ΔΙΕΥΘΥΝΣΗ ΑΝΑΣΤΗΛΩΣΗΣ ΑΡΧΑΙΩΝ ΜΝΗΜΕΙΩΝ

# *«ΓΕΩΣΤΑΤΙΚΗ ΜΕΛΕΤΗ ΠΡΟΣΤΑΣΙΑΣ ΚΑΙ ΑΠΟΚΑΤΑΣΤΑΣΗΣ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ ΣΤΟΝ ΚΡΟΝΙΟ ΛΟΦΟ»*



**Ιούνιος 2021**

ΕΛΕΓΧΘΗΚΕ

Δρ Μιχαήλ Δ. Λεφαντζής
Αρχιτέκτων Μηχανικός

ΘΕΩΡΗΘΗΚΕ
Σύμφωνα με τους όρους της
απόφασης ΥΠΟΥΡΓΕΙΟΥ ΠΟΛΙΤΙΣΜΟΥ
32049β1 / 15-9-23
Ο ΑΝΑΠΛΗΡΩΤΗΣ ΠΡΟΪΣΤΑΜΕΝΟΣ
ΤΗΣ ΔΑΑΜ ΘΕΜΙΣΤΟΚΛΗΣ ΒΛΑΧΟΥΛΗΣ

ΓΕΩΤΕΧΝΙΚΗ ΠΕΡΙΒΑΛΛΟΝΤΙΚΗ Α.Ε.,
Μελρτητική Εταιρεία,
Κοραή 14, Χαλάνδρι, Ηράκλειο Κρήτης, ΤΚ 71201,
τηλ. – 2810-341890, email: info@geoper.gr

**«ΓΕΩΣΤΑΤΙΚΗ ΜΕΛΕΤΗ ΠΡΟΣΤΑΣΙΑΣ ΚΑΙ ΑΠΟΚΑΤΑΣΤΑΣΗΣ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ ΣΤΟΝ ΚΡΟΝΙΟ ΛΟΦΟ»**

# ΤΕΥΧΟΣ ΓΕΩΣΤΑΤΙΚΩΝ ΥΠΟΛΟΓΙΣΜΩΝ

## ΠΕΡΙΕΧΟΜΕΝΑ

**1. ΕΙΣΑΓΩΓΗ ..... 4**

1.1. Ανάθεση ..... 4
1.2. Αντικείμενο ..... 4
1.3. Διατιθέμενα στοιχεία ..... 4
1.4. Βασικά παραδοτέα της γεωστατικής μελέτης ..... 6
1.5. Ομάδα Εργασίας ..... 7
1.6. Γενική Βιβλιογραφία ..... 7

**2. ΒΑΣΙΚΑ ΣΤΟΙΧΕΙΑ - Η ΠΕΡΙΓΡΑΦΗ ΤΟΥ ΠΡΟΒΛΗΜΑΤΟΣ – ΠΡΟΤΑΣΗ ΕΠΕΜΒΑΣΗΣ ..... 9**

2.1. Περιγραφή του τεχνικού θέματος - βασικά δεδομένα ..... 9
2.2. Οι πρόσφατες αστοχίες – ποιοτική αποτίμηση ..... 9
2.3. Κύρια αίτια των παρατηρούμενων αστοχιών και ολισθήσεων ..... 14
2.4. Βασικά στοιχεία της προτεινόμενης επέμβασης ..... 15

**3. ΔΙΑΘΕΣΙΜΑ ΔΕΔΟΜΕΝΑ ΓΙΑ ΤΗΝ ΕΚΠΟΝΗΣΗ ΤΗΣ ΜΕΛΕΤΗΣ ..... 16**

3.1. Γεωλογικά δεδομένα ..... 16
3.2. Γεωτεχνικά δεδομένα ..... 17
3.2.1. Σύνοψη των γεωτεχνικών παραμέτρων ..... 18
3.3. Σεισμικά δεδομένα ..... 19
3.3.1. ΓΕΝΙΚΑ ΣΕΙΣΜΙΚΑ ΔΕΔΟΜΕΝΑ ..... 19
3.3.2. Ιστορική σεισμικότητα στην περιοχή του αναλήμματος των Θησαυρών ..... 20

**4. ΓΕΩΤΕΧΝΙΚΑ ΠΡΟΣΟΜΟΙΩΜΑΤΑ ΤΗΣ ΜΕΛΕΤΗΣ ..... 22**

**5. Ο ΒΑΣΙΚΟΣ ΣΧΕΔΙΑΣΜΟΣ ΤΗΣ ΜΕΛΕΤΗΣ – ΚΑΤΑΣΤΡΩΣΗ ΤΩΝ ΓΕΩΣΤΑΤΙΚΩΝ ΥΠΟΛΟΓΙΣΜΩΝ - ..... 29**

5.1. Γενικά ..... 29
5.2. Περιγραφή των αναλύσεων ..... 30

**6. ΑΝΑΛΥΣΕΙΣ ΕΡΜΗΝΕΙΑΣ ΠΡΟΣΦΑΤΩΝ ΟΛΙΣΘΗΣΕΩΝ ΤΟΥ ΠΡΑΝΟΥΣ (2019) ΑΝΑΝΤΗ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ -ΒΑΘΜΟΝΟΜΗΣΗΣ ΙΔΙΟΤΗΤΩΝ ΓΕΩΤΕΧΝΙΚΗΣ ΕΝΟΤΗΤΑΣ Ι ..... 32**

6.1. Περιγραφή των ανάδρομων αναλύσεων - Δεδομένα για τις αναλύσεις..... 32

6.2. Αποτελέσματα των ανάδρομων αναλύσεων ..... 34

**7. ΑΝΑΛΥΣΕΙΣ ΑΠΟΤΙΜΗΣΗΣ ΤΗΣ ΥΦΙΣΤΑΜΕΝΗΣ ΚΑΤΑΣΤΑΣΗΣ ΕΥΣΤΑΘΕΙΑΣ ΤΟΥ ΥΠΟ ΜΕΛΕΤΗ ΠΡΑΝΟΥΣ ΑΝΑΝΤΗ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ ..... 39**

7.1. Γενικά ..... 39

7.2. Περιγραφή αναλύσεων - αποτελέσματα..... 39

**8. ΣΧΕΔΙΑΣΜΟΣ ΕΠΕΜΒΑΣΕΩΝ ΓΙΑ ΤΗΝ ΚΑΝΟΝΙΣΤΙΚΗ ΕΞΑΣΦΑΛΙΣΗ ΤΗΣ ΕΥΣΤΑΘΕΙΑΣ ΤΟΥ ΚΑΙ ΤΗ ΧΩΜΑΤΟΥΡΓΙΚΗ ΑΠΟΚΑΤΑΣΤΑΣΗ (ΥΠΟ ΜΕΛΕΤΗ) ΠΡΑΝΟΥΣ ..... 44**

8.1. Γενικά ..... 44

8.2. Υπολογιστική τεκμηρίωση της επέμβασης..... 45

8.3. Αναλύσεις ευσταθείας στην φάση κατασκευής..... 54

**9. ΓΕΩΣΤΑΤΙΚΟΙ ΥΠΟΛΟΓΙΣΜΟΙ ΜΙΚΡΟΠΑΣΣΑΛΩΝ ΣΤΟ ΠΛΑΙΣΙΟ ΤΗΣ ΜΕΛΕΤΗΣ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ ..... 55**

9.1. Μικροπάσσαλοι θεμελίωσης νέων διατάξεων αντιστήριξης..... 55

9.2. Μικροπάσσαλοι βελτίωσης της ευστάθειας του ανατολικού τμήματος του πρανούς 59

**10. ΑΝΑΛΥΣΕΙΣ ΕΣΩΤΕΡΙΚΗΣ ΕΥΣΤΑΘΕΙΑΣ ΤΩΝ ΠΡΟΤΕΙΧΙΣΜΑΤΩΝ ΑΝΤΙΣΤΗΡΙΞΗΣ ΑΠΟ ΣΑΡΑΖΑΝΕΤΙΑ ..... 60**

10.1. Γενικά ..... 60

10.2. Σχεδιασμός τοίχων συρματοκιβωτίων..... 60

**11. ΣΥΝΔΥΑΣΤΙΚΟΣ ΕΛΕΓΧΟΣ ΕΥΣΤΑΘΕΙΑΣ ΤΗΣ ΑΝΑΣΤΗΛΩΤΙΚΗΣ ΠΡΟΤΑΣΗΣ ΚΑΙ ΤΗΣ ΧΩΜΑΤΟΥΡΓΙΚΗΣ ΑΠΟΚΑΤΑΣΤΑΣΗΣ ΤΟΥ ΠΡΑΝΟΥΣ ..... 63**

11.1. Γενικά ..... 63

11.2. Αποτελέσματα 2-Δ ελαστοπλαστικών αναλύσεων ..... 64

**12. ΒΑΣΙΚΗ ΠΕΡΙΓΡΑΦΗ ΕΡΓΑΣΙΩΝ ..... 68**

## ΠΑΡΑΡΤΗΜΑΤΑ

ΠΑΡΑΡΤΗΜΑ Α (ψηφιακά): ΔΕΔΟΜΕΝΑ ΥΠΟΛΟΓΙΣΜΩΝ ΕΥΣΤΑΘΕΙΑΣ ΜΕ ΤΗ ΜΕΘΟΔΟ ΟΡΙΑΚΗΣ ΙΣΟΡΡΟΠΙΑΣ

ΠΑΡΑΡΤΗΜΑ Β (ψηφιακά): ΔΕΔΟΜΕΝΑ ΥΠΟΛΟΓΙΣΜΩΝ ΕΛΑΣΤΟΠΛΑΣΤΙΚΩΝ ΑΝΑΛΥΣΕΩΝ ΜΕ ΠΕΠΕΡΑΣΜΕΝΑ ΣΤΟΙΧΕΙΑ

ΠΑΡΑΡΤΗΜΑ Γ: (ψηφιακά) ΔΕΔΟΜΕΝΑ – ΑΠΟΤΕΛΕΣΜΑΤΑ ΥΠΟΛΟΓΙΣΜΩΝ ΣΧΕΔΙΑΣΜΟΥ ΜΙΚΡΟΠΑΣΣΑΛΩΝ ΘΕΜΕΛΙΩΣΗΣ ‘Η/ΚΑΙ ΑΝΤΙΣΤΗΡΙΞΗΣ

ΠΑΡΑΡΤΗΜΑ Δ: ψηφιακά) ΔΕΔΟΜΕΝΑ – ΑΠΟΤΕΛΕΣΜΑΤΑ ΥΠΟΛΟΓΙΣΜΩΝ ΣΧΕΔΙΑΣΜΟΥ ΠΡΟΤΕΙΧΙΣΜΑΤΩΝ ΑΝΤΙΣΤΗΡΙΞΗΣ ΜΕ ΣΥΡΜΑΤΟΚΙΒΩΤΙΑ

ΠΑΡΑΡΤΗΜΑ Ε: ψηφιακά) ΠΡΟΜΕΤΡΗΣΗ ΤΩΝ ΕΡΓΑΣΙΩΝ ΧΩΜΑΤΟΥΡΓΙΚΗΣ ΑΠΟΚΑΤΑΣΤΑΣΗΣ – ΠΡΟΣΤΑΣΙΑΣ ΤΟΥ ΠΡΑΝΟΥΣ

## ΣΧΕΔΙΑ

1. ΣΧΕΔΙΟ 01: ΚΑΤΟΨΗ – ΟΨΗ (ΠΕΡΙΟΧΗ ΕΠΕΜΒΑΣΗΣ ΣΤΟ ΑΝΑΤΟΛΙΚΟ ΑΚΡΟ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ) - ψηφιακά
2. ΣΧΕΔΙΟ 02: ΤΥΠΙΚΗ ΔΙΑΤΟΜΗ – ΔΙΑΤΟΜΗ S60 (ΧΩΜΑΤΟΥΡΓΙΚΗ ΔΙΑΜΟΡΦΩΣΗ ΣΤΑ ΠΡΑΝΗ ΒΔ ΤΟΥ ΣΤΑΔΙΟΥ) - ψηφιακά
3. ΣΧΕΔΙΟ 03: ΔΙΑΤΟΜΕΣ S39 και S44: (ΠΕΡΙΟΧΗ ΕΠΕΜΒΑΣΗΣ ΣΤΟ ΑΝΑΤΟΛΙΚΟ ΑΚΡΟ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ) - ψηφιακά
4. ΣΧΕΔΙΟ 04: ΔΙΑΤΟΜΕΣ S48 και S51: (ΠΕΡΙΟΧΗ ΕΠΕΜΒΑΣΗΣ ΣΤΟ ΑΝΑΤΟΛΙΚΟ ΑΚΡΟ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ) - ψηφιακά
5. ΣΧΕΔΙΟ 05: ΣΧΕΔΙΟ ΛΕΠΤΟΜΕΡΕΙΩΝ: ΛΕΠΤΟΜΕΡΕΙΕΣ ΚΑΤΑΣΚΕΥΗΣ ΜΙΚΡΟΠΑΣΣΑΛΩΝ ΚΑΙ ΕΝΔΕΙΚΤΙΚΗΣ ΠΛΟΚΗΣ ΣΥΡΜΑΤΟΚΙΒΩΤΙΩΝ (ΠΕΡΙΟΧΗ ΕΠΕΜΒΑΣΗΣ ΣΤΟ ΑΝΑΤΟΛΙΚΟ ΑΚΡΟ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ) - (ψηφιακά)

# 1. ΕΙΣΑΓΩΓΗ

## 1.1. Ανάθεση

Η Διεύθυνση Αναστήλωσης Αρχαίων Μνημείων ανέθεσε στην Μελετητική Εταιρεία ΓΕΩ.ΠΕΡ. ΑΕ την εκπόνηση της γεωτεχνικής μελέτης **«ΓΕΩΣΤΑΤΙΚΗ ΜΕΛΕΤΗ ΠΡΟΣΤΑΣΙΑΣ ΚΑΙ ΑΠΟΚΑΤΑΣΤΑΣΗΣ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ ΣΤΟΝ ΚΡΟΝΙΟ ΛΟΦΟ»** με την από 23-12-2020 σύμβαση. Η ανωτέρω μελέτη εκπονείται στο πλαίσιο διεπιστημονικής προσέγγισης για την επίλυση τεχνικών θεμάτων σχετικών με την ευστάθεια του ανατολικού τμήματος του αναλήμματος των Θησαυρών και του αντιστηριζόμενου πρανούς, εν παραλλήλω με μελέτη Τοπογραφικής τεκμηρίωσης, Αρχιτεκτονική μελέτη, Στατική μελέτη και Υδραυλική μελέτη.

## 1.2. Αντικείμενο

Τα βασικά αντικείμενα της γεωτεχνικής μελέτης συνοψίζονται ως ακολούθως:

- Ο εντοπισμός των αιτίων για την εκδηλωθείσα τοπική αστάθεια του πρανούς στο ανατολικό όριο του αναλήμματος των Θησαυρών, με παράλληλη δομητική αστοχία (ανατροπή) του αναλήμματος (περιοχή μεταξύ αντηρίδων Ν και Ξ)
- Ο κανονιστικός έλεγχος της ευστάθειας του πρανούς στο ανατολικό άκρο του αναλήμματος των Θησαυρών, στον Κρόνιο λόφο, στην υφιστάμενη κατάσταση – περιοχή από αντηρίδα Ν του αναλήμματος έως το ανατολικό άκρο του
- Ο (κανονιστικός) σχεδιασμός, τυχόν απαιτούμενων μέτρων για τη βελτίωση της ευστάθειας του πρανούς (σε συνεργασία με τους μελετητές των παράλληλα εκπονούμενων μελετών: αρχιτεκτονική, στατική και υδραυλική μελέτη) – περιοχή από αντηρίδα Ν του αναλήμματος έως το ανατολικό άκρο του
- Η χωματουργική αποκατάσταση τα γεωμετρίας του πρανούς (επίσης σε συνεργασία με τους μελετητές των υπόλοιπων –πλην γεωτεχνικών- αντικειμένων)

## 1.3. Διατιθέμενα στοιχεία

Για την εκπόνηση της μελέτης και την κατάστρωση των απαραίτητων γεωστατικών υπολογισμών, ετέθησαν υπόψιν του αναδόχου από την ΔΑΑΜ τα ακόλουθα στοιχεία/δεδομένα:

1. «Γεωτεχνική διερεύνηση για τη διαπίστωση των γεωτεχνικών συνθηκών του Κρονίου λόφου και του Ιερού της Δήμητρας Χαμύνης», Δ. Εγγλέζος, Ιούλιος 2013

2. «Ερευνητικές εργασίες για την αντιμετώπιση των προβλημάτων ευσταθείας του τοιχίου στο βόρειο τμήμα στον αρχαιολογικό χώρο της Ολυμπίας και προτάσεις για την προστασία του», ΕΚΠΑ, Τμήμα Γεωλογίας, Τομέας Δυναμικής Τεκτονικής & Εφαρμοσμένης Γεωλογίας, Η. Μαριολάκος, Καθηγητής, 2002, Αθήνα
3. «Αποκατάσταση Αναλημματικού Τοίχου Κρονίου στην Ολυμπία - Μελέτη πρόσθετων μέτρων υποστήριξης του πρανούς για την εξασφάλιση του αναλημματικού Τοίχου – Προμελέτη –εξέταση εναλλακτικών λύσεων», Σωτηρόπουλος & Συν/τες Α.Τ.Ε., 2002
4. Klaus Herrmann *Die Stuetzmauer am KronosHuegel,* στο *XI Bericht ueber die Ausgrabungen in Olympia, DAI,* Walter De Gruyter – Berlin – New York 1999 (Δημοσίευση του Γερμανικού Αρχαιολογικού Ινστιτούτου – στα Γερμανικά)
5. Γενικό τοπογραφικό διάγραμμα του αρχαιολογικού χώρου
6. Σχέδια όψης και κάτοψης του μνημείου (Γερμανικό Αρχαιολογικό Ινστιτούτο)
7. «Μελέτη ωρίμανσης: Στερέωση του αναλημματικού τοίχου των Θησαυρών στο ιερό της Ολυμπίας» (ΔΑΑΜ, Ζ' ΕΠΚΑ, Ιαν. 2013)
8. «Στατική μελέτη των διατάξεων αντιστήριξης α. Στο ανάλημμα του Κρονίου λόφου και β. Στο Ιερό της Δήμητρας Χαμύνης» - Τεύχος γεωστατικών υπολογισμών, Δ. Εγγλέζος, Οκτώβριος 2014

Επιπλέον, των ανωτέρω, αξιοποιήθηκαν δεδομένα από δημοσιεύσεις σχετικές με την ευστάθεια του αναλήμματος των Θησαυρών και του ανάντη αντιστηριζόμενου πρανούς:

- Δ. Εγγλέζος, 2015, «Αντιμετώπιση γεωστατικών προβλημάτων του αναλήμματος των Θησαυρών στην Αρχαία Ολυμπία». 4$^{ο}$ Συνέδριο ΕΤΕΠΑΜ, Θεσσαλονίκη, 2015.
- D. Egglezos, "Interpretation of the Current State of the Treasuries Retaining Wall at Ancient Olympia Through Staged Historical Back Analysis". Listening to the Stones, Archaeopress Publishing Ltd, pp 125-142, 2019,

Παράλληλα με τα διατεθέντα από τη ΔΑΑΜ στοιχεία, κατά τη σύνταξη της συνολικής μελέτης για την αντιμετώπιση των προβλημάτων του αναλήμματος των Θησαυρών α) χρησιμοποιήθηκε το παραχθέν, στο πλαίσιο των τοπογραφικών εργασιών της μελέτης, τοπογραφικό υπόβαθρο και γενικότερα η γεωμετρική τεκμηρίωση του αναλήμματος και του πρανούς μετά την επελθούσα το 2019 αστοχία, β) υπήρξε συστηματική συνεργασία με τον αρχιτέκτονα μελετητή, το στατικό μελετητή και τον υδραυλικό μελετητή προκειμένου ο συνολικός σχεδιασμός της τεχνικής πρότασης η οποία εξασφαλίζει παράλληλα, την ευστάθεια του πρανούς, την αναστήλωση του ανατολικού τμήματος του αναλήμματος και της ριζικής αντιμετώπισης των ομβρίων να μην παρουσιάζει ασυμβατότητες.

Η αξιοποίηση του ανωτέρω υλικού αναλύεται συστηματικά στο κεφάλαιο 3 της παρούσας μελέτης.

## 1.4. Βασικά παραδοτέα της γεωστατικής μελέτης

Στο πλαίσιο της γεωτεχνικής μελέτης, βάσει, αφενός, των συμβατικών υποχρεώσεων του αναδόχου μελετητή και αφετέρου, των αποτελεσμάτων από την εκπόνησή της, περιλαμβάνονται τα εξής:

1. Τεύχος Τεχνικής Έκθεσης και Υπολογισμών

Στο Τεύχος Τεχνικής Έκθεσης και Γεωτεχνικών Υπολογισμών περιέχονται (όχι περιοριστικά):

- Αναφορές στις όποιες διατιθέμενες λοιπές μελέτες (αρχαιολογική, γεωτεχνική κλπ.) και στα δεδομένα που επηρεάζουν τον σχεδιασμό του έργου.
- Αποτίμηση της ευστάθειας του πρανούς στην υφιστάμενη κατάσταση
- Πρόταση τυχόν απαιτούμενων μέτρων προστασίας – αποκατάστασης και βελτίωσης της ευστάθειας του πρανούς και υπολογιστική αξιολόγησή των
- Το κανονιστικό πλαίσιο σχεδιασμού των τυχόν απαιτούμενων μέτρων
- Η τεκμηρίωση της μεθόδου ανάλυσης και του υπολογιστικού προσομοιώματος
- Οι παραδοχές υλικών, δράσεων και φορτίων και το κανονιστικό πλαίσιο σχεδιασμού
- Τα δεδομένα και τα αποτελέσματα των αναλύσεων

2. Σχέδια αναφορικά με την ευστάθεια και τη μορφολογική αποκατάσταση του πρανούς στο ανατολικό τμήμα του αναλήμματος των Θησαυρών

Στα Σχέδια περιλαμβάνονται:

- Γενική κάτοψη της περιοχής μελέτης σε κλίμακα 1:100 και *επέμβασης* σε 1:50
- Τυπικές εγκάρσιες διατομές σε κλίμακες 1:50

Σημειωτέον ότι τα σχέδια της μελέτης τα οποία αφορούν στην όψη του πρανούς, και σε κατασκευαστικές λεπτομέρειες, παρουσιάζονται στα αρχιτεκτονικά σχέδια της μελέτης, δεδομένου ότι στην όψη αποτυπώνεται κυρίαρχα η πρόταση αναστήλωσης για το ανατολικό τμήμα του αναλήμματος των Θησαυρών.

## 1.5. Ομάδα Εργασίας

Η σύνταξη της παρούσας έκθεσης έγινε από τον Εγγλέζο Δημήτρη, Δρα Πολιτικό Μηχανικό – Εδαφομηχανικό.

## 1.6. Γενική Βιβλιογραφία

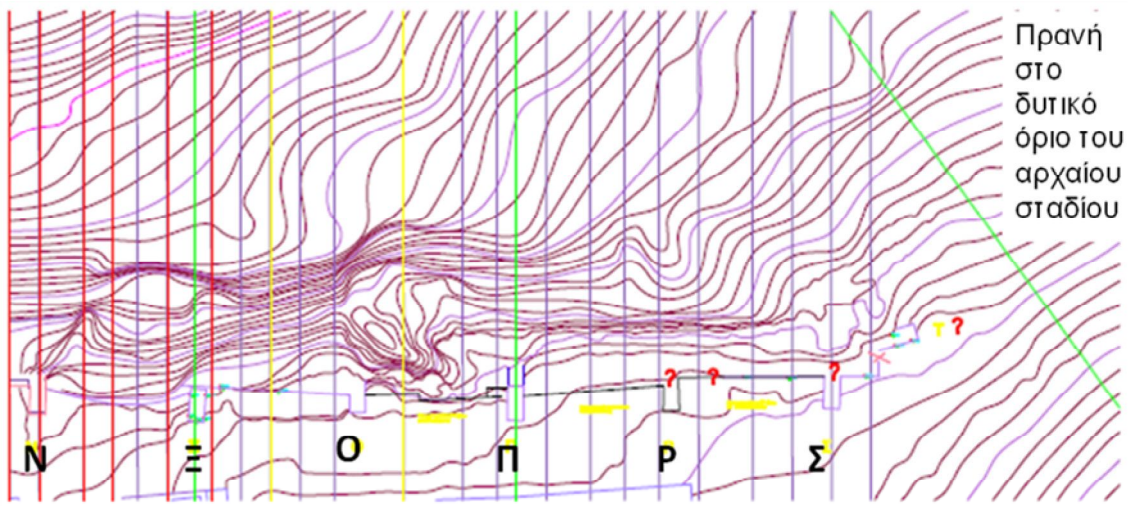

| ΕΔΑΦΟΜΗΧΑΝΙΚΗ |
|---|
| Lee W. Abramson, Tomas S. Lee, Sunil Sharma, Glenn M. Boyce. "Slope stability and Stabilitzation Methods". |
| Βαλαλάς Δ. Θ., 1996. " Εδαφομηχανική" Αθήνα. |
| Bowles E. Joseph, 1996. "Foundation analysis and design", 5η Έκδοση. |
| Tomlinson M. J., 1995. "Foundation Design & Construction", 6th Edition,. |
| Simsons Noel & Menziers Bruce, 1999. "Foundation Engineering", Second Edition. |
| Γκαζέτας Γ., "Εδαφομηχανική, 2001". |
| Γκαζέτας Γ., "Σημειώσεις Εδαφοδυναμικής, 2001". |
| Καββαδάς Μ., "Στοιχεία Εδαφομηχανικής, 2002". |
| Terzaghi K., Peck R.B. "Εφαρμοσμένη εδαφομηχανική". |
| Koerner. "Designing with Geosynthetics" |
| Λοϊζος Α. "Εδαφομηχανική - Θεμελιώσεις" Ι - ΙV. |
| Braja M. Das, 1998. "Principles of foundation Engineering", 4η Εκδοση. |
| Powrie William, 1997. "Soil Mechanics". |
| Muni Budhu, 2000. "Soil Mechanics & Foundations". |
| Robert W. Day, 1999. "Geotechnical and Foundation Engineering". |
| Shamsher Prakash, 1981. "Soil Dynamics" |
| ΟΑΣΠ/ΥΠΕΧΩΔΕ, 2000, Ελληνικός Αντισεισμικός Κανονισμός, ΕΑΚ2000. |
| Poulos H.G., Davis E.H., 1980, “Pile foundation analysis and design” |
| Kramer S.L., 1996, “Geotechnical earthquake engineering” |

| |
|---|
| Taylor D.W., 1960, “Fundamentals of Soil Mechanics”, J. Wiley & Sons |
| Papazachos, B. & Papazachou C. (1997). **"**The earthquakes of Greece**"**, Thessaloniki, Ziti Publications |
| Κατσικάτσος Γ.Χ., 1992. «ΓΕΩΛΟΓΙΑ ΤΗΣ ΕΛΛΑΔΑΣ», Αθήνα |
| DIN 1054, (11/1976). **"**Permissible Loading of Subsoil**"**. German Standards, Standardized Regulations for Civil Engineering & Commity for Civil Engineering |
| Bjerrum, L. (1963). “Allowable settlements of structures”, Proc. of the European Conf. on Soil Mechanics & Foundation Engineering, Vol. 2, pp. 135-137 |
| Τσελέντης, Α. (1997). «Σύγχρονη σεισμολογία», Αθήνα, Εκδόσεις Παπασωτηρίου |
| Αναγωστόπουλος Α., Παπαδόπουλος Β., 1990, «Επιφανειακές Θεμελιώσεις», Εκδόσεις Συμεών, Αθήνα. |
| Steinbrenner, W. (1934). "Tafeln zur Setzungberechnung", Die Strasse, Vol. 1, p. 121 |
| Fang, H. Y. (1991). Foundation Engineering Handbook, Van Nostrand Reinhold, N.Y., USA |
| Barnes G.E., 2005, ΕΔΑΦΟΜΗΧΑΝΙΚΗ: Αρχές και Εφαρμογές, Εκδόσεις ΚΛΕΙΔΑΡΙΘΜΟΣ, Αθήνα. |
| Εγγλέζος Δ., (2004), «Θεωρητική και πειραματική διερεύνηση της συμπεριφοράς εδαφικού στοιχείου υπό ανακυκλική φόρτιση», Αθήνα, ΕΜΠ, Διδ. Διατριβή |
| Fox, E.N. (1948). "The mean elastic settlement of a uniformly loaded area at a depth below the ground surface". Proc. 2nd Int. Conf. SMFE, Rotterdam, Vol. 1, p. 129 |
| Cedergren, R.H., 1997. **"**Seepage, Drainage & Flow Nets, 2nd ed.**"**, JOHN WILEY & SONS, USA, Chapter 2, pp. 73-75 |

# 2. ΒΑΣΙΚΑ ΣΤΟΙΧΕΙΑ - Η ΠΕΡΙΓΡΑΦΗ ΤΟΥ ΠΡΟΒΛΗΜΑΤΟΣ – ΠΡΟΤΑΣΗ ΕΠΕΜΒΑΣΗΣ

## 2.1. Περιγραφή του τεχνικού θέματος - βασικά δεδομένα

Στο πλαίσιο της παρούσας γεωτεχνικής μελέτης εξετάζεται συστηματικά η ευστάθεια του πρανούς ανάντη του ανατολικού τμήματος του αναλήμματος των Θησαυρών. Ειδικότερα, εξετάζεται το τμήμα του πρανούς το οποίο εκτείνεται από την αντηρίδα Ν έως το δυτικό πρανές του αρχαίου Σταδίου (σχετικά δες το απόσπασμα οριζοντογραφίας, στο πλαίσιο της παρούσας μελέτης, στην Εικόνα 2.1). Στο εν λόγω τμήμα το ανάλημμα διατηρούσε –ήδη από την αποκάλυψή του το 19$^{ο}$ αι.- μόνο τους κατώτερους δόμους, ενώ το απώτατο ανατολικό άκρο του παρουσιάζει μόνιμη μετακίνηση/άλμα τάξης 1μ από το υπόλοιπο δυτικό τμήμα. Οι ανωτέρω ιστορικές αστοχίες, στο ανατολικό τμήμα του αναλήμματος, ερμηνεύονται ως αποτέλεσμα ολισθητικών φαινομένων τα οποία προκλήθηκαν από τη δράση του νερού (Δ. Εγγλέζος, 2014).




Εικ. 2.1: Περιοχή εξεταζόμενων πρανών στο πλαίσιο της παρούσας γεωτεχνικής μελέτης.

## 2.2. Οι πρόσφατες αστοχίες – ποιοτική αποτίμηση

Κατά τη διάρκεια του χειμώνα 2018/2019, ως αποτέλεσμα ισχυρών και παρατεταμένων βροχοπτώσεων, στο ανατολικό άκρο του αναλήμματος των Θησαυρών, προκλήθηκαν ολισθήσεις γαιών και καταρρεύσεις (ανατροπές) των –μικρού ύψους- ιστάμενων τμημάτων του αναλήμματος.

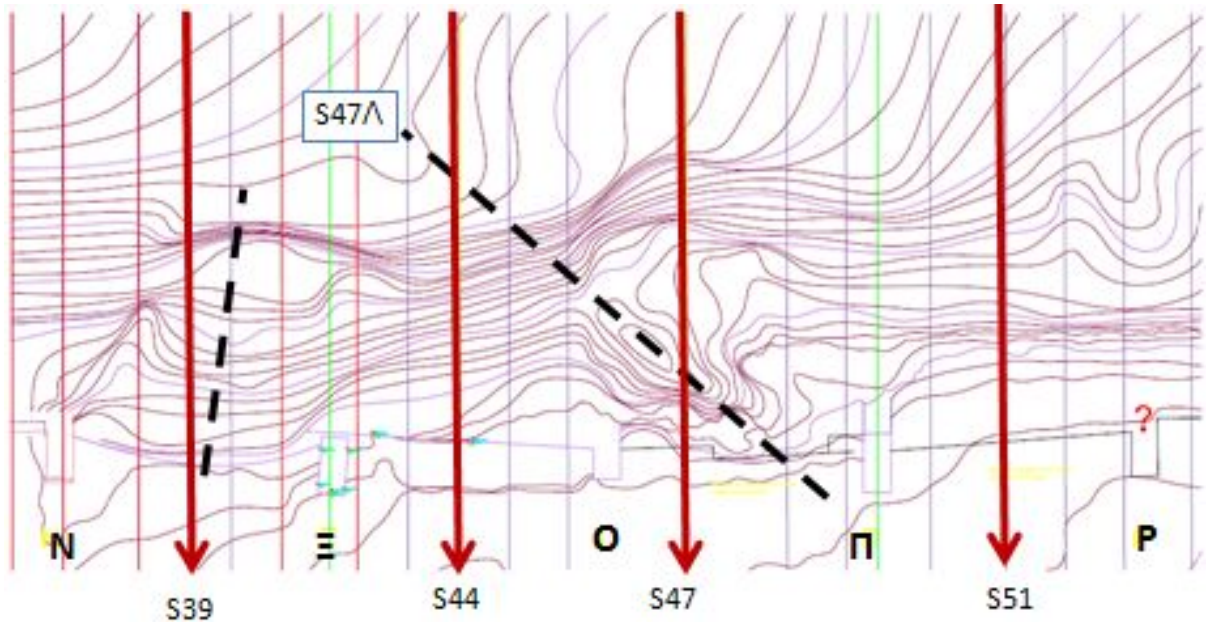
Ειδικότερα, από το δυτικό πέρας του αναλήμματος έως τα δυτικά πρανή του αρχαίου σταδίου διαμορφώθηκε η ακόλουθη κατάσταση:

- Από το δυτικό άκρο του αναλήμματος έως την αντηρίδα Ν, διατηρήθηκε η προ των βροχοπτώσεων κατάσταση, δηλαδή η ευστάθεια του ανάντη πρανούς και του αναλήμματος. Η εν λόγω ευστάθεια αποδίδεται κατά σειρά α) στην διάταξη της πασσαλοσειράς (στο μέσον του πρανούς μεταξύ αναλήμματος και επαρχιακής οδού), β) στην βελτίωση-εξυγίανση του τμήματος του πρανούς μεταξύ του αναλήμματος και τη πασσαλοσειράς, με την αντικατάσταση εδάφους από συρματοκιβώτια με λιθορριπή και γ) στην αντιστηρικτική δράση μεταλλικών αντηρίδων οι οποίες αποτρέπουν την κατάρρευση του –ευρισκόμενου σε οριακή ισορροπία- αναλήμματος
- Ολίσθηση του εδαφικού πρανούς στην περιοχή μεταξύ αντηρίδων Ν και Ξ η οποία οδήγησε σε ανατροπή τους έως τούδε ιστάμενους δόμους του αναλήμματος (Εικ. 2.2, 2.6). Η ολίσθηση φαίνεται ότι συνέβη εντός της επιφανειακής εδαφικής ενότητας του πρανούς (σχετικά δες χαρακτηριστικά διαταραγμένες ισοϋψείς της Εικόνας 2.3). Στην εν λόγω περιοχή έχουν κατασκευαστεί ισχυροί πάσσαλοι αντιμετώπισης βαθιών γενικών ασταθειών (σύμφωνα με την προαναφερθείσα γεωστατική μελέτη στην παράγραφο 1.3). Εν τούτοις, όπως διαπιστώθηκε κατά την αυτοψία της περιοχής μελέτης από την διεπιστημονική ομάδα μελετητών, η προβλεπόμενη κατά τη γεωστατική μελέτη του 2014 (στο τμήμα μεταξύ αντηρίδων Ν και Ξ) βελτίωση-εξυγίανση του τμήματος του πρανούς μεταξύ του αναλήμματος και της πασσαλοσειράς, με την αντικατάσταση εδάφους από συρματοκιβώτια με λιθορριπή δεν είχε υλοποιηθεί (σχετικά δες απόσπασμα όψης και διατομής της Εικόνας 2.4). Στην παρούσα μελέτη επαναλαμβάνεται ουσιαστικά, για το τμήμα του πρανούς μεταξύ των αντηρίδων Ν και Ξ η τεχνική πρόταση της γεωστατικής μελέτης το 2014.
- Το τμήμα του πρανούς ανάντη των αντηρίδων Ξ – Ο διατηρήθηκε ευσταθές.
- Το τμήμα του πρανούς ανάντη των αντηρίδων Ο – Π ολίσθησε επί της επιφανειακής εδαφικής ενότητας (Εικ. 2.5, 2.6). Η ολίσθηση έχει άξονα κίνησης λοξά ως προς το διαμήκη άξονα του αρχαίου αναλήμματος (σχετικά δες χαρακτηριστικά διαταραγμένες ισοϋψείς της Εικόνας 2.3).
- Το τμήμα του πρανούς ανάντη των αντηρίδων Π – Ρ διατηρήθηκε ευσταθές.
- Από την αντηρίδα Ρ έως τα δυτικά πρανή του αρχαίου σταδίου επίσης το πρανές (το οποίο εκτείνεται από τον επαρχιακό δρόμο ως το επίπεδο του αρχαίου σταδίου) παρέμεινε ευσταθές. Αυτό αποτελεί διαχρονική κατάσταση από την αρχαιολογική αποκάλυψη του πρανούς το $19^{ο}$ αι.

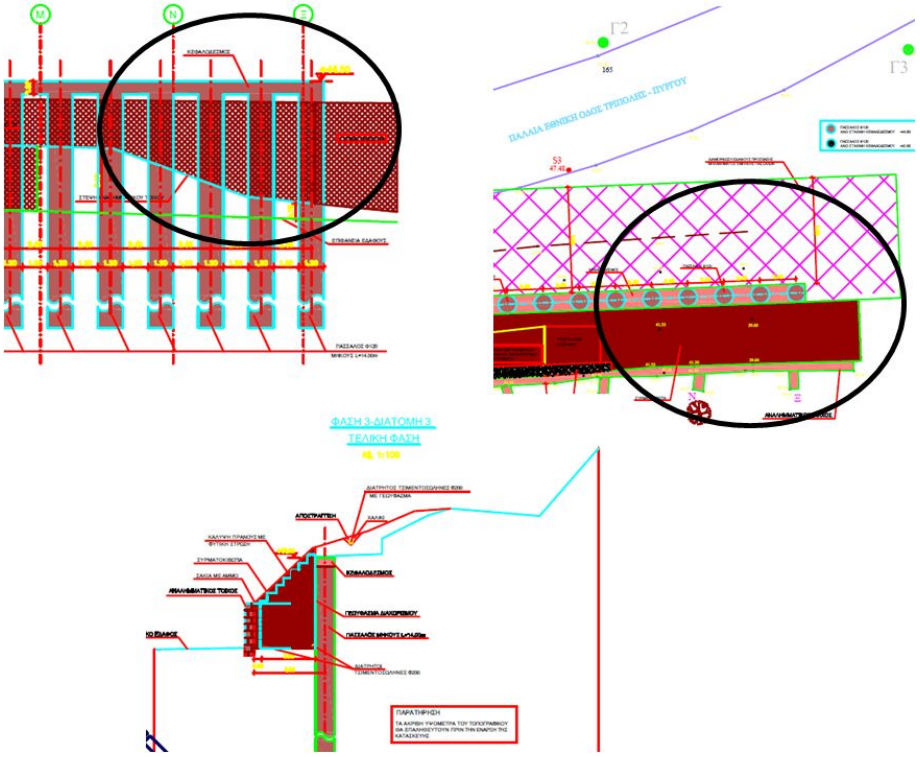
Σημειωτέον, ότι ήδη η ΕΦΑ Ηλείας έχει προχωρήσεις στην απομάκρυνση του διαταραγμένου από τις ολισθήσεις εδαφικού υλικού και έχει δημιουργήσεις προσωρινούς αναβαθμούς (Εικ. 2.7, 2.8).



Εικ. 2.2: Ολίσθηση πρανούς - ανατροπή αναλήμματος στην περιοχή μεταξύ των αντηρίδων Ν και Ξ.




Εικ. 2.3: Χαρακτηριστική διαταραχή ισοϋψών στις περιοχές πρόσφατων ολισθήσεων (οι άξονες ολίσθησης με μαύρη διακεκομμένη γραμμή)



Εικ. 2.4: Προβλέψεις γεωστατικής μελέτης (2014) για το τμήμα πρανούς και αναλήμματος μεταξύ των αντηρίδων Ν και Ξ.



Εικ. 2.5: Ολίσθηση πρανούς - ανατροπή αναλήμματος στην περιοχή μεταξύ των αντηρίδων Ο και Π.



Εικ. 2.6: Άποψη των 2 πρόσφατων λοβών ολίσθησης ανάντη του αναλήμματος των Θησαυρών (αριστερά η περιοχή ολίσθησης ανάντη Ν-Ξ και δεξιά η αριστερά η περιοχή ολίσθησης ανάντη Ο-Π).



Εικ. 2.7: Περιοχή μεταξύ των αντηρίδων Ν και Ξ μετά την αφαίρεση της ολισθήσασας εδαφικής μάζας από την ΕΦΑ Ηλείας.



Εικ. 2.8: Περιοχή μεταξύ των αντηρίδων Ο και Π μετά την αφαίρεση της ολισθήσασας εδαφικής μάζας από την ΕΦΑ Ηλείας (δεξιό τμήμα της εικόνας).

## 2.3. Κύρια αίτια των παρατηρούμενων αστοχιών και ολισθήσεων

Οι παρατηρούμενες αστοχίες κατά μήκος του ανατολικού τμήματος του αναλήμματος των Θησαυρών αποδίδονται κατά κύριο λόγο στα ακόλουθα αίτια:

- Σχετικά απότομη γεωμετρία των πρανών (μεγάλη σχετικά κλίση και ύψος) σε συνδυασμό με τυπικές μηχανικές ιδιότητες εδαφικού υλικού
- Αδυναμία του ελάχιστα διατηρούμενου ιστάμενου τμήματος του αναλήμματος των Θησαυρών στο ανατολικό πέρας του, να λειτουργήσει αποτελεσματικά ως τοίχος αντιστήριξης.
- Τέλος, και σημαντικότερο η ισχυρή επίδραση κατά χρονικές φάσεις του νερού των ομβρίων, η οποία απομειώνει περιστασιακά τη διατμητική αντοχή του εδάφους το οποίο δομεί το πρανές, και οδηγεί (συστηματικά, βάσει των διατιθέμενων ιστορικών/αρχαιολογικών δεδομένων) σε οριακή ισορροπία ή/και εκδήλωση ασταθειών.

## 2.4. Βασικά στοιχεία της προτεινόμενης επέμβασης

Στο πλαίσιο του σχεδιασμού της προτεινόμενης γεωτεχνικής επέμβασης επιχειρούνται συνδυαστικά τα ακόλουθα:

1. Αφαίρεση του διαταραγμένου και ολίσθησαντος εδάφους. Το έδαφος αυτό, μετά την επελθούσα αστοχία, παρουσιάζει τις ελάχιστες τιμές διατμητικής αντοχής και αποτελεί, πλέον, μία μάζα αποκομμένη από το ανάντη συνεκτικό –προς το παρόν- πρανές, χωρίς ιδιαίτερη συμβολή στην αντιστήριξη του ανάντη πρανούς. Σε κάθε περίπτωση το διαταραγμένο έδαφος –εφόσον δεν αφαιρεθεί- προορίζεται να ξαναστοχήσει (υπό μορφή λασπορροής πλέον) σε επόμενο γεγονός ισχυρών παρατεταμένων βροχοπτώσεων.
2. Αποκατάσταση της μορφής του πρανούς στο ανατολικό τμήμα του αναλήμματος των Θησαυρών με α) εξασφάλιση της αντιστήριξης του ανάντη πρανούς, β) προσαρμογή της μορφής του σε αλληλεπίδραση με την πρόταση αναστήλωσης (απαίτηση τοιχίου ελαχίστου ύψους για τον πλευρικό περιορισμό του εδάφους χωματουργικής διαμόρφωσης της όψης του πρανούς) και την ανάπτυξη υδραυλικών-στραγγιστικών μέτρων στην ανάντη επιφάνεια του αποκαθιστώμενου πρανούς και γ) εξασφάλιση στραγγιστικής λειτουργίας της παρειάς του (φυσικού και διατηρούμενου) ανάντη πρανούς. Τα ανωτέρω υλοποιούνται ως ακολούθως:
   - Κατασκευή αντιστηρικτικού τοιχίου από συρματοκιβώτια με λιθορριπή, σε 2 στάθμες. Ο τοίχος αντιστήριξης δημιουργεί επιπλέον την κύρια (κρυφή) μάζα αποκατάστασης του πρανούς.
   - Πλήρωση της υπόβασης των τοίχων αντιστήριξης και του κενού μεταξύ της πίσω παρειάς των τοίχων αντιστήριξης και της πρόσθιας επιφάνειας του φυσικού πρανούς με κατάλληλο κοκκώδες υλικό.
   - Κάλυψη της άνω επιφάνειας των τοίχων αντιστήριξης με κατάλληλης σύστασης και συμπύκνωσης εδαφικό υλικό, το οποίο αποτελεί και την υπόβαση για την κατασκευή επιφανειακών στεγανωτικών και υδραυλικών διατάξεων για τη μόνιμη αντιμετώπιση της δράσης των ομβρίων, στο πλαίσιο της υδραυλικής μελέτης) και την διάστρωση γεωκυψελών για την ανάπτυξη επιφανειακής βλάστησης.

Οι ανωτέρω επεμβάσεις αξιοποιούν την εμπειρία από την πρόσφατη επέμβαση σταθεροποίηση του αναλήμματος και του ανάντη πρανούς (2015-216) και αποτελούν προσαρμογή στις ειδικότερες γεωτεχνικές και μορφολογικές συνθήκες της ανατολικής περιοχής του αναλήμματος.

## 3. ΔΙΑΘΕΣΙΜΑ ΔΕΔΟΜΕΝΑ ΓΙΑ ΤΗΝ ΕΚΠΟΝΗΣΗ ΤΗΣ ΜΕΛΕΤΗΣ

Κατά την εκπόνηση της παρούσας μελέτης, αξιοποιήθηκαν συστηματικά, τεχνικά δεδομένα τα οποία διετέθησαν από την ΔΑΑΜ στους μελετητές. Το αξιοποιούμενο υλικό για τη σύνταξη της παρούσας μελέτης περιλαμβάνει γεωλογικά, γεωτεχνικά και σεισμικά δεδομένα και προέρχεται από το γεωστατικό τεύχος της μελέτης «Στατική μελέτη των διατάξεων αντιστήριξης α. Στο ανάλημμα του Κρονίου λόφου και β. Στο Ιερό της Δήμητρας Χαμύνης» - Τεύχος γεωστατικών υπολογισμών, Δ. Εγγλέζος, Οκτώβριος 2014. Το σχετικό υλικό παρουσιάζεται συνοπτικά στη συνέχεια.

### 3.1. Γεωλογικά δεδομένα

Τα γεωλογικά δε

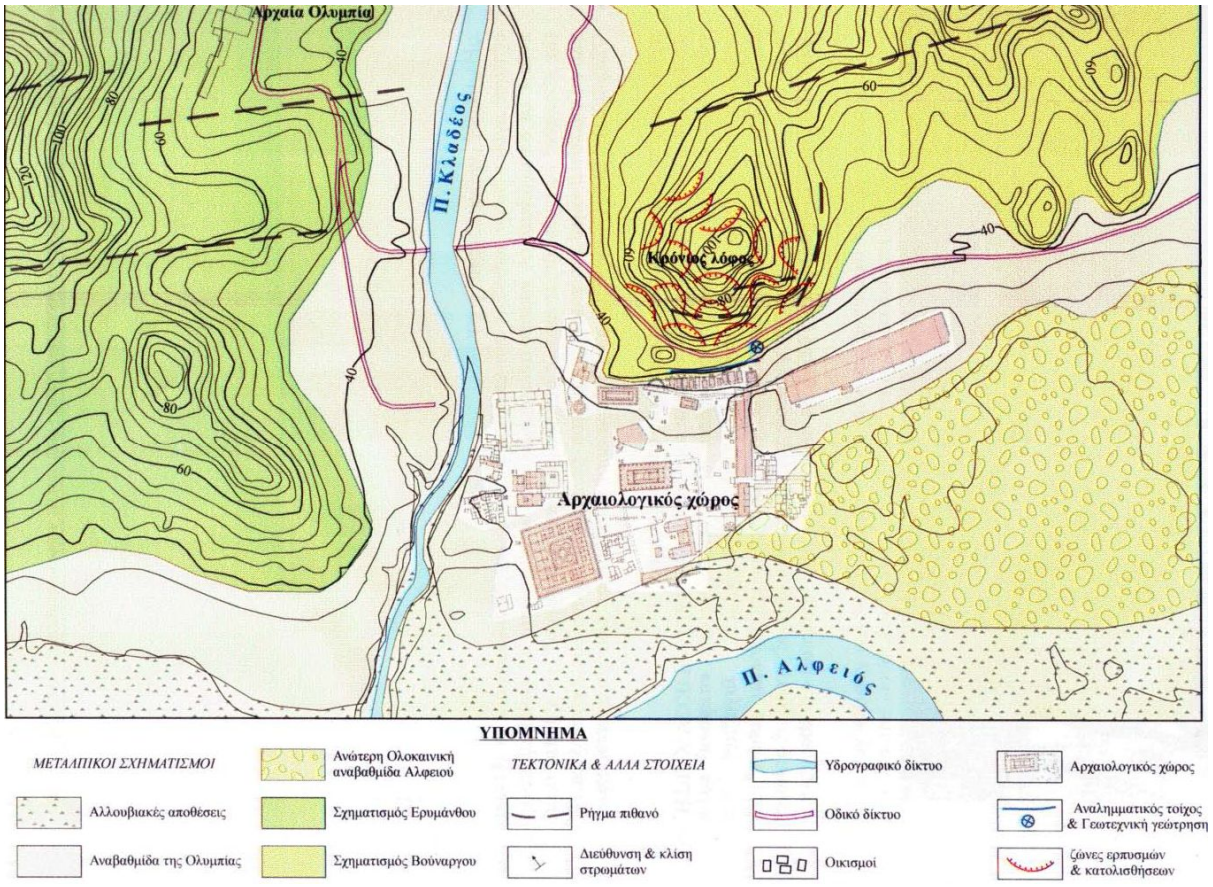
Συνοπτικά, στην ευρύτερη περιοχή του αρχαιολογικού χώρου Ολυμπίας απαντώνται οι ακόλουθοι γεωλογικοί σχηματισμοί:

- ΣΧΗΜΑΤΙΣΜΟΣ ΒΟΥΝΑΡΓΟΥ: Στην περιοχή του Κρονίου λόφου επικρατεί ο γεωλογικός σχηματισμός Βούναργου, με πολλές (κατά κανόνα επιφανειακές) ζώνες ολισθήσεων και ερπυσμού. Ο σχηματισμός Βούναργου αποτελείται από εναλλαγές μαργών, ιλύων, αργίλων και ιλυολίθων. Πρόκειται για σχηματισμό με πολύπλοκη στρωματογραφική διάταξη τόσο σε κατακόρυφη όσο και σε οριζόντια έννοια.
- ΑΝΑΒΑΘΜΙΔΑ ΟΛΥΜΠΙΑΣ: Στην περιοχή του αρχαιολογικού χώρου (κοιλάδα του Κλαδέου) απαντώνται κυρίως μεγάλου πάχους αλλουβιακές (ποτάμιες) αποθέσεις ως αποτέλεσμα των πλημμυρών του Κλαδέου ποταμού, αποτελούμενες κυρίως από ιλυοαμμώδεις- αργιλοαμμώδεις σχηματισμούς και ασύνδετα κροκαλοπαγή –.
- Οι λοφώδεις σχηματισμοί που περιβάλλουν τον αρχαιολογικό χώρο δομούνται ως επί το πλείστον από μαργαϊκούς σχηματισμούς, έντονα αποσαθρωμένους – εδαφοποιημένους επιφανειακά, με ερπυστική συμπεριφορά και μάργες μέτρια αποσαθρωμένες σε μεγαλύτερο βάθος (στιφρές άργιλοι – ημίβραχοι).

Αναλυτικά δεδομένα για τη γεωλογία της περιοχής της αρχαίας Ολυμπίας παρουσιάζονται σε σχετική μελέτη που εκπονήθηκε το 2002:

«Ερευνητικές εργασίες για την αντιμετώπιση των προβλημάτων ευσταθείας του τοιχίου στο βόρειο τμήμα στον αρχαιολογικό χώρο της Ολυμπίας και προτάσεις για την προστασία του», ΕΚΠΑ, Τμήμα Γεωλογίας, Τομέας Δυναμικής Τεκτονικής & Εφαρμοσμένης Γεωλογίας, Η. Μαριολάκος, Καθηγητής, 2002, Αθήνα.

Ενδεικτικά, τα γεωλογικά δεδομένα στην περιοχή ενδιαφέροντος παρουσιάζονται στο ακόλουθο απόσπασμα γεωλογικής οριζοντιογραφίας (Η. Μαριολάκος, 2002).




## 3.2. Γεωτεχνικά δεδομένα

Στην περιοχή του αναλήμματος των Θησαυρών απαντώνται οι ακόλουθες 6 γεωτεχνικές/δομητικές ενότητες:

Ενότητα Ι – **Μανδύας αποσάθρωσης μάργας – (CL-ML)**

Ενότητα ΙΙ: **Εδαφοποιημένη κίτρινη ΜΑΡΓΑ (CL)**

Ενότητα ΙΙΙ: **Στιφρή Εδαφοποιημένη Τεφρή ΜΑΡΓΑ (CL, CL-ML)**

Ενότητα ΙV: **Τεφρή ΜΑΡΓΑ – Ημίβραχος**

Ενότητες Να και Νβ: **Δομικοί λίθοι-διεπιφάνειες του αναλήμματος.**

Ειδικότερα, για την προσομοίωση του πρανούς και την πραγματοποίηση αναλύσεων (στο πλαίσιο της γεωστατικής μελέτης το 2014) για την εκτίμηση της ευστάθειας του συστήματος πρανές-ανάλημμα στην περιοχή του Κρονίου αναλήμματος συντάχθηκαν αντιπροσωπευτικές γεωτεχνικές διατομές σύμφωνα με τις προβλέψεις της γεωτεχνικής μελέτης «Γεωτεχνική

διερεύνηση για τη διαπίστωση των γεωτεχνικών συνθηκών του Κρονίου λόφου και του Ιερού της Δήμητρας Χαμύνης».
Οι γεωτεχνικές διατομές στηρίχθηκαν στην στρωματογραφία των γεωτρήσεων Γ1 και της Γ2, της υφιστάμενης γεωτεχνικής μελέτης (Εγγλέζος, 2013).

### 3.2.1. Σύνοψη των γεωτεχνικών παραμέτρων

Συνοπτικά, οι τιμές των φυσικών και μηχανικών παραμέτρων των γεωτεχνικών ενοτήτων της περιοχής μελέτης, οι οποίες υιοθετήθηκαν για τις αναλύσεις λαμβάνονται από τη μελέτη «Γεωτεχνική διερεύνηση για τη διαπίστωση των γεωτεχνικών συνθηκών του Κρονίου λόφου και του Ιερού της Δήμητρας Χαμύνης» παρουσιάζονται ακολούθως, στον Πίνακα 3.1.

Πίνακας 3.1: Περιοχή Κρονίου: Παράμετροι γεωτεχνικών ενοτήτων (I-V)

| ΚΡΟΝΙΟ: ΠΑΡΑΜΕΤΡΟΙ ΓΕΩΤΕΧΝΙΚΩΝ ΕΝΟΤΗΤΩΝ | | | | | | |
|---|---|---|---|---|---|---|
| | I | II | III | IV | Vα | Vβ |
| $\gamma(kN/m^3)$ | 20.0 | 19.5 | 21.0 | 22.2 | 25.0 | - |
| $c'$ $(kN/m^2)$ | 2 | 5 | 7 | 60 | 80 | - |
| $\varphi'(^o)$ | 28 | 28 | 33 | 34 | 45 | 30 |
| $\varphi_{res}(^o)$ | 24 | 24 | 24 | - | - | 25 |
| $c_u(kN/m^2)$ | 80 | 100 | 150 | - | - | - |
| GSI | - | - | - | 70 | 50 | - |
| $E_i$ (MPa) | 10 | 20 | 30 | 175 | 3250 | - |
| $\sigma_{ci}$, MPa | - | - | - | 1.0 | 10.0 | - |
| $E_{RM}$ (MPa) | - | - | - | 125 | 1000 | - |
| $\sigma_{cRM}$, kPa | - | - | - | 180 | 600 | - |
| $\sigma_{cRM\text{-}tx}$ kPa | - | - | - | 240 | 1600 | - |
| $\sigma_{tRM}$ kPa | - | - | - | 10 | 20 | - |
| $\nu^1$ | 0.3 | 0.3 | 0.3 | 0.3 | 0.25 | - |
| (1) Κατ' εκτίμηση | | | | | | |

ΣΗΜΕΙΩΣΗ: Οι ανωτέρω τιμές φυσικών και μηχανικών ιδιοτήτων χρησιμοποιούνται ακολούθως για τους γεωστατικούς υπολογισμούς της παρούσας μελέτης. Ειδικά οι τιμές οι οποίες αφορούν στην ΕΝΟΤΗΤΑ Ι, καθορίζονται από ανάδρομες αναλύσεις ευστάθειας για την ερμηνεία των πρόσφατων ολισθήσεων (2019) στα πρανή του ανατολικού πέρατος του αναλήμματος των Θησαυρών.

## 3.3. Σεισμικά δεδομένα

Τα σεισμικά δεδομένα σχεδιασμού των έργων λαμβάνονται σύμφωνα με τη μελέτη «Γεωτεχνική διερεύνηση για τη διαπίστωση των γεωτεχνικών συνθηκών του Κρονίου λόφου και του Ιερού της Δήμητρας Χαμύνης». Οι αναλύσεις των μέτρων αντιστήριξης γίνονται βάσει των κανονιστικών προβλέψεων του EC-8, ενώ οι αναλύσεις ευσταθείας της τρέχουσας κατάστασης βάσει ιστορικών σεισμολογικών δεδομένων

Ακολούθως παρατίθενται τα σχετικά δεδομένα από την αναφερθείσα μελέτη

### 3.3.1. ΓΕΝΙΚΑ ΣΕΙΣΜΙΚΑ ΔΕΔΟΜΕΝΑ

Σύμφωνα με τον ισχύοντα ΕΑΚ 2003, η περιοχή του έργου ανήκει στη ζώνη σεισμικής επικινδυνότητας ΙΙ, με επιτάχυνση σχεδιασμού $a_{gR}$ = 0.24g. Τέλος το υπέδαφος θεμελίωσης στην περιοχή του έργου κατατάσσεται στην **κατηγορία Β** (μεγάλου πάχους στιφρές άργιλοι - ημιβραχώδεις σχηματισμοί).

Σημειωτέον, ότι οι γεωτεχνικές ενότητες που απαντώνται στις περιοχές ενδιαφέροντος της παρούσης μελέτης (λόγω της συνεκτικής φύσης τους) δεν θεωρούνται κατά ΕΑΚ2003 σεισμικώς ευαίσθητα εδάφη, επομένως ο έλεγχος συνίζησης παρέλκει.

Επιπλέον, σύμφωνα με τις προβλέψεις του (παράλληλα ισχύοντος) Ευρωκώδικα 8 (EC-8) το έδαφος στο πρανές που αντιστηρίζεται από το ανάλημμα κατατάσσεται σε **κατηγορία Β** (εδάφη με γεωτεχνικούς σχηματισμούς ταχύτητας 360÷800 m/s.)

Στην περίπτωση αυτή προβλέπεται εδαφική ενίσχυση ίση με S = 1.20.

$$a_g = a_{gR} * S = 0.24*1.20= 0.29g.$$

Ειδικότερα για την περιοχή αναλήμματος των Θησαυρών ισχύουν τα ακόλουθα:

Κατά EC-8 προβλέπεται τοπογραφική σεισμική επιδείνωση λόγω της γεωμορφολογίας του πρανούς, η οποία, για πρανές ήπιας κλίσης (<30$^o$), λαμβάνεται ίση με $S_T$ = 1.20 στη στέψη και γραμμική μεταβολή (απομείωση) έως τη βάση ($S_T$ = 1.0). Επειδή η στέψη του αναλήμματος βρίσκεται περί τη βάση του αρχικού φυσικού πρανούς (Κρόνιος λόφος) μπορεί να ληφθεί ασφαλώς $S_T$ = 1.0.

Επίσης, για τον καθορισμό των σεισμικών δράσεων σχεδιασμού μέτρων προστασίας του αναλήμματος θα πρέπει να ληφθεί υπόψιν ο μέγιστος συντελεστής σπουδαιότητας (λόγω της μνημειακής φύσης του αντικειμένου) για προσαύξηση των σεισμικών δράσεων σχεδιασμού ($\gamma_I$=1.40 κατά EC-8).

Τελικώς, κατά EC-8 η σεισμική δράση σχεδιασμού $a_g$ στην ευρύτερη περιοχή της μελέτης διαμορφώνεται σε:

$\mathbf{a_{gd}} = a_{gR} * S * S_T * \gamma_I = 0.24*1.20*1.0*1.40 =$ **0.40g**,

Η ευστάθεια του πρανούς, λόγω του σχετικά χαμηλού ύψους του, είναι δυνατόν να γίνει με ψευδοστατική σεισμική ανάλυση. Στην περίπτωση αυτή για την σεισμική ανάλυση φυσικού πρανούς, τόσο ο ΕΑΚ2003 όσο και ο EC-8 (δυσμενής περίπτωση) προβλέπουν τις ακόλουθες σεισμικές δράσεις:

- Οριζόντια δράση: $\mathbf{a_h} = 0.50\ a_g$ **= 0.20 g**
- Κατακόρυφη δράση: $\mathbf{a_v} = \pm 0.25\ a_g$ **= 0.10 g**

### 3.3.2. Ιστορική σεισμικότητα στην περιοχή του αναλήμματος των Θησαυρών

Επιπλέον των κανονιστικών προβλέψεων, συγκεντρώθηκαν ορισμένες από τις σημαντικότερες ιστορικές σεισμικές δράσεις που έχουν εκδηλωθεί στην ευρύτερη περιοχή του αρχαιολογικού χώρου της αρχαίας Ολυμπίας (σύμφωνα με τα διατιθέμενα ιστορικά στοιχεία), και εκτιμήθηκαν οι αντίστοιχες εδαφικές επιταχύνσεις βάσει εμπειρικών σεισμολογικών σχέσεων. Οι εμπειρικές σεισμολογικές σχέσεις συναρτούν την κατανομή της σεισμικής επιτάχυνσης με: την επικεντρική απόσταση R, το μέγεθος του σεισμού M, το είδος του ρήγματος, και τις επικρατούσες γεωτεχνικές συνθήκες, για σεισμολογικές εκτιμήσεις ιστορικών σεισμών σε διάστημα περίπου 2400 ετών.

Οι εκτιμηθείσες επιφανειακές επιταχύνσεις έγιναν με εμπειρική εκτίμηση της επιτάχυνσης σε βράχο και πρόσθετη πρόβλεψη εδαφικής ενίσχυσης (S=1.20), για κατηγορία εδάφους Β κατά EC-8. Τα ιστορικά σεισμολογικά δεδομένα και οι εμπειρικές εκτιμήσεις έντασης των ιστορικών σεισμών παρουσιάζονται στον ακόλουθο Πίνακα 3.2.

Πίνακας 3.2: Βασικά ιστορικά σεισμολογικά δεδομένα για την περιοχή του αρχαιολογικού χώρου της αρχαίας Ολυμπίας (μακροσεισμική εκτίμηση επιτάχυνσης για έδαφος κατηγορίας Β)

| ΕΤΟΣ | ΕΠΙΚΕΝΤΡΟ | ΑΠΟΣΤΑΣΗ (km) | ΜΕΓΕΘΟΣ ML | PGA(g)[1] | PGA(g)[2] | PGA(g)[3] | ΒΛΑΒΕΣ | ΚΑΤΗΓ. ΕΔΑΦΟΥΣ | S (EC-8) | $S_T$ (EC-8) | $a_{eff}$ (g) [1] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 401 πΧ | ΟΛΥΜΠΙΑ | 21.4 | 5.9 | 0.06188 | 0.1118 | 0.08023 | | Β | 1.2 | 1.0 | 0.050 |
| 551 | ΝΑΥΠΑΚΤΟΣ | 73.7 | 6.5 | 0.0273 | 0.04442 | 0.04351 | | Β | 1.2 | 1.0 | 0.022 |
| 1785 | ΠΑΤΡΑ | 62.7 | 6.4 | 0.03012 | 0.05059 | 0.0466 | | Β | 1.2 | 1.0 | 0.024 |
| 1804 | ΠΑΤΡΑ | 51.6 | 6.4 | 0.03817 | 0.06458 | 0.05738 | | Β | 1.2 | 1.0 | 0.031 |
| 1806 | ΠΑΤΡΑ | 75.0 | 6.2 | 0.0196 | 0.03398 | 0.03085 | | Β | 1.2 | 1.0 | 0.016 |
| 1642 | ΦΙΛΙΑΤΡΑ | 97.7 | 6.8 | 0.02612 | 0.03884 | 0.04415 | | Β | 1.2 | 1.0 | 0.021 |
| 1796 | ΦΙΛΙΑΤΡΑ | 97.7 | 6.6 | 0.02123 | 0.03297 | 0.03553 | | Β | 1.2 | 1.0 | 0.017 |
| 1886 | ΦΙΛΙΑΤΡΑ | 97.7 | 7.3 | 0.04386 | 0.05852 | 0.07602 | | Β | 1.2 | 1.0 | 0.035 |
| 1947 | ΦΙΛΙΑΤΡΑ | 97.7 | 7.0 | 0.03214 | 0.04576 | 0.05487 | | Β | 1.2 | 1.0 | 0.026 |
| 1783 | ΛΑΔΩΝΑΣ | 17.7 | 6.1 | 0.09297 | 0.15673 | 0.11881 | | Β | 1.2 | 1.0 | 0.074 |
| 1899 | ΚΥΠΑΡΙΣΣΙΑ | 50.2 | 6.5 | 0.04379 | 0.07252 | 0.06587 | | Β | 1.2 | 1.0 | 0.035 |
| 1919 | ΚΥΠΑΡΙΣΣΙΑ | 50.2 | 6.3 | 0.03559 | 0.06156 | 0.05301 | | Β | 1.2 | 1.0 | 0.028 |
| 1947 | ΠΥΛΙΑ | 75.6 | 7.0 | 0.04439 | 0.0647 | 0.07284 | | Β | 1.2 | 1.0 | 0.036 |
| 1965 | ΜΕΓΑΛΟΠΟΛΗ | 47.3 | 6.1 | 0.03103 | 0.05609 | 0.04536 | | Β | 1.2 | 1.0 | 0.025 |
| 1966 | ΜΕΓΑΛΟΠΟΛΗ | 47.3 | 6.0 | 0.02798 | 0.05167 | 0.04069 | | Β | 1.2 | 1.0 | 0.022 |
| 1752 | ΚΥΛΛΗΝΗ | 45.8 | 6.8 | 0.06674 | 0.1037 | 0.10056 | | Β | 1.2 | 1.0 | 0.053 |
| 1791 | ΚΥΛΛΗΝΗ | 45.8 | 6.8 | 0.06674 | 0.1037 | 0.10056 | | Β | 1.2 | 1.0 | 0.053 |
| 1820 | ΚΥΛΛΗΝΗ | 45.8 | 6.9 | 0.07402 | 0.11256 | 0.1121 | | Β | 1.2 | 1.0 | 0.059 |
| 1873 | ΚΥΛΛΗΝΗ | 45.8 | 6.6 | 0.05425 | 0.08802 | 0.08092 | | Β | 1.2 | 1.0 | 0.043 |
| 1939 | ΚΥΛΛΗΝΗ | 45.8 | 6.3 | 0.03975 | 0.06882 | 0.05841 | | Β | 1.2 | 1.0 | 0.032 |
| 1988 | ΚΥΛΛΗΝΗ | 45.8 | 6.0 | 0.02913 | 0.05382 | 0.04216 | | Β | 1.2 | 1.0 | 0.023 |
| 1993 | ΠΥΡΓΟΣ | 16.9 | 5.2 | 0.03831 | 0.07792 | 0.04653 | | Β | 1.2 | 1.0 | 0.031 |
| 2002 | ΒΑΡΘΟΛΟΜΙΟ | 45.9 | 5.6 | 0.01916 | 0.03859 | 0.02719 | | Β | 1.2 | 1.0 | 0.015 |
| 2008 | ΑΝΔΡΑΒΙΔΑ | 34.8 | 6.5 | 0.06755 | 0.11144 | 0.09637 | | Β | 1.2 | 1.0 | 0.054 |

([1]) Scarlatoudis (2003), ([2]) Rinaldis (1998), ([3]) Βάσει MMI: Koliopoulos (1998)

Από τον ανωτέρω Πίνακα 3.2 προκύπτει ότι μετά την ανασκαφή του αρχαιολογικού χώρου ($19^{ος}$ αι.), μικρές σχετικά σεισμικές εντάσεις έχουν καταπονήσει τον αρχαιολογικό χώρο της αρχαίας Ολυμπίας. Σε κάθε περίπτωση οι κανονιστικές εκτιμήσεις σεισμικής έντασης στην περιοχή της μελέτης υπερβαίνουν συστηματικά τις μακροσεισμικές ιστορικές εκτιμήσεις.

## 4. ΓΕΩΤΕΧΝΙΚΑ ΠΡΟΣΟΜΟΙΩΜΑΤΑ ΤΗΣ ΜΕΛΕΤΗΣ

Στο πλαίσιο της παρούσας γεωτεχνικής μελέτης ελέγχεται το τμήμα του πρανούς ανάντη από το ανάλημμα των Θησαυρών, το οποίο εκτείνεται από την αντηρίδα Ν του αναλήμματος (δυτικό όριο) έως το δυτικό πρανές του αρχαίου σταδίου (Εικ. 4.1β), στην κατεύθυνση του σχεδιασμού μέτρων για την κανονιστική εξασφάλιση της ευστάθειάς του. Ο εν λόγω έλεγχος/σχεδιασμός περιλαμβάνει (μεταξύ άλλων) τους απαραίτητους γεωστατικούς υπολογισμούς ευστάθειας για:

- την ερμηνεία πρόσφατων ολισθήσεων στα τμήματα εδάφους ανάντη των περιοχών μεταξύ των αντηρίδων Ν-Ξ και Ο-Π του αναλήμματος των Θησαυρών,
- την αποτίμηση υφιστάμενης κατάστασης ευστάθειας του υπόλοιπου τμήματος του (προς μελέτη) πρανούς και
- το σχεδιασμό μέτρων κανονιστικής εξασφάλισης της ευστάθειας

Οι ανωτέρω γεωστατικοί υπολογισμοί πραγματοποιούνται με 2-διάστατες αναλύσεις επί επαρκούς αριθμού διατομών/γεωτεχνικών προσομοιωμάτων του πρανούς οι οποίες οι οποίες είναι αντιπροσωπευτικές της γεωμετρίας (αναγλύφου του πρανούς) και της γεωτεχνικής στρωματογραφίας χαρακτηριστικών περιοχών του (προς μελέτη) πρανούς. Ειδικότερα, για την διεξοδική υπολογιστική τεκμηρίωση της ευστάθειας του (προς μελέτη) πρανούς επιλέγονται 6 χαρακτηριστικές διατομές, ως ακολούθως:

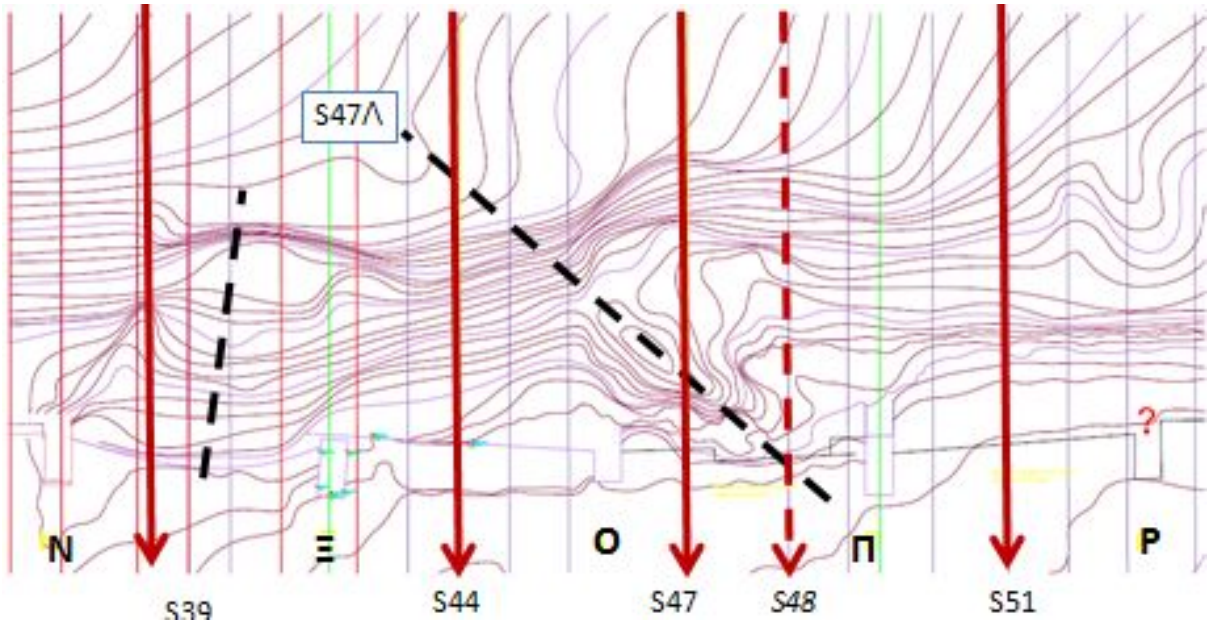
- Διατομή S39, αντιπροσωπευτική του πρανούς ανάντη του αναλήμματος στην περιοχή των αντηρίδων Ν – Ξ. Η διατομή S39 έχει διεύθυνση εγκάρσια στο διαμήκη άξονα του αναλήμματος, και παράλληλη στη διεύθυνση της πρόσφατης ολίσθησης του πρανούς (2019) στην εν λόγω περιοχή.
- Διατομή S44, αντιπροσωπευτική του πρανούς ανάντη του αναλήμματος στην περιοχή των αντηρίδων Ξ-Ο. Η διατομή S44 έχει διεύθυνση εγκάρσια στο διαμήκη άξονα του αναλήμματος (πρακτικά κάθετα στις ισοϋψείς του πρανούς στην εν λόγω περιοχή, η οποία παρέμεινε ευσταθής κατά τις πρόσφατες ολισθήσεις (2019).
- Διατομή S47, αντιπροσωπευτική του πρανούς ανάντη του αναλήμματος στην περιοχή των αντηρίδων Ο – Π. Η διατομή S47 έχει διεύθυνση εγκάρσια στο διαμήκη άξονα του αναλήμματος, και λοξή ως προς τη διεύθυνση της πρόσφατης ολίσθησης του πρανούς (2019) στην εν λόγω περιοχή. Υπό την έννοια αυτή είναι συντηρητική ως προς τη γεωμετρία της ολίσθησης.
- Διατομή S47Λ, επίσης αντιπροσωπευτική του πρανούς ανάντη του αναλήμματος στην περιοχή των αντηρίδων Ο – Π. Η διατομή S47 έχει διεύθυνση λοξή στο διαμήκη άξονα του αναλήμματος, και παράλληλη ως

προς τη διεύθυνση της πρόσφατης ολίσθησης του πρανούς (2019) στην εν λόγω περιοχή. Υπό την έννοια αυτή είναι έχει ευμενέστερα γεωμετρικά χαρακτηριστικά από τη διατομή S47 και είναι πλέον αντιπροσωπευτική της γεωμετρίας της ολίσθησης.

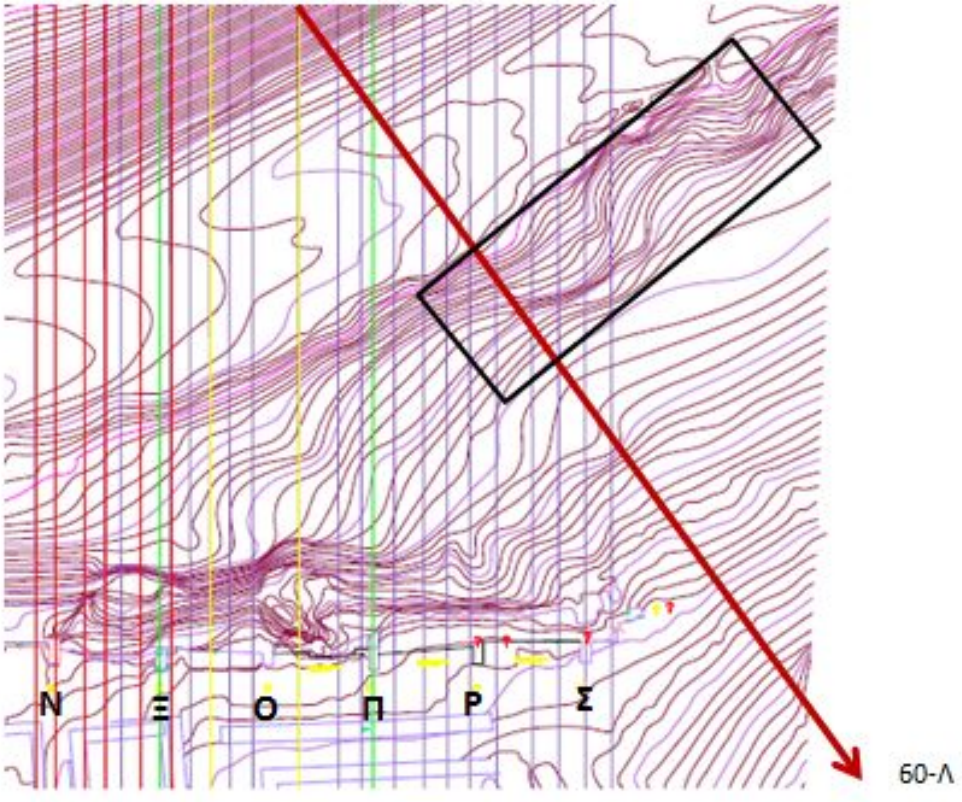
ΣΗΜΕΙΩΣΗ: Κατά την τελική αποτίμηση της ευστάθειας με τα μέτρα επέμβασης, ελέγχεται, η γειτονική στην S47, διατομή S48 (δες κεφ. 8 της παρούσας μελέτης) η οποία είναι η δυσμενέστερη από άποψη γεωμετρικού αναγλύφου.

- Διατομή S51, αντιπροσωπευτική του πρανούς ανάντη του αναλήμματος στην περιοχή των αντηρίδων Π-Ρ. Η διατομή S51 έχει διεύθυνση εγκάρσια στο διαμήκη άξονα του αναλήμματος (πρακτικά κάθετα στις ισοϋψείς του πρανούς στην εν λόγω περιοχή, η οποία παρέμεινε ευσταθής κατά τις πρόσφατες ολισθήσεις (2019).
- Διατομή S60Λ, αντιπροσωπευτική του πρανούς στην περιοχή του δυτικού άκρου του αρχαίου σταδίου. Η διατομή έχει διεύθυνση λοξή ως προς το διαμήκη άξονα του αναλήμματος και εγκάρσια στις ισοϋψείς οι οποίες χαρακτηρίζουν την εν λόγω περιοχή του πρανούς. Σημειωτέον ότι η εν λόγω περιοχή παρουσιάζει διαχρονική ευστάθεια από την ανασκαφική αποκάλυψη της περιοχή ς τον $19^{ο}$ αι.

Οι ανωτέρω διατομές, παρουσιάζονται επίσης στα αποσπάσματα οριζοντιογραφίας των Εικόνων 4.1.α και 4.1β. Για την ονομασία των διατομών χρησιμοποιείται η σχετική ονοματοδοσία η οποία απαντάται στα σχέδια τοπογραφικής αποτύπωσης της υπό μελέτη περιοχής (στο πλαίσιο της παρούσας μελέτης).




Εικ. 4.1α: Άξονες υπολογιστικών διατομών ευστάθειας στην περιοχή μελέτης (ΥΠΟΛΟΓΙΣΤΙΚΕΣ ΔΙΑΤΟΜΕΣ ανάντη του αναλήμματος των Θησαυρών)




Εικ. 4.1β: Άξονας υπολογιστικών διατομών ευστάθειας στην περιοχή μελέτης (υπολογιστικη ΔΙΑΤΟΜΗ ΠΡΑΝΟΥΣ στο δυτικό όριο αρχαίου σταδίου)

Αναφορικά με τη γεωτεχνική διαστρωμάτωση των ανωτέρω διατομών, αξιοποιούνται δεδομένα από τη διαθέσιμη για τη μελετώμενη περιοχή γεωτεχνική έρευνα (Εγγλέζος, 2013, δες παράγραφο 3.2 του παρόντος τεύχους). Σύμφωνα με τα δεδομένα της εν λόγω έρευνας, το πρανές δομείται από 4 βασικές γεωτεχνικές ενότητες (Ενότητες I – IV), των οποίων τα φυσικά και μηχανικά χαρακτηριστικά περιλαμβάνονται στον Πίνακα 3.1 της παραγράφου 3.2.1 του παρόντος τεύχους.

Η γεωμετρία και τα γεωτεχνικά στρωματογραφικά δεδομένα των ανωτέρω 6 διατομών υπολογισμού παρουσιάζονται στις εικόνες 5.2 – 5.7 του παρόντος κεφαλαίου.

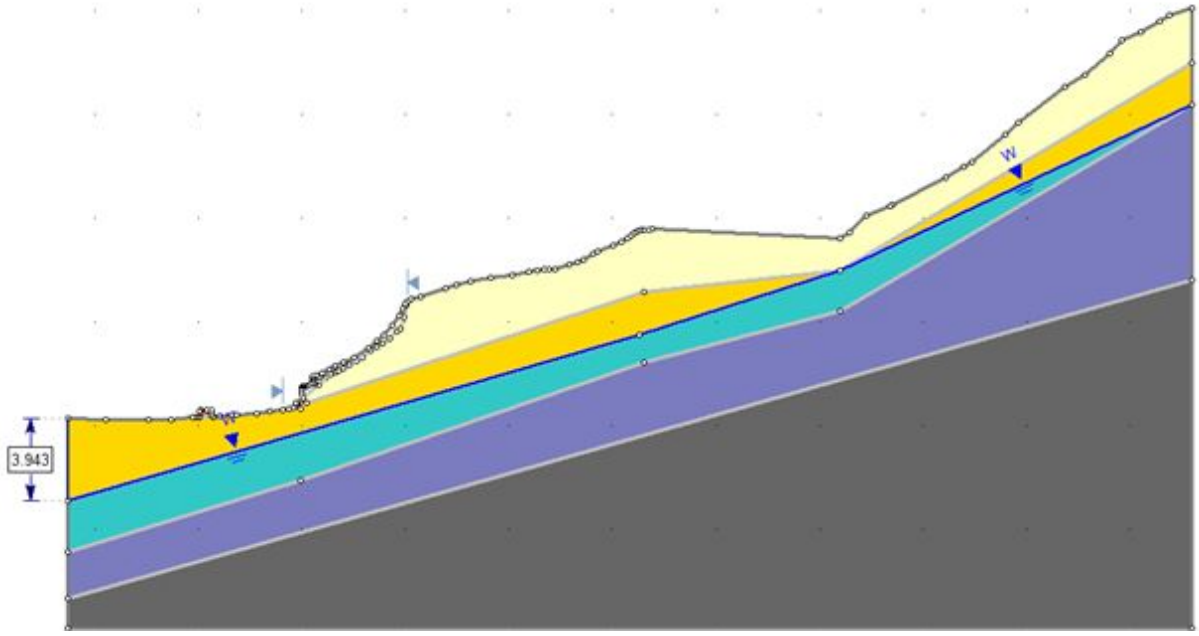
Για τη γεωμετρική απόδοση της γεωτεχνικής στρωματογραφίας στις 6 διατομές της παρούσας μελέτης, αξιοποιούνται τα μητρώα των γεωτρήσεων της διαθέσιμης γεωτεχνικής έρευνας (δες παράγραφο 1.3 της παρούσας μελέτης: Εγγλέζος,2013) και οι συνταχθείσες γεωτεχνικές διατομές για τη γεωστατική μελέτη στερέωσης του πρανούς (δες παράγραφο 1.3 της παρούσας μελέτης: Εγγλέζος, 2014).

Οι φυσικές και μηχανικές ιδιότητες των γεωτεχνικών ενοτήτων οι οποίες δομούν τις 6 διατομές υπολογισμού λαμβάνονται καταρχήν από τον Πίνακα 3.1 της παραγράφου 3.2.1 του παρόντος τεύχους. Ειδικά, για την επιφανειακή Ενότητα Ι, στην οποία εκδηλώθηκαν οι πρόσφατες ολισθήσεις, οι μηχανικές παράμετροι διατμητικής αντοχής εκτιμώνται βάσει ανάδρομων αναλύσεων ερμηνείας των εν λόγω αστοχιών.

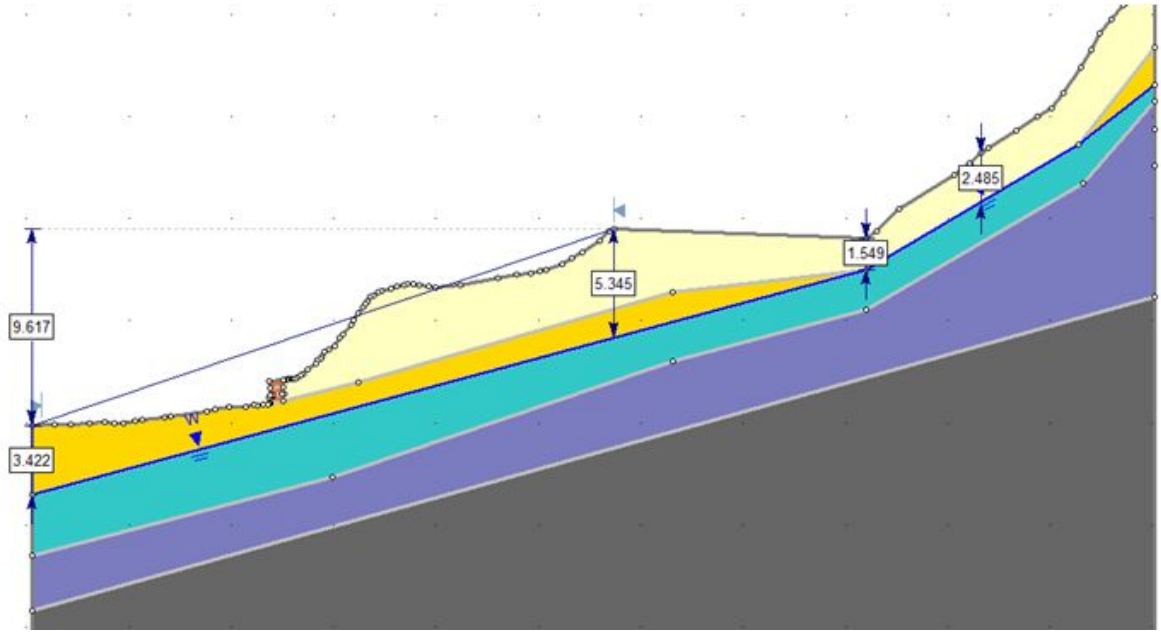
***Material Properties***

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT |
|---|---|---|---|---|---|---|---|
| Color | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 |
| Friction Angle [deg] | 28 | 30 | 33 | 34 | 25 | 45 | 28 |
| Water Surface | None | None | Water Table | Water Table | None | None | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | | | Automatically Calculated |
| Ru Value | 0 | 0 | | | 0 | 0 | |

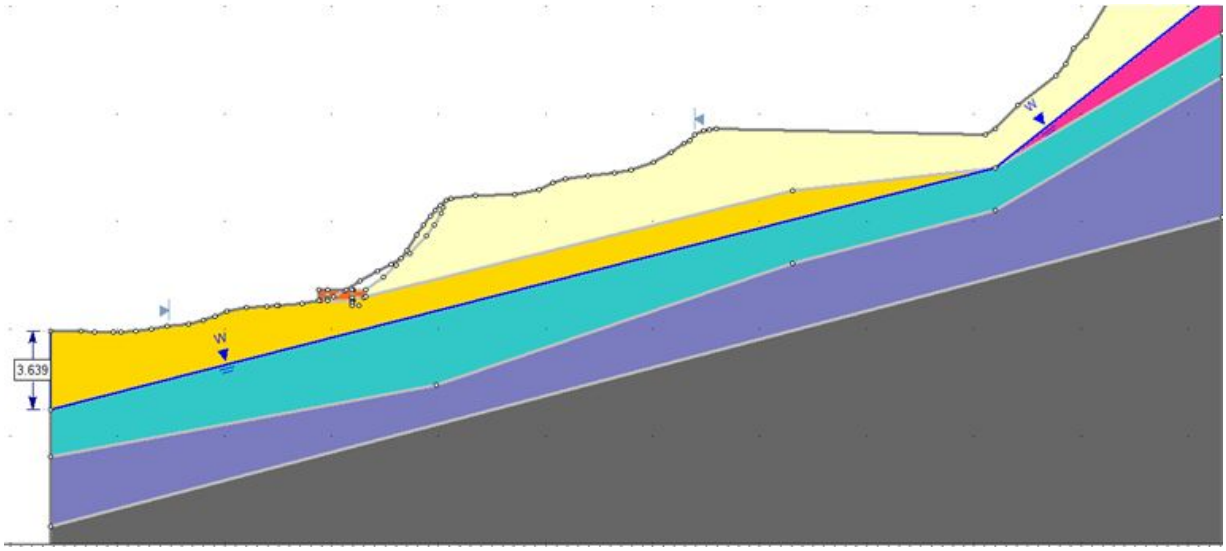
Εικ. 4.2: Χρωματικό υπόμνημα των γωϋλικών τωνγεωτεχνικών προσομοιωμάτων στο υπό μελέτη πρανές ανάντη του αναλήμματος των Θησαυρών.



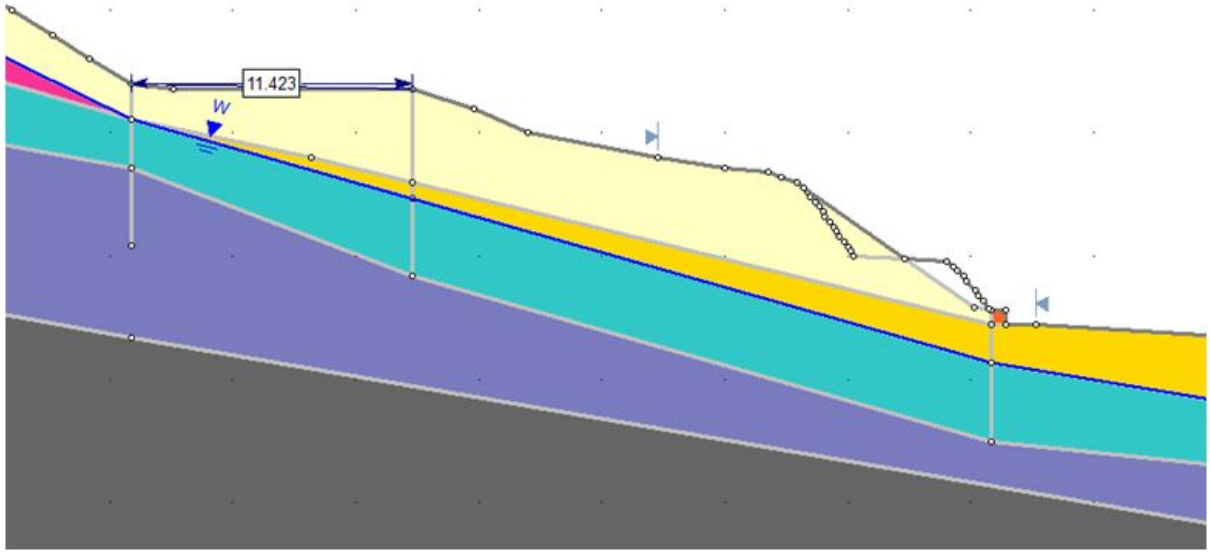

Εικ. 4.3: Γεωτεχνικό προσομοίωμα στη διατομή S39 του υπό μελέτη πρανές ανάντη του αναλήμματος των Θησαυρών.



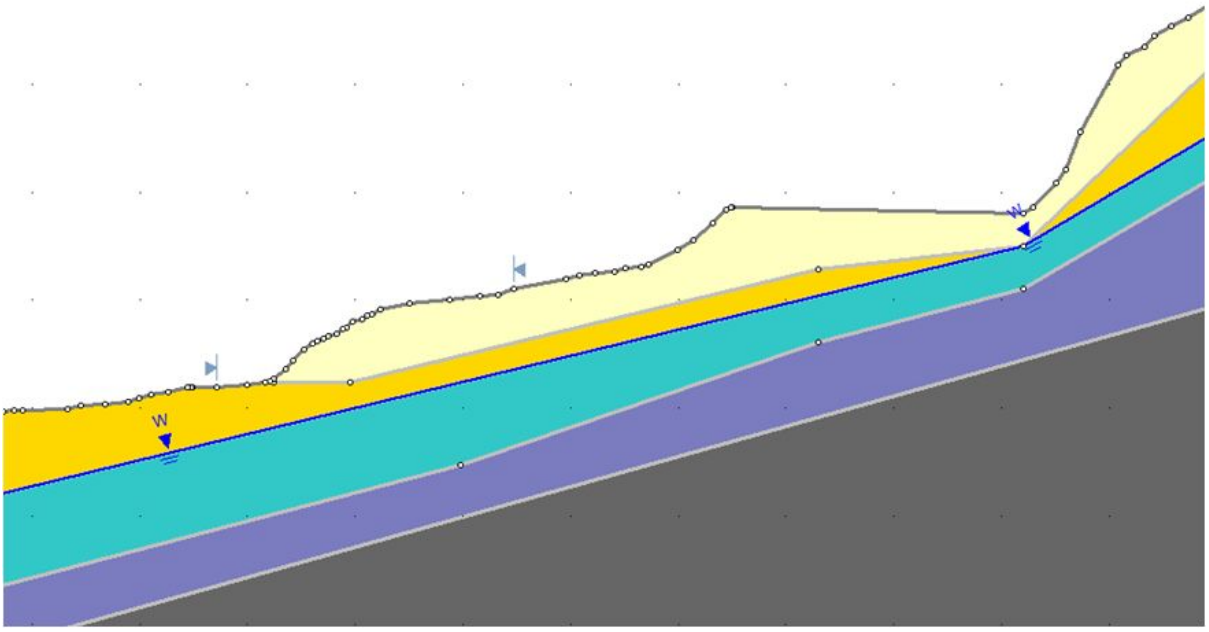

Εικ. 4.4: Γεωτεχνικό προσομοίωμα στη διατομή S44 του υπό μελέτη πρανές ανάντη του αναλήμματος των Θησαυρών.



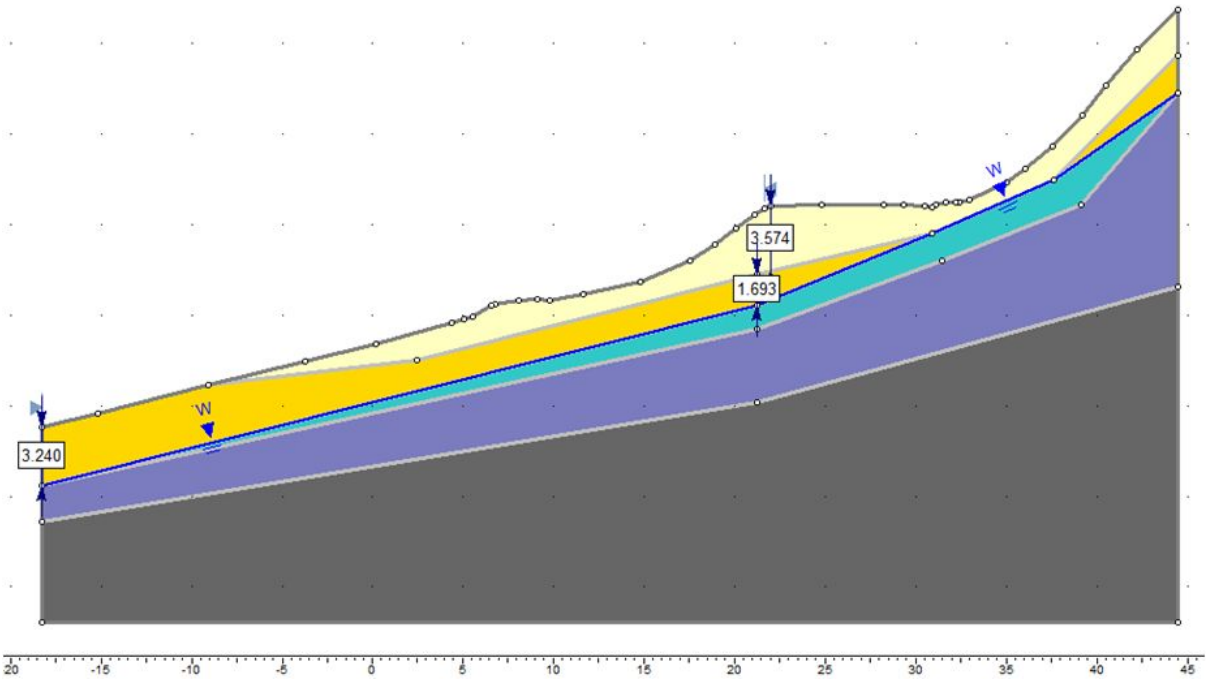

Εικ. 4.5: Γεωτεχνικό προσομοίωμα στη διατομή S47 του υπό μελέτη πρανές ανάντη του αναλήμματος των Θησαυρών (εκτιμώμενη γεωμετρία προ ολίσθησης).




Εικ. 4.6: Γεωτεχνικό προσομοίωμα στη διατομή S47Λ του υπό μελέτη πρανές ανάντη του αναλήμματος των Θησαυρών (εκτιμώμενη γεωμετρία προ ολίσθησης).




Εικ. 4.7: Γεωτεχνικό προσομοίωμα στη διατομή S51 του υπό μελέτη πρανές ανάντη του αναλήμματος των Θησαυρών.




Εικ. 4.8: Γεωτεχνικό προσομοίωμα στη διατομή S60Λ του υπό μελέτη πρανές ανάντη του αναλήμματος των Θησαυρών.

# 5. Ο ΒΑΣΙΚΟΣ ΣΧΕΔΙΑΣΜΟΣ ΤΗΣ ΜΕΛΕΤΗΣ – ΚΑΤΑΣΤΡΩΣΗ ΤΩΝ ΓΕΩΣΤΑΤΙΚΩΝ ΥΠΟΛΟΓΙΣΜΩΝ -

## 5.1. Γενικά

Η οργάνωση και ο βασικός σχεδιασμός της γεωτεχνικής μελέτης περιλαμβάνει τα ακόλουθα βήματα:

**Α. Αναφορικά με τον σχεδιασμό χωματουργικής αποκατάστασης- κανονιστικής εξασφάλισης του πρανούς στην περιοχή μεταξύ του ανατολικού τμήματος του αναλήμματος των Θησαυρών και του δυτικού ορίου των πρανών του αρχαίου σταδίου**:

1. Υπολογιστική ερμηνεία των ολισθήσεων (διατομές S39, S47, S47Λ)
2. Υπολογιστική αποτίμηση της ευστάθειας των διατηρούμενων –επί του παρόντος- σε κατάσταση ευστάθειας τμημάτων πρανούς στην περιοχή μελέτης (διατομές S44, S51, S60Λ) βάσει κανονιστικών απαιτήσεων
3. Υπολογιστικός σχεδιασμός χωματουργικής αποκατάστασης του πρανούς στην περιοχή μελέτης (διατομές S39, S44, S48, S51, S60Λ) η οποία εν συντομία περιλαμβάνει:

- Αφαίρεση της ολισθήσασας (ή δυνάμει επιρρεπούς σε ολίσθηση) εδαφικής μάζας στο τμήμα μεταξύ των αντηρίδων Ν και Π, με δημιουργία προσωρινού πρανούς κλίσης H:V = 1:1.
- Δημιουργία προτειχίσματος αντιστήριξης του προσωρινού πρανούς από συρματοκιβώτια με λιθορριπή, με ταυτόχρονη δημιουργία του βασικού πυρήνα για την χωματουργική τελική διαμόρφωση του πρανούς στην περιοχή μελέτης.
- Εγκατάσταση μικροπασσάλων στις περιοχές μεταξύ των αντηρίδων Ξ και Ο (διατομή S44) και Π και Ρ (διατομή S51) μπροστά από το αρχαίο -προς αναστήλωση- ανάλημμα.

4. Υπολογιστική τεκμηρίωση του σχεδιασμού βασικής αντιστήριξης του πρανούς (στο τμήμα μεταξύ αντηρίδων Ν και Ρ με προτείχισμα από συρματοκιβώτια με λιθορριπή.

**Β. Συνδρομή σε γεωστατικά θέματα τα οποία αφορούν στην εκπόνηση της στατικής, της αρχιτεκτονικής και της υδραυλικής μελέτης**

5. Γεωστατικοί υπολογισμοί για το σχεδιασμό της θεμελίωσης επί μικροπασσάλων των νέων διατάξεων αντιστήριξης στο τμήμα του αναλήμματος από το δυτικό άκρο του αναλήμματος έως την αντηρίδα Ξ. Οι υπολογισμοί αυτοί γίνονται επικουρικά, στο

πλαίσιο συνδρομής της στατικής μελέτης (εκτός των συμβατικών υποχρεώσεων της γεωτεχνικής μελέτης)

6. Υπολογιστική κανονιστική αποτίμηση/τεκμηρίωση της ευστάθειας του (αναστηλούμενου βάσει της σχετικής αρχιτεκτονικής πρότασης) αναλήμματος στην περιοχή αντηρίδων Ν-Σ, με θεώρηση αποκαταστημένου ανάντη πρανούς, βάσει του γεωτεχνικού και του υδραυλικού σχεδιασμού. Η ανωτέρω αποτίμηση επικυρώνει την επάρκεια του συνολικού διεπιστημονικού σχεδιασμού για την περιοχή του αναλήμματος ανατολικά της αντηρίδας Ν.

## 5.2. Περιγραφή των αναλύσεων

Προκειμένου να τεκμηριωθούν ποσοτικά οι ανωτέρω τεθέντες στόχοι, εκπονούνται οι ακόλουθοι γεωστατικοί-γεωσεισμικοί υπολογισμοί:

- Αναλύσεις ευσταθείας με τη μέθοδο οριακής ισορροπίας α) για ερμηνεία των ολισθητικών φαινομένων τα οποία συνέβησαν στο ανατολικό άκρο του αναλήμματος των Θησαυρών (χειμώνας 2019) ως αποτέλεσμα ισχυρών βροχοπτώσεων, β) για αποτίμηση της υφιστάμενης κατάστασης και γ) για την ποσοτική τεκμηρίωση προτεινόμενων μέτρων επέμβασης. Οι αναλύσεις με τη μέθοδο οριακής ισορροπίας, πραγματοποιούνται με το λογισμικό SLIDE της Rocscience.
- Στατική ανάλυση/έλεγχος εσωτερικής και εξωτερικής ευστάθειας των γεωτεχνικών μέτρων επέμβασης (προτειχίσματος συρματοκιβωτίων) α) για τη χωματουργική αποκατάσταση της μορφολογίας του ανατολικού πρανούς και του αντίστοιχου τμήματος του Αναλήμματος των Θησαυρών (συνεργασία με μελετητή υδραυλικής μελέτης και αρχιτεκτονικής μελέτης) σε κανονιστικά σενάρια φόρτισης. Οι στατικές αναλύσεις του προτειχίσματος συρματοκιβωτίων πραγματοποιούνται με το λογισμικό Macstars της Maccaferri.
- Αναλύσεις αλληλεπίδρασης εδάφους – αναλήμματος, με πεπερασμένα και διακριτά στοιχεία, για την επάρκεια του προς αναστήλωση τμήματος του Αναλήμματος των Θησαυρών (στην περιοχή μεταξύ των αντηρίδων Ν και Ρ του αναλήμματος) σε συνεργασία με το μελετητή της αρχιτεκτονικής πρότασης αναστήλωσης (Γ. Αντωνίου). Οι αναλύσεις με πεπερασμένα στοιχεία, πραγματοποιούνται με το λογισμικό PHASE της Rocscience.
- Αναλύσεις υπολογισμού του οριζόντιου και κατακόρυφου φορτίου μικροπασσάλων για το σχεδιασμό θεμελίωσης νέας διάταξης μεταλλικών αντηρίδων αντιστήριξης του –ευρισκόμενου σε δυσμενή από άποψη ισορροπίας γεωμετρία- τμήματος του αναλήμματος μεταξύ του δυτικού άκρου του αναλήμματος και της αντηρίδας Ν (σε

συνεργασία με το μελετητή στατικής μελέτης, από τον οποίο υπολογίστηκαν τα φορτία επί των μικροπασσάλων θεμελίωσης). Οι αναλύσεις μικροπασσάλων πραγματοποιούνται με το λογισμικό ALLPILE της Civiltech.

Η οργάνωση των γεωστατικών – γεωσεισμικών υπολογισμών, οι θέσεις στις οποίες πραγματοποιούνται αναλύσεις για την αποτίμηση της ευστάθειας του πρανούς από την αντηρίδα Ν έως τα δυτικά πρανή του αρχαίου σταδίου, ο τύπος των αναλύσεων, η προσομοίωση των υλικών και τα εξεταζόμενα σενάρια φόρτισης περιγράφονται αναλυτικά στις ακόλουθες παραγράφους του παρόντος Κεφαλαίου.

# 6. ΑΝΑΛΥΣΕΙΣ ΕΡΜΗΝΕΙΑΣ ΠΡΟΣΦΑΤΩΝ ΟΛΙΣΘΗΣΕΩΝ ΤΟΥ ΠΡΑΝΟΥΣ (2019) ΑΝΑΝΤΗ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ - ΒΑΘΜΟΝΟΜΗΣΗΣ ΙΔΙΟΤΗΤΩΝ ΓΕΩΤΕΧΝΙΚΗΣ ΕΝΟΤΗΤΑΣ Ι

Το παρόν κεφάλαιο περιλαμβάνει τους γεωστατικούς υπολογισμούς οι οποίοι αποσκοπούν α) στην εκτίμηση και τη βαθμονόμηση των μηχανικών ιδιοτήτων των γεωϋλικών τα οποία δομούν το υπό μελέτη πρανές, ανάντη του αναλήμματος των Θησαυρών (και ειδικότερα της επιφανειακής γεωτεχνικής ΕΝΟΤΗΤΑΣ Ι) και β) την ερμηνεία των πρόσφατων (2019) ολισθήσεων ανάντη του αναλήμματος των Θησαυρών (περιοχές ανάντη του διαστήματος μεταξύ των αντηρίδων α) Ν-Ξ και β) Ο-Π). ,

Για το σκοπό αυτό επιλέγονται, για ανάδρομες 2-Δ αναλύσεις ευσταθείας, υπολογιστικές διατομές οι οποίες:

i) Αντιπροσωπεύουν τους άξονες κατεύθυνσης των πρόσφατων (2019) ολισθήσεων. Με τις ανάδρομες 2-Δ αναλύσεις ευσταθείας, με όρους οριακής ισορροπίας, επιχειρούνται να αναπαραχθούν υπολογιστικά οι παρατηρούμενες ολισθήσεις:
   - Διατομή S39 (περιοχή ανάντη των αντηρίδων Ν και Ξ)
   - Διατομή S47 (περιοχή ανάντη των αντηρίδων Ο και Π)
   - Διατομή S47Λ (περιοχή ανάντη των αντηρίδων Ο και Π)

ii) Αντιπροσωπεύουν περιοχές (της μελέτης) στις οποίες το πρανές ανάντη του αρχαίου αναλήμματος – κατά τη φάση ολίσθησης γειτονικών περιοχών (2019)- παρέμεινε ευσταθές:
   - Διατομή S44 (περιοχή ανάντη των αντηρίδων Ξ και Ο)
   - Διατομή S51 (περιοχή ανάντη των αντηρίδων Π και Ρ)
   - Διατομή S60Λ (περιοχή πρανών στο δυτικό μόριο του αρχαίου σταδίου)

## 6.1. Περιγραφή των ανάδρομων αναλύσεων - Δεδομένα για τις αναλύσεις

Α. ΔΕΔΟΜΕΝΑ - ΠΑΡΑΔΟΧΕΣ

Για την υλοποίηση των ανάδρομων αναλύσεων θεωρούνται τα ακόλουθα δεδομένα και παραδοχές:

- Τα αποτελέσματα των ανάδρομων αναλύσεων, για τα σενάρια τα οποία εξετάζονται, (πρέπει να) ικανοποιούν αυταπόδεικτες μηχανικές καταστάσεις. Εν προκειμένω, βάσει του πρόσφατου ιστορικού του πρανούς, πρέπει να προκύπτει (οριακή) επιφανειακή ολίσθηση –εντός της ΕΝΟΤΗΤΑΣ Ι- για τις υπολογιστικές διατομές S39 S47, S47Λ και ευστάθεια για τις υπολογιστικές διατομές S44 S51, S60Λ.

- Τα εξεταζόμενα πρανή δομούνται από τις συνεκτικές γεωτεχνικές ΕΝΟΤΗΤΕΣ Ι – IV (Πίνακας 3.1, §3.2.1 της παρούσας μελέτης) και περιγράφονται στρωματογραφικά από τα γεωτεχνικά προσομοιώματα του κεφαλαίου 4 της παρούσας μελέτης, με την –εκτιμώμενη- γεωμετρία πριν τις πρόσφατες (2019) ολισθήσεις.
- Για τα εδαφικά υλικά τα οποία δομούν το πρανές θεωρούνται καταρχάς χαρακτηριστικές τιμές μηχανικών και φυσικών ιδιοτήτων, σύμφωνα με τη διαθέσιμη για την περιοχή του πρανούς γεωτεχνική έρευνα (Εγγλέζος (2013), Πίνακας 3.1, §3.2.1 της παρούσας μελέτης).
- Οι ολισθήσεις του πρανούς (θέσεις διατομών S39 S47, S47Λ) αποδίδονται σε επίδραση του νερού (σε συμφωνία με τα πραγματικά γεγονότα τα οποία προκάλεσαν τα ολισθητικά φαινόμενα το χειμώνα του 2019), με εύλογη θεώρηση ανάπτυξης σχετικά υψηλής υδατικής υπερπίεσης (μετά από ισχυρή βροχόπτωση) ίσης με RU=0.10.
- Κατά τις ανάδρομες αναλύσεις, στις υπολογιστικές διατομές οι οποίες αντιπροσωπεύουν γεγονός ολίσθησης, επιδιώκεται η τιμή οριακού συντελεστή ασφαλείας (**FS <= 1.0)**. Στην κατεύθυνση αυτή πραγματοποιούνται επαναληπτικά αναλύσεις με αρχικές τιμές διατμητικής αντοχής της ΕΝΟΤΗΤΑΣ Ι: **c=2 kPa, φ = 28$^o$** (τιμές συνοχής **c** και γωνία διατμητικής αντοχής **φ** ίσες με τις προκύψασες κατά τη αξιολόγηση της γεωτεχνικής έρευνας το 2013: Εγγλέζος, 2013). Μέχρι την επίτευξη του οριακού συντελεστή ασφαλείας, εξετάζεται διαδοχικά i) αύξηση της αρχικής τιμής της συνοχής ανά 0.5 kPa έως την τιμή $c_{max}$=4 kPa και –εάν απαιτείται - ii) αύξηση της γωνίας διατμητικής αντοχής κατά 1$^o$ (28$^o$ => 29$^o$).
- Η ανωτέρω διαδικασία εφαρμόζεται και για τις υπολογιστικές διατομές οι οποίες αντιπροσωπεύουν περιοχές πρανούς με ευσταθή κατάσταση (διατομές S44, S51 και S60Λ).
- Βάσει των ανωτέρω δεδομένων, στις επιλεγμένες θέσεις υπολογισμού πραγματοποιήθηκαν 2-Δ αναλύσεις ευστάθειας με τη μέθοδο οριακής ισορροπίας, με 2 καθιερωμένες υπολογιστικές μεθόδους (BISHOP, JANBU διορθωμένη), με εξέταση κυκλικών επιφανειών αστοχίας (οι οποίες οδηγούν σε ελαφρώς δυσμενέστερα αποτελέσματα από πολυγωνικές επιφάνειες στην περίπτωση του συγκεκριμένου πρανούς).
- Ειδικά, στη διατομή S39, ως ανάντη όρια για την διερεύνηση κυκλικών επιφανειών ολίσθησης τίθεται η εμπρόσθια παρειά των υφιστάμενων πασσάλων σταθεροποίησης του πρανούς, έναντι γενικής ολίσθησης. Επιπλέον, λαμβάνοντας υπόψιν τη διαταραχή του εδάφους από την κατασκευή των –μεγάλης διαμέτρου-

υφιστάμενων πασσάλων στην περιοχή της διατομής S39, θεωρείται μικρή απομείωση της συνοχής της εδαφικής ΕΝΟΤΗΤΑΣ Ι κατά 5% ($c_{s39}$ = 1.90 kPa).

## 6.2. Αποτελέσματα των ανάδρομων αναλύσεων

Συνολικά, πραγματοποιήθηκαν 18 ανάδρομες αναλύσεις οριακής ισορροπίας. Τα αποτελέσματα των εν λόγω αναλύσεων παρουσιάζονται συγκεντρωτικά στον ακόλουθο Πίνακα 6.1.

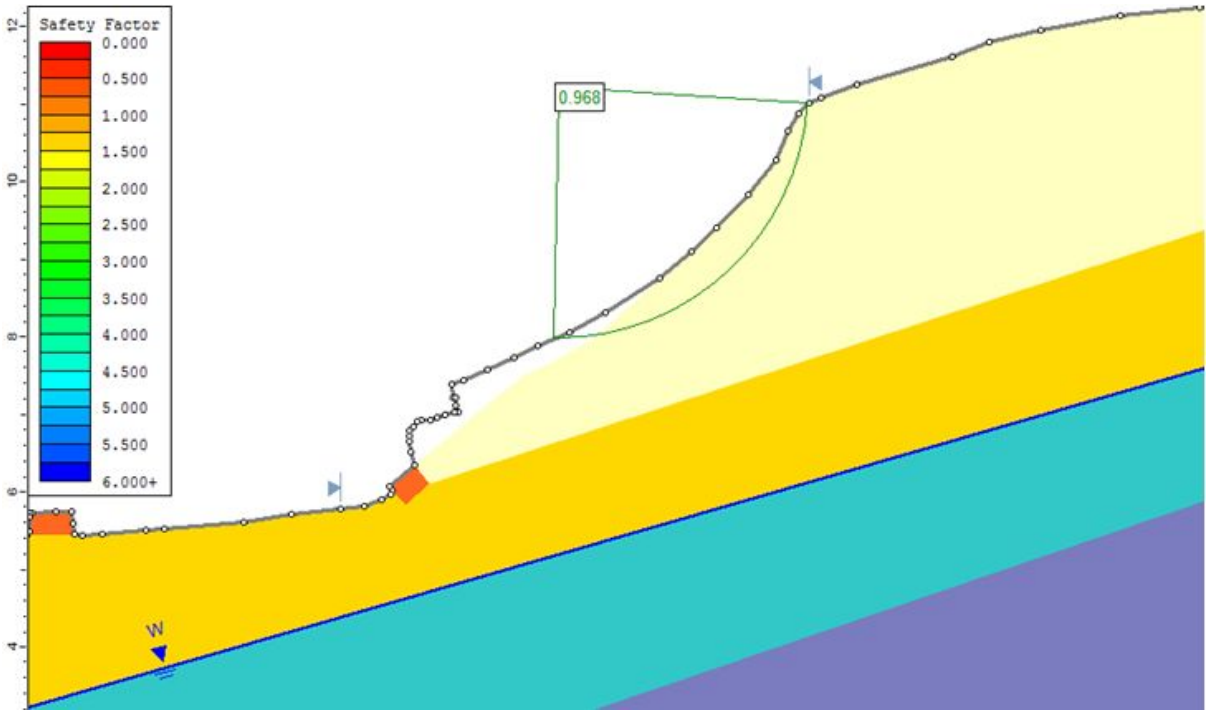
Πίνακας 6.1: Αποτελέσματα ανάδρομων αναλύσεων ευσταθείας για την ερμηνεία αστοχιών-βαθμονόμησης γεωτεχνικών ιδιοτήτων ΕΝΟΤΗΤΑΣ Ι

| 2-Δ ΑΝΑΔΡΟΜΕΣ ΑΝΑΛΥΣΕΙΣ ΟΡΙΑΚΗΣ ΙΣΟΡΡΟΠΙΑΣ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ΔΙΑΤΟΜΗ | ΠΕΡΙΟΧΗ ΑΝΑΛΗΜΜΑΤΟΣ (βάσει αντηρίδων) | ΠΑΡΑΤΗΡΗΣΗ | ΣΥΝΤΕΛΕΣΤΗΣ ΑΣΦΑΛΕΙΑΣ, FS | | | | | | ΕΝΟΤΗΤΑ Ι | |
| | | | Κανονικές Συνθήκες | | Υψηλή Υδροφορία (RU=0.10) | | Σεισμός 1959 (ah=0.032) | | c [1](kPa) | φ(ο) [2] |
| | | | BISHOP | JANBU cor. | BISHOP | JANBU cor. | BISHOP | JANBU cor. | | |
| S39[3] | Ν - Ξ | Αστοχία πρανούς και αναλήμματος, RU=0.10[5] | | | 0.99 | 0.97 | | | 1.90 [6] | 28 |
| S44[3] | Ξ - Ο | Οριακή ευστάθεια, RU=0.10[5] | | | 1.01 | 1.00 | | | 4 | 29 |
| S47[3] | Ξ - Ο | Αστοχία πρανούς και αναλήμματος, RU=0.10[5] | | | 0.98 | 0.98 | | | 4 | 29 |
| S47Λ[4] | Ο - Π | Αστοχία πρανούς και αναλήμματος, RU=0.10[5] | | | 0.99 | 0.98 | | | 2 | 28 |
| S51[3] | Π - Ρ | Οριακή ευστάθεια, RU=0.10[5] | | | 1.13 | 1.12 | | | 2 | 28 |
| S60Λ[4] | Περιοχή πρανών αρχ. Σταδίου | ευστάθεια, RU=0.10[5] | | | 1.22 | 1.17 | | | 2 | 28 |

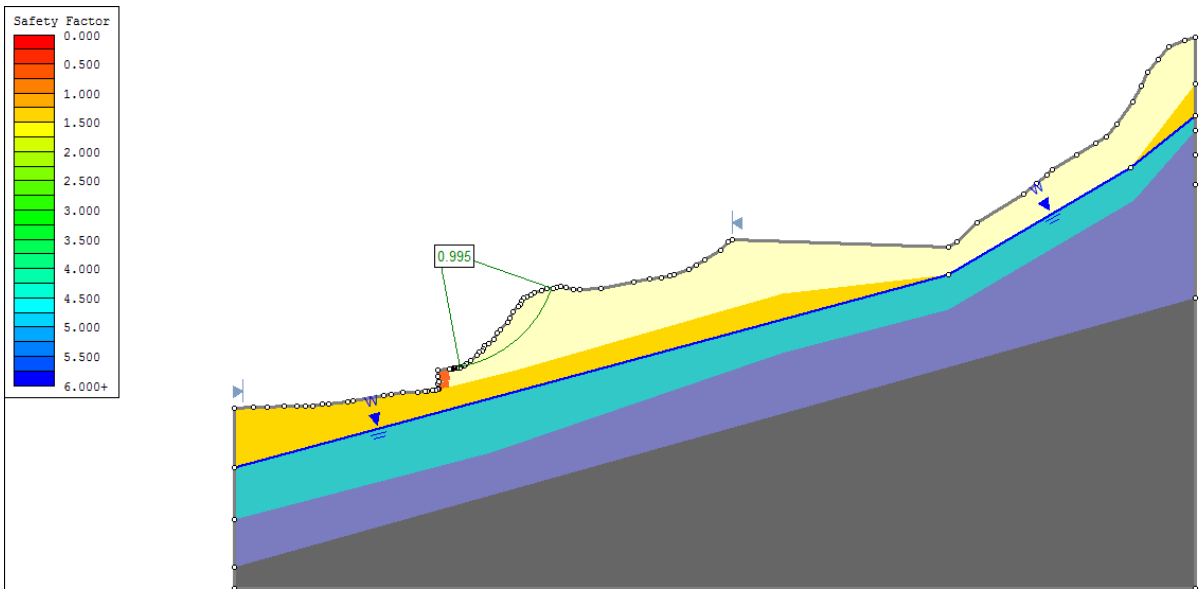
1: ΕΝΟΤΗΤΑ Ι: Από τις ανάδρομες αναλύσεις
2:ΕΝΟΤΗΤΑ Ι: Παραδοχή
3: Εγκάρσια στον άξονα του αναλήμματος
4: Λοξά στον άξονα του αναλήμματος, στη διεύθυνση του άξονα της ολίσθησης
5: Παραδοχή σχετικά υψηλής υδατικής υπερπίεσης λόγω ισχυρών παρατεταμένων βροχοπτώσεων, RU=0.10
6: Θεώρηση διαταραχής εδάφους λόγω των πασσάλων Φ120 => απομείωση 5% της συνοχής c

ΧΡΩΜΑΤΙΚΟ ΥΠΟΜΝΗΜΑ: Συντελεστής ασφαλείας σε ΑΝΑΛΥΣΕΙΣ ΟΡΙΑΚΗΣ ΙΣΟΡΡΟΠΙΑΣ)
Ευστάθεια, εξασφάλιση κανονιστικής απαίτησης
Όχι Αστοχία, μη εξασφάλιση κανονιστικής απαίτησης κατά EC-7
Υπολογιστική Αστοχία

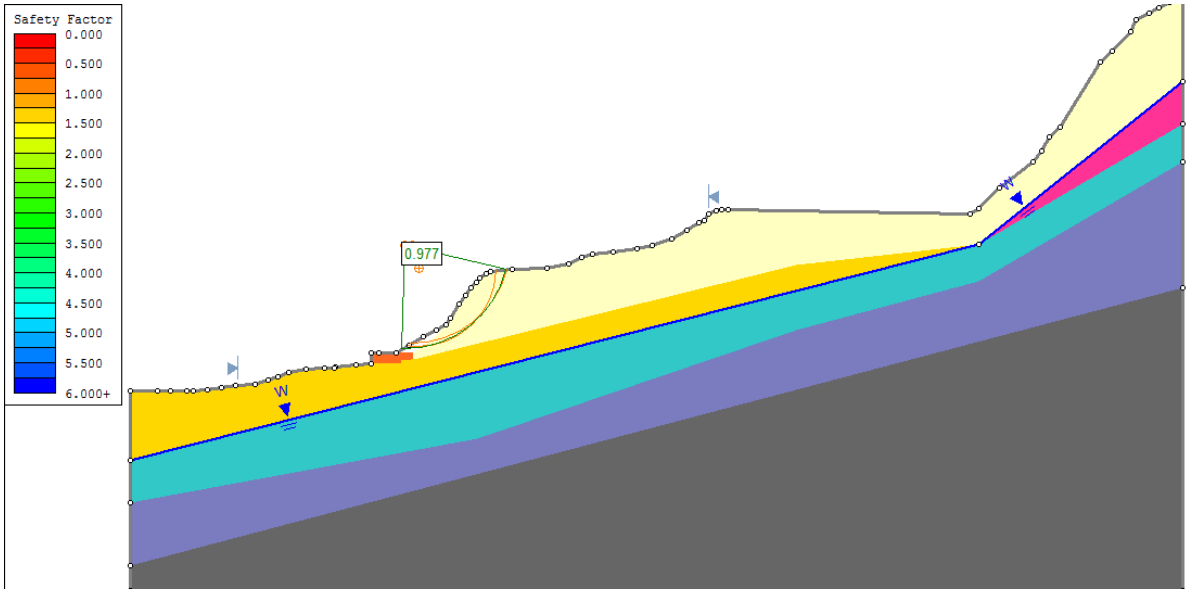
Τα αποτελέσματα από τις ανάδρομες αναλύσεις ερμηνείας ολισθήσεων - βαθμονόμησης, υπό το καθεστώς αυξημένης επίδρασης του νερού, παρουσιάζονται στις ακόλουθες εικόνες (Εικ.6.1 έως Εικ. 6.6).



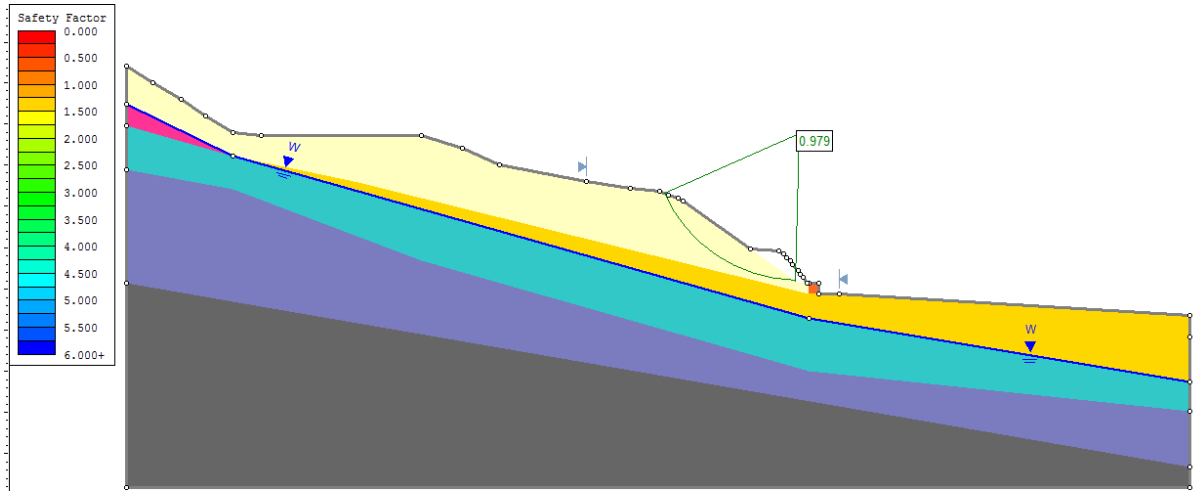

Εικ. 6.1: Ανάδρομη ανάλυση στη διατομή S39. Κυκλική επιφάνεια ολίσθησης, μέθοδος JANBU διορθ., RU=0.10, FS=0.97.



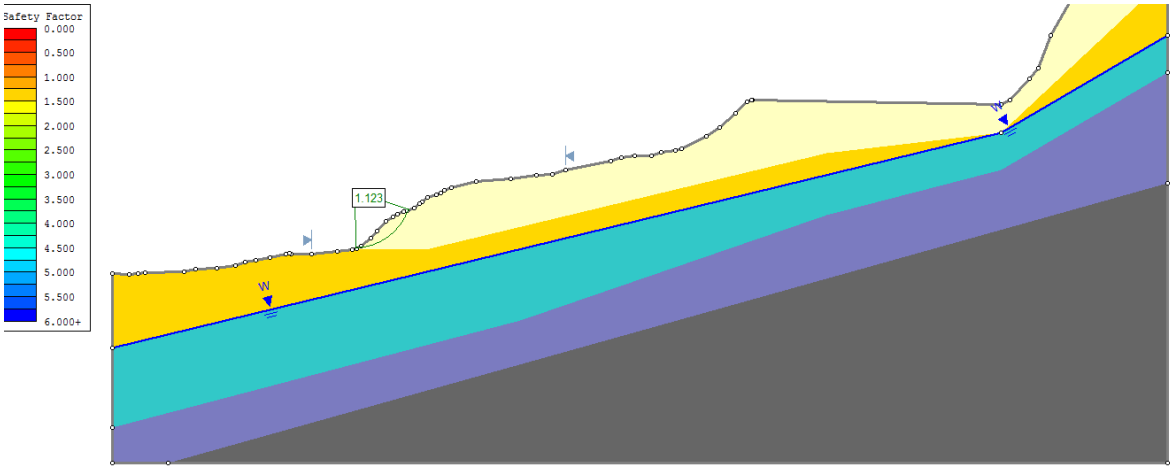

Εικ. 6.2: Ανάδρομη ανάλυση στη διατομή S44. Κυκλική επιφάνεια ολίσθησης, μέθοδος JANBU διορθ., RU=0.10, FS=1.00.



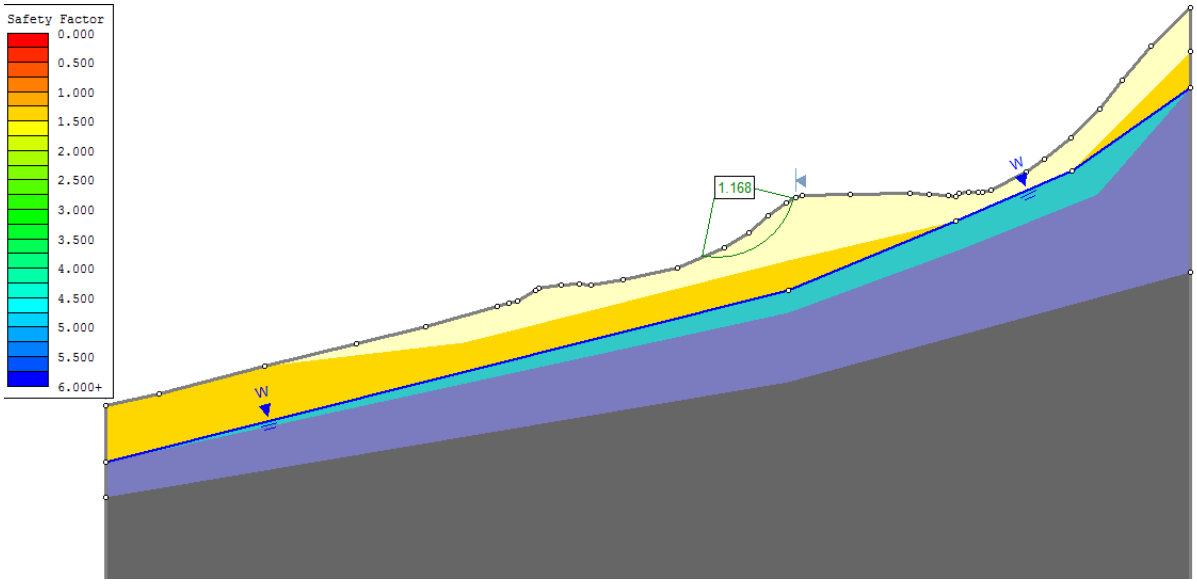

Εικ. 6.3: Ανάδρομη ανάλυση στη διατομή S47. Κυκλική επιφάνεια ολίσθησης, μέθοδος JANBU διορθ., RU=0.10, FS=0.98.




Εικ. 6.4: Ανάδρομη ανάλυση στη διατομή S47Λ. Κυκλική επιφάνεια ολίσθησης, μέθοδος JANBU διορθ., RU=0.10, FS=0.98.




Εικ. 6.5: Ανάδρομη ανάλυση στη διατομή S51. Κυκλική επιφάνεια ολίσθησης, μέθοδος JANBU διορθ., RU=0.10, FS=1.12.




Εικ. 6.6: Ανάδρομη ανάλυση στη διατομή S60Λ. Κυκλική επιφάνεια ολίσθησης, μέθοδος JANBU διορθ., RU=0.10, FS=1.17.

Αναλυτικά τα δεδομένα για τις ανάδρομες αναλύσεις ευσταθείας παρουσιάζονται στο ΠΑΡΑΡΤΗΜΑ Α της μελέτης.

Από τις ανάδρομες αναλύσεις προκύπτουν τα ακόλουθα βασικά συμπεράσματα:

1. Από τις αναλύσεις αναπαράγονται α) οι οριακές καταστάσεις ολίσθησης στις διατομές S39, S47 και S47Λ και β) η ευσταθής κατάσταση στις διατομές S44, S51 και S60Λ. Οι παρατηρούμενες ολισθήσεις και αστοχίες του αναλήμματος στις εξεταζόμενες θέσεις, ερμηνεύονται ικανοποιητικά, ως αποτέλεσμα της δράσης του νερού στο πρανές (RU=0.10).

2. Οι αναλύσεις με κυκλικές επιφάνειες ολίσθησης αποδίδουν ρεαλιστικά την πραγματικότητα.
3. Αναφορικά με τη μέθοδο ανάλυσης φαίνεται ότι η μέθοδος BISHOP οδηγεί σε ελαφρώς ευμενέστερα αποτελέσματα από τη μέθοδο JANBU (διορθωμένη).

Από τις ανάδρομες αναλύσεις προκύπτουν οι ακόλουθες τιμές διατμητικής αντοχής για την επιφανειακή εδαφική ΕΝΟΤΗΤΑ Ι του (υπό μελέτη) πρανούς: 2 kPa≤c≤4 kPa, $28^o \leq \varphi' \leq 30^o$.

Βάσει των ανωτέρω, για τις αναλύσεις α) αποτίμησης της υφιστάμενης κατάστασης και β) το σχεδιασμό μέτρων εξασφάλισης της κανονιστικά απαιτούμενης ευστάθειας και της χωματουργικής αποκατάστασης του υπό μελέτη πρανούς, επιλέγονται για την ΕΝΟΤΗΤΑ Ι, οι ακόλουθες χαρακτηριστικές τιμές διατμητικής αντοχής: **c = 3 kPa, $\varphi' = 28^o$.**

# 7. ΑΝΑΛΥΣΕΙΣ ΑΠΟΤΙΜΗΣΗΣ ΤΗΣ ΥΦΙΣΤΑΜΕΝΗΣ ΚΑΤΑΣΤΑΣΗΣ ΕΥΣΤΑΘΕΙΑΣ ΤΟΥ ΥΠΟ ΜΕΛΕΤΗ ΠΡΑΝΟΥΣ ΑΝΑΝΤΗ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ

## 7.1. Γενικά

Το παρόν κεφάλαιο περιλαμβάνει τους γεωστατικούς υπολογισμούς για την (υπολογιστική) αποτίμηση της ευστάθειας του υπό μελέτη πρανούς στην υφιστάμενη κατάσταση. Στο πλαίσιο αυτό εξετάζονται οι περιοχές του πρανούς οι οποίες παρέμειναν ευσταθείς, υπό την πρόσφατη, δυσμενή δράση του νερού από ισχυρές βροχοπτώσεις: S44, S51 και S60Λ. Βάσει των γεωστατικών υπολογισμών αποτίμησης της υφιστάμενης κατάστασης, ελέγχεται υπολογιστικά η διαθέσιμη κανονιστική επάρκεια ευστάθειας και η τυχόν απαίτηση για σχεδιασμό μέτρων επέμβασης.

## 7.2. Περιγραφή αναλύσεων - αποτελέσματα

Εν συντομία οι γεωστατικοί υπολογισμοί για την ευστάθεια της υφιστάμενης κατάστασης του υπό μελέτη πρανούς, αναλύονται ως ακολούθως:

1.ΤΥΠΟΣ ΑΝΑΛΥΣΗΣ

Οι υπολογισμοί περιλαμβάνουν:

- 2-Δ αναλύσεις αποτίμησης της ευστάθειας με όρους οριακής ισορροπίας (μέθοδοι BISHOP JANBU για κυκλικές επιφάνειες ολίσθησης)

2. ΘΕΣΕΙΣ ΑΝΑΛΥΣΗΣ

Εξετάζεται η (γενική και τοπική) ευστάθεια του ΠΡΑΝΟΥΣ Β σε 3 χαρακτηριστικές θέσεις (υπολογιστικές διατομές), αντιπροσωπευτικές της μεταβαλλόμενης γεωμετρίας και των σύνθετων γεωτεχνικών συνθηκών του υπό μελέτη πρανούς:

- ΔΙΑΤΟΜΗ S44
- ΔΙΑΤΟΜΗ S51
- ΔΙΑΤΟΜΗ S60Λ

Τα γεωμετρικά χαρακτηριστικά των διατομών υπολογισμού, παρουσιάζονται στα σχετικά γεωτεχνικά προσομοιώματα του κεφ. 4 της παρούσας μελέτης.

3. ΚΑΤΑΣΤΑΣΕΙΣ (ΣΕΝΑΡΙΑ) ΥΠΟΛΟΓΙΣΜΟΥ – ΚΑΝΟΝΙΣΤΙΚΕΣ ΑΠΑΙΤΗΣΕΙΣ (κατά EC-7 και EC-8)

Κατά τους γεωστατικούς υπολογισμούς εξετάζονται οι ακόλουθες καταστάσεις φόρτισης:

- Κανονικές γεωτεχνικές συνθήκες (ΚΣ) – απαιτούμενος ενιαίος συντελεστής ασφαλείας, FS = 1.40
- Συνθήκες υψηλής υδροφορίας (ΥΥ) - απαιτούμενος ενιαίος συντελεστής ασφαλείας, FS = 1.20
- Σεισμός σχεδιασμού (σύμφωνα με τις δράσεις οι οποίες περιγράφονται αναλυτικά στο προηγούμενο κεφάλαιο της μελέτης) - απαιτούμενος ενιαίος συντελεστής ασφαλείας, FS = 1.00

4. ΙΔΙΟΤΗΤΕΣ – ΠΡΟΣΟΜΟΙΩΣΗ ΓΕΩΫΛΙΚΩΝ ΤΟΥ –ΥΠΟ ΜΕΛΕΤΗ - ΠΡΑΝΟΥΣ

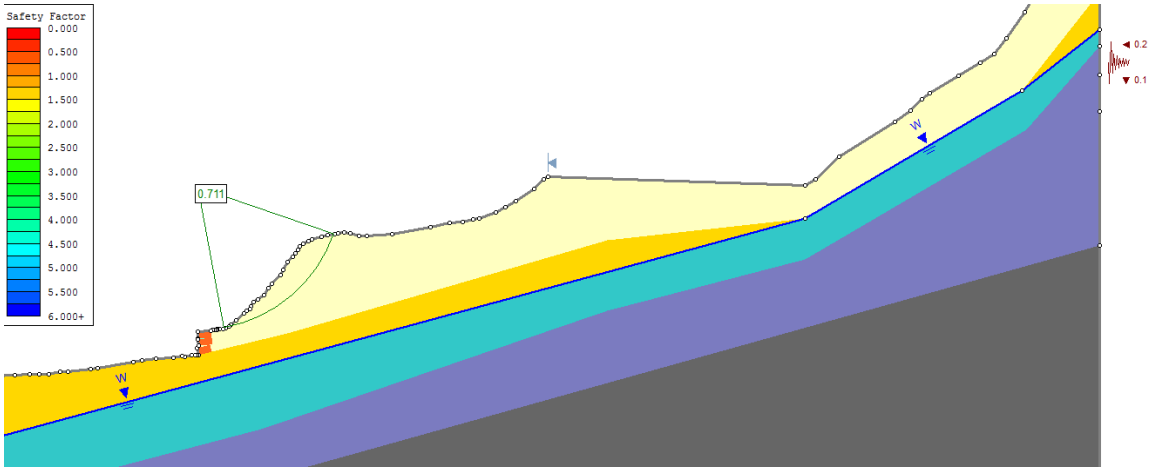
Η προσομοίωση και οι ιδιότητες των γεωϋλικών τα οποία υπεισέρχονται στους γεωστατικούς υπολογισμούς ευστάθειας του (υπό μελέτη) πρανούς, λαμβάνονται από τον Πίνακα 3.1 της παραγράφου §3.2.1 της παρούσας μελέτης. Ειδικά, για την ΕΝΟΤΗΤΑ Ι λαμβάνονται τιμές διατμητικής αντοχής:

- c = 3 kPa
- $\varphi = 28^{o}$

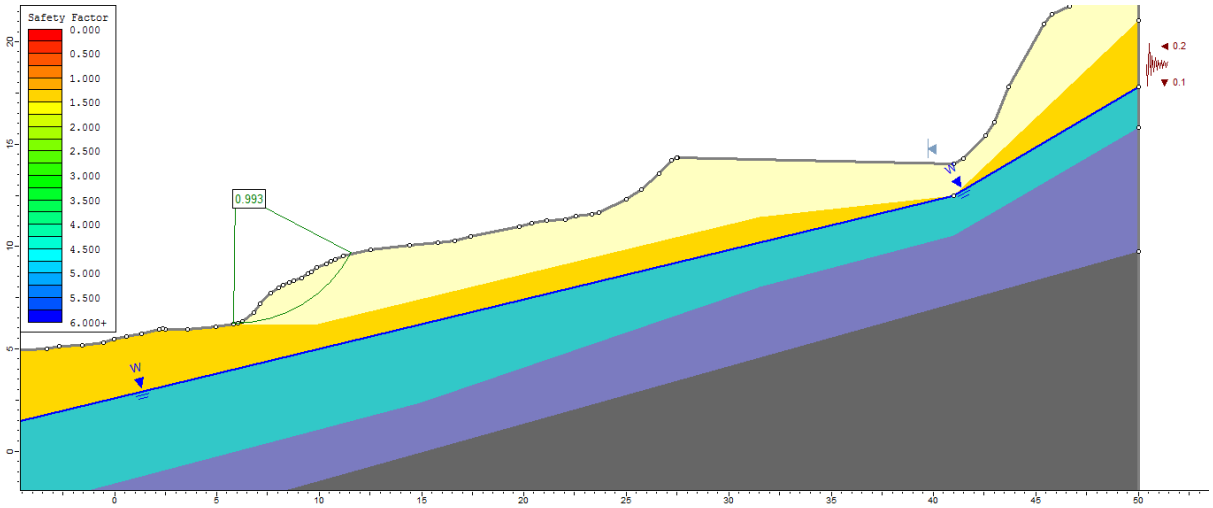
βάσει των αποτελεσμάτων από τις ανάδρομες αναλύσεις (κεφ. 6 της παρούσας μελέτης).

Συνολικά πραγματοποιήθηκαν 12 2-Δ αναλύσεις οριακής ισορροπίας για τον έλεγχο γενικής και τοπικής ευστάθειας του, υπό μελέτη, πρανούς στην υφιστάμενη κατάσταση.

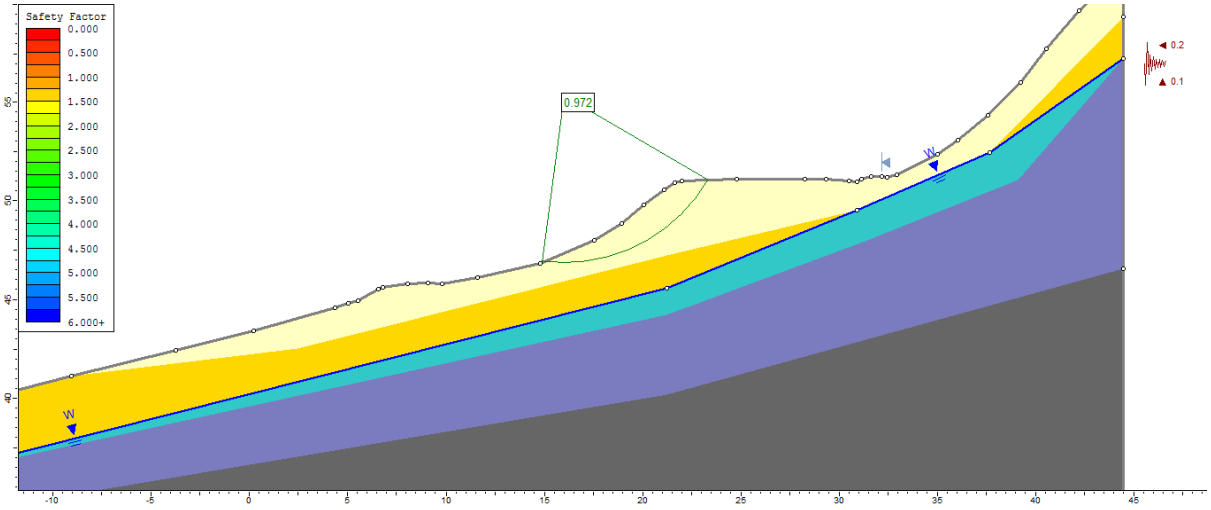
Ενδεικτικά εποπτικά αποτελέσματα από τις αναλύσεις για την αποτίμηση της υφιστάμενης κατάστασης, υπό την (κρίσιμη) σεισμική δράση, παρουσιάζονται στις Εικόνες 7.1 – 7.3.




Εικ. 7.1: Υπολογισμός ευστάθειας στην υφιστάμενη κατάσταση (Διατομή S44), για τον ακραίο κατά EC-8 σεισμό ($a_h$=0.20, $a_v$=0.10). Μέθοδος JANBU corr,,κατακόρυφη συνιστώσα ΚΑΤΩ FS = 0.71.




Εικ.7.2: Υπολογισμός ευστάθειας στην υφιστάμενη κατάσταση (Διατομή S51), για τον ακραίο κατά EC-8 σεισμό ($a_h$=0.20, $a_v$=0.10). Μέθοδος JANBU corr,,κατακόρυφη συνιστώσα ΚΑΤΩ FS = 0.99.




Εικ.7.3: Υπολογισμός ευστάθειας στην υφιστάμενη κατάσταση (Διατομή S60Λ), για τον ακραίο κατά EC-8 σεισμό (ah=0.20, av=0.10). Μέθοδος JANBU corr,,κατακόρυφη συνιστώσα ΑΝΩ FS = 0.97.

Συγκεντρωτικά τα αποτελέσματα των αναλύσεων για την για την αποτίμηση της υφιστάμενης κατάστασης ευστάθειας του, υπό μελέτη, πρανούς παρουσιάζονται στον ακόλουθο Πίνακα 7.1.

Πίνακας 7.1: Αποτελέσματα αναλύσεων ευσταθείας για την υφιστάμενη κατάσταση του πρανούς

| ΜΕΘΟΔΟΣ ΟΡΙΑΚΗΣ ΙΣΟΡΡΟΠΙΑΣ - 2-Δ ΑΝΑΛΥΣΗ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Α/Α | Παρατηρήσεις | Κατάσταση Ανάλυσης | ΔΙΑΤΟΜΕΣ ΑΝΑΛΥΣΗΣ | | | | | | |
| | | | S44 (περιοχή αντηρ. Ξ-Ο) | | S51 (περιοχή αντηρ. Π-Ρ) | | S60Λ (περιοχή πρανών αρχ. σταδίου) | | |
| | | | Συντελεστής ασφαλείας FS | | Συντελεστής ασφαλείας FS | | Συντελεστής ασφαλείας FS | | |
| | | | ΜΕΘΟΔΟΣ ΑΝΑΛΥΣΗΣ | | ΜΕΘΟΔΟΣ ΑΝΑΛΥΣΗΣ | | ΜΕΘΟΔΟΣ ΑΝΑΛΥΣΗΣ | | |
| | | | Απλ. BISHOP | Διορθ. JANBU | Απλ. BISHOP | Διορθ. JANBU | Απλ. BISHOP | Διορθ. JANBU | |
| I | | ΚΑΝΟΝΙΚΕΣ ΓΕΩΣΤΑΤΙΚΕΣ ΣΥΝΘΗΚΕΣ | ΕΝΟΤΗΤΑ I: c = 3 kPa, φ' = 28° | | | | | | |
| 1 | RU=0 | κυκλικές επιφάνειες ολίσθησης | 0.99 | 0.98 | 1.43 | 1.44 | 1.43 | 1.41 | |
| II | | ΣΕΙΣΜΟΣ | | | | | | | |
| 5 | $a_{hd}$=0.20, $a_{vd}$=0.10 (κάτω) | κυκλικές επιφάνειες ολίσθησης | 0.74 | 0.71 | 1.00 | 0.98 | 1.01 | 0.98 | |
| 6 | $a_{hd}$=0.20, $a_{vd}$= -0.10 (άνω) | | 0.75 | 0.72 | 1.00 | 0.99 | 1.00 | 0.97 | |
| III | | ΥΨΗΛΗ ΥΔΡΟΦΟΡΙΑ | | | | | | | |
| 13 | RU=0.20 | κυκλικές επιφάνειες ολίσθησης | 0.76 | 0.74 | 1.17 | 1.17 | 1.17 | 1.14 | |

| ΧΡΩΜΑΤΙΚΟ ΥΠΟΜΝΗΜΑ: Συντελεστής ασφαλείας σε ΑΝΑΛΥΣΕΙΣ ΟΡΙΑΚΗΣ ΙΣΟΡΡΟΠΙΑΣ) |
|---|
| Ευστάθεια, εξασφάλιση κανονιστικής απαίτησης |
| Όχι Αστοχία, μη εξασφάλιση κανονιστικής απαίτησης κατά EC-7 |
| Υπολογιστική Αστοχία |

Αναλυτικά, τα δεδομένα και τα αποτελέσματα των 2-Δ υπολογισμών ευστάθειας με τη μέθοδο οριακής ισορροπίας περιλαμβάνονται στο ΠΑΡΑΡΤΗΜΑ Α της μελέτης.

Από τις αναλύσεις αποτίμησης της υφιστάμενης κατάστασης ευστάθειας του, υπό μελέτη, πρανούς προκύπτουν το ακόλουθα βασικά συμπεράσματα:

1. Υπό κανονικές γεωστατικές συνθήκες προκύπτει η –αυταπόδεικτη- κατάσταση ευστάθειας στα εξεταζόμενα τμήματα του υπό μελέτη πρανούς, η οποία όμως υπολείπεται συστηματικά των κανονιστικών (κατά EC-7) απαιτήσεων. Ειδικά, η περιοχή του πρανούς ανάντη των αντηρίδων Ξ ως Ο (διατομή S44), χαρακτηρίζεται από κατάσταση υπολογιστικής οριακής ισορροπίας. Αντίθετα, οι περιοχές του πρανούς ανάντη των αντηρίδων Π ως Ρ (διατομή S51) και τα πρανή στο δυτικό όριο του αρχαίου σταδίου (διατομή S60Λ) χαρακτηρίζονται από υπολογιστική ευστάθεια, κανονιστικά επαρκή.
2. Για τον εξεταζόμενο (ακραίο) σεισμό σχεδιασμού, προκύπτει συστηματική υπολογιστική γενική αστάθεια (περιοχή του πρανούς το οποίο χαρακτηρίζεται από τη διατομή S44) ή τοπική αστάθεια (περιοχές του πρανούς οι οποίες χαρακτηρίζονται από τις διατομές S51 και S60Λ ).
3. Στην περίπτωση επίδρασης του νερού, προκύπτει υπολογιστική αστάθεια για την περιοχή του πρανούς ανάντη των αντηρίδων Ξ ως Ο (διατομή S44), και –οριακά ανεπαρκής- κανονιστικά ευστάθεια για τις περιοχές του πρανούς ανάντη των αντηρίδων Π ως Ρ (διατομή S51) και τα πρανή στο δυτικό όριο του αρχαίου σταδίου (διατομή S60Λ).
4. Αναφορικά, με τη μέθοδο υπολογισμού, προκύπτει ότι η μέθοδος JANBU (διορθωμένη) οδηγεί σε δυσμενέστερα κατά τι αποτελέσματα σε σύγκριση με την μέθοδο BISHOP (άρα υπέρ της ασφαλείας για το σχεδιασμό και την ποσοτική αποτίμηση μέτρων επέμβασης).
5. Εκ των ανωτέρω, προκύπτει ότι η κρίσιμη κατάσταση φόρτισης για το, υπό μελέτη, πρανές, είναι ο ακραίος (κατά EC-8) σεισμός σχεδιασμού.

Εν κατακλείδι, για την εξασφάλιση του υπό μελέτη πρανούς και την επίτευξη του κανονιστικά (κατά EC-7 και EC-8) απαιτούμενου επιπέδου ασφαλείας, ως προϋπόθεση για τη μακροπρόθεσμη ευστάθεια του υπό μελέτη πρανούς, είναι απαραίτητο να σχεδιασθούν μέτρα βελτίωσης της ευστάθειάς του.

# 8. ΣΧΕΔΙΑΣΜΟΣ ΕΠΕΜΒΑΣΕΩΝ ΓΙΑ ΤΗΝ ΚΑΝΟΝΙΣΤΙΚΗ ΕΞΑΣΦΑΛΙΣΗ ΤΗΣ ΕΥΣΤΑΘΕΙΑΣ ΤΟΥ ΚΑΙ ΤΗ ΧΩΜΑΤΟΥΡΓΙΚΗ ΑΠΟΚΑΤΑΣΤΑΣΗ (ΥΠΟ ΜΕΛΕΤΗ) ΠΡΑΝΟΥΣ

## 8.1. Γενικά

Οι επεμβάσεις στην υπό μελέτη περιοχή του πρανούς, ανάντη του αναλήμματος των Θησαυρών, αποσκοπούν:

- στην εξασφάλιση της απαιτούμενης γενικής και τοπικής ευστάθειας όλων των περιοχών του (υπό μελέτη) πρανούς, σύμφωνα με το κανονιστικό πλαίσιο της μελέτης (EC-7, EC-8)

  και

- στην χωματουργική αποκατάσταση της μορφολογίας του πρανούς με προσαρμογή στη γεωμετρία του (προς αναστήλωση, βάσει της σχετικής αρχιτεκτονικής πρότασης) αρχαίου αναλήμματος στην υπό μελέτη περιοχή.

Στο πλαίσιο των ανωτέρω στόχων, η επιλεγείσα μέθοδος επέμβασης για τη μόνιμη εξασφάλιση της ευστάθειας του, υπό μελέτη, πρανούς περιλαμβάνει, εν συνόψει, τα ακόλουθα μέτρα:

1. Εκσκαφή απομάκρυνση της ολισθήσασας (ή επιρρεπούς σε ολίσθηση) εδαφικής μάζας στο τμήμα του πρανούς ανάντη του αναλήμματος μεταξύ των αντηρίδων Ν και Ρ.
2. Εγκατάσταση συρματοκιβωτίων με λιθορριπή, ως προτείχισμα αντιστήριξης του δημιουργούμενου, μετά την εκσκαφή, πρανούς, και τοποθέτηση μεταβατικού επιχώματος μεταξύ της πίσω παρειάς των συρματοκιβωτίων και του πρανούς του φυσικού εδάφους.
3. Εκσκαφή απάλυνσης της κλίσης του πρανούς στην περιοχή του αναβαθμού του επαρχιακού δρόμου Ολυμπία – Τρίπολη (περιοχές ανάντη των διαστημάτων μεταξύ των αντηρίδων Π και Ρ και του πρανούς στο δυτικό όριο του αρχαίου σταδίου).
4. Επίχωση των συρματοκιβωτίων με επίλεκτο εδαφικό υλικό (αμμοχάλικο) σε στρώσεις πάχους 50 εκ., με κλίση σύμφωνα με τα σχέδιας της μελέτης, με παρεμβολή γεωπλέγματος (εφελκυστικής αντοχής 40kN/m) μεταξύ διαδοχικών στρώσεων, για την αποτροπή επιφανειακών ολισθήσεων.
5. Κατασκευή διάταξης μικροπασσάλων Φ25, ανά 0.75m όψης αναλήμματος, έμπροσθεν του (προς αναστήλωση) τμήματος του αναλήμματος στα διαστήματα α) μεταξύ των αντηρίδων Ξ και Ο και β) μεταξύ των αντηρίδων Π και Ρ για βελτίωση της γενικής ευστάθειας του πρανούς.

6. Αναστήλωση του αναλήμματος, σύμφωνα με την σχετική αρχιτεκτονική πρόταση και διαμόρφωση της επίχωσης στην κρυφή παρειά του (σχετικά δες σχέδια αρχιτεκτονικής μελέτης).
7. Κατασκευή των υδραυλικών διατάξεων στεγάνωσης της επιφάνειας του (προς μελέτη) πρανούς, εγκατάσταση διατάξεων απορροής των ομβρίων και των στοιχείων τελικής διαμόρφωσης της αποκαθιστούμενης επιφάνειας (σχετικά δες σχέδια υδραυλικής μελέτης και αρχιτεκτονικής μελέτης)

Οι εργασίες για την υλοποίηση των μέτρων επέμβασης αναλύονται εκτενώς στο Κεφ. 12 της παρούσας μελέτης.

## 8.2. Υπολογιστική τεκμηρίωση της επέμβασης

Στο πλαίσιο αποτίμησης/τεκμηρίωσης της συνεισφοράς των προτεινόμενων γεωτεχνικών μέτρων στη βελτίωση της ευστάθειας του (υπό μελέτη) πρανούς, υλοποιούνται γεωστατικοί υπολογισμοί ευστάθειας ως ακολούθως:

- 2-Δ αναλύσεις οριακής ισορροπίας με τις μεθόδους i) BISHOP και ii) τροποποιημένη JANBU (για τη δυσμενή περίπτωση κυκλικών επιφανειών ολίσθησης) σε 5 χαρακτηριστικές διατομές του υπό μελέτη πρανούς
- 2-Δ ελαστοπλαστική ανάλυση ευστάθειας με πεπερασμένα στοιχεία για τον υπολογισμό της ευστάθειας με τη μέθοδο διαδοχικής υποβάθμισης της διατμητικής αντοχής (SSR). Η ανάλυση γίνεται α) για λόγους επιβεβαίωσης των αναλύσεων οριακής ισορροπίας σε 1 διατομή (S44) και β) για αξιολόγηση της βελτίωση της γενικής ευστάθειας i) με διάταξη μικροπασσάλων και ii) χωρίς διάταξη μικροπασσάλων

Κατά τις αναλύσεις εξετάζονται τα ακόλουθα χαρακτηριστικά κανονιστικά σενάρια καταπόνησης του υπό μελέτη πρανούς (για εξασφάλιση της μακροπρόθεσμης κανονιστικής ευστάθειάς του):

- Κανονικές γεωστατικές συνθήκες
- Συνθήκες υψηλής υδροφορίας: RU = 0.20
- Ακραίες Σεισμικές δράσεις σχεδιασμού (γI=1.40):
  Για την ευστάθεια του πρανούς: $a_{hd}$ = 0.20, $a_{vd}$ = ± 0.10

Ειδικότερα, οι 2-Δ ελαστοπλαστικές αναλύσεις με πεπερασμένα στοιχεία γίνονται σε διαδοχικά μηχανικά στάδια τα οποία κατά σειρά αφορούν:

- Επιβολή αρχικών γεωστατικών συνθηκών στις διατομές ανάλυσης
- Αρχική εκσκαφή του πρανούς
- Υλοποίηση στερεωτικών επεμβάσεων σε φάσεις
- Επιβολή (ψευδοστατικά) της κανονιστικής σεισμικής δράσης

Τα γεωτεχνικά προσομοιώματα για την υπολογιστική τεκμηρίωση της προτεινόμενης επέμβασης στερέωσης/βελτίωσης της ευστάθειας του υπό μελέτη πρανούς αφορούν στις διατομές:

- S39, περιοχή μεταξύ των αντηρίδων Ν-Ξ
- S44, περιοχή μεταξύ των αντηρίδων Ξ-Ο
- S48, περιοχή μεταξύ των αντηρίδων Ο-Π
- S51, περιοχή μεταξύ των αντηρίδων Π-Π
- S60Λ, περιοχή πρανών στο δυτικό όριο του αρχαίου σταδίου

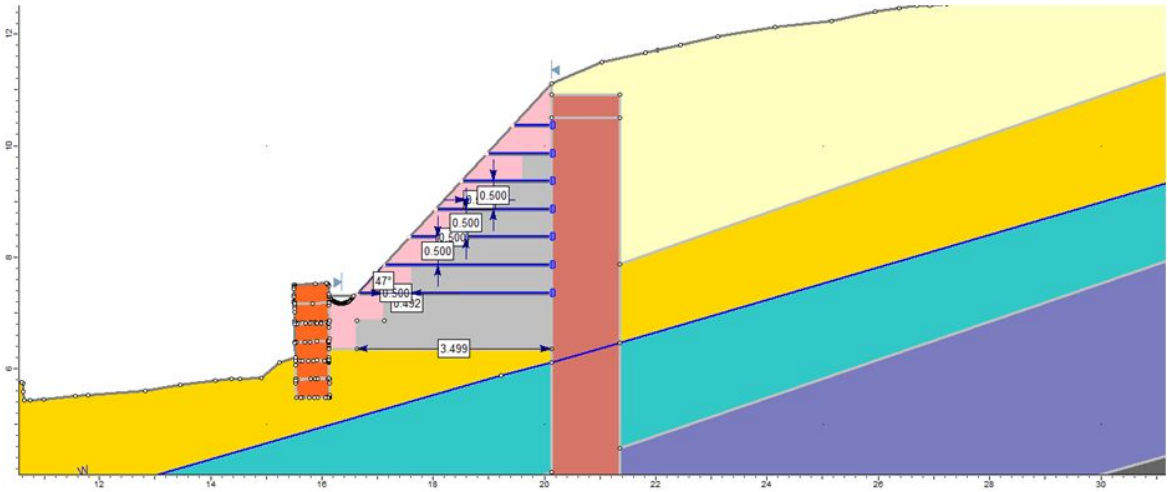
Τα δεδομένα τα οποία αφορούν στις μηχανικές και βασικές ιδιότητες των υλικών του πρανούς παρουσιάζονται εποπτικά στην Εικ. 8.1. Οι ανωτέρω διατομές με τα γεωτεχνικά μέτρα επέμβασης παρουσιάζονται εποπτικά στις ακόλουθες Εικόνες (Εικ. 8.2 – Εικ. 8.6).

***Material Properties***

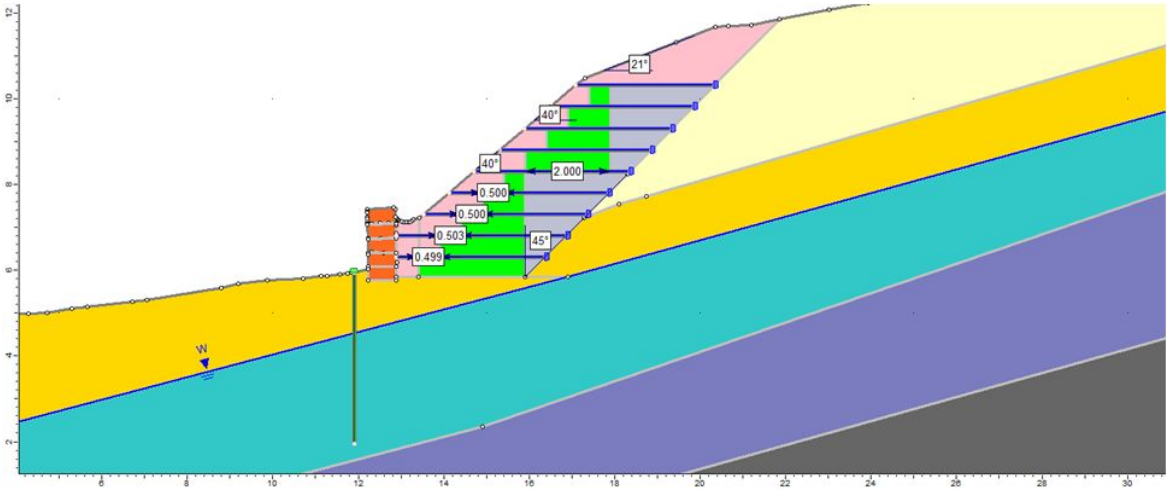
| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | None | None | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |
| Ru Value | 0.2 | 0.2 | | | | | | |

| Property | GRAVEL | SW |
|---|---|---|
| Color | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19 |
| Cohesion [kPa] | 0 | 1 |
| Friction Angle [deg] | 36 | 35 |
| Water Surface | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated |

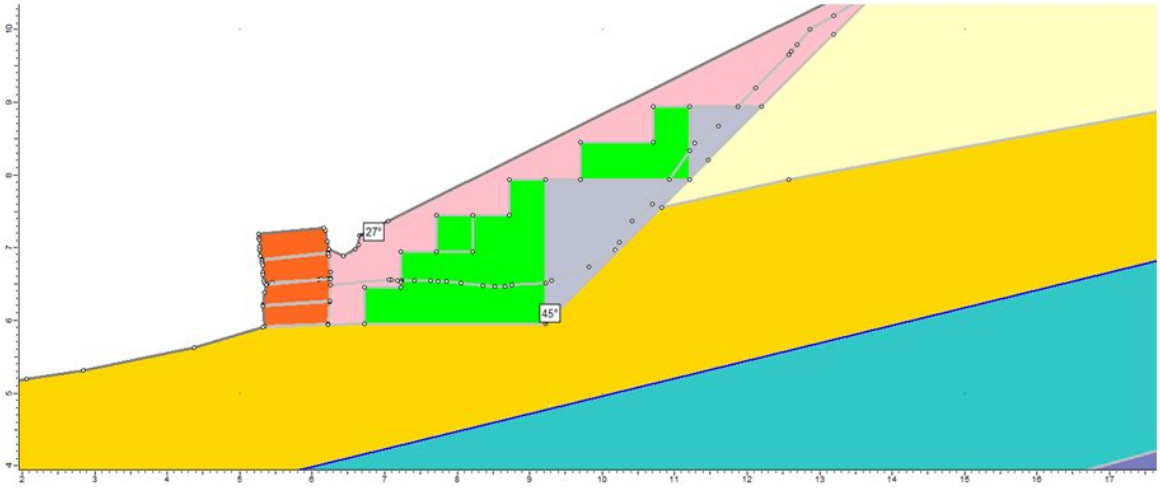
Εικ. 8.1: Χρωματικό υπόμνημα με γεωτεχνικές/δομητικές ενότητες πρανούς ανάντη αναλήμματος Θησαυρών



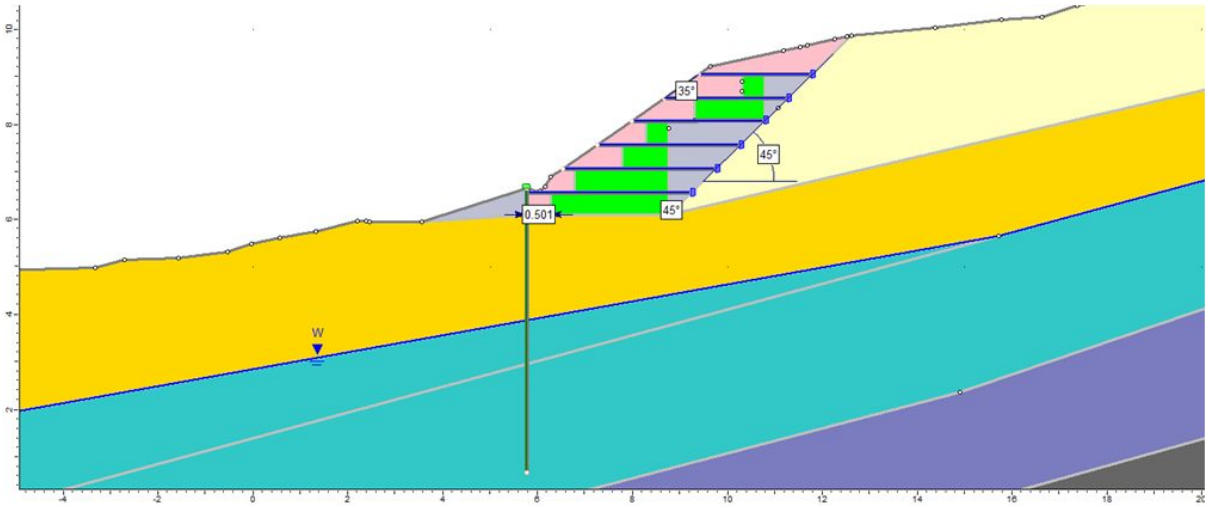

Εικ. 8.2: Γεωτεχνικά Προσομοιώματα μέτρων επέμβασης – υπολογιστική διατομή πρανούς S39 μεταξύ αντηρίδων Ν και Ξ.



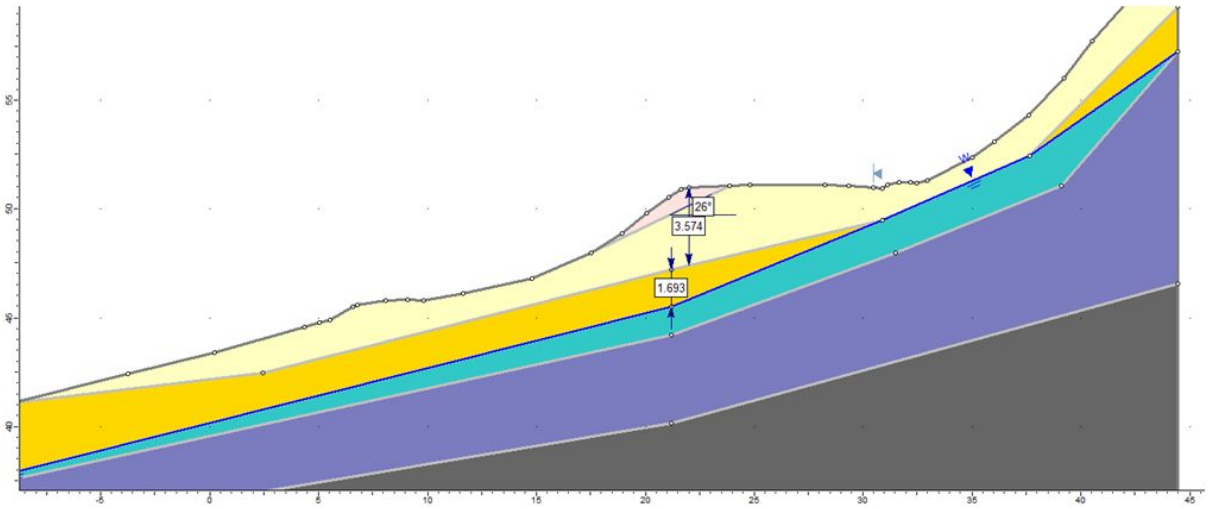

Εικ. 8.3: Γεωτεχνικά Προσομοιώματα μέτρων επέμβασης – υπολογιστική διατομή πρανούς S44 μεταξύ αντηρίδων Ξ και Ο.




Εικ. 8.4: Γεωτεχνικά Προσομοιώματα μέτρων επέμβασης – υπολογιστική διατομή πρανούς S48 μεταξύ αντηρίδων Ο και Π



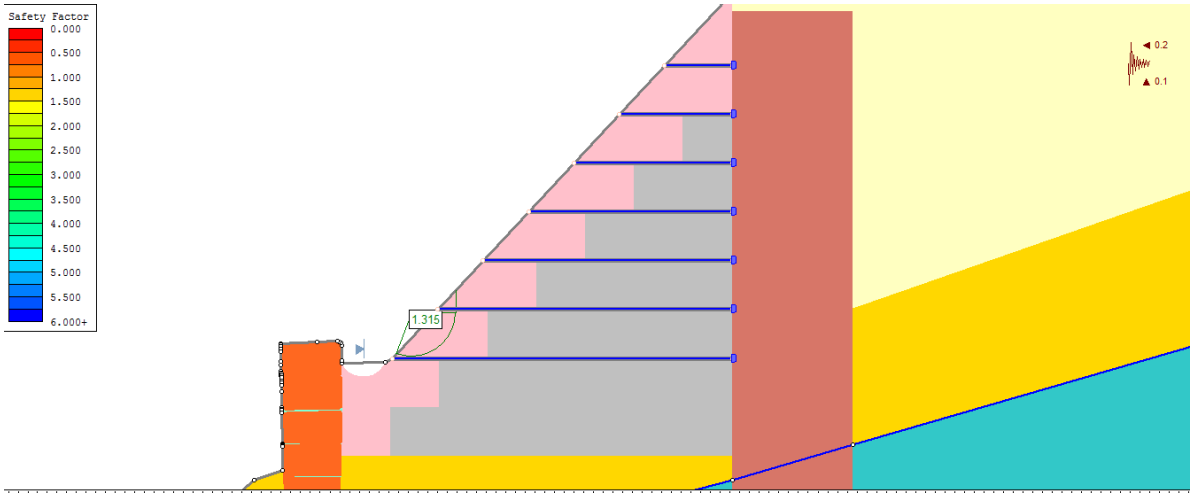

Εικ. 8.5: Γεωτεχνικά Προσομοιώματα μέτρων επέμβασης – υπολογιστική διατομή πρανούς S51 μεταξύ αντηρίδων Π και Ρ



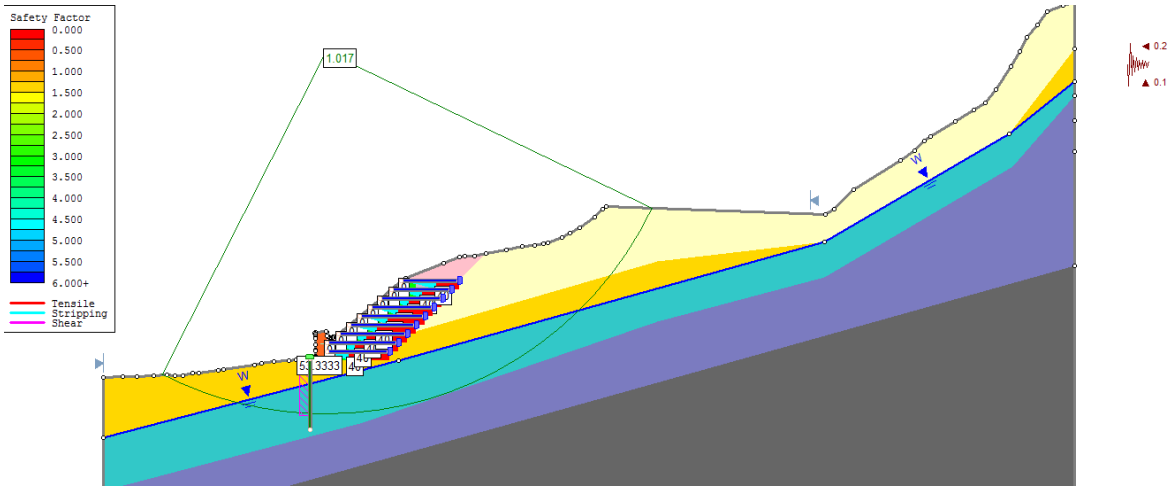

Εικ. 8.6: Γεωτεχνικά Προσομοιώματα μέτρων επέμβασης – υπολογιστική διατομή πρανούς S60Λ στο δυτικό όριο του αρχαίου σταδίου

Συνολικά, για την υπολογιστική αποτίμηση των μέτρων επέμβασης, πραγματοποιήθηκαν 21 αναλύσεις οριακής ισορροπίας και 2 ελαστοπλαστικές αναλύσεις για την ποσοτική τεκμηρίωση των μέτρων επέμβασης για τη βελτίωση της ευστάθειας του υπό μελέτη πρανούς.

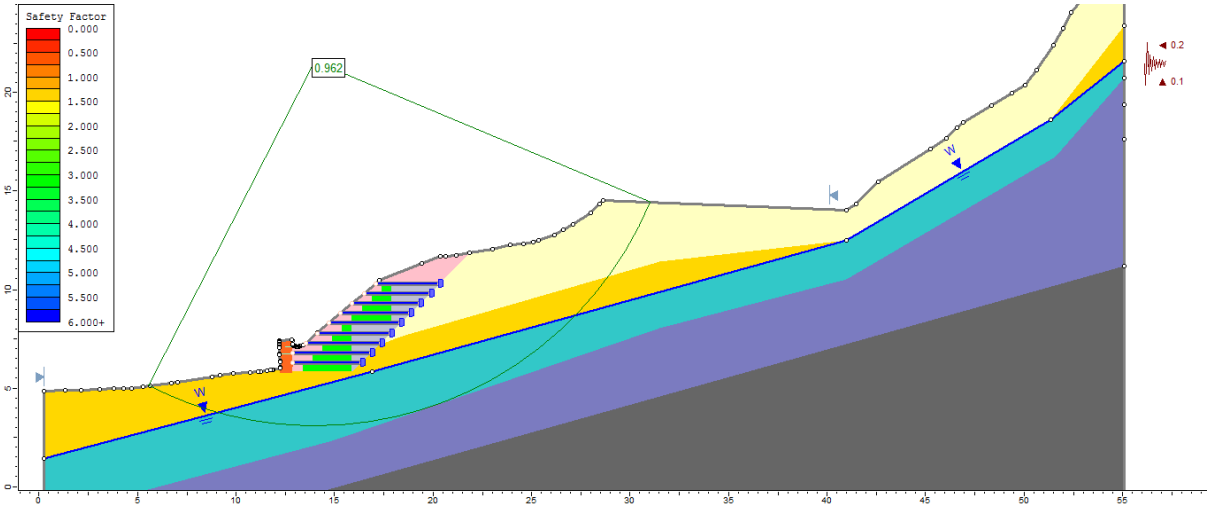
Χαρακτηριστικά αποτελέσματα από τις (κρίσιμες) σεισμικές αναλύσεις των υπολογιστικών διατομών του υπό μελέτη πρανούς με τα μέτρα επέμβασης παρουσιάζονται στις ακόλουθες Εικόνες 8.7 – 8.14.



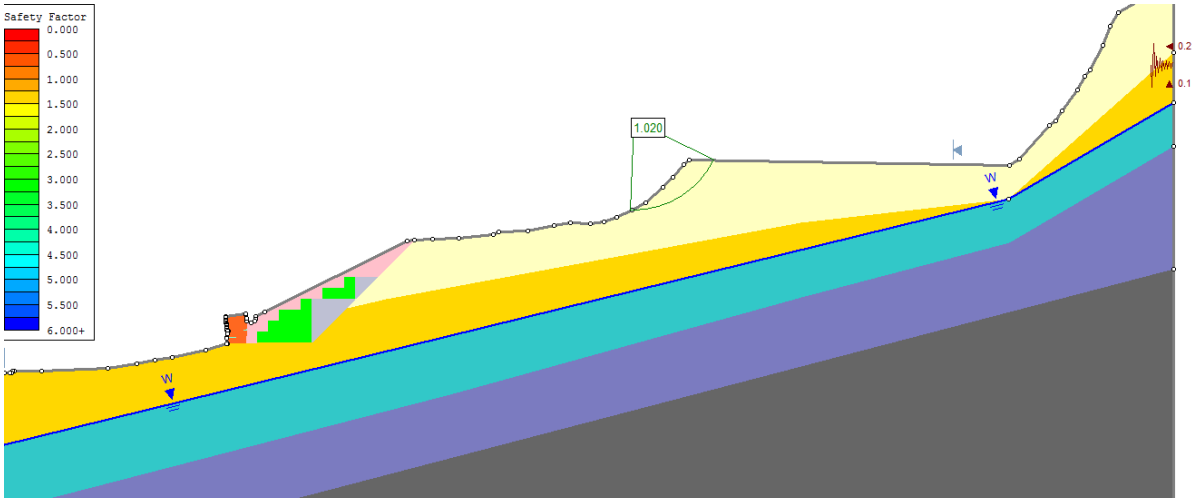

Σχ. 8.7: Αποτελέσματα ανάλυσης ευστάθειας χωματουργικά αποκαταστημένης διατομής S39, για τον ακραίο (κατά EC-8) σεισμό: ah=0.20, av=0.10 ΑΝΩ. Κυκλική επιφάνεια ολίσθησης, μέθοδος JANBU διορθ., FS=1,32.



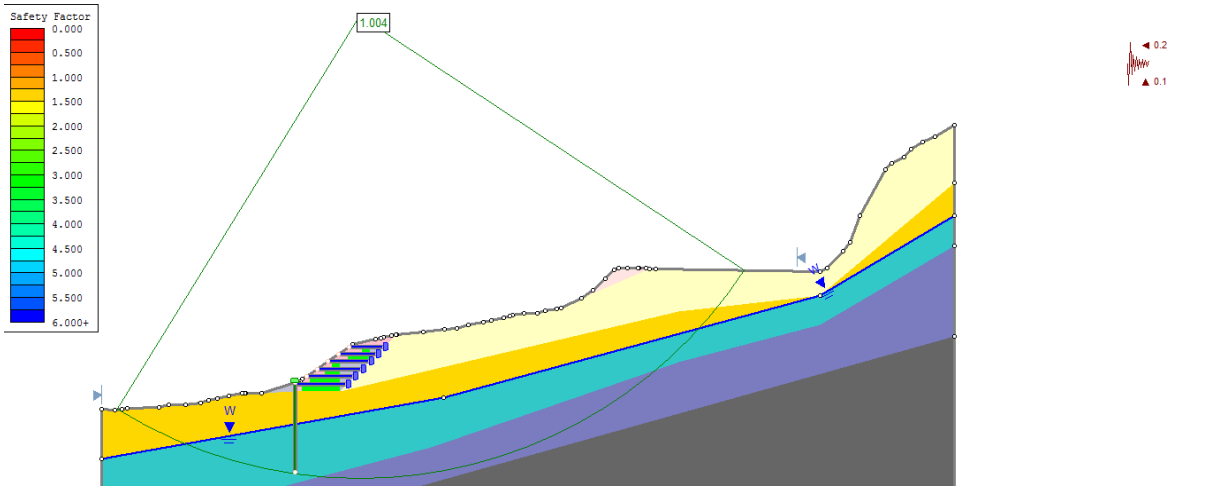

Σχ. 8.8: Αποτελέσματα ανάλυσης ευστάθειας χωματουργικά αποκαταστημένης διατομής S44, με διάταξη μικροπασσάλων έμπροσθεν του αρχαίου αναλήμματος, για τον ακραίο (κατά EC-8) σεισμό: ah=0.20, av=0.10 ΑΝΩ. Κυκλική επιφάνεια ολίσθησης, μέθοδος JANBU διορθ., FS=1.02.



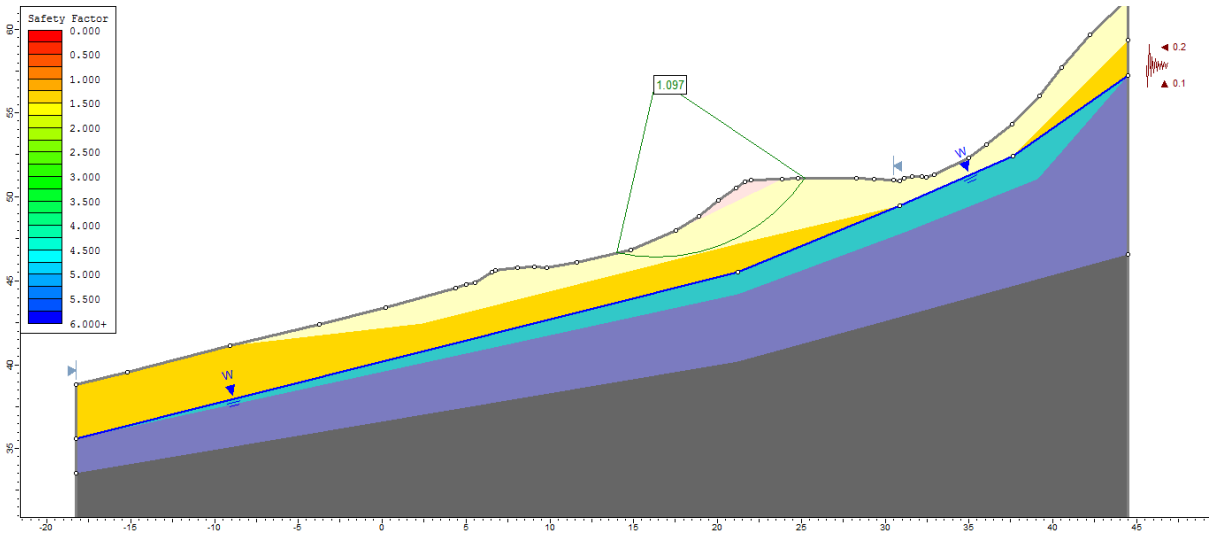

Σχ. 8.9: Αποτελέσματα ανάλυσης ευστάθειας χωματουργικά αποκαταστημένης διατομής S44, χωρίς διάταξη μικροπασσάλων έμπροσθεν του αρχαίου αναλήμματος, για τον ακραίο (κατά EC-8) σεισμό: ah=0.20, av=0.10 ΑΝΩ. Κυκλική επιφάνεια ολίσθησης, μέθοδος JANBU διορθ., FS=0.96.



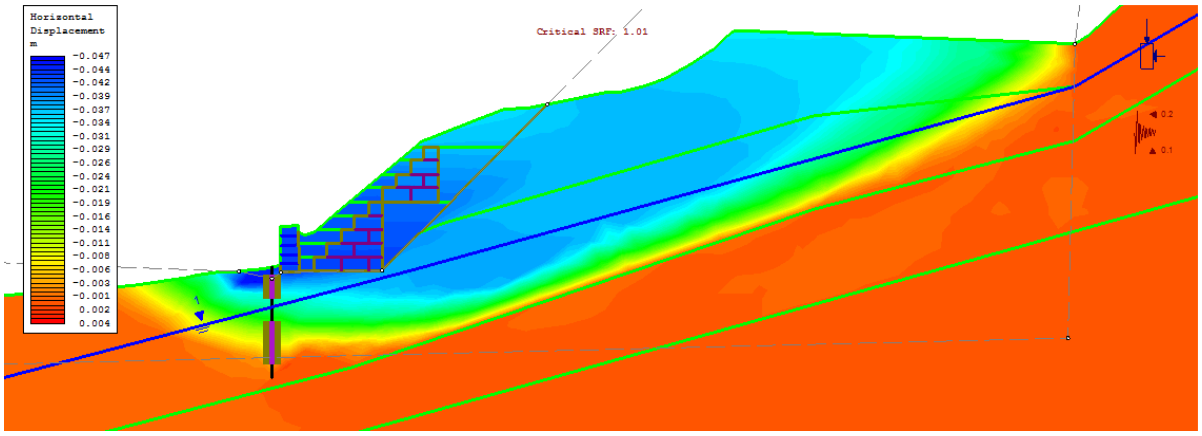

Σχ. 8.10: Αποτελέσματα ανάλυσης ευστάθειας χωματουργικά αποκαταστημένης διατομής S48, με για τον ακραίο (κατά EC-8) σεισμό: ah=0.20, av=0.10 ΑΝΩ. Κυκλική επιφάνεια ολίσθησης, μέθοδος JANBU διορθ., FS=1.02.



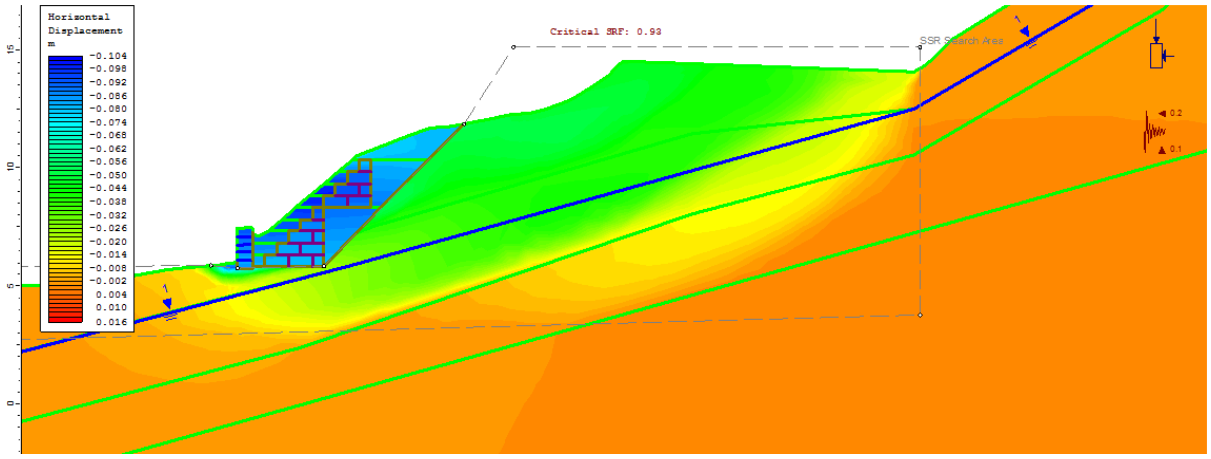

Σχ. 8.11: Αποτελέσματα ανάλυσης ευστάθειας χωματουργικά αποκαταστημένης διατομής S51, με διάταξη μικροπασσάλων έμπροσθεν του αρχαίου αναλήμματος, για τον ακραίο (κατά EC-8) σεισμό: ah=0.20, av=0.10 ΑΝΩ. Κυκλική επιφάνεια ολίσθησης, μέθοδος JANBU διορθ., FS=1.00.




Σχ. 8.12: Αποτελέσματα ανάλυσης ευστάθειας χωματουργικά αποκαταστημένης διατομής S60Λ, με για τον ακραίο (κατά EC-8) σεισμό: ah=0.20, av=0.10 ΑΝΩ. Κυκλική επιφάνεια ολίσθησης, μέθοδος JANBU διορθ., FS=1.10.




Σχ. 8.13: Αποτελέσματα ελαστοπλαστικής ανάλυσης ευστάθειας με πεπερασμένα στοιχεία, χωματουργικά αποκαταστημένης διατομής S44, με διάταξη μικροπασσάλων έμπροσθεν του αρχαίου αναλήμματος, για τον ακραίο (κατά EC-8) σεισμό: ah=0.20, av=0.10 ΑΝΩ. Μέθοδος διαδοχικής υποβάθμισης διατμητικής αντοχής (SSR), FS=1.01.




Σχ. 8.14: Αποτελέσματα ελαστοπλαστικής ανάλυσης ευστάθειας με πεπερασμένα στοιχεία, χωματουργικά αποκαταστημένης διατομής S44, χωρίς διάταξη μικροπασσάλων έμπροσθεν του αρχαίου αναλήμματος, για τον ακραίο (κατά EC-8) σεισμό: ah=0.20, av=0.10 ΑΝΩ. Μέθοδος διαδοχικής υποβάθμισης διατμητικής αντοχής (SSR), FS=0.93.

Συγκεντρωτικά τα αποτελέσματα των αναλύσεων ευσταθείας για την τεκμηρίωση των μέτρων επέμβασης παρουσιάζονται στον ακόλουθο Πίνακα 8.1.

Τα αναλυτικά δεδομένα των υπολογισμών, παρουσιάζονται στα ΠΑΡΑΡΤΗΜΑΤΑ Α και Β, για αναλύσεις οριακής ισορροπίας και αναλύσεις με πεπερασμένα στοιχεία αντίστοιχα.

Πίνακας 8.1: Αποτελέσματα αναλύσεων ευσταθείας για την υπολογιστική τεκμηρίωση των επεμβάσεων

| 2-Δ ΑΝΑΛΥΣΕΙΣ ΟΡΙΑΚΗΣ ΙΣΟΡΡΟΠΙΑΣ, c=3, ϕ=28 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ΔΙΑΤΟΜΗ | ΠΕΡΙΟΧΗ ΑΝΑΛΗΜΜΑΤΟΣ (βάσει αντηρίδων) | ΠΑΡΑΤΗΡΗΣΕΙΣ | ΣΥΝΤΕΛΕΣΤΗΣ ΑΣΦΑΛΕΙΑΣ, FS | | | | | | | |
| | | | ΚΣ [1] | | ΥΥ [2] (RU=0.2) | | ΣΣ [3] ($a_{hd}$=0.20, $a_{vd}$=0.10 ΚΑΤΩ) | | ΣΣ [3] ($a_{hd}$=0.20, $a_{vd}$=0.10 ΑΝΩ) | |
| | | | JANBU,cor | BISHOP | JANBU,cor | BISHOP | JANBU,cor | BISHOP | JANBU,cor | BISHOP |
| **S39** | **Ν-Ξ** | Προτείχισμα με συρματοκιβώτια | 1.77 | 1.69 | 1.77 | 1.69 | 1.29 | 1.29 | 1.32 | 1.35 |
| **S44** | **Ξ-Ο** | Προτείχισμα με συρματοκιβώτια, πρόσθια διάταξη μικροπασσάλων Φ25 (L=4m) | 1.68 | 1.76 | 1.39 | 1.49 | 1.09 | 1.15 | 1.02 | 1.07 |
| **S44** | **Ξ-Ο** | Προτείχισμα με συρματοκιβώτια, χωρίς μικροπασσάλους | | | | | | | 0.96 | |
| **S48** | **Ο-Π** | Προτείχισμα με συρματοκιβώτια | 1.41 | 1.38 [4] | 1.16 [4] | 1.13 [4] | 1.04 | 1.00 | 1.06 | 1.02 |
| **S51** | **Π-Ρ** | Προτείχισμα με συρματοκιβώτια, πρόσθια διάταξη μικροπασσάλων Φ25 (L=6m) + χωμ. διαμόρφωση | 1.64 | 1.64 | 1.37 | 1.38 | 1.05 | 1.07 | 1.00 | 1.04 |
| **S60Λ** | **πρανή αρχ. Σταδίου** | χωματουργική διαμόργωση | 1.73 | 1.74 | 1.41 | 1.43 | 1.14 | 1.15 | 1.10 | 1.12 |

| 2-Δ ΑΝΑΛΥΣΕΙΣ SSR με Πεπερασμένα Στοιχεία | | | | | | |
|---|---|---|---|---|---|---|
| ΔΙΑΤΟΜΗ | ΠΕΡΙΟΧΗ ΑΝΑΛΗΜΜΑΤΟΣ (βάσει αντηρίδων) | ΠΑΡΑΤΗΡΗΣΕΙΣ | ΣΥΝΤΕΛΕΣΤΗΣ ΑΣΦΑΛΕΙΑΣ, FS | | | |
| | | | ΚΣ [1] | ΥΥ [2] (RU=0.1) | ΣΣ 3 (ahd=0.20, avd=0.10 ΚΑΤΩ) | ΣΣ 3 (ahd=0.20, avd=0.10 ΑΝΩ) |
| **S44** | **Ξ-Ο** | Προτείχισμα με συρματοκιβώτια, πρόσθια διάταξη μικροπασσάλων Φ25 | | | | 1.01 |
| | | Προτείχισμα με συρματοκιβώτια, χωρίς πρόσθια διάταξη μικροπασσάλων Φ25 | | | | 0.93 |

1: Κανονικές γεωστατικές συνθήκες
2: Υψηλή Υδροφορία
3: Σεισμικές συυνθήκες
4: κατάντη πρανές της επαρχιακής οδού

ΧΡΩΜΑΤΙΚΟ ΥΠΟΜΝΗΜΑ: Συντελεστής ασφαλείας σε ΑΝΑΛΥΣΕΙΣ ΟΡΙΑΚΗΣ ΙΣΟΡΡΟΠΙΑΣ)

| | |
|---|---|
| | Ευστάθεια, εξασφάλιση κανονιστικής απαίτησης |
| | Όχι Αστοχία, μη εξασφάλιση κανονιστικής απαίτησης κατά EC-7 |
| | Υπολογιστική Αστοχία |

Από την ανάγνωση των αποτελεσμάτων υπολογιστικής τεκμηρίωσης των μέτρων επέμβασης στη βελτίωση της ευστάθειας του, υπό μελέτη, πρανούς ανάντη του αναλήμματος των Θησαυρών, προκύπτει η υπολογιστική κανονιστική ευστάθεια, ακόμη και για την περίπτωση του ακραίου - κατα EC-8- σεισμού με την υλοποίηση των προτεινόμενων μέτρων (σχετικά δες παράγραφο 8.1 της παρούσας μελέτης).

Από τη σύγκριση των χρησιμοποιούμενων μεθόδων υπολογισμού της ευστάθειας στην παρούσα μελέτη (μέθοδος οριακής ισορροπίας και μέθοδος SSR με πεπερασμένα στοιχεία για τη διατομή S44) προκύπτει η καλή σύγκριση της μεθόδου SSR και της μεθόδου JANBU (διορθωμένη).

Αξίζει επίσης να αναφερθεί η προκύπτουσα υπολογιστική αστοχία (για την περίπτωση του ακραίου - κατά EC-8- σεισμού) στις περιοχές του υπό μελέτη πρανούς, μεταξύ των αντηρίδων Ξ και Ο (διατομή S44) και Π και Ρ (διατομή S51) στην περίπτωση μη υλοποίησης μικροπασσάλων έμπροσθεν του (προς αναστήλωση) αρχαίου αναλήμματος.

Εν κατακλείδι, με τον προτεινόμενο σχεδιασμό μέτρων επέμβασης, εξασφαλίζονται υπολογιστικά οι κανονιστικές απαιτήσεις για τη μακροπρόθεσμη ευστάθεια του υπό μελέτη πρανούς, ανάντη του αναλήμματος των Θησαυρών.

## 8.3. Αναλύσεις ευσταθείας στην φάση κατασκευής

Χάριν πληρότητας, στο παρόν κεφάλαιο εξετάζεται η ευστάθεια των προσωρινών εκσκαφών, στην περιοχή του υπό μελέτη πρανούς, για την υλοποίηση των μέτρων βελτίωσης της ευστάθειας και χωματουργικής αποκατάστασης του πρανούς.

Βάσει αναλυτικών σχέσεων, το μέγιστο δυνατό ύψος κατακόρυφης προσωρινής εκσκαφής συνεκτικού εδάφους (Ενότητα Ι) , για την τοποθέτηση (σε ντουλάπια) των συρματοκιβωτίων, υπολογίζεται:

$$H_{exc} = \frac{2c_u}{\gamma} = 4*80/20 = 8\text{m}.$$

Με θεώρηση συντελεστή ασφαλείας ίσο με 2, και δεδομένου ότι οι προσωρινή χωματουργική διαμόρφωση δημιουργεί πρανές ηπιότερης κλίσης από κατακόρυφο πρανές ($\beta=45^o$) εκτιμάται ότι προσωρινή εκσκαφή κεκλιμένων πρανών ύψους 4-5μ σε φατνώματα (ντουλάπια) είναι κατ' αρχήν αποδεκτή.

# 9. ΓΕΩΣΤΑΤΙΚΟΙ ΥΠΟΛΟΓΙΣΜΟΙ ΜΙΚΡΟΠΑΣΣΑΛΩΝ ΣΤΟ ΠΛΑΙΣΙΟ ΤΗΣ ΜΕΛΕΤΗΣ ΤΟΥ ΑΝΑΛΗΜΜΑΤΟΣ ΤΩΝ ΘΗΣΑΥΡΩΝ

Στο παρόν κεφάλαιο εξετάζεται ο γεωτεχνικός σχεδιασμός μικροπασσάλων οι οποίοι χρησιμοποιούνται α) για τη θεμελίωση των νέων διατάξεων αντιστήριξης αναλήμματος των Θησαυρών στην περιοχή μεταξύ των αντηρίδων Α και Ν και β) για τη βελτίωση της γενικής ευστάθειας του πρανούς στην περιοχή μεταξύ των αντηρίδων Ν και Ρ.

## 9.1. Μικροπάσσαλοι θεμελίωσης νέων διατάξεων αντιστήριξης

Στην περιοχή του αναλήμματος των Θησαυρών μεταξύ των αντηρίδων Α και Ν προβλέπεται -στο πλαίσιο του στατικού αντικειμένου για τη γενική μελέτη του αναλήμματος των Θησαυρών- ο σχεδιασμός νέων μεταλλικών 3γωνικών πλαισίων αντιστήριξης του αναλήμματος των Θησαυρών (σε αντικατάσταση των εγκατεστημένων μεταλλικών στοιχείων αντιστήριξης). Προκειμένου να αποφευχθεί η θεμελίωση των νέων στοιχείων σε μεγάλης έκτασης επιφανειακή θεμελίωση, εξετάσθηκε η λύση θεμελίωσης των νέων πλαισίων επό μικροπασσάλων.

Ειδικότερα, κατόπιν παραμετρικών γεωστατικών υπολογισμών αναφορικά με το μήκος και τη διάμετρο των μικροπασσάλων, επελέγη η περίπτωση θεμελίωσης επί ζεύγους μικροπασσάλων, διατεταγμένων εγκάρσια στον άξονα του αναλήμματος, αξονικής απόστασης ίσης με 1.50μ., με δεσμευμένη κεφαλή επί κεφαλοδέσμου από οπλισμένο σκυρόδεμα (κεφαλόδεσμος ορθογωνικής διατομής, διαστάσεων ΒxΗ = 0.50μx0.50μ και μήκους 1.95μ), διαμέτρου Φ25εκ., από γαρμπιλοσκυρόδεμα C25/30, με οπλισμό από μεταλλική δοκό HEB140, κατηγορίας χάλυβα St355, ενεργού μήκους 6μ (μη συμπεριλαμβανομένου του μήκους πάκτωσης εντός του κεφαλοδέσμου θεμελίωσης).

Κατά τους γεωστατικούς υπολογισμούς εξετάσθηκε η κατάλληλη διάταξη μικροπασσάλων για την ασφαλή ανάληψη των εντατικών μεγεθών τα οποία επιβάλλονται στην κεφαλή των πασσάλων, βάσει των αποτελεσμάτων από τις στατικές αναλύσεις για την κρίσιμη σεισμική φόρτιση (μελετητής στατικής μελέτης Χ. Καρναβέζος). Τα εν λόγω (σεισμικά) εντατικά μεγέθη (περιβάλλουσα σεισμικών συνδυασμών καταπόνησης κεφαλοδέσμου και αξονικές δυνάμεις επί μεμονωμένου μικροπασσάλου) παρουσιάζονται ακολούθως:

- Καμπτική ροπή κεφαλοδέσμου, M = 240 kN-m
- Τέμνουσα κεφαλοδέσμου, Q = 167 kN
- Θλιπτική Αξονική δύναμη κεφαλοδέσμου, N = 10 kN
- Θλιπτική Αξονική δύναμη Ν, μικροπασσάλου = 169 kN
- Εφελκυστική Αξονική δύναμη Ν, μικροπασσάλου =160 kN

Για τα ανωτέρω φορτία έγινε (παραμετρική) γεωστατική επίλυση μικροπασσάλων προκειμένου να εξαχθούν τα οριακά φορτία σε κατακόρυφη και οριζόντια φόρτιση βάσει των ακόλουθων δεομένων και παραδοχών:

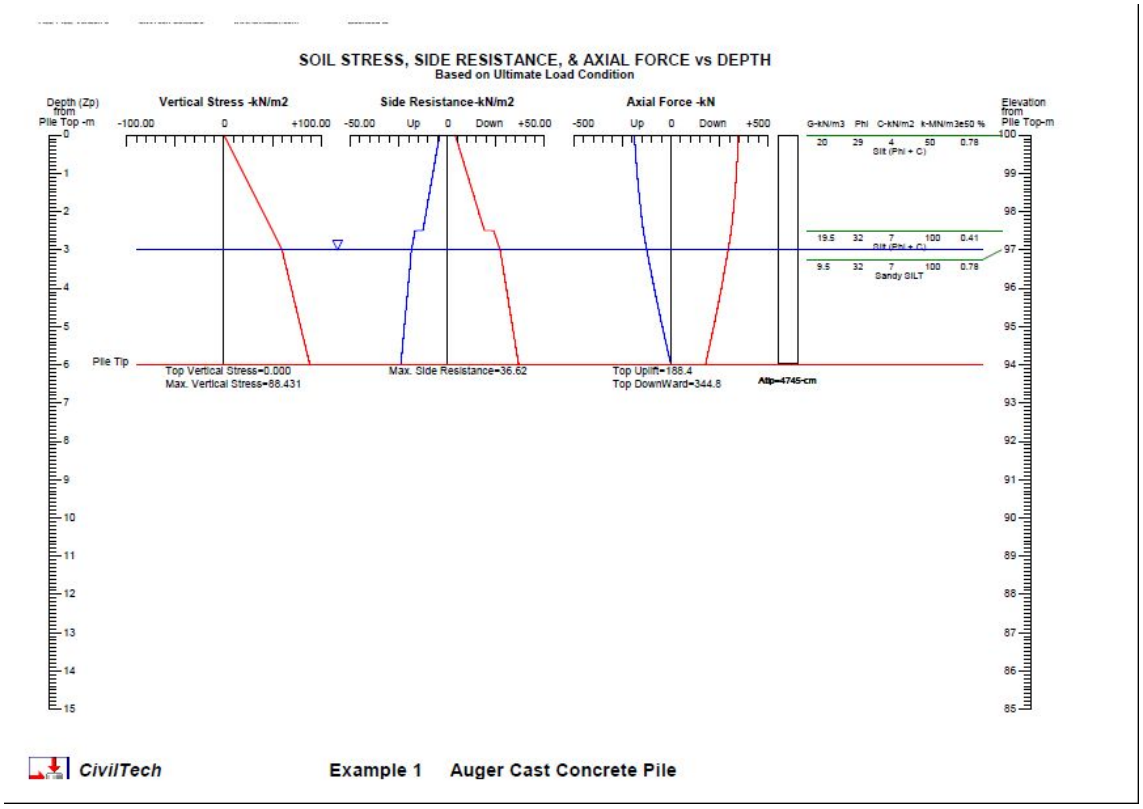
- Θεωρήθηκε ζεύγος μικροπασσάλων Φ25 από οπλισμένο σκυρόδεμα, ενεργού μήκους 6μ, με αξονική απόσταση 1.50μ (λεπτομερώς τα γεωμετρικά χαρακτηριστικά του κεφαλοδέσμου παρουσιάζονται ανωτέρω)
- Η κεφαλή των πασσάλων θεωρήθηκε δεσμευμένη στον κεφαλόδεσμο
- Οι μηχανικές ιδιότητες των εδαφικών ενοτήτων από τις οποίες διέρχονται οι μικροπάσσαλοι (Ενότητες II και III) ελήφθησαν από τον Πίνακα 3.1 της παραγράφου §3.2.1 της παρούσας μελέτης. Ειδικότερα θεωρήθηκε το ακόλουθο γεωτεχνικό προσομοίωμα:

| ΕΝΟΤΗΤΑ | Βάθος | | Φαιν. Βάρος | Διατμητική αντοχή | | Οριζόντια ελατήρια |
|---|---|---|---|---|---|---|
| | από | έως | γ (kN/m$^3$) | c(kPa) | ϕ(o) | kh(MN/m$^3$) |
| II | 0 | 2.5 | 20 | 4 | 29 | 50 |
| III | 2.5 | 3 | 19.5 | 7 | 32 | 100 |
| III * | 3 | 6 | 9.5 | 7 | 32 | 100 |

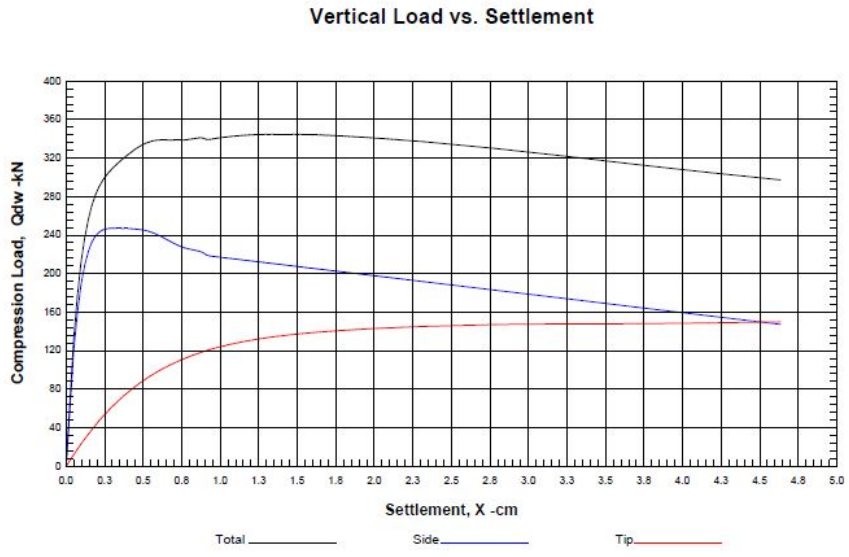
* Υπό τον ΥΟ

- Ο υπολογισμός των αναπτυσσόμενων εντατικών μεγεθών (οριζόντιου, κατακόρυφου φορτίου και καμπτικής ροπής) επί των μικροπασσάλων του ζεύγους, ως αποτέλεσμα των εισαγόμενων εντάσεων από το μεταλλικό πλαίσιο αντιστήριξης και την αντίδραση του εδάφους, η καθίζηση των μικροπασσάλων, καθώς και η μέγιστη αναπτυσσόμενη πίεση στο, περιβάλλον τους μικροπασσάλους, έδαφος γίνεται με το λογισμικό AllPile.

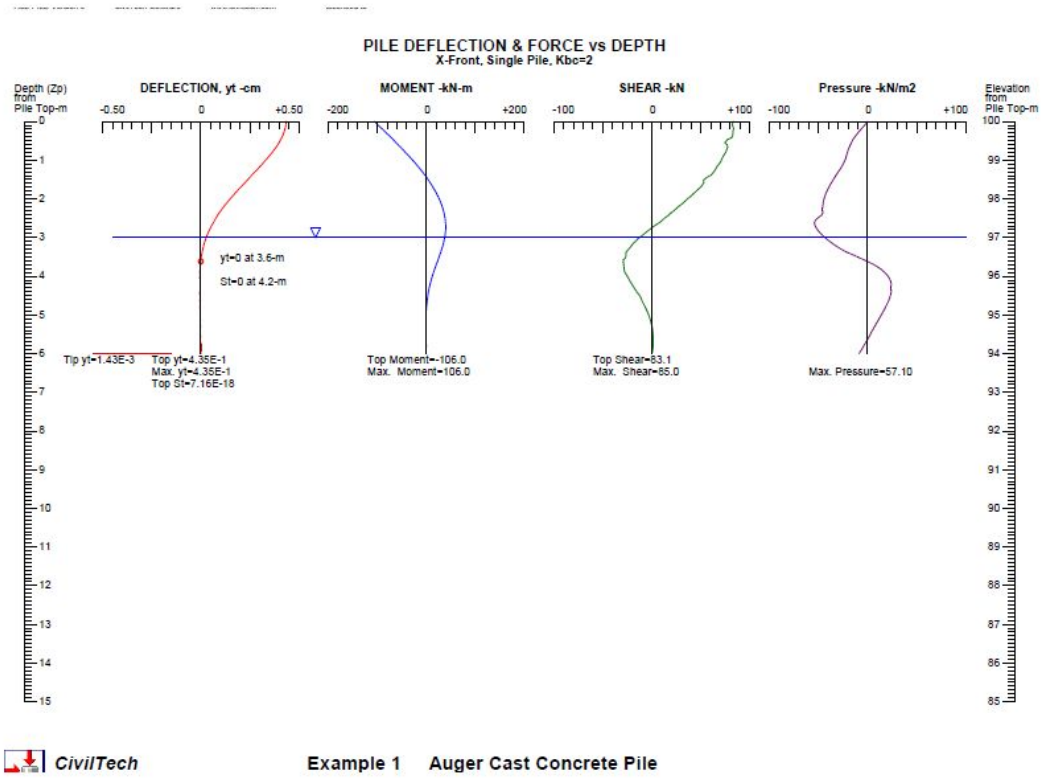
Τα ανωτέρω αποτελέσματα παρουσιάζονται αναλυτικά στις Εικόνες 9.1 – 9.4.



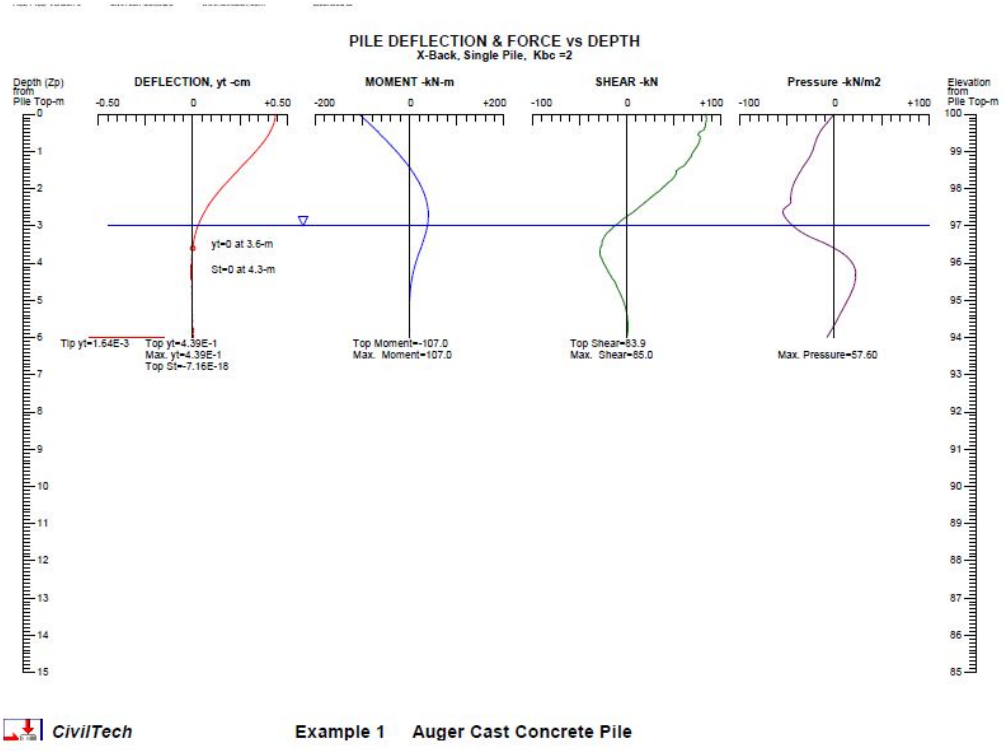

Εικ. 9.1: Αποτελέσματα θλιπτικής και εφελκυστικής αντοχής αξονικού φορτίου για τον πρόσθιο πάσσαλο του ζεύγους.




Εικ. 9.2: Διάγραμμα κατακόρυφου φορτίου – καθίζησης μικροπασσάλου (για τα γεωτεχνικά δεδομένα στην περιοχή θεμελίωσης).




Εικ. 9.3: Αποτελέσματα καμπτικής ροπής, τέμνουσας και μέγιστης εδαφικής πίεσης για τον πρόσθιο πάσσαλο του ζεύγους.




Εικ. 9.4: Αποτελέσματα καμπτικής ροπής, τέμνουσας και μέγιστης εδαφικής πίεσης για τον οπίσθιο πάσσαλο του ζεύγους.

Συγκεντρωτικά τα αποτελέσματα των γεωστατικών υπολογισμών μικροπασσάλων θεμελίωσης παρουσιάζονται στον ακόλουθο Πίνακα 9.1.

Πίνακας 9.1: Αποτελέσματα γεωστατικών αναλύσεων μικροπασσάλων θεμελίωσης

| ΜΙΚΡΟ-ΠΑΣΣΑΛΟΣ | Ενεργό Μήκος (m) | Μετακίνηση κεφαλής (cm) | ΡΟΠΗ (kN-m) | ΤΕΜΝΟΥΣΑ (kN) | ΑΞΟΝΙΚΗ σε Θλίψη (kN) | ΑΞΟΝΙΚΗ σε Εφελκυσμό (kN) | Καθίζηση (cm) | Μέγιστη εδαφική πίεση (kPa) |
|---|---|---|---|---|---|---|---|---|
| **Πρόσθιος** | 4 | 0.44 | 106 | 85 | 344 | 188 | 0.12 | 57 |
| **Οπίσθιος** | 4 | 0.44 | 107 | 85 | 344 | 188 | 0.12 | 58 |

Τα ανωτέρω αποτελέσματα χρησιμοποιούνται από το στατικό μελετητή της μελέτης (Χ. Καρναβέζος) για το στατικό σχεδιασμό των μικροπασσάλων.

Τα αναλυτικά αποτελέσματα υπολογισμών μικροπασσάλων θεμελίωσης περιέχονται στο ΠΑΡΑΡΤΗΜΑ Γ.

## 9.2. Μικροπάσσαλοι βελτίωσης της ευστάθειας του ανατολικού τμήματος του πρανούς

Από τις αναλύσεις ευστάθειας για τον έλεγχο κανονιστικής επάρκειας της προτεινόμενης χωματουργικής διαμόρφωσης προκύπτει ανεπαρκής συντελεστής ασφαλείας για τον ακραίο σεισμό, για τις διατομές οι οποίες αντιπροσωπεύουν τις περιοχές μεταξύ των αντηρίδων Ξ – Ο (διατομή S44) και Π – Ρ (διατομή S51). Ειδικότερα, προκύπτει υπολογιστική βαθιά ολίσθηση σε κυκλική επιφάνεια η οποία διέρχεται κάτω από το προτείχισμα με σαραζανέτια και το προς αναστήλωση (σύμφωνα με την αρχιτεκτονική πρόταση) αρχαίο ανάλημμα.

Η αντιμετώπιση της υπολογιστικής αστοχίας γίνεται με την κατασκευή μικροπασσάλων Φ25, από οπλισμένο σκυρόδεμα, επί κεφαλοδέσμου, σε αξονική (διαμήκη) απόσταση, s = 0.75μ. Συγκεκριμένα, κατασκευάζονται 8 μικροπάσσαλοι, ενεργού μήκους 4μ, έμπροσθεν της περιοχής μεταξύ αντηρίδων Ξ – Ο και επίσης 8 μικροπάσσαλοι, ενεργού μήκους 6μ, έμπροσθεν της περιοχής μεταξύ αντηρίδων Π – Ρ.

Οι μικροπάσσαλοι και ο κεφαλόδεσμος κατασκευάζονται απολύτως όμοια (ανάλογα) με τους αντίστοιχους για τη θεμελίωση των νέων διατάξεων αντιστήριξης. Συντηρητικά, θεωρείται ότι κάθε μικροπάσσαλος εισάγει διατμητική σταθεροποιητική δύναμη ίση με 67kN/m. Η θέση των πασσάλων, οι λεπτομέρειες κατασκευής τους καθώς και οι ιδιότητες των υλικών τους παρουσιάζεται στα σχετικά σχέδια οριζοντιογραφίας και διατομών, τα οποία συνοδεύουν την παρούσα μελέτη.

# 10. ΑΝΑΛΥΣΕΙΣ ΕΣΩΤΕΡΙΚΗΣ ΕΥΣΤΑΘΕΙΑΣ ΤΩΝ ΠΡΟΤΕΙΧΙΣΜΑΤΩΝ ΑΝΤΙΣΤΗΡΙΞΗΣ ΑΠΟ ΣΑΡΑΖΑΝΕΤΙΑ

## 10.1. Γενικά

Το παρόν κεφάλαιο περιλαμβάνει τους γεωστατικούς υπολογισμούς οι οποίοι αποσκοπούν στον έλεγχο επάρκειας της εσωτερικής και εξωτερικής ευστάθειας του προτειχίσματος συρματοκιβωτίων.

Ειδικότερα, ο έλεγχος πρέπει να περιλαμβάνει τις ακόλουθες γεωτεχνικές και στατικές καταστάσεις αστοχίας:

- σε ολίσθηση
- σε ανατροπή
- γενικής ευστάθειας
- φέρουσας ικανότητας εδάφους θεμελίωσης

Εκ των ανωτέρω ελέγχων, α) ο έλεγχος φέρουσας ικανότητας του εδάφους παρέλκει, δεδομένου ότι το προτείχισμα από συρματοκιβώτια τοποθετείται σε αντικατάσταση (με εκσκαφή) φυσικού εδάφους του πρανούς και β) ο έλεγχος γενικής ευστάθειας καλύπτεται από τις αναλύσεις ευσταθείας με τη μέθοδο οριακής ισορροπίας και τη μέθοδο SSR με τη μέθοδο πεπερασμένων στοιχείων.

## 10.2. Σχεδιασμός τοίχων συρματοκιβωτίων

Ο υπολογισμός-σχεδιασμός του τοίχου από συρματοκιβώτια έγινε επί της γεωμετρικά δυσμενούς γεωτεχνικής διατομής S44 με απλοποιητική προσομοίωση του προτειχίσματος και του αλληλεπιδρώντος με αυτό εδάφους (σχετικά δες Εικ. 10.1).

Ειδικότερα εξετάσθηκε, το κατώτερο (κρίσιμο) τμήμα του προτειχίσματος με συρματοκιβώτια ύψους 0.5μ, με γεωμετρία βαθμιδωτής διατομής (πλάτους 3μ στη βάση και ύψους 2.5, με υποχώρηση πλάτους 0.5μ ανά 0.5 ύψους) και έδραση επί της επιφάνειας εκσκαφής.

Για τις αναλύσεις καθορίσθηκαν οι ακόλουθοι αποδεκτοί συντελεστές ασφαλείας, για μόνιμη εγκατάσταση του προτειχίσματος συρματοκιβωτίων:

Α. ΣΤΑΤΙΚΕΣ ΣΥΝΘΗΚΕΣ

Ολίσθηση: FS=1.20

Ανατροπή: FS=1.40

Γενική ευστάθεια: FS=1.10

Φέρουσα ικανότητα εδάφους: FS=1.10

Β. ΣΕΙΣΜΙΚΕΣ ΣΥΝΘΗΚΕΣ (σεισμική δράση σχεδιασμού, $a_{hd}$ = 0.20, $a_{vd}$ = 0.10)

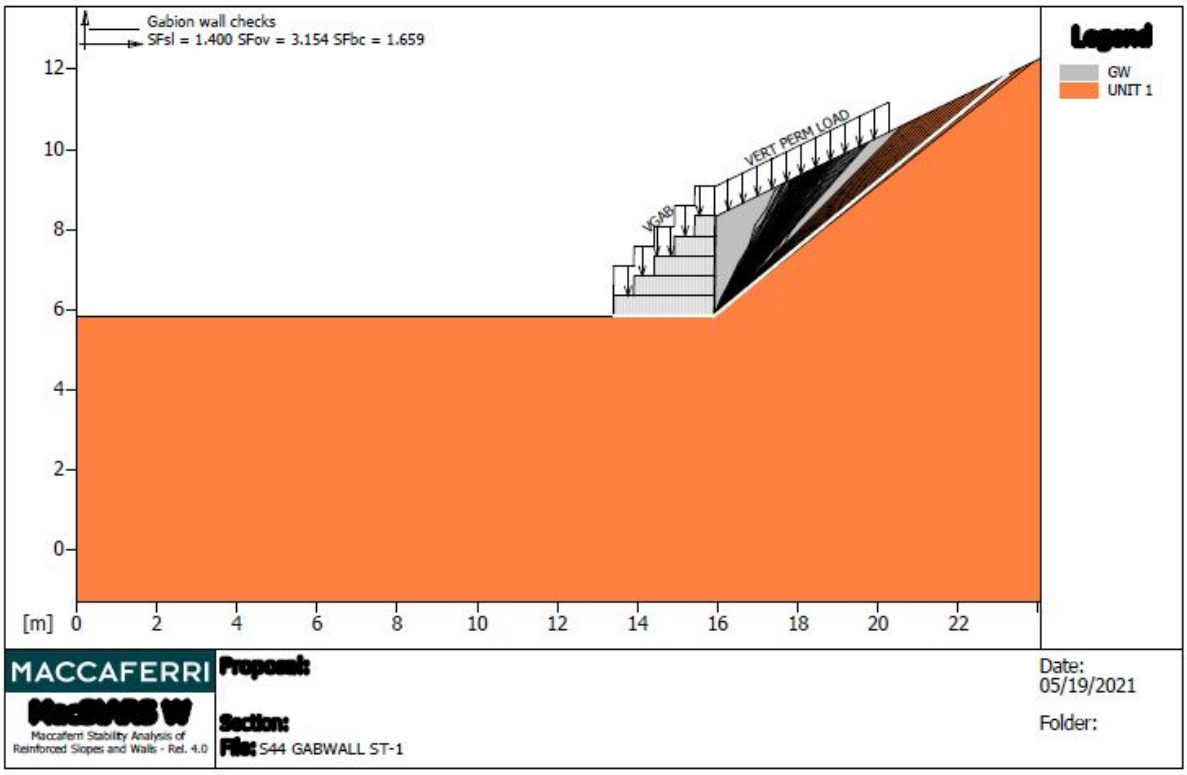
Ολίσθηση: FS=1.00

Ανατροπή: FS=1.00

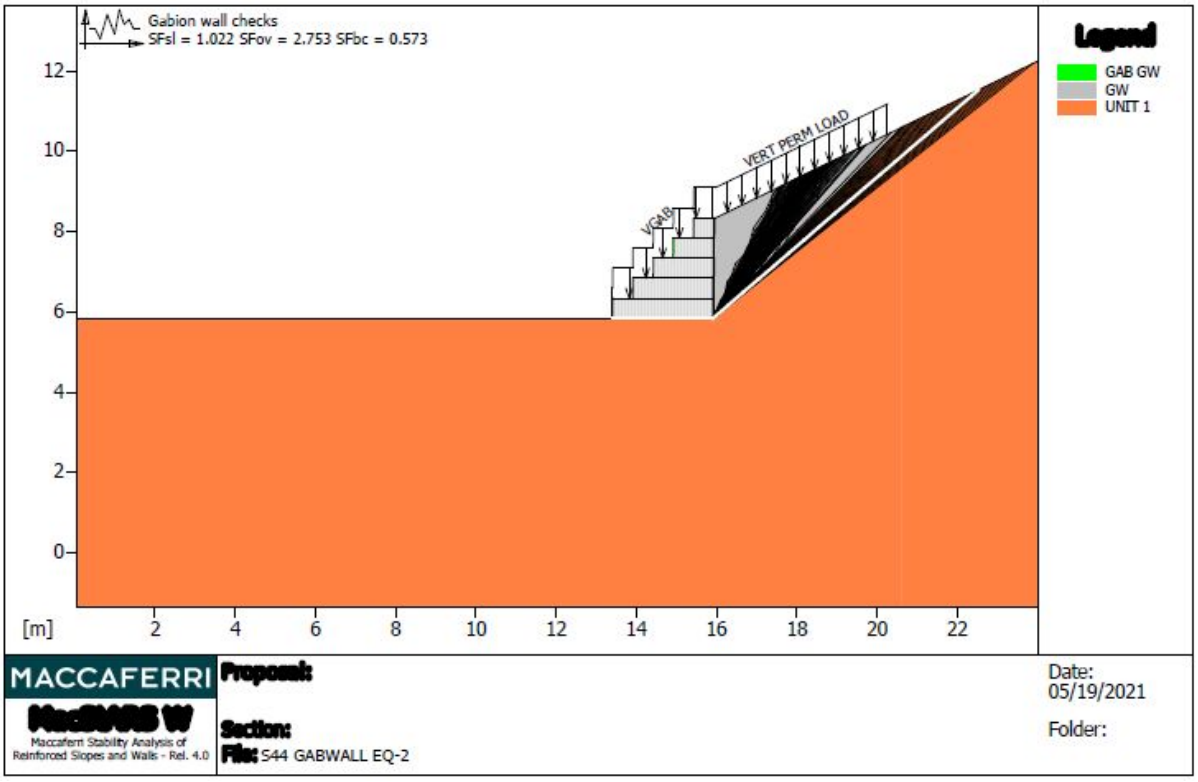
Γενική ευστάθεια: FS=1.00

Φέρουσα ικανότητα εδάφους: FS=1.00

Τα αποτελέσματα από τους υπολογισμούς, από τους οποίους προκύπτει η επάρκεια του περιγραφόμενου σχεδιασμού παρουσιάζονται εποπτικά στις Εικόνες 10.1 και 10.2 για στατικές και σεισμικές συνθήκες αντίστοιχα.




Εικ. 10.1: Αποτελέσματα υπολογισμών εσωτερικής ευστάθειας προτειχίσματος συρματοκιβωτίων για στατικές συνθήκες.




Εικ. 10.2: Αποτελέσματα υπολογισμών εσωτερικής ευστάθειας προτειχίσματος συρματοκιβωτίων για σεισμικές συνθήκες.

Συγκεντρωτικά τα αποτελέσματα υπολογισμών εσωτερικής ευστάθειας του προτειχίσματος συρματοκιβωτίων, παρουσιάζονται στον Πίνακα 10.1.

Πίνακας 10.1: Συγκεντρωτικά αποτελέσματα υπολογισμών εσωτερικής ευστάθειας του προτειχίσματος συρματοκιβωτίων.

| Διατομή ελέγχου | Κατάσταση φόρτισης | | | |
|---|---|---|---|---|
| | Στατικές συνθήκες | | Σεισμικές συνθήκες [1] | |
| | Ολίσθηση | Ανατροπή | Ολίσθηση | Ανατροπή |
| | FS | FS | FS | FS |
| **S44** | 1.40 | 3.15 | 1.02 | 2.75 |

1: $a_{hd} = 0.20$, $a_{vd} = 0.10$

Τα αναλυτικά αποτελέσματα υπολογισμών του προτειχίσματος περιέχονται στο ΠΑΡΑΡΤΗΜΑ Δ.

# 11. ΣΥΝΔΥΑΣΤΙΚΟΣ ΕΛΕΓΧΟΣ ΕΥΣΤΑΘΕΙΑΣ ΤΗΣ ΑΝΑΣΤΗΛΩΤΙΚΗΣ ΠΡΟΤΑΣΗΣ ΚΑΙ ΤΗΣ ΧΩΜΑΤΟΥΡΓΙΚΗΣ ΑΠΟΚΑΤΑΣΤΑΣΗΣ ΤΟΥ ΠΡΑΝΟΥΣ

## 11.1. Γενικά

Στο παρόν κεφάλαιο αξιολογείται συνολικά η προκύπτουσα (υπολογιστικά) ευστάθεια της τελικής διαμόρφωσης στο ανατολικό άκρο του αναλήμματος των Θησαυρών (περιοχή αντηρίδων Ν – Ρ, με έμφαση στην εσωτερική και εξωτερική ευστάθεια του –προς ανστήλωση- αρχαίου αναλήμματος. Η διαμόρφωση αυτή προκύπτει ως αποτέλεσμα της εφαρμογής των επιμέρους ειδικότερων μελετητικών σχεδιασμών στην περιοχή μελέτης (αθροιστικό αποτέλεσμα γεωτεχνικής, αρχιτεκτονικής, στατικής και υδραυλικής μελέτης και ειδικότερα του γεωτεχνικού σχεδιασμού αποκατάστασης του πρανούς και της αρχιτεκτονικής αναστηλωτικής παρέμβασης στο ανάλημμα).

Προς τον σκοπό αυτό πραγματοποιούνται κατάλληλες 2-Δ ελαστοπλαστικές αναλύσεις αλληλεπίδρασης αρχαίου αναλήμματος και (ως αποτέλεσμα γεωτεχνικού σχεδιασμού) διαμορφωμένου πρανούς, στη δυσμενή διατομή S44, η οποία αντιπροσωπεύει χαρακτηριστικά την περιοχή του αναλήμματος μεταξύ των αντηρίδων Ξ και Ο, με χρησιμοποίηση πεπερασμένων και διακριτών στοιχείων.

Η ανάλυση γίνεται σε στάδια αντιπροσωπευτικά των κατασκευαστικών σταδίων χωματουργικής διαμόρφωσης και αναστήλωσης:

- Αρχική εκσκαφή του πρανούς για απομάκρυνση του ολισθήσαντος εδάφους
- Τοποθέτηση της κάτω στάθμης προτειχίσματος συρματοκιβωτίων και της μεταβατικής λιθορριπής
- Τοποθέτηση της άνω στάθμης προτειχίσματος συρματοκιβωτίων και της μεταβατικής λιθορριπής
- Διαμόρφωση της επιφάνειας του πρανούς με διάστρωση καλά συμπυκνωμένου αμμμοχάλικου
- Αναστήλωση του αρχαίου αναλήμματος στην προβλεπόμενη αρχιτεκτονικά θέση
- Κατασκευή μικροπασσάλων εξωτερικά του αρχαίου αναλήμματος για την αποτροπή ολισθήσεων επί βαθέων κυκλικών επιφανειών
- Επιβολή της σεισμικής δράσης του ακραίου σεισμού σχεδιασμού ($a_h$=0.20g, $a_v$=0.10g)

Συνολικά πραγματοποιούνται 4 ψευδοστατικές ελαστοπλαστικές αναλύσεις προκειμένου να ελεγχθεί η επίδραση των εξωτερικών μικροπασσάλων στην απόκριση του αναλήμματος σε αλληλεπίδραση με το διαμορφωμένο πρανές.

Η συνολική αξιολόγηση της ευστάθειας γίνεται σε 2 άξονες:

α) με κατάλληλο επιτελεστικό κριτήριο (κριτήριο Κ) το οποίο βρίσκει εφαρμογή σε αναλημματικές δομές και εκφράζει τη σχετική μετακίνηση της στέψης του αναλήμματος ως προς τη βάση, ανηγμένη στο ύψος του αναλήμματος (ισοδύναμο της στροφής του αναλήμματος).

Το επιτελεστικό κριτήριο παρουσιάζεται στον ακόλουθο Πίνακα 11.1.

Πίνακας 11.1: Στάθμες επιτελεστικότητας κριτηρίου Κ

| Ανηγμένο (ως προς το ύψος) σχετικό βέλος κορυφής-ποδός | Στάθμη Επιτελεστικότητας Οριακή Κατάσταση Ελέγχου |
|---|---|
| <2% | Οιονεί Πλήρης Λειτουργικότητα |
| 2%-5% | Περιορισμένες Βλάβες |
| 5%-10% | Σημαντικές Βλάβες |
| 10%-15% | Οιονεί Κατάρρευση |

ΣΗΜΕΙΩΣΗ: Κατά την εφαρμογή του κριτηρίου Κ, λαμβάνεται υπόψιν η τυχόν αρχική κλίση του τοίχου αντιστήριξης προς τα έσω. Το κριτήριο εφαρμόζεται από την μετακίνηση η οποία έχει οδηγήσει σε κατακορυφότητα την όψη και πέραν αυτής.

β) Με τον προσδιορισμό της δημιουργίας πλαστικών ζωνών στα επιμέρους συστήματα τα οποία δομούν τη συνολική επέμβαση στο –υπό μελέτη- πρανές.

## 11.2. Αποτελέσματα 2-Δ ελαστοπλαστικών αναλύσεων

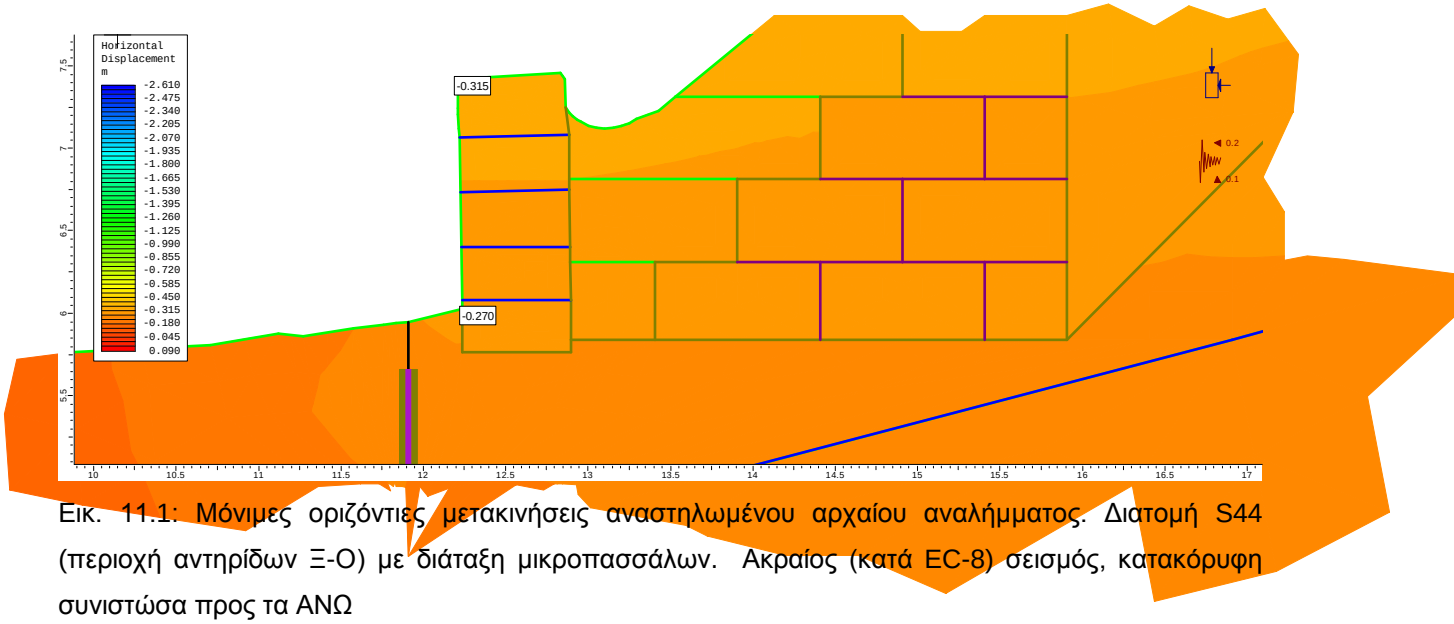
Οι 2-Δ ελαστοπλαστικές αναλύσεις πραγματοποιούνται στη δυσμενέστερη γεωμετρικά διατομή (ανάλημμα και πρανές) S44.

Τα αποτελέσματα από τις ελαστικές αναλύσεις και η αξιολόγηση της απόκρισης του –προς αναστήλωση- αρχαίου αναλήμματος, βάσει του προαναφερθέντος επιτελεστικού κριτήριου Κ, παρουσιάζονται συστηματικά στον Πίνακα 11.2.

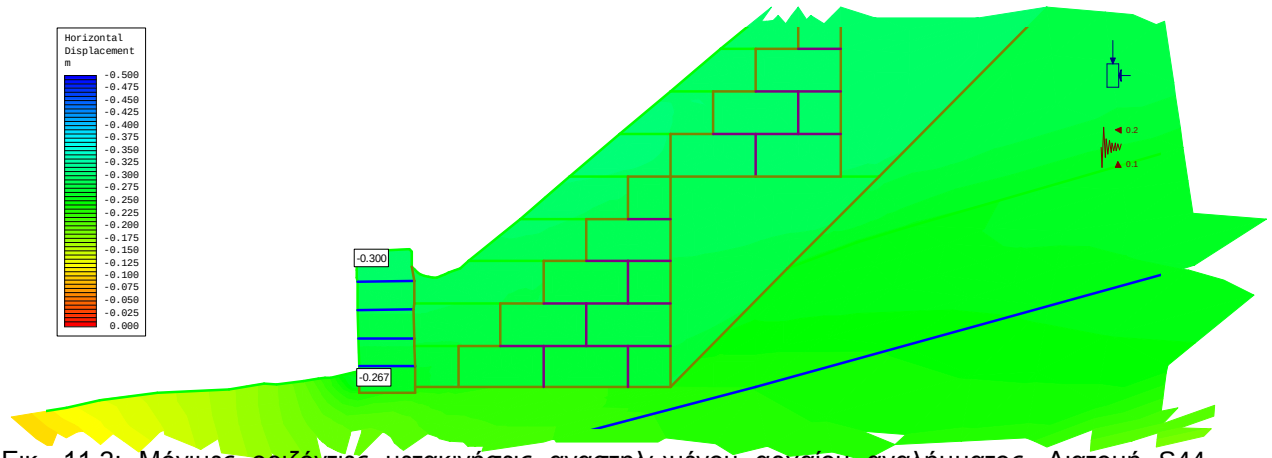
Πίνακας 11.2 Αποτελέσματα επιτελεστικής απόκρισης του αναστηλωμένου τμήματος του αρχαίου αναλήμματος (μεταξύ των αντηρίδων Ν και Ρ) στον ακραίο (κατά EC-8) κανονιστικό σεισμό

| ΔΙΑΤΟΜΗ | ΦΟΡΤΙΣΗ | ΜΕΤΡΑ | Μετακίνηση στέψης αναλήμματος (m) | Μετακίνηση βάσης αναλήμματος (m) | Ελεύθερο ύψος αναλήμματος (m) | Επιτελεστική απόκριση (κριτήριο K%) | Αξιολόγηση απόκρισης |
|---|---|---|---|---|---|---|---|
| S44 | Ακραίος Σεισμός: $a_{hd}$ = 0.20, $a_{vd}$ = 0.10 ΑΝΩ | Πρόσθια διάταξη μικροπασσάλων | 0.338 | 0.286 | 1.40 | 3.71 | ΑΠΟΔΕΚΤΗ |
| S44 | Ακραίος Σεισμός: ahd = 0.20, avd = 0.10 ΑΝΩ | Χωρίς διάταξη μικροπασσάλων | 0.297 | 0.268 | 1.40 | 2.07 | ΑΠΟΔΕΚΤΗ |
| S44 | Ακραίος Σεισμός: ahd = 0.20, avd = 0.10 ΚΑΤΩ | Πρόσθια διάταξη μικροπασσάλων | 0.126 | 0.106 | 1.40 | 1.43 | ΑΠΟΔΕΚΤΗ |
| S44 | Ακραίος Σεισμός: ahd = 0.20, avd = 0.10 ΚΑΤΩ | Χωρίς διάταξη μικροπασσάλων | 0.115 | 0.095 | 1.40 | 1.43 | ΑΠΟΔΕΚΤΗ |

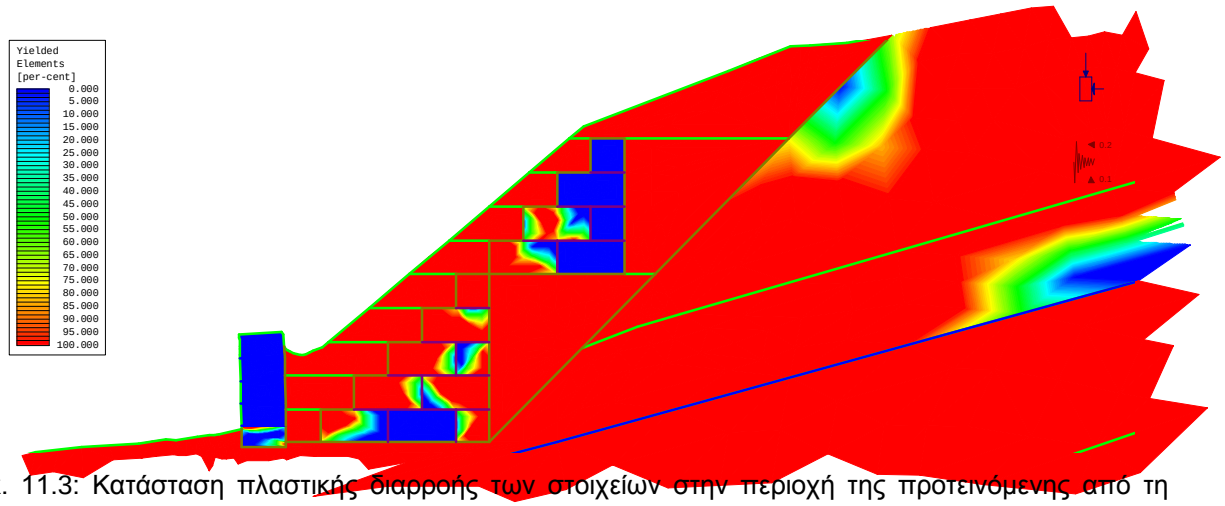
Χαρακτηριστικά εποπτικά αποτελέσματα από τις 2-Δ ελαστοπλαστικές αναλύσεις αλληλεπίδρασης πρανούς και αναλήμματος αναφορικά με τις μόνιμες μετακινήσεις του αναλήμματος και την δημιουργία πλαστικών περιοχών (υπέρβαση τεθέντος ελαστικού ορίου αναλόγως του υλικού και του νόμου ο οποίος διέπει την καταστατική συμπεριφορά του) για την περίπτωση του ακραίου –κατά EC-8- σεισμού, παρουσιάζονται στις Εικόνες 11.1 – 11.4.



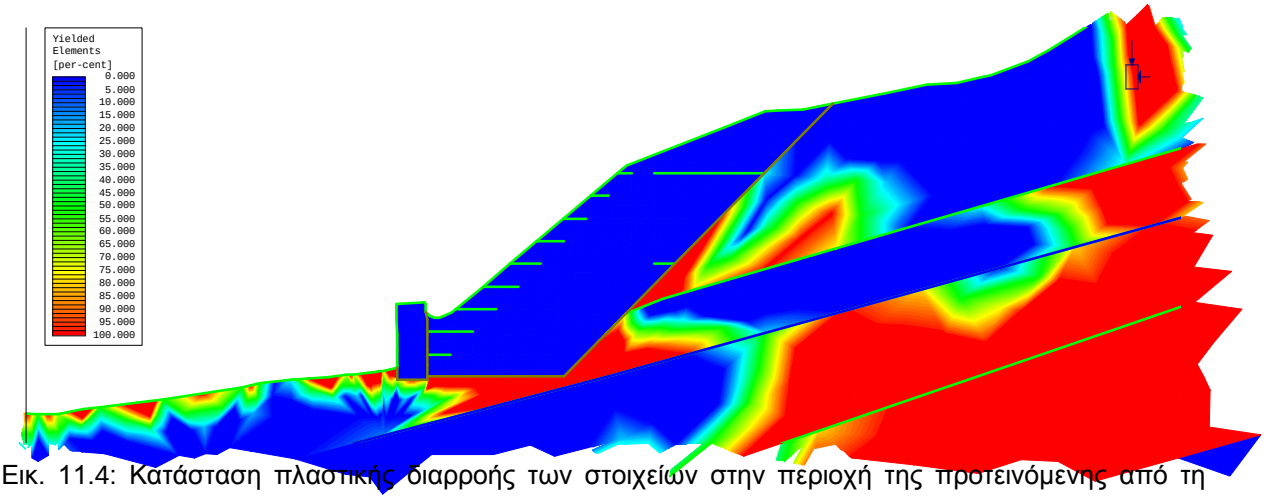

Εικ. 11.1: Μόνιμες οριζόντιες μετακινήσεις αναστηλωμένου αρχαίου αναλήμματος. Διατομή S44 (περιοχή αντηρίδων Ξ-Ο) με διάταξη μικροπασσάλων. Ακραίος (κατά EC-8) σεισμός, κατακόρυφη συνιστώσα προς τα ΑΝΩ




Εικ. 11.2: Μόνιμες οριζόντιες μετακινήσεις αναστηλωμένου αρχαίου αναλήμματος. Διατομή S44 (περιοχή αντηρίδων Ξ-Ο) χωρίς διάταξη μικροπασσάλων. Ακραίος (κατά EC-8) σεισμός, κατακόρυφη συνιστώσα προς τα ΑΝΩ




Εικ. 11.3: Κατάσταση πλαστικής διαρροής των στοιχείων στην περιοχή της προτεινόμενης από τη μελέτη επέμβασης. Διατομή S44 ((περιοχή αντηρίδων Ξ-Ο) χωρίς διάταξη μικροπασσάλων – κόκκινο = πλαστική περιοχή, μπλε = ελαστική περιοχή.




Εικ. 11.4: Κατάσταση πλαστικής διαρροής των στοιχείων στην περιοχή της προτεινόμενης από τη μελέτη επέμβασης. Διατομή S44 ((περιοχή αντηρίδων Ξ-Ο) με διάταξη μικροπασσάλων – κόκκινο = πλαστική περιοχή, μπλε = ελαστική περιοχή.

Από τα αποτελέσματα των ελαστοπλαστικών αναλύσεων προκύπτουν:

- η υπολογιστική στατική επάρκεια της αναστηλωτικής μελετητικής πρότασης για το αρχαίο ανάλημμα στην περιοχή επέμβασης (περιοχή μεταξύ αντηρίδων Ν και Ρ) ακόμη και για τα τμήματα στα οποία δεν προβλέπεται η κατασκευή εξωτερικών μικροπασσάλων.
- Η θετική επίδραση των μικροπασσάλων, στην επιβαλλόμενη ένταση στις επιμέρους δομικά συστήματα τα οποία συγκροτούν την συνολική επέμβαση εξασφάλισης – χωματουργικής αποκατάστασης του πρανούς και της αναστήλωσης του αρχαίου αναλήμματος.

## 12. ΒΑΣΙΚΗ ΠΕΡΙΓΡΑΦΗ ΕΡΓΑΣΙΩΝ

Στο πλαίσιο της υλοποίησης μόνιμων μέτρων επέμβασης, για την κανονιστική εξασφάλιση και τη σταθεροποίηση του πρανούς στην περιοχή μελέτης, καθώς και τη χωματουργική αποκατάσταση της μορφολογίας του πρανούς σε συνδυασμό με την -προβλεπόμενη από την αρχιτεκτονική μελέτη- αναστήλωση του αρχαίου αναλήμματος στην περιοχή μελέτης, προβλέπονται οι ακόλουθες βασικές εργασίες:

1. Εκσκαφή απομάκρυνση της ολισθήσασας (ή επιρρεπούς σε ολίσθηση) εδαφικής μάζας στο τμήμα του πρανούς ανάντη του αναλήμματος μεταξύ των αντηρίδων Ν και Σ. Η εκσκαφή γίνεται σε πλάτος 3μ με παράλληλη δημιουργία πρανούς κλίσης Η:V = 1:1, σύμφωνα με τα σχέδια τα οποία συνοδεύουν την παρούσα μελέτη.
2. Μικρή εκσκαφή για τη δημιουργία σκάφης έδρασης βάθους 30 εκ και πλάτους 3μ, στην επιφάνεια του φυσικού εδάφους, για την προετοιμασία έδρασης προτειχίσματος συρματοκιβωτίων. Η επιφάνεια της σκάφης έδρασης θα συμπυκνωθεί με χρήση χειροκίνητης δονητικής πλάκας και ακολούθως, η σκάφη θα πληρωθεί με επίλεκτο εδαφικό υλικό (κατηγορία Ε4 κατά ΕΤΕΠ 02-07-01-00). Το υλικό πλήρωσης της σκάφης θα συμπυκνωθεί επίσης με χρήση χειροκίνητης δονητικής πλάκας.
3. Εκσκαφή απάλυνσης της κλίσης του πρανούς στην περιοχή του αναβαθμού του επαρχιακού δρόμου Ολυμπία – Τρίπολη (α) περιοχή ανάντη του διαστήματος μεταξύ των αντηρίδων Π και Ρ και β) του πρανούς στο δυτικό όριο του αρχαίου σταδίου). Στην περιοχή αυτή θα πρέπει να γίνει συμπύκνωση της διαταραγμένης, λόγω χωματουργικής διαμόρφωσης, επιφάνειας με χρήση χειροκίνητης δονητικής πλάκας.
4. Διάστρωση γεωϋφάσματος στραγγιστηρίου (ΕΤΕΠ 08-03-03-00) στην δημιουργούμενη επιφάνεια της εκσκαφής του πρανούς και στην επιφάνεια της διαμορφωμένης σκάφης έδρασης των συρματοκιβωτίων από λιθορριπή .
5. Εγκατάσταση συρματοκιβωτίων με λιθορριπή και τοποθέτηση μεταβατικού επιχώματος μεταξύ της πίσω παρειάς των συρματοκιβωτίων και του πρανούς του φυσικού εδάφους με τοποθέτηση σκύρων διαστάσεων 3-8 εκ, σύμφωνα με τα σχέδια της μελέτης.
6. Επίχωση των συρματοκιβωτίων με επίλεκτο εδαφικό υλικό (αμμοχάλικο) σε στρώσεις πάχους 50 εκ. με παρεμβολή γεωπλέγματος ενίσχυσης/συγκράτησης (εφελκυστικής αντοχής 40 kN/m) μεταξύ διαδοχικών στρώσεων, για την αποτροπή επιφανειακών ολισθήσεων. Οι εδαφικές στρώσεις θα συμπυκνωθούν με χρήση χειροκίνητης δονητικής πλάκας. Η εξωτερική επιφάνεια της κάθε διακριτής στρώσης του εδαφικού υλικού επίχωσης θα εγκιβωτισθεί με μη υφαντό γεωϋφασμα διαχωρισμού βάρους

280gr/$m^2$, σύμφωνα με το σχέδιο λεπτομερειών της μελέτης, για την αποτροπή διαρροής εδαφικού υλικού. Επίσης, μη υφαντό γεωϋφασμα διαχωρισμού βάρους 280gr/$m^2$ θα καλυφθεί η εξωτερική επιφάνεια των συρματοκιβωτίων, προκειμένου να αποτραπεί διείσδυση του επιφανειακού εδαφικού υλικού κάλυψης εντός των συρματοκιβωτίων.

7. Κατασκευή διάταξης μικροπασσάλων Φ25, έμπροσθεν του (προς αναστήλωση) τμήματος του αναλήμματος στα διαστήματα μεταξύ των αντηρίδων Ξ-Ο και Π-Ρ για βελτίωση της γενικής ευστάθειας του πρανούς. Η κεφαλή των μικροπασσάλων θα ενσωματωθεί/πακτωθεί σε κεφαλόδεσμο από οπλισμένο σκυρόδεμα διατομής 50εκ. x 50εκ., του οποίου η άνω παρειά θα υπόκειται κατά 30εκ. της επιφάνεια του εδάφους. Θα χρησιμοποιηθούν μικροπάσσαλοι και κεφαλόδεσμος ίδιοι/αντίστοιχοι με τους προβλεπόμενους (στη στατική μελέτη) για αναβάθμιση της μεταλλικής αντιστηρικτικής διάταξης του αναλήμματος των Θησαυρών από το δυτικό του άκρο έως την αντηρίδα Ξ. Ειδικότερα στο διάστημα μεταξύ των αντηρίδων Ξ-Ο θα χρησιμοποιηθούν μικροπάσσαλοι μήκους 4μ, ενώ στο διάστημα μεταξύ των αντηρίδων Π-Ρ θα χρησιμοποιηθούν μικροπάσσαλοι μήκους 6μ. Τα ανωτέρω μήκη θεωρούνται από την κάτω παρειά του κεφαλοδέσμου. Η κατασκευή του κεφαλοδέσμου θα γίνει σε σκάμμα διατομής 0.50μ x 0.80μ. Μετά τη σκυροδέτηση του κεφαλοδέσμου το σκάμμα θα επιχωθεί με εδαφικό υλικό από επίλεκτο αμμοχάλικο Ε4 (ΕΤΕΠ 02-07-01-00) το οποίο θα συμπυκνωθεί με χρήση χειροκίνητης δονητικής πλάκας. Η ακριβής διάταξη, τα γεωμετρικά χαρακτηριστικά, οι μηχανικές ιδιότητες των υλικών και ο οπλισμός των μικροπασσάλων βελτίωσης της ευστάθειας παρουσιάζεται στα σχέδια της παρούσας μελέτης.
8. Αναστήλωση του αναλήμματος, σύμφωνα με την σχετική αρχιτεκτονική πρόταση και διαμόρφωση της επίχωσης στην κρυφή παρειά του (σχετικά δες σχέδια αρχιτεκτονικής μελέτης).
9. Κατασκευή των υδραυλικών διατάξεων στεγάνωσης της επιφάνειας του (προς μελέτη) πρανούς, εγκατάσταση διατάξεων απορροής των ομβρίων και των στοιχείων τελικής διαμόρφωσης της αποκαθιστούμενης επιφάνειας (σχετικά δες σχέδια υδραυλικής μελέτης και αρχιτεκτονικής μελέτης).
10. Προμέτρηση των εργασιών αποκατάστασης – προστασίας του πρανούς περιέχεται στο ΠΑΡΑΤΗΜΑ Ε της παρούσας μελέτης.

