Consorzio di Bonifica PIANURA di FERRARA

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PROGETTO CIARLE

PROGETTO ESECUTIVO

OPERE DI COMPETENZA DEL MINISTERO DELLE POLITICHE AGRICOLE.
RETE RURALE NAZIONALE 2014–2020.
BANDO PSRN PROGRAMMA SVILUPPO RURALE NAZIONALE–SOTTOMISURA 4.3–
OPERAZIONE 4.3.1–INVESTIMENTI IN INFRASTRUTTURE IRRIGUE

LAVORI DI IMPLEMENTAZIONE PRIMARIA DEL SISTEMA IRRIGUO CIARLE
NEI COMUNI DI POGGIO RENATICO E TERRE DEL RENO (FE)–
CONDOTTO DISTRIBUTORE SUD E IMPIANTO DI SOLLEVAMENTO

CUP : J81E17000370006

CALCOLI ESECUTIVI

RELAZIONE DI CALCOLO STRUTTURE IN C.A.

Oggetto dell'elaborato:
ALLEGATO H - VERIFICA STABILITA'

Elab. n°
7.e.1.8

Pos. arch.

Data: 12 MAGGIO 2017

Scala:

IL RESPONSABILE DEL PROCEDIMENTO
(Dott. Ing. Marco Volpin)

GRUPPO DI PROGETTAZIONE
IL PROGETTISTA
(Ing. Valeria Chierici)

ORDINE DEGLI INGEGNERI DELLA PROVINCIA DI FERRARA
N. 1324 Albo
dott. ing.
Valeria CHIERICI

I COLLABORATORI TECNICI
Geom. Cesare Formignani
Ing. Laura Montanari
Geom . Marcello Nepoti
Geom. Carlo Mazzanti
Geom. Pietro Ghisellini
Geom. Federico Sarto

Elab.:

Aggiornamenti:
30 MARZO 2020

File:

Slope Stability

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File Information

Title: VerificaStab_CIARLE
Revision Number: 10
File Version: 8.1
Tool Version: 8.11.1.7283
Date: 19/05/2017
Time: 11:31:52
File Name: VerifStab.gsz
Directory: C:\Users\Tecnico 1\Desktop\
Last Solved Date: 19/05/2017
Last Solved Time: 11:31:54

Project Settings

Length(L) Units: meters
Time(t) Units: Seconds
Force(F) Units: kN
Pressure(p) Units: kPa
Strength Units: kPa
Unit Weight of Water: 9.807 kN/m³
View: 2D
Element Thickness: 1

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Side Function
  - Interslice force function option: Half-Sine
- Lambda
  - Lambda 1: -1
  - Lambda 2: -0.8
  - Lambda 3: -0.6
  - Lambda 4: -0.4
  - Lambda 5: -0.2
  - Lambda 6: 0
  - Lambda 7: 0.2
  - Lambda 8: 0.4
  - Lambda 9: 0.6
  - Lambda 10: 0.8
  - Lambda 11: 1
- PWP Conditions Source: (none)

Slip Surface

Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 m
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Terreno1

Model: Mohr-Coulomb
Unit Weight: 19 kN/m³
Cohesion': 50 kPa
Phi': 0 °
Phi-B: 0 °

Bedrock

Model: Bedrock (Impenetrable)

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (17.5; 20) m
Left-Zone Right Coordinate: (22.42; 22.42) m
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (23; 23) m
Right-Zone Right Coordinate: (26; 23) m
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0; 20) m
Right Coordinate: (48; 23) m

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 20 kN/m³
Direction: Vertical

Coordinates

	X (m)	Y (m)
	24	24
	48	24

Points

	X (m)	Y (m)
Point 1	20	20
Point 2	23	23
Point 3	24	23
Point 4	48	23
Point 5	48	5
Point 6	0	5
Point 7	0	20
Point 8	48	0
Point 9	0	0

Regions

	Material	Points	Area (m²)
Region 1	Terreno1	1;2;3;4;5;6;7	799.5
Region 2	Bedrock	6;5;8;9	240

Current Slip Surface

Slip Surface: 73
F of S: 3.988
Volume: 8.246318 m³
Weight: 156.68004 kN
Resisting Moment: 1,818.4291 kN-m
Activating Moment: 455.9254 kN-m
Resisting Force: 283.69417 kN
Activating Force: 71.129333 kN
F of S Rank: 1
Exit: (20.326117; 20.326117) m
Entry: (26; 23) m
Radius: 5.4422113 m
Center: (21.267024; 25.686374) m

