

ALLEGATO 2

VERIFICA DI STABILITÀ PRE-OPERAM INTERFERENZA 02

SEZIONE A-A' - RELAZIONE DI CALCOLO

Analisi di stabilità dei pendii con BISHOP

| | |
|--------------------------------|------|
| Numero di strati | 4.0 |
| Numero dei conci | 50.0 |
| Coefficiente di sicurezza [R2] | 1.1 |

Superficie di forma circolare

Maglia dei Centri

| | |
|--|----------|
| Ascissa vertice sinistro inferiore xi | 226.73 m |
| Ordinata vertice sinistro inferiore yi | 313.68 m |
| Ascissa vertice destro superiore xs | 270.38 m |
| Ordinata vertice destro superiore ys | 347.41 m |
| Passo di ricerca | 10.0 |
| Numero di celle lungo x | 10.0 |
| Numero di celle lungo y | 10.0 |

Coefficienti sismici [N.T.C.] 2018

Dati generali

| | |
|----------------------|---------------------|
| Descrizione: | |
| Latitudine: | 41.57 |
| Longitudine: | 15.2 |
| Tipo di costruzione: | 2 - Opere ordinarie |
| Classe d'uso: | Classe IV |
| Vita nominale: | 50.0 [anni] |
| Vita di riferimento: | 100.0 [anni] |

Parametri sismici su sito di riferimento

| | |
|------------------------|----|
| Categoria sottosuolo: | C |
| Categoria topografica: | T1 |

| S.L. Stato limite | TR Tempo ritorno [anni] | ag [m/s ²] | F0 [-] | TC* [sec] |
|----------------------|-------------------------------|---------------------------|-----------|--------------|
| S.L.O. | 60.0 | 0.76 | 2.5 | 0.31 |
| S.L.D. | 101.0 | 0.97 | 2.52 | 0.33 |
| S.L.V. | 949.0 | 2.4 | 2.49 | 0.36 |
| S.L.C. | 1950.0 | 3.11 | 2.47 | 0.37 |

Coefficienti sismici orizzontali e verticali

Opera: Stabilità dei pendii

| S.L. Stato limite | amax [m/s ²] | beta [-] | kh [-] | kv [sec] |
|----------------------|-----------------------------|-------------|-----------|-------------|
| S.L.O. | 1.14 | 0.2 | 0.0233 | 0.0116 |
| S.L.D. | 1.455 | 0.2 | 0.0297 | 0.0148 |
| S.L.V. | 3.2024 | 0.28 | 0.0914 | 0.0457 |
| S.L.C. | 3.8252 | 0.28 | 0.1092 | 0.0546 |

| | |
|---|--------|
| Coefficiente azione sismica orizzontale | 0.0914 |
| Coefficiente azione sismica verticale | 0.0457 |

Vertici profilo

| N | X m | y m |
|---|--------|--------|
| 1 | 0.0 | 165.0 |
| 2 | 133.78 | 168.6 |
| 3 | 173.54 | 170.0 |
| 4 | 226.94 | 175.0 |
| 5 | 263.26 | 180.0 |
| 6 | 301.11 | 185.0 |
| 7 | 315.62 | 186.5 |
| 8 | 350.08 | 190.0 |
| 9 | 540.28 | 192.4 |

Vertici strato1

| N | X m | y m |
|---|--------|--------|
| 1 | 0.0 | 164.0 |
| 2 | 133.78 | 167.6 |
| 3 | 173.54 | 169.0 |
| 4 | 226.94 | 174.0 |
| 5 | 263.26 | 179.0 |
| 6 | 301.11 | 184.0 |
| 7 | 315.62 | 185.5 |
| 8 | 350.08 | 189.0 |
| 9 | 540.28 | 191.4 |

Vertici strato2

| N | X m | y m |
|---|--------|--------|
| 1 | 0.0 | 164.0 |
| 2 | 133.78 | 167.6 |
| 3 | 173.54 | 169.0 |
| 4 | 226.94 | 174.0 |
| 5 | 263.26 | 179.0 |
| 6 | 301.11 | 184.0 |
| 7 | 315.62 | 185.5 |
| 8 | 399.68 | 186.36 |
| 9 | 540.28 | 187.06 |

