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GRUPPO FS ITALIANE

Direzione Tecnica

S.S 685 "DELLE TRE VALLI UMBRE"

TRATTO SPOLETO - ACQUASPARTA

1° stralcio: Madonna di Baiano-Firenzuola

PROGETTO ESECUTIVO

COD. PG143

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PROTOCOLLO | DATA

03.STUDIO GEOLOGICO GEOTECNICO
03.05 GEOTECNICA

Relazione geotecnica di calcolo: stabilità rilevati e trincee

CODICE PROGETTO	NOME FILE	REVISIONE	SCALA:
PROGETTO: DTPG143 LIV. PROG.: E ANNO: 23	T00GE05GETRE02B		
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REV.	DESCRIZIONE	DATA	REDATTO	VERIFICATO	APPROVATO
B	Rev. A seguito istr. ANAS	Set 2023	D.Carlaccini	D.Carlaccini	N.Granieri
A	Emissione	Ago 2023	D.Carlaccini	D.Carlaccini	N.Granieri

INDICE

1 PREMESSA

Nel presente elaborato vengono riportati i criteri ed i risultati delle verifiche di stabilità dei rilevati e delle trincee previste nell'ambito della progettazione esecutiva dell'intervento di I stralcio (Baiano – Firenzuola) del tratto Spoleto – Acquasparta della strada S.S. 685 "delle TRE VALLI UMBRE".

Le verifiche sono state condotte con riferimento al modello geotecnico la cui descrizione è riportata nel dettaglio nella Relazione Geotecnica generale (elaborato T00GE05GETRE01A).

Nello specifico, le verifiche sono state effettuate in corrispondenza delle seguenti sezioni rappresentative.

Tabella 1 _ Riepilogo sezioni di studio per le verifiche di stabilità globale.

Sezione	progressiva	Tipologia
Sez. 4, in Asse Principale	0+050	Trincea
Sez. 13, in Asse Principale	0+378.84	Trincea
Sez. 22 in Asse Principale	0+575	Rilevato
Sez. 42 in Asse Principale	1+225	Rilevato
Sez. 72 in Asse Principale	2+890	Rilevato
Sez. 81 in Asse Principale	3+800	Rilevato

2 NORMATIVA DI RIFERIMENTO

Nel progetto è stato fatto riferimento alle seguenti Normative ed Istruzioni:

- D.M. 17/01/2018 "Norme Tecniche per le Costruzioni" (pubblicato sulla G.U. n. 42 – Suppl. Ordinario n. 8 – del 20 febbraio 2018).
- Circolare 21/01/2019 "Istruzione C.S.LL.PP. per l'applicazione delle Norme Tecniche per le Costruzioni" di cui al D.M. 17 gennaio 2018.
- Decreto Ministero Lavori Pubblici 11/03/1988 – "Norme tecniche riguardanti le indagini sui terreni e sulle rocce, la stabilità dei pendii naturali e delle scarpate, i criteri generali e le prescrizioni per la progettazione, l'esecuzione e il collaudo delle opere di sostegno delle terre e delle opere di fondazione."
- Circolare Ministero Lavori Pubblici n. 30483 del 24/09/1988 – D.M. 11.3.88. "Norme tecniche riguardanti le indagini sui terreni e sulle rocce, la stabilità dei pendii naturali e delle scarpate, i criteri generali e le prescrizioni per la progettazione, l'esecuzione e il collaudo delle opere di sostegno delle terre e delle opere di fondazione."

3 MODELLO GEOTECNICO

Il modello geotecnico è stato definito sulla base di quanto riportato nell'elaborato "T00GE05GETRE01A". Nella tabella seguente è riportata una sintesi delle caratteristiche fisiche e meccaniche delle unità geotecniche interessate dalle opere oggetto delle verifiche descritte nel presente documento (trincee e rilevati). In tabella sono indicate anche le caratteristiche dei materiali previsti per la realizzazione dei rilevati (R), definite sulla base dell'esperienza progettuale.

Tabella 2 _ Valori caratteristici dei parametri geotecnici utilizzati nelle analisi.

Unità geotecnica		γ [kN/m^3]	c'_k [kPa]	φ'_k [kN/m^3]	$c_{u,k}$ [kPa]
Depositi eluvio - colluviali	COL	25	25	25	150
Depositi alluvionali	All	25	0	38	-
Schlier	SCH	20	7.5	27.5	150
Bisciaro 1 *facies marnosa*	BI1	20	15	25	200
Scaglia cinerea 1 *facies marnosa*	SCC1	19	15	30	150
Rilevato	Ril	35	0	0	-

4 DEFINIZIONE DELL'AZIONE SISMICA

In conformità al paragrafo 2.4.3 delle *NTC2018*, al fine di caratterizzare l'azione sismica, si assume una vita nominale V_N = 50 anni. Le azioni sismiche sulle costruzioni vengono valutate in relazione ad un periodo di riferimento V_R, funzione del tipo di costruzione, che si ricava, moltiplicando la vita nominale di progetto V_N per il coefficiente d'uso C_U mediante l'espressione $V_R = V_N C_U$, dove C_U rappresenta il coefficiente d'uso, il quale è definito al variare della classe d'uso, come mostrato in Figura 4:1 a seguire:

Tab. 2.4.II – *Valori del coefficiente d'uso* C_U

CLASSE D'USO	I	II	III	IV
COEFFICIENTE C_U	0,7	1,0	1,5	2,0

Figura 4:1: Valori del coefficiente C_U.

Con riferimento allo "stato limite di salvaguardia della vita" *SLV* e considerando una probabilità di superamento P_{VR} = 10% (fissata dalla norma) , si ottiene come di seguito indicato il periodo di ritorno T_R:

$$T_R = -\frac{V_R}{\ln(1 - P_{VR})}$$

I parametri sismici sono stati determinati utilizzando il foglio di calcolo *Spettri – NTC ver. 1.0.3*.

Nella tabella seguente vengono riepilogate le grandezze sismiche necessarie per la definizione dell'azione sismica, valutate lungo il tracciato, considerando per l'opera una vita nominale V_N = 50 anni ed una classe d'uso IV (coefficiente d'uso c_u = 2.0) quindi un periodo di riferimento V_R = cu • V_N = 100 anni e, con riferimento allo stato limite ultimo SLV, un periodo di ritorno T_R = 949 anni. Si specifica che i valori dell'accelerazione massima (a_{max}/g) indicati in tabella sono stati determinati assumendo un valore del coefficiente di amplificazione topografica S_T = 1.0.

Tabella 4:1: Riepilogo grandezze necessarie per la definizione dell'azione sismica.

da prg. a prg.	*Comune*	*Categoria sottosuolo*	a_g/g [-]	S_T [-]	S_S [-]	a_{max}/g [-]
0+000 ÷ 0+325	Spoleto	C	0.224	1.000	1.368	0.306
0+325 ÷ 1+575	Spoleto	B	0.227	1.000	1.176	0.266
1+575 ÷ 2+150	Spoleto	C	0.230	1.000	1.358	0.313
2+150 ÷ 4+370	Spoleto	B	0.237	1.000	1.167	0.276

La caratterizzazione sismica lungo il tracciato è descritta anche nella Relazione Sismica ("T00GE03GEORE01A") e nella "Planimetria con classificazione sismica del territorio" (T00GE03GEOCS01A).

5 VERIFICHE DI STABILITÀ: CRITERI DI VERIFICA

Tutte le analisi sono state effettuate con riferimento alle prescrizioni contenute nelle Norme Tecniche delle costruzioni del 20-02-2018 (NTC2018) e alle Istruzioni per l'applicazione delle "Norme tecniche per le costruzioni" 11/02/2019. Le verifiche di sicurezza relative agli stati limite ultimi (SLU) consistono, in generale, nel verificare il rispetto della condizione:

$$E_d < R_d$$

dove con E_d si indica il valore di progetto delle azioni, o degli effetti delle azioni, e con R_d il valore di progetto delle resistenze. Le azioni di progetto, E_d, o, altresì, gli effetti delle azioni, sono valutabili a partire dalle azioni caratteristiche adottando per i coefficienti parziali γ_F i valori specificati nella figura a seguire (Tabella 6.2.I delle NTC2018).

Tab. 6.2.I – *Coefficienti parziali per le azioni o per l'effetto delle azioni*

	Effetto	Coefficiente Parziale γ_F (o γ_E)	EQU	(A1)	(A2)
Carichi permanenti G_1	Favorevole	γ_{G1}	0,9	1,0	1,0
	Sfavorevole		1,1	1,3	1,0
Carichi permanenti G_2 [1]	Favorevole	γ_{G2}	0,8	0,8	0,8
	Sfavorevole		1,5	1,5	1,3
Azioni variabili Q	Favorevole	γ_{Qi}	0,0	0,0	0,0
	Sfavorevole		1,5	1,5	1,3

[1] Per i carichi permanenti G_2 si applica quanto indicato alla Tabella 2.6.I. Per la spinta delle terre si fa riferimento ai coefficienti γ_{G1}

Figura 2 – Coefficienti parziali per le azioni (Tab.6.2.I delle NTC2018).

Le resistenze di progetto, R_d, si determinano a partire dai valori caratteristici dei parametri geotecnici di resistenza, divisi per i coefficienti parziali γ_M specificati nella figura a seguire (Tabella 6.2.II delle NTC2018) e tenendo conto, ove necessario, dei coefficienti parziali γ_R, specifici per ciascun tipo di opera.

Tab. 6.2.II – *Coefficienti parziali per i parametri geotecnici del terreno*

Parametro	Grandezza alla quale applicare il coefficiente parziale	Coefficiente parziale γ_M	(M1)	(M2)
Tangente dell'angolo di resistenza al taglio	$\tan \varphi'_k$	$\gamma_{\varphi'}$	1,0	1,25
Coesione efficace	c'_k	$\gamma_{c'}$	1,0	1,25
Resistenza non drenata	c_{uk}	γ_{cu}	1,0	1,4
Peso dell'unità di volume	γ_γ	γ_γ	1,0	1,0

Figura 3 – Coefficienti parziali per i parametri geotecnici (Tab.6.II delle NTC2018).

Nel caso dei rilevati e delle trincee (fronti di scavo), le verifiche di sicurezza vengono effettuate nei confronti dei meccanismi di instabilità globale (verifiche di stabilità) verificando che non si raggiunga una condizione

di stato limite ultimo con i valori di progetto delle azioni e dei parametri geotecnici secondo l'Approccio 1 Combinazione 2: A2+M2+R2, tenendo conto dei valori dei coefficienti parziali riportati nelle Tabelle 6.2.I, 6.2.II delle NTC2018 (Figura 2 e Figura 3) e 6.8.I (Figura 4).

Tab. 6.8.I - *Coefficienti parziali per le verifiche di sicurezza di opere di materiali sciolti e di fronti di scavo*

COEFFICIENTE	R2
γ_R	1,1

Figura 4 – Coefficiente parziale per la verifica di stabilità globale per opere di materiali sciolti [Tab. 6.2.II delle NTC2018].

In condizioni sismiche, le verifiche di stabilità sono state effettuate assumendo valori unitari per i coefficienti parziali da applicare alle azioni (A_i) ed ai parametri geotecnici (Mi); per le resistenze è definito un coefficiente parziale γ_R = 1.2 (cfr. par. 7.11.4 delle NTC18).

Le analisi in presenza di sisma sono state effettuate adottando il metodo pseudo-statico, in cui l'azione sismica è rappresentata da una azione statica equivalente proporzionale al peso W del volume di terreno instabile; le componenti orizzontali e verticali di tale forza possono esprimersi come $F_h = k_h \bullet W$ e $F_v = k_v \bullet W$, dove i coefficienti di intensità sismica orizzontale (k_h) e verticale (k_v) si ottengono in funzione dell'accelerazione di picco tramite le seguenti relazioni:

$$k_h = \beta_m \cdot \frac{a_{\max}}{g} = \beta_m \cdot \frac{S_S \cdot S_T \cdot a_g}{g} \quad , \qquad k_v = \pm 0.5 \cdot k_h$$

con

- a_g = accelerazione orizzontale massima attesa su sito di riferimento;
- β_m = coefficiente di riduzione dell'accelerazione massima attesa al sito;
- S_s = coefficiente che tiene conto della amplificazione stratigrafica;
- S_T = coefficiente di amplificazione topografica.

Nella precedente espressione, con riferimento alle verifiche di stato limite ultimo (SLV), per il coefficiente di riduzione dell'accelerazione massima attesa al sito si è assunto β_m = 0.38, valore definito per i fronti di scavo ed i rilevati.

Nella tabella seguente sono riportati i parametri utilizzati per la definizione dell'azione sismica nelle analisi pseudo-statiche, valutati con riferimento a quanto descritto in precedenza.

Tabella 2 _ Riepilogo dei parametri per le verifica stabilità globale con metodo pseudo-statico.

Sezione	Prg.	Tipologia	Cat. suolo	Cat. topo.	a_g/g [-]	S_S [-]	S_T [-]	a_g/g [-]	β [-]	k_h [-]	k_v [-]
Sez. 4, in AP	0+050	Trincea	C	T1	0.224	1.000	1.368	0.306	0.38	0.116	0.058
Sez. 13, in AP	0+378.84	Trincea	B	T1	0.227	1.000	1.176	0.267	0.38	0.101	0.051
Sez. 22 in AP	0+575	Rilevato	B	T1	0.227	1.000	1.176	0.267	0.38	0.101	0.051
Sez. 42 in AP	1+225	Rilevato	B	T1	0.227	1.000	1.176	0.267	0.38	0.101	0.051
Sez. 72 in AP	2+890	Rilevato	B	T1	0.237	1.000	1.167	0.277	0.38	0.105	0.053
Sez. 81 in AP	3+800	Rilevato	B	T1	0.237	1.000	1.167	0.277	0.38	0.105	0.053

Per i terreni caratterizzati con parametri di resistenza definiti sia in tensioni efficaci (TE) che in tensioni totali (TT), le verifiche in condizioni statiche sono state effettuate considerando entrambe le condizioni; le verifiche sismiche sono state invece effettuate soltanto in termini di tensioni totali (TT) ovvero con riferimento alle condizioni non drenate.

Per le condizioni di esercizio in condizioni statiche è stato considerato un valore caratteristico del sovraccarico stradale q_k = 20 kPa uniformemente ripartito sulla sede stradale, al quale è stato applicato il coefficiente parziale sui carichi variabili γ_Q = 1.3, ottenendo quindi un valore di progetto $q_{d,(stat)}$ = 26 kPa; in condizioni sismiche, applicando un fattore di combinazione ψ = 0.2 ed un fattore amplificativo unitario (γ_Q = 1.0), il valore di progetto del sovraccarico stradale risulta $q_{d,(sism)}$ = 4 kPa.

Tutte le analisi di stabilità sono state eseguite nell'ipotesi di problema piano con i tradizionali metodi dell'equilibrio limite globale, schematizzando il terreno come un mezzo rigido-plastico e adottando il criterio di rottura di *Mohr-Coulomb*. In particolare, è stato utilizzato il metodo delle strisce, nel quale la porzione di terreno delimitato dalla generica superficie *S* e dalla superficie topografica è suddivisa in settori verticali in modo da valutare, seppur in modo approssimato e discreto, la distribuzione della tensione efficace normale e della corrispondente resistenza a taglio lungo la superficie di scorrimento; in dettaglio, si è utilizzato il metodo di *Bishop* (1955). Tutte le analisi sono state effettuate con il codice di calcolo *RocScience Slide* (versione 7.038).

6 RISULTATI DELLE VERIFICHE DI STABILITÀ: RILEVATI

Nella tabella seguente sono riepilogati i risultati delle verifiche di stabilità globale (meccanismi di rottura generale dell'opera rilevato-terreno), espressi in termini di coefficienti di sicurezza minimi in condizioni statiche e sismiche ($FS = R_d/F_d$), in condizioni drenate (TE) e non drenate (TT), ottenuti in corrispondenza delle sezioni di calcolo valutate come maggiormente rappresentative.

Nelle figure successive sono riportati i risultati delle analisi di stabilità in forma grafica; in particolare, sono state rappresentate tutte le superfici di scorrimento analizzate, tra le quali è stata evidenziata quella in corrispondenza della quale si ottiene il valore più basso del coefficiente di sicurezza (rapporto R_d/F_d).

Per le condizioni sismiche si riporta solo l'output della condizione più gravosa tra k_{v+} [sisma verso il basso, ↓] e k_{v-} [sisma verso l'alto, ↑].

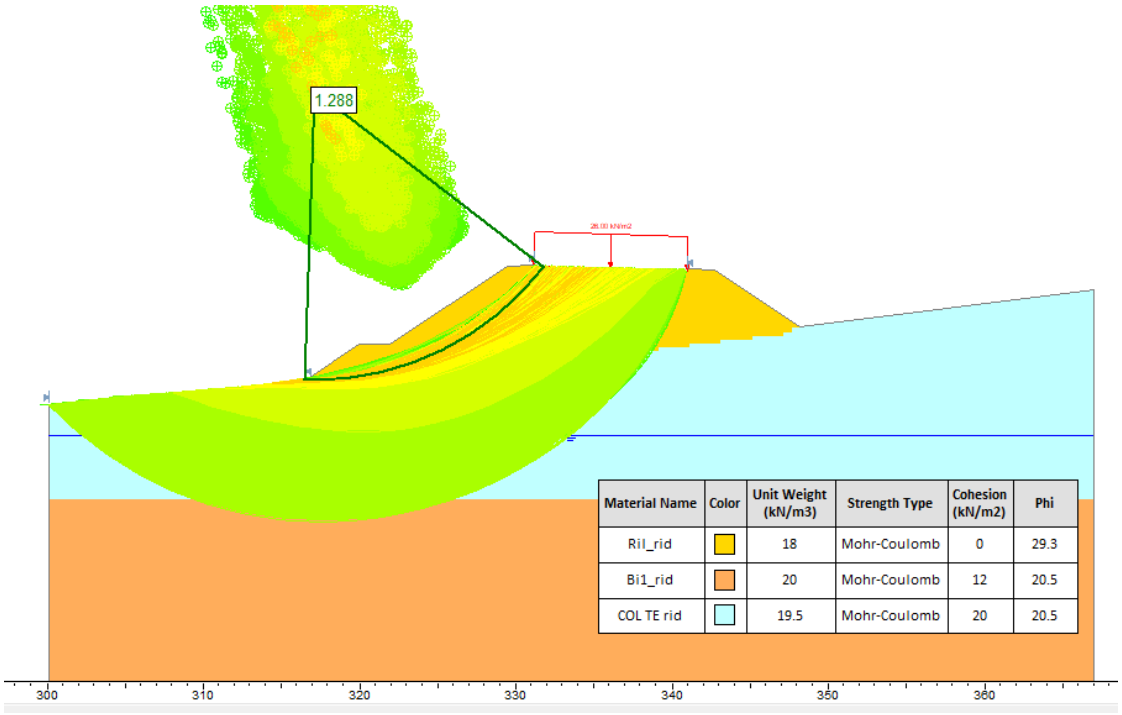
Tabella 3 _ Riepilogo dei coefficienti di sicurezza ($FS = R_d/F_d$) ottenuti dalle verifiche di stabilità in corrispondenza dei rilevati.

Sezione rilevato (in AP)	Prg.	$FS_{min\ TE}$ statico [-]	$FS_{min\ TT}$ statico [-]	$FS_{min\ TT}$ sismico (↓) [-]	$FS_{min\ TT}$ sismico (↑) [-]
Sez. 22	0+575	1.288	1.575	1.811	1.820
Sez. 42	1+225	1.278	1.297	1.420	1.388
Sez. 72	2+890	1.440	1.440	1.544	1.503
Sez. 81	3+800	1.210	1.210	1.270	1.242

6.1 SEZIONE 22 IN ASSE PRINCIPALE

Tale sezione risulta dimensionante per il tratto da pk 0+465 a pk 0+599.

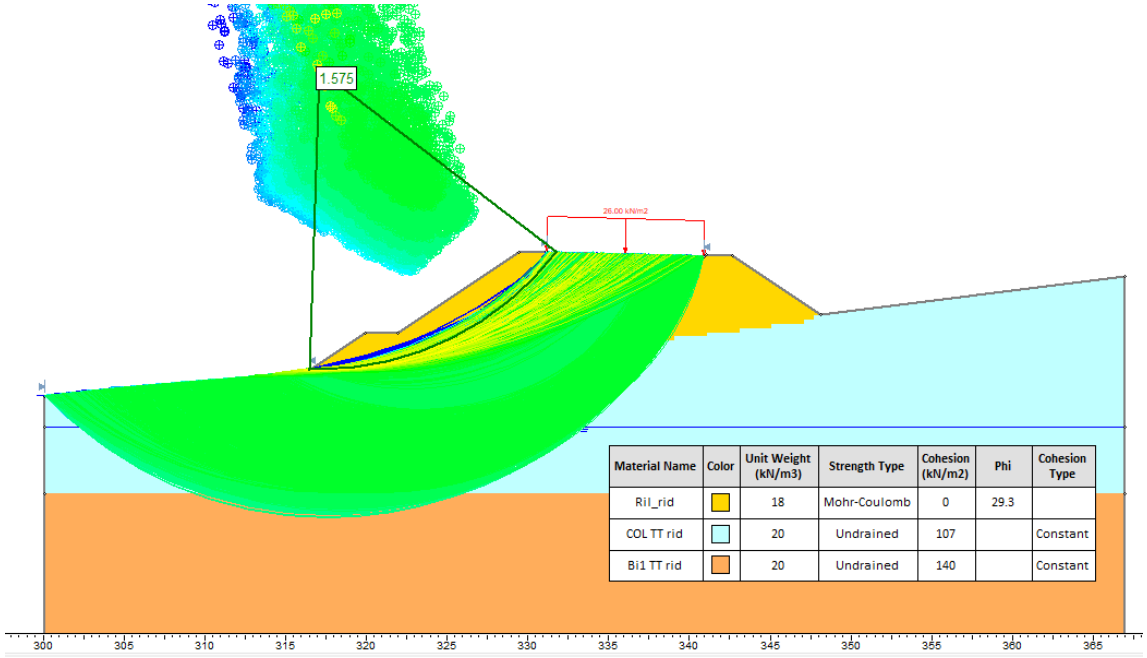
Condizioni statiche - con parametri definiti in termini di tensioni efficaci (condizioni drenate)



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kN/m2)	Phi
Ril_rid		18	Mohr-Coulomb	0	29.3
Bi1_rid		20	Mohr-Coulomb	12	20.5
COL TE rid		19.5	Mohr-Coulomb	20	20.5

Figura 5 – Sez.22 in AP – Verifica stabilità globale in condizioni statiche e drenate.

Condizioni statiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kN/m2)	Phi	Cohesion Type
Ril_rid		18	Mohr-Coulomb	0	29.3	
COL TT rid		20	Undrained	107		Constant
Bi1 TT rid		20	Undrained	140		Constant

Figura 6 – Sez.22 in AP – Verifica stabilità globale in condizioni statiche e non drenate.

Condizioni sismiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

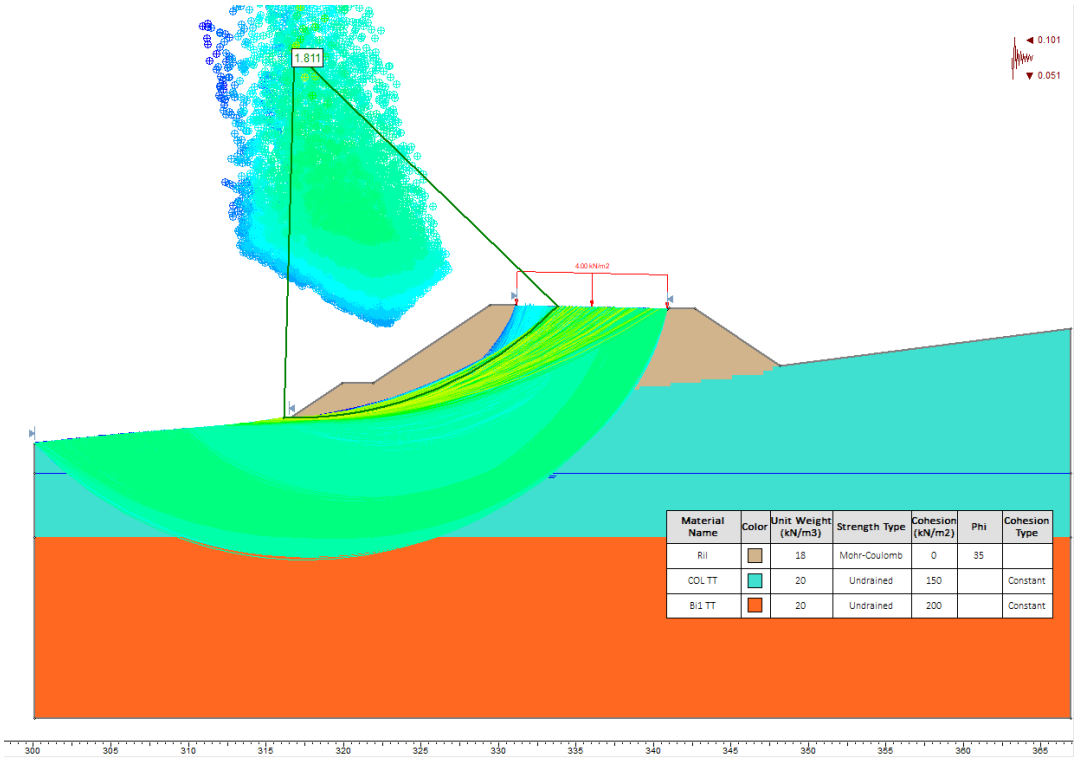


Figura 7 – Sez.22 in AP – Verifica stabilità globale in condizioni sismiche (sisma ↓) e non drenate.

6.2 SEZIONE 42 IN ASSE PRINCIPALE

Tale sezione risulta dimensionante per il tratto da pk 1+180 a pk 1+242.

Condizioni statiche - con parametri definiti in termini di tensioni efficaci (condizioni drenate)

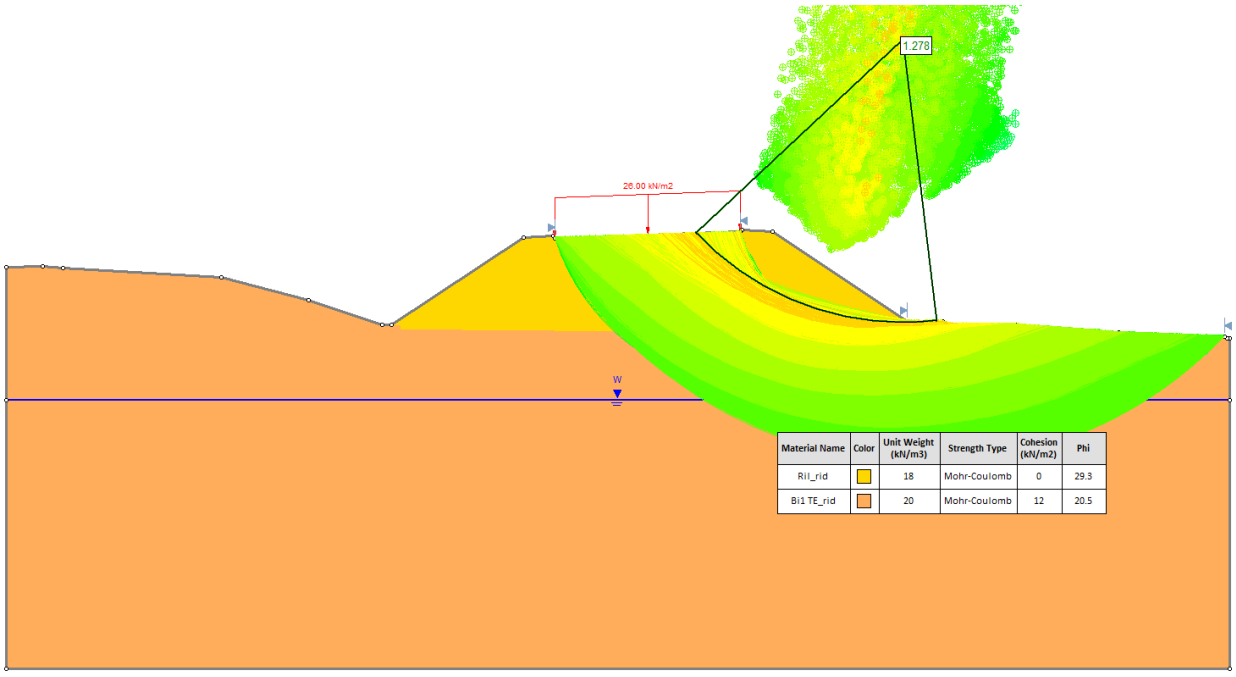


Figura 8 – Sez.42 in AP – Verifica stabilità globale in condizioni statiche e drenate.

Condizioni statiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

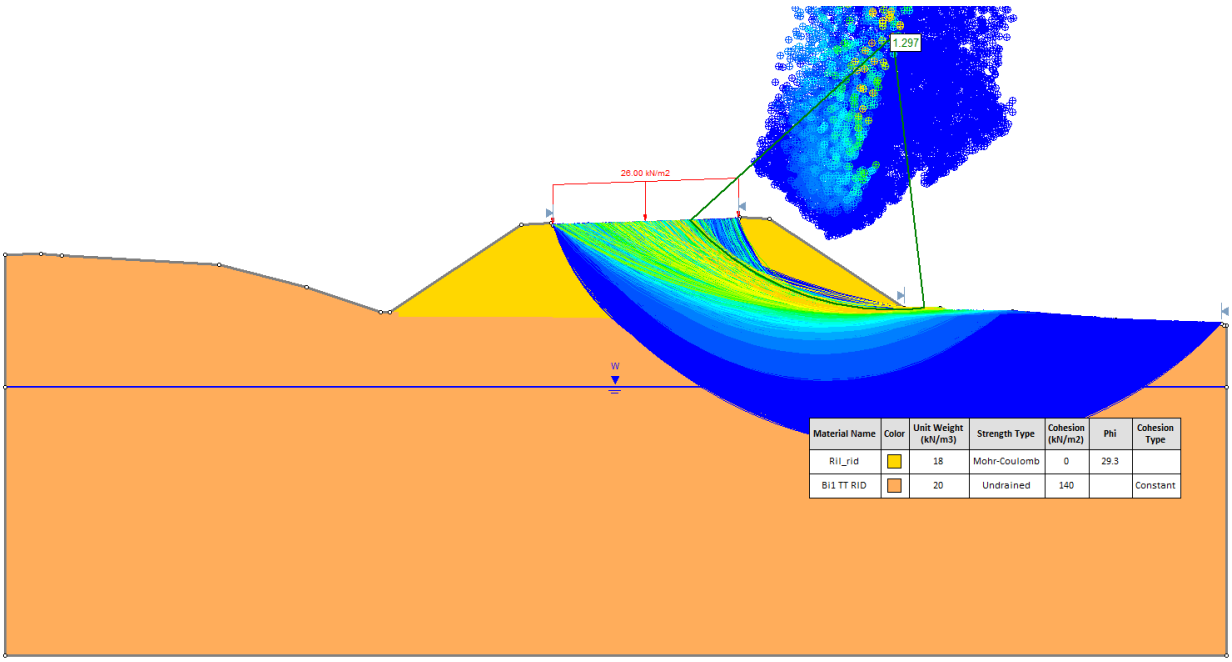


Figura 9 – Sez.42 in AP – Verifica stabilità globale in condizioni statiche e non drenate.

