

Block wall analysis

Input data

Project

Date : 28.10.2005


Geometry of structure

Slope of wall = 0.00 °

No.	Width b [m]	Height h [m]	Offset k [m]	Offs.(L) o ₁ [m]	Offs.(R) o ₂ [m]	Reinforcement	Overhang l [m]	Anchorage l _a [m]	Bear.cap. T _d [kN/m ²]	Strength R _t [kN/m]
7	0.30	0.80	0.00	0.00	0.00	NO	-	-	-	-
6	1.60	0.20	0.00	0.00	0.00	NO	-	-	-	-
5	1.00	0.50	0.00	0.60	0.00	NO	-	-	-	-
4	1.00	1.00	0.00	0.00	0.00	NO	-	-	-	-
3	1.00	1.00	0.00	0.00	0.00	NO	-	-	-	-
2	1.00	1.00	0.80	0.00	0.00	NO	-	-	-	-
1	2.50	0.70	0.00	-0.20	-0.20	NO	-	-	-	-

Note: Blocks are ordered from bottom to the top

Basic soil parametres

No.	Name	Pattern	φ _{ef} [°]	c _{ef} [kPa]	γ [kN/m ³]	γ _{su} [kN/m ³]	δ [°]
1	Soil No.1		30.00	5.00	20.00	10.00	15.00


All soils are considered as cohesionless for at rest pressure analysis.

Soil parameters

Soil No.1

Unit weight : $\gamma = 20,00 \text{ kN/m}^3$
 Stress-state : effective
 Angle of intern. friction : $\varphi_{ef} = 30,00^\circ$
 Cohesion of soil : $c_{ef} = 5,00 \text{ kPa}$
 Angle of friction struc.-soil : $\delta = 15,00^\circ$
 Soil : cohesionless
 Saturated unit weight : $\gamma_{sat} = 20,00 \text{ kN/m}^3$

Geological profile and assigned soils

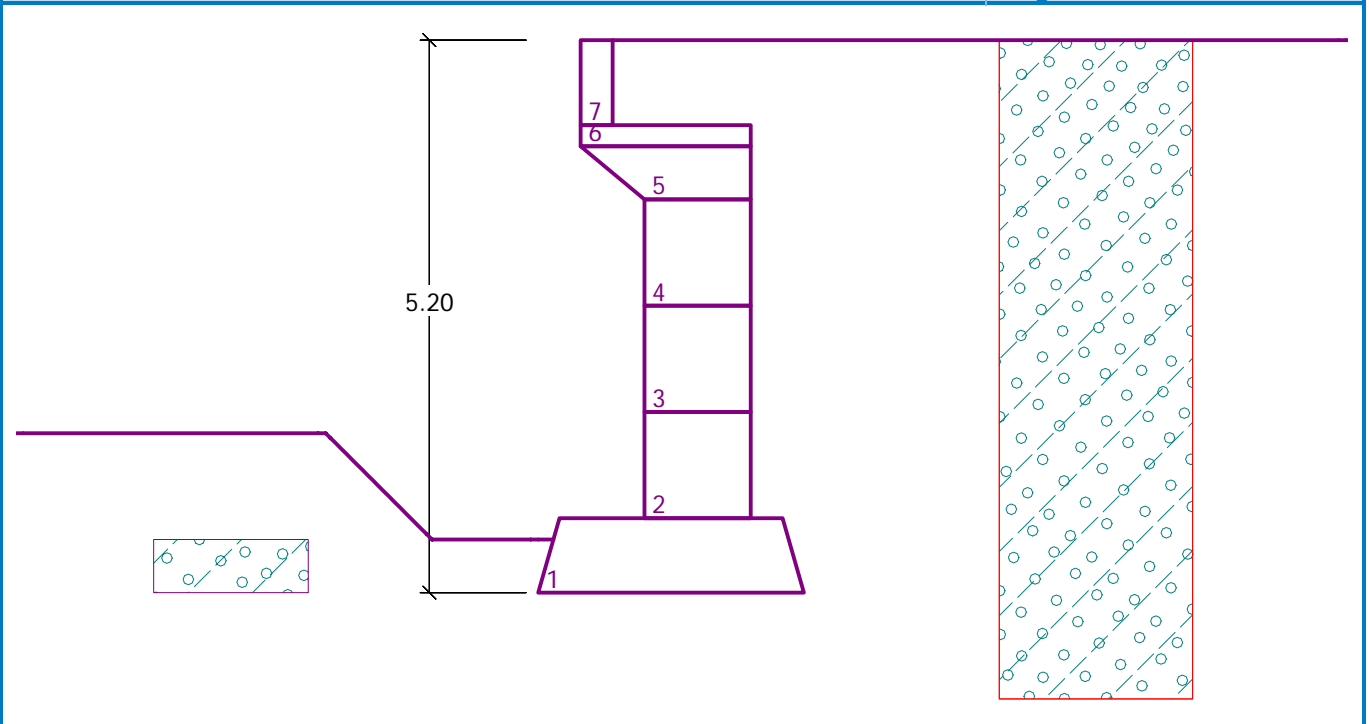
No.	Layer [m]	Assigned soil	Pattern
1	-	Soil No.1	

Terrain profile

Terrain behind the structure is flat.

