Gabion analysis

Input data

Project

Task : KhadiKhad
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Material of blocks - filling

Number	Name	γ [kN/m3]	φ [°]	c [kPa]
1	Rubble Masonry	24.00	45.00	0.00

Material of blocks - mesh

Number	Name	Strength overh. R_t [kN/m]	Spacing of vert. meshes b [m]	Bear.cap. of front joint R_s [kN/m]
1	Rubble Masonry	0.00	35.00	0.00

Geometry of structure

Number	Width b [m]	Height h [m]	Offset a [m]	Material
14	0.30	0.82	0.00	Rubble Masonry
13	0.30	1.20	0.00	Rubble Masonry
12	0.30	1.20	0.00	Rubble Masonry
11	0.30	1.20	0.00	Rubble Masonry
10	0.30	1.20	0.00	Rubble Masonry
9	0.30	1.20	0.00	Rubble Masonry
8	0.30	1.20	0.00	Rubble Masonry
7	0.30	1.20	0.00	Rubble Masonry
6	0.30	1.20	0.10	Rubble Masonry
5	0.40	1.20	0.20	Rubble Masonry
4	0.60	1.20	0.20	Rubble Masonry
3	0.80	1.20	0.20	Rubble Masonry
2	1.00	1.20	1.00	Rubble Masonry
1	2.00	1.20	-	Rubble Masonry

Gabion slope = 45.00 °
Overall height = 10.41 m
Overall wall volume = 8.89 m3/m

Soil parameters

Soil Sandy

Unit weight : γ = 19.00 kN/m3
Stress-state : effective
Angle of internal friction : φ_{ef} = 30.00 °
Cohesion of soil : c_{ef} = 0.00 kPa
Angle of friction struc.-soil : δ = 10.00 °
Soil : cohesionless
Saturated unit weight : γ_{sat} = 20.50 kN/m3

Geological profile and assigned soils

Number	Layer [m]	Assigned soil	Pattern
1	15.00	Soil Sandy	
2	-	Soil Sandy	

Terrain profile

Terrain behind the structure is flat.

Water influence

Ground water table is located below the structure.

Input surface surcharges

Number	Surcharge new	Surcharge change	Action	Mag.1 [kN/m2]	Mag.2 [kN/m2]	Ord.x x [m]	Length l [m]	Depth z [m]
1	YES		permanent	5.00				on terrain

Resistance on front face of the structure

Resistance on front face of the structure: passive
Soil on front face of the structure - Soil Sandy
Angle of friction struc.-soil $\delta = 0.00$ °
Soil thickness in front of structure $h = 1.10$ m

Terrain in front of structure is flat.

Global settings

Active earth pressure calculation - Coulomb
Passive earth pressure calculation - Coulomb

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 = 2.00
Factor of safety for bearing capacity = 1.00
Safety factor for net stress = 1.00

Coeff. of reduction of friction between blocks $k_t = 1.00$

Shape of earth wedge
Earth wedge is calculated as skew.
Masonry friction reduction factor base-soil $\mu = 1.00$

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	-2.67	213.26	4.83	1.000
FF resistance	-17.51	-0.37	17.51	2.06	1.000
Active pressure	56.35	-2.46	-39.46	5.28	1.000
Surch.1 - surface	2.55	-4.39	-1.79	7.22	1.000

Verification of complete wall

Check for overturning stability
Resisting moment M_{res} = 843.79 kNm/m
Overturning moment M_{ovr} = 143.20 kNm/m

