

 AFS Geo Consultants, LLC Geotechnical Consulting and Earth Retaining Structures Design	Revision	Date	Design	Check

Design Computations for:

Wet-Cast Precast Concrete Gravity Retaining Walls
Stone Strong[®] Retaining Wall System

Prepared for:
MTR Earth Consulting, LLC
20369 Hacienda Court
Boca Raton, FL. 33498

Project:

TIMBER RETAINING WALL REPLACEMENT
 SITE RETAINING WALL No. 1
 419 MAPLE AVENUE E
 Vienna, VA 2218

Site Retaining Wall No. 1

Date:

July 20, 2022

Table of Contents

Retaining Wall Design Computations - Wall 1	3 Sheets
Pedestrian Handrail/Fence Stability Calculations	1 Sheet

DocuSigned by:


 5474E2AB532C477...

8/11/2022 | 11:15:27 AM EDT



These calculations include proprietary information to AFS Geo Consultants, LLC. These calculations have been prepared for the exclusive use of the client referenced on this sheet and in connection with this project only. The use or dissemination of these calculations for other purposes is expressly prohibited without the written consent of AFS Geo Consultants, LLC.



STONE STRONG GRAVITY CALCULATIONS - ver 6.3

Project Name: **419 Maple Avenue**
 Location: **Vienna, VA**
 Job#: **VA22028**
 Section: **Replacement Wall**
 Calc by:

Page 1 of 3

7/19/22 12:46

Notes

Wall Configuration

unit	w (in)	h (ft)	setback (in)		modular units		unit fill		soil wedge		CIP Extension		Internal Stability FS		Seismic Internal FS	
			face	tail	Wb (lb)	xb (in)	Wa (lb)	xa (in)	Ws (lb)	xs (in)	we (in)	h _t	Topple	Shear	Topple	Shear
DF	28.0	1.50	6.0	-9.0	438	20.0	0	20.0	69	37.3			8.75	7.17	13.84	10.71 OK!
V6	44.0	1.50	0.0	1.0	375	21.0	301	23.5	0	0.0			7.06	4.14	8.68	4.96 OK!
V24	43.0	3.00	0.0	0.0	750	20.2	594	23.8	0	0.0						
													External Stability OK!			
		43.0	6.00	6.0	-9.0	1,563	20.3	895	23.7	69	37.3	2,527				

backfill height **6.00** feet $\omega =$ 6.34 deg interface friction angle
 exposed height 5.25 feet $\omega' =$ -7.13 deg δ 21.0 deg

Retained Soil

γ **125** pcf
 ϕ **28** deg

Foundation Soil

γ **125** pcf
 ϕ **28** deg
 c' psf

base embedment **9** in
 base thickness **9** in
 base material **agg**
 toe slope H:1V slope

Aggregate Unit Fill

γ **110** pcf
 © S T O N E S T R O N G

allowable bearing pressure **2,500** psf
 (if specified) (gross)

composite friction coefficient μ_b 0.69
 S Y S T E M S



STONE STRONG GRAVITY CALCULATIONS - ver 6.3

Project Name: 419 Maple Avenue

Location: Vienna, VA

Job#: VA22028

Section: Replacement Wall

Calc by:

Page 2 of 3

7/19/22 12:46

Seismic Load

PGA 0.10 G

site class (A to E or 1)

1

Fpga 1.00

Fa 1.00

k_h 0.03Backfill Slope & Surcharge

length 1 20.0 feet (horizontal)

length 2 feet (horizontal)

length 3 feet (horizontal)

length 4 feet (horizontal)

effective slope 17.17 H:1V slope

failure plane α 55.61 deg

rise in grade

1 ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

LL surcharge

100 psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

psf

tier height

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

ft

Analysis

$K_a = 0.394$	$Q_{lh} = 207 \text{ lb}$	$\Delta K_{AE} = 0.028$	$e = 0.42 \text{ ft}$
$P_h = 781 \text{ lb}$	$Q_{lv} = 111 \text{ lb}$	$P_{IR} = 88 \text{ lb}$	$B'_f = 3.50 \text{ ft}$
$P_v = 417 \text{ lb}$	$R_s = 1,803 \text{ lb}$	$\Delta P_{AEh} = 55 \text{ lb}$	$e_{eq} = 0.39 \text{ ft}$
	$q_{ult} = 6,413 \text{ psf}$	$\Delta P_{AEv} = 29 \text{ lb}$	$B'_{f eq} = 3.55 \text{ ft}$

ResultsOvertuning: Desired FS = 1.5

Actual FS = 2.74 OK!

Desired FS = 1.5

Sliding: Desired FS = 1.5

Actual FS = 1.83 OK!

Desired FS = 1.5

Bearing Capacity:(gross) $q_{all} = 2,500 \text{ psf}$ $q_c = 967 \text{ psf}$ OK!Seismic Overtuning: Desired FS = 1.13

Actual FS = 2.97 OK!

Desired FS = 1.13

Seismic Sliding: Desired FS = 1.13

Actual FS = 1.95 OK!

Desired FS = 1.13

Seismic Bearing:(gross) $q_{all} = 3,333 \text{ psf}$ $q_c = 930 \text{ psf}$ OK!



Calc by:

7/19/22 12:46

© S T O N E S T R O N G S Y S T E M S

Stability of a Big Modular Block Wall Under Railing Effects

Stone Strong Precast Wall System

Direct Mount - 50 plf/200 lbs Min. Post Load (IBC)

Railing Load	50	plf	Transverse
Max. Post Spacing	8	ft	
Post Load	200	lbs	Transverse
No. of Posts per Unit	2		
Total Post Load	400	lbs	Transverse
Railing Height	42	inches	(above grade)
Unit Weight of Backfill	125	pcf	
Friction Angle (Retained Backfill)	30	degrees	
Ka	0.333		
No. of Courses	1	courses	
Course/Block Height	18	inches	
Block Width	96	inches	
Block depth	28	inches	
No. of Tributary Blocks	1		
Tributary Block Width	96	inches	
Average Block Unit Weight	150	pcf	

StoneStrong DF

1 Block Resisting Overturning

Solid Concrete

	Force lbs/ft	Arm ft.	Overturning Moment lbs-ft
Earth Pressure	46.88	0.50	23.44
Railing Load	400	5.00	2,000.00
			2,023.44

	Force lbs/ft	Arm ft.	Resisting Moment lbs-ft
Blocks	4,200.00	1.17	4,900.00
			4,900.00

SF_{OT} =

2.422

O.K.