Gabion analysis

Input data

Project

Date : 11/2/2005

Material of blocks - filling

No.	Name	γ [kN/m³]	ϕ [°]	c [kPa]
1	Material No. 1	17.00	30.00	0.00

Material of blocks - mesh

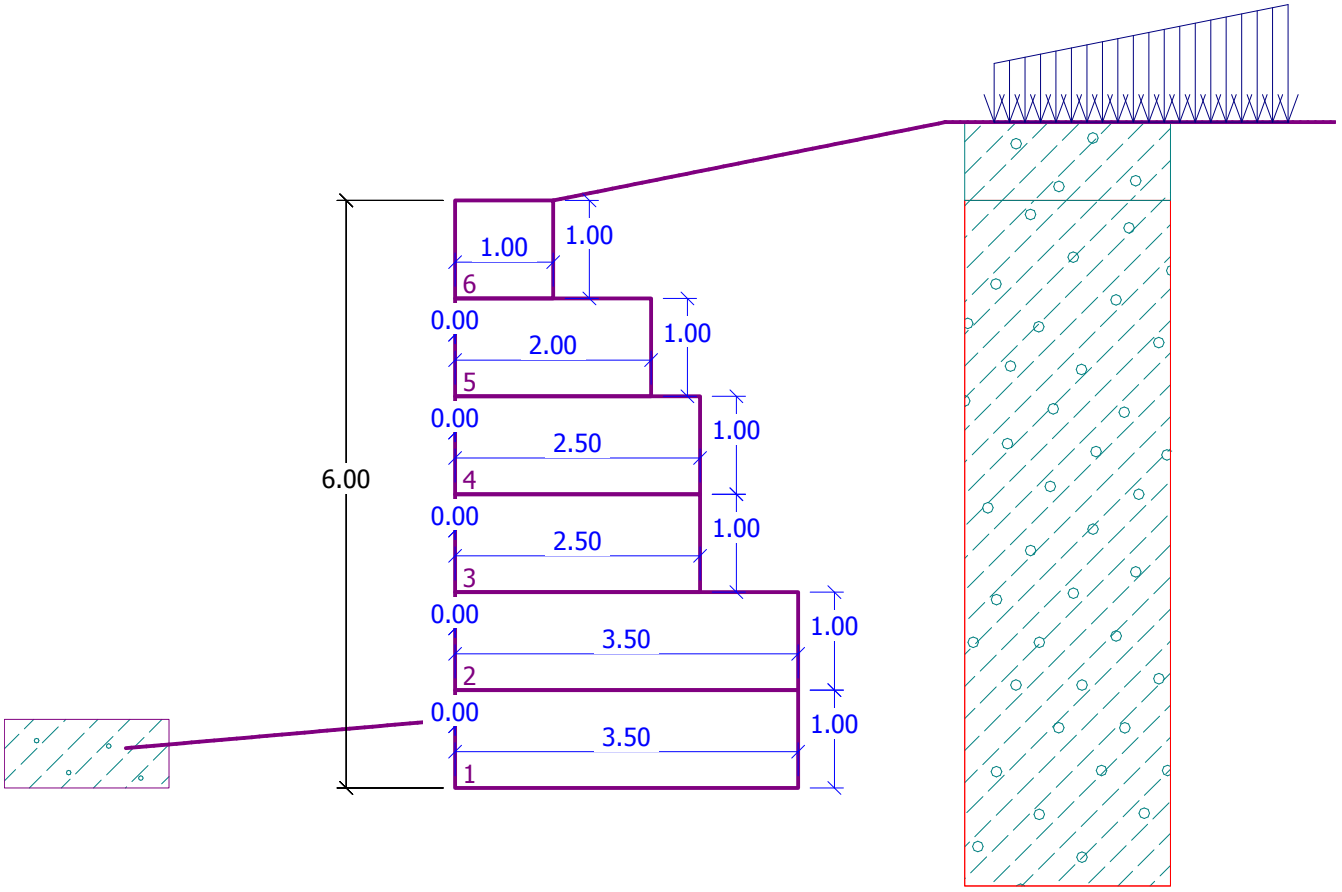
No.	Name	Strength overh. R_t [kN/m]	Spacing of vert. meshes b [m]	Bear.cap. of front joint R_s [kN/m]
1	Material No. 1	40.00	1.00	40.00