.

| Ο Συντάξας | Για τη ΓΕΩ.ΠΕΡ. ΑΕ |
|---|---|
| Δ. Εγγλέζος | Χ. Γκούβας |
| Δρ Πολιτικός Μηχανικός ΕΜΠ | Γεωλόγος |

# ΠΑΡΑΡΤΗΜΑΤΑ

ΠΑΡΑΡΤΗΜΑ Α (ψηφιακά): ΔΕΔΟΜΕΝΑ ΥΠΟΛΟΓΙΣΜΩΝ ΕΥΣΤΑΘΕΙΑΣ ΜΕ ΤΗ ΜΕΘΟΔΟ ΟΡΙΑΚΗΣ ΙΣΟΡΡΟΠΙΑΣ

ΠΑΡΑΡΤΗΜΑ Β (ψηφιακά): ΔΕΔΟΜΕΝΑ ΥΠΟΛΟΓΙΣΜΩΝ ΕΛΑΣΤΟΠΛΑΣΤΙΚΩΝ ΑΝΑΛΥΣΕΩΝ ΜΕ ΠΕΠΕΡΑΣΜΕΝΑ ΣΤΟΙΧΕΙΑ

ΠΑΡΑΡΤΗΜΑ Γ: (ψηφιακά) ΔΕΔΟΜΕΝΑ – ΑΠΟΤΕΛΕΣΜΑΤΑ ΥΠΟΛΟΓΙΣΜΩΝ ΣΧΕΔΙΑΣΜΟΥ ΜΙΚΡΟΠΑΣΣΑΛΩΝ ΘΕΜΕΛΙΩΣΗΣ ‘Η/ΚΑΙ ΑΝΤΙΣΤΗΡΙΞΗΣ

ΠΑΡΑΡΤΗΜΑ Δ: ψηφιακά) ΔΕΔΟΜΕΝΑ – ΑΠΟΤΕΛΕΣΜΑΤΑ ΥΠΟΛΟΓΙΣΜΩΝ ΣΧΕΔΙΑΣΜΟΥ ΠΡΟΤΕΙΧΙΣΜΑΤΩΝ ΑΝΤΙΣΤΗΡΙΞΗΣ ΜΕ ΣΥΡΜΑΤΟΚΙΒΩΤΙΑ

ΠΑΡΑΡΤΗΜΑ Ε: ψηφιακά) ΠΡΟΜΕΤΡΗΣΗ ΤΩΝ ΕΡΓΑΣΙΩΝ ΧΩΜΑΤΟΥΡΓΙΚΗΣ ΑΠΟΚΑΤΑΣΤΑΣΗΣ – ΠΡΟΣΤΑΣΙΑΣ ΤΟΥ ΠΡΑΝΟΥΣ

ΠΑΡΑΡΤΗΜΑ Α (ψηφιακά): ΔΕΔΟΜΕΝΑ ΥΠΟΛΟΓΙΣΜΩΝ ΕΥΣΤΑΘΕΙΑΣ ΜΕ ΤΗ ΜΕΘΟΔΟ ΟΡΙΑΚΗΣ ΙΣΟΡΡΟΠΙΑΣ

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: BA S39-SLIDE PRO SLIDE RU=0.10, cdisturbed=1.9
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 26/2/2021, 7:52:01

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT V | UNIT II UNDER WT | AIR |
|---|---|---|---|---|---|---|---|
| Color | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 25 | 19.5 | 0.001 |
| Cohesion [kPa] | 1.9 | 5 | 7 | 60 | 500 | 5 | 0.001 |
| Friction Angle [deg] | 28 | 30 | 33 | 34 | 45 | 28 | 0 |
| Water Surface | None | None | Water Table | Water Table | None | Water Table | None |
| Hu Value | | | Automatically Calculated | Automatically Calculated | | Automatically Calculated | |
| Ru Value | 0.1 | 0.1 | | | 0 | | 0 |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.981577
Center: 15.284, 11.390
Radius: 4.778
Left Slip Surface Endpoint: 14.973, 6.622
Right Slip Surface Endpoint: 20.039, 10.930
Left Slope Intercept: 14.973 6.799
Right Slope Intercept: 20.039 10.930
Resisting Moment=191.357 kN-m
Driving Moment=194.949 kN-m

### Method: bishop simplified

FS: 0.991041
Center: 16.883, 11.212
Radius: 3.243
Left Slip Surface Endpoint: 16.824, 7.970
Right Slip Surface Endpoint: 20.120, 11.012
Resisting Moment=58.2431 kN-m
Driving Moment=58.7696 kN-m

### Method: janbu simplified

FS: 0.900663
Center: 16.523, 11.091
Radius: 3.587
Left Slip Surface Endpoint: 15.934, 7.552
Right Slip Surface Endpoint: 20.109, 11.000
Resisting Horizontal Force=19.5561 kN
Driving Horizontal Force=21.713 kN

### Method: janbu corrected

FS: 0.970538
Center: 16.523, 11.091
Radius: 3.587
Left Slip Surface Endpoint: 15.934, 7.552
Right Slip Surface Endpoint: 20.109, 11.000
Resisting Horizontal Force=21.0733 kN
Driving Horizontal Force=21.713 kN

### Method: spencer

FS: 1.012500
Center: 15.284, 11.390
Radius: 4.778
Left Slip Surface Endpoint: 14.973, 6.622
Right Slip Surface Endpoint: 20.039, 10.930
Left Slope Intercept: 14.973 6.799
Right Slope Intercept: 20.039 10.930
Resisting Moment=197.386 kN-m
Driving Moment=194.949 kN-m
Resisting Horizontal Force=32.3206 kN
Driving Horizontal Force=31.9215 kN

### Method: corp of eng#1

FS: 1.058720
Center: 15.284, 11.390
Radius: 4.778
Left Slip Surface Endpoint: 14.973, 6.622
Right Slip Surface Endpoint: 20.039, 10.930
Left Slope Intercept: 14.973 6.799
Right Slope Intercept: 20.039 10.930
Resisting Horizontal Force=33.0325 kN
Driving Horizontal Force=31.2003 kN

### Method: corp of eng#2

FS: 1.054620
Center: 15.049, 11.194
Radius: 4.746
Left Slip Surface Endpoint: 14.998, 6.447
Right Slip Surface Endpoint: 19.713, 10.312
Left Slope Intercept: 14.998 6.829
Right Slope Intercept: 19.713 10.312
Resisting Horizontal Force=30.9462 kN
Driving Horizontal Force=29.3434 kN

### Method: lowe-karafiath

FS: 1.006530
Center: 16.838, 11.168
Radius: 3.171
Left Slip Surface Endpoint: 16.884, 7.997
Right Slip Surface Endpoint: 19.997, 10.887
Resisting Horizontal Force=10.4746 kN
Driving Horizontal Force=10.4067 kN

### Method: gle/morgenstern-price

FS: 0.982352
Center: 16.883, 11.212
Radius: 3.243
Left Slip Surface Endpoint: 16.824, 7.970
Right Slip Surface Endpoint: 20.120, 11.012

Resisting Moment=57.7325 kN-m
Driving Moment=58.7696 kN-m
Resisting Horizontal Force=12.8165 kN
Driving Horizontal Force=13.0467 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 2171
Number of Invalid Surfaces: 7829

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 170 surfaces
Error Code -106 reported for 250 surfaces
Error Code -108 reported for 741 surfaces
Error Code -109 reported for 14 surfaces
Error Code -114 reported for 6649 surfaces
Error Code -123 reported for 4 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 1915
Number of Invalid Surfaces: 8085

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 170 surfaces
Error Code -106 reported for 250 surfaces
Error Code -108 reported for 744 surfaces
Error Code -109 reported for 14 surfaces
Error Code -112 reported for 253 surfaces
Error Code -114 reported for 6649 surfaces
Error Code -123 reported for 4 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 1633
Number of Invalid Surfaces: 8367

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 170 surfaces
Error Code -106 reported for 250 surfaces
Error Code -108 reported for 1045 surfaces
Error Code -109 reported for 14 surfaces
Error Code -112 reported for 234 surfaces
Error Code -114 reported for 6649 surfaces
Error Code -123 reported for 4 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 1633
Number of Invalid Surfaces: 8367

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 170 surfaces
Error Code -106 reported for 250 surfaces

Error Code -108 reported for 1045 surfaces
Error Code -109 reported for 14 surfaces
Error Code -112 reported for 234 surfaces
Error Code -114 reported for 6649 surfaces
Error Code -123 reported for 4 surfaces

## Method: spencer

Number of Valid Surfaces: 928
Number of Invalid Surfaces: 9072

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 170 surfaces
Error Code -106 reported for 250 surfaces
Error Code -108 reported for 1295 surfaces
Error Code -109 reported for 14 surfaces
Error Code -111 reported for 436 surfaces
Error Code -112 reported for 253 surfaces
Error Code -114 reported for 6649 surfaces
Error Code -123 reported for 4 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 528
Number of Invalid Surfaces: 9472

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 170 surfaces
Error Code -106 reported for 250 surfaces
Error Code -108 reported for 2025 surfaces
Error Code -109 reported for 14 surfaces
Error Code -111 reported for 338 surfaces
Error Code -112 reported for 21 surfaces
Error Code -114 reported for 6649 surfaces
Error Code -123 reported for 4 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 302
Number of Invalid Surfaces: 9698

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 170 surfaces
Error Code -106 reported for 250 surfaces
Error Code -108 reported for 2449 surfaces
Error Code -109 reported for 14 surfaces
Error Code -111 reported for 147 surfaces
Error Code -112 reported for 14 surfaces
Error Code -114 reported for 6649 surfaces
Error Code -123 reported for 4 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 151
Number of Invalid Surfaces: 9849

**Error Codes:**

Error Code -101 reported for 1 surface

Error Code -105 reported for 170 surfaces
Error Code -106 reported for 250 surfaces
Error Code -108 reported for 2711 surfaces
Error Code -109 reported for 14 surfaces
Error Code -111 reported for 49 surfaces
Error Code -112 reported for 1 surface
Error Code -114 reported for 6649 surfaces
Error Code -123 reported for 4 surfaces

### Method: gle/morgenstern-price

Number of Valid Surfaces: 1375
Number of Invalid Surfaces: 8625

#### Error Codes:

Error Code -101 reported for 1 surface
Error Code -105 reported for 170 surfaces
Error Code -106 reported for 250 surfaces
Error Code -108 reported for 1092 surfaces
Error Code -109 reported for 14 surfaces
Error Code -111 reported for 192 surfaces
Error Code -112 reported for 253 surfaces
Error Code -114 reported for 6649 surfaces
Error Code -123 reported for 4 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.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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.
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.981577

| 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 | 0.185184 | 5.01082e-005 | AIR | 0.001 | 0 | 0.00101877 | 0.001 | 0.00027002 | 0 | 0.00027002 |
| 2 | 0.185184 | 6.08361e-005 | AIR | 0.001 | 0 | 0.00101877 | 0.001 | 0.000328502 | 0 | 0.000328502 |
| 3 | 0.204197 | 0.312308 | UNIT I | 1.9 | 28 | 2.68045 | 2.63107 | 1.52788 | 0.152945 | 1.37493 |
| 4 | 0.204197 | 0.919819 | UNIT I | 1.9 | 28 | 4.11887 | 4.04299 | 4.48083 | 0.450457 | 4.03037 |
| 5 | 0.204197 | 1.49359 | UNIT I | 1.9 | 28 | 5.45089 | 5.35047 | 7.22083 | 0.731447 | 6.48938 |
| 6 | 0.204197 | 2.0334 | UNIT I | 1.9 | 28 | 6.66297 | 6.54022 | 9.72278 | 0.995801 | 8.72698 |
| 7 | 0.204197 | 2.53792 | UNIT I | 1.9 | 28 | 7.74091 | 7.5983 | 11.9598 | 1.24288 | 10.7169 |
| 8 | 0.204197 | 2.89892 | UNIT I | 1.9 | 28 | 8.43284 | 8.27748 | 13.414 | 1.41967 | 11.9943 |
| 9 | 0.204197 | 3.04285 | UNIT I | 1.9 | 28 | 8.58842 | 8.4302 | 13.7717 | 1.49016 | 12.2815 |
| 10 | 0.204197 | 3.21166 | UNIT I | 1.9 | 28 | 8.75318 | 8.59192 | 14.1585 | 1.57282 | 12.5857 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 0.204197 | 3.34869 | UNIT I | 1.9 | 28 | 8.80181 | 8.63965 | 14.3154 | 1.63993 | 12.6754 |
| 12 | 0.204197 | 3.47031 | UNIT I | 1.9 | 28 | 8.76982 | 8.60825 | 14.3159 | 1.69949 | 12.6164 |
| 13 | 0.204197 | 3.74018 | UNIT I | 1.9 | 28 | 8.96537 | 8.8002 | 14.809 | 1.83165 | 12.9774 |
| 14 | 0.204197 | 4.0063 | UNIT I | 1.9 | 28 | 9.07076 | 8.90365 | 15.1339 | 1.96198 | 13.1719 |
| 15 | 0.204197 | 4.21967 | UNIT I | 1.9 | 28 | 8.99807 | 8.8323 | 15.1043 | 2.06647 | 13.0378 |
| 16 | 0.204197 | 4.37509 | UNIT I | 1.9 | 28 | 8.75056 | 8.58935 | 14.7234 | 2.14258 | 12.5808 |
| 17 | 0.204197 | 4.46587 | UNIT I | 1.9 | 28 | 8.33474 | 8.18119 | 14.0002 | 2.18704 | 11.8132 |
| 18 | 0.204197 | 4.48337 | UNIT I | 1.9 | 28 | 7.7611 | 7.61812 | 12.9499 | 2.19561 | 10.7542 |
| 19 | 0.204197 | 4.43685 | UNIT I | 1.9 | 28 | 7.0692 | 6.93896 | 11.6497 | 2.17283 | 9.47692 |
| 20 | 0.204197 | 4.31423 | UNIT I | 1.9 | 28 | 6.2753 | 6.15969 | 10.1241 | 2.11278 | 8.01129 |
| 21 | 0.204197 | 4.12475 | UNIT I | 1.9 | 28 | 5.4247 | 5.32476 | 8.46104 | 2.01999 | 6.44105 |
| 22 | 0.204197 | 3.79624 | UNIT I | 1.9 | 28 | 4.50523 | 4.42223 | 6.60272 | 1.85911 | 4.74361 |
| 23 | 0.204197 | 3.33549 | UNIT I | 1.9 | 28 | 3.59852 | 3.53222 | 4.70322 | 1.63347 | 3.06975 |
| 24 | 0.204197 | 2.72532 | UNIT I | 1.9 | 28 | 2.7796 | 2.72839 | 2.89263 | 1.33465 | 1.55798 |
| 25 | 0.204197 | 1.38585 | UNIT I | 1.9 | 28 | 2.06977 | 2.03163 | 0.926252 | 0.678685 | 0.247567 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 0.991041

| 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 | 0.134786 | 4.06218e-006 | AIR | 0.001 | 0 | 0.00100904 | 0.001 | 2.77899e-005 | 0 | 2.77899e-005 |
| 2 | 0.134786 | 1.20252e-005 | AIR | 0.001 | 0 | 0.00100904 | 0.001 | 4.49714e-005 | 0 | 4.49714e-005 |
| 3 | 0.134786 | 2.04199e-005 | AIR | 0.001 | 0 | 0.00100904 | 0.001 | 6.5125e-005 | 0 | 6.5125e-005 |
| 4 | 0.134786 | 2.82313e-005 | AIR | 0.001 | 0 | 0.00100904 | 0.001 | 8.04954e-005 | 0 | 8.04954e-005 |
| 5 | 0.131293 | 0.117466 | UNIT I | 1.9 | 28 | 2.1527 | 2.13341 | 0.528456 | 0.089469 | 0.438987 |
| 6 | 0.131293 | 0.345334 | UNIT I | 1.9 | 28 | 2.86065 | 2.83502 | 2.02154 | 0.263026 | 1.75851 |
| 7 | 0.131293 | 0.559009 | UNIT I | 1.9 | 28 | 3.49229 | 3.461 | 3.36159 | 0.425773 | 2.93582 |
| 8 | 0.131293 | 0.758065 | UNIT I | 1.9 | 28 | 4.04937 | 4.01309 | 4.55152 | 0.577386 | 3.97414 |
| 9 | 0.131293 | 0.941974 | UNIT I | 1.9 | 28 | 4.53303 | 4.49242 | 5.5931 | 0.717461 | 4.87564 |
| 10 | 0.131293 | 1.11009 | UNIT I | 1.9 | 28 | 4.94392 | 4.89963 | 6.48698 | 0.845507 | 5.64148 |
| 11 | 0.131293 | 1.26162 | UNIT I | 1.9 | 28 | 5.28208 | 5.23476 | 7.23267 | 0.960922 | 6.27175 |
| 12 | 0.131293 | 1.39561 | UNIT I | 1.9 | 28 | 5.54704 | 5.49734 | 7.8286 | 1.06298 | 6.76562 |
| 13 | 0.131293 | 1.51087 | UNIT I | 1.9 | 28 | 5.73767 | 5.68627 | 8.27174 | 1.15077 | 7.12097 |
| 14 | 0.131293 | 1.60883 | UNIT I | 1.9 | 28 | 5.8601 | 5.8076 | 8.57448 | 1.22538 | 7.3491 |
| 15 | 0.131293 | 1.69627 | UNIT I | 1.9 | 28 | 5.93413 | 5.88097 | 8.77909 | 1.29198 | 7.48711 |
| 16 | 0.131293 | 1.76105 | UNIT I | 1.9 | 28 | 5.9279 | 5.87479 | 8.81678 | 1.34132 | 7.47546 |
| 17 | 0.131293 | 1.8192 | UNIT I | 1.9 | 28 | 5.88381 | 5.8311 | 8.77891 | 1.38561 | 7.3933 |
| 18 | 0.131293 | 1.85838 | UNIT I | 1.9 | 28 | 5.76934 | 5.71765 | 8.5954 | 1.41545 | 7.17995 |
| 19 | 0.131293 | 1.86158 | UNIT I | 1.9 | 28 | 5.54441 | 5.49474 | 8.1786 | 1.41789 | 6.76071 |
| 20 | 0.131293 | 1.85177 | UNIT I | 1.9 | 28 | 5.26351 | 5.21635 | 7.64755 | 1.41041 | 6.23714 |
| 21 | 0.131293 | 1.81528 | UNIT I | 1.9 | 28 | 4.89179 | 4.84796 | 6.92693 | 1.38262 | 5.54431 |
| 22 | 0.131293 | 1.71879 | UNIT I | 1.9 | 28 | 4.35821 | 4.31916 | 5.85891 | 1.30913 | 4.54978 |
| 23 | 0.131293 | 1.79264 | UNIT I | 1.9 | 28 | 4.06931 | 4.03285 | 5.37666 | 1.36538 | 4.01128 |
| 24 | 0.131293 | 1.67917 | UNIT I | 1.9 | 28 | 3.28813 | 3.25867 | 3.83425 | 1.27895 | 2.5553 |
| 25 | 0.131293 | 0.748311 | UNIT I | 1.9 | 28 | 1.16984 | 1.15936 | -0.822986 | 0.569956 | -1.39294 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.900663

| 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 | 0.173218 | 9.15422e-006 | AIR | 0.001 | 0 | 0.00111029 | 0.001 | 0.000209608 | 0 | 0.000209608 |
| 2 | 0.173218 | 2.71936e-005 | AIR | 0.001 | 0 | 0.00111029 | 0.001 | 0.000259051 | 0 | 0.000259051 |
| 3 | 0.173218 | 4.3612e-005 | AIR | 0.001 | 0 | 0.00111029 | 0.001 | 0.000299864 | 0 | 0.000299864 |
| 4 | 0.166131 | 0.118085 | UNIT I | 1.9 | 28 | 2.48135 | 2.23486 | 0.70085 | 0.071079 | 0.629771 |
| 5 | 0.166131 | 0.347117 | UNIT I | 1.9 | 28 | 3.12675 | 2.81615 | 1.93196 | 0.208942 | 1.72302 |
| 6 | 0.166131 | 0.596276 | UNIT I | 1.9 | 28 | 3.79893 | 3.42156 | 3.22056 | 0.358919 | 2.86164 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 0.166131 | 0.821763 | UNIT I | 1.9 | 28 | 4.36566 | 3.93199 | 4.31627 | 0.494647 | 3.82162 |
| 8 | 0.166131 | 1.0261 | UNIT I | 1.9 | 28 | 4.84069 | 4.35983 | 5.24391 | 0.617643 | 4.62627 |
| 9 | 0.166131 | 1.2754 | UNIT I | 1.9 | 28 | 5.41417 | 4.87634 | 6.3654 | 0.767709 | 5.59769 |
| 10 | 0.166131 | 1.59946 | UNIT I | 1.9 | 28 | 6.15746 | 5.5458 | 7.81952 | 0.962769 | 6.85675 |
| 11 | 0.166131 | 1.89676 | UNIT I | 1.9 | 28 | 6.78476 | 6.11078 | 9.06104 | 1.14172 | 7.91932 |
| 12 | 0.166131 | 2.16518 | UNIT I | 1.9 | 28 | 7.2954 | 6.5707 | 10.0876 | 1.30329 | 8.78431 |
| 13 | 0.166131 | 2.40305 | UNIT I | 1.9 | 28 | 7.68985 | 6.92596 | 10.8989 | 1.44648 | 9.45243 |
| 14 | 0.166131 | 2.60828 | UNIT I | 1.9 | 28 | 7.96728 | 7.17583 | 11.4924 | 1.57001 | 9.92237 |
| 15 | 0.166131 | 2.77823 | UNIT I | 1.9 | 28 | 8.12557 | 7.3184 | 11.8628 | 1.67231 | 10.1905 |
| 16 | 0.166131 | 2.9097 | UNIT I | 1.9 | 28 | 8.16147 | 7.35073 | 12.0028 | 1.75145 | 10.2513 |
| 17 | 0.166131 | 3.01298 | UNIT I | 1.9 | 28 | 8.10179 | 7.29698 | 11.9638 | 1.81361 | 10.1502 |
| 18 | 0.166131 | 3.0782 | UNIT I | 1.9 | 28 | 7.92634 | 7.13896 | 11.7059 | 1.85287 | 9.85306 |
| 19 | 0.166131 | 3.12034 | UNIT I | 1.9 | 28 | 7.66745 | 6.90579 | 11.2928 | 1.87824 | 9.41453 |
| 20 | 0.166131 | 3.11355 | UNIT I | 1.9 | 28 | 7.27087 | 6.5486 | 10.6169 | 1.87415 | 8.74276 |
| 21 | 0.166131 | 3.04535 | UNIT I | 1.9 | 28 | 6.71383 | 6.0469 | 9.63228 | 1.8331 | 7.79918 |
| 22 | 0.166131 | 2.9325 | UNIT I | 1.9 | 28 | 6.02356 | 5.4252 | 8.39511 | 1.76517 | 6.62994 |
| 23 | 0.166131 | 2.74241 | UNIT I | 1.9 | 28 | 5.12905 | 4.61955 | 6.76547 | 1.65075 | 5.11472 |
| 24 | 0.166131 | 2.70579 | UNIT I | 1.9 | 28 | 4.27386 | 3.84931 | 5.29483 | 1.62871 | 3.66612 |
| 25 | 0.166131 | 1.2891 | UNIT I | 1.9 | 28 | 1.37809 | 1.24119 | -0.463085 | 0.775952 | -1.23904 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.970538

| 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 | 0.173218 | 9.15422e-006 | AIR | 0.001 | 0 | 0.00103036 | 0.001 | 0.000209608 | 0 | 0.000209608 |
| 2 | 0.173218 | 2.71936e-005 | AIR | 0.001 | 0 | 0.00103036 | 0.001 | 0.000259051 | 0 | 0.000259051 |
| 3 | 0.173218 | 4.3612e-005 | AIR | 0.001 | 0 | 0.00103036 | 0.001 | 0.000299864 | 0 | 0.000299864 |
| 4 | 0.166131 | 0.118085 | UNIT I | 1.9 | 28 | 2.3027 | 2.23486 | 0.70085 | 0.071079 | 0.629771 |
| 5 | 0.166131 | 0.347117 | UNIT I | 1.9 | 28 | 2.90163 | 2.81615 | 1.93196 | 0.208942 | 1.72302 |
| 6 | 0.166131 | 0.596276 | UNIT I | 1.9 | 28 | 3.52543 | 3.42156 | 3.22056 | 0.358919 | 2.86164 |
| 7 | 0.166131 | 0.821763 | UNIT I | 1.9 | 28 | 4.05135 | 3.93199 | 4.31627 | 0.494647 | 3.82162 |
| 8 | 0.166131 | 1.0261 | UNIT I | 1.9 | 28 | 4.49218 | 4.35983 | 5.24391 | 0.617643 | 4.62627 |
| 9 | 0.166131 | 1.2754 | UNIT I | 1.9 | 28 | 5.02437 | 4.87634 | 6.3654 | 0.767709 | 5.59769 |
| 10 | 0.166131 | 1.59946 | UNIT I | 1.9 | 28 | 5.71415 | 5.5458 | 7.81952 | 0.962769 | 6.85675 |
| 11 | 0.166131 | 1.89676 | UNIT I | 1.9 | 28 | 6.29628 | 6.11078 | 9.06104 | 1.14172 | 7.91932 |
| 12 | 0.166131 | 2.16518 | UNIT I | 1.9 | 28 | 6.77016 | 6.5707 | 10.0876 | 1.30329 | 8.78431 |
| 13 | 0.166131 | 2.40305 | UNIT I | 1.9 | 28 | 7.13621 | 6.92596 | 10.8989 | 1.44648 | 9.45243 |
| 14 | 0.166131 | 2.60828 | UNIT I | 1.9 | 28 | 7.39366 | 7.17583 | 11.4924 | 1.57001 | 9.92237 |
| 15 | 0.166131 | 2.77823 | UNIT I | 1.9 | 28 | 7.54056 | 7.3184 | 11.8628 | 1.67231 | 10.1905 |
| 16 | 0.166131 | 2.9097 | UNIT I | 1.9 | 28 | 7.57387 | 7.35073 | 12.0028 | 1.75145 | 10.2513 |
| 17 | 0.166131 | 3.01298 | UNIT I | 1.9 | 28 | 7.51849 | 7.29698 | 11.9638 | 1.81361 | 10.1502 |
| 18 | 0.166131 | 3.0782 | UNIT I | 1.9 | 28 | 7.35567 | 7.13896 | 11.7059 | 1.85287 | 9.85306 |
| 19 | 0.166131 | 3.12034 | UNIT I | 1.9 | 28 | 7.11542 | 6.90579 | 11.2928 | 1.87824 | 9.41453 |
| 20 | 0.166131 | 3.11355 | UNIT I | 1.9 | 28 | 6.74739 | 6.5486 | 10.6169 | 1.87415 | 8.74276 |
| 21 | 0.166131 | 3.04535 | UNIT I | 1.9 | 28 | 6.23046 | 6.0469 | 9.63228 | 1.8331 | 7.79918 |
| 22 | 0.166131 | 2.9325 | UNIT I | 1.9 | 28 | 5.58989 | 5.4252 | 8.39511 | 1.76517 | 6.62994 |
| 23 | 0.166131 | 2.74241 | UNIT I | 1.9 | 28 | 4.75978 | 4.61955 | 6.76547 | 1.65075 | 5.11472 |
| 24 | 0.166131 | 2.70579 | UNIT I | 1.9 | 28 | 3.96616 | 3.84931 | 5.29483 | 1.62871 | 3.66612 |
| 25 | 0.166131 | 1.2891 | UNIT I | 1.9 | 28 | 1.27887 | 1.24119 | -0.463085 | 0.775952 | -1.23904 |

**Global Minimum Query (spencer) - Safety Factor**: 1.0125

| 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 | 0.185184 | 5.01082e-005 | AIR | 0.001 | 0 | 0.000987654 | 0.001 | 0.000979362 | 0 | 0.000979362 |
| 2 | 0.185184 | 6.08361e-005 | AIR | 0.001 | 0 | 0.000987654 | 0.001 | 0.000973367 | 0 | 0.000973367 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 0.204197 | 0.312308 | UNIT I | 1.9 | 28 | 3.66815 | 3.714 | 3.56459 | 0.152945 | 3.41164 |
| 4 | 0.204197 | 0.919819 | UNIT I | 1.9 | 28 | 5.34446 | 5.41127 | 7.0542 | 0.450457 | 6.60374 |
| 5 | 0.204197 | 1.49359 | UNIT I | 1.9 | 28 | 6.71746 | 6.80143 | 9.94969 | 0.731447 | 9.21824 |
| 6 | 0.204197 | 2.0334 | UNIT I | 1.9 | 28 | 7.82761 | 7.92546 | 12.328 | 0.995801 | 11.3322 |
| 7 | 0.204197 | 2.53792 | UNIT I | 1.9 | 28 | 8.7056 | 8.81442 | 14.247 | 1.24288 | 13.0041 |
| 8 | 0.204197 | 2.89892 | UNIT I | 1.9 | 28 | 9.12415 | 9.2382 | 15.2208 | 1.41967 | 13.8011 |
| 9 | 0.204197 | 3.04285 | UNIT I | 1.9 | 28 | 8.9876 | 9.09995 | 15.0313 | 1.49016 | 13.5411 |
| 10 | 0.204197 | 3.21166 | UNIT I | 1.9 | 28 | 8.89243 | 9.00359 | 14.9327 | 1.57282 | 13.3599 |
| 11 | 0.204197 | 3.34869 | UNIT I | 1.9 | 28 | 8.71652 | 8.82548 | 14.6649 | 1.63993 | 13.0249 |
| 12 | 0.204197 | 3.47031 | UNIT I | 1.9 | 28 | 8.5008 | 8.60706 | 14.3136 | 1.69949 | 12.6142 |
| 13 | 0.204197 | 3.74018 | UNIT I | 1.9 | 28 | 8.53646 | 8.64317 | 14.5137 | 1.83165 | 12.682 |
| 14 | 0.204197 | 4.0063 | UNIT I | 1.9 | 28 | 8.52393 | 8.63048 | 14.6202 | 1.96198 | 12.6582 |
| 15 | 0.204197 | 4.21967 | UNIT I | 1.9 | 28 | 8.38828 | 8.49313 | 14.4664 | 2.06647 | 12.3999 |
| 16 | 0.204197 | 4.37509 | UNIT I | 1.9 | 28 | 8.13686 | 8.23857 | 14.0637 | 2.14258 | 11.9211 |
| 17 | 0.204197 | 4.46587 | UNIT I | 1.9 | 28 | 7.77562 | 7.87282 | 13.4203 | 2.18704 | 11.2332 |
| 18 | 0.204197 | 4.48337 | UNIT I | 1.9 | 28 | 7.3093 | 7.40067 | 12.5409 | 2.19561 | 10.3452 |
| 19 | 0.204197 | 4.43685 | UNIT I | 1.9 | 28 | 6.76536 | 6.84993 | 11.4823 | 2.17283 | 9.30946 |
| 20 | 0.204197 | 4.31423 | UNIT I | 1.9 | 28 | 6.14379 | 6.22059 | 10.2386 | 2.11278 | 8.12585 |
| 21 | 0.204197 | 4.12475 | UNIT I | 1.9 | 28 | 5.46807 | 5.53642 | 8.8591 | 2.01999 | 6.83911 |
| 22 | 0.204197 | 3.79624 | UNIT I | 1.9 | 28 | 4.6852 | 4.74377 | 7.20747 | 1.85911 | 5.34836 |
| 23 | 0.204197 | 3.33549 | UNIT I | 1.9 | 28 | 3.82525 | 3.87307 | 5.34426 | 1.63347 | 3.71079 |
| 24 | 0.204197 | 2.72532 | UNIT I | 1.9 | 28 | 2.87981 | 2.91581 | 3.24512 | 1.33465 | 1.91047 |
| 25 | 0.204197 | 1.38585 | UNIT I | 1.9 | 28 | 1.40305 | 1.42059 | -0.222956 | 0.678685 | -0.901641 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.05872

| 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 | 0.185184 | 5.01082e-005 | AIR | 0.001 | 0 | 0.000944537 | 0.001 | 0.00122982 | 0 | 0.00122982 |
| 2 | 0.185184 | 6.08361e-005 | AIR | 0.001 | 0 | 0.000944537 | 0.001 | 0.00120407 | 0 | 0.00120407 |
| 3 | 0.204197 | 0.312308 | UNIT I | 1.9 | 28 | 4.04918 | 4.28695 | 4.64215 | 0.152945 | 4.4892 |
| 4 | 0.204197 | 0.919819 | UNIT I | 1.9 | 28 | 5.82009 | 6.16185 | 8.46584 | 0.450457 | 8.01538 |
| 5 | 0.204197 | 1.49359 | UNIT I | 1.9 | 28 | 7.20986 | 7.63322 | 11.5141 | 0.731447 | 10.7826 |
| 6 | 0.204197 | 2.0334 | UNIT I | 1.9 | 28 | 8.2782 | 8.7643 | 13.9057 | 0.995801 | 12.9099 |
| 7 | 0.204197 | 2.53792 | UNIT I | 1.9 | 28 | 9.0713 | 9.60397 | 15.7319 | 1.24288 | 14.4891 |
| 8 | 0.204197 | 2.89892 | UNIT I | 1.9 | 28 | 9.37185 | 9.92216 | 16.5071 | 1.41967 | 15.0875 |
| 9 | 0.204197 | 3.04285 | UNIT I | 1.9 | 28 | 9.10786 | 9.64267 | 16.052 | 1.49016 | 14.5618 |
| 10 | 0.204197 | 3.21166 | UNIT I | 1.9 | 28 | 8.89042 | 9.41247 | 15.7017 | 1.57282 | 14.1289 |
| 11 | 0.204197 | 3.34869 | UNIT I | 1.9 | 28 | 8.59992 | 9.10491 | 15.1904 | 1.63993 | 13.5505 |
| 12 | 0.204197 | 3.47031 | UNIT I | 1.9 | 28 | 8.27901 | 8.76515 | 14.611 | 1.69949 | 12.9115 |
| 13 | 0.204197 | 3.74018 | UNIT I | 1.9 | 28 | 8.20164 | 8.68324 | 14.589 | 1.83165 | 12.7574 |
| 14 | 0.204197 | 4.0063 | UNIT I | 1.9 | 28 | 8.08203 | 8.55661 | 14.4812 | 1.96198 | 12.5193 |
| 15 | 0.204197 | 4.21967 | UNIT I | 1.9 | 28 | 7.85548 | 8.31675 | 14.1346 | 2.06647 | 12.0681 |
| 16 | 0.204197 | 4.37509 | UNIT I | 1.9 | 28 | 7.53481 | 7.97725 | 13.5722 | 2.14258 | 11.4296 |
| 17 | 0.204197 | 4.46587 | UNIT I | 1.9 | 28 | 7.13118 | 7.54992 | 12.813 | 2.18704 | 10.6259 |
| 18 | 0.204197 | 4.48337 | UNIT I | 1.9 | 28 | 6.65418 | 7.04491 | 11.8718 | 2.19561 | 9.67616 |
| 19 | 0.204197 | 4.43685 | UNIT I | 1.9 | 28 | 6.13246 | 6.49256 | 10.8102 | 2.17283 | 8.63734 |
| 20 | 0.204197 | 4.31423 | UNIT I | 1.9 | 28 | 5.56954 | 5.89658 | 9.62927 | 2.11278 | 7.51649 |
| 21 | 0.204197 | 4.12475 | UNIT I | 1.9 | 28 | 4.98804 | 5.28094 | 8.3786 | 2.01999 | 6.35861 |
| 22 | 0.204197 | 3.79624 | UNIT I | 1.9 | 28 | 4.33935 | 4.59416 | 6.92609 | 1.85911 | 5.06698 |
| 23 | 0.204197 | 3.33549 | UNIT I | 1.9 | 28 | 3.63745 | 3.85104 | 5.30284 | 1.63347 | 3.66937 |
| 24 | 0.204197 | 2.72532 | UNIT I | 1.9 | 28 | 2.83386 | 3.00026 | 3.40395 | 1.33465 | 2.0693 |
| 25 | 0.204197 | 1.38585 | UNIT I | 1.9 | 28 | 1.15638 | 1.22428 | -0.592156 | 0.678685 | -1.27084 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.05462

| 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 | 0.145485 | 6.5399e-005 | AIR | 0.001 | 0 | 0.000948209 | 0.001 | 0.000865116 | 0 | 0.000865116 |
| 2 | 0.190386 | 0.269362 | UNIT I | 1.9 | 28 | 4.67853 | 4.93407 | 5.84774 | 0.141482 | 5.70626 |
| 3 | 0.190386 | 0.794019 | UNIT I | 1.9 | 28 | 6.89661 | 7.2733 | 10.5228 | 0.417057 | 10.1057 |
| 4 | 0.190386 | 1.29081 | UNIT I | 1.9 | 28 | 1.20883 | 1.27485 | -0.497734 | 0.677997 | -1.17573 |
| 5 | 0.190386 | 1.75957 | UNIT I | 1.9 | 28 | 6.98446 | 7.36595 | 11.2042 | 0.924212 | 10.2799 |
| 6 | 0.190386 | 2.20029 | UNIT I | 1.9 | 28 | 7.66304 | 8.0816 | 12.7816 | 1.1557 | 11.6259 |
| 7 | 0.190386 | 2.61162 | UNIT I | 1.9 | 28 | 8.14952 | 8.59465 | 13.9625 | 1.37175 | 12.5908 |
| 8 | 0.190386 | 2.96542 | UNIT I | 1.9 | 28 | 8.46985 | 8.93247 | 14.7837 | 1.55758 | 13.2261 |
| 9 | 0.190386 | 3.1026 | UNIT I | 1.9 | 28 | 8.39226 | 8.85065 | 14.7019 | 1.62964 | 13.0723 |
| 10 | 0.190386 | 3.19543 | UNIT I | 1.9 | 28 | 8.37103 | 8.82826 | 14.7086 | 1.6784 | 13.0302 |
| 11 | 0.190386 | 3.2893 | UNIT I | 1.9 | 28 | 8.97166 | 9.46169 | 15.9492 | 1.7277 | 14.2215 |
| 12 | 0.190386 | 3.35203 | UNIT I | 1.9 | 28 | 8.68099 | 9.15515 | 15.4056 | 1.76065 | 13.6449 |
| 13 | 0.190386 | 3.4292 | UNIT I | 1.9 | 28 | 8.41606 | 8.87574 | 14.9207 | 1.80118 | 13.1195 |
| 14 | 0.190386 | 3.62863 | UNIT I | 1.9 | 28 | 8.58274 | 9.05153 | 15.356 | 1.90593 | 13.4501 |
| 15 | 0.190386 | 3.79578 | UNIT I | 1.9 | 28 | 7.90387 | 8.33558 | 14.0973 | 1.99373 | 12.1035 |
| 16 | 0.190386 | 3.91395 | UNIT I | 1.9 | 28 | 7.48721 | 7.89616 | 13.3329 | 2.05579 | 11.2771 |
| 17 | 0.190386 | 3.97759 | UNIT I | 1.9 | 28 | 7.98091 | 8.41683 | 14.3456 | 2.08922 | 12.2564 |
| 18 | 0.190386 | 3.97953 | UNIT I | 1.9 | 28 | 7.1861 | 7.57861 | 12.7702 | 2.09024 | 10.6799 |
| 19 | 0.190386 | 3.9102 | UNIT I | 1.9 | 28 | 6.16974 | 6.50673 | 10.7178 | 2.05383 | 8.66398 |
| 20 | 0.190386 | 3.76856 | UNIT I | 1.9 | 28 | 5.53884 | 5.84137 | 9.39207 | 1.97943 | 7.41264 |
| 21 | 0.190386 | 3.54428 | UNIT I | 1.9 | 28 | 4.8486 | 5.11343 | 7.90521 | 1.86163 | 6.04358 |
| 22 | 0.190386 | 3.23082 | UNIT I | 1.9 | 28 | 4.21406 | 4.44423 | 6.48198 | 1.69698 | 4.785 |
| 23 | 0.190386 | 2.75615 | UNIT I | 1.9 | 28 | 3.60718 | 3.8042 | 5.02895 | 1.44767 | 3.58128 |
| 24 | 0.190386 | 2.05279 | UNIT I | 1.9 | 28 | 2.95964 | 3.1213 | 3.37517 | 1.07822 | 2.29695 |
| 25 | 0.190386 | 0.784494 | UNIT I | 1.9 | 28 | 0.763507 | 0.80521 | -1.64695 | 0.412054 | -2.059 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.00653

| 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 | 0.132164 | 3.61962e-006 | AIR | 0.001 | 0 | 0.000993512 | 0.001 | 0.000251873 | 0 | 0.000251873 |
| 2 | 0.132164 | 1.11768e-005 | AIR | 0.001 | 0 | 0.000993512 | 0.001 | 0.000348891 | 0 | 0.000348891 |
| 3 | 0.132164 | 1.88391e-005 | AIR | 0.001 | 0 | 0.000993512 | 0.001 | 0.000394743 | 0 | 0.000394743 |
| 4 | 0.132164 | 2.5759e-005 | AIR | 0.001 | 0 | 0.000993512 | 0.001 | 0.000481302 | 0 | 0.000481302 |
| 5 | 0.123082 | 0.0983395 | UNIT I | 1.9 | 28 | 2.42471 | 2.44054 | 1.0965 | 0.0798973 | 1.0166 |
| 6 | 0.123082 | 0.288946 | UNIT I | 1.9 | 28 | 3.15284 | 3.17343 | 2.62974 | 0.234758 | 2.39498 |
| 7 | 0.123082 | 0.467332 | UNIT I | 1.9 | 28 | 3.75425 | 3.77877 | 3.91313 | 0.37969 | 3.53344 |
| 8 | 0.123082 | 0.633095 | UNIT I | 1.9 | 28 | 4.2785 | 4.30644 | 5.04023 | 0.514367 | 4.52586 |
| 9 | 0.123082 | 0.785744 | UNIT I | 1.9 | 28 | 4.71267 | 4.74344 | 5.98613 | 0.638388 | 5.34774 |
| 10 | 0.123082 | 0.924683 | UNIT I | 1.9 | 28 | 5.23919 | 5.2734 | 7.09572 | 0.751271 | 6.34444 |
| 11 | 0.123082 | 1.04919 | UNIT I | 1.9 | 28 | 5.60616 | 5.64277 | 7.89156 | 0.852431 | 7.03913 |
| 12 | 0.123082 | 1.15841 | UNIT I | 1.9 | 28 | 5.60002 | 5.63659 | 7.96867 | 0.941163 | 7.02751 |
| 13 | 0.123082 | 1.25127 | UNIT I | 1.9 | 28 | 5.6458 | 5.68267 | 8.13075 | 1.01661 | 7.11414 |
| 14 | 0.123082 | 1.32747 | UNIT I | 1.9 | 28 | 5.70751 | 5.74478 | 8.30951 | 1.07852 | 7.23099 |
| 15 | 0.123082 | 1.39445 | UNIT I | 1.9 | 28 | 5.53885 | 5.57502 | 8.04466 | 1.13294 | 6.91172 |
| 16 | 0.123082 | 1.44279 | UNIT I | 1.9 | 28 | 5.34516 | 5.38006 | 7.71726 | 1.17221 | 6.54505 |
| 17 | 0.123082 | 1.47557 | UNIT I | 1.9 | 28 | 5.06749 | 5.10058 | 7.21826 | 1.19885 | 6.01941 |
| 18 | 0.123082 | 1.50086 | UNIT I | 1.9 | 28 | 4.58615 | 4.6161 | 6.32761 | 1.2194 | 5.10821 |
| 19 | 0.123082 | 1.49533 | UNIT I | 1.9 | 28 | 4.14884 | 4.17593 | 5.49532 | 1.2149 | 4.28042 |
| 20 | 0.123082 | 1.45646 | UNIT I | 1.9 | 28 | 3.61246 | 3.63605 | 4.44835 | 1.18332 | 3.26503 |
| 21 | 0.123082 | 1.40782 | UNIT I | 1.9 | 28 | 2.87551 | 2.89428 | 3.01378 | 1.1438 | 1.86998 |
| 22 | 0.123082 | 1.30507 | UNIT I | 1.9 | 28 | 2.12711 | 2.141 | 1.51357 | 1.06032 | 0.453254 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 0.123082 | 1.14886 | UNIT I | 1.9 | 28 | 1.03887 | 1.04566 | -0.673382 | 0.933406 | -1.60679 |
| 24 | 0.123082 | 1.10267 | UNIT I | 1.9 | 28 | 0.269063 | 0.27082 | -2.16817 | 0.895878 | -3.06404 |
| 25 | 0.123082 | 0.523796 | UNIT I | 1.9 | 28 | 3.81468 | 3.83959 | 4.07341 | 0.425565 | 3.64784 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 0.982352

| 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 | 0.134786 | 4.06218e-006 | AIR | 0.001 | 0 | 0.00101797 | 0.001 | 0.000133031 | 0 | 0.000133031 |
| 2 | 0.134786 | 1.20252e-005 | AIR | 0.001 | 0 | 0.00101797 | 0.001 | 0.000353385 | 0 | 0.000353385 |
| 3 | 0.134786 | 2.04199e-005 | AIR | 0.001 | 0 | 0.00101797 | 0.001 | 0.000555702 | 0 | 0.000555702 |
| 4 | 0.134786 | 2.82313e-005 | AIR | 0.001 | 0 | 0.00101797 | 0.001 | 0.000720003 | 0 | 0.000720003 |
| 5 | 0.131293 | 0.117466 | UNIT I | 1.9 | 28 | 2.75319 | 2.7046 | 1.60271 | 0.089469 | 1.51324 |
| 6 | 0.131293 | 0.345334 | UNIT I | 1.9 | 28 | 3.77102 | 3.70447 | 3.65673 | 0.263026 | 3.39371 |
| 7 | 0.131293 | 0.559009 | UNIT I | 1.9 | 28 | 4.64471 | 4.56274 | 5.43365 | 0.425773 | 5.00788 |
| 8 | 0.131293 | 0.758065 | UNIT I | 1.9 | 28 | 5.3392 | 5.24497 | 6.86836 | 0.577386 | 6.29097 |
| 9 | 0.131293 | 0.941974 | UNIT I | 1.9 | 28 | 5.83832 | 5.73529 | 7.93062 | 0.717461 | 7.21316 |
| 10 | 0.131293 | 1.11009 | UNIT I | 1.9 | 28 | 6.14444 | 6.036 | 8.6242 | 0.845507 | 7.77869 |
| 11 | 0.131293 | 1.26162 | UNIT I | 1.9 | 28 | 6.27532 | 6.16457 | 8.98139 | 0.960922 | 8.02046 |
| 12 | 0.131293 | 1.39561 | UNIT I | 1.9 | 28 | 6.25953 | 6.14906 | 9.05427 | 1.06298 | 7.99129 |
| 13 | 0.131293 | 1.51087 | UNIT I | 1.9 | 28 | 6.13075 | 6.02255 | 8.90416 | 1.15077 | 7.75339 |
| 14 | 0.131293 | 1.60883 | UNIT I | 1.9 | 28 | 5.92936 | 5.82472 | 8.60671 | 1.22538 | 7.38133 |
| 15 | 0.131293 | 1.69627 | UNIT I | 1.9 | 28 | 5.70236 | 5.60172 | 8.25393 | 1.29198 | 6.96195 |
| 16 | 0.131293 | 1.76105 | UNIT I | 1.9 | 28 | 5.44382 | 5.34775 | 7.82557 | 1.34132 | 6.48425 |
| 17 | 0.131293 | 1.8192 | UNIT I | 1.9 | 28 | 5.20373 | 5.11189 | 7.42627 | 1.38561 | 6.04066 |
| 18 | 0.131293 | 1.85838 | UNIT I | 1.9 | 28 | 4.96136 | 4.8738 | 7.00834 | 1.41545 | 5.59289 |
| 19 | 0.131293 | 1.86158 | UNIT I | 1.9 | 28 | 4.68651 | 4.6038 | 6.50297 | 1.41789 | 5.08508 |
| 20 | 0.131293 | 1.85177 | UNIT I | 1.9 | 28 | 4.41988 | 4.34188 | 6.00295 | 1.41041 | 4.59254 |
| 21 | 0.131293 | 1.81528 | UNIT I | 1.9 | 28 | 4.13051 | 4.05761 | 5.44051 | 1.38262 | 4.05789 |
| 22 | 0.131293 | 1.71879 | UNIT I | 1.9 | 28 | 3.75621 | 3.68992 | 4.67548 | 1.30913 | 3.36635 |
| 23 | 0.131293 | 1.79264 | UNIT I | 1.9 | 28 | 3.62144 | 3.55753 | 4.48275 | 1.36538 | 3.11737 |
| 24 | 0.131293 | 1.67917 | UNIT I | 1.9 | 28 | 3.1176 | 3.06258 | 3.46545 | 1.27895 | 2.1865 |
| 25 | 0.131293 | 0.748311 | UNIT I | 1.9 | 28 | 1.23803 | 1.21618 | -0.71612 | 0.569956 | -1.28608 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 3.65838 | 1.395 |
| 31.314 | 9.356 |
| 40.9932 | 12.499 |
| 58.0021 | 20.4799 |

### External Boundary

| X | Y |
|---|---|
| 14.746 | 6.02666 |
| 14.7169 | 5.96829 |
| 14.6081 | 5.89815 |
| 14.3766 | 5.81399 |
| 14.0784 | 5.78594 |
| 13.4437 | 5.71074 |
| 12.8258 | 5.60607 |

| | |
|---|---|
| 11.8014 | 5.52326 |
| 11.5686 | 5.50586 |
| 11.0034 | 5.45149 |
| 10.7524 | 5.4347 |
| 10.636 | 5.45906 |
| 10.6305 | 5.59574 |
| 10.6048 | 5.75407 |
| 10.399 | 5.75001 |
| 10.1022 | 5.73375 |
| 10.0685 | 5.72431 |
| 10.0564 | 5.68384 |
| 10.0604 | 5.49634 |
| 10.0348 | 5.43565 |
| 9.93759 | 5.41811 |
| 9.8428 | 5.42774 |
| 9.68457 | 5.41399 |
| 8.64953 | 5.32683 |
| 7.55344 | 5.30054 |
| 5.50321 | 5.27185 |
| 3.65838 | 5.33752 |
| 3.65838 | 1.395 |
| 3.65838 | -1.04955 |
| 3.65838 | -3.32965 |
| 3.65838 | -4.75029 |
| 58.0021 | -4.75029 |
| 58.0021 | 12.0122 |
| 58.0021 | 20.4799 |
| 58.0021 | 22.496 |
| 58.0021 | 25.0965 |
| 56.8949 | 24.7535 |
| 56.4427 | 24.473 |
| 55.5382 | 23.943 |
| 54.6182 | 23.5377 |
| 54.0256 | 22.9298 |
| 52.8404 | 21.8854 |
| 51.8424 | 21.3086 |
| 49.5934 | 19.6012 |
| 48.9572 | 18.9962 |
| 47.3932 | 17.7083 |
| 46.9773 | 17.486 |
| 46.0972 | 16.9639 |
| 43.5489 | 15.6354 |
| 43.4254 | 15.5699 |
| 42.2853 | 15.1476 |
| 41.452 | 14.3099 |
| 40.9932 | 14.0475 |
| 31.9222 | 14.4593 |
| 31.7395 | 14.452 |
| 31.5166 | 14.4557 |
| 31.3741 | 14.4484 |
| 31.2608 | 14.3826 |
| 31.1439 | 14.3388 |
| 30.9868 | 14.2402 |
| 30.8698 | 14.1233 |

| | |
|---|---|
| 30.7164 | 14.0174 |
| 30.424 | 13.8822 |
| 30.0367 | 13.6996 |
| 29.3037 | 13.4105 |
| 29.0415 | 13.294 |
| 28.5697 | 12.9916 |
| 28.3087 | 12.8759 |
| 27.9296 | 12.7397 |
| 27.2257 | 12.5521 |
| 26.9223 | 12.5087 |
| 26.6947 | 12.5123 |
| 26.3695 | 12.4618 |
| 25.9469 | 12.404 |
| 25.1621 | 12.2299 |
| 24.1387 | 12.1322 |
| 23.1127 | 11.9491 |
| 22.4365 | 11.8002 |
| 21.9609 | 11.6054 |
| 20.7378 | 11.2413 |
| 20.2752 | 11.0757 |
| 20.1209 | 11.0129 |
| 19.9809 | 10.8702 |
| 19.8529 | 10.6536 |
| 19.6953 | 10.2696 |
| 19.3287 | 9.826 |
| 18.919 | 9.402 |
| 18.596 | 9.1 |
| 18.1832 | 8.75524 |
| 17.4884 | 8.30977 |
| 17.0228 | 8.05977 |
| 16.6206 | 7.87899 |
| 16.3045 | 7.73054 |
| 15.9677 | 7.56708 |
| 15.656 | 7.43053 |
| 15.5079 | 7.38823 |
| 15.5291 | 7.20938 |
| 15.5656 | 7.20938 |
| 15.5656 | 7.11707 |
| 15.5898 | 7.02947 |
| 15.5461 | 7.02011 |
| 15.4245 | 7.00188 |
| 15.3191 | 6.96136 |
| 15.2421 | 6.93097 |
| 15.1123 | 6.92692 |
| 15.0596 | 6.90463 |
| 15.011 | 6.84386 |
| 14.9644 | 6.78916 |
| 14.9664 | 6.72433 |
| 14.9705 | 6.65545 |
| 14.9786 | 6.52376 |
| 15.0229 | 6.34895 |
| 14.7043 | 6.07533 |

## Material Boundary

| X | Y |
|---|---|
| 15.5898 | 7.02947 |
| 15.6596 | 7.04442 |
| 15.7082 | 7.09101 |
| 15.7771 | 7.14369 |
| 16.0122 | 7.26119 |
| 16.1156 | 7.3321 |
| 16.373 | 7.45973 |
| 16.4865 | 7.52253 |
| 16.6385 | 7.58331 |
| 16.748 | 7.64408 |
| 16.9915 | 7.77741 |
| 17.3005 | 7.95004 |
| 17.6459 | 8.12266 |
| 17.9368 | 8.31346 |
| 18.3185 | 8.6042 |
| 18.6003 | 8.80408 |
| 18.8821 | 8.97671 |
| 19.2184 | 9.23111 |
| 19.591 | 9.54002 |
| 19.7637 | 9.65813 |
| 19.9153 | 10.2307 |
| 20.0467 | 10.8359 |
| 20.1209 | 11.0129 |

### Material Boundary

| X | Y |
|---|---|
| 14.9068 | 5.83949 |
| 15.2254 | 6.11312 |
| 15.0229 | 6.34895 |

### Material Boundary

| X | Y |
|---|---|
| 14.746 | 6.02666 |
| 14.9068 | 5.83949 |

### Material Boundary

| X | Y |
|---|---|
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 58.0021 | 22.496 |

### Material Boundary

| X | Y |
|---|---|
| 15.2254 | 6.11312 |
| 31.5166 | 11.426 |

### Material Boundary

| X | Y |
|---|---|
| 3.65838 | -1.04955 |
| 14.9068 | 2.359 |
| 31.5166 | 8.039 |

### Material Boundary

| X | Y |
|---|---|
| 31.5166 | 8.039 |
| 40.9932 | 10.529 |

### Material Boundary

| X | Y |
|---|---|
| 40.9932 | 10.529 |
| 58.0021 | 20.4799 |

### Material Boundary

| X | Y |
|---|---|
| 3.65838 | -3.32965 |
| 58.0021 | 12.0122 |

### Material Boundary

| X | Y |
|---|---|
| 31.314 | 9.356 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| 3.65838 | 1.395 |
| 31.314 | 9.356 |

### Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 58.0021 | 20.4799 |

### Material Boundary

| X | Y |
|---|---|
| 10.0348 | 5.43565 |
| 10.636 | 5.45906 |

### Material Boundary

| X | Y |
|---|---|
| 17.3005 | 7.95004 |
| 18.596 | 9.1 |

## Material Boundary

| X | Y |
|---|---|
| 15.0229 | 6.34895 |
| 15.765 | 6.959 |
| 16.373 | 7.45973 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: BA S44-SLIDE RU=0.1 c=4 phi=29
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 26/2/2021, 7:56:50

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT |
|---|---|---|---|---|---|---|---|
| Color | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 |
| Cohesion [kPa] | 4 | 5 | 7 | 60 | 0 | 500 | 5 |
| Friction Angle [deg] | 29 | 30 | 33 | 34 | 25 | 45 | 28 |
| Water Surface | None | None | Water Table | Water Table | None | None | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | | | Automatically Calculated |
| Ru Value | 0.1 | 0.1 | | | 0 | 0 | |

## Global Minimums

### Method: ordinary/fellenius

FS: 1.005130
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=480.115 kN-m
Driving Moment=477.664 kN-m

### Method: bishop simplified

FS: 1.001180
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=478.229 kN-m
Driving Moment=477.664 kN-m

## Method: janbu simplified

FS: 0.943310
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=50.6609 kN
Driving Horizontal Force=53.7055 kN

## Method: janbu corrected

FS: 0.994999
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=53.4369 kN
Driving Horizontal Force=53.7055 kN

## Method: spencer

FS: 0.999912
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=477.622 kN-m
Driving Moment=477.664 kN-m
Resisting Horizontal Force=52.3744 kN
Driving Horizontal Force=52.379 kN

## Method: corp of eng#1

FS: 1.013910
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=52.8418 kN
Driving Horizontal Force=52.1168 kN

## Method: corp of eng#2

FS: 1.034970
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=53.5192 kN
Driving Horizontal Force=51.7107 kN

## Method: lowe-karafiath

FS: 1.014990
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=52.875 kN
Driving Horizontal Force=52.094 kN

### Method: gle/morgenstern-price

FS: 0.994784
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=475.173 kN-m
Driving Moment=477.664 kN-m
Resisting Horizontal Force=52.3062 kN
Driving Horizontal Force=52.5804 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 6832
Number of Invalid Surfaces: 3168

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 332 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 6805
Number of Invalid Surfaces: 3195

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 336 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 6229
Number of Invalid Surfaces: 3771

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 932 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 3 surfaces
Error Code -114 reported for 2407 surfaces

Error Code -123 reported for 2 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 6229
Number of Invalid Surfaces: 3771

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 932 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 3 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: spencer

Number of Valid Surfaces: 5895
Number of Invalid Surfaces: 4105

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 965 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 281 surfaces
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 4819
Number of Invalid Surfaces: 5181

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 1438 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 907 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 4304
Number of Invalid Surfaces: 5696

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces

Error Code -107 reported for 16 surfaces
Error Code -108 reported for 2533 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 327 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 2878
Number of Invalid Surfaces: 7122

### Error Codes:

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 3797 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 489 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 6029
Number of Invalid Surfaces: 3971

### Error Codes:

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 934 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 178 surfaces
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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.
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## Slice Data

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.00513

| 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 | 0.210844 | 0.0864458 | UNIT I | 4 | 29 | 4.17519 | 4.19661 | 0.395697 | 0.041 | 0.354697 |
| 2 | 0.210844 | 0.45195 | UNIT I | 4 | 29 | 4.98846 | 5.01405 | 2.04374 | 0.214353 | 1.82939 |
| 3 | 0.210844 | 0.980908 | UNIT I | 4 | 29 | 6.13498 | 6.16645 | 4.37362 | 0.46523 | 3.90839 |
| 4 | 0.210844 | 1.45004 | UNIT I | 4 | 29 | 7.10881 | 7.14528 | 6.36197 | 0.687731 | 5.67424 |
| 5 | 0.210844 | 1.92215 | UNIT I | 4 | 29 | 8.04366 | 8.08492 | 8.28104 | 0.91165 | 7.36939 |
| 6 | 0.210844 | 2.37623 | UNIT I | 4 | 29 | 8.8894 | 8.935 | 10.03 | 1.12701 | 8.90297 |
| 7 | 0.210844 | 3.12138 | UNIT I | 4 | 29 | 10.2652 | 10.3178 | 12.8781 | 1.48042 | 11.3977 |
| 8 | 0.210844 | 3.47706 | UNIT I | 4 | 29 | 10.7836 | 10.8389 | 13.9868 | 1.64912 | 12.3377 |
| 9 | 0.210844 | 3.63612 | UNIT I | 4 | 29 | 10.872 | 10.9277 | 14.2225 | 1.72456 | 12.4979 |
| 10 | 0.210844 | 4.17081 | UNIT I | 4 | 29 | 11.6115 | 11.6711 | 15.8171 | 1.97816 | 13.839 |
| 11 | 0.210844 | 4.96127 | UNIT I | 4 | 29 | 12.7102 | 12.7754 | 18.1843 | 2.35306 | 15.8312 |
| 12 | 0.210844 | 5.36294 | UNIT I | 4 | 29 | 13.0175 | 13.0843 | 18.9321 | 2.54356 | 16.3885 |
| 13 | 0.210844 | 5.74535 | UNIT I | 4 | 29 | 13.2087 | 13.2765 | 19.4602 | 2.72493 | 16.7353 |
| 14 | 0.210844 | 6.48576 | UNIT I | 4 | 29 | 13.8579 | 13.929 | 20.9885 | 3.0761 | 17.9124 |
| 15 | 0.210844 | 7.21064 | UNIT I | 4 | 29 | 14.3297 | 14.4032 | 22.1877 | 3.4199 | 18.7678 |
| 16 | 0.210844 | 7.44339 | UNIT I | 4 | 29 | 13.9783 | 14.05 | 21.6609 | 3.53029 | 18.1306 |
| 17 | 0.210844 | 7.77584 | UNIT I | 4 | 29 | 13.6744 | 13.7446 | 21.2677 | 3.68797 | 17.5797 |
| 18 | 0.210844 | 8.01884 | UNIT I | 4 | 29 | 13.1682 | 13.2357 | 20.4649 | 3.80322 | 16.6617 |
| 19 | 0.210844 | 7.6576 | UNIT I | 4 | 29 | 11.9477 | 12.009 | 18.0804 | 3.63189 | 14.4486 |
| 20 | 0.210844 | 7.0784 | UNIT I | 4 | 29 | 10.5681 | 10.6223 | 15.3041 | 3.35718 | 11.9469 |
| 21 | 0.210844 | 6.28722 | UNIT I | 4 | 29 | 9.11364 | 9.16039 | 12.2915 | 2.98194 | 9.3096 |
| 22 | 0.210844 | 5.30046 | UNIT I | 4 | 29 | 7.67887 | 7.71826 | 9.22185 | 2.51393 | 6.70792 |
| 23 | 0.210844 | 4.17977 | UNIT I | 4 | 29 | 6.3818 | 6.41454 | 6.33835 | 1.98241 | 4.35594 |
| 24 | 0.210844 | 2.84956 | UNIT I | 4 | 29 | 5.25303 | 5.27998 | 3.66063 | 1.3515 | 2.30913 |
| 25 | 0.210844 | 1.02832 | UNIT I | 4 | 29 | 4.30256 | 4.32464 | 1.07338 | 0.487719 | 0.58566 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.00118

| 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 | 0.210844 | 0.0864458 | UNIT I | 4 | 29 | 3.77895 | 3.78341 | -0.349743 | 0.041 | -0.390743 |
| 2 | 0.210844 | 0.45195 | UNIT I | 4 | 29 | 4.48301 | 4.4883 | 1.09527 | 0.214353 | 0.880915 |
| 3 | 0.210844 | 0.980908 | UNIT I | 4 | 29 | 5.49947 | 5.50596 | 3.18205 | 0.46523 | 2.71682 |
| 4 | 0.210844 | 1.45004 | UNIT I | 4 | 29 | 6.35979 | 6.36729 | 4.95845 | 0.687731 | 4.27072 |
| 5 | 0.210844 | 1.92215 | UNIT I | 4 | 29 | 7.19507 | 7.20356 | 6.69102 | 0.91165 | 5.77937 |
| 6 | 0.210844 | 2.37623 | UNIT I | 4 | 29 | 7.96358 | 7.97298 | 8.29445 | 1.12701 | 7.16744 |
| 7 | 0.210844 | 3.12138 | UNIT I | 4 | 29 | 9.26164 | 9.27257 | 10.9924 | 1.48042 | 9.51197 |
| 8 | 0.210844 | 3.47706 | UNIT I | 4 | 29 | 9.7722 | 9.78373 | 12.0832 | 1.64912 | 10.4341 |
| 9 | 0.210844 | 3.63612 | UNIT I | 4 | 29 | 9.89188 | 9.90355 | 12.3748 | 1.72456 | 10.6503 |
| 10 | 0.210844 | 4.17081 | UNIT I | 4 | 29 | 10.6828 | 10.6955 | 14.057 | 1.97816 | 12.0789 |
| 11 | 0.210844 | 4.96127 | UNIT I | 4 | 29 | 11.8902 | 11.9043 | 16.6127 | 2.35306 | 14.2597 |
| 12 | 0.210844 | 5.36294 | UNIT I | 4 | 29 | 12.3553 | 12.3699 | 17.6432 | 2.54356 | 15.0997 |
| 13 | 0.210844 | 5.74535 | UNIT I | 4 | 29 | 12.7513 | 12.7663 | 18.5398 | 2.72493 | 15.8149 |
| 14 | 0.210844 | 6.48576 | UNIT I | 4 | 29 | 13.71 | 13.7261 | 20.6225 | 3.0761 | 17.5464 |
| 15 | 0.210844 | 7.21064 | UNIT I | 4 | 29 | 14.5737 | 14.5909 | 22.5264 | 3.4199 | 19.1065 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.210844 | 7.44339 | UNIT I | 4 | 29 | 14.5773 | 14.5945 | 22.6432 | 3.53029 | 19.1129 |
| 17 | 0.210844 | 7.77584 | UNIT I | 4 | 29 | 14.6956 | 14.7129 | 23.0146 | 3.68797 | 19.3266 |
| 18 | 0.210844 | 8.01884 | UNIT I | 4 | 29 | 14.6232 | 14.6405 | 22.9991 | 3.80322 | 19.1959 |
| 19 | 0.210844 | 7.6576 | UNIT I | 4 | 29 | 13.6141 | 13.6301 | 21.0051 | 3.63189 | 17.3732 |
| 20 | 0.210844 | 7.0784 | UNIT I | 4 | 29 | 12.2958 | 12.3103 | 18.3494 | 3.35718 | 14.9922 |
| 21 | 0.210844 | 6.28722 | UNIT I | 4 | 29 | 10.7089 | 10.7215 | 15.1079 | 2.98194 | 12.126 |
| 22 | 0.210844 | 5.30046 | UNIT I | 4 | 29 | 8.91211 | 8.92263 | 11.3946 | 2.51393 | 8.88065 |
| 23 | 0.210844 | 4.17977 | UNIT I | 4 | 29 | 7.02337 | 7.03166 | 7.45167 | 1.98241 | 5.46926 |
| 24 | 0.210844 | 2.84956 | UNIT I | 4 | 29 | 5.00197 | 5.00787 | 3.16974 | 1.3515 | 1.81824 |
| 25 | 0.210844 | 1.02832 | UNIT I | 4 | 29 | 2.66326 | 2.6664 | -1.91817 | 0.487719 | -2.40589 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.94331

| 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 | 0.210844 | 0.0864458 | UNIT I | 4 | 29 | 3.98685 | 3.76083 | -0.390473 | 0.041 | -0.431473 |
| 2 | 0.210844 | 0.45195 | UNIT I | 4 | 29 | 4.72557 | 4.45768 | 1.04002 | 0.214353 | 0.825668 |
| 3 | 0.210844 | 0.980908 | UNIT I | 4 | 29 | 5.79209 | 5.46374 | 3.10588 | 0.46523 | 2.64065 |
| 4 | 0.210844 | 1.45004 | UNIT I | 4 | 29 | 6.69253 | 6.31313 | 4.86073 | 0.687731 | 4.17299 |
| 5 | 0.210844 | 1.92215 | UNIT I | 4 | 29 | 7.56516 | 7.13629 | 6.56965 | 0.91165 | 5.658 |
| 6 | 0.210844 | 2.37623 | UNIT I | 4 | 29 | 8.36618 | 7.8919 | 8.14817 | 1.12701 | 7.02116 |
| 7 | 0.210844 | 3.12138 | UNIT I | 4 | 29 | 9.72169 | 9.17057 | 10.8084 | 1.48042 | 9.32795 |
| 8 | 0.210844 | 3.47706 | UNIT I | 4 | 29 | 10.249 | 9.66794 | 11.8744 | 1.64912 | 10.2252 |
| 9 | 0.210844 | 3.63612 | UNIT I | 4 | 29 | 10.3656 | 9.77801 | 12.1483 | 1.72456 | 10.4238 |
| 10 | 0.210844 | 4.17081 | UNIT I | 4 | 29 | 11.1848 | 10.5508 | 13.796 | 1.97816 | 11.8179 |
| 11 | 0.210844 | 4.96127 | UNIT I | 4 | 29 | 12.438 | 11.7329 | 16.3036 | 2.35306 | 13.9505 |
| 12 | 0.210844 | 5.36294 | UNIT I | 4 | 29 | 12.913 | 12.1809 | 17.3024 | 2.54356 | 14.7588 |
| 13 | 0.210844 | 5.74535 | UNIT I | 4 | 29 | 13.3146 | 12.5598 | 18.1672 | 2.72493 | 15.4422 |
| 14 | 0.210844 | 6.48576 | UNIT I | 4 | 29 | 14.302 | 13.4913 | 20.1988 | 3.0761 | 17.1227 |
| 15 | 0.210844 | 7.21064 | UNIT I | 4 | 29 | 15.1881 | 14.3271 | 22.0504 | 3.4199 | 18.6305 |
| 16 | 0.210844 | 7.44339 | UNIT I | 4 | 29 | 15.1762 | 14.3159 | 22.1406 | 3.53029 | 18.6104 |
| 17 | 0.210844 | 7.77584 | UNIT I | 4 | 29 | 15.2828 | 14.4164 | 22.4797 | 3.68797 | 18.7918 |
| 18 | 0.210844 | 8.01884 | UNIT I | 4 | 29 | 15.1901 | 14.329 | 22.4371 | 3.80322 | 18.6339 |
| 19 | 0.210844 | 7.6576 | UNIT I | 4 | 29 | 14.1244 | 13.3237 | 20.4523 | 3.63189 | 16.8204 |
| 20 | 0.210844 | 7.0784 | UNIT I | 4 | 29 | 12.7396 | 12.0174 | 17.821 | 3.35718 | 14.4638 |
| 21 | 0.210844 | 6.28722 | UNIT I | 4 | 29 | 11.079 | 10.4509 | 14.6197 | 2.98194 | 11.6378 |
| 22 | 0.210844 | 5.30046 | UNIT I | 4 | 29 | 9.20475 | 8.68293 | 10.9621 | 2.51393 | 8.44822 |
| 23 | 0.210844 | 4.17977 | UNIT I | 4 | 29 | 7.24 | 6.82956 | 7.08705 | 1.98241 | 5.10464 |
| 24 | 0.210844 | 2.84956 | UNIT I | 4 | 29 | 5.14424 | 4.85261 | 2.88964 | 1.3515 | 1.53814 |
| 25 | 0.210844 | 1.02832 | UNIT I | 4 | 29 | 2.73081 | 2.576 | -2.08124 | 0.487719 | -2.56896 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.994999

| 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 | 0.210844 | 0.0864458 | UNIT I | 4 | 29 | 3.77973 | 3.76083 | -0.390473 | 0.041 | -0.431473 |
| 2 | 0.210844 | 0.45195 | UNIT I | 4 | 29 | 4.48008 | 4.45768 | 1.04002 | 0.214353 | 0.825668 |
| 3 | 0.210844 | 0.980908 | UNIT I | 4 | 29 | 5.4912 | 5.46374 | 3.10588 | 0.46523 | 2.64065 |
| 4 | 0.210844 | 1.45004 | UNIT I | 4 | 29 | 6.34486 | 6.31313 | 4.86073 | 0.687731 | 4.17299 |
| 5 | 0.210844 | 1.92215 | UNIT I | 4 | 29 | 7.17216 | 7.13629 | 6.56965 | 0.91165 | 5.658 |
| 6 | 0.210844 | 2.37623 | UNIT I | 4 | 29 | 7.93157 | 7.8919 | 8.14817 | 1.12701 | 7.02116 |
| 7 | 0.210844 | 3.12138 | UNIT I | 4 | 29 | 9.21666 | 9.17057 | 10.8084 | 1.48042 | 9.32795 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0.210844 | 3.47706 | UNIT I | 4 | 29 | 9.71653 | 9.66794 | 11.8744 | 1.64912 | 10.2252 |
| 9 | 0.210844 | 3.63612 | UNIT I | 4 | 29 | 9.82716 | 9.77801 | 12.1483 | 1.72456 | 10.4238 |
| 10 | 0.210844 | 4.17081 | UNIT I | 4 | 29 | 10.6038 | 10.5508 | 13.796 | 1.97816 | 11.8179 |
| 11 | 0.210844 | 4.96127 | UNIT I | 4 | 29 | 11.7919 | 11.7329 | 16.3036 | 2.35306 | 13.9505 |
| 12 | 0.210844 | 5.36294 | UNIT I | 4 | 29 | 12.2422 | 12.1809 | 17.3024 | 2.54356 | 14.7588 |
| 13 | 0.210844 | 5.74535 | UNIT I | 4 | 29 | 12.6229 | 12.5598 | 18.1672 | 2.72493 | 15.4422 |
| 14 | 0.210844 | 6.48576 | UNIT I | 4 | 29 | 13.5591 | 13.4913 | 20.1988 | 3.0761 | 17.1227 |
| 15 | 0.210844 | 7.21064 | UNIT I | 4 | 29 | 14.3991 | 14.3271 | 22.0504 | 3.4199 | 18.6305 |
| 16 | 0.210844 | 7.44339 | UNIT I | 4 | 29 | 14.3879 | 14.3159 | 22.1406 | 3.53029 | 18.6104 |
| 17 | 0.210844 | 7.77584 | UNIT I | 4 | 29 | 14.4889 | 14.4164 | 22.4797 | 3.68797 | 18.7918 |
| 18 | 0.210844 | 8.01884 | UNIT I | 4 | 29 | 14.401 | 14.329 | 22.4371 | 3.80322 | 18.6339 |
| 19 | 0.210844 | 7.6576 | UNIT I | 4 | 29 | 13.3906 | 13.3237 | 20.4523 | 3.63189 | 16.8204 |
| 20 | 0.210844 | 7.0784 | UNIT I | 4 | 29 | 12.0778 | 12.0174 | 17.821 | 3.35718 | 14.4638 |
| 21 | 0.210844 | 6.28722 | UNIT I | 4 | 29 | 10.5035 | 10.4509 | 14.6197 | 2.98194 | 11.6378 |
| 22 | 0.210844 | 5.30046 | UNIT I | 4 | 29 | 8.72657 | 8.68293 | 10.9621 | 2.51393 | 8.44822 |
| 23 | 0.210844 | 4.17977 | UNIT I | 4 | 29 | 6.86389 | 6.82956 | 7.08705 | 1.98241 | 5.10464 |
| 24 | 0.210844 | 2.84956 | UNIT I | 4 | 29 | 4.877 | 4.85261 | 2.88964 | 1.3515 | 1.53814 |
| 25 | 0.210844 | 1.02832 | UNIT I | 4 | 29 | 2.58895 | 2.576 | -2.08124 | 0.487719 | -2.56896 |

**Global Minimum Query (spencer) - Safety Factor**: 0.999912

| 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 | 0.210844 | 0.0864458 | UNIT I | 4 | 29 | 5.32922 | 5.32875 | 2.43813 | 0.041 | 2.39713 |
| 2 | 0.210844 | 0.45195 | UNIT I | 4 | 29 | 6.12748 | 6.12694 | 4.05146 | 0.214353 | 3.8371 |
| 3 | 0.210844 | 0.980908 | UNIT I | 4 | 29 | 7.24704 | 7.2464 | 6.32187 | 0.46523 | 5.85664 |
| 4 | 0.210844 | 1.45004 | UNIT I | 4 | 29 | 8.12547 | 8.12475 | 8.12897 | 0.687731 | 7.44124 |
| 5 | 0.210844 | 1.92215 | UNIT I | 4 | 29 | 8.92604 | 8.92525 | 9.79704 | 0.91165 | 8.88539 |
| 6 | 0.210844 | 2.37623 | UNIT I | 4 | 29 | 9.60811 | 9.60726 | 11.2428 | 1.12701 | 10.1158 |
| 7 | 0.210844 | 3.12138 | UNIT I | 4 | 29 | 10.8074 | 10.8064 | 13.7595 | 1.48042 | 12.2791 |
| 8 | 0.210844 | 3.47706 | UNIT I | 4 | 29 | 11.1306 | 11.1296 | 14.5113 | 1.64912 | 12.8622 |
| 9 | 0.210844 | 3.63612 | UNIT I | 4 | 29 | 11.0402 | 11.0392 | 14.4236 | 1.72456 | 12.699 |
| 10 | 0.210844 | 4.17081 | UNIT I | 4 | 29 | 11.5997 | 11.5987 | 15.6866 | 1.97816 | 13.7084 |
| 11 | 0.210844 | 4.96127 | UNIT I | 4 | 29 | 12.5159 | 12.5148 | 17.7141 | 2.35306 | 15.361 |
| 12 | 0.210844 | 5.36294 | UNIT I | 4 | 29 | 12.6908 | 12.6896 | 18.2201 | 2.54356 | 15.6765 |
| 13 | 0.210844 | 5.74535 | UNIT I | 4 | 29 | 12.7839 | 12.7828 | 18.5695 | 2.72493 | 15.8446 |
| 14 | 0.210844 | 6.48576 | UNIT I | 4 | 29 | 13.3512 | 13.35 | 19.9439 | 3.0761 | 16.8678 |
| 15 | 0.210844 | 7.21064 | UNIT I | 4 | 29 | 13.7944 | 13.7932 | 21.0872 | 3.4199 | 17.6673 |
| 16 | 0.210844 | 7.44339 | UNIT I | 4 | 29 | 13.4899 | 13.4887 | 20.6483 | 3.53029 | 17.118 |
| 17 | 0.210844 | 7.77584 | UNIT I | 4 | 29 | 13.2788 | 13.2776 | 20.4253 | 3.68797 | 16.7373 |
| 18 | 0.210844 | 8.01884 | UNIT I | 4 | 29 | 12.9151 | 12.914 | 19.8845 | 3.80322 | 16.0813 |
| 19 | 0.210844 | 7.6576 | UNIT I | 4 | 29 | 11.8475 | 11.8465 | 17.7873 | 3.63189 | 14.1554 |
| 20 | 0.210844 | 7.0784 | UNIT I | 4 | 29 | 10.5982 | 10.5973 | 15.259 | 3.35718 | 11.9018 |
| 21 | 0.210844 | 6.28722 | UNIT I | 4 | 29 | 9.21454 | 9.21373 | 12.3878 | 2.98194 | 9.40583 |
| 22 | 0.210844 | 5.30046 | UNIT I | 4 | 29 | 7.75117 | 7.75049 | 9.28001 | 2.51393 | 6.76608 |
| 23 | 0.210844 | 4.17977 | UNIT I | 4 | 29 | 6.29421 | 6.29366 | 6.12029 | 1.98241 | 4.13788 |
| 24 | 0.210844 | 2.84956 | UNIT I | 4 | 29 | 4.80913 | 4.8087 | 2.81043 | 1.3515 | 1.45893 |
| 25 | 0.210844 | 1.02832 | UNIT I | 4 | 29 | 3.15028 | 3.15 | -1.04572 | 0.487719 | -1.53344 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.01391

| Slice | Width | Weight | Base | Base Cohesion | Base Friction Angle | Shear Stress | Shear Strength | Base Normal Stress | Pore Pressure | Effective Normal Stress |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | [kPa] | [degrees] | [kPa] | [kPa] | [kPa] | [kPa] | [kPa] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.210844 | 0.0864458 | UNIT I | 4 | 29 | 5.89338 | 5.97536 | 3.60465 | 0.041 | 3.56365 |
| 2 | 0.210844 | 0.45195 | UNIT I | 4 | 29 | 6.68384 | 6.77681 | 5.22387 | 0.214353 | 5.00951 |
| 3 | 0.210844 | 0.980908 | UNIT I | 4 | 29 | 7.79074 | 7.89911 | 7.49943 | 0.46523 | 7.0342 |
| 4 | 0.210844 | 1.45004 | UNIT I | 4 | 29 | 8.62873 | 8.74876 | 9.25471 | 0.687731 | 8.56698 |
| 5 | 0.210844 | 1.92215 | UNIT I | 4 | 29 | 9.37363 | 9.50402 | 10.8412 | 0.91165 | 9.92951 |
| 6 | 0.210844 | 2.37623 | UNIT I | 4 | 29 | 9.98859 | 10.1275 | 12.1814 | 1.12701 | 11.0544 |
| 7 | 0.210844 | 3.12138 | UNIT I | 4 | 29 | 11.1113 | 11.2659 | 14.5884 | 1.48042 | 13.1079 |
| 8 | 0.210844 | 3.47706 | UNIT I | 4 | 29 | 11.3535 | 11.5114 | 15.2001 | 1.64912 | 13.5509 |
| 9 | 0.210844 | 3.63612 | UNIT I | 4 | 29 | 11.1903 | 11.3459 | 14.977 | 1.72456 | 13.2524 |
| 10 | 0.210844 | 4.17081 | UNIT I | 4 | 29 | 11.6649 | 11.8272 | 16.0987 | 1.97816 | 14.1206 |
| 11 | 0.210844 | 4.96127 | UNIT I | 4 | 29 | 12.4793 | 12.6529 | 17.9633 | 2.35306 | 15.6102 |
| 12 | 0.210844 | 5.36294 | UNIT I | 4 | 29 | 12.5735 | 12.7484 | 18.3262 | 2.54356 | 15.7826 |
| 13 | 0.210844 | 5.74535 | UNIT I | 4 | 29 | 12.5892 | 12.7643 | 18.5362 | 2.72493 | 15.8112 |
| 14 | 0.210844 | 6.48576 | UNIT I | 4 | 29 | 13.0504 | 13.232 | 19.731 | 3.0761 | 16.6549 |
| 15 | 0.210844 | 7.21064 | UNIT I | 4 | 29 | 13.3837 | 13.5698 | 20.6844 | 3.4199 | 17.2645 |
| 16 | 0.210844 | 7.44339 | UNIT I | 4 | 29 | 13.0092 | 13.1902 | 20.1098 | 3.53029 | 16.5795 |
| 17 | 0.210844 | 7.77584 | UNIT I | 4 | 29 | 12.7136 | 12.8904 | 19.7267 | 3.68797 | 16.0387 |
| 18 | 0.210844 | 8.01884 | UNIT I | 4 | 29 | 12.2649 | 12.4355 | 19.0212 | 3.80322 | 15.218 |
| 19 | 0.210844 | 7.6576 | UNIT I | 4 | 29 | 11.1729 | 11.3283 | 16.8525 | 3.63189 | 13.2206 |
| 20 | 0.210844 | 7.0784 | UNIT I | 4 | 29 | 9.92402 | 10.0621 | 14.2934 | 3.35718 | 10.9362 |
| 21 | 0.210844 | 6.28722 | UNIT I | 4 | 29 | 8.57477 | 8.69404 | 11.4502 | 2.98194 | 8.46825 |
| 22 | 0.210844 | 5.30046 | UNIT I | 4 | 29 | 7.19683 | 7.29694 | 8.46178 | 2.51393 | 5.94785 |
| 23 | 0.210844 | 4.17977 | UNIT I | 4 | 29 | 5.90054 | 5.98262 | 5.55916 | 1.98241 | 3.57675 |
| 24 | 0.210844 | 2.84956 | UNIT I | 4 | 29 | 4.74221 | 4.80818 | 2.8095 | 1.3515 | 1.458 |
| 25 | 0.210844 | 1.02832 | UNIT I | 4 | 29 | 3.92875 | 3.98339 | 0.457762 | 0.487719 | -0.0299566 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.03497

| 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 | 0.210844 | 0.0864458 | UNIT I | 4 | 29 | 5.08108 | 5.25877 | 2.31189 | 0.041 | 2.27089 |
| 2 | 0.210844 | 0.45195 | UNIT I | 4 | 29 | 6.97221 | 7.21603 | 6.01623 | 0.214353 | 5.80187 |
| 3 | 0.210844 | 0.980908 | UNIT I | 4 | 29 | 7.43544 | 7.69546 | 7.13202 | 0.46523 | 6.66679 |
| 4 | 0.210844 | 1.45004 | UNIT I | 4 | 29 | 9.46301 | 9.79393 | 11.1403 | 0.687731 | 10.4525 |
| 5 | 0.210844 | 1.92215 | UNIT I | 4 | 29 | 8.83212 | 9.14098 | 10.1862 | 0.91165 | 9.27456 |
| 6 | 0.210844 | 2.37623 | UNIT I | 4 | 29 | 12.3091 | 12.7395 | 16.8936 | 1.12701 | 15.7666 |
| 7 | 0.210844 | 3.12138 | UNIT I | 4 | 29 | 10.2927 | 10.6527 | 13.4822 | 1.48042 | 12.0017 |
| 8 | 0.210844 | 3.47706 | UNIT I | 4 | 29 | 4.91887 | 5.09088 | 3.61711 | 1.64912 | 1.96799 |
| 9 | 0.210844 | 3.63612 | UNIT I | 4 | 29 | 21.6336 | 22.3901 | 34.9012 | 1.72456 | 33.1767 |
| 10 | 0.210844 | 4.17081 | UNIT I | 4 | 29 | 15.849 | 16.4032 | 24.3542 | 1.97816 | 22.376 |
| 11 | 0.210844 | 4.96127 | UNIT I | 4 | 29 | 6.03649 | 6.24759 | 6.40781 | 2.35306 | 4.05475 |
| 12 | 0.210844 | 5.36294 | UNIT I | 4 | 29 | 14.0091 | 14.499 | 21.4843 | 2.54356 | 18.9408 |
| 13 | 0.210844 | 5.74535 | UNIT I | 4 | 29 | 17.7047 | 18.3238 | 28.5658 | 2.72493 | 25.8409 |
| 14 | 0.210844 | 6.48576 | UNIT I | 4 | 29 | 12.6773 | 13.1206 | 19.5302 | 3.0761 | 16.4541 |
| 15 | 0.210844 | 7.21064 | UNIT I | 4 | 29 | 8.76333 | 9.06978 | 12.566 | 3.4199 | 9.14611 |
| 16 | 0.210844 | 7.44339 | UNIT I | 4 | 29 | 12.6318 | 13.0735 | 19.8993 | 3.53029 | 16.369 |
| 17 | 0.210844 | 7.77584 | UNIT I | 4 | 29 | 10.9932 | 11.3777 | 16.9976 | 3.68797 | 13.3097 |
| 18 | 0.210844 | 8.01884 | UNIT I | 4 | 29 | 8.36961 | 8.6623 | 12.2142 | 3.80322 | 8.411 |
| 19 | 0.210844 | 7.6576 | UNIT I | 4 | 29 | 9.65468 | 9.9923 | 14.4423 | 3.63189 | 10.8104 |
| 20 | 0.210844 | 7.0784 | UNIT I | 4 | 29 | 10.0073 | 10.3573 | 14.826 | 3.35718 | 11.4688 |
| 21 | 0.210844 | 6.28722 | UNIT I | 4 | 29 | 9.26081 | 9.58466 | 13.0569 | 2.98194 | 10.075 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 0.210844 | 5.30046 | UNIT I | 4 | 29 | 8.11523 | 8.39902 | 10.45 | 2.51393 | 7.93604 |
| 23 | 0.210844 | 4.17977 | UNIT I | 4 | 29 | 6.43256 | 6.65751 | 6.77668 | 1.98241 | 4.79427 |
| 24 | 0.210844 | 2.84956 | UNIT I | 4 | 29 | 4.92919 | 5.10156 | 3.33878 | 1.3515 | 1.98728 |
| 25 | 0.210844 | 1.02832 | UNIT I | 4 | 29 | 2.88476 | 2.98564 | -1.34223 | 0.487719 | -1.82995 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.01499

| 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 | 0.210844 | 0.0864458 | UNIT I | 4 | 29 | 4.6188 | 4.68803 | 1.28224 | 0.041 | 1.24124 |
| 2 | 0.210844 | 0.45195 | UNIT I | 4 | 29 | 5.87142 | 5.95943 | 3.74926 | 0.214353 | 3.53491 |
| 3 | 0.210844 | 0.980908 | UNIT I | 4 | 29 | 6.83835 | 6.94086 | 5.77067 | 0.46523 | 5.30544 |
| 4 | 0.210844 | 1.45004 | UNIT I | 4 | 29 | 8.22645 | 8.34976 | 8.5349 | 0.687731 | 7.84717 |
| 5 | 0.210844 | 1.92215 | UNIT I | 4 | 29 | 8.6814 | 8.81153 | 9.59189 | 0.91165 | 8.68024 |
| 6 | 0.210844 | 2.37623 | UNIT I | 4 | 29 | 10.4709 | 10.6278 | 13.0839 | 1.12701 | 11.9569 |
| 7 | 0.210844 | 3.12138 | UNIT I | 4 | 29 | 10.7307 | 10.8915 | 13.9131 | 1.48042 | 12.4327 |
| 8 | 0.210844 | 3.47706 | UNIT I | 4 | 29 | 8.77026 | 8.90173 | 10.4921 | 1.64912 | 8.84296 |
| 9 | 0.210844 | 3.63612 | UNIT I | 4 | 29 | 15.5721 | 15.8055 | 23.0223 | 1.72456 | 21.2978 |
| 10 | 0.210844 | 4.17081 | UNIT I | 4 | 29 | 13.5163 | 13.719 | 19.5116 | 1.97816 | 17.5335 |
| 11 | 0.210844 | 4.96127 | UNIT I | 4 | 29 | 10.8298 | 10.9922 | 14.9673 | 2.35306 | 12.6142 |
| 12 | 0.210844 | 5.36294 | UNIT I | 4 | 29 | 13.8253 | 14.0325 | 20.6427 | 2.54356 | 18.0991 |
| 13 | 0.210844 | 5.74535 | UNIT I | 4 | 29 | 15.2975 | 15.5268 | 23.5199 | 2.72493 | 20.795 |
| 14 | 0.210844 | 6.48576 | UNIT I | 4 | 29 | 13.7027 | 13.9081 | 20.9508 | 3.0761 | 17.8747 |
| 15 | 0.210844 | 7.21064 | UNIT I | 4 | 29 | 12.1758 | 12.3583 | 18.4987 | 3.4199 | 15.0788 |
| 16 | 0.210844 | 7.44339 | UNIT I | 4 | 29 | 13.447 | 13.6486 | 20.9369 | 3.53029 | 17.4066 |
| 17 | 0.210844 | 7.77584 | UNIT I | 4 | 29 | 12.3867 | 12.5724 | 19.153 | 3.68797 | 15.4651 |
| 18 | 0.210844 | 8.01884 | UNIT I | 4 | 29 | 10.7889 | 10.9506 | 16.3424 | 3.80322 | 12.5392 |
| 19 | 0.210844 | 7.6576 | UNIT I | 4 | 29 | 10.698 | 10.8583 | 16.0046 | 3.63189 | 12.3727 |
| 20 | 0.210844 | 7.0784 | UNIT I | 4 | 29 | 10.1022 | 10.2537 | 14.6391 | 3.35718 | 11.2819 |
| 21 | 0.210844 | 6.28722 | UNIT I | 4 | 29 | 8.95116 | 9.08534 | 12.1561 | 2.98194 | 9.1742 |
| 22 | 0.210844 | 5.30046 | UNIT I | 4 | 29 | 7.66761 | 7.78255 | 9.33783 | 2.51393 | 6.8239 |
| 23 | 0.210844 | 4.17977 | UNIT I | 4 | 29 | 6.1844 | 6.2771 | 6.09041 | 1.98241 | 4.108 |
| 24 | 0.210844 | 2.84956 | UNIT I | 4 | 29 | 4.68509 | 4.75532 | 2.71414 | 1.3515 | 1.36264 |
| 25 | 0.210844 | 1.02832 | UNIT I | 4 | 29 | 3.03586 | 3.08137 | -1.16954 | 0.487719 | -1.65726 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 0.994784

| 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 | 0.210844 | 0.0864458 | UNIT I | 4 | 29 | 3.98602 | 3.96523 | -0.021732 | 0.041 | -0.062732 |
| 2 | 0.210844 | 0.45195 | UNIT I | 4 | 29 | 5.10268 | 5.07606 | 2.15561 | 0.214353 | 1.94126 |
| 3 | 0.210844 | 0.980908 | UNIT I | 4 | 29 | 6.58229 | 6.54796 | 5.06188 | 0.46523 | 4.59665 |
| 4 | 0.210844 | 1.45004 | UNIT I | 4 | 29 | 7.88654 | 7.8454 | 7.625 | 0.687731 | 6.93727 |
| 5 | 0.210844 | 1.92215 | UNIT I | 4 | 29 | 9.09821 | 9.05075 | 10.0234 | 0.91165 | 9.1118 |
| 6 | 0.210844 | 2.37623 | UNIT I | 4 | 29 | 10.1281 | 10.0753 | 12.0871 | 1.12701 | 10.9601 |
| 7 | 0.210844 | 3.12138 | UNIT I | 4 | 29 | 11.5723 | 11.512 | 15.0324 | 1.48042 | 13.552 |
| 8 | 0.210844 | 3.47706 | UNIT I | 4 | 29 | 12.026 | 11.9633 | 16.0153 | 1.64912 | 14.3662 |
| 9 | 0.210844 | 3.63612 | UNIT I | 4 | 29 | 11.9346 | 11.8723 | 15.9266 | 1.72456 | 14.202 |
| 10 | 0.210844 | 4.17081 | UNIT I | 4 | 29 | 12.3841 | 12.3195 | 16.9869 | 1.97816 | 15.0087 |
| 11 | 0.210844 | 4.96127 | UNIT I | 4 | 29 | 13.1026 | 13.0343 | 18.6513 | 2.35306 | 16.2983 |
| 12 | 0.210844 | 5.36294 | UNIT I | 4 | 29 | 13.0248 | 12.9568 | 18.7021 | 2.54356 | 16.1586 |
| 13 | 0.210844 | 5.74535 | UNIT I | 4 | 29 | 12.8518 | 12.7848 | 18.5731 | 2.72493 | 15.8481 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 0.210844 | 6.48576 | UNIT I | 4 | 29 | 13.1715 | 13.1028 | 19.498 | 3.0761 | 16.4219 |
| 15 | 0.210844 | 7.21064 | UNIT I | 4 | 29 | 13.4274 | 13.3573 | 20.301 | 3.4199 | 16.8811 |
| 16 | 0.210844 | 7.44339 | UNIT I | 4 | 29 | 13.0282 | 12.9602 | 19.695 | 3.53029 | 16.1647 |
| 17 | 0.210844 | 7.77584 | UNIT I | 4 | 29 | 12.8225 | 12.7557 | 19.4836 | 3.68797 | 15.7956 |
| 18 | 0.210844 | 8.01884 | UNIT I | 4 | 29 | 12.5724 | 12.5069 | 19.15 | 3.80322 | 15.3468 |
| 19 | 0.210844 | 7.6576 | UNIT I | 4 | 29 | 11.6878 | 11.6269 | 17.3911 | 3.63189 | 13.7592 |
| 20 | 0.210844 | 7.0784 | UNIT I | 4 | 29 | 10.6571 | 10.6015 | 15.2667 | 3.35718 | 11.9095 |
| 21 | 0.210844 | 6.28722 | UNIT I | 4 | 29 | 9.4845 | 9.43503 | 12.787 | 2.98194 | 9.80506 |
| 22 | 0.210844 | 5.30046 | UNIT I | 4 | 29 | 8.17354 | 8.13091 | 9.9663 | 2.51393 | 7.45237 |
| 23 | 0.210844 | 4.17977 | UNIT I | 4 | 29 | 6.75667 | 6.72143 | 6.89198 | 1.98241 | 4.90957 |
| 24 | 0.210844 | 2.84956 | UNIT I | 4 | 29 | 5.09712 | 5.07053 | 3.28279 | 1.3515 | 1.93129 |
| 25 | 0.210844 | 1.02832 | UNIT I | 4 | 29 | 2.82235 | 2.80763 | -1.66338 | 0.487719 | -2.1511 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 0.246463 | 1.46432 |
| 40.9932 | 12.499 |
| 51.3789 | 18.6032 |
| 55.0767 | 21.5626 |

### External Boundary

| X | Y |
|---|---|
| 11.8302 | 6.25839 |
| 11.9085 | 5.94261 |
| 11.8338 | 5.93829 |
| 11.7564 | 5.93035 |
| 11.5778 | 5.90654 |
| 11.2683 | 5.85829 |
| 11.121 | 5.87353 |
| 10.7096 | 5.80753 |
| 9.86652 | 5.76184 |
| 9.18593 | 5.68061 |
| 8.79485 | 5.58415 |
| 7.0512 | 5.31012 |
| 6.72302 | 5.27311 |
| 5.64857 | 5.14084 |
| 5.29472 | 5.11414 |
| 4.72058 | 5.0007 |
| 4.27995 | 4.99402 |
| 3.82598 | 5.01405 |
| 3.08493 | 4.98068 |
| 2.13692 | 4.92729 |
| 1.3558 | 4.92062 |
| 0.246463 | 4.88648 |
| 0.246463 | 1.46432 |
| 0.246463 | -1.48563 |

| | |
|---|---|
| 0.246463 | -4.15895 |
| 0.246463 | -5.39914 |
| 55.0767 | -5.39914 |
| 55.0767 | 11.1863 |
| 55.0767 | 17.6064 |
| 55.0767 | 19.3597 |
| 55.0767 | 20.73 |
| 55.0767 | 21.5626 |
| 55.0767 | 23.365 |
| 55.0767 | 26.0251 |
| 54.4584 | 25.8397 |
| 53.5618 | 25.4688 |
| 52.9744 | 24.7581 |
| 52.387 | 24.0473 |
| 51.9851 | 23.2439 |
| 51.4905 | 22.3786 |
| 50.6249 | 21.1116 |
| 50.0375 | 20.3699 |
| 49.3883 | 19.9682 |
| 48.3371 | 19.3192 |
| 46.9347 | 18.4742 |
| 46.5963 | 18.1974 |
| 46.0426 | 17.6746 |
| 45.2735 | 17.1211 |
| 42.619 | 15.4479 |
| 41.5004 | 14.3587 |
| 40.9932 | 14.0478 |
| 28.6564 | 14.5035 |
| 28.4403 | 14.3523 |
| 27.9984 | 13.9021 |
| 27.1243 | 13.33 |
| 26.6199 | 13.034 |
| 26.1664 | 12.775 |
| 25.3511 | 12.4826 |
| 25.084 | 12.4182 |
| 24.588 | 12.3104 |
| 23.9236 | 12.26 |
| 23.0163 | 12.0768 |
| 21.1904 | 11.726 |
| 19.9593 | 11.6492 |
| 19.6087 | 11.6628 |
| 19.1761 | 11.7671 |
| 18.9009 | 11.8177 |
| 18.6038 | 11.7888 |
| 18.4227 | 11.7381 |
| 18.104 | 11.7019 |
| 17.7852 | 11.586 |
| 17.3578 | 11.4629 |
| 17.1622 | 11.376 |
| 16.9304 | 11.2529 |
| 16.7783 | 11.1443 |

| | |
|---|---|
| 16.6624 | 10.9633 |
| 16.5537 | 10.8184 |
| 16.4378 | 10.6591 |
| 16.177 | 10.3912 |
| 15.9742 | 10.0364 |
| 15.8293 | 9.7757 |
| 15.4386 | 9.35059 |
| 15.2492 | 9.14782 |
| 15.0644 | 8.79185 |
| 14.7514 | 8.58118 |
| 14.545 | 8.45563 |
| 14.4374 | 8.27628 |
| 14.3746 | 8.15073 |
| 14.1996 | 8.06105 |
| 14.1009 | 7.92653 |
| 13.7201 | 7.61191 |
| 13.4783 | 7.4007 |
| 13.3755 | 7.30665 |
| 13.2134 | 7.22479 |
| 13.1036 | 7.18821 |
| 12.938 | 7.17699 |
| 12.8129 | 7.15925 |
| 12.7783 | 7.15306 |
| 12.7324 | 7.13449 |
| 12.6742 | 7.13078 |
| 12.5863 | 7.12211 |
| 12.5045 | 7.10679 |
| 11.8575 | 7.04435 |
| 11.8894 | 6.70473 |
| 11.8904 | 6.69465 |
| 11.9207 | 6.3809 |

## Material Boundary

| X | Y |
|---|---|
| 12.5045 | 7.10679 |
| 12.5364 | 6.76717 |

## Material Boundary

| X | Y |
|---|---|
| 11.8894 | 6.70473 |
| 12.5364 | 6.76717 |

## Material Boundary

| X | Y |
|---|---|
| 11.9085 | 5.94261 |
| 12.5394 | 6.09906 |
| 12.4593 | 6.43289 |
| 12.5676 | 6.44334 |

| | |
|---|---|
| 12.5374 | 6.75631 |
| 12.5364 | 6.76717 |

### Material Boundary

| X | Y |
|---|---|
| 12.5394 | 6.09906 |
| 16.176 | 6.98 |

### Material Boundary

| X | Y |
|---|---|
| 16.176 | 6.98 |
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |
| 51.3789 | 18.6032 |
| 55.0767 | 23.365 |

### Material Boundary

| X | Y |
|---|---|
| 0.246463 | -1.48563 |
| 14.9068 | 2.359 |
| 31.5166 | 8.039 |
| 40.9932 | 10.529 |
| 51.5928 | 16.7302 |
| 55.0767 | 20.73 |

### Material Boundary

| X | Y |
|---|---|
| 0.246463 | -4.15895 |
| 55.0767 | 11.1863 |

### Material Boundary

| X | Y |
|---|---|
| 0.246463 | 1.46432 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| 51.3789 | 18.6032 |
| 55.0767 | 21.5626 |

### Material Boundary

| X | Y |
|---|---|
| 11.8904 | 6.69465 |
| 12.5374 | 6.75631 |

## Material Boundary

| X | Y |
|---|---|
| 11.8302 | 6.25839 |
| 12.0064 | 6.30208 |
| 12.4593 | 6.43289 |
| 11.9871 | 6.38732 |
| 11.9207 | 6.3809 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: BA S47-SLIDE PRO SLIDE RU=0.10 c=4 phi=29
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 26/2/2021, 7:58:11

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT V | UNIT I UNDER WT | UNIT II UNDER WT | AIR |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 25 | 20 | 19.5 | 0.001 |
| Cohesion [kPa] | 4 | 5 | 7 | 60 | 500 | 2 | 5 | 0.001 |
| Friction Angle [deg] | 29 | 30 | 33 | 34 | 45 | 28 | 28 | 0 |
| Water Surface | None | None | Water Table | Water Table | None | Water Table | Water Table | None |
| Hu Value | | | Automatically Calculated | Automatically Calculated | | Automatically Calculated | Automatically Calculated | |
| Ru Value | 0.1 | 0.1 | | | 0 | | | 0 |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.978877
Center: 11.165, 12.434
Radius: 5.451
Left Slip Surface Endpoint: 10.971, 6.987
Right Slip Surface Endpoint: 16.466, 11.165
Resisting Moment=352.676 kN-m
Driving Moment=360.286 kN-m

### Method: bishop simplified

FS: 0.980761
Center: 11.165, 12.434
Radius: 5.451
Left Slip Surface Endpoint: 10.971, 6.987
Right Slip Surface Endpoint: 16.466, 11.165
Resisting Moment=353.355 kN-m
Driving Moment=360.286 kN-m

### Method: janbu simplified

FS: 0.915768
Center: 11.165, 12.434
Radius: 5.451
Left Slip Surface Endpoint: 10.971, 6.987
Right Slip Surface Endpoint: 16.466, 11.165
Resisting Horizontal Force=46.7073 kN
Driving Horizontal Force=51.0034 kN

### Method: janbu corrected

FS: 0.977073
Center: 11.165, 12.434
Radius: 5.451
Left Slip Surface Endpoint: 10.971, 6.987

Right Slip Surface Endpoint: 16.466, 11.165
Resisting Horizontal Force=49.834 kN
Driving Horizontal Force=51.0034 kN

### Method: spencer

FS: 0.972561
Center: 11.165, 12.434
Radius: 5.451
Left Slip Surface Endpoint: 10.971, 6.987
Right Slip Surface Endpoint: 16.466, 11.165
Resisting Moment=350.4 kN-m
Driving Moment=360.286 kN-m
Resisting Horizontal Force=48.5393 kN
Driving Horizontal Force=49.9087 kN

### Method: corp of eng#1

FS: 0.989971
Center: 11.165, 12.434
Radius: 5.451
Left Slip Surface Endpoint: 10.971, 6.987
Right Slip Surface Endpoint: 16.466, 11.165
Resisting Horizontal Force=48.9806 kN
Driving Horizontal Force=49.4768 kN

### Method: corp of eng#2

FS: 1.019830
Center: 11.165, 12.434
Radius: 5.451
Left Slip Surface Endpoint: 10.971, 6.987
Right Slip Surface Endpoint: 16.466, 11.165
Resisting Horizontal Force=49.7755 kN
Driving Horizontal Force=48.8076 kN

### Method: lowe-karafiath

FS: 0.994924
Center: 11.165, 12.434
Radius: 5.451
Left Slip Surface Endpoint: 10.971, 6.987
Right Slip Surface Endpoint: 16.466, 11.165
Resisting Horizontal Force=49.1192 kN
Driving Horizontal Force=49.3698 kN

### Method: gle/morgenstern-price

FS: 0.973413
Center: 11.165, 12.434
Radius: 5.451
Left Slip Surface Endpoint: 10.971, 6.987
Right Slip Surface Endpoint: 16.466, 11.165
Resisting Moment=350.707 kN-m
Driving Moment=360.286 kN-m
Resisting Horizontal Force=48.4291 kN
Driving Horizontal Force=49.7519 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 7218
Number of Invalid Surfaces: 2782

**Error Codes:**

Error Code -105 reported for 142 surfaces
Error Code -106 reported for 201 surfaces
Error Code -108 reported for 439 surfaces
Error Code -109 reported for 3 surfaces
Error Code -114 reported for 1991 surfaces
Error Code -123 reported for 6 surfaces

## Method: bishop simplified

Number of Valid Surfaces: 7130
Number of Invalid Surfaces: 2870

**Error Codes:**

Error Code -105 reported for 142 surfaces
Error Code -106 reported for 201 surfaces
Error Code -108 reported for 459 surfaces
Error Code -109 reported for 3 surfaces
Error Code -112 reported for 68 surfaces
Error Code -114 reported for 1991 surfaces
Error Code -123 reported for 6 surfaces

## Method: janbu simplified

Number of Valid Surfaces: 6583
Number of Invalid Surfaces: 3417

**Error Codes:**

Error Code -105 reported for 142 surfaces
Error Code -106 reported for 201 surfaces
Error Code -108 reported for 1023 surfaces
Error Code -109 reported for 3 surfaces
Error Code -112 reported for 51 surfaces
Error Code -114 reported for 1991 surfaces
Error Code -123 reported for 6 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 6583
Number of Invalid Surfaces: 3417

**Error Codes:**

Error Code -105 reported for 142 surfaces
Error Code -106 reported for 201 surfaces
Error Code -108 reported for 1023 surfaces
Error Code -109 reported for 3 surfaces
Error Code -112 reported for 51 surfaces
Error Code -114 reported for 1991 surfaces
Error Code -123 reported for 6 surfaces

## Method: spencer

Number of Valid Surfaces: 6088
Number of Invalid Surfaces: 3912

**Error Codes:**

Error Code -105 reported for 142 surfaces
Error Code -106 reported for 201 surfaces
Error Code -108 reported for 1235 surfaces
Error Code -109 reported for 3 surfaces
Error Code -111 reported for 266 surfaces
Error Code -112 reported for 68 surfaces
Error Code -114 reported for 1991 surfaces
Error Code -123 reported for 6 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 5062
Number of Invalid Surfaces: 4938

**Error Codes:**

Error Code -105 reported for 142 surfaces
Error Code -106 reported for 201 surfaces
Error Code -108 reported for 1578 surfaces
Error Code -109 reported for 3 surfaces
Error Code -111 reported for 1012 surfaces
Error Code -112 reported for 5 surfaces
Error Code -114 reported for 1991 surfaces
Error Code -123 reported for 6 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 4986
Number of Invalid Surfaces: 5014

**Error Codes:**

Error Code -105 reported for 142 surfaces
Error Code -106 reported for 201 surfaces
Error Code -108 reported for 2248 surfaces
Error Code -109 reported for 3 surfaces
Error Code -111 reported for 423 surfaces
Error Code -114 reported for 1991 surfaces
Error Code -123 reported for 6 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 2921
Number of Invalid Surfaces: 7079

**Error Codes:**

Error Code -105 reported for 142 surfaces
Error Code -106 reported for 201 surfaces
Error Code -108 reported for 4188 surfaces
Error Code -109 reported for 3 surfaces
Error Code -111 reported for 548 surfaces
Error Code -114 reported for 1991 surfaces
Error Code -123 reported for 6 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 6256
Number of Invalid Surfaces: 3744

**Error Codes:**

Error Code -105 reported for 142 surfaces
Error Code -106 reported for 201 surfaces
Error Code -108 reported for 1147 surfaces
Error Code -109 reported for 3 surfaces
Error Code -111 reported for 185 surfaces
Error Code -112 reported for 69 surfaces
Error Code -114 reported for 1991 surfaces
Error Code -123 reported for 6 surfaces

**Error Codes**

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-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.
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.978877

| 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 | 0.231232 | 1.54629e-005 | AIR | 0.001 | 0 | 0.00102158 | 0.001 | 6.68577e-005 | 0 | 6.68577e-005 |
| 2 | 0.231232 | 4.53979e-005 | AIR | 0.001 | 0 | 0.00102158 | 0.001 | 0.000196178 | 0 | 0.000196178 |
| 3 | 0.231232 | 7.45637e-005 | AIR | 0.001 | 0 | 0.00102158 | 0.001 | 0.000320868 | 0 | 0.000320868 |
| 4 | 0.231232 | 0.000101842 | AIR | 0.001 | 0 | 0.00102158 | 0.001 | 0.000434834 | 0 | 0.000434834 |
| 5 | 0.217653 | 0.242664 | UNIT I | 4 | 29 | 4.64106 | 4.54302 | 1.09113 | 0.111491 | 0.979644 |
| 6 | 0.217653 | 0.708947 | UNIT I | 4 | 29 | 5.68394 | 5.56388 | 3.14704 | 0.325723 | 2.82132 |
| 7 | 0.217653 | 1.17353 | UNIT I | 4 | 29 | 6.68396 | 6.54277 | 5.12645 | 0.539174 | 4.58727 |
| 8 | 0.217653 | 1.76554 | UNIT I | 4 | 29 | 7.91056 | 7.74347 | 7.56457 | 0.811169 | 6.7534 |
| 9 | 0.217653 | 2.33769 | UNIT I | 4 | 29 | 9.02143 | 8.83087 | 9.78915 | 1.07404 | 8.71511 |
| 10 | 0.217653 | 2.98969 | UNIT I | 4 | 29 | 10.2113 | 9.99559 | 12.1899 | 1.3736 | 10.8163 |
| 11 | 0.217653 | 3.86097 | UNIT I | 4 | 29 | 11.7264 | 11.4787 | 15.2659 | 1.77391 | 13.492 |
| 12 | 0.217653 | 4.7238 | UNIT I | 4 | 29 | 13.0684 | 12.7923 | 18.0321 | 2.17033 | 15.8617 |
| 13 | 0.217653 | 5.64427 | UNIT I | 4 | 29 | 14.3397 | 14.0368 | 20.7001 | 2.59324 | 18.1069 |
| 14 | 0.217653 | 6.51419 | UNIT I | 4 | 29 | 15.3187 | 14.9951 | 22.8286 | 2.99292 | 19.8356 |
| 15 | 0.217653 | 7.25295 | UNIT I | 4 | 29 | 15.8687 | 15.5335 | 24.1392 | 3.33234 | 20.8069 |
| 16 | 0.217653 | 7.87501 | UNIT I | 4 | 29 | 16.0343 | 15.6956 | 24.7176 | 3.61814 | 21.0995 |
| 17 | 0.217653 | 8.35823 | UNIT I | 4 | 29 | 15.8081 | 15.4742 | 24.5402 | 3.84015 | 20.7001 |
| 18 | 0.217653 | 8.63782 | UNIT I | 4 | 29 | 15.1441 | 14.8242 | 23.496 | 3.96861 | 19.5274 |
| 19 | 0.217653 | 8.69427 | UNIT I | 4 | 29 | 14.088 | 13.7904 | 21.657 | 3.99455 | 17.6624 |
| 20 | 0.217653 | 8.40361 | UNIT I | 4 | 29 | 12.5997 | 12.3336 | 18.8952 | 3.86101 | 15.0342 |
| 21 | 0.217653 | 7.85106 | UNIT I | 4 | 29 | 10.9024 | 10.6722 | 15.644 | 3.60714 | 12.0369 |
| 22 | 0.217653 | 6.86796 | UNIT I | 4 | 29 | 9.00139 | 8.81125 | 11.8352 | 3.15546 | 8.67972 |
| 23 | 0.217653 | 5.47845 | UNIT I | 4 | 29 | 7.12856 | 6.97798 | 7.88947 | 2.51705 | 5.37242 |
| 24 | 0.217653 | 3.75535 | UNIT I | 4 | 29 | 5.53839 | 5.4214 | 4.28965 | 1.72538 | 2.56427 |
| 25 | 0.217653 | 1.39571 | UNIT I | 4 | 29 | 4.37577 | 4.28334 | 1.15241 | 0.641254 | 0.511156 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 0.980761

| 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 | 0.231232 | 1.54629e-005 | AIR | 0.001 | 0 | 0.00101962 | 0.001 | 8.1633e-005 | 0 | 8.1633e-005 |
| 2 | 0.231232 | 4.53979e-005 | AIR | 0.001 | 0 | 0.00101962 | 0.001 | 0.000168021 | 0 | 0.000168021 |
| 3 | 0.231232 | 7.45637e-005 | AIR | 0.001 | 0 | 0.00101962 | 0.001 | 0.000250929 | 0 | 0.000250929 |
| 4 | 0.231232 | 0.000101842 | AIR | 0.001 | 0 | 0.00101962 | 0.001 | 0.000325283 | 0 | 0.000325283 |
| 5 | 0.217653 | 0.242664 | UNIT I | 4 | 29 | 4.27129 | 4.18911 | 0.452659 | 0.111491 | 0.341168 |
| 6 | 0.217653 | 0.708947 | UNIT I | 4 | 29 | 5.16154 | 5.06224 | 2.24205 | 0.325723 | 1.91633 |
| 7 | 0.217653 | 1.17353 | UNIT I | 4 | 29 | 6.00832 | 5.89273 | 3.95375 | 0.539174 | 3.41458 |
| 8 | 0.217653 | 1.76554 | UNIT I | 4 | 29 | 7.07231 | 6.93625 | 6.10831 | 0.811169 | 5.29714 |
| 9 | 0.217653 | 2.33769 | UNIT I | 4 | 29 | 8.04646 | 7.89165 | 8.09478 | 1.07404 | 7.02074 |
| 10 | 0.217653 | 2.98969 | UNIT I | 4 | 29 | 9.12498 | 8.94942 | 10.3026 | 1.3736 | 8.929 |
| 11 | 0.217653 | 3.86097 | UNIT I | 4 | 29 | 10.5589 | 10.3558 | 13.24 | 1.77391 | 11.4661 |
| 12 | 0.217653 | 4.7238 | UNIT I | 4 | 29 | 11.8984 | 11.6695 | 16.0064 | 2.17033 | 13.8361 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 0.217653 | 5.64427 | UNIT I | 4 | 29 | 13.26 | 13.0049 | 18.8385 | 2.59324 | 16.2453 |
| 14 | 0.217653 | 6.51419 | UNIT I | 4 | 29 | 14.4421 | 14.1642 | 21.3297 | 2.99292 | 18.3368 |
| 15 | 0.217653 | 7.25295 | UNIT I | 4 | 29 | 15.3082 | 15.0137 | 23.2016 | 3.33234 | 19.8692 |
| 16 | 0.217653 | 7.87501 | UNIT I | 4 | 29 | 15.8933 | 15.5875 | 24.5225 | 3.61814 | 20.9044 |
| 17 | 0.217653 | 8.35823 | UNIT I | 4 | 29 | 16.1695 | 15.8584 | 25.2333 | 3.84015 | 21.3931 |
| 18 | 0.217653 | 8.63782 | UNIT I | 4 | 29 | 16.0468 | 15.7381 | 25.1446 | 3.96861 | 21.176 |
| 19 | 0.217653 | 8.69427 | UNIT I | 4 | 29 | 15.5163 | 15.2178 | 24.232 | 3.99455 | 20.2375 |
| 20 | 0.217653 | 8.40361 | UNIT I | 4 | 29 | 14.426 | 14.1485 | 22.1693 | 3.86101 | 18.3083 |
| 21 | 0.217653 | 7.85106 | UNIT I | 4 | 29 | 12.9428 | 12.6938 | 19.2912 | 3.60714 | 15.6841 |
| 22 | 0.217653 | 6.86796 | UNIT I | 4 | 29 | 10.8935 | 10.6839 | 15.2136 | 3.15546 | 12.0581 |
| 23 | 0.217653 | 5.47845 | UNIT I | 4 | 29 | 8.40391 | 8.24223 | 10.1702 | 2.51705 | 7.65318 |
| 24 | 0.217653 | 3.75535 | UNIT I | 4 | 29 | 5.67612 | 5.56692 | 4.55219 | 1.72538 | 2.82681 |
| 25 | 0.217653 | 1.39571 | UNIT I | 4 | 29 | 2.61744 | 2.56708 | -1.9438 | 0.641254 | -2.58506 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.915768

| 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 | 0.231232 | 1.54629e-005 | AIR | 0.001 | 0 | 0.00109198 | 0.001 | 8.27513e-005 | 0 | 8.27513e-005 |
| 2 | 0.231232 | 4.53979e-005 | AIR | 0.001 | 0 | 0.00109198 | 0.001 | 0.000165877 | 0 | 0.000165877 |
| 3 | 0.231232 | 7.45637e-005 | AIR | 0.001 | 0 | 0.00109198 | 0.001 | 0.000245512 | 0 | 0.000245512 |
| 4 | 0.231232 | 0.000101842 | AIR | 0.001 | 0 | 0.00109198 | 0.001 | 0.000316563 | 0 | 0.000316563 |
| 5 | 0.217653 | 0.242664 | UNIT I | 4 | 29 | 4.54668 | 4.16371 | 0.406826 | 0.111491 | 0.295335 |
| 6 | 0.217653 | 0.708947 | UNIT I | 4 | 29 | 5.4863 | 5.02418 | 2.17339 | 0.325723 | 1.84766 |
| 7 | 0.217653 | 1.17353 | UNIT I | 4 | 29 | 6.3772 | 5.84004 | 3.85869 | 0.539174 | 3.31952 |
| 8 | 0.217653 | 1.76554 | UNIT I | 4 | 29 | 7.49591 | 6.86451 | 5.97888 | 0.811169 | 5.16771 |
| 9 | 0.217653 | 2.33769 | UNIT I | 4 | 29 | 8.51645 | 7.79909 | 7.92778 | 1.07404 | 6.85374 |
| 10 | 0.217653 | 2.98969 | UNIT I | 4 | 29 | 9.64451 | 8.83213 | 10.091 | 1.3736 | 8.71739 |
| 11 | 0.217653 | 3.86097 | UNIT I | 4 | 29 | 11.1445 | 10.2057 | 12.9694 | 1.77391 | 11.1955 |
| 12 | 0.217653 | 4.7238 | UNIT I | 4 | 29 | 12.5406 | 11.4843 | 15.6723 | 2.17033 | 13.5019 |
| 13 | 0.217653 | 5.64427 | UNIT I | 4 | 29 | 13.9557 | 12.7802 | 18.4332 | 2.59324 | 15.8399 |
| 14 | 0.217653 | 6.51419 | UNIT I | 4 | 29 | 15.1776 | 13.8992 | 20.8516 | 2.99292 | 17.8586 |
| 15 | 0.217653 | 7.25295 | UNIT I | 4 | 29 | 16.0637 | 14.7106 | 22.6548 | 3.33234 | 19.3225 |
| 16 | 0.217653 | 7.87501 | UNIT I | 4 | 29 | 16.6516 | 15.249 | 23.9119 | 3.61814 | 20.2937 |
| 17 | 0.217653 | 8.35823 | UNIT I | 4 | 29 | 16.9133 | 15.4887 | 24.5663 | 3.84015 | 20.7261 |
| 18 | 0.217653 | 8.63782 | UNIT I | 4 | 29 | 16.7559 | 15.3445 | 24.4346 | 3.96861 | 20.466 |
| 19 | 0.217653 | 8.69427 | UNIT I | 4 | 29 | 16.1718 | 14.8096 | 23.4955 | 3.99455 | 19.501 |
| 20 | 0.217653 | 8.40361 | UNIT I | 4 | 29 | 15.0047 | 13.7408 | 21.4339 | 3.86101 | 17.5729 |
| 21 | 0.217653 | 7.85106 | UNIT I | 4 | 29 | 13.4313 | 12.2999 | 18.5806 | 3.60714 | 14.9735 |
| 22 | 0.217653 | 6.86796 | UNIT I | 4 | 29 | 11.2749 | 10.3252 | 14.5664 | 3.15546 | 11.4109 |
| 23 | 0.217653 | 5.47845 | UNIT I | 4 | 29 | 8.67059 | 7.94025 | 9.62546 | 2.51705 | 7.10841 |
| 24 | 0.217653 | 3.75535 | UNIT I | 4 | 29 | 5.83231 | 5.34104 | 4.14469 | 1.72538 | 2.41931 |
| 25 | 0.217653 | 1.39571 | UNIT I | 4 | 29 | 2.67296 | 2.44781 | -2.15897 | 0.641254 | -2.80022 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.977073

| 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 | 0.231232 | 1.54629e-005 | AIR | 0.001 | 0 | 0.00102346 | 0.001 | 8.27513e-005 | 0 | 8.27513e-005 |
| 2 | 0.231232 | 4.53979e-005 | AIR | 0.001 | 0 | 0.00102346 | 0.001 | 0.000165877 | 0 | 0.000165877 |
| 3 | 0.231232 | 7.45637e-005 | AIR | 0.001 | 0 | 0.00102346 | 0.001 | 0.000245512 | 0 | 0.000245512 |
| 4 | 0.231232 | 0.000101842 | AIR | 0.001 | 0 | 0.00102346 | 0.001 | 0.000316563 | 0 | 0.000316563 |
| 5 | 0.217653 | 0.242664 | UNIT I | 4 | 29 | 4.26141 | 4.16371 | 0.406826 | 0.111491 | 0.295335 |
| 6 | 0.217653 | 0.708947 | UNIT I | 4 | 29 | 5.14207 | 5.02418 | 2.17339 | 0.325723 | 1.84766 |
| 7 | 0.217653 | 1.17353 | UNIT I | 4 | 29 | 5.97708 | 5.84004 | 3.85869 | 0.539174 | 3.31952 |
| 8 | 0.217653 | 1.76554 | UNIT I | 4 | 29 | 7.02559 | 6.86451 | 5.97888 | 0.811169 | 5.16771 |
| 9 | 0.217653 | 2.33769 | UNIT I | 4 | 29 | 7.9821 | 7.79909 | 7.92778 | 1.07404 | 6.85374 |
| 10 | 0.217653 | 2.98969 | UNIT I | 4 | 29 | 9.03938 | 8.83213 | 10.091 | 1.3736 | 8.71739 |
| 11 | 0.217653 | 3.86097 | UNIT I | 4 | 29 | 10.4452 | 10.2057 | 12.9694 | 1.77391 | 11.1955 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.217653 | 4.7238 | UNIT I | 4 | 29 | 11.7537 | 11.4843 | 15.6723 | 2.17033 | 13.5019 |
| 13 | 0.217653 | 5.64427 | UNIT I | 4 | 29 | 13.0801 | 12.7802 | 18.4332 | 2.59324 | 15.8399 |
| 14 | 0.217653 | 6.51419 | UNIT I | 4 | 29 | 14.2253 | 13.8992 | 20.8516 | 2.99292 | 17.8586 |
| 15 | 0.217653 | 7.25295 | UNIT I | 4 | 29 | 15.0558 | 14.7106 | 22.6548 | 3.33234 | 19.3225 |
| 16 | 0.217653 | 7.87501 | UNIT I | 4 | 29 | 15.6068 | 15.249 | 23.9119 | 3.61814 | 20.2937 |
| 17 | 0.217653 | 8.35823 | UNIT I | 4 | 29 | 15.8521 | 15.4887 | 24.5663 | 3.84015 | 20.7261 |
| 18 | 0.217653 | 8.63782 | UNIT I | 4 | 29 | 15.7046 | 15.3445 | 24.4346 | 3.96861 | 20.466 |
| 19 | 0.217653 | 8.69427 | UNIT I | 4 | 29 | 15.1571 | 14.8096 | 23.4955 | 3.99455 | 19.501 |
| 20 | 0.217653 | 8.40361 | UNIT I | 4 | 29 | 14.0632 | 13.7408 | 21.4339 | 3.86101 | 17.5729 |
| 21 | 0.217653 | 7.85106 | UNIT I | 4 | 29 | 12.5885 | 12.2999 | 18.5806 | 3.60714 | 14.9735 |
| 22 | 0.217653 | 6.86796 | UNIT I | 4 | 29 | 10.5674 | 10.3252 | 14.5664 | 3.15546 | 11.4109 |
| 23 | 0.217653 | 5.47845 | UNIT I | 4 | 29 | 8.12657 | 7.94025 | 9.62546 | 2.51705 | 7.10841 |
| 24 | 0.217653 | 3.75535 | UNIT I | 4 | 29 | 5.46637 | 5.34104 | 4.14469 | 1.72538 | 2.41931 |
| 25 | 0.217653 | 1.39571 | UNIT I | 4 | 29 | 2.50525 | 2.44781 | -2.15897 | 0.641254 | -2.80022 |

**Global Minimum Query (spencer) - Safety Factor**: 0.972561

| 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 | 0.231232 | 1.54629e-005 | AIR | 0.001 | 0 | 0.00102821 | 0.001 | 0.000750832 | 0 | 0.000750832 |
| 2 | 0.231232 | 4.53979e-005 | AIR | 0.001 | 0 | 0.00102821 | 0.001 | 0.000814906 | 0 | 0.000814906 |
| 3 | 0.231232 | 7.45637e-005 | AIR | 0.001 | 0 | 0.00102821 | 0.001 | 0.000872302 | 0 | 0.000872302 |
| 4 | 0.231232 | 0.000101842 | AIR | 0.001 | 0 | 0.00102821 | 0.001 | 0.000918745 | 0 | 0.000918745 |
| 5 | 0.217653 | 0.242664 | UNIT I | 4 | 29 | 6.17572 | 6.00626 | 3.73088 | 0.111491 | 3.61939 |
| 6 | 0.217653 | 0.708947 | UNIT I | 4 | 29 | 7.18869 | 6.99144 | 5.7224 | 0.325723 | 5.39668 |
| 7 | 0.217653 | 1.17353 | UNIT I | 4 | 29 | 8.07005 | 7.84862 | 7.48227 | 0.539174 | 6.94309 |
| 8 | 0.217653 | 1.76554 | UNIT I | 4 | 29 | 9.13887 | 8.88811 | 9.62954 | 0.811169 | 8.81837 |
| 9 | 0.217653 | 2.33769 | UNIT I | 4 | 29 | 10.0271 | 9.75198 | 11.4509 | 1.07404 | 10.3768 |
| 10 | 0.217653 | 2.98969 | UNIT I | 4 | 29 | 10.9633 | 10.6625 | 13.3931 | 1.3736 | 12.0195 |
| 11 | 0.217653 | 3.86097 | UNIT I | 4 | 29 | 12.204 | 11.8691 | 15.9702 | 1.77391 | 14.1963 |
| 12 | 0.217653 | 4.7238 | UNIT I | 4 | 29 | 13.2576 | 12.8938 | 18.2152 | 2.17033 | 16.0449 |
| 13 | 0.217653 | 5.64427 | UNIT I | 4 | 29 | 14.2521 | 13.861 | 20.383 | 2.59324 | 17.7897 |
| 14 | 0.217653 | 6.51419 | UNIT I | 4 | 29 | 14.9958 | 14.5843 | 22.0874 | 2.99292 | 19.0945 |
| 15 | 0.217653 | 7.25295 | UNIT I | 4 | 29 | 15.3812 | 14.9592 | 23.1033 | 3.33234 | 19.771 |
| 16 | 0.217653 | 7.87501 | UNIT I | 4 | 29 | 15.4677 | 15.0433 | 23.5408 | 3.61814 | 19.9226 |
| 17 | 0.217653 | 8.35823 | UNIT I | 4 | 29 | 15.2539 | 14.8353 | 23.3875 | 3.84015 | 19.5473 |
| 18 | 0.217653 | 8.63782 | UNIT I | 4 | 29 | 14.689 | 14.2859 | 22.5249 | 3.96861 | 18.5563 |
| 19 | 0.217653 | 8.69427 | UNIT I | 4 | 29 | 13.7971 | 13.4186 | 20.9861 | 3.99455 | 16.9915 |
| 20 | 0.217653 | 8.40361 | UNIT I | 4 | 29 | 12.4963 | 12.1534 | 18.5702 | 3.86101 | 14.7092 |
| 21 | 0.217653 | 7.85106 | UNIT I | 4 | 29 | 10.9572 | 10.6566 | 15.6159 | 3.60714 | 12.0088 |
| 22 | 0.217653 | 6.86796 | UNIT I | 4 | 29 | 9.10533 | 8.85549 | 11.915 | 3.15546 | 8.75953 |
| 23 | 0.217653 | 5.47845 | UNIT I | 4 | 29 | 7.10299 | 6.90809 | 7.76339 | 2.51705 | 5.24634 |
| 24 | 0.217653 | 3.75535 | UNIT I | 4 | 29 | 5.17882 | 5.03672 | 3.59569 | 1.72538 | 1.87031 |
| 25 | 0.217653 | 1.39571 | UNIT I | 4 | 29 | 3.59657 | 3.49788 | -0.26459 | 0.641254 | -0.905844 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.989971

| 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 | 0.231232 | 1.54629e-005 | AIR | 0.001 | 0 | 0.00101013 | 0.001 | 0.000863767 | 0 | 0.000863767 |
| 2 | 0.231232 | 4.53979e-005 | AIR | 0.001 | 0 | 0.00101013 | 0.001 | 0.000921528 | 0 | 0.000921528 |
| 3 | 0.231232 | 7.45637e-005 | AIR | 0.001 | 0 | 0.00101013 | 0.001 | 0.000972377 | 0 | 0.000972377 |
| 4 | 0.231232 | 0.000101842 | AIR | 0.001 | 0 | 0.00101013 | 0.001 | 0.00101209 | 0 | 0.00101209 |
| 5 | 0.217653 | 0.242664 | UNIT I | 4 | 29 | 6.52011 | 6.45472 | 4.53992 | 0.111491 | 4.42843 |
| 6 | 0.217653 | 0.708947 | UNIT I | 4 | 29 | 7.51445 | 7.43909 | 6.53002 | 0.325723 | 6.2043 |
| 7 | 0.217653 | 1.17353 | UNIT I | 4 | 29 | 8.36309 | 8.27922 | 8.2591 | 0.539174 | 7.71992 |
| 8 | 0.217653 | 1.76554 | UNIT I | 4 | 29 | 9.39344 | 9.29923 | 10.3712 | 0.811169 | 9.56005 |
| 9 | 0.217653 | 2.33769 | UNIT I | 4 | 29 | 10.2329 | 10.1303 | 12.1334 | 1.07404 | 11.0593 |
| 10 | 0.217653 | 2.98969 | UNIT I | 4 | 29 | 11.1136 | 11.0021 | 14.0057 | 1.3736 | 12.6321 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 0.217653 | 3.86097 | UNIT I | 4 | 29 | 12.2887 | 12.1655 | 16.5048 | 1.77391 | 14.7309 |
| 12 | 0.217653 | 4.7238 | UNIT I | 4 | 29 | 13.2687 | 13.1356 | 18.6514 | 2.17033 | 16.481 |
| 13 | 0.217653 | 5.64427 | UNIT I | 4 | 29 | 14.1817 | 14.0395 | 20.705 | 2.59324 | 18.1118 |
| 14 | 0.217653 | 6.51419 | UNIT I | 4 | 29 | 14.8416 | 14.6928 | 22.2833 | 2.99292 | 19.2904 |
| 15 | 0.217653 | 7.25295 | UNIT I | 4 | 29 | 15.1478 | 14.9959 | 23.1696 | 3.33234 | 19.8372 |
| 16 | 0.217653 | 7.87501 | UNIT I | 4 | 29 | 15.1623 | 15.0102 | 23.481 | 3.61814 | 19.8629 |
| 17 | 0.217653 | 8.35823 | UNIT I | 4 | 29 | 14.888 | 14.7387 | 23.2133 | 3.84015 | 19.3731 |
| 18 | 0.217653 | 8.63782 | UNIT I | 4 | 29 | 14.2816 | 14.1384 | 22.2588 | 3.96861 | 18.2902 |
| 19 | 0.217653 | 8.69427 | UNIT I | 4 | 29 | 13.3718 | 13.2377 | 20.6598 | 3.99455 | 16.6653 |
| 20 | 0.217653 | 8.40361 | UNIT I | 4 | 29 | 12.0873 | 11.966 | 18.2321 | 3.86101 | 14.3711 |
| 21 | 0.217653 | 7.85106 | UNIT I | 4 | 29 | 10.5955 | 10.4892 | 15.314 | 3.60714 | 11.7069 |
| 22 | 0.217653 | 6.86796 | UNIT I | 4 | 29 | 8.82981 | 8.74126 | 11.7089 | 3.15546 | 8.55346 |
| 23 | 0.217653 | 5.47845 | UNIT I | 4 | 29 | 6.93919 | 6.8696 | 7.69394 | 2.51705 | 5.17689 |
| 24 | 0.217653 | 3.75535 | UNIT I | 4 | 29 | 5.1128 | 5.06152 | 3.64042 | 1.72538 | 1.91504 |
| 25 | 0.217653 | 1.39571 | UNIT I | 4 | 29 | 3.18029 | 3.14839 | -0.895083 | 0.641254 | -1.53634 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.01983

| 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 | 0.231232 | 1.54629e-005 | AIR | 0.001 | 0 | 0.000980556 | 0.001 | 0.000646748 | 0 | 0.000646748 |
| 2 | 0.231232 | 4.53979e-005 | AIR | 0.001 | 0 | 0.000980556 | 0.001 | 0.000752785 | 0 | 0.000752785 |
| 3 | 0.231232 | 7.45637e-005 | AIR | 0.001 | 0 | 0.000980556 | 0.001 | 0.000827601 | 0 | 0.000827601 |
| 4 | 0.231232 | 0.000101842 | AIR | 0.001 | 0 | 0.000980556 | 0.001 | 0.000853472 | 0 | 0.000853472 |
| 5 | 0.217653 | 0.242664 | UNIT I | 4 | 29 | 5.53804 | 5.64786 | 3.08431 | 0.111491 | 2.97282 |
| 6 | 0.217653 | 0.708947 | UNIT I | 4 | 29 | 6.30847 | 6.43357 | 4.71602 | 0.325723 | 4.39029 |
| 7 | 0.217653 | 1.17353 | UNIT I | 4 | 29 | 7.23739 | 7.38091 | 6.63847 | 0.539174 | 6.0993 |
| 8 | 0.217653 | 1.76554 | UNIT I | 4 | 29 | 8.44742 | 8.61493 | 9.13674 | 0.811169 | 8.32557 |
| 9 | 0.217653 | 2.33769 | UNIT I | 4 | 29 | 9.41613 | 9.60285 | 11.1818 | 1.07404 | 10.1078 |
| 10 | 0.217653 | 2.98969 | UNIT I | 4 | 29 | 15.0693 | 15.3681 | 21.8821 | 1.3736 | 20.5085 |
| 11 | 0.217653 | 3.86097 | UNIT I | 4 | 29 | 20.9555 | 21.371 | 33.1121 | 1.77391 | 31.3382 |
| 12 | 0.217653 | 4.7238 | UNIT I | 4 | 29 | 17.8572 | 18.2113 | 27.8082 | 2.17033 | 25.6379 |
| 13 | 0.217653 | 5.64427 | UNIT I | 4 | 29 | 14.7007 | 14.9922 | 22.4237 | 2.59324 | 19.8305 |
| 14 | 0.217653 | 6.51419 | UNIT I | 4 | 29 | 13.5478 | 13.8165 | 20.7023 | 2.99292 | 17.7094 |
| 15 | 0.217653 | 7.25295 | UNIT I | 4 | 29 | 13.0871 | 13.3467 | 20.1942 | 3.33234 | 16.8618 |
| 16 | 0.217653 | 7.87501 | UNIT I | 4 | 29 | 12.6666 | 12.9178 | 19.7062 | 3.61814 | 16.0881 |
| 17 | 0.217653 | 8.35823 | UNIT I | 4 | 29 | 12.1904 | 12.4321 | 19.0521 | 3.84015 | 15.212 |
| 18 | 0.217653 | 8.63782 | UNIT I | 4 | 29 | 11.3019 | 11.526 | 17.5459 | 3.96861 | 13.5773 |
| 19 | 0.217653 | 8.69427 | UNIT I | 4 | 29 | 10.7744 | 10.9881 | 16.6014 | 3.99455 | 12.6069 |
| 20 | 0.217653 | 8.40361 | UNIT I | 4 | 29 | 10.5242 | 10.7329 | 16.0074 | 3.86101 | 12.1464 |
| 21 | 0.217653 | 7.85106 | UNIT I | 4 | 29 | 9.33597 | 9.5211 | 13.5675 | 3.60714 | 9.96031 |
| 22 | 0.217653 | 6.86796 | UNIT I | 4 | 29 | 9.18296 | 9.36506 | 12.8343 | 3.15546 | 9.67884 |
| 23 | 0.217653 | 5.47845 | UNIT I | 4 | 29 | 7.92921 | 8.08645 | 9.88921 | 2.51705 | 7.37216 |
| 24 | 0.217653 | 3.75535 | UNIT I | 4 | 29 | 5.4366 | 5.54441 | 4.51158 | 1.72538 | 2.7862 |
| 25 | 0.217653 | 1.39571 | UNIT I | 4 | 29 | 2.73316 | 2.78736 | -1.5464 | 0.641254 | -2.18765 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.994924

| 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 | 0.231232 | 1.54629e-005 | AIR | 0.001 | 0 | 0.0010051 | 0.001 | 0.000354468 | 0 | 0.000354468 |
| 2 | 0.231232 | 4.53979e-005 | AIR | 0.001 | 0 | 0.0010051 | 0.001 | 0.000497596 | 0 | 0.000497596 |
| 3 | 0.231232 | 7.45637e-005 | AIR | 0.001 | 0 | 0.0010051 | 0.001 | 0.000624094 | 0 | 0.000624094 |
| 4 | 0.231232 | 0.000101842 | AIR | 0.001 | 0 | 0.0010051 | 0.001 | 0.000720207 | 0 | 0.000720207 |
| 5 | 0.217653 | 0.242664 | UNIT I | 4 | 29 | 5.09683 | 5.07096 | 2.04355 | 0.111491 | 1.93206 |
| 6 | 0.217653 | 0.708947 | UNIT I | 4 | 29 | 6.09819 | 6.06724 | 4.05511 | 0.325723 | 3.72939 |
| 7 | 0.217653 | 1.17353 | UNIT I | 4 | 29 | 7.1354 | 7.09918 | 6.13025 | 0.539174 | 5.59108 |
| 8 | 0.217653 | 1.76554 | UNIT I | 4 | 29 | 8.42558 | 8.38281 | 8.71796 | 0.811169 | 7.90679 |
| 9 | 0.217653 | 2.33769 | UNIT I | 4 | 29 | 9.54202 | 9.49358 | 10.9847 | 1.07404 | 9.91066 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 0.217653 | 2.98969 | UNIT I | 4 | 29 | 12.7225 | 12.658 | 16.993 | 1.3736 | 15.6194 |
| 11 | 0.217653 | 3.86097 | UNIT I | 4 | 29 | 15.4701 | 15.3916 | 22.3248 | 1.77391 | 20.5509 |
| 12 | 0.217653 | 4.7238 | UNIT I | 4 | 29 | 15.191 | 15.1139 | 22.2204 | 2.17033 | 20.0501 |
| 13 | 0.217653 | 5.64427 | UNIT I | 4 | 29 | 15.186 | 15.1089 | 22.6342 | 2.59324 | 20.0409 |
| 14 | 0.217653 | 6.51419 | UNIT I | 4 | 29 | 15.4043 | 15.3261 | 23.4257 | 2.99292 | 20.4328 |
| 15 | 0.217653 | 7.25295 | UNIT I | 4 | 29 | 15.4123 | 15.3341 | 23.7797 | 3.33234 | 20.4473 |
| 16 | 0.217653 | 7.87501 | UNIT I | 4 | 29 | 15.1067 | 15.03 | 23.5167 | 3.61814 | 19.8986 |
| 17 | 0.217653 | 8.35823 | UNIT I | 4 | 29 | 14.5002 | 14.4266 | 22.6502 | 3.84015 | 18.81 |
| 18 | 0.217653 | 8.63782 | UNIT I | 4 | 29 | 13.4688 | 13.4005 | 20.9275 | 3.96861 | 16.9589 |
| 19 | 0.217653 | 8.69427 | UNIT I | 4 | 29 | 12.4704 | 12.4071 | 19.1614 | 3.99455 | 15.1669 |
| 20 | 0.217653 | 8.40361 | UNIT I | 4 | 29 | 11.4918 | 11.4335 | 17.2713 | 3.86101 | 13.4103 |
| 21 | 0.217653 | 7.85106 | UNIT I | 4 | 29 | 10.0037 | 9.95296 | 14.3466 | 3.60714 | 10.7394 |
| 22 | 0.217653 | 6.86796 | UNIT I | 4 | 29 | 8.8165 | 8.77175 | 11.7639 | 3.15546 | 8.60848 |
| 23 | 0.217653 | 5.47845 | UNIT I | 4 | 29 | 7.21008 | 7.17348 | 8.24216 | 2.51705 | 5.72511 |
| 24 | 0.217653 | 3.75535 | UNIT I | 4 | 29 | 5.20754 | 5.18111 | 3.85616 | 1.72538 | 2.13078 |
| 25 | 0.217653 | 1.39571 | UNIT I | 4 | 29 | 2.86317 | 2.84864 | -1.43585 | 0.641254 | -2.07711 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 0.973413

| 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 | 0.231232 | 1.54629e-005 | AIR | 0.001 | 0 | 0.00102731 | 0.001 | 0.000176648 | 0 | 0.000176648 |
| 2 | 0.231232 | 4.53979e-005 | AIR | 0.001 | 0 | 0.00102731 | 0.001 | 0.000445789 | 0 | 0.000445789 |
| 3 | 0.231232 | 7.45637e-005 | AIR | 0.001 | 0 | 0.00102731 | 0.001 | 0.000691409 | 0 | 0.000691409 |
| 4 | 0.231232 | 0.000101842 | AIR | 0.001 | 0 | 0.00102731 | 0.001 | 0.000896284 | 0 | 0.000896284 |
| 5 | 0.217653 | 0.242664 | UNIT I | 4 | 29 | 5.39669 | 5.25321 | 2.37233 | 0.111491 | 2.26084 |
| 6 | 0.217653 | 0.708947 | UNIT I | 4 | 29 | 6.78165 | 6.60135 | 5.01868 | 0.325723 | 4.69296 |
| 7 | 0.217653 | 1.17353 | UNIT I | 4 | 29 | 8.02995 | 7.81646 | 7.42424 | 0.539174 | 6.88506 |
| 8 | 0.217653 | 1.76554 | UNIT I | 4 | 29 | 9.39302 | 9.14329 | 10.0899 | 0.811169 | 9.27874 |
| 9 | 0.217653 | 2.33769 | UNIT I | 4 | 29 | 10.476 | 10.1975 | 12.2546 | 1.07404 | 11.1805 |
| 10 | 0.217653 | 2.98969 | UNIT I | 4 | 29 | 11.4798 | 11.1746 | 14.3169 | 1.3736 | 12.9433 |
| 11 | 0.217653 | 3.86097 | UNIT I | 4 | 29 | 12.6623 | 12.3256 | 16.7937 | 1.77391 | 15.0198 |
| 12 | 0.217653 | 4.7238 | UNIT I | 4 | 29 | 13.5467 | 13.1866 | 18.7433 | 2.17033 | 16.573 |
| 13 | 0.217653 | 5.64427 | UNIT I | 4 | 29 | 14.2954 | 13.9153 | 20.481 | 2.59324 | 17.8877 |
| 14 | 0.217653 | 6.51419 | UNIT I | 4 | 29 | 14.7663 | 14.3737 | 21.7076 | 2.99292 | 18.7147 |
| 15 | 0.217653 | 7.25295 | UNIT I | 4 | 29 | 14.9096 | 14.5132 | 22.2986 | 3.33234 | 18.9663 |
| 16 | 0.217653 | 7.87501 | UNIT I | 4 | 29 | 14.8358 | 14.4414 | 22.455 | 3.61814 | 18.8368 |
| 17 | 0.217653 | 8.35823 | UNIT I | 4 | 29 | 14.5823 | 14.1946 | 22.2317 | 3.84015 | 18.3915 |
| 18 | 0.217653 | 8.63782 | UNIT I | 4 | 29 | 14.1161 | 13.7408 | 21.5414 | 3.96861 | 17.5728 |
| 19 | 0.217653 | 8.69427 | UNIT I | 4 | 29 | 13.4562 | 13.0985 | 20.4086 | 3.99455 | 16.414 |
| 20 | 0.217653 | 8.40361 | UNIT I | 4 | 29 | 12.482 | 12.1501 | 18.5642 | 3.86101 | 14.7032 |
| 21 | 0.217653 | 7.85106 | UNIT I | 4 | 29 | 11.3158 | 11.0149 | 16.2624 | 3.60714 | 12.6553 |
| 22 | 0.217653 | 6.86796 | UNIT I | 4 | 29 | 9.77284 | 9.51301 | 13.1012 | 3.15546 | 9.94574 |
| 23 | 0.217653 | 5.47845 | UNIT I | 4 | 29 | 7.87424 | 7.66489 | 9.12868 | 2.51705 | 6.61163 |
| 24 | 0.217653 | 3.75535 | UNIT I | 4 | 29 | 5.65149 | 5.50123 | 4.43367 | 1.72538 | 2.70829 |
| 25 | 0.217653 | 1.39571 | UNIT I | 4 | 29 | 2.75445 | 2.68122 | -1.7379 | 0.641254 | -2.37915 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -3.10833 | 1.24285 |
| 40.9932 | 12.499 |
| 51.6186 | 20.9459 |

### External Boundary

| X | Y |
|---|---|
| 51.6186 | 25.4506 |
| 51.4164 | 25.3495 |
| 50.9362 | 25.0969 |
| 50.3803 | 24.7685 |
| 49.8496 | 24.4906 |
| 49.1925 | 24.137 |
| 48.8893 | 23.5307 |
| 47.9542 | 22.5203 |
| 47.3224 | 21.9393 |
| 45.2514 | 18.5926 |
| 44.6686 | 18.0416 |
| 44.2906 | 17.3331 |
| 43.8181 | 16.7821 |
| 42.0617 | 15.3849 |
| 40.9931 | 14.3104 |
| 40.5342 | 14.0481 |
| 27.958 | 14.3067 |
| 27.628 | 14.278 |
| 27.3646 | 14.2014 |
| 26.9718 | 14.0387 |
| 26.7324 | 13.7418 |
| 26.4546 | 13.5982 |
| 25.8415 | 13.2056 |
| 25.0464 | 12.7364 |
| 23.9931 | 12.3952 |
| 23.2017 | 12.2279 |
| 21.9689 | 12.0909 |
| 20.9188 | 11.9692 |
| 20.3252 | 11.7867 |
| 19.6708 | 11.4672 |
| 18.5598 | 11.2542 |
| 16.7335 | 11.1934 |
| 15.592 | 11.0717 |
| 15.3637 | 10.95 |
| 15.0617 | 10.7357 |
| 14.8483 | 10.5139 |
| 14.6008 | 10.2238 |
| 14.302 | 9.82285 |
| 13.9862 | 9.37071 |
| 13.4997 | 8.61999 |
| 13.2619 | 8.29152 |
| 12.7765 | 8.01721 |
| 12.1273 | 7.66924 |
| 11.3464 | 7.19901 |
| 10.6805 | 6.82351 |
| 9.81145 | 6.82351 |
| 9.39579 | 6.82351 |
| 9.39579 | 6.28473 |
| 8.61797 | 6.18331 |
| 7.53178 | 6.09905 |
| 7.44731 | 6.05867 |
| 6.96617 | 6.02195 |
| 6.01534 | 5.9685 |
| 5.08819 | 5.80675 |
| 4.55403 | 5.59438 |
| 4.0077 | 5.40022 |
| 3.33392 | 5.21819 |

| | |
|---|---|
| 2.32627 | 5.10896 |
| 1.59787 | 4.99975 |
| 0.851238 | 4.89054 |
| 0.156039 | 4.83615 |
| -0.202979 | 4.86102 |
| -1.05255 | 4.8326 |
| -1.70663 | 4.87168 |
| -3.10833 | 4.88164 |
| -3.10833 | 1.24285 |
| -3.10833 | -0.952757 |
| -3.10833 | -4.2254 |
| -3.10833 | -5.50878 |
| 51.6186 | -5.50878 |
| 51.6186 | 10.2101 |
| 51.6186 | 16.7453 |
| 51.6186 | 18.7441 |
| 51.6186 | 20.9459 |

### Material Boundary

| X | Y |
|---|---|
| 9.48355 | 6.28473 |
| 9.81145 | 6.40542 |
| 10.1045 | 6.50307 |
| 10.6126 | 6.78521 |
| 10.6805 | 6.82351 |
| 10.9696 | 6.82351 |

### Material Boundary

| X | Y |
|---|---|
| 9.81145 | 6.28473 |
| 9.81145 | 6.40542 |
| 9.81145 | 6.82351 |

### Material Boundary

| X | Y |
|---|---|
| 9.39579 | 6.28473 |
| 9.48355 | 6.28473 |
| 9.81145 | 6.28473 |
| 10.9655 | 6.28357 |

### Material Boundary

| X | Y |
|---|---|
| 10.9696 | 6.82351 |
| 11.0161 | 6.82378 |
| 11.5996 | 6.82712 |
| 11.6042 | 6.46715 |
| 11.4967 | 6.46419 |

### Material Boundary

| X | Y |
|---|---|
| 10.9655 | 6.28357 |
| 10.9655 | 6.44961 |
| 11.4967 | 6.46419 |

### Material Boundary

| X | Y |
|---|---|
| 11.5996 | 6.82712 |
| 12.4243 | 7.40007 |
| 13.0303 | 7.97164 |
| 13.2619 | 8.29152 |
| 13.6382 | 8.50417 |
| 14.4506 | 9.30694 |
| 14.8006 | 9.83941 |
| 15.1354 | 10.3566 |
| 15.2268 | 10.6609 |
| 15.3637 | 10.95 |

### Material Boundary

| X | Y |
|---|---|
| 11.0161 | 6.28473 |
| 10.9655 | 6.28357 |
| 10.9607 | 6.23741 |
| 10.9607 | 6.09481 |
| 11.2765 | 6.07854 |

### Material Boundary

| X | Y |
|---|---|
| 10.9655 | 6.44961 |
| 10.9696 | 6.82351 |

### Material Boundary

| X | Y |
|---|---|
| 11.6042 | 6.46715 |
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |
| 51.6186 | 18.7441 |

### Material Boundary

| X | Y |
|---|---|
| -3.10833 | -0.952757 |
| 14.9068 | 2.359 |
| 31.5166 | 8.039 |
| 40.9932 | 10.529 |
| 51.6186 | 16.7453 |

### Material Boundary

| X | Y |
|---|---|
| -3.10833 | -4.2254 |
| 51.6186 | 10.2101 |

### Material Boundary

| X | Y |
|---|---|
| -3.10833 | 1.24285 |
| 40.9932 | 12.499 |

## Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 51.6186 | 20.9459 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: ΒΑ Slide47 2η ΟΛΙΣΘ ΛΟΞΗ ΔΙΑΤ Ο-Π c=2 phi=28
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 6/7/2021, 16:54:38

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT V | UNIT I UNDER WT | UNIT II UNDER WT | AIR |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | No strength |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 25 | 20 | 19.5 | 0.001 |
| Cohesion [kPa] | 2 | 5 | 7 | 60 | 500 | 2 | 5 | |
| Friction Angle [deg] | 28 | 30 | 33 | 34 | 45 | 28 | 28 | |
| Water Surface | None | None | Water Table | Water Table | None | Water Table | Water Table | None |
| Hu Value | | | Automatically Calculated | Automatically Calculated | | Automatically Calculated | Automatically Calculated | |
| Ru Value | 0.1 | 0.1 | | | 0 | | | 0 |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.972558
Center: 10.260, 46.913
Radius: 8.934
Left Slip Surface Endpoint: 2.100, 43.275
Right Slip Surface Endpoint: 10.006, 37.983
Left Slope Intercept: 2.100 43.275
Right Slope Intercept: 10.006 38.790
Resisting Moment=844.439 kN-m
Driving Moment=868.266 kN-m

### Method: bishop simplified

FS: 0.987120
Center: 12.923, 51.797
Radius: 14.118
Left Slip Surface Endpoint: 1.556, 43.423
Right Slip Surface Endpoint: 10.005, 37.984
Left Slope Intercept: 1.556 43.423
Right Slope Intercept: 10.005 38.792
Resisting Moment=1159.24 kN-m
Driving Moment=1174.37 kN-m

### Method: janbu simplified

FS: 0.926119
Center: 10.260, 46.913
Radius: 8.934
Left Slip Surface Endpoint: 2.100, 43.275

Right Slip Surface Endpoint: 10.006, 37.983
Left Slope Intercept: 2.100 43.275
Right Slope Intercept: 10.006 38.790
Resisting Horizontal Force=78.3599 kN
Driving Horizontal Force=84.6111 kN

### Method: janbu corrected

FS: 0.979409
Center: 10.260, 46.913
Radius: 8.934
Left Slip Surface Endpoint: 2.100, 43.275
Right Slip Surface Endpoint: 10.006, 37.983
Left Slope Intercept: 2.100 43.275
Right Slope Intercept: 10.006 38.790
Resisting Horizontal Force=82.8689 kN
Driving Horizontal Force=84.6111 kN

### Method: spencer

FS: 0.997275
Center: 12.923, 51.797
Radius: 14.118
Left Slip Surface Endpoint: 1.556, 43.423
Right Slip Surface Endpoint: 10.005, 37.984
Left Slope Intercept: 1.556 43.423
Right Slope Intercept: 10.005 38.792
Resisting Moment=1171.17 kN-m
Driving Moment=1174.37 kN-m
Resisting Horizontal Force=69.5287 kN
Driving Horizontal Force=69.7187 kN

### Method: corp of eng#1

FS: 0.521321
Center: 9.775, 38.475
Radius: 0.400
Left Slip Surface Endpoint: 9.377, 38.429
Right Slip Surface Endpoint: 9.862, 38.085
Left Slope Intercept: 9.377 39.511
Right Slope Intercept: 9.862 38.939
Resisting Horizontal Force=1.38383 kN
Driving Horizontal Force=2.65447 kN

### Method: corp of eng#2

FS: 0.547869
Center: 9.559, 38.678
Radius: 0.398
Left Slip Surface Endpoint: 9.175, 38.573
Right Slip Surface Endpoint: 9.586, 38.281
Left Slope Intercept: 9.175 39.694
Right Slope Intercept: 9.586 39.305
Resisting Horizontal Force=1.79935 kN
Driving Horizontal Force=3.28427 kN

### Method: lowe-karafiath

FS: 0.716126
Center: 9.574, 39.059
Radius: 0.780
Left Slip Surface Endpoint: 8.833, 38.816
Right Slip Surface Endpoint: 9.588, 38.280
Left Slope Intercept: 8.833 39.811
Right Slope Intercept: 9.588 39.303
Resisting Horizontal Force=1.85038 kN

Driving Horizontal Force=2.58387 kN

### Method: gle/morgenstern-price

FS: 0.984264
Center: 12.923, 51.797
Radius: 14.118
Left Slip Surface Endpoint: 1.556, 43.423
Right Slip Surface Endpoint: 10.005, 37.984
Left Slope Intercept: 1.556 43.423
Right Slope Intercept: 10.005 38.792
Resisting Moment=1155.89 kN-m
Driving Moment=1174.37 kN-m
Resisting Horizontal Force=68.6326 kN
Driving Horizontal Force=69.7299 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 5128
Number of Invalid Surfaces: 4872

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 134 surfaces
Error Code -108 reported for 348 surfaces
Error Code -114 reported for 4384 surfaces
Error Code -123 reported for 5 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 5093
Number of Invalid Surfaces: 4907

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 134 surfaces
Error Code -108 reported for 373 surfaces
Error Code -112 reported for 10 surfaces
Error Code -114 reported for 4384 surfaces
Error Code -123 reported for 5 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 4880
Number of Invalid Surfaces: 5120

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 134 surfaces
Error Code -108 reported for 596 surfaces
Error Code -114 reported for 4384 surfaces
Error Code -123 reported for 5 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 4880
Number of Invalid Surfaces: 5120

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 134 surfaces
Error Code -108 reported for 596 surfaces
Error Code -114 reported for 4384 surfaces
Error Code -123 reported for 5 surfaces

## Method: spencer

Number of Valid Surfaces: 4458
Number of Invalid Surfaces: 5542

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 134 surfaces
Error Code -108 reported for 719 surfaces
Error Code -111 reported for 289 surfaces
Error Code -112 reported for 10 surfaces
Error Code -114 reported for 4384 surfaces
Error Code -123 reported for 5 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 4011
Number of Invalid Surfaces: 5989

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 134 surfaces
Error Code -108 reported for 1198 surfaces
Error Code -111 reported for 250 surfaces
Error Code -114 reported for 4384 surfaces
Error Code -123 reported for 5 surfaces
Error Code -500 reported for 17 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 4286
Number of Invalid Surfaces: 5714

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 134 surfaces
Error Code -108 reported for 1114 surfaces
Error Code -111 reported for 76 surfaces
Error Code -114 reported for 4384 surfaces
Error Code -123 reported for 5 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 2754
Number of Invalid Surfaces: 7246

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 134 surfaces
Error Code -108 reported for 2593 surfaces
Error Code -111 reported for 129 surfaces
Error Code -114 reported for 4384 surfaces
Error Code -123 reported for 5 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 4664
Number of Invalid Surfaces: 5336

### Error Codes:

Error Code -101 reported for 1 surface
Error Code -106 reported for 134 surfaces
Error Code -108 reported for 664 surfaces
Error Code -111 reported for 137 surfaces
Error Code -112 reported for 11 surfaces
Error Code -114 reported for 4384 surfaces
Error Code -123 reported for 5 surfaces

### Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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).
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.
-500 = Cannot generate interslice force function

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.972558

| 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 | 0.316249 | 1.578 | UNIT I | 2 | 28 | 2.53897 | 2.46929 | 1.38159 | 0.498974 | 0.882615 |
| 2 | 0.316249 | 4.46739 | UNIT I | 2 | 28 | 3.85722 | 3.75137 | 4.70647 | 1.41262 | 3.29385 |
| 3 | 0.316249 | 6.78445 | UNIT I | 2 | 28 | 5.42327 | 5.27444 | 8.30361 | 2.14529 | 6.15832 |
| 4 | 0.316249 | 8.24547 | UNIT I | 2 | 28 | 6.88332 | 6.69443 | 11.4362 | 2.60727 | 8.82895 |
| 5 | 0.316249 | 9.22698 | UNIT I | 2 | 28 | 8.2438 | 8.01757 | 14.235 | 2.91763 | 11.3174 |
| 6 | 0.316249 | 9.95212 | UNIT I | 2 | 28 | 9.53849 | 9.27673 | 16.8325 | 3.14693 | 13.6855 |
| 7 | 0.316249 | 10.4751 | UNIT I | 2 | 28 | 10.7415 | 10.4467 | 19.1982 | 3.3123 | 15.8859 |
| 8 | 0.316249 | 10.8239 | UNIT I | 2 | 28 | 11.825 | 11.5005 | 21.2904 | 3.4226 | 17.8678 |
| 9 | 0.316249 | 11.0196 | UNIT I | 2 | 28 | 12.7672 | 12.4168 | 23.0756 | 3.48448 | 19.5912 |
| 10 | 0.316249 | 11.0785 | UNIT I | 2 | 28 | 13.5507 | 13.1788 | 24.5274 | 3.50308 | 21.0243 |
| 11 | 0.316249 | 11.0133 | UNIT I | 2 | 28 | 14.1621 | 13.7735 | 25.6251 | 3.48248 | 22.1427 |
| 12 | 0.316249 | 10.8345 | UNIT I | 2 | 28 | 14.5912 | 14.1908 | 26.3536 | 3.42594 | 22.9276 |
| 13 | 0.316249 | 10.5505 | UNIT I | 2 | 28 | 14.8308 | 14.4238 | 26.7019 | 3.33615 | 23.3658 |
| 14 | 0.316249 | 10.1683 | UNIT I | 2 | 28 | 14.8758 | 14.4676 | 26.6635 | 3.21529 | 23.4482 |
| 15 | 0.316249 | 9.69373 | UNIT I | 2 | 28 | 14.7239 | 14.3198 | 26.2353 | 3.06522 | 23.1701 |
| 16 | 0.316249 | 9.13159 | UNIT I | 2 | 28 | 14.3739 | 13.9795 | 25.4177 | 2.88747 | 22.5303 |
| 17 | 0.316249 | 8.48601 | UNIT I | 2 | 28 | 13.8277 | 13.4482 | 24.2142 | 2.68334 | 21.5309 |
| 18 | 0.316249 | 7.76047 | UNIT I | 2 | 28 | 13.0877 | 12.7285 | 22.6313 | 2.45391 | 20.1774 |
| 19 | 0.316249 | 6.9578 | UNIT I | 2 | 28 | 12.1584 | 11.8248 | 20.6778 | 2.20011 | 18.4777 |
| 20 | 0.316249 | 6.08044 | UNIT I | 2 | 28 | 11.0459 | 10.7428 | 18.3655 | 1.92268 | 16.4428 |
| 21 | 0.316249 | 5.13038 | UNIT I | 2 | 28 | 9.7574 | 9.48964 | 15.7082 | 1.62226 | 14.086 |
| 22 | 0.316249 | 4.10927 | UNIT I | 2 | 28 | 8.30162 | 8.07381 | 12.7226 | 1.29938 | 11.4232 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 0.316249 | 3.01838 | UNIT I | 2 | 28 | 6.68846 | 6.50492 | 9.42696 | 0.954432 | 8.47252 |
| 24 | 0.316249 | 1.85871 | UNIT I | 2 | 28 | 4.92915 | 4.79388 | 5.84225 | 0.587738 | 5.25452 |
| 25 | 0.316249 | 0.631024 | UNIT I | 2 | 28 | 3.03614 | 2.95282 | 1.99153 | 0.199534 | 1.79199 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 0.98712

| 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 | 0.337951 | 1.24663 | UNIT I | 2 | 28 | 2.24379 | 2.21489 | 0.773026 | 0.368879 | 0.404147 |
| 2 | 0.337951 | 3.27197 | UNIT I | 2 | 28 | 4.08008 | 4.02753 | 4.78141 | 0.968181 | 3.81323 |
| 3 | 0.337951 | 5.02322 | UNIT I | 2 | 28 | 5.76743 | 5.69315 | 8.4322 | 1.48638 | 6.94582 |
| 4 | 0.337951 | 6.65306 | UNIT I | 2 | 28 | 7.41805 | 7.32251 | 11.9788 | 1.96865 | 10.0102 |
| 5 | 0.337951 | 7.78925 | UNIT I | 2 | 28 | 8.66748 | 8.55584 | 14.6346 | 2.30485 | 12.3297 |
| 6 | 0.337951 | 8.345 | UNIT I | 2 | 28 | 9.3968 | 9.27577 | 16.153 | 2.4693 | 13.6837 |
| 7 | 0.337951 | 8.72003 | UNIT I | 2 | 28 | 9.96211 | 9.8338 | 17.3135 | 2.58027 | 14.7332 |
| 8 | 0.337951 | 8.97655 | UNIT I | 2 | 28 | 10.4153 | 10.2811 | 18.2307 | 2.65617 | 15.5746 |
| 9 | 0.337951 | 9.1234 | UNIT I | 2 | 28 | 10.7591 | 10.6205 | 18.9125 | 2.69963 | 16.2129 |
| 10 | 0.337951 | 9.16812 | UNIT I | 2 | 28 | 10.996 | 10.8544 | 19.3655 | 2.71286 | 16.6527 |
| 11 | 0.337951 | 9.11714 | UNIT I | 2 | 28 | 11.1281 | 10.9847 | 19.5956 | 2.69777 | 16.8979 |
| 12 | 0.337951 | 8.97605 | UNIT I | 2 | 28 | 11.1571 | 11.0134 | 19.6077 | 2.65602 | 16.9517 |
| 13 | 0.337951 | 8.74968 | UNIT I | 2 | 28 | 11.0845 | 10.9418 | 19.4061 | 2.58904 | 16.817 |
| 14 | 0.337951 | 8.44227 | UNIT I | 2 | 28 | 10.9116 | 10.7711 | 18.9941 | 2.49808 | 16.496 |
| 15 | 0.337951 | 8.05755 | UNIT I | 2 | 28 | 10.6393 | 10.5022 | 18.3746 | 2.38424 | 15.9904 |
| 16 | 0.337951 | 7.59882 | UNIT I | 2 | 28 | 10.2682 | 10.1359 | 17.55 | 2.2485 | 15.3015 |
| 17 | 0.337951 | 7.06897 | UNIT I | 2 | 28 | 9.79883 | 9.67262 | 16.5218 | 2.09172 | 14.4301 |
| 18 | 0.337951 | 6.47062 | UNIT I | 2 | 28 | 9.23145 | 9.11255 | 15.2914 | 1.91466 | 13.3768 |
| 19 | 0.337951 | 5.80607 | UNIT I | 2 | 28 | 8.56603 | 8.4557 | 13.8594 | 1.71802 | 12.1414 |
| 20 | 0.337951 | 5.07733 | UNIT I | 2 | 28 | 7.80229 | 7.7018 | 12.2259 | 1.50239 | 10.7235 |
| 21 | 0.337951 | 4.28622 | UNIT I | 2 | 28 | 6.93976 | 6.85038 | 10.3905 | 1.2683 | 9.12224 |
| 22 | 0.337951 | 3.43435 | UNIT I | 2 | 28 | 5.97774 | 5.90075 | 8.35247 | 1.01623 | 7.33624 |
| 23 | 0.337951 | 2.52313 | UNIT I | 2 | 28 | 4.91525 | 4.85194 | 6.11033 | 0.746597 | 5.36373 |
| 24 | 0.337951 | 1.55379 | UNIT I | 2 | 28 | 3.75106 | 3.70275 | 3.66217 | 0.45977 | 3.2024 |
| 25 | 0.337951 | 0.527513 | UNIT I | 2 | 28 | 2.4838 | 2.45181 | 1.00583 | 0.156092 | 0.849736 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.926119

| 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 | 0.316249 | 1.578 | UNIT I | 2 | 28 | 2.19265 | 2.03066 | 0.556635 | 0.498974 | 0.0576612 |
| 2 | 0.316249 | 4.46739 | UNIT I | 2 | 28 | 4.79931 | 4.44473 | 6.01048 | 1.41262 | 4.59786 |
| 3 | 0.316249 | 6.78445 | UNIT I | 2 | 28 | 7.20245 | 6.67033 | 10.9289 | 2.14529 | 8.78361 |
| 4 | 0.316249 | 8.24547 | UNIT I | 2 | 28 | 8.98794 | 8.3239 | 14.5008 | 2.60727 | 11.8935 |
| 5 | 0.316249 | 9.22698 | UNIT I | 2 | 28 | 10.385 | 9.61773 | 17.2445 | 2.91763 | 14.3269 |
| 6 | 0.316249 | 9.95212 | UNIT I | 2 | 28 | 11.558 | 10.7041 | 19.5169 | 3.14693 | 16.37 |
| 7 | 0.316249 | 10.4751 | UNIT I | 2 | 28 | 12.5364 | 11.6102 | 21.3864 | 3.3123 | 18.0741 |
| 8 | 0.316249 | 10.8239 | UNIT I | 2 | 28 | 13.3321 | 12.3471 | 22.8828 | 3.4226 | 19.4602 |
| 9 | 0.316249 | 11.0196 | UNIT I | 2 | 28 | 13.9549 | 12.9239 | 24.0293 | 3.48448 | 20.5448 |
| 10 | 0.316249 | 11.0785 | UNIT I | 2 | 28 | 14.4122 | 13.3474 | 24.8445 | 3.50308 | 21.3414 |
| 11 | 0.316249 | 11.0133 | UNIT I | 2 | 28 | 14.7104 | 13.6236 | 25.3433 | 3.48248 | 21.8608 |
| 12 | 0.316249 | 10.8345 | UNIT I | 2 | 28 | 14.8542 | 13.7568 | 25.5372 | 3.42594 | 22.1113 |
| 13 | 0.316249 | 10.5505 | UNIT I | 2 | 28 | 14.8473 | 13.7504 | 25.4353 | 3.33615 | 22.0992 |
| 14 | 0.316249 | 10.1683 | UNIT I | 2 | 28 | 14.6923 | 13.6068 | 25.0444 | 3.21529 | 21.8291 |
| 15 | 0.316249 | 9.69373 | UNIT I | 2 | 28 | 14.3908 | 13.3276 | 24.3693 | 3.06522 | 21.3041 |
| 16 | 0.316249 | 9.13159 | UNIT I | 2 | 28 | 13.9438 | 12.9136 | 23.413 | 2.88747 | 20.5255 |
| 17 | 0.316249 | 8.48601 | UNIT I | 2 | 28 | 13.3513 | 12.3649 | 22.1769 | 2.68334 | 19.4936 |
| 18 | 0.316249 | 7.76047 | UNIT I | 2 | 28 | 12.6127 | 11.6808 | 20.6609 | 2.45391 | 18.207 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 0.316249 | 6.9578 | UNIT I | 2 | 28 | 11.7263 | 10.8599 | 18.8632 | 2.20011 | 16.6631 |
| 20 | 0.316249 | 6.08044 | UNIT I | 2 | 28 | 10.6897 | 9.89993 | 16.7803 | 1.92268 | 14.8576 |
| 21 | 0.316249 | 5.13038 | UNIT I | 2 | 28 | 9.49979 | 8.79794 | 14.4073 | 1.62226 | 12.7851 |
| 22 | 0.316249 | 4.10927 | UNIT I | 2 | 28 | 8.15242 | 7.55011 | 11.7376 | 1.29938 | 10.4382 |
| 23 | 0.316249 | 3.01838 | UNIT I | 2 | 28 | 6.64241 | 6.15166 | 8.76257 | 0.954432 | 7.80814 |
| 24 | 0.316249 | 1.85871 | UNIT I | 2 | 28 | 4.9635 | 4.59679 | 5.4716 | 0.587738 | 4.88386 |
| 25 | 0.316249 | 0.631024 | UNIT I | 2 | 28 | 3.10825 | 2.87861 | 1.85196 | 0.199534 | 1.65243 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.979409

| 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 | 0.316249 | 1.578 | UNIT I | 2 | 28 | 2.07335 | 2.03066 | 0.556635 | 0.498974 | 0.0576612 |
| 2 | 0.316249 | 4.46739 | UNIT I | 2 | 28 | 4.53818 | 4.44473 | 6.01048 | 1.41262 | 4.59786 |
| 3 | 0.316249 | 6.78445 | UNIT I | 2 | 28 | 6.81057 | 6.67033 | 10.9289 | 2.14529 | 8.78361 |
| 4 | 0.316249 | 8.24547 | UNIT I | 2 | 28 | 8.4989 | 8.3239 | 14.5008 | 2.60727 | 11.8935 |
| 5 | 0.316249 | 9.22698 | UNIT I | 2 | 28 | 9.81993 | 9.61773 | 17.2445 | 2.91763 | 14.3269 |
| 6 | 0.316249 | 9.95212 | UNIT I | 2 | 28 | 10.9291 | 10.7041 | 19.5169 | 3.14693 | 16.37 |
| 7 | 0.316249 | 10.4751 | UNIT I | 2 | 28 | 11.8543 | 11.6102 | 21.3864 | 3.3123 | 18.0741 |
| 8 | 0.316249 | 10.8239 | UNIT I | 2 | 28 | 12.6067 | 12.3471 | 22.8828 | 3.4226 | 19.4602 |
| 9 | 0.316249 | 11.0196 | UNIT I | 2 | 28 | 13.1956 | 12.9239 | 24.0293 | 3.48448 | 20.5448 |
| 10 | 0.316249 | 11.0785 | UNIT I | 2 | 28 | 13.628 | 13.3474 | 24.8445 | 3.50308 | 21.3414 |
| 11 | 0.316249 | 11.0133 | UNIT I | 2 | 28 | 13.91 | 13.6236 | 25.3433 | 3.48248 | 21.8608 |
| 12 | 0.316249 | 10.8345 | UNIT I | 2 | 28 | 14.046 | 13.7568 | 25.5372 | 3.42594 | 22.1113 |
| 13 | 0.316249 | 10.5505 | UNIT I | 2 | 28 | 14.0395 | 13.7504 | 25.4353 | 3.33615 | 22.0992 |
| 14 | 0.316249 | 10.1683 | UNIT I | 2 | 28 | 13.8929 | 13.6068 | 25.0444 | 3.21529 | 21.8291 |
| 15 | 0.316249 | 9.69373 | UNIT I | 2 | 28 | 13.6078 | 13.3276 | 24.3693 | 3.06522 | 21.3041 |
| 16 | 0.316249 | 9.13159 | UNIT I | 2 | 28 | 13.1851 | 12.9136 | 23.413 | 2.88747 | 20.5255 |
| 17 | 0.316249 | 8.48601 | UNIT I | 2 | 28 | 12.6249 | 12.3649 | 22.1769 | 2.68334 | 19.4936 |
| 18 | 0.316249 | 7.76047 | UNIT I | 2 | 28 | 11.9264 | 11.6808 | 20.6609 | 2.45391 | 18.207 |
| 19 | 0.316249 | 6.9578 | UNIT I | 2 | 28 | 11.0882 | 10.8599 | 18.8632 | 2.20011 | 16.6631 |
| 20 | 0.316249 | 6.08044 | UNIT I | 2 | 28 | 10.1081 | 9.89993 | 16.7803 | 1.92268 | 14.8576 |
| 21 | 0.316249 | 5.13038 | UNIT I | 2 | 28 | 8.98291 | 8.79794 | 14.4073 | 1.62226 | 12.7851 |
| 22 | 0.316249 | 4.10927 | UNIT I | 2 | 28 | 7.70884 | 7.55011 | 11.7376 | 1.29938 | 10.4382 |
| 23 | 0.316249 | 3.01838 | UNIT I | 2 | 28 | 6.28099 | 6.15166 | 8.76257 | 0.954432 | 7.80814 |
| 24 | 0.316249 | 1.85871 | UNIT I | 2 | 28 | 4.69343 | 4.59679 | 5.4716 | 0.587738 | 4.88386 |
| 25 | 0.316249 | 0.631024 | UNIT I | 2 | 28 | 2.93913 | 2.87861 | 1.85196 | 0.199534 | 1.65243 |

**Global Minimum Query (spencer) - Safety Factor**: 0.997275

| 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 | 0.337951 | 1.24663 | UNIT I | 2 | 28 | 2.39585 | 2.38932 | 1.10108 | 0.368879 | 0.732203 |
| 2 | 0.337951 | 3.27197 | UNIT I | 2 | 28 | 3.73632 | 3.72614 | 4.21458 | 0.968181 | 3.2464 |
| 3 | 0.337951 | 5.02322 | UNIT I | 2 | 28 | 5.02568 | 5.01199 | 7.15111 | 1.48638 | 5.66473 |
| 4 | 0.337951 | 6.65306 | UNIT I | 2 | 28 | 6.3443 | 6.32701 | 10.1066 | 1.96865 | 8.13794 |
| 5 | 0.337951 | 7.78925 | UNIT I | 2 | 28 | 7.41601 | 7.3958 | 12.4529 | 2.30485 | 10.148 |
| 6 | 0.337951 | 8.345 | UNIT I | 2 | 28 | 8.12918 | 8.10703 | 13.9549 | 2.4693 | 11.4856 |
| 7 | 0.337951 | 8.72003 | UNIT I | 2 | 28 | 8.74073 | 8.71691 | 15.2129 | 2.58027 | 12.6327 |
| 8 | 0.337951 | 8.97655 | UNIT I | 2 | 28 | 9.28459 | 9.25929 | 16.3089 | 2.65617 | 13.6527 |
| 9 | 0.337951 | 9.1234 | UNIT I | 2 | 28 | 9.75731 | 9.73072 | 17.239 | 2.69963 | 14.5394 |
| 10 | 0.337951 | 9.16812 | UNIT I | 2 | 28 | 10.1551 | 10.1275 | 17.9984 | 2.71286 | 15.2855 |
| 11 | 0.337951 | 9.11714 | UNIT I | 2 | 28 | 10.474 | 10.4454 | 18.5813 | 2.69777 | 15.8835 |
| 12 | 0.337951 | 8.97605 | UNIT I | 2 | 28 | 10.7094 | 10.6802 | 18.9812 | 2.65602 | 16.3251 |
| 13 | 0.337951 | 8.74968 | UNIT I | 2 | 28 | 10.8568 | 10.8272 | 19.1906 | 2.58904 | 16.6015 |
| 14 | 0.337951 | 8.44227 | UNIT I | 2 | 28 | 10.9109 | 10.8812 | 19.2012 | 2.49808 | 16.7031 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 0.337951 | 8.05755 | UNIT I | 2 | 28 | 10.8664 | 10.8368 | 19.0038 | 2.38424 | 16.6196 |
| 16 | 0.337951 | 7.59882 | UNIT I | 2 | 28 | 10.7173 | 10.6881 | 18.5884 | 2.2485 | 16.3399 |
| 17 | 0.337951 | 7.06897 | UNIT I | 2 | 28 | 10.4571 | 10.4286 | 17.9437 | 2.09172 | 15.8519 |
| 18 | 0.337951 | 6.47062 | UNIT I | 2 | 28 | 10.2976 | 10.2696 | 17.4675 | 1.91466 | 15.5528 |
| 19 | 0.337951 | 5.80607 | UNIT I | 2 | 28 | 10.3009 | 10.2728 | 17.277 | 1.71802 | 15.5589 |
| 20 | 0.337951 | 5.07733 | UNIT I | 2 | 28 | 10.2019 | 10.1741 | 16.8756 | 1.50239 | 15.3732 |
| 21 | 0.337951 | 4.28622 | UNIT I | 2 | 28 | 9.99153 | 9.9643 | 16.247 | 1.2683 | 14.9787 |
| 22 | 0.337951 | 3.43435 | UNIT I | 2 | 28 | 9.66078 | 9.63445 | 15.3745 | 1.01623 | 14.3583 |
| 23 | 0.337951 | 2.52313 | UNIT I | 2 | 28 | 6.14594 | 6.12919 | 8.51249 | 0.746597 | 7.76589 |
| 24 | 0.337951 | 1.55379 | UNIT I | 2 | 28 | 3.72298 | 3.71283 | 3.68114 | 0.45977 | 3.22137 |
| 25 | 0.337951 | 0.527513 | UNIT I | 2 | 28 | 0 | 0 | -7.3744 | 0.156092 | -7.53049 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.521321

| 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 | 0.0194022 | 0.0131957 | UNIT I | 2 | 28 | 29.1444 | 15.1936 | 24.8815 | 0.0680112 | 24.8135 |
| 2 | 0.0194022 | 0.0323783 | UNIT I | 2 | 28 | 1.9937 | 1.03936 | -1.63982 | 0.16688 | -1.8067 |
| 3 | 0.0194022 | 0.0422553 | UNIT I | 2 | 28 | 2.26479 | 1.18068 | -1.32313 | 0.217786 | -1.54092 |
| 4 | 0.0194022 | 0.0487932 | UNIT I | 2 | 28 | 2.52995 | 1.31892 | -1.02945 | 0.251483 | -1.28093 |
| 5 | 0.0194022 | 0.0533176 | UNIT I | 2 | 28 | 2.79087 | 1.45494 | -0.750305 | 0.274802 | -1.02511 |
| 6 | 0.0194022 | 0.0564202 | UNIT I | 2 | 28 | 3.53722 | 1.84403 | -0.0025489 | 0.290793 | -0.293342 |
| 7 | 0.0194022 | 0.0584299 | UNIT I | 2 | 28 | 4.05698 | 2.11499 | 0.517417 | 0.301151 | 0.216266 |
| 8 | 0.0194022 | 0.0595527 | UNIT I | 2 | 28 | 4.39164 | 2.28945 | 0.851324 | 0.306938 | 0.544386 |
| 9 | 0.0194022 | 0.0599277 | UNIT I | 2 | 28 | 4.73143 | 2.46659 | 1.1864 | 0.30887 | 0.877534 |
| 10 | 0.0194022 | 0.0596537 | UNIT I | 2 | 28 | 5.08021 | 2.64842 | 1.52696 | 0.307458 | 1.2195 |
| 11 | 0.0194022 | 0.0588039 | UNIT I | 2 | 28 | 5.44265 | 2.83737 | 1.87794 | 0.303078 | 1.57486 |
| 12 | 0.0194022 | 0.0574336 | UNIT I | 2 | 28 | 5.82474 | 3.03656 | 2.24551 | 0.296016 | 1.94949 |
| 13 | 0.0194022 | 0.0555856 | UNIT I | 2 | 28 | 6.23455 | 3.2502 | 2.63778 | 0.286491 | 2.35129 |
| 14 | 0.0194022 | 0.0532935 | UNIT I | 2 | 28 | 6.68329 | 3.48414 | 3.06594 | 0.274677 | 2.79126 |
| 15 | 0.0194022 | 0.0505837 | UNIT I | 2 | 28 | 7.1873 | 3.74689 | 3.54613 | 0.260711 | 3.28542 |
| 16 | 0.0194022 | 0.047477 | UNIT I | 2 | 28 | 7.7713 | 4.05134 | 4.1027 | 0.244699 | 3.858 |
| 17 | 0.0194022 | 0.0439897 | UNIT I | 2 | 28 | 6.11357 | 3.18713 | 2.45939 | 0.226725 | 2.23266 |
| 18 | 0.0194022 | 0.040134 | UNIT I | 2 | 28 | 0 | 0 | -5.1755 | 0.206853 | -5.38235 |
| 19 | 0.0194022 | 0.0359194 | UNIT I | 2 | 28 | 0 | 0 | -5.38741 | 0.18513 | -5.57254 |
| 20 | 0.0194022 | 0.0313522 | UNIT I | 2 | 28 | 0 | 0 | -5.6287 | 0.161591 | -5.79029 |
| 21 | 0.0194022 | 0.0264362 | UNIT I | 2 | 28 | 0 | 0 | -5.90339 | 0.136254 | -6.03965 |
| 22 | 0.0194022 | 0.0211725 | UNIT I | 2 | 28 | 0 | 0 | -6.21641 | 0.109124 | -6.32554 |
| 23 | 0.0194022 | 0.0155598 | UNIT I | 2 | 28 | 0 | 0 | -6.13272 | 0.0801959 | -6.21292 |
| 24 | 0.0194022 | 0.00959439 | UNIT I | 2 | 28 | 31.0342 | 16.1788 | 26.7158 | 0.04945 | 26.6664 |
| 25 | 0.0194022 | 0.00326973 | UNIT I | 2 | 28 | 0 | 0 | -154.685 | 0.0168524 | -154.702 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 0.547869

| 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 | 0.0164472 | 0.00568261 | UNIT I | 2 | 28 | 55.1917 | 30.2378 | 53.1422 | 0.0345507 | 53.1077 |
| 2 | 0.0164472 | 0.0149443 | UNIT I | 2 | 28 | 2.47979 | 1.3586 | -1.11543 | 0.0908623 | -1.2063 |
| 3 | 0.0164472 | 0.0210864 | UNIT I | 2 | 28 | 2.76556 | 1.51516 | -0.783637 | 0.128207 | -0.911844 |
| 4 | 0.0164472 | 0.0254939 | UNIT I | 2 | 28 | 3.04133 | 1.66625 | -0.472694 | 0.155005 | -0.627699 |
| 5 | 0.0164472 | 0.0287247 | UNIT I | 2 | 28 | 3.31141 | 1.81422 | -0.174756 | 0.174648 | -0.349404 |
| 6 | 0.0164472 | 0.0310746 | UNIT I | 2 | 28 | 3.57848 | 1.96054 | 0.114723 | 0.188936 | -0.0742133 |
| 7 | 0.0164472 | 0.032724 | UNIT I | 2 | 28 | 18.8814 | 10.3446 | 15.8928 | 0.198964 | 15.6938 |
| 8 | 0.0164472 | 0.0337927 | UNIT I | 2 | 28 | 28.7333 | 15.7421 | 26.0505 | 0.205462 | 25.845 |
| 9 | 0.0164472 | 0.0343653 | UNIT I | 2 | 28 | 12.5016 | 6.84923 | 9.32899 | 0.208943 | 9.12005 |
| 10 | 0.0164472 | 0.0345037 | UNIT I | 2 | 28 | 2.77274 | 1.5191 | -0.694657 | 0.209785 | -0.904442 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 0.0164472 | 0.0342552 | UNIT I | 2 | 28 | 2.89763 | 1.58752 | -0.567489 | 0.208274 | -0.775763 |
| 12 | 0.0164472 | 0.0336562 | UNIT I | 2 | 28 | 3.02595 | 1.65782 | -0.438905 | 0.204632 | -0.643537 |
| 13 | 0.0164472 | 0.0327358 | UNIT I | 2 | 28 | 3.15809 | 1.73022 | -0.308351 | 0.199036 | -0.507387 |
| 14 | 0.0164472 | 0.0315173 | UNIT I | 2 | 28 | 3.29419 | 1.80479 | -0.175517 | 0.191627 | -0.367144 |
| 15 | 0.0164472 | 0.0300194 | UNIT I | 2 | 28 | 3.4339 | 1.88133 | -0.0406672 | 0.18252 | -0.223187 |
| 16 | 0.0164472 | 0.0282576 | UNIT I | 2 | 28 | 3.57571 | 1.95902 | 0.094739 | 0.171808 | -0.077069 |
| 17 | 0.0164472 | 0.0262443 | UNIT I | 2 | 28 | 3.71584 | 2.03579 | 0.226882 | 0.159568 | 0.0673144 |
| 18 | 0.0164472 | 0.02399 | UNIT I | 2 | 28 | 0 | 0 | -12.4275 | 0.145861 | -12.5733 |
| 19 | 0.0164472 | 0.0215028 | UNIT I | 2 | 28 | 0 | 0 | -24.6066 | 0.130739 | -24.7373 |
| 20 | 0.0164472 | 0.0187895 | UNIT I | 2 | 28 | 0 | 0 | -13.5607 | 0.114242 | -13.6749 |
| 21 | 0.0164472 | 0.0158551 | UNIT I | 2 | 28 | 8.96632 | 4.91237 | 5.57376 | 0.0964005 | 5.47736 |
| 22 | 0.0164472 | 0.0127036 | UNIT I | 2 | 28 | 10.0109 | 5.48468 | 6.63098 | 0.0772387 | 6.55374 |
| 23 | 0.0164472 | 0.00933742 | UNIT I | 2 | 28 | 11.3314 | 6.20815 | 7.97116 | 0.0567722 | 7.91439 |
| 24 | 0.0164472 | 0.00575813 | UNIT I | 2 | 28 | 13.0189 | 7.13267 | 9.68817 | 0.0350099 | 9.65316 |
| 25 | 0.0164472 | 0.00196608 | UNIT I | 2 | 28 | 0 | 0 | -292.732 | 0.0119539 | -292.744 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.716126

| 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 | 0.0301839 | 0.016113 | UNIT I | 2 | 28 | 22.6939 | 16.2517 | 26.8569 | 0.0533826 | 26.8035 |
| 2 | 0.0301839 | 0.0431893 | UNIT I | 2 | 28 | 1.25077 | 0.89571 | -1.93377 | 0.143087 | -2.07686 |
| 3 | 0.0301839 | 0.0622251 | UNIT I | 2 | 28 | 1.59238 | 1.14034 | -1.41063 | 0.206153 | -1.61678 |
| 4 | 0.0301839 | 0.0762881 | UNIT I | 2 | 28 | 1.83071 | 1.31102 | -1.04304 | 0.252744 | -1.29579 |
| 5 | 0.0301839 | 0.0868132 | UNIT I | 2 | 28 | 2.02004 | 1.4466 | -0.753172 | 0.287614 | -1.04079 |
| 6 | 0.0301839 | 0.0946172 | UNIT I | 2 | 28 | 5.13703 | 3.67876 | 3.47077 | 0.313469 | 3.1573 |
| 7 | 0.0301839 | 0.10022 | UNIT I | 2 | 28 | 17.6304 | 12.6256 | 20.3158 | 0.33203 | 19.9838 |
| 8 | 0.0301839 | 0.103975 | UNIT I | 2 | 28 | 12.4747 | 8.93345 | 13.3844 | 0.344472 | 13.0399 |
| 9 | 0.0301839 | 0.10614 | UNIT I | 2 | 28 | 0.640502 | 0.45868 | -2.54715 | 0.351643 | -2.8988 |
| 10 | 0.0301839 | 0.106905 | UNIT I | 2 | 28 | 0.783773 | 0.56128 | -2.35166 | 0.354177 | -2.70584 |
| 11 | 0.0301839 | 0.106417 | UNIT I | 2 | 28 | 0.906475 | 0.64915 | -2.18801 | 0.35256 | -2.54057 |
| 12 | 0.0301839 | 0.104791 | UNIT I | 2 | 28 | 1.00657 | 0.72083 | -2.05859 | 0.347175 | -2.40576 |
| 13 | 0.0301839 | 0.10212 | UNIT I | 2 | 28 | 1.08217 | 0.77497 | -1.96562 | 0.338327 | -2.30395 |
| 14 | 0.0301839 | 0.0984796 | UNIT I | 2 | 28 | 1.13173 | 0.81046 | -1.91094 | 0.326265 | -2.23721 |
| 15 | 0.0301839 | 0.0939299 | UNIT I | 2 | 28 | 6.31337 | 4.52117 | 5.05282 | 0.311192 | 4.74163 |
| 16 | 0.0301839 | 0.0885216 | UNIT I | 2 | 28 | 7.49298 | 5.36592 | 6.62366 | 0.293274 | 6.33038 |
| 17 | 0.0301839 | 0.0822966 | UNIT I | 2 | 28 | 1.61691 | 1.15791 | -1.31109 | 0.272651 | -1.58374 |
| 18 | 0.0301839 | 0.0752896 | UNIT I | 2 | 28 | 0 | 0 | -4.40048 | 0.249436 | -4.64991 |
| 19 | 0.0301839 | 0.0675292 | UNIT I | 2 | 28 | 0 | 0 | -4.41279 | 0.223726 | -4.63651 |
| 20 | 0.0301839 | 0.0590388 | UNIT I | 2 | 28 | 0 | 0 | -4.46032 | 0.195597 | -4.65592 |
| 21 | 0.0301839 | 0.0498372 | UNIT I | 2 | 28 | 0 | 0 | -7.20344 | 0.165112 | -7.36855 |
| 22 | 0.0301839 | 0.0399395 | UNIT I | 2 | 28 | 0 | 0 | -8.96222 | 0.13232 | -9.09454 |
| 23 | 0.0301839 | 0.0293568 | UNIT I | 2 | 28 | 0 | 0 | -5.98052 | 0.0972597 | -6.07778 |
| 24 | 0.0301839 | 0.018097 | UNIT I | 2 | 28 | 0 | 0 | -3.99876 | 0.0599558 | -4.05871 |
| 25 | 0.0301839 | 0.00616475 | UNIT I | 2 | 28 | 0 | 0 | -67.5853 | 0.0204239 | -67.6057 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 0.984264

| 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 | 0.337951 | 1.24663 | UNIT I | 2 | 28 | 2.27922 | 2.24336 | 0.826572 | 0.368879 | 0.457693 |
| 2 | 0.337951 | 3.27197 | UNIT I | 2 | 28 | 4.02165 | 3.95837 | 4.65135 | 0.968181 | 3.68317 |
| 3 | 0.337951 | 5.02322 | UNIT I | 2 | 28 | 5.45849 | 5.3726 | 7.82931 | 1.48638 | 6.34293 |
| 4 | 0.337951 | 6.65306 | UNIT I | 2 | 28 | 6.77866 | 6.67199 | 10.7554 | 1.96865 | 8.78674 |
| 5 | 0.337951 | 7.78925 | UNIT I | 2 | 28 | 7.72923 | 7.6076 | 12.8512 | 2.30485 | 10.5463 |
| 6 | 0.337951 | 8.345 | UNIT I | 2 | 28 | 8.2677 | 8.1376 | 14.0124 | 2.4693 | 11.5431 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 0.337951 | 8.72003 | UNIT I | 2 | 28 | 8.72951 | 8.59214 | 14.9783 | 2.58027 | 12.398 |
| 8 | 0.337951 | 8.97655 | UNIT I | 2 | 28 | 9.16813 | 9.02386 | 15.8661 | 2.65617 | 13.21 |
| 9 | 0.337951 | 9.1234 | UNIT I | 2 | 28 | 9.58926 | 9.43836 | 16.6892 | 2.69963 | 13.9895 |
| 10 | 0.337951 | 9.16812 | UNIT I | 2 | 28 | 9.99332 | 9.83607 | 17.4504 | 2.71286 | 14.7375 |
| 11 | 0.337951 | 9.11714 | UNIT I | 2 | 28 | 10.3748 | 10.2115 | 18.1414 | 2.69777 | 15.4437 |
| 12 | 0.337951 | 8.97605 | UNIT I | 2 | 28 | 10.7213 | 10.5526 | 18.7412 | 2.65602 | 16.0852 |
| 13 | 0.337951 | 8.74968 | UNIT I | 2 | 28 | 11.0138 | 10.8405 | 19.2155 | 2.58904 | 16.6265 |
| 14 | 0.337951 | 8.44227 | UNIT I | 2 | 28 | 11.2265 | 11.0499 | 19.5184 | 2.49808 | 17.0203 |
| 15 | 0.337951 | 8.05755 | UNIT I | 2 | 28 | 11.3295 | 11.1512 | 19.5952 | 2.38424 | 17.211 |
| 16 | 0.337951 | 7.59882 | UNIT I | 2 | 28 | 11.2909 | 11.1132 | 19.3879 | 2.2485 | 17.1394 |
| 17 | 0.337951 | 7.06897 | UNIT I | 2 | 28 | 11.0803 | 10.906 | 18.8414 | 2.09172 | 16.7496 |
| 18 | 0.337951 | 6.47062 | UNIT I | 2 | 28 | 10.8416 | 10.6709 | 18.2223 | 1.91466 | 16.3077 |
| 19 | 0.337951 | 5.80607 | UNIT I | 2 | 28 | 10.5248 | 10.3592 | 17.4394 | 1.71802 | 15.7213 |
| 20 | 0.337951 | 5.07733 | UNIT I | 2 | 28 | 9.84538 | 9.69045 | 15.966 | 1.50239 | 14.4636 |
| 21 | 0.337951 | 4.28622 | UNIT I | 2 | 28 | 8.77655 | 8.63844 | 13.7534 | 1.2683 | 12.4851 |
| 22 | 0.337951 | 3.43435 | UNIT I | 2 | 28 | 7.31969 | 7.20451 | 10.8045 | 1.01623 | 9.78826 |
| 23 | 0.337951 | 2.52313 | UNIT I | 2 | 28 | 4.81682 | 4.74102 | 5.90171 | 0.746597 | 5.15511 |
| 24 | 0.337951 | 1.55379 | UNIT I | 2 | 28 | 3.20878 | 3.15829 | 2.63819 | 0.45977 | 2.17842 |
| 25 | 0.337951 | 0.527513 | UNIT I | 2 | 28 | 1.9458 | 1.91518 | -0.00343273 | 0.156092 | -0.159525 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -30.6204 | 48.7287 |
| -24.1344 | 45.56 |
| 10.8523 | 35.6946 |
| 33.994 | 31.8243 |

### External Boundary

| X | Y |
|---|---|
| 33.994 | 34.5709 |
| 33.994 | 35.9106 |
| 12.6805 | 37.2155 |
| 11.4505 | 37.2155 |
| 11.4505 | 37.8155 |
| 10.8523 | 37.8155 |
| 10.74 | 37.865 |
| 10.5 | 38.171 |
| 10.336 | 38.39 |
| 10.19 | 38.6 |
| 9.82203 | 38.981 |
| 9.70315 | 39.2 |
| 9.47978 | 39.4 |
| 9.29568 | 39.6 |
| 9.03802 | 39.8 |
| 7.31843 | 39.891 |
| 3.22121 | 42.8 |
| 2.91575 | 43 |
| 2.30593 | 43.2 |
| 1.75893 | 43.4 |
| 0 | 43.6 |

| | |
|---|---|
| -2.69498 | 44 |
| -7.98097 | 45 |
| -10.2156 | 46 |
| -12.711 | 46.8 |
| -22.4219 | 46.8 |
| -24.1344 | 47 |
| -25.842 | 48 |
| -27.3195 | 49 |
| -29.0141 | 50 |
| -30.6204 | 51 |
| -30.6204 | 48.7287 |
| -30.6204 | 47.4047 |
| -30.6204 | 44.7382 |
| -30.6204 | 37.8537 |
| -30.6204 | 25.427 |
| 33.994 | 25.427 |
| 33.994 | 26.6839 |
| 33.994 | 30.0736 |
| 33.994 | 31.8243 |

### Material Boundary

| X | Y |
|---|---|
| 3.22121 | 42.8 |
| 3.34754 | 42.6 |
| 3.50191 | 42.4 |
| 3.68339 | 42.2 |
| 3.82764 | 42.0169 |
| 3.98796 | 41.8 |
| 4.08595 | 41.6 |
| 4.26469 | 41.3731 |
| 4.44984 | 41.2 |
| 4.54551 | 41 |
| 4.64988 | 40.8 |
| 4.85464 | 40.6 |
| 5.02366 | 40.4 |
| 5.152 | 40.2 |
| 5.26027 | 40 |
| 7.31843 | 39.891 |

### Material Boundary

| X | Y |
|---|---|
| 10.8523 | 37.2155 |
| 11.4505 | 37.2155 |

### Material Boundary

| X | Y |
|---|---|
| 10.8523 | 37.2155 |
| 10.8523 | 37.8155 |

### Material Boundary

| X | Y |
|---|---|

| | |
|---|---|
| -24.1344 | 45.56 |
| -24.1344 | 47 |

### Material Boundary

| X | Y |
|---|---|
| -12.711 | 42.999 |
| -12.711 | 46.8 |

### Material Boundary

| X | Y |
|---|---|
| -12.711 | 42.999 |
| 10.8523 | 37.2155 |

### Material Boundary

| X | Y |
|---|---|
| -16.8124 | 44.0056 |
| -12.711 | 42.999 |

### Material Boundary

| X | Y |
|---|---|
| -24.1344 | 45.56 |
| -16.8124 | 44.0056 |

### Material Boundary

| X | Y |
|---|---|
| -30.6204 | 47.4047 |
| -24.1344 | 45.56 |

### Material Boundary

| X | Y |
|---|---|
| -24.1344 | 43.56 |
| -24.1344 | 45.56 |

### Material Boundary

| X | Y |
|---|---|
| -12.711 | 39.207 |
| -12.711 | 42.3389 |
| -12.711 | 42.999 |

### Material Boundary

| X | Y |
|---|---|
| 10.8523 | 32.497 |
| 10.8523 | 35.6946 |
| 10.8523 | 37.2155 |

### Material Boundary

| X | Y |
|---|---|

| | |
|---|---|
| 10.8523 | 32.497 |
| 33.994 | 30.0736 |

### Material Boundary

| X | Y |
|---|---|
| -12.711 | 39.207 |
| 10.8523 | 32.497 |

### Material Boundary

| X | Y |
|---|---|
| -24.1344 | 43.56 |
| -12.711 | 39.207 |

### Material Boundary

| X | Y |
|---|---|
| -30.6204 | 44.7382 |
| -24.1344 | 43.56 |

### Material Boundary

| X | Y |
|---|---|
| -24.1344 | 40.45 |
| -24.1344 | 43.56 |

### Material Boundary

| X | Y |
|---|---|
| -30.6204 | 37.8537 |
| -24.1344 | 36.702 |
| 33.994 | 26.6839 |

### Material Boundary

| X | Y |
|---|---|
| 7.31843 | 39.891 |
| 10.127 | 37.897 |
| 10.74 | 37.865 |

### Material Boundary

| X | Y |
|---|---|
| -30.6204 | 48.7287 |
| -24.1344 | 45.56 |
| -12.711 | 42.3389 |
| 10.8523 | 35.6946 |
| 33.994 | 31.8243 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: BA S51 RU=0..10 c=2 phi=28
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 17/5/2021, 20:11:32

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT |
|---|---|---|---|---|---|
| Color | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 |
| Cohesion [kPa] | 2 | 5 | 7 | 60 | 5 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 |
| Water Surface | None | None | Water Table | Water Table | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated |
| Ru Value | 0.1 | 0.1 | | | |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.510442
Center: 36.644, 23.126
Radius: 9.837
Left Slip Surface Endpoint: 41.966, 14.853
Right Slip Surface Endpoint: 46.364, 21.609
Resisting Moment=456.066 kN-m
Driving Moment=893.474 kN-m

### Method: bishop simplified

FS: 0.450652
Center: 35.231, 25.071
Radius: 11.932
Left Slip Surface Endpoint: 42.864, 15.900
Right Slip Surface Endpoint: 46.717, 21.840
Resisting Moment=423.473 kN-m
Driving Moment=939.69 kN-m

## Method: janbu simplified

FS: 0.419201
Center: 37.088, 22.767
Radius: 9.282
Left Slip Surface Endpoint: 42.006, 14.894
Right Slip Surface Endpoint: 46.293, 21.574
Resisting Horizontal Force=21.9214 kN
Driving Horizontal Force=52.2932 kN

## Method: janbu corrected

FS: 0.439035
Center: 37.088, 22.767
Radius: 9.282
Left Slip Surface Endpoint: 42.006, 14.894
Right Slip Surface Endpoint: 46.293, 21.574
Resisting Horizontal Force=22.9586 kN
Driving Horizontal Force=52.2932 kN

## Method: spencer

FS: 0.446175
Center: 35.231, 25.071
Radius: 11.932
Left Slip Surface Endpoint: 42.864, 15.900
Right Slip Surface Endpoint: 46.717, 21.840
Resisting Moment=419.266 kN-m
Driving Moment=939.69 kN-m
Resisting Horizontal Force=20.258 kN
Driving Horizontal Force=45.4037 kN

## Method: corp of eng#1

FS: 0.452120
Center: 35.231, 25.071
Radius: 11.932
Left Slip Surface Endpoint: 42.864, 15.900
Right Slip Surface Endpoint: 46.717, 21.840
Resisting Horizontal Force=20.7525 kN
Driving Horizontal Force=45.9004 kN

## Method: corp of eng#2

FS: 0.458108
Center: 35.231, 25.071
Radius: 11.932
Left Slip Surface Endpoint: 42.864, 15.900
Right Slip Surface Endpoint: 46.717, 21.840
Resisting Horizontal Force=20.9235 kN
Driving Horizontal Force=45.6739 kN

## Method: lowe-karafiath

FS: 0.453451
Center: 35.231, 25.071
Radius: 11.932

Left Slip Surface Endpoint: 42.864, 15.900
Right Slip Surface Endpoint: 46.717, 21.840
Resisting Horizontal Force=20.6393 kN
Driving Horizontal Force=45.516 kN

### Method: gle/morgenstern-price

FS: 0.445314
Center: 35.231, 25.071
Radius: 11.932
Left Slip Surface Endpoint: 42.864, 15.900
Right Slip Surface Endpoint: 46.717, 21.840
Resisting Moment=418.457 kN-m
Driving Moment=939.69 kN-m
Resisting Horizontal Force=20.2611 kN
Driving Horizontal Force=45.4984 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 8247
Number of Invalid Surfaces: 1753

**Error Codes:**

Error Code -103 reported for 80 surfaces
Error Code -105 reported for 345 surfaces
Error Code -106 reported for 101 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 118 surfaces
Error Code -109 reported for 10 surfaces
Error Code -114 reported for 1051 surfaces
Error Code -123 reported for 2 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 8245
Number of Invalid Surfaces: 1755

**Error Codes:**

Error Code -103 reported for 80 surfaces
Error Code -105 reported for 345 surfaces
Error Code -106 reported for 101 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 120 surfaces
Error Code -109 reported for 10 surfaces
Error Code -114 reported for 1051 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 7671
Number of Invalid Surfaces: 2329

**Error Codes:**

Error Code -103 reported for 80 surfaces
Error Code -105 reported for 345 surfaces
Error Code -106 reported for 101 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 694 surfaces
Error Code -109 reported for 10 surfaces
Error Code -114 reported for 1051 surfaces
Error Code -123 reported for 2 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 7671
Number of Invalid Surfaces: 2329

**Error Codes:**

Error Code -103 reported for 80 surfaces
Error Code -105 reported for 345 surfaces
Error Code -106 reported for 101 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 694 surfaces
Error Code -109 reported for 10 surfaces
Error Code -114 reported for 1051 surfaces
Error Code -123 reported for 2 surfaces

## Method: spencer

Number of Valid Surfaces: 7303
Number of Invalid Surfaces: 2697

**Error Codes:**

Error Code -103 reported for 80 surfaces
Error Code -105 reported for 345 surfaces
Error Code -106 reported for 101 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 759 surfaces
Error Code -109 reported for 10 surfaces
Error Code -111 reported for 303 surfaces
Error Code -114 reported for 1051 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 6433
Number of Invalid Surfaces: 3567

**Error Codes:**

Error Code -103 reported for 80 surfaces
Error Code -105 reported for 345 surfaces
Error Code -106 reported for 101 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 1243 surfaces
Error Code -109 reported for 10 surfaces
Error Code -111 reported for 689 surfaces

Error Code -114 reported for 1051 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 5531
Number of Invalid Surfaces: 4469

### Error Codes:

Error Code -103 reported for 80 surfaces
Error Code -105 reported for 345 surfaces
Error Code -106 reported for 101 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 2533 surfaces
Error Code -109 reported for 10 surfaces
Error Code -111 reported for 301 surfaces
Error Code -114 reported for 1051 surfaces
Error Code -123 reported for 2 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 3801
Number of Invalid Surfaces: 6199

### Error Codes:

Error Code -103 reported for 80 surfaces
Error Code -105 reported for 345 surfaces
Error Code -106 reported for 101 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 3937 surfaces
Error Code -109 reported for 10 surfaces
Error Code -111 reported for 627 surfaces
Error Code -114 reported for 1051 surfaces
Error Code -123 reported for 2 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 7589
Number of Invalid Surfaces: 2411

### Error Codes:

Error Code -103 reported for 80 surfaces
Error Code -105 reported for 345 surfaces
Error Code -106 reported for 101 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 767 surfaces
Error Code -109 reported for 10 surfaces
Error Code -111 reported for 9 surfaces
Error Code -114 reported for 1051 surfaces
Error Code -123 reported for 2 surfaces

### Error Codes

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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.
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.510442

| 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 | 0.175907 | 0.116576 | UNIT I | 2 | 28 | 4.35154 | 2.22121 | 0.482307 | 0.0662713 | 0.416036 |
| 2 | 0.175907 | 0.340506 | UNIT I | 2 | 28 | 5.14772 | 2.62761 | 1.37394 | 0.193571 | 1.18037 |
| 3 | 0.175907 | 0.545568 | UNIT I | 2 | 28 | 5.8282 | 2.97496 | 2.14378 | 0.310146 | 1.83363 |
| 4 | 0.175907 | 0.794226 | UNIT I | 2 | 28 | 6.60872 | 3.37337 | 3.03443 | 0.451503 | 2.58293 |
| 5 | 0.175907 | 1.12612 | UNIT I | 2 | 28 | 7.60155 | 3.88015 | 4.17622 | 0.640177 | 3.53604 |
| 6 | 0.175907 | 1.46175 | UNIT I | 2 | 28 | 8.52367 | 4.35084 | 5.25226 | 0.830978 | 4.42128 |
| 7 | 0.175907 | 2.27327 | UNIT I | 2 | 28 | 10.7996 | 5.51255 | 7.89847 | 1.29231 | 6.60616 |
| 8 | 0.175907 | 3.25848 | UNIT I | 2 | 28 | 13.368 | 6.8236 | 10.9243 | 1.85239 | 9.07189 |
| 9 | 0.175907 | 4.21745 | UNIT I | 2 | 28 | 15.5991 | 7.96244 | 13.6112 | 2.39754 | 11.2137 |
| 10 | 0.175907 | 5.11726 | UNIT I | 2 | 28 | 17.4064 | 8.88498 | 15.8579 | 2.90907 | 12.9488 |
| 11 | 0.175907 | 5.64696 | UNIT I | 2 | 28 | 18.0276 | 9.20205 | 16.7553 | 3.21019 | 13.5451 |
| 12 | 0.175907 | 6.05041 | UNIT I | 2 | 28 | 18.1846 | 9.2822 | 17.1354 | 3.43955 | 13.6958 |
| 13 | 0.175907 | 6.41803 | UNIT I | 2 | 28 | 18.1268 | 9.25267 | 17.2888 | 3.64854 | 13.6403 |
| 14 | 0.175907 | 6.74625 | UNIT I | 2 | 28 | 17.8584 | 9.11567 | 17.2178 | 3.83513 | 13.3826 |
| 15 | 0.175907 | 7.03075 | UNIT I | 2 | 28 | 17.3852 | 8.87414 | 16.9252 | 3.99686 | 12.9284 |
| 16 | 0.175907 | 7.26621 | UNIT I | 2 | 28 | 16.7147 | 8.5319 | 16.4154 | 4.13071 | 12.2847 |
| 17 | 0.175907 | 7.44599 | UNIT I | 2 | 28 | 15.8566 | 8.09386 | 15.6938 | 4.23291 | 11.4609 |
| 18 | 0.175907 | 7.56157 | UNIT I | 2 | 28 | 14.8229 | 7.56622 | 14.7671 | 4.29862 | 10.4685 |
| 19 | 0.175907 | 7.60175 | UNIT I | 2 | 28 | 13.6291 | 6.95685 | 13.6439 | 4.32146 | 9.32248 |
| 20 | 0.175907 | 7.4882 | UNIT I | 2 | 28 | 12.225 | 6.24013 | 12.2314 | 4.25691 | 7.97453 |
| 21 | 0.175907 | 6.96598 | UNIT I | 2 | 28 | 10.4499 | 5.33408 | 10.2305 | 3.96004 | 6.27047 |
| 22 | 0.175907 | 6.24466 | UNIT I | 2 | 28 | 8.67922 | 4.43024 | 8.12061 | 3.54998 | 4.57063 |
| 23 | 0.175907 | 5.06967 | UNIT I | 2 | 28 | 6.87586 | 3.50973 | 5.72142 | 2.88202 | 2.8394 |
| 24 | 0.175907 | 3.4933 | UNIT I | 2 | 28 | 5.31593 | 2.71347 | 3.32772 | 1.98588 | 1.34184 |
| 25 | 0.175907 | 1.30422 | UNIT I | 2 | 28 | 4.19216 | 2.13986 | 1.00445 | 0.741424 | 0.263031 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 0.450652

| 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 | 0.154117 | 0.132883 | UNIT I | 2 | 28 | 2.68078 | 1.2081 | -1.40312 | 0.0862223 | -1.48935 |
| 2 | 0.154117 | 0.758397 | UNIT I | 2 | 28 | 4.75562 | 2.14313 | 0.761274 | 0.492091 | 0.269183 |
| 3 | 0.154117 | 1.51539 | UNIT I | 2 | 28 | 7.19287 | 3.24148 | 3.31817 | 0.983273 | 2.33489 |
| 4 | 0.154117 | 2.25802 | UNIT I | 2 | 28 | 9.49034 | 4.27684 | 5.74726 | 1.46513 | 4.28213 |
| 5 | 0.154117 | 2.98556 | UNIT I | 2 | 28 | 11.6465 | 5.2485 | 8.04676 | 1.9372 | 6.10956 |
| 6 | 0.154117 | 3.57371 | UNIT I | 2 | 28 | 13.2708 | 5.98051 | 9.80507 | 2.31883 | 7.48624 |
| 7 | 0.154117 | 3.91722 | UNIT I | 2 | 28 | 14.0628 | 6.33743 | 10.6992 | 2.54171 | 8.15754 |
| 8 | 0.154117 | 4.23797 | UNIT I | 2 | 28 | 14.7371 | 6.64132 | 11.4789 | 2.74983 | 8.72907 |
| 9 | 0.154117 | 4.53985 | UNIT I | 2 | 28 | 15.3078 | 6.89851 | 12.1585 | 2.94571 | 9.21274 |
| 10 | 0.154117 | 4.82159 | UNIT I | 2 | 28 | 15.773 | 7.10814 | 12.7355 | 3.12852 | 9.60699 |
| 11 | 0.154117 | 5.08178 | UNIT I | 2 | 28 | 16.1304 | 7.2692 | 13.2073 | 3.29735 | 9.90994 |
| 12 | 0.154117 | 5.31877 | UNIT I | 2 | 28 | 16.3775 | 7.38056 | 13.5705 | 3.45112 | 10.1194 |
| 13 | 0.154117 | 5.53067 | UNIT I | 2 | 28 | 16.5114 | 7.44089 | 13.8214 | 3.58861 | 10.2328 |
| 14 | 0.154117 | 5.7153 | UNIT I | 2 | 28 | 16.5287 | 7.44867 | 13.9559 | 3.70841 | 10.2475 |
| 15 | 0.154117 | 5.87006 | UNIT I | 2 | 28 | 16.4254 | 7.40216 | 13.9688 | 3.80882 | 10.16 |
| 16 | 0.154117 | 5.99187 | UNIT I | 2 | 28 | 16.1973 | 7.29935 | 13.8545 | 3.88787 | 9.96664 |
| 17 | 0.154117 | 6.01379 | UNIT I | 2 | 28 | 15.69 | 7.07074 | 13.4387 | 3.90209 | 9.53666 |
| 18 | 0.154117 | 5.77244 | UNIT I | 2 | 28 | 14.554 | 6.55879 | 12.3193 | 3.74549 | 8.57383 |
| 19 | 0.154117 | 5.46465 | UNIT I | 2 | 28 | 13.2856 | 5.9872 | 11.0446 | 3.54577 | 7.49884 |
| 20 | 0.154117 | 4.95282 | UNIT I | 2 | 28 | 11.6169 | 5.23518 | 9.29814 | 3.21367 | 6.08447 |
| 21 | 0.154117 | 4.25489 | UNIT I | 2 | 28 | 9.64651 | 4.34722 | 7.1753 | 2.76081 | 4.41449 |
| 22 | 0.154117 | 3.48075 | UNIT I | 2 | 28 | 7.64559 | 3.4455 | 4.9771 | 2.25851 | 2.71859 |
| 23 | 0.154117 | 2.61233 | UNIT I | 2 | 28 | 5.62179 | 2.53347 | 2.69834 | 1.69503 | 1.00331 |
| 24 | 0.154117 | 1.62248 | UNIT I | 2 | 28 | 3.58936 | 1.61755 | 0.333473 | 1.05275 | -0.719277 |
| 25 | 0.154117 | 0.514175 | UNIT I | 2 | 28 | 1.6432 | 0.74051 | -2.03513 | 0.333626 | -2.36875 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.419201

| 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 | 0.171498 | 0.115967 | UNIT I | 2 | 28 | 3.06763 | 1.28595 | -1.2753 | 0.0676199 | -1.34292 |
| 2 | 0.171498 | 0.33907 | UNIT I | 2 | 28 | 3.8056 | 1.59531 | -0.563395 | 0.197711 | -0.761106 |
| 3 | 0.171498 | 0.544131 | UNIT I | 2 | 28 | 4.44444 | 1.86311 | 0.059836 | 0.317281 | -0.257445 |
| 4 | 0.171498 | 0.813112 | UNIT I | 2 | 28 | 5.27056 | 2.20943 | 0.867995 | 0.474124 | 0.393871 |
| 5 | 0.171498 | 1.13986 | UNIT I | 2 | 28 | 6.2475 | 2.61896 | 1.82874 | 0.664649 | 1.16409 |
| 6 | 0.171498 | 1.48568 | UNIT I | 2 | 28 | 7.23355 | 3.03231 | 2.80779 | 0.866294 | 1.9415 |
| 7 | 0.171498 | 2.30644 | UNIT I | 2 | 28 | 9.68321 | 4.05921 | 5.21769 | 1.34488 | 3.87281 |
| 8 | 0.171498 | 3.25223 | UNIT I | 2 | 28 | 12.3859 | 5.19218 | 7.89998 | 1.89637 | 6.00361 |
| 9 | 0.171498 | 4.17289 | UNIT I | 2 | 28 | 14.8509 | 6.2255 | 10.3802 | 2.4332 | 7.94702 |
| 10 | 0.171498 | 5.03977 | UNIT I | 2 | 28 | 16.9952 | 7.12442 | 12.5763 | 2.93867 | 9.63765 |
| 11 | 0.171498 | 5.55672 | UNIT I | 2 | 28 | 17.9784 | 7.53655 | 13.6528 | 3.24011 | 10.4127 |
| 12 | 0.171498 | 5.94856 | UNIT I | 2 | 28 | 18.5106 | 7.75967 | 14.301 | 3.46859 | 10.8324 |
| 13 | 0.171498 | 6.30596 | UNIT I | 2 | 28 | 18.8638 | 7.90771 | 14.7878 | 3.67699 | 11.1108 |
| 14 | 0.171498 | 6.62545 | UNIT I | 2 | 28 | 19.032 | 7.97825 | 15.1067 | 3.86328 | 11.2435 |
| 15 | 0.171498 | 6.90279 | UNIT I | 2 | 28 | 19.0084 | 7.96835 | 15.2499 | 4.025 | 11.2249 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.171498 | 7.13279 | UNIT I | 2 | 28 | 18.7843 | 7.87438 | 15.2072 | 4.15911 | 11.0481 |
| 17 | 0.171498 | 7.30888 | UNIT I | 2 | 28 | 18.3488 | 7.69185 | 14.9666 | 4.26179 | 10.7048 |
| 18 | 0.171498 | 7.42262 | UNIT I | 2 | 28 | 17.6888 | 7.41516 | 14.5125 | 4.32811 | 10.1844 |
| 19 | 0.171498 | 7.4628 | UNIT I | 2 | 28 | 16.7871 | 7.03719 | 13.8251 | 4.35154 | 9.47358 |
| 20 | 0.171498 | 7.39764 | UNIT I | 2 | 28 | 15.5905 | 6.53557 | 12.8437 | 4.31354 | 8.53018 |
| 21 | 0.171498 | 6.95415 | UNIT I | 2 | 28 | 13.6313 | 5.71426 | 11.0404 | 4.05495 | 6.9855 |
| 22 | 0.171498 | 6.27068 | UNIT I | 2 | 28 | 11.2789 | 4.72812 | 8.78727 | 3.65642 | 5.13085 |
| 23 | 0.171498 | 5.22381 | UNIT I | 2 | 28 | 8.45761 | 3.54544 | 5.95254 | 3.04599 | 2.90655 |
| 24 | 0.171498 | 3.66699 | UNIT I | 2 | 28 | 5.20116 | 2.18033 | 2.47737 | 2.13821 | 0.339158 |
| 25 | 0.171498 | 1.39244 | UNIT I | 2 | 28 | 1.77428 | 0.74378 | -1.55069 | 0.811927 | -2.36262 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.439035

| 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 | 0.171498 | 0.115967 | UNIT I | 2 | 28 | 2.92905 | 1.28595 | -1.2753 | 0.0676199 | -1.34292 |
| 2 | 0.171498 | 0.33907 | UNIT I | 2 | 28 | 3.63368 | 1.59531 | -0.563395 | 0.197711 | -0.761106 |
| 3 | 0.171498 | 0.544131 | UNIT I | 2 | 28 | 4.24366 | 1.86311 | 0.059836 | 0.317281 | -0.257445 |
| 4 | 0.171498 | 0.813112 | UNIT I | 2 | 28 | 5.03246 | 2.20943 | 0.867995 | 0.474124 | 0.393871 |
| 5 | 0.171498 | 1.13986 | UNIT I | 2 | 28 | 5.96526 | 2.61896 | 1.82874 | 0.664649 | 1.16409 |
| 6 | 0.171498 | 1.48568 | UNIT I | 2 | 28 | 6.90676 | 3.03231 | 2.80779 | 0.866294 | 1.9415 |
| 7 | 0.171498 | 2.30644 | UNIT I | 2 | 28 | 9.24575 | 4.05921 | 5.21769 | 1.34488 | 3.87281 |
| 8 | 0.171498 | 3.25223 | UNIT I | 2 | 28 | 11.8263 | 5.19218 | 7.89998 | 1.89637 | 6.00361 |
| 9 | 0.171498 | 4.17289 | UNIT I | 2 | 28 | 14.18 | 6.2255 | 10.3802 | 2.4332 | 7.94702 |
| 10 | 0.171498 | 5.03977 | UNIT I | 2 | 28 | 16.2275 | 7.12442 | 12.5763 | 2.93867 | 9.63765 |
| 11 | 0.171498 | 5.55672 | UNIT I | 2 | 28 | 17.1662 | 7.53655 | 13.6528 | 3.24011 | 10.4127 |
| 12 | 0.171498 | 5.94856 | UNIT I | 2 | 28 | 17.6744 | 7.75967 | 14.301 | 3.46859 | 10.8324 |
| 13 | 0.171498 | 6.30596 | UNIT I | 2 | 28 | 18.0116 | 7.90771 | 14.7878 | 3.67699 | 11.1108 |
| 14 | 0.171498 | 6.62545 | UNIT I | 2 | 28 | 18.1722 | 7.97825 | 15.1067 | 3.86328 | 11.2435 |
| 15 | 0.171498 | 6.90279 | UNIT I | 2 | 28 | 18.1497 | 7.96835 | 15.2499 | 4.025 | 11.2249 |
| 16 | 0.171498 | 7.13279 | UNIT I | 2 | 28 | 17.9357 | 7.87438 | 15.2072 | 4.15911 | 11.0481 |
| 17 | 0.171498 | 7.30888 | UNIT I | 2 | 28 | 17.5199 | 7.69185 | 14.9666 | 4.26179 | 10.7048 |
| 18 | 0.171498 | 7.42262 | UNIT I | 2 | 28 | 16.8897 | 7.41516 | 14.5125 | 4.32811 | 10.1844 |
| 19 | 0.171498 | 7.4628 | UNIT I | 2 | 28 | 16.0288 | 7.03719 | 13.8251 | 4.35154 | 9.47358 |
| 20 | 0.171498 | 7.39764 | UNIT I | 2 | 28 | 14.8862 | 6.53557 | 12.8437 | 4.31354 | 8.53018 |
| 21 | 0.171498 | 6.95415 | UNIT I | 2 | 28 | 13.0155 | 5.71426 | 11.0404 | 4.05495 | 6.9855 |
| 22 | 0.171498 | 6.27068 | UNIT I | 2 | 28 | 10.7693 | 4.72812 | 8.78727 | 3.65642 | 5.13085 |
| 23 | 0.171498 | 5.22381 | UNIT I | 2 | 28 | 8.07553 | 3.54544 | 5.95254 | 3.04599 | 2.90655 |
| 24 | 0.171498 | 3.66699 | UNIT I | 2 | 28 | 4.96619 | 2.18033 | 2.47737 | 2.13821 | 0.339158 |
| 25 | 0.171498 | 1.39244 | UNIT I | 2 | 28 | 1.69412 | 0.74378 | -1.55069 | 0.811927 | -2.36262 |

**Global Minimum Query (spencer) - Safety Factor**: 0.446175

| 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 | 0.154117 | 0.132883 | UNIT I | 2 | 28 | 5.08477 | 2.2687 | 0.591569 | 0.0862223 | 0.505346 |
| 2 | 0.154117 | 0.758397 | UNIT I | 2 | 28 | 7.23366 | 3.22748 | 2.80065 | 0.492091 | 2.30855 |
| 3 | 0.154117 | 1.51539 | UNIT I | 2 | 28 | 9.66553 | 4.31252 | 5.33247 | 0.983273 | 4.3492 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 0.154117 | 2.25802 | UNIT I | 2 | 28 | 11.8469 | 5.28577 | 7.64477 | 1.46513 | 6.17964 |
| 5 | 0.154117 | 2.98556 | UNIT I | 2 | 28 | 13.7869 | 6.15138 | 9.74481 | 1.9372 | 7.80761 |
| 6 | 0.154117 | 3.57371 | UNIT I | 2 | 28 | 15.1163 | 6.74451 | 11.2419 | 2.31883 | 8.92311 |
| 7 | 0.154117 | 3.91722 | UNIT I | 2 | 28 | 15.5845 | 6.95343 | 11.8578 | 2.54171 | 9.31604 |
| 8 | 0.154117 | 4.23797 | UNIT I | 2 | 28 | 15.9104 | 7.09883 | 12.3394 | 2.74983 | 9.58953 |
| 9 | 0.154117 | 4.53985 | UNIT I | 2 | 28 | 16.1143 | 7.18978 | 12.7063 | 2.94571 | 9.76056 |
| 10 | 0.154117 | 4.82159 | UNIT I | 2 | 28 | 16.2008 | 7.22841 | 12.9617 | 3.12852 | 9.83323 |
| 11 | 0.154117 | 5.08178 | UNIT I | 2 | 28 | 16.1747 | 7.21673 | 13.1086 | 3.29735 | 9.81123 |
| 12 | 0.154117 | 5.31877 | UNIT I | 2 | 28 | 16.04 | 7.15666 | 13.1494 | 3.45112 | 9.69826 |
| 13 | 0.154117 | 5.53067 | UNIT I | 2 | 28 | 15.801 | 7.04999 | 13.0863 | 3.58861 | 9.49767 |
| 14 | 0.154117 | 5.7153 | UNIT I | 2 | 28 | 15.4613 | 6.89843 | 12.921 | 3.70841 | 9.2126 |
| 15 | 0.154117 | 5.87006 | UNIT I | 2 | 28 | 15.0245 | 6.70357 | 12.655 | 3.80882 | 8.84614 |
| 16 | 0.154117 | 5.99187 | UNIT I | 2 | 28 | 14.4941 | 6.46691 | 12.2889 | 3.88787 | 8.40104 |
| 17 | 0.154117 | 6.01379 | UNIT I | 2 | 28 | 13.7627 | 6.14056 | 11.6893 | 3.90209 | 7.78725 |
| 18 | 0.154117 | 5.77244 | UNIT I | 2 | 28 | 12.5954 | 5.61976 | 10.5533 | 3.74549 | 6.80777 |
| 19 | 0.154117 | 5.46465 | UNIT I | 2 | 28 | 11.3779 | 5.07653 | 9.33188 | 3.54577 | 5.78611 |
| 20 | 0.154117 | 4.95282 | UNIT I | 2 | 28 | 9.93639 | 4.43337 | 7.79019 | 3.21367 | 4.57652 |
| 21 | 0.154117 | 4.25489 | UNIT I | 2 | 28 | 8.36105 | 3.73049 | 6.01541 | 2.76081 | 3.2546 |
| 22 | 0.154117 | 3.48075 | UNIT I | 2 | 28 | 6.84288 | 3.05312 | 4.23913 | 2.25851 | 1.98062 |
| 23 | 0.154117 | 2.61233 | UNIT I | 2 | 28 | 5.38874 | 2.40432 | 2.45544 | 1.69503 | 0.760411 |
| 24 | 0.154117 | 1.62248 | UNIT I | 2 | 28 | 4.00909 | 1.78876 | 0.655465 | 1.05275 | -0.397285 |
| 25 | 0.154117 | 0.514175 | UNIT I | 2 | 28 | 2.79139 | 1.24545 | -1.08548 | 0.333626 | -1.41911 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.45212

| 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 | 0.154117 | 0.132883 | UNIT I | 2 | 28 | 7.28592 | 3.29411 | 2.52009 | 0.0862223 | 2.43386 |
| 2 | 0.154117 | 0.758397 | UNIT I | 2 | 28 | 9.37791 | 4.23994 | 4.70481 | 0.492091 | 4.21272 |
| 3 | 0.154117 | 1.51539 | UNIT I | 2 | 28 | 11.6761 | 5.27901 | 7.15021 | 0.983273 | 6.16694 |
| 4 | 0.154117 | 2.25802 | UNIT I | 2 | 28 | 13.64 | 6.16692 | 9.30194 | 1.46513 | 7.83681 |
| 5 | 0.154117 | 2.98556 | UNIT I | 2 | 28 | 15.2972 | 6.91615 | 11.1831 | 1.9372 | 9.24594 |
| 6 | 0.154117 | 3.57371 | UNIT I | 2 | 28 | 16.3105 | 7.37431 | 12.4264 | 2.31883 | 10.1076 |
| 7 | 0.154117 | 3.91722 | UNIT I | 2 | 28 | 16.4781 | 7.45009 | 12.7918 | 2.54171 | 10.2501 |
| 8 | 0.154117 | 4.23797 | UNIT I | 2 | 28 | 16.5078 | 7.46351 | 13.0252 | 2.74983 | 10.2754 |
| 9 | 0.154117 | 4.53985 | UNIT I | 2 | 28 | 16.4245 | 7.42585 | 13.1502 | 2.94571 | 10.2045 |
| 10 | 0.154117 | 4.82159 | UNIT I | 2 | 28 | 16.2371 | 7.34113 | 13.1738 | 3.12852 | 10.0452 |
| 11 | 0.154117 | 5.08178 | UNIT I | 2 | 28 | 15.9535 | 7.21289 | 13.1014 | 3.29735 | 9.80402 |
| 12 | 0.154117 | 5.31877 | UNIT I | 2 | 28 | 15.5801 | 7.04409 | 12.9377 | 3.45112 | 9.48656 |
| 13 | 0.154117 | 5.53067 | UNIT I | 2 | 28 | 15.1226 | 6.83723 | 12.6861 | 3.58861 | 9.09752 |
| 14 | 0.154117 | 5.7153 | UNIT I | 2 | 28 | 14.5854 | 6.59433 | 12.3491 | 3.70841 | 8.64066 |
| 15 | 0.154117 | 5.87006 | UNIT I | 2 | 28 | 13.9719 | 6.31697 | 11.9279 | 3.80882 | 8.11906 |
| 16 | 0.154117 | 5.99187 | UNIT I | 2 | 28 | 13.2849 | 6.00635 | 11.4227 | 3.88787 | 7.53484 |
| 17 | 0.154117 | 6.01379 | UNIT I | 2 | 28 | 12.4407 | 5.62471 | 10.7192 | 3.90209 | 6.81708 |
| 18 | 0.154117 | 5.77244 | UNIT I | 2 | 28 | 11.2717 | 5.09614 | 9.56848 | 3.74549 | 5.82299 |
| 19 | 0.154117 | 5.46465 | UNIT I | 2 | 28 | 10.0875 | 4.56077 | 8.36188 | 3.54577 | 4.81611 |
| 20 | 0.154117 | 4.95282 | UNIT I | 2 | 28 | 8.77802 | 3.96872 | 6.91629 | 3.21367 | 3.70262 |
| 21 | 0.154117 | 4.25489 | UNIT I | 2 | 28 | 7.44052 | 3.36401 | 5.32613 | 2.76081 | 2.56532 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 0.154117 | 3.48075 | UNIT I | 2 | 28 | 6.23521 | 2.81906 | 3.79894 | 2.25851 | 1.54043 |
| 23 | 0.154117 | 2.61233 | UNIT I | 2 | 28 | 5.20752 | 2.35442 | 2.3616 | 1.69503 | 0.666571 |
| 24 | 0.154117 | 1.62248 | UNIT I | 2 | 28 | 4.43643 | 2.0058 | 1.06366 | 1.05275 | 0.0109113 |
| 25 | 0.154117 | 0.514175 | UNIT I | 2 | 28 | 4.19684 | 1.89748 | 0.140808 | 0.333626 | -0.192818 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 0.458108

| 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 | 0.154117 | 0.132883 | UNIT I | 2 | 28 | 9.03837 | 4.14055 | 4.11201 | 0.0862223 | 4.02579 |
| 2 | 0.154117 | 0.758397 | UNIT I | 2 | 28 | 14.5393 | 6.66057 | 9.25733 | 0.492091 | 8.76524 |
| 3 | 0.154117 | 1.51539 | UNIT I | 2 | 28 | 15.0043 | 6.87359 | 10.1492 | 0.983273 | 9.16588 |
| 4 | 0.154117 | 2.25802 | UNIT I | 2 | 28 | 16.6499 | 7.62744 | 12.0488 | 1.46513 | 10.5837 |
| 5 | 0.154117 | 2.98556 | UNIT I | 2 | 28 | 12.4701 | 5.71263 | 8.91962 | 1.9372 | 6.98242 |
| 6 | 0.154117 | 3.57371 | UNIT I | 2 | 28 | 10.7643 | 4.93123 | 7.83167 | 2.31883 | 5.51284 |
| 7 | 0.154117 | 3.91722 | UNIT I | 2 | 28 | 15.5376 | 7.1179 | 12.1671 | 2.54171 | 9.62536 |
| 8 | 0.154117 | 4.23797 | UNIT I | 2 | 28 | 16.5153 | 7.56579 | 13.2176 | 2.74983 | 10.4678 |
| 9 | 0.154117 | 4.53985 | UNIT I | 2 | 28 | 16.3157 | 7.47433 | 13.2414 | 2.94571 | 10.2957 |
| 10 | 0.154117 | 4.82159 | UNIT I | 2 | 28 | 16.0138 | 7.33605 | 13.1642 | 3.12852 | 10.0357 |
| 11 | 0.154117 | 5.08178 | UNIT I | 2 | 28 | 15.6234 | 7.15722 | 12.9967 | 3.29735 | 9.69934 |
| 12 | 0.154117 | 5.31877 | UNIT I | 2 | 28 | 15.1576 | 6.9438 | 12.749 | 3.45112 | 9.29793 |
| 13 | 0.154117 | 5.53067 | UNIT I | 2 | 28 | 14.6285 | 6.70144 | 12.4307 | 3.58861 | 8.84214 |
| 14 | 0.154117 | 5.7153 | UNIT I | 2 | 28 | 14.048 | 6.43549 | 12.0503 | 3.70841 | 8.34194 |
| 15 | 0.154117 | 5.87006 | UNIT I | 2 | 28 | 13.4268 | 6.15093 | 11.6156 | 3.80882 | 7.80676 |
| 16 | 0.154117 | 5.99187 | UNIT I | 2 | 28 | 11.3307 | 5.19069 | 9.8887 | 3.88787 | 6.00083 |
| 17 | 0.154117 | 6.01379 | UNIT I | 2 | 28 | 10.5595 | 4.83741 | 9.23848 | 3.90209 | 5.33639 |
| 18 | 0.154117 | 5.77244 | UNIT I | 2 | 28 | 11.25 | 5.15371 | 9.67677 | 3.74549 | 5.93128 |
| 19 | 0.154117 | 5.46465 | UNIT I | 2 | 28 | 10.2134 | 4.67886 | 8.58396 | 3.54577 | 5.03819 |
| 20 | 0.154117 | 4.95282 | UNIT I | 2 | 28 | 9.82611 | 4.50142 | 7.91815 | 3.21367 | 4.70448 |
| 21 | 0.154117 | 4.25489 | UNIT I | 2 | 28 | 8.68981 | 3.98087 | 6.4863 | 2.76081 | 3.72549 |
| 22 | 0.154117 | 3.48075 | UNIT I | 2 | 28 | 7.01322 | 3.21281 | 4.53947 | 2.25851 | 2.28096 |
| 23 | 0.154117 | 2.61233 | UNIT I | 2 | 28 | 5.38156 | 2.46534 | 2.57019 | 1.69503 | 0.875156 |
| 24 | 0.154117 | 1.62248 | UNIT I | 2 | 28 | 3.57052 | 1.63569 | 0.367577 | 1.05275 | -0.685173 |
| 25 | 0.154117 | 0.514175 | UNIT I | 2 | 28 | 2.78993 | 1.27809 | -1.02409 | 0.333626 | -1.35771 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.453451

| 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 | 0.154117 | 0.132883 | UNIT I | 2 | 28 | 6.29663 | 2.85521 | 1.69465 | 0.0862223 | 1.60842 |
| 2 | 0.154117 | 0.758397 | UNIT I | 2 | 28 | 9.23714 | 4.18859 | 4.60824 | 0.492091 | 4.11615 |
| 3 | 0.154117 | 1.51539 | UNIT I | 2 | 28 | 11.4532 | 5.19346 | 6.9893 | 0.983273 | 6.00603 |
| 4 | 0.154117 | 2.25802 | UNIT I | 2 | 28 | 13.6541 | 6.19145 | 9.34813 | 1.46513 | 7.883 |
| 5 | 0.154117 | 2.98556 | UNIT I | 2 | 28 | 14.3892 | 6.52479 | 10.4471 | 1.9372 | 8.50988 |
| 6 | 0.154117 | 3.57371 | UNIT I | 2 | 28 | 14.6504 | 6.64325 | 11.0515 | 2.31883 | 8.7327 |
| 7 | 0.154117 | 3.91722 | UNIT I | 2 | 28 | 16.2001 | 7.34594 | 12.596 | 2.54171 | 10.0543 |
| 8 | 0.154117 | 4.23797 | UNIT I | 2 | 28 | 16.733 | 7.58759 | 13.2586 | 2.74983 | 10.5087 |
| 9 | 0.154117 | 4.53985 | UNIT I | 2 | 28 | 16.7744 | 7.60639 | 13.4898 | 2.94571 | 10.5441 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 0.154117 | 4.82159 | UNIT I | 2 | 28 | 16.6661 | 7.55724 | 13.5802 | 3.12852 | 10.4517 |
| 11 | 0.154117 | 5.08178 | UNIT I | 2 | 28 | 16.4162 | 7.44393 | 13.5359 | 3.29735 | 10.2385 |
| 12 | 0.154117 | 5.31877 | UNIT I | 2 | 28 | 16.0346 | 7.27092 | 13.3643 | 3.45112 | 9.91316 |
| 13 | 0.154117 | 5.53067 | UNIT I | 2 | 28 | 15.5328 | 7.04336 | 13.0738 | 3.58861 | 9.48517 |
| 14 | 0.154117 | 5.7153 | UNIT I | 2 | 28 | 14.9241 | 6.76736 | 12.6745 | 3.70841 | 8.9661 |
| 15 | 0.154117 | 5.87006 | UNIT I | 2 | 28 | 14.2244 | 6.45009 | 12.1782 | 3.80882 | 8.36939 |
| 16 | 0.154117 | 5.99187 | UNIT I | 2 | 28 | 12.7317 | 5.77321 | 10.9843 | 3.88787 | 7.09639 |
| 17 | 0.154117 | 6.01379 | UNIT I | 2 | 28 | 11.6973 | 5.30413 | 10.1162 | 3.90209 | 6.21415 |
| 18 | 0.154117 | 5.77244 | UNIT I | 2 | 28 | 11.4007 | 5.16965 | 9.70673 | 3.74549 | 5.96124 |
| 19 | 0.154117 | 5.46465 | UNIT I | 2 | 28 | 10.1373 | 4.59675 | 8.42954 | 3.54577 | 4.88377 |
| 20 | 0.154117 | 4.95282 | UNIT I | 2 | 28 | 9.25154 | 4.19512 | 7.34208 | 3.21367 | 4.12841 |
| 21 | 0.154117 | 4.25489 | UNIT I | 2 | 28 | 8.13607 | 3.68931 | 5.93795 | 2.76081 | 3.17714 |
| 22 | 0.154117 | 3.48075 | UNIT I | 2 | 28 | 6.65346 | 3.01702 | 4.17123 | 2.25851 | 1.91272 |
| 23 | 0.154117 | 2.61233 | UNIT I | 2 | 28 | 5.26831 | 2.38892 | 2.42647 | 1.69503 | 0.73144 |
| 24 | 0.154117 | 1.62248 | UNIT I | 2 | 28 | 4.00473 | 1.81595 | 0.706602 | 1.05275 | -0.346148 |
| 25 | 0.154117 | 0.514175 | UNIT I | 2 | 28 | 2.86621 | 1.29968 | -0.983476 | 0.333626 | -1.3171 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 0.445314

| 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 | 0.154117 | 0.132883 | UNIT I | 2 | 28 | 2.98562 | 1.32954 | -1.17473 | 0.0862223 | -1.26096 |
| 2 | 0.154117 | 0.758397 | UNIT I | 2 | 28 | 5.68762 | 2.53278 | 1.4941 | 0.492091 | 1.00201 |
| 3 | 0.154117 | 1.51539 | UNIT I | 2 | 28 | 8.7501 | 3.89654 | 4.55015 | 0.983273 | 3.56688 |
| 4 | 0.154117 | 2.25802 | UNIT I | 2 | 28 | 11.581 | 5.1572 | 7.40297 | 1.46513 | 5.93784 |
| 5 | 0.154117 | 2.98556 | UNIT I | 2 | 28 | 14.1021 | 6.27987 | 9.98646 | 1.9372 | 8.04926 |
| 6 | 0.154117 | 3.57371 | UNIT I | 2 | 28 | 15.8728 | 7.06837 | 11.851 | 2.31883 | 9.53221 |
| 7 | 0.154117 | 3.91722 | UNIT I | 2 | 28 | 16.5987 | 7.39162 | 12.6819 | 2.54171 | 10.1402 |
| 8 | 0.154117 | 4.23797 | UNIT I | 2 | 28 | 17.0041 | 7.57217 | 13.2296 | 2.74983 | 10.4797 |
| 9 | 0.154117 | 4.53985 | UNIT I | 2 | 28 | 17.1307 | 7.62852 | 13.5314 | 2.94571 | 10.5857 |
| 10 | 0.154117 | 4.82159 | UNIT I | 2 | 28 | 17.019 | 7.57882 | 13.6208 | 3.12852 | 10.4923 |
| 11 | 0.154117 | 5.08178 | UNIT I | 2 | 28 | 16.7192 | 7.4453 | 13.5385 | 3.29735 | 10.2411 |
| 12 | 0.154117 | 5.31877 | UNIT I | 2 | 28 | 16.2844 | 7.25166 | 13.328 | 3.45112 | 9.87691 |
| 13 | 0.154117 | 5.53067 | UNIT I | 2 | 28 | 15.7653 | 7.02052 | 13.0308 | 3.58861 | 9.44223 |
| 14 | 0.154117 | 5.7153 | UNIT I | 2 | 28 | 15.2058 | 6.77136 | 12.682 | 3.70841 | 8.97363 |
| 15 | 0.154117 | 5.87006 | UNIT I | 2 | 28 | 14.6395 | 6.51918 | 12.3082 | 3.80882 | 8.49934 |
| 16 | 0.154117 | 5.99187 | UNIT I | 2 | 28 | 14.0886 | 6.27387 | 11.9258 | 3.88787 | 8.03797 |
| 17 | 0.154117 | 6.01379 | UNIT I | 2 | 28 | 13.4515 | 5.99016 | 11.4065 | 3.90209 | 7.50438 |
| 18 | 0.154117 | 5.77244 | UNIT I | 2 | 28 | 12.4681 | 5.55221 | 10.4262 | 3.74549 | 6.68071 |
| 19 | 0.154117 | 5.46465 | UNIT I | 2 | 28 | 11.4935 | 5.11822 | 9.41029 | 3.54577 | 5.86452 |
| 20 | 0.154117 | 4.95282 | UNIT I | 2 | 28 | 10.2953 | 4.58466 | 8.07472 | 3.21367 | 4.86105 |
| 21 | 0.154117 | 4.25489 | UNIT I | 2 | 28 | 8.89368 | 3.96048 | 6.44795 | 2.76081 | 3.68714 |
| 22 | 0.154117 | 3.48075 | UNIT I | 2 | 28 | 7.4302 | 3.30877 | 4.71995 | 2.25851 | 2.46144 |
| 23 | 0.154117 | 2.61233 | UNIT I | 2 | 28 | 5.83437 | 2.59813 | 2.81995 | 1.69503 | 1.12492 |
| 24 | 0.154117 | 1.62248 | UNIT I | 2 | 28 | 4.01201 | 1.78661 | 0.651417 | 1.05275 | -0.401333 |
| 25 | 0.154117 | 0.514175 | UNIT I | 2 | 28 | 1.90605 | 0.84879 | -1.83149 | 0.333626 | -2.16512 |

## *List Of Coordinates*

## Water Table

| X | Y |
|---|---|
| -7.22118 | 0.864 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

## External Boundary

| X | Y |
|---|---|
| -7.22118 | 4.87717 |
| -7.22118 | 0.864 |
| -7.22118 | -3.44395 |
| -7.22118 | -5.39909 |
| -4.18484 | -5.39909 |
| 49.9902 | -5.39909 |
| 49.9902 | 9.76285 |
| 49.9902 | 15.7927 |
| 49.9902 | 17.787 |
| 49.9902 | 21.0279 |
| 49.9902 | 23.8629 |
| 48.6865 | 23.1062 |
| 47.8664 | 22.7068 |
| 47.0674 | 22.2234 |
| 46.6258 | 21.7399 |
| 45.7847 | 21.3196 |
| 45.3851 | 20.8782 |
| 43.6609 | 17.8094 |
| 42.9761 | 16.0499 |
| 42.5174 | 15.4341 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 27.4875 | 14.3186 |
| 27.4445 | 14.3168 |
| 27.2003 | 14.1883 |
| 26.5834 | 13.5717 |
| 25.7224 | 12.801 |
| 24.9899 | 12.3128 |
| 23.6437 | 11.6418 |
| 23.2984 | 11.5524 |
| 22.5311 | 11.4757 |
| 22.0195 | 11.2967 |
| 21.1116 | 11.2584 |
| 20.3826 | 11.1561 |
| 19.7816 | 10.9771 |
| 17.3761 | 10.5131 |
| 16.6293 | 10.2749 |

| | |
|---|---|
| 15.7792 | 10.2113 |
| 14.3889 | 10.0446 |
| 12.514 | 9.86192 |
| 11.1768 | 9.55661 |
| 10.7629 | 9.3793 |
| 10.5624 | 9.27457 |
| 10.3293 | 9.15274 |
| 9.87595 | 9.00005 |
| 9.59509 | 8.75871 |
| 9.44235 | 8.6601 |
| 9.12206 | 8.45334 |
| 8.7464 | 8.31738 |
| 8.5505 | 8.24647 |
| 8.24707 | 8.11781 |
| 7.9937 | 7.98051 |
| 7.62053 | 7.73837 |
| 7.10879 | 7.20477 |
| 6.80797 | 6.79327 |
| 6.24421 | 6.35423 |
| 6.04432 | 6.24523 |
| 5.80445 | 6.1963 |
| 4.96247 | 6.09843 |
| 3.55263 | 5.94674 |
| 2.46637 | 5.95601 |
| 2.37408 | 5.97731 |
| 2.19776 | 5.96607 |
| 1.33058 | 5.75328 |
| 0.562161 | 5.61447 |
| -0.0303637 | 5.49417 |
| -0.539558 | 5.31833 |
| -1.58574 | 5.19803 |
| -2.70597 | 5.15175 |
| -3.32627 | 4.98518 |
| -5.4581 | 4.92122 |
| -5.8548 | 4.89919 |
| -6.3176 | 4.84044 |

## Material Boundary

| X | Y |
|---|---|
| 5.80445 | 6.1963 |
| 6.24488 | 6.19908 |

## Material Boundary

| X | Y |
|---|---|
| 9.74793 | 6.17913 |
| 31.5166 | 11.426 |

| | |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

## Material Boundary

| X | Y |
|---|---|
| -7.22118 | -3.44395 |
| 14.9068 | 2.35905 |
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |
| 49.9902 | 15.7927 |

## Material Boundary

| X | Y |
|---|---|
| -4.18484 | -5.39909 |
| 49.9902 | 9.76285 |

## Material Boundary

| X | Y |
|---|---|
| -7.22118 | 0.864 |
| 40.9932 | 12.499 |

## Material Boundary

| X | Y |
|---|---|
| 6.24488 | 6.19908 |
| 9.74793 | 6.17913 |

## Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 21.0279 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: BA S60Λ-SLIDE RU=0.10full lim c=2 phi=28
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/3/2021, 20:34:28

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT |
|---|---|---|---|---|---|
| Color | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 |
| Cohesion [kPa] | 2 | 5 | 7 | 60 | 5 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 |
| Water Surface | None | None | Water Table | Water Table | Water Table |
| Hu Value | | | 1 | 1 | 1 |
| Ru Value | 0.1 | 0.1 | | | |

## Global Minimums

### Method: ordinary/fellenius

FS: 1.148570
Center: 17.113, 51.934
Radius: 4.579
Left Slip Surface Endpoint: 16.218, 47.443
Right Slip Surface Endpoint: 21.562, 50.849
Resisting Moment=224.868 kN-m
Driving Moment=195.781 kN-m

### Method: bishop simplified

FS: 1.219440
Center: 18.055, 51.905
Radius: 3.561
Left Slip Surface Endpoint: 18.075, 48.345
Right Slip Surface Endpoint: 21.428, 50.766
Resisting Moment=81.0095 kN-m
Driving Moment=66.4316 kN-m

## Method: janbu simplified

FS: 1.089790
Center: 17.113, 51.934
Radius: 4.579
Left Slip Surface Endpoint: 16.218, 47.443
Right Slip Surface Endpoint: 21.562, 50.849
Resisting Horizontal Force=41.8208 kN
Driving Horizontal Force=38.375 kN

## Method: janbu corrected

FS: 1.168480
Center: 17.113, 51.934
Radius: 4.579
Left Slip Surface Endpoint: 16.218, 47.443
Right Slip Surface Endpoint: 21.562, 50.849
Resisting Horizontal Force=44.8405 kN
Driving Horizontal Force=38.375 kN

## Method: spencer

FS: 1.215820
Center: 18.055, 51.905
Radius: 3.561
Left Slip Surface Endpoint: 18.075, 48.345
Right Slip Surface Endpoint: 21.428, 50.766
Resisting Moment=80.7688 kN-m
Driving Moment=66.4316 kN-m
Resisting Horizontal Force=18.3498 kN
Driving Horizontal Force=15.0926 kN

## Method: corp of eng#1

FS: 1.245320
Center: 18.055, 51.905
Radius: 3.561
Left Slip Surface Endpoint: 18.075, 48.345
Right Slip Surface Endpoint: 21.428, 50.766
Resisting Horizontal Force=18.5339 kN
Driving Horizontal Force=14.8829 kN

## Method: corp of eng#2

FS: 1.251620
Center: 18.055, 51.905
Radius: 3.561
Left Slip Surface Endpoint: 18.075, 48.345
Right Slip Surface Endpoint: 21.428, 50.766
Resisting Horizontal Force=18.5565 kN
Driving Horizontal Force=14.8259 kN

## Method: lowe-karafiath

FS: 1.233650
Center: 18.055, 51.905
Radius: 3.561
Left Slip Surface Endpoint: 18.075, 48.345

Right Slip Surface Endpoint: 21.428, 50.766
Resisting Horizontal Force=18.4545 kN
Driving Horizontal Force=14.9592 kN

### Method: gle/morgenstern-price

FS: 1.212300
Center: 18.055, 51.905
Radius: 3.561
Left Slip Surface Endpoint: 18.075, 48.345
Right Slip Surface Endpoint: 21.428, 50.766
Resisting Moment=80.5352 kN-m
Driving Moment=66.4316 kN-m
Resisting Horizontal Force=18.3463 kN
Driving Horizontal Force=15.1334 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 9190
Number of Invalid Surfaces: 810

**Error Codes:**

Error Code -105 reported for 239 surfaces
Error Code -106 reported for 84 surfaces
Error Code -108 reported for 232 surfaces
Error Code -114 reported for 251 surfaces
Error Code -123 reported for 4 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 9190
Number of Invalid Surfaces: 810

**Error Codes:**

Error Code -105 reported for 239 surfaces
Error Code -106 reported for 84 surfaces
Error Code -108 reported for 232 surfaces
Error Code -114 reported for 251 surfaces
Error Code -123 reported for 4 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 8981
Number of Invalid Surfaces: 1019

**Error Codes:**

Error Code -105 reported for 239 surfaces
Error Code -106 reported for 84 surfaces
Error Code -108 reported for 441 surfaces
Error Code -114 reported for 251 surfaces
Error Code -123 reported for 4 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 8981
Number of Invalid Surfaces: 1019

**Error Codes:**

Error Code -105 reported for 239 surfaces
Error Code -106 reported for 84 surfaces
Error Code -108 reported for 441 surfaces
Error Code -114 reported for 251 surfaces
Error Code -123 reported for 4 surfaces

## Method: spencer

Number of Valid Surfaces: 8963
Number of Invalid Surfaces: 1037

**Error Codes:**

Error Code -105 reported for 239 surfaces
Error Code -106 reported for 84 surfaces
Error Code -108 reported for 444 surfaces
Error Code -111 reported for 15 surfaces
Error Code -114 reported for 251 surfaces
Error Code -123 reported for 4 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 8570
Number of Invalid Surfaces: 1430

**Error Codes:**

Error Code -105 reported for 239 surfaces
Error Code -106 reported for 84 surfaces
Error Code -108 reported for 478 surfaces
Error Code -111 reported for 374 surfaces
Error Code -114 reported for 251 surfaces
Error Code -123 reported for 4 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 7642
Number of Invalid Surfaces: 2358

**Error Codes:**

Error Code -105 reported for 239 surfaces
Error Code -106 reported for 84 surfaces
Error Code -108 reported for 1246 surfaces
Error Code -111 reported for 534 surfaces
Error Code -114 reported for 251 surfaces
Error Code -123 reported for 4 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 4259
Number of Invalid Surfaces: 5741

**Error Codes:**

Error Code -105 reported for 239 surfaces
Error Code -106 reported for 84 surfaces
Error Code -108 reported for 4419 surfaces
Error Code -111 reported for 744 surfaces
Error Code -114 reported for 251 surfaces
Error Code -123 reported for 4 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 8978
Number of Invalid Surfaces: 1022

**Error Codes:**

Error Code -105 reported for 239 surfaces
Error Code -106 reported for 84 surfaces
Error Code -108 reported for 443 surfaces
Error Code -111 reported for 1 surface
Error Code -114 reported for 251 surfaces
Error Code -123 reported for 4 surfaces

**Error Codes**

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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).
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

# *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.14857

| 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 | 0.213759 | 0.261147 | UNIT I | 2 | 28 | 2.23519 | 2.56728 | 1.18906 | 0.122169 | 1.06689 |
| 2 | 0.213759 | 0.76247 | UNIT I | 2 | 28 | 3.204 | 3.68002 | 3.51635 | 0.356696 | 3.15965 |
| 3 | 0.213759 | 1.22222 | UNIT I | 2 | 28 | 4.10872 | 4.71915 | 5.68576 | 0.571776 | 5.11398 |
| 4 | 0.213759 | 1.64101 | UNIT I | 2 | 28 | 4.93649 | 5.6699 | 7.66976 | 0.767692 | 6.90207 |
| 5 | 0.213759 | 2.01915 | UNIT I | 2 | 28 | 5.676 | 6.51928 | 9.44412 | 0.944591 | 8.49953 |
| 6 | 0.213759 | 2.35669 | UNIT I | 2 | 28 | 6.31752 | 7.25611 | 10.9878 | 1.1025 | 9.88531 |
| 7 | 0.213759 | 2.72467 | UNIT I | 2 | 28 | 6.99011 | 8.02863 | 12.6128 | 1.27465 | 11.3382 |
| 8 | 0.213759 | 3.14954 | UNIT I | 2 | 28 | 7.73332 | 8.88226 | 14.4171 | 1.47341 | 12.9436 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 0.213759 | 3.53293 | UNIT I | 2 | 28 | 8.34825 | 9.58855 | 15.9247 | 1.65276 | 14.272 |
| 10 | 0.213759 | 3.87312 | UNIT I | 2 | 28 | 8.82604 | 10.1373 | 17.116 | 1.81191 | 15.3041 |
| 11 | 0.213759 | 4.16864 | UNIT I | 2 | 28 | 9.16069 | 10.5217 | 17.9772 | 1.95016 | 16.027 |
| 12 | 0.213759 | 4.41763 | UNIT I | 2 | 28 | 9.34803 | 10.7369 | 18.4983 | 2.06664 | 16.4317 |
| 13 | 0.213759 | 4.63198 | UNIT I | 2 | 28 | 9.40954 | 10.8075 | 18.7314 | 2.16692 | 16.5645 |
| 14 | 0.213759 | 4.92213 | UNIT I | 2 | 28 | 9.52113 | 10.9357 | 19.1082 | 2.30265 | 16.8056 |
| 15 | 0.213759 | 5.18681 | UNIT I | 2 | 28 | 9.50678 | 10.9192 | 19.2011 | 2.42647 | 16.7746 |
| 16 | 0.213759 | 5.39104 | UNIT I | 2 | 28 | 9.31691 | 10.7011 | 18.8864 | 2.52202 | 16.3644 |
| 17 | 0.213759 | 5.52872 | UNIT I | 2 | 28 | 8.955 | 10.2854 | 18.1691 | 2.58642 | 15.5827 |
| 18 | 0.213759 | 5.59192 | UNIT I | 2 | 28 | 8.42804 | 9.68019 | 17.0603 | 2.61599 | 14.4443 |
| 19 | 0.213759 | 5.52894 | UNIT I | 2 | 28 | 7.70296 | 8.84739 | 15.4646 | 2.58653 | 12.8781 |
| 20 | 0.213759 | 5.32521 | UNIT I | 2 | 28 | 6.81186 | 7.8239 | 13.4444 | 2.49122 | 10.9532 |
| 21 | 0.213759 | 5.00087 | UNIT I | 2 | 28 | 5.82951 | 6.6956 | 11.1706 | 2.33949 | 8.83113 |
| 22 | 0.213759 | 4.52373 | UNIT I | 2 | 28 | 4.79093 | 5.50272 | 8.70393 | 2.11627 | 6.58766 |
| 23 | 0.213759 | 3.83683 | UNIT I | 2 | 28 | 3.74386 | 4.30009 | 6.12077 | 1.79493 | 4.32584 |
| 24 | 0.213759 | 2.77216 | UNIT I | 2 | 28 | 2.74022 | 3.14734 | 3.45471 | 1.29686 | 2.15785 |
| 25 | 0.213759 | 1.0648 | UNIT I | 2 | 28 | 1.94009 | 2.22833 | 0.92755 | 0.498129 | 0.429421 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.21944

| 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 | 0.134135 | 0.102232 | UNIT I | 2 | 28 | 1.91872 | 2.33977 | 0.715223 | 0.0762161 | 0.639007 |
| 2 | 0.134135 | 0.300237 | UNIT I | 2 | 28 | 2.45198 | 2.99005 | 2.08584 | 0.223832 | 1.86201 |
| 3 | 0.134135 | 0.485277 | UNIT I | 2 | 28 | 2.93176 | 3.57511 | 3.32413 | 0.361783 | 2.96235 |
| 4 | 0.134135 | 0.657231 | UNIT I | 2 | 28 | 3.35984 | 4.09712 | 4.43408 | 0.489978 | 3.94411 |
| 5 | 0.134135 | 0.81592 | UNIT I | 2 | 28 | 3.73763 | 4.55782 | 5.41884 | 0.608284 | 4.81056 |
| 6 | 0.134135 | 0.9611 | UNIT I | 2 | 28 | 4.06626 | 4.95856 | 6.28075 | 0.716518 | 5.56424 |
| 7 | 0.134135 | 1.11305 | UNIT I | 2 | 28 | 4.40067 | 5.36635 | 7.161 | 0.829801 | 6.3312 |
| 8 | 0.134135 | 1.29637 | UNIT I | 2 | 28 | 4.80339 | 5.85744 | 8.22126 | 0.966467 | 7.2548 |
| 9 | 0.134135 | 1.46665 | UNIT I | 2 | 28 | 5.15706 | 6.28873 | 9.15933 | 1.09342 | 8.06591 |
| 10 | 0.134135 | 1.62167 | UNIT I | 2 | 28 | 5.45728 | 6.65483 | 9.96346 | 1.20898 | 8.75448 |
| 11 | 0.134135 | 1.76073 | UNIT I | 2 | 28 | 5.70363 | 6.95523 | 10.6321 | 1.31266 | 9.3194 |
| 12 | 0.134135 | 1.883 | UNIT I | 2 | 28 | 5.89532 | 7.18899 | 11.1629 | 1.40381 | 9.75909 |
| 13 | 0.134135 | 1.98747 | UNIT I | 2 | 28 | 6.03121 | 7.3547 | 11.5525 | 1.4817 | 10.0708 |
| 14 | 0.134135 | 2.07293 | UNIT I | 2 | 28 | 6.10971 | 7.45042 | 11.7961 | 1.54541 | 10.2507 |
| 15 | 0.134135 | 2.13749 | UNIT I | 2 | 28 | 6.12773 | 7.4724 | 11.8857 | 1.59354 | 10.2921 |
| 16 | 0.134135 | 2.15918 | UNIT I | 2 | 28 | 6.0379 | 7.36286 | 11.6958 | 1.60971 | 10.0861 |
| 17 | 0.134135 | 2.14491 | UNIT I | 2 | 28 | 5.86005 | 7.14598 | 11.2773 | 1.59907 | 9.67818 |
| 18 | 0.134135 | 2.10322 | UNIT I | 2 | 28 | 5.61599 | 6.84836 | 10.6864 | 1.56799 | 9.11845 |
| 19 | 0.134135 | 2.03037 | UNIT I | 2 | 28 | 5.30063 | 6.4638 | 9.90885 | 1.51368 | 8.39517 |
| 20 | 0.134135 | 1.92141 | UNIT I | 2 | 28 | 4.90746 | 5.98435 | 8.92591 | 1.43245 | 7.49346 |
| 21 | 0.134135 | 1.76946 | UNIT I | 2 | 28 | 4.42798 | 5.39966 | 7.713 | 1.31917 | 6.39383 |
| 22 | 0.134135 | 1.56456 | UNIT I | 2 | 28 | 3.85093 | 4.69598 | 6.23679 | 1.16641 | 5.07038 |
| 23 | 0.134135 | 1.2851 | UNIT I | 2 | 28 | 3.15049 | 3.84183 | 4.42202 | 0.958063 | 3.46395 |
| 24 | 0.134135 | 0.883 | UNIT I | 2 | 28 | 2.27359 | 2.7725 | 2.11117 | 0.658293 | 1.45287 |
| 25 | 0.134135 | 0.326053 | UNIT I | 2 | 28 | 1.23529 | 1.50636 | -0.685322 | 0.243079 | -0.928401 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.08979

| 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 | 0.213759 | 0.261147 | UNIT I | 2 | 28 | 2.59283 | 2.82564 | 1.67498 | 0.122169 | 1.55281 |
| 2 | 0.213759 | 0.76247 | UNIT I | 2 | 28 | 3.6253 | 3.95082 | 4.02566 | 0.356696 | 3.66896 |
| 3 | 0.213759 | 1.22222 | UNIT I | 2 | 28 | 4.52038 | 4.92626 | 6.07526 | 0.571776 | 5.50349 |
| 4 | 0.213759 | 1.64101 | UNIT I | 2 | 28 | 5.28926 | 5.76418 | 7.84711 | 0.767692 | 7.07942 |
| 5 | 0.213759 | 2.01915 | UNIT I | 2 | 28 | 5.94091 | 6.47434 | 9.35959 | 0.944591 | 8.415 |
| 6 | 0.213759 | 2.35669 | UNIT I | 2 | 28 | 6.48244 | 7.0645 | 10.6274 | 1.1025 | 9.52493 |
| 7 | 0.213759 | 2.72467 | UNIT I | 2 | 28 | 7.05856 | 7.69235 | 11.9804 | 1.27465 | 10.7058 |
| 8 | 0.213759 | 3.14954 | UNIT I | 2 | 28 | 7.71607 | 8.4089 | 13.5268 | 1.47341 | 12.0534 |
| 9 | 0.213759 | 3.53293 | UNIT I | 2 | 28 | 8.26418 | 9.00622 | 14.8295 | 1.65276 | 13.1768 |
| 10 | 0.213759 | 3.87312 | UNIT I | 2 | 28 | 8.70449 | 9.48607 | 15.8912 | 1.81191 | 14.0793 |
| 11 | 0.213759 | 4.16864 | UNIT I | 2 | 28 | 9.03881 | 9.8504 | 16.7146 | 1.95016 | 14.7645 |
| 12 | 0.213759 | 4.41763 | UNIT I | 2 | 28 | 9.26794 | 10.1001 | 17.3007 | 2.06664 | 15.2341 |
| 13 | 0.213759 | 4.63198 | UNIT I | 2 | 28 | 9.41614 | 10.2616 | 17.7048 | 2.16692 | 15.5378 |
| 14 | 0.213759 | 4.92213 | UNIT I | 2 | 28 | 9.66907 | 10.5373 | 18.3589 | 2.30265 | 16.0563 |
| 15 | 0.213759 | 5.18681 | UNIT I | 2 | 28 | 9.85028 | 10.7347 | 18.8541 | 2.42647 | 16.4277 |
| 16 | 0.213759 | 5.39104 | UNIT I | 2 | 28 | 9.90416 | 10.7935 | 19.0601 | 2.52202 | 16.538 |
| 17 | 0.213759 | 5.52872 | UNIT I | 2 | 28 | 9.82478 | 10.707 | 18.9618 | 2.58642 | 16.3754 |
| 18 | 0.213759 | 5.59192 | UNIT I | 2 | 28 | 9.60406 | 10.4664 | 18.539 | 2.61599 | 15.923 |
| 19 | 0.213759 | 5.52894 | UNIT I | 2 | 28 | 9.17223 | 9.9958 | 17.6244 | 2.58653 | 15.0379 |
| 20 | 0.213759 | 5.32521 | UNIT I | 2 | 28 | 8.52137 | 9.2865 | 16.1951 | 2.49122 | 13.7039 |
| 21 | 0.213759 | 5.00087 | UNIT I | 2 | 28 | 7.69316 | 8.38393 | 14.3459 | 2.33949 | 12.0064 |
| 22 | 0.213759 | 4.52373 | UNIT I | 2 | 28 | 6.66027 | 7.2583 | 12.0057 | 2.11627 | 9.88944 |
| 23 | 0.213759 | 3.83683 | UNIT I | 2 | 28 | 5.37862 | 5.86157 | 9.05748 | 1.79493 | 7.26255 |
| 24 | 0.213759 | 2.77216 | UNIT I | 2 | 28 | 3.71989 | 4.0539 | 5.15968 | 1.29686 | 3.86282 |
| 25 | 0.213759 | 1.0648 | UNIT I | 2 | 28 | 1.60988 | 1.75443 | 0.0362707 | 0.498129 | -0.461858 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.16848

| 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 | 0.213759 | 0.261147 | UNIT I | 2 | 28 | 2.41822 | 2.82564 | 1.67498 | 0.122169 | 1.55281 |
| 2 | 0.213759 | 0.76247 | UNIT I | 2 | 28 | 3.38116 | 3.95082 | 4.02566 | 0.356696 | 3.66896 |
| 3 | 0.213759 | 1.22222 | UNIT I | 2 | 28 | 4.21596 | 4.92626 | 6.07526 | 0.571776 | 5.50349 |
| 4 | 0.213759 | 1.64101 | UNIT I | 2 | 28 | 4.93306 | 5.76418 | 7.84711 | 0.767692 | 7.07942 |
| 5 | 0.213759 | 2.01915 | UNIT I | 2 | 28 | 5.54082 | 6.47434 | 9.35959 | 0.944591 | 8.415 |
| 6 | 0.213759 | 2.35669 | UNIT I | 2 | 28 | 6.04589 | 7.0645 | 10.6274 | 1.1025 | 9.52493 |
| 7 | 0.213759 | 2.72467 | UNIT I | 2 | 28 | 6.58321 | 7.69235 | 11.9804 | 1.27465 | 10.7058 |
| 8 | 0.213759 | 3.14954 | UNIT I | 2 | 28 | 7.19644 | 8.4089 | 13.5268 | 1.47341 | 12.0534 |
| 9 | 0.213759 | 3.53293 | UNIT I | 2 | 28 | 7.70764 | 9.00622 | 14.8295 | 1.65276 | 13.1768 |
| 10 | 0.213759 | 3.87312 | UNIT I | 2 | 28 | 8.1183 | 9.48607 | 15.8912 | 1.81191 | 14.0793 |
| 11 | 0.213759 | 4.16864 | UNIT I | 2 | 28 | 8.4301 | 9.8504 | 16.7146 | 1.95016 | 14.7645 |
| 12 | 0.213759 | 4.41763 | UNIT I | 2 | 28 | 8.6438 | 10.1001 | 17.3007 | 2.06664 | 15.2341 |
| 13 | 0.213759 | 4.63198 | UNIT I | 2 | 28 | 8.78202 | 10.2616 | 17.7048 | 2.16692 | 15.5378 |
| 14 | 0.213759 | 4.92213 | UNIT I | 2 | 28 | 9.01792 | 10.5373 | 18.3589 | 2.30265 | 16.0563 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 0.213759 | 5.18681 | UNIT I | 2 | 28 | 9.18693 | 10.7347 | 18.8541 | 2.42647 | 16.4277 |
| 16 | 0.213759 | 5.39104 | UNIT I | 2 | 28 | 9.23717 | 10.7935 | 19.0601 | 2.52202 | 16.538 |
| 17 | 0.213759 | 5.52872 | UNIT I | 2 | 28 | 9.16314 | 10.707 | 18.9618 | 2.58642 | 16.3754 |
| 18 | 0.213759 | 5.59192 | UNIT I | 2 | 28 | 8.95729 | 10.4664 | 18.539 | 2.61599 | 15.923 |
| 19 | 0.213759 | 5.52894 | UNIT I | 2 | 28 | 8.55453 | 9.9958 | 17.6244 | 2.58653 | 15.0379 |
| 20 | 0.213759 | 5.32521 | UNIT I | 2 | 28 | 7.9475 | 9.2865 | 16.1951 | 2.49122 | 13.7039 |
| 21 | 0.213759 | 5.00087 | UNIT I | 2 | 28 | 7.17507 | 8.38393 | 14.3459 | 2.33949 | 12.0064 |
| 22 | 0.213759 | 4.52373 | UNIT I | 2 | 28 | 6.21175 | 7.2583 | 12.0057 | 2.11627 | 9.88944 |
| 23 | 0.213759 | 3.83683 | UNIT I | 2 | 28 | 5.01641 | 5.86157 | 9.05748 | 1.79493 | 7.26255 |
| 24 | 0.213759 | 2.77216 | UNIT I | 2 | 28 | 3.46938 | 4.0539 | 5.15968 | 1.29686 | 3.86282 |
| 25 | 0.213759 | 1.0648 | UNIT I | 2 | 28 | 1.50146 | 1.75443 | 0.0362707 | 0.498129 | -0.461858 |