Vertici strato3

| N | X m | y m |
|----|--------|--------|
| 1 | 0.0 | 161.0 |
| 2 | 81.0 | 163.98 |
| 3 | 133.78 | 167.6 |
| 4 | 173.54 | 169.0 |
| 5 | 226.94 | 174.0 |
| 6 | 263.26 | 179.0 |
| 7 | 301.11 | 184.0 |
| 8 | 315.62 | 185.5 |
| 9 | 399.68 | 186.36 |
| 10 | 540.28 | 187.06 |

Stratigrafia

c: coesione; Fi: Angolo di attrito; G: Peso Specifico; Gs: Peso Specifico Saturo

| Strato | c (kg/cm ²) | Fi (°) | G (Kg/m ³) | Gs (Kg/m ³) | Litologia |
|--------|----------------------------|-----------|---------------------------|----------------------------|-----------|
| 1 | 0 | 20 | 1850 | 1930 | |
| 2 | 0.12 | 22.4 | 1700 | 1830 | |
| 3 | 0.1 | 23 | 1750 | 1850 | |
| 4 | 0.15 | 23.8 | 2100 | 2131 | |

Risultati analisi pendio [A2+M2+R2]

| | |
|----------------------------|----------|
| Fs minimo individuato | 1.93 |
| Ascissa centro superficie | 246.37 m |
| Ordinata centro superficie | 325.49 m |
| Raggio superficie | 162.67 m |

B: Larghezza del concio; Alfa: Angolo di inclinazione della base del concio; Li: Lunghezza della base del concio; Wi: Peso del concio ; Ui: Forze derivanti dalle pressioni neutre; Ni: forze agenti normalmente alla direzione di scivolamento; Ti: forze agenti parallelamente alla superficie di scivolamento; Fi: Angolo di attrito; c: coesione.