Geometry of structure

No.	Width b [m]	Height h [m]	Offset a [m]	Material
6	1.00	1.00	0.00	Material No. 1
5	2.00	1.00	0.00	Material No. 1
4	2.50	1.00	0.00	Material No. 1
3	2.50	1.00	0.00	Material No. 1
2	3.50	1.00	0.00	Material No. 1
1	3.50	1.00	-	Material No. 1

Gabion slope = 0.00 °
Overall height = 6.00 m
Overall wall volume = 15.00 m³/m

Name : Geometry **Stage : 1**



Soil parameters

Soil No. 1

Unit weight :	γ = 20.00 kN/m^3
Stress-state :	effective
Angle of internal friction :	φ_{ef} = 25.00 °
Cohesion of soil :	c_{ef} = 9.00 kPa
Angle of friction struc.-soil :	δ = 16.00 °
Soil :	cohesionless
Solid unit weight :	γ_s = 25.00 kN/m^3
Porosity <0.0 - 1.0> :	n = 0.30

Soil No. 2

Unit weight :	γ = 19.00 kN/m^3
Stress-state :	effective
Angle of internal friction :	φ_{ef} = 30.00 °
Cohesion of soil :	c_{ef} = 5.00 kPa
Angle of friction struc.-soil :	δ = 16.00 °
Soil :	cohesionless
Saturated unit weight :	γ_{sat} = 20.00 kN/m^3

Geological profile and assigned soils

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

Terrain profile

Terrain behind construction has the slope 1: 5.00 (slope angle is 11.31 °).
Embankment height is 0.80 m, embankment length is 4.00 m.

Water influence

Ground water table is located below the structure.

Inserted surface loads

No.	Surcharge new	Surcharge change	Name	Action	Mag.1 [kN/m2]	Mag.2 [kN/m2]	Ord.x x [m]	Length l [m]	Depth z [m]
1	YES		Surcharge No. 1	permanent	10.00	20.00	4.50	3.00	on terrain

Resistance on front face of the structure

Resistance on front face of the structure: 2/3 pass., 1/3 at rest
Soil on front face of the structure - Soil No. 2
Soil thickness in front of structure h = 0.70 m
Angle of friction struc.-soil δ = 0.00 °
Soil slope in front of structure β = -5.00 °

Global settings

Verification methodology : Analysis according to EN 1997
Input of patial factors : Standard
Design approach : 1 - reduction of actions and materials

Partial factors on actions (F)	Fact.	Combination 1 [–] Unfavourable	Combination 1 [–] Favourable	Combination 2 [–] Unfavourable	Combination 2 [–] Favourable
Permanent actions	γ_G	1.35	1.00	1.00	1.00
Variable actions	γ_Q	1.50	0.00	1.30	0.00
Water actions	γ_w	1.30		1.00	

Partial factors for soil parameters (M)	Fact.	Combination 1 [–]	Combination 2 [–]
Partial factor for intenal friction	$\gamma_{m\phi}$	1.00	1.25
Partial factor for effective cohesion	γ_{mc}	1.00	1.25
Partial factor for undrained shear strength	γ_{mcu}	1.00	1.40
Partial factor for Poisson's ratio	γ_{mv}	1.00	1.00

Partial factors for variable actions	Fact.	[–]
Factor for combination value	ψ_0	0.70
Factor for frequent value	ψ_1	0.50
Factor for quasi-permanent value	ψ_2	0.30

Active earth pressure calculation - Coulomb
Passive earth pressure calculation - Caqout-Kerisel

Settings of the stage of construction

Combination : basic

Verification No. 1

Forces acting on construction - combination 1

Name	F_{hor} [kN/m]	App.Pt. Z [m]	F_{vert} [kN/m]	App.Pt. X [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0.00	-2.43	255.00	1.40	1.000	1.000	1.350
FF resistance	-15.76	-0.29	0.00	0.00	1.000	1.000	1.000
Weight - earth wedge	0.00	-3.95	40.99	2.20	1.000	1.000	1.350

Name	F_{hor} [kN/m]	App.Pt. Z [m]	F_{vert} [kN/m]	App.Pt. X [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Active pressure	126.39	-2.07	97.75	3.01	1.000	1.350	1.350
Surcharge No. 1	10.74	-2.14	8.07	2.51	1.350	1.350	1.350