**Global Minimum Query (spencer) - Safety Factor**: 1.21582

| 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 | 0.134135 | 0.102232 | UNIT I | 2 | 28 | 2.47555 | 3.00982 | 1.97541 | 0.0762161 | 1.8992 |
| 2 | 0.134135 | 0.300237 | UNIT I | 2 | 28 | 3.10816 | 3.77896 | 3.56957 | 0.223832 | 3.34574 |
| 3 | 0.134135 | 0.485277 | UNIT I | 2 | 28 | 3.64074 | 4.42648 | 4.92533 | 0.361783 | 4.56354 |
| 4 | 0.134135 | 0.657231 | UNIT I | 2 | 28 | 4.08329 | 4.96454 | 6.06547 | 0.489978 | 5.57549 |
| 5 | 0.134135 | 0.81592 | UNIT I | 2 | 28 | 4.44424 | 5.4034 | 7.00914 | 0.608284 | 6.40086 |
| 6 | 0.134135 | 0.9611 | UNIT I | 2 | 28 | 4.73073 | 5.75172 | 7.77247 | 0.716518 | 7.05596 |
| 7 | 0.134135 | 1.11305 | UNIT I | 2 | 28 | 5.0074 | 6.0881 | 8.51842 | 0.829801 | 7.68862 |
| 8 | 0.134135 | 1.29637 | UNIT I | 2 | 28 | 5.34026 | 6.49279 | 9.41615 | 0.966467 | 8.44968 |
| 9 | 0.134135 | 1.46665 | UNIT I | 2 | 28 | 5.60382 | 6.81324 | 10.1458 | 1.09342 | 9.05236 |
| 10 | 0.134135 | 1.62167 | UNIT I | 2 | 28 | 5.79802 | 7.04935 | 10.7054 | 1.20898 | 9.49647 |
| 11 | 0.134135 | 1.76073 | UNIT I | 2 | 28 | 5.9268 | 7.20592 | 11.1036 | 1.31266 | 9.79091 |
| 12 | 0.134135 | 1.883 | UNIT I | 2 | 28 | 5.99347 | 7.28698 | 11.3472 | 1.40381 | 9.94337 |
| 13 | 0.134135 | 1.98747 | UNIT I | 2 | 28 | 6.00085 | 7.29595 | 11.442 | 1.4817 | 9.96026 |
| 14 | 0.134135 | 2.07293 | UNIT I | 2 | 28 | 5.95124 | 7.23564 | 11.3922 | 1.54541 | 9.8468 |
| 15 | 0.134135 | 2.13749 | UNIT I | 2 | 28 | 5.84566 | 7.10727 | 11.1989 | 1.59354 | 9.6054 |
| 16 | 0.134135 | 2.15918 | UNIT I | 2 | 28 | 5.64737 | 6.86619 | 10.7617 | 1.60971 | 9.15196 |
| 17 | 0.134135 | 2.14491 | UNIT I | 2 | 28 | 5.37992 | 6.54101 | 10.1395 | 1.59907 | 8.54043 |
| 18 | 0.134135 | 2.10322 | UNIT I | 2 | 28 | 5.06656 | 6.16002 | 9.39184 | 1.56799 | 7.82385 |
| 19 | 0.134135 | 2.03037 | UNIT I | 2 | 28 | 4.70739 | 5.72334 | 8.51627 | 1.51368 | 7.00259 |
| 20 | 0.134135 | 1.92141 | UNIT I | 2 | 28 | 4.30192 | 5.23036 | 7.50787 | 1.43245 | 6.07542 |
| 21 | 0.134135 | 1.76946 | UNIT I | 2 | 28 | 3.84885 | 4.67951 | 6.35859 | 1.31917 | 5.03942 |
| 22 | 0.134135 | 1.56456 | UNIT I | 2 | 28 | 3.34554 | 4.06758 | 5.05499 | 1.16641 | 3.88858 |
| 23 | 0.134135 | 1.2851 | UNIT I | 2 | 28 | 2.77966 | 3.37957 | 3.55266 | 0.958063 | 2.59459 |
| 24 | 0.134135 | 0.883 | UNIT I | 2 | 28 | 2.12006 | 2.57761 | 1.74462 | 0.658293 | 1.08633 |
| 25 | 0.134135 | 0.326053 | UNIT I | 2 | 28 | 1.37044 | 1.6662 | -0.3847 | 0.243079 | -0.627779 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.24532

| 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 | 0.134135 | 0.102232 | UNIT I | 2 | 28 | 2.62881 | 3.27371 | 2.47171 | 0.0762161 | 2.3955 |
| 2 | 0.134135 | 0.300237 | UNIT I | 2 | 28 | 3.28006 | 4.08472 | 4.14463 | 0.223832 | 3.92079 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 0.134135 | 0.485277 | UNIT I | 2 | 28 | 3.81486 | 4.75072 | 5.53513 | 0.361783 | 5.17335 |
| 4 | 0.134135 | 0.657231 | UNIT I | 2 | 28 | 4.24688 | 5.28873 | 6.67519 | 0.489978 | 6.18521 |
| 5 | 0.134135 | 0.81592 | UNIT I | 2 | 28 | 4.58765 | 5.71309 | 7.59162 | 0.608284 | 6.98333 |
| 6 | 0.134135 | 0.9611 | UNIT I | 2 | 28 | 4.84688 | 6.03592 | 8.30699 | 0.716518 | 7.59048 |
| 7 | 0.134135 | 1.11305 | UNIT I | 2 | 28 | 5.09145 | 6.34048 | 8.99303 | 0.829801 | 8.16323 |
| 8 | 0.134135 | 1.29637 | UNIT I | 2 | 28 | 5.38719 | 6.70877 | 9.82234 | 0.966467 | 8.85588 |
| 9 | 0.134135 | 1.46665 | UNIT I | 2 | 28 | 5.60952 | 6.98565 | 10.4701 | 1.09342 | 9.37664 |
| 10 | 0.134135 | 1.62167 | UNIT I | 2 | 28 | 5.76038 | 7.17352 | 10.9389 | 1.20898 | 9.72995 |
| 11 | 0.134135 | 1.76073 | UNIT I | 2 | 28 | 5.84549 | 7.27951 | 11.242 | 1.31266 | 9.92933 |
| 12 | 0.134135 | 1.883 | UNIT I | 2 | 28 | 5.86984 | 7.30983 | 11.3902 | 1.40381 | 9.98637 |
| 13 | 0.134135 | 1.98747 | UNIT I | 2 | 28 | 5.83778 | 7.26991 | 11.3929 | 1.4817 | 9.91124 |
| 14 | 0.134135 | 2.07293 | UNIT I | 2 | 28 | 5.7531 | 7.16445 | 11.2583 | 1.54541 | 9.71292 |
| 15 | 0.134135 | 2.13749 | UNIT I | 2 | 28 | 5.61829 | 6.99657 | 10.9907 | 1.59354 | 9.39716 |
| 16 | 0.134135 | 2.15918 | UNIT I | 2 | 28 | 5.40069 | 6.72559 | 10.4972 | 1.60971 | 8.88752 |
| 17 | 0.134135 | 2.14491 | UNIT I | 2 | 28 | 5.12411 | 6.38116 | 9.83885 | 1.59907 | 8.23978 |
| 18 | 0.134135 | 2.10322 | UNIT I | 2 | 28 | 4.81137 | 5.99169 | 9.07525 | 1.56799 | 7.50726 |
| 19 | 0.134135 | 2.03037 | UNIT I | 2 | 28 | 4.46339 | 5.55835 | 8.20598 | 1.51368 | 6.6923 |
| 20 | 0.134135 | 1.92141 | UNIT I | 2 | 28 | 4.08024 | 5.08121 | 7.22737 | 1.43245 | 5.79492 |
| 21 | 0.134135 | 1.76946 | UNIT I | 2 | 28 | 3.6605 | 4.55849 | 6.13099 | 1.31917 | 4.81182 |
| 22 | 0.134135 | 1.56456 | UNIT I | 2 | 28 | 3.19992 | 3.98493 | 4.89952 | 1.16641 | 3.73311 |
| 23 | 0.134135 | 1.2851 | UNIT I | 2 | 28 | 2.68165 | 3.33951 | 3.47732 | 0.958063 | 2.51926 |
| 24 | 0.134135 | 0.883 | UNIT I | 2 | 28 | 2.06051 | 2.56599 | 1.72277 | 0.658293 | 1.06447 |
| 25 | 0.134135 | 0.326053 | UNIT I | 2 | 28 | 1.29387 | 1.61128 | -0.487994 | 0.243079 | -0.731073 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.25162

| 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 | 0.134135 | 0.102232 | UNIT I | 2 | 28 | 2.48774 | 3.11371 | 2.17081 | 0.0762161 | 2.09459 |
| 2 | 0.134135 | 0.300237 | UNIT I | 2 | 28 | 3.11579 | 3.89978 | 3.7968 | 0.223832 | 3.57297 |
| 3 | 0.134135 | 0.485277 | UNIT I | 2 | 28 | 3.63914 | 4.55482 | 5.16671 | 0.361783 | 4.80492 |
| 4 | 0.134135 | 0.657231 | UNIT I | 2 | 28 | 4.06906 | 5.09292 | 6.30691 | 0.489978 | 5.81694 |
| 5 | 0.134135 | 0.81592 | UNIT I | 2 | 28 | 4.41502 | 5.52593 | 7.2396 | 0.608284 | 6.63131 |
| 6 | 0.134135 | 0.9611 | UNIT I | 2 | 28 | 5.27643 | 6.60408 | 9.37553 | 0.716518 | 8.65901 |
| 7 | 0.134135 | 1.11305 | UNIT I | 2 | 28 | 5.89781 | 7.38182 | 10.9515 | 0.829801 | 10.1217 |
| 8 | 0.134135 | 1.29637 | UNIT I | 2 | 28 | 5.63767 | 7.05622 | 10.4758 | 0.966467 | 9.50936 |
| 9 | 0.134135 | 1.46665 | UNIT I | 2 | 28 | 5.65186 | 7.07398 | 10.6362 | 1.09342 | 9.54276 |
| 10 | 0.134135 | 1.62167 | UNIT I | 2 | 28 | 5.77879 | 7.23285 | 11.0505 | 1.20898 | 9.84156 |
| 11 | 0.134135 | 1.76073 | UNIT I | 2 | 28 | 5.83968 | 7.30906 | 11.2976 | 1.31266 | 9.98491 |
| 12 | 0.134135 | 1.883 | UNIT I | 2 | 28 | 5.84055 | 7.31015 | 11.3907 | 1.40381 | 9.98691 |
| 13 | 0.134135 | 1.98747 | UNIT I | 2 | 28 | 5.78669 | 7.24274 | 11.3419 | 1.4817 | 9.86019 |
| 14 | 0.134135 | 2.07293 | UNIT I | 2 | 28 | 5.62251 | 7.03725 | 11.0191 | 1.54541 | 9.47368 |
| 15 | 0.134135 | 2.13749 | UNIT I | 2 | 28 | 5.20723 | 6.51747 | 10.0897 | 1.59354 | 8.49611 |
| 16 | 0.134135 | 2.15918 | UNIT I | 2 | 28 | 5.10114 | 6.38469 | 9.85614 | 1.60971 | 8.24643 |
| 17 | 0.134135 | 2.14491 | UNIT I | 2 | 28 | 5.08908 | 6.36959 | 9.81708 | 1.59907 | 8.21801 |
| 18 | 0.134135 | 2.10322 | UNIT I | 2 | 28 | 4.77822 | 5.98051 | 9.05426 | 1.56799 | 7.48627 |
| 19 | 0.134135 | 2.03037 | UNIT I | 2 | 28 | 4.43256 | 5.54788 | 8.18625 | 1.51368 | 6.67257 |
| 20 | 0.134135 | 1.92141 | UNIT I | 2 | 28 | 4.05215 | 5.07175 | 7.20958 | 1.43245 | 5.77713 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 21 | 0.134135 | 1.76946 | UNIT I | 2 | 28 | 3.63554 | 4.55032 | 6.11559 | 1.31917 | 4.79642 |
| 22 | 0.134135 | 1.56456 | UNIT I | 2 | 28 | 3.15974 | 3.9548 | 4.84285 | 1.16641 | 3.67644 |
| 23 | 0.134135 | 1.2851 | UNIT I | 2 | 28 | 2.64893 | 3.31545 | 3.43207 | 0.958063 | 2.47401 |
| 24 | 0.134135 | 0.883 | UNIT I | 2 | 28 | 2.04798 | 2.56329 | 1.7177 | 0.658293 | 1.0594 |
| 25 | 0.134135 | 0.326053 | UNIT I | 2 | 28 | 1.31891 | 1.65077 | -0.413718 | 0.243079 | -0.656797 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.23365

| 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 | 0.134135 | 0.102232 | UNIT I | 2 | 28 | 2.17899 | 2.68811 | 1.37037 | 0.0762161 | 1.29415 |
| 2 | 0.134135 | 0.300237 | UNIT I | 2 | 28 | 2.805 | 3.46039 | 2.97043 | 0.223832 | 2.7466 |
| 3 | 0.134135 | 0.485277 | UNIT I | 2 | 28 | 3.36368 | 4.1496 | 4.40459 | 0.361783 | 4.0428 |
| 4 | 0.134135 | 0.657231 | UNIT I | 2 | 28 | 3.85447 | 4.75507 | 5.67152 | 0.489978 | 5.18154 |
| 5 | 0.134135 | 0.81592 | UNIT I | 2 | 28 | 4.27712 | 5.27647 | 6.77043 | 0.608284 | 6.16214 |
| 6 | 0.134135 | 0.9611 | UNIT I | 2 | 28 | 4.86071 | 5.99641 | 8.23269 | 0.716518 | 7.51618 |
| 7 | 0.134135 | 1.11305 | UNIT I | 2 | 28 | 5.34128 | 6.58927 | 9.46093 | 0.829801 | 8.63113 |
| 8 | 0.134135 | 1.29637 | UNIT I | 2 | 28 | 5.5327 | 6.82541 | 10.0418 | 0.966467 | 9.07532 |
| 9 | 0.134135 | 1.46665 | UNIT I | 2 | 28 | 5.77207 | 7.12071 | 10.7241 | 1.09342 | 9.63065 |
| 10 | 0.134135 | 1.62167 | UNIT I | 2 | 28 | 5.99488 | 7.39558 | 11.3566 | 1.20898 | 10.1476 |
| 11 | 0.134135 | 1.76073 | UNIT I | 2 | 28 | 6.13516 | 7.56864 | 11.7857 | 1.31266 | 10.4731 |
| 12 | 0.134135 | 1.883 | UNIT I | 2 | 28 | 6.19434 | 7.64165 | 12.0142 | 1.40381 | 10.6104 |
| 13 | 0.134135 | 1.98747 | UNIT I | 2 | 28 | 6.17447 | 7.61713 | 12.046 | 1.4817 | 10.5643 |
| 14 | 0.134135 | 2.07293 | UNIT I | 2 | 28 | 6.05095 | 7.46475 | 11.8231 | 1.54541 | 10.2777 |
| 15 | 0.134135 | 2.13749 | UNIT I | 2 | 28 | 5.75592 | 7.10079 | 11.1868 | 1.59354 | 9.59322 |
| 16 | 0.134135 | 2.15918 | UNIT I | 2 | 28 | 5.53808 | 6.83205 | 10.6975 | 1.60971 | 9.08777 |
| 17 | 0.134135 | 2.14491 | UNIT I | 2 | 28 | 5.32535 | 6.56962 | 10.1933 | 1.59907 | 8.59419 |
| 18 | 0.134135 | 2.10322 | UNIT I | 2 | 28 | 4.94334 | 6.09835 | 9.27588 | 1.56799 | 7.70789 |
| 19 | 0.134135 | 2.03037 | UNIT I | 2 | 28 | 4.5285 | 5.58659 | 8.25906 | 1.51368 | 6.74538 |
| 20 | 0.134135 | 1.92141 | UNIT I | 2 | 28 | 4.09456 | 5.05125 | 7.17101 | 1.43245 | 5.73856 |
| 21 | 0.134135 | 1.76946 | UNIT I | 2 | 28 | 3.65673 | 4.51112 | 6.04191 | 1.31917 | 4.72274 |
| 22 | 0.134135 | 1.56456 | UNIT I | 2 | 28 | 3.2171 | 3.96878 | 4.86914 | 1.16641 | 3.70273 |
| 23 | 0.134135 | 1.2851 | UNIT I | 2 | 28 | 2.75159 | 3.3945 | 3.58073 | 0.958063 | 2.62267 |
| 24 | 0.134135 | 0.883 | UNIT I | 2 | 28 | 2.16498 | 2.67082 | 1.91993 | 0.658293 | 1.26163 |
| 25 | 0.134135 | 0.326053 | UNIT I | 2 | 28 | 1.01196 | 1.2484 | -1.17047 | 0.243079 | -1.41355 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.2123

| 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 | 0.134135 | 0.102232 | UNIT I | 2 | 28 | 1.99884 | 2.4232 | 0.872137 | 0.0762161 | 0.795921 |
| 2 | 0.134135 | 0.300237 | UNIT I | 2 | 28 | 2.70558 | 3.27997 | 2.63111 | 0.223832 | 2.40727 |
| 3 | 0.134135 | 0.485277 | UNIT I | 2 | 28 | 3.3849 | 4.10351 | 4.31792 | 0.361783 | 3.95613 |
| 4 | 0.134135 | 0.657231 | UNIT I | 2 | 28 | 4.00778 | 4.85863 | 5.86628 | 0.489978 | 5.37631 |
| 5 | 0.134135 | 0.81592 | UNIT I | 2 | 28 | 4.54793 | 5.51346 | 7.21615 | 0.608284 | 6.60787 |
| 6 | 0.134135 | 0.9611 | UNIT I | 2 | 28 | 4.98501 | 6.04333 | 8.32091 | 0.716518 | 7.60439 |
| 7 | 0.134135 | 1.11305 | UNIT I | 2 | 28 | 5.36489 | 6.50386 | 9.30035 | 0.829801 | 8.47055 |
| 8 | 0.134135 | 1.29637 | UNIT I | 2 | 28 | 5.74649 | 6.96647 | 10.3071 | 0.966467 | 9.3406 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 0.134135 | 1.46665 | UNIT I | 2 | 28 | 6.00358 | 7.27814 | 11.0202 | 1.09342 | 9.92674 |
| 10 | 0.134135 | 1.62167 | UNIT I | 2 | 28 | 6.14087 | 7.44458 | 11.4488 | 1.20898 | 10.2398 |
| 11 | 0.134135 | 1.76073 | UNIT I | 2 | 28 | 6.17433 | 7.48514 | 11.6287 | 1.31266 | 10.316 |
| 12 | 0.134135 | 1.883 | UNIT I | 2 | 28 | 6.12377 | 7.42385 | 11.6046 | 1.40381 | 10.2008 |
| 13 | 0.134135 | 1.98747 | UNIT I | 2 | 28 | 6.01002 | 7.28595 | 11.4231 | 1.4817 | 9.94139 |
| 14 | 0.134135 | 2.07293 | UNIT I | 2 | 28 | 5.85222 | 7.09465 | 11.1271 | 1.54541 | 9.58166 |
| 15 | 0.134135 | 2.13749 | UNIT I | 2 | 28 | 5.66504 | 6.86773 | 10.7484 | 1.59354 | 9.15485 |
| 16 | 0.134135 | 2.15918 | UNIT I | 2 | 28 | 5.42118 | 6.5721 | 10.2086 | 1.60971 | 8.59889 |
| 17 | 0.134135 | 2.14491 | UNIT I | 2 | 28 | 5.1469 | 6.23959 | 9.57257 | 1.59907 | 7.9735 |
| 18 | 0.134135 | 2.10322 | UNIT I | 2 | 28 | 4.86352 | 5.89604 | 8.89538 | 1.56799 | 7.32739 |
| 19 | 0.134135 | 2.03037 | UNIT I | 2 | 28 | 4.5658 | 5.53512 | 8.16228 | 1.51368 | 6.6486 |
| 20 | 0.134135 | 1.92141 | UNIT I | 2 | 28 | 4.24487 | 5.14605 | 7.34931 | 1.43245 | 5.91686 |
| 21 | 0.134135 | 1.76946 | UNIT I | 2 | 28 | 3.88759 | 4.71293 | 6.42146 | 1.31917 | 5.10229 |
| 22 | 0.134135 | 1.56456 | UNIT I | 2 | 28 | 3.47411 | 4.21166 | 5.32594 | 1.16641 | 4.15953 |
| 23 | 0.134135 | 1.2851 | UNIT I | 2 | 28 | 2.96219 | 3.59106 | 3.95043 | 0.958063 | 2.99237 |
| 24 | 0.134135 | 0.883 | UNIT I | 2 | 28 | 2.26079 | 2.74076 | 2.05145 | 0.658293 | 1.39316 |
| 25 | 0.134135 | 0.326053 | UNIT I | 2 | 28 | 1.28444 | 1.55713 | -0.58984 | 0.243079 | -0.832919 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

### External Boundary

| X | Y |
|---|---|
| 42.2084 | 59.656 |
| 40.5299 | 57.6985 |
| 39.2201 | 56.0079 |
| 37.5797 | 54.3301 |
| 36.0284 | 53.0971 |
| 34.9857 | 52.3471 |
| 32.931 | 51.3318 |
| 32.4461 | 51.1888 |
| 32.1758 | 51.2126 |
| 31.6273 | 51.2126 |
| 31.1106 | 51.1173 |
| 30.8801 | 50.9584 |
| 30.4826 | 51.006 |
| 29.3379 | 51.0855 |
| 28.2568 | 51.1173 |
| 24.7792 | 51.0927 |

| | |
|---|---|
| 22.0128 | 50.9974 |
| 21.6472 | 50.902 |
| 21.0828 | 50.5524 |
| 20.0653 | 49.8134 |
| 18.9094 | 48.8644 |
| 17.5182 | 47.9982 |
| 14.7996 | 46.8381 |
| 11.6166 | 46.1137 |
| 9.81213 | 45.8117 |
| 9.0967 | 45.8514 |
| 8.0633 | 45.8117 |
| 6.7641 | 45.612 |
| 6.55742 | 45.5405 |
| 5.53992 | 44.9127 |
| 5.02322 | 44.8015 |
| 4.35549 | 44.5869 |
| 0.198047 | 43.403 |
| -3.76343 | 42.432 |
| -9.07729 | 41.119 |
| -15.1823 | 39.5377 |
| -18.268 | 38.8216 |
| -18.268 | 35.5812 |
| -18.268 | 33.5624 |
| -18.268 | 28.0059 |
| 44.4591 | 28.0059 |
| 44.4591 | 46.5638 |
| 44.4591 | 57.23 |
| 44.4591 | 59.34 |
| 44.4591 | 61.8678 |

## Material Boundary

| X | Y |
|---|---|
| 37.639 | 52.44 |
| 44.4591 | 59.34 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 47.235 |
| 30.8801 | 49.506 |

## Material Boundary

| X | Y |
|---|---|
| -9.07729 | 41.119 |
| 2.44 | 42.482 |
| 21.211 | 47.235 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 44.211 |
| 31.462 | 47.978 |
| 39.112 | 51.057 |
| 44.4591 | 57.23 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 44.211 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 33.5624 |
| 21.211 | 40.173 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 40.173 |
| 44.4591 | 46.5638 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: YK S44-SLIDE ST c=3, phi=28
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 26/2/2021, 7:56:50

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT |
|---|---|---|---|---|---|---|---|
| Color | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 |
| Friction Angle [deg] | 28 | 30 | 33 | 34 | 25 | 45 | 28 |
| Water Surface | None | None | Water Table | Water Table | None | None | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | | | Automatically Calculated |
| Ru Value | 0 | 0 | | | 0 | 0 | |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.938266
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=448.176 kN-m
Driving Moment=477.664 kN-m

### Method: bishop simplified

FS: 0.988726
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=472.279 kN-m
Driving Moment=477.664 kN-m

## Method: janbu simplified

FS: 0.931846
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=49.8206 kN
Driving Horizontal Force=53.4644 kN

## Method: janbu corrected

FS: 0.982907
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=52.5505 kN
Driving Horizontal Force=53.4644 kN

## Method: spencer

FS: 0.984386
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=470.206 kN-m
Driving Moment=477.664 kN-m
Resisting Horizontal Force=51.4152 kN
Driving Horizontal Force=52.2307 kN

## Method: corp of eng#1

FS: 0.998589
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=51.8197 kN
Driving Horizontal Force=51.8929 kN

## Method: corp of eng#2

FS: 1.013260
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=52.2463 kN
Driving Horizontal Force=51.5624 kN

## Method: lowe-karafiath

FS: 0.995068
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=51.7995 kN
Driving Horizontal Force=52.0562 kN

### Method: gle/morgenstern-price

FS: 0.983607
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=469.834 kN-m
Driving Moment=477.664 kN-m
Resisting Horizontal Force=51.457 kN
Driving Horizontal Force=52.3146 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 6832
Number of Invalid Surfaces: 3168

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 332 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 6805
Number of Invalid Surfaces: 3195

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 336 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 6213
Number of Invalid Surfaces: 3787

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 949 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 2 surfaces
Error Code -114 reported for 2407 surfaces

Error Code -123 reported for 2 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 6213
Number of Invalid Surfaces: 3787

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 949 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 2 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: spencer

Number of Valid Surfaces: 5851
Number of Invalid Surfaces: 4149

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 966 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 324 surfaces
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 4674
Number of Invalid Surfaces: 5326

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 1514 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 976 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 4273
Number of Invalid Surfaces: 5727

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces

Error Code -107 reported for 16 surfaces
Error Code -108 reported for 2557 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 334 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 2751
Number of Invalid Surfaces: 7249

### Error Codes:

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 3897 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 516 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 6018
Number of Invalid Surfaces: 3982

### Error Codes:

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 949 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 174 surfaces
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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.
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## Slice Data

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.938266

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 3.42073 | 3.20955 | 0.394108 | 0 | 0.394108 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 4.34928 | 4.08078 | 2.03266 | 0 | 2.03266 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 5.65834 | 5.30903 | 4.34265 | 0 | 4.34265 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 6.77023 | 6.35228 | 6.30471 | 0 | 6.30471 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 7.83759 | 7.35374 | 8.18822 | 0 | 8.18822 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 8.80324 | 8.25978 | 9.89219 | 0 | 9.89219 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 10.374 | 9.73361 | 12.6641 | 0 | 12.6641 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 10.9659 | 10.289 | 13.7086 | 0 | 13.7086 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 11.0669 | 10.3836 | 13.8866 | 0 | 13.8866 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 11.9112 | 11.1759 | 15.3766 | 0 | 15.3766 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 13.1657 | 12.3529 | 17.5902 | 0 | 17.5902 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 13.5166 | 12.6822 | 18.2095 | 0 | 18.2095 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 13.7349 | 12.887 | 18.5947 | 0 | 18.5947 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 14.4762 | 13.5825 | 19.9027 | 0 | 19.9027 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 15.0147 | 14.0878 | 20.8531 | 0 | 20.8531 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 14.6134 | 13.7113 | 20.1451 | 0 | 20.1451 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 14.2666 | 13.3859 | 19.533 | 0 | 19.533 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 13.6886 | 12.8435 | 18.513 | 0 | 18.513 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 12.2951 | 11.536 | 16.0539 | 0 | 16.0539 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 10.7199 | 10.0581 | 13.2744 | 0 | 13.2744 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 9.05926 | 8.5 | 10.344 | 0 | 10.344 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 7.42108 | 6.96295 | 7.45324 | 0 | 7.45324 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 5.94015 | 5.57344 | 4.83994 | 0 | 4.83994 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.65136 | 4.36421 | 2.5657 | 0 | 2.5657 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 3.56615 | 3.346 | 0.650733 | 0 | 0.650733 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 0.988726

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 2.93826 | 2.90513 | -0.178421 | 0 | -0.178421 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 3.72088 | 3.67893 | 1.27687 | 0 | 1.27687 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 4.84259 | 4.78799 | 3.36272 | 0 | 3.36272 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 5.79588 | 5.73054 | 5.13542 | 0 | 5.13542 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 6.72282 | 6.64703 | 6.85908 | 0 | 6.85908 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 7.57813 | 7.49269 | 8.44953 | 0 | 8.44953 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 9.00925 | 8.90768 | 11.1107 | 0 | 11.1107 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 9.58639 | 9.47831 | 12.1839 | 0 | 12.1839 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 9.73947 | 9.62967 | 12.4686 | 0 | 12.4686 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 10.6229 | 10.5032 | 14.1114 | 0 | 14.1114 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 11.9606 | 11.8258 | 16.5989 | 0 | 16.5989 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 12.4923 | 12.3515 | 17.5876 | 0 | 17.5876 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 12.95 | 12.804 | 18.4386 | 0 | 18.4386 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 14.0221 | 13.864 | 20.4322 | 0 | 20.4322 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 14.9929 | 14.8239 | 22.2374 | 0 | 22.2374 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 15.028 | 14.8586 | 22.3027 | 0 | 22.3027 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 15.1901 | 15.0188 | 22.604 | 0 | 22.604 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 15.1461 | 14.9753 | 22.5223 | 0 | 22.5223 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 14.0809 | 13.9222 | 20.5417 | 0 | 20.5417 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 12.6795 | 12.5366 | 17.9356 | 0 | 17.9356 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 10.9859 | 10.862 | 14.7863 | 0 | 14.7863 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 9.06469 | 8.96249 | 11.2138 | 0 | 11.2138 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 7.04606 | 6.96662 | 7.46013 | 0 | 7.46013 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.88742 | 4.83232 | 3.44609 | 0 | 3.44609 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.39018 | 2.36323 | -1.19759 | 0 | -1.19759 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.931846

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 3.09843 | 2.88726 | -0.212031 | 0 | -0.212031 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 3.92022 | 3.65304 | 1.22819 | 0 | 1.22819 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 5.09753 | 4.75011 | 3.29147 | 0 | 3.29147 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 6.09567 | 5.68023 | 5.04078 | 0 | 5.04078 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 7.0644 | 6.58293 | 6.73853 | 0 | 6.73853 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 7.95623 | 7.41398 | 8.30147 | 0 | 8.30147 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 9.4505 | 8.80641 | 10.9203 | 0 | 10.9203 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 10.0471 | 9.36232 | 11.9658 | 0 | 11.9658 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 10.1985 | 9.5034 | 12.2311 | 0 | 12.2311 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 11.1136 | 10.3561 | 13.8348 | 0 | 13.8348 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 12.5016 | 11.6496 | 16.2675 | 0 | 16.2675 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 13.0451 | 12.1561 | 17.22 | 0 | 17.22 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 13.5101 | 12.5893 | 18.0349 | 0 | 18.0349 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 14.614 | 13.618 | 19.9696 | 0 | 19.9696 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 15.6097 | 14.5458 | 21.7146 | 0 | 21.7146 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 15.6294 | 14.5642 | 21.7491 | 0 | 21.7491 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 15.78 | 14.7045 | 22.013 | 0 | 22.013 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 15.7154 | 14.6443 | 21.8997 | 0 | 21.8997 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 14.5913 | 13.5968 | 19.9296 | 0 | 19.9296 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 13.1204 | 12.2262 | 17.3519 | 0 | 17.3519 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 11.3501 | 10.5766 | 14.2495 | 0 | 14.2495 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 9.34876 | 8.7116 | 10.7419 | 0 | 10.7419 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 7.25201 | 6.75776 | 7.06732 | 0 | 7.06732 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 5.01785 | 4.67586 | 3.15184 | 0 | 3.15184 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.44614 | 2.27943 | -1.3552 | 0 | -1.3552 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.982907

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 2.93747 | 2.88726 | -0.212031 | 0 | -0.212031 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 3.71657 | 3.65304 | 1.22819 | 0 | 1.22819 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 4.83272 | 4.75011 | 3.29147 | 0 | 3.29147 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 5.77901 | 5.68023 | 5.04078 | 0 | 5.04078 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 6.69741 | 6.58293 | 6.73853 | 0 | 6.73853 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 7.54291 | 7.41398 | 8.30147 | 0 | 8.30147 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 8.95956 | 8.80641 | 10.9203 | 0 | 10.9203 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 9.52513 | 9.36232 | 11.9658 | 0 | 11.9658 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 9.66867 | 9.5034 | 12.2311 | 0 | 12.2311 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 10.5362 | 10.3561 | 13.8348 | 0 | 13.8348 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 11.8522 | 11.6496 | 16.2675 | 0 | 16.2675 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 12.3674 | 12.1561 | 17.22 | 0 | 17.22 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 12.8082 | 12.5893 | 18.0349 | 0 | 18.0349 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 13.8548 | 13.618 | 19.9696 | 0 | 19.9696 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 14.7988 | 14.5458 | 21.7146 | 0 | 21.7146 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 14.8175 | 14.5642 | 21.7491 | 0 | 21.7491 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 14.9602 | 14.7045 | 22.013 | 0 | 22.013 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 14.899 | 14.6443 | 21.8997 | 0 | 21.8997 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 13.8333 | 13.5968 | 19.9296 | 0 | 19.9296 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 12.4388 | 12.2262 | 17.3519 | 0 | 17.3519 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 10.7605 | 10.5766 | 14.2495 | 0 | 14.2495 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 8.8631 | 8.7116 | 10.7419 | 0 | 10.7419 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.87528 | 6.75776 | 7.06732 | 0 | 7.06732 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.75717 | 4.67586 | 3.15184 | 0 | 3.15184 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.31907 | 2.27943 | -1.3552 | 0 | -1.3552 |

**Global Minimum Query (spencer) - Safety Factor**: 0.984386

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 4.16685 | 4.10179 | 2.07217 | 0 | 2.07217 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 5.08761 | 5.00817 | 3.77682 | 0 | 3.77682 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 6.36584 | 6.26644 | 6.14326 | 0 | 6.14326 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 7.38115 | 7.2659 | 8.02298 | 0 | 8.02298 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 8.31368 | 8.18387 | 9.74944 | 0 | 9.74944 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 9.11812 | 8.97575 | 11.2387 | 0 | 11.2387 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 10.5034 | 10.3394 | 13.8033 | 0 | 13.8033 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 10.916 | 10.7455 | 14.5672 | 0 | 14.5672 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 10.8674 | 10.6978 | 14.4774 | 0 | 14.4774 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 11.5509 | 11.3705 | 15.7426 | 0 | 15.7426 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 12.6422 | 12.4448 | 17.7631 | 0 | 17.7631 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 12.9035 | 12.702 | 18.2468 | 0 | 18.2468 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 13.0764 | 12.8722 | 18.5669 | 0 | 18.5669 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 13.7947 | 13.5793 | 19.8968 | 0 | 19.8968 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 14.381 | 14.1565 | 20.9823 | 0 | 20.9823 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 14.1175 | 13.8971 | 20.4945 | 0 | 20.4945 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 13.9661 | 13.748 | 20.214 | 0 | 20.214 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 13.6432 | 13.4302 | 19.6164 | 0 | 19.6164 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 12.5019 | 12.3067 | 17.5034 | 0 | 17.5034 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 11.1419 | 10.968 | 14.9855 | 0 | 14.9855 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 9.61406 | 9.46395 | 12.1569 | 0 | 12.1569 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 7.97856 | 7.85398 | 9.12901 | 0 | 9.12901 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.33537 | 6.23645 | 6.08687 | 0 | 6.08687 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.64129 | 4.56882 | 2.95052 | 0 | 2.95052 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.71389 | 2.67151 | -0.617792 | 0 | -0.617792 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.998589

| Slice | Width | Weight | Base | Base Cohesion | Base Friction Angle | Shear Stress | Shear Strength | Base Normal Stress | Pore Pressure | Effective Normal Stress |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | [kPa] | [degrees] | [kPa] | [kPa] | [kPa] | [kPa] | [kPa] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 4.46819 | 4.46189 | 2.74942 | 0 | 2.74942 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 5.40866 | 5.40103 | 4.51568 | 0 | 4.51568 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 6.70431 | 6.69485 | 6.94901 | 0 | 6.94901 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 7.71266 | 7.70178 | 8.84274 | 0 | 8.84274 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 8.62283 | 8.61066 | 10.5521 | 0 | 10.5521 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 9.39113 | 9.37788 | 11.9951 | 0 | 11.9951 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 10.7319 | 10.7168 | 14.5132 | 0 | 14.5132 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 11.0854 | 11.0698 | 15.177 | 0 | 15.177 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 10.9776 | 10.9621 | 14.9745 | 0 | 14.9745 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 11.592 | 11.5756 | 16.1284 | 0 | 16.1284 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 12.5987 | 12.5809 | 18.019 | 0 | 18.019 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 12.7869 | 12.7689 | 18.3726 | 0 | 18.3726 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 12.8892 | 12.871 | 18.5646 | 0 | 18.5646 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 13.5179 | 13.4988 | 19.7453 | 0 | 19.7453 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 14.0176 | 13.9978 | 20.6839 | 0 | 20.6839 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 13.7074 | 13.6881 | 20.1013 | 0 | 20.1013 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 13.5133 | 13.4942 | 19.7366 | 0 | 19.7366 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 13.1674 | 13.1488 | 19.0871 | 0 | 19.0871 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 12.0591 | 12.0421 | 17.0057 | 0 | 17.0057 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 10.7587 | 10.7435 | 14.5635 | 0 | 14.5635 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 9.31065 | 9.29751 | 11.8439 | 0 | 11.8439 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 7.76395 | 7.753 | 8.93909 | 0 | 8.93909 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.20043 | 6.19168 | 6.00267 | 0 | 6.00267 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.55293 | 4.54651 | 2.90857 | 0 | 2.90857 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.58204 | 2.57839 | -0.792929 | 0 | -0.792929 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.01326

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 3.94325 | 3.99554 | 1.87234 | 0 | 1.87234 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 5.69415 | 5.76965 | 5.20895 | 0 | 5.20895 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 6.48005 | 6.56598 | 6.70665 | 0 | 6.70665 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 8.42515 | 8.53687 | 10.4133 | 0 | 10.4133 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 8.2161 | 8.32505 | 10.0149 | 0 | 10.0149 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 11.3385 | 11.4888 | 15.9652 | 0 | 15.9652 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 10.0783 | 10.212 | 13.5637 | 0 | 13.5637 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 5.616 | 5.69047 | 5.06005 | 0 | 5.06005 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 19.9055 | 20.1694 | 32.291 | 0 | 32.291 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 15.2179 | 15.4197 | 23.358 | 0 | 23.358 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 7.10338 | 7.19757 | 7.89448 | 0 | 7.89448 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 14.0714 | 14.258 | 21.1733 | 0 | 21.1733 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 17.3709 | 17.6012 | 27.4609 | 0 | 27.4609 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 13.2568 | 13.4326 | 19.6209 | 0 | 19.6209 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 10.0619 | 10.1953 | 13.5324 | 0 | 13.5324 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 13.4026 | 13.5803 | 19.8986 | 0 | 19.8986 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 11.9987 | 12.1578 | 17.2233 | 0 | 17.2233 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 9.59766 | 9.72492 | 12.6477 | 0 | 12.6477 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 10.4834 | 10.6224 | 14.3357 | 0 | 14.3357 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 10.5717 | 10.7119 | 14.504 | 0 | 14.504 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 9.62904 | 9.75672 | 12.7076 | 0 | 12.7076 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 8.33808 | 8.44864 | 10.2474 | 0 | 10.2474 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.46949 | 6.55528 | 6.6865 | 0 | 6.6865 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.74428 | 4.80719 | 3.39883 | 0 | 3.39883 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.53971 | 2.57338 | -0.802352 | 0 | -0.802352 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.995068

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 3.59156 | 3.57385 | 1.07925 | 0 | 1.07925 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 4.83316 | 4.80932 | 3.40283 | 0 | 3.40283 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 5.97696 | 5.94748 | 5.54343 | 0 | 5.54343 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 7.39522 | 7.35875 | 8.19759 | 0 | 8.19759 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 8.05372 | 8.014 | 9.42998 | 0 | 9.42998 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 9.78138 | 9.73314 | 12.6632 | 0 | 12.6632 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 10.401 | 10.3497 | 13.8228 | 0 | 13.8228 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 8.87656 | 8.83278 | 10.9699 | 0 | 10.9699 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 14.72 | 14.6474 | 21.9055 | 0 | 21.9055 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 13.2042 | 13.1391 | 19.0689 | 0 | 19.0689 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 11.2116 | 11.1563 | 15.3397 | 0 | 15.3397 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 13.92 | 13.8513 | 20.4084 | 0 | 20.4084 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 15.3102 | 15.2347 | 23.01 | 0 | 23.01 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 14.167 | 14.0971 | 20.8707 | 0 | 20.8707 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 13.0457 | 12.9813 | 18.7722 | 0 | 18.7722 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 14.1572 | 14.0874 | 20.8523 | 0 | 20.8523 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 13.2657 | 13.2003 | 19.184 | 0 | 19.184 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 11.8529 | 11.7945 | 16.54 | 0 | 16.54 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 11.5471 | 11.4902 | 15.9677 | 0 | 15.9677 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 10.7591 | 10.706 | 14.4929 | 0 | 14.4929 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 9.42921 | 9.38271 | 12.0041 | 0 | 12.0041 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 7.94477 | 7.90559 | 9.22608 | 0 | 9.22608 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.26253 | 6.23164 | 6.07782 | 0 | 6.07782 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.55221 | 4.52976 | 2.87706 | 0 | 2.87706 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.63594 | 2.62294 | -0.709144 | 0 | -0.709144 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 0.983607

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 3.10809 | 3.05714 | 0.107469 | 0 | 0.107469 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 4.25771 | 4.18791 | 2.23414 | 0 | 2.23414 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 5.8206 | 5.72518 | 5.1253 | 0 | 5.1253 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 7.21391 | 7.09565 | 7.70279 | 0 | 7.70279 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 8.52796 | 8.38816 | 10.1337 | 0 | 10.1337 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 9.66367 | 9.50525 | 12.2346 | 0 | 12.2346 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 11.2824 | 11.0975 | 15.2291 | 0 | 15.2291 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 11.8216 | 11.6278 | 16.2265 | 0 | 16.2265 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 11.7663 | 11.5734 | 16.1243 | 0 | 16.1243 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 12.3295 | 12.1274 | 17.1661 | 0 | 17.1661 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 13.2098 | 12.9932 | 18.7945 | 0 | 18.7945 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 13.2052 | 12.9888 | 18.7861 | 0 | 18.7861 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 13.0982 | 12.8835 | 18.5881 | 0 | 18.5881 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 13.55 | 13.3279 | 19.4239 | 0 | 19.4239 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 13.9275 | 13.6992 | 20.1223 | 0 | 20.1223 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 13.5533 | 13.3311 | 19.43 | 0 | 19.43 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 13.3855 | 13.1661 | 19.1197 | 0 | 19.1197 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 13.1502 | 12.9347 | 18.6844 | 0 | 18.6844 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 12.1757 | 11.9761 | 16.8816 | 0 | 16.8816 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 11.0232 | 10.8425 | 14.7496 | 0 | 14.7496 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 9.70644 | 9.54732 | 12.3137 | 0 | 12.3137 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 8.24272 | 8.1076 | 9.60599 | 0 | 9.60599 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.68555 | 6.57595 | 6.72538 | 0 | 6.72538 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.90254 | 4.82217 | 3.42699 | 0 | 3.42699 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.51296 | 2.47176 | -0.993469 | 0 | -0.993469 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 0.246463 | 1.46432 |
| 40.9932 | 12.499 |
| 51.3789 | 18.6032 |
| 55.0767 | 21.5626 |

### External Boundary

| X | Y |
|---|---|
| 11.8302 | 6.25839 |
| 11.9085 | 5.94261 |
| 11.8338 | 5.93829 |
| 11.7564 | 5.93035 |
| 11.5778 | 5.90654 |
| 11.2683 | 5.85829 |
| 11.121 | 5.87353 |
| 10.7096 | 5.80753 |
| 9.86652 | 5.76184 |
| 9.18593 | 5.68061 |
| 8.79485 | 5.58415 |
| 7.0512 | 5.31012 |
| 6.72302 | 5.27311 |
| 5.64857 | 5.14084 |
| 5.29472 | 5.11414 |
| 4.72058 | 5.0007 |
| 4.27995 | 4.99402 |
| 3.82598 | 5.01405 |
| 3.08493 | 4.98068 |
| 2.13692 | 4.92729 |
| 1.3558 | 4.92062 |
| 0.246463 | 4.88648 |
| 0.246463 | 1.46432 |
| 0.246463 | -1.48563 |

| | |
|---|---|
| 0.246463 | -4.15895 |
| 0.246463 | -5.39914 |
| 55.0767 | -5.39914 |
| 55.0767 | 11.1863 |
| 55.0767 | 17.6064 |
| 55.0767 | 19.3597 |
| 55.0767 | 20.73 |
| 55.0767 | 21.5626 |
| 55.0767 | 23.365 |
| 55.0767 | 26.0251 |
| 54.4584 | 25.8397 |
| 53.5618 | 25.4688 |
| 52.9744 | 24.7581 |
| 52.387 | 24.0473 |
| 51.9851 | 23.2439 |
| 51.4905 | 22.3786 |
| 50.6249 | 21.1116 |
| 50.0375 | 20.3699 |
| 49.3883 | 19.9682 |
| 48.3371 | 19.3192 |
| 46.9347 | 18.4742 |
| 46.5963 | 18.1974 |
| 46.0426 | 17.6746 |
| 45.2735 | 17.1211 |
| 42.619 | 15.4479 |
| 41.5004 | 14.3587 |
| 40.9932 | 14.0478 |
| 28.6564 | 14.5035 |
| 28.4403 | 14.3523 |
| 27.9984 | 13.9021 |
| 27.1243 | 13.33 |
| 26.6199 | 13.034 |
| 26.1664 | 12.775 |
| 25.3511 | 12.4826 |
| 25.084 | 12.4182 |
| 24.588 | 12.3104 |
| 23.9236 | 12.26 |
| 23.0163 | 12.0768 |
| 21.1904 | 11.726 |
| 19.9593 | 11.6492 |
| 19.6087 | 11.6628 |
| 19.1761 | 11.7671 |
| 18.9009 | 11.8177 |
| 18.6038 | 11.7888 |
| 18.4227 | 11.7381 |
| 18.104 | 11.7019 |
| 17.7852 | 11.586 |
| 17.3578 | 11.4629 |
| 17.1622 | 11.376 |
| 16.9304 | 11.2529 |
| 16.7783 | 11.1443 |

| | |
|---|---|
| 16.6624 | 10.9633 |
| 16.5537 | 10.8184 |
| 16.4378 | 10.6591 |
| 16.177 | 10.3912 |
| 15.9742 | 10.0364 |
| 15.8293 | 9.7757 |
| 15.4386 | 9.35059 |
| 15.2492 | 9.14782 |
| 15.0644 | 8.79185 |
| 14.7514 | 8.58118 |
| 14.545 | 8.45563 |
| 14.4374 | 8.27628 |
| 14.3746 | 8.15073 |
| 14.1996 | 8.06105 |
| 14.1009 | 7.92653 |
| 13.7201 | 7.61191 |
| 13.4783 | 7.4007 |
| 13.3755 | 7.30665 |
| 13.2134 | 7.22479 |
| 13.1036 | 7.18821 |
| 12.938 | 7.17699 |
| 12.8129 | 7.15925 |
| 12.7783 | 7.15306 |
| 12.7324 | 7.13449 |
| 12.6742 | 7.13078 |
| 12.5863 | 7.12211 |
| 12.5045 | 7.10679 |
| 11.8575 | 7.04435 |
| 11.8894 | 6.70473 |
| 11.8904 | 6.69465 |
| 11.9207 | 6.3809 |

## Material Boundary

| X | Y |
|---|---|
| 12.5045 | 7.10679 |
| 12.5364 | 6.76717 |

## Material Boundary

| X | Y |
|---|---|
| 11.8894 | 6.70473 |
| 12.5364 | 6.76717 |

## Material Boundary

| X | Y |
|---|---|
| 11.9085 | 5.94261 |
| 12.5394 | 6.09906 |
| 12.4593 | 6.43289 |
| 12.5676 | 6.44334 |

| | |
|---|---|
| 12.5374 | 6.75631 |
| 12.5364 | 6.76717 |

### Material Boundary

| X | Y |
|---|---|
| 12.5394 | 6.09906 |
| 16.176 | 6.98 |

### Material Boundary

| X | Y |
|---|---|
| 16.176 | 6.98 |
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |
| 51.3789 | 18.6032 |
| 55.0767 | 23.365 |

### Material Boundary

| X | Y |
|---|---|
| 0.246463 | -1.48563 |
| 14.9068 | 2.359 |
| 31.5166 | 8.039 |
| 40.9932 | 10.529 |
| 51.5928 | 16.7302 |
| 55.0767 | 20.73 |

### Material Boundary

| X | Y |
|---|---|
| 0.246463 | -4.15895 |
| 55.0767 | 11.1863 |

### Material Boundary

| X | Y |
|---|---|
| 0.246463 | 1.46432 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| 51.3789 | 18.6032 |
| 55.0767 | 21.5626 |

### Material Boundary

| X | Y |
|---|---|
| 11.8904 | 6.69465 |
| 12.5374 | 6.75631 |

## Material Boundary

| X | Y |
|---|---|
| 11.8302 | 6.25839 |
| 12.0064 | 6.30208 |
| 12.4593 | 6.43289 |
| 11.9871 | 6.38732 |
| 11.9207 | 6.3809 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: YK S44-SLIDE RU=0.20 c=3, phi=28
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 26/2/2021, 7:56:50

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT |
|---|---|---|---|---|---|---|---|
| Color | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 |
| Friction Angle [deg] | 28 | 30 | 33 | 34 | 25 | 45 | 28 |
| Water Surface | None | None | Water Table | Water Table | None | None | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | | | Automatically Calculated |
| Ru Value | 0.2 | 0.2 | | | 0 | 0 | |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.813790
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=388.718 kN-m
Driving Moment=477.664 kN-m

### Method: bishop simplified

FS: 0.763593
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=364.741 kN-m
Driving Moment=477.664 kN-m

## Method: janbu simplified

FS: 0.705888
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=38.3707 kN
Driving Horizontal Force=54.358 kN

## Method: janbu corrected

FS: 0.744568
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=40.4732 kN
Driving Horizontal Force=54.358 kN

## Method: spencer

FS: 0.762526
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=364.231 kN-m
Driving Moment=477.664 kN-m
Resisting Horizontal Force=40.4613 kN
Driving Horizontal Force=53.0622 kN

## Method: corp of eng#1

FS: 0.776548
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=41.071 kN
Driving Horizontal Force=52.8892 kN

## Method: corp of eng#2

FS: 0.798136
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=41.7805 kN
Driving Horizontal Force=52.3475 kN

## Method: lowe-karafiath

FS: 0.774765
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=40.9318 kN
Driving Horizontal Force=52.8312 kN

### Method: gle/morgenstern-price

FS: 0.762219
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=364.085 kN-m
Driving Moment=477.664 kN-m
Resisting Horizontal Force=40.4917 kN
Driving Horizontal Force=53.1235 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 6832
Number of Invalid Surfaces: 3168

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 332 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 6805
Number of Invalid Surfaces: 3195

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 336 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 6213
Number of Invalid Surfaces: 3787

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 948 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 3 surfaces
Error Code -114 reported for 2407 surfaces

Error Code -123 reported for 2 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 6213
Number of Invalid Surfaces: 3787

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 948 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 3 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: spencer

Number of Valid Surfaces: 5849
Number of Invalid Surfaces: 4151

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 965 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 327 surfaces
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 4633
Number of Invalid Surfaces: 5367

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 1461 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 1070 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 4231
Number of Invalid Surfaces: 5769

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces

Error Code -107 reported for 16 surfaces
Error Code -108 reported for 2544 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 389 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 2873
Number of Invalid Surfaces: 7127

### Error Codes:

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 3821 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 470 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 6021
Number of Invalid Surfaces: 3979

### Error Codes:

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -107 reported for 16 surfaces
Error Code -108 reported for 947 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 173 surfaces
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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.
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## Slice Data

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.81379

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 3.89246 | 3.16764 | 0.397286 | 0.082 | 0.315286 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 4.74892 | 3.86463 | 2.05483 | 0.428707 | 1.62613 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 5.95635 | 4.84722 | 4.40458 | 0.930461 | 3.47412 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 6.98192 | 5.68182 | 6.41924 | 1.37546 | 5.04378 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 7.96643 | 6.483 | 8.37386 | 1.8233 | 6.55056 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 8.8571 | 7.20782 | 10.1678 | 2.25402 | 7.91375 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 10.306 | 8.38689 | 13.0921 | 2.96085 | 10.1313 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 10.8519 | 8.83118 | 14.2651 | 3.29824 | 10.9669 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 10.945 | 8.90692 | 14.5584 | 3.44911 | 11.1093 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 11.7238 | 9.54072 | 16.2576 | 3.95631 | 12.3013 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 12.8809 | 10.4823 | 18.7783 | 4.70611 | 14.0722 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 13.2045 | 10.7457 | 19.6547 | 5.08713 | 14.5676 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 13.4059 | 10.9096 | 20.3257 | 5.44987 | 14.8758 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 14.0896 | 11.466 | 22.0744 | 6.15221 | 15.9221 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 14.5864 | 11.8703 | 23.5223 | 6.8398 | 16.6825 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 14.2163 | 11.5691 | 23.1767 | 7.06058 | 16.1161 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 13.8963 | 11.3087 | 23.0023 | 7.37594 | 15.6264 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 13.3632 | 10.8748 | 22.4168 | 7.60643 | 14.8104 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 12.0778 | 9.82882 | 20.1069 | 7.26378 | 12.8432 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 10.625 | 8.64648 | 17.3338 | 6.71436 | 10.6195 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 9.09326 | 7.4 | 14.2391 | 5.96387 | 8.27521 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 7.58225 | 6.17036 | 10.9905 | 5.02786 | 5.96259 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.21628 | 5.05875 | 7.83675 | 3.96481 | 3.87194 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 5.02755 | 4.09137 | 4.75556 | 2.70301 | 2.05255 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 4.02659 | 3.2768 | 1.49602 | 0.975439 | 0.520586 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 0.763593

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 3.64931 | 2.78659 | -0.319364 | 0.082 | -0.401364 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 4.40918 | 3.36682 | 1.1186 | 0.428707 | 0.68989 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 5.50216 | 4.20141 | 3.18999 | 0.930461 | 2.25953 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 6.41917 | 4.90163 | 4.95191 | 1.37546 | 3.57645 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 7.30305 | 5.57656 | 6.66913 | 1.8233 | 4.84583 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 8.10939 | 6.19227 | 8.25779 | 2.25402 | 6.00377 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 9.47593 | 7.23575 | 10.9272 | 2.96085 | 7.96631 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 9.99463 | 7.63183 | 12.0095 | 3.29824 | 8.71121 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 10.0948 | 7.70832 | 12.3042 | 3.44911 | 8.85505 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 10.9037 | 8.32601 | 13.9731 | 3.95631 | 10.0168 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 12.1453 | 9.27405 | 16.5059 | 4.70611 | 11.7998 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 12.5979 | 9.6197 | 17.537 | 5.08713 | 12.4498 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 12.974 | 9.90688 | 18.4398 | 5.44987 | 12.9899 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 13.9325 | 10.6388 | 20.5186 | 6.15221 | 14.3664 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 14.7833 | 11.2884 | 22.4281 | 6.8398 | 15.5883 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 14.7359 | 11.2522 | 22.5808 | 7.06058 | 15.5202 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 14.8042 | 11.3044 | 22.9943 | 7.37594 | 15.6183 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 14.6732 | 11.2043 | 23.0365 | 7.60643 | 15.4301 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 13.5837 | 10.3724 | 21.1292 | 7.26378 | 13.8655 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 12.1866 | 9.30557 | 18.5734 | 6.71436 | 11.8591 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 10.5282 | 8.03923 | 15.4413 | 5.96387 | 9.47743 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 8.67334 | 6.6229 | 11.8415 | 5.02786 | 6.81367 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.74587 | 5.1511 | 8.01045 | 3.96481 | 4.04564 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.71172 | 3.59784 | 3.82738 | 2.70301 | 1.12437 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.40243 | 1.83448 | -1.21659 | 0.975439 | -2.19203 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.705888

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 3.90661 | 2.75763 | -0.373829 | 0.082 | -0.455829 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 4.71318 | 3.32698 | 1.04367 | 0.428707 | 0.614958 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 5.87311 | 4.14576 | 3.08532 | 0.930461 | 2.15486 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 6.8423 | 4.8299 | 4.81699 | 1.37546 | 3.44153 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 7.77364 | 5.48732 | 6.50129 | 1.8233 | 4.67799 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 8.62004 | 6.08478 | 8.05566 | 2.25402 | 5.80164 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 10.0588 | 7.10042 | 10.6726 | 2.96085 | 7.71175 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 10.595 | 7.47886 | 11.7218 | 3.29824 | 8.42352 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 10.6865 | 7.54348 | 11.9942 | 3.44911 | 8.54504 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 11.527 | 8.13676 | 13.6171 | 3.95631 | 9.66083 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 12.8217 | 9.05068 | 16.0858 | 4.70611 | 11.3797 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 13.2809 | 9.3748 | 17.0764 | 5.08713 | 11.9892 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 13.6577 | 9.64084 | 17.9395 | 5.44987 | 12.4896 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 14.6452 | 10.3379 | 19.9527 | 6.15221 | 13.8005 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 15.5161 | 10.9526 | 21.7965 | 6.8398 | 14.9567 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 15.4422 | 10.9004 | 21.9192 | 7.06058 | 14.8586 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 15.4885 | 10.9331 | 22.296 | 7.37594 | 14.92 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 15.325 | 10.8177 | 22.3094 | 7.60643 | 14.703 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 14.1612 | 9.99622 | 20.4218 | 7.26378 | 13.158 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 12.6798 | 8.95051 | 17.9057 | 6.71436 | 11.1913 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 10.9308 | 7.71594 | 14.8333 | 5.96387 | 8.86939 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 8.98363 | 6.34144 | 11.3122 | 5.02786 | 6.28432 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.96823 | 4.91879 | 7.57353 | 3.96481 | 3.60872 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.85137 | 3.42452 | 3.50141 | 2.70301 | 0.798399 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.46361 | 1.73903 | -1.3961 | 0.975439 | -2.37154 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.744568

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 3.70367 | 2.75763 | -0.373829 | 0.082 | -0.455829 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 4.46834 | 3.32698 | 1.04367 | 0.428707 | 0.614958 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 5.56801 | 4.14576 | 3.08532 | 0.930461 | 2.15486 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 6.48685 | 4.8299 | 4.81699 | 1.37546 | 3.44153 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 7.3698 | 5.48732 | 6.50129 | 1.8233 | 4.67799 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 8.17223 | 6.08478 | 8.05566 | 2.25402 | 5.80164 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 9.53629 | 7.10042 | 10.6726 | 2.96085 | 7.71175 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 10.0446 | 7.47886 | 11.7218 | 3.29824 | 8.42352 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 10.1314 | 7.54348 | 11.9942 | 3.44911 | 8.54504 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 10.9282 | 8.13676 | 13.6171 | 3.95631 | 9.66083 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 12.1556 | 9.05068 | 16.0858 | 4.70611 | 11.3797 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 12.5909 | 9.3748 | 17.0764 | 5.08713 | 11.9892 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 12.9482 | 9.64084 | 17.9395 | 5.44987 | 12.4896 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 13.8844 | 10.3379 | 19.9527 | 6.15221 | 13.8005 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 14.7101 | 10.9526 | 21.7965 | 6.8398 | 14.9567 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 14.64 | 10.9004 | 21.9192 | 7.06058 | 14.8586 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 14.6838 | 10.9331 | 22.296 | 7.37594 | 14.92 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 14.5289 | 10.8177 | 22.3094 | 7.60643 | 14.703 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 13.4255 | 9.99622 | 20.4218 | 7.26378 | 13.158 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 12.0211 | 8.95051 | 17.9057 | 6.71436 | 11.1913 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 10.363 | 7.71594 | 14.8333 | 5.96387 | 8.86939 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 8.51694 | 6.34144 | 11.3122 | 5.02786 | 6.28432 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.60623 | 4.91879 | 7.57353 | 3.96481 | 3.60872 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.59934 | 3.42452 | 3.50141 | 2.70301 | 0.798399 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.33562 | 1.73903 | -1.3961 | 0.975439 | -2.37154 |

**Global Minimum Query (spencer) - Safety Factor**: 0.762526

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 5.74834 | 4.38326 | 2.68354 | 0.082 | 2.60154 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 6.66262 | 5.08042 | 4.3414 | 0.428707 | 3.91269 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 7.9313 | 6.04782 | 6.66257 | 0.930461 | 5.73211 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 8.89226 | 6.78058 | 8.48568 | 1.37546 | 7.11022 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 9.74165 | 7.42826 | 10.1516 | 1.8233 | 8.32834 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 10.4365 | 7.95812 | 11.5789 | 2.25402 | 9.32487 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 11.6911 | 8.91476 | 14.0849 | 2.96085 | 11.124 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 11.9471 | 9.10995 | 14.7894 | 3.29824 | 11.4911 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 11.7422 | 8.95375 | 14.6465 | 3.44911 | 11.1974 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 12.2385 | 9.33214 | 15.8653 | 3.95631 | 11.909 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 13.0968 | 9.98662 | 17.846 | 4.70611 | 13.1399 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 13.1481 | 10.0258 | 18.3007 | 5.08713 | 13.2136 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 13.1055 | 9.99331 | 18.6024 | 5.44987 | 13.1525 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 13.539 | 10.3239 | 19.9264 | 6.15221 | 13.7742 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 13.8235 | 10.5407 | 21.0219 | 6.8398 | 14.1821 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 13.3443 | 10.1754 | 20.5555 | 7.06058 | 13.4949 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 12.9549 | 9.87844 | 20.3124 | 7.37594 | 12.9365 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 12.4134 | 9.46556 | 19.7664 | 7.60643 | 12.16 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 11.2105 | 8.54826 | 17.6985 | 7.26378 | 10.4348 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 9.86617 | 7.52321 | 15.2213 | 6.71436 | 8.50694 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 8.43715 | 6.43355 | 12.4215 | 5.96387 | 6.45759 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 6.98531 | 5.32648 | 9.40332 | 5.02786 | 4.37546 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 5.59671 | 4.26764 | 6.34889 | 3.96481 | 2.38408 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.25513 | 3.24465 | 3.16312 | 2.70301 | 0.460113 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.85826 | 2.1795 | -0.567699 | 0.975439 | -1.54314 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.776548

| Slice | Width | Weight | Base | Base Cohesion | Base Friction Angle | Shear Stress | Shear Strength | Base Normal Stress | Pore Pressure | Effective Normal Stress |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | [kPa] | [degrees] | [kPa] | [kPa] | [kPa] | [kPa] | [kPa] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 6.4607 | 5.01704 | 3.87551 | 0.082 | 3.79351 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 7.36616 | 5.72018 | 5.54463 | 0.428707 | 5.11592 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 8.62073 | 6.69441 | 7.87862 | 0.930461 | 6.94816 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 9.52724 | 7.39836 | 9.64757 | 1.37546 | 8.27211 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 10.3015 | 7.99964 | 11.2262 | 1.8233 | 9.40294 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 10.9064 | 8.46937 | 12.5404 | 2.25402 | 10.2864 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 12.0634 | 9.36783 | 14.937 | 2.96085 | 11.9762 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 12.2129 | 9.48394 | 15.4928 | 3.29824 | 12.1945 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 11.9125 | 9.25061 | 15.2048 | 3.44911 | 11.7557 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 12.3044 | 9.55492 | 16.2843 | 3.95631 | 12.328 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 13.0432 | 10.1287 | 18.1132 | 4.70611 | 13.4071 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 13.0012 | 10.096 | 18.4328 | 5.08713 | 13.3457 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 12.8727 | 9.99627 | 18.6079 | 5.44987 | 13.1581 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 13.1952 | 10.2467 | 19.7812 | 6.15221 | 13.629 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 13.3705 | 10.3829 | 20.7249 | 6.8398 | 13.8851 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 12.8291 | 9.9624 | 20.155 | 7.06058 | 13.0944 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 12.3682 | 9.60449 | 19.7972 | 7.37594 | 12.4212 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 11.7602 | 9.13235 | 19.1397 | 7.60643 | 11.5333 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 10.551 | 8.19333 | 17.031 | 7.26378 | 9.76725 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 9.22226 | 7.16153 | 14.5411 | 6.71436 | 7.82669 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 7.83484 | 6.08413 | 11.7643 | 5.96387 | 5.80041 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 6.46045 | 5.01685 | 8.821 | 5.02786 | 3.79314 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 5.19942 | 4.0376 | 5.91626 | 3.96481 | 1.95145 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.10102 | 3.18464 | 3.05027 | 2.70301 | 0.347262 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 3.3603 | 2.60944 | 0.240898 | 0.975439 | -0.734541 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 0.798136

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 5.33613 | 4.25896 | 2.44976 | 0.082 | 2.36776 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 7.87212 | 6.28302 | 6.60315 | 0.428707 | 6.17445 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 8.12791 | 6.48718 | 7.48889 | 0.930461 | 6.55843 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 10.851 | 8.66058 | 12.0215 | 1.37546 | 10.646 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 9.46628 | 7.55538 | 10.3907 | 1.8233 | 8.56742 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 14.498 | 11.5714 | 18.3744 | 2.25402 | 16.1204 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 10.7598 | 8.58776 | 13.4699 | 2.96085 | 10.509 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 2.71169 | 2.1643 | 1.7265 | 3.29824 | -1.57174 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 27.5338 | 21.9757 | 39.1372 | 3.44911 | 35.688 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 19.0808 | 15.2291 | 26.9559 | 3.95631 | 22.9996 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 2.8702 | 2.29081 | 3.37231 | 4.70611 | -1.3338 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 15.3539 | 12.2545 | 22.4923 | 5.08713 | 17.4052 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 21.6992 | 17.3189 | 32.3797 | 5.44987 | 26.9299 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 13.084 | 10.4429 | 20.1502 | 6.15221 | 13.998 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 5.42152 | 4.32711 | 9.33573 | 6.8398 | 2.49593 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 12.6059 | 10.0612 | 20.3408 | 7.06058 | 13.2803 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 9.41703 | 7.51607 | 15.8694 | 7.37594 | 8.49351 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 5.00778 | 3.99689 | 9.48131 | 7.60643 | 1.87488 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 8.14078 | 6.49745 | 13.8415 | 7.26378 | 6.57775 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 9.16868 | 7.31785 | 14.8351 | 6.71436 | 8.12069 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 8.62146 | 6.8811 | 13.2631 | 5.96387 | 7.29927 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 7.65526 | 6.10994 | 10.8768 | 5.02786 | 5.84894 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 5.92409 | 4.72823 | 7.21514 | 3.96481 | 3.25033 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.49518 | 3.58776 | 3.80843 | 2.70301 | 1.10542 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.57426 | 2.05461 | -0.802581 | 0.975439 | -1.77802 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.774765

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 4.69905 | 3.64066 | 1.2869 | 0.082 | 1.2049 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 6.18555 | 4.79235 | 3.79963 | 0.428707 | 3.37093 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 7.24306 | 5.61167 | 5.84229 | 0.930461 | 4.91183 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 8.88402 | 6.88303 | 8.6784 | 1.37546 | 7.30294 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 9.28216 | 7.19149 | 9.70638 | 1.8233 | 7.88308 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 11.5002 | 8.90999 | 13.3691 | 2.25402 | 11.1151 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 11.4978 | 8.90812 | 14.0724 | 2.96085 | 11.1115 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 8.6335 | 6.68893 | 10.2361 | 3.29824 | 6.93784 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 18.0119 | 13.955 | 24.0524 | 3.44911 | 20.6033 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 15.0166 | 11.6343 | 20.1951 | 3.95631 | 16.2388 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 10.7028 | 8.29212 | 14.6591 | 4.70611 | 9.95303 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 14.8993 | 11.5435 | 21.155 | 5.08713 | 16.0679 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 17.0884 | 13.2395 | 24.7076 | 5.44987 | 19.2578 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 14.3665 | 11.1307 | 21.4438 | 6.15221 | 15.2916 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 11.5359 | 8.93762 | 18.0068 | 6.8398 | 11.167 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 13.6529 | 10.5778 | 21.3123 | 7.06058 | 14.2517 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 11.8562 | 9.18574 | 19.0096 | 7.37594 | 11.6337 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 9.13587 | 7.07815 | 15.2763 | 7.60643 | 7.66988 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 9.58284 | 7.42445 | 15.585 | 7.26378 | 8.32118 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 9.26844 | 7.18086 | 14.5774 | 6.71436 | 7.86305 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 8.17592 | 6.33442 | 12.235 | 5.96387 | 6.27113 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 6.95172 | 5.38595 | 9.51519 | 5.02786 | 4.48733 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 5.45654 | 4.22754 | 6.27348 | 3.96481 | 2.30867 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.14547 | 3.21176 | 3.10127 | 2.70301 | 0.398263 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.79803 | 2.16782 | -0.589666 | 0.975439 | -1.56511 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 0.762219

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 3.90313 | 2.97504 | 0.0350591 | 0.082 | -0.0469409 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 5.24291 | 3.99625 | 2.30237 | 0.428707 | 1.87367 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 7.01964 | 5.3505 | 5.35111 | 0.930461 | 4.42065 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 8.61826 | 6.569 | 8.08778 | 1.37546 | 6.71232 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 10.1013 | 7.69942 | 10.6616 | 1.8233 | 8.83833 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 11.343 | 8.64586 | 12.8723 | 2.25402 | 10.6183 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 12.9842 | 9.8968 | 15.9319 | 2.96085 | 12.971 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 13.4495 | 10.2515 | 16.9363 | 3.29824 | 13.638 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 13.2384 | 10.0906 | 16.7845 | 3.44911 | 13.3354 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 13.5399 | 10.3204 | 17.7239 | 3.95631 | 13.7676 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 14.0493 | 10.7086 | 19.2039 | 4.70611 | 14.4978 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 13.658 | 10.4104 | 19.024 | 5.08713 | 13.9369 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 13.1437 | 10.0184 | 18.6496 | 5.44987 | 13.1997 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 13.1224 | 10.0021 | 19.3213 | 6.15221 | 13.169 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 13.0458 | 9.94373 | 19.899 | 6.8398 | 13.0592 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 12.3709 | 9.42933 | 19.1524 | 7.06058 | 12.0918 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 11.9486 | 9.10742 | 18.8623 | 7.37594 | 11.4864 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 11.5552 | 8.80757 | 18.5289 | 7.60643 | 10.9224 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 10.6402 | 8.11018 | 16.8746 | 7.26378 | 9.61084 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 9.65398 | 7.35845 | 14.9114 | 6.71436 | 8.19704 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 8.58348 | 6.54249 | 12.6263 | 5.96387 | 6.66246 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 7.41292 | 5.65027 | 10.0123 | 5.02786 | 4.98443 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.15264 | 4.68966 | 7.14261 | 3.96481 | 3.1778 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 4.6532 | 3.54676 | 3.73131 | 2.70301 | 1.0283 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.52644 | 1.9257 | -1.04503 | 0.975439 | -2.02047 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 0.246463 | 1.46432 |
| 40.9932 | 12.499 |
| 51.3789 | 18.6032 |
| 55.0767 | 21.5626 |

### External Boundary

| X | Y |
|---|---|
| 11.8302 | 6.25839 |
| 11.9085 | 5.94261 |
| 11.8338 | 5.93829 |
| 11.7564 | 5.93035 |
| 11.5778 | 5.90654 |
| 11.2683 | 5.85829 |
| 11.121 | 5.87353 |
| 10.7096 | 5.80753 |
| 9.86652 | 5.76184 |
| 9.18593 | 5.68061 |
| 8.79485 | 5.58415 |
| 7.0512 | 5.31012 |
| 6.72302 | 5.27311 |
| 5.64857 | 5.14084 |
| 5.29472 | 5.11414 |
| 4.72058 | 5.0007 |
| 4.27995 | 4.99402 |
| 3.82598 | 5.01405 |
| 3.08493 | 4.98068 |
| 2.13692 | 4.92729 |
| 1.3558 | 4.92062 |
| 0.246463 | 4.88648 |
| 0.246463 | 1.46432 |
| 0.246463 | -1.48563 |

| | |
|---|---|
| 0.246463 | -4.15895 |
| 0.246463 | -5.39914 |
| 55.0767 | -5.39914 |
| 55.0767 | 11.1863 |
| 55.0767 | 17.6064 |
| 55.0767 | 19.3597 |
| 55.0767 | 20.73 |
| 55.0767 | 21.5626 |
| 55.0767 | 23.365 |
| 55.0767 | 26.0251 |
| 54.4584 | 25.8397 |
| 53.5618 | 25.4688 |
| 52.9744 | 24.7581 |
| 52.387 | 24.0473 |
| 51.9851 | 23.2439 |
| 51.4905 | 22.3786 |
| 50.6249 | 21.1116 |
| 50.0375 | 20.3699 |
| 49.3883 | 19.9682 |
| 48.3371 | 19.3192 |
| 46.9347 | 18.4742 |
| 46.5963 | 18.1974 |
| 46.0426 | 17.6746 |
| 45.2735 | 17.1211 |
| 42.619 | 15.4479 |
| 41.5004 | 14.3587 |
| 40.9932 | 14.0478 |
| 28.6564 | 14.5035 |
| 28.4403 | 14.3523 |
| 27.9984 | 13.9021 |
| 27.1243 | 13.33 |
| 26.6199 | 13.034 |
| 26.1664 | 12.775 |
| 25.3511 | 12.4826 |
| 25.084 | 12.4182 |
| 24.588 | 12.3104 |
| 23.9236 | 12.26 |
| 23.0163 | 12.0768 |
| 21.1904 | 11.726 |
| 19.9593 | 11.6492 |
| 19.6087 | 11.6628 |
| 19.1761 | 11.7671 |
| 18.9009 | 11.8177 |
| 18.6038 | 11.7888 |
| 18.4227 | 11.7381 |
| 18.104 | 11.7019 |
| 17.7852 | 11.586 |
| 17.3578 | 11.4629 |
| 17.1622 | 11.376 |
| 16.9304 | 11.2529 |
| 16.7783 | 11.1443 |

| | |
|---|---|
| 16.6624 | 10.9633 |
| 16.5537 | 10.8184 |
| 16.4378 | 10.6591 |
| 16.177 | 10.3912 |
| 15.9742 | 10.0364 |
| 15.8293 | 9.7757 |
| 15.4386 | 9.35059 |
| 15.2492 | 9.14782 |
| 15.0644 | 8.79185 |
| 14.7514 | 8.58118 |
| 14.545 | 8.45563 |
| 14.4374 | 8.27628 |
| 14.3746 | 8.15073 |
| 14.1996 | 8.06105 |
| 14.1009 | 7.92653 |
| 13.7201 | 7.61191 |
| 13.4783 | 7.4007 |
| 13.3755 | 7.30665 |
| 13.2134 | 7.22479 |
| 13.1036 | 7.18821 |
| 12.938 | 7.17699 |
| 12.8129 | 7.15925 |
| 12.7783 | 7.15306 |
| 12.7324 | 7.13449 |
| 12.6742 | 7.13078 |
| 12.5863 | 7.12211 |
| 12.5045 | 7.10679 |
| 11.8575 | 7.04435 |
| 11.8894 | 6.70473 |
| 11.8904 | 6.69465 |
| 11.9207 | 6.3809 |

## Material Boundary

| X | Y |
|---|---|
| 12.5045 | 7.10679 |
| 12.5364 | 6.76717 |

## Material Boundary

| X | Y |
|---|---|
| 11.8894 | 6.70473 |
| 12.5364 | 6.76717 |

## Material Boundary

| X | Y |
|---|---|
| 11.9085 | 5.94261 |
| 12.5394 | 6.09906 |
| 12.4593 | 6.43289 |
| 12.5676 | 6.44334 |

| | |
|---|---|
| 12.5374 | 6.75631 |
| 12.5364 | 6.76717 |

### Material Boundary

| X | Y |
|---|---|
| 12.5394 | 6.09906 |
| 16.176 | 6.98 |

### Material Boundary

| X | Y |
|---|---|
| 16.176 | 6.98 |
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |
| 51.3789 | 18.6032 |
| 55.0767 | 23.365 |

### Material Boundary

| X | Y |
|---|---|
| 0.246463 | -1.48563 |
| 14.9068 | 2.359 |
| 31.5166 | 8.039 |
| 40.9932 | 10.529 |
| 51.5928 | 16.7302 |
| 55.0767 | 20.73 |

### Material Boundary

| X | Y |
|---|---|
| 0.246463 | -4.15895 |
| 55.0767 | 11.1863 |

### Material Boundary

| X | Y |
|---|---|
| 0.246463 | 1.46432 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| 51.3789 | 18.6032 |
| 55.0767 | 21.5626 |

### Material Boundary

| X | Y |
|---|---|
| 11.8904 | 6.69465 |
| 12.5374 | 6.75631 |

## Material Boundary

| X | Y |
|---|---|
| 11.8302 | 6.25839 |
| 12.0064 | 6.30208 |
| 12.4593 | 6.43289 |
| 11.9871 | 6.38732 |
| 11.9207 | 6.3809 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: YK S44-SLIDE EQ=0.20dn c=3, phi=28
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 26/2/2021, 7:56:50

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): 0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT |
|---|---|---|---|---|---|---|---|
| Color | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 |
| Friction Angle [deg] | 28 | 30 | 33 | 34 | 25 | 45 | 28 |
| Water Surface | None | None | Water Table | Water Table | None | None | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | | | Automatically Calculated |
| Ru Value | 0 | 0 | | | 0 | 0 | |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.687156
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=427.096 kN-m
Driving Moment=621.542 kN-m

### Method: bishop simplified

FS: 0.742013
Center: 10.436, 17.120

Radius: 10.163
Left Slip Surface Endpoint: 13.518, 7.436
Right Slip Surface Endpoint: 19.085, 11.784
Resisting Moment=693.192 kN-m
Driving Moment=934.205 kN-m

### Method: janbu simplified

FS: 0.674210
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=48.1104 kN
Driving Horizontal Force=71.3582 kN

### Method: janbu corrected

FS: 0.711154
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=50.7466 kN
Driving Horizontal Force=71.3582 kN

### Method: spencer

FS: 0.741248
Center: 8.618, 19.011
Radius: 12.605
Left Slip Surface Endpoint: 13.438, 7.364
Right Slip Surface Endpoint: 18.961, 11.807
Resisting Moment=748.759 kN-m
Driving Moment=1010.13 kN-m
Resisting Horizontal Force=46.2378 kN
Driving Horizontal Force=62.3783 kN

### Method: corp of eng#1

FS: 0.725589
Center: 10.436, 17.120
Radius: 10.163
Left Slip Surface Endpoint: 13.518, 7.436
Right Slip Surface Endpoint: 19.085, 11.784
Resisting Horizontal Force=53.1639 kN
Driving Horizontal Force=73.27 kN

### Method: corp of eng#2

FS: 0.736070
Center: 10.436, 17.120
Radius: 10.163
Left Slip Surface Endpoint: 13.518, 7.436
Right Slip Surface Endpoint: 19.085, 11.784
Resisting Horizontal Force=53.6463 kN
Driving Horizontal Force=72.882 kN

### Method: lowe-karafiath

FS: 0.722150
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=50.5541 kN
Driving Horizontal Force=70.0049 kN

### Method: gle/morgenstern-price

FS: 0.739965
Center: 10.436, 17.120
Radius: 10.163
Left Slip Surface Endpoint: 13.518, 7.436
Right Slip Surface Endpoint: 19.085, 11.784
Resisting Moment=691.279 kN-m
Driving Moment=934.205 kN-m
Resisting Horizontal Force=53.8737 kN
Driving Horizontal Force=72.8057 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 6992
Number of Invalid Surfaces: 3008

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 188 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 6969
Number of Invalid Surfaces: 3031

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 189 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 22 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 6426
Number of Invalid Surfaces: 3574

**Error Codes:**

Error Code -105 reported for 139 surfaces

Error Code -106 reported for 271 surfaces
Error Code -108 reported for 752 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 2 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 6426
Number of Invalid Surfaces: 3574

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 752 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 2 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: spencer

Number of Valid Surfaces: 5732
Number of Invalid Surfaces: 4268

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 794 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 632 surfaces
Error Code -112 reported for 22 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 5776
Number of Invalid Surfaces: 4224

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 1074 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 330 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 4780
Number of Invalid Surfaces: 5220

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 2048 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 352 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 3694
Number of Invalid Surfaces: 6306

### Error Codes:

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 2981 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 505 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 6156
Number of Invalid Surfaces: 3844

### Error Codes:

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 756 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 246 surfaces
Error Code -112 reported for 22 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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.
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

# *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.687156

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 4.68902 | 3.22209 | 0.41769 | 0 | 0.41769 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 6.02248 | 4.13838 | 2.14097 | 0 | 2.14097 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 7.88266 | 5.41662 | 4.54499 | 0 | 4.54499 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 9.4381 | 6.48545 | 6.5552 | 0 | 6.5552 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 10.9086 | 7.49593 | 8.45562 | 0 | 8.45562 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 12.2143 | 8.39315 | 10.143 | 0 | 10.143 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 14.3393 | 9.85335 | 12.8893 | 0 | 12.8893 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 15.0782 | 10.3611 | 13.8442 | 0 | 13.8442 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 15.1286 | 10.3957 | 13.9093 | 0 | 13.9093 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 16.1802 | 11.1183 | 15.2683 | 0 | 15.2683 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 17.756 | 12.2011 | 17.3048 | 0 | 17.3048 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 18.0898 | 12.4305 | 17.7362 | 0 | 17.7362 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 18.2297 | 12.5267 | 17.917 | 0 | 17.917 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 19.0312 | 13.0774 | 18.9528 | 0 | 18.9528 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 19.5336 | 13.4226 | 19.602 | 0 | 19.602 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 18.8083 | 12.9242 | 18.6647 | 0 | 18.6647 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 18.1429 | 12.467 | 17.8048 | 0 | 17.8048 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 17.1815 | 11.8064 | 16.5624 | 0 | 16.5624 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 15.239 | 10.4716 | 14.052 | 0 | 14.052 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 13.1242 | 9.01836 | 11.3189 | 0 | 11.3189 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 10.9737 | 7.54065 | 8.53971 | 0 | 8.53971 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 8.93294 | 6.13832 | 5.90231 | 0 | 5.90231 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 7.16748 | 4.92518 | 3.62074 | 0 | 3.62074 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 5.7294 | 3.93699 | 1.76222 | 0 | 1.76222 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 4.66305 | 3.20424 | 0.384127 | 0 | 0.384127 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 0.742013

| 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 | 0.222682 | 0.255223 | UNIT I | 3 | 28 | 4.00232 | 2.96977 | -0.05685 | 0 | -0.05685 |
| 2 | 0.222682 | 0.727766 | UNIT I | 3 | 28 | 5.27687 | 3.91551 | 1.72181 | 0 | 1.72181 |
| 3 | 0.222682 | 1.19448 | UNIT I | 3 | 28 | 6.49584 | 4.82 | 3.42292 | 0 | 3.42292 |
| 4 | 0.222682 | 1.67105 | UNIT I | 3 | 28 | 7.70301 | 5.71573 | 5.10755 | 0 | 5.10755 |
| 5 | 0.222682 | 2.46008 | UNIT I | 3 | 28 | 9.71297 | 7.20715 | 7.91248 | 0 | 7.91248 |
| 6 | 0.222682 | 2.80131 | UNIT I | 3 | 28 | 10.4682 | 7.76754 | 8.96644 | 0 | 8.96644 |
| 7 | 0.222682 | 2.97339 | UNIT I | 3 | 28 | 10.7525 | 7.97852 | 9.36321 | 0 | 9.36321 |
| 8 | 0.222682 | 3.75787 | UNIT I | 3 | 28 | 12.5958 | 9.34628 | 11.9356 | 0 | 11.9356 |
| 9 | 0.222682 | 4.49543 | UNIT I | 3 | 28 | 14.253 | 10.5759 | 14.2482 | 0 | 14.2482 |
| 10 | 0.222682 | 4.97251 | UNIT I | 3 | 28 | 15.1978 | 11.277 | 15.5667 | 0 | 15.5667 |
| 11 | 0.222682 | 5.54953 | UNIT I | 3 | 28 | 16.3428 | 12.1266 | 17.1646 | 0 | 17.1646 |
| 12 | 0.222682 | 6.5616 | UNIT I | 3 | 28 | 18.4772 | 13.7103 | 20.1431 | 0 | 20.1431 |
| 13 | 0.222682 | 7.18256 | UNIT I | 3 | 28 | 19.596 | 14.5405 | 21.7045 | 0 | 21.7045 |
| 14 | 0.222682 | 7.59145 | UNIT I | 3 | 28 | 20.1626 | 14.9609 | 22.4951 | 0 | 22.4951 |
| 15 | 0.222682 | 8.15904 | UNIT I | 3 | 28 | 21.0418 | 15.6133 | 23.7221 | 0 | 23.7221 |
| 16 | 0.222682 | 8.18563 | UNIT I | 3 | 28 | 20.6587 | 15.329 | 23.1875 | 0 | 23.1875 |
| 17 | 0.222682 | 7.86359 | UNIT I | 3 | 28 | 19.505 | 14.473 | 21.5775 | 0 | 21.5775 |
| 18 | 0.222682 | 7.38087 | UNIT I | 3 | 28 | 18.0289 | 13.3777 | 19.5176 | 0 | 19.5176 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 0.222682 | 6.73817 | UNIT I | 3 | 28 | 16.2563 | 12.0624 | 17.0439 | 0 | 17.0439 |
| 20 | 0.222682 | 6.0571 | UNIT I | 3 | 28 | 14.4578 | 10.7279 | 14.534 | 0 | 14.534 |
| 21 | 0.222682 | 5.33666 | UNIT I | 3 | 28 | 12.6395 | 9.37869 | 11.9966 | 0 | 11.9966 |
| 22 | 0.222682 | 4.36999 | UNIT I | 3 | 28 | 10.4201 | 7.73185 | 8.8993 | 0 | 8.8993 |
| 23 | 0.222682 | 3.35206 | UNIT I | 3 | 28 | 8.20655 | 6.08937 | 5.81026 | 0 | 5.81026 |
| 24 | 0.222682 | 2.21303 | UNIT I | 3 | 28 | 5.89488 | 4.37408 | 2.58428 | 0 | 2.58428 |
| 25 | 0.222682 | 0.812982 | UNIT I | 3 | 28 | 3.28852 | 2.44013 | -1.05297 | 0 | -1.05297 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.67421

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 4.14874 | 2.79712 | -0.381564 | 0 | -0.381564 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 5.32838 | 3.59245 | 1.11423 | 0 | 1.11423 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 7.01022 | 4.72636 | 3.24681 | 0 | 3.24681 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 8.41668 | 5.67461 | 5.0302 | 0 | 5.0302 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 9.76654 | 6.5847 | 6.74185 | 0 | 6.74185 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 10.993 | 7.41159 | 8.29698 | 0 | 8.29698 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 13.0608 | 8.80573 | 10.919 | 0 | 10.919 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 13.8411 | 9.33182 | 11.9084 | 0 | 11.9084 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 13.9882 | 9.431 | 12.0949 | 0 | 12.0949 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 15.1989 | 10.2473 | 13.6301 | 0 | 13.6301 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 17.0525 | 11.497 | 15.9804 | 0 | 15.9804 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 17.7184 | 11.9459 | 16.8248 | 0 | 16.8248 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 18.2668 | 12.3157 | 17.5202 | 0 | 17.5202 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 19.6792 | 13.2679 | 19.311 | 0 | 19.311 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 20.9245 | 14.1075 | 20.8902 | 0 | 20.8902 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 20.8328 | 14.0457 | 20.774 | 0 | 20.774 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 20.9116 | 14.0988 | 20.8739 | 0 | 20.8739 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 20.695 | 13.9528 | 20.5992 | 0 | 20.5992 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 19.0702 | 12.8573 | 18.5389 | 0 | 18.5389 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 17.0029 | 11.4635 | 15.9176 | 0 | 15.9176 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 14.566 | 9.82057 | 12.8276 | 0 | 12.8276 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 11.8597 | 7.99594 | 9.39598 | 0 | 9.39598 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 9.06977 | 6.11493 | 5.85833 | 0 | 5.85833 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 6.15421 | 4.14923 | 2.16139 | 0 | 2.16139 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.88532 | 1.94531 | -1.98358 | 0 | -1.98358 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.711154

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 3.93321 | 2.79712 | -0.381564 | 0 | -0.381564 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 5.05157 | 3.59245 | 1.11423 | 0 | 1.11423 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 6.64604 | 4.72636 | 3.24681 | 0 | 3.24681 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 7.97944 | 5.67461 | 5.0302 | 0 | 5.0302 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 9.25918 | 6.5847 | 6.74185 | 0 | 6.74185 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 10.4219 | 7.41159 | 8.29698 | 0 | 8.29698 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 12.3823 | 8.80573 | 10.919 | 0 | 10.919 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 13.1221 | 9.33182 | 11.9084 | 0 | 11.9084 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 13.2615 | 9.431 | 12.0949 | 0 | 12.0949 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 14.4093 | 10.2473 | 13.6301 | 0 | 13.6301 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 16.1666 | 11.497 | 15.9804 | 0 | 15.9804 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 16.7979 | 11.9459 | 16.8248 | 0 | 16.8248 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 17.3179 | 12.3157 | 17.5202 | 0 | 17.5202 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 18.6569 | 13.2679 | 19.311 | 0 | 19.311 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 19.8375 | 14.1075 | 20.8902 | 0 | 20.8902 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 19.7506 | 14.0457 | 20.774 | 0 | 20.774 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 19.8252 | 14.0988 | 20.8739 | 0 | 20.8739 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 19.6199 | 13.9528 | 20.5992 | 0 | 20.5992 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 18.0795 | 12.8573 | 18.5389 | 0 | 18.5389 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 16.1196 | 11.4635 | 15.9176 | 0 | 15.9176 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 13.8093 | 9.82057 | 12.8276 | 0 | 12.8276 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 11.2436 | 7.99594 | 9.39598 | 0 | 9.39598 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 8.5986 | 6.11493 | 5.85833 | 0 | 5.85833 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 5.8345 | 4.14923 | 2.16139 | 0 | 2.16139 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.73543 | 1.94531 | -1.98358 | 0 | -1.98358 |

**Global Minimum Query (spencer) - Safety Factor**: 0.741248

| 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 | 0.220903 | 0.214072 | UNIT I | 3 | 28 | 6.70808 | 4.97235 | 3.70944 | 0 | 3.70944 |
| 2 | 0.220903 | 0.608189 | UNIT I | 3 | 28 | 7.66899 | 5.68462 | 5.04905 | 0 | 5.04905 |
| 3 | 0.220903 | 0.949803 | UNIT I | 3 | 28 | 8.40294 | 6.22866 | 6.07223 | 0 | 6.07223 |
| 4 | 0.220903 | 1.39609 | UNIT I | 3 | 28 | 9.33808 | 6.92183 | 7.37586 | 0 | 7.37586 |
| 5 | 0.220903 | 1.84419 | UNIT I | 3 | 28 | 10.1909 | 7.55401 | 8.56484 | 0 | 8.56484 |
| 6 | 0.220903 | 2.4171 | UNIT I | 3 | 28 | 11.2585 | 8.34537 | 10.0532 | 0 | 10.0532 |
| 7 | 0.220903 | 2.49652 | UNIT I | 3 | 28 | 11.1004 | 8.22813 | 9.83267 | 0 | 9.83267 |
| 8 | 0.220903 | 2.81506 | UNIT I | 3 | 28 | 11.4618 | 8.49601 | 10.3365 | 0 | 10.3365 |
| 9 | 0.220903 | 3.70136 | UNIT I | 3 | 28 | 12.9689 | 9.61316 | 12.4375 | 0 | 12.4375 |
| 10 | 0.220903 | 4.12156 | UNIT I | 3 | 28 | 13.3984 | 9.93154 | 13.0363 | 0 | 13.0363 |
| 11 | 0.220903 | 4.51749 | UNIT I | 3 | 28 | 13.7265 | 10.1748 | 13.4937 | 0 | 13.4937 |
| 12 | 0.220903 | 5.30369 | UNIT I | 3 | 28 | 14.7308 | 10.9191 | 14.8937 | 0 | 14.8937 |
| 13 | 0.220903 | 6.1267 | UNIT I | 3 | 28 | 15.698 | 11.6361 | 16.2422 | 0 | 16.2422 |
| 14 | 0.220903 | 6.44623 | UNIT I | 3 | 28 | 15.7052 | 11.6414 | 16.2522 | 0 | 16.2522 |
| 15 | 0.220903 | 6.92061 | UNIT I | 3 | 28 | 15.9412 | 11.8164 | 16.5812 | 0 | 16.5812 |
| 16 | 0.220903 | 7.2397 | UNIT I | 3 | 28 | 15.8901 | 11.7785 | 16.5099 | 0 | 16.5099 |
| 17 | 0.220903 | 6.97098 | UNIT I | 3 | 28 | 14.9316 | 11.068 | 15.1738 | 0 | 15.1738 |
| 18 | 0.220903 | 6.54643 | UNIT I | 3 | 28 | 13.7996 | 10.2289 | 13.5956 | 0 | 13.5956 |
| 19 | 0.220903 | 5.94943 | UNIT I | 3 | 28 | 12.4942 | 9.26131 | 11.7758 | 0 | 11.7758 |
| 20 | 0.220903 | 5.27014 | UNIT I | 3 | 28 | 11.1598 | 8.27219 | 9.91553 | 0 | 9.91553 |
| 21 | 0.220903 | 4.59144 | UNIT I | 3 | 28 | 9.9099 | 7.34569 | 8.17304 | 0 | 8.17304 |
| 22 | 0.220903 | 3.78517 | UNIT I | 3 | 28 | 8.57873 | 6.35897 | 6.31731 | 0 | 6.31731 |
| 23 | 0.220903 | 2.79403 | UNIT I | 3 | 28 | 7.10826 | 5.26898 | 4.26734 | 0 | 4.26734 |
| 24 | 0.220903 | 1.81875 | UNIT I | 3 | 28 | 5.74509 | 4.25854 | 2.36696 | 0 | 2.36696 |
| 25 | 0.220903 | 0.660919 | UNIT I | 3 | 28 | 4.46358 | 3.30862 | 0.580431 | 0 | 0.580431 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.725589

| 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 | 0.222682 | 0.255223 | UNIT I | 3 | 28 | 6.31924 | 4.58517 | 2.98127 | 0 | 2.98127 |
| 2 | 0.222682 | 0.727766 | UNIT I | 3 | 28 | 7.68332 | 5.57493 | 4.84272 | 0 | 4.84272 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 0.222682 | 1.19448 | UNIT I | 3 | 28 | 8.91922 | 6.47169 | 6.52932 | 0 | 6.52932 |
| 4 | 0.222682 | 1.67105 | UNIT I | 3 | 28 | 10.082 | 7.31537 | 8.11604 | 0 | 8.11604 |
| 5 | 0.222682 | 2.46008 | UNIT I | 3 | 28 | 12.0355 | 8.73282 | 10.7819 | 0 | 10.7819 |
| 6 | 0.222682 | 2.80131 | UNIT I | 3 | 28 | 12.6014 | 9.14347 | 11.5542 | 0 | 11.5542 |
| 7 | 0.222682 | 2.97339 | UNIT I | 3 | 28 | 12.6629 | 9.18804 | 11.638 | 0 | 11.638 |
| 8 | 0.222682 | 3.75787 | UNIT I | 3 | 28 | 14.2531 | 10.3419 | 13.808 | 0 | 13.808 |
| 9 | 0.222682 | 4.49543 | UNIT I | 3 | 28 | 15.588 | 11.3105 | 15.6298 | 0 | 15.6298 |
| 10 | 0.222682 | 4.97251 | UNIT I | 3 | 28 | 16.1876 | 11.7456 | 16.448 | 0 | 16.448 |
| 11 | 0.222682 | 5.54953 | UNIT I | 3 | 28 | 16.9393 | 12.291 | 17.4738 | 0 | 17.4738 |
| 12 | 0.222682 | 6.5616 | UNIT I | 3 | 28 | 18.5427 | 13.4544 | 19.6619 | 0 | 19.6619 |
| 13 | 0.222682 | 7.18256 | UNIT I | 3 | 28 | 19.1753 | 13.9134 | 20.5252 | 0 | 20.5252 |
| 14 | 0.222682 | 7.59145 | UNIT I | 3 | 28 | 19.2976 | 14.0021 | 20.692 | 0 | 20.692 |
| 15 | 0.222682 | 8.15904 | UNIT I | 3 | 28 | 19.6712 | 14.2732 | 21.2018 | 0 | 21.2018 |
| 16 | 0.222682 | 8.18563 | UNIT I | 3 | 28 | 18.9803 | 13.7719 | 20.2589 | 0 | 20.2589 |
| 17 | 0.222682 | 7.86359 | UNIT I | 3 | 28 | 17.6896 | 12.8354 | 18.4977 | 0 | 18.4977 |
| 18 | 0.222682 | 7.38087 | UNIT I | 3 | 28 | 16.192 | 11.7487 | 16.454 | 0 | 16.454 |
| 19 | 0.222682 | 6.73817 | UNIT I | 3 | 28 | 14.5215 | 10.5366 | 14.1743 | 0 | 14.1743 |
| 20 | 0.222682 | 6.0571 | UNIT I | 3 | 28 | 12.895 | 9.35648 | 11.9548 | 0 | 11.9548 |
| 21 | 0.222682 | 5.33666 | UNIT I | 3 | 28 | 11.3155 | 8.21038 | 9.79929 | 0 | 9.79929 |
| 22 | 0.222682 | 4.36999 | UNIT I | 3 | 28 | 9.50236 | 6.89481 | 7.32508 | 0 | 7.32508 |
| 23 | 0.222682 | 3.35206 | UNIT I | 3 | 28 | 7.75954 | 5.63024 | 4.94676 | 0 | 4.94676 |
| 24 | 0.222682 | 2.21303 | UNIT I | 3 | 28 | 6.00808 | 4.3594 | 2.55666 | 0 | 2.55666 |
| 25 | 0.222682 | 0.812982 | UNIT I | 3 | 28 | 4.21172 | 3.05598 | 0.105285 | 0 | 0.105285 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 0.73607

| 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 | 0.222682 | 0.255223 | UNIT I | 3 | 28 | 6.44315 | 4.74261 | 3.27738 | 0 | 3.27738 |
| 2 | 0.222682 | 0.727766 | UNIT I | 3 | 28 | 8.36441 | 6.15679 | 5.93706 | 0 | 5.93706 |
| 3 | 0.222682 | 1.19448 | UNIT I | 3 | 28 | 9.11885 | 6.71211 | 6.98148 | 0 | 6.98148 |
| 4 | 0.222682 | 1.67105 | UNIT I | 3 | 28 | 12.2064 | 8.9848 | 11.2558 | 0 | 11.2558 |
| 5 | 0.222682 | 2.46008 | UNIT I | 3 | 28 | 11.39 | 8.38382 | 10.1255 | 0 | 10.1255 |
| 6 | 0.222682 | 2.80131 | UNIT I | 3 | 28 | 7.84169 | 5.77203 | 5.21344 | 0 | 5.21344 |
| 7 | 0.222682 | 2.97339 | UNIT I | 3 | 28 | 23.7093 | 17.4517 | 27.1797 | 0 | 27.1797 |
| 8 | 0.222682 | 3.75787 | UNIT I | 3 | 28 | 19.0438 | 14.0176 | 20.721 | 0 | 20.721 |
| 9 | 0.222682 | 4.49543 | UNIT I | 3 | 28 | 8.41959 | 6.19741 | 6.01344 | 0 | 6.01344 |
| 10 | 0.222682 | 4.97251 | UNIT I | 3 | 28 | 21.7812 | 16.0325 | 24.5105 | 0 | 24.5105 |
| 11 | 0.222682 | 5.54953 | UNIT I | 3 | 28 | 24.5592 | 18.0773 | 28.3562 | 0 | 28.3562 |
| 12 | 0.222682 | 6.5616 | UNIT I | 3 | 28 | 12.1629 | 8.95276 | 11.1955 | 0 | 11.1955 |
| 13 | 0.222682 | 7.18256 | UNIT I | 3 | 28 | 14.2826 | 10.513 | 14.1298 | 0 | 14.1298 |
| 14 | 0.222682 | 7.59145 | UNIT I | 3 | 28 | 20.2935 | 14.9374 | 22.451 | 0 | 22.451 |
| 15 | 0.222682 | 8.15904 | UNIT I | 3 | 28 | 12.6594 | 9.31819 | 11.8828 | 0 | 11.8828 |
| 16 | 0.222682 | 8.18563 | UNIT I | 3 | 28 | 13.4474 | 9.89826 | 12.9737 | 0 | 12.9737 |
| 17 | 0.222682 | 7.86359 | UNIT I | 3 | 28 | 16.6704 | 12.2706 | 17.4354 | 0 | 17.4354 |
| 18 | 0.222682 | 7.38087 | UNIT I | 3 | 28 | 16.1897 | 11.9168 | 16.77 | 0 | 16.77 |
| 19 | 0.222682 | 6.73817 | UNIT I | 3 | 28 | 15.4972 | 11.407 | 15.8113 | 0 | 15.8113 |
| 20 | 0.222682 | 6.0571 | UNIT I | 3 | 28 | 13.6413 | 10.0409 | 13.2421 | 0 | 13.2421 |
| 21 | 0.222682 | 5.33666 | UNIT I | 3 | 28 | 11.9233 | 8.77641 | 10.8638 | 0 | 10.8638 |
| 22 | 0.222682 | 4.36999 | UNIT I | 3 | 28 | 10.1245 | 7.45233 | 8.37363 | 0 | 8.37363 |
| 23 | 0.222682 | 3.35206 | UNIT I | 3 | 28 | 8.06039 | 5.93301 | 5.51621 | 0 | 5.51621 |
| 24 | 0.222682 | 2.21303 | UNIT I | 3 | 28 | 6.21321 | 4.57336 | 2.95904 | 0 | 2.95904 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 0.222682 | 0.812982 | UNIT I | 3 | 28 | 3.24855 | 2.39116 | -1.14506 | 0 | -1.14506 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.72215

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 5.15682 | 3.724 | 1.36164 | 0 | 1.36164 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 7.10668 | 5.13209 | 4.00988 | 0 | 4.00988 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 8.65481 | 6.25007 | 6.11251 | 0 | 6.11251 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 10.8052 | 7.803 | 9.03315 | 0 | 9.03315 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 11.5227 | 8.32112 | 10.0076 | 0 | 10.0076 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 14.2688 | 10.3042 | 13.7372 | 0 | 13.7372 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 14.6679 | 10.5924 | 14.2792 | 0 | 14.2792 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 11.6434 | 8.40826 | 10.1714 | 0 | 10.1714 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 22.0805 | 15.9454 | 24.3468 | 0 | 24.3468 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 18.975 | 13.7028 | 20.1291 | 0 | 20.1291 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 14.5822 | 10.5305 | 14.1628 | 0 | 14.1628 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 19.3382 | 13.9651 | 20.6224 | 0 | 20.6224 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 21.8171 | 15.7552 | 23.989 | 0 | 23.989 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 19.132 | 13.8162 | 20.3424 | 0 | 20.3424 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 16.3727 | 11.8235 | 16.5946 | 0 | 16.5946 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 18.6497 | 13.4679 | 19.6873 | 0 | 19.6873 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 16.7976 | 12.1304 | 17.1717 | 0 | 17.1717 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 14.0711 | 10.1615 | 13.4687 | 0 | 13.4687 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 14.2701 | 10.3052 | 13.739 | 0 | 13.739 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 13.4683 | 9.72615 | 12.6501 | 0 | 12.6501 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 11.7709 | 8.50033 | 10.3446 | 0 | 10.3446 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 9.79409 | 7.0728 | 7.65981 | 0 | 7.65981 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 7.63851 | 5.51615 | 4.73219 | 0 | 4.73219 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 5.64419 | 4.07595 | 2.02357 | 0 | 2.02357 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 3.79464 | 2.7403 | -0.488428 | 0 | -0.488428 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 0.739965

| 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 | 0.222682 | 0.255223 | UNIT I | 3 | 28 | 4.43025 | 3.27823 | 0.523267 | 0 | 0.523267 |
| 2 | 0.222682 | 0.727766 | UNIT I | 3 | 28 | 6.65986 | 4.92806 | 3.62616 | 0 | 3.62616 |
| 3 | 0.222682 | 1.19448 | UNIT I | 3 | 28 | 8.89897 | 6.58493 | 6.74228 | 0 | 6.74228 |
| 4 | 0.222682 | 1.67105 | UNIT I | 3 | 28 | 11.066 | 8.18848 | 9.75813 | 0 | 9.75813 |
| 5 | 0.222682 | 2.46008 | UNIT I | 3 | 28 | 13.882 | 10.2722 | 13.677 | 0 | 13.677 |
| 6 | 0.222682 | 2.80131 | UNIT I | 3 | 28 | 15.1076 | 11.1791 | 15.3826 | 0 | 15.3826 |
| 7 | 0.222682 | 2.97339 | UNIT I | 3 | 28 | 15.5259 | 11.4886 | 15.9648 | 0 | 15.9648 |
| 8 | 0.222682 | 3.75787 | UNIT I | 3 | 28 | 17.0858 | 12.6429 | 18.1357 | 0 | 18.1357 |
| 9 | 0.222682 | 4.49543 | UNIT I | 3 | 28 | 18.0391 | 13.3483 | 19.4622 | 0 | 19.4622 |
| 10 | 0.222682 | 4.97251 | UNIT I | 3 | 28 | 18.0044 | 13.3226 | 19.414 | 0 | 19.414 |
| 11 | 0.222682 | 5.54953 | UNIT I | 3 | 28 | 17.9052 | 13.2492 | 19.276 | 0 | 19.276 |
| 12 | 0.222682 | 6.5616 | UNIT I | 3 | 28 | 18.4337 | 13.6403 | 20.0115 | 0 | 20.0115 |
| 13 | 0.222682 | 7.18256 | UNIT I | 3 | 28 | 18.1117 | 13.402 | 19.5632 | 0 | 19.5632 |
| 14 | 0.222682 | 7.59145 | UNIT I | 3 | 28 | 17.4828 | 12.9367 | 18.6882 | 0 | 18.6882 |
| 15 | 0.222682 | 8.15904 | UNIT I | 3 | 28 | 17.2696 | 12.7789 | 18.3914 | 0 | 18.3914 |
| 16 | 0.222682 | 8.18563 | UNIT I | 3 | 28 | 16.4252 | 12.1541 | 17.2163 | 0 | 17.2163 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0.222682 | 7.86359 | UNIT I | 3 | 28 | 15.3148 | 11.3324 | 15.6709 | 0 | 15.6709 |
| 18 | 0.222682 | 7.38087 | UNIT I | 3 | 28 | 14.2026 | 10.5094 | 14.1231 | 0 | 14.1231 |
| 19 | 0.222682 | 6.73817 | UNIT I | 3 | 28 | 13.0419 | 9.65055 | 12.5079 | 0 | 12.5079 |
| 20 | 0.222682 | 6.0571 | UNIT I | 3 | 28 | 11.9548 | 8.84614 | 10.995 | 0 | 10.995 |
| 21 | 0.222682 | 5.33666 | UNIT I | 3 | 28 | 10.8941 | 8.06125 | 9.51884 | 0 | 9.51884 |
| 22 | 0.222682 | 4.36999 | UNIT I | 3 | 28 | 9.50838 | 7.03587 | 7.59037 | 0 | 7.59037 |
| 23 | 0.222682 | 3.35206 | UNIT I | 3 | 28 | 7.998 | 5.91824 | 5.4884 | 0 | 5.4884 |
| 24 | 0.222682 | 2.21303 | UNIT I | 3 | 28 | 6.15091 | 4.55146 | 2.91788 | 0 | 2.91788 |
| 25 | 0.222682 | 0.812982 | UNIT I | 3 | 28 | 3.55605 | 2.63135 | -0.693325 | 0 | -0.693325 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 0.246463 | 1.46432 |
| 40.9932 | 12.499 |
| 51.3789 | 18.6032 |
| 55.0767 | 21.5626 |

### External Boundary

| X | Y |
|---|---|
| 11.8302 | 6.25839 |
| 11.9085 | 5.94261 |
| 11.8338 | 5.93829 |
| 11.7564 | 5.93035 |
| 11.5778 | 5.90654 |
| 11.2683 | 5.85829 |
| 11.121 | 5.87353 |
| 10.7096 | 5.80753 |
| 9.86652 | 5.76184 |
| 9.18593 | 5.68061 |
| 8.79485 | 5.58415 |
| 7.0512 | 5.31012 |
| 6.72302 | 5.27311 |
| 5.64857 | 5.14084 |
| 5.29472 | 5.11414 |
| 4.72058 | 5.0007 |
| 4.27995 | 4.99402 |
| 3.82598 | 5.01405 |
| 3.08493 | 4.98068 |
| 2.13692 | 4.92729 |
| 1.3558 | 4.92062 |
| 0.246463 | 4.88648 |
| 0.246463 | 1.46432 |
| 0.246463 | -1.48563 |
| 0.246463 | -4.15895 |
| 0.246463 | -5.39914 |
| 55.0767 | -5.39914 |

| | |
|---|---|
| 55.0767 | 11.1863 |
| 55.0767 | 17.6064 |
| 55.0767 | 19.3597 |
| 55.0767 | 20.73 |
| 55.0767 | 21.5626 |
| 55.0767 | 23.365 |
| 55.0767 | 26.0251 |
| 54.4584 | 25.8397 |
| 53.5618 | 25.4688 |
| 52.9744 | 24.7581 |
| 52.387 | 24.0473 |
| 51.9851 | 23.2439 |
| 51.4905 | 22.3786 |
| 50.6249 | 21.1116 |
| 50.0375 | 20.3699 |
| 49.3883 | 19.9682 |
| 48.3371 | 19.3192 |
| 46.9347 | 18.4742 |
| 46.5963 | 18.1974 |
| 46.0426 | 17.6746 |
| 45.2735 | 17.1211 |
| 42.619 | 15.4479 |
| 41.5004 | 14.3587 |
| 40.9932 | 14.0478 |
| 28.6564 | 14.5035 |
| 28.4403 | 14.3523 |
| 27.9984 | 13.9021 |
| 27.1243 | 13.33 |
| 26.6199 | 13.034 |
| 26.1664 | 12.775 |
| 25.3511 | 12.4826 |
| 25.084 | 12.4182 |
| 24.588 | 12.3104 |
| 23.9236 | 12.26 |
| 23.0163 | 12.0768 |
| 21.1904 | 11.726 |
| 19.9593 | 11.6492 |
| 19.6087 | 11.6628 |
| 19.1761 | 11.7671 |
| 18.9009 | 11.8177 |
| 18.6038 | 11.7888 |
| 18.4227 | 11.7381 |
| 18.104 | 11.7019 |
| 17.7852 | 11.586 |
| 17.3578 | 11.4629 |
| 17.1622 | 11.376 |
| 16.9304 | 11.2529 |
| 16.7783 | 11.1443 |
| 16.6624 | 10.9633 |
| 16.5537 | 10.8184 |
| 16.4378 | 10.6591 |

| | |
|---|---|
| 16.177 | 10.3912 |
| 15.9742 | 10.0364 |
| 15.8293 | 9.7757 |
| 15.4386 | 9.35059 |
| 15.2492 | 9.14782 |
| 15.0644 | 8.79185 |
| 14.7514 | 8.58118 |
| 14.545 | 8.45563 |
| 14.4374 | 8.27628 |
| 14.3746 | 8.15073 |
| 14.1996 | 8.06105 |
| 14.1009 | 7.92653 |
| 13.7201 | 7.61191 |
| 13.4783 | 7.4007 |
| 13.3755 | 7.30665 |
| 13.2134 | 7.22479 |
| 13.1036 | 7.18821 |
| 12.938 | 7.17699 |
| 12.8129 | 7.15925 |
| 12.7783 | 7.15306 |
| 12.7324 | 7.13449 |
| 12.6742 | 7.13078 |
| 12.5863 | 7.12211 |
| 12.5045 | 7.10679 |
| 11.8575 | 7.04435 |
| 11.8894 | 6.70473 |
| 11.8904 | 6.69465 |
| 11.9207 | 6.3809 |

## Material Boundary

| X | Y |
|---|---|
| 12.5045 | 7.10679 |
| 12.5364 | 6.76717 |

## Material Boundary

| X | Y |
|---|---|
| 11.8894 | 6.70473 |
| 12.5364 | 6.76717 |

## Material Boundary

| X | Y |
|---|---|
| 11.9085 | 5.94261 |
| 12.5394 | 6.09906 |
| 12.4593 | 6.43289 |
| 12.5676 | 6.44334 |
| 12.5374 | 6.75631 |
| 12.5364 | 6.76717 |

## Material Boundary

| X | Y |
|---|---|
| 12.5394 | 6.09906 |
| 16.176 | 6.98 |

## Material Boundary

| X | Y |
|---|---|
| 16.176 | 6.98 |
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |
| 51.3789 | 18.6032 |
| 55.0767 | 23.365 |

## Material Boundary

| X | Y |
|---|---|
| 0.246463 | -1.48563 |
| 14.9068 | 2.359 |
| 31.5166 | 8.039 |
| 40.9932 | 10.529 |
| 51.5928 | 16.7302 |
| 55.0767 | 20.73 |

## Material Boundary

| X | Y |
|---|---|
| 0.246463 | -4.15895 |
| 55.0767 | 11.1863 |

## Material Boundary

| X | Y |
|---|---|
| 0.246463 | 1.46432 |
| 40.9932 | 12.499 |

## Material Boundary

| X | Y |
|---|---|
| 51.3789 | 18.6032 |
| 55.0767 | 21.5626 |

## Material Boundary

| X | Y |
|---|---|
| 11.8904 | 6.69465 |
| 12.5374 | 6.75631 |

## Material Boundary

| X | Y |
|---|---|

| | |
|---|---|
| 11.8302 | 6.25839 |
| 12.0064 | 6.30208 |
| 12.4593 | 6.43289 |
| 11.9871 | 6.38732 |
| 11.9207 | 6.3809 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: YK S44-SLIDE EQ=0.20up c=3, phi=28
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 26/2/2021, 7:56:50

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): -0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT |
|---|---|---|---|---|---|---|---|
| Color | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 |
| Friction Angle [deg] | 28 | 30 | 33 | 34 | 25 | 45 | 28 |
| Water Surface | None | None | Water Table | Water Table | None | None | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | | | Automatically Calculated |
| Ru Value | 0 | 0 | | | 0 | 0 | |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.698919
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Moment=367.638 kN-m
Driving Moment=526.009 kN-m

### Method: bishop simplified

FS: 0.749300
Center: 10.436, 17.120

Radius: 10.163
Left Slip Surface Endpoint: 13.518, 7.436
Right Slip Surface Endpoint: 19.085, 11.784
Resisting Moment=594.797 kN-m
Driving Moment=793.803 kN-m

### Method: janbu simplified

FS: 0.683474
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=41.3997 kN
Driving Horizontal Force=60.5724 kN

### Method: janbu corrected

FS: 0.720925
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=43.6682 kN
Driving Horizontal Force=60.5724 kN

### Method: spencer

FS: 0.748162
Center: 10.436, 17.120
Radius: 10.163
Left Slip Surface Endpoint: 13.518, 7.436
Right Slip Surface Endpoint: 19.085, 11.784
Resisting Moment=593.894 kN-m
Driving Moment=793.803 kN-m
Resisting Horizontal Force=46.396 kN
Driving Horizontal Force=62.0133 kN

### Method: corp of eng#1

FS: 0.730528
Center: 10.436, 17.120
Radius: 10.163
Left Slip Surface Endpoint: 13.518, 7.436
Right Slip Surface Endpoint: 19.085, 11.784
Resisting Horizontal Force=45.5854 kN
Driving Horizontal Force=62.4006 kN

### Method: corp of eng#2

FS: 0.741590
Center: 10.436, 17.120
Radius: 10.163
Left Slip Surface Endpoint: 13.518, 7.436
Right Slip Surface Endpoint: 19.085, 11.784
Resisting Horizontal Force=46.1402 kN
Driving Horizontal Force=62.2179 kN

### Method: lowe-karafiath

FS: 0.731689
Center: 11.886, 13.987
Radius: 6.901
Left Slip Surface Endpoint: 13.139, 7.200
Right Slip Surface Endpoint: 18.410, 11.737
Resisting Horizontal Force=43.5153 kN
Driving Horizontal Force=59.4723 kN

### Method: gle/morgenstern-price

FS: 0.746642
Center: 10.436, 17.120
Radius: 10.163
Left Slip Surface Endpoint: 13.518, 7.436
Right Slip Surface Endpoint: 19.085, 11.784
Resisting Moment=592.687 kN-m
Driving Moment=793.803 kN-m
Resisting Horizontal Force=46.2523 kN
Driving Horizontal Force=61.9471 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 6988
Number of Invalid Surfaces: 3012

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 192 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 6964
Number of Invalid Surfaces: 3036

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 193 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 6405
Number of Invalid Surfaces: 3595

**Error Codes:**

Error Code -105 reported for 139 surfaces

Error Code -106 reported for 271 surfaces
Error Code -108 reported for 773 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 2 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 6405
Number of Invalid Surfaces: 3595

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 773 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 2 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: spencer

Number of Valid Surfaces: 5705
Number of Invalid Surfaces: 4295

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 844 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 608 surfaces
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 5829
Number of Invalid Surfaces: 4171

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 1086 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 265 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 4802
Number of Invalid Surfaces: 5198

**Error Codes:**

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 2020 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 357 surfaces
Error Code -112 reported for 1 surface
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 4057
Number of Invalid Surfaces: 5943

### Error Codes:

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 2727 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 396 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 6110
Number of Invalid Surfaces: 3890

### Error Codes:

Error Code -105 reported for 139 surfaces
Error Code -106 reported for 271 surfaces
Error Code -108 reported for 779 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 268 surfaces
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 2407 surfaces
Error Code -123 reported for 2 surfaces

### Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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.
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

# *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.698919

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 4.55014 | 3.18018 | 0.338869 | 0 | 0.338869 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 5.61184 | 3.92222 | 1.73444 | 0 | 1.73444 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 7.08925 | 4.95481 | 3.67646 | 0 | 3.67646 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 8.31999 | 5.815 | 5.29422 | 0 | 5.29422 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 9.4792 | 6.62519 | 6.818 | 0 | 6.818 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 10.5036 | 7.34119 | 8.16461 | 0 | 8.16461 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 12.1711 | 8.50663 | 10.3565 | 0 | 10.3565 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 12.7387 | 8.90329 | 11.1024 | 0 | 11.1024 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 12.7611 | 8.919 | 11.132 | 0 | 11.132 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 13.5683 | 9.48312 | 12.193 | 0 | 12.193 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 14.7808 | 10.3306 | 13.7868 | 0 | 13.7868 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 15.0147 | 10.4941 | 14.0943 | 0 | 14.0943 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 15.0937 | 10.5493 | 14.1981 | 0 | 14.1981 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 15.6827 | 10.9609 | 14.9723 | 0 | 14.9723 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 16.0319 | 11.205 | 15.4313 | 0 | 15.4313 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 15.4266 | 10.782 | 14.6357 | 0 | 14.6357 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 14.8655 | 10.3898 | 13.8982 | 0 | 13.8982 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 14.0756 | 9.83769 | 12.8598 | 0 | 12.8598 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 12.5399 | 8.76434 | 10.8411 | 0 | 10.8411 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 10.8836 | 7.60674 | 8.664 | 0 | 8.664 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 9.21516 | 6.44065 | 6.47091 | 0 | 6.47091 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 7.64855 | 5.34572 | 4.41166 | 0 | 4.41166 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.31045 | 4.41049 | 2.65274 | 0 | 2.65274 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 5.2426 | 3.66415 | 1.24908 | 0 | 1.24908 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 4.48556 | 3.13504 | 0.25398 | 0 | 0.25398 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 0.7493

| 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 | 0.222682 | 0.255223 | UNIT I | 3 | 28 | 3.83863 | 2.87629 | -0.232667 | 0 | -0.232667 |
| 2 | 0.222682 | 0.727766 | UNIT I | 3 | 28 | 4.86501 | 3.64535 | 1.21373 | 0 | 1.21373 |
| 3 | 0.222682 | 1.19448 | UNIT I | 3 | 28 | 5.84652 | 4.3808 | 2.59691 | 0 | 2.59691 |
| 4 | 0.222682 | 1.67105 | UNIT I | 3 | 28 | 6.81871 | 5.10926 | 3.96693 | 0 | 3.96693 |
| 5 | 0.222682 | 2.46008 | UNIT I | 3 | 28 | 8.44301 | 6.32635 | 6.25595 | 0 | 6.25595 |
| 6 | 0.222682 | 2.80131 | UNIT I | 3 | 28 | 9.04867 | 6.78017 | 7.10947 | 0 | 7.10947 |
| 7 | 0.222682 | 2.97339 | UNIT I | 3 | 28 | 9.27197 | 6.94749 | 7.42414 | 0 | 7.42414 |
| 8 | 0.222682 | 3.75787 | UNIT I | 3 | 28 | 10.7617 | 8.06371 | 9.52346 | 0 | 9.52346 |
| 9 | 0.222682 | 4.49543 | UNIT I | 3 | 28 | 12.1004 | 9.06681 | 11.41 | 0 | 11.41 |
| 10 | 0.222682 | 4.97251 | UNIT I | 3 | 28 | 12.8606 | 9.63644 | 12.4813 | 0 | 12.4813 |
| 11 | 0.222682 | 5.54953 | UNIT I | 3 | 28 | 13.7836 | 10.328 | 13.782 | 0 | 13.782 |
| 12 | 0.222682 | 6.5616 | UNIT I | 3 | 28 | 15.5107 | 11.6221 | 16.2159 | 0 | 16.2159 |
| 13 | 0.222682 | 7.18256 | UNIT I | 3 | 28 | 16.4127 | 12.298 | 17.487 | 0 | 17.487 |
| 14 | 0.222682 | 7.59145 | UNIT I | 3 | 28 | 16.8658 | 12.6375 | 18.1256 | 0 | 18.1256 |
| 15 | 0.222682 | 8.15904 | UNIT I | 3 | 28 | 17.5731 | 13.1675 | 19.1224 | 0 | 19.1224 |
| 16 | 0.222682 | 8.18563 | UNIT I | 3 | 28 | 17.254 | 12.9284 | 18.6727 | 0 | 18.6727 |
| 17 | 0.222682 | 7.86359 | UNIT I | 3 | 28 | 16.3081 | 12.2196 | 17.3396 | 0 | 17.3396 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 0.222682 | 7.38087 | UNIT I | 3 | 28 | 15.0993 | 11.3139 | 15.6363 | 0 | 15.6363 |
| 19 | 0.222682 | 6.73817 | UNIT I | 3 | 28 | 13.6488 | 10.227 | 13.592 | 0 | 13.592 |
| 20 | 0.222682 | 6.0571 | UNIT I | 3 | 28 | 12.1763 | 9.1237 | 11.517 | 0 | 11.517 |
| 21 | 0.222682 | 5.33666 | UNIT I | 3 | 28 | 10.6869 | 8.00771 | 9.41815 | 0 | 9.41815 |
| 22 | 0.222682 | 4.36999 | UNIT I | 3 | 28 | 8.87003 | 6.64631 | 6.85773 | 0 | 6.85773 |
| 23 | 0.222682 | 3.35206 | UNIT I | 3 | 28 | 7.05663 | 5.28753 | 4.30222 | 0 | 4.30222 |
| 24 | 0.222682 | 2.21303 | UNIT I | 3 | 28 | 5.16181 | 3.86774 | 1.63199 | 0 | 1.63199 |
| 25 | 0.222682 | 0.812982 | UNIT I | 3 | 28 | 3.02519 | 2.26677 | -1.379 | 0 | -1.379 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.683474

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 4.04495 | 2.76462 | -0.442694 | 0 | -0.442694 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 4.98503 | 3.40714 | 0.765716 | 0 | 0.765716 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 6.33218 | 4.32788 | 2.49738 | 0 | 2.49738 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 7.4574 | 5.09694 | 3.94376 | 0 | 3.94376 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 8.53756 | 5.8352 | 5.33221 | 0 | 5.33221 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 9.51846 | 6.50562 | 6.59313 | 0 | 6.59313 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 11.1813 | 7.64211 | 8.73054 | 0 | 8.73054 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 11.8021 | 8.0664 | 9.52851 | 0 | 9.52851 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 11.9102 | 8.14029 | 9.66749 | 0 | 9.66749 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 12.8802 | 8.80328 | 10.9144 | 0 | 10.9144 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 14.3717 | 9.82268 | 12.8316 | 0 | 12.8316 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 14.9009 | 10.1844 | 13.5118 | 0 | 13.5118 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 15.335 | 10.4811 | 14.0698 | 0 | 14.0698 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 16.4697 | 11.2566 | 15.5285 | 0 | 15.5285 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 17.4694 | 11.9399 | 16.8134 | 0 | 16.8134 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 17.3841 | 11.8816 | 16.7037 | 0 | 16.7037 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 17.4366 | 11.9175 | 16.7714 | 0 | 16.7714 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 17.2488 | 11.7891 | 16.53 | 0 | 16.53 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 15.9163 | 10.8784 | 14.8171 | 0 | 14.8171 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 14.2226 | 9.72076 | 12.6399 | 0 | 12.6399 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 12.226 | 8.35613 | 10.0734 | 0 | 10.0734 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 10.007 | 6.83951 | 7.22105 | 0 | 7.22105 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 7.71549 | 5.27334 | 4.27554 | 0 | 4.27554 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 5.31547 | 3.63299 | 1.19047 | 0 | 1.19047 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.61776 | 1.78917 | -2.27725 | 0 | -2.27725 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.720925

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 3.83482 | 2.76462 | -0.442694 | 0 | -0.442694 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 4.72607 | 3.40714 | 0.765716 | 0 | 0.765716 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 6.00323 | 4.32788 | 2.49738 | 0 | 2.49738 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 7.07 | 5.09694 | 3.94376 | 0 | 3.94376 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 8.09405 | 5.8352 | 5.33221 | 0 | 5.33221 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 9.02399 | 6.50562 | 6.59313 | 0 | 6.59313 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 10.6004 | 7.64211 | 8.73054 | 0 | 8.73054 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 11.189 | 8.0664 | 9.52851 | 0 | 9.52851 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 11.2915 | 8.14029 | 9.66749 | 0 | 9.66749 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 12.2111 | 8.80328 | 10.9144 | 0 | 10.9144 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 13.6251 | 9.82268 | 12.8316 | 0 | 12.8316 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 14.1268 | 10.1844 | 13.5118 | 0 | 13.5118 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 14.5383 | 10.4811 | 14.0698 | 0 | 14.0698 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 15.6141 | 11.2566 | 15.5285 | 0 | 15.5285 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 16.5619 | 11.9399 | 16.8134 | 0 | 16.8134 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 16.481 | 11.8816 | 16.7037 | 0 | 16.7037 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 16.5308 | 11.9175 | 16.7714 | 0 | 16.7714 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 16.3528 | 11.7891 | 16.53 | 0 | 16.53 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 15.0895 | 10.8784 | 14.8171 | 0 | 14.8171 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 13.4837 | 9.72076 | 12.6399 | 0 | 12.6399 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 11.5908 | 8.35613 | 10.0734 | 0 | 10.0734 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 9.48713 | 6.83951 | 7.22105 | 0 | 7.22105 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 7.31469 | 5.27334 | 4.27554 | 0 | 4.27554 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 5.03934 | 3.63299 | 1.19047 | 0 | 1.19047 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 2.48177 | 1.78917 | -2.27725 | 0 | -2.27725 |

**Global Minimum Query (spencer) - Safety Factor**: 0.748162

| 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 | 0.222682 | 0.255223 | UNIT I | 3 | 28 | 7.94009 | 5.94047 | 5.5302 | 0 | 5.5302 |
| 2 | 0.222682 | 0.727766 | UNIT I | 3 | 28 | 8.86263 | 6.63068 | 6.82831 | 0 | 6.82831 |
| 3 | 0.222682 | 1.19448 | UNIT I | 3 | 28 | 9.64715 | 7.21763 | 7.93218 | 0 | 7.93218 |
| 4 | 0.222682 | 1.67105 | UNIT I | 3 | 28 | 10.3463 | 7.7407 | 8.91594 | 0 | 8.91594 |
| 5 | 0.222682 | 2.46008 | UNIT I | 3 | 28 | 11.6174 | 8.69168 | 10.7045 | 0 | 10.7045 |
| 6 | 0.222682 | 2.80131 | UNIT I | 3 | 28 | 11.821 | 8.844 | 10.991 | 0 | 10.991 |
| 7 | 0.222682 | 2.97339 | UNIT I | 3 | 28 | 11.6565 | 8.72097 | 10.7596 | 0 | 10.7596 |
| 8 | 0.222682 | 3.75787 | UNIT I | 3 | 28 | 12.5965 | 9.42421 | 12.0822 | 0 | 12.0822 |
| 9 | 0.222682 | 4.49543 | UNIT I | 3 | 28 | 13.3345 | 9.97638 | 13.1207 | 0 | 13.1207 |
| 10 | 0.222682 | 4.97251 | UNIT I | 3 | 28 | 13.5481 | 10.1362 | 13.4212 | 0 | 13.4212 |
| 11 | 0.222682 | 5.54953 | UNIT I | 3 | 28 | 13.8676 | 10.3752 | 13.8707 | 0 | 13.8707 |
| 12 | 0.222682 | 6.5616 | UNIT I | 3 | 28 | 14.7623 | 11.0446 | 15.1297 | 0 | 15.1297 |
| 13 | 0.222682 | 7.18256 | UNIT I | 3 | 28 | 14.9935 | 11.2176 | 15.455 | 0 | 15.455 |
| 14 | 0.222682 | 7.59145 | UNIT I | 3 | 28 | 14.8883 | 11.1389 | 15.307 | 0 | 15.307 |
| 15 | 0.222682 | 8.15904 | UNIT I | 3 | 28 | 14.9537 | 11.1878 | 15.399 | 0 | 15.399 |
| 16 | 0.222682 | 8.18563 | UNIT I | 3 | 28 | 14.3319 | 10.7226 | 14.524 | 0 | 14.524 |
| 17 | 0.222682 | 7.86359 | UNIT I | 3 | 28 | 13.3398 | 9.98035 | 13.1281 | 0 | 13.1281 |
| 18 | 0.222682 | 7.38087 | UNIT I | 3 | 28 | 12.236 | 9.15453 | 11.575 | 0 | 11.575 |
| 19 | 0.222682 | 6.73817 | UNIT I | 3 | 28 | 11.045 | 8.26344 | 9.89909 | 0 | 9.89909 |
| 20 | 0.222682 | 6.0571 | UNIT I | 3 | 28 | 9.90413 | 7.40989 | 8.2938 | 0 | 8.2938 |
| 21 | 0.222682 | 5.33666 | UNIT I | 3 | 28 | 8.81603 | 6.59582 | 6.76276 | 0 | 6.76276 |
| 22 | 0.222682 | 4.36999 | UNIT I | 3 | 28 | 7.6207 | 5.70152 | 5.08082 | 0 | 5.08082 |
| 23 | 0.222682 | 3.35206 | UNIT I | 3 | 28 | 6.51275 | 4.87259 | 3.52182 | 0 | 3.52182 |
| 24 | 0.222682 | 2.21303 | UNIT I | 3 | 28 | 5.46538 | 4.08899 | 2.0481 | 0 | 2.0481 |
| 25 | 0.222682 | 0.812982 | UNIT I | 3 | 28 | 4.37635 | 3.27422 | 0.515729 | 0 | 0.515729 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.730528

| 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 | 0.222682 | 0.255223 | UNIT I | 3 | 28 | 6.08924 | 4.44836 | 2.72397 | 0 | 2.72397 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.222682 | 0.727766 | UNIT I | 3 | 28 | 7.13365 | 5.21133 | 4.1589 | 0 | 4.1589 |
| 3 | 0.222682 | 1.19448 | UNIT I | 3 | 28 | 8.07824 | 5.90138 | 5.45669 | 0 | 5.45669 |
| 4 | 0.222682 | 1.67105 | UNIT I | 3 | 28 | 8.96608 | 6.54997 | 6.67653 | 0 | 6.67653 |
| 5 | 0.222682 | 2.46008 | UNIT I | 3 | 28 | 10.4732 | 7.651 | 8.74726 | 0 | 8.74726 |
| 6 | 0.222682 | 2.80131 | UNIT I | 3 | 28 | 10.895 | 7.95912 | 9.32673 | 0 | 9.32673 |
| 7 | 0.222682 | 2.97339 | UNIT I | 3 | 28 | 10.9226 | 7.97925 | 9.36462 | 0 | 9.36462 |
| 8 | 0.222682 | 3.75787 | UNIT I | 3 | 28 | 12.1469 | 8.87364 | 11.0467 | 0 | 11.0467 |
| 9 | 0.222682 | 4.49543 | UNIT I | 3 | 28 | 13.172 | 9.6225 | 12.4551 | 0 | 12.4551 |
| 10 | 0.222682 | 4.97251 | UNIT I | 3 | 28 | 13.6223 | 9.95145 | 13.0738 | 0 | 13.0738 |
| 11 | 0.222682 | 5.54953 | UNIT I | 3 | 28 | 14.1921 | 10.3678 | 13.8567 | 0 | 13.8567 |
| 12 | 0.222682 | 6.5616 | UNIT I | 3 | 28 | 15.4291 | 11.2714 | 15.5562 | 0 | 15.5562 |
| 13 | 0.222682 | 7.18256 | UNIT I | 3 | 28 | 15.9072 | 11.6206 | 16.213 | 0 | 16.213 |
| 14 | 0.222682 | 7.59145 | UNIT I | 3 | 28 | 15.9865 | 11.6786 | 16.3221 | 0 | 16.3221 |
| 15 | 0.222682 | 8.15904 | UNIT I | 3 | 28 | 16.2633 | 11.8808 | 16.7024 | 0 | 16.7024 |
| 16 | 0.222682 | 8.18563 | UNIT I | 3 | 28 | 15.7074 | 11.4747 | 15.9386 | 0 | 15.9386 |
| 17 | 0.222682 | 7.86359 | UNIT I | 3 | 28 | 14.6822 | 10.7258 | 14.53 | 0 | 14.53 |
| 18 | 0.222682 | 7.38087 | UNIT I | 3 | 28 | 13.4948 | 9.85833 | 12.8986 | 0 | 12.8986 |
| 19 | 0.222682 | 6.73817 | UNIT I | 3 | 28 | 12.1715 | 8.89163 | 11.0806 | 0 | 11.0806 |
| 20 | 0.222682 | 6.0571 | UNIT I | 3 | 28 | 10.882 | 7.94961 | 9.30886 | 0 | 9.30886 |
| 21 | 0.222682 | 5.33666 | UNIT I | 3 | 28 | 9.62817 | 7.03365 | 7.5862 | 0 | 7.5862 |
| 22 | 0.222682 | 4.36999 | UNIT I | 3 | 28 | 8.18931 | 5.98252 | 5.6093 | 0 | 5.6093 |
| 23 | 0.222682 | 3.35206 | UNIT I | 3 | 28 | 6.80316 | 4.9699 | 3.70485 | 0 | 3.70485 |
| 24 | 0.222682 | 2.21303 | UNIT I | 3 | 28 | 5.40689 | 3.94989 | 1.78647 | 0 | 1.78647 |
| 25 | 0.222682 | 0.812982 | UNIT I | 3 | 28 | 3.98002 | 2.90752 | -0.173938 | 0 | -0.173938 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 0.74159

| 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 | 0.222682 | 0.255223 | UNIT I | 3 | 28 | 6.21106 | 4.60606 | 3.02056 | 0 | 3.02056 |
| 2 | 0.222682 | 0.727766 | UNIT I | 3 | 28 | 7.78332 | 5.77203 | 5.21342 | 0 | 5.21342 |
| 3 | 0.222682 | 1.19448 | UNIT I | 3 | 28 | 8.26163 | 6.12674 | 5.88055 | 0 | 5.88055 |
| 4 | 0.222682 | 1.67105 | UNIT I | 3 | 28 | 10.9309 | 8.10627 | 9.60349 | 0 | 9.60349 |
| 5 | 0.222682 | 2.46008 | UNIT I | 3 | 28 | 9.85523 | 7.30854 | 8.1032 | 0 | 8.1032 |
| 6 | 0.222682 | 2.80131 | UNIT I | 3 | 28 | 6.5776 | 4.87788 | 3.53178 | 0 | 3.53178 |
| 7 | 0.222682 | 2.97339 | UNIT I | 3 | 28 | 20.8615 | 15.4707 | 23.454 | 0 | 23.454 |
| 8 | 0.222682 | 3.75787 | UNIT I | 3 | 28 | 16.3461 | 12.1221 | 17.1562 | 0 | 17.1562 |
| 9 | 0.222682 | 4.49543 | UNIT I | 3 | 28 | 6.77032 | 5.0208 | 3.80058 | 0 | 3.80058 |
| 10 | 0.222682 | 4.97251 | UNIT I | 3 | 28 | 18.469 | 13.6964 | 20.1171 | 0 | 20.1171 |
| 11 | 0.222682 | 5.54953 | UNIT I | 3 | 28 | 20.6901 | 15.3436 | 23.215 | 0 | 23.215 |
| 12 | 0.222682 | 6.5616 | UNIT I | 3 | 28 | 9.82408 | 7.28544 | 8.05975 | 0 | 8.05975 |
| 13 | 0.222682 | 7.18256 | UNIT I | 3 | 28 | 11.67 | 8.65432 | 10.6342 | 0 | 10.6342 |
| 14 | 0.222682 | 7.59145 | UNIT I | 3 | 28 | 16.7414 | 12.4153 | 17.7075 | 0 | 17.7075 |
| 15 | 0.222682 | 8.15904 | UNIT I | 3 | 28 | 10.4294 | 7.73434 | 8.90401 | 0 | 8.90401 |
| 16 | 0.222682 | 8.18563 | UNIT I | 3 | 28 | 11.2752 | 8.36156 | 10.0836 | 0 | 10.0836 |
| 17 | 0.222682 | 7.86359 | UNIT I | 3 | 28 | 13.992 | 10.3763 | 13.8728 | 0 | 13.8728 |
| 18 | 0.222682 | 7.38087 | UNIT I | 3 | 28 | 13.6433 | 10.1177 | 13.3865 | 0 | 13.3865 |
| 19 | 0.222682 | 6.73817 | UNIT I | 3 | 28 | 13.0361 | 9.66745 | 12.5396 | 0 | 12.5396 |
| 20 | 0.222682 | 6.0571 | UNIT I | 3 | 28 | 11.5497 | 8.56515 | 10.4665 | 0 | 10.4665 |
| 21 | 0.222682 | 5.33666 | UNIT I | 3 | 28 | 10.242 | 7.59538 | 8.64264 | 0 | 8.64264 |
| 22 | 0.222682 | 4.36999 | UNIT I | 3 | 28 | 8.68725 | 6.44238 | 6.47418 | 0 | 6.47418 |
| 23 | 0.222682 | 3.35206 | UNIT I | 3 | 28 | 7.00067 | 5.19163 | 4.12185 | 0 | 4.12185 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 0.222682 | 2.21303 | UNIT I | 3 | 28 | 5.5549 | 4.11946 | 2.10539 | 0 | 2.10539 |
| 25 | 0.222682 | 0.812982 | UNIT I | 3 | 28 | 2.99947 | 2.22438 | -1.45873 | 0 | -1.45873 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.731689

| 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 | 0.210844 | 0.0864458 | UNIT I | 3 | 28 | 5.04787 | 3.69347 | 1.30423 | 0 | 1.30423 |
| 2 | 0.210844 | 0.45195 | UNIT I | 3 | 28 | 6.73145 | 4.92533 | 3.62103 | 0 | 3.62103 |
| 3 | 0.210844 | 0.980908 | UNIT I | 3 | 28 | 7.86919 | 5.7578 | 5.18666 | 0 | 5.18666 |
| 4 | 0.210844 | 1.45004 | UNIT I | 3 | 28 | 9.6787 | 7.0818 | 7.67677 | 0 | 7.67677 |
| 5 | 0.210844 | 1.92215 | UNIT I | 3 | 28 | 10.086 | 7.37981 | 8.23722 | 0 | 8.23722 |
| 6 | 0.210844 | 2.37623 | UNIT I | 3 | 28 | 12.484 | 9.13442 | 11.5372 | 0 | 11.5372 |
| 7 | 0.210844 | 3.12138 | UNIT I | 3 | 28 | 12.4911 | 9.13959 | 11.5469 | 0 | 11.5469 |
| 8 | 0.210844 | 3.47706 | UNIT I | 3 | 28 | 9.64227 | 7.05514 | 7.62662 | 0 | 7.62662 |
| 9 | 0.210844 | 3.63612 | UNIT I | 3 | 28 | 19.0906 | 13.9684 | 20.6286 | 0 | 20.6286 |
| 10 | 0.210844 | 4.17081 | UNIT I | 3 | 28 | 16.0865 | 11.7703 | 16.4945 | 0 | 16.4945 |
| 11 | 0.210844 | 4.96127 | UNIT I | 3 | 28 | 11.9965 | 8.77771 | 10.8663 | 0 | 10.8663 |
| 12 | 0.210844 | 5.36294 | UNIT I | 3 | 28 | 16.1402 | 11.8096 | 16.5684 | 0 | 16.5684 |
| 13 | 0.210844 | 5.74535 | UNIT I | 3 | 28 | 18.203 | 13.3189 | 19.407 | 0 | 19.407 |
| 14 | 0.210844 | 6.48576 | UNIT I | 3 | 28 | 15.8085 | 11.5669 | 16.1121 | 0 | 16.1121 |
| 15 | 0.210844 | 7.21064 | UNIT I | 3 | 28 | 13.4502 | 9.84135 | 12.8667 | 0 | 12.8667 |
| 16 | 0.210844 | 7.44339 | UNIT I | 3 | 28 | 15.4045 | 11.2713 | 15.5561 | 0 | 15.5561 |
| 17 | 0.210844 | 7.77584 | UNIT I | 3 | 28 | 13.8555 | 10.138 | 13.4245 | 0 | 13.4245 |
| 18 | 0.210844 | 8.01884 | UNIT I | 3 | 28 | 11.5646 | 8.46169 | 10.2719 | 0 | 10.2719 |
| 19 | 0.210844 | 7.6576 | UNIT I | 3 | 28 | 11.8421 | 8.66472 | 10.6538 | 0 | 10.6538 |
| 20 | 0.210844 | 7.0784 | UNIT I | 3 | 28 | 11.2437 | 8.22691 | 9.8304 | 0 | 9.8304 |
| 21 | 0.210844 | 6.28722 | UNIT I | 3 | 28 | 9.8905 | 7.23677 | 7.9682 | 0 | 7.9682 |
| 22 | 0.210844 | 5.30046 | UNIT I | 3 | 28 | 8.25881 | 6.04288 | 5.72283 | 0 | 5.72283 |
| 23 | 0.210844 | 4.17977 | UNIT I | 3 | 28 | 6.5544 | 4.79578 | 3.37737 | 0 | 3.37737 |
| 24 | 0.210844 | 2.84956 | UNIT I | 3 | 28 | 5.13957 | 3.76057 | 1.43042 | 0 | 1.43042 |
| 25 | 0.210844 | 1.02832 | UNIT I | 3 | 28 | 3.5088 | 2.56735 | -0.813689 | 0 | -0.813689 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 0.746642

| 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 | 0.222682 | 0.255223 | UNIT I | 3 | 28 | 4.27067 | 3.18866 | 0.354816 | 0 | 0.354816 |
| 2 | 0.222682 | 0.727766 | UNIT I | 3 | 28 | 6.23137 | 4.6526 | 3.10808 | 0 | 3.10808 |
| 3 | 0.222682 | 1.19448 | UNIT I | 3 | 28 | 8.17785 | 6.10593 | 5.84139 | 0 | 5.84139 |
| 4 | 0.222682 | 1.67105 | UNIT I | 3 | 28 | 10.0283 | 7.48753 | 8.43983 | 0 | 8.43983 |
| 5 | 0.222682 | 2.46008 | UNIT I | 3 | 28 | 12.3277 | 9.20435 | 11.6687 | 0 | 11.6687 |
| 6 | 0.222682 | 2.80131 | UNIT I | 3 | 28 | 13.319 | 9.94455 | 13.0608 | 0 | 13.0608 |
| 7 | 0.222682 | 2.97339 | UNIT I | 3 | 28 | 13.6354 | 10.1808 | 13.5051 | 0 | 13.5051 |
| 8 | 0.222682 | 3.75787 | UNIT I | 3 | 28 | 14.7628 | 11.0225 | 15.0882 | 0 | 15.0882 |
| 9 | 0.222682 | 4.49543 | UNIT I | 3 | 28 | 15.3642 | 11.4715 | 15.9327 | 0 | 15.9327 |
| 10 | 0.222682 | 4.97251 | UNIT I | 3 | 28 | 15.1836 | 11.3368 | 15.6792 | 0 | 15.6792 |
| 11 | 0.222682 | 5.54953 | UNIT I | 3 | 28 | 14.9369 | 11.1525 | 15.3326 | 0 | 15.3326 |
| 12 | 0.222682 | 6.5616 | UNIT I | 3 | 28 | 15.1494 | 11.3112 | 15.6311 | 0 | 15.6311 |
| 13 | 0.222682 | 7.18256 | UNIT I | 3 | 28 | 14.7588 | 11.0196 | 15.0826 | 0 | 15.0826 |
| 14 | 0.222682 | 7.59145 | UNIT I | 3 | 28 | 14.1846 | 10.5908 | 14.2763 | 0 | 14.2763 |
| 15 | 0.222682 | 8.15904 | UNIT I | 3 | 28 | 13.9622 | 10.4248 | 13.964 | 0 | 13.964 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.222682 | 8.18563 | UNIT I | 3 | 28 | 13.3227 | 9.94726 | 13.0659 | 0 | 13.0659 |
| 17 | 0.222682 | 7.86359 | UNIT I | 3 | 28 | 12.5156 | 9.34467 | 11.9326 | 0 | 11.9326 |
| 18 | 0.222682 | 7.38087 | UNIT I | 3 | 28 | 11.7178 | 8.74899 | 10.8123 | 0 | 10.8123 |
| 19 | 0.222682 | 6.73817 | UNIT I | 3 | 28 | 10.8799 | 8.12341 | 9.63573 | 0 | 9.63573 |
| 20 | 0.222682 | 6.0571 | UNIT I | 3 | 28 | 10.0853 | 7.53009 | 8.51986 | 0 | 8.51986 |
| 21 | 0.222682 | 5.33666 | UNIT I | 3 | 28 | 9.29415 | 6.9394 | 7.40895 | 0 | 7.40895 |
| 22 | 0.222682 | 4.36999 | UNIT I | 3 | 28 | 8.22729 | 6.14284 | 5.91081 | 0 | 5.91081 |
| 23 | 0.222682 | 3.35206 | UNIT I | 3 | 28 | 7.02725 | 5.24684 | 4.22569 | 0 | 4.22569 |
| 24 | 0.222682 | 2.21303 | UNIT I | 3 | 28 | 5.50959 | 4.11369 | 2.09454 | 0 | 2.09454 |
| 25 | 0.222682 | 0.812982 | UNIT I | 3 | 28 | 3.31391 | 2.47431 | -0.988683 | 0 | -0.988683 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 0.246463 | 1.46432 |
| 40.9932 | 12.499 |
| 51.3789 | 18.6032 |
| 55.0767 | 21.5626 |

### External Boundary

| X | Y |
|---|---|
| 11.8302 | 6.25839 |
| 11.9085 | 5.94261 |
| 11.8338 | 5.93829 |
| 11.7564 | 5.93035 |
| 11.5778 | 5.90654 |
| 11.2683 | 5.85829 |
| 11.121 | 5.87353 |
| 10.7096 | 5.80753 |
| 9.86652 | 5.76184 |
| 9.18593 | 5.68061 |
| 8.79485 | 5.58415 |
| 7.0512 | 5.31012 |
| 6.72302 | 5.27311 |
| 5.64857 | 5.14084 |
| 5.29472 | 5.11414 |
| 4.72058 | 5.0007 |
| 4.27995 | 4.99402 |
| 3.82598 | 5.01405 |
| 3.08493 | 4.98068 |
| 2.13692 | 4.92729 |
| 1.3558 | 4.92062 |
| 0.246463 | 4.88648 |
| 0.246463 | 1.46432 |
| 0.246463 | -1.48563 |
| 0.246463 | -4.15895 |
| 0.246463 | -5.39914 |

| | |
|---|---|
| 55.0767 | -5.39914 |
| 55.0767 | 11.1863 |
| 55.0767 | 17.6064 |
| 55.0767 | 19.3597 |
| 55.0767 | 20.73 |
| 55.0767 | 21.5626 |
| 55.0767 | 23.365 |
| 55.0767 | 26.0251 |
| 54.4584 | 25.8397 |
| 53.5618 | 25.4688 |
| 52.9744 | 24.7581 |
| 52.387 | 24.0473 |
| 51.9851 | 23.2439 |
| 51.4905 | 22.3786 |
| 50.6249 | 21.1116 |
| 50.0375 | 20.3699 |
| 49.3883 | 19.9682 |
| 48.3371 | 19.3192 |
| 46.9347 | 18.4742 |
| 46.5963 | 18.1974 |
| 46.0426 | 17.6746 |
| 45.2735 | 17.1211 |
| 42.619 | 15.4479 |
| 41.5004 | 14.3587 |
| 40.9932 | 14.0478 |
| 28.6564 | 14.5035 |
| 28.4403 | 14.3523 |
| 27.9984 | 13.9021 |
| 27.1243 | 13.33 |
| 26.6199 | 13.034 |
| 26.1664 | 12.775 |
| 25.3511 | 12.4826 |
| 25.084 | 12.4182 |
| 24.588 | 12.3104 |
| 23.9236 | 12.26 |
| 23.0163 | 12.0768 |
| 21.1904 | 11.726 |
| 19.9593 | 11.6492 |
| 19.6087 | 11.6628 |
| 19.1761 | 11.7671 |
| 18.9009 | 11.8177 |
| 18.6038 | 11.7888 |
| 18.4227 | 11.7381 |
| 18.104 | 11.7019 |
| 17.7852 | 11.586 |
| 17.3578 | 11.4629 |
| 17.1622 | 11.376 |
| 16.9304 | 11.2529 |
| 16.7783 | 11.1443 |
| 16.6624 | 10.9633 |
| 16.5537 | 10.8184 |

| | |
|---|---|
| 16.4378 | 10.6591 |
| 16.177 | 10.3912 |
| 15.9742 | 10.0364 |
| 15.8293 | 9.7757 |
| 15.4386 | 9.35059 |
| 15.2492 | 9.14782 |
| 15.0644 | 8.79185 |
| 14.7514 | 8.58118 |
| 14.545 | 8.45563 |
| 14.4374 | 8.27628 |
| 14.3746 | 8.15073 |
| 14.1996 | 8.06105 |
| 14.1009 | 7.92653 |
| 13.7201 | 7.61191 |
| 13.4783 | 7.4007 |
| 13.3755 | 7.30665 |
| 13.2134 | 7.22479 |
| 13.1036 | 7.18821 |
| 12.938 | 7.17699 |
| 12.8129 | 7.15925 |
| 12.7783 | 7.15306 |
| 12.7324 | 7.13449 |
| 12.6742 | 7.13078 |
| 12.5863 | 7.12211 |
| 12.5045 | 7.10679 |
| 11.8575 | 7.04435 |
| 11.8894 | 6.70473 |
| 11.8904 | 6.69465 |
| 11.9207 | 6.3809 |

## Material Boundary

| X | Y |
|---|---|
| 12.5045 | 7.10679 |
| 12.5364 | 6.76717 |

## Material Boundary

| X | Y |
|---|---|
| 11.8894 | 6.70473 |
| 12.5364 | 6.76717 |

## Material Boundary

| X | Y |
|---|---|
| 11.9085 | 5.94261 |
| 12.5394 | 6.09906 |
| 12.4593 | 6.43289 |
| 12.5676 | 6.44334 |
| 12.5374 | 6.75631 |
| 12.5364 | 6.76717 |

## Material Boundary

| X | Y |
|---|---|
| 12.5394 | 6.09906 |
| 16.176 | 6.98 |

## Material Boundary

| X | Y |
|---|---|
| 16.176 | 6.98 |
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |
| 51.3789 | 18.6032 |
| 55.0767 | 23.365 |

## Material Boundary

| X | Y |
|---|---|
| 0.246463 | -1.48563 |
| 14.9068 | 2.359 |
| 31.5166 | 8.039 |
| 40.9932 | 10.529 |
| 51.5928 | 16.7302 |
| 55.0767 | 20.73 |

## Material Boundary

| X | Y |
|---|---|
| 0.246463 | -4.15895 |
| 55.0767 | 11.1863 |

## Material Boundary

| X | Y |
|---|---|
| 0.246463 | 1.46432 |
| 40.9932 | 12.499 |

## Material Boundary

| X | Y |
|---|---|
| 51.3789 | 18.6032 |
| 55.0767 | 21.5626 |

## Material Boundary

| X | Y |
|---|---|
| 11.8904 | 6.69465 |
| 12.5374 | 6.75631 |

## Material Boundary

| X | Y |
|---|---|
| 11.8302 | 6.25839 |
| 12.0064 | 6.30208 |
| 12.4593 | 6.43289 |
| 11.9871 | 6.38732 |
| 11.9207 | 6.3809 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: YK S51 ST c=3 phi=28 LOCAL
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 17/5/2021, 20:11:32

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT |
|---|---|---|---|---|---|
| Color | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 |
| Water Surface | None | None | Water Table | Water Table | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated |
| Ru Value | 0 | 0 | | | |

## Global Minimums

### Method: ordinary/fellenius

FS: 1.376940
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Moment=466.956 kN-m
Driving Moment=339.127 kN-m

### Method: bishop simplified

FS: 1.428420
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Moment=484.415 kN-m
Driving Moment=339.127 kN-m

## Method: janbu simplified

FS: 1.362810
Center: 6.294, 10.424
Radius: 4.208
Left Slip Surface Endpoint: 5.965, 6.229
Right Slip Surface Endpoint: 10.301, 9.143
Resisting Horizontal Force=42.9045 kN
Driving Horizontal Force=31.4823 kN

## Method: janbu corrected

FS: 1.435060
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Horizontal Force=61.4021 kN
Driving Horizontal Force=42.7872 kN

## Method: spencer

FS: 1.425560
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Moment=483.445 kN-m
Driving Moment=339.127 kN-m
Resisting Horizontal Force=59.1577 kN
Driving Horizontal Force=41.4979 kN

## Method: corp of eng#1

FS: 1.438160
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Horizontal Force=59.3191 kN
Driving Horizontal Force=41.2464 kN

## Method: corp of eng#2

FS: 1.442180
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Horizontal Force=59.3399 kN
Driving Horizontal Force=41.1458 kN

## Method: lowe-karafiath

FS: 1.429530
Center: 5.657, 13.205

Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Horizontal Force=59.2231 kN
Driving Horizontal Force=41.4285 kN

### Method: gle/morgenstern-price

FS: 1.425150
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Moment=483.307 kN-m
Driving Moment=339.127 kN-m
Resisting Horizontal Force=59.1692 kN
Driving Horizontal Force=41.5178 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 8829
Number of Invalid Surfaces: 1171

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 234 surfaces
Error Code -109 reported for 2 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 8828
Number of Invalid Surfaces: 1172

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 235 surfaces
Error Code -109 reported for 2 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 8648
Number of Invalid Surfaces: 1352

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 415 surfaces
Error Code -109 reported for 2 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 8648
Number of Invalid Surfaces: 1352

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 415 surfaces
Error Code -109 reported for 2 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

## Method: spencer

Number of Valid Surfaces: 8608
Number of Invalid Surfaces: 1392

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 426 surfaces
Error Code -109 reported for 2 surfaces
Error Code -111 reported for 29 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 7766
Number of Invalid Surfaces: 2234

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 581 surfaces
Error Code -109 reported for 2 surfaces

Error Code -111 reported for 716 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 7338
Number of Invalid Surfaces: 2662

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 1271 surfaces
Error Code -109 reported for 2 surfaces
Error Code -111 reported for 454 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 4656
Number of Invalid Surfaces: 5344

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 3188 surfaces
Error Code -109 reported for 2 surfaces
Error Code -111 reported for 1219 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 8626
Number of Invalid Surfaces: 1374

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 427 surfaces
Error Code -109 reported for 2 surfaces
Error Code -111 reported for 10 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 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.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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.
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.37694

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 2.54338 | 3.50209 | 0.944291 | 0 | 0.944291 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 3.50553 | 4.8269 | 3.4359 | 0 | 3.4359 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 4.56541 | 6.2863 | 6.18062 | 0 | 6.18062 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 5.6971 | 7.84457 | 9.11133 | 0 | 9.11133 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 7.4266 | 10.226 | 13.5901 | 0 | 13.5901 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 8.78845 | 12.1012 | 17.1168 | 0 | 17.1168 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 9.88656 | 13.6132 | 19.9605 | 0 | 19.9605 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 10.5977 | 14.5924 | 21.8021 | 0 | 21.8021 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 10.8763 | 14.976 | 22.5236 | 0 | 22.5236 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.9449 | 15.0705 | 22.7013 | 0 | 22.7013 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.7786 | 14.8415 | 22.2706 | 0 | 22.2706 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 10.4466 | 14.3844 | 21.411 | 0 | 21.411 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.98867 | 13.7538 | 20.2249 | 0 | 20.2249 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 9.47877 | 13.0517 | 18.9044 | 0 | 18.9044 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 9.14792 | 12.5961 | 18.0477 | 0 | 18.0477 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 8.82484 | 12.1513 | 17.211 | 0 | 17.211 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 8.57115 | 11.802 | 16.5541 | 0 | 16.5541 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 8.05679 | 11.0937 | 15.2221 | 0 | 15.2221 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.20182 | 9.91647 | 13.008 | 0 | 13.008 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.40123 | 8.81411 | 10.9348 | 0 | 10.9348 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 5.67102 | 7.80866 | 9.04378 | 0 | 9.04378 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 4.89228 | 6.73638 | 7.0271 | 0 | 7.0271 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.09336 | 5.63631 | 4.95819 | 0 | 4.95819 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.265 | 4.49571 | 2.81301 | 0 | 2.81301 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.49791 | 3.43948 | 0.826534 | 0 | 0.826534 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.42842

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 2.39099 | 3.41534 | 0.781138 | 0 | 0.781138 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 3.26765 | 4.66757 | 3.13624 | 0 | 3.13624 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 4.22953 | 6.04155 | 5.72034 | 0 | 5.72034 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 5.25782 | 7.51037 | 8.4828 | 0 | 8.4828 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 6.84999 | 9.78466 | 12.7601 | 0 | 12.7601 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 8.11432 | 11.5907 | 16.1567 | 0 | 16.1567 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 9.15487 | 13.077 | 18.952 | 0 | 18.952 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 9.85915 | 14.083 | 20.8442 | 0 | 20.8442 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 10.1817 | 14.5437 | 21.7106 | 0 | 21.7106 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.3294 | 14.7547 | 22.1073 | 0 | 22.1073 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.2725 | 14.6735 | 21.9547 | 0 | 21.9547 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 10.0713 | 14.3861 | 21.4141 | 0 | 21.4141 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.75686 | 13.9369 | 20.5694 | 0 | 20.5694 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 9.39745 | 13.4235 | 19.6038 | 0 | 19.6038 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 9.23636 | 13.1934 | 19.171 | 0 | 19.171 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 9.0996 | 12.998 | 18.8036 | 0 | 18.8036 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 9.06063 | 12.9424 | 18.6989 | 0 | 18.6989 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 8.73273 | 12.474 | 17.818 | 0 | 17.818 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.9717 | 11.3869 | 15.7735 | 0 | 15.7735 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 7.23039 | 10.328 | 13.782 | 0 | 13.782 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 6.52591 | 9.32174 | 11.8894 | 0 | 11.8894 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 5.67248 | 8.10268 | 9.59674 | 0 | 9.59674 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.66532 | 6.66403 | 6.89104 | 0 | 6.89104 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.41868 | 4.88331 | 3.54198 | 0 | 3.54198 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.00137 | 2.8588 | -0.265551 | 0 | -0.265551 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.36281

| 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 | 0.173448 | 0.10364 | UNIT I | 3 | 28 | 2.49041 | 3.39395 | 0.740919 | 0 | 0.740919 |
| 2 | 0.173448 | 0.426385 | UNIT I | 3 | 28 | 3.18055 | 4.33449 | 2.50982 | 0 | 2.50982 |
| 3 | 0.173448 | 0.84432 | UNIT I | 3 | 28 | 4.0608 | 5.5341 | 4.76596 | 0 | 4.76596 |
| 4 | 0.173448 | 1.26332 | UNIT I | 3 | 28 | 4.9155 | 6.69889 | 6.95662 | 0 | 6.95662 |
| 5 | 0.173448 | 1.66195 | UNIT I | 3 | 28 | 5.69899 | 7.76664 | 8.96474 | 0 | 8.96474 |
| 6 | 0.173448 | 2.24588 | UNIT I | 3 | 28 | 6.85068 | 9.33618 | 11.9166 | 0 | 11.9166 |
| 7 | 0.173448 | 2.91407 | UNIT I | 3 | 28 | 8.14088 | 11.0945 | 15.2235 | 0 | 15.2235 |
| 8 | 0.173448 | 3.41951 | UNIT I | 3 | 28 | 9.05276 | 12.3372 | 17.5607 | 0 | 17.5607 |
| 9 | 0.173448 | 3.86668 | UNIT I | 3 | 28 | 9.81355 | 13.374 | 19.5106 | 0 | 19.5106 |
| 10 | 0.173448 | 4.26386 | UNIT I | 3 | 28 | 10.4446 | 14.234 | 21.1281 | 0 | 21.1281 |
| 11 | 0.173448 | 4.46504 | UNIT I | 3 | 28 | 10.6636 | 14.5324 | 21.6894 | 0 | 21.6894 |
| 12 | 0.173448 | 4.60127 | UNIT I | 3 | 28 | 10.7411 | 14.6381 | 21.888 | 0 | 21.888 |
| 13 | 0.173448 | 4.66346 | UNIT I | 3 | 28 | 10.6649 | 14.5343 | 21.6928 | 0 | 21.6928 |
| 14 | 0.173448 | 4.65438 | UNIT I | 3 | 28 | 10.4463 | 14.2363 | 21.1325 | 0 | 21.1325 |
| 15 | 0.173448 | 4.56767 | UNIT I | 3 | 28 | 10.0795 | 13.7365 | 20.1924 | 0 | 20.1924 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.173448 | 4.4214 | UNIT I | 3 | 28 | 9.60361 | 13.0879 | 18.9725 | 0 | 18.9725 |
| 17 | 0.173448 | 4.21885 | UNIT I | 3 | 28 | 9.02934 | 12.3053 | 17.5007 | 0 | 17.5007 |
| 18 | 0.173448 | 3.9697 | UNIT I | 3 | 28 | 8.37829 | 11.418 | 15.832 | 0 | 15.832 |
| 19 | 0.173448 | 3.71945 | UNIT I | 3 | 28 | 7.72961 | 10.534 | 14.1694 | 0 | 14.1694 |
| 20 | 0.173448 | 3.5147 | UNIT I | 3 | 28 | 7.15503 | 9.75095 | 12.6967 | 0 | 12.6967 |
| 21 | 0.173448 | 3.24002 | UNIT I | 3 | 28 | 6.46571 | 8.81154 | 10.9299 | 0 | 10.9299 |
| 22 | 0.173448 | 2.94348 | UNIT I | 3 | 28 | 5.73911 | 7.82132 | 9.0676 | 0 | 9.0676 |
| 23 | 0.173448 | 2.54945 | UNIT I | 3 | 28 | 4.86642 | 6.632 | 6.83078 | 0 | 6.83078 |
| 24 | 0.173448 | 1.7622 | UNIT I | 3 | 28 | 3.48429 | 4.74842 | 3.2883 | 0 | 3.2883 |
| 25 | 0.173448 | 0.647776 | UNIT I | 3 | 28 | 1.81378 | 2.47184 | -0.993326 | 0 | -0.993326 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.43506

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 2.37721 | 3.41144 | 0.773802 | 0 | 0.773802 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 3.24715 | 4.65985 | 3.12172 | 0 | 3.12172 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 4.20088 | 6.02851 | 5.69579 | 0 | 5.69579 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 5.21959 | 7.49043 | 8.44525 | 0 | 8.44525 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 6.79682 | 9.75384 | 12.7022 | 0 | 12.7022 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 8.04736 | 11.5485 | 16.0773 | 0 | 16.0773 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 9.07481 | 13.0229 | 18.8503 | 0 | 18.8503 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 9.76816 | 14.0179 | 20.7216 | 0 | 20.7216 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 10.0826 | 14.4692 | 21.5705 | 0 | 21.5705 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.2238 | 14.6717 | 21.9513 | 0 | 21.9513 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.1624 | 14.5836 | 21.7856 | 0 | 21.7856 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 9.95812 | 14.2905 | 21.2344 | 0 | 21.2344 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.64211 | 13.837 | 20.3815 | 0 | 20.3815 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 9.28184 | 13.32 | 19.4091 | 0 | 19.4091 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 9.1176 | 13.0843 | 18.9658 | 0 | 18.9658 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 8.97734 | 12.883 | 18.5872 | 0 | 18.5872 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 8.93344 | 12.82 | 18.4688 | 0 | 18.4688 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 8.6046 | 12.3481 | 17.5813 | 0 | 17.5813 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.8494 | 11.2644 | 15.543 | 0 | 15.543 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 7.11427 | 10.2094 | 13.5589 | 0 | 13.5589 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 6.41603 | 9.20739 | 11.6744 | 0 | 11.6744 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 5.57216 | 7.99638 | 9.39682 | 0 | 9.39682 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.5784 | 6.57028 | 6.71473 | 0 | 6.71473 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.35132 | 4.80935 | 3.4029 | 0 | 3.4029 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 1.95945 | 2.81192 | -0.35372 | 0 | -0.35372 |

**Global Minimum Query (spencer) - Safety Factor**: 1.42556

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 2.89002 | 4.11989 | 2.1062 | 0 | 2.1062 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 3.8803 | 5.5316 | 4.76124 | 0 | 4.76124 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 4.92921 | 7.02689 | 7.57349 | 0 | 7.57349 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 6.0126 | 8.57132 | 10.4781 | 0 | 10.4781 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 7.66972 | 10.9337 | 14.921 | 0 | 14.921 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 8.91645 | 12.7109 | 18.2636 | 0 | 18.2636 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 9.8832 | 14.0891 | 20.8555 | 0 | 20.8555 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 10.4681 | 14.9229 | 22.4238 | 0 | 22.4238 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 10.6442 | 15.174 | 22.896 | 0 | 22.896 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.6382 | 15.1654 | 22.8798 | 0 | 22.8798 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.4301 | 14.8687 | 22.3217 | 0 | 22.3217 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 10.0875 | 14.3804 | 21.4033 | 0 | 21.4033 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.64688 | 13.7522 | 20.222 | 0 | 20.222 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 9.17653 | 13.0817 | 18.961 | 0 | 18.961 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 8.90014 | 12.6877 | 18.2199 | 0 | 18.2199 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 8.65165 | 12.3334 | 17.5536 | 0 | 17.5536 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 8.49427 | 12.1091 | 17.1317 | 0 | 17.1317 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 8.08884 | 11.5311 | 16.0447 | 0 | 16.0447 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.32642 | 10.4443 | 14.0006 | 0 | 14.0006 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.60422 | 9.41471 | 12.0643 | 0 | 12.0643 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 5.93504 | 8.46075 | 10.2702 | 0 | 10.2702 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 5.16786 | 7.36709 | 8.2133 | 0 | 8.2133 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.30527 | 6.13742 | 5.90062 | 0 | 5.90062 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.28678 | 4.6855 | 3.16997 | 0 | 3.16997 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.14978 | 3.06465 | 0.121583 | 0 | 0.121583 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.43816

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 2.97794 | 4.28275 | 2.41249 | 0 | 2.41249 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 3.98309 | 5.72832 | 5.13122 | 0 | 5.13122 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 5.0395 | 7.24761 | 7.98861 | 0 | 7.98861 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 6.12231 | 8.80486 | 10.9174 | 0 | 10.9174 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 7.77491 | 11.1816 | 15.3873 | 0 | 15.3873 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 9.00282 | 12.9475 | 18.7085 | 0 | 18.7085 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 9.94159 | 14.2976 | 21.2478 | 0 | 21.2478 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 10.4933 | 15.0911 | 22.74 | 0 | 22.74 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 10.6355 | 15.2956 | 23.1247 | 0 | 23.1247 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.5971 | 15.2403 | 23.0206 | 0 | 23.0206 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.36 | 14.8994 | 22.3796 | 0 | 22.3796 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 9.99326 | 14.3719 | 21.3875 | 0 | 21.3875 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.5335 | 13.7107 | 20.1439 | 0 | 20.1439 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 9.04837 | 13.013 | 18.8318 | 0 | 18.8318 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 8.75579 | 12.5922 | 18.0404 | 0 | 18.0404 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 8.49294 | 12.2142 | 17.3294 | 0 | 17.3294 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 8.32092 | 11.9668 | 16.8641 | 0 | 16.8641 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 7.91167 | 11.3783 | 15.7572 | 0 | 15.7572 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.16187 | 10.2999 | 13.7291 | 0 | 13.7291 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.45541 | 9.28391 | 11.8183 | 0 | 11.8183 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 5.80396 | 8.34703 | 10.0563 | 0 | 10.0563 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 5.06148 | 7.27922 | 8.04804 | 0 | 8.04804 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.22897 | 6.08193 | 5.79626 | 0 | 5.79626 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.24462 | 4.66628 | 3.13382 | 0 | 3.13382 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.12653 | 3.05829 | 0.10963 | 0 | 0.10963 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.44218

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 3.0309 | 4.37111 | 2.57869 | 0 | 2.57869 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 4.35235 | 6.27687 | 6.16293 | 0 | 6.16293 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 6.01549 | 8.67542 | 10.6739 | 0 | 10.6739 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 8.31734 | 11.9951 | 16.9173 | 0 | 16.9173 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 8.59007 | 12.3884 | 17.657 | 0 | 17.657 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 8.74722 | 12.6151 | 18.0833 | 0 | 18.0833 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 8.57769 | 12.3706 | 17.6235 | 0 | 17.6235 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 8.38003 | 12.0855 | 17.0874 | 0 | 17.0874 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 9.79663 | 14.1285 | 20.9296 | 0 | 20.9296 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 9.4163 | 13.58 | 19.898 | 0 | 19.898 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 9.43156 | 13.602 | 19.9394 | 0 | 19.9394 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 9.61967 | 13.8733 | 20.4498 | 0 | 20.4498 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.95909 | 14.3628 | 21.3703 | 0 | 21.3703 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 10.4913 | 15.1303 | 22.8137 | 0 | 22.8137 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 9.76029 | 14.0761 | 20.8312 | 0 | 20.8312 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 9.12244 | 13.1562 | 19.101 | 0 | 19.101 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 7.28291 | 10.5033 | 14.1116 | 0 | 14.1116 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 6.57755 | 9.48601 | 12.1984 | 0 | 12.1984 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.70582 | 11.1132 | 15.2587 | 0 | 15.2587 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.84381 | 9.87 | 12.9206 | 0 | 12.9206 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 5.80299 | 8.36895 | 10.0975 | 0 | 10.0975 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 5.0921 | 7.34372 | 8.16936 | 0 | 8.16936 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.30396 | 6.20709 | 6.03166 | 0 | 6.03166 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.31805 | 4.78523 | 3.35754 | 0 | 3.35754 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.08584 | 3.00816 | 0.0153428 | 0 | 0.0153428 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.42953

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 2.71496 | 3.88111 | 1.65714 | 0 | 1.65714 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 3.81039 | 5.44706 | 4.60225 | 0 | 4.60225 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 5.0662 | 7.24228 | 7.97858 | 0 | 7.97858 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 6.50207 | 9.29491 | 11.839 | 0 | 11.839 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 7.88114 | 11.2663 | 15.5467 | 0 | 15.5467 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 8.91282 | 12.7411 | 18.3204 | 0 | 18.3204 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 9.5495 | 13.6513 | 20.0321 | 0 | 20.0321 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 9.79455 | 14.0016 | 20.6911 | 0 | 20.6911 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 10.4597 | 14.9525 | 22.4794 | 0 | 22.4794 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.3026 | 14.7279 | 22.057 | 0 | 22.057 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.1999 | 14.581 | 21.7807 | 0 | 21.7807 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 10.1167 | 14.4621 | 21.5571 | 0 | 21.5571 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 10.059 | 14.3797 | 21.4021 | 0 | 21.4021 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 10.0684 | 14.3931 | 21.4273 | 0 | 21.4273 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 9.52537 | 13.6168 | 19.9673 | 0 | 19.9673 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 9.03186 | 12.9113 | 18.6405 | 0 | 18.6405 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 7.99549 | 11.4298 | 15.8541 | 0 | 15.8541 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 7.38514 | 10.5573 | 14.2132 | 0 | 14.2132 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.47085 | 10.6798 | 14.4436 | 0 | 14.4436 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.63436 | 9.48401 | 12.1946 | 0 | 12.1946 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 5.77425 | 8.25446 | 9.8822 | 0 | 9.8822 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 5.03063 | 7.19143 | 7.88295 | 0 | 7.88295 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.21232 | 6.02164 | 5.68289 | 0 | 5.68289 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.25015 | 4.64618 | 3.09602 | 0 | 3.09602 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.1263 | 3.0396 | 0.0744815 | 0 | 0.0744815 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.42515

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 2.46277 | 3.50982 | 0.958835 | 0 | 0.958835 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 3.50903 | 5.00089 | 3.76313 | 0 | 3.76313 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 4.67787 | 6.66666 | 6.89599 | 0 | 6.89599 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 5.92301 | 8.44118 | 10.2334 | 0 | 10.2334 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 7.74192 | 11.0334 | 15.1086 | 0 | 15.1086 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 9.15869 | 13.0525 | 18.906 | 0 | 18.906 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 10.2534 | 14.6126 | 21.8401 | 0 | 21.8401 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 10.8997 | 15.5337 | 23.5725 | 0 | 23.5725 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 11.0647 | 15.7689 | 24.0147 | 0 | 24.0147 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.9863 | 15.6571 | 23.8046 | 0 | 23.8046 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.6651 | 15.1994 | 22.9437 | 0 | 22.9437 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 10.192 | 14.5251 | 21.6755 | 0 | 21.6755 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.62397 | 13.7156 | 20.1531 | 0 | 20.1531 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 9.04486 | 12.8903 | 18.6009 | 0 | 18.6009 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 8.6856 | 12.3783 | 17.638 | 0 | 17.638 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 8.38993 | 11.9569 | 16.8455 | 0 | 16.8455 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 8.22634 | 11.7238 | 16.407 | 0 | 16.407 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 7.85978 | 11.2014 | 15.4245 | 0 | 15.4245 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.16769 | 10.215 | 13.5695 | 0 | 13.5695 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.53544 | 9.31398 | 11.8749 | 0 | 11.8749 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 5.96949 | 8.50742 | 10.358 | 0 | 10.358 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 5.29591 | 7.54746 | 8.55254 | 0 | 8.55254 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.48445 | 6.39101 | 6.37754 | 0 | 6.37754 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.4086 | 4.85777 | 3.49396 | 0 | 3.49396 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.04547 | 2.9151 | -0.15968 | 0 | -0.15968 |

# List Of Coordinates

## Water Table

| X | Y |
|---|---|
| -7.22118 | 0.864 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

## External Boundary

| X | Y |
|---|---|
| -7.22118 | 4.87717 |
| -7.22118 | 0.864 |
| -7.22118 | -3.44395 |
| -7.22118 | -5.39909 |
| -4.18484 | -5.39909 |
| 49.9902 | -5.39909 |
| 49.9902 | 9.76285 |
| 49.9902 | 15.7927 |
| 49.9902 | 17.787 |
| 49.9902 | 21.0279 |
| 49.9902 | 23.8629 |
| 48.6865 | 23.1062 |
| 47.8664 | 22.7068 |
| 47.0674 | 22.2234 |
| 46.6258 | 21.7399 |
| 45.7847 | 21.3196 |
| 45.3851 | 20.8782 |
| 43.6609 | 17.8094 |
| 42.9761 | 16.0499 |
| 42.5174 | 15.4341 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 27.4875 | 14.3186 |
| 27.4445 | 14.3168 |
| 27.2003 | 14.1883 |
| 26.5834 | 13.5717 |
| 25.7224 | 12.801 |
| 24.9899 | 12.3128 |
| 23.6437 | 11.6418 |
| 23.2984 | 11.5524 |
| 22.5311 | 11.4757 |
| 22.0195 | 11.2967 |
| 21.1116 | 11.2584 |
| 20.3826 | 11.1561 |
| 19.7816 | 10.9771 |
| 17.3761 | 10.5131 |

| | |
|---|---|
| 16.6293 | 10.2749 |
| 15.7792 | 10.2113 |
| 14.3889 | 10.0446 |
| 12.514 | 9.86192 |
| 11.1768 | 9.55661 |
| 10.7629 | 9.3793 |
| 10.5624 | 9.27457 |
| 10.3293 | 9.15274 |
| 9.87595 | 9.00005 |
| 9.59509 | 8.75871 |
| 9.44235 | 8.6601 |
| 9.12206 | 8.45334 |
| 8.7464 | 8.31738 |
| 8.5505 | 8.24647 |
| 8.24707 | 8.11781 |
| 7.9937 | 7.98051 |
| 7.62053 | 7.73837 |
| 7.10879 | 7.20477 |
| 6.80797 | 6.79327 |
| 6.24421 | 6.35423 |
| 6.04432 | 6.24523 |
| 5.80445 | 6.1963 |
| 4.96247 | 6.09843 |
| 3.55263 | 5.94674 |
| 2.46637 | 5.95601 |
| 2.37408 | 5.97731 |
| 2.19776 | 5.96607 |
| 1.33058 | 5.75328 |
| 0.562161 | 5.61447 |
| -0.0303637 | 5.49417 |
| -0.539558 | 5.31833 |
| -1.58574 | 5.19803 |
| -2.70597 | 5.15175 |
| -3.32627 | 4.98518 |
| -5.4581 | 4.92122 |
| -5.8548 | 4.89919 |
| -6.3176 | 4.84044 |

## Material Boundary

| X | Y |
|---|---|
| 5.80445 | 6.1963 |
| 6.24488 | 6.19908 |

## Material Boundary

| X | Y |
|---|---|
| 9.74793 | 6.17913 |

| | |
|---|---|
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

## Material Boundary

| X | Y |
|---|---|
| -7.22118 | -3.44395 |
| 14.9068 | 2.35905 |
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |
| 49.9902 | 15.7927 |

## Material Boundary

| X | Y |
|---|---|
| -4.18484 | -5.39909 |
| 49.9902 | 9.76285 |

## Material Boundary

| X | Y |
|---|---|
| -7.22118 | 0.864 |
| 40.9932 | 12.499 |

## Material Boundary

| X | Y |
|---|---|
| 6.24488 | 6.19908 |
| 9.74793 | 6.17913 |

## Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 21.0279 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: YK S51 RU=0.20 c=3 phi=28 LOCAL
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 17/5/2021, 20:11:32

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT |
|---|---|---|---|---|---|
| Color | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 |
| Water Surface | None | None | Water Table | Water Table | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated |
| Ru Value | 0.2 | 0.2 | | | |

## Global Minimums

### Method: ordinary/fellenius

FS: 1.186250
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Moment=402.287 kN-m
Driving Moment=339.127 kN-m

### Method: bishop simplified

FS: 1.164890
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Moment=395.046 kN-m
Driving Moment=339.127 kN-m

## Method: janbu simplified

FS: 1.102840
Center: 6.294, 10.424
Radius: 4.208
Left Slip Surface Endpoint: 5.965, 6.229
Right Slip Surface Endpoint: 10.301, 9.143
Resisting Horizontal Force=35.0715 kN
Driving Horizontal Force=31.801 kN

## Method: janbu corrected

FS: 1.165940
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Horizontal Force=50.0513 kN
Driving Horizontal Force=42.9278 kN

## Method: spencer

FS: 1.159090
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Moment=393.078 kN-m
Driving Moment=339.127 kN-m
Resisting Horizontal Force=48.4176 kN
Driving Horizontal Force=41.7721 kN

## Method: corp of eng#1

FS: 1.176910
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Horizontal Force=48.6917 kN
Driving Horizontal Force=41.3725 kN

## Method: corp of eng#2

FS: 1.184030
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Horizontal Force=48.7885 kN
Driving Horizontal Force=41.2054 kN

## Method: lowe-karafiath

FS: 1.168390
Center: 5.657, 13.205

Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Horizontal Force=48.5758 kN
Driving Horizontal Force=41.5748 kN

### Method: gle/morgenstern-price

FS: 1.163240
Center: 5.657, 13.205
Radius: 6.972
Left Slip Surface Endpoint: 6.033, 6.243
Right Slip Surface Endpoint: 11.666, 9.668
Resisting Moment=394.485 kN-m
Driving Moment=339.127 kN-m
Resisting Horizontal Force=48.4935 kN
Driving Horizontal Force=41.6883 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 8829
Number of Invalid Surfaces: 1171

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 234 surfaces
Error Code -109 reported for 2 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 8828
Number of Invalid Surfaces: 1172

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 235 surfaces
Error Code -109 reported for 2 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 8636
Number of Invalid Surfaces: 1364

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 427 surfaces
Error Code -109 reported for 2 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 8636
Number of Invalid Surfaces: 1364

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 427 surfaces
Error Code -109 reported for 2 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

## Method: spencer

Number of Valid Surfaces: 8604
Number of Invalid Surfaces: 1396

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 441 surfaces
Error Code -109 reported for 2 surfaces
Error Code -111 reported for 18 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 7817
Number of Invalid Surfaces: 2183

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 555 surfaces
Error Code -109 reported for 2 surfaces

Error Code -111 reported for 691 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 7398
Number of Invalid Surfaces: 2602

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 1259 surfaces
Error Code -109 reported for 2 surfaces
Error Code -111 reported for 405 surfaces
Error Code -112 reported for 1 surface
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 4824
Number of Invalid Surfaces: 5176

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 3087 surfaces
Error Code -109 reported for 2 surfaces
Error Code -111 reported for 1152 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 8612
Number of Invalid Surfaces: 1388

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 1 surface
Error Code -106 reported for 83 surfaces
Error Code -107 reported for 23 surfaces
Error Code -108 reported for 439 surfaces
Error Code -109 reported for 2 surfaces
Error Code -111 reported for 12 surfaces
Error Code -114 reported for 819 surfaces
Error Code -123 reported for 8 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.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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.
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.18625

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 2.86758 | 3.40167 | 0.945225 | 0.18979 | 0.755435 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 3.76103 | 4.46152 | 3.44318 | 0.694461 | 2.74872 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 4.74524 | 5.62904 | 6.20349 | 1.25897 | 4.94452 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 5.79613 | 6.87566 | 9.16362 | 1.87456 | 7.28906 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 7.40213 | 8.78078 | 13.7026 | 2.8305 | 10.8721 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 8.66675 | 10.2809 | 17.311 | 3.61752 | 13.6935 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 9.68643 | 11.4905 | 20.2595 | 4.29115 | 15.9684 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 10.3468 | 12.2739 | 22.2217 | 4.7801 | 17.4416 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 10.6055 | 12.5808 | 23.069 | 5.05013 | 18.0188 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.6693 | 12.6564 | 23.3815 | 5.22043 | 18.161 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.5148 | 12.4732 | 23.0855 | 5.26907 | 17.8164 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 10.2066 | 12.1076 | 22.3583 | 5.22945 | 17.1288 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.78127 | 11.603 | 21.2982 | 5.11826 | 16.18 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 9.30776 | 11.0413 | 20.1006 | 4.9771 | 15.1235 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 9.00056 | 10.6769 | 19.4037 | 4.96556 | 14.4382 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 8.70054 | 10.321 | 18.7425 | 4.97369 | 13.7688 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 8.46497 | 10.0416 | 18.2967 | 5.05344 | 13.2433 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 7.98734 | 9.47498 | 17.1187 | 4.94107 | 12.1777 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.1934 | 8.53317 | 14.9306 | 4.52424 | 10.4064 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.44998 | 7.65129 | 12.8599 | 4.11212 | 8.7478 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 5.77191 | 6.84693 | 10.9527 | 3.71768 | 7.23503 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 5.04878 | 5.98911 | 8.82221 | 3.20051 | 5.6217 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.30689 | 5.10905 | 6.51172 | 2.54517 | 3.96655 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.53768 | 4.19657 | 3.91497 | 1.66455 | 2.25042 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.82536 | 3.35158 | 1.24282 | 0.581587 | 0.661228 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.16489

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 2.83118 | 3.29801 | 0.750261 | 0.18979 | 0.560471 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 3.67096 | 4.27627 | 3.09478 | 0.694461 | 2.40032 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 4.58942 | 5.34617 | 5.67147 | 1.25897 | 4.4125 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 5.56774 | 6.4858 | 8.43037 | 1.87456 | 6.55581 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 7.08584 | 8.25422 | 12.7122 | 2.8305 | 9.88174 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 8.28078 | 9.6462 | 16.1172 | 3.61752 | 12.4997 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 9.25485 | 10.7809 | 18.9248 | 4.29115 | 14.6337 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 9.9018 | 11.5345 | 20.8312 | 4.7801 | 16.0511 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 10.1803 | 11.8589 | 21.7113 | 5.05013 | 16.6612 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.2903 | 11.9871 | 22.1227 | 5.22043 | 16.9022 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.2048 | 11.8875 | 21.984 | 5.26907 | 16.7149 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 9.98209 | 11.628 | 21.4564 | 5.22945 | 16.227 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.65263 | 11.2442 | 20.6234 | 5.11826 | 15.5052 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 9.28154 | 10.812 | 19.6693 | 4.9771 | 14.6922 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 9.0982 | 10.5984 | 19.2561 | 4.96556 | 14.2905 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 8.93748 | 10.4112 | 18.9121 | 4.97369 | 13.9384 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 8.86779 | 10.33 | 18.8392 | 5.05344 | 13.7857 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 8.52719 | 9.93324 | 17.9806 | 4.94107 | 13.0395 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.78391 | 9.0674 | 15.9354 | 4.52424 | 11.4111 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 7.06159 | 8.22598 | 13.9408 | 4.11212 | 9.82865 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 6.37586 | 7.42717 | 12.044 | 3.71768 | 8.32628 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 5.55543 | 6.47147 | 9.72938 | 3.20051 | 6.52887 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.59776 | 5.35589 | 6.97595 | 2.54517 | 4.43078 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.42709 | 3.99218 | 3.53057 | 1.66455 | 1.86602 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.1101 | 2.45803 | -0.437703 | 0.581587 | -1.01929 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.10284

| 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 | 0.173448 | 0.10364 | UNIT I | 3 | 28 | 3.03483 | 3.34694 | 0.772001 | 0.119505 | 0.652496 |
| 2 | 0.173448 | 0.426385 | UNIT I | 3 | 28 | 3.69725 | 4.07747 | 2.51809 | 0.491658 | 2.02644 |
| 3 | 0.173448 | 0.84432 | UNIT I | 3 | 28 | 4.54291 | 5.0101 | 4.75403 | 0.973572 | 3.78046 |
| 4 | 0.173448 | 1.26332 | UNIT I | 3 | 28 | 5.35797 | 5.90898 | 6.92774 | 1.45672 | 5.47102 |
| 5 | 0.173448 | 1.66195 | UNIT I | 3 | 28 | 6.09811 | 6.72524 | 8.92255 | 1.91637 | 7.00618 |
| 6 | 0.173448 | 2.24588 | UNIT I | 3 | 28 | 7.19296 | 7.93268 | 11.8667 | 2.58969 | 9.27702 |
| 7 | 0.173448 | 2.91407 | UNIT I | 3 | 28 | 8.41543 | 9.28087 | 15.1728 | 3.36017 | 11.8126 |
| 8 | 0.173448 | 3.41951 | UNIT I | 3 | 28 | 9.2632 | 10.2158 | 17.514 | 3.94299 | 13.571 |
| 9 | 0.173448 | 3.86668 | UNIT I | 3 | 28 | 9.95938 | 10.9836 | 19.4736 | 4.45861 | 15.015 |
| 10 | 0.173448 | 4.26386 | UNIT I | 3 | 28 | 10.5258 | 11.6083 | 21.1065 | 4.91659 | 16.1899 |
| 11 | 0.173448 | 4.46504 | UNIT I | 3 | 28 | 10.6927 | 11.7923 | 21.6845 | 5.14858 | 16.5359 |
| 12 | 0.173448 | 4.60127 | UNIT I | 3 | 28 | 10.7224 | 11.825 | 21.9032 | 5.30566 | 16.5975 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 0.173448 | 4.66346 | UNIT I | 3 | 28 | 10.6044 | 11.695 | 21.7302 | 5.37737 | 16.3528 |
| 14 | 0.173448 | 4.65438 | UNIT I | 3 | 28 | 10.3506 | 11.4151 | 21.1933 | 5.36689 | 15.8264 |
| 15 | 0.173448 | 4.56767 | UNIT I | 3 | 28 | 9.95675 | 10.9807 | 20.2764 | 5.26691 | 15.0095 |
| 16 | 0.173448 | 4.4214 | UNIT I | 3 | 28 | 9.46084 | 10.4338 | 19.0792 | 5.09825 | 13.9809 |
| 17 | 0.173448 | 4.21885 | UNIT I | 3 | 28 | 8.87394 | 9.78654 | 17.6283 | 4.86469 | 12.7636 |
| 18 | 0.173448 | 3.9697 | UNIT I | 3 | 28 | 8.21697 | 9.062 | 15.9784 | 4.5774 | 11.401 |
| 19 | 0.173448 | 3.71945 | UNIT I | 3 | 28 | 7.5642 | 8.3421 | 14.3359 | 4.28885 | 10.047 |
| 20 | 0.173448 | 3.5147 | UNIT I | 3 | 28 | 6.98159 | 7.69958 | 12.8913 | 4.05275 | 8.8386 |
| 21 | 0.173448 | 3.24002 | UNIT I | 3 | 28 | 6.29361 | 6.94085 | 11.1477 | 3.73601 | 7.41167 |
| 22 | 0.173448 | 2.94348 | UNIT I | 3 | 28 | 5.5721 | 6.14514 | 9.30925 | 3.39409 | 5.91516 |
| 23 | 0.173448 | 2.54945 | UNIT I | 3 | 28 | 4.71773 | 5.2029 | 7.0828 | 2.93973 | 4.14307 |
| 24 | 0.173448 | 1.7622 | UNIT I | 3 | 28 | 3.40565 | 3.75589 | 3.45359 | 2.03197 | 1.42162 |
| 25 | 0.173448 | 0.647776 | UNIT I | 3 | 28 | 1.84523 | 2.03499 | -1.06798 | 0.746941 | -1.81492 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.16594

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 2.8241 | 3.29273 | 0.740339 | 0.18979 | 0.550549 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 3.65919 | 4.2664 | 3.07621 | 0.694461 | 2.38175 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 4.57151 | 5.33011 | 5.64126 | 1.25897 | 4.38229 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 5.5422 | 6.46187 | 8.38539 | 1.87456 | 6.51083 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 7.04856 | 8.2182 | 12.6445 | 2.8305 | 9.81403 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 8.23169 | 9.59766 | 16.0259 | 3.61752 | 12.4084 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 9.19384 | 10.7195 | 18.8093 | 4.29115 | 14.5182 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 9.82997 | 11.4612 | 20.6932 | 4.7801 | 15.9131 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 10.0997 | 11.7757 | 21.5547 | 5.05013 | 16.5046 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.202 | 11.895 | 21.9494 | 5.22043 | 16.729 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.1104 | 11.7881 | 21.7971 | 5.26907 | 16.5281 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 9.88299 | 11.523 | 21.2588 | 5.22945 | 16.0294 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.55014 | 11.1349 | 20.4178 | 5.11826 | 15.2995 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 9.17646 | 10.6992 | 19.4572 | 4.9771 | 14.4801 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 8.98862 | 10.4802 | 19.0338 | 4.96556 | 14.0682 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 8.82318 | 10.2873 | 18.6791 | 4.97369 | 13.7054 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 8.74753 | 10.1991 | 18.593 | 5.05344 | 13.5395 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 8.40466 | 9.79933 | 17.7288 | 4.94107 | 12.7877 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.66545 | 8.93745 | 15.691 | 4.52424 | 11.1667 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.94775 | 8.10066 | 13.7051 | 4.11212 | 9.59295 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 6.26689 | 7.30682 | 11.8176 | 3.71768 | 8.09994 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 5.45465 | 6.3598 | 9.51935 | 3.20051 | 6.31884 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.50903 | 5.25726 | 6.79047 | 2.54517 | 4.2453 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.35649 | 3.91347 | 3.38254 | 1.66455 | 1.71799 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.06347 | 2.40588 | -0.535782 | 0.581587 | -1.11737 |

**Global Minimum Query (spencer) - Safety Factor**: 1.15909

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 3.5115 | 4.07014 | 2.20243 | 0.18979 | 2.01264 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 4.47005 | 5.18119 | 4.79669 | 0.694461 | 4.10223 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 5.47634 | 6.34757 | 7.55484 | 1.25897 | 6.29587 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 6.50568 | 7.54067 | 10.4143 | 1.87456 | 8.53977 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 8.08276 | 9.36865 | 14.8082 | 2.8305 | 11.9777 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 9.24448 | 10.7152 | 18.1277 | 3.61752 | 14.5101 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 10.1228 | 11.7333 | 20.716 | 4.29115 | 16.4249 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 10.6244 | 12.3147 | 22.2984 | 4.7801 | 17.5183 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 10.7295 | 12.4365 | 22.7976 | 5.05013 | 17.7475 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.6592 | 12.355 | 22.8147 | 5.22043 | 17.5942 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.3975 | 12.0517 | 22.2928 | 5.26907 | 17.0237 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 10.0112 | 11.6038 | 21.4109 | 5.22945 | 16.1814 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.53602 | 11.0531 | 20.264 | 5.11826 | 15.1457 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 9.0369 | 10.4746 | 19.0347 | 4.9771 | 14.0576 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 8.71864 | 10.1057 | 18.3294 | 4.96556 | 13.3639 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 8.42639 | 9.76695 | 17.7005 | 4.97369 | 12.7268 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 8.21588 | 9.52295 | 17.3213 | 5.05344 | 12.2679 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 7.78269 | 9.02084 | 16.2646 | 4.94107 | 11.3236 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.0373 | 8.15686 | 14.2229 | 4.52424 | 9.69864 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.33593 | 7.34391 | 12.2818 | 4.11212 | 8.16971 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 5.68912 | 6.5942 | 10.4774 | 3.71768 | 6.75972 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 4.96839 | 5.75881 | 8.3891 | 3.20051 | 5.18859 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.18165 | 4.84691 | 6.01869 | 2.54517 | 3.47352 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.28763 | 3.81066 | 3.18917 | 1.66455 | 1.52462 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.34827 | 2.72186 | 0.0584844 | 0.581587 | -0.523103 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.17691

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 3.71082 | 4.3673 | 2.76132 | 0.18979 | 2.57153 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 4.69428 | 5.52475 | 5.44283 | 0.694461 | 4.74837 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 5.7118 | 6.72228 | 8.25956 | 1.25897 | 7.00059 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 6.73742 | 7.92934 | 11.1453 | 1.87456 | 9.27075 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 8.30327 | 9.7722 | 15.5672 | 2.8305 | 12.7367 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 9.42746 | 11.0953 | 18.8425 | 3.61752 | 15.225 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 10.2516 | 12.0652 | 21.3402 | 4.29115 | 17.0491 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 10.6894 | 12.5805 | 22.7983 | 4.7801 | 18.0182 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 10.7299 | 12.6281 | 23.1579 | 5.05013 | 18.1078 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.5976 | 12.4725 | 23.0356 | 5.22043 | 17.8151 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.2809 | 12.0997 | 22.3832 | 5.26907 | 17.1141 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 9.84803 | 11.5902 | 21.3853 | 5.22945 | 16.1559 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.33583 | 10.9874 | 20.1404 | 5.11826 | 15.0222 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 8.80761 | 10.3658 | 18.8301 | 4.9771 | 13.853 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 8.45708 | 9.95322 | 18.0427 | 4.96556 | 13.0771 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 8.13552 | 9.57478 | 17.339 | 4.97369 | 12.3654 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 7.89437 | 9.29096 | 16.885 | 5.05344 | 11.8316 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 7.45076 | 8.76887 | 15.7907 | 4.94107 | 10.8497 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 6.72654 | 7.91653 | 13.7709 | 4.52424 | 9.24663 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.0522 | 7.1229 | 11.8662 | 4.11212 | 7.75405 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 5.43619 | 6.39791 | 10.1082 | 3.71768 | 6.39054 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 4.7608 | 5.60303 | 8.0961 | 3.20051 | 4.89559 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.0324 | 4.74577 | 5.82848 | 2.54517 | 3.28331 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.2107 | 3.77871 | 3.12907 | 1.66455 | 1.46452 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.34411 | 2.75881 | 0.127967 | 0.581587 | -0.45362 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.18403

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 3.81698 | 4.51942 | 3.0474 | 0.18979 | 2.85761 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 5.31807 | 6.29675 | 6.89472 | 0.694461 | 6.20026 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 7.32416 | 8.67203 | 11.9265 | 1.25897 | 10.6675 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 10.4072 | 12.3224 | 19.4074 | 1.87456 | 17.5329 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 9.45167 | 11.1911 | 18.2357 | 2.8305 | 15.4052 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 8.80049 | 10.4201 | 17.5726 | 3.61752 | 13.9551 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 8.01046 | 9.48462 | 16.487 | 4.29115 | 12.1958 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 7.52336 | 8.90788 | 15.8912 | 4.7801 | 11.1111 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 9.50754 | 11.2572 | 20.5797 | 5.05013 | 15.5296 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 8.93811 | 10.583 | 19.482 | 5.22043 | 14.2615 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 9.00215 | 10.6588 | 19.6732 | 5.26907 | 14.4041 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 9.3327 | 11.0502 | 20.3697 | 5.22945 | 15.1402 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.89086 | 11.7111 | 21.5014 | 5.11826 | 16.3832 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 10.7498 | 12.7281 | 23.273 | 4.9771 | 18.2959 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 9.85422 | 11.6677 | 21.2671 | 4.96556 | 16.3016 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 9.05945 | 10.7267 | 19.5054 | 4.97369 | 14.5317 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 6.34646 | 7.5144 | 13.5438 | 5.05344 | 8.49036 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 5.61563 | 6.64908 | 11.804 | 4.94107 | 6.86291 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.43951 | 8.8086 | 15.4486 | 4.52424 | 10.9244 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.56523 | 7.77343 | 13.0896 | 4.11212 | 8.97751 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 5.41541 | 6.41201 | 10.1347 | 3.71768 | 6.41704 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 4.80081 | 5.6843 | 8.24892 | 3.20051 | 5.04841 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.15679 | 4.92176 | 6.15949 | 2.54517 | 3.61432 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.32233 | 3.93374 | 3.42065 | 1.66455 | 1.7561 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.23602 | 2.64752 | -0.081337 | 0.581587 | -0.662924 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.16839

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 3.30646 | 3.86323 | 1.8133 | 0.18979 | 1.62351 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 4.4421 | 5.1901 | 4.81342 | 0.694461 | 4.11896 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 5.75825 | 6.72788 | 8.27008 | 1.25897 | 7.01111 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 7.29337 | 8.5215 | 12.259 | 1.87456 | 10.3844 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 8.45113 | 9.87421 | 15.759 | 2.8305 | 12.9285 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 9.29224 | 10.857 | 18.3943 | 3.61752 | 14.7768 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 9.6958 | 11.3285 | 19.9547 | 4.29115 | 15.6636 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 9.72138 | 11.3584 | 20.4999 | 4.7801 | 15.7198 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 10.4883 | 12.2544 | 22.4552 | 5.05013 | 17.405 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 10.1964 | 11.9133 | 21.984 | 5.22043 | 16.7635 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.0625 | 11.7569 | 21.7383 | 5.26907 | 16.4693 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 10.0089 | 11.6943 | 21.581 | 5.22945 | 16.3515 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 10.0332 | 11.7227 | 21.5232 | 5.11826 | 16.4049 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 10.1778 | 11.8917 | 21.6999 | 4.9771 | 16.7228 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 9.50502 | 11.1056 | 20.2099 | 4.96556 | 15.2444 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 8.88112 | 10.3766 | 18.8471 | 4.97369 | 13.8734 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 7.41972 | 8.66913 | 15.7155 | 5.05344 | 10.6621 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 6.71045 | 7.84042 | 14.0446 | 4.94107 | 9.10351 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 7.1386 | 8.34067 | 14.5686 | 4.52424 | 10.0443 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.28774 | 7.34653 | 12.2868 | 4.11212 | 8.17463 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 5.37525 | 6.28039 | 9.88718 | 3.71768 | 6.1695 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 4.69835 | 5.4895 | 7.88257 | 3.20051 | 4.68206 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.00003 | 4.6736 | 5.69276 | 2.54517 | 3.14759 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.21684 | 3.75852 | 3.09112 | 1.66455 | 1.42657 |
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.36458 | 2.76275 | 0.135387 | 0.581587 | -0.4462 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.16324

| 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 | 0.225308 | 0.213806 | UNIT I | 3 | 28 | 2.92969 | 3.40793 | 0.956993 | 0.18979 | 0.767203 |
| 2 | 0.225308 | 0.782337 | UNIT I | 3 | 28 | 4.00086 | 4.65396 | 3.80511 | 0.694461 | 3.11065 |
| 3 | 0.225308 | 1.41828 | UNIT I | 3 | 28 | 5.19257 | 6.0402 | 6.97673 | 1.25897 | 5.71776 |
| 4 | 0.225308 | 2.11176 | UNIT I | 3 | 28 | 6.45082 | 7.50385 | 10.3451 | 1.87456 | 8.4705 |
| 5 | 0.225308 | 3.18867 | UNIT I | 3 | 28 | 8.25007 | 9.59681 | 15.2373 | 2.8305 | 12.4068 |
| 6 | 0.225308 | 4.07527 | UNIT I | 3 | 28 | 9.62898 | 11.2008 | 19.041 | 3.61752 | 15.4235 |
| 7 | 0.225308 | 4.83414 | UNIT I | 3 | 28 | 10.6603 | 12.4005 | 21.9708 | 4.29115 | 17.6797 |
| 8 | 0.225308 | 5.38497 | UNIT I | 3 | 28 | 11.223 | 13.0551 | 23.6909 | 4.7801 | 18.9108 |
| 9 | 0.225308 | 5.68916 | UNIT I | 3 | 28 | 11.2935 | 13.137 | 24.115 | 5.05013 | 19.0648 |
| 10 | 0.225308 | 5.88101 | UNIT I | 3 | 28 | 11.109 | 12.9224 | 23.8817 | 5.22043 | 18.6613 |
| 11 | 0.225308 | 5.9358 | UNIT I | 3 | 28 | 10.6818 | 12.4255 | 22.9958 | 5.26907 | 17.7267 |
| 12 | 0.225308 | 5.89117 | UNIT I | 3 | 28 | 10.1091 | 11.7593 | 21.7033 | 5.22945 | 16.4738 |
| 13 | 0.225308 | 5.76592 | UNIT I | 3 | 28 | 9.45445 | 10.9978 | 20.1599 | 5.11826 | 15.0417 |
| 14 | 0.225308 | 5.6069 | UNIT I | 3 | 28 | 8.80262 | 10.2396 | 18.5927 | 4.9771 | 13.6156 |
| 15 | 0.225308 | 5.59389 | UNIT I | 3 | 28 | 8.36554 | 9.73113 | 17.625 | 4.96556 | 12.6594 |
| 16 | 0.225308 | 5.60305 | UNIT I | 3 | 28 | 8.00371 | 9.31024 | 16.8415 | 4.97369 | 11.8678 |
| 17 | 0.225308 | 5.69289 | UNIT I | 3 | 28 | 7.7794 | 9.04931 | 16.4305 | 5.05344 | 11.3771 |
| 18 | 0.225308 | 5.5663 | UNIT I | 3 | 28 | 7.39926 | 8.60711 | 15.4865 | 4.94107 | 10.5455 |
| 19 | 0.225308 | 5.09673 | UNIT I | 3 | 28 | 6.75728 | 7.86034 | 13.6652 | 4.52424 | 9.14095 |
| 20 | 0.225308 | 4.63246 | UNIT I | 3 | 28 | 6.18584 | 7.19562 | 12.0029 | 4.11212 | 7.8908 |
| 21 | 0.225308 | 4.1881 | UNIT I | 3 | 28 | 5.685 | 6.61302 | 10.5128 | 3.71768 | 6.79511 |
| 22 | 0.225308 | 3.60549 | UNIT I | 3 | 28 | 5.09665 | 5.92863 | 8.70845 | 3.20051 | 5.50794 |
| 23 | 0.225308 | 2.86723 | UNIT I | 3 | 28 | 4.38411 | 5.09977 | 6.49426 | 2.54517 | 3.94909 |
| 24 | 0.225308 | 1.87518 | UNIT I | 3 | 28 | 3.42091 | 3.97934 | 3.50642 | 1.66455 | 1.84187 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 0.225308 | 0.65518 | UNIT I | 3 | 28 | 2.16426 | 2.51755 | -0.325772 | 0.581587 | -0.907359 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -7.22118 | 0.864 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

### External Boundary

| X | Y |
|---|---|
| -7.22118 | 4.87717 |
| -7.22118 | 0.864 |
| -7.22118 | -3.44395 |
| -7.22118 | -5.39909 |
| -4.18484 | -5.39909 |
| 49.9902 | -5.39909 |
| 49.9902 | 9.76285 |
| 49.9902 | 15.7927 |
| 49.9902 | 17.787 |
| 49.9902 | 21.0279 |
| 49.9902 | 23.8629 |
| 48.6865 | 23.1062 |
| 47.8664 | 22.7068 |
| 47.0674 | 22.2234 |
| 46.6258 | 21.7399 |
| 45.7847 | 21.3196 |
| 45.3851 | 20.8782 |
| 43.6609 | 17.8094 |
| 42.9761 | 16.0499 |
| 42.5174 | 15.4341 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 27.4875 | 14.3186 |
| 27.4445 | 14.3168 |
| 27.2003 | 14.1883 |
| 26.5834 | 13.5717 |
| 25.7224 | 12.801 |
| 24.9899 | 12.3128 |
| 23.6437 | 11.6418 |
| 23.2984 | 11.5524 |
| 22.5311 | 11.4757 |
| 22.0195 | 11.2967 |
| 21.1116 | 11.2584 |
| 20.3826 | 11.1561 |

| | |
|---|---|
| 19.7816 | 10.9771 |
| 17.3761 | 10.5131 |
| 16.6293 | 10.2749 |
| 15.7792 | 10.2113 |
| 14.3889 | 10.0446 |
| 12.514 | 9.86192 |
| 11.1768 | 9.55661 |
| 10.7629 | 9.3793 |
| 10.5624 | 9.27457 |
| 10.3293 | 9.15274 |
| 9.87595 | 9.00005 |
| 9.59509 | 8.75871 |
| 9.44235 | 8.6601 |
| 9.12206 | 8.45334 |
| 8.7464 | 8.31738 |
| 8.5505 | 8.24647 |
| 8.24707 | 8.11781 |
| 7.9937 | 7.98051 |
| 7.62053 | 7.73837 |
| 7.10879 | 7.20477 |
| 6.80797 | 6.79327 |
| 6.24421 | 6.35423 |
| 6.04432 | 6.24523 |
| 5.80445 | 6.1963 |
| 4.96247 | 6.09843 |
| 3.55263 | 5.94674 |
| 2.46637 | 5.95601 |
| 2.37408 | 5.97731 |
| 2.19776 | 5.96607 |
| 1.33058 | 5.75328 |
| 0.562161 | 5.61447 |
| -0.0303637 | 5.49417 |
| -0.539558 | 5.31833 |
| -1.58574 | 5.19803 |
| -2.70597 | 5.15175 |
| -3.32627 | 4.98518 |
| -5.4581 | 4.92122 |
| -5.8548 | 4.89919 |
| -6.3176 | 4.84044 |

## Material Boundary

| X | Y |
|---|---|
| 5.80445 | 6.1963 |
| 6.24488 | 6.19908 |

## Material Boundary

| | |
|---|---|

| X | Y |
|---|---|
| 9.74793 | 6.17913 |
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

## Material Boundary

| X | Y |
|---|---|
| -7.22118 | -3.44395 |
| 14.9068 | 2.35905 |
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |
| 49.9902 | 15.7927 |

## Material Boundary

| X | Y |
|---|---|
| -4.18484 | -5.39909 |
| 49.9902 | 9.76285 |

## Material Boundary

| X | Y |
|---|---|
| -7.22118 | 0.864 |
| 40.9932 | 12.499 |

## Material Boundary

| X | Y |
|---|---|
| 6.24488 | 6.19908 |
| 9.74793 | 6.17913 |

## Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 21.0279 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: YK S51 EQ=0.20dn c=3 phi=28 LOCAL
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 17/5/2021, 20:11:32

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): 0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT |
|---|---|---|---|---|---|
| Color | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 |
| Water Surface | None | None | Water Table | Water Table | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated |
| Ru Value | 0 | 0 | | | |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.960460
Center: 5.878, 12.674
Radius: 6.477
Left Slip Surface Endpoint: 5.813, 6.198
Right Slip Surface Endpoint: 11.608, 9.655
Resisting Moment=452.527 kN-m
Driving Moment=471.157 kN-m

### Method: bishop simplified

FS: 1.004510
Center: 5.172, 14.956
Radius: 8.724
Left Slip Surface Endpoint: 6.114, 6.283
Right Slip Surface Endpoint: 12.202, 9.791
Resisting Moment=647.398 kN-m
Driving Moment=644.49 kN-m

## Method: janbu simplified

FS: 0.940159
Center: 5.878, 12.674
Radius: 6.477
Left Slip Surface Endpoint: 5.813, 6.198
Right Slip Surface Endpoint: 11.608, 9.655
Resisting Horizontal Force=61.6721 kN
Driving Horizontal Force=65.5975 kN

## Method: janbu corrected

FS: 0.993218
Center: 5.878, 12.674
Radius: 6.477
Left Slip Surface Endpoint: 5.813, 6.198
Right Slip Surface Endpoint: 11.608, 9.655
Resisting Horizontal Force=65.1526 kN
Driving Horizontal Force=65.5975 kN

## Method: spencer

FS: 1.005890
Center: 5.172, 14.956
Radius: 8.724
Left Slip Surface Endpoint: 6.114, 6.283
Right Slip Surface Endpoint: 12.202, 9.791
Resisting Moment=648.284 kN-m
Driving Moment=644.49 kN-m
Resisting Horizontal Force=64.8534 kN
Driving Horizontal Force=64.4739 kN

## Method: corp of eng#1

FS: 0.988133
Center: 5.172, 14.956
Radius: 8.724
Left Slip Surface Endpoint: 6.114, 6.283
Right Slip Surface Endpoint: 12.202, 9.791
Resisting Horizontal Force=64.3794 kN
Driving Horizontal Force=65.1526 kN

## Method: corp of eng#2

FS: 0.992012
Center: 5.172, 14.956
Radius: 8.724
Left Slip Surface Endpoint: 6.114, 6.283
Right Slip Surface Endpoint: 12.202, 9.791

Resisting Horizontal Force=64.4591 kN
Driving Horizontal Force=64.9782 kN

### Method: lowe-karafiath

FS: 0.984996
Center: 5.172, 14.956
Radius: 8.724
Left Slip Surface Endpoint: 6.114, 6.283
Right Slip Surface Endpoint: 12.202, 9.791
Resisting Horizontal Force=64.2975 kN
Driving Horizontal Force=65.2769 kN

### Method: gle/morgenstern-price

FS: 1.001990
Center: 5.172, 14.956
Radius: 8.724
Left Slip Surface Endpoint: 6.114, 6.283
Right Slip Surface Endpoint: 12.202, 9.791
Resisting Moment=645.774 kN-m
Driving Moment=644.49 kN-m
Resisting Horizontal Force=64.7722 kN
Driving Horizontal Force=64.6434 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 9367
Number of Invalid Surfaces: 633

**Error Codes:**

Error Code -106 reported for 68 surfaces
Error Code -108 reported for 110 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 449 surfaces
Error Code -123 reported for 5 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 9367
Number of Invalid Surfaces: 633

**Error Codes:**

Error Code -106 reported for 68 surfaces
Error Code -108 reported for 110 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 449 surfaces
Error Code -123 reported for 5 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 9219

Number of Invalid Surfaces: 781

**Error Codes:**

Error Code -106 reported for 68 surfaces
Error Code -108 reported for 258 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 449 surfaces
Error Code -123 reported for 5 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 9219
Number of Invalid Surfaces: 781

**Error Codes:**

Error Code -106 reported for 68 surfaces
Error Code -108 reported for 258 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 449 surfaces
Error Code -123 reported for 5 surfaces

## Method: spencer

Number of Valid Surfaces: 9098
Number of Invalid Surfaces: 902

**Error Codes:**

Error Code -106 reported for 68 surfaces
Error Code -108 reported for 261 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 118 surfaces
Error Code -114 reported for 449 surfaces
Error Code -123 reported for 5 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 9130
Number of Invalid Surfaces: 870

**Error Codes:**

Error Code -106 reported for 68 surfaces
Error Code -108 reported for 287 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 60 surfaces
Error Code -114 reported for 449 surfaces
Error Code -123 reported for 5 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 8533
Number of Invalid Surfaces: 1467

**Error Codes:**

Error Code -106 reported for 68 surfaces
Error Code -108 reported for 643 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 301 surfaces
Error Code -114 reported for 449 surfaces
Error Code -123 reported for 5 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 6545
Number of Invalid Surfaces: 3455

### Error Codes:

Error Code -106 reported for 68 surfaces
Error Code -108 reported for 2005 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 927 surfaces
Error Code -114 reported for 449 surfaces
Error Code -123 reported for 5 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 9199
Number of Invalid Surfaces: 801

### Error Codes:

Error Code -106 reported for 68 surfaces
Error Code -108 reported for 263 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 15 surfaces
Error Code -114 reported for 449 surfaces
Error Code -123 reported for 5 surfaces

### Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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.
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

# *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.96046

| Slice | Width | Weight | Base | Base | Base Friction | Shear | Shear | Base Normal | Pore | Effective Normal |
|---|---|---|---|---|---|---|---|---|---|---|

| Number | [m] | [kN] | Material | [kPa] | Angle [degrees] | [kPa] | [kPa] | Stress [kPa] | [kPa] | Stress [kPa] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.231787 | 0.100092 | UNIT I | 3 | 28 | 3.38608 | 3.25219 | 0.474301 | 0 | 0.474301 |
| 2 | 0.231787 | 0.459614 | UNIT I | 3 | 28 | 4.31914 | 4.14836 | 2.15975 | 0 | 2.15975 |
| 3 | 0.231787 | 1.10358 | UNIT I | 3 | 28 | 5.96282 | 5.72705 | 5.12881 | 0 | 5.12881 |
| 4 | 0.231787 | 1.79864 | UNIT I | 3 | 28 | 7.68783 | 7.38385 | 8.24483 | 0 | 8.24483 |
| 5 | 0.231787 | 2.60731 | UNIT I | 3 | 28 | 9.63126 | 9.25044 | 11.7554 | 0 | 11.7554 |
| 6 | 0.231787 | 3.77503 | UNIT I | 3 | 28 | 12.3642 | 11.8753 | 16.692 | 0 | 16.692 |
| 7 | 0.231787 | 4.68344 | UNIT I | 3 | 28 | 14.3325 | 13.7658 | 20.2475 | 0 | 20.2475 |
| 8 | 0.231787 | 5.48645 | UNIT I | 3 | 28 | 15.9207 | 15.2912 | 23.1164 | 0 | 23.1164 |
| 9 | 0.231787 | 5.98289 | UNIT I | 3 | 28 | 16.6775 | 16.0181 | 24.4836 | 0 | 24.4836 |
| 10 | 0.231787 | 6.29049 | UNIT I | 3 | 28 | 16.914 | 16.2452 | 24.9106 | 0 | 24.9106 |
| 11 | 0.231787 | 6.45863 | UNIT I | 3 | 28 | 16.7707 | 16.1076 | 24.6517 | 0 | 24.6517 |
| 12 | 0.231787 | 6.48093 | UNIT I | 3 | 28 | 16.2653 | 15.6222 | 23.739 | 0 | 23.739 |
| 13 | 0.231787 | 6.39905 | UNIT I | 3 | 28 | 15.5163 | 14.9028 | 22.3859 | 0 | 22.3859 |
| 14 | 0.231787 | 6.24607 | UNIT I | 3 | 28 | 14.6149 | 14.037 | 20.7576 | 0 | 20.7576 |
| 15 | 0.231787 | 6.11556 | UNIT I | 3 | 28 | 13.7477 | 13.2041 | 19.1911 | 0 | 19.1911 |
| 16 | 0.231787 | 6.13013 | UNIT I | 3 | 28 | 13.1105 | 12.5921 | 18.0401 | 0 | 18.0401 |
| 17 | 0.231787 | 6.14454 | UNIT I | 3 | 28 | 12.4369 | 11.9451 | 16.8233 | 0 | 16.8233 |
| 18 | 0.231787 | 6.18779 | UNIT I | 3 | 28 | 11.7682 | 11.3029 | 15.6155 | 0 | 15.6155 |
| 19 | 0.231787 | 5.76716 | UNIT I | 3 | 28 | 10.4673 | 10.0535 | 13.2657 | 0 | 13.2657 |
| 20 | 0.231787 | 5.21315 | UNIT I | 3 | 28 | 9.09223 | 8.73272 | 10.7817 | 0 | 10.7817 |
| 21 | 0.231787 | 4.7049 | UNIT I | 3 | 28 | 7.88482 | 7.57305 | 8.60066 | 0 | 8.60066 |
| 22 | 0.231787 | 4.08642 | UNIT I | 3 | 28 | 6.69875 | 6.43388 | 6.45821 | 0 | 6.45821 |
| 23 | 0.231787 | 3.26327 | UNIT I | 3 | 28 | 5.51928 | 5.30105 | 4.32764 | 0 | 4.32764 |
| 24 | 0.231787 | 2.1911 | UNIT I | 3 | 28 | 4.41713 | 4.24248 | 2.33677 | 0 | 2.33677 |
| 25 | 0.231787 | 0.772944 | UNIT I | 3 | 28 | 3.46713 | 3.33004 | 0.62071 | 0 | 0.62071 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.00451

| 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 | 0.243531 | 0.266526 | UNIT I | 3 | 28 | 3.40151 | 3.41685 | 0.783987 | 0 | 0.783987 |
| 2 | 0.243531 | 0.951886 | UNIT I | 3 | 28 | 4.86985 | 4.89181 | 3.55798 | 0 | 3.55798 |
| 3 | 0.243531 | 1.64978 | UNIT I | 3 | 28 | 6.32348 | 6.352 | 6.30418 | 0 | 6.30418 |
| 4 | 0.243531 | 2.73159 | UNIT I | 3 | 28 | 8.5606 | 8.59921 | 10.5306 | 0 | 10.5306 |
| 5 | 0.243531 | 3.86559 | UNIT I | 3 | 28 | 10.8434 | 10.8923 | 14.8432 | 0 | 14.8432 |
| 6 | 0.243531 | 4.75381 | UNIT I | 3 | 28 | 12.5448 | 12.6014 | 18.0576 | 0 | 18.0576 |
| 7 | 0.243531 | 5.45861 | UNIT I | 3 | 28 | 13.8159 | 13.8782 | 20.4589 | 0 | 20.4589 |
| 8 | 0.243531 | 5.83369 | UNIT I | 3 | 28 | 14.3759 | 14.4407 | 21.5169 | 0 | 21.5169 |
| 9 | 0.243531 | 6.07566 | UNIT I | 3 | 28 | 14.6472 | 14.7133 | 22.0295 | 0 | 22.0295 |
| 10 | 0.243531 | 6.15772 | UNIT I | 3 | 28 | 14.5884 | 14.6542 | 21.9184 | 0 | 21.9184 |
| 11 | 0.243531 | 6.12745 | UNIT I | 3 | 28 | 14.3056 | 14.3701 | 21.384 | 0 | 21.384 |
| 12 | 0.243531 | 6.02093 | UNIT I | 3 | 28 | 13.877 | 13.9396 | 20.5744 | 0 | 20.5744 |
| 13 | 0.243531 | 5.93888 | UNIT I | 3 | 28 | 13.4983 | 13.5592 | 19.859 | 0 | 19.859 |
| 14 | 0.243531 | 6.04472 | UNIT I | 3 | 28 | 13.4683 | 13.529 | 19.8021 | 0 | 19.8021 |
| 15 | 0.243531 | 6.18326 | UNIT I | 3 | 28 | 13.4865 | 13.5473 | 19.8365 | 0 | 19.8365 |
| 16 | 0.243531 | 6.35243 | UNIT I | 3 | 28 | 13.5448 | 13.6059 | 19.9468 | 0 | 19.9468 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0.243531 | 6.03914 | UNIT I | 3 | 28 | 12.7417 | 12.7992 | 18.4296 | 0 | 18.4296 |
| 18 | 0.243531 | 5.66037 | UNIT I | 3 | 28 | 11.84 | 11.8934 | 16.726 | 0 | 16.726 |
| 19 | 0.243531 | 5.36983 | UNIT I | 3 | 28 | 11.1041 | 11.1542 | 15.3358 | 0 | 15.3358 |
| 20 | 0.243531 | 4.97904 | UNIT I | 3 | 28 | 10.2149 | 10.261 | 13.6559 | 0 | 13.6559 |
| 21 | 0.243531 | 4.44905 | UNIT I | 3 | 28 | 9.1213 | 9.16244 | 11.5899 | 0 | 11.5899 |
| 22 | 0.243531 | 3.68807 | UNIT I | 3 | 28 | 7.6976 | 7.73232 | 8.90021 | 0 | 8.90021 |
| 23 | 0.243531 | 2.76707 | UNIT I | 3 | 28 | 6.08335 | 6.11079 | 5.85055 | 0 | 5.85055 |
| 24 | 0.243531 | 1.7439 | UNIT I | 3 | 28 | 4.3904 | 4.4102 | 2.6522 | 0 | 2.6522 |
| 25 | 0.243531 | 0.602525 | UNIT I | 3 | 28 | 2.61957 | 2.63138 | -0.693267 | 0 | -0.693267 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.940159

| 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 | 0.231787 | 0.100092 | UNIT I | 3 | 28 | 3.4442 | 3.23809 | 0.44779 | 0 | 0.44779 |
| 2 | 0.231787 | 0.459614 | UNIT I | 3 | 28 | 4.31741 | 4.05905 | 1.99179 | 0 | 1.99179 |
| 3 | 0.231787 | 1.10358 | UNIT I | 3 | 28 | 5.88654 | 5.53428 | 4.76631 | 0 | 4.76631 |
| 4 | 0.231787 | 1.79864 | UNIT I | 3 | 28 | 7.52291 | 7.07273 | 7.65967 | 0 | 7.65967 |
| 5 | 0.231787 | 2.60731 | UNIT I | 3 | 28 | 9.37556 | 8.81452 | 10.9355 | 0 | 10.9355 |
| 6 | 0.231787 | 3.77503 | UNIT I | 3 | 28 | 12.0246 | 11.3051 | 15.6196 | 0 | 15.6196 |
| 7 | 0.231787 | 4.68344 | UNIT I | 3 | 28 | 13.9522 | 13.1173 | 19.0279 | 0 | 19.0279 |
| 8 | 0.231787 | 5.48645 | UNIT I | 3 | 28 | 15.5541 | 14.6233 | 21.8603 | 0 | 21.8603 |
| 9 | 0.231787 | 5.98289 | UNIT I | 3 | 28 | 16.3851 | 15.4046 | 23.3297 | 0 | 23.3297 |
| 10 | 0.231787 | 6.29049 | UNIT I | 3 | 28 | 16.7499 | 15.7476 | 23.9747 | 0 | 23.9747 |
| 11 | 0.231787 | 6.45863 | UNIT I | 3 | 28 | 16.781 | 15.7768 | 24.0297 | 0 | 24.0297 |
| 12 | 0.231787 | 6.48093 | UNIT I | 3 | 28 | 16.4821 | 15.4958 | 23.5011 | 0 | 23.5011 |
| 13 | 0.231787 | 6.39905 | UNIT I | 3 | 28 | 15.9588 | 15.0038 | 22.5759 | 0 | 22.5759 |
| 14 | 0.231787 | 6.24607 | UNIT I | 3 | 28 | 15.2918 | 14.3767 | 21.3966 | 0 | 21.3966 |
| 15 | 0.231787 | 6.11556 | UNIT I | 3 | 28 | 14.6774 | 13.7991 | 20.3101 | 0 | 20.3101 |
| 16 | 0.231787 | 6.13013 | UNIT I | 3 | 28 | 14.3508 | 13.492 | 19.7325 | 0 | 19.7325 |
| 17 | 0.231787 | 6.14454 | UNIT I | 3 | 28 | 14.0104 | 13.172 | 19.1307 | 0 | 19.1307 |
| 18 | 0.231787 | 6.18779 | UNIT I | 3 | 28 | 13.7069 | 12.8866 | 18.594 | 0 | 18.594 |
| 19 | 0.231787 | 5.76716 | UNIT I | 3 | 28 | 12.5427 | 11.7921 | 16.5356 | 0 | 16.5356 |
| 20 | 0.231787 | 5.21315 | UNIT I | 3 | 28 | 11.17 | 10.5016 | 14.1085 | 0 | 14.1085 |
| 21 | 0.231787 | 4.7049 | UNIT I | 3 | 28 | 9.91362 | 9.32038 | 11.8869 | 0 | 11.8869 |
| 22 | 0.231787 | 4.08642 | UNIT I | 3 | 28 | 8.51257 | 8.00317 | 9.40959 | 0 | 9.40959 |
| 23 | 0.231787 | 3.26327 | UNIT I | 3 | 28 | 6.84603 | 6.43636 | 6.46285 | 0 | 6.46285 |
| 24 | 0.231787 | 2.1911 | UNIT I | 3 | 28 | 4.90493 | 4.61141 | 3.03062 | 0 | 3.03062 |
| 25 | 0.231787 | 0.772944 | UNIT I | 3 | 28 | 2.64681 | 2.48842 | -0.96214 | 0 | -0.96214 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.993218

| 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 | 0.231787 | 0.100092 | UNIT I | 3 | 28 | 3.26021 | 3.23809 | 0.44779 | 0 | 0.44779 |
| 2 | 0.231787 | 0.459614 | UNIT I | 3 | 28 | 4.08677 | 4.05905 | 1.99179 | 0 | 1.99179 |
| 3 | 0.231787 | 1.10358 | UNIT I | 3 | 28 | 5.57207 | 5.53428 | 4.76631 | 0 | 4.76631 |
| 4 | 0.231787 | 1.79864 | UNIT I | 3 | 28 | 7.12102 | 7.07273 | 7.65967 | 0 | 7.65967 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 0.231787 | 2.60731 | UNIT I | 3 | 28 | 8.87471 | 8.81452 | 10.9355 | 0 | 10.9355 |
| 6 | 0.231787 | 3.77503 | UNIT I | 3 | 28 | 11.3823 | 11.3051 | 15.6196 | 0 | 15.6196 |
| 7 | 0.231787 | 4.68344 | UNIT I | 3 | 28 | 13.2069 | 13.1173 | 19.0279 | 0 | 19.0279 |
| 8 | 0.231787 | 5.48645 | UNIT I | 3 | 28 | 14.7232 | 14.6233 | 21.8603 | 0 | 21.8603 |
| 9 | 0.231787 | 5.98289 | UNIT I | 3 | 28 | 15.5098 | 15.4046 | 23.3297 | 0 | 23.3297 |
| 10 | 0.231787 | 6.29049 | UNIT I | 3 | 28 | 15.8551 | 15.7476 | 23.9747 | 0 | 23.9747 |
| 11 | 0.231787 | 6.45863 | UNIT I | 3 | 28 | 15.8845 | 15.7768 | 24.0297 | 0 | 24.0297 |
| 12 | 0.231787 | 6.48093 | UNIT I | 3 | 28 | 15.6016 | 15.4958 | 23.5011 | 0 | 23.5011 |
| 13 | 0.231787 | 6.39905 | UNIT I | 3 | 28 | 15.1063 | 15.0038 | 22.5759 | 0 | 22.5759 |
| 14 | 0.231787 | 6.24607 | UNIT I | 3 | 28 | 14.4749 | 14.3767 | 21.3966 | 0 | 21.3966 |
| 15 | 0.231787 | 6.11556 | UNIT I | 3 | 28 | 13.8933 | 13.7991 | 20.3101 | 0 | 20.3101 |
| 16 | 0.231787 | 6.13013 | UNIT I | 3 | 28 | 13.5841 | 13.492 | 19.7325 | 0 | 19.7325 |
| 17 | 0.231787 | 6.14454 | UNIT I | 3 | 28 | 13.2619 | 13.172 | 19.1307 | 0 | 19.1307 |
| 18 | 0.231787 | 6.18779 | UNIT I | 3 | 28 | 12.9746 | 12.8866 | 18.594 | 0 | 18.594 |
| 19 | 0.231787 | 5.76716 | UNIT I | 3 | 28 | 11.8727 | 11.7921 | 16.5356 | 0 | 16.5356 |
| 20 | 0.231787 | 5.21315 | UNIT I | 3 | 28 | 10.5733 | 10.5016 | 14.1085 | 0 | 14.1085 |
| 21 | 0.231787 | 4.7049 | UNIT I | 3 | 28 | 9.38402 | 9.32038 | 11.8869 | 0 | 11.8869 |
| 22 | 0.231787 | 4.08642 | UNIT I | 3 | 28 | 8.05782 | 8.00317 | 9.40959 | 0 | 9.40959 |
| 23 | 0.231787 | 3.26327 | UNIT I | 3 | 28 | 6.48031 | 6.43636 | 6.46285 | 0 | 6.46285 |
| 24 | 0.231787 | 2.1911 | UNIT I | 3 | 28 | 4.6429 | 4.61141 | 3.03062 | 0 | 3.03062 |
| 25 | 0.231787 | 0.772944 | UNIT I | 3 | 28 | 2.50541 | 2.48842 | -0.96214 | 0 | -0.96214 |

**Global Minimum Query (spencer) - Safety Factor**: 1.00589

| 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 | 0.243531 | 0.266526 | UNIT I | 3 | 28 | 5.20265 | 5.23329 | 4.2002 | 0 | 4.2002 |
| 2 | 0.243531 | 0.951886 | UNIT I | 3 | 28 | 6.87235 | 6.91283 | 7.35897 | 0 | 7.35897 |
| 3 | 0.243531 | 1.64978 | UNIT I | 3 | 28 | 8.41196 | 8.46151 | 10.2716 | 0 | 10.2716 |
| 4 | 0.243531 | 2.73159 | UNIT I | 3 | 28 | 10.7247 | 10.7879 | 14.6469 | 0 | 14.6469 |
| 5 | 0.243531 | 3.86559 | UNIT I | 3 | 28 | 12.9349 | 13.0111 | 18.8281 | 0 | 18.8281 |
| 6 | 0.243531 | 4.75381 | UNIT I | 3 | 28 | 14.3912 | 14.476 | 21.5832 | 0 | 21.5832 |
| 7 | 0.243531 | 5.45861 | UNIT I | 3 | 28 | 15.3137 | 15.4039 | 23.3282 | 0 | 23.3282 |
| 8 | 0.243531 | 5.83369 | UNIT I | 3 | 28 | 15.4724 | 15.5635 | 23.6284 | 0 | 23.6284 |
| 9 | 0.243531 | 6.07566 | UNIT I | 3 | 28 | 15.3384 | 15.4287 | 23.375 | 0 | 23.375 |
| 10 | 0.243531 | 6.15772 | UNIT I | 3 | 28 | 14.8989 | 14.9867 | 22.5437 | 0 | 22.5437 |
| 11 | 0.243531 | 6.12745 | UNIT I | 3 | 28 | 14.2765 | 14.3606 | 21.3662 | 0 | 21.3662 |
| 12 | 0.243531 | 6.02093 | UNIT I | 3 | 28 | 13.556 | 13.6358 | 20.0031 | 0 | 20.0031 |
| 13 | 0.243531 | 5.93888 | UNIT I | 3 | 28 | 12.9127 | 12.9888 | 18.7862 | 0 | 18.7862 |
| 14 | 0.243531 | 6.04472 | UNIT I | 3 | 28 | 12.5883 | 12.6624 | 18.1723 | 0 | 18.1723 |
| 15 | 0.243531 | 6.18326 | UNIT I | 3 | 28 | 12.316 | 12.3886 | 17.6574 | 0 | 17.6574 |
| 16 | 0.243531 | 6.35243 | UNIT I | 3 | 28 | 12.0864 | 12.1576 | 17.2229 | 0 | 17.2229 |
| 17 | 0.243531 | 6.03914 | UNIT I | 3 | 28 | 11.2092 | 11.2753 | 15.5635 | 0 | 15.5635 |
| 18 | 0.243531 | 5.66037 | UNIT I | 3 | 28 | 10.3015 | 10.3621 | 13.8462 | 0 | 13.8462 |
| 19 | 0.243531 | 5.36983 | UNIT I | 3 | 28 | 9.55797 | 9.61427 | 12.4396 | 0 | 12.4396 |
| 20 | 0.243531 | 4.97904 | UNIT I | 3 | 28 | 8.74124 | 8.79273 | 10.8946 | 0 | 10.8946 |
| 21 | 0.243531 | 4.44905 | UNIT I | 3 | 28 | 7.82054 | 7.8666 | 9.15275 | 0 | 9.15275 |
| 22 | 0.243531 | 3.68807 | UNIT I | 3 | 28 | 6.7152 | 6.75475 | 7.06167 | 0 | 7.06167 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 0.243531 | 2.76707 | UNIT I | 3 | 28 | 5.52521 | 5.55775 | 4.81043 | 0 | 4.81043 |
| 24 | 0.243531 | 1.7439 | UNIT I | 3 | 28 | 4.32142 | 4.34687 | 2.5331 | 0 | 2.5331 |
| 25 | 0.243531 | 0.602525 | UNIT I | 3 | 28 | 3.25636 | 3.27554 | 0.518208 | 0 | 0.518208 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.988133

| 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 | 0.243531 | 0.266526 | UNIT I | 3 | 28 | 4.58092 | 4.52656 | 2.87104 | 0 | 2.87104 |
| 2 | 0.243531 | 0.951886 | UNIT I | 3 | 28 | 6.2089 | 6.13522 | 5.89648 | 0 | 5.89648 |
| 3 | 0.243531 | 1.64978 | UNIT I | 3 | 28 | 7.75099 | 7.65901 | 8.7623 | 0 | 8.7623 |
| 4 | 0.243531 | 2.73159 | UNIT I | 3 | 28 | 10.0856 | 9.96596 | 13.1011 | 0 | 13.1011 |
| 5 | 0.243531 | 3.86559 | UNIT I | 3 | 28 | 12.3733 | 12.2265 | 17.3525 | 0 | 17.3525 |
| 6 | 0.243531 | 4.75381 | UNIT I | 3 | 28 | 13.958 | 13.7924 | 20.2975 | 0 | 20.2975 |
| 7 | 0.243531 | 5.45861 | UNIT I | 3 | 28 | 15.0357 | 14.8573 | 22.3004 | 0 | 22.3004 |
| 8 | 0.243531 | 5.83369 | UNIT I | 3 | 28 | 15.3522 | 15.17 | 22.8885 | 0 | 22.8885 |
| 9 | 0.243531 | 6.07566 | UNIT I | 3 | 28 | 15.3686 | 15.1862 | 22.919 | 0 | 22.919 |
| 10 | 0.243531 | 6.15772 | UNIT I | 3 | 28 | 15.0613 | 14.8826 | 22.348 | 0 | 22.348 |
| 11 | 0.243531 | 6.12745 | UNIT I | 3 | 28 | 14.5494 | 14.3767 | 21.3965 | 0 | 21.3965 |
| 12 | 0.243531 | 6.02093 | UNIT I | 3 | 28 | 13.9174 | 13.7522 | 20.2219 | 0 | 20.2219 |
| 13 | 0.243531 | 5.93888 | UNIT I | 3 | 28 | 13.3512 | 13.1928 | 19.1698 | 0 | 19.1698 |
| 14 | 0.243531 | 6.04472 | UNIT I | 3 | 28 | 13.1166 | 12.961 | 18.7339 | 0 | 18.7339 |
| 15 | 0.243531 | 6.18326 | UNIT I | 3 | 28 | 12.9299 | 12.7764 | 18.3868 | 0 | 18.3868 |
| 16 | 0.243531 | 6.35243 | UNIT I | 3 | 28 | 12.7811 | 12.6294 | 18.1103 | 0 | 18.1103 |
| 17 | 0.243531 | 6.03914 | UNIT I | 3 | 28 | 11.8996 | 11.7584 | 16.4722 | 0 | 16.4722 |
| 18 | 0.243531 | 5.66037 | UNIT I | 3 | 28 | 10.9637 | 10.8336 | 14.7328 | 0 | 14.7328 |
| 19 | 0.243531 | 5.36983 | UNIT I | 3 | 28 | 10.1941 | 10.0731 | 13.3025 | 0 | 13.3025 |
| 20 | 0.243531 | 4.97904 | UNIT I | 3 | 28 | 9.32493 | 9.21427 | 11.6873 | 0 | 11.6873 |
| 21 | 0.243531 | 4.44905 | UNIT I | 3 | 28 | 8.32185 | 8.22309 | 9.8232 | 0 | 9.8232 |
| 22 | 0.243531 | 3.68807 | UNIT I | 3 | 28 | 7.09505 | 7.01085 | 7.54331 | 0 | 7.54331 |
| 23 | 0.243531 | 2.76707 | UNIT I | 3 | 28 | 5.76389 | 5.69549 | 5.06948 | 0 | 5.06948 |
| 24 | 0.243531 | 1.7439 | UNIT I | 3 | 28 | 4.41842 | 4.36599 | 2.56906 | 0 | 2.56906 |
| 25 | 0.243531 | 0.602525 | UNIT I | 3 | 28 | 3.13069 | 3.09354 | 0.175914 | 0 | 0.175914 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 0.992012

| 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 | 0.243531 | 0.266526 | UNIT I | 3 | 28 | 4.89791 | 4.85879 | 3.49587 | 0 | 3.49587 |
| 2 | 0.243531 | 0.951886 | UNIT I | 3 | 28 | 7.12176 | 7.06487 | 7.64491 | 0 | 7.64491 |
| 3 | 0.243531 | 1.64978 | UNIT I | 3 | 28 | 11.0072 | 10.9193 | 14.8941 | 0 | 14.8941 |
| 4 | 0.243531 | 2.73159 | UNIT I | 3 | 28 | 13.0171 | 12.9131 | 18.6438 | 0 | 18.6438 |
| 5 | 0.243531 | 3.86559 | UNIT I | 3 | 28 | 11.7751 | 11.681 | 16.3266 | 0 | 16.3266 |
| 6 | 0.243531 | 4.75381 | UNIT I | 3 | 28 | 12.2141 | 12.1165 | 17.1457 | 0 | 17.1457 |
| 7 | 0.243531 | 5.45861 | UNIT I | 3 | 28 | 11.8975 | 11.8025 | 16.555 | 0 | 16.555 |
| 8 | 0.243531 | 5.83369 | UNIT I | 3 | 28 | 13.5869 | 13.4784 | 19.707 | 0 | 19.707 |
| 9 | 0.243531 | 6.07566 | UNIT I | 3 | 28 | 13.5789 | 13.4704 | 19.692 | 0 | 19.692 |
| 10 | 0.243531 | 6.15772 | UNIT I | 3 | 28 | 13.6402 | 13.5312 | 19.8063 | 0 | 19.8063 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 0.243531 | 6.12745 | UNIT I | 3 | 28 | 13.9573 | 13.8458 | 20.398 | 0 | 20.398 |
| 12 | 0.243531 | 6.02093 | UNIT I | 3 | 28 | 15.3964 | 15.2734 | 23.0829 | 0 | 23.0829 |
| 13 | 0.243531 | 5.93888 | UNIT I | 3 | 28 | 15.5145 | 15.3906 | 23.3033 | 0 | 23.3033 |
| 14 | 0.243531 | 6.04472 | UNIT I | 3 | 28 | 14.7622 | 14.6443 | 21.8997 | 0 | 21.8997 |
| 15 | 0.243531 | 6.18326 | UNIT I | 3 | 28 | 12.2517 | 12.1539 | 17.2159 | 0 | 17.2159 |
| 16 | 0.243531 | 6.35243 | UNIT I | 3 | 28 | 10.2474 | 10.1655 | 13.4764 | 0 | 13.4764 |
| 17 | 0.243531 | 6.03914 | UNIT I | 3 | 28 | 11.6216 | 11.5287 | 16.0402 | 0 | 16.0402 |
| 18 | 0.243531 | 5.66037 | UNIT I | 3 | 28 | 11.7936 | 11.6994 | 16.3611 | 0 | 16.3611 |
| 19 | 0.243531 | 5.36983 | UNIT I | 3 | 28 | 10.231 | 10.1492 | 13.4458 | 0 | 13.4458 |
| 20 | 0.243531 | 4.97904 | UNIT I | 3 | 28 | 9.27097 | 9.19691 | 11.6547 | 0 | 11.6547 |
| 21 | 0.243531 | 4.44905 | UNIT I | 3 | 28 | 8.4181 | 8.35086 | 10.0635 | 0 | 10.0635 |
| 22 | 0.243531 | 3.68807 | UNIT I | 3 | 28 | 7.37732 | 7.31839 | 8.12171 | 0 | 8.12171 |
| 23 | 0.243531 | 2.76707 | UNIT I | 3 | 28 | 5.95824 | 5.91065 | 5.47416 | 0 | 5.47416 |
| 24 | 0.243531 | 1.7439 | UNIT I | 3 | 28 | 4.41736 | 4.38207 | 2.5993 | 0 | 2.5993 |
| 25 | 0.243531 | 0.602525 | UNIT I | 3 | 28 | 2.86312 | 2.84025 | -0.300453 | 0 | -0.300453 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.984996

| 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 | 0.243531 | 0.266526 | UNIT I | 3 | 28 | 4.20285 | 4.13979 | 2.14363 | 0 | 2.14363 |
| 2 | 0.243531 | 0.951886 | UNIT I | 3 | 28 | 6.04397 | 5.95329 | 5.55431 | 0 | 5.55431 |
| 3 | 0.243531 | 1.64978 | UNIT I | 3 | 28 | 8.27956 | 8.15533 | 9.69578 | 0 | 9.69578 |
| 4 | 0.243531 | 2.73159 | UNIT I | 3 | 28 | 10.5883 | 10.4294 | 13.9728 | 0 | 13.9728 |
| 5 | 0.243531 | 3.86559 | UNIT I | 3 | 28 | 12.1662 | 11.9836 | 16.8958 | 0 | 16.8958 |
| 6 | 0.243531 | 4.75381 | UNIT I | 3 | 28 | 13.4509 | 13.2491 | 19.2757 | 0 | 19.2757 |
| 7 | 0.243531 | 5.45861 | UNIT I | 3 | 28 | 13.9983 | 13.7883 | 20.2898 | 0 | 20.2898 |
| 8 | 0.243531 | 5.83369 | UNIT I | 3 | 28 | 14.8015 | 14.5794 | 21.7777 | 0 | 21.7777 |
| 9 | 0.243531 | 6.07566 | UNIT I | 3 | 28 | 14.8256 | 14.6032 | 21.8225 | 0 | 21.8225 |
| 10 | 0.243531 | 6.15772 | UNIT I | 3 | 28 | 14.7012 | 14.4806 | 21.5918 | 0 | 21.5918 |
| 11 | 0.243531 | 6.12745 | UNIT I | 3 | 28 | 14.6129 | 14.3936 | 21.4283 | 0 | 21.4283 |
| 12 | 0.243531 | 6.02093 | UNIT I | 3 | 28 | 15.0464 | 14.8206 | 22.2314 | 0 | 22.2314 |
| 13 | 0.243531 | 5.93888 | UNIT I | 3 | 28 | 14.804 | 14.5819 | 21.7824 | 0 | 21.7824 |
| 14 | 0.243531 | 6.04472 | UNIT I | 3 | 28 | 14.2728 | 14.0587 | 20.7985 | 0 | 20.7985 |
| 15 | 0.243531 | 6.18326 | UNIT I | 3 | 28 | 12.9469 | 12.7526 | 18.342 | 0 | 18.342 |
| 16 | 0.243531 | 6.35243 | UNIT I | 3 | 28 | 11.7642 | 11.5877 | 16.151 | 0 | 16.151 |
| 17 | 0.243531 | 6.03914 | UNIT I | 3 | 28 | 11.9166 | 11.7378 | 16.4334 | 0 | 16.4334 |
| 18 | 0.243531 | 5.66037 | UNIT I | 3 | 28 | 11.4839 | 11.3116 | 15.6319 | 0 | 15.6319 |
| 19 | 0.243531 | 5.36983 | UNIT I | 3 | 28 | 10.2151 | 10.0619 | 13.2814 | 0 | 13.2814 |
| 20 | 0.243531 | 4.97904 | UNIT I | 3 | 28 | 9.22487 | 9.08646 | 11.447 | 0 | 11.447 |
| 21 | 0.243531 | 4.44905 | UNIT I | 3 | 28 | 8.24914 | 8.12537 | 9.63942 | 0 | 9.63942 |
| 22 | 0.243531 | 3.68807 | UNIT I | 3 | 28 | 7.10601 | 6.99939 | 7.52177 | 0 | 7.52177 |
| 23 | 0.243531 | 2.76707 | UNIT I | 3 | 28 | 5.76737 | 5.68084 | 5.04194 | 0 | 5.04194 |
| 24 | 0.243531 | 1.7439 | UNIT I | 3 | 28 | 4.41188 | 4.34568 | 2.53085 | 0 | 2.53085 |
| 25 | 0.243531 | 0.602525 | UNIT I | 3 | 28 | 3.16344 | 3.11597 | 0.218113 | 0 | 0.218113 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.00199

| | | | | | Base | | | Base | | Effective |
|---|---|---|---|---|---|---|---|---|---|---|

| Slice Number | Width [m] | Weight [kN] | Base Material | Cohesion [kPa] | Friction Angle [degrees] | Stress [kPa] | Strength [kPa] | Normal Stress [kPa] | Pressure [kPa] | Normal Stress [kPa] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.243531 | 0.266526 | UNIT I | 3 | 28 | 3.61033 | 3.61751 | 1.16137 | 0 | 1.16137 |
| 2 | 0.243531 | 0.951886 | UNIT I | 3 | 28 | 5.56173 | 5.5728 | 4.83872 | 0 | 4.83872 |
| 3 | 0.243531 | 1.64978 | UNIT I | 3 | 28 | 7.56224 | 7.57729 | 8.60863 | 0 | 8.60863 |
| 4 | 0.243531 | 2.73159 | UNIT I | 3 | 28 | 10.3764 | 10.397 | 13.9118 | 0 | 13.9118 |
| 5 | 0.243531 | 3.86559 | UNIT I | 3 | 28 | 13.1383 | 13.1644 | 19.1164 | 0 | 19.1164 |
| 6 | 0.243531 | 4.75381 | UNIT I | 3 | 28 | 15.0928 | 15.1228 | 22.7996 | 0 | 22.7996 |
| 7 | 0.243531 | 5.45861 | UNIT I | 3 | 28 | 16.3501 | 16.3826 | 25.169 | 0 | 25.169 |
| 8 | 0.243531 | 5.83369 | UNIT I | 3 | 28 | 16.6378 | 16.6709 | 25.7111 | 0 | 25.7111 |
| 9 | 0.243531 | 6.07566 | UNIT I | 3 | 28 | 16.4394 | 16.4721 | 25.3373 | 0 | 25.3373 |
| 10 | 0.243531 | 6.15772 | UNIT I | 3 | 28 | 15.7895 | 15.8209 | 24.1126 | 0 | 24.1126 |
| 11 | 0.243531 | 6.12745 | UNIT I | 3 | 28 | 14.8724 | 14.902 | 22.3844 | 0 | 22.3844 |
| 12 | 0.243531 | 6.02093 | UNIT I | 3 | 28 | 13.8331 | 13.8606 | 20.4259 | 0 | 20.4259 |
| 13 | 0.243531 | 5.93888 | UNIT I | 3 | 28 | 12.8935 | 12.9191 | 18.6552 | 0 | 18.6552 |
| 14 | 0.243531 | 6.04472 | UNIT I | 3 | 28 | 12.325 | 12.3495 | 17.5839 | 0 | 17.5839 |
| 15 | 0.243531 | 6.18326 | UNIT I | 3 | 28 | 11.8931 | 11.9168 | 16.77 | 0 | 16.77 |
| 16 | 0.243531 | 6.35243 | UNIT I | 3 | 28 | 11.6083 | 11.6314 | 16.2334 | 0 | 16.2334 |
| 17 | 0.243531 | 6.03914 | UNIT I | 3 | 28 | 10.7819 | 10.8033 | 14.6759 | 0 | 14.6759 |
| 18 | 0.243531 | 5.66037 | UNIT I | 3 | 28 | 9.99626 | 10.0162 | 13.1955 | 0 | 13.1955 |
| 19 | 0.243531 | 5.36983 | UNIT I | 3 | 28 | 9.43347 | 9.45224 | 12.1349 | 0 | 12.1349 |
| 20 | 0.243531 | 4.97904 | UNIT I | 3 | 28 | 8.8277 | 8.84527 | 10.9934 | 0 | 10.9934 |
| 21 | 0.243531 | 4.44905 | UNIT I | 3 | 28 | 8.10867 | 8.12481 | 9.63837 | 0 | 9.63837 |
| 22 | 0.243531 | 3.68807 | UNIT I | 3 | 28 | 7.12731 | 7.14149 | 7.789 | 0 | 7.789 |
| 23 | 0.243531 | 2.76707 | UNIT I | 3 | 28 | 5.92442 | 5.93621 | 5.5222 | 0 | 5.5222 |
| 24 | 0.243531 | 1.7439 | UNIT I | 3 | 28 | 4.50591 | 4.51488 | 2.84907 | 0 | 2.84907 |
| 25 | 0.243531 | 0.602525 | UNIT I | 3 | 28 | 2.75401 | 2.75949 | -0.45234 | 0 | -0.45234 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -7.22118 | 0.864 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

### External Boundary

| X | Y |
|---|---|
| -7.22118 | 4.87717 |
| -7.22118 | 0.864 |
| -7.22118 | -3.44395 |
| -7.22118 | -5.39909 |
| -4.18484 | -5.39909 |
| 49.9902 | -5.39909 |
| 49.9902 | 9.76285 |

| | |
|---|---|
| 49.9902 | 15.7927 |
| 49.9902 | 17.787 |
| 49.9902 | 21.0279 |
| 49.9902 | 23.8629 |
| 48.6865 | 23.1062 |
| 47.8664 | 22.7068 |
| 47.0674 | 22.2234 |
| 46.6258 | 21.7399 |
| 45.7847 | 21.3196 |
| 45.3851 | 20.8782 |
| 43.6609 | 17.8094 |
| 42.9761 | 16.0499 |
| 42.5174 | 15.4341 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 27.4875 | 14.3186 |
| 27.4445 | 14.3168 |
| 27.2003 | 14.1883 |
| 26.5834 | 13.5717 |
| 25.7224 | 12.801 |
| 24.9899 | 12.3128 |
| 23.6437 | 11.6418 |
| 23.2984 | 11.5524 |
| 22.5311 | 11.4757 |
| 22.0195 | 11.2967 |
| 21.1116 | 11.2584 |
| 20.3826 | 11.1561 |
| 19.7816 | 10.9771 |
| 17.3761 | 10.5131 |
| 16.6293 | 10.2749 |
| 15.7792 | 10.2113 |
| 14.3889 | 10.0446 |
| 12.514 | 9.86192 |
| 11.1768 | 9.55661 |
| 10.7629 | 9.3793 |
| 10.5624 | 9.27457 |
| 10.3293 | 9.15274 |
| 9.87595 | 9.00005 |
| 9.59509 | 8.75871 |
| 9.44235 | 8.6601 |
| 9.12206 | 8.45334 |
| 8.7464 | 8.31738 |
| 8.5505 | 8.24647 |
| 8.24707 | 8.11781 |
| 7.9937 | 7.98051 |
| 7.62053 | 7.73837 |
| 7.10879 | 7.20477 |
| 6.80797 | 6.79327 |

| | |
|---|---|
| 6.24421 | 6.35423 |
| 6.04432 | 6.24523 |
| 5.80445 | 6.1963 |
| 4.96247 | 6.09843 |
| 3.55263 | 5.94674 |
| 2.46637 | 5.95601 |
| 2.37408 | 5.97731 |
| 2.19776 | 5.96607 |
| 1.33058 | 5.75328 |
| 0.562161 | 5.61447 |
| -0.0303637 | 5.49417 |
| -0.539558 | 5.31833 |
| -1.58574 | 5.19803 |
| -2.70597 | 5.15175 |
| -3.32627 | 4.98518 |
| -5.4581 | 4.92122 |
| -5.8548 | 4.89919 |
| -6.3176 | 4.84044 |

## Material Boundary

| X | Y |
|---|---|
| 5.80445 | 6.1963 |
| 6.24488 | 6.19908 |

## Material Boundary

| X | Y |
|---|---|
| 9.74793 | 6.17913 |
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

## Material Boundary

| X | Y |
|---|---|
| -7.22118 | -3.44395 |
| 14.9068 | 2.35905 |
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |
| 49.9902 | 15.7927 |

## Material Boundary

| X | Y |
|---|---|
| -4.18484 | -5.39909 |
| 49.9902 | 9.76285 |

## Material Boundary

| X | Y |
|---|---|
| -7.22118 | 0.864 |
| 40.9932 | 12.499 |

## Material Boundary

| X | Y |
|---|---|
| 6.24488 | 6.19908 |
| 9.74793 | 6.17913 |

## Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 21.0279 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: YK S51 EQ=0.20up c=3 phi=28 LOCAL
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 17/5/2021, 20:11:32

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): -0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT |
|---|---|---|---|---|---|
| Color | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 |
| Water Surface | None | None | Water Table | Water Table | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated |
| Ru Value | 0 | 0 | | | |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.959963
Center: 6.055, 13.035
Radius: 6.765
Left Slip Surface Endpoint: 6.090, 6.270
Right Slip Surface Endpoint: 11.961, 9.736
Resisting Moment=437.497 kN-m
Driving Moment=455.744 kN-m

### Method: bishop simplified

FS: 1.004090

Center: 5.249, 15.283
Radius: 9.026
Left Slip Surface Endpoint: 6.149, 6.302
Right Slip Surface Endpoint: 12.455, 9.849
Resisting Moment=614.48 kN-m
Driving Moment=611.974 kN-m

## Method: janbu simplified

FS: 0.934825
Center: 6.204, 11.926
Radius: 5.727
Left Slip Surface Endpoint: 5.869, 6.209
Right Slip Surface Endpoint: 11.445, 9.618
Resisting Horizontal Force=53.1394 kN
Driving Horizontal Force=56.8442 kN

## Method: janbu corrected

FS: 0.987419
Center: 6.055, 13.035
Radius: 6.765
Left Slip Surface Endpoint: 6.090, 6.270
Right Slip Surface Endpoint: 11.961, 9.736
Resisting Horizontal Force=60.5198 kN
Driving Horizontal Force=61.2909 kN

## Method: spencer

FS: 1.003920
Center: 5.249, 15.283
Radius: 9.026
Left Slip Surface Endpoint: 6.149, 6.302
Right Slip Surface Endpoint: 12.455, 9.849
Resisting Moment=614.373 kN-m
Driving Moment=611.974 kN-m
Resisting Horizontal Force=59.8455 kN
Driving Horizontal Force=59.6117 kN

## Method: corp of eng#1

FS: 0.982773
Center: 5.924, 13.159
Radius: 6.884
Left Slip Surface Endpoint: 6.104, 6.278
Right Slip Surface Endpoint: 11.886, 9.719
Resisting Horizontal Force=55.8524 kN
Driving Horizontal Force=56.8314 kN

## Method: corp of eng#2

FS: 0.988762
Center: 5.249, 15.283
Radius: 9.026
Left Slip Surface Endpoint: 6.149, 6.302
Right Slip Surface Endpoint: 12.455, 9.849
Resisting Horizontal Force=59.4177 kN
Driving Horizontal Force=60.0931 kN

### Method: lowe-karafiath

FS: 0.976040
Center: 5.924, 13.159
Radius: 6.884
Left Slip Surface Endpoint: 6.104, 6.278
Right Slip Surface Endpoint: 11.886, 9.719
Resisting Horizontal Force=55.7026 kN
Driving Horizontal Force=57.07 kN

### Method: gle/morgenstern-price

FS: 1.002570
Center: 5.249, 15.283
Radius: 9.026
Left Slip Surface Endpoint: 6.149, 6.302
Right Slip Surface Endpoint: 12.455, 9.849
Resisting Moment=613.549 kN-m
Driving Moment=611.974 kN-m
Resisting Horizontal Force=59.7896 kN
Driving Horizontal Force=59.6361 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 7800
Number of Invalid Surfaces: 2200

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 11 surfaces
Error Code -106 reported for 164 surfaces
Error Code -108 reported for 376 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 1635 surfaces
Error Code -123 reported for 12 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 7800
Number of Invalid Surfaces: 2200

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 11 surfaces
Error Code -106 reported for 164 surfaces
Error Code -108 reported for 376 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 1635 surfaces
Error Code -123 reported for 12 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 7491
Number of Invalid Surfaces: 2509

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 11 surfaces
Error Code -106 reported for 164 surfaces
Error Code -108 reported for 685 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 1635 surfaces
Error Code -123 reported for 12 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 7491
Number of Invalid Surfaces: 2509

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 11 surfaces
Error Code -106 reported for 164 surfaces
Error Code -108 reported for 685 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 1635 surfaces
Error Code -123 reported for 12 surfaces

## Method: spencer

Number of Valid Surfaces: 6943
Number of Invalid Surfaces: 3057

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 11 surfaces
Error Code -106 reported for 164 surfaces
Error Code -108 reported for 740 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 493 surfaces
Error Code -114 reported for 1635 surfaces
Error Code -123 reported for 12 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 7080
Number of Invalid Surfaces: 2920

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -105 reported for 11 surfaces
Error Code -106 reported for 164 surfaces
Error Code -108 reported for 802 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 294 surfaces
Error Code -114 reported for 1635 surfaces

Error Code -123 reported for 12 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 6830
Number of Invalid Surfaces: 3170

### Error Codes:

Error Code -101 reported for 1 surface
Error Code -105 reported for 11 surfaces
Error Code -106 reported for 164 surfaces
Error Code -108 reported for 1123 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 223 surfaces
Error Code -114 reported for 1635 surfaces
Error Code -123 reported for 12 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 4921
Number of Invalid Surfaces: 5079

### Error Codes:

Error Code -101 reported for 1 surface
Error Code -105 reported for 11 surfaces
Error Code -106 reported for 164 surfaces
Error Code -108 reported for 2735 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 520 surfaces
Error Code -114 reported for 1635 surfaces
Error Code -123 reported for 12 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 7421
Number of Invalid Surfaces: 2579

### Error Codes:

Error Code -101 reported for 1 surface
Error Code -105 reported for 11 surfaces
Error Code -106 reported for 164 surfaces
Error Code -108 reported for 701 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 54 surfaces
Error Code -114 reported for 1635 surfaces
Error Code -123 reported for 12 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.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-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.
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.959963

| 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 | 0.234852 | 0.288246 | UNIT I | 3 | 28 | 3.73358 | 3.5841 | 1.09854 | 0 | 1.09854 |
| 2 | 0.234852 | 1.0096 | UNIT I | 3 | 28 | 5.23387 | 5.02432 | 3.8072 | 0 | 3.8072 |
| 3 | 0.234852 | 1.74732 | UNIT I | 3 | 28 | 6.72719 | 6.45785 | 6.5033 | 0 | 6.5033 |
| 4 | 0.234852 | 2.72184 | UNIT I | 3 | 28 | 8.64852 | 8.30226 | 9.97208 | 0 | 9.97208 |
| 5 | 0.234852 | 3.92734 | UNIT I | 3 | 28 | 10.9492 | 10.5108 | 14.1258 | 0 | 14.1258 |
| 6 | 0.234852 | 4.84922 | UNIT I | 3 | 28 | 12.5824 | 12.0787 | 17.0745 | 0 | 17.0745 |
| 7 | 0.234852 | 5.66499 | UNIT I | 3 | 28 | 13.9089 | 13.352 | 19.4693 | 0 | 19.4693 |
| 8 | 0.234852 | 6.1318 | UNIT I | 3 | 28 | 14.4823 | 13.9025 | 20.5046 | 0 | 20.5046 |
| 9 | 0.234852 | 6.45787 | UNIT I | 3 | 28 | 14.7243 | 14.1348 | 20.9416 | 0 | 20.9416 |
| 10 | 0.234852 | 6.63427 | UNIT I | 3 | 28 | 14.6391 | 14.053 | 20.7877 | 0 | 20.7877 |
| 11 | 0.234852 | 6.67713 | UNIT I | 3 | 28 | 14.2789 | 13.7072 | 20.1373 | 0 | 20.1373 |
| 12 | 0.234852 | 6.62366 | UNIT I | 3 | 28 | 13.7293 | 13.1796 | 19.1451 | 0 | 19.1451 |
| 13 | 0.234852 | 6.51627 | UNIT I | 3 | 28 | 13.0764 | 12.5528 | 17.9663 | 0 | 17.9663 |
| 14 | 0.234852 | 6.53112 | UNIT I | 3 | 28 | 12.5894 | 12.0854 | 17.0871 | 0 | 17.0871 |
| 15 | 0.234852 | 6.61675 | UNIT I | 3 | 28 | 12.17 | 11.6827 | 16.3299 | 0 | 16.3299 |
| 16 | 0.234852 | 6.77259 | UNIT I | 3 | 28 | 11.7996 | 11.3272 | 15.6612 | 0 | 15.6612 |
| 17 | 0.234852 | 6.75169 | UNIT I | 3 | 28 | 11.1652 | 10.7182 | 14.5157 | 0 | 14.5157 |
| 18 | 0.234852 | 6.33122 | UNIT I | 3 | 28 | 10.0711 | 9.6679 | 12.5405 | 0 | 12.5405 |
| 19 | 0.234852 | 5.92005 | UNIT I | 3 | 28 | 9.04425 | 8.68215 | 10.6866 | 0 | 10.6866 |
| 20 | 0.234852 | 5.53261 | UNIT I | 3 | 28 | 8.10036 | 7.77605 | 8.98245 | 0 | 8.98245 |
| 21 | 0.234852 | 4.99339 | UNIT I | 3 | 28 | 7.09782 | 6.81364 | 7.1724 | 0 | 7.1724 |
| 22 | 0.234852 | 4.29393 | UNIT I | 3 | 28 | 6.08432 | 5.84072 | 5.34262 | 0 | 5.34262 |
| 23 | 0.234852 | 3.31424 | UNIT I | 3 | 28 | 5.0486 | 4.84647 | 3.4727 | 0 | 3.4727 |
| 24 | 0.234852 | 2.13175 | UNIT I | 3 | 28 | 4.12652 | 3.96131 | 1.80796 | 0 | 1.80796 |
| 25 | 0.234852 | 0.748493 | UNIT I | 3 | 28 | 3.39316 | 3.25731 | 0.483931 | 0 | 0.483931 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.00409

| 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 | 0.252269 | 0.315029 | UNIT I | 3 | 28 | 3.37751 | 3.39132 | 0.735973 | 0 | 0.735973 |
| 2 | 0.252269 | 1.08083 | UNIT I | 3 | 28 | 4.67418 | 4.6933 | 3.18464 | 0 | 3.18464 |
| 3 | 0.252269 | 1.88526 | UNIT I | 3 | 28 | 6.00052 | 6.02506 | 5.68929 | 0 | 5.68929 |
| 4 | 0.252269 | 3.17207 | UNIT I | 3 | 28 | 8.1115 | 8.14468 | 9.67574 | 0 | 9.67574 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 0.252269 | 4.29879 | UNIT I | 3 | 28 | 9.89191 | 9.93237 | 13.0379 | 0 | 13.0379 |
| 6 | 0.252269 | 5.25478 | UNIT I | 3 | 28 | 11.3361 | 11.3825 | 15.7652 | 0 | 15.7652 |
| 7 | 0.252269 | 5.86945 | UNIT I | 3 | 28 | 12.1778 | 12.2276 | 17.3546 | 0 | 17.3546 |
| 8 | 0.252269 | 6.24964 | UNIT I | 3 | 28 | 12.6132 | 12.6648 | 18.1768 | 0 | 18.1768 |
| 9 | 0.252269 | 6.46483 | UNIT I | 3 | 28 | 12.7688 | 12.821 | 18.4707 | 0 | 18.4707 |
| 10 | 0.252269 | 6.52232 | UNIT I | 3 | 28 | 12.6673 | 12.7191 | 18.279 | 0 | 18.279 |
| 11 | 0.252269 | 6.4744 | UNIT I | 3 | 28 | 12.3998 | 12.4506 | 17.7739 | 0 | 17.7739 |
| 12 | 0.252269 | 6.38059 | UNIT I | 3 | 28 | 12.0637 | 12.113 | 17.1391 | 0 | 17.1391 |
| 13 | 0.252269 | 6.47051 | UNIT I | 3 | 28 | 12.0038 | 12.0529 | 17.026 | 0 | 17.026 |
| 14 | 0.252269 | 6.63384 | UNIT I | 3 | 28 | 12.0443 | 12.0936 | 17.1026 | 0 | 17.1026 |
| 15 | 0.252269 | 6.91841 | UNIT I | 3 | 28 | 12.2478 | 12.2979 | 17.4867 | 0 | 17.4867 |
| 16 | 0.252269 | 6.78077 | UNIT I | 3 | 28 | 11.8345 | 11.8829 | 16.7063 | 0 | 16.7063 |
| 17 | 0.252269 | 6.41818 | UNIT I | 3 | 28 | 11.1104 | 11.1558 | 15.3389 | 0 | 15.3389 |
| 18 | 0.252269 | 6.16312 | UNIT I | 3 | 28 | 10.5457 | 10.5888 | 14.2724 | 0 | 14.2724 |
| 19 | 0.252269 | 5.85196 | UNIT I | 3 | 28 | 9.91269 | 9.95323 | 13.0771 | 0 | 13.0771 |
| 20 | 0.252269 | 5.39037 | UNIT I | 3 | 28 | 9.09274 | 9.12993 | 11.5287 | 0 | 11.5287 |
| 21 | 0.252269 | 4.71157 | UNIT I | 3 | 28 | 8.01411 | 8.04689 | 9.49181 | 0 | 9.49181 |
| 22 | 0.252269 | 3.84405 | UNIT I | 3 | 28 | 6.73344 | 6.76098 | 7.07337 | 0 | 7.07337 |
| 23 | 0.252269 | 2.88298 | UNIT I | 3 | 28 | 5.3867 | 5.40873 | 4.53016 | 0 | 4.53016 |
| 24 | 0.252269 | 1.81603 | UNIT I | 3 | 28 | 3.97346 | 3.98971 | 1.86138 | 0 | 1.86138 |
| 25 | 0.252269 | 0.627175 | UNIT I | 3 | 28 | 2.49414 | 2.50434 | -0.932197 | 0 | -0.932197 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.934825

| 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 | 0.223021 | 0.122249 | UNIT I | 3 | 28 | 3.56944 | 3.3368 | 0.633432 | 0 | 0.633432 |
| 2 | 0.223021 | 0.567687 | UNIT I | 3 | 28 | 4.51234 | 4.21825 | 2.29119 | 0 | 2.29119 |
| 3 | 0.223021 | 1.234 | UNIT I | 3 | 28 | 5.91007 | 5.52488 | 4.74861 | 0 | 4.74861 |
| 4 | 0.223021 | 1.91469 | UNIT I | 3 | 28 | 7.27903 | 6.80462 | 7.15545 | 0 | 7.15545 |
| 5 | 0.223021 | 2.73206 | UNIT I | 3 | 28 | 8.88285 | 8.30391 | 9.97522 | 0 | 9.97522 |
| 6 | 0.223021 | 3.85252 | UNIT I | 3 | 28 | 11.0553 | 10.3348 | 13.7947 | 0 | 13.7947 |
| 7 | 0.223021 | 4.71755 | UNIT I | 3 | 28 | 12.6067 | 11.7851 | 16.5223 | 0 | 16.5223 |
| 8 | 0.223021 | 5.4916 | UNIT I | 3 | 28 | 13.9038 | 12.9976 | 18.8028 | 0 | 18.8028 |
| 9 | 0.223021 | 5.99281 | UNIT I | 3 | 28 | 14.5995 | 13.648 | 20.0259 | 0 | 20.0259 |
| 10 | 0.223021 | 6.30586 | UNIT I | 3 | 28 | 14.8915 | 13.9209 | 20.5393 | 0 | 20.5393 |
| 11 | 0.223021 | 6.49387 | UNIT I | 3 | 28 | 14.9217 | 13.9492 | 20.5924 | 0 | 20.5924 |
| 12 | 0.223021 | 6.54237 | UNIT I | 3 | 28 | 14.6774 | 13.7208 | 20.1629 | 0 | 20.1629 |
| 13 | 0.223021 | 6.49122 | UNIT I | 3 | 28 | 14.2465 | 13.318 | 19.4053 | 0 | 19.4053 |
| 14 | 0.223021 | 6.35941 | UNIT I | 3 | 28 | 13.673 | 12.7819 | 18.397 | 0 | 18.397 |
| 15 | 0.223021 | 6.19716 | UNIT I | 3 | 28 | 13.0518 | 12.2012 | 17.3049 | 0 | 17.3049 |
| 16 | 0.223021 | 6.17638 | UNIT I | 3 | 28 | 12.6724 | 11.8465 | 16.6378 | 0 | 16.6378 |
| 17 | 0.223021 | 6.14754 | UNIT I | 3 | 28 | 12.2693 | 11.4697 | 15.9291 | 0 | 15.9291 |
| 18 | 0.223021 | 6.19209 | UNIT I | 3 | 28 | 11.9684 | 11.1884 | 15.4001 | 0 | 15.4001 |
| 19 | 0.223021 | 5.94667 | UNIT I | 3 | 28 | 11.1996 | 10.4696 | 14.0483 | 0 | 14.0483 |
| 20 | 0.223021 | 5.38264 | UNIT I | 3 | 28 | 9.96213 | 9.31285 | 11.8728 | 0 | 11.8728 |
| 21 | 0.223021 | 4.80399 | UNIT I | 3 | 28 | 8.73681 | 8.16739 | 9.71845 | 0 | 9.71845 |
| 22 | 0.223021 | 4.18998 | UNIT I | 3 | 28 | 7.49731 | 7.00867 | 7.53923 | 0 | 7.53923 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 0.223021 | 3.37434 | UNIT I | 3 | 28 | 6.03939 | 5.64577 | 4.97596 | 0 | 4.97596 |
| 24 | 0.223021 | 2.31577 | UNIT I | 3 | 28 | 4.3665 | 4.08191 | 2.03478 | 0 | 2.03478 |
| 25 | 0.223021 | 0.848492 | UNIT I | 3 | 28 | 2.39048 | 2.23468 | -1.43936 | 0 | -1.43936 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.987419

| 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 | 0.234852 | 0.288246 | UNIT I | 3 | 28 | 3.58705 | 3.54193 | 1.01921 | 0 | 1.01921 |
| 2 | 0.234852 | 1.0096 | UNIT I | 3 | 28 | 4.95964 | 4.89724 | 3.56818 | 0 | 3.56818 |
| 3 | 0.234852 | 1.74732 | UNIT I | 3 | 28 | 6.31187 | 6.23246 | 6.07939 | 0 | 6.07939 |
| 4 | 0.234852 | 2.72184 | UNIT I | 3 | 28 | 8.0679 | 7.9664 | 9.34043 | 0 | 9.34043 |
| 5 | 0.234852 | 3.92734 | UNIT I | 3 | 28 | 10.1928 | 10.0645 | 13.2864 | 0 | 13.2864 |
| 6 | 0.234852 | 4.84922 | UNIT I | 3 | 28 | 11.7104 | 11.5631 | 16.1048 | 0 | 16.1048 |
| 7 | 0.234852 | 5.66499 | UNIT I | 3 | 28 | 12.9744 | 12.8111 | 18.452 | 0 | 18.452 |
| 8 | 0.234852 | 6.1318 | UNIT I | 3 | 28 | 13.5628 | 13.3922 | 19.5449 | 0 | 19.5449 |
| 9 | 0.234852 | 6.45787 | UNIT I | 3 | 28 | 13.8754 | 13.7008 | 20.1253 | 0 | 20.1253 |
| 10 | 0.234852 | 6.63427 | UNIT I | 3 | 28 | 13.9102 | 13.7352 | 20.19 | 0 | 20.19 |
| 11 | 0.234852 | 6.67713 | UNIT I | 3 | 28 | 13.7085 | 13.536 | 19.8154 | 0 | 19.8154 |
| 12 | 0.234852 | 6.62366 | UNIT I | 3 | 28 | 13.3439 | 13.176 | 19.1383 | 0 | 19.1383 |
| 13 | 0.234852 | 6.51627 | UNIT I | 3 | 28 | 12.8934 | 12.7312 | 18.3017 | 0 | 18.3017 |
| 14 | 0.234852 | 6.53112 | UNIT I | 3 | 28 | 12.6394 | 12.4804 | 17.8301 | 0 | 17.8301 |
| 15 | 0.234852 | 6.61675 | UNIT I | 3 | 28 | 12.4883 | 12.3312 | 17.5494 | 0 | 17.5494 |
| 16 | 0.234852 | 6.77259 | UNIT I | 3 | 28 | 12.4296 | 12.2732 | 17.4404 | 0 | 17.4404 |
| 17 | 0.234852 | 6.75169 | UNIT I | 3 | 28 | 12.0899 | 11.9378 | 16.8096 | 0 | 16.8096 |
| 18 | 0.234852 | 6.33122 | UNIT I | 3 | 28 | 11.1679 | 11.0274 | 15.0973 | 0 | 15.0973 |
| 19 | 0.234852 | 5.92005 | UNIT I | 3 | 28 | 10.2777 | 10.1484 | 13.4442 | 0 | 13.4442 |
| 20 | 0.234852 | 5.53261 | UNIT I | 3 | 28 | 9.43657 | 9.31785 | 11.8822 | 0 | 11.8822 |
| 21 | 0.234852 | 4.99339 | UNIT I | 3 | 28 | 8.41156 | 8.30573 | 9.97864 | 0 | 9.97864 |
| 22 | 0.234852 | 4.29393 | UNIT I | 3 | 28 | 7.21291 | 7.12216 | 7.75266 | 0 | 7.75266 |
| 23 | 0.234852 | 3.31424 | UNIT I | 3 | 28 | 5.72326 | 5.65126 | 4.98629 | 0 | 4.98629 |
| 24 | 0.234852 | 2.13175 | UNIT I | 3 | 28 | 4.08531 | 4.03391 | 1.9445 | 0 | 1.9445 |
| 25 | 0.234852 | 0.748493 | UNIT I | 3 | 28 | 2.35718 | 2.32753 | -1.26474 | 0 | -1.26474 |

