Slope stability analysis

Input data

Project

Task : Sanacija plazu na LC 440291 Zg.Gruškovje-Straža pri hiši Zg.Gruškovje 6
Description : Povratna stabilnostna analiza
Customer : Občina Oplotnica
Author : GROING d.o.o.
Date : 05/08/2025

Settings

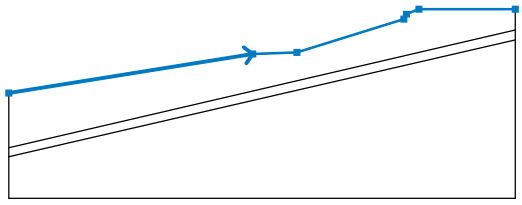
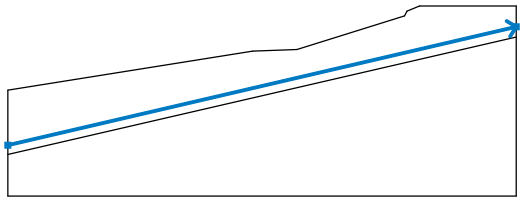
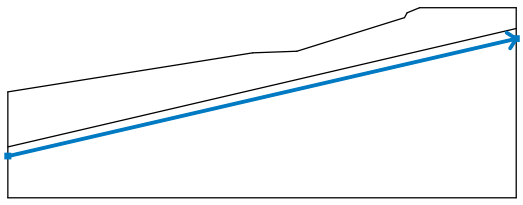
Slovenia - EN 1997 (85)

Stability analysis

Earthquake analysis : Standard
Verification methodology : Safety factors (ASD)

Safety factors			
Permanent design situation			
Safety factor :	SF_s =	1,50	[–]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		0,00	7,70	29,40	12,40	34,70	12,60
		47,60	16,60	47,90	17,20	49,40	17,80
		61,00	17,80				
2		0,00	1,10	61,00	15,30		
3		0,00	0,00	61,00	14,10		

Soil parameters - effective stress state

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m^3]
1	Glina		14,50	1,00	19,00
2	Preperina		32,00	10,00	20,00

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No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m^3]
3	Hribina		34,00	30,00	22,00

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [kN/m^3]	γ_s [kN/m^3]	n [–]
1	Glina		19,00		
2	Preperina		20,00		
3	Hribina		22,00		

Soil parameters

Glina

Unit weight : γ = 19,00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 14,50 °
Cohesion of soil : c_{ef} = 1,00 kPa
Saturated unit weight : γ_{sat} = 19,00 kN/m^3

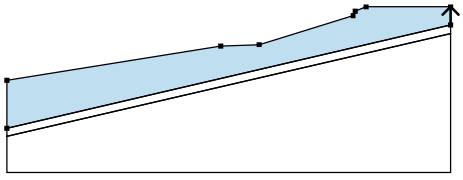
Preperina

Unit weight : γ = 20,00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 32,00 °
Cohesion of soil : c_{ef} = 10,00 kPa
Saturated unit weight : γ_{sat} = 20,00 kN/m^3

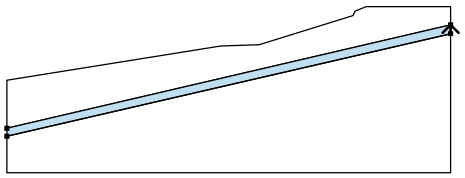
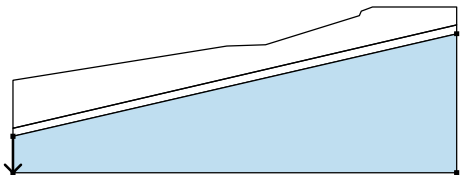
Hribina

Unit weight : γ = 22,00 kN/m^3
Stress-state : effective
Angle of internal friction : φ_{ef} = 34,00 °
Cohesion of soil : c_{ef} = 30,00 kPa
Saturated unit weight : γ_{sat} = 22,00 kN/m^3

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		61,00	15,30	61,00	17,80	Glina
		49,40	17,80	47,90	17,20	
		47,60	16,60	34,70	12,60	
		29,40	12,40	0,00	7,70	
		0,00	1,10			

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No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
2		61,00	14,10	61,00	15,30	Preperina
		0,00	1,10	0,00	0,00	
3		0,00	0,00	0,00	-5,00	Hribina
		61,00	-5,00	61,00	14,10	

Surcharge

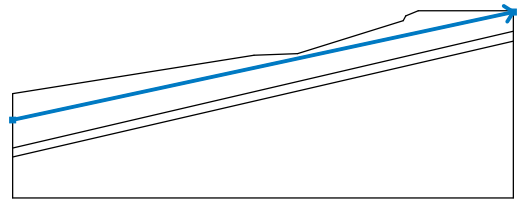
No.	Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope α [°]	Magnitude q, q_1, f, F	Magnitude q_2	Magnitude unit
1	strip	permanent	on terrain	x = 50,90	l = 10,00		0,00	150,00		kN/m^2

Surcharges

No.	Name
1	Objekt

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0,00	4,50	61,00	17,65		

Tensile crack

Tensile crack not input.