Condizioni sismiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

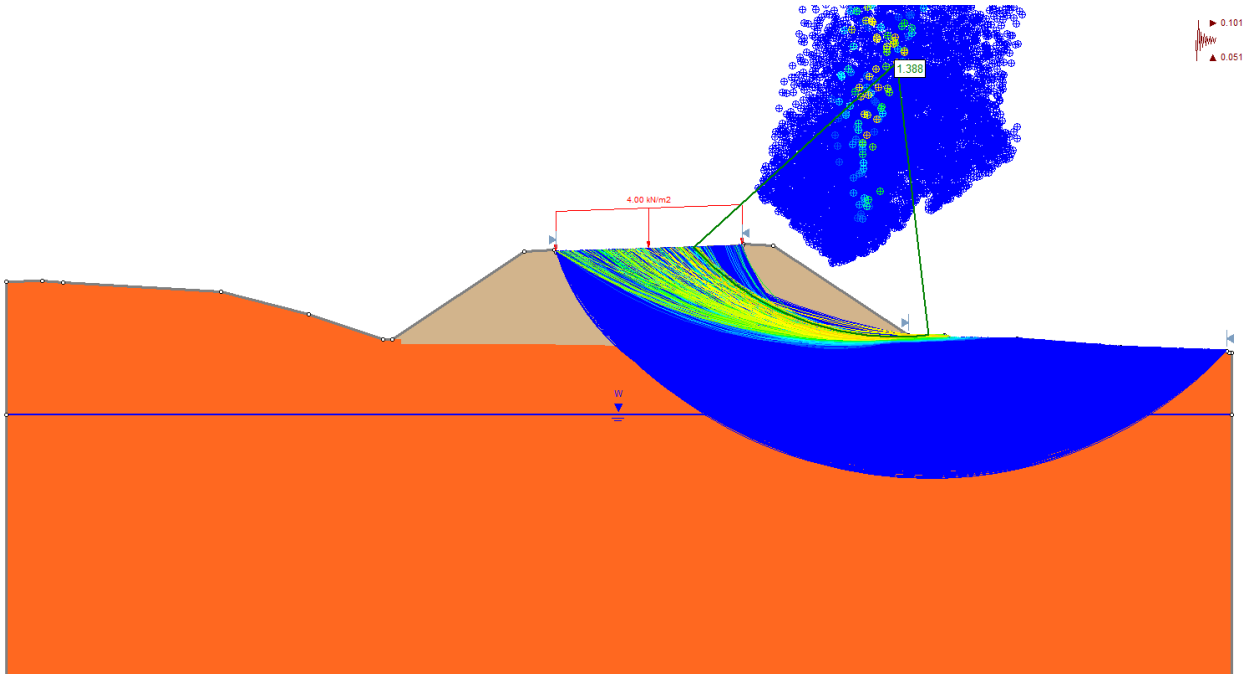


Figura 10 – Sez.42 in AP – Verifica stabilità globale in condizioni sismiche (sisma↑) e non drenate.

6.3 SEZIONE 72 IN ASSE PRINCIPALE

Tale sezione risulta dimensionante per il tratto da pk 2+245 a pk 2+904.

Condizioni statiche - con parametri definiti in termini di tensioni efficaci (condizioni drenate)

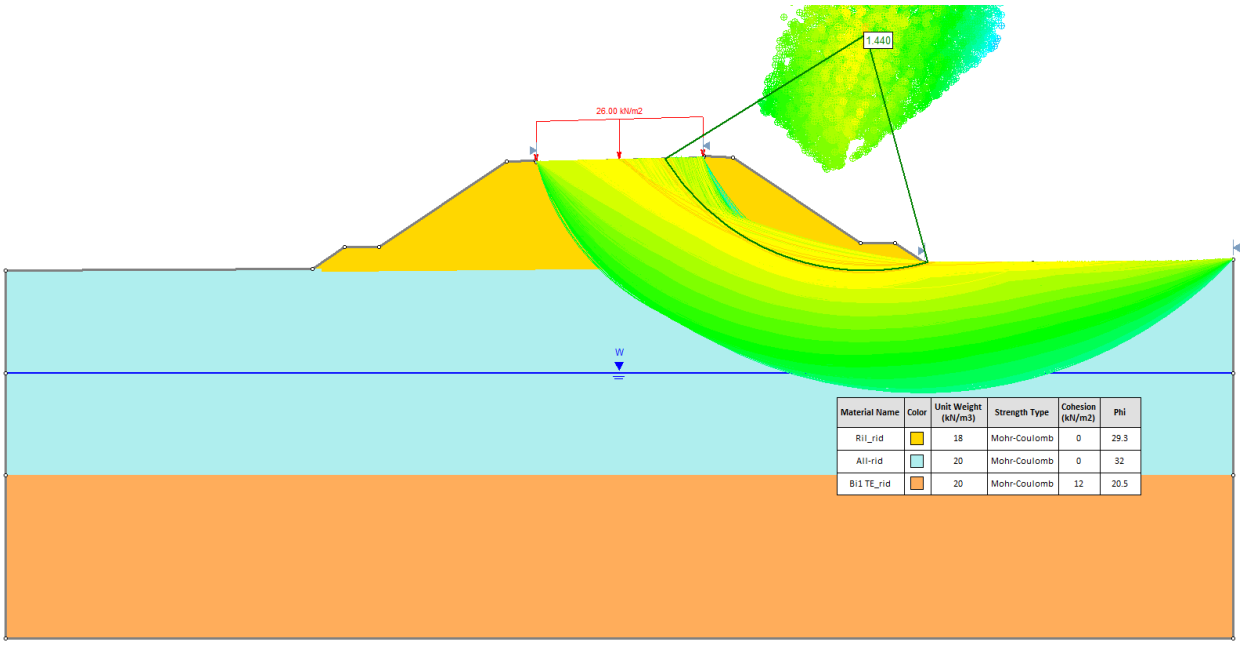


Figura 11 – Sez.72 in AP – Verifica stabilità globale in condizioni statiche e drenate.

Condizioni statiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

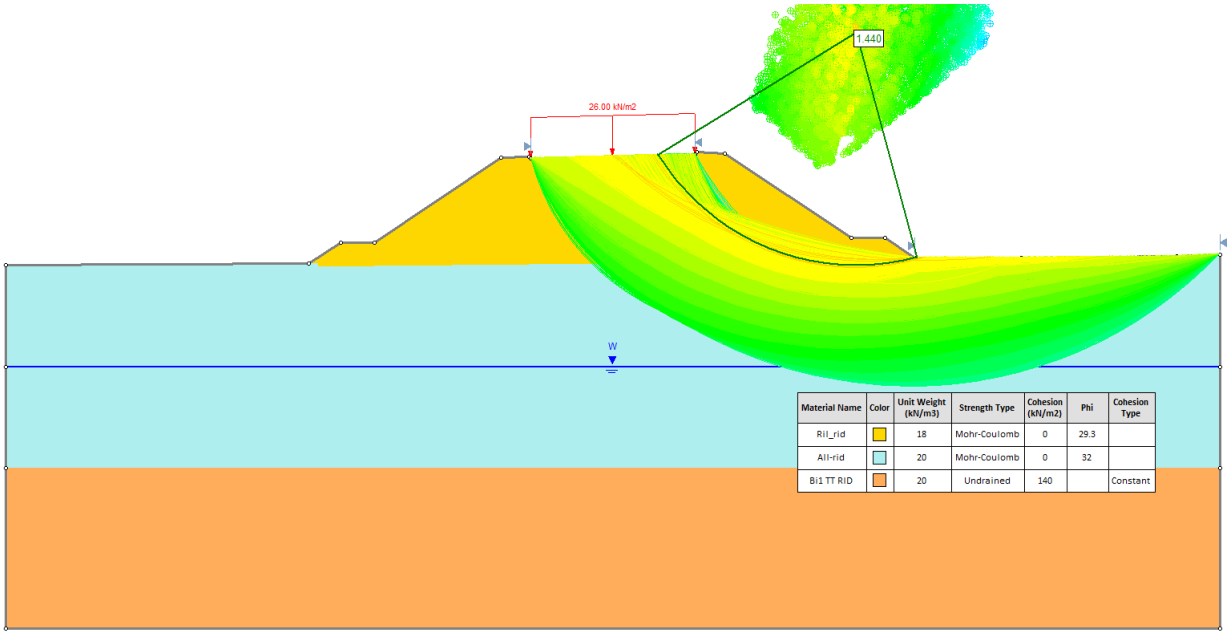


Figura 12 – Sez.72 in AP – Verifica stabilità globale in condizioni statiche e non drenate.

Condizioni sismiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

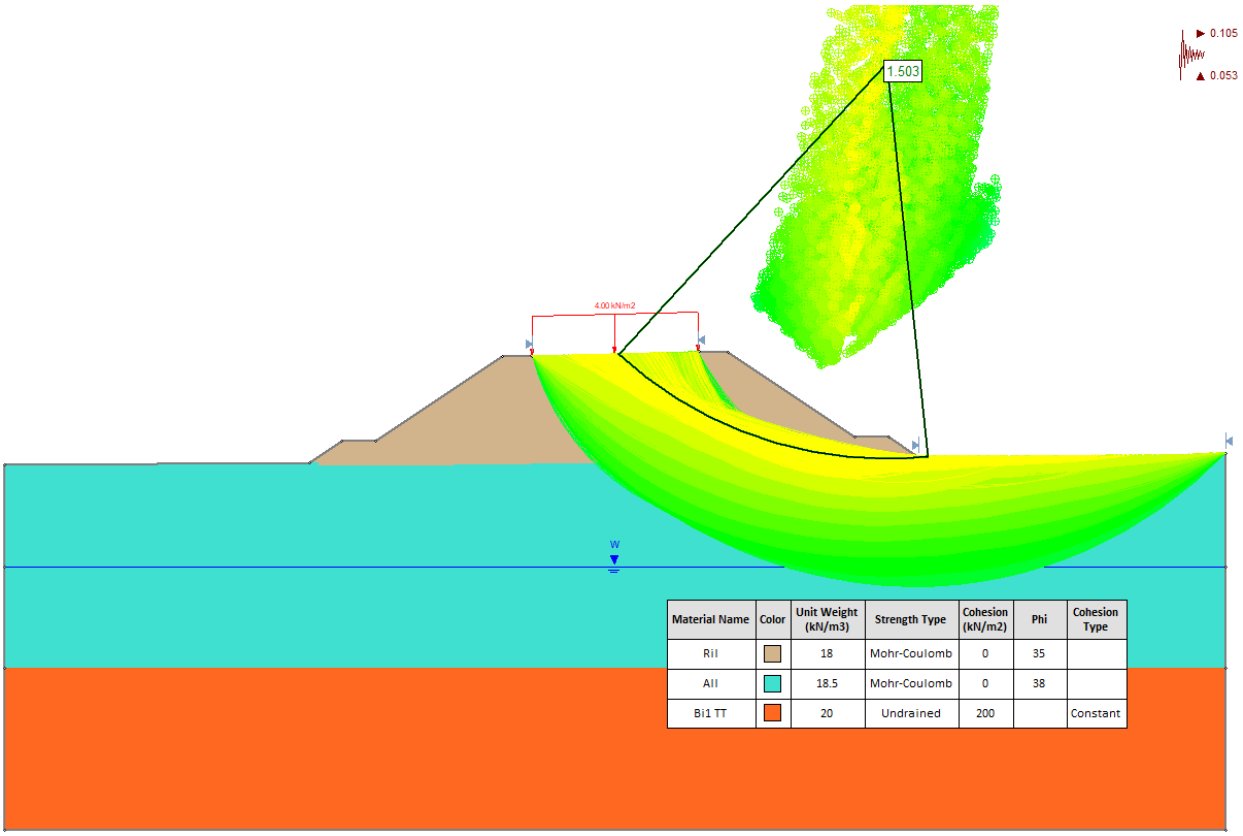


Figura 13 – Sez.72 in AP – Verifica stabilità globale in condizioni sismiche (sisma↑) e non drenate.

6.4 SEZIONE 81 IN ASSE PRINCIPALE

Tale sezione risulta dimensionante per il tratto da pk 3+670 a pk 4+370.

Condizioni statiche - con parametri definiti in termini di tensioni efficaci (condizioni drenate)

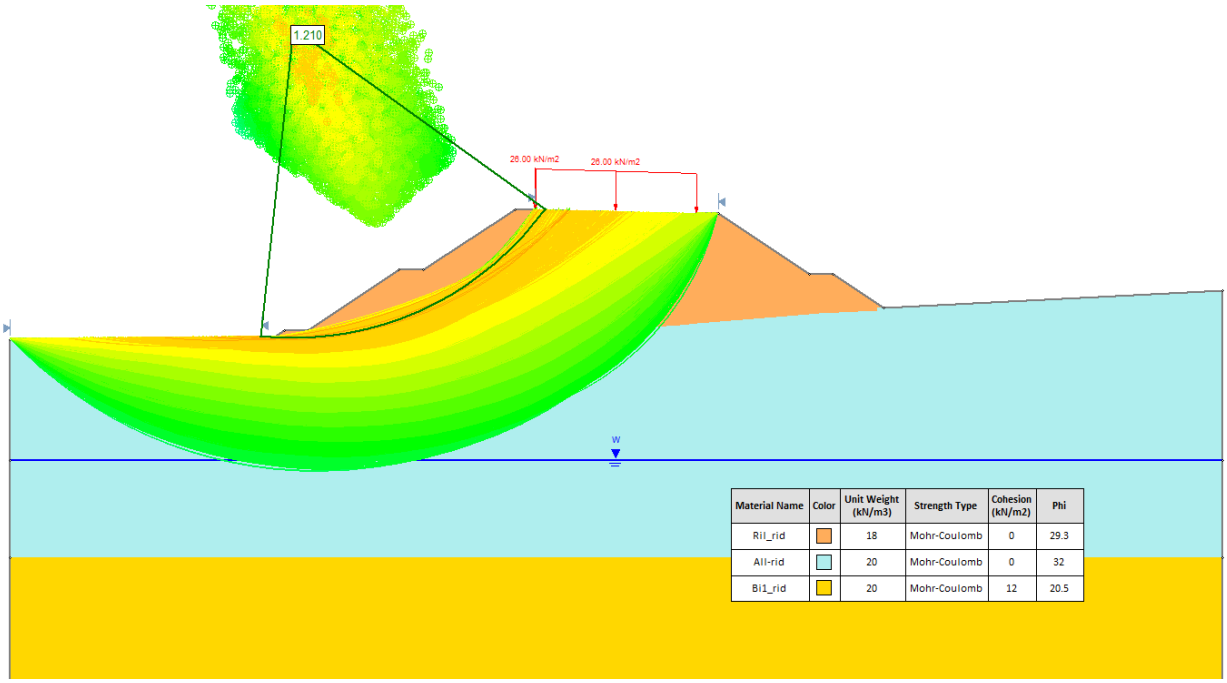


Figura 14 – Sez.81 in AP – Verifica stabilità globale in condizioni statiche e drenate.

Condizioni statiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

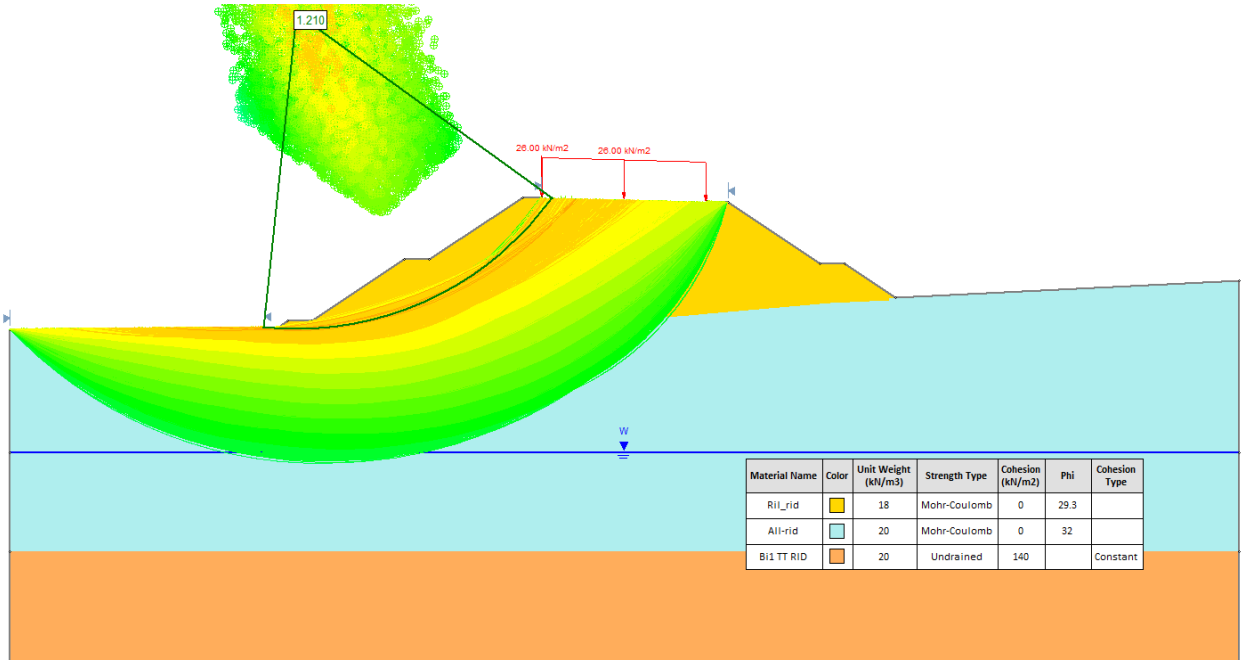


Figura 15 – Sez.81 in AP – Verifica stabilità globale in condizioni statiche e non drenate.

Condizioni sismiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

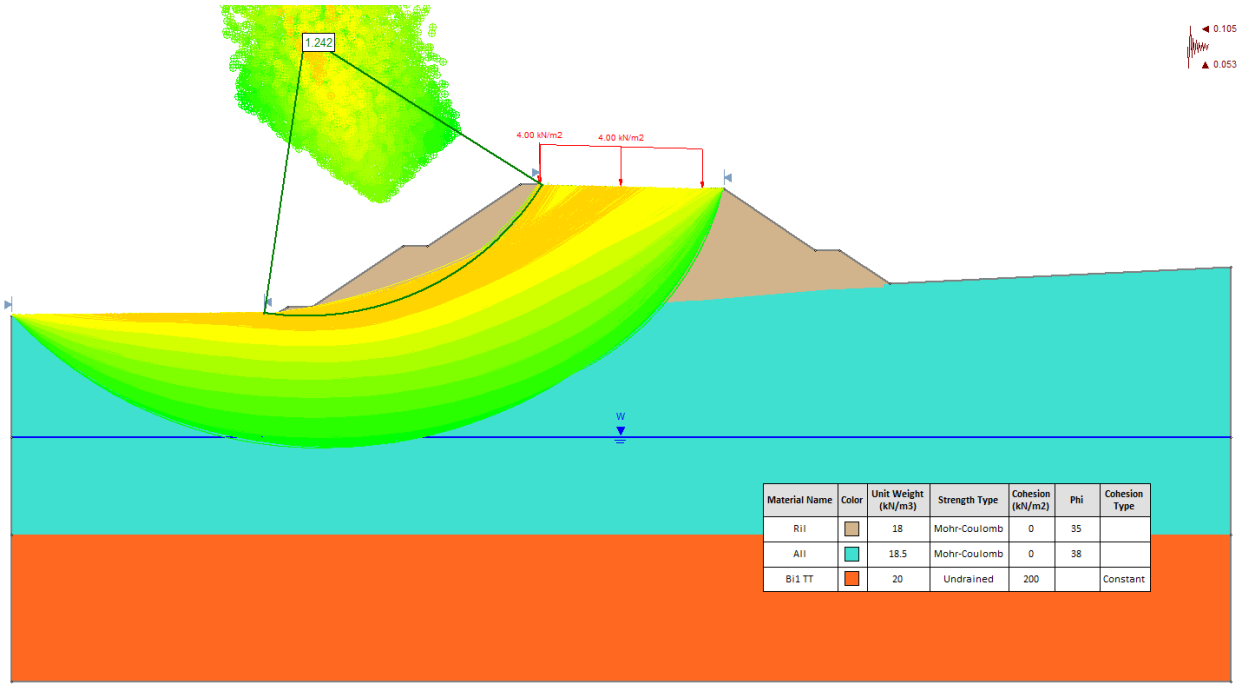


Figura 16 – Sez.81 in AP – Verifica stabilità globale in condizioni sismiche (sisma↑) e non drenate.

7 RISULTATI DELLE VERIFICHE DI STABILITÀ: FRONTI DI SCAVO

Nella tabella seguente sono riepilogati i risultati delle verifiche di stabilità globale (meccanismi di rottura generale), espressi in termini di coefficienti di sicurezza minimi in condizioni statiche e sismiche ($FS = R_d/F_d$), in condizioni drenate (TE) e non drenate (TT), ottenuti in corrispondenza delle sezioni di calcolo valutate come maggiormente rappresentative.

Le verifiche sono state condotte anche con riferimento agli scavi provvisionali previsti per la realizzazione delle fondazioni dei viadotti, in tal caso soltanto in condizioni statiche.

Nelle figure successive sono riportati i risultati delle analisi di stabilità in forma grafica. Per le condizioni sismiche si riporta solo l'output della condizione più gravosa tra k_{v+} [sisma verso il basso, ↓] e k_{v-} [sisma verso l'alto, ↑].

Tabella 4: Riepilogo dei coefficienti di sicurezza ($FS = R_d/F_d$) ottenuti dalle verifiche di stabilità in corrispondenza dei fronti di scavo delle trincee.

Sezione rilevato (in AP)	Prg.	$FS_{min\ TE}$ statico [-]	$FS_{min\ TT}$ statico [-]	$FS_{min\ TT}$ sismico (↓) [-]	$FS_{min\ TT}$ sismico (↑) [-]
Sez. 4	0+050	1.370	2.938	3.042	3.327
Sez. 13	0+378.84	1.287	5.167	5.245	5.627
Scavi per fondazioni del VI01	Pila 07	1.130	1.130	-	-
Scavi per fondazioni del VI01	Pila 08	1.222	1.222	-	-

7.1 SEZIONE 4 IN ASSE PRINCIPALE

Tale sezione risulta dimensionante per il tratto da pk 0+010 a pk 0+050.

Condizioni statiche - con parametri definiti in termini di tensioni efficaci (condizioni drenate)

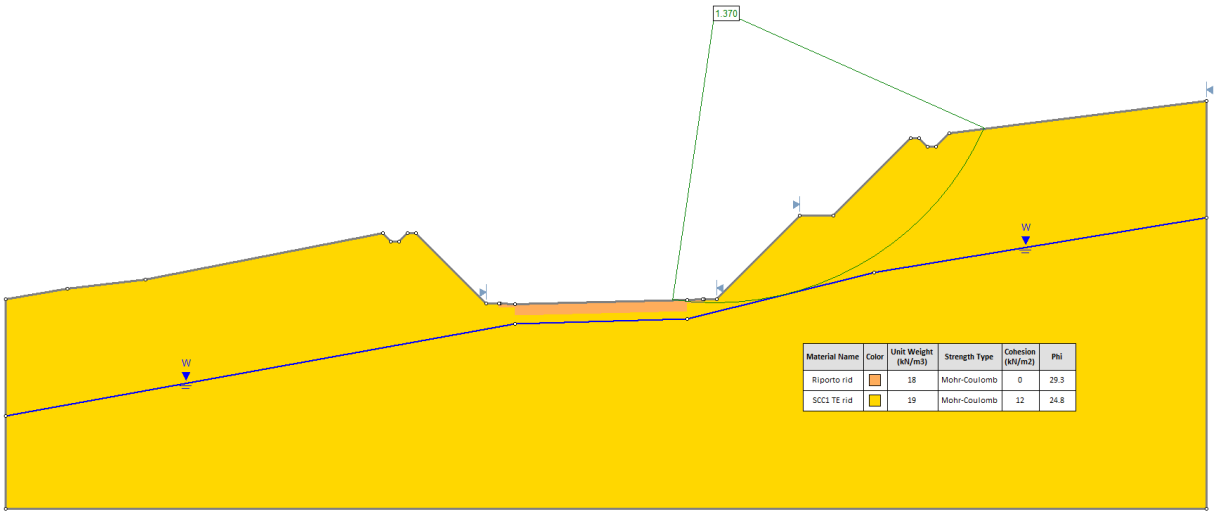


Figura 17 – Sez.4 in AP – Verifica stabilità globale in condizioni statiche e drenate.

Condizioni statiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

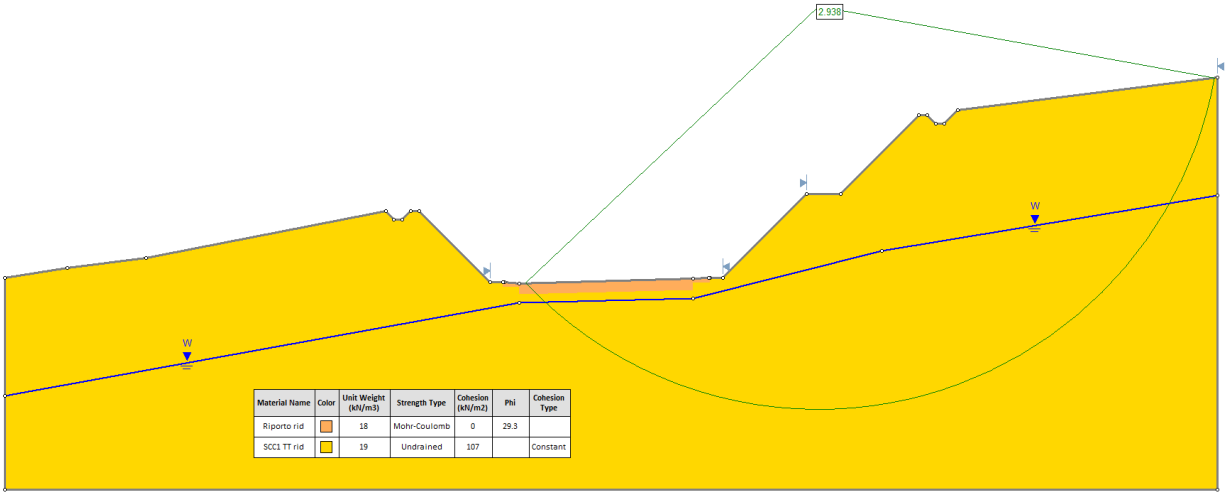


Figura 18 – Sez.4 in AP – Verifica stabilità globale in condizioni statiche e non drenate.

Condizioni sismiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

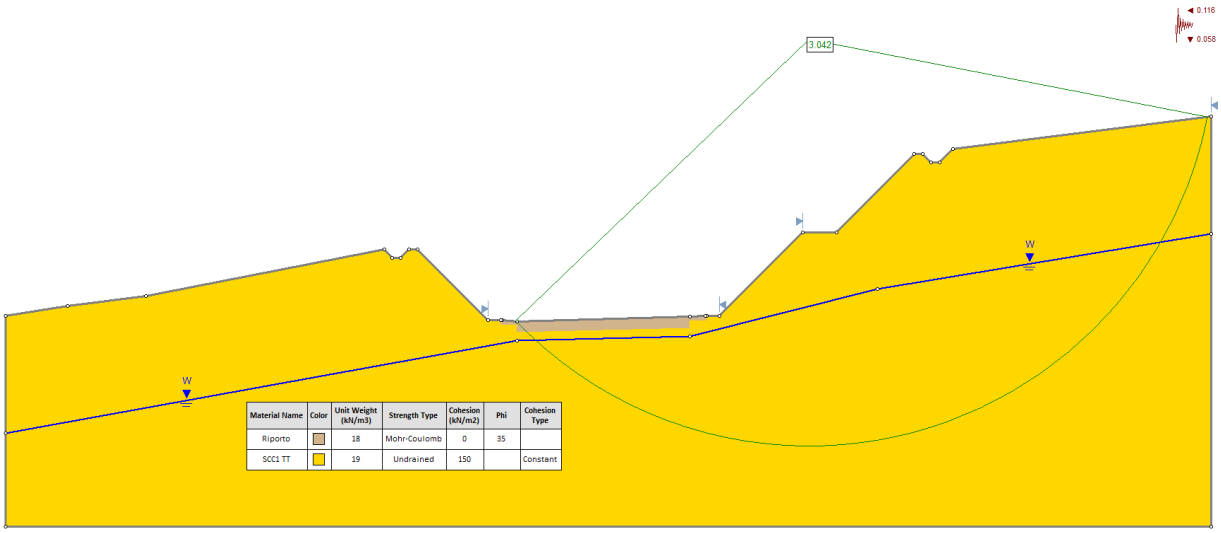


Figura 19 – Sez.4 in AP – Verifica stabilità globale in condizioni sismiche (sisma ↓) e non drenate.

7.2 SEZIONE 13 IN ASSE PRINCIPALE

Tale sezione risulta dimensionante per il tratto da pk 0+379 a pk 0+440.

Condizioni statiche - con parametri definiti in termini di tensioni efficaci (condizioni drenate)

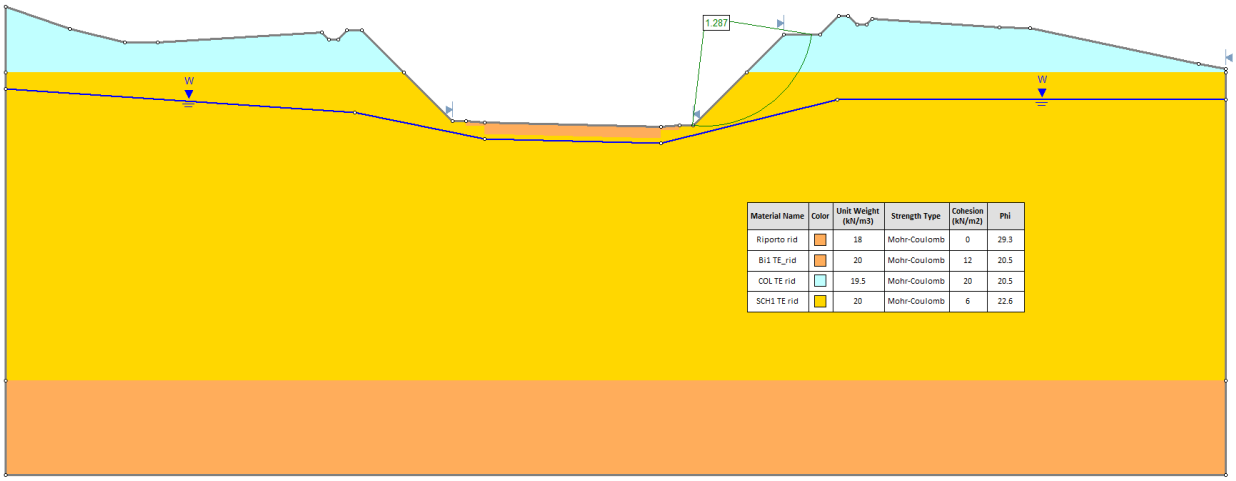


Figura 20 – Sez.13 in AP – Verifica stabilità globale in condizioni statiche e drenate.

Condizioni statiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

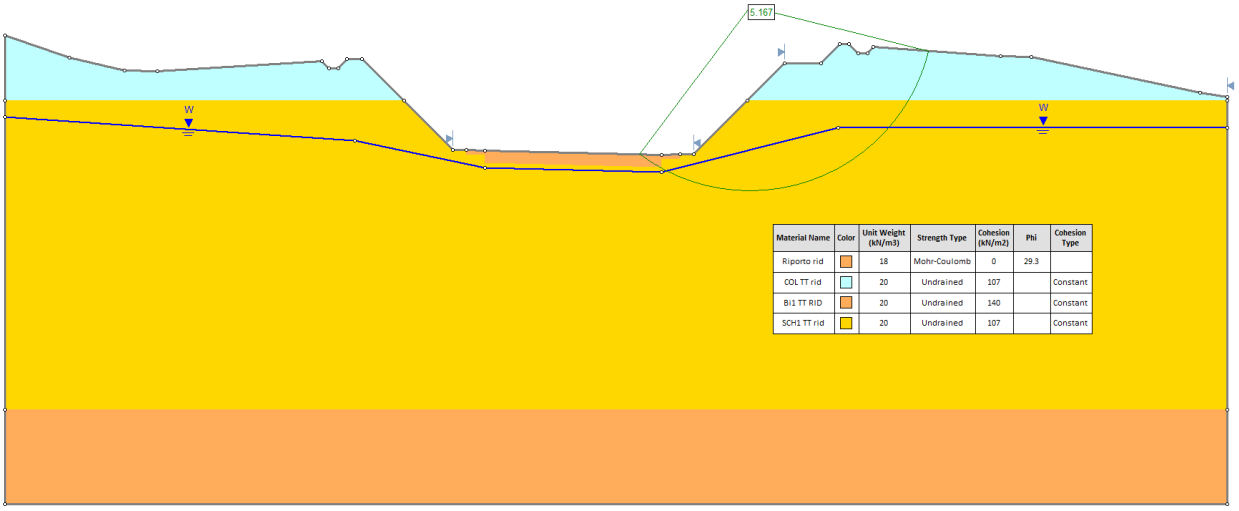


Figura 21 – Sez.13 in AP – Verifica stabilità globale in condizioni statiche e non drenate.