**Global Minimum Query (spencer) - Safety Factor**: 1.00392

| 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 | 0.252269 | 0.315029 | UNIT I | 3 | 28 | 5.33512 | 5.35603 | 4.43106 | 0 | 4.43106 |
| 2 | 0.252269 | 1.08083 | UNIT I | 3 | 28 | 6.74028 | 6.7667 | 7.08414 | 0 | 7.08414 |
| 3 | 0.252269 | 1.88526 | UNIT I | 3 | 28 | 8.07299 | 8.10464 | 9.60041 | 0 | 9.60041 |
| 4 | 0.252269 | 3.17207 | UNIT I | 3 | 28 | 10.1635 | 10.2033 | 13.5475 | 0 | 13.5475 |
| 5 | 0.252269 | 4.29879 | UNIT I | 3 | 28 | 11.7605 | 11.8066 | 16.5629 | 0 | 16.5629 |
| 6 | 0.252269 | 5.25478 | UNIT I | 3 | 28 | 12.9081 | 12.9587 | 18.7295 | 0 | 18.7295 |
| 7 | 0.252269 | 5.86945 | UNIT I | 3 | 28 | 13.3878 | 13.4403 | 19.6353 | 0 | 19.6353 |
| 8 | 0.252269 | 6.24964 | UNIT I | 3 | 28 | 13.4493 | 13.502 | 19.7514 | 0 | 19.7514 |
| 9 | 0.252269 | 6.46483 | UNIT I | 3 | 28 | 13.2475 | 13.2994 | 19.3703 | 0 | 19.3703 |
| 10 | 0.252269 | 6.52232 | UNIT I | 3 | 28 | 12.8256 | 12.8759 | 18.5738 | 0 | 18.5738 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 0.252269 | 6.4744 | UNIT I | 3 | 28 | 12.2818 | 12.33 | 17.5471 | 0 | 17.5471 |
| 12 | 0.252269 | 6.38059 | UNIT I | 3 | 28 | 11.7083 | 11.7542 | 16.4643 | 0 | 16.4643 |
| 13 | 0.252269 | 6.47051 | UNIT I | 3 | 28 | 11.3909 | 11.4355 | 15.865 | 0 | 15.865 |
| 14 | 0.252269 | 6.63384 | UNIT I | 3 | 28 | 11.1677 | 11.2114 | 15.4434 | 0 | 15.4434 |
| 15 | 0.252269 | 6.91841 | UNIT I | 3 | 28 | 11.079 | 11.1224 | 15.276 | 0 | 15.276 |
| 16 | 0.252269 | 6.78077 | UNIT I | 3 | 28 | 10.5233 | 10.5645 | 14.2268 | 0 | 14.2268 |
| 17 | 0.252269 | 6.41818 | UNIT I | 3 | 28 | 9.76218 | 9.80045 | 12.7898 | 0 | 12.7898 |
| 18 | 0.252269 | 6.16312 | UNIT I | 3 | 28 | 9.14907 | 9.18493 | 11.6322 | 0 | 11.6322 |
| 19 | 0.252269 | 5.85196 | UNIT I | 3 | 28 | 8.5137 | 8.54707 | 10.4325 | 0 | 10.4325 |
| 20 | 0.252269 | 5.39037 | UNIT I | 3 | 28 | 7.77796 | 7.80845 | 9.04339 | 0 | 9.04339 |
| 21 | 0.252269 | 4.71157 | UNIT I | 3 | 28 | 6.9047 | 6.93177 | 7.3946 | 0 | 7.3946 |
| 22 | 0.252269 | 3.84405 | UNIT I | 3 | 28 | 5.94538 | 5.96869 | 5.58331 | 0 | 5.58331 |
| 23 | 0.252269 | 2.88298 | UNIT I | 3 | 28 | 4.99766 | 5.01725 | 3.79388 | 0 | 3.79388 |
| 24 | 0.252269 | 1.81603 | UNIT I | 3 | 28 | 4.06974 | 4.08569 | 2.04189 | 0 | 2.04189 |
| 25 | 0.252269 | 0.627175 | UNIT I | 3 | 28 | 3.14041 | 3.15272 | 0.287217 | 0 | 0.287217 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.982773

| 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 | 0.231282 | 0.273563 | UNIT I | 3 | 28 | 4.88887 | 4.80465 | 3.39405 | 0 | 3.39405 |
| 2 | 0.231282 | 0.960452 | UNIT I | 3 | 28 | 6.371 | 6.26125 | 6.13352 | 0 | 6.13352 |
| 3 | 0.231282 | 1.65658 | UNIT I | 3 | 28 | 7.73687 | 7.60359 | 8.6581 | 0 | 8.6581 |
| 4 | 0.231282 | 2.59123 | UNIT I | 3 | 28 | 9.49254 | 9.32901 | 11.9031 | 0 | 11.9031 |
| 5 | 0.231282 | 3.74458 | UNIT I | 3 | 28 | 11.5409 | 11.3421 | 15.6892 | 0 | 15.6892 |
| 6 | 0.231282 | 4.62272 | UNIT I | 3 | 28 | 12.8592 | 12.6377 | 18.1259 | 0 | 18.1259 |
| 7 | 0.231282 | 5.40545 | UNIT I | 3 | 28 | 13.8719 | 13.6329 | 19.9976 | 0 | 19.9976 |
| 8 | 0.231282 | 5.8518 | UNIT I | 3 | 28 | 14.1723 | 13.9282 | 20.553 | 0 | 20.553 |
| 9 | 0.231282 | 6.15998 | UNIT I | 3 | 28 | 14.1883 | 13.9439 | 20.5825 | 0 | 20.5825 |
| 10 | 0.231282 | 6.32632 | UNIT I | 3 | 28 | 13.9454 | 13.7052 | 20.1335 | 0 | 20.1335 |
| 11 | 0.231282 | 6.36075 | UNIT I | 3 | 28 | 13.4891 | 13.2567 | 19.29 | 0 | 19.29 |
| 12 | 0.231282 | 6.30083 | UNIT I | 3 | 28 | 12.902 | 12.6798 | 18.205 | 0 | 18.205 |
| 13 | 0.231282 | 6.18509 | UNIT I | 3 | 28 | 12.257 | 12.0459 | 17.0128 | 0 | 17.0128 |
| 14 | 0.231282 | 6.15168 | UNIT I | 3 | 28 | 11.756 | 11.5535 | 16.0868 | 0 | 16.0868 |
| 15 | 0.231282 | 6.22543 | UNIT I | 3 | 28 | 11.4146 | 11.218 | 15.4557 | 0 | 15.4557 |
| 16 | 0.231282 | 6.33428 | UNIT I | 3 | 28 | 11.1189 | 10.9274 | 14.9092 | 0 | 14.9092 |
| 17 | 0.231282 | 6.38554 | UNIT I | 3 | 28 | 10.7474 | 10.5622 | 14.2225 | 0 | 14.2225 |
| 18 | 0.231282 | 5.99528 | UNIT I | 3 | 28 | 9.85894 | 9.6891 | 12.5804 | 0 | 12.5804 |
| 19 | 0.231282 | 5.56011 | UNIT I | 3 | 28 | 8.96779 | 8.8133 | 10.9332 | 0 | 10.9332 |
| 20 | 0.231282 | 5.17879 | UNIT I | 3 | 28 | 8.18283 | 8.04186 | 9.48236 | 0 | 9.48236 |
| 21 | 0.231282 | 4.68164 | UNIT I | 3 | 28 | 7.32223 | 7.19609 | 7.89172 | 0 | 7.89172 |
| 22 | 0.231282 | 4.02359 | UNIT I | 3 | 28 | 6.36006 | 6.2505 | 6.1133 | 0 | 6.1133 |
| 23 | 0.231282 | 3.13179 | UNIT I | 3 | 28 | 5.25628 | 5.16573 | 4.07316 | 0 | 4.07316 |
| 24 | 0.231282 | 2.00781 | UNIT I | 3 | 28 | 4.05061 | 3.98083 | 1.84467 | 0 | 1.84467 |
| 25 | 0.231282 | 0.703132 | UNIT I | 3 | 28 | 2.97276 | 2.92155 | -0.147539 | 0 | -0.147539 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 0.988762

| Slice | Width | Weight | Base | Base | Base Friction | Shear | Shear | Base Normal | Pore | Effective Normal |
|---|---|---|---|---|---|---|---|---|---|---|

| Number | [m] | [kN] | Material | [kPa] | Angle [degrees] | [kPa] | [kPa] | Stress [kPa] | [kPa] | Stress [kPa] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.252269 | 0.315029 | UNIT I | 3 | 28 | 4.93363 | 4.87819 | 3.53236 | 0 | 3.53236 |
| 2 | 0.252269 | 1.08083 | UNIT I | 3 | 28 | 7.20647 | 7.12548 | 7.75888 | 0 | 7.75888 |
| 3 | 0.252269 | 1.88526 | UNIT I | 3 | 28 | 10.4869 | 10.3691 | 13.8592 | 0 | 13.8592 |
| 4 | 0.252269 | 3.17207 | UNIT I | 3 | 28 | 11.3695 | 11.2417 | 15.5004 | 0 | 15.5004 |
| 5 | 0.252269 | 4.29879 | UNIT I | 3 | 28 | 10.4425 | 10.3251 | 13.7765 | 0 | 13.7765 |
| 6 | 0.252269 | 5.25478 | UNIT I | 3 | 28 | 10.4397 | 10.3224 | 13.7714 | 0 | 13.7714 |
| 7 | 0.252269 | 5.86945 | UNIT I | 3 | 28 | 10.4149 | 10.2978 | 13.7252 | 0 | 13.7252 |
| 8 | 0.252269 | 6.24964 | UNIT I | 3 | 28 | 11.9496 | 11.8154 | 16.5793 | 0 | 16.5793 |
| 9 | 0.252269 | 6.46483 | UNIT I | 3 | 28 | 11.8629 | 11.7296 | 16.4179 | 0 | 16.4179 |
| 10 | 0.252269 | 6.52232 | UNIT I | 3 | 28 | 12.1954 | 12.0584 | 17.0363 | 0 | 17.0363 |
| 11 | 0.252269 | 6.4744 | UNIT I | 3 | 28 | 12.7451 | 12.6019 | 18.0585 | 0 | 18.0585 |
| 12 | 0.252269 | 6.38059 | UNIT I | 3 | 28 | 14.0688 | 13.9107 | 20.52 | 0 | 20.52 |
| 13 | 0.252269 | 6.47051 | UNIT I | 3 | 28 | 13.7449 | 13.5904 | 19.9177 | 0 | 19.9177 |
| 14 | 0.252269 | 6.63384 | UNIT I | 3 | 28 | 12.1073 | 11.9712 | 16.8724 | 0 | 16.8724 |
| 15 | 0.252269 | 6.91841 | UNIT I | 3 | 28 | 9.53828 | 9.43109 | 12.0951 | 0 | 12.0951 |
| 16 | 0.252269 | 6.78077 | UNIT I | 3 | 28 | 9.80358 | 9.69341 | 12.5885 | 0 | 12.5885 |
| 17 | 0.252269 | 6.41818 | UNIT I | 3 | 28 | 11.2578 | 11.1313 | 15.2928 | 0 | 15.2928 |
| 18 | 0.252269 | 6.16312 | UNIT I | 3 | 28 | 9.98475 | 9.87254 | 12.9254 | 0 | 12.9254 |
| 19 | 0.252269 | 5.85196 | UNIT I | 3 | 28 | 9.04075 | 8.93915 | 11.1699 | 0 | 11.1699 |
| 20 | 0.252269 | 5.39037 | UNIT I | 3 | 28 | 8.31506 | 8.22162 | 9.82043 | 0 | 9.82043 |
| 21 | 0.252269 | 4.71157 | UNIT I | 3 | 28 | 7.62197 | 7.53631 | 8.53155 | 0 | 8.53155 |
| 22 | 0.252269 | 3.84405 | UNIT I | 3 | 28 | 6.56693 | 6.49313 | 6.56964 | 0 | 6.56964 |
| 23 | 0.252269 | 2.88298 | UNIT I | 3 | 28 | 5.32341 | 5.26359 | 4.2572 | 0 | 4.2572 |
| 24 | 0.252269 | 1.81603 | UNIT I | 3 | 28 | 4.04296 | 3.99752 | 1.87607 | 0 | 1.87607 |
| 25 | 0.252269 | 0.627175 | UNIT I | 3 | 28 | 2.74697 | 2.7161 | -0.533935 | 0 | -0.533935 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.97604

| 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 | 0.231282 | 0.273563 | UNIT I | 3 | 28 | 4.2961 | 4.19317 | 2.24402 | 0 | 2.24402 |
| 2 | 0.231282 | 0.960452 | UNIT I | 3 | 28 | 5.94919 | 5.80665 | 5.27856 | 0 | 5.27856 |
| 3 | 0.231282 | 1.65658 | UNIT I | 3 | 28 | 8.11056 | 7.91623 | 9.24607 | 0 | 9.24607 |
| 4 | 0.231282 | 2.59123 | UNIT I | 3 | 28 | 10.15 | 9.90683 | 12.9899 | 0 | 12.9899 |
| 5 | 0.231282 | 3.74458 | UNIT I | 3 | 28 | 11.321 | 11.0497 | 15.1394 | 0 | 15.1394 |
| 6 | 0.231282 | 4.62272 | UNIT I | 3 | 28 | 12.4926 | 12.1933 | 17.2901 | 0 | 17.2901 |
| 7 | 0.231282 | 5.40545 | UNIT I | 3 | 28 | 12.9545 | 12.6441 | 18.1379 | 0 | 18.1379 |
| 8 | 0.231282 | 5.8518 | UNIT I | 3 | 28 | 13.2979 | 12.9793 | 18.7683 | 0 | 18.7683 |
| 9 | 0.231282 | 6.15998 | UNIT I | 3 | 28 | 13.694 | 13.3659 | 19.4954 | 0 | 19.4954 |
| 10 | 0.231282 | 6.32632 | UNIT I | 3 | 28 | 13.6086 | 13.2825 | 19.3386 | 0 | 19.3386 |
| 11 | 0.231282 | 6.36075 | UNIT I | 3 | 28 | 13.5273 | 13.2032 | 19.1894 | 0 | 19.1894 |
| 12 | 0.231282 | 6.30083 | UNIT I | 3 | 28 | 13.2696 | 12.9517 | 18.7164 | 0 | 18.7164 |
| 13 | 0.231282 | 6.18509 | UNIT I | 3 | 28 | 13.9581 | 13.6237 | 19.9803 | 0 | 19.9803 |
| 14 | 0.231282 | 6.15168 | UNIT I | 3 | 28 | 13.3296 | 13.0102 | 18.8264 | 0 | 18.8264 |
| 15 | 0.231282 | 6.22543 | UNIT I | 3 | 28 | 12.4718 | 12.1729 | 17.2518 | 0 | 17.2518 |
| 16 | 0.231282 | 6.33428 | UNIT I | 3 | 28 | 10.9923 | 10.7289 | 14.536 | 0 | 14.536 |
| 17 | 0.231282 | 6.38554 | UNIT I | 3 | 28 | 9.79203 | 9.55741 | 12.3327 | 0 | 12.3327 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 0.231282 | 5.99528 | UNIT I | 3 | 28 | 10.1014 | 9.85934 | 12.9005 | 0 | 12.9005 |
| 19 | 0.231282 | 5.56011 | UNIT I | 3 | 28 | 9.38513 | 9.16026 | 11.5858 | 0 | 11.5858 |
| 20 | 0.231282 | 5.17879 | UNIT I | 3 | 28 | 8.17308 | 7.97725 | 9.36082 | 0 | 9.36082 |
| 21 | 0.231282 | 4.68164 | UNIT I | 3 | 28 | 7.23994 | 7.06647 | 7.64792 | 0 | 7.64792 |
| 22 | 0.231282 | 4.02359 | UNIT I | 3 | 28 | 6.30197 | 6.15097 | 5.9261 | 0 | 5.9261 |
| 23 | 0.231282 | 3.13179 | UNIT I | 3 | 28 | 5.26172 | 5.13565 | 4.01659 | 0 | 4.01659 |
| 24 | 0.231282 | 2.00781 | UNIT I | 3 | 28 | 4.04438 | 3.94748 | 1.78195 | 0 | 1.78195 |
| 25 | 0.231282 | 0.703132 | UNIT I | 3 | 28 | 3.0327 | 2.96003 | -0.0751679 | 0 | -0.0751679 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.00257

| 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 | 0.252269 | 0.315029 | UNIT I | 3 | 28 | 3.59972 | 3.60897 | 1.1453 | 0 | 1.1453 |
| 2 | 0.252269 | 1.08083 | UNIT I | 3 | 28 | 5.40268 | 5.41656 | 4.5449 | 0 | 4.5449 |
| 3 | 0.252269 | 1.88526 | UNIT I | 3 | 28 | 7.28531 | 7.30403 | 8.09468 | 0 | 8.09468 |
| 4 | 0.252269 | 3.17207 | UNIT I | 3 | 28 | 9.95446 | 9.98004 | 13.1275 | 0 | 13.1275 |
| 5 | 0.252269 | 4.29879 | UNIT I | 3 | 28 | 12.15 | 12.1812 | 17.2674 | 0 | 17.2674 |
| 6 | 0.252269 | 5.25478 | UNIT I | 3 | 28 | 13.7815 | 13.8169 | 20.3436 | 0 | 20.3436 |
| 7 | 0.252269 | 5.86945 | UNIT I | 3 | 28 | 14.5488 | 14.5862 | 21.7906 | 0 | 21.7906 |
| 8 | 0.252269 | 6.24964 | UNIT I | 3 | 28 | 14.6795 | 14.7172 | 22.0369 | 0 | 22.0369 |
| 9 | 0.252269 | 6.46483 | UNIT I | 3 | 28 | 14.3573 | 14.3942 | 21.4295 | 0 | 21.4295 |
| 10 | 0.252269 | 6.52232 | UNIT I | 3 | 28 | 13.6813 | 13.7165 | 20.1549 | 0 | 20.1549 |
| 11 | 0.252269 | 6.4744 | UNIT I | 3 | 28 | 12.8138 | 12.8468 | 18.5191 | 0 | 18.5191 |
| 12 | 0.252269 | 6.38059 | UNIT I | 3 | 28 | 11.9041 | 11.9347 | 16.8038 | 0 | 16.8038 |
| 13 | 0.252269 | 6.47051 | UNIT I | 3 | 28 | 11.2709 | 11.2999 | 15.6098 | 0 | 15.6098 |
| 14 | 0.252269 | 6.63384 | UNIT I | 3 | 28 | 10.7917 | 10.8194 | 14.7062 | 0 | 14.7062 |
| 15 | 0.252269 | 6.91841 | UNIT I | 3 | 28 | 10.5337 | 10.5607 | 14.2197 | 0 | 14.2197 |
| 16 | 0.252269 | 6.78077 | UNIT I | 3 | 28 | 9.94031 | 9.96586 | 13.1009 | 0 | 13.1009 |
| 17 | 0.252269 | 6.41818 | UNIT I | 3 | 28 | 9.24442 | 9.26818 | 11.7887 | 0 | 11.7887 |
| 18 | 0.252269 | 6.16312 | UNIT I | 3 | 28 | 8.76925 | 8.79179 | 10.8928 | 0 | 10.8928 |
| 19 | 0.252269 | 5.85196 | UNIT I | 3 | 28 | 8.33184 | 8.35325 | 10.068 | 0 | 10.068 |
| 20 | 0.252269 | 5.39037 | UNIT I | 3 | 28 | 7.82096 | 7.84106 | 9.10471 | 0 | 9.10471 |
| 21 | 0.252269 | 4.71157 | UNIT I | 3 | 28 | 7.14577 | 7.16413 | 7.83158 | 0 | 7.83158 |
| 22 | 0.252269 | 3.84405 | UNIT I | 3 | 28 | 6.29667 | 6.31285 | 6.23056 | 0 | 6.23056 |
| 23 | 0.252269 | 2.88298 | UNIT I | 3 | 28 | 5.3193 | 5.33297 | 4.38769 | 0 | 4.38769 |
| 24 | 0.252269 | 1.81603 | UNIT I | 3 | 28 | 4.1373 | 4.14793 | 2.15894 | 0 | 2.15894 |
| 25 | 0.252269 | 0.627175 | UNIT I | 3 | 28 | 2.63888 | 2.64567 | -0.666407 | 0 | -0.666407 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -7.22118 | 0.864 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

## External Boundary

| X | Y |
|---|---|
| -7.22118 | 4.87717 |
| -7.22118 | 0.864 |
| -7.22118 | -3.44395 |
| -7.22118 | -5.39909 |
| -4.18484 | -5.39909 |
| 49.9902 | -5.39909 |
| 49.9902 | 9.76285 |
| 49.9902 | 15.7927 |
| 49.9902 | 17.787 |
| 49.9902 | 21.0279 |
| 49.9902 | 23.8629 |
| 48.6865 | 23.1062 |
| 47.8664 | 22.7068 |
| 47.0674 | 22.2234 |
| 46.6258 | 21.7399 |
| 45.7847 | 21.3196 |
| 45.3851 | 20.8782 |
| 43.6609 | 17.8094 |
| 42.9761 | 16.0499 |
| 42.5174 | 15.4341 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 27.4875 | 14.3186 |
| 27.4445 | 14.3168 |
| 27.2003 | 14.1883 |
| 26.5834 | 13.5717 |
| 25.7224 | 12.801 |
| 24.9899 | 12.3128 |
| 23.6437 | 11.6418 |
| 23.2984 | 11.5524 |
| 22.5311 | 11.4757 |
| 22.0195 | 11.2967 |
| 21.1116 | 11.2584 |
| 20.3826 | 11.1561 |
| 19.7816 | 10.9771 |
| 17.3761 | 10.5131 |
| 16.6293 | 10.2749 |
| 15.7792 | 10.2113 |
| 14.3889 | 10.0446 |
| 12.514 | 9.86192 |
| 11.1768 | 9.55661 |
| 10.7629 | 9.3793 |
| 10.5624 | 9.27457 |
| 10.3293 | 9.15274 |
| 9.87595 | 9.00005 |
| 9.59509 | 8.75871 |

| | |
|---|---|
| 9.44235 | 8.6601 |
| 9.12206 | 8.45334 |
| 8.7464 | 8.31738 |
| 8.5505 | 8.24647 |
| 8.24707 | 8.11781 |
| 7.9937 | 7.98051 |
| 7.62053 | 7.73837 |
| 7.10879 | 7.20477 |
| 6.80797 | 6.79327 |
| 6.24421 | 6.35423 |
| 6.04432 | 6.24523 |
| 5.80445 | 6.1963 |
| 4.96247 | 6.09843 |
| 3.55263 | 5.94674 |
| 2.46637 | 5.95601 |
| 2.37408 | 5.97731 |
| 2.19776 | 5.96607 |
| 1.33058 | 5.75328 |
| 0.562161 | 5.61447 |
| -0.0303637 | 5.49417 |
| -0.539558 | 5.31833 |
| -1.58574 | 5.19803 |
| -2.70597 | 5.15175 |
| -3.32627 | 4.98518 |
| -5.4581 | 4.92122 |
| -5.8548 | 4.89919 |
| -6.3176 | 4.84044 |

## Material Boundary

| X | Y |
|---|---|
| 5.80445 | 6.1963 |
| 6.24488 | 6.19908 |

## Material Boundary

| X | Y |
|---|---|
| 9.74793 | 6.17913 |
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

## Material Boundary

| X | Y |
|---|---|
| -7.22118 | -3.44395 |
| 14.9068 | 2.35905 |
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |

| | |
|---|---|
| 49.9902 | 15.7927 |

## Material Boundary

| X | Y |
|---|---|
| -4.18484 | -5.39909 |
| 49.9902 | 9.76285 |

## Material Boundary

| X | Y |
|---|---|
| -7.22118 | 0.864 |
| 40.9932 | 12.499 |

## Material Boundary

| X | Y |
|---|---|
| 6.24488 | 6.19908 |
| 9.74793 | 6.17913 |

## Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 21.0279 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: YK S60Λ-SLIDE ST c=3
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/3/2021, 20:34:28

## 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
Corps of Engineers #1
Corps of Engineers #2
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified
Janbu corrected
Lowe-Karafiath
Ordinary/Fellenius
Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT |
|---|---|---|---|---|---|
| Color | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 |
| Water Surface | None | None | Water Table | Water Table | Water Table |
| Hu Value | | | 1 | 1 | 1 |
| Ru Value | 0 | 0 | | | |

## Global Minimums

### Method: ordinary/fellenius

FS: 1.340110
Center: 17.347, 52.560
Radius: 5.290
Left Slip Surface Endpoint: 16.140, 47.410
Right Slip Surface Endpoint: 22.405, 51.011
Resisting Moment=447.953 kN-m
Driving Moment=334.266 kN-m

### Method: bishop simplified

FS: 1.426380
Center: 16.395, 54.416
Radius: 7.137
Left Slip Surface Endpoint: 15.877, 47.298
Right Slip Surface Endpoint: 22.672, 51.020
Resisting Moment=605.705 kN-m
Driving Moment=424.644 kN-m

## Method: janbu simplified

FS: 1.320320
Center: 17.347, 52.560
Radius: 5.290
Left Slip Surface Endpoint: 16.140, 47.410
Right Slip Surface Endpoint: 22.405, 51.011
Resisting Horizontal Force=75.2996 kN
Driving Horizontal Force=57.0314 kN

## Method: janbu corrected

FS: 1.407190
Center: 16.395, 54.416
Radius: 7.137
Left Slip Surface Endpoint: 15.877, 47.298
Right Slip Surface Endpoint: 22.672, 51.020
Resisting Horizontal Force=74.606 kN
Driving Horizontal Force=53.0176 kN

## Method: spencer

FS: 1.419130
Center: 16.395, 54.416
Radius: 7.137
Left Slip Surface Endpoint: 15.877, 47.298
Right Slip Surface Endpoint: 22.672, 51.020
Resisting Moment=602.626 kN-m
Driving Moment=424.644 kN-m
Resisting Horizontal Force=71.905 kN
Driving Horizontal Force=50.6682 kN

## Method: corp of eng#1

FS: 1.434130
Center: 16.472, 55.281
Radius: 7.611
Left Slip Surface Endpoint: 16.761, 47.675
Right Slip Surface Endpoint: 22.781, 51.024
Resisting Horizontal Force=55.8851 kN
Driving Horizontal Force=38.968 kN

## Method: corp of eng#2

FS: 1.451460
Center: 16.472, 55.281
Radius: 7.611
Left Slip Surface Endpoint: 16.761, 47.675
Right Slip Surface Endpoint: 22.781, 51.024
Resisting Horizontal Force=56.1041 kN
Driving Horizontal Force=38.6536 kN

## Method: lowe-karafiath

FS: 1.434960
Center: 16.472, 55.281
Radius: 7.611
Left Slip Surface Endpoint: 16.761, 47.675

Right Slip Surface Endpoint: 22.781, 51.024
Resisting Horizontal Force=55.9276 kN
Driving Horizontal Force=38.9749 kN

### Method: gle/morgenstern-price

FS: 1.422630
Center: 16.395, 54.416
Radius: 7.137
Left Slip Surface Endpoint: 15.877, 47.298
Right Slip Surface Endpoint: 22.672, 51.020
Resisting Moment=604.11 kN-m
Driving Moment=424.644 kN-m
Resisting Horizontal Force=71.9653 kN
Driving Horizontal Force=50.5861 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 9431
Number of Invalid Surfaces: 569

**Error Codes:**

Error Code -105 reported for 27 surfaces
Error Code -106 reported for 56 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 187 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 292 surfaces
Error Code -123 reported for 5 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 9431
Number of Invalid Surfaces: 569

**Error Codes:**

Error Code -105 reported for 27 surfaces
Error Code -106 reported for 56 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 187 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 292 surfaces
Error Code -123 reported for 5 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 9240
Number of Invalid Surfaces: 760

**Error Codes:**

Error Code -105 reported for 27 surfaces

Error Code -106 reported for 56 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 378 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 292 surfaces
Error Code -123 reported for 5 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 9240
Number of Invalid Surfaces: 760

**Error Codes:**

Error Code -105 reported for 27 surfaces
Error Code -106 reported for 56 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 378 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 292 surfaces
Error Code -123 reported for 5 surfaces

## Method: spencer

Number of Valid Surfaces: 9227
Number of Invalid Surfaces: 773

**Error Codes:**

Error Code -105 reported for 27 surfaces
Error Code -106 reported for 56 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 383 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 8 surfaces
Error Code -114 reported for 292 surfaces
Error Code -123 reported for 5 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 8676
Number of Invalid Surfaces: 1324

**Error Codes:**

Error Code -105 reported for 27 surfaces
Error Code -106 reported for 56 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 433 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 509 surfaces
Error Code -114 reported for 292 surfaces
Error Code -123 reported for 5 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 8064

Number of Invalid Surfaces: 1936

**Error Codes:**

Error Code -105 reported for 27 surfaces
Error Code -106 reported for 56 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 1061 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 493 surfaces
Error Code -114 reported for 292 surfaces
Error Code -123 reported for 5 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 4696
Number of Invalid Surfaces: 5304

**Error Codes:**

Error Code -105 reported for 27 surfaces
Error Code -106 reported for 56 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 4063 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 859 surfaces
Error Code -114 reported for 292 surfaces
Error Code -123 reported for 5 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 9235
Number of Invalid Surfaces: 765

**Error Codes:**

Error Code -105 reported for 27 surfaces
Error Code -106 reported for 56 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 378 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 5 surfaces
Error Code -114 reported for 292 surfaces
Error Code -123 reported for 5 surfaces

**Error Codes**

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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.
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.34011

| 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 | 0.250595 | 0.379273 | UNIT I | 3 | 28 | 2.81399 | 3.77105 | 1.45014 | 0 | 1.45014 |
| 2 | 0.250595 | 1.10809 | UNIT I | 3 | 28 | 3.9497 | 5.29303 | 4.31255 | 0 | 4.31255 |
| 3 | 0.250595 | 1.77813 | UNIT I | 3 | 28 | 5.01998 | 6.72732 | 7.01005 | 0 | 7.01005 |
| 4 | 0.250595 | 2.39051 | UNIT I | 3 | 28 | 6.00876 | 8.0524 | 9.50218 | 0 | 9.50218 |
| 5 | 0.250595 | 2.94596 | UNIT I | 3 | 28 | 6.90189 | 9.24929 | 11.7532 | 0 | 11.7532 |
| 6 | 0.250595 | 3.47387 | UNIT I | 3 | 28 | 7.73302 | 10.3631 | 13.848 | 0 | 13.848 |
| 7 | 0.250595 | 4.12037 | UNIT I | 3 | 28 | 8.7209 | 11.687 | 16.3378 | 0 | 16.3378 |
| 8 | 0.250595 | 4.73906 | UNIT I | 3 | 28 | 9.62068 | 12.8928 | 18.6056 | 0 | 18.6056 |
| 9 | 0.250595 | 5.29974 | UNIT I | 3 | 28 | 10.3741 | 13.9024 | 20.5045 | 0 | 20.5045 |
| 10 | 0.250595 | 5.80111 | UNIT I | 3 | 28 | 10.9712 | 14.7026 | 22.0094 | 0 | 22.0094 |
| 11 | 0.250595 | 6.2414 | UNIT I | 3 | 28 | 11.4039 | 15.2825 | 23.1 | 0 | 23.1 |
| 12 | 0.250595 | 6.72456 | UNIT I | 3 | 28 | 11.8178 | 15.8371 | 24.1431 | 0 | 24.1431 |
| 13 | 0.250595 | 7.27144 | UNIT I | 3 | 28 | 12.2253 | 16.3833 | 25.1703 | 0 | 25.1703 |
| 14 | 0.250595 | 7.74849 | UNIT I | 3 | 28 | 12.4295 | 16.6569 | 25.685 | 0 | 25.685 |
| 15 | 0.250595 | 8.15063 | UNIT I | 3 | 28 | 12.4261 | 16.6523 | 25.6762 | 0 | 25.6762 |
| 16 | 0.250595 | 8.46554 | UNIT I | 3 | 28 | 12.2064 | 16.3579 | 25.1226 | 0 | 25.1226 |
| 17 | 0.250595 | 8.61018 | UNIT I | 3 | 28 | 11.6917 | 15.6681 | 23.8253 | 0 | 23.8253 |
| 18 | 0.250595 | 8.63135 | UNIT I | 3 | 28 | 10.9666 | 14.6965 | 21.9979 | 0 | 21.9979 |
| 19 | 0.250595 | 8.5409 | UNIT I | 3 | 28 | 10.0738 | 13.5 | 19.7476 | 0 | 19.7476 |
| 20 | 0.250595 | 8.31616 | UNIT I | 3 | 28 | 9.02777 | 12.0982 | 17.1112 | 0 | 17.1112 |
| 21 | 0.250595 | 7.84745 | UNIT I | 3 | 28 | 7.79629 | 10.4479 | 14.0074 | 0 | 14.0074 |
| 22 | 0.250595 | 7.1522 | UNIT I | 3 | 28 | 6.47855 | 8.68197 | 10.6862 | 0 | 10.6862 |
| 23 | 0.250595 | 5.97867 | UNIT I | 3 | 28 | 5.04906 | 6.76629 | 7.08337 | 0 | 7.08337 |
| 24 | 0.250595 | 4.18747 | UNIT I | 3 | 28 | 3.66112 | 4.9063 | 3.58524 | 0 | 3.58524 |
| 25 | 0.250595 | 1.54617 | UNIT I | 3 | 28 | 2.54862 | 3.41543 | 0.781318 | 0 | 0.781318 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.42638

| 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 | 0.271836 | 0.337275 | UNIT I | 3 | 28 | 2.61811 | 3.73443 | 1.38126 | 0 | 1.38126 |
| 2 | 0.271836 | 0.985028 | UNIT I | 3 | 28 | 3.47411 | 4.9554 | 3.67757 | 0 | 3.67757 |
| 3 | 0.271836 | 1.57924 | UNIT I | 3 | 28 | 4.23325 | 6.03823 | 5.71409 | 0 | 5.71409 |
| 4 | 0.271836 | 2.11988 | UNIT I | 3 | 28 | 4.89932 | 6.98829 | 7.50089 | 0 | 7.50089 |
| 5 | 0.271836 | 2.60669 | UNIT I | 3 | 28 | 5.47539 | 7.80998 | 9.04628 | 0 | 9.04628 |
| 6 | 0.271836 | 3.03918 | UNIT I | 3 | 28 | 5.96396 | 8.50688 | 10.3569 | 0 | 10.3569 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 0.271836 | 3.54352 | UNIT I | 3 | 28 | 6.53024 | 9.3146 | 11.876 | 0 | 11.876 |
| 8 | 0.271836 | 4.13965 | UNIT I | 3 | 28 | 7.19551 | 10.2635 | 13.6607 | 0 | 13.6607 |
| 9 | 0.271836 | 4.6786 | UNIT I | 3 | 28 | 7.76822 | 11.0804 | 15.1971 | 0 | 15.1971 |
| 10 | 0.271836 | 5.1585 | UNIT I | 3 | 28 | 8.24869 | 11.7658 | 16.486 | 0 | 16.486 |
| 11 | 0.271836 | 5.57735 | UNIT I | 3 | 28 | 8.63694 | 12.3196 | 17.5275 | 0 | 17.5275 |
| 12 | 0.271836 | 6.03175 | UNIT I | 3 | 28 | 9.05098 | 12.9101 | 18.6382 | 0 | 18.6382 |
| 13 | 0.271836 | 6.59582 | UNIT I | 3 | 28 | 9.57501 | 13.6576 | 20.0441 | 0 | 20.0441 |
| 14 | 0.271836 | 7.09335 | UNIT I | 3 | 28 | 9.99727 | 14.2599 | 21.1768 | 0 | 21.1768 |
| 15 | 0.271836 | 7.51667 | UNIT I | 3 | 28 | 10.3109 | 14.7072 | 22.018 | 0 | 22.018 |
| 16 | 0.271836 | 7.83737 | UNIT I | 3 | 28 | 10.4862 | 14.9573 | 22.4883 | 0 | 22.4883 |
| 17 | 0.271836 | 7.97372 | UNIT I | 3 | 28 | 10.4373 | 14.8875 | 22.3571 | 0 | 22.3571 |
| 18 | 0.271836 | 8.00546 | UNIT I | 3 | 28 | 10.259 | 14.6332 | 21.8789 | 0 | 21.8789 |
| 19 | 0.271836 | 7.93396 | UNIT I | 3 | 28 | 9.95695 | 14.2024 | 21.0687 | 0 | 21.0687 |
| 20 | 0.271836 | 7.69292 | UNIT I | 3 | 28 | 9.46718 | 13.5038 | 19.7549 | 0 | 19.7549 |
| 21 | 0.271836 | 7.22569 | UNIT I | 3 | 28 | 8.74294 | 12.4708 | 17.8119 | 0 | 17.8119 |
| 22 | 0.271836 | 6.45315 | UNIT I | 3 | 28 | 7.72395 | 11.0173 | 15.0783 | 0 | 15.0783 |
| 23 | 0.271836 | 5.12707 | UNIT I | 3 | 28 | 6.20697 | 8.8535 | 11.0088 | 0 | 11.0088 |
| 24 | 0.271836 | 3.32231 | UNIT I | 3 | 28 | 4.32556 | 6.16989 | 5.96169 | 0 | 5.96169 |
| 25 | 0.271836 | 1.1649 | UNIT I | 3 | 28 | 2.26901 | 3.23647 | 0.444739 | 0 | 0.444739 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.32032

| 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 | 0.250595 | 0.379273 | UNIT I | 3 | 28 | 3.1468 | 4.15478 | 2.17182 | 0 | 2.17182 |
| 2 | 0.250595 | 1.10809 | UNIT I | 3 | 28 | 4.33078 | 5.71802 | 5.11185 | 0 | 5.11185 |
| 3 | 0.250595 | 1.77813 | UNIT I | 3 | 28 | 5.36876 | 7.08848 | 7.68933 | 0 | 7.68933 |
| 4 | 0.250595 | 2.39051 | UNIT I | 3 | 28 | 6.27191 | 8.28093 | 9.93199 | 0 | 9.93199 |
| 5 | 0.250595 | 2.94596 | UNIT I | 3 | 28 | 7.04913 | 9.30711 | 11.8619 | 0 | 11.8619 |
| 6 | 0.250595 | 3.47387 | UNIT I | 3 | 28 | 7.7536 | 10.2372 | 13.6113 | 0 | 13.6113 |
| 7 | 0.250595 | 4.12037 | UNIT I | 3 | 28 | 8.61589 | 11.3757 | 15.7525 | 0 | 15.7525 |
| 8 | 0.250595 | 4.73906 | UNIT I | 3 | 28 | 9.40221 | 12.4139 | 17.705 | 0 | 17.705 |
| 9 | 0.250595 | 5.29974 | UNIT I | 3 | 28 | 10.0696 | 13.2951 | 19.3622 | 0 | 19.3622 |
| 10 | 0.250595 | 5.80111 | UNIT I | 3 | 28 | 10.6205 | 14.0224 | 20.7301 | 0 | 20.7301 |
| 11 | 0.250595 | 6.2414 | UNIT I | 3 | 28 | 11.056 | 14.5975 | 21.8118 | 0 | 21.8118 |
| 12 | 0.250595 | 6.72456 | UNIT I | 3 | 28 | 11.5274 | 15.2198 | 22.9821 | 0 | 22.9821 |
| 13 | 0.250595 | 7.27144 | UNIT I | 3 | 28 | 12.0576 | 15.9199 | 24.2988 | 0 | 24.2988 |
| 14 | 0.250595 | 7.74849 | UNIT I | 3 | 28 | 12.4572 | 16.4475 | 25.291 | 0 | 25.291 |
| 15 | 0.250595 | 8.15063 | UNIT I | 3 | 28 | 12.722 | 16.7971 | 25.9485 | 0 | 25.9485 |
| 16 | 0.250595 | 8.46554 | UNIT I | 3 | 28 | 12.8383 | 16.9507 | 26.2375 | 0 | 26.2375 |
| 17 | 0.250595 | 8.61018 | UNIT I | 3 | 28 | 12.704 | 16.7734 | 25.9039 | 0 | 25.9039 |
| 18 | 0.250595 | 8.63135 | UNIT I | 3 | 28 | 12.3873 | 16.3552 | 25.1174 | 0 | 25.1174 |
| 19 | 0.250595 | 8.5409 | UNIT I | 3 | 28 | 11.908 | 15.7224 | 23.9274 | 0 | 23.9274 |
| 20 | 0.250595 | 8.31616 | UNIT I | 3 | 28 | 11.2437 | 14.8453 | 22.2778 | 0 | 22.2778 |
| 21 | 0.250595 | 7.84745 | UNIT I | 3 | 28 | 10.278 | 13.5703 | 19.8798 | 0 | 19.8798 |
| 22 | 0.250595 | 7.1522 | UNIT I | 3 | 28 | 9.0504 | 11.9494 | 16.8314 | 0 | 16.8314 |
| 23 | 0.250595 | 5.97867 | UNIT I | 3 | 28 | 7.33198 | 9.68056 | 12.5643 | 0 | 12.5643 |
| 24 | 0.250595 | 4.18747 | UNIT I | 3 | 28 | 5.08206 | 6.70995 | 6.97741 | 0 | 6.97741 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 0.250595 | 1.54617 | UNIT I | 3 | 28 | 2.31076 | 3.05095 | 0.09582 | 0 | 0.09582 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.40719

| 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 | 0.271836 | 0.337275 | UNIT I | 3 | 28 | 2.65767 | 3.73984 | 1.39144 | 0 | 1.39144 |
| 2 | 0.271836 | 0.985028 | UNIT I | 3 | 28 | 3.52294 | 4.95745 | 3.68141 | 0 | 3.68141 |
| 3 | 0.271836 | 1.57924 | UNIT I | 3 | 28 | 4.28845 | 6.03466 | 5.70736 | 0 | 5.70736 |
| 4 | 0.271836 | 2.11988 | UNIT I | 3 | 28 | 4.95834 | 6.97733 | 7.48029 | 0 | 7.48029 |
| 5 | 0.271836 | 2.60669 | UNIT I | 3 | 28 | 5.53606 | 7.79029 | 9.00923 | 0 | 9.00923 |
| 6 | 0.271836 | 3.03918 | UNIT I | 3 | 28 | 6.02438 | 8.47745 | 10.3016 | 0 | 10.3016 |
| 7 | 0.271836 | 3.54352 | UNIT I | 3 | 28 | 6.59028 | 9.27377 | 11.7992 | 0 | 11.7992 |
| 8 | 0.271836 | 4.13965 | UNIT I | 3 | 28 | 7.25498 | 10.2091 | 13.5584 | 0 | 13.5584 |
| 9 | 0.271836 | 4.6786 | UNIT I | 3 | 28 | 7.82525 | 11.0116 | 15.0676 | 0 | 15.0676 |
| 10 | 0.271836 | 5.1585 | UNIT I | 3 | 28 | 8.30161 | 11.6819 | 16.3284 | 0 | 16.3284 |
| 11 | 0.271836 | 5.57735 | UNIT I | 3 | 28 | 8.68432 | 12.2205 | 17.3412 | 0 | 17.3412 |
| 12 | 0.271836 | 6.03175 | UNIT I | 3 | 28 | 9.09213 | 12.7944 | 18.4205 | 0 | 18.4205 |
| 13 | 0.271836 | 6.59582 | UNIT I | 3 | 28 | 9.60943 | 13.5223 | 19.7896 | 0 | 19.7896 |
| 14 | 0.271836 | 7.09335 | UNIT I | 3 | 28 | 10.0235 | 14.1049 | 20.8852 | 0 | 20.8852 |
| 15 | 0.271836 | 7.51667 | UNIT I | 3 | 28 | 10.3275 | 14.5328 | 21.6899 | 0 | 21.6899 |
| 16 | 0.271836 | 7.83737 | UNIT I | 3 | 28 | 10.4923 | 14.7646 | 22.1259 | 0 | 22.1259 |
| 17 | 0.271836 | 7.97372 | UNIT I | 3 | 28 | 10.432 | 14.6798 | 21.9665 | 0 | 21.9665 |
| 18 | 0.271836 | 8.00546 | UNIT I | 3 | 28 | 10.2422 | 14.4127 | 21.4641 | 0 | 21.4641 |
| 19 | 0.271836 | 7.93396 | UNIT I | 3 | 28 | 9.92858 | 13.9714 | 20.6343 | 0 | 20.6343 |
| 20 | 0.271836 | 7.69292 | UNIT I | 3 | 28 | 9.42794 | 13.2669 | 19.3093 | 0 | 19.3093 |
| 21 | 0.271836 | 7.22569 | UNIT I | 3 | 28 | 8.69434 | 12.2346 | 17.3677 | 0 | 17.3677 |
| 22 | 0.271836 | 6.45315 | UNIT I | 3 | 28 | 7.66894 | 10.7917 | 14.654 | 0 | 14.654 |
| 23 | 0.271836 | 5.12707 | UNIT I | 3 | 28 | 6.15178 | 8.65673 | 10.6388 | 0 | 10.6388 |
| 24 | 0.271836 | 3.32231 | UNIT I | 3 | 28 | 4.27821 | 6.02025 | 5.68025 | 0 | 5.68025 |
| 25 | 0.271836 | 1.1649 | UNIT I | 3 | 28 | 2.23853 | 3.15003 | 0.28217 | 0 | 0.28217 |

**Global Minimum Query (spencer) - Safety Factor**: 1.41913

| 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 | 0.271836 | 0.337275 | UNIT I | 3 | 28 | 3.20875 | 4.55364 | 2.92197 | 0 | 2.92197 |
| 2 | 0.271836 | 0.985028 | UNIT I | 3 | 28 | 4.22433 | 5.99487 | 5.63254 | 0 | 5.63254 |
| 3 | 0.271836 | 1.57924 | UNIT I | 3 | 28 | 5.07927 | 7.20814 | 7.91439 | 0 | 7.91439 |
| 4 | 0.271836 | 2.11988 | UNIT I | 3 | 28 | 5.78905 | 8.21541 | 9.80876 | 0 | 9.80876 |
| 5 | 0.271836 | 2.60669 | UNIT I | 3 | 28 | 6.36659 | 9.03502 | 11.3502 | 0 | 11.3502 |
| 6 | 0.271836 | 3.03918 | UNIT I | 3 | 28 | 6.82282 | 9.68247 | 12.5679 | 0 | 12.5679 |
| 7 | 0.271836 | 3.54352 | UNIT I | 3 | 28 | 7.34621 | 10.4252 | 13.9648 | 0 | 13.9648 |
| 8 | 0.271836 | 4.13965 | UNIT I | 3 | 28 | 7.95543 | 11.2898 | 15.5908 | 0 | 15.5908 |
| 9 | 0.271836 | 4.6786 | UNIT I | 3 | 28 | 8.44285 | 11.9815 | 16.8917 | 0 | 16.8917 |
| 10 | 0.271836 | 5.1585 | UNIT I | 3 | 28 | 8.81511 | 12.5098 | 17.8853 | 0 | 17.8853 |
| 11 | 0.271836 | 5.57735 | UNIT I | 3 | 28 | 9.0781 | 12.883 | 18.5872 | 0 | 18.5872 |
| 12 | 0.271836 | 6.03175 | UNIT I | 3 | 28 | 9.35489 | 13.2758 | 19.3259 | 0 | 19.3259 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 0.271836 | 6.59582 | UNIT I | 3 | 28 | 9.72631 | 13.8029 | 20.3173 | 0 | 20.3173 |
| 14 | 0.271836 | 7.09335 | UNIT I | 3 | 28 | 9.98281 | 14.1669 | 21.002 | 0 | 21.002 |
| 15 | 0.271836 | 7.51667 | UNIT I | 3 | 28 | 10.1234 | 14.3664 | 21.377 | 0 | 21.377 |
| 16 | 0.271836 | 7.83737 | UNIT I | 3 | 28 | 10.1261 | 14.3702 | 21.3842 | 0 | 21.3842 |
| 17 | 0.271836 | 7.97372 | UNIT I | 3 | 28 | 9.91988 | 14.0776 | 20.834 | 0 | 20.834 |
| 18 | 0.271836 | 8.00546 | UNIT I | 3 | 28 | 9.6006 | 13.6245 | 19.9818 | 0 | 19.9818 |
| 19 | 0.271836 | 7.93396 | UNIT I | 3 | 28 | 9.17929 | 13.0266 | 18.8574 | 0 | 18.8574 |
| 20 | 0.271836 | 7.69292 | UNIT I | 3 | 28 | 8.60758 | 12.2153 | 17.3314 | 0 | 17.3314 |
| 21 | 0.271836 | 7.22569 | UNIT I | 3 | 28 | 7.85605 | 11.1488 | 15.3256 | 0 | 15.3256 |
| 22 | 0.271836 | 6.45315 | UNIT I | 3 | 28 | 6.88808 | 9.77508 | 12.7421 | 0 | 12.7421 |
| 23 | 0.271836 | 5.12707 | UNIT I | 3 | 28 | 5.55749 | 7.8868 | 9.19073 | 0 | 9.19073 |
| 24 | 0.271836 | 3.32231 | UNIT I | 3 | 28 | 3.99559 | 5.67026 | 5.02203 | 0 | 5.02203 |
| 25 | 0.271836 | 1.1649 | UNIT I | 3 | 28 | 2.34676 | 3.33036 | 0.621325 | 0 | 0.621325 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.43413

| 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 | 0.240818 | 0.205428 | UNIT I | 3 | 28 | 2.91554 | 4.18126 | 2.22162 | 0 | 2.22162 |
| 2 | 0.240818 | 0.598721 | UNIT I | 3 | 28 | 3.55433 | 5.09737 | 3.94458 | 0 | 3.94458 |
| 3 | 0.240818 | 0.956742 | UNIT I | 3 | 28 | 4.0913 | 5.86745 | 5.3929 | 0 | 5.3929 |
| 4 | 0.240818 | 1.35801 | UNIT I | 3 | 28 | 4.66427 | 6.68917 | 6.93831 | 0 | 6.93831 |
| 5 | 0.240818 | 1.8579 | UNIT I | 3 | 28 | 5.35702 | 7.68267 | 8.80681 | 0 | 8.80681 |
| 6 | 0.240818 | 2.32339 | UNIT I | 3 | 28 | 5.95106 | 8.53459 | 10.409 | 0 | 10.409 |
| 7 | 0.240818 | 2.75151 | UNIT I | 3 | 28 | 6.44901 | 9.24872 | 11.7521 | 0 | 11.7521 |
| 8 | 0.240818 | 3.14137 | UNIT I | 3 | 28 | 6.85653 | 9.83315 | 12.8513 | 0 | 12.8513 |
| 9 | 0.240818 | 3.49262 | UNIT I | 3 | 28 | 7.17948 | 10.2963 | 13.7224 | 0 | 13.7224 |
| 10 | 0.240818 | 3.92847 | UNIT I | 3 | 28 | 7.59204 | 10.888 | 14.8351 | 0 | 14.8351 |
| 11 | 0.240818 | 4.41529 | UNIT I | 3 | 28 | 8.03952 | 11.5297 | 16.042 | 0 | 16.042 |
| 12 | 0.240818 | 4.85856 | UNIT I | 3 | 28 | 8.39503 | 12.0396 | 17.001 | 0 | 17.001 |
| 13 | 0.240818 | 5.25635 | UNIT I | 3 | 28 | 8.66207 | 12.4225 | 17.7212 | 0 | 17.7212 |
| 14 | 0.240818 | 5.60239 | UNIT I | 3 | 28 | 8.8387 | 12.6759 | 18.1976 | 0 | 18.1976 |
| 15 | 0.240818 | 5.82492 | UNIT I | 3 | 28 | 8.84759 | 12.6886 | 18.2216 | 0 | 18.2216 |
| 16 | 0.240818 | 5.96682 | UNIT I | 3 | 28 | 8.75091 | 12.5499 | 17.9608 | 0 | 17.9608 |
| 17 | 0.240818 | 6.0516 | UNIT I | 3 | 28 | 8.58284 | 12.3089 | 17.5075 | 0 | 17.5075 |
| 18 | 0.240818 | 6.07471 | UNIT I | 3 | 28 | 8.3443 | 11.9668 | 16.8641 | 0 | 16.8641 |
| 19 | 0.240818 | 5.9663 | UNIT I | 3 | 28 | 7.97085 | 11.4312 | 15.8569 | 0 | 15.8569 |
| 20 | 0.240818 | 5.73189 | UNIT I | 3 | 28 | 7.48181 | 10.7299 | 14.5378 | 0 | 14.5378 |
| 21 | 0.240818 | 5.3168 | UNIT I | 3 | 28 | 6.83949 | 9.80872 | 12.8053 | 0 | 12.8053 |
| 22 | 0.240818 | 4.52675 | UNIT I | 3 | 28 | 5.89026 | 8.4474 | 10.2451 | 0 | 10.2451 |
| 23 | 0.240818 | 3.45244 | UNIT I | 3 | 28 | 4.75479 | 6.81899 | 7.18248 | 0 | 7.18248 |
| 24 | 0.240818 | 2.17483 | UNIT I | 3 | 28 | 3.53289 | 5.06662 | 3.88675 | 0 | 3.88675 |
| 25 | 0.240818 | 0.751555 | UNIT I | 3 | 28 | 2.27342 | 3.26038 | 0.489708 | 0 | 0.489708 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.45146

| 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 | 0.240818 | 0.205428 | UNIT I | 3 | 28 | 2.73313 | 3.96703 | 1.81872 | 0 | 1.81872 |
| 2 | 0.240818 | 0.598721 | UNIT I | 3 | 28 | 3.34511 | 4.85529 | 3.48929 | 0 | 3.48929 |
| 3 | 0.240818 | 0.956742 | UNIT I | 3 | 28 | 4.15831 | 6.03562 | 5.70917 | 0 | 5.70917 |
| 4 | 0.240818 | 1.35801 | UNIT I | 3 | 28 | 5.01561 | 7.27996 | 8.04945 | 0 | 8.04945 |
| 5 | 0.240818 | 1.8579 | UNIT I | 3 | 28 | 5.44474 | 7.90282 | 9.22085 | 0 | 9.22085 |
| 6 | 0.240818 | 2.32339 | UNIT I | 3 | 28 | 5.95932 | 8.64971 | 10.6256 | 0 | 10.6256 |
| 7 | 0.240818 | 2.75151 | UNIT I | 3 | 28 | 6.44439 | 9.35378 | 11.9497 | 0 | 11.9497 |
| 8 | 0.240818 | 3.14137 | UNIT I | 3 | 28 | 6.90946 | 10.0288 | 13.2193 | 0 | 13.2193 |
| 9 | 0.240818 | 3.49262 | UNIT I | 3 | 28 | 8.13469 | 11.8072 | 16.5639 | 0 | 16.5639 |
| 10 | 0.240818 | 3.92847 | UNIT I | 3 | 28 | 8.55656 | 12.4195 | 17.7155 | 0 | 17.7155 |
| 11 | 0.240818 | 4.41529 | UNIT I | 3 | 28 | 8.06236 | 11.7022 | 16.3665 | 0 | 16.3665 |
| 12 | 0.240818 | 4.85856 | UNIT I | 3 | 28 | 8.35013 | 12.1199 | 17.152 | 0 | 17.152 |
| 13 | 0.240818 | 5.25635 | UNIT I | 3 | 28 | 8.42152 | 12.2235 | 17.3469 | 0 | 17.3469 |
| 14 | 0.240818 | 5.60239 | UNIT I | 3 | 28 | 8.23487 | 11.9526 | 16.8374 | 0 | 16.8374 |
| 15 | 0.240818 | 5.82492 | UNIT I | 3 | 28 | 8.35828 | 12.1317 | 17.1743 | 0 | 17.1743 |
| 16 | 0.240818 | 5.96682 | UNIT I | 3 | 28 | 8.531 | 12.3824 | 17.6457 | 0 | 17.6457 |
| 17 | 0.240818 | 6.0516 | UNIT I | 3 | 28 | 8.32217 | 12.0793 | 17.0757 | 0 | 17.0757 |
| 18 | 0.240818 | 6.07471 | UNIT I | 3 | 28 | 7.82157 | 11.3527 | 15.7091 | 0 | 15.7091 |
| 19 | 0.240818 | 5.9663 | UNIT I | 3 | 28 | 7.56343 | 10.978 | 15.0044 | 0 | 15.0044 |
| 20 | 0.240818 | 5.73189 | UNIT I | 3 | 28 | 6.95499 | 10.0949 | 13.3435 | 0 | 13.3435 |
| 21 | 0.240818 | 5.3168 | UNIT I | 3 | 28 | 6.41887 | 9.31674 | 11.8801 | 0 | 11.8801 |
| 22 | 0.240818 | 4.52675 | UNIT I | 3 | 28 | 5.92381 | 8.59817 | 10.5286 | 0 | 10.5286 |
| 23 | 0.240818 | 3.45244 | UNIT I | 3 | 28 | 5.03554 | 7.30888 | 8.10383 | 0 | 8.10383 |
| 24 | 0.240818 | 2.17483 | UNIT I | 3 | 28 | 3.67005 | 5.32693 | 4.37632 | 0 | 4.37632 |
| 25 | 0.240818 | 0.751555 | UNIT I | 3 | 28 | 2.13962 | 3.10557 | 0.198549 | 0 | 0.198549 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.43496

| 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 | 0.240818 | 0.205428 | UNIT I | 3 | 28 | 2.57821 | 3.69963 | 1.31581 | 0 | 1.31581 |
| 2 | 0.240818 | 0.598721 | UNIT I | 3 | 28 | 3.20619 | 4.60075 | 3.01057 | 0 | 3.01057 |
| 3 | 0.240818 | 0.956742 | UNIT I | 3 | 28 | 3.88348 | 5.57264 | 4.83843 | 0 | 4.83843 |
| 4 | 0.240818 | 1.35801 | UNIT I | 3 | 28 | 4.60629 | 6.60984 | 6.78913 | 0 | 6.78913 |
| 5 | 0.240818 | 1.8579 | UNIT I | 3 | 28 | 5.24233 | 7.52253 | 8.50563 | 0 | 8.50563 |
| 6 | 0.240818 | 2.32339 | UNIT I | 3 | 28 | 5.86605 | 8.41754 | 10.1889 | 0 | 10.1889 |
| 7 | 0.240818 | 2.75151 | UNIT I | 3 | 28 | 6.42592 | 9.22094 | 11.6999 | 0 | 11.6999 |
| 8 | 0.240818 | 3.14137 | UNIT I | 3 | 28 | 6.92609 | 9.93866 | 13.0497 | 0 | 13.0497 |
| 9 | 0.240818 | 3.49262 | UNIT I | 3 | 28 | 7.69481 | 11.0418 | 15.1243 | 0 | 15.1243 |
| 10 | 0.240818 | 3.92847 | UNIT I | 3 | 28 | 8.16565 | 11.7174 | 16.395 | 0 | 16.395 |
| 11 | 0.240818 | 4.41529 | UNIT I | 3 | 28 | 8.28486 | 11.8884 | 16.7167 | 0 | 16.7167 |
| 12 | 0.240818 | 4.85856 | UNIT I | 3 | 28 | 8.64683 | 12.4079 | 17.6936 | 0 | 17.6936 |
| 13 | 0.240818 | 5.25635 | UNIT I | 3 | 28 | 8.84638 | 12.6942 | 18.2321 | 0 | 18.2321 |
| 14 | 0.240818 | 5.60239 | UNIT I | 3 | 28 | 8.85398 | 12.7051 | 18.2526 | 0 | 18.2526 |
| 15 | 0.240818 | 5.82492 | UNIT I | 3 | 28 | 8.88527 | 12.75 | 18.3371 | 0 | 18.3371 |
| 16 | 0.240818 | 5.96682 | UNIT I | 3 | 28 | 8.87443 | 12.7345 | 18.3078 | 0 | 18.3078 |
| 17 | 0.240818 | 6.0516 | UNIT I | 3 | 28 | 8.63339 | 12.3886 | 17.6573 | 0 | 17.6573 |
| 18 | 0.240818 | 6.07471 | UNIT I | 3 | 28 | 8.20414 | 11.7726 | 16.4989 | 0 | 16.4989 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 0.240818 | 5.9663 | UNIT I | 3 | 28 | 7.82043 | 11.222 | 15.4633 | 0 | 15.4633 |
| 20 | 0.240818 | 5.73189 | UNIT I | 3 | 28 | 7.21868 | 10.3585 | 13.8393 | 0 | 13.8393 |
| 21 | 0.240818 | 5.3168 | UNIT I | 3 | 28 | 6.5842 | 9.44806 | 12.127 | 0 | 12.127 |
| 22 | 0.240818 | 4.52675 | UNIT I | 3 | 28 | 5.80776 | 8.3339 | 10.0316 | 0 | 10.0316 |
| 23 | 0.240818 | 3.45244 | UNIT I | 3 | 28 | 4.77182 | 6.84737 | 7.23587 | 0 | 7.23587 |
| 24 | 0.240818 | 2.17483 | UNIT I | 3 | 28 | 3.54495 | 5.08686 | 3.92481 | 0 | 3.92481 |
| 25 | 0.240818 | 0.751555 | UNIT I | 3 | 28 | 2.27232 | 3.26068 | 0.490273 | 0 | 0.490273 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.42263

| 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 | 0.271836 | 0.337275 | UNIT I | 3 | 28 | 2.70338 | 3.84591 | 1.59092 | 0 | 1.59092 |
| 2 | 0.271836 | 0.985028 | UNIT I | 3 | 28 | 3.76952 | 5.36263 | 4.44347 | 0 | 4.44347 |
| 3 | 0.271836 | 1.57924 | UNIT I | 3 | 28 | 4.78489 | 6.80713 | 7.16019 | 0 | 7.16019 |
| 4 | 0.271836 | 2.11988 | UNIT I | 3 | 28 | 5.71125 | 8.125 | 9.63872 | 0 | 9.63872 |
| 5 | 0.271836 | 2.60669 | UNIT I | 3 | 28 | 6.51365 | 9.26651 | 11.7856 | 0 | 11.7856 |
| 6 | 0.271836 | 3.03918 | UNIT I | 3 | 28 | 7.16453 | 10.1925 | 13.5271 | 0 | 13.5271 |
| 7 | 0.271836 | 3.54352 | UNIT I | 3 | 28 | 7.82497 | 11.132 | 15.2941 | 0 | 15.2941 |
| 8 | 0.271836 | 4.13965 | UNIT I | 3 | 28 | 8.5049 | 12.0993 | 17.1133 | 0 | 17.1133 |
| 9 | 0.271836 | 4.6786 | UNIT I | 3 | 28 | 8.99187 | 12.7921 | 18.4162 | 0 | 18.4162 |
| 10 | 0.271836 | 5.1585 | UNIT I | 3 | 28 | 9.29426 | 13.2223 | 19.2253 | 0 | 19.2253 |
| 11 | 0.271836 | 5.57735 | UNIT I | 3 | 28 | 9.43021 | 13.4157 | 19.5891 | 0 | 19.5891 |
| 12 | 0.271836 | 6.03175 | UNIT I | 3 | 28 | 9.54148 | 13.574 | 19.8868 | 0 | 19.8868 |
| 13 | 0.271836 | 6.59582 | UNIT I | 3 | 28 | 9.72895 | 13.8407 | 20.3884 | 0 | 20.3884 |
| 14 | 0.271836 | 7.09335 | UNIT I | 3 | 28 | 9.80641 | 13.9509 | 20.5957 | 0 | 20.5957 |
| 15 | 0.271836 | 7.51667 | UNIT I | 3 | 28 | 9.79503 | 13.9347 | 20.5652 | 0 | 20.5652 |
| 16 | 0.271836 | 7.83737 | UNIT I | 3 | 28 | 9.69184 | 13.7879 | 20.289 | 0 | 20.289 |
| 17 | 0.271836 | 7.97372 | UNIT I | 3 | 28 | 9.43914 | 13.4284 | 19.613 | 0 | 19.613 |
| 18 | 0.271836 | 8.00546 | UNIT I | 3 | 28 | 9.13644 | 12.9978 | 18.8031 | 0 | 18.8031 |
| 19 | 0.271836 | 7.93396 | UNIT I | 3 | 28 | 8.79461 | 12.5115 | 17.8885 | 0 | 17.8885 |
| 20 | 0.271836 | 7.69292 | UNIT I | 3 | 28 | 8.3591 | 11.8919 | 16.7232 | 0 | 16.7232 |
| 21 | 0.271836 | 7.22569 | UNIT I | 3 | 28 | 7.78505 | 11.0753 | 15.1873 | 0 | 15.1873 |
| 22 | 0.271836 | 6.45315 | UNIT I | 3 | 28 | 7.00562 | 9.9664 | 13.1019 | 0 | 13.1019 |
| 23 | 0.271836 | 5.12707 | UNIT I | 3 | 28 | 5.80212 | 8.25427 | 9.88185 | 0 | 9.88185 |
| 24 | 0.271836 | 3.32231 | UNIT I | 3 | 28 | 4.21498 | 5.99635 | 5.63531 | 0 | 5.63531 |
| 25 | 0.271836 | 1.1649 | UNIT I | 3 | 28 | 2.29641 | 3.26694 | 0.502049 | 0 | 0.502049 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |

| | |
|---|---|
| 44.4591 | 57.23 |

## External Boundary

| X | Y |
|---|---|
| 42.2084 | 59.656 |
| 40.5299 | 57.6985 |
| 39.2201 | 56.0079 |
| 37.5797 | 54.3301 |
| 36.0284 | 53.0971 |
| 34.9857 | 52.3471 |
| 32.931 | 51.3318 |
| 32.4461 | 51.1888 |
| 32.1758 | 51.2126 |
| 31.6273 | 51.2126 |
| 31.1106 | 51.1173 |
| 30.8801 | 50.9584 |
| 30.4826 | 51.006 |
| 29.3379 | 51.0855 |
| 28.2568 | 51.1173 |
| 24.7792 | 51.0927 |
| 22.0128 | 50.9974 |
| 21.6472 | 50.902 |
| 21.0828 | 50.5524 |
| 20.0653 | 49.8134 |
| 18.9094 | 48.8644 |
| 17.5182 | 47.9982 |
| 14.7996 | 46.8381 |
| 11.6166 | 46.1137 |
| 9.81213 | 45.8117 |
| 9.0967 | 45.8514 |
| 8.0633 | 45.8117 |
| 6.7641 | 45.612 |
| 6.55742 | 45.5405 |
| 5.53992 | 44.9127 |
| 5.02322 | 44.8015 |
| 4.35549 | 44.5869 |
| 0.198047 | 43.403 |
| -3.76343 | 42.432 |
| -9.07729 | 41.119 |
| -15.1823 | 39.5377 |
| -18.268 | 38.8216 |
| -18.268 | 35.5812 |
| -18.268 | 33.5624 |
| -18.268 | 28.0059 |
| 44.4591 | 28.0059 |
| 44.4591 | 46.5638 |
| 44.4591 | 57.23 |

| | |
|---|---|
| 44.4591 | 59.34 |
| 44.4591 | 61.8678 |

## Material Boundary

| X | Y |
|---|---|
| 37.639 | 52.44 |
| 44.4591 | 59.34 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 47.235 |
| 30.8801 | 49.506 |

## Material Boundary

| X | Y |
|---|---|
| -9.07729 | 41.119 |
| 2.44 | 42.482 |
| 21.211 | 47.235 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 44.211 |
| 31.462 | 47.978 |
| 39.112 | 51.057 |
| 44.4591 | 57.23 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 44.211 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 33.5624 |
| 21.211 | 40.173 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 40.173 |
| 44.4591 | 46.5638 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: YK S60Λ-SLIDE RU=0.2 c=3
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/3/2021, 20:34:28

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT |
|---|---|---|---|---|---|
| Color | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 |
| Water Surface | None | None | Water Table | Water Table | Water Table |
| Hu Value | | | 1 | 1 | 1 |
| Ru Value | 0.2 | 0.2 | | | |

## Global Minimums

### Method: ordinary/fellenius

FS: 1.148560
Center: 16.294, 53.693
Radius: 6.973
Left Slip Surface Endpoint: 14.868, 46.867
Right Slip Surface Endpoint: 22.736, 51.022
Resisting Moment=676.207 kN-m
Driving Moment=588.743 kN-m

### Method: bishop simplified

FS: 1.167620
Center: 17.284, 53.218
Radius: 5.410
Left Slip Surface Endpoint: 17.081, 47.812
Right Slip Surface Endpoint: 22.220, 51.005
Resisting Moment=251.762 kN-m
Driving Moment=215.621 kN-m

## Method: janbu simplified

FS: 1.066240
Center: 16.294, 53.693
Radius: 6.973
Left Slip Surface Endpoint: 14.868, 46.867
Right Slip Surface Endpoint: 22.736, 51.022
Resisting Horizontal Force=83.2111 kN
Driving Horizontal Force=78.0415 kN

## Method: janbu corrected

FS: 1.138080
Center: 16.294, 53.693
Radius: 6.973
Left Slip Surface Endpoint: 14.868, 46.867
Right Slip Surface Endpoint: 22.736, 51.022
Resisting Horizontal Force=88.8174 kN
Driving Horizontal Force=78.0415 kN

## Method: spencer

FS: 1.165820
Center: 17.284, 53.218
Radius: 5.410
Left Slip Surface Endpoint: 17.081, 47.812
Right Slip Surface Endpoint: 22.220, 51.005
Resisting Moment=251.375 kN-m
Driving Moment=215.621 kN-m
Resisting Horizontal Force=38.8595 kN
Driving Horizontal Force=33.3324 kN

## Method: corp of eng#1

FS: 1.185820
Center: 15.930, 55.767
Radius: 8.688
Left Slip Surface Endpoint: 15.403, 47.096
Right Slip Surface Endpoint: 23.219, 51.039
Resisting Horizontal Force=74.6436 kN
Driving Horizontal Force=62.9466 kN

## Method: corp of eng#2

FS: 1.202960
Center: 17.284, 53.218
Radius: 5.410
Left Slip Surface Endpoint: 17.081, 47.812
Right Slip Surface Endpoint: 22.220, 51.005
Resisting Horizontal Force=39.3379 kN
Driving Horizontal Force=32.7009 kN

## Method: lowe-karafiath

FS: 1.180500
Center: 17.284, 53.218
Radius: 5.410
Left Slip Surface Endpoint: 17.081, 47.812

Right Slip Surface Endpoint: 22.220, 51.005
Resisting Horizontal Force=39.0388 kN
Driving Horizontal Force=33.0696 kN

### Method: gle/morgenstern-price

FS: 1.165270
Center: 17.284, 53.218
Radius: 5.410
Left Slip Surface Endpoint: 17.081, 47.812
Right Slip Surface Endpoint: 22.220, 51.005
Resisting Moment=251.256 kN-m
Driving Moment=215.621 kN-m
Resisting Horizontal Force=38.8626 kN
Driving Horizontal Force=33.3507 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 9455
Number of Invalid Surfaces: 545

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -107 reported for 24 surfaces
Error Code -108 reported for 187 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 9455
Number of Invalid Surfaces: 545

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -107 reported for 24 surfaces
Error Code -108 reported for 187 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 9228
Number of Invalid Surfaces: 772

**Error Codes:**

Error Code -105 reported for 3 surfaces

Error Code -106 reported for 69 surfaces
Error Code -107 reported for 24 surfaces
Error Code -108 reported for 414 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 9228
Number of Invalid Surfaces: 772

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -107 reported for 24 surfaces
Error Code -108 reported for 414 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

## Method: spencer

Number of Valid Surfaces: 9222
Number of Invalid Surfaces: 778

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -107 reported for 24 surfaces
Error Code -108 reported for 418 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 2 surfaces
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 8718
Number of Invalid Surfaces: 1282

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -107 reported for 24 surfaces
Error Code -108 reported for 450 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 474 surfaces
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 8115

Number of Invalid Surfaces: 1885

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -107 reported for 24 surfaces
Error Code -108 reported for 1037 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 490 surfaces
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 4843
Number of Invalid Surfaces: 5157

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -107 reported for 24 surfaces
Error Code -108 reported for 4031 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 768 surfaces
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 9225
Number of Invalid Surfaces: 775

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -107 reported for 24 surfaces
Error Code -108 reported for 415 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 2 surfaces
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

**Error Codes**

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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.
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.14856

| 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 | 0.314717 | 0.57572 | UNIT I | 3 | 28 | 3.26701 | 3.75235 | 1.78084 | 0.365865 | 1.41497 |
| 2 | 0.314717 | 1.683 | UNIT I | 3 | 28 | 4.55536 | 5.2321 | 5.26749 | 1.06953 | 4.19796 |
| 3 | 0.314717 | 2.70277 | UNIT I | 3 | 28 | 5.76573 | 6.62229 | 8.53012 | 1.71759 | 6.81253 |
| 4 | 0.314717 | 3.63641 | UNIT I | 3 | 28 | 6.88189 | 7.90426 | 11.5345 | 2.31091 | 9.2236 |
| 5 | 0.314717 | 4.48474 | UNIT I | 3 | 28 | 7.88945 | 9.06151 | 14.25 | 2.85001 | 11.4 |
| 6 | 0.314717 | 5.24802 | UNIT I | 3 | 28 | 8.77588 | 10.0796 | 16.6499 | 3.33507 | 13.3148 |
| 7 | 0.314717 | 5.92601 | UNIT I | 3 | 28 | 9.53047 | 10.9463 | 18.7108 | 3.76593 | 14.9448 |
| 8 | 0.314717 | 6.51795 | UNIT I | 3 | 28 | 10.1444 | 11.6514 | 20.4131 | 4.1421 | 16.271 |
| 9 | 0.314717 | 7.08403 | UNIT I | 3 | 28 | 10.6807 | 12.2675 | 21.9314 | 4.50185 | 17.4296 |
| 10 | 0.314717 | 7.83503 | UNIT I | 3 | 28 | 11.3682 | 13.0571 | 23.8937 | 4.9791 | 18.9146 |
| 11 | 0.314717 | 8.52694 | UNIT I | 3 | 28 | 11.9179 | 13.6884 | 25.5207 | 5.4188 | 20.1019 |
| 12 | 0.314717 | 9.12359 | UNIT I | 3 | 28 | 12.286 | 14.1112 | 26.695 | 5.79797 | 20.8971 |
| 13 | 0.314717 | 9.62536 | UNIT I | 3 | 28 | 12.4732 | 14.3262 | 27.4183 | 6.11684 | 21.3015 |
| 14 | 0.314717 | 10.2586 | UNIT I | 3 | 28 | 12.7052 | 14.5927 | 28.3219 | 6.51925 | 21.8027 |
| 15 | 0.314717 | 10.9129 | UNIT I | 3 | 28 | 12.8532 | 14.7627 | 29.0576 | 6.93504 | 22.1225 |
| 16 | 0.314717 | 11.4475 | UNIT I | 3 | 28 | 12.78 | 14.6786 | 29.2391 | 7.27478 | 21.9643 |
| 17 | 0.314717 | 11.8311 | UNIT I | 3 | 28 | 12.4697 | 14.3222 | 28.8125 | 7.51857 | 21.2939 |
| 18 | 0.314717 | 11.9378 | UNIT I | 3 | 28 | 11.8443 | 13.6039 | 27.5294 | 7.58635 | 19.9431 |
| 19 | 0.314717 | 11.8603 | UNIT I | 3 | 28 | 11.0177 | 12.6545 | 25.6946 | 7.53714 | 18.1574 |
| 20 | 0.314717 | 11.5933 | UNIT I | 3 | 28 | 10.0231 | 11.5121 | 23.3764 | 7.36742 | 16.009 |
| 21 | 0.314717 | 10.9733 | UNIT I | 3 | 28 | 8.81151 | 10.1206 | 20.3653 | 6.97347 | 13.3918 |
| 22 | 0.314717 | 9.9669 | UNIT I | 3 | 28 | 7.45405 | 8.56142 | 16.7934 | 6.33388 | 10.4595 |
| 23 | 0.314717 | 8.10895 | UNIT I | 3 | 28 | 5.86993 | 6.74197 | 12.1908 | 5.15317 | 7.03763 |
| 24 | 0.314717 | 5.40838 | UNIT I | 3 | 28 | 4.30339 | 4.9427 | 7.09068 | 3.43698 | 3.6537 |
| 25 | 0.314717 | 1.93841 | UNIT I | 3 | 28 | 3.0354 | 3.48633 | 2.1465 | 1.23185 | 0.914653 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.16762

| 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 | 0.205568 | 0.178723 | UNIT I | 3 | 28 | 2.9105 | 3.39835 | 0.923076 | 0.173882 | 0.749194 |
| 2 | 0.205568 | 0.52091 | UNIT I | 3 | 28 | 3.46167 | 4.04192 | 2.46637 | 0.506801 | 1.95957 |
| 3 | 0.205568 | 0.892454 | UNIT I | 3 | 28 | 4.04483 | 4.72282 | 4.10844 | 0.868282 | 3.24016 |
| 4 | 0.205568 | 1.3294 | UNIT I | 3 | 28 | 4.71916 | 5.51018 | 6.01435 | 1.29339 | 4.72096 |
| 5 | 0.205568 | 1.73666 | UNIT I | 3 | 28 | 5.32076 | 6.21263 | 7.73171 | 1.68962 | 6.04209 |
| 6 | 0.205568 | 2.11254 | UNIT I | 3 | 28 | 5.84967 | 6.83019 | 9.25886 | 2.05533 | 7.20353 |
| 7 | 0.205568 | 2.45649 | UNIT I | 3 | 28 | 6.30761 | 7.36489 | 10.5991 | 2.38996 | 8.20915 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0.205568 | 2.76776 | UNIT I | 3 | 28 | 6.69587 | 7.81823 | 11.7546 | 2.6928 | 9.0618 |
| 9 | 0.205568 | 3.04634 | UNIT I | 3 | 28 | 7.01672 | 8.19286 | 12.7302 | 2.96383 | 9.76633 |
| 10 | 0.205568 | 3.38491 | UNIT I | 3 | 28 | 7.41441 | 8.65721 | 13.9329 | 3.29323 | 10.6396 |
| 11 | 0.205568 | 3.75112 | UNIT I | 3 | 28 | 7.83459 | 9.14782 | 15.2119 | 3.64952 | 11.5623 |
| 12 | 0.205568 | 4.07962 | UNIT I | 3 | 28 | 8.17738 | 9.54807 | 16.2842 | 3.96912 | 12.3151 |
| 13 | 0.205568 | 4.36843 | UNIT I | 3 | 28 | 8.44179 | 9.8568 | 17.1459 | 4.25011 | 12.8958 |
| 14 | 0.205568 | 4.61518 | UNIT I | 3 | 28 | 8.62627 | 10.0722 | 17.7911 | 4.49018 | 13.3009 |
| 15 | 0.205568 | 4.80813 | UNIT I | 3 | 28 | 8.71631 | 10.1773 | 18.1765 | 4.67791 | 13.4986 |
| 16 | 0.205568 | 4.89561 | UNIT I | 3 | 28 | 8.64419 | 10.0931 | 18.1033 | 4.76301 | 13.3403 |
| 17 | 0.205568 | 4.92013 | UNIT I | 3 | 28 | 8.47396 | 9.89436 | 17.7533 | 4.78687 | 12.9664 |
| 18 | 0.205568 | 4.88647 | UNIT I | 3 | 28 | 8.21535 | 9.59241 | 17.1526 | 4.75412 | 12.3985 |
| 19 | 0.205568 | 4.78776 | UNIT I | 3 | 28 | 7.86279 | 9.18075 | 16.2824 | 4.65808 | 11.6243 |
| 20 | 0.205568 | 4.60291 | UNIT I | 3 | 28 | 7.39425 | 8.63367 | 15.0736 | 4.47824 | 10.5954 |
| 21 | 0.205568 | 4.26794 | UNIT I | 3 | 28 | 6.74077 | 7.87066 | 13.3127 | 4.15234 | 9.16039 |
| 22 | 0.205568 | 3.82114 | UNIT I | 3 | 28 | 5.96192 | 6.96126 | 11.1677 | 3.71765 | 7.45003 |
| 23 | 0.205568 | 3.15837 | UNIT I | 3 | 28 | 4.959 | 5.79023 | 8.32048 | 3.07283 | 5.24765 |
| 24 | 0.205568 | 2.13861 | UNIT I | 3 | 28 | 3.62664 | 4.23454 | 4.40253 | 2.08068 | 2.32185 |
| 25 | 0.205568 | 0.788428 | UNIT I | 3 | 28 | 2.07763 | 2.42588 | -0.312695 | 0.767074 | -1.07977 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.06624

| 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 | 0.314717 | 0.57572 | UNIT I | 3 | 28 | 3.90377 | 4.16236 | 2.55194 | 0.365865 | 2.18608 |
| 2 | 0.314717 | 1.683 | UNIT I | 3 | 28 | 5.31312 | 5.66506 | 6.08179 | 1.06953 | 5.01226 |
| 3 | 0.314717 | 2.70277 | UNIT I | 3 | 28 | 6.54016 | 6.97338 | 9.19043 | 1.71759 | 7.47284 |
| 4 | 0.314717 | 3.63641 | UNIT I | 3 | 28 | 7.59999 | 8.10341 | 11.909 | 2.31091 | 9.59813 |
| 5 | 0.314717 | 4.48474 | UNIT I | 3 | 28 | 8.50473 | 9.06808 | 14.2624 | 2.85001 | 11.4124 |
| 6 | 0.314717 | 5.24802 | UNIT I | 3 | 28 | 9.26409 | 9.87774 | 16.2702 | 3.33507 | 12.9352 |
| 7 | 0.314717 | 5.92601 | UNIT I | 3 | 28 | 9.8859 | 10.5407 | 17.948 | 3.76593 | 14.1821 |
| 8 | 0.314717 | 6.51795 | UNIT I | 3 | 28 | 10.3764 | 11.0637 | 19.3077 | 4.1421 | 15.1656 |
| 9 | 0.314717 | 7.08403 | UNIT I | 3 | 28 | 10.8119 | 11.5281 | 20.5408 | 4.50185 | 16.039 |
| 10 | 0.314717 | 7.83503 | UNIT I | 3 | 28 | 11.4334 | 12.1908 | 22.2644 | 4.9791 | 17.2853 |
| 11 | 0.314717 | 8.52694 | UNIT I | 3 | 28 | 11.9548 | 12.7467 | 23.7497 | 5.4188 | 18.3309 |
| 12 | 0.314717 | 9.12359 | UNIT I | 3 | 28 | 12.3398 | 13.1572 | 24.9009 | 5.79797 | 19.1029 |
| 13 | 0.314717 | 9.62536 | UNIT I | 3 | 28 | 12.594 | 13.4282 | 25.7293 | 6.11684 | 19.6125 |
| 14 | 0.314717 | 10.2586 | UNIT I | 3 | 28 | 12.9569 | 13.8152 | 26.8597 | 6.51925 | 20.3404 |
| 15 | 0.314717 | 10.9129 | UNIT I | 3 | 28 | 13.304 | 14.1853 | 27.9714 | 6.93504 | 21.0364 |
| 16 | 0.314717 | 11.4475 | UNIT I | 3 | 28 | 13.4907 | 14.3843 | 28.6853 | 7.27478 | 21.4106 |
| 17 | 0.314717 | 11.8311 | UNIT I | 3 | 28 | 13.4911 | 14.3848 | 28.9301 | 7.51857 | 21.4116 |
| 18 | 0.314717 | 11.9378 | UNIT I | 3 | 28 | 13.1944 | 14.0684 | 28.4029 | 7.58635 | 20.8165 |
| 19 | 0.314717 | 11.8603 | UNIT I | 3 | 28 | 12.7012 | 13.5425 | 27.3647 | 7.53714 | 19.8276 |
| 20 | 0.314717 | 11.5933 | UNIT I | 3 | 28 | 12.0155 | 12.8114 | 25.82 | 7.36742 | 18.4526 |
| 21 | 0.314717 | 10.9733 | UNIT I | 3 | 28 | 11.0103 | 11.7397 | 23.4104 | 6.97347 | 16.4369 |
| 22 | 0.314717 | 9.9669 | UNIT I | 3 | 28 | 9.68714 | 10.3288 | 20.1174 | 6.33388 | 13.7835 |
| 23 | 0.314717 | 8.10895 | UNIT I | 3 | 28 | 7.73548 | 8.24788 | 15.023 | 5.15317 | 9.86984 |
| 24 | 0.314717 | 5.40838 | UNIT I | 3 | 28 | 5.28721 | 5.63744 | 8.39728 | 3.43698 | 4.9603 |
| 25 | 0.314717 | 1.93841 | UNIT I | 3 | 28 | 2.57812 | 2.74889 | 0.759578 | 1.23185 | -0.472272 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.13808

| 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 | 0.314717 | 0.57572 | UNIT I | 3 | 28 | 3.65735 | 4.16236 | 2.55194 | 0.365865 | 2.18608 |
| 2 | 0.314717 | 1.683 | UNIT I | 3 | 28 | 4.97773 | 5.66506 | 6.08179 | 1.06953 | 5.01226 |
| 3 | 0.314717 | 2.70277 | UNIT I | 3 | 28 | 6.12732 | 6.97338 | 9.19043 | 1.71759 | 7.47284 |
| 4 | 0.314717 | 3.63641 | UNIT I | 3 | 28 | 7.12025 | 8.10341 | 11.909 | 2.31091 | 9.59813 |
| 5 | 0.314717 | 4.48474 | UNIT I | 3 | 28 | 7.96788 | 9.06808 | 14.2624 | 2.85001 | 11.4124 |
| 6 | 0.314717 | 5.24802 | UNIT I | 3 | 28 | 8.6793 | 9.87774 | 16.2702 | 3.33507 | 12.9352 |
| 7 | 0.314717 | 5.92601 | UNIT I | 3 | 28 | 9.26186 | 10.5407 | 17.948 | 3.76593 | 14.1821 |
| 8 | 0.314717 | 6.51795 | UNIT I | 3 | 28 | 9.72137 | 11.0637 | 19.3077 | 4.1421 | 15.1656 |
| 9 | 0.314717 | 7.08403 | UNIT I | 3 | 28 | 10.1294 | 11.5281 | 20.5408 | 4.50185 | 16.039 |
| 10 | 0.314717 | 7.83503 | UNIT I | 3 | 28 | 10.7117 | 12.1908 | 22.2644 | 4.9791 | 17.2853 |
| 11 | 0.314717 | 8.52694 | UNIT I | 3 | 28 | 11.2002 | 12.7467 | 23.7497 | 5.4188 | 18.3309 |
| 12 | 0.314717 | 9.12359 | UNIT I | 3 | 28 | 11.5609 | 13.1572 | 24.9009 | 5.79797 | 19.1029 |
| 13 | 0.314717 | 9.62536 | UNIT I | 3 | 28 | 11.799 | 13.4282 | 25.7293 | 6.11684 | 19.6125 |
| 14 | 0.314717 | 10.2586 | UNIT I | 3 | 28 | 12.139 | 13.8152 | 26.8597 | 6.51925 | 20.3404 |
| 15 | 0.314717 | 10.9129 | UNIT I | 3 | 28 | 12.4642 | 14.1853 | 27.9714 | 6.93504 | 21.0364 |
| 16 | 0.314717 | 11.4475 | UNIT I | 3 | 28 | 12.6391 | 14.3843 | 28.6853 | 7.27478 | 21.4106 |
| 17 | 0.314717 | 11.8311 | UNIT I | 3 | 28 | 12.6395 | 14.3848 | 28.9301 | 7.51857 | 21.4116 |
| 18 | 0.314717 | 11.9378 | UNIT I | 3 | 28 | 12.3615 | 14.0684 | 28.4029 | 7.58635 | 20.8165 |
| 19 | 0.314717 | 11.8603 | UNIT I | 3 | 28 | 11.8994 | 13.5425 | 27.3647 | 7.53714 | 19.8276 |
| 20 | 0.314717 | 11.5933 | UNIT I | 3 | 28 | 11.257 | 12.8114 | 25.82 | 7.36742 | 18.4526 |
| 21 | 0.314717 | 10.9733 | UNIT I | 3 | 28 | 10.3153 | 11.7397 | 23.4104 | 6.97347 | 16.4369 |
| 22 | 0.314717 | 9.9669 | UNIT I | 3 | 28 | 9.07565 | 10.3288 | 20.1174 | 6.33388 | 13.7835 |
| 23 | 0.314717 | 8.10895 | UNIT I | 3 | 28 | 7.24719 | 8.24788 | 15.023 | 5.15317 | 9.86984 |
| 24 | 0.314717 | 5.40838 | UNIT I | 3 | 28 | 4.95347 | 5.63744 | 8.39728 | 3.43698 | 4.9603 |
| 25 | 0.314717 | 1.93841 | UNIT I | 3 | 28 | 2.41538 | 2.74889 | 0.759578 | 1.23185 | -0.472272 |

**Global Minimum Query (spencer) - Safety Factor**: 1.16582

| 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 | 0.205568 | 0.178723 | UNIT I | 3 | 28 | 3.78376 | 4.41118 | 2.82793 | 0.173882 | 2.65405 |
| 2 | 0.205568 | 0.52091 | UNIT I | 3 | 28 | 4.44245 | 5.1791 | 4.60509 | 0.506801 | 4.09829 |
| 3 | 0.205568 | 0.892454 | UNIT I | 3 | 28 | 5.09991 | 5.94558 | 6.40812 | 0.868282 | 5.53984 |
| 4 | 0.205568 | 1.3294 | UNIT I | 3 | 28 | 5.82669 | 6.79287 | 8.42674 | 1.29339 | 7.13335 |
| 5 | 0.205568 | 1.73666 | UNIT I | 3 | 28 | 6.42555 | 7.49103 | 10.136 | 1.68962 | 8.44641 |
| 6 | 0.205568 | 2.11254 | UNIT I | 3 | 28 | 6.90641 | 8.05163 | 11.5561 | 2.05533 | 9.50074 |
| 7 | 0.205568 | 2.45649 | UNIT I | 3 | 28 | 7.27998 | 8.48715 | 12.7098 | 2.38996 | 10.3198 |
| 8 | 0.205568 | 2.76776 | UNIT I | 3 | 28 | 7.55536 | 8.80819 | 13.6164 | 2.6928 | 10.9236 |
| 9 | 0.205568 | 3.04634 | UNIT I | 3 | 28 | 7.74179 | 9.02553 | 14.2962 | 2.96383 | 11.3324 |
| 10 | 0.205568 | 3.38491 | UNIT I | 3 | 28 | 7.99094 | 9.316 | 15.1719 | 3.29323 | 11.8787 |
| 11 | 0.205568 | 3.75112 | UNIT I | 3 | 28 | 8.24308 | 9.60995 | 16.081 | 3.64952 | 12.4315 |
| 12 | 0.205568 | 4.07962 | UNIT I | 3 | 28 | 8.40106 | 9.79412 | 16.747 | 3.96912 | 12.7779 |
| 13 | 0.205568 | 4.36843 | UNIT I | 3 | 28 | 8.47006 | 9.87456 | 17.1793 | 4.25011 | 12.9292 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 0.205568 | 4.61518 | UNIT I | 3 | 28 | 8.45448 | 9.8564 | 17.3852 | 4.49018 | 12.895 |
| 15 | 0.205568 | 4.80813 | UNIT I | 3 | 28 | 8.34726 | 9.7314 | 17.3378 | 4.67791 | 12.6599 |
| 16 | 0.205568 | 4.89561 | UNIT I | 3 | 28 | 8.09751 | 9.44024 | 16.8753 | 4.76301 | 12.1123 |
| 17 | 0.205568 | 4.92013 | UNIT I | 3 | 28 | 7.76958 | 9.05793 | 16.1802 | 4.78687 | 11.3933 |
| 18 | 0.205568 | 4.88647 | UNIT I | 3 | 28 | 7.37785 | 8.60125 | 15.2885 | 4.75412 | 10.5344 |
| 19 | 0.205568 | 4.78776 | UNIT I | 3 | 28 | 6.92391 | 8.07203 | 14.1972 | 4.65808 | 9.53912 |
| 20 | 0.205568 | 4.60291 | UNIT I | 3 | 28 | 6.39786 | 7.45875 | 12.8639 | 4.47824 | 8.38569 |
| 21 | 0.205568 | 4.26794 | UNIT I | 3 | 28 | 5.75885 | 6.71378 | 11.1369 | 4.15234 | 6.9846 |
| 22 | 0.205568 | 3.82114 | UNIT I | 3 | 28 | 5.06237 | 5.90181 | 9.17516 | 3.71765 | 5.45751 |
| 23 | 0.205568 | 3.15837 | UNIT I | 3 | 28 | 4.25356 | 4.95888 | 6.75694 | 3.07283 | 3.68411 |
| 24 | 0.205568 | 2.13861 | UNIT I | 3 | 28 | 3.28509 | 3.82982 | 3.64136 | 2.08068 | 1.56068 |
| 25 | 0.205568 | 0.788428 | UNIT I | 3 | 28 | 2.25241 | 2.62591 | 0.0635124 | 0.767074 | -0.703562 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.18582

| 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 | 0.312614 | 0.435866 | UNIT I | 3 | 28 | 4.01708 | 4.76353 | 3.59557 | 0.278853 | 3.31672 |
| 2 | 0.312614 | 1.27415 | UNIT I | 3 | 28 | 5.14827 | 6.10492 | 6.65465 | 0.815159 | 5.83949 |
| 3 | 0.312614 | 2.04556 | UNIT I | 3 | 28 | 6.08237 | 7.2126 | 9.23144 | 1.30868 | 7.92276 |
| 4 | 0.312614 | 2.75001 | UNIT I | 3 | 28 | 6.84116 | 8.11239 | 11.3744 | 1.75937 | 9.615 |
| 5 | 0.312614 | 3.38716 | UNIT I | 3 | 28 | 7.44295 | 8.826 | 13.1241 | 2.16699 | 10.9571 |
| 6 | 0.312614 | 3.95639 | UNIT I | 3 | 28 | 7.90324 | 9.37182 | 14.5148 | 2.53117 | 11.9837 |
| 7 | 0.312614 | 4.46681 | UNIT I | 3 | 28 | 8.24721 | 9.77971 | 15.6085 | 2.85772 | 12.7508 |
| 8 | 0.312614 | 5.15435 | UNIT I | 3 | 28 | 8.7558 | 10.3828 | 17.1826 | 3.29759 | 13.885 |
| 9 | 0.312614 | 5.87695 | UNIT I | 3 | 28 | 9.24999 | 10.9688 | 18.7471 | 3.75988 | 14.9872 |
| 10 | 0.312614 | 6.52614 | UNIT I | 3 | 28 | 9.6134 | 11.3998 | 19.9729 | 4.17522 | 15.7977 |
| 11 | 0.312614 | 7.09964 | UNIT I | 3 | 28 | 9.85532 | 11.6866 | 20.8793 | 4.54212 | 16.3372 |
| 12 | 0.312614 | 7.70804 | UNIT I | 3 | 28 | 10.0932 | 11.9687 | 21.799 | 4.93136 | 16.8677 |
| 13 | 0.312614 | 8.48121 | UNIT I | 3 | 28 | 10.4431 | 12.3837 | 23.0741 | 5.426 | 17.6481 |
| 14 | 0.312614 | 9.1773 | UNIT I | 3 | 28 | 10.6719 | 12.655 | 24.0297 | 5.87134 | 18.1584 |
| 15 | 0.312614 | 9.78244 | UNIT I | 3 | 28 | 10.7772 | 12.7798 | 24.6517 | 6.25849 | 18.3932 |
| 16 | 0.312614 | 10.1898 | UNIT I | 3 | 28 | 10.6829 | 12.668 | 24.7021 | 6.51912 | 18.1829 |
| 17 | 0.312614 | 10.4213 | UNIT I | 3 | 28 | 10.4274 | 12.3651 | 24.2803 | 6.66721 | 17.6131 |
| 18 | 0.312614 | 10.5421 | UNIT I | 3 | 28 | 10.0765 | 11.9489 | 23.575 | 6.74449 | 16.8305 |
| 19 | 0.312614 | 10.4736 | UNIT I | 3 | 28 | 9.58593 | 11.3672 | 22.4371 | 6.70066 | 15.7364 |
| 20 | 0.312614 | 10.1449 | UNIT I | 3 | 28 | 8.92799 | 10.587 | 20.7594 | 6.4904 | 14.269 |
| 21 | 0.312614 | 9.3145 | UNIT I | 3 | 28 | 7.98006 | 9.46291 | 18.1141 | 5.95911 | 12.155 |
| 22 | 0.312614 | 7.84533 | UNIT I | 3 | 28 | 6.71755 | 7.96581 | 14.3585 | 5.01919 | 9.33933 |
| 23 | 0.312614 | 5.91873 | UNIT I | 3 | 28 | 5.31143 | 6.2984 | 9.99 | 3.78661 | 6.20339 |
| 24 | 0.312614 | 3.75496 | UNIT I | 3 | 28 | 3.92747 | 4.65727 | 5.51918 | 2.4023 | 3.11688 |
| 25 | 0.312614 | 1.30473 | UNIT I | 3 | 28 | 2.57714 | 3.05603 | 0.940095 | 0.834723 | 0.105372 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.20296

| 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 | 0.205568 | 0.178723 | UNIT I | 3 | 28 | 3.48307 | 4.18999 | 2.41194 | 0.173882 | 2.23806 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.205568 | 0.52091 | UNIT I | 3 | 28 | 4.43626 | 5.33664 | 4.90139 | 0.506801 | 4.39459 |
| 3 | 0.205568 | 0.892454 | UNIT I | 3 | 28 | 5.53683 | 6.66059 | 7.75284 | 0.868282 | 6.88456 |
| 4 | 0.205568 | 1.3294 | UNIT I | 3 | 28 | 5.96676 | 7.17777 | 9.15062 | 1.29339 | 7.85723 |
| 5 | 0.205568 | 1.73666 | UNIT I | 3 | 28 | 6.46356 | 7.77541 | 10.6709 | 1.68962 | 8.98126 |
| 6 | 0.205568 | 2.11254 | UNIT I | 3 | 28 | 6.91427 | 8.31759 | 12.0563 | 2.05533 | 10.0009 |
| 7 | 0.205568 | 2.45649 | UNIT I | 3 | 28 | 7.25339 | 8.72554 | 13.1581 | 2.38996 | 10.7682 |
| 8 | 0.205568 | 2.76776 | UNIT I | 3 | 28 | 7.65515 | 9.20884 | 14.3699 | 2.6928 | 11.6771 |
| 9 | 0.205568 | 3.04634 | UNIT I | 3 | 28 | 9.3024 | 11.1904 | 18.3678 | 2.96383 | 15.4039 |
| 10 | 0.205568 | 3.38491 | UNIT I | 3 | 28 | 9.49951 | 11.4275 | 19.1431 | 3.29323 | 15.8499 |
| 11 | 0.205568 | 3.75112 | UNIT I | 3 | 28 | 8.19418 | 9.85727 | 16.5462 | 3.64952 | 12.8967 |
| 12 | 0.205568 | 4.07962 | UNIT I | 3 | 28 | 8.23011 | 9.90049 | 16.9471 | 3.96912 | 12.978 |
| 13 | 0.205568 | 4.36843 | UNIT I | 3 | 28 | 8.18086 | 9.84125 | 17.1166 | 4.25011 | 12.8665 |
| 14 | 0.205568 | 4.61518 | UNIT I | 3 | 28 | 7.72311 | 9.29059 | 16.3211 | 4.49018 | 11.8309 |
| 15 | 0.205568 | 4.80813 | UNIT I | 3 | 28 | 7.25149 | 8.72325 | 15.4418 | 4.67791 | 10.7639 |
| 16 | 0.205568 | 4.89561 | UNIT I | 3 | 28 | 7.32258 | 8.80877 | 15.6877 | 4.76301 | 10.9247 |
| 17 | 0.205568 | 4.92013 | UNIT I | 3 | 28 | 7.26615 | 8.74089 | 15.5839 | 4.78687 | 10.797 |
| 18 | 0.205568 | 4.88647 | UNIT I | 3 | 28 | 6.85903 | 8.25114 | 14.6301 | 4.75412 | 9.87595 |
| 19 | 0.205568 | 4.78776 | UNIT I | 3 | 28 | 6.24924 | 7.51758 | 13.1544 | 4.65808 | 8.49634 |
| 20 | 0.205568 | 4.60291 | UNIT I | 3 | 28 | 5.73188 | 6.89522 | 11.8041 | 4.47824 | 7.32582 |
| 21 | 0.205568 | 4.26794 | UNIT I | 3 | 28 | 5.35428 | 6.44099 | 10.6239 | 4.15234 | 6.47157 |
| 22 | 0.205568 | 3.82114 | UNIT I | 3 | 28 | 4.6039 | 5.53831 | 8.49151 | 3.71765 | 4.77386 |
| 23 | 0.205568 | 3.15837 | UNIT I | 3 | 28 | 4.10078 | 4.93307 | 6.70841 | 3.07283 | 3.63558 |
| 24 | 0.205568 | 2.13861 | UNIT I | 3 | 28 | 3.37631 | 4.06156 | 4.07717 | 2.08068 | 1.99649 |
| 25 | 0.205568 | 0.788428 | UNIT I | 3 | 28 | 2.12093 | 2.5514 | -0.0766227 | 0.767074 | -0.843697 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.1805

| 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 | 0.205568 | 0.178723 | UNIT I | 3 | 28 | 3.17745 | 3.75098 | 1.58627 | 0.173882 | 1.41239 |
| 2 | 0.205568 | 0.52091 | UNIT I | 3 | 28 | 3.96122 | 4.67622 | 3.6593 | 0.506801 | 3.1525 |
| 3 | 0.205568 | 0.892454 | UNIT I | 3 | 28 | 4.82856 | 5.70011 | 5.94646 | 0.868282 | 5.07818 |
| 4 | 0.205568 | 1.3294 | UNIT I | 3 | 28 | 5.51952 | 6.51579 | 7.90566 | 1.29339 | 6.61227 |
| 5 | 0.205568 | 1.73666 | UNIT I | 3 | 28 | 6.18352 | 7.29965 | 9.7761 | 1.68962 | 8.08648 |
| 6 | 0.205568 | 2.11254 | UNIT I | 3 | 28 | 6.77161 | 7.99388 | 11.4474 | 2.05533 | 9.3921 |
| 7 | 0.205568 | 2.45649 | UNIT I | 3 | 28 | 7.25586 | 8.56554 | 12.8572 | 2.38996 | 10.4672 |
| 8 | 0.205568 | 2.76776 | UNIT I | 3 | 28 | 7.70496 | 9.0957 | 14.1572 | 2.6928 | 11.4644 |
| 9 | 0.205568 | 3.04634 | UNIT I | 3 | 28 | 8.60673 | 10.1602 | 16.4303 | 2.96383 | 13.4665 |
| 10 | 0.205568 | 3.38491 | UNIT I | 3 | 28 | 8.92813 | 10.5397 | 17.4733 | 3.29323 | 14.1801 |
| 11 | 0.205568 | 3.75112 | UNIT I | 3 | 28 | 8.65078 | 10.2122 | 17.2138 | 3.64952 | 13.5642 |
| 12 | 0.205568 | 4.07962 | UNIT I | 3 | 28 | 8.80979 | 10.4 | 17.8864 | 3.96912 | 13.9173 |
| 13 | 0.205568 | 4.36843 | UNIT I | 3 | 28 | 8.85037 | 10.4479 | 18.2575 | 4.25011 | 14.0074 |
| 14 | 0.205568 | 4.61518 | UNIT I | 3 | 28 | 8.6248 | 10.1816 | 17.9968 | 4.49018 | 13.5066 |
| 15 | 0.205568 | 4.80813 | UNIT I | 3 | 28 | 8.28678 | 9.78254 | 17.434 | 4.67791 | 12.7561 |
| 16 | 0.205568 | 4.89561 | UNIT I | 3 | 28 | 8.10281 | 9.56537 | 17.1107 | 4.76301 | 12.3476 |
| 17 | 0.205568 | 4.92013 | UNIT I | 3 | 28 | 7.81142 | 9.22138 | 16.4876 | 4.78687 | 11.7007 |
| 18 | 0.205568 | 4.88647 | UNIT I | 3 | 28 | 7.2894 | 8.60514 | 15.2958 | 4.75412 | 10.5417 |
| 19 | 0.205568 | 4.78776 | UNIT I | 3 | 28 | 6.59457 | 7.78489 | 13.6571 | 4.65808 | 8.99905 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 0.205568 | 4.60291 | UNIT I | 3 | 28 | 5.90152 | 6.96675 | 11.9386 | 4.47824 | 7.46037 |
| 21 | 0.205568 | 4.26794 | UNIT I | 3 | 28 | 5.27224 | 6.22388 | 10.2156 | 4.15234 | 6.06325 |
| 22 | 0.205568 | 3.82114 | UNIT I | 3 | 28 | 4.4104 | 5.20648 | 7.86742 | 3.71765 | 4.14977 |
| 23 | 0.205568 | 3.15837 | UNIT I | 3 | 28 | 3.80038 | 4.48635 | 5.86823 | 3.07283 | 2.7954 |
| 24 | 0.205568 | 2.13861 | UNIT I | 3 | 28 | 3.13301 | 3.69852 | 3.39442 | 2.08068 | 1.31374 |
| 25 | 0.205568 | 0.788428 | UNIT I | 3 | 28 | 2.3941 | 2.82624 | 0.440278 | 0.767074 | -0.326796 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.16527

| 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 | 0.205568 | 0.178723 | UNIT I | 3 | 28 | 3.02597 | 3.52607 | 1.16328 | 0.173882 | 0.9894 |
| 2 | 0.205568 | 0.52091 | UNIT I | 3 | 28 | 3.83858 | 4.47298 | 3.27707 | 0.506801 | 2.77027 |
| 3 | 0.205568 | 0.892454 | UNIT I | 3 | 28 | 4.72442 | 5.50522 | 5.57989 | 0.868282 | 4.71161 |
| 4 | 0.205568 | 1.3294 | UNIT I | 3 | 28 | 5.71478 | 6.65926 | 8.17547 | 1.29339 | 6.88208 |
| 5 | 0.205568 | 1.73666 | UNIT I | 3 | 28 | 6.59179 | 7.68121 | 10.4937 | 1.68962 | 8.80408 |
| 6 | 0.205568 | 2.11254 | UNIT I | 3 | 28 | 7.31627 | 8.52543 | 12.4471 | 2.05533 | 10.3918 |
| 7 | 0.205568 | 2.45649 | UNIT I | 3 | 28 | 7.86383 | 9.16348 | 13.9818 | 2.38996 | 11.5918 |
| 8 | 0.205568 | 2.76776 | UNIT I | 3 | 28 | 8.22437 | 9.58361 | 15.0748 | 2.6928 | 12.382 |
| 9 | 0.205568 | 3.04634 | UNIT I | 3 | 28 | 8.40337 | 9.7922 | 15.7381 | 2.96383 | 12.7743 |
| 10 | 0.205568 | 3.38491 | UNIT I | 3 | 28 | 8.56234 | 9.97744 | 16.4159 | 3.29323 | 13.1226 |
| 11 | 0.205568 | 3.75112 | UNIT I | 3 | 28 | 8.65879 | 10.0898 | 16.9835 | 3.64952 | 13.334 |
| 12 | 0.205568 | 4.07962 | UNIT I | 3 | 28 | 8.61944 | 10.044 | 17.2169 | 3.96912 | 13.2478 |
| 13 | 0.205568 | 4.36843 | UNIT I | 3 | 28 | 8.47786 | 9.879 | 17.1877 | 4.25011 | 12.9375 |
| 14 | 0.205568 | 4.61518 | UNIT I | 3 | 28 | 8.26675 | 9.633 | 16.965 | 4.49018 | 12.4749 |
| 15 | 0.205568 | 4.80813 | UNIT I | 3 | 28 | 8.00388 | 9.32668 | 16.5767 | 4.67791 | 11.8987 |
| 16 | 0.205568 | 4.89561 | UNIT I | 3 | 28 | 7.65749 | 8.92304 | 15.9026 | 4.76301 | 11.1396 |
| 17 | 0.205568 | 4.92013 | UNIT I | 3 | 28 | 7.2995 | 8.50589 | 15.1419 | 4.78687 | 10.3551 |
| 18 | 0.205568 | 4.88647 | UNIT I | 3 | 28 | 6.94548 | 8.09336 | 14.3333 | 4.75412 | 9.57921 |
| 19 | 0.205568 | 4.78776 | UNIT I | 3 | 28 | 6.59211 | 7.68159 | 13.4629 | 4.65808 | 8.80481 |
| 20 | 0.205568 | 4.60291 | UNIT I | 3 | 28 | 6.21834 | 7.24604 | 12.4639 | 4.47824 | 7.98565 |
| 21 | 0.205568 | 4.26794 | UNIT I | 3 | 28 | 5.75975 | 6.71166 | 11.133 | 4.15234 | 6.98062 |
| 22 | 0.205568 | 3.82114 | UNIT I | 3 | 28 | 5.24545 | 6.11237 | 9.57117 | 3.71765 | 5.85352 |
| 23 | 0.205568 | 3.15837 | UNIT I | 3 | 28 | 4.56116 | 5.31498 | 7.42667 | 3.07283 | 4.35384 |
| 24 | 0.205568 | 2.13861 | UNIT I | 3 | 28 | 3.53934 | 4.12429 | 4.19517 | 2.08068 | 2.11449 |
| 25 | 0.205568 | 0.788428 | UNIT I | 3 | 28 | 2.12587 | 2.47722 | -0.216139 | 0.767074 | -0.983213 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

## External Boundary

| X | Y |
|---|---|
| 42.2084 | 59.656 |
| 40.5299 | 57.6985 |
| 39.2201 | 56.0079 |
| 37.5797 | 54.3301 |
| 36.0284 | 53.0971 |
| 34.9857 | 52.3471 |
| 32.931 | 51.3318 |
| 32.4461 | 51.1888 |
| 32.1758 | 51.2126 |
| 31.6273 | 51.2126 |
| 31.1106 | 51.1173 |
| 30.8801 | 50.9584 |
| 30.4826 | 51.006 |
| 29.3379 | 51.0855 |
| 28.2568 | 51.1173 |
| 24.7792 | 51.0927 |
| 22.0128 | 50.9974 |
| 21.6472 | 50.902 |
| 21.0828 | 50.5524 |
| 20.0653 | 49.8134 |
| 18.9094 | 48.8644 |
| 17.5182 | 47.9982 |
| 14.7996 | 46.8381 |
| 11.6166 | 46.1137 |
| 9.81213 | 45.8117 |
| 9.0967 | 45.8514 |
| 8.0633 | 45.8117 |
| 6.7641 | 45.612 |
| 6.55742 | 45.5405 |
| 5.53992 | 44.9127 |
| 5.02322 | 44.8015 |
| 4.35549 | 44.5869 |
| 0.198047 | 43.403 |
| -3.76343 | 42.432 |
| -9.07729 | 41.119 |
| -15.1823 | 39.5377 |
| -18.268 | 38.8216 |
| -18.268 | 35.5812 |
| -18.268 | 33.5624 |
| -18.268 | 28.0059 |
| 44.4591 | 28.0059 |
| 44.4591 | 46.5638 |
| 44.4591 | 57.23 |
| 44.4591 | 59.34 |
| 44.4591 | 61.8678 |

## Material Boundary

| X | Y |
|---|---|
| 37.639 | 52.44 |
| 44.4591 | 59.34 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 47.235 |
| 30.8801 | 49.506 |

## Material Boundary

| X | Y |
|---|---|
| -9.07729 | 41.119 |
| 2.44 | 42.482 |
| 21.211 | 47.235 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 44.211 |
| 31.462 | 47.978 |
| 39.112 | 51.057 |
| 44.4591 | 57.23 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 44.211 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 33.5624 |
| 21.211 | 40.173 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 40.173 |
| 44.4591 | 46.5638 |

## Material Boundary

| X | Y |
|---|---|

| | |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: YK S60Λ-SLIDE EQ=0.20dn c=3
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/3/2021, 20:34:28

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): 0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT |
|---|---|---|---|---|---|
| Color | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 |
| Water Surface | None | None | Water Table | Water Table | Water Table |
| Hu Value | | | 1 | 1 | 1 |
| Ru Value | 0 | 0 | | | |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.937605
Center: 16.097, 54.394
Radius: 7.569
Left Slip Surface Endpoint: 14.967, 46.910
Right Slip Surface Endpoint: 22.876, 51.027
Resisting Moment=818.094 kN-m
Driving Moment=872.536 kN-m

### Method: bishop simplified

FS: 1.010070
Center: 15.930, 55.767
Radius: 8.688
Left Slip Surface Endpoint: 15.403, 47.096
Right Slip Surface Endpoint: 23.219, 51.039
Resisting Moment=918.639 kN-m

Driving Moment=909.479 kN-m

## Method: janbu simplified

FS: 0.925086
Center: 16.097, 54.394
Radius: 7.569
Left Slip Surface Endpoint: 14.967, 46.910
Right Slip Surface Endpoint: 22.876, 51.027
Resisting Horizontal Force=98.5908 kN
Driving Horizontal Force=106.575 kN

## Method: janbu corrected

FS: 0.983245
Center: 16.097, 54.394
Radius: 7.569
Left Slip Surface Endpoint: 14.967, 46.910
Right Slip Surface Endpoint: 22.876, 51.027
Resisting Horizontal Force=104.789 kN
Driving Horizontal Force=106.575 kN

## Method: spencer

FS: 1.009390
Center: 15.930, 55.767
Radius: 8.688
Left Slip Surface Endpoint: 15.403, 47.096
Right Slip Surface Endpoint: 23.219, 51.039
Resisting Moment=918.021 kN-m
Driving Moment=909.479 kN-m
Resisting Horizontal Force=92.6711 kN
Driving Horizontal Force=91.8088 kN

## Method: corp of eng#1

FS: 0.991817
Center: 15.930, 55.767
Radius: 8.688
Left Slip Surface Endpoint: 15.403, 47.096
Right Slip Surface Endpoint: 23.219, 51.039
Resisting Horizontal Force=92.0241 kN
Driving Horizontal Force=92.7834 kN

## Method: corp of eng#2

FS: 1.008090
Center: 15.930, 55.767
Radius: 8.688
Left Slip Surface Endpoint: 15.403, 47.096
Right Slip Surface Endpoint: 23.219, 51.039
Resisting Horizontal Force=92.6301 kN
Driving Horizontal Force=91.8867 kN

## Method: lowe-karafiath

FS: 0.991925
Center: 15.930, 55.767
Radius: 8.688

Left Slip Surface Endpoint: 15.403, 47.096
Right Slip Surface Endpoint: 23.219, 51.039
Resisting Horizontal Force=92.0912 kN
Driving Horizontal Force=92.8409 kN

### Method: gle/morgenstern-price

FS: 1.015650
Center: 15.930, 55.767
Radius: 8.688
Left Slip Surface Endpoint: 15.403, 47.096
Right Slip Surface Endpoint: 23.219, 51.039
Resisting Moment=923.717 kN-m
Driving Moment=909.479 kN-m
Resisting Horizontal Force=92.9508 kN
Driving Horizontal Force=91.5181 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 9538
Number of Invalid Surfaces: 462

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -108 reported for 128 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 9538
Number of Invalid Surfaces: 462

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -108 reported for 128 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 9381
Number of Invalid Surfaces: 619

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -108 reported for 285 surfaces
Error Code -109 reported for 1 surface

Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 9381
Number of Invalid Surfaces: 619

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -108 reported for 285 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

## Method: spencer

Number of Valid Surfaces: 9218
Number of Invalid Surfaces: 782

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -108 reported for 290 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 158 surfaces
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 9305
Number of Invalid Surfaces: 695

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -108 reported for 294 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 66 surfaces
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces
Error Code -500 reported for 1 surface

## Method: corp of eng#2

Number of Valid Surfaces: 8692
Number of Invalid Surfaces: 1308

**Error Codes:**

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -108 reported for 619 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 355 surfaces

Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 6000
Number of Invalid Surfaces: 4000

### Error Codes:

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -108 reported for 2783 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 883 surfaces
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 9374
Number of Invalid Surfaces: 626

### Error Codes:

Error Code -105 reported for 3 surfaces
Error Code -106 reported for 69 surfaces
Error Code -108 reported for 285 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 7 surfaces
Error Code -114 reported for 256 surfaces
Error Code -123 reported for 5 surfaces

### Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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.
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.
-500 = Cannot generate interslice force function

# *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.937605

| 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 | 0.316356 | 0.528843 | UNIT I | 3 | 28 | 4.24938 | 3.98424 | 1.85109 | 0 | 1.85109 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.316356 | 1.54607 | UNIT I | 3 | 28 | 6.27321 | 5.88179 | 5.41985 | 0 | 5.41985 |
| 3 | 0.316356 | 2.48283 | UNIT I | 3 | 28 | 8.12539 | 7.61841 | 8.68597 | 0 | 8.68597 |
| 4 | 0.316356 | 3.33978 | UNIT I | 3 | 28 | 9.78869 | 9.17792 | 11.619 | 0 | 11.619 |
| 5 | 0.316356 | 4.11717 | UNIT I | 3 | 28 | 11.2486 | 10.5467 | 14.1933 | 0 | 14.1933 |
| 6 | 0.316356 | 4.81481 | UNIT I | 3 | 28 | 12.4933 | 11.7137 | 16.3882 | 0 | 16.3882 |
| 7 | 0.316356 | 5.4321 | UNIT I | 3 | 28 | 13.5137 | 12.6705 | 18.1876 | 0 | 18.1876 |
| 8 | 0.316356 | 5.96799 | UNIT I | 3 | 28 | 14.3036 | 13.4111 | 19.5805 | 0 | 19.5805 |
| 9 | 0.316356 | 6.58449 | UNIT I | 3 | 28 | 15.1562 | 14.2105 | 21.0838 | 0 | 21.0838 |
| 10 | 0.316356 | 7.32428 | UNIT I | 3 | 28 | 16.1244 | 15.1183 | 22.7911 | 0 | 22.7911 |
| 11 | 0.316356 | 7.97727 | UNIT I | 3 | 28 | 16.817 | 15.7677 | 24.0126 | 0 | 24.0126 |
| 12 | 0.316356 | 8.53946 | UNIT I | 3 | 28 | 17.2308 | 16.1557 | 24.7422 | 0 | 24.7422 |
| 13 | 0.316356 | 9.06178 | UNIT I | 3 | 28 | 17.4534 | 16.3644 | 25.1349 | 0 | 25.1349 |
| 14 | 0.316356 | 9.7667 | UNIT I | 3 | 28 | 17.8177 | 16.706 | 25.7772 | 0 | 25.7772 |
| 15 | 0.316356 | 10.4058 | UNIT I | 3 | 28 | 17.9187 | 16.8007 | 25.9554 | 0 | 25.9554 |
| 16 | 0.316356 | 10.9316 | UNIT I | 3 | 28 | 17.6999 | 16.5955 | 25.5695 | 0 | 25.5695 |
| 17 | 0.316356 | 11.2642 | UNIT I | 3 | 28 | 17.085 | 16.019 | 24.4852 | 0 | 24.4852 |
| 18 | 0.316356 | 11.3546 | UNIT I | 3 | 28 | 16.069 | 15.0664 | 22.6936 | 0 | 22.6936 |
| 19 | 0.316356 | 11.295 | UNIT I | 3 | 28 | 14.8198 | 13.8951 | 20.4908 | 0 | 20.4908 |
| 20 | 0.316356 | 11.022 | UNIT I | 3 | 28 | 13.3298 | 12.4981 | 17.8634 | 0 | 17.8634 |
| 21 | 0.316356 | 10.4094 | UNIT I | 3 | 28 | 11.5749 | 10.8527 | 14.7687 | 0 | 14.7687 |
| 22 | 0.316356 | 9.29009 | UNIT I | 3 | 28 | 9.56946 | 8.97237 | 11.2324 | 0 | 11.2324 |
| 23 | 0.316356 | 7.36705 | UNIT I | 3 | 28 | 7.34592 | 6.88757 | 7.31146 | 0 | 7.31146 |
| 24 | 0.316356 | 4.78217 | UNIT I | 3 | 28 | 5.28833 | 4.95836 | 3.68314 | 0 | 3.68314 |
| 25 | 0.316356 | 1.69025 | UNIT I | 3 | 28 | 3.72126 | 3.48907 | 0.919808 | 0 | 0.919808 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.01007

| 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 | 0.312614 | 0.435866 | UNIT I | 3 | 28 | 3.86454 | 3.90346 | 1.69916 | 0 | 1.69916 |
| 2 | 0.312614 | 1.27415 | UNIT I | 3 | 28 | 5.34911 | 5.40298 | 4.51934 | 0 | 4.51934 |
| 3 | 0.312614 | 2.04556 | UNIT I | 3 | 28 | 6.65623 | 6.72326 | 7.00242 | 0 | 7.00242 |
| 4 | 0.312614 | 2.75001 | UNIT I | 3 | 28 | 7.79502 | 7.87352 | 9.16575 | 0 | 9.16575 |
| 5 | 0.312614 | 3.38716 | UNIT I | 3 | 28 | 8.77318 | 8.86153 | 11.0239 | 0 | 11.0239 |
| 6 | 0.312614 | 3.95639 | UNIT I | 3 | 28 | 9.59722 | 9.69386 | 12.5893 | 0 | 12.5893 |
| 7 | 0.312614 | 4.46681 | UNIT I | 3 | 28 | 10.2895 | 10.3931 | 13.9044 | 0 | 13.9044 |
| 8 | 0.312614 | 5.15435 | UNIT I | 3 | 28 | 11.2483 | 11.3615 | 15.7257 | 0 | 15.7257 |
| 9 | 0.312614 | 5.87695 | UNIT I | 3 | 28 | 12.2252 | 12.3483 | 17.5816 | 0 | 17.5816 |
| 10 | 0.312614 | 6.52614 | UNIT I | 3 | 28 | 13.0429 | 13.1742 | 19.1349 | 0 | 19.1349 |
| 11 | 0.312614 | 7.09964 | UNIT I | 3 | 28 | 13.7036 | 13.8416 | 20.39 | 0 | 20.39 |
| 12 | 0.312614 | 7.70804 | UNIT I | 3 | 28 | 14.384 | 14.5288 | 21.6825 | 0 | 21.6825 |
| 13 | 0.312614 | 8.48121 | UNIT I | 3 | 28 | 15.2762 | 15.43 | 23.3774 | 0 | 23.3774 |
| 14 | 0.312614 | 9.1773 | UNIT I | 3 | 28 | 16.0044 | 16.1656 | 24.7609 | 0 | 24.7609 |
| 15 | 0.312614 | 9.78244 | UNIT I | 3 | 28 | 16.553 | 16.7197 | 25.8031 | 0 | 25.8031 |
| 16 | 0.312614 | 10.1898 | UNIT I | 3 | 28 | 16.7755 | 16.9444 | 26.2256 | 0 | 26.2256 |
| 17 | 0.312614 | 10.4213 | UNIT I | 3 | 28 | 16.7175 | 16.8858 | 26.1154 | 0 | 26.1154 |
| 18 | 0.312614 | 10.5421 | UNIT I | 3 | 28 | 16.4808 | 16.6468 | 25.6659 | 0 | 25.6659 |
| 19 | 0.312614 | 10.4736 | UNIT I | 3 | 28 | 15.9687 | 16.1295 | 24.6931 | 0 | 24.6931 |
| 20 | 0.312614 | 10.1449 | UNIT I | 3 | 28 | 15.1057 | 15.2578 | 23.0536 | 0 | 23.0536 |
| 21 | 0.312614 | 9.3145 | UNIT I | 3 | 28 | 13.6153 | 13.7524 | 20.2223 | 0 | 20.2223 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 0.312614 | 7.84533 | UNIT I | 3 | 28 | 11.3903 | 11.505 | 15.9956 | 0 | 15.9956 |
| 23 | 0.312614 | 5.91873 | UNIT I | 3 | 28 | 8.72711 | 8.81499 | 10.9364 | 0 | 10.9364 |
| 24 | 0.312614 | 3.75496 | UNIT I | 3 | 28 | 5.94751 | 6.0074 | 5.65608 | 0 | 5.65608 |
| 25 | 0.312614 | 1.30473 | UNIT I | 3 | 28 | 3.06197 | 3.09281 | 0.174545 | 0 | 0.174545 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.925086

| 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 | 0.316356 | 0.528843 | UNIT I | 3 | 28 | 4.6456 | 4.29758 | 2.44039 | 0 | 2.44039 |
| 2 | 0.316356 | 1.54607 | UNIT I | 3 | 28 | 6.66589 | 6.16652 | 5.95536 | 0 | 5.95536 |
| 3 | 0.316356 | 2.48283 | UNIT I | 3 | 28 | 8.42204 | 7.79111 | 9.01078 | 0 | 9.01078 |
| 4 | 0.316356 | 3.33978 | UNIT I | 3 | 28 | 9.9347 | 9.19045 | 11.6426 | 0 | 11.6426 |
| 5 | 0.316356 | 4.11717 | UNIT I | 3 | 28 | 11.2207 | 10.3802 | 13.88 | 0 | 13.88 |
| 6 | 0.316356 | 4.81481 | UNIT I | 3 | 28 | 12.294 | 11.373 | 15.7473 | 0 | 15.7473 |
| 7 | 0.316356 | 5.4321 | UNIT I | 3 | 28 | 13.1657 | 12.1794 | 17.264 | 0 | 17.264 |
| 8 | 0.316356 | 5.96799 | UNIT I | 3 | 28 | 13.8453 | 12.8081 | 18.4463 | 0 | 18.4463 |
| 9 | 0.316356 | 6.58449 | UNIT I | 3 | 28 | 14.6316 | 13.5355 | 19.8144 | 0 | 19.8144 |
| 10 | 0.316356 | 7.32428 | UNIT I | 3 | 28 | 15.5886 | 14.4208 | 21.4794 | 0 | 21.4794 |
| 11 | 0.316356 | 7.97727 | UNIT I | 3 | 28 | 16.3431 | 15.1188 | 22.7921 | 0 | 22.7921 |
| 12 | 0.316356 | 8.53946 | UNIT I | 3 | 28 | 16.8973 | 15.6315 | 23.7564 | 0 | 23.7564 |
| 13 | 0.316356 | 9.06178 | UNIT I | 3 | 28 | 17.3426 | 16.0434 | 24.5311 | 0 | 24.5311 |
| 14 | 0.316356 | 9.7667 | UNIT I | 3 | 28 | 18.0332 | 16.6823 | 25.7326 | 0 | 25.7326 |
| 15 | 0.316356 | 10.4058 | UNIT I | 3 | 28 | 18.56 | 17.1696 | 26.6491 | 0 | 26.6491 |
| 16 | 0.316356 | 10.9316 | UNIT I | 3 | 28 | 18.8549 | 17.4424 | 27.1621 | 0 | 27.1621 |
| 17 | 0.316356 | 11.2642 | UNIT I | 3 | 28 | 18.8093 | 17.4002 | 27.0829 | 0 | 27.0829 |
| 18 | 0.316356 | 11.3546 | UNIT I | 3 | 28 | 18.3714 | 16.9951 | 26.321 | 0 | 26.321 |
| 19 | 0.316356 | 11.295 | UNIT I | 3 | 28 | 17.6923 | 16.3669 | 25.1395 | 0 | 25.1395 |
| 20 | 0.316356 | 11.022 | UNIT I | 3 | 28 | 16.7006 | 15.4495 | 23.4141 | 0 | 23.4141 |
| 21 | 0.316356 | 10.4094 | UNIT I | 3 | 28 | 15.2581 | 14.1151 | 20.9045 | 0 | 20.9045 |
| 22 | 0.316356 | 9.29009 | UNIT I | 3 | 28 | 13.2087 | 12.2192 | 17.3387 | 0 | 17.3387 |
| 23 | 0.316356 | 7.36705 | UNIT I | 3 | 28 | 10.2982 | 9.52672 | 12.275 | 0 | 12.275 |
| 24 | 0.316356 | 4.78217 | UNIT I | 3 | 28 | 6.85551 | 6.34194 | 6.28527 | 0 | 6.28527 |
| 25 | 0.316356 | 1.69025 | UNIT I | 3 | 28 | 3.24303 | 3.00008 | 0.000146912 | 0 | 0.000146912 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.983245

| 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 | 0.316356 | 0.528843 | UNIT I | 3 | 28 | 4.37081 | 4.29758 | 2.44039 | 0 | 2.44039 |
| 2 | 0.316356 | 1.54607 | UNIT I | 3 | 28 | 6.2716 | 6.16652 | 5.95536 | 0 | 5.95536 |
| 3 | 0.316356 | 2.48283 | UNIT I | 3 | 28 | 7.92387 | 7.79111 | 9.01078 | 0 | 9.01078 |
| 4 | 0.316356 | 3.33978 | UNIT I | 3 | 28 | 9.34706 | 9.19045 | 11.6426 | 0 | 11.6426 |
| 5 | 0.316356 | 4.11717 | UNIT I | 3 | 28 | 10.557 | 10.3802 | 13.88 | 0 | 13.88 |
| 6 | 0.316356 | 4.81481 | UNIT I | 3 | 28 | 11.5668 | 11.373 | 15.7473 | 0 | 15.7473 |
| 7 | 0.316356 | 5.4321 | UNIT I | 3 | 28 | 12.387 | 12.1794 | 17.264 | 0 | 17.264 |
| 8 | 0.316356 | 5.96799 | UNIT I | 3 | 28 | 13.0263 | 12.8081 | 18.4463 | 0 | 18.4463 |
| 9 | 0.316356 | 6.58449 | UNIT I | 3 | 28 | 13.7662 | 13.5355 | 19.8144 | 0 | 19.8144 |
| 10 | 0.316356 | 7.32428 | UNIT I | 3 | 28 | 14.6665 | 14.4208 | 21.4794 | 0 | 21.4794 |
| 11 | 0.316356 | 7.97727 | UNIT I | 3 | 28 | 15.3764 | 15.1188 | 22.7921 | 0 | 22.7921 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.316356 | 8.53946 | UNIT I | 3 | 28 | 15.8979 | 15.6315 | 23.7564 | 0 | 23.7564 |
| 13 | 0.316356 | 9.06178 | UNIT I | 3 | 28 | 16.3168 | 16.0434 | 24.5311 | 0 | 24.5311 |
| 14 | 0.316356 | 9.7667 | UNIT I | 3 | 28 | 16.9666 | 16.6823 | 25.7326 | 0 | 25.7326 |
| 15 | 0.316356 | 10.4058 | UNIT I | 3 | 28 | 17.4622 | 17.1696 | 26.6491 | 0 | 26.6491 |
| 16 | 0.316356 | 10.9316 | UNIT I | 3 | 28 | 17.7396 | 17.4424 | 27.1621 | 0 | 27.1621 |
| 17 | 0.316356 | 11.2642 | UNIT I | 3 | 28 | 17.6967 | 17.4002 | 27.0829 | 0 | 27.0829 |
| 18 | 0.316356 | 11.3546 | UNIT I | 3 | 28 | 17.2847 | 16.9951 | 26.321 | 0 | 26.321 |
| 19 | 0.316356 | 11.295 | UNIT I | 3 | 28 | 16.6458 | 16.3669 | 25.1395 | 0 | 25.1395 |
| 20 | 0.316356 | 11.022 | UNIT I | 3 | 28 | 15.7128 | 15.4495 | 23.4141 | 0 | 23.4141 |
| 21 | 0.316356 | 10.4094 | UNIT I | 3 | 28 | 14.3556 | 14.1151 | 20.9045 | 0 | 20.9045 |
| 22 | 0.316356 | 9.29009 | UNIT I | 3 | 28 | 12.4274 | 12.2192 | 17.3387 | 0 | 17.3387 |
| 23 | 0.316356 | 7.36705 | UNIT I | 3 | 28 | 9.68906 | 9.52672 | 12.275 | 0 | 12.275 |
| 24 | 0.316356 | 4.78217 | UNIT I | 3 | 28 | 6.45001 | 6.34194 | 6.28527 | 0 | 6.28527 |
| 25 | 0.316356 | 1.69025 | UNIT I | 3 | 28 | 3.0512 | 3.00008 | 0.000146912 | 0 | 0.000146912 |

**Global Minimum Query (spencer) - Safety Factor**: 1.00939

| 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 | 0.312614 | 0.435866 | UNIT I | 3 | 28 | 5.66832 | 5.72155 | 5.11849 | 0 | 5.11849 |
| 2 | 0.312614 | 1.27415 | UNIT I | 3 | 28 | 7.50912 | 7.57963 | 8.61303 | 0 | 8.61303 |
| 3 | 0.312614 | 2.04556 | UNIT I | 3 | 28 | 8.99344 | 9.07789 | 11.4308 | 0 | 11.4308 |
| 4 | 0.312614 | 2.75001 | UNIT I | 3 | 28 | 10.1693 | 10.2648 | 13.663 | 0 | 13.663 |
| 5 | 0.312614 | 3.38716 | UNIT I | 3 | 28 | 11.0761 | 11.1801 | 15.3845 | 0 | 15.3845 |
| 6 | 0.312614 | 3.95639 | UNIT I | 3 | 28 | 11.7466 | 11.8569 | 16.6575 | 0 | 16.6575 |
| 7 | 0.312614 | 4.46681 | UNIT I | 3 | 28 | 12.2272 | 12.342 | 17.5697 | 0 | 17.5697 |
| 8 | 0.312614 | 5.15435 | UNIT I | 3 | 28 | 12.9647 | 13.0864 | 18.9697 | 0 | 18.9697 |
| 9 | 0.312614 | 5.87695 | UNIT I | 3 | 28 | 13.675 | 13.8034 | 20.3182 | 0 | 20.3182 |
| 10 | 0.312614 | 6.52614 | UNIT I | 3 | 28 | 14.1787 | 14.3118 | 21.2744 | 0 | 21.2744 |
| 11 | 0.312614 | 7.09964 | UNIT I | 3 | 28 | 14.4944 | 14.6305 | 21.8739 | 0 | 21.8739 |
| 12 | 0.312614 | 7.70804 | UNIT I | 3 | 28 | 14.8069 | 14.9459 | 22.4669 | 0 | 22.4669 |
| 13 | 0.312614 | 8.48121 | UNIT I | 3 | 28 | 15.2949 | 15.4385 | 23.3934 | 0 | 23.3934 |
| 14 | 0.312614 | 9.1773 | UNIT I | 3 | 28 | 15.6012 | 15.7477 | 23.975 | 0 | 23.975 |
| 15 | 0.312614 | 9.78244 | UNIT I | 3 | 28 | 15.7252 | 15.8729 | 24.2105 | 0 | 24.2105 |
| 16 | 0.312614 | 10.1898 | UNIT I | 3 | 28 | 15.5541 | 15.7002 | 23.8856 | 0 | 23.8856 |
| 17 | 0.312614 | 10.4213 | UNIT I | 3 | 28 | 15.1487 | 15.2909 | 23.1158 | 0 | 23.1158 |
| 18 | 0.312614 | 10.5421 | UNIT I | 3 | 28 | 14.6103 | 14.7475 | 22.0939 | 0 | 22.0939 |
| 19 | 0.312614 | 10.4736 | UNIT I | 3 | 28 | 13.8725 | 14.0028 | 20.6933 | 0 | 20.6933 |
| 20 | 0.312614 | 10.1449 | UNIT I | 3 | 28 | 12.8927 | 13.0138 | 18.8332 | 0 | 18.8332 |
| 21 | 0.312614 | 9.3145 | UNIT I | 3 | 28 | 11.4814 | 11.5892 | 16.1539 | 0 | 16.1539 |
| 22 | 0.312614 | 7.84533 | UNIT I | 3 | 28 | 9.59309 | 9.68317 | 12.5692 | 0 | 12.5692 |
| 23 | 0.312614 | 5.91873 | UNIT I | 3 | 28 | 7.47709 | 7.5473 | 8.55223 | 0 | 8.55223 |
| 24 | 0.312614 | 3.75496 | UNIT I | 3 | 28 | 5.37487 | 5.42534 | 4.56141 | 0 | 4.56141 |
| 25 | 0.312614 | 1.30473 | UNIT I | 3 | 28 | 3.54626 | 3.57956 | 1.09 | 0 | 1.09 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.991817

| 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 | 0.312614 | 0.435866 | UNIT I | 3 | 28 | 5.3006 | 5.25723 | 4.24524 | 0 | 4.24524 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.312614 | 1.27415 | UNIT I | 3 | 28 | 7.08795 | 7.02995 | 7.57925 | 0 | 7.57925 |
| 3 | 0.312614 | 2.04556 | UNIT I | 3 | 28 | 8.55993 | 8.48988 | 10.325 | 0 | 10.325 |
| 4 | 0.312614 | 2.75001 | UNIT I | 3 | 28 | 9.75417 | 9.67435 | 12.5526 | 0 | 12.5526 |
| 5 | 0.312614 | 3.38716 | UNIT I | 3 | 28 | 10.7018 | 10.6143 | 14.3203 | 0 | 14.3203 |
| 6 | 0.312614 | 3.95639 | UNIT I | 3 | 28 | 11.4289 | 11.3354 | 15.6766 | 0 | 15.6766 |
| 7 | 0.312614 | 4.46681 | UNIT I | 3 | 28 | 11.9759 | 11.878 | 16.697 | 0 | 16.697 |
| 8 | 0.312614 | 5.15435 | UNIT I | 3 | 28 | 12.786 | 12.6814 | 18.208 | 0 | 18.208 |
| 9 | 0.312614 | 5.87695 | UNIT I | 3 | 28 | 13.5781 | 13.467 | 19.6855 | 0 | 19.6855 |
| 10 | 0.312614 | 6.52614 | UNIT I | 3 | 28 | 14.1693 | 14.0534 | 20.7884 | 0 | 20.7884 |
| 11 | 0.312614 | 7.09964 | UNIT I | 3 | 28 | 14.5746 | 14.4553 | 21.5442 | 0 | 21.5442 |
| 12 | 0.312614 | 7.70804 | UNIT I | 3 | 28 | 14.9793 | 14.8567 | 22.2993 | 0 | 22.2993 |
| 13 | 0.312614 | 8.48121 | UNIT I | 3 | 28 | 15.5687 | 15.4413 | 23.3987 | 0 | 23.3987 |
| 14 | 0.312614 | 9.1773 | UNIT I | 3 | 28 | 15.9738 | 15.8431 | 24.1544 | 0 | 24.1544 |
| 15 | 0.312614 | 9.78244 | UNIT I | 3 | 28 | 16.1904 | 16.0579 | 24.5584 | 0 | 24.5584 |
| 16 | 0.312614 | 10.1898 | UNIT I | 3 | 28 | 16.0958 | 15.9641 | 24.3819 | 0 | 24.3819 |
| 17 | 0.312614 | 10.4213 | UNIT I | 3 | 28 | 15.7489 | 15.62 | 23.7347 | 0 | 23.7347 |
| 18 | 0.312614 | 10.5421 | UNIT I | 3 | 28 | 15.253 | 15.1282 | 22.8099 | 0 | 22.8099 |
| 19 | 0.312614 | 10.4736 | UNIT I | 3 | 28 | 14.5347 | 14.4158 | 21.4701 | 0 | 21.4701 |
| 20 | 0.312614 | 10.1449 | UNIT I | 3 | 28 | 13.545 | 13.4342 | 19.6239 | 0 | 19.6239 |
| 21 | 0.312614 | 9.3145 | UNIT I | 3 | 28 | 12.0765 | 11.9776 | 16.8845 | 0 | 16.8845 |
| 22 | 0.312614 | 7.84533 | UNIT I | 3 | 28 | 10.0762 | 9.99371 | 13.1533 | 0 | 13.1533 |
| 23 | 0.312614 | 5.91873 | UNIT I | 3 | 28 | 7.81334 | 7.7494 | 8.93233 | 0 | 8.93233 |
| 24 | 0.312614 | 3.75496 | UNIT I | 3 | 28 | 5.55517 | 5.50971 | 4.72009 | 0 | 4.72009 |
| 25 | 0.312614 | 1.30473 | UNIT I | 3 | 28 | 3.4708 | 3.4424 | 0.832038 | 0 | 0.832038 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.00809

| 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 | 0.312614 | 0.435866 | UNIT I | 3 | 28 | 4.94622 | 4.98623 | 3.73555 | 0 | 3.73555 |
| 2 | 0.312614 | 1.27415 | UNIT I | 3 | 28 | 6.65305 | 6.70687 | 6.97161 | 0 | 6.97161 |
| 3 | 0.312614 | 2.04556 | UNIT I | 3 | 28 | 8.07668 | 8.14202 | 9.67074 | 0 | 9.67074 |
| 4 | 0.312614 | 2.75001 | UNIT I | 3 | 28 | 9.24792 | 9.32274 | 11.8913 | 0 | 11.8913 |
| 5 | 0.312614 | 3.38716 | UNIT I | 3 | 28 | 10.1924 | 10.2749 | 13.682 | 0 | 13.682 |
| 6 | 0.312614 | 3.95639 | UNIT I | 3 | 28 | 11.4009 | 11.4931 | 15.9732 | 0 | 15.9732 |
| 7 | 0.312614 | 4.46681 | UNIT I | 3 | 28 | 13.8994 | 14.0118 | 20.7102 | 0 | 20.7102 |
| 8 | 0.312614 | 5.15435 | UNIT I | 3 | 28 | 14.6988 | 14.8177 | 22.2258 | 0 | 22.2258 |
| 9 | 0.312614 | 5.87695 | UNIT I | 3 | 28 | 13.6328 | 13.7431 | 20.2049 | 0 | 20.2049 |
| 10 | 0.312614 | 6.52614 | UNIT I | 3 | 28 | 14.151 | 14.2655 | 21.1874 | 0 | 21.1874 |
| 11 | 0.312614 | 7.09964 | UNIT I | 3 | 28 | 16.8483 | 16.9846 | 26.3011 | 0 | 26.3011 |
| 12 | 0.312614 | 7.70804 | UNIT I | 3 | 28 | 17.8986 | 18.0434 | 28.2925 | 0 | 28.2925 |
| 13 | 0.312614 | 8.48121 | UNIT I | 3 | 28 | 15.9596 | 16.0887 | 24.6162 | 0 | 24.6162 |
| 14 | 0.312614 | 9.1773 | UNIT I | 3 | 28 | 15.4008 | 15.5254 | 23.5569 | 0 | 23.5569 |
| 15 | 0.312614 | 9.78244 | UNIT I | 3 | 28 | 14.3489 | 14.465 | 21.5625 | 0 | 21.5625 |
| 16 | 0.312614 | 10.1898 | UNIT I | 3 | 28 | 14.4044 | 14.5209 | 21.6676 | 0 | 21.6676 |
| 17 | 0.312614 | 10.4213 | UNIT I | 3 | 28 | 14.9847 | 15.1059 | 22.7679 | 0 | 22.7679 |
| 18 | 0.312614 | 10.5421 | UNIT I | 3 | 28 | 13.7598 | 13.8711 | 20.4456 | 0 | 20.4456 |
| 19 | 0.312614 | 10.4736 | UNIT I | 3 | 28 | 13.1335 | 13.2398 | 19.2583 | 0 | 19.2583 |
| 20 | 0.312614 | 10.1449 | UNIT I | 3 | 28 | 11.4532 | 11.5458 | 16.0724 | 0 | 16.0724 |
| 21 | 0.312614 | 9.3145 | UNIT I | 3 | 28 | 10.6554 | 10.7416 | 14.5598 | 0 | 14.5598 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 0.312614 | 7.84533 | UNIT I | 3 | 28 | 10.5774 | 10.663 | 14.412 | 0 | 14.412 |
| 23 | 0.312614 | 5.91873 | UNIT I | 3 | 28 | 8.60481 | 8.67442 | 10.672 | 0 | 10.672 |
| 24 | 0.312614 | 3.75496 | UNIT I | 3 | 28 | 5.90957 | 5.95738 | 5.56202 | 0 | 5.56202 |
| 25 | 0.312614 | 1.30473 | UNIT I | 3 | 28 | 3.09274 | 3.11776 | 0.221479 | 0 | 0.221479 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.991925

| 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 | 0.312614 | 0.435866 | UNIT I | 3 | 28 | 4.37492 | 4.33959 | 2.5194 | 0 | 2.5194 |
| 2 | 0.312614 | 1.27415 | UNIT I | 3 | 28 | 6.08424 | 6.03511 | 5.7082 | 0 | 5.7082 |
| 3 | 0.312614 | 2.04556 | UNIT I | 3 | 28 | 7.59296 | 7.53165 | 8.52278 | 0 | 8.52278 |
| 4 | 0.312614 | 2.75001 | UNIT I | 3 | 28 | 8.90321 | 8.83132 | 10.9671 | 0 | 10.9671 |
| 5 | 0.312614 | 3.38716 | UNIT I | 3 | 28 | 10.0178 | 9.93687 | 13.0464 | 0 | 13.0464 |
| 6 | 0.312614 | 3.95639 | UNIT I | 3 | 28 | 11.1389 | 11.0489 | 15.1378 | 0 | 15.1378 |
| 7 | 0.312614 | 4.46681 | UNIT I | 3 | 28 | 12.697 | 12.5945 | 18.0446 | 0 | 18.0446 |
| 8 | 0.312614 | 5.15435 | UNIT I | 3 | 28 | 13.6853 | 13.5748 | 19.8884 | 0 | 19.8884 |
| 9 | 0.312614 | 5.87695 | UNIT I | 3 | 28 | 13.9378 | 13.8253 | 20.3595 | 0 | 20.3595 |
| 10 | 0.312614 | 6.52614 | UNIT I | 3 | 28 | 14.6661 | 14.5477 | 21.7181 | 0 | 21.7181 |
| 11 | 0.312614 | 7.09964 | UNIT I | 3 | 28 | 16.1636 | 16.0331 | 24.5117 | 0 | 24.5117 |
| 12 | 0.312614 | 7.70804 | UNIT I | 3 | 28 | 16.9289 | 16.7922 | 25.9393 | 0 | 25.9393 |
| 13 | 0.312614 | 8.48121 | UNIT I | 3 | 28 | 16.5867 | 16.4528 | 25.301 | 0 | 25.301 |
| 14 | 0.312614 | 9.1773 | UNIT I | 3 | 28 | 16.6125 | 16.4784 | 25.3492 | 0 | 25.3492 |
| 15 | 0.312614 | 9.78244 | UNIT I | 3 | 28 | 16.2208 | 16.0898 | 24.6184 | 0 | 24.6184 |
| 16 | 0.312614 | 10.1898 | UNIT I | 3 | 28 | 16.0419 | 15.9124 | 24.2846 | 0 | 24.2846 |
| 17 | 0.312614 | 10.4213 | UNIT I | 3 | 28 | 15.9511 | 15.8223 | 24.1152 | 0 | 24.1152 |
| 18 | 0.312614 | 10.5421 | UNIT I | 3 | 28 | 14.9004 | 14.7801 | 22.1551 | 0 | 22.1551 |
| 19 | 0.312614 | 10.4736 | UNIT I | 3 | 28 | 13.9908 | 13.8778 | 20.4582 | 0 | 20.4582 |
| 20 | 0.312614 | 10.1449 | UNIT I | 3 | 28 | 12.4201 | 12.3198 | 17.5281 | 0 | 17.5281 |
| 21 | 0.312614 | 9.3145 | UNIT I | 3 | 28 | 11.1413 | 11.0513 | 15.1424 | 0 | 15.1424 |
| 22 | 0.312614 | 7.84533 | UNIT I | 3 | 28 | 10.0149 | 9.93402 | 13.041 | 0 | 13.041 |
| 23 | 0.312614 | 5.91873 | UNIT I | 3 | 28 | 7.88125 | 7.81761 | 9.06061 | 0 | 9.06061 |
| 24 | 0.312614 | 3.75496 | UNIT I | 3 | 28 | 5.54322 | 5.49846 | 4.69892 | 0 | 4.69892 |
| 25 | 0.312614 | 1.30473 | UNIT I | 3 | 28 | 3.48707 | 3.45891 | 0.863093 | 0 | 0.863093 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.01565

| 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 | 0.312614 | 0.435866 | UNIT I | 3 | 28 | 4.0577 | 4.1212 | 2.10867 | 0 | 2.10867 |
| 2 | 0.312614 | 1.27415 | UNIT I | 3 | 28 | 6.10275 | 6.19826 | 6.01506 | 0 | 6.01506 |
| 3 | 0.312614 | 2.04556 | UNIT I | 3 | 28 | 8.10872 | 8.23562 | 9.84679 | 0 | 9.84679 |
| 4 | 0.312614 | 2.75001 | UNIT I | 3 | 28 | 9.97215 | 10.1282 | 13.4062 | 0 | 13.4062 |
| 5 | 0.312614 | 3.38716 | UNIT I | 3 | 28 | 11.5847 | 11.766 | 16.4863 | 0 | 16.4863 |
| 6 | 0.312614 | 3.95639 | UNIT I | 3 | 28 | 12.8535 | 13.0547 | 18.9102 | 0 | 18.9102 |
| 7 | 0.312614 | 4.46681 | UNIT I | 3 | 28 | 13.7373 | 13.9523 | 20.5983 | 0 | 20.5983 |
| 8 | 0.312614 | 5.15435 | UNIT I | 3 | 28 | 14.6409 | 14.87 | 22.3242 | 0 | 22.3242 |
| 9 | 0.312614 | 5.87695 | UNIT I | 3 | 28 | 15.2858 | 15.525 | 23.5561 | 0 | 23.5561 |
| 10 | 0.312614 | 6.52614 | UNIT I | 3 | 28 | 15.5186 | 15.7615 | 24.001 | 0 | 24.001 |
| 11 | 0.312614 | 7.09964 | UNIT I | 3 | 28 | 15.4124 | 15.6536 | 23.798 | 0 | 23.798 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.312614 | 7.70804 | UNIT I | 3 | 28 | 15.2186 | 15.4568 | 23.4278 | 0 | 23.4278 |
| 13 | 0.312614 | 8.48121 | UNIT I | 3 | 28 | 15.1798 | 15.4174 | 23.3538 | 0 | 23.3538 |
| 14 | 0.312614 | 9.1773 | UNIT I | 3 | 28 | 15.0103 | 15.2452 | 23.0298 | 0 | 23.0298 |
| 15 | 0.312614 | 9.78244 | UNIT I | 3 | 28 | 14.7642 | 14.9953 | 22.5598 | 0 | 22.5598 |
| 16 | 0.312614 | 10.1898 | UNIT I | 3 | 28 | 14.3703 | 14.5952 | 21.8074 | 0 | 21.8074 |
| 17 | 0.312614 | 10.4213 | UNIT I | 3 | 28 | 13.9054 | 14.123 | 20.9193 | 0 | 20.9193 |
| 18 | 0.312614 | 10.5421 | UNIT I | 3 | 28 | 13.4705 | 13.6813 | 20.0886 | 0 | 20.0886 |
| 19 | 0.312614 | 10.4736 | UNIT I | 3 | 28 | 12.9902 | 13.1935 | 19.1712 | 0 | 19.1712 |
| 20 | 0.312614 | 10.1449 | UNIT I | 3 | 28 | 12.3937 | 12.5876 | 18.0317 | 0 | 18.0317 |
| 21 | 0.312614 | 9.3145 | UNIT I | 3 | 28 | 11.4222 | 11.6009 | 16.176 | 0 | 16.176 |
| 22 | 0.312614 | 7.84533 | UNIT I | 3 | 28 | 9.90775 | 10.0628 | 13.2832 | 0 | 13.2832 |
| 23 | 0.312614 | 5.91873 | UNIT I | 3 | 28 | 7.97492 | 8.09973 | 9.59119 | 0 | 9.59119 |
| 24 | 0.312614 | 3.75496 | UNIT I | 3 | 28 | 5.76141 | 5.85158 | 5.36306 | 0 | 5.36306 |
| 25 | 0.312614 | 1.30473 | UNIT I | 3 | 28 | 3.10919 | 3.15785 | 0.296872 | 0 | 0.296872 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

### External Boundary

| X | Y |
|---|---|
| 42.2084 | 59.656 |
| 40.5299 | 57.6985 |
| 39.2201 | 56.0079 |
| 37.5797 | 54.3301 |
| 36.0284 | 53.0971 |
| 34.9857 | 52.3471 |
| 32.931 | 51.3318 |
| 32.4461 | 51.1888 |
| 32.1758 | 51.2126 |
| 31.6273 | 51.2126 |
| 31.1106 | 51.1173 |
| 30.8801 | 50.9584 |
| 30.4826 | 51.006 |
| 29.3379 | 51.0855 |
| 28.2568 | 51.1173 |
| 24.7792 | 51.0927 |
| 22.0128 | 50.9974 |
| 21.6472 | 50.902 |
| 21.0828 | 50.5524 |
| 20.0653 | 49.8134 |
| 18.9094 | 48.8644 |

| | |
|---|---|
| 17.5182 | 47.9982 |
| 14.7996 | 46.8381 |
| 11.6166 | 46.1137 |
| 9.81213 | 45.8117 |
| 9.0967 | 45.8514 |
| 8.0633 | 45.8117 |
| 6.7641 | 45.612 |
| 6.55742 | 45.5405 |
| 5.53992 | 44.9127 |
| 5.02322 | 44.8015 |
| 4.35549 | 44.5869 |
| 0.198047 | 43.403 |
| -3.76343 | 42.432 |
| -9.07729 | 41.119 |
| -15.1823 | 39.5377 |
| -18.268 | 38.8216 |
| -18.268 | 35.5812 |
| -18.268 | 33.5624 |
| -18.268 | 28.0059 |
| 44.4591 | 28.0059 |
| 44.4591 | 46.5638 |
| 44.4591 | 57.23 |
| 44.4591 | 59.34 |
| 44.4591 | 61.8678 |

## Material Boundary

| X | Y |
|---|---|
| 37.639 | 52.44 |
| 44.4591 | 59.34 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 47.235 |
| 30.8801 | 49.506 |

## Material Boundary

| X | Y |
|---|---|
| -9.07729 | 41.119 |
| 2.44 | 42.482 |
| 21.211 | 47.235 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 44.211 |
| 31.462 | 47.978 |
| 39.112 | 51.057 |

| | |
|---|---|
| 44.4591 | 57.23 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 44.211 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 33.5624 |
| 21.211 | 40.173 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 40.173 |
| 44.4591 | 46.5638 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: YK S60Λ-SLIDE EQ=0.20up c=3
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/3/2021, 20:34:28

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): -0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT |
|---|---|---|---|---|---|
| Color | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 |
| Water Surface | None | None | Water Table | Water Table | Water Table |
| Hu Value | | | 1 | 1 | 1 |
| Ru Value | 0 | 0 | | | |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.931461
Center: 16.001, 55.314
Radius: 8.508
Left Slip Surface Endpoint: 14.893, 46.878
Right Slip Surface Endpoint: 23.360, 51.044
Resisting Moment=879.252 kN-m
Driving Moment=943.95 kN-m

### Method: bishop simplified

FS: 1.006680
Center: 15.376, 56.367

Radius: 9.694
Left Slip Surface Endpoint: 14.324, 46.730
Right Slip Surface Endpoint: 23.480, 51.048
Resisting Moment=1121.45 kN-m
Driving Moment=1114.01 kN-m

## Method: janbu simplified

FS: 0.913837
Center: 16.490, 53.581
Radius: 6.902
Left Slip Surface Endpoint: 14.875, 46.870
Right Slip Surface Endpoint: 22.903, 51.028
Resisting Horizontal Force=96.7483 kN
Driving Horizontal Force=105.87 kN

## Method: janbu corrected

FS: 0.972150
Center: 16.001, 55.314
Radius: 8.508
Left Slip Surface Endpoint: 14.893, 46.878
Right Slip Surface Endpoint: 23.360, 51.044
Resisting Horizontal Force=100.408 kN
Driving Horizontal Force=103.285 kN

## Method: spencer

FS: 1.008960
Center: 16.001, 55.314
Radius: 8.508
Left Slip Surface Endpoint: 14.893, 46.878
Right Slip Surface Endpoint: 23.360, 51.044
Resisting Moment=952.411 kN-m
Driving Moment=943.95 kN-m
Resisting Horizontal Force=98.7899 kN
Driving Horizontal Force=97.9122 kN

## Method: corp of eng#1

FS: 0.983330
Center: 16.001, 55.314
Radius: 8.508
Left Slip Surface Endpoint: 14.893, 46.878
Right Slip Surface Endpoint: 23.360, 51.044
Resisting Horizontal Force=97.6877 kN
Driving Horizontal Force=99.3437 kN

## Method: corp of eng#2

FS: 1.002120
Center: 15.376, 56.367
Radius: 9.694
Left Slip Surface Endpoint: 14.324, 46.730
Right Slip Surface Endpoint: 23.480, 51.048
Resisting Horizontal Force=102.286 kN
Driving Horizontal Force=102.07 kN

### Method: lowe-karafiath

FS: 0.980855
Center: 16.001, 55.314
Radius: 8.508
Left Slip Surface Endpoint: 14.893, 46.878
Right Slip Surface Endpoint: 23.360, 51.044
Resisting Horizontal Force=97.6816 kN
Driving Horizontal Force=99.5883 kN

### Method: gle/morgenstern-price

FS: 1.010990
Center: 15.376, 56.367
Radius: 9.694
Left Slip Surface Endpoint: 14.324, 46.730
Right Slip Surface Endpoint: 23.480, 51.048
Resisting Moment=1126.25 kN-m
Driving Moment=1114.01 kN-m
Resisting Horizontal Force=102.692 kN
Driving Horizontal Force=101.576 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 9520
Number of Invalid Surfaces: 480

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 71 surfaces
Error Code -108 reported for 128 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 276 surfaces
Error Code -123 reported for 3 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 9520
Number of Invalid Surfaces: 480

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 71 surfaces
Error Code -108 reported for 128 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 276 surfaces
Error Code -123 reported for 3 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 9363

Number of Invalid Surfaces: 637

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 71 surfaces
Error Code -108 reported for 285 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 276 surfaces
Error Code -123 reported for 3 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 9363
Number of Invalid Surfaces: 637

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 71 surfaces
Error Code -108 reported for 285 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 276 surfaces
Error Code -123 reported for 3 surfaces

## Method: spencer

Number of Valid Surfaces: 9082
Number of Invalid Surfaces: 918

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 71 surfaces
Error Code -108 reported for 295 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 271 surfaces
Error Code -114 reported for 276 surfaces
Error Code -123 reported for 3 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 9294
Number of Invalid Surfaces: 706

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 71 surfaces
Error Code -108 reported for 301 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 53 surfaces
Error Code -114 reported for 276 surfaces
Error Code -123 reported for 3 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 8801
Number of Invalid Surfaces: 1199

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 71 surfaces
Error Code -108 reported for 568 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 279 surfaces
Error Code -114 reported for 276 surfaces
Error Code -123 reported for 3 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 6197
Number of Invalid Surfaces: 3803

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 71 surfaces
Error Code -108 reported for 2575 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 876 surfaces
Error Code -114 reported for 276 surfaces
Error Code -123 reported for 3 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 9349
Number of Invalid Surfaces: 651

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 71 surfaces
Error Code -108 reported for 289 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 10 surfaces
Error Code -114 reported for 276 surfaces
Error Code -123 reported for 3 surfaces

**Error Codes**

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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.
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## Slice Data

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.931461

| 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 | 0.338694 | 0.586062 | UNIT I | 3 | 28 | 4.12056 | 3.83814 | 1.57631 | 0 | 1.57631 |
| 2 | 0.338694 | 1.71425 | UNIT I | 3 | 28 | 5.84874 | 5.44787 | 4.60378 | 0 | 4.60378 |
| 3 | 0.338694 | 2.75493 | UNIT I | 3 | 28 | 7.42415 | 6.91531 | 7.36364 | 0 | 7.36364 |
| 4 | 0.338694 | 3.70863 | UNIT I | 3 | 28 | 8.83439 | 8.22889 | 9.83413 | 0 | 9.83413 |
| 5 | 0.338694 | 4.57548 | UNIT I | 3 | 28 | 10.0692 | 9.37903 | 11.9972 | 0 | 11.9972 |
| 6 | 0.338694 | 5.35516 | UNIT I | 3 | 28 | 11.1203 | 10.3581 | 13.8386 | 0 | 13.8386 |
| 7 | 0.338694 | 6.04695 | UNIT I | 3 | 28 | 11.9817 | 11.1605 | 15.3477 | 0 | 15.3477 |
| 8 | 0.338694 | 6.66286 | UNIT I | 3 | 28 | 12.6682 | 11.8 | 16.5503 | 0 | 16.5503 |
| 9 | 0.338694 | 7.48129 | UNIT I | 3 | 28 | 13.5636 | 12.634 | 18.1188 | 0 | 18.1188 |
| 10 | 0.338694 | 8.32742 | UNIT I | 3 | 28 | 14.4011 | 13.4141 | 19.586 | 0 | 19.586 |
| 11 | 0.338694 | 9.07799 | UNIT I | 3 | 28 | 15.0067 | 13.9782 | 20.647 | 0 | 20.647 |
| 12 | 0.338694 | 9.73395 | UNIT I | 3 | 28 | 15.3853 | 14.3308 | 21.3101 | 0 | 21.3101 |
| 13 | 0.338694 | 10.5555 | UNIT I | 3 | 28 | 15.8543 | 14.7677 | 22.1318 | 0 | 22.1318 |
| 14 | 0.338694 | 11.4285 | UNIT I | 3 | 28 | 16.2479 | 15.1343 | 22.8213 | 0 | 22.8213 |
| 15 | 0.338694 | 12.1873 | UNIT I | 3 | 28 | 16.3691 | 15.2472 | 23.0336 | 0 | 23.0336 |
| 16 | 0.338694 | 12.7698 | UNIT I | 3 | 28 | 16.1678 | 15.0597 | 22.681 | 0 | 22.681 |
| 17 | 0.338694 | 13.0776 | UNIT I | 3 | 28 | 15.5801 | 14.5123 | 21.6515 | 0 | 21.6515 |
| 18 | 0.338694 | 13.236 | UNIT I | 3 | 28 | 14.7702 | 13.7579 | 20.2327 | 0 | 20.2327 |
| 19 | 0.338694 | 13.1775 | UNIT I | 3 | 28 | 13.7173 | 12.7771 | 18.3881 | 0 | 18.3881 |
| 20 | 0.338694 | 12.7814 | UNIT I | 3 | 28 | 12.3869 | 11.5379 | 16.0575 | 0 | 16.0575 |
| 21 | 0.338694 | 11.7463 | UNIT I | 3 | 28 | 10.6751 | 9.94342 | 13.0587 | 0 | 13.0587 |
| 22 | 0.338694 | 9.9007 | UNIT I | 3 | 28 | 8.65827 | 8.06484 | 9.52559 | 0 | 9.52559 |
| 23 | 0.338694 | 7.5279 | UNIT I | 3 | 28 | 6.69323 | 6.23448 | 6.08317 | 0 | 6.08317 |
| 24 | 0.338694 | 4.82288 | UNIT I | 3 | 28 | 5.01155 | 4.66806 | 3.13716 | 0 | 3.13716 |
| 25 | 0.338694 | 1.68904 | UNIT I | 3 | 28 | 3.69365 | 3.44049 | 0.82845 | 0 | 0.82845 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.00668

| 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 | 0.366234 | 0.404617 | UNIT I | 3 | 28 | 3.68031 | 3.7049 | 1.32572 | 0 | 1.32572 |
| 2 | 0.366234 | 1.29036 | UNIT I | 3 | 28 | 4.78621 | 4.81818 | 3.4195 | 0 | 3.4195 |
| 3 | 0.366234 | 2.43926 | UNIT I | 3 | 28 | 6.19207 | 6.23343 | 6.08119 | 0 | 6.08119 |
| 4 | 0.366234 | 3.51431 | UNIT I | 3 | 28 | 7.44791 | 7.49766 | 8.45889 | 0 | 8.45889 |
| 5 | 0.366234 | 4.49291 | UNIT I | 3 | 28 | 8.53346 | 8.59046 | 10.5141 | 0 | 10.5141 |
| 6 | 0.366234 | 5.3746 | UNIT I | 3 | 28 | 9.4569 | 9.52007 | 12.2625 | 0 | 12.2625 |
| 7 | 0.366234 | 6.15847 | UNIT I | 3 | 28 | 10.2251 | 10.2934 | 13.7169 | 0 | 13.7169 |
| 8 | 0.366234 | 6.84318 | UNIT I | 3 | 28 | 10.8437 | 10.9161 | 14.888 | 0 | 14.888 |
| 9 | 0.366234 | 7.4463 | UNIT I | 3 | 28 | 11.3398 | 11.4156 | 15.8274 | 0 | 15.8274 |
| 10 | 0.366234 | 8.29605 | UNIT I | 3 | 28 | 12.0935 | 12.1743 | 17.2543 | 0 | 17.2543 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 0.366234 | 9.16941 | UNIT I | 3 | 28 | 12.838 | 12.9237 | 18.6638 | 0 | 18.6638 |
| 12 | 0.366234 | 9.93295 | UNIT I | 3 | 28 | 13.4243 | 13.514 | 19.7739 | 0 | 19.7739 |
| 13 | 0.366234 | 10.6407 | UNIT I | 3 | 28 | 13.9167 | 14.0097 | 20.7062 | 0 | 20.7062 |
| 14 | 0.366234 | 11.6081 | UNIT I | 3 | 28 | 14.6495 | 14.7474 | 22.0937 | 0 | 22.0937 |
| 15 | 0.366234 | 12.5181 | UNIT I | 3 | 28 | 15.2765 | 15.3785 | 23.2806 | 0 | 23.2806 |
| 16 | 0.366234 | 13.2824 | UNIT I | 3 | 28 | 15.7091 | 15.814 | 24.0996 | 0 | 24.0996 |
| 17 | 0.366234 | 13.7308 | UNIT I | 3 | 28 | 15.7865 | 15.892 | 24.2462 | 0 | 24.2462 |
| 18 | 0.366234 | 13.9706 | UNIT I | 3 | 28 | 15.6303 | 15.7347 | 23.9506 | 0 | 23.9506 |
| 19 | 0.366234 | 14.003 | UNIT I | 3 | 28 | 15.2523 | 15.3542 | 23.2348 | 0 | 23.2348 |
| 20 | 0.366234 | 13.6476 | UNIT I | 3 | 28 | 14.4999 | 14.5968 | 21.8102 | 0 | 21.8102 |
| 21 | 0.366234 | 12.597 | UNIT I | 3 | 28 | 13.1285 | 13.2162 | 19.214 | 0 | 19.214 |
| 22 | 0.366234 | 10.5679 | UNIT I | 3 | 28 | 10.9542 | 11.0273 | 15.0972 | 0 | 15.0972 |
| 23 | 0.366234 | 7.98258 | UNIT I | 3 | 28 | 8.4169 | 8.47312 | 10.2934 | 0 | 10.2934 |
| 24 | 0.366234 | 5.07374 | UNIT I | 3 | 28 | 5.76762 | 5.80615 | 5.27759 | 0 | 5.27759 |
| 25 | 0.366234 | 1.76541 | UNIT I | 3 | 28 | 3.01087 | 3.03098 | 0.0582622 | 0 | 0.0582622 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.913837

| 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 | 0.321151 | 0.629494 | UNIT I | 3 | 28 | 4.9278 | 4.50321 | 2.82713 | 0 | 2.82713 |
| 2 | 0.321151 | 1.84035 | UNIT I | 3 | 28 | 6.95813 | 6.3586 | 6.3166 | 0 | 6.3166 |
| 3 | 0.321151 | 2.95605 | UNIT I | 3 | 28 | 8.7036 | 7.95367 | 9.31647 | 0 | 9.31647 |
| 4 | 0.321151 | 3.97851 | UNIT I | 3 | 28 | 10.1938 | 9.31546 | 11.8777 | 0 | 11.8777 |
| 5 | 0.321151 | 4.90897 | UNIT I | 3 | 28 | 11.452 | 10.4653 | 14.0401 | 0 | 14.0401 |
| 6 | 0.321151 | 5.74804 | UNIT I | 3 | 28 | 12.4967 | 11.42 | 15.8356 | 0 | 15.8356 |
| 7 | 0.321151 | 6.49575 | UNIT I | 3 | 28 | 13.3427 | 12.193 | 17.2896 | 0 | 17.2896 |
| 8 | 0.321151 | 7.15152 | UNIT I | 3 | 28 | 14.0016 | 12.7952 | 18.422 | 0 | 18.422 |
| 9 | 0.321151 | 7.82734 | UNIT I | 3 | 28 | 14.6513 | 13.3889 | 19.5388 | 0 | 19.5388 |
| 10 | 0.321151 | 8.66847 | UNIT I | 3 | 28 | 15.4998 | 14.1643 | 20.997 | 0 | 20.997 |
| 11 | 0.321151 | 9.42233 | UNIT I | 3 | 28 | 16.1704 | 14.7771 | 22.1495 | 0 | 22.1495 |
| 12 | 0.321151 | 10.0752 | UNIT I | 3 | 28 | 16.6522 | 15.2174 | 22.9777 | 0 | 22.9777 |
| 13 | 0.321151 | 10.6597 | UNIT I | 3 | 28 | 16.9978 | 15.5332 | 23.5715 | 0 | 23.5715 |
| 14 | 0.321151 | 11.4233 | UNIT I | 3 | 28 | 17.5341 | 16.0233 | 24.4932 | 0 | 24.4932 |
| 15 | 0.321151 | 12.1309 | UNIT I | 3 | 28 | 17.9389 | 16.3932 | 25.189 | 0 | 25.189 |
| 16 | 0.321151 | 12.712 | UNIT I | 3 | 28 | 18.1261 | 16.5643 | 25.5107 | 0 | 25.5107 |
| 17 | 0.321151 | 13.0906 | UNIT I | 3 | 28 | 18.0122 | 16.4602 | 25.3149 | 0 | 25.3149 |
| 18 | 0.321151 | 13.1994 | UNIT I | 3 | 28 | 17.5345 | 16.0237 | 24.494 | 0 | 24.494 |
| 19 | 0.321151 | 13.1358 | UNIT I | 3 | 28 | 16.8242 | 15.3746 | 23.2732 | 0 | 23.2732 |
| 20 | 0.321151 | 12.8309 | UNIT I | 3 | 28 | 15.8182 | 14.4553 | 21.5443 | 0 | 21.5443 |
| 21 | 0.321151 | 12.1466 | UNIT I | 3 | 28 | 14.3956 | 13.1552 | 19.0992 | 0 | 19.0992 |
| 22 | 0.321151 | 10.8813 | UNIT I | 3 | 28 | 12.4048 | 11.336 | 15.6777 | 0 | 15.6777 |
| 23 | 0.321151 | 8.72209 | UNIT I | 3 | 28 | 9.65163 | 8.82002 | 10.9459 | 0 | 10.9459 |
| 24 | 0.321151 | 5.77802 | UNIT I | 3 | 28 | 6.41161 | 5.85917 | 5.37731 | 0 | 5.37731 |
| 25 | 0.321151 | 2.07949 | UNIT I | 3 | 28 | 2.95965 | 2.70463 | -0.555504 | 0 | -0.555504 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 0.97215

| | | | | | Base | | | Base | | Effective |
|---|---|---|---|---|---|---|---|---|---|---|

| Slice Number | Width [m] | Weight [kN] | Base Material | Cohesion [kPa] | Friction Angle [degrees] | Stress [kPa] | Strength [kPa] | Normal Stress [kPa] | Pressure [kPa] | Normal Stress [kPa] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.338694 | 0.586062 | UNIT I | 3 | 28 | 4.20972 | 4.09248 | 2.05466 | 0 | 2.05466 |
| 2 | 0.338694 | 1.71425 | UNIT I | 3 | 28 | 5.81677 | 5.65477 | 4.9929 | 0 | 4.9929 |
| 3 | 0.338694 | 2.75493 | UNIT I | 3 | 28 | 7.21903 | 7.01798 | 7.55673 | 0 | 7.55673 |
| 4 | 0.338694 | 3.70863 | UNIT I | 3 | 28 | 8.43138 | 8.19657 | 9.77334 | 0 | 9.77334 |
| 5 | 0.338694 | 4.57548 | UNIT I | 3 | 28 | 9.46612 | 9.20249 | 11.6652 | 0 | 11.6652 |
| 6 | 0.338694 | 5.35516 | UNIT I | 3 | 28 | 10.3334 | 10.0456 | 13.2509 | 0 | 13.2509 |
| 7 | 0.338694 | 6.04695 | UNIT I | 3 | 28 | 11.0416 | 10.7341 | 14.5458 | 0 | 14.5458 |
| 8 | 0.338694 | 6.66286 | UNIT I | 3 | 28 | 11.6152 | 11.2917 | 15.5945 | 0 | 15.5945 |
| 9 | 0.338694 | 7.48129 | UNIT I | 3 | 28 | 12.4208 | 12.0749 | 17.0673 | 0 | 17.0673 |
| 10 | 0.338694 | 8.32742 | UNIT I | 3 | 28 | 13.2196 | 12.8515 | 18.5279 | 0 | 18.5279 |
| 11 | 0.338694 | 9.07799 | UNIT I | 3 | 28 | 13.8565 | 13.4706 | 19.6924 | 0 | 19.6924 |
| 12 | 0.338694 | 9.73395 | UNIT I | 3 | 28 | 14.3396 | 13.9402 | 20.5755 | 0 | 20.5755 |
| 13 | 0.338694 | 10.5555 | UNIT I | 3 | 28 | 14.9826 | 14.5653 | 21.7512 | 0 | 21.7512 |
| 14 | 0.338694 | 11.4285 | UNIT I | 3 | 28 | 15.638 | 15.2025 | 22.9495 | 0 | 22.9495 |
| 15 | 0.338694 | 12.1873 | UNIT I | 3 | 28 | 16.1123 | 15.6636 | 23.8168 | 0 | 23.8168 |
| 16 | 0.338694 | 12.7698 | UNIT I | 3 | 28 | 16.3436 | 15.8884 | 24.2396 | 0 | 24.2396 |
| 17 | 0.338694 | 13.0776 | UNIT I | 3 | 28 | 16.2375 | 15.7853 | 24.0456 | 0 | 24.0456 |
| 18 | 0.338694 | 13.236 | UNIT I | 3 | 28 | 15.9437 | 15.4997 | 23.5085 | 0 | 23.5085 |
| 19 | 0.338694 | 13.1775 | UNIT I | 3 | 28 | 15.4027 | 14.9737 | 22.5193 | 0 | 22.5193 |
| 20 | 0.338694 | 12.7814 | UNIT I | 3 | 28 | 14.5113 | 14.1072 | 20.8897 | 0 | 20.8897 |
| 21 | 0.338694 | 11.7463 | UNIT I | 3 | 28 | 13.0154 | 12.6529 | 18.1545 | 0 | 18.1545 |
| 22 | 0.338694 | 9.9007 | UNIT I | 3 | 28 | 10.826 | 10.5245 | 14.1515 | 0 | 14.1515 |
| 23 | 0.338694 | 7.5279 | UNIT I | 3 | 28 | 8.28536 | 8.05461 | 9.50634 | 0 | 9.50634 |
| 24 | 0.338694 | 4.82288 | UNIT I | 3 | 28 | 5.63507 | 5.47813 | 4.66068 | 0 | 4.66068 |
| 25 | 0.338694 | 1.68904 | UNIT I | 3 | 28 | 2.8829 | 2.80261 | -0.371242 | 0 | -0.371242 |

**Global Minimum Query (spencer) - Safety Factor**: 1.00896

| 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 | 0.338694 | 0.586062 | UNIT I | 3 | 28 | 6.35048 | 6.40738 | 6.40834 | 0 | 6.40834 |
| 2 | 0.338694 | 1.71425 | UNIT I | 3 | 28 | 8.29787 | 8.37222 | 10.1037 | 0 | 10.1037 |
| 3 | 0.338694 | 2.75493 | UNIT I | 3 | 28 | 9.8022 | 9.89003 | 12.9583 | 0 | 12.9583 |
| 4 | 0.338694 | 3.70863 | UNIT I | 3 | 28 | 10.9501 | 11.0482 | 15.1364 | 0 | 15.1364 |
| 5 | 0.338694 | 4.57548 | UNIT I | 3 | 28 | 11.8055 | 11.9113 | 16.7597 | 0 | 16.7597 |
| 6 | 0.338694 | 5.35516 | UNIT I | 3 | 28 | 12.4169 | 12.5282 | 17.9199 | 0 | 17.9199 |
| 7 | 0.338694 | 6.04695 | UNIT I | 3 | 28 | 12.821 | 12.9359 | 18.6867 | 0 | 18.6867 |
| 8 | 0.338694 | 6.66286 | UNIT I | 3 | 28 | 13.0647 | 13.1818 | 19.1491 | 0 | 19.1491 |
| 9 | 0.338694 | 7.48129 | UNIT I | 3 | 28 | 13.5362 | 13.6575 | 20.0439 | 0 | 20.0439 |
| 10 | 0.338694 | 8.32742 | UNIT I | 3 | 28 | 13.978 | 14.1032 | 20.8822 | 0 | 20.8822 |
| 11 | 0.338694 | 9.07799 | UNIT I | 3 | 28 | 14.2427 | 14.3703 | 21.3845 | 0 | 21.3845 |
| 12 | 0.338694 | 9.73395 | UNIT I | 3 | 28 | 14.3516 | 14.4802 | 21.5911 | 0 | 21.5911 |
| 13 | 0.338694 | 10.5555 | UNIT I | 3 | 28 | 14.6002 | 14.731 | 22.0628 | 0 | 22.0628 |
| 14 | 0.338694 | 11.4285 | UNIT I | 3 | 28 | 14.8452 | 14.9782 | 22.5278 | 0 | 22.5278 |
| 15 | 0.338694 | 12.1873 | UNIT I | 3 | 28 | 14.9186 | 15.0523 | 22.6671 | 0 | 22.6671 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.338694 | 12.7698 | UNIT I | 3 | 28 | 14.7794 | 14.9118 | 22.4029 | 0 | 22.4029 |
| 17 | 0.338694 | 13.0776 | UNIT I | 3 | 28 | 14.3647 | 14.4934 | 21.6159 | 0 | 21.6159 |
| 18 | 0.338694 | 13.236 | UNIT I | 3 | 28 | 13.8121 | 13.9359 | 20.5675 | 0 | 20.5675 |
| 19 | 0.338694 | 13.1775 | UNIT I | 3 | 28 | 13.0849 | 13.2021 | 19.1874 | 0 | 19.1874 |
| 20 | 0.338694 | 12.7814 | UNIT I | 3 | 28 | 12.118 | 12.2266 | 17.3526 | 0 | 17.3526 |
| 21 | 0.338694 | 11.7463 | UNIT I | 3 | 28 | 10.7449 | 10.8412 | 14.7471 | 0 | 14.7471 |
| 22 | 0.338694 | 9.9007 | UNIT I | 3 | 28 | 8.93919 | 9.01929 | 11.3206 | 0 | 11.3206 |
| 23 | 0.338694 | 7.5279 | UNIT I | 3 | 28 | 6.98056 | 7.04311 | 7.60397 | 0 | 7.60397 |
| 24 | 0.338694 | 4.82288 | UNIT I | 3 | 28 | 5.05477 | 5.10006 | 3.94964 | 0 | 3.94964 |
| 25 | 0.338694 | 1.68904 | UNIT I | 3 | 28 | 3.22861 | 3.25754 | 0.484356 | 0 | 0.484356 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.98333

| 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 | 0.338694 | 0.586062 | UNIT I | 3 | 28 | 5.70279 | 5.60772 | 4.90439 | 0 | 4.90439 |
| 2 | 0.338694 | 1.71425 | UNIT I | 3 | 28 | 7.61703 | 7.49005 | 8.44454 | 0 | 8.44454 |
| 3 | 0.338694 | 2.75493 | UNIT I | 3 | 28 | 9.16692 | 9.01411 | 11.3109 | 0 | 11.3109 |
| 4 | 0.338694 | 3.70863 | UNIT I | 3 | 28 | 10.4053 | 10.2318 | 13.6011 | 0 | 13.6011 |
| 5 | 0.338694 | 4.57548 | UNIT I | 3 | 28 | 11.3741 | 11.1845 | 15.3928 | 0 | 15.3928 |
| 6 | 0.338694 | 5.35516 | UNIT I | 3 | 28 | 12.1073 | 11.9054 | 16.7487 | 0 | 16.7487 |
| 7 | 0.338694 | 6.04695 | UNIT I | 3 | 28 | 12.6322 | 12.4216 | 17.7195 | 0 | 17.7195 |
| 8 | 0.338694 | 6.66286 | UNIT I | 3 | 28 | 12.9901 | 12.7735 | 18.3813 | 0 | 18.3813 |
| 9 | 0.338694 | 7.48129 | UNIT I | 3 | 28 | 13.5733 | 13.347 | 19.4599 | 0 | 19.4599 |
| 10 | 0.338694 | 8.32742 | UNIT I | 3 | 28 | 14.1232 | 13.8878 | 20.477 | 0 | 20.477 |
| 11 | 0.338694 | 9.07799 | UNIT I | 3 | 28 | 14.4875 | 14.246 | 21.1507 | 0 | 21.1507 |
| 12 | 0.338694 | 9.73395 | UNIT I | 3 | 28 | 14.6854 | 14.4406 | 21.5167 | 0 | 21.5167 |
| 13 | 0.338694 | 10.5555 | UNIT I | 3 | 28 | 15.0247 | 14.7742 | 22.144 | 0 | 22.144 |
| 14 | 0.338694 | 11.4285 | UNIT I | 3 | 28 | 15.358 | 15.102 | 22.7605 | 0 | 22.7605 |
| 15 | 0.338694 | 12.1873 | UNIT I | 3 | 28 | 15.5088 | 15.2503 | 23.0394 | 0 | 23.0394 |
| 16 | 0.338694 | 12.7698 | UNIT I | 3 | 28 | 15.4321 | 15.1748 | 22.8975 | 0 | 22.8975 |
| 17 | 0.338694 | 13.0776 | UNIT I | 3 | 28 | 15.0588 | 14.8078 | 22.2072 | 0 | 22.2072 |
| 18 | 0.338694 | 13.236 | UNIT I | 3 | 28 | 14.5342 | 14.2919 | 21.237 | 0 | 21.237 |
| 19 | 0.338694 | 13.1775 | UNIT I | 3 | 28 | 13.8174 | 13.5871 | 19.9114 | 0 | 19.9114 |
| 20 | 0.338694 | 12.7814 | UNIT I | 3 | 28 | 12.8363 | 12.6223 | 18.097 | 0 | 18.097 |
| 21 | 0.338694 | 11.7463 | UNIT I | 3 | 28 | 11.4048 | 11.2147 | 15.4496 | 0 | 15.4496 |
| 22 | 0.338694 | 9.9007 | UNIT I | 3 | 28 | 9.48399 | 9.32589 | 11.8973 | 0 | 11.8973 |
| 23 | 0.338694 | 7.5279 | UNIT I | 3 | 28 | 7.37002 | 7.24716 | 7.98775 | 0 | 7.98775 |
| 24 | 0.338694 | 4.82288 | UNIT I | 3 | 28 | 5.25984 | 5.17216 | 4.08524 | 0 | 4.08524 |
| 25 | 0.338694 | 1.68904 | UNIT I | 3 | 28 | 3.35982 | 3.30381 | 0.571383 | 0 | 0.571383 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.00212

| 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 | 0.366234 | 0.404617 | UNIT I | 3 | 28 | 4.4222 | 4.43158 | 2.6924 | 0 | 2.6924 |
| 2 | 0.366234 | 1.29036 | UNIT I | 3 | 28 | 6.26875 | 6.28204 | 6.17261 | 0 | 6.17261 |
| 3 | 0.366234 | 2.43926 | UNIT I | 3 | 28 | 7.84252 | 7.85915 | 9.13874 | 0 | 9.13874 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 0.366234 | 3.51431 | UNIT I | 3 | 28 | 8.96842 | 8.98743 | 11.2607 | 0 | 11.2607 |
| 5 | 0.366234 | 4.49291 | UNIT I | 3 | 28 | 10.0343 | 10.0556 | 13.2696 | 0 | 13.2696 |
| 6 | 0.366234 | 5.3746 | UNIT I | 3 | 28 | 10.8763 | 10.8994 | 14.8566 | 0 | 14.8566 |
| 7 | 0.366234 | 6.15847 | UNIT I | 3 | 28 | 11.5168 | 11.5412 | 16.0637 | 0 | 16.0637 |
| 8 | 0.366234 | 6.84318 | UNIT I | 3 | 28 | 12.6856 | 12.7125 | 18.2666 | 0 | 18.2666 |
| 9 | 0.366234 | 7.4463 | UNIT I | 3 | 28 | 15.136 | 15.1681 | 22.8849 | 0 | 22.8849 |
| 10 | 0.366234 | 8.29605 | UNIT I | 3 | 28 | 15.2366 | 15.2689 | 23.0744 | 0 | 23.0744 |
| 11 | 0.366234 | 9.16941 | UNIT I | 3 | 28 | 13.648 | 13.6769 | 20.0803 | 0 | 20.0803 |
| 12 | 0.366234 | 9.93295 | UNIT I | 3 | 28 | 15.3448 | 15.3773 | 23.2783 | 0 | 23.2783 |
| 13 | 0.366234 | 10.6407 | UNIT I | 3 | 28 | 16.992 | 17.028 | 26.3828 | 0 | 26.3828 |
| 14 | 0.366234 | 11.6081 | UNIT I | 3 | 28 | 15.7272 | 15.7605 | 23.9989 | 0 | 23.9989 |
| 15 | 0.366234 | 12.5181 | UNIT I | 3 | 28 | 13.9223 | 13.9518 | 20.5973 | 0 | 20.5973 |
| 16 | 0.366234 | 13.2824 | UNIT I | 3 | 28 | 13.1884 | 13.2164 | 19.2143 | 0 | 19.2143 |
| 17 | 0.366234 | 13.7308 | UNIT I | 3 | 28 | 13.3941 | 13.4225 | 19.6019 | 0 | 19.6019 |
| 18 | 0.366234 | 13.9706 | UNIT I | 3 | 28 | 13.1355 | 13.1633 | 19.1144 | 0 | 19.1144 |
| 19 | 0.366234 | 14.003 | UNIT I | 3 | 28 | 12.397 | 12.4233 | 17.7226 | 0 | 17.7226 |
| 20 | 0.366234 | 13.6476 | UNIT I | 3 | 28 | 10.6112 | 10.6337 | 14.3569 | 0 | 14.3569 |
| 21 | 0.366234 | 12.597 | UNIT I | 3 | 28 | 10.0212 | 10.0424 | 13.2449 | 0 | 13.2449 |
| 22 | 0.366234 | 10.5679 | UNIT I | 3 | 28 | 10.2052 | 10.2268 | 13.5916 | 0 | 13.5916 |
| 23 | 0.366234 | 7.98258 | UNIT I | 3 | 28 | 8.34684 | 8.36454 | 10.0892 | 0 | 10.0892 |
| 24 | 0.366234 | 5.07374 | UNIT I | 3 | 28 | 5.73664 | 5.7488 | 5.16974 | 0 | 5.16974 |
| 25 | 0.366234 | 1.76541 | UNIT I | 3 | 28 | 3.04344 | 3.04989 | 0.0938381 | 0 | 0.0938381 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.980855

| 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 | 0.338694 | 0.586062 | UNIT I | 3 | 28 | 4.56037 | 4.47306 | 2.77042 | 0 | 2.77042 |
| 2 | 0.338694 | 1.71425 | UNIT I | 3 | 28 | 6.37662 | 6.25454 | 6.12089 | 0 | 6.12089 |
| 3 | 0.338694 | 2.75493 | UNIT I | 3 | 28 | 7.98145 | 7.82865 | 9.08137 | 0 | 9.08137 |
| 4 | 0.338694 | 3.70863 | UNIT I | 3 | 28 | 9.37682 | 9.1973 | 11.6554 | 0 | 11.6554 |
| 5 | 0.338694 | 4.57548 | UNIT I | 3 | 28 | 10.5656 | 10.3633 | 13.8484 | 0 | 13.8484 |
| 6 | 0.338694 | 5.35516 | UNIT I | 3 | 28 | 11.5514 | 11.3302 | 15.6669 | 0 | 15.6669 |
| 7 | 0.338694 | 6.04695 | UNIT I | 3 | 28 | 12.6133 | 12.3718 | 17.6257 | 0 | 17.6257 |
| 8 | 0.338694 | 6.66286 | UNIT I | 3 | 28 | 14.2076 | 13.9356 | 20.5668 | 0 | 20.5668 |
| 9 | 0.338694 | 7.48129 | UNIT I | 3 | 28 | 14.9125 | 14.627 | 21.8673 | 0 | 21.8673 |
| 10 | 0.338694 | 8.32742 | UNIT I | 3 | 28 | 14.7681 | 14.4854 | 21.6009 | 0 | 21.6009 |
| 11 | 0.338694 | 9.07799 | UNIT I | 3 | 28 | 15.4573 | 15.1614 | 22.8723 | 0 | 22.8723 |
| 12 | 0.338694 | 9.73395 | UNIT I | 3 | 28 | 16.9399 | 16.6156 | 25.6072 | 0 | 25.6072 |
| 13 | 0.338694 | 10.5555 | UNIT I | 3 | 28 | 17.0833 | 16.7562 | 25.8717 | 0 | 25.8717 |
| 14 | 0.338694 | 11.4285 | UNIT I | 3 | 28 | 16.2235 | 15.9129 | 24.2856 | 0 | 24.2856 |
| 15 | 0.338694 | 12.1873 | UNIT I | 3 | 28 | 15.8046 | 15.502 | 23.5129 | 0 | 23.5129 |
| 16 | 0.338694 | 12.7698 | UNIT I | 3 | 28 | 15.4177 | 15.1225 | 22.7991 | 0 | 22.7991 |
| 17 | 0.338694 | 13.0776 | UNIT I | 3 | 28 | 15.2232 | 14.9318 | 22.4405 | 0 | 22.4405 |
| 18 | 0.338694 | 13.236 | UNIT I | 3 | 28 | 14.2563 | 13.9834 | 20.6567 | 0 | 20.6567 |
| 19 | 0.338694 | 13.1775 | UNIT I | 3 | 28 | 13.2238 | 12.9706 | 18.752 | 0 | 18.752 |
| 20 | 0.338694 | 12.7814 | UNIT I | 3 | 28 | 11.6188 | 11.3963 | 15.7912 | 0 | 15.7912 |
| 21 | 0.338694 | 11.7463 | UNIT I | 3 | 28 | 10.3914 | 10.1925 | 13.5271 | 0 | 13.5271 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 0.338694 | 9.9007 | UNIT I | 3 | 28 | 9.41778 | 9.23748 | 11.731 | 0 | 11.731 |
| 23 | 0.338694 | 7.5279 | UNIT I | 3 | 28 | 7.42814 | 7.28593 | 8.06066 | 0 | 8.06066 |
| 24 | 0.338694 | 4.82288 | UNIT I | 3 | 28 | 5.23016 | 5.13003 | 4.006 | 0 | 4.006 |
| 25 | 0.338694 | 1.68904 | UNIT I | 3 | 28 | 3.40618 | 3.34097 | 0.641262 | 0 | 0.641262 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.01099

| 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 | 0.366234 | 0.404617 | UNIT I | 3 | 28 | 3.87065 | 3.91319 | 1.71746 | 0 | 1.71746 |
| 2 | 0.366234 | 1.29036 | UNIT I | 3 | 28 | 5.49628 | 5.55668 | 4.80841 | 0 | 4.80841 |
| 3 | 0.366234 | 2.43926 | UNIT I | 3 | 28 | 7.57678 | 7.66005 | 8.76427 | 0 | 8.76427 |
| 4 | 0.366234 | 3.51431 | UNIT I | 3 | 28 | 9.55187 | 9.65684 | 12.5197 | 0 | 12.5197 |
| 5 | 0.366234 | 4.49291 | UNIT I | 3 | 28 | 11.278 | 11.4019 | 15.8018 | 0 | 15.8018 |
| 6 | 0.366234 | 5.3746 | UNIT I | 3 | 28 | 12.6576 | 12.7967 | 18.4249 | 0 | 18.4249 |
| 7 | 0.366234 | 6.15847 | UNIT I | 3 | 28 | 13.6258 | 13.7755 | 20.2658 | 0 | 20.2658 |
| 8 | 0.366234 | 6.84318 | UNIT I | 3 | 28 | 14.1604 | 14.316 | 21.2823 | 0 | 21.2823 |
| 9 | 0.366234 | 7.4463 | UNIT I | 3 | 28 | 14.3054 | 14.4626 | 21.5581 | 0 | 21.5581 |
| 10 | 0.366234 | 8.29605 | UNIT I | 3 | 28 | 14.4935 | 14.6528 | 21.9158 | 0 | 21.9158 |
| 11 | 0.366234 | 9.16941 | UNIT I | 3 | 28 | 14.4949 | 14.6542 | 21.9183 | 0 | 21.9183 |
| 12 | 0.366234 | 9.93295 | UNIT I | 3 | 28 | 14.2378 | 14.3943 | 21.4296 | 0 | 21.4296 |
| 13 | 0.366234 | 10.6407 | UNIT I | 3 | 28 | 13.8652 | 14.0176 | 20.7212 | 0 | 20.7212 |
| 14 | 0.366234 | 11.6081 | UNIT I | 3 | 28 | 13.7388 | 13.8898 | 20.4806 | 0 | 20.4806 |
| 15 | 0.366234 | 12.5181 | UNIT I | 3 | 28 | 13.5952 | 13.7446 | 20.2077 | 0 | 20.2077 |
| 16 | 0.366234 | 13.2824 | UNIT I | 3 | 28 | 13.4079 | 13.5553 | 19.8517 | 0 | 19.8517 |
| 17 | 0.366234 | 13.7308 | UNIT I | 3 | 28 | 13.0805 | 13.2243 | 19.2291 | 0 | 19.2291 |
| 18 | 0.366234 | 13.9706 | UNIT I | 3 | 28 | 12.7331 | 12.873 | 18.5684 | 0 | 18.5684 |
| 19 | 0.366234 | 14.003 | UNIT I | 3 | 28 | 12.3785 | 12.5146 | 17.8943 | 0 | 17.8943 |
| 20 | 0.366234 | 13.6476 | UNIT I | 3 | 28 | 11.884 | 12.0146 | 16.954 | 0 | 16.954 |
| 21 | 0.366234 | 12.597 | UNIT I | 3 | 28 | 11.0164 | 11.1375 | 15.3043 | 0 | 15.3043 |
| 22 | 0.366234 | 10.5679 | UNIT I | 3 | 28 | 9.54231 | 9.64718 | 12.5015 | 0 | 12.5015 |
| 23 | 0.366234 | 7.98258 | UNIT I | 3 | 28 | 7.70649 | 7.79118 | 9.01089 | 0 | 9.01089 |
| 24 | 0.366234 | 5.07374 | UNIT I | 3 | 28 | 5.59576 | 5.65726 | 4.99758 | 0 | 4.99758 |
| 25 | 0.366234 | 1.76541 | UNIT I | 3 | 28 | 3.05764 | 3.09124 | 0.1716 | 0 | 0.1716 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

### External Boundary

| X | Y |
|---|---|
| 42.2084 | 59.656 |
| 40.5299 | 57.6985 |
| 39.2201 | 56.0079 |
| 37.5797 | 54.3301 |
| 36.0284 | 53.0971 |
| 34.9857 | 52.3471 |
| 32.931 | 51.3318 |
| 32.4461 | 51.1888 |
| 32.1758 | 51.2126 |
| 31.6273 | 51.2126 |
| 31.1106 | 51.1173 |
| 30.8801 | 50.9584 |
| 30.4826 | 51.006 |
| 29.3379 | 51.0855 |
| 28.2568 | 51.1173 |
| 24.7792 | 51.0927 |
| 22.0128 | 50.9974 |
| 21.6472 | 50.902 |
| 21.0828 | 50.5524 |
| 20.0653 | 49.8134 |
| 18.9094 | 48.8644 |
| 17.5182 | 47.9982 |
| 14.7996 | 46.8381 |
| 11.6166 | 46.1137 |
| 9.81213 | 45.8117 |
| 9.0967 | 45.8514 |
| 8.0633 | 45.8117 |
| 6.7641 | 45.612 |
| 6.55742 | 45.5405 |
| 5.53992 | 44.9127 |
| 5.02322 | 44.8015 |
| 4.35549 | 44.5869 |
| 0.198047 | 43.403 |
| -3.76343 | 42.432 |
| -9.07729 | 41.119 |
| -15.1823 | 39.5377 |
| -18.268 | 38.8216 |
| -18.268 | 35.5812 |
| -18.268 | 33.5624 |
| -18.268 | 28.0059 |
| 44.4591 | 28.0059 |
| 44.4591 | 46.5638 |
| 44.4591 | 57.23 |
| 44.4591 | 59.34 |
| 44.4591 | 61.8678 |

## Material Boundary

| X | Y |
|---|---|
| 37.639 | 52.44 |
| 44.4591 | 59.34 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 47.235 |
| 30.8801 | 49.506 |

## Material Boundary

| X | Y |
|---|---|
| -9.07729 | 41.119 |
| 2.44 | 42.482 |
| 21.211 | 47.235 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 44.211 |
| 31.462 | 47.978 |
| 39.112 | 51.057 |
| 44.4591 | 57.23 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 44.211 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 33.5624 |
| 21.211 | 40.173 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 40.173 |
| 44.4591 | 46.5638 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |

| | |
|---|---|
| 21.211 | 45.542 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S39 + GABIONS ST + GEOTEX
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 8/5/2021, 15:10:48

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |

| Property | AIR | PILE | SW |
|---|---|---|---|
| Color | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 1e-005 | 24 | 19 |
| Cohesion [kPa] | 1e-005 | 500 | 1 |
| Friction Angle [deg] | 0 | 45 | 35 |
| Water Surface | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated |

## Support Properties

### GEOTEX

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Parallel to Reinforcement
Anchorage: Embedded End
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 40 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 30 degrees

## Global Minimums

### Method: ordinary/fellenius

FS: 1.638650
Center: 19.352, 11.038
Radius: 0.678
Left Slip Surface Endpoint: 19.429, 10.365
Right Slip Surface Endpoint: 20.029, 11.011
Resisting Moment=1.29092 kN-m
Driving Moment=0.787796 kN-m

### Method: bishop simplified

FS: 1.685550
Center: 19.352, 11.038
Radius: 0.678
Left Slip Surface Endpoint: 19.429, 10.365
Right Slip Surface Endpoint: 20.029, 11.011
Resisting Moment=1.32787 kN-m
Driving Moment=0.787796 kN-m

### Method: janbu simplified

FS: 1.642240
Center: 18.120, 9.347
Radius: 0.473
Left Slip Surface Endpoint: 18.051, 8.879
Right Slip Surface Endpoint: 18.593, 9.347
Left Slope Intercept: 18.051 8.879
Right Slope Intercept: 18.593 9.464
Resisting Horizontal Force=1.55411 kN
Driving Horizontal Force=0.946331 kN

### Method: janbu corrected

FS: 1.769960
Center: 18.120, 9.347
Radius: 0.473
Left Slip Surface Endpoint: 18.051, 8.879
Right Slip Surface Endpoint: 18.593, 9.347
Left Slope Intercept: 18.051 8.879
Right Slope Intercept: 18.593 9.464
Resisting Horizontal Force=1.67497 kN
Driving Horizontal Force=0.946331 kN

### Method: spencer

FS: 1.753190
Center: 19.312, 11.047
Radius: 0.684
Left Slip Surface Endpoint: 19.439, 10.375
Right Slip Surface Endpoint: 19.991, 10.971
Resisting Moment=1.08521 kN-m
Driving Moment=0.618993 kN-m
Resisting Horizontal Force=1.11793 kN
Driving Horizontal Force=0.637652 kN

### Method: corp of eng#1

FS: 1.751970
Center: 19.312, 11.047
Radius: 0.684
Left Slip Surface Endpoint: 19.439, 10.375
Right Slip Surface Endpoint: 19.991, 10.971
Resisting Horizontal Force=1.11782 kN
Driving Horizontal Force=0.638035 kN

### Method: corp of eng#2

FS: 1.751970
Center: 19.312, 11.047
Radius: 0.684
Left Slip Surface Endpoint: 19.439, 10.375
Right Slip Surface Endpoint: 19.991, 10.971
Resisting Horizontal Force=1.11782 kN
Driving Horizontal Force=0.638035 kN

### Method: lowe-karafiath

Resisting Horizontal Force=-0 kN

Driving Horizontal Force=0 kN

### Method: gle/morgenstern-price

FS: 1.684660
Center: 19.352, 11.038
Radius: 0.678
Left Slip Surface Endpoint: 19.429, 10.365
Right Slip Surface Endpoint: 20.029, 11.011
Resisting Moment=1.32717 kN-m
Driving Moment=0.787796 kN-m
Resisting Horizontal Force=1.39007 kN
Driving Horizontal Force=0.825133 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 7439
Number of Invalid Surfaces: 2561

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 839 surfaces
Error Code -109 reported for 124 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 6904
Number of Invalid Surfaces: 3096

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 839 surfaces
Error Code -109 reported for 124 surfaces
Error Code -112 reported for 535 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 6571
Number of Invalid Surfaces: 3429

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 1197 surfaces
Error Code -109 reported for 124 surfaces
Error Code -112 reported for 510 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 6571
Number of Invalid Surfaces: 3429

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 1197 surfaces
Error Code -109 reported for 124 surfaces

Error Code -112 reported for 510 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: spencer

Number of Valid Surfaces: 6004
Number of Invalid Surfaces: 3996

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 1478 surfaces
Error Code -109 reported for 124 surfaces
Error Code -111 reported for 226 surfaces
Error Code -112 reported for 570 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: corp of eng#1

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

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 8272 surfaces
Error Code -109 reported for 124 surfaces
Error Code -112 reported for 1 surface
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: corp of eng#2

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

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 8273 surfaces
Error Code -109 reported for 124 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: lowe-karafiath

Number of Valid Surfaces: 0
Number of Invalid Surfaces: 10000

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 8278 surfaces
Error Code -109 reported for 124 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: gle/morgenstern-price

Number of Valid Surfaces: 5752
Number of Invalid Surfaces: 4248

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 1445 surfaces

Error Code -109 reported for 124 surfaces
Error Code -111 reported for 533 surfaces
Error Code -112 reported for 548 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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.
-111 = safety factor equation did not converge
-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.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.63865

| 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 | 0.0239836 | 0.00516135 | SW | 1 | 35 | 0.700608 | 1.14805 | 0.21144 | 0 | 0.21144 |
| 2 | 0.0239836 | 0.0152839 | SW | 1 | 35 | 0.874915 | 1.43368 | 0.619361 | 0 | 0.619361 |
| 3 | 0.0239836 | 0.0250024 | SW | 1 | 35 | 1.03736 | 1.69987 | 0.999515 | 0 | 0.999515 |
| 4 | 0.0239836 | 0.0343086 | SW | 1 | 35 | 1.18678 | 1.94472 | 1.34919 | 0 | 1.34919 |
| 5 | 0.0239836 | 0.0431921 | SW | 1 | 35 | 1.32211 | 2.16647 | 1.66589 | 0 | 1.66589 |
| 6 | 0.0239836 | 0.0516404 | SW | 1 | 35 | 1.44236 | 2.36352 | 1.9473 | 0 | 1.9473 |
| 7 | 0.0239836 | 0.0596384 | SW | 1 | 35 | 1.54664 | 2.5344 | 2.19136 | 0 | 2.19136 |
| 8 | 0.0239836 | 0.0671683 | SW | 1 | 35 | 1.63417 | 2.67784 | 2.3962 | 0 | 2.3962 |
| 9 | 0.0239836 | 0.0742087 | SW | 1 | 35 | 1.70427 | 2.79271 | 2.56025 | 0 | 2.56025 |
| 10 | 0.0239836 | 0.0807343 | SW | 1 | 35 | 1.75638 | 2.87809 | 2.68219 | 0 | 2.68219 |
| 11 | 0.0239836 | 0.0867151 | SW | 1 | 35 | 1.79003 | 2.93324 | 2.76096 | 0 | 2.76096 |
| 12 | 0.0239836 | 0.0921148 | SW | 1 | 35 | 1.80495 | 2.95768 | 2.79586 | 0 | 2.79586 |
| 13 | 0.0239836 | 0.09689 | SW | 1 | 35 | 1.80097 | 2.95116 | 2.78654 | 0 | 2.78654 |
| 14 | 0.0239836 | 0.100988 | SW | 1 | 35 | 1.77811 | 2.9137 | 2.73305 | 0 | 2.73305 |
| 15 | 0.0239836 | 0.104343 | SW | 1 | 35 | 1.73659 | 2.84567 | 2.63589 | 0 | 2.63589 |
| 16 | 0.0239836 | 0.106874 | SW | 1 | 35 | 1.67687 | 2.7478 | 2.49611 | 0 | 2.49611 |
| 17 | 0.0239836 | 0.108477 | SW | 1 | 35 | 1.59965 | 2.62126 | 2.3154 | 0 | 2.3154 |
| 18 | 0.0239836 | 0.109015 | SW | 1 | 35 | 1.50598 | 2.46778 | 2.09621 | 0 | 2.09621 |
| 19 | 0.0239836 | 0.108305 | SW | 1 | 35 | 1.39735 | 2.28976 | 1.84197 | 0 | 1.84197 |
| 20 | 0.0239836 | 0.106089 | SW | 1 | 35 | 1.27575 | 2.0905 | 1.5574 | 0 | 1.5574 |
| 21 | 0.0239836 | 0.101983 | SW | 1 | 35 | 1.14392 | 1.87449 | 1.2489 | 0 | 1.2489 |
| 22 | 0.0239836 | 0.0953672 | SW | 1 | 35 | 1.00569 | 1.64798 | 0.925411 | 0 | 0.925411 |
| 23 | 0.0239836 | 0.085109 | SW | 1 | 35 | 0.866547 | 1.41997 | 0.599777 | 0 | 0.599777 |
| 24 | 0.0239836 | 0.068567 | SW | 1 | 35 | 0.734977 | 1.20437 | 0.291871 | 0 | 0.291871 |
| 25 | 0.0239836 | 0.0291257 | SW | 1 | 35 | 0.622596 | 1.02022 | 0.0288725 | 0 | 0.0288725 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.68555

| 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 | 0.0239836 | 0.00516135 | SW | 1 | 35 | 0.646834 | 1.09027 | 0.12892 | 0 | 0.12892 |
| 2 | 0.0239836 | 0.0152839 | SW | 1 | 35 | 0.801407 | 1.35081 | 0.501011 | 0 | 0.501011 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 0.0239836 | 0.0250024 | SW | 1 | 35 | 0.944958 | 1.59277 | 0.846569 | 0 | 0.846569 |
| 4 | 0.0239836 | 0.0343086 | SW | 1 | 35 | 1.07764 | 1.81642 | 1.16597 | 0 | 1.16597 |
| 5 | 0.0239836 | 0.0431921 | SW | 1 | 35 | 1.19955 | 2.0219 | 1.45943 | 0 | 1.45943 |
| 6 | 0.0239836 | 0.0516404 | SW | 1 | 35 | 1.31071 | 2.20927 | 1.72702 | 0 | 1.72702 |
| 7 | 0.0239836 | 0.0596384 | SW | 1 | 35 | 1.4111 | 2.37848 | 1.96867 | 0 | 1.96867 |
| 8 | 0.0239836 | 0.0671683 | SW | 1 | 35 | 1.50062 | 2.52937 | 2.18416 | 0 | 2.18416 |
| 9 | 0.0239836 | 0.0742087 | SW | 1 | 35 | 1.5791 | 2.66165 | 2.37309 | 0 | 2.37309 |
| 10 | 0.0239836 | 0.0807343 | SW | 1 | 35 | 1.64631 | 2.77494 | 2.53487 | 0 | 2.53487 |
| 11 | 0.0239836 | 0.0867151 | SW | 1 | 35 | 1.70193 | 2.86868 | 2.66875 | 0 | 2.66875 |
| 12 | 0.0239836 | 0.0921148 | SW | 1 | 35 | 1.74553 | 2.94217 | 2.7737 | 0 | 2.7737 |
| 13 | 0.0239836 | 0.09689 | SW | 1 | 35 | 1.77658 | 2.99451 | 2.84845 | 0 | 2.84845 |
| 14 | 0.0239836 | 0.100988 | SW | 1 | 35 | 1.7944 | 3.02455 | 2.89135 | 0 | 2.89135 |
| 15 | 0.0239836 | 0.104343 | SW | 1 | 35 | 1.79815 | 3.03087 | 2.90038 | 0 | 2.90038 |
| 16 | 0.0239836 | 0.106874 | SW | 1 | 35 | 1.78674 | 3.01164 | 2.87292 | 0 | 2.87292 |
| 17 | 0.0239836 | 0.108477 | SW | 1 | 35 | 1.75881 | 2.96456 | 2.80568 | 0 | 2.80568 |
| 18 | 0.0239836 | 0.109015 | SW | 1 | 35 | 1.71256 | 2.8866 | 2.69434 | 0 | 2.69434 |
| 19 | 0.0239836 | 0.108305 | SW | 1 | 35 | 1.64562 | 2.77377 | 2.53321 | 0 | 2.53321 |
| 20 | 0.0239836 | 0.106089 | SW | 1 | 35 | 1.55473 | 2.62057 | 2.31442 | 0 | 2.31442 |
| 21 | 0.0239836 | 0.101983 | SW | 1 | 35 | 1.43521 | 2.41911 | 2.02669 | 0 | 2.02669 |
| 22 | 0.0239836 | 0.0953672 | SW | 1 | 35 | 1.27983 | 2.15721 | 1.65266 | 0 | 1.65266 |
| 23 | 0.0239836 | 0.085109 | SW | 1 | 35 | 1.07619 | 1.81397 | 1.16247 | 0 | 1.16247 |
| 24 | 0.0239836 | 0.068567 | SW | 1 | 35 | 0.797931 | 1.34495 | 0.492642 | 0 | 0.492642 |
| 25 | 0.0239836 | 0.0291257 | SW | 1 | 35 | 0.299787 | 0.505306 | -0.706494 | 0 | -0.706494 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.64224

| 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 | 0.0216801 | 0.00536671 | SW | 1 | 35 | 0.754323 | 1.23878 | 0.341012 | 0 | 0.341012 |
| 2 | 0.0216801 | 0.0158922 | SW | 1 | 35 | 0.952906 | 1.5649 | 0.806761 | 0 | 0.806761 |
| 3 | 0.0216801 | 0.0260041 | SW | 1 | 35 | 1.1355 | 1.86477 | 1.23502 | 0 | 1.23502 |
| 4 | 0.0216801 | 0.0357056 | SW | 1 | 35 | 1.30306 | 2.13994 | 1.62801 | 0 | 1.62801 |
| 5 | 0.0216801 | 0.044997 | SW | 1 | 35 | 1.45632 | 2.39162 | 1.98745 | 0 | 1.98745 |
| 6 | 0.0216801 | 0.0538763 | SW | 1 | 35 | 1.59583 | 2.62073 | 2.31464 | 0 | 2.31464 |
| 7 | 0.0216801 | 0.0623386 | SW | 1 | 35 | 1.72199 | 2.82792 | 2.61054 | 0 | 2.61054 |
| 8 | 0.0216801 | 0.0703764 | SW | 1 | 35 | 1.83506 | 3.01361 | 2.87574 | 0 | 2.87574 |
| 9 | 0.0216801 | 0.0779788 | SW | 1 | 35 | 1.93519 | 3.17804 | 3.11056 | 0 | 3.11056 |
| 10 | 0.0216801 | 0.0851317 | SW | 1 | 35 | 2.02235 | 3.32119 | 3.315 | 0 | 3.315 |
| 11 | 0.0216801 | 0.0918168 | SW | 1 | 35 | 2.09645 | 3.44287 | 3.48878 | 0 | 3.48878 |
| 12 | 0.0216801 | 0.0980111 | SW | 1 | 35 | 2.15721 | 3.54265 | 3.63128 | 0 | 3.63128 |
| 13 | 0.0216801 | 0.103686 | SW | 1 | 35 | 2.20421 | 3.61984 | 3.74152 | 0 | 3.74152 |
| 14 | 0.0216801 | 0.108805 | SW | 1 | 35 | 2.23687 | 3.67347 | 3.81811 | 0 | 3.81811 |
| 15 | 0.0216801 | 0.113323 | SW | 1 | 35 | 2.25435 | 3.70219 | 3.85913 | 0 | 3.85913 |
| 16 | 0.0216801 | 0.117183 | SW | 1 | 35 | 2.2556 | 3.70423 | 3.86204 | 0 | 3.86204 |
| 17 | 0.0216801 | 0.120311 | SW | 1 | 35 | 2.23912 | 3.67717 | 3.82339 | 0 | 3.82339 |
| 18 | 0.0216801 | 0.122607 | SW | 1 | 35 | 2.20296 | 3.61779 | 3.73859 | 0 | 3.73859 |
| 19 | 0.0216801 | 0.12394 | SW | 1 | 35 | 2.14441 | 3.52163 | 3.60126 | 0 | 3.60126 |
| 20 | 0.0216801 | 0.124122 | SW | 1 | 35 | 2.05961 | 3.38237 | 3.4024 | 0 | 3.4024 |
| 21 | 0.0216801 | 0.122873 | SW | 1 | 35 | 1.94279 | 3.19053 | 3.12842 | 0 | 3.12842 |
| 22 | 0.0216801 | 0.119739 | SW | 1 | 35 | 1.78465 | 2.93083 | 2.75751 | 0 | 2.75751 |
| 23 | 0.0216801 | 0.113889 | SW | 1 | 35 | 1.56823 | 2.57541 | 2.24992 | 0 | 2.24992 |
| 24 | 0.0216801 | 0.103371 | SW | 1 | 35 | 1.25427 | 2.05982 | 1.51358 | 0 | 1.51358 |
| 25 | 0.0216801 | 0.0722513 | SW | 1 | 35 | 0.536584 | 0.8812 | -0.169664 | 0 | -0.169664 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.76996

| 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 | 0.0216801 | 0.00536671 | SW | 1 | 35 | 0.699891 | 1.23878 | 0.341012 | 0 | 0.341012 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.0216801 | 0.0158922 | SW | 1 | 35 | 0.884144 | 1.5649 | 0.806761 | 0 | 0.806761 |
| 3 | 0.0216801 | 0.0260041 | SW | 1 | 35 | 1.05357 | 1.86477 | 1.23502 | 0 | 1.23502 |
| 4 | 0.0216801 | 0.0357056 | SW | 1 | 35 | 1.20903 | 2.13994 | 1.62801 | 0 | 1.62801 |
| 5 | 0.0216801 | 0.044997 | SW | 1 | 35 | 1.35123 | 2.39162 | 1.98745 | 0 | 1.98745 |
| 6 | 0.0216801 | 0.0538763 | SW | 1 | 35 | 1.48067 | 2.62073 | 2.31464 | 0 | 2.31464 |
| 7 | 0.0216801 | 0.0623386 | SW | 1 | 35 | 1.59773 | 2.82792 | 2.61054 | 0 | 2.61054 |
| 8 | 0.0216801 | 0.0703764 | SW | 1 | 35 | 1.70264 | 3.01361 | 2.87574 | 0 | 2.87574 |
| 9 | 0.0216801 | 0.0779788 | SW | 1 | 35 | 1.79554 | 3.17804 | 3.11056 | 0 | 3.11056 |
| 10 | 0.0216801 | 0.0851317 | SW | 1 | 35 | 1.87642 | 3.32119 | 3.315 | 0 | 3.315 |
| 11 | 0.0216801 | 0.0918168 | SW | 1 | 35 | 1.94517 | 3.44287 | 3.48878 | 0 | 3.48878 |
| 12 | 0.0216801 | 0.0980111 | SW | 1 | 35 | 2.00154 | 3.54265 | 3.63128 | 0 | 3.63128 |
| 13 | 0.0216801 | 0.103686 | SW | 1 | 35 | 2.04515 | 3.61984 | 3.74152 | 0 | 3.74152 |
| 14 | 0.0216801 | 0.108805 | SW | 1 | 35 | 2.07545 | 3.67347 | 3.81811 | 0 | 3.81811 |
| 15 | 0.0216801 | 0.113323 | SW | 1 | 35 | 2.09168 | 3.70219 | 3.85913 | 0 | 3.85913 |
| 16 | 0.0216801 | 0.117183 | SW | 1 | 35 | 2.09283 | 3.70423 | 3.86204 | 0 | 3.86204 |
| 17 | 0.0216801 | 0.120311 | SW | 1 | 35 | 2.07754 | 3.67717 | 3.82339 | 0 | 3.82339 |
| 18 | 0.0216801 | 0.122607 | SW | 1 | 35 | 2.044 | 3.61779 | 3.73859 | 0 | 3.73859 |
| 19 | 0.0216801 | 0.12394 | SW | 1 | 35 | 1.98967 | 3.52163 | 3.60126 | 0 | 3.60126 |
| 20 | 0.0216801 | 0.124122 | SW | 1 | 35 | 1.91099 | 3.38237 | 3.4024 | 0 | 3.4024 |
| 21 | 0.0216801 | 0.122873 | SW | 1 | 35 | 1.8026 | 3.19053 | 3.12842 | 0 | 3.12842 |
| 22 | 0.0216801 | 0.119739 | SW | 1 | 35 | 1.65587 | 2.93083 | 2.75751 | 0 | 2.75751 |
| 23 | 0.0216801 | 0.113889 | SW | 1 | 35 | 1.45507 | 2.57541 | 2.24992 | 0 | 2.24992 |
| 24 | 0.0216801 | 0.103371 | SW | 1 | 35 | 1.16377 | 2.05982 | 1.51358 | 0 | 1.51358 |
| 25 | 0.0216801 | 0.0722513 | SW | 1 | 35 | 0.497864 | 0.8812 | -0.169664 | 0 | -0.169664 |

**Global Minimum Query (spencer) - Safety Factor**: 1.75319

| 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 | 0.0221045 | 0.0040485 | SW | 1 | 35 | 0.748942 | 1.31304 | 0.447065 | 0 | 0.447065 |
| 2 | 0.0221045 | 0.011984 | SW | 1 | 35 | 0.882532 | 1.54725 | 0.781547 | 0 | 0.781547 |
| 3 | 0.0221045 | 0.0195926 | SW | 1 | 35 | 1.00076 | 1.75453 | 1.07758 | 0 | 1.07758 |
| 4 | 0.0221045 | 0.0268656 | SW | 1 | 35 | 1.10428 | 1.93601 | 1.33676 | 0 | 1.33676 |
| 5 | 0.0221045 | 0.033793 | SW | 1 | 35 | 1.19365 | 2.09269 | 1.56052 | 0 | 1.56052 |
| 6 | 0.0221045 | 0.0403626 | SW | 1 | 35 | 1.26935 | 2.22541 | 1.75007 | 0 | 1.75007 |
| 7 | 0.0221045 | 0.0465606 | SW | 1 | 35 | 1.33182 | 2.33493 | 1.90648 | 0 | 1.90648 |
| 8 | 0.0221045 | 0.0523705 | SW | 1 | 35 | 1.38142 | 2.42189 | 2.03067 | 0 | 2.03067 |
| 9 | 0.0221045 | 0.0577731 | SW | 1 | 35 | 1.41846 | 2.48683 | 2.12342 | 0 | 2.12342 |
| 10 | 0.0221045 | 0.0627459 | SW | 1 | 35 | 1.44321 | 2.53023 | 2.18539 | 0 | 2.18539 |
| 11 | 0.0221045 | 0.0672622 | SW | 1 | 35 | 1.45589 | 2.55245 | 2.21713 | 0 | 2.21713 |
| 12 | 0.0221045 | 0.0712903 | SW | 1 | 35 | 1.45668 | 2.55383 | 2.21909 | 0 | 2.21909 |
| 13 | 0.0221045 | 0.0747925 | SW | 1 | 35 | 1.44571 | 2.53461 | 2.19165 | 0 | 2.19165 |
| 14 | 0.0221045 | 0.0777228 | SW | 1 | 35 | 1.42313 | 2.49502 | 2.13511 | 0 | 2.13511 |
| 15 | 0.0221045 | 0.0800252 | SW | 1 | 35 | 1.38903 | 2.43523 | 2.04972 | 0 | 2.04972 |
| 16 | 0.0221045 | 0.0816298 | SW | 1 | 35 | 1.34352 | 2.35544 | 1.93576 | 0 | 1.93576 |
| 17 | 0.0221045 | 0.0824478 | SW | 1 | 35 | 1.28671 | 2.25585 | 1.79354 | 0 | 1.79354 |
| 18 | 0.0221045 | 0.0823642 | SW | 1 | 35 | 1.21882 | 2.13683 | 1.62356 | 0 | 1.62356 |
| 19 | 0.0221045 | 0.0812243 | SW | 1 | 35 | 1.14019 | 1.99896 | 1.42667 | 0 | 1.42667 |
| 20 | 0.0221045 | 0.078813 | SW | 1 | 35 | 1.05145 | 1.84339 | 1.20449 | 0 | 1.20449 |
| 21 | 0.0221045 | 0.0748136 | SW | 1 | 35 | 0.953879 | 1.67233 | 0.96019 | 0 | 0.96019 |
| 22 | 0.0221045 | 0.0687237 | SW | 1 | 35 | 0.850089 | 1.49037 | 0.700316 | 0 | 0.700316 |
| 23 | 0.0221045 | 0.0596471 | SW | 1 | 35 | 0.74598 | 1.30784 | 0.439645 | 0 | 0.439645 |
| 24 | 0.0221045 | 0.0456083 | SW | 1 | 35 | 0.657375 | 1.1525 | 0.217798 | 0 | 0.217798 |
| 25 | 0.0221045 | 0.0185002 | SW | 1 | 35 | 0.654368 | 1.14723 | 0.21027 | 0 | 0.21027 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.75197

| 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 | 0.0221045 | 0.0040485 | SW | 1 | 35 | 0.826618 | 1.44821 | 0.640108 | 0 | 0.640108 |
| 2 | 0.0221045 | 0.011984 | SW | 1 | 35 | 0.965451 | 1.69144 | 0.987482 | 0 | 0.987482 |
| 3 | 0.0221045 | 0.0195926 | SW | 1 | 35 | 1.08556 | 1.90187 | 1.288 | 0 | 1.288 |
| 4 | 0.0221045 | 0.0268656 | SW | 1 | 35 | 1.1879 | 2.08116 | 1.54406 | 0 | 1.54406 |
| 5 | 0.0221045 | 0.033793 | SW | 1 | 35 | 1.27332 | 2.23081 | 1.75778 | 0 | 1.75778 |
| 6 | 0.0221045 | 0.0403626 | SW | 1 | 35 | 1.34257 | 2.35214 | 1.93106 | 0 | 1.93106 |
| 7 | 0.0221045 | 0.0465606 | SW | 1 | 35 | 1.39635 | 2.44636 | 2.06561 | 0 | 2.06561 |
| 8 | 0.0221045 | 0.0523705 | SW | 1 | 35 | 1.43526 | 2.51454 | 2.16298 | 0 | 2.16298 |
| 9 | 0.0221045 | 0.0577731 | SW | 1 | 35 | 1.45988 | 2.55767 | 2.22459 | 0 | 2.22459 |
| 10 | 0.0221045 | 0.0627459 | SW | 1 | 35 | 1.47073 | 2.57667 | 2.25172 | 0 | 2.25172 |
| 11 | 0.0221045 | 0.0672622 | SW | 1 | 35 | 1.46828 | 2.57239 | 2.2456 | 0 | 2.2456 |
| 12 | 0.0221045 | 0.0712903 | SW | 1 | 35 | 1.45302 | 2.54564 | 2.2074 | 0 | 2.2074 |
| 13 | 0.0221045 | 0.0747925 | SW | 1 | 35 | 1.42538 | 2.49723 | 2.13827 | 0 | 2.13827 |
| 14 | 0.0221045 | 0.0777228 | SW | 1 | 35 | 1.38587 | 2.428 | 2.0394 | 0 | 2.0394 |
| 15 | 0.0221045 | 0.0800252 | SW | 1 | 35 | 1.335 | 2.33888 | 1.91212 | 0 | 1.91212 |
| 16 | 0.0221045 | 0.0816298 | SW | 1 | 35 | 1.27338 | 2.23093 | 1.75795 | 0 | 1.75795 |
| 17 | 0.0221045 | 0.0824478 | SW | 1 | 35 | 1.20179 | 2.1055 | 1.57882 | 0 | 1.57882 |
| 18 | 0.0221045 | 0.0823642 | SW | 1 | 35 | 1.12125 | 1.9644 | 1.3773 | 0 | 1.3773 |
| 19 | 0.0221045 | 0.0812243 | SW | 1 | 35 | 1.03324 | 1.81021 | 1.1571 | 0 | 1.1571 |
| 20 | 0.0221045 | 0.078813 | SW | 1 | 35 | 0.940039 | 1.64692 | 0.923897 | 0 | 0.923897 |
| 21 | 0.0221045 | 0.0748136 | SW | 1 | 35 | 0.845364 | 1.48105 | 0.687013 | 0 | 0.687013 |
| 22 | 0.0221045 | 0.0687237 | SW | 1 | 35 | 0.755879 | 1.32428 | 0.463114 | 0 | 0.463114 |
| 23 | 0.0221045 | 0.0596471 | SW | 1 | 35 | 0.684944 | 1.2 | 0.28563 | 0 | 0.28563 |
| 24 | 0.0221045 | 0.0456083 | SW | 1 | 35 | 0.665152 | 1.16533 | 0.236111 | 0 | 0.236111 |
| 25 | 0.0221045 | 0.0185002 | SW | 1 | 35 | 0.832329 | 1.45822 | 0.654399 | 0 | 0.654399 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.75197

| 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 | 0.0221045 | 0.0040485 | SW | 1 | 35 | 0.826618 | 1.44821 | 0.640108 | 0 | 0.640108 |
| 2 | 0.0221045 | 0.011984 | SW | 1 | 35 | 0.965451 | 1.69144 | 0.987482 | 0 | 0.987482 |
| 3 | 0.0221045 | 0.0195926 | SW | 1 | 35 | 1.08556 | 1.90187 | 1.288 | 0 | 1.288 |
| 4 | 0.0221045 | 0.0268656 | SW | 1 | 35 | 1.1879 | 2.08116 | 1.54406 | 0 | 1.54406 |
| 5 | 0.0221045 | 0.033793 | SW | 1 | 35 | 1.27332 | 2.23081 | 1.75778 | 0 | 1.75778 |
| 6 | 0.0221045 | 0.0403626 | SW | 1 | 35 | 1.34257 | 2.35214 | 1.93106 | 0 | 1.93106 |
| 7 | 0.0221045 | 0.0465606 | SW | 1 | 35 | 1.39635 | 2.44636 | 2.06561 | 0 | 2.06561 |
| 8 | 0.0221045 | 0.0523705 | SW | 1 | 35 | 1.43526 | 2.51454 | 2.16298 | 0 | 2.16298 |
| 9 | 0.0221045 | 0.0577731 | SW | 1 | 35 | 1.45988 | 2.55767 | 2.22459 | 0 | 2.22459 |
| 10 | 0.0221045 | 0.0627459 | SW | 1 | 35 | 1.47073 | 2.57667 | 2.25172 | 0 | 2.25172 |
| 11 | 0.0221045 | 0.0672622 | SW | 1 | 35 | 1.46828 | 2.57239 | 2.2456 | 0 | 2.2456 |
| 12 | 0.0221045 | 0.0712903 | SW | 1 | 35 | 1.45302 | 2.54564 | 2.2074 | 0 | 2.2074 |
| 13 | 0.0221045 | 0.0747925 | SW | 1 | 35 | 1.42538 | 2.49723 | 2.13827 | 0 | 2.13827 |
| 14 | 0.0221045 | 0.0777228 | SW | 1 | 35 | 1.38587 | 2.428 | 2.0394 | 0 | 2.0394 |
| 15 | 0.0221045 | 0.0800252 | SW | 1 | 35 | 1.335 | 2.33888 | 1.91212 | 0 | 1.91212 |
| 16 | 0.0221045 | 0.0816298 | SW | 1 | 35 | 1.27338 | 2.23093 | 1.75795 | 0 | 1.75795 |
| 17 | 0.0221045 | 0.0824478 | SW | 1 | 35 | 1.20179 | 2.1055 | 1.57882 | 0 | 1.57882 |
| 18 | 0.0221045 | 0.0823642 | SW | 1 | 35 | 1.12125 | 1.9644 | 1.3773 | 0 | 1.3773 |
| 19 | 0.0221045 | 0.0812243 | SW | 1 | 35 | 1.03324 | 1.81021 | 1.1571 | 0 | 1.1571 |
| 20 | 0.0221045 | 0.078813 | SW | 1 | 35 | 0.940039 | 1.64692 | 0.923897 | 0 | 0.923897 |
| 21 | 0.0221045 | 0.0748136 | SW | 1 | 35 | 0.845364 | 1.48105 | 0.687013 | 0 | 0.687013 |
| 22 | 0.0221045 | 0.0687237 | SW | 1 | 35 | 0.755879 | 1.32428 | 0.463114 | 0 | 0.463114 |
| 23 | 0.0221045 | 0.0596471 | SW | 1 | 35 | 0.684944 | 1.2 | 0.28563 | 0 | 0.28563 |
| 24 | 0.0221045 | 0.0456083 | SW | 1 | 35 | 0.665152 | 1.16533 | 0.236111 | 0 | 0.236111 |
| 25 | 0.0221045 | 0.0185002 | SW | 1 | 35 | 0.832329 | 1.45822 | 0.654399 | 0 | 0.654399 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.68466

| Slice | Width | Weight | Base | Base Cohesion | Base Friction Angle | Shear Stress | Shear Strength | Base Normal Stress | Pore Pressure | Effective Normal Stress |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | [kPa] | [degrees] | [kPa] | [kPa] | [kPa] | [kPa] | [kPa] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0239836 | 0.00516135 | SW | 1 | 35 | 0.655891 | 1.10495 | 0.149889 | 0 | 0.149889 |
| 2 | 0.0239836 | 0.0152839 | SW | 1 | 35 | 0.830038 | 1.39833 | 0.568875 | 0 | 0.568875 |
| 3 | 0.0239836 | 0.0250024 | SW | 1 | 35 | 0.994088 | 1.6747 | 0.963571 | 0 | 0.963571 |
| 4 | 0.0239836 | 0.0343086 | SW | 1 | 35 | 1.14557 | 1.92989 | 1.32802 | 0 | 1.32802 |
| 5 | 0.0239836 | 0.0431921 | SW | 1 | 35 | 1.28232 | 2.16027 | 1.65704 | 0 | 1.65704 |
| 6 | 0.0239836 | 0.0516404 | SW | 1 | 35 | 1.40266 | 2.36301 | 1.94658 | 0 | 1.94658 |
| 7 | 0.0239836 | 0.0596384 | SW | 1 | 35 | 1.5055 | 2.53626 | 2.194 | 0 | 2.194 |
| 8 | 0.0239836 | 0.0671683 | SW | 1 | 35 | 1.59037 | 2.67924 | 2.39821 | 0 | 2.39821 |
| 9 | 0.0239836 | 0.0742087 | SW | 1 | 35 | 1.65743 | 2.7922 | 2.55953 | 0 | 2.55953 |
| 10 | 0.0239836 | 0.0807343 | SW | 1 | 35 | 1.70732 | 2.87625 | 2.67956 | 0 | 2.67956 |
| 11 | 0.0239836 | 0.0867151 | SW | 1 | 35 | 1.7411 | 2.93316 | 2.76084 | 0 | 2.76084 |
| 12 | 0.0239836 | 0.0921148 | SW | 1 | 35 | 1.76006 | 2.96511 | 2.80647 | 0 | 2.80647 |
| 13 | 0.0239836 | 0.09689 | SW | 1 | 35 | 1.76556 | 2.97437 | 2.81969 | 0 | 2.81969 |
| 14 | 0.0239836 | 0.100988 | SW | 1 | 35 | 1.75882 | 2.96302 | 2.80348 | 0 | 2.80348 |
| 15 | 0.0239836 | 0.104343 | SW | 1 | 35 | 1.74081 | 2.93268 | 2.76015 | 0 | 2.76015 |
| 16 | 0.0239836 | 0.106874 | SW | 1 | 35 | 1.71208 | 2.88427 | 2.69102 | 0 | 2.69102 |
| 17 | 0.0239836 | 0.108477 | SW | 1 | 35 | 1.6726 | 2.81777 | 2.59605 | 0 | 2.59605 |
| 18 | 0.0239836 | 0.109015 | SW | 1 | 35 | 1.62165 | 2.73193 | 2.47346 | 0 | 2.47346 |
| 19 | 0.0239836 | 0.108305 | SW | 1 | 35 | 1.55755 | 2.62395 | 2.31924 | 0 | 2.31924 |
| 20 | 0.0239836 | 0.106089 | SW | 1 | 35 | 1.47734 | 2.48882 | 2.12625 | 0 | 2.12625 |
| 21 | 0.0239836 | 0.101983 | SW | 1 | 35 | 1.37605 | 2.31818 | 1.88255 | 0 | 1.88255 |
| 22 | 0.0239836 | 0.0953672 | SW | 1 | 35 | 1.24529 | 2.09789 | 1.56795 | 0 | 1.56795 |
| 23 | 0.0239836 | 0.085109 | SW | 1 | 35 | 1.06979 | 1.80223 | 1.14569 | 0 | 1.14569 |
| 24 | 0.0239836 | 0.068567 | SW | 1 | 35 | 0.816415 | 1.37538 | 0.536101 | 0 | 0.536101 |
| 25 | 0.0239836 | 0.0291257 | SW | 1 | 35 | 0.317644 | 0.535122 | -0.663915 | 0 | -0.663915 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 3.65843 | 1.39495 |
| 19.2238 | 5.87564 |
| 20.1197 | 6.113 |
| 21.3574 | 6.469 |
| 31.314 | 9.35595 |
| 40.9932 | 12.499 |
| 58.0021 | 20.4798 |

### External Boundary

| X | Y |
|---|---|
| 15.5089 | 7.16214 |
| 15.5047 | 7.15683 |
| 15.5007 | 7.15046 |
| 15.5042 | 7.12849 |
| 15.5014 | 7.10641 |
| 15.5072 | 7.07713 |
| 15.5055 | 7.01397 |
| 15.5079 | 6.85826 |
| 15.5082 | 6.83806 |
| 15.5083 | 6.8308 |
| 15.5088 | 6.79587 |
| 15.5135 | 6.4847 |
| 15.5136 | 6.47673 |
| 15.5138 | 6.46397 |

| | |
|---|---|
| 15.5139 | 6.45861 |
| 15.5177 | 6.20837 |
| 15.2255 | 6.11307 |
| 14.9068 | 5.83945 |
| 14.531 | 5.81394 |
| 14.3766 | 5.81394 |
| 14.0785 | 5.7859 |
| 13.4437 | 5.71069 |
| 12.8259 | 5.60602 |
| 11.8014 | 5.52321 |
| 11.5686 | 5.50581 |
| 11.0035 | 5.45144 |
| 10.7524 | 5.43465 |
| 10.6428 | 5.44141 |
| 10.6306 | 5.59569 |
| 10.6252 | 5.74861 |
| 10.6047 | 5.75406 |
| 10.3991 | 5.74996 |
| 10.1023 | 5.7337 |
| 10.0685 | 5.72426 |
| 10.0564 | 5.68379 |
| 10.0604 | 5.49629 |
| 10.0348 | 5.4356 |
| 9.93764 | 5.41807 |
| 9.84285 | 5.42769 |
| 8.64957 | 5.32679 |
| 7.55348 | 5.30049 |
| 5.50325 | 5.27181 |
| 3.65843 | 5.33747 |
| 3.65843 | 1.39495 |
| 3.65843 | -1.0496 |
| 3.65843 | -3.3297 |
| 3.65843 | -4.75034 |
| 58.0021 | -4.75034 |
| 58.0021 | 12.0122 |
| 58.0021 | 20.4798 |
| 58.0021 | 22.4959 |
| 58.0021 | 25.0964 |
| 56.8949 | 24.7535 |
| 56.4427 | 24.4729 |
| 55.5383 | 23.9429 |
| 54.6182 | 23.5376 |
| 54.0256 | 22.9297 |
| 52.8405 | 21.8853 |
| 51.8424 | 21.3086 |
| 49.5935 | 19.6011 |
| 48.9572 | 18.9962 |
| 47.3933 | 17.7083 |
| 46.9774 | 17.4859 |
| 46.0973 | 16.9639 |
| 43.5489 | 15.6354 |
| 43.4255 | 15.5699 |
| 42.2853 | 15.1476 |
| 41.4521 | 14.3098 |
| 40.9932 | 14.0475 |
| 31.9223 | 14.4593 |
| 31.7396 | 14.452 |
| 31.5167 | 14.4556 |

| | |
|---|---|
| 31.3742 | 14.4483 |
| 31.2609 | 14.3826 |
| 31.144 | 14.3387 |
| 30.9868 | 14.2401 |
| 30.8699 | 14.1232 |
| 30.7164 | 14.0173 |
| 30.4241 | 13.8822 |
| 30.0367 | 13.6995 |
| 29.3038 | 13.4105 |
| 29.0415 | 13.294 |
| 28.5698 | 12.9915 |
| 28.3087 | 12.8758 |
| 27.9296 | 12.7397 |
| 27.2258 | 12.552 |
| 26.9223 | 12.5087 |
| 26.6947 | 12.5123 |
| 26.3696 | 12.4617 |
| 25.9469 | 12.4039 |
| 25.1621 | 12.2298 |
| 24.1388 | 12.1321 |
| 23.1127 | 11.949 |
| 22.4366 | 11.8001 |
| 21.8179 | 11.6679 |
| 21.026 | 11.4986 |
| 20.1197 | 11.1092 |
| 16.639 | 7.35729 |
| 16.5678 | 7.31284 |
| 16.1209 | 7.30962 |
| 16.1206 | 7.33432 |
| 16.1188 | 7.49116 |
| 16.1103 | 7.51787 |
| 16.094 | 7.52834 |
| 16.0725 | 7.53066 |
| 15.8692 | 7.52384 |
| 15.5001 | 7.51145 |
| 15.496 | 7.50613 |
| 15.4919 | 7.49977 |
| 15.4954 | 7.47779 |
| 15.4926 | 7.45571 |
| 15.4984 | 7.42643 |
| 15.4958 | 7.32881 |
| 15.4965 | 7.29105 |
| 15.4971 | 7.22273 |
| 15.499 | 7.20763 |
| 15.5022 | 7.20164 |
| 15.4983 | 7.18196 |
| 15.5016 | 7.17677 |
| 15.5089 | 7.1669 |

## Material Boundary

| X | Y |
|---|---|
| 15.5284 | 5.82373 |
| 15.5233 | 6.07038 |
| 15.522 | 6.13452 |
| 16.1172 | 6.13731 |

### Material Boundary

| X | Y |
|---|---|
| 15.5284 | 5.82373 |
| 16.1142 | 5.82835 |

### Material Boundary

| X | Y |
|---|---|
| 15.5177 | 6.20837 |
| 15.5194 | 6.15051 |
| 15.5211 | 6.144 |
| 15.5295 | 6.13929 |
| 15.6015 | 6.13888 |
| 15.6404 | 6.14189 |
| 15.7567 | 6.14479 |
| 15.8444 | 6.14588 |
| 15.908 | 6.14886 |
| 16.0494 | 6.14667 |

### Material Boundary

| X | Y |
|---|---|
| 16.0656 | 5.47884 |
| 15.9242 | 5.4822 |
| 15.8606 | 5.47975 |
| 15.7729 | 5.47939 |
| 15.6487 | 5.4783 |
| 15.6176 | 5.47476 |
| 15.5457 | 5.47576 |
| 15.5342 | 5.48056 |
| 15.5325 | 5.48709 |
| 15.5302 | 5.74206 |
| 15.5298 | 5.79109 |
| 15.5379 | 5.8026 |
| 15.546 | 5.80758 |
| 15.8018 | 5.81474 |
| 15.8736 | 5.81963 |
| 15.9184 | 5.82267 |
| 16.113 | 5.8242 |
| 16.1154 | 5.82256 |
| 16.1187 | 5.82031 |
| 16.132 | 5.81467 |
| 16.1377 | 5.8089 |
| 16.1389 | 5.73815 |
| 16.1402 | 5.53386 |
| 16.1398 | 5.48483 |
| 16.1279 | 5.48168 |
| 16.108 | 5.48053 |
| 16.0656 | 5.47884 |

### Material Boundary

| X | Y |
|---|---|
| 16.1209 | 7.30962 |
| 16.1258 | 7.30002 |
| 16.1318 | 7.28949 |
| 16.1384 | 7.27928 |

| | |
|---|---|
| 16.1454 | 7.26939 |
| 16.153 | 7.25987 |
| 16.161 | 7.25072 |
| 16.1694 | 7.24198 |
| 16.1782 | 7.23365 |
| 16.1875 | 7.22578 |
| 16.1971 | 7.21836 |
| 16.207 | 7.21142 |
| 16.2138 | 7.20721 |
| 16.2173 | 7.20498 |
| 16.2279 | 7.19906 |
| 16.2388 | 7.19366 |
| 16.2499 | 7.18879 |
| 16.2613 | 7.18448 |
| 16.2728 | 7.18073 |
| 16.2845 | 7.17755 |
| 16.2964 | 7.17495 |
| 16.3084 | 7.17293 |
| 16.3204 | 7.1715 |
| 16.3325 | 7.17066 |
| 16.3447 | 7.17042 |
| 16.3568 | 7.17077 |
| 16.3689 | 7.17172 |
| 16.381 | 7.17326 |
| 16.3929 | 7.17538 |
| 16.4047 | 7.17809 |
| 16.4164 | 7.18138 |
| 16.4279 | 7.18523 |
| 16.4393 | 7.18964 |
| 16.4503 | 7.19461 |
| 16.4612 | 7.20011 |
| 16.4717 | 7.20613 |
| 16.4819 | 7.21266 |
| 16.4918 | 7.21969 |
| 16.5014 | 7.22719 |
| 16.5105 | 7.23515 |
| 16.5193 | 7.24355 |
| 16.5277 | 7.25237 |
| 16.5331 | 7.25867 |
| 16.5356 | 7.26159 |
| 16.543 | 7.27118 |
| 16.55 | 7.28113 |
| 16.5564 | 7.2914 |
| 16.5624 | 7.30198 |
| 16.5678 | 7.31284 |

## Material Boundary

| X | Y |
|---|---|
| 20.1197 | 10.9142 |
| 21.3574 | 10.9142 |
| 21.3574 | 10.5064 |
| 20.1197 | 10.5064 |
| 20.1197 | 10.9142 |

## Material Boundary

| X | Y |
|---|---|

| | |
|---|---|
| 19.6199 | 9.85802 |
| 20.1197 | 9.85802 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 4.571 |
| 21.3574 | 6.469 |
| 21.3574 | 7.874 |
| 21.3574 | 10.5064 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | 4.14158 |
| 20.1197 | 6.113 |
| 20.1197 | 6.35721 |
| 20.1197 | 9.85802 |
| 20.1197 | 10.5064 |

### Material Boundary

| X | Y |
|---|---|
| 19.2238 | 5.87564 |
| 20.1197 | 6.113 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 7.874 |
| 31.5167 | 11.426 |
| 40.9932 | 12.499 |
| 58.0021 | 22.4959 |

### Material Boundary

| X | Y |
|---|---|
| 3.65843 | -1.0496 |
| 14.9068 | 2.35895 |
| 20.1197 | 4.14158 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 4.571 |
| 31.5167 | 8.03895 |
| 40.9932 | 10.529 |
| 58.0021 | 20.4798 |

### Material Boundary

| X | Y |
|---|---|
| 3.65843 | -3.3297 |
| 20.1197 | 1.31751 |
| 21.3574 | 1.66694 |
| 58.0021 | 12.0122 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 6.469 |
| 31.314 | 9.35595 |
| 40.9932 | 12.499 |
| 58.0021 | 20.4798 |

### Material Boundary

| X | Y |
|---|---|
| 3.65843 | 1.39495 |
| 19.2238 | 5.87564 |

### Material Boundary

| X | Y |
|---|---|
| 15.5136 | 6.47673 |
| 15.5211 | 6.46598 |

### Material Boundary

| X | Y |
|---|---|
| 16.1149 | 7.1834 |
| 16.1221 | 7.20482 |
| 16.1212 | 7.28558 |
| 16.1209 | 7.30962 |

### Material Boundary

| X | Y |
|---|---|
| 15.8362 | 7.17313 |
| 16.1149 | 7.1834 |
| 16.1149 | 7.179 |
| 16.1174 | 7.16969 |
| 16.1191 | 7.16857 |
| 16.1276 | 7.14186 |
| 16.1308 | 6.85552 |
| 16.1096 | 6.84172 |
| 16.0893 | 6.83024 |
| 16.0742 | 6.82998 |
| 15.9836 | 6.82644 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | -4.05 |
| 21.3574 | 1.66694 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 1.66694 |
| 21.3574 | 4.571 |

### Material Boundary

| X | Y |
|---|---|
| 16.6205 | 6.35721 |
| 20.1197 | 6.35721 |

### Material Boundary

| X | Y |
|---|---|
| 15.5135 | 6.4847 |
| 16.1249 | 6.49385 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | -4.05 |
| 20.1197 | 1.31751 |
| 20.1197 | 4.14158 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | -4.05 |
| 21.3574 | -4.05 |

### Material Boundary

| X | Y |
|---|---|
| 15.5138 | 6.46397 |
| 15.5206 | 6.4655 |
| 15.5211 | 6.46598 |
| 15.5256 | 6.47004 |
| 15.531 | 6.47617 |
| 15.6953 | 6.48318 |
| 15.7844 | 6.47982 |
| 15.9016 | 6.48876 |
| 16.1013 | 6.488 |
| 16.1052 | 6.48637 |
| 16.1154 | 6.48163 |
| 16.1204 | 6.47674 |
| 16.1208 | 6.45974 |
| 16.1221 | 6.40601 |
| 16.1225 | 6.37441 |
| 16.1228 | 6.35721 |
| 16.1251 | 6.20174 |
| 16.1251 | 6.15271 |
| 16.1167 | 6.15043 |
| 16.1132 | 6.14946 |
| 16.0933 | 6.14814 |
| 16.0494 | 6.14667 |

### Material Boundary

| X | Y |
|---|---|
| 15.5083 | 6.8308 |
| 15.5104 | 6.82747 |
| 15.5202 | 6.82322 |
| 15.5286 | 6.82336 |
| 15.5404 | 6.82356 |
| 15.5539 | 6.82211 |
| 15.5808 | 6.82088 |
| 15.643 | 6.82531 |
| 15.7945 | 6.8262 |

| | |
|---|---|
| 15.8567 | 6.82558 |
| 15.8779 | 6.82507 |

### Material Boundary

| X | Y |
|---|---|
| 15.5284 | 5.82373 |
| 15.5298 | 5.79109 |

### Material Boundary

| X | Y |
|---|---|
| 16.1142 | 5.82835 |
| 16.1167 | 6.10361 |
| 16.1171 | 6.13323 |
| 16.1172 | 6.13731 |

### Material Boundary

| X | Y |
|---|---|
| 15.5089 | 7.16214 |
| 15.8326 | 7.17135 |
| 16.1149 | 7.179 |

### Material Boundary

| X | Y |
|---|---|
| 15.8779 | 6.82507 |
| 15.9836 | 6.82644 |

### Material Boundary

| X | Y |
|---|---|
| 15.5089 | 7.1669 |
| 15.8362 | 7.17313 |

### Material Boundary

| X | Y |
|---|---|
| 16.1228 | 6.35721 |
| 16.6205 | 6.35721 |

### Material Boundary

| X | Y |
|---|---|
| 15.5088 | 6.79587 |
| 15.5257 | 6.79762 |
| 15.5338 | 6.80266 |
| 15.5583 | 6.80471 |
| 15.7004 | 6.81531 |
| 15.7895 | 6.81195 |
| 15.8845 | 6.81919 |
| 15.9067 | 6.82088 |
| 15.9902 | 6.82057 |
| 16.1064 | 6.82013 |
| 16.1197 | 6.8146 |
| 16.1255 | 6.80887 |
| 16.1272 | 6.73814 |

| | |
|---|---|
| 16.1302 | 6.53386 |
| 16.1249 | 6.49385 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | 10.9142 |
| 20.1197 | 11.1092 |

### Material Boundary

| X | Y |
|---|---|
| 21.8179 | 11.6679 |
| 22.0277 | 11.7055 |
| 22.4366 | 11.8001 |

### Material Boundary

| X | Y |
|---|---|
| 16.1255 | 6.80887 |
| 16.1308 | 6.85552 |

### Material Boundary

| X | Y |
|---|---|
| 16.1204 | 6.47674 |
| 16.1249 | 6.49385 |

### Material Boundary

| X | Y |
|---|---|
| 15.5211 | 6.144 |
| 15.522 | 6.13452 |

### Material Boundary

| X | Y |
|---|---|
| 16.1172 | 6.13731 |
| 16.1251 | 6.15271 |

### Material Boundary

| X | Y |
|---|---|
| 16.113 | 5.8242 |
| 16.1142 | 5.82835 |

### Material Boundary

| X | Y |
|---|---|
| 16.6205 | 6.35721 |
| 16.6202 | 6.857 |
| 17.1202 | 6.857 |
| 17.1202 | 7.35729 |
| 17.6201 | 7.35729 |
| 17.6201 | 7.85774 |
| 18.1201 | 7.85774 |
| 18.1201 | 8.35751 |
| 18.62 | 8.35751 |

| | |
|---|---|
| 18.62 | 8.85787 |
| 19.1204 | 8.85787 |
| 19.1204 | 9.35802 |
| 19.6199 | 9.358 |
| 19.6199 | 9.85802 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S39 + GABIONS RU + GEOTEX
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 8/5/2021, 15:10:48

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | None | None | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |
| Ru Value | 0.2 | 0.2 | | | | | | |

| Property | AIR | PILE | SW |
|---|---|---|---|
| Color | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 1e-005 | 24 | 19 |
| Cohesion [kPa] | 1e-005 | 500 | 1 |
| Friction Angle [deg] | 0 | 45 | 35 |
| Water Surface | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated |

## Support Properties

### GEOTEX

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Parallel to Reinforcement
Anchorage: Embedded End
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 40 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 30 degrees

## Global Minimums

### Method: ordinary/fellenius

FS: 1.638650
Center: 19.352, 11.038
Radius: 0.678
Left Slip Surface Endpoint: 19.429, 10.365
Right Slip Surface Endpoint: 20.029, 11.011
Resisting Moment=1.29092 kN-m
Driving Moment=0.787796 kN-m

### Method: bishop simplified

FS: 1.685550
Center: 19.352, 11.038
Radius: 0.678
Left Slip Surface Endpoint: 19.429, 10.365
Right Slip Surface Endpoint: 20.029, 11.011
Resisting Moment=1.32787 kN-m
Driving Moment=0.787796 kN-m

### Method: janbu simplified

FS: 1.642240
Center: 18.120, 9.347
Radius: 0.473
Left Slip Surface Endpoint: 18.051, 8.879
Right Slip Surface Endpoint: 18.593, 9.347
Left Slope Intercept: 18.051 8.879
Right Slope Intercept: 18.593 9.464
Resisting Horizontal Force=1.55411 kN
Driving Horizontal Force=0.946331 kN

### Method: janbu corrected

FS: 1.769960
Center: 18.120, 9.347
Radius: 0.473
Left Slip Surface Endpoint: 18.051, 8.879
Right Slip Surface Endpoint: 18.593, 9.347
Left Slope Intercept: 18.051 8.879
Right Slope Intercept: 18.593 9.464
Resisting Horizontal Force=1.67497 kN
Driving Horizontal Force=0.946331 kN

### Method: spencer

FS: 1.753190
Center: 19.312, 11.047
Radius: 0.684
Left Slip Surface Endpoint: 19.439, 10.375
Right Slip Surface Endpoint: 19.991, 10.971
Resisting Moment=1.08521 kN-m
Driving Moment=0.618993 kN-m
Resisting Horizontal Force=1.11793 kN
Driving Horizontal Force=0.637652 kN

### Method: corp of eng#1

FS: 1.751970
Center: 19.312, 11.047
Radius: 0.684
Left Slip Surface Endpoint: 19.439, 10.375
Right Slip Surface Endpoint: 19.991, 10.971
Resisting Horizontal Force=1.11782 kN
Driving Horizontal Force=0.638035 kN

### Method: corp of eng#2

FS: 1.751970
Center: 19.312, 11.047
Radius: 0.684
Left Slip Surface Endpoint: 19.439, 10.375
Right Slip Surface Endpoint: 19.991, 10.971
Resisting Horizontal Force=1.11782 kN
Driving Horizontal Force=0.638035 kN

### Method: lowe-karafiath

Resisting Horizontal Force=-0 kN
Driving Horizontal Force=0 kN

### Method: gle/morgenstern-price

FS: 1.684660
Center: 19.352, 11.038
Radius: 0.678
Left Slip Surface Endpoint: 19.429, 10.365
Right Slip Surface Endpoint: 20.029, 11.011
Resisting Moment=1.32717 kN-m
Driving Moment=0.787796 kN-m
Resisting Horizontal Force=1.39007 kN
Driving Horizontal Force=0.825133 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 7439
Number of Invalid Surfaces: 2561

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 839 surfaces
Error Code -109 reported for 124 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 6904
Number of Invalid Surfaces: 3096

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 839 surfaces
Error Code -109 reported for 124 surfaces
Error Code -112 reported for 535 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 6571
Number of Invalid Surfaces: 3429

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 1197 surfaces
Error Code -109 reported for 124 surfaces
Error Code -112 reported for 510 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 6571
Number of Invalid Surfaces: 3429

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 1197 surfaces

Error Code -109 reported for 124 surfaces
Error Code -112 reported for 510 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: spencer

Number of Valid Surfaces: 6004
Number of Invalid Surfaces: 3996

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 1478 surfaces
Error Code -109 reported for 124 surfaces
Error Code -111 reported for 226 surfaces
Error Code -112 reported for 570 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: corp of eng#1

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

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 8272 surfaces
Error Code -109 reported for 124 surfaces
Error Code -112 reported for 1 surface
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: corp of eng#2

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

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 8273 surfaces
Error Code -109 reported for 124 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: lowe-karafiath

Number of Valid Surfaces: 0
Number of Invalid Surfaces: 10000

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 8278 surfaces
Error Code -109 reported for 124 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: gle/morgenstern-price

