SWALE GRADE. PROVIDE #4 DWL. &amp; #4 DROP-IN BAR ON EA. SIDE OF THE 1/2 BLK. DRAIN AS SHOWN.</p>	-	6
<p><b>DRAINAGE BLOCK-OUT</b></p>	-	5

<p><b>TYPICAL WALL PLAN - MASONRY CONSTRUCTION</b></p>	-	-
<p><b>TYPICAL WALL ELEVATION - MASONRY CONSTRUCTION</b></p>	-	-
<p><b>TYPICAL MASONRY WALL STEPPED FOOTING</b></p>	-	2
<p><b>REBAR LOCATION DETAIL</b></p>	-	6
<p><b>CMU WALL INTERSECTION</b></p>	-	4
<p><b>TYPICAL EXPANSION JOINT</b></p>	-	3

<p><b>TYPICAL REINFORCING</b></p>	-	1
<p><b>SCOPE OF WORK:</b></p> <p>LIMITED TO STRUCTURAL SITE WALL DESIGN AND DETAILING FOR CONSTRUCTION OF:</p> <ol style="list-style-type: none"> <li>TWO (2) COMBINATION CMU RETAINING WALLS</li> </ol>	-	-
<p><b>REFERENCES</b></p> <p>THE WORK IS BASED ON THE INFORMATION SET FORTH IN THE FOLLOWING REFERENCES.</p> <p>GEOTECHNICAL INVESTIGATION: SLADDEN ENGINEERING, PROJECT No. 544-1208, AUGUST 31, 2021.</p>	-	-
<p><b>SHEET INDEX</b></p> <p>S-0: STANDARD DETAILS / STRUCTURAL NOTES</p> <p>S-5.0: STRUCTURAL WALL DETAILS</p>	-	-

**PROJECT DESCRIPTION:**

SITE WALLS

**OWNER:**

**ENGINEER OF RECORD:**

**GSE**  
GHANIM STRUCTURAL ENGINEERING

898 N. FAIR OAKS AVE. STE. F  
PASADENA, CA 91103  
626.407.2224 GSE JOB #: 23-057

**THE VILLAGE AT RIO DEL SOL**  
**TRACT NO. 28561**  
**CATHEDRAL CITY, CA**

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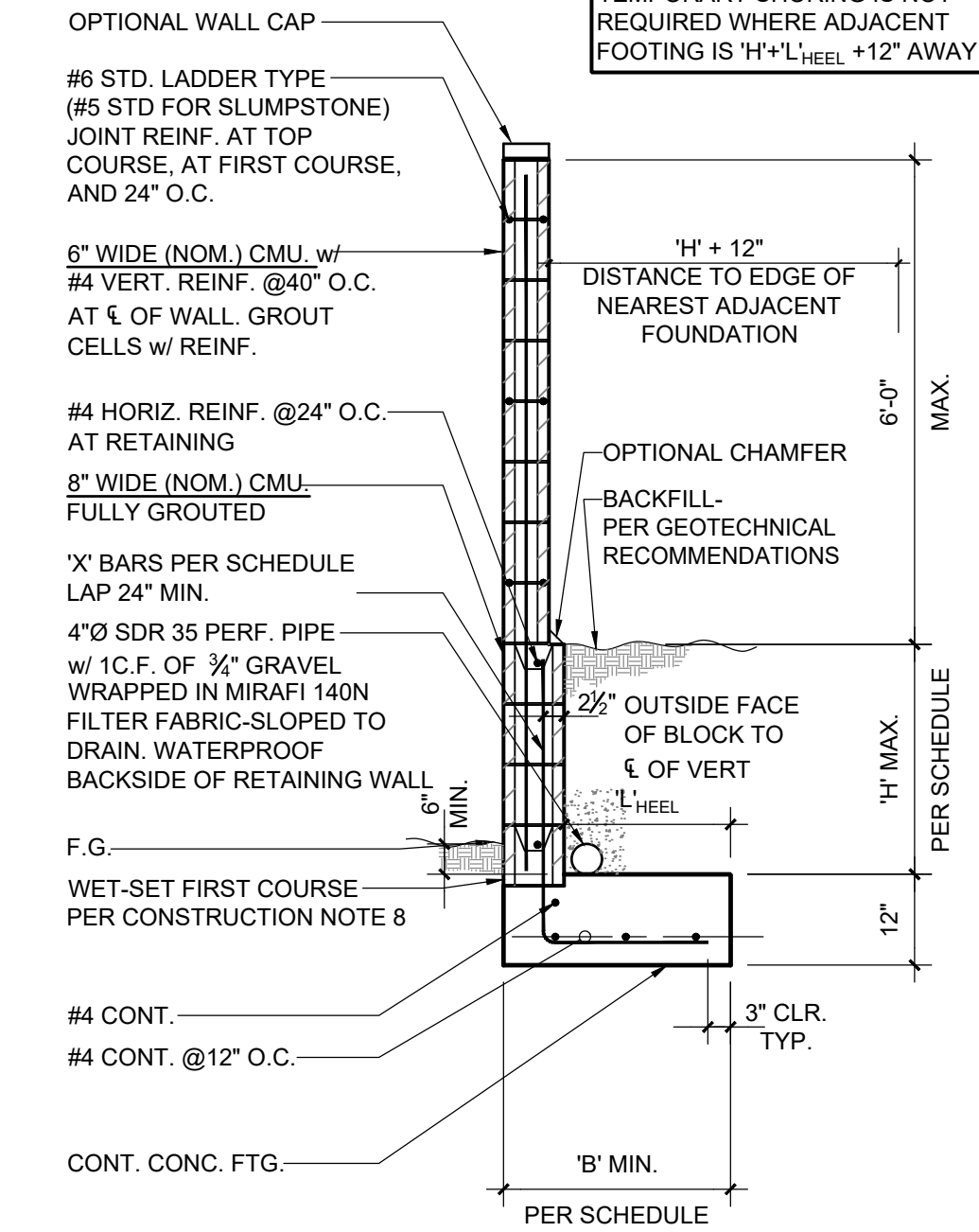
**DRAWN BY:** D.E. HYLTON  
**PROJECT NUMBER:** 23-057  
**DATE:** 03 / 31 / 2023

