

COMMITTENTE:



ALTA SORVEGLIANZA:



GENERAL CONTRACTOR:



**INFRASTRUTTURE FERROVIARIE STRATEGICHE DEFINITE DALLA LEGGE OBIETTIVO N. 443/01**

**LINEA A.V. /A.C. TORINO – VENEZIA      Tratta MILANO – VERONA**  
**Lotto funzionale Treviglio-Brescia**  
**PROGETTO DEFINITIVO**

**PROGETTO DI COLTIVAZIONE**  
**CAVA BG3 COVO**  
**VERIFICA STABILITA' SCARPATE**

ALTA SORVEGLIANZA

SCALA:

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COMMESSA    LOTTO    FASE    ENTE    TIPO DOC.    OPERA/DISCIPLINA    PROGR.    REV.

A 2 0 2    1 1    D    E 2    C L    S A 0 0 0 0    0 0 1    A

PROGETTAZIONE GENERAL CONTRACTOR							Autorizzato/Data
Rev.	Descrizione	Redatto	Data	Verificato	Data	Approvato	Data
A	EMISSIONE PER A.I.	POLIDORO	15/2/2013	CALEFFI	15/2/2013	LIANI	15/2/2013

Consorzio  
Cepav due  
Project Manager  
*[Signature]*  
Data: 15/2/2013

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Progetto cofinanziato  
dalla Unione Europea

CUP: J41C07000000001

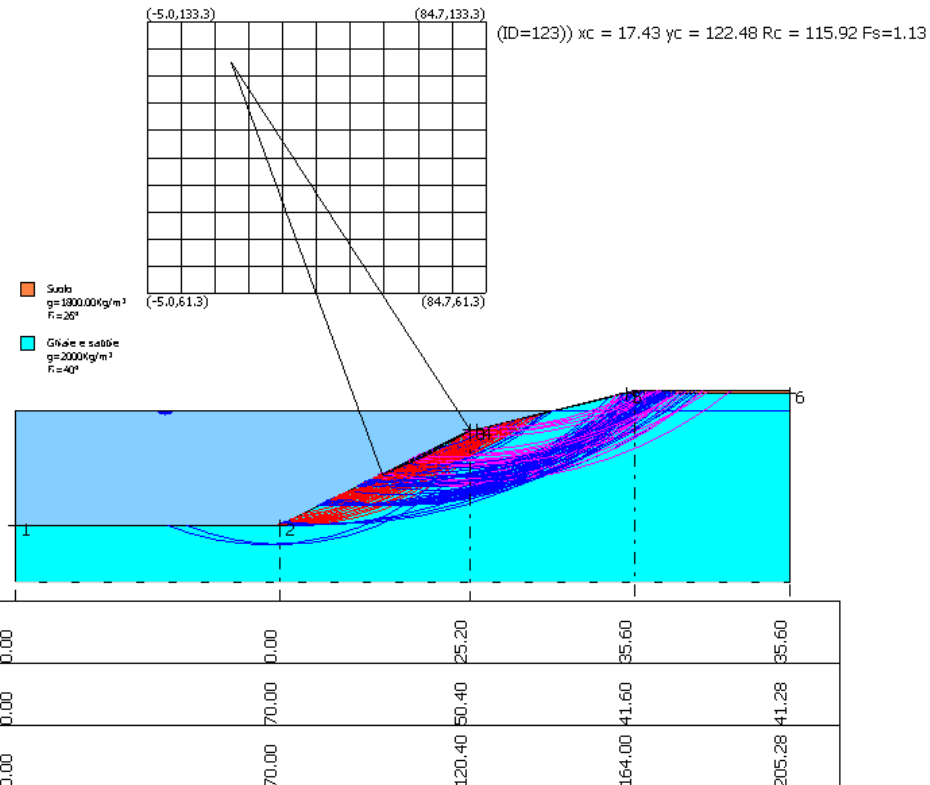


## Sommario

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## 1. VERIFICA STABILITÀ SCARPATE DI SCAVO



Analisi di stabilità dei pendii con: SARMA (1973)

Lat./Long. 45.4999/9.80896  
 Normativa NTC 2008  
 Numero di strati 2.0  
 Numero dei conchi 50.0  
 Grado di sicurezza ritenuto accettabile 1.1  
 Coefficiente parziale resistenza 1.1  
 Analisi Condizione drenata  
 Superficie di forma circolare

### Maglia dei Centri

Ascissa vertice sinistro inferiore xi -5.01 m  
 Ordinata vertice sinistro inferiore yi 61.27 m  
 Ascissa vertice destro superiore xs 84.73 m  
 Ordinata vertice destro superiore ys 133.29 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.]