Condizioni sismiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

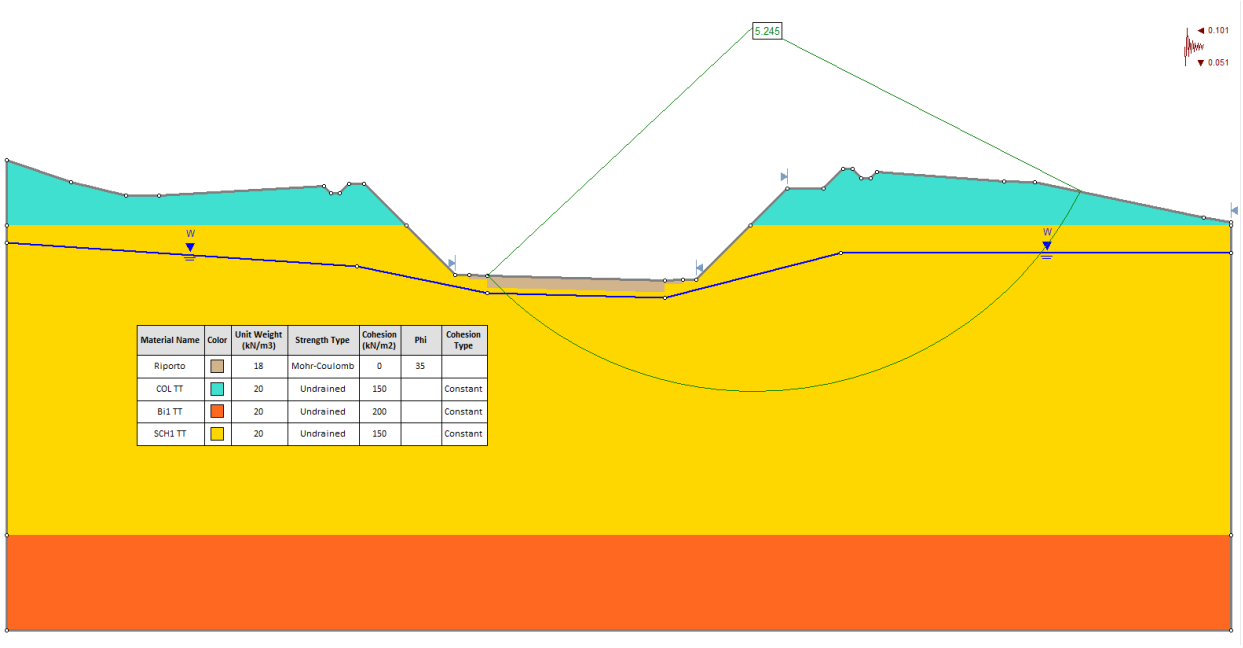


Figura 22 – Sez.13 in AP – Verifica stabilità globale in condizioni sismiche (sisma ↓) e non drenate.

7.3 SCAVI PROVVISIONALI PER LE FONDAZIONI DEL VIADOTTO VI01

La sezione analizzata in corrispondenza della pila 7 dove lo scavo è di altezza maggiore (circa 6 m al centro della trincea), risulta dimensionante per gli scavi provvisionali previsti per la realizzazione di tutte le fondazioni del viadotto VI01.

Condizioni statiche - con parametri definiti in termini di tensioni efficaci (condizioni drenate)

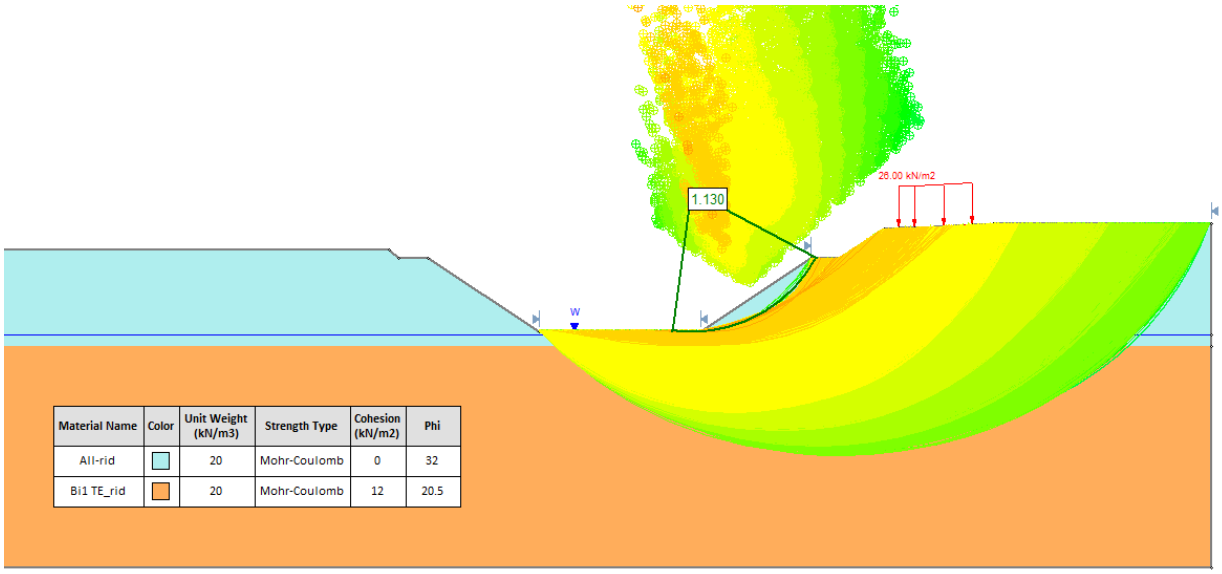


Figura 23 – Scavi alla pila 7 del VI01 – Verifica stabilità globale in condizioni statiche e drenate.

Condizioni statiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

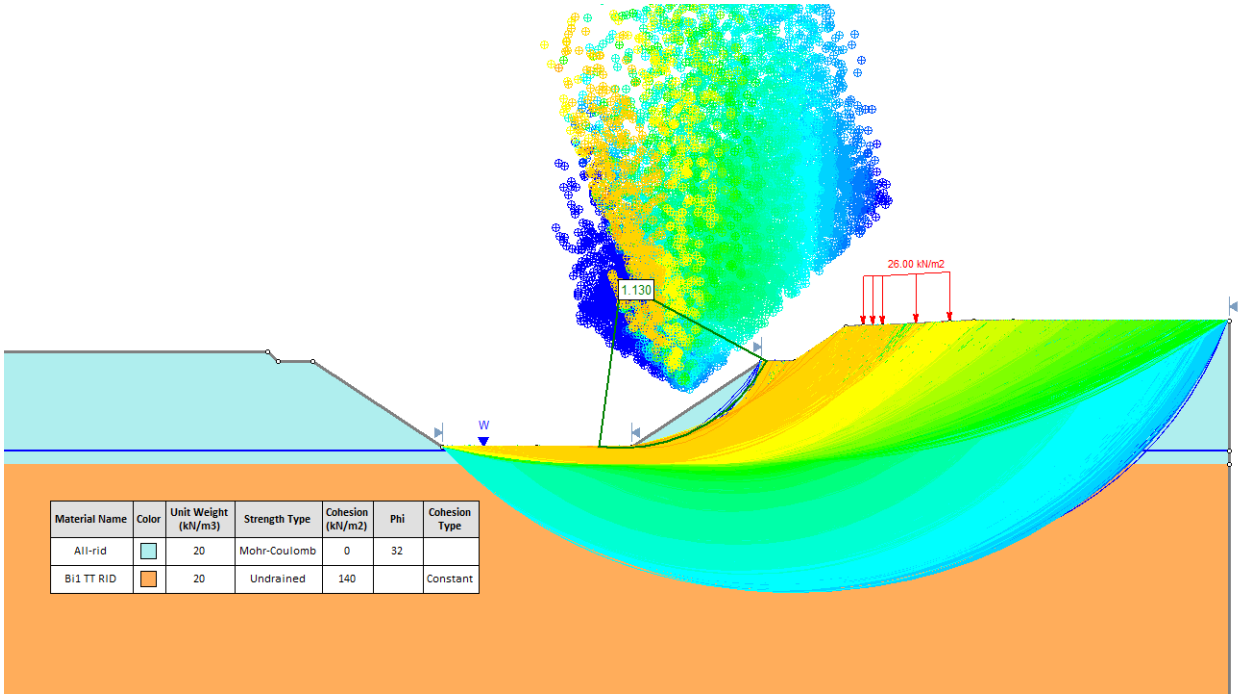


Figura 24 – Scavi alla pila 7 del VI01 – Verifica stabilità globale in condizioni statiche non drenate.

7.4 SCAVI PROVVISIONALI PER LE FONDAZIONI DEL VIADOTTO VI02

La sezione analizzata in corrispondenza della pila 8 dove lo scavo è di altezza maggiore (circa 3.2 m al centro della trincea), risulta dimensionante per gli scavi provvisionali previsti per la realizzazione di tutte le fondazioni del viadotto VI02.

Condizioni statiche - con parametri definiti in termini di tensioni efficaci (condizioni drenate)

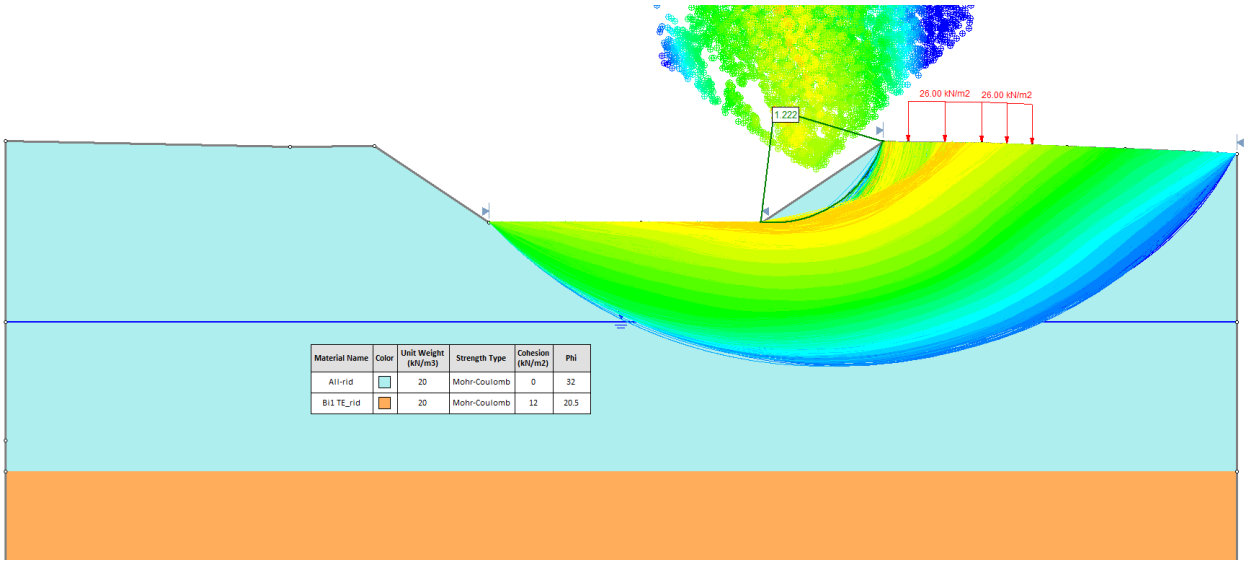


Figura 25 – Scavi alla pila 8 del VI02 – Verifica stabilità globale in condizioni statiche e drenate.

Condizioni statiche - con parametri definiti in termini di tensioni totali (condizioni non drenate)

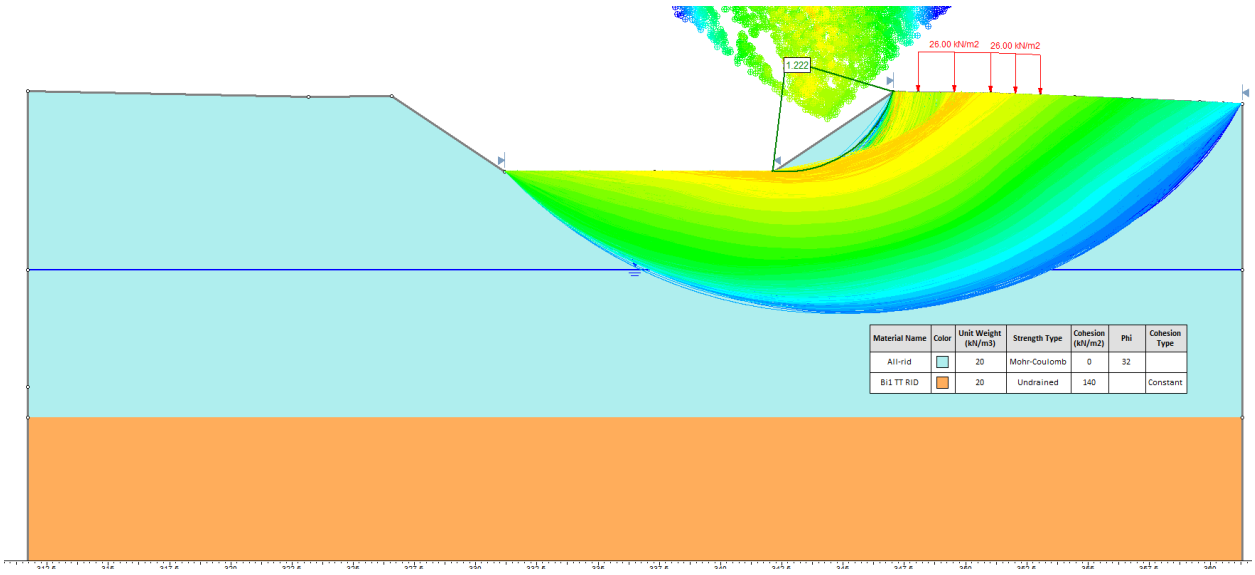


Figura 26 – Scavi alla pila 8 del VI02 – Verifica stabilità globale in condizioni statiche non drenate.

8 ANALISI DI STABILITÀ: GIUDIZIO MOTIVATO DI ACCETTABILITÀ DEI RISULTATI

Le analisi di stabilità in corrispondenza delle trincee e dei rilevati sono state condotte utilizzando il codice di calcolo SLIDE delle RocScience (versione 7.038), che implementa il metodo delle strisce (nel caso specifico si è fatto ricorso al metodo di Bishop, 1955).

Oltre all'esame della documentazione fornita dal produttore del software, contenente un'esauriente descrizione delle basi teoriche, degli algoritmi impiegati e l'individuazione dei campi di impiego, la scrivente ha eseguito numerosi confronti tra i risultati delle analisi numeriche ottenute con il software SLIDE ed i risultati ottenuti con altri codici di calcolo e con metodi tradizionali, verificando in tal modo l'affidabilità e la robustezza del codice di calcolo in oggetto.

In base a quanto sopra si giudicano i risultati ottenuti affidabili ed accettabili

9 APPENDICE – TABULATI DEL CODICE DI CALCOLO SLIDE

9.1 SEZIONE 22 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI STATICHE IN TE

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 22 AP_TE_STAT
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search

- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 26
- Orientation: Vertical

Material Properties

Property	Ril_rid	Bi1_rid	COL TE rid
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [kN/m3]	18	20	19.5
Cohesion [kPa]	0	12	20
Friction Angle [deg]	29.3	20.5	20.5
Water Surface	Water Table	Water Table	Water Table
Hu Value	1	1	1

Global Minimums

Method: bishop simplified

- FS: 1.287930
- Center: 317.074, 118.920
- Radius: 18.567
- Left Slip Surface Endpoint: 316.437, 100.363
- Right Slip Surface Endpoint: 331.804, 107.616
- Resisting Moment=5653.41 kN-m
- Driving Moment=4389.54 kN-m

Method: janbu simplified

- FS: 1.196450

- Center: 317.074, 118.920
- Radius: 18.567
- Left Slip Surface Endpoint: 316.437, 100.363
- Right Slip Surface Endpoint: 331.804, 107.616
- Resisting Horizontal Force=263.709 kN
- Driving Horizontal Force=220.41 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9995
- Number of Invalid Surfaces: 5

Error Codes:

- Error Code -101 reported for 2 surfaces
- Error Code -113 reported for 3 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9995
- Number of Invalid Surfaces: 5

Error Codes:

- Error Code -101 reported for 2 surfaces
- Error Code -113 reported for 3 surfaces

Error Codes

The following errors were encountered during the computation:

- -101 = Only one (or zero) surface / slope intersections.
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.28793**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.677457	2.42782	COL TE rid	20	20.5	16.6467	21.4398	3.85082	0	3.85082

2	0.612082	6.87784	Ril_rid	0	29.3	4.85665	6.25503	11.1463	0	11.1463
3	0.612082	11.1363	Ril_rid	0	29.3	7.75319	9.98557	17.7941	0	17.7941
4	0.612082	15.1715	Ril_rid	0	29.3	10.4154	13.4143	23.9039	0	23.9039
5	0.612082	18.9817	Ril_rid	0	29.3	12.8507	16.5508	29.4932	0	29.4932
6	0.612082	22.2337	Ril_rid	0	29.3	14.8442	19.1183	34.0684	0	34.0684
7	0.612082	21.9443	Ril_rid	0	29.3	14.4482	18.6083	33.1596	0	33.1596
8	0.612082	20.5672	Ril_rid	0	29.3	13.3532	17.198	30.6465	0	30.6465
9	0.612082	18.9814	Ril_rid	0	29.3	12.1508	15.6494	27.8868	0	27.8868
10	0.612082	19.8604	Ril_rid	0	29.3	12.5331	16.1417	28.7642	0	28.7642
11	0.612082	22.2428	Ril_rid	0	29.3	13.8341	17.8173	31.7502	0	31.7502
12	0.612082	24.3648	Ril_rid	0	29.3	14.9309	19.23	34.2676	0	34.2676
13	0.612082	26.2165	Ril_rid	0	29.3	15.8236	20.3797	36.3161	0	36.3161
14	0.612082	27.7865	Ril_rid	0	29.3	16.5111	21.2652	37.8941	0	37.8941
15	0.612082	29.0611	Ril_rid	0	29.3	16.9917	21.8841	38.9971	0	38.9971
16	0.612082	30.0245	Ril_rid	0	29.3	17.2624	22.2328	39.6184	0	39.6184
17	0.612082	30.6577	Ril_rid	0	29.3	17.3195	22.3063	39.7494	0	39.7494
18	0.612082	30.9385	Ril_rid	0	29.3	17.1578	22.0981	39.3784	0	39.3784
19	0.612082	30.8399	Ril_rid	0	29.3	16.7713	21.6002	38.491	0	38.491
20	0.612082	30.3297	Ril_rid	0	29.3	16.152	20.8026	37.0698	0	37.0698
21	0.612082	29.368	Ril_rid	0	29.3	15.2906	19.6932	35.0929	0	35.0929
22	0.612082	26.3317	Ril_rid	0	29.3	13.3764	17.2279	30.6998	0	30.6998
23	0.612082	20.1195	Ril_rid	0	29.3	9.94666	12.8106	22.8281	0	22.8281
24	0.612082	13.1512	Ril_rid	0	29.3	6.33655	8.16103	14.5428	0	14.5428
25	0.612082	4.24935	Ril_rid	0	29.3	9.34073	12.0302	21.4376	0	21.4376

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.19645**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.677457	2.42782	COL TE rid	20	20.5	17.926	21.4476	3.87184	0	3.87184
2	0.612082	6.87784	Ril_rid	0	29.3	5.2247	6.25109	11.1393	0	11.1393
3	0.612082	11.1363	Ril_rid	0	29.3	8.33166	9.96842	17.7634	0	17.7634
4	0.612082	15.1715	Ril_rid	0	29.3	11.1806	13.377	23.8375	0	23.8375
5	0.612082	18.9817	Ril_rid	0	29.3	13.7804	16.4876	29.3806	0	29.3806
6	0.612082	22.2337	Ril_rid	0	29.3	15.9019	19.0258	33.9036	0	33.9036
7	0.612082	21.9443	Ril_rid	0	29.3	15.4621	18.4996	32.9659	0	32.9659
8	0.612082	20.5672	Ril_rid	0	29.3	14.2759	17.0804	30.437	0	30.437
9	0.612082	18.9814	Ril_rid	0	29.3	12.9776	15.527	27.6688	0	27.6688
10	0.612082	19.8604	Ril_rid	0	29.3	13.3725	15.9995	28.5108	0	28.5108
11	0.612082	22.2428	Ril_rid	0	29.3	14.746	17.6429	31.4393	0	31.4393
12	0.612082	24.3648	Ril_rid	0	29.3	15.8995	19.0229	33.8983	0	33.8983
13	0.612082	26.2165	Ril_rid	0	29.3	16.833	20.1399	35.8889	0	35.8889
14	0.612082	27.7865	Ril_rid	0	29.3	17.5467	20.9937	37.4102	0	37.4102
15	0.612082	29.0611	Ril_rid	0	29.3	18.0387	21.5824	38.4593	0	38.4593
16	0.612082	30.0245	Ril_rid	0	29.3	18.3067	21.9031	39.0309	0	39.0309
17	0.612082	30.6577	Ril_rid	0	29.3	18.3474	21.9517	39.1174	0	39.1174
18	0.612082	30.9385	Ril_rid	0	29.3	18.1558	21.7225	38.709	0	38.709
19	0.612082	30.8399	Ril_rid	0	29.3	17.7261	21.2084	37.7929	0	37.7929
20	0.612082	30.3297	Ril_rid	0	29.3	17.0508	20.4004	36.3531	0	36.3531

21	0.612082	29.368	Ril_rid	0	29.3	16.1209	19.2878	34.3704	0	34.3704
22	0.612082	26.3317	Ril_rid	0	29.3	14.0835	16.8502	30.0268	0	30.0268
23	0.612082	20.1195	Ril_rid	0	29.3	10.4571	12.5114	22.2951	0	22.2951
24	0.612082	13.1512	Ril_rid	0	29.3	6.65116	7.95778	14.1806	0	14.1806
25	0.612082	4.24935	Ril_rid	0	29.3	9.78729	11.71	20.867	0	20.867

List Of Coordinates

Water Table

X	Y
300.065	96.8091
366.955	96.8091

Line Load

X	Y
340.94	107.384
331.19	107.632

External Boundary

X	Y
300.065	81.0237
366.955	81.0237
366.955	92.719
366.955	106.144
348.166	103.763
342.69	107.414
341.015	107.481
340.94	107.384
331.19	107.632
331.115	107.729
329.44	107.662
321.94	102.662
319.94	102.662
316.499	100.368
316.081	100.335
314.172	100.041
312.586	99.8665
307.401	99.4362
305.36	99.2692
300.065	98.7187
300.065	92.719

Material Boundary

X	Y
316.499	100.368
317.114	100.418
321.94	100.806
327.96	101.29
329.44	101.465
332.565	101.835
340.94	102.827
347.71	103.706
348.166	103.763

Material Boundary

X	Y
317.114	100.418
317.114	100.218
319.114	100.218
319.114	100.379
321.114	100.379
321.114	100.54
323.114	100.54
323.114	100.7
325.114	100.7
325.114	100.861
327.114	100.861
327.114	101.022
329.114	101.022
329.114	101.227
331.114	101.227
331.115	101.464
333.114	101.464
333.114	101.7
335.114	101.7
335.114	101.936
337.114	101.936
337.114	102.173
339.114	102.173
339.114	102.41
341.114	102.41
341.114	102.648
343.114	102.648
343.114	102.885
345.114	102.885
345.114	103.156
347.114	103.156
347.114	103.426

347.71	103.426
347.71	103.706

X	Y
300.065	92.719
366.955	92.719

Material Boundary

9.2 SEZIONE 22 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI STATICHE IN TT

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 22 AP_TT_STAT
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 26
- Orientation: Vertical

Material Properties

Property	Ril_rid	COL TT rid	Bi1 TT rid
Color			
Strength Type	Mohr-Coulomb	Undrained	Undrained
Unit Weight [kN/m3]	18	20	20
Cohesion [kPa]	0		
Friction Angle [deg]	29.3		
Cohesion Type		107	140
Water Surface	Water Table	None	None
Hu Value	1		
Ru Value		0	0

Global Minimums

Method: bishop simplified

- FS: 1.574610
- Center: 317.074, 118.920
- Radius: 18.567
- Left Slip Surface Endpoint: 316.437, 100.363
- Right Slip Surface Endpoint: 331.804, 107.616

- Resisting Moment=6911.81 kN-m
- Driving Moment=4389.54 kN-m

Method: janbu simplified

- FS: 1.435760
- Center: 317.074, 118.920
- Radius: 18.567
- Left Slip Surface Endpoint: 316.437, 100.363
- Right Slip Surface Endpoint: 331.804, 107.616
- Resisting Horizontal Force=329.406 kN
- Driving Horizontal Force=229.429 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9995
- Number of Invalid Surfaces: 5

  Error Codes:

  - Error Code -101 reported for 2 surfaces
  - Error Code -113 reported for 3 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9989
- Number of Invalid Surfaces: 11

  Error Codes:

  - Error Code -101 reported for 2 surfaces
  - Error Code -108 reported for 6 surfaces
  - Error Code -113 reported for 3 surfaces

  Error Codes

  The following errors were encountered during the computation:

  - -101 = Only one (or zero) surface / slope intersections.

- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.57461**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.677457	2.4389	COL TT rid	107	0	67.9533	107	4.69184	0	4.69184
2	0.612082	6.87784	Ril_rid	0	29.3	3.97822	6.26415	11.1626	0	11.1626
3	0.612082	11.1363	Ril_rid	0	29.3	6.36697	10.0255	17.8653	0	17.8653
4	0.612082	15.1715	Ril_rid	0	29.3	8.57438	13.5013	24.0591	0	24.0591
5	0.612082	18.9817	Ril_rid	0	29.3	10.605	16.6988	29.7568	0	29.7568
6	0.612082	22.2337	Ril_rid	0	29.3	12.2797	19.3357	34.4557	0	34.4557
7	0.612082	21.9443	Ril_rid	0	29.3	11.9806	18.8647	33.6165	0	33.6165
8	0.612082	20.5672	Ril_rid	0	29.3	11.0987	17.4762	31.1421	0	31.1421
9	0.612082	18.9814	Ril_rid	0	29.3	10.1231	15.94	28.4048	0	28.4048
10	0.612082	19.8604	Ril_rid	0	29.3	10.4662	16.4802	29.3675	0	29.3675
11	0.612082	22.2428	Ril_rid	0	29.3	11.5801	18.2341	32.4928	0	32.4928
12	0.612082	24.3648	Ril_rid	0	29.3	12.5281	19.7268	35.1527	0	35.1527
13	0.612082	26.2165	Ril_rid	0	29.3	13.3091	20.9566	37.3442	0	37.3442
14	0.612082	27.7865	Ril_rid	0	29.3	13.9214	21.9208	39.0624	0	39.0624
15	0.612082	29.0611	Ril_rid	0	29.3	14.3625	22.6153	40.2999	0	40.2999
16	0.612082	30.0245	Ril_rid	0	29.3	14.6288	23.0346	41.0471	0	41.0471
17	0.612082	30.6577	Ril_rid	0	29.3	14.7159	23.1718	41.2916	0	41.2916
18	0.612082	30.9385	Ril_rid	0	29.3	14.6185	23.0185	41.0184	0	41.0184
19	0.612082	30.8399	Ril_rid	0	29.3	14.33	22.5641	40.2088	0	40.2088
20	0.612082	30.3297	Ril_rid	0	29.3	13.8423	21.7962	38.8403	0	38.8403
21	0.612082	29.368	Ril_rid	0	29.3	13.1457	20.6994	36.8858	0	36.8858
22	0.612082	26.3317	Ril_rid	0	29.3	11.5391	18.1696	32.3778	0	32.3778
23	0.612082	20.1195	Ril_rid	0	29.3	8.61185	13.5603	24.1641	0	24.1641
24	0.612082	13.1512	Ril_rid	0	29.3	5.50821	8.67328	15.4556	0	15.4556
25	0.612082	4.24935	Ril_rid	0	29.3	8.15586	12.8423	22.8847	0	22.8847

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.43576**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.677457	2.4389	COL TT rid	107	0	74.525	107	4.79668	0	4.79668
2	0.612082	6.87784	Ril_rid	0	29.3	4.36019	6.26018	11.1555	0	11.1555
3	0.612082	11.1363	Ril_rid	0	29.3	6.97059	10.0081	17.8343	0	17.8343
4	0.612082	15.1715	Ril_rid	0	29.3	9.37712	13.4633	23.9914	0	23.9914
5	0.612082	18.9817	Ril_rid	0	29.3	11.5856	16.6341	29.6416	0	29.6416
6	0.612082	22.2337	Ril_rid	0	29.3	13.401	19.2406	34.2863	0	34.2863
7	0.612082	21.9443	Ril_rid	0	29.3	13.061	18.7524	33.4164	0	33.4164
8	0.612082	20.5672	Ril_rid	0	29.3	12.0871	17.3542	30.9247	0	30.9247
9	0.612082	18.9814	Ril_rid	0	29.3	11.0133	15.8124	28.1773	0	28.1773

10	0.612082	19.8604	Ril_rid	0	29.3	11.3747	16.3314	29.1021	0	29.1021
11	0.612082	22.2428	Ril_rid	0	29.3	12.5722	18.0506	32.1658	0	32.1658
12	0.612082	24.3648	Ril_rid	0	29.3	13.5871	19.5078	34.7624	0	34.7624
13	0.612082	26.2165	Ril_rid	0	29.3	14.4188	20.7019	36.8904	0	36.8904
14	0.612082	27.7865	Ril_rid	0	29.3	15.0659	21.631	38.546	0	38.546
15	0.612082	29.0611	Ril_rid	0	29.3	15.526	22.2916	39.7231	0	39.7231
16	0.612082	30.0245	Ril_rid	0	29.3	15.7959	22.6791	40.4137	0	40.4137
17	0.612082	30.6577	Ril_rid	0	29.3	15.8714	22.7875	40.6069	0	40.6069
18	0.612082	30.9385	Ril_rid	0	29.3	15.7472	22.6092	40.2891	0	40.2891
19	0.612082	30.8399	Ril_rid	0	29.3	15.4169	22.1349	39.4438	0	39.4438
20	0.612082	30.3297	Ril_rid	0	29.3	14.8723	21.353	38.0505	0	38.0505
21	0.612082	29.368	Ril_rid	0	29.3	14.1039	20.2498	36.0847	0	36.0847
22	0.612082	26.3317	Ril_rid	0	29.3	12.3614	17.748	31.6265	0	31.6265
23	0.612082	20.1195	Ril_rid	0	29.3	9.21045	13.224	23.5649	0	23.5649
24	0.612082	13.1512	Ril_rid	0	29.3	5.88049	8.44297	15.0452	0	15.0452
25	0.612082	4.24935	Ril_rid	0	29.3	8.68968	12.4763	22.2325	0	22.2325

List Of Coordinates

Water Table

X	Y
300.065	96.8091
366.955	96.8091

Line Load

X	Y
340.94	107.384
331.19	107.632

External Boundary

X	Y
300.065	81.0237
366.955	81.0237
366.955	92.719
366.955	106.144
348.166	103.763
342.69	107.414
341.015	107.481
340.94	107.384
331.19	107.632
331.115	107.729
329.44	107.662
321.94	102.662
319.94	102.662
316.499	100.368
316.081	100.335
314.172	100.041
312.586	99.8665
307.401	99.4362
305.36	99.2692
300.065	98.7187
300.065	92.719

Material Boundary

X	Y
316.499	100.368
317.114	100.418
321.94	100.806
327.96	101.29
329.44	101.465
332.565	101.835
340.94	102.827
347.71	103.706
348.166	103.763

Material Boundary

X	Y
317.114	100.418
317.114	100.218
319.114	100.218
319.114	100.379
321.114	100.379
321.114	100.54
323.114	100.54
323.114	100.7
325.114	100.7
325.114	100.861

327.114	100.861
327.114	101.022
329.114	101.022
329.114	101.227
331.114	101.227
331.115	101.464
333.114	101.464
333.114	101.7
335.114	101.7
335.114	101.936
337.114	101.936
337.114	102.173
339.114	102.173
339.114	102.41
341.114	102.41

341.114	102.648
343.114	102.648
343.114	102.885
345.114	102.885
345.114	103.156
347.114	103.156
347.114	103.426
347.71	103.426
347.71	103.706