**SHEET TITLE:**  
SITE WALLS  
STANDARD DETAILS  
**SHEET NUMBER:**  
S-0



**Angelus** BLOCK CO., INC. Since 1946  
 ANGELUS BLOCK MASONRY WALL SYSTEM  
**COMBINATION CMU RETAINING WALL & FENCE**  
 HEEL-IN FOOTING

NOTE:  
 TEMPORARY SHORING IS  
 REQUIRED AT THIS CONDITION.  
 TEMPORARY SHORING IS NOT  
 REQUIRED WHERE ADJACENT  
 FOOTING IS 'H'+L<sub>HEEL</sub> +12" AWAY.



MASONRY WALL SCHEDULE		
'H' MAX.	'B' MIN.	'X' BARS
2'-0"	2'-9"	#4@32" O.C.
2'-8"	2'-11"	#4@32" O.C.
3'-4"	3'-0"	#4@24" O.C.
4'-0"	3'-1"	#4@24" O.C.
4'-8"	3'-3"	#4@16" O.C.

SEE SHEET S-0 FOR STANDARD NOTES AND DETAILS.

PROJECT DESCRIPTION:  
 SITE WALLS  
 OWNER:

ENGINEER OF RECORD:  
**GSE**  
**GHANIM STRUCTURAL**  
 ENGINEERING  
 898 N. FAR OAKS AVE. STE. F  
 PASADENA, CA 91103  
 626.407.2224 GSE JOB #: 23-057