Earthquake

Earthquake not included.

Settings of the stage of construction

Design situation : permanent

Results (Stage of construction 1)

Analysis 1

Circular slip surface

Slip surface parameters							
Center :	x =	14,57	[m]	Angles :	α_1 =	-12,12	[°]
	z =	70,17	[m]		α_2 =	34,70	[°]
Radius :	R =	63,70	[m]				
Analysis of the slip surface without optimization.							

Slope stability verification (Bishop)

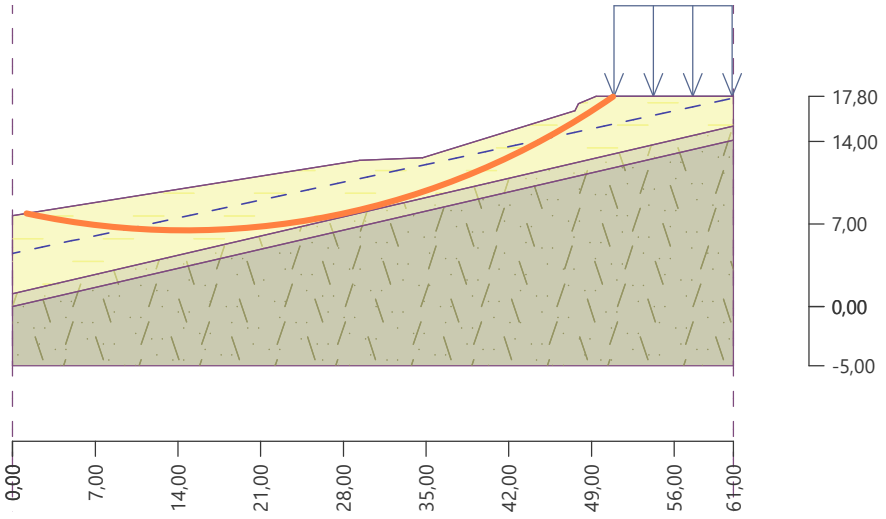
Sum of active forces : F_a = 439,85 kN/m

Sum of passive forces : F_p = 576,09 kN/m

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Sliding moment : M_a = 28018,27 kNm/m
Resisting moment : M_p = 36696,81 kNm/m
Factor of safety = 1,31 < 1,50
Slope stability NOT ACCEPTABLE

Name : Analysis	Stage - analysis : 1 - 1
Description : Drsina 1	



Analysis 2

Circular slip surface

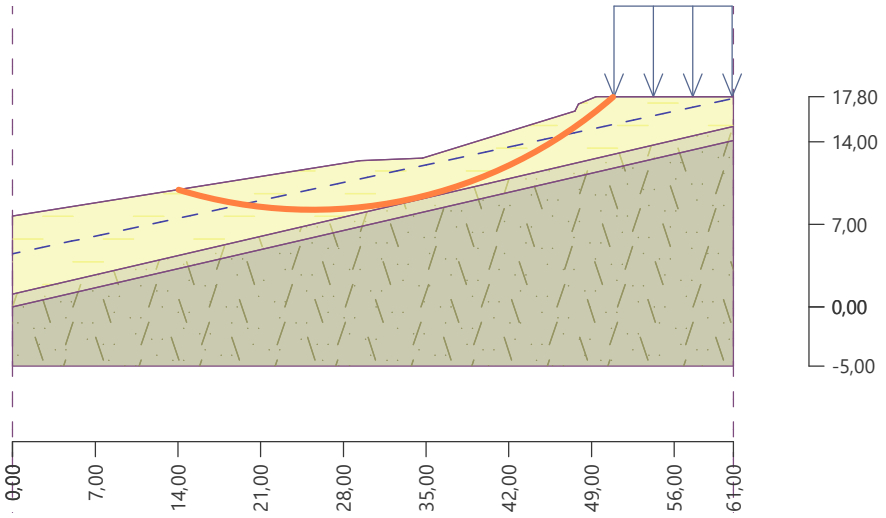
Slip surface parameters							
Center :	x =	25,38	[m]	Angles :	α_1 =	-17,02	[°]
	z =	46,95	[m]		α_2 =	41,13	[°]
Radius :	R =	38,70	[m]				
Analysis of the slip surface without optimization.							