Material Boundary

X	Y
300.065	92.719
366.955	92.719

9.3 SEZIONE 22 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI SISMICHE (SISMA ↓)

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 22 AP_TT_SISM+
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1

- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Loading

- Seismic Load Coefficient (Horizontal): 0.101
- Seismic Load Coefficient (Vertical): 0.051
- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 4
- Orientation: Vertical

Material Properties

Property	Ril	COL TT	Bi1 TT
Color			
Strength Type	Mohr-Coulomb	Undrained	Undrained
Unit Weight [kN/m3]	18	20	20
Cohesion [kPa]	0		
Friction Angle [deg]	35		
Cohesion Type		150	200
Water Surface	Water Table	None	None
Hu Value	1		
Ru Value		0	0

Global Minimums

Method: bishop simplified

- FS: 1.811000
- Center: 316.841, 124.021
- Radius: 23.688
- Left Slip Surface Endpoint: 316.176, 100.342
- Right Slip Surface Endpoint: 333.879, 107.564
- Resisting Moment=15134.2 kN-m
- Driving Moment=8356.83 kN-m

Method: janbu simplified

- FS: 1.689050
- Center: 316.841, 124.021
- Radius: 23.688
- Left Slip Surface Endpoint: 316.176, 100.342
- Right Slip Surface Endpoint: 333.879, 107.564
- Resisting Horizontal Force=584.962 kN
- Driving Horizontal Force=346.327 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9999
- Number of Invalid Surfaces: 1

  Error Codes:

  - Error Code -101 reported for 1 surface

Method: janbu simplified

- Number of Valid Surfaces: 9950
- Number of Invalid Surfaces: 50

  Error Codes:

- Error Code -101 reported for 1 surface
- Error Code -108 reported for 49 surfaces

Error Codes

The following errors were encountered during the computation:

- -101 = Only one (or zero) surface / slope intersections.
- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.811**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.938092	2.7768	COL TT	150	0	82.8272	150	3.79656	0	3.79656
2	0.698527	8.39238	Ril	0	35	4.8331	8.75275	12.5002	0	12.5002
3	0.698527	13.887	Ril	0	35	7.90801	14.3214	20.4531	0	20.4531
4	0.698527	19.1213	Ril	0	35	10.7676	19.5002	27.8492	0	27.8492
5	0.698527	24.0936	Ril	0	35	13.4174	24.2989	34.7025	0	34.7025
6	0.698527	26.131	Ril	0	35	14.3909	26.062	37.2204	0	37.2204
7	0.698527	24.7221	Ril	0	35	13.4641	24.3835	34.8233	0	34.8233
8	0.698527	23.0607	Ril	0	35	12.4194	22.4915	32.1212	0	32.1212
9	0.698527	24.5396	Ril	0	35	13.0675	23.6653	33.7976	0	33.7976
10	0.698527	28.1509	Ril	0	35	14.8206	26.8401	38.3317	0	38.3317
11	0.698527	31.4738	Ril	0	35	16.3796	29.6634	42.3638	0	42.3638
12	0.698527	34.5005	Ril	0	35	17.7449	32.1361	45.8952	0	45.8952
13	0.698527	37.222	Ril	0	35	18.9166	34.2579	48.9254	0	48.9254
14	0.698527	39.6278	Ril	0	35	19.8936	36.0274	51.4524	0	51.4524
15	0.698527	41.7059	Ril	0	35	20.6746	37.4417	53.4724	0	53.4724
16	0.698527	43.4424	Ril	0	35	21.2573	38.497	54.9794	0	54.9794
17	0.698527	44.8213	Ril	0	35	21.6388	39.1878	55.966	0	55.966
18	0.698527	45.8238	Ril	0	35	21.8151	39.5072	56.4221	0	56.4221
19	0.698527	46.0815	Ril	0	35	21.6189	39.1519	55.9147	0	55.9147
20	0.698527	41.9034	Ril	0	35	19.3586	35.0585	50.0686	0	50.0686
21	0.698527	36.1273	Ril	0	35	16.4208	29.738	42.4703	0	42.4703
22	0.698527	28.5187	Ril	0	35	13.7494	24.9002	35.5612	0	35.5612
23	0.698527	21.0322	Ril	0	35	10.3886	18.8138	26.8689	0	26.8689
24	0.698527	13.0766	Ril	0	35	6.76278	12.2474	17.4912	0	17.4912
25	0.698527	4.47286	Ril	0	35	2.99855	5.43038	7.75538	0	7.75538

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.68905**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.938092	2.7768	COL TT	150	0	88.8073	150	3.84629	0	3.84629
2	0.698527	8.39238	Ril	0	35	5.17828	8.74637	12.4911	0	12.4911

3	0.698527	13.887	Ril	0	35	8.466	14.2995	20.4218	0	20.4218
4	0.698527	19.1213	Ril	0	35	11.5183	19.455	27.7847	0	27.7847
5	0.698527	24.0936	Ril	0	35	14.3417	24.2238	34.5953	0	34.5953
6	0.698527	26.131	Ril	0	35	15.3705	25.9616	37.0771	0	37.0771
7	0.698527	24.7221	Ril	0	35	14.3697	24.2712	34.6628	0	34.6628
8	0.698527	23.0607	Ril	0	35	13.2448	22.3711	31.9492	0	31.9492
9	0.698527	24.5396	Ril	0	35	13.9255	23.5209	33.5914	0	33.5914
10	0.698527	28.1509	Ril	0	35	15.7819	26.6564	38.0694	0	38.0694
11	0.698527	31.4738	Ril	0	35	17.4289	29.4383	42.0423	0	42.0423
12	0.698527	34.5005	Ril	0	35	18.8676	31.8683	45.5126	0	45.5126
13	0.698527	37.222	Ril	0	35	20.0981	33.9467	48.4808	0	48.4808
14	0.698527	39.6278	Ril	0	35	21.12	35.6727	50.946	0	50.946
15	0.698527	41.7059	Ril	0	35	21.9321	37.0444	52.9048	0	52.9048
16	0.698527	43.4424	Ril	0	35	22.5324	38.0584	54.3531	0	54.3531
17	0.698527	44.8213	Ril	0	35	22.9183	38.7101	55.2837	0	55.2837
18	0.698527	45.8238	Ril	0	35	23.0859	38.9933	55.6882	0	55.6882
19	0.698527	46.0815	Ril	0	35	22.8589	38.6098	55.1405	0	55.1405
20	0.698527	41.9034	Ril	0	35	20.4509	34.5426	49.3319	0	49.3319
21	0.698527	36.1273	Ril	0	35	17.3314	29.2736	41.8071	0	41.8071
22	0.698527	28.5187	Ril	0	35	14.498	24.4879	34.9723	0	34.9723
23	0.698527	21.0322	Ril	0	35	10.9433	18.4837	26.3974	0	26.3974
24	0.698527	13.0766	Ril	0	35	7.11625	12.0197	17.1658	0	17.1658
25	0.698527	4.47286	Ril	0	35	3.15165	5.32329	7.60246	0	7.60246

List Of Coordinates

Water Table

X	Y
300.065	96.8091
366.955	96.8091

Line Load

X	Y
340.94	107.384
331.19	107.632

External Boundary

X	Y
300.065	81.0237
366.955	81.0237
366.955	92.719
366.955	106.144
348.166	103.763
342.69	107.414
341.015	107.481
340.94	107.384
331.19	107.632
331.115	107.729
329.44	107.662
321.94	102.662
319.94	102.662
316.499	100.368
316.081	100.335
314.172	100.041
312.586	99.8665
307.401	99.4362
305.36	99.2692
300.065	98.7187
300.065	92.719

Material Boundary

X	Y
316.499	100.368
317.114	100.418
321.94	100.806
327.96	101.29
329.44	101.465
332.565	101.835
340.94	102.827
347.71	103.706
348.166	103.763

Material Boundary

X	Y
317.114	100.418
317.114	100.218
319.114	100.218
319.114	100.379
321.114	100.379
321.114	100.54
323.114	100.54
323.114	100.7
325.114	100.7
325.114	100.861
327.114	100.861
327.114	101.022
329.114	101.022
329.114	101.227
331.114	101.227
331.115	101.464
333.114	101.464
333.114	101.7
335.114	101.7
335.114	101.936
337.114	101.936
337.114	102.173
339.114	102.173
339.114	102.41
341.114	102.41
341.114	102.648
343.114	102.648
343.114	102.885
345.114	102.885
345.114	103.156
347.114	103.156
347.114	103.426
347.71	103.426
347.71	103.706

Material Boundary

X	Y
300.065	92.719
366.955	92.719

9.4 SEZIONE 42 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI STATICHE IN TE

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 42 AP_TE_STAT
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Left to Right
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 26
- Orientation: Vertical

Material Properties

Property	Ril_rid	Bi1 TE_rid
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [kN/m3]	18	20
Cohesion [kPa]	0	12

Friction Angle [deg]	29.3	20.5
Water Surface	Water Table	Water Table
Hu Value	1	1

Global Minimums

Method: bishop simplified

- FS: 1.277770
- Center: 350.265, 118.404
- Radius: 15.807
- Left Slip Surface Endpoint: 338.731, 107.597
- Right Slip Surface Endpoint: 352.146, 102.710
- Resisting Moment=4071.22 kN-m
- Driving Moment=3186.19 kN-m

Method: janbu simplified

- FS: 1.215690
- Center: 348.915, 110.713
- Radius: 8.322
- Left Slip Surface Endpoint: 341.167, 107.678
- Right Slip Surface Endpoint: 351.198, 102.710
- Resisting Horizontal Force=175.838 kN
- Driving Horizontal Force=144.64 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9946
- Number of Invalid Surfaces: 54

  Error Codes:

  - Error Code -113 reported for 54 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9946
- Number of Invalid Surfaces: 54

Error Codes:

- Error Code -113 reported for 54 surfaces

Error Codes

The following errors were encountered during the computation:

- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.27777**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.54211	2.7759	Ril_rid	0	29.3	9.45929	12.0868	21.5384	0	21.5384
2	0.54211	8.08244	Ril_rid	0	29.3	12.793	16.3465	29.1291	0	29.1291
3	0.54211	12.9284	Ril_rid	0	29.3	15.9938	20.4364	36.4171	0	36.4171
4	0.54211	17.3668	Ril_rid	0	29.3	19.0634	24.3587	43.4066	0	43.4066
5	0.54211	21.7116	Ril_rid	0	29.3	18.9216	24.1774	43.0836	0	43.0836
6	0.54211	25.8114	Ril_rid	0	29.3	16.3088	20.8389	37.1345	0	37.1345
7	0.54211	28.8596	Ril_rid	0	29.3	18.588	23.7512	42.3241	0	42.3241
8	0.54211	31.5894	Ril_rid	0	29.3	20.7202	26.4757	47.1791	0	47.1791
9	0.54211	31.9853	Ril_rid	0	29.3	21.3485	27.2785	48.6097	0	48.6097
10	0.54211	30.9165	Ril_rid	0	29.3	20.9837	26.8124	47.779	0	47.779
11	0.54211	29.6102	Ril_rid	0	29.3	20.4254	26.099	46.5079	0	46.5079
12	0.54211	28.0774	Ril_rid	0	29.3	19.6757	25.141	44.8008	0	44.8008
13	0.54211	26.3274	Ril_rid	0	29.3	18.7355	23.9396	42.6599	0	42.6599
14	0.54211	24.368	Ril_rid	0	29.3	17.605	22.4951	40.0857	0	40.0857
15	0.54211	22.2056	Ril_rid	0	29.3	16.2833	20.8063	37.0765	0	37.0765
16	0.54211	19.8459	Ril_rid	0	29.3	14.7689	18.8712	33.6281	0	33.6281
17	0.54211	17.2933	Ril_rid	0	29.3	13.0589	16.6863	29.7347	0	29.7347
18	0.54211	14.5516	Ril_rid	0	29.3	11.1501	14.2472	25.3883	0	25.3883
19	0.54211	11.6237	Ril_rid	0	29.3	9.03762	11.548	20.5782	0	20.5782
20	0.54211	8.51168	Ril_rid	0	29.3	6.71582	8.58127	15.2916	0	15.2916
21	0.54211	5.21709	Ril_rid	0	29.3	4.17772	5.33817	9.51252	0	9.51252
22	0.104642	0.615261	Bi1 TE_rid	12	20.5	11.0918	14.1727	5.81119	0	5.81119
23	0.64213	1.66914	Ril_rid	0	29.3	1.15039	1.46994	2.6194	0	2.6194
24	0.64213	0.952053	Ril_rid	0	29.3	0.668195	0.853799	1.52145	0	1.52145
25	0.64213	0.368091	Ril_rid	0	29.3	0.2632	0.336309	0.599297	0	0.599297

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.21569**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]

1	0.400808	3.6458	Ril_rid	0	29.3	3.18823	3.8759	6.90677	0	6.90677
2	0.400808	9.30608	Ril_rid	0	29.3	6.03174	7.33272	13.0667	0	13.0667
3	0.400808	13.6335	Ril_rid	0	29.3	9.57168	11.6362	20.7354	0	20.7354
4	0.400808	17.2332	Ril_rid	0	29.3	12.8488	15.6202	27.8349	0	27.8349
5	0.400808	20.1187	Ril_rid	0	29.3	15.7457	19.1419	34.1104	0	34.1104
6	0.400808	21.2342	Ril_rid	0	29.3	17.3133	21.0476	37.5063	0	37.5063
7	0.400808	21.7369	Ril_rid	0	29.3	18.3673	22.329	39.7899	0	39.7899
8	0.400808	21.9501	Ril_rid	0	29.3	19.149	23.2793	41.4832	0	41.4832
9	0.400808	21.9104	Ril_rid	0	29.3	19.6789	23.9235	42.631	0	42.631
10	0.400808	21.6451	Ril_rid	0	29.3	19.972	24.2798	43.2662	0	43.2662
11	0.400808	21.175	Ril_rid	0	29.3	20.0396	24.3619	43.4124	0	43.4124
12	0.400808	20.5163	Ril_rid	0	29.3	19.8894	24.1794	43.0874	0	43.0874
13	0.400808	19.6818	Ril_rid	0	29.3	19.5269	23.7387	42.3019	0	42.3019
14	0.400808	18.6814	Ril_rid	0	29.3	18.9548	23.0432	41.0625	0	41.0625
15	0.400808	17.5231	Ril_rid	0	29.3	18.174	22.094	39.3712	0	39.3712
16	0.400808	16.2131	Ril_rid	0	29.3	17.1832	20.8895	37.2247	0	37.2247
17	0.400808	14.7562	Ril_rid	0	29.3	15.9791	19.4256	34.616	0	34.616
18	0.400808	13.1557	Ril_rid	0	29.3	14.5562	17.6958	31.5337	0	31.5337
19	0.491139	13.7318	Bi1 TE_rid	12	20.5	18.2747	22.2164	27.3251	0	27.3251
20	0.491139	10.8596	Bi1 TE_rid	12	20.5	16.797	20.4199	22.5199	0	22.5199
21	0.375922	6.2129	Ril_rid	0	29.3	7.90885	9.61471	17.1332	0	17.1332
22	0.375922	4.2637	Ril_rid	0	29.3	5.54931	6.74624	12.0217	0	12.0217
23	0.308399	2.02045	Bi1 TE_rid	12	20.5	12.5206	15.2212	8.6155	0	8.6155
24	0.308399	0.87865	Bi1 TE_rid	12	20.5	11.4659	13.9389	5.18594	0	5.18594
25	0.465823	0.496515	Ril_rid	0	29.3	0.557402	0.677628	1.20752	0	1.20752

List Of Coordinates

Water Table

X	Y
300.365	98.3183
368.448	98.3183

Line Load

X	Y
330.89	107.336
341.24	107.68

External Boundary

X	Y
300.365	83.3638
368.448	83.3638
368.448	101.754
368.304	101.749
368.187	101.851
362.26	102.077
356.517	102.533
352.703	102.568
352.49	102.71
350.49	102.71
342.99	107.71
341.309	107.777
341.24	107.68
330.89	107.336
330.82	107.448
329.14	107.381
321.802	102.489
321.302	102.489
317.186	103.89
312.314	105.154
303.531	105.657
302.376	105.745
300.365	105.725

Material Boundary

X	Y
321.802	102.489
322.333	102.483
329.14	102.405

336.365	102.317
337.656	102.317
339.865	102.369
346.805	102.616
350.115	102.599
352.703	102.568

322.333	102.283
329.14	102.205
330.89	102.205
336.365	102.117
337.656	102.09
341.315	102.22
346.805	102.416
350.115	102.399
350.115	102.599

Material Boundary

X	Y
322.333	102.483

9.5 SEZIONE 42 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI STATICHE IN TT

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 42 AP_TT_STAT
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Left to Right
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces

- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 26
- Orientation: Vertical

Material Properties

Property	Ril_rid	Bi1 TT RID
Color		
Strength Type	Mohr-Coulomb	Undrained
Unit Weight [kN/m3]	18	20
Cohesion [kPa]	0	
Friction Angle [deg]	29.3	
Cohesion Type		140
Water Surface	Water Table	None
Hu Value	1	
Ru Value		0

Global Minimums

Method: bishop simplified

- FS: 1.296830
- Center: 349.826, 117.873

- Radius: 15.265
- Left Slip Surface Endpoint: 338.544, 107.590
- Right Slip Surface Endpoint: 351.588, 102.710
- Resisting Moment=4150.26 kN-m
- Driving Moment=3200.31 kN-m

Method: janbu simplified

- FS: 1.230090
- Center: 349.826, 117.873
- Radius: 15.265
- Left Slip Surface Endpoint: 338.544, 107.590
- Right Slip Surface Endpoint: 351.588, 102.710
- Resisting Horizontal Force=239.639 kN
- Driving Horizontal Force=194.814 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9946
- Number of Invalid Surfaces: 54

Error Codes:

- Error Code -113 reported for 54 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9897
- Number of Invalid Surfaces: 103

Error Codes:

- Error Code -108 reported for 49 surfaces
- Error Code -113 reported for 54 surfaces

Error Codes

The following errors were encountered during the computation:

- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.29683**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.521761	2.63988	Ril_rid	0	29.3	9.26706	12.0178	21.4154	0	21.4154
2	0.521761	7.68414	Ril_rid	0	29.3	12.5081	16.2209	28.9053	0	28.9053
3	0.521761	12.2871	Ril_rid	0	29.3	15.6185	20.2546	36.0932	0	36.0932
4	0.521761	16.5013	Ril_rid	0	29.3	18.6006	24.1218	42.9845	0	42.9845
5	0.521761	20.3675	Ril_rid	0	29.3	21.4572	27.8263	49.5858	0	49.5858
6	0.521761	24.5094	Ril_rid	0	29.3	17.2763	22.4044	39.9242	0	39.9242
7	0.521761	27.6363	Ril_rid	0	29.3	18.1781	23.5739	42.0081	0	42.0081
8	0.521761	30.2731	Ril_rid	0	29.3	20.2783	26.2975	46.8615	0	46.8615
9	0.521761	32.3074	Ril_rid	0	29.3	22.02	28.5562	50.8866	0	50.8866
10	0.521761	31.8032	Ril_rid	0	29.3	22.0409	28.5833	50.9349	0	50.9349
11	0.521761	30.6595	Ril_rid	0	29.3	21.5933	28.0028	49.9003	0	49.9003
12	0.521761	29.3038	Ril_rid	0	29.3	20.9635	27.1861	48.4451	0	48.4451
13	0.521761	27.745	Ril_rid	0	29.3	20.1533	26.1354	46.5727	0	46.5727
14	0.521761	25.9907	Ril_rid	0	29.3	19.1631	24.8513	44.2845	0	44.2845
15	0.521761	24.0473	Ril_rid	0	29.3	17.9927	23.3335	41.5798	0	41.5798
16	0.521761	21.9201	Ril_rid	0	29.3	16.641	21.5806	38.4562	0	38.4562
17	0.521761	19.6136	Ril_rid	0	29.3	15.1061	19.5901	34.909	0	34.909
18	0.521761	17.1315	Ril_rid	0	29.3	13.3851	17.3582	30.9319	0	30.9319
19	0.521761	14.4766	Ril_rid	0	29.3	11.4741	14.88	26.5159	0	26.5159
20	0.521761	11.6511	Ril_rid	0	29.3	9.36854	12.1494	21.65	0	21.65
21	0.521761	8.65673	Ril_rid	0	29.3	7.06235	9.15867	16.3206	0	16.3206
22	0.521761	5.49435	Ril_rid	0	29.3	4.54853	5.89867	10.5113	0	10.5113
23	0.521761	2.18224	Ril_rid	0	29.3	1.83362	2.37789	4.23736	0	4.23736
24	0.521761	0.641844	Ril_rid	0	29.3	0.547526	0.710048	1.26529	0	1.26529
25	0.521761	0.242151	Ril_rid	0	29.3	0.209785	0.272056	0.484798	0	0.484798

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.23009**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.521761	2.63988	Ril_rid	0	29.3	9.60231	11.8117	21.0482	0	21.0482
2	0.521761	7.68414	Ril_rid	0	29.3	12.9751	15.9606	28.4414	0	28.4414
3	0.521761	12.2871	Ril_rid	0	29.3	16.2186	19.9503	35.551	0	35.551
4	0.521761	16.5013	Ril_rid	0	29.3	19.3339	23.7824	42.3798	0	42.3798
5	0.521761	20.3675	Ril_rid	0	29.3	22.3234	27.4598	48.9328	0	48.9328
6	0.521761	24.5094	Ril_rid	0	29.3	17.9895	22.1287	39.4328	0	39.4328
7	0.521761	27.6363	Ril_rid	0	29.3	18.9443	23.3032	41.5258	0	41.5258
8	0.521761	30.2731	Ril_rid	0	29.3	21.1502	26.0166	46.361	0	46.361
9	0.521761	32.3074	Ril_rid	0	29.3	22.9849	28.2735	50.3828	0	50.3828

10	0.521761	31.8032	Ril_rid	0	29.3	23.0244	28.3221	50.4692	0	50.4692
11	0.521761	30.6595	Ril_rid	0	29.3	22.5737	27.7677	49.4814	0	49.4814
12	0.521761	29.3038	Ril_rid	0	29.3	21.9317	26.978	48.0743	0	48.0743
13	0.521761	27.745	Ril_rid	0	29.3	21.0997	25.9545	46.2504	0	46.2504
14	0.521761	25.9907	Ril_rid	0	29.3	20.0777	24.6974	44.0103	0	44.0103
15	0.521761	24.0473	Ril_rid	0	29.3	18.8654	23.2061	41.3528	0	41.3528
16	0.521761	21.9201	Ril_rid	0	29.3	17.461	21.4786	38.2744	0	38.2744
17	0.521761	19.6136	Ril_rid	0	29.3	15.8622	19.5119	34.7698	0	34.7698
18	0.521761	17.1315	Ril_rid	0	29.3	14.0656	17.3019	30.8315	0	30.8315
19	0.521761	14.4766	Ril_rid	0	29.3	12.0667	14.8431	26.45	0	26.45
20	0.521761	11.6511	Ril_rid	0	29.3	9.85993	12.1286	21.6129	0	21.6129
21	0.521761	8.65673	Ril_rid	0	29.3	7.43871	9.15028	16.3056	0	16.3056
22	0.521761	5.49435	Ril_rid	0	29.3	4.79483	5.89807	10.5102	0	10.5102
23	0.521761	2.18224	Ril_rid	0	29.3	1.93453	2.37964	4.24048	0	4.24048
24	0.521761	0.641844	Ril_rid	0	29.3	0.578159	0.711188	1.26732	0	1.26732
25	0.521761	0.242151	Ril_rid	0	29.3	0.221723	0.272739	0.486015	0	0.486015

List Of Coordinates

Water Table

X	Y
300.365	98.3183
368.448	98.3183

Line Load

X	Y
330.89	107.336
341.24	107.68

External Boundary

X	Y
300.365	83.3638
368.448	83.3638
368.448	101.754
368.304	101.749
368.187	101.851
362.26	102.077
356.517	102.533
352.703	102.568
352.49	102.71
350.49	102.71
342.99	107.71
341.309	107.777
341.24	107.68
330.89	107.336
330.82	107.448
329.14	107.381

321.802	102.489
321.302	102.489
317.186	103.89
312.314	105.154
303.531	105.657
302.376	105.745
300.365	105.725

Material Boundary

X	Y
321.802	102.489
322.333	102.483
329.14	102.405
336.365	102.317
337.656	102.317
339.865	102.369
346.805	102.616
350.115	102.599
352.703	102.568

Material Boundary

X	Y
322.333	102.483
322.333	102.283
329.14	102.205
330.89	102.205
336.365	102.117
337.656	102.09
341.315	102.22
346.805	102.416

350.115 102.399	350.115 102.599

9.6 SEZIONE 42 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI SISMICHE (SISMA ↑)

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 42 AP_TT_SISM
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Left to Right
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Loading

- Seismic Load Coefficient (Horizontal): 0.101
- Seismic Load Coefficient (Vertical): -0.051
- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 4
- Orientation: Vertical

Material Properties

Property	Ril	Bi1 TT
Color		
Strength Type	Mohr-Coulomb	Undrained
Unit Weight [kN/m3]	18	20
Cohesion [kPa]	0	
Friction Angle [deg]	35	
Cohesion Type		200
Water Surface	Water Table	None
Hu Value	1	
Ru Value		0

Global Minimums

Method: bishop simplified

- FS: 1.387890
- Center: 349.826, 117.873
- Radius: 15.265
- Left Slip Surface Endpoint: 338.544, 107.590
- Right Slip Surface Endpoint: 351.588, 102.710

- Resisting Moment=4235.23 kN-m
- Driving Moment=3051.57 kN-m

Method: janbu simplified

- FS: 1.308170
- Center: 349.826, 117.873
- Radius: 15.265
- Left Slip Surface Endpoint: 338.544, 107.590
- Right Slip Surface Endpoint: 351.588, 102.710
- Resisting Horizontal Force=249.162 kN
- Driving Horizontal Force=190.467 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9946
- Number of Invalid Surfaces: 54

Error Codes:

- Error Code -113 reported for 54 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9903
- Number of Invalid Surfaces: 97

Error Codes:

- Error Code -108 reported for 43 surfaces
- Error Code -113 reported for 54 surfaces

Error Codes

The following errors were encountered during the computation:

- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.38789**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.521761	2.63988	Ril	0	35	2.91241	4.0421	5.77272	0	5.77272
2	0.521761	7.68414	Ril	0	35	6.14219	8.52469	12.1745	0	12.1745
3	0.521761	12.2871	Ril	0	35	9.26752	12.8623	18.3693	0	18.3693
4	0.521761	16.5013	Ril	0	35	12.2848	17.05	24.3499	0	24.3499
5	0.521761	20.3675	Ril	0	35	15.1927	21.0858	30.1137	0	30.1137
6	0.521761	24.5094	Ril	0	35	17.1353	23.7819	33.9641	0	33.9641
7	0.521761	27.6363	Ril	0	35	19.4519	26.9971	38.5558	0	38.5558
8	0.521761	30.2731	Ril	0	35	21.7496	30.186	43.1101	0	43.1101
9	0.521761	32.3074	Ril	0	35	23.671	32.8528	46.9187	0	46.9187
10	0.521761	31.8032	Ril	0	35	23.7459	32.9567	47.0669	0	47.0669
11	0.521761	30.6595	Ril	0	35	23.3141	32.3574	46.2111	0	46.2111
12	0.521761	29.3038	Ril	0	35	22.6828	31.4813	44.9599	0	44.9599
13	0.521761	27.745	Ril	0	35	21.8527	30.3291	43.3144	0	43.3144
14	0.521761	25.9907	Ril	0	35	20.8231	28.9002	41.2738	0	41.2738
15	0.521761	24.0473	Ril	0	35	19.593	27.1929	38.8355	0	38.8355
16	0.521761	21.9201	Ril	0	35	18.1598	25.2038	35.9947	0	35.9947
17	0.521761	19.6136	Ril	0	35	16.5203	22.9284	32.7451	0	32.7451
18	0.521761	17.1315	Ril	0	35	14.6701	20.3605	29.0777	0	29.0777
19	0.521761	14.4766	Ril	0	35	12.6036	17.4924	24.9817	0	24.9817
20	0.521761	11.6511	Ril	0	35	10.314	14.3147	20.4435	0	20.4435
21	0.521761	8.65673	Ril	0	35	7.79312	10.816	15.4468	0	15.4468
22	0.521761	5.49435	Ril	0	35	5.03113	6.98265	9.97226	0	9.97226
23	0.521761	2.18224	Ril	0	35	2.03315	2.82179	4.02992	0	4.02992
24	0.521761	0.641844	Ril	0	35	0.608653	0.844744	1.20642	0	1.20642
25	0.521761	0.242151	Ril	0	35	0.233825	0.324523	0.463467	0	0.463467

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.30817**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.521761	2.63988	Ril	0	35	3.02096	3.95193	5.64394	0	5.64394
2	0.521761	7.68414	Ril	0	35	6.38001	8.34614	11.9195	0	11.9195
3	0.521761	12.2871	Ril	0	35	9.63881	12.6092	18.0078	0	18.0078
4	0.521761	16.5013	Ril	0	35	12.7926	16.7349	23.8999	0	23.8999
5	0.521761	20.3675	Ril	0	35	15.839	20.7201	29.5913	0	29.5913
6	0.521761	24.5094	Ril	0	35	17.884	23.3953	33.4119	0	33.4119
7	0.521761	27.6363	Ril	0	35	20.3235	26.5866	37.9696	0	37.9696
8	0.521761	30.2731	Ril	0	35	22.7478	29.758	42.4988	0	42.4988
9	0.521761	32.3074	Ril	0	35	24.7826	32.4198	46.3003	0	46.3003
10	0.521761	31.8032	Ril	0	35	24.8857	32.5547	46.4929	0	46.4929
11	0.521761	30.6595	Ril	0	35	24.4572	31.9942	45.6925	0	45.6925
12	0.521761	29.3038	Ril	0	35	23.8182	31.1582	44.4985	0	44.4985
13	0.521761	27.745	Ril	0	35	22.9687	30.047	42.9114	0	42.9114

14	0.521761	25.9907	Ril	0	35	21.9079	28.6592	40.9296	0	40.9296
15	0.521761	24.0473	Ril	0	35	20.6337	26.9924	38.549	0	38.549
16	0.521761	21.9201	Ril	0	35	19.1432	25.0425	35.7644	0	35.7644
17	0.521761	19.6136	Ril	0	35	17.4322	22.8043	32.5679	0	32.5679
18	0.521761	17.1315	Ril	0	35	15.4955	20.2707	28.9496	0	28.9496
19	0.521761	14.4766	Ril	0	35	13.3264	17.4332	24.8973	0	24.8973
20	0.521761	11.6511	Ril	0	35	10.917	14.2813	20.3959	0	20.3959
21	0.521761	8.65673	Ril	0	35	8.25764	10.8024	15.4274	0	15.4274
22	0.521761	5.49435	Ril	0	35	5.33697	6.98167	9.97086	0	9.97086
23	0.521761	2.18224	Ril	0	35	2.15924	2.82465	4.03402	0	4.03402
24	0.521761	0.641844	Ril	0	35	0.647177	0.846618	1.2091	0	1.2091
25	0.521761	0.242151	Ril	0	35	0.248937	0.325652	0.465079	0	0.465079

List Of Coordinates

Water Table

X	Y
300.365	98.3183
368.448	98.3183

Line Load

X	Y
330.89	107.336
341.24	107.68

External Boundary

X	Y
300.365	83.3638
368.448	83.3638
368.448	101.754
368.304	101.749
368.187	101.851
362.26	102.077
356.517	102.533
352.703	102.568
352.49	102.71
350.49	102.71
342.99	107.71
341.309	107.777
341.24	107.68
330.89	107.336
330.82	107.448
329.14	107.381
321.802	102.489
321.302	102.489
317.186	103.89
312.314	105.154
303.531	105.657
302.376	105.745
300.365	105.725

Material Boundary

X	Y
321.802	102.489
322.333	102.483
329.14	102.405
336.365	102.317
337.656	102.317
339.865	102.369
346.805	102.616
350.115	102.599
352.703	102.568

Material Boundary

X	Y
322.333	102.483
322.333	102.283
329.14	102.205
330.89	102.205
336.365	102.117
337.656	102.09
341.315	102.22
346.805	102.416
350.115	102.399
350.115	102.599