THE VILLAGE AT RIO DEL SOL  
 TRACT NO. 28561  
 CATHEDRAL CITY, CA

DETAIL

DETAIL

DETAIL

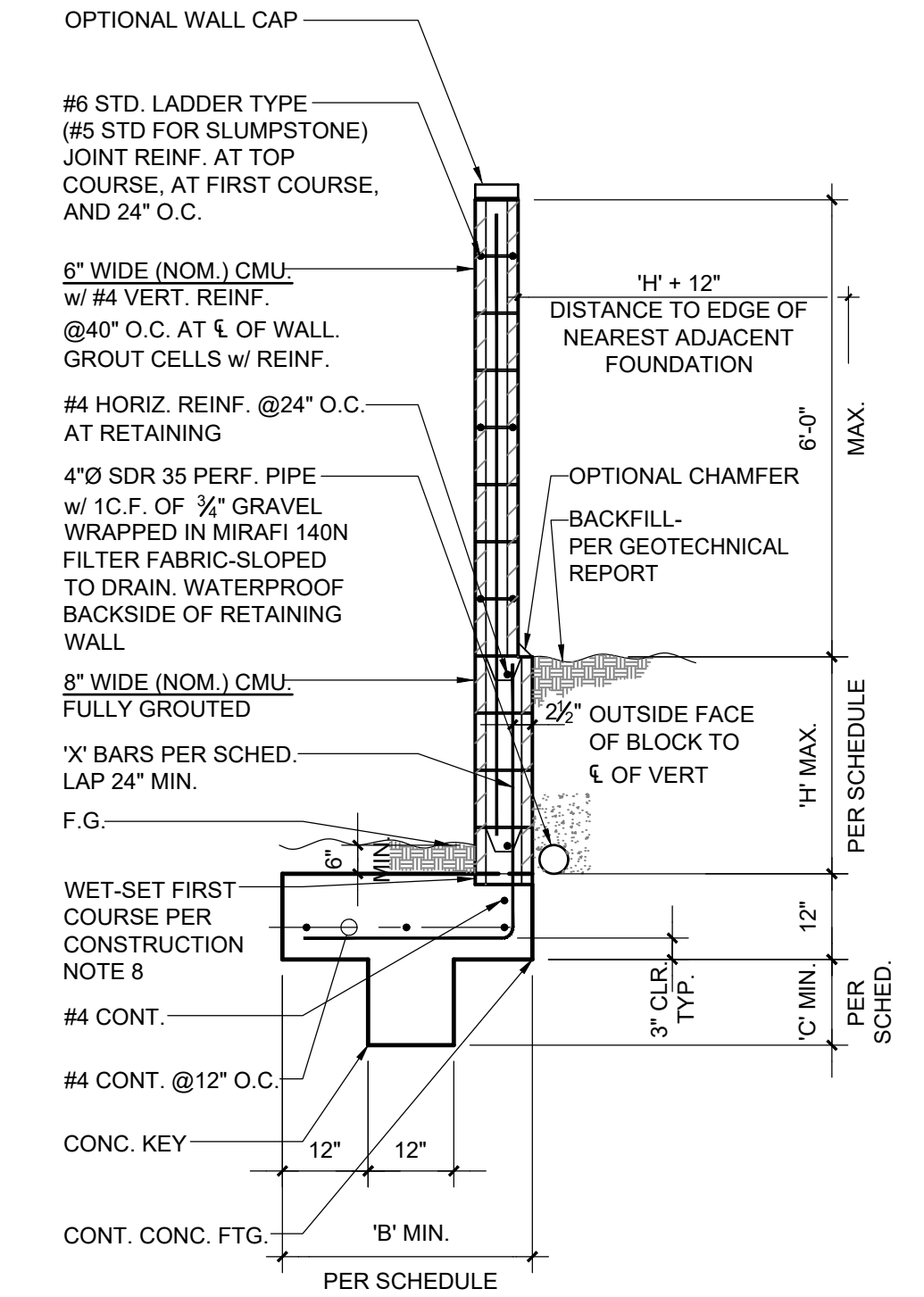
DETAIL

CMU COMBO WALL

N.T.S.

2

**Angelus** BLOCK CO., INC. Since 1946  
 ANGELUS BLOCK MASONRY WALL SYSTEM  
**COMBINATION RETAINING AND FENCE WALL**  
 TOE-OUT FOOTING



MASONRY WALL SCHEDULE			
'H' MAX.	'B' MIN.	'C' MIN.	'X' BARS
2'-0"	2'-7"	N/A	#4@32" O.C.
2'-8"	2'-10"	N/A	#4@32" O.C.
3'-4"	3'-0"	0'-2"	#4@24" O.C.
4'-0"	3'-4"	0'-5"	#4@24" O.C.
4'-8"	3'-8"	0'-7"	#4@8" O.C.

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DRAWN BY: D.E. HYLTON  
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 DATE: 03 / 31 / 2023

SHEET TITLE:  
 SITE WALLS  
 WALL DETAILS  
 SHEET NUMBER:

S-5.0

DETAIL

DETAIL

DETAIL

DETAIL

COMBO CMU WALL

N.T.S.

1