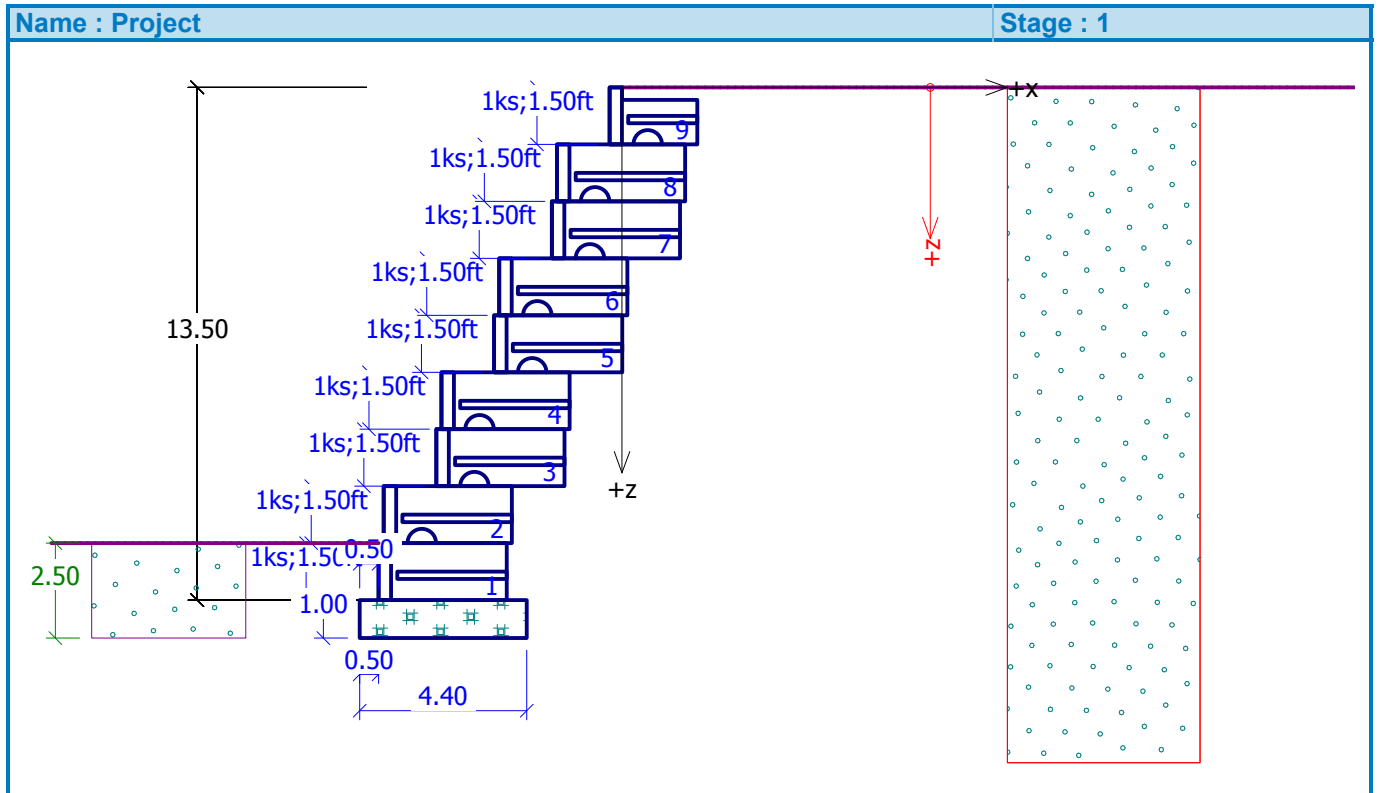


Analysis of Redi Rock wall

Input data

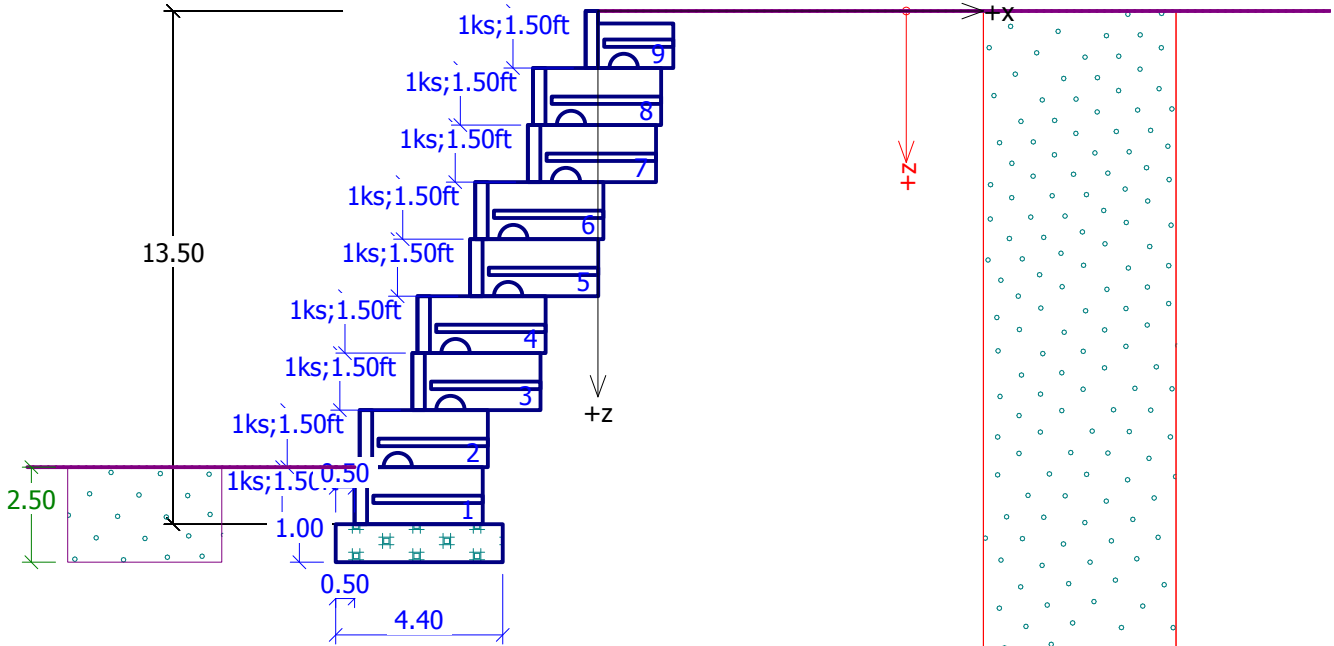
Project

Task : Redi-Rock Wall - Preliminary Calculation
 Descript. : H=13.5', LL=0 psf, BS= Flat
 Author : JWB
 Customer : RRI - Preliminary Design Charts
 Date : 1/29/2010



Name : Project

Stage : 1



Blocks

No.	Description	Height h [in]	Width w [in]	Unit weight γ [pcf]
1	Block 28	18.00	27.75	130.0
2	Block 41	18.00	40.50	130.0
3	Block 60	18.00	60.00	130.0
4	Top block 28	18.00	27.75	130.0
5	Top block 24	18.00	24.00	130.0
6	Retired block 41	18.00	41.00	130.0
7	Planter 41	18.00	40.50	112.0

No.	Description	Shear cap. F [lbf/ft]	Max. shear cap. F_{max} [lbf/ft]	Friction f [°]	Cohesion c [psf]
1	Block 28	1700.0	9000.0	75.00	0.0
2	Block 41	1700.0	9000.0	75.00	0.0
3	Block 60	1700.0	9000.0	75.00	0.0
4	Top block 28	1700.0	9000.0	75.00	0.0
5	Top block 24	1700.0	9000.0	75.00	0.0
6	Retired block 41	1700.0	9000.0	75.00	0.0
7	Planter 41	1700.0	9000.0	75.00	0.0