### Dati generali

Tipo opera: 2 - Opere ordinarie  
 Classe d'uso: Classe II  
 Vita nominale: 50.0 [anni]  
 Vita di riferimento: 50.0 [anni]

### Parametri sismici su sito di riferimento

Categoria sottosuolo: B  
 Categoria topografica: T1

S.L. Stato limite	TR Tempo ritorno [anni]	ag [m/s <sup>2</sup> ]	F0 [-]	TC* [sec]
S.L.O.	30.0	0.35	2.43	0.21
S.L.D.	50.0	0.46	2.4	0.23
S.L.V.	475.0	1.27	2.44	0.27
S.L.C.	975.0	1.65	2.48	0.28

### Coefficienti sismici orizzontali e verticali

Opera: Stabilità dei pendii e Fondazioni

S.L. Stato limite	amax [m/s <sup>2</sup> ]	beta [-]	kh [-]	kv [sec]
S.L.O.	0.42	0.2	0.0086	0.0043
S.L.D.	0.552	0.2	0.0113	0.0056
S.L.V.	1.524	0.24	0.0373	0.0186
S.L.C.	1.98	0.24	0.0485	0.0242

Coefficiente azione sismica orizzontale 0.0373  
 Coefficiente azione sismica verticale 0.0186

### Vertici profilo

N	X m	y m
1	-40.0	0.0
2	30.0	0.0
3	80.4	25.2
4	82.4	25.2
5	124.0	35.6
6	165.28	35.6

### Falda

Nr.	X (m)	y (m)
1	-40.0	30.2
2	0.0	30.2
3	165.28	30.2

Vertici strato .....1



N	X (m)	y (m)
1	-40.0	0.0
2	30.0	0.0
3	80.4	25.2
4	82.4	25.2
5	122.0	35.1
6	165.28	35.1

### Coefficienti parziali per i parametri geotecnici del terreno

Tangente angolo di resistenza al taglio 1.25

Coesione efficace 1.25

Coesione non drenata 1.4

Riduzione parametri geotecnici terreno Si

### Stratigrafia

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

Strato	c (kg/cm <sup>2</sup> )	cu (kg/cm <sup>2</sup> )	Fi (°)	G (Kg/m <sup>3</sup> )	Gs (Kg/m <sup>3</sup> )	Litologia	
1	0		26	1800.00	1900	Suolo	
2			40	2000	2100	Ghiaie e sabbie	

### Risultati analisi pendio [NTC 2008: [A2+M2+R2]]

Fs minimo individuato 1.13

Ascissa centro superficie 17.43 m

Ordinata centro superficie 122.48 m

Raggio superficie 115.92 m

(ID=123) xc = 17.425 yc = 122.483 Rc = 115.919 Fs=1.127

Nr.	B m	Alfa (°)	Li m	Wi (Kg)
1	0.47	20.19	0.5	15.87
2	0.47	20.44	0.5	46.73
3	0.47	20.69	0.5	76.43
4	0.47	20.93	0.5	104.97
5	0.47	21.18	0.5	132.34
6	0.47	21.42	0.5	158.52
7	0.47	21.67	0.5	183.53
8	0.47	21.92	0.5	207.35
9	0.47	22.17	0.5	229.98
10	0.47	22.41	0.5	251.4
11	0.47	22.66	0.5	271.61
12	0.47	22.91	0.5	290.61
13	0.47	23.16	0.51	308.39
14	0.47	23.41	0.51	324.94
15	0.47	23.66	0.51	340.26
16	0.47	23.92	0.51	354.33