Number of Valid Surfaces: 5752
Number of Invalid Surfaces: 4248

**Error Codes:**

Error Code -106 reported for 590 surfaces

Error Code -108 reported for 1445 surfaces
Error Code -109 reported for 124 surfaces
Error Code -111 reported for 533 surfaces
Error Code -112 reported for 548 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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.
-111 = safety factor equation did not converge
-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.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.63865

| 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 | 0.0239836 | 0.00516135 | SW | 1 | 35 | 0.700608 | 1.14805 | 0.21144 | 0 | 0.21144 |
| 2 | 0.0239836 | 0.0152839 | SW | 1 | 35 | 0.874915 | 1.43368 | 0.619361 | 0 | 0.619361 |
| 3 | 0.0239836 | 0.0250024 | SW | 1 | 35 | 1.03736 | 1.69987 | 0.999515 | 0 | 0.999515 |
| 4 | 0.0239836 | 0.0343086 | SW | 1 | 35 | 1.18678 | 1.94472 | 1.34919 | 0 | 1.34919 |
| 5 | 0.0239836 | 0.0431921 | SW | 1 | 35 | 1.32211 | 2.16647 | 1.66589 | 0 | 1.66589 |
| 6 | 0.0239836 | 0.0516404 | SW | 1 | 35 | 1.44236 | 2.36352 | 1.9473 | 0 | 1.9473 |
| 7 | 0.0239836 | 0.0596384 | SW | 1 | 35 | 1.54664 | 2.5344 | 2.19136 | 0 | 2.19136 |
| 8 | 0.0239836 | 0.0671683 | SW | 1 | 35 | 1.63417 | 2.67784 | 2.3962 | 0 | 2.3962 |
| 9 | 0.0239836 | 0.0742087 | SW | 1 | 35 | 1.70427 | 2.79271 | 2.56025 | 0 | 2.56025 |
| 10 | 0.0239836 | 0.0807343 | SW | 1 | 35 | 1.75638 | 2.87809 | 2.68219 | 0 | 2.68219 |
| 11 | 0.0239836 | 0.0867151 | SW | 1 | 35 | 1.79003 | 2.93324 | 2.76096 | 0 | 2.76096 |
| 12 | 0.0239836 | 0.0921148 | SW | 1 | 35 | 1.80495 | 2.95768 | 2.79586 | 0 | 2.79586 |
| 13 | 0.0239836 | 0.09689 | SW | 1 | 35 | 1.80097 | 2.95116 | 2.78654 | 0 | 2.78654 |
| 14 | 0.0239836 | 0.100988 | SW | 1 | 35 | 1.77811 | 2.9137 | 2.73305 | 0 | 2.73305 |
| 15 | 0.0239836 | 0.104343 | SW | 1 | 35 | 1.73659 | 2.84567 | 2.63589 | 0 | 2.63589 |
| 16 | 0.0239836 | 0.106874 | SW | 1 | 35 | 1.67687 | 2.7478 | 2.49611 | 0 | 2.49611 |
| 17 | 0.0239836 | 0.108477 | SW | 1 | 35 | 1.59965 | 2.62126 | 2.3154 | 0 | 2.3154 |
| 18 | 0.0239836 | 0.109015 | SW | 1 | 35 | 1.50598 | 2.46778 | 2.09621 | 0 | 2.09621 |
| 19 | 0.0239836 | 0.108305 | SW | 1 | 35 | 1.39735 | 2.28976 | 1.84197 | 0 | 1.84197 |
| 20 | 0.0239836 | 0.106089 | SW | 1 | 35 | 1.27575 | 2.0905 | 1.5574 | 0 | 1.5574 |
| 21 | 0.0239836 | 0.101983 | SW | 1 | 35 | 1.14392 | 1.87449 | 1.2489 | 0 | 1.2489 |
| 22 | 0.0239836 | 0.0953672 | SW | 1 | 35 | 1.00569 | 1.64798 | 0.925411 | 0 | 0.925411 |
| 23 | 0.0239836 | 0.085109 | SW | 1 | 35 | 0.866547 | 1.41997 | 0.599777 | 0 | 0.599777 |
| 24 | 0.0239836 | 0.068567 | SW | 1 | 35 | 0.734977 | 1.20437 | 0.291871 | 0 | 0.291871 |
| 25 | 0.0239836 | 0.0291257 | SW | 1 | 35 | 0.622596 | 1.02022 | 0.0288725 | 0 | 0.0288725 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.68555

| 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 | 0.0239836 | 0.00516135 | SW | 1 | 35 | 0.646834 | 1.09027 | 0.12892 | 0 | 0.12892 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.0239836 | 0.0152839 | SW | 1 | 35 | 0.801407 | 1.35081 | 0.501011 | 0 | 0.501011 |
| 3 | 0.0239836 | 0.0250024 | SW | 1 | 35 | 0.944958 | 1.59277 | 0.846569 | 0 | 0.846569 |
| 4 | 0.0239836 | 0.0343086 | SW | 1 | 35 | 1.07764 | 1.81642 | 1.16597 | 0 | 1.16597 |
| 5 | 0.0239836 | 0.0431921 | SW | 1 | 35 | 1.19955 | 2.0219 | 1.45943 | 0 | 1.45943 |
| 6 | 0.0239836 | 0.0516404 | SW | 1 | 35 | 1.31071 | 2.20927 | 1.72702 | 0 | 1.72702 |
| 7 | 0.0239836 | 0.0596384 | SW | 1 | 35 | 1.4111 | 2.37848 | 1.96867 | 0 | 1.96867 |
| 8 | 0.0239836 | 0.0671683 | SW | 1 | 35 | 1.50062 | 2.52937 | 2.18416 | 0 | 2.18416 |
| 9 | 0.0239836 | 0.0742087 | SW | 1 | 35 | 1.5791 | 2.66165 | 2.37309 | 0 | 2.37309 |
| 10 | 0.0239836 | 0.0807343 | SW | 1 | 35 | 1.64631 | 2.77494 | 2.53487 | 0 | 2.53487 |
| 11 | 0.0239836 | 0.0867151 | SW | 1 | 35 | 1.70193 | 2.86868 | 2.66875 | 0 | 2.66875 |
| 12 | 0.0239836 | 0.0921148 | SW | 1 | 35 | 1.74553 | 2.94217 | 2.7737 | 0 | 2.7737 |
| 13 | 0.0239836 | 0.09689 | SW | 1 | 35 | 1.77658 | 2.99451 | 2.84845 | 0 | 2.84845 |
| 14 | 0.0239836 | 0.100988 | SW | 1 | 35 | 1.7944 | 3.02455 | 2.89135 | 0 | 2.89135 |
| 15 | 0.0239836 | 0.104343 | SW | 1 | 35 | 1.79815 | 3.03087 | 2.90038 | 0 | 2.90038 |
| 16 | 0.0239836 | 0.106874 | SW | 1 | 35 | 1.78674 | 3.01164 | 2.87292 | 0 | 2.87292 |
| 17 | 0.0239836 | 0.108477 | SW | 1 | 35 | 1.75881 | 2.96456 | 2.80568 | 0 | 2.80568 |
| 18 | 0.0239836 | 0.109015 | SW | 1 | 35 | 1.71256 | 2.8866 | 2.69434 | 0 | 2.69434 |
| 19 | 0.0239836 | 0.108305 | SW | 1 | 35 | 1.64562 | 2.77377 | 2.53321 | 0 | 2.53321 |
| 20 | 0.0239836 | 0.106089 | SW | 1 | 35 | 1.55473 | 2.62057 | 2.31442 | 0 | 2.31442 |
| 21 | 0.0239836 | 0.101983 | SW | 1 | 35 | 1.43521 | 2.41911 | 2.02669 | 0 | 2.02669 |
| 22 | 0.0239836 | 0.0953672 | SW | 1 | 35 | 1.27983 | 2.15721 | 1.65266 | 0 | 1.65266 |
| 23 | 0.0239836 | 0.085109 | SW | 1 | 35 | 1.07619 | 1.81397 | 1.16247 | 0 | 1.16247 |
| 24 | 0.0239836 | 0.068567 | SW | 1 | 35 | 0.797931 | 1.34495 | 0.492642 | 0 | 0.492642 |
| 25 | 0.0239836 | 0.0291257 | SW | 1 | 35 | 0.299787 | 0.505306 | -0.706494 | 0 | -0.706494 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.64224

| 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 | 0.0216801 | 0.00536671 | SW | 1 | 35 | 0.754323 | 1.23878 | 0.341012 | 0 | 0.341012 |
| 2 | 0.0216801 | 0.0158922 | SW | 1 | 35 | 0.952906 | 1.5649 | 0.806761 | 0 | 0.806761 |
| 3 | 0.0216801 | 0.0260041 | SW | 1 | 35 | 1.1355 | 1.86477 | 1.23502 | 0 | 1.23502 |
| 4 | 0.0216801 | 0.0357056 | SW | 1 | 35 | 1.30306 | 2.13994 | 1.62801 | 0 | 1.62801 |
| 5 | 0.0216801 | 0.044997 | SW | 1 | 35 | 1.45632 | 2.39162 | 1.98745 | 0 | 1.98745 |
| 6 | 0.0216801 | 0.0538763 | SW | 1 | 35 | 1.59583 | 2.62073 | 2.31464 | 0 | 2.31464 |
| 7 | 0.0216801 | 0.0623386 | SW | 1 | 35 | 1.72199 | 2.82792 | 2.61054 | 0 | 2.61054 |
| 8 | 0.0216801 | 0.0703764 | SW | 1 | 35 | 1.83506 | 3.01361 | 2.87574 | 0 | 2.87574 |
| 9 | 0.0216801 | 0.0779788 | SW | 1 | 35 | 1.93519 | 3.17804 | 3.11056 | 0 | 3.11056 |
| 10 | 0.0216801 | 0.0851317 | SW | 1 | 35 | 2.02235 | 3.32119 | 3.315 | 0 | 3.315 |
| 11 | 0.0216801 | 0.0918168 | SW | 1 | 35 | 2.09645 | 3.44287 | 3.48878 | 0 | 3.48878 |
| 12 | 0.0216801 | 0.0980111 | SW | 1 | 35 | 2.15721 | 3.54265 | 3.63128 | 0 | 3.63128 |
| 13 | 0.0216801 | 0.103686 | SW | 1 | 35 | 2.20421 | 3.61984 | 3.74152 | 0 | 3.74152 |
| 14 | 0.0216801 | 0.108805 | SW | 1 | 35 | 2.23687 | 3.67347 | 3.81811 | 0 | 3.81811 |
| 15 | 0.0216801 | 0.113323 | SW | 1 | 35 | 2.25435 | 3.70219 | 3.85913 | 0 | 3.85913 |
| 16 | 0.0216801 | 0.117183 | SW | 1 | 35 | 2.2556 | 3.70423 | 3.86204 | 0 | 3.86204 |
| 17 | 0.0216801 | 0.120311 | SW | 1 | 35 | 2.23912 | 3.67717 | 3.82339 | 0 | 3.82339 |
| 18 | 0.0216801 | 0.122607 | SW | 1 | 35 | 2.20296 | 3.61779 | 3.73859 | 0 | 3.73859 |
| 19 | 0.0216801 | 0.12394 | SW | 1 | 35 | 2.14441 | 3.52163 | 3.60126 | 0 | 3.60126 |
| 20 | 0.0216801 | 0.124122 | SW | 1 | 35 | 2.05961 | 3.38237 | 3.4024 | 0 | 3.4024 |
| 21 | 0.0216801 | 0.122873 | SW | 1 | 35 | 1.94279 | 3.19053 | 3.12842 | 0 | 3.12842 |
| 22 | 0.0216801 | 0.119739 | SW | 1 | 35 | 1.78465 | 2.93083 | 2.75751 | 0 | 2.75751 |
| 23 | 0.0216801 | 0.113889 | SW | 1 | 35 | 1.56823 | 2.57541 | 2.24992 | 0 | 2.24992 |
| 24 | 0.0216801 | 0.103371 | SW | 1 | 35 | 1.25427 | 2.05982 | 1.51358 | 0 | 1.51358 |
| 25 | 0.0216801 | 0.0722513 | SW | 1 | 35 | 0.536584 | 0.8812 | -0.169664 | 0 | -0.169664 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.76996

| 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 | 0.0216801 | 0.00536671 | SW | 1 | 35 | 0.699891 | 1.23878 | 0.341012 | 0 | 0.341012 |
| 2 | 0.0216801 | 0.0158922 | SW | 1 | 35 | 0.884144 | 1.5649 | 0.806761 | 0 | 0.806761 |
| 3 | 0.0216801 | 0.0260041 | SW | 1 | 35 | 1.05357 | 1.86477 | 1.23502 | 0 | 1.23502 |
| 4 | 0.0216801 | 0.0357056 | SW | 1 | 35 | 1.20903 | 2.13994 | 1.62801 | 0 | 1.62801 |
| 5 | 0.0216801 | 0.044997 | SW | 1 | 35 | 1.35123 | 2.39162 | 1.98745 | 0 | 1.98745 |
| 6 | 0.0216801 | 0.0538763 | SW | 1 | 35 | 1.48067 | 2.62073 | 2.31464 | 0 | 2.31464 |
| 7 | 0.0216801 | 0.0623386 | SW | 1 | 35 | 1.59773 | 2.82792 | 2.61054 | 0 | 2.61054 |
| 8 | 0.0216801 | 0.0703764 | SW | 1 | 35 | 1.70264 | 3.01361 | 2.87574 | 0 | 2.87574 |
| 9 | 0.0216801 | 0.0779788 | SW | 1 | 35 | 1.79554 | 3.17804 | 3.11056 | 0 | 3.11056 |
| 10 | 0.0216801 | 0.0851317 | SW | 1 | 35 | 1.87642 | 3.32119 | 3.315 | 0 | 3.315 |
| 11 | 0.0216801 | 0.0918168 | SW | 1 | 35 | 1.94517 | 3.44287 | 3.48878 | 0 | 3.48878 |
| 12 | 0.0216801 | 0.0980111 | SW | 1 | 35 | 2.00154 | 3.54265 | 3.63128 | 0 | 3.63128 |
| 13 | 0.0216801 | 0.103686 | SW | 1 | 35 | 2.04515 | 3.61984 | 3.74152 | 0 | 3.74152 |
| 14 | 0.0216801 | 0.108805 | SW | 1 | 35 | 2.07545 | 3.67347 | 3.81811 | 0 | 3.81811 |
| 15 | 0.0216801 | 0.113323 | SW | 1 | 35 | 2.09168 | 3.70219 | 3.85913 | 0 | 3.85913 |
| 16 | 0.0216801 | 0.117183 | SW | 1 | 35 | 2.09283 | 3.70423 | 3.86204 | 0 | 3.86204 |
| 17 | 0.0216801 | 0.120311 | SW | 1 | 35 | 2.07754 | 3.67717 | 3.82339 | 0 | 3.82339 |
| 18 | 0.0216801 | 0.122607 | SW | 1 | 35 | 2.044 | 3.61779 | 3.73859 | 0 | 3.73859 |
| 19 | 0.0216801 | 0.12394 | SW | 1 | 35 | 1.98967 | 3.52163 | 3.60126 | 0 | 3.60126 |
| 20 | 0.0216801 | 0.124122 | SW | 1 | 35 | 1.91099 | 3.38237 | 3.4024 | 0 | 3.4024 |
| 21 | 0.0216801 | 0.122873 | SW | 1 | 35 | 1.8026 | 3.19053 | 3.12842 | 0 | 3.12842 |
| 22 | 0.0216801 | 0.119739 | SW | 1 | 35 | 1.65587 | 2.93083 | 2.75751 | 0 | 2.75751 |
| 23 | 0.0216801 | 0.113889 | SW | 1 | 35 | 1.45507 | 2.57541 | 2.24992 | 0 | 2.24992 |
| 24 | 0.0216801 | 0.103371 | SW | 1 | 35 | 1.16377 | 2.05982 | 1.51358 | 0 | 1.51358 |
| 25 | 0.0216801 | 0.0722513 | SW | 1 | 35 | 0.497864 | 0.8812 | -0.169664 | 0 | -0.169664 |

**Global Minimum Query (spencer) - Safety Factor**: 1.75319

| 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 | 0.0221045 | 0.0040485 | SW | 1 | 35 | 0.748942 | 1.31304 | 0.447065 | 0 | 0.447065 |
| 2 | 0.0221045 | 0.011984 | SW | 1 | 35 | 0.882532 | 1.54725 | 0.781547 | 0 | 0.781547 |
| 3 | 0.0221045 | 0.0195926 | SW | 1 | 35 | 1.00076 | 1.75453 | 1.07758 | 0 | 1.07758 |
| 4 | 0.0221045 | 0.0268656 | SW | 1 | 35 | 1.10428 | 1.93601 | 1.33676 | 0 | 1.33676 |
| 5 | 0.0221045 | 0.033793 | SW | 1 | 35 | 1.19365 | 2.09269 | 1.56052 | 0 | 1.56052 |
| 6 | 0.0221045 | 0.0403626 | SW | 1 | 35 | 1.26935 | 2.22541 | 1.75007 | 0 | 1.75007 |
| 7 | 0.0221045 | 0.0465606 | SW | 1 | 35 | 1.33182 | 2.33493 | 1.90648 | 0 | 1.90648 |
| 8 | 0.0221045 | 0.0523705 | SW | 1 | 35 | 1.38142 | 2.42189 | 2.03067 | 0 | 2.03067 |
| 9 | 0.0221045 | 0.0577731 | SW | 1 | 35 | 1.41846 | 2.48683 | 2.12342 | 0 | 2.12342 |
| 10 | 0.0221045 | 0.0627459 | SW | 1 | 35 | 1.44321 | 2.53023 | 2.18539 | 0 | 2.18539 |
| 11 | 0.0221045 | 0.0672622 | SW | 1 | 35 | 1.45589 | 2.55245 | 2.21713 | 0 | 2.21713 |
| 12 | 0.0221045 | 0.0712903 | SW | 1 | 35 | 1.45668 | 2.55383 | 2.21909 | 0 | 2.21909 |
| 13 | 0.0221045 | 0.0747925 | SW | 1 | 35 | 1.44571 | 2.53461 | 2.19165 | 0 | 2.19165 |
| 14 | 0.0221045 | 0.0777228 | SW | 1 | 35 | 1.42313 | 2.49502 | 2.13511 | 0 | 2.13511 |
| 15 | 0.0221045 | 0.0800252 | SW | 1 | 35 | 1.38903 | 2.43523 | 2.04972 | 0 | 2.04972 |
| 16 | 0.0221045 | 0.0816298 | SW | 1 | 35 | 1.34352 | 2.35544 | 1.93576 | 0 | 1.93576 |
| 17 | 0.0221045 | 0.0824478 | SW | 1 | 35 | 1.28671 | 2.25585 | 1.79354 | 0 | 1.79354 |
| 18 | 0.0221045 | 0.0823642 | SW | 1 | 35 | 1.21882 | 2.13683 | 1.62356 | 0 | 1.62356 |
| 19 | 0.0221045 | 0.0812243 | SW | 1 | 35 | 1.14019 | 1.99896 | 1.42667 | 0 | 1.42667 |
| 20 | 0.0221045 | 0.078813 | SW | 1 | 35 | 1.05145 | 1.84339 | 1.20449 | 0 | 1.20449 |
| 21 | 0.0221045 | 0.0748136 | SW | 1 | 35 | 0.953879 | 1.67233 | 0.96019 | 0 | 0.96019 |
| 22 | 0.0221045 | 0.0687237 | SW | 1 | 35 | 0.850089 | 1.49037 | 0.700316 | 0 | 0.700316 |
| 23 | 0.0221045 | 0.0596471 | SW | 1 | 35 | 0.74598 | 1.30784 | 0.439645 | 0 | 0.439645 |
| 24 | 0.0221045 | 0.0456083 | SW | 1 | 35 | 0.657375 | 1.1525 | 0.217798 | 0 | 0.217798 |
| 25 | 0.0221045 | 0.0185002 | SW | 1 | 35 | 0.654368 | 1.14723 | 0.21027 | 0 | 0.21027 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.75197

| Slice | Width | Weight | Base | Base Cohesion | Base Friction Angle | Shear Stress | Shear Strength | Base Normal Stress | Pore Pressure | Effective Normal Stress |
|---|---|---|---|---|---|---|---|---|---|---|

| | | | | [kPa] | [degrees] | [kPa] | [kPa] | [kPa] | [kPa] | [kPa] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0221045 | 0.0040485 | SW | 1 | 35 | 0.826618 | 1.44821 | 0.640108 | 0 | 0.640108 |
| 2 | 0.0221045 | 0.011984 | SW | 1 | 35 | 0.965451 | 1.69144 | 0.987482 | 0 | 0.987482 |
| 3 | 0.0221045 | 0.0195926 | SW | 1 | 35 | 1.08556 | 1.90187 | 1.288 | 0 | 1.288 |
| 4 | 0.0221045 | 0.0268656 | SW | 1 | 35 | 1.1879 | 2.08116 | 1.54406 | 0 | 1.54406 |
| 5 | 0.0221045 | 0.033793 | SW | 1 | 35 | 1.27332 | 2.23081 | 1.75778 | 0 | 1.75778 |
| 6 | 0.0221045 | 0.0403626 | SW | 1 | 35 | 1.34257 | 2.35214 | 1.93106 | 0 | 1.93106 |
| 7 | 0.0221045 | 0.0465606 | SW | 1 | 35 | 1.39635 | 2.44636 | 2.06561 | 0 | 2.06561 |
| 8 | 0.0221045 | 0.0523705 | SW | 1 | 35 | 1.43526 | 2.51454 | 2.16298 | 0 | 2.16298 |
| 9 | 0.0221045 | 0.0577731 | SW | 1 | 35 | 1.45988 | 2.55767 | 2.22459 | 0 | 2.22459 |
| 10 | 0.0221045 | 0.0627459 | SW | 1 | 35 | 1.47073 | 2.57667 | 2.25172 | 0 | 2.25172 |
| 11 | 0.0221045 | 0.0672622 | SW | 1 | 35 | 1.46828 | 2.57239 | 2.2456 | 0 | 2.2456 |
| 12 | 0.0221045 | 0.0712903 | SW | 1 | 35 | 1.45302 | 2.54564 | 2.2074 | 0 | 2.2074 |
| 13 | 0.0221045 | 0.0747925 | SW | 1 | 35 | 1.42538 | 2.49723 | 2.13827 | 0 | 2.13827 |
| 14 | 0.0221045 | 0.0777228 | SW | 1 | 35 | 1.38587 | 2.428 | 2.0394 | 0 | 2.0394 |
| 15 | 0.0221045 | 0.0800252 | SW | 1 | 35 | 1.335 | 2.33888 | 1.91212 | 0 | 1.91212 |
| 16 | 0.0221045 | 0.0816298 | SW | 1 | 35 | 1.27338 | 2.23093 | 1.75795 | 0 | 1.75795 |
| 17 | 0.0221045 | 0.0824478 | SW | 1 | 35 | 1.20179 | 2.1055 | 1.57882 | 0 | 1.57882 |
| 18 | 0.0221045 | 0.0823642 | SW | 1 | 35 | 1.12125 | 1.9644 | 1.3773 | 0 | 1.3773 |
| 19 | 0.0221045 | 0.0812243 | SW | 1 | 35 | 1.03324 | 1.81021 | 1.1571 | 0 | 1.1571 |
| 20 | 0.0221045 | 0.078813 | SW | 1 | 35 | 0.940039 | 1.64692 | 0.923897 | 0 | 0.923897 |
| 21 | 0.0221045 | 0.0748136 | SW | 1 | 35 | 0.845364 | 1.48105 | 0.687013 | 0 | 0.687013 |
| 22 | 0.0221045 | 0.0687237 | SW | 1 | 35 | 0.755879 | 1.32428 | 0.463114 | 0 | 0.463114 |
| 23 | 0.0221045 | 0.0596471 | SW | 1 | 35 | 0.684944 | 1.2 | 0.28563 | 0 | 0.28563 |
| 24 | 0.0221045 | 0.0456083 | SW | 1 | 35 | 0.665152 | 1.16533 | 0.236111 | 0 | 0.236111 |
| 25 | 0.0221045 | 0.0185002 | SW | 1 | 35 | 0.832329 | 1.45822 | 0.654399 | 0 | 0.654399 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.75197

| 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 | 0.0221045 | 0.0040485 | SW | 1 | 35 | 0.826618 | 1.44821 | 0.640108 | 0 | 0.640108 |
| 2 | 0.0221045 | 0.011984 | SW | 1 | 35 | 0.965451 | 1.69144 | 0.987482 | 0 | 0.987482 |
| 3 | 0.0221045 | 0.0195926 | SW | 1 | 35 | 1.08556 | 1.90187 | 1.288 | 0 | 1.288 |
| 4 | 0.0221045 | 0.0268656 | SW | 1 | 35 | 1.1879 | 2.08116 | 1.54406 | 0 | 1.54406 |
| 5 | 0.0221045 | 0.033793 | SW | 1 | 35 | 1.27332 | 2.23081 | 1.75778 | 0 | 1.75778 |
| 6 | 0.0221045 | 0.0403626 | SW | 1 | 35 | 1.34257 | 2.35214 | 1.93106 | 0 | 1.93106 |
| 7 | 0.0221045 | 0.0465606 | SW | 1 | 35 | 1.39635 | 2.44636 | 2.06561 | 0 | 2.06561 |
| 8 | 0.0221045 | 0.0523705 | SW | 1 | 35 | 1.43526 | 2.51454 | 2.16298 | 0 | 2.16298 |
| 9 | 0.0221045 | 0.0577731 | SW | 1 | 35 | 1.45988 | 2.55767 | 2.22459 | 0 | 2.22459 |
| 10 | 0.0221045 | 0.0627459 | SW | 1 | 35 | 1.47073 | 2.57667 | 2.25172 | 0 | 2.25172 |
| 11 | 0.0221045 | 0.0672622 | SW | 1 | 35 | 1.46828 | 2.57239 | 2.2456 | 0 | 2.2456 |
| 12 | 0.0221045 | 0.0712903 | SW | 1 | 35 | 1.45302 | 2.54564 | 2.2074 | 0 | 2.2074 |
| 13 | 0.0221045 | 0.0747925 | SW | 1 | 35 | 1.42538 | 2.49723 | 2.13827 | 0 | 2.13827 |
| 14 | 0.0221045 | 0.0777228 | SW | 1 | 35 | 1.38587 | 2.428 | 2.0394 | 0 | 2.0394 |
| 15 | 0.0221045 | 0.0800252 | SW | 1 | 35 | 1.335 | 2.33888 | 1.91212 | 0 | 1.91212 |
| 16 | 0.0221045 | 0.0816298 | SW | 1 | 35 | 1.27338 | 2.23093 | 1.75795 | 0 | 1.75795 |
| 17 | 0.0221045 | 0.0824478 | SW | 1 | 35 | 1.20179 | 2.1055 | 1.57882 | 0 | 1.57882 |
| 18 | 0.0221045 | 0.0823642 | SW | 1 | 35 | 1.12125 | 1.9644 | 1.3773 | 0 | 1.3773 |
| 19 | 0.0221045 | 0.0812243 | SW | 1 | 35 | 1.03324 | 1.81021 | 1.1571 | 0 | 1.1571 |
| 20 | 0.0221045 | 0.078813 | SW | 1 | 35 | 0.940039 | 1.64692 | 0.923897 | 0 | 0.923897 |
| 21 | 0.0221045 | 0.0748136 | SW | 1 | 35 | 0.845364 | 1.48105 | 0.687013 | 0 | 0.687013 |
| 22 | 0.0221045 | 0.0687237 | SW | 1 | 35 | 0.755879 | 1.32428 | 0.463114 | 0 | 0.463114 |
| 23 | 0.0221045 | 0.0596471 | SW | 1 | 35 | 0.684944 | 1.2 | 0.28563 | 0 | 0.28563 |
| 24 | 0.0221045 | 0.0456083 | SW | 1 | 35 | 0.665152 | 1.16533 | 0.236111 | 0 | 0.236111 |
| 25 | 0.0221045 | 0.0185002 | SW | 1 | 35 | 0.832329 | 1.45822 | 0.654399 | 0 | 0.654399 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.68466

| 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 | 0.0239836 | 0.00516135 | SW | 1 | 35 | 0.655891 | 1.10495 | 0.149889 | 0 | 0.149889 |
| 2 | 0.0239836 | 0.0152839 | SW | 1 | 35 | 0.830038 | 1.39833 | 0.568875 | 0 | 0.568875 |
| 3 | 0.0239836 | 0.0250024 | SW | 1 | 35 | 0.994088 | 1.6747 | 0.963571 | 0 | 0.963571 |
| 4 | 0.0239836 | 0.0343086 | SW | 1 | 35 | 1.14557 | 1.92989 | 1.32802 | 0 | 1.32802 |
| 5 | 0.0239836 | 0.0431921 | SW | 1 | 35 | 1.28232 | 2.16027 | 1.65704 | 0 | 1.65704 |
| 6 | 0.0239836 | 0.0516404 | SW | 1 | 35 | 1.40266 | 2.36301 | 1.94658 | 0 | 1.94658 |
| 7 | 0.0239836 | 0.0596384 | SW | 1 | 35 | 1.5055 | 2.53626 | 2.194 | 0 | 2.194 |
| 8 | 0.0239836 | 0.0671683 | SW | 1 | 35 | 1.59037 | 2.67924 | 2.39821 | 0 | 2.39821 |
| 9 | 0.0239836 | 0.0742087 | SW | 1 | 35 | 1.65743 | 2.7922 | 2.55953 | 0 | 2.55953 |
| 10 | 0.0239836 | 0.0807343 | SW | 1 | 35 | 1.70732 | 2.87625 | 2.67956 | 0 | 2.67956 |
| 11 | 0.0239836 | 0.0867151 | SW | 1 | 35 | 1.7411 | 2.93316 | 2.76084 | 0 | 2.76084 |
| 12 | 0.0239836 | 0.0921148 | SW | 1 | 35 | 1.76006 | 2.96511 | 2.80647 | 0 | 2.80647 |
| 13 | 0.0239836 | 0.09689 | SW | 1 | 35 | 1.76556 | 2.97437 | 2.81969 | 0 | 2.81969 |
| 14 | 0.0239836 | 0.100988 | SW | 1 | 35 | 1.75882 | 2.96302 | 2.80348 | 0 | 2.80348 |
| 15 | 0.0239836 | 0.104343 | SW | 1 | 35 | 1.74081 | 2.93268 | 2.76015 | 0 | 2.76015 |
| 16 | 0.0239836 | 0.106874 | SW | 1 | 35 | 1.71208 | 2.88427 | 2.69102 | 0 | 2.69102 |
| 17 | 0.0239836 | 0.108477 | SW | 1 | 35 | 1.6726 | 2.81777 | 2.59605 | 0 | 2.59605 |
| 18 | 0.0239836 | 0.109015 | SW | 1 | 35 | 1.62165 | 2.73193 | 2.47346 | 0 | 2.47346 |
| 19 | 0.0239836 | 0.108305 | SW | 1 | 35 | 1.55755 | 2.62395 | 2.31924 | 0 | 2.31924 |
| 20 | 0.0239836 | 0.106089 | SW | 1 | 35 | 1.47734 | 2.48882 | 2.12625 | 0 | 2.12625 |
| 21 | 0.0239836 | 0.101983 | SW | 1 | 35 | 1.37605 | 2.31818 | 1.88255 | 0 | 1.88255 |
| 22 | 0.0239836 | 0.0953672 | SW | 1 | 35 | 1.24529 | 2.09789 | 1.56795 | 0 | 1.56795 |
| 23 | 0.0239836 | 0.085109 | SW | 1 | 35 | 1.06979 | 1.80223 | 1.14569 | 0 | 1.14569 |
| 24 | 0.0239836 | 0.068567 | SW | 1 | 35 | 0.816415 | 1.37538 | 0.536101 | 0 | 0.536101 |
| 25 | 0.0239836 | 0.0291257 | SW | 1 | 35 | 0.317644 | 0.535122 | -0.663915 | 0 | -0.663915 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 3.65843 | 1.39495 |
| 19.2238 | 5.87564 |
| 20.1197 | 6.113 |
| 21.3574 | 6.469 |
| 31.314 | 9.35595 |
| 40.9932 | 12.499 |
| 58.0021 | 20.4798 |

### External Boundary

| X | Y |
|---|---|
| 15.5089 | 7.16214 |
| 15.5047 | 7.15683 |
| 15.5007 | 7.15046 |
| 15.5042 | 7.12849 |
| 15.5014 | 7.10641 |
| 15.5072 | 7.07713 |
| 15.5055 | 7.01397 |
| 15.5079 | 6.85826 |
| 15.5082 | 6.83806 |
| 15.5083 | 6.8308 |
| 15.5088 | 6.79587 |
| 15.5135 | 6.4847 |
| 15.5136 | 6.47673 |

| | |
|---|---|
| 15.5138 | 6.46397 |
| 15.5139 | 6.45861 |
| 15.5177 | 6.20837 |
| 15.2255 | 6.11307 |
| 14.9068 | 5.83945 |
| 14.531 | 5.81394 |
| 14.3766 | 5.81394 |
| 14.0785 | 5.7859 |
| 13.4437 | 5.71069 |
| 12.8259 | 5.60602 |
| 11.8014 | 5.52321 |
| 11.5686 | 5.50581 |
| 11.0035 | 5.45144 |
| 10.7524 | 5.43465 |
| 10.6428 | 5.44141 |
| 10.6306 | 5.59569 |
| 10.6252 | 5.74861 |
| 10.6047 | 5.75406 |
| 10.3991 | 5.74996 |
| 10.1023 | 5.7337 |
| 10.0685 | 5.72426 |
| 10.0564 | 5.68379 |
| 10.0604 | 5.49629 |
| 10.0348 | 5.4356 |
| 9.93764 | 5.41807 |
| 9.84285 | 5.42769 |
| 8.64957 | 5.32679 |
| 7.55348 | 5.30049 |
| 5.50325 | 5.27181 |
| 3.65843 | 5.33747 |
| 3.65843 | 1.39495 |
| 3.65843 | -1.0496 |
| 3.65843 | -3.3297 |
| 3.65843 | -4.75034 |
| 58.0021 | -4.75034 |
| 58.0021 | 12.0122 |
| 58.0021 | 20.4798 |
| 58.0021 | 22.4959 |
| 58.0021 | 25.0964 |
| 56.8949 | 24.7535 |
| 56.4427 | 24.4729 |
| 55.5383 | 23.9429 |
| 54.6182 | 23.5376 |
| 54.0256 | 22.9297 |
| 52.8405 | 21.8853 |
| 51.8424 | 21.3086 |
| 49.5935 | 19.6011 |
| 48.9572 | 18.9962 |
| 47.3933 | 17.7083 |
| 46.9774 | 17.4859 |
| 46.0973 | 16.9639 |
| 43.5489 | 15.6354 |
| 43.4255 | 15.5699 |
| 42.2853 | 15.1476 |
| 41.4521 | 14.3098 |
| 40.9932 | 14.0475 |
| 31.9223 | 14.4593 |

| | |
|---|---|
| 31.7396 | 14.452 |
| 31.5167 | 14.4556 |
| 31.3742 | 14.4483 |
| 31.2609 | 14.3826 |
| 31.144 | 14.3387 |
| 30.9868 | 14.2401 |
| 30.8699 | 14.1232 |
| 30.7164 | 14.0173 |
| 30.4241 | 13.8822 |
| 30.0367 | 13.6995 |
| 29.3038 | 13.4105 |
| 29.0415 | 13.294 |
| 28.5698 | 12.9915 |
| 28.3087 | 12.8758 |
| 27.9296 | 12.7397 |
| 27.2258 | 12.552 |
| 26.9223 | 12.5087 |
| 26.6947 | 12.5123 |
| 26.3696 | 12.4617 |
| 25.9469 | 12.4039 |
| 25.1621 | 12.2298 |
| 24.1388 | 12.1321 |
| 23.1127 | 11.949 |
| 22.4366 | 11.8001 |
| 21.8179 | 11.6679 |
| 21.026 | 11.4986 |
| 20.1197 | 11.1092 |
| 16.639 | 7.35729 |
| 16.5678 | 7.31284 |
| 16.1209 | 7.30962 |
| 16.1206 | 7.33432 |
| 16.1188 | 7.49116 |
| 16.1103 | 7.51787 |
| 16.094 | 7.52834 |
| 16.0725 | 7.53066 |
| 15.8692 | 7.52384 |
| 15.5001 | 7.51145 |
| 15.496 | 7.50613 |
| 15.4919 | 7.49977 |
| 15.4954 | 7.47779 |
| 15.4926 | 7.45571 |
| 15.4984 | 7.42643 |
| 15.4958 | 7.32881 |
| 15.4965 | 7.29105 |
| 15.4971 | 7.22273 |
| 15.499 | 7.20763 |
| 15.5022 | 7.20164 |
| 15.4983 | 7.18196 |
| 15.5016 | 7.17677 |
| 15.5089 | 7.1669 |

## Material Boundary

| X | Y |
|---|---|
| 15.5284 | 5.82373 |
| 15.5233 | 6.07038 |
| 15.522 | 6.13452 |
| 16.1172 | 6.13731 |

### Material Boundary

| X | Y |
|---|---|
| 15.5284 | 5.82373 |
| 16.1142 | 5.82835 |

### Material Boundary

| X | Y |
|---|---|
| 15.5177 | 6.20837 |
| 15.5194 | 6.15051 |
| 15.5211 | 6.144 |
| 15.5295 | 6.13929 |
| 15.6015 | 6.13888 |
| 15.6404 | 6.14189 |
| 15.7567 | 6.14479 |
| 15.8444 | 6.14588 |
| 15.908 | 6.14886 |
| 16.0494 | 6.14667 |

### Material Boundary

| X | Y |
|---|---|
| 16.0656 | 5.47884 |
| 15.9242 | 5.4822 |
| 15.8606 | 5.47975 |
| 15.7729 | 5.47939 |
| 15.6487 | 5.4783 |
| 15.6176 | 5.47476 |
| 15.5457 | 5.47576 |
| 15.5342 | 5.48056 |
| 15.5325 | 5.48709 |
| 15.5302 | 5.74206 |
| 15.5298 | 5.79109 |
| 15.5379 | 5.8026 |
| 15.546 | 5.80758 |
| 15.8018 | 5.81474 |
| 15.8736 | 5.81963 |
| 15.9184 | 5.82267 |
| 16.113 | 5.8242 |
| 16.1154 | 5.82256 |
| 16.1187 | 5.82031 |
| 16.132 | 5.81467 |
| 16.1377 | 5.8089 |
| 16.1389 | 5.73815 |
| 16.1402 | 5.53386 |
| 16.1398 | 5.48483 |
| 16.1279 | 5.48168 |
| 16.108 | 5.48053 |
| 16.0656 | 5.47884 |

### Material Boundary

| X | Y |
|---|---|
| 16.1209 | 7.30962 |
| 16.1258 | 7.30002 |
| 16.1318 | 7.28949 |

| | |
|---|---|
| 16.1384 | 7.27928 |
| 16.1454 | 7.26939 |
| 16.153 | 7.25987 |
| 16.161 | 7.25072 |
| 16.1694 | 7.24198 |
| 16.1782 | 7.23365 |
| 16.1875 | 7.22578 |
| 16.1971 | 7.21836 |
| 16.207 | 7.21142 |
| 16.2138 | 7.20721 |
| 16.2173 | 7.20498 |
| 16.2279 | 7.19906 |
| 16.2388 | 7.19366 |
| 16.2499 | 7.18879 |
| 16.2613 | 7.18448 |
| 16.2728 | 7.18073 |
| 16.2845 | 7.17755 |
| 16.2964 | 7.17495 |
| 16.3084 | 7.17293 |
| 16.3204 | 7.1715 |
| 16.3325 | 7.17066 |
| 16.3447 | 7.17042 |
| 16.3568 | 7.17077 |
| 16.3689 | 7.17172 |
| 16.381 | 7.17326 |
| 16.3929 | 7.17538 |
| 16.4047 | 7.17809 |
| 16.4164 | 7.18138 |
| 16.4279 | 7.18523 |
| 16.4393 | 7.18964 |
| 16.4503 | 7.19461 |
| 16.4612 | 7.20011 |
| 16.4717 | 7.20613 |
| 16.4819 | 7.21266 |
| 16.4918 | 7.21969 |
| 16.5014 | 7.22719 |
| 16.5105 | 7.23515 |
| 16.5193 | 7.24355 |
| 16.5277 | 7.25237 |
| 16.5331 | 7.25867 |
| 16.5356 | 7.26159 |
| 16.543 | 7.27118 |
| 16.55 | 7.28113 |
| 16.5564 | 7.2914 |
| 16.5624 | 7.30198 |
| 16.5678 | 7.31284 |

## Material Boundary

| X | Y |
|---|---|
| 20.1197 | 10.9142 |
| 21.3574 | 10.9142 |
| 21.3574 | 10.5064 |
| 20.1197 | 10.5064 |
| 20.1197 | 10.9142 |

## Material Boundary

| X | Y |
|---|---|
| 19.6199 | 9.85802 |
| 20.1197 | 9.85802 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 4.571 |
| 21.3574 | 6.469 |
| 21.3574 | 7.874 |
| 21.3574 | 10.5064 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | 4.14158 |
| 20.1197 | 6.113 |
| 20.1197 | 6.35721 |
| 20.1197 | 9.85802 |
| 20.1197 | 10.5064 |

### Material Boundary

| X | Y |
|---|---|
| 19.2238 | 5.87564 |
| 20.1197 | 6.113 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 7.874 |
| 31.5167 | 11.426 |
| 40.9932 | 12.499 |
| 58.0021 | 22.4959 |

### Material Boundary

| X | Y |
|---|---|
| 3.65843 | -1.0496 |
| 14.9068 | 2.35895 |
| 20.1197 | 4.14158 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 4.571 |
| 31.5167 | 8.03895 |
| 40.9932 | 10.529 |
| 58.0021 | 20.4798 |

### Material Boundary

| X | Y |
|---|---|
| 3.65843 | -3.3297 |
| 20.1197 | 1.31751 |
| 21.3574 | 1.66694 |
| 58.0021 | 12.0122 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 6.469 |
| 31.314 | 9.35595 |
| 40.9932 | 12.499 |
| 58.0021 | 20.4798 |

### Material Boundary

| X | Y |
|---|---|
| 3.65843 | 1.39495 |
| 19.2238 | 5.87564 |

### Material Boundary

| X | Y |
|---|---|
| 15.5136 | 6.47673 |
| 15.5211 | 6.46598 |

### Material Boundary

| X | Y |
|---|---|
| 16.1149 | 7.1834 |
| 16.1221 | 7.20482 |
| 16.1212 | 7.28558 |
| 16.1209 | 7.30962 |

### Material Boundary

| X | Y |
|---|---|
| 15.8362 | 7.17313 |
| 16.1149 | 7.1834 |
| 16.1149 | 7.179 |
| 16.1174 | 7.16969 |
| 16.1191 | 7.16857 |
| 16.1276 | 7.14186 |
| 16.1308 | 6.85552 |
| 16.1096 | 6.84172 |
| 16.0893 | 6.83024 |
| 16.0742 | 6.82998 |
| 15.9836 | 6.82644 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | -4.05 |
| 21.3574 | 1.66694 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 1.66694 |
| 21.3574 | 4.571 |

### Material Boundary

| X | Y |
|---|---|
| 16.6205 | 6.35721 |

| | |
|---|---|
| 20.1197 | 6.35721 |

### Material Boundary

| X | Y |
|---|---|
| 15.5135 | 6.4847 |
| 16.1249 | 6.49385 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | -4.05 |
| 20.1197 | 1.31751 |
| 20.1197 | 4.14158 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | -4.05 |
| 21.3574 | -4.05 |

### Material Boundary

| X | Y |
|---|---|
| 15.5138 | 6.46397 |
| 15.5206 | 6.4655 |
| 15.5211 | 6.46598 |
| 15.5256 | 6.47004 |
| 15.531 | 6.47617 |
| 15.6953 | 6.48318 |
| 15.7844 | 6.47982 |
| 15.9016 | 6.48876 |
| 16.1013 | 6.488 |
| 16.1052 | 6.48637 |
| 16.1154 | 6.48163 |
| 16.1204 | 6.47674 |
| 16.1208 | 6.45974 |
| 16.1221 | 6.40601 |
| 16.1225 | 6.37441 |
| 16.1228 | 6.35721 |
| 16.1251 | 6.20174 |
| 16.1251 | 6.15271 |
| 16.1167 | 6.15043 |
| 16.1132 | 6.14946 |
| 16.0933 | 6.14814 |
| 16.0494 | 6.14667 |

### Material Boundary

| X | Y |
|---|---|
| 15.5083 | 6.8308 |
| 15.5104 | 6.82747 |
| 15.5202 | 6.82322 |
| 15.5286 | 6.82336 |
| 15.5404 | 6.82356 |
| 15.5539 | 6.82211 |
| 15.5808 | 6.82088 |
| 15.643 | 6.82531 |

| | |
|---|---|
| 15.7945 | 6.8262 |
| 15.8567 | 6.82558 |
| 15.8779 | 6.82507 |

### Material Boundary

| X | Y |
|---|---|
| 15.5284 | 5.82373 |
| 15.5298 | 5.79109 |

### Material Boundary

| X | Y |
|---|---|
| 16.1142 | 5.82835 |
| 16.1167 | 6.10361 |
| 16.1171 | 6.13323 |
| 16.1172 | 6.13731 |

### Material Boundary

| X | Y |
|---|---|
| 15.5089 | 7.16214 |
| 15.8326 | 7.17135 |
| 16.1149 | 7.179 |

### Material Boundary

| X | Y |
|---|---|
| 15.8779 | 6.82507 |
| 15.9836 | 6.82644 |

### Material Boundary

| X | Y |
|---|---|
| 15.5089 | 7.1669 |
| 15.8362 | 7.17313 |

### Material Boundary

| X | Y |
|---|---|
| 16.1228 | 6.35721 |
| 16.6205 | 6.35721 |

### Material Boundary

| X | Y |
|---|---|
| 15.5088 | 6.79587 |
| 15.5257 | 6.79762 |
| 15.5338 | 6.80266 |
| 15.5583 | 6.80471 |
| 15.7004 | 6.81531 |
| 15.7895 | 6.81195 |
| 15.8845 | 6.81919 |
| 15.9067 | 6.82088 |
| 15.9902 | 6.82057 |
| 16.1064 | 6.82013 |
| 16.1197 | 6.8146 |
| 16.1255 | 6.80887 |

| | |
|---|---|
| 16.1272 | 6.73814 |
| 16.1302 | 6.53386 |
| 16.1249 | 6.49385 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | 10.9142 |
| 20.1197 | 11.1092 |

### Material Boundary

| X | Y |
|---|---|
| 21.8179 | 11.6679 |
| 22.0277 | 11.7055 |
| 22.4366 | 11.8001 |

### Material Boundary

| X | Y |
|---|---|
| 16.1255 | 6.80887 |
| 16.1308 | 6.85552 |

### Material Boundary

| X | Y |
|---|---|
| 16.1204 | 6.47674 |
| 16.1249 | 6.49385 |

### Material Boundary

| X | Y |
|---|---|
| 15.5211 | 6.144 |
| 15.522 | 6.13452 |

### Material Boundary

| X | Y |
|---|---|
| 16.1172 | 6.13731 |
| 16.1251 | 6.15271 |

### Material Boundary

| X | Y |
|---|---|
| 16.113 | 5.8242 |
| 16.1142 | 5.82835 |

### Material Boundary

| X | Y |
|---|---|
| 16.6205 | 6.35721 |
| 16.6202 | 6.857 |
| 17.1202 | 6.857 |
| 17.1202 | 7.35729 |
| 17.6201 | 7.35729 |
| 17.6201 | 7.85774 |
| 18.1201 | 7.85774 |
| 18.1201 | 8.35751 |

| | |
|---|---|
| 18.62 | 8.35751 |
| 18.62 | 8.85787 |
| 19.1204 | 8.85787 |
| 19.1204 | 9.35802 |
| 19.6199 | 9.358 |
| 19.6199 | 9.85802 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S39 + GABIONS EQdn + GEOTEX
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 8/5/2021, 15:10:48

## 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
Corps of Engineers #2
Janbu corrected

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: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): 0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |

| Property | AIR | PILE | SW |
|---|---|---|---|
| Color | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 1e-005 | 24 | 19 |
| Cohesion [kPa] | 1e-005 | 500 | 1 |
| Friction Angle [deg] | 0 | 45 | 35 |
| Water Surface | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated |

## Support Properties

### GEOTEX

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Parallel to Reinforcement
Anchorage: Embedded End
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 40 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 30 degrees

## Global Minimums

### Method: bishop simplified

FS: 1.286490
Center: 19.352, 11.038
Radius: 0.678
Left Slip Surface Endpoint: 19.429, 10.365
Right Slip Surface Endpoint: 20.029, 11.011
Resisting Moment=1.30416 kN-m
Driving Moment=1.01373 kN-m

### Method: janbu corrected

FS: 1.290350
Center: 18.120, 9.347
Radius: 0.473
Left Slip Surface Endpoint: 18.051, 8.879
Right Slip Surface Endpoint: 18.593, 9.347
Left Slope Intercept: 18.051 8.879
Right Slope Intercept: 18.593 9.464
Resisting Horizontal Force=1.67658 kN
Driving Horizontal Force=1.29932 kN

### Method: corp of eng#2

FS: 1.293900
Center: 19.312, 11.047
Radius: 0.684
Left Slip Surface Endpoint: 19.439, 10.375
Right Slip Surface Endpoint: 19.991, 10.971
Resisting Horizontal Force=1.09559 kN
Driving Horizontal Force=0.846734 kN

## *Valid / Invalid Surfaces*

### Method: bishop simplified

Number of Valid Surfaces: 7196
Number of Invalid Surfaces: 2804

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 710 surfaces
Error Code -109 reported for 124 surfaces
Error Code -112 reported for 372 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 7065
Number of Invalid Surfaces: 2935

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 927 surfaces
Error Code -109 reported for 124 surfaces
Error Code -112 reported for 286 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: corp of eng#2

Number of Valid Surfaces: 3
Number of Invalid Surfaces: 9997

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 7984 surfaces
Error Code -109 reported for 124 surfaces
Error Code -111 reported for 9 surfaces
Error Code -112 reported for 282 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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.
-111 = safety factor equation did not converge
-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.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.28649

| 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 | 0.0239836 | 0.00516135 | SW | 1 | 35 | 0.844913 | 1.08697 | 0.124208 | 0 | 0.124208 |
| 2 | 0.0239836 | 0.0152839 | SW | 1 | 35 | 1.06084 | 1.36476 | 0.52093 | 0 | 0.52093 |
| 3 | 0.0239836 | 0.0250024 | SW | 1 | 35 | 1.25956 | 1.62041 | 0.886032 | 0 | 0.886032 |
| 4 | 0.0239836 | 0.0343086 | SW | 1 | 35 | 1.44149 | 1.85446 | 1.2203 | 0 | 1.2203 |
| 5 | 0.0239836 | 0.0431921 | SW | 1 | 35 | 1.60695 | 2.06733 | 1.52431 | 0 | 1.52431 |
| 6 | 0.0239836 | 0.0516404 | SW | 1 | 35 | 1.75617 | 2.2593 | 1.79847 | 0 | 1.79847 |
| 7 | 0.0239836 | 0.0596384 | SW | 1 | 35 | 1.88926 | 2.43052 | 2.04299 | 0 | 2.04299 |
| 8 | 0.0239836 | 0.0671683 | SW | 1 | 35 | 2.00623 | 2.581 | 2.25791 | 0 | 2.25791 |
| 9 | 0.0239836 | 0.0742087 | SW | 1 | 35 | 2.10701 | 2.71065 | 2.44306 | 0 | 2.44306 |
| 10 | 0.0239836 | 0.0807343 | SW | 1 | 35 | 2.1914 | 2.81921 | 2.5981 | 0 | 2.5981 |
| 11 | 0.0239836 | 0.0867151 | SW | 1 | 35 | 2.25908 | 2.90629 | 2.72246 | 0 | 2.72246 |
| 12 | 0.0239836 | 0.0921148 | SW | 1 | 35 | 2.30963 | 2.97131 | 2.81532 | 0 | 2.81532 |
| 13 | 0.0239836 | 0.09689 | SW | 1 | 35 | 2.34244 | 3.01352 | 2.8756 | 0 | 2.8756 |
| 14 | 0.0239836 | 0.100988 | SW | 1 | 35 | 2.35674 | 3.03192 | 2.90188 | 0 | 2.90188 |
| 15 | 0.0239836 | 0.104343 | SW | 1 | 35 | 2.35153 | 3.02522 | 2.89232 | 0 | 2.89232 |
| 16 | 0.0239836 | 0.106874 | SW | 1 | 35 | 2.32554 | 2.99179 | 2.84458 | 0 | 2.84458 |
| 17 | 0.0239836 | 0.108477 | SW | 1 | 35 | 2.27713 | 2.92951 | 2.75563 | 0 | 2.75563 |
| 18 | 0.0239836 | 0.109015 | SW | 1 | 35 | 2.20415 | 2.83562 | 2.62154 | 0 | 2.62154 |
| 19 | 0.0239836 | 0.108305 | SW | 1 | 35 | 2.10376 | 2.70647 | 2.43709 | 0 | 2.43709 |
| 20 | 0.0239836 | 0.106089 | SW | 1 | 35 | 1.97207 | 2.53705 | 2.19514 | 0 | 2.19514 |
| 21 | 0.0239836 | 0.101983 | SW | 1 | 35 | 1.80354 | 2.32023 | 1.88548 | 0 | 1.88548 |
| 22 | 0.0239836 | 0.0953672 | SW | 1 | 35 | 1.58968 | 2.04511 | 1.49257 | 0 | 1.49257 |
| 23 | 0.0239836 | 0.085109 | SW | 1 | 35 | 1.3162 | 1.69328 | 0.990101 | 0 | 0.990101 |
| 24 | 0.0239836 | 0.068567 | SW | 1 | 35 | 0.953133 | 1.2262 | 0.323041 | 0 | 0.323041 |
| 25 | 0.0239836 | 0.0291257 | SW | 1 | 35 | 0.335678 | 0.431846 | -0.81141 | 0 | -0.81141 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.29035

| 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 | 0.0216801 | 0.00536671 | SW | 1 | 35 | 0.994717 | 1.28353 | 0.404927 | 0 | 0.404927 |
| 2 | 0.0216801 | 0.0158922 | SW | 1 | 35 | 1.26991 | 1.63863 | 0.912064 | 0 | 0.912064 |
| 3 | 0.0216801 | 0.0260041 | SW | 1 | 35 | 1.51873 | 1.95969 | 1.37058 | 0 | 1.37058 |
| 4 | 0.0216801 | 0.0357056 | SW | 1 | 35 | 1.74328 | 2.24944 | 1.78438 | 0 | 1.78438 |
| 5 | 0.0216801 | 0.044997 | SW | 1 | 35 | 1.9452 | 2.50999 | 2.15649 | 0 | 2.15649 |
| 6 | 0.0216801 | 0.0538763 | SW | 1 | 35 | 2.1258 | 2.74302 | 2.48929 | 0 | 2.48929 |
| 7 | 0.0216801 | 0.0623386 | SW | 1 | 35 | 2.28604 | 2.94979 | 2.78459 | 0 | 2.78459 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0.0216801 | 0.0703764 | SW | 1 | 35 | 2.42664 | 3.13122 | 3.04371 | 0 | 3.04371 |
| 9 | 0.0216801 | 0.0779788 | SW | 1 | 35 | 2.54811 | 3.28796 | 3.26755 | 0 | 3.26755 |
| 10 | 0.0216801 | 0.0851317 | SW | 1 | 35 | 2.65072 | 3.42036 | 3.45664 | 0 | 3.45664 |
| 11 | 0.0216801 | 0.0918168 | SW | 1 | 35 | 2.73455 | 3.52853 | 3.61112 | 0 | 3.61112 |
| 12 | 0.0216801 | 0.0980111 | SW | 1 | 35 | 2.79947 | 3.6123 | 3.73075 | 0 | 3.73075 |
| 13 | 0.0216801 | 0.103686 | SW | 1 | 35 | 2.84514 | 3.67122 | 3.8149 | 0 | 3.8149 |
| 14 | 0.0216801 | 0.108805 | SW | 1 | 35 | 2.87096 | 3.70454 | 3.86248 | 0 | 3.86248 |
| 15 | 0.0216801 | 0.113323 | SW | 1 | 35 | 2.87606 | 3.71112 | 3.87189 | 0 | 3.87189 |
| 16 | 0.0216801 | 0.117183 | SW | 1 | 35 | 2.85922 | 3.6894 | 3.84087 | 0 | 3.84087 |
| 17 | 0.0216801 | 0.120311 | SW | 1 | 35 | 2.81876 | 3.63719 | 3.7663 | 0 | 3.7663 |
| 18 | 0.0216801 | 0.122607 | SW | 1 | 35 | 2.75239 | 3.55154 | 3.64399 | 0 | 3.64399 |
| 19 | 0.0216801 | 0.12394 | SW | 1 | 35 | 2.65691 | 3.42835 | 3.46804 | 0 | 3.46804 |
| 20 | 0.0216801 | 0.124122 | SW | 1 | 35 | 2.52779 | 3.26174 | 3.23011 | 0 | 3.23011 |
| 21 | 0.0216801 | 0.122873 | SW | 1 | 35 | 2.3583 | 3.04303 | 2.91775 | 0 | 2.91775 |
| 22 | 0.0216801 | 0.119739 | SW | 1 | 35 | 2.13759 | 2.75824 | 2.51102 | 0 | 2.51102 |
| 23 | 0.0216801 | 0.113889 | SW | 1 | 35 | 1.8462 | 2.38224 | 1.97405 | 0 | 1.97405 |
| 24 | 0.0216801 | 0.103371 | SW | 1 | 35 | 1.43976 | 1.85779 | 1.22505 | 0 | 1.22505 |
| 25 | 0.0216801 | 0.0722513 | SW | 1 | 35 | 0.57455 | 0.74137 | -0.369361 | 0 | -0.369361 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.2939

| 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 | 0.0221045 | 0.0040485 | SW | 1 | 35 | 1.18943 | 1.539 | 0.769773 | 0 | 0.769773 |
| 2 | 0.0221045 | 0.011984 | SW | 1 | 35 | 1.372 | 1.77523 | 1.10714 | 0 | 1.10714 |
| 3 | 0.0221045 | 0.0195926 | SW | 1 | 35 | 1.52656 | 1.97522 | 1.39276 | 0 | 1.39276 |
| 4 | 0.0221045 | 0.0268656 | SW | 1 | 35 | 1.655 | 2.1414 | 1.63008 | 0 | 1.63008 |
| 5 | 0.0221045 | 0.033793 | SW | 1 | 35 | 1.75898 | 2.27594 | 1.82224 | 0 | 1.82224 |
| 6 | 0.0221045 | 0.0403626 | SW | 1 | 35 | 1.84002 | 2.3808 | 1.97198 | 0 | 1.97198 |
| 7 | 0.0221045 | 0.0465606 | SW | 1 | 35 | 1.89947 | 2.45772 | 2.08184 | 0 | 2.08184 |
| 8 | 0.0221045 | 0.0523705 | SW | 1 | 35 | 1.93857 | 2.50831 | 2.15409 | 0 | 2.15409 |
| 9 | 0.0221045 | 0.0577731 | SW | 1 | 35 | 1.95844 | 2.53403 | 2.19082 | 0 | 2.19082 |
| 10 | 0.0221045 | 0.0627459 | SW | 1 | 35 | 1.96014 | 2.53623 | 2.19397 | 0 | 2.19397 |
| 11 | 0.0221045 | 0.0672622 | SW | 1 | 35 | 1.94466 | 2.5162 | 2.16536 | 0 | 2.16536 |
| 12 | 0.0221045 | 0.0712903 | SW | 1 | 35 | 1.91295 | 2.47516 | 2.10674 | 0 | 2.10674 |
| 13 | 0.0221045 | 0.0747925 | SW | 1 | 35 | 1.86592 | 2.41431 | 2.01985 | 0 | 2.01985 |
| 14 | 0.0221045 | 0.0777228 | SW | 1 | 35 | 1.80454 | 2.33489 | 1.90643 | 0 | 1.90643 |
| 15 | 0.0221045 | 0.0800252 | SW | 1 | 35 | 1.72982 | 2.23821 | 1.76834 | 0 | 1.76834 |
| 16 | 0.0221045 | 0.0816298 | SW | 1 | 35 | 1.64285 | 2.12569 | 1.60765 | 0 | 1.60765 |
| 17 | 0.0221045 | 0.0824478 | SW | 1 | 35 | 1.54498 | 1.99905 | 1.42679 | 0 | 1.42679 |
| 18 | 0.0221045 | 0.0823642 | SW | 1 | 35 | 1.43781 | 1.86039 | 1.22876 | 0 | 1.22876 |
| 19 | 0.0221045 | 0.0812243 | SW | 1 | 35 | 1.32352 | 1.71251 | 1.01756 | 0 | 1.01756 |
| 20 | 0.0221045 | 0.078813 | SW | 1 | 35 | 1.20517 | 1.55937 | 0.798855 | 0 | 0.798855 |
| 21 | 0.0221045 | 0.0748136 | SW | 1 | 35 | 1.0874 | 1.40698 | 0.581234 | 0 | 0.581234 |
| 22 | 0.0221045 | 0.0687237 | SW | 1 | 35 | 0.977934 | 1.26535 | 0.378959 | 0 | 0.378959 |
| 23 | 0.0221045 | 0.0596471 | SW | 1 | 35 | 0.891119 | 1.15302 | 0.218534 | 0 | 0.218534 |
| 24 | 0.0221045 | 0.0456083 | SW | 1 | 35 | 0.859165 | 1.11167 | 0.159486 | 0 | 0.159486 |
| 25 | 0.0221045 | 0.0185002 | SW | 1 | 35 | 0.979524 | 1.26741 | 0.381895 | 0 | 0.381895 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 3.65843 | 1.39495 |
| 19.2238 | 5.87564 |
| 20.1197 | 6.113 |
| 21.3574 | 6.469 |

| | |
|---|---|
| 31.314 | 9.35595 |
| 40.9932 | 12.499 |
| 58.0021 | 20.4798 |

## External Boundary

| X | Y |
|---|---|
| 15.5089 | 7.16214 |
| 15.5047 | 7.15683 |
| 15.5007 | 7.15046 |
| 15.5042 | 7.12849 |
| 15.5014 | 7.10641 |
| 15.5072 | 7.07713 |
| 15.5055 | 7.01397 |
| 15.5079 | 6.85826 |
| 15.5082 | 6.83806 |
| 15.5083 | 6.8308 |
| 15.5088 | 6.79587 |
| 15.5135 | 6.4847 |
| 15.5136 | 6.47673 |
| 15.5138 | 6.46397 |
| 15.5139 | 6.45861 |
| 15.5177 | 6.20837 |
| 15.2255 | 6.11307 |
| 14.9068 | 5.83945 |
| 14.531 | 5.81394 |
| 14.3766 | 5.81394 |
| 14.0785 | 5.7859 |
| 13.4437 | 5.71069 |
| 12.8259 | 5.60602 |
| 11.8014 | 5.52321 |
| 11.5686 | 5.50581 |
| 11.0035 | 5.45144 |
| 10.7524 | 5.43465 |
| 10.6428 | 5.44141 |
| 10.6306 | 5.59569 |
| 10.6252 | 5.74861 |
| 10.6047 | 5.75406 |
| 10.3991 | 5.74996 |
| 10.1023 | 5.7337 |
| 10.0685 | 5.72426 |
| 10.0564 | 5.68379 |
| 10.0604 | 5.49629 |
| 10.0348 | 5.4356 |
| 9.93764 | 5.41807 |
| 9.84285 | 5.42769 |
| 8.64957 | 5.32679 |
| 7.55348 | 5.30049 |
| 5.50325 | 5.27181 |
| 3.65843 | 5.33747 |
| 3.65843 | 1.39495 |
| 3.65843 | -1.0496 |
| 3.65843 | -3.3297 |
| 3.65843 | -4.75034 |
| 58.0021 | -4.75034 |
| 58.0021 | 12.0122 |
| 58.0021 | 20.4798 |
| 58.0021 | 22.4959 |

| | |
|---|---|
| 58.0021 | 25.0964 |
| 56.8949 | 24.7535 |
| 56.4427 | 24.4729 |
| 55.5383 | 23.9429 |
| 54.6182 | 23.5376 |
| 54.0256 | 22.9297 |
| 52.8405 | 21.8853 |
| 51.8424 | 21.3086 |
| 49.5935 | 19.6011 |
| 48.9572 | 18.9962 |
| 47.3933 | 17.7083 |
| 46.9774 | 17.4859 |
| 46.0973 | 16.9639 |
| 43.5489 | 15.6354 |
| 43.4255 | 15.5699 |
| 42.2853 | 15.1476 |
| 41.4521 | 14.3098 |
| 40.9932 | 14.0475 |
| 31.9223 | 14.4593 |
| 31.7396 | 14.452 |
| 31.5167 | 14.4556 |
| 31.3742 | 14.4483 |
| 31.2609 | 14.3826 |
| 31.144 | 14.3387 |
| 30.9868 | 14.2401 |
| 30.8699 | 14.1232 |
| 30.7164 | 14.0173 |
| 30.4241 | 13.8822 |
| 30.0367 | 13.6995 |
| 29.3038 | 13.4105 |
| 29.0415 | 13.294 |
| 28.5698 | 12.9915 |
| 28.3087 | 12.8758 |
| 27.9296 | 12.7397 |
| 27.2258 | 12.552 |
| 26.9223 | 12.5087 |
| 26.6947 | 12.5123 |
| 26.3696 | 12.4617 |
| 25.9469 | 12.4039 |
| 25.1621 | 12.2298 |
| 24.1388 | 12.1321 |
| 23.1127 | 11.949 |
| 22.4366 | 11.8001 |
| 21.8179 | 11.6679 |
| 21.026 | 11.4986 |
| 20.1197 | 11.1092 |
| 16.639 | 7.35729 |
| 16.5678 | 7.31284 |
| 16.1209 | 7.30962 |
| 16.1206 | 7.33432 |
| 16.1188 | 7.49116 |
| 16.1103 | 7.51787 |
| 16.094 | 7.52834 |
| 16.0725 | 7.53066 |
| 15.8692 | 7.52384 |
| 15.5001 | 7.51145 |
| 15.496 | 7.50613 |
| 15.4919 | 7.49977 |

| | |
|---|---|
| 15.4954 | 7.47779 |
| 15.4926 | 7.45571 |
| 15.4984 | 7.42643 |
| 15.4958 | 7.32881 |
| 15.4965 | 7.29105 |
| 15.4971 | 7.22273 |
| 15.499 | 7.20763 |
| 15.5022 | 7.20164 |
| 15.4983 | 7.18196 |
| 15.5016 | 7.17677 |
| 15.5089 | 7.1669 |

### Material Boundary

| X | Y |
|---|---|
| 15.5284 | 5.82373 |
| 15.5233 | 6.07038 |
| 15.522 | 6.13452 |
| 16.1172 | 6.13731 |

### Material Boundary

| X | Y |
|---|---|
| 15.5284 | 5.82373 |
| 16.1142 | 5.82835 |

### Material Boundary

| X | Y |
|---|---|
| 15.5177 | 6.20837 |
| 15.5194 | 6.15051 |
| 15.5211 | 6.144 |
| 15.5295 | 6.13929 |
| 15.6015 | 6.13888 |
| 15.6404 | 6.14189 |
| 15.7567 | 6.14479 |
| 15.8444 | 6.14588 |
| 15.908 | 6.14886 |
| 16.0494 | 6.14667 |

### Material Boundary

| X | Y |
|---|---|
| 16.0656 | 5.47884 |
| 15.9242 | 5.4822 |
| 15.8606 | 5.47975 |
| 15.7729 | 5.47939 |
| 15.6487 | 5.4783 |
| 15.6176 | 5.47476 |
| 15.5457 | 5.47576 |
| 15.5342 | 5.48056 |
| 15.5325 | 5.48709 |
| 15.5302 | 5.74206 |
| 15.5298 | 5.79109 |
| 15.5379 | 5.8026 |
| 15.546 | 5.80758 |
| 15.8018 | 5.81474 |
| 15.8736 | 5.81963 |

| | |
|---|---|
| 15.9184 | 5.82267 |
| 16.113 | 5.8242 |
| 16.1154 | 5.82256 |
| 16.1187 | 5.82031 |
| 16.132 | 5.81467 |
| 16.1377 | 5.8089 |
| 16.1389 | 5.73815 |
| 16.1402 | 5.53386 |
| 16.1398 | 5.48483 |
| 16.1279 | 5.48168 |
| 16.108 | 5.48053 |
| 16.0656 | 5.47884 |

### Material Boundary

| X | Y |
|---|---|
| 16.1209 | 7.30962 |
| 16.1258 | 7.30002 |
| 16.1318 | 7.28949 |
| 16.1384 | 7.27928 |
| 16.1454 | 7.26939 |
| 16.153 | 7.25987 |
| 16.161 | 7.25072 |
| 16.1694 | 7.24198 |
| 16.1782 | 7.23365 |
| 16.1875 | 7.22578 |
| 16.1971 | 7.21836 |
| 16.207 | 7.21142 |
| 16.2138 | 7.20721 |
| 16.2173 | 7.20498 |
| 16.2279 | 7.19906 |
| 16.2388 | 7.19366 |
| 16.2499 | 7.18879 |
| 16.2613 | 7.18448 |
| 16.2728 | 7.18073 |
| 16.2845 | 7.17755 |
| 16.2964 | 7.17495 |
| 16.3084 | 7.17293 |
| 16.3204 | 7.1715 |
| 16.3325 | 7.17066 |
| 16.3447 | 7.17042 |
| 16.3568 | 7.17077 |
| 16.3689 | 7.17172 |
| 16.381 | 7.17326 |
| 16.3929 | 7.17538 |
| 16.4047 | 7.17809 |
| 16.4164 | 7.18138 |
| 16.4279 | 7.18523 |
| 16.4393 | 7.18964 |
| 16.4503 | 7.19461 |
| 16.4612 | 7.20011 |
| 16.4717 | 7.20613 |
| 16.4819 | 7.21266 |
| 16.4918 | 7.21969 |
| 16.5014 | 7.22719 |
| 16.5105 | 7.23515 |
| 16.5193 | 7.24355 |
| 16.5277 | 7.25237 |

| | |
|---|---|
| 16.5331 | 7.25867 |
| 16.5356 | 7.26159 |
| 16.543 | 7.27118 |
| 16.55 | 7.28113 |
| 16.5564 | 7.2914 |
| 16.5624 | 7.30198 |
| 16.5678 | 7.31284 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | 10.9142 |
| 21.3574 | 10.9142 |
| 21.3574 | 10.5064 |
| 20.1197 | 10.5064 |
| 20.1197 | 10.9142 |

### Material Boundary

| X | Y |
|---|---|
| 19.6199 | 9.85802 |
| 20.1197 | 9.85802 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 4.571 |
| 21.3574 | 6.469 |
| 21.3574 | 7.874 |
| 21.3574 | 10.5064 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | 4.14158 |
| 20.1197 | 6.113 |
| 20.1197 | 6.35721 |
| 20.1197 | 9.85802 |
| 20.1197 | 10.5064 |

### Material Boundary

| X | Y |
|---|---|
| 19.2238 | 5.87564 |
| 20.1197 | 6.113 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 7.874 |
| 31.5167 | 11.426 |
| 40.9932 | 12.499 |
| 58.0021 | 22.4959 |

### Material Boundary

| X | Y |
|---|---|
| 3.65843 | -1.0496 |

| | |
|---|---|
| 14.9068 | 2.35895 |
| 20.1197 | 4.14158 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 4.571 |
| 31.5167 | 8.03895 |
| 40.9932 | 10.529 |
| 58.0021 | 20.4798 |

### Material Boundary

| X | Y |
|---|---|
| 3.65843 | -3.3297 |
| 20.1197 | 1.31751 |
| 21.3574 | 1.66694 |
| 58.0021 | 12.0122 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 6.469 |
| 31.314 | 9.35595 |
| 40.9932 | 12.499 |
| 58.0021 | 20.4798 |

### Material Boundary

| X | Y |
|---|---|
| 3.65843 | 1.39495 |
| 19.2238 | 5.87564 |

### Material Boundary

| X | Y |
|---|---|
| 15.5136 | 6.47673 |
| 15.5211 | 6.46598 |

### Material Boundary

| X | Y |
|---|---|
| 16.1149 | 7.1834 |
| 16.1221 | 7.20482 |
| 16.1212 | 7.28558 |
| 16.1209 | 7.30962 |

### Material Boundary

| X | Y |
|---|---|
| 15.8362 | 7.17313 |
| 16.1149 | 7.1834 |
| 16.1149 | 7.179 |
| 16.1174 | 7.16969 |
| 16.1191 | 7.16857 |
| 16.1276 | 7.14186 |
| 16.1308 | 6.85552 |
| 16.1096 | 6.84172 |

| | |
|---|---|
| 16.0893 | 6.83024 |
| 16.0742 | 6.82998 |
| 15.9836 | 6.82644 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | -4.05 |
| 21.3574 | 1.66694 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 1.66694 |
| 21.3574 | 4.571 |

### Material Boundary

| X | Y |
|---|---|
| 16.6205 | 6.35721 |
| 20.1197 | 6.35721 |

### Material Boundary

| X | Y |
|---|---|
| 15.5135 | 6.4847 |
| 16.1249 | 6.49385 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | -4.05 |
| 20.1197 | 1.31751 |
| 20.1197 | 4.14158 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | -4.05 |
| 21.3574 | -4.05 |

### Material Boundary

| X | Y |
|---|---|
| 15.5138 | 6.46397 |
| 15.5206 | 6.4655 |
| 15.5211 | 6.46598 |
| 15.5256 | 6.47004 |
| 15.531 | 6.47617 |
| 15.6953 | 6.48318 |
| 15.7844 | 6.47982 |
| 15.9016 | 6.48876 |
| 16.1013 | 6.488 |
| 16.1052 | 6.48637 |
| 16.1154 | 6.48163 |
| 16.1204 | 6.47674 |
| 16.1208 | 6.45974 |
| 16.1221 | 6.40601 |

| | |
|---|---|
| 16.1225 | 6.37441 |
| 16.1228 | 6.35721 |
| 16.1251 | 6.20174 |
| 16.1251 | 6.15271 |
| 16.1167 | 6.15043 |
| 16.1132 | 6.14946 |
| 16.0933 | 6.14814 |
| 16.0494 | 6.14667 |

### Material Boundary

| X | Y |
|---|---|
| 15.5083 | 6.8308 |
| 15.5104 | 6.82747 |
| 15.5202 | 6.82322 |
| 15.5286 | 6.82336 |
| 15.5404 | 6.82356 |
| 15.5539 | 6.82211 |
| 15.5808 | 6.82088 |
| 15.643 | 6.82531 |
| 15.7945 | 6.8262 |
| 15.8567 | 6.82558 |
| 15.8779 | 6.82507 |

### Material Boundary

| X | Y |
|---|---|
| 15.5284 | 5.82373 |
| 15.5298 | 5.79109 |

### Material Boundary

| X | Y |
|---|---|
| 16.1142 | 5.82835 |
| 16.1167 | 6.10361 |
| 16.1171 | 6.13323 |
| 16.1172 | 6.13731 |

### Material Boundary

| X | Y |
|---|---|
| 15.5089 | 7.16214 |
| 15.8326 | 7.17135 |
| 16.1149 | 7.179 |

### Material Boundary

| X | Y |
|---|---|
| 15.8779 | 6.82507 |
| 15.9836 | 6.82644 |

### Material Boundary

| X | Y |
|---|---|
| 15.5089 | 7.1669 |
| 15.8362 | 7.17313 |

### Material Boundary

| X | Y |
|---|---|
| 16.1228 | 6.35721 |
| 16.6205 | 6.35721 |

### Material Boundary

| X | Y |
|---|---|
| 15.5088 | 6.79587 |
| 15.5257 | 6.79762 |
| 15.5338 | 6.80266 |
| 15.5583 | 6.80471 |
| 15.7004 | 6.81531 |
| 15.7895 | 6.81195 |
| 15.8845 | 6.81919 |
| 15.9067 | 6.82088 |
| 15.9902 | 6.82057 |
| 16.1064 | 6.82013 |
| 16.1197 | 6.8146 |
| 16.1255 | 6.80887 |
| 16.1272 | 6.73814 |
| 16.1302 | 6.53386 |
| 16.1249 | 6.49385 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | 10.9142 |
| 20.1197 | 11.1092 |

### Material Boundary

| X | Y |
|---|---|
| 21.8179 | 11.6679 |
| 22.0277 | 11.7055 |
| 22.4366 | 11.8001 |

### Material Boundary

| X | Y |
|---|---|
| 16.1255 | 6.80887 |
| 16.1308 | 6.85552 |

### Material Boundary

| X | Y |
|---|---|
| 16.1204 | 6.47674 |
| 16.1249 | 6.49385 |

### Material Boundary

| X | Y |
|---|---|
| 15.5211 | 6.144 |
| 15.522 | 6.13452 |

### Material Boundary

| X | Y |
|---|---|
| 16.1172 | 6.13731 |

| | |
|---|---|
| 16.1251 | 6.15271 |

## Material Boundary

| X | Y |
|---|---|
| 16.113 | 5.8242 |
| 16.1142 | 5.82835 |

## Material Boundary

| X | Y |
|---|---|
| 16.6205 | 6.35721 |
| 16.6202 | 6.857 |
| 17.1202 | 6.857 |
| 17.1202 | 7.35729 |
| 17.6201 | 7.35729 |
| 17.6201 | 7.85774 |
| 18.1201 | 7.85774 |
| 18.1201 | 8.35751 |
| 18.62 | 8.35751 |
| 18.62 | 8.85787 |
| 19.1204 | 8.85787 |
| 19.1204 | 9.35802 |
| 19.6199 | 9.358 |
| 19.6199 | 9.85802 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S39 + GABIONS EQup + GEOTEX
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 8/5/2021, 15:10:48

## 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 corrected

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: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): -0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |

| Property | AIR | PILE | SW |
|---|---|---|---|
| Color | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 1e-005 | 24 | 19 |
| Cohesion [kPa] | 1e-005 | 500 | 1 |
| Friction Angle [deg] | 0 | 45 | 35 |
| Water Surface | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated |

## Support Properties

### GEOTEX

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Parallel to Reinforcement
Anchorage: Embedded End
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 40 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 30 degrees

## Global Minimums

### Method: bishop simplified

FS: 1.350580
Center: 19.352, 11.038
Radius: 0.678
Left Slip Surface Endpoint: 19.429, 10.365
Right Slip Surface Endpoint: 20.029, 11.011
Resisting Moment=1.15633 kN-m
Driving Moment=0.856173 kN-m

### Method: janbu corrected

FS: 1.314980
Center: 16.841, 7.823
Radius: 0.454
Left Slip Surface Endpoint: 16.677, 7.399
Right Slip Surface Endpoint: 17.295, 7.823
Left Slope Intercept: 16.677 7.399
Right Slope Intercept: 17.295 8.065
Resisting Horizontal Force=2.25558 kN
Driving Horizontal Force=1.71529 kN

## Valid / Invalid Surfaces

### Method: bishop simplified

Number of Valid Surfaces: 6993
Number of Invalid Surfaces: 3007

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 811 surfaces
Error Code -109 reported for 124 surfaces
Error Code -112 reported for 474 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 6810
Number of Invalid Surfaces: 3190

**Error Codes:**

Error Code -106 reported for 590 surfaces
Error Code -108 reported for 1064 surfaces
Error Code -109 reported for 124 surfaces
Error Code -112 reported for 404 surfaces
Error Code -113 reported for 950 surfaces
Error Code -123 reported for 58 surfaces

**Error Codes**

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## Slice Data

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.35058

| 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 | 0.0239836 | 0.00516135 | SW | 1 | 35 | 0.786568 | 1.06232 | 0.0890062 | 0 | 0.0890062 |
| 2 | 0.0239836 | 0.0152839 | SW | 1 | 35 | 0.953888 | 1.2883 | 0.411738 | 0 | 0.411738 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 0.0239836 | 0.0250024 | SW | 1 | 35 | 1.10803 | 1.49648 | 0.709052 | 0 | 0.709052 |
| 4 | 0.0239836 | 0.0343086 | SW | 1 | 35 | 1.24928 | 1.68725 | 0.981502 | 0 | 0.981502 |
| 5 | 0.0239836 | 0.0431921 | SW | 1 | 35 | 1.37785 | 1.8609 | 1.2295 | 0 | 1.2295 |
| 6 | 0.0239836 | 0.0516404 | SW | 1 | 35 | 1.49388 | 2.01761 | 1.45329 | 0 | 1.45329 |
| 7 | 0.0239836 | 0.0596384 | SW | 1 | 35 | 1.59742 | 2.15744 | 1.65299 | 0 | 1.65299 |
| 8 | 0.0239836 | 0.0671683 | SW | 1 | 35 | 1.68844 | 2.28038 | 1.82857 | 0 | 1.82857 |
| 9 | 0.0239836 | 0.0742087 | SW | 1 | 35 | 1.76686 | 2.38629 | 1.97982 | 0 | 1.97982 |
| 10 | 0.0239836 | 0.0807343 | SW | 1 | 35 | 1.83249 | 2.47492 | 2.1064 | 0 | 2.1064 |
| 11 | 0.0239836 | 0.0867151 | SW | 1 | 35 | 1.88504 | 2.5459 | 2.20777 | 0 | 2.20777 |
| 12 | 0.0239836 | 0.0921148 | SW | 1 | 35 | 1.92414 | 2.59871 | 2.28319 | 0 | 2.28319 |
| 13 | 0.0239836 | 0.09689 | SW | 1 | 35 | 1.94929 | 2.63267 | 2.3317 | 0 | 2.3317 |
| 14 | 0.0239836 | 0.100988 | SW | 1 | 35 | 1.95983 | 2.64691 | 2.35203 | 0 | 2.35203 |
| 15 | 0.0239836 | 0.104343 | SW | 1 | 35 | 1.95492 | 2.64028 | 2.34256 | 0 | 2.34256 |
| 16 | 0.0239836 | 0.106874 | SW | 1 | 35 | 1.93351 | 2.61136 | 2.30127 | 0 | 2.30127 |
| 17 | 0.0239836 | 0.108477 | SW | 1 | 35 | 1.89423 | 2.55831 | 2.22549 | 0 | 2.22549 |
| 18 | 0.0239836 | 0.109015 | SW | 1 | 35 | 1.83529 | 2.4787 | 2.1118 | 0 | 2.1118 |
| 19 | 0.0239836 | 0.108305 | SW | 1 | 35 | 1.75431 | 2.36934 | 1.95562 | 0 | 1.95562 |
| 20 | 0.0239836 | 0.106089 | SW | 1 | 35 | 1.64807 | 2.22585 | 1.7507 | 0 | 1.7507 |
| 21 | 0.0239836 | 0.101983 | SW | 1 | 35 | 1.5119 | 2.04194 | 1.48804 | 0 | 1.48804 |
| 22 | 0.0239836 | 0.0953672 | SW | 1 | 35 | 1.33866 | 1.80797 | 1.1539 | 0 | 1.1539 |
| 23 | 0.0239836 | 0.085109 | SW | 1 | 35 | 1.11617 | 1.50748 | 0.724756 | 0 | 0.724756 |
| 24 | 0.0239836 | 0.068567 | SW | 1 | 35 | 0.818671 | 1.10568 | 0.150927 | 0 | 0.150927 |
| 25 | 0.0239836 | 0.0291257 | SW | 1 | 35 | 0.302968 | 0.409182 | -0.843774 | 0 | -0.843774 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.31498

| 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 | 0.0247079 | 0.00829687 | SW | 1 | 35 | 1.156 | 1.52011 | 0.7428 | 0 | 0.7428 |
| 2 | 0.0247079 | 0.0245249 | SW | 1 | 35 | 1.48337 | 1.9506 | 1.3576 | 0 | 1.3576 |
| 3 | 0.0247079 | 0.0400391 | SW | 1 | 35 | 1.77106 | 2.32891 | 1.89788 | 0 | 1.89788 |
| 4 | 0.0247079 | 0.0548703 | SW | 1 | 35 | 2.02498 | 2.66281 | 2.37474 | 0 | 2.37474 |
| 5 | 0.0247079 | 0.069041 | SW | 1 | 35 | 2.24939 | 2.9579 | 2.79617 | 0 | 2.79617 |
| 6 | 0.0247079 | 0.082567 | SW | 1 | 35 | 2.44738 | 3.21825 | 3.16799 | 0 | 3.16799 |
| 7 | 0.0247079 | 0.0954574 | SW | 1 | 35 | 2.62124 | 3.44688 | 3.4945 | 0 | 3.4945 |
| 8 | 0.0247079 | 0.107716 | SW | 1 | 35 | 2.77264 | 3.64597 | 3.77884 | 0 | 3.77884 |
| 9 | 0.0247079 | 0.11934 | SW | 1 | 35 | 2.9028 | 3.81712 | 4.02326 | 0 | 4.02326 |
| 10 | 0.0247079 | 0.130322 | SW | 1 | 35 | 3.01249 | 3.96137 | 4.22927 | 0 | 4.22927 |
| 11 | 0.0247079 | 0.140648 | SW | 1 | 35 | 3.10222 | 4.07936 | 4.3978 | 0 | 4.3978 |
| 12 | 0.0247079 | 0.150296 | SW | 1 | 35 | 3.17215 | 4.17131 | 4.52909 | 0 | 4.52909 |
| 13 | 0.0247079 | 0.159238 | SW | 1 | 35 | 3.22215 | 4.23706 | 4.62302 | 0 | 4.62302 |
| 14 | 0.0247079 | 0.167436 | SW | 1 | 35 | 3.2518 | 4.27605 | 4.67867 | 0 | 4.67867 |
| 15 | 0.0247079 | 0.17484 | SW | 1 | 35 | 3.26032 | 4.28725 | 4.69467 | 0 | 4.69467 |
| 16 | 0.0247079 | 0.181383 | SW | 1 | 35 | 3.24653 | 4.26912 | 4.66879 | 0 | 4.66879 |
| 17 | 0.0247079 | 0.186981 | SW | 1 | 35 | 3.20872 | 4.2194 | 4.59777 | 0 | 4.59777 |
| 18 | 0.0247079 | 0.191517 | SW | 1 | 35 | 3.1445 | 4.13495 | 4.47719 | 0 | 4.47719 |
| 19 | 0.0247079 | 0.194835 | SW | 1 | 35 | 3.05044 | 4.01127 | 4.30056 | 0 | 4.30056 |
| 20 | 0.0247079 | 0.196712 | SW | 1 | 35 | 2.9216 | 3.84184 | 4.05858 | 0 | 4.05858 |
| 21 | 0.0247079 | 0.196811 | SW | 1 | 35 | 2.7504 | 3.61672 | 3.73707 | 0 | 3.73707 |
| 22 | 0.0247079 | 0.194592 | SW | 1 | 35 | 2.52451 | 3.31968 | 3.31286 | 0 | 3.31286 |
| 23 | 0.0247079 | 0.189057 | SW | 1 | 35 | 2.22105 | 2.92064 | 2.74297 | 0 | 2.74297 |
| 24 | 0.0247079 | 0.177871 | SW | 1 | 35 | 1.78628 | 2.34892 | 1.92646 | 0 | 1.92646 |
| 25 | 0.0247079 | 0.142008 | SW | 1 | 35 | 0.791323 | 1.04057 | 0.0579447 | 0 | 0.0579447 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 3.65843 | 1.39495 |
| 19.2238 | 5.87564 |
| 20.1197 | 6.113 |
| 21.3574 | 6.469 |
| 31.314 | 9.35595 |
| 40.9932 | 12.499 |
| 58.0021 | 20.4798 |

## External Boundary

| X | Y |
|---|---|
| 15.5089 | 7.16214 |
| 15.5047 | 7.15683 |
| 15.5007 | 7.15046 |
| 15.5042 | 7.12849 |
| 15.5014 | 7.10641 |
| 15.5072 | 7.07713 |
| 15.5055 | 7.01397 |
| 15.5079 | 6.85826 |
| 15.5082 | 6.83806 |
| 15.5083 | 6.8308 |
| 15.5088 | 6.79587 |
| 15.5135 | 6.4847 |
| 15.5136 | 6.47673 |
| 15.5138 | 6.46397 |
| 15.5139 | 6.45861 |
| 15.5177 | 6.20837 |
| 15.2255 | 6.11307 |
| 14.9068 | 5.83945 |
| 14.531 | 5.81394 |
| 14.3766 | 5.81394 |
| 14.0785 | 5.7859 |
| 13.4437 | 5.71069 |
| 12.8259 | 5.60602 |
| 11.8014 | 5.52321 |
| 11.5686 | 5.50581 |
| 11.0035 | 5.45144 |
| 10.7524 | 5.43465 |
| 10.6428 | 5.44141 |
| 10.6306 | 5.59569 |
| 10.6252 | 5.74861 |
| 10.6047 | 5.75406 |
| 10.3991 | 5.74996 |
| 10.1023 | 5.7337 |
| 10.0685 | 5.72426 |
| 10.0564 | 5.68379 |
| 10.0604 | 5.49629 |
| 10.0348 | 5.4356 |
| 9.93764 | 5.41807 |
| 9.84285 | 5.42769 |
| 8.64957 | 5.32679 |
| 7.55348 | 5.30049 |
| 5.50325 | 5.27181 |
| 3.65843 | 5.33747 |
| 3.65843 | 1.39495 |
| 3.65843 | -1.0496 |
| 3.65843 | -3.3297 |

| | |
|---|---|
| 3.65843 | -4.75034 |
| 58.0021 | -4.75034 |
| 58.0021 | 12.0122 |
| 58.0021 | 20.4798 |
| 58.0021 | 22.4959 |
| 58.0021 | 25.0964 |
| 56.8949 | 24.7535 |
| 56.4427 | 24.4729 |
| 55.5383 | 23.9429 |
| 54.6182 | 23.5376 |
| 54.0256 | 22.9297 |
| 52.8405 | 21.8853 |
| 51.8424 | 21.3086 |
| 49.5935 | 19.6011 |
| 48.9572 | 18.9962 |
| 47.3933 | 17.7083 |
| 46.9774 | 17.4859 |
| 46.0973 | 16.9639 |
| 43.5489 | 15.6354 |
| 43.4255 | 15.5699 |
| 42.2853 | 15.1476 |
| 41.4521 | 14.3098 |
| 40.9932 | 14.0475 |
| 31.9223 | 14.4593 |
| 31.7396 | 14.452 |
| 31.5167 | 14.4556 |
| 31.3742 | 14.4483 |
| 31.2609 | 14.3826 |
| 31.144 | 14.3387 |
| 30.9868 | 14.2401 |
| 30.8699 | 14.1232 |
| 30.7164 | 14.0173 |
| 30.4241 | 13.8822 |
| 30.0367 | 13.6995 |
| 29.3038 | 13.4105 |
| 29.0415 | 13.294 |
| 28.5698 | 12.9915 |
| 28.3087 | 12.8758 |
| 27.9296 | 12.7397 |
| 27.2258 | 12.552 |
| 26.9223 | 12.5087 |
| 26.6947 | 12.5123 |
| 26.3696 | 12.4617 |
| 25.9469 | 12.4039 |
| 25.1621 | 12.2298 |
| 24.1388 | 12.1321 |
| 23.1127 | 11.949 |
| 22.4366 | 11.8001 |
| 21.8179 | 11.6679 |
| 21.026 | 11.4986 |
| 20.1197 | 11.1092 |
| 16.639 | 7.35729 |
| 16.5678 | 7.31284 |
| 16.1209 | 7.30962 |
| 16.1206 | 7.33432 |
| 16.1188 | 7.49116 |
| 16.1103 | 7.51787 |
| 16.094 | 7.52834 |

| | |
|---|---|
| 16.0725 | 7.53066 |
| 15.8692 | 7.52384 |
| 15.5001 | 7.51145 |
| 15.496 | 7.50613 |
| 15.4919 | 7.49977 |
| 15.4954 | 7.47779 |
| 15.4926 | 7.45571 |
| 15.4984 | 7.42643 |
| 15.4958 | 7.32881 |
| 15.4965 | 7.29105 |
| 15.4971 | 7.22273 |
| 15.499 | 7.20763 |
| 15.5022 | 7.20164 |
| 15.4983 | 7.18196 |
| 15.5016 | 7.17677 |
| 15.5089 | 7.1669 |

### Material Boundary

| X | Y |
|---|---|
| 15.5284 | 5.82373 |
| 15.5233 | 6.07038 |
| 15.522 | 6.13452 |
| 16.1172 | 6.13731 |

### Material Boundary

| X | Y |
|---|---|
| 15.5284 | 5.82373 |
| 16.1142 | 5.82835 |

### Material Boundary

| X | Y |
|---|---|
| 15.5177 | 6.20837 |
| 15.5194 | 6.15051 |
| 15.5211 | 6.144 |
| 15.5295 | 6.13929 |
| 15.6015 | 6.13888 |
| 15.6404 | 6.14189 |
| 15.7567 | 6.14479 |
| 15.8444 | 6.14588 |
| 15.908 | 6.14886 |
| 16.0494 | 6.14667 |

### Material Boundary

| X | Y |
|---|---|
| 16.0656 | 5.47884 |
| 15.9242 | 5.4822 |
| 15.8606 | 5.47975 |
| 15.7729 | 5.47939 |
| 15.6487 | 5.4783 |
| 15.6176 | 5.47476 |
| 15.5457 | 5.47576 |
| 15.5342 | 5.48056 |
| 15.5325 | 5.48709 |
| 15.5302 | 5.74206 |

| | |
|---|---|
| 15.5298 | 5.79109 |
| 15.5379 | 5.8026 |
| 15.546 | 5.80758 |
| 15.8018 | 5.81474 |
| 15.8736 | 5.81963 |
| 15.9184 | 5.82267 |
| 16.113 | 5.8242 |
| 16.1154 | 5.82256 |
| 16.1187 | 5.82031 |
| 16.132 | 5.81467 |
| 16.1377 | 5.8089 |
| 16.1389 | 5.73815 |
| 16.1402 | 5.53386 |
| 16.1398 | 5.48483 |
| 16.1279 | 5.48168 |
| 16.108 | 5.48053 |
| 16.0656 | 5.47884 |

## Material Boundary

| X | Y |
|---|---|
| 16.1209 | 7.30962 |
| 16.1258 | 7.30002 |
| 16.1318 | 7.28949 |
| 16.1384 | 7.27928 |
| 16.1454 | 7.26939 |
| 16.153 | 7.25987 |
| 16.161 | 7.25072 |
| 16.1694 | 7.24198 |
| 16.1782 | 7.23365 |
| 16.1875 | 7.22578 |
| 16.1971 | 7.21836 |
| 16.207 | 7.21142 |
| 16.2138 | 7.20721 |
| 16.2173 | 7.20498 |
| 16.2279 | 7.19906 |
| 16.2388 | 7.19366 |
| 16.2499 | 7.18879 |
| 16.2613 | 7.18448 |
| 16.2728 | 7.18073 |
| 16.2845 | 7.17755 |
| 16.2964 | 7.17495 |
| 16.3084 | 7.17293 |
| 16.3204 | 7.1715 |
| 16.3325 | 7.17066 |
| 16.3447 | 7.17042 |
| 16.3568 | 7.17077 |
| 16.3689 | 7.17172 |
| 16.381 | 7.17326 |
| 16.3929 | 7.17538 |
| 16.4047 | 7.17809 |
| 16.4164 | 7.18138 |
| 16.4279 | 7.18523 |
| 16.4393 | 7.18964 |
| 16.4503 | 7.19461 |
| 16.4612 | 7.20011 |
| 16.4717 | 7.20613 |
| 16.4819 | 7.21266 |

| | |
|---|---|
| 16.4918 | 7.21969 |
| 16.5014 | 7.22719 |
| 16.5105 | 7.23515 |
| 16.5193 | 7.24355 |
| 16.5277 | 7.25237 |
| 16.5331 | 7.25867 |
| 16.5356 | 7.26159 |
| 16.543 | 7.27118 |
| 16.55 | 7.28113 |
| 16.5564 | 7.2914 |
| 16.5624 | 7.30198 |
| 16.5678 | 7.31284 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | 10.9142 |
| 21.3574 | 10.9142 |
| 21.3574 | 10.5064 |
| 20.1197 | 10.5064 |
| 20.1197 | 10.9142 |

### Material Boundary

| X | Y |
|---|---|
| 19.6199 | 9.85802 |
| 20.1197 | 9.85802 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 4.571 |
| 21.3574 | 6.469 |
| 21.3574 | 7.874 |
| 21.3574 | 10.5064 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | 4.14158 |
| 20.1197 | 6.113 |
| 20.1197 | 6.35721 |
| 20.1197 | 9.85802 |
| 20.1197 | 10.5064 |

### Material Boundary

| X | Y |
|---|---|
| 19.2238 | 5.87564 |
| 20.1197 | 6.113 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 7.874 |
| 31.5167 | 11.426 |
| 40.9932 | 12.499 |
| 58.0021 | 22.4959 |

### Material Boundary

| X | Y |
|---|---|
| 3.65843 | -1.0496 |
| 14.9068 | 2.35895 |
| 20.1197 | 4.14158 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 4.571 |
| 31.5167 | 8.03895 |
| 40.9932 | 10.529 |
| 58.0021 | 20.4798 |

### Material Boundary

| X | Y |
|---|---|
| 3.65843 | -3.3297 |
| 20.1197 | 1.31751 |
| 21.3574 | 1.66694 |
| 58.0021 | 12.0122 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 6.469 |
| 31.314 | 9.35595 |
| 40.9932 | 12.499 |
| 58.0021 | 20.4798 |

### Material Boundary

| X | Y |
|---|---|
| 3.65843 | 1.39495 |
| 19.2238 | 5.87564 |

### Material Boundary

| X | Y |
|---|---|
| 15.5136 | 6.47673 |
| 15.5211 | 6.46598 |

### Material Boundary

| X | Y |
|---|---|
| 16.1149 | 7.1834 |
| 16.1221 | 7.20482 |
| 16.1212 | 7.28558 |
| 16.1209 | 7.30962 |

### Material Boundary

| X | Y |
|---|---|
| 15.8362 | 7.17313 |
| 16.1149 | 7.1834 |
| 16.1149 | 7.179 |

| | |
|---|---|
| 16.1174 | 7.16969 |
| 16.1191 | 7.16857 |
| 16.1276 | 7.14186 |
| 16.1308 | 6.85552 |
| 16.1096 | 6.84172 |
| 16.0893 | 6.83024 |
| 16.0742 | 6.82998 |
| 15.9836 | 6.82644 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | -4.05 |
| 21.3574 | 1.66694 |

### Material Boundary

| X | Y |
|---|---|
| 21.3574 | 1.66694 |
| 21.3574 | 4.571 |

### Material Boundary

| X | Y |
|---|---|
| 16.6205 | 6.35721 |
| 20.1197 | 6.35721 |

### Material Boundary

| X | Y |
|---|---|
| 15.5135 | 6.4847 |
| 16.1249 | 6.49385 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | -4.05 |
| 20.1197 | 1.31751 |
| 20.1197 | 4.14158 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | -4.05 |
| 21.3574 | -4.05 |

### Material Boundary

| X | Y |
|---|---|
| 15.5138 | 6.46397 |
| 15.5206 | 6.4655 |
| 15.5211 | 6.46598 |
| 15.5256 | 6.47004 |
| 15.531 | 6.47617 |
| 15.6953 | 6.48318 |
| 15.7844 | 6.47982 |
| 15.9016 | 6.48876 |
| 16.1013 | 6.488 |

| | |
|---|---|
| 16.1052 | 6.48637 |
| 16.1154 | 6.48163 |
| 16.1204 | 6.47674 |
| 16.1208 | 6.45974 |
| 16.1221 | 6.40601 |
| 16.1225 | 6.37441 |
| 16.1228 | 6.35721 |
| 16.1251 | 6.20174 |
| 16.1251 | 6.15271 |
| 16.1167 | 6.15043 |
| 16.1132 | 6.14946 |
| 16.0933 | 6.14814 |
| 16.0494 | 6.14667 |

### Material Boundary

| X | Y |
|---|---|
| 15.5083 | 6.8308 |
| 15.5104 | 6.82747 |
| 15.5202 | 6.82322 |
| 15.5286 | 6.82336 |
| 15.5404 | 6.82356 |
| 15.5539 | 6.82211 |
| 15.5808 | 6.82088 |
| 15.643 | 6.82531 |
| 15.7945 | 6.8262 |
| 15.8567 | 6.82558 |
| 15.8779 | 6.82507 |

### Material Boundary

| X | Y |
|---|---|
| 15.5284 | 5.82373 |
| 15.5298 | 5.79109 |

### Material Boundary

| X | Y |
|---|---|
| 16.1142 | 5.82835 |
| 16.1167 | 6.10361 |
| 16.1171 | 6.13323 |
| 16.1172 | 6.13731 |

### Material Boundary

| X | Y |
|---|---|
| 15.5089 | 7.16214 |
| 15.8326 | 7.17135 |
| 16.1149 | 7.179 |

### Material Boundary

| X | Y |
|---|---|
| 15.8779 | 6.82507 |
| 15.9836 | 6.82644 |

### Material Boundary

| X | Y |
|---|---|
| 15.5089 | 7.1669 |
| 15.8362 | 7.17313 |

### Material Boundary

| X | Y |
|---|---|
| 16.1228 | 6.35721 |
| 16.6205 | 6.35721 |

### Material Boundary

| X | Y |
|---|---|
| 15.5088 | 6.79587 |
| 15.5257 | 6.79762 |
| 15.5338 | 6.80266 |
| 15.5583 | 6.80471 |
| 15.7004 | 6.81531 |
| 15.7895 | 6.81195 |
| 15.8845 | 6.81919 |
| 15.9067 | 6.82088 |
| 15.9902 | 6.82057 |
| 16.1064 | 6.82013 |
| 16.1197 | 6.8146 |
| 16.1255 | 6.80887 |
| 16.1272 | 6.73814 |
| 16.1302 | 6.53386 |
| 16.1249 | 6.49385 |

### Material Boundary

| X | Y |
|---|---|
| 20.1197 | 10.9142 |
| 20.1197 | 11.1092 |

### Material Boundary

| X | Y |
|---|---|
| 21.8179 | 11.6679 |
| 22.0277 | 11.7055 |
| 22.4366 | 11.8001 |

### Material Boundary

| X | Y |
|---|---|
| 16.1255 | 6.80887 |
| 16.1308 | 6.85552 |

### Material Boundary

| X | Y |
|---|---|
| 16.1204 | 6.47674 |
| 16.1249 | 6.49385 |

### Material Boundary

| X | Y |
|---|---|
| 15.5211 | 6.144 |

| | |
|---|---|
| 15.522 | 6.13452 |

### Material Boundary

| X | Y |
|---|---|
| 16.1172 | 6.13731 |
| 16.1251 | 6.15271 |

### Material Boundary

| X | Y |
|---|---|
| 16.113 | 5.8242 |
| 16.1142 | 5.82835 |

### Material Boundary

| X | Y |
|---|---|
| 16.6205 | 6.35721 |
| 16.6202 | 6.857 |
| 17.1202 | 6.857 |
| 17.1202 | 7.35729 |
| 17.6201 | 7.35729 |
| 17.6201 | 7.85774 |
| 18.1201 | 7.85774 |
| 18.1201 | 8.35751 |
| 18.62 | 8.35751 |
| 18.62 | 8.85787 |
| 19.1204 | 8.85787 |
| 19.1204 | 9.35802 |
| 19.6199 | 9.358 |
| 19.6199 | 9.85802 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S44 + GABIONS ST loc lim + GEOTEX+MPILE=0.75m oop
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/5/2021, 7:15:55

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |

| Property | GRAVEL | SW |
|---|---|---|
| Color | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19 |
| Cohesion [kPa] | 0 | 1 |
| Friction Angle [deg] | 36 | 35 |
| Water Surface | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated |

## Support Properties

### GEOTEX

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Parallel to Reinforcement
Anchorage: Embedded End
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 40 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 30 degrees

### MICROPILE

Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 0.75 m
Pile Shear Strength: 40 kN
Force Direction: Parallel to Surface

## Global Minimums

### Method: bishop simplified

FS: 1.759990

Center: 11.979, 24.988
Radius: 21.668
Left Slip Surface Endpoint: 3.606, 5.004
Right Slip Surface Endpoint: 30.895, 14.420
Resisting Moment=25001.9 kN-m
Driving Moment=14205.7 kN-m

### Method: janbu simplified

FS: 1.561120
Center: 12.974, 21.211
Radius: 18.402
Left Slip Surface Endpoint: 4.279, 4.994
Right Slip Surface Endpoint: 30.089, 14.450
Resisting Horizontal Force=1047.3 kN
Driving Horizontal Force=670.868 kN

### Method: janbu corrected

FS: 1.681220
Center: 12.974, 21.211
Radius: 18.402
Left Slip Surface Endpoint: 4.279, 4.994
Right Slip Surface Endpoint: 30.089, 14.450
Resisting Horizontal Force=1127.88 kN
Driving Horizontal Force=670.868 kN

### Method: spencer

FS: 1.759670
Center: 12.296, 26.473
Radius: 22.739
Left Slip Surface Endpoint: 4.778, 5.012
Right Slip Surface Endpoint: 31.563, 14.396
Resisting Moment=25555.8 kN-m
Driving Moment=14523.1 kN-m
Resisting Horizontal Force=1021.44 kN
Driving Horizontal Force=580.469 kN

### Method: corp of eng#1

FS: 1.793400
Center: 12.195, 27.364
Radius: 23.999
Left Slip Surface Endpoint: 3.492, 4.999
Right Slip Surface Endpoint: 32.370, 14.366
Resisting Horizontal Force=1138.35 kN
Driving Horizontal Force=634.745 kN

### Method: corp of eng#2

FS: 1.853630
Center: 12.296, 26.473
Radius: 22.739
Left Slip Surface Endpoint: 4.778, 5.012
Right Slip Surface Endpoint: 31.563, 14.396
Resisting Horizontal Force=1030.11 kN
Driving Horizontal Force=555.724 kN

### Method: lowe-karafiath

FS: 1.802590
Center: 12.296, 26.473
Radius: 22.739
Left Slip Surface Endpoint: 4.778, 5.012
Right Slip Surface Endpoint: 31.563, 14.396
Resisting Horizontal Force=1025.35 kN
Driving Horizontal Force=568.821 kN

### Method: gle/morgenstern-price

FS: 1.759950
Center: 11.979, 24.988
Radius: 21.668
Left Slip Surface Endpoint: 3.606, 5.004
Right Slip Surface Endpoint: 30.895, 14.420
Resisting Moment=25001.2 kN-m
Driving Moment=14205.7 kN-m
Resisting Horizontal Force=1041.97 kN
Driving Horizontal Force=592.044 kN

## *Valid / Invalid Surfaces*

### Method: bishop simplified

Number of Valid Surfaces: 8207
Number of Invalid Surfaces: 1793

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 206 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 7877
Number of Invalid Surfaces: 2123

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 536 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 7877
Number of Invalid Surfaces: 2123

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 536 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: spencer

Number of Valid Surfaces: 7628
Number of Invalid Surfaces: 2372

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 547 surfaces
Error Code -111 reported for 230 surfaces
Error Code -112 reported for 48 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 5622
Number of Invalid Surfaces: 4378

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 1807 surfaces
Error Code -111 reported for 984 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 5965
Number of Invalid Surfaces: 4035

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 1946 surfaces
Error Code -111 reported for 497 surfaces
Error Code -112 reported for 45 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 3559
Number of Invalid Surfaces: 6441

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 4107 surfaces
Error Code -111 reported for 747 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 7688
Number of Invalid Surfaces: 2312

### Error Codes:

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 543 surfaces
Error Code -111 reported for 182 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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).
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.75999

| 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 | 1.20692 | 5.43061 | UNIT II | 5 | 28 | 4.75181 | 8.36313 | 6.32513 | 0 | 6.32513 |
| 2 | 1.20692 | 18.0247 | UNIT II | 5 | 28 | 8.13379 | 14.3154 | 17.5197 | 0 | 17.5197 |
| 3 | 1.20692 | 29.6016 | UNIT II | 5 | 28 | 11.1067 | 19.5476 | 27.36 | 0 | 27.36 |
| 4 | 1.20692 | 40.0515 | UNIT II | 5 | 28 | 13.6722 | 24.063 | 35.8522 | 0 | 35.8522 |
| 5 | 1.08487 | 44.2283 | UNIT II UNDER WT | 5 | 28 | 15.1946 | 26.7423 | 42.8948 | 2.00345 | 40.8913 |
| 6 | 1.08487 | 49.8376 | UNIT II UNDER WT | 5 | 28 | 15.3938 | 27.093 | 47.307 | 5.75601 | 41.5509 |
| 7 | 1.08487 | 53.2275 | UNIT II UNDER WT | 5 | 28 | 15.1193 | 26.6098 | 49.6455 | 9.00331 | 40.6422 |
| 8 | 1.08487 | 76.4278 | UNIT II UNDER WT | 5 | 28 | 20.3305 | 35.7815 | 69.6418 | 11.7502 | 57.8916 |
| 9 | 1.08487 | 82.9123 | UNIT II UNDER WT | 5 | 28 | 21.3035 | 37.4939 | 75.1098 | 13.9977 | 61.1121 |
| 10 | 1.08487 | 94.4317 | UNIT II UNDER WT | 5 | 28 | 23.5807 | 41.5018 | 84.3929 | 15.743 | 68.6499 |
| 11 | 1.08487 | 109.218 | UNIT II UNDER WT | 5 | 28 | 26.7983 | 47.1648 | 96.2802 | 16.9794 | 79.3008 |
| 12 | 1.08487 | 125.273 | UNIT II UNDER WT | 5 | 28 | 30.3898 | 53.4858 | 108.885 | 17.6961 | 91.189 |
| 13 | 1.08487 | 135.021 | UNIT II UNDER WT | 5 | 28 | 32.3929 | 57.0112 | 115.666 | 17.8474 | 97.8189 |
| 14 | 1.08487 | 138.582 | UNIT II UNDER WT | 5 | 28 | 32.8513 | 57.818 | 116.952 | 17.6157 | 99.3358 |
| 15 | 1.08487 | 139.186 | UNIT II UNDER WT | 5 | 28 | 32.6876 | 57.5298 | 115.6 | 16.8052 | 98.7944 |
| 16 | 1.08487 | 134.766 | UNIT II UNDER WT | 5 | 28 | 31.4276 | 55.3123 | 110.005 | 15.3816 | 94.6236 |
| 17 | 1.08487 | 127.22 | UNIT II UNDER WT | 5 | 28 | 29.5898 | 52.0777 | 101.842 | 13.3011 | 88.5406 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 1.08487 | 118.887 | UNIT II UNDER WT | 5 | 28 | 27.7684 | 48.8721 | 93.0186 | 10.5073 | 82.5113 |
| 19 | 1.08487 | 108.178 | UNIT II UNDER WT | 5 | 28 | 25.6095 | 45.0724 | 82.2929 | 6.92746 | 75.3654 |
| 20 | 1.08487 | 95.6852 | UNIT II UNDER WT | 5 | 28 | 23.2889 | 40.9882 | 70.1493 | 2.46534 | 67.684 |
| 21 | 1.10821 | 87.0858 | UNIT II | 5 | 28 | 20.9669 | 36.9016 | 59.9982 | 0 | 59.9982 |
| 22 | 1.10821 | 78.2221 | UNIT II | 5 | 28 | 18.4668 | 32.5013 | 51.7225 | 0 | 51.7225 |
| 23 | 0.962324 | 61.1001 | UNIT I | 3 | 28 | 15.4047 | 27.1121 | 45.3483 | 0 | 45.3483 |
| 24 | 0.962324 | 41.5751 | UNIT I | 3 | 28 | 10.4462 | 18.3852 | 28.9353 | 0 | 28.9353 |
| 25 | 0.962324 | 14.615 | UNIT I | 3 | 28 | 4.22178 | 7.43029 | 8.33215 | 0 | 8.33215 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.56112

| 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 | 0.928375 | 4.75301 | UNIT II | 5 | 28 | 5.9644 | 9.31115 | 8.10809 | 0 | 8.10809 |
| 2 | 0.928375 | 14.8346 | UNIT II | 5 | 28 | 10.1412 | 15.8317 | 20.3716 | 0 | 20.3716 |
| 3 | 0.928375 | 23.5498 | UNIT II | 5 | 28 | 13.5497 | 21.1527 | 30.3788 | 0 | 30.3788 |
| 4 | 0.928375 | 31.5721 | UNIT II | 5 | 28 | 16.5335 | 25.8107 | 39.1392 | 0 | 39.1392 |
| 5 | 1.07026 | 45.5231 | UNIT II UNDER WT | 5 | 28 | 18.3973 | 28.7204 | 47.1241 | 2.51259 | 44.6115 |
| 6 | 1.07026 | 54.1801 | UNIT II UNDER WT | 5 | 28 | 19.2049 | 29.9812 | 54.2141 | 7.23127 | 46.9828 |
| 7 | 1.07026 | 59.5516 | UNIT II UNDER WT | 5 | 28 | 19.1132 | 29.838 | 58.0606 | 11.347 | 46.7136 |
| 8 | 1.07026 | 65.9249 | UNIT II UNDER WT | 5 | 28 | 20.7322 | 32.3654 | 66.343 | 14.8763 | 51.4667 |
| 9 | 1.07026 | 98.9453 | UNIT II UNDER WT | 5 | 28 | 28.7062 | 44.8139 | 92.7082 | 17.8292 | 74.879 |
| 10 | 1.07026 | 97.8371 | UNIT II UNDER WT | 5 | 28 | 27.0013 | 42.1522 | 90.0826 | 20.2095 | 69.8731 |
| 11 | 1.07026 | 113.223 | UNIT II UNDER WT | 5 | 28 | 30.6089 | 47.7841 | 102.481 | 22.0151 | 80.4655 |
| 12 | 1.07026 | 129.057 | UNIT II UNDER WT | 5 | 28 | 34.3896 | 53.6863 | 114.804 | 23.2382 | 91.5659 |
| 13 | 1.07026 | 142.916 | UNIT II UNDER WT | 5 | 28 | 37.6571 | 58.7872 | 124.877 | 23.7186 | 101.159 |
| 14 | 1.07026 | 149.148 | UNIT II UNDER WT | 5 | 28 | 38.664 | 60.3592 | 127.979 | 23.8638 | 104.115 |
| 15 | 1.07026 | 150.992 | UNIT II UNDER WT | 5 | 28 | 38.5416 | 60.168 | 127.121 | 23.3647 | 103.756 |
| 16 | 1.07026 | 149.999 | UNIT II UNDER WT | 5 | 28 | 37.7867 | 58.9895 | 123.72 | 22.1809 | 101.539 |
| 17 | 1.07026 | 142.663 | UNIT II UNDER WT | 5 | 28 | 35.492 | 55.4073 | 115.061 | 20.2586 | 94.802 |
| 18 | 1.07026 | 134.419 | UNIT II UNDER WT | 5 | 28 | 33.2101 | 51.845 | 105.629 | 17.5261 | 88.1029 |
| 19 | 1.07026 | 124.334 | UNIT II UNDER WT | 5 | 28 | 30.7167 | 47.9525 | 94.669 | 13.8867 | 80.7823 |
| 20 | 1.07026 | 110.705 | UNIT II UNDER WT | 5 | 28 | 27.6286 | 43.1316 | 80.9216 | 9.20652 | 71.715 |
| 21 | 1.07026 | 96.5416 | UNIT II UNDER WT | 5 | 28 | 24.7641 | 38.6598 | 66.5983 | 3.29334 | 63.3049 |
| 22 | 0.824027 | 65.6893 | UNIT II | 5 | 28 | 22.0576 | 34.4345 | 55.3583 | 0 | 55.3583 |
| 23 | 0.824027 | 57.9457 | UNIT II | 5 | 28 | 18.9465 | 29.5778 | 46.2241 | 0 | 46.2241 |
| 24 | 1.12694 | 64.5644 | UNIT I | 3 | 28 | 14.0375 | 21.9143 | 35.5726 | 0 | 35.5726 |
| 25 | 1.12694 | 25.607 | UNIT I | 3 | 28 | 5.64553 | 8.81335 | 10.9333 | 0 | 10.9333 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.68122

| 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 | 0.928375 | 4.75301 | UNIT II | 5 | 28 | 5.53833 | 9.31115 | 8.10809 | 0 | 8.10809 |
| 2 | 0.928375 | 14.8346 | UNIT II | 5 | 28 | 9.41679 | 15.8317 | 20.3716 | 0 | 20.3716 |
| 3 | 0.928375 | 23.5498 | UNIT II | 5 | 28 | 12.5818 | 21.1527 | 30.3788 | 0 | 30.3788 |
| 4 | 0.928375 | 31.5721 | UNIT II | 5 | 28 | 15.3524 | 25.8107 | 39.1392 | 0 | 39.1392 |
| 5 | 1.07026 | 45.5231 | UNIT II UNDER WT | 5 | 28 | 17.0831 | 28.7204 | 47.1241 | 2.51259 | 44.6115 |
| 6 | 1.07026 | 54.1801 | UNIT II UNDER WT | 5 | 28 | 17.833 | 29.9812 | 54.2141 | 7.23127 | 46.9828 |
| 7 | 1.07026 | 59.5516 | UNIT II UNDER WT | 5 | 28 | 17.7478 | 29.838 | 58.0606 | 11.347 | 46.7136 |
| 8 | 1.07026 | 65.9249 | UNIT II UNDER WT | 5 | 28 | 19.2511 | 32.3654 | 66.343 | 14.8763 | 51.4667 |
| 9 | 1.07026 | 98.9453 | UNIT II UNDER WT | 5 | 28 | 26.6556 | 44.8139 | 92.7082 | 17.8292 | 74.879 |
| 10 | 1.07026 | 97.8371 | UNIT II UNDER WT | 5 | 28 | 25.0724 | 42.1522 | 90.0826 | 20.2095 | 69.8731 |
| 11 | 1.07026 | 113.223 | UNIT II UNDER WT | 5 | 28 | 28.4223 | 47.7841 | 102.481 | 22.0151 | 80.4655 |
| 12 | 1.07026 | 129.057 | UNIT II UNDER WT | 5 | 28 | 31.9329 | 53.6863 | 114.804 | 23.2382 | 91.5659 |
| 13 | 1.07026 | 142.916 | UNIT II UNDER WT | 5 | 28 | 34.967 | 58.7872 | 124.877 | 23.7186 | 101.159 |
| 14 | 1.07026 | 149.148 | UNIT II UNDER WT | 5 | 28 | 35.902 | 60.3592 | 127.979 | 23.8638 | 104.115 |
| 15 | 1.07026 | 150.992 | UNIT II UNDER WT | 5 | 28 | 35.7883 | 60.168 | 127.121 | 23.3647 | 103.756 |
| 16 | 1.07026 | 149.999 | UNIT II UNDER WT | 5 | 28 | 35.0873 | 58.9895 | 123.72 | 22.1809 | 101.539 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 1.07026 | 142.663 | UNIT II UNDER WT | 5 | 28 | 32.9566 | 55.4073 | 115.061 | 20.2586 | 94.802 |
| 18 | 1.07026 | 134.419 | UNIT II UNDER WT | 5 | 28 | 30.8377 | 51.845 | 105.629 | 17.5261 | 88.1029 |
| 19 | 1.07026 | 124.334 | UNIT II UNDER WT | 5 | 28 | 28.5224 | 47.9525 | 94.669 | 13.8867 | 80.7823 |
| 20 | 1.07026 | 110.705 | UNIT II UNDER WT | 5 | 28 | 25.6549 | 43.1316 | 80.9216 | 9.20652 | 71.715 |
| 21 | 1.07026 | 96.5416 | UNIT II UNDER WT | 5 | 28 | 22.9951 | 38.6598 | 66.5983 | 3.29334 | 63.3049 |
| 22 | 0.824027 | 65.6893 | UNIT II | 5 | 28 | 20.4819 | 34.4345 | 55.3583 | 0 | 55.3583 |
| 23 | 0.824027 | 57.9457 | UNIT II | 5 | 28 | 17.5931 | 29.5778 | 46.2241 | 0 | 46.2241 |
| 24 | 1.12694 | 64.5644 | UNIT I | 3 | 28 | 13.0348 | 21.9143 | 35.5726 | 0 | 35.5726 |
| 25 | 1.12694 | 25.607 | UNIT I | 3 | 28 | 5.24223 | 8.81335 | 10.9333 | 0 | 10.9333 |

**Global Minimum Query (spencer) - Safety Factor**: 1.75967

| 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 | 1.18903 | 6.63947 | UNIT II | 5 | 28 | 5.86459 | 10.3197 | 10.005 | 0 | 10.005 |
| 2 | 1.18903 | 17.9855 | UNIT II | 5 | 28 | 9.44762 | 16.6247 | 21.8629 | 0 | 21.8629 |
| 3 | 1.18903 | 28.2732 | UNIT II | 5 | 28 | 12.4076 | 21.8333 | 31.6588 | 0 | 31.6588 |
| 4 | 1.18903 | 37.8026 | UNIT II | 5 | 28 | 14.9168 | 26.2487 | 39.963 | 0 | 39.963 |
| 5 | 1.0323 | 38.6021 | UNIT II UNDER WT | 5 | 28 | 15.8491 | 27.8891 | 44.7613 | 1.71334 | 43.048 |
| 6 | 1.0323 | 41.8924 | UNIT II UNDER WT | 5 | 28 | 15.4135 | 27.1227 | 46.5297 | 4.92297 | 41.6067 |
| 7 | 1.0323 | 59.9897 | UNIT II UNDER WT | 5 | 28 | 24.925 | 43.8598 | 80.7847 | 7.70008 | 73.0847 |
| 8 | 1.0323 | 72.2618 | UNIT II UNDER WT | 5 | 28 | 22.4068 | 39.4286 | 74.7973 | 10.0465 | 64.7508 |
| 9 | 1.0323 | 79.307 | UNIT II UNDER WT | 5 | 28 | 23.3073 | 41.0131 | 79.692 | 11.9613 | 67.7307 |
| 10 | 1.0323 | 93.1028 | UNIT II UNDER WT | 5 | 28 | 26.2695 | 46.2257 | 90.9753 | 13.441 | 77.5343 |
| 11 | 1.0323 | 108.226 | UNIT II UNDER WT | 5 | 28 | 29.5657 | 52.0258 | 102.922 | 14.4791 | 88.4425 |
| 12 | 1.0323 | 119.926 | UNIT II UNDER WT | 5 | 28 | 31.8539 | 56.0523 | 111.023 | 15.0071 | 96.0155 |
| 13 | 1.0323 | 125.501 | UNIT II UNDER WT | 5 | 28 | 32.401 | 57.015 | 113.088 | 15.2627 | 97.8256 |
| 14 | 1.0323 | 127.492 | UNIT II UNDER WT | 5 | 28 | 32.0745 | 56.4405 | 111.787 | 15.0413 | 96.7453 |
| 15 | 1.0323 | 127.285 | UNIT II UNDER WT | 5 | 28 | 31.3065 | 55.0891 | 108.526 | 14.3219 | 94.2044 |
| 16 | 1.0323 | 121.646 | UNIT II UNDER WT | 5 | 28 | 29.3329 | 51.6163 | 100.751 | 13.0783 | 87.6724 |
| 17 | 1.0323 | 115.854 | UNIT II UNDER WT | 5 | 28 | 27.5511 | 48.4808 | 93.0531 | 11.2779 | 81.7752 |
| 18 | 1.0323 | 108.936 | UNIT II UNDER WT | 5 | 28 | 25.7338 | 45.283 | 84.6408 | 8.87962 | 75.7612 |
| 19 | 1.0323 | 99.5203 | UNIT II UNDER WT | 5 | 28 | 23.596 | 41.5211 | 74.5182 | 5.83199 | 68.6862 |
| 20 | 1.0323 | 90.2886 | UNIT II UNDER WT | 5 | 28 | 21.7882 | 38.3401 | 64.7729 | 2.06932 | 62.7036 |
| 21 | 1.24611 | 100.031 | UNIT II | 5 | 28 | 19.9106 | 35.036 | 56.4894 | 0 | 56.4894 |
| 22 | 1.24611 | 93.0385 | UNIT II | 5 | 28 | 17.8051 | 31.3311 | 49.5216 | 0 | 49.5216 |
| 23 | 1.00648 | 64.4695 | UNIT I | 3 | 28 | 13.9093 | 24.4757 | 40.3899 | 0 | 40.3899 |
| 24 | 1.00648 | 41.3017 | UNIT I | 3 | 28 | 8.94378 | 15.7381 | 23.9569 | 0 | 23.9569 |
| 25 | 1.00648 | 14.4478 | UNIT I | 3 | 28 | 2.723 | 4.79159 | 3.36949 | 0 | 3.36949 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.7934

| 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 | 1.26459 | 5.65298 | UNIT II | 5 | 28 | 5.51965 | 9.89894 | 9.21353 | 0 | 9.21353 |
| 2 | 1.26459 | 18.489 | UNIT II | 5 | 28 | 9.46571 | 16.9758 | 22.5232 | 0 | 22.5232 |
| 3 | 1.26459 | 30.61 | UNIT II | 5 | 28 | 12.8392 | 23.0259 | 33.9019 | 0 | 33.9019 |
| 4 | 1.26459 | 41.6286 | UNIT II | 5 | 28 | 15.6111 | 27.997 | 43.251 | 0 | 43.251 |
| 5 | 1.10252 | 44.6681 | UNIT II UNDER WT | 5 | 28 | 17.1276 | 30.7166 | 50.3516 | 1.98562 | 48.366 |
| 6 | 1.10252 | 49.9734 | UNIT II UNDER WT | 5 | 28 | 17.004 | 30.495 | 53.6695 | 5.72033 | 47.9492 |
| 7 | 1.10252 | 53.5361 | UNIT II UNDER WT | 5 | 28 | 16.479 | 29.5535 | 55.1631 | 8.98469 | 46.1784 |
| 8 | 1.10252 | 82.4158 | UNIT II UNDER WT | 5 | 28 | 28.5254 | 51.1575 | 98.5921 | 11.7826 | 86.8095 |
| 9 | 1.10252 | 83.5558 | UNIT II UNDER WT | 5 | 28 | 22.4455 | 40.2537 | 80.4176 | 14.115 | 66.3026 |
| 10 | 1.10252 | 98.8555 | UNIT II UNDER WT | 5 | 28 | 25.4232 | 45.5939 | 92.3254 | 15.9798 | 76.3456 |
| 11 | 1.10252 | 115.087 | UNIT II UNDER WT | 5 | 28 | 28.597 | 51.2858 | 104.423 | 17.3719 | 87.0511 |
| 12 | 1.10252 | 131.548 | UNIT II UNDER WT | 5 | 28 | 31.7639 | 56.9653 | 116.015 | 18.2829 | 97.7322 |
| 13 | 1.10252 | 140.425 | UNIT II UNDER WT | 5 | 28 | 32.9323 | 59.0607 | 120.373 | 18.6996 | 101.674 |
| 14 | 1.10252 | 144.182 | UNIT II UNDER WT | 5 | 28 | 32.8375 | 58.8908 | 120.106 | 18.7522 | 101.353 |
| 15 | 1.10252 | 145.32 | UNIT II UNDER WT | 5 | 28 | 32.2317 | 57.8043 | 117.59 | 18.2798 | 99.3105 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 1.10252 | 140.294 | UNIT II UNDER WT | 5 | 28 | 30.3419 | 54.4151 | 110.194 | 17.2571 | 92.9365 |
| 17 | 1.10252 | 134.242 | UNIT II UNDER WT | 5 | 28 | 28.4546 | 51.0305 | 102.223 | 15.6523 | 86.5709 |
| 18 | 1.10252 | 127.128 | UNIT II UNDER WT | 5 | 28 | 26.581 | 47.6704 | 93.6767 | 13.4255 | 80.2512 |
| 19 | 1.10252 | 117.292 | UNIT II UNDER WT | 5 | 28 | 24.3933 | 43.7469 | 83.3991 | 10.5269 | 72.8722 |
| 20 | 1.10252 | 107.936 | UNIT II UNDER WT | 5 | 28 | 22.6054 | 40.5406 | 73.735 | 6.89285 | 66.8421 |
| 21 | 1.10252 | 101.91 | UNIT II UNDER WT | 5 | 28 | 21.769 | 39.0405 | 66.4624 | 2.44153 | 64.0209 |
| 22 | 1.17267 | 104.105 | UNIT II | 5 | 28 | 20.7643 | 37.2387 | 60.6322 | 0 | 60.6322 |
| 23 | 1.17267 | 93.2628 | UNIT II | 5 | 28 | 17.9974 | 32.2765 | 51.2997 | 0 | 51.2997 |
| 24 | 1.36538 | 71.9041 | UNIT I | 3 | 28 | 11.0943 | 19.8966 | 31.7778 | 0 | 31.7778 |
| 25 | 1.36538 | 25.3973 | UNIT I | 3 | 28 | 3.59281 | 6.44334 | 6.476 | 0 | 6.476 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.85363

| 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 | 1.18903 | 6.63947 | UNIT II | 5 | 28 | 5.05397 | 9.36819 | 8.21539 | 0 | 8.21539 |
| 2 | 1.18903 | 17.9855 | UNIT II | 5 | 28 | 8.19727 | 15.1947 | 19.1735 | 0 | 19.1735 |
| 3 | 1.18903 | 28.2732 | UNIT II | 5 | 28 | 11.1452 | 20.6591 | 29.4505 | 0 | 29.4505 |
| 4 | 1.18903 | 37.8026 | UNIT II | 5 | 28 | 12.5414 | 23.2472 | 34.318 | 0 | 34.318 |
| 5 | 1.0323 | 38.6021 | UNIT II UNDER WT | 5 | 28 | 13.1062 | 24.2941 | 38.0002 | 1.71334 | 36.2869 |
| 6 | 1.0323 | 41.8924 | UNIT II UNDER WT | 5 | 28 | 40.9558 | 75.9169 | 138.298 | 4.92297 | 133.375 |
| 7 | 1.0323 | 59.9897 | UNIT II UNDER WT | 5 | 28 | 33.0516 | 61.2654 | 113.52 | 7.70008 | 105.82 |
| 8 | 1.0323 | 72.2618 | UNIT II UNDER WT | 5 | 28 | 0.0620782 | 0.11507 | 0.859286 | 10.0465 | -9.18721 |
| 9 | 1.0323 | 79.307 | UNIT II UNDER WT | 5 | 28 | 56.0737 | 103.94 | 198.041 | 11.9613 | 186.079 |
| 10 | 1.0323 | 93.1028 | UNIT II UNDER WT | 5 | 28 | 27.187 | 50.3947 | 98.8163 | 13.441 | 85.3753 |
| 11 | 1.0323 | 108.226 | UNIT II UNDER WT | 5 | 28 | 20.607 | 38.1978 | 76.9152 | 14.4791 | 62.4361 |
| 12 | 1.0323 | 119.926 | UNIT II UNDER WT | 5 | 28 | 13.0873 | 24.259 | 51.2281 | 15.0071 | 36.221 |
| 13 | 1.0323 | 125.501 | UNIT II UNDER WT | 5 | 28 | 21.992 | 40.7651 | 82.5271 | 15.2627 | 67.2644 |
| 14 | 1.0323 | 127.492 | UNIT II UNDER WT | 5 | 28 | 24.4463 | 45.3144 | 90.8616 | 15.0413 | 75.8203 |
| 15 | 1.0323 | 127.285 | UNIT II UNDER WT | 5 | 28 | 22 | 40.7798 | 81.614 | 14.3219 | 67.2921 |
| 16 | 1.0323 | 121.646 | UNIT II UNDER WT | 5 | 28 | 27.4425 | 50.8683 | 99.344 | 13.0783 | 86.2657 |
| 17 | 1.0323 | 115.854 | UNIT II UNDER WT | 5 | 28 | 27.8672 | 51.6555 | 99.0246 | 11.2779 | 87.7467 |
| 18 | 1.0323 | 108.936 | UNIT II UNDER WT | 5 | 28 | 23.675 | 43.8847 | 82.0112 | 8.87962 | 73.1316 |
| 19 | 1.0323 | 99.5203 | UNIT II UNDER WT | 5 | 28 | 25.7285 | 47.6912 | 86.1225 | 5.83199 | 80.2905 |
| 20 | 1.0323 | 90.2886 | UNIT II UNDER WT | 5 | 28 | 27.6595 | 51.2705 | 89.0913 | 2.06932 | 87.022 |
| 21 | 1.24611 | 100.031 | UNIT II | 5 | 28 | 21.7659 | 40.3459 | 66.4759 | 0 | 66.4759 |
| 22 | 1.24611 | 93.0385 | UNIT II | 5 | 28 | 12.4647 | 23.1049 | 34.0502 | 0 | 34.0502 |
| 23 | 1.00648 | 64.4695 | UNIT I | 3 | 28 | 8.38625 | 15.545 | 23.5938 | 0 | 23.5938 |
| 24 | 1.00648 | 41.3017 | UNIT I | 3 | 28 | 9.53664 | 17.6774 | 27.6042 | 0 | 27.6042 |
| 25 | 1.00648 | 14.4478 | UNIT I | 3 | 28 | 4.28927 | 7.95072 | 9.31094 | 0 | 9.31094 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.80259

| 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 | 1.18903 | 6.63947 | UNIT II | 5 | 28 | 4.71396 | 8.49734 | 6.57753 | 0 | 6.57753 |
| 2 | 1.18903 | 17.9855 | UNIT II | 5 | 28 | 7.73455 | 13.9422 | 16.8179 | 0 | 16.8179 |
| 3 | 1.18903 | 28.2732 | UNIT II | 5 | 28 | 10.6257 | 19.1538 | 26.6194 | 0 | 26.6194 |
| 4 | 1.18903 | 37.8026 | UNIT II | 5 | 28 | 12.7753 | 23.0286 | 33.907 | 0 | 33.907 |
| 5 | 1.0323 | 38.6021 | UNIT II UNDER WT | 5 | 28 | 13.8607 | 24.9852 | 39.2999 | 1.71334 | 37.5866 |
| 6 | 1.0323 | 41.8924 | UNIT II UNDER WT | 5 | 28 | 23.9899 | 43.2439 | 76.8493 | 4.92297 | 71.9263 |
| 7 | 1.0323 | 59.9897 | UNIT II UNDER WT | 5 | 28 | 25.6617 | 46.2576 | 85.2944 | 7.70008 | 77.5944 |
| 8 | 1.0323 | 72.2618 | UNIT II UNDER WT | 5 | 28 | 15.3842 | 27.7314 | 52.7981 | 10.0465 | 42.7516 |
| 9 | 1.0323 | 79.307 | UNIT II UNDER WT | 5 | 28 | 35.7718 | 64.4818 | 123.83 | 11.9613 | 111.869 |
| 10 | 1.0323 | 93.1028 | UNIT II UNDER WT | 5 | 28 | 28.1969 | 50.8275 | 99.63 | 13.441 | 86.189 |
| 11 | 1.0323 | 108.226 | UNIT II UNDER WT | 5 | 28 | 28.4126 | 51.2162 | 101.399 | 14.4791 | 86.92 |
| 12 | 1.0323 | 119.926 | UNIT II UNDER WT | 5 | 28 | 26.3544 | 47.5061 | 94.9491 | 15.0071 | 79.942 |
| 13 | 1.0323 | 125.501 | UNIT II UNDER WT | 5 | 28 | 29.61 | 53.3746 | 106.242 | 15.2627 | 90.9798 |
| 14 | 1.0323 | 127.492 | UNIT II UNDER WT | 5 | 28 | 30.2526 | 54.5331 | 108.199 | 15.0413 | 93.158 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 1.0323 | 127.285 | UNIT II UNDER WT | 5 | 28 | 28.3832 | 51.1632 | 101.142 | 14.3219 | 86.8201 |
| 16 | 1.0323 | 121.646 | UNIT II UNDER WT | 5 | 28 | 29.7482 | 53.6238 | 104.526 | 13.0783 | 91.4479 |
| 17 | 1.0323 | 115.854 | UNIT II UNDER WT | 5 | 28 | 28.7344 | 51.7963 | 99.289 | 11.2779 | 88.0111 |
| 18 | 1.0323 | 108.936 | UNIT II UNDER WT | 5 | 28 | 25.4043 | 45.7936 | 85.6016 | 8.87962 | 76.722 |
| 19 | 1.0323 | 99.5203 | UNIT II UNDER WT | 5 | 28 | 24.9546 | 44.983 | 81.029 | 5.83199 | 75.197 |
| 20 | 1.0323 | 90.2886 | UNIT II UNDER WT | 5 | 28 | 24.8006 | 44.7053 | 76.7442 | 2.06932 | 74.6749 |
| 21 | 1.24611 | 100.031 | UNIT II | 5 | 28 | 20.5746 | 37.0875 | 60.3479 | 0 | 60.3479 |
| 22 | 1.24611 | 93.0385 | UNIT II | 5 | 28 | 14.1055 | 25.4264 | 38.4164 | 0 | 38.4164 |
| 23 | 1.00648 | 64.4695 | UNIT I | 3 | 28 | 10.1816 | 18.3532 | 28.8752 | 0 | 28.8752 |
| 24 | 1.00648 | 41.3017 | UNIT I | 3 | 28 | 8.19726 | 14.7763 | 22.148 | 0 | 22.148 |
| 25 | 1.00648 | 14.4478 | UNIT I | 3 | 28 | 1.81325 | 3.26854 | 0.505047 | 0 | 0.505047 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.75995

| 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 | 1.20692 | 5.43061 | UNIT II | 5 | 28 | 4.88033 | 8.58913 | 6.75016 | 0 | 6.75016 |
| 2 | 1.20692 | 18.0247 | UNIT II | 5 | 28 | 8.74854 | 15.397 | 19.554 | 0 | 19.554 |
| 3 | 1.20692 | 29.6016 | UNIT II | 5 | 28 | 12.4211 | 21.8605 | 31.71 | 0 | 31.71 |
| 4 | 1.20692 | 40.0515 | UNIT II | 5 | 28 | 15.7254 | 27.6759 | 42.6472 | 0 | 42.6472 |
| 5 | 1.08487 | 44.2283 | UNIT II UNDER WT | 5 | 28 | 17.809 | 31.343 | 51.5475 | 2.00345 | 49.5441 |
| 6 | 1.08487 | 49.8376 | UNIT II UNDER WT | 5 | 28 | 18.253 | 32.1244 | 56.7696 | 5.75601 | 51.0136 |
| 7 | 1.08487 | 53.2275 | UNIT II UNDER WT | 5 | 28 | 17.9535 | 31.5973 | 59.0255 | 9.00331 | 50.0222 |
| 8 | 1.08487 | 76.4278 | UNIT II UNDER WT | 5 | 28 | 28.4915 | 50.1437 | 96.6534 | 11.7502 | 84.9032 |
| 9 | 1.08487 | 82.9123 | UNIT II UNDER WT | 5 | 28 | 24.4402 | 43.0136 | 85.4909 | 13.9977 | 71.4932 |
| 10 | 1.08487 | 94.4317 | UNIT II UNDER WT | 5 | 28 | 26.1648 | 46.0488 | 92.9442 | 15.743 | 77.2012 |
| 11 | 1.08487 | 109.218 | UNIT II UNDER WT | 5 | 28 | 28.672 | 50.4613 | 102.479 | 16.9794 | 85.4998 |
| 12 | 1.08487 | 125.273 | UNIT II UNDER WT | 5 | 28 | 31.3763 | 55.2207 | 112.148 | 17.6961 | 94.4518 |
| 13 | 1.08487 | 135.021 | UNIT II UNDER WT | 5 | 28 | 32.3365 | 56.9107 | 115.477 | 17.8474 | 97.6294 |
| 14 | 1.08487 | 138.582 | UNIT II UNDER WT | 5 | 28 | 31.7532 | 55.884 | 113.315 | 17.6157 | 95.699 |
| 15 | 1.08487 | 139.186 | UNIT II UNDER WT | 5 | 28 | 30.6802 | 53.9956 | 108.952 | 16.8052 | 92.147 |
| 16 | 1.08487 | 134.766 | UNIT II UNDER WT | 5 | 28 | 28.7438 | 50.5877 | 101.12 | 15.3816 | 85.7379 |
| 17 | 1.08487 | 127.22 | UNIT II UNDER WT | 5 | 28 | 26.5067 | 46.6505 | 91.6344 | 13.3011 | 78.3333 |
| 18 | 1.08487 | 118.887 | UNIT II UNDER WT | 5 | 28 | 24.5454 | 43.1987 | 82.3483 | 10.5073 | 71.841 |
| 19 | 1.08487 | 108.178 | UNIT II UNDER WT | 5 | 28 | 22.5122 | 39.6203 | 72.0388 | 6.92746 | 65.1113 |
| 20 | 1.08487 | 95.6852 | UNIT II UNDER WT | 5 | 28 | 20.5378 | 36.1455 | 61.0414 | 2.46534 | 58.5761 |
| 21 | 1.10821 | 87.0858 | UNIT II | 5 | 28 | 18.6249 | 32.7789 | 52.2445 | 0 | 52.2445 |
| 22 | 1.10821 | 78.2221 | UNIT II | 5 | 28 | 16.5884 | 29.1947 | 45.5035 | 0 | 45.5035 |
| 23 | 0.962324 | 61.1001 | UNIT I | 3 | 28 | 14.0173 | 24.6697 | 40.7548 | 0 | 40.7548 |
| 24 | 0.962324 | 41.5751 | UNIT I | 3 | 28 | 9.72545 | 17.1163 | 26.549 | 0 | 26.549 |
| 25 | 0.962324 | 14.615 | UNIT I | 3 | 28 | 3.96214 | 6.97316 | 7.47242 | 0 | 7.47242 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

### External Boundary

| X | Y |
|---|---|
| 13.291 | 7.18104 |
| 13.2484 | 7.15374 |

| | |
|---|---|
| 13.2017 | 7.13399 |
| 13.1524 | 7.12236 |
| 13.1019 | 7.11917 |
| 13.0515 | 7.12451 |
| 13.0028 | 7.13824 |
| 12.9532 | 7.16181 |
| 12.932 | 7.17578 |
| 12.9064 | 7.19655 |
| 12.8845 | 7.21846 |
| 12.8627 | 7.24586 |
| 12.8587 | 7.42036 |
| 12.8334 | 7.45725 |
| 12.2064 | 7.41964 |
| 12.2037 | 7.36919 |
| 12.2098 | 7.33997 |
| 12.2084 | 7.24233 |
| 12.2094 | 7.20458 |
| 12.213 | 7.12119 |
| 12.2172 | 7.0821 |
| 12.2175 | 7.06797 |
| 12.2237 | 6.7447 |
| 12.2237 | 6.73133 |
| 12.2291 | 6.41223 |
| 12.2291 | 6.4021 |
| 12.2291 | 6.36602 |
| 12.2368 | 6.08724 |
| 12.2368 | 6.07782 |
| 12.2368 | 6.0236 |
| 12.2366 | 6.02355 |
| 11.9085 | 5.94224 |
| 11.8339 | 5.93791 |
| 11.7565 | 5.92998 |
| 11.5778 | 5.90617 |
| 11.2683 | 5.85792 |
| 11.121 | 5.87315 |
| 10.7096 | 5.80715 |
| 9.86652 | 5.76146 |
| 9.18594 | 5.68024 |
| 8.79485 | 5.58378 |
| 7.05121 | 5.30975 |
| 6.72302 | 5.27274 |
| 5.64857 | 5.14047 |
| 5.29473 | 5.11377 |
| 4.72058 | 5.00032 |
| 4.27996 | 4.99365 |
| 3.82599 | 5.01368 |
| 3.08494 | 4.98031 |
| 2.13693 | 4.92692 |
| 1.35581 | 4.92025 |
| 0.246468 | 4.88611 |
| 0.246468 | 1.46395 |
| 0.246468 | -1.486 |
| 0.246468 | -4.15932 |
| 0.246468 | -5.39951 |
| 55.0767 | -5.39951 |
| 55.0767 | 11.186 |
| 55.0767 | 17.606 |
| 55.0767 | 19.3593 |

| | |
|---|---|
| 55.0767 | 20.7296 |
| 55.0767 | 21.5622 |
| 55.0767 | 23.3646 |
| 55.0767 | 26.0247 |
| 54.4584 | 25.8393 |
| 53.5618 | 25.4685 |
| 52.9744 | 24.7577 |
| 52.387 | 24.047 |
| 51.9851 | 23.2435 |
| 51.4905 | 22.3782 |
| 50.6249 | 21.1112 |
| 50.0375 | 20.3695 |
| 49.3883 | 19.9678 |
| 48.3371 | 19.3189 |
| 46.9348 | 18.4738 |
| 46.5963 | 18.197 |
| 46.0426 | 17.6743 |
| 45.2735 | 17.1207 |
| 42.619 | 15.4475 |
| 41.5004 | 14.3584 |
| 40.9932 | 14.0474 |
| 28.6564 | 14.5032 |
| 28.4404 | 14.3519 |
| 27.9984 | 13.9017 |
| 27.1243 | 13.3297 |
| 26.6199 | 13.0337 |
| 26.1665 | 12.7746 |
| 25.3511 | 12.4823 |
| 25.084 | 12.4178 |
| 24.588 | 12.31 |
| 23.9236 | 12.2596 |
| 23.0163 | 12.0764 |
| 21.8624 | 11.8547 |
| 21.1904 | 11.7256 |
| 20.6568 | 11.6923 |
| 20.3595 | 11.6738 |
| 19.4411 | 11.318 |
| 17.296 | 10.487 |
| 17.0867 | 10.3106 |
| 16.4941 | 9.811 |
| 15.9007 | 9.3108 |
| 15.3078 | 8.811 |
| 14.7147 | 8.3111 |
| 14.1218 | 7.8113 |
| 13.5288 | 7.3114 |
| 13.4289 | 7.22714 |

### Material Boundary

| X | Y |
|---|---|
| 12.2291 | 6.41223 |
| 12.3008 | 6.41721 |
| 12.578 | 6.4141 |

### Material Boundary

| X | Y |
|---|---|
| 12.8627 | 7.24586 |

| | |
|---|---|
| 12.885 | 7.09757 |
| 12.885 | 7.08304 |
| 12.885 | 7.042 |
| 12.885 | 6.86356 |
| 12.8841 | 6.81105 |
| 12.8832 | 6.76234 |
| 12.8836 | 6.74889 |
| 12.8925 | 6.4141 |
| 12.8925 | 6.4021 |
| 12.8959 | 6.3106 |
| 12.9005 | 6.18615 |
| 12.8959 | 6.0921 |

### Material Boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 13.4052 | 6.3106 |
| 13.9047 | 6.3106 |
| 13.9047 | 6.81105 |
| 14.4072 | 6.81105 |
| 14.4072 | 7.3114 |
| 14.907 | 7.3114 |
| 14.907 | 7.8113 |
| 15.4072 | 7.8113 |
| 15.4072 | 8.3111 |
| 15.907 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 12.2357 | 5.7619 |
| 12.8857 | 5.75977 |
| 12.8882 | 5.83842 |
| 12.8959 | 6.07782 |
| 12.8959 | 6.0921 |

### Material Boundary

| X | Y |
|---|---|
| 13.4052 | 6.3106 |
| 13.4181 | 6.81105 |
| 13.4289 | 7.22714 |

### Material Boundary

| X | Y |
|---|---|
| 12.2237 | 6.7447 |
| 12.5345 | 6.75446 |

### Material Boundary

| X | Y |
|---|---|
| 0.246468 | -1.486 |
| 14.9068 | 2.35863 |
| 31.5166 | 8.03863 |
| 40.9932 | 10.5286 |
| 51.5928 | 16.7299 |

| | |
|---|---|
| 55.0767 | 20.7296 |

### Material Boundary

| X | Y |
|---|---|
| 0.246468 | -4.15932 |
| 55.0767 | 11.186 |

### Material Boundary

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |

### Material Boundary

| X | Y |
|---|---|
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

### Material Boundary

| X | Y |
|---|---|
| 18.0906 | 7.53452 |
| 18.742 | 7.7233 |
| 31.5166 | 11.4256 |
| 40.9932 | 12.4986 |

### Material Boundary

| X | Y |
|---|---|
| 51.3789 | 18.6028 |
| 55.0767 | 23.3646 |

### Material Boundary

| X | Y |
|---|---|
| 12.2172 | 7.0821 |
| 12.2784 | 7.08498 |
| 12.3072 | 7.08633 |
| 12.5047 | 7.09561 |

### Material Boundary

| X | Y |
|---|---|
| 12.5047 | 7.09561 |
| 12.6979 | 7.09757 |
| 12.885 | 7.09757 |

### Material Boundary

| X | Y |
|---|---|
| 12.5345 | 6.75446 |
| 12.8832 | 6.76234 |

### Material Boundary

| X | Y |
|---|---|
| 12.578 | 6.4141 |
| 12.8925 | 6.4141 |

**Material Boundary**

| X | Y |
|---|---|
| 12.8882 | 5.83842 |
| 13.4052 | 5.83641 |

**Material Boundary**

| X | Y |
|---|---|
| 12.2368 | 6.07782 |
| 12.8959 | 6.07782 |

**Material Boundary**

| X | Y |
|---|---|
| 12.2368 | 6.08724 |
| 12.8959 | 6.0921 |

**Material Boundary**

| X | Y |
|---|---|
| 12.2291 | 6.4021 |
| 12.8925 | 6.4021 |

**Material Boundary**

| X | Y |
|---|---|
| 12.2237 | 6.73133 |
| 12.8836 | 6.74889 |

**Material Boundary**

| X | Y |
|---|---|
| 12.2175 | 7.06797 |
| 12.885 | 7.08304 |

**Material Boundary**

| X | Y |
|---|---|
| 12.2357 | 5.7619 |
| 12.2366 | 6.02355 |

**Material Boundary**

| X | Y |
|---|---|
| 15.907 | 5.83641 |
| 15.907 | 8.3111 |

**Material Boundary**

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 15.907 | 5.83641 |
| 15.9074 | 5.83641 |

| | |
|---|---|
| 16.9071 | 5.83641 |

### Material Boundary

| X | Y |
|---|---|
| 15.9074 | 5.83641 |
| 16.9071 | 6.84674 |
| 17.2805 | 7.22412 |
| 18.298 | 8.2524 |
| 20.3347 | 10.3108 |
| 21.8624 | 11.8547 |

### Material Boundary

| X | Y |
|---|---|
| 17.2805 | 7.22412 |
| 18.0906 | 7.53452 |

### Material Boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 15.907 | 8.811 |
| 16.4071 | 8.811 |
| 16.4071 | 9.3108 |
| 16.9071 | 9.31084 |
| 16.9071 | 9.811 |
| 17.407 | 9.811 |
| 17.407 | 10.3106 |
| 17.9068 | 10.3108 |
| 17.9068 | 9.31092 |
| 17.9068 | 8.3111 |
| 16.9071 | 8.3111 |
| 15.907 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 17.9068 | 10.3108 |
| 20.3347 | 10.3108 |

### Material Boundary

| X | Y |
|---|---|
| 12.8959 | 6.3106 |
| 13.4052 | 6.3106 |

### Material Boundary

| X | Y |
|---|---|
| 12.8841 | 6.81105 |
| 13.4181 | 6.81105 |
| 13.9047 | 6.81105 |

### Material Boundary

| X | Y |
|---|---|
| 13.5288 | 7.3114 |

| | |
|---|---|
| 14.4072 | 7.3114 |

### Material Boundary

| X | Y |
|---|---|
| 14.1218 | 7.8113 |
| 14.907 | 7.8113 |

### Material Boundary

| X | Y |
|---|---|
| 14.7147 | 8.3111 |
| 15.4072 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 15.3078 | 8.811 |
| 15.907 | 8.811 |

### Material Boundary

| X | Y |
|---|---|
| 15.9007 | 9.3108 |
| 16.4071 | 9.3108 |

### Material Boundary

| X | Y |
|---|---|
| 16.4941 | 9.811 |
| 16.9071 | 9.811 |

### Material Boundary

| X | Y |
|---|---|
| 17.0867 | 10.3106 |
| 17.407 | 10.3106 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S44 + GABIONS RU=0.20 loc lim + GEOTEX+MPILE=0.75m oop
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/5/2021, 7:15:55

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | None | None | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |
| Ru Value | 0.2 | 0.2 | | | | | | |

| Property | GRAVEL | SW |
|---|---|---|
| Color | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19 |
| Cohesion [kPa] | 0 | 1 |
| Friction Angle [deg] | 36 | 35 |
| Water Surface | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated |

## Support Properties

### GEOTEX

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Parallel to Reinforcement
Anchorage: Embedded End
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 40 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 30 degrees

### MICROPILE

Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 0.75 m
Pile Shear Strength: 40 kN
Force Direction: Parallel to Surface

## Global Minimums

### Method: bishop simplified

FS: 1.490040
Center: 11.478, 17.951
Radius: 13.077
Left Slip Surface Endpoint: 7.744, 5.419
Right Slip Surface Endpoint: 23.177, 12.109
Resisting Moment=5408.84 kN-m
Driving Moment=3630 kN-m

### Method: janbu simplified

FS: 1.296270
Center: 11.696, 15.309
Radius: 10.419
Left Slip Surface Endpoint: 8.209, 5.492
Right Slip Surface Endpoint: 21.501, 11.785
Resisting Horizontal Force=306.52 kN
Driving Horizontal Force=236.464 kN

### Method: janbu corrected

FS: 1.391430
Center: 11.696, 15.309
Radius: 10.419
Left Slip Surface Endpoint: 8.209, 5.492
Right Slip Surface Endpoint: 21.501, 11.785
Resisting Horizontal Force=329.023 kN
Driving Horizontal Force=236.464 kN

### Method: spencer

FS: 1.489440
Center: 11.918, 16.606
Radius: 11.683
Left Slip Surface Endpoint: 8.282, 5.503
Right Slip Surface Endpoint: 22.659, 12.008
Resisting Moment=4621.88 kN-m
Driving Moment=3103.09 kN-m
Resisting Horizontal Force=356.129 kN
Driving Horizontal Force=239.102 kN

### Method: corp of eng#1

FS: 1.517440
Center: 9.974, 32.667
Radius: 27.599
Left Slip Surface Endpoint: 6.670, 5.266
Right Slip Surface Endpoint: 30.688, 14.428
Resisting Horizontal Force=584.919 kN
Driving Horizontal Force=385.464 kN

### Method: corp of eng#2

FS: 1.543480
Center: 9.974, 32.667
Radius: 27.599
Left Slip Surface Endpoint: 6.670, 5.266
Right Slip Surface Endpoint: 30.688, 14.428
Resisting Horizontal Force=586.89 kN
Driving Horizontal Force=380.238 kN

### Method: lowe-karafiath

FS: 1.519160
Center: 9.974, 32.667
Radius: 27.599
Left Slip Surface Endpoint: 6.670, 5.266
Right Slip Surface Endpoint: 30.688, 14.428
Resisting Horizontal Force=585.253 kN
Driving Horizontal Force=385.248 kN

### Method: gle/morgenstern-price

FS: 1.490390
Center: 11.918, 16.606
Radius: 11.683
Left Slip Surface Endpoint: 8.282, 5.503
Right Slip Surface Endpoint: 22.659, 12.008
Resisting Moment=4624.82 kN-m
Driving Moment=3103.09 kN-m
Resisting Horizontal Force=356.201 kN
Driving Horizontal Force=238.998 kN

## *Valid / Invalid Surfaces*

### Method: bishop simplified

Number of Valid Surfaces: 8207
Number of Invalid Surfaces: 1793

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 206 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 7880
Number of Invalid Surfaces: 2120

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 533 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 7880
Number of Invalid Surfaces: 2120

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 533 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: spencer

Number of Valid Surfaces: 7614
Number of Invalid Surfaces: 2386

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 546 surfaces
Error Code -111 reported for 247 surfaces
Error Code -112 reported for 46 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 5637
Number of Invalid Surfaces: 4363

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 1861 surfaces
Error Code -111 reported for 915 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 5949
Number of Invalid Surfaces: 4051

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 1962 surfaces
Error Code -111 reported for 498 surfaces
Error Code -112 reported for 44 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 3560
Number of Invalid Surfaces: 6440

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 4091 surfaces
Error Code -111 reported for 762 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 7674
Number of Invalid Surfaces: 2326

### Error Codes:

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 46 surfaces
Error Code -108 reported for 541 surfaces
Error Code -111 reported for 198 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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).
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.49004

| 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 | 0.617522 | 1.59349 | UNIT II | 5 | 28 | 4.52999 | 6.74987 | 3.80711 | 0.516093 | 3.29102 |
| 2 | 0.617522 | 4.61843 | UNIT II | 5 | 28 | 5.95686 | 8.87596 | 8.78542 | 1.49579 | 7.28963 |
| 3 | 0.617522 | 7.52817 | UNIT II | 5 | 28 | 7.2758 | 10.8412 | 13.4239 | 2.43818 | 10.9858 |
| 4 | 0.617522 | 9.47345 | UNIT II | 5 | 28 | 8.08362 | 12.0449 | 16.3177 | 3.06821 | 13.2495 |
| 5 | 0.617522 | 10.6605 | UNIT II | 5 | 28 | 8.50549 | 12.6735 | 17.8845 | 3.45268 | 14.4318 |
| 6 | 0.617522 | 11.7729 | UNIT II | 5 | 28 | 8.87957 | 13.2309 | 19.293 | 3.81295 | 15.48 |
| 7 | 0.617522 | 12.623 | UNIT II | 5 | 28 | 8.46455 | 12.6125 | 18.4053 | 4.08826 | 14.317 |
| 8 | 0.617522 | 30.1622 | UNIT II | 5 | 28 | 16.8853 | 25.1597 | 47.6837 | 9.76876 | 37.9149 |
| 9 | 0.617522 | 28.8707 | UNIT II | 5 | 28 | 16.0358 | 23.894 | 44.885 | 9.35049 | 35.5345 |
| 10 | 0.617522 | 27.3722 | UNIT II | 5 | 28 | 15.1192 | 22.5282 | 41.8309 | 8.86516 | 32.9658 |
| 11 | 0.617522 | 31.5716 | UNIT II | 5 | 28 | 16.6732 | 24.8438 | 47.5459 | 10.2252 | 37.3207 |
| 12 | 0.617522 | 35.5196 | UNIT II | 5 | 28 | 18.0614 | 26.9122 | 52.7147 | 11.5039 | 41.2108 |
| 13 | 0.617522 | 39.0781 | UNIT II | 5 | 28 | 19.2294 | 28.6526 | 57.1405 | 12.6564 | 44.4841 |
| 14 | 0.617522 | 43.4826 | UNIT II | 5 | 28 | 20.6864 | 30.8236 | 62.65 | 14.0829 | 48.5671 |
| 15 | 0.617522 | 46.6756 | UNIT II | 5 | 28 | 21.5856 | 32.1634 | 66.2041 | 15.1171 | 51.087 |
| 16 | 0.617522 | 48.6373 | UNIT II | 5 | 28 | 21.941 | 32.693 | 67.8353 | 15.7524 | 52.0829 |
| 17 | 0.617522 | 48.3925 | UNIT II | 5 | 28 | 21.3998 | 31.8866 | 66.2395 | 15.6731 | 50.5664 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 0.617522 | 47.3192 | UNIT II | 5 | 28 | 20.5282 | 30.5878 | 63.4491 | 15.3255 | 48.1236 |
| 19 | 0.617522 | 45.0832 | UNIT II | 5 | 28 | 19.2184 | 28.6362 | 59.0546 | 14.6013 | 44.4533 |
| 20 | 0.617522 | 42.1782 | UNIT II | 5 | 28 | 17.6734 | 26.334 | 53.7838 | 13.6605 | 40.1233 |
| 21 | 0.61635 | 38.113 | UNIT I | 3 | 28 | 14.7555 | 21.9863 | 48.0753 | 12.3673 | 35.708 |
| 22 | 0.61635 | 31.573 | UNIT I | 3 | 28 | 12.0526 | 17.9588 | 38.3785 | 10.2452 | 28.1333 |
| 23 | 0.61635 | 24.3611 | UNIT I | 3 | 28 | 9.23432 | 13.7595 | 28.1406 | 7.90497 | 20.2356 |
| 24 | 0.61635 | 16.0265 | UNIT I | 3 | 28 | 6.21207 | 9.25624 | 16.9667 | 5.20045 | 11.7663 |
| 25 | 0.61635 | 5.72228 | UNIT I | 3 | 28 | 2.85341 | 4.2517 | 4.21093 | 1.85683 | 2.3541 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.29627

| 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 | 0.533561 | 1.33885 | UNIT II | 5 | 28 | 5.39997 | 6.99982 | 4.26296 | 0.501855 | 3.76111 |
| 2 | 0.533561 | 4.04689 | UNIT II | 5 | 28 | 7.12565 | 9.23676 | 9.48511 | 1.51694 | 7.96817 |
| 3 | 0.533561 | 6.27938 | UNIT II | 5 | 28 | 8.45078 | 10.9545 | 13.5525 | 2.35376 | 11.1988 |
| 4 | 0.533561 | 7.82154 | UNIT II | 5 | 28 | 9.26524 | 12.0102 | 16.1162 | 2.93183 | 13.1844 |
| 5 | 0.533561 | 8.88148 | UNIT II | 5 | 28 | 9.73787 | 12.6229 | 17.6657 | 3.32914 | 14.3366 |
| 6 | 0.533561 | 9.9074 | UNIT II | 5 | 28 | 10.1719 | 13.1856 | 19.1086 | 3.71369 | 15.3949 |
| 7 | 0.533561 | 10.6482 | UNIT II | 5 | 28 | 10.4902 | 13.5982 | 20.1622 | 3.99137 | 16.1709 |
| 8 | 0.533561 | 20.6212 | UNIT II | 5 | 28 | 16.2113 | 21.0142 | 37.8479 | 7.72964 | 30.1182 |
| 9 | 0.533561 | 28.8064 | UNIT II | 5 | 28 | 20.7155 | 26.8529 | 51.8972 | 10.7978 | 41.0994 |
| 10 | 0.533561 | 22.1339 | UNIT II | 5 | 28 | 16.4357 | 21.3051 | 38.9621 | 8.29669 | 30.6654 |
| 11 | 0.533561 | 24.5703 | UNIT II | 5 | 28 | 17.4831 | 22.6628 | 42.4288 | 9.20994 | 33.2188 |
| 12 | 0.533561 | 27.542 | UNIT II | 5 | 28 | 18.7738 | 24.3359 | 46.6893 | 10.3238 | 36.3655 |
| 13 | 0.533561 | 30.1974 | UNIT II | 5 | 28 | 19.8233 | 25.6964 | 50.2435 | 11.3192 | 38.9243 |
| 14 | 0.533561 | 32.523 | UNIT II | 5 | 28 | 20.6317 | 26.7442 | 53.0858 | 12.1909 | 40.8949 |
| 15 | 0.533561 | 35.2767 | UNIT II | 5 | 28 | 21.5989 | 27.998 | 56.4761 | 13.2231 | 43.253 |
| 16 | 0.533561 | 37.5738 | UNIT II | 5 | 28 | 22.2528 | 28.8457 | 58.9315 | 14.0842 | 44.8473 |
| 17 | 0.533561 | 38.9109 | UNIT II | 5 | 28 | 22.352 | 28.9742 | 59.6742 | 14.5854 | 45.0888 |
| 18 | 0.533561 | 38.5986 | UNIT II | 5 | 28 | 21.5905 | 27.9871 | 57.7007 | 14.4683 | 43.2324 |
| 19 | 0.533561 | 37.5247 | UNIT II | 5 | 28 | 20.439 | 26.4945 | 54.491 | 14.0658 | 40.4252 |
| 20 | 0.533561 | 35.231 | UNIT II | 5 | 28 | 18.7124 | 24.2563 | 49.4218 | 13.206 | 36.2158 |
| 21 | 0.607956 | 36.2743 | UNIT I | 3 | 28 | 15.3728 | 19.9273 | 43.7687 | 11.9332 | 31.8355 |
| 22 | 0.607956 | 31.0126 | UNIT I | 3 | 28 | 12.6427 | 16.3884 | 35.3821 | 10.2023 | 25.1798 |
| 23 | 0.607956 | 23.6593 | UNIT I | 3 | 28 | 9.27971 | 12.029 | 24.7643 | 7.78322 | 16.9811 |
| 24 | 0.607956 | 11.8968 | UNIT I | 3 | 28 | 4.78656 | 6.20468 | 9.94083 | 3.91371 | 6.02712 |
| 25 | 0.189012 | 0.809511 | SW | 1 | 35 | 1.29057 | 1.67292 | 0.961031 | 0 | 0.961031 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.39143

| 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 | 0.533561 | 1.33885 | UNIT II | 5 | 28 | 5.03067 | 6.99982 | 4.26296 | 0.501855 | 3.76111 |
| 2 | 0.533561 | 4.04689 | UNIT II | 5 | 28 | 6.63832 | 9.23676 | 9.48511 | 1.51694 | 7.96817 |
| 3 | 0.533561 | 6.27938 | UNIT II | 5 | 28 | 7.87283 | 10.9545 | 13.5525 | 2.35376 | 11.1988 |
| 4 | 0.533561 | 7.82154 | UNIT II | 5 | 28 | 8.63159 | 12.0102 | 16.1162 | 2.93183 | 13.1844 |
| 5 | 0.533561 | 8.88148 | UNIT II | 5 | 28 | 9.0719 | 12.6229 | 17.6657 | 3.32914 | 14.3366 |
| 6 | 0.533561 | 9.9074 | UNIT II | 5 | 28 | 9.47628 | 13.1856 | 19.1086 | 3.71369 | 15.3949 |
| 7 | 0.533561 | 10.6482 | UNIT II | 5 | 28 | 9.77282 | 13.5982 | 20.1622 | 3.99137 | 16.1709 |
| 8 | 0.533561 | 20.6212 | UNIT II | 5 | 28 | 15.1026 | 21.0142 | 37.8479 | 7.72964 | 30.1182 |
| 9 | 0.533561 | 28.8064 | UNIT II | 5 | 28 | 19.2988 | 26.8529 | 51.8972 | 10.7978 | 41.0994 |
| 10 | 0.533561 | 22.1339 | UNIT II | 5 | 28 | 15.3117 | 21.3051 | 38.9621 | 8.29669 | 30.6654 |
| 11 | 0.533561 | 24.5703 | UNIT II | 5 | 28 | 16.2874 | 22.6628 | 42.4288 | 9.20994 | 33.2188 |
| 12 | 0.533561 | 27.542 | UNIT II | 5 | 28 | 17.4898 | 24.3359 | 46.6893 | 10.3238 | 36.3655 |
| 13 | 0.533561 | 30.1974 | UNIT II | 5 | 28 | 18.4676 | 25.6964 | 50.2435 | 11.3192 | 38.9243 |
| 14 | 0.533561 | 32.523 | UNIT II | 5 | 28 | 19.2207 | 26.7442 | 53.0858 | 12.1909 | 40.8949 |
| 15 | 0.533561 | 35.2767 | UNIT II | 5 | 28 | 20.1217 | 27.998 | 56.4761 | 13.2231 | 43.253 |
| 16 | 0.533561 | 37.5738 | UNIT II | 5 | 28 | 20.731 | 28.8457 | 58.9315 | 14.0842 | 44.8473 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0.533561 | 38.9109 | UNIT II | 5 | 28 | 20.8233 | 28.9742 | 59.6742 | 14.5854 | 45.0888 |
| 18 | 0.533561 | 38.5986 | UNIT II | 5 | 28 | 20.1139 | 27.9871 | 57.7007 | 14.4683 | 43.2324 |
| 19 | 0.533561 | 37.5247 | UNIT II | 5 | 28 | 19.0412 | 26.4945 | 54.491 | 14.0658 | 40.4252 |
| 20 | 0.533561 | 35.231 | UNIT II | 5 | 28 | 17.4326 | 24.2563 | 49.4218 | 13.206 | 36.2158 |
| 21 | 0.607956 | 36.2743 | UNIT I | 3 | 28 | 14.3215 | 19.9273 | 43.7687 | 11.9332 | 31.8355 |
| 22 | 0.607956 | 31.0126 | UNIT I | 3 | 28 | 11.7781 | 16.3884 | 35.3821 | 10.2023 | 25.1798 |
| 23 | 0.607956 | 23.6593 | UNIT I | 3 | 28 | 8.64507 | 12.029 | 24.7643 | 7.78322 | 16.9811 |
| 24 | 0.607956 | 11.8968 | UNIT I | 3 | 28 | 4.45921 | 6.20468 | 9.94083 | 3.91371 | 6.02712 |
| 25 | 0.189012 | 0.809511 | SW | 1 | 35 | 1.2023 | 1.67292 | 0.961031 | 0 | 0.961031 |

**Global Minimum Query (spencer) - Safety Factor**: 1.48944

| 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 | 0.579715 | 1.49883 | UNIT II | 5 | 28 | 5.51544 | 8.21491 | 6.56345 | 0.517094 | 6.04636 |
| 2 | 0.579715 | 4.58362 | UNIT II | 5 | 28 | 7.45001 | 11.0963 | 13.0469 | 1.58133 | 11.4656 |
| 3 | 0.579715 | 6.90459 | UNIT II | 5 | 28 | 8.69652 | 12.9529 | 17.3394 | 2.38206 | 14.9573 |
| 4 | 0.579715 | 8.45442 | UNIT II | 5 | 28 | 9.34765 | 13.9228 | 19.698 | 2.91675 | 16.7812 |
| 5 | 0.579715 | 9.7749 | UNIT II | 5 | 28 | 9.8059 | 14.6053 | 21.4373 | 3.37231 | 18.065 |
| 6 | 0.579715 | 10.8008 | UNIT II | 5 | 28 | 10.0561 | 14.978 | 22.4921 | 3.72623 | 18.7659 |
| 7 | 0.579715 | 16.1118 | UNIT II | 5 | 28 | 23.7928 | 35.4379 | 62.8038 | 5.55853 | 57.2453 |
| 8 | 0.579715 | 32.7932 | UNIT II | 5 | 28 | 21.0341 | 31.3291 | 60.8315 | 11.3136 | 49.5179 |
| 9 | 0.579715 | 24.1167 | UNIT II | 5 | 28 | 15.8733 | 23.6424 | 43.3814 | 8.32018 | 35.0612 |
| 10 | 0.579715 | 26.8837 | UNIT II | 5 | 28 | 16.6816 | 24.8463 | 46.6002 | 9.27479 | 37.3254 |
| 11 | 0.579715 | 30.7027 | UNIT II | 5 | 28 | 17.903 | 26.6655 | 51.3393 | 10.5923 | 40.747 |
| 12 | 0.579715 | 34.1719 | UNIT II | 5 | 28 | 18.8477 | 28.0725 | 55.1823 | 11.7892 | 43.3931 |
| 13 | 0.579715 | 37.2798 | UNIT II | 5 | 28 | 19.5298 | 29.0885 | 58.1652 | 12.8614 | 45.3038 |
| 14 | 0.579715 | 41.2845 | UNIT II | 5 | 28 | 20.4908 | 30.5198 | 62.2388 | 14.243 | 47.9958 |
| 15 | 0.579715 | 43.9642 | UNIT II | 5 | 28 | 20.7931 | 30.9701 | 64.0102 | 15.1675 | 48.8427 |
| 16 | 0.579715 | 45.7202 | UNIT II | 5 | 28 | 20.6525 | 30.7606 | 64.222 | 15.7733 | 48.4487 |
| 17 | 0.579715 | 45.3379 | UNIT II | 5 | 28 | 19.6646 | 29.2892 | 61.3229 | 15.6415 | 45.6814 |
| 18 | 0.579715 | 44.4352 | UNIT II | 5 | 28 | 18.4942 | 27.546 | 57.7328 | 15.33 | 42.4028 |
| 19 | 0.579715 | 42.2554 | UNIT II | 5 | 28 | 16.9095 | 25.1857 | 52.5419 | 14.578 | 37.9639 |
| 20 | 0.579715 | 39.4221 | UNIT II | 5 | 28 | 15.1652 | 22.5876 | 46.6779 | 13.6005 | 33.0774 |
| 21 | 0.55651 | 34.5117 | UNIT I | 3 | 28 | 12.1822 | 18.1446 | 40.8858 | 12.4029 | 28.4829 |
| 22 | 0.55651 | 29.3046 | UNIT I | 3 | 28 | 9.92339 | 14.7803 | 32.6871 | 10.5315 | 22.1556 |
| 23 | 0.55651 | 22.5256 | UNIT I | 3 | 28 | 7.41893 | 11.0501 | 23.2353 | 8.09532 | 15.14 |
| 24 | 0.55651 | 14.9507 | UNIT I | 3 | 28 | 4.9846 | 7.42427 | 13.6938 | 5.37302 | 8.3208 |
| 25 | 0.55651 | 5.39731 | UNIT I | 3 | 28 | 0.888978 | 1.32408 | -1.21224 | 1.9397 | -3.15194 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.51744

| 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 | 0.967726 | 2.12659 | UNIT II | 5 | 28 | 4.77263 | 7.24218 | 4.65643 | 0.439502 | 4.21693 |
| 2 | 0.967726 | 6.48646 | UNIT II | 5 | 28 | 6.22771 | 9.45017 | 9.71011 | 1.34056 | 8.36955 |
| 3 | 0.967726 | 10.6061 | UNIT II | 5 | 28 | 7.50436 | 11.3874 | 14.205 | 2.19197 | 12.013 |
| 4 | 0.967726 | 13.15 | UNIT II | 5 | 28 | 8.17327 | 12.4025 | 16.6397 | 2.71771 | 13.9219 |
| 5 | 0.967726 | 14.2397 | UNIT II | 5 | 28 | 8.32903 | 12.6388 | 17.3094 | 2.94291 | 14.3665 |
| 6 | 0.967726 | 24.6831 | UNIT II | 5 | 28 | 17.7625 | 26.9535 | 46.3897 | 5.10126 | 41.2885 |
| 7 | 0.967726 | 41.8368 | UNIT II | 5 | 28 | 16.3067 | 24.7444 | 45.7803 | 8.64641 | 37.1338 |
| 8 | 0.967726 | 41.6392 | UNIT II | 5 | 28 | 15.8139 | 23.9967 | 44.3332 | 8.60558 | 35.7276 |
| 9 | 0.967726 | 52.7128 | UNIT II | 5 | 28 | 18.5529 | 28.1529 | 54.4384 | 10.8942 | 43.5442 |
| 10 | 0.967726 | 64.2625 | UNIT II | 5 | 28 | 21.2468 | 32.2408 | 64.5137 | 13.2811 | 51.2326 |
| 11 | 0.967726 | 75.6967 | UNIT II | 5 | 28 | 23.7314 | 36.0109 | 73.9672 | 15.6442 | 58.323 |
| 12 | 0.967726 | 81.7647 | UNIT II | 5 | 28 | 24.6486 | 37.4027 | 77.839 | 16.8983 | 60.9407 |
| 13 | 0.967726 | 84.1763 | UNIT II | 5 | 28 | 24.561 | 37.2699 | 78.0875 | 17.3967 | 60.6908 |
| 14 | 0.967726 | 84.6832 | UNIT II | 5 | 28 | 23.9821 | 36.3914 | 76.5401 | 17.5015 | 59.0386 |
| 15 | 0.967726 | 82.2998 | UNIT II | 5 | 28 | 22.7208 | 34.4774 | 72.4478 | 17.0089 | 55.4389 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.967726 | 76.6248 | UNIT II | 5 | 28 | 20.7487 | 31.4849 | 65.6468 | 15.8361 | 49.8107 |
| 17 | 0.967726 | 71.191 | UNIT II | 5 | 28 | 18.9195 | 28.7092 | 59.3036 | 14.7131 | 44.5905 |
| 18 | 0.967726 | 64.9139 | UNIT II | 5 | 28 | 16.993 | 25.7858 | 52.5081 | 13.4158 | 39.0923 |
| 19 | 0.967726 | 56.5851 | UNIT II | 5 | 28 | 14.7369 | 22.3624 | 44.3483 | 11.6944 | 32.6539 |
| 20 | 0.938563 | 47.7341 | UNIT I | 3 | 28 | 11.5873 | 17.5831 | 37.5986 | 10.1717 | 27.4269 |
| 21 | 0.938563 | 42.8946 | UNIT I | 3 | 28 | 10.2351 | 15.5312 | 32.7082 | 9.14048 | 23.5677 |
| 22 | 0.938563 | 39.9026 | UNIT I | 3 | 28 | 9.3006 | 14.1131 | 29.4036 | 8.50292 | 20.9007 |
| 23 | 0.938563 | 38.2502 | UNIT I | 3 | 28 | 8.64687 | 13.1211 | 27.1858 | 8.1508 | 19.035 |
| 24 | 0.938563 | 27.1993 | UNIT I | 3 | 28 | 6.38964 | 9.69589 | 18.389 | 5.79595 | 12.5931 |
| 25 | 0.938563 | 9.34697 | UNIT I | 3 | 28 | 1.64768 | 2.50025 | 1.05187 | 1.99176 | -0.939894 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.54348

| 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 | 0.967726 | 2.12659 | UNIT II | 5 | 28 | 4.22959 | 6.52829 | 3.3138 | 0.439502 | 2.87429 |
| 2 | 0.967726 | 6.48646 | UNIT II | 5 | 28 | 5.60297 | 8.64807 | 8.20157 | 1.34056 | 6.86101 |
| 3 | 0.967726 | 10.6061 | UNIT II | 5 | 28 | 6.47556 | 9.99489 | 11.586 | 2.19197 | 9.39398 |
| 4 | 0.967726 | 13.15 | UNIT II | 5 | 28 | 6.9498 | 10.7269 | 13.4884 | 2.71771 | 10.7707 |
| 5 | 0.967726 | 14.2397 | UNIT II | 5 | 28 | 18.1526 | 28.0182 | 46.2339 | 2.94291 | 43.291 |
| 6 | 0.967726 | 24.6831 | UNIT II | 5 | 28 | 23.8336 | 36.7867 | 64.8834 | 5.10126 | 59.7822 |
| 7 | 0.967726 | 41.8368 | UNIT II | 5 | 28 | 0.455859 | 0.70361 | 0.566073 | 8.64641 | -8.08034 |
| 8 | 0.967726 | 41.6392 | UNIT II | 5 | 28 | 40.5824 | 62.6381 | 117.007 | 8.60558 | 108.401 |
| 9 | 0.967726 | 52.7128 | UNIT II | 5 | 28 | 19.6628 | 30.3492 | 58.5691 | 10.8942 | 47.6749 |
| 10 | 0.967726 | 64.2625 | UNIT II | 5 | 28 | 21.7489 | 33.569 | 67.0116 | 13.2811 | 53.7305 |
| 11 | 0.967726 | 75.6967 | UNIT II | 5 | 28 | 11.9201 | 18.3985 | 40.8433 | 15.6442 | 25.1991 |
| 12 | 0.967726 | 81.7647 | UNIT II | 5 | 28 | 13.1141 | 20.2413 | 45.563 | 16.8983 | 28.6647 |
| 13 | 0.967726 | 84.1763 | UNIT II | 5 | 28 | 24.1358 | 37.2532 | 78.0561 | 17.3967 | 60.6594 |
| 14 | 0.967726 | 84.6832 | UNIT II | 5 | 28 | 17.332 | 26.7516 | 58.4103 | 17.5015 | 40.9088 |
| 15 | 0.967726 | 82.2998 | UNIT II | 5 | 28 | 18.5563 | 28.6413 | 61.4716 | 17.0089 | 44.4627 |
| 16 | 0.967726 | 76.6248 | UNIT II | 5 | 28 | 22.6926 | 35.0256 | 72.306 | 15.8361 | 56.4699 |
| 17 | 0.967726 | 71.191 | UNIT II | 5 | 28 | 19.0759 | 29.4433 | 60.6842 | 14.7131 | 45.9711 |
| 18 | 0.967726 | 64.9139 | UNIT II | 5 | 28 | 16.7163 | 25.8013 | 52.5372 | 13.4158 | 39.1214 |
| 19 | 0.967726 | 56.5851 | UNIT II | 5 | 28 | 17.027 | 26.2809 | 51.718 | 11.6944 | 40.0236 |
| 20 | 0.938563 | 47.7341 | UNIT I | 3 | 28 | 15.8121 | 24.4057 | 50.4301 | 10.1717 | 40.2584 |
| 21 | 0.938563 | 42.8946 | UNIT I | 3 | 28 | 12.1645 | 18.7757 | 38.8102 | 9.14048 | 29.6698 |
| 22 | 0.938563 | 39.9026 | UNIT I | 3 | 28 | 9.36196 | 14.45 | 30.0372 | 8.50292 | 21.5343 |
| 23 | 0.938563 | 38.2502 | UNIT I | 3 | 28 | 5.21106 | 8.04316 | 17.6356 | 8.1508 | 9.48481 |
| 24 | 0.938563 | 27.1993 | UNIT I | 3 | 28 | 4.38424 | 6.76699 | 12.8806 | 5.79595 | 7.08467 |
| 25 | 0.938563 | 9.34697 | UNIT I | 3 | 28 | 3.63385 | 5.60877 | 6.89815 | 1.99176 | 4.90639 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.51916

| 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 | 0.967726 | 2.12659 | UNIT II | 5 | 28 | 4.10177 | 6.23125 | 2.75514 | 0.439502 | 2.31564 |
| 2 | 0.967726 | 6.48646 | UNIT II | 5 | 28 | 5.45908 | 8.29322 | 7.53421 | 1.34056 | 6.19365 |
| 3 | 0.967726 | 10.6061 | UNIT II | 5 | 28 | 6.55765 | 9.96212 | 11.5244 | 2.19197 | 9.33243 |
| 4 | 0.967726 | 13.15 | UNIT II | 5 | 28 | 7.21353 | 10.9585 | 13.924 | 2.71771 | 11.2063 |
| 5 | 0.967726 | 14.2397 | UNIT II | 5 | 28 | 11.6414 | 17.6851 | 26.8001 | 2.94291 | 23.8572 |
| 6 | 0.967726 | 24.6831 | UNIT II | 5 | 28 | 16.8396 | 25.582 | 43.8104 | 5.10126 | 38.7091 |
| 7 | 0.967726 | 41.8368 | UNIT II | 5 | 28 | 10.4719 | 15.9085 | 29.1623 | 8.64641 | 20.5159 |
| 8 | 0.967726 | 41.6392 | UNIT II | 5 | 28 | 25.5928 | 38.8796 | 72.3239 | 8.60558 | 63.7183 |
| 9 | 0.967726 | 52.7128 | UNIT II | 5 | 28 | 19.7954 | 30.0724 | 58.0485 | 10.8942 | 47.1543 |
| 10 | 0.967726 | 64.2625 | UNIT II | 5 | 28 | 22.4734 | 34.1407 | 68.0868 | 13.2811 | 54.8057 |
| 11 | 0.967726 | 75.6967 | UNIT II | 5 | 28 | 20.5293 | 31.1873 | 64.8955 | 15.6442 | 49.2513 |
| 12 | 0.967726 | 81.7647 | UNIT II | 5 | 28 | 20.7491 | 31.5212 | 66.7775 | 16.8983 | 49.8792 |
| 13 | 0.967726 | 84.1763 | UNIT II | 5 | 28 | 25.5028 | 38.7429 | 80.8579 | 17.3967 | 63.4612 |
| 14 | 0.967726 | 84.6832 | UNIT II | 5 | 28 | 21.8467 | 33.1887 | 70.5168 | 17.5015 | 53.0153 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 0.967726 | 82.2998 | UNIT II | 5 | 28 | 21.6249 | 32.8517 | 69.3903 | 17.0089 | 52.3814 |
| 16 | 0.967726 | 76.6248 | UNIT II | 5 | 28 | 22.5327 | 34.2308 | 70.8111 | 15.8361 | 54.975 |
| 17 | 0.967726 | 71.191 | UNIT II | 5 | 28 | 19.6439 | 29.8423 | 61.4346 | 14.7131 | 46.7215 |
| 18 | 0.967726 | 64.9139 | UNIT II | 5 | 28 | 17.3181 | 26.3089 | 53.492 | 13.4158 | 40.0762 |
| 19 | 0.967726 | 56.5851 | UNIT II | 5 | 28 | 16.1261 | 24.4981 | 48.3651 | 11.6944 | 36.6707 |
| 20 | 0.938563 | 47.7341 | UNIT I | 3 | 28 | 13.6608 | 20.753 | 43.5603 | 10.1717 | 33.3886 |
| 21 | 0.938563 | 42.8946 | UNIT I | 3 | 28 | 10.9628 | 16.6543 | 34.8205 | 9.14048 | 25.68 |
| 22 | 0.938563 | 39.9026 | UNIT I | 3 | 28 | 8.99997 | 13.6724 | 28.5748 | 8.50292 | 20.0719 |
| 23 | 0.938563 | 38.2502 | UNIT I | 3 | 28 | 6.8894 | 10.4661 | 22.1925 | 8.1508 | 14.0417 |
| 24 | 0.938563 | 27.1993 | UNIT I | 3 | 28 | 5.25093 | 7.977 | 15.1564 | 5.79595 | 9.3604 |
| 25 | 0.938563 | 9.34697 | UNIT I | 3 | 28 | 1.55665 | 2.3648 | 0.797114 | 1.99176 | -1.19465 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.49039

| 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 | 0.579715 | 1.49883 | UNIT II | 5 | 28 | 4.70319 | 7.00959 | 4.29658 | 0.517094 | 3.77949 |
| 2 | 0.579715 | 4.58362 | UNIT II | 5 | 28 | 6.62723 | 9.87715 | 10.7539 | 1.58133 | 9.17259 |
| 3 | 0.579715 | 6.90459 | UNIT II | 5 | 28 | 8.16776 | 12.1732 | 15.8728 | 2.38206 | 13.4907 |
| 4 | 0.579715 | 8.45442 | UNIT II | 5 | 28 | 9.23847 | 13.7689 | 19.4087 | 2.91675 | 16.4919 |
| 5 | 0.579715 | 9.7749 | UNIT II | 5 | 28 | 10.0939 | 15.0439 | 22.2622 | 3.37231 | 18.8899 |
| 6 | 0.579715 | 10.8008 | UNIT II | 5 | 28 | 10.6638 | 15.8932 | 24.2134 | 3.72623 | 20.4872 |
| 7 | 0.579715 | 16.1118 | UNIT II | 5 | 28 | 24.4167 | 36.3904 | 64.5952 | 5.55853 | 59.0367 |
| 8 | 0.579715 | 32.7932 | UNIT II | 5 | 28 | 23.1891 | 34.5608 | 66.9094 | 11.3136 | 55.5958 |
| 9 | 0.579715 | 24.1167 | UNIT II | 5 | 28 | 17.8237 | 26.5642 | 48.8766 | 8.32018 | 40.5564 |
| 10 | 0.579715 | 26.8837 | UNIT II | 5 | 28 | 18.2582 | 27.2119 | 51.0494 | 9.27479 | 41.7746 |
| 11 | 0.579715 | 30.7027 | UNIT II | 5 | 28 | 18.9947 | 28.3095 | 54.4311 | 10.5923 | 43.8388 |
| 12 | 0.579715 | 34.1719 | UNIT II | 5 | 28 | 19.3807 | 28.8848 | 56.7101 | 11.7892 | 44.9209 |
| 13 | 0.579715 | 37.2798 | UNIT II | 5 | 28 | 19.4826 | 29.0367 | 58.068 | 12.8614 | 45.2066 |
| 14 | 0.579715 | 41.2845 | UNIT II | 5 | 28 | 19.8922 | 29.6472 | 60.5978 | 14.243 | 46.3548 |
| 15 | 0.579715 | 43.9642 | UNIT II | 5 | 28 | 19.733 | 29.4098 | 61.0758 | 15.1675 | 45.9083 |
| 16 | 0.579715 | 45.7202 | UNIT II | 5 | 28 | 19.2687 | 28.7179 | 60.3802 | 15.7733 | 44.6069 |
| 17 | 0.579715 | 45.3379 | UNIT II | 5 | 28 | 18.1328 | 27.025 | 57.0643 | 15.6415 | 41.4228 |
| 18 | 0.579715 | 44.4352 | UNIT II | 5 | 28 | 16.9927 | 25.3257 | 53.5571 | 15.33 | 38.2271 |
| 19 | 0.579715 | 42.2554 | UNIT II | 5 | 28 | 15.6095 | 23.2643 | 48.9281 | 14.578 | 34.3501 |
| 20 | 0.579715 | 39.4221 | UNIT II | 5 | 28 | 14.2108 | 21.1796 | 44.03 | 13.6005 | 30.4295 |
| 21 | 0.55651 | 34.5117 | UNIT I | 3 | 28 | 11.7149 | 17.4598 | 39.5979 | 12.4029 | 27.195 |
| 22 | 0.55651 | 29.3046 | UNIT I | 3 | 28 | 9.91345 | 14.7749 | 32.6768 | 10.5315 | 22.1453 |
| 23 | 0.55651 | 22.5256 | UNIT I | 3 | 28 | 7.73282 | 11.5249 | 24.1284 | 8.09532 | 16.033 |
| 24 | 0.55651 | 14.9507 | UNIT I | 3 | 28 | 5.37047 | 8.00409 | 14.7843 | 5.37302 | 9.41133 |
| 25 | 0.55651 | 5.39731 | UNIT I | 3 | 28 | 2.42004 | 3.60681 | 3.08094 | 1.9397 | 1.14124 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

### External Boundary

| X | Y |
|---|---|
| 13.291 | 7.18104 |
| 13.2484 | 7.15374 |

| | |
|---|---|
| 13.2017 | 7.13399 |
| 13.1524 | 7.12236 |
| 13.1019 | 7.11917 |
| 13.0515 | 7.12451 |
| 13.0028 | 7.13824 |
| 12.9532 | 7.16181 |
| 12.932 | 7.17578 |
| 12.9064 | 7.19655 |
| 12.8845 | 7.21846 |
| 12.8627 | 7.24586 |
| 12.8587 | 7.42036 |
| 12.8334 | 7.45725 |
| 12.2064 | 7.41964 |
| 12.2037 | 7.36919 |
| 12.2098 | 7.33997 |
| 12.2084 | 7.24233 |
| 12.2094 | 7.20458 |
| 12.213 | 7.12119 |
| 12.2172 | 7.0821 |
| 12.2175 | 7.06797 |
| 12.2237 | 6.7447 |
| 12.2237 | 6.73133 |
| 12.2291 | 6.41223 |
| 12.2291 | 6.4021 |
| 12.2291 | 6.36602 |
| 12.2368 | 6.08724 |
| 12.2368 | 6.07782 |
| 12.2368 | 6.0236 |
| 12.2366 | 6.02355 |
| 11.9085 | 5.94224 |
| 11.8339 | 5.93791 |
| 11.7565 | 5.92998 |
| 11.5778 | 5.90617 |
| 11.2683 | 5.85792 |
| 11.121 | 5.87315 |
| 10.7096 | 5.80715 |
| 9.86652 | 5.76146 |
| 9.18594 | 5.68024 |
| 8.79485 | 5.58378 |
| 7.05121 | 5.30975 |
| 6.72302 | 5.27274 |
| 5.64857 | 5.14047 |
| 5.29473 | 5.11377 |
| 4.72058 | 5.00032 |
| 4.27996 | 4.99365 |
| 3.82599 | 5.01368 |
| 3.08494 | 4.98031 |
| 2.13693 | 4.92692 |
| 1.35581 | 4.92025 |
| 0.246468 | 4.88611 |
| 0.246468 | 1.46395 |
| 0.246468 | -1.486 |
| 0.246468 | -4.15932 |
| 0.246468 | -5.39951 |
| 55.0767 | -5.39951 |
| 55.0767 | 11.186 |
| 55.0767 | 17.606 |
| 55.0767 | 19.3593 |

| | |
|---|---|
| 55.0767 | 20.7296 |
| 55.0767 | 21.5622 |
| 55.0767 | 23.3646 |
| 55.0767 | 26.0247 |
| 54.4584 | 25.8393 |
| 53.5618 | 25.4685 |
| 52.9744 | 24.7577 |
| 52.387 | 24.047 |
| 51.9851 | 23.2435 |
| 51.4905 | 22.3782 |
| 50.6249 | 21.1112 |
| 50.0375 | 20.3695 |
| 49.3883 | 19.9678 |
| 48.3371 | 19.3189 |
| 46.9348 | 18.4738 |
| 46.5963 | 18.197 |
| 46.0426 | 17.6743 |
| 45.2735 | 17.1207 |
| 42.619 | 15.4475 |
| 41.5004 | 14.3584 |
| 40.9932 | 14.0474 |
| 28.6564 | 14.5032 |
| 28.4404 | 14.3519 |
| 27.9984 | 13.9017 |
| 27.1243 | 13.3297 |
| 26.6199 | 13.0337 |
| 26.1665 | 12.7746 |
| 25.3511 | 12.4823 |
| 25.084 | 12.4178 |
| 24.588 | 12.31 |
| 23.9236 | 12.2596 |
| 23.0163 | 12.0764 |
| 21.8624 | 11.8547 |
| 21.1904 | 11.7256 |
| 20.6568 | 11.6923 |
| 20.3595 | 11.6738 |
| 19.4411 | 11.318 |
| 17.296 | 10.487 |
| 17.0867 | 10.3106 |
| 16.4941 | 9.811 |
| 15.9007 | 9.3108 |
| 15.3078 | 8.811 |
| 14.7147 | 8.3111 |
| 14.1218 | 7.8113 |
| 13.5288 | 7.3114 |
| 13.4289 | 7.22714 |

## Material Boundary

| X | Y |
|---|---|
| 12.2291 | 6.41223 |
| 12.3008 | 6.41721 |
| 12.578 | 6.4141 |

## Material Boundary

| X | Y |
|---|---|
| 12.8627 | 7.24586 |

| | |
|---|---|
| 12.885 | 7.09757 |
| 12.885 | 7.08304 |
| 12.885 | 7.042 |
| 12.885 | 6.86356 |
| 12.8841 | 6.81105 |
| 12.8832 | 6.76234 |
| 12.8836 | 6.74889 |
| 12.8925 | 6.4141 |
| 12.8925 | 6.4021 |
| 12.8959 | 6.3106 |
| 12.9005 | 6.18615 |
| 12.8959 | 6.0921 |

### Material Boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 13.4052 | 6.3106 |
| 13.9047 | 6.3106 |
| 13.9047 | 6.81105 |
| 14.4072 | 6.81105 |
| 14.4072 | 7.3114 |
| 14.907 | 7.3114 |
| 14.907 | 7.8113 |
| 15.4072 | 7.8113 |
| 15.4072 | 8.3111 |
| 15.907 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 12.2357 | 5.7619 |
| 12.8857 | 5.75977 |
| 12.8882 | 5.83842 |
| 12.8959 | 6.07782 |
| 12.8959 | 6.0921 |

### Material Boundary

| X | Y |
|---|---|
| 13.4052 | 6.3106 |
| 13.4181 | 6.81105 |
| 13.4289 | 7.22714 |

### Material Boundary

| X | Y |
|---|---|
| 12.2237 | 6.7447 |
| 12.5345 | 6.75446 |

### Material Boundary

| X | Y |
|---|---|
| 0.246468 | -1.486 |
| 14.9068 | 2.35863 |
| 31.5166 | 8.03863 |
| 40.9932 | 10.5286 |
| 51.5928 | 16.7299 |

| | |
|---|---|
| 55.0767 | 20.7296 |

### Material Boundary

| X | Y |
|---|---|
| 0.246468 | -4.15932 |
| 55.0767 | 11.186 |

### Material Boundary

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |

### Material Boundary

| X | Y |
|---|---|
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

### Material Boundary

| X | Y |
|---|---|
| 18.0906 | 7.53452 |
| 18.742 | 7.7233 |
| 31.5166 | 11.4256 |
| 40.9932 | 12.4986 |

### Material Boundary

| X | Y |
|---|---|
| 51.3789 | 18.6028 |
| 55.0767 | 23.3646 |

### Material Boundary

| X | Y |
|---|---|
| 12.2172 | 7.0821 |
| 12.2784 | 7.08498 |
| 12.3072 | 7.08633 |
| 12.5047 | 7.09561 |

### Material Boundary

| X | Y |
|---|---|
| 12.5047 | 7.09561 |
| 12.6979 | 7.09757 |
| 12.885 | 7.09757 |

### Material Boundary

| X | Y |
|---|---|
| 12.5345 | 6.75446 |
| 12.8832 | 6.76234 |

### Material Boundary

| X | Y |
|---|---|
| 12.578 | 6.4141 |
| 12.8925 | 6.4141 |

**Material Boundary**

| X | Y |
|---|---|
| 12.8882 | 5.83842 |
| 13.4052 | 5.83641 |

**Material Boundary**

| X | Y |
|---|---|
| 12.2368 | 6.07782 |
| 12.8959 | 6.07782 |

**Material Boundary**

| X | Y |
|---|---|
| 12.2368 | 6.08724 |
| 12.8959 | 6.0921 |

**Material Boundary**

| X | Y |
|---|---|
| 12.2291 | 6.4021 |
| 12.8925 | 6.4021 |

**Material Boundary**

| X | Y |
|---|---|
| 12.2237 | 6.73133 |
| 12.8836 | 6.74889 |

**Material Boundary**

| X | Y |
|---|---|
| 12.2175 | 7.06797 |
| 12.885 | 7.08304 |

**Material Boundary**

| X | Y |
|---|---|
| 12.2357 | 5.7619 |
| 12.2366 | 6.02355 |

**Material Boundary**

| X | Y |
|---|---|
| 15.907 | 5.83641 |
| 15.907 | 8.3111 |

**Material Boundary**

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 15.907 | 5.83641 |
| 15.9074 | 5.83641 |

| | |
|---|---|
| 16.9071 | 5.83641 |

### Material Boundary

| X | Y |
|---|---|
| 15.9074 | 5.83641 |
| 16.9071 | 6.84674 |
| 17.2805 | 7.22412 |
| 18.298 | 8.2524 |
| 20.3347 | 10.3108 |
| 21.8624 | 11.8547 |

### Material Boundary

| X | Y |
|---|---|
| 17.2805 | 7.22412 |
| 18.0906 | 7.53452 |

### Material Boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 15.907 | 8.811 |
| 16.4071 | 8.811 |
| 16.4071 | 9.3108 |
| 16.9071 | 9.31084 |
| 16.9071 | 9.811 |
| 17.407 | 9.811 |
| 17.407 | 10.3106 |
| 17.9068 | 10.3108 |
| 17.9068 | 9.31092 |
| 17.9068 | 8.3111 |
| 16.9071 | 8.3111 |
| 15.907 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 17.9068 | 10.3108 |
| 20.3347 | 10.3108 |

### Material Boundary

| X | Y |
|---|---|
| 12.8959 | 6.3106 |
| 13.4052 | 6.3106 |

### Material Boundary

| X | Y |
|---|---|
| 12.8841 | 6.81105 |
| 13.4181 | 6.81105 |
| 13.9047 | 6.81105 |

### Material Boundary

| X | Y |
|---|---|
| 13.5288 | 7.3114 |

| | |
|---|---|
| 14.4072 | 7.3114 |

### Material Boundary

| X | Y |
|---|---|
| 14.1218 | 7.8113 |
| 14.907 | 7.8113 |

### Material Boundary

| X | Y |
|---|---|
| 14.7147 | 8.3111 |
| 15.4072 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 15.3078 | 8.811 |
| 15.907 | 8.811 |

### Material Boundary

| X | Y |
|---|---|
| 15.9007 | 9.3108 |
| 16.4071 | 9.3108 |

### Material Boundary

| X | Y |
|---|---|
| 16.4941 | 9.811 |
| 16.9071 | 9.811 |

### Material Boundary

| X | Y |
|---|---|
| 17.0867 | 10.3106 |
| 17.407 | 10.3106 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S44 + GABIONS EQdn loc lim + GEOTEX+MPILE=0.75m oop
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/5/2021, 7:15:55

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): 0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |

| Property | GRAVEL | SW |
|---|---|---|
| Color | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19 |
| Cohesion [kPa] | 0 | 1 |
| Friction Angle [deg] | 36 | 35 |
| Water Surface | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated |

## Support Properties

### GEOTEX

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Parallel to Reinforcement
Anchorage: Embedded End
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 40 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 30 degrees

### MICROPILE

Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 0.75 m
Pile Shear Strength: 40 kN
Force Direction: Parallel to Surface

## *Global Minimums*

### Method: bishop simplified

FS: 1.151330
Center: 12.155, 28.391
Radius: 25.347
Left Slip Surface Endpoint: 2.514, 4.948
Right Slip Surface Endpoint: 33.247, 14.334
Resisting Moment=36456.3 kN-m
Driving Moment=31664.5 kN-m

### Method: janbu simplified

FS: 1.016750
Center: 12.818, 23.238
Radius: 20.448
Left Slip Surface Endpoint: 3.567, 5.002
Right Slip Surface Endpoint: 31.261, 14.407
Resisting Horizontal Force=1191.84 kN
Driving Horizontal Force=1172.21 kN

### Method: janbu corrected

FS: 1.092220
Center: 12.818, 23.238
Radius: 20.448
Left Slip Surface Endpoint: 3.567, 5.002
Right Slip Surface Endpoint: 31.261, 14.407
Resisting Horizontal Force=1280.31 kN
Driving Horizontal Force=1172.21 kN

### Method: spencer

FS: 1.160160
Center: 12.195, 27.364
Radius: 23.999
Left Slip Surface Endpoint: 3.492, 4.999
Right Slip Surface Endpoint: 32.370, 14.366
Resisting Moment=31490.2 kN-m
Driving Moment=27143 kN-m
Resisting Horizontal Force=1208.38 kN
Driving Horizontal Force=1041.56 kN

### Method: corp of eng#1

FS: 1.120430
Center: 12.155, 28.391
Radius: 25.347
Left Slip Surface Endpoint: 2.514, 4.948
Right Slip Surface Endpoint: 33.247, 14.334
Resisting Horizontal Force=1324.49 kN
Driving Horizontal Force=1182.13 kN

### Method: corp of eng#2

FS: 1.159700
Center: 11.627, 30.394
Radius: 26.742
Left Slip Surface Endpoint: 3.277, 4.989
Right Slip Surface Endpoint: 33.016, 14.342
Resisting Horizontal Force=1194.22 kN
Driving Horizontal Force=1029.77 kN

### Method: lowe-karafiath

FS: 1.117180
Center: 12.155, 28.391

Radius: 25.347
Left Slip Surface Endpoint: 2.514, 4.948
Right Slip Surface Endpoint: 33.247, 14.334
Resisting Horizontal Force=1323.47 kN
Driving Horizontal Force=1184.65 kN

### Method: gle/morgenstern-price

FS: 1.159770
Center: 12.093, 31.024
Radius: 27.469
Left Slip Surface Endpoint: 3.327, 4.991
Right Slip Surface Endpoint: 33.891, 14.310
Resisting Moment=37820.8 kN-m
Driving Moment=32610.6 kN-m
Resisting Horizontal Force=1279.97 kN
Driving Horizontal Force=1103.64 kN

## *Valid / Invalid Surfaces*

### Method: bishop simplified

Number of Valid Surfaces: 8338
Number of Invalid Surfaces: 1662

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 122 surfaces
Error Code -112 reported for 38 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 8050
Number of Invalid Surfaces: 1950

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 414 surfaces
Error Code -112 reported for 34 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 8050
Number of Invalid Surfaces: 1950

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 414 surfaces
Error Code -112 reported for 34 surfaces

Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: spencer

Number of Valid Surfaces: 7436
Number of Invalid Surfaces: 2564

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 451 surfaces
Error Code -111 reported for 571 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: corp of eng#1

Number of Valid Surfaces: 6686
Number of Invalid Surfaces: 3314

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 1168 surfaces
Error Code -111 reported for 610 surfaces
Error Code -112 reported for 34 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: corp of eng#2

Number of Valid Surfaces: 6469
Number of Invalid Surfaces: 3531

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 1505 surfaces
Error Code -111 reported for 488 surfaces
Error Code -112 reported for 36 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: lowe-karafiath

Number of Valid Surfaces: 4558
Number of Invalid Surfaces: 5442

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface

Error Code -108 reported for 3333 surfaces
Error Code -111 reported for 573 surfaces
Error Code -112 reported for 34 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: gle/morgenstern-price

Number of Valid Surfaces: 7801
Number of Invalid Surfaces: 2199

#### Error Codes:

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 453 surfaces
Error Code -111 reported for 206 surfaces
Error Code -112 reported for 38 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

#### Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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).
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.15133

| 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 | 1.3065 | 7.19128 | UNIT II | 5 | 28 | 8.65496 | 9.96471 | 9.33728 | 0 | 9.33728 |
| 2 | 1.3065 | 19.5708 | UNIT II | 5 | 28 | 14.0101 | 16.1303 | 20.9331 | 0 | 20.9331 |
| 3 | 1.3065 | 32.947 | UNIT II | 5 | 28 | 19.4928 | 22.4427 | 32.805 | 0 | 32.805 |
| 4 | 1.3065 | 44.776 | UNIT II | 5 | 28 | 24.0164 | 27.6508 | 42.6 | 0 | 42.6 |
| 5 | 1.2238 | 51.9637 | UNIT II UNDER WT | 5 | 28 | 26.7106 | 30.7527 | 50.7601 | 2.32626 | 48.4339 |
| 6 | 1.2238 | 60.5952 | UNIT II UNDER WT | 5 | 28 | 27.7102 | 31.9036 | 57.2992 | 6.7009 | 50.5983 |
| 7 | 1.2238 | 65.3771 | UNIT II UNDER WT | 5 | 28 | 27.2957 | 31.4264 | 60.2246 | 10.5238 | 49.7008 |
| 8 | 1.2238 | 84.6387 | UNIT II UNDER WT | 5 | 28 | 33.2865 | 38.3237 | 76.4741 | 13.8014 | 62.6727 |
| 9 | 1.2238 | 102.234 | UNIT II UNDER WT | 5 | 28 | 38.3789 | 44.1868 | 90.2351 | 16.5358 | 73.6993 |
| 10 | 1.2238 | 115.119 | UNIT II UNDER WT | 5 | 28 | 41.7132 | 48.0257 | 99.6452 | 18.7256 | 80.9196 |
| 11 | 1.2238 | 135.266 | UNIT II UNDER WT | 5 | 28 | 47.9624 | 55.2205 | 114.817 | 20.3654 | 94.4513 |
| 12 | 1.2238 | 155.264 | UNIT II UNDER WT | 5 | 28 | 54.171 | 62.3687 | 129.19 | 21.2952 | 107.895 |
| 13 | 1.2238 | 165.396 | UNIT II UNDER WT | 5 | 28 | 56.5132 | 65.0654 | 134.923 | 21.9565 | 112.966 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 1.2238 | 169.509 | UNIT II UNDER WT | 5 | 28 | 56.7531 | 65.3416 | 135.516 | 22.0297 | 113.486 |
| 15 | 1.2238 | 169.067 | UNIT II UNDER WT | 5 | 28 | 55.5442 | 63.9497 | 132.358 | 21.4903 | 110.868 |
| 16 | 1.2238 | 162.213 | UNIT II UNDER WT | 5 | 28 | 52.3355 | 60.2554 | 124.228 | 20.3071 | 103.921 |
| 17 | 1.2238 | 154.968 | UNIT II UNDER WT | 5 | 28 | 49.3227 | 56.7867 | 115.838 | 18.4405 | 97.397 |
| 18 | 1.2238 | 145.039 | UNIT II UNDER WT | 5 | 28 | 45.745 | 52.6676 | 105.49 | 15.8401 | 89.6498 |
| 19 | 1.2238 | 134.224 | UNIT II UNDER WT | 5 | 28 | 42.2457 | 48.6387 | 94.5146 | 12.4419 | 82.0727 |
| 20 | 1.2238 | 127.89 | UNIT II UNDER WT | 5 | 28 | 40.5279 | 46.661 | 86.516 | 8.16336 | 78.3527 |
| 21 | 1.2238 | 125.132 | UNIT II UNDER WT | 5 | 28 | 40.1807 | 46.2613 | 80.4975 | 2.89619 | 77.6013 |
| 22 | 1.12645 | 105.952 | UNIT II | 5 | 28 | 36.818 | 42.3897 | 70.3196 | 0 | 70.3196 |
| 23 | 1.12645 | 81.5886 | UNIT II | 5 | 28 | 27.9776 | 32.2114 | 51.1773 | 0 | 51.1773 |
| 24 | 1.22461 | 57.4165 | UNIT I | 3 | 28 | 17.1556 | 19.7518 | 31.5056 | 0 | 31.5056 |
| 25 | 1.22461 | 20.1103 | UNIT I | 3 | 28 | 6.69733 | 7.71084 | 8.85982 | 0 | 8.85982 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.01675

| 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 | 1.04309 | 5.01721 | UNIT II | 5 | 28 | 10.2 | 10.3708 | 10.101 | 0 | 10.101 |
| 2 | 1.04309 | 15.8127 | UNIT II | 5 | 28 | 17.3048 | 17.5947 | 23.6872 | 0 | 23.6872 |
| 3 | 1.04309 | 26.4112 | UNIT II | 5 | 28 | 23.7433 | 24.141 | 35.9991 | 0 | 35.9991 |
| 4 | 1.04309 | 35.7918 | UNIT II | 5 | 28 | 28.9642 | 29.4494 | 45.9827 | 0 | 45.9827 |
| 5 | 1.09161 | 46.7765 | UNIT II UNDER WT | 5 | 28 | 32.0952 | 32.6328 | 54.4238 | 2.45394 | 51.9698 |
| 6 | 1.09161 | 55.487 | UNIT II UNDER WT | 5 | 28 | 33.4378 | 33.9979 | 61.6153 | 7.07814 | 54.5372 |
| 7 | 1.09161 | 61.0091 | UNIT II UNDER WT | 5 | 28 | 33.2494 | 33.8063 | 65.3194 | 11.1428 | 54.1766 |
| 8 | 1.09161 | 65.3765 | UNIT II UNDER WT | 5 | 28 | 34.3818 | 34.9577 | 71.003 | 14.6607 | 56.3423 |
| 9 | 1.09161 | 99.3294 | UNIT II UNDER WT | 5 | 28 | 48.2416 | 49.0496 | 100.485 | 17.6398 | 82.8449 |
| 10 | 1.09161 | 98.2204 | UNIT II UNDER WT | 5 | 28 | 45.1073 | 45.8628 | 96.935 | 20.083 | 76.852 |
| 11 | 1.09161 | 114.212 | UNIT II UNDER WT | 5 | 28 | 50.9664 | 51.8201 | 110.045 | 21.9887 | 88.0558 |
| 12 | 1.09161 | 130.621 | UNIT II UNDER WT | 5 | 28 | 56.9638 | 57.9179 | 122.875 | 23.3507 | 99.5241 |
| 13 | 1.09161 | 145.796 | UNIT II UNDER WT | 5 | 28 | 62.3604 | 63.4049 | 133.845 | 24.0006 | 109.844 |
| 14 | 1.09161 | 153.087 | UNIT II UNDER WT | 5 | 28 | 63.9007 | 64.971 | 137.164 | 24.3748 | 112.789 |
| 15 | 1.54738 | 220.911 | UNIT II UNDER WT | 5 | 28 | 63.2258 | 64.2848 | 135.455 | 23.9566 | 111.499 |
| 16 | 1.16182 | 163.034 | UNIT II UNDER WT | 5 | 28 | 60.4103 | 61.4222 | 128.834 | 22.7197 | 106.114 |
| 17 | 1.16182 | 154.892 | UNIT II UNDER WT | 5 | 28 | 56.123 | 57.0631 | 118.682 | 20.7655 | 97.9164 |
| 18 | 1.16182 | 145.819 | UNIT II UNDER WT | 5 | 28 | 51.9234 | 52.7931 | 107.853 | 17.967 | 89.8862 |
| 19 | 1.16182 | 133.663 | UNIT II UNDER WT | 5 | 28 | 47.0405 | 47.8284 | 94.7783 | 14.2295 | 80.5488 |
| 20 | 1.16182 | 119.864 | UNIT II UNDER WT | 5 | 28 | 42.095 | 42.8001 | 80.5156 | 9.42375 | 71.0919 |
| 21 | 1.16182 | 108.723 | UNIT II UNDER WT | 5 | 28 | 38.5952 | 39.2417 | 67.7665 | 3.36753 | 64.399 |
| 22 | 0.892778 | 77.0162 | UNIT II | 5 | 28 | 35.2244 | 35.8144 | 57.9535 | 0 | 57.9535 |
| 23 | 0.892778 | 71.2668 | UNIT II | 5 | 28 | 31.2633 | 31.787 | 50.3791 | 0 | 50.3791 |
| 24 | 1.15084 | 64.8654 | UNIT I | 3 | 28 | 20.2844 | 20.6242 | 33.1464 | 0 | 33.1464 |
| 25 | 1.15084 | 23.2373 | UNIT I | 3 | 28 | 7.48886 | 7.6143 | 8.67824 | 0 | 8.67824 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.09222

| 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 | 1.04309 | 5.01721 | UNIT II | 5 | 28 | 9.49518 | 10.3708 | 10.101 | 0 | 10.101 |
| 2 | 1.04309 | 15.8127 | UNIT II | 5 | 28 | 16.1091 | 17.5947 | 23.6872 | 0 | 23.6872 |
| 3 | 1.04309 | 26.4112 | UNIT II | 5 | 28 | 22.1027 | 24.141 | 35.9991 | 0 | 35.9991 |
| 4 | 1.04309 | 35.7918 | UNIT II | 5 | 28 | 26.9629 | 29.4494 | 45.9827 | 0 | 45.9827 |
| 5 | 1.09161 | 46.7765 | UNIT II UNDER WT | 5 | 28 | 29.8775 | 32.6328 | 54.4238 | 2.45394 | 51.9698 |
| 6 | 1.09161 | 55.487 | UNIT II UNDER WT | 5 | 28 | 31.1273 | 33.9979 | 61.6153 | 7.07814 | 54.5372 |
| 7 | 1.09161 | 61.0091 | UNIT II UNDER WT | 5 | 28 | 30.9519 | 33.8063 | 65.3194 | 11.1428 | 54.1766 |
| 8 | 1.09161 | 65.3765 | UNIT II UNDER WT | 5 | 28 | 32.0061 | 34.9577 | 71.003 | 14.6607 | 56.3423 |
| 9 | 1.09161 | 99.3294 | UNIT II UNDER WT | 5 | 28 | 44.9082 | 49.0496 | 100.485 | 17.6398 | 82.8449 |
| 10 | 1.09161 | 98.2204 | UNIT II UNDER WT | 5 | 28 | 41.9904 | 45.8628 | 96.935 | 20.083 | 76.852 |
| 11 | 1.09161 | 114.212 | UNIT II UNDER WT | 5 | 28 | 47.4447 | 51.8201 | 110.045 | 21.9887 | 88.0558 |
| 12 | 1.09161 | 130.621 | UNIT II UNDER WT | 5 | 28 | 53.0277 | 57.9179 | 122.875 | 23.3507 | 99.5241 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 1.09161 | 145.796 | UNIT II UNDER WT | 5 | 28 | 58.0514 | 63.4049 | 133.845 | 24.0006 | 109.844 |
| 14 | 1.09161 | 153.087 | UNIT II UNDER WT | 5 | 28 | 59.4853 | 64.971 | 137.164 | 24.3748 | 112.789 |
| 15 | 1.54738 | 220.911 | UNIT II UNDER WT | 5 | 28 | 58.857 | 64.2848 | 135.455 | 23.9566 | 111.499 |
| 16 | 1.16182 | 163.034 | UNIT II UNDER WT | 5 | 28 | 56.2361 | 61.4222 | 128.834 | 22.7197 | 106.114 |
| 17 | 1.16182 | 154.892 | UNIT II UNDER WT | 5 | 28 | 52.2451 | 57.0631 | 118.682 | 20.7655 | 97.9164 |
| 18 | 1.16182 | 145.819 | UNIT II UNDER WT | 5 | 28 | 48.3356 | 52.7931 | 107.853 | 17.967 | 89.8862 |
| 19 | 1.16182 | 133.663 | UNIT II UNDER WT | 5 | 28 | 43.7901 | 47.8284 | 94.7783 | 14.2295 | 80.5488 |
| 20 | 1.16182 | 119.864 | UNIT II UNDER WT | 5 | 28 | 39.1863 | 42.8001 | 80.5156 | 9.42375 | 71.0919 |
| 21 | 1.16182 | 108.723 | UNIT II UNDER WT | 5 | 28 | 35.9284 | 39.2417 | 67.7665 | 3.36753 | 64.399 |
| 22 | 0.892778 | 77.0162 | UNIT II | 5 | 28 | 32.7905 | 35.8144 | 57.9535 | 0 | 57.9535 |
| 23 | 0.892778 | 71.2668 | UNIT II | 5 | 28 | 29.1031 | 31.787 | 50.3791 | 0 | 50.3791 |
| 24 | 1.15084 | 64.8654 | UNIT I | 3 | 28 | 18.8828 | 20.6242 | 33.1464 | 0 | 33.1464 |
| 25 | 1.15084 | 23.2373 | UNIT I | 3 | 28 | 6.9714 | 7.6143 | 8.67824 | 0 | 8.67824 |

**Global Minimum Query (spencer) - Safety Factor**: 1.16016

| 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 | 1.26459 | 5.65298 | UNIT II | 5 | 28 | 11.7563 | 13.6392 | 16.2479 | 0 | 16.2479 |
| 2 | 1.26459 | 18.489 | UNIT II | 5 | 28 | 19.5932 | 22.7313 | 33.3476 | 0 | 33.3476 |
| 3 | 1.26459 | 30.61 | UNIT II | 5 | 28 | 25.6792 | 29.792 | 46.627 | 0 | 46.627 |
| 4 | 1.26459 | 41.6286 | UNIT II | 5 | 28 | 30.2277 | 35.069 | 56.5516 | 0 | 56.5516 |
| 5 | 1.10252 | 44.6681 | UNIT II UNDER WT | 5 | 28 | 32.2898 | 37.4613 | 63.0364 | 1.98562 | 61.0508 |
| 6 | 1.10252 | 49.9734 | UNIT II UNDER WT | 5 | 28 | 31.3446 | 36.3648 | 64.7089 | 5.72033 | 58.9885 |
| 7 | 1.10252 | 53.5361 | UNIT II UNDER WT | 5 | 28 | 29.7358 | 34.4983 | 64.4629 | 8.98469 | 55.4782 |
| 8 | 1.10252 | 82.4158 | UNIT II UNDER WT | 5 | 28 | 53.5703 | 62.1501 | 119.267 | 11.7826 | 107.484 |
| 9 | 1.10252 | 83.5558 | UNIT II UNDER WT | 5 | 28 | 38.9212 | 45.1548 | 89.6351 | 14.115 | 75.5201 |
| 10 | 1.10252 | 98.8555 | UNIT II UNDER WT | 5 | 28 | 43.2805 | 50.2123 | 101.012 | 15.9798 | 85.032 |
| 11 | 1.10252 | 115.087 | UNIT II UNDER WT | 5 | 28 | 47.8439 | 55.5066 | 112.361 | 17.3719 | 94.9894 |
| 12 | 1.10252 | 131.548 | UNIT II UNDER WT | 5 | 28 | 52.2747 | 60.647 | 122.939 | 18.2829 | 104.656 |
| 13 | 1.10252 | 140.425 | UNIT II UNDER WT | 5 | 28 | 53.3532 | 61.8983 | 125.71 | 18.6996 | 107.01 |
| 14 | 1.10252 | 144.182 | UNIT II UNDER WT | 5 | 28 | 52.403 | 60.7959 | 123.689 | 18.7522 | 104.937 |
| 15 | 1.10252 | 145.32 | UNIT II UNDER WT | 5 | 28 | 50.6941 | 58.8133 | 119.488 | 18.2798 | 101.208 |
| 16 | 1.10252 | 140.294 | UNIT II UNDER WT | 5 | 28 | 47.0532 | 54.5892 | 110.52 | 17.2571 | 93.2634 |
| 17 | 1.10252 | 134.242 | UNIT II UNDER WT | 5 | 28 | 43.5289 | 50.5005 | 101.226 | 15.6523 | 85.5737 |
| 18 | 1.10252 | 127.128 | UNIT II UNDER WT | 5 | 28 | 40.1318 | 46.5593 | 91.5876 | 13.4255 | 78.1621 |
| 19 | 1.10252 | 117.292 | UNIT II UNDER WT | 5 | 28 | 36.3687 | 42.1935 | 80.4777 | 10.5269 | 69.9508 |
| 20 | 1.10252 | 107.936 | UNIT II UNDER WT | 5 | 28 | 33.3084 | 38.6431 | 70.1662 | 6.89285 | 63.2734 |
| 21 | 1.10252 | 101.91 | UNIT II UNDER WT | 5 | 28 | 31.7274 | 36.8089 | 62.2654 | 2.44153 | 59.8238 |
| 22 | 1.17267 | 104.105 | UNIT II | 5 | 28 | 29.875 | 34.6598 | 55.782 | 0 | 55.782 |
| 23 | 1.17267 | 93.2628 | UNIT II | 5 | 28 | 25.4935 | 29.5765 | 46.2217 | 0 | 46.2217 |
| 24 | 1.36538 | 71.9041 | UNIT I | 3 | 28 | 15.3808 | 17.8442 | 27.9178 | 0 | 27.9178 |
| 25 | 1.36538 | 25.3973 | UNIT I | 3 | 28 | 5.78287 | 6.70905 | 6.9757 | 0 | 6.9757 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.12043

| 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 | 1.3065 | 7.19128 | UNIT II | 5 | 28 | 11.8465 | 13.2732 | 15.5596 | 0 | 15.5596 |
| 2 | 1.3065 | 19.5708 | UNIT II | 5 | 28 | 18.7457 | 21.0033 | 30.0979 | 0 | 30.0979 |
| 3 | 1.3065 | 32.947 | UNIT II | 5 | 28 | 25.3129 | 28.3613 | 43.9363 | 0 | 43.9363 |
| 4 | 1.3065 | 44.776 | UNIT II | 5 | 28 | 30.2703 | 33.9158 | 54.3827 | 0 | 54.3827 |
| 5 | 1.2238 | 51.9637 | UNIT II UNDER WT | 5 | 28 | 32.7555 | 36.7003 | 61.9458 | 2.32626 | 59.6196 |
| 6 | 1.2238 | 60.5952 | UNIT II UNDER WT | 5 | 28 | 33.0915 | 37.0767 | 67.0284 | 6.7009 | 60.3275 |
| 7 | 1.2238 | 65.3771 | UNIT II UNDER WT | 5 | 28 | 31.7481 | 35.5715 | 68.0204 | 10.5238 | 57.4966 |
| 8 | 1.2238 | 84.6387 | UNIT II UNDER WT | 5 | 28 | 45.1553 | 50.5933 | 99.5497 | 13.8014 | 85.7483 |
| 9 | 1.2238 | 102.234 | UNIT II UNDER WT | 5 | 28 | 42.4973 | 47.6152 | 96.6836 | 16.5358 | 80.1478 |
| 10 | 1.2238 | 115.119 | UNIT II UNDER WT | 5 | 28 | 45.1522 | 50.5899 | 104.468 | 18.7256 | 85.7424 |
| 11 | 1.2238 | 135.266 | UNIT II UNDER WT | 5 | 28 | 50.8523 | 56.9764 | 118.119 | 20.3654 | 97.7533 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.2238 | 155.264 | UNIT II UNDER WT | 5 | 28 | 56.3394 | 63.1243 | 130.611 | 21.2952 | 109.316 |
| 13 | 1.2238 | 165.396 | UNIT II UNDER WT | 5 | 28 | 57.6567 | 64.6003 | 134.048 | 21.9565 | 112.091 |
| 14 | 1.2238 | 169.509 | UNIT II UNDER WT | 5 | 28 | 56.831 | 63.6752 | 132.381 | 22.0297 | 110.352 |
| 15 | 1.2238 | 169.067 | UNIT II UNDER WT | 5 | 28 | 54.6275 | 61.2063 | 127.199 | 21.4903 | 105.709 |
| 16 | 1.2238 | 162.213 | UNIT II UNDER WT | 5 | 28 | 50.5794 | 56.6707 | 117.486 | 20.3071 | 97.1785 |
| 17 | 1.2238 | 154.968 | UNIT II UNDER WT | 5 | 28 | 46.9063 | 52.5552 | 107.879 | 18.4405 | 89.4387 |
| 18 | 1.2238 | 145.039 | UNIT II UNDER WT | 5 | 28 | 42.8792 | 48.0431 | 96.7922 | 15.8401 | 80.9521 |
| 19 | 1.2238 | 134.224 | UNIT II UNDER WT | 5 | 28 | 39.1325 | 43.8452 | 85.4992 | 12.4419 | 73.0573 |
| 20 | 1.2238 | 127.89 | UNIT II UNDER WT | 5 | 28 | 37.2343 | 41.7184 | 77.2204 | 8.16336 | 69.057 |
| 21 | 1.2238 | 125.132 | UNIT II UNDER WT | 5 | 28 | 36.7423 | 41.1672 | 70.9167 | 2.89619 | 68.0205 |
| 22 | 1.12645 | 105.952 | UNIT II | 5 | 28 | 33.4141 | 37.4382 | 61.0074 | 0 | 61.0074 |
| 23 | 1.12645 | 81.5886 | UNIT II | 5 | 28 | 25.1792 | 28.2115 | 43.6545 | 0 | 43.6545 |
| 24 | 1.22461 | 57.4165 | UNIT I | 3 | 28 | 15.1214 | 16.9425 | 26.222 | 0 | 26.222 |
| 25 | 1.22461 | 20.1103 | UNIT I | 3 | 28 | 5.80189 | 6.50061 | 6.58368 | 0 | 6.58368 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.1597

| 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 | 1.15567 | 4.23703 | UNIT II | 5 | 28 | 7.45723 | 8.64815 | 6.86117 | 0 | 6.86117 |
| 2 | 1.15567 | 12.8314 | UNIT II | 5 | 28 | 12.4153 | 14.3981 | 17.6752 | 0 | 17.6752 |
| 3 | 1.15567 | 22.1354 | UNIT II | 5 | 28 | 16.8634 | 19.5565 | 27.3768 | 0 | 27.3768 |
| 4 | 1.15567 | 30.354 | UNIT II | 5 | 28 | 21.3568 | 24.7675 | 37.1773 | 0 | 37.1773 |
| 5 | 1.15567 | 38.1352 | UNIT II | 5 | 28 | 23.134 | 26.8285 | 41.0535 | 0 | 41.0535 |
| 6 | 1.21415 | 47.3727 | UNIT II UNDER WT | 5 | 28 | 23.1035 | 26.7931 | 42.8598 | 1.87292 | 40.9869 |
| 7 | 1.21415 | 51.2327 | UNIT II UNDER WT | 5 | 28 | 71.2041 | 82.5754 | 151.263 | 5.36468 | 145.898 |
| 8 | 1.21415 | 72.0668 | UNIT II UNDER WT | 5 | 28 | 61.3435 | 71.1401 | 132.741 | 8.34925 | 124.392 |
| 9 | 1.21415 | 85.8666 | UNIT II UNDER WT | 5 | 28 | 8.17705 | 9.48292 | 19.2581 | 10.827 | 8.43113 |
| 10 | 1.21415 | 99.4721 | UNIT II UNDER WT | 5 | 28 | 94.5477 | 109.647 | 209.607 | 12.7952 | 196.812 |
| 11 | 1.21415 | 118.976 | UNIT II UNDER WT | 5 | 28 | 40.2414 | 46.6679 | 92.6136 | 14.2476 | 78.366 |
| 12 | 1.21415 | 138.157 | UNIT II UNDER WT | 5 | 28 | 17.7244 | 20.555 | 44.3272 | 15.0726 | 29.2546 |
| 13 | 1.21415 | 147.705 | UNIT II UNDER WT | 5 | 28 | 28.6595 | 33.2364 | 68.7203 | 15.6154 | 53.1049 |
| 14 | 1.21415 | 151.507 | UNIT II UNDER WT | 5 | 28 | 38.5127 | 44.6632 | 90.2019 | 15.6063 | 74.5956 |
| 15 | 1.21415 | 150.941 | UNIT II UNDER WT | 5 | 28 | 40.0466 | 46.4421 | 92.9648 | 15.0231 | 77.9417 |
| 16 | 1.21415 | 144.146 | UNIT II UNDER WT | 5 | 28 | 48.7383 | 56.5218 | 110.736 | 13.8378 | 96.8981 |
| 17 | 1.21415 | 137.09 | UNIT II UNDER WT | 5 | 28 | 41.8388 | 48.5205 | 93.8656 | 12.0156 | 81.85 |
| 18 | 1.21415 | 127.552 | UNIT II UNDER WT | 5 | 28 | 44.3178 | 51.3953 | 96.7695 | 9.51275 | 87.2568 |
| 19 | 1.21415 | 117.111 | UNIT II UNDER WT | 5 | 28 | 48.0432 | 55.7157 | 101.657 | 6.27469 | 95.3827 |
| 20 | 1.21415 | 111.132 | UNIT II UNDER WT | 5 | 28 | 42.0036 | 48.7116 | 84.4416 | 2.23212 | 82.2095 |
| 21 | 1.38448 | 124.197 | UNIT II | 5 | 28 | 23.0871 | 26.7741 | 40.9511 | 0 | 40.9511 |
| 22 | 1.38448 | 107.98 | UNIT II | 5 | 28 | 21.706 | 25.1724 | 37.9389 | 0 | 37.9389 |
| 23 | 0.993305 | 55.4945 | UNIT I | 3 | 28 | 21.4254 | 24.847 | 41.0882 | 0 | 41.0882 |
| 24 | 0.993305 | 34.9769 | UNIT I | 3 | 28 | 13.6923 | 15.879 | 24.2218 | 0 | 24.2218 |
| 25 | 0.993305 | 12.0908 | UNIT I | 3 | 28 | 5.66821 | 6.57342 | 6.72065 | 0 | 6.72065 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.11718

| 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 | 1.3065 | 7.19128 | UNIT II | 5 | 28 | 8.18344 | 9.14238 | 7.79072 | 0 | 7.79072 |
| 2 | 1.3065 | 19.5708 | UNIT II | 5 | 28 | 13.8301 | 15.4507 | 19.6549 | 0 | 19.6549 |
| 3 | 1.3065 | 32.947 | UNIT II | 5 | 28 | 20.2285 | 22.5989 | 33.0987 | 0 | 33.0987 |
| 4 | 1.3065 | 44.776 | UNIT II | 5 | 28 | 25.6762 | 28.6849 | 44.5448 | 0 | 44.5448 |
| 5 | 1.2238 | 51.9637 | UNIT II UNDER WT | 5 | 28 | 28.6699 | 32.0294 | 53.1611 | 2.32626 | 50.8349 |
| 6 | 1.2238 | 60.5952 | UNIT II UNDER WT | 5 | 28 | 28.9314 | 32.3216 | 58.0854 | 6.7009 | 51.3845 |
| 7 | 1.2238 | 65.3771 | UNIT II UNDER WT | 5 | 28 | 53.4908 | 59.7588 | 113.51 | 10.5238 | 102.986 |
| 8 | 1.2238 | 84.6387 | UNIT II UNDER WT | 5 | 28 | 49.239 | 55.0088 | 107.854 | 13.8014 | 94.0526 |
| 9 | 1.2238 | 102.234 | UNIT II UNDER WT | 5 | 28 | 33.8722 | 37.8413 | 78.3014 | 16.5358 | 61.7656 |
| 10 | 1.2238 | 115.119 | UNIT II UNDER WT | 5 | 28 | 70.8995 | 79.2075 | 158.289 | 18.7256 | 139.564 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 1.2238 | 135.266 | UNIT II UNDER WT | 5 | 28 | 54.0236 | 60.3541 | 124.471 | 20.3654 | 104.106 |
| 12 | 1.2238 | 155.264 | UNIT II UNDER WT | 5 | 28 | 47.1921 | 52.7221 | 111.048 | 21.2952 | 89.7523 |
| 13 | 1.2238 | 165.396 | UNIT II UNDER WT | 5 | 28 | 49.5026 | 55.3033 | 116.564 | 21.9565 | 94.6072 |
| 14 | 1.2238 | 169.509 | UNIT II UNDER WT | 5 | 28 | 53.2003 | 59.4343 | 124.406 | 22.0297 | 102.376 |
| 15 | 1.2238 | 169.067 | UNIT II UNDER WT | 5 | 28 | 52.0643 | 58.1652 | 121.479 | 21.4903 | 99.9891 |
| 16 | 1.2238 | 162.213 | UNIT II UNDER WT | 5 | 28 | 54.9692 | 61.4105 | 126.4 | 20.3071 | 106.092 |
| 17 | 1.2238 | 154.968 | UNIT II UNDER WT | 5 | 28 | 48.2786 | 53.9359 | 110.476 | 18.4405 | 92.0354 |
| 18 | 1.2238 | 145.039 | UNIT II UNDER WT | 5 | 28 | 47.3141 | 52.8584 | 105.849 | 15.8401 | 90.0087 |
| 19 | 1.2238 | 134.224 | UNIT II UNDER WT | 5 | 28 | 47.1535 | 52.6789 | 102.113 | 12.4419 | 89.6706 |
| 20 | 1.2238 | 127.89 | UNIT II UNDER WT | 5 | 28 | 41.0505 | 45.8608 | 85.0111 | 8.16336 | 76.8478 |
| 21 | 1.2238 | 125.132 | UNIT II UNDER WT | 5 | 28 | 29.3345 | 32.7719 | 55.1275 | 2.89619 | 52.2313 |
| 22 | 1.12645 | 105.952 | UNIT II | 5 | 28 | 26.4393 | 29.5375 | 46.1483 | 0 | 46.1483 |
| 23 | 1.12645 | 81.5886 | UNIT II | 5 | 28 | 24.5106 | 27.3828 | 42.096 | 0 | 42.096 |
| 24 | 1.22461 | 57.4165 | UNIT I | 3 | 28 | 14.565 | 16.2717 | 24.9604 | 0 | 24.9604 |
| 25 | 1.22461 | 20.1103 | UNIT I | 3 | 28 | 5.82763 | 6.51051 | 6.60232 | 0 | 6.60232 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.15977

| 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 | 1.11788 | 4.04648 | UNIT II | 5 | 28 | 7.46445 | 8.65705 | 6.87791 | 0 | 6.87791 |
| 2 | 1.11788 | 12.3544 | UNIT II | 5 | 28 | 12.5296 | 14.5314 | 17.926 | 0 | 17.926 |
| 3 | 1.11788 | 21.3819 | UNIT II | 5 | 28 | 18.2666 | 21.185 | 30.4396 | 0 | 30.4396 |
| 4 | 1.11788 | 29.4048 | UNIT II | 5 | 28 | 23.5468 | 27.3089 | 41.957 | 0 | 41.957 |
| 5 | 1.11788 | 37.0483 | UNIT II | 5 | 28 | 28.4949 | 33.0475 | 52.7497 | 0 | 52.7497 |
| 6 | 1.23053 | 48.8052 | UNIT II UNDER WT | 5 | 28 | 31.7627 | 36.8374 | 61.8884 | 2.01084 | 59.8775 |
| 7 | 1.23053 | 53.4903 | UNIT II UNDER WT | 5 | 28 | 31.7783 | 36.8555 | 65.6891 | 5.77751 | 59.9116 |
| 8 | 1.23053 | 71.6609 | UNIT II UNDER WT | 5 | 28 | 48.8651 | 56.6723 | 106.217 | 9.03583 | 97.1812 |
| 9 | 1.23053 | 90.7627 | UNIT II UNDER WT | 5 | 28 | 44.5976 | 51.723 | 99.6611 | 11.7876 | 87.8735 |
| 10 | 1.23053 | 103.274 | UNIT II UNDER WT | 5 | 28 | 46.377 | 53.7867 | 105.786 | 14.0315 | 91.754 |
| 11 | 1.23053 | 123.821 | UNIT II UNDER WT | 5 | 28 | 50.9941 | 59.1414 | 117.588 | 15.7632 | 101.825 |
| 12 | 1.23053 | 144.383 | UNIT II UNDER WT | 5 | 28 | 55.0277 | 63.8195 | 127.479 | 16.8556 | 110.624 |
| 13 | 1.23053 | 155.081 | UNIT II UNDER WT | 5 | 28 | 54.734 | 63.4788 | 127.673 | 17.6903 | 109.982 |
| 14 | 1.23053 | 159.809 | UNIT II UNDER WT | 5 | 28 | 52.4322 | 60.8093 | 122.945 | 17.9828 | 104.962 |
| 15 | 1.23053 | 160.004 | UNIT II UNDER WT | 5 | 28 | 49.1003 | 56.9451 | 115.408 | 17.7139 | 97.6942 |
| 16 | 1.23053 | 153.98 | UNIT II UNDER WT | 5 | 28 | 44.4978 | 51.6072 | 104.515 | 16.8592 | 87.6557 |
| 17 | 1.23053 | 147.728 | UNIT II UNDER WT | 5 | 28 | 40.7866 | 47.3031 | 94.9489 | 15.3884 | 79.5605 |
| 18 | 1.23053 | 138.934 | UNIT II UNDER WT | 5 | 28 | 37.2239 | 43.1712 | 85.0536 | 13.2637 | 71.7899 |
| 19 | 1.23053 | 129.722 | UNIT II UNDER WT | 5 | 28 | 34.4259 | 39.9261 | 76.124 | 10.4378 | 65.6862 |
| 20 | 1.23053 | 125.501 | UNIT II UNDER WT | 5 | 28 | 33.8373 | 39.2435 | 71.2542 | 6.8517 | 64.4025 |
| 21 | 1.23053 | 125.279 | UNIT II UNDER WT | 5 | 28 | 34.9866 | 40.5764 | 69.3397 | 2.43016 | 66.9095 |
| 22 | 1.33016 | 123.966 | UNIT II | 5 | 28 | 32.719 | 37.9465 | 61.9634 | 0 | 61.9634 |
| 23 | 1.33016 | 93.4199 | UNIT II | 5 | 28 | 25.108 | 29.1195 | 45.3622 | 0 | 45.3622 |
| 24 | 1.31302 | 58.4778 | UNIT I | 3 | 28 | 15.6257 | 18.1222 | 28.4407 | 0 | 28.4407 |
| 25 | 1.31302 | 20.3836 | UNIT I | 3 | 28 | 6.43872 | 7.46744 | 8.40201 | 0 | 8.40201 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

## External Boundary

| X | Y |
|---|---|
| 13.291 | 7.18104 |
| 13.2484 | 7.15374 |
| 13.2017 | 7.13399 |
| 13.1524 | 7.12236 |
| 13.1019 | 7.11917 |
| 13.0515 | 7.12451 |
| 13.0028 | 7.13824 |
| 12.9532 | 7.16181 |
| 12.932 | 7.17578 |
| 12.9064 | 7.19655 |
| 12.8845 | 7.21846 |
| 12.8627 | 7.24586 |
| 12.8587 | 7.42036 |
| 12.8334 | 7.45725 |
| 12.2064 | 7.41964 |
| 12.2037 | 7.36919 |
| 12.2098 | 7.33997 |
| 12.2084 | 7.24233 |
| 12.2094 | 7.20458 |
| 12.213 | 7.12119 |
| 12.2172 | 7.0821 |
| 12.2175 | 7.06797 |
| 12.2237 | 6.7447 |
| 12.2237 | 6.73133 |
| 12.2291 | 6.41223 |
| 12.2291 | 6.4021 |
| 12.2291 | 6.36602 |
| 12.2368 | 6.08724 |
| 12.2368 | 6.07782 |
| 12.2368 | 6.0236 |
| 12.2366 | 6.02355 |
| 11.9085 | 5.94224 |
| 11.8339 | 5.93791 |
| 11.7565 | 5.92998 |
| 11.5778 | 5.90617 |
| 11.2683 | 5.85792 |
| 11.121 | 5.87315 |
| 10.7096 | 5.80715 |
| 9.86652 | 5.76146 |
| 9.18594 | 5.68024 |
| 8.79485 | 5.58378 |
| 7.05121 | 5.30975 |
| 6.72302 | 5.27274 |
| 5.64857 | 5.14047 |
| 5.29473 | 5.11377 |
| 4.72058 | 5.00032 |
| 4.27996 | 4.99365 |
| 3.82599 | 5.01368 |
| 3.08494 | 4.98031 |
| 2.13693 | 4.92692 |
| 1.35581 | 4.92025 |
| 0.246468 | 4.88611 |
| 0.246468 | 1.46395 |
| 0.246468 | -1.486 |
| 0.246468 | -4.15932 |

| | |
|---|---|
| 0.246468 | -5.39951 |
| 55.0767 | -5.39951 |
| 55.0767 | 11.186 |
| 55.0767 | 17.606 |
| 55.0767 | 19.3593 |
| 55.0767 | 20.7296 |
| 55.0767 | 21.5622 |
| 55.0767 | 23.3646 |
| 55.0767 | 26.0247 |
| 54.4584 | 25.8393 |
| 53.5618 | 25.4685 |
| 52.9744 | 24.7577 |
| 52.387 | 24.047 |
| 51.9851 | 23.2435 |
| 51.4905 | 22.3782 |
| 50.6249 | 21.1112 |
| 50.0375 | 20.3695 |
| 49.3883 | 19.9678 |
| 48.3371 | 19.3189 |
| 46.9348 | 18.4738 |
| 46.5963 | 18.197 |
| 46.0426 | 17.6743 |
| 45.2735 | 17.1207 |
| 42.619 | 15.4475 |
| 41.5004 | 14.3584 |
| 40.9932 | 14.0474 |
| 28.6564 | 14.5032 |
| 28.4404 | 14.3519 |
| 27.9984 | 13.9017 |
| 27.1243 | 13.3297 |
| 26.6199 | 13.0337 |
| 26.1665 | 12.7746 |
| 25.3511 | 12.4823 |
| 25.084 | 12.4178 |
| 24.588 | 12.31 |
| 23.9236 | 12.2596 |
| 23.0163 | 12.0764 |
| 21.8624 | 11.8547 |
| 21.1904 | 11.7256 |
| 20.6568 | 11.6923 |
| 20.3595 | 11.6738 |
| 19.4411 | 11.318 |
| 17.296 | 10.487 |
| 17.0867 | 10.3106 |
| 16.4941 | 9.811 |
| 15.9007 | 9.3108 |
| 15.3078 | 8.811 |
| 14.7147 | 8.3111 |
| 14.1218 | 7.8113 |
| 13.5288 | 7.3114 |
| 13.4289 | 7.22714 |

## Material Boundary

| X | Y |
|---|---|
| 12.2291 | 6.41223 |
| 12.3008 | 6.41721 |
| 12.578 | 6.4141 |

### Material Boundary

| X | Y |
|---|---|
| 12.8627 | 7.24586 |
| 12.885 | 7.09757 |
| 12.885 | 7.08304 |
| 12.885 | 7.042 |
| 12.885 | 6.86356 |
| 12.8841 | 6.81105 |
| 12.8832 | 6.76234 |
| 12.8836 | 6.74889 |
| 12.8925 | 6.4141 |
| 12.8925 | 6.4021 |
| 12.8959 | 6.3106 |
| 12.9005 | 6.18615 |
| 12.8959 | 6.0921 |

### Material Boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 13.4052 | 6.3106 |
| 13.9047 | 6.3106 |
| 13.9047 | 6.81105 |
| 14.4072 | 6.81105 |
| 14.4072 | 7.3114 |
| 14.907 | 7.3114 |
| 14.907 | 7.8113 |
| 15.4072 | 7.8113 |
| 15.4072 | 8.3111 |
| 15.907 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 12.2357 | 5.7619 |
| 12.8857 | 5.75977 |
| 12.8882 | 5.83842 |
| 12.8959 | 6.07782 |
| 12.8959 | 6.0921 |

### Material Boundary

| X | Y |
|---|---|
| 13.4052 | 6.3106 |
| 13.4181 | 6.81105 |
| 13.4289 | 7.22714 |

### Material Boundary

| X | Y |
|---|---|
| 12.2237 | 6.7447 |
| 12.5345 | 6.75446 |

### Material Boundary

| X | Y |
|---|---|

| | |
|---|---|
| 0.246468 | -1.486 |
| 14.9068 | 2.35863 |
| 31.5166 | 8.03863 |
| 40.9932 | 10.5286 |
| 51.5928 | 16.7299 |
| 55.0767 | 20.7296 |

### Material Boundary

| X | Y |
|---|---|
| 0.246468 | -4.15932 |
| 55.0767 | 11.186 |

### Material Boundary

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |

### Material Boundary

| X | Y |
|---|---|
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

### Material Boundary

| X | Y |
|---|---|
| 18.0906 | 7.53452 |
| 18.742 | 7.7233 |
| 31.5166 | 11.4256 |
| 40.9932 | 12.4986 |

### Material Boundary

| X | Y |
|---|---|
| 51.3789 | 18.6028 |
| 55.0767 | 23.3646 |

### Material Boundary

| X | Y |
|---|---|
| 12.2172 | 7.0821 |
| 12.2784 | 7.08498 |
| 12.3072 | 7.08633 |
| 12.5047 | 7.09561 |

### Material Boundary

| X | Y |
|---|---|
| 12.5047 | 7.09561 |
| 12.6979 | 7.09757 |
| 12.885 | 7.09757 |

### Material Boundary

| | |
|---|---|

| X | Y |
|---|---|
| 12.5345 | 6.75446 |
| 12.8832 | 6.76234 |

### Material Boundary

| X | Y |
|---|---|
| 12.578 | 6.4141 |
| 12.8925 | 6.4141 |

### Material Boundary

| X | Y |
|---|---|
| 12.8882 | 5.83842 |
| 13.4052 | 5.83641 |

### Material Boundary

| X | Y |
|---|---|
| 12.2368 | 6.07782 |
| 12.8959 | 6.07782 |

### Material Boundary

| X | Y |
|---|---|
| 12.2368 | 6.08724 |
| 12.8959 | 6.0921 |

### Material Boundary

| X | Y |
|---|---|
| 12.2291 | 6.4021 |
| 12.8925 | 6.4021 |

### Material Boundary

| X | Y |
|---|---|
| 12.2237 | 6.73133 |
| 12.8836 | 6.74889 |

### Material Boundary

| X | Y |
|---|---|
| 12.2175 | 7.06797 |
| 12.885 | 7.08304 |

### Material Boundary

| X | Y |
|---|---|
| 12.2357 | 5.7619 |
| 12.2366 | 6.02355 |

### Material Boundary

| X | Y |
|---|---|
| 15.907 | 5.83641 |
| 15.907 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 15.907 | 5.83641 |
| 15.9074 | 5.83641 |
| 16.9071 | 5.83641 |

### Material Boundary

| X | Y |
|---|---|
| 15.9074 | 5.83641 |
| 16.9071 | 6.84674 |
| 17.2805 | 7.22412 |
| 18.298 | 8.2524 |
| 20.3347 | 10.3108 |
| 21.8624 | 11.8547 |

### Material Boundary

| X | Y |
|---|---|
| 17.2805 | 7.22412 |
| 18.0906 | 7.53452 |

### Material Boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 15.907 | 8.811 |
| 16.4071 | 8.811 |
| 16.4071 | 9.3108 |
| 16.9071 | 9.31084 |
| 16.9071 | 9.811 |
| 17.407 | 9.811 |
| 17.407 | 10.3106 |
| 17.9068 | 10.3108 |
| 17.9068 | 9.31092 |
| 17.9068 | 8.3111 |
| 16.9071 | 8.3111 |
| 15.907 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 17.9068 | 10.3108 |
| 20.3347 | 10.3108 |

### Material Boundary

| X | Y |
|---|---|
| 12.8959 | 6.3106 |
| 13.4052 | 6.3106 |

### Material Boundary

| X | Y |
|---|---|
| 12.8841 | 6.81105 |
| 13.4181 | 6.81105 |
| 13.9047 | 6.81105 |

### Material Boundary

| X | Y |
|---|---|
| 13.5288 | 7.3114 |
| 14.4072 | 7.3114 |

### Material Boundary

| X | Y |
|---|---|
| 14.1218 | 7.8113 |
| 14.907 | 7.8113 |

### Material Boundary

| X | Y |
|---|---|
| 14.7147 | 8.3111 |
| 15.4072 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 15.3078 | 8.811 |
| 15.907 | 8.811 |

### Material Boundary

| X | Y |
|---|---|
| 15.9007 | 9.3108 |
| 16.4071 | 9.3108 |

### Material Boundary

| X | Y |
|---|---|
| 16.4941 | 9.811 |
| 16.9071 | 9.811 |

### Material Boundary

| X | Y |
|---|---|
| 17.0867 | 10.3106 |
| 17.407 | 10.3106 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S44 + GABIONS EQup loc lim + GEOTEX+MPILE=0.75m oop
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/5/2021, 7:15:55

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): -0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |

| Property | GRAVEL | SW |
|---|---|---|
| Color | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19 |
| Cohesion [kPa] | 0 | 1 |
| Friction Angle [deg] | 36 | 35 |
| Water Surface | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated |

## Support Properties

### GEOTEX

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Parallel to Reinforcement
Anchorage: Embedded End
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 40 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 30 degrees

### MICROPILE

Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 0.75 m
Pile Shear Strength: 40 kN
Force Direction: Parallel to Surface

## *Global Minimums*

### Method: bishop simplified

FS: 1.073530
Center: 12.155, 28.391
Radius: 25.347
Left Slip Surface Endpoint: 2.514, 4.948
Right Slip Surface Endpoint: 33.247, 14.334
Resisting Moment=29793.8 kN-m
Driving Moment=27753.2 kN-m

### Method: janbu simplified

FS: 0.946826
Center: 12.818, 23.238
Radius: 20.448
Left Slip Surface Endpoint: 3.567, 5.002
Right Slip Surface Endpoint: 31.261, 14.407
Resisting Horizontal Force=971.68 kN
Driving Horizontal Force=1026.25 kN

### Method: janbu corrected

FS: 1.017110
Center: 12.818, 23.238
Radius: 20.448
Left Slip Surface Endpoint: 3.567, 5.002
Right Slip Surface Endpoint: 31.261, 14.407
Resisting Horizontal Force=1043.81 kN
Driving Horizontal Force=1026.25 kN

### Method: spencer

FS: 1.087260
Center: 11.629, 37.113
Radius: 33.925
Left Slip Surface Endpoint: 0.965, 4.908
Right Slip Surface Endpoint: 36.654, 14.208
Resisting Moment=46014.9 kN-m
Driving Moment=42321.9 kN-m
Resisting Horizontal Force=1276.09 kN
Driving Horizontal Force=1173.68 kN

### Method: corp of eng#1

FS: 1.042050
Center: 12.235, 34.027
Radius: 30.727
Left Slip Surface Endpoint: 2.336, 4.938
Right Slip Surface Endpoint: 35.745, 14.241
Resisting Horizontal Force=1189.84 kN
Driving Horizontal Force=1141.83 kN

### Method: corp of eng#2

FS: 1.078140
Center: 12.235, 34.027
Radius: 30.727
Left Slip Surface Endpoint: 2.336, 4.938
Right Slip Surface Endpoint: 35.745, 14.241
Resisting Horizontal Force=1201.6 kN
Driving Horizontal Force=1114.52 kN

### Method: lowe-karafiath

FS: 1.036180
Center: 13.373, 25.859

Radius: 22.604
Left Slip Surface Endpoint: 4.666, 4.999
Right Slip Surface Endpoint: 32.827, 14.349
Resisting Horizontal Force=1029.28 kN
Driving Horizontal Force=993.34 kN

### Method: gle/morgenstern-price

FS: 1.084750
Center: 11.700, 33.052
Radius: 29.888
Left Slip Surface Endpoint: 1.599, 4.922
Right Slip Surface Endpoint: 34.950, 14.271
Resisting Moment=37784.6 kN-m
Driving Moment=34832.7 kN-m
Resisting Horizontal Force=1180.23 kN
Driving Horizontal Force=1088.02 kN

## *Valid / Invalid Surfaces*

### Method: bishop simplified

Number of Valid Surfaces: 8334
Number of Invalid Surfaces: 1666

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 125 surfaces
Error Code -112 reported for 39 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 8023
Number of Invalid Surfaces: 1977

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 437 surfaces
Error Code -112 reported for 38 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 8023
Number of Invalid Surfaces: 1977

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 437 surfaces
Error Code -112 reported for 38 surfaces

Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: spencer

Number of Valid Surfaces: 7475
Number of Invalid Surfaces: 2525

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 473 surfaces
Error Code -111 reported for 509 surfaces
Error Code -112 reported for 41 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: corp of eng#1

Number of Valid Surfaces: 6726
Number of Invalid Surfaces: 3274

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 1193 surfaces
Error Code -111 reported for 541 surfaces
Error Code -112 reported for 38 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: corp of eng#2

Number of Valid Surfaces: 6486
Number of Invalid Surfaces: 3514

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 1511 surfaces
Error Code -111 reported for 462 surfaces
Error Code -112 reported for 39 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: lowe-karafiath

Number of Valid Surfaces: 4740
Number of Invalid Surfaces: 5260

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface

Error Code -108 reported for 3193 surfaces
Error Code -111 reported for 527 surfaces
Error Code -112 reported for 38 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

### Method: gle/morgenstern-price

Number of Valid Surfaces: 7663
Number of Invalid Surfaces: 2337

#### Error Codes:

Error Code -101 reported for 1 surface
Error Code -103 reported for 1 surface
Error Code -105 reported for 30 surfaces
Error Code -106 reported for 107 surfaces
Error Code -107 reported for 1 surface
Error Code -108 reported for 482 surfaces
Error Code -111 reported for 314 surfaces
Error Code -112 reported for 39 surfaces
Error Code -114 reported for 1356 surfaces
Error Code -123 reported for 6 surfaces

#### Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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).
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.07353

| 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 | 1.3065 | 7.19128 | UNIT II | 5 | 28 | 8.75627 | 9.40012 | 8.27542 | 0 | 8.27542 |
| 2 | 1.3065 | 19.5708 | UNIT II | 5 | 28 | 13.4545 | 14.4438 | 17.7612 | 0 | 17.7612 |
| 3 | 1.3065 | 32.947 | UNIT II | 5 | 28 | 18.2477 | 19.5894 | 27.4387 | 0 | 27.4387 |
| 4 | 1.3065 | 44.776 | UNIT II | 5 | 28 | 22.1765 | 23.8071 | 35.371 | 0 | 35.371 |
| 5 | 1.2238 | 51.9637 | UNIT II UNDER WT | 5 | 28 | 24.2561 | 26.0397 | 41.8961 | 2.32626 | 39.5698 |
| 6 | 1.2238 | 60.5952 | UNIT II UNDER WT | 5 | 28 | 24.6593 | 26.4725 | 47.0849 | 6.7009 | 40.384 |
| 7 | 1.2238 | 65.3771 | UNIT II UNDER WT | 5 | 28 | 23.8919 | 25.6487 | 49.3583 | 10.5238 | 38.8345 |
| 8 | 1.2238 | 84.6387 | UNIT II UNDER WT | 5 | 28 | 28.8365 | 30.9568 | 62.619 | 13.8014 | 48.8176 |
| 9 | 1.2238 | 102.234 | UNIT II UNDER WT | 5 | 28 | 33 | 35.4265 | 73.7598 | 16.5358 | 57.224 |
| 10 | 1.2238 | 115.119 | UNIT II UNDER WT | 5 | 28 | 35.6916 | 38.316 | 81.3841 | 18.7256 | 62.6585 |
| 11 | 1.2238 | 135.266 | UNIT II UNDER WT | 5 | 28 | 40.977 | 43.99 | 93.6949 | 20.3654 | 73.3295 |
| 12 | 1.2238 | 155.264 | UNIT II UNDER WT | 5 | 28 | 46.2769 | 49.6796 | 105.325 | 21.2952 | 84.0301 |
| 13 | 1.2238 | 165.396 | UNIT II UNDER WT | 5 | 28 | 48.2191 | 51.7646 | 109.908 | 21.9565 | 87.9512 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 1.2238 | 169.509 | UNIT II UNDER WT | 5 | 28 | 48.3759 | 51.933 | 110.298 | 22.0297 | 88.2681 |
| 15 | 1.2238 | 169.067 | UNIT II UNDER WT | 5 | 28 | 47.3209 | 50.8004 | 107.629 | 21.4903 | 86.1384 |
| 16 | 1.2238 | 162.213 | UNIT II UNDER WT | 5 | 28 | 44.5802 | 47.8582 | 100.912 | 20.3071 | 80.6045 |
| 17 | 1.2238 | 154.968 | UNIT II UNDER WT | 5 | 28 | 42.062 | 45.1548 | 93.9606 | 18.4405 | 75.5201 |
| 18 | 1.2238 | 145.039 | UNIT II UNDER WT | 5 | 28 | 39.1066 | 41.9821 | 85.3934 | 15.8401 | 69.5533 |
| 19 | 1.2238 | 134.224 | UNIT II UNDER WT | 5 | 28 | 36.2712 | 38.9382 | 76.2705 | 12.4419 | 63.8286 |
| 20 | 1.2238 | 127.89 | UNIT II UNDER WT | 5 | 28 | 35.0239 | 37.5992 | 69.4738 | 8.16336 | 61.3105 |
| 21 | 1.2238 | 125.132 | UNIT II UNDER WT | 5 | 28 | 35.0027 | 37.5764 | 64.1636 | 2.89619 | 61.2674 |
| 22 | 1.12645 | 105.952 | UNIT II | 5 | 28 | 32.2177 | 34.5867 | 55.6444 | 0 | 55.6444 |
| 23 | 1.12645 | 81.5886 | UNIT II | 5 | 28 | 24.5549 | 26.3604 | 40.1731 | 0 | 40.1731 |
| 24 | 1.22461 | 57.4165 | UNIT I | 3 | 28 | 15.0013 | 16.1043 | 24.6456 | 0 | 24.6456 |
| 25 | 1.22461 | 20.1103 | UNIT I | 3 | 28 | 6.01782 | 6.46031 | 6.50788 | 0 | 6.50788 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.946826

| 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 | 1.04309 | 5.01721 | UNIT II | 5 | 28 | 10.5138 | 9.95474 | 9.31851 | 0 | 9.31851 |
| 2 | 1.04309 | 15.8127 | UNIT II | 5 | 28 | 16.7865 | 15.8939 | 20.4884 | 0 | 20.4884 |
| 3 | 1.04309 | 26.4112 | UNIT II | 5 | 28 | 22.4267 | 21.2342 | 30.532 | 0 | 30.532 |
| 4 | 1.04309 | 35.7918 | UNIT II | 5 | 28 | 26.956 | 25.5226 | 38.5974 | 0 | 38.5974 |
| 5 | 1.09161 | 46.7765 | UNIT II UNDER WT | 5 | 28 | 29.3229 | 27.7637 | 45.2663 | 2.45394 | 42.8123 |
| 6 | 1.09161 | 55.487 | UNIT II UNDER WT | 5 | 28 | 29.8753 | 28.2867 | 50.8741 | 7.07814 | 43.7959 |
| 7 | 1.09161 | 61.0091 | UNIT II UNDER WT | 5 | 28 | 29.1754 | 27.624 | 53.6923 | 11.1428 | 42.5495 |
| 8 | 1.09161 | 65.3765 | UNIT II UNDER WT | 5 | 28 | 30.0514 | 28.4534 | 58.7701 | 14.6607 | 44.1094 |
| 9 | 1.09161 | 99.3294 | UNIT II UNDER WT | 5 | 28 | 41.555 | 39.3454 | 82.234 | 17.6398 | 64.5942 |
| 10 | 1.09161 | 98.2204 | UNIT II UNDER WT | 5 | 28 | 38.4945 | 36.4476 | 79.2273 | 20.083 | 59.1443 |
| 11 | 1.09161 | 114.212 | UNIT II UNDER WT | 5 | 28 | 43.3854 | 41.0784 | 89.8423 | 21.9887 | 67.8536 |
| 12 | 1.09161 | 130.621 | UNIT II UNDER WT | 5 | 28 | 48.4399 | 45.8642 | 100.205 | 23.3507 | 76.8541 |
| 13 | 1.09161 | 145.796 | UNIT II UNDER WT | 5 | 28 | 53.0244 | 50.2049 | 109.019 | 24.0006 | 85.0182 |
| 14 | 1.09161 | 153.087 | UNIT II UNDER WT | 5 | 28 | 54.2652 | 51.3797 | 111.602 | 24.3748 | 87.2273 |
| 15 | 1.54738 | 220.911 | UNIT II UNDER WT | 5 | 28 | 53.6344 | 50.7824 | 110.061 | 23.9566 | 86.1042 |
| 16 | 1.16182 | 163.034 | UNIT II UNDER WT | 5 | 28 | 51.2156 | 48.4923 | 104.517 | 22.7197 | 81.7972 |
| 17 | 1.16182 | 154.892 | UNIT II UNDER WT | 5 | 28 | 47.5961 | 45.0652 | 96.1175 | 20.7655 | 75.352 |
| 18 | 1.16182 | 145.819 | UNIT II UNDER WT | 5 | 28 | 44.1196 | 41.7736 | 87.1284 | 17.967 | 69.1614 |
| 19 | 1.16182 | 133.663 | UNIT II UNDER WT | 5 | 28 | 40.1211 | 37.9877 | 76.2706 | 14.2295 | 62.0411 |
| 20 | 1.16182 | 119.864 | UNIT II UNDER WT | 5 | 28 | 36.1364 | 34.2149 | 64.369 | 9.42375 | 54.9453 |
| 21 | 1.16182 | 108.723 | UNIT II UNDER WT | 5 | 28 | 33.4564 | 31.6774 | 53.5404 | 3.36753 | 50.1728 |
| 22 | 0.892778 | 77.0162 | UNIT II | 5 | 28 | 30.6916 | 29.0596 | 45.2496 | 0 | 45.2496 |
| 23 | 0.892778 | 71.2668 | UNIT II | 5 | 28 | 27.2134 | 25.7664 | 39.0559 | 0 | 39.0559 |
| 24 | 1.15084 | 64.8654 | UNIT I | 3 | 28 | 17.5486 | 16.6155 | 25.607 | 0 | 25.607 |
| 25 | 1.15084 | 23.2373 | UNIT I | 3 | 28 | 6.61664 | 6.26481 | 6.14019 | 0 | 6.14019 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.01711

| 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 | 1.04309 | 5.01721 | UNIT II | 5 | 28 | 9.78728 | 9.95474 | 9.31851 | 0 | 9.31851 |
| 2 | 1.04309 | 15.8127 | UNIT II | 5 | 28 | 15.6265 | 15.8939 | 20.4884 | 0 | 20.4884 |
| 3 | 1.04309 | 26.4112 | UNIT II | 5 | 28 | 20.877 | 21.2342 | 30.532 | 0 | 30.532 |
| 4 | 1.04309 | 35.7918 | UNIT II | 5 | 28 | 25.0933 | 25.5226 | 38.5974 | 0 | 38.5974 |
| 5 | 1.09161 | 46.7765 | UNIT II UNDER WT | 5 | 28 | 27.2967 | 27.7637 | 45.2663 | 2.45394 | 42.8123 |
| 6 | 1.09161 | 55.487 | UNIT II UNDER WT | 5 | 28 | 27.8109 | 28.2867 | 50.8741 | 7.07814 | 43.7959 |
| 7 | 1.09161 | 61.0091 | UNIT II UNDER WT | 5 | 28 | 27.1593 | 27.624 | 53.6923 | 11.1428 | 42.5495 |
| 8 | 1.09161 | 65.3765 | UNIT II UNDER WT | 5 | 28 | 27.9748 | 28.4534 | 58.7701 | 14.6607 | 44.1094 |
| 9 | 1.09161 | 99.3294 | UNIT II UNDER WT | 5 | 28 | 38.6835 | 39.3454 | 82.234 | 17.6398 | 64.5942 |
| 10 | 1.09161 | 98.2204 | UNIT II UNDER WT | 5 | 28 | 35.8345 | 36.4476 | 79.2273 | 20.083 | 59.1443 |
| 11 | 1.09161 | 114.212 | UNIT II UNDER WT | 5 | 28 | 40.3874 | 41.0784 | 89.8423 | 21.9887 | 67.8536 |
| 12 | 1.09161 | 130.621 | UNIT II UNDER WT | 5 | 28 | 45.0927 | 45.8642 | 100.205 | 23.3507 | 76.8541 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 1.09161 | 145.796 | UNIT II UNDER WT | 5 | 28 | 49.3603 | 50.2049 | 109.019 | 24.0006 | 85.0182 |
| 14 | 1.09161 | 153.087 | UNIT II UNDER WT | 5 | 28 | 50.5154 | 51.3797 | 111.602 | 24.3748 | 87.2273 |
| 15 | 1.54738 | 220.911 | UNIT II UNDER WT | 5 | 28 | 49.9281 | 50.7824 | 110.061 | 23.9566 | 86.1042 |
| 16 | 1.16182 | 163.034 | UNIT II UNDER WT | 5 | 28 | 47.6766 | 48.4923 | 104.517 | 22.7197 | 81.7972 |
| 17 | 1.16182 | 154.892 | UNIT II UNDER WT | 5 | 28 | 44.3071 | 45.0652 | 96.1175 | 20.7655 | 75.352 |
| 18 | 1.16182 | 145.819 | UNIT II UNDER WT | 5 | 28 | 41.0709 | 41.7736 | 87.1284 | 17.967 | 69.1614 |
| 19 | 1.16182 | 133.663 | UNIT II UNDER WT | 5 | 28 | 37.3487 | 37.9877 | 76.2706 | 14.2295 | 62.0411 |
| 20 | 1.16182 | 119.864 | UNIT II UNDER WT | 5 | 28 | 33.6393 | 34.2149 | 64.369 | 9.42375 | 54.9453 |
| 21 | 1.16182 | 108.723 | UNIT II UNDER WT | 5 | 28 | 31.1445 | 31.6774 | 53.5404 | 3.36753 | 50.1728 |
| 22 | 0.892778 | 77.0162 | UNIT II | 5 | 28 | 28.5708 | 29.0596 | 45.2496 | 0 | 45.2496 |
| 23 | 0.892778 | 71.2668 | UNIT II | 5 | 28 | 25.333 | 25.7664 | 39.0559 | 0 | 39.0559 |
| 24 | 1.15084 | 64.8654 | UNIT I | 3 | 28 | 16.336 | 16.6155 | 25.607 | 0 | 25.607 |
| 25 | 1.15084 | 23.2373 | UNIT I | 3 | 28 | 6.15942 | 6.26481 | 6.14019 | 0 | 6.14019 |