Analisi dei conc. Superficie...xc = 246.374 yc = 325.489 Rc = 162.673 Fs=1.9335

| Nr. | B m | Alfa (°) | Li m | Wi (Kg) | Kh•Wi (Kg) | Kv•Wi (Kg) | c (kg/cm ²) | Fi (°) | Ui (Kg) | N'i (Kg) | Ti (Kg) |
|-----|--------|-------------|---------|------------|---------------|---------------|----------------------------|-----------|------------|-------------|------------|
| 1 | 2.82 | -18.6 | 2.97 | 3200.54 | 292.53 | 146.26 | 0.0 | 16.2 | 0.0 | 3558.2 | 535.9 |
| 2 | 2.82 | -17.6 | 2.96 | 9941.1 | 908.62 | 454.31 | 0.12 | 19.4 | 0.0 | 11685.9 | 3967.0 |
| 3 | 2.82 | -16.5 | 2.94 | 16620.4 | 1519.11 | 759.55 | 0.12 | 19.4 | 0.0 | 18905.9 | 5274.4 |
| 4 | 2.82 | -15.5 | 2.92 | 22971.62 | 2099.61 | 1049.8 | 0.12 | 19.4 | 0.0 | 25643.4 | 6494.5 |
| 5 | 2.82 | -14.5 | 2.91 | 29000.13 | 2650.61 | 1325.31 | 0.12 | 19.4 | 0.0 | 31925.0 | 7632.2 |
| 6 | 2.82 | -13.5 | 2.9 | 34710.26 | 3172.52 | 1586.26 | 0.12 | 19.4 | 0.0 | 37772.3 | 8691.2 |
| 7 | 2.82 | -12.4 | 2.89 | 40106.76 | 3665.76 | 1832.88 | 0.12 | 19.4 | 0.0 | 43208.0 | 9675.9 |
| 8 | 2.82 | -11.4 | 2.87 | 45192.78 | 4130.62 | 2065.31 | 0.12 | 19.4 | 0.0 | 48249.2 | 10589.1 |
| 9 | 2.82 | -10.4 | 2.86 | 49972.42 | 4567.48 | 2283.74 | 0.12 | 19.4 | 0.0 | 52914.1 | 11434.4 |
| 10 | 2.82 | -9.4 | 2.86 | 54448.25 | 4976.57 | 2488.29 | 0.12 | 19.4 | 0.0 | 57216.8 | 12214.1 |
| 11 | 2.82 | -8.4 | 2.85 | 58623.76 | 5358.21 | 2679.11 | 0.12 | 19.4 | 0.0 | 61172.7 | 12931.2 |
| 12 | 2.95 | -7.4 | 2.97 | 65500.93 | 5986.79 | 2993.39 | 0.12 | 19.4 | 0.0 | 67894.0 | 14235.4 |
| 13 | 2.69 | -6.4 | 2.7 | 63414.66 | 5796.1 | 2898.05 | 0.12 | 19.4 | 0.0 | 65332.6 | 13600.3 |
| 14 | 2.82 | -5.4 | 2.83 | 70434.87 | 6437.75 | 3218.87 | 0.12 | 19.4 | 0.0 | 72163.9 | 14925.8 |
| 15 | 2.82 | -4.4 | 2.83 | 74162.5 | 6778.45 | 3389.23 | 0.12 | 19.4 | 0.0 | 75583.3 | 15547.1 |
| 16 | 2.82 | -3.4 | 2.82 | 77599.49 | 7092.59 | 3546.3 | 0.12 | 19.4 | 0.0 | 78701.1 | 16114.0 |
| 17 | 2.82 | -2.4 | 2.82 | 80745.12 | 7380.1 | 3690.05 | 0.12 | 19.4 | 0.0 | 81521.9 | 16627.2 |
| 18 | 2.82 | -1.4 | 2.82 | 83602.33 | 7641.25 | 3820.63 | 0.12 | 19.4 | 0.0 | 84056.3 | 17088.7 |
| 19 | 2.82 | -0.4 | 2.82 | 86169.56 | 7875.9 | 3937.95 | 0.12 | 19.4 | 0.0 | 86306.5 | 17498.9 |
| 20 | 2.82 | 0.6 | 2.82 | 88448.89 | 8084.23 | 4042.11 | 0.12 | 19.4 | 0.0 | 88281.1 | 17859.3 |
| 21 | 2.82 | 1.5 | 2.82 | 90438.64 | 8266.09 | 4133.05 | 0.12 | 19.4 | 0.0 | 89981.7 | 18170.1 |
| 22 | 2.82 | 2.5 | 2.82 | 92139.91 | 8421.59 | 4210.79 | 0.12 | 19.4 | 0.0 | 91413.4 | 18432.5 |
| 23 | 2.82 | 3.5 | 2.82 | 93550.73 | 8550.54 | 4275.27 | 0.12 | 19.4 | 0.0 | 92577.9 | 18646.6 |
| 24 | 2.82 | 4.5 | 2.83 | 94672.3 | 8653.05 | 4326.52 | 0.12 | 19.4 | 0.0 | 93479.2 | 18813.3 |
| 25 | 2.64 | 5.5 | 2.65 | 89478.75 | 8178.36 | 4089.18 | 0.12 | 19.4 | 0.0 | 88185.9 | 17739.5 |
| 26 | 2.99 | 6.5 | 3.01 | 102009.1 | 9323.63 | 4661.82 | 0.12 | 19.4 | 0.0 | 100370.8 | 20187.3 |
| 27 | 2.82 | 7.5 | 2.84 | 96134.32 | 8786.68 | 4393.34 | 0.12 | 19.4 | 0.0 | 94459.8 | 19001.9 |
| 28 | 2.82 | 8.5 | 2.85 | 95988.38 | 8773.34 | 4386.67 | 0.12 | 19.4 | 0.0 | 94218.7 | 18962.3 |
| 29 | 2.82 | 9.5 | 2.86 | 95542.91 | 8732.62 | 4366.31 | 0.12 | 19.4 | 0.0 | 93711.4 | 18874.6 |
| 30 | 2.82 | 10.5 | 2.87 | 94796.26 | 8664.38 | 4332.19 | 0.12 | 19.4 | 0.0 | 92936.7 | 18738.8 |
| 31 | 2.82 | 11.5 | 2.88 | 93744.97 | 8568.29 | 4284.15 | 0.12 | 19.4 | 0.0 | 91890.8 | 18554.0 |

