

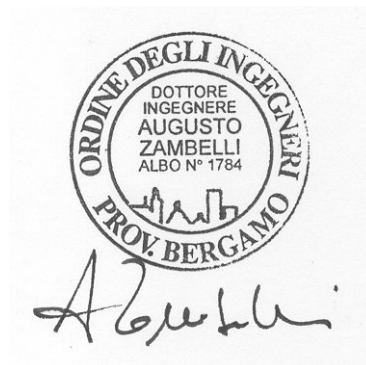
COMUNE DI COLOGNO AL SERIO
PROVINCIA DI BERGAMO

INTERVENTO DI RIFACIMENTO DI TRATTO DI MURO DEL PARCO DELLA ROCCA

PROGETTO ESECUTIVO

DIMENSIONAMENTO DI MASSIMA DELLE TERRE ARMATE

PROGETTISTA
DOTT. ING. Augusto Zambelli



TRF P1079 H420 Rev1

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PROJECT IDENTIFICATION

Title: TRF P1079 H420 Rev1
 Project Number: - -
 Client: -
 Designer: -
 Station Number: -

Description:

Terra rinforzata con geogriglie PAVIROCK TPV

Company's information:

Name:
Street:

Telephone #:
Fax #:
E-Mail:

Original file path and name: \\Pdc\sat\ ERIO terra rinforzata\Rev1\TRF P1079 H420 Rev1.MSE
Original date and time of creating this file: -

PROGRAM MODE: Analysis of a General Slope using GEOSYNTHETIC as reinforcing material.

INPUT DATA (EXCLUDING REINFORCEMENT LAYOUT)

SOIL DATA

Soil Layer #:	Unit weight, γ [kN/m ³]	Internal angle of friction, ϕ [deg.] RFTan=1.25		Cohesion, c [kPa] RFCoh=1.25	
1.....Riempimento.....	18.0	30.0	24.8	0.0	0.0
2.....Terreno in sito.....	18.0	30.0	24.8	0.0	0.0

REINFORCEMENT

Reinforcement Type #	Geosynthetic Designated Name	Ultimate Strength, Tult [kN/m]	Reduction Factor for Installation Damage, RFid	Reduction Factor for Durability, RFd	Reduction Factor for Creep, RFC	Additional Reduction Factor, RFa	Coverage Ratio, Rc
2	PAVIROCK TPV 55	55.00	1.11	1.15	1.59	1.00	1.00

Interaction Parameters		== Direct Sliding ==		==== Pullout ====	
Type #	Geosynthetic Designated Name	Cds-phi	Cds-c	Ci	Alpha
2	PAVIROCK TPV 55	0.90	0.90	0.90	0.90

Relative Orientation of Reinforcement Force, ROR = 0.00. Assigned Factor of Safety to resist pullout, Fs-po = 1.30
 Design method for Global Stability: Comprehensive Bishop.

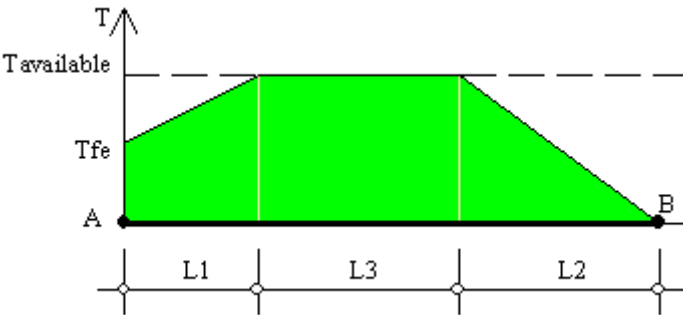
WATER

Water is not present

SEISMICITY

Horizontal peak ground acceleration coefficient, Ao = 0.044
 Design horizontal seismic coefficient, kh = Am = 1.00 x Ao = 0.044 & design vertical seismic coefficient, kv (down) = 0.500 x kh = 0.022

DISTRIBUTION OF AVAILABLE STRENGTH ALONG EACH REINFORCEMENT LAYER



A = Front-end of reinforcement (at face of slope)
 B = Rear-end of reinforcement
 AB = L1 + L2 + L3 = Embedded length of reinforcement

Tavailable = Long-term strength of reinforcement
 Tfe = Available front-end strength (e.g., connection to facing)