**Global Minimum Query (spencer) - Safety Factor**: 1.08726

| 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 | 1.34526 | 5.79916 | UNIT II | 5 | 28 | 11.0316 | 11.9942 | 13.1542 | 0 | 13.1542 |
| 2 | 1.34526 | 17.2354 | UNIT II | 5 | 28 | 16.5054 | 17.9457 | 24.3472 | 0 | 24.3472 |
| 3 | 1.34526 | 26.6726 | UNIT II | 5 | 28 | 20.3018 | 22.0733 | 32.1101 | 0 | 32.1101 |
| 4 | 1.34526 | 37.3737 | UNIT II | 5 | 28 | 24.2591 | 26.376 | 40.2023 | 0 | 40.2023 |
| 5 | 1.34526 | 47.2775 | UNIT II | 5 | 28 | 27.4419 | 29.8365 | 46.7107 | 0 | 46.7107 |
| 6 | 1.43316 | 60.8392 | UNIT II UNDER WT | 5 | 28 | 28.6656 | 31.167 | 51.5666 | 2.35358 | 49.213 |
| 7 | 1.43316 | 69.9861 | UNIT II UNDER WT | 5 | 28 | 27.8475 | 30.2775 | 54.3204 | 6.7805 | 47.5399 |
| 8 | 1.43316 | 74.8 | UNIT II UNDER WT | 5 | 28 | 35.8523 | 38.9808 | 74.5575 | 10.6488 | 63.9087 |
| 9 | 1.43316 | 114.056 | UNIT II UNDER WT | 5 | 28 | 35.9009 | 39.0336 | 77.9684 | 13.9607 | 64.0077 |
| 10 | 1.43316 | 124.009 | UNIT II UNDER WT | 5 | 28 | 35.8426 | 38.9702 | 80.6043 | 16.7155 | 63.8888 |
| 11 | 1.43316 | 152.002 | UNIT II UNDER WT | 5 | 28 | 41.62 | 45.2518 | 94.6123 | 18.9093 | 75.703 |
| 12 | 1.43316 | 179.828 | UNIT II UNDER WT | 5 | 28 | 47.1792 | 51.2961 | 107.473 | 20.4026 | 87.0702 |
| 13 | 1.43316 | 194.1 | UNIT II UNDER WT | 5 | 28 | 48.5047 | 52.7372 | 111.408 | 21.6281 | 89.7804 |
| 14 | 1.43316 | 200.601 | UNIT II UNDER WT | 5 | 28 | 47.8384 | 52.0128 | 110.684 | 22.2659 | 88.4181 |
| 15 | 1.43316 | 197.678 | UNIT II UNDER WT | 5 | 28 | 44.9971 | 48.9236 | 104.906 | 22.2982 | 82.6081 |
| 16 | 1.43316 | 192.142 | UNIT II UNDER WT | 5 | 28 | 41.9681 | 45.6302 | 98.1171 | 21.7029 | 76.4142 |
| 17 | 1.43316 | 184.32 | UNIT II UNDER WT | 5 | 28 | 38.8823 | 42.2752 | 90.5567 | 20.4522 | 70.1045 |
| 18 | 1.43316 | 176.057 | UNIT II UNDER WT | 5 | 28 | 36.2088 | 39.3684 | 83.1496 | 18.512 | 64.6376 |
| 19 | 1.43316 | 176.279 | UNIT II UNDER WT | 5 | 28 | 35.912 | 39.0457 | 79.8711 | 15.8406 | 64.0305 |
| 20 | 1.43316 | 181.243 | UNIT II UNDER WT | 5 | 28 | 36.9416 | 40.1651 | 78.5223 | 12.3863 | 66.136 |
| 21 | 1.43316 | 162.732 | UNIT II UNDER WT | 5 | 28 | 33.4562 | 36.3756 | 67.0944 | 8.08522 | 59.0091 |
| 22 | 1.43316 | 134.463 | UNIT II UNDER WT | 5 | 28 | 28.7591 | 31.2686 | 52.2611 | 2.85705 | 49.4041 |
| 23 | 2.07228 | 137.209 | UNIT II | 5 | 28 | 21.1538 | 22.9997 | 33.8526 | 0 | 33.8526 |
| 24 | 1.26352 | 47.2309 | UNIT I | 3 | 28 | 11.3947 | 12.389 | 17.6581 | 0 | 17.6581 |
| 25 | 1.26352 | 16.2636 | UNIT I | 3 | 28 | 4.84728 | 5.27025 | 4.26972 | 0 | 4.26972 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.04205

| 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 | 1.4753 | 7.76804 | UNIT II | 5 | 28 | 10.7415 | 11.1931 | 11.6476 | 0 | 11.6476 |
| 2 | 1.4753 | 21.1575 | UNIT II | 5 | 28 | 16.1108 | 16.7883 | 22.1706 | 0 | 22.1706 |
| 3 | 1.4753 | 35.8244 | UNIT II | 5 | 28 | 21.4265 | 22.3275 | 32.5883 | 0 | 32.5883 |
| 4 | 1.4753 | 49.0588 | UNIT II | 5 | 28 | 25.639 | 26.7171 | 40.8438 | 0 | 40.8438 |
| 5 | 1.34366 | 55.7306 | UNIT II UNDER WT | 5 | 28 | 27.6373 | 28.7994 | 47.0499 | 2.28979 | 44.7601 |
| 6 | 1.34366 | 63.1704 | UNIT II UNDER WT | 5 | 28 | 26.8091 | 27.9364 | 49.7337 | 6.59655 | 43.1371 |
| 7 | 1.34366 | 69.7956 | UNIT II UNDER WT | 5 | 28 | 33.0589 | 34.449 | 65.7454 | 10.36 | 55.3854 |
| 8 | 1.34366 | 109.457 | UNIT II UNDER WT | 5 | 28 | 37.6178 | 39.1996 | 77.9034 | 13.5832 | 64.3202 |
| 9 | 1.34366 | 116.916 | UNIT II UNDER WT | 5 | 28 | 37.2698 | 38.837 | 79.904 | 16.2661 | 63.6379 |
| 10 | 1.34366 | 141.876 | UNIT II UNDER WT | 5 | 28 | 43.1355 | 44.9493 | 93.5393 | 18.4054 | 75.1339 |
| 11 | 1.34366 | 166.781 | UNIT II UNDER WT | 5 | 28 | 48.8805 | 50.9359 | 106.254 | 19.8613 | 86.3926 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 1.34366 | 179.796 | UNIT II UNDER WT | 5 | 28 | 50.5488 | 52.6744 | 110.719 | 21.0568 | 89.6623 |
| 13 | 1.34366 | 185.941 | UNIT II UNDER WT | 5 | 28 | 50.2376 | 52.3501 | 110.736 | 21.6831 | 89.0529 |
| 14 | 1.34366 | 184.821 | UNIT II UNDER WT | 5 | 28 | 48.04 | 50.0601 | 106.468 | 21.7224 | 84.7458 |
| 15 | 1.34366 | 179.387 | UNIT II UNDER WT | 5 | 28 | 45.001 | 46.8933 | 99.9422 | 21.1524 | 78.7898 |
| 16 | 1.34366 | 172.97 | UNIT II UNDER WT | 5 | 28 | 42.1406 | 43.9126 | 93.1292 | 19.9452 | 73.184 |
| 17 | 1.34366 | 163.579 | UNIT II UNDER WT | 5 | 28 | 38.9449 | 40.5825 | 84.9873 | 18.0661 | 66.9212 |
| 18 | 1.34366 | 159.264 | UNIT II UNDER WT | 5 | 28 | 37.524 | 39.1019 | 79.6084 | 15.4724 | 64.136 |
| 19 | 1.34366 | 161.267 | UNIT II UNDER WT | 5 | 28 | 38.0172 | 39.6158 | 77.2139 | 12.1107 | 65.1032 |
| 20 | 1.34366 | 158.307 | UNIT II UNDER WT | 5 | 28 | 37.5947 | 39.1756 | 72.1898 | 7.91456 | 64.2752 |
| 21 | 1.34366 | 133.352 | UNIT II UNDER WT | 5 | 28 | 32.5952 | 33.9658 | 57.2759 | 2.79927 | 54.4767 |
| 22 | 1.09277 | 87.7104 | UNIT II | 5 | 28 | 26.9894 | 28.1243 | 43.4906 | 0 | 43.4906 |
| 23 | 1.09277 | 67.0553 | UNIT II | 5 | 28 | 20.7488 | 21.6213 | 31.2601 | 0 | 31.2601 |
| 24 | 1.23981 | 48.772 | UNIT I | 3 | 28 | 12.5706 | 13.0992 | 18.9938 | 0 | 18.9938 |
| 25 | 1.23981 | 16.8611 | UNIT I | 3 | 28 | 5.49661 | 5.72774 | 5.13012 | 0 | 5.13012 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.07814

| 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 | 1.4753 | 7.76804 | UNIT II | 5 | 28 | 8.59975 | 9.27173 | 8.03399 | 0 | 8.03399 |
| 2 | 1.4753 | 21.1575 | UNIT II | 5 | 28 | 13.576 | 14.6368 | 18.1242 | 0 | 18.1242 |
| 3 | 1.4753 | 35.8244 | UNIT II | 5 | 28 | 19.2124 | 20.7137 | 29.5533 | 0 | 29.5533 |
| 4 | 1.4753 | 49.0588 | UNIT II | 5 | 28 | 23.7595 | 25.6161 | 38.7733 | 0 | 38.7733 |
| 5 | 1.34366 | 55.7306 | UNIT II UNDER WT | 5 | 28 | 23.2077 | 25.0212 | 39.9441 | 2.28979 | 37.6543 |
| 6 | 1.34366 | 63.1704 | UNIT II UNDER WT | 5 | 28 | 67.8861 | 73.1907 | 134.844 | 6.59655 | 128.248 |
| 7 | 1.34366 | 69.7956 | UNIT II UNDER WT | 5 | 28 | 38.3871 | 41.3867 | 78.7933 | 10.36 | 68.4333 |
| 8 | 1.34366 | 109.457 | UNIT II UNDER WT | 5 | 28 | 15.1669 | 16.352 | 34.9333 | 13.5832 | 21.3501 |
| 9 | 1.34366 | 116.916 | UNIT II UNDER WT | 5 | 28 | 110.075 | 118.676 | 230.061 | 16.2661 | 213.795 |
| 10 | 1.34366 | 141.876 | UNIT II UNDER WT | 5 | 28 | 34.155 | 36.8239 | 78.2574 | 18.4054 | 59.852 |
| 11 | 1.34366 | 166.781 | UNIT II UNDER WT | 5 | 28 | 10.4207 | 11.235 | 31.5875 | 19.8613 | 11.7262 |
| 12 | 1.34366 | 179.796 | UNIT II UNDER WT | 5 | 28 | 24.5734 | 26.4936 | 61.4804 | 21.0568 | 40.4236 |
| 13 | 1.34366 | 185.941 | UNIT II UNDER WT | 5 | 28 | 31.2895 | 33.7345 | 75.7252 | 21.6831 | 54.0421 |
| 14 | 1.34366 | 184.821 | UNIT II UNDER WT | 5 | 28 | 35.8873 | 38.6915 | 85.0867 | 21.7224 | 63.3643 |
| 15 | 1.34366 | 179.387 | UNIT II UNDER WT | 5 | 28 | 46.6235 | 50.2667 | 106.287 | 21.1524 | 85.1345 |
| 16 | 1.34366 | 172.97 | UNIT II UNDER WT | 5 | 28 | 43.5594 | 46.9631 | 98.8664 | 19.9452 | 78.9212 |
| 17 | 1.34366 | 163.579 | UNIT II UNDER WT | 5 | 28 | 51.0104 | 54.9964 | 112.096 | 18.0661 | 94.0295 |
| 18 | 1.34366 | 159.264 | UNIT II UNDER WT | 5 | 28 | 50.7126 | 54.6753 | 108.898 | 15.4724 | 93.4255 |
| 19 | 1.34366 | 161.267 | UNIT II UNDER WT | 5 | 28 | 24.169 | 26.0576 | 51.7144 | 12.1107 | 39.6037 |
| 20 | 1.34366 | 158.307 | UNIT II UNDER WT | 5 | 28 | 21.6673 | 23.3604 | 42.4454 | 7.91456 | 34.5309 |
| 21 | 1.34366 | 133.352 | UNIT II UNDER WT | 5 | 28 | 32.5215 | 35.0627 | 59.339 | 2.79927 | 56.5397 |
| 22 | 1.09277 | 87.7104 | UNIT II | 5 | 28 | 29.0472 | 31.317 | 49.4952 | 0 | 49.4952 |
| 23 | 1.09277 | 67.0553 | UNIT II | 5 | 28 | 22.3619 | 24.1093 | 35.9394 | 0 | 35.9394 |
| 24 | 1.23981 | 48.772 | UNIT I | 3 | 28 | 13.7628 | 14.8382 | 22.2644 | 0 | 22.2644 |
| 25 | 1.23981 | 16.8611 | UNIT I | 3 | 28 | 5.74846 | 6.19764 | 6.01387 | 0 | 6.01387 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.03618

| 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 | 1.04094 | 5.79519 | UNIT II | 5 | 28 | 8.5591 | 8.86877 | 7.2761 | 0 | 7.2761 |
| 2 | 1.04094 | 16.0415 | UNIT II | 5 | 28 | 13.735 | 14.232 | 17.3628 | 0 | 17.3628 |
| 3 | 1.04094 | 25.2494 | UNIT II | 5 | 28 | 18.6157 | 19.2892 | 26.874 | 0 | 26.874 |
| 4 | 1.04094 | 33.9249 | UNIT II | 5 | 28 | 22.9308 | 23.7604 | 35.2832 | 0 | 35.2832 |
| 5 | 1.15524 | 46.9857 | UNIT II UNDER WT | 5 | 28 | 24.7577 | 25.6534 | 41.1799 | 2.33642 | 38.8435 |
| 6 | 1.15524 | 53.3792 | UNIT II UNDER WT | 5 | 28 | 44.5061 | 46.1163 | 84.0573 | 6.72873 | 77.3285 |
| 7 | 1.15524 | 61.2886 | UNIT II UNDER WT | 5 | 28 | 35.3064 | 36.5838 | 69.9657 | 10.5654 | 59.4003 |
| 8 | 1.15524 | 95.7337 | UNIT II UNDER WT | 5 | 28 | 29.0639 | 30.1154 | 61.09 | 13.8548 | 47.2352 |
| 9 | 1.15524 | 98.3805 | UNIT II UNDER WT | 5 | 28 | 69.3536 | 71.8628 | 142.352 | 16.6011 | 125.751 |
| 10 | 1.15524 | 117.023 | UNIT II UNDER WT | 5 | 28 | 48.1482 | 49.8902 | 103.231 | 18.8039 | 84.4266 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 1.15524 | 137.069 | UNIT II UNDER WT | 5 | 28 | 44.0119 | 45.6042 | 96.8238 | 20.4587 | 76.3651 |
| 12 | 1.15524 | 151.667 | UNIT II UNDER WT | 5 | 28 | 40.2172 | 41.6723 | 90.4501 | 21.4792 | 68.9709 |
| 13 | 1.15524 | 158.56 | UNIT II UNDER WT | 5 | 28 | 48.9841 | 50.7563 | 108.206 | 22.151 | 86.0554 |
| 14 | 1.15524 | 161.588 | UNIT II UNDER WT | 5 | 28 | 43.3124 | 44.8794 | 97.2382 | 22.2362 | 75.002 |
| 15 | 1.15524 | 158.975 | UNIT II UNDER WT | 5 | 28 | 43.9314 | 45.5208 | 97.9182 | 21.7093 | 76.2089 |
| 16 | 1.15524 | 153.137 | UNIT II UNDER WT | 5 | 28 | 48.6726 | 50.4336 | 105.985 | 20.5367 | 85.4481 |
| 17 | 1.15524 | 146.467 | UNIT II UNDER WT | 5 | 28 | 40.7273 | 42.2008 | 88.6401 | 18.6757 | 69.9644 |
| 18 | 1.15524 | 136.971 | UNIT II UNDER WT | 5 | 28 | 40.276 | 41.7332 | 85.1565 | 16.071 | 69.0855 |
| 19 | 1.15524 | 127.279 | UNIT II UNDER WT | 5 | 28 | 40.3476 | 41.8074 | 81.8756 | 12.6512 | 69.2244 |
| 20 | 1.15524 | 121.28 | UNIT II UNDER WT | 5 | 28 | 34.622 | 35.8746 | 66.3892 | 8.32252 | 58.0666 |
| 21 | 1.15524 | 117.74 | UNIT II UNDER WT | 5 | 28 | 24.9249 | 25.8267 | 42.1281 | 2.95879 | 39.1693 |
| 22 | 1.02931 | 97.4521 | UNIT II | 5 | 28 | 22.4713 | 23.2843 | 34.3878 | 0 | 34.3878 |
| 23 | 1.02931 | 75.9888 | UNIT II | 5 | 28 | 20.9507 | 21.7087 | 31.4245 | 0 | 31.4245 |
| 24 | 1.15013 | 55.6228 | UNIT I | 3 | 28 | 12.5122 | 12.9649 | 18.7412 | 0 | 18.7412 |
| 25 | 1.15013 | 19.6177 | UNIT I | 3 | 28 | 5.61745 | 5.82069 | 5.30494 | 0 | 5.30494 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.08475

| 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 | 1.22652 | 5.25738 | UNIT II | 5 | 28 | 8.13035 | 8.8194 | 7.18325 | 0 | 7.18325 |
| 2 | 1.22652 | 15.7582 | UNIT II | 5 | 28 | 13.4243 | 14.562 | 17.9835 | 0 | 17.9835 |
| 3 | 1.22652 | 24.2437 | UNIT II | 5 | 28 | 18.0686 | 19.5999 | 27.4584 | 0 | 27.4584 |
| 4 | 1.22652 | 34.2705 | UNIT II | 5 | 28 | 23.4762 | 25.4658 | 38.4906 | 0 | 38.4906 |
| 5 | 1.22652 | 43.0984 | UNIT II | 5 | 28 | 28.2086 | 30.5993 | 48.1452 | 0 | 48.1452 |
| 6 | 1.39636 | 59.3177 | UNIT II UNDER WT | 5 | 28 | 31.1572 | 33.7978 | 56.548 | 2.38723 | 54.1607 |
| 7 | 1.39636 | 68.4991 | UNIT II UNDER WT | 5 | 28 | 31.691 | 34.3768 | 62.1085 | 6.85878 | 55.2498 |
| 8 | 1.39636 | 73.3218 | UNIT II UNDER WT | 5 | 28 | 41.1471 | 44.6343 | 85.2687 | 10.7272 | 74.5415 |
| 9 | 1.39636 | 110.298 | UNIT II UNDER WT | 5 | 28 | 40.821 | 44.2806 | 87.872 | 13.9958 | 73.8762 |
| 10 | 1.39636 | 118.996 | UNIT II UNDER WT | 5 | 28 | 39.4943 | 42.8414 | 87.8335 | 16.664 | 71.1695 |
| 11 | 1.39636 | 144.884 | UNIT II UNDER WT | 5 | 28 | 43.5041 | 47.1911 | 98.0772 | 18.7272 | 79.35 |
| 12 | 1.39636 | 171.876 | UNIT II UNDER WT | 5 | 28 | 47.3261 | 51.337 | 107.324 | 20.1766 | 87.1475 |
| 13 | 1.39636 | 186.149 | UNIT II UNDER WT | 5 | 28 | 47.1404 | 51.1355 | 107.786 | 21.0175 | 86.7685 |
| 14 | 1.39636 | 192.14 | UNIT II UNDER WT | 5 | 28 | 44.8989 | 48.7041 | 103.569 | 21.3737 | 82.1954 |
| 15 | 1.39636 | 190.144 | UNIT II UNDER WT | 5 | 28 | 41.2816 | 44.7802 | 95.8812 | 21.0659 | 74.8153 |
| 16 | 1.39636 | 183.065 | UNIT II UNDER WT | 5 | 28 | 37.375 | 40.5425 | 86.9098 | 20.0639 | 66.8459 |
| 17 | 1.39636 | 174.587 | UNIT II UNDER WT | 5 | 28 | 34.1938 | 37.0917 | 78.6852 | 18.3298 | 60.3554 |
| 18 | 1.39636 | 163.2 | UNIT II UNDER WT | 5 | 28 | 31.3442 | 34.0006 | 70.358 | 15.8159 | 54.5421 |
| 19 | 1.39636 | 157.893 | UNIT II UNDER WT | 5 | 28 | 30.7649 | 33.3722 | 65.8223 | 12.4623 | 53.36 |
| 20 | 1.39636 | 159.338 | UNIT II UNDER WT | 5 | 28 | 32.3737 | 35.1174 | 64.8352 | 8.19271 | 56.6425 |
| 21 | 1.39636 | 147.49 | UNIT II UNDER WT | 5 | 28 | 31.7615 | 34.4533 | 58.303 | 2.90913 | 55.3938 |
| 22 | 1.18287 | 101.067 | UNIT II | 5 | 28 | 26.9548 | 29.2392 | 45.5874 | 0 | 45.5874 |
| 23 | 1.18287 | 76.5856 | UNIT II | 5 | 28 | 21.0288 | 22.811 | 33.4976 | 0 | 33.4976 |
| 24 | 1.25546 | 51.7095 | UNIT I | 3 | 28 | 13.1076 | 14.2185 | 21.099 | 0 | 21.099 |
| 25 | 1.25546 | 17.9165 | UNIT I | 3 | 28 | 5.63591 | 6.11355 | 5.85575 | 0 | 5.85575 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

## External Boundary

| X | Y |
|---|---|
| 13.291 | 7.18104 |
| 13.2484 | 7.15374 |
| 13.2017 | 7.13399 |
| 13.1524 | 7.12236 |
| 13.1019 | 7.11917 |
| 13.0515 | 7.12451 |
| 13.0028 | 7.13824 |
| 12.9532 | 7.16181 |
| 12.932 | 7.17578 |
| 12.9064 | 7.19655 |
| 12.8845 | 7.21846 |
| 12.8627 | 7.24586 |
| 12.8587 | 7.42036 |
| 12.8334 | 7.45725 |
| 12.2064 | 7.41964 |
| 12.2037 | 7.36919 |
| 12.2098 | 7.33997 |
| 12.2084 | 7.24233 |
| 12.2094 | 7.20458 |
| 12.213 | 7.12119 |
| 12.2172 | 7.0821 |
| 12.2175 | 7.06797 |
| 12.2237 | 6.7447 |
| 12.2237 | 6.73133 |
| 12.2291 | 6.41223 |
| 12.2291 | 6.4021 |
| 12.2291 | 6.36602 |
| 12.2368 | 6.08724 |
| 12.2368 | 6.07782 |
| 12.2368 | 6.0236 |
| 12.2366 | 6.02355 |
| 11.9085 | 5.94224 |
| 11.8339 | 5.93791 |
| 11.7565 | 5.92998 |
| 11.5778 | 5.90617 |
| 11.2683 | 5.85792 |
| 11.121 | 5.87315 |
| 10.7096 | 5.80715 |
| 9.86652 | 5.76146 |
| 9.18594 | 5.68024 |
| 8.79485 | 5.58378 |
| 7.05121 | 5.30975 |
| 6.72302 | 5.27274 |
| 5.64857 | 5.14047 |
| 5.29473 | 5.11377 |
| 4.72058 | 5.00032 |
| 4.27996 | 4.99365 |
| 3.82599 | 5.01368 |
| 3.08494 | 4.98031 |
| 2.13693 | 4.92692 |
| 1.35581 | 4.92025 |
| 0.246468 | 4.88611 |
| 0.246468 | 1.46395 |
| 0.246468 | -1.486 |
| 0.246468 | -4.15932 |

| | |
|---|---|
| 0.246468 | -5.39951 |
| 55.0767 | -5.39951 |
| 55.0767 | 11.186 |
| 55.0767 | 17.606 |
| 55.0767 | 19.3593 |
| 55.0767 | 20.7296 |
| 55.0767 | 21.5622 |
| 55.0767 | 23.3646 |
| 55.0767 | 26.0247 |
| 54.4584 | 25.8393 |
| 53.5618 | 25.4685 |
| 52.9744 | 24.7577 |
| 52.387 | 24.047 |
| 51.9851 | 23.2435 |
| 51.4905 | 22.3782 |
| 50.6249 | 21.1112 |
| 50.0375 | 20.3695 |
| 49.3883 | 19.9678 |
| 48.3371 | 19.3189 |
| 46.9348 | 18.4738 |
| 46.5963 | 18.197 |
| 46.0426 | 17.6743 |
| 45.2735 | 17.1207 |
| 42.619 | 15.4475 |
| 41.5004 | 14.3584 |
| 40.9932 | 14.0474 |
| 28.6564 | 14.5032 |
| 28.4404 | 14.3519 |
| 27.9984 | 13.9017 |
| 27.1243 | 13.3297 |
| 26.6199 | 13.0337 |
| 26.1665 | 12.7746 |
| 25.3511 | 12.4823 |
| 25.084 | 12.4178 |
| 24.588 | 12.31 |
| 23.9236 | 12.2596 |
| 23.0163 | 12.0764 |
| 21.8624 | 11.8547 |
| 21.1904 | 11.7256 |
| 20.6568 | 11.6923 |
| 20.3595 | 11.6738 |
| 19.4411 | 11.318 |
| 17.296 | 10.487 |
| 17.0867 | 10.3106 |
| 16.4941 | 9.811 |
| 15.9007 | 9.3108 |
| 15.3078 | 8.811 |
| 14.7147 | 8.3111 |
| 14.1218 | 7.8113 |
| 13.5288 | 7.3114 |
| 13.4289 | 7.22714 |

## Material Boundary

| X | Y |
|---|---|
| 12.2291 | 6.41223 |
| 12.3008 | 6.41721 |
| 12.578 | 6.4141 |

### Material Boundary

| X | Y |
|---|---|
| 12.8627 | 7.24586 |
| 12.885 | 7.09757 |
| 12.885 | 7.08304 |
| 12.885 | 7.042 |
| 12.885 | 6.86356 |
| 12.8841 | 6.81105 |
| 12.8832 | 6.76234 |
| 12.8836 | 6.74889 |
| 12.8925 | 6.4141 |
| 12.8925 | 6.4021 |
| 12.8959 | 6.3106 |
| 12.9005 | 6.18615 |
| 12.8959 | 6.0921 |

### Material Boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 13.4052 | 6.3106 |
| 13.9047 | 6.3106 |
| 13.9047 | 6.81105 |
| 14.4072 | 6.81105 |
| 14.4072 | 7.3114 |
| 14.907 | 7.3114 |
| 14.907 | 7.8113 |
| 15.4072 | 7.8113 |
| 15.4072 | 8.3111 |
| 15.907 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 12.2357 | 5.7619 |
| 12.8857 | 5.75977 |
| 12.8882 | 5.83842 |
| 12.8959 | 6.07782 |
| 12.8959 | 6.0921 |

### Material Boundary

| X | Y |
|---|---|
| 13.4052 | 6.3106 |
| 13.4181 | 6.81105 |
| 13.4289 | 7.22714 |

### Material Boundary

| X | Y |
|---|---|
| 12.2237 | 6.7447 |
| 12.5345 | 6.75446 |

### Material Boundary

| X | Y |
|---|---|

| | |
|---|---|
| 0.246468 | -1.486 |
| 14.9068 | 2.35863 |
| 31.5166 | 8.03863 |
| 40.9932 | 10.5286 |
| 51.5928 | 16.7299 |
| 55.0767 | 20.7296 |

### Material Boundary

| X | Y |
|---|---|
| 0.246468 | -4.15932 |
| 55.0767 | 11.186 |

### Material Boundary

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |

### Material Boundary

| X | Y |
|---|---|
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

### Material Boundary

| X | Y |
|---|---|
| 18.0906 | 7.53452 |
| 18.742 | 7.7233 |
| 31.5166 | 11.4256 |
| 40.9932 | 12.4986 |

### Material Boundary

| X | Y |
|---|---|
| 51.3789 | 18.6028 |
| 55.0767 | 23.3646 |

### Material Boundary

| X | Y |
|---|---|
| 12.2172 | 7.0821 |
| 12.2784 | 7.08498 |
| 12.3072 | 7.08633 |
| 12.5047 | 7.09561 |

### Material Boundary

| X | Y |
|---|---|
| 12.5047 | 7.09561 |
| 12.6979 | 7.09757 |
| 12.885 | 7.09757 |

### Material Boundary

| | |
|---|---|

| X | Y |
|---|---|
| 12.5345 | 6.75446 |
| 12.8832 | 6.76234 |

### Material Boundary

| X | Y |
|---|---|
| 12.578 | 6.4141 |
| 12.8925 | 6.4141 |

### Material Boundary

| X | Y |
|---|---|
| 12.8882 | 5.83842 |
| 13.4052 | 5.83641 |

### Material Boundary

| X | Y |
|---|---|
| 12.2368 | 6.07782 |
| 12.8959 | 6.07782 |

### Material Boundary

| X | Y |
|---|---|
| 12.2368 | 6.08724 |
| 12.8959 | 6.0921 |

### Material Boundary

| X | Y |
|---|---|
| 12.2291 | 6.4021 |
| 12.8925 | 6.4021 |

### Material Boundary

| X | Y |
|---|---|
| 12.2237 | 6.73133 |
| 12.8836 | 6.74889 |

### Material Boundary

| X | Y |
|---|---|
| 12.2175 | 7.06797 |
| 12.885 | 7.08304 |

### Material Boundary

| X | Y |
|---|---|
| 12.2357 | 5.7619 |
| 12.2366 | 6.02355 |

### Material Boundary

| X | Y |
|---|---|
| 15.907 | 5.83641 |
| 15.907 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 15.907 | 5.83641 |
| 15.9074 | 5.83641 |
| 16.9071 | 5.83641 |

### Material Boundary

| X | Y |
|---|---|
| 15.9074 | 5.83641 |
| 16.9071 | 6.84674 |
| 17.2805 | 7.22412 |
| 18.298 | 8.2524 |
| 20.3347 | 10.3108 |
| 21.8624 | 11.8547 |

### Material Boundary

| X | Y |
|---|---|
| 17.2805 | 7.22412 |
| 18.0906 | 7.53452 |

### Material Boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 15.907 | 8.811 |
| 16.4071 | 8.811 |
| 16.4071 | 9.3108 |
| 16.9071 | 9.31084 |
| 16.9071 | 9.811 |
| 17.407 | 9.811 |
| 17.407 | 10.3106 |
| 17.9068 | 10.3108 |
| 17.9068 | 9.31092 |
| 17.9068 | 8.3111 |
| 16.9071 | 8.3111 |
| 15.907 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 17.9068 | 10.3108 |
| 20.3347 | 10.3108 |

### Material Boundary

| X | Y |
|---|---|
| 12.8959 | 6.3106 |
| 13.4052 | 6.3106 |

### Material Boundary

| X | Y |
|---|---|
| 12.8841 | 6.81105 |
| 13.4181 | 6.81105 |
| 13.9047 | 6.81105 |

### Material Boundary

| X | Y |
|---|---|
| 13.5288 | 7.3114 |
| 14.4072 | 7.3114 |

### Material Boundary

| X | Y |
|---|---|
| 14.1218 | 7.8113 |
| 14.907 | 7.8113 |

### Material Boundary

| X | Y |
|---|---|
| 14.7147 | 8.3111 |
| 15.4072 | 8.3111 |

### Material Boundary

| X | Y |
|---|---|
| 15.3078 | 8.811 |
| 15.907 | 8.811 |

### Material Boundary

| X | Y |
|---|---|
| 15.9007 | 9.3108 |
| 16.4071 | 9.3108 |

### Material Boundary

| X | Y |
|---|---|
| 16.4941 | 9.811 |
| 16.9071 | 9.811 |

### Material Boundary

| X | Y |
|---|---|
| 17.0867 | 10.3106 |
| 17.407 | 10.3106 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S48 + GABIONS ST fullroad lim
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 15/5/2021, 22:33:46

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |

| Property | GRAVEL | SW |
|---|---|---|
| Color | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19 |
| Cohesion [kPa] | 0 | 1 |
| Friction Angle [deg] | 36 | 35 |
| Water Surface | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated |

## Global Minimums

### Method: ordinary/fellenius

FS: 1.310540
Center: 23.898, 15.123
Radius: 3.292
Left Slip Surface Endpoint: 23.493, 11.856
Right Slip Surface Endpoint: 27.084, 14.291
Resisting Moment=119.639 kN-m
Driving Moment=91.2897 kN-m

### Method: bishop simplified

FS: 1.402510
Center: 24.079, 15.023
Radius: 2.962
Left Slip Surface Endpoint: 23.920, 12.065
Right Slip Surface Endpoint: 26.949, 14.294
Resisting Moment=89.8893 kN-m
Driving Moment=64.0918 kN-m

### Method: janbu simplified

FS: 1.293470
Center: 23.898, 15.123
Radius: 3.292
Left Slip Surface Endpoint: 23.493, 11.856

Right Slip Surface Endpoint: 27.084, 14.291
Resisting Horizontal Force=30.4005 kN
Driving Horizontal Force=23.5031 kN

### Method: janbu corrected

FS: 1.383060
Center: 23.898, 15.123
Radius: 3.292
Left Slip Surface Endpoint: 23.493, 11.856
Right Slip Surface Endpoint: 27.084, 14.291
Resisting Horizontal Force=32.5063 kN
Driving Horizontal Force=23.5031 kN

### Method: spencer

FS: 1.398230
Center: 24.079, 15.023
Radius: 2.962
Left Slip Surface Endpoint: 23.920, 12.065
Right Slip Surface Endpoint: 26.949, 14.294
Resisting Moment=89.615 kN-m
Driving Moment=64.0918 kN-m
Resisting Horizontal Force=23.8124 kN
Driving Horizontal Force=17.0304 kN

### Method: corp of eng#1

FS: 1.441730
Center: 23.890, 16.100
Radius: 3.965
Left Slip Surface Endpoint: 24.050, 12.139
Right Slip Surface Endpoint: 27.414, 14.285
Resisting Horizontal Force=27.4281 kN
Driving Horizontal Force=19.0244 kN

### Method: corp of eng#2

FS: 1.474750
Center: 23.890, 16.100
Radius: 3.965
Left Slip Surface Endpoint: 24.050, 12.139
Right Slip Surface Endpoint: 27.414, 14.285
Resisting Horizontal Force=27.6132 kN
Driving Horizontal Force=18.724 kN

### Method: lowe-karafiath

FS: 1.424830
Center: 24.079, 15.023
Radius: 2.962
Left Slip Surface Endpoint: 23.920, 12.065
Right Slip Surface Endpoint: 26.949, 14.294
Resisting Horizontal Force=23.9669 kN
Driving Horizontal Force=16.8209 kN

### Method: gle/morgenstern-price

FS: 1.395420
Center: 24.079, 15.023
Radius: 2.962
Left Slip Surface Endpoint: 23.920, 12.065
Right Slip Surface Endpoint: 26.949, 14.294
Resisting Moment=89.4353 kN-m
Driving Moment=64.0918 kN-m
Resisting Horizontal Force=23.818 kN
Driving Horizontal Force=17.0686 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 8947
Number of Invalid Surfaces: 1053

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 9 surfaces
Error Code -105 reported for 28 surfaces
Error Code -106 reported for 112 surfaces
Error Code -107 reported for 28 surfaces
Error Code -108 reported for 175 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 695 surfaces
Error Code -123 reported for 4 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 8901
Number of Invalid Surfaces: 1099

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 9 surfaces
Error Code -105 reported for 28 surfaces
Error Code -106 reported for 112 surfaces
Error Code -107 reported for 28 surfaces
Error Code -108 reported for 178 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 43 surfaces
Error Code -114 reported for 695 surfaces
Error Code -123 reported for 4 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 8620
Number of Invalid Surfaces: 1380

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 9 surfaces
Error Code -105 reported for 28 surfaces
Error Code -106 reported for 112 surfaces
Error Code -107 reported for 28 surfaces
Error Code -108 reported for 490 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 12 surfaces
Error Code -114 reported for 695 surfaces
Error Code -123 reported for 4 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 8620
Number of Invalid Surfaces: 1380

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 9 surfaces
Error Code -105 reported for 28 surfaces
Error Code -106 reported for 112 surfaces
Error Code -107 reported for 28 surfaces
Error Code -108 reported for 490 surfaces

Error Code -109 reported for 1 surface
Error Code -112 reported for 12 surfaces
Error Code -114 reported for 695 surfaces
Error Code -123 reported for 4 surfaces

## Method: spencer

Number of Valid Surfaces: 8499
Number of Invalid Surfaces: 1501

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 9 surfaces
Error Code -105 reported for 28 surfaces
Error Code -106 reported for 112 surfaces
Error Code -107 reported for 28 surfaces
Error Code -108 reported for 477 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 103 surfaces
Error Code -112 reported for 43 surfaces
Error Code -114 reported for 695 surfaces
Error Code -123 reported for 4 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 7603
Number of Invalid Surfaces: 2397

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 9 surfaces
Error Code -105 reported for 28 surfaces
Error Code -106 reported for 112 surfaces
Error Code -107 reported for 28 surfaces
Error Code -108 reported for 777 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 742 surfaces
Error Code -114 reported for 695 surfaces
Error Code -123 reported for 4 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 7113
Number of Invalid Surfaces: 2887

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 9 surfaces
Error Code -105 reported for 28 surfaces
Error Code -106 reported for 112 surfaces
Error Code -107 reported for 28 surfaces
Error Code -108 reported for 1563 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 444 surfaces
Error Code -112 reported for 2 surfaces
Error Code -114 reported for 695 surfaces
Error Code -123 reported for 4 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 4732
Number of Invalid Surfaces: 5268

**Error Codes:**

Error Code -101 reported for 1 surface

Error Code -103 reported for 9 surfaces
Error Code -105 reported for 28 surfaces
Error Code -106 reported for 112 surfaces
Error Code -107 reported for 28 surfaces
Error Code -108 reported for 3511 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 879 surfaces
Error Code -114 reported for 695 surfaces
Error Code -123 reported for 4 surfaces

### Method: gle/morgenstern-price

Number of Valid Surfaces: 8563
Number of Invalid Surfaces: 1437

#### Error Codes:

Error Code -101 reported for 1 surface
Error Code -103 reported for 9 surfaces
Error Code -105 reported for 28 surfaces
Error Code -106 reported for 112 surfaces
Error Code -107 reported for 28 surfaces
Error Code -108 reported for 478 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 38 surfaces
Error Code -112 reported for 43 surfaces
Error Code -114 reported for 695 surfaces
Error Code -123 reported for 4 surfaces

#### Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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.
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.31054

| 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 | 0.143654 | 0.11081 | UNIT I | 3 | 28 | 2.59887 | 3.40592 | 0.763426 | 0 | 0.763426 |
| 2 | 0.143654 | 0.32379 | UNIT I | 3 | 28 | 3.20054 | 4.19444 | 2.24642 | 0 | 2.24642 |
| 3 | 0.143654 | 0.530453 | UNIT I | 3 | 28 | 3.78698 | 4.96299 | 3.69184 | 0 | 3.69184 |
| 4 | 0.143654 | 0.749729 | UNIT I | 3 | 28 | 4.40474 | 5.77259 | 5.21448 | 0 | 5.21448 |
| 5 | 0.143654 | 0.953543 | UNIT I | 3 | 28 | 4.96781 | 6.51052 | 6.60232 | 0 | 6.60232 |
| 6 | 0.143654 | 1.14009 | UNIT I | 3 | 28 | 5.46518 | 7.16234 | 7.82819 | 0 | 7.82819 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 0.143654 | 1.32493 | UNIT I | 3 | 28 | 5.93485 | 7.77786 | 8.98586 | 0 | 8.98586 |
| 8 | 0.143654 | 1.58459 | UNIT I | 3 | 28 | 6.57815 | 8.62093 | 10.5715 | 0 | 10.5715 |
| 9 | 0.143654 | 1.84108 | UNIT I | 3 | 28 | 7.16991 | 9.39645 | 12.03 | 0 | 12.03 |
| 10 | 0.143654 | 2.07873 | UNIT I | 3 | 28 | 7.66183 | 10.0411 | 13.2424 | 0 | 13.2424 |
| 11 | 0.143654 | 2.29681 | UNIT I | 3 | 28 | 8.04815 | 10.5474 | 14.1947 | 0 | 14.1947 |
| 12 | 0.143654 | 2.49453 | UNIT I | 3 | 28 | 8.32449 | 10.9096 | 14.8757 | 0 | 14.8757 |
| 13 | 0.143654 | 2.68225 | UNIT I | 3 | 28 | 8.51386 | 11.1578 | 15.3425 | 0 | 15.3425 |
| 14 | 0.143654 | 2.85436 | UNIT I | 3 | 28 | 8.60072 | 11.2716 | 15.5566 | 0 | 15.5566 |
| 15 | 0.143654 | 3.00168 | UNIT I | 3 | 28 | 8.56548 | 11.2254 | 15.4697 | 0 | 15.4697 |
| 16 | 0.143654 | 3.15462 | UNIT I | 3 | 28 | 8.47187 | 11.1027 | 15.239 | 0 | 15.239 |
| 17 | 0.143654 | 3.35537 | UNIT I | 3 | 28 | 8.38943 | 10.9947 | 15.0358 | 0 | 15.0358 |
| 18 | 0.143654 | 3.52611 | UNIT I | 3 | 28 | 8.16169 | 10.6962 | 14.4745 | 0 | 14.4745 |
| 19 | 0.143654 | 3.65225 | UNIT I | 3 | 28 | 7.77489 | 10.1893 | 13.5211 | 0 | 13.5211 |
| 20 | 0.143654 | 3.6592 | UNIT I | 3 | 28 | 7.14764 | 9.36727 | 11.9751 | 0 | 11.9751 |
| 21 | 0.143654 | 3.46515 | UNIT I | 3 | 28 | 6.2484 | 8.18878 | 9.7587 | 0 | 9.7587 |
| 22 | 0.143654 | 2.95131 | UNIT I | 3 | 28 | 5.08245 | 6.66075 | 6.88489 | 0 | 6.88489 |
| 23 | 0.143654 | 2.33903 | UNIT I | 3 | 28 | 4.01802 | 5.26577 | 4.26127 | 0 | 4.26127 |
| 24 | 0.143654 | 1.59022 | UNIT I | 3 | 28 | 3.11609 | 4.08376 | 2.03826 | 0 | 2.03826 |
| 25 | 0.143654 | 0.587057 | UNIT I | 3 | 28 | 2.45725 | 3.22032 | 0.414361 | 0 | 0.414361 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.40251

| 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 | 0.121169 | 0.0842778 | UNIT I | 3 | 28 | 2.43316 | 3.41254 | 0.775866 | 0 | 0.775866 |
| 2 | 0.121169 | 0.247124 | UNIT I | 3 | 28 | 2.90355 | 4.07226 | 2.01664 | 0 | 2.01664 |
| 3 | 0.121169 | 0.398545 | UNIT I | 3 | 28 | 3.32448 | 4.66262 | 3.12693 | 0 | 3.12693 |
| 4 | 0.121169 | 0.538502 | UNIT I | 3 | 28 | 3.69775 | 5.18613 | 4.11152 | 0 | 4.11152 |
| 5 | 0.121169 | 0.697139 | UNIT I | 3 | 28 | 4.11492 | 5.77121 | 5.21188 | 0 | 5.21188 |
| 6 | 0.121169 | 0.900406 | UNIT I | 3 | 28 | 4.64961 | 6.52113 | 6.62229 | 0 | 6.62229 |
| 7 | 0.121169 | 1.093 | UNIT I | 3 | 28 | 5.13592 | 7.20318 | 7.90503 | 0 | 7.90503 |
| 8 | 0.121169 | 1.27334 | UNIT I | 3 | 28 | 5.57053 | 7.81272 | 9.05142 | 0 | 9.05142 |
| 9 | 0.121169 | 1.44107 | UNIT I | 3 | 28 | 5.95358 | 8.34995 | 10.0618 | 0 | 10.0618 |
| 10 | 0.121169 | 1.59569 | UNIT I | 3 | 28 | 6.28482 | 8.81452 | 10.9355 | 0 | 10.9355 |
| 11 | 0.121169 | 1.73801 | UNIT I | 3 | 28 | 6.56732 | 9.21073 | 11.6807 | 0 | 11.6807 |
| 12 | 0.121169 | 1.87614 | UNIT I | 3 | 28 | 6.82339 | 9.56987 | 12.3561 | 0 | 12.3561 |
| 13 | 0.121169 | 2.00113 | UNIT I | 3 | 28 | 7.02886 | 9.85804 | 12.8981 | 0 | 12.8981 |
| 14 | 0.121169 | 2.10983 | UNIT I | 3 | 28 | 7.17591 | 10.0643 | 13.286 | 0 | 13.286 |
| 15 | 0.121169 | 2.20943 | UNIT I | 3 | 28 | 7.28312 | 10.2146 | 13.5688 | 0 | 13.5688 |
| 16 | 0.121169 | 2.35022 | UNIT I | 3 | 28 | 7.47337 | 10.4815 | 14.0706 | 0 | 14.0706 |
| 17 | 0.121169 | 2.48158 | UNIT I | 3 | 28 | 7.61456 | 10.6795 | 14.4431 | 0 | 14.4431 |
| 18 | 0.121169 | 2.58903 | UNIT I | 3 | 28 | 7.66973 | 10.7569 | 14.5885 | 0 | 14.5885 |
| 19 | 0.121169 | 2.66247 | UNIT I | 3 | 28 | 7.61427 | 10.6791 | 14.4423 | 0 | 14.4423 |
| 20 | 0.121169 | 2.64957 | UNIT I | 3 | 28 | 7.33205 | 10.2833 | 13.6979 | 0 | 13.6979 |
| 21 | 0.121169 | 2.53782 | UNIT I | 3 | 28 | 6.8069 | 9.54675 | 12.3127 | 0 | 12.3127 |
| 22 | 0.121169 | 2.17381 | UNIT I | 3 | 28 | 5.74514 | 8.05761 | 9.51197 | 0 | 9.51197 |
| 23 | 0.121169 | 1.7206 | UNIT I | 3 | 28 | 4.52889 | 6.35182 | 6.30387 | 0 | 6.30387 |
| 24 | 0.121169 | 1.16813 | UNIT I | 3 | 28 | 3.17353 | 4.45091 | 2.72876 | 0 | 2.72876 |
| 25 | 0.121169 | 0.430779 | UNIT I | 3 | 28 | 1.61212 | 2.26101 | -1.38984 | 0 | -1.38984 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.29347

| 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 | 0.143654 | 0.11081 | UNIT I | 3 | 28 | 2.75202 | 3.55966 | 1.05257 | 0 | 1.05257 |
| 2 | 0.143654 | 0.32379 | UNIT I | 3 | 28 | 3.3252 | 4.30105 | 2.44692 | 0 | 2.44692 |
| 3 | 0.143654 | 0.530453 | UNIT I | 3 | 28 | 3.85982 | 4.99256 | 3.74746 | 0 | 3.74746 |
| 4 | 0.143654 | 0.749729 | UNIT I | 3 | 28 | 4.41121 | 5.70577 | 5.08881 | 0 | 5.08881 |
| 5 | 0.143654 | 0.953543 | UNIT I | 3 | 28 | 4.90007 | 6.3381 | 6.27805 | 0 | 6.27805 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 0.143654 | 1.14009 | UNIT I | 3 | 28 | 5.32407 | 6.88653 | 7.30953 | 0 | 7.30953 |
| 7 | 0.143654 | 1.32493 | UNIT I | 3 | 28 | 5.72748 | 7.40833 | 8.29085 | 0 | 8.29085 |
| 8 | 0.143654 | 1.58459 | UNIT I | 3 | 28 | 6.31203 | 8.16442 | 9.71288 | 0 | 9.71288 |
| 9 | 0.143654 | 1.84108 | UNIT I | 3 | 28 | 6.86505 | 8.87973 | 11.0582 | 0 | 11.0582 |
| 10 | 0.143654 | 2.07873 | UNIT I | 3 | 28 | 7.34653 | 9.50251 | 12.2295 | 0 | 12.2295 |
| 11 | 0.143654 | 2.29681 | UNIT I | 3 | 28 | 7.75636 | 10.0326 | 13.2264 | 0 | 13.2264 |
| 12 | 0.143654 | 2.49453 | UNIT I | 3 | 28 | 8.09417 | 10.4696 | 14.0482 | 0 | 14.0482 |
| 13 | 0.143654 | 2.68225 | UNIT I | 3 | 28 | 8.38616 | 10.8472 | 14.7585 | 0 | 14.7585 |
| 14 | 0.143654 | 2.85436 | UNIT I | 3 | 28 | 8.61855 | 11.1478 | 15.3238 | 0 | 15.3238 |
| 15 | 0.143654 | 3.00168 | UNIT I | 3 | 28 | 8.77011 | 11.3439 | 15.6926 | 0 | 15.6926 |
| 16 | 0.143654 | 3.15462 | UNIT I | 3 | 28 | 8.90991 | 11.5247 | 16.0327 | 0 | 16.0327 |
| 17 | 0.143654 | 3.35537 | UNIT I | 3 | 28 | 9.12543 | 11.8035 | 16.5569 | 0 | 16.5569 |
| 18 | 0.143654 | 3.52611 | UNIT I | 3 | 28 | 9.23679 | 11.9475 | 16.8278 | 0 | 16.8278 |
| 19 | 0.143654 | 3.65225 | UNIT I | 3 | 28 | 9.21155 | 11.9149 | 16.7664 | 0 | 16.7664 |
| 20 | 0.143654 | 3.6592 | UNIT I | 3 | 28 | 8.89968 | 11.5115 | 16.0078 | 0 | 16.0078 |
| 21 | 0.143654 | 3.46515 | UNIT I | 3 | 28 | 8.15908 | 10.5535 | 14.2061 | 0 | 14.2061 |
| 22 | 0.143654 | 2.95131 | UNIT I | 3 | 28 | 6.81304 | 8.81246 | 10.9316 | 0 | 10.9316 |
| 23 | 0.143654 | 2.33903 | UNIT I | 3 | 28 | 5.32781 | 6.89136 | 7.31858 | 0 | 7.31858 |
| 24 | 0.143654 | 1.59022 | UNIT I | 3 | 28 | 3.68002 | 4.76 | 3.31007 | 0 | 3.31007 |
| 25 | 0.143654 | 0.587057 | UNIT I | 3 | 28 | 1.79672 | 2.324 | -1.27137 | 0 | -1.27137 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.38306

| 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 | 0.143654 | 0.11081 | UNIT I | 3 | 28 | 2.57376 | 3.55966 | 1.05257 | 0 | 1.05257 |
| 2 | 0.143654 | 0.32379 | UNIT I | 3 | 28 | 3.10981 | 4.30105 | 2.44692 | 0 | 2.44692 |
| 3 | 0.143654 | 0.530453 | UNIT I | 3 | 28 | 3.60979 | 4.99256 | 3.74746 | 0 | 3.74746 |
| 4 | 0.143654 | 0.749729 | UNIT I | 3 | 28 | 4.12547 | 5.70577 | 5.08881 | 0 | 5.08881 |
| 5 | 0.143654 | 0.953543 | UNIT I | 3 | 28 | 4.58266 | 6.3381 | 6.27805 | 0 | 6.27805 |
| 6 | 0.143654 | 1.14009 | UNIT I | 3 | 28 | 4.9792 | 6.88653 | 7.30953 | 0 | 7.30953 |
| 7 | 0.143654 | 1.32493 | UNIT I | 3 | 28 | 5.35648 | 7.40833 | 8.29085 | 0 | 8.29085 |
| 8 | 0.143654 | 1.58459 | UNIT I | 3 | 28 | 5.90316 | 8.16442 | 9.71288 | 0 | 9.71288 |
| 9 | 0.143654 | 1.84108 | UNIT I | 3 | 28 | 6.42035 | 8.87973 | 11.0582 | 0 | 11.0582 |
| 10 | 0.143654 | 2.07873 | UNIT I | 3 | 28 | 6.87064 | 9.50251 | 12.2295 | 0 | 12.2295 |
| 11 | 0.143654 | 2.29681 | UNIT I | 3 | 28 | 7.25393 | 10.0326 | 13.2264 | 0 | 13.2264 |
| 12 | 0.143654 | 2.49453 | UNIT I | 3 | 28 | 7.56986 | 10.4696 | 14.0482 | 0 | 14.0482 |
| 13 | 0.143654 | 2.68225 | UNIT I | 3 | 28 | 7.84294 | 10.8472 | 14.7585 | 0 | 14.7585 |
| 14 | 0.143654 | 2.85436 | UNIT I | 3 | 28 | 8.06026 | 11.1478 | 15.3238 | 0 | 15.3238 |
| 15 | 0.143654 | 3.00168 | UNIT I | 3 | 28 | 8.20201 | 11.3439 | 15.6926 | 0 | 15.6926 |
| 16 | 0.143654 | 3.15462 | UNIT I | 3 | 28 | 8.33275 | 11.5247 | 16.0327 | 0 | 16.0327 |
| 17 | 0.143654 | 3.35537 | UNIT I | 3 | 28 | 8.53432 | 11.8035 | 16.5569 | 0 | 16.5569 |
| 18 | 0.143654 | 3.52611 | UNIT I | 3 | 28 | 8.63846 | 11.9475 | 16.8278 | 0 | 16.8278 |
| 19 | 0.143654 | 3.65225 | UNIT I | 3 | 28 | 8.61485 | 11.9149 | 16.7664 | 0 | 16.7664 |
| 20 | 0.143654 | 3.6592 | UNIT I | 3 | 28 | 8.32319 | 11.5115 | 16.0078 | 0 | 16.0078 |
| 21 | 0.143654 | 3.46515 | UNIT I | 3 | 28 | 7.63057 | 10.5535 | 14.2061 | 0 | 14.2061 |
| 22 | 0.143654 | 2.95131 | UNIT I | 3 | 28 | 6.37171 | 8.81246 | 10.9316 | 0 | 10.9316 |
| 23 | 0.143654 | 2.33903 | UNIT I | 3 | 28 | 4.98269 | 6.89136 | 7.31858 | 0 | 7.31858 |
| 24 | 0.143654 | 1.59022 | UNIT I | 3 | 28 | 3.44164 | 4.76 | 3.31007 | 0 | 3.31007 |
| 25 | 0.143654 | 0.587057 | UNIT I | 3 | 28 | 1.68033 | 2.324 | -1.27137 | 0 | -1.27137 |

**Global Minimum Query (spencer) - Safety Factor**: 1.39823

| 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 | 0.121169 | 0.0842778 | UNIT I | 3 | 28 | 3.11262 | 4.35216 | 2.54305 | 0 | 2.54305 |
| 2 | 0.121169 | 0.247124 | UNIT I | 3 | 28 | 3.6638 | 5.12284 | 3.99248 | 0 | 3.99248 |
| 3 | 0.121169 | 0.398545 | UNIT I | 3 | 28 | 4.12203 | 5.76354 | 5.19746 | 0 | 5.19746 |
| 4 | 0.121169 | 0.538502 | UNIT I | 3 | 28 | 4.49849 | 6.28992 | 6.18743 | 0 | 6.18743 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 0.121169 | 0.697139 | UNIT I | 3 | 28 | 4.9058 | 6.85944 | 7.25855 | 0 | 7.25855 |
| 6 | 0.121169 | 0.900406 | UNIT I | 3 | 28 | 5.42411 | 7.58416 | 8.62153 | 0 | 8.62153 |
| 7 | 0.121169 | 1.093 | UNIT I | 3 | 28 | 5.86361 | 8.19868 | 9.77726 | 0 | 9.77726 |
| 8 | 0.121169 | 1.27334 | UNIT I | 3 | 28 | 6.2264 | 8.70594 | 10.7313 | 0 | 10.7313 |
| 9 | 0.121169 | 1.44107 | UNIT I | 3 | 28 | 6.5177 | 9.11324 | 11.4973 | 0 | 11.4973 |
| 10 | 0.121169 | 1.59569 | UNIT I | 3 | 28 | 6.74164 | 9.42637 | 12.0862 | 0 | 12.0862 |
| 11 | 0.121169 | 1.73801 | UNIT I | 3 | 28 | 6.90516 | 9.655 | 12.5163 | 0 | 12.5163 |
| 12 | 0.121169 | 1.87614 | UNIT I | 3 | 28 | 7.03306 | 9.83384 | 12.8526 | 0 | 12.8526 |
| 13 | 0.121169 | 2.00113 | UNIT I | 3 | 28 | 7.10393 | 9.93293 | 13.0389 | 0 | 13.0389 |
| 14 | 0.121169 | 2.10983 | UNIT I | 3 | 28 | 7.11339 | 9.94615 | 13.0638 | 0 | 13.0638 |
| 15 | 0.121169 | 2.20943 | UNIT I | 3 | 28 | 7.0812 | 9.90115 | 12.9792 | 0 | 12.9792 |
| 16 | 0.121169 | 2.35022 | UNIT I | 3 | 28 | 7.11655 | 9.95058 | 13.0721 | 0 | 13.0721 |
| 17 | 0.121169 | 2.48158 | UNIT I | 3 | 28 | 7.09988 | 9.92726 | 13.0283 | 0 | 13.0283 |
| 18 | 0.121169 | 2.58903 | UNIT I | 3 | 28 | 7.00225 | 9.79076 | 12.7716 | 0 | 12.7716 |
| 19 | 0.121169 | 2.66247 | UNIT I | 3 | 28 | 6.80793 | 9.51905 | 12.2605 | 0 | 12.2605 |
| 20 | 0.121169 | 2.64957 | UNIT I | 3 | 28 | 6.43209 | 8.99354 | 11.2722 | 0 | 11.2722 |
| 21 | 0.121169 | 2.53782 | UNIT I | 3 | 28 | 5.87777 | 8.21848 | 9.81454 | 0 | 9.81454 |
| 22 | 0.121169 | 2.17381 | UNIT I | 3 | 28 | 4.95123 | 6.92296 | 7.37803 | 0 | 7.37803 |
| 23 | 0.121169 | 1.7206 | UNIT I | 3 | 28 | 3.96785 | 5.54796 | 4.79204 | 0 | 4.79204 |
| 24 | 0.121169 | 1.16813 | UNIT I | 3 | 28 | 2.96313 | 4.14314 | 2.14993 | 0 | 2.14993 |
| 25 | 0.121169 | 0.430779 | UNIT I | 3 | 28 | 2.01956 | 2.82381 | -0.331365 | 0 | -0.331365 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.44173

| 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 | 0.134572 | 0.0883673 | UNIT I | 3 | 28 | 2.89903 | 4.17962 | 2.21854 | 0 | 2.21854 |
| 2 | 0.134572 | 0.259212 | UNIT I | 3 | 28 | 3.38504 | 4.88031 | 3.53634 | 0 | 3.53634 |
| 3 | 0.134572 | 0.42061 | UNIT I | 3 | 28 | 3.80425 | 5.4847 | 4.67304 | 0 | 4.67304 |
| 4 | 0.134572 | 0.642212 | UNIT I | 3 | 28 | 4.36843 | 6.29809 | 6.2028 | 0 | 6.2028 |
| 5 | 0.134572 | 0.88549 | UNIT I | 3 | 28 | 4.95051 | 7.1373 | 7.78116 | 0 | 7.78116 |
| 6 | 0.134572 | 1.11639 | UNIT I | 3 | 28 | 5.4531 | 7.8619 | 9.14388 | 0 | 9.14388 |
| 7 | 0.134572 | 1.33463 | UNIT I | 3 | 28 | 5.88172 | 8.47985 | 10.3061 | 0 | 10.3061 |
| 8 | 0.134572 | 1.53988 | UNIT I | 3 | 28 | 6.24115 | 8.99806 | 11.2807 | 0 | 11.2807 |
| 9 | 0.134572 | 1.73352 | UNIT I | 3 | 28 | 6.54 | 9.42892 | 12.091 | 0 | 12.091 |
| 10 | 0.134572 | 1.92587 | UNIT I | 3 | 28 | 6.80698 | 9.81383 | 12.815 | 0 | 12.815 |
| 11 | 0.134572 | 2.1062 | UNIT I | 3 | 28 | 7.01879 | 10.1192 | 13.3893 | 0 | 13.3893 |
| 12 | 0.134572 | 2.27141 | UNIT I | 3 | 28 | 7.17226 | 10.3405 | 13.8054 | 0 | 13.8054 |
| 13 | 0.134572 | 2.45854 | UNIT I | 3 | 28 | 7.34996 | 10.5967 | 14.2873 | 0 | 14.2873 |
| 14 | 0.134572 | 2.68972 | UNIT I | 3 | 28 | 7.59187 | 10.9454 | 14.9432 | 0 | 14.9432 |
| 15 | 0.134572 | 2.90373 | UNIT I | 3 | 28 | 7.76778 | 11.199 | 15.4202 | 0 | 15.4202 |
| 16 | 0.134572 | 3.09581 | UNIT I | 3 | 28 | 7.87273 | 11.3504 | 15.7048 | 0 | 15.7048 |
| 17 | 0.134572 | 3.20564 | UNIT I | 3 | 28 | 7.80239 | 11.2489 | 15.514 | 0 | 15.514 |
| 18 | 0.134572 | 3.20808 | UNIT I | 3 | 28 | 7.53099 | 10.8577 | 14.7781 | 0 | 14.7781 |
| 19 | 0.134572 | 2.93457 | UNIT I | 3 | 28 | 6.80151 | 9.80594 | 12.8001 | 0 | 12.8001 |
| 20 | 0.134572 | 2.60401 | UNIT I | 3 | 28 | 6.02061 | 8.68009 | 10.6827 | 0 | 10.6827 |
| 21 | 0.134572 | 2.2408 | UNIT I | 3 | 28 | 5.23581 | 7.54862 | 8.55468 | 0 | 8.55468 |
| 22 | 0.134572 | 1.83946 | UNIT I | 3 | 28 | 4.44422 | 6.40736 | 6.40828 | 0 | 6.40828 |
| 23 | 0.134572 | 1.39242 | UNIT I | 3 | 28 | 3.64103 | 5.24938 | 4.23048 | 0 | 4.23048 |
| 24 | 0.134572 | 0.888564 | UNIT I | 3 | 28 | 2.81777 | 4.06246 | 1.99819 | 0 | 1.99819 |
| 25 | 0.134572 | 0.310382 | UNIT I | 3 | 28 | 1.9724 | 2.84367 | -0.29401 | 0 | -0.29401 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.47475

| 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 | 0.134572 | 0.0883673 | UNIT I | 3 | 28 | 2.75803 | 4.0674 | 2.00748 | 0 | 2.00748 |
| 2 | 0.134572 | 0.259212 | UNIT I | 3 | 28 | 3.30006 | 4.86677 | 3.51089 | 0 | 3.51089 |
| 3 | 0.134572 | 0.42061 | UNIT I | 3 | 28 | 4.23653 | 6.24782 | 6.10826 | 0 | 6.10826 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 0.134572 | 0.642212 | UNIT I | 3 | 28 | 5.04757 | 7.4439 | 8.35772 | 0 | 8.35772 |
| 5 | 0.134572 | 0.88549 | UNIT I | 3 | 28 | 5.14521 | 7.5879 | 8.62858 | 0 | 8.62858 |
| 6 | 0.134572 | 1.11639 | UNIT I | 3 | 28 | 5.61075 | 8.27446 | 9.9198 | 0 | 9.9198 |
| 7 | 0.134572 | 1.33463 | UNIT I | 3 | 28 | 5.99583 | 8.84235 | 10.9879 | 0 | 10.9879 |
| 8 | 0.134572 | 1.53988 | UNIT I | 3 | 28 | 6.40474 | 9.44539 | 12.122 | 0 | 12.122 |
| 9 | 0.134572 | 1.73352 | UNIT I | 3 | 28 | 6.78387 | 10.0045 | 13.1736 | 0 | 13.1736 |
| 10 | 0.134572 | 1.92587 | UNIT I | 3 | 28 | 6.91289 | 10.1948 | 13.5314 | 0 | 13.5314 |
| 11 | 0.134572 | 2.1062 | UNIT I | 3 | 28 | 6.95449 | 10.2561 | 13.6468 | 0 | 13.6468 |
| 12 | 0.134572 | 2.27141 | UNIT I | 3 | 28 | 8.1332 | 11.9944 | 16.9161 | 0 | 16.9161 |
| 13 | 0.134572 | 2.45854 | UNIT I | 3 | 28 | 8.30891 | 12.2536 | 17.4034 | 0 | 17.4034 |
| 14 | 0.134572 | 2.68972 | UNIT I | 3 | 28 | 7.41187 | 10.9307 | 14.9154 | 0 | 14.9154 |
| 15 | 0.134572 | 2.90373 | UNIT I | 3 | 28 | 7.12382 | 10.5058 | 14.1165 | 0 | 14.1165 |
| 16 | 0.134572 | 3.09581 | UNIT I | 3 | 28 | 6.58229 | 9.70723 | 12.6145 | 0 | 12.6145 |
| 17 | 0.134572 | 3.20564 | UNIT I | 3 | 28 | 5.30477 | 7.82321 | 9.07113 | 0 | 9.07113 |
| 18 | 0.134572 | 3.20808 | UNIT I | 3 | 28 | 5.00538 | 7.38169 | 8.24075 | 0 | 8.24075 |
| 19 | 0.134572 | 2.93457 | UNIT I | 3 | 28 | 6.33851 | 9.34772 | 11.9383 | 0 | 11.9383 |
| 20 | 0.134572 | 2.60401 | UNIT I | 3 | 28 | 6.66895 | 9.83503 | 12.8548 | 0 | 12.8548 |
| 21 | 0.134572 | 2.2408 | UNIT I | 3 | 28 | 5.79276 | 8.54287 | 10.4246 | 0 | 10.4246 |
| 22 | 0.134572 | 1.83946 | UNIT I | 3 | 28 | 4.86566 | 7.17563 | 7.85322 | 0 | 7.85322 |
| 23 | 0.134572 | 1.39242 | UNIT I | 3 | 28 | 3.88292 | 5.72633 | 5.12748 | 0 | 5.12748 |
| 24 | 0.134572 | 0.888564 | UNIT I | 3 | 28 | 2.83915 | 4.18704 | 2.23251 | 0 | 2.23251 |
| 25 | 0.134572 | 0.310382 | UNIT I | 3 | 28 | 1.72937 | 2.55039 | -0.84559 | 0 | -0.84559 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.42483

| 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 | 0.121169 | 0.0842778 | UNIT I | 3 | 28 | 2.65906 | 3.7887 | 1.48334 | 0 | 1.48334 |
| 2 | 0.121169 | 0.247124 | UNIT I | 3 | 28 | 3.21297 | 4.57794 | 2.96768 | 0 | 2.96768 |
| 3 | 0.121169 | 0.398545 | UNIT I | 3 | 28 | 3.7092 | 5.28498 | 4.29741 | 0 | 4.29741 |
| 4 | 0.121169 | 0.538502 | UNIT I | 3 | 28 | 4.42047 | 6.29842 | 6.20343 | 0 | 6.20343 |
| 5 | 0.121169 | 0.697139 | UNIT I | 3 | 28 | 5.09693 | 7.26226 | 8.01614 | 0 | 8.01614 |
| 6 | 0.121169 | 0.900406 | UNIT I | 3 | 28 | 5.4655 | 7.78741 | 9.00383 | 0 | 9.00383 |
| 7 | 0.121169 | 1.093 | UNIT I | 3 | 28 | 5.91649 | 8.42999 | 10.2123 | 0 | 10.2123 |
| 8 | 0.121169 | 1.27334 | UNIT I | 3 | 28 | 6.34669 | 9.04296 | 11.3651 | 0 | 11.3651 |
| 9 | 0.121169 | 1.44107 | UNIT I | 3 | 28 | 6.69493 | 9.53913 | 12.2983 | 0 | 12.2983 |
| 10 | 0.121169 | 1.59569 | UNIT I | 3 | 28 | 7.00784 | 9.98498 | 13.1369 | 0 | 13.1369 |
| 11 | 0.121169 | 1.73801 | UNIT I | 3 | 28 | 7.2604 | 10.3448 | 13.8136 | 0 | 13.8136 |
| 12 | 0.121169 | 1.87614 | UNIT I | 3 | 28 | 7.3526 | 10.4762 | 14.0607 | 0 | 14.0607 |
| 13 | 0.121169 | 2.00113 | UNIT I | 3 | 28 | 7.35162 | 10.4748 | 14.0581 | 0 | 14.0581 |
| 14 | 0.121169 | 2.10983 | UNIT I | 3 | 28 | 7.59204 | 10.8174 | 14.7024 | 0 | 14.7024 |
| 15 | 0.121169 | 2.20943 | UNIT I | 3 | 28 | 7.7489 | 11.0409 | 15.1227 | 0 | 15.1227 |
| 16 | 0.121169 | 2.35022 | UNIT I | 3 | 28 | 7.41332 | 10.5627 | 14.2234 | 0 | 14.2234 |
| 17 | 0.121169 | 2.48158 | UNIT I | 3 | 28 | 7.02905 | 10.0152 | 13.1937 | 0 | 13.1937 |
| 18 | 0.121169 | 2.58903 | UNIT I | 3 | 28 | 6.64495 | 9.46793 | 12.1644 | 0 | 12.1644 |
| 19 | 0.121169 | 2.66247 | UNIT I | 3 | 28 | 6.13064 | 8.73512 | 10.7862 | 0 | 10.7862 |
| 20 | 0.121169 | 2.64957 | UNIT I | 3 | 28 | 5.24422 | 7.47212 | 8.41083 | 0 | 8.41083 |
| 21 | 0.121169 | 2.53782 | UNIT I | 3 | 28 | 4.93102 | 7.02586 | 7.57156 | 0 | 7.57156 |
| 22 | 0.121169 | 2.17381 | UNIT I | 3 | 28 | 4.76182 | 6.78479 | 7.11817 | 0 | 7.11817 |
| 23 | 0.121169 | 1.7206 | UNIT I | 3 | 28 | 3.84819 | 5.48301 | 4.66986 | 0 | 4.66986 |
| 24 | 0.121169 | 1.16813 | UNIT I | 3 | 28 | 2.81323 | 4.00837 | 1.89646 | 0 | 1.89646 |
| 25 | 0.121169 | 0.430779 | UNIT I | 3 | 28 | 2.16972 | 3.09148 | 0.172053 | 0 | 0.172053 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.39542

| 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 | 0.121169 | 0.0842778 | UNIT I | 3 | 28 | 2.52434 | 3.52251 | 0.982696 | 0 | 0.982696 |
| 2 | 0.121169 | 0.247124 | UNIT I | 3 | 28 | 3.18455 | 4.44379 | 2.71538 | 0 | 2.71538 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 0.121169 | 0.398545 | UNIT I | 3 | 28 | 3.81836 | 5.32822 | 4.37875 | 0 | 4.37875 |
| 4 | 0.121169 | 0.538502 | UNIT I | 3 | 28 | 4.39786 | 6.13686 | 5.89958 | 0 | 5.89958 |
| 5 | 0.121169 | 0.697139 | UNIT I | 3 | 28 | 4.99737 | 6.97343 | 7.47294 | 0 | 7.47294 |
| 6 | 0.121169 | 0.900406 | UNIT I | 3 | 28 | 5.67743 | 7.9224 | 9.25767 | 0 | 9.25767 |
| 7 | 0.121169 | 1.093 | UNIT I | 3 | 28 | 6.23832 | 8.70508 | 10.7297 | 0 | 10.7297 |
| 8 | 0.121169 | 1.27334 | UNIT I | 3 | 28 | 6.66557 | 9.30127 | 11.851 | 0 | 11.851 |
| 9 | 0.121169 | 1.44107 | UNIT I | 3 | 28 | 6.95904 | 9.71079 | 12.6211 | 0 | 12.6211 |
| 10 | 0.121169 | 1.59569 | UNIT I | 3 | 28 | 7.12772 | 9.94617 | 13.0638 | 0 | 13.0638 |
| 11 | 0.121169 | 1.73801 | UNIT I | 3 | 28 | 7.19115 | 10.0347 | 13.2303 | 0 | 13.2303 |
| 12 | 0.121169 | 1.87614 | UNIT I | 3 | 28 | 7.19152 | 10.0352 | 13.2313 | 0 | 13.2313 |
| 13 | 0.121169 | 2.00113 | UNIT I | 3 | 28 | 7.12655 | 9.94453 | 13.0608 | 0 | 13.0608 |
| 14 | 0.121169 | 2.10983 | UNIT I | 3 | 28 | 7.01036 | 9.78239 | 12.7558 | 0 | 12.7558 |
| 15 | 0.121169 | 2.20943 | UNIT I | 3 | 28 | 6.87802 | 9.59773 | 12.4085 | 0 | 12.4085 |
| 16 | 0.121169 | 2.35022 | UNIT I | 3 | 28 | 6.84979 | 9.55833 | 12.3344 | 0 | 12.3344 |
| 17 | 0.121169 | 2.48158 | UNIT I | 3 | 28 | 6.81677 | 9.51226 | 12.2478 | 0 | 12.2478 |
| 18 | 0.121169 | 2.58903 | UNIT I | 3 | 28 | 6.75557 | 9.42686 | 12.0872 | 0 | 12.0872 |
| 19 | 0.121169 | 2.66247 | UNIT I | 3 | 28 | 6.65165 | 9.28185 | 11.8144 | 0 | 11.8144 |
| 20 | 0.121169 | 2.64957 | UNIT I | 3 | 28 | 6.41155 | 8.9468 | 11.1843 | 0 | 11.1843 |
| 21 | 0.121169 | 2.53782 | UNIT I | 3 | 28 | 6.02117 | 8.40206 | 10.1598 | 0 | 10.1598 |
| 22 | 0.121169 | 2.17381 | UNIT I | 3 | 28 | 5.21786 | 7.2811 | 8.05155 | 0 | 8.05155 |
| 23 | 0.121169 | 1.7206 | UNIT I | 3 | 28 | 4.28559 | 5.9802 | 5.60494 | 0 | 5.60494 |
| 24 | 0.121169 | 1.16813 | UNIT I | 3 | 28 | 3.1763 | 4.43227 | 2.6937 | 0 | 2.6937 |
| 25 | 0.121169 | 0.430779 | UNIT I | 3 | 28 | 1.69282 | 2.36219 | -1.19954 | 0 | -1.19954 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -5.17248 | 1.262 |
| 40.982 | 12.5067 |
| 48.4804 | 16.8997 |

### External Boundary

| X | Y |
|---|---|
| 7.0471 | 7.37 |
| 6.65347 | 7.1722 |
| 6.64126 | 7.03314 |
| 6.59548 | 6.97972 |
| 6.43139 | 6.88651 |
| 6.22983 | 6.98289 |
| 6.20082 | 7.08159 |
| 6.18801 | 7.23842 |
| 6.16065 | 7.27376 |
| 5.26106 | 7.18753 |
| 5.26127 | 7.137 |
| 5.26906 | 7.1082 |
| 5.27338 | 7.01064 |
| 5.27667 | 6.97302 |
| 5.28509 | 6.88998 |
| 5.30936 | 6.84551 |
| 5.30827 | 6.82804 |
| 5.30584 | 6.78939 |
| 5.31363 | 6.76058 |
| 5.31795 | 6.66302 |
| 5.32124 | 6.6254 |

| | |
|---|---|
| 5.32967 | 6.54237 |
| 5.34448 | 6.50821 |
| 5.37396 | 6.50326 |
| 5.37032 | 6.49139 |
| 5.3391 | 6.38946 |
| 5.31847 | 6.20899 |
| 5.31944 | 6.19675 |
| 5.34169 | 5.9151 |
| 5.31738 | 5.90787 |
| 4.37578 | 5.62795 |
| 2.84443 | 5.31101 |
| 2.05801 | 5.19007 |
| 1.21108 | 5.00866 |
| -0.119822 | 4.81214 |
| -3.13102 | 4.668 |
| -4.37303 | 4.67353 |
| -4.46405 | 4.67107 |
| -4.50833 | 4.60468 |
| -4.56244 | 4.58501 |
| -4.81089 | 4.58501 |
| -5.17248 | 4.57027 |
| -5.17248 | 2.74311 |
| -5.17248 | 1.262 |
| -5.17248 | -1.737 |
| -5.17248 | -4.66367 |
| -5.17248 | -5.39909 |
| 48.4804 | -5.39909 |
| 48.4804 | 9.34031 |
| 48.4804 | 14.9094 |
| 48.4804 | 16.8997 |
| 48.4804 | 19.16 |
| 48.4804 | 22.6129 |
| 47.7327 | 22.2747 |
| 47.1273 | 21.9188 |
| 46.8424 | 21.5095 |
| 45.97 | 20.9756 |
| 45.5961 | 20.3705 |
| 45.2757 | 19.4985 |
| 44.6989 | 18.3685 |
| 44.4436 | 18.1023 |
| 44.1107 | 17.4811 |
| 43.4024 | 16.5348 |
| 43.1042 | 16.0823 |
| 42.8392 | 15.8505 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 26.3931 | 14.3033 |
| 26.1708 | 14.0891 |
| 25.6822 | 13.4908 |
| 25.199 | 13.039 |
| 24.4255 | 12.3536 |
| 23.8204 | 12.0079 |
| 23.1116 | 11.6796 |
| 22.5066 | 11.455 |
| 21.9015 | 11.4031 |
| 20.9679 | 11.4377 |
| 20.2418 | 11.3167 |
| 19.0316 | 11.0748 |

| | |
|---|---|
| 17.7402 | 11.0127 |
| 17.4709 | 10.905 |
| 15.9193 | 10.7326 |
| 14.6909 | 10.6895 |
| 13.8776 | 10.6286 |
| 13.5261 | 10.6022 |

### Material Boundary

| X | Y |
|---|---|
| -5.17248 | -1.737 |
| 15.651 | 3.653 |
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |
| 48.4804 | 14.9094 |

### Material Boundary

| X | Y |
|---|---|
| -5.17248 | -4.66367 |
| 48.4804 | 9.34031 |

### Material Boundary

| X | Y |
|---|---|
| -5.17248 | 1.262 |
| 40.982 | 12.5067 |

### Material Boundary

| X | Y |
|---|---|
| 7.05478 | 6.55395 |
| 7.09425 | 6.55587 |
| 7.17214 | 6.55377 |
| 7.21749 | 6.55254 |
| 7.23249 | 6.55214 |
| 7.40399 | 6.54751 |
| 7.63002 | 6.54332 |
| 7.73202 | 6.53754 |
| 7.85185 | 6.53076 |
| 8.05278 | 6.50985 |
| 8.35414 | 6.47638 |
| 8.51739 | 6.46801 |
| 8.65969 | 6.46383 |
| 8.7476 | 6.48893 |
| 9.2187 | 6.51516 |
| 9.2976 | 6.55054 |
| 9.81226 | 6.72932 |
| 10.1768 | 6.96511 |
| 10.2379 | 7.071 |

### Material Boundary

| X | Y |
|---|---|
| 5.30936 | 6.84551 |
| 6.22222 | 6.935 |
| 6.22222 | 6.91685 |
| 6.23259 | 6.8908 |

| | |
|---|---|
| 6.25108 | 6.66437 |
| 6.25108 | 6.5848 |
| 6.20873 | 6.5766 |
| 6.12072 | 6.56712 |

### Material Boundary

| X | Y |
|---|---|
| 5.37396 | 6.50326 |
| 5.44406 | 6.52403 |
| 6.08984 | 6.56515 |
| 6.12072 | 6.56712 |

### Material Boundary

| X | Y |
|---|---|
| 6.22222 | 6.935 |
| 6.22983 | 6.98289 |

### Material Boundary

| X | Y |
|---|---|
| 5.30827 | 6.82804 |
| 6.22222 | 6.91685 |

### Material Boundary

| X | Y |
|---|---|
| 5.37032 | 6.49139 |
| 6.25593 | 6.56825 |

### Material Boundary

| X | Y |
|---|---|
| 10.2379 | 7.071 |
| 10.4127 | 7.36168 |
| 10.6915 | 7.59747 |
| 10.9257 | 7.94138 |
| 11.2016 | 8.33339 |
| 11.2812 | 8.44419 |
| 11.6029 | 8.66926 |
| 11.8746 | 8.94686 |
| 12.1205 | 9.19815 |
| 12.5682 | 9.65556 |
| 12.6055 | 9.69815 |
| 12.6931 | 9.79829 |
| 12.8699 | 10.0002 |
| 13.1927 | 10.1884 |
| 13.8776 | 10.6286 |

### Material Boundary

| X | Y |
|---|---|
| 6.71685 | 5.94959 |
| 9.2187 | 5.94959 |
| 9.2187 | 6.51516 |
| 9.2187 | 7.94138 |
| 8.71919 | 7.94138 |

| | |
|---|---|
| 8.71919 | 7.44674 |
| 8.21887 | 7.44674 |
| 8.21887 | 6.94674 |
| 7.71702 | 6.94674 |
| 7.21749 | 6.94674 |
| 7.21749 | 6.55254 |
| 7.21749 | 6.54654 |
| 7.21749 | 6.52614 |
| 7.21749 | 6.455 |
| 6.71685 | 6.455 |
| 6.71685 | 5.94959 |

### Material Boundary

| X | Y |
|---|---|
| 5.31847 | 6.20899 |
| 6.23818 | 6.2705 |

### Material Boundary

| X | Y |
|---|---|
| 5.31944 | 6.19675 |
| 6.23739 | 6.25721 |

### Material Boundary

| X | Y |
|---|---|
| 5.34169 | 5.9151 |
| 6.21903 | 5.94912 |

### Material Boundary

| X | Y |
|---|---|
| 6.21903 | 5.94912 |
| 6.23739 | 6.25721 |

### Material Boundary

| X | Y |
|---|---|
| 6.25108 | 6.5848 |
| 6.25593 | 6.56825 |

### Material Boundary

| X | Y |
|---|---|
| 6.23739 | 6.25721 |
| 6.23818 | 6.2705 |

### Material Boundary

| X | Y |
|---|---|
| 6.23818 | 6.2705 |
| 6.25593 | 6.56825 |

### Material Boundary

| X | Y |
|---|---|
| 6.25593 | 6.488 |

| | |
|---|---|
| 7.05478 | 6.55395 |

### Material Boundary

| X | Y |
|---|---|
| 9.2187 | 7.94138 |
| 9.70168 | 7.94138 |

### Material Boundary

| X | Y |
|---|---|
| 9.2187 | 5.94959 |
| 10.8156 | 7.55366 |
| 11.2016 | 7.94138 |
| 11.46 | 8.201 |
| 12.2025 | 8.94686 |
| 13.1927 | 9.94144 |
| 13.7377 | 10.4889 |

### Material Boundary

| X | Y |
|---|---|
| 7.71702 | 6.94674 |
| 7.71702 | 7.44674 |
| 8.21887 | 7.44674 |

### Material Boundary

| X | Y |
|---|---|
| 13.7377 | 10.4889 |
| 13.8776 | 10.6286 |

### Material Boundary

| X | Y |
|---|---|
| 10.7022 | 8.94686 |
| 11.2016 | 8.94686 |
| 11.2016 | 8.33339 |
| 11.2016 | 7.94138 |
| 10.9257 | 7.94138 |
| 9.70168 | 7.94138 |
| 9.70168 | 8.44679 |
| 10.7022 | 8.44679 |
| 10.7022 | 8.94686 |

### Material Boundary

| X | Y |
|---|---|
| 11.2016 | 8.94686 |
| 11.8746 | 8.94686 |
| 12.2025 | 8.94686 |

### Material Boundary

| X | Y |
|---|---|
| 5.31738 | 5.90787 |
| 6.2226 | 5.9356 |
| 6.21903 | 5.94912 |

### Material Boundary

| X | Y |
|---|---|
| 6.2226 | 5.9356 |
| 6.71685 | 5.94959 |

### Material Boundary

| X | Y |
|---|---|
| 10.8156 | 7.55366 |
| 12.574 | 7.94138 |
| 31.5055 | 11.4337 |
| 40.982 | 12.5067 |
| 48.4804 | 19.16 |

### Material Boundary

| X | Y |
|---|---|
| 40.982 | 12.5067 |
| 48.4804 | 16.8997 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S48 + GABIONS RU fullroad lim
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 15/5/2021, 22:33:46

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | None | None | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |
| Ru Value | 0.2 | 0.2 | | | | | | |

| Property | GRAVEL | SW |
|---|---|---|
| Color | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19 |
| Cohesion [kPa] | 0 | 1 |
| Friction Angle [deg] | 36 | 35 |
| Water Surface | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated |

## Global Minimums

### Method: ordinary/fellenius

FS: 1.160750
Center: 24.259, 14.895
Radius: 2.936
Left Slip Surface Endpoint: 23.795, 11.996
Right Slip Surface Endpoint: 27.132, 14.290
Resisting Moment=91.7306 kN-m
Driving Moment=79.0268 kN-m

### Method: bishop simplified

FS: 1.164200
Center: 23.429, 16.022
Radius: 4.060
Left Slip Surface Endpoint: 23.748, 11.974
Right Slip Surface Endpoint: 27.101, 14.291
Resisting Moment=100.396 kN-m
Driving Moment=86.2362 kN-m

### Method: janbu simplified

FS: 1.045550
Center: 24.016, 14.642

Radius: 2.901
Left Slip Surface Endpoint: 23.391, 11.809
Right Slip Surface Endpoint: 26.896, 14.295
Resisting Horizontal Force=25.6911 kN
Driving Horizontal Force=24.572 kN

### Method: janbu corrected

FS: 1.125430
Center: 24.016, 14.642
Radius: 2.901
Left Slip Surface Endpoint: 23.391, 11.809
Right Slip Surface Endpoint: 26.896, 14.295
Resisting Horizontal Force=27.6541 kN
Driving Horizontal Force=24.572 kN

### Method: spencer

FS: 1.161700
Center: 23.429, 16.022
Radius: 4.060
Left Slip Surface Endpoint: 23.748, 11.974
Right Slip Surface Endpoint: 27.101, 14.291
Resisting Moment=100.181 kN-m
Driving Moment=86.2362 kN-m
Resisting Horizontal Force=19.9259 kN
Driving Horizontal Force=17.1523 kN

### Method: corp of eng#1

FS: 1.181720
Center: 23.429, 16.022
Radius: 4.060
Left Slip Surface Endpoint: 23.748, 11.974
Right Slip Surface Endpoint: 27.101, 14.291
Resisting Horizontal Force=20.0617 kN
Driving Horizontal Force=16.9768 kN

### Method: corp of eng#2

FS: 1.210420
Center: 23.429, 16.022
Radius: 4.060
Left Slip Surface Endpoint: 23.748, 11.974
Right Slip Surface Endpoint: 27.101, 14.291
Resisting Horizontal Force=20.279 kN
Driving Horizontal Force=16.7537 kN

### Method: lowe-karafiath

FS: 1.180810
Center: 23.429, 16.022
Radius: 4.060
Left Slip Surface Endpoint: 23.748, 11.974
Right Slip Surface Endpoint: 27.101, 14.291
Resisting Horizontal Force=20.07 kN
Driving Horizontal Force=16.9968 kN

### Method: gle/morgenstern-price

FS: 1.160610
Center: 23.429, 16.022
Radius: 4.060
Left Slip Surface Endpoint: 23.748, 11.974
Right Slip Surface Endpoint: 27.101, 14.291
Resisting Moment=100.086 kN-m
Driving Moment=86.2362 kN-m
Resisting Horizontal Force=19.9355 kN
Driving Horizontal Force=17.1767 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 8903
Number of Invalid Surfaces: 1097

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 3 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 122 surfaces
Error Code -107 reported for 21 surfaces
Error Code -108 reported for 175 surfaces
Error Code -114 reported for 734 surfaces
Error Code -123 reported for 4 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 8857
Number of Invalid Surfaces: 1143

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 3 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 122 surfaces
Error Code -107 reported for 21 surfaces
Error Code -108 reported for 177 surfaces
Error Code -112 reported for 44 surfaces
Error Code -114 reported for 734 surfaces
Error Code -123 reported for 4 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 8577
Number of Invalid Surfaces: 1423

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 3 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 122 surfaces
Error Code -107 reported for 21 surfaces
Error Code -108 reported for 487 surfaces
Error Code -112 reported for 14 surfaces
Error Code -114 reported for 734 surfaces
Error Code -123 reported for 4 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 8577
Number of Invalid Surfaces: 1423

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 3 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 122 surfaces
Error Code -107 reported for 21 surfaces
Error Code -108 reported for 487 surfaces
Error Code -112 reported for 14 surfaces
Error Code -114 reported for 734 surfaces

Error Code -123 reported for 4 surfaces

### Method: spencer

Number of Valid Surfaces: 8449
Number of Invalid Surfaces: 1551

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 3 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 122 surfaces
Error Code -107 reported for 21 surfaces
Error Code -108 reported for 483 surfaces
Error Code -111 reported for 102 surfaces
Error Code -112 reported for 44 surfaces
Error Code -114 reported for 734 surfaces
Error Code -123 reported for 4 surfaces

### Method: corp of eng#1

Number of Valid Surfaces: 7595
Number of Invalid Surfaces: 2405

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 3 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 122 surfaces
Error Code -107 reported for 21 surfaces
Error Code -108 reported for 785 surfaces
Error Code -111 reported for 698 surfaces
Error Code -114 reported for 734 surfaces
Error Code -123 reported for 4 surfaces

### Method: corp of eng#2

Number of Valid Surfaces: 7023
Number of Invalid Surfaces: 2977

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 3 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 122 surfaces
Error Code -107 reported for 21 surfaces
Error Code -108 reported for 1575 surfaces
Error Code -111 reported for 477 surfaces
Error Code -112 reported for 3 surfaces
Error Code -114 reported for 734 surfaces
Error Code -123 reported for 4 surfaces

### Method: lowe-karafiath

Number of Valid Surfaces: 4769
Number of Invalid Surfaces: 5231

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 3 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 122 surfaces
Error Code -107 reported for 21 surfaces
Error Code -108 reported for 3479 surfaces
Error Code -111 reported for 830 surfaces

Error Code -114 reported for 734 surfaces
Error Code -123 reported for 4 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 8519
Number of Invalid Surfaces: 1481

### Error Codes:

Error Code -101 reported for 1 surface
Error Code -103 reported for 3 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 122 surfaces
Error Code -107 reported for 21 surfaces
Error Code -108 reported for 470 surfaces
Error Code -111 reported for 45 surfaces
Error Code -112 reported for 44 surfaces
Error Code -114 reported for 734 surfaces
Error Code -123 reported for 4 surfaces

### Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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).
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.16075

| 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 | 0.133455 | 0.113508 | UNIT I | 3 | 28 | 2.89052 | 3.35517 | 0.838079 | 0.170106 | 0.667973 |
| 2 | 0.133455 | 0.344506 | UNIT I | 3 | 28 | 3.52289 | 4.0892 | 2.56477 | 0.516286 | 2.04849 |
| 3 | 0.133455 | 0.560561 | UNIT I | 3 | 28 | 4.12077 | 4.78318 | 4.19375 | 0.840071 | 3.35368 |
| 4 | 0.133455 | 0.761165 | UNIT I | 3 | 28 | 4.67464 | 5.42609 | 5.70351 | 1.1407 | 4.56281 |
| 5 | 0.133455 | 0.950471 | UNIT I | 3 | 28 | 5.18879 | 6.02289 | 7.10963 | 1.4244 | 5.68523 |
| 6 | 0.133455 | 1.19899 | UNIT I | 3 | 28 | 5.84897 | 6.78919 | 8.92327 | 1.79685 | 7.12642 |
| 7 | 0.133455 | 1.45973 | UNIT I | 3 | 28 | 6.51701 | 7.56462 | 10.7724 | 2.1876 | 8.58477 |
| 8 | 0.133455 | 1.70462 | UNIT I | 3 | 28 | 7.10849 | 8.25118 | 12.4306 | 2.55459 | 9.87603 |
| 9 | 0.133455 | 1.93329 | UNIT I | 3 | 28 | 7.61602 | 8.84029 | 13.8813 | 2.89728 | 10.984 |
| 10 | 0.133455 | 2.14526 | UNIT I | 3 | 28 | 8.03306 | 9.32438 | 15.1094 | 3.21494 | 11.8944 |
| 11 | 0.133455 | 2.34182 | UNIT I | 3 | 28 | 8.35874 | 9.70241 | 16.1149 | 3.50951 | 12.6054 |
| 12 | 0.133455 | 2.53267 | UNIT I | 3 | 28 | 8.61286 | 9.99738 | 16.9557 | 3.79553 | 13.1602 |
| 13 | 0.133455 | 2.70664 | UNIT I | 3 | 28 | 8.76486 | 10.1738 | 17.5482 | 4.05624 | 13.492 |
| 14 | 0.133455 | 2.86026 | UNIT I | 3 | 28 | 8.80616 | 10.2218 | 17.8686 | 4.28646 | 13.5822 |
| 15 | 0.133455 | 3.02832 | UNIT I | 3 | 28 | 8.80963 | 10.2258 | 18.128 | 4.53832 | 13.5897 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.133455 | 3.23317 | UNIT I | 3 | 28 | 8.80738 | 10.2232 | 18.4301 | 4.84532 | 13.5848 |
| 17 | 0.133455 | 3.41261 | UNIT I | 3 | 28 | 8.66704 | 10.0603 | 18.3927 | 5.11423 | 13.2785 |
| 18 | 0.133455 | 3.56066 | UNIT I | 3 | 28 | 8.38358 | 9.73124 | 17.9957 | 5.33611 | 12.6596 |
| 19 | 0.133455 | 3.61647 | UNIT I | 3 | 28 | 7.87727 | 9.14354 | 16.9741 | 5.41974 | 11.5543 |
| 20 | 0.133455 | 3.5566 | UNIT I | 3 | 28 | 7.16163 | 8.31286 | 15.3221 | 5.33002 | 9.99203 |
| 21 | 0.133455 | 3.19934 | UNIT I | 3 | 28 | 6.10012 | 7.08072 | 12.4694 | 4.79462 | 7.67473 |
| 22 | 0.133455 | 2.74378 | UNIT I | 3 | 28 | 5.05159 | 5.86363 | 9.49763 | 4.11191 | 5.38572 |
| 23 | 0.133455 | 2.20261 | UNIT I | 3 | 28 | 4.09893 | 4.75783 | 6.6069 | 3.3009 | 3.306 |
| 24 | 0.133455 | 1.52831 | UNIT I | 3 | 28 | 3.29243 | 3.82168 | 3.83575 | 2.29037 | 1.54538 |
| 25 | 0.133455 | 0.574866 | UNIT I | 3 | 28 | 2.71158 | 3.14747 | 1.13886 | 0.86151 | 0.277349 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.1642

| 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 | 0.134122 | 0.066727 | UNIT I | 3 | 28 | 2.64327 | 3.0773 | 0.244875 | 0.099502 | 0.145373 |
| 2 | 0.134122 | 0.218128 | UNIT I | 3 | 28 | 2.99439 | 3.48607 | 1.23943 | 0.325269 | 0.914164 |
| 3 | 0.134122 | 0.36331 | UNIT I | 3 | 28 | 3.31908 | 3.86408 | 2.16686 | 0.541762 | 1.62509 |
| 4 | 0.134122 | 0.496737 | UNIT I | 3 | 28 | 3.60428 | 4.1961 | 2.99027 | 0.740726 | 2.24954 |
| 5 | 0.134122 | 0.618193 | UNIT I | 3 | 28 | 3.85072 | 4.48301 | 3.71097 | 0.921838 | 2.78913 |
| 6 | 0.134122 | 0.775929 | UNIT I | 3 | 28 | 4.17667 | 4.86248 | 4.65986 | 1.15705 | 3.50281 |
| 7 | 0.134122 | 0.980116 | UNIT I | 3 | 28 | 4.60232 | 5.35802 | 5.89633 | 1.46153 | 4.4348 |
| 8 | 0.134122 | 1.1715 | UNIT I | 3 | 28 | 4.98297 | 5.80117 | 7.01516 | 1.74693 | 5.26823 |
| 9 | 0.134122 | 1.34951 | UNIT I | 3 | 28 | 5.31829 | 6.19155 | 8.01478 | 2.01236 | 6.00242 |
| 10 | 0.134122 | 1.51359 | UNIT I | 3 | 28 | 5.60806 | 6.5289 | 8.89395 | 2.25704 | 6.63691 |
| 11 | 0.134122 | 1.66342 | UNIT I | 3 | 28 | 5.85247 | 6.81345 | 9.6525 | 2.48047 | 7.17203 |
| 12 | 0.134122 | 1.80884 | UNIT I | 3 | 28 | 6.07413 | 7.0715 | 10.3547 | 2.69732 | 7.6574 |
| 13 | 0.134122 | 1.94374 | UNIT I | 3 | 28 | 6.2594 | 7.28719 | 10.9615 | 2.89846 | 8.06303 |
| 14 | 0.134122 | 2.06149 | UNIT I | 3 | 28 | 6.3944 | 7.44436 | 11.4327 | 3.07405 | 8.35864 |
| 15 | 0.134122 | 2.17753 | UNIT I | 3 | 28 | 6.51215 | 7.58145 | 11.8635 | 3.24709 | 8.61646 |
| 16 | 0.134122 | 2.34731 | UNIT I | 3 | 28 | 6.7246 | 7.82878 | 12.5819 | 3.50026 | 9.08161 |
| 17 | 0.134122 | 2.50423 | UNIT I | 3 | 28 | 6.8896 | 8.02087 | 13.1772 | 3.73427 | 9.4429 |
| 18 | 0.134122 | 2.6374 | UNIT I | 3 | 28 | 6.98492 | 8.13184 | 13.5844 | 3.93285 | 9.65159 |
| 19 | 0.134122 | 2.70495 | UNIT I | 3 | 28 | 6.93118 | 8.06928 | 13.5675 | 4.03358 | 9.53395 |
| 20 | 0.134122 | 2.67959 | UNIT I | 3 | 28 | 6.68444 | 7.78203 | 12.9894 | 3.99575 | 8.9937 |
| 21 | 0.134122 | 2.38428 | UNIT I | 3 | 28 | 5.9406 | 6.91605 | 10.9204 | 3.55539 | 7.36503 |
| 22 | 0.134122 | 1.96121 | UNIT I | 3 | 28 | 4.99249 | 5.81226 | 8.21362 | 2.92452 | 5.2891 |
| 23 | 0.134122 | 1.48864 | UNIT I | 3 | 28 | 3.99705 | 4.65337 | 5.32937 | 2.21984 | 3.10953 |
| 24 | 0.134122 | 0.953431 | UNIT I | 3 | 28 | 2.95072 | 3.43523 | 2.24029 | 1.42174 | 0.818547 |
| 25 | 0.134122 | 0.334085 | UNIT I | 3 | 28 | 1.85096 | 2.15489 | -1.09123 | 0.498181 | -1.58942 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.04555

| 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 | 0.140207 | 0.122925 | UNIT I | 3 | 28 | 3.5811 | 3.74422 | 1.57503 | 0.175348 | 1.39968 |
| 2 | 0.140207 | 0.35935 | UNIT I | 3 | 28 | 4.22237 | 4.4147 | 3.17326 | 0.512601 | 2.66066 |
| 3 | 0.140207 | 0.577124 | UNIT I | 3 | 28 | 4.77493 | 4.99243 | 4.57047 | 0.823248 | 3.74722 |
| 4 | 0.140207 | 0.794317 | UNIT I | 3 | 28 | 5.29923 | 5.54061 | 5.91126 | 1.13307 | 4.77819 |
| 5 | 0.140207 | 1.01588 | UNIT I | 3 | 28 | 5.8112 | 6.0759 | 7.23403 | 1.44911 | 5.78492 |
| 6 | 0.140207 | 1.21943 | UNIT I | 3 | 28 | 6.24762 | 6.5322 | 8.38255 | 1.73948 | 6.64307 |
| 7 | 0.140207 | 1.40484 | UNIT I | 3 | 28 | 6.6123 | 6.91349 | 9.36419 | 2.00396 | 7.36023 |
| 8 | 0.140207 | 1.5947 | UNIT I | 3 | 28 | 6.96982 | 7.2873 | 10.338 | 2.27478 | 8.06322 |
| 9 | 0.140207 | 1.85235 | UNIT I | 3 | 28 | 7.48593 | 7.82691 | 11.7204 | 2.64231 | 9.07811 |
| 10 | 0.140207 | 2.0992 | UNIT I | 3 | 28 | 7.94526 | 8.30717 | 12.9758 | 2.99444 | 9.98136 |
| 11 | 0.140207 | 2.32623 | UNIT I | 3 | 28 | 8.32634 | 8.7056 | 14.0489 | 3.3183 | 10.7306 |
| 12 | 0.140207 | 2.53258 | UNIT I | 3 | 28 | 8.6294 | 9.02247 | 14.9393 | 3.61264 | 11.3266 |
| 13 | 0.140207 | 2.71726 | UNIT I | 3 | 28 | 8.85411 | 9.25741 | 15.6445 | 3.87608 | 11.7685 |
| 14 | 0.140207 | 2.88965 | UNIT I | 3 | 28 | 9.02394 | 9.43498 | 16.2244 | 4.12198 | 12.1024 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 0.140207 | 3.04443 | UNIT I | 3 | 28 | 9.1262 | 9.5419 | 16.6463 | 4.34278 | 12.3036 |
| 16 | 0.140207 | 3.17208 | UNIT I | 3 | 28 | 9.13952 | 9.55582 | 16.8546 | 4.52487 | 12.3297 |
| 17 | 0.140207 | 3.29323 | UNIT I | 3 | 28 | 9.10839 | 9.52328 | 16.9662 | 4.69768 | 12.2685 |
| 18 | 0.140207 | 3.45884 | UNIT I | 3 | 28 | 9.13246 | 9.54844 | 17.2498 | 4.93392 | 12.3159 |
| 19 | 0.140207 | 3.59172 | UNIT I | 3 | 28 | 9.03978 | 9.45154 | 17.2571 | 5.12346 | 12.1336 |
| 20 | 0.140207 | 3.67687 | UNIT I | 3 | 28 | 8.79659 | 9.19727 | 16.9003 | 5.24494 | 11.6553 |
| 21 | 0.140207 | 3.64232 | UNIT I | 3 | 28 | 8.26781 | 8.64441 | 15.8113 | 5.19565 | 10.6156 |
| 22 | 0.140207 | 3.43693 | UNIT I | 3 | 28 | 7.37796 | 7.71403 | 13.7685 | 4.90266 | 8.8658 |
| 23 | 0.140207 | 2.85493 | UNIT I | 3 | 28 | 5.83827 | 6.1042 | 9.91061 | 4.07246 | 5.83815 |
| 24 | 0.140207 | 2.06898 | UNIT I | 3 | 28 | 4.01155 | 4.19428 | 5.19743 | 2.95133 | 2.2461 |
| 25 | 0.140207 | 0.810327 | UNIT I | 3 | 28 | 1.63272 | 1.70709 | -1.2757 | 1.1559 | -2.4316 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.12543

| 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 | 0.140207 | 0.122925 | UNIT I | 3 | 28 | 3.32693 | 3.74422 | 1.57503 | 0.175348 | 1.39968 |
| 2 | 0.140207 | 0.35935 | UNIT I | 3 | 28 | 3.92268 | 4.4147 | 3.17326 | 0.512601 | 2.66066 |
| 3 | 0.140207 | 0.577124 | UNIT I | 3 | 28 | 4.43602 | 4.99243 | 4.57047 | 0.823248 | 3.74722 |
| 4 | 0.140207 | 0.794317 | UNIT I | 3 | 28 | 4.9231 | 5.54061 | 5.91126 | 1.13307 | 4.77819 |
| 5 | 0.140207 | 1.01588 | UNIT I | 3 | 28 | 5.39874 | 6.0759 | 7.23403 | 1.44911 | 5.78492 |
| 6 | 0.140207 | 1.21943 | UNIT I | 3 | 28 | 5.80418 | 6.5322 | 8.38255 | 1.73948 | 6.64307 |
| 7 | 0.140207 | 1.40484 | UNIT I | 3 | 28 | 6.14298 | 6.91349 | 9.36419 | 2.00396 | 7.36023 |
| 8 | 0.140207 | 1.5947 | UNIT I | 3 | 28 | 6.47513 | 7.2873 | 10.338 | 2.27478 | 8.06322 |
| 9 | 0.140207 | 1.85235 | UNIT I | 3 | 28 | 6.9546 | 7.82691 | 11.7204 | 2.64231 | 9.07811 |
| 10 | 0.140207 | 2.0992 | UNIT I | 3 | 28 | 7.38133 | 8.30717 | 12.9758 | 2.99444 | 9.98136 |
| 11 | 0.140207 | 2.32623 | UNIT I | 3 | 28 | 7.73535 | 8.7056 | 14.0489 | 3.3183 | 10.7306 |
| 12 | 0.140207 | 2.53258 | UNIT I | 3 | 28 | 8.01691 | 9.02247 | 14.9393 | 3.61264 | 11.3266 |
| 13 | 0.140207 | 2.71726 | UNIT I | 3 | 28 | 8.22566 | 9.25741 | 15.6445 | 3.87608 | 11.7685 |
| 14 | 0.140207 | 2.88965 | UNIT I | 3 | 28 | 8.38344 | 9.43498 | 16.2244 | 4.12198 | 12.1024 |
| 15 | 0.140207 | 3.04443 | UNIT I | 3 | 28 | 8.47845 | 9.5419 | 16.6463 | 4.34278 | 12.3036 |
| 16 | 0.140207 | 3.17208 | UNIT I | 3 | 28 | 8.49082 | 9.55582 | 16.8546 | 4.52487 | 12.3297 |
| 17 | 0.140207 | 3.29323 | UNIT I | 3 | 28 | 8.4619 | 9.52328 | 16.9662 | 4.69768 | 12.2685 |
| 18 | 0.140207 | 3.45884 | UNIT I | 3 | 28 | 8.48426 | 9.54844 | 17.2498 | 4.93392 | 12.3159 |
| 19 | 0.140207 | 3.59172 | UNIT I | 3 | 28 | 8.39816 | 9.45154 | 17.2571 | 5.12346 | 12.1336 |
| 20 | 0.140207 | 3.67687 | UNIT I | 3 | 28 | 8.17223 | 9.19727 | 16.9003 | 5.24494 | 11.6553 |
| 21 | 0.140207 | 3.64232 | UNIT I | 3 | 28 | 7.68098 | 8.64441 | 15.8113 | 5.19565 | 10.6156 |
| 22 | 0.140207 | 3.43693 | UNIT I | 3 | 28 | 6.8543 | 7.71403 | 13.7685 | 4.90266 | 8.8658 |
| 23 | 0.140207 | 2.85493 | UNIT I | 3 | 28 | 5.42388 | 6.1042 | 9.91061 | 4.07246 | 5.83815 |
| 24 | 0.140207 | 2.06898 | UNIT I | 3 | 28 | 3.72682 | 4.19428 | 5.19743 | 2.95133 | 2.2461 |
| 25 | 0.140207 | 0.810327 | UNIT I | 3 | 28 | 1.51683 | 1.70709 | -1.2757 | 1.1559 | -2.4316 |

**Global Minimum Query (spencer) - Safety Factor**: 1.1617

| 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 | 0.134122 | 0.066727 | UNIT I | 3 | 28 | 3.40751 | 3.9585 | 1.90218 | 0.099502 | 1.80268 |
| 2 | 0.134122 | 0.218128 | UNIT I | 3 | 28 | 3.79515 | 4.40883 | 2.97489 | 0.325269 | 2.64962 |
| 3 | 0.134122 | 0.36331 | UNIT I | 3 | 28 | 4.13067 | 4.7986 | 3.92443 | 0.541762 | 3.38267 |
| 4 | 0.134122 | 0.496737 | UNIT I | 3 | 28 | 4.40301 | 5.11498 | 4.71842 | 0.740726 | 3.97769 |
| 5 | 0.134122 | 0.618193 | UNIT I | 3 | 28 | 4.61738 | 5.36401 | 5.36789 | 0.921838 | 4.44606 |
| 6 | 0.134122 | 0.775929 | UNIT I | 3 | 28 | 4.90344 | 5.69633 | 6.2281 | 1.15705 | 5.07105 |
| 7 | 0.134122 | 0.980116 | UNIT I | 3 | 28 | 5.27596 | 6.12908 | 7.34648 | 1.46153 | 5.88495 |
| 8 | 0.134122 | 1.1715 | UNIT I | 3 | 28 | 5.58145 | 6.48397 | 8.29934 | 1.74693 | 6.55241 |
| 9 | 0.134122 | 1.34951 | UNIT I | 3 | 28 | 5.82371 | 6.7654 | 9.09406 | 2.01236 | 7.0817 |
| 10 | 0.134122 | 1.51359 | UNIT I | 3 | 28 | 6.00638 | 6.97761 | 9.7378 | 2.25704 | 7.48076 |
| 11 | 0.134122 | 1.66342 | UNIT I | 3 | 28 | 6.13324 | 7.12498 | 10.2385 | 2.48047 | 7.75799 |
| 12 | 0.134122 | 1.80884 | UNIT I | 3 | 28 | 6.22817 | 7.23526 | 10.6627 | 2.69732 | 7.96534 |
| 13 | 0.134122 | 1.94374 | UNIT I | 3 | 28 | 6.28067 | 7.29626 | 10.9786 | 2.89846 | 8.08011 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 0.134122 | 2.06149 | UNIT I | 3 | 28 | 6.28129 | 7.29697 | 11.1555 | 3.07405 | 8.08141 |
| 15 | 0.134122 | 2.17753 | UNIT I | 3 | 28 | 6.26082 | 7.27319 | 11.2838 | 3.24709 | 8.03669 |
| 16 | 0.134122 | 2.34731 | UNIT I | 3 | 28 | 6.31084 | 7.3313 | 11.6463 | 3.50026 | 8.146 |
| 17 | 0.134122 | 2.50423 | UNIT I | 3 | 28 | 6.31226 | 7.33295 | 11.8833 | 3.73427 | 8.14907 |
| 18 | 0.134122 | 2.6374 | UNIT I | 3 | 28 | 6.25094 | 7.26172 | 11.948 | 3.93285 | 8.01515 |
| 19 | 0.134122 | 2.70495 | UNIT I | 3 | 28 | 6.07257 | 7.0545 | 11.659 | 4.03358 | 7.62541 |
| 20 | 0.134122 | 2.67959 | UNIT I | 3 | 28 | 5.75575 | 6.68645 | 10.929 | 3.99575 | 6.93322 |
| 21 | 0.134122 | 2.38428 | UNIT I | 3 | 28 | 5.10379 | 5.92907 | 9.06419 | 3.55539 | 5.5088 |
| 22 | 0.134122 | 1.96121 | UNIT I | 3 | 28 | 4.34744 | 5.05042 | 6.78081 | 2.92452 | 3.85629 |
| 23 | 0.134122 | 1.48864 | UNIT I | 3 | 28 | 3.60158 | 4.18396 | 4.44656 | 2.21984 | 2.22672 |
| 24 | 0.134122 | 0.953431 | UNIT I | 3 | 28 | 2.86564 | 3.32902 | 2.04053 | 1.42174 | 0.618792 |
| 25 | 0.134122 | 0.334085 | UNIT I | 3 | 28 | 2.13657 | 2.48205 | -0.475931 | 0.498181 | -0.974112 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.18172

| 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 | 0.134122 | 0.066727 | UNIT I | 3 | 28 | 3.57304 | 4.22233 | 2.39837 | 0.099502 | 2.29887 |
| 2 | 0.134122 | 0.218128 | UNIT I | 3 | 28 | 3.9612 | 4.68103 | 3.48682 | 0.325269 | 3.16155 |
| 3 | 0.134122 | 0.36331 | UNIT I | 3 | 28 | 4.29031 | 5.06995 | 4.43478 | 0.541762 | 3.89302 |
| 4 | 0.134122 | 0.496737 | UNIT I | 3 | 28 | 4.55046 | 5.37737 | 5.21191 | 0.740726 | 4.47119 |
| 5 | 0.134122 | 0.618193 | UNIT I | 3 | 28 | 4.74831 | 5.61117 | 5.83274 | 0.921838 | 4.9109 |
| 6 | 0.134122 | 0.775929 | UNIT I | 3 | 28 | 5.01447 | 5.9257 | 6.6595 | 1.15705 | 5.50245 |
| 7 | 0.134122 | 0.980116 | UNIT I | 3 | 28 | 5.36207 | 6.33647 | 7.7365 | 1.46153 | 6.27497 |
| 8 | 0.134122 | 1.1715 | UNIT I | 3 | 28 | 5.63842 | 6.66303 | 8.63606 | 1.74693 | 6.88913 |
| 9 | 0.134122 | 1.34951 | UNIT I | 3 | 28 | 5.8487 | 6.91152 | 9.36888 | 2.01236 | 7.35652 |
| 10 | 0.134122 | 1.51359 | UNIT I | 3 | 28 | 5.9978 | 7.08772 | 9.94489 | 2.25704 | 7.68785 |
| 11 | 0.134122 | 1.66342 | UNIT I | 3 | 28 | 6.09066 | 7.19745 | 10.3747 | 2.48047 | 7.89428 |
| 12 | 0.134122 | 1.80884 | UNIT I | 3 | 28 | 6.1513 | 7.26911 | 10.7263 | 2.69732 | 8.02901 |
| 13 | 0.134122 | 1.94374 | UNIT I | 3 | 28 | 6.17048 | 7.29178 | 10.9701 | 2.89846 | 8.07167 |
| 14 | 0.134122 | 2.06149 | UNIT I | 3 | 28 | 6.14022 | 7.25602 | 11.0785 | 3.07405 | 8.00442 |
| 15 | 0.134122 | 2.17753 | UNIT I | 3 | 28 | 6.09055 | 7.19733 | 11.1411 | 3.24709 | 7.89405 |
| 16 | 0.134122 | 2.34731 | UNIT I | 3 | 28 | 6.10736 | 7.21719 | 11.4316 | 3.50026 | 7.93138 |
| 17 | 0.134122 | 2.50423 | UNIT I | 3 | 28 | 6.07961 | 7.1844 | 11.604 | 3.73427 | 7.86973 |
| 18 | 0.134122 | 2.6374 | UNIT I | 3 | 28 | 5.99564 | 7.08517 | 11.616 | 3.93285 | 7.68311 |
| 19 | 0.134122 | 2.70495 | UNIT I | 3 | 28 | 5.80722 | 6.86251 | 11.2979 | 4.03358 | 7.26433 |
| 20 | 0.134122 | 2.67959 | UNIT I | 3 | 28 | 5.49684 | 6.49573 | 10.5703 | 3.99575 | 6.5745 |
| 21 | 0.134122 | 2.38428 | UNIT I | 3 | 28 | 4.886 | 5.77388 | 8.77231 | 3.55539 | 5.21692 |
| 22 | 0.134122 | 1.96121 | UNIT I | 3 | 28 | 4.18465 | 4.94509 | 6.58268 | 2.92452 | 3.65816 |
| 23 | 0.134122 | 1.48864 | UNIT I | 3 | 28 | 3.4934 | 4.12822 | 4.34169 | 2.21984 | 2.12185 |
| 24 | 0.134122 | 0.953431 | UNIT I | 3 | 28 | 2.80316 | 3.31255 | 2.00956 | 1.42174 | 0.587823 |
| 25 | 0.134122 | 0.334085 | UNIT I | 3 | 28 | 2.09487 | 2.47554 | -0.488177 | 0.498181 | -0.986358 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.21042

| 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 | 0.134122 | 0.066727 | UNIT I | 3 | 28 | 3.24972 | 3.93353 | 1.85521 | 0.099502 | 1.75571 |
| 2 | 0.134122 | 0.218128 | UNIT I | 3 | 28 | 3.70997 | 4.49062 | 3.12871 | 0.325269 | 2.80345 |
| 3 | 0.134122 | 0.36331 | UNIT I | 3 | 28 | 3.98496 | 4.82348 | 3.97122 | 0.541762 | 3.42946 |
| 4 | 0.134122 | 0.496737 | UNIT I | 3 | 28 | 4.24358 | 5.13652 | 4.75893 | 0.740726 | 4.0182 |
| 5 | 0.134122 | 0.618193 | UNIT I | 3 | 28 | 5.56211 | 6.73249 | 7.94161 | 0.921838 | 7.01978 |
| 6 | 0.134122 | 0.775929 | UNIT I | 3 | 28 | 6.33533 | 7.66841 | 9.9371 | 1.15705 | 8.78005 |
| 7 | 0.134122 | 0.980116 | UNIT I | 3 | 28 | 5.53112 | 6.69498 | 8.41077 | 1.46153 | 6.94924 |
| 8 | 0.134122 | 1.1715 | UNIT I | 3 | 28 | 5.69358 | 6.89162 | 9.06601 | 1.74693 | 7.31908 |
| 9 | 0.134122 | 1.34951 | UNIT I | 3 | 28 | 5.86039 | 7.09353 | 9.71117 | 2.01236 | 7.69881 |
| 10 | 0.134122 | 1.51359 | UNIT I | 3 | 28 | 6.01741 | 7.28359 | 10.3133 | 2.25704 | 8.05629 |
| 11 | 0.134122 | 1.66342 | UNIT I | 3 | 28 | 6.29276 | 7.61688 | 11.1636 | 2.48047 | 8.68311 |
| 12 | 0.134122 | 1.80884 | UNIT I | 3 | 28 | 6.26313 | 7.58102 | 11.3129 | 2.69732 | 8.61562 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 0.134122 | 1.94374 | UNIT I | 3 | 28 | 6.02758 | 7.2959 | 10.9779 | 2.89846 | 8.07946 |
| 14 | 0.134122 | 2.06149 | UNIT I | 3 | 28 | 6.74029 | 8.15858 | 12.7759 | 3.07405 | 9.70187 |
| 15 | 0.134122 | 2.17753 | UNIT I | 3 | 28 | 7.035 | 8.51531 | 13.6199 | 3.24709 | 10.3728 |
| 16 | 0.134122 | 2.34731 | UNIT I | 3 | 28 | 6.13605 | 7.4272 | 11.8266 | 3.50026 | 8.32634 |
| 17 | 0.134122 | 2.50423 | UNIT I | 3 | 28 | 5.52265 | 6.68473 | 10.6643 | 3.73427 | 6.92999 |
| 18 | 0.134122 | 2.6374 | UNIT I | 3 | 28 | 4.70458 | 5.69452 | 9.00048 | 3.93285 | 5.06763 |
| 19 | 0.134122 | 2.70495 | UNIT I | 3 | 28 | 4.14952 | 5.02266 | 7.83765 | 4.03358 | 3.80407 |
| 20 | 0.134122 | 2.67959 | UNIT I | 3 | 28 | 3.78043 | 4.57591 | 6.95964 | 3.99575 | 2.96389 |
| 21 | 0.134122 | 2.38428 | UNIT I | 3 | 28 | 4.56569 | 5.5264 | 8.30684 | 3.55539 | 4.75145 |
| 22 | 0.134122 | 1.96121 | UNIT I | 3 | 28 | 4.89916 | 5.93004 | 8.43514 | 2.92452 | 5.51062 |
| 23 | 0.134122 | 1.48864 | UNIT I | 3 | 28 | 3.92208 | 4.74737 | 5.50616 | 2.21984 | 3.28632 |
| 24 | 0.134122 | 0.953431 | UNIT I | 3 | 28 | 2.88943 | 3.49742 | 2.35725 | 1.42174 | 0.935514 |
| 25 | 0.134122 | 0.334085 | UNIT I | 3 | 28 | 1.79744 | 2.17565 | -1.05218 | 0.498181 | -1.55037 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.18081

| 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 | 0.134122 | 0.066727 | UNIT I | 3 | 28 | 3.00012 | 3.54257 | 1.11992 | 0.099502 | 1.02042 |
| 2 | 0.134122 | 0.218128 | UNIT I | 3 | 28 | 3.455 | 4.0797 | 2.35589 | 0.325269 | 2.03062 |
| 3 | 0.134122 | 0.36331 | UNIT I | 3 | 28 | 3.82225 | 4.51335 | 3.38796 | 0.541762 | 2.8462 |
| 4 | 0.134122 | 0.496737 | UNIT I | 3 | 28 | 4.15392 | 4.90499 | 4.32349 | 0.740726 | 3.58276 |
| 5 | 0.134122 | 0.618193 | UNIT I | 3 | 28 | 4.87897 | 5.76114 | 6.11478 | 0.921838 | 5.19294 |
| 6 | 0.134122 | 0.775929 | UNIT I | 3 | 28 | 5.3938 | 6.36905 | 7.49332 | 1.15705 | 6.33627 |
| 7 | 0.134122 | 0.980116 | UNIT I | 3 | 28 | 5.42556 | 6.40656 | 7.86836 | 1.46153 | 6.40683 |
| 8 | 0.134122 | 1.1715 | UNIT I | 3 | 28 | 5.75235 | 6.79243 | 8.87947 | 1.74693 | 7.13254 |
| 9 | 0.134122 | 1.34951 | UNIT I | 3 | 28 | 6.02991 | 7.12018 | 9.76127 | 2.01236 | 7.74891 |
| 10 | 0.134122 | 1.51359 | UNIT I | 3 | 28 | 6.25506 | 7.38604 | 10.506 | 2.25704 | 8.24892 |
| 11 | 0.134122 | 1.66342 | UNIT I | 3 | 28 | 6.48197 | 7.65398 | 11.2333 | 2.48047 | 8.75287 |
| 12 | 0.134122 | 1.80884 | UNIT I | 3 | 28 | 6.55232 | 7.73705 | 11.6064 | 2.69732 | 8.90912 |
| 13 | 0.134122 | 1.94374 | UNIT I | 3 | 28 | 6.49052 | 7.66407 | 11.6703 | 2.89846 | 8.77185 |
| 14 | 0.134122 | 2.06149 | UNIT I | 3 | 28 | 6.78479 | 8.01155 | 12.4994 | 3.07405 | 9.42534 |
| 15 | 0.134122 | 2.17753 | UNIT I | 3 | 28 | 6.86083 | 8.10134 | 12.8413 | 3.24709 | 9.59425 |
| 16 | 0.134122 | 2.34731 | UNIT I | 3 | 28 | 6.45717 | 7.62469 | 12.198 | 3.50026 | 8.69778 |
| 17 | 0.134122 | 2.50423 | UNIT I | 3 | 28 | 6.12156 | 7.2284 | 11.6867 | 3.73427 | 7.95247 |
| 18 | 0.134122 | 2.6374 | UNIT I | 3 | 28 | 5.61731 | 6.63298 | 10.7655 | 3.93285 | 6.83262 |
| 19 | 0.134122 | 2.70495 | UNIT I | 3 | 28 | 5.07254 | 5.98971 | 9.65639 | 4.03358 | 5.62281 |
| 20 | 0.134122 | 2.67959 | UNIT I | 3 | 28 | 4.53661 | 5.35688 | 8.4284 | 3.99575 | 4.43265 |
| 21 | 0.134122 | 2.38428 | UNIT I | 3 | 28 | 4.64699 | 5.48721 | 8.23316 | 3.55539 | 4.67777 |
| 22 | 0.134122 | 1.96121 | UNIT I | 3 | 28 | 4.3433 | 5.12861 | 6.92787 | 2.92452 | 4.00335 |
| 23 | 0.134122 | 1.48864 | UNIT I | 3 | 28 | 3.53922 | 4.17915 | 4.43748 | 2.21984 | 2.21764 |
| 24 | 0.134122 | 0.953431 | UNIT I | 3 | 28 | 2.81769 | 3.32715 | 2.03703 | 1.42174 | 0.615286 |
| 25 | 0.134122 | 0.334085 | UNIT I | 3 | 28 | 2.23671 | 2.64113 | -0.176748 | 0.498181 | -0.674929 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.16061

| 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 | 0.134122 | 0.066727 | UNIT I | 3 | 28 | 2.74916 | 3.19071 | 0.458168 | 0.099502 | 0.358666 |
| 2 | 0.134122 | 0.218128 | UNIT I | 3 | 28 | 3.31546 | 3.84796 | 1.92004 | 0.325269 | 1.59477 |
| 3 | 0.134122 | 0.36331 | UNIT I | 3 | 28 | 3.86424 | 4.48487 | 3.33439 | 0.541762 | 2.79263 |
| 4 | 0.134122 | 0.496737 | UNIT I | 3 | 28 | 4.35661 | 5.05632 | 4.60811 | 0.740726 | 3.86738 |
| 5 | 0.134122 | 0.618193 | UNIT I | 3 | 28 | 4.77102 | 5.53729 | 5.69378 | 0.921838 | 4.77195 |
| 6 | 0.134122 | 0.775929 | UNIT I | 3 | 28 | 5.21526 | 6.05288 | 6.89868 | 1.15705 | 5.74163 |
| 7 | 0.134122 | 0.980116 | UNIT I | 3 | 28 | 5.69492 | 6.60958 | 8.25019 | 1.46153 | 6.78866 |
| 8 | 0.134122 | 1.1715 | UNIT I | 3 | 28 | 6.04953 | 7.02115 | 9.30964 | 1.74693 | 7.56271 |
| 9 | 0.134122 | 1.34951 | UNIT I | 3 | 28 | 6.28014 | 7.28879 | 10.0784 | 2.01236 | 8.06602 |
| 10 | 0.134122 | 1.51359 | UNIT I | 3 | 28 | 6.39643 | 7.42376 | 10.5769 | 2.25704 | 8.31989 |
| 11 | 0.134122 | 1.66342 | UNIT I | 3 | 28 | 6.41496 | 7.44527 | 10.8408 | 2.48047 | 8.36035 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.134122 | 1.80884 | UNIT I | 3 | 28 | 6.37612 | 7.40019 | 10.9729 | 2.69732 | 8.27554 |
| 13 | 0.134122 | 1.94374 | UNIT I | 3 | 28 | 6.28776 | 7.29764 | 10.9812 | 2.89846 | 8.0827 |
| 14 | 0.134122 | 2.06149 | UNIT I | 3 | 28 | 6.1583 | 7.14738 | 10.8742 | 3.07405 | 7.80012 |
| 15 | 0.134122 | 2.17753 | UNIT I | 3 | 28 | 6.03278 | 7.00171 | 10.7732 | 3.24709 | 7.52611 |
| 16 | 0.134122 | 2.34731 | UNIT I | 3 | 28 | 6.01306 | 6.97882 | 10.9833 | 3.50026 | 7.48307 |
| 17 | 0.134122 | 2.50423 | UNIT I | 3 | 28 | 5.99459 | 6.95738 | 11.177 | 3.73427 | 7.44274 |
| 18 | 0.134122 | 2.6374 | UNIT I | 3 | 28 | 5.97078 | 6.92975 | 11.3237 | 3.93285 | 7.39081 |
| 19 | 0.134122 | 2.70495 | UNIT I | 3 | 28 | 5.88838 | 6.83411 | 11.2445 | 4.03358 | 7.21091 |
| 20 | 0.134122 | 2.67959 | UNIT I | 3 | 28 | 5.71661 | 6.63476 | 10.8317 | 3.99575 | 6.83598 |
| 21 | 0.134122 | 2.38428 | UNIT I | 3 | 28 | 5.20808 | 6.04455 | 9.28136 | 3.55539 | 5.72597 |
| 22 | 0.134122 | 1.96121 | UNIT I | 3 | 28 | 4.55418 | 5.28563 | 7.22316 | 2.92452 | 4.29864 |
| 23 | 0.134122 | 1.48864 | UNIT I | 3 | 28 | 3.83669 | 4.4529 | 4.95233 | 2.21984 | 2.73249 |
| 24 | 0.134122 | 0.953431 | UNIT I | 3 | 28 | 2.99459 | 3.47555 | 2.31611 | 1.42174 | 0.894374 |
| 25 | 0.134122 | 0.334085 | UNIT I | 3 | 28 | 1.92835 | 2.23807 | -0.934808 | 0.498181 | -1.43299 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -5.17248 | 1.262 |
| 40.982 | 12.5067 |
| 48.4804 | 16.8997 |

### External Boundary

| X | Y |
|---|---|
| 7.0471 | 7.37 |
| 6.65347 | 7.1722 |
| 6.64126 | 7.03314 |
| 6.59548 | 6.97972 |
| 6.43139 | 6.88651 |
| 6.22983 | 6.98289 |
| 6.20082 | 7.08159 |
| 6.18801 | 7.23842 |
| 6.16065 | 7.27376 |
| 5.26106 | 7.18753 |
| 5.26127 | 7.137 |
| 5.26906 | 7.1082 |
| 5.27338 | 7.01064 |
| 5.27667 | 6.97302 |
| 5.28509 | 6.88998 |
| 5.30936 | 6.84551 |
| 5.30827 | 6.82804 |
| 5.30584 | 6.78939 |
| 5.31363 | 6.76058 |
| 5.31795 | 6.66302 |
| 5.32124 | 6.6254 |
| 5.32967 | 6.54237 |
| 5.34448 | 6.50821 |
| 5.37396 | 6.50326 |
| 5.37032 | 6.49139 |
| 5.3391 | 6.38946 |
| 5.31847 | 6.20899 |
| 5.31944 | 6.19675 |
| 5.34169 | 5.9151 |
| 5.31738 | 5.90787 |

| | |
|---|---|
| 4.37578 | 5.62795 |
| 2.84443 | 5.31101 |
| 2.05801 | 5.19007 |
| 1.21108 | 5.00866 |
| -0.119822 | 4.81214 |
| -3.13102 | 4.668 |
| -4.37303 | 4.67353 |
| -4.46405 | 4.67107 |
| -4.50833 | 4.60468 |
| -4.56244 | 4.58501 |
| -4.81089 | 4.58501 |
| -5.17248 | 4.57027 |
| -5.17248 | 2.74311 |
| -5.17248 | 1.262 |
| -5.17248 | -1.737 |
| -5.17248 | -4.66367 |
| -5.17248 | -5.39909 |
| 48.4804 | -5.39909 |
| 48.4804 | 9.34031 |
| 48.4804 | 14.9094 |
| 48.4804 | 16.8997 |
| 48.4804 | 19.16 |
| 48.4804 | 22.6129 |
| 47.7327 | 22.2747 |
| 47.1273 | 21.9188 |
| 46.8424 | 21.5095 |
| 45.97 | 20.9756 |
| 45.5961 | 20.3705 |
| 45.2757 | 19.4985 |
| 44.6989 | 18.3685 |
| 44.4436 | 18.1023 |
| 44.1107 | 17.4811 |
| 43.4024 | 16.5348 |
| 43.1042 | 16.0823 |
| 42.8392 | 15.8505 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 26.3931 | 14.3033 |
| 26.1708 | 14.0891 |
| 25.6822 | 13.4908 |
| 25.199 | 13.039 |
| 24.4255 | 12.3536 |
| 23.8204 | 12.0079 |
| 23.1116 | 11.6796 |
| 22.5066 | 11.455 |
| 21.9015 | 11.4031 |
| 20.9679 | 11.4377 |
| 20.2418 | 11.3167 |
| 19.0316 | 11.0748 |
| 17.7402 | 11.0127 |
| 17.4709 | 10.905 |
| 15.9193 | 10.7326 |
| 14.6909 | 10.6895 |
| 13.8776 | 10.6286 |
| 13.5261 | 10.6022 |

**Material Boundary**

| X | Y |
|---|---|
| -5.17248 | -1.737 |
| 15.651 | 3.653 |
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |
| 48.4804 | 14.9094 |

### Material Boundary

| X | Y |
|---|---|
| -5.17248 | -4.66367 |
| 48.4804 | 9.34031 |

### Material Boundary

| X | Y |
|---|---|
| -5.17248 | 1.262 |
| 40.982 | 12.5067 |

### Material Boundary

| X | Y |
|---|---|
| 7.05478 | 6.55395 |
| 7.09425 | 6.55587 |
| 7.17214 | 6.55377 |
| 7.21749 | 6.55254 |
| 7.23249 | 6.55214 |
| 7.40399 | 6.54751 |
| 7.63002 | 6.54332 |
| 7.73202 | 6.53754 |
| 7.85185 | 6.53076 |
| 8.05278 | 6.50985 |
| 8.35414 | 6.47638 |
| 8.51739 | 6.46801 |
| 8.65969 | 6.46383 |
| 8.7476 | 6.48893 |
| 9.2187 | 6.51516 |
| 9.2976 | 6.55054 |
| 9.81226 | 6.72932 |
| 10.1768 | 6.96511 |
| 10.2379 | 7.071 |

### Material Boundary

| X | Y |
|---|---|
| 5.30936 | 6.84551 |
| 6.22222 | 6.935 |
| 6.22222 | 6.91685 |
| 6.23259 | 6.8908 |
| 6.25108 | 6.66437 |
| 6.25108 | 6.5848 |
| 6.20873 | 6.5766 |
| 6.12072 | 6.56712 |

### Material Boundary

| X | Y |
|---|---|
| 5.37396 | 6.50326 |

| | |
|---|---|
| 5.44406 | 6.52403 |
| 6.08984 | 6.56515 |
| 6.12072 | 6.56712 |

### Material Boundary

| X | Y |
|---|---|
| 6.22222 | 6.935 |
| 6.22983 | 6.98289 |

### Material Boundary

| X | Y |
|---|---|
| 5.30827 | 6.82804 |
| 6.22222 | 6.91685 |

### Material Boundary

| X | Y |
|---|---|
| 5.37032 | 6.49139 |
| 6.25593 | 6.56825 |

### Material Boundary

| X | Y |
|---|---|
| 10.2379 | 7.071 |
| 10.4127 | 7.36168 |
| 10.6915 | 7.59747 |
| 10.9257 | 7.94138 |
| 11.2016 | 8.33339 |
| 11.2812 | 8.44419 |
| 11.6029 | 8.66926 |
| 11.8746 | 8.94686 |
| 12.1205 | 9.19815 |
| 12.5682 | 9.65556 |
| 12.6055 | 9.69815 |
| 12.6931 | 9.79829 |
| 12.8699 | 10.0002 |
| 13.1927 | 10.1884 |
| 13.8776 | 10.6286 |

### Material Boundary

| X | Y |
|---|---|
| 6.71685 | 5.94959 |
| 9.2187 | 5.94959 |
| 9.2187 | 6.51516 |
| 9.2187 | 7.94138 |
| 8.71919 | 7.94138 |
| 8.71919 | 7.44674 |
| 8.21887 | 7.44674 |
| 8.21887 | 6.94674 |
| 7.71702 | 6.94674 |
| 7.21749 | 6.94674 |
| 7.21749 | 6.55254 |
| 7.21749 | 6.54654 |
| 7.21749 | 6.52614 |
| 7.21749 | 6.455 |

| | |
|---|---|
| 6.71685 | 6.455 |
| 6.71685 | 5.94959 |

### Material Boundary

| X | Y |
|---|---|
| 5.31847 | 6.20899 |
| 6.23818 | 6.2705 |

### Material Boundary

| X | Y |
|---|---|
| 5.31944 | 6.19675 |
| 6.23739 | 6.25721 |

### Material Boundary

| X | Y |
|---|---|
| 5.34169 | 5.9151 |
| 6.21903 | 5.94912 |

### Material Boundary

| X | Y |
|---|---|
| 6.21903 | 5.94912 |
| 6.23739 | 6.25721 |

### Material Boundary

| X | Y |
|---|---|
| 6.25108 | 6.5848 |
| 6.25593 | 6.56825 |

### Material Boundary

| X | Y |
|---|---|
| 6.23739 | 6.25721 |
| 6.23818 | 6.2705 |

### Material Boundary

| X | Y |
|---|---|
| 6.23818 | 6.2705 |
| 6.25593 | 6.56825 |

### Material Boundary

| X | Y |
|---|---|
| 6.25593 | 6.488 |
| 7.05478 | 6.55395 |

### Material Boundary

| X | Y |
|---|---|
| 9.2187 | 7.94138 |
| 9.70168 | 7.94138 |

### Material Boundary

| X | Y |
|---|---|
| 9.2187 | 5.94959 |
| 10.8156 | 7.55366 |
| 11.2016 | 7.94138 |
| 11.46 | 8.201 |
| 12.2025 | 8.94686 |
| 13.1927 | 9.94144 |
| 13.7377 | 10.4889 |

### Material Boundary

| X | Y |
|---|---|
| 7.71702 | 6.94674 |
| 7.71702 | 7.44674 |
| 8.21887 | 7.44674 |

### Material Boundary

| X | Y |
|---|---|
| 13.7377 | 10.4889 |
| 13.8776 | 10.6286 |

### Material Boundary

| X | Y |
|---|---|
| 10.7022 | 8.94686 |
| 11.2016 | 8.94686 |
| 11.2016 | 8.33339 |
| 11.2016 | 7.94138 |
| 10.9257 | 7.94138 |
| 9.70168 | 7.94138 |
| 9.70168 | 8.44679 |
| 10.7022 | 8.44679 |
| 10.7022 | 8.94686 |

### Material Boundary

| X | Y |
|---|---|
| 11.2016 | 8.94686 |
| 11.8746 | 8.94686 |
| 12.2025 | 8.94686 |

### Material Boundary

| X | Y |
|---|---|
| 5.31738 | 5.90787 |
| 6.2226 | 5.9356 |
| 6.21903 | 5.94912 |

### Material Boundary

| X | Y |
|---|---|
| 6.2226 | 5.9356 |
| 6.71685 | 5.94959 |

### Material Boundary

| X | Y |
|---|---|

| | |
|---|---|
| 10.8156 | 7.55366 |
| 12.574 | 7.94138 |
| 31.5055 | 11.4337 |
| 40.982 | 12.5067 |
| 48.4804 | 19.16 |

## Material Boundary

| X | Y |
|---|---|
| 40.982 | 12.5067 |
| 48.4804 | 16.8997 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S48 + GABIONS EQdn fullroad lim
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 15/5/2021, 22:33:46

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): 0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |

| Property | GRAVEL | SW |
|---|---|---|
| Color | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19 |
| Cohesion [kPa] | 0 | 1 |
| Friction Angle [deg] | 36 | 35 |
| Water Surface | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.968471
Center: 24.220, 14.865
Radius: 2.922
Left Slip Surface Endpoint: 23.758, 11.979
Right Slip Surface Endpoint: 27.086, 14.291
Resisting Moment=101.079 kN-m
Driving Moment=104.37 kN-m

### Method: bishop simplified

FS: 1.035700
Center: 23.395, 15.973
Radius: 4.028
Left Slip Surface Endpoint: 23.711, 11.957
Right Slip Surface Endpoint: 27.055, 14.292
Resisting Moment=116.683 kN-m
Driving Moment=112.66 kN-m

### Method: janbu simplified

FS: 0.934825
Center: 24.220, 14.865
Radius: 2.922
Left Slip Surface Endpoint: 23.758, 11.979
Right Slip Surface Endpoint: 27.086, 14.291
Resisting Horizontal Force=29.5997 kN
Driving Horizontal Force=31.6633 kN

### Method: janbu corrected

FS: 1.002430
Center: 24.220, 14.865
Radius: 2.922
Left Slip Surface Endpoint: 23.758, 11.979
Right Slip Surface Endpoint: 27.086, 14.291
Resisting Horizontal Force=31.7402 kN
Driving Horizontal Force=31.6633 kN

### Method: spencer

FS: 1.031050
Center: 23.395, 15.973
Radius: 4.028
Left Slip Surface Endpoint: 23.711, 11.957
Right Slip Surface Endpoint: 27.055, 14.292
Resisting Moment=116.159 kN-m
Driving Moment=112.66 kN-m
Resisting Horizontal Force=23.3907 kN
Driving Horizontal Force=22.6863 kN

### Method: corp of eng#1

FS: 1.017630
Center: 23.395, 15.973
Radius: 4.028
Left Slip Surface Endpoint: 23.711, 11.957
Right Slip Surface Endpoint: 27.055, 14.292
Resisting Horizontal Force=23.2364 kN
Driving Horizontal Force=22.8338 kN

### Method: corp of eng#2

FS: 1.037990
Center: 23.395, 15.973
Radius: 4.028
Left Slip Surface Endpoint: 23.711, 11.957
Right Slip Surface Endpoint: 27.055, 14.292
Resisting Horizontal Force=23.4528 kN
Driving Horizontal Force=22.5946 kN

### Method: lowe-karafiath

FS: 1.017570
Center: 23.395, 15.973
Radius: 4.028
Left Slip Surface Endpoint: 23.711, 11.957
Right Slip Surface Endpoint: 27.055, 14.292
Resisting Horizontal Force=23.2247 kN
Driving Horizontal Force=22.8236 kN

### Method: gle/morgenstern-price

FS: 1.033700
Center: 23.395, 15.973
Radius: 4.028
Left Slip Surface Endpoint: 23.711, 11.957

Right Slip Surface Endpoint: 27.055, 14.292
Resisting Moment=116.457 kN-m
Driving Moment=112.66 kN-m
Resisting Horizontal Force=23.3807 kN
Driving Horizontal Force=22.6184 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 8994
Number of Invalid Surfaces: 1006

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 2 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 128 surfaces
Error Code -108 reported for 101 surfaces
Error Code -114 reported for 733 surfaces
Error Code -123 reported for 4 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 8957
Number of Invalid Surfaces: 1043

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 2 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 128 surfaces
Error Code -108 reported for 102 surfaces
Error Code -112 reported for 36 surfaces
Error Code -114 reported for 733 surfaces
Error Code -123 reported for 4 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 8728
Number of Invalid Surfaces: 1272

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 2 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 128 surfaces
Error Code -108 reported for 360 surfaces
Error Code -112 reported for 7 surfaces
Error Code -114 reported for 733 surfaces
Error Code -123 reported for 4 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 8728
Number of Invalid Surfaces: 1272

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 2 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 128 surfaces
Error Code -108 reported for 360 surfaces
Error Code -112 reported for 7 surfaces

Error Code -114 reported for 733 surfaces
Error Code -123 reported for 4 surfaces

### Method: spencer

Number of Valid Surfaces: 8243
Number of Invalid Surfaces: 1757

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 2 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 128 surfaces
Error Code -108 reported for 403 surfaces
Error Code -111 reported for 413 surfaces
Error Code -112 reported for 36 surfaces
Error Code -114 reported for 733 surfaces
Error Code -123 reported for 4 surfaces

### Method: corp of eng#1

Number of Valid Surfaces: 8450
Number of Invalid Surfaces: 1550

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 2 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 128 surfaces
Error Code -108 reported for 514 surfaces
Error Code -111 reported for 131 surfaces
Error Code -114 reported for 733 surfaces
Error Code -123 reported for 4 surfaces

### Method: corp of eng#2

Number of Valid Surfaces: 7601
Number of Invalid Surfaces: 2399

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 2 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 128 surfaces
Error Code -108 reported for 1131 surfaces
Error Code -111 reported for 362 surfaces
Error Code -112 reported for 1 surface
Error Code -114 reported for 733 surfaces
Error Code -123 reported for 4 surfaces

### Method: lowe-karafiath

Number of Valid Surfaces: 5841
Number of Invalid Surfaces: 4159

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -103 reported for 2 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 128 surfaces
Error Code -108 reported for 2528 surfaces
Error Code -111 reported for 726 surfaces
Error Code -114 reported for 733 surfaces
Error Code -123 reported for 4 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 8635
Number of Invalid Surfaces: 1365

### Error Codes:

Error Code -101 reported for 1 surface
Error Code -103 reported for 2 surfaces
Error Code -105 reported for 37 surfaces
Error Code -106 reported for 128 surfaces
Error Code -108 reported for 361 surfaces
Error Code -111 reported for 63 surfaces
Error Code -112 reported for 36 surfaces
Error Code -114 reported for 733 surfaces
Error Code -123 reported for 4 surfaces

### Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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).
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.968471

| 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 | 0.133087 | 0.106095 | UNIT I | 3 | 28 | 3.58203 | 3.46909 | 0.882225 | 0 | 0.882225 |
| 2 | 0.133087 | 0.332503 | UNIT I | 3 | 28 | 4.61887 | 4.47324 | 2.77076 | 0 | 2.77076 |
| 3 | 0.133087 | 0.547324 | UNIT I | 3 | 28 | 5.59639 | 5.41994 | 4.55125 | 0 | 4.55125 |
| 4 | 0.133087 | 0.746754 | UNIT I | 3 | 28 | 6.48542 | 6.28094 | 6.17056 | 0 | 6.17056 |
| 5 | 0.133087 | 0.930837 | UNIT I | 3 | 28 | 7.2763 | 7.04689 | 7.61106 | 0 | 7.61106 |
| 6 | 0.133087 | 1.15119 | UNIT I | 3 | 28 | 8.18936 | 7.93116 | 9.27414 | 0 | 9.27414 |
| 7 | 0.133087 | 1.41033 | UNIT I | 3 | 28 | 9.21639 | 8.92581 | 11.1448 | 0 | 11.1448 |
| 8 | 0.133087 | 1.65368 | UNIT I | 3 | 28 | 10.1025 | 9.78399 | 12.7588 | 0 | 12.7588 |
| 9 | 0.133087 | 1.88087 | UNIT I | 3 | 28 | 10.8383 | 10.4966 | 14.099 | 0 | 14.099 |
| 10 | 0.133087 | 2.09141 | UNIT I | 3 | 28 | 11.416 | 11.0561 | 15.1513 | 0 | 15.1513 |
| 11 | 0.133087 | 2.28493 | UNIT I | 3 | 28 | 11.8307 | 11.4577 | 15.9066 | 0 | 15.9066 |
| 12 | 0.133087 | 2.471 | UNIT I | 3 | 28 | 12.1157 | 11.7338 | 16.4258 | 0 | 16.4258 |
| 13 | 0.133087 | 2.6436 | UNIT I | 3 | 28 | 12.2456 | 11.8596 | 16.6624 | 0 | 16.6624 |
| 14 | 0.133087 | 2.79591 | UNIT I | 3 | 28 | 12.1981 | 11.8135 | 16.5757 | 0 | 16.5757 |
| 15 | 0.133087 | 2.94082 | UNIT I | 3 | 28 | 12.0183 | 11.6394 | 16.2483 | 0 | 16.2483 |
| 16 | 0.133087 | 3.13476 | UNIT I | 3 | 28 | 11.8636 | 11.4895 | 15.9664 | 0 | 15.9664 |
| 17 | 0.133087 | 3.31244 | UNIT I | 3 | 28 | 11.5255 | 11.1621 | 15.3506 | 0 | 15.3506 |
| 18 | 0.133087 | 3.4605 | UNIT I | 3 | 28 | 10.9801 | 10.6339 | 14.3572 | 0 | 14.3572 |
| 19 | 0.133087 | 3.54105 | UNIT I | 3 | 28 | 10.1716 | 9.85091 | 12.8847 | 0 | 12.8847 |
| 20 | 0.133087 | 3.5211 | UNIT I | 3 | 28 | 9.10071 | 8.81377 | 10.9341 | 0 | 10.9341 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 21 | 0.133087 | 3.23289 | UNIT I | 3 | 28 | 7.62577 | 7.38534 | 8.24761 | 0 | 8.24761 |
| 22 | 0.133087 | 2.7772 | UNIT I | 3 | 28 | 6.11589 | 5.92306 | 5.49749 | 0 | 5.49749 |
| 23 | 0.133087 | 2.23502 | UNIT I | 3 | 28 | 4.80986 | 4.65821 | 3.11864 | 0 | 3.11864 |
| 24 | 0.133087 | 1.55729 | UNIT I | 3 | 28 | 3.78795 | 3.66852 | 1.2573 | 0 | 1.2573 |
| 25 | 0.133087 | 0.588049 | UNIT I | 3 | 28 | 3.17263 | 3.0726 | 0.136539 | 0 | 0.136539 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.0357

| 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 | 0.133752 | 0.0630848 | UNIT I | 3 | 28 | 3.01486 | 3.12249 | 0.230365 | 0 | 0.230365 |
| 2 | 0.133752 | 0.20674 | UNIT I | 3 | 28 | 3.53445 | 3.66063 | 1.24247 | 0 | 1.24247 |
| 3 | 0.133752 | 0.351033 | UNIT I | 3 | 28 | 4.03903 | 4.18322 | 2.22532 | 0 | 2.22532 |
| 4 | 0.133752 | 0.483574 | UNIT I | 3 | 28 | 4.48125 | 4.64123 | 3.0867 | 0 | 3.0867 |
| 5 | 0.133752 | 0.604145 | UNIT I | 3 | 28 | 4.86261 | 5.03621 | 3.82955 | 0 | 3.82955 |
| 6 | 0.133752 | 0.735802 | UNIT I | 3 | 28 | 5.27081 | 5.45898 | 4.62466 | 0 | 4.62466 |
| 7 | 0.133752 | 0.932458 | UNIT I | 3 | 28 | 5.90016 | 6.1108 | 5.85057 | 0 | 5.85057 |
| 8 | 0.133752 | 1.12235 | UNIT I | 3 | 28 | 6.48126 | 6.71264 | 6.98245 | 0 | 6.98245 |
| 9 | 0.133752 | 1.29885 | UNIT I | 3 | 28 | 6.99152 | 7.24112 | 7.9764 | 0 | 7.9764 |
| 10 | 0.133752 | 1.46142 | UNIT I | 3 | 28 | 7.43099 | 7.69628 | 8.83238 | 0 | 8.83238 |
| 11 | 0.133752 | 1.60942 | UNIT I | 3 | 28 | 7.7993 | 8.07774 | 9.54986 | 0 | 9.54986 |
| 12 | 0.133752 | 1.74853 | UNIT I | 3 | 28 | 8.11708 | 8.40686 | 10.1689 | 0 | 10.1689 |
| 13 | 0.133752 | 1.88157 | UNIT I | 3 | 28 | 8.39408 | 8.69375 | 10.7084 | 0 | 10.7084 |
| 14 | 0.133752 | 1.99754 | UNIT I | 3 | 28 | 8.59469 | 8.90152 | 11.0991 | 0 | 11.0991 |
| 15 | 0.133752 | 2.09852 | UNIT I | 3 | 28 | 8.72711 | 9.03867 | 11.3571 | 0 | 11.3571 |
| 16 | 0.133752 | 2.24793 | UNIT I | 3 | 28 | 8.98653 | 9.30735 | 11.8624 | 0 | 11.8624 |
| 17 | 0.133752 | 2.40219 | UNIT I | 3 | 28 | 9.22932 | 9.55881 | 12.3353 | 0 | 12.3353 |
| 18 | 0.133752 | 2.5325 | UNIT I | 3 | 28 | 9.36659 | 9.70098 | 12.6027 | 0 | 12.6027 |
| 19 | 0.133752 | 2.61947 | UNIT I | 3 | 28 | 9.34432 | 9.67791 | 12.5593 | 0 | 12.5593 |
| 20 | 0.133752 | 2.61072 | UNIT I | 3 | 28 | 9.02431 | 9.34648 | 11.936 | 0 | 11.936 |
| 21 | 0.133752 | 2.40981 | UNIT I | 3 | 28 | 8.17223 | 8.46398 | 10.2763 | 0 | 10.2763 |
| 22 | 0.133752 | 1.98475 | UNIT I | 3 | 28 | 6.76147 | 7.00285 | 7.52826 | 0 | 7.52826 |
| 23 | 0.133752 | 1.50862 | UNIT I | 3 | 28 | 5.28754 | 5.4763 | 4.65726 | 0 | 4.65726 |
| 24 | 0.133752 | 0.967942 | UNIT I | 3 | 28 | 3.74905 | 3.88289 | 1.66047 | 0 | 1.66047 |
| 25 | 0.133752 | 0.339677 | UNIT I | 3 | 28 | 2.1471 | 2.22375 | -1.45991 | 0 | -1.45991 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.934825

| 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 | 0.133087 | 0.106095 | UNIT I | 3 | 28 | 4.02009 | 3.75808 | 1.42574 | 0 | 1.42574 |
| 2 | 0.133087 | 0.332503 | UNIT I | 3 | 28 | 5.03001 | 4.70218 | 3.20134 | 0 | 3.20134 |
| 3 | 0.133087 | 0.547324 | UNIT I | 3 | 28 | 5.93135 | 5.54477 | 4.78601 | 0 | 4.78601 |
| 4 | 0.133087 | 0.746754 | UNIT I | 3 | 28 | 6.71445 | 6.27684 | 6.16285 | 0 | 6.16285 |
| 5 | 0.133087 | 0.930837 | UNIT I | 3 | 28 | 7.3877 | 6.90621 | 7.34652 | 0 | 7.34652 |
| 6 | 0.133087 | 1.15119 | UNIT I | 3 | 28 | 8.18845 | 7.65477 | 8.75431 | 0 | 8.75431 |
| 7 | 0.133087 | 1.41033 | UNIT I | 3 | 28 | 9.11662 | 8.52244 | 10.3862 | 0 | 10.3862 |
| 8 | 0.133087 | 1.65368 | UNIT I | 3 | 28 | 9.92863 | 9.28153 | 11.8139 | 0 | 11.8139 |
| 9 | 0.133087 | 1.88087 | UNIT I | 3 | 28 | 10.6283 | 9.93561 | 13.044 | 0 | 13.044 |
| 10 | 0.133087 | 2.09141 | UNIT I | 3 | 28 | 11.2183 | 10.4871 | 14.0813 | 0 | 14.0813 |
| 11 | 0.133087 | 2.28493 | UNIT I | 3 | 28 | 11.7011 | 10.9385 | 14.9301 | 0 | 14.9301 |
| 12 | 0.133087 | 2.471 | UNIT I | 3 | 28 | 12.1168 | 11.3271 | 15.661 | 0 | 15.661 |
| 13 | 0.133087 | 2.6436 | UNIT I | 3 | 28 | 12.443 | 11.632 | 16.2344 | 0 | 16.2344 |
| 14 | 0.133087 | 2.79591 | UNIT I | 3 | 28 | 12.6555 | 11.8307 | 16.608 | 0 | 16.608 |
| 15 | 0.133087 | 2.94082 | UNIT I | 3 | 28 | 12.8023 | 11.9679 | 16.8661 | 0 | 16.8661 |
| 16 | 0.133087 | 3.13476 | UNIT I | 3 | 28 | 13.0737 | 12.2216 | 17.3434 | 0 | 17.3434 |
| 17 | 0.133087 | 3.31244 | UNIT I | 3 | 28 | 13.2302 | 12.3679 | 17.6185 | 0 | 17.6185 |
| 18 | 0.133087 | 3.4605 | UNIT I | 3 | 28 | 13.2249 | 12.363 | 17.6093 | 0 | 17.6093 |
| 19 | 0.133087 | 3.54105 | UNIT I | 3 | 28 | 12.9396 | 12.0963 | 17.1076 | 0 | 17.1076 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 0.133087 | 3.5211 | UNIT I | 3 | 28 | 12.2877 | 11.4868 | 15.9614 | 0 | 15.9614 |
| 21 | 0.133087 | 3.23289 | UNIT I | 3 | 28 | 10.8281 | 10.1223 | 13.3952 | 0 | 13.3952 |
| 22 | 0.133087 | 2.7772 | UNIT I | 3 | 28 | 8.93537 | 8.35301 | 10.0676 | 0 | 10.0676 |
| 23 | 0.133087 | 2.23502 | UNIT I | 3 | 28 | 6.88463 | 6.43592 | 6.46205 | 0 | 6.46205 |
| 24 | 0.133087 | 1.55729 | UNIT I | 3 | 28 | 4.62165 | 4.32043 | 2.48337 | 0 | 2.48337 |
| 25 | 0.133087 | 0.588049 | UNIT I | 3 | 28 | 2.00619 | 1.87544 | -2.11498 | 0 | -2.11498 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.00243

| 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 | 0.133087 | 0.106095 | UNIT I | 3 | 28 | 3.74897 | 3.75808 | 1.42574 | 0 | 1.42574 |
| 2 | 0.133087 | 0.332503 | UNIT I | 3 | 28 | 4.69078 | 4.70218 | 3.20134 | 0 | 3.20134 |
| 3 | 0.133087 | 0.547324 | UNIT I | 3 | 28 | 5.53133 | 5.54477 | 4.78601 | 0 | 4.78601 |
| 4 | 0.133087 | 0.746754 | UNIT I | 3 | 28 | 6.26162 | 6.27684 | 6.16285 | 0 | 6.16285 |
| 5 | 0.133087 | 0.930837 | UNIT I | 3 | 28 | 6.88947 | 6.90621 | 7.34652 | 0 | 7.34652 |
| 6 | 0.133087 | 1.15119 | UNIT I | 3 | 28 | 7.63621 | 7.65477 | 8.75431 | 0 | 8.75431 |
| 7 | 0.133087 | 1.41033 | UNIT I | 3 | 28 | 8.50178 | 8.52244 | 10.3862 | 0 | 10.3862 |
| 8 | 0.133087 | 1.65368 | UNIT I | 3 | 28 | 9.25903 | 9.28153 | 11.8139 | 0 | 11.8139 |
| 9 | 0.133087 | 1.88087 | UNIT I | 3 | 28 | 9.91152 | 9.93561 | 13.044 | 0 | 13.044 |
| 10 | 0.133087 | 2.09141 | UNIT I | 3 | 28 | 10.4617 | 10.4871 | 14.0813 | 0 | 14.0813 |
| 11 | 0.133087 | 2.28493 | UNIT I | 3 | 28 | 10.9119 | 10.9385 | 14.9301 | 0 | 14.9301 |
| 12 | 0.133087 | 2.471 | UNIT I | 3 | 28 | 11.2997 | 11.3271 | 15.661 | 0 | 15.661 |
| 13 | 0.133087 | 2.6436 | UNIT I | 3 | 28 | 11.6038 | 11.632 | 16.2344 | 0 | 16.2344 |
| 14 | 0.133087 | 2.79591 | UNIT I | 3 | 28 | 11.802 | 11.8307 | 16.608 | 0 | 16.608 |
| 15 | 0.133087 | 2.94082 | UNIT I | 3 | 28 | 11.9389 | 11.9679 | 16.8661 | 0 | 16.8661 |
| 16 | 0.133087 | 3.13476 | UNIT I | 3 | 28 | 12.192 | 12.2216 | 17.3434 | 0 | 17.3434 |
| 17 | 0.133087 | 3.31244 | UNIT I | 3 | 28 | 12.338 | 12.3679 | 17.6185 | 0 | 17.6185 |
| 18 | 0.133087 | 3.4605 | UNIT I | 3 | 28 | 12.333 | 12.363 | 17.6093 | 0 | 17.6093 |
| 19 | 0.133087 | 3.54105 | UNIT I | 3 | 28 | 12.0669 | 12.0963 | 17.1076 | 0 | 17.1076 |
| 20 | 0.133087 | 3.5211 | UNIT I | 3 | 28 | 11.459 | 11.4868 | 15.9614 | 0 | 15.9614 |
| 21 | 0.133087 | 3.23289 | UNIT I | 3 | 28 | 10.0978 | 10.1223 | 13.3952 | 0 | 13.3952 |
| 22 | 0.133087 | 2.7772 | UNIT I | 3 | 28 | 8.33276 | 8.35301 | 10.0676 | 0 | 10.0676 |
| 23 | 0.133087 | 2.23502 | UNIT I | 3 | 28 | 6.42032 | 6.43592 | 6.46205 | 0 | 6.46205 |
| 24 | 0.133087 | 1.55729 | UNIT I | 3 | 28 | 4.30996 | 4.32043 | 2.48337 | 0 | 2.48337 |
| 25 | 0.133087 | 0.588049 | UNIT I | 3 | 28 | 1.87089 | 1.87544 | -2.11498 | 0 | -2.11498 |

**Global Minimum Query (spencer) - Safety Factor**: 1.03105

| 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 | 0.133752 | 0.0630848 | UNIT I | 3 | 28 | 4.76256 | 4.91044 | 3.59301 | 0 | 3.59301 |
| 2 | 0.133752 | 0.20674 | UNIT I | 3 | 28 | 5.28777 | 5.45196 | 4.61148 | 0 | 4.61148 |
| 3 | 0.133752 | 0.351033 | UNIT I | 3 | 28 | 5.75084 | 5.9294 | 5.5094 | 0 | 5.5094 |
| 4 | 0.133752 | 0.483574 | UNIT I | 3 | 28 | 6.1063 | 6.2959 | 6.19869 | 0 | 6.19869 |
| 5 | 0.133752 | 0.604145 | UNIT I | 3 | 28 | 6.36822 | 6.56595 | 6.70657 | 0 | 6.70657 |
| 6 | 0.133752 | 0.735802 | UNIT I | 3 | 28 | 6.63789 | 6.844 | 7.22954 | 0 | 7.22954 |
| 7 | 0.133752 | 0.932458 | UNIT I | 3 | 28 | 7.10897 | 7.3297 | 8.143 | 0 | 8.143 |
| 8 | 0.133752 | 1.12235 | UNIT I | 3 | 28 | 7.50013 | 7.73301 | 8.90152 | 0 | 8.90152 |
| 9 | 0.133752 | 1.29885 | UNIT I | 3 | 28 | 7.79791 | 8.04004 | 9.47892 | 0 | 9.47892 |
| 10 | 0.133752 | 1.46142 | UNIT I | 3 | 28 | 8.01091 | 8.25965 | 9.89194 | 0 | 9.89194 |
| 11 | 0.133752 | 1.60942 | UNIT I | 3 | 28 | 8.14618 | 8.39912 | 10.1543 | 0 | 10.1543 |
| 12 | 0.133752 | 1.74853 | UNIT I | 3 | 28 | 8.22762 | 8.48309 | 10.3122 | 0 | 10.3122 |
| 13 | 0.133752 | 1.88157 | UNIT I | 3 | 28 | 8.26724 | 8.52394 | 10.389 | 0 | 10.389 |
| 14 | 0.133752 | 1.99754 | UNIT I | 3 | 28 | 8.23927 | 8.4951 | 10.3348 | 0 | 10.3348 |
| 15 | 0.133752 | 2.09852 | UNIT I | 3 | 28 | 8.15476 | 8.40797 | 10.1709 | 0 | 10.1709 |
| 16 | 0.133752 | 2.24793 | UNIT I | 3 | 28 | 8.16353 | 8.41701 | 10.1879 | 0 | 10.1879 |
| 17 | 0.133752 | 2.40219 | UNIT I | 3 | 28 | 8.1505 | 8.40357 | 10.1626 | 0 | 10.1626 |
| 18 | 0.133752 | 2.5325 | UNIT I | 3 | 28 | 8.052 | 8.30201 | 9.97164 | 0 | 9.97164 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 0.133752 | 2.61947 | UNIT I | 3 | 28 | 7.83573 | 8.07903 | 9.55227 | 0 | 9.55227 |
| 20 | 0.133752 | 2.61072 | UNIT I | 3 | 28 | 7.41941 | 7.64978 | 8.74498 | 0 | 8.74498 |
| 21 | 0.133752 | 2.40981 | UNIT I | 3 | 28 | 6.67625 | 6.88355 | 7.3039 | 0 | 7.3039 |
| 22 | 0.133752 | 1.98475 | UNIT I | 3 | 28 | 5.63576 | 5.81075 | 5.28623 | 0 | 5.28623 |
| 23 | 0.133752 | 1.50862 | UNIT I | 3 | 28 | 4.6366 | 4.78057 | 3.34877 | 0 | 3.34877 |
| 24 | 0.133752 | 0.967942 | UNIT I | 3 | 28 | 3.70832 | 3.82346 | 1.5487 | 0 | 1.5487 |
| 25 | 0.133752 | 0.339677 | UNIT I | 3 | 28 | 2.96928 | 3.06148 | 0.115621 | 0 | 0.115621 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.01763

| 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 | 0.133752 | 0.0630848 | UNIT I | 3 | 28 | 4.46787 | 4.54664 | 2.90881 | 0 | 2.90881 |
| 2 | 0.133752 | 0.20674 | UNIT I | 3 | 28 | 5.00862 | 5.09692 | 3.94374 | 0 | 3.94374 |
| 3 | 0.133752 | 0.351033 | UNIT I | 3 | 28 | 5.49563 | 5.59252 | 4.87582 | 0 | 4.87582 |
| 4 | 0.133752 | 0.483574 | UNIT I | 3 | 28 | 5.88167 | 5.98536 | 5.61464 | 0 | 5.61464 |
| 5 | 0.133752 | 0.604145 | UNIT I | 3 | 28 | 6.17794 | 6.28686 | 6.18169 | 0 | 6.18169 |
| 6 | 0.133752 | 0.735802 | UNIT I | 3 | 28 | 6.48446 | 6.59878 | 6.76832 | 0 | 6.76832 |
| 7 | 0.133752 | 0.932458 | UNIT I | 3 | 28 | 6.99794 | 7.12131 | 7.75103 | 0 | 7.75103 |
| 8 | 0.133752 | 1.12235 | UNIT I | 3 | 28 | 7.43419 | 7.56525 | 8.58599 | 0 | 8.58599 |
| 9 | 0.133752 | 1.29885 | UNIT I | 3 | 28 | 7.77753 | 7.91465 | 9.24311 | 0 | 9.24311 |
| 10 | 0.133752 | 1.46142 | UNIT I | 3 | 28 | 8.03495 | 8.17661 | 9.73576 | 0 | 9.73576 |
| 11 | 0.133752 | 1.60942 | UNIT I | 3 | 28 | 8.21229 | 8.35707 | 10.0752 | 0 | 10.0752 |
| 12 | 0.133752 | 1.74853 | UNIT I | 3 | 28 | 8.33326 | 8.48018 | 10.3067 | 0 | 10.3067 |
| 13 | 0.133752 | 1.88157 | UNIT I | 3 | 28 | 8.40977 | 8.55803 | 10.4532 | 0 | 10.4532 |
| 14 | 0.133752 | 1.99754 | UNIT I | 3 | 28 | 8.41421 | 8.56255 | 10.4617 | 0 | 10.4617 |
| 15 | 0.133752 | 2.09852 | UNIT I | 3 | 28 | 8.35768 | 8.50503 | 10.3534 | 0 | 10.3534 |
| 16 | 0.133752 | 2.24793 | UNIT I | 3 | 28 | 8.39925 | 8.54733 | 10.433 | 0 | 10.433 |
| 17 | 0.133752 | 2.40219 | UNIT I | 3 | 28 | 8.41794 | 8.56635 | 10.4688 | 0 | 10.4688 |
| 18 | 0.133752 | 2.5325 | UNIT I | 3 | 28 | 8.34605 | 8.49319 | 10.3312 | 0 | 10.3312 |
| 19 | 0.133752 | 2.61947 | UNIT I | 3 | 28 | 8.14864 | 8.2923 | 9.95335 | 0 | 9.95335 |
| 20 | 0.133752 | 2.61072 | UNIT I | 3 | 28 | 7.73571 | 7.87209 | 9.16305 | 0 | 9.16305 |
| 21 | 0.133752 | 2.40981 | UNIT I | 3 | 28 | 6.96509 | 7.08788 | 7.68818 | 0 | 7.68818 |
| 22 | 0.133752 | 1.98475 | UNIT I | 3 | 28 | 5.85882 | 5.96211 | 5.5709 | 0 | 5.5709 |
| 23 | 0.133752 | 1.50862 | UNIT I | 3 | 28 | 4.77942 | 4.86368 | 3.50507 | 0 | 3.50507 |
| 24 | 0.133752 | 0.967942 | UNIT I | 3 | 28 | 3.74605 | 3.81209 | 1.52732 | 0 | 1.52732 |
| 25 | 0.133752 | 0.339677 | UNIT I | 3 | 28 | 2.83195 | 2.88188 | -0.222157 | 0 | -0.222157 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.03799

| 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 | 0.133752 | 0.0630848 | UNIT I | 3 | 28 | 3.92165 | 4.07063 | 2.01357 | 0 | 2.01357 |
| 2 | 0.133752 | 0.20674 | UNIT I | 3 | 28 | 4.64215 | 4.81851 | 3.42013 | 0 | 3.42013 |
| 3 | 0.133752 | 0.351033 | UNIT I | 3 | 28 | 5.04997 | 5.24182 | 4.21625 | 0 | 4.21625 |
| 4 | 0.133752 | 0.483574 | UNIT I | 3 | 28 | 5.45525 | 5.6625 | 5.00743 | 0 | 5.00743 |
| 5 | 0.133752 | 0.604145 | UNIT I | 3 | 28 | 6.78429 | 7.04202 | 7.60191 | 0 | 7.60191 |
| 6 | 0.133752 | 0.735802 | UNIT I | 3 | 28 | 8.11142 | 8.41957 | 10.1927 | 0 | 10.1927 |
| 7 | 0.133752 | 0.932458 | UNIT I | 3 | 28 | 7.75211 | 8.04661 | 9.49125 | 0 | 9.49125 |
| 8 | 0.133752 | 1.12235 | UNIT I | 3 | 28 | 7.51896 | 7.80461 | 9.03616 | 0 | 9.03616 |
| 9 | 0.133752 | 1.29885 | UNIT I | 3 | 28 | 7.80336 | 8.09981 | 9.59139 | 0 | 9.59139 |
| 10 | 0.133752 | 1.46142 | UNIT I | 3 | 28 | 7.99907 | 8.30295 | 9.97337 | 0 | 9.97337 |
| 11 | 0.133752 | 1.60942 | UNIT I | 3 | 28 | 8.4196 | 8.73946 | 10.7943 | 0 | 10.7943 |
| 12 | 0.133752 | 1.74853 | UNIT I | 3 | 28 | 8.50893 | 8.83218 | 10.9687 | 0 | 10.9687 |
| 13 | 0.133752 | 1.88157 | UNIT I | 3 | 28 | 8.22095 | 8.53326 | 10.4065 | 0 | 10.4065 |
| 14 | 0.133752 | 1.99754 | UNIT I | 3 | 28 | 8.55959 | 8.88477 | 11.0677 | 0 | 11.0677 |
| 15 | 0.133752 | 2.09852 | UNIT I | 3 | 28 | 9.39365 | 9.75051 | 12.6958 | 0 | 12.6958 |
| 16 | 0.133752 | 2.24793 | UNIT I | 3 | 28 | 8.6556 | 8.98443 | 11.2551 | 0 | 11.2551 |
| 17 | 0.133752 | 2.40219 | UNIT I | 3 | 28 | 7.68089 | 7.97269 | 9.35226 | 0 | 9.35226 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 0.133752 | 2.5325 | UNIT I | 3 | 28 | 7.22567 | 7.50017 | 8.4636 | 0 | 8.4636 |
| 19 | 0.133752 | 2.61947 | UNIT I | 3 | 28 | 7.05246 | 7.32038 | 8.12545 | 0 | 8.12545 |
| 20 | 0.133752 | 2.61072 | UNIT I | 3 | 28 | 5.88815 | 6.11184 | 5.8525 | 0 | 5.8525 |
| 21 | 0.133752 | 2.40981 | UNIT I | 3 | 28 | 6.36515 | 6.60696 | 6.7837 | 0 | 6.7837 |
| 22 | 0.133752 | 1.98475 | UNIT I | 3 | 28 | 6.74309 | 6.99926 | 7.52152 | 0 | 7.52152 |
| 23 | 0.133752 | 1.50862 | UNIT I | 3 | 28 | 5.30228 | 5.50371 | 4.70879 | 0 | 4.70879 |
| 24 | 0.133752 | 0.967942 | UNIT I | 3 | 28 | 3.74834 | 3.89074 | 1.67523 | 0 | 1.67523 |
| 25 | 0.133752 | 0.339677 | UNIT I | 3 | 28 | 2.12505 | 2.20578 | -1.49372 | 0 | -1.49372 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.01757

| 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 | 0.133752 | 0.0630848 | UNIT I | 3 | 28 | 3.57829 | 3.64116 | 1.20584 | 0 | 1.20584 |
| 2 | 0.133752 | 0.20674 | UNIT I | 3 | 28 | 4.26132 | 4.33619 | 2.513 | 0 | 2.513 |
| 3 | 0.133752 | 0.351033 | UNIT I | 3 | 28 | 4.8128 | 4.89736 | 3.56842 | 0 | 3.56842 |
| 4 | 0.133752 | 0.483574 | UNIT I | 3 | 28 | 5.31669 | 5.4101 | 4.53274 | 0 | 4.53274 |
| 5 | 0.133752 | 0.604145 | UNIT I | 3 | 28 | 6.14806 | 6.25608 | 6.1238 | 0 | 6.1238 |
| 6 | 0.133752 | 0.735802 | UNIT I | 3 | 28 | 6.94544 | 7.06747 | 7.64977 | 0 | 7.64977 |
| 7 | 0.133752 | 0.932458 | UNIT I | 3 | 28 | 7.26123 | 7.38881 | 8.25418 | 0 | 8.25418 |
| 8 | 0.133752 | 1.12235 | UNIT I | 3 | 28 | 7.58861 | 7.72194 | 8.88069 | 0 | 8.88069 |
| 9 | 0.133752 | 1.29885 | UNIT I | 3 | 28 | 8.02128 | 8.16221 | 9.70873 | 0 | 9.70873 |
| 10 | 0.133752 | 1.46142 | UNIT I | 3 | 28 | 8.34808 | 8.49476 | 10.3341 | 0 | 10.3341 |
| 11 | 0.133752 | 1.60942 | UNIT I | 3 | 28 | 8.69497 | 8.84774 | 10.998 | 0 | 10.998 |
| 12 | 0.133752 | 1.74853 | UNIT I | 3 | 28 | 8.85617 | 9.01177 | 11.3065 | 0 | 11.3065 |
| 13 | 0.133752 | 1.88157 | UNIT I | 3 | 28 | 8.80544 | 8.96015 | 11.2094 | 0 | 11.2094 |
| 14 | 0.133752 | 1.99754 | UNIT I | 3 | 28 | 8.94976 | 9.10701 | 11.4856 | 0 | 11.4856 |
| 15 | 0.133752 | 2.09852 | UNIT I | 3 | 28 | 9.25625 | 9.41888 | 12.0722 | 0 | 12.0722 |
| 16 | 0.133752 | 2.24793 | UNIT I | 3 | 28 | 8.90678 | 9.06327 | 11.4034 | 0 | 11.4034 |
| 17 | 0.133752 | 2.40219 | UNIT I | 3 | 28 | 8.39703 | 8.54457 | 10.4278 | 0 | 10.4278 |
| 18 | 0.133752 | 2.5325 | UNIT I | 3 | 28 | 8.02306 | 8.16403 | 9.7121 | 0 | 9.7121 |
| 19 | 0.133752 | 2.61947 | UNIT I | 3 | 28 | 7.71623 | 7.8518 | 9.12493 | 0 | 9.12493 |
| 20 | 0.133752 | 2.61072 | UNIT I | 3 | 28 | 6.85106 | 6.97143 | 7.4692 | 0 | 7.4692 |
| 21 | 0.133752 | 2.40981 | UNIT I | 3 | 28 | 6.58922 | 6.70499 | 6.96806 | 0 | 6.96806 |
| 22 | 0.133752 | 1.98475 | UNIT I | 3 | 28 | 6.13882 | 6.24668 | 6.10609 | 0 | 6.10609 |
| 23 | 0.133752 | 1.50862 | UNIT I | 3 | 28 | 4.9123 | 4.99861 | 3.75883 | 0 | 3.75883 |
| 24 | 0.133752 | 0.967942 | UNIT I | 3 | 28 | 3.71317 | 3.77841 | 1.46398 | 0 | 1.46398 |
| 25 | 0.133752 | 0.339677 | UNIT I | 3 | 28 | 2.54913 | 2.59392 | -0.763729 | 0 | -0.763729 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.0337

| 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 | 0.133752 | 0.0630848 | UNIT I | 3 | 28 | 3.21403 | 3.32234 | 0.606232 | 0 | 0.606232 |
| 2 | 0.133752 | 0.20674 | UNIT I | 3 | 28 | 4.1636 | 4.30391 | 2.4523 | 0 | 2.4523 |
| 3 | 0.133752 | 0.351033 | UNIT I | 3 | 28 | 5.12129 | 5.29388 | 4.31416 | 0 | 4.31416 |
| 4 | 0.133752 | 0.483574 | UNIT I | 3 | 28 | 5.98141 | 6.18298 | 5.9863 | 0 | 5.9863 |
| 5 | 0.133752 | 0.604145 | UNIT I | 3 | 28 | 6.69474 | 6.92035 | 7.37312 | 0 | 7.37312 |
| 6 | 0.133752 | 0.735802 | UNIT I | 3 | 28 | 7.31491 | 7.56142 | 8.57879 | 0 | 8.57879 |
| 7 | 0.133752 | 0.932458 | UNIT I | 3 | 28 | 8.01022 | 8.28016 | 9.93052 | 0 | 9.93052 |
| 8 | 0.133752 | 1.12235 | UNIT I | 3 | 28 | 8.48701 | 8.77302 | 10.8574 | 0 | 10.8574 |
| 9 | 0.133752 | 1.29885 | UNIT I | 3 | 28 | 8.73282 | 9.02712 | 11.3354 | 0 | 11.3354 |
| 10 | 0.133752 | 1.46142 | UNIT I | 3 | 28 | 8.77749 | 9.07329 | 11.4222 | 0 | 11.4222 |
| 11 | 0.133752 | 1.60942 | UNIT I | 3 | 28 | 8.66363 | 8.95559 | 11.2009 | 0 | 11.2009 |
| 12 | 0.133752 | 1.74853 | UNIT I | 3 | 28 | 8.45693 | 8.74193 | 10.799 | 0 | 10.799 |
| 13 | 0.133752 | 1.88157 | UNIT I | 3 | 28 | 8.21096 | 8.48767 | 10.3208 | 0 | 10.3208 |
| 14 | 0.133752 | 1.99754 | UNIT I | 3 | 28 | 7.93793 | 8.20544 | 9.79003 | 0 | 9.79003 |
| 15 | 0.133752 | 2.09852 | UNIT I | 3 | 28 | 7.67541 | 7.93407 | 9.27964 | 0 | 9.27964 |
| 16 | 0.133752 | 2.24793 | UNIT I | 3 | 28 | 7.58347 | 7.83903 | 9.10088 | 0 | 9.10088 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0.133752 | 2.40219 | UNIT I | 3 | 28 | 7.56549 | 7.82045 | 9.06594 | 0 | 9.06594 |
| 18 | 0.133752 | 2.5325 | UNIT I | 3 | 28 | 7.56291 | 7.81778 | 9.06094 | 0 | 9.06094 |
| 19 | 0.133752 | 2.61947 | UNIT I | 3 | 28 | 7.53658 | 7.79056 | 9.00976 | 0 | 9.00976 |
| 20 | 0.133752 | 2.61072 | UNIT I | 3 | 28 | 7.38 | 7.62871 | 8.70536 | 0 | 8.70536 |
| 21 | 0.133752 | 2.40981 | UNIT I | 3 | 28 | 6.89772 | 7.13017 | 7.76769 | 0 | 7.76769 |
| 22 | 0.133752 | 1.98475 | UNIT I | 3 | 28 | 6.01015 | 6.21269 | 6.0422 | 0 | 6.0422 |
| 23 | 0.133752 | 1.50862 | UNIT I | 3 | 28 | 5.01828 | 5.1874 | 4.11389 | 0 | 4.11389 |
| 24 | 0.133752 | 0.967942 | UNIT I | 3 | 28 | 3.82974 | 3.95881 | 1.80325 | 0 | 1.80325 |
| 25 | 0.133752 | 0.339677 | UNIT I | 3 | 28 | 2.28013 | 2.35697 | -1.20936 | 0 | -1.20936 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -5.17248 | 1.262 |
| 40.982 | 12.5067 |
| 48.4804 | 16.8997 |

### External Boundary

| X | Y |
|---|---|
| 7.0471 | 7.37 |
| 6.65347 | 7.1722 |
| 6.64126 | 7.03314 |
| 6.59548 | 6.97972 |
| 6.43139 | 6.88651 |
| 6.22983 | 6.98289 |
| 6.20082 | 7.08159 |
| 6.18801 | 7.23842 |
| 6.16065 | 7.27376 |
| 5.26106 | 7.18753 |
| 5.26127 | 7.137 |
| 5.26906 | 7.1082 |
| 5.27338 | 7.01064 |
| 5.27667 | 6.97302 |
| 5.28509 | 6.88998 |
| 5.30936 | 6.84551 |
| 5.30827 | 6.82804 |
| 5.30584 | 6.78939 |
| 5.31363 | 6.76058 |
| 5.31795 | 6.66302 |
| 5.32124 | 6.6254 |
| 5.32967 | 6.54237 |
| 5.34448 | 6.50821 |
| 5.37396 | 6.50326 |
| 5.37032 | 6.49139 |
| 5.3391 | 6.38946 |
| 5.31847 | 6.20899 |
| 5.31944 | 6.19675 |
| 5.34169 | 5.9151 |
| 5.31738 | 5.90787 |
| 4.37578 | 5.62795 |
| 2.84443 | 5.31101 |
| 2.05801 | 5.19007 |
| 1.21108 | 5.00866 |
| -0.119822 | 4.81214 |

| | |
|---|---|
| -3.13102 | 4.668 |
| -4.37303 | 4.67353 |
| -4.46405 | 4.67107 |
| -4.50833 | 4.60468 |
| -4.56244 | 4.58501 |
| -4.81089 | 4.58501 |
| -5.17248 | 4.57027 |
| -5.17248 | 2.74311 |
| -5.17248 | 1.262 |
| -5.17248 | -1.737 |
| -5.17248 | -4.66367 |
| -5.17248 | -5.39909 |
| 48.4804 | -5.39909 |
| 48.4804 | 9.34031 |
| 48.4804 | 14.9094 |
| 48.4804 | 16.8997 |
| 48.4804 | 19.16 |
| 48.4804 | 22.6129 |
| 47.7327 | 22.2747 |
| 47.1273 | 21.9188 |
| 46.8424 | 21.5095 |
| 45.97 | 20.9756 |
| 45.5961 | 20.3705 |
| 45.2757 | 19.4985 |
| 44.6989 | 18.3685 |
| 44.4436 | 18.1023 |
| 44.1107 | 17.4811 |
| 43.4024 | 16.5348 |
| 43.1042 | 16.0823 |
| 42.8392 | 15.8505 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 26.3931 | 14.3033 |
| 26.1708 | 14.0891 |
| 25.6822 | 13.4908 |
| 25.199 | 13.039 |
| 24.4255 | 12.3536 |
| 23.8204 | 12.0079 |
| 23.1116 | 11.6796 |
| 22.5066 | 11.455 |
| 21.9015 | 11.4031 |
| 20.9679 | 11.4377 |
| 20.2418 | 11.3167 |
| 19.0316 | 11.0748 |
| 17.7402 | 11.0127 |
| 17.4709 | 10.905 |
| 15.9193 | 10.7326 |
| 14.6909 | 10.6895 |
| 13.8776 | 10.6286 |
| 13.5261 | 10.6022 |

## Material Boundary

| X | Y |
|---|---|
| -5.17248 | -1.737 |
| 15.651 | 3.653 |
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |

| | |
|---|---|
| 48.4804 | 14.9094 |

### Material Boundary

| X | Y |
|---|---|
| -5.17248 | -4.66367 |
| 48.4804 | 9.34031 |

### Material Boundary

| X | Y |
|---|---|
| -5.17248 | 1.262 |
| 40.982 | 12.5067 |

### Material Boundary

| X | Y |
|---|---|
| 7.05478 | 6.55395 |
| 7.09425 | 6.55587 |
| 7.17214 | 6.55377 |
| 7.21749 | 6.55254 |
| 7.23249 | 6.55214 |
| 7.40399 | 6.54751 |
| 7.63002 | 6.54332 |
| 7.73202 | 6.53754 |
| 7.85185 | 6.53076 |
| 8.05278 | 6.50985 |
| 8.35414 | 6.47638 |
| 8.51739 | 6.46801 |
| 8.65969 | 6.46383 |
| 8.7476 | 6.48893 |
| 9.2187 | 6.51516 |
| 9.2976 | 6.55054 |
| 9.81226 | 6.72932 |
| 10.1768 | 6.96511 |
| 10.2379 | 7.071 |

### Material Boundary

| X | Y |
|---|---|
| 5.30936 | 6.84551 |
| 6.22222 | 6.935 |
| 6.22222 | 6.91685 |
| 6.23259 | 6.8908 |
| 6.25108 | 6.66437 |
| 6.25108 | 6.5848 |
| 6.20873 | 6.5766 |
| 6.12072 | 6.56712 |

### Material Boundary

| X | Y |
|---|---|
| 5.37396 | 6.50326 |
| 5.44406 | 6.52403 |
| 6.08984 | 6.56515 |
| 6.12072 | 6.56712 |

### Material Boundary

| X | Y |
|---|---|
| 6.22222 | 6.935 |
| 6.22983 | 6.98289 |

### Material Boundary

| X | Y |
|---|---|
| 5.30827 | 6.82804 |
| 6.22222 | 6.91685 |

### Material Boundary

| X | Y |
|---|---|
| 5.37032 | 6.49139 |
| 6.25593 | 6.56825 |

### Material Boundary

| X | Y |
|---|---|
| 10.2379 | 7.071 |
| 10.4127 | 7.36168 |
| 10.6915 | 7.59747 |
| 10.9257 | 7.94138 |
| 11.2016 | 8.33339 |
| 11.2812 | 8.44419 |
| 11.6029 | 8.66926 |
| 11.8746 | 8.94686 |
| 12.1205 | 9.19815 |
| 12.5682 | 9.65556 |
| 12.6055 | 9.69815 |
| 12.6931 | 9.79829 |
| 12.8699 | 10.0002 |
| 13.1927 | 10.1884 |
| 13.8776 | 10.6286 |

### Material Boundary

| X | Y |
|---|---|
| 6.71685 | 5.94959 |
| 9.2187 | 5.94959 |
| 9.2187 | 6.51516 |
| 9.2187 | 7.94138 |
| 8.71919 | 7.94138 |
| 8.71919 | 7.44674 |
| 8.21887 | 7.44674 |
| 8.21887 | 6.94674 |
| 7.71702 | 6.94674 |
| 7.21749 | 6.94674 |
| 7.21749 | 6.55254 |
| 7.21749 | 6.54654 |
| 7.21749 | 6.52614 |
| 7.21749 | 6.455 |
| 6.71685 | 6.455 |
| 6.71685 | 5.94959 |

### Material Boundary

| X | Y |
|---|---|

| | |
|---|---|
| 5.31847 | 6.20899 |
| 6.23818 | 6.2705 |

### Material Boundary

| X | Y |
|---|---|
| 5.31944 | 6.19675 |
| 6.23739 | 6.25721 |

### Material Boundary

| X | Y |
|---|---|
| 5.34169 | 5.9151 |
| 6.21903 | 5.94912 |

### Material Boundary

| X | Y |
|---|---|
| 6.21903 | 5.94912 |
| 6.23739 | 6.25721 |

### Material Boundary

| X | Y |
|---|---|
| 6.25108 | 6.5848 |
| 6.25593 | 6.56825 |

### Material Boundary

| X | Y |
|---|---|
| 6.23739 | 6.25721 |
| 6.23818 | 6.2705 |

### Material Boundary

| X | Y |
|---|---|
| 6.23818 | 6.2705 |
| 6.25593 | 6.56825 |

### Material Boundary

| X | Y |
|---|---|
| 6.25593 | 6.488 |
| 7.05478 | 6.55395 |

### Material Boundary

| X | Y |
|---|---|
| 9.2187 | 7.94138 |
| 9.70168 | 7.94138 |

### Material Boundary

| X | Y |
|---|---|
| 9.2187 | 5.94959 |
| 10.8156 | 7.55366 |
| 11.2016 | 7.94138 |
| 11.46 | 8.201 |

| | |
|---|---|
| 12.2025 | 8.94686 |
| 13.1927 | 9.94144 |
| 13.7377 | 10.4889 |

### Material Boundary

| X | Y |
|---|---|
| 7.71702 | 6.94674 |
| 7.71702 | 7.44674 |
| 8.21887 | 7.44674 |

### Material Boundary

| X | Y |
|---|---|
| 13.7377 | 10.4889 |
| 13.8776 | 10.6286 |

### Material Boundary

| X | Y |
|---|---|
| 10.7022 | 8.94686 |
| 11.2016 | 8.94686 |
| 11.2016 | 8.33339 |
| 11.2016 | 7.94138 |
| 10.9257 | 7.94138 |
| 9.70168 | 7.94138 |
| 9.70168 | 8.44679 |
| 10.7022 | 8.44679 |
| 10.7022 | 8.94686 |

### Material Boundary

| X | Y |
|---|---|
| 11.2016 | 8.94686 |
| 11.8746 | 8.94686 |
| 12.2025 | 8.94686 |

### Material Boundary

| X | Y |
|---|---|
| 5.31738 | 5.90787 |
| 6.2226 | 5.9356 |
| 6.21903 | 5.94912 |

### Material Boundary

| X | Y |
|---|---|
| 6.2226 | 5.9356 |
| 6.71685 | 5.94959 |

### Material Boundary

| X | Y |
|---|---|
| 10.8156 | 7.55366 |
| 12.574 | 7.94138 |
| 31.5055 | 11.4337 |
| 40.982 | 12.5067 |
| 48.4804 | 19.16 |

## Material Boundary

| X | Y |
|---|---|
| 40.982 | 12.5067 |
| 48.4804 | 16.8997 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S48 + GABIONS EQup fullroad lim
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 15/5/2021, 22:33:46

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): -0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | INTERFACE | UNIT V | UNIT II UNDER WT | GABION |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 20 | 25 | 19.5 | 18 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 0 | 500 | 5 | 20 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 25 | 45 | 28 | 32 |
| Water Surface | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated |

| Property | GRAVEL | SW |
|---|---|---|
| Color | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19 |
| Cohesion [kPa] | 0 | 1 |
| Friction Angle [deg] | 36 | 35 |
| Water Surface | Water Table | Water Table |
| Hu Value | Automatically Calculated | Automatically Calculated |

## Global Minimums

### Method: ordinary/fellenius

FS: 0.986113
Center: 22.826, 16.686
Radius: 5.207
Left Slip Surface Endpoint: 22.586, 11.484
Right Slip Surface Endpoint: 27.447, 14.285
Resisting Moment=210.323 kN-m
Driving Moment=213.285 kN-m

### Method: bishop simplified

FS: 1.056030
Center: 23.370, 16.539
Radius: 4.598
Left Slip Surface Endpoint: 23.702, 11.953
Right Slip Surface Endpoint: 27.378, 14.286
Resisting Moment=138.339 kN-m
Driving Moment=130.998 kN-m

### Method: janbu simplified

FS: 0.962870
Center: 23.874, 16.070
Radius: 4.115
Left Slip Surface Endpoint: 23.712, 11.958
Right Slip Surface Endpoint: 27.581, 14.283
Resisting Horizontal Force=29.9298 kN
Driving Horizontal Force=31.084 kN

### Method: janbu corrected

FS: 1.019730
Center: 23.874, 16.070
Radius: 4.115
Left Slip Surface Endpoint: 23.712, 11.958
Right Slip Surface Endpoint: 27.581, 14.283
Resisting Horizontal Force=31.6973 kN
Driving Horizontal Force=31.084 kN

### Method: spencer

FS: 1.057440
Center: 23.370, 16.539
Radius: 4.598
Left Slip Surface Endpoint: 23.702, 11.953
Right Slip Surface Endpoint: 27.378, 14.286
Resisting Moment=138.523 kN-m
Driving Moment=130.998 kN-m
Resisting Horizontal Force=25.1376 kN
Driving Horizontal Force=23.7721 kN

### Method: corp of eng#1

FS: 1.026980
Center: 23.874, 16.070
Radius: 4.115
Left Slip Surface Endpoint: 23.712, 11.958
Right Slip Surface Endpoint: 27.581, 14.283
Resisting Horizontal Force=30.8458 kN
Driving Horizontal Force=30.0354 kN

### Method: corp of eng#2

FS: 1.055260
Center: 23.370, 16.539
Radius: 4.598
Left Slip Surface Endpoint: 23.702, 11.953
Right Slip Surface Endpoint: 27.378, 14.286
Resisting Horizontal Force=25.0823 kN
Driving Horizontal Force=23.769 kN

### Method: lowe-karafiath

FS: 1.026450
Center: 23.874, 16.070
Radius: 4.115
Left Slip Surface Endpoint: 23.712, 11.958
Right Slip Surface Endpoint: 27.581, 14.283
Resisting Horizontal Force=30.8095 kN
Driving Horizontal Force=30.0157 kN

### Method: gle/morgenstern-price

FS: 1.054440
Center: 23.370, 16.539
Radius: 4.598
Left Slip Surface Endpoint: 23.702, 11.953

Right Slip Surface Endpoint: 27.378, 14.286
Resisting Moment=138.13 kN-m
Driving Moment=130.998 kN-m
Resisting Horizontal Force=25.1007 kN
Driving Horizontal Force=23.8047 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 8954
Number of Invalid Surfaces: 1046

**Error Codes:**

Error Code -103 reported for 3 surfaces
Error Code -105 reported for 29 surfaces
Error Code -106 reported for 118 surfaces
Error Code -108 reported for 109 surfaces
Error Code -109 reported for 1 surface
Error Code -114 reported for 783 surfaces
Error Code -123 reported for 3 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 8918
Number of Invalid Surfaces: 1082

**Error Codes:**

Error Code -103 reported for 3 surfaces
Error Code -105 reported for 29 surfaces
Error Code -106 reported for 118 surfaces
Error Code -108 reported for 110 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 35 surfaces
Error Code -114 reported for 783 surfaces
Error Code -123 reported for 3 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 8663
Number of Invalid Surfaces: 1337

**Error Codes:**

Error Code -103 reported for 3 surfaces
Error Code -105 reported for 29 surfaces
Error Code -106 reported for 118 surfaces
Error Code -108 reported for 395 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 5 surfaces
Error Code -114 reported for 783 surfaces
Error Code -123 reported for 3 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 8663
Number of Invalid Surfaces: 1337

**Error Codes:**

Error Code -103 reported for 3 surfaces
Error Code -105 reported for 29 surfaces
Error Code -106 reported for 118 surfaces
Error Code -108 reported for 395 surfaces
Error Code -109 reported for 1 surface
Error Code -112 reported for 5 surfaces

Error Code -114 reported for 783 surfaces
Error Code -123 reported for 3 surfaces

## Method: spencer

Number of Valid Surfaces: 8219
Number of Invalid Surfaces: 1781

**Error Codes:**

Error Code -103 reported for 3 surfaces
Error Code -105 reported for 29 surfaces
Error Code -106 reported for 118 surfaces
Error Code -108 reported for 442 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 367 surfaces
Error Code -112 reported for 35 surfaces
Error Code -114 reported for 783 surfaces
Error Code -123 reported for 3 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 8429
Number of Invalid Surfaces: 1571

**Error Codes:**

Error Code -103 reported for 3 surfaces
Error Code -105 reported for 29 surfaces
Error Code -106 reported for 118 surfaces
Error Code -108 reported for 532 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 102 surfaces
Error Code -114 reported for 783 surfaces
Error Code -123 reported for 3 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 7616
Number of Invalid Surfaces: 2384

**Error Codes:**

Error Code -103 reported for 3 surfaces
Error Code -105 reported for 29 surfaces
Error Code -106 reported for 118 surfaces
Error Code -108 reported for 1118 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 326 surfaces
Error Code -112 reported for 3 surfaces
Error Code -114 reported for 783 surfaces
Error Code -123 reported for 3 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 5974
Number of Invalid Surfaces: 4026

**Error Codes:**

Error Code -103 reported for 3 surfaces
Error Code -105 reported for 29 surfaces
Error Code -106 reported for 118 surfaces
Error Code -108 reported for 2355 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 734 surfaces
Error Code -114 reported for 783 surfaces
Error Code -123 reported for 3 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 8532
Number of Invalid Surfaces: 1468

### Error Codes:

Error Code -103 reported for 3 surfaces
Error Code -105 reported for 29 surfaces
Error Code -106 reported for 118 surfaces
Error Code -108 reported for 402 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 94 surfaces
Error Code -112 reported for 35 surfaces
Error Code -114 reported for 783 surfaces
Error Code -123 reported for 3 surfaces

### Error Codes

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.
-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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.
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.986113

| 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 | 0.194426 | 0.143196 | UNIT I | 3 | 28 | 3.40157 | 3.35433 | 0.666399 | 0 | 0.666399 |
| 2 | 0.194426 | 0.416174 | UNIT I | 3 | 28 | 4.07861 | 4.02197 | 1.92205 | 0 | 1.92205 |
| 3 | 0.194426 | 0.665219 | UNIT I | 3 | 28 | 4.68149 | 4.61648 | 3.04015 | 0 | 3.04015 |
| 4 | 0.194426 | 0.934136 | UNIT I | 3 | 28 | 5.31346 | 5.23967 | 4.21222 | 0 | 4.21222 |
| 5 | 0.194426 | 1.19224 | UNIT I | 3 | 28 | 5.89376 | 5.81191 | 5.28845 | 0 | 5.28845 |
| 6 | 0.194426 | 1.42289 | UNIT I | 3 | 28 | 6.37952 | 6.29093 | 6.18935 | 0 | 6.18935 |
| 7 | 0.194426 | 1.64209 | UNIT I | 3 | 28 | 6.80681 | 6.71228 | 6.98177 | 0 | 6.98177 |
| 8 | 0.194426 | 1.88919 | UNIT I | 3 | 28 | 7.26113 | 7.16029 | 7.82434 | 0 | 7.82434 |
| 9 | 0.194426 | 2.11179 | UNIT I | 3 | 28 | 7.61934 | 7.51353 | 8.48872 | 0 | 8.48872 |
| 10 | 0.194426 | 2.33717 | UNIT I | 3 | 28 | 7.9394 | 7.82915 | 9.08232 | 0 | 9.08232 |
| 11 | 0.194426 | 2.70068 | UNIT I | 3 | 28 | 8.48978 | 8.37188 | 10.103 | 0 | 10.103 |
| 12 | 0.194426 | 3.05568 | UNIT I | 3 | 28 | 8.94821 | 8.82395 | 10.9533 | 0 | 10.9533 |
| 13 | 0.194426 | 3.37659 | UNIT I | 3 | 28 | 9.26369 | 9.13505 | 11.5384 | 0 | 11.5384 |
| 14 | 0.194426 | 3.66703 | UNIT I | 3 | 28 | 9.44655 | 9.31537 | 11.8775 | 0 | 11.8775 |
| 15 | 0.194426 | 3.94543 | UNIT I | 3 | 28 | 9.53137 | 9.39901 | 12.0348 | 0 | 12.0348 |
| 16 | 0.194426 | 4.18679 | UNIT I | 3 | 28 | 9.47937 | 9.34773 | 11.9383 | 0 | 11.9383 |
| 17 | 0.194426 | 4.50225 | UNIT I | 3 | 28 | 9.45767 | 9.32633 | 11.8981 | 0 | 11.8981 |
| 18 | 0.194426 | 4.85791 | UNIT I | 3 | 28 | 9.39291 | 9.26247 | 11.778 | 0 | 11.778 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19 | 0.194426 | 5.13012 | UNIT I | 3 | 28 | 9.12029 | 8.99364 | 11.2724 | 0 | 11.2724 |
| 20 | 0.194426 | 5.14013 | UNIT I | 3 | 28 | 8.47903 | 8.36128 | 10.0831 | 0 | 10.0831 |
| 21 | 0.194426 | 4.53912 | UNIT I | 3 | 28 | 7.24755 | 7.1469 | 7.7992 | 0 | 7.7992 |
| 22 | 0.194426 | 3.73845 | UNIT I | 3 | 28 | 6.00112 | 5.91778 | 5.48754 | 0 | 5.48754 |
| 23 | 0.194426 | 2.84029 | UNIT I | 3 | 28 | 4.89798 | 4.82996 | 3.44165 | 0 | 3.44165 |
| 24 | 0.194426 | 1.81999 | UNIT I | 3 | 28 | 3.97585 | 3.92064 | 1.73147 | 0 | 1.73147 |
| 25 | 0.194426 | 0.63779 | UNIT I | 3 | 28 | 3.27923 | 3.23369 | 0.439508 | 0 | 0.439508 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.05603

| 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 | 0.147035 | 0.0777975 | UNIT I | 3 | 28 | 2.94909 | 3.11432 | 0.21501 | 0 | 0.21501 |
| 2 | 0.147035 | 0.255025 | UNIT I | 3 | 28 | 3.4184 | 3.60993 | 1.14711 | 0 | 1.14711 |
| 3 | 0.147035 | 0.433152 | UNIT I | 3 | 28 | 3.87533 | 4.09246 | 2.05461 | 0 | 2.05461 |
| 4 | 0.147035 | 0.597663 | UNIT I | 3 | 28 | 4.27908 | 4.51884 | 2.85653 | 0 | 2.85653 |
| 5 | 0.147035 | 0.74875 | UNIT I | 3 | 28 | 4.6321 | 4.89164 | 3.55766 | 0 | 3.55766 |
| 6 | 0.147035 | 0.960017 | UNIT I | 3 | 28 | 5.13702 | 5.42485 | 4.56048 | 0 | 4.56048 |
| 7 | 0.147035 | 1.21149 | UNIT I | 3 | 28 | 5.73236 | 6.05354 | 5.74287 | 0 | 5.74287 |
| 8 | 0.147035 | 1.44809 | UNIT I | 3 | 28 | 6.26715 | 6.6183 | 6.80505 | 0 | 6.80505 |
| 9 | 0.147035 | 1.66936 | UNIT I | 3 | 28 | 6.74177 | 7.11951 | 7.74769 | 0 | 7.74769 |
| 10 | 0.147035 | 1.87475 | UNIT I | 3 | 28 | 7.15629 | 7.55726 | 8.57095 | 0 | 8.57095 |
| 11 | 0.147035 | 2.07035 | UNIT I | 3 | 28 | 7.52752 | 7.94929 | 9.30824 | 0 | 9.30824 |
| 12 | 0.147035 | 2.26169 | UNIT I | 3 | 28 | 7.86955 | 8.31048 | 9.98759 | 0 | 9.98759 |
| 13 | 0.147035 | 2.43517 | UNIT I | 3 | 28 | 8.14901 | 8.6056 | 10.5426 | 0 | 10.5426 |
| 14 | 0.147035 | 2.60641 | UNIT I | 3 | 28 | 8.4043 | 8.87519 | 11.0496 | 0 | 11.0496 |
| 15 | 0.147035 | 2.84623 | UNIT I | 3 | 28 | 8.79969 | 9.29274 | 11.8349 | 0 | 11.8349 |
| 16 | 0.147035 | 3.07705 | UNIT I | 3 | 28 | 9.14609 | 9.65855 | 12.5229 | 0 | 12.5229 |
| 17 | 0.147035 | 3.28185 | UNIT I | 3 | 28 | 9.40419 | 9.93111 | 13.0355 | 0 | 13.0355 |
| 18 | 0.147035 | 3.38947 | UNIT I | 3 | 28 | 9.41947 | 9.94724 | 13.0659 | 0 | 13.0659 |
| 19 | 0.147035 | 3.33685 | UNIT I | 3 | 28 | 9.06982 | 9.578 | 12.3714 | 0 | 12.3714 |
| 20 | 0.147035 | 2.96639 | UNIT I | 3 | 28 | 8.05309 | 8.5043 | 10.3521 | 0 | 10.3521 |
| 21 | 0.147035 | 2.54201 | UNIT I | 3 | 28 | 6.95618 | 7.34593 | 8.17349 | 0 | 8.17349 |
| 22 | 0.147035 | 2.07652 | UNIT I | 3 | 28 | 5.81616 | 6.14204 | 5.9093 | 0 | 5.9093 |
| 23 | 0.147035 | 1.56265 | UNIT I | 3 | 28 | 4.63149 | 4.89099 | 3.55644 | 0 | 3.55644 |
| 24 | 0.147035 | 0.99018 | UNIT I | 3 | 28 | 3.40133 | 3.59191 | 1.11322 | 0 | 1.11322 |
| 25 | 0.147035 | 0.343894 | UNIT I | 3 | 28 | 2.12672 | 2.24588 | -1.4183 | 0 | -1.4183 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.96287

| 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 | 0.154757 | 0.112282 | UNIT I | 3 | 28 | 3.51632 | 3.38576 | 0.725513 | 0 | 0.725513 |
| 2 | 0.154757 | 0.36096 | UNIT I | 3 | 28 | 4.23482 | 4.07758 | 2.02664 | 0 | 2.02664 |
| 3 | 0.154757 | 0.604534 | UNIT I | 3 | 28 | 4.90814 | 4.7259 | 3.24594 | 0 | 3.24594 |
| 4 | 0.154757 | 0.830904 | UNIT I | 3 | 28 | 5.50146 | 5.29719 | 4.32039 | 0 | 4.32039 |
| 5 | 0.154757 | 1.05084 | UNIT I | 3 | 28 | 6.051 | 5.82633 | 5.31556 | 0 | 5.31556 |
| 6 | 0.154757 | 1.35899 | UNIT I | 3 | 28 | 6.83619 | 6.58236 | 6.73744 | 0 | 6.73744 |
| 7 | 0.154757 | 1.67591 | UNIT I | 3 | 28 | 7.61336 | 7.33068 | 8.14481 | 0 | 8.14481 |
| 8 | 0.154757 | 1.97456 | UNIT I | 3 | 28 | 8.30503 | 7.99666 | 9.39735 | 0 | 9.39735 |
| 9 | 0.154757 | 2.25444 | UNIT I | 3 | 28 | 8.91284 | 8.58191 | 10.4981 | 0 | 10.4981 |
| 10 | 0.154757 | 2.51666 | UNIT I | 3 | 28 | 9.44255 | 9.09195 | 11.4573 | 0 | 11.4573 |
| 11 | 0.154757 | 2.77521 | UNIT I | 3 | 28 | 9.93346 | 9.56463 | 12.3462 | 0 | 12.3462 |
| 12 | 0.154757 | 3.01688 | UNIT I | 3 | 28 | 10.3508 | 9.96648 | 13.102 | 0 | 13.102 |
| 13 | 0.154757 | 3.2413 | UNIT I | 3 | 28 | 10.6951 | 10.298 | 13.7255 | 0 | 13.7255 |
| 14 | 0.154757 | 3.53421 | UNIT I | 3 | 28 | 11.1801 | 10.765 | 14.6038 | 0 | 14.6038 |
| 15 | 0.154757 | 3.8373 | UNIT I | 3 | 28 | 11.6503 | 11.2177 | 15.4554 | 0 | 15.4554 |
| 16 | 0.154757 | 4.11289 | UNIT I | 3 | 28 | 12.0115 | 11.5655 | 16.1094 | 0 | 16.1094 |
| 17 | 0.154757 | 4.28819 | UNIT I | 3 | 28 | 12.0971 | 11.6479 | 16.2643 | 0 | 16.2643 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 0.154757 | 4.28271 | UNIT I | 3 | 28 | 11.7414 | 11.3055 | 15.6203 | 0 | 15.6203 |
| 19 | 0.154757 | 3.92079 | UNIT I | 3 | 28 | 10.5954 | 10.202 | 13.545 | 0 | 13.545 |
| 20 | 0.154757 | 3.49538 | UNIT I | 3 | 28 | 9.34544 | 8.99844 | 11.2814 | 0 | 11.2814 |
| 21 | 0.154757 | 3.02368 | UNIT I | 3 | 28 | 8.04043 | 7.74189 | 8.91817 | 0 | 8.91817 |
| 22 | 0.154757 | 2.49729 | UNIT I | 3 | 28 | 6.67686 | 6.42895 | 6.44891 | 0 | 6.44891 |
| 23 | 0.154757 | 1.90414 | UNIT I | 3 | 28 | 5.25117 | 5.05619 | 3.86713 | 0 | 3.86713 |
| 24 | 0.154757 | 1.22578 | UNIT I | 3 | 28 | 3.76048 | 3.62085 | 1.16765 | 0 | 1.16765 |
| 25 | 0.154757 | 0.431242 | UNIT I | 3 | 28 | 2.20523 | 2.12335 | -1.64875 | 0 | -1.64875 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.01973

| 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 | 0.154757 | 0.112282 | UNIT I | 3 | 28 | 3.32025 | 3.38576 | 0.725513 | 0 | 0.725513 |
| 2 | 0.154757 | 0.36096 | UNIT I | 3 | 28 | 3.99869 | 4.07758 | 2.02664 | 0 | 2.02664 |
| 3 | 0.154757 | 0.604534 | UNIT I | 3 | 28 | 4.63446 | 4.7259 | 3.24594 | 0 | 3.24594 |
| 4 | 0.154757 | 0.830904 | UNIT I | 3 | 28 | 5.1947 | 5.29719 | 4.32039 | 0 | 4.32039 |
| 5 | 0.154757 | 1.05084 | UNIT I | 3 | 28 | 5.7136 | 5.82633 | 5.31556 | 0 | 5.31556 |
| 6 | 0.154757 | 1.35899 | UNIT I | 3 | 28 | 6.455 | 6.58236 | 6.73744 | 0 | 6.73744 |
| 7 | 0.154757 | 1.67591 | UNIT I | 3 | 28 | 7.18884 | 7.33068 | 8.14481 | 0 | 8.14481 |
| 8 | 0.154757 | 1.97456 | UNIT I | 3 | 28 | 7.84194 | 7.99666 | 9.39735 | 0 | 9.39735 |
| 9 | 0.154757 | 2.25444 | UNIT I | 3 | 28 | 8.41586 | 8.58191 | 10.4981 | 0 | 10.4981 |
| 10 | 0.154757 | 2.51666 | UNIT I | 3 | 28 | 8.91604 | 9.09195 | 11.4573 | 0 | 11.4573 |
| 11 | 0.154757 | 2.77521 | UNIT I | 3 | 28 | 9.37957 | 9.56463 | 12.3462 | 0 | 12.3462 |
| 12 | 0.154757 | 3.01688 | UNIT I | 3 | 28 | 9.77365 | 9.96648 | 13.102 | 0 | 13.102 |
| 13 | 0.154757 | 3.2413 | UNIT I | 3 | 28 | 10.0987 | 10.298 | 13.7255 | 0 | 13.7255 |
| 14 | 0.154757 | 3.53421 | UNIT I | 3 | 28 | 10.5567 | 10.765 | 14.6038 | 0 | 14.6038 |
| 15 | 0.154757 | 3.8373 | UNIT I | 3 | 28 | 11.0007 | 11.2177 | 15.4554 | 0 | 15.4554 |
| 16 | 0.154757 | 4.11289 | UNIT I | 3 | 28 | 11.3417 | 11.5655 | 16.1094 | 0 | 16.1094 |
| 17 | 0.154757 | 4.28819 | UNIT I | 3 | 28 | 11.4225 | 11.6479 | 16.2643 | 0 | 16.2643 |
| 18 | 0.154757 | 4.28271 | UNIT I | 3 | 28 | 11.0867 | 11.3055 | 15.6203 | 0 | 15.6203 |
| 19 | 0.154757 | 3.92079 | UNIT I | 3 | 28 | 10.0046 | 10.202 | 13.545 | 0 | 13.545 |
| 20 | 0.154757 | 3.49538 | UNIT I | 3 | 28 | 8.82434 | 8.99844 | 11.2814 | 0 | 11.2814 |
| 21 | 0.154757 | 3.02368 | UNIT I | 3 | 28 | 7.5921 | 7.74189 | 8.91817 | 0 | 8.91817 |
| 22 | 0.154757 | 2.49729 | UNIT I | 3 | 28 | 6.30456 | 6.42895 | 6.44891 | 0 | 6.44891 |
| 23 | 0.154757 | 1.90414 | UNIT I | 3 | 28 | 4.95836 | 5.05619 | 3.86713 | 0 | 3.86713 |
| 24 | 0.154757 | 1.22578 | UNIT I | 3 | 28 | 3.55079 | 3.62085 | 1.16765 | 0 | 1.16765 |
| 25 | 0.154757 | 0.431242 | UNIT I | 3 | 28 | 2.08226 | 2.12335 | -1.64875 | 0 | -1.64875 |

**Global Minimum Query (spencer) - Safety Factor**: 1.05744

| 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 | 0.147035 | 0.0777975 | UNIT I | 3 | 28 | 4.81873 | 5.09552 | 3.9411 | 0 | 3.9411 |
| 2 | 0.147035 | 0.255025 | UNIT I | 3 | 28 | 5.25511 | 5.55696 | 4.80895 | 0 | 4.80895 |
| 3 | 0.147035 | 0.433152 | UNIT I | 3 | 28 | 5.63622 | 5.95996 | 5.56687 | 0 | 5.56687 |
| 4 | 0.147035 | 0.597663 | UNIT I | 3 | 28 | 5.92517 | 6.26551 | 6.14153 | 0 | 6.14153 |
| 5 | 0.147035 | 0.74875 | UNIT I | 3 | 28 | 6.13602 | 6.48847 | 6.56086 | 0 | 6.56086 |
| 6 | 0.147035 | 0.960017 | UNIT I | 3 | 28 | 6.47994 | 6.85215 | 7.24482 | 0 | 7.24482 |
| 7 | 0.147035 | 1.21149 | UNIT I | 3 | 28 | 6.88282 | 7.27817 | 8.04605 | 0 | 8.04605 |
| 8 | 0.147035 | 1.44809 | UNIT I | 3 | 28 | 7.19889 | 7.61239 | 8.67463 | 0 | 8.67463 |
| 9 | 0.147035 | 1.66936 | UNIT I | 3 | 28 | 7.43759 | 7.86481 | 9.14936 | 0 | 9.14936 |
| 10 | 0.147035 | 1.87475 | UNIT I | 3 | 28 | 7.60677 | 8.0437 | 9.48584 | 0 | 9.48584 |
| 11 | 0.147035 | 2.07035 | UNIT I | 3 | 28 | 7.72694 | 8.17078 | 9.72481 | 0 | 9.72481 |
| 12 | 0.147035 | 2.26169 | UNIT I | 3 | 28 | 7.81367 | 8.26249 | 9.89733 | 0 | 9.89733 |
| 13 | 0.147035 | 2.43517 | UNIT I | 3 | 28 | 7.84354 | 8.29407 | 9.95667 | 0 | 9.95667 |
| 14 | 0.147035 | 2.60641 | UNIT I | 3 | 28 | 7.84982 | 8.30071 | 9.96918 | 0 | 9.96918 |
| 15 | 0.147035 | 2.84623 | UNIT I | 3 | 28 | 7.95313 | 8.40996 | 10.1746 | 0 | 10.1746 |
| 16 | 0.147035 | 3.07705 | UNIT I | 3 | 28 | 8.00926 | 8.46931 | 10.2863 | 0 | 10.2863 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0.147035 | 3.28185 | UNIT I | 3 | 28 | 7.99327 | 8.4524 | 10.2545 | 0 | 10.2545 |
| 18 | 0.147035 | 3.38947 | UNIT I | 3 | 28 | 7.80707 | 8.25551 | 9.8842 | 0 | 9.8842 |
| 19 | 0.147035 | 3.33685 | UNIT I | 3 | 28 | 7.38686 | 7.81116 | 9.04849 | 0 | 9.04849 |
| 20 | 0.147035 | 2.96639 | UNIT I | 3 | 28 | 6.57098 | 6.94842 | 7.42589 | 0 | 7.42589 |
| 21 | 0.147035 | 2.54201 | UNIT I | 3 | 28 | 5.75201 | 6.08241 | 5.79719 | 0 | 5.79719 |
| 22 | 0.147035 | 2.07652 | UNIT I | 3 | 28 | 4.95969 | 5.24457 | 4.22142 | 0 | 4.22142 |
| 23 | 0.147035 | 1.56265 | UNIT I | 3 | 28 | 4.20433 | 4.44583 | 2.71921 | 0 | 2.71921 |
| 24 | 0.147035 | 0.99018 | UNIT I | 3 | 28 | 3.50596 | 3.70734 | 1.33031 | 0 | 1.33031 |
| 25 | 0.147035 | 0.343894 | UNIT I | 3 | 28 | 2.92248 | 3.09034 | 0.16991 | 0 | 0.16991 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.02698

| 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 | 0.154757 | 0.112282 | UNIT I | 3 | 28 | 4.73183 | 4.85949 | 3.49719 | 0 | 3.49719 |
| 2 | 0.154757 | 0.36096 | UNIT I | 3 | 28 | 5.46871 | 5.61626 | 4.92047 | 0 | 4.92047 |
| 3 | 0.154757 | 0.604534 | UNIT I | 3 | 28 | 6.10474 | 6.26945 | 6.14894 | 0 | 6.14894 |
| 4 | 0.154757 | 0.830904 | UNIT I | 3 | 28 | 6.61394 | 6.79238 | 7.13246 | 0 | 7.13246 |
| 5 | 0.154757 | 1.05084 | UNIT I | 3 | 28 | 7.04709 | 7.23722 | 7.96908 | 0 | 7.96908 |
| 6 | 0.154757 | 1.35899 | UNIT I | 3 | 28 | 7.69429 | 7.90188 | 9.21911 | 0 | 9.21911 |
| 7 | 0.154757 | 1.67591 | UNIT I | 3 | 28 | 8.29783 | 8.52171 | 10.3848 | 0 | 10.3848 |
| 8 | 0.154757 | 1.97456 | UNIT I | 3 | 28 | 8.78759 | 9.02468 | 11.3307 | 0 | 11.3307 |
| 9 | 0.154757 | 2.25444 | UNIT I | 3 | 28 | 9.17419 | 9.42171 | 12.0775 | 0 | 12.0775 |
| 10 | 0.154757 | 2.51666 | UNIT I | 3 | 28 | 9.47054 | 9.72606 | 12.6499 | 0 | 12.6499 |
| 11 | 0.154757 | 2.77521 | UNIT I | 3 | 28 | 9.71763 | 9.97981 | 13.1271 | 0 | 13.1271 |
| 12 | 0.154757 | 3.01688 | UNIT I | 3 | 28 | 9.88838 | 10.1552 | 13.4569 | 0 | 13.4569 |
| 13 | 0.154757 | 3.2413 | UNIT I | 3 | 28 | 9.98781 | 10.2573 | 13.649 | 0 | 13.649 |
| 14 | 0.154757 | 3.53421 | UNIT I | 3 | 28 | 10.1953 | 10.4703 | 14.0496 | 0 | 14.0496 |
| 15 | 0.154757 | 3.8373 | UNIT I | 3 | 28 | 10.3771 | 10.6571 | 14.4009 | 0 | 14.4009 |
| 16 | 0.154757 | 4.11289 | UNIT I | 3 | 28 | 10.4598 | 10.742 | 14.5606 | 0 | 14.5606 |
| 17 | 0.154757 | 4.28819 | UNIT I | 3 | 28 | 10.3214 | 10.5999 | 14.2933 | 0 | 14.2933 |
| 18 | 0.154757 | 4.28271 | UNIT I | 3 | 28 | 9.85269 | 10.1185 | 13.388 | 0 | 13.388 |
| 19 | 0.154757 | 3.92079 | UNIT I | 3 | 28 | 8.82405 | 9.06212 | 11.4012 | 0 | 11.4012 |
| 20 | 0.154757 | 3.49538 | UNIT I | 3 | 28 | 7.76295 | 7.97239 | 9.35169 | 0 | 9.35169 |
| 21 | 0.154757 | 3.02368 | UNIT I | 3 | 28 | 6.70857 | 6.88957 | 7.31522 | 0 | 7.31522 |
| 22 | 0.154757 | 2.49729 | UNIT I | 3 | 28 | 5.66307 | 5.81586 | 5.29587 | 0 | 5.29587 |
| 23 | 0.154757 | 1.90414 | UNIT I | 3 | 28 | 4.63171 | 4.75667 | 3.30382 | 0 | 3.30382 |
| 24 | 0.154757 | 1.22578 | UNIT I | 3 | 28 | 3.62606 | 3.72389 | 1.36143 | 0 | 1.36143 |
| 25 | 0.154757 | 0.431242 | UNIT I | 3 | 28 | 2.67421 | 2.74636 | -0.477024 | 0 | -0.477024 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.05526

| 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 | 0.147035 | 0.0777975 | UNIT I | 3 | 28 | 3.83662 | 4.04863 | 1.97219 | 0 | 1.97219 |
| 2 | 0.147035 | 0.255025 | UNIT I | 3 | 28 | 4.48353 | 4.73129 | 3.25609 | 0 | 3.25609 |
| 3 | 0.147035 | 0.433152 | UNIT I | 3 | 28 | 4.83683 | 5.10411 | 3.95726 | 0 | 3.95726 |
| 4 | 0.147035 | 0.597663 | UNIT I | 3 | 28 | 5.29398 | 5.58653 | 4.86455 | 0 | 4.86455 |
| 5 | 0.147035 | 0.74875 | UNIT I | 3 | 28 | 6.98307 | 7.36895 | 8.21682 | 0 | 8.21682 |
| 6 | 0.147035 | 0.960017 | UNIT I | 3 | 28 | 7.81496 | 8.24681 | 9.86784 | 0 | 9.86784 |
| 7 | 0.147035 | 1.21149 | UNIT I | 3 | 28 | 6.86262 | 7.24185 | 7.97776 | 0 | 7.97776 |
| 8 | 0.147035 | 1.44809 | UNIT I | 3 | 28 | 7.19827 | 7.59605 | 8.64394 | 0 | 8.64394 |
| 9 | 0.147035 | 1.66936 | UNIT I | 3 | 28 | 7.4517 | 7.86348 | 9.14687 | 0 | 9.14687 |
| 10 | 0.147035 | 1.87475 | UNIT I | 3 | 28 | 7.90465 | 8.34146 | 10.0458 | 0 | 10.0458 |
| 11 | 0.147035 | 2.07035 | UNIT I | 3 | 28 | 8.08948 | 8.5365 | 10.4126 | 0 | 10.4126 |
| 12 | 0.147035 | 2.26169 | UNIT I | 3 | 28 | 7.90161 | 8.33825 | 10.0398 | 0 | 10.0398 |
| 13 | 0.147035 | 2.43517 | UNIT I | 3 | 28 | 8.77321 | 9.25802 | 11.7696 | 0 | 11.7696 |
| 14 | 0.147035 | 2.60641 | UNIT I | 3 | 28 | 9.32525 | 9.84056 | 12.8652 | 0 | 12.8652 |
| 15 | 0.147035 | 2.84623 | UNIT I | 3 | 28 | 8.35843 | 8.82032 | 10.9464 | 0 | 10.9464 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.147035 | 3.07705 | UNIT I | 3 | 28 | 7.5041 | 7.91878 | 9.25085 | 0 | 9.25085 |
| 17 | 0.147035 | 3.28185 | UNIT I | 3 | 28 | 6.94581 | 7.32964 | 8.14285 | 0 | 8.14285 |
| 18 | 0.147035 | 3.38947 | UNIT I | 3 | 28 | 5.60057 | 5.91006 | 5.47303 | 0 | 5.47303 |
| 19 | 0.147035 | 3.33685 | UNIT I | 3 | 28 | 6.07031 | 6.40576 | 6.4053 | 0 | 6.4053 |
| 20 | 0.147035 | 2.96639 | UNIT I | 3 | 28 | 7.47293 | 7.88588 | 9.18903 | 0 | 9.18903 |
| 21 | 0.147035 | 2.54201 | UNIT I | 3 | 28 | 6.97914 | 7.36481 | 8.20902 | 0 | 8.20902 |
| 22 | 0.147035 | 2.07652 | UNIT I | 3 | 28 | 5.83158 | 6.15383 | 5.93149 | 0 | 5.93149 |
| 23 | 0.147035 | 1.56265 | UNIT I | 3 | 28 | 4.63711 | 4.89336 | 3.56088 | 0 | 3.56088 |
| 24 | 0.147035 | 0.99018 | UNIT I | 3 | 28 | 3.39445 | 3.58203 | 1.09463 | 0 | 1.09463 |
| 25 | 0.147035 | 0.343894 | UNIT I | 3 | 28 | 2.104 | 2.22027 | -1.46646 | 0 | -1.46646 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.02645

| 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 | 0.154757 | 0.112282 | UNIT I | 3 | 28 | 3.77163 | 3.87139 | 1.63884 | 0 | 1.63884 |
| 2 | 0.154757 | 0.36096 | UNIT I | 3 | 28 | 4.63899 | 4.76169 | 3.31326 | 0 | 3.31326 |
| 3 | 0.154757 | 0.604534 | UNIT I | 3 | 28 | 5.35165 | 5.4932 | 4.68903 | 0 | 4.68903 |
| 4 | 0.154757 | 0.830904 | UNIT I | 3 | 28 | 6.23208 | 6.39692 | 6.38869 | 0 | 6.38869 |
| 5 | 0.154757 | 1.05084 | UNIT I | 3 | 28 | 7.35938 | 7.55404 | 8.56493 | 0 | 8.56493 |
| 6 | 0.154757 | 1.35899 | UNIT I | 3 | 28 | 8.09033 | 8.30432 | 9.97598 | 0 | 9.97598 |
| 7 | 0.154757 | 1.67591 | UNIT I | 3 | 28 | 8.44765 | 8.67109 | 10.6658 | 0 | 10.6658 |
| 8 | 0.154757 | 1.97456 | UNIT I | 3 | 28 | 9.06848 | 9.30834 | 11.8643 | 0 | 11.8643 |
| 9 | 0.154757 | 2.25444 | UNIT I | 3 | 28 | 9.62811 | 9.88277 | 12.9446 | 0 | 12.9446 |
| 10 | 0.154757 | 2.51666 | UNIT I | 3 | 28 | 10.1161 | 10.3837 | 13.8867 | 0 | 13.8867 |
| 11 | 0.154757 | 2.77521 | UNIT I | 3 | 28 | 10.3556 | 10.6295 | 14.349 | 0 | 14.349 |
| 12 | 0.154757 | 3.01688 | UNIT I | 3 | 28 | 10.7008 | 10.9839 | 15.0154 | 0 | 15.0154 |
| 13 | 0.154757 | 3.2413 | UNIT I | 3 | 28 | 11.4096 | 11.7113 | 16.3836 | 0 | 16.3836 |
| 14 | 0.154757 | 3.53421 | UNIT I | 3 | 28 | 11.187 | 11.4829 | 15.954 | 0 | 15.954 |
| 15 | 0.154757 | 3.8373 | UNIT I | 3 | 28 | 10.5432 | 10.8221 | 14.7112 | 0 | 14.7112 |
| 16 | 0.154757 | 4.11289 | UNIT I | 3 | 28 | 9.93427 | 10.197 | 13.5357 | 0 | 13.5357 |
| 17 | 0.154757 | 4.28819 | UNIT I | 3 | 28 | 8.35181 | 8.57272 | 10.4808 | 0 | 10.4808 |
| 18 | 0.154757 | 4.28271 | UNIT I | 3 | 28 | 7.98566 | 8.19688 | 9.77391 | 0 | 9.77391 |
| 19 | 0.154757 | 3.92079 | UNIT I | 3 | 28 | 8.83487 | 9.06855 | 11.4133 | 0 | 11.4133 |
| 20 | 0.154757 | 3.49538 | UNIT I | 3 | 28 | 8.24649 | 8.46461 | 10.2774 | 0 | 10.2774 |
| 21 | 0.154757 | 3.02368 | UNIT I | 3 | 28 | 7.03143 | 7.21741 | 7.93178 | 0 | 7.93178 |
| 22 | 0.154757 | 2.49729 | UNIT I | 3 | 28 | 5.83957 | 5.99403 | 5.63094 | 0 | 5.63094 |
| 23 | 0.154757 | 1.90414 | UNIT I | 3 | 28 | 4.68533 | 4.80926 | 3.40273 | 0 | 3.40273 |
| 24 | 0.154757 | 1.22578 | UNIT I | 3 | 28 | 3.57906 | 3.67372 | 1.26709 | 0 | 1.26709 |
| 25 | 0.154757 | 0.431242 | UNIT I | 3 | 28 | 2.56391 | 2.63172 | -0.692628 | 0 | -0.692628 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.05444

| 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 | 0.147035 | 0.0777975 | UNIT I | 3 | 28 | 3.14859 | 3.32 | 0.601831 | 0 | 0.601831 |
| 2 | 0.147035 | 0.255025 | UNIT I | 3 | 28 | 4.04497 | 4.26518 | 2.37945 | 0 | 2.37945 |
| 3 | 0.147035 | 0.433152 | UNIT I | 3 | 28 | 4.94537 | 5.2146 | 4.16505 | 0 | 4.16505 |
| 4 | 0.147035 | 0.597663 | UNIT I | 3 | 28 | 5.75377 | 6.06701 | 5.76821 | 0 | 5.76821 |
| 5 | 0.147035 | 0.74875 | UNIT I | 3 | 28 | 6.42494 | 6.77471 | 7.09919 | 0 | 7.09919 |
| 6 | 0.147035 | 0.960017 | UNIT I | 3 | 28 | 7.12794 | 7.51598 | 8.49331 | 0 | 8.49331 |
| 7 | 0.147035 | 1.21149 | UNIT I | 3 | 28 | 7.76536 | 8.18811 | 9.75744 | 0 | 9.75744 |
| 8 | 0.147035 | 1.44809 | UNIT I | 3 | 28 | 8.17447 | 8.61949 | 10.5687 | 0 | 10.5687 |
| 9 | 0.147035 | 1.66936 | UNIT I | 3 | 28 | 8.36879 | 8.82439 | 10.9541 | 0 | 10.9541 |
| 10 | 0.147035 | 1.87475 | UNIT I | 3 | 28 | 8.37929 | 8.83546 | 10.9749 | 0 | 10.9749 |
| 11 | 0.147035 | 2.07035 | UNIT I | 3 | 28 | 8.26248 | 8.71229 | 10.7433 | 0 | 10.7433 |
| 12 | 0.147035 | 2.26169 | UNIT I | 3 | 28 | 8.07544 | 8.51507 | 10.3723 | 0 | 10.3723 |
| 13 | 0.147035 | 2.43517 | UNIT I | 3 | 28 | 7.83747 | 8.26414 | 9.90044 | 0 | 9.90044 |
| 14 | 0.147035 | 2.60641 | UNIT I | 3 | 28 | 7.61724 | 8.03192 | 9.46367 | 0 | 9.46367 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 0.147035 | 2.84623 | UNIT I | 3 | 28 | 7.55906 | 7.97057 | 9.34826 | 0 | 9.34826 |
| 16 | 0.147035 | 3.07705 | UNIT I | 3 | 28 | 7.54778 | 7.95868 | 9.32592 | 0 | 9.32592 |
| 17 | 0.147035 | 3.28185 | UNIT I | 3 | 28 | 7.57111 | 7.98328 | 9.37219 | 0 | 9.37219 |
| 18 | 0.147035 | 3.38947 | UNIT I | 3 | 28 | 7.52712 | 7.9369 | 9.28494 | 0 | 9.28494 |
| 19 | 0.147035 | 3.33685 | UNIT I | 3 | 28 | 7.32104 | 7.7196 | 8.8763 | 0 | 8.8763 |
| 20 | 0.147035 | 2.96639 | UNIT I | 3 | 28 | 6.70633 | 7.07142 | 7.65721 | 0 | 7.65721 |
| 21 | 0.147035 | 2.54201 | UNIT I | 3 | 28 | 6.04828 | 6.37755 | 6.35226 | 0 | 6.35226 |
| 22 | 0.147035 | 2.07652 | UNIT I | 3 | 28 | 5.33987 | 5.63057 | 4.9474 | 0 | 4.9474 |
| 23 | 0.147035 | 1.56265 | UNIT I | 3 | 28 | 4.5336 | 4.78041 | 3.34846 | 0 | 3.34846 |
| 24 | 0.147035 | 0.99018 | UNIT I | 3 | 28 | 3.55195 | 3.74532 | 1.40175 | 0 | 1.40175 |
| 25 | 0.147035 | 0.343894 | UNIT I | 3 | 28 | 2.26607 | 2.38944 | -1.1483 | 0 | -1.1483 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -5.17248 | 1.262 |
| 40.982 | 12.5067 |
| 48.4804 | 16.8997 |

### External Boundary

| X | Y |
|---|---|
| 7.0471 | 7.37 |
| 6.65347 | 7.1722 |
| 6.64126 | 7.03314 |
| 6.59548 | 6.97972 |
| 6.43139 | 6.88651 |
| 6.22983 | 6.98289 |
| 6.20082 | 7.08159 |
| 6.18801 | 7.23842 |
| 6.16065 | 7.27376 |
| 5.26106 | 7.18753 |
| 5.26127 | 7.137 |
| 5.26906 | 7.1082 |
| 5.27338 | 7.01064 |
| 5.27667 | 6.97302 |
| 5.28509 | 6.88998 |
| 5.30936 | 6.84551 |
| 5.30827 | 6.82804 |
| 5.30584 | 6.78939 |
| 5.31363 | 6.76058 |
| 5.31795 | 6.66302 |
| 5.32124 | 6.6254 |
| 5.32967 | 6.54237 |
| 5.34448 | 6.50821 |
| 5.37396 | 6.50326 |
| 5.37032 | 6.49139 |
| 5.3391 | 6.38946 |
| 5.31847 | 6.20899 |
| 5.31944 | 6.19675 |
| 5.34169 | 5.9151 |
| 5.31738 | 5.90787 |
| 4.37578 | 5.62795 |
| 2.84443 | 5.31101 |
| 2.05801 | 5.19007 |

| | |
|---|---|
| 1.21108 | 5.00866 |
| -0.119822 | 4.81214 |
| -3.13102 | 4.668 |
| -4.37303 | 4.67353 |
| -4.46405 | 4.67107 |
| -4.50833 | 4.60468 |
| -4.56244 | 4.58501 |
| -4.81089 | 4.58501 |
| -5.17248 | 4.57027 |
| -5.17248 | 2.74311 |
| -5.17248 | 1.262 |
| -5.17248 | -1.737 |
| -5.17248 | -4.66367 |
| -5.17248 | -5.39909 |
| 48.4804 | -5.39909 |
| 48.4804 | 9.34031 |
| 48.4804 | 14.9094 |
| 48.4804 | 16.8997 |
| 48.4804 | 19.16 |
| 48.4804 | 22.6129 |
| 47.7327 | 22.2747 |
| 47.1273 | 21.9188 |
| 46.8424 | 21.5095 |
| 45.97 | 20.9756 |
| 45.5961 | 20.3705 |
| 45.2757 | 19.4985 |
| 44.6989 | 18.3685 |
| 44.4436 | 18.1023 |
| 44.1107 | 17.4811 |
| 43.4024 | 16.5348 |
| 43.1042 | 16.0823 |
| 42.8392 | 15.8505 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 26.3931 | 14.3033 |
| 26.1708 | 14.0891 |
| 25.6822 | 13.4908 |
| 25.199 | 13.039 |
| 24.4255 | 12.3536 |
| 23.8204 | 12.0079 |
| 23.1116 | 11.6796 |
| 22.5066 | 11.455 |
| 21.9015 | 11.4031 |
| 20.9679 | 11.4377 |
| 20.2418 | 11.3167 |
| 19.0316 | 11.0748 |
| 17.7402 | 11.0127 |
| 17.4709 | 10.905 |
| 15.9193 | 10.7326 |
| 14.6909 | 10.6895 |
| 13.8776 | 10.6286 |
| 13.5261 | 10.6022 |

## Material Boundary

| X | Y |
|---|---|
| -5.17248 | -1.737 |
| 15.651 | 3.653 |

| | |
|---|---|
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |
| 48.4804 | 14.9094 |

### Material Boundary

| X | Y |
|---|---|
| -5.17248 | -4.66367 |
| 48.4804 | 9.34031 |

### Material Boundary

| X | Y |
|---|---|
| -5.17248 | 1.262 |
| 40.982 | 12.5067 |

### Material Boundary

| X | Y |
|---|---|
| 7.05478 | 6.55395 |
| 7.09425 | 6.55587 |
| 7.17214 | 6.55377 |
| 7.21749 | 6.55254 |
| 7.23249 | 6.55214 |
| 7.40399 | 6.54751 |
| 7.63002 | 6.54332 |
| 7.73202 | 6.53754 |
| 7.85185 | 6.53076 |
| 8.05278 | 6.50985 |
| 8.35414 | 6.47638 |
| 8.51739 | 6.46801 |
| 8.65969 | 6.46383 |
| 8.7476 | 6.48893 |
| 9.2187 | 6.51516 |
| 9.2976 | 6.55054 |
| 9.81226 | 6.72932 |
| 10.1768 | 6.96511 |
| 10.2379 | 7.071 |

### Material Boundary

| X | Y |
|---|---|
| 5.30936 | 6.84551 |
| 6.22222 | 6.935 |
| 6.22222 | 6.91685 |
| 6.23259 | 6.8908 |
| 6.25108 | 6.66437 |
| 6.25108 | 6.5848 |
| 6.20873 | 6.5766 |
| 6.12072 | 6.56712 |

### Material Boundary

| X | Y |
|---|---|
| 5.37396 | 6.50326 |
| 5.44406 | 6.52403 |
| 6.08984 | 6.56515 |
| 6.12072 | 6.56712 |

### Material Boundary

| X | Y |
|---|---|
| 6.22222 | 6.935 |
| 6.22983 | 6.98289 |

### Material Boundary

| X | Y |
|---|---|
| 5.30827 | 6.82804 |
| 6.22222 | 6.91685 |

### Material Boundary

| X | Y |
|---|---|
| 5.37032 | 6.49139 |
| 6.25593 | 6.56825 |

### Material Boundary

| X | Y |
|---|---|
| 10.2379 | 7.071 |
| 10.4127 | 7.36168 |
| 10.6915 | 7.59747 |
| 10.9257 | 7.94138 |
| 11.2016 | 8.33339 |
| 11.2812 | 8.44419 |
| 11.6029 | 8.66926 |
| 11.8746 | 8.94686 |
| 12.1205 | 9.19815 |
| 12.5682 | 9.65556 |
| 12.6055 | 9.69815 |
| 12.6931 | 9.79829 |
| 12.8699 | 10.0002 |
| 13.1927 | 10.1884 |
| 13.8776 | 10.6286 |

### Material Boundary

| X | Y |
|---|---|
| 6.71685 | 5.94959 |
| 9.2187 | 5.94959 |
| 9.2187 | 6.51516 |
| 9.2187 | 7.94138 |
| 8.71919 | 7.94138 |
| 8.71919 | 7.44674 |
| 8.21887 | 7.44674 |
| 8.21887 | 6.94674 |
| 7.71702 | 6.94674 |
| 7.21749 | 6.94674 |
| 7.21749 | 6.55254 |
| 7.21749 | 6.54654 |
| 7.21749 | 6.52614 |
| 7.21749 | 6.455 |
| 6.71685 | 6.455 |
| 6.71685 | 5.94959 |

### Material Boundary

| X | Y |
|---|---|
| 5.31847 | 6.20899 |
| 6.23818 | 6.2705 |

### Material Boundary

| X | Y |
|---|---|
| 5.31944 | 6.19675 |
| 6.23739 | 6.25721 |

### Material Boundary

| X | Y |
|---|---|
| 5.34169 | 5.9151 |
| 6.21903 | 5.94912 |

### Material Boundary

| X | Y |
|---|---|
| 6.21903 | 5.94912 |
| 6.23739 | 6.25721 |

### Material Boundary

| X | Y |
|---|---|
| 6.25108 | 6.5848 |
| 6.25593 | 6.56825 |

### Material Boundary

| X | Y |
|---|---|
| 6.23739 | 6.25721 |
| 6.23818 | 6.2705 |

### Material Boundary

| X | Y |
|---|---|
| 6.23818 | 6.2705 |
| 6.25593 | 6.56825 |

### Material Boundary

| X | Y |
|---|---|
| 6.25593 | 6.488 |
| 7.05478 | 6.55395 |

### Material Boundary

| X | Y |
|---|---|
| 9.2187 | 7.94138 |
| 9.70168 | 7.94138 |

### Material Boundary

| X | Y |
|---|---|
| 9.2187 | 5.94959 |
| 10.8156 | 7.55366 |

| | |
|---|---|
| 11.2016 | 7.94138 |
| 11.46 | 8.201 |
| 12.2025 | 8.94686 |
| 13.1927 | 9.94144 |
| 13.7377 | 10.4889 |

### Material Boundary

| X | Y |
|---|---|
| 7.71702 | 6.94674 |
| 7.71702 | 7.44674 |
| 8.21887 | 7.44674 |

### Material Boundary

| X | Y |
|---|---|
| 13.7377 | 10.4889 |
| 13.8776 | 10.6286 |

### Material Boundary

| X | Y |
|---|---|
| 10.7022 | 8.94686 |
| 11.2016 | 8.94686 |
| 11.2016 | 8.33339 |
| 11.2016 | 7.94138 |
| 10.9257 | 7.94138 |
| 9.70168 | 7.94138 |
| 9.70168 | 8.44679 |
| 10.7022 | 8.44679 |
| 10.7022 | 8.94686 |

### Material Boundary

| X | Y |
|---|---|
| 11.2016 | 8.94686 |
| 11.8746 | 8.94686 |
| 12.2025 | 8.94686 |

### Material Boundary

| X | Y |
|---|---|
| 5.31738 | 5.90787 |
| 6.2226 | 5.9356 |
| 6.21903 | 5.94912 |

### Material Boundary

| X | Y |
|---|---|
| 6.2226 | 5.9356 |
| 6.71685 | 5.94959 |

### Material Boundary

| X | Y |
|---|---|
| 10.8156 | 7.55366 |
| 12.574 | 7.94138 |
| 31.5055 | 11.4337 |

| | |
|---|---|
| 40.982 | 12.5067 |
| 48.4804 | 19.16 |

## Material Boundary

| X | Y |
|---|---|
| 40.982 | 12.5067 |
| 48.4804 | 16.8997 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S51 + GABIONS ST Dmin=0.5fullroad lim + GEOTEX+MPILE=0.75 oop
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 15/5/2021, 19:37:13

## 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

## Design Standard

Selected Type: Eurocode 7 - Design Approach 3

| Type | Partial Factor |
|---|---|
| Permanent Actions: Unfavourable | 1 |
| Permanent Actions: Favourable | 1 |
| Variable Actions: Unfavourable | 1.3 |
| Variable Actions: Favourable | 0 |
| Effective cohesion | 1.25 |
| Coefficient of shearing resistance | 1.25 |
| Undrained strength | 1.4 |
| Weight density | 1 |
| Shear strength (other models) | 1.25 |
| Earth resistance | 1 |
| Tensile and plate strength | 1 |
| Shear strength | 1 |
| Compressive strength | 1 |
| Bond strength | 1 |
| Seismic Coefficient | 1 |

## Analysis Options

### Analysis Methods Used

Bishop simplified
Corps of Engineers #1
Corps of Engineers #2
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified
Janbu corrected
Lowe-Karafiath
Ordinary/Fellenius

Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: 0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT | GABION | AIR | GRAVEL |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | No strength | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 | 18 | 1e-005 | 19 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 | 20 | | 0 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 | 32 | | 36 |
| Water Surface | None | None | Water Table | Water Table | Water Table | Water Table | None | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | | Automatically Calculated |
| Ru Value | 0 | 0 | | | | | 0 | |

| Property | SW |
|---|---|
| Color | |
| Strength Type | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 |
| Cohesion [kPa] | 1 |

| | |
|---|---|
| Friction Angle [deg] | 35 |
| Water Surface | Water Table |
| Hu Value | Automatically Calculated |

## *Support Properties*

### GEOTEX

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Parallel to Reinforcement
Anchorage: Embedded End
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 40 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 30 degrees

### MICROPILE

Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 0.75 m
Pile Shear Strength: 90 kN
Force Direction: Parallel to Surface

## *Global Minimums*

### Method: ordinary/fellenius

FS: 1.566150
Center: 24.879, 16.807
Radius: 5.379
Left Slip Surface Endpoint: 23.507, 11.606
Right Slip Surface Endpoint: 29.625, 14.276
Resisting Moment=306.487 kN-m
Driving Moment=195.694 kN-m

### Method: bishop simplified

FS: 1.641230
Center: 24.164, 18.546
Radius: 7.138
Left Slip Surface Endpoint: 22.930, 11.516
Right Slip Surface Endpoint: 29.880, 14.271
Resisting Moment=436.957 kN-m
Driving Moment=266.238 kN-m

### Method: janbu simplified

FS: 1.538110
Center: 24.879, 16.807
Radius: 5.379
Left Slip Surface Endpoint: 23.507, 11.606
Right Slip Surface Endpoint: 29.625, 14.276
Resisting Horizontal Force=53.2569 kN
Driving Horizontal Force=34.6248 kN

### Method: janbu corrected

FS: 1.636150
Center: 24.164, 18.546

Radius: 7.138
Left Slip Surface Endpoint: 22.930, 11.516
Right Slip Surface Endpoint: 29.880, 14.271
Resisting Horizontal Force=57.7149 kN
Driving Horizontal Force=35.2749 kN

### Method: spencer

FS: 1.640010
Center: 24.164, 18.546
Radius: 7.138
Left Slip Surface Endpoint: 22.930, 11.516
Right Slip Surface Endpoint: 29.880, 14.271
Resisting Moment=436.633 kN-m
Driving Moment=266.238 kN-m
Resisting Horizontal Force=55.1364 kN
Driving Horizontal Force=33.6196 kN

### Method: corp of eng#1

FS: 1.210660
Center: 27.858, 13.727
Radius: 0.358
Left Slip Surface Endpoint: 27.634, 13.447
Right Slip Surface Endpoint: 28.214, 13.696
Left Slope Intercept: 27.634 14.316
Right Slope Intercept: 28.214 14.304
Resisting Horizontal Force=2.67406 kN
Driving Horizontal Force=2.20876 kN

### Method: corp of eng#2

FS: 1.674410
Center: 24.164, 18.546
Radius: 7.138
Left Slip Surface Endpoint: 22.930, 11.516
Right Slip Surface Endpoint: 29.880, 14.271
Resisting Horizontal Force=55.296 kN
Driving Horizontal Force=33.0242 kN

### Method: lowe-karafiath

FS: 1.638200
Center: 24.164, 18.546
Radius: 7.138
Left Slip Surface Endpoint: 22.930, 11.516
Right Slip Surface Endpoint: 29.880, 14.271
Resisting Horizontal Force=55.1318 kN
Driving Horizontal Force=33.6538 kN

### Method: gle/morgenstern-price

FS: 1.635130
Center: 24.164, 18.546
Radius: 7.138
Left Slip Surface Endpoint: 22.930, 11.516
Right Slip Surface Endpoint: 29.880, 14.271
Resisting Moment=435.335 kN-m
Driving Moment=266.238 kN-m
Resisting Horizontal Force=55.1102 kN
Driving Horizontal Force=33.7039 kN

## *Valid / Invalid Surfaces*

## Method: ordinary/fellenius

Number of Valid Surfaces: 9546
Number of Invalid Surfaces: 454

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 40 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: bishop simplified

Number of Valid Surfaces: 9527
Number of Invalid Surfaces: 473

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 40 surfaces
Error Code -112 reported for 19 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: janbu simplified

Number of Valid Surfaces: 9260
Number of Invalid Surfaces: 740

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 311 surfaces
Error Code -112 reported for 15 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 9260
Number of Invalid Surfaces: 740

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 311 surfaces
Error Code -112 reported for 15 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: spencer

Number of Valid Surfaces: 9060
Number of Invalid Surfaces: 940

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 330 surfaces
Error Code -111 reported for 172 surfaces
Error Code -112 reported for 24 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 8344
Number of Invalid Surfaces: 1656

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 856 surfaces
Error Code -111 reported for 386 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 7866
Number of Invalid Surfaces: 2134

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 1310 surfaces
Error Code -111 reported for 410 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 4774
Number of Invalid Surfaces: 5226

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 3664 surfaces
Error Code -111 reported for 1148 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 8995
Number of Invalid Surfaces: 1005

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 323 surfaces
Error Code -111 reported for 247 surfaces

Error Code -112 reported for 21 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

### Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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).
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-115 = Surface too shallow, below the minimum depth.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.56615

| 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 | 0.244737 | 0.309975 | UNIT I | 2.4 | 23.0433 | 1.85783 | 2.90964 | 1.19811 | 0 | 1.19811 |
| 2 | 0.244737 | 1.079 | UNIT I | 2.4 | 23.0433 | 2.688 | 4.20981 | 4.25469 | 0 | 4.25469 |
| 3 | 0.244737 | 1.83583 | UNIT I | 2.4 | 23.0433 | 3.529 | 5.52694 | 7.35115 | 0 | 7.35115 |
| 4 | 0.244737 | 2.53921 | UNIT I | 2.4 | 23.0433 | 4.32442 | 6.77269 | 10.2798 | 0 | 10.2798 |
| 5 | 0.244737 | 3.19002 | UNIT I | 2.4 | 23.0433 | 5.0636 | 7.93036 | 13.0013 | 0 | 13.0013 |
| 6 | 0.244737 | 3.78879 | UNIT I | 2.4 | 23.0433 | 5.73699 | 8.98499 | 15.4807 | 0 | 15.4807 |
| 7 | 0.244737 | 4.30074 | UNIT I | 2.4 | 23.0433 | 6.29738 | 9.86264 | 17.544 | 0 | 17.544 |
| 8 | 0.244737 | 4.71679 | UNIT I | 2.4 | 23.0433 | 6.72815 | 10.5373 | 19.13 | 0 | 19.13 |
| 9 | 0.244737 | 5.08026 | UNIT I | 2.4 | 23.0433 | 7.07266 | 11.0769 | 20.3985 | 0 | 20.3985 |
| 10 | 0.244737 | 5.39051 | UNIT I | 2.4 | 23.0433 | 7.32694 | 11.4751 | 21.3347 | 0 | 21.3347 |
| 11 | 0.244737 | 5.64636 | UNIT I | 2.4 | 23.0433 | 7.48795 | 11.7273 | 21.9275 | 0 | 21.9275 |
| 12 | 0.244737 | 5.84623 | UNIT I | 2.4 | 23.0433 | 7.55384 | 11.8304 | 22.1701 | 0 | 22.1701 |
| 13 | 0.244737 | 5.98808 | UNIT I | 2.4 | 23.0433 | 7.52395 | 11.7836 | 22.0601 | 0 | 22.0601 |
| 14 | 0.244737 | 6.06931 | UNIT I | 2.4 | 23.0433 | 7.39896 | 11.5879 | 21.5999 | 0 | 21.5999 |
| 15 | 0.244737 | 6.08669 | UNIT I | 2.4 | 23.0433 | 7.18089 | 11.2464 | 20.7969 | 0 | 20.7969 |
| 16 | 0.244737 | 6.03616 | UNIT I | 2.4 | 23.0433 | 6.8733 | 10.7646 | 19.6645 | 0 | 19.6645 |
| 17 | 0.244737 | 5.91265 | UNIT I | 2.4 | 23.0433 | 6.48144 | 10.1509 | 18.2217 | 0 | 18.2217 |
| 18 | 0.244737 | 5.70975 | UNIT I | 2.4 | 23.0433 | 6.01244 | 9.41639 | 16.4949 | 0 | 16.4949 |
| 19 | 0.244737 | 5.4193 | UNIT I | 2.4 | 23.0433 | 5.47563 | 8.57566 | 14.5184 | 0 | 14.5184 |
| 20 | 0.244737 | 5.03067 | UNIT I | 2.4 | 23.0433 | 4.88289 | 7.64734 | 12.336 | 0 | 12.336 |
| 21 | 0.244737 | 4.52971 | UNIT I | 2.4 | 23.0433 | 4.24922 | 6.65491 | 10.0029 | 0 | 10.0029 |
| 22 | 0.244737 | 3.8969 | UNIT I | 2.4 | 23.0433 | 3.59352 | 5.62799 | 7.5887 | 0 | 7.5887 |
| 23 | 0.244737 | 3.10416 | UNIT I | 2.4 | 23.0433 | 2.93981 | 4.60418 | 5.18183 | 0 | 5.18183 |
| 24 | 0.244737 | 2.10828 | UNIT I | 2.4 | 23.0433 | 2.31917 | 3.63217 | 2.89671 | 0 | 2.89671 |
| 25 | 0.244737 | 0.822259 | UNIT I | 2.4 | 23.0433 | 1.76936 | 2.77108 | 0.872385 | 0 | 0.872385 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.64123

| 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 | 0.277964 | 0.1873 | UNIT I | 2.4 | 23.0433 | 1.70536 | 2.79888 | 0.937731 | 0 | 0.937731 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.277964 | 0.585965 | UNIT I | 2.4 | 23.0433 | 2.0703 | 3.39783 | 2.34581 | 0 | 2.34581 |
| 3 | 0.277964 | 1.12739 | UNIT I | 2.4 | 23.0433 | 2.56364 | 4.20753 | 4.24936 | 0 | 4.24936 |
| 4 | 0.277964 | 1.88526 | UNIT I | 2.4 | 23.0433 | 3.25085 | 5.3354 | 6.90085 | 0 | 6.90085 |
| 5 | 0.277964 | 2.64203 | UNIT I | 2.4 | 23.0433 | 3.92331 | 6.43905 | 9.49543 | 0 | 9.49543 |
| 6 | 0.277964 | 3.34157 | UNIT I | 2.4 | 23.0433 | 4.52955 | 7.43404 | 11.8346 | 0 | 11.8346 |
| 7 | 0.277964 | 3.98374 | UNIT I | 2.4 | 23.0433 | 5.07118 | 8.32298 | 13.9244 | 0 | 13.9244 |
| 8 | 0.277964 | 4.55031 | UNIT I | 2.4 | 23.0433 | 5.53329 | 9.0814 | 15.7074 | 0 | 15.7074 |
| 9 | 0.277964 | 4.98279 | UNIT I | 2.4 | 23.0433 | 5.86544 | 9.62653 | 16.9889 | 0 | 16.9889 |
| 10 | 0.277964 | 5.3473 | UNIT I | 2.4 | 23.0433 | 6.12962 | 10.0601 | 18.0082 | 0 | 18.0082 |
| 11 | 0.277964 | 5.65107 | UNIT I | 2.4 | 23.0433 | 6.33371 | 10.3951 | 18.7957 | 0 | 18.7957 |
| 12 | 0.277964 | 5.89244 | UNIT I | 2.4 | 23.0433 | 6.47756 | 10.6312 | 19.3507 | 0 | 19.3507 |
| 13 | 0.277964 | 6.0694 | UNIT I | 2.4 | 23.0433 | 6.56071 | 10.7676 | 19.6716 | 0 | 19.6716 |
| 14 | 0.277964 | 6.17944 | UNIT I | 2.4 | 23.0433 | 6.58237 | 10.8032 | 19.7551 | 0 | 19.7551 |
| 15 | 0.277964 | 6.21956 | UNIT I | 2.4 | 23.0433 | 6.54136 | 10.7359 | 19.5969 | 0 | 19.5969 |
| 16 | 0.277964 | 6.1861 | UNIT I | 2.4 | 23.0433 | 6.43614 | 10.5632 | 19.1909 | 0 | 19.1909 |
| 17 | 0.277964 | 6.07467 | UNIT I | 2.4 | 23.0433 | 6.26473 | 10.2819 | 18.5295 | 0 | 18.5295 |
| 18 | 0.277964 | 5.87988 | UNIT I | 2.4 | 23.0433 | 6.02463 | 9.88781 | 17.6032 | 0 | 17.6032 |
| 19 | 0.277964 | 5.5952 | UNIT I | 2.4 | 23.0433 | 5.71278 | 9.37599 | 16.3999 | 0 | 16.3999 |
| 20 | 0.277964 | 5.2125 | UNIT I | 2.4 | 23.0433 | 5.3254 | 8.7402 | 14.9052 | 0 | 14.9052 |
| 21 | 0.277964 | 4.7216 | UNIT I | 2.4 | 23.0433 | 4.85786 | 7.97286 | 13.1013 | 0 | 13.1013 |
| 22 | 0.277964 | 4.10953 | UNIT I | 2.4 | 23.0433 | 4.3045 | 7.06467 | 10.9662 | 0 | 10.9662 |
| 23 | 0.277964 | 3.3593 | UNIT I | 2.4 | 23.0433 | 3.65835 | 6.00419 | 8.4731 | 0 | 8.4731 |
| 24 | 0.277964 | 2.44327 | UNIT I | 2.4 | 23.0433 | 2.90729 | 4.77153 | 5.57524 | 0 | 5.57524 |
| 25 | 0.277964 | 0.934698 | UNIT I | 2.4 | 23.0433 | 1.7629 | 2.89332 | 1.15975 | 0 | 1.15975 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.53811

| 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 | 0.244737 | 0.309975 | UNIT I | 2.4 | 23.0433 | 2.04604 | 3.14703 | 1.75619 | 0 | 1.75619 |
| 2 | 0.244737 | 1.079 | UNIT I | 2.4 | 23.0433 | 2.93424 | 4.51318 | 4.9679 | 0 | 4.9679 |
| 3 | 0.244737 | 1.83583 | UNIT I | 2.4 | 23.0433 | 3.78457 | 5.82108 | 8.04263 | 0 | 8.04263 |
| 4 | 0.244737 | 2.53921 | UNIT I | 2.4 | 23.0433 | 4.55112 | 7.00012 | 10.8145 | 0 | 10.8145 |
| 5 | 0.244737 | 3.19002 | UNIT I | 2.4 | 23.0433 | 5.23831 | 8.0571 | 13.2993 | 0 | 13.2993 |
| 6 | 0.244737 | 3.78879 | UNIT I | 2.4 | 23.0433 | 5.84964 | 8.99739 | 15.5099 | 0 | 15.5099 |
| 7 | 0.244737 | 4.30074 | UNIT I | 2.4 | 23.0433 | 6.34877 | 9.76511 | 17.3147 | 0 | 17.3147 |
| 8 | 0.244737 | 4.71679 | UNIT I | 2.4 | 23.0433 | 6.72929 | 10.3504 | 18.6906 | 0 | 18.6906 |
| 9 | 0.244737 | 5.08026 | UNIT I | 2.4 | 23.0433 | 7.04216 | 10.8316 | 19.822 | 0 | 19.822 |
| 10 | 0.244737 | 5.39051 | UNIT I | 2.4 | 23.0433 | 7.28843 | 11.2104 | 20.7124 | 0 | 20.7124 |
| 11 | 0.244737 | 5.64636 | UNIT I | 2.4 | 23.0433 | 7.46848 | 11.4874 | 21.3635 | 0 | 21.3635 |
| 12 | 0.244737 | 5.84623 | UNIT I | 2.4 | 23.0433 | 7.58223 | 11.6623 | 21.7748 | 0 | 21.7748 |
| 13 | 0.244737 | 5.98808 | UNIT I | 2.4 | 23.0433 | 7.62908 | 11.7344 | 21.9442 | 0 | 21.9442 |
| 14 | 0.244737 | 6.06931 | UNIT I | 2.4 | 23.0433 | 7.60795 | 11.7019 | 21.8678 | 0 | 21.8678 |
| 15 | 0.244737 | 6.08669 | UNIT I | 2.4 | 23.0433 | 7.51718 | 11.5623 | 21.5396 | 0 | 21.5396 |
| 16 | 0.244737 | 6.03616 | UNIT I | 2.4 | 23.0433 | 7.35447 | 11.312 | 20.9513 | 0 | 20.9513 |
| 17 | 0.244737 | 5.91265 | UNIT I | 2.4 | 23.0433 | 7.11682 | 10.9465 | 20.0919 | 0 | 20.0919 |
| 18 | 0.244737 | 5.70975 | UNIT I | 2.4 | 23.0433 | 6.80032 | 10.4596 | 18.9475 | 0 | 18.9475 |
| 19 | 0.244737 | 5.4193 | UNIT I | 2.4 | 23.0433 | 6.39998 | 9.84387 | 17.4998 | 0 | 17.4998 |
| 20 | 0.244737 | 5.03067 | UNIT I | 2.4 | 23.0433 | 5.90943 | 9.08936 | 15.7261 | 0 | 15.7261 |
| 21 | 0.244737 | 4.52971 | UNIT I | 2.4 | 23.0433 | 5.32051 | 8.18353 | 13.5965 | 0 | 13.5965 |
| 22 | 0.244737 | 3.8969 | UNIT I | 2.4 | 23.0433 | 4.62258 | 7.11003 | 11.0729 | 0 | 11.0729 |
| 23 | 0.244737 | 3.10416 | UNIT I | 2.4 | 23.0433 | 3.80158 | 5.84725 | 8.10416 | 0 | 8.10416 |
| 24 | 0.244737 | 2.10828 | UNIT I | 2.4 | 23.0433 | 2.83853 | 4.36597 | 4.6218 | 0 | 4.6218 |
| 25 | 0.244737 | 0.822259 | UNIT I | 2.4 | 23.0433 | 1.6964 | 2.60925 | 0.491926 | 0 | 0.491926 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.63615

| 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 | 0.277964 | 0.1873 | UNIT I | 2.4 | 23.0433 | 1.71522 | 2.80635 | 0.955303 | 0 | 0.955303 |
| 2 | 0.277964 | 0.585965 | UNIT I | 2.4 | 23.0433 | 2.08079 | 3.40449 | 2.36146 | 0 | 2.36146 |
| 3 | 0.277964 | 1.12739 | UNIT I | 2.4 | 23.0433 | 2.57488 | 4.21289 | 4.26195 | 0 | 4.26195 |
| 4 | 0.277964 | 1.88526 | UNIT I | 2.4 | 23.0433 | 3.26293 | 5.33864 | 6.90847 | 0 | 6.90847 |
| 5 | 0.277964 | 2.64203 | UNIT I | 2.4 | 23.0433 | 3.93533 | 6.43879 | 9.49482 | 0 | 9.49482 |
| 6 | 0.277964 | 3.34157 | UNIT I | 2.4 | 23.0433 | 4.54056 | 7.42903 | 11.8228 | 0 | 11.8228 |
| 7 | 0.277964 | 3.98374 | UNIT I | 2.4 | 23.0433 | 5.08032 | 8.31217 | 13.899 | 0 | 13.899 |
| 8 | 0.277964 | 4.55031 | UNIT I | 2.4 | 23.0433 | 5.53984 | 9.06401 | 15.6665 | 0 | 15.6665 |
| 9 | 0.277964 | 4.98279 | UNIT I | 2.4 | 23.0433 | 5.86878 | 9.6022 | 16.9317 | 0 | 16.9317 |
| 10 | 0.277964 | 5.3473 | UNIT I | 2.4 | 23.0433 | 6.12935 | 10.0285 | 17.934 | 0 | 17.934 |
| 11 | 0.277964 | 5.65107 | UNIT I | 2.4 | 23.0433 | 6.32954 | 10.3561 | 18.704 | 0 | 18.704 |
| 12 | 0.277964 | 5.89244 | UNIT I | 2.4 | 23.0433 | 6.46928 | 10.5847 | 19.2415 | 0 | 19.2415 |
| 13 | 0.277964 | 6.0694 | UNIT I | 2.4 | 23.0433 | 6.54822 | 10.7139 | 19.5452 | 0 | 19.5452 |
| 14 | 0.277964 | 6.17944 | UNIT I | 2.4 | 23.0433 | 6.56563 | 10.7424 | 19.6121 | 0 | 19.6121 |
| 15 | 0.277964 | 6.21956 | UNIT I | 2.4 | 23.0433 | 6.52045 | 10.6684 | 19.4383 | 0 | 19.4383 |
| 16 | 0.277964 | 6.1861 | UNIT I | 2.4 | 23.0433 | 6.41124 | 10.4898 | 19.0183 | 0 | 19.0183 |
| 17 | 0.277964 | 6.07467 | UNIT I | 2.4 | 23.0433 | 6.23612 | 10.2032 | 18.3447 | 0 | 18.3447 |
| 18 | 0.277964 | 5.87988 | UNIT I | 2.4 | 23.0433 | 5.99273 | 9.80501 | 17.4085 | 0 | 17.4085 |
| 19 | 0.277964 | 5.5952 | UNIT I | 2.4 | 23.0433 | 5.67815 | 9.2903 | 16.1985 | 0 | 16.1985 |
| 20 | 0.277964 | 5.2125 | UNIT I | 2.4 | 23.0433 | 5.28877 | 8.65322 | 14.7007 | 0 | 14.7007 |
| 21 | 0.277964 | 4.7216 | UNIT I | 2.4 | 23.0433 | 4.82019 | 7.88656 | 12.8984 | 0 | 12.8984 |
| 22 | 0.277964 | 4.10953 | UNIT I | 2.4 | 23.0433 | 4.26703 | 6.9815 | 10.7707 | 0 | 10.7707 |
| 23 | 0.277964 | 3.3593 | UNIT I | 2.4 | 23.0433 | 3.62266 | 5.92721 | 8.29213 | 0 | 8.29213 |
| 24 | 0.277964 | 2.44327 | UNIT I | 2.4 | 23.0433 | 2.87549 | 4.70474 | 5.41822 | 0 | 5.41822 |
| 25 | 0.277964 | 0.934698 | UNIT I | 2.4 | 23.0433 | 1.74122 | 2.8489 | 1.05532 | 0 | 1.05532 |