| | | | | | | | | | | |
|----|------|------|------|----------|----------------|------|------|-----|----------|---------|
| 32 | 2.82 | 12.6 | 2.89 | 92388.28 | 8444.294222.15 | 0.12 | 19.4 | 0.0 | 90571.9 | 18320.1 |
| 33 | 2.82 | 13.6 | 2.9 | 90720.18 | 8291.824145.91 | 0.12 | 19.4 | 0.0 | 88972.7 | 18035.7 |
| 34 | 2.82 | 14.6 | 2.91 | 88737.8 | 8110.644055.32 | 0.12 | 19.4 | 0.0 | 87088.7 | 17700.0 |
| 35 | 2.82 | 15.6 | 2.93 | 86436.54 | 7900.33950.15 | 0.12 | 19.4 | 0.0 | 84912.5 | 17311.6 |
| 36 | 2.82 | 16.7 | 2.94 | 83810.98 | 7660.323830.16 | 0.12 | 19.4 | 0.0 | 82435.6 | 16869.1 |
| 37 | 2.82 | 17.7 | 2.96 | 80859.12 | 7390.523695.26 | 0.12 | 19.4 | 0.0 | 79652.9 | 16371.5 |
| 38 | 3.86 | 18.9 | 4.08 | 105446.0 | 9637.774818.88 | 0.12 | 19.4 | 0.0 | 104094.3 | 21530.5 |
| 39 | 1.77 | 20.0 | 1.89 | 45988.06 | 4203.312101.65 | 0.12 | 19.4 | 0.0 | 45490.9 | 9472.6 |
| 40 | 2.82 | 20.9 | 3.02 | 69429.98 | 6345.93172.95 | 0.12 | 19.4 | 0.0 | 68802.1 | 14427.1 |
| 41 | 2.82 | 21.9 | 3.04 | 64624.25 | 5906.662953.33 | 0.12 | 19.4 | 0.0 | 64188.8 | 13598.9 |
| 42 | 2.82 | 23.0 | 3.06 | 59456.36 | 5434.312717.16 | 0.12 | 19.4 | 0.0 | 59198.6 | 12702.9 |
| 43 | 2.82 | 24.1 | 3.09 | 53917.94 | 4928.12464.05 | 0.12 | 19.4 | 0.0 | 53812.7 | 11735.7 |
| 44 | 1.46 | 24.9 | 1.62 | 25711.92 | 2350.071175.04 | 0.12 | 19.4 | 0.0 | 25705.1 | 5693.3 |
| 45 | 4.17 | 26.0 | 4.64 | 63652.32 | 5817.822908.91 | 0.12 | 19.4 | 0.0 | 63744.2 | 14512.7 |
| 46 | 2.82 | 27.4 | 3.17 | 34349.71 | 3139.561569.78 | 0.12 | 19.4 | 0.0 | 34411.7 | 8249.2 |
| 47 | 2.82 | 28.5 | 3.21 | 26908.77 | 2459.461229.73 | 0.12 | 19.4 | 0.0 | 26877.1 | 6894.8 |
| 48 | 2.82 | 29.6 | 3.24 | 19041.71 | 1740.41 870.21 | 0.12 | 19.4 | 0.0 | 18810.8 | 5444.9 |
| 49 | 2.82 | 30.8 | 3.28 | 10852.83 | 991.95 495.97 | 0.1 | 18.2 | 0.0 | 10587.4 | 3434.1 |
| 50 | 2.82 | 32.0 | 3.32 | 3887.26 | 355.3 177.65 | 0.0 | 16.2 | 0.0 | 4188.1 | 630.7 |