9.7 SEZIONE 72 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI STATICHE IN TE

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 72 AP_TE_STAT
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Left to Right
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined

- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 26
- Orientation: Vertical

Material Properties

Property	Ril_rid	All-rid	Bi1 TE_rid
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [kN/m3]	18	20	20
Cohesion [kPa]	0	0	12
Friction Angle [deg]	29.3	32	20.5
Water Surface	Water Table	Water Table	Water Table
Hu Value	1	1	1

Global Minimums

Method: bishop simplified

- FS: 1.439840
- Center: 350.510, 115.270
- Radius: 13.848
- Left Slip Surface Endpoint: 338.726, 107.995
- Right Slip Surface Endpoint: 354.126, 101.902
- Resisting Moment=6014.77 kN-m
- Driving Moment=4177.39 kN-m

Method: janbu simplified

- FS: 1.291530
- Center: 350.510, 115.270

- Radius: 13.848
- Left Slip Surface Endpoint: 338.726, 107.995
- Right Slip Surface Endpoint: 354.126, 101.902
- Resisting Horizontal Force=373.167 kN
- Driving Horizontal Force=288.934 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9984
- Number of Invalid Surfaces: 16

Error Codes:

- Error Code -113 reported for 16 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9984
- Number of Invalid Surfaces: 16

Error Codes:

- Error Code -113 reported for 16 surfaces

Error Codes

The following errors were encountered during the computation:

- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.43984**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.612167	5.09742	Ril_rid	0	29.3	8.48532	12.2175	21.7714	0	21.7714
2	0.612167	14.5591	Ril_rid	0	29.3	13.0019	18.7206	33.3596	0	33.3596
3	0.612167	22.732	Ril_rid	0	29.3	17.227	24.8041	44.2004	0	44.2004
4	0.612167	30.2259	Ril_rid	0	29.3	18.5086	26.6494	47.4886	0	47.4886
5	0.612167	36.9639	Ril_rid	0	29.3	17.6363	25.3934	45.2506	0	45.2506
6	0.612167	42.1794	Ril_rid	0	29.3	20.6953	29.7979	53.0992	0	53.0992
7	0.612167	46.212	Ril_rid	0	29.3	23.2536	33.4814	59.6632	0	59.6632
8	0.612167	46.5447	Ril_rid	0	29.3	23.9698	34.5127	61.5008	0	61.5008

9	0.612167	45.9207	Ril_rid	0	29.3	24.1634	34.7914	61.9976	0	61.9976
10	0.612167	44.8572	Ril_rid	0	29.3	24.0872	34.6817	61.802	0	61.802
11	0.612167	43.3866	Ril_rid	0	29.3	23.7508	34.1973	60.9389	0	60.9389
12	0.612167	41.5347	Ril_rid	0	29.3	23.1611	33.3483	59.426	0	59.426
13	0.612167	39.3224	Ril_rid	0	29.3	22.323	32.1415	57.2755	0	57.2755
14	0.612167	36.7665	Ril_rid	0	29.3	21.2387	30.5804	54.4936	0	54.4936
15	0.612167	33.8804	Ril_rid	0	29.3	19.9089	28.6657	51.0816	0	51.0816
16	0.670314	33.4834	All-rid	0	32	20.2263	29.1226	46.6058	0	46.6058
17	0.670314	29.3669	All-rid	0	32	18.1042	26.0671	41.7161	0	41.7161
18	0.670314	24.8058	All-rid	0	32	15.6077	22.4726	35.9637	0	35.9637
19	0.670314	20.7645	All-rid	0	32	13.3373	19.2036	30.7322	0	30.7322
20	0.670314	20.2776	All-rid	0	32	13.3011	19.1515	30.6489	0	30.6489
21	0.670314	19.7927	All-rid	0	32	13.266	19.1009	30.5678	0	30.5678
22	0.670314	17.8547	All-rid	0	32	12.2368	17.619	28.1963	0	28.1963
23	0.670314	11.4953	All-rid	0	32	8.06353	11.6102	18.5803	0	18.5803
24	0.153039	1.64211	Ril_rid	0	29.3	4.55235	6.55466	11.6803	0	11.6803
25	0.702396	2.93232	All-rid	0	32	2.02441	2.91482	4.66469	0	4.66469

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.29153**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.612167	5.09742	Ril_rid	0	29.3	9.07064	11.715	20.8759	0	20.8759
2	0.612167	14.5591	Ril_rid	0	29.3	13.955	18.0233	32.1171	0	32.1171
3	0.612167	22.732	Ril_rid	0	29.3	18.5527	23.9614	42.6988	0	42.6988
4	0.612167	30.2259	Ril_rid	0	29.3	19.992	25.8203	46.0113	0	46.0113
5	0.612167	36.9639	Ril_rid	0	29.3	19.1004	24.6687	43.9592	0	43.9592
6	0.612167	42.1794	Ril_rid	0	29.3	22.4678	29.0178	51.7091	0	51.7091
7	0.612167	46.212	Ril_rid	0	29.3	25.302	32.6783	58.2319	0	58.2319
8	0.612167	46.5447	Ril_rid	0	29.3	26.1367	33.7563	60.1531	0	60.1531
9	0.612167	45.9207	Ril_rid	0	29.3	26.4012	34.0979	60.7617	0	60.7617
10	0.612167	44.8572	Ril_rid	0	29.3	26.3691	34.0565	60.688	0	60.688
11	0.612167	43.3866	Ril_rid	0	29.3	26.05	33.6444	59.9536	0	59.9536
12	0.612167	41.5347	Ril_rid	0	29.3	25.4504	32.87	58.5737	0	58.5737
13	0.612167	39.3224	Ril_rid	0	29.3	24.5743	31.7384	56.5571	0	56.5571
14	0.612167	36.7665	Ril_rid	0	29.3	23.4231	30.2517	53.908	0	53.908
15	0.612167	33.8804	Ril_rid	0	29.3	21.9965	28.4091	50.6245	0	50.6245
16	0.670314	33.4834	All-rid	0	32	22.3732	28.8957	46.2427	0	46.2427
17	0.670314	29.3669	All-rid	0	32	20.0706	25.9218	41.4836	0	41.4836
18	0.670314	24.8058	All-rid	0	32	17.3427	22.3986	35.8454	0	35.8454
19	0.670314	20.7645	All-rid	0	32	14.8551	19.1858	30.7037	0	30.7037
20	0.670314	20.2776	All-rid	0	32	14.8515	19.1811	30.6961	0	30.6961
21	0.670314	19.7927	All-rid	0	32	14.8507	19.1801	30.6945	0	30.6945
22	0.670314	17.8547	All-rid	0	32	13.7363	17.7408	28.3911	0	28.3911
23	0.670314	11.4953	All-rid	0	32	9.0783	11.7249	18.7637	0	18.7637
24	0.153039	1.64211	Ril_rid	0	29.3	5.12836	6.62343	11.8028	0	11.8028
25	0.702396	2.93232	All-rid	0	32	2.28836	2.95548	4.72975	0	4.72975

List Of Coordinates

Water Table

X	Y
300.065	95.4593
372.065	95.4593

Line Load

X	Y
331.19	107.796
340.94	108.054

External Boundary

X	Y
300.065	79.9207
372.065	79.9207
372.065	89.4593
372.065	102.099
369.504	101.972
360.283	101.902
353.962	101.902
352.19	103.084
350.19	103.084
342.69	108.084
341.015	108.151
340.94	108.054
331.19	107.796
331.115	107.893
329.44	107.826
321.94	102.826
319.94	102.826
318.033	101.555
300.065	101.459
300.065	89.4593

Material Boundary

X	Y
318.033	101.555
318.584	101.562
336.065	101.764
353.424	101.9
353.962	101.902

Material Boundary

X	Y
318.584	101.562
318.584	101.362
321.94	101.404
331.115	101.512
350.016	101.688
353.424	101.7
353.424	101.9

Material Boundary

X	Y
300.065	89.4593
372.065	89.4593

9.8 SEZIONE 72 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI STATICHE IN TT

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 72 AP_TT_STAT
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second

- Failure Direction: Left to Right
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 26
- Orientation: Vertical

Material Properties

Property	Ril_rid	All-rid	Bi1 TT RID
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Undrained
Unit Weight [kN/m3]	18	20	20
Cohesion [kPa]	0	0	
Friction Angle [deg]	29.3	32	
Cohesion Type			140
Water Surface	Water Table	Water Table	None
Hu Value	1	1	
Ru Value			0

Global Minimums

Method: bishop simplified

- FS: 1.439840
- Center: 350.510, 115.270
- Radius: 13.848
- Left Slip Surface Endpoint: 338.726, 107.995
- Right Slip Surface Endpoint: 354.126, 101.902
- Resisting Moment=6014.77 kN-m
- Driving Moment=4177.39 kN-m

Method: janbu simplified

- FS: 1.291530
- Center: 350.510, 115.270
- Radius: 13.848
- Left Slip Surface Endpoint: 338.726, 107.995
- Right Slip Surface Endpoint: 354.126, 101.902
- Resisting Horizontal Force=373.167 kN
- Driving Horizontal Force=288.934 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9984

- Number of Invalid Surfaces: 16

Error Codes:

- Error Code -113 reported for 16 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9984
- Number of Invalid Surfaces: 16

Error Codes:

- Error Code -113 reported for 16 surfaces

Error Codes

The following errors were encountered during the computation:

- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.43984**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.612167	5.09742	Ril_rid	0	29.3	8.48532	12.2175	21.7714	0	21.7714
2	0.612167	14.5591	Ril_rid	0	29.3	13.0019	18.7206	33.3596	0	33.3596
3	0.612167	22.732	Ril_rid	0	29.3	17.227	24.8041	44.2004	0	44.2004
4	0.612167	30.2259	Ril_rid	0	29.3	18.5086	26.6494	47.4886	0	47.4886
5	0.612167	36.9639	Ril_rid	0	29.3	17.6363	25.3934	45.2506	0	45.2506
6	0.612167	42.1794	Ril_rid	0	29.3	20.6953	29.7979	53.0992	0	53.0992
7	0.612167	46.212	Ril_rid	0	29.3	23.2536	33.4814	59.6632	0	59.6632
8	0.612167	46.5447	Ril_rid	0	29.3	23.9698	34.5127	61.5008	0	61.5008
9	0.612167	45.9207	Ril_rid	0	29.3	24.1634	34.7914	61.9976	0	61.9976
10	0.612167	44.8572	Ril_rid	0	29.3	24.0872	34.6817	61.802	0	61.802
11	0.612167	43.3866	Ril_rid	0	29.3	23.7508	34.1973	60.9389	0	60.9389
12	0.612167	41.5347	Ril_rid	0	29.3	23.1611	33.3483	59.426	0	59.426
13	0.612167	39.3224	Ril_rid	0	29.3	22.323	32.1415	57.2755	0	57.2755
14	0.612167	36.7665	Ril_rid	0	29.3	21.2387	30.5804	54.4936	0	54.4936
15	0.612167	33.8804	Ril_rid	0	29.3	19.9089	28.6657	51.0816	0	51.0816
16	0.670314	33.4834	All-rid	0	32	20.2263	29.1226	46.6058	0	46.6058
17	0.670314	29.3669	All-rid	0	32	18.1042	26.0671	41.7161	0	41.7161
18	0.670314	24.8058	All-rid	0	32	15.6077	22.4726	35.9637	0	35.9637
19	0.670314	20.7645	All-rid	0	32	13.3373	19.2036	30.7322	0	30.7322
20	0.670314	20.2776	All-rid	0	32	13.3011	19.1515	30.6489	0	30.6489
21	0.670314	19.7927	All-rid	0	32	13.266	19.1009	30.5678	0	30.5678
22	0.670314	17.8547	All-rid	0	32	12.2368	17.619	28.1963	0	28.1963
23	0.670314	11.4953	All-rid	0	32	8.06353	11.6102	18.5803	0	18.5803

24	0.153039	1.64211	Ril_rid	0	29.3	4.55235	6.55466	11.6803	0	11.6803
25	0.702396	2.93232	All-rid	0	32	2.02441	2.91482	4.66469	0	4.66469

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.29153**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.612167	5.09742	Ril_rid	0	29.3	9.07064	11.715	20.8759	0	20.8759
2	0.612167	14.5591	Ril_rid	0	29.3	13.955	18.0233	32.1171	0	32.1171
3	0.612167	22.732	Ril_rid	0	29.3	18.5527	23.9614	42.6988	0	42.6988
4	0.612167	30.2259	Ril_rid	0	29.3	19.992	25.8203	46.0113	0	46.0113
5	0.612167	36.9639	Ril_rid	0	29.3	19.1004	24.6687	43.9592	0	43.9592
6	0.612167	42.1794	Ril_rid	0	29.3	22.4678	29.0178	51.7091	0	51.7091
7	0.612167	46.212	Ril_rid	0	29.3	25.302	32.6783	58.2319	0	58.2319
8	0.612167	46.5447	Ril_rid	0	29.3	26.1367	33.7563	60.1531	0	60.1531
9	0.612167	45.9207	Ril_rid	0	29.3	26.4012	34.0979	60.7617	0	60.7617
10	0.612167	44.8572	Ril_rid	0	29.3	26.3691	34.0565	60.688	0	60.688
11	0.612167	43.3866	Ril_rid	0	29.3	26.05	33.6444	59.9536	0	59.9536
12	0.612167	41.5347	Ril_rid	0	29.3	25.4504	32.87	58.5737	0	58.5737
13	0.612167	39.3224	Ril_rid	0	29.3	24.5743	31.7384	56.5571	0	56.5571
14	0.612167	36.7665	Ril_rid	0	29.3	23.4231	30.2517	53.908	0	53.908
15	0.612167	33.8804	Ril_rid	0	29.3	21.9965	28.4091	50.6245	0	50.6245
16	0.670314	33.4834	All-rid	0	32	22.3732	28.8957	46.2427	0	46.2427
17	0.670314	29.3669	All-rid	0	32	20.0706	25.9218	41.4836	0	41.4836
18	0.670314	24.8058	All-rid	0	32	17.3427	22.3986	35.8454	0	35.8454
19	0.670314	20.7645	All-rid	0	32	14.8551	19.1858	30.7037	0	30.7037
20	0.670314	20.2776	All-rid	0	32	14.8515	19.1811	30.6961	0	30.6961
21	0.670314	19.7927	All-rid	0	32	14.8507	19.1801	30.6945	0	30.6945
22	0.670314	17.8547	All-rid	0	32	13.7363	17.7408	28.3911	0	28.3911
23	0.670314	11.4953	All-rid	0	32	9.0783	11.7249	18.7637	0	18.7637
24	0.153039	1.64211	Ril_rid	0	29.3	5.12836	6.62343	11.8028	0	11.8028
25	0.702396	2.93232	All-rid	0	32	2.28836	2.95548	4.72975	0	4.72975

List Of Coordinates

Water Table

X	Y
300.065	95.4593
372.065	95.4593

Line Load

X	Y
331.19	107.796
340.94	108.054

External Boundary

X	Y
300.065	79.9207
372.065	79.9207
372.065	89.4593
372.065	102.099
369.504	101.972
360.283	101.902
353.962	101.902
352.19	103.084
350.19	103.084
342.69	108.084
341.015	108.151
340.94	108.054
331.19	107.796
331.115	107.893
329.44	107.826

321.94	102.826
319.94	102.826
318.033	101.555
300.065	101.459
300.065	89.4593

Material Boundary

X	Y
318.033	101.555
318.584	101.562
336.065	101.764
353.424	101.9
353.962	101.902

Material Boundary

X	Y
318.584	101.562
318.584	101.362
321.94	101.404
331.115	101.512
350.016	101.688
353.424	101.7
353.424	101.9

Material Boundary

X	Y
300.065	89.4593
372.065	89.4593

9.9 SEZIONE 72 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI SISMICHE (SISMA ↑)

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 72 AP_TT_SISM
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Left to Right
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25

- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Loading

- Seismic Load Coefficient (Horizontal): 0.105
- Seismic Load Coefficient (Vertical): -0.053
- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 4
- Orientation: Vertical

Material Properties

Property	Ril	All	Bi1 TT
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Undrained
Unit Weight [kN/m3]	18	18.5	20
Cohesion [kPa]	0	0	
Friction Angle [deg]	35	38	
Cohesion Type			200
Water Surface	Water Table	Water Table	None
Hu Value	1	1	

Ru Value	0

Global Minimums

Method: bishop simplified

- FS: 1.502980
- Center: 352.090, 125.094
- Radius: 23.320
- Left Slip Surface Endpoint: 336.302, 107.931
- Right Slip Surface Endpoint: 354.527, 101.902
- Resisting Moment=11064.7 kN-m
- Driving Moment=7361.85 kN-m

Method: janbu simplified

- FS: 1.354890
- Center: 350.510, 115.270
- Radius: 13.848
- Left Slip Surface Endpoint: 338.726, 107.995
- Right Slip Surface Endpoint: 354.126, 101.902
- Resisting Horizontal Force=409.067 kN
- Driving Horizontal Force=301.919 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9984
- Number of Invalid Surfaces: 16

  Error Codes:

  - Error Code -113 reported for 16 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9984

- Number of Invalid Surfaces: 16

Error Codes:

- Error Code -113 reported for 16 surfaces

Error Codes

The following errors were encountered during the computation:

- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.50298**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.744409	4.52708	Ril	0	35	3.22398	4.84558	6.92021	0	6.92021
2	0.744409	13.2237	Ril	0	35	7.04547	10.5892	15.123	0	15.123
3	0.744409	21.2393	Ril	0	35	10.7309	16.1283	23.0335	0	23.0335
4	0.744409	28.6355	Ril	0	35	14.2785	21.4603	30.6486	0	30.6486
5	0.744409	35.4627	Ril	0	35	17.6878	26.5844	37.9665	0	37.9665
6	0.744409	41.7624	Ril	0	35	20.9586	31.5003	44.9871	0	44.9871
7	0.744409	48.338	Ril	0	35	23.3044	35.0261	50.0225	0	50.0225
8	0.744409	53.4112	Ril	0	35	25.8065	38.7867	55.3931	0	55.3931
9	0.744409	57.1025	Ril	0	35	28.0461	42.1527	60.2004	0	60.2004
10	0.744409	55.7281	Ril	0	35	27.8099	41.7977	59.6934	0	59.6934
11	0.744409	52.9027	Ril	0	35	26.8122	40.2982	57.5518	0	57.5518
12	0.744409	49.6931	Ril	0	35	25.5703	38.4316	54.886	0	54.886
13	0.744409	46.1126	Ril	0	35	24.084	36.1977	51.6957	0	51.6957
14	0.744409	42.1726	Ril	0	35	22.352	33.5946	47.9781	0	47.9781
15	0.744409	37.8826	Ril	0	35	20.3721	30.6189	43.7284	0	43.7284
16	0.744409	33.2506	Ril	0	35	18.1411	27.2657	38.9395	0	38.9395
17	0.744409	28.2835	Ril	0	35	15.6546	23.5285	33.6022	0	33.6022
18	0.744409	22.9866	Ril	0	35	12.907	19.3989	27.7045	0	27.7045
19	0.744409	17.7596	Ril	0	35	10.1168	15.2053	21.7154	0	21.7154
20	0.744409	17.0377	Ril	0	35	9.8473	14.8003	21.137	0	21.137
21	0.744409	17.4228	Ril	0	35	10.2184	15.358	21.9335	0	21.9335
22	0.744409	16.0489	Ril	0	35	9.55315	14.3582	20.5056	0	20.5056
23	0.744409	9.53532	Ril	0	35	5.76204	8.66023	12.3681	0	12.3681
24	0.551719	2.45466	All	0	38	2.27186	3.41456	4.37044	0	4.37044
25	0.551719	0.262131	All	0	38	0.245774	0.369394	0.472802	0	0.472802

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.35489**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.612167	5.09742	Ril	0	35	3.47604	4.70965	6.72608	0	6.72608
2	0.612167	14.5591	Ril	0	35	8.28274	11.2222	16.027	0	16.027

3	0.612167	22.732	Ril	0	35	12.8942	17.4702	24.9501	0	24.9501
4	0.612167	30.2259	Ril	0	35	16.9418	22.9543	32.7821	0	32.7821
5	0.612167	36.9639	Ril	0	35	20.4563	27.7161	39.5827	0	39.5827
6	0.612167	42.1794	Ril	0	35	24.1609	32.7353	46.7509	0	46.7509
7	0.612167	46.212	Ril	0	35	27.3123	37.0052	52.849	0	52.849
8	0.612167	46.5447	Ril	0	35	28.3153	38.3641	54.7897	0	54.7897
9	0.612167	45.9207	Ril	0	35	28.7008	38.8864	55.5356	0	55.5356
10	0.612167	44.8572	Ril	0	35	28.762	38.9693	55.654	0	55.654
11	0.612167	43.3866	Ril	0	35	28.5069	38.6237	55.1604	0	55.1604
12	0.612167	41.5347	Ril	0	35	27.9404	37.8562	54.0643	0	54.0643
13	0.612167	39.3224	Ril	0	35	27.0647	36.6697	52.3697	0	52.3697
14	0.612167	36.7665	Ril	0	35	25.8791	35.0634	50.0758	0	50.0758
15	0.612167	33.8804	Ril	0	35	24.3808	33.0333	47.1765	0	47.1765
16	0.670314	33.4244	All	0	38	24.8523	33.6722	43.0984	0	43.0984
17	0.670314	29.2065	All	0	38	22.3015	30.2161	38.675	0	38.675
18	0.670314	24.5775	All	0	38	19.2778	26.1193	33.4312	0	33.4312
19	0.670314	20.5025	All	0	38	16.527	22.3923	28.6608	0	28.6608
20	0.670314	20.017	All	0	38	16.5941	22.4832	28.7773	0	28.7773
21	0.670314	19.5663	All	0	38	16.697	22.6226	28.9556	0	28.9556
22	0.670314	17.6953	All	0	38	15.5629	21.086	26.9889	0	26.9889
23	0.670314	11.4366	All	0	38	10.3824	14.067	18.0048	0	18.0048
24	0.153039	1.64211	Ril	0	35	5.88833	7.97804	11.3938	0	11.3938
25	0.702396	2.8433	All	0	38	2.5702	3.48234	4.4572	0	4.4572

List Of Coordinates

Water Table

X	Y
300.065	95.4593
372.065	95.4593

Line Load

X	Y
331.19	107.796
340.94	108.054

External Boundary

X	Y
300.065	79.9207
372.065	79.9207
372.065	89.4593
372.065	102.099
369.504	101.972
360.283	101.902
353.962	101.902
352.19	103.084
350.19	103.084
342.69	108.084
341.015	108.151
340.94	108.054
331.19	107.796
331.115	107.893
329.44	107.826
321.94	102.826
319.94	102.826
318.033	101.555
300.065	101.459
300.065	89.4593

Material Boundary

X	Y
318.033	101.555
318.584	101.562
336.065	101.764
353.424	101.9
353.962	101.902

Material Boundary

X	Y
318.584	101.562

318.584	101.362
321.94	101.404
331.115	101.512
350.016	101.688
353.424	101.7
353.424	101.9

Material Boundary

X	Y
300.065	89.4593
372.065	89.4593

9.10 SEZIONE 81 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI STATICHE IN TE

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 81 AP_STAT TE
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.2

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 26
- Orientation: Vertical

Material Properties

Property	Ril_rid	All-rid	Bi1_rid
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [kN/m3]	18	20	20
Cohesion [kPa]	0	0	12
Friction Angle [deg]	29.3	32	20.5
Water Surface	Water Table	Water Table	Water Table
Hu Value	1	1	1

Global Minimums

Method: bishop simplified

- FS: 1.209770
- Center: 147.120, 120.987
- Radius: 25.670
- Left Slip Surface Endpoint: 144.396, 95.462
- Right Slip Surface Endpoint: 167.930, 105.957

- Resisting Moment=14767.7 kN-m
- Driving Moment=12207 kN-m

Method: janbu simplified

- FS: 1.127890
- Center: 147.120, 120.987
- Radius: 25.670
- Left Slip Surface Endpoint: 144.396, 95.462
- Right Slip Surface Endpoint: 167.930, 105.957
- Resisting Horizontal Force=493.904 kN
- Driving Horizontal Force=437.899 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9902
- Number of Invalid Surfaces: 98

  Error Codes:

  - Error Code -101 reported for 1 surface
  - Error Code -105 reported for 1 surface
  - Error Code -113 reported for 96 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9902
- Number of Invalid Surfaces: 98

  Error Codes:

  - Error Code -101 reported for 1 surface
  - Error Code -105 reported for 1 surface
  - Error Code -113 reported for 96 surfaces

Error Codes

The following errors were encountered during the computation:

- -101 = Only one (or zero) surface / slope intersections.
- -105 = More than two surface / slope intersections with no valid slip surface.
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.20977**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.84563	0.70868	All-rid	0	32	0.453953	0.549179	0.87887	0	0.87887
2	0.84563	3.68974	All-rid	0	32	2.32178	2.80882	4.49505	0	4.49505
3	0.949696	11.2787	Ril_rid	0	29.3	5.56502	6.73239	11.997	0	11.997
4	0.949696	11.7221	Ril_rid	0	29.3	5.68533	6.87794	12.2564	0	12.2564
5	0.949696	13.2897	Ril_rid	0	29.3	6.33755	7.66698	13.6624	0	13.6624
6	0.949696	22.201	Ril_rid	0	29.3	10.4115	12.5955	22.4449	0	22.4449
7	0.949696	31.2634	Ril_rid	0	29.3	14.4198	17.4447	31.0861	0	31.0861
8	0.949696	39.7099	Ril_rid	0	29.3	18.0146	21.7935	38.8356	0	38.8356
9	0.949696	47.5304	Ril_rid	0	29.3	21.2072	25.6558	45.7181	0	45.7181
10	0.949696	54.7116	Ril_rid	0	29.3	24.0065	29.0424	51.7528	0	51.7528
11	0.949696	61.2368	Ril_rid	0	29.3	26.4192	31.9612	56.9541	0	56.9541
12	0.949696	67.0858	Ril_rid	0	29.3	28.4497	34.4176	61.3313	0	61.3313
13	0.949696	69.3653	Ril_rid	0	29.3	28.9048	34.9681	62.3125	0	62.3125
14	0.949696	63.3602	Ril_rid	0	29.3	25.9312	31.3708	55.902	0	55.902
15	0.949696	58.2607	Ril_rid	0	29.3	23.4048	28.3144	50.4557	0	50.4557
16	0.949696	60.2203	Ril_rid	0	29.3	23.7291	28.7067	51.1548	0	51.1548
17	0.949696	62.085	Ril_rid	0	29.3	23.9743	29.0034	51.6835	0	51.6835
18	0.949696	63.0292	Ril_rid	0	29.3	23.8259	28.8239	51.3636	0	51.3636
19	0.949696	62.9778	Ril_rid	0	29.3	23.2735	28.1556	50.1727	0	50.1727
20	0.949696	61.8383	Ril_rid	0	29.3	22.3037	26.9824	48.0822	0	48.0822
21	0.949696	59.4951	Ril_rid	0	29.3	20.9	25.2842	45.0559	0	45.0559
22	0.949696	55.8006	Ril_rid	0	29.3	19.0416	23.0359	41.0495	0	41.0495
23	0.949696	48.5656	Ril_rid	0	29.3	16.0438	19.4093	34.5869	0	34.5869
24	0.949696	32.1583	Ril_rid	0	29.3	10.2377	12.3853	22.0704	0	22.0704
25	0.949696	10.8974	Ril_rid	0	29.3	10.9361	13.2302	23.5759	0	23.5759

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.12789**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.84563	0.70868	All-rid	0	32	0.488665	0.55116	0.882041	0	0.882041
2	0.84563	3.68974	All-rid	0	32	2.49589	2.81509	4.50509	0	4.50509
3	0.949696	11.2787	Ril_rid	0	29.3	5.9735	6.73745	12.006	0	12.006
4	0.949696	11.7221	Ril_rid	0	29.3	6.0949	6.87438	12.25	0	12.25
5	0.949696	13.2897	Ril_rid	0	29.3	6.78578	7.65361	13.6386	0	13.6386
6	0.949696	22.201	Ril_rid	0	29.3	11.1346	12.5586	22.3791	0	22.3791
7	0.949696	31.2634	Ril_rid	0	29.3	15.4034	17.3733	30.9588	0	30.9588
8	0.949696	39.7099	Ril_rid	0	29.3	19.2214	21.6796	38.6326	0	38.6326
9	0.949696	47.5304	Ril_rid	0	29.3	22.6024	25.493	45.4281	0	45.4281

10	0.949696	54.7116	Ril_rid	0	29.3	25.5575	28.8261	51.3675	0	51.3675
11	0.949696	61.2368	Ril_rid	0	29.3	28.0951	31.6882	56.4677	0	56.4677
12	0.949696	67.0858	Ril_rid	0	29.3	30.2211	34.0861	60.7406	0	60.7406
13	0.949696	69.3653	Ril_rid	0	29.3	30.6707	34.5932	61.6443	0	61.6443
14	0.949696	63.3602	Ril_rid	0	29.3	27.4849	30.9999	55.2412	0	55.2412
15	0.949696	58.2607	Ril_rid	0	29.3	24.7792	27.9482	49.8031	0	49.8031
16	0.949696	60.2203	Ril_rid	0	29.3	25.0938	28.303	50.4353	0	50.4353
17	0.949696	62.085	Ril_rid	0	29.3	25.3234	28.562	50.8969	0	50.8969
18	0.949696	63.0292	Ril_rid	0	29.3	25.1362	28.3509	50.5207	0	50.5207
19	0.949696	62.9778	Ril_rid	0	29.3	24.5226	27.6588	49.2873	0	49.2873
20	0.949696	61.8383	Ril_rid	0	29.3	23.4698	26.4714	47.1715	0	47.1715
21	0.949696	59.4951	Ril_rid	0	29.3	21.9621	24.7708	44.1412	0	44.1412
22	0.949696	55.8006	Ril_rid	0	29.3	19.9795	22.5347	40.1564	0	40.1564
23	0.949696	48.5656	Ril_rid	0	29.3	16.807	18.9565	33.78	0	33.78
24	0.949696	32.1583	Ril_rid	0	29.3	10.7058	12.075	21.5174	0	21.5174
25	0.949696	10.8974	Ril_rid	0	29.3	11.4134	12.8731	22.9396	0	22.9396

List Of Coordinates

Water Table

X	Y
123.75	85.3105
223.75	85.3105

Line Load

X	Y
167.017	106.077
167.092	105.98
180.408	105.617

External Boundary

X	Y
223.75	99.3068
195.795	97.8883
191.658	100.647
189.658	100.647
182.158	105.647
180.477	105.713
180.408	105.617
167.092	105.98
167.017	106.077
165.432	106.014
157.842	101.01
155.842	101.01
148.342	96.0103
146.342	96.0103
145.535	95.4725

123.75	95.2748
123.75	77.3105
123.75	65.2748
223.75	65.2748
223.75	77.3105

Material Boundary

X	Y
145.535	95.4725
146.087	95.4796
148.342	95.507
155.842	95.5644
157.842	95.5798
164.752	95.7666
165.342	95.7965
171.967	96.1852
179.033	96.6818
189.658	97.5749
190.496	97.65
191.658	97.7023
195.289	97.8655
195.795	97.8883

Material Boundary

X	Y
146.087	95.4796
146.087	95.2796
148.342	95.307
158.388	95.384
164.752	95.5666

165.342	95.5965
168.467	95.755
169.277	95.7961
171.967	95.9852
179.033	96.4818
180.493	96.5845
189.658	97.3749
190.496	97.45

195.289	97.6655
195.289	97.8655

Material Boundary

X	Y
123.75	77.3105
223.75	77.3105

9.11 SEZIONE 81 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI STATICHE IN TT

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 81 AP_STAT TT
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.2

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 26
- Orientation: Vertical

Material Properties

Property	Ril_rid	All-rid	Bi1 TT RID
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Undrained
Unit Weight [kN/m3]	18	20	20
Cohesion [kPa]	0	0	
Friction Angle [deg]	29.3	32	
Cohesion Type			140
Water Surface	Water Table	Water Table	None
Hu Value	1	1	
Ru Value			0

Global Minimums

Method: bishop simplified

- FS: 1.209770
- Center: 147.120, 120.987
- Radius: 25.670

- Left Slip Surface Endpoint: 144.396, 95.462
- Right Slip Surface Endpoint: 167.930, 105.957
- Resisting Moment=14767.7 kN-m
- Driving Moment=12207 kN-m