**Global Minimum Query (spencer) - Safety Factor**: 1.64001

| 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 | 0.277964 | 0.1873 | UNIT I | 2.4 | 23.0433 | 1.96118 | 3.21635 | 1.91916 | 0 | 1.91916 |
| 2 | 0.277964 | 0.585965 | UNIT I | 2.4 | 23.0433 | 2.38449 | 3.91059 | 3.55125 | 0 | 3.55125 |
| 3 | 0.277964 | 1.12739 | UNIT I | 2.4 | 23.0433 | 2.94034 | 4.82219 | 5.69433 | 0 | 5.69433 |
| 4 | 0.277964 | 1.88526 | UNIT I | 2.4 | 23.0433 | 3.69607 | 6.06159 | 8.60805 | 0 | 8.60805 |
| 5 | 0.277964 | 2.64203 | UNIT I | 2.4 | 23.0433 | 4.4062 | 7.22621 | 11.346 | 0 | 11.346 |
| 6 | 0.277964 | 3.34157 | UNIT I | 2.4 | 23.0433 | 5.01697 | 8.22788 | 13.7008 | 0 | 13.7008 |
| 7 | 0.277964 | 3.98374 | UNIT I | 2.4 | 23.0433 | 5.53573 | 9.07865 | 15.7009 | 0 | 15.7009 |
| 8 | 0.277964 | 4.55031 | UNIT I | 2.4 | 23.0433 | 5.94851 | 9.75561 | 17.2923 | 0 | 17.2923 |
| 9 | 0.277964 | 4.98279 | UNIT I | 2.4 | 23.0433 | 6.19858 | 10.1657 | 18.2566 | 0 | 18.2566 |
| 10 | 0.277964 | 5.3473 | UNIT I | 2.4 | 23.0433 | 6.36888 | 10.445 | 18.9131 | 0 | 18.9131 |
| 11 | 0.277964 | 5.65107 | UNIT I | 2.4 | 23.0433 | 6.41262 | 10.5168 | 19.0817 | 0 | 19.0817 |
| 12 | 0.277964 | 5.89244 | UNIT I | 2.4 | 23.0433 | 6.40785 | 10.5089 | 19.0634 | 0 | 19.0634 |
| 13 | 0.277964 | 6.0694 | UNIT I | 2.4 | 23.0433 | 6.34607 | 10.4076 | 18.8252 | 0 | 18.8252 |
| 14 | 0.277964 | 6.17944 | UNIT I | 2.4 | 23.0433 | 6.1687 | 10.1167 | 18.1413 | 0 | 18.1413 |
| 15 | 0.277964 | 6.21956 | UNIT I | 2.4 | 23.0433 | 5.96209 | 9.77789 | 17.3447 | 0 | 17.3447 |
| 16 | 0.277964 | 6.1861 | UNIT I | 2.4 | 23.0433 | 5.975 | 9.79906 | 17.3945 | 0 | 17.3945 |
| 17 | 0.277964 | 6.07467 | UNIT I | 2.4 | 23.0433 | 6.18759 | 10.1477 | 18.2141 | 0 | 18.2141 |
| 18 | 0.277964 | 5.87988 | UNIT I | 2.4 | 23.0433 | 5.94867 | 9.75588 | 17.293 | 0 | 17.293 |
| 19 | 0.277964 | 5.5952 | UNIT I | 2.4 | 23.0433 | 5.54258 | 9.08989 | 15.7273 | 0 | 15.7273 |
| 20 | 0.277964 | 5.2125 | UNIT I | 2.4 | 23.0433 | 5.08403 | 8.33786 | 13.9594 | 0 | 13.9594 |
| 21 | 0.277964 | 4.7216 | UNIT I | 2.4 | 23.0433 | 4.57236 | 7.49871 | 11.9866 | 0 | 11.9866 |
| 22 | 0.277964 | 4.10953 | UNIT I | 2.4 | 23.0433 | 4.00637 | 6.57049 | 9.80445 | 0 | 9.80445 |
| 23 | 0.277964 | 3.3593 | UNIT I | 2.4 | 23.0433 | 3.38903 | 5.55804 | 7.42427 | 0 | 7.42427 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 0.277964 | 2.44327 | UNIT I | 2.4 | 23.0433 | 2.71174 | 4.44728 | 4.81295 | 0 | 4.81295 |
| 25 | 0.277964 | 0.934698 | UNIT I | 2.4 | 23.0433 | 1.7775 | 2.91512 | 1.21099 | 0 | 1.21099 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.21066

| 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 | 0.0232002 | 0.00595592 | UNIT I | 2.4 | 23.0433 | 0 | 0 | -97.1808 | 0 | -97.1808 |
| 2 | 0.0232002 | 0.0172818 | UNIT I | 2.4 | 23.0433 | 6.23539 | 7.54894 | 12.1047 | 0 | 12.1047 |
| 3 | 0.0232002 | 0.027515 | UNIT I | 2.4 | 23.0433 | 5.68418 | 6.88161 | 10.5359 | 0 | 10.5359 |
| 4 | 0.0232002 | 0.0367893 | UNIT I | 2.4 | 23.0433 | 5.32929 | 6.45196 | 9.52578 | 0 | 9.52578 |
| 5 | 0.0232002 | 0.0451999 | UNIT I | 2.4 | 23.0433 | 5.076 | 6.14531 | 8.80488 | 0 | 8.80488 |
| 6 | 0.0232002 | 0.052816 | UNIT I | 2.4 | 23.0433 | 4.87973 | 5.90769 | 8.24623 | 0 | 8.24623 |
| 7 | 0.0232002 | 0.0596876 | UNIT I | 2.4 | 23.0433 | 4.71706 | 5.71076 | 7.7833 | 0 | 7.7833 |
| 8 | 0.0232002 | 0.0658506 | UNIT I | 2.4 | 23.0433 | 4.57465 | 5.53835 | 7.37799 | 0 | 7.37799 |
| 9 | 0.0232002 | 0.0713291 | UNIT I | 2.4 | 23.0433 | 4.4443 | 5.38054 | 7.00698 | 0 | 7.00698 |
| 10 | 0.0232002 | 0.0761372 | UNIT I | 2.4 | 23.0433 | 4.3207 | 5.2309 | 6.65518 | 0 | 6.65518 |
| 11 | 0.0232002 | 0.0802805 | UNIT I | 2.4 | 23.0433 | 4.2002 | 5.08501 | 6.31219 | 0 | 6.31219 |
| 12 | 0.0232002 | 0.0837558 | UNIT I | 2.4 | 23.0433 | 4.08016 | 4.93969 | 5.9706 | 0 | 5.9706 |
| 13 | 0.0232002 | 0.0865512 | UNIT I | 2.4 | 23.0433 | 3.95858 | 4.7925 | 5.62457 | 0 | 5.62457 |
| 14 | 0.0232002 | 0.0886454 | UNIT I | 2.4 | 23.0433 | 3.83381 | 4.64144 | 5.2694 | 0 | 5.2694 |
| 15 | 0.0232002 | 0.0900059 | UNIT I | 2.4 | 23.0433 | 3.70438 | 4.48475 | 4.90105 | 0 | 4.90105 |
| 16 | 0.0232002 | 0.0905869 | UNIT I | 2.4 | 23.0433 | 3.56895 | 4.32079 | 4.5156 | 0 | 4.5156 |
| 17 | 0.0232002 | 0.0903248 | UNIT I | 2.4 | 23.0433 | 3.4261 | 4.14784 | 4.10901 | 0 | 4.10901 |
| 18 | 0.0232002 | 0.0891323 | UNIT I | 2.4 | 23.0433 | 3.27426 | 3.96401 | 3.67684 | 0 | 3.67684 |
| 19 | 0.0232002 | 0.0868875 | UNIT I | 2.4 | 23.0433 | 3.11154 | 3.76702 | 3.21373 | 0 | 3.21373 |
| 20 | 0.0232002 | 0.0834153 | UNIT I | 2.4 | 23.0433 | 2.93646 | 3.55506 | 2.71543 | 0 | 2.71543 |
| 21 | 0.0232002 | 0.0784526 | UNIT I | 2.4 | 23.0433 | 2.7441 | 3.32217 | 2.16795 | 0 | 2.16795 |
| 22 | 0.0232002 | 0.0715737 | UNIT I | 2.4 | 23.0433 | 2.52933 | 3.06216 | 1.55668 | 0 | 1.55668 |
| 23 | 0.0232002 | 0.0620012 | UNIT I | 2.4 | 23.0433 | 2.28357 | 2.76463 | 0.857207 | 0 | 0.857207 |
| 24 | 0.0232002 | 0.0479492 | UNIT I | 2.4 | 23.0433 | 1.98725 | 2.40588 | 0.01383 | 0 | 0.01383 |
| 25 | 0.0232002 | 0.0197423 | UNIT I | 2.4 | 23.0433 | 4.30465 | 5.21147 | 6.6095 | 0 | 6.6095 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.67441

| 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 | 0.277964 | 0.1873 | UNIT I | 2.4 | 23.0433 | 1.74987 | 2.93 | 1.24598 | 0 | 1.24598 |
| 2 | 0.277964 | 0.585965 | UNIT I | 2.4 | 23.0433 | 2.29498 | 3.84274 | 3.39174 | 0 | 3.39174 |
| 3 | 0.277964 | 1.12739 | UNIT I | 2.4 | 23.0433 | 3.07667 | 5.15161 | 6.4688 | 0 | 6.4688 |
| 4 | 0.277964 | 1.88526 | UNIT I | 2.4 | 23.0433 | 3.85595 | 6.45644 | 9.53633 | 0 | 9.53633 |
| 5 | 0.277964 | 2.64203 | UNIT I | 2.4 | 23.0433 | 4.39652 | 7.36158 | 11.6642 | 0 | 11.6642 |
| 6 | 0.277964 | 3.34157 | UNIT I | 2.4 | 23.0433 | 4.99385 | 8.36175 | 14.0155 | 0 | 14.0155 |
| 7 | 0.277964 | 3.98374 | UNIT I | 2.4 | 23.0433 | 5.83605 | 9.77194 | 17.3308 | 0 | 17.3308 |
| 8 | 0.277964 | 4.55031 | UNIT I | 2.4 | 23.0433 | 6.59393 | 11.0409 | 20.3141 | 0 | 20.3141 |
| 9 | 0.277964 | 4.98279 | UNIT I | 2.4 | 23.0433 | 6.51496 | 10.9087 | 20.0032 | 0 | 20.0032 |
| 10 | 0.277964 | 5.3473 | UNIT I | 2.4 | 23.0433 | 7.31901 | 12.255 | 23.1683 | 0 | 23.1683 |
| 11 | 0.277964 | 5.65107 | UNIT I | 2.4 | 23.0433 | 7.31479 | 12.248 | 23.1516 | 0 | 23.1516 |
| 12 | 0.277964 | 5.89244 | UNIT I | 2.4 | 23.0433 | 6.22324 | 10.4203 | 18.8549 | 0 | 18.8549 |
| 13 | 0.277964 | 6.0694 | UNIT I | 2.4 | 23.0433 | 6.29769 | 10.5449 | 19.1479 | 0 | 19.1479 |
| 14 | 0.277964 | 6.17944 | UNIT I | 2.4 | 23.0433 | 5.88872 | 9.86013 | 17.5381 | 0 | 17.5381 |
| 15 | 0.277964 | 6.21956 | UNIT I | 2.4 | 23.0433 | 4.52138 | 7.57064 | 12.1557 | 0 | 12.1557 |
| 16 | 0.277964 | 6.1861 | UNIT I | 2.4 | 23.0433 | 3.71663 | 6.22316 | 8.9879 | 0 | 8.9879 |
| 17 | 0.277964 | 6.07467 | UNIT I | 2.4 | 23.0433 | 4.50295 | 7.53978 | 12.0831 | 0 | 12.0831 |
| 18 | 0.277964 | 5.87988 | UNIT I | 2.4 | 23.0433 | 5.58768 | 9.35607 | 16.3531 | 0 | 16.3531 |
| 19 | 0.277964 | 5.5952 | UNIT I | 2.4 | 23.0433 | 5.61631 | 9.40401 | 16.4658 | 0 | 16.4658 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 0.277964 | 5.2125 | UNIT I | 2.4 | 23.0433 | 5.24429 | 8.78109 | 15.0013 | 0 | 15.0013 |
| 21 | 0.277964 | 4.7216 | UNIT I | 2.4 | 23.0433 | 4.80056 | 8.0381 | 13.2546 | 0 | 13.2546 |
| 22 | 0.277964 | 4.10953 | UNIT I | 2.4 | 23.0433 | 4.24827 | 7.11335 | 11.0807 | 0 | 11.0807 |
| 23 | 0.277964 | 3.3593 | UNIT I | 2.4 | 23.0433 | 3.60895 | 6.04286 | 8.56403 | 0 | 8.56403 |
| 24 | 0.277964 | 2.44327 | UNIT I | 2.4 | 23.0433 | 2.8712 | 4.80757 | 5.65997 | 0 | 5.65997 |
| 25 | 0.277964 | 0.934698 | UNIT I | 2.4 | 23.0433 | 1.73283 | 2.90147 | 1.17891 | 0 | 1.17891 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.6382

| 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 | 0.277964 | 0.1873 | UNIT I | 2.4 | 23.0433 | 1.71336 | 2.80683 | 0.956419 | 0 | 0.956419 |
| 2 | 0.277964 | 0.585965 | UNIT I | 2.4 | 23.0433 | 2.17661 | 3.56572 | 2.7405 | 0 | 2.7405 |
| 3 | 0.277964 | 1.12739 | UNIT I | 2.4 | 23.0433 | 2.81734 | 4.61537 | 5.20811 | 0 | 5.20811 |
| 4 | 0.277964 | 1.88526 | UNIT I | 2.4 | 23.0433 | 3.58402 | 5.87134 | 8.16081 | 0 | 8.16081 |
| 5 | 0.277964 | 2.64203 | UNIT I | 2.4 | 23.0433 | 4.26232 | 6.98253 | 10.7731 | 0 | 10.7731 |
| 6 | 0.277964 | 3.34157 | UNIT I | 2.4 | 23.0433 | 4.9213 | 8.06208 | 13.311 | 0 | 13.311 |
| 7 | 0.277964 | 3.98374 | UNIT I | 2.4 | 23.0433 | 5.6368 | 9.23421 | 16.0666 | 0 | 16.0666 |
| 8 | 0.277964 | 4.55031 | UNIT I | 2.4 | 23.0433 | 6.25914 | 10.2537 | 18.4634 | 0 | 18.4634 |
| 9 | 0.277964 | 4.98279 | UNIT I | 2.4 | 23.0433 | 6.45548 | 10.5754 | 19.2195 | 0 | 19.2195 |
| 10 | 0.277964 | 5.3473 | UNIT I | 2.4 | 23.0433 | 6.93225 | 11.3564 | 21.0557 | 0 | 21.0557 |
| 11 | 0.277964 | 5.65107 | UNIT I | 2.4 | 23.0433 | 7.0035 | 11.4731 | 21.3301 | 0 | 21.3301 |
| 12 | 0.277964 | 5.89244 | UNIT I | 2.4 | 23.0433 | 6.62472 | 10.8526 | 19.8713 | 0 | 19.8713 |
| 13 | 0.277964 | 6.0694 | UNIT I | 2.4 | 23.0433 | 6.60438 | 10.8193 | 19.793 | 0 | 19.793 |
| 14 | 0.277964 | 6.17944 | UNIT I | 2.4 | 23.0433 | 6.29781 | 10.3171 | 18.6123 | 0 | 18.6123 |
| 15 | 0.277964 | 6.21956 | UNIT I | 2.4 | 23.0433 | 5.56596 | 9.11816 | 15.7938 | 0 | 15.7938 |
| 16 | 0.277964 | 6.1861 | UNIT I | 2.4 | 23.0433 | 5.13907 | 8.41882 | 14.1497 | 0 | 14.1497 |
| 17 | 0.277964 | 6.07467 | UNIT I | 2.4 | 23.0433 | 5.57842 | 9.13856 | 15.8417 | 0 | 15.8417 |
| 18 | 0.277964 | 5.87988 | UNIT I | 2.4 | 23.0433 | 5.93077 | 9.71579 | 17.1987 | 0 | 17.1987 |
| 19 | 0.277964 | 5.5952 | UNIT I | 2.4 | 23.0433 | 5.6792 | 9.30366 | 16.2299 | 0 | 16.2299 |
| 20 | 0.277964 | 5.2125 | UNIT I | 2.4 | 23.0433 | 5.21417 | 8.54185 | 14.4389 | 0 | 14.4389 |
| 21 | 0.277964 | 4.7216 | UNIT I | 2.4 | 23.0433 | 4.68188 | 7.66985 | 12.3889 | 0 | 12.3889 |
| 22 | 0.277964 | 4.10953 | UNIT I | 2.4 | 23.0433 | 4.07656 | 6.67822 | 10.0577 | 0 | 10.0577 |
| 23 | 0.277964 | 3.3593 | UNIT I | 2.4 | 23.0433 | 3.42098 | 5.60425 | 7.53288 | 0 | 7.53288 |
| 24 | 0.277964 | 2.44327 | UNIT I | 2.4 | 23.0433 | 2.71702 | 4.45102 | 4.82177 | 0 | 4.82177 |
| 25 | 0.277964 | 0.934698 | UNIT I | 2.4 | 23.0433 | 1.77956 | 2.91528 | 1.21138 | 0 | 1.21138 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.63513

| 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 | 0.277964 | 0.1873 | UNIT I | 2.4 | 23.0433 | 1.74436 | 2.85226 | 1.06322 | 0 | 1.06322 |
| 2 | 0.277964 | 0.585965 | UNIT I | 2.4 | 23.0433 | 2.1928 | 3.58551 | 2.78703 | 0 | 2.78703 |
| 3 | 0.277964 | 1.12739 | UNIT I | 2.4 | 23.0433 | 2.7967 | 4.57296 | 5.10845 | 0 | 5.10845 |
| 4 | 0.277964 | 1.88526 | UNIT I | 2.4 | 23.0433 | 3.6204 | 5.91983 | 8.27478 | 0 | 8.27478 |
| 5 | 0.277964 | 2.64203 | UNIT I | 2.4 | 23.0433 | 4.42638 | 7.2377 | 11.373 | 0 | 11.373 |
| 6 | 0.277964 | 3.34157 | UNIT I | 2.4 | 23.0433 | 5.13758 | 8.40061 | 14.1069 | 0 | 14.1069 |
| 7 | 0.277964 | 3.98374 | UNIT I | 2.4 | 23.0433 | 5.73886 | 9.38378 | 16.4182 | 0 | 16.4182 |
| 8 | 0.277964 | 4.55031 | UNIT I | 2.4 | 23.0433 | 6.20188 | 10.1409 | 18.1981 | 0 | 18.1981 |
| 9 | 0.277964 | 4.98279 | UNIT I | 2.4 | 23.0433 | 6.46165 | 10.5656 | 19.1966 | 0 | 19.1966 |
| 10 | 0.277964 | 5.3473 | UNIT I | 2.4 | 23.0433 | 6.60141 | 10.7942 | 19.7339 | 0 | 19.7339 |
| 11 | 0.277964 | 5.65107 | UNIT I | 2.4 | 23.0433 | 6.57498 | 10.751 | 19.6323 | 0 | 19.6323 |
| 12 | 0.277964 | 5.89244 | UNIT I | 2.4 | 23.0433 | 6.48165 | 10.5983 | 19.2735 | 0 | 19.2735 |
| 13 | 0.277964 | 6.0694 | UNIT I | 2.4 | 23.0433 | 6.33131 | 10.3525 | 18.6956 | 0 | 18.6956 |
| 14 | 0.277964 | 6.17944 | UNIT I | 2.4 | 23.0433 | 6.0739 | 9.93162 | 17.7061 | 0 | 17.7061 |
| 15 | 0.277964 | 6.21956 | UNIT I | 2.4 | 23.0433 | 5.82677 | 9.52753 | 16.7562 | 0 | 16.7562 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.277964 | 6.1861 | UNIT I | 2.4 | 23.0433 | 5.86136 | 9.58408 | 16.8891 | 0 | 16.8891 |
| 17 | 0.277964 | 6.07467 | UNIT I | 2.4 | 23.0433 | 6.09698 | 9.96935 | 17.7949 | 0 | 17.7949 |
| 18 | 0.277964 | 5.87988 | UNIT I | 2.4 | 23.0433 | 5.84733 | 9.56114 | 16.8352 | 0 | 16.8352 |
| 19 | 0.277964 | 5.5952 | UNIT I | 2.4 | 23.0433 | 5.45087 | 8.91288 | 15.3112 | 0 | 15.3112 |
| 20 | 0.277964 | 5.2125 | UNIT I | 2.4 | 23.0433 | 5.02683 | 8.21952 | 13.6811 | 0 | 13.6811 |
| 21 | 0.277964 | 4.7216 | UNIT I | 2.4 | 23.0433 | 4.56923 | 7.47129 | 11.9221 | 0 | 11.9221 |
| 22 | 0.277964 | 4.10953 | UNIT I | 2.4 | 23.0433 | 4.06713 | 6.65028 | 9.99203 | 0 | 9.99203 |
| 23 | 0.277964 | 3.3593 | UNIT I | 2.4 | 23.0433 | 3.50463 | 5.73053 | 7.82978 | 0 | 7.82978 |
| 24 | 0.277964 | 2.44327 | UNIT I | 2.4 | 23.0433 | 2.84713 | 4.65542 | 5.30229 | 0 | 5.30229 |
| 25 | 0.277964 | 0.934698 | UNIT I | 2.4 | 23.0433 | 1.77035 | 2.89476 | 1.16313 | 0 | 1.16313 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -7.22118 | 1.56282 |
| 15.7129 | 5.65286 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

### External Boundary

| X | Y |
|---|---|
| 3.55263 | 5.94674 |
| 2.46637 | 5.95601 |
| 2.37408 | 5.97731 |
| 2.19776 | 5.96607 |
| 1.33058 | 5.75328 |
| 0.562161 | 5.61447 |
| -0.0303637 | 5.49417 |
| -0.539558 | 5.31833 |
| -1.58574 | 5.19803 |
| -2.70597 | 5.15175 |
| -3.32627 | 4.98518 |
| -5.4581 | 4.92122 |
| -5.8548 | 4.89919 |
| -6.3176 | 4.84044 |
| -7.22118 | 4.87717 |
| -7.22118 | 1.56282 |
| -7.22118 | -0.557959 |
| -7.22118 | -3.44395 |
| -7.22118 | -5.39909 |
| -4.18484 | -5.39909 |
| 49.9902 | -5.39909 |
| 49.9902 | 9.76285 |
| 49.9902 | 15.7927 |
| 49.9902 | 17.787 |
| 49.9902 | 19.9918 |
| 49.9902 | 23.8629 |
| 48.6865 | 23.1062 |
| 47.8664 | 22.7068 |
| 47.0674 | 22.2234 |
| 46.6258 | 21.7399 |

| | |
|---|---|
| 45.7847 | 21.3196 |
| 45.3851 | 20.8782 |
| 43.6609 | 17.8094 |
| 42.9761 | 16.0499 |
| 42.5174 | 15.4341 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 29.9354 | 14.2695 |
| 29.5681 | 14.2768 |
| 29.2838 | 14.2825 |
| 28.8436 | 14.2914 |
| 28.769 | 14.2914 |
| 28.0829 | 14.3066 |
| 27.4875 | 14.3186 |
| 27.4445 | 14.3168 |
| 27.2003 | 14.1883 |
| 26.5834 | 13.5717 |
| 25.7224 | 12.801 |
| 24.9899 | 12.3128 |
| 23.6437 | 11.6418 |
| 23.2984 | 11.5524 |
| 22.5311 | 11.4757 |
| 22.0195 | 11.2967 |
| 21.1116 | 11.2584 |
| 20.3826 | 11.1561 |
| 20.1707 | 11.093 |
| 19.7816 | 10.9771 |
| 18.907 | 10.8084 |
| 18.407 | 10.712 |
| 17.3761 | 10.5131 |
| 16.6293 | 10.2749 |
| 15.7792 | 10.2113 |
| 14.3889 | 10.0446 |
| 12.6085 | 9.87112 |
| 12.514 | 9.86192 |
| 12.2636 | 9.80476 |
| 11.6804 | 9.67161 |
| 11.5419 | 9.63999 |
| 11.1768 | 9.55661 |
| 9.645 | 9.226 |
| 9.40071 | 9.05704 |
| 8.67713 | 8.5566 |
| 7.9753 | 8.0712 |
| 7.25267 | 7.57141 |
| 6.52923 | 7.07106 |
| 6.279 | 6.898 |
| 6.15839 | 6.694 |
| 6.054 | 6.601 |
| 5.88 | 6.601 |
| 5.76991 | 6.664 |

## Material Boundary

| X | Y |
|---|---|
| 8.772 | 6.09843 |

| | |
|---|---|
| 31.5166 | 11.426 |

### Material Boundary

| X | Y |
|---|---|
| -7.22118 | -3.44395 |
| 14.9068 | 2.35905 |
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |
| 49.9902 | 15.7927 |

### Material Boundary

| X | Y |
|---|---|
| -4.18484 | -5.39909 |
| 49.9902 | 9.76285 |

### Material Boundary

| X | Y |
|---|---|
| -7.22118 | -0.557959 |
| 15.7129 | 5.65286 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| 3.55263 | 5.94674 |
| 5.76991 | 6.09843 |
| 5.76991 | 6.49459 |
| 5.76991 | 6.664 |

### Material Boundary

| X | Y |
|---|---|
| 5.76991 | 6.09843 |
| 6.27057 | 6.09843 |

### Material Boundary

| X | Y |
|---|---|
| 9.30584 | 8.08442 |
| 10.7916 | 8.08442 |

### Material Boundary

| X | Y |
|---|---|
| 9.80532 | 8.5566 |
| 10.1973 | 8.5566 |
| 10.3078 | 8.5566 |

### Material Boundary

| X | Y |
|---|---|
| 10.3078 | 8.5566 |
| 10.3078 | 8.6975 |

| | |
|---|---|
| 10.3078 | 8.91614 |
| 10.3078 | 9.05704 |

### Material Boundary

| X | Y |
|---|---|
| 10.3078 | 9.05704 |
| 10.4184 | 9.05704 |
| 10.7916 | 9.05704 |
| 10.7916 | 8.08442 |

### Material Boundary

| X | Y |
|---|---|
| 9.30584 | 8.08442 |
| 9.30584 | 8.5566 |
| 9.80532 | 8.5566 |

### Material Boundary

| X | Y |
|---|---|
| 7.27258 | 7.07106 |
| 7.77235 | 7.07106 |

### Material Boundary

| X | Y |
|---|---|
| 7.77235 | 7.07106 |
| 7.77235 | 7.57141 |

### Material Boundary

| X | Y |
|---|---|
| 7.77235 | 7.57141 |
| 8.272 | 7.57141 |

### Material Boundary

| X | Y |
|---|---|
| 8.272 | 7.57141 |
| 8.272 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 8.272 | 8.0712 |
| 8.661 | 8.0712 |
| 8.772 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 6.27057 | 6.09843 |
| 8.772 | 6.09843 |
| 8.772 | 7.93029 |
| 8.772 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 8.772 | 6.09843 |
| 10.7916 | 8.08442 |
| 11.0694 | 8.35766 |
| 11.7807 | 9.05704 |
| 12.6085 | 9.87112 |

### Material Boundary

| X | Y |
|---|---|
| 6.27057 | 6.09843 |
| 6.27057 | 6.57061 |
| 6.77005 | 6.57061 |
| 6.77005 | 7.07106 |
| 7.27258 | 7.07106 |

### Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 19.9918 |

### Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

### Material Boundary

| X | Y |
|---|---|
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| -7.22118 | 1.56282 |
| 15.7129 | 5.65286 |

### Material Boundary

| X | Y |
|---|---|
| 8.772 | 8.0712 |
| 9.30584 | 8.08442 |

### Material Boundary

| X | Y |
|---|---|
| 10.7916 | 9.05704 |
| 11.7807 | 9.05704 |

### Material Boundary

| X | Y |
|---|---|
| 7.25267 | 7.57141 |
| 7.77235 | 7.57141 |

### Material Boundary

| X | Y |
|---|---|
| 7.9753 | 8.0712 |
| 8.272 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 8.67713 | 8.5566 |
| 9.30584 | 8.5566 |

### Material Boundary

| X | Y |
|---|---|
| 9.40071 | 9.05704 |
| 10.3078 | 9.05704 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 25.8179 | 12.8466 |
| 28.0829 | 14.3066 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 28.8436 | 14.2914 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 29.2838 | 14.2825 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 29.5681 | 14.2768 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S51 + GABIONS RU=0.20 Dmin=0.5fullroad lim + GEOTEX+MPILE=0.75 oop
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 15/5/2021, 19:37:13

## 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

## Design Standard

Selected Type: Eurocode 7 - Design Approach 3

| Type | Partial Factor |
|---|---|
| Permanent Actions: Unfavourable | 1 |
| Permanent Actions: Favourable | 1 |
| Variable Actions: Unfavourable | 1.3 |
| Variable Actions: Favourable | 0 |
| Effective cohesion | 1.25 |
| Coefficient of shearing resistance | 1.25 |
| Undrained strength | 1.4 |
| Weight density | 1 |
| Shear strength (other models) | 1.25 |
| Earth resistance | 1 |
| Tensile and plate strength | 1 |
| Shear strength | 1 |
| Compressive strength | 1 |
| Bond strength | 1 |
| Seismic Coefficient | 1 |

## Analysis Options

### Analysis Methods Used

Bishop simplified
Corps of Engineers #1
Corps of Engineers #2
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified
Janbu corrected
Lowe-Karafiath
Ordinary/Fellenius

Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: 0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT | GABION | AIR | GRAVEL |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | No strength | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 | 18 | 1e-005 | 19 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 | 20 | | 0 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 | 32 | | 36 |
| Water Surface | None | None | Water Table | Water Table | Water Table | Water Table | None | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | | Automatically Calculated |
| Ru Value | 0.2 | 0.2 | | | | | 0 | |

| Property | SW |
|---|---|
| Color | |
| Strength Type | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 |
| Cohesion [kPa] | 1 |

| | |
|---|---|
| Friction Angle [deg] | 35 |
| Water Surface | Water Table |
| Hu Value | Automatically Calculated |

## *Support Properties*

### GEOTEX

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Parallel to Reinforcement
Anchorage: Embedded End
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 40 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 30 degrees

### MICROPILE

Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 0.75 m
Pile Shear Strength: 90 kN
Force Direction: Parallel to Surface

## *Global Minimums*

### Method: ordinary/fellenius

FS: 1.336070
Center: 25.194, 17.135
Radius: 6.145
Left Slip Surface Endpoint: 22.749, 11.497
Right Slip Surface Endpoint: 30.622, 14.256
Resisting Moment=503.452 kN-m
Driving Moment=376.816 kN-m

### Method: bishop simplified

FS: 1.378290
Center: 24.332, 19.367
Radius: 8.065
Left Slip Surface Endpoint: 22.622, 11.485
Right Slip Surface Endpoint: 30.572, 14.257
Resisting Moment=541.77 kN-m
Driving Moment=393.075 kN-m

### Method: janbu simplified

FS: 1.277260
Center: 24.370, 16.820
Radius: 6.182
Left Slip Surface Endpoint: 21.625, 11.280
Right Slip Surface Endpoint: 30.001, 14.268
Resisting Horizontal Force=81.2261 kN
Driving Horizontal Force=63.594 kN

### Method: janbu corrected

FS: 1.364570
Center: 24.879, 16.807

Radius: 5.379
Left Slip Surface Endpoint: 23.507, 11.606
Right Slip Surface Endpoint: 29.625, 14.276
Resisting Horizontal Force=47.41 kN
Driving Horizontal Force=34.7437 kN

### Method: spencer

FS: 1.378570
Center: 24.332, 19.367
Radius: 8.065
Left Slip Surface Endpoint: 22.622, 11.485
Right Slip Surface Endpoint: 30.572, 14.257
Resisting Moment=541.882 kN-m
Driving Moment=393.075 kN-m
Resisting Horizontal Force=61.3976 kN
Driving Horizontal Force=44.5372 kN

### Method: corp of eng#1

FS: 1.163340
Center: 27.858, 13.727
Radius: 0.358
Left Slip Surface Endpoint: 27.634, 13.447
Right Slip Surface Endpoint: 28.214, 13.696
Left Slope Intercept: 27.634 14.316
Right Slope Intercept: 28.214 14.304
Resisting Horizontal Force=2.54937 kN
Driving Horizontal Force=2.19142 kN

### Method: corp of eng#2

FS: 1.416780
Center: 24.164, 18.546
Radius: 7.138
Left Slip Surface Endpoint: 22.930, 11.516
Right Slip Surface Endpoint: 29.880, 14.271
Resisting Horizontal Force=46.7193 kN
Driving Horizontal Force=32.9756 kN

### Method: lowe-karafiath

FS: 1.380890
Center: 24.164, 18.546
Radius: 7.138
Left Slip Surface Endpoint: 22.930, 11.516
Right Slip Surface Endpoint: 29.880, 14.271
Resisting Horizontal Force=46.4947 kN
Driving Horizontal Force=33.67 kN

### Method: gle/morgenstern-price

FS: 1.374600
Center: 24.332, 19.367
Radius: 8.065
Left Slip Surface Endpoint: 22.622, 11.485
Right Slip Surface Endpoint: 30.572, 14.257
Resisting Moment=540.321 kN-m
Driving Moment=393.075 kN-m
Resisting Horizontal Force=61.365 kN
Driving Horizontal Force=44.6421 kN

## *Valid / Invalid Surfaces*

## Method: ordinary/fellenius

Number of Valid Surfaces: 9546
Number of Invalid Surfaces: 454

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 40 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: bishop simplified

Number of Valid Surfaces: 9531
Number of Invalid Surfaces: 469

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 40 surfaces
Error Code -112 reported for 15 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: janbu simplified

Number of Valid Surfaces: 9262
Number of Invalid Surfaces: 738

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 309 surfaces
Error Code -112 reported for 15 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 9262
Number of Invalid Surfaces: 738

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 309 surfaces
Error Code -112 reported for 15 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: spencer

Number of Valid Surfaces: 9066
Number of Invalid Surfaces: 934

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 322 surfaces
Error Code -111 reported for 176 surfaces
Error Code -112 reported for 22 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 8303
Number of Invalid Surfaces: 1697

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 837 surfaces
Error Code -111 reported for 446 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 7854
Number of Invalid Surfaces: 2146

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 1292 surfaces
Error Code -111 reported for 439 surfaces
Error Code -112 reported for 1 surface
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 4848
Number of Invalid Surfaces: 5152

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 3592 surfaces
Error Code -111 reported for 1146 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 8996
Number of Invalid Surfaces: 1004

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -107 reported for 26 surfaces
Error Code -108 reported for 319 surfaces

Error Code -111 reported for 254 surfaces
Error Code -112 reported for 17 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

### Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.
-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).
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-115 = Surface too shallow, below the minimum depth.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.33607

| 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 | 0.314904 | 0.472075 | UNIT I | 2.4 | 23.0433 | 2.12521 | 2.83942 | 1.33287 | 0.299822 | 1.03305 |
| 2 | 0.314904 | 1.36755 | UNIT I | 2.4 | 23.0433 | 2.7884 | 3.7255 | 3.9847 | 0.868553 | 3.11614 |
| 3 | 0.314904 | 2.36208 | UNIT I | 2.4 | 23.0433 | 3.56775 | 4.76677 | 7.06425 | 1.50019 | 5.56406 |
| 4 | 0.314904 | 3.61716 | UNIT I | 2.4 | 23.0433 | 4.58224 | 6.12219 | 11.0478 | 2.29731 | 8.75053 |
| 5 | 0.314904 | 4.92701 | UNIT I | 2.4 | 23.0433 | 5.66988 | 7.57536 | 15.296 | 3.12922 | 12.1668 |
| 6 | 0.314904 | 6.13592 | UNIT I | 2.4 | 23.0433 | 6.69237 | 8.94148 | 19.2754 | 3.89701 | 15.3784 |
| 7 | 0.314904 | 7.24611 | UNIT I | 2.4 | 23.0433 | 7.63251 | 10.1976 | 22.9335 | 4.60211 | 18.3314 |
| 8 | 0.314904 | 8.20767 | UNIT I | 2.4 | 23.0433 | 8.43358 | 11.2679 | 26.0603 | 5.21282 | 20.8475 |
| 9 | 0.314904 | 8.9938 | UNIT I | 2.4 | 23.0433 | 9.0602 | 12.1051 | 28.5278 | 5.7121 | 22.8157 |
| 10 | 0.314904 | 9.68215 | UNIT I | 2.4 | 23.0433 | 9.56522 | 12.7798 | 30.5512 | 6.14928 | 24.4019 |
| 11 | 0.314904 | 10.2726 | UNIT I | 2.4 | 23.0433 | 9.94125 | 13.2822 | 32.1073 | 6.52428 | 25.583 |
| 12 | 0.314904 | 10.7634 | UNIT I | 2.4 | 23.0433 | 10.1822 | 13.6041 | 33.176 | 6.83599 | 26.34 |
| 13 | 0.314904 | 11.1518 | UNIT I | 2.4 | 23.0433 | 10.2839 | 13.74 | 33.742 | 7.08271 | 26.6593 |
| 14 | 0.314904 | 11.4343 | UNIT I | 2.4 | 23.0433 | 10.2442 | 13.687 | 33.7967 | 7.26209 | 26.5346 |
| 15 | 0.314904 | 11.6058 | UNIT I | 2.4 | 23.0433 | 10.0632 | 13.4451 | 33.3371 | 7.37105 | 25.9661 |
| 16 | 0.314904 | 11.6602 | UNIT I | 2.4 | 23.0433 | 9.74298 | 13.0173 | 32.3658 | 7.40558 | 24.9602 |
| 17 | 0.314904 | 11.5893 | UNIT I | 2.4 | 23.0433 | 9.28866 | 12.4103 | 30.8938 | 7.36054 | 23.5333 |
| 18 | 0.314904 | 11.3827 | UNIT I | 2.4 | 23.0433 | 8.70786 | 11.6343 | 28.9383 | 7.22931 | 21.7089 |
| 19 | 0.314904 | 11.0268 | UNIT I | 2.4 | 23.0433 | 8.01155 | 10.704 | 26.5252 | 7.00329 | 19.5219 |
| 20 | 0.314904 | 10.5038 | UNIT I | 2.4 | 23.0433 | 7.21452 | 9.6391 | 23.6896 | 6.67112 | 17.0185 |
| 21 | 0.314904 | 9.78948 | UNIT I | 2.4 | 23.0433 | 6.33614 | 8.46553 | 20.4769 | 6.21744 | 14.2595 |
| 22 | 0.314904 | 8.79903 | UNIT I | 2.4 | 23.0433 | 5.38083 | 7.18916 | 16.8473 | 5.58839 | 11.2589 |
| 23 | 0.314904 | 6.91887 | UNIT I | 2.4 | 23.0433 | 4.19509 | 5.60493 | 11.9288 | 4.39428 | 7.53449 |
| 24 | 0.314904 | 4.50474 | UNIT I | 2.4 | 23.0433 | 3.06519 | 4.09531 | 6.84655 | 2.86103 | 3.98552 |
| 25 | 0.314904 | 1.59856 | UNIT I | 2.4 | 23.0433 | 2.13551 | 2.85319 | 2.08068 | 1.01527 | 1.06541 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.37829

| 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 | 0.318011 | 0.284378 | UNIT I | 2.4 | 23.0433 | 2.08827 | 2.87825 | 1.30316 | 0.178848 | 1.12431 |
| 2 | 0.318011 | 0.813475 | UNIT I | 2.4 | 23.0433 | 2.49173 | 3.43432 | 2.9432 | 0.511603 | 2.4316 |
| 3 | 0.318011 | 1.38053 | UNIT I | 2.4 | 23.0433 | 2.91579 | 4.0188 | 4.67387 | 0.868228 | 3.80565 |
| 4 | 0.318011 | 2.19959 | UNIT I | 2.4 | 23.0433 | 3.52982 | 4.86511 | 7.1786 | 1.38335 | 5.79525 |
| 5 | 0.318011 | 3.25157 | UNIT I | 2.4 | 23.0433 | 4.31178 | 5.94289 | 10.374 | 2.04494 | 8.32902 |
| 6 | 0.318011 | 4.23798 | UNIT I | 2.4 | 23.0433 | 5.02411 | 6.92468 | 13.3024 | 2.66531 | 10.6371 |
| 7 | 0.318011 | 5.14855 | UNIT I | 2.4 | 23.0433 | 5.66121 | 7.80279 | 15.9394 | 3.23797 | 12.7015 |
| 8 | 0.318011 | 5.96258 | UNIT I | 2.4 | 23.0433 | 6.20974 | 8.55882 | 18.2287 | 3.74993 | 14.4788 |
| 9 | 0.318011 | 6.60028 | UNIT I | 2.4 | 23.0433 | 6.61269 | 9.1142 | 19.9354 | 4.15098 | 15.7845 |
| 10 | 0.318011 | 7.1471 | UNIT I | 2.4 | 23.0433 | 6.93778 | 9.56227 | 21.3327 | 4.49488 | 16.8378 |
| 11 | 0.318011 | 7.61497 | UNIT I | 2.4 | 23.0433 | 7.19586 | 9.91798 | 22.4632 | 4.78913 | 17.6741 |
| 12 | 0.318011 | 8.00208 | UNIT I | 2.4 | 23.0433 | 7.38734 | 10.1819 | 23.3271 | 5.03259 | 18.2945 |
| 13 | 0.318011 | 8.30619 | UNIT I | 2.4 | 23.0433 | 7.51228 | 10.3541 | 23.9232 | 5.22384 | 18.6994 |
| 14 | 0.318011 | 8.52446 | UNIT I | 2.4 | 23.0433 | 7.57038 | 10.4342 | 24.2487 | 5.36112 | 18.8876 |
| 15 | 0.318011 | 8.65347 | UNIT I | 2.4 | 23.0433 | 7.56094 | 10.4212 | 24.2993 | 5.44225 | 18.8571 |
| 16 | 0.318011 | 8.68903 | UNIT I | 2.4 | 23.0433 | 7.4829 | 10.3136 | 24.0688 | 5.46461 | 18.6042 |
| 17 | 0.318011 | 8.62608 | UNIT I | 2.4 | 23.0433 | 7.33473 | 10.1094 | 23.5491 | 5.42502 | 18.1241 |
| 18 | 0.318011 | 8.45847 | UNIT I | 2.4 | 23.0433 | 7.11446 | 9.80579 | 22.73 | 5.31962 | 17.4103 |
| 19 | 0.318011 | 8.17872 | UNIT I | 2.4 | 23.0433 | 6.81955 | 9.39932 | 21.5984 | 5.14368 | 16.4547 |
| 20 | 0.318011 | 7.77762 | UNIT I | 2.4 | 23.0433 | 6.44685 | 8.88563 | 20.1385 | 4.89142 | 15.2471 |
| 21 | 0.318011 | 7.2437 | UNIT I | 2.4 | 23.0433 | 5.99246 | 8.25935 | 18.3304 | 4.55563 | 13.7748 |
| 22 | 0.318011 | 6.55179 | UNIT I | 2.4 | 23.0433 | 5.44496 | 7.50474 | 16.1213 | 4.12048 | 12.0008 |
| 23 | 0.318011 | 5.14803 | UNIT I | 2.4 | 23.0433 | 4.47486 | 6.16766 | 12.0951 | 3.23765 | 8.85741 |
| 24 | 0.318011 | 3.24762 | UNIT I | 2.4 | 23.0433 | 3.24129 | 4.46744 | 6.90281 | 2.04246 | 4.86035 |
| 25 | 0.318011 | 1.12314 | UNIT I | 2.4 | 23.0433 | 1.92976 | 2.65977 | 1.31705 | 0.706352 | 0.610693 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.27726

| 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 | 0.335018 | 0.534189 | UNIT I | 2.4 | 23.0433 | 2.71828 | 3.47195 | 2.83895 | 0.318901 | 2.52004 |
| 2 | 0.335018 | 1.75099 | UNIT I | 2.4 | 23.0433 | 3.75763 | 4.79947 | 6.68625 | 1.04531 | 5.64094 |
| 3 | 0.335018 | 3.2243 | UNIT I | 2.4 | 23.0433 | 4.98 | 6.36076 | 11.2362 | 1.92485 | 9.31138 |
| 4 | 0.335018 | 4.19549 | UNIT I | 2.4 | 23.0433 | 5.71498 | 7.29951 | 14.0229 | 2.50464 | 11.5183 |
| 5 | 0.335018 | 4.90683 | UNIT I | 2.4 | 23.0433 | 6.20221 | 7.92183 | 15.9106 | 2.92929 | 12.9813 |
| 6 | 0.335018 | 5.66693 | UNIT I | 2.4 | 23.0433 | 6.7148 | 8.57654 | 17.9035 | 3.38306 | 14.5205 |
| 7 | 0.335018 | 6.71794 | UNIT I | 2.4 | 23.0433 | 7.44948 | 9.51492 | 20.737 | 4.0105 | 16.7265 |
| 8 | 0.335018 | 7.91889 | UNIT I | 2.4 | 23.0433 | 8.27979 | 10.5754 | 23.9472 | 4.72744 | 19.2197 |
| 9 | 0.335018 | 9.00398 | UNIT I | 2.4 | 23.0433 | 8.98952 | 11.482 | 26.726 | 5.37522 | 21.3508 |
| 10 | 0.335018 | 9.97324 | UNIT I | 2.4 | 23.0433 | 9.5838 | 12.241 | 29.0892 | 5.95385 | 23.1353 |
| 11 | 0.335018 | 10.758 | UNIT I | 2.4 | 23.0433 | 10.0146 | 12.7912 | 30.8509 | 6.42232 | 24.4286 |
| 12 | 0.335018 | 11.344 | UNIT I | 2.4 | 23.0433 | 10.2777 | 13.1273 | 31.9912 | 6.77219 | 25.2191 |
| 13 | 0.335018 | 11.8083 | UNIT I | 2.4 | 23.0433 | 10.4366 | 13.3302 | 32.7452 | 7.04938 | 25.6958 |
| 14 | 0.335018 | 12.1466 | UNIT I | 2.4 | 23.0433 | 10.4911 | 13.3998 | 33.1108 | 7.25134 | 25.8594 |
| 15 | 0.335018 | 12.353 | UNIT I | 2.4 | 23.0433 | 10.4401 | 13.3347 | 33.081 | 7.37454 | 25.7065 |
| 16 | 0.335018 | 12.4197 | UNIT I | 2.4 | 23.0433 | 10.2813 | 13.1319 | 32.6441 | 7.41432 | 25.2297 |
| 17 | 0.335018 | 12.3364 | UNIT I | 2.4 | 23.0433 | 10.011 | 12.7867 | 31.783 | 7.36463 | 24.4184 |
| 18 | 0.335018 | 12.09 | UNIT I | 2.4 | 23.0433 | 9.62396 | 12.2923 | 30.4735 | 7.21751 | 23.256 |
| 19 | 0.335018 | 11.6628 | UNIT I | 2.4 | 23.0433 | 9.11273 | 11.6393 | 28.6833 | 6.96251 | 21.7208 |
| 20 | 0.335018 | 11.0314 | UNIT I | 2.4 | 23.0433 | 8.46752 | 10.8152 | 26.369 | 6.58554 | 19.7834 |
| 21 | 0.335018 | 10.1629 | UNIT I | 2.4 | 23.0433 | 7.67502 | 9.80299 | 23.4709 | 6.06708 | 17.4039 |
| 22 | 0.335018 | 9.01027 | UNIT I | 2.4 | 23.0433 | 6.7169 | 8.57923 | 19.9058 | 5.37898 | 14.5268 |
| 23 | 0.335018 | 7.50111 | UNIT I | 2.4 | 23.0433 | 5.56733 | 7.11093 | 15.553 | 4.47803 | 11.075 |
| 24 | 0.335018 | 5.47292 | UNIT I | 2.4 | 23.0433 | 4.16653 | 5.32174 | 10.136 | 3.26724 | 6.86874 |
| 25 | 0.335018 | 2.05079 | UNIT I | 2.4 | 23.0433 | 2.14998 | 2.74609 | 2.03791 | 1.22429 | 0.813617 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.36457

| 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 | 0.244737 | 0.309975 | UNIT I | 2.4 | 23.0433 | 2.25334 | 3.07484 | 1.8398 | 0.253313 | 1.58649 |
| 2 | 0.244737 | 1.079 | UNIT I | 2.4 | 23.0433 | 3.05089 | 4.16315 | 5.02678 | 0.88176 | 4.14502 |
| 3 | 0.244737 | 1.83583 | UNIT I | 2.4 | 23.0433 | 3.81006 | 5.19909 | 8.08066 | 1.50025 | 6.58041 |
| 4 | 0.244737 | 2.53921 | UNIT I | 2.4 | 23.0433 | 4.48974 | 6.12656 | 10.8359 | 2.07506 | 8.76079 |
| 5 | 0.244737 | 3.19002 | UNIT I | 2.4 | 23.0433 | 5.09466 | 6.95202 | 13.3083 | 2.6069 | 10.7014 |
| 6 | 0.244737 | 3.78879 | UNIT I | 2.4 | 23.0433 | 5.62862 | 7.68064 | 15.5105 | 3.09621 | 12.4143 |
| 7 | 0.244737 | 4.30074 | UNIT I | 2.4 | 23.0433 | 6.05943 | 8.26851 | 17.3109 | 3.51459 | 13.7963 |
| 8 | 0.244737 | 4.71679 | UNIT I | 2.4 | 23.0433 | 6.38205 | 8.70875 | 18.6858 | 3.85458 | 14.8313 |
| 9 | 0.244737 | 5.08026 | UNIT I | 2.4 | 23.0433 | 6.6428 | 9.06456 | 19.8194 | 4.15162 | 15.6678 |
| 10 | 0.244737 | 5.39051 | UNIT I | 2.4 | 23.0433 | 6.84295 | 9.33768 | 20.715 | 4.40515 | 16.3098 |
| 11 | 0.244737 | 5.64636 | UNIT I | 2.4 | 23.0433 | 6.98314 | 9.52899 | 21.3738 | 4.61423 | 16.7596 |
| 12 | 0.244737 | 5.84623 | UNIT I | 2.4 | 23.0433 | 7.0636 | 9.63877 | 21.7952 | 4.77756 | 17.0177 |
| 13 | 0.244737 | 5.98808 | UNIT I | 2.4 | 23.0433 | 7.08406 | 9.66669 | 21.9768 | 4.89348 | 17.0833 |
| 14 | 0.244737 | 6.06931 | UNIT I | 2.4 | 23.0433 | 7.04382 | 9.61178 | 21.9141 | 4.95987 | 16.9542 |
| 15 | 0.244737 | 6.08669 | UNIT I | 2.4 | 23.0433 | 6.94169 | 9.47242 | 21.6007 | 4.97407 | 16.6266 |
| 16 | 0.244737 | 6.03616 | UNIT I | 2.4 | 23.0433 | 6.77594 | 9.24625 | 21.0277 | 4.93278 | 16.0949 |
| 17 | 0.244737 | 5.91265 | UNIT I | 2.4 | 23.0433 | 6.54422 | 8.93005 | 20.1834 | 4.83184 | 15.3516 |
| 18 | 0.244737 | 5.70975 | UNIT I | 2.4 | 23.0433 | 6.24344 | 8.51961 | 19.0527 | 4.66603 | 14.3866 |
| 19 | 0.244737 | 5.4193 | UNIT I | 2.4 | 23.0433 | 5.86964 | 8.00953 | 17.6161 | 4.42868 | 13.1875 |
| 20 | 0.244737 | 5.03067 | UNIT I | 2.4 | 23.0433 | 5.41771 | 7.39284 | 15.8488 | 4.11109 | 11.7377 |
| 21 | 0.244737 | 4.52971 | UNIT I | 2.4 | 23.0433 | 4.88113 | 6.66065 | 13.7181 | 3.7017 | 10.0164 |
| 22 | 0.244737 | 3.8969 | UNIT I | 2.4 | 23.0433 | 4.25146 | 5.80142 | 11.181 | 3.18457 | 7.99643 |
| 23 | 0.244737 | 3.10416 | UNIT I | 2.4 | 23.0433 | 3.51764 | 4.80006 | 8.17907 | 2.53673 | 5.64234 |
| 24 | 0.244737 | 2.10828 | UNIT I | 2.4 | 23.0433 | 2.66491 | 3.63646 | 4.62969 | 1.7229 | 2.90679 |
| 25 | 0.244737 | 0.822259 | UNIT I | 2.4 | 23.0433 | 1.6643 | 2.27105 | 0.368812 | 0.671954 | -0.303142 |

**Global Minimum Query (spencer) - Safety Factor**: 1.37857

| 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 | 0.318011 | 0.284378 | UNIT I | 2.4 | 23.0433 | 2.41351 | 3.32719 | 2.35859 | 0.178848 | 2.17974 |
| 2 | 0.318011 | 0.813475 | UNIT I | 2.4 | 23.0433 | 2.88852 | 3.98203 | 4.23081 | 0.511603 | 3.71921 |
| 3 | 0.318011 | 1.38053 | UNIT I | 2.4 | 23.0433 | 3.36705 | 4.64172 | 6.13832 | 0.868228 | 5.2701 |
| 4 | 0.318011 | 2.19959 | UNIT I | 2.4 | 23.0433 | 4.04672 | 5.57868 | 8.85613 | 1.38335 | 7.47278 |
| 5 | 0.318011 | 3.25157 | UNIT I | 2.4 | 23.0433 | 4.89018 | 6.74145 | 12.2513 | 2.04494 | 10.2064 |
| 6 | 0.318011 | 4.23798 | UNIT I | 2.4 | 23.0433 | 5.62215 | 7.75053 | 15.2439 | 2.66531 | 12.5786 |
| 7 | 0.318011 | 5.14855 | UNIT I | 2.4 | 23.0433 | 6.24314 | 8.60661 | 17.8292 | 3.23797 | 14.5912 |
| 8 | 0.318011 | 5.96258 | UNIT I | 2.4 | 23.0433 | 6.74191 | 9.29419 | 19.9575 | 3.74993 | 16.2076 |
| 9 | 0.318011 | 6.60028 | UNIT I | 2.4 | 23.0433 | 7.05325 | 9.7234 | 21.3676 | 4.15098 | 17.2166 |
| 10 | 0.318011 | 7.1471 | UNIT I | 2.4 | 23.0433 | 7.25759 | 10.0051 | 22.3738 | 4.49488 | 17.8789 |
| 11 | 0.318011 | 7.61497 | UNIT I | 2.4 | 23.0433 | 7.32841 | 10.1027 | 22.8975 | 4.78913 | 18.1084 |
| 12 | 0.318011 | 8.00208 | UNIT I | 2.4 | 23.0433 | 7.3453 | 10.126 | 23.1957 | 5.03259 | 18.1631 |
| 13 | 0.318011 | 8.30619 | UNIT I | 2.4 | 23.0433 | 7.25829 | 10.0061 | 23.105 | 5.22384 | 17.8812 |
| 14 | 0.318011 | 8.52446 | UNIT I | 2.4 | 23.0433 | 7.08969 | 9.77363 | 22.6958 | 5.36112 | 17.3347 |
| 15 | 0.318011 | 8.65347 | UNIT I | 2.4 | 23.0433 | 7.14782 | 9.85377 | 22.9654 | 5.44225 | 17.5231 |
| 16 | 0.318011 | 8.68903 | UNIT I | 2.4 | 23.0433 | 7.4847 | 10.3182 | 24.0795 | 5.46461 | 18.6149 |
| 17 | 0.318011 | 8.62608 | UNIT I | 2.4 | 23.0433 | 7.25827 | 10.006 | 23.3061 | 5.42502 | 17.8811 |
| 18 | 0.318011 | 8.45847 | UNIT I | 2.4 | 23.0433 | 6.8912 | 9.5 | 22.0111 | 5.31962 | 16.6914 |
| 19 | 0.318011 | 8.17872 | UNIT I | 2.4 | 23.0433 | 6.46784 | 8.91637 | 20.4631 | 5.14368 | 15.3194 |
| 20 | 0.318011 | 7.77762 | UNIT I | 2.4 | 23.0433 | 5.98898 | 8.25623 | 18.6589 | 4.89142 | 13.7675 |
| 21 | 0.318011 | 7.2437 | UNIT I | 2.4 | 23.0433 | 5.46014 | 7.52718 | 16.6092 | 4.55563 | 12.0535 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 0.318011 | 6.55179 | UNIT I | 2.4 | 23.0433 | 4.87309 | 6.71789 | 14.2714 | 4.12048 | 10.151 |
| 23 | 0.318011 | 5.14803 | UNIT I | 2.4 | 23.0433 | 4.00152 | 5.51637 | 10.5639 | 3.23765 | 7.32629 |
| 24 | 0.318011 | 3.24762 | UNIT I | 2.4 | 23.0433 | 2.98007 | 4.10824 | 6.05836 | 2.04246 | 4.0159 |
| 25 | 0.318011 | 1.12314 | UNIT I | 2.4 | 23.0433 | 1.95008 | 2.68832 | 1.38416 | 0.706352 | 0.677808 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.16334

| 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 | 0.0232002 | 0.00595592 | UNIT I | 2.4 | 23.0433 | 0 | 0 | -97.1808 | 0.0513438 | -97.2321 |
| 2 | 0.0232002 | 0.0172818 | UNIT I | 2.4 | 23.0433 | 6.64972 | 7.73588 | 12.6931 | 0.14898 | 12.5441 |
| 3 | 0.0232002 | 0.027515 | UNIT I | 2.4 | 23.0433 | 5.94596 | 6.91717 | 10.8567 | 0.237197 | 10.6195 |
| 4 | 0.0232002 | 0.0367893 | UNIT I | 2.4 | 23.0433 | 5.49431 | 6.39175 | 9.70136 | 0.317147 | 9.38421 |
| 5 | 0.0232002 | 0.0451999 | UNIT I | 2.4 | 23.0433 | 5.17285 | 6.01778 | 8.89474 | 0.389652 | 8.50509 |
| 6 | 0.0232002 | 0.052816 | UNIT I | 2.4 | 23.0433 | 4.9252 | 5.72968 | 8.28311 | 0.455307 | 7.8278 |
| 7 | 0.0232002 | 0.0596876 | UNIT I | 2.4 | 23.0433 | 4.7221 | 5.49341 | 7.78684 | 0.514545 | 7.2723 |
| 8 | 0.0232002 | 0.0658506 | UNIT I | 2.4 | 23.0433 | 4.54697 | 5.28967 | 7.361 | 0.567674 | 6.79332 |
| 9 | 0.0232002 | 0.0713291 | UNIT I | 2.4 | 23.0433 | 4.38972 | 5.10674 | 6.97818 | 0.614902 | 6.36328 |
| 10 | 0.0232002 | 0.0761372 | UNIT I | 2.4 | 23.0433 | 4.24388 | 4.93707 | 6.62079 | 0.656351 | 5.96444 |
| 11 | 0.0232002 | 0.0802805 | UNIT I | 2.4 | 23.0433 | 4.10501 | 4.77552 | 6.27669 | 0.692069 | 5.58462 |
| 12 | 0.0232002 | 0.0837558 | UNIT I | 2.4 | 23.0433 | 3.96997 | 4.61843 | 5.93735 | 0.722028 | 5.21533 |
| 13 | 0.0232002 | 0.0865512 | UNIT I | 2.4 | 23.0433 | 3.83641 | 4.46305 | 5.59615 | 0.746126 | 4.85003 |
| 14 | 0.0232002 | 0.0886454 | UNIT I | 2.4 | 23.0433 | 3.70244 | 4.3072 | 5.24782 | 0.764179 | 4.48364 |
| 15 | 0.0232002 | 0.0900059 | UNIT I | 2.4 | 23.0433 | 3.56649 | 4.14904 | 4.88771 | 0.775908 | 4.11181 |
| 16 | 0.0232002 | 0.0905869 | UNIT I | 2.4 | 23.0433 | 3.42711 | 3.98689 | 4.51154 | 0.780916 | 3.73062 |
| 17 | 0.0232002 | 0.0903248 | UNIT I | 2.4 | 23.0433 | 3.28291 | 3.81914 | 4.11491 | 0.778657 | 3.33626 |
| 18 | 0.0232002 | 0.0891323 | UNIT I | 2.4 | 23.0433 | 3.1324 | 3.64405 | 3.69301 | 0.768377 | 2.92464 |
| 19 | 0.0232002 | 0.0868875 | UNIT I | 2.4 | 23.0433 | 2.97385 | 3.4596 | 3.24006 | 0.749025 | 2.49103 |
| 20 | 0.0232002 | 0.0834153 | UNIT I | 2.4 | 23.0433 | 2.80608 | 3.26442 | 2.75127 | 0.719092 | 2.03218 |
| 21 | 0.0232002 | 0.0784526 | UNIT I | 2.4 | 23.0433 | 2.62453 | 3.05322 | 2.21196 | 0.676311 | 1.53565 |
| 22 | 0.0232002 | 0.0715737 | UNIT I | 2.4 | 23.0433 | 2.42478 | 2.82085 | 1.60638 | 0.61701 | 0.989374 |
| 23 | 0.0232002 | 0.0620012 | UNIT I | 2.4 | 23.0433 | 2.19954 | 2.55881 | 0.907839 | 0.53449 | 0.373349 |
| 24 | 0.0232002 | 0.0479492 | UNIT I | 2.4 | 23.0433 | 1.93185 | 2.2474 | 0.0546112 | 0.413353 | -0.358742 |
| 25 | 0.0232002 | 0.0197423 | UNIT I | 2.4 | 23.0433 | 4.38306 | 5.09899 | 6.51528 | 0.170191 | 6.34509 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.41678

| 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 | 0.277964 | 0.1873 | UNIT I | 2.4 | 23.0433 | 2.0563 | 2.91332 | 1.34154 | 0.134765 | 1.20677 |
| 2 | 0.277964 | 0.585965 | UNIT I | 2.4 | 23.0433 | 2.64285 | 3.74433 | 3.58199 | 0.421612 | 3.16038 |
| 3 | 0.277964 | 1.12739 | UNIT I | 2.4 | 23.0433 | 3.49676 | 4.95414 | 6.81573 | 0.811175 | 6.00456 |
| 4 | 0.277964 | 1.88526 | UNIT I | 2.4 | 23.0433 | 4.24549 | 6.01492 | 9.85483 | 1.35648 | 8.49835 |
| 5 | 0.277964 | 2.64203 | UNIT I | 2.4 | 23.0433 | 4.66724 | 6.61245 | 11.8041 | 1.90098 | 9.90309 |
| 6 | 0.277964 | 3.34157 | UNIT I | 2.4 | 23.0433 | 5.20869 | 7.37957 | 14.1108 | 2.40432 | 11.7065 |
| 7 | 0.277964 | 3.98374 | UNIT I | 2.4 | 23.0433 | 6.1046 | 8.64887 | 17.5569 | 2.86637 | 14.6905 |
| 8 | 0.277964 | 4.55031 | UNIT I | 2.4 | 23.0433 | 6.91297 | 9.79416 | 20.657 | 3.27402 | 17.383 |
| 9 | 0.277964 | 4.98279 | UNIT I | 2.4 | 23.0433 | 6.66555 | 9.44362 | 20.1441 | 3.5852 | 16.5589 |
| 10 | 0.277964 | 5.3473 | UNIT I | 2.4 | 23.0433 | 7.61432 | 10.7878 | 23.5664 | 3.84747 | 19.719 |
| 11 | 0.277964 | 5.65107 | UNIT I | 2.4 | 23.0433 | 7.53994 | 10.6824 | 23.5373 | 4.06604 | 19.4713 |
| 12 | 0.277964 | 5.89244 | UNIT I | 2.4 | 23.0433 | 6.06223 | 8.58884 | 18.7891 | 4.23971 | 14.5494 |
| 13 | 0.277964 | 6.0694 | UNIT I | 2.4 | 23.0433 | 6.14434 | 8.70518 | 19.1899 | 4.36703 | 14.8229 |
| 14 | 0.277964 | 6.17944 | UNIT I | 2.4 | 23.0433 | 5.62507 | 7.96949 | 17.5395 | 4.44621 | 13.0933 |
| 15 | 0.277964 | 6.21956 | UNIT I | 2.4 | 23.0433 | 3.83013 | 5.42645 | 11.59 | 4.47508 | 7.11491 |
| 16 | 0.277964 | 6.1861 | UNIT I | 2.4 | 23.0433 | 2.84624 | 4.03249 | 8.28881 | 4.451 | 3.83781 |
| 17 | 0.277964 | 6.07467 | UNIT I | 2.4 | 23.0433 | 3.95621 | 5.60508 | 11.9057 | 4.37082 | 7.53486 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 0.277964 | 5.87988 | UNIT I | 2.4 | 23.0433 | 5.35683 | 7.58945 | 16.4306 | 4.23068 | 12.1999 |
| 19 | 0.277964 | 5.5952 | UNIT I | 2.4 | 23.0433 | 5.46304 | 7.73993 | 16.5795 | 4.02584 | 12.5537 |
| 20 | 0.277964 | 5.2125 | UNIT I | 2.4 | 23.0433 | 5.10621 | 7.23437 | 15.1156 | 3.75048 | 11.3652 |
| 21 | 0.277964 | 4.7216 | UNIT I | 2.4 | 23.0433 | 4.68558 | 6.63844 | 13.3614 | 3.39727 | 9.96418 |
| 22 | 0.277964 | 4.10953 | UNIT I | 2.4 | 23.0433 | 4.16028 | 5.8942 | 11.1714 | 2.95687 | 8.21456 |
| 23 | 0.277964 | 3.3593 | UNIT I | 2.4 | 23.0433 | 3.55809 | 5.04103 | 8.62588 | 2.41707 | 6.20881 |
| 24 | 0.277964 | 2.44327 | UNIT I | 2.4 | 23.0433 | 2.86878 | 4.06443 | 5.67091 | 1.75797 | 3.91294 |
| 25 | 0.277964 | 0.934698 | UNIT I | 2.4 | 23.0433 | 1.81502 | 2.57148 | 1.07567 | 0.672531 | 0.40314 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.38089

| 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 | 0.277964 | 0.1873 | UNIT I | 2.4 | 23.0433 | 2.00614 | 2.77025 | 1.0052 | 0.134765 | 0.870433 |
| 2 | 0.277964 | 0.585965 | UNIT I | 2.4 | 23.0433 | 2.47997 | 3.42456 | 2.83027 | 0.421612 | 2.40865 |
| 3 | 0.277964 | 1.12739 | UNIT I | 2.4 | 23.0433 | 3.13423 | 4.32802 | 5.34378 | 0.811175 | 4.53261 |
| 4 | 0.277964 | 1.88526 | UNIT I | 2.4 | 23.0433 | 3.87203 | 5.34685 | 8.28427 | 1.35648 | 6.92779 |
| 5 | 0.277964 | 2.64203 | UNIT I | 2.4 | 23.0433 | 4.49658 | 6.20928 | 10.8563 | 1.90098 | 8.95527 |
| 6 | 0.277964 | 3.34157 | UNIT I | 2.4 | 23.0433 | 5.12092 | 7.07143 | 13.3864 | 2.40432 | 10.9821 |
| 7 | 0.277964 | 3.98374 | UNIT I | 2.4 | 23.0433 | 5.83912 | 8.06318 | 16.18 | 2.86637 | 13.3136 |
| 8 | 0.277964 | 4.55031 | UNIT I | 2.4 | 23.0433 | 6.46215 | 8.92352 | 18.6102 | 3.27402 | 15.3362 |
| 9 | 0.277964 | 4.98279 | UNIT I | 2.4 | 23.0433 | 6.58479 | 9.09287 | 19.3195 | 3.5852 | 15.7343 |
| 10 | 0.277964 | 5.3473 | UNIT I | 2.4 | 23.0433 | 7.09133 | 9.79234 | 21.2262 | 3.84747 | 17.3787 |
| 11 | 0.277964 | 5.65107 | UNIT I | 2.4 | 23.0433 | 7.10777 | 9.81505 | 21.4981 | 4.06604 | 17.4321 |
| 12 | 0.277964 | 5.89244 | UNIT I | 2.4 | 23.0433 | 6.56929 | 9.07146 | 19.9237 | 4.23971 | 15.684 |
| 13 | 0.277964 | 6.0694 | UNIT I | 2.4 | 23.0433 | 6.51263 | 8.99323 | 19.8671 | 4.36703 | 15.5001 |
| 14 | 0.277964 | 6.17944 | UNIT I | 2.4 | 23.0433 | 6.11881 | 8.4494 | 18.6678 | 4.44621 | 14.2216 |
| 15 | 0.277964 | 6.21956 | UNIT I | 2.4 | 23.0433 | 5.19015 | 7.16703 | 15.6819 | 4.47508 | 11.2069 |
| 16 | 0.277964 | 6.1861 | UNIT I | 2.4 | 23.0433 | 4.64421 | 6.41315 | 13.8855 | 4.451 | 9.43455 |
| 17 | 0.277964 | 6.07467 | UNIT I | 2.4 | 23.0433 | 5.23281 | 7.22593 | 15.7161 | 4.37082 | 11.3453 |
| 18 | 0.277964 | 5.87988 | UNIT I | 2.4 | 23.0433 | 5.74398 | 7.9318 | 17.2354 | 4.23068 | 13.0048 |
| 19 | 0.277964 | 5.5952 | UNIT I | 2.4 | 23.0433 | 5.51715 | 7.61858 | 16.2942 | 4.02584 | 12.2684 |
| 20 | 0.277964 | 5.2125 | UNIT I | 2.4 | 23.0433 | 5.0506 | 6.97432 | 14.5043 | 3.75048 | 10.7538 |
| 21 | 0.277964 | 4.7216 | UNIT I | 2.4 | 23.0433 | 4.52707 | 6.25138 | 12.4515 | 3.39727 | 9.05425 |
| 22 | 0.277964 | 4.10953 | UNIT I | 2.4 | 23.0433 | 3.94157 | 5.44288 | 10.1104 | 2.95687 | 7.15353 |
| 23 | 0.277964 | 3.3593 | UNIT I | 2.4 | 23.0433 | 3.32444 | 4.59068 | 7.56716 | 2.41707 | 5.15009 |
| 24 | 0.277964 | 2.44327 | UNIT I | 2.4 | 23.0433 | 2.6831 | 3.70507 | 4.82608 | 1.75797 | 3.06811 |
| 25 | 0.277964 | 0.934698 | UNIT I | 2.4 | 23.0433 | 1.8802 | 2.59634 | 1.13412 | 0.672531 | 0.461586 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.3746

| 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 | 0.318011 | 0.284378 | UNIT I | 2.4 | 23.0433 | 2.13597 | 2.93611 | 1.43918 | 0.178848 | 1.26034 |
| 2 | 0.318011 | 0.813475 | UNIT I | 2.4 | 23.0433 | 2.64558 | 3.63662 | 3.41877 | 0.511603 | 2.90717 |
| 3 | 0.318011 | 1.38053 | UNIT I | 2.4 | 23.0433 | 3.20016 | 4.39894 | 5.56756 | 0.868228 | 4.69933 |
| 4 | 0.318011 | 2.19959 | UNIT I | 2.4 | 23.0433 | 3.96987 | 5.45699 | 8.57004 | 1.38335 | 7.18669 |
| 5 | 0.318011 | 3.25157 | UNIT I | 2.4 | 23.0433 | 4.92062 | 6.76388 | 12.304 | 2.04494 | 10.2591 |
| 6 | 0.318011 | 4.23798 | UNIT I | 2.4 | 23.0433 | 5.77257 | 7.93498 | 15.6775 | 2.66531 | 13.0122 |
| 7 | 0.318011 | 5.14855 | UNIT I | 2.4 | 23.0433 | 6.49698 | 8.93075 | 18.5912 | 3.23797 | 15.3532 |
| 8 | 0.318011 | 5.96258 | UNIT I | 2.4 | 23.0433 | 7.06239 | 9.70796 | 20.9303 | 3.74993 | 17.1803 |
| 9 | 0.318011 | 6.60028 | UNIT I | 2.4 | 23.0433 | 7.39097 | 10.1596 | 22.3932 | 4.15098 | 18.2422 |
| 10 | 0.318011 | 7.1471 | UNIT I | 2.4 | 23.0433 | 7.55976 | 10.3916 | 23.2825 | 4.49488 | 18.7876 |
| 11 | 0.318011 | 7.61497 | UNIT I | 2.4 | 23.0433 | 7.54311 | 10.3688 | 23.523 | 4.78913 | 18.7338 |
| 12 | 0.318011 | 8.00208 | UNIT I | 2.4 | 23.0433 | 7.44672 | 10.2363 | 23.4549 | 5.03259 | 18.4223 |
| 13 | 0.318011 | 8.30619 | UNIT I | 2.4 | 23.0433 | 7.2357 | 9.94619 | 22.9642 | 5.22384 | 17.7404 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 0.318011 | 8.52446 | UNIT I | 2.4 | 23.0433 | 6.96032 | 9.56766 | 22.2116 | 5.36112 | 16.8505 |
| 15 | 0.318011 | 8.65347 | UNIT I | 2.4 | 23.0433 | 6.99085 | 9.60962 | 22.3914 | 5.44225 | 16.9492 |
| 16 | 0.318011 | 8.68903 | UNIT I | 2.4 | 23.0433 | 7.34054 | 10.0903 | 23.5438 | 5.46461 | 18.0792 |
| 17 | 0.318011 | 8.62608 | UNIT I | 2.4 | 23.0433 | 7.06729 | 9.71469 | 22.6212 | 5.42502 | 17.1962 |
| 18 | 0.318011 | 8.45847 | UNIT I | 2.4 | 23.0433 | 6.68247 | 9.18573 | 21.2722 | 5.31962 | 15.9526 |
| 19 | 0.318011 | 8.17872 | UNIT I | 2.4 | 23.0433 | 6.28585 | 8.64053 | 19.8146 | 5.14368 | 14.6709 |
| 20 | 0.318011 | 7.77762 | UNIT I | 2.4 | 23.0433 | 5.87872 | 8.08089 | 18.2467 | 4.89142 | 13.3552 |
| 21 | 0.318011 | 7.2437 | UNIT I | 2.4 | 23.0433 | 5.4602 | 7.50559 | 16.5584 | 4.55563 | 12.0028 |
| 22 | 0.318011 | 6.55179 | UNIT I | 2.4 | 23.0433 | 5.01086 | 6.88793 | 14.6712 | 4.12048 | 10.5507 |
| 23 | 0.318011 | 5.14803 | UNIT I | 2.4 | 23.0433 | 4.22095 | 5.80212 | 11.2357 | 3.23765 | 7.99806 |
| 24 | 0.318011 | 3.24762 | UNIT I | 2.4 | 23.0433 | 3.1635 | 4.34855 | 6.62332 | 2.04246 | 4.58086 |
| 25 | 0.318011 | 1.12314 | UNIT I | 2.4 | 23.0433 | 1.93731 | 2.66303 | 1.3247 | 0.706352 | 0.618352 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -7.22118 | 1.56282 |
| 15.7129 | 5.65286 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

### External Boundary

| X | Y |
|---|---|
| 3.55263 | 5.94674 |
| 2.46637 | 5.95601 |
| 2.37408 | 5.97731 |
| 2.19776 | 5.96607 |
| 1.33058 | 5.75328 |
| 0.562161 | 5.61447 |
| -0.0303637 | 5.49417 |
| -0.539558 | 5.31833 |
| -1.58574 | 5.19803 |
| -2.70597 | 5.15175 |
| -3.32627 | 4.98518 |
| -5.4581 | 4.92122 |
| -5.8548 | 4.89919 |
| -6.3176 | 4.84044 |
| -7.22118 | 4.87717 |
| -7.22118 | 1.56282 |
| -7.22118 | -0.557959 |
| -7.22118 | -3.44395 |
| -7.22118 | -5.39909 |
| -4.18484 | -5.39909 |
| 49.9902 | -5.39909 |
| 49.9902 | 9.76285 |
| 49.9902 | 15.7927 |
| 49.9902 | 17.787 |
| 49.9902 | 19.9918 |
| 49.9902 | 23.8629 |
| 48.6865 | 23.1062 |
| 47.8664 | 22.7068 |

| | |
|---|---|
| 47.0674 | 22.2234 |
| 46.6258 | 21.7399 |
| 45.7847 | 21.3196 |
| 45.3851 | 20.8782 |
| 43.6609 | 17.8094 |
| 42.9761 | 16.0499 |
| 42.5174 | 15.4341 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 29.9354 | 14.2695 |
| 29.5681 | 14.2768 |
| 29.2838 | 14.2825 |
| 28.8436 | 14.2914 |
| 28.769 | 14.2914 |
| 28.0829 | 14.3066 |
| 27.4875 | 14.3186 |
| 27.4445 | 14.3168 |
| 27.2003 | 14.1883 |
| 26.5834 | 13.5717 |
| 25.7224 | 12.801 |
| 24.9899 | 12.3128 |
| 23.6437 | 11.6418 |
| 23.2984 | 11.5524 |
| 22.5311 | 11.4757 |
| 22.0195 | 11.2967 |
| 21.1116 | 11.2584 |
| 20.3826 | 11.1561 |
| 20.1707 | 11.093 |
| 19.7816 | 10.9771 |
| 18.907 | 10.8084 |
| 18.407 | 10.712 |
| 17.3761 | 10.5131 |
| 16.6293 | 10.2749 |
| 15.7792 | 10.2113 |
| 14.3889 | 10.0446 |
| 12.6085 | 9.87112 |
| 12.514 | 9.86192 |
| 12.2636 | 9.80476 |
| 11.6804 | 9.67161 |
| 11.5419 | 9.63999 |
| 11.1768 | 9.55661 |
| 9.645 | 9.226 |
| 9.40071 | 9.05704 |
| 8.67713 | 8.5566 |
| 7.9753 | 8.0712 |
| 7.25267 | 7.57141 |
| 6.52923 | 7.07106 |
| 6.279 | 6.898 |
| 6.15839 | 6.694 |
| 6.054 | 6.601 |
| 5.88 | 6.601 |
| 5.76991 | 6.664 |

## Material Boundary

| X | Y |
|---|---|
| 8.772 | 6.09843 |
| 31.5166 | 11.426 |

### Material Boundary

| X | Y |
|---|---|
| -7.22118 | -3.44395 |
| 14.9068 | 2.35905 |
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |
| 49.9902 | 15.7927 |

### Material Boundary

| X | Y |
|---|---|
| -4.18484 | -5.39909 |
| 49.9902 | 9.76285 |

### Material Boundary

| X | Y |
|---|---|
| -7.22118 | -0.557959 |
| 15.7129 | 5.65286 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| 3.55263 | 5.94674 |
| 5.76991 | 6.09843 |
| 5.76991 | 6.49459 |
| 5.76991 | 6.664 |

### Material Boundary

| X | Y |
|---|---|
| 5.76991 | 6.09843 |
| 6.27057 | 6.09843 |

### Material Boundary

| X | Y |
|---|---|
| 9.30584 | 8.08442 |
| 10.7916 | 8.08442 |

### Material Boundary

| X | Y |
|---|---|
| 9.80532 | 8.5566 |
| 10.1973 | 8.5566 |
| 10.3078 | 8.5566 |

### Material Boundary

| X | Y |
|---|---|

| | |
|---|---|
| 10.3078 | 8.5566 |
| 10.3078 | 8.6975 |
| 10.3078 | 8.91614 |
| 10.3078 | 9.05704 |

### Material Boundary

| X | Y |
|---|---|
| 10.3078 | 9.05704 |
| 10.4184 | 9.05704 |
| 10.7916 | 9.05704 |
| 10.7916 | 8.08442 |

### Material Boundary

| X | Y |
|---|---|
| 9.30584 | 8.08442 |
| 9.30584 | 8.5566 |
| 9.80532 | 8.5566 |

### Material Boundary

| X | Y |
|---|---|
| 7.27258 | 7.07106 |
| 7.77235 | 7.07106 |

### Material Boundary

| X | Y |
|---|---|
| 7.77235 | 7.07106 |
| 7.77235 | 7.57141 |

### Material Boundary

| X | Y |
|---|---|
| 7.77235 | 7.57141 |
| 8.272 | 7.57141 |

### Material Boundary

| X | Y |
|---|---|
| 8.272 | 7.57141 |
| 8.272 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 8.272 | 8.0712 |
| 8.661 | 8.0712 |
| 8.772 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 6.27057 | 6.09843 |
| 8.772 | 6.09843 |

| | |
|---|---|
| 8.772 | 7.93029 |
| 8.772 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 8.772 | 6.09843 |
| 10.7916 | 8.08442 |
| 11.0694 | 8.35766 |
| 11.7807 | 9.05704 |
| 12.6085 | 9.87112 |

### Material Boundary

| X | Y |
|---|---|
| 6.27057 | 6.09843 |
| 6.27057 | 6.57061 |
| 6.77005 | 6.57061 |
| 6.77005 | 7.07106 |
| 7.27258 | 7.07106 |

### Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 19.9918 |

### Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

### Material Boundary

| X | Y |
|---|---|
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| -7.22118 | 1.56282 |
| 15.7129 | 5.65286 |

### Material Boundary

| X | Y |
|---|---|
| 8.772 | 8.0712 |
| 9.30584 | 8.08442 |

### Material Boundary

| X | Y |
|---|---|
| 10.7916 | 9.05704 |
| 11.7807 | 9.05704 |

### Material Boundary

| X | Y |
|---|---|
| 7.25267 | 7.57141 |
| 7.77235 | 7.57141 |

### Material Boundary

| X | Y |
|---|---|
| 7.9753 | 8.0712 |
| 8.272 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 8.67713 | 8.5566 |
| 9.30584 | 8.5566 |

### Material Boundary

| X | Y |
|---|---|
| 9.40071 | 9.05704 |
| 10.3078 | 9.05704 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 25.8179 | 12.8466 |
| 28.0829 | 14.3066 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 28.8436 | 14.2914 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 29.2838 | 14.2825 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 29.5681 | 14.2768 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S51 + GABIONS EQdn Dmin=0.5fullroad lim + GEOTEX+MPILE=0.75 oop
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 15/5/2021, 19:37:13

## 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

## Design Standard

Selected Type: Eurocode 7 - Design Approach 3

| Type | Partial Factor |
|---|---|
| Permanent Actions: Unfavourable | 1 |
| Permanent Actions: Favourable | 1 |
| Variable Actions: Unfavourable | 1.3 |
| Variable Actions: Favourable | 0 |
| Effective cohesion | 1.25 |
| Coefficient of shearing resistance | 1.25 |
| Undrained strength | 1.4 |
| Weight density | 1 |
| Shear strength (other models) | 1.25 |
| Earth resistance | 1 |
| Tensile and plate strength | 1 |
| Shear strength | 1 |
| Compressive strength | 1 |
| Bond strength | 1 |
| Seismic Coefficient | 1 |

## Analysis Options

### Analysis Methods Used

Bishop simplified
Corps of Engineers #1
Corps of Engineers #2
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified
Janbu corrected
Lowe-Karafiath
Ordinary/Fellenius

Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: 0.1

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): 0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT | GABION | AIR | GRAVEL |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | No strength | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 | 18 | 1e-005 | 19 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 | 20 | | 0 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 | 32 | | 36 |
| Water Surface | None | None | Water Table | Water Table | Water Table | Water Table | None | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | | Automatically Calculated |
| Ru Value | 0 | 0 | | | | | 0 | |

| Property | SW |
|---|---|
| Color | |
| Strength Type | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 |
| Cohesion [kPa] | 1 |
| Friction Angle [deg] | 35 |
| Water Surface | Water Table |
| Hu Value | Automatically Calculated |

## *Support Properties*

### GEOTEX

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Parallel to Reinforcement
Anchorage: Embedded End
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 40 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 30 degrees

### MICROPILE

Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 0.75 m
Pile Shear Strength: 90 kN
Force Direction: Parallel to Surface

## *Global Minimums*

### Method: ordinary/fellenius

FS: 1.006860
Center: 24.332, 19.367
Radius: 8.065
Left Slip Surface Endpoint: 22.622, 11.485
Right Slip Surface Endpoint: 30.572, 14.257
Resisting Moment=630.279 kN-m
Driving Moment=625.987 kN-m

### Method: bishop simplified

FS: 1.066110
Center: 24.332, 19.367
Radius: 8.065
Left Slip Surface Endpoint: 22.622, 11.485
Right Slip Surface Endpoint: 30.572, 14.257
Resisting Moment=667.37 kN-m
Driving Moment=625.987 kN-m

### Method: janbu simplified

FS: 0.993791
Center: 25.194, 17.135
Radius: 6.145
Left Slip Surface Endpoint: 22.749, 11.497
Right Slip Surface Endpoint: 30.622, 14.256
Resisting Horizontal Force=97.1127 kN

Driving Horizontal Force=97.7194 kN

### Method: janbu corrected

FS: 1.049990
Center: 24.332, 19.367
Radius: 8.065
Left Slip Surface Endpoint: 22.622, 11.485
Right Slip Surface Endpoint: 30.572, 14.257
Resisting Horizontal Force=78.9665 kN
Driving Horizontal Force=75.207 kN

### Method: spencer

FS: 1.073740
Center: 24.457, 21.064
Radius: 9.532
Left Slip Surface Endpoint: 23.433, 11.587
Right Slip Surface Endpoint: 31.118, 14.246
Resisting Moment=752.329 kN-m
Driving Moment=700.666 kN-m
Resisting Horizontal Force=73.4877 kN
Driving Horizontal Force=68.4411 kN

### Method: corp of eng#1

FS: 0.759791
Center: 27.380, 13.470
Radius: 0.277
Left Slip Surface Endpoint: 27.200, 13.261
Right Slip Surface Endpoint: 27.657, 13.457
Left Slope Intercept: 27.200 14.188
Right Slope Intercept: 27.657 14.315
Resisting Horizontal Force=2.27681 kN
Driving Horizontal Force=2.99663 kN

### Method: corp of eng#2

FS: 0.790438
Center: 26.754, 13.574
Radius: 0.626
Left Slip Surface Endpoint: 26.550, 12.982
Right Slip Surface Endpoint: 27.324, 13.314
Left Slope Intercept: 26.550 13.542
Right Slope Intercept: 27.324 14.254
Resisting Horizontal Force=2.58971 kN
Driving Horizontal Force=3.2763 kN

### Method: lowe-karafiath

FS: 0.846632
Center: 26.754, 13.574
Radius: 0.626
Left Slip Surface Endpoint: 26.550, 12.982
Right Slip Surface Endpoint: 27.324, 13.314
Left Slope Intercept: 26.550 13.542
Right Slope Intercept: 27.324 14.254
Resisting Horizontal Force=1.99119 kN
Driving Horizontal Force=2.3519 kN

### Method: gle/morgenstern-price

FS: 1.071460
Center: 24.332, 19.367
Radius: 8.065
Left Slip Surface Endpoint: 22.622, 11.485

Right Slip Surface Endpoint: 30.572, 14.257
Resisting Moment=670.719 kN-m
Driving Moment=625.987 kN-m
Resisting Horizontal Force=76.2305 kN
Driving Horizontal Force=71.1465 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 9599
Number of Invalid Surfaces: 401

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 13 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 9594
Number of Invalid Surfaces: 406

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 13 surfaces
Error Code -112 reported for 5 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 9462
Number of Invalid Surfaces: 538

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 147 surfaces
Error Code -112 reported for 3 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 9462
Number of Invalid Surfaces: 538

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 147 surfaces
Error Code -112 reported for 3 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

### Method: spencer

Number of Valid Surfaces: 9037
Number of Invalid Surfaces: 963

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 192 surfaces
Error Code -111 reported for 370 surfaces
Error Code -112 reported for 13 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 8907
Number of Invalid Surfaces: 1093

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 460 surfaces
Error Code -111 reported for 245 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 8538
Number of Invalid Surfaces: 1462

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 782 surfaces
Error Code -111 reported for 292 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 6135
Number of Invalid Surfaces: 3865

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 2509 surfaces
Error Code -111 reported for 968 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 9114
Number of Invalid Surfaces: 886

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 217 surfaces

Error Code -111 reported for 275 surfaces
Error Code -112 reported for 6 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

### Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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).
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-115 = Surface too shallow, below the minimum depth.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.00686

| 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 | 0.318011 | 0.284378 | UNIT I | 2.4 | 23.0433 | 2.7981 | 2.8173 | 0.981025 | 0 | 0.981025 |
| 2 | 0.318011 | 0.813475 | UNIT I | 2.4 | 23.0433 | 3.57726 | 3.6018 | 2.82532 | 0 | 2.82532 |
| 3 | 0.318011 | 1.38053 | UNIT I | 2.4 | 23.0433 | 4.41642 | 4.44672 | 4.81165 | 0 | 4.81165 |
| 4 | 0.318011 | 2.19959 | UNIT I | 2.4 | 23.0433 | 5.6235 | 5.66208 | 7.66884 | 0 | 7.66884 |
| 5 | 0.318011 | 3.25157 | UNIT I | 2.4 | 23.0433 | 7.15945 | 7.20856 | 11.3045 | 0 | 11.3045 |
| 6 | 0.318011 | 4.23798 | UNIT I | 2.4 | 23.0433 | 8.57115 | 8.62995 | 14.646 | 0 | 14.646 |
| 7 | 0.318011 | 5.14855 | UNIT I | 2.4 | 23.0433 | 9.83215 | 9.8996 | 17.6309 | 0 | 17.6309 |
| 8 | 0.318011 | 5.96258 | UNIT I | 2.4 | 23.0433 | 10.9038 | 10.9786 | 20.1675 | 0 | 20.1675 |
| 9 | 0.318011 | 6.60028 | UNIT I | 2.4 | 23.0433 | 11.6683 | 11.7484 | 21.9771 | 0 | 21.9771 |
| 10 | 0.318011 | 7.1471 | UNIT I | 2.4 | 23.0433 | 12.2473 | 12.3313 | 23.3476 | 0 | 23.3476 |
| 11 | 0.318011 | 7.61497 | UNIT I | 2.4 | 23.0433 | 12.6573 | 12.7441 | 24.318 | 0 | 24.318 |
| 12 | 0.318011 | 8.00208 | UNIT I | 2.4 | 23.0433 | 12.8975 | 12.986 | 24.8867 | 0 | 24.8867 |
| 13 | 0.318011 | 8.30619 | UNIT I | 2.4 | 23.0433 | 12.9691 | 13.0581 | 25.0563 | 0 | 25.0563 |
| 14 | 0.318011 | 8.52446 | UNIT I | 2.4 | 23.0433 | 12.8753 | 12.9636 | 24.834 | 0 | 24.834 |
| 15 | 0.318011 | 8.65347 | UNIT I | 2.4 | 23.0433 | 12.6207 | 12.7073 | 24.2316 | 0 | 24.2316 |
| 16 | 0.318011 | 8.68903 | UNIT I | 2.4 | 23.0433 | 12.2127 | 12.2964 | 23.2656 | 0 | 23.2656 |
| 17 | 0.318011 | 8.62608 | UNIT I | 2.4 | 23.0433 | 11.6603 | 11.7403 | 21.9581 | 0 | 21.9581 |
| 18 | 0.318011 | 8.45847 | UNIT I | 2.4 | 23.0433 | 10.9753 | 11.0506 | 20.3367 | 0 | 20.3367 |
| 19 | 0.318011 | 8.17872 | UNIT I | 2.4 | 23.0433 | 10.1719 | 10.2417 | 18.4351 | 0 | 18.4351 |
| 20 | 0.318011 | 7.77762 | UNIT I | 2.4 | 23.0433 | 9.26736 | 9.33093 | 16.294 | 0 | 16.294 |
| 21 | 0.318011 | 7.2437 | UNIT I | 2.4 | 23.0433 | 8.28203 | 8.33884 | 13.9617 | 0 | 13.9617 |
| 22 | 0.318011 | 6.55179 | UNIT I | 2.4 | 23.0433 | 7.23213 | 7.28174 | 11.4765 | 0 | 11.4765 |
| 23 | 0.318011 | 5.14803 | UNIT I | 2.4 | 23.0433 | 5.79403 | 5.83378 | 8.07252 | 0 | 8.07252 |
| 24 | 0.318011 | 3.24762 | UNIT I | 2.4 | 23.0433 | 4.2731 | 4.30241 | 4.47238 | 0 | 4.47238 |
| 25 | 0.318011 | 1.12314 | UNIT I | 2.4 | 23.0433 | 2.94326 | 2.96345 | 1.32463 | 0 | 1.32463 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.06611

| 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 | 0.318011 | 0.284378 | UNIT I | 2.4 | 23.0433 | 2.86797 | 3.05757 | 1.54588 | 0 | 1.54588 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.318011 | 0.813475 | UNIT I | 2.4 | 23.0433 | 3.5959 | 3.83362 | 3.3703 | 0 | 3.3703 |
| 3 | 0.318011 | 1.38053 | UNIT I | 2.4 | 23.0433 | 4.35495 | 4.64286 | 5.27276 | 0 | 5.27276 |
| 4 | 0.318011 | 2.19959 | UNIT I | 2.4 | 23.0433 | 5.44829 | 5.80848 | 8.01304 | 0 | 8.01304 |
| 5 | 0.318011 | 3.25157 | UNIT I | 2.4 | 23.0433 | 6.83316 | 7.2849 | 11.484 | 0 | 11.484 |
| 6 | 0.318011 | 4.23798 | UNIT I | 2.4 | 23.0433 | 8.08454 | 8.61901 | 14.6203 | 0 | 14.6203 |
| 7 | 0.318011 | 5.14855 | UNIT I | 2.4 | 23.0433 | 9.19428 | 9.80211 | 17.4017 | 0 | 17.4017 |
| 8 | 0.318011 | 5.96258 | UNIT I | 2.4 | 23.0433 | 10.1404 | 10.8108 | 19.7731 | 0 | 19.7731 |
| 9 | 0.318011 | 6.60028 | UNIT I | 2.4 | 23.0433 | 10.8245 | 11.5401 | 21.4875 | 0 | 21.4875 |
| 10 | 0.318011 | 7.1471 | UNIT I | 2.4 | 23.0433 | 11.3677 | 12.1193 | 22.8491 | 0 | 22.8491 |
| 11 | 0.318011 | 7.61497 | UNIT I | 2.4 | 23.0433 | 11.7904 | 12.5699 | 23.9085 | 0 | 23.9085 |
| 12 | 0.318011 | 8.00208 | UNIT I | 2.4 | 23.0433 | 12.0944 | 12.894 | 24.6703 | 0 | 24.6703 |
| 13 | 0.318011 | 8.30619 | UNIT I | 2.4 | 23.0433 | 12.2807 | 13.0926 | 25.1373 | 0 | 25.1373 |
| 14 | 0.318011 | 8.52446 | UNIT I | 2.4 | 23.0433 | 12.3499 | 13.1663 | 25.3105 | 0 | 25.3105 |
| 15 | 0.318011 | 8.65347 | UNIT I | 2.4 | 23.0433 | 12.3015 | 13.1148 | 25.1895 | 0 | 25.1895 |
| 16 | 0.318011 | 8.68903 | UNIT I | 2.4 | 23.0433 | 12.135 | 12.9372 | 24.7721 | 0 | 24.7721 |
| 17 | 0.318011 | 8.62608 | UNIT I | 2.4 | 23.0433 | 11.8487 | 12.632 | 24.0545 | 0 | 24.0545 |
| 18 | 0.318011 | 8.45847 | UNIT I | 2.4 | 23.0433 | 11.4403 | 12.1966 | 23.031 | 0 | 23.031 |
| 19 | 0.318011 | 8.17872 | UNIT I | 2.4 | 23.0433 | 10.9068 | 11.6278 | 21.6938 | 0 | 21.6938 |
| 20 | 0.318011 | 7.77762 | UNIT I | 2.4 | 23.0433 | 10.2441 | 10.9214 | 20.033 | 0 | 20.033 |
| 21 | 0.318011 | 7.2437 | UNIT I | 2.4 | 23.0433 | 9.44743 | 10.072 | 18.0362 | 0 | 18.0362 |
| 22 | 0.318011 | 6.55179 | UNIT I | 2.4 | 23.0433 | 8.49939 | 9.06128 | 15.6601 | 0 | 15.6601 |
| 23 | 0.318011 | 5.14803 | UNIT I | 2.4 | 23.0433 | 6.85243 | 7.30544 | 11.5322 | 0 | 11.5322 |
| 24 | 0.318011 | 3.24762 | UNIT I | 2.4 | 23.0433 | 4.78271 | 5.09889 | 6.34485 | 0 | 6.34485 |
| 25 | 0.318011 | 1.12314 | UNIT I | 2.4 | 23.0433 | 2.60642 | 2.77873 | 0.89036 | 0 | 0.89036 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.993791

| 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 | 0.314904 | 0.472075 | UNIT I | 2.4 | 23.0433 | 3.7683 | 3.7449 | 3.16175 | 0 | 3.16175 |
| 2 | 0.314904 | 1.36755 | UNIT I | 2.4 | 23.0433 | 5.2172 | 5.18481 | 6.54683 | 0 | 6.54683 |
| 3 | 0.314904 | 2.36208 | UNIT I | 2.4 | 23.0433 | 6.75755 | 6.71559 | 10.1455 | 0 | 10.1455 |
| 4 | 0.314904 | 3.61716 | UNIT I | 2.4 | 23.0433 | 8.65307 | 8.59934 | 14.5741 | 0 | 14.5741 |
| 5 | 0.314904 | 4.92701 | UNIT I | 2.4 | 23.0433 | 10.548 | 10.4825 | 19.0011 | 0 | 19.0011 |
| 6 | 0.314904 | 6.13592 | UNIT I | 2.4 | 23.0433 | 12.1992 | 12.1234 | 22.8589 | 0 | 22.8589 |
| 7 | 0.314904 | 7.24611 | UNIT I | 2.4 | 23.0433 | 13.6274 | 13.5428 | 26.1958 | 0 | 26.1958 |
| 8 | 0.314904 | 8.20767 | UNIT I | 2.4 | 23.0433 | 14.7717 | 14.68 | 28.8691 | 0 | 28.8691 |
| 9 | 0.314904 | 8.9938 | UNIT I | 2.4 | 23.0433 | 15.609 | 15.5121 | 30.8253 | 0 | 30.8253 |
| 10 | 0.314904 | 9.68215 | UNIT I | 2.4 | 23.0433 | 16.268 | 16.167 | 32.3648 | 0 | 32.3648 |
| 11 | 0.314904 | 10.2726 | UNIT I | 2.4 | 23.0433 | 16.7566 | 16.6526 | 33.5065 | 0 | 33.5065 |
| 12 | 0.314904 | 10.7634 | UNIT I | 2.4 | 23.0433 | 17.0795 | 16.9735 | 34.2609 | 0 | 34.2609 |
| 13 | 0.314904 | 11.1518 | UNIT I | 2.4 | 23.0433 | 17.2397 | 17.1327 | 34.6353 | 0 | 34.6353 |
| 14 | 0.314904 | 11.4343 | UNIT I | 2.4 | 23.0433 | 17.2384 | 17.1314 | 34.632 | 0 | 34.632 |
| 15 | 0.314904 | 11.6058 | UNIT I | 2.4 | 23.0433 | 17.0753 | 16.9693 | 34.2511 | 0 | 34.2511 |
| 16 | 0.314904 | 11.6602 | UNIT I | 2.4 | 23.0433 | 16.7485 | 16.6445 | 33.4875 | 0 | 33.4875 |
| 17 | 0.314904 | 11.5893 | UNIT I | 2.4 | 23.0433 | 16.2541 | 16.1532 | 32.3327 | 0 | 32.3327 |
| 18 | 0.314904 | 11.3827 | UNIT I | 2.4 | 23.0433 | 15.5868 | 15.49 | 30.7735 | 0 | 30.7735 |
| 19 | 0.314904 | 11.0268 | UNIT I | 2.4 | 23.0433 | 14.7383 | 14.6468 | 28.7912 | 0 | 28.7912 |
| 20 | 0.314904 | 10.5038 | UNIT I | 2.4 | 23.0433 | 13.698 | 13.6129 | 26.3607 | 0 | 26.3607 |
| 21 | 0.314904 | 9.78948 | UNIT I | 2.4 | 23.0433 | 12.4513 | 12.374 | 23.4479 | 0 | 23.4479 |
| 22 | 0.314904 | 8.79903 | UNIT I | 2.4 | 23.0433 | 10.9255 | 10.8576 | 19.8831 | 0 | 19.8831 |
| 23 | 0.314904 | 6.91887 | UNIT I | 2.4 | 23.0433 | 8.53778 | 8.48477 | 14.3047 | 0 | 14.3047 |
| 24 | 0.314904 | 4.50474 | UNIT I | 2.4 | 23.0433 | 5.76958 | 5.73376 | 7.83737 | 0 | 7.83737 |
| 25 | 0.314904 | 1.59856 | UNIT I | 2.4 | 23.0433 | 2.79654 | 2.77917 | 0.891399 | 0 | 0.891399 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.04999

| 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 | 0.318011 | 0.284378 | UNIT I | 2.4 | 23.0433 | 2.93018 | 3.07666 | 1.59077 | 0 | 1.59077 |
| 2 | 0.318011 | 0.813475 | UNIT I | 2.4 | 23.0433 | 3.66876 | 3.85216 | 3.4139 | 0 | 3.4139 |
| 3 | 0.318011 | 1.38053 | UNIT I | 2.4 | 23.0433 | 4.43731 | 4.65913 | 5.31103 | 0 | 5.31103 |
| 4 | 0.318011 | 2.19959 | UNIT I | 2.4 | 23.0433 | 5.54433 | 5.82149 | 8.04361 | 0 | 8.04361 |
| 5 | 0.318011 | 3.25157 | UNIT I | 2.4 | 23.0433 | 6.94518 | 7.29237 | 11.5015 | 0 | 11.5015 |
| 6 | 0.318011 | 4.23798 | UNIT I | 2.4 | 23.0433 | 8.20751 | 8.6178 | 14.6175 | 0 | 14.6175 |
| 7 | 0.318011 | 5.14855 | UNIT I | 2.4 | 23.0433 | 9.32358 | 9.78967 | 17.3725 | 0 | 17.3725 |
| 8 | 0.318011 | 5.96258 | UNIT I | 2.4 | 23.0433 | 10.2718 | 10.7853 | 19.7129 | 0 | 19.7129 |
| 9 | 0.318011 | 6.60028 | UNIT I | 2.4 | 23.0433 | 10.9529 | 11.5004 | 21.3942 | 0 | 21.3942 |
| 10 | 0.318011 | 7.1471 | UNIT I | 2.4 | 23.0433 | 11.4904 | 12.0648 | 22.7211 | 0 | 22.7211 |
| 11 | 0.318011 | 7.61497 | UNIT I | 2.4 | 23.0433 | 11.9053 | 12.5004 | 23.7451 | 0 | 23.7451 |
| 12 | 0.318011 | 8.00208 | UNIT I | 2.4 | 23.0433 | 12.1995 | 12.8094 | 24.4714 | 0 | 24.4714 |
| 13 | 0.318011 | 8.30619 | UNIT I | 2.4 | 23.0433 | 12.3746 | 12.9932 | 24.9037 | 0 | 24.9037 |
| 14 | 0.318011 | 8.52446 | UNIT I | 2.4 | 23.0433 | 12.4314 | 13.0528 | 25.0437 | 0 | 25.0437 |
| 15 | 0.318011 | 8.65347 | UNIT I | 2.4 | 23.0433 | 12.3697 | 12.9881 | 24.8917 | 0 | 24.8917 |
| 16 | 0.318011 | 8.68903 | UNIT I | 2.4 | 23.0433 | 12.1894 | 12.7987 | 24.4464 | 0 | 24.4464 |
| 17 | 0.318011 | 8.62608 | UNIT I | 2.4 | 23.0433 | 11.8889 | 12.4832 | 23.7046 | 0 | 23.7046 |
| 18 | 0.318011 | 8.45847 | UNIT I | 2.4 | 23.0433 | 11.4663 | 12.0395 | 22.6616 | 0 | 22.6616 |
| 19 | 0.318011 | 8.17872 | UNIT I | 2.4 | 23.0433 | 10.919 | 11.4648 | 21.3105 | 0 | 21.3105 |
| 20 | 0.318011 | 7.77762 | UNIT I | 2.4 | 23.0433 | 10.2433 | 10.7553 | 19.6426 | 0 | 19.6426 |
| 21 | 0.318011 | 7.2437 | UNIT I | 2.4 | 23.0433 | 9.43466 | 9.9063 | 17.6466 | 0 | 17.6466 |
| 22 | 0.318011 | 6.55179 | UNIT I | 2.4 | 23.0433 | 8.47648 | 8.90022 | 15.2814 | 0 | 15.2814 |
| 23 | 0.318011 | 5.14803 | UNIT I | 2.4 | 23.0433 | 6.82406 | 7.1652 | 11.2025 | 0 | 11.2025 |
| 24 | 0.318011 | 3.24762 | UNIT I | 2.4 | 23.0433 | 4.75537 | 4.99309 | 6.0961 | 0 | 6.0961 |
| 25 | 0.318011 | 1.12314 | UNIT I | 2.4 | 23.0433 | 2.58696 | 2.71628 | 0.743544 | 0 | 0.743544 |

**Global Minimum Query (spencer) - Safety Factor**: 1.07374

| 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 | 0.307389 | 0.336306 | UNIT I | 2.4 | 23.0433 | 3.70905 | 3.98255 | 3.72045 | 0 | 3.72045 |
| 2 | 0.307389 | 1.26589 | UNIT I | 2.4 | 23.0433 | 5.26558 | 5.65386 | 7.64953 | 0 | 7.64953 |
| 3 | 0.307389 | 2.23787 | UNIT I | 2.4 | 23.0433 | 6.76833 | 7.26743 | 11.4429 | 0 | 11.4429 |
| 4 | 0.307389 | 3.15186 | UNIT I | 2.4 | 23.0433 | 8.05671 | 8.65081 | 14.6951 | 0 | 14.6951 |
| 5 | 0.307389 | 4.00791 | UNIT I | 2.4 | 23.0433 | 9.15261 | 9.82752 | 17.4614 | 0 | 17.4614 |
| 6 | 0.307389 | 4.7513 | UNIT I | 2.4 | 23.0433 | 9.9713 | 10.7066 | 19.528 | 0 | 19.528 |
| 7 | 0.307389 | 5.36651 | UNIT I | 2.4 | 23.0433 | 10.5119 | 11.2871 | 20.8928 | 0 | 20.8928 |
| 8 | 0.307389 | 5.92261 | UNIT I | 2.4 | 23.0433 | 10.8484 | 11.6483 | 21.742 | 0 | 21.742 |
| 9 | 0.307389 | 6.41917 | UNIT I | 2.4 | 23.0433 | 10.9908 | 11.8013 | 22.1015 | 0 | 22.1015 |
| 10 | 0.307389 | 6.85529 | UNIT I | 2.4 | 23.0433 | 11.0651 | 11.8811 | 22.2891 | 0 | 22.2891 |
| 11 | 0.307389 | 7.22985 | UNIT I | 2.4 | 23.0433 | 10.9199 | 11.7252 | 21.9226 | 0 | 21.9226 |
| 12 | 0.307389 | 7.54148 | UNIT I | 2.4 | 23.0433 | 10.7135 | 11.5035 | 21.4016 | 0 | 21.4016 |
| 13 | 0.307389 | 7.78856 | UNIT I | 2.4 | 23.0433 | 11.2356 | 12.0642 | 22.7196 | 0 | 22.7196 |
| 14 | 0.307389 | 7.96916 | UNIT I | 2.4 | 23.0433 | 12.2959 | 13.2026 | 25.396 | 0 | 25.396 |
| 15 | 0.307389 | 8.081 | UNIT I | 2.4 | 23.0433 | 11.9877 | 12.8717 | 24.618 | 0 | 24.618 |
| 16 | 0.307389 | 8.12144 | UNIT I | 2.4 | 23.0433 | 11.545 | 12.3963 | 23.5005 | 0 | 23.5005 |
| 17 | 0.307389 | 8.08737 | UNIT I | 2.4 | 23.0433 | 11.0379 | 11.8518 | 22.2203 | 0 | 22.2203 |
| 18 | 0.307389 | 7.97514 | UNIT I | 2.4 | 23.0433 | 10.4691 | 11.2411 | 20.7846 | 0 | 20.7846 |
| 19 | 0.307389 | 7.78049 | UNIT I | 2.4 | 23.0433 | 9.85228 | 10.5788 | 19.2276 | 0 | 19.2276 |
| 20 | 0.307389 | 7.49768 | UNIT I | 2.4 | 23.0433 | 9.17907 | 9.85593 | 17.5282 | 0 | 17.5282 |
| 21 | 0.307389 | 6.68583 | UNIT I | 2.4 | 23.0433 | 8.12253 | 8.72149 | 14.8613 | 0 | 14.8613 |
| 22 | 0.307389 | 5.40359 | UNIT I | 2.4 | 23.0433 | 6.76875 | 7.26788 | 11.4439 | 0 | 11.4439 |
| 23 | 0.307389 | 4.01215 | UNIT I | 2.4 | 23.0433 | 5.41072 | 5.80971 | 8.01592 | 0 | 8.01592 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 0.307389 | 2.50099 | UNIT I | 2.4 | 23.0433 | 4.04834 | 4.34686 | 4.57689 | 0 | 4.57689 |
| 25 | 0.307389 | 0.857012 | UNIT I | 2.4 | 23.0433 | 2.72609 | 2.92711 | 1.23918 | 0 | 1.23918 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.759791

| 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 | 0.0182752 | 0.00387059 | UNIT I | 2.4 | 23.0433 | 0 | 0 | -149.984 | 0 | -149.984 |
| 2 | 0.0182752 | 0.0112143 | UNIT I | 2.4 | 23.0433 | 19.6488 | 14.929 | 29.4544 | 0 | 29.4544 |
| 3 | 0.0182752 | 0.0178225 | UNIT I | 2.4 | 23.0433 | 13.1459 | 9.98811 | 17.8389 | 0 | 17.8389 |
| 4 | 0.0182752 | 0.0237949 | UNIT I | 2.4 | 23.0433 | 10.322 | 7.84257 | 12.795 | 0 | 12.795 |
| 5 | 0.0182752 | 0.0292011 | UNIT I | 2.4 | 23.0433 | 8.81249 | 6.69565 | 10.0987 | 0 | 10.0987 |
| 6 | 0.0182752 | 0.0340911 | UNIT I | 2.4 | 23.0433 | 7.87931 | 5.98663 | 8.43182 | 0 | 8.43182 |
| 7 | 0.0182752 | 0.0385009 | UNIT I | 2.4 | 23.0433 | 7.23716 | 5.49873 | 7.28482 | 0 | 7.28482 |
| 8 | 0.0182752 | 0.0424565 | UNIT I | 2.4 | 23.0433 | 6.75732 | 5.13415 | 6.42774 | 0 | 6.42774 |
| 9 | 0.0182752 | 0.0459754 | UNIT I | 2.4 | 23.0433 | 6.37456 | 4.84333 | 5.74406 | 0 | 5.74406 |
| 10 | 0.0182752 | 0.0490685 | UNIT I | 2.4 | 23.0433 | 6.05272 | 4.5988 | 5.16918 | 0 | 5.16918 |
| 11 | 0.0182752 | 0.0517409 | UNIT I | 2.4 | 23.0433 | 5.77024 | 4.38418 | 4.66462 | 0 | 4.66462 |
| 12 | 0.0182752 | 0.0539919 | UNIT I | 2.4 | 23.0433 | 5.51344 | 4.18906 | 4.20593 | 0 | 4.20593 |
| 13 | 0.0182752 | 0.055815 | UNIT I | 2.4 | 23.0433 | 5.27316 | 4.0065 | 3.77673 | 0 | 3.77673 |
| 14 | 0.0182752 | 0.057198 | UNIT I | 2.4 | 23.0433 | 5.69915 | 4.33016 | 4.53763 | 0 | 4.53763 |
| 15 | 0.0182752 | 0.0581213 | UNIT I | 2.4 | 23.0433 | 5.82323 | 4.42444 | 4.75927 | 0 | 4.75927 |
| 16 | 0.0182752 | 0.058557 | UNIT I | 2.4 | 23.0433 | 5.55503 | 4.22066 | 4.28019 | 0 | 4.28019 |
| 17 | 0.0182752 | 0.0584661 | UNIT I | 2.4 | 23.0433 | 5.33757 | 4.05544 | 3.89178 | 0 | 3.89178 |
| 18 | 0.0182752 | 0.0577945 | UNIT I | 2.4 | 23.0433 | 5.03187 | 3.82317 | 3.34575 | 0 | 3.34575 |
| 19 | 0.0182752 | 0.0564666 | UNIT I | 2.4 | 23.0433 | 4.72044 | 3.58655 | 2.78947 | 0 | 2.78947 |
| 20 | 0.0182752 | 0.0543735 | UNIT I | 2.4 | 23.0433 | 4.39825 | 3.34175 | 2.21397 | 0 | 2.21397 |
| 21 | 0.0182752 | 0.0513508 | UNIT I | 2.4 | 23.0433 | 4.05899 | 3.08399 | 1.60799 | 0 | 1.60799 |
| 22 | 0.0182752 | 0.0471312 | UNIT I | 2.4 | 23.0433 | 3.69357 | 2.80634 | 0.955266 | 0 | 0.955266 |
| 23 | 0.0182752 | 0.0412239 | UNIT I | 2.4 | 23.0433 | 3.28629 | 2.49689 | 0.227782 | 0 | 0.227782 |
| 24 | 0.0182752 | 0.0324858 | UNIT I | 2.4 | 23.0433 | 2.80134 | 2.12843 | -0.638425 | 0 | -0.638425 |
| 25 | 0.0182752 | 0.0136021 | UNIT I | 2.4 | 23.0433 | 10.7798 | 8.19042 | 13.6128 | 0 | 13.6128 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 0.790438

| 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 | 0.0309827 | 0.00680028 | UNIT I | 2.4 | 23.0433 | 0 | 0 | -67.9311 | 0 | -67.9311 |
| 2 | 0.0309827 | 0.0198916 | UNIT I | 2.4 | 23.0433 | 0 | 0 | -7.94805 | 0 | -7.94805 |
| 3 | 0.0309827 | 0.031985 | UNIT I | 2.4 | 23.0433 | 3.9989 | 3.16088 | 1.78877 | 0 | 1.78877 |
| 4 | 0.0309827 | 0.0431158 | UNIT I | 2.4 | 23.0433 | 4.472 | 3.53484 | 2.66791 | 0 | 2.66791 |
| 5 | 0.0309827 | 0.0533101 | UNIT I | 2.4 | 23.0433 | 4.42065 | 3.49425 | 2.57247 | 0 | 2.57247 |
| 6 | 0.0309827 | 0.062586 | UNIT I | 2.4 | 23.0433 | 4.33342 | 3.4253 | 2.41039 | 0 | 2.41039 |
| 7 | 0.0309827 | 0.0709544 | UNIT I | 2.4 | 23.0433 | 4.22436 | 3.3391 | 2.20773 | 0 | 2.20773 |
| 8 | 0.0309827 | 0.0784193 | UNIT I | 2.4 | 23.0433 | 4.10229 | 3.2426 | 1.98088 | 0 | 1.98088 |
| 9 | 0.0309827 | 0.084978 | UNIT I | 2.4 | 23.0433 | 3.9727 | 3.14017 | 1.74007 | 0 | 1.74007 |
| 10 | 0.0309827 | 0.0906212 | UNIT I | 2.4 | 23.0433 | 3.83894 | 3.03444 | 1.49152 | 0 | 1.49152 |
| 11 | 0.0309827 | 0.0953321 | UNIT I | 2.4 | 23.0433 | 3.70291 | 2.92692 | 1.23875 | 0 | 1.23875 |
| 12 | 0.0309827 | 0.0990864 | UNIT I | 2.4 | 23.0433 | 3.56554 | 2.81834 | 0.983473 | 0 | 0.983473 |
| 13 | 0.0309827 | 0.101851 | UNIT I | 2.4 | 23.0433 | 3.42702 | 2.70885 | 0.726074 | 0 | 0.726074 |
| 14 | 0.0309827 | 0.103582 | UNIT I | 2.4 | 23.0433 | 3.28704 | 2.5982 | 0.465957 | 0 | 0.465957 |
| 15 | 0.0309827 | 0.104224 | UNIT I | 2.4 | 23.0433 | 3.14486 | 2.48581 | 0.201739 | 0 | 0.201739 |
| 16 | 0.0309827 | 0.103706 | UNIT I | 2.4 | 23.0433 | 2.99935 | 2.3708 | -0.0686469 | 0 | -0.0686469 |
| 17 | 0.0309827 | 0.101936 | UNIT I | 2.4 | 23.0433 | 2.84906 | 2.25201 | -0.347919 | 0 | -0.347919 |
| 18 | 0.0309827 | 0.0987992 | UNIT I | 2.4 | 23.0433 | 2.69217 | 2.12799 | -0.639461 | 0 | -0.639461 |
| 19 | 0.0309827 | 0.0941426 | UNIT I | 2.4 | 23.0433 | 2.52648 | 1.99702 | -0.947359 | 0 | -0.947359 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 0.0309827 | 0.0877645 | UNIT I | 2.4 | 23.0433 | 2.40503 | 1.90103 | -1.17304 | 0 | -1.17304 |
| 21 | 0.0309827 | 0.0793882 | UNIT I | 2.4 | 23.0433 | 9.49423 | 7.5046 | 12.0004 | 0 | 12.0004 |
| 22 | 0.0309827 | 0.0686191 | UNIT I | 2.4 | 23.0433 | 10.3407 | 8.17365 | 13.5733 | 0 | 13.5733 |
| 23 | 0.0309827 | 0.0548601 | UNIT I | 2.4 | 23.0433 | 2.72678 | 2.15535 | -0.575151 | 0 | -0.575151 |
| 24 | 0.0309827 | 0.0371278 | UNIT I | 2.4 | 23.0433 | 2.4333 | 1.92337 | -1.1205 | 0 | -1.1205 |
| 25 | 0.0309827 | 0.0135567 | UNIT I | 2.4 | 23.0433 | 16.7882 | 13.27 | 25.5543 | 0 | 25.5543 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.846632

| 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 | 0.0309827 | 0.00680028 | UNIT I | 2.4 | 23.0433 | 0 | 0 | -13.429 | 0 | -13.429 |
| 2 | 0.0309827 | 0.0198916 | UNIT I | 2.4 | 23.0433 | 2.02104 | 1.71107 | -1.6196 | 0 | -1.6196 |
| 3 | 0.0309827 | 0.031985 | UNIT I | 2.4 | 23.0433 | 2.70352 | 2.28889 | -0.261218 | 0 | -0.261218 |
| 4 | 0.0309827 | 0.0431158 | UNIT I | 2.4 | 23.0433 | 2.85353 | 2.41589 | 0.0373545 | 0 | 0.0373545 |
| 5 | 0.0309827 | 0.0533101 | UNIT I | 2.4 | 23.0433 | 2.9162 | 2.46895 | 0.162091 | 0 | 0.162091 |
| 6 | 0.0309827 | 0.062586 | UNIT I | 2.4 | 23.0433 | 2.94232 | 2.49106 | 0.214085 | 0 | 0.214085 |
| 7 | 0.0309827 | 0.0709544 | UNIT I | 2.4 | 23.0433 | 2.93384 | 2.48388 | 0.1972 | 0 | 0.1972 |
| 8 | 0.0309827 | 0.0784193 | UNIT I | 2.4 | 23.0433 | 2.89279 | 2.44913 | 0.115503 | 0 | 0.115503 |
| 9 | 0.0309827 | 0.084978 | UNIT I | 2.4 | 23.0433 | 2.82132 | 2.38862 | -0.0267468 | 0 | -0.0267468 |
| 10 | 0.0309827 | 0.0906212 | UNIT I | 2.4 | 23.0433 | 2.72166 | 2.30425 | -0.225107 | 0 | -0.225107 |
| 11 | 0.0309827 | 0.0953321 | UNIT I | 2.4 | 23.0433 | 2.59614 | 2.19798 | -0.474936 | 0 | -0.474936 |
| 12 | 0.0309827 | 0.0990864 | UNIT I | 2.4 | 23.0433 | 2.44721 | 2.07189 | -0.771367 | 0 | -0.771367 |
| 13 | 0.0309827 | 0.101851 | UNIT I | 2.4 | 23.0433 | 2.27743 | 1.92814 | -1.10929 | 0 | -1.10929 |
| 14 | 0.0309827 | 0.103582 | UNIT I | 2.4 | 23.0433 | 2.08953 | 1.76906 | -1.48327 | 0 | -1.48327 |
| 15 | 0.0309827 | 0.104224 | UNIT I | 2.4 | 23.0433 | 1.88643 | 1.59711 | -1.88752 | 0 | -1.88752 |
| 16 | 0.0309827 | 0.103706 | UNIT I | 2.4 | 23.0433 | 1.67126 | 1.41494 | -2.31578 | 0 | -2.31578 |
| 17 | 0.0309827 | 0.101936 | UNIT I | 2.4 | 23.0433 | 1.44745 | 1.22546 | -2.76122 | 0 | -2.76122 |
| 18 | 0.0309827 | 0.0987992 | UNIT I | 2.4 | 23.0433 | 1.21883 | 1.0319 | -3.21629 | 0 | -3.21629 |
| 19 | 0.0309827 | 0.0941426 | UNIT I | 2.4 | 23.0433 | 0.989663 | 0.83788 | -3.67239 | 0 | -3.67239 |
| 20 | 0.0309827 | 0.0877645 | UNIT I | 2.4 | 23.0433 | 0.787249 | 0.66651 | -4.0753 | 0 | -4.0753 |
| 21 | 0.0309827 | 0.0793882 | UNIT I | 2.4 | 23.0433 | 3.67066 | 3.10769 | 1.66372 | 0 | 1.66372 |
| 22 | 0.0309827 | 0.0686191 | UNIT I | 2.4 | 23.0433 | 4.82739 | 4.08702 | 3.96603 | 0 | 3.96603 |
| 23 | 0.0309827 | 0.0548601 | UNIT I | 2.4 | 23.0433 | 1.37202 | 1.1616 | -2.91136 | 0 | -2.91136 |
| 24 | 0.0309827 | 0.0371278 | UNIT I | 2.4 | 23.0433 | 1.44639 | 1.22456 | -2.76336 | 0 | -2.76336 |
| 25 | 0.0309827 | 0.0135567 | UNIT I | 2.4 | 23.0433 | 22.3762 | 18.9444 | 38.8944 | 0 | 38.8944 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.07146

| 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 | 0.318011 | 0.284378 | UNIT I | 2.4 | 23.0433 | 2.97109 | 3.1834 | 1.8417 | 0 | 1.8417 |
| 2 | 0.318011 | 0.813475 | UNIT I | 2.4 | 23.0433 | 3.99585 | 4.28139 | 4.42295 | 0 | 4.42295 |
| 3 | 0.318011 | 1.38053 | UNIT I | 2.4 | 23.0433 | 5.12446 | 5.49065 | 7.26583 | 0 | 7.26583 |
| 4 | 0.318011 | 2.19959 | UNIT I | 2.4 | 23.0433 | 6.6503 | 7.12553 | 11.1093 | 0 | 11.1093 |
| 5 | 0.318011 | 3.25157 | UNIT I | 2.4 | 23.0433 | 8.48586 | 9.09226 | 15.7329 | 0 | 15.7329 |
| 6 | 0.318011 | 4.23798 | UNIT I | 2.4 | 23.0433 | 10.0901 | 10.8112 | 19.7739 | 0 | 19.7739 |
| 7 | 0.318011 | 5.14855 | UNIT I | 2.4 | 23.0433 | 11.386 | 12.1996 | 23.0381 | 0 | 23.0381 |
| 8 | 0.318011 | 5.96258 | UNIT I | 2.4 | 23.0433 | 12.3057 | 13.1851 | 25.3548 | 0 | 25.3548 |
| 9 | 0.318011 | 6.60028 | UNIT I | 2.4 | 23.0433 | 12.7137 | 13.6222 | 26.3825 | 0 | 26.3825 |
| 10 | 0.318011 | 7.1471 | UNIT I | 2.4 | 23.0433 | 12.7704 | 13.683 | 26.5253 | 0 | 26.5253 |
| 11 | 0.318011 | 7.61497 | UNIT I | 2.4 | 23.0433 | 12.4359 | 13.3246 | 25.6827 | 0 | 25.6827 |
| 12 | 0.318011 | 8.00208 | UNIT I | 2.4 | 23.0433 | 11.9794 | 12.8355 | 24.533 | 0 | 24.533 |
| 13 | 0.318011 | 8.30619 | UNIT I | 2.4 | 23.0433 | 11.3387 | 12.149 | 22.9189 | 0 | 22.9189 |
| 14 | 0.318011 | 8.52446 | UNIT I | 2.4 | 23.0433 | 10.6364 | 11.3965 | 21.1499 | 0 | 21.1499 |
| 15 | 0.318011 | 8.65347 | UNIT I | 2.4 | 23.0433 | 10.6718 | 11.4344 | 21.239 | 0 | 21.239 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0.318011 | 8.68903 | UNIT I | 2.4 | 23.0433 | 11.4327 | 12.2497 | 23.1557 | 0 | 23.1557 |
| 17 | 0.318011 | 8.62608 | UNIT I | 2.4 | 23.0433 | 10.9093 | 11.6888 | 21.8372 | 0 | 21.8372 |
| 18 | 0.318011 | 8.45847 | UNIT I | 2.4 | 23.0433 | 10.205 | 10.9343 | 20.0633 | 0 | 20.0633 |
| 19 | 0.318011 | 8.17872 | UNIT I | 2.4 | 23.0433 | 9.52321 | 10.2037 | 18.3459 | 0 | 18.3459 |
| 20 | 0.318011 | 7.77762 | UNIT I | 2.4 | 23.0433 | 8.85909 | 9.49216 | 16.673 | 0 | 16.673 |
| 21 | 0.318011 | 7.2437 | UNIT I | 2.4 | 23.0433 | 8.20446 | 8.79075 | 15.0241 | 0 | 15.0241 |
| 22 | 0.318011 | 6.55179 | UNIT I | 2.4 | 23.0433 | 7.51747 | 8.05467 | 13.2936 | 0 | 13.2936 |
| 23 | 0.318011 | 5.14803 | UNIT I | 2.4 | 23.0433 | 6.29009 | 6.73958 | 10.2019 | 0 | 10.2019 |
| 24 | 0.318011 | 3.24762 | UNIT I | 2.4 | 23.0433 | 4.61025 | 4.9397 | 5.9706 | 0 | 5.9706 |
| 25 | 0.318011 | 1.12314 | UNIT I | 2.4 | 23.0433 | 2.61594 | 2.80287 | 0.947111 | 0 | 0.947111 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -7.22118 | 1.56282 |
| 15.7129 | 5.65286 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

### External Boundary

| X | Y |
|---|---|
| 3.55263 | 5.94674 |
| 2.46637 | 5.95601 |
| 2.37408 | 5.97731 |
| 2.19776 | 5.96607 |
| 1.33058 | 5.75328 |
| 0.562161 | 5.61447 |
| -0.0303637 | 5.49417 |
| -0.539558 | 5.31833 |
| -1.58574 | 5.19803 |
| -2.70597 | 5.15175 |
| -3.32627 | 4.98518 |
| -5.4581 | 4.92122 |
| -5.8548 | 4.89919 |
| -6.3176 | 4.84044 |
| -7.22118 | 4.87717 |
| -7.22118 | 1.56282 |
| -7.22118 | -0.557959 |
| -7.22118 | -3.44395 |
| -7.22118 | -5.39909 |
| -4.18484 | -5.39909 |
| 49.9902 | -5.39909 |
| 49.9902 | 9.76285 |
| 49.9902 | 15.7927 |
| 49.9902 | 17.787 |
| 49.9902 | 19.9918 |
| 49.9902 | 23.8629 |
| 48.6865 | 23.1062 |
| 47.8664 | 22.7068 |
| 47.0674 | 22.2234 |
| 46.6258 | 21.7399 |

| | |
|---|---|
| 45.7847 | 21.3196 |
| 45.3851 | 20.8782 |
| 43.6609 | 17.8094 |
| 42.9761 | 16.0499 |
| 42.5174 | 15.4341 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 29.9354 | 14.2695 |
| 29.5681 | 14.2768 |
| 29.2838 | 14.2825 |
| 28.8436 | 14.2914 |
| 28.769 | 14.2914 |
| 28.0829 | 14.3066 |
| 27.4875 | 14.3186 |
| 27.4445 | 14.3168 |
| 27.2003 | 14.1883 |
| 26.5834 | 13.5717 |
| 25.7224 | 12.801 |
| 24.9899 | 12.3128 |
| 23.6437 | 11.6418 |
| 23.2984 | 11.5524 |
| 22.5311 | 11.4757 |
| 22.0195 | 11.2967 |
| 21.1116 | 11.2584 |
| 20.3826 | 11.1561 |
| 20.1707 | 11.093 |
| 19.7816 | 10.9771 |
| 18.907 | 10.8084 |
| 18.407 | 10.712 |
| 17.3761 | 10.5131 |
| 16.6293 | 10.2749 |
| 15.7792 | 10.2113 |
| 14.3889 | 10.0446 |
| 12.6085 | 9.87112 |
| 12.514 | 9.86192 |
| 12.2636 | 9.80476 |
| 11.6804 | 9.67161 |
| 11.5419 | 9.63999 |
| 11.1768 | 9.55661 |
| 9.645 | 9.226 |
| 9.40071 | 9.05704 |
| 8.67713 | 8.5566 |
| 7.9753 | 8.0712 |
| 7.25267 | 7.57141 |
| 6.52923 | 7.07106 |
| 6.279 | 6.898 |
| 6.15839 | 6.694 |
| 6.054 | 6.601 |
| 5.88 | 6.601 |
| 5.76991 | 6.664 |

## Material Boundary

| X | Y |
|---|---|
| 8.772 | 6.09843 |

| | |
|---|---|
| 31.5166 | 11.426 |

### Material Boundary

| X | Y |
|---|---|
| -7.22118 | -3.44395 |
| 14.9068 | 2.35905 |
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |
| 49.9902 | 15.7927 |

### Material Boundary

| X | Y |
|---|---|
| -4.18484 | -5.39909 |
| 49.9902 | 9.76285 |

### Material Boundary

| X | Y |
|---|---|
| -7.22118 | -0.557959 |
| 15.7129 | 5.65286 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| 3.55263 | 5.94674 |
| 5.76991 | 6.09843 |
| 5.76991 | 6.49459 |
| 5.76991 | 6.664 |

### Material Boundary

| X | Y |
|---|---|
| 5.76991 | 6.09843 |
| 6.27057 | 6.09843 |

### Material Boundary

| X | Y |
|---|---|
| 9.30584 | 8.08442 |
| 10.7916 | 8.08442 |

### Material Boundary

| X | Y |
|---|---|
| 9.80532 | 8.5566 |
| 10.1973 | 8.5566 |
| 10.3078 | 8.5566 |

### Material Boundary

| X | Y |
|---|---|
| 10.3078 | 8.5566 |
| 10.3078 | 8.6975 |

| | |
|---|---|
| 10.3078 | 8.91614 |
| 10.3078 | 9.05704 |

### Material Boundary

| X | Y |
|---|---|
| 10.3078 | 9.05704 |
| 10.4184 | 9.05704 |
| 10.7916 | 9.05704 |
| 10.7916 | 8.08442 |

### Material Boundary

| X | Y |
|---|---|
| 9.30584 | 8.08442 |
| 9.30584 | 8.5566 |
| 9.80532 | 8.5566 |

### Material Boundary

| X | Y |
|---|---|
| 7.27258 | 7.07106 |
| 7.77235 | 7.07106 |

### Material Boundary

| X | Y |
|---|---|
| 7.77235 | 7.07106 |
| 7.77235 | 7.57141 |

### Material Boundary

| X | Y |
|---|---|
| 7.77235 | 7.57141 |
| 8.272 | 7.57141 |

### Material Boundary

| X | Y |
|---|---|
| 8.272 | 7.57141 |
| 8.272 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 8.272 | 8.0712 |
| 8.661 | 8.0712 |
| 8.772 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 6.27057 | 6.09843 |
| 8.772 | 6.09843 |
| 8.772 | 7.93029 |
| 8.772 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 8.772 | 6.09843 |
| 10.7916 | 8.08442 |
| 11.0694 | 8.35766 |
| 11.7807 | 9.05704 |
| 12.6085 | 9.87112 |

### Material Boundary

| X | Y |
|---|---|
| 6.27057 | 6.09843 |
| 6.27057 | 6.57061 |
| 6.77005 | 6.57061 |
| 6.77005 | 7.07106 |
| 7.27258 | 7.07106 |

### Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 19.9918 |

### Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

### Material Boundary

| X | Y |
|---|---|
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| -7.22118 | 1.56282 |
| 15.7129 | 5.65286 |

### Material Boundary

| X | Y |
|---|---|
| 8.772 | 8.0712 |
| 9.30584 | 8.08442 |

### Material Boundary

| X | Y |
|---|---|
| 10.7916 | 9.05704 |
| 11.7807 | 9.05704 |

### Material Boundary

| X | Y |
|---|---|
| 7.25267 | 7.57141 |
| 7.77235 | 7.57141 |

### Material Boundary

| X | Y |
|---|---|
| 7.9753 | 8.0712 |
| 8.272 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 8.67713 | 8.5566 |
| 9.30584 | 8.5566 |

### Material Boundary

| X | Y |
|---|---|
| 9.40071 | 9.05704 |
| 10.3078 | 9.05704 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 25.8179 | 12.8466 |
| 28.0829 | 14.3066 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 28.8436 | 14.2914 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 29.2838 | 14.2825 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 29.5681 | 14.2768 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.S51 + GABIONS EQup Dmin=0.5fullroad lim + GEOTEX+MPILE=0.75 oop
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 15/5/2021, 19:37:13

## 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

## Design Standard

Selected Type: Eurocode 7 - Design Approach 3

| Type | Partial Factor |
|---|---|
| Permanent Actions: Unfavourable | 1 |
| Permanent Actions: Favourable | 1 |
| Variable Actions: Unfavourable | 1.3 |
| Variable Actions: Favourable | 0 |
| Effective cohesion | 1.25 |
| Coefficient of shearing resistance | 1.25 |
| Undrained strength | 1.4 |
| Weight density | 1 |
| Shear strength (other models) | 1.25 |
| Earth resistance | 1 |
| Tensile and plate strength | 1 |
| Shear strength | 1 |
| Compressive strength | 1 |
| Bond strength | 1 |
| Seismic Coefficient | 1 |

## Analysis Options

### Analysis Methods Used

Bishop simplified
Corps of Engineers #1
Corps of Engineers #2
GLE/Morgenstern-Price with interslice force function: Half Sine
Janbu simplified
Janbu corrected
Lowe-Karafiath
Ordinary/Fellenius

Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: 0.1

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): -0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT | GABION | AIR | GRAVEL |
|---|---|---|---|---|---|---|---|---|
| Color | | | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | No strength | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 | 18 | 1e-005 | 19 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 | 20 | | 0 |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 | 32 | | 36 |
| Water Surface | None | None | Water Table | Water Table | Water Table | Water Table | None | Water Table |
| Hu Value | | | Automatically Calculated | Automatically Calculated | Automatically Calculated | Automatically Calculated | | Automatically Calculated |
| Ru Value | 0 | 0 | | | | | 0 | |

| Property | SW |
|---|---|
| Color | |
| Strength Type | Mohr-Coulomb |
| Unit Weight [kN/m3] | 19 |
| Cohesion [kPa] | 1 |
| Friction Angle [deg] | 35 |
| Water Surface | Water Table |
| Hu Value | Automatically Calculated |

## *Support Properties*

### GEOTEX

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Parallel to Reinforcement
Anchorage: Embedded End
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 40 kN/m
Pullout Strength Adhesion: 5 kN/m2
Pullout Strength Friction Angle: 30 degrees

### MICROPILE

Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 0.75 m
Pile Shear Strength: 90 kN
Force Direction: Parallel to Surface

## *Global Minimums*

### Method: ordinary/fellenius

FS: 0.927173
Center: 5.416, 18.194
Radius: 17.632
Left Slip Surface Endpoint: -6.127, 4.865
Right Slip Surface Endpoint: 21.636, 11.281
Resisting Moment=14550.1 kN-m
Driving Moment=15693 kN-m

### Method: bishop simplified

FS: 1.037040
Center: 7.553, 41.094
Radius: 38.850
Left Slip Surface Endpoint: -6.424, 4.845
Right Slip Surface Endpoint: 35.548, 14.157
Resisting Moment=57637.9 kN-m
Driving Moment=55579.3 kN-m

### Method: janbu simplified

FS: 0.936104
Center: 10.091, 31.150
Radius: 30.947
Left Slip Surface Endpoint: -6.224, 4.852
Right Slip Surface Endpoint: 35.950, 14.149
Resisting Horizontal Force=1789.06 kN

Driving Horizontal Force=1911.18 kN

### Method: janbu corrected

FS: 1.004170
Center: 10.091, 31.150
Radius: 30.947
Left Slip Surface Endpoint: -6.224, 4.852
Right Slip Surface Endpoint: 35.950, 14.149
Resisting Horizontal Force=1919.15 kN
Driving Horizontal Force=1911.18 kN

### Method: spencer

FS: 1.043260
Center: 7.553, 41.094
Radius: 38.850
Left Slip Surface Endpoint: -6.424, 4.845
Right Slip Surface Endpoint: 35.548, 14.157
Resisting Moment=57983.5 kN-m
Driving Moment=55579.3 kN-m
Resisting Horizontal Force=1419.3 kN
Driving Horizontal Force=1360.45 kN

### Method: corp of eng#1

FS: 0.749987
Center: 27.380, 13.470
Radius: 0.277
Left Slip Surface Endpoint: 27.200, 13.261
Right Slip Surface Endpoint: 27.657, 13.457
Left Slope Intercept: 27.200 14.188
Right Slope Intercept: 27.657 14.315
Resisting Horizontal Force=2.19873 kN
Driving Horizontal Force=2.9317 kN

### Method: corp of eng#2

FS: 0.792070
Center: 26.754, 13.574
Radius: 0.626
Left Slip Surface Endpoint: 26.550, 12.982
Right Slip Surface Endpoint: 27.324, 13.314
Left Slope Intercept: 26.550 13.542
Right Slope Intercept: 27.324 14.254
Resisting Horizontal Force=2.51362 kN
Driving Horizontal Force=3.17348 kN

### Method: lowe-karafiath

FS: 0.825236
Center: 26.754, 13.574
Radius: 0.626
Left Slip Surface Endpoint: 26.550, 12.982
Right Slip Surface Endpoint: 27.324, 13.314
Left Slope Intercept: 26.550 13.542
Right Slope Intercept: 27.324 14.254
Resisting Horizontal Force=1.84425 kN
Driving Horizontal Force=2.23481 kN

### Method: gle/morgenstern-price

FS: 1.045030
Center: 7.407, 46.716
Radius: 44.227
Left Slip Surface Endpoint: -6.890, 4.864

Right Slip Surface Endpoint: 37.300, 14.122
Resisting Moment=68183.6 kN-m
Driving Moment=65245.3 kN-m
Resisting Horizontal Force=1471.72 kN
Driving Horizontal Force=1408.3 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 9597
Number of Invalid Surfaces: 403

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 15 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 9588
Number of Invalid Surfaces: 412

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 15 surfaces
Error Code -112 reported for 9 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 9445
Number of Invalid Surfaces: 555

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 159 surfaces
Error Code -112 reported for 8 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 9445
Number of Invalid Surfaces: 555

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 159 surfaces
Error Code -112 reported for 8 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

### Method: spencer

Number of Valid Surfaces: 8992
Number of Invalid Surfaces: 1008

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 210 surfaces
Error Code -111 reported for 396 surfaces
Error Code -112 reported for 14 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 8913
Number of Invalid Surfaces: 1087

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 488 surfaces
Error Code -111 reported for 211 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 8567
Number of Invalid Surfaces: 1433

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 789 surfaces
Error Code -111 reported for 256 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 6395
Number of Invalid Surfaces: 3605

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 2324 surfaces
Error Code -111 reported for 893 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 9061
Number of Invalid Surfaces: 939

**Error Codes:**

Error Code -101 reported for 1 surface
Error Code -106 reported for 24 surfaces
Error Code -108 reported for 230 surfaces

Error Code -111 reported for 310 surfaces
Error Code -112 reported for 11 surfaces
Error Code -114 reported for 275 surfaces
Error Code -115 reported for 88 surfaces

### Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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).
-111 = safety factor equation did not converge
-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.
-114 = Surface with Reverse Curvature.
-115 = Surface too shallow, below the minimum depth.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 0.927173

| 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 | 1.22533 | 12.7322 | UNIT II | 4 | 23.0433 | 7.41662 | 6.87649 | 6.76237 | 0 | 6.76237 |
| 2 | 1.22533 | 35.0195 | UNIT II | 4 | 23.0433 | 13.7393 | 12.7387 | 20.544 | 0 | 20.544 |
| 3 | 1.22533 | 55.2352 | UNIT II | 4 | 23.0433 | 20.3605 | 18.8777 | 34.976 | 0 | 34.976 |
| 4 | 1.1048 | 65.1812 | UNIT II UNDER WT | 4 | 23.0433 | 25.2562 | 23.4169 | 48.9801 | 3.33281 | 45.6473 |
| 5 | 1.1048 | 77.4898 | UNIT II UNDER WT | 4 | 23.0433 | 27.9518 | 25.9162 | 61.1026 | 9.57978 | 51.5228 |
| 6 | 1.1048 | 91.202 | UNIT II UNDER WT | 4 | 23.0433 | 31.3267 | 29.0453 | 73.8993 | 15.0201 | 58.8792 |
| 7 | 1.1048 | 102.336 | UNIT II UNDER WT | 4 | 23.0433 | 33.8938 | 31.4254 | 84.1815 | 19.7069 | 64.4746 |
| 8 | 1.1048 | 110.834 | UNIT II UNDER WT | 4 | 23.0433 | 35.54 | 32.9517 | 91.7423 | 23.679 | 68.0633 |
| 9 | 1.1048 | 115.096 | UNIT II UNDER WT | 4 | 23.0433 | 35.6092 | 33.0159 | 95.1766 | 26.9633 | 68.2133 |
| 10 | 1.1048 | 123.588 | UNIT II UNDER WT | 4 | 23.0433 | 37.2833 | 34.5681 | 101.44 | 29.5775 | 71.8627 |
| 11 | 1.1048 | 130.633 | UNIT II UNDER WT | 4 | 23.0433 | 38.3934 | 35.5973 | 105.813 | 31.5303 | 74.2825 |
| 12 | 1.1048 | 143.172 | UNIT II UNDER WT | 4 | 23.0433 | 41.4522 | 38.4334 | 113.773 | 32.8229 | 80.9502 |
| 13 | 1.1048 | 155.617 | UNIT II UNDER WT | 4 | 23.0433 | 44.2696 | 41.0456 | 120.539 | 33.4481 | 87.0909 |
| 14 | 1.1048 | 168.435 | UNIT II UNDER WT | 4 | 23.0433 | 46.9111 | 43.4947 | 126.239 | 33.3906 | 92.8484 |
| 15 | 1.1048 | 172.346 | UNIT II UNDER WT | 4 | 23.0433 | 46.2523 | 42.8839 | 124.039 | 32.6259 | 91.4127 |
| 16 | 1.1048 | 170.654 | UNIT II UNDER WT | 4 | 23.0433 | 43.6873 | 40.5057 | 116.94 | 31.1183 | 85.8219 |
| 17 | 1.1048 | 166.306 | UNIT II UNDER WT | 4 | 23.0433 | 40.3571 | 37.418 | 107.381 | 28.8183 | 78.5631 |
| 18 | 1.1048 | 157.757 | UNIT II UNDER WT | 4 | 23.0433 | 36.0269 | 33.4032 | 94.7835 | 25.6589 | 69.1246 |
| 19 | 1.1048 | 146.75 | UNIT II UNDER WT | 4 | 23.0433 | 31.4153 | 29.1274 | 80.6205 | 21.5484 | 59.0721 |
| 20 | 1.1048 | 133.527 | UNIT II UNDER WT | 4 | 23.0433 | 26.9457 | 24.9833 | 65.1112 | 15.7814 | 49.3298 |
| 21 | 1.1048 | 118.18 | UNIT II UNDER WT | 4 | 23.0433 | 22.1391 | 20.5268 | 49.3688 | 10.5159 | 38.8529 |
| 22 | 1.1048 | 101.569 | UNIT II UNDER WT | 4 | 23.0433 | 17.8707 | 16.5692 | 33.3261 | 3.7772 | 29.5489 |
| 23 | 0.901541 | 66.8291 | UNIT II | 4 | 23.0433 | 13.4097 | 12.4331 | 19.8255 | 0 | 19.8255 |
| 24 | 0.901541 | 49.2061 | UNIT II | 4 | 23.0433 | 9.28375 | 8.60764 | 10.8322 | 0 | 10.8322 |
| 25 | 1.29331 | 29.1451 | UNIT I | 2.4 | 23.0433 | 3.73908 | 3.46677 | 2.50788 | 0 | 2.50788 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.03704

| 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 | 1.69624 | 12.0478 | UNIT II | 4 | 23.0433 | 7.60181 | 7.88338 | 9.12947 | 0 | 9.12947 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 1.69624 | 33.0881 | UNIT II | 4 | 23.0433 | 12.6618 | 13.1308 | 21.4656 | 0 | 21.4656 |
| 3 | 1.69624 | 55.3734 | UNIT II | 4 | 23.0433 | 17.8039 | 18.4634 | 34.002 | 0 | 34.002 |
| 4 | 1.69624 | 75.366 | UNIT II | 4 | 23.0433 | 22.1898 | 23.0117 | 44.6949 | 0 | 44.6949 |
| 5 | 1.66379 | 96.0526 | UNIT II UNDER WT | 4 | 23.0433 | 25.8138 | 26.7699 | 56.2535 | 2.7234 | 53.5301 |
| 6 | 1.66379 | 110.88 | UNIT II UNDER WT | 4 | 23.0433 | 26.5824 | 27.567 | 63.2246 | 7.82073 | 55.4039 |
| 7 | 1.66379 | 125.961 | UNIT II UNDER WT | 4 | 23.0433 | 27.6822 | 28.7076 | 70.3098 | 12.2246 | 58.0852 |
| 8 | 1.66379 | 147.703 | UNIT II UNDER WT | 4 | 23.0433 | 31.5897 | 32.7598 | 83.5553 | 15.944 | 67.6113 |
| 9 | 1.66379 | 182.045 | UNIT II UNDER WT | 4 | 23.0433 | 36.3485 | 37.6948 | 98.1976 | 18.9839 | 79.2137 |
| 10 | 1.66379 | 216.379 | UNIT II UNDER WT | 4 | 23.0433 | 42.2343 | 43.7987 | 114.908 | 21.3456 | 93.5627 |
| 11 | 1.66379 | 228.711 | UNIT II UNDER WT | 4 | 23.0433 | 43.4831 | 45.0937 | 119.634 | 23.0264 | 96.6074 |
| 12 | 1.66379 | 233.496 | UNIT II UNDER WT | 4 | 23.0433 | 43.3626 | 44.9687 | 120.333 | 24.0199 | 96.3134 |
| 13 | 1.66379 | 230.838 | UNIT II UNDER WT | 4 | 23.0433 | 41.9627 | 43.517 | 117.217 | 24.3159 | 92.9012 |
| 14 | 1.66379 | 225.991 | UNIT II UNDER WT | 4 | 23.0433 | 40.6196 | 42.1241 | 112.985 | 23.3584 | 89.6265 |
| 15 | 1.66379 | 223.764 | UNIT II UNDER WT | 4 | 23.0433 | 39.3592 | 40.8171 | 110.215 | 23.6609 | 86.5536 |
| 16 | 1.66379 | 218.573 | UNIT II UNDER WT | 4 | 23.0433 | 37.8007 | 39.2008 | 105.99 | 23.2361 | 82.7536 |
| 17 | 1.66379 | 209.912 | UNIT II UNDER WT | 4 | 23.0433 | 35.8698 | 37.1984 | 100.1 | 22.0541 | 78.0462 |
| 18 | 1.66379 | 196.407 | UNIT II UNDER WT | 4 | 23.0433 | 33.3387 | 34.5736 | 91.9537 | 20.0778 | 71.8759 |
| 19 | 1.66379 | 190.149 | UNIT II UNDER WT | 4 | 23.0433 | 32.4939 | 33.6975 | 87.0777 | 17.2618 | 69.8159 |
| 20 | 1.66379 | 186.419 | UNIT II UNDER WT | 4 | 23.0433 | 32.3961 | 33.5961 | 83.1274 | 13.5497 | 69.5777 |
| 21 | 1.66379 | 178.083 | UNIT II UNDER WT | 4 | 23.0433 | 31.7481 | 32.9241 | 76.87 | 8.8719 | 67.9981 |
| 22 | 1.66379 | 163.666 | UNIT II UNDER WT | 4 | 23.0433 | 30.348 | 31.4721 | 67.7253 | 3.14093 | 64.5844 |
| 23 | 2.49904 | 174.22 | UNIT II | 4 | 23.0433 | 22.3581 | 23.1862 | 45.1051 | 0 | 45.1051 |
| 24 | 1.37019 | 52.356 | UNIT I | 2.4 | 23.0433 | 11.9942 | 12.4385 | 23.5996 | 0 | 23.5996 |
| 25 | 1.37019 | 17.9967 | UNIT I | 2.4 | 23.0433 | 5.09215 | 5.28076 | 6.7724 | 0 | 6.7724 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 0.936104

| 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 | 1.50195 | 14.5677 | UNIT II | 4 | 23.0433 | 11.2032 | 10.4874 | 15.2512 | 0 | 15.2512 |
| 2 | 1.50195 | 40.183 | UNIT II | 4 | 23.0433 | 19.8074 | 18.5418 | 34.1864 | 0 | 34.1864 |
| 3 | 1.50195 | 66.2987 | UNIT II | 4 | 23.0433 | 27.9719 | 26.1846 | 52.154 | 0 | 52.154 |
| 4 | 1.78358 | 107.858 | UNIT II UNDER WT | 4 | 23.0433 | 32.4203 | 30.3488 | 66.6543 | 4.71038 | 61.9439 |
| 5 | 1.78358 | 142.366 | UNIT II UNDER WT | 4 | 23.0433 | 35.7827 | 33.4963 | 82.8962 | 13.5532 | 69.343 |
| 6 | 1.78358 | 168.576 | UNIT II UNDER WT | 4 | 23.0433 | 37.4192 | 35.0283 | 94.2164 | 21.2718 | 72.9446 |
| 7 | 1.78358 | 192.47 | UNIT II UNDER WT | 4 | 23.0433 | 38.9556 | 36.4665 | 104.247 | 27.921 | 76.3257 |
| 8 | 1.78358 | 224.316 | UNIT II UNDER WT | 4 | 23.0433 | 42.8656 | 40.1267 | 118.472 | 33.5409 | 84.9308 |
| 9 | 1.76356 | 267.129 | UNIT III | 5.6 | 27.453 | 62.7405 | 58.7316 | 140.408 | 38.1385 | 102.27 |
| 10 | 1.76356 | 307.933 | UNIT III | 5.6 | 27.453 | 70.3414 | 65.8469 | 157.706 | 41.741 | 115.965 |
| 11 | 1.76356 | 324.052 | UNIT III | 5.6 | 27.453 | 71.188 | 66.6394 | 161.876 | 44.3859 | 117.49 |
| 12 | 1.76356 | 330.316 | UNIT III | 5.6 | 27.453 | 69.8339 | 65.3718 | 161.12 | 46.0699 | 115.051 |
| 13 | 1.76356 | 329.396 | UNIT III | 5.6 | 27.453 | 67.1533 | 62.8625 | 157.001 | 46.7799 | 110.221 |
| 14 | 1.76356 | 326.858 | UNIT III | 5.6 | 27.453 | 65.0507 | 60.8942 | 152.129 | 45.6965 | 106.432 |
| 15 | 1.76356 | 324.772 | UNIT III | 5.6 | 27.453 | 62.4815 | 58.4892 | 147.721 | 45.9187 | 101.803 |
| 16 | 1.76356 | 318.139 | UNIT III | 5.6 | 27.453 | 59.375 | 55.5812 | 141.308 | 45.1023 | 96.2053 |
| 17 | 1.76356 | 302.96 | UNIT III | 5.6 | 27.453 | 54.8776 | 51.3711 | 131.287 | 43.1849 | 88.102 |
| 18 | 1.76356 | 289.448 | UNIT III | 5.6 | 27.453 | 51.4112 | 48.1262 | 121.94 | 40.0841 | 81.8558 |
| 19 | 1.76356 | 282.842 | UNIT III | 5.6 | 27.453 | 50.0289 | 46.8323 | 115.056 | 35.6906 | 79.3655 |
| 20 | 1.76356 | 268.846 | UNIT III | 5.6 | 27.453 | 47.5963 | 44.5551 | 104.84 | 29.858 | 74.9818 |
| 21 | 1.76356 | 246.864 | UNIT III | 5.6 | 27.453 | 44.1495 | 41.3285 | 91.1577 | 22.3862 | 68.7715 |
| 22 | 1.43132 | 166.455 | UNIT II UNDER WT | 4 | 23.0433 | 32.204 | 30.1463 | 75.5334 | 14.0658 | 61.4676 |
| 23 | 1.43132 | 127.223 | UNIT II UNDER WT | 4 | 23.0433 | 26.1442 | 24.4737 | 53.0918 | 4.96002 | 48.1318 |
| 24 | 1.19607 | 72.3369 | UNIT II | 4 | 23.0433 | 18.9507 | 17.7398 | 32.3009 | 0 | 32.3009 |
| 25 | 1.76502 | 41.1834 | UNIT I | 2.4 | 23.0433 | 7.45823 | 6.98168 | 10.7711 | 0 | 10.7711 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.00417

| 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 | 1.50195 | 14.5677 | UNIT II | 4 | 23.0433 | 10.4438 | 10.4874 | 15.2512 | 0 | 15.2512 |
| 2 | 1.50195 | 40.183 | UNIT II | 4 | 23.0433 | 18.4648 | 18.5418 | 34.1864 | 0 | 34.1864 |
| 3 | 1.50195 | 66.2987 | UNIT II | 4 | 23.0433 | 26.0759 | 26.1846 | 52.154 | 0 | 52.154 |
| 4 | 1.78358 | 107.858 | UNIT II UNDER WT | 4 | 23.0433 | 30.2228 | 30.3488 | 66.6543 | 4.71038 | 61.9439 |
| 5 | 1.78358 | 142.366 | UNIT II UNDER WT | 4 | 23.0433 | 33.3572 | 33.4963 | 82.8962 | 13.5532 | 69.343 |
| 6 | 1.78358 | 168.576 | UNIT II UNDER WT | 4 | 23.0433 | 34.8828 | 35.0283 | 94.2164 | 21.2718 | 72.9446 |
| 7 | 1.78358 | 192.47 | UNIT II UNDER WT | 4 | 23.0433 | 36.3151 | 36.4665 | 104.247 | 27.921 | 76.3257 |
| 8 | 1.78358 | 224.316 | UNIT II UNDER WT | 4 | 23.0433 | 39.9601 | 40.1267 | 118.472 | 33.5409 | 84.9308 |
| 9 | 1.76356 | 267.129 | UNIT III | 5.6 | 27.453 | 58.4877 | 58.7316 | 140.408 | 38.1385 | 102.27 |
| 10 | 1.76356 | 307.933 | UNIT III | 5.6 | 27.453 | 65.5735 | 65.8469 | 157.706 | 41.741 | 115.965 |
| 11 | 1.76356 | 324.052 | UNIT III | 5.6 | 27.453 | 66.3627 | 66.6394 | 161.876 | 44.3859 | 117.49 |
| 12 | 1.76356 | 330.316 | UNIT III | 5.6 | 27.453 | 65.1003 | 65.3718 | 161.12 | 46.0699 | 115.051 |
| 13 | 1.76356 | 329.396 | UNIT III | 5.6 | 27.453 | 62.6015 | 62.8625 | 157.001 | 46.7799 | 110.221 |
| 14 | 1.76356 | 326.858 | UNIT III | 5.6 | 27.453 | 60.6413 | 60.8942 | 152.129 | 45.6965 | 106.432 |
| 15 | 1.76356 | 324.772 | UNIT III | 5.6 | 27.453 | 58.2463 | 58.4892 | 147.721 | 45.9187 | 101.803 |
| 16 | 1.76356 | 318.139 | UNIT III | 5.6 | 27.453 | 55.3504 | 55.5812 | 141.308 | 45.1023 | 96.2053 |
| 17 | 1.76356 | 302.96 | UNIT III | 5.6 | 27.453 | 51.1578 | 51.3711 | 131.287 | 43.1849 | 88.102 |
| 18 | 1.76356 | 289.448 | UNIT III | 5.6 | 27.453 | 47.9263 | 48.1262 | 121.94 | 40.0841 | 81.8558 |
| 19 | 1.76356 | 282.842 | UNIT III | 5.6 | 27.453 | 46.6378 | 46.8323 | 115.056 | 35.6906 | 79.3655 |
| 20 | 1.76356 | 268.846 | UNIT III | 5.6 | 27.453 | 44.3701 | 44.5551 | 104.84 | 29.858 | 74.9818 |
| 21 | 1.76356 | 246.864 | UNIT III | 5.6 | 27.453 | 41.1569 | 41.3285 | 91.1577 | 22.3862 | 68.7715 |
| 22 | 1.43132 | 166.455 | UNIT II UNDER WT | 4 | 23.0433 | 30.0211 | 30.1463 | 75.5334 | 14.0658 | 61.4676 |
| 23 | 1.43132 | 127.223 | UNIT II UNDER WT | 4 | 23.0433 | 24.3721 | 24.4737 | 53.0918 | 4.96002 | 48.1318 |
| 24 | 1.19607 | 72.3369 | UNIT II | 4 | 23.0433 | 17.6661 | 17.7398 | 32.3009 | 0 | 32.3009 |
| 25 | 1.76502 | 41.1834 | UNIT I | 2.4 | 23.0433 | 6.95269 | 6.98168 | 10.7711 | 0 | 10.7711 |

**Global Minimum Query (spencer) - Safety Factor**: 1.04326

| 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 | 1.69624 | 12.0478 | UNIT II | 4 | 23.0433 | 9.92355 | 10.3528 | 14.935 | 0 | 14.935 |
| 2 | 1.69624 | 33.0881 | UNIT II | 4 | 23.0433 | 16.2135 | 16.9149 | 30.3617 | 0 | 30.3617 |
| 3 | 1.69624 | 55.3734 | UNIT II | 4 | 23.0433 | 22.1869 | 23.1467 | 45.0122 | 0 | 45.0122 |
| 4 | 1.69624 | 75.366 | UNIT II | 4 | 23.0433 | 26.897 | 28.0606 | 56.5643 | 0 | 56.5643 |
| 5 | 1.66379 | 96.0526 | UNIT II UNDER WT | 4 | 23.0433 | 30.4504 | 31.7677 | 68.0025 | 2.7234 | 65.2791 |
| 6 | 1.66379 | 110.88 | UNIT II UNDER WT | 4 | 23.0433 | 30.4948 | 31.814 | 73.2092 | 7.82073 | 65.3884 |
| 7 | 1.66379 | 125.961 | UNIT II UNDER WT | 4 | 23.0433 | 30.8799 | 32.2158 | 78.5572 | 12.2246 | 66.3326 |
| 8 | 1.66379 | 147.703 | UNIT II UNDER WT | 4 | 23.0433 | 47.3606 | 49.4094 | 122.698 | 15.944 | 106.754 |
| 9 | 1.66379 | 182.045 | UNIT II UNDER WT | 4 | 23.0433 | 38.4939 | 40.1591 | 103.991 | 18.9839 | 85.0069 |
| 10 | 1.66379 | 216.379 | UNIT II UNDER WT | 4 | 23.0433 | 43.7094 | 45.6003 | 119.144 | 21.3456 | 97.7982 |
| 11 | 1.66379 | 228.711 | UNIT II UNDER WT | 4 | 23.0433 | 43.9852 | 45.888 | 121.501 | 23.0264 | 98.4744 |
| 12 | 1.66379 | 233.496 | UNIT II UNDER WT | 4 | 23.0433 | 42.9073 | 44.7635 | 119.851 | 24.0199 | 95.8311 |
| 13 | 1.66379 | 230.838 | UNIT II UNDER WT | 4 | 23.0433 | 40.6463 | 42.4047 | 114.602 | 24.3159 | 90.2863 |
| 14 | 1.66379 | 225.991 | UNIT II UNDER WT | 4 | 23.0433 | 38.6069 | 40.277 | 108.642 | 23.3584 | 85.2837 |
| 15 | 1.66379 | 223.764 | UNIT II UNDER WT | 4 | 23.0433 | 36.6431 | 38.2283 | 104.129 | 23.6609 | 80.4677 |
| 16 | 1.66379 | 218.573 | UNIT II UNDER WT | 4 | 23.0433 | 34.5149 | 36.008 | 98.4838 | 23.2361 | 75.2477 |
| 17 | 1.66379 | 209.912 | UNIT II UNDER WT | 4 | 23.0433 | 32.172 | 33.5638 | 91.5558 | 22.0541 | 69.5017 |
| 18 | 1.66379 | 196.407 | UNIT II UNDER WT | 4 | 23.0433 | 29.4303 | 30.7035 | 82.8555 | 20.0778 | 62.7777 |
| 19 | 1.66379 | 190.149 | UNIT II UNDER WT | 4 | 23.0433 | 28.3656 | 29.5927 | 77.4279 | 17.2618 | 60.1661 |
| 20 | 1.66379 | 186.419 | UNIT II UNDER WT | 4 | 23.0433 | 27.8728 | 29.0786 | 72.5072 | 13.5497 | 58.9575 |
| 21 | 1.66379 | 178.083 | UNIT II UNDER WT | 4 | 23.0433 | 27.62 | 28.8148 | 67.2088 | 8.8719 | 58.3369 |
| 22 | 1.66379 | 163.666 | UNIT II UNDER WT | 4 | 23.0433 | 26.4043 | 27.5465 | 58.4967 | 3.14093 | 55.3557 |
| 23 | 2.49904 | 174.22 | UNIT II | 4 | 23.0433 | 19.4857 | 20.3286 | 38.387 | 0 | 38.387 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 1.37019 | 52.356 | UNIT I | 2.4 | 23.0433 | 10.3143 | 10.7605 | 19.6548 | 0 | 19.6548 |
| 25 | 1.37019 | 17.9967 | UNIT I | 2.4 | 23.0433 | 4.34723 | 4.53529 | 5.01987 | 0 | 5.01987 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 0.749987

| 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 | 0.0182752 | 0.00387059 | UNIT I | 2.4 | 23.0433 | 0 | 0 | -150.049 | 0 | -150.049 |
| 2 | 0.0182752 | 0.0112143 | UNIT I | 2.4 | 23.0433 | 20.5236 | 15.3924 | 30.544 | 0 | 30.544 |
| 3 | 0.0182752 | 0.0178225 | UNIT I | 2.4 | 23.0433 | 13.2729 | 9.95447 | 17.7599 | 0 | 17.7599 |
| 4 | 0.0182752 | 0.0237949 | UNIT I | 2.4 | 23.0433 | 10.2084 | 7.65614 | 12.3567 | 0 | 12.3567 |
| 5 | 0.0182752 | 0.0292011 | UNIT I | 2.4 | 23.0433 | 8.59916 | 6.44926 | 9.51945 | 0 | 9.51945 |
| 6 | 0.0182752 | 0.0340911 | UNIT I | 2.4 | 23.0433 | 7.61747 | 5.713 | 7.78857 | 0 | 7.78857 |
| 7 | 0.0182752 | 0.0385009 | UNIT I | 2.4 | 23.0433 | 6.94967 | 5.21216 | 6.6111 | 0 | 6.6111 |
| 8 | 0.0182752 | 0.0424565 | UNIT I | 2.4 | 23.0433 | 6.45625 | 4.8421 | 5.74115 | 0 | 5.74115 |
| 9 | 0.0182752 | 0.0459754 | UNIT I | 2.4 | 23.0433 | 6.06727 | 4.55037 | 5.05533 | 0 | 5.05533 |
| 10 | 0.0182752 | 0.0490685 | UNIT I | 2.4 | 23.0433 | 5.74426 | 4.30812 | 4.48582 | 0 | 4.48582 |
| 11 | 0.0182752 | 0.0517409 | UNIT I | 2.4 | 23.0433 | 5.46439 | 4.09822 | 3.99237 | 0 | 3.99237 |
| 12 | 0.0182752 | 0.0539919 | UNIT I | 2.4 | 23.0433 | 5.21326 | 3.90988 | 3.54958 | 0 | 3.54958 |
| 13 | 0.0182752 | 0.055815 | UNIT I | 2.4 | 23.0433 | 4.98127 | 3.73589 | 3.14054 | 0 | 3.14054 |
| 14 | 0.0182752 | 0.057198 | UNIT I | 2.4 | 23.0433 | 5.42749 | 4.07055 | 3.9273 | 0 | 3.9273 |
| 15 | 0.0182752 | 0.0581213 | UNIT I | 2.4 | 23.0433 | 5.56887 | 4.17658 | 4.17658 | 0 | 4.17658 |
| 16 | 0.0182752 | 0.058557 | UNIT I | 2.4 | 23.0433 | 5.31441 | 3.98574 | 3.72792 | 0 | 3.72792 |
| 17 | 0.0182752 | 0.0584661 | UNIT I | 2.4 | 23.0433 | 5.11352 | 3.83507 | 3.37373 | 0 | 3.37373 |
| 18 | 0.0182752 | 0.0577945 | UNIT I | 2.4 | 23.0433 | 4.82546 | 3.61903 | 2.86582 | 0 | 2.86582 |
| 19 | 0.0182752 | 0.0564666 | UNIT I | 2.4 | 23.0433 | 4.53391 | 3.40037 | 2.35178 | 0 | 2.35178 |
| 20 | 0.0182752 | 0.0543735 | UNIT I | 2.4 | 23.0433 | 4.23394 | 3.1754 | 1.8229 | 0 | 1.8229 |
| 21 | 0.0182752 | 0.0513508 | UNIT I | 2.4 | 23.0433 | 3.91943 | 2.93952 | 1.26836 | 0 | 1.26836 |
| 22 | 0.0182752 | 0.0471312 | UNIT I | 2.4 | 23.0433 | 3.58154 | 2.68611 | 0.672622 | 0 | 0.672622 |
| 23 | 0.0182752 | 0.0412239 | UNIT I | 2.4 | 23.0433 | 3.20509 | 2.40378 | 0.00888094 | 0 | 0.00888094 |
| 24 | 0.0182752 | 0.0324858 | UNIT I | 2.4 | 23.0433 | 2.75526 | 2.06641 | -0.784244 | 0 | -0.784244 |
| 25 | 0.0182752 | 0.0136021 | UNIT I | 2.4 | 23.0433 | 10.8428 | 8.13197 | 13.4753 | 0 | 13.4753 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 0.79207

| 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 | 0.0309827 | 0.00680028 | UNIT I | 2.4 | 23.0433 | 0 | 0 | -69.8905 | 0 | -69.8905 |
| 2 | 0.0309827 | 0.0198916 | UNIT I | 2.4 | 23.0433 | 0 | 0 | -8.93381 | 0 | -8.93381 |
| 3 | 0.0309827 | 0.031985 | UNIT I | 2.4 | 23.0433 | 4.55917 | 3.61118 | 2.84738 | 0 | 2.84738 |
| 4 | 0.0309827 | 0.0431158 | UNIT I | 2.4 | 23.0433 | 4.96392 | 3.93177 | 3.60105 | 0 | 3.60105 |
| 5 | 0.0309827 | 0.0533101 | UNIT I | 2.4 | 23.0433 | 4.61575 | 3.656 | 2.95273 | 0 | 2.95273 |
| 6 | 0.0309827 | 0.062586 | UNIT I | 2.4 | 23.0433 | 4.32296 | 3.42409 | 2.40754 | 0 | 2.40754 |
| 7 | 0.0309827 | 0.0709544 | UNIT I | 2.4 | 23.0433 | 4.07459 | 3.22736 | 1.94505 | 0 | 1.94505 |
| 8 | 0.0309827 | 0.0784193 | UNIT I | 2.4 | 23.0433 | 3.86046 | 3.05775 | 1.54632 | 0 | 1.54632 |
| 9 | 0.0309827 | 0.084978 | UNIT I | 2.4 | 23.0433 | 3.67223 | 2.90866 | 1.19582 | 0 | 1.19582 |
| 10 | 0.0309827 | 0.0906212 | UNIT I | 2.4 | 23.0433 | 3.50343 | 2.77496 | 0.881505 | 0 | 0.881505 |
| 11 | 0.0309827 | 0.0953321 | UNIT I | 2.4 | 23.0433 | 3.34919 | 2.65279 | 0.594295 | 0 | 0.594295 |
| 12 | 0.0309827 | 0.0990864 | UNIT I | 2.4 | 23.0433 | 3.20588 | 2.53928 | 0.327439 | 0 | 0.327439 |
| 13 | 0.0309827 | 0.101851 | UNIT I | 2.4 | 23.0433 | 3.07083 | 2.43231 | 0.0759631 | 0 | 0.0759631 |
| 14 | 0.0309827 | 0.103582 | UNIT I | 2.4 | 23.0433 | 2.94208 | 2.33033 | -0.163779 | 0 | -0.163779 |
| 15 | 0.0309827 | 0.104224 | UNIT I | 2.4 | 23.0433 | 2.8182 | 2.23221 | -0.394458 | 0 | -0.394458 |
| 16 | 0.0309827 | 0.103706 | UNIT I | 2.4 | 23.0433 | 2.69814 | 2.13712 | -0.618015 | 0 | -0.618015 |
| 17 | 0.0309827 | 0.101936 | UNIT I | 2.4 | 23.0433 | 2.58117 | 2.04446 | -0.835832 | 0 | -0.835832 |
| 18 | 0.0309827 | 0.0987992 | UNIT I | 2.4 | 23.0433 | 2.4668 | 1.95388 | -1.04878 | 0 | -1.04878 |
| 19 | 0.0309827 | 0.0941426 | UNIT I | 2.4 | 23.0433 | 2.35489 | 1.86524 | -1.25717 | 0 | -1.25717 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 0.0309827 | 0.0877645 | UNIT I | 2.4 | 23.0433 | 2.30041 | 1.82208 | -1.35863 | 0 | -1.35863 |
| 21 | 0.0309827 | 0.0793882 | UNIT I | 2.4 | 23.0433 | 9.24259 | 7.32078 | 11.5683 | 0 | 11.5683 |
| 22 | 0.0309827 | 0.0686191 | UNIT I | 2.4 | 23.0433 | 10.1084 | 8.00657 | 13.1805 | 0 | 13.1805 |
| 23 | 0.0309827 | 0.0548601 | UNIT I | 2.4 | 23.0433 | 2.68779 | 2.12892 | -0.637295 | 0 | -0.637295 |
| 24 | 0.0309827 | 0.0371278 | UNIT I | 2.4 | 23.0433 | 2.44819 | 1.93914 | -1.08345 | 0 | -1.08345 |
| 25 | 0.0309827 | 0.0135567 | UNIT I | 2.4 | 23.0433 | 16.5802 | 13.1327 | 25.2317 | 0 | 25.2317 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 0.825236

| 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 | 0.0309827 | 0.00680028 | UNIT I | 2.4 | 23.0433 | 0 | 0 | -13.4765 | 0 | -13.4765 |
| 2 | 0.0309827 | 0.0198916 | UNIT I | 2.4 | 23.0433 | 1.99294 | 1.64464 | -1.77577 | 0 | -1.77577 |
| 3 | 0.0309827 | 0.031985 | UNIT I | 2.4 | 23.0433 | 2.64003 | 2.17865 | -0.520375 | 0 | -0.520375 |
| 4 | 0.0309827 | 0.0431158 | UNIT I | 2.4 | 23.0433 | 2.74277 | 2.26343 | -0.321051 | 0 | -0.321051 |
| 5 | 0.0309827 | 0.0533101 | UNIT I | 2.4 | 23.0433 | 2.76232 | 2.27957 | -0.283125 | 0 | -0.283125 |
| 6 | 0.0309827 | 0.062586 | UNIT I | 2.4 | 23.0433 | 2.75123 | 2.27041 | -0.304655 | 0 | -0.304655 |
| 7 | 0.0309827 | 0.0709544 | UNIT I | 2.4 | 23.0433 | 2.71133 | 2.23749 | -0.382044 | 0 | -0.382044 |
| 8 | 0.0309827 | 0.0784193 | UNIT I | 2.4 | 23.0433 | 2.64458 | 2.1824 | -0.511551 | 0 | -0.511551 |
| 9 | 0.0309827 | 0.084978 | UNIT I | 2.4 | 23.0433 | 2.55296 | 2.1068 | -0.689295 | 0 | -0.689295 |
| 10 | 0.0309827 | 0.0906212 | UNIT I | 2.4 | 23.0433 | 2.43856 | 2.01239 | -0.911247 | 0 | -0.911247 |
| 11 | 0.0309827 | 0.0953321 | UNIT I | 2.4 | 23.0433 | 2.30352 | 1.90095 | -1.17323 | 0 | -1.17323 |
| 12 | 0.0309827 | 0.0990864 | UNIT I | 2.4 | 23.0433 | 2.1501 | 1.77434 | -1.47087 | 0 | -1.47087 |
| 13 | 0.0309827 | 0.101851 | UNIT I | 2.4 | 23.0433 | 1.98065 | 1.63451 | -1.79961 | 0 | -1.79961 |
| 14 | 0.0309827 | 0.103582 | UNIT I | 2.4 | 23.0433 | 1.79768 | 1.48351 | -2.15459 | 0 | -2.15459 |
| 15 | 0.0309827 | 0.104224 | UNIT I | 2.4 | 23.0433 | 1.60383 | 1.32354 | -2.53066 | 0 | -2.53066 |
| 16 | 0.0309827 | 0.103706 | UNIT I | 2.4 | 23.0433 | 1.40197 | 1.15696 | -2.92225 | 0 | -2.92225 |
| 17 | 0.0309827 | 0.101936 | UNIT I | 2.4 | 23.0433 | 1.19525 | 0.98636 | -3.32335 | 0 | -3.32335 |
| 18 | 0.0309827 | 0.0987992 | UNIT I | 2.4 | 23.0433 | 0.987087 | 0.81458 | -3.72717 | 0 | -3.72717 |
| 19 | 0.0309827 | 0.0941426 | UNIT I | 2.4 | 23.0433 | 0.781413 | 0.64485 | -4.12622 | 0 | -4.12622 |
| 20 | 0.0309827 | 0.0877645 | UNIT I | 2.4 | 23.0433 | 0.605948 | 0.50005 | -4.46659 | 0 | -4.46659 |
| 21 | 0.0309827 | 0.0793882 | UNIT I | 2.4 | 23.0433 | 3.64808 | 3.01053 | 1.4353 | 0 | 1.4353 |
| 22 | 0.0309827 | 0.0686191 | UNIT I | 2.4 | 23.0433 | 4.85799 | 4.00899 | 3.78257 | 0 | 3.78257 |
| 23 | 0.0309827 | 0.0548601 | UNIT I | 2.4 | 23.0433 | 1.3018 | 1.07429 | -3.11662 | 0 | -3.11662 |
| 24 | 0.0309827 | 0.0371278 | UNIT I | 2.4 | 23.0433 | 1.37751 | 1.13677 | -2.96973 | 0 | -2.96973 |
| 25 | 0.0309827 | 0.0135567 | UNIT I | 2.4 | 23.0433 | 22.9013 | 18.899 | 38.7878 | 0 | 38.7878 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.04503

| 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 | 1.91653 | 12.2293 | UNIT II | 4 | 23.0433 | 7.32729 | 7.65724 | 8.59781 | 0 | 8.59781 |
| 2 | 1.91653 | 36.1755 | UNIT II | 4 | 23.0433 | 13.1493 | 13.7414 | 22.9012 | 0 | 22.9012 |
| 3 | 1.91653 | 61.2709 | UNIT II | 4 | 23.0433 | 19.3993 | 20.2729 | 38.2561 | 0 | 38.2561 |
| 4 | 1.91653 | 85.3232 | UNIT II | 4 | 23.0433 | 25.3684 | 26.5107 | 52.9204 | 0 | 52.9204 |
| 5 | 1.74921 | 100.829 | UNIT II UNDER WT | 4 | 23.0433 | 30.0351 | 31.3876 | 66.9604 | 2.57462 | 64.3858 |
| 6 | 1.74921 | 113.131 | UNIT II UNDER WT | 4 | 23.0433 | 30.5641 | 31.9404 | 73.0741 | 7.38875 | 65.6854 |
| 7 | 1.74921 | 132.495 | UNIT II UNDER WT | 4 | 23.0433 | 46.4479 | 48.5394 | 116.244 | 11.5362 | 104.708 |
| 8 | 1.74921 | 161.845 | UNIT II UNDER WT | 4 | 23.0433 | 37.9701 | 39.6799 | 98.9026 | 15.0227 | 83.8799 |
| 9 | 1.74921 | 201.451 | UNIT II UNDER WT | 4 | 23.0433 | 43.7699 | 45.7409 | 115.98 | 17.8507 | 98.129 |
| 10 | 1.74921 | 228.121 | UNIT II UNDER WT | 4 | 23.0433 | 46.3151 | 48.4007 | 124.402 | 20.0194 | 104.382 |
| 11 | 1.74921 | 236.779 | UNIT II UNDER WT | 4 | 23.0433 | 44.9187 | 46.9414 | 122.477 | 21.5252 | 100.951 |
| 12 | 1.74921 | 237.109 | UNIT II UNDER WT | 4 | 23.0433 | 42.045 | 43.9383 | 116.252 | 22.361 | 93.8911 |
| 13 | 1.74921 | 233.722 | UNIT II UNDER WT | 4 | 23.0433 | 38.8872 | 40.6383 | 108.65 | 22.5165 | 86.1331 |
| 14 | 1.74921 | 231.571 | UNIT II UNDER WT | 4 | 23.0433 | 36.2796 | 37.9133 | 102.275 | 22.5478 | 79.727 |
| 15 | 1.74921 | 228.92 | UNIT II UNDER WT | 4 | 23.0433 | 33.7919 | 35.3136 | 96.4383 | 22.8233 | 73.615 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 1.74921 | 223.274 | UNIT II UNDER WT | 4 | 23.0433 | 31.4446 | 32.8605 | 90.2407 | 22.3922 | 67.8485 |
| 17 | 1.74921 | 211.212 | UNIT II UNDER WT | 4 | 23.0433 | 28.7007 | 29.9931 | 82.3354 | 21.228 | 61.1074 |
| 18 | 1.74921 | 206.857 | UNIT II UNDER WT | 4 | 23.0433 | 27.9379 | 29.1959 | 78.531 | 19.298 | 59.233 |
| 19 | 1.74921 | 207.186 | UNIT II UNDER WT | 4 | 23.0433 | 28.355 | 29.6318 | 76.8211 | 16.5631 | 60.258 |
| 20 | 1.74921 | 202.936 | UNIT II UNDER WT | 4 | 23.0433 | 29.1227 | 30.4341 | 75.1194 | 12.9754 | 62.144 |
| 21 | 1.74921 | 191.478 | UNIT II UNDER WT | 4 | 23.0433 | 28.8111 | 30.1085 | 69.8554 | 8.47674 | 61.3787 |
| 22 | 1.74921 | 156.801 | UNIT II UNDER WT | 4 | 23.0433 | 25.4517 | 26.5978 | 56.1212 | 2.99584 | 53.1253 |
| 23 | 2.24413 | 139.379 | UNIT II | 4 | 23.0433 | 19.2272 | 20.093 | 37.8331 | 0 | 37.8331 |
| 24 | 1.39686 | 48.6925 | UNIT I | 2.4 | 23.0433 | 10.89 | 11.3804 | 21.1122 | 0 | 21.1122 |
| 25 | 1.39686 | 16.668 | UNIT I | 2.4 | 23.0433 | 4.82315 | 5.04034 | 6.20719 | 0 | 6.20719 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -7.22118 | 1.56282 |
| 15.7129 | 5.65286 |
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

### External Boundary

| X | Y |
|---|---|
| 3.55263 | 5.94674 |
| 2.46637 | 5.95601 |
| 2.37408 | 5.97731 |
| 2.19776 | 5.96607 |
| 1.33058 | 5.75328 |
| 0.562161 | 5.61447 |
| -0.0303637 | 5.49417 |
| -0.539558 | 5.31833 |
| -1.58574 | 5.19803 |
| -2.70597 | 5.15175 |
| -3.32627 | 4.98518 |
| -5.4581 | 4.92122 |
| -5.8548 | 4.89919 |
| -6.3176 | 4.84044 |
| -7.22118 | 4.87717 |
| -7.22118 | 1.56282 |
| -7.22118 | -0.557959 |
| -7.22118 | -3.44395 |
| -7.22118 | -5.39909 |
| -4.18484 | -5.39909 |
| 49.9902 | -5.39909 |
| 49.9902 | 9.76285 |
| 49.9902 | 15.7927 |
| 49.9902 | 17.787 |
| 49.9902 | 19.9918 |
| 49.9902 | 23.8629 |
| 48.6865 | 23.1062 |
| 47.8664 | 22.7068 |
| 47.0674 | 22.2234 |
| 46.6258 | 21.7399 |

| | |
|---|---|
| 45.7847 | 21.3196 |
| 45.3851 | 20.8782 |
| 43.6609 | 17.8094 |
| 42.9761 | 16.0499 |
| 42.5174 | 15.4341 |
| 41.4521 | 14.3101 |
| 40.9932 | 14.0478 |
| 29.9354 | 14.2695 |
| 29.5681 | 14.2768 |
| 29.2838 | 14.2825 |
| 28.8436 | 14.2914 |
| 28.769 | 14.2914 |
| 28.0829 | 14.3066 |
| 27.4875 | 14.3186 |
| 27.4445 | 14.3168 |
| 27.2003 | 14.1883 |
| 26.5834 | 13.5717 |
| 25.7224 | 12.801 |
| 24.9899 | 12.3128 |
| 23.6437 | 11.6418 |
| 23.2984 | 11.5524 |
| 22.5311 | 11.4757 |
| 22.0195 | 11.2967 |
| 21.1116 | 11.2584 |
| 20.3826 | 11.1561 |
| 20.1707 | 11.093 |
| 19.7816 | 10.9771 |
| 18.907 | 10.8084 |
| 18.407 | 10.712 |
| 17.3761 | 10.5131 |
| 16.6293 | 10.2749 |
| 15.7792 | 10.2113 |
| 14.3889 | 10.0446 |
| 12.6085 | 9.87112 |
| 12.514 | 9.86192 |
| 12.2636 | 9.80476 |
| 11.6804 | 9.67161 |
| 11.5419 | 9.63999 |
| 11.1768 | 9.55661 |
| 9.645 | 9.226 |
| 9.40071 | 9.05704 |
| 8.67713 | 8.5566 |
| 7.9753 | 8.0712 |
| 7.25267 | 7.57141 |
| 6.52923 | 7.07106 |
| 6.279 | 6.898 |
| 6.15839 | 6.694 |
| 6.054 | 6.601 |
| 5.88 | 6.601 |
| 5.76991 | 6.664 |

## Material Boundary

| X | Y |
|---|---|
| 8.772 | 6.09843 |

| | |
|---|---|
| 31.5166 | 11.426 |

### Material Boundary

| X | Y |
|---|---|
| -7.22118 | -3.44395 |
| 14.9068 | 2.35905 |
| 31.5166 | 8.03905 |
| 40.9932 | 10.529 |
| 49.9902 | 15.7927 |

### Material Boundary

| X | Y |
|---|---|
| -4.18484 | -5.39909 |
| 49.9902 | 9.76285 |

### Material Boundary

| X | Y |
|---|---|
| -7.22118 | -0.557959 |
| 15.7129 | 5.65286 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| 3.55263 | 5.94674 |
| 5.76991 | 6.09843 |
| 5.76991 | 6.49459 |
| 5.76991 | 6.664 |

### Material Boundary

| X | Y |
|---|---|
| 5.76991 | 6.09843 |
| 6.27057 | 6.09843 |

### Material Boundary

| X | Y |
|---|---|
| 9.30584 | 8.08442 |
| 10.7916 | 8.08442 |

### Material Boundary

| X | Y |
|---|---|
| 9.80532 | 8.5566 |
| 10.1973 | 8.5566 |
| 10.3078 | 8.5566 |

### Material Boundary

| X | Y |
|---|---|
| 10.3078 | 8.5566 |
| 10.3078 | 8.6975 |

| | |
|---|---|
| 10.3078 | 8.91614 |
| 10.3078 | 9.05704 |

### Material Boundary

| X | Y |
|---|---|
| 10.3078 | 9.05704 |
| 10.4184 | 9.05704 |
| 10.7916 | 9.05704 |
| 10.7916 | 8.08442 |

### Material Boundary

| X | Y |
|---|---|
| 9.30584 | 8.08442 |
| 9.30584 | 8.5566 |
| 9.80532 | 8.5566 |

### Material Boundary

| X | Y |
|---|---|
| 7.27258 | 7.07106 |
| 7.77235 | 7.07106 |

### Material Boundary

| X | Y |
|---|---|
| 7.77235 | 7.07106 |
| 7.77235 | 7.57141 |

### Material Boundary

| X | Y |
|---|---|
| 7.77235 | 7.57141 |
| 8.272 | 7.57141 |

### Material Boundary

| X | Y |
|---|---|
| 8.272 | 7.57141 |
| 8.272 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 8.272 | 8.0712 |
| 8.661 | 8.0712 |
| 8.772 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 6.27057 | 6.09843 |
| 8.772 | 6.09843 |
| 8.772 | 7.93029 |
| 8.772 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 8.772 | 6.09843 |
| 10.7916 | 8.08442 |
| 11.0694 | 8.35766 |
| 11.7807 | 9.05704 |
| 12.6085 | 9.87112 |

### Material Boundary

| X | Y |
|---|---|
| 6.27057 | 6.09843 |
| 6.27057 | 6.57061 |
| 6.77005 | 6.57061 |
| 6.77005 | 7.07106 |
| 7.27258 | 7.07106 |

### Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 19.9918 |

### Material Boundary

| X | Y |
|---|---|
| 40.9932 | 12.499 |
| 49.9902 | 17.787 |

### Material Boundary

| X | Y |
|---|---|
| 31.5166 | 11.426 |
| 40.9932 | 12.499 |

### Material Boundary

| X | Y |
|---|---|
| -7.22118 | 1.56282 |
| 15.7129 | 5.65286 |

### Material Boundary

| X | Y |
|---|---|
| 8.772 | 8.0712 |
| 9.30584 | 8.08442 |

### Material Boundary

| X | Y |
|---|---|
| 10.7916 | 9.05704 |
| 11.7807 | 9.05704 |

### Material Boundary

| X | Y |
|---|---|
| 7.25267 | 7.57141 |
| 7.77235 | 7.57141 |

### Material Boundary

| X | Y |
|---|---|
| 7.9753 | 8.0712 |
| 8.272 | 8.0712 |

### Material Boundary

| X | Y |
|---|---|
| 8.67713 | 8.5566 |
| 9.30584 | 8.5566 |

### Material Boundary

| X | Y |
|---|---|
| 9.40071 | 9.05704 |
| 10.3078 | 9.05704 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 25.8179 | 12.8466 |
| 28.0829 | 14.3066 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 28.8436 | 14.2914 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 29.2838 | 14.2825 |

### Material Boundary

| X | Y |
|---|---|
| 24.9899 | 12.3128 |
| 29.5681 | 14.2768 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.IMPR S60Λ-SLIDE ST + XΩM ROAD
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/3/2021, 20:34:28

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT | AIR |
|---|---|---|---|---|---|---|
| Color | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | No strength |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 | 0.001 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 | |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 | |
| Water Surface | None | None | Water Table | Water Table | Water Table | None |
| Hu Value | | | 1 | 1 | 1 | |
| Ru Value | 0 | 0 | | | | 0 |

## Global Minimums

### Method: ordinary/fellenius

FS: 1.650500
Center: 15.472, 57.606
Radius: 11.105
Left Slip Surface Endpoint: 13.844, 46.621
Right Slip Surface Endpoint: 24.459, 51.082
Resisting Moment=1628.91 kN-m
Driving Moment=986.922 kN-m

### Method: bishop simplified

FS: 1.739040
Center: 15.472, 57.606
Radius: 11.105
Left Slip Surface Endpoint: 13.844, 46.621
Right Slip Surface Endpoint: 24.459, 51.082
Resisting Moment=1716.3 kN-m
Driving Moment=986.922 kN-m

### Method: janbu simplified

FS: 1.634870
Center: 15.472, 57.606
Radius: 11.105

Left Slip Surface Endpoint: 13.844, 46.621
Right Slip Surface Endpoint: 24.459, 51.082
Resisting Horizontal Force=136.568 kN
Driving Horizontal Force=83.5347 kN

### Method: janbu corrected

FS: 1.726740
Center: 15.472, 57.606
Radius: 11.105
Left Slip Surface Endpoint: 13.844, 46.621
Right Slip Surface Endpoint: 24.459, 51.082
Resisting Horizontal Force=144.243 kN
Driving Horizontal Force=83.5347 kN

### Method: spencer

FS: 1.737360
Center: 15.472, 57.606
Radius: 11.105
Left Slip Surface Endpoint: 13.844, 46.621
Right Slip Surface Endpoint: 24.459, 51.082
Resisting Moment=1714.64 kN-m
Driving Moment=986.922 kN-m
Resisting Horizontal Force=138.337 kN
Driving Horizontal Force=79.6248 kN

### Method: corp of eng#1

FS: 1.181320
Center: 20.758, 49.781
Radius: 0.362
Left Slip Surface Endpoint: 20.569, 49.472
Right Slip Surface Endpoint: 21.117, 49.737
Left Slope Intercept: 20.569 50.179
Right Slope Intercept: 21.117 50.574
Resisting Horizontal Force=2.5102 kN
Driving Horizontal Force=2.12491 kN

### Method: corp of eng#2

FS: 1.049930
Center: 20.758, 49.781
Radius: 0.362
Left Slip Surface Endpoint: 20.569, 49.472
Right Slip Surface Endpoint: 21.117, 49.737
Left Slope Intercept: 20.569 50.179
Right Slope Intercept: 21.117 50.574
Resisting Horizontal Force=3.12923 kN
Driving Horizontal Force=2.98042 kN

### Method: lowe-karafiath

FS: 1.745400
Center: 15.472, 57.606
Radius: 11.105
Left Slip Surface Endpoint: 13.844, 46.621
Right Slip Surface Endpoint: 24.459, 51.082
Resisting Horizontal Force=138.436 kN
Driving Horizontal Force=79.3147 kN

### Method: gle/morgenstern-price

FS: 1.736300
Center: 15.472, 57.606
Radius: 11.105
Left Slip Surface Endpoint: 13.844, 46.621
Right Slip Surface Endpoint: 24.459, 51.082
Resisting Moment=1713.6 kN-m
Driving Moment=986.922 kN-m
Resisting Horizontal Force=138.314 kN
Driving Horizontal Force=79.6602 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 9538
Number of Invalid Surfaces: 462

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 208 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 9536
Number of Invalid Surfaces: 464

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 210 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 9367
Number of Invalid Surfaces: 633

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 379 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 9367
Number of Invalid Surfaces: 633

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 379 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: spencer

Number of Valid Surfaces: 9264
Number of Invalid Surfaces: 736

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 390 surfaces
Error Code -111 reported for 92 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 8958
Number of Invalid Surfaces: 1042

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 409 surfaces
Error Code -111 reported for 379 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 8205
Number of Invalid Surfaces: 1795

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 1010 surfaces
Error Code -111 reported for 531 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 4793
Number of Invalid Surfaces: 5207

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces

Error Code -108 reported for 4105 surfaces
Error Code -111 reported for 848 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 9281
Number of Invalid Surfaces: 719

### Error Codes:

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 394 surfaces
Error Code -111 reported for 71 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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).
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.6505

| 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 | 0.424598 | 0.610003 | UNIT I | 3 | 28 | 2.27293 | 3.75147 | 1.4133 | 0 | 1.4133 |
| 2 | 0.424598 | 1.76333 | UNIT I | 3 | 28 | 3.14484 | 5.19056 | 4.11984 | 0 | 4.11984 |
| 3 | 0.424598 | 2.97543 | UNIT I | 3 | 28 | 4.06927 | 6.71633 | 6.98941 | 0 | 6.98941 |
| 4 | 0.424598 | 4.52516 | UNIT I | 3 | 28 | 5.2504 | 8.66578 | 10.6558 | 0 | 10.6558 |
| 5 | 0.424598 | 5.96522 | UNIT I | 3 | 28 | 6.34062 | 10.4652 | 14.04 | 0 | 14.04 |
| 6 | 0.424598 | 7.27406 | UNIT I | 3 | 28 | 7.31422 | 12.0721 | 17.0622 | 0 | 17.0622 |
| 7 | 0.424598 | 8.45102 | UNIT I | 3 | 28 | 8.16298 | 13.473 | 19.6968 | 0 | 19.6968 |
| 8 | 0.424598 | 9.49481 | UNIT I | 3 | 28 | 8.87998 | 14.6564 | 21.9225 | 0 | 21.9225 |
| 9 | 0.424598 | 10.4151 | UNIT I | 3 | 28 | 9.46822 | 15.6273 | 23.7486 | 0 | 23.7486 |
| 10 | 0.424598 | 11.3378 | UNIT I | 3 | 28 | 10.0161 | 16.5315 | 25.4491 | 0 | 25.4491 |
| 11 | 0.424598 | 12.1608 | UNIT I | 3 | 28 | 10.4448 | 17.2391 | 26.7799 | 0 | 26.7799 |
| 12 | 0.424598 | 12.8387 | UNIT I | 3 | 28 | 10.7216 | 17.696 | 27.6391 | 0 | 27.6391 |
| 13 | 0.424598 | 13.3666 | UNIT I | 3 | 28 | 10.8454 | 17.9004 | 28.0235 | 0 | 28.0235 |
| 14 | 0.424598 | 13.7383 | UNIT I | 3 | 28 | 10.817 | 17.8535 | 27.9355 | 0 | 27.9355 |
| 15 | 0.424598 | 13.9465 | UNIT I | 3 | 28 | 10.6388 | 17.5593 | 27.3821 | 0 | 27.3821 |
| 16 | 0.424598 | 13.9822 | UNIT I | 3 | 28 | 10.3149 | 17.0247 | 26.3766 | 0 | 26.3766 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0.424598 | 13.8348 | UNIT I | 3 | 28 | 9.85174 | 16.2603 | 24.939 | 0 | 24.939 |
| 18 | 0.424598 | 13.4912 | UNIT I | 3 | 28 | 9.25798 | 15.2803 | 23.0958 | 0 | 23.0958 |
| 19 | 0.424598 | 12.9356 | UNIT I | 3 | 28 | 8.5448 | 14.1032 | 20.882 | 0 | 20.882 |
| 20 | 0.424598 | 12.1482 | UNIT I | 3 | 28 | 7.72628 | 12.7522 | 18.3413 | 0 | 18.3413 |
| 21 | 0.424598 | 11.1043 | UNIT I | 3 | 28 | 6.82 | 11.2564 | 15.528 | 0 | 15.528 |
| 22 | 0.424598 | 9.77244 | UNIT I | 3 | 28 | 5.84746 | 9.65123 | 12.5092 | 0 | 12.5092 |
| 23 | 0.424598 | 8.11105 | UNIT I | 3 | 28 | 4.83507 | 7.98029 | 9.36655 | 0 | 9.36655 |
| 24 | 0.424598 | 5.93371 | UNIT I | 3 | 28 | 3.77237 | 6.2263 | 6.06778 | 0 | 6.06778 |
| 25 | 0.424598 | 2.15156 | UNIT I | 3 | 28 | 2.42996 | 4.01065 | 1.90074 | 0 | 1.90074 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.73904

| 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 | 0.424598 | 0.610003 | UNIT I | 3 | 28 | 2.25285 | 3.91779 | 1.72611 | 0 | 1.72611 |
| 2 | 0.424598 | 1.76333 | UNIT I | 3 | 28 | 3.07918 | 5.35481 | 4.42876 | 0 | 4.42876 |
| 3 | 0.424598 | 2.97543 | UNIT I | 3 | 28 | 3.92902 | 6.83272 | 7.2083 | 0 | 7.2083 |
| 4 | 0.424598 | 4.52516 | UNIT I | 3 | 28 | 5.00317 | 8.70072 | 10.7215 | 0 | 10.7215 |
| 5 | 0.424598 | 5.96522 | UNIT I | 3 | 28 | 5.97412 | 10.3892 | 13.8972 | 0 | 13.8972 |
| 6 | 0.424598 | 7.27406 | UNIT I | 3 | 28 | 6.8299 | 11.8775 | 16.6961 | 0 | 16.6961 |
| 7 | 0.424598 | 8.45102 | UNIT I | 3 | 28 | 7.57349 | 13.1706 | 19.1281 | 0 | 19.1281 |
| 8 | 0.424598 | 9.49481 | UNIT I | 3 | 28 | 8.20723 | 14.2727 | 21.2008 | 0 | 21.2008 |
| 9 | 0.424598 | 10.4151 | UNIT I | 3 | 28 | 8.74068 | 15.2004 | 22.9456 | 0 | 22.9456 |
| 10 | 0.424598 | 11.3378 | UNIT I | 3 | 28 | 9.26137 | 16.1059 | 24.6485 | 0 | 24.6485 |
| 11 | 0.424598 | 12.1608 | UNIT I | 3 | 28 | 9.70064 | 16.8698 | 26.0853 | 0 | 26.0853 |
| 12 | 0.424598 | 12.8387 | UNIT I | 3 | 28 | 10.0305 | 17.4434 | 27.1639 | 0 | 27.1639 |
| 13 | 0.424598 | 13.3666 | UNIT I | 3 | 28 | 10.2503 | 17.8256 | 27.8829 | 0 | 27.8829 |
| 14 | 0.424598 | 13.7383 | UNIT I | 3 | 28 | 10.3589 | 18.0145 | 28.2382 | 0 | 28.2382 |
| 15 | 0.424598 | 13.9465 | UNIT I | 3 | 28 | 10.3545 | 18.0069 | 28.224 | 0 | 28.224 |
| 16 | 0.424598 | 13.9822 | UNIT I | 3 | 28 | 10.2347 | 17.7986 | 27.8323 | 0 | 27.8323 |
| 17 | 0.424598 | 13.8348 | UNIT I | 3 | 28 | 9.99638 | 17.3841 | 27.0526 | 0 | 27.0526 |
| 18 | 0.424598 | 13.4912 | UNIT I | 3 | 28 | 9.63537 | 16.7563 | 25.8718 | 0 | 25.8718 |
| 19 | 0.424598 | 12.9356 | UNIT I | 3 | 28 | 9.14666 | 15.9064 | 24.2734 | 0 | 24.2734 |
| 20 | 0.424598 | 12.1482 | UNIT I | 3 | 28 | 8.52401 | 14.8236 | 22.237 | 0 | 22.237 |
| 21 | 0.424598 | 11.1043 | UNIT I | 3 | 28 | 7.75997 | 13.4949 | 19.738 | 0 | 19.738 |
| 22 | 0.424598 | 9.77244 | UNIT I | 3 | 28 | 6.84531 | 11.9043 | 16.7465 | 0 | 16.7465 |
| 23 | 0.424598 | 8.11105 | UNIT I | 3 | 28 | 5.76873 | 10.0321 | 13.2254 | 0 | 13.2254 |
| 24 | 0.424598 | 5.93371 | UNIT I | 3 | 28 | 4.44687 | 7.73329 | 8.90201 | 0 | 8.90201 |
| 25 | 0.424598 | 2.15156 | UNIT I | 3 | 28 | 2.34831 | 4.08381 | 2.03834 | 0 | 2.03834 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.63487

| 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 | 0.424598 | 0.610003 | UNIT I | 3 | 28 | 2.40277 | 3.92822 | 1.74573 | 0 | 1.74573 |
| 2 | 0.424598 | 1.76333 | UNIT I | 3 | 28 | 3.28138 | 5.36463 | 4.44722 | 0 | 4.44722 |
| 3 | 0.424598 | 2.97543 | UNIT I | 3 | 28 | 4.18368 | 6.83977 | 7.22156 | 0 | 7.22156 |
| 4 | 0.424598 | 4.52516 | UNIT I | 3 | 28 | 5.32332 | 8.70294 | 10.7257 | 0 | 10.7257 |
| 5 | 0.424598 | 5.96522 | UNIT I | 3 | 28 | 6.3516 | 10.384 | 13.8874 | 0 | 13.8874 |
| 6 | 0.424598 | 7.27406 | UNIT I | 3 | 28 | 7.25607 | 11.8627 | 16.6684 | 0 | 16.6684 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 0.424598 | 8.45102 | UNIT I | 3 | 28 | 8.04021 | 13.1447 | 19.0794 | 0 | 19.0794 |
| 8 | 0.424598 | 9.49481 | UNIT I | 3 | 28 | 8.70669 | 14.2343 | 21.1287 | 0 | 21.1287 |
| 9 | 0.424598 | 10.4151 | UNIT I | 3 | 28 | 9.266 | 15.1487 | 22.8484 | 0 | 22.8484 |
| 10 | 0.424598 | 11.3378 | UNIT I | 3 | 28 | 9.81099 | 16.0397 | 24.5241 | 0 | 24.5241 |
| 11 | 0.424598 | 12.1608 | UNIT I | 3 | 28 | 10.269 | 16.7885 | 25.9325 | 0 | 25.9325 |
| 12 | 0.424598 | 12.8387 | UNIT I | 3 | 28 | 10.6105 | 17.3468 | 26.9825 | 0 | 26.9825 |
| 13 | 0.424598 | 13.3666 | UNIT I | 3 | 28 | 10.8352 | 17.7141 | 27.6731 | 0 | 27.6731 |
| 14 | 0.424598 | 13.7383 | UNIT I | 3 | 28 | 10.9418 | 17.8885 | 28.0012 | 0 | 28.0012 |
| 15 | 0.424598 | 13.9465 | UNIT I | 3 | 28 | 10.929 | 17.8675 | 27.9616 | 0 | 27.9616 |
| 16 | 0.424598 | 13.9822 | UNIT I | 3 | 28 | 10.7942 | 17.6471 | 27.5473 | 0 | 27.5473 |
| 17 | 0.424598 | 13.8348 | UNIT I | 3 | 28 | 10.5343 | 17.2222 | 26.7481 | 0 | 26.7481 |
| 18 | 0.424598 | 13.4912 | UNIT I | 3 | 28 | 10.1453 | 16.5863 | 25.5521 | 0 | 25.5521 |
| 19 | 0.424598 | 12.9356 | UNIT I | 3 | 28 | 9.62223 | 15.7311 | 23.9437 | 0 | 23.9437 |
| 20 | 0.424598 | 12.1482 | UNIT I | 3 | 28 | 8.95888 | 14.6466 | 21.904 | 0 | 21.904 |
| 21 | 0.424598 | 11.1043 | UNIT I | 3 | 28 | 8.14768 | 13.3204 | 19.4098 | 0 | 19.4098 |
| 22 | 0.424598 | 9.77244 | UNIT I | 3 | 28 | 7.17945 | 11.7375 | 16.4328 | 0 | 16.4328 |
| 23 | 0.424598 | 8.11105 | UNIT I | 3 | 28 | 6.04306 | 9.87961 | 12.9387 | 0 | 12.9387 |
| 24 | 0.424598 | 5.93371 | UNIT I | 3 | 28 | 4.65206 | 7.60552 | 8.66173 | 0 | 8.66173 |
| 25 | 0.424598 | 2.15156 | UNIT I | 3 | 28 | 2.45287 | 4.01013 | 1.89978 | 0 | 1.89978 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.72674

| 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 | 0.424598 | 0.610003 | UNIT I | 3 | 28 | 2.27494 | 3.92822 | 1.74573 | 0 | 1.74573 |
| 2 | 0.424598 | 1.76333 | UNIT I | 3 | 28 | 3.1068 | 5.36463 | 4.44722 | 0 | 4.44722 |
| 3 | 0.424598 | 2.97543 | UNIT I | 3 | 28 | 3.96109 | 6.83977 | 7.22156 | 0 | 7.22156 |
| 4 | 0.424598 | 4.52516 | UNIT I | 3 | 28 | 5.0401 | 8.70294 | 10.7257 | 0 | 10.7257 |
| 5 | 0.424598 | 5.96522 | UNIT I | 3 | 28 | 6.01367 | 10.384 | 13.8874 | 0 | 13.8874 |
| 6 | 0.424598 | 7.27406 | UNIT I | 3 | 28 | 6.87002 | 11.8627 | 16.6684 | 0 | 16.6684 |
| 7 | 0.424598 | 8.45102 | UNIT I | 3 | 28 | 7.61244 | 13.1447 | 19.0794 | 0 | 19.0794 |
| 8 | 0.424598 | 9.49481 | UNIT I | 3 | 28 | 8.24345 | 14.2343 | 21.1287 | 0 | 21.1287 |
| 9 | 0.424598 | 10.4151 | UNIT I | 3 | 28 | 8.77301 | 15.1487 | 22.8484 | 0 | 22.8484 |
| 10 | 0.424598 | 11.3378 | UNIT I | 3 | 28 | 9.28901 | 16.0397 | 24.5241 | 0 | 24.5241 |
| 11 | 0.424598 | 12.1608 | UNIT I | 3 | 28 | 9.72266 | 16.7885 | 25.9325 | 0 | 25.9325 |
| 12 | 0.424598 | 12.8387 | UNIT I | 3 | 28 | 10.046 | 17.3468 | 26.9825 | 0 | 26.9825 |
| 13 | 0.424598 | 13.3666 | UNIT I | 3 | 28 | 10.2587 | 17.7141 | 27.6731 | 0 | 27.6731 |
| 14 | 0.424598 | 13.7383 | UNIT I | 3 | 28 | 10.3597 | 17.8885 | 28.0012 | 0 | 28.0012 |
| 15 | 0.424598 | 13.9465 | UNIT I | 3 | 28 | 10.3475 | 17.8675 | 27.9616 | 0 | 27.9616 |
| 16 | 0.424598 | 13.9822 | UNIT I | 3 | 28 | 10.2199 | 17.6471 | 27.5473 | 0 | 27.5473 |
| 17 | 0.424598 | 13.8348 | UNIT I | 3 | 28 | 9.97382 | 17.2222 | 26.7481 | 0 | 26.7481 |
| 18 | 0.424598 | 13.4912 | UNIT I | 3 | 28 | 9.60556 | 16.5863 | 25.5521 | 0 | 25.5521 |
| 19 | 0.424598 | 12.9356 | UNIT I | 3 | 28 | 9.11029 | 15.7311 | 23.9437 | 0 | 23.9437 |
| 20 | 0.424598 | 12.1482 | UNIT I | 3 | 28 | 8.48223 | 14.6466 | 21.904 | 0 | 21.904 |
| 21 | 0.424598 | 11.1043 | UNIT I | 3 | 28 | 7.71419 | 13.3204 | 19.4098 | 0 | 19.4098 |
| 22 | 0.424598 | 9.77244 | UNIT I | 3 | 28 | 6.79747 | 11.7375 | 16.4328 | 0 | 16.4328 |
| 23 | 0.424598 | 8.11105 | UNIT I | 3 | 28 | 5.72154 | 9.87961 | 12.9387 | 0 | 12.9387 |
| 24 | 0.424598 | 5.93371 | UNIT I | 3 | 28 | 4.40455 | 7.60552 | 8.66173 | 0 | 8.66173 |
| 25 | 0.424598 | 2.15156 | UNIT I | 3 | 28 | 2.32237 | 4.01013 | 1.89978 | 0 | 1.89978 |

**Global Minimum Query (spencer) - Safety Factor**: 1.73736

| 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 | 0.424598 | 0.610003 | UNIT I | 3 | 28 | 2.64603 | 4.59711 | 3.00374 | 0 | 3.00374 |
| 2 | 0.424598 | 1.76333 | UNIT I | 3 | 28 | 3.61534 | 6.28114 | 6.17091 | 0 | 6.17091 |
| 3 | 0.424598 | 2.97543 | UNIT I | 3 | 28 | 4.57344 | 7.94571 | 9.30152 | 0 | 9.30152 |
| 4 | 0.424598 | 4.52516 | UNIT I | 3 | 28 | 5.75326 | 9.99548 | 13.1566 | 0 | 13.1566 |
| 5 | 0.424598 | 5.96522 | UNIT I | 3 | 28 | 6.7727 | 11.7666 | 16.4876 | 0 | 16.4876 |
| 6 | 0.424598 | 7.27406 | UNIT I | 3 | 28 | 7.62778 | 13.2522 | 19.2816 | 0 | 19.2816 |
| 7 | 0.424598 | 8.45102 | UNIT I | 3 | 28 | 8.33074 | 14.4735 | 21.5784 | 0 | 21.5784 |
| 8 | 0.424598 | 9.49481 | UNIT I | 3 | 28 | 8.89182 | 15.4483 | 23.4118 | 0 | 23.4118 |
| 9 | 0.424598 | 10.4151 | UNIT I | 3 | 28 | 9.3276 | 16.2054 | 24.8356 | 0 | 24.8356 |
| 10 | 0.424598 | 11.3378 | UNIT I | 3 | 28 | 9.72781 | 16.9007 | 26.1434 | 0 | 26.1434 |
| 11 | 0.424598 | 12.1608 | UNIT I | 3 | 28 | 10.0291 | 17.4241 | 27.1279 | 0 | 27.1279 |
| 12 | 0.424598 | 12.8387 | UNIT I | 3 | 28 | 10.2065 | 17.7324 | 27.7077 | 0 | 27.7077 |
| 13 | 0.424598 | 13.3666 | UNIT I | 3 | 28 | 10.2067 | 17.7327 | 27.7082 | 0 | 27.7082 |
| 14 | 0.424598 | 13.7383 | UNIT I | 3 | 28 | 10.1185 | 17.5794 | 27.42 | 0 | 27.42 |
| 15 | 0.424598 | 13.9465 | UNIT I | 3 | 28 | 9.94566 | 17.2792 | 26.8553 | 0 | 26.8553 |
| 16 | 0.424598 | 13.9822 | UNIT I | 3 | 28 | 9.70213 | 16.8561 | 26.0596 | 0 | 26.0596 |
| 17 | 0.424598 | 13.8348 | UNIT I | 3 | 28 | 9.32346 | 16.1982 | 24.8222 | 0 | 24.8222 |
| 18 | 0.424598 | 13.4912 | UNIT I | 3 | 28 | 8.92958 | 15.5139 | 23.5351 | 0 | 23.5351 |
| 19 | 0.424598 | 12.9356 | UNIT I | 3 | 28 | 8.54486 | 14.8455 | 22.2781 | 0 | 22.2781 |
| 20 | 0.424598 | 12.1482 | UNIT I | 3 | 28 | 8.06937 | 14.0194 | 20.7245 | 0 | 20.7245 |
| 21 | 0.424598 | 11.1043 | UNIT I | 3 | 28 | 7.25482 | 12.6042 | 18.0629 | 0 | 18.0629 |
| 22 | 0.424598 | 9.77244 | UNIT I | 3 | 28 | 6.30282 | 10.9503 | 14.9523 | 0 | 14.9523 |
| 23 | 0.424598 | 8.11105 | UNIT I | 3 | 28 | 5.2523 | 9.12514 | 11.5197 | 0 | 11.5197 |
| 24 | 0.424598 | 5.93371 | UNIT I | 3 | 28 | 4.05015 | 7.03656 | 7.59167 | 0 | 7.59167 |
| 25 | 0.424598 | 2.15156 | UNIT I | 3 | 28 | 2.32791 | 4.04441 | 1.96425 | 0 | 1.96425 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.18132

| 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 | 0.0219285 | 0.00479056 | UNIT I | 3 | 28 | 0 | 0 | -75.0504 | 0 | -75.0504 |
| 2 | 0.0219285 | 0.0139451 | UNIT I | 3 | 28 | 5.46127 | 6.45151 | 6.49134 | 0 | 6.49134 |
| 3 | 0.0219285 | 0.0223449 | UNIT I | 3 | 28 | 5.1612 | 6.09703 | 5.82466 | 0 | 5.82466 |
| 4 | 0.0219285 | 0.0300531 | UNIT I | 3 | 28 | 4.95037 | 5.84797 | 5.35624 | 0 | 5.35624 |
| 5 | 0.0219285 | 0.0371167 | UNIT I | 3 | 28 | 4.78893 | 5.65726 | 4.99759 | 0 | 4.99759 |
| 6 | 0.0219285 | 0.0435706 | UNIT I | 3 | 28 | 4.6556 | 5.49975 | 4.70134 | 0 | 4.70134 |
| 7 | 0.0219285 | 0.0494397 | UNIT I | 3 | 28 | 4.53821 | 5.36108 | 4.44056 | 0 | 4.44056 |
| 8 | 0.0219285 | 0.054741 | UNIT I | 3 | 28 | 4.42943 | 5.23258 | 4.19887 | 0 | 4.19887 |
| 9 | 0.0219285 | 0.0594846 | UNIT I | 3 | 28 | 4.32458 | 5.10871 | 3.9659 | 0 | 3.9659 |
| 10 | 0.0219285 | 0.0636743 | UNIT I | 3 | 28 | 4.22052 | 4.98578 | 3.7347 | 0 | 3.7347 |
| 11 | 0.0219285 | 0.0673074 | UNIT I | 3 | 28 | 4.11506 | 4.8612 | 3.50041 | 0 | 3.50041 |
| 12 | 0.0219285 | 0.0703753 | UNIT I | 3 | 28 | 4.00659 | 4.73307 | 3.25943 | 0 | 3.25943 |
| 13 | 0.0219285 | 0.0728622 | UNIT I | 3 | 28 | 3.89385 | 4.59988 | 3.00893 | 0 | 3.00893 |
| 14 | 0.0219285 | 0.0747449 | UNIT I | 3 | 28 | 3.77573 | 4.46035 | 2.74653 | 0 | 2.74653 |
| 15 | 0.0219285 | 0.0759906 | UNIT I | 3 | 28 | 3.6513 | 4.31335 | 2.47006 | 0 | 2.47006 |
| 16 | 0.0219285 | 0.076555 | UNIT I | 3 | 28 | 3.51958 | 4.15775 | 2.17741 | 0 | 2.17741 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0.0219285 | 0.0763784 | UNIT I | 3 | 28 | 3.37956 | 3.99234 | 1.86632 | 0 | 1.86632 |
| 18 | 0.0219285 | 0.0753799 | UNIT I | 3 | 28 | 3.23008 | 3.81576 | 1.53423 | 0 | 1.53423 |
| 19 | 0.0219285 | 0.073448 | UNIT I | 3 | 28 | 3.06975 | 3.62636 | 1.178 | 0 | 1.178 |
| 20 | 0.0219285 | 0.0704244 | UNIT I | 3 | 28 | 2.89672 | 3.42195 | 0.79358 | 0 | 0.79358 |
| 21 | 0.0219285 | 0.0660725 | UNIT I | 3 | 28 | 2.70844 | 3.19954 | 0.375274 | 0 | 0.375274 |
| 22 | 0.0219285 | 0.0600131 | UNIT I | 3 | 28 | 2.50098 | 2.95446 | -0.0856455 | 0 | -0.0856455 |
| 23 | 0.0219285 | 0.0515618 | UNIT I | 3 | 28 | 2.26738 | 2.6785 | -0.604654 | 0 | -0.604654 |
| 24 | 0.0219285 | 0.0391827 | UNIT I | 3 | 28 | 2.03109 | 2.39937 | -1.12962 | 0 | -1.12962 |
| 25 | 0.0219285 | 0.0158787 | UNIT I | 3 | 28 | 9.32578 | 11.0167 | 15.0773 | 0 | 15.0773 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.04993

| 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 | 0.0219285 | 0.00479056 | UNIT I | 3 | 28 | 0 | 0 | -137.546 | 0 | -137.546 |
| 2 | 0.0219285 | 0.0139451 | UNIT I | 3 | 28 | 12.2731 | 12.8859 | 18.5926 | 0 | 18.5926 |
| 3 | 0.0219285 | 0.0223449 | UNIT I | 3 | 28 | 10.1687 | 10.6764 | 14.4373 | 0 | 14.4373 |
| 4 | 0.0219285 | 0.0300531 | UNIT I | 3 | 28 | 8.7785 | 9.21681 | 11.6921 | 0 | 11.6921 |
| 5 | 0.0219285 | 0.0371167 | UNIT I | 3 | 28 | 7.80762 | 8.19745 | 9.77499 | 0 | 9.77499 |
| 6 | 0.0219285 | 0.0435706 | UNIT I | 3 | 28 | 7.0958 | 7.45009 | 8.3694 | 0 | 8.3694 |
| 7 | 0.0219285 | 0.0494397 | UNIT I | 3 | 28 | 6.5506 | 6.87767 | 7.29283 | 0 | 7.29283 |
| 8 | 0.0219285 | 0.054741 | UNIT I | 3 | 28 | 6.11599 | 6.42136 | 6.43466 | 0 | 6.43466 |
| 9 | 0.0219285 | 0.0594846 | UNIT I | 3 | 28 | 5.75658 | 6.04401 | 5.72493 | 0 | 5.72493 |
| 10 | 0.0219285 | 0.0636743 | UNIT I | 3 | 28 | 5.44917 | 5.72125 | 5.11791 | 0 | 5.11791 |
| 11 | 0.0219285 | 0.0673074 | UNIT I | 3 | 28 | 5.1781 | 5.43664 | 4.58265 | 0 | 4.58265 |
| 12 | 0.0219285 | 0.0703753 | UNIT I | 3 | 28 | 4.93243 | 5.17871 | 4.09755 | 0 | 4.09755 |
| 13 | 0.0219285 | 0.0728622 | UNIT I | 3 | 28 | 4.70439 | 4.93928 | 3.64725 | 0 | 3.64725 |
| 14 | 0.0219285 | 0.0747449 | UNIT I | 3 | 28 | 4.48821 | 4.71231 | 3.22038 | 0 | 3.22038 |
| 15 | 0.0219285 | 0.0759906 | UNIT I | 3 | 28 | 4.27954 | 4.49322 | 2.80834 | 0 | 2.80834 |
| 16 | 0.0219285 | 0.076555 | UNIT I | 3 | 28 | 4.07493 | 4.27839 | 2.40429 | 0 | 2.40429 |
| 17 | 0.0219285 | 0.0763784 | UNIT I | 3 | 28 | 3.87148 | 4.06478 | 2.00255 | 0 | 2.00255 |
| 18 | 0.0219285 | 0.0753799 | UNIT I | 3 | 28 | 3.66658 | 3.84965 | 1.59796 | 0 | 1.59796 |
| 19 | 0.0219285 | 0.073448 | UNIT I | 3 | 28 | 3.45759 | 3.63023 | 1.18529 | 0 | 1.18529 |
| 20 | 0.0219285 | 0.0704244 | UNIT I | 3 | 28 | 3.24141 | 3.40326 | 0.758418 | 0 | 0.758418 |
| 21 | 0.0219285 | 0.0660725 | UNIT I | 3 | 28 | 3.01367 | 3.16414 | 0.308705 | 0 | 0.308705 |
| 22 | 0.0219285 | 0.0600131 | UNIT I | 3 | 28 | 2.76686 | 2.90501 | -0.178645 | 0 | -0.178645 |
| 23 | 0.0219285 | 0.0515618 | UNIT I | 3 | 28 | 3.13775 | 3.29442 | 0.553716 | 0 | 0.553716 |
| 24 | 0.0219285 | 0.0391827 | UNIT I | 3 | 28 | 3.17479 | 3.33331 | 0.626863 | 0 | 0.626863 |
| 25 | 0.0219285 | 0.0158787 | UNIT I | 3 | 28 | 11.9319 | 12.5277 | 17.9189 | 0 | 17.9189 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.7454

| 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 | 0.424598 | 0.610003 | UNIT I | 3 | 28 | 2.29077 | 3.99831 | 1.87754 | 0 | 1.87754 |
| 2 | 0.424598 | 1.76333 | UNIT I | 3 | 28 | 3.24063 | 5.65619 | 4.99557 | 0 | 4.99557 |
| 3 | 0.424598 | 2.97543 | UNIT I | 3 | 28 | 4.29857 | 7.50273 | 8.46841 | 0 | 8.46841 |
| 4 | 0.424598 | 4.52516 | UNIT I | 3 | 28 | 5.44468 | 9.50315 | 12.2306 | 0 | 12.2306 |
| 5 | 0.424598 | 5.96522 | UNIT I | 3 | 28 | 6.47161 | 11.2955 | 15.6016 | 0 | 15.6016 |
| 6 | 0.424598 | 7.27406 | UNIT I | 3 | 28 | 7.40348 | 12.922 | 18.6606 | 0 | 18.6606 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 0.424598 | 8.45102 | UNIT I | 3 | 28 | 8.19967 | 14.3117 | 21.2742 | 0 | 21.2742 |
| 8 | 0.424598 | 9.49481 | UNIT I | 3 | 28 | 9.05076 | 15.7972 | 24.068 | 0 | 24.068 |
| 9 | 0.424598 | 10.4151 | UNIT I | 3 | 28 | 10.0128 | 17.4763 | 27.2258 | 0 | 27.2258 |
| 10 | 0.424598 | 11.3378 | UNIT I | 3 | 28 | 10.3613 | 18.0847 | 28.3702 | 0 | 28.3702 |
| 11 | 0.424598 | 12.1608 | UNIT I | 3 | 28 | 10.3834 | 18.1231 | 28.4424 | 0 | 28.4424 |
| 12 | 0.424598 | 12.8387 | UNIT I | 3 | 28 | 11.1667 | 19.4904 | 31.0139 | 0 | 31.0139 |
| 13 | 0.424598 | 13.3666 | UNIT I | 3 | 28 | 11.0616 | 19.3069 | 30.6687 | 0 | 30.6687 |
| 14 | 0.424598 | 13.7383 | UNIT I | 3 | 28 | 10.2599 | 17.9077 | 28.0373 | 0 | 28.0373 |
| 15 | 0.424598 | 13.9465 | UNIT I | 3 | 28 | 9.83333 | 17.1631 | 26.6368 | 0 | 26.6368 |
| 16 | 0.424598 | 13.9822 | UNIT I | 3 | 28 | 9.59591 | 16.7487 | 25.8577 | 0 | 25.8577 |
| 17 | 0.424598 | 13.8348 | UNIT I | 3 | 28 | 9.03936 | 15.7773 | 24.0305 | 0 | 24.0305 |
| 18 | 0.424598 | 13.4912 | UNIT I | 3 | 28 | 8.21726 | 14.3424 | 21.3318 | 0 | 21.3318 |
| 19 | 0.424598 | 12.9356 | UNIT I | 3 | 28 | 7.64954 | 13.3515 | 19.4683 | 0 | 19.4683 |
| 20 | 0.424598 | 12.1482 | UNIT I | 3 | 28 | 7.64661 | 13.3464 | 19.4586 | 0 | 19.4586 |
| 21 | 0.424598 | 11.1043 | UNIT I | 3 | 28 | 7.29986 | 12.7412 | 18.3205 | 0 | 18.3205 |
| 22 | 0.424598 | 9.77244 | UNIT I | 3 | 28 | 6.35166 | 11.0862 | 15.2079 | 0 | 15.2079 |
| 23 | 0.424598 | 8.11105 | UNIT I | 3 | 28 | 5.23086 | 9.12995 | 11.5287 | 0 | 11.5287 |
| 24 | 0.424598 | 5.93371 | UNIT I | 3 | 28 | 3.97962 | 6.94603 | 7.42141 | 0 | 7.42141 |
| 25 | 0.424598 | 2.15156 | UNIT I | 3 | 28 | 2.30965 | 4.03127 | 1.93953 | 0 | 1.93953 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.7363

| 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 | 0.424598 | 0.610003 | UNIT I | 3 | 28 | 2.3075 | 4.00651 | 1.89298 | 0 | 1.89298 |
| 2 | 0.424598 | 1.76333 | UNIT I | 3 | 28 | 3.27968 | 5.69451 | 5.06765 | 0 | 5.06765 |
| 3 | 0.424598 | 2.97543 | UNIT I | 3 | 28 | 4.32327 | 7.5065 | 8.47549 | 0 | 8.47549 |
| 4 | 0.424598 | 4.52516 | UNIT I | 3 | 28 | 5.63 | 9.77537 | 12.7426 | 0 | 12.7426 |
| 5 | 0.424598 | 5.96522 | UNIT I | 3 | 28 | 6.82102 | 11.8433 | 16.6319 | 0 | 16.6319 |
| 6 | 0.424598 | 7.27406 | UNIT I | 3 | 28 | 7.84743 | 13.6255 | 19.9836 | 0 | 19.9836 |
| 7 | 0.424598 | 8.45102 | UNIT I | 3 | 28 | 8.68646 | 15.0823 | 22.7235 | 0 | 22.7235 |
| 8 | 0.424598 | 9.49481 | UNIT I | 3 | 28 | 9.32679 | 16.1941 | 24.8147 | 0 | 24.8147 |
| 9 | 0.424598 | 10.4151 | UNIT I | 3 | 28 | 9.77619 | 16.9744 | 26.2819 | 0 | 26.2819 |
| 10 | 0.424598 | 11.3378 | UNIT I | 3 | 28 | 10.1266 | 17.5828 | 27.4262 | 0 | 27.4262 |
| 11 | 0.424598 | 12.1608 | UNIT I | 3 | 28 | 10.3256 | 17.9283 | 28.076 | 0 | 28.076 |
| 12 | 0.424598 | 12.8387 | UNIT I | 3 | 28 | 10.3655 | 17.9976 | 28.2065 | 0 | 28.2065 |
| 13 | 0.424598 | 13.3666 | UNIT I | 3 | 28 | 10.2024 | 17.7145 | 27.674 | 0 | 27.674 |
| 14 | 0.424598 | 13.7383 | UNIT I | 3 | 28 | 9.96746 | 17.3065 | 26.9066 | 0 | 26.9066 |
| 15 | 0.424598 | 13.9465 | UNIT I | 3 | 28 | 9.686 | 16.8178 | 25.9874 | 0 | 25.9874 |
| 16 | 0.424598 | 13.9822 | UNIT I | 3 | 28 | 9.38536 | 16.2958 | 25.0057 | 0 | 25.0057 |
| 17 | 0.424598 | 13.8348 | UNIT I | 3 | 28 | 9.00017 | 15.627 | 23.748 | 0 | 23.748 |
| 18 | 0.424598 | 13.4912 | UNIT I | 3 | 28 | 8.65455 | 15.0269 | 22.6193 | 0 | 22.6193 |
| 19 | 0.424598 | 12.9356 | UNIT I | 3 | 28 | 8.33594 | 14.4737 | 21.5789 | 0 | 21.5789 |
| 20 | 0.424598 | 12.1482 | UNIT I | 3 | 28 | 7.91177 | 13.7372 | 20.1936 | 0 | 20.1936 |
| 21 | 0.424598 | 11.1043 | UNIT I | 3 | 28 | 7.19356 | 12.4902 | 17.8484 | 0 | 17.8484 |
| 22 | 0.424598 | 9.77244 | UNIT I | 3 | 28 | 6.36859 | 11.0578 | 15.1545 | 0 | 15.1545 |
| 23 | 0.424598 | 8.11105 | UNIT I | 3 | 28 | 5.44224 | 9.44936 | 12.1295 | 0 | 12.1295 |
| 24 | 0.424598 | 5.93371 | UNIT I | 3 | 28 | 4.30251 | 7.47045 | 8.40768 | 0 | 8.40768 |
| 25 | 0.424598 | 2.15156 | UNIT I | 3 | 28 | 2.3472 | 4.07544 | 2.02261 | 0 | 2.02261 |

# List Of Coordinates

## Water Table

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

## External Boundary

| X | Y |
|---|---|
| 42.2084 | 59.656 |
| 40.5299 | 57.6985 |
| 39.2201 | 56.0079 |
| 37.5797 | 54.3301 |
| 36.0284 | 53.0971 |
| 34.9857 | 52.3471 |
| 32.931 | 51.3318 |
| 32.4461 | 51.1888 |
| 32.1758 | 51.2126 |
| 31.6273 | 51.2126 |
| 31.1106 | 51.1173 |
| 30.8801 | 50.9584 |
| 30.4826 | 51.006 |
| 29.3379 | 51.0855 |
| 28.2568 | 51.1173 |
| 24.7792 | 51.0927 |
| 23.8593 | 51.061 |
| 22.0128 | 50.9974 |
| 21.6472 | 50.902 |
| 21.0828 | 50.5524 |
| 20.0653 | 49.8134 |
| 18.9094 | 48.8644 |
| 17.5182 | 47.9982 |
| 14.7996 | 46.8381 |
| 11.6166 | 46.1137 |
| 9.81213 | 45.8117 |
| 9.0967 | 45.8514 |
| 8.0633 | 45.8117 |
| 6.7641 | 45.612 |
| 6.55742 | 45.5405 |
| 5.53992 | 44.9127 |
| 5.02322 | 44.8015 |
| 4.35549 | 44.5869 |
| 0.198047 | 43.403 |
| -3.76343 | 42.432 |
| -9.07729 | 41.119 |

| | |
|---|---|
| -15.1823 | 39.5377 |
| -18.268 | 38.8216 |
| -18.268 | 35.5812 |
| -18.268 | 33.5624 |
| -18.268 | 28.0059 |
| 44.4591 | 28.0059 |
| 44.4591 | 46.5638 |
| 44.4591 | 57.23 |
| 44.4591 | 59.34 |
| 44.4591 | 61.8678 |

## Material Boundary

| X | Y |
|---|---|
| 37.639 | 52.44 |
| 44.4591 | 59.34 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 47.235 |
| 30.8801 | 49.506 |

## Material Boundary

| X | Y |
|---|---|
| -9.07729 | 41.119 |
| 2.44 | 42.482 |
| 21.211 | 47.235 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 44.211 |
| 31.462 | 47.978 |
| 39.112 | 51.057 |
| 44.4591 | 57.23 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 44.211 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 33.5624 |
| 21.211 | 40.173 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 40.173 |
| 44.4591 | 46.5638 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

## Material Boundary

| X | Y |
|---|---|
| 17.5182 | 47.9982 |
| 23.8593 | 51.061 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.IMPR S60Λ-SLIDE RU=0.20 + XΩM ROAD
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/3/2021, 20:34:28

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT | AIR |
|---|---|---|---|---|---|---|
| Color | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | No strength |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 | 0.001 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 | |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 | |
| Water Surface | None | None | Water Table | Water Table | Water Table | None |
| Hu Value | | | 1 | 1 | 1 | |
| Ru Value | 0.2 | 0.2 | | | | 0 |

## Global Minimums

### Method: ordinary/fellenius

FS: 1.387080
Center: 16.372, 57.055
Radius: 10.673
Left Slip Surface Endpoint: 13.983, 46.652
Right Slip Surface Endpoint: 25.226, 51.096
Resisting Moment=1714.73 kN-m
Driving Moment=1236.22 kN-m

### Method: bishop simplified

FS: 1.427900
Center: 15.472, 57.606
Radius: 11.105
Left Slip Surface Endpoint: 13.844, 46.621
Right Slip Surface Endpoint: 24.459, 51.082
Resisting Moment=1409.23 kN-m
Driving Moment=986.922 kN-m

### Method: janbu simplified

FS: 1.325550
Center: 16.372, 57.055
Radius: 10.673
Left Slip Surface Endpoint: 13.983, 46.652

Right Slip Surface Endpoint: 25.226, 51.096
Resisting Horizontal Force=147.045 kN
Driving Horizontal Force=110.931 kN

## Method: janbu corrected

FS: 1.406080
Center: 16.372, 57.055
Radius: 10.673
Left Slip Surface Endpoint: 13.983, 46.652
Right Slip Surface Endpoint: 25.226, 51.096
Resisting Horizontal Force=155.978 kN
Driving Horizontal Force=110.931 kN

## Method: spencer

FS: 1.428260
Center: 15.472, 57.606
Radius: 11.105
Left Slip Surface Endpoint: 13.844, 46.621
Right Slip Surface Endpoint: 24.459, 51.082
Resisting Moment=1409.59 kN-m
Driving Moment=986.922 kN-m
Resisting Horizontal Force=114.088 kN
Driving Horizontal Force=79.879 kN

## Method: corp of eng#1

FS: 1.132470
Center: 20.758, 49.781
Radius: 0.362
Left Slip Surface Endpoint: 20.569, 49.472
Right Slip Surface Endpoint: 21.117, 49.737
Left Slope Intercept: 20.569 50.179
Right Slope Intercept: 21.117 50.574
Resisting Horizontal Force=2.37724 kN
Driving Horizontal Force=2.09917 kN

## Method: corp of eng#2

FS: 1.084410
Center: 20.758, 49.781
Radius: 0.362
Left Slip Surface Endpoint: 20.569, 49.472
Right Slip Surface Endpoint: 21.117, 49.737
Left Slope Intercept: 20.569 50.179
Right Slope Intercept: 21.117 50.574
Resisting Horizontal Force=3.10354 kN
Driving Horizontal Force=2.86198 kN

## Method: lowe-karafiath

FS: 1.435170
Center: 15.472, 57.606
Radius: 11.105
Left Slip Surface Endpoint: 13.844, 46.621
Right Slip Surface Endpoint: 24.459, 51.082
Resisting Horizontal Force=114.273 kN
Driving Horizontal Force=79.6237 kN

### Method: gle/morgenstern-price

FS: 1.428470
Center: 15.472, 57.606
Radius: 11.105
Left Slip Surface Endpoint: 13.844, 46.621
Right Slip Surface Endpoint: 24.459, 51.082
Resisting Moment=1409.79 kN-m
Driving Moment=986.922 kN-m
Resisting Horizontal Force=114.091 kN
Driving Horizontal Force=79.8693 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 9538
Number of Invalid Surfaces: 462

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 208 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 9536
Number of Invalid Surfaces: 464

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 210 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 9372
Number of Invalid Surfaces: 628

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 374 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 9372
Number of Invalid Surfaces: 628

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 374 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: spencer

Number of Valid Surfaces: 9279
Number of Invalid Surfaces: 721

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 380 surfaces
Error Code -111 reported for 87 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 9013
Number of Invalid Surfaces: 987

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 385 surfaces
Error Code -111 reported for 348 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 8254
Number of Invalid Surfaces: 1746

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 990 surfaces
Error Code -111 reported for 502 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 4910
Number of Invalid Surfaces: 5090

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 4032 surfaces

Error Code -111 reported for 804 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 9291
Number of Invalid Surfaces: 709

### Error Codes:

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 382 surfaces
Error Code -111 reported for 73 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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).
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

## *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.38708

| 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 | 0.449718 | 0.835105 | UNIT I | 3 | 28 | 2.70887 | 3.75742 | 1.79589 | 0.371391 | 1.4245 |
| 2 | 0.449718 | 2.43319 | UNIT I | 3 | 28 | 3.77922 | 5.24208 | 5.29884 | 1.0821 | 4.21674 |
| 3 | 0.449718 | 4.36054 | UNIT I | 3 | 28 | 5.09456 | 7.06656 | 9.58732 | 1.93923 | 7.64809 |
| 4 | 0.449718 | 6.3766 | UNIT I | 3 | 28 | 6.48572 | 8.99621 | 14.1131 | 2.83582 | 11.2772 |
| 5 | 0.449718 | 8.22913 | UNIT I | 3 | 28 | 7.76774 | 10.7745 | 18.2814 | 3.65969 | 14.6217 |
| 6 | 0.449718 | 9.91928 | UNIT I | 3 | 28 | 8.92638 | 12.3816 | 22.0556 | 4.41134 | 17.6442 |
| 7 | 0.449718 | 11.4473 | UNIT I | 3 | 28 | 9.94917 | 13.8003 | 25.4033 | 5.09089 | 20.3124 |
| 8 | 0.449718 | 12.8148 | UNIT I | 3 | 28 | 10.8268 | 15.0177 | 28.301 | 5.69902 | 22.602 |
| 9 | 0.449718 | 14.1521 | UNIT I | 3 | 28 | 11.6388 | 16.144 | 31.014 | 6.29377 | 24.7203 |
| 10 | 0.449718 | 15.4029 | UNIT I | 3 | 28 | 12.3387 | 17.1147 | 33.396 | 6.85002 | 26.546 |
| 11 | 0.449718 | 16.4836 | UNIT I | 3 | 28 | 12.8654 | 17.8453 | 35.2507 | 7.33067 | 27.92 |
| 12 | 0.449718 | 17.3899 | UNIT I | 3 | 28 | 13.2142 | 18.3291 | 36.5635 | 7.73371 | 28.8298 |
| 13 | 0.449718 | 18.116 | UNIT I | 3 | 28 | 13.3819 | 18.5618 | 37.3242 | 8.05659 | 29.2676 |
| 14 | 0.449718 | 18.6546 | UNIT I | 3 | 28 | 13.368 | 18.5425 | 37.5272 | 8.29613 | 29.231 |
| 15 | 0.449718 | 18.9969 | UNIT I | 3 | 28 | 13.1736 | 18.2729 | 37.1726 | 8.44839 | 28.7242 |
| 16 | 0.449718 | 19.1322 | UNIT I | 3 | 28 | 12.8029 | 17.7587 | 36.2656 | 8.50854 | 27.757 |
| 17 | 0.449718 | 19.047 | UNIT I | 3 | 28 | 12.2622 | 17.0086 | 34.8171 | 8.47065 | 26.3464 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 0.449718 | 18.7248 | UNIT I | 3 | 28 | 11.561 | 16.036 | 32.8445 | 8.32738 | 24.5171 |
| 19 | 0.449718 | 18.1452 | UNIT I | 3 | 28 | 10.712 | 14.8584 | 30.372 | 8.06961 | 22.3024 |
| 20 | 0.449718 | 17.2823 | UNIT I | 3 | 28 | 9.73203 | 13.4991 | 27.4316 | 7.68584 | 19.7458 |
| 21 | 0.449718 | 16.1029 | UNIT I | 3 | 28 | 8.64202 | 11.9872 | 24.0637 | 7.16134 | 16.9024 |
| 22 | 0.449718 | 14.5622 | UNIT I | 3 | 28 | 7.46808 | 10.3588 | 20.316 | 6.47614 | 13.8399 |
| 23 | 0.449718 | 11.6755 | UNIT I | 3 | 28 | 5.94376 | 8.24447 | 15.0558 | 5.19237 | 9.86341 |
| 24 | 0.449718 | 7.49203 | UNIT I | 3 | 28 | 4.26736 | 5.91917 | 8.82205 | 3.33188 | 5.49017 |
| 25 | 0.449718 | 2.63164 | UNIT I | 3 | 28 | 2.78259 | 3.85968 | 2.78716 | 1.17035 | 1.61681 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.4279

| 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 | 0.424598 | 0.610003 | UNIT I | 3 | 28 | 2.65579 | 3.7922 | 1.77724 | 0.287332 | 1.48991 |
| 2 | 0.424598 | 1.76333 | UNIT I | 3 | 28 | 3.4531 | 4.93068 | 4.46167 | 0.830588 | 3.63108 |
| 3 | 0.424598 | 2.97543 | UNIT I | 3 | 28 | 4.26959 | 6.09655 | 7.22528 | 1.40153 | 5.82375 |
| 4 | 0.424598 | 4.52516 | UNIT I | 3 | 28 | 5.30103 | 7.56934 | 10.7252 | 2.1315 | 8.59368 |
| 5 | 0.424598 | 5.96522 | UNIT I | 3 | 28 | 6.22731 | 8.89197 | 13.891 | 2.80982 | 11.0812 |
| 6 | 0.424598 | 7.27406 | UNIT I | 3 | 28 | 7.03765 | 10.0491 | 16.6837 | 3.42633 | 13.2574 |
| 7 | 0.424598 | 8.45102 | UNIT I | 3 | 28 | 7.73581 | 11.046 | 19.113 | 3.98072 | 15.1323 |
| 8 | 0.424598 | 9.49481 | UNIT I | 3 | 28 | 8.32481 | 11.887 | 21.1864 | 4.47238 | 16.714 |
| 9 | 0.424598 | 10.4151 | UNIT I | 3 | 28 | 8.81459 | 12.5863 | 22.9352 | 4.90587 | 18.0293 |
| 10 | 0.424598 | 11.3378 | UNIT I | 3 | 28 | 9.28987 | 13.265 | 24.6462 | 5.3405 | 19.3057 |
| 11 | 0.424598 | 12.1608 | UNIT I | 3 | 28 | 9.68478 | 13.8289 | 26.0944 | 5.72814 | 20.3663 |
| 12 | 0.424598 | 12.8387 | UNIT I | 3 | 28 | 9.9729 | 14.2403 | 27.1874 | 6.04747 | 21.1399 |
| 13 | 0.424598 | 13.3666 | UNIT I | 3 | 28 | 10.1543 | 14.4993 | 27.9233 | 6.29611 | 21.6272 |
| 14 | 0.424598 | 13.7383 | UNIT I | 3 | 28 | 10.2285 | 14.6053 | 28.2975 | 6.4712 | 21.8263 |
| 15 | 0.424598 | 13.9465 | UNIT I | 3 | 28 | 10.1943 | 14.5565 | 28.304 | 6.56925 | 21.7347 |
| 16 | 0.424598 | 13.9822 | UNIT I | 3 | 28 | 10.0501 | 14.3506 | 27.9335 | 6.58608 | 21.3474 |
| 17 | 0.424598 | 13.8348 | UNIT I | 3 | 28 | 9.79354 | 13.9842 | 27.175 | 6.51665 | 20.6583 |
| 18 | 0.424598 | 13.4912 | UNIT I | 3 | 28 | 9.42139 | 13.4528 | 26.0138 | 6.35483 | 19.6589 |
| 19 | 0.424598 | 12.9356 | UNIT I | 3 | 28 | 8.92971 | 12.7507 | 24.4316 | 6.09311 | 18.3385 |
| 20 | 0.424598 | 12.1482 | UNIT I | 3 | 28 | 8.31359 | 11.871 | 22.4061 | 5.72222 | 16.6839 |
| 21 | 0.424598 | 11.1043 | UNIT I | 3 | 28 | 7.56699 | 10.8049 | 19.9094 | 5.23053 | 14.6788 |
| 22 | 0.424598 | 9.77244 | UNIT I | 3 | 28 | 6.6826 | 9.54208 | 16.907 | 4.60315 | 12.3039 |
| 23 | 0.424598 | 8.11105 | UNIT I | 3 | 28 | 5.65155 | 8.06985 | 13.3556 | 3.82058 | 9.53501 |
| 24 | 0.424598 | 5.93371 | UNIT I | 3 | 28 | 4.39894 | 6.28125 | 8.96612 | 2.79498 | 6.17114 |
| 25 | 0.424598 | 2.15156 | UNIT I | 3 | 28 | 2.44053 | 3.48484 | 1.92531 | 1.01346 | 0.911848 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.32555

| 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 | 0.449718 | 0.835105 | UNIT I | 3 | 28 | 3.11789 | 4.13292 | 2.50211 | 0.371391 | 2.13072 |
| 2 | 0.449718 | 2.43319 | UNIT I | 3 | 28 | 4.2785 | 5.67137 | 6.10622 | 1.0821 | 5.02412 |
| 3 | 0.449718 | 4.36054 | UNIT I | 3 | 28 | 5.64464 | 7.48225 | 10.3691 | 1.93923 | 8.42989 |
| 4 | 0.449718 | 6.3766 | UNIT I | 3 | 28 | 7.02892 | 9.31719 | 14.7167 | 2.83582 | 11.8809 |
| 5 | 0.449718 | 8.22913 | UNIT I | 3 | 28 | 8.24819 | 10.9334 | 18.5802 | 3.65969 | 14.9205 |
| 6 | 0.449718 | 9.91928 | UNIT I | 3 | 28 | 9.31139 | 12.3427 | 21.9824 | 4.41134 | 17.5711 |
| 7 | 0.449718 | 11.4473 | UNIT I | 3 | 28 | 10.2258 | 13.5548 | 24.9416 | 5.09089 | 19.8507 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0.449718 | 12.8148 | UNIT I | 3 | 28 | 10.9987 | 14.5793 | 27.4765 | 5.69902 | 21.7775 |
| 9 | 0.449718 | 14.1521 | UNIT I | 3 | 28 | 11.724 | 15.5408 | 29.8795 | 6.29377 | 23.5857 |
| 10 | 0.449718 | 15.4029 | UNIT I | 3 | 28 | 12.3649 | 16.3903 | 32.0336 | 6.85002 | 25.1835 |
| 11 | 0.449718 | 16.4836 | UNIT I | 3 | 28 | 12.8689 | 17.0584 | 33.7707 | 7.33067 | 26.44 |
| 12 | 0.449718 | 17.3899 | UNIT I | 3 | 28 | 13.238 | 17.5476 | 35.0937 | 7.73371 | 27.36 |
| 13 | 0.449718 | 18.116 | UNIT I | 3 | 28 | 13.4727 | 17.8588 | 36.0019 | 8.05659 | 27.9453 |
| 14 | 0.449718 | 18.6546 | UNIT I | 3 | 28 | 13.5733 | 17.9921 | 36.4922 | 8.29613 | 28.1961 |
| 15 | 0.449718 | 18.9969 | UNIT I | 3 | 28 | 13.5387 | 17.9462 | 36.558 | 8.44839 | 28.1096 |
| 16 | 0.449718 | 19.1322 | UNIT I | 3 | 28 | 13.367 | 17.7186 | 36.1901 | 8.50854 | 27.6815 |
| 17 | 0.449718 | 19.047 | UNIT I | 3 | 28 | 13.0553 | 17.3055 | 35.3753 | 8.47065 | 26.9047 |
| 18 | 0.449718 | 18.7248 | UNIT I | 3 | 28 | 12.5998 | 16.7016 | 34.0963 | 8.32738 | 25.769 |
| 19 | 0.449718 | 18.1452 | UNIT I | 3 | 28 | 11.9949 | 15.8999 | 32.3308 | 8.06961 | 24.2612 |
| 20 | 0.449718 | 17.2823 | UNIT I | 3 | 28 | 11.2342 | 14.8915 | 30.0505 | 7.68584 | 22.3647 |
| 21 | 0.449718 | 16.1029 | UNIT I | 3 | 28 | 10.309 | 13.6651 | 27.2194 | 7.16134 | 20.0581 |
| 22 | 0.449718 | 14.5622 | UNIT I | 3 | 28 | 9.20787 | 12.2055 | 23.7892 | 6.47614 | 17.313 |
| 23 | 0.449718 | 11.6755 | UNIT I | 3 | 28 | 7.45281 | 9.87907 | 18.13 | 5.19237 | 12.9376 |
| 24 | 0.449718 | 7.49203 | UNIT I | 3 | 28 | 5.14499 | 6.81994 | 10.5161 | 3.33188 | 7.18427 |
| 25 | 0.449718 | 2.63164 | UNIT I | 3 | 28 | 2.66837 | 3.53706 | 2.18042 | 1.17035 | 1.01007 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.40608

| 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 | 0.449718 | 0.835105 | UNIT I | 3 | 28 | 2.93932 | 4.13292 | 2.50211 | 0.371391 | 2.13072 |
| 2 | 0.449718 | 2.43319 | UNIT I | 3 | 28 | 4.03346 | 5.67137 | 6.10622 | 1.0821 | 5.02412 |
| 3 | 0.449718 | 4.36054 | UNIT I | 3 | 28 | 5.32135 | 7.48225 | 10.3691 | 1.93923 | 8.42989 |
| 4 | 0.449718 | 6.3766 | UNIT I | 3 | 28 | 6.62636 | 9.31719 | 14.7167 | 2.83582 | 11.8809 |
| 5 | 0.449718 | 8.22913 | UNIT I | 3 | 28 | 7.7758 | 10.9334 | 18.5802 | 3.65969 | 14.9205 |
| 6 | 0.449718 | 9.91928 | UNIT I | 3 | 28 | 8.7781 | 12.3427 | 21.9824 | 4.41134 | 17.5711 |
| 7 | 0.449718 | 11.4473 | UNIT I | 3 | 28 | 9.64013 | 13.5548 | 24.9416 | 5.09089 | 19.8507 |
| 8 | 0.449718 | 12.8148 | UNIT I | 3 | 28 | 10.3688 | 14.5793 | 27.4765 | 5.69902 | 21.7775 |
| 9 | 0.449718 | 14.1521 | UNIT I | 3 | 28 | 11.0526 | 15.5408 | 29.8795 | 6.29377 | 23.5857 |
| 10 | 0.449718 | 15.4029 | UNIT I | 3 | 28 | 11.6567 | 16.3903 | 32.0336 | 6.85002 | 25.1835 |
| 11 | 0.449718 | 16.4836 | UNIT I | 3 | 28 | 12.1319 | 17.0584 | 33.7707 | 7.33067 | 26.44 |
| 12 | 0.449718 | 17.3899 | UNIT I | 3 | 28 | 12.4798 | 17.5476 | 35.0937 | 7.73371 | 27.36 |
| 13 | 0.449718 | 18.116 | UNIT I | 3 | 28 | 12.7011 | 17.8588 | 36.0019 | 8.05659 | 27.9453 |
| 14 | 0.449718 | 18.6546 | UNIT I | 3 | 28 | 12.7959 | 17.9921 | 36.4922 | 8.29613 | 28.1961 |
| 15 | 0.449718 | 18.9969 | UNIT I | 3 | 28 | 12.7633 | 17.9462 | 36.558 | 8.44839 | 28.1096 |
| 16 | 0.449718 | 19.1322 | UNIT I | 3 | 28 | 12.6014 | 17.7186 | 36.1901 | 8.50854 | 27.6815 |
| 17 | 0.449718 | 19.047 | UNIT I | 3 | 28 | 12.3076 | 17.3055 | 35.3753 | 8.47065 | 26.9047 |
| 18 | 0.449718 | 18.7248 | UNIT I | 3 | 28 | 11.8781 | 16.7016 | 34.0963 | 8.32738 | 25.769 |
| 19 | 0.449718 | 18.1452 | UNIT I | 3 | 28 | 11.308 | 15.8999 | 32.3308 | 8.06961 | 24.2612 |
| 20 | 0.449718 | 17.2823 | UNIT I | 3 | 28 | 10.5908 | 14.8915 | 30.0505 | 7.68584 | 22.3647 |
| 21 | 0.449718 | 16.1029 | UNIT I | 3 | 28 | 9.71858 | 13.6651 | 27.2194 | 7.16134 | 20.0581 |
| 22 | 0.449718 | 14.5622 | UNIT I | 3 | 28 | 8.68051 | 12.2055 | 23.7892 | 6.47614 | 17.313 |
| 23 | 0.449718 | 11.6755 | UNIT I | 3 | 28 | 7.02597 | 9.87907 | 18.13 | 5.19237 | 12.9376 |
| 24 | 0.449718 | 7.49203 | UNIT I | 3 | 28 | 4.85032 | 6.81994 | 10.5161 | 3.33188 | 7.18427 |
| 25 | 0.449718 | 2.63164 | UNIT I | 3 | 28 | 2.51555 | 3.53706 | 2.18042 | 1.17035 | 1.01007 |

**Global Minimum Query (spencer) - Safety Factor**: 1.42826

| 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 | 0.424598 | 0.610003 | UNIT I | 3 | 28 | 3.21656 | 4.59409 | 3.28539 | 0.287332 | 2.99805 |
| 2 | 0.424598 | 1.76333 | UNIT I | 3 | 28 | 4.1778 | 5.96699 | 6.4107 | 0.830588 | 5.58011 |
| 3 | 0.424598 | 2.97543 | UNIT I | 3 | 28 | 5.11487 | 7.30536 | 9.49872 | 1.40153 | 8.09719 |
| 4 | 0.424598 | 4.52516 | UNIT I | 3 | 28 | 6.26189 | 8.94361 | 13.3098 | 2.1315 | 11.1783 |
| 5 | 0.424598 | 5.96522 | UNIT I | 3 | 28 | 7.23418 | 10.3323 | 16.5999 | 2.80982 | 13.79 |
| 6 | 0.424598 | 7.27406 | UNIT I | 3 | 28 | 8.03136 | 11.4709 | 19.3577 | 3.42633 | 15.9314 |
| 7 | 0.424598 | 8.45102 | UNIT I | 3 | 28 | 8.66876 | 12.3812 | 21.6243 | 3.98072 | 17.6435 |
| 8 | 0.424598 | 9.49481 | UNIT I | 3 | 28 | 9.1594 | 13.082 | 23.4339 | 4.47238 | 18.9615 |
| 9 | 0.424598 | 10.4151 | UNIT I | 3 | 28 | 9.52166 | 13.5994 | 24.8405 | 4.90587 | 19.9346 |
| 10 | 0.424598 | 11.3378 | UNIT I | 3 | 28 | 9.84254 | 14.0577 | 26.137 | 5.3405 | 20.7965 |
| 11 | 0.424598 | 12.1608 | UNIT I | 3 | 28 | 10.0632 | 14.3728 | 27.1172 | 5.72814 | 21.389 |
| 12 | 0.424598 | 12.8387 | UNIT I | 3 | 28 | 10.1611 | 14.5127 | 27.6996 | 6.04747 | 21.6522 |
| 13 | 0.424598 | 13.3666 | UNIT I | 3 | 28 | 10.0733 | 14.3873 | 27.7124 | 6.29611 | 21.4163 |
| 14 | 0.424598 | 13.7383 | UNIT I | 3 | 28 | 9.90709 | 14.1499 | 27.4412 | 6.4712 | 20.97 |
| 15 | 0.424598 | 13.9465 | UNIT I | 3 | 28 | 9.66792 | 13.8083 | 26.8968 | 6.56925 | 20.3275 |
| 16 | 0.424598 | 13.9822 | UNIT I | 3 | 28 | 9.37329 | 13.3875 | 26.122 | 6.58608 | 19.5359 |
| 17 | 0.424598 | 13.8348 | UNIT I | 3 | 28 | 8.94783 | 12.7798 | 24.9099 | 6.51665 | 18.3933 |
| 18 | 0.424598 | 13.4912 | UNIT I | 3 | 28 | 8.53587 | 12.1914 | 23.6414 | 6.35483 | 17.2865 |
| 19 | 0.424598 | 12.9356 | UNIT I | 3 | 28 | 8.16789 | 11.6659 | 22.3912 | 6.09311 | 16.2981 |
| 20 | 0.424598 | 12.1482 | UNIT I | 3 | 28 | 7.72771 | 11.0372 | 20.838 | 5.72222 | 15.1158 |
| 21 | 0.424598 | 11.1043 | UNIT I | 3 | 28 | 6.9248 | 9.89042 | 18.1895 | 5.23053 | 12.959 |
| 22 | 0.424598 | 9.77244 | UNIT I | 3 | 28 | 6.00202 | 8.57244 | 15.0834 | 4.60315 | 10.4802 |
| 23 | 0.424598 | 8.11105 | UNIT I | 3 | 28 | 5.01045 | 7.15623 | 11.6373 | 3.82058 | 7.81673 |
| 24 | 0.424598 | 5.93371 | UNIT I | 3 | 28 | 3.91323 | 5.58911 | 7.66439 | 2.79498 | 4.86941 |
| 25 | 0.424598 | 2.15156 | UNIT I | 3 | 28 | 2.42445 | 3.46275 | 1.88377 | 1.01346 | 0.870306 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.13247

| 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 | 0.0219285 | 0.00479056 | UNIT I | 3 | 28 | 0 | 0 | -75.0504 | 0.0436926 | -75.0941 |
| 2 | 0.0219285 | 0.0139451 | UNIT I | 3 | 28 | 5.88011 | 6.65905 | 7.00886 | 0.127187 | 6.88168 |
| 3 | 0.0219285 | 0.0223449 | UNIT I | 3 | 28 | 5.4242 | 6.14274 | 6.11444 | 0.203798 | 5.91064 |
| 4 | 0.0219285 | 0.0300531 | UNIT I | 3 | 28 | 5.10871 | 5.78546 | 5.51279 | 0.274101 | 5.23869 |
| 5 | 0.0219285 | 0.0371167 | UNIT I | 3 | 28 | 4.87159 | 5.51693 | 5.07216 | 0.338525 | 4.73364 |
| 6 | 0.0219285 | 0.0435706 | UNIT I | 3 | 28 | 4.68063 | 5.30067 | 4.72432 | 0.397388 | 4.32693 |
| 7 | 0.0219285 | 0.0494397 | UNIT I | 3 | 28 | 4.51782 | 5.11629 | 4.43108 | 0.450918 | 3.98016 |
| 8 | 0.0219285 | 0.054741 | UNIT I | 3 | 28 | 4.37241 | 4.95162 | 4.16974 | 0.499269 | 3.67047 |
| 9 | 0.0219285 | 0.0594846 | UNIT I | 3 | 28 | 4.23767 | 4.79903 | 3.92602 | 0.542533 | 3.38349 |
| 10 | 0.0219285 | 0.0636743 | UNIT I | 3 | 28 | 4.10915 | 4.65349 | 3.6905 | 0.580745 | 3.10976 |
| 11 | 0.0219285 | 0.0673074 | UNIT I | 3 | 28 | 3.98378 | 4.51151 | 3.45663 | 0.613882 | 2.84274 |
| 12 | 0.0219285 | 0.0703753 | UNIT I | 3 | 28 | 3.85936 | 4.37061 | 3.21961 | 0.641862 | 2.57775 |
| 13 | 0.0219285 | 0.0728622 | UNIT I | 3 | 28 | 3.73423 | 4.2289 | 2.97576 | 0.664545 | 2.31122 |
| 14 | 0.0219285 | 0.0747449 | UNIT I | 3 | 28 | 3.60704 | 4.08486 | 2.72203 | 0.681716 | 2.04032 |
| 15 | 0.0219285 | 0.0759906 | UNIT I | 3 | 28 | 3.47666 | 3.93721 | 2.45572 | 0.693078 | 1.76264 |
| 16 | 0.0219285 | 0.076555 | UNIT I | 3 | 28 | 3.34209 | 3.78481 | 2.17425 | 0.698225 | 1.47602 |
| 17 | 0.0219285 | 0.0763784 | UNIT I | 3 | 28 | 3.20231 | 3.62652 | 1.87493 | 0.696614 | 1.17831 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 0.0219285 | 0.0753799 | UNIT I | 3 | 28 | 3.05627 | 3.46113 | 1.55477 | 0.687507 | 0.867259 |
| 19 | 0.0219285 | 0.073448 | UNIT I | 3 | 28 | 2.90275 | 3.28727 | 1.21017 | 0.669887 | 0.540282 |
| 20 | 0.0219285 | 0.0704244 | UNIT I | 3 | 28 | 2.74024 | 3.10324 | 0.83648 | 0.64231 | 0.19417 |
| 21 | 0.0219285 | 0.0660725 | UNIT I | 3 | 28 | 2.56672 | 2.90674 | 0.427219 | 0.602619 | -0.1754 |
| 22 | 0.0219285 | 0.0600131 | UNIT I | 3 | 28 | 2.37915 | 2.69431 | -0.0275646 | 0.547353 | -0.574918 |
| 23 | 0.0219285 | 0.0515618 | UNIT I | 3 | 28 | 2.17217 | 2.45992 | -0.545468 | 0.470273 | -1.01574 |
| 24 | 0.0219285 | 0.0391827 | UNIT I | 3 | 28 | 1.97436 | 2.2359 | -1.07969 | 0.357368 | -1.43706 |
| 25 | 0.0219285 | 0.0158787 | UNIT I | 3 | 28 | 9.5284 | 10.7906 | 14.7969 | 0.144822 | 14.6521 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.08441

| 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 | 0.0219285 | 0.00479056 | UNIT I | 3 | 28 | 0 | 0 | -139.135 | 0.0436926 | -139.179 |
| 2 | 0.0219285 | 0.0139451 | UNIT I | 3 | 28 | 17.5993 | 19.0849 | 30.3784 | 0.127187 | 30.2513 |
| 3 | 0.0219285 | 0.0223449 | UNIT I | 3 | 28 | 11.194 | 12.1389 | 17.3916 | 0.203798 | 17.1878 |
| 4 | 0.0219285 | 0.0300531 | UNIT I | 3 | 28 | 8.48571 | 9.20199 | 11.9384 | 0.274101 | 11.6643 |
| 5 | 0.0219285 | 0.0371167 | UNIT I | 3 | 28 | 7.10614 | 7.70597 | 9.18918 | 0.338525 | 8.85065 |
| 6 | 0.0219285 | 0.0435706 | UNIT I | 3 | 28 | 6.28641 | 6.81705 | 7.57622 | 0.397388 | 7.17883 |
| 7 | 0.0219285 | 0.0494397 | UNIT I | 3 | 28 | 5.73604 | 6.22022 | 6.50725 | 0.450918 | 6.05633 |
| 8 | 0.0219285 | 0.054741 | UNIT I | 3 | 28 | 5.33005 | 5.77996 | 5.7276 | 0.499269 | 5.22833 |
| 9 | 0.0219285 | 0.0594846 | UNIT I | 3 | 28 | 5.00831 | 5.43106 | 5.11468 | 0.542533 | 4.57215 |
| 10 | 0.0219285 | 0.0636743 | UNIT I | 3 | 28 | 4.73897 | 5.13899 | 4.60359 | 0.580745 | 4.02285 |
| 11 | 0.0219285 | 0.0673074 | UNIT I | 3 | 28 | 4.50378 | 4.88394 | 4.15707 | 0.613882 | 3.54318 |
| 12 | 0.0219285 | 0.0703753 | UNIT I | 3 | 28 | 4.29151 | 4.65376 | 3.75212 | 0.641862 | 3.11026 |
| 13 | 0.0219285 | 0.0728622 | UNIT I | 3 | 28 | 4.09487 | 4.44052 | 3.37377 | 0.664545 | 2.70922 |
| 14 | 0.0219285 | 0.0747449 | UNIT I | 3 | 28 | 3.90889 | 4.23884 | 3.01163 | 0.681716 | 2.32992 |
| 15 | 0.0219285 | 0.0759906 | UNIT I | 3 | 28 | 3.73 | 4.04485 | 2.65815 | 0.693078 | 1.96507 |
| 16 | 0.0219285 | 0.076555 | UNIT I | 3 | 28 | 3.55553 | 3.85566 | 2.30748 | 0.698225 | 1.60925 |
| 17 | 0.0219285 | 0.0763784 | UNIT I | 3 | 28 | 3.3834 | 3.669 | 1.95481 | 0.696614 | 1.2582 |
| 18 | 0.0219285 | 0.0753799 | UNIT I | 3 | 28 | 3.21187 | 3.48299 | 1.59587 | 0.687507 | 0.908364 |
| 19 | 0.0219285 | 0.073448 | UNIT I | 3 | 28 | 3.0394 | 3.29595 | 1.22649 | 0.669887 | 0.556604 |
| 20 | 0.0219285 | 0.0704244 | UNIT I | 3 | 28 | 2.86448 | 3.10627 | 0.842169 | 0.64231 | 0.199859 |
| 21 | 0.0219285 | 0.0660725 | UNIT I | 3 | 28 | 2.68549 | 2.91218 | 0.437448 | 0.602619 | -0.165171 |
| 22 | 0.0219285 | 0.0600131 | UNIT I | 3 | 28 | 2.50042 | 2.71149 | 0.00473537 | 0.547353 | -0.542618 |
| 23 | 0.0219285 | 0.0515618 | UNIT I | 3 | 28 | 2.88071 | 3.12387 | 0.703237 | 0.470273 | 0.232964 |
| 24 | 0.0219285 | 0.0391827 | UNIT I | 3 | 28 | 2.94541 | 3.19403 | 0.72228 | 0.357368 | 0.364912 |
| 25 | 0.0219285 | 0.0158787 | UNIT I | 3 | 28 | 11.433 | 12.3981 | 17.82 | 0.144822 | 17.6751 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.43517

| 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 | 0.424598 | 0.610003 | UNIT I | 3 | 28 | 2.70805 | 3.88651 | 1.95462 | 0.287332 | 1.66728 |
| 2 | 0.424598 | 1.76333 | UNIT I | 3 | 28 | 3.67401 | 5.27283 | 5.10516 | 0.830588 | 4.27457 |
| 3 | 0.424598 | 2.97543 | UNIT I | 3 | 28 | 4.76699 | 6.84144 | 8.62624 | 1.40153 | 7.22471 |
| 4 | 0.424598 | 4.52516 | UNIT I | 3 | 28 | 5.87976 | 8.43845 | 12.3597 | 2.1315 | 10.2282 |
| 5 | 0.424598 | 5.96522 | UNIT I | 3 | 28 | 6.86905 | 9.85826 | 15.7083 | 2.80982 | 12.8985 |
| 6 | 0.424598 | 7.27406 | UNIT I | 3 | 28 | 7.77185 | 11.1539 | 18.7616 | 3.42633 | 15.3353 |
| 7 | 0.424598 | 8.45102 | UNIT I | 3 | 28 | 8.53282 | 12.2461 | 21.37 | 3.98072 | 17.3893 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0.424598 | 9.49481 | UNIT I | 3 | 28 | 9.4023 | 13.4939 | 24.2086 | 4.47238 | 19.7362 |
| 9 | 0.424598 | 10.4151 | UNIT I | 3 | 28 | 10.4505 | 14.9983 | 27.4712 | 4.90587 | 22.5653 |
| 10 | 0.424598 | 11.3378 | UNIT I | 3 | 28 | 10.6988 | 15.3546 | 28.5762 | 5.3405 | 23.2357 |
| 11 | 0.424598 | 12.1608 | UNIT I | 3 | 28 | 10.5469 | 15.1366 | 28.5537 | 5.72814 | 22.8256 |
| 12 | 0.424598 | 12.8387 | UNIT I | 3 | 28 | 11.4351 | 16.4113 | 31.2704 | 6.04747 | 25.2229 |
| 13 | 0.424598 | 13.3666 | UNIT I | 3 | 28 | 11.2029 | 16.0781 | 30.8925 | 6.29611 | 24.5964 |
| 14 | 0.424598 | 13.7383 | UNIT I | 3 | 28 | 10.0888 | 14.4791 | 28.0603 | 6.4712 | 21.5891 |
| 15 | 0.424598 | 13.9465 | UNIT I | 3 | 28 | 9.51072 | 13.6495 | 26.5981 | 6.56925 | 20.0288 |
| 16 | 0.424598 | 13.9822 | UNIT I | 3 | 28 | 9.22044 | 13.2329 | 25.8313 | 6.58608 | 19.2452 |
| 17 | 0.424598 | 13.8348 | UNIT I | 3 | 28 | 8.56756 | 12.2959 | 23.9996 | 6.51665 | 17.483 |
| 18 | 0.424598 | 13.4912 | UNIT I | 3 | 28 | 7.62901 | 10.9489 | 21.3045 | 6.35483 | 14.9497 |
| 19 | 0.424598 | 12.9356 | UNIT I | 3 | 28 | 7.05288 | 10.1221 | 19.4878 | 6.09311 | 13.3947 |
| 20 | 0.424598 | 12.1482 | UNIT I | 3 | 28 | 7.20801 | 10.3447 | 19.5355 | 5.72222 | 13.8133 |
| 21 | 0.424598 | 11.1043 | UNIT I | 3 | 28 | 6.98175 | 10.02 | 18.4332 | 5.23053 | 13.2027 |
| 22 | 0.424598 | 9.77244 | UNIT I | 3 | 28 | 6.06529 | 8.70472 | 15.3322 | 4.60315 | 10.729 |
| 23 | 0.424598 | 8.11105 | UNIT I | 3 | 28 | 4.99847 | 7.17366 | 11.6701 | 3.82058 | 7.8495 |
| 24 | 0.424598 | 5.93371 | UNIT I | 3 | 28 | 3.85563 | 5.53349 | 7.55979 | 2.79498 | 4.76481 |
| 25 | 0.424598 | 2.15156 | UNIT I | 3 | 28 | 2.40951 | 3.45806 | 1.87494 | 1.01346 | 0.861478 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.42847

| 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 | 0.424598 | 0.610003 | UNIT I | 3 | 28 | 2.72792 | 3.89676 | 1.97389 | 0.287332 | 1.68655 |
| 2 | 0.424598 | 1.76333 | UNIT I | 3 | 28 | 3.72181 | 5.3165 | 5.18728 | 0.830588 | 4.3567 |
| 3 | 0.424598 | 2.97543 | UNIT I | 3 | 28 | 4.79145 | 6.84444 | 8.63188 | 1.40153 | 7.23035 |
| 4 | 0.424598 | 4.52516 | UNIT I | 3 | 28 | 6.11916 | 8.74103 | 12.9288 | 2.1315 | 10.7973 |
| 5 | 0.424598 | 5.96522 | UNIT I | 3 | 28 | 7.32185 | 10.4591 | 16.8383 | 2.80982 | 14.0284 |
| 6 | 0.424598 | 7.27406 | UNIT I | 3 | 28 | 8.34289 | 11.9176 | 20.1978 | 3.42633 | 16.7715 |
| 7 | 0.424598 | 8.45102 | UNIT I | 3 | 28 | 9.15427 | 13.0766 | 22.932 | 3.98072 | 18.9513 |
| 8 | 0.424598 | 9.49481 | UNIT I | 3 | 28 | 9.74252 | 13.9169 | 25.004 | 4.47238 | 20.5316 |
| 9 | 0.424598 | 10.4151 | UNIT I | 3 | 28 | 10.116 | 14.4504 | 26.4409 | 4.90587 | 21.535 |
| 10 | 0.424598 | 11.3378 | UNIT I | 3 | 28 | 10.3654 | 14.8066 | 27.5455 | 5.3405 | 22.205 |
| 11 | 0.424598 | 12.1608 | UNIT I | 3 | 28 | 10.4465 | 14.9225 | 28.1511 | 5.72814 | 22.423 |
| 12 | 0.424598 | 12.8387 | UNIT I | 3 | 28 | 10.3601 | 14.7991 | 28.2382 | 6.04747 | 22.1908 |
| 13 | 0.424598 | 13.3666 | UNIT I | 3 | 28 | 10.0552 | 14.3636 | 27.668 | 6.29611 | 21.3719 |
| 14 | 0.424598 | 13.7383 | UNIT I | 3 | 28 | 9.69478 | 13.8487 | 26.8746 | 6.4712 | 20.4034 |
| 15 | 0.424598 | 13.9465 | UNIT I | 3 | 28 | 9.31206 | 13.302 | 25.9446 | 6.56925 | 19.3753 |
| 16 | 0.424598 | 13.9822 | UNIT I | 3 | 28 | 8.94237 | 12.7739 | 24.9682 | 6.58608 | 18.3821 |
| 17 | 0.424598 | 13.8348 | UNIT I | 3 | 28 | 8.5083 | 12.1539 | 23.7326 | 6.51665 | 17.2159 |
| 18 | 0.424598 | 13.4912 | UNIT I | 3 | 28 | 8.16059 | 11.6572 | 22.6366 | 6.35483 | 16.2818 |
| 19 | 0.424598 | 12.9356 | UNIT I | 3 | 28 | 7.88332 | 11.2611 | 21.63 | 6.09311 | 15.5369 |
| 20 | 0.424598 | 12.1482 | UNIT I | 3 | 28 | 7.51728 | 10.7382 | 20.2757 | 5.72222 | 14.5534 |
| 21 | 0.424598 | 11.1043 | UNIT I | 3 | 28 | 6.84131 | 9.77261 | 17.968 | 5.23053 | 12.7374 |
| 22 | 0.424598 | 9.77244 | UNIT I | 3 | 28 | 6.08123 | 8.68686 | 15.2986 | 4.60315 | 10.6954 |
| 23 | 0.424598 | 8.11105 | UNIT I | 3 | 28 | 5.24462 | 7.49178 | 12.2684 | 3.82058 | 8.44782 |
| 24 | 0.424598 | 5.93371 | UNIT I | 3 | 28 | 4.21942 | 6.02732 | 8.48854 | 2.79498 | 5.69356 |
| 25 | 0.424598 | 2.15156 | UNIT I | 3 | 28 | 2.43592 | 3.47964 | 1.91553 | 1.01346 | 0.902068 |