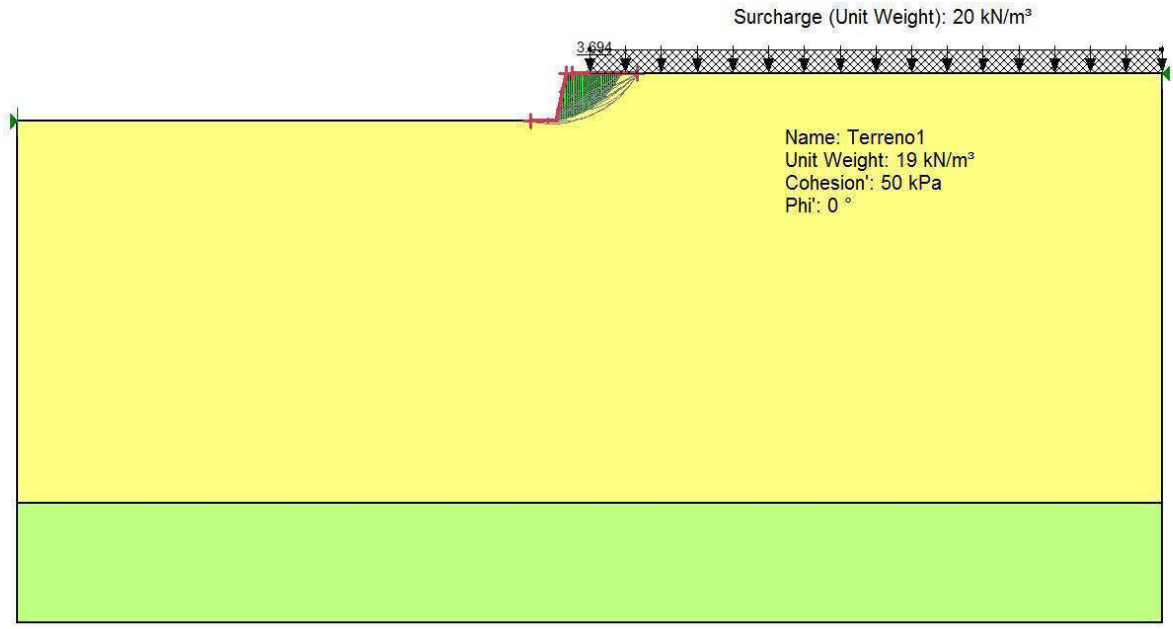
Slip Slices

	X (m)	Y (m)	PWP (kPa)	Base Normal Stress (kPa)	Frictional Strength (kPa)	Cohesive Strength (kPa)
Slice 1	20.421612	20.311097	0	4.6488114	0	50
Slice 2	20.612604	20.284509	0	9.508108	0	50
Slice 3	20.803596	20.264777	0	14.211505	0	50
Slice 4	20.994587	20.251827	0	18.674689	0	50
Slice 5	21.185579	20.24561	0	22.823938	0	50
Slice 6	21.376571	20.246103	0	26.600769	0	50
Slice 7	21.567562	20.253309	0	29.964901	0	50
Slice 8	21.758554	20.267253	0	32.895346	0	50
Slice 9	21.949546	20.287988	0	35.389742	0	50
Slice 10	22.140537	20.315594	0	37.462284	0	50
Slice 11	22.331529	20.350176	0	39.140703	0	50
Slice 12	22.522521	20.391871	0	40.462814	0	50
Slice 13	22.713512	20.44085	0	41.473042	0	50
Slice 14	22.904504	20.497318	0	42.219258	0	50
Slice 15	23.1	20.563232	0	41.102982	0	50
Slice 16	23.3	20.63929	0	38.236138	0	50
Slice 17	23.5	20.724574	0	35.305134	0	50
Slice 18	23.7	20.819568	0	32.315394	0	50
Slice 19	23.9	20.924857	0	29.259756	0	50

Slice 20	24.090909	21.035349	0	42.774439	0	50
Slice 21	24.272727	21.15079	0	39.968992	0	50
Slice 22	24.454545	21.276749	0	37.151403	0	50
Slice 23	24.636364	21.41416	0	34.281403	0	50
Slice 24	24.818182	21.564172	0	31.302693	0	50
Slice 25	25	21.728225	0	28.136789	0	50
Slice 26	25.181818	21.908158	0	24.672298	0	50
Slice 27	25.363636	22.106381	0	20.745598	0	50
Slice 28	25.545455	22.32616	0	16.103752	0	50
Slice 29	25.727273	22.572111	0	10.32676	0	50
Slice 30	25.909091	22.851156	0	2.6429244	0	50