Name : Terrain

Stage : 1



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 - Soil No.1
Soil thickness in front of structure $h = 0.50$ m

Terrain shape in front of structure

No.	Coordinate X [m]	Depth Z [m]
1	0.00	0.00
2	0.00	-0.50
3	-1.00	-0.50
4	-2.00	-1.50
5	-3.00	-1.50

Origin [0,0] is located in bottom left edge of construction.
Positive coordinate +z has downward direction.

Analysis settings

Active earth pressure calculation - Coulomb (CSN 730037)
Passive earth pressure calculation - Caquot-Kerisel (CSN 730037)
Analysis carried out according to classical theory (safety factor)

Safety factor for slip = 1.50
Safety factor for overturning = 1.50

Verification No. 1

Forces acting on construction

Name	F_{hor} [kN/m]	App.Pt. Z [m]	F_{vert} [kN/m]	App.Pt. X [m]	Design coefficient
Weight - wall	0.00	-2.11	116.40	1.36	1.000
FF resistance	-1.20	-0.17	0.69	0.05	1.000
Weight - earth wedge	0.00	-5.20	0.00	0.70	1.000
Weight - earth wedge	0.00	-0.87	1.56	2.10	1.000
Weight - earth wedge	0.00	-4.77	17.10	1.24	1.000
Active pressure	65.46	-1.36	45.95	2.19	1.000

Verification of complete wall

Check for overturning stability

Resisting moment $M_{res} = 283.34$ kNm

Overturning moment $M_{ovr} = 88.82$ kNm

Safety factor = 3.19 > 1.50

Wall for overturning is SATISFACTORY

Check for slip

Resisting horizontal force $H_{res} = 115.61$ kN/m

Active horizontal force $H_{act} = 64.26$ kN/m

Safety factor = 1.80 > 1.50

Wall for slip is SATISFACTORY

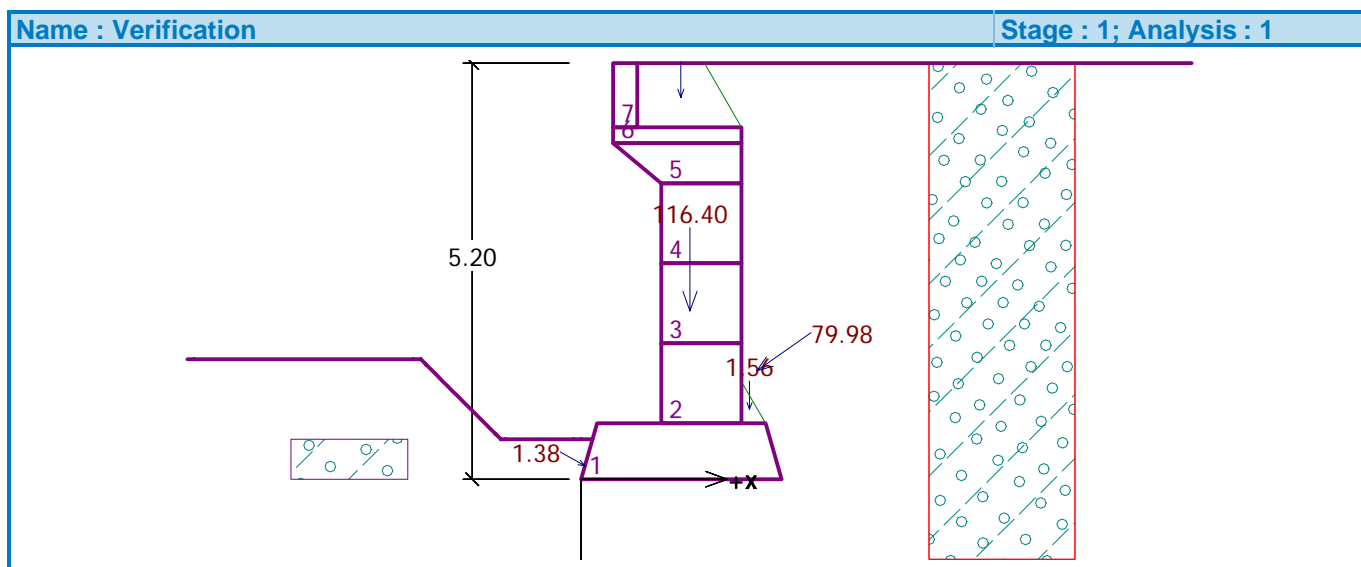
Forces acting at the center of footing bottom