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17	0.47	24.17	0.51	367.16
18	0.47	24.42	0.51	378.73
19	0.47	24.67	0.51	389.03
20	0.47	24.92	0.51	398.07
21	0.47	25.18	0.51	405.81
22	0.47	25.43	0.51	412.29
23	0.47	25.69	0.52	417.46
24	0.47	25.94	0.52	421.33
25	0.47	26.2	0.52	423.88
26	0.47	26.46	0.52	425.11
27	0.47	26.71	0.52	425.02
28	0.47	26.97	0.52	423.59
29	0.47	27.23	0.52	420.81
30	0.47	27.49	0.52	416.66
31	0.47	27.75	0.53	411.16
32	0.47	28.01	0.53	404.28
33	0.47	28.27	0.53	396.01
34	0.47	28.53	0.53	386.35
35	0.47	28.79	0.53	375.27
36	0.47	29.05	0.53	362.79
37	0.47	29.32	0.53	348.87
38	0.47	29.58	0.53	333.51
39	0.47	29.84	0.54	316.7
40	0.47	30.11	0.54	298.43
41	0.47	30.38	0.54	278.69
42	0.47	30.64	0.54	257.46
43	0.47	30.91	0.54	234.73
44	0.47	31.18	0.54	210.49
45	0.47	31.45	0.55	184.73
46	0.47	31.72	0.55	157.43
47	0.47	31.99	0.55	128.58
48	0.47	32.26	0.55	98.17
49	0.47	32.53	0.55	66.17
50	0.47	32.8	0.55	32.59

**Sforzi sui concii**

Nr.	Xi (Kg)	Ei (Kg)	Xi-1 (Kg)	Ei-1 (Kg)	N'i (Kg)	Ti (Kg)	Ui (Kg)
1	-0.3	1.78	0.0	0.0	14.36	7.77	16510.29
2	-2.55	7.0	-0.3	1.78	43.5	23.55	16338.13
3	-6.76	15.26	-2.55	7.0	71.57	38.74	16163.69
4	-12.62	26.14	-6.76	15.26	98.31	53.22	15986.98
5	-19.87	39.22	-12.62	26.14	123.74	66.99	15807.97
6	-28.25	54.12	-19.87	39.22	147.88	80.05	15626.67
7	-37.5	70.48	-28.25	54.12	170.73	92.42	15443.06
8	-47.41	87.94	-37.5	70.48	192.3	104.1	15257.12
9	-57.76	106.18	-47.41	87.94	212.62	115.1	15068.84
10	-68.37	124.9	-57.76	106.18	231.68	125.42	14878.21
11	-79.04	143.8	-68.37	124.9	249.5	135.07	14685.22
12	-89.62	162.6	-79.04	143.8	266.1	144.05	14489.87
13	-99.95	181.08	-89.62	162.6	281.48	152.38	14292.12
14	-109.9	198.98	-99.95	181.08	295.64	160.04	14091.97
15	-119.35	216.1	-109.9	198.98	308.61	167.07	13889.41
16	-128.18	232.24	-119.35	216.1	320.36	173.43	13684.42



