Slope stability analysis

Input data (Construction stage 1)

Project

Task : Yard extension stability assessment
Part : Long term conditions - traditional FoS
Description : Section A-A'
Customer : Bryn Aggregates Ltd
Author : JPCE Ltd
Date : 07/10/2023

Settings

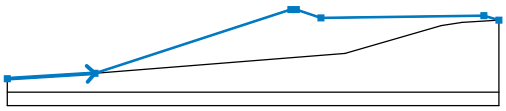
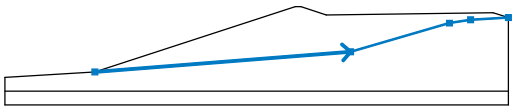
Standard - safety factors

Stability analysis

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

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	0.00	32.72	2.02	105.67	25.82
		107.77	25.82	116.94	22.72	177.69	23.54
		183.30	21.85				
2		32.72	2.02	125.88	9.40	161.86	19.80
		169.57	21.03	183.30	21.85		
3		0.00	-5.00	183.30	-5.00		

Soil parameters - effective stress state

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m³]
1	Imported soils		30.00	0.00	19.00

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [kN/m³]	γ_s [kN/m³]	n [–]
1	Imported soils		19.00		

Soil parameters - total stress state

No.	Name	Pattern	c_u [kPa]	γ [kN/m³]
1	In-situ clay soils		150.00	21.00
2	Sandstone bedrock		300.00	20.00

Soil parameters

In-situ clay soils

Unit weight : γ = 21.00 kN/m³
Stress-state : total
Shear strength : Mohr-Coulomb
Cohesion of soil : c_u = 150.00 kPa

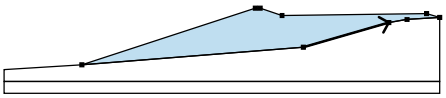
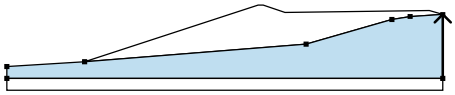
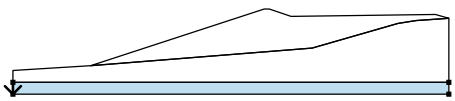
Imported soils

Unit weight : γ = 19.00 kN/m³
Stress-state : effective
Shear strength : Mohr-Coulomb
Angle of internal friction : φ_{ef} = 30.00 °
Cohesion of soil : c_{ef} = 0.00 kPa
Saturated unit weight : γ_{sat} = 19.00 kN/m³

Sandstone bedrock

Unit weight : γ = 20.00 kN/m³
Stress-state : total
Shear strength : Mohr-Coulomb
Cohesion of soil : c_u = 300.00 kPa

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		125.88	9.40	161.86	19.80	Imported soils
		169.57	21.03	183.30	21.85	
		177.69	23.54	116.94	22.72	
		107.77	25.82	105.67	25.82	
		32.72	2.02			
2		183.30	-5.00	183.30	21.85	In-situ clay soils
		169.57	21.03	161.86	19.80	
		125.88	9.40	32.72	2.02	
		0.00	0.00	0.00	-5.00	
3		0.00	-5.00	0.00	-10.00	Sandstone bedrock
		183.30	-10.00	183.30	-5.00	

Surcharge

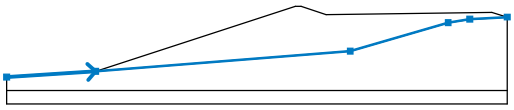
No.	Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope α [°]	Magnitude q, q_1, f, F, x	Magnitude q_2, z	Magnitude unit
1	strip	permanent	on terrain	x = 117.00	l = 60.00		0.00	100.00		kN/m^2

Surcharges

No.	Name
1	Working loads

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	-0.14	32.63	1.97	125.80	9.40
		161.68	19.84	169.58	21.11	183.30	21.84

Tensile crack

Tensile crack not input.

Earthquake

Earthquake not included.

Settings of the stage of construction

Design situation : permanent

Results (Construction stage 1)

Analysis 1

Circular slip surface

Slip surface parameters							
Center :	x =	-26.73	[m]	Angles :	α_1 =	17.51	[°]
	z =	328.38	[m]		α_2 =	18.63	[°]
Radius :	R =	328.72	[m]				
Slip surface after grid search.							

Total weight of soil above the slip surface: 1.11 kN/m

Slope stability verification (Bishop)

Sum of active forces : F_a = 0.35 kN/m

Sum of passive forces : F_p = 0.61 kN/m

Sliding moment : M_a = 113.48 kNm/m

Resisting moment : M_p = 200.52 kNm/m

Factor of safety = 1.77 > 1.50

Slope stability ACCEPTABLE

Name : Analysis	Stage - analysis : 1 - 1