Overall moment $M = 32.60$ kNm/m

Normal force $N = 181.70$ kN/m

Shear force $Q = 64.26$ kN/m

Overall check - WALL is SATISFACTORY



Bearing capacity of foundation soil

Forces acting at the center of the footing bottom

Company Name	Project Name
Project Author	Project Part

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [m]	Stress [kPa]
1	32.60	181.70	64.26	0.18	84.86

Bearing capacity of foundation soil check

Eccentricity verification

Max. eccentricity of normal force $e = 179.4$ mm

Maximum allowable eccentricity $e_{alw} = 825.0$ mm

Eccentricity of the normal force is SATISFACTORY

Footing bottom bearing capacity verification

Max. stress at footing bottom $\sigma = 84.86$ kPa

Bearing capacity of foundation soil $R_d = 200.00$ kPa

Bearing capacity of foundation soil is SATISFACTORY

Overall verification - bearing capacity of found. soil is SATISFACTORY

Dimensioning No. 1

Active pressure behind the structure - partial results

Layer No.	Thickness [m]	α [°]	ϕ_d [°]	c_d [kPa]	γ [kN/m ³]	δ_d [°]	K_a	Comment
1	0.32	30.00	30.00	5.00	20.00	30.00	0.667	
2	0.48	30.00	30.00	5.00	20.00	30.00	0.667	
3	0.04	0.00	30.00	5.00	20.00	15.00	0.301	
4	0.16	0.00	30.00	5.00	20.00	15.00	0.301	
5	0.50	0.00	30.00	5.00	20.00	15.00	0.301	
6	1.00	0.00	30.00	5.00	20.00	15.00	0.301	
7	1.00	0.00	30.00	5.00	20.00	15.00	0.301	

Active pressure distribution behind the structure (without surcharge)

Layer No.	Start [m] End [m]	σ_z [kPa]	σ_w [kPa]	Pressure [kPa]	Hor. comp. [kPa]	Vert. comp. [kPa]
1	0.00	0.00	0.00	0.00	0.00	0.00
	0.32	6.50	0.00	0.00	0.00	0.00
2	0.32	6.50	0.00	0.00	0.00	0.00
	0.80	16.00	0.00	6.34	3.17	5.49
3	0.80	16.00	0.00	0.00	0.00	0.00
	0.84	16.83	0.00	0.00	0.00	0.00
4	0.84	16.83	0.00	0.00	0.00	0.00
	1.00	20.00	0.00	0.96	0.92	0.25
5	1.00	20.00	0.00	0.96	0.92	0.25
	1.50	30.00	0.00	3.97	3.83	1.03
6	1.50	30.00	0.00	3.97	3.83	1.03
	2.50	50.00	0.00	10.00	9.66	2.59
7	2.50	50.00	0.00	10.00	9.66	2.59
	3.50	70.00	0.00	16.03	15.48	4.15

Forces acting on construction

Company Name	Project Name
Project Author	Project Part

Name	F_{hor} [kN/m]	App.Pt. Z [m]	F_{vert} [kN/m]	App.Pt. X [m]	Design coefficient
Weight - wall	0.00	-1.57	64.20	0.37	1.000
Weight - earth wedge	0.00	-3.07	17.10	0.24	1.000
Active pressure	21.33	-0.96	6.82	0.98	1.000

Verification of construction joint above the block No.: 2

Check for overturning stability:

Resisting moment $M_{res} = 34.37$ kNm/m

Overturning moment $M_{bc} = 20.39$ kNm/m

Factor of safety = 1.69 > 1.50

Joint for overturning stability is SATISFACTORY

Check for slip:

Resisting horizontal force $H_{res} = 32.66$ kN/m

Active horizontal force $H_{act} = 21.33$ kN/m

Factor of safety = 1.53 > 1.50

Joint for slip is SATISFACTORY

Forces acting on the bottom block:

Moment $M = 37.25$ kNm/m

Normal force $N = 88.12$ kN/m

Shear force $Q = 21.33$ kN/m