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17	-136.3	247.23	-128.18	232.24	330.94	179.15	13476.99
18	-143.63	260.9	-136.3	247.23	340.33	184.24	13267.1
19	-150.09	273.12	-143.63	260.9	348.55	188.69	13054.74
20	-155.63	283.76	-150.09	273.12	355.6	192.5	12839.9
21	-160.18	292.72	-155.63	283.76	361.46	195.68	12622.55
22	-163.73	299.91	-160.18	292.72	366.19	198.24	12402.69
23	-166.24	305.26	-163.73	299.91	369.75	200.17	12180.3
24	-167.69	308.72	-166.24	305.26	372.14	201.46	11955.35
25	-168.08	310.25	-167.69	308.72	373.4	202.14	11727.84
26	-167.42	309.85	-168.08	310.25	373.48	202.19	11497.75
27	-165.72	307.51	-167.42	309.85	372.44	201.62	11265.06
28	-163.0	303.25	-165.72	307.51	370.23	200.43	11029.75
29	-159.3	297.12	-163.0	303.25	366.89	198.62	10791.81
30	-154.66	289.17	-159.3	297.12	362.39	196.18	10551.22
31	-149.13	279.46	-154.66	289.17	356.74	193.12	10307.95
32	-142.77	268.1	-149.13	279.46	349.94	189.44	10061.99
33	-135.66	255.2	-142.77	268.1	342.0	185.14	9813.32
34	-127.85	240.89	-135.66	255.2	332.89	180.21	9561.92
35	-119.44	225.31	-127.85	240.89	322.63	174.66	9307.77
36	-110.54	208.63	-119.44	225.31	311.23	168.48	9050.85
37	-101.22	191.04	-110.54	208.63	298.63	161.67	8791.14
38	-91.59	172.74	-101.22	191.04	284.89	154.22	8528.6
39	-81.79	153.96	-91.59	172.74	269.97	146.15	8263.25
40	-71.91	134.94	-81.79	153.96	253.87	137.43	7995.02
41	-62.09	115.94	-71.91	134.94	236.59	128.08	7723.92
42	-52.47	97.26	-62.09	115.94	218.11	118.08	7449.9
43	-43.19	79.2	-52.47	97.26	198.45	107.43	7172.97
44	-34.39	62.07	-43.19	79.2	177.57	96.13	6893.07
45	-26.22	46.22	-34.39	62.07	155.49	84.18	6610.21
46	-18.86	32.04	-26.22	46.22	132.19	71.56	6324.33
47	-12.46	19.89	-18.86	32.04	107.65	58.28	6035.43
48	-7.19	10.2	-12.46	19.89	81.88	44.33	5743.46
49	-3.23	3.4	-7.19	10.2	54.86	29.7	5448.41
50	0.0	0.0	-3.23	3.4	25.89	14.02	5150.26

### Numero di superfici esaminate....(165)

N°	Xo	Yo	Ro	Fs
1	26.4	64.9	69.8	1.67
2	30.9	61.3	66.2	1.61
3	35.4	64.9	64.7	1.33
4	39.9	61.3	56.0	1.25
5	44.3	64.9	54.6	1.19
6	48.8	61.3	51.0	1.29
7	53.3	64.9	49.5	1.24
8	57.8	61.3	45.9	1.38
9	62.3	64.9	49.5	1.58
10	66.8	61.3	45.9	1.73
11	71.3	64.9	44.5	1.86
12	75.8	61.3	51.0	1.95
13	80.2	64.9	49.5	1.96
14	84.7	61.3	45.9	2.08

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15	26.4	72.1	71.9	1.22
16	30.9	68.5	68.3	1.26
17	35.4	72.1	66.8	1.22
18	39.9	68.5	63.2	1.29
19	44.3	72.1	61.8	1.25
20	48.8	68.5	58.2	1.35
21	53.3	72.1	56.7	1.34
22	57.8	68.5	53.1	1.46
23	62.3	72.1	56.7	1.65
24	66.8	68.5	48.1	1.72
25	71.3	72.1	61.8	1.80
26	75.8	68.5	58.2	1.88
27	80.2	72.1	56.7	1.91
28	84.7	68.5	53.1	1.99
29	26.4	79.3	79.1	1.24
30	30.9	75.7	75.5	1.29
31	35.4	79.3	74.0	1.26
32	39.9	75.7	65.4	1.16
33	44.3	79.3	69.0	1.32
34	48.8	75.7	65.4	1.40
35	53.3	79.3	63.9	1.42
36	57.8	75.7	60.3	1.53
37	62.3	79.3	74.0	1.68
38	66.8	75.7	65.4	1.75
39	71.3	79.3	69.0	1.76
40	75.8	75.7	65.4	1.82
41	80.2	79.3	63.9	1.85
42	84.7	75.7	60.0	1.93
43	21.9	82.9	82.7	1.19
44	26.4	86.5	86.3	1.27
45	30.9	82.9	77.6	1.20
46	35.4	86.5	76.2	1.14
47	39.9	82.9	72.6	1.23
48	44.3	86.5	76.2	1.37
49	48.8	82.9	67.5	1.30
50	53.3	86.5	71.1	1.49
51	57.8	82.9	67.5	1.59
52	62.3	86.5	76.2	1.65
53	66.8	82.9	72.6	1.71
54	71.3	86.5	76.2	1.75
55	75.8	82.9	67.5	1.80
56	80.2	86.5	70.2	1.84
57	84.7	82.9	65.7	1.90
58	17.4	93.7	93.5	1.17
59	21.9	90.1	89.9	1.22
60	26.4	93.7	88.4	1.17
61	30.9	90.1	84.8	1.24
62	35.4	93.7	83.4	1.20
63	39.9	90.1	79.8	1.29
64	44.3	93.7	83.4	1.43
65	48.8	90.1	74.7	1.38





