

Gabion analysis

Input data

Project

Date : 1.8.2018 r/

Settings

Standard - EN 1997 - DA2

Wall analysis

Active earth pressure calculation : Coulomb
Passive earth pressure calculation : Caquot-Kerisel
Earthquake analysis : Mononobe-Okabe
Shape of earth wedge : Calculate as skew
Allowable eccentricity : 0,333
Verification methodology : according to EN 1997
Design approach : 2 - reduction of actions and resistances

Partial factors on actions (A)				
Permanent design situation				
		Unfavourable	Favourable	
Permanent actions :	$\gamma_G =$	1,35 [-]	1,00	[-]
Variable actions :	$\gamma_Q =$	1,50 [-]	0,00	[-]
Water load :	$\gamma_w =$	1,35 [-]		

Partial factors for resistances (R)				
Permanent design situation				
Partial factor on overturning :	$\gamma_{Re} =$	1,40	[-]	
Partial factor on sliding resistance :	$\gamma_{Rh} =$	1,10	[-]	
Partial factor on bearing capacity :	$\gamma_{Rv} =$	1,40	[-]	
Partial factor on gabion mesh strength :	$\gamma_{Rn1} =$	1,10	[-]	
Partial factor on gabion joint strength :	$\gamma_{Rn2} =$	1,10	[-]	

Partial factors for variable actions				
Permanent design situation				
Factor for combination value :	$\psi_0 =$	0,70	[-]	
Factor for frequent value :	$\psi_1 =$	0,50	[-]	
Factor for quasi-permanent value :	$\psi_2 =$	0,30	[-]	

Material of blocks - filling

No.	Name	γ [kN/m ³]	φ [°]	c [kPa]
1	Габион	18,00	30,00	0,00

Material of blocks - mesh

No.	Name	Strength overh. R_t [kN/m]	Spacing of vert. meshes v [m]	Bear.cap. of front joint R_s [kN/m]
1	Габион	7,00	1,00	5,00

Geometry of structure

No.	Width b [m]	Height h [m]	Offset a [m]	Material
3	1,00	1,00	1,00	Габион

No.	Width b [m]	Height h [m]	Offset a [m]	Material
2	2,00	1,00	1,00	Габион
1	3,00	1,00	-	Габион

Gabion slope = 0,00 °
 Overall height = 3,00 m
 Overall wall volume = 6,00 m³/m

Soil parameters

Заскалявка

Unit weight : $\gamma = 22,00 \text{ kN/m}^3$
 Stress-state : effective
 Angle of internal friction : $\varphi_{ef} = 34,00^\circ$
 Cohesion of soil : $c_{ef} = 0,00 \text{ kPa}$
 Angle of friction struc.-soil : $\delta = 34,00^\circ$
 Soil : cohesionless
 Saturated unit weight : $\gamma_{sat} = 22,00 \text{ kN/m}^3$