Slope Stability

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File Information

Title: VerificaStab_CIARLE
Revision Number: 27
File Version: 8.1
Tool Version: 8.11.1.7283
Date: 24/05/2017
Time: 09:47:37
File Name: VerifStab-B.gsz
Directory: C:\Documenti\VerifStab_CIARLE\
Last Solved Date: 24/05/2017
Last Solved Time: 09:47:39

Project Settings

Length(L) Units: meters
Time(t) Units: Seconds
Force(F) Units: kN
Pressure(p) Units: kPa
Strength Units: kPa
Unit Weight of Water: 9.807 kN/m³
View: 2D
Element Thickness: 1

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Side Function
Interslice force function option: Half-Sine
Lambda
Lambda 1: -1
Lambda 2: -0.8
Lambda 3: -0.6
Lambda 4: -0.4
Lambda 5: -0.2
Lambda 6: 0
Lambda 7: 0.2
Lambda 8: 0.4
Lambda 9: 0.6
Lambda 10: 0.8
Lambda 11: 1
PWP Conditions Source: (none)
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 m
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Terreno1

Model: Mohr-Coulomb
Unit Weight: 19 kN/m³
Cohesion': 50 kPa
Phi': 0 °
Phi-B: 0 °

Bedrock

Model: Bedrock (Impenetrable)

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (21.5; 21) m
Left-Zone Right Coordinate: (23; 23) m
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (23.25; 23) m
Right-Zone Right Coordinate: (26; 23) m
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0; 21) m
Right Coordinate: (48; 23) m

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 20 kN/m³
Direction: Vertical

Coordinates

	X (m)	Y (m)
	24	24
	48	24

Points

	X (m)	Y (m)
Point 1	22.6	21
Point 2	23	23
Point 3	24	23
Point 4	48	23
Point 5	48	5
Point 6	0	5
Point 7	0	21
Point 8	48	0
Point 9	0	0

Regions

	Material	Points	Area (m²)
Region 1	Terreno1	1;2;3;4;5;6;7	818.4
Region 2	Bedrock	6;5;8;9	240

Current Slip Surface

Slip Surface: 43
F of S: 3.694
Volume: 3.1979074 m³
Weight: 60.760241 kN
Resisting Moment: 628.75659 kN-m
Activating Moment: 170.21041 kN-m
Resisting Force: 135.29226 kN
Activating Force: 36.624281 kN
F of S Rank: 1
Exit: (22.606655; 21.033274) m
Entry: (25.3125; 23) m
Radius: 3.6168535 m
Center: (22.074096; 24.610705) m

Slip Slices

	X (m)	Y (m)	PWP (kPa)	Base Normal Stress (kPa)	Frictional Strength (kPa)	Cohesive Strength (kPa)
Slice 1	22.655823	21.041287	0	2.872427	0	50
Slice 2	22.754159	21.058714	0	12.439551	0	50
Slice 3	22.852496	21.078965	0	21.608023	0	50
Slice 4	22.950832	21.102088	0	30.299302	0	50
Slice 5	23.045455	21.127048	0	34.07863	0	50
Slice 6	23.136364	21.153689	0	33.192214	0	50
Slice 7	23.227273	21.182949	0	32.158107	0	50
Slice 8	23.318182	21.214893	0	30.992067	0	50
Slice 9	23.409091	21.2496	0	29.710288	0	50
Slice 10	23.5	21.287155	0	28.328271	0	50
Slice	23.590909	21.327657	0	26.859881	0	50

11						
Slice 12	23.681818	21.371217	0	25.316592	0	50
Slice 13	23.772727	21.417958	0	23.706898	0	50
Slice 14	23.863636	21.468025	0	22.03586	0	50
Slice 15	23.954545	21.521578	0	20.304718	0	50
Slice 16	24.04375	21.577658	0	34.654912	0	50
Slice 17	24.13125	21.636328	0	32.791268	0	50
Slice 18	24.21875	21.698809	0	30.951592	0	50
Slice 19	24.30625	21.765353	0	29.126281	0	50
Slice 20	24.39375	21.836253	0	27.300927	0	50
Slice 21	24.48125	21.911853	0	25.455517	0	50
Slice 22	24.56875	21.992561	0	23.563087	0	50
Slice 23	24.65625	22.078866	0	21.587566	0	50
Slice 24	24.74375	22.171367	0	19.480276	0	50
Slice 25	24.83125	22.270799	0	17.17423	0	50
Slice 26	24.91875	22.378094	0	14.574459	0	50
Slice 27	25.00625	22.494455	0	11.540848	0	50
Slice 28	25.09375	22.621485	0	7.8556081	0	50
Slice 29	25.18125	22.761406	0	3.156073	0	50
Slice 30	25.26875	22.917457	0	-3.221192	-0	50