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66	53.3	93.7	78.3	1.55
67	57.8	90.1	84.8	1.62
68	62.3	93.7	83.4	1.65
69	66.8	90.1	79.8	1.68
70	71.3	93.7	83.4	1.72
71	75.8	90.1	74.6	1.79
72	80.2	93.7	76.0	1.84
73	84.7	90.1	71.6	1.89
74	17.4	100.9	100.7	1.20
75	21.9	97.3	97.1	1.25
76	26.4	100.9	95.6	1.22
77	30.9	97.3	92.0	1.28
78	35.4	100.9	90.6	1.26
79	39.9	97.3	87.0	1.35
80	44.3	100.9	90.6	1.47
81	48.8	97.3	81.9	1.45
82	53.3	100.9	95.6	1.56
83	57.8	97.3	92.0	1.62
84	62.3	100.9	95.6	1.65
85	66.8	97.3	87.0	1.68
86	71.3	100.9	89.9	1.72
87	75.8	97.3	85.2	1.78
88	80.2	100.9	82.0	1.85
89	84.7	97.3	81.6	1.92
90	17.4	108.1	107.4	1.22
91	21.9	104.5	99.2	1.15
92	26.4	108.1	102.8	1.26
93	30.9	104.5	94.2	1.16
94	35.4	108.1	97.8	1.32
95	39.9	104.5	94.2	1.40
96	44.3	108.1	92.7	1.43
97	48.8	104.5	89.1	1.52
98	53.3	108.1	102.8	1.57
99	57.8	104.5	99.2	1.59
100	62.3	108.1	97.8	1.63
101	66.8	104.5	94.2	1.69
102	71.3	108.1	95.6	1.75
103	75.8	104.5	90.9	1.78
104	80.2	108.1	88.2	1.86
105	84.7	104.5	80.0	1.93
106	17.4	115.3	114.1	1.25
107	21.9	111.7	106.4	1.20
108	26.4	115.3	110.0	1.31
109	30.9	111.7	101.4	1.24
110	35.4	115.3	105.0	1.37
111	39.9	111.7	101.4	1.45
112	44.3	115.3	99.9	1.50
113	48.8	111.7	106.4	1.53
114	53.3	115.3	110.0	1.57
115	57.8	111.7	106.4	1.59
116	62.3	115.3	104.9	1.64