обратен насип

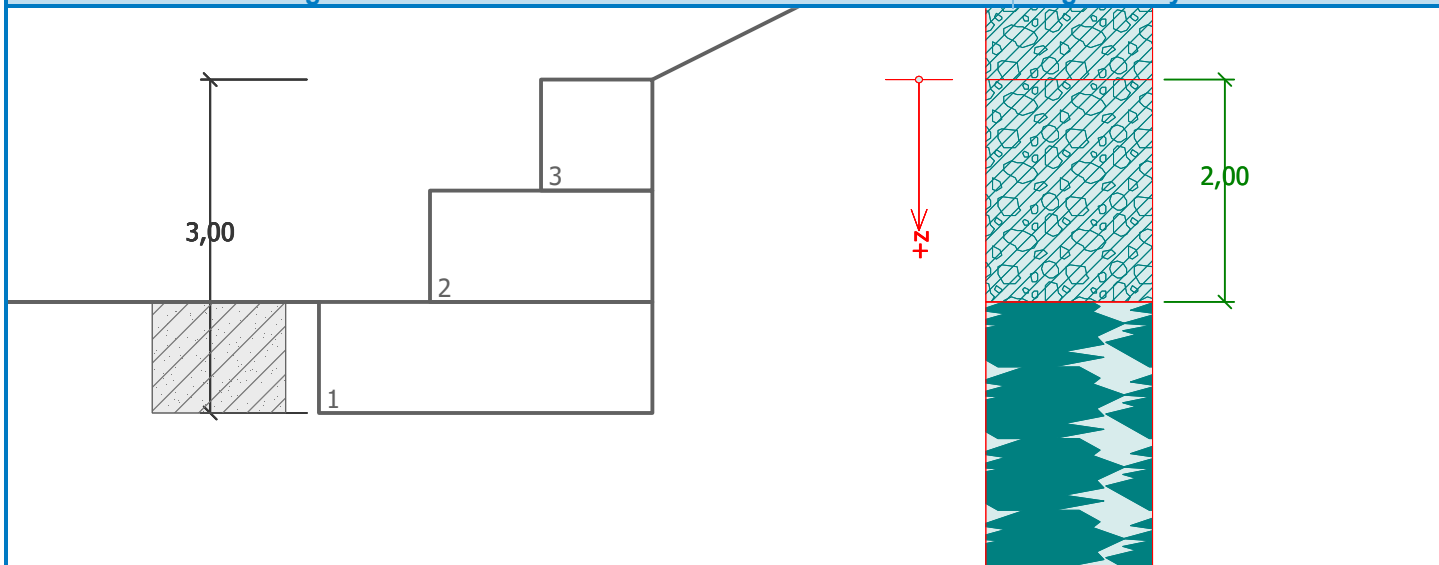
Unit weight : $\gamma = 20,00 \text{ kN/m}^3$
 Stress-state : effective
 Angle of internal friction : $\varphi_{ef} = 32,00^\circ$
 Cohesion of soil : $c_{ef} = 0,00 \text{ kPa}$
 Angle of friction struc.-soil : $\delta = 32,00^\circ$
 Soil : cohesionless
 Saturated unit weight : $\gamma_{sat} = 20,00 \text{ kN/m}^3$

Речно корито

Unit weight : $\gamma = 16,00 \text{ kN/m}^3$
 Stress-state : effective
 Angle of internal friction : $\varphi_{ef} = 33,00^\circ$
 Cohesion of soil : $c_{ef} = 0,00 \text{ kPa}$
 Angle of friction struc.-soil : $\delta = 33,00^\circ$
 Soil : cohesionless
 Saturated unit weight : $\gamma_{sat} = 16,00 \text{ kN/m}^3$

Geological profile and assigned soils

No.	Layer [m]	Assigned soil	Pattern
1	2,00	обратен насип	
2	-	Речно корито	



Foundation

Type of foundation : soil from geological profile

Terrain profile

Terrain behind construction has the slope 1: 2,00 (slope angle is 26,57 °).
Embankment height is 2,00 m, embankment length is 4,00 m.