L1 = Front-end 'pullout' length
 L2 = Rear-end pullout length
 Tavailable prevails along L3

Factor of safety on resistance to pullout on either end of reinforcement, $F_{s-po} = 1.30$

Reinforcement Layer #	Designated Name	Height Relative to Toe [m]	L [m]	L1 [m]	L2 [m]	L3 [m]	Tfe [kN/m]	Tavailable [kN/m]
1	PAVIROCK TPV 55	0.00	4.00	0.00	0.61	3.39	27.10	27.10
2	PAVIROCK TPV 55	0.60	3.70	0.00	0.72	2.98	27.10	27.10
3	PAVIROCK TPV 55	1.20	3.50	0.00	0.86	2.64	27.10	27.10
4	PAVIROCK TPV 55	1.80	3.30	0.00	1.07	2.23	27.10	27.10
5	PAVIROCK TPV 55	2.40	3.10	0.00	1.43	1.67	27.10	27.10
6	PAVIROCK TPV 55	3.00	2.90	0.00	2.14	0.76	27.10	27.10
7	PAVIROCK TPV 55	3.60	2.70	0.00	2.70	0.00	16.81	16.81 (*)

(*) This Tavailable is dictated by the pullout resistance capacity, which is smaller than the long-term strength of the reinforcement that is related to its specified ultimate strength.

RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.)
 The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each entry point (considering all specified exit points)									
Entry Point #	Entry Point (X, Y) [m]		Exit Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	101.10	104.20	100.54	103.25	99.98	104.22	1.12	39.23	
2	101.41	104.20	100.53	103.25	100.44	104.21	0.97	3.80	
3	101.71	104.20	100.49	103.00	100.50	104.21	1.21	1.38	
4	102.02	104.20	100.48	103.00	100.50	104.56	1.56	1.38	
5	102.33	104.20	100.49	103.00	100.50	104.99	1.99	1.39	
6	102.64	104.20	100.48	103.00	100.50	105.50	2.50	1.41	
7	102.94	104.20	100.48	103.00	100.50	106.09	3.09	1.45	
8	103.25	104.20	100.49	103.00	100.50	106.75	3.75	1.48	
9	103.56	104.20	100.47	103.00	100.50	107.49	4.49	1.52	
10	103.86	104.20	100.47	103.00	100.50	108.31	5.31	1.56	
11	104.17	104.20	96.98	100.01	99.34	104.22	4.83	1.46	
12	104.48	104.20	96.92	100.05	99.54	104.23	4.93	1.37	
13	104.78	104.20	96.96	100.03	99.74	104.23	5.04	1.30	
14	105.09	104.20	97.00	100.00	99.95	104.21	5.14	1.26	
15	105.40	104.20	96.92	100.05	99.97	104.57	5.44	1.24	
16	105.70	104.20	96.94	100.04	99.98	104.95	5.78	1.22	OK
17	106.01	104.20	96.98	100.01	99.92	105.50	6.22	1.22	
18	106.32	104.20	96.90	100.05	99.91	105.97	6.65	1.23	
19	106.62	104.20	96.96	100.02	99.82	106.65	7.23	1.24	
20	106.93	104.20	96.93	100.04	100.49	105.59	6.59	1.26	
21	107.24	104.20	96.96	100.03	100.50	106.06	6.99	1.26	
22	107.55	104.20	96.98	100.01	100.49	106.57	7.44	1.27	
23	107.85	104.20	96.89	100.06	100.48	107.13	7.94	1.29	
24	108.16	104.20	96.91	100.04	100.52	107.56	8.34	1.31	
25	108.47	104.20	96.94	100.03	100.49	108.22	8.93	1.33	
26	108.77	104.20	96.96	100.02	100.52	108.72	9.41	1.35	
27	109.08	104.20	96.99	100.00	100.55	109.25	9.91	1.38	
28	109.39	104.20	96.88	100.04	100.48	110.10	10.69	1.40	
29	109.69	104.20	96.91	100.03	100.49	110.74	11.29	1.43	
30	110.00	104.20	96.93	100.02	100.49	111.42	11.94	1.45	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-entry' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

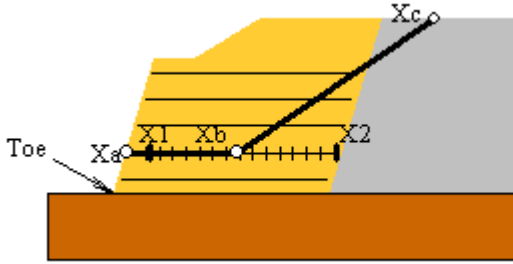
RESULTS OF ROTATIONAL STABILITY ANALYSIS

Results in the tables below represent critical circles identified between specified points on entry and exit. (Theta-exit set to 50.00 deg.)
 The most critical circle is obtained from a search considering all the combinations of input entry and exit points.