Safety factor = 5.89 > 2.00
Wall for overturning is SATISFACTORY

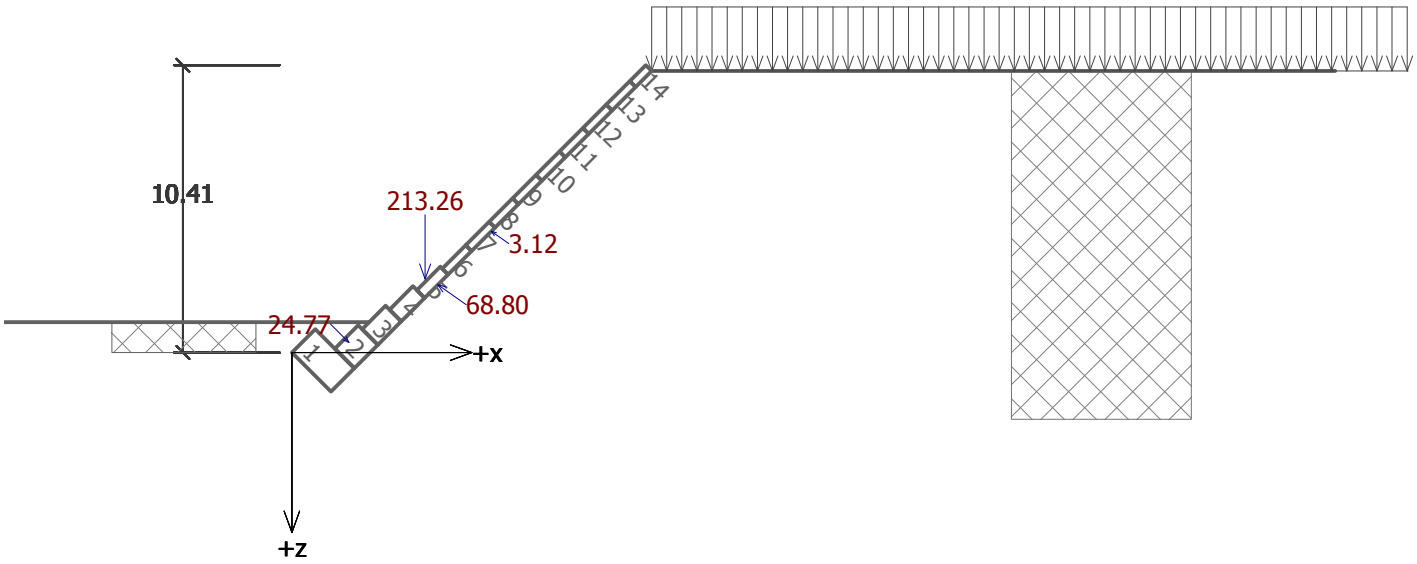
Check for slip
Since the net resultant force of active earth pressure and weight of soil are acting in the same direction and are opposite to the plane of the slip surface. So it will be safe in slip.

Wall for slip is SATISFACTORY

Forces acting at the centre of footing bottom
Overall moment M = -537.30 kNm/m
Normal force N = 163.29 kN/m
Shear force Q = -86.19 kN/m

Overall check - WALL is SATISFACTORY

Name : Geometry	Stage : 1; Analysis : 1



Bearing capacity of foundation soil

Forces acting at the centre of the footing bottom

Number	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [m]	Stress [kPa]
1	-537.30	163.29	-86.19	0.00	81.64

Bearing capacity of foundation soil check

Eccentricity verification
Max. eccentricity of normal force e = 0.0 mm
Maximum allowable eccentricity e_{alw} = 660.0 mm

Eccentricity of the normal force is SATISFACTORY

Footing bottom bearing capacity verification
Max. stress at footing bottom σ = 81.64 kPa
Bearing capacity of foundation soil R_d = 180.00 kPa

Safety factor = 2.20 > 1.00
Bearing capacity of foundation soil is SATISFACTORY

Overall verification - bearing capacity of found. soil is SATISFACTORY

Dimensioning 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	-3.62	155.66	4.65	1.000
FF resistance	-13.30	-0.32	13.30	0.60	1.000

Name	F_{hor} [kN/m]	App.Pt. Z [m]	F_{vert} [kN/m]	App.Pt. X [m]	Design coefficient
Active pressure	48.42	-2.88	-33.90	4.29	1.000
Surch.1 - surface	2.37	-4.67	-1.66	6.09	1.000

Verification of construction joint above the block No.: 1

Check for overturning stability
Resisting moment M_{res} = 575.89 kNm/m
Overturning moment M_{ovr} = 146.28 kNm/m

Safety factor = 3.94 > 2.00
Joint for overturning stability is SATISFACTORY

Check for slip
Since the net resultant force of active earth pressure and weight of soil are acting in the same direction and are opposite to the plane of the slip surface. So it will be safe in slip.

Joint for slip is SATISFACTORY

Forces acting at the centre of footing bottom
Overall moment M = -369.19 kNm/m
Normal force N = 120.84 kN/m
Shear force Q = -58.94 kN/m

Slope stability analysis

Results (Stage of construction 1)

Analysis 1

Circular slip surface

Slip surface parameters							
Center :	x =	-10.21	[m]	Angles :	α_1 =	-35.28	[°]
	z =	2.27	[m]		α_2 =	80.61	[°]
Radius :	R =	13.94	[m]				
The slip surface after optimization.							

Slope stability verification (Bishop)
Sum of active forces : F_a = 675.03 kN/m
Sum of passive forces : F_p = 1028.21 kN/m

Sliding moment : M_a = 9404.34 kNm/m
Resisting moment : M_p = 14324.83 kNm/m

Factor of safety = 1.52 > 1.50
Slope stability ACCEPTABLE