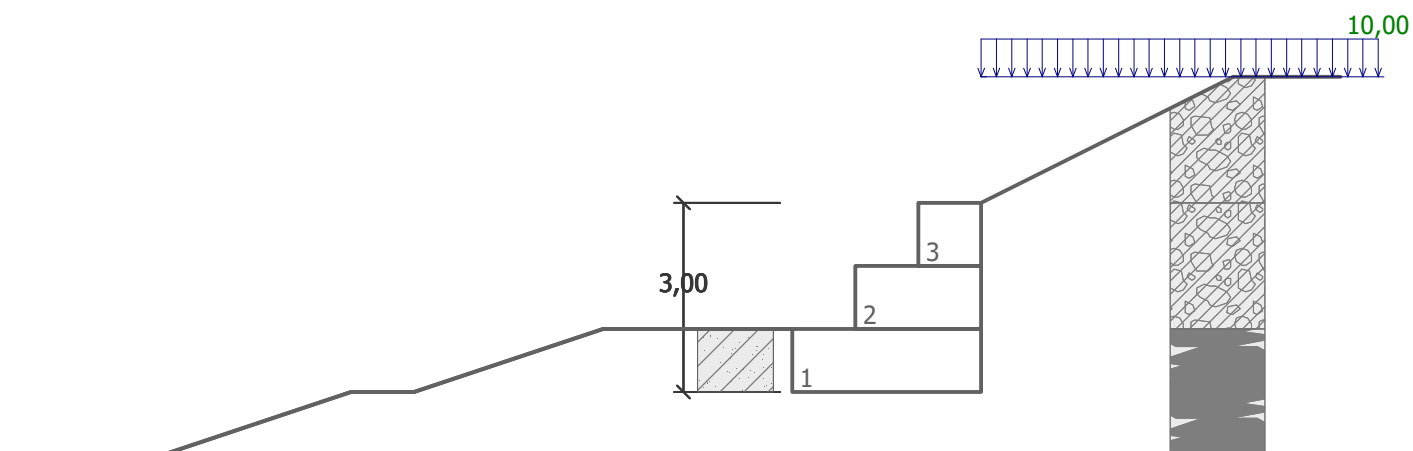
Water influence

Ground water table is located below the structure.

Input surface surcharges

No.	Surcharge		Action	Mag.1 [kN/m ²]	Mag.2 [kN/m ²]	Ord.x x [m]	Length l [m]	Depth z [m]
	new	change						
1	YES		permanent	10,00				on terrain

No.	Name
1	Валиране



Resistance on front face of the structure

Resistance on front face of the structure: at rest

Soil on front face of the structure - Заскалявка

Soil thickness in front of structure

$h = 1,00$ m

Terrain shape in front of structure

No.	Coordinate x[m]	Depth z[m]
1	0,00	0,00
2	0,00	-1,00
3	-3,00	-1,00
4	-6,00	0,00
5	-7,00	0,00
6	-10,00	1,00
7	-11,00	1,00

Origin [0,0] is located in bottom left edge of construction.

Positive coordinate +z has downward direction.

Settings of the stage of construction

Design situation : permanent

Verification No. 1

Pressure at rest on front face of the structure - partial results

Layer No.	Thickness [m]	α [°]	φ_d [°]	c_d [kPa]	γ [kN/m ³]	K_r	Comment
1	1,00	0,00	34,00	0,00	22,00	0,441	

Pressure at rest distribution on front face of the structure

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
	1,00	22,00	0,00	9,70	9,70	0,00

Active pressure behind the structure - partial results

Layer No.	Thickness [m]	α [°]	φ_d [°]	c_d [kPa]	γ [kN/m³]	δ_d [°]	K_a	Comment
1	1,00	0,00	32,00	0,00	20,00	32,00	0,476	
2	1,00	0,00	32,00	0,00	20,00	32,00	0,476	
3	1,00	0,00	33,00	0,00	16,00	33,00	0,268	

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
	1,00	20,00	0,00	9,52	8,07	5,04
2	1,00	20,00	0,00	9,52	8,07	5,04
	2,00	40,00	0,00	19,03	16,14	10,09
3	2,00	40,00	0,00	21,41	17,96	11,66
	3,00	56,00	0,00	25,69	21,55	13,99

Pressure profile due to surcharge - Валиране

Point No.	Depth [m]	Hor. comp. [kPa]	Vert. comp. [kPa]
1	0,00	4,04	2,52
2	1,00	4,04	2,52
3	2,00	4,04	2,52
4	2,00	2,24	1,46
5	3,00	2,24	1,46

Forces acting on construction

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	-1,17	108,00	1,83	1,000	1,000	1,350
FF resistance	-4,85	-0,33	0,00	0,00	1,000	1,000	1,000
Active pressure	35,89	-1,02	22,91	3,00	1,350	1,350	1,350
Валиране	10,31	-1,67	6,50	3,00	1,350	1,350	1,350