Method: janbu simplified

- FS: 1.127890
- Center: 147.120, 120.987
- Radius: 25.670
- Left Slip Surface Endpoint: 144.396, 95.462
- Right Slip Surface Endpoint: 167.930, 105.957
- Resisting Horizontal Force=493.904 kN
- Driving Horizontal Force=437.899 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9902
- Number of Invalid Surfaces: 98

  Error Codes:

  - Error Code -101 reported for 1 surface
  - Error Code -105 reported for 1 surface
  - Error Code -113 reported for 96 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9902
- Number of Invalid Surfaces: 98

  Error Codes:

  - Error Code -101 reported for 1 surface
  - Error Code -105 reported for 1 surface
  - Error Code -113 reported for 96 surfaces

Error Codes

The following errors were encountered during the computation:

- -101 = Only one (or zero) surface / slope intersections.
- -105 = More than two surface / slope intersections with no valid slip surface.
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.20977**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.84563	0.70868	All-rid	0	32	0.453953	0.549179	0.87887	0	0.87887
2	0.84563	3.68974	All-rid	0	32	2.32178	2.80882	4.49505	0	4.49505
3	0.949696	11.2787	Ril_rid	0	29.3	5.56502	6.73239	11.997	0	11.997
4	0.949696	11.7221	Ril_rid	0	29.3	5.68533	6.87794	12.2564	0	12.2564
5	0.949696	13.2897	Ril_rid	0	29.3	6.33755	7.66698	13.6624	0	13.6624
6	0.949696	22.201	Ril_rid	0	29.3	10.4115	12.5955	22.4449	0	22.4449
7	0.949696	31.2634	Ril_rid	0	29.3	14.4198	17.4447	31.0861	0	31.0861
8	0.949696	39.7099	Ril_rid	0	29.3	18.0146	21.7935	38.8356	0	38.8356
9	0.949696	47.5304	Ril_rid	0	29.3	21.2072	25.6558	45.7181	0	45.7181
10	0.949696	54.7116	Ril_rid	0	29.3	24.0065	29.0424	51.7528	0	51.7528
11	0.949696	61.2368	Ril_rid	0	29.3	26.4192	31.9612	56.9541	0	56.9541
12	0.949696	67.0858	Ril_rid	0	29.3	28.4497	34.4176	61.3313	0	61.3313
13	0.949696	69.3653	Ril_rid	0	29.3	28.9048	34.9681	62.3125	0	62.3125
14	0.949696	63.3602	Ril_rid	0	29.3	25.9312	31.3708	55.902	0	55.902
15	0.949696	58.2607	Ril_rid	0	29.3	23.4048	28.3144	50.4557	0	50.4557
16	0.949696	60.2203	Ril_rid	0	29.3	23.7291	28.7067	51.1548	0	51.1548
17	0.949696	62.085	Ril_rid	0	29.3	23.9743	29.0034	51.6835	0	51.6835
18	0.949696	63.0292	Ril_rid	0	29.3	23.8259	28.8239	51.3636	0	51.3636
19	0.949696	62.9778	Ril_rid	0	29.3	23.2735	28.1556	50.1727	0	50.1727
20	0.949696	61.8383	Ril_rid	0	29.3	22.3037	26.9824	48.0822	0	48.0822
21	0.949696	59.4951	Ril_rid	0	29.3	20.9	25.2842	45.0559	0	45.0559
22	0.949696	55.8006	Ril_rid	0	29.3	19.0416	23.0359	41.0495	0	41.0495
23	0.949696	48.5656	Ril_rid	0	29.3	16.0438	19.4093	34.5869	0	34.5869
24	0.949696	32.1583	Ril_rid	0	29.3	10.2377	12.3853	22.0704	0	22.0704
25	0.949696	10.8974	Ril_rid	0	29.3	10.9361	13.2302	23.5759	0	23.5759

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.12789**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.84563	0.70868	All-rid	0	32	0.488665	0.55116	0.882041	0	0.882041
2	0.84563	3.68974	All-rid	0	32	2.49589	2.81509	4.50509	0	4.50509
3	0.949696	11.2787	Ril_rid	0	29.3	5.9735	6.73745	12.006	0	12.006
4	0.949696	11.7221	Ril_rid	0	29.3	6.0949	6.87438	12.25	0	12.25
5	0.949696	13.2897	Ril_rid	0	29.3	6.78578	7.65361	13.6386	0	13.6386

6	0.949696	22.201	Ril_rid	0	29.3	11.1346	12.5586	22.3791	0	22.3791
7	0.949696	31.2634	Ril_rid	0	29.3	15.4034	17.3733	30.9588	0	30.9588
8	0.949696	39.7099	Ril_rid	0	29.3	19.2214	21.6796	38.6326	0	38.6326
9	0.949696	47.5304	Ril_rid	0	29.3	22.6024	25.493	45.4281	0	45.4281
10	0.949696	54.7116	Ril_rid	0	29.3	25.5575	28.8261	51.3675	0	51.3675
11	0.949696	61.2368	Ril_rid	0	29.3	28.0951	31.6882	56.4677	0	56.4677
12	0.949696	67.0858	Ril_rid	0	29.3	30.2211	34.0861	60.7406	0	60.7406
13	0.949696	69.3653	Ril_rid	0	29.3	30.6707	34.5932	61.6443	0	61.6443
14	0.949696	63.3602	Ril_rid	0	29.3	27.4849	30.9999	55.2412	0	55.2412
15	0.949696	58.2607	Ril_rid	0	29.3	24.7792	27.9482	49.8031	0	49.8031
16	0.949696	60.2203	Ril_rid	0	29.3	25.0938	28.303	50.4353	0	50.4353
17	0.949696	62.085	Ril_rid	0	29.3	25.3234	28.562	50.8969	0	50.8969
18	0.949696	63.0292	Ril_rid	0	29.3	25.1362	28.3509	50.5207	0	50.5207
19	0.949696	62.9778	Ril_rid	0	29.3	24.5226	27.6588	49.2873	0	49.2873
20	0.949696	61.8383	Ril_rid	0	29.3	23.4698	26.4714	47.1715	0	47.1715
21	0.949696	59.4951	Ril_rid	0	29.3	21.9621	24.7708	44.1412	0	44.1412
22	0.949696	55.8006	Ril_rid	0	29.3	19.9795	22.5347	40.1564	0	40.1564
23	0.949696	48.5656	Ril_rid	0	29.3	16.807	18.9565	33.78	0	33.78
24	0.949696	32.1583	Ril_rid	0	29.3	10.7058	12.075	21.5174	0	21.5174
25	0.949696	10.8974	Ril_rid	0	29.3	11.4134	12.8731	22.9396	0	22.9396

List Of Coordinates

Water Table

X	Y
123.75	85.3105
223.75	85.3105

Line Load

X	Y
167.017	106.077
167.092	105.98
180.408	105.617

External Boundary

X	Y
223.75	99.3068
195.795	97.8883
191.658	100.647
189.658	100.647
182.158	105.647
180.477	105.713
180.408	105.617
167.092	105.98
167.017	106.077
165.432	106.014
157.842	101.01
155.842	101.01
148.342	96.0103
146.342	96.0103
145.535	95.4725
123.75	95.2748
123.75	77.3105
123.75	65.2748
223.75	65.2748
223.75	77.3105

Material Boundary

X	Y
145.535	95.4725
146.087	95.4796
148.342	95.507
155.842	95.5644
157.842	95.5798
164.752	95.7666
165.342	95.7965
171.967	96.1852
179.033	96.6818
189.658	97.5749
190.496	97.65
191.658	97.7023
195.289	97.8655
195.795	97.8883

Material Boundary

X	Y
146.087	95.4796
146.087	95.2796
148.342	95.307
158.388	95.384
164.752	95.5666
165.342	95.5965
168.467	95.755
169.277	95.7961
171.967	95.9852
179.033	96.4818
180.493	96.5845
189.658	97.3749
190.496	97.45
195.289	97.6655
195.289	97.8655

Material Boundary

X	Y
123.75	77.3105
223.75	77.3105

9.12 SEZIONE 81 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI SISMICHE (SISMA ↑)

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 81 AP_SISM-
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Loading

- Seismic Load Coefficient (Horizontal): 0.105
- Seismic Load Coefficient (Vertical): -0.053
- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 4
- Orientation: Vertical

Material Properties

Property	Ril	All	Bi1 TT
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Undrained
Unit Weight [kN/m3]	18	18.5	20
Cohesion [kPa]	0	0	
Friction Angle [deg]	35	38	
Cohesion Type			200
Water Surface	Water Table	Water Table	None
Hu Value	1	1	
Ru Value			0

Global Minimums

Method: bishop simplified

- FS: 1.241530
- Center: 147.831, 118.235
- Radius: 23.022
- Left Slip Surface Endpoint: 144.447, 95.463
- Right Slip Surface Endpoint: 167.317, 105.974
- Resisting Moment=14999.5 kN-m
- Driving Moment=12081.5 kN-m

Method: janbu simplified

- FS: 1.136510
- Center: 147.831, 118.235
- Radius: 23.022
- Left Slip Surface Endpoint: 144.447, 95.463
- Right Slip Surface Endpoint: 167.317, 105.974
- Resisting Horizontal Force=558.979 kN
- Driving Horizontal Force=491.836 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9906
- Number of Invalid Surfaces: 94

  Error Codes:

  - Error Code -101 reported for 1 surface
  - Error Code -105 reported for 1 surface
  - Error Code -113 reported for 92 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9906
- Number of Invalid Surfaces: 94

Error Codes:

- Error Code -101 reported for 1 surface
- Error Code -105 reported for 1 surface
- Error Code -113 reported for 92 surfaces

Error Codes

The following errors were encountered during the computation:

- -101 = Only one (or zero) surface / slope intersections.
- -105 = More than two surface / slope intersections with no valid slip surface.
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.24153**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.934426	1.10504	All	0	38	0.766232	0.9513	1.21761	0	1.21761
2	0.934426	6.56699	All	0	38	4.42862	5.49827	7.03747	0	7.03747
3	0.934426	12.9538	All	0	38	8.50491	10.5591	13.515	0	13.515
4	0.934426	13.371	All	0	38	8.55396	10.62	13.593	0	13.593
5	0.934426	16.7528	All	0	38	10.45	12.974	16.6059	0	16.6059
6	0.934426	26.1799	All	0	38	15.9311	19.7789	25.3159	0	25.3159
7	0.908594	34.0344	Ril	0	35	18.7691	23.3024	33.2792	0	33.2792
8	0.908594	41.8992	Ril	0	35	22.6212	28.0849	40.1094	0	40.1094
9	0.908594	49.1549	Ril	0	35	25.9826	32.2582	46.0694	0	46.0694
10	0.908594	55.7882	Ril	0	35	28.8694	35.8422	51.1879	0	51.1879
11	0.908594	61.7822	Ril	0	35	31.294	38.8525	55.4871	0	55.4871
12	0.908594	67.1158	Ril	0	35	33.2659	41.3006	58.9834	0	58.9834
13	0.908594	69.8006	Ril	0	35	33.8396	42.0129	60.0006	0	60.0006
14	0.908594	64.5042	Ril	0	35	30.5702	37.9538	54.2036	0	54.2036
15	0.908594	58.6707	Ril	0	35	27.1616	33.7219	48.1598	0	48.1598
16	0.908594	59.3325	Ril	0	35	26.8066	33.2812	47.5306	0	47.5306
17	0.908594	60.7377	Ril	0	35	26.7494	33.2102	47.429	0	47.429
18	0.908594	61.2162	Ril	0	35	26.2416	32.5797	46.5287	0	46.5287
19	0.908594	60.6826	Ril	0	35	25.2729	31.3771	44.8111	0	44.8111
20	0.908594	59.029	Ril	0	35	23.8293	29.5848	42.2515	0	42.2515
21	0.908594	56.1171	Ril	0	35	21.8927	27.1805	38.8177	0	38.8177
22	0.908594	51.7652	Ril	0	35	19.4403	24.1357	34.4694	0	34.4694
23	0.908594	45.7006	Ril	0	35	16.4347	20.4042	29.1403	0	29.1403
24	0.908594	32.3613	Ril	0	35	11.0626	13.7345	19.6149	0	19.6149
25	0.908594	12.0192	Ril	0	35	4.33555	5.38271	7.68731	0	7.68731

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.13651**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.934426	1.10504	All	0	38	0.843847	0.959041	1.22751	0	1.22751
2	0.934426	6.56699	All	0	38	4.86369	5.52763	7.07505	0	7.07505
3	0.934426	12.9538	All	0	38	9.31615	10.5879	13.5519	0	13.5519
4	0.934426	13.371	All	0	38	9.34704	10.623	13.5968	0	13.5968
5	0.934426	16.7528	All	0	38	11.3925	12.9477	16.5722	0	16.5722
6	0.934426	26.1799	All	0	38	17.3297	19.6954	25.2089	0	25.2089
7	0.908594	34.0344	Ril	0	35	20.3868	23.1698	33.0899	0	33.0899
8	0.908594	41.8992	Ril	0	35	24.5265	27.8746	39.8091	0	39.8091
9	0.908594	49.1549	Ril	0	35	28.1214	31.9602	45.6439	0	45.6439
10	0.908594	55.7882	Ril	0	35	31.1917	35.4497	50.6274	0	50.6274
11	0.908594	61.7822	Ril	0	35	33.7539	38.3616	54.7861	0	54.7861
12	0.908594	67.1158	Ril	0	35	35.8203	40.7101	58.14	0	58.14
13	0.908594	69.8006	Ril	0	35	36.3768	41.3426	59.0433	0	59.0433
14	0.908594	64.5042	Ril	0	35	32.8069	37.2854	53.2491	0	53.2491
15	0.908594	58.6707	Ril	0	35	29.0995	33.0719	47.2316	0	47.2316
16	0.908594	59.3325	Ril	0	35	28.67	32.5837	46.5343	0	46.5343
17	0.908594	60.7377	Ril	0	35	28.5586	32.4571	46.3536	0	46.3536
18	0.908594	61.2162	Ril	0	35	27.966	31.7836	45.3917	0	45.3917
19	0.908594	60.6826	Ril	0	35	26.8834	30.5532	43.6344	0	43.6344
20	0.908594	59.029	Ril	0	35	25.2981	28.7516	41.0616	0	41.0616
21	0.908594	56.1171	Ril	0	35	23.1941	26.3603	37.6464	0	37.6464
22	0.908594	51.7652	Ril	0	35	20.5501	23.3554	33.355	0	33.355
23	0.908594	45.7006	Ril	0	35	17.331	19.6968	28.13	0	28.13
24	0.908594	32.3613	Ril	0	35	11.6344	13.2226	18.8839	0	18.8839
25	0.908594	12.0192	Ril	0	35	4.54562	5.16614	7.37801	0	7.37801

List Of Coordinates

Water Table

X	Y
123.75	85.3105
223.75	85.3105

Line Load

X	Y
167.017	106.077
167.092	105.98
180.408	105.617

External Boundary

X	Y
223.75	99.3068
195.795	97.8883
191.658	100.647
189.658	100.647
182.158	105.647
180.477	105.713
180.408	105.617
167.092	105.98
167.017	106.077
165.432	106.014
157.842	101.01
155.842	101.01
148.342	96.0103
146.342	96.0103
145.535	95.4725
123.75	95.2748
123.75	77.3105
123.75	65.2748
223.75	65.2748
223.75	77.3105

Material Boundary

X	Y
145.535	95.4725
146.087	95.4796
148.342	95.507
155.842	95.5644
157.842	95.5798
164.752	95.7666
165.342	95.7965
171.967	96.1852
179.033	96.6818
189.658	97.5749
190.496	97.65
191.658	97.7023
195.289	97.8655
195.795	97.8883

Material Boundary

X	Y
146.087	95.4796
146.087	95.2796
148.342	95.307
158.388	95.384
164.752	95.5666
165.342	95.5965
168.467	95.755
169.277	95.7961
171.967	95.9852
179.033	96.4818
180.493	96.5845
189.658	97.3749
190.496	97.45
195.289	97.6655
195.289	97.8655

Material Boundary

X	Y
123.75	77.3105
223.75	77.3105

9.13 SEZIONE 4 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI STATICHE IN TE

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 4 AP_TE_STAT
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified

- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Material Properties

Property	Riporto rid	SCC1 TE rid
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [kN/m3]	18	19
Cohesion [kPa]	0	12
Friction Angle [deg]	29.3	24.8
Water Surface	Water Table	Water Table
Hu Value	1	1

Global Minimums

Method: bishop simplified

- FS: 1.370460
- Center: 342.623, 118.907
- Radius: 17.716
- Left Slip Surface Endpoint: 340.050, 101.379

- Right Slip Surface Endpoint: 358.798, 111.682
- Resisting Moment=12563.8 kN-m
- Driving Moment=9167.61 kN-m

Method: janbu simplified

- FS: 1.259650
- Center: 344.513, 116.365
- Radius: 16.055
- Left Slip Surface Endpoint: 338.831, 101.349
- Right Slip Surface Endpoint: 359.911, 111.820
- Resisting Horizontal Force=791.277 kN
- Driving Horizontal Force=628.172 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9955
- Number of Invalid Surfaces: 45

Error Codes:

- Error Code -109 reported for 1 surface
- Error Code -113 reported for 44 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9955
- Number of Invalid Surfaces: 45

Error Codes:

- Error Code -109 reported for 1 surface
- Error Code -113 reported for 44 surfaces

Error Codes

The following errors were encountered during the computation:

- -109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.37046**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.629982	0.548362	Riporto rid	0	29.3	0.376166	0.51552	0.918645	0	0.918645
2	0.629982	1.55337	Riporto rid	0	29.3	1.0492	1.43789	2.56229	0	2.56229
3	0.629982	2.45798	Riporto rid	0	29.3	1.63533	2.24115	3.99368	0	3.99368
4	0.766286	3.69191	SCC1 TE rid	12	24.8	10.44	14.3076	4.99417	0	4.99417
5	0.766286	9.45223	SCC1 TE rid	12	24.8	12.8017	17.5442	11.9988	0	11.9988
6	0.766286	20.0727	SCC1 TE rid	12	24.8	17.185	23.5513	24.9993	0	24.9993
7	0.766286	30.2066	SCC1 TE rid	12	24.8	21.2359	29.103	37.0143	0	37.0143
8	0.766286	39.8478	SCC1 TE rid	12	24.8	24.9624	34.21	48.0669	0	48.0669
9	0.766286	48.9876	SCC1 TE rid	12	24.8	28.3679	38.8771	58.1731	0.00562725	58.1674
10	0.766286	57.6138	SCC1 TE rid	12	24.8	31.4057	43.0403	67.3527	0.175376	67.1774
11	0.766286	64.3368	SCC1 TE rid	12	24.8	33.6849	46.1638	73.9372	0	73.9372
12	0.766286	62.1429	SCC1 TE rid	12	24.8	32.3116	44.2818	69.8642	0	69.8642
13	0.766286	57.9593	SCC1 TE rid	12	24.8	30.1851	41.3675	63.5571	0	63.5571
14	0.766286	57.5522	SCC1 TE rid	12	24.8	29.5394	40.4825	61.6418	0	61.6418
15	0.766286	63.2048	SCC1 TE rid	12	24.8	31.1546	42.6961	66.4325	0	66.4325
16	0.766286	68.239	SCC1 TE rid	12	24.8	32.4449	44.4645	70.2597	0	70.2597
17	0.766286	72.5239	SCC1 TE rid	12	24.8	33.3645	45.7247	72.9868	0	72.9868
18	0.766286	75.9851	SCC1 TE rid	12	24.8	33.8888	46.4432	74.542	0	74.542
19	0.766286	78.5267	SCC1 TE rid	12	24.8	33.9862	46.5767	74.831	0	74.831
20	0.766286	76.0489	SCC1 TE rid	12	24.8	32.2779	44.2356	69.7642	0	69.7642
21	0.766286	59.5095	SCC1 TE rid	12	24.8	25.9287	35.5343	50.933	0	50.933
22	0.766286	50.1052	SCC1 TE rid	12	24.8	22.0695	30.2454	39.4867	0	39.4867
23	0.766286	43.9011	SCC1 TE rid	12	24.8	19.2689	26.4072	31.1799	0	31.1799

24	0.766286	28.9467	SCC1 TE rid	12	24.8	13.9572	19.1278	15.426	0	15.426
25	0.766286	10.341	SCC1 TE rid	12	24.8	7.99159	10.9522	-2.26773	0	-2.26773

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.25965**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.978899	3.16451	Riporto rid	0	29.3	1.69795	2.13882	3.81132	0	3.81132
2	0.978899	8.89107	Riporto rid	0	29.3	4.6023	5.79729	10.3307	0	10.3307
3	0.831383	11.689	SCC1 TE rid	12	24.8	15.9088	20.0395	17.399	0	17.399
4	0.831383	14.7983	SCC1 TE rid	12	24.8	16.9618	21.3659	20.4395	0.169735	20.2697
5	0.831383	19.9602	SCC1 TE rid	12	24.8	17.8079	22.4317	25.837	3.26076	22.5763
6	0.831383	33.5667	SCC1 TE rid	12	24.8	22.5834	28.4472	41.5169	5.92194	35.595
7	0.831383	47.0255	SCC1 TE rid	12	24.8	27.2711	34.3521	56.5329	8.15843	48.3744
8	0.831383	59.8031	SCC1 TE rid	12	24.8	31.6418	39.8576	70.2613	9.97188	60.2894
9	0.831383	71.8966	SCC1 TE rid	12	24.8	35.7068	44.9781	82.7315	11.3605	71.371
10	0.831383	83.2975	SCC1 TE rid	12	24.8	39.4732	49.7224	93.9577	12.3189	81.6388
11	0.831383	90.7719	SCC1 TE rid	12	24.8	41.6262	52.4344	100.346	12.8382	87.508
12	0.831383	88.1947	SCC1 TE rid	12	24.8	39.7872	50.118	95.4	12.9051	82.4949
13	0.831383	84.8397	SCC1 TE rid	12	24.8	37.8327	47.6559	89.6682	12.5018	77.1664
14	0.831383	89.985	SCC1 TE rid	12	24.8	39.3547	49.5732	92.9205	11.6047	81.3158
15	0.831383	97.5539	SCC1 TE rid	12	24.8	41.8448	52.7098	98.2873	10.1834	88.1039
16	0.831383	104.216	SCC1 TE rid	12	24.8	43.9978	55.4218	102.172	8.19859	93.9734
17	0.831383	109.888	SCC1 TE rid	12	24.8	45.9592	57.8925	104.352	5.03103	99.3208
18	0.831383	114.465	SCC1 TE rid	12	24.8	47.55	59.8963	104.72	1.06228	103.657
19	0.831383	114.428	SCC1 TE rid	12	24.8	46.4848	58.5546	100.754	0	100.754
20	0.831383	97.5344	SCC1 TE rid	12	24.8	39.3952	49.6242	81.4262	0	81.4262
21	0.831383	88.3588	SCC1 TE rid	12	24.8	34.9862	44.0704	69.4067	0	69.4067
22	0.831383	81.4895	SCC1 TE rid	12	24.8	31.2914	39.4162	59.3342	0	59.3342
23	0.831383	65.2241	SCC1 TE rid	12	24.8	24.7903	31.2271	41.6113	0	41.6113
24	0.831383	44.7278	SCC1 TE rid	12	24.8	17.3462	21.8501	21.3176	0	21.3176
25	0.831383	16.6033	SCC1 TE rid	12	24.8	8.55511	10.7765	-2.648	0	-2.648

List Of Coordinates

Water Table

X	Y
300.065	94.4593
330.622	99.9933
340.94	100.251
352.158	103.049
372.065	106.331

External Boundary

X	Y
300.065	88.8819
372.065	88.8819
372.065	113.331
356.653	111.415
355.833	110.595
355.333	110.595
354.833	111.095
354.333	111.095
349.69	106.451
347.69	106.451
342.69	101.451
341.94	101.451
341.84	101.451
340.94	101.401
330.622	101.143

329.722	101.193
329.622	101.193
328.872	101.193
324.647	105.404
324.162	105.404
323.662	104.904
323.162	104.904
322.662	105.404
308.451	102.63
303.763	102.069
300.065	101.459

Material Boundary

X	Y
329.622	101.193
329.622	100.923
330.622	100.923
330.622	100.493
340.94	100.751
340.94	101.181
341.94	101.181
341.94	101.451

9.14 SEZIONE 4 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI STATICHE IN TT

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 4 AP_TT_STAT
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Material Properties

Property	Riporto rid	SCC1 TT rid
Color		
Strength Type	Mohr-Coulomb	Undrained
Unit Weight [kN/m3]	18	19
Cohesion [kPa]	0	
Friction Angle [deg]	29.3	
Cohesion Type		107
Water Surface	Water Table	None
Hu Value	1	
Ru Value		0

Global Minimums

Method: bishop simplified

- FS: 2.938030
- Center: 348.392, 117.581
- Radius: 23.940
- Left Slip Surface Endpoint: 330.979, 101.152
- Right Slip Surface Endpoint: 371.950, 113.317
- Resisting Moment=133035 kN-m
- Driving Moment=45280.5 kN-m

Method: janbu simplified

- FS: 2.920960
- Center: 347.626, 119.509
- Radius: 25.031
- Left Slip Surface Endpoint: 330.618, 101.144
- Right Slip Surface Endpoint: 371.876, 113.308
- Resisting Horizontal Force=4341.48 kN
- Driving Horizontal Force=1486.32 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 6449
- Number of Invalid Surfaces: 3551

Error Codes:

- Error Code -109 reported for 1 surface
- Error Code -112 reported for 3506 surfaces
- Error Code -113 reported for 44 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 4354
- Number of Invalid Surfaces: 5646

Error Codes:

- Error Code -108 reported for 2095 surfaces
- Error Code -109 reported for 1 surface
- Error Code -112 reported for 3506 surfaces
- Error Code -113 reported for 44 surfaces

Error Codes

The following errors were encountered during the computation:

- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).

- -109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
- -112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 2.93803**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.621218	3.63412	Riporto rid	0	29.3	1.38798	4.07792	7.26677	0	7.26677
2	1.68125	44.3852	SCC1 TT rid	107	0	36.419	107	58.9902	0	58.9902
3	1.68125	89.7364	SCC1 TT rid	107	0	36.419	107	80.4373	0	80.4373
4	1.68125	127.666	SCC1 TT rid	107	0	36.419	107	98.4648	0	98.4648
5	1.68125	159.388	SCC1 TT rid	107	0	36.419	107	113.452	0	113.452
6	1.68125	185.714	SCC1 TT rid	107	0	36.419	107	125.678	0	125.678
7	1.68125	207.675	SCC1 TT rid	107	0	36.419	107	135.622	0	135.622
8	1.68125	229.986	SCC1 TT rid	107	0	36.419	107	145.998	0	145.998
9	1.68125	285.787	SCC1 TT rid	107	0	36.419	107	176.449	0	176.449
10	1.68125	347.084	SCC1 TT rid	107	0	36.419	107	210.271	0	210.271
11	1.68125	399.571	SCC1 TT rid	107	0	36.419	107	238.913	0	238.913
12	1.68125	409.804	SCC1 TT rid	107	0	36.419	107	242.439	0	242.439
13	1.68125	444.177	SCC1 TT rid	107	0	36.419	107	260.306	0	260.306
14	1.68125	490.198	SCC1 TT rid	107	0	36.419	107	285.041	0	285.041
15	1.68125	525.232	SCC1 TT rid	107	0	36.419	107	303.136	0	303.136
16	1.68125	510.991	SCC1 TT rid	107	0	36.419	107	291.767	0	291.767
17	1.68125	511.553	SCC1 TT rid	107	0	36.419	107	288.976	0	288.976
18	1.68125	493.127	SCC1 TT rid	107	0	36.419	107	274.575	0	274.575
19	1.68125	469.29	SCC1 TT rid	107	0	36.419	107	256.502	0	256.502
20	1.68125	439.222	SCC1 TT rid	107	0	36.419	107	234.067	0	234.067
21	1.68125	401.696	SCC1 TT rid	107	0	36.419	107	206.189	0	206.189
22	1.68125	354.748	SCC1 TT rid	107	0	36.419	107	171.05	0	171.05
23	1.68125	294.875	SCC1 TT rid	107	0	36.419	107	125.135	0	125.135
24	1.68125	214.449	SCC1 TT rid	107	0	36.419	107	59.7395	0	59.7395
25	1.68125	83.8793	SCC1 TT rid	107	0	36.419	107	-68.3316	0	-68.3316

- **Global Minimum Query (janbu simplified) - Safety Factor: 2.92096**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.7096	4.14938	Riporto rid	0	29.3	1.35554	3.95947	7.05569	0	7.05569
2	1.68951	41.7582	SCC1 TT rid	107	0	36.6318	107	53.5039	0	53.5039
3	1.68951	82.3002	SCC1 TT rid	107	0	36.6318	107	72.8541	0	72.8541
4	1.68951	116.476	SCC1 TT rid	107	0	36.6318	107	89.1307	0	89.1307
5	1.68951	145.155	SCC1 TT rid	107	0	36.6318	107	102.63	0	102.63

6	1.68951	168.938	SCC1 TT rid	107	0	36.6318	107	113.571	0	113.571
7	1.68951	188.556	SCC1 TT rid	107	0	36.6318	107	122.289	0	122.289
8	1.68951	206.882	SCC1 TT rid	107	0	36.6318	107	130.416	0	130.416
9	1.68951	256.942	SCC1 TT rid	107	0	36.6318	107	157.447	0	157.447
10	1.68951	317.255	SCC1 TT rid	107	0	36.6318	107	190.624	0	190.624
11	1.68951	371.159	SCC1 TT rid	107	0	36.6318	107	220.047	0	220.047
12	1.68951	383.028	SCC1 TT rid	107	0	36.6318	107	224.594	0	224.594
13	1.68951	411.847	SCC1 TT rid	107	0	36.6318	107	239.146	0	239.146
14	1.68951	457.335	SCC1 TT rid	107	0	36.6318	107	263.497	0	263.497
15	1.68951	494.74	SCC1 TT rid	107	0	36.6318	107	282.957	0	282.957
16	1.68951	480.324	SCC1 TT rid	107	0	36.6318	107	271.588	0	271.588
17	1.68951	481.161	SCC1 TT rid	107	0	36.6318	107	269.027	0	269.027
18	1.68951	462.071	SCC1 TT rid	107	0	36.6318	107	254.364	0	254.364
19	1.68951	437.683	SCC1 TT rid	107	0	36.6318	107	236.135	0	236.135
20	1.68951	407.217	SCC1 TT rid	107	0	36.6318	107	213.69	0	213.69
21	1.68951	369.528	SCC1 TT rid	107	0	36.6318	107	186.036	0	186.036
22	1.68951	322.813	SCC1 TT rid	107	0	36.6318	107	151.542	0	151.542
23	1.68951	263.966	SCC1 TT rid	107	0	36.6318	107	107.168	0	107.168
24	1.68951	186.62	SCC1 TT rid	107	0	36.6318	107	45.9429	0	45.9429
25	1.68951	71.1145	SCC1 TT rid	107	0	36.6318	107	-58.5195	0	-58.5195

List Of Coordinates

Water Table

X	Y
300.065	94.4593
330.622	99.9933
340.94	100.251
352.158	103.049
372.065	106.331

External Boundary

X	Y
300.065	88.8819
372.065	88.8819
372.065	113.331
356.653	111.415
355.833	110.595
355.333	110.595
354.833	111.095
354.333	111.095
349.69	106.451
347.69	106.451
342.69	101.451
341.94	101.451
341.84	101.451
340.94	101.401
330.622	101.143
329.722	101.193
329.622	101.193
328.872	101.193
324.647	105.404
324.162	105.404
323.662	104.904
323.162	104.904
322.662	105.404
308.451	102.63
303.763	102.069
300.065	101.459

Material Boundary

X	Y
329.622	101.193
329.622	100.923
330.622	100.923
330.622	100.493
340.94	100.751
340.94	101.181
341.94	101.181
341.94	101.451

9.15 SEZIONE 4 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI SISMICHE (SISMA ↓)

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 4 AP_TT_SISM
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined

- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Loading

- Seismic Load Coefficient (Horizontal): 0.116
- Seismic Load Coefficient (Vertical): 0.058