Verification of complete wall

Check for overturning stability
Resisting moment M_{res} = 769.01 kNm/m
Overturning moment M_{ovr} = 287.93 kNm/m

Wall for overturning is SATISFACTORY

Check for slip
Resisting horizontal force H_{res} = 224.85 kN/m
Active horizontal force H_{act} = 169.37 kN/m

Wall for slip is SATISFACTORY

Overall check - WALL is SATISFACTORY

Maximum stress in footing bottom :226.63kPa

Forces acting on construction - combination 2

Name	F_{hor} [kN/m]	App.Pt. Z [m]	F_{vert} [kN/m]	App.Pt. X [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0.00	-2.43	255.00	1.40	1.000	1.000	1.000
FF resistance	-12.27	-0.28	0.00	0.00	1.000	1.000	1.000
Weight - earth wedge	0.00	-3.95	40.99	2.20	1.000	1.000	1.000
Active pressure	163.53	-2.09	106.01	2.99	1.000	1.000	1.000
Surcharge No. 1	13.84	-2.42	9.50	2.37	1.000	1.000	1.000

Verification of complete wall

Check for overturning stability
Resisting moment M_{res} = 786.60 kNm/m
Overturning moment M_{ovr} = 371.18 kNm/m

Wall for overturning is SATISFACTORY

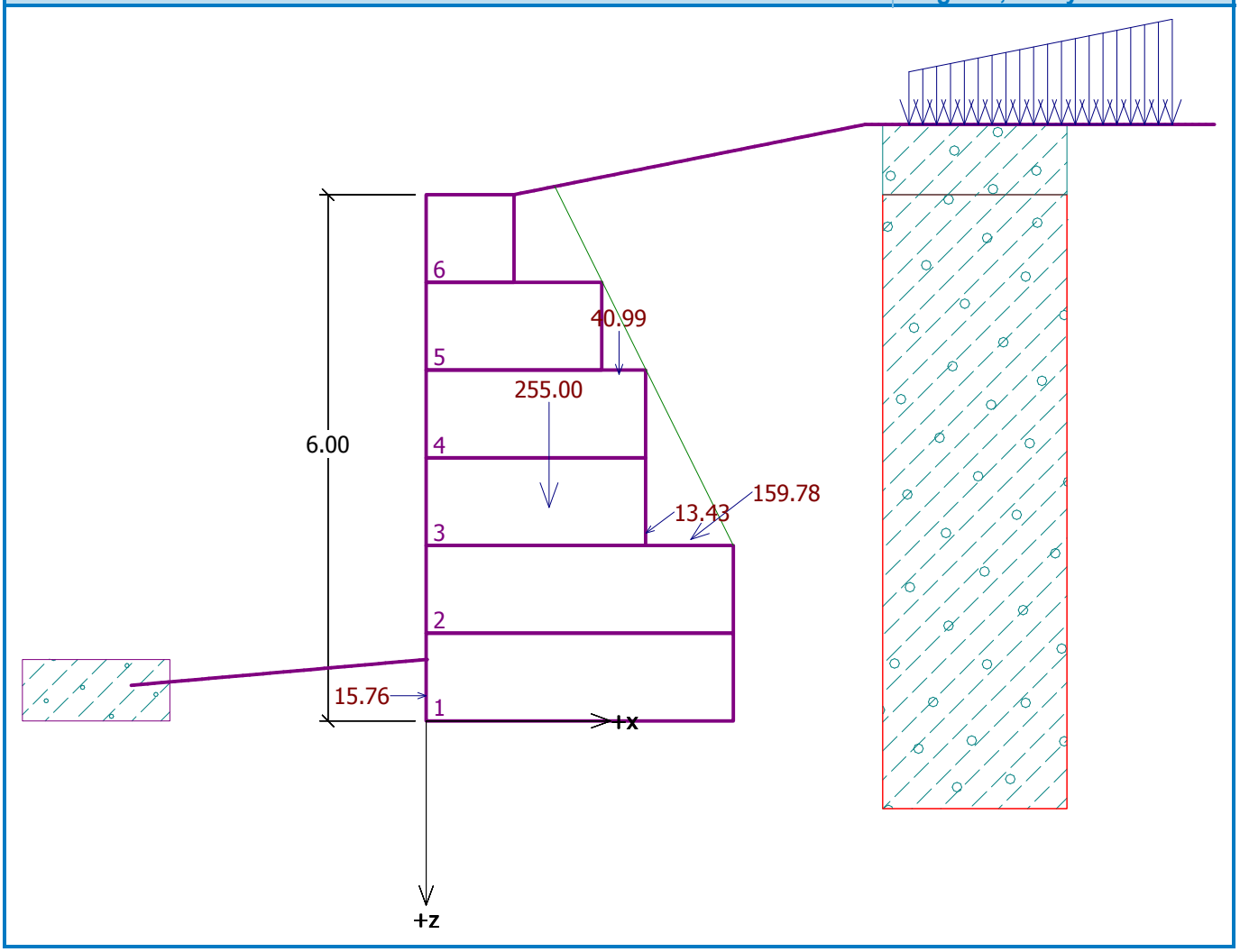
Check for slip
Resisting horizontal force H_{res} = 168.04 kN/m
Active horizontal force H_{act} = 165.10 kN/m