Setbacks

No.	Setback s [in]
1	0.375
2	1.625
3	9.375
4	16.625

Geometry

No. group	Description	Count	Setbacks [in]
1	Block 41	1	1.63
2	Planter 41	1	16.63
3	Block 41	1	1.63
4	Planter 41	1	16.63
5	Block 41	1	1.63
6	Planter 41	1	16.63
7	Block 41	1	1.63
8	Planter 41	1	16.63
9	Block 28	1	1.63

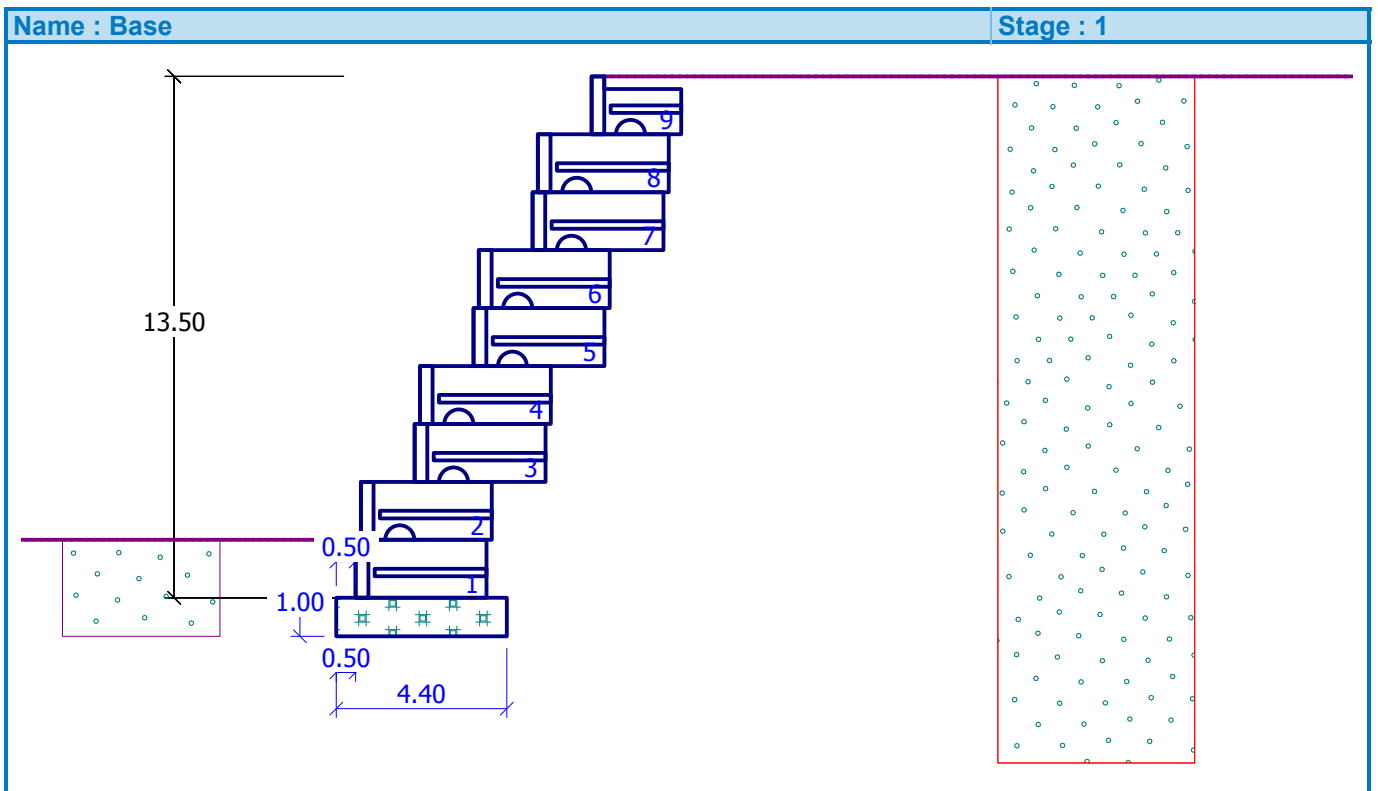
Base

Geometry

Upper setback $a_1 = 0.50$ ft
 Lower setback $a_2 = 0.50$ ft
 Height $h = 1.00$ ft
 Width $b = 4.40$ ft

Material

Soil creating foundation - Crushed Stone #57
 Soil bearing capacity $R_d = 15000.0$ psf



Soil parameters


Sand

Unit weight : $\gamma = 120.0$ pcf
 Stress-state : effective
 Angle of internal friction : $\varphi_{ef} = 30.00^\circ$
 Cohesion of soil : $c_{ef} = 0.0$ psf
 Angle of friction struc.-soil : $\delta = 20.00^\circ$
 Saturated unit weight : $\gamma_{sat} = 130.0$ pcf

Crushed Stone #57

Unit weight : $\gamma = 130.0$ pcf
Stress-state : effective
Angle of internal friction : $\varphi_{ef} = 40.00^\circ$
Cohesion of soil : $c_{ef} = 0.0$ psf
Angle of friction struc.-soil : $\delta = 26.00^\circ$
Saturated unit weight : $\gamma_{sat} = 140.0$ pcf

Geological profile and assigned soils

No.	Layer [ft]	Assigned soil	Pattern
1	-	Sand	

Terrain profile

Terrain behind the structure is flat.

Water influence

Ground water table is located below the structure.

Resistance on front face of the structure

Resistance on front face of the structure: at rest