Slope stability verification (Bishop)
Sum of active forces : F_a = 333,13 kN/m
Sum of passive forces : F_p = 397,35 kN/m

Sliding moment : M_a = 12892,10 kNm/m
Resisting moment : M_p = 15377,39 kNm/m
Factor of safety = 1,19 < 1,50
Slope stability NOT ACCEPTABLE

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Name : Analysis	Stage - analysis : 1 - 2
Description : Drsina 2	



Analysis 3

Circular slip surface

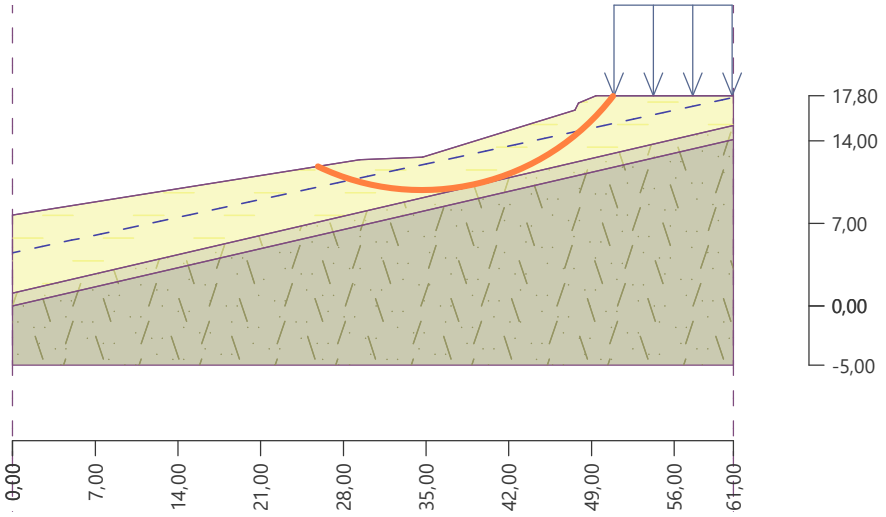
Slip surface parameters							
Center :	x =	34,65	[m]	Angles :	α_1 =	-25,59	[°]
	z =	30,23	[m]		α_2 =	52,46	[°]
Radius :	R =	20,40	[m]				
Analysis of the slip surface without optimization.							

Slope stability verification (Bishop)

Sum of active forces : F_a = 265,17 kN/m
Sum of passive forces : F_p = 262,45 kN/m

Sliding moment : M_a = 5409,56 kNm/m
Resisting moment : M_p = 5353,94 kNm/m
Factor of safety = 0,99 < 1,50
Slope stability NOT ACCEPTABLE

Name : Analysis	Stage - analysis : 1 - 3
Description : Drsina 3	



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Analysis 4

Circular slip surface

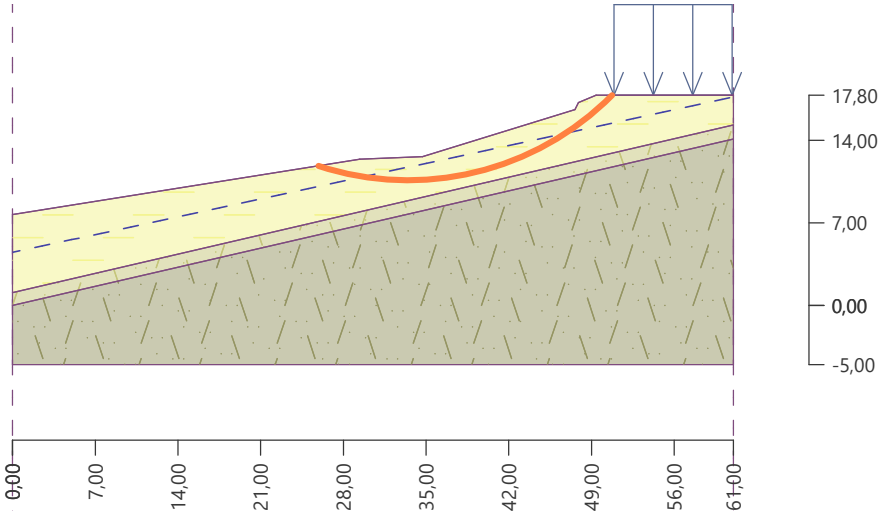
Slip surface parameters							
Center :	x =	33,49	[m]	Angles :	α_1 =	-18,19	[°]
	z =	34,95	[m]		α_2 =	45,17	[°]
Radius :	R =	24,32	[m]				
Analysis of the slip surface without optimization.							