Wall for slip is SATISFACTORY

Overall check - WALL is SATISFACTORY

Maximum stress in footing bottom :203.80kPa

Name : Verification | **Stage : 1; Analysis : 1**



Bearing capacity of foundation soil

Forces acting at the centre of the footing bottom

Numbe	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [m]	Stress [kPa]
1	300.10	542.44	169.37	0.55	226.63

Bearing capacity of foundation soil check

Eccentricity verification
Max. eccentricity of normal force e = 553.2 mm
Maximum allowable eccentricity e_{alw} = 1155.0 mm

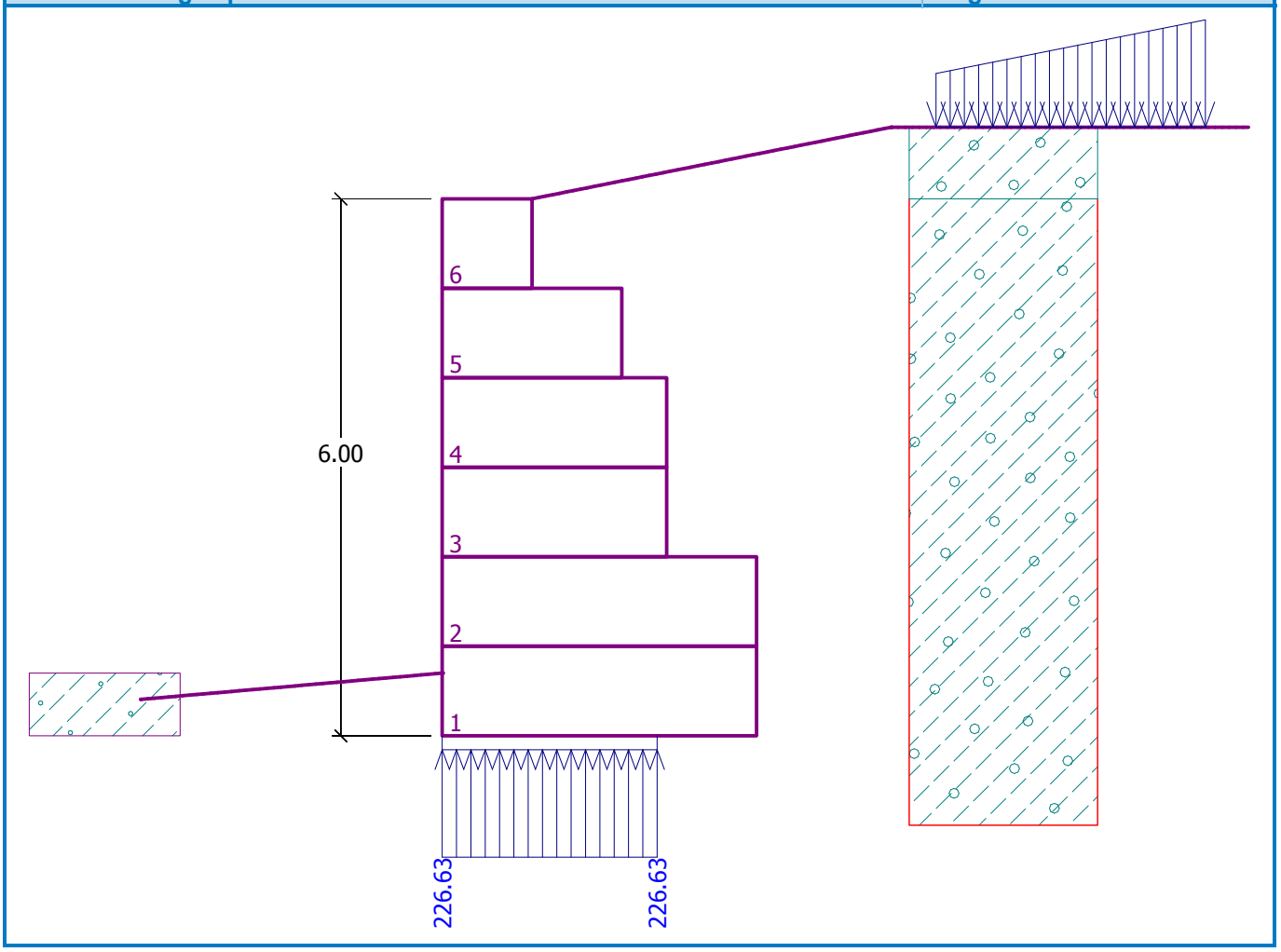
Eccentricity of the normal force is SATISFACTORY