Soil on front face of the structure - Sand
Soil thickness in front of structure $h = 2.50$ ft
Terrain in front of structure is flat.

Global settings

Verification methodology : Classical way
Active earth pressure calculation - Coulomb
Passive earth pressure calculation - Caquot-Kerisel

Settings of the stage of construction

Analysis carried out according to classical theory (safety factor)

Safety factor for slip = 1.50
Safety factor for overturning = 1.50
Factor of safety for bearing capacity = 2.00

Hinge Height Concept is not considered in analysis.
MRF (block - soil found.) $\mu = 0.70$
Masonry friction reduction factor base-soil $\mu = 1.00$

Verification No. 1

Active pressure behind the structure - partial results

Layer No.	Thickness [ft]	α [°]	ϕ_d [°]	c_d [psf]	γ [pcf]	δ_d [°]	K_a	Comment
1	0.33	30.00	30.00	0.0	120.0	30.00	0.667	
2	12.62	-20.87	30.00	0.0	120.0	20.00	0.170	
3	0.55	30.00	30.00	0.0	120.0	30.00	0.667	
4	1.00	0.00	30.00	0.0	120.0	20.00	0.297	

Active pressure distribution behind the structure (without surcharge)

Layer No.	Start [ft] End [ft]	σ_z [psf]	σ_w [psf]	Pressure [psf]	Hor. comp. [psf]	Vert. comp. [psf]
1	0.00	0.0	0.0	0.0	0.0	0.0
	0.33	39.4	0.0	26.2	13.1	22.7
2	0.33	39.4	0.0	6.7	6.7	-0.1
	12.95	1554.3	0.0	263.6	263.6	-4.0
3	12.95	1554.3	0.0	1036.2	518.1	897.3
	13.50	1620.0	0.0	1080.0	540.0	935.3
4	13.50	1620.0	0.0	481.6	452.6	164.7
	14.50	1740.0	0.0	517.3	486.1	176.9