Material Properties

Property	Riporto	SCC1 TT
Color		
Strength Type	Mohr-Coulomb	Undrained
Unit Weight [kN/m3]	18	19
Cohesion [kPa]	0	
Friction Angle [deg]	35	
Cohesion Type		150
Water Surface	Water Table	None
Hu Value	1	
Ru Value		0

Global Minimums

Method: bishop simplified

- FS: 3.042180
- Center: 348.064, 117.918
- Radius: 24.269
- Left Slip Surface Endpoint: 330.520, 101.149
- Right Slip Surface Endpoint: 371.892, 113.310
- Resisting Moment=190012 kN-m
- Driving Moment=62459.3 kN-m

Method: janbu simplified

- FS: 2.974700
- Center: 347.626, 119.509
- Radius: 25.031
- Left Slip Surface Endpoint: 330.618, 101.144
- Right Slip Surface Endpoint: 371.876, 113.308

- Resisting Horizontal Force=6086.14 kN
- Driving Horizontal Force=2045.97 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 6449
- Number of Invalid Surfaces: 3551

Error Codes:

- Error Code -109 reported for 1 surface
- Error Code -112 reported for 3506 surfaces
- Error Code -113 reported for 44 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 4374
- Number of Invalid Surfaces: 5626

Error Codes:

- Error Code -108 reported for 2075 surfaces
- Error Code -109 reported for 1 surface
- Error Code -112 reported for 3506 surfaces
- Error Code -113 reported for 44 surfaces

Error Codes

The following errors were encountered during the computation:

- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
- -112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 3.04218**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.637256	3.68839	Riporto	0	35	1.8346	5.58119	7.97077	0	7.97077
2	1.69727	44.739	SCC1 TT	150	0	49.3067	150	71.4376	0	71.4376
3	1.69727	90.4211	SCC1 TT	150	0	49.3067	150	92.5715	0	92.5715
4	1.69727	128.665	SCC1 TT	150	0	49.3067	150	110.366	0	110.366
5	1.69727	160.667	SCC1 TT	150	0	49.3067	150	125.125	0	125.125
6	1.69727	187.229	SCC1 TT	150	0	49.3067	150	137.082	0	137.082
7	1.69727	209.125	SCC1 TT	150	0	49.3067	150	146.545	0	146.545
8	1.69727	228.68	SCC1 TT	150	0	49.3067	150	154.844	0	154.844
9	1.69727	278.037	SCC1 TT	150	0	49.3067	150	181.927	0	181.927
10	1.69727	340.369	SCC1 TT	150	0	49.3067	150	217.232	0	217.232
11	1.69727	396.957	SCC1 TT	150	0	49.3067	150	249.034	0	249.034
12	1.69727	411.994	SCC1 TT	150	0	49.3067	150	254.959	0	254.959
13	1.69727	439.625	SCC1 TT	150	0	49.3067	150	268.706	0	268.706
14	1.69727	486.453	SCC1 TT	150	0	49.3067	150	294.339	0	294.339
15	1.69727	525.923	SCC1 TT	150	0	49.3067	150	315.245	0	315.245
16	1.69727	512.899	SCC1 TT	150	0	49.3067	150	303.217	0	303.217
17	1.69727	514.446	SCC1 TT	150	0	49.3067	150	299.968	0	299.968
18	1.69727	495.669	SCC1 TT	150	0	49.3067	150	283.624	0	283.624
19	1.69727	471.39	SCC1 TT	150	0	49.3067	150	263.244	0	263.244
20	1.69727	440.792	SCC1 TT	150	0	49.3067	150	238.044	0	238.044
21	1.69727	402.639	SCC1 TT	150	0	49.3067	150	206.791	0	206.791
22	1.69727	354.959	SCC1 TT	150	0	49.3067	150	167.391	0	167.391
23	1.69727	294.249	SCC1 TT	150	0	49.3067	150	115.777	0	115.777
24	1.69727	212.953	SCC1 TT	150	0	49.3067	150	41.818	0	41.818
25	1.69727	82.9182	SCC1 TT	150	0	49.3067	150	-103.676	0	-103.676

- **Global Minimum Query (janbu simplified) - Safety Factor: 2.9747**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.7096	4.14938	Riporto	0	35	1.84291	5.4821	7.82925	0	7.82925
2	1.68951	41.7582	SCC1 TT	150	0	50.4253	150	65.7773	0	65.7773
3	1.68951	82.3002	SCC1 TT	150	0	50.4253	150	84.7697	0	84.7697
4	1.68951	116.476	SCC1 TT	150	0	50.4253	150	100.732	0	100.732
5	1.68951	145.155	SCC1 TT	150	0	50.4253	150	113.907	0	113.907
6	1.68951	168.938	SCC1 TT	150	0	50.4253	150	124.484	0	124.484
7	1.68951	188.556	SCC1 TT	150	0	50.4253	150	132.786	0	132.786
8	1.68951	206.882	SCC1 TT	150	0	50.4253	150	140.518	0	140.518
9	1.68951	256.942	SCC1 TT	150	0	50.4253	150	168.288	0	168.288
10	1.68951	317.255	SCC1 TT	150	0	50.4253	150	202.586	0	202.586
11	1.68951	371.159	SCC1 TT	150	0	50.4253	150	232.925	0	232.925
12	1.68951	383.028	SCC1 TT	150	0	50.4253	150	236.947	0	236.947
13	1.68951	411.847	SCC1 TT	150	0	50.4253	150	251.544	0	251.544
14	1.68951	457.335	SCC1 TT	150	0	50.4253	150	276.488	0	276.488
15	1.68951	494.74	SCC1 TT	150	0	50.4253	150	296.224	0	296.224
16	1.68951	480.324	SCC1 TT	150	0	50.4253	150	283.292	0	283.292

17	1.68951	481.161	SCC1 TT	150	0	50.4253	150	279.608	0	279.608
18	1.68951	462.071	SCC1 TT	150	0	50.4253	150	263.023	0	263.023
19	1.68951	437.683	SCC1 TT	150	0	50.4253	150	242.528	0	242.528
20	1.68951	407.217	SCC1 TT	150	0	50.4253	150	217.375	0	217.375
21	1.68951	369.528	SCC1 TT	150	0	50.4253	150	186.416	0	186.416
22	1.68951	322.813	SCC1 TT	150	0	50.4253	150	147.74	0	147.74
23	1.68951	263.966	SCC1 TT	150	0	50.4253	150	97.7533	0	97.7533
24	1.68951	186.62	SCC1 TT	150	0	50.4253	150	28.0568	0	28.0568
25	1.68951	71.1145	SCC1 TT	150	0	50.4253	150	-93.9629	0	-93.9629

List Of Coordinates

Water Table

X	Y
300.065	94.4593
330.622	99.9933
340.94	100.251
352.158	103.049
372.065	106.331

External Boundary

X	Y
300.065	88.8819
372.065	88.8819
372.065	113.331
356.653	111.415
355.833	110.595
355.333	110.595
354.833	111.095
354.333	111.095
349.69	106.451
347.69	106.451
342.69	101.451
341.94	101.451
341.84	101.451
340.94	101.401
330.622	101.143
329.722	101.193
329.622	101.193
328.872	101.193
324.647	105.404
324.162	105.404
323.662	104.904
323.162	104.904
322.662	105.404
308.451	102.63
303.763	102.069
300.065	101.459

Material Boundary

X	Y
329.622	101.193
329.622	100.923
330.622	100.923
330.622	100.493
340.94	100.751
340.94	101.181
341.94	101.181
341.94	101.451

9.16 SEZIONE 13 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI STATICHE IN TE

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 13 AP_TE_STAT
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Material Properties

Property	Riporto rid	Bi1 TE_rid	COL TE rid	SCH1 TE rid
Color				

Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [kN/m3]	18	20	19.5	20
Cohesion [kPa]	0	12	20	6
Friction Angle [deg]	29.3	20.5	20.5	22.6
Water Surface	Water Table	Water Table	Water Table	Water Table
Hu Value	1	1	1	1

Global Minimums

Method: bishop simplified

- FS: 1.286730
- Center: 344.705, 107.874
- Radius: 6.016
- Left Slip Surface Endpoint: 343.990, 101.901
- Right Slip Surface Endpoint: 350.642, 106.901
- Resisting Moment=1050.07 kN-m
- Driving Moment=816.078 kN-m

Method: janbu simplified

- FS: 1.132200
- Center: 345.779, 105.001
- Radius: 4.165
- Left Slip Surface Endpoint: 343.013, 101.887
- Right Slip Surface Endpoint: 349.944, 105.001
- Left Slope Intercept: 343.013 101.887
- Right Slope Intercept: 349.944 106.901
- Resisting Horizontal Force=159.459 kN
- Driving Horizontal Force=140.84 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9965
- Number of Invalid Surfaces: 35

Error Codes:

- Error Code -101 reported for 1 surface
- Error Code -113 reported for 34 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9965
- Number of Invalid Surfaces: 35

Error Codes:

- Error Code -101 reported for 1 surface
- Error Code -113 reported for 34 surfaces

Error Codes

The following errors were encountered during the computation:

- -101 = Only one (or zero) surface / slope intersections.
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.28673**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.268914	0.54832	SCH1 TE rid	6	22.6	5.49442	7.06984	2.57013	0	2.57013
2	0.268914	2.07692	SCH1 TE rid	6	22.6	7.28327	9.3716	8.09973	0	8.09973
3	0.268914	3.56575	SCH1 TE rid	6	22.6	8.9729	11.5457	13.3227	0	13.3227
4	0.268914	4.98985	SCH1 TE rid	6	22.6	10.5375	13.5589	18.1591	0	18.1591
5	0.268914	6.34908	SCH1 TE rid	6	22.6	11.9812	15.4166	22.6219	0	22.6219
6	0.268914	7.64291	SCH1 TE rid	6	22.6	13.3071	17.1226	26.7203	0	26.7203
7	0.268914	8.87041	SCH1 TE rid	6	22.6	14.517	18.6794	30.4602	0	30.4602
8	0.268914	10.0302	SCH1 TE rid	6	22.6	15.6118	20.0882	33.8447	0	33.8447
9	0.268914	11.1204	SCH1 TE rid	6	22.6	16.5916	21.3489	36.8734	0	36.8734
10	0.268914	12.1386	SCH1 TE rid	6	22.6	17.4553	22.4603	39.5431	0	39.5431
11	0.268914	13.0817	SCH1 TE rid	6	22.6	18.2008	23.4195	41.8475	0	41.8475
12	0.268914	13.9331	SCH1 TE rid	6	22.6	18.8113	24.205	43.7347	0	43.7347
13	0.268914	14.678	SCH1 TE rid	6	22.6	19.2723	24.7982	45.1596	0	45.1596
14	0.268914	15.3329	SCH1 TE rid	6	22.6	19.6017	25.2221	46.1781	0	46.1781
15	0.268914	15.8907	SCH1 TE rid	6	22.6	19.792	25.467	46.7666	0	46.7666
16	0.268914	16.3421	SCH1 TE rid	6	22.6	19.8327	25.5193	46.8921	0	46.8921
17	0.268914	16.675	SCH1 TE rid	6	22.6	19.7097	25.361	46.5119	0	46.5119
18	0.268914	16.8735	SCH1 TE rid	6	22.6	19.4044	24.9682	45.5681	0	45.5681
19	0.268914	16.8817	SCH1 TE rid	6	22.6	18.8606	24.2685	43.8873	0	43.8873
20	0.268914	15.7565	SCH1 TE rid	6	22.6	17.244	22.1884	38.8901	0	38.8901

21	0.268914	13.9704	SCH1 TE rid	6	22.6	15.0399	19.3523	32.0769	0	32.0769
22	0.268914	11.8793	SCH1 TE rid	6	22.6	12.5878	16.1971	24.4969	0	24.4969
23	0.245092	8.67603	COL TE rid	20	20.5	16.6278	21.3955	3.73243	0	3.73243
24	0.245092	6.10948	COL TE rid	20	20.5	13.2719	17.0774	-7.81686	0	-7.81686
25	0.245092	2.33051	COL TE rid	20	20.5	8.50094	10.9384	-24.2363	0	-24.2363

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.1322**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.277792	0.600157	Riporto rid	0	29.3	1.79049	2.02719	3.61242	0	3.61242
2	0.277239	1.85681	SCH1 TE rid	6	22.6	10.3561	11.7252	13.7539	0	13.7539
3	0.277239	2.82392	SCH1 TE rid	6	22.6	11.4526	12.9666	16.7361	0	16.7361
4	0.277239	3.69949	SCH1 TE rid	6	22.6	11.9597	13.5407	19.0392	0.923751	18.1155
5	0.277239	5.52292	SCH1 TE rid	6	22.6	13.54	15.33	25.2036	2.78974	22.4139
6	0.277239	7.60121	SCH1 TE rid	6	22.6	15.5265	17.5791	32.2472	4.43027	27.8169
7	0.277239	9.56134	SCH1 TE rid	6	22.6	17.3344	19.626	38.5962	5.86175	32.7344
8	0.277239	11.4099	SCH1 TE rid	6	22.6	18.9838	21.4935	44.3167	7.0959	37.2208
9	0.277239	13.1516	SCH1 TE rid	6	22.6	20.4882	23.1967	49.4531	8.14079	41.3123
10	0.277239	14.7891	SCH1 TE rid	6	22.6	21.856	24.7454	54.0342	9.00145	45.0328
11	0.277239	16.3238	SCH1 TE rid	6	22.6	23.0926	26.1454	58.0766	9.68031	48.3963
12	0.277239	17.7557	SCH1 TE rid	6	22.6	24.1999	27.3991	61.5854	10.1773	51.4081
13	0.277239	19.0835	SCH1 TE rid	6	22.6	25.1776	28.5061	64.5575	10.4899	54.0676
14	0.277239	20.304	SCH1 TE rid	6	22.6	26.0224	29.4626	66.978	10.6129	56.3651
15	0.277239	21.4046	SCH1 TE rid	6	22.6	26.7185	30.2507	68.7967	10.5381	58.2586
16	0.277239	22.3588	SCH1 TE rid	6	22.6	27.2341	30.8344	69.9143	10.2536	59.6607
17	0.277239	23.1826	SCH1 TE rid	6	22.6	27.5865	31.2334	70.3622	9.74272	60.6194
18	0.277239	23.8654	SCH1 TE rid	6	22.6	27.7583	31.428	70.0691	8.98229	61.0869
19	0.277239	24.3888	SCH1 TE rid	6	22.6	27.7204	31.385	68.9233	7.9399	60.9834
20	0.277239	24.7264	SCH1 TE rid	6	22.6	27.4288	31.0549	66.7592	6.56874	60.1905
21	0.277239	24.8382	SCH1 TE rid	6	22.6	26.815	30.3599	63.3189	4.79804	58.5209
22	0.277239	24.6085	SCH1 TE rid	6	22.6	25.7145	29.114	58.0402	2.5126	55.5276
23	0.277239	22.9302	SCH1 TE rid	6	22.6	22.9484	25.9822	48.004	0	48.004
24	0.277239	20.1491	SCH1 TE rid	6	22.6	18.0996	20.4924	34.8156	0	34.8156
25	0.277239	14.3934	SCH1 TE rid	6	22.6	8.20072	9.28486	7.89137	0	7.89137

List Of Coordinates

Water Table

X	Y
306.136	103.936
325.373	102.645
332.53	101.159
342.29	100.915
351.991	103.352
373.415	103.352

External Boundary

X	Y
306.136	82.6422
373.415	82.6422
373.415	87.8516
373.415	104.852
373.415	105.038
371.926	105.298
362.63	107.261
360.932	107.299
353.936	107.796
353.599	107.459
353.099	107.459
352.599	107.959

352.099	107.959
351.04	106.901
349.04	106.901
346.991	104.852
344.04	101.901
343.29	101.901
342.29	101.851
332.54	102.095
331.54	102.145
330.79	102.145
328.083	104.852
325.79	107.145
324.956	107.145
324.456	106.645
323.956	106.645
323.569	107.031
314.514	106.487
312.698	106.502
309.667	107.223
306.136	108.436
306.136	104.852
306.136	87.8516

Material Boundary

X	Y

331.54	102.145
331.54	101.875
332.54	101.875
332.53	101.445
342.29	101.201
342.29	101.631
343.29	101.631
343.29	101.901

Material Boundary

X	Y
306.136	87.8516
373.415	87.8516

Material Boundary

X	Y
306.136	104.852
328.083	104.852

Material Boundary

X	Y
346.991	104.852
373.415	104.852

9.17 SEZIONE 13 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI STATICHE IN TT

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 13 AP_TT_STAT
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Material Properties

Property	Riporto rid	COL TT rid	Bi1 TT RID	SCH1 TT rid
Color				
Strength Type	Mohr-Coulomb	Undrained	Undrained	Undrained
Unit Weight [kN/m3]	18	20	20	20
Cohesion [kPa]	0			
Friction Angle [deg]	29.3			
Cohesion Type		107	140	107
Water Surface	Water Table	None	None	None
Hu Value	1			
Ru Value		0	0	0

Global Minimums

Method: bishop simplified

- FS: 5.167170
- Center: 347.149, 110.015
- Radius: 10.165
- Left Slip Surface Endpoint: 341.051, 101.882
- Right Slip Surface Endpoint: 357.018, 107.577
- Resisting Moment=20506.3 kN-m
- Driving Moment=3968.57 kN-m

Method: janbu simplified

- FS: 5.097390
- Center: 346.698, 111.827
- Radius: 14.087
- Left Slip Surface Endpoint: 336.611, 101.993
- Right Slip Surface Endpoint: 360.059, 107.361
- Resisting Horizontal Force=2436.9 kN
- Driving Horizontal Force=478.069 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9336
- Number of Invalid Surfaces: 664

  Error Codes:

  - Error Code -101 reported for 1 surface
  - Error Code -112 reported for 629 surfaces
  - Error Code -113 reported for 34 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 8974
- Number of Invalid Surfaces: 1026

Error Codes:

- Error Code -101 reported for 1 surface
- Error Code -108 reported for 362 surfaces
- Error Code -112 reported for 629 surfaces
- Error Code -113 reported for 34 surfaces

Error Codes

The following errors were encountered during the computation:

- -101 = Only one (or zero) surface / slope intersections.
- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 5.16717**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.512245	1.60064	Riporto rid	0	29.3	0.367402	1.89843	3.38297	0	3.38297
2	0.512245	4.59727	Riporto rid	0	29.3	1.04459	5.39757	9.61835	0	9.61835
3	0.65859	10.4068	SCH1 TT rid	107	0	20.7077	107	26.7396	0	26.7396
4	0.65859	15.1969	SCH1 TT rid	107	0	20.7077	107	32.1718	0	32.1718
5	0.65859	19.098	SCH1 TT rid	107	0	20.7077	107	36.4194	0	36.4194
6	0.65859	26.3546	SCH1 TT rid	107	0	20.7077	107	45.8822	0	45.8822
7	0.65859	37.179	SCH1 TT rid	107	0	20.7077	107	60.8493	0	60.8493
8	0.65859	47.4009	SCH1 TT rid	107	0	20.7077	107	74.9627	0	74.9627
9	0.65859	57.0415	SCH1 TT rid	107	0	20.7077	107	88.2328	0	88.2328
10	0.65859	66.1133	SCH1 TT rid	107	0	20.7077	107	100.66	0	100.66
11	0.65859	74.6214	SCH1 TT rid	107	0	20.7077	107	112.235	0	112.235
12	0.65859	82.5638	SCH1 TT rid	107	0	20.7077	107	122.937	0	122.937
13	0.65859	89.1518	SCH1 TT rid	107	0	20.7077	107	131.551	0	131.551
14	0.65859	88.6911	SCH1 TT rid	107	0	20.7077	107	129.411	0	129.411
15	0.65859	86.1713	SCH1 TT rid	107	0	20.7077	107	124.069	0	124.069
16	0.65859	83.6438	SCH1 TT rid	107	0	20.7077	107	118.609	0	118.609
17	0.65859	86.8018	SCH1 TT rid	107	0	20.7077	107	121.637	0	121.637
18	0.65859	88.1639	SCH1 TT rid	107	0	20.7077	107	121.738	0	121.738
19	0.65859	78.5995	SCH1 TT rid	107	0	20.7077	107	104.968	0	104.968
20	0.65859	70.755	SCH1 TT rid	107	0	20.7077	107	90.4032	0	90.4032
21	0.65859	65.973	SCH1 TT rid	107	0	20.7077	107	79.8666	0	79.8666
22	0.65859	55.9483	SCH1 TT rid	107	0	20.7077	107	60.3396	0	60.3396

23	0.65859	43.7119	SCH1 TT rid	107	0	20.7077	107	35.5076	0	35.5076
24	0.556118	24.923	COL TT rid	107	0	20.7077	107	4.31634	0	4.31634
25	0.556118	9.32733	COL TT rid	107	0	20.7077	107	-44.2094	0	-44.2094

- **Global Minimum Query (janbu simplified) - Safety Factor: 5.09739**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.696835	4.07648	Riporto rid	0	29.3	0.719876	3.66949	6.53896	0	6.53896
2	0.940411	18.0277	SCH1 TT rid	107	0	20.9911	107	36.3557	0	36.3557
3	0.940411	30.9174	SCH1 TT rid	107	0	20.9911	107	47.3105	0	47.3105
4	0.940411	41.6676	SCH1 TT rid	107	0	20.9911	107	56.4193	0	56.4193
5	0.940411	50.5828	SCH1 TT rid	107	0	20.9911	107	63.8699	0	63.8699
6	0.940411	57.874	SCH1 TT rid	107	0	20.9911	107	69.8009	0	69.8009
7	0.940411	64.5633	SCH1 TT rid	107	0	20.9911	107	75.2408	0	75.2408
8	0.940411	70.6016	SCH1 TT rid	107	0	20.9911	107	80.096	0	80.096
9	0.940411	80.6911	SCH1 TT rid	107	0	20.9911	107	89.3348	0	89.3348
10	0.940411	100.524	SCH1 TT rid	107	0	20.9911	107	108.984	0	108.984
11	0.940411	119.38	SCH1 TT rid	107	0	20.9911	107	127.624	0	127.624
12	0.940411	137.049	SCH1 TT rid	107	0	20.9911	107	145.011	0	145.011
13	0.940411	153.533	SCH1 TT rid	107	0	20.9911	107	161.129	0	161.129
14	0.940411	166.389	SCH1 TT rid	107	0	20.9911	107	173.357	0	173.357
15	0.940411	164.752	SCH1 TT rid	107	0	20.9911	107	170.125	0	170.125
16	0.940411	161.212	SCH1 TT rid	107	0	20.9911	107	164.793	0	164.793
17	0.940411	168.729	SCH1 TT rid	107	0	20.9911	107	171.109	0	171.109
18	0.940411	161.18	SCH1 TT rid	107	0	20.9911	107	161.254	0	161.254
19	0.940411	149.917	SCH1 TT rid	107	0	20.9911	107	147.241	0	147.241
20	0.940411	140.885	SCH1 TT rid	107	0	20.9911	107	135.303	0	135.303
21	0.940411	126.227	SCH1 TT rid	107	0	20.9911	107	116.949	0	116.949
22	0.940411	108.951	SCH1 TT rid	107	0	20.9911	107	95.1392	0	95.1392
23	0.940411	88.2964	SCH1 TT rid	107	0	20.9911	107	68.6001	0	68.6001
24	0.940411	62.8491	SCH1 TT rid	107	0	20.9911	107	34.7494	0	34.7494
25	1.12146	29.0342	COL TT rid	107	0	20.9911	107	-21.0419	0	-21.0419

List Of Coordinates

Water Table

X	Y
306.136	103.936
325.373	102.645
332.53	101.159
342.29	100.915
351.991	103.352
373.415	103.352

External Boundary

X	Y
306.136	82.6422
373.415	82.6422
373.415	87.8516
373.415	104.852
373.415	105.038
371.926	105.298
362.63	107.261
360.932	107.299
353.936	107.796
353.599	107.459
353.099	107.459
352.599	107.959
352.099	107.959
351.04	106.901
349.04	106.901

346.991	104.852
344.04	101.901
343.29	101.901
342.29	101.851
332.54	102.095
331.54	102.145
330.79	102.145
328.083	104.852
325.79	107.145
324.956	107.145
324.456	106.645
323.956	106.645
323.569	107.031
314.514	106.487
312.698	106.502
309.667	107.223
306.136	108.436
306.136	104.852
306.136	87.8516

Material Boundary

X	Y
331.54	102.145

331.54	101.875
332.54	101.875
332.53	101.445
342.29	101.201
342.29	101.631
343.29	101.631
343.29	101.901

Material Boundary

X	Y
306.136	87.8516
373.415	87.8516

Material Boundary

X	Y
306.136	104.852
328.083	104.852

Material Boundary

X	Y
346.991	104.852
373.415	104.852

9.18 SEZIONE 13 IN ASSE PRINCIPALE – ANALISI IN CONDIZIONI SISMICHE (SISMA ↓)

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: SEZ 13 AP_TT_SISM
-
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1.5

Loading

- Seismic Load Coefficient (Horizontal): 0.101
- Seismic Load Coefficient (Vertical): 0.051

Material Properties

Property	Riporto	COL TT	Bi1 TT	SCH1 TT
Color				
Strength Type	Mohr-Coulomb	Undrained	Undrained	Undrained
Unit Weight [kN/m3]	18	20	20	20
Cohesion [kPa]	0			
Friction Angle [deg]	35			
Cohesion Type		150	200	150
Water Surface	Water Table	None	None	None
Hu Value	1			

Ru Value	0	0	0

Global Minimums

Method: bishop simplified

- FS: 5.245030
- Center: 347.259, 115.867
- Radius: 20.141
- Left Slip Surface Endpoint: 332.562, 102.094
- Right Slip Surface Endpoint: 365.202, 106.718
- Resisting Moment=113897 kN-m
- Driving Moment=21715.3 kN-m

Method: janbu simplified

- FS: 4.844190
- Center: 348.191, 116.773
- Radius: 21.454
- Left Slip Surface Endpoint: 332.544, 102.095
- Right Slip Surface Endpoint: 366.943, 106.350
- Resisting Horizontal Force=5065.13 kN
- Driving Horizontal Force=1045.61 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9336
- Number of Invalid Surfaces: 664

  Error Codes:

  - Error Code -101 reported for 1 surface
  - Error Code -112 reported for 629 surfaces
  - Error Code -113 reported for 34 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 8984
- Number of Invalid Surfaces: 1016

Error Codes:

- Error Code -101 reported for 1 surface
- Error Code -108 reported for 352 surfaces
- Error Code -112 reported for 629 surfaces
- Error Code -113 reported for 34 surfaces

Error Codes

The following errors were encountered during the computation:

- -101 = Only one (or zero) surface / slope intersections.
- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 5.24503**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.654162	3.82685	Riporto	0	35	0.949985	4.9827	7.11603	0	7.11603
2	1.34367	31.323	SCH1 TT	150	0	28.5985	150	49.9292	0	49.9292
3	1.34367	59.931	SCH1 TT	150	0	28.5985	150	68.1941	0	68.1941
4	1.34367	83.7935	SCH1 TT	150	0	28.5985	150	83.4539	0	83.4539
5	1.34367	103.656	SCH1 TT	150	0	28.5985	150	96.059	0	96.059
6	1.34367	120.025	SCH1 TT	150	0	28.5985	150	106.261	0	106.261
7	1.34367	133.259	SCH1 TT	150	0	28.5985	150	114.247	0	114.247
8	1.34367	143.976	SCH1 TT	150	0	28.5985	150	120.434	0	120.434
9	1.34367	154.477	SCH1 TT	150	0	28.5985	150	126.575	0	126.575
10	1.34367	177.144	SCH1 TT	150	0	28.5985	150	142.315	0	142.315
11	1.34367	216.716	SCH1 TT	150	0	28.5985	150	171.33	0	171.33
12	1.34367	253.913	SCH1 TT	150	0	28.5985	150	198.513	0	198.513
13	1.34367	287.793	SCH1 TT	150	0	28.5985	150	223.1	0	223.1
14	1.34367	294.922	SCH1 TT	150	0	28.5985	150	226.734	0	226.734
15	1.34367	298.426	SCH1 TT	150	0	28.5985	150	227.48	0	227.48
16	1.34367	303.008	SCH1 TT	150	0	28.5985	150	228.98	0	228.98

17	1.34367	289.277	SCH1 TT	150	0	28.5985	150	216.03	0	216.03
18	1.34367	275.168	SCH1 TT	150	0	28.5985	150	202.609	0	202.609
19	1.34367	255.003	SCH1 TT	150	0	28.5985	150	184.206	0	184.206
20	1.34367	231.302	SCH1 TT	150	0	28.5985	150	162.697	0	162.697
21	1.34367	203.54	SCH1 TT	150	0	28.5985	150	137.52	0	137.52
22	1.34367	171.062	SCH1 TT	150	0	28.5985	150	107.915	0	107.915
23	1.34367	133.774	SCH1 TT	150	0	28.5985	150	73.357	0	73.357
24	1.34367	84.5963	SCH1 TT	150	0	28.5985	150	27.3507	0	27.3507
25	1.08104	22.6387	COL TT	150	0	28.5985	150	-27.3517	0	-27.3517

- **Global Minimum Query (janbu simplified) - Safety Factor: 4.84419**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.652899	3.81946	Riporto	0	35	1.04251	5.0501	7.21229	0	7.21229
2	1.42741	34.3962	SCH1 TT	150	0	30.9649	150	52.9924	0	52.9924
3	1.42741	66.8476	SCH1 TT	150	0	30.9649	150	72.4189	0	72.4189
4	1.42741	93.9277	SCH1 TT	150	0	30.9649	150	88.6621	0	88.6621
5	1.42741	116.484	SCH1 TT	150	0	30.9649	150	102.091	0	102.091
6	1.42741	135.092	SCH1 TT	150	0	30.9649	150	112.971	0	112.971
7	1.42741	150.158	SCH1 TT	150	0	30.9649	150	121.502	0	121.502
8	1.42741	163.312	SCH1 TT	150	0	30.9649	150	128.81	0	128.81
9	1.42741	178.441	SCH1 TT	150	0	30.9649	150	137.706	0	137.706
10	1.42741	218.902	SCH1 TT	150	0	30.9649	150	165.345	0	165.345
11	1.42741	263.76	SCH1 TT	150	0	30.9649	150	196.28	0	196.28
12	1.42741	305.881	SCH1 TT	150	0	30.9649	150	225.228	0	225.228
13	1.42741	328.755	SCH1 TT	150	0	30.9649	150	240.004	0	240.004
14	1.42741	329.955	SCH1 TT	150	0	30.9649	150	238.793	0	238.793
15	1.42741	343.686	SCH1 TT	150	0	30.9649	150	246.752	0	246.752
16	1.42741	329.504	SCH1 TT	150	0	30.9649	150	234.067	0	234.067
17	1.42741	318.154	SCH1 TT	150	0	30.9649	150	223.335	0	223.335
18	1.42741	299.201	SCH1 TT	150	0	30.9649	150	206.819	0	206.819
19	1.42741	276.709	SCH1 TT	150	0	30.9649	150	187.44	0	187.44
20	1.42741	250.273	SCH1 TT	150	0	30.9649	150	164.799	0	164.799
21	1.42741	219.639	SCH1 TT	150	0	30.9649	150	138.553	0	138.553
22	1.42741	184.561	SCH1 TT	150	0	30.9649	150	108.265	0	108.265
23	1.42741	137.333	SCH1 TT	150	0	30.9649	150	67.8024	0	67.8024
24	1.42741	79.7001	SCH1 TT	150	0	30.9649	150	17.4877	0	17.4877
25	0.915024	15.4782	COL TT	150	0	30.9649	150	-32.9267	0	-32.9267

List Of Coordinates

351.991	103.352
373.415	103.352

Water Table

X	Y
306.136	103.936
325.373	102.645
332.53	101.159
342.29	100.915

External Boundary

X	Y
306.136	82.6422
373.415	82.6422
373.415	87.8516

373.415	104.852
373.415	105.038
371.926	105.298
362.63	107.261
360.932	107.299
353.936	107.796
353.599	107.459
353.099	107.459
352.599	107.959
352.099	107.959
351.04	106.901
349.04	106.901
346.991	104.852
344.04	101.901
343.29	101.901
342.29	101.851
332.54	102.095
331.54	102.145
330.79	102.145
328.083	104.852
325.79	107.145
324.956	107.145
324.456	106.645
323.956	106.645
323.569	107.031
314.514	106.487
312.698	106.502
309.667	107.223
306.136	108.436
306.136	104.852