Critical circles for each exit point (considering all specified entry points).									
Exit Point #	Exit Point (X, Y) [m]		Entry Point (X, Y) [m]		Critical Circle (Xc, Yc, R) [m]			Fs	STATUS
1	96.94	100.04	105.70	104.20	99.98	104.95	5.78	1.22	On extreme X-exit
2	97.21	100.00	105.70	104.20	100.06	104.93	5.69	1.23	
3	97.42	100.00	106.01	104.20	100.14	105.32	5.98	1.24	
4	97.61	100.01	106.01	104.20	100.22	105.29	5.89	1.26	
5	97.81	100.02	106.01	104.20	100.31	105.26	5.80	1.28	
6	98.01	100.03	106.01	104.20	100.39	105.21	5.71	1.30	
7	98.21	100.03	106.01	104.20	100.48	105.17	5.62	1.33	
8	98.43	100.02	106.32	104.20	100.53	105.59	5.95	1.35	
9	98.63	100.03	106.01	104.20	100.66	105.06	5.42	1.39	
10	98.86	100.02	106.32	104.20	100.71	105.47	5.75	1.42	
11	99.08	100.02	106.32	104.20	100.80	105.41	5.65	1.45	
12	99.31	100.01	106.62	104.20	100.82	105.86	6.04	1.48	
13	99.54	100.00	106.01	104.20	99.80	106.68	6.68	1.50	
14	99.73	100.00	106.01	104.20	99.90	106.54	6.54	1.51	
15	99.98	100.00	106.93	104.20	98.80	109.81	9.88	1.48	
16	99.98	100.00	106.93	104.20	98.80	109.81	9.88	1.48	
17	99.98	100.24	105.70	104.20	97.70	109.64	9.68	1.30	
18	100.05	100.50	105.70	104.20	98.99	108.28	7.86	1.55	
19	100.11	100.75	105.70	104.20	99.49	108.01	7.29	1.32	
20	100.15	101.00	105.70	104.20	100.47	106.86	5.87	1.58	
21	100.16	101.26	105.70	104.20	100.79	106.76	5.54	1.35	
22	100.22	101.51	105.70	104.20	101.44	105.95	4.61	1.61	
23	100.28	101.76	105.70	104.20	101.87	105.47	4.04	1.95	
24	100.33	102.00	105.70	104.20	101.21	107.52	5.59	1.55	
25	100.33	102.26	105.70	104.20	101.70	106.88	4.82	1.88	
26	100.38	102.50	105.09	104.20	100.93	108.36	5.89	1.56	
27	100.44	102.75	105.09	104.20	101.54	107.43	4.80	1.95	
28	100.48	103.00	102.02	104.20	100.50	104.56	1.56	1.38	
29	100.53	103.25	103.56	104.20	100.90	107.36	4.13	2.12	
30	100.56	103.50	104.48	104.20	101.75	108.18	4.83	3.06	

Note: In the 'Status' column, OK means the critical circle was identified within the specified search domain. 'On extreme X-exit' means that the critical result is on the edge of the search domain; a lower Fs may result if the search domain is expanded.

RESULTS OF TRANSLATIONAL ANALYSIS



Results in the table below represent critical two-part wedges identified between specified starting (X1) and ending (X2) search points. Wedges along all reinforcement layers and at elevation zero are reported. The critical two-part wedge, one for each predetermined elevation, is defined by Xa, Xb and Xc where Xa is the front end of the passive wedge (slope face), Xb is where the passive wedge ends and the active one starts, and Xc is the X-ordinate at which the active wedge starts.