Forces acting on construction

Name	F_{hor} [lbf/ft]	App.Pt. Z [ft]	F_{vert} [lbf/ft]	App.Pt. X [ft]	Design coefficient
Weight - wall	0.0	-6.72	5824.8	4.50	1.000
FF resistance	-187.4	-0.83	0.2	0.25	1.000
Weight - earth wedge	0.0	-1.18	17.3	4.12	1.000
Weight - earth wedge	0.0	-14.33	74.4	7.86	1.000
Active pressure	2467.0	-4.31	650.7	4.25	1.000

Verification of complete wall

Check for overturning stability

Resisting moment $M_{res} = 29613.5$ lbfft/ft

Overturning moment $M_{ovr} = 10470.0$ lbfft/ft

Safety factor = 2.83 > 1.50

Wall for overturning is SATISFACTORY

Check for slip

Resisting horizontal force $H_{res} = 3791.7$ lbf/ft

Active horizontal force $H_{act} = 2279.6$ lbf/ft

Safety factor = 1.66 > 1.50

Wall for slip is SATISFACTORY

Forces acting at the centre of footing bottom

Overall moment $M = -4695.3$ lbfft/ft

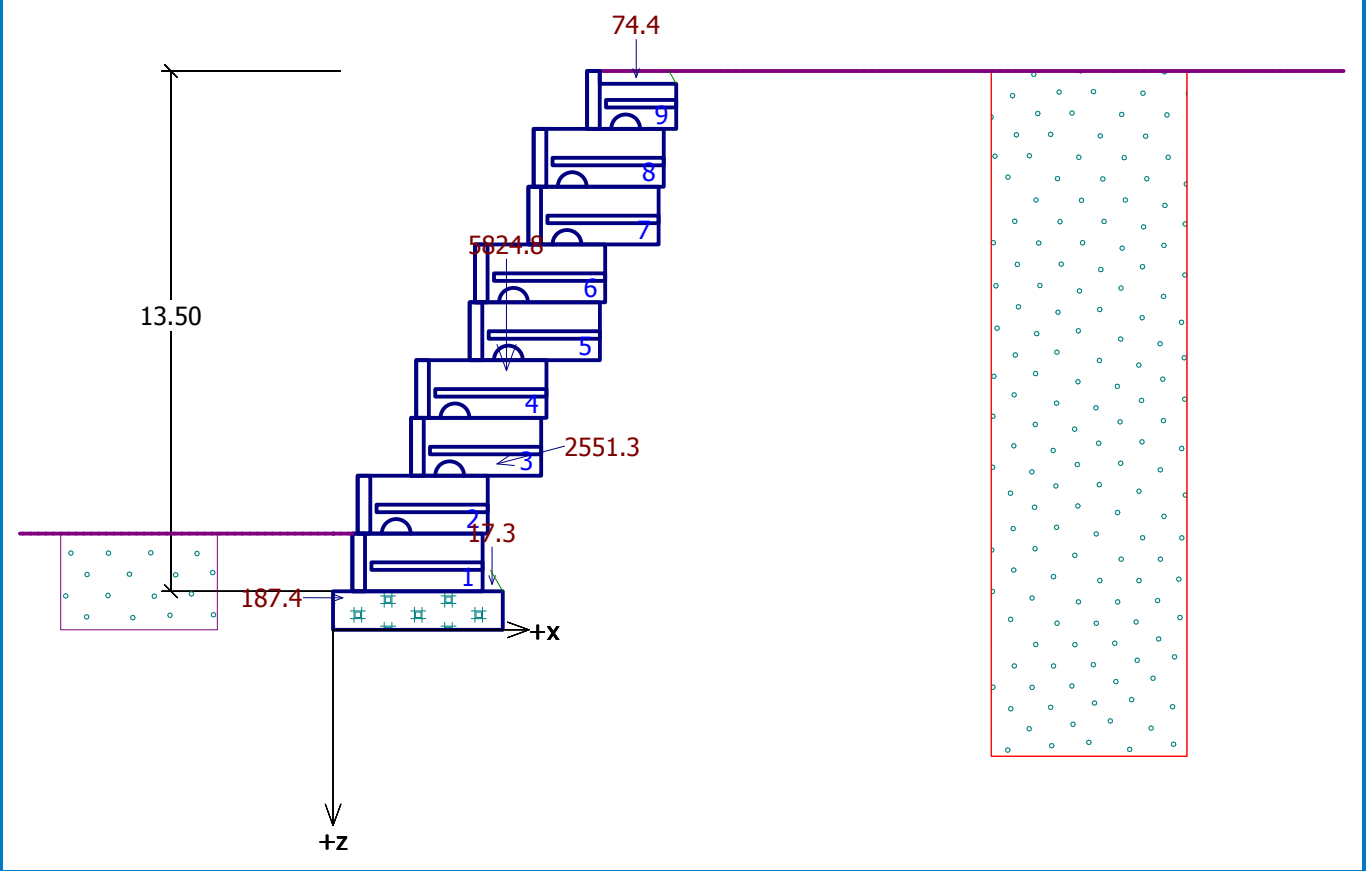
Normal force $N = 6567.4$ lbf/ft

Shear force $Q = 2279.6$ lbf/ft

Overall check - WALL is SATISFACTORY

Name : Verification

Stage : 1; Analysis : 1