## *List Of Coordinates*

## Water Table

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

## External Boundary

| X | Y |
|---|---|
| 42.2084 | 59.656 |
| 40.5299 | 57.6985 |
| 39.2201 | 56.0079 |
| 37.5797 | 54.3301 |
| 36.0284 | 53.0971 |
| 34.9857 | 52.3471 |
| 32.931 | 51.3318 |
| 32.4461 | 51.1888 |
| 32.1758 | 51.2126 |
| 31.6273 | 51.2126 |
| 31.1106 | 51.1173 |
| 30.8801 | 50.9584 |
| 30.4826 | 51.006 |
| 29.3379 | 51.0855 |
| 28.2568 | 51.1173 |
| 24.7792 | 51.0927 |
| 23.8593 | 51.061 |
| 22.0128 | 50.9974 |
| 21.6472 | 50.902 |
| 21.0828 | 50.5524 |
| 20.0653 | 49.8134 |
| 18.9094 | 48.8644 |
| 17.5182 | 47.9982 |
| 14.7996 | 46.8381 |
| 11.6166 | 46.1137 |
| 9.81213 | 45.8117 |
| 9.0967 | 45.8514 |
| 8.0633 | 45.8117 |
| 6.7641 | 45.612 |
| 6.55742 | 45.5405 |
| 5.53992 | 44.9127 |
| 5.02322 | 44.8015 |
| 4.35549 | 44.5869 |
| 0.198047 | 43.403 |
| -3.76343 | 42.432 |
| -9.07729 | 41.119 |
| -15.1823 | 39.5377 |
| -18.268 | 38.8216 |

| | |
|---|---|
| -18.268 | 35.5812 |
| -18.268 | 33.5624 |
| -18.268 | 28.0059 |
| 44.4591 | 28.0059 |
| 44.4591 | 46.5638 |
| 44.4591 | 57.23 |
| 44.4591 | 59.34 |
| 44.4591 | 61.8678 |

### Material Boundary

| X | Y |
|---|---|
| 37.639 | 52.44 |
| 44.4591 | 59.34 |

### Material Boundary

| X | Y |
|---|---|
| 21.211 | 47.235 |
| 30.8801 | 49.506 |

### Material Boundary

| X | Y |
|---|---|
| -9.07729 | 41.119 |
| 2.44 | 42.482 |
| 21.211 | 47.235 |

### Material Boundary

| X | Y |
|---|---|
| 21.211 | 44.211 |
| 31.462 | 47.978 |
| 39.112 | 51.057 |
| 44.4591 | 57.23 |

### Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 44.211 |

### Material Boundary

| X | Y |
|---|---|
| -18.268 | 33.5624 |
| 21.211 | 40.173 |

### Material Boundary

| X | Y |
|---|---|

| | |
|---|---|
| 21.211 | 40.173 |
| 44.4591 | 46.5638 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

## Material Boundary

| X | Y |
|---|---|
| 17.5182 | 47.9982 |
| 23.8593 | 51.061 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.IMPR S60Λ-SLIDE EQ=0.20dn + XΩM ROAD
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/3/2021, 20:34:28

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): 0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT | AIR |
|---|---|---|---|---|---|---|
| Color | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | No strength |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 | 0.001 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 | |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 | |
| Water Surface | None | None | Water Table | Water Table | Water Table | None |
| Hu Value | | | 1 | 1 | 1 | |
| Ru Value | 0 | 0 | | | | 0 |

## Global Minimums

### Method: ordinary/fellenius

FS: 1.082230
Center: 16.372, 57.055
Radius: 10.673
Left Slip Surface Endpoint: 13.983, 46.652
Right Slip Surface Endpoint: 25.226, 51.096
Resisting Moment=2071.96 kN-m
Driving Moment=1914.52 kN-m

### Method: bishop simplified

FS: 1.148890
Center: 14.839, 60.279
Radius: 13.894
Left Slip Surface Endpoint: 13.222, 46.479

Right Slip Surface Endpoint: 25.266, 51.096
Resisting Moment=2578.27 kN-m
Driving Moment=2244.14 kN-m

## Method: janbu simplified

FS: 1.069930
Center: 16.372, 57.055
Radius: 10.673
Left Slip Surface Endpoint: 13.983, 46.652
Right Slip Surface Endpoint: 25.226, 51.096
Resisting Horizontal Force=185.696 kN
Driving Horizontal Force=173.558 kN

## Method: janbu corrected

FS: 1.134930
Center: 16.372, 57.055
Radius: 10.673
Left Slip Surface Endpoint: 13.983, 46.652
Right Slip Surface Endpoint: 25.226, 51.096
Resisting Horizontal Force=196.977 kN
Driving Horizontal Force=173.558 kN

## Method: spencer

FS: 1.155050
Center: 14.839, 60.279
Radius: 13.894
Left Slip Surface Endpoint: 13.222, 46.479
Right Slip Surface Endpoint: 25.266, 51.096
Resisting Moment=2592.09 kN-m
Driving Moment=2244.14 kN-m
Resisting Horizontal Force=170.045 kN
Driving Horizontal Force=147.219 kN

## Method: corp of eng#1

FS: 1.105570
Center: 20.758, 49.781
Radius: 0.362
Left Slip Surface Endpoint: 20.569, 49.472
Right Slip Surface Endpoint: 21.117, 49.737
Left Slope Intercept: 20.569 50.179
Right Slope Intercept: 21.117 50.574
Resisting Horizontal Force=2.55626 kN
Driving Horizontal Force=2.31218 kN

## Method: corp of eng#2

FS: 1.076930
Center: 20.758, 49.781
Radius: 0.362
Left Slip Surface Endpoint: 20.569, 49.472
Right Slip Surface Endpoint: 21.117, 49.737
Left Slope Intercept: 20.569 50.179
Right Slope Intercept: 21.117 50.574
Resisting Horizontal Force=3.29715 kN
Driving Horizontal Force=3.06161 kN

### Method: lowe-karafiath

FS: 1.132110
Center: 14.839, 60.279
Radius: 13.894
Left Slip Surface Endpoint: 13.222, 46.479
Right Slip Surface Endpoint: 25.266, 51.096
Resisting Horizontal Force=168.947 kN
Driving Horizontal Force=149.232 kN

### Method: gle/morgenstern-price

FS: 1.151520
Center: 14.839, 60.279
Radius: 13.894
Left Slip Surface Endpoint: 13.222, 46.479
Right Slip Surface Endpoint: 25.266, 51.096
Resisting Moment=2584.18 kN-m
Driving Moment=2244.14 kN-m
Resisting Horizontal Force=169.898 kN
Driving Horizontal Force=147.542 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 9610
Number of Invalid Surfaces: 390

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 136 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 9610
Number of Invalid Surfaces: 390

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 136 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 9475
Number of Invalid Surfaces: 525

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 271 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: janbu corrected

Number of Valid Surfaces: 9475
Number of Invalid Surfaces: 525

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 271 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: spencer

Number of Valid Surfaces: 9259
Number of Invalid Surfaces: 741

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 283 surfaces
Error Code -111 reported for 204 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 9411
Number of Invalid Surfaces: 589

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 273 surfaces
Error Code -111 reported for 62 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 8787
Number of Invalid Surfaces: 1213

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 569 surfaces
Error Code -111 reported for 390 surfaces

Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 5950
Number of Invalid Surfaces: 4050

### Error Codes:

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 2860 surfaces
Error Code -111 reported for 936 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 9394
Number of Invalid Surfaces: 606

### Error Codes:

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 278 surfaces
Error Code -111 reported for 74 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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).
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

# *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.08223

| 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 | 0.449718 | 0.835105 | UNIT I | 3 | 28 | 3.77059 | 4.08065 | 2.03242 | 0 | 2.03242 |
| 2 | 0.449718 | 2.43319 | UNIT I | 3 | 28 | 5.70495 | 6.17407 | 5.96955 | 0 | 5.96955 |
| 3 | 0.449718 | 4.36054 | UNIT I | 3 | 28 | 8.05078 | 8.7128 | 10.7442 | 0 | 10.7442 |
| 4 | 0.449718 | 6.3766 | UNIT I | 3 | 28 | 10.4964 | 11.3595 | 15.722 | 0 | 15.722 |
| 5 | 0.449718 | 8.22913 | UNIT I | 3 | 28 | 12.7112 | 13.7564 | 20.2298 | 0 | 20.2298 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 0.449718 | 9.91928 | UNIT I | 3 | 28 | 14.6743 | 15.881 | 24.2255 | 0 | 24.2255 |
| 7 | 0.449718 | 11.4473 | UNIT I | 3 | 28 | 16.3689 | 17.7149 | 27.6748 | 0 | 27.6748 |
| 8 | 0.449718 | 12.8148 | UNIT I | 3 | 28 | 17.7836 | 19.2459 | 30.5541 | 0 | 30.5541 |
| 9 | 0.449718 | 14.1521 | UNIT I | 3 | 28 | 19.0599 | 20.6272 | 33.152 | 0 | 33.152 |
| 10 | 0.449718 | 15.4029 | UNIT I | 3 | 28 | 20.1202 | 21.7747 | 35.31 | 0 | 35.31 |
| 11 | 0.449718 | 16.4836 | UNIT I | 3 | 28 | 20.8648 | 22.5805 | 36.8255 | 0 | 36.8255 |
| 12 | 0.449718 | 17.3899 | UNIT I | 3 | 28 | 21.2911 | 23.0419 | 37.6933 | 0 | 37.6933 |
| 13 | 0.449718 | 18.116 | UNIT I | 3 | 28 | 21.4007 | 23.1605 | 37.9163 | 0 | 37.9163 |
| 14 | 0.449718 | 18.6546 | UNIT I | 3 | 28 | 21.1987 | 22.9419 | 37.5053 | 0 | 37.5053 |
| 15 | 0.449718 | 18.9969 | UNIT I | 3 | 28 | 20.6946 | 22.3963 | 36.4791 | 0 | 36.4791 |
| 16 | 0.449718 | 19.1322 | UNIT I | 3 | 28 | 19.902 | 21.5385 | 34.8659 | 0 | 34.8659 |
| 17 | 0.449718 | 19.047 | UNIT I | 3 | 28 | 18.8396 | 20.3888 | 32.7035 | 0 | 32.7035 |
| 18 | 0.449718 | 18.7248 | UNIT I | 3 | 28 | 17.5312 | 18.9728 | 30.0404 | 0 | 30.0404 |
| 19 | 0.449718 | 18.1452 | UNIT I | 3 | 28 | 16.0064 | 17.3226 | 26.9369 | 0 | 26.9369 |
| 20 | 0.449718 | 17.2823 | UNIT I | 3 | 28 | 14.3014 | 15.4774 | 23.4665 | 0 | 23.4665 |
| 21 | 0.449718 | 16.1029 | UNIT I | 3 | 28 | 12.46 | 13.4846 | 19.7187 | 0 | 19.7187 |
| 22 | 0.449718 | 14.5622 | UNIT I | 3 | 28 | 10.5345 | 11.4007 | 15.7995 | 0 | 15.7995 |
| 23 | 0.449718 | 11.6755 | UNIT I | 3 | 28 | 8.16136 | 8.83247 | 10.9693 | 0 | 10.9693 |
| 24 | 0.449718 | 7.49203 | UNIT I | 3 | 28 | 5.67524 | 6.14191 | 5.90907 | 0 | 5.90907 |
| 25 | 0.449718 | 2.63164 | UNIT I | 3 | 28 | 3.59088 | 3.88616 | 1.66663 | 0 | 1.66663 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.14889

| 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 | 0.481772 | 0.721365 | UNIT I | 3 | 28 | 3.53634 | 4.06287 | 1.99896 | 0 | 1.99896 |
| 2 | 0.481772 | 2.08684 | UNIT I | 3 | 28 | 4.96454 | 5.70371 | 5.08493 | 0 | 5.08493 |
| 3 | 0.481772 | 3.29833 | UNIT I | 3 | 28 | 6.18151 | 7.10187 | 7.7145 | 0 | 7.7145 |
| 4 | 0.481772 | 4.58778 | UNIT I | 3 | 28 | 7.44195 | 8.54998 | 10.438 | 0 | 10.438 |
| 5 | 0.481772 | 6.33814 | UNIT I | 3 | 28 | 9.14084 | 10.5018 | 14.1089 | 0 | 14.1089 |
| 6 | 0.481772 | 7.96817 | UNIT I | 3 | 28 | 10.6634 | 12.251 | 17.3987 | 0 | 17.3987 |
| 7 | 0.481772 | 9.44389 | UNIT I | 3 | 28 | 11.9825 | 13.7666 | 20.2491 | 0 | 20.2491 |
| 8 | 0.481772 | 10.7638 | UNIT I | 3 | 28 | 13.1049 | 15.0561 | 22.6743 | 0 | 22.6743 |
| 9 | 0.481772 | 11.9266 | UNIT I | 3 | 28 | 14.0368 | 16.1267 | 24.6877 | 0 | 24.6877 |
| 10 | 0.481772 | 13.0718 | UNIT I | 3 | 28 | 14.919 | 17.1403 | 26.594 | 0 | 26.594 |
| 11 | 0.481772 | 14.1572 | UNIT I | 3 | 28 | 15.7123 | 18.0517 | 28.3082 | 0 | 28.3082 |
| 12 | 0.481772 | 15.0743 | UNIT I | 3 | 28 | 16.3177 | 18.7472 | 29.6161 | 0 | 29.6161 |
| 13 | 0.481772 | 15.818 | UNIT I | 3 | 28 | 16.7371 | 19.2291 | 30.5224 | 0 | 30.5224 |
| 14 | 0.481772 | 16.3823 | UNIT I | 3 | 28 | 16.9717 | 19.4986 | 31.0293 | 0 | 31.0293 |
| 15 | 0.481772 | 16.7598 | UNIT I | 3 | 28 | 17.0216 | 19.556 | 31.1372 | 0 | 31.1372 |
| 16 | 0.481772 | 16.9422 | UNIT I | 3 | 28 | 16.8865 | 19.4007 | 30.8452 | 0 | 30.8452 |
| 17 | 0.481772 | 16.9192 | UNIT I | 3 | 28 | 16.5649 | 19.0313 | 30.1506 | 0 | 30.1506 |
| 18 | 0.481772 | 16.6789 | UNIT I | 3 | 28 | 16.0549 | 18.4453 | 29.0486 | 0 | 29.0486 |
| 19 | 0.481772 | 16.2069 | UNIT I | 3 | 28 | 15.3533 | 17.6392 | 27.5323 | 0 | 27.5323 |
| 20 | 0.481772 | 15.486 | UNIT I | 3 | 28 | 14.456 | 16.6084 | 25.5937 | 0 | 25.5937 |
| 21 | 0.481772 | 14.4954 | UNIT I | 3 | 28 | 13.3585 | 15.3474 | 23.222 | 0 | 23.222 |
| 22 | 0.481772 | 13.2095 | UNIT I | 3 | 28 | 12.0543 | 13.8491 | 20.4042 | 0 | 20.4042 |
| 23 | 0.481772 | 10.7579 | UNIT I | 3 | 28 | 9.9087 | 11.384 | 15.768 | 0 | 15.768 |
| 24 | 0.481772 | 6.80491 | UNIT I | 3 | 28 | 6.75169 | 7.75695 | 8.94653 | 0 | 8.94653 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 0.481772 | 2.36313 | UNIT I | 3 | 28 | 3.40768 | 3.91505 | 1.72096 | 0 | 1.72096 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.06993

| 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 | 0.449718 | 0.835105 | UNIT I | 3 | 28 | 4.25542 | 4.553 | 2.92077 | 0 | 2.92077 |
| 2 | 0.449718 | 2.43319 | UNIT I | 3 | 28 | 6.26661 | 6.70483 | 6.96777 | 0 | 6.96777 |
| 3 | 0.449718 | 4.36054 | UNIT I | 3 | 28 | 8.61327 | 9.2156 | 11.6899 | 0 | 11.6899 |
| 4 | 0.449718 | 6.3766 | UNIT I | 3 | 28 | 10.9708 | 11.738 | 16.4338 | 0 | 16.4338 |
| 5 | 0.449718 | 8.22913 | UNIT I | 3 | 28 | 13.0274 | 13.9384 | 20.5721 | 0 | 20.5721 |
| 6 | 0.449718 | 9.91928 | UNIT I | 3 | 28 | 14.8027 | 15.8379 | 24.1446 | 0 | 24.1446 |
| 7 | 0.449718 | 11.4473 | UNIT I | 3 | 28 | 16.3131 | 17.4539 | 27.184 | 0 | 27.184 |
| 8 | 0.449718 | 12.8148 | UNIT I | 3 | 28 | 17.5742 | 18.8032 | 29.7216 | 0 | 29.7216 |
| 9 | 0.449718 | 14.1521 | UNIT I | 3 | 28 | 18.7469 | 20.0579 | 32.0814 | 0 | 32.0814 |
| 10 | 0.449718 | 15.4029 | UNIT I | 3 | 28 | 19.7704 | 21.1529 | 34.1406 | 0 | 34.1406 |
| 11 | 0.449718 | 16.4836 | UNIT I | 3 | 28 | 20.5584 | 21.996 | 35.7263 | 0 | 35.7263 |
| 12 | 0.449718 | 17.3899 | UNIT I | 3 | 28 | 21.1161 | 22.5928 | 36.8486 | 0 | 36.8486 |
| 13 | 0.449718 | 18.116 | UNIT I | 3 | 28 | 21.4472 | 22.947 | 37.5149 | 0 | 37.5149 |
| 14 | 0.449718 | 18.6546 | UNIT I | 3 | 28 | 21.5536 | 23.0608 | 37.729 | 0 | 37.729 |
| 15 | 0.449718 | 18.9969 | UNIT I | 3 | 28 | 21.4355 | 22.9345 | 37.4914 | 0 | 37.4914 |
| 16 | 0.449718 | 19.1322 | UNIT I | 3 | 28 | 21.0921 | 22.5671 | 36.8003 | 0 | 36.8003 |
| 17 | 0.449718 | 19.047 | UNIT I | 3 | 28 | 20.5207 | 21.9557 | 35.6504 | 0 | 35.6504 |
| 18 | 0.449718 | 18.7248 | UNIT I | 3 | 28 | 19.7168 | 21.0956 | 34.0328 | 0 | 34.0328 |
| 19 | 0.449718 | 18.1452 | UNIT I | 3 | 28 | 18.6744 | 19.9803 | 31.9353 | 0 | 31.9353 |
| 20 | 0.449718 | 17.2823 | UNIT I | 3 | 28 | 17.3853 | 18.6011 | 29.3413 | 0 | 29.3413 |
| 21 | 0.449718 | 16.1029 | UNIT I | 3 | 28 | 15.839 | 16.9466 | 26.2297 | 0 | 26.2297 |
| 22 | 0.449718 | 14.5622 | UNIT I | 3 | 28 | 14.0212 | 15.0017 | 22.5718 | 0 | 22.5718 |
| 23 | 0.449718 | 11.6755 | UNIT I | 3 | 28 | 11.1757 | 11.9572 | 16.8462 | 0 | 16.8462 |
| 24 | 0.449718 | 7.49203 | UNIT I | 3 | 28 | 7.48283 | 8.0061 | 9.41509 | 0 | 9.41509 |
| 25 | 0.449718 | 2.63164 | UNIT I | 3 | 28 | 3.56911 | 3.81869 | 1.53974 | 0 | 1.53974 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.13493

| 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 | 0.449718 | 0.835105 | UNIT I | 3 | 28 | 4.0117 | 4.553 | 2.92077 | 0 | 2.92077 |
| 2 | 0.449718 | 2.43319 | UNIT I | 3 | 28 | 5.9077 | 6.70483 | 6.96777 | 0 | 6.96777 |
| 3 | 0.449718 | 4.36054 | UNIT I | 3 | 28 | 8.11997 | 9.2156 | 11.6899 | 0 | 11.6899 |
| 4 | 0.449718 | 6.3766 | UNIT I | 3 | 28 | 10.3425 | 11.738 | 16.4338 | 0 | 16.4338 |
| 5 | 0.449718 | 8.22913 | UNIT I | 3 | 28 | 12.2813 | 13.9384 | 20.5721 | 0 | 20.5721 |
| 6 | 0.449718 | 9.91928 | UNIT I | 3 | 28 | 13.955 | 15.8379 | 24.1446 | 0 | 24.1446 |
| 7 | 0.449718 | 11.4473 | UNIT I | 3 | 28 | 15.3788 | 17.4539 | 27.184 | 0 | 27.184 |
| 8 | 0.449718 | 12.8148 | UNIT I | 3 | 28 | 16.5677 | 18.8032 | 29.7216 | 0 | 29.7216 |
| 9 | 0.449718 | 14.1521 | UNIT I | 3 | 28 | 17.6732 | 20.0579 | 32.0814 | 0 | 32.0814 |
| 10 | 0.449718 | 15.4029 | UNIT I | 3 | 28 | 18.6381 | 21.1529 | 34.1406 | 0 | 34.1406 |
| 11 | 0.449718 | 16.4836 | UNIT I | 3 | 28 | 19.3809 | 21.996 | 35.7263 | 0 | 35.7263 |
| 12 | 0.449718 | 17.3899 | UNIT I | 3 | 28 | 19.9068 | 22.5928 | 36.8486 | 0 | 36.8486 |
| 13 | 0.449718 | 18.116 | UNIT I | 3 | 28 | 20.2189 | 22.947 | 37.5149 | 0 | 37.5149 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 0.449718 | 18.6546 | UNIT I | 3 | 28 | 20.3191 | 23.0608 | 37.729 | 0 | 37.729 |
| 15 | 0.449718 | 18.9969 | UNIT I | 3 | 28 | 20.2079 | 22.9345 | 37.4914 | 0 | 37.4914 |
| 16 | 0.449718 | 19.1322 | UNIT I | 3 | 28 | 19.8841 | 22.5671 | 36.8003 | 0 | 36.8003 |
| 17 | 0.449718 | 19.047 | UNIT I | 3 | 28 | 19.3454 | 21.9557 | 35.6504 | 0 | 35.6504 |
| 18 | 0.449718 | 18.7248 | UNIT I | 3 | 28 | 18.5876 | 21.0956 | 34.0328 | 0 | 34.0328 |
| 19 | 0.449718 | 18.1452 | UNIT I | 3 | 28 | 17.6049 | 19.9803 | 31.9353 | 0 | 31.9353 |
| 20 | 0.449718 | 17.2823 | UNIT I | 3 | 28 | 16.3896 | 18.6011 | 29.3413 | 0 | 29.3413 |
| 21 | 0.449718 | 16.1029 | UNIT I | 3 | 28 | 14.9318 | 16.9466 | 26.2297 | 0 | 26.2297 |
| 22 | 0.449718 | 14.5622 | UNIT I | 3 | 28 | 13.2182 | 15.0017 | 22.5718 | 0 | 22.5718 |
| 23 | 0.449718 | 11.6755 | UNIT I | 3 | 28 | 10.5357 | 11.9572 | 16.8462 | 0 | 16.8462 |
| 24 | 0.449718 | 7.49203 | UNIT I | 3 | 28 | 7.05427 | 8.0061 | 9.41509 | 0 | 9.41509 |
| 25 | 0.449718 | 2.63164 | UNIT I | 3 | 28 | 3.3647 | 3.81869 | 1.53974 | 0 | 1.53974 |

**Global Minimum Query (spencer) - Safety Factor**: 1.15505

| 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 | 0.481772 | 0.721365 | UNIT I | 3 | 28 | 4.88486 | 5.64226 | 4.96936 | 0 | 4.96936 |
| 2 | 0.481772 | 2.08684 | UNIT I | 3 | 28 | 6.61797 | 7.64409 | 8.73426 | 0 | 8.73426 |
| 3 | 0.481772 | 3.29833 | UNIT I | 3 | 28 | 7.97628 | 9.213 | 11.685 | 0 | 11.685 |
| 4 | 0.481772 | 4.58778 | UNIT I | 3 | 28 | 9.30458 | 10.7473 | 14.5705 | 0 | 14.5705 |
| 5 | 0.481772 | 6.33814 | UNIT I | 3 | 28 | 11.0682 | 12.7843 | 18.4015 | 0 | 18.4015 |
| 6 | 0.481772 | 7.96817 | UNIT I | 3 | 28 | 12.5356 | 14.4792 | 21.5892 | 0 | 21.5892 |
| 7 | 0.481772 | 9.44389 | UNIT I | 3 | 28 | 13.703 | 15.8276 | 24.1254 | 0 | 24.1254 |
| 8 | 0.481772 | 10.7638 | UNIT I | 3 | 28 | 14.6021 | 16.8662 | 26.0784 | 0 | 26.0784 |
| 9 | 0.481772 | 11.9266 | UNIT I | 3 | 28 | 15.26 | 17.6261 | 27.5076 | 0 | 27.5076 |
| 10 | 0.481772 | 13.0718 | UNIT I | 3 | 28 | 15.8234 | 18.2768 | 28.7315 | 0 | 28.7315 |
| 11 | 0.481772 | 14.1572 | UNIT I | 3 | 28 | 16.2636 | 18.7853 | 29.6879 | 0 | 29.6879 |
| 12 | 0.481772 | 15.0743 | UNIT I | 3 | 28 | 16.4816 | 19.0371 | 30.1613 | 0 | 30.1613 |
| 13 | 0.481772 | 15.818 | UNIT I | 3 | 28 | 16.3869 | 18.9277 | 29.9557 | 0 | 29.9557 |
| 14 | 0.481772 | 16.3823 | UNIT I | 3 | 28 | 16.1654 | 18.6718 | 29.4745 | 0 | 29.4745 |
| 15 | 0.481772 | 16.7598 | UNIT I | 3 | 28 | 15.9025 | 18.3682 | 28.9035 | 0 | 28.9035 |
| 16 | 0.481772 | 16.9422 | UNIT I | 3 | 28 | 15.4504 | 17.846 | 27.9213 | 0 | 27.9213 |
| 17 | 0.481772 | 16.9192 | UNIT I | 3 | 28 | 14.9625 | 17.2824 | 26.8612 | 0 | 26.8612 |
| 18 | 0.481772 | 16.6789 | UNIT I | 3 | 28 | 14.6113 | 16.8768 | 26.0984 | 0 | 26.0984 |
| 19 | 0.481772 | 16.2069 | UNIT I | 3 | 28 | 14.2327 | 16.4395 | 25.276 | 0 | 25.276 |
| 20 | 0.481772 | 15.486 | UNIT I | 3 | 28 | 13.1334 | 15.1697 | 22.8879 | 0 | 22.8879 |
| 21 | 0.481772 | 14.4954 | UNIT I | 3 | 28 | 11.8314 | 13.6659 | 20.0597 | 0 | 20.0597 |
| 22 | 0.481772 | 13.2095 | UNIT I | 3 | 28 | 10.4221 | 12.0381 | 16.9981 | 0 | 16.9981 |
| 23 | 0.481772 | 10.7579 | UNIT I | 3 | 28 | 8.49703 | 9.8145 | 12.8162 | 0 | 12.8162 |
| 24 | 0.481772 | 6.80491 | UNIT I | 3 | 28 | 5.9915 | 6.92048 | 7.37335 | 0 | 7.37335 |
| 25 | 0.481772 | 2.36313 | UNIT I | 3 | 28 | 3.46907 | 4.00695 | 1.89379 | 0 | 1.89379 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.10557

| 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 | 0.0219285 | 0.00479056 | UNIT I | 3 | 28 | 0 | 0 | -75.0492 | 0 | -75.0492 |
| 2 | 0.0219285 | 0.0139451 | UNIT I | 3 | 28 | 6.38419 | 7.05817 | 7.6323 | 0 | 7.6323 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 0.0219285 | 0.0223449 | UNIT I | 3 | 28 | 5.91034 | 6.53429 | 6.64704 | 0 | 6.64704 |
| 4 | 0.0219285 | 0.0300531 | UNIT I | 3 | 28 | 5.58887 | 6.17889 | 5.97864 | 0 | 5.97864 |
| 5 | 0.0219285 | 0.0371167 | UNIT I | 3 | 28 | 5.351 | 5.91591 | 5.48404 | 0 | 5.48404 |
| 6 | 0.0219285 | 0.0435706 | UNIT I | 3 | 28 | 5.16127 | 5.70614 | 5.08948 | 0 | 5.08948 |
| 7 | 0.0219285 | 0.0494397 | UNIT I | 3 | 28 | 4.99993 | 5.52777 | 4.75406 | 0 | 4.75406 |
| 8 | 0.0219285 | 0.054741 | UNIT I | 3 | 28 | 4.85533 | 5.36791 | 4.45339 | 0 | 4.45339 |
| 9 | 0.0219285 | 0.0594846 | UNIT I | 3 | 28 | 4.72018 | 5.21849 | 4.17237 | 0 | 4.17237 |
| 10 | 0.0219285 | 0.0636743 | UNIT I | 3 | 28 | 4.58969 | 5.07422 | 3.90104 | 0 | 3.90104 |
| 11 | 0.0219285 | 0.0673074 | UNIT I | 3 | 28 | 4.46057 | 4.93147 | 3.63256 | 0 | 3.63256 |
| 12 | 0.0219285 | 0.0703753 | UNIT I | 3 | 28 | 4.33043 | 4.78759 | 3.36197 | 0 | 3.36197 |
| 13 | 0.0219285 | 0.0728622 | UNIT I | 3 | 28 | 4.19746 | 4.64059 | 3.08551 | 0 | 3.08551 |
| 14 | 0.0219285 | 0.0747449 | UNIT I | 3 | 28 | 4.0602 | 4.48884 | 2.8001 | 0 | 2.8001 |
| 15 | 0.0219285 | 0.0759906 | UNIT I | 3 | 28 | 3.91737 | 4.33093 | 2.50311 | 0 | 2.50311 |
| 16 | 0.0219285 | 0.076555 | UNIT I | 3 | 28 | 3.76777 | 4.16553 | 2.19204 | 0 | 2.19204 |
| 17 | 0.0219285 | 0.0763784 | UNIT I | 3 | 28 | 3.61017 | 3.9913 | 1.86436 | 0 | 1.86436 |
| 18 | 0.0219285 | 0.0753799 | UNIT I | 3 | 28 | 3.44326 | 3.80677 | 1.51731 | 0 | 1.51731 |
| 19 | 0.0219285 | 0.073448 | UNIT I | 3 | 28 | 3.26546 | 3.61019 | 1.1476 | 0 | 1.1476 |
| 20 | 0.0219285 | 0.0704244 | UNIT I | 3 | 28 | 3.07477 | 3.39937 | 0.751104 | 0 | 0.751104 |
| 21 | 0.0219285 | 0.0660725 | UNIT I | 3 | 28 | 2.86844 | 3.17126 | 0.322096 | 0 | 0.322096 |
| 22 | 0.0219285 | 0.0600131 | UNIT I | 3 | 28 | 2.64233 | 2.92128 | -0.148052 | 0 | -0.148052 |
| 23 | 0.0219285 | 0.0515618 | UNIT I | 3 | 28 | 2.3892 | 2.64142 | -0.674384 | 0 | -0.674384 |
| 24 | 0.0219285 | 0.0391827 | UNIT I | 3 | 28 | 2.13439 | 2.35972 | -1.20419 | 0 | -1.20419 |
| 25 | 0.0219285 | 0.0158787 | UNIT I | 3 | 28 | 9.71869 | 10.7447 | 14.5656 | 0 | 14.5656 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.07693

| 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 | 0.0219285 | 0.00479056 | UNIT I | 3 | 28 | 0 | 0 | -139.152 | 0 | -139.152 |
| 2 | 0.0219285 | 0.0139451 | UNIT I | 3 | 28 | 18.8035 | 20.25 | 32.4424 | 0 | 32.4424 |
| 3 | 0.0219285 | 0.0223449 | UNIT I | 3 | 28 | 11.8775 | 12.7912 | 18.4147 | 0 | 18.4147 |
| 4 | 0.0219285 | 0.0300531 | UNIT I | 3 | 28 | 8.98948 | 9.68104 | 12.5652 | 0 | 12.5652 |
| 5 | 0.0219285 | 0.0371167 | UNIT I | 3 | 28 | 7.54003 | 8.12008 | 9.62947 | 0 | 9.62947 |
| 6 | 0.0219285 | 0.0435706 | UNIT I | 3 | 28 | 6.69072 | 7.20544 | 7.90926 | 0 | 7.90926 |
| 7 | 0.0219285 | 0.0494397 | UNIT I | 3 | 28 | 6.12711 | 6.59847 | 6.76775 | 0 | 6.76775 |
| 8 | 0.0219285 | 0.054741 | UNIT I | 3 | 28 | 5.71487 | 6.15452 | 5.93281 | 0 | 5.93281 |
| 9 | 0.0219285 | 0.0594846 | UNIT I | 3 | 28 | 5.38981 | 5.80445 | 5.27442 | 0 | 5.27442 |
| 10 | 0.0219285 | 0.0636743 | UNIT I | 3 | 28 | 5.11809 | 5.51182 | 4.72403 | 0 | 4.72403 |
| 11 | 0.0219285 | 0.0673074 | UNIT I | 3 | 28 | 4.88037 | 5.25582 | 4.24258 | 0 | 4.24258 |
| 12 | 0.0219285 | 0.0703753 | UNIT I | 3 | 28 | 4.66482 | 5.02368 | 3.80599 | 0 | 3.80599 |
| 13 | 0.0219285 | 0.0728622 | UNIT I | 3 | 28 | 4.46372 | 4.80711 | 3.39867 | 0 | 3.39867 |
| 14 | 0.0219285 | 0.0747449 | UNIT I | 3 | 28 | 4.27177 | 4.6004 | 3.00992 | 0 | 3.00992 |
| 15 | 0.0219285 | 0.0759906 | UNIT I | 3 | 28 | 4.08519 | 4.39946 | 2.63199 | 0 | 2.63199 |
| 16 | 0.0219285 | 0.076555 | UNIT I | 3 | 28 | 3.90102 | 4.20113 | 2.259 | 0 | 2.259 |
| 17 | 0.0219285 | 0.0763784 | UNIT I | 3 | 28 | 3.71695 | 4.00289 | 1.88616 | 0 | 1.88616 |
| 18 | 0.0219285 | 0.0753799 | UNIT I | 3 | 28 | 3.53091 | 3.80254 | 1.50937 | 0 | 1.50937 |
| 19 | 0.0219285 | 0.073448 | UNIT I | 3 | 28 | 3.34099 | 3.59802 | 1.1247 | 0 | 1.1247 |
| 20 | 0.0219285 | 0.0704244 | UNIT I | 3 | 28 | 3.14518 | 3.38714 | 0.728113 | 0 | 0.728113 |
| 21 | 0.0219285 | 0.0660725 | UNIT I | 3 | 28 | 2.94114 | 3.1674 | 0.314838 | 0 | 0.314838 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 0.0219285 | 0.0600131 | UNIT I | 3 | 28 | 2.7257 | 2.93538 | -0.121526 | 0 | -0.121526 |
| 23 | 0.0219285 | 0.0515618 | UNIT I | 3 | 28 | 3.07388 | 3.31036 | 0.583699 | 0 | 0.583699 |
| 24 | 0.0219285 | 0.0391827 | UNIT I | 3 | 28 | 3.0913 | 3.32911 | 0.618965 | 0 | 0.618965 |
| 25 | 0.0219285 | 0.0158787 | UNIT I | 3 | 28 | 11.5345 | 12.4218 | 17.7199 | 0 | 17.7199 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.13211

| 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 | 0.481772 | 0.721365 | UNIT I | 3 | 28 | 3.71963 | 4.21103 | 2.27763 | 0 | 2.27763 |
| 2 | 0.481772 | 2.08684 | UNIT I | 3 | 28 | 5.27657 | 5.97366 | 5.59264 | 0 | 5.59264 |
| 3 | 0.481772 | 3.29833 | UNIT I | 3 | 28 | 6.86673 | 7.77389 | 8.97838 | 0 | 8.97838 |
| 4 | 0.481772 | 4.58778 | UNIT I | 3 | 28 | 8.60154 | 9.73789 | 12.6721 | 0 | 12.6721 |
| 5 | 0.481772 | 6.33814 | UNIT I | 3 | 28 | 10.3192 | 11.6825 | 16.3293 | 0 | 16.3293 |
| 6 | 0.481772 | 7.96817 | UNIT I | 3 | 28 | 11.8557 | 13.4219 | 19.6008 | 0 | 19.6008 |
| 7 | 0.481772 | 9.44389 | UNIT I | 3 | 28 | 13.2688 | 15.0217 | 22.6097 | 0 | 22.6097 |
| 8 | 0.481772 | 10.7638 | UNIT I | 3 | 28 | 14.5201 | 16.4384 | 25.2738 | 0 | 25.2738 |
| 9 | 0.481772 | 11.9266 | UNIT I | 3 | 28 | 16.4854 | 18.6633 | 29.4583 | 0 | 29.4583 |
| 10 | 0.481772 | 13.0718 | UNIT I | 3 | 28 | 17.3614 | 19.655 | 31.3235 | 0 | 31.3235 |
| 11 | 0.481772 | 14.1572 | UNIT I | 3 | 28 | 17.2584 | 19.5384 | 31.1042 | 0 | 31.1042 |
| 12 | 0.481772 | 15.0743 | UNIT I | 3 | 28 | 18.5749 | 21.0288 | 33.9071 | 0 | 33.9071 |
| 13 | 0.481772 | 15.818 | UNIT I | 3 | 28 | 18.3005 | 20.7182 | 33.3231 | 0 | 33.3231 |
| 14 | 0.481772 | 16.3823 | UNIT I | 3 | 28 | 16.7671 | 18.9822 | 30.058 | 0 | 30.058 |
| 15 | 0.481772 | 16.7598 | UNIT I | 3 | 28 | 16.3515 | 18.5117 | 29.1732 | 0 | 29.1732 |
| 16 | 0.481772 | 16.9422 | UNIT I | 3 | 28 | 15.8505 | 17.9445 | 28.1064 | 0 | 28.1064 |
| 17 | 0.481772 | 16.9192 | UNIT I | 3 | 28 | 14.5178 | 16.4358 | 25.269 | 0 | 25.269 |
| 18 | 0.481772 | 16.6789 | UNIT I | 3 | 28 | 13.2894 | 15.0451 | 22.6535 | 0 | 22.6535 |
| 19 | 0.481772 | 16.2069 | UNIT I | 3 | 28 | 13.7549 | 15.5721 | 23.6447 | 0 | 23.6447 |
| 20 | 0.481772 | 15.486 | UNIT I | 3 | 28 | 13.9473 | 15.7899 | 24.0543 | 0 | 24.0543 |
| 21 | 0.481772 | 14.4954 | UNIT I | 3 | 28 | 12.7582 | 14.4437 | 21.5225 | 0 | 21.5225 |
| 22 | 0.481772 | 13.2095 | UNIT I | 3 | 28 | 11.228 | 12.7113 | 18.2643 | 0 | 18.2643 |
| 23 | 0.481772 | 10.7579 | UNIT I | 3 | 28 | 9.07572 | 10.2747 | 13.6817 | 0 | 13.6817 |
| 24 | 0.481772 | 6.80491 | UNIT I | 3 | 28 | 6.27261 | 7.10129 | 7.71341 | 0 | 7.71341 |
| 25 | 0.481772 | 2.36313 | UNIT I | 3 | 28 | 3.53437 | 4.00129 | 1.88315 | 0 | 1.88315 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.15152

| 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 | 0.481772 | 0.721365 | UNIT I | 3 | 28 | 3.67527 | 4.23215 | 2.31732 | 0 | 2.31732 |
| 2 | 0.481772 | 2.08684 | UNIT I | 3 | 28 | 5.49619 | 6.32897 | 6.26087 | 0 | 6.26087 |
| 3 | 0.481772 | 3.29833 | UNIT I | 3 | 28 | 7.20172 | 8.29293 | 9.95455 | 0 | 9.95455 |
| 4 | 0.481772 | 4.58778 | UNIT I | 3 | 28 | 8.98852 | 10.3505 | 13.8242 | 0 | 13.8242 |
| 5 | 0.481772 | 6.33814 | UNIT I | 3 | 28 | 11.2244 | 12.9251 | 18.6664 | 0 | 18.6664 |
| 6 | 0.481772 | 7.96817 | UNIT I | 3 | 28 | 13.1636 | 15.1582 | 22.8663 | 0 | 22.8663 |
| 7 | 0.481772 | 9.44389 | UNIT I | 3 | 28 | 14.7034 | 16.9313 | 26.201 | 0 | 26.201 |
| 8 | 0.481772 | 10.7638 | UNIT I | 3 | 28 | 15.8117 | 18.2075 | 28.6011 | 0 | 28.6011 |
| 9 | 0.481772 | 11.9266 | UNIT I | 3 | 28 | 16.4929 | 18.9919 | 30.0763 | 0 | 30.0763 |
| 10 | 0.481772 | 13.0718 | UNIT I | 3 | 28 | 16.9059 | 19.4675 | 30.9708 | 0 | 30.9708 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 0.481772 | 14.1572 | UNIT I | 3 | 28 | 17.059 | 19.6438 | 31.3025 | 0 | 31.3025 |
| 12 | 0.481772 | 15.0743 | UNIT I | 3 | 28 | 16.9042 | 19.4655 | 30.967 | 0 | 30.967 |
| 13 | 0.481772 | 15.818 | UNIT I | 3 | 28 | 16.3915 | 18.8751 | 29.8566 | 0 | 29.8566 |
| 14 | 0.481772 | 16.3823 | UNIT I | 3 | 28 | 15.8068 | 18.2019 | 28.5907 | 0 | 28.5907 |
| 15 | 0.481772 | 16.7598 | UNIT I | 3 | 28 | 15.2978 | 17.6157 | 27.4881 | 0 | 27.4881 |
| 16 | 0.481772 | 16.9422 | UNIT I | 3 | 28 | 14.7161 | 16.9459 | 26.2285 | 0 | 26.2285 |
| 17 | 0.481772 | 16.9192 | UNIT I | 3 | 28 | 14.237 | 16.3942 | 25.1909 | 0 | 25.1909 |
| 18 | 0.481772 | 16.6789 | UNIT I | 3 | 28 | 13.9841 | 16.103 | 24.6432 | 0 | 24.6432 |
| 19 | 0.481772 | 16.2069 | UNIT I | 3 | 28 | 13.7009 | 15.7769 | 24.0298 | 0 | 24.0298 |
| 20 | 0.481772 | 15.486 | UNIT I | 3 | 28 | 12.8026 | 14.7424 | 22.0842 | 0 | 22.0842 |
| 21 | 0.481772 | 14.4954 | UNIT I | 3 | 28 | 11.8177 | 13.6083 | 19.9514 | 0 | 19.9514 |
| 22 | 0.481772 | 13.2095 | UNIT I | 3 | 28 | 10.7993 | 12.4356 | 17.7458 | 0 | 17.7458 |
| 23 | 0.481772 | 10.7579 | UNIT I | 3 | 28 | 9.14386 | 10.5293 | 14.1606 | 0 | 14.1606 |
| 24 | 0.481772 | 6.80491 | UNIT I | 3 | 28 | 6.50974 | 7.4961 | 8.45592 | 0 | 8.45592 |
| 25 | 0.481772 | 2.36313 | UNIT I | 3 | 28 | 3.41571 | 3.93326 | 1.75521 | 0 | 1.75521 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

### External Boundary

| X | Y |
|---|---|
| 42.2084 | 59.656 |
| 40.5299 | 57.6985 |
| 39.2201 | 56.0079 |
| 37.5797 | 54.3301 |
| 36.0284 | 53.0971 |
| 34.9857 | 52.3471 |
| 32.931 | 51.3318 |
| 32.4461 | 51.1888 |
| 32.1758 | 51.2126 |
| 31.6273 | 51.2126 |
| 31.1106 | 51.1173 |
| 30.8801 | 50.9584 |
| 30.4826 | 51.006 |
| 29.3379 | 51.0855 |
| 28.2568 | 51.1173 |
| 24.7792 | 51.0927 |
| 23.8593 | 51.061 |
| 22.0128 | 50.9974 |
| 21.6472 | 50.902 |

| | |
|---|---|
| 21.0828 | 50.5524 |
| 20.0653 | 49.8134 |
| 18.9094 | 48.8644 |
| 17.5182 | 47.9982 |
| 14.7996 | 46.8381 |
| 11.6166 | 46.1137 |
| 9.81213 | 45.8117 |
| 9.0967 | 45.8514 |
| 8.0633 | 45.8117 |
| 6.7641 | 45.612 |
| 6.55742 | 45.5405 |
| 5.53992 | 44.9127 |
| 5.02322 | 44.8015 |
| 4.35549 | 44.5869 |
| 0.198047 | 43.403 |
| -3.76343 | 42.432 |
| -9.07729 | 41.119 |
| -15.1823 | 39.5377 |
| -18.268 | 38.8216 |
| -18.268 | 35.5812 |
| -18.268 | 33.5624 |
| -18.268 | 28.0059 |
| 44.4591 | 28.0059 |
| 44.4591 | 46.5638 |
| 44.4591 | 57.23 |
| 44.4591 | 59.34 |
| 44.4591 | 61.8678 |

## Material Boundary

| X | Y |
|---|---|
| 37.639 | 52.44 |
| 44.4591 | 59.34 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 47.235 |
| 30.8801 | 49.506 |

## Material Boundary

| X | Y |
|---|---|
| -9.07729 | 41.119 |
| 2.44 | 42.482 |
| 21.211 | 47.235 |

## Material Boundary

| | |
|---|---|

| X | Y |
|---|---|
| 21.211 | 44.211 |
| 31.462 | 47.978 |
| 39.112 | 51.057 |
| 44.4591 | 57.23 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 44.211 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 33.5624 |
| 21.211 | 40.173 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 40.173 |
| 44.4591 | 46.5638 |

## Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |

## Material Boundary

| X | Y |
|---|---|
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

## Material Boundary

| X | Y |
|---|---|
| 17.5182 | 47.9982 |
| 23.8593 | 51.061 |

# Slide Analysis Information

# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: 1.IMPR S60Λ-SLIDE EQ=0.20up + ΧΩΜ ROAD
Slide Modeler Version: 6.005
Project Title: SLIDE - An Interactive Slope Stability Program
Date Created: 10/3/2021, 20:34:28

## 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
- Corps of Engineers #1
- Corps of Engineers #2
- GLE/Morgenstern-Price with interslice force function: Half Sine
- Janbu simplified
- Janbu corrected
- Lowe-Karafiath
- Ordinary/Fellenius
- Spencer

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: Invalid Surfaces
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

## Loading

Seismic Load Coefficient (Horizontal): 0.2
Seismic Load Coefficient (Vertical): -0.1

## Material Properties

| Property | UNIT I | UNIT II | UNIT III | UNIT IV | UNIT II UNDER WT | AIR |
|---|---|---|---|---|---|---|
| Color | | | | | | |
| Strength Type | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | Mohr-Coulomb | No strength |
| Unit Weight [kN/m3] | 19 | 19.5 | 21 | 22.2 | 19.5 | 0.001 |
| Cohesion [kPa] | 3 | 5 | 7 | 60 | 5 | |
| Friction Angle [deg] | 28 | 28 | 33 | 34 | 28 | |
| Water Surface | None | None | Water Table | Water Table | Water Table | None |
| Hu Value | | | 1 | 1 | 1 | |
| Ru Value | 0 | 0 | | | | 0 |

## Global Minimums

### Method: ordinary/fellenius

FS: 1.047300
Center: 16.372, 57.055
Radius: 10.673
Left Slip Surface Endpoint: 13.983, 46.652
Right Slip Surface Endpoint: 25.226, 51.096
Resisting Moment=1746.14 kN-m
Driving Moment=1667.28 kN-m

### Method: bishop simplified

FS: 1.118220
Center: 14.839, 60.279
Radius: 13.894
Left Slip Surface Endpoint: 13.222, 46.479
Right Slip Surface Endpoint: 25.266, 51.096
Resisting Moment=2186.84 kN-m
Driving Moment=1955.64 kN-m

### Method: janbu simplified

FS: 1.033780
Center: 16.372, 57.055
Radius: 10.673
Left Slip Surface Endpoint: 13.983, 46.652
Right Slip Surface Endpoint: 25.226, 51.096
Resisting Horizontal Force=156.396 kN
Driving Horizontal Force=151.286 kN

### Method: janbu corrected

FS: 1.096580
Center: 16.372, 57.055
Radius: 10.673
Left Slip Surface Endpoint: 13.983, 46.652
Right Slip Surface Endpoint: 25.226, 51.096
Resisting Horizontal Force=165.897 kN
Driving Horizontal Force=151.286 kN

### Method: spencer

FS: 1.119690
Center: 14.839, 60.279
Radius: 13.894
Left Slip Surface Endpoint: 13.222, 46.479
Right Slip Surface Endpoint: 25.266, 51.096
Resisting Moment=2189.71 kN-m
Driving Moment=1955.64 kN-m
Resisting Horizontal Force=144.206 kN
Driving Horizontal Force=128.791 kN

### Method: corp of eng#1

FS: 1.086880
Center: 20.758, 49.781
Radius: 0.362
Left Slip Surface Endpoint: 20.569, 49.472
Right Slip Surface Endpoint: 21.117, 49.737
Left Slope Intercept: 20.569 50.179
Right Slope Intercept: 21.117 50.574
Resisting Horizontal Force=2.42345 kN
Driving Horizontal Force=2.22973 kN

### Method: corp of eng#2

FS: 1.064200
Center: 20.758, 49.781
Radius: 0.362
Left Slip Surface Endpoint: 20.569, 49.472
Right Slip Surface Endpoint: 21.117, 49.737
Left Slope Intercept: 20.569 50.179
Right Slope Intercept: 21.117 50.574
Resisting Horizontal Force=3.1694 kN
Driving Horizontal Force=2.9782 kN

### Method: lowe-karafiath

FS: 1.098950
Center: 14.839, 60.279
Radius: 13.894
Left Slip Surface Endpoint: 13.222, 46.479
Right Slip Surface Endpoint: 25.266, 51.096

Resisting Horizontal Force=143.302 kN
Driving Horizontal Force=130.4 kN

### Method: gle/morgenstern-price

FS: 1.121150
Center: 14.839, 60.279
Radius: 13.894
Left Slip Surface Endpoint: 13.222, 46.479
Right Slip Surface Endpoint: 25.266, 51.096
Resisting Moment=2192.56 kN-m
Driving Moment=1955.64 kN-m
Resisting Horizontal Force=144.278 kN
Driving Horizontal Force=128.688 kN

## *Valid / Invalid Surfaces*

### Method: ordinary/fellenius

Number of Valid Surfaces: 9605
Number of Invalid Surfaces: 395

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 141 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Method: bishop simplified

Number of Valid Surfaces: 9603
Number of Invalid Surfaces: 397

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 143 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu simplified

Number of Valid Surfaces: 9475
Number of Invalid Surfaces: 525

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 271 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Method: janbu corrected

Number of Valid Surfaces: 9475
Number of Invalid Surfaces: 525

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 271 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: spencer

Number of Valid Surfaces: 9110
Number of Invalid Surfaces: 890

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 282 surfaces
Error Code -111 reported for 354 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#1

Number of Valid Surfaces: 9415
Number of Invalid Surfaces: 585

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 273 surfaces
Error Code -111 reported for 58 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: corp of eng#2

Number of Valid Surfaces: 8909
Number of Invalid Surfaces: 1091

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 510 surfaces
Error Code -111 reported for 327 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: lowe-karafiath

Number of Valid Surfaces: 6176
Number of Invalid Surfaces: 3824

**Error Codes:**

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 2622 surfaces

Error Code -111 reported for 948 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

## Method: gle/morgenstern-price

Number of Valid Surfaces: 9380
Number of Invalid Surfaces: 620

### Error Codes:

Error Code -105 reported for 2 surfaces
Error Code -106 reported for 53 surfaces
Error Code -108 reported for 277 surfaces
Error Code -111 reported for 89 surfaces
Error Code -114 reported for 197 surfaces
Error Code -123 reported for 2 surfaces

### Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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).
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-123 = Surface radius equal or less than the internal cutoff of 0.01.

# *Slice Data*

**Global Minimum Query (ordinary/fellenius) - Safety Factor**: 1.0473

| 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 | 0.449718 | 0.835105 | UNIT I | 3 | 28 | 3.71556 | 3.8913 | 1.67629 | 0 | 1.67629 |
| 2 | 0.449718 | 2.43319 | UNIT I | 3 | 28 | 5.36002 | 5.61355 | 4.91537 | 0 | 4.91537 |
| 3 | 0.449718 | 4.36054 | UNIT I | 3 | 28 | 7.34857 | 7.69616 | 8.8322 | 0 | 8.8322 |
| 4 | 0.449718 | 6.3766 | UNIT I | 3 | 28 | 9.41513 | 9.86047 | 12.9027 | 0 | 12.9027 |
| 5 | 0.449718 | 8.22913 | UNIT I | 3 | 28 | 11.2792 | 11.8127 | 16.5743 | 0 | 16.5743 |
| 6 | 0.449718 | 9.91928 | UNIT I | 3 | 28 | 12.9243 | 13.5356 | 19.8146 | 0 | 19.8146 |
| 7 | 0.449718 | 11.4473 | UNIT I | 3 | 28 | 14.3367 | 15.0148 | 22.5966 | 0 | 22.5966 |
| 8 | 0.449718 | 12.8148 | UNIT I | 3 | 28 | 15.508 | 16.2415 | 24.9037 | 0 | 24.9037 |
| 9 | 0.449718 | 14.1521 | UNIT I | 3 | 28 | 16.558 | 17.3412 | 26.9718 | 0 | 26.9718 |
| 10 | 0.449718 | 15.4029 | UNIT I | 3 | 28 | 17.422 | 18.2461 | 28.6737 | 0 | 28.6737 |
| 11 | 0.449718 | 16.4836 | UNIT I | 3 | 28 | 18.017 | 18.8692 | 29.8456 | 0 | 29.8456 |
| 12 | 0.449718 | 17.3899 | UNIT I | 3 | 28 | 18.3421 | 19.2097 | 30.486 | 0 | 30.486 |
| 13 | 0.449718 | 18.116 | UNIT I | 3 | 28 | 18.3998 | 19.2701 | 30.5995 | 0 | 30.5995 |
| 14 | 0.449718 | 18.6546 | UNIT I | 3 | 28 | 18.1956 | 19.0563 | 30.1975 | 0 | 30.1975 |
| 15 | 0.449718 | 18.9969 | UNIT I | 3 | 28 | 17.739 | 18.5781 | 29.2981 | 0 | 29.2981 |
| 16 | 0.449718 | 19.1322 | UNIT I | 3 | 28 | 17.0428 | 17.8489 | 27.9269 | 0 | 27.9269 |
| 17 | 0.449718 | 19.047 | UNIT I | 3 | 28 | 16.124 | 16.8867 | 26.1172 | 0 | 26.1172 |
| 18 | 0.449718 | 18.7248 | UNIT I | 3 | 28 | 15.0042 | 15.7139 | 23.9113 | 0 | 23.9113 |
| 19 | 0.449718 | 18.1452 | UNIT I | 3 | 28 | 13.7095 | 14.358 | 21.3614 | 0 | 21.3614 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 0.449718 | 17.2823 | UNIT I | 3 | 28 | 12.2722 | 12.8526 | 18.53 | 0 | 18.53 |
| 21 | 0.449718 | 16.1029 | UNIT I | 3 | 28 | 10.7303 | 11.2379 | 15.4931 | 0 | 15.4931 |
| 22 | 0.449718 | 14.5622 | UNIT I | 3 | 28 | 9.12921 | 9.56102 | 12.3395 | 0 | 12.3395 |
| 23 | 0.449718 | 11.6755 | UNIT I | 3 | 28 | 7.18166 | 7.52135 | 8.50344 | 0 | 8.50344 |
| 24 | 0.449718 | 7.49203 | UNIT I | 3 | 28 | 5.16769 | 5.41212 | 4.53654 | 0 | 4.53654 |
| 25 | 0.449718 | 2.63164 | UNIT I | 3 | 28 | 3.50544 | 3.67124 | 1.26243 | 0 | 1.26243 |

**Global Minimum Query (bishop simplified) - Safety Factor**: 1.11822

| 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 | 0.481772 | 0.721365 | UNIT I | 3 | 28 | 3.48871 | 3.90115 | 1.69481 | 0 | 1.69481 |
| 2 | 0.481772 | 2.08684 | UNIT I | 3 | 28 | 4.68006 | 5.23334 | 4.20031 | 0 | 4.20031 |
| 3 | 0.481772 | 3.29833 | UNIT I | 3 | 28 | 5.69309 | 6.36613 | 6.33076 | 0 | 6.33076 |
| 4 | 0.481772 | 4.58778 | UNIT I | 3 | 28 | 6.74211 | 7.53916 | 8.53693 | 0 | 8.53693 |
| 5 | 0.481772 | 6.33814 | UNIT I | 3 | 28 | 8.15894 | 9.12349 | 11.5166 | 0 | 11.5166 |
| 6 | 0.481772 | 7.96817 | UNIT I | 3 | 28 | 9.42674 | 10.5412 | 14.1829 | 0 | 14.1829 |
| 7 | 0.481772 | 9.44389 | UNIT I | 3 | 28 | 10.523 | 11.7671 | 16.4884 | 0 | 16.4884 |
| 8 | 0.481772 | 10.7638 | UNIT I | 3 | 28 | 11.4535 | 12.8075 | 18.4453 | 0 | 18.4453 |
| 9 | 0.481772 | 11.9266 | UNIT I | 3 | 28 | 12.2236 | 13.6687 | 20.0649 | 0 | 20.0649 |
| 10 | 0.481772 | 13.0718 | UNIT I | 3 | 28 | 12.9517 | 14.4828 | 21.5959 | 0 | 21.5959 |
| 11 | 0.481772 | 14.1572 | UNIT I | 3 | 28 | 13.6047 | 15.213 | 22.9693 | 0 | 22.9693 |
| 12 | 0.481772 | 15.0743 | UNIT I | 3 | 28 | 14.0997 | 15.7666 | 24.0106 | 0 | 24.0106 |
| 13 | 0.481772 | 15.818 | UNIT I | 3 | 28 | 14.4388 | 16.1457 | 24.7234 | 0 | 24.7234 |
| 14 | 0.481772 | 16.3823 | UNIT I | 3 | 28 | 14.6226 | 16.3513 | 25.1102 | 0 | 25.1102 |
| 15 | 0.481772 | 16.7598 | UNIT I | 3 | 28 | 14.6518 | 16.3839 | 25.1715 | 0 | 25.1715 |
| 16 | 0.481772 | 16.9422 | UNIT I | 3 | 28 | 14.5259 | 16.2432 | 24.9069 | 0 | 24.9069 |
| 17 | 0.481772 | 16.9192 | UNIT I | 3 | 28 | 14.2441 | 15.928 | 24.314 | 0 | 24.314 |
| 18 | 0.481772 | 16.6789 | UNIT I | 3 | 28 | 13.8046 | 15.4366 | 23.3897 | 0 | 23.3897 |
| 19 | 0.481772 | 16.2069 | UNIT I | 3 | 28 | 13.2049 | 14.766 | 22.1287 | 0 | 22.1287 |
| 20 | 0.481772 | 15.486 | UNIT I | 3 | 28 | 12.4421 | 13.913 | 20.5243 | 0 | 20.5243 |
| 21 | 0.481772 | 14.4954 | UNIT I | 3 | 28 | 11.512 | 12.8729 | 18.5682 | 0 | 18.5682 |
| 22 | 0.481772 | 13.2095 | UNIT I | 3 | 28 | 10.4098 | 11.6404 | 16.2504 | 0 | 16.2504 |
| 23 | 0.481772 | 10.7579 | UNIT I | 3 | 28 | 8.60615 | 9.62357 | 12.4571 | 0 | 12.4571 |
| 24 | 0.481772 | 6.80491 | UNIT I | 3 | 28 | 5.96048 | 6.66513 | 6.89311 | 0 | 6.89311 |
| 25 | 0.481772 | 2.36313 | UNIT I | 3 | 28 | 3.16095 | 3.53464 | 1.00551 | 0 | 1.00551 |

**Global Minimum Query (janbu simplified) - Safety Factor**: 1.03378

| 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 | 0.449718 | 0.835105 | UNIT I | 3 | 28 | 4.20915 | 4.35133 | 2.54148 | 0 | 2.54148 |
| 2 | 0.449718 | 2.43319 | UNIT I | 3 | 28 | 5.8995 | 6.09879 | 5.82797 | 0 | 5.82797 |
| 3 | 0.449718 | 4.36054 | UNIT I | 3 | 28 | 7.87269 | 8.13863 | 9.66436 | 0 | 9.66436 |
| 4 | 0.449718 | 6.3766 | UNIT I | 3 | 28 | 9.85278 | 10.1856 | 13.5142 | 0 | 13.5142 |
| 5 | 0.449718 | 8.22913 | UNIT I | 3 | 28 | 11.5756 | 11.9666 | 16.8637 | 0 | 16.8637 |
| 6 | 0.449718 | 9.91928 | UNIT I | 3 | 28 | 13.0585 | 13.4996 | 19.747 | 0 | 19.747 |
| 7 | 0.449718 | 11.4473 | UNIT I | 3 | 28 | 14.3159 | 14.7995 | 22.1916 | 0 | 22.1916 |
| 8 | 0.449718 | 12.8148 | UNIT I | 3 | 28 | 15.3613 | 15.8802 | 24.2241 | 0 | 24.2241 |
| 9 | 0.449718 | 14.1521 | UNIT I | 3 | 28 | 16.3312 | 16.8829 | 26.1099 | 0 | 26.1099 |
| 10 | 0.449718 | 15.4029 | UNIT I | 3 | 28 | 17.1742 | 17.7543 | 27.7488 | 0 | 27.7488 |
| 11 | 0.449718 | 16.4836 | UNIT I | 3 | 28 | 17.8178 | 18.4197 | 29.0002 | 0 | 29.0002 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 0.449718 | 17.3899 | UNIT I | 3 | 28 | 18.2667 | 18.8837 | 29.8729 | 0 | 29.8729 |
| 13 | 0.449718 | 18.116 | UNIT I | 3 | 28 | 18.5242 | 19.1499 | 30.3734 | 0 | 30.3734 |
| 14 | 0.449718 | 18.6546 | UNIT I | 3 | 28 | 18.592 | 19.22 | 30.5054 | 0 | 30.5054 |
| 15 | 0.449718 | 18.9969 | UNIT I | 3 | 28 | 18.4708 | 19.0947 | 30.2696 | 0 | 30.2696 |
| 16 | 0.449718 | 19.1322 | UNIT I | 3 | 28 | 18.1599 | 18.7733 | 29.6653 | 0 | 29.6653 |
| 17 | 0.449718 | 19.047 | UNIT I | 3 | 28 | 17.6573 | 18.2538 | 28.6882 | 0 | 28.6882 |
| 18 | 0.449718 | 18.7248 | UNIT I | 3 | 28 | 16.9597 | 17.5326 | 27.3318 | 0 | 27.3318 |
| 19 | 0.449718 | 18.1452 | UNIT I | 3 | 28 | 16.062 | 16.6046 | 25.5867 | 0 | 25.5867 |
| 20 | 0.449718 | 17.2823 | UNIT I | 3 | 28 | 14.9578 | 15.4631 | 23.4398 | 0 | 23.4398 |
| 21 | 0.449718 | 16.1029 | UNIT I | 3 | 28 | 13.6386 | 14.0993 | 20.8747 | 0 | 20.8747 |
| 22 | 0.449718 | 14.5622 | UNIT I | 3 | 28 | 12.0925 | 12.501 | 17.8688 | 0 | 17.8688 |
| 23 | 0.449718 | 11.6755 | UNIT I | 3 | 28 | 9.68786 | 10.0151 | 13.1935 | 0 | 13.1935 |
| 24 | 0.449718 | 7.49203 | UNIT I | 3 | 28 | 6.57751 | 6.7997 | 7.1462 | 0 | 7.1462 |
| 25 | 0.449718 | 2.63164 | UNIT I | 3 | 28 | 3.28676 | 3.39779 | 0.748136 | 0 | 0.748136 |

**Global Minimum Query (janbu corrected) - Safety Factor**: 1.09658

| 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 | 0.449718 | 0.835105 | UNIT I | 3 | 28 | 3.96809 | 4.35133 | 2.54148 | 0 | 2.54148 |
| 2 | 0.449718 | 2.43319 | UNIT I | 3 | 28 | 5.56165 | 6.09879 | 5.82797 | 0 | 5.82797 |
| 3 | 0.449718 | 4.36054 | UNIT I | 3 | 28 | 7.42183 | 8.13863 | 9.66436 | 0 | 9.66436 |
| 4 | 0.449718 | 6.3766 | UNIT I | 3 | 28 | 9.28852 | 10.1856 | 13.5142 | 0 | 13.5142 |
| 5 | 0.449718 | 8.22913 | UNIT I | 3 | 28 | 10.9127 | 11.9666 | 16.8637 | 0 | 16.8637 |
| 6 | 0.449718 | 9.91928 | UNIT I | 3 | 28 | 12.3106 | 13.4996 | 19.747 | 0 | 19.747 |
| 7 | 0.449718 | 11.4473 | UNIT I | 3 | 28 | 13.4961 | 14.7995 | 22.1916 | 0 | 22.1916 |
| 8 | 0.449718 | 12.8148 | UNIT I | 3 | 28 | 14.4816 | 15.8802 | 24.2241 | 0 | 24.2241 |
| 9 | 0.449718 | 14.1521 | UNIT I | 3 | 28 | 15.396 | 16.8829 | 26.1099 | 0 | 26.1099 |
| 10 | 0.449718 | 15.4029 | UNIT I | 3 | 28 | 16.1906 | 17.7543 | 27.7488 | 0 | 27.7488 |
| 11 | 0.449718 | 16.4836 | UNIT I | 3 | 28 | 16.7974 | 18.4197 | 29.0002 | 0 | 29.0002 |
| 12 | 0.449718 | 17.3899 | UNIT I | 3 | 28 | 17.2205 | 18.8837 | 29.8729 | 0 | 29.8729 |
| 13 | 0.449718 | 18.116 | UNIT I | 3 | 28 | 17.4633 | 19.1499 | 30.3734 | 0 | 30.3734 |
| 14 | 0.449718 | 18.6546 | UNIT I | 3 | 28 | 17.5272 | 19.22 | 30.5054 | 0 | 30.5054 |
| 15 | 0.449718 | 18.9969 | UNIT I | 3 | 28 | 17.413 | 19.0947 | 30.2696 | 0 | 30.2696 |
| 16 | 0.449718 | 19.1322 | UNIT I | 3 | 28 | 17.1199 | 18.7733 | 29.6653 | 0 | 29.6653 |
| 17 | 0.449718 | 19.047 | UNIT I | 3 | 28 | 16.6461 | 18.2538 | 28.6882 | 0 | 28.6882 |
| 18 | 0.449718 | 18.7248 | UNIT I | 3 | 28 | 15.9884 | 17.5326 | 27.3318 | 0 | 27.3318 |
| 19 | 0.449718 | 18.1452 | UNIT I | 3 | 28 | 15.1422 | 16.6046 | 25.5867 | 0 | 25.5867 |
| 20 | 0.449718 | 17.2823 | UNIT I | 3 | 28 | 14.1012 | 15.4631 | 23.4398 | 0 | 23.4398 |
| 21 | 0.449718 | 16.1029 | UNIT I | 3 | 28 | 12.8575 | 14.0993 | 20.8747 | 0 | 20.8747 |
| 22 | 0.449718 | 14.5622 | UNIT I | 3 | 28 | 11.4 | 12.501 | 17.8688 | 0 | 17.8688 |
| 23 | 0.449718 | 11.6755 | UNIT I | 3 | 28 | 9.13305 | 10.0151 | 13.1935 | 0 | 13.1935 |
| 24 | 0.449718 | 7.49203 | UNIT I | 3 | 28 | 6.20082 | 6.7997 | 7.1462 | 0 | 7.1462 |
| 25 | 0.449718 | 2.63164 | UNIT I | 3 | 28 | 3.09853 | 3.39779 | 0.748136 | 0 | 0.748136 |

**Global Minimum Query (spencer) - Safety Factor**: 1.11969

| 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 | 0.481772 | 0.721365 | UNIT I | 3 | 28 | 4.83999 | 5.41929 | 4.55003 | 0 | 4.55003 |
| 2 | 0.481772 | 2.08684 | UNIT I | 3 | 28 | 6.24683 | 6.99451 | 7.51257 | 0 | 7.51257 |
| 3 | 0.481772 | 3.29833 | UNIT I | 3 | 28 | 7.34528 | 8.22444 | 9.82573 | 0 | 9.82573 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 0.481772 | 4.58778 | UNIT I | 3 | 28 | 8.42064 | 9.42851 | 12.0903 | 0 | 12.0903 |
| 5 | 0.481772 | 6.33814 | UNIT I | 3 | 28 | 9.85761 | 11.0375 | 15.1163 | 0 | 15.1163 |
| 6 | 0.481772 | 7.96817 | UNIT I | 3 | 28 | 11.0508 | 12.3734 | 17.6289 | 0 | 17.6289 |
| 7 | 0.481772 | 9.44389 | UNIT I | 3 | 28 | 11.997 | 13.4329 | 19.6215 | 0 | 19.6215 |
| 8 | 0.481772 | 10.7638 | UNIT I | 3 | 28 | 12.7224 | 14.2452 | 21.1491 | 0 | 21.1491 |
| 9 | 0.481772 | 11.9266 | UNIT I | 3 | 28 | 13.2493 | 14.8351 | 22.2585 | 0 | 22.2585 |
| 10 | 0.481772 | 13.0718 | UNIT I | 3 | 28 | 13.6963 | 15.3356 | 23.1999 | 0 | 23.1999 |
| 11 | 0.481772 | 14.1572 | UNIT I | 3 | 28 | 14.0407 | 15.7212 | 23.9251 | 0 | 23.9251 |
| 12 | 0.481772 | 15.0743 | UNIT I | 3 | 28 | 14.1985 | 15.8979 | 24.2575 | 0 | 24.2575 |
| 13 | 0.481772 | 15.818 | UNIT I | 3 | 28 | 14.076 | 15.7608 | 23.9996 | 0 | 23.9996 |
| 14 | 0.481772 | 16.3823 | UNIT I | 3 | 28 | 13.8585 | 15.5172 | 23.5414 | 0 | 23.5414 |
| 15 | 0.481772 | 16.7598 | UNIT I | 3 | 28 | 13.6298 | 15.2612 | 23.0599 | 0 | 23.0599 |
| 16 | 0.481772 | 16.9422 | UNIT I | 3 | 28 | 13.2396 | 14.8242 | 22.2381 | 0 | 22.2381 |
| 17 | 0.481772 | 16.9192 | UNIT I | 3 | 28 | 12.8406 | 14.3775 | 21.398 | 0 | 21.398 |
| 18 | 0.481772 | 16.6789 | UNIT I | 3 | 28 | 12.6058 | 14.1146 | 20.9035 | 0 | 20.9035 |
| 19 | 0.481772 | 16.2069 | UNIT I | 3 | 28 | 12.3685 | 13.8489 | 20.4038 | 0 | 20.4038 |
| 20 | 0.481772 | 15.486 | UNIT I | 3 | 28 | 11.429 | 12.797 | 18.4254 | 0 | 18.4254 |
| 21 | 0.481772 | 14.4954 | UNIT I | 3 | 28 | 10.3088 | 11.5427 | 16.0664 | 0 | 16.0664 |
| 22 | 0.481772 | 13.2095 | UNIT I | 3 | 28 | 9.10291 | 10.1924 | 13.527 | 0 | 13.527 |
| 23 | 0.481772 | 10.7579 | UNIT I | 3 | 28 | 7.48567 | 8.38163 | 10.1214 | 0 | 10.1214 |
| 24 | 0.481772 | 6.80491 | UNIT I | 3 | 28 | 5.4056 | 6.0526 | 5.7411 | 0 | 5.7411 |
| 25 | 0.481772 | 2.36313 | UNIT I | 3 | 28 | 3.31195 | 3.70836 | 1.33222 | 0 | 1.33222 |

**Global Minimum Query (corp of eng#1) - Safety Factor**: 1.08688

| 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 | 0.0219285 | 0.00479056 | UNIT I | 3 | 28 | 0 | 0 | -75.1088 | 0 | -75.1088 |
| 2 | 0.0219285 | 0.0139451 | UNIT I | 3 | 28 | 6.45603 | 7.01693 | 7.55476 | 0 | 7.55476 |
| 3 | 0.0219285 | 0.0223449 | UNIT I | 3 | 28 | 5.86583 | 6.37545 | 6.34832 | 0 | 6.34832 |
| 4 | 0.0219285 | 0.0300531 | UNIT I | 3 | 28 | 5.47286 | 5.94834 | 5.54502 | 0 | 5.54502 |
| 5 | 0.0219285 | 0.0371167 | UNIT I | 3 | 28 | 5.1879 | 5.63863 | 4.96255 | 0 | 4.96255 |
| 6 | 0.0219285 | 0.0435706 | UNIT I | 3 | 28 | 4.96595 | 5.39739 | 4.50885 | 0 | 4.50885 |
| 7 | 0.0219285 | 0.0494397 | UNIT I | 3 | 28 | 4.78232 | 5.19781 | 4.13348 | 0 | 4.13348 |
| 8 | 0.0219285 | 0.054741 | UNIT I | 3 | 28 | 4.62254 | 5.02415 | 3.80687 | 0 | 3.80687 |
| 9 | 0.0219285 | 0.0594846 | UNIT I | 3 | 28 | 4.47763 | 4.86665 | 3.51067 | 0 | 3.51067 |
| 10 | 0.0219285 | 0.0636743 | UNIT I | 3 | 28 | 4.34175 | 4.71896 | 3.23288 | 0 | 3.23288 |
| 11 | 0.0219285 | 0.0673074 | UNIT I | 3 | 28 | 4.21086 | 4.5767 | 2.96534 | 0 | 2.96534 |
| 12 | 0.0219285 | 0.0703753 | UNIT I | 3 | 28 | 4.08212 | 4.43677 | 2.70217 | 0 | 2.70217 |
| 13 | 0.0219285 | 0.0728622 | UNIT I | 3 | 28 | 3.95335 | 4.29682 | 2.43897 | 0 | 2.43897 |
| 14 | 0.0219285 | 0.0747449 | UNIT I | 3 | 28 | 3.82288 | 4.15501 | 2.17226 | 0 | 2.17226 |
| 15 | 0.0219285 | 0.0759906 | UNIT I | 3 | 28 | 3.68925 | 4.00977 | 1.8991 | 0 | 1.8991 |
| 16 | 0.0219285 | 0.076555 | UNIT I | 3 | 28 | 3.55116 | 3.85969 | 1.61683 | 0 | 1.61683 |
| 17 | 0.0219285 | 0.0763784 | UNIT I | 3 | 28 | 3.40735 | 3.70338 | 1.32287 | 0 | 1.32287 |
| 18 | 0.0219285 | 0.0753799 | UNIT I | 3 | 28 | 3.25648 | 3.53941 | 1.01448 | 0 | 1.01448 |
| 19 | 0.0219285 | 0.073448 | UNIT I | 3 | 28 | 3.09702 | 3.36609 | 0.688523 | 0 | 0.688523 |
| 20 | 0.0219285 | 0.0704244 | UNIT I | 3 | 28 | 2.92706 | 3.18137 | 0.341101 | 0 | 0.341101 |
| 21 | 0.0219285 | 0.0660725 | UNIT I | 3 | 28 | 2.74401 | 2.98241 | -0.0330799 | 0 | -0.0330799 |
| 22 | 0.0219285 | 0.0600131 | UNIT I | 3 | 28 | 2.54396 | 2.76498 | -0.442005 | 0 | -0.442005 |
| 23 | 0.0219285 | 0.0515618 | UNIT I | 3 | 28 | 2.32009 | 2.52166 | -0.899633 | 0 | -0.899633 |
| 24 | 0.0219285 | 0.0391827 | UNIT I | 3 | 28 | 2.09902 | 2.28139 | -1.35152 | 0 | -1.35152 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 0.0219285 | 0.0158787 | UNIT I | 3 | 28 | 9.80439 | 10.6562 | 14.3991 | 0 | 14.3991 |

**Global Minimum Query (corp of eng#2) - Safety Factor**: 1.0642

| 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 | 0.0219285 | 0.00479056 | UNIT I | 3 | 28 | 0 | 0 | -139.226 | 0 | -139.226 |
| 2 | 0.0219285 | 0.0139451 | UNIT I | 3 | 28 | 19.6914 | 20.9556 | 33.7695 | 0 | 33.7695 |
| 3 | 0.0219285 | 0.0223449 | UNIT I | 3 | 28 | 11.9216 | 12.687 | 18.2185 | 0 | 18.2185 |
| 4 | 0.0219285 | 0.0300531 | UNIT I | 3 | 28 | 8.78905 | 9.35331 | 11.9488 | 0 | 11.9488 |
| 5 | 0.0219285 | 0.0371167 | UNIT I | 3 | 28 | 7.2555 | 7.7213 | 8.87949 | 0 | 8.87949 |
| 6 | 0.0219285 | 0.0435706 | UNIT I | 3 | 28 | 6.37407 | 6.78328 | 7.11532 | 0 | 7.11532 |
| 7 | 0.0219285 | 0.0494397 | UNIT I | 3 | 28 | 5.79861 | 6.17088 | 5.96358 | 0 | 5.96358 |
| 8 | 0.0219285 | 0.054741 | UNIT I | 3 | 28 | 5.38408 | 5.72974 | 5.13388 | 0 | 5.13388 |
| 9 | 0.0219285 | 0.0594846 | UNIT I | 3 | 28 | 5.06207 | 5.38705 | 4.48939 | 0 | 4.48939 |
| 10 | 0.0219285 | 0.0636743 | UNIT I | 3 | 28 | 4.7969 | 5.10486 | 3.95867 | 0 | 3.95867 |
| 11 | 0.0219285 | 0.0673074 | UNIT I | 3 | 28 | 4.56835 | 4.86164 | 3.50124 | 0 | 3.50124 |
| 12 | 0.0219285 | 0.0703753 | UNIT I | 3 | 28 | 4.3641 | 4.64427 | 3.09242 | 0 | 3.09242 |
| 13 | 0.0219285 | 0.0728622 | UNIT I | 3 | 28 | 4.17614 | 4.44425 | 2.71624 | 0 | 2.71624 |
| 14 | 0.0219285 | 0.0747449 | UNIT I | 3 | 28 | 3.99904 | 4.25578 | 2.36177 | 0 | 2.36177 |
| 15 | 0.0219285 | 0.0759906 | UNIT I | 3 | 28 | 3.82888 | 4.07469 | 2.0212 | 0 | 2.0212 |
| 16 | 0.0219285 | 0.076555 | UNIT I | 3 | 28 | 3.66269 | 3.89784 | 1.68859 | 0 | 1.68859 |
| 17 | 0.0219285 | 0.0763784 | UNIT I | 3 | 28 | 3.49813 | 3.72271 | 1.35921 | 0 | 1.35921 |
| 18 | 0.0219285 | 0.0753799 | UNIT I | 3 | 28 | 3.33315 | 3.54714 | 1.02902 | 0 | 1.02902 |
| 19 | 0.0219285 | 0.073448 | UNIT I | 3 | 28 | 3.16588 | 3.36913 | 0.694227 | 0 | 0.694227 |
| 20 | 0.0219285 | 0.0704244 | UNIT I | 3 | 28 | 2.99438 | 3.18662 | 0.350987 | 0 | 0.350987 |
| 21 | 0.0219285 | 0.0660725 | UNIT I | 3 | 28 | 2.81643 | 2.99725 | -0.00517993 | 0 | -0.00517993 |
| 22 | 0.0219285 | 0.0600131 | UNIT I | 3 | 28 | 2.62903 | 2.79782 | -0.380249 | 0 | -0.380249 |
| 23 | 0.0219285 | 0.0515618 | UNIT I | 3 | 28 | 3.01787 | 3.21161 | 0.397987 | 0 | 0.397987 |
| 24 | 0.0219285 | 0.0391827 | UNIT I | 3 | 28 | 3.0689 | 3.26592 | 0.500126 | 0 | 0.500126 |
| 25 | 0.0219285 | 0.0158787 | UNIT I | 3 | 28 | 11.6181 | 12.364 | 17.611 | 0 | 17.611 |

**Global Minimum Query (lowe-karafiath) - Safety Factor**: 1.09895

| 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 | 0.481772 | 0.721365 | UNIT I | 3 | 28 | 3.68297 | 4.0474 | 1.96988 | 0 | 1.96988 |
| 2 | 0.481772 | 2.08684 | UNIT I | 3 | 28 | 4.99257 | 5.48659 | 4.6766 | 0 | 4.6766 |
| 3 | 0.481772 | 3.29833 | UNIT I | 3 | 28 | 6.35631 | 6.98527 | 7.4952 | 0 | 7.4952 |
| 4 | 0.481772 | 4.58778 | UNIT I | 3 | 28 | 7.83789 | 8.61345 | 10.5574 | 0 | 10.5574 |
| 5 | 0.481772 | 6.33814 | UNIT I | 3 | 28 | 9.24453 | 10.1593 | 13.4647 | 0 | 13.4647 |
| 6 | 0.481772 | 7.96817 | UNIT I | 3 | 28 | 10.5055 | 11.5451 | 16.0709 | 0 | 16.0709 |
| 7 | 0.481772 | 9.44389 | UNIT I | 3 | 28 | 11.6737 | 12.8288 | 18.4853 | 0 | 18.4853 |
| 8 | 0.481772 | 10.7638 | UNIT I | 3 | 28 | 12.7091 | 13.9667 | 20.6253 | 0 | 20.6253 |
| 9 | 0.481772 | 11.9266 | UNIT I | 3 | 28 | 14.3935 | 15.8177 | 24.1067 | 0 | 24.1067 |
| 10 | 0.481772 | 13.0718 | UNIT I | 3 | 28 | 15.0926 | 16.586 | 25.5516 | 0 | 25.5516 |
| 11 | 0.481772 | 14.1572 | UNIT I | 3 | 28 | 14.931 | 16.4084 | 25.2175 | 0 | 25.2175 |
| 12 | 0.481772 | 15.0743 | UNIT I | 3 | 28 | 16.034 | 17.6206 | 27.4973 | 0 | 27.4973 |
| 13 | 0.481772 | 15.818 | UNIT I | 3 | 28 | 15.7216 | 17.2773 | 26.8518 | 0 | 26.8518 |
| 14 | 0.481772 | 16.3823 | UNIT I | 3 | 28 | 14.3385 | 15.7573 | 23.9931 | 0 | 23.9931 |
| 15 | 0.481772 | 16.7598 | UNIT I | 3 | 28 | 13.969 | 15.3512 | 23.2292 | 0 | 23.2292 |
| 16 | 0.481772 | 16.9422 | UNIT I | 3 | 28 | 13.5285 | 14.8671 | 22.3186 | 0 | 22.3186 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0.481772 | 16.9192 | UNIT I | 3 | 28 | 12.4339 | 13.6642 | 20.0565 | 0 | 20.0565 |
| 18 | 0.481772 | 16.6789 | UNIT I | 3 | 28 | 11.5206 | 12.6606 | 18.1689 | 0 | 18.1689 |
| 19 | 0.481772 | 16.2069 | UNIT I | 3 | 28 | 11.9664 | 13.1505 | 19.0902 | 0 | 19.0902 |
| 20 | 0.481772 | 15.486 | UNIT I | 3 | 28 | 12.0648 | 13.2586 | 19.2936 | 0 | 19.2936 |
| 21 | 0.481772 | 14.4954 | UNIT I | 3 | 28 | 11.0396 | 12.132 | 17.1747 | 0 | 17.1747 |
| 22 | 0.481772 | 13.2095 | UNIT I | 3 | 28 | 9.73681 | 10.7003 | 14.4821 | 0 | 14.4821 |
| 23 | 0.481772 | 10.7579 | UNIT I | 3 | 28 | 7.93213 | 8.71701 | 10.7521 | 0 | 10.7521 |
| 24 | 0.481772 | 6.80491 | UNIT I | 3 | 28 | 5.61122 | 6.16645 | 5.95523 | 0 | 5.95523 |
| 25 | 0.481772 | 2.36313 | UNIT I | 3 | 28 | 3.34946 | 3.68089 | 1.28057 | 0 | 1.28057 |

**Global Minimum Query (gle/morgenstern-price) - Safety Factor**: 1.12115

| 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 | 0.481772 | 0.721365 | UNIT I | 3 | 28 | 3.63425 | 4.07454 | 2.02091 | 0 | 2.02091 |
| 2 | 0.481772 | 2.08684 | UNIT I | 3 | 28 | 5.2187 | 5.85095 | 5.36187 | 0 | 5.36187 |
| 3 | 0.481772 | 3.29833 | UNIT I | 3 | 28 | 6.70356 | 7.5157 | 8.49281 | 0 | 8.49281 |
| 4 | 0.481772 | 4.58778 | UNIT I | 3 | 28 | 8.24734 | 9.2465 | 11.7479 | 0 | 11.7479 |
| 5 | 0.481772 | 6.33814 | UNIT I | 3 | 28 | 10.149 | 11.3786 | 15.7578 | 0 | 15.7578 |
| 6 | 0.481772 | 7.96817 | UNIT I | 3 | 28 | 11.7781 | 13.205 | 19.1927 | 0 | 19.1927 |
| 7 | 0.481772 | 9.44389 | UNIT I | 3 | 28 | 13.0463 | 14.6269 | 21.8671 | 0 | 21.8671 |
| 8 | 0.481772 | 10.7638 | UNIT I | 3 | 28 | 13.9287 | 15.6162 | 23.7275 | 0 | 23.7275 |
| 9 | 0.481772 | 11.9266 | UNIT I | 3 | 28 | 14.4339 | 16.1826 | 24.7929 | 0 | 24.7929 |
| 10 | 0.481772 | 13.0718 | UNIT I | 3 | 28 | 14.6961 | 16.4765 | 25.3455 | 0 | 25.3455 |
| 11 | 0.481772 | 14.1572 | UNIT I | 3 | 28 | 14.7312 | 16.5159 | 25.4198 | 0 | 25.4198 |
| 12 | 0.481772 | 15.0743 | UNIT I | 3 | 28 | 14.5065 | 16.264 | 24.9458 | 0 | 24.9458 |
| 13 | 0.481772 | 15.818 | UNIT I | 3 | 28 | 13.9576 | 15.6486 | 23.7886 | 0 | 23.7886 |
| 14 | 0.481772 | 16.3823 | UNIT I | 3 | 28 | 13.3824 | 15.0037 | 22.5757 | 0 | 22.5757 |
| 15 | 0.481772 | 16.7598 | UNIT I | 3 | 28 | 12.9286 | 14.4949 | 21.6188 | 0 | 21.6188 |
| 16 | 0.481772 | 16.9422 | UNIT I | 3 | 28 | 12.4266 | 13.9321 | 20.5605 | 0 | 20.5605 |
| 17 | 0.481772 | 16.9192 | UNIT I | 3 | 28 | 12.0574 | 13.5181 | 19.7816 | 0 | 19.7816 |
| 18 | 0.481772 | 16.6789 | UNIT I | 3 | 28 | 11.9471 | 13.3945 | 19.5491 | 0 | 19.5491 |
| 19 | 0.481772 | 16.2069 | UNIT I | 3 | 28 | 11.8179 | 13.2496 | 19.2767 | 0 | 19.2767 |
| 20 | 0.481772 | 15.486 | UNIT I | 3 | 28 | 11.0462 | 12.3844 | 17.6496 | 0 | 17.6496 |
| 21 | 0.481772 | 14.4954 | UNIT I | 3 | 28 | 10.1999 | 11.4357 | 15.8652 | 0 | 15.8652 |
| 22 | 0.481772 | 13.2095 | UNIT I | 3 | 28 | 9.34003 | 10.4716 | 14.052 | 0 | 14.052 |
| 23 | 0.481772 | 10.7579 | UNIT I | 3 | 28 | 7.969 | 8.93444 | 11.161 | 0 | 11.161 |
| 24 | 0.481772 | 6.80491 | UNIT I | 3 | 28 | 5.78277 | 6.48335 | 6.55123 | 0 | 6.55123 |
| 25 | 0.481772 | 2.36313 | UNIT I | 3 | 28 | 3.18363 | 3.56932 | 1.07074 | 0 | 1.07074 |

## *List Of Coordinates*

### Water Table

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

## External Boundary

| X | Y |
|---|---|
| 42.2084 | 59.656 |
| 40.5299 | 57.6985 |
| 39.2201 | 56.0079 |
| 37.5797 | 54.3301 |
| 36.0284 | 53.0971 |
| 34.9857 | 52.3471 |
| 32.931 | 51.3318 |
| 32.4461 | 51.1888 |
| 32.1758 | 51.2126 |
| 31.6273 | 51.2126 |
| 31.1106 | 51.1173 |
| 30.8801 | 50.9584 |
| 30.4826 | 51.006 |
| 29.3379 | 51.0855 |
| 28.2568 | 51.1173 |
| 24.7792 | 51.0927 |
| 23.8593 | 51.061 |
| 22.0128 | 50.9974 |
| 21.6472 | 50.902 |
| 21.0828 | 50.5524 |
| 20.0653 | 49.8134 |
| 18.9094 | 48.8644 |
| 17.5182 | 47.9982 |
| 14.7996 | 46.8381 |
| 11.6166 | 46.1137 |
| 9.81213 | 45.8117 |
| 9.0967 | 45.8514 |
| 8.0633 | 45.8117 |
| 6.7641 | 45.612 |
| 6.55742 | 45.5405 |
| 5.53992 | 44.9127 |
| 5.02322 | 44.8015 |
| 4.35549 | 44.5869 |
| 0.198047 | 43.403 |
| -3.76343 | 42.432 |
| -9.07729 | 41.119 |
| -15.1823 | 39.5377 |
| -18.268 | 38.8216 |
| -18.268 | 35.5812 |
| -18.268 | 33.5624 |
| -18.268 | 28.0059 |
| 44.4591 | 28.0059 |
| 44.4591 | 46.5638 |
| 44.4591 | 57.23 |
| 44.4591 | 59.34 |
| 44.4591 | 61.8678 |

## Material Boundary

| X | Y |
|---|---|
| 37.639 | 52.44 |
| 44.4591 | 59.34 |

### Material Boundary

| X | Y |
|---|---|
| 21.211 | 47.235 |
| 30.8801 | 49.506 |

### Material Boundary

| X | Y |
|---|---|
| -9.07729 | 41.119 |
| 2.44 | 42.482 |
| 21.211 | 47.235 |

### Material Boundary

| X | Y |
|---|---|
| 21.211 | 44.211 |
| 31.462 | 47.978 |
| 39.112 | 51.057 |
| 44.4591 | 57.23 |

### Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 44.211 |

### Material Boundary

| X | Y |
|---|---|
| -18.268 | 33.5624 |
| 21.211 | 40.173 |

### Material Boundary

| X | Y |
|---|---|
| 21.211 | 40.173 |
| 44.4591 | 46.5638 |

### Material Boundary

| X | Y |
|---|---|
| -18.268 | 35.5812 |
| 21.211 | 45.542 |

### Material Boundary

| X | Y |
|---|---|

| | |
|---|---|
| 21.211 | 45.542 |
| 30.8801 | 49.506 |
| 37.639 | 52.44 |
| 44.4591 | 57.23 |

## Material Boundary

| X | Y |
|---|---|
| 17.5182 | 47.9982 |
| 23.8593 | 51.061 |

ΠΑΡΑΡΤΗΜΑ Β (ψηφιακά): ΔΕΔΟΜΕΝΑ ΥΠΟΛΟΓΙΣΜΩΝ ΕΛΑΣΤΟΠΛΑΣΤΙΚΩΝ ΑΝΑΛΥΣΕΩΝ ΜΕ ΠΕΠΕΡΑΣΜΕΝΑ ΣΤΟΙΧΕΙΑ

# Phase2 Analysis Information
# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: F-S44 + GABIONS EQdn loc lim + GEOTEX+noPILE+OCR
Last saved with Phase2 version: 8.005
Project Title: SLIDE - An Interactive Slope Stability Program
Analysis: Converted from Slide v6.005 with PHASE2 8.005

## General Settings

Number of Stages: 7
Analysis Type: Plane Strain
Solver Type: Gaussian Elimination
Units: Metric, stress as kPa

## Analysis Options

Maximum Number of Iterations: 500
Tolerance: 0.01
Number of Load Steps: 20
Convergence Type: Absolute Energy
Tensile Failure: Reduces Shear Strength
Joint tension reduces joint stiffness by a factor of 0.01

## Groundwater Analysis

Method: Piezometric Lines
Pore Fluid Unit Weight: 9.81 kN/m3
Probability: None

## Field Stress

Field stress: gravity
Using actual ground surface
Total stress ratio (horizontal/vertical in-plane): 0.5
Total stress ratio (horizontal/vertical out-of-plane): 0.5
Locked-in horizontal stress (in-plane): 0
Locked-in horizontal stress (out-of-plane): 0

## Seismic Loading

Horizontal seismic load coefficient: -0.2 (positive to the right)
Vertical seismic load coefficient: -0.1 (positive up)
Seismic load applied in: Stage 7

## Mesh

Mesh type: uniform
Element type: 6 noded triangles
Number of elements on Stage 1: 1290
Number of nodes on Stage 1: 2832
Number of elements on Stage 2: 1294
Number of nodes on Stage 2: 2832
Number of elements on Stage 3: 1325
Number of nodes on Stage 3: 2832
Number of elements on Stage 4: 1345
Number of nodes on Stage 4: 2832
Number of elements on Stage 5: 1345
Number of nodes on Stage 5: 2832
Number of elements on Stage 6: 1345
Number of nodes on Stage 6: 2832
Number of elements on Stage 7: 1345
Number of nodes on Stage 7: 2832

## Mesh Quality

All elements are of good quality

### Poor quality elements defined as:

Side length ratio (maximum / minimum) > 30.00
Minimum interior angle < 2.0 degrees
Maximum interior angle > 175.0 degrees

## Reset Displacements

Displacements reset after: Stage 1
Displacements reset after: Stage 2
Displacements reset after: Stage 3
Displacements reset after: Stage 4
Displacements reset after: Stage 5

## Material Properties

### Material: UNIT I

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 3 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 3 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 3 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Properties changed in Stage 1

Young's modulus: 40000 kPa (factor = 2)

## Material: UNIT III

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 21 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 30000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 7 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 33 degrees |
| Peak cohesion | 7 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 33 degrees |
| Residual Cohesion | 7 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT IV

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 22.2 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 175000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 60 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 34 degrees |
| Peak cohesion | 60 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 34 degrees |
| Residual Cohesion | 60 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT V

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 25 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 1.38234e+006 kPa |
| Poisson's ratio | 0.4 |
| Failure Criterion | Generalized Hoek-Brown |
| Material type | Plastic |
| Dilation Parameter | 0 |
| Compressive strength | 15000 kPa |
| mb parameter | 1.5091 |
| s parameter | 0.003866 |
| a parameter | 0.505734 |
| Residual mb parameter | 1.2623 |
| Residual s parameter | 0.002218 |
| Residual a parameter | 0.508086 |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II UNDER WT

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GABION

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 18 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 100000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 20 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 32 degrees |
| Peak cohesion | 20 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 32 degrees |
| Residual Cohesion | 20 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GRAVEL

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 50000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 36 degrees |
| Peak cohesion | 0 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 36 degrees |
| Residual Cohesion | 0 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: SW

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 40000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 1 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 35 degrees |
| Peak cohesion | 1 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 35 degrees |
| Residual Cohesion | 1 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Material: AIR

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 0.01 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.2 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 0.01 degrees |
| Peak cohesion | 0.01 kPa |
| Material type | Elastic |
| Piezo to use | None |
| Ru value | 0 |

## *Joint Properties*

### Joint: Joint SOIL

| | |
|---|---|
| Color | |
| Normal stiffness | 200000 kPa/m |
| Shear stiffness | 20000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 25 degrees |

## Joint: Joint UNIT V Intrf

| | |
|---|---|
| Color | |
| Normal stiffness | 1e+006 kPa/m |
| Shear stiffness | 100000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 32 degrees |
| Residual Friction angle | 28 degrees |

## Joint: Joint 4 GABIONS

| | |
|---|---|
| Color | |
| Normal stiffness | 500000 kPa/m |
| Shear stiffness | 50000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 3 kPa |
| Residual Cohesion | 2 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 28 degrees |

# *List of All Coordinates*

## External boundary

| X | Y |
|---|---|
| -11.931 | -13.213 |
| 61.92 | -13.213 |
| 61.92 | 27.196 |
| -11.931 | 27.196 |

## Material boundary

| X | Y |
|---|---|
| 0.246468 | -1.486 |
| 14.9068 | 2.35863 |
| 31.5166 | 8.03863 |
| 40.9932 | 10.5286 |
| 51.5928 | 16.7299 |
| 55.0767 | 20.7296 |

## Material boundary

| X | Y |
|---|---|
| 0.246468 | -4.15932 |
| 55.0767 | 11.186 |

## Material boundary

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 11.9085 | 4.52456 |
| 16.9071 | 5.83641 |

## Material boundary

| X | Y |
|---|---|
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

## Material boundary

| X | Y |
|---|---|
| 18.0906 | 7.53452 |
| 18.742 | 7.7233 |
| 31.5166 | 11.4256 |
| 40.9932 | 12.4986 |

## Material boundary

| X | Y |
|---|---|
| 51.3789 | 18.6028 |
| 55.0767 | 23.3646 |

## Material boundary

| X | Y |
|---|---|
| 17.2805 | 7.22412 |
| 18.0906 | 7.53452 |

## Material boundary

| X | Y |
|---|---|
| 17.9068 | 10.3107 |
| 20.3347 | 10.3108 |

## Material boundary

| X | Y |
|---|---|
| 17.9068 | 8.3111 |
| 18.356 | 8.3111 |

## Material boundary

| X | Y |
|---|---|

| | |
|---|---|
| 13.291 | 7.18104 |
| 13.2484 | 7.15374 |
| 13.2017 | 7.13399 |
| 13.1524 | 7.12236 |
| 13.1019 | 7.11917 |
| 13.0515 | 7.12451 |
| 13.0028 | 7.13824 |
| 12.9532 | 7.16181 |
| 12.932 | 7.17578 |
| 12.9064 | 7.19655 |
| 12.8845 | 7.21846 |
| 12.8627 | 7.24586 |
| 12.8587 | 7.42036 |
| 12.8334 | 7.45725 |
| 12.2064 | 7.41964 |
| 12.2037 | 7.36919 |
| 12.2098 | 7.33997 |
| 12.2084 | 7.24233 |
| 12.2094 | 7.20458 |
| 12.213 | 7.12119 |
| 12.2175 | 7.06797 |
| 12.2237 | 6.73133 |
| 12.2291 | 6.4021 |
| 12.2368 | 6.07782 |
| 12.2368 | 6.0236 |
| 11.9085 | 5.94224 |
| 11.8339 | 5.93791 |
| 11.7565 | 5.92998 |
| 11.5778 | 5.90617 |
| 11.2683 | 5.85792 |
| 11.121 | 5.87315 |
| 10.7096 | 5.80715 |
| 9.86652 | 5.76146 |
| 9.18594 | 5.68024 |
| 8.79485 | 5.58378 |
| 7.05121 | 5.30975 |
| 6.72302 | 5.27274 |
| 5.64857 | 5.14047 |
| 5.29473 | 5.11377 |
| 4.72058 | 5.00032 |
| 4.27996 | 4.99365 |
| 3.82599 | 5.01368 |
| 3.08494 | 4.98031 |
| 2.13693 | 4.92692 |
| 1.35581 | 4.92025 |
| 0.246468 | 4.88611 |
| 0.246468 | 1.46395 |
| 0.246468 | -1.486 |
| 0.246468 | -4.15932 |
| 0.246468 | -5.39951 |
| 55.0767 | -5.39951 |
| 55.0767 | 11.186 |
| 55.0767 | 17.606 |
| 55.0767 | 19.3593 |
| 55.0767 | 20.7296 |
| 55.0767 | 21.5622 |

| | |
|---|---|
| 55.0767 | 23.3646 |
| 55.0767 | 26.0247 |
| 54.4584 | 25.8393 |
| 53.5618 | 25.4685 |
| 52.9744 | 24.7577 |
| 52.387 | 24.047 |
| 51.9851 | 23.2435 |
| 51.4905 | 22.3782 |
| 50.6249 | 21.1112 |
| 50.0375 | 20.3695 |
| 49.3883 | 19.9678 |
| 48.3371 | 19.3189 |
| 46.9348 | 18.4738 |
| 46.5963 | 18.197 |
| 46.0426 | 17.6743 |
| 45.2735 | 17.1207 |
| 42.619 | 15.4475 |
| 41.5004 | 14.3584 |
| 40.9932 | 14.0474 |
| 28.6564 | 14.5032 |
| 28.4404 | 14.3519 |
| 27.9984 | 13.9017 |
| 27.1243 | 13.3297 |
| 26.6199 | 13.0337 |
| 26.1665 | 12.7746 |
| 25.3511 | 12.4823 |
| 25.084 | 12.4178 |
| 24.588 | 12.31 |
| 23.9236 | 12.2596 |
| 23.0163 | 12.0764 |
| 21.8624 | 11.8547 |
| 21.1904 | 11.7256 |
| 20.6568 | 11.6923 |
| 20.3595 | 11.6738 |
| 19.4411 | 11.318 |
| 17.296 | 10.487 |
| 17.0867 | 10.3106 |
| 16.4941 | 9.811 |
| 15.9007 | 9.3108 |
| 15.3078 | 8.811 |
| 14.7147 | 8.3111 |
| 14.132 | 7.81 |
| 13.5288 | 7.3114 |
| 13.4289 | 7.22714 |
| 13.291 | 7.18104 |

## Material boundary

| X | Y |
|---|---|
| 12.8925 | 6.3106 |
| 13.4052 | 6.3106 |

## Material boundary

| X | Y |
|---|---|
| 13.9047 | 6.81105 |
| 12.8841 | 6.81105 |

## Material boundary

| X | Y |
|---|---|
| 14.4072 | 7.3114 |
| 13.5288 | 7.3114 |

## Material boundary

| X | Y |
|---|---|
| 14.907 | 7.81 |
| 14.132 | 7.81 |

## Material boundary

| X | Y |
|---|---|
| 15.4072 | 8.3111 |
| 14.7147 | 8.3111 |

## Material boundary

| X | Y |
|---|---|
| 15.907 | 8.811 |
| 15.3078 | 8.811 |

## Material boundary

| X | Y |
|---|---|
| 16.4071 | 9.3108 |
| 15.9007 | 9.3108 |

## Material boundary

| X | Y |
|---|---|
| 16.9071 | 9.811 |
| 16.8746 | 9.811 |
| 16.4941 | 9.811 |

## Material boundary

| X | Y |
|---|---|
| 17.407 | 10.3106 |
| 17.0867 | 10.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.9072 | 5.83641 |
| 17.2805 | 7.22412 |
| 18.356 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 14.4072 | 5.83641 |
| 15.4072 | 5.83641 |
| 15.9072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.83641 |
| 13.4052 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 5.75977 |
| 12.8959 | 5.75977 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.83641 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 5.75977 |
| 12.2368 | 6.0236 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.75977 |
| 12.8959 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.2237 | 6.73133 |
| 12.8836 | 6.74889 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 6.07782 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|

| X | Y |
|---|---|
| 12.2291 | 6.4021 |
| 12.8925 | 6.4021 |

## Joint boundary

| X | Y |
|---|---|
| 12.2175 | 7.06797 |
| 12.885 | 7.08304 |

## Joint boundary

| X | Y |
|---|---|
| 12.8627 | 7.24586 |
| 12.885 | 7.08304 |
| 12.8841 | 6.81105 |
| 12.8836 | 6.74889 |
| 12.8925 | 6.4021 |
| 12.8925 | 6.3106 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 13.4052 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.9072 | 5.83641 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.3106 |
| 13.9047 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.81105 |
| 14.4072 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.3114 |
| 14.907 | 7.81 |

## Joint boundary

| X | Y |
|---|---|

| X | Y |
|---|---|
| 15.4072 | 7.81 |
| 15.4072 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 7.81 |
| 15.907 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 6.81105 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 7.81 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 6.81105 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 20.3347 | 10.3108 |
| 21.8624 | 11.8547 |

## Joint boundary

| X | Y |
|---|---|
| 20.3347 | 10.3108 |
| 18.356 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 10.3107 |
| 17.9068 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 9.811 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 8.811 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 8.3111 |
| 17.9068 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.811 |
| 17.407 | 10.3106 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.3108 |
| 16.9071 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 8.811 |
| 16.4071 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 15.907 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.3114 |
| 15.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.81105 |
| 14.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.3106 |
| 14.4072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.3106 |
| 15.4072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.3108 |
| 17.407 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.811 |
| 16.9071 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 6.3106 |
| 13.9047 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.81105 |
| 14.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 7.3114 |
| 14.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.81 |
| 15.4072 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 8.3111 |
| 15.907 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.81 |
| 15.907 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.3114 |
| 15.4072 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.3114 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.81105 |
| 14.907 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.81105 |
| 15.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.81105 |
| 15.907 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.3106 |
| 14.4072 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.3106 |
| 14.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.3106 |
| 15.4072 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.3106 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 16.9071 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.3111 |
| 17.9068 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.811 |
| 16.4071 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 9.3108 |
| 16.9071 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.811 |
| 17.407 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 10.3106 |
| 17.9068 | 10.3107 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.811 |
| 17.9068 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.3108 |
| 17.407 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.3108 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 8.811 |
| 16.9071 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.811 |
| 17.407 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 8.811 |
| 17.9068 | 8.811 |

## Piezometric line

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

# Phase2 Analysis Information
# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: F-S44 + GABIONS EQdn loc lim + GEOTEX+PILE+OCR
Last saved with Phase2 version: 8.005
Project Title: SLIDE - An Interactive Slope Stability Program
Analysis: Converted from Slide v6.005 with PHASE2 8.005

## General Settings

Number of Stages: 7
Analysis Type: Plane Strain
Solver Type: Gaussian Elimination
Units: Metric, stress as kPa

## Analysis Options

Maximum Number of Iterations: 500
Tolerance: 0.01
Number of Load Steps: 20
Convergence Type: Absolute Energy
Tensile Failure: Reduces Shear Strength
Joint tension reduces joint stiffness by a factor of 0.01

## Groundwater Analysis

Method: Piezometric Lines
Pore Fluid Unit Weight: 9.81 kN/m3
Probability: None

## Field Stress

Field stress: gravity
Using actual ground surface
Total stress ratio (horizontal/vertical in-plane): 0.5
Total stress ratio (horizontal/vertical out-of-plane): 0.5
Locked-in horizontal stress (in-plane): 0
Locked-in horizontal stress (out-of-plane): 0

## Seismic Loading

Horizontal seismic load coefficient: -0.2 (positive to the right)
Vertical seismic load coefficient: -0.1 (positive up)
Seismic load applied in: Stage 7

## Mesh

Mesh type: uniform
Element type: 6 noded triangles
Number of elements on Stage 1: 1294
Number of nodes on Stage 1: 2846
Number of elements on Stage 2: 1298
Number of nodes on Stage 2: 2846
Number of elements on Stage 3: 1329
Number of nodes on Stage 3: 2846
Number of elements on Stage 4: 1349
Number of nodes on Stage 4: 2846
Number of elements on Stage 5: 1349
Number of nodes on Stage 5: 2846
Number of elements on Stage 6: 1349
Number of nodes on Stage 6: 2846
Number of elements on Stage 7: 1349
Number of nodes on Stage 7: 2846

## Mesh Quality

All elements are of good quality

### Poor quality elements defined as:

Side length ratio (maximum / minimum) > 30.00
Minimum interior angle < 2.0 degrees
Maximum interior angle > 175.0 degrees

## Reset Displacements

Displacements reset after: Stage 1
Displacements reset after: Stage 2
Displacements reset after: Stage 3
Displacements reset after: Stage 4
Displacements reset after: Stage 5

## Material Properties

### Material: UNIT I

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 3 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 3 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 3 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Properties changed in Stage 1

Young's modulus: 40000 kPa (factor = 2)

## Material: UNIT III

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 21 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 30000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 7 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 33 degrees |
| Peak cohesion | 7 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 33 degrees |
| Residual Cohesion | 7 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT IV

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 22.2 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 175000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 60 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 34 degrees |
| Peak cohesion | 60 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 34 degrees |
| Residual Cohesion | 60 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT V

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 25 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 1.38234e+006 kPa |
| Poisson's ratio | 0.4 |
| Failure Criterion | Generalized Hoek-Brown |
| Material type | Plastic |
| Dilation Parameter | 0 |
| Compressive strength | 15000 kPa |
| mb parameter | 1.5091 |
| s parameter | 0.003866 |
| a parameter | 0.505734 |
| Residual mb parameter | 1.2623 |
| Residual s parameter | 0.002218 |
| Residual a parameter | 0.508086 |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II UNDER WT

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GABION

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 18 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 100000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 20 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 32 degrees |
| Peak cohesion | 20 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 32 degrees |
| Residual Cohesion | 20 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GRAVEL

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 50000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 36 degrees |
| Peak cohesion | 0 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 36 degrees |
| Residual Cohesion | 0 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: SW

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 40000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 1 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 35 degrees |
| Peak cohesion | 1 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 35 degrees |
| Residual Cohesion | 1 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Material: AIR

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 0.01 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.2 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 0.01 degrees |
| Peak cohesion | 0.01 kPa |
| Material type | Elastic |
| Piezo to use | None |
| Ru value | 0 |

## *Joint Properties*

### Joint: Joint SOIL

| | |
|---|---|
| Color | |
| Normal stiffness | 200000 kPa/m |
| Shear stiffness | 20000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 25 degrees |

### Joint: Joint UNIT V Intrf

| | |
|---|---|
| Color | |
| Normal stiffness | 1e+006 kPa/m |
| Shear stiffness | 100000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 32 degrees |
| Residual Friction angle | 28 degrees |

### Joint: Joint 4 GABIONS

| | |
|---|---|
| Color | |
| Normal stiffness | 500000 kPa/m |
| Shear stiffness | 50000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 3 kPa |
| Residual Cohesion | 2 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 28 degrees |

## *Liner Properties*

### Liner: PILE

| | |
|---|---|
| Color | |
| Liner Type | Reinforced Concrete |
| Equivalent Young's modulus | 2.35671e+007 kPa |
| Equivalent thickness | 0.136498 m |
| Poisson ratio | 0 |

Reinforcement Properties

| | |
|---|---|
| Type | I-beam(HE Europe): HE 140 B |
| Spacing | 0.75 m |
| Section Depth | 0.14 m |
| Area | 0.004296 m2 |
| Moment of inertia | 1.509e-005 m4 |
| Young's modulus | 2e+008 kPa |
| Poisson ratio | 0.25 |
| Compressive strength | 400000 kPa |
| Tensile strength | 400000 kPa |

Concrete Properties

| | |
|---|---|
| Thickness | 0.065 m |
| Young's modulus | 3e+007 kPa |
| Poisson ratio | 0.15 |
| Compressive strength | 30000 kPa |
| Tensile strength | 3000 kPa |

## Structural Interface Properties

Structural Interface: Structural 2
Joint (positive side): Joint SOIL
Liner: PILE
Joint (negative side): Joint SOIL

## List of All Coordinates

### External boundary

| X | Y |
|---|---|
| -11.931 | -13.213 |
| 61.92 | -13.213 |
| 61.92 | 27.196 |
| -11.931 | 27.196 |

### Material boundary

| X | Y |
|---|---|
| 0.246468 | -1.486 |
| 14.9068 | 2.35863 |
| 31.5166 | 8.03863 |
| 40.9932 | 10.5286 |
| 51.5928 | 16.7299 |
| 55.0767 | 20.7296 |

### Material boundary

| X | Y |
|---|---|
| 0.246468 | -4.15932 |
| 55.0767 | 11.186 |

### Material boundary

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 11.9085 | 4.52456 |
| 16.9071 | 5.83641 |

### Material boundary

| X | Y |
|---|---|
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

## Material boundary

| X | Y |
|---|---|
| 18.0906 | 7.53452 |
| 18.742 | 7.7233 |
| 31.5166 | 11.4256 |
| 40.9932 | 12.4986 |

## Material boundary

| X | Y |
|---|---|
| 51.3789 | 18.6028 |
| 55.0767 | 23.3646 |

## Material boundary

| X | Y |
|---|---|
| 17.2805 | 7.22412 |
| 18.0906 | 7.53452 |

## Material boundary

| X | Y |
|---|---|
| 17.9068 | 10.3107 |
| 20.3347 | 10.3108 |

## Material boundary

| X | Y |
|---|---|
| 17.9068 | 8.3111 |
| 18.356 | 8.3111 |

## Material boundary

| X | Y |
|---|---|
| 13.291 | 7.18104 |
| 13.2484 | 7.15374 |
| 13.2017 | 7.13399 |
| 13.1524 | 7.12236 |
| 13.1019 | 7.11917 |
| 13.0515 | 7.12451 |
| 13.0028 | 7.13824 |
| 12.9532 | 7.16181 |
| 12.932 | 7.17578 |
| 12.9064 | 7.19655 |
| 12.8845 | 7.21846 |
| 12.8627 | 7.24586 |
| 12.8587 | 7.42036 |
| 12.8334 | 7.45725 |

| | |
|---|---|
| 12.2064 | 7.41964 |
| 12.2037 | 7.36919 |
| 12.2098 | 7.33997 |
| 12.2084 | 7.24233 |
| 12.2094 | 7.20458 |
| 12.213 | 7.12119 |
| 12.2175 | 7.06797 |
| 12.2237 | 6.73133 |
| 12.2291 | 6.4021 |
| 12.2368 | 6.07782 |
| 12.2368 | 6.0236 |
| 11.9085 | 5.94224 |
| 11.8339 | 5.93791 |
| 11.7565 | 5.92998 |
| 11.5778 | 5.90617 |
| 11.2683 | 5.85792 |
| 11.121 | 5.87315 |
| 10.7096 | 5.80715 |
| 9.86652 | 5.76146 |
| 9.18594 | 5.68024 |
| 8.79485 | 5.58378 |
| 7.05121 | 5.30975 |
| 6.72302 | 5.27274 |
| 5.64857 | 5.14047 |
| 5.29473 | 5.11377 |
| 4.72058 | 5.00032 |
| 4.27996 | 4.99365 |
| 3.82599 | 5.01368 |
| 3.08494 | 4.98031 |
| 2.13693 | 4.92692 |
| 1.35581 | 4.92025 |
| 0.246468 | 4.88611 |
| 0.246468 | 1.46395 |
| 0.246468 | -1.486 |
| 0.246468 | -4.15932 |
| 0.246468 | -5.39951 |
| 55.0767 | -5.39951 |
| 55.0767 | 11.186 |
| 55.0767 | 17.606 |
| 55.0767 | 19.3593 |
| 55.0767 | 20.7296 |
| 55.0767 | 21.5622 |
| 55.0767 | 23.3646 |
| 55.0767 | 26.0247 |
| 54.4584 | 25.8393 |
| 53.5618 | 25.4685 |
| 52.9744 | 24.7577 |
| 52.387 | 24.047 |
| 51.9851 | 23.2435 |
| 51.4905 | 22.3782 |
| 50.6249 | 21.1112 |
| 50.0375 | 20.3695 |
| 49.3883 | 19.9678 |
| 48.3371 | 19.3189 |
| 46.9348 | 18.4738 |
| 46.5963 | 18.197 |

| | |
|---|---|
| 46.0426 | 17.6743 |
| 45.2735 | 17.1207 |
| 42.619 | 15.4475 |
| 41.5004 | 14.3584 |
| 40.9932 | 14.0474 |
| 28.6564 | 14.5032 |
| 28.4404 | 14.3519 |
| 27.9984 | 13.9017 |
| 27.1243 | 13.3297 |
| 26.6199 | 13.0337 |
| 26.1665 | 12.7746 |
| 25.3511 | 12.4823 |
| 25.084 | 12.4178 |
| 24.588 | 12.31 |
| 23.9236 | 12.2596 |
| 23.0163 | 12.0764 |
| 21.8624 | 11.8547 |
| 21.1904 | 11.7256 |
| 20.6568 | 11.6923 |
| 20.3595 | 11.6738 |
| 19.4411 | 11.318 |
| 17.296 | 10.487 |
| 17.0867 | 10.3106 |
| 16.4941 | 9.811 |
| 15.9007 | 9.3108 |
| 15.3078 | 8.811 |
| 14.7147 | 8.3111 |
| 14.132 | 7.81 |
| 13.5288 | 7.3114 |
| 13.4289 | 7.22714 |
| 13.291 | 7.18104 |

## Material boundary

| X | Y |
|---|---|
| 12.8925 | 6.3106 |
| 13.4052 | 6.3106 |

## Material boundary

| X | Y |
|---|---|
| 13.9047 | 6.81105 |
| 12.8841 | 6.81105 |

## Material boundary

| X | Y |
|---|---|
| 14.4072 | 7.3114 |
| 13.5288 | 7.3114 |

## Material boundary

| X | Y |
|---|---|
| 14.907 | 7.81 |
| 14.132 | 7.81 |

## Material boundary

| X | Y |
|---|---|
| 15.4072 | 8.3111 |
| 14.7147 | 8.3111 |

## Material boundary

| X | Y |
|---|---|
| 15.907 | 8.811 |
| 15.3078 | 8.811 |

## Material boundary

| X | Y |
|---|---|
| 16.4071 | 9.3108 |
| 15.9007 | 9.3108 |

## Material boundary

| X | Y |
|---|---|
| 16.9071 | 9.811 |
| 16.8746 | 9.811 |
| 16.4941 | 9.811 |

## Material boundary

| X | Y |
|---|---|
| 17.407 | 10.3106 |
| 17.0867 | 10.3106 |

## Structural interface

| X | Y |
|---|---|
| 11.9085 | 5.94224 |
| 11.9085 | 4.52456 |
| 11.9085 | 1.94224 |

## Joint boundary

| X | Y |
|---|---|
| 15.9072 | 5.83641 |
| 17.2805 | 7.22412 |
| 18.356 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 14.4072 | 5.83641 |
| 15.4072 | 5.83641 |
| 15.9072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.83641 |
| 13.4052 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 5.75977 |
| 12.8959 | 5.75977 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.83641 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 5.75977 |
| 12.2368 | 6.0236 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.75977 |
| 12.8959 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.2237 | 6.73133 |
| 12.8836 | 6.74889 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 6.07782 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 12.2291 | 6.4021 |
| 12.8925 | 6.4021 |

## Joint boundary

| X | Y |
|---|---|
| 12.2175 | 7.06797 |
| 12.885 | 7.08304 |

## Joint boundary

| X | Y |
|---|---|
| 12.8627 | 7.24586 |
| 12.885 | 7.08304 |
| 12.8841 | 6.81105 |
| 12.8836 | 6.74889 |
| 12.8925 | 6.4021 |
| 12.8925 | 6.3106 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 13.4052 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.9072 | 5.83641 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.3106 |
| 13.9047 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.81105 |
| 14.4072 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.3114 |
| 14.907 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.81 |
| 15.4072 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 7.81 |
| 15.907 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 6.81105 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 7.81 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 6.81105 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 20.3347 | 10.3108 |
| 21.8624 | 11.8547 |

## Joint boundary

| X | Y |
|---|---|
| 20.3347 | 10.3108 |
| 18.356 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 10.3107 |
| 17.9068 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 9.811 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 8.811 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 8.3111 |
| 17.9068 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.811 |
| 17.407 | 10.3106 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.3108 |
| 16.9071 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 8.811 |
| 16.4071 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 15.907 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.3114 |
| 15.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.81105 |
| 14.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.3106 |
| 14.4072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.3106 |
| 15.4072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.3108 |
| 17.407 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.811 |
| 16.9071 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 6.3106 |
| 13.9047 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.81105 |
| 14.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 7.3114 |
| 14.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.81 |
| 15.4072 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 8.3111 |
| 15.907 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.81 |
| 15.907 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.3114 |
| 15.4072 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.3114 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.81105 |
| 14.907 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.81105 |
| 15.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.81105 |
| 15.907 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.3106 |
| 14.4072 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.3106 |
| 14.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.3106 |
| 15.4072 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.3106 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 16.9071 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.3111 |
| 17.9068 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.811 |
| 16.4071 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 9.3108 |
| 16.9071 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.811 |
| 17.407 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 10.3106 |
| 17.9068 | 10.3107 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.811 |
| 17.9068 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.3108 |
| 17.407 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.3108 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 8.811 |
| 16.9071 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.811 |
| 17.407 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 8.811 |
| 17.9068 | 8.811 |

## Piezometric line

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

# Phase2 Analysis Information
# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: F-S44 + GABIONS EQup loc lim + GEOTEX+noPILE+OCR
Last saved with Phase2 version: 8.005
Project Title: SLIDE - An Interactive Slope Stability Program
Analysis: Converted from Slide v6.005 with PHASE2 8.005

## General Settings

Number of Stages: 7
Analysis Type: Plane Strain
Solver Type: Gaussian Elimination
Units: Metric, stress as kPa

## Analysis Options

Maximum Number of Iterations: 500
Tolerance: 0.01
Number of Load Steps: 20
Convergence Type: Absolute Energy
Tensile Failure: Reduces Shear Strength
Joint tension reduces joint stiffness by a factor of 0.01

## Groundwater Analysis

Method: Piezometric Lines
Pore Fluid Unit Weight: 9.81 kN/m3
Probability: None

## Field Stress

Field stress: gravity
Using actual ground surface
Total stress ratio (horizontal/vertical in-plane): 0.5
Total stress ratio (horizontal/vertical out-of-plane): 0.5
Locked-in horizontal stress (in-plane): 0
Locked-in horizontal stress (out-of-plane): 0

## Seismic Loading

Horizontal seismic load coefficient: -0.2 (positive to the right)
Vertical seismic load coefficient: 0.1 (positive up)
Seismic load applied in: Stage 7

## Mesh

Mesh type: uniform
Element type: 6 noded triangles
Number of elements on Stage 1: 1290
Number of nodes on Stage 1: 2832
Number of elements on Stage 2: 1294
Number of nodes on Stage 2: 2832
Number of elements on Stage 3: 1325
Number of nodes on Stage 3: 2832
Number of elements on Stage 4: 1345
Number of nodes on Stage 4: 2832
Number of elements on Stage 5: 1345
Number of nodes on Stage 5: 2832
Number of elements on Stage 6: 1345
Number of nodes on Stage 6: 2832
Number of elements on Stage 7: 1345
Number of nodes on Stage 7: 2832

## Mesh Quality

All elements are of good quality

### Poor quality elements defined as:

Side length ratio (maximum / minimum) > 30.00
Minimum interior angle < 2.0 degrees
Maximum interior angle > 175.0 degrees

## Reset Displacements

Displacements reset after: Stage 1
Displacements reset after: Stage 2
Displacements reset after: Stage 3
Displacements reset after: Stage 4
Displacements reset after: Stage 5

## Material Properties

### Material: UNIT I

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 3 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 3 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 3 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Properties changed in Stage 1

Young's modulus: 40000 kPa (factor = 2)

## Material: UNIT III

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 21 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 30000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 7 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 33 degrees |
| Peak cohesion | 7 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 33 degrees |
| Residual Cohesion | 7 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT IV

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 22.2 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 175000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 60 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 34 degrees |
| Peak cohesion | 60 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 34 degrees |
| Residual Cohesion | 60 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT V

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 25 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 1.38234e+006 kPa |
| Poisson's ratio | 0.4 |
| Failure Criterion | Generalized Hoek-Brown |
| Material type | Plastic |
| Dilation Parameter | 0 |
| Compressive strength | 15000 kPa |
| mb parameter | 1.5091 |
| s parameter | 0.003866 |
| a parameter | 0.505734 |
| Residual mb parameter | 1.2623 |
| Residual s parameter | 0.002218 |
| Residual a parameter | 0.508086 |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II UNDER WT

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GABION

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 18 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 100000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 20 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 32 degrees |
| Peak cohesion | 20 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 32 degrees |
| Residual Cohesion | 20 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GRAVEL

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 50000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 36 degrees |
| Peak cohesion | 0 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 36 degrees |
| Residual Cohesion | 0 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: SW

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 40000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 1 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 35 degrees |
| Peak cohesion | 1 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 35 degrees |
| Residual Cohesion | 1 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Material: AIR

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 0.01 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.2 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 0.01 degrees |
| Peak cohesion | 0.01 kPa |
| Material type | Elastic |
| Piezo to use | None |
| Ru value | 0 |

## *Joint Properties*

### Joint: Joint SOIL

| | |
|---|---|
| Color | |
| Normal stiffness | 200000 kPa/m |
| Shear stiffness | 20000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 25 degrees |

## Joint: Joint UNIT V Intrf

| | |
|---|---|
| Color | |
| Normal stiffness | 1e+006 kPa/m |
| Shear stiffness | 100000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 32 degrees |
| Residual Friction angle | 28 degrees |

## Joint: Joint 4 GABIONS

| | |
|---|---|
| Color | |
| Normal stiffness | 500000 kPa/m |
| Shear stiffness | 50000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 3 kPa |
| Residual Cohesion | 2 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 28 degrees |

# *List of All Coordinates*

## External boundary

| X | Y |
|---|---|
| -11.931 | -13.213 |
| 61.92 | -13.213 |
| 61.92 | 27.196 |
| -11.931 | 27.196 |

## Material boundary

| X | Y |
|---|---|
| 0.246468 | -1.486 |
| 14.9068 | 2.35863 |
| 31.5166 | 8.03863 |
| 40.9932 | 10.5286 |
| 51.5928 | 16.7299 |
| 55.0767 | 20.7296 |

## Material boundary

| X | Y |
|---|---|
| 0.246468 | -4.15932 |
| 55.0767 | 11.186 |

## Material boundary

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 11.9085 | 4.52456 |
| 16.9071 | 5.83641 |

## Material boundary

| X | Y |
|---|---|
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

## Material boundary

| X | Y |
|---|---|
| 18.0906 | 7.53452 |
| 18.742 | 7.7233 |
| 31.5166 | 11.4256 |
| 40.9932 | 12.4986 |

## Material boundary

| X | Y |
|---|---|
| 51.3789 | 18.6028 |
| 55.0767 | 23.3646 |

## Material boundary

| X | Y |
|---|---|
| 17.2805 | 7.22412 |
| 18.0906 | 7.53452 |

## Material boundary

| X | Y |
|---|---|
| 17.9068 | 10.3107 |
| 20.3347 | 10.3108 |

## Material boundary

| X | Y |
|---|---|
| 17.9068 | 8.3111 |
| 18.356 | 8.3111 |

## Material boundary

| X | Y |
|---|---|

| | |
|---|---|
| 13.291 | 7.18104 |
| 13.2484 | 7.15374 |
| 13.2017 | 7.13399 |
| 13.1524 | 7.12236 |
| 13.1019 | 7.11917 |
| 13.0515 | 7.12451 |
| 13.0028 | 7.13824 |
| 12.9532 | 7.16181 |
| 12.932 | 7.17578 |
| 12.9064 | 7.19655 |
| 12.8845 | 7.21846 |
| 12.8627 | 7.24586 |
| 12.8587 | 7.42036 |
| 12.8334 | 7.45725 |
| 12.2064 | 7.41964 |
| 12.2037 | 7.36919 |
| 12.2098 | 7.33997 |
| 12.2084 | 7.24233 |
| 12.2094 | 7.20458 |
| 12.213 | 7.12119 |
| 12.2175 | 7.06797 |
| 12.2237 | 6.73133 |
| 12.2291 | 6.4021 |
| 12.2368 | 6.07782 |
| 12.2368 | 6.0236 |
| 11.9085 | 5.94224 |
| 11.8339 | 5.93791 |
| 11.7565 | 5.92998 |
| 11.5778 | 5.90617 |
| 11.2683 | 5.85792 |
| 11.121 | 5.87315 |
| 10.7096 | 5.80715 |
| 9.86652 | 5.76146 |
| 9.18594 | 5.68024 |
| 8.79485 | 5.58378 |
| 7.05121 | 5.30975 |
| 6.72302 | 5.27274 |
| 5.64857 | 5.14047 |
| 5.29473 | 5.11377 |
| 4.72058 | 5.00032 |
| 4.27996 | 4.99365 |
| 3.82599 | 5.01368 |
| 3.08494 | 4.98031 |
| 2.13693 | 4.92692 |
| 1.35581 | 4.92025 |
| 0.246468 | 4.88611 |
| 0.246468 | 1.46395 |
| 0.246468 | -1.486 |
| 0.246468 | -4.15932 |
| 0.246468 | -5.39951 |
| 55.0767 | -5.39951 |
| 55.0767 | 11.186 |
| 55.0767 | 17.606 |
| 55.0767 | 19.3593 |
| 55.0767 | 20.7296 |
| 55.0767 | 21.5622 |

| | |
|---|---|
| 55.0767 | 23.3646 |
| 55.0767 | 26.0247 |
| 54.4584 | 25.8393 |
| 53.5618 | 25.4685 |
| 52.9744 | 24.7577 |
| 52.387 | 24.047 |
| 51.9851 | 23.2435 |
| 51.4905 | 22.3782 |
| 50.6249 | 21.1112 |
| 50.0375 | 20.3695 |
| 49.3883 | 19.9678 |
| 48.3371 | 19.3189 |
| 46.9348 | 18.4738 |
| 46.5963 | 18.197 |
| 46.0426 | 17.6743 |
| 45.2735 | 17.1207 |
| 42.619 | 15.4475 |
| 41.5004 | 14.3584 |
| 40.9932 | 14.0474 |
| 28.6564 | 14.5032 |
| 28.4404 | 14.3519 |
| 27.9984 | 13.9017 |
| 27.1243 | 13.3297 |
| 26.6199 | 13.0337 |
| 26.1665 | 12.7746 |
| 25.3511 | 12.4823 |
| 25.084 | 12.4178 |
| 24.588 | 12.31 |
| 23.9236 | 12.2596 |
| 23.0163 | 12.0764 |
| 21.8624 | 11.8547 |
| 21.1904 | 11.7256 |
| 20.6568 | 11.6923 |
| 20.3595 | 11.6738 |
| 19.4411 | 11.318 |
| 17.296 | 10.487 |
| 17.0867 | 10.3106 |
| 16.4941 | 9.811 |
| 15.9007 | 9.3108 |
| 15.3078 | 8.811 |
| 14.7147 | 8.3111 |
| 14.132 | 7.81 |
| 13.5288 | 7.3114 |
| 13.4289 | 7.22714 |
| 13.291 | 7.18104 |

## Material boundary

| X | Y |
|---|---|
| 12.8925 | 6.3106 |
| 13.4052 | 6.3106 |

## Material boundary

| X | Y |
|---|---|
| 13.9047 | 6.81105 |
| 12.8841 | 6.81105 |

## Material boundary

| X | Y |
|---|---|
| 14.4072 | 7.3114 |
| 13.5288 | 7.3114 |

## Material boundary

| X | Y |
|---|---|
| 14.907 | 7.81 |
| 14.132 | 7.81 |

## Material boundary

| X | Y |
|---|---|
| 15.4072 | 8.3111 |
| 14.7147 | 8.3111 |

## Material boundary

| X | Y |
|---|---|
| 15.907 | 8.811 |
| 15.3078 | 8.811 |

## Material boundary

| X | Y |
|---|---|
| 16.4071 | 9.3108 |
| 15.9007 | 9.3108 |

## Material boundary

| X | Y |
|---|---|
| 16.9071 | 9.811 |
| 16.8746 | 9.811 |
| 16.4941 | 9.811 |

## Material boundary

| X | Y |
|---|---|
| 17.407 | 10.3106 |
| 17.0867 | 10.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.9072 | 5.83641 |
| 17.2805 | 7.22412 |
| 18.356 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 14.4072 | 5.83641 |
| 15.4072 | 5.83641 |
| 15.9072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.83641 |
| 13.4052 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 5.75977 |
| 12.8959 | 5.75977 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.83641 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 5.75977 |
| 12.2368 | 6.0236 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.75977 |
| 12.8959 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.2237 | 6.73133 |
| 12.8836 | 6.74889 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 6.07782 |
| 12.8959 | 6.07782 |

## Joint boundary

| |
|---|

| X | Y |
|---|---|
| 12.2291 | 6.4021 |
| 12.8925 | 6.4021 |

## Joint boundary

| X | Y |
|---|---|
| 12.2175 | 7.06797 |
| 12.885 | 7.08304 |

## Joint boundary

| X | Y |
|---|---|
| 12.8627 | 7.24586 |
| 12.885 | 7.08304 |
| 12.8841 | 6.81105 |
| 12.8836 | 6.74889 |
| 12.8925 | 6.4021 |
| 12.8925 | 6.3106 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 13.4052 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.9072 | 5.83641 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.3106 |
| 13.9047 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.81105 |
| 14.4072 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.3114 |
| 14.907 | 7.81 |

## Joint boundary

| X | Y |
|---|---|

| X | Y |
|---|---|
| 15.4072 | 7.81 |
| 15.4072 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 7.81 |
| 15.907 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 6.81105 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 7.81 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 6.81105 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 20.3347 | 10.3108 |
| 21.8624 | 11.8547 |

## Joint boundary

| X | Y |
|---|---|
| 20.3347 | 10.3108 |
| 18.356 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 10.3107 |
| 17.9068 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 9.811 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 8.811 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 8.3111 |
| 17.9068 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.811 |
| 17.407 | 10.3106 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.3108 |
| 16.9071 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 8.811 |
| 16.4071 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 15.907 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.3114 |
| 15.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.81105 |
| 14.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.3106 |
| 14.4072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.3106 |
| 15.4072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.3108 |
| 17.407 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.811 |
| 16.9071 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 6.3106 |
| 13.9047 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.81105 |
| 14.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 7.3114 |
| 14.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.81 |
| 15.4072 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 8.3111 |
| 15.907 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.81 |
| 15.907 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.3114 |
| 15.4072 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.3114 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.81105 |
| 14.907 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.81105 |
| 15.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.81105 |
| 15.907 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.3106 |
| 14.4072 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.3106 |
| 14.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.3106 |
| 15.4072 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.3106 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 16.9071 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.3111 |
| 17.9068 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.811 |
| 16.4071 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 9.3108 |
| 16.9071 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.811 |
| 17.407 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 10.3106 |
| 17.9068 | 10.3107 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.811 |
| 17.9068 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.3108 |
| 17.407 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.3108 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 8.811 |
| 16.9071 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.811 |
| 17.407 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 8.811 |
| 17.9068 | 8.811 |

## Piezometric line

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

# Phase2 Analysis Information
# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: F-S44 + GABIONS EQup loc lim + GEOTEX+noPILE+OCR+SSR
Last saved with Phase2 version: 8.005
Project Title: SLIDE - An Interactive Slope Stability Program
Analysis: Converted from Slide v6.005 with PHASE2 8.005

## General Settings

Number of Stages: 7
Analysis Type: Plane Strain
Solver Type: Gaussian Elimination
Units: Metric, stress as kPa

## Analysis Options

Maximum Number of Iterations: 500
Tolerance: 0.01
Number of Load Steps: 20
Convergence Type: Absolute Energy
Tensile Failure: Reduces Shear Strength
Joint tension reduces joint stiffness by a factor of 0.01

## Strength Reduction Settings

Inital Estimate of SRF: 1
Step Size: Automatic
Tolerance (SRF): 0.01
Limit SSR Search Area: Yes
Apply SSR to Mohr-Coulomb Tensile Strength: Yes
Convergence Parameters: Automatic

## Groundwater Analysis

Method: Piezometric Lines
Pore Fluid Unit Weight: 9.81 kN/m3
Probability: None

## Field Stress

Field stress: gravity
Using actual ground surface
Total stress ratio (horizontal/vertical in-plane): 0.5
Total stress ratio (horizontal/vertical out-of-plane): 0.5

Locked-in horizontal stress (in-plane): 0
Locked-in horizontal stress (out-of-plane): 0

## Seismic Loading

Horizontal seismic load coefficient: -0.2 (positive to the right)
Vertical seismic load coefficient: 0.1 (positive up)
Seismic load applied in: Stage 7

## Mesh

Mesh type: uniform
Element type: 6 noded triangles
Number of elements on Stage 1: 1290
Number of nodes on Stage 1: 2832
Number of elements on Stage 2: 1294
Number of nodes on Stage 2: 2832
Number of elements on Stage 3: 1325
Number of nodes on Stage 3: 2832
Number of elements on Stage 4: 1345
Number of nodes on Stage 4: 2832
Number of elements on Stage 5: 1345
Number of nodes on Stage 5: 2832
Number of elements on Stage 6: 1345
Number of nodes on Stage 6: 2832
Number of elements on Stage 7: 1345
Number of nodes on Stage 7: 2832

## Mesh Quality

All elements are of good quality

### Poor quality elements defined as:

Side length ratio (maximum / minimum) > 30.00
Minimum interior angle < 2.0 degrees
Maximum interior angle > 175.0 degrees

## Reset Displacements

Displacements reset after: Stage 1
Displacements reset after: Stage 2
Displacements reset after: Stage 3
Displacements reset after: Stage 4
Displacements reset after: Stage 5

## Material Properties

### Material: UNIT I

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 3 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 3 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 3 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Properties changed in Stage 1

Young's modulus: 40000 kPa (factor = 2)

## Material: UNIT III

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 21 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 30000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 7 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 33 degrees |
| Peak cohesion | 7 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 33 degrees |
| Residual Cohesion | 7 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT IV

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 22.2 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 175000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 60 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 34 degrees |
| Peak cohesion | 60 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 34 degrees |
| Residual Cohesion | 60 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT V

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 25 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 1.38234e+006 kPa |
| Poisson's ratio | 0.4 |
| Failure Criterion | Generalized Hoek-Brown |
| Material type | Plastic |
| Dilation Parameter | 0 |
| Compressive strength | 15000 kPa |
| mb parameter | 1.5091 |
| s parameter | 0.003866 |
| a parameter | 0.505734 |
| Residual mb parameter | 1.2623 |
| Residual s parameter | 0.002218 |
| Residual a parameter | 0.508086 |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II UNDER WT

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GABION

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 18 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 100000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 20 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 32 degrees |
| Peak cohesion | 20 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 32 degrees |
| Residual Cohesion | 20 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GRAVEL

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 50000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 36 degrees |
| Peak cohesion | 0 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 36 degrees |
| Residual Cohesion | 0 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: SW

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 40000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 1 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 35 degrees |
| Peak cohesion | 1 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 35 degrees |
| Residual Cohesion | 1 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Material: AIR

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 0.01 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.2 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 0.01 degrees |
| Peak cohesion | 0.01 kPa |
| Material type | Elastic |
| Piezo to use | None |
| Ru value | 0 |

## *Joint Properties*

### Joint: Joint SOIL

| | |
|---|---|
| Color | |
| Normal stiffness | 200000 kPa/m |
| Shear stiffness | 20000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 25 degrees |
| Apply SSR? | No |

### Joint: Joint UNIT V Intrf

| | |
|---|---|
| Color | |
| Normal stiffness | 1e+006 kPa/m |
| Shear stiffness | 100000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 32 degrees |
| Residual Friction angle | 28 degrees |
| Apply SSR? | No |

### Joint: Joint 4 GABIONS

| | |
|---|---|
| Color | |
| Normal stiffness | 500000 kPa/m |
| Shear stiffness | 50000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 3 kPa |
| Residual Cohesion | 2 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 28 degrees |
| Apply SSR? | No |

## *List of All Coordinates*

### External boundary

| X | Y |
|---|---|
| -11.931 | -13.213 |
| 61.92 | -13.213 |
| 61.92 | 27.196 |
| -11.931 | 27.196 |

### Material boundary

| X | Y |
|---|---|
| 0.246468 | -1.486 |
| 14.9068 | 2.35863 |
| 31.5166 | 8.03863 |
| 40.9932 | 10.5286 |
| 51.5928 | 16.7299 |
| 55.0767 | 20.7296 |

## Material boundary

| X | Y |
|---|---|
| 0.246468 | -4.15932 |
| 55.0767 | 11.186 |

## Material boundary

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 11.9085 | 4.52456 |
| 16.9071 | 5.83641 |

## Material boundary

| X | Y |
|---|---|
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

## Material boundary

| X | Y |
|---|---|
| 18.0906 | 7.53452 |
| 18.742 | 7.7233 |
| 31.5166 | 11.4256 |
| 40.9932 | 12.4986 |

## Material boundary

| X | Y |
|---|---|
| 51.3789 | 18.6028 |
| 55.0767 | 23.3646 |

## Material boundary

| X | Y |
|---|---|
| 17.2805 | 7.22412 |
| 18.0906 | 7.53452 |

## Material boundary

| X | Y |
|---|---|
| 17.9068 | 10.3107 |
| 20.3347 | 10.3108 |

## Material boundary

| X | Y |
|---|---|
| 17.9068 | 8.3111 |
| 18.356 | 8.3111 |

## Material boundary

| X | Y |
|---|---|
| 13.291 | 7.18104 |
| 13.2484 | 7.15374 |
| 13.2017 | 7.13399 |
| 13.1524 | 7.12236 |
| 13.1019 | 7.11917 |
| 13.0515 | 7.12451 |
| 13.0028 | 7.13824 |
| 12.9532 | 7.16181 |
| 12.932 | 7.17578 |
| 12.9064 | 7.19655 |
| 12.8845 | 7.21846 |
| 12.8627 | 7.24586 |
| 12.8587 | 7.42036 |
| 12.8334 | 7.45725 |
| 12.2064 | 7.41964 |
| 12.2037 | 7.36919 |
| 12.2098 | 7.33997 |
| 12.2084 | 7.24233 |
| 12.2094 | 7.20458 |
| 12.213 | 7.12119 |
| 12.2175 | 7.06797 |
| 12.2237 | 6.73133 |
| 12.2291 | 6.4021 |
| 12.2368 | 6.07782 |
| 12.2368 | 6.0236 |
| 11.9085 | 5.94224 |
| 11.8339 | 5.93791 |
| 11.7565 | 5.92998 |
| 11.5778 | 5.90617 |
| 11.2683 | 5.85792 |
| 11.121 | 5.87315 |
| 10.7096 | 5.80715 |
| 9.86652 | 5.76146 |
| 9.18594 | 5.68024 |
| 8.79485 | 5.58378 |
| 7.05121 | 5.30975 |
| 6.72302 | 5.27274 |
| 5.64857 | 5.14047 |
| 5.29473 | 5.11377 |
| 4.72058 | 5.00032 |
| 4.27996 | 4.99365 |
| 3.82599 | 5.01368 |
| 3.08494 | 4.98031 |
| 2.13693 | 4.92692 |
| 1.35581 | 4.92025 |
| 0.246468 | 4.88611 |
| 0.246468 | 1.46395 |
| 0.246468 | -1.486 |
| 0.246468 | -4.15932 |
| 0.246468 | -5.39951 |
| 55.0767 | -5.39951 |
| 55.0767 | 11.186 |
| 55.0767 | 17.606 |

| | |
|---|---|
| 55.0767 | 19.3593 |
| 55.0767 | 20.7296 |
| 55.0767 | 21.5622 |
| 55.0767 | 23.3646 |
| 55.0767 | 26.0247 |
| 54.4584 | 25.8393 |
| 53.5618 | 25.4685 |
| 52.9744 | 24.7577 |
| 52.387 | 24.047 |
| 51.9851 | 23.2435 |
| 51.4905 | 22.3782 |
| 50.6249 | 21.1112 |
| 50.0375 | 20.3695 |
| 49.3883 | 19.9678 |
| 48.3371 | 19.3189 |
| 46.9348 | 18.4738 |
| 46.5963 | 18.197 |
| 46.0426 | 17.6743 |
| 45.2735 | 17.1207 |
| 42.619 | 15.4475 |
| 41.5004 | 14.3584 |
| 40.9932 | 14.0474 |
| 28.6564 | 14.5032 |
| 28.4404 | 14.3519 |
| 27.9984 | 13.9017 |
| 27.1243 | 13.3297 |
| 26.6199 | 13.0337 |
| 26.1665 | 12.7746 |
| 25.3511 | 12.4823 |
| 25.084 | 12.4178 |
| 24.588 | 12.31 |
| 23.9236 | 12.2596 |
| 23.0163 | 12.0764 |
| 21.8624 | 11.8547 |
| 21.1904 | 11.7256 |
| 20.6568 | 11.6923 |
| 20.3595 | 11.6738 |
| 19.4411 | 11.318 |
| 17.296 | 10.487 |
| 17.0867 | 10.3106 |
| 16.4941 | 9.811 |
| 15.9007 | 9.3108 |
| 15.3078 | 8.811 |
| 14.7147 | 8.3111 |
| 14.132 | 7.81 |
| 13.5288 | 7.3114 |
| 13.4289 | 7.22714 |
| 13.291 | 7.18104 |

## Material boundary

| X | Y |
|---|---|
| 12.8925 | 6.3106 |
| 13.4052 | 6.3106 |

## Material boundary

| X | Y |
|---|---|
| 13.9047 | 6.81105 |
| 12.8841 | 6.81105 |

## Material boundary

| X | Y |
|---|---|
| 14.4072 | 7.3114 |
| 13.5288 | 7.3114 |

## Material boundary

| X | Y |
|---|---|
| 14.907 | 7.81 |
| 14.132 | 7.81 |

## Material boundary

| X | Y |
|---|---|
| 15.4072 | 8.3111 |
| 14.7147 | 8.3111 |

## Material boundary

| X | Y |
|---|---|
| 15.907 | 8.811 |
| 15.3078 | 8.811 |

## Material boundary

| X | Y |
|---|---|
| 16.4071 | 9.3108 |
| 15.9007 | 9.3108 |

## Material boundary

| X | Y |
|---|---|
| 16.9071 | 9.811 |
| 16.8746 | 9.811 |
| 16.4941 | 9.811 |

## Material boundary

| X | Y |
|---|---|
| 17.407 | 10.3106 |
| 17.0867 | 10.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.9072 | 5.83641 |
| 17.2805 | 7.22412 |
| 18.356 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 14.4072 | 5.83641 |
| 15.4072 | 5.83641 |
| 15.9072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.83641 |
| 13.4052 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 5.75977 |
| 12.8959 | 5.75977 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.83641 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 5.75977 |
| 12.2368 | 6.0236 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.75977 |
| 12.8959 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.2237 | 6.73133 |
| 12.8836 | 6.74889 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 6.07782 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 12.2291 | 6.4021 |
| 12.8925 | 6.4021 |

## Joint boundary

| X | Y |
|---|---|
| 12.2175 | 7.06797 |
| 12.885 | 7.08304 |

## Joint boundary

| X | Y |
|---|---|
| 12.8627 | 7.24586 |
| 12.885 | 7.08304 |
| 12.8841 | 6.81105 |
| 12.8836 | 6.74889 |
| 12.8925 | 6.4021 |
| 12.8925 | 6.3106 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 13.4052 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.9072 | 5.83641 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.3106 |
| 13.9047 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.81105 |
| 14.4072 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.3114 |
| 14.907 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.81 |
| 15.4072 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 7.81 |
| 15.907 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 6.81105 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 7.81 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 6.81105 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 20.3347 | 10.3108 |
| 21.8624 | 11.8547 |

## Joint boundary

| X | Y |
|---|---|
| 20.3347 | 10.3108 |
| 18.356 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 10.3107 |
| 17.9068 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 9.811 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 8.811 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 8.3111 |
| 17.9068 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.811 |
| 17.407 | 10.3106 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.3108 |
| 16.9071 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 8.811 |
| 16.4071 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 15.907 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.3114 |
| 15.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.81105 |
| 14.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.3106 |
| 14.4072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.3106 |
| 15.4072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.3108 |
| 17.407 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.811 |
| 16.9071 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 6.3106 |
| 13.9047 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.81105 |
| 14.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 7.3114 |
| 14.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.81 |
| 15.4072 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 8.3111 |
| 15.907 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.81 |
| 15.907 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.3114 |
| 15.4072 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.3114 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.81105 |
| 14.907 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.81105 |
| 15.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.81105 |
| 15.907 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.3106 |
| 14.4072 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.3106 |
| 14.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.3106 |
| 15.4072 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.3106 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 16.9071 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.3111 |
| 17.9068 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.811 |
| 16.4071 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 9.3108 |
| 16.9071 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.811 |
| 17.407 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 10.3106 |
| 17.9068 | 10.3107 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.811 |
| 17.9068 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.3108 |
| 17.407 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.3108 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 8.811 |
| 16.9071 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.811 |
| 17.407 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 8.811 |
| 17.9068 | 8.811 |

## Piezometric line

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

## SSR Search Area

| X | Y |
|---|---|
| 1.35581 | 5.791 |
| 1.408 | 2.663 |
| 41.231 | 3.742 |
| 41.231 | 15.118 |
| 23.951 | 15.118 |
| 21.8624 | 11.8547 |
| 15.9072 | 5.83641 |
| 12.2368 | 5.75977 |
| 11.121 | 5.87315 |
| 1.408 | 5.791 |

# Phase2 Analysis Information
# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: F-S44 + GABIONS EQup loc lim + GEOTEX+PILE+OCR
Last saved with Phase2 version: 8.005
Project Title: SLIDE - An Interactive Slope Stability Program
Analysis: Converted from Slide v6.005 with PHASE2 8.005

## General Settings

Number of Stages: 7
Analysis Type: Plane Strain
Solver Type: Gaussian Elimination
Units: Metric, stress as kPa

## Analysis Options

Maximum Number of Iterations: 500
Tolerance: 0.01
Number of Load Steps: 20
Convergence Type: Absolute Energy
Tensile Failure: Reduces Shear Strength
Joint tension reduces joint stiffness by a factor of 0.01

## Groundwater Analysis

Method: Piezometric Lines
Pore Fluid Unit Weight: 9.81 kN/m3
Probability: None

## Field Stress

Field stress: gravity
Using actual ground surface
Total stress ratio (horizontal/vertical in-plane): 0.5
Total stress ratio (horizontal/vertical out-of-plane): 0.5
Locked-in horizontal stress (in-plane): 0
Locked-in horizontal stress (out-of-plane): 0

## Seismic Loading

Horizontal seismic load coefficient: -0.2 (positive to the right)
Vertical seismic load coefficient: 0.1 (positive up)
Seismic load applied in: Stage 7

## Mesh

Mesh type: uniform
Element type: 6 noded triangles
Number of elements on Stage 1: 1294
Number of nodes on Stage 1: 2846
Number of elements on Stage 2: 1298
Number of nodes on Stage 2: 2846
Number of elements on Stage 3: 1329
Number of nodes on Stage 3: 2846
Number of elements on Stage 4: 1349
Number of nodes on Stage 4: 2846
Number of elements on Stage 5: 1349
Number of nodes on Stage 5: 2846
Number of elements on Stage 6: 1349
Number of nodes on Stage 6: 2846
Number of elements on Stage 7: 1349
Number of nodes on Stage 7: 2846

## Mesh Quality

All elements are of good quality

### Poor quality elements defined as:

Side length ratio (maximum / minimum) > 30.00
Minimum interior angle < 2.0 degrees
Maximum interior angle > 175.0 degrees

## Reset Displacements

Displacements reset after: Stage 1
Displacements reset after: Stage 2
Displacements reset after: Stage 3
Displacements reset after: Stage 4
Displacements reset after: Stage 5

## Material Properties

### Material: UNIT I

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 3 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 3 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 3 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Properties changed in Stage 1

Young's modulus: 40000 kPa (factor = 2)

## Material: UNIT III

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 21 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 30000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 7 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 33 degrees |
| Peak cohesion | 7 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 33 degrees |
| Residual Cohesion | 7 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT IV

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 22.2 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 175000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 60 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 34 degrees |
| Peak cohesion | 60 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 34 degrees |
| Residual Cohesion | 60 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT V

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 25 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 1.38234e+006 kPa |
| Poisson's ratio | 0.4 |
| Failure Criterion | Generalized Hoek-Brown |
| Material type | Plastic |
| Dilation Parameter | 0 |
| Compressive strength | 15000 kPa |
| mb parameter | 1.5091 |
| s parameter | 0.003866 |
| a parameter | 0.505734 |
| Residual mb parameter | 1.2623 |
| Residual s parameter | 0.002218 |
| Residual a parameter | 0.508086 |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II UNDER WT

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GABION

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 18 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 100000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 20 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 32 degrees |
| Peak cohesion | 20 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 32 degrees |
| Residual Cohesion | 20 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GRAVEL

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 50000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 36 degrees |
| Peak cohesion | 0 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 36 degrees |
| Residual Cohesion | 0 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: SW

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 40000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 1 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 35 degrees |
| Peak cohesion | 1 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 35 degrees |
| Residual Cohesion | 1 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Material: AIR

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 0.01 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.2 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 0.01 degrees |
| Peak cohesion | 0.01 kPa |
| Material type | Elastic |
| Piezo to use | None |
| Ru value | 0 |

## *Joint Properties*

### Joint: Joint SOIL

| | |
|---|---|
| Color | |
| Normal stiffness | 200000 kPa/m |
| Shear stiffness | 20000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 25 degrees |

### Joint: Joint UNIT V Intrf

| | |
|---|---|
| Color | |
| Normal stiffness | 1e+006 kPa/m |
| Shear stiffness | 100000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 32 degrees |
| Residual Friction angle | 28 degrees |

### Joint: Joint 4 GABIONS

| | |
|---|---|
| Color | |
| Normal stiffness | 500000 kPa/m |
| Shear stiffness | 50000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 3 kPa |
| Residual Cohesion | 2 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 28 degrees |

## *Liner Properties*

### Liner: PILE

| | |
|---|---|
| Color | |
| Liner Type | Reinforced Concrete |
| Equivalent Young's modulus | 2.35671e+007 kPa |
| Equivalent thickness | 0.136498 m |
| Poisson ratio | 0 |

Reinforcement Properties

| | |
|---|---|
| Type | I-beam(HE Europe): HE 140 B |
| Spacing | 0.75 m |
| Section Depth | 0.14 m |
| Area | 0.004296 m2 |
| Moment of inertia | 1.509e-005 m4 |
| Young's modulus | 2e+008 kPa |
| Poisson ratio | 0.25 |
| Compressive strength | 400000 kPa |
| Tensile strength | 400000 kPa |

Concrete Properties

| | |
|---|---|
| Thickness | 0.065 m |
| Young's modulus | 3e+007 kPa |
| Poisson ratio | 0.15 |
| Compressive strength | 30000 kPa |
| Tensile strength | 3000 kPa |

## *Structural Interface Properties*

Structural Interface: Structural 2
Joint (positive side): Joint SOIL
Liner: PILE
Joint (negative side): Joint SOIL

## *List of All Coordinates*

### External boundary

| X | Y |
|---|---|
| -11.931 | -13.213 |
| 61.92 | -13.213 |
| 61.92 | 27.196 |
| -11.931 | 27.196 |

### Material boundary

| X | Y |
|---|---|
| 0.246468 | -1.486 |
| 14.9068 | 2.35863 |
| 31.5166 | 8.03863 |
| 40.9932 | 10.5286 |
| 51.5928 | 16.7299 |
| 55.0767 | 20.7296 |

### Material boundary

| X | Y |
|---|---|
| 0.246468 | -4.15932 |
| 55.0767 | 11.186 |

### Material boundary

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 11.9085 | 4.52456 |
| 16.9071 | 5.83641 |

### Material boundary

| X | Y |
|---|---|
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

## Material boundary

| X | Y |
|---|---|
| 18.0906 | 7.53452 |
| 18.742 | 7.7233 |
| 31.5166 | 11.4256 |
| 40.9932 | 12.4986 |

## Material boundary

| X | Y |
|---|---|
| 51.3789 | 18.6028 |
| 55.0767 | 23.3646 |

## Material boundary

| X | Y |
|---|---|
| 17.2805 | 7.22412 |
| 18.0906 | 7.53452 |

## Material boundary

| X | Y |
|---|---|
| 17.9068 | 10.3107 |
| 20.3347 | 10.3108 |

## Material boundary

| X | Y |
|---|---|
| 17.9068 | 8.3111 |
| 18.356 | 8.3111 |

## Material boundary

| X | Y |
|---|---|
| 13.291 | 7.18104 |
| 13.2484 | 7.15374 |
| 13.2017 | 7.13399 |
| 13.1524 | 7.12236 |
| 13.1019 | 7.11917 |
| 13.0515 | 7.12451 |
| 13.0028 | 7.13824 |
| 12.9532 | 7.16181 |
| 12.932 | 7.17578 |
| 12.9064 | 7.19655 |
| 12.8845 | 7.21846 |
| 12.8627 | 7.24586 |
| 12.8587 | 7.42036 |
| 12.8334 | 7.45725 |

| | |
|---|---|
| 12.2064 | 7.41964 |
| 12.2037 | 7.36919 |
| 12.2098 | 7.33997 |
| 12.2084 | 7.24233 |
| 12.2094 | 7.20458 |
| 12.213 | 7.12119 |
| 12.2175 | 7.06797 |
| 12.2237 | 6.73133 |
| 12.2291 | 6.4021 |
| 12.2368 | 6.07782 |
| 12.2368 | 6.0236 |
| 11.9085 | 5.94224 |
| 11.8339 | 5.93791 |
| 11.7565 | 5.92998 |
| 11.5778 | 5.90617 |
| 11.2683 | 5.85792 |
| 11.121 | 5.87315 |
| 10.7096 | 5.80715 |
| 9.86652 | 5.76146 |
| 9.18594 | 5.68024 |
| 8.79485 | 5.58378 |
| 7.05121 | 5.30975 |
| 6.72302 | 5.27274 |
| 5.64857 | 5.14047 |
| 5.29473 | 5.11377 |
| 4.72058 | 5.00032 |
| 4.27996 | 4.99365 |
| 3.82599 | 5.01368 |
| 3.08494 | 4.98031 |
| 2.13693 | 4.92692 |
| 1.35581 | 4.92025 |
| 0.246468 | 4.88611 |
| 0.246468 | 1.46395 |
| 0.246468 | -1.486 |
| 0.246468 | -4.15932 |
| 0.246468 | -5.39951 |
| 55.0767 | -5.39951 |
| 55.0767 | 11.186 |
| 55.0767 | 17.606 |
| 55.0767 | 19.3593 |
| 55.0767 | 20.7296 |
| 55.0767 | 21.5622 |
| 55.0767 | 23.3646 |
| 55.0767 | 26.0247 |
| 54.4584 | 25.8393 |
| 53.5618 | 25.4685 |
| 52.9744 | 24.7577 |
| 52.387 | 24.047 |
| 51.9851 | 23.2435 |
| 51.4905 | 22.3782 |
| 50.6249 | 21.1112 |
| 50.0375 | 20.3695 |
| 49.3883 | 19.9678 |
| 48.3371 | 19.3189 |
| 46.9348 | 18.4738 |
| 46.5963 | 18.197 |

| | |
|---|---|
| 46.0426 | 17.6743 |
| 45.2735 | 17.1207 |
| 42.619 | 15.4475 |
| 41.5004 | 14.3584 |
| 40.9932 | 14.0474 |
| 28.6564 | 14.5032 |
| 28.4404 | 14.3519 |
| 27.9984 | 13.9017 |
| 27.1243 | 13.3297 |
| 26.6199 | 13.0337 |
| 26.1665 | 12.7746 |
| 25.3511 | 12.4823 |
| 25.084 | 12.4178 |
| 24.588 | 12.31 |
| 23.9236 | 12.2596 |
| 23.0163 | 12.0764 |
| 21.8624 | 11.8547 |
| 21.1904 | 11.7256 |
| 20.6568 | 11.6923 |
| 20.3595 | 11.6738 |
| 19.4411 | 11.318 |
| 17.296 | 10.487 |
| 17.0867 | 10.3106 |
| 16.4941 | 9.811 |
| 15.9007 | 9.3108 |
| 15.3078 | 8.811 |
| 14.7147 | 8.3111 |
| 14.132 | 7.81 |
| 13.5288 | 7.3114 |
| 13.4289 | 7.22714 |
| 13.291 | 7.18104 |

## Material boundary

| X | Y |
|---|---|
| 12.8925 | 6.3106 |
| 13.4052 | 6.3106 |

## Material boundary

| X | Y |
|---|---|
| 13.9047 | 6.81105 |
| 12.8841 | 6.81105 |

## Material boundary

| X | Y |
|---|---|
| 14.4072 | 7.3114 |
| 13.5288 | 7.3114 |

## Material boundary

| X | Y |
|---|---|
| 14.907 | 7.81 |
| 14.132 | 7.81 |

## Material boundary

| X | Y |
|---|---|
| 15.4072 | 8.3111 |
| 14.7147 | 8.3111 |

## Material boundary

| X | Y |
|---|---|
| 15.907 | 8.811 |
| 15.3078 | 8.811 |

## Material boundary

| X | Y |
|---|---|
| 16.4071 | 9.3108 |
| 15.9007 | 9.3108 |

## Material boundary

| X | Y |
|---|---|
| 16.9071 | 9.811 |
| 16.8746 | 9.811 |
| 16.4941 | 9.811 |

## Material boundary

| X | Y |
|---|---|
| 17.407 | 10.3106 |
| 17.0867 | 10.3106 |

## Structural interface

| X | Y |
|---|---|
| 11.9085 | 5.94224 |
| 11.9085 | 4.52456 |
| 11.9085 | 1.94224 |

## Joint boundary

| X | Y |
|---|---|
| 15.9072 | 5.83641 |
| 17.2805 | 7.22412 |
| 18.356 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 14.4072 | 5.83641 |
| 15.4072 | 5.83641 |
| 15.9072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.83641 |
| 13.4052 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 5.75977 |
| 12.8959 | 5.75977 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.83641 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 5.75977 |
| 12.2368 | 6.0236 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.75977 |
| 12.8959 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.2237 | 6.73133 |
| 12.8836 | 6.74889 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 6.07782 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 12.2291 | 6.4021 |
| 12.8925 | 6.4021 |

## Joint boundary

| X | Y |
|---|---|
| 12.2175 | 7.06797 |
| 12.885 | 7.08304 |

## Joint boundary

| X | Y |
|---|---|
| 12.8627 | 7.24586 |
| 12.885 | 7.08304 |
| 12.8841 | 6.81105 |
| 12.8836 | 6.74889 |
| 12.8925 | 6.4021 |
| 12.8925 | 6.3106 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 13.4052 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.9072 | 5.83641 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.3106 |
| 13.9047 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.81105 |
| 14.4072 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.3114 |
| 14.907 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.81 |
| 15.4072 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 7.81 |
| 15.907 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 6.81105 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 7.81 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 6.81105 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 20.3347 | 10.3108 |
| 21.8624 | 11.8547 |

## Joint boundary

| X | Y |
|---|---|
| 20.3347 | 10.3108 |
| 18.356 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 10.3107 |
| 17.9068 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 9.811 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 8.811 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 8.3111 |
| 17.9068 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.811 |
| 17.407 | 10.3106 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.3108 |
| 16.9071 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 8.811 |
| 16.4071 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 15.907 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.3114 |
| 15.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.81105 |
| 14.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.3106 |
| 14.4072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.3106 |
| 15.4072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.3108 |
| 17.407 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.811 |
| 16.9071 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 6.3106 |
| 13.9047 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.81105 |
| 14.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 7.3114 |
| 14.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.81 |
| 15.4072 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 8.3111 |
| 15.907 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.81 |
| 15.907 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.3114 |
| 15.4072 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.3114 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.81105 |
| 14.907 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.81105 |
| 15.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.81105 |
| 15.907 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.3106 |
| 14.4072 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.3106 |
| 14.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.3106 |
| 15.4072 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.3106 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 16.9071 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.3111 |
| 17.9068 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.811 |
| 16.4071 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 9.3108 |
| 16.9071 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.811 |
| 17.407 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 10.3106 |
| 17.9068 | 10.3107 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.811 |
| 17.9068 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.3108 |
| 17.407 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.3108 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 8.811 |
| 16.9071 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.811 |
| 17.407 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 8.811 |
| 17.9068 | 8.811 |

## Piezometric line

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

# Phase2 Analysis Information
# SLIDE - An Interactive Slope Stability Program

## Project Summary

File Name: F-S44 + GABIONS EQup loc lim + GEOTEX+PILE+OCR+SSR
Last saved with Phase2 version: 8.005
Project Title: SLIDE - An Interactive Slope Stability Program
Analysis: Converted from Slide v6.005 with PHASE2 8.005

## General Settings

Number of Stages: 7
Analysis Type: Plane Strain
Solver Type: Gaussian Elimination
Units: Metric, stress as kPa

## Analysis Options

Maximum Number of Iterations: 500
Tolerance: 0.01
Number of Load Steps: 20
Convergence Type: Absolute Energy
Tensile Failure: Reduces Shear Strength
Joint tension reduces joint stiffness by a factor of 0.01

## Strength Reduction Settings

Inital Estimate of SRF: 1
Step Size: Automatic
Tolerance (SRF): 0.01
Limit SSR Search Area: Yes
Apply SSR to Mohr-Coulomb Tensile Strength: Yes
Convergence Parameters: Automatic

## Groundwater Analysis

Method: Piezometric Lines
Pore Fluid Unit Weight: 9.81 kN/m3
Probability: None

## Field Stress

Field stress: gravity
Using actual ground surface
Total stress ratio (horizontal/vertical in-plane): 0.5
Total stress ratio (horizontal/vertical out-of-plane): 0.5

Locked-in horizontal stress (in-plane): 0
Locked-in horizontal stress (out-of-plane): 0

## Seismic Loading

Horizontal seismic load coefficient: -0.2 (positive to the right)
Vertical seismic load coefficient: 0.1 (positive up)
Seismic load applied in: Stage 7

## Mesh

Mesh type: uniform
Element type: 6 noded triangles
Number of elements on Stage 1: 1302
Number of nodes on Stage 1: 2861
Number of elements on Stage 2: 1306
Number of nodes on Stage 2: 2861
Number of elements on Stage 3: 1337
Number of nodes on Stage 3: 2861
Number of elements on Stage 4: 1357
Number of nodes on Stage 4: 2861
Number of elements on Stage 5: 1357
Number of nodes on Stage 5: 2861
Number of elements on Stage 6: 1357
Number of nodes on Stage 6: 2861
Number of elements on Stage 7: 1357
Number of nodes on Stage 7: 2861

## Mesh Quality

All elements are of good quality

### Poor quality elements defined as:

Side length ratio (maximum / minimum) > 30.00
Minimum interior angle < 2.0 degrees
Maximum interior angle > 175.0 degrees

## Reset Displacements

Displacements reset after: Stage 1
Displacements reset after: Stage 2
Displacements reset after: Stage 3
Displacements reset after: Stage 4
Displacements reset after: Stage 5

## Material Properties

### Material: UNIT I

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 11000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 3 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 3.5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 3.5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5.5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5.5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Properties changed in Stage 1

Young's modulus: 40000 kPa (factor = 2)

## Material: UNIT III

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 21 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 30000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 7 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 33 degrees |
| Peak cohesion | 7 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 33 degrees |
| Residual Cohesion | 7 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT IV

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 22.2 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 175000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 60 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 34 degrees |
| Peak cohesion | 60 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 34 degrees |
| Residual Cohesion | 60 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT V

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 25 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 1.38234e+006 kPa |
| Poisson's ratio | 0.4 |
| Failure Criterion | Generalized Hoek-Brown |
| Material type | Plastic |
| Dilation Parameter | 0 |
| Compressive strength | 15000 kPa |
| mb parameter | 1.5091 |
| s parameter | 0.003866 |
| a parameter | 0.505734 |
| Residual mb parameter | 1.2623 |
| Residual s parameter | 0.002218 |
| Residual a parameter | 0.508086 |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II UNDER WT

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GABION

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 18 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 100000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 20 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 32 degrees |
| Peak cohesion | 20 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 32 degrees |
| Residual Cohesion | 20 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GRAVEL

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 50000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 36 degrees |
| Peak cohesion | 0 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 36 degrees |
| Residual Cohesion | 0 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: SW

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 40000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 1 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 35 degrees |
| Peak cohesion | 1 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 35 degrees |
| Residual Cohesion | 1 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Material: AIR

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 0.01 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.2 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 0.01 degrees |
| Peak cohesion | 0.01 kPa |
| Material type | Elastic |
| Piezo to use | None |
| Ru value | 0 |

## *Joint Properties*

### Joint: Joint SOIL

| | |
|---|---|
| Color | |
| Normal stiffness | 200000 kPa/m |
| Shear stiffness | 20000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 25 degrees |
| Apply SSR? | No |

### Joint: Joint UNIT V Intrf

| | |
|---|---|
| Color | |
| Normal stiffness | 1e+006 kPa/m |
| Shear stiffness | 100000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 32 degrees |
| Residual Friction angle | 28 degrees |
| Apply SSR? | No |

### Joint: Joint 4 GABIONS

| | |
|---|---|
| Color | |
| Normal stiffness | 500000 kPa/m |
| Shear stiffness | 50000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 3 kPa |
| Residual Cohesion | 2 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 28 degrees |
| Apply SSR? | No |

## *Liner Properties*

### Liner: PILE

| | |
|---|---|
| Color | |
| Liner Type | Reinforced Concrete |
| Equivalent Young's modulus | 2.35671e+007 kPa |
| Equivalent thickness | 0.136498 m |
| Poisson ratio | 0 |

Reinforcement Properties

| | |
|---|---|
| Type | I-beam(HE Europe): HE 140 B |
| Spacing | 0.75 m |
| Section Depth | 0.14 m |
| Area | 0.004296 m2 |
| Moment of inertia | 1.509e-005 m4 |
| Young's modulus | 2e+008 kPa |
| Poisson ratio | 0.25 |
| Compressive strength | 400000 kPa |
| Tensile strength | 400000 kPa |

Concrete Properties

| | |
|---|---|
| Thickness | 0.065 m |
| Young's modulus | 3e+007 kPa |
| Poisson ratio | 0.15 |
| Compressive strength | 30000 kPa |
| Tensile strength | 3000 kPa |

## *Structural Interface Properties*

Structural Interface: Structural 2
Joint (positive side): Joint SOIL
Liner: PILE
Joint (negative side): Joint SOIL

## *List of All Coordinates*

### External boundary

| X | Y |
|---|---|
| -11.931 | -13.213 |
| 61.92 | -13.213 |
| 61.92 | 27.196 |
| -11.931 | 27.196 |

### Material boundary

| X | Y |
|---|---|
| 0.246468 | -1.486 |
| 14.9068 | 2.35863 |
| 31.5166 | 8.03863 |
| 40.9932 | 10.5286 |
| 51.5928 | 16.7299 |
| 55.0767 | 20.7296 |

### Material boundary

| X | Y |
|---|---|
| 0.246468 | -4.15932 |
| 55.0767 | 11.186 |

### Material boundary

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 11.9085 | 4.52456 |
| 16.9071 | 5.83641 |

## Material boundary

| X | Y |
|---|---|
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

## Material boundary

| X | Y |
|---|---|
| 18.0906 | 7.53452 |
| 18.742 | 7.7233 |
| 31.5166 | 11.4256 |
| 40.9932 | 12.4986 |

## Material boundary

| X | Y |
|---|---|
| 51.3789 | 18.6028 |
| 55.0767 | 23.3646 |

## Material boundary

| X | Y |
|---|---|
| 17.2805 | 7.22412 |
| 18.0906 | 7.53452 |

## Material boundary

| X | Y |
|---|---|
| 17.9068 | 10.3107 |
| 20.3347 | 10.3108 |

## Material boundary

| X | Y |
|---|---|
| 17.9068 | 8.3111 |
| 18.356 | 8.3111 |

## Material boundary

| X | Y |
|---|---|
| 13.291 | 7.18104 |
| 13.2484 | 7.15374 |
| 13.2017 | 7.13399 |
| 13.1524 | 7.12236 |
| 13.1019 | 7.11917 |
| 13.0515 | 7.12451 |

| | |
|---|---|
| 13.0028 | 7.13824 |
| 12.9532 | 7.16181 |
| 12.932 | 7.17578 |
| 12.9064 | 7.19655 |
| 12.8845 | 7.21846 |
| 12.8627 | 7.24586 |
| 12.8587 | 7.42036 |
| 12.8334 | 7.45725 |
| 12.2064 | 7.41964 |
| 12.2037 | 7.36919 |
| 12.2098 | 7.33997 |
| 12.2084 | 7.24233 |
| 12.2094 | 7.20458 |
| 12.213 | 7.12119 |
| 12.2175 | 7.06797 |
| 12.2237 | 6.73133 |
| 12.2291 | 6.4021 |
| 12.2368 | 6.07782 |
| 12.2368 | 6.0236 |
| 11.9085 | 5.94224 |
| 11.8339 | 5.93791 |
| 11.7565 | 5.92998 |
| 11.5778 | 5.90617 |
| 11.2683 | 5.85792 |
| 11.121 | 5.87315 |
| 10.7096 | 5.80715 |
| 9.86652 | 5.76146 |
| 9.18594 | 5.68024 |
| 8.79485 | 5.58378 |
| 7.05121 | 5.30975 |
| 6.72302 | 5.27274 |
| 5.64857 | 5.14047 |
| 5.29473 | 5.11377 |
| 4.72058 | 5.00032 |
| 4.27996 | 4.99365 |
| 3.82599 | 5.01368 |
| 3.08494 | 4.98031 |
| 2.13693 | 4.92692 |
| 1.35581 | 4.92025 |
| 0.246468 | 4.88611 |
| 0.246468 | 1.46395 |
| 0.246468 | -1.486 |
| 0.246468 | -4.15932 |
| 0.246468 | -5.39951 |
| 55.0767 | -5.39951 |
| 55.0767 | 11.186 |
| 55.0767 | 17.606 |
| 55.0767 | 19.3593 |
| 55.0767 | 20.7296 |
| 55.0767 | 21.5622 |
| 55.0767 | 23.3646 |
| 55.0767 | 26.0247 |
| 54.4584 | 25.8393 |
| 53.5618 | 25.4685 |
| 52.9744 | 24.7577 |
| 52.387 | 24.047 |

| | |
|---|---|
| 51.9851 | 23.2435 |
| 51.4905 | 22.3782 |
| 50.6249 | 21.1112 |
| 50.0375 | 20.3695 |
| 49.3883 | 19.9678 |
| 48.3371 | 19.3189 |
| 46.9348 | 18.4738 |
| 46.5963 | 18.197 |
| 46.0426 | 17.6743 |
| 45.2735 | 17.1207 |
| 42.619 | 15.4475 |
| 41.5004 | 14.3584 |
| 40.9932 | 14.0474 |
| 28.6564 | 14.5032 |
| 28.4404 | 14.3519 |
| 27.9984 | 13.9017 |
| 27.1243 | 13.3297 |
| 26.6199 | 13.0337 |
| 26.1665 | 12.7746 |
| 25.3511 | 12.4823 |
| 25.084 | 12.4178 |
| 24.588 | 12.31 |
| 23.9236 | 12.2596 |
| 23.0163 | 12.0764 |
| 21.8624 | 11.8547 |
| 21.1904 | 11.7256 |
| 20.6568 | 11.6923 |
| 20.3595 | 11.6738 |
| 19.4411 | 11.318 |
| 17.296 | 10.487 |
| 17.0867 | 10.3106 |
| 16.4941 | 9.811 |
| 15.9007 | 9.3108 |
| 15.3078 | 8.811 |
| 14.7147 | 8.3111 |
| 14.132 | 7.81 |
| 13.5288 | 7.3114 |
| 13.4289 | 7.22714 |
| 13.291 | 7.18104 |

## Material boundary

| X | Y |
|---|---|
| 12.8925 | 6.3106 |
| 13.4052 | 6.3106 |

## Material boundary

| X | Y |
|---|---|
| 13.9047 | 6.81105 |
| 12.8841 | 6.81105 |

## Material boundary

| X | Y |
|---|---|
| 14.4072 | 7.3114 |
| 13.5288 | 7.3114 |

## Material boundary

| X | Y |
|---|---|
| 14.907 | 7.81 |
| 14.132 | 7.81 |

## Material boundary

| X | Y |
|---|---|
| 15.4072 | 8.3111 |
| 14.7147 | 8.3111 |

## Material boundary

| X | Y |
|---|---|
| 15.907 | 8.811 |
| 15.3078 | 8.811 |

## Material boundary

| X | Y |
|---|---|
| 16.4071 | 9.3108 |
| 15.9007 | 9.3108 |

## Material boundary

| X | Y |
|---|---|
| 16.9071 | 9.811 |
| 16.8746 | 9.811 |
| 16.4941 | 9.811 |

## Material boundary

| X | Y |
|---|---|
| 17.407 | 10.3106 |
| 17.0867 | 10.3106 |

## Structural interface

| X | Y |
|---|---|
| 11.9085 | 5.94224 |
| 11.9085 | 4.52456 |
| 11.9085 | 1.94224 |

## Joint boundary

| X | Y |
|---|---|
| 15.9072 | 5.83641 |
| 17.2805 | 7.22412 |
| 18.356 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 14.4072 | 5.83641 |
| 15.4072 | 5.83641 |
| 15.9072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.83641 |
| 13.4052 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 5.75977 |
| 12.8959 | 5.75977 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.83641 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 5.75977 |
| 12.2368 | 6.0236 |

## Joint boundary

| X | Y |
|---|---|
| 12.8959 | 5.75977 |
| 12.8959 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 12.2237 | 6.73133 |
| 12.8836 | 6.74889 |

## Joint boundary

| X | Y |
|---|---|
| 12.2368 | 6.07782 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 12.2291 | 6.4021 |
| 12.8925 | 6.4021 |

## Joint boundary

| X | Y |
|---|---|
| 12.2175 | 7.06797 |
| 12.885 | 7.08304 |

## Joint boundary

| X | Y |
|---|---|
| 12.8627 | 7.24586 |
| 12.885 | 7.08304 |
| 12.8841 | 6.81105 |
| 12.8836 | 6.74889 |
| 12.8925 | 6.4021 |
| 12.8925 | 6.3106 |
| 12.8959 | 6.07782 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 5.83641 |
| 13.4052 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.9072 | 5.83641 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.3106 |
| 13.9047 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.81105 |
| 14.4072 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.3114 |
| 14.907 | 7.81 |

## Joint boundary

| X | Y |
|---|---|

| X | Y |
|---|---|
| 15.4072 | 7.81 |
| 15.4072 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 7.81 |
| 15.907 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 6.81105 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 7.81 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 6.81105 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 20.3347 | 10.3108 |
| 21.8624 | 11.8547 |

## Joint boundary

| X | Y |
|---|---|
| 20.3347 | 10.3108 |
| 18.356 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 10.3107 |
| 17.9068 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 9.811 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 8.811 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.9068 | 8.3111 |
| 17.9068 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.811 |
| 17.407 | 10.3106 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.3108 |
| 16.9071 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 8.811 |
| 16.4071 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 15.907 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.3114 |
| 15.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.81105 |
| 14.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.3106 |
| 14.4072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.3106 |
| 15.4072 | 5.83641 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.3108 |
| 17.407 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.811 |
| 16.9071 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 13.4052 | 6.3106 |
| 13.9047 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.81105 |
| 14.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 7.3114 |
| 14.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.81 |
| 15.4072 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 8.3111 |
| 15.907 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.81 |
| 15.907 | 7.81 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 7.3114 |
| 15.4072 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 7.3114 |
| 15.907 | 7.3114 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.81105 |
| 14.907 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.81105 |
| 15.4072 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.81105 |
| 15.907 | 6.81105 |

## Joint boundary

| X | Y |
|---|---|
| 13.9047 | 6.3106 |
| 14.4072 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.4072 | 6.3106 |
| 14.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 14.907 | 6.3106 |
| 15.4072 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.4072 | 6.3106 |
| 15.907 | 6.3106 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.3111 |
| 16.9071 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.3111 |
| 17.9068 | 8.3111 |

## Joint boundary

| X | Y |
|---|---|
| 15.907 | 8.811 |
| 16.4071 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 9.3108 |
| 16.9071 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.811 |
| 17.407 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 10.3106 |
| 17.9068 | 10.3107 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.811 |
| 17.9068 | 9.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 9.3108 |
| 17.407 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 9.3108 |
| 17.9068 | 9.3108 |

## Joint boundary

| X | Y |
|---|---|
| 16.4071 | 8.811 |
| 16.9071 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 16.9071 | 8.811 |
| 17.407 | 8.811 |

## Joint boundary

| X | Y |
|---|---|
| 17.407 | 8.811 |
| 17.9068 | 8.811 |

## Piezometric line

| X | Y |
|---|---|
| 0.246468 | 1.46395 |
| 16.9071 | 5.83641 |
| 40.9932 | 12.4986 |
| 51.3789 | 18.6028 |
| 55.0767 | 21.5622 |

## SSR Search Area

| X | Y |
|---|---|
| 1.084 | 2.42555 |
| 40.744 | 3.379 |
| 40.9932 | 14.0474 |
| 41.288 | 16.478 |
| 26.8167 | 16.8603 |
| 21.8624 | 11.8541 |
| 15.9072 | 5.83641 |
| 12.2368 | 5.75977 |
| 11.9085 | 5.55428 |
| 10.7096 | 5.80715 |
| 1.084 | 6.145 |
| 1.084 | -0.057 |

# Phase2 Analysis Information
# Project1

## Project Summary

File Name: ANASTILOTIKI PROTASI EQ=0.24
Last saved with Phase2 version: 8.005
Project Title: Project1

## General Settings

Number of Stages: 8
Analysis Type: Plane Strain
Solver Type: Gaussian Elimination
Units: Metric, stress as kPa

## Analysis Options

Maximum Number of Iterations: 500
Tolerance: 0.01
Number of Load Steps: 10
Convergence Type: Absolute Energy
Tensile Failure: Reduces Shear Strength
Joint tension reduces joint stiffness by a factor of 0.01

## Groundwater Analysis

Method: Piezometric Lines
Pore Fluid Unit Weight: 9.81 kN/m3
Probability: None

## Field Stress

Field stress: constant
Sigma one: 10 kPa (compression positive)
Sigma three: 10 kPa (compression positive)
Sigma Z: 10 kPa (compression positive)
Angle from the horizontal to sigma 1: 0 degrees (counter-clockwise)

## Seismic Loading

Horizontal seismic load coefficient: -0.24 (positive to the right)
Vertical seismic load coefficient: -0.12 (positive up)
Seismic load applied in: Stage 8

## Mesh

Mesh type: graded
Element type: 3 noded triangles
Number of elements on Stage 1: 6448
Number of nodes on Stage 1: 3779
Number of elements on Stage 2: 6448
Number of nodes on Stage 2: 3779
Number of elements on Stage 3: 6448
Number of nodes on Stage 3: 3779
Number of elements on Stage 4: 6448
Number of nodes on Stage 4: 3779
Number of elements on Stage 5: 6640
Number of nodes on Stage 5: 3779
Number of elements on Stage 6: 6640
Number of nodes on Stage 6: 3779
Number of elements on Stage 7: 6640
Number of nodes on Stage 7: 3779
Number of elements on Stage 8: 6640
Number of nodes on Stage 8: 3779

## Mesh Quality

12 of 9706 Elements ( 0.1 % of elements) are poor quality elements
8 of 9706 Elements ( 0.1 % of elements) are poor quality elements because of the side length ratio
12 of 9706 Elements ( 0.1 % of elements) are poor quality elements because of the minimum interior angle
0 of 9706 Elements ( 0.0 % of elements) are poor quality elements because of the maximum interior angle
0 of 9706 Elements ( 0.0 % of elements) are poor quality elements because they are inverted
Note: Elements can be of poor quality for more than one reason

### Poor quality elements defined as:

Side length ratio (maximum / minimum) > 30.00
Minimum interior angle < 2.0 degrees
Maximum interior angle > 175.0 degrees

## Reset Displacements

Displacements reset after: Stage 6

## Excavation Areas

### Original Un-deformed Areas

External Boundary Area: 1885.519 m2
External Boundary Perimeter: 179.000 m

### Stage 1

External Boundary Area: 1885.519 m2 (0 m2 change from original area)
External Boundary Perimeter: 179.000 m (0 m change from original perimeter)

### Stage 2

Values not available until this stage is viewed in a window

### Stage 3

Values not available until this stage is viewed in a window

### Stage 4

Values not available until this stage is viewed in a window

### Stage 5

Values not available until this stage is viewed in a window

### Stage 6

Values not available until this stage is viewed in a window

### Stage 7

Values not available until this stage is viewed in a window

### Stage 8

Values not available until this stage is viewed in a window

## *Material Properties*

### Material: UNIT I

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 3 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 3 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 3 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Material: UNIT II

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Properties changed in Stage 1

Young's modulus: 40000 kPa (factor = 2)

## Material: UNIT III

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 21 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 30000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 7 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 33 degrees |
| Peak cohesion | 7 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 33 degrees |
| Residual Cohesion | 7 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT IV

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 22.2 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 175000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 60 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 34 degrees |
| Peak cohesion | 60 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 34 degrees |
| Residual Cohesion | 60 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT V STONE WALL

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 25 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 1.38234e+006 kPa |
| Poisson's ratio | 0.4 |
| Failure Criterion | Generalized Hoek-Brown |
| Material type | Plastic |
| Dilation Parameter | 0 |
| Compressive strength | 15000 kPa |
| mb parameter | 1.5091 |
| s parameter | 0.003866 |
| a parameter | 0.505734 |
| Residual mb parameter | 1.2623 |
| Residual s parameter | 0.002218 |
| Residual a parameter | 0.508086 |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II UNDER WT

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GABION

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 18 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 100000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 20 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 32 degrees |
| Peak cohesion | 20 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 32 degrees |
| Residual Cohesion | 20 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: SW

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 40000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 1 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 35 degrees |
| Peak cohesion | 1 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 35 degrees |
| Residual Cohesion | 1 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Material: AIR

| | |
|---|---|
| Color | |
| Initial element loading | No initial element loading |
| Elastic type | isotropic |
| Young's modulus | 1 kPa |
| Poisson's ratio | 0.2 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 0.01 degrees |
| Peak cohesion | 0.01 kPa |
| Material type | Elastic |
| Piezo to use | 1 |
| Hu Type | Custom |
| Hu value | 1 |

## *Joint Properties*

### Joint: Joint SOIL

| | |
|---|---|
| Color | |
| Normal stiffness | 200000 kPa/m |
| Shear stiffness | 20000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 25 degrees |

### Joint: Joint UNIT V Intrf

| | |
|---|---|
| Color | |
| Normal stiffness | 1e+006 kPa/m |
| Shear stiffness | 100000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 32 degrees |
| Residual Friction angle | 28 degrees |

### Joint: Joint 4 GABIONS

| | |
|---|---|
| Color | |
| Normal stiffness | 500000 kPa/m |
| Shear stiffness | 50000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 3 kPa |
| Residual Cohesion | 2 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 28 degrees |

## *Liner Properties*

### Liner: PILE Φ120

| | |
|---|---|
| Color | |
| Liner Type | Reinforced Concrete |
| Equivalent Young's modulus | 2.63918e+007 kPa |
| Equivalent thickness | 0.582056 m |
| Poisson ratio | 0 |

Reinforcement Properties

| | |
|---|---|
| Type | Rebar(Europe): #20 (diameter=20mm) |
| Spacing | 0.147 m |
| Section Depth | 0.465 m |
| Area | 0.000628 m2 |
| Moment of inertia | 3.3963e-005 m4 |
| Young's modulus | 2e+008 kPa |
| Poisson ratio | 0.25 |
| Compressive strength | 350000 kPa |
| Tensile strength | 350000 kPa |

Concrete Properties

| | |
|---|---|
| Thickness | 0.565 m |
| Young's modulus | 2.5e+007 kPa |
| Poisson ratio | 0.15 |
| Compressive strength | 25000 kPa |
| Tensile strength | 2500 kPa |

## Structural Interface Properties

Structural Interface: PILE Φ120
Joint (positive side): Joint SOIL
Liner: PILE Φ120
Joint (negative side): Joint SOIL

## Displacements

Displacement data is not available for Stage 1 until total displacement is viewed in a window
Displacement data is not available for Stage 2 until total displacement is viewed in a window
Displacement data is not available for Stage 3 until total displacement is viewed in a window
Displacement data is not available for Stage 4 until total displacement is viewed in a window
Displacement data is not available for Stage 5 until total displacement is viewed in a window
Displacement data is not available for Stage 6 until total displacement is viewed in a window
Displacement data is not available for Stage 7 until total displacement is viewed in a window
Displacement data is not available for Stage 8 until total displacement is viewed in a window

## Yielded Elements

### Yielded Mesh Elements

Number of yielded mesh elements on Stage 1: 3516
Number of yielded mesh elements is not available for Stage 2 until the stage is viewed in a window
Number of yielded mesh elements is not available for Stage 3 until the stage is viewed in a window
Number of yielded mesh elements is not available for Stage 4 until the stage is viewed in a window
Number of yielded mesh elements is not available for Stage 5 until the stage is viewed in a window
Number of yielded mesh elements is not available for Stage 6 until the stage is viewed in a window
Number of yielded mesh elements is not available for Stage 7 until the stage is viewed in a window
Number of yielded mesh elements is not available for Stage 8 until the stage is viewed in a window

### Yielded Liner Elements

Number of yielded liner elements on Stage 1: 0
Number of yielded liner elements on Stage 2: 0
Number of yielded liner elements on Stage 3: 0
Number of yielded liner elements on Stage 4: 0
Number of yielded liner elements on Stage 5: 0
Number of yielded liner elements on Stage 6: 0
Number of yielded liner elements on Stage 7: 0
Number of yielded liner elements on Stage 8: 0

### Yielded Joint Elements

Number of yielded joint elements on Stage 1: 71
Number of yielded joint elements on Stage 2: 71
Number of yielded joint elements on Stage 3: 108

Number of yielded joint elements on Stage 4: 108
Number of yielded joint elements on Stage 5: 201
Number of yielded joint elements on Stage 6: 201
Number of yielded joint elements on Stage 7: 202
Number of yielded joint elements on Stage 8: 276

## *List of All Coordinates*

### External boundary

| X | Y |
|---|---|
| 55.5684 | -7.1e-015 |
| 55.5684 | 17.1049 |
| 55.5684 | 26.8204 |
| 55.5684 | 27.5842 |
| 55.5684 | 29.483 |
| 55.5684 | 33.9315 |
| 0 | 10 |
| 0 | 8.06994 |
| 0 | 7.18572 |
| 0 | 4.23588 |
| 0 | 1.55304 |
| 0 | 0 |

### Material boundary

| X | Y |
|---|---|
| 0 | 4.23588 |
| 15.2007 | 8.22223 |
| 16.1516 | 8.54739 |
| 31.8106 | 13.9022 |
| 41.2871 | 16.3922 |
| 51.8868 | 22.5935 |
| 55.5684 | 26.8204 |

### Material boundary

| X | Y |
|---|---|
| 55.5684 | 17.1049 |
| 16.1516 | 6.07337 |
| 0 | 1.55304 |

### Material boundary

| X | Y |
|---|---|
| 0 | 7.18572 |
| 16.1516 | 11.282 |
| 17.3506 | 11.6197 |
| 41.2871 | 18.3622 |
| 51.6729 | 24.4664 |
| 55.5684 | 27.5842 |

### Material boundary

| X | Y |
|---|---|
| 11.8787 | 11.5126 |
| 0 | 8.06994 |

## Material boundary

| X | Y |
|---|---|
| 55.5684 | 29.483 |
| 51.6729 | 24.4664 |

## Material boundary

| X | Y |
|---|---|
| 41.2871 | 18.3622 |
| 31.8106 | 17.2892 |
| 19.0359 | 13.5869 |
| 18.3846 | 13.3981 |
| 17.3506 | 13.0985 |
| 16.1516 | 12.751 |
| 15.1516 | 12.4611 |
| 14.5334 | 12.282 |
| 13.6516 | 12.0264 |
| 13.2106 | 11.8986 |

## Material boundary

| X | Y |
|---|---|
| 13.6516 | 13.782 |
| 14.5527 | 14.1117 |
| 14.7587 | 14.282 |
| 15.3079 | 14.782 |
| 15.4183 | 14.782 |
| 16.1516 | 15.4602 |

## Material boundary

| X | Y |
|---|---|
| 12.3898 | 14.5677 |
| 12.3898 | 14.1077 |
| 12.3898 | 13.7738 |
| 12.3898 | 13.421 |
| 12.3898 | 13.0634 |
| 12.3898 | 12.7024 |
| 12.3898 | 12.3324 |
| 12.3898 | 11.9686 |
| 12.3898 | 11.615 |

## Material boundary

| X | Y |
|---|---|
| 19.3002 | 18.658 |
| 18.9771 | 18.6323 |
| 18.5115 | 18.465 |
| 18.072 | 18.1564 |
| 17.7947 | 17.9158 |
| 17.353 | 17.5736 |
| 17.1772 | 17.4206 |
| 16.8777 | 17.2123 |
| 16.4903 | 16.9162 |
| 15.9487 | 16.5364 |
| 15.8413 | 16.4736 |
| 15.6347 | 16.3379 |
| 15.3246 | 16.0441 |
| 14.8695 | 15.6074 |
| 14.3939 | 15.2638 |
| 13.978 | 15.0342 |
| 13.9455 | 15.0042 |
| 13.9417 | 14.933 |
| 13.9455 | 14.7851 |
| 13.9201 | 14.7088 |
| 13.4773 | 14.5969 |
| 13.2106 | 14.5677 |

## Material boundary

| X | Y |
|---|---|
| 13.7506 | 14.2103 |
| 13.6796 | 14.1946 |
| 13.6705 | 14.1486 |
| 13.6508 | 14.106 |
| 13.6218 | 14.0692 |
| 13.5849 | 14.0401 |
| 13.5423 | 14.0205 |
| 13.4963 | 14.0113 |
| 13.4494 | 14.0132 |
| 13.4043 | 14.0259 |
| 13.3633 | 14.0488 |
| 13.3289 | 14.0807 |
| 13.3028 | 14.1197 |
| 13.2106 | 14.1077 |
| 13.2563 | 14.0604 |
| 13.2825 | 14.0272 |
| 13.3136 | 13.9984 |
| 13.3488 | 13.9749 |
| 13.3873 | 13.9572 |
| 13.428 | 13.9457 |
| 13.4701 | 13.9407 |
| 13.5124 | 13.9424 |
| 13.5539 | 13.9506 |
| 13.5936 | 13.9653 |
| 13.6305 | 13.986 |
| 13.6638 | 14.0122 |
| 13.6925 | 14.0433 |
| 13.716 | 14.0785 |
| 13.7338 | 14.1169 |

| | |
|---|---|
| 13.7453 | 14.1577 |
| 13.7506 | 14.2103 |
| 14.3101 | 14.2103 |
| 16.1516 | 15.8516 |
| 19.3002 | 18.658 |
| 19.4375 | 18.6689 |
| 20.3199 | 18.6401 |
| 20.9532 | 18.6895 |
| 21.481 | 18.7027 |
| 21.8336 | 18.7489 |
| 22.2118 | 18.8926 |
| 22.7339 | 19.1429 |
| 23.0375 | 19.3719 |
| 23.3694 | 19.6432 |
| 23.7495 | 19.8305 |
| 24.1027 | 19.9749 |
| 24.5845 | 20.2585 |
| 24.9111 | 20.3816 |
| 25.3982 | 20.4619 |
| 35.3524 | 19.9295 |
| 35.8113 | 20.1918 |
| 36.6389 | 20.9336 |
| 37.1096 | 21.1759 |
| 37.7615 | 21.3931 |
| 39.0469 | 22.2497 |
| 40.7966 | 23.3561 |
| 41.8425 | 24.3331 |
| 43.4032 | 25.7118 |
| 44.4386 | 27.3893 |
| 45.2242 | 28.7099 |
| 45.7241 | 29.9948 |
| 46.6882 | 30.78 |
| 47.5451 | 31.4225 |
| 48.5806 | 31.9222 |
| 55.5684 | 33.9315 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 11.282 |
| 12.3898 | 11.282 |

## Material boundary

| X | Y |
|---|---|
| 12.3898 | 11.282 |
| 12.3898 | 11.615 |

## Material boundary

| X | Y |
|---|---|
| 0 | 10 |
| 2.26616 | 10.104 |
| 3.59516 | 10.184 |
| 4.35573 | 10.2561 |
| 5.24441 | 10.3841 |
| 5.98897 | 10.5282 |
| 6.50936 | 10.6882 |
| 7.48559 | 11.0373 |
| 7.96027 | 11.2383 |
| 8.36254 | 11.3429 |
| 8.96594 | 11.4474 |
| 9.72219 | 11.4876 |
| 10.5911 | 11.5118 |
| 11.6962 | 11.5432 |
| 12.2505 | 11.5734 |
| 12.3898 | 11.615 |

## Material boundary

| X | Y |
|---|---|
| 12.3898 | 14.5677 |
| 13.2106 | 14.5677 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 14.2587 |
| 16.1516 | 15.8516 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 11.782 |
| 13.6516 | 11.782 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 12.282 |
| 13.6516 | 12.282 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 12.782 |
| 13.6516 | 12.782 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 13.282 |
| 13.6516 | 13.282 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 13.7738 |
| 13.6516 | 13.782 |

## Structural interface

| X | Y |
|---|---|
| 16.1516 | 15.8516 |
| 16.1516 | 15.4602 |
| 16.1516 | 14.782 |
| 16.1516 | 14.282 |
| 16.1516 | 13.782 |
| 16.1516 | 13.282 |
| 16.1516 | 12.782 |
| 16.1516 | 12.751 |
| 16.1516 | 12.282 |
| 16.1516 | 11.782 |
| 16.1516 | 11.282 |
| 16.1516 | 8.54739 |
| 16.1516 | 6.07337 |
| 16.1516 | 1.85159 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 11.282 |
| 13.6516 | 11.282 |
| 14.1516 | 11.282 |
| 15.1516 | 11.282 |
| 16.1516 | 11.282 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 11.282 |
| 13.2106 | 11.615 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 14.1077 |
| 12.3898 | 14.1077 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 13.7738 |
| 12.3898 | 13.7738 |

## Joint boundary

| |
|---|

| X | Y |
|---|---|
| 13.2106 | 13.421 |
| 12.3898 | 13.421 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 13.0634 |
| 12.3898 | 13.0634 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 12.7024 |
| 12.3898 | 12.7024 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 12.3324 |
| 12.3898 | 12.3324 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 11.9686 |
| 12.3898 | 11.9686 |

## Joint boundary

| X | Y |
|---|---|
| 12.3898 | 11.615 |
| 13.2106 | 11.615 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 11.615 |
| 13.2106 | 11.782 |
| 13.2106 | 11.8986 |
| 13.2106 | 11.9686 |
| 13.2106 | 12.282 |
| 13.2106 | 12.3324 |
| 13.2106 | 12.7024 |
| 13.2106 | 12.782 |
| 13.2106 | 13.0634 |
| 13.2106 | 13.282 |
| 13.2106 | 13.421 |
| 13.2106 | 13.7738 |
| 13.2106 | 14.1077 |

## Joint boundary

| |
|---|

| X | Y |
|---|---|
| 13.2106 | 14.1077 |
| 13.2106 | 14.2587 |
| 13.2106 | 14.5677 |

## Piezometric line

| X | Y |
|---|---|
| 0 | 7.18572 |
| 16.1516 | 11.282 |
| 41.2871 | 18.3622 |
| 51.6729 | 24.4664 |
| 55.5684 | 27.5842 |

# Phase2 Analysis Information
# Project1

## Project Summary

File Name: ANASTILOTIKI PROTASI EQ=0.24 UP
Last saved with Phase2 version: 8.005
Project Title: Project1

## General Settings

Number of Stages: 8
Analysis Type: Plane Strain
Solver Type: Gaussian Elimination
Units: Metric, stress as kPa

## Analysis Options

Maximum Number of Iterations: 500
Tolerance: 0.01
Number of Load Steps: 10
Convergence Type: Absolute Energy
Tensile Failure: Reduces Shear Strength
Joint tension reduces joint stiffness by a factor of 0.01

## Groundwater Analysis

Method: Piezometric Lines
Pore Fluid Unit Weight: 9.81 kN/m3
Probability: None

## Field Stress

Field stress: constant
Sigma one: 10 kPa (compression positive)
Sigma three: 10 kPa (compression positive)
Sigma Z: 10 kPa (compression positive)
Angle from the horizontal to sigma 1: 0 degrees (counter-clockwise)

## Seismic Loading

Horizontal seismic load coefficient: -0.24 (positive to the right)
Vertical seismic load coefficient: 0.12 (positive up)
Seismic load applied in: Stage 8

## Mesh

Mesh type: graded
Element type: 3 noded triangles
Number of elements on Stage 1: 6448
Number of nodes on Stage 1: 3779
Number of elements on Stage 2: 6448
Number of nodes on Stage 2: 3779
Number of elements on Stage 3: 6448
Number of nodes on Stage 3: 3779
Number of elements on Stage 4: 6448
Number of nodes on Stage 4: 3779
Number of elements on Stage 5: 6640
Number of nodes on Stage 5: 3779
Number of elements on Stage 6: 6640
Number of nodes on Stage 6: 3779
Number of elements on Stage 7: 6640
Number of nodes on Stage 7: 3779
Number of elements on Stage 8: 6640
Number of nodes on Stage 8: 3779

## Mesh Quality

12 of 9706 Elements ( 0.1 % of elements) are poor quality elements
8 of 9706 Elements ( 0.1 % of elements) are poor quality elements because of the side length ratio
12 of 9706 Elements ( 0.1 % of elements) are poor quality elements because of the minimum interior angle
0 of 9706 Elements ( 0.0 % of elements) are poor quality elements because of the maximum interior angle
0 of 9706 Elements ( 0.0 % of elements) are poor quality elements because they are inverted
Note: Elements can be of poor quality for more than one reason

### Poor quality elements defined as:

Side length ratio (maximum / minimum) > 30.00
Minimum interior angle < 2.0 degrees
Maximum interior angle > 175.0 degrees

## Reset Displacements

Displacements reset after: Stage 6

## Excavation Areas

### Original Un-deformed Areas

External Boundary Area: 1885.519 m2
External Boundary Perimeter: 179.000 m

### Stage 1

External Boundary Area: 1885.519 m2 (0 m2 change from original area)
External Boundary Perimeter: 179.000 m (0 m change from original perimeter)

### Stage 2

Values not available until this stage is viewed in a window

### Stage 3

Values not available until this stage is viewed in a window

### Stage 4

Values not available until this stage is viewed in a window

### Stage 5

Values not available until this stage is viewed in a window

### Stage 6

Values not available until this stage is viewed in a window

### Stage 7

Values not available until this stage is viewed in a window

### Stage 8

Values not available until this stage is viewed in a window

## *Material Properties*

### Material: UNIT I

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 10000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 3 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 3 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 3 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Material: UNIT II

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Properties changed in Stage 1

Young's modulus: 40000 kPa (factor = 2)

## Material: UNIT III

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 21 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 30000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 7 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 33 degrees |
| Peak cohesion | 7 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 33 degrees |
| Residual Cohesion | 7 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT IV

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 22.2 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 175000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 60 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 34 degrees |
| Peak cohesion | 60 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 34 degrees |
| Residual Cohesion | 60 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT V STONE WALL

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 25 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 1.38234e+006 kPa |
| Poisson's ratio | 0.4 |
| Failure Criterion | Generalized Hoek-Brown |
| Material type | Plastic |
| Dilation Parameter | 0 |
| Compressive strength | 15000 kPa |
| mb parameter | 1.5091 |
| s parameter | 0.003866 |
| a parameter | 0.505734 |
| Residual mb parameter | 1.2623 |
| Residual s parameter | 0.002218 |
| Residual a parameter | 0.508086 |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: UNIT II UNDER WT

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19.5 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 20000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 5 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 28 degrees |
| Peak cohesion | 5 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 28 degrees |
| Residual Cohesion | 5 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: GABION

| | |
|---|---|
| Color | |
| Initial element loading | body force only |
| Unit weight | 18 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 100000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 20 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 32 degrees |
| Peak cohesion | 20 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 32 degrees |
| Residual Cohesion | 20 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

## Material: SW

| | |
|---|---|
| Color | |
| Initial element loading | field stress & body force |
| Unit weight | 19 kN/m3 |
| Elastic type | isotropic |
| Young's modulus | 40000 kPa |
| Poisson's ratio | 0.3 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 1 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 35 degrees |
| Peak cohesion | 1 kPa |
| Material type | Plastic |
| Dilation Angle | 0 degrees |
| Residual Friction Angle | 35 degrees |
| Residual Cohesion | 1 kPa |
| Piezo to use | 1 |
| Hu Type | Auto |

### Material: AIR

| | |
|---|---|
| Color | |
| Initial element loading | No initial element loading |
| Elastic type | isotropic |
| Young's modulus | 1 kPa |
| Poisson's ratio | 0.2 |
| Failure criterion | Mohr-Coulomb |
| Peak tensile strength | 0 kPa |
| Residual tensile strength | 0 kPa |
| Peak friction angle | 0.01 degrees |
| Peak cohesion | 0.01 kPa |
| Material type | Elastic |
| Piezo to use | 1 |
| Hu Type | Custom |
| Hu value | 1 |

## *Joint Properties*

### Joint: Joint SOIL

| | |
|---|---|
| Color | |
| Normal stiffness | 200000 kPa/m |
| Shear stiffness | 20000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 25 degrees |

### Joint: Joint UNIT V Intrf

| | |
|---|---|
| Color | |
| Normal stiffness | 1e+006 kPa/m |
| Shear stiffness | 100000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 0 kPa |
| Residual Cohesion | 0 kPa |
| Friction angle | 32 degrees |
| Residual Friction angle | 28 degrees |

### Joint: Joint 4 GABIONS

| | |
|---|---|
| Color | |
| Normal stiffness | 500000 kPa/m |
| Shear stiffness | 50000 kPa/m |
| Initial joint deformation | allowed |
| Pressure from Groundwater Analysis | Not Included |
| Additional Pressure Inside Joint | Not Included |
| Slip Criterion | Mohr-Coulomb |
| Tensile strength | 0 kPa (tension positive) |
| Residual Tensile strength | 0 kPa |
| Cohesion | 3 kPa |
| Residual Cohesion | 2 kPa |
| Friction angle | 30 degrees |
| Residual Friction angle | 28 degrees |

## *Liner Properties*

### Liner: PILE Φ120

| | |
|---|---|
| Color | |
| Liner Type | Reinforced Concrete |
| Equivalent Young's modulus | 2.63918e+007 kPa |
| Equivalent thickness | 0.582056 m |
| Poisson ratio | 0 |

Reinforcement Properties

| | |
|---|---|
| Type | Rebar(Europe): #20 (diameter=20mm) |
| Spacing | 0.147 m |
| Section Depth | 0.465 m |
| Area | 0.000628 m2 |
| Moment of inertia | 3.3963e-005 m4 |
| Young's modulus | 2e+008 kPa |
| Poisson ratio | 0.25 |
| Compressive strength | 350000 kPa |
| Tensile strength | 350000 kPa |

Concrete Properties

| | |
|---|---|
| Thickness | 0.565 m |
| Young's modulus | 2.5e+007 kPa |
| Poisson ratio | 0.15 |
| Compressive strength | 25000 kPa |
| Tensile strength | 2500 kPa |

## Structural Interface Properties

Structural Interface: PILE Φ120
Joint (positive side): Joint SOIL
Liner: PILE Φ120
Joint (negative side): Joint SOIL

## Displacements

Displacement data is not available for Stage 1 until total displacement is viewed in a window
Displacement data is not available for Stage 2 until total displacement is viewed in a window
Displacement data is not available for Stage 3 until total displacement is viewed in a window
Displacement data is not available for Stage 4 until total displacement is viewed in a window
Displacement data is not available for Stage 5 until total displacement is viewed in a window
Displacement data is not available for Stage 6 until total displacement is viewed in a window
Displacement data is not available for Stage 7 until total displacement is viewed in a window
Displacement data is not available for Stage 8 until total displacement is viewed in a window

## Yielded Elements

### Yielded Mesh Elements

Number of yielded mesh elements on Stage 1: 3521
Number of yielded mesh elements is not available for Stage 2 until the stage is viewed in a window
Number of yielded mesh elements is not available for Stage 3 until the stage is viewed in a window
Number of yielded mesh elements is not available for Stage 4 until the stage is viewed in a window
Number of yielded mesh elements is not available for Stage 5 until the stage is viewed in a window
Number of yielded mesh elements is not available for Stage 6 until the stage is viewed in a window
Number of yielded mesh elements is not available for Stage 7 until the stage is viewed in a window
Number of yielded mesh elements is not available for Stage 8 until the stage is viewed in a window

### Yielded Liner Elements

Number of yielded liner elements on Stage 1: 0
Number of yielded liner elements on Stage 2: 0
Number of yielded liner elements on Stage 3: 0
Number of yielded liner elements on Stage 4: 0
Number of yielded liner elements on Stage 5: 0
Number of yielded liner elements on Stage 6: 0
Number of yielded liner elements on Stage 7: 0
Number of yielded liner elements on Stage 8: 0

### Yielded Joint Elements

Number of yielded joint elements on Stage 1: 71
Number of yielded joint elements on Stage 2: 71
Number of yielded joint elements on Stage 3: 108

Number of yielded joint elements on Stage 4: 108
Number of yielded joint elements on Stage 5: 201
Number of yielded joint elements on Stage 6: 201
Number of yielded joint elements on Stage 7: 202
Number of yielded joint elements on Stage 8: 288

## *List of All Coordinates*

### External boundary

| X | Y |
|---|---|
| 55.5684 | -7.1e-015 |
| 55.5684 | 17.1049 |
| 55.5684 | 26.8204 |
| 55.5684 | 27.5842 |
| 55.5684 | 29.483 |
| 55.5684 | 33.9315 |
| 0 | 10 |
| 0 | 8.06994 |
| 0 | 7.18572 |
| 0 | 4.23588 |
| 0 | 1.55304 |
| 0 | 0 |

### Material boundary

| X | Y |
|---|---|
| 0 | 4.23588 |
| 15.2007 | 8.22223 |
| 16.1516 | 8.54739 |
| 31.8106 | 13.9022 |
| 41.2871 | 16.3922 |
| 51.8868 | 22.5935 |
| 55.5684 | 26.8204 |

### Material boundary

| X | Y |
|---|---|
| 55.5684 | 17.1049 |
| 16.1516 | 6.07337 |
| 0 | 1.55304 |

### Material boundary

| X | Y |
|---|---|
| 0 | 7.18572 |
| 16.1516 | 11.282 |
| 17.3506 | 11.6197 |
| 41.2871 | 18.3622 |
| 51.6729 | 24.4664 |
| 55.5684 | 27.5842 |

### Material boundary

| X | Y |
|---|---|
| 11.8787 | 11.5126 |
| 0 | 8.06994 |

## Material boundary

| X | Y |
|---|---|
| 55.5684 | 29.483 |
| 51.6729 | 24.4664 |

## Material boundary

| X | Y |
|---|---|
| 41.2871 | 18.3622 |
| 31.8106 | 17.2892 |
| 19.0359 | 13.5869 |
| 18.3846 | 13.3981 |
| 17.3506 | 13.0985 |
| 16.1516 | 12.751 |
| 15.1516 | 12.4611 |
| 14.5334 | 12.282 |
| 13.6516 | 12.0264 |
| 13.2106 | 11.8986 |

## Material boundary

| X | Y |
|---|---|
| 13.6516 | 13.782 |
| 14.5527 | 14.1117 |
| 14.7587 | 14.282 |
| 15.3079 | 14.782 |
| 15.4183 | 14.782 |
| 16.1516 | 15.4602 |

## Material boundary

| X | Y |
|---|---|
| 12.3898 | 14.5677 |
| 12.3898 | 14.1077 |
| 12.3898 | 13.7738 |
| 12.3898 | 13.421 |
| 12.3898 | 13.0634 |
| 12.3898 | 12.7024 |
| 12.3898 | 12.3324 |
| 12.3898 | 11.9686 |
| 12.3898 | 11.615 |

## Material boundary

| X | Y |
|---|---|
| 19.3002 | 18.658 |
| 18.9771 | 18.6323 |
| 18.5115 | 18.465 |
| 18.072 | 18.1564 |
| 17.7947 | 17.9158 |
| 17.353 | 17.5736 |
| 17.1772 | 17.4206 |
| 16.8777 | 17.2123 |
| 16.4903 | 16.9162 |
| 15.9487 | 16.5364 |
| 15.8413 | 16.4736 |
| 15.6347 | 16.3379 |
| 15.3246 | 16.0441 |
| 14.8695 | 15.6074 |
| 14.3939 | 15.2638 |
| 13.978 | 15.0342 |
| 13.9455 | 15.0042 |
| 13.9417 | 14.933 |
| 13.9455 | 14.7851 |
| 13.9201 | 14.7088 |
| 13.4773 | 14.5969 |
| 13.2106 | 14.5677 |

## Material boundary

| X | Y |
|---|---|
| 13.7506 | 14.2103 |
| 13.6796 | 14.1946 |
| 13.6705 | 14.1486 |
| 13.6508 | 14.106 |
| 13.6218 | 14.0692 |
| 13.5849 | 14.0401 |
| 13.5423 | 14.0205 |
| 13.4963 | 14.0113 |
| 13.4494 | 14.0132 |
| 13.4043 | 14.0259 |
| 13.3633 | 14.0488 |
| 13.3289 | 14.0807 |
| 13.3028 | 14.1197 |
| 13.2106 | 14.1077 |
| 13.2563 | 14.0604 |
| 13.2825 | 14.0272 |
| 13.3136 | 13.9984 |
| 13.3488 | 13.9749 |
| 13.3873 | 13.9572 |
| 13.428 | 13.9457 |
| 13.4701 | 13.9407 |
| 13.5124 | 13.9424 |
| 13.5539 | 13.9506 |
| 13.5936 | 13.9653 |
| 13.6305 | 13.986 |
| 13.6638 | 14.0122 |
| 13.6925 | 14.0433 |
| 13.716 | 14.0785 |
| 13.7338 | 14.1169 |

| | |
|---|---|
| 13.7453 | 14.1577 |
| 13.7506 | 14.2103 |
| 14.3101 | 14.2103 |
| 16.1516 | 15.8516 |
| 19.3002 | 18.658 |
| 19.4375 | 18.6689 |
| 20.3199 | 18.6401 |
| 20.9532 | 18.6895 |
| 21.481 | 18.7027 |
| 21.8336 | 18.7489 |
| 22.2118 | 18.8926 |
| 22.7339 | 19.1429 |
| 23.0375 | 19.3719 |
| 23.3694 | 19.6432 |
| 23.7495 | 19.8305 |
| 24.1027 | 19.9749 |
| 24.5845 | 20.2585 |
| 24.9111 | 20.3816 |
| 25.3982 | 20.4619 |
| 35.3524 | 19.9295 |
| 35.8113 | 20.1918 |
| 36.6389 | 20.9336 |
| 37.1096 | 21.1759 |
| 37.7615 | 21.3931 |
| 39.0469 | 22.2497 |
| 40.7966 | 23.3561 |
| 41.8425 | 24.3331 |
| 43.4032 | 25.7118 |
| 44.4386 | 27.3893 |
| 45.2242 | 28.7099 |
| 45.7241 | 29.9948 |
| 46.6882 | 30.78 |
| 47.5451 | 31.4225 |
| 48.5806 | 31.9222 |
| 55.5684 | 33.9315 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 11.282 |
| 12.3898 | 11.282 |

## Material boundary

| X | Y |
|---|---|
| 12.3898 | 11.282 |
| 12.3898 | 11.615 |

## Material boundary

| X | Y |
|---|---|
| 0 | 10 |
| 2.26616 | 10.104 |
| 3.59516 | 10.184 |
| 4.35573 | 10.2561 |
| 5.24441 | 10.3841 |
| 5.98897 | 10.5282 |
| 6.50936 | 10.6882 |
| 7.48559 | 11.0373 |
| 7.96027 | 11.2383 |
| 8.36254 | 11.3429 |
| 8.96594 | 11.4474 |
| 9.72219 | 11.4876 |
| 10.5911 | 11.5118 |
| 11.6962 | 11.5432 |
| 12.2505 | 11.5734 |
| 12.3898 | 11.615 |

## Material boundary

| X | Y |
|---|---|
| 12.3898 | 14.5677 |
| 13.2106 | 14.5677 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 14.2587 |
| 16.1516 | 15.8516 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 11.782 |
| 13.6516 | 11.782 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 12.282 |
| 13.6516 | 12.282 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 12.782 |
| 13.6516 | 12.782 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 13.282 |
| 13.6516 | 13.282 |

## Material boundary

| X | Y |
|---|---|
| 13.2106 | 13.7738 |
| 13.6516 | 13.782 |

## Structural interface

| X | Y |
|---|---|
| 16.1516 | 15.8516 |
| 16.1516 | 15.4602 |
| 16.1516 | 14.782 |
| 16.1516 | 14.282 |
| 16.1516 | 13.782 |
| 16.1516 | 13.282 |
| 16.1516 | 12.782 |
| 16.1516 | 12.751 |
| 16.1516 | 12.282 |
| 16.1516 | 11.782 |
| 16.1516 | 11.282 |
| 16.1516 | 8.54739 |
| 16.1516 | 6.07337 |
| 16.1516 | 1.85159 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 11.282 |
| 13.6516 | 11.282 |
| 14.1516 | 11.282 |
| 15.1516 | 11.282 |
| 16.1516 | 11.282 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 11.282 |
| 13.2106 | 11.615 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 14.1077 |
| 12.3898 | 14.1077 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 13.7738 |
| 12.3898 | 13.7738 |

## Joint boundary

| |
|---|

| X | Y |
|---|---|
| 13.2106 | 13.421 |
| 12.3898 | 13.421 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 13.0634 |
| 12.3898 | 13.0634 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 12.7024 |
| 12.3898 | 12.7024 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 12.3324 |
| 12.3898 | 12.3324 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 11.9686 |
| 12.3898 | 11.9686 |

## Joint boundary

| X | Y |
|---|---|
| 12.3898 | 11.615 |
| 13.2106 | 11.615 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 11.615 |
| 13.2106 | 11.782 |
| 13.2106 | 11.8986 |
| 13.2106 | 11.9686 |
| 13.2106 | 12.282 |
| 13.2106 | 12.3324 |
| 13.2106 | 12.7024 |
| 13.2106 | 12.782 |
| 13.2106 | 13.0634 |
| 13.2106 | 13.282 |
| 13.2106 | 13.421 |
| 13.2106 | 13.7738 |
| 13.2106 | 14.1077 |

## Joint boundary

| X | Y |
|---|---|
| 13.2106 | 14.1077 |
| 13.2106 | 14.2587 |
| 13.2106 | 14.5677 |

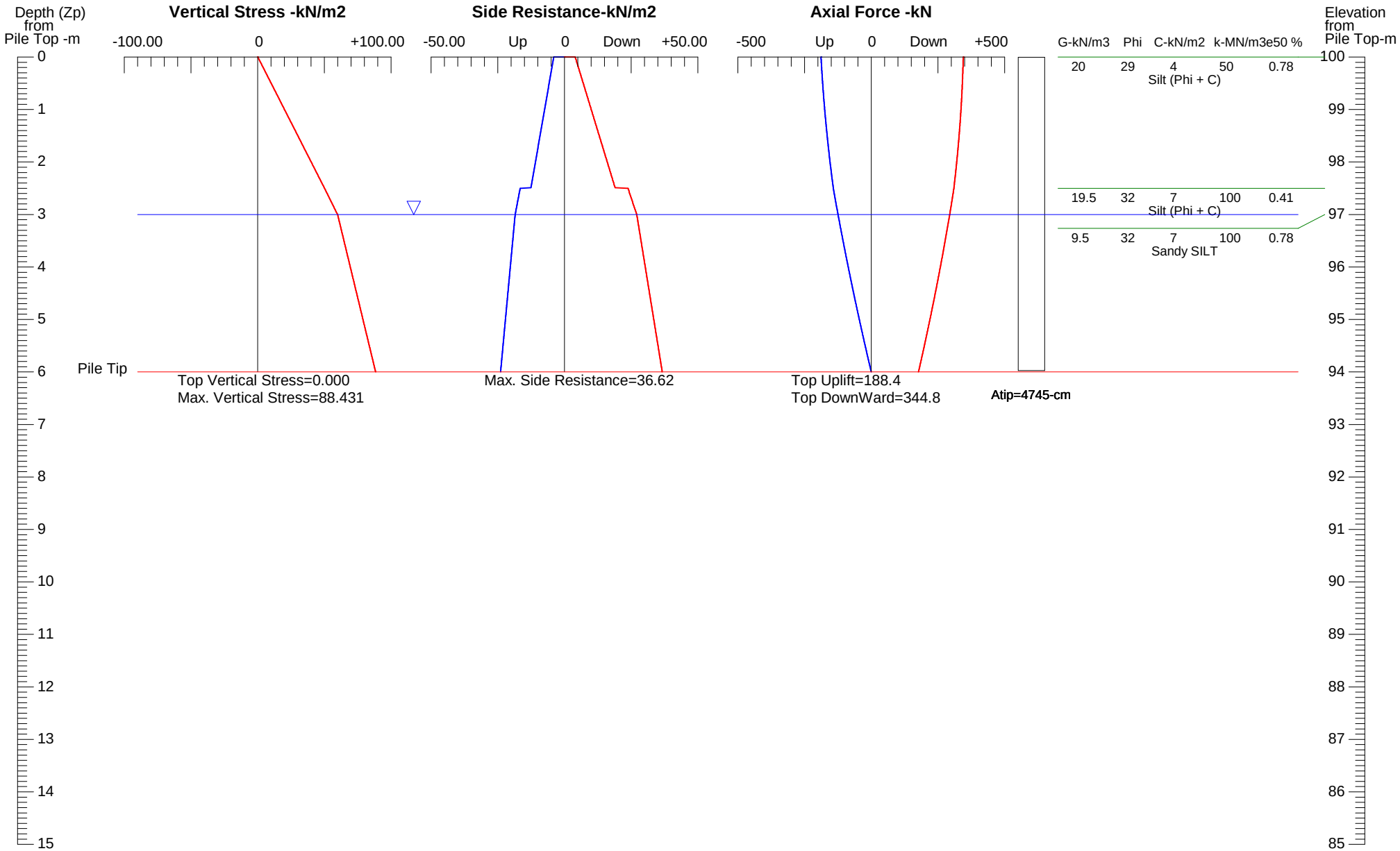
## Piezometric line

| X | Y |
|---|---|
| 0 | 7.18572 |
| 16.1516 | 11.282 |
| 41.2871 | 18.3622 |
| 51.6729 | 24.4664 |
| 55.5684 | 27.5842 |

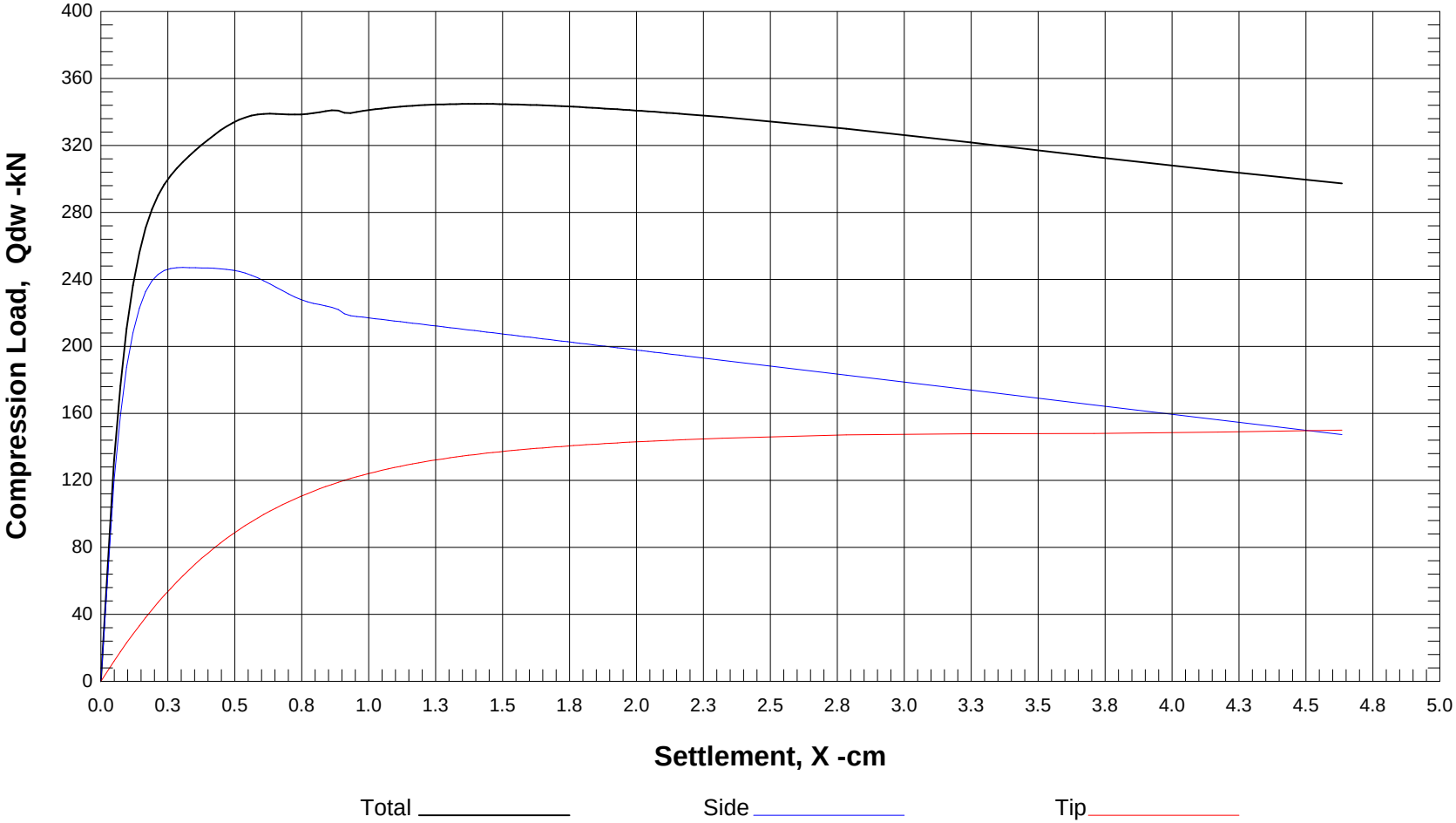
ΠΑΡΑΡΤΗΜΑ Γ: (ψηφιακά) ΔΕΔΟΜΕΝΑ – ΑΠΟΤΕΛΕΣΜΑΤΑ ΥΠΟΛΟΓΙΣΜΩΝ ΣΧΕΔΙΑΣΜΟΥ ΜΙΚΡΟΠΑΣΣΑΛΩΝ ΘΕΜΕΛΙΩΣΗΣ ‘Η/ΚΑΙ ΑΝΤΙΣΤΗΡΙΞΗΣ

# SOIL STRESS, SIDE RESISTANCE, & AXIAL FORCE vs DEPTH

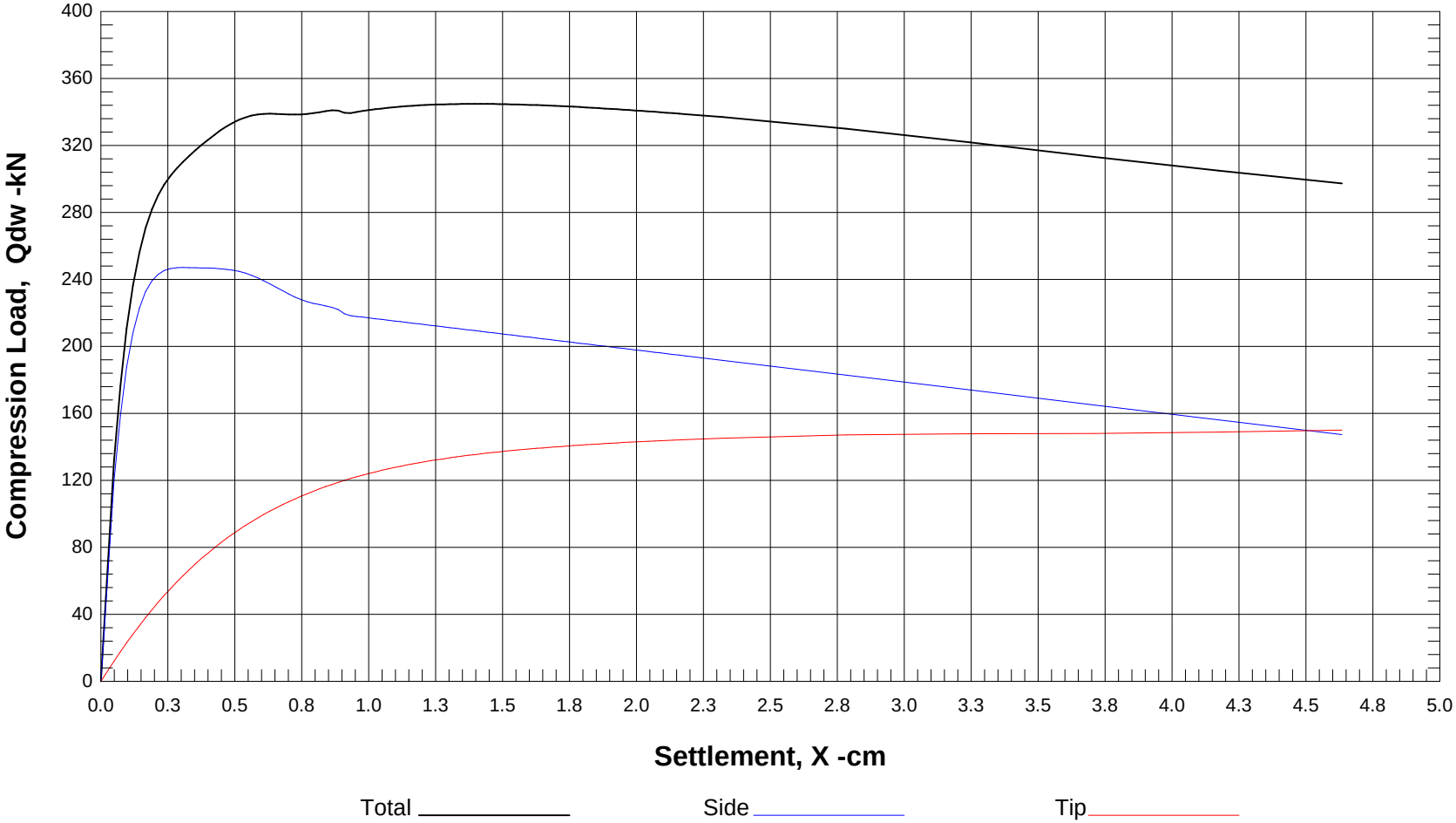
**Based on Ultimate Load Condition**



# Vertical Load vs. Settlement

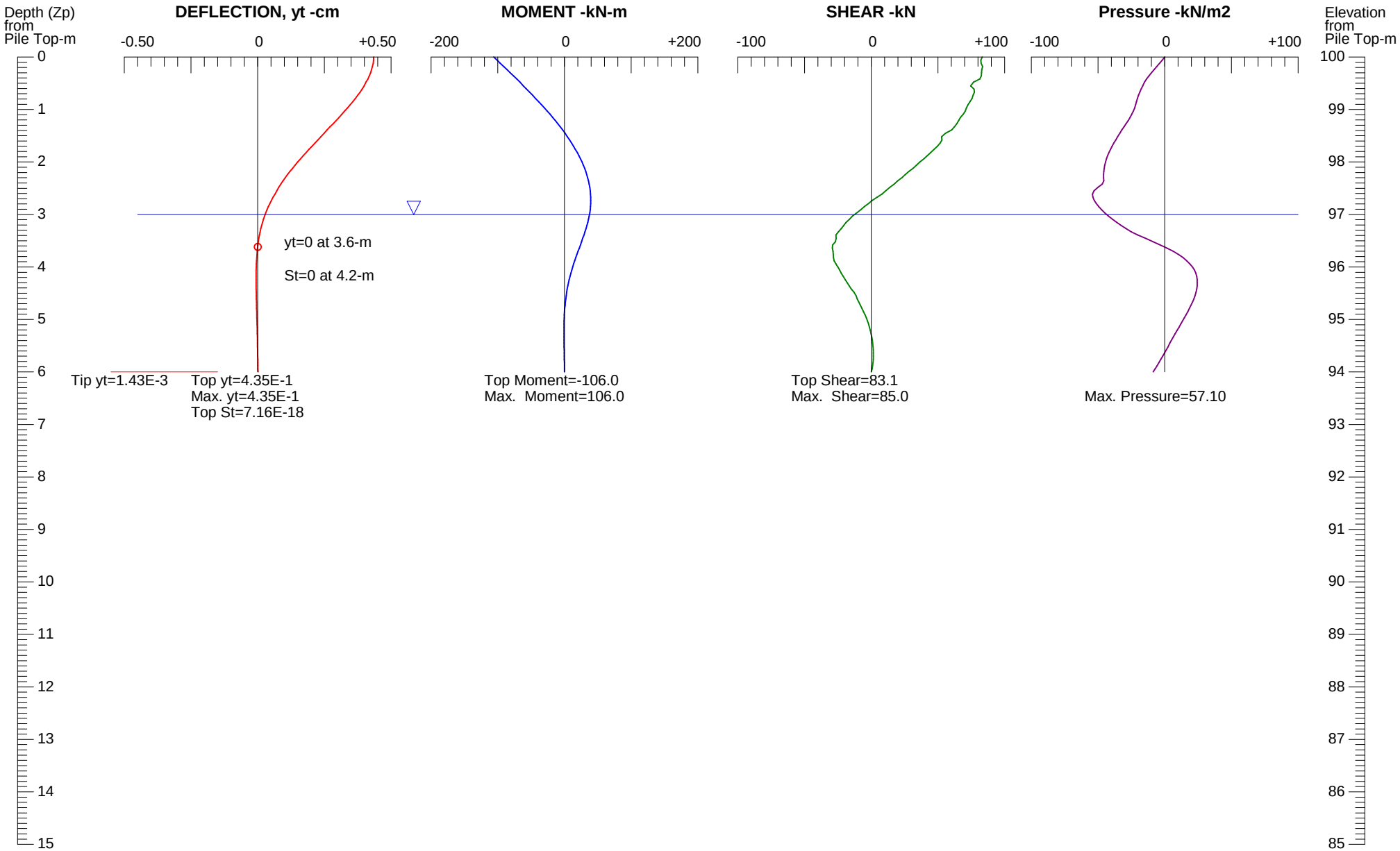


# Vertical Load vs. Settlement



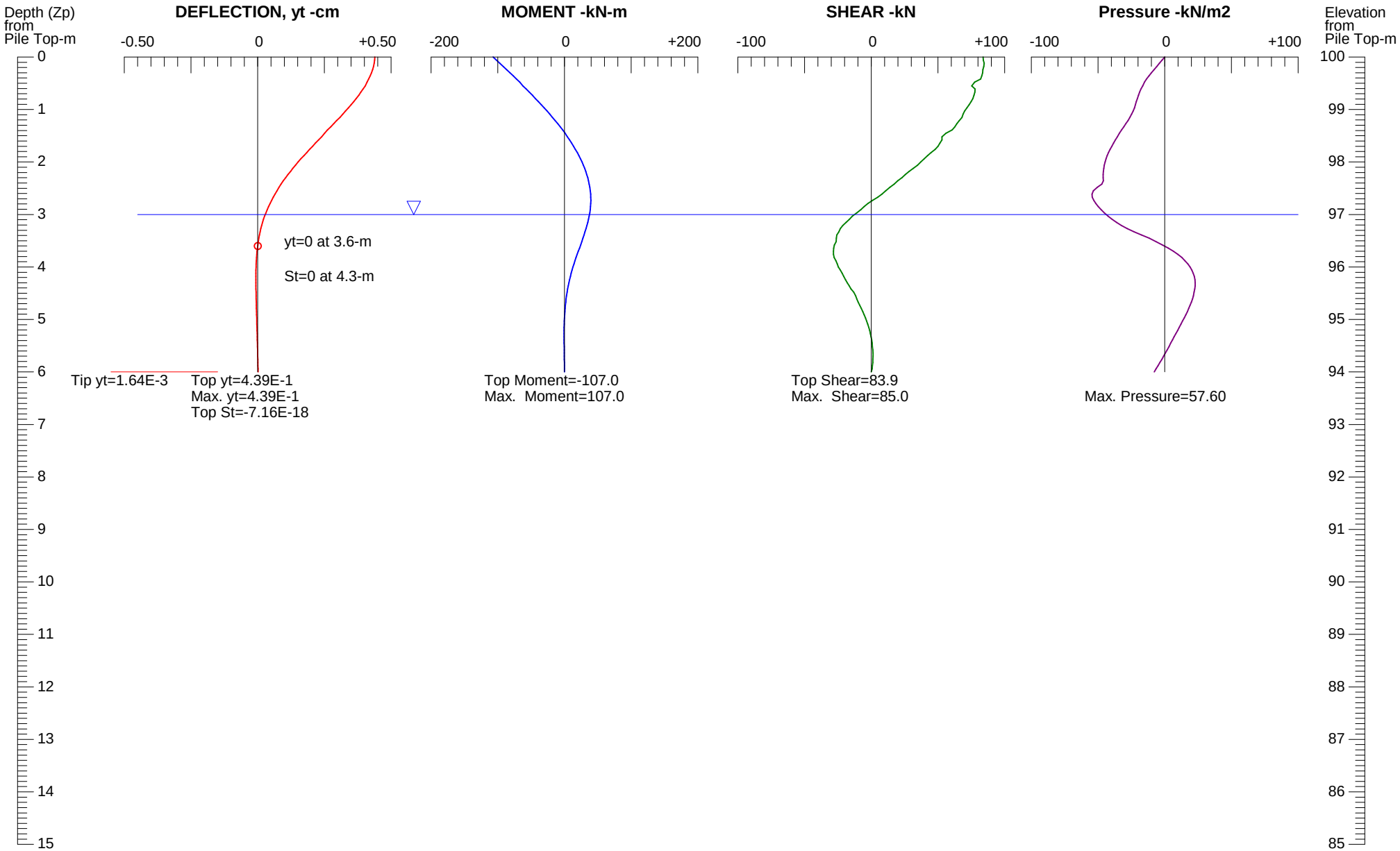
# PILE DEFLECTION & FORCE vs DEPTH

**X-Front, Single Pile, Kbc=2**



# PILE DEFLECTION & FORCE vs DEPTH

**X-Back, Single Pile, Kbc =2**



ΠΑΡΑΡΤΗΜΑ Δ: ψηφιακά) ΔΕΔΟΜΕΝΑ – ΑΠΟΤΕΛΕΣΜΑΤΑ ΥΠΟΛΟΓΙΣΜΩΝ ΣΧΕΔΙΑΣΜΟΥ ΠΡΟΤΕΙΧΙΣΜΑΤΩΝ ΑΝΤΙΣΤΗΡΙΞΗΣ ΜΕ ΣΥΡΜΑΤΟΚΙΒΩΤΙΑ

MACCAFERRI

# MacStARS W – Rel. 4.0

Maccaferri Stability Analysis of Reinforced Slopes and Walls

Officine Maccaferri S.p.A. - Via Kennedy 10 - 40069 Zola Predosa (Bologna)
Tel. 051.6436000 - Fax 051.236507

D. EGGLEZOS

Project Title.....:

Cross Section.....:

Site.....:

Folder.....:

File.....: S44 GABWALL ST-1

Date.....: 05/19/2021

TABLE OF CONTENTS

SOIL PROPERTIES.....2
STRATA PROFILES.....2
GABION WALL.....2
Wall : S44 GAB WALL.....2
SURCHARGE LOADS.....3
CHECKS RESULTS.....4
Wall Checks :.....4

## SOIL PROPERTIES

Soil: GW Description: BACKFILL

| | | |
|---|---|---|
| Cohesion | [kN/m²] | 0.00 |
| Friction Angle | [°] | 36.00 |
| Ru value | | 0.00 |
| Bulk unit weight - above GWT | [kN/m³] | 19.00 |
| Bulk unit weight - below GWT | [kN/m³] | 19.00 |
| Elastic Modulus | [kN/m²] | 0.00 |
| Poisson's ratio | | 0.30 |

Soil: UNIT 1 Description: NAT. SOIL, CL

| | | |
|---|---|---|
| Cohesion | [kN/m²] | 2.00 |
| Friction Angle | [°] | 28.00 |
| Ru value | | 0.00 |
| Bulk unit weight - above GWT | [kN/m³] | 19.00 |
| Bulk unit weight - below GWT | [kN/m³] | 20.00 |
| Elastic Modulus | [kN/m²] | 0.00 |
| Poisson's ratio | | 0.30 |

## STRATA PROFILES

Stratum: GW Description:
Soil : GW

| X [m] | Y [m] | X [m] | Y [m] | X [m] | Y [m] | X [m] | Y [m] |
|---|---|---|---|---|---|---|---|
| 15.91 | 5.84 | 15.91 | 8.31 | 20.62 | 10.60 | | |

Stratum: UNIT1 Description:
Soil : UNIT 1

| X [m] | Y [m] | X [m] | Y [m] | X [m] | Y [m] | X [m] | Y [m] |
|---|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.01 | 5.84 | 15.91 | 5.84 | 20.62 | 10.60 |
| 24.06 | 12.27 | | | | | | |

## GABION WALL

Wall : S44 GAB WALL
Wall origin [m] : Abscissa = 13.41 Ordinate = 5.84
Wall batter [°] = 0.00

Gabion filling soil : GW
Backfill soil : GW
Gabion covering soil : GW
Gabion foundation soil : UNIT 1

| Layer | Length [m] | Height [m] | Offset [m] | Pu [kN/m³] |
|---|---|---|---|---|
| 1 | 2.50 | 0.50 | 0.00 | 98.10 |
| 2 | 2.00 | 0.50 | 0.50 | 98.10 |
| 3 | 1.50 | 0.50 | 1.00 | 98.10 |
| 4 | 1.00 | 0.50 | 1.50 | 98.10 |
| 5 | 0.50 | 0.50 | 2.00 | 98.10 |

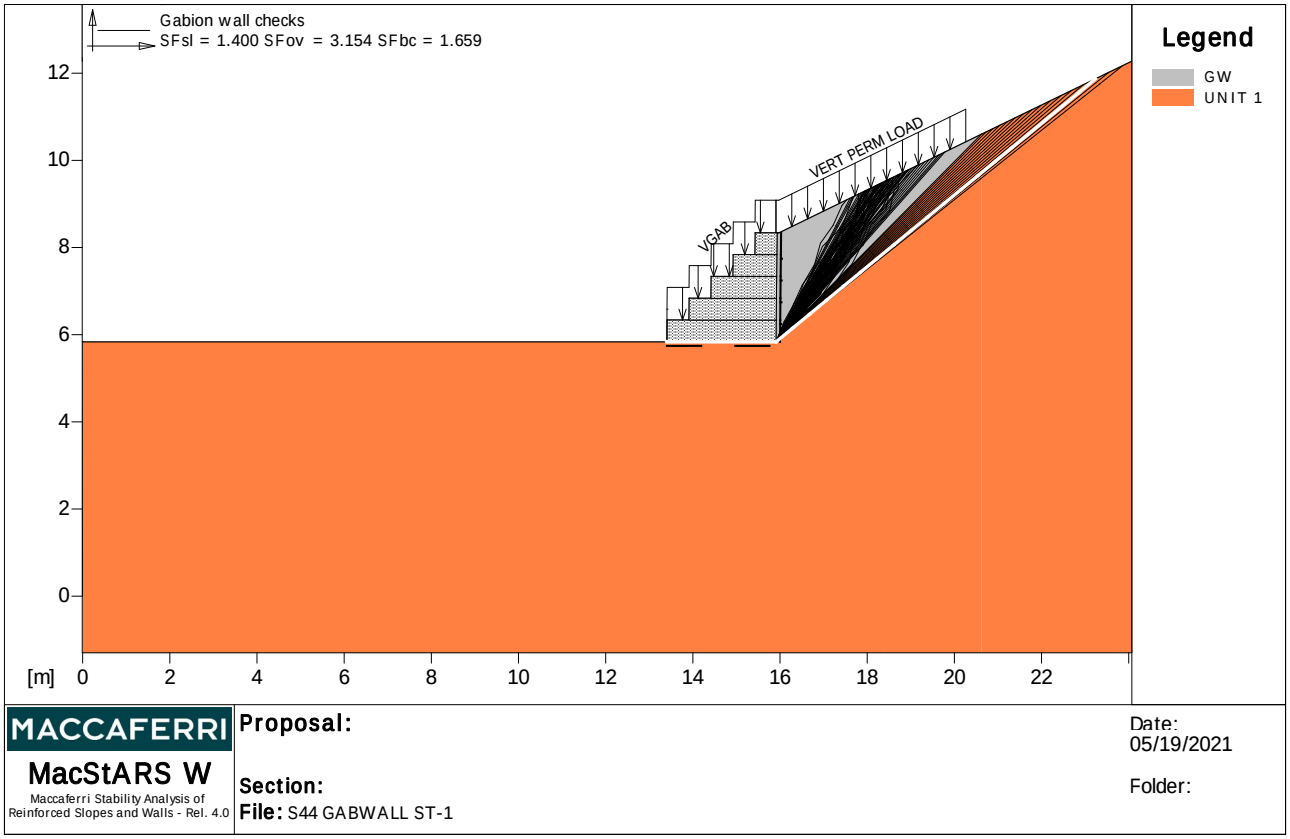
Gabions without diaphragms
Mesh type 10x12 Wire diameter 2,7 [mm]
Brinch Hansen, Vesic or Meyerhof bearing capacity parameters

Embedment depth [m] : 0.00
Natural soil slope [°] : 0.00

SURCHARGE LOADS

Distributed Loads : VERT PERM LOAD Description : DISTRIBUTED
Magnitude [kN/m²] = 30.00 Inclination angle [°] = 0.00
Abscissa [m] : from = 15.91 To = 20.26
Distributed Loads : VGAB Description :
Magnitude [kN/m²] = 15.00 Inclination angle [°] = 0.00
Abscissa [m] : from = 13.41 To = 15.91

CHECKS RESULTS




Wall Checks :

Considered block : S44 GAB WALL

| | | | |
|---|---|---|---|
| Resisting force | [kN/m] | : | 72.50 |
| Active force | [kN/m] | : | 51.79 |
| Sliding safety factor | | : | 1.400 |
| Restoring moment | [kN*m/m] | : | 307.43 |
| Overturning moment | [kN*m/m] | : | 97.47 |
| Overturning safety factor | | : | 3.154 |

Ultimate bearing pressure computed with Brinch Hansen

| | | | |
|---|---|---|---|
| Ultimate bearing pressure | [kN/m²] | : | 94.30 |
| Active pressure | [kN/m²] | : | 56.84 |
| Bearing capacity safety factor | | : | 1.659 |
| Equivalent bearing area | [m] | : | 2.50 |
| Eccentricity of normal force | [m] | : | 0.00 |
| Lever arm of overturning force | [m] | : | 1.88 |
| Normal force on the base | [kN] | : | 142.09 |
| Outer edge stress | [kN/m²] | : | 56.84 |
| Inner edge stress | [kN/m²] | : | 56.84 |

Officine Maccaferri assumes no responsibilities for the drawings and calculations submitted to the customer based on the data provided by him, nor it is responsible for the project and site visits that were subsequently realized without specific assignment.
This technical proposal is carried out on the basis of Officine Maccaferri products with the only purpose of drawing up the offer. Therefore Officine Maccaferri is not liable for the possible use of this proposal with products other than those of Officine Maccaferri, or at least not controlled by Officine Maccaferri itself.

MACCAFERRI

# MacStARS W – Rel. 4.0

Maccaferri Stability Analysis of Reinforced Slopes and Walls

Officine Maccaferri S.p.A. - Via Kennedy 10 - 40069 Zola Predosa (Bologna)
Tel. 051.6436000 - Fax 051.236507

D. EGGLEZOS

Project Title.....:

Cross Section.....:

Site.....:

Folder.....:

File.....: S44 GABWALL EQ-2

Date.....: 05/19/2021

TABLE OF CONTENTS

SOIL PROPERTIES.....2
STRATA PROFILES.....2
GABION WALL.....2
Wall : S44 GAB WALL.....2
SURCHARGE LOADS.....3
CHECKS RESULTS.....4
Wall Checks :.....4

## SOIL PROPERTIES

Soil: GAB GW Description:

| | | |
|---|---|---|
| Cohesion | [kN/m²] | 5.00 |
| Friction Angle | [°] | 36.00 |
| Ru value | | 0.00 |
| Bulk unit weight - above GWT | [kN/m³] | 17.00 |
| Bulk unit weight - below GWT | [kN/m³] | 17.00 |
| Elastic Modulus | [kN/m²] | 0.00 |
| Poisson's ratio | | 0.30 |

Soil: GW Description: BACKFILL

| | | |
|---|---|---|
| Cohesion | [kN/m²] | 0.00 |
| Friction Angle | [°] | 36.00 |
| Ru value | | 0.00 |
| Bulk unit weight - above GWT | [kN/m³] | 19.00 |
| Bulk unit weight - below GWT | [kN/m³] | 19.00 |
| Elastic Modulus | [kN/m²] | 0.00 |
| Poisson's ratio | | 0.30 |

Soil: UNIT 1 Description: NAT. SOIL, CL

| | | |
|---|---|---|
| Cohesion | [kN/m²] | 2.00 |
| Friction Angle | [°] | 28.00 |
| Ru value | | 0.00 |
| Bulk unit weight - above GWT | [kN/m³] | 19.00 |
| Bulk unit weight - below GWT | [kN/m³] | 20.00 |
| Elastic Modulus | [kN/m²] | 0.00 |
| Poisson's ratio | | 0.30 |

## STRATA PROFILES

Stratum: GW Description:
Soil : GW

| X [m] | Y [m] | X [m] | Y [m] | X [m] | Y [m] | X [m] | Y [m] |
|---|---|---|---|---|---|---|---|
| 15.91 | 5.84 | 15.91 | 8.31 | 20.62 | 10.60 | | |

Stratum: UNIT1 Description:
Soil : UNIT 1

| X [m] | Y [m] | X [m] | Y [m] | X [m] | Y [m] | X [m] | Y [m] |
|---|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.01 | 5.84 | 15.91 | 5.84 | 20.62 | 10.60 |
| 24.06 | 12.27 | | | | | | |

## GABION WALL

Wall : S44 GAB WALL
Wall origin [m]: Abscissa = 13.41 Ordinate = 5.84
Wall batter [°] = 0.00

Gabion filling soil: GAB GW
Backfill soil: GW
Gabion covering soil: GW
Gabion foundation soil: UNIT 1

| Layer | Length [m] | Height [m] | Offset [m] | Pu [kN/m³] |
|---|---|---|---|---|
| 1 | 2.50 | 0.50 | 0.00 | 98.10 |
| 2 | 2.00 | 0.50 | 0.50 | 98.10 |
| 3 | 1.50 | 0.50 | 1.00 | 98.10 |
| 4 | 1.00 | 0.50 | 1.50 | 98.10 |
| 5 | 0.50 | 0.50 | 2.00 | 98.10 |

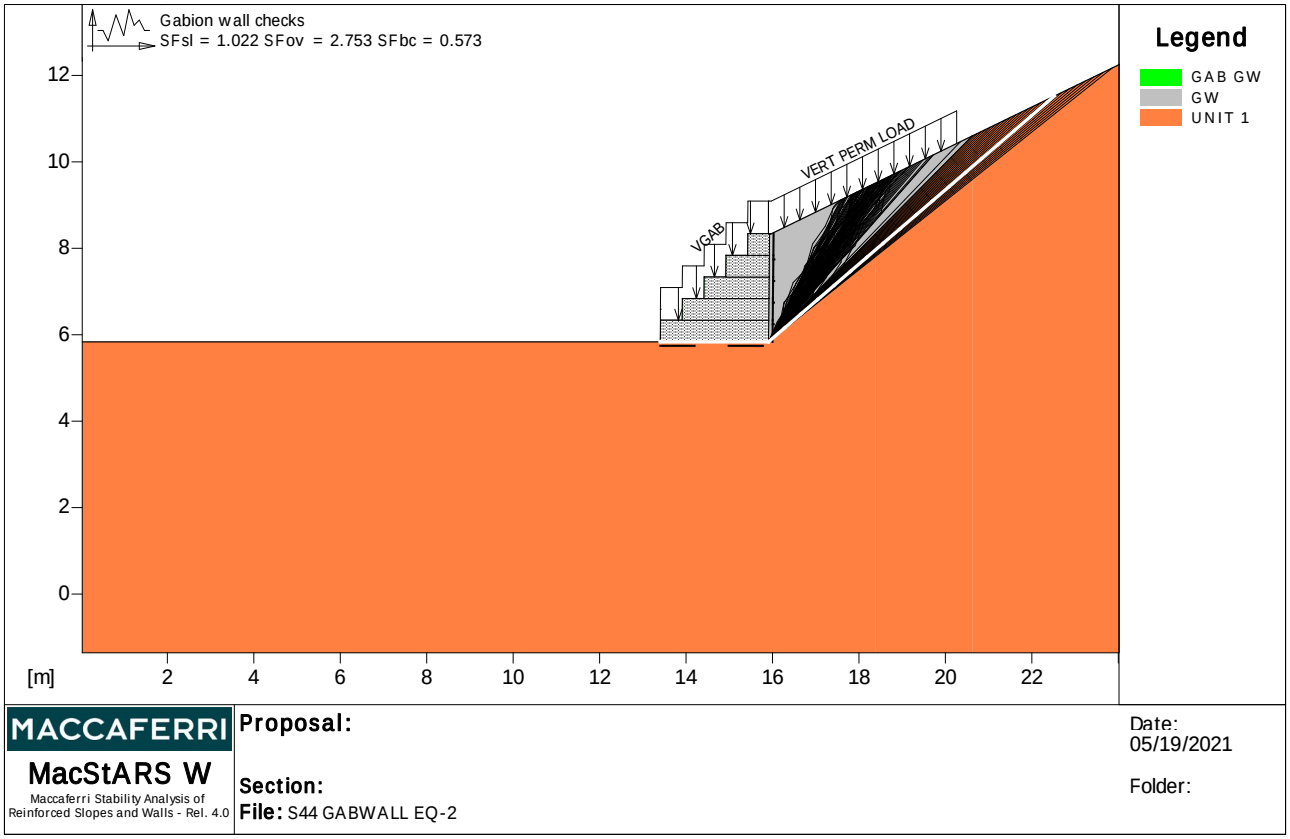
Gabions without diaphragms
Mesh type 10x12 Wire diameter 2,7 [mm]
Brinch Hansen, Vesic or Meyerhof bearing capacity parameters
Embedment depth [m] : 0.00
Natural soil slope [°] : 0.00

SURCHARGE LOADS

Distributed Loads : VERT PERM LOAD Description : DISTRIBUTED
Magnitude [kN/m²] = 30.00 Inclination angle [°] = 0.00
Abscissa [m] : from = 15.91 To = 20.26
Distributed Loads : VGAB Description :
Magnitude [kN/m²] = 15.00 Inclination angle [°] = 0.00
Abscissa [m] : from = 13.41 To = 15.91

Earthquake Load :
Acceleration [m/s²] : Horizontal = 1.96 Vertical = 0.98

CHECKS RESULTS




Wall Checks :

Considered block : S44 GAB WALL

| | | | |
|---|---|---|---|
| Resisting force | [kN/m] | : | 80.92 |
| Active force | [kN/m] | : | 79.18 |
| Sliding safety factor | | : | 1.022 |
| Restoring moment | [kN*m/m] | : | 333.50 |
| Overturning moment | [kN*m/m] | : | 121.16 |
| Overturning safety factor | | : | 2.753 |

Ultimate bearing pressure computed with Brinch Hansen

| | | | |
|---|---|---|---|
| Ultimate bearing pressure | [kN/m²] | : | 32.72 |
| Active pressure | [kN/m²] | : | 57.11 |
| Bearing capacity safety factor | | : | 0.573 |
| Equivalent bearing area | [m] | : | 2.50 |
| Eccentricity of normal force | [m] | : | 0.00 |
| Lever arm of overturning force | [m] | : | 1.53 |
| Normal force on the base | [kN] | : | 142.78 |
| Outer edge stress | [kN/m²] | : | 57.11 |
| Inner edge stress | [kN/m²] | : | 57.11 |

Officine Maccaferri assumes no responsibilities for the drawings and calculations submitted to the customer based on the data provided by him, nor it is responsible for the project and site visits that were subsequently realized without specific assignment.
This technical proposal is carried out on the basis of Officine Maccaferri products with the only purpose of drawing up the offer. Therefore Officine Maccaferri is not liable for the possible use of this proposal with products other than those of Officine Maccaferri, or at least not controlled by Officine Maccaferri itself.

ΠΑΡΑΡΤΗΜΑ Ε: ψηφιακά) ΠΡΟΜΕΤΡΗΣΗ ΤΩΝ ΕΡΓΑΣΙΩΝ ΧΩΜΑΤΟΥΡΓΙΚΗΣ ΑΠΟΚΑΤΑΣΤΑΣΗΣ – ΠΡΟΣΤΑΣΙΑΣ ΤΟΥ ΠΡΑΝΟΥΣ

ΠΡΟΜΕΤΡΗΣΕΙΣ ΕΡΓΑΣΙΩΝ ΧΩΜΑΤΟΥΡΓΙΚΗΣ ΑΠΟΚΑΤΑΣΤΑΣΗΣ – ΠΡΟΣΤΑΣΙΑΣ ΑΝΑΤΟΛΙΚΗΣ ΠΕΡΙΟΧΗΣ ΑΝΑΛΗΜΜΑΤΟΣ ΘΗΣΑΥΡΩΝ

| | | | ΠΟΣΟΤΗΤΕΣ ΣΤΗ ΔΙΑΤΟΜΗ | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ΔΙΑΤΟΜΕΣ | ΑΠΟΣΤΑΣΗ ΜΕΤΑΞΥ | | ΕΚΣΚΑΦΕΣ $m^2$ | Ε4 $m^2$ | ΣΥΡΜΑΤΟ-ΚΙΒΩΤΙΑ $m^2$ | ΘΡΑΥΣΤΟ $m^2$ | ΓΕΩΥΦΑΣΜΑ ΣΤΡΑΓΙΣΤΗΡΙΟΥ m | ΓΕΩΥΦΑΣΜΑ ΔΙΑΧΩΡΙΣΜΟΥ m | ΓΕΩΠΛΕΓΜΑ m |
| | | | | | | | | | |
| ***S39*** | | 3.2 | 11.45 | 4.73 | 7 | 0 | 8.67 | 24.25 | 27.28 |
| | 6.4 | | | | | | | | |
| ***S44*** | | 7.05 | 24.26 | 8.15 | 6.2 | 6 | 11.57 | 42.7 | 47.51 |
| | 7.7 | | | | | | | | |
| ***S48*** | | 6.45 | 13.84 | 5.56 | 4.24 | 2.46 | 10.8 | 30.2 | 30 |
| | 5.2 | | | | | | | | |
| ***S51*** | | 2.6 | 9.37 | 4.35 | 3.9 | 2.5 | 8.56 | 22.93 | 25.91 |
| | | | | | | | | | |
| ***S61*** | | 20 | 4.55 | | | | | | |
| | | | **412.303** | **119.7655** | **103.598** | **64.667** | **201.2285** | **633.043** | **683.1075** |
| | | | **ΟΓΚΟΣ $m^3$** | | | | **ΕΠΙΦΑΝΕΙΕΣ $m^2$** | | |

| | διαμετρος (mm) | αριθμός πασσάλων | μηκος (m) | αριθμός πασσάλων | μηκος (m) | συνολικο μηκος (m) | όγκος $m^3/m$ | συνολικός όγκος ($m^3$) |
|---|---|---|---|---|---|---|---|---|
| Μικροπάσσαλοι | 250 | 8 | 6 | 8 | 4 | 80 | 0.05 | 4 |
| | | | 6.5* | | 4.5* | 88 | | |

* για τον υπολογισμό οπλισμού του μικροπασσάλου

| | αριθμός | μήκος (m) | επιφάνεια διατομής ($m^2$) | **συνολικός όγκος ($m^3$)** |
|---|---|---|---|---|
| Κεφαλόδεσμοι | 2 | 6.3 | 0.25 | **3.15** |

| | | | |
|---|---|---|---|
| ΟΠΛΙΣΜΟΣ ΜΙΚΡΟΠΑΣΣΑΛΩΝ | **2966 kg** | 33,7 kg/m | |
| ΟΠΛΙΣΜΟΣ ΚΕΦΑΛΟΔΕΣΜΩΝ | **1260 Kg** | 100 kg/m | |

| | αριθμός | μήκος (m) | επιφάνεια διατομής ($m^2$) (0.50m x 0.80m) | **συνολικός όγκος ($m^3$)** |
|---|---|---|---|---|
| ΕΚΣΚΑΦΗ ΚΕΦΑΛΟΔΕΣΜΟΥ | 2 | 6.3 | 0.4 | **5.04** |
| ΕΠΙΧΩΣΗ ΣΚΑΜΜΑΤΟΣ ΚΕΦΑΛΟΔΕΣΜΟΥ | 2 | 6.3 | 0.15 | **1.89** |