Footing bottom bearing capacity verification
Max. stress at footing bottom σ = 226.63 kPa
Bearing capacity of foundation soil R_d = 230.00 kPa

Bearing capacity of foundation soil is SATISFACTORY

Overall verification - bearing capacity of found. soil is SATISFACTORY

Name : Bearing cap. **Stage : 1**



Dimensioning No. 1

Forces acting on construction - combination 1

Name	F_{hor} [kN/m]	App.Pt. Z [m]	F_{vert} [kN/m]	App.Pt. X [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0.00	-2.02	195.50	1.29	1.000	1.000	1.350
Weight - earth wedge	0.00	-2.95	40.99	2.20	1.000	1.000	1.350
Active pressure	91.41	-1.68	87.72	2.96	1.000	1.350	1.350
Surcharge No. 1	8.12	-1.66	7.32	2.45	1.000	1.350	1.350

Verification of construction joint above the block No.: 1

Check for overturning stability
Resisting moment M_{res} = 620.42 kNm/m
Overturning moment M_{ovr} = 166.64 kNm/m

Joint for overturning stability is SATISFACTORY

Check for slip
Resisting horizontal force H_{res} = 210.61 kN/m
Active horizontal force H_{act} = 134.37 kN/m

Joint for slip is SATISFACTORY

Forces acting on construction - combination 2

Name	F_{hor} [kN/m]	App.Pt. Z [m]	F_{vert} [kN/m]	App.Pt. X [m]	Coeff. overtur.	Coeff. sliding	Coeff. stress
Weight - wall	0.00	-2.02	195.50	1.29	1.000	1.000	1.000
Weight - earth wedge	0.00	-2.95	40.99	2.20	1.000	1.000	1.000
Active pressure	118.26	-1.70	95.49	2.93	1.000	1.000	1.000
Surcharge No. 1	10.87	-1.94	8.80	2.32	1.000	1.000	1.000

Verification of construction joint above the block No.: 1

Check for overturning stability
Resisting moment M_{res} = 643.53 kNm/m
Overturning moment M_{ovr} = 222.07 kNm/m

Joint for overturning stability is SATISFACTORY

Check for slip
Resisting horizontal force H_{res} = 196.75 kN/m
Active horizontal force H_{act} = 129.13 kN/m

Joint for slip is SATISFACTORY

Verification of gabion block for maximum stress:

Maximum pressure on the bottom block = 163.49 kPa
Red.Coeff. by offset of top block = 1.00
Average value of pressure on face = 71.66 kPa
Shear force trasmitted by friction = 170.54 kN/m

Bearing capacity against transverse pressure:
Joint bear.capacity = 40.00 kN/m
Computed stress-state = 35.83 kN/m

Transverse pressure check is SATISFACTORY

Joint btw. blocks check:
Mesh material bear.capacity = 40.00 kN/m
Computed stress-state = 35.83 kN/m

Joint between blocks is SATISFACTORY

Name : Dimensioning | **Stage : 1; Dimensioning : 1**