Verification of complete wall

Check for overturning stability

Resisting moment $M_{res} = 226,52$ kNm/m

Overturning moment $M_{ovr} = 70,93$ kNm/m

Wall for overturning is **SATISFACTORY**

Check for slip

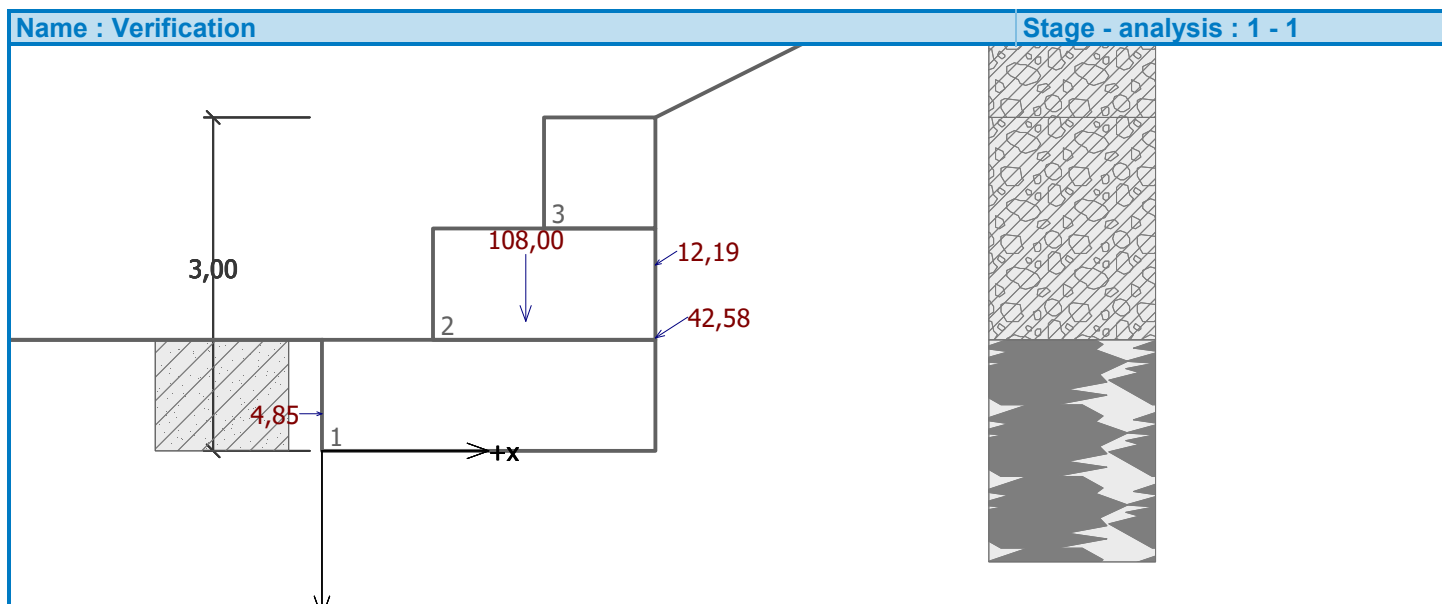
Resisting horizontal force $H_{res} = 87,20$ kN/m

Active horizontal force $H_{act} = 57,53$ kN/m

Wall for slip is **SATISFACTORY**

Overall check - WALL is **SATISFACTORY**

Maximum stress in footing bottom: 61,84 kPa



Bearing capacity of foundation soil

Design load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]	Eccentricity [-]	Stress [kPa]
1	-37,23	185,51	57,53	0,000	61,84
2	-24,63	147,71	57,53	0,000	49,24