Critical two-part wedge along each interface:									
Interface	Height Relative to Toe [m]	(Xa, Ya) [m]	(Xb, Yb) [m]	(Xc, Yc) [m]	Fs	STATUS			
At toe elevation	0.00	100.00	100.00	100.20	100.00	105.98	104.20	1.09	Minimum on Edge
Reinf. Layer #1	0.00	100.00	100.00	100.88	100.00	105.71	104.20	1.24	OK
Reinf. Layer #2	0.60	100.10	100.60	100.92	100.60	106.06	104.20	1.34	OK
Reinf. Layer #3	1.20	100.20	101.20	100.98	101.20	105.26	104.20	1.46	OK
Reinf. Layer #4	1.80	100.30	101.80	100.40	101.80	104.24	104.20	1.68	Minimum on Edge
Reinf. Layer #5	2.40	100.40	102.40	103.49	102.40	105.64	104.20	1.84	Minimum on Edge
Reinf. Layer #6	3.00	100.50	103.00	103.39	103.00	104.93	104.20	2.18	Minimum on Edge
Reinf. Layer #7	3.60	100.60	103.60	100.70	103.60	101.24	104.20	2.22	Minimum on Edge

Note: In the 'Status' column, OK means the critical two part-wedge was identified within the specified search domain. 'Minimum on Edge' means the critical result corresponds to a minimum on the edge of the search domain; i.e., either on X1 or X2 or the internally preset limits on Xc.

CRITICAL RESULTS OF ROTATIONAL AND TRANSLATIONAL STABILITY ANALYSES

Rotational (Circular Arc; Bishop) Stability Analysis

Minimum Factor of Safety = 1.22

Critical Circle: Xc = 99.98[m], Yc = 104.95[m], R = 5.78[m]. (Number of slices used = 53)

Translational (2-Part Wedge; Spencer), Direct Sliding, Stability Analysis

Minimum Factor of Safety = 1.09

Critical Two-Part Wedge: (Xa = 100.00, Ya = 100.00) [m]

(Xb = 100.20, Yb = 100.00) [m]

(Xc = 105.98, Yc = 104.20) [m]

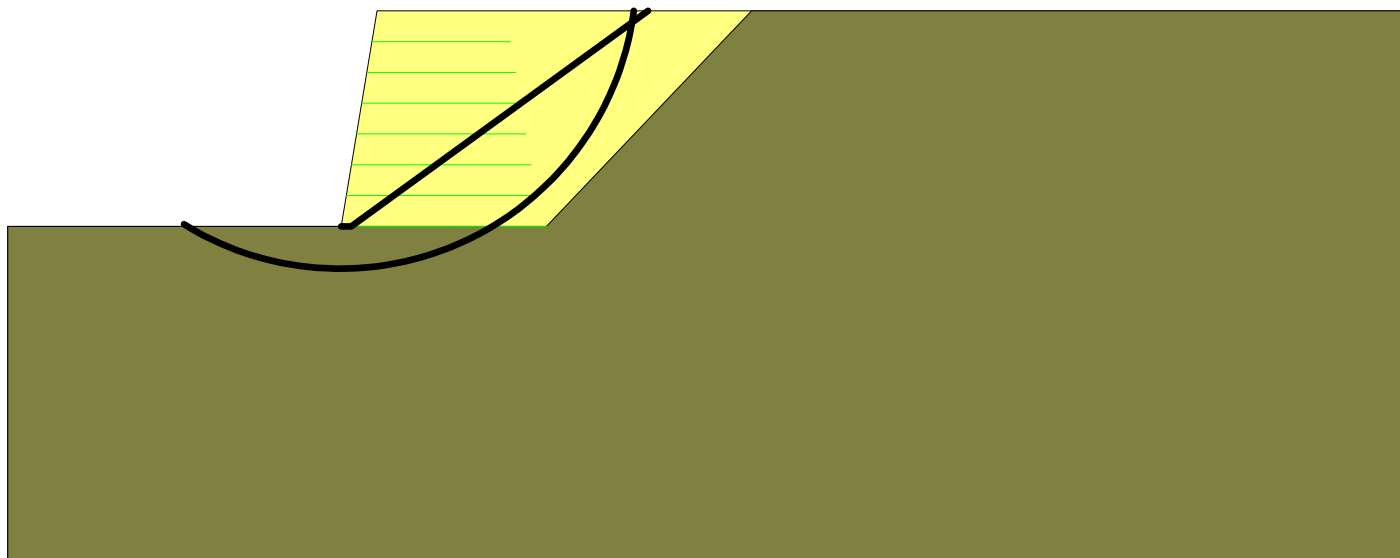
(Number of slices used = 30)