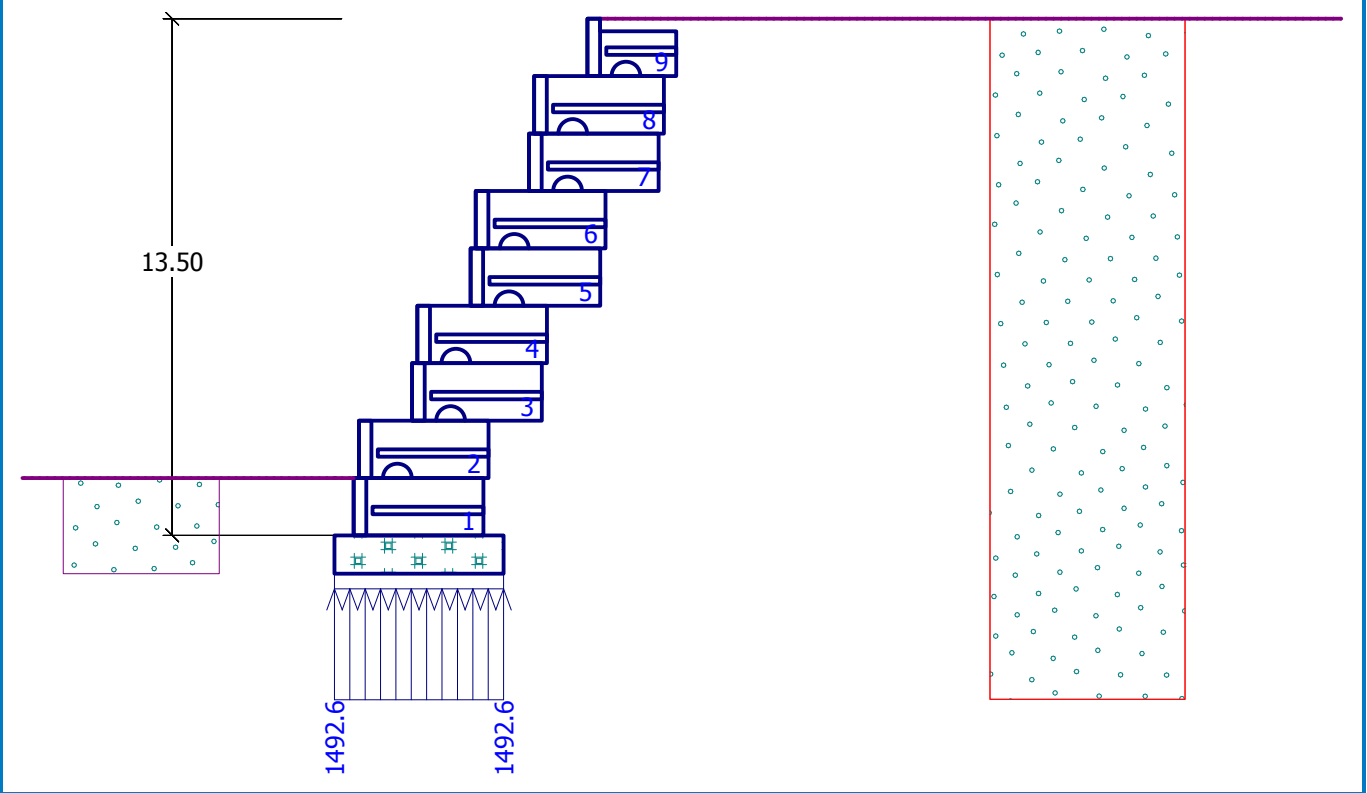
Bearing capacity of foundation soil

Forces acting at the centre of the footing bottom

Number	Moment [lbfft/ft]	Norm. force [lbf/ft]	Shear Force [lbf/ft]	Eccentricity [ft]	Stress [psf]
1	-4695.3	6567.4	2279.6	0.00	1492.6

Name : Bearing cap.

Stage : 1



Dimensioning No. 1

Active pressure behind the structure - partial results

Layer No.	Thickness [ft]	α [°]	ϕ_d [°]	c_d [psf]	γ [pcf]	δ_d [°]	K_a	Comment
1	0.33	30.00	30.00	0.0	120.0	30.00	0.667	
2	13.17	-20.87	30.00	0.0	120.0	20.00	0.170	

Active pressure distribution behind the structure (without surcharge)

Layer No.	Start [ft] End [ft]	σ_z [psf]	σ_w [psf]	Pressure [psf]	Hor. comp. [psf]	Vert. comp. [psf]
1	0.00	0.0	0.0	0.0	0.0	0.0
	0.33	39.4	0.0	26.2	13.1	22.7
2	0.33	39.4	0.0	6.7	6.7	-0.1
	13.50	1620.0	0.0	274.7	274.7	-4.2

Forces acting on construction

Name	F_{hor} [lbf/ft]	App.Pt. Z [ft]	F_{vert} [lbf/ft]	App.Pt. X [ft]	Design coefficient
Weight - wall	0.0	-6.40	5252.8	4.25	1.000
FF resistance	-67.5	-0.50	0.0	0.00	1.000