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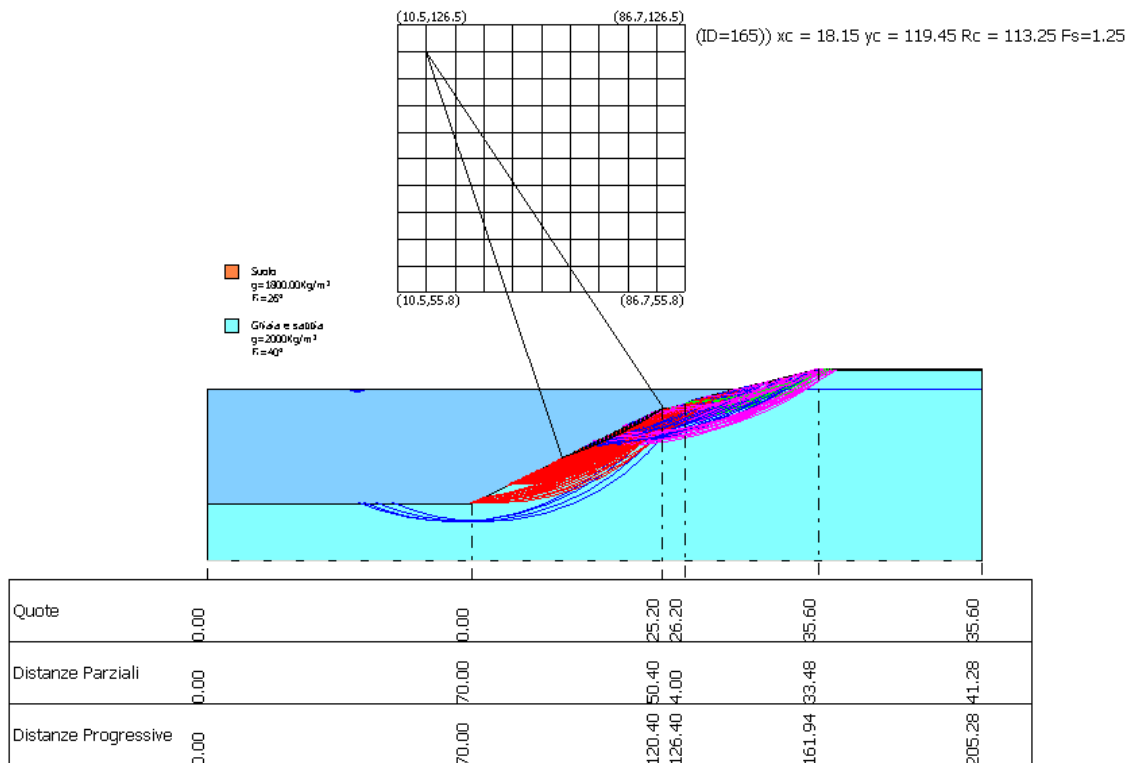
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117	66.8	111.7	100.3	1.68
118	71.3	115.3	105.8	1.74
119	75.8	111.7	100.9	1.81
120	80.2	115.3	98.1	1.87
121	84.7	111.7	86.0	1.90
122	12.9	118.9	116.1	1.15
123	17.4	122.5	115.9	1.13
124	21.9	118.9	113.6	1.25
125	26.4	122.5	117.2	1.35
126	30.9	118.9	108.6	1.30
127	35.4	122.5	112.2	1.43
128	39.9	118.9	108.6	1.49
129	44.3	122.5	122.3	1.52
130	48.8	118.9	113.6	1.54
131	53.3	122.5	112.2	1.57
132	57.8	118.9	113.6	1.60
133	62.3	122.5	110.8	1.64
134	66.8	118.9	106.1	1.68
135	71.3	122.5	107.4	1.75
136	75.8	118.9	106.7	1.81
137	80.2	122.5	111.2	1.90
138	84.7	118.9	95.5	1.98
139	8.5	129.7	129.6	1.20
140	12.9	126.1	122.9	1.17
141	17.4	129.7	122.7	1.15
142	21.9	126.1	120.5	1.28
143	26.4	129.7	119.4	1.27
144	30.9	126.1	115.8	1.35
145	35.4	129.7	129.5	1.46
146	39.9	126.1	110.7	1.47
147	44.3	129.7	124.4	1.51
148	48.8	126.1	120.8	1.54
149	53.3	129.7	119.4	1.58
150	57.8	126.1	120.5	1.60
151	62.3	129.7	121.3	1.66
152	66.8	126.1	112.1	1.69
153	71.3	129.7	113.5	1.76
154	75.8	126.1	108.9	1.84
155	80.2	129.7	113.5	1.94
156	84.7	126.1	101.4	1.99
157	12.9	133.3	129.7	1.21
158	21.9	133.3	127.3	1.32
159	30.9	133.3	123.0	1.40
160	39.9	133.3	133.1	1.49
161	48.8	133.3	128.0	1.55
162	57.8	133.3	121.5	1.63
163	66.8	133.3	122.3	1.71
164	75.8	133.3	115.1	1.85
165	84.7	133.3	107.5	2.03

=====



## 2. VERIFICA DI STABILITÀ SCARPATA DI RECUPERO



Analisi di stabilità dei pendii con: SARMA (1973)

=====  
 Lat./Long. 45.4999/9.80896  
 Normativa NTC 2008  
 Numero di strati 2.0  
 Numero dei conci 50.0  
 Grado di sicurezza ritenuto accettabile 1.3  
 Coefficiente parziale resistenza 1.0  
 Analisi Condizione drenata  
 Superficie di forma circolare  
 =====

Maglia dei Centri

=====  
 Ascissa vertice sinistro inferiore  $x_i$  10.54 m  
 Ordinata vertice sinistