

Slope stability analysis

Input data (Construction stage 1)

Project

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

Settings

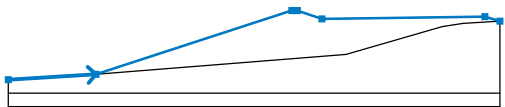
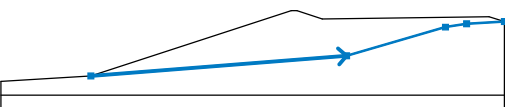

Standard - safety factors

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 - total stress state

No.	Name	Pattern	c_u [kPa]	γ [kN/m ³]
1	In-situ clay soils		150.00	21.00
2	Imported soils		75.00	19.00
3	Sandstone bedrock		300.00	20.00

Soil parameters**In-situ clay soils**

Unit weight : $\gamma = 21.00 \text{ kN/m}^3$
 Stress-state : total
 Shear strength : Mohr-Coulomb
 Cohesion of soil : $c_u = 150.00 \text{ kPa}$

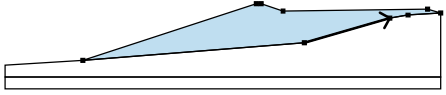
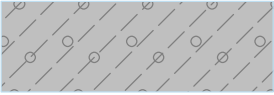
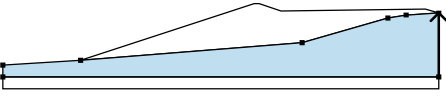

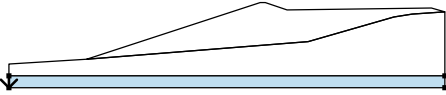

Imported soils

Unit weight : $\gamma = 19.00 \text{ kN/m}^3$
 Stress-state : total
 Shear strength : Mohr-Coulomb
 Cohesion of soil : $c_u = 75.00 \text{ kPa}$

Sandstone bedrock

Unit weight : $\gamma = 20.00 \text{ kN/m}^3$
 Stress-state : total
 Shear strength : Mohr-Coulomb
 Cohesion of soil : $c_u = 300.00 \text{ kPa}$

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

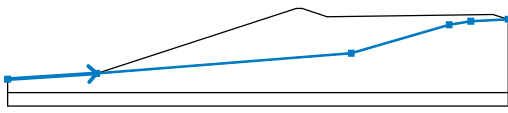
No.	Type	Type of action	Location z [m]	Origin x [m]	Length l [m]	Width b [m]	Slope α [°]	Magnitude		
								q, q ₁ , f, F, x	q ₂ , z	unit
1	strip	permanent	on terrain	x = 117.00	l = 60.00		0.00	100.00		kN/m ²

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 =	74.98 [m]	Angles :	$\alpha_1 =$	-13.67 [°]
	z =	101.87 [m]		$\alpha_2 =$	34.83 [°]
Radius :	R =	96.21 [m]			
The slip surface after optimization.					

Total weight of soil above the slip surface: 13716.73 kN/m

Slope stability verification (Bishop)Sum of active forces : $F_a = 3180.70$ kN/mSum of passive forces : $F_p = 6108.01$ kN/mSliding moment : $M_a = 306015.08$ kNm/mResisting moment : $M_p = 587651.79$ kNm/m

Factor of safety = 1.92 > 1.50

Slope stability ACCEPTABLE