Weight - earth wedge	0.0	-13.33	74.4	7.36	1.000
Active pressure	1855.3	-4.51	-24.3	4.59	1.000

Verification of most stressed block No.1

Check for overturning stability

Resisting moment $M_{res} = 22742.5$ lbfft/ft

Overturning moment $M_{OVR} = 8324.2$ lbfft/ft



Safety factor = 2.73 > 1.50

Joint for overturning stability is SATISFACTORY

Check for slip

Resisting horizontal force $H_{res} = 3114.8$ lbf/ft

Active horizontal force $H_{act} = 1787.8$ lbf/ft

Safety factor = 1.74 > 1.50

Joint for verification is SATISFACTORY

Verification of bearing capacity of soil:

Maximum stress $\sigma = 1571.2$ psf

Bearing capacity of footing material $R_d = 0.0$ psf

Safety factor = 9.55 > 2.00

Footing bearing capacity is SATISFACTORY

Table of utilization of individual rows of blocks

Number of block	Height [ft]	Overturning [%]	Slip [%]
1	0.00	54.90	86.09
2	1.50	39.81	22.98
3	3.00	42.90	19.84
4	4.50	28.67	13.60
5	6.00	30.90	11.22
6	7.50	18.26	6.68
7	9.00	19.08	5.55
8	10.50	9.24	3.59
9	12.00	5.36	1.70