Interslice resultant force inclination = 35.93 [degrees]

Three-Part Wedge Stability Analysis

NOT CONDUCTED

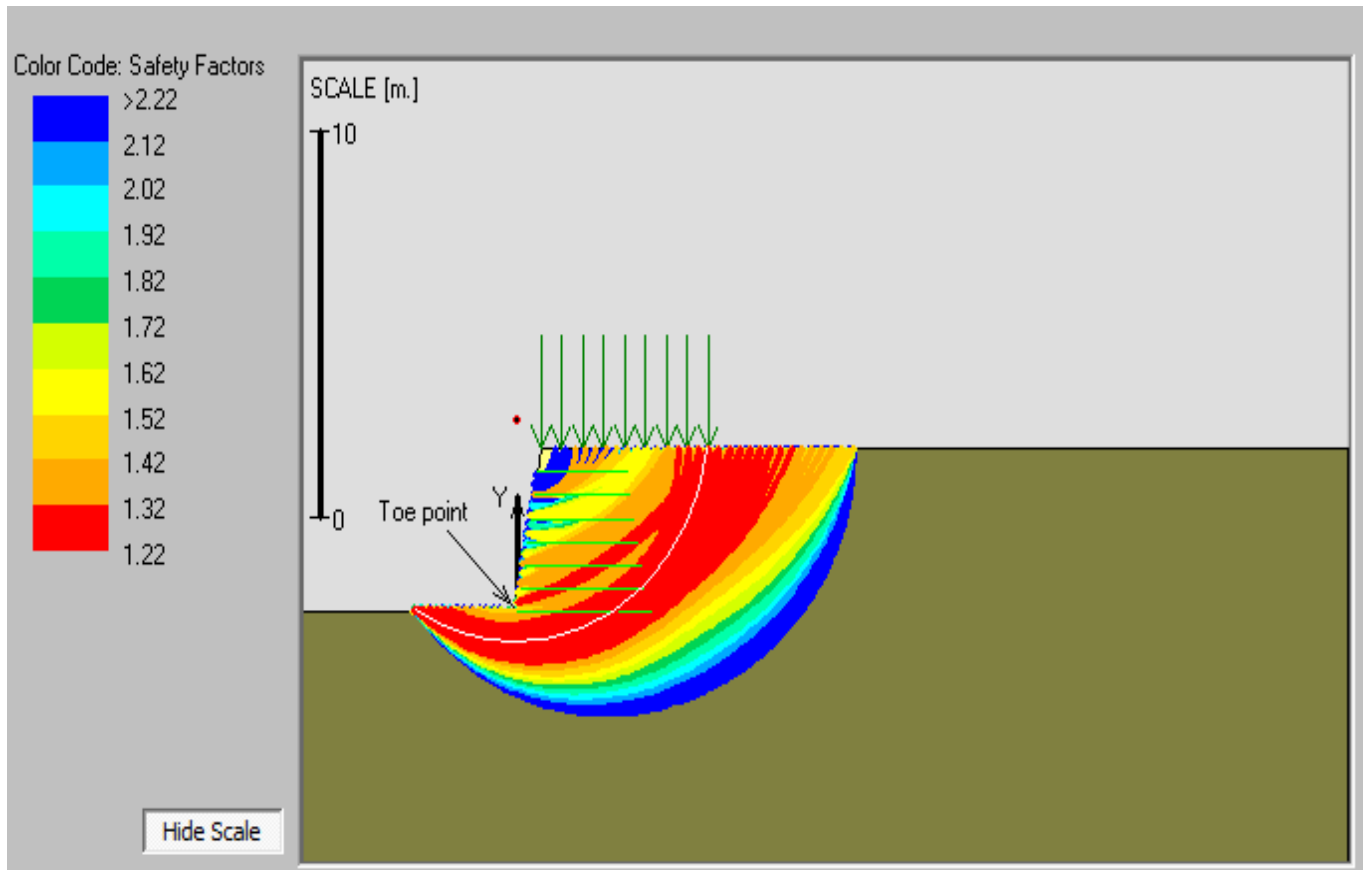
REINFORCEMENT LAYOUT: DRAWING



SCALE:



SAFETY MAP: BISHOP ROTATIONAL ANALYSIS MODE



SAFETY MAP: SPENCER TRANSLATIONAL, 2-PART WEDGE