Slope stability verification (Bishop)

Sum of active forces : F_a = 202,75 kN/m
Sum of passive forces : F_p = 208,75 kN/m

Sliding moment : M_a = 4930,96 kNm/m
Resisting moment : M_p = 5076,72 kNm/m
Factor of safety = 1,03 < 1,50
Slope stability NOT ACCEPTABLE

Name : Analysis | **Stage - analysis : 1 - 4**
Description : Drsina 4



Analysis 5

Circular slip surface

Slip surface parameters							
Center :	x =	35,53	[m]	Angles :	α_1 =	-32,96	[°]
	z =	26,73	[m]		α_2 =	59,79	[°]
Radius :	R =	17,76	[m]				
Analysis of the slip surface without optimization.							

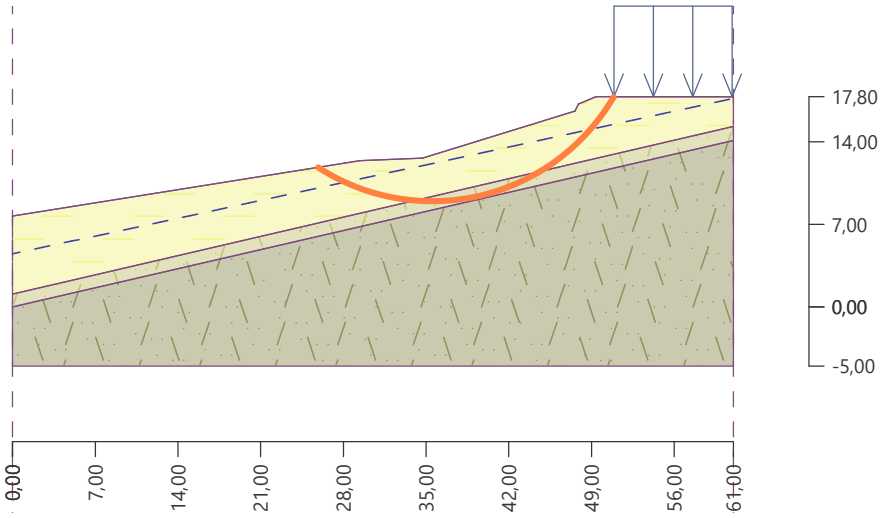
Slope stability verification (Bishop)

Sum of active forces : F_a = 321,69 kN/m
Sum of passive forces : F_p = 607,39 kN/m

Sliding moment : M_a = 5711,74 kNm/m
Resisting moment : M_p = 10784,56 kNm/m
Factor of safety = 1,89 > 1,50
Slope stability ACCEPTABLE

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Name : Analysis	Stage - analysis : 1 - 5
Description : Drsina 5	



Analysis 6

Circular slip surface

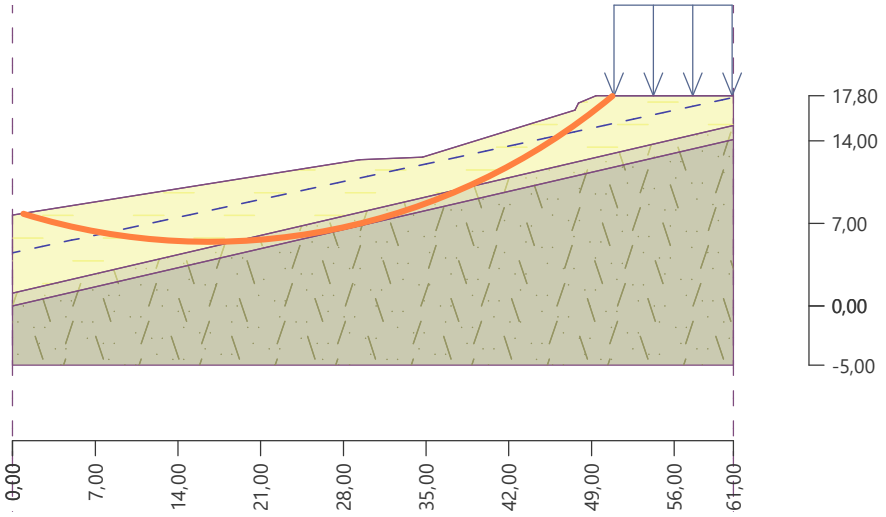
Slip surface parameters							
Center :	x =	16,65	[m]	Angles :	α_1 =	-17,17	[°]
	z =	58,77	[m]		α_2 =	39,77	[°]
Radius :	R =	53,30	[m]				
Analysis of the slip surface without optimization.							

Slope stability verification (Bishop)

Sum of active forces : F_a = 564,21 kN/m
Sum of passive forces : F_p = 1275,32 kN/m

Sliding moment : M_a = 30072,84 kNm/m
Resisting moment : M_p = 67975,84 kNm/m
Factor of safety = 2,26 > 1,50
Slope stability ACCEPTABLE

Name : Analysis	Stage - analysis : 1 - 6
Description : Drsina 6	



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