306.136	87.8516

Material Boundary

X	Y
331.54	102.145
331.54	101.875
332.54	101.875
332.53	101.445
342.29	101.201
342.29	101.631
343.29	101.631
343.29	101.901

Material Boundary

X	Y
306.136	87.8516
373.415	87.8516

Material Boundary

X	Y
306.136	104.852
328.083	104.852

Material Boundary

X	Y
346.991	104.852
373.415	104.852

9.19 SEZIONE DI SCAVO ALLA PILA 07 DEL VI01 - ANALISI IN CONDIZIONI STATICHE IN TE

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: PILA 7_V01_TE_STAT
- Slide Modeler Version: 6.005
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled

- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 26
- Orientation: Vertical

Material Properties

Property	All-rid	Bi1 TE_rid
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [kN/m3]	20	20
Cohesion [kPa]	0	12
Friction Angle [deg]	32	20.5
Water Surface	Water Table	Water Table
Hu Value	1	1

Global Minimums

Method: bishop simplified

- FS: 1.130450
- Center: 342.188, 114.181
- Radius: 9.646
- Left Slip Surface Endpoint: 340.906, 104.621
- Right Slip Surface Endpoint: 350.687, 109.621
- Resisting Moment=975.533 kN-m
- Driving Moment=862.958 kN-m

Method: janbu simplified

- FS: 1.046680
- Center: 342.188, 114.181

- Radius: 9.646
- Left Slip Surface Endpoint: 340.906, 104.621
- Right Slip Surface Endpoint: 350.687, 109.621
- Resisting Horizontal Force=82.7677 kN
- Driving Horizontal Force=79.0765 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9952
- Number of Invalid Surfaces: 48

Error Codes:

- Error Code -113 reported for 48 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9952
- Number of Invalid Surfaces: 48

Error Codes:

- Error Code -113 reported for 48 surfaces

Error Codes

The following errors were encountered during the computation:

- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.13045**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.391265	0.173562	All-rid	0	32	0.261582	0.295705	0.473226	0	0.473226
2	0.391265	0.457757	All-rid	0	32	0.673586	0.761455	1.21858	0	1.21858
3	0.391265	0.616647	All-rid	0	32	0.886612	1.00227	1.60396	0	1.60396
4	0.391265	0.651025	All-rid	0	32	0.915158	1.03454	1.65561	0	1.65561
5	0.391265	0.579712	All-rid	0	32	0.797109	0.901092	1.44205	0	1.44205
6	0.391265	1.64283	All-rid	0	32	2.21032	2.49866	3.99871	0	3.99871
7	0.391265	3.34339	All-rid	0	32	4.40259	4.97691	7.96474	0	7.96474
8	0.391265	4.91635	All-rid	0	32	6.33681	7.16345	11.4639	0	11.4639

9	0.391265	6.35928	All-rid	0	32	8.02309	9.0697	14.5145	0	14.5145
10	0.391265	7.66897	All-rid	0	32	9.46941	10.7047	17.1311	0	17.1311
11	0.391265	8.84137	All-rid	0	32	10.682	12.0755	19.3249	0	19.3249
12	0.391265	9.87144	All-rid	0	32	11.6654	13.1871	21.1038	0	21.1038
13	0.391265	10.753	All-rid	0	32	12.4223	14.0428	22.4732	0	22.4732
14	0.391265	11.4785	All-rid	0	32	12.9543	14.6442	23.4356	0	23.4356
15	0.391265	12.0387	All-rid	0	32	13.2611	14.991	23.9905	0	23.9905
16	0.391265	12.4224	All-rid	0	32	13.341	15.0813	24.1351	0	24.1351
17	0.391265	12.6158	All-rid	0	32	13.1906	14.9113	23.8631	0	23.8631
18	0.391265	12.6017	All-rid	0	32	12.8047	14.4751	23.1649	0	23.1649
19	0.391265	12.3584	All-rid	0	32	12.1763	13.7647	22.0281	0	22.0281
20	0.391265	11.8582	All-rid	0	32	11.2959	12.7694	20.4354	0	20.4354
21	0.391265	11.0644	All-rid	0	32	10.1514	11.4757	18.3649	0	18.3649
22	0.391265	9.9274	All-rid	0	32	8.72803	9.8666	15.7899	0	15.7899
23	0.391265	8.37717	All-rid	0	32	7.0074	7.92151	12.6771	0	12.6771
24	0.391265	6.30867	All-rid	0	32	4.96831	5.61643	8.98817	0	8.98817
25	0.391265	2.59744	All-rid	0	32	1.89387	2.14093	3.4262	0	3.4262

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.04668**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.391265	0.173562	All-rid	0	32	0.283989	0.297246	0.475692	0	0.475692
2	0.391265	0.457757	All-rid	0	32	0.729851	0.76392	1.22253	0	1.22253
3	0.391265	0.616647	All-rid	0	32	0.958889	1.00365	1.60617	0	1.60617
4	0.391265	0.651025	All-rid	0	32	0.988019	1.03414	1.65497	0	1.65497
5	0.391265	0.579712	All-rid	0	32	0.859123	0.899227	1.43906	0	1.43906
6	0.391265	1.64283	All-rid	0	32	2.37843	2.48946	3.98397	0	3.98397
7	0.391265	3.34339	All-rid	0	32	4.73002	4.95082	7.92295	0	7.92295
8	0.391265	4.91635	All-rid	0	32	6.79773	7.11505	11.3865	0	11.3865
9	0.391265	6.35928	All-rid	0	32	8.59387	8.99503	14.395	0	14.395
10	0.391265	7.66897	All-rid	0	32	10.1283	10.6011	16.9653	0	16.9653
11	0.391265	8.84137	All-rid	0	32	11.4087	11.9413	19.1101	0	19.1101
12	0.391265	9.87144	All-rid	0	32	12.4411	13.0219	20.8393	0	20.8393
13	0.391265	10.753	All-rid	0	32	13.2294	13.8469	22.1597	0	22.1597
14	0.391265	11.4785	All-rid	0	32	13.776	14.4191	23.0753	0	23.0753
15	0.391265	12.0387	All-rid	0	32	14.0817	14.739	23.5873	0	23.5873
16	0.391265	12.4224	All-rid	0	32	14.1454	14.8057	23.6941	0	23.6941
17	0.391265	12.6158	All-rid	0	32	13.9645	14.6164	23.3912	0	23.3912
18	0.391265	12.6017	All-rid	0	32	13.5346	14.1664	22.6711	0	22.6711
19	0.391265	12.3584	All-rid	0	32	12.849	13.4488	21.5226	0	21.5226
20	0.391265	11.8582	All-rid	0	32	11.8991	12.4546	19.9315	0	19.9315
21	0.391265	11.0644	All-rid	0	32	10.6735	11.1717	17.8785	0	17.8785
22	0.391265	9.9274	All-rid	0	32	9.15813	9.58563	15.3402	0	15.3402
23	0.391265	8.37717	All-rid	0	32	7.33599	7.67843	12.2881	0	12.2881
24	0.391265	6.30867	All-rid	0	32	5.18777	5.42993	8.68971	0	8.68971
25	0.391265	2.59744	All-rid	0	32	1.97141	2.06344	3.30219	0	3.30219

List Of Coordinates

Water Table

X	Y
290.996	104.421
377.468	104.421

Line Load

X	Y
356.256	111.631
357.368	111.681
361.256	111.856

External Boundary

X	Y
290.996	88.5782
377.468	88.5782
377.468	103.621
377.468	111.942
364.929	111.942
362.681	111.92
361.256	111.856
357.368	111.681
356.256	111.631
355.256	111.586
352.309	109.621
350.309	109.621
342.809	104.621
337.309	104.621
331.809	104.621
324.309	109.621
322.309	109.621
321.662	110.14
290.996	110.14
290.996	103.621

Material Boundary

X	Y
290.996	103.621
377.468	103.621

Material Boundary

X	Y
356.256	111.466
356.256	111.631

Material Boundary

X	Y
361.256	111.691
361.256	111.856

9.20 SEZIONE DI SCAVO ALLA PILA 07 DEL VI01 - ANALISI IN CONDIZIONI STATICHE IN TT

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: PILA 7_V01_TT_STAT
- Slide Modeler Version: 6.005
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 26
- Orientation: Vertical

Material Properties

Property	All-rid	Bi1 TT RID
Color		
Strength Type	Mohr-Coulomb	Undrained
Unit Weight [kN/m3]	20	20
Cohesion [kPa]	0	

Friction Angle [deg]	32	
Cohesion Type		140
Water Surface	Water Table	None
Hu Value	1	
Ru Value		0

Global Minimums

Method: bishop simplified

- FS: 1.130450
- Center: 342.188, 114.181
- Radius: 9.646
- Left Slip Surface Endpoint: 340.906, 104.621
- Right Slip Surface Endpoint: 350.687, 109.621
- Resisting Moment=975.533 kN-m
- Driving Moment=862.958 kN-m

Method: janbu simplified

- FS: 1.046680
- Center: 342.188, 114.181
- Radius: 9.646
- Left Slip Surface Endpoint: 340.906, 104.621
- Right Slip Surface Endpoint: 350.687, 109.621
- Resisting Horizontal Force=82.7677 kN
- Driving Horizontal Force=79.0765 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9952
- Number of Invalid Surfaces: 48

  Error Codes:

  - Error Code -113 reported for 48 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9946
- Number of Invalid Surfaces: 54

Error Codes:

- Error Code -108 reported for 6 surfaces
- Error Code -113 reported for 48 surfaces

Error Codes

The following errors were encountered during the computation:

- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.13045**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.391265	0.173562	All-rid	0	32	0.261582	0.295705	0.473226	0	0.473226
2	0.391265	0.457757	All-rid	0	32	0.673586	0.761455	1.21858	0	1.21858
3	0.391265	0.616647	All-rid	0	32	0.886612	1.00227	1.60396	0	1.60396
4	0.391265	0.651025	All-rid	0	32	0.915158	1.03454	1.65561	0	1.65561
5	0.391265	0.579712	All-rid	0	32	0.797109	0.901092	1.44205	0	1.44205
6	0.391265	1.64283	All-rid	0	32	2.21032	2.49866	3.99871	0	3.99871
7	0.391265	3.34339	All-rid	0	32	4.40259	4.97691	7.96474	0	7.96474
8	0.391265	4.91635	All-rid	0	32	6.33681	7.16345	11.4639	0	11.4639
9	0.391265	6.35928	All-rid	0	32	8.02309	9.0697	14.5145	0	14.5145
10	0.391265	7.66897	All-rid	0	32	9.46941	10.7047	17.1311	0	17.1311
11	0.391265	8.84137	All-rid	0	32	10.682	12.0755	19.3249	0	19.3249
12	0.391265	9.87144	All-rid	0	32	11.6654	13.1871	21.1038	0	21.1038
13	0.391265	10.753	All-rid	0	32	12.4223	14.0428	22.4732	0	22.4732
14	0.391265	11.4785	All-rid	0	32	12.9543	14.6442	23.4356	0	23.4356
15	0.391265	12.0387	All-rid	0	32	13.2611	14.991	23.9905	0	23.9905
16	0.391265	12.4224	All-rid	0	32	13.341	15.0813	24.1351	0	24.1351
17	0.391265	12.6158	All-rid	0	32	13.1906	14.9113	23.8631	0	23.8631
18	0.391265	12.6017	All-rid	0	32	12.8047	14.4751	23.1649	0	23.1649
19	0.391265	12.3584	All-rid	0	32	12.1763	13.7647	22.0281	0	22.0281
20	0.391265	11.8582	All-rid	0	32	11.2959	12.7694	20.4354	0	20.4354
21	0.391265	11.0644	All-rid	0	32	10.1514	11.4757	18.3649	0	18.3649
22	0.391265	9.9274	All-rid	0	32	8.72803	9.8666	15.7899	0	15.7899
23	0.391265	8.37717	All-rid	0	32	7.0074	7.92151	12.6771	0	12.6771
24	0.391265	6.30867	All-rid	0	32	4.96831	5.61643	8.98817	0	8.98817

25	0.391265	2.59744	All-rid	0	32	1.89387	2.14093	3.4262	0	3.4262

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.04668**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.391265	0.173562	All-rid	0	32	0.283989	0.297246	0.475692	0	0.475692
2	0.391265	0.457757	All-rid	0	32	0.729851	0.76392	1.22253	0	1.22253
3	0.391265	0.616647	All-rid	0	32	0.958889	1.00365	1.60617	0	1.60617
4	0.391265	0.651025	All-rid	0	32	0.988019	1.03414	1.65497	0	1.65497
5	0.391265	0.579712	All-rid	0	32	0.859123	0.899227	1.43906	0	1.43906
6	0.391265	1.64283	All-rid	0	32	2.37843	2.48946	3.98397	0	3.98397
7	0.391265	3.34339	All-rid	0	32	4.73002	4.95082	7.92295	0	7.92295
8	0.391265	4.91635	All-rid	0	32	6.79773	7.11505	11.3865	0	11.3865
9	0.391265	6.35928	All-rid	0	32	8.59387	8.99503	14.395	0	14.395
10	0.391265	7.66897	All-rid	0	32	10.1283	10.6011	16.9653	0	16.9653
11	0.391265	8.84137	All-rid	0	32	11.4087	11.9413	19.1101	0	19.1101
12	0.391265	9.87144	All-rid	0	32	12.4411	13.0219	20.8393	0	20.8393
13	0.391265	10.753	All-rid	0	32	13.2294	13.8469	22.1597	0	22.1597
14	0.391265	11.4785	All-rid	0	32	13.776	14.4191	23.0753	0	23.0753
15	0.391265	12.0387	All-rid	0	32	14.0817	14.739	23.5873	0	23.5873
16	0.391265	12.4224	All-rid	0	32	14.1454	14.8057	23.6941	0	23.6941
17	0.391265	12.6158	All-rid	0	32	13.9645	14.6164	23.3912	0	23.3912
18	0.391265	12.6017	All-rid	0	32	13.5346	14.1664	22.6711	0	22.6711
19	0.391265	12.3584	All-rid	0	32	12.849	13.4488	21.5226	0	21.5226
20	0.391265	11.8582	All-rid	0	32	11.8991	12.4546	19.9315	0	19.9315
21	0.391265	11.0644	All-rid	0	32	10.6735	11.1717	17.8785	0	17.8785
22	0.391265	9.9274	All-rid	0	32	9.15813	9.58563	15.3402	0	15.3402
23	0.391265	8.37717	All-rid	0	32	7.33599	7.67843	12.2881	0	12.2881
24	0.391265	6.30867	All-rid	0	32	5.18777	5.42993	8.68971	0	8.68971
25	0.391265	2.59744	All-rid	0	32	1.97141	2.06344	3.30219	0	3.30219

List Of Coordinates

Water Table

X	Y
290.996	104.421
377.468	104.421

Line Load

X	Y
361.256	111.856
357.368	111.681
356.256	111.631

External Boundary

X	Y
290.996	88.5782
377.468	88.5782
377.468	103.621
377.468	111.942
364.929	111.942
362.681	111.92
361.256	111.856
357.368	111.681
356.256	111.631
355.256	111.586
352.309	109.621
350.309	109.621
342.809	104.621
337.309	104.621
331.809	104.621
324.309	109.621

322.309	109.621
321.662	110.14
290.996	110.14
290.996	103.621

Material Boundary

X	Y
290.996	103.621
377.468	103.621

Material Boundary

X	Y
356.256	111.466
356.256	111.631

Material Boundary

X	Y
361.256	111.691
361.256	111.856

9.21 SEZIONE DI SCAVO ALLA PILA 08 DEL VI02 - ANALISI IN CONDIZIONI STATICHE IN TE

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: PILA 8_V02_TE_STAT
- Slide Modeler Version: 6.005
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3

- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled
- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 26
- Orientation: Vertical

Material Properties

Property	All-rid	Bi1 TE_rid
Color		
Strength Type	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [kN/m3]	20	20
Cohesion [kPa]	0	12
Friction Angle [deg]	32	20.5
Water Surface	Water Table	Water Table
Hu Value	1	1

Global Minimums

Method: bishop simplified

- FS: 1.221900
- Center: 342.661, 109.196
- Radius: 4.609

- Left Slip Surface Endpoint: 342.108, 104.621
- Right Slip Surface Endpoint: 347.075, 107.870
- Resisting Moment=230.129 kN-m
- Driving Moment=188.336 kN-m

Method: janbu simplified

- FS: 1.079690
- Center: 342.661, 109.196
- Radius: 4.609
- Left Slip Surface Endpoint: 342.108, 104.621
- Right Slip Surface Endpoint: 347.075, 107.870
- Resisting Horizontal Force=40.0423 kN
- Driving Horizontal Force=37.0867 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9968
- Number of Invalid Surfaces: 32

Error Codes:

- Error Code -113 reported for 32 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9967
- Number of Invalid Surfaces: 33

Error Codes:

- Error Code -108 reported for 1 surface
- Error Code -113 reported for 32 surfaces

Error Codes

The following errors were encountered during the computation:

- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.2219**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.198686	0.133308	All-rid	0	32	0.361381	0.441571	0.706659	0	0.706659
2	0.198686	0.678193	All-rid	0	32	1.79646	2.1951	3.51289	0	3.51289
3	0.198686	1.2313	All-rid	0	32	3.1892	3.89688	6.23629	0	6.23629
4	0.198686	1.75032	All-rid	0	32	4.43523	5.41941	8.67287	0	8.67287
5	0.198686	2.23522	All-rid	0	32	5.54329	6.77334	10.8396	0	10.8396
6	0.198686	2.68575	All-rid	0	32	6.52036	7.96723	12.7502	0	12.7502
7	0.198686	3.1015	All-rid	0	32	7.37206	9.00792	14.4157	0	14.4157
8	0.198686	3.4818	All-rid	0	32	8.10274	9.90074	15.8445	0	15.8445
9	0.198686	3.82579	All-rid	0	32	8.71569	10.6497	17.0431	0	17.0431
10	0.198686	4.13233	All-rid	0	32	9.21319	11.2576	18.016	0	18.016
11	0.198686	4.39999	All-rid	0	32	9.59669	11.7262	18.7658	0	18.7658
12	0.198686	4.62698	All-rid	0	32	9.8666	12.056	19.2936	0	19.2936
13	0.198686	4.81109	All-rid	0	32	10.0225	12.2465	19.5985	0	19.5985
14	0.198686	4.94962	All-rid	0	32	10.0631	12.2961	19.6779	0	19.6779
15	0.198686	5.03919	All-rid	0	32	9.98601	12.2019	19.5271	0	19.5271
16	0.198686	5.07559	All-rid	0	32	9.78771	11.9596	19.1393	0	19.1393
17	0.198686	5.05351	All-rid	0	32	9.46338	11.5633	18.5051	0	18.5051
18	0.198686	4.9661	All-rid	0	32	9.00655	11.0051	17.6118	0	17.6118
19	0.198686	4.80438	All-rid	0	32	8.40887	10.2748	16.4431	0	16.4431
20	0.198686	4.55613	All-rid	0	32	7.65922	9.3588	14.9772	0	14.9772
21	0.198686	4.20414	All-rid	0	32	6.74315	8.23946	13.1859	0	13.1859
22	0.198686	3.7227	All-rid	0	32	5.64135	6.89317	11.0314	0	11.0314
23	0.198686	3.07016	All-rid	0	32	4.32766	5.28797	8.46252	0	8.46252
24	0.198686	2.16977	All-rid	0	32	2.76608	3.37987	5.40893	0	5.40893
25	0.198686	0.838978	All-rid	0	32	0.906932	1.10818	1.77346	0	1.77346

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.07969**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.198686	0.133308	All-rid	0	32	0.411911	0.444736	0.711728	0	0.711728
2	0.198686	0.678193	All-rid	0	32	2.04104	2.20369	3.52663	0	3.52663
3	0.198686	1.2313	All-rid	0	32	3.61231	3.90017	6.24158	0	6.24158
4	0.198686	1.75032	All-rid	0	32	5.00903	5.4082	8.65496	0	8.65496
5	0.198686	2.23522	All-rid	0	32	6.24297	6.74047	10.787	0	10.787
6	0.198686	2.68575	All-rid	0	32	7.32361	7.90723	12.6542	0	12.6542
7	0.198686	3.1015	All-rid	0	32	8.25859	8.91672	14.2697	0	14.2697
8	0.198686	3.4818	All-rid	0	32	9.05398	9.77549	15.644	0	15.644
9	0.198686	3.82579	All-rid	0	32	9.71446	10.4886	16.7853	0	16.7853

10	0.198686	4.13233	All-rid	0	32	10.2435	11.0598	17.6995	0	17.6995
11	0.198686	4.39999	All-rid	0	32	10.6436	11.4918	18.3906	0	18.3906
12	0.198686	4.62698	All-rid	0	32	10.9159	11.7858	18.8612	0	18.8612
13	0.198686	4.81109	All-rid	0	32	11.0608	11.9422	19.1115	0	19.1115
14	0.198686	4.94962	All-rid	0	32	11.0774	11.9602	19.1403	0	19.1403
15	0.198686	5.03919	All-rid	0	32	10.9641	11.8378	18.9444	0	18.9444
16	0.198686	5.07559	All-rid	0	32	10.7175	11.5716	18.5185	0	18.5185
17	0.198686	5.05351	All-rid	0	32	10.3334	11.1569	17.8548	0	17.8548
18	0.198686	4.9661	All-rid	0	32	9.80568	10.5871	16.9428	0	16.9428
19	0.198686	4.80438	All-rid	0	32	9.12602	9.85327	15.7685	0	15.7685
20	0.198686	4.55613	All-rid	0	32	8.28391	8.94406	14.3135	0	14.3135
21	0.198686	4.20414	All-rid	0	32	7.26532	7.84429	12.5535	0	12.5535
22	0.198686	3.7227	All-rid	0	32	6.0517	6.53396	10.4565	0	10.4565
23	0.198686	3.07016	All-rid	0	32	4.6184	4.98644	7.97997	0	7.97997
24	0.198686	2.16977	All-rid	0	32	2.93255	3.16624	5.06704	0	5.06704
25	0.198686	0.838978	All-rid	0	32	0.952533	1.02844	1.64584	0	1.64584

List Of Coordinates

Water Table

X	Y
311.721	100.621
361.291	100.621

Line Load

X	Y
348.062	107.858
351.04	107.82
353.062	107.734

External Boundary

X	Y
311.721	88.5782
361.291	88.5782
361.291	94.6208
361.291	107.385
360.505	107.418
359.558	107.458
356.796	107.576
354.465	107.675
353.062	107.734
351.04	107.82
348.062	107.858
347.062	107.87
342.188	104.621
337.309	104.621
331.186	104.621
326.554	107.709
323.183	107.688
311.721	107.904
311.721	95.8525
311.721	94.6208

Material Boundary

X	Y
348.062	107.705
348.062	107.858

Material Boundary

X	Y
353.062	107.582
353.062	107.734

Material Boundary

X	Y
311.721	94.6208
361.291	94.6208

9.22 SEZIONE DI SCAVO ALLA PILA 08 DEL VI02 - ANALISI IN CONDIZIONI STATICHE IN TT

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

- File Name: PILA 8_V02_TT_STAT
- Slide Modeler Version: 6.005
- Project Title: SLIDE - An Interactive Slope Stability Program
- Date Created: 24/10/2022, 19:12:07

General Settings

- Units of Measurement: Metric Units
- Time Units: days
- Permeability Units: meters/second
- Failure Direction: Right to Left
- Data Output: Standard
- Maximum Material Properties: 20
- Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

- Bishop simplified
- Janbu simplified

- Number of slices: 25
- Tolerance: 0.005
- Maximum number of iterations: 50
- Check malpha < 0.2: Yes
- Initial trial value of FS: 1
- Steffensen Iteration: Yes

Groundwater Analysis

- Groundwater Method: Water Surfaces
- Pore Fluid Unit Weight: 9.81 kN/m3
- Advanced Groundwater Method: None

Random Numbers

- Pseudo-random Seed: 10116
- Random Number Generation Method: Park and Miller v.3

Surface Options

- Surface Type: Circular
- Search Method: Slope Search
- Number of Surfaces: 10000
- Upper Angle: Not Defined
- Lower Angle: Not Defined
- Composite Surfaces: Disabled

- Reverse Curvature: Create Tension Crack
- Minimum Elevation: Not Defined
- Minimum Depth: 1

Loading

- 1 Distributed Load present

Distributed Load 1

- Distribution: Constant
- Magnitude [kN/m2]: 26
- Orientation: Vertical

Material Properties

Property	All-rid	Bi1 TT RID
Color		
Strength Type	Mohr-Coulomb	Undrained
Unit Weight [kN/m3]	20	20
Cohesion [kPa]	0	
Friction Angle [deg]	32	
Cohesion Type		140
Water Surface	Water Table	None
Hu Value	1	
Ru Value		0

Global Minimums

Method: bishop simplified

- FS: 1.221900
- Center: 342.661, 109.196
- Radius: 4.609
- Left Slip Surface Endpoint: 342.108, 104.621
- Right Slip Surface Endpoint: 347.075, 107.870
- Resisting Moment=230.129 kN-m
- Driving Moment=188.336 kN-m

Method: janbu simplified

- FS: 1.079690

- Center: 342.661, 109.196
- Radius: 4.609
- Left Slip Surface Endpoint: 342.108, 104.621
- Right Slip Surface Endpoint: 347.075, 107.870
- Resisting Horizontal Force=40.0423 kN
- Driving Horizontal Force=37.0867 kN

Valid / Invalid Surfaces

Method: bishop simplified

- Number of Valid Surfaces: 9968
- Number of Invalid Surfaces: 32

Error Codes:

- Error Code -113 reported for 32 surfaces

Method: janbu simplified

- Number of Valid Surfaces: 9967
- Number of Invalid Surfaces: 33

Error Codes:

- Error Code -108 reported for 1 surface
- Error Code -113 reported for 32 surfaces

Error Codes

The following errors were encountered during the computation:

- -108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
- -113 = Surface intersects outside slope limits.

Slice Data

- **Global Minimum Query (bishop simplified) - Safety Factor: 1.2219**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.198686	0.133308	All-rid	0	32	0.361381	0.441571	0.706659	0	0.706659
2	0.198686	0.678193	All-rid	0	32	1.79646	2.1951	3.51289	0	3.51289

3	0.198686	1.2313	All-rid	0	32	3.1892	3.89688	6.23629	0	6.23629
4	0.198686	1.75032	All-rid	0	32	4.43523	5.41941	8.67287	0	8.67287
5	0.198686	2.23522	All-rid	0	32	5.54329	6.77334	10.8396	0	10.8396
6	0.198686	2.68575	All-rid	0	32	6.52036	7.96723	12.7502	0	12.7502
7	0.198686	3.1015	All-rid	0	32	7.37206	9.00792	14.4157	0	14.4157
8	0.198686	3.4818	All-rid	0	32	8.10274	9.90074	15.8445	0	15.8445
9	0.198686	3.82579	All-rid	0	32	8.71569	10.6497	17.0431	0	17.0431
10	0.198686	4.13233	All-rid	0	32	9.21319	11.2576	18.016	0	18.016
11	0.198686	4.39999	All-rid	0	32	9.59669	11.7262	18.7658	0	18.7658
12	0.198686	4.62698	All-rid	0	32	9.8666	12.056	19.2936	0	19.2936
13	0.198686	4.81109	All-rid	0	32	10.0225	12.2465	19.5985	0	19.5985
14	0.198686	4.94962	All-rid	0	32	10.0631	12.2961	19.6779	0	19.6779
15	0.198686	5.03919	All-rid	0	32	9.98601	12.2019	19.5271	0	19.5271
16	0.198686	5.07559	All-rid	0	32	9.78771	11.9596	19.1393	0	19.1393
17	0.198686	5.05351	All-rid	0	32	9.46338	11.5633	18.5051	0	18.5051
18	0.198686	4.9661	All-rid	0	32	9.00655	11.0051	17.6118	0	17.6118
19	0.198686	4.80438	All-rid	0	32	8.40887	10.2748	16.4431	0	16.4431
20	0.198686	4.55613	All-rid	0	32	7.65922	9.3588	14.9772	0	14.9772
21	0.198686	4.20414	All-rid	0	32	6.74315	8.23946	13.1859	0	13.1859
22	0.198686	3.7227	All-rid	0	32	5.64135	6.89317	11.0314	0	11.0314
23	0.198686	3.07016	All-rid	0	32	4.32766	5.28797	8.46252	0	8.46252
24	0.198686	2.16977	All-rid	0	32	2.76608	3.37987	5.40893	0	5.40893
25	0.198686	0.838978	All-rid	0	32	0.906932	1.10818	1.77346	0	1.77346

- **Global Minimum Query (janbu simplified) - Safety Factor: 1.07969**

Slice Number	Width [m]	Weight [kN]	Base Material	Base Cohesion [kPa]	Base Friction Angle [degrees]	Shear Stress [kPa]	Shear Strength [kPa]	Base Normal Stress [kPa]	Pore Pressure [kPa]	Effective Normal Stress [kPa]
1	0.198686	0.133308	All-rid	0	32	0.411911	0.444736	0.711728	0	0.711728
2	0.198686	0.678193	All-rid	0	32	2.04104	2.20369	3.52663	0	3.52663
3	0.198686	1.2313	All-rid	0	32	3.61231	3.90017	6.24158	0	6.24158
4	0.198686	1.75032	All-rid	0	32	5.00903	5.4082	8.65496	0	8.65496
5	0.198686	2.23522	All-rid	0	32	6.24297	6.74047	10.787	0	10.787
6	0.198686	2.68575	All-rid	0	32	7.32361	7.90723	12.6542	0	12.6542
7	0.198686	3.1015	All-rid	0	32	8.25859	8.91672	14.2697	0	14.2697
8	0.198686	3.4818	All-rid	0	32	9.05398	9.77549	15.644	0	15.644
9	0.198686	3.82579	All-rid	0	32	9.71446	10.4886	16.7853	0	16.7853
10	0.198686	4.13233	All-rid	0	32	10.2435	11.0598	17.6995	0	17.6995
11	0.198686	4.39999	All-rid	0	32	10.6436	11.4918	18.3906	0	18.3906
12	0.198686	4.62698	All-rid	0	32	10.9159	11.7858	18.8612	0	18.8612
13	0.198686	4.81109	All-rid	0	32	11.0608	11.9422	19.1115	0	19.1115
14	0.198686	4.94962	All-rid	0	32	11.0774	11.9602	19.1403	0	19.1403
15	0.198686	5.03919	All-rid	0	32	10.9641	11.8378	18.9444	0	18.9444
16	0.198686	5.07559	All-rid	0	32	10.7175	11.5716	18.5185	0	18.5185
17	0.198686	5.05351	All-rid	0	32	10.3334	11.1569	17.8548	0	17.8548
18	0.198686	4.9661	All-rid	0	32	9.80568	10.5871	16.9428	0	16.9428
19	0.198686	4.80438	All-rid	0	32	9.12602	9.85327	15.7685	0	15.7685
20	0.198686	4.55613	All-rid	0	32	8.28391	8.94406	14.3135	0	14.3135
21	0.198686	4.20414	All-rid	0	32	7.26532	7.84429	12.5535	0	12.5535

22	0.198686	3.7227	All-rid	0	32	6.0517	6.53396	10.4565	0	10.4565
23	0.198686	3.07016	All-rid	0	32	4.6184	4.98644	7.97997	0	7.97997
24	0.198686	2.16977	All-rid	0	32	2.93255	3.16624	5.06704	0	5.06704
25	0.198686	0.838978	All-rid	0	32	0.952533	1.02844	1.64584	0	1.64584

List Of Coordinates

Water Table

X	Y
311.721	100.621
361.291	100.621

Line Load

X	Y
348.062	107.858
351.04	107.82
353.062	107.734

External Boundary

X	Y
311.721	88.5782
361.291	88.5782
361.291	94.6208
361.291	107.385
360.505	107.418
359.558	107.458
356.796	107.576
354.465	107.675
353.062	107.734
351.04	107.82
348.062	107.858
347.062	107.87
342.188	104.621
337.309	104.621
331.186	104.621
326.554	107.709
323.183	107.688
311.721	107.904
311.721	95.8525
311.721	94.6208

Material Boundary

X	Y
348.062	107.705
348.062	107.858

Material Boundary

X	Y
353.062	107.582
353.062	107.734

Material Boundary

X	Y
311.721	94.6208
361.291	94.6208