Service load acting at the center of footing bottom

No.	Moment [kNm/m]	Norm. force [kN/m]	Shear Force [kN/m]
1	-28,00	137,41	41,36

Verification of foundation soil

Eccentricity verification

Max. eccentricity of normal force $e = 0,000$

Maximum allowable eccentricity $e_{alw} = 0,333$

Eccentricity of the normal force is SATISFACTORY

Verification of bearing capacity

Design bearing capacity of foundation soil $R = 150,00$ kPa

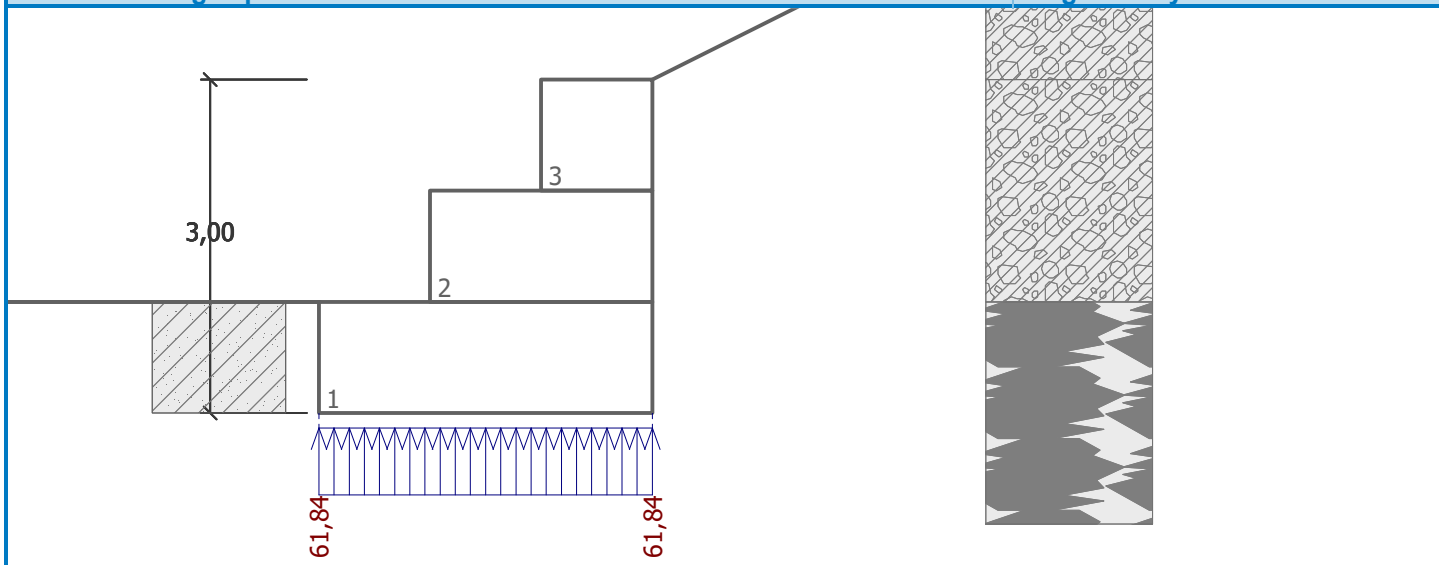
Partial factor on bearing capacity $\gamma_{Rv} = 1,40$

Max. stress at footing bottom $\sigma = 61,84$ kPa

Bearing capacity of foundation soil $R_d = 107,14$ 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	1,00	0,00	32,00	0,00	20,00	32,00	0,476	
2	1,00	0,00	32,00	0,00	20,00	32,00	0,476	

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
	1,00	20,00	0,00	9,52	8,07	5,04
2	1,00	20,00	0,00	9,52	8,07	5,04
	2,00	40,00	0,00	19,03	16,14	10,09

Pressure profile due to surcharge - Валиране

Point No.	Depth [m]	Hor. comp. [kPa]	Vert. comp. [kPa]
1	0,00	4,04	2,52
2	1,00	4,04	2,52
3	2,00	4,04	2,52

Forces acting on construction

Name	F_{hor} [kN/m]	App.Pt. z [m]	F_{vert} [kN/m]	App.Pt. x [m]	Coeff. overturn.	Coeff. sliding	Coeff. stress
Weight - wall	0,00	-0,83	54,00	1,17	1,000	1,000	1,350
Active pressure	16,14	-0,67	10,09	2,00	1,350	1,350	1,350
Валиране	8,07	-1,00	5,04	2,00	1,350	1,350	1,350

Verification of the most stressed construction joint - above the block No. 1

Check for overturning stability

Resisting moment $M_{res} = 74,18$ kNm/m

Overturning moment $M_{ovr} = 25,42$ kNm/m

Joint for overturning stability is SATISFACTORY

Active horizontal force $H_{act} = 32,68 \text{ kN/m}$

Joint for slip is SATISFACTORY

Maximum pressure on the bottom block = 46,66 kPa

Red.Coeff. by offset of top block = 0,00

Average value of pressure on face = 3,75 kPa

Shear force transmitted by friction = 53,88 kN/m

Bearing capacity against transverse pressure:

Joint bear.capacity = 4,55 kN/m

Computed stress-state = 1,88 kN/m

Transverse pressure check is SATISFACTORY

Joint btw. blocks check:

Mesh material bear.capacity = 6,36 kN/m

Computed stress-state = 1,88 kN/m

Joint between blocks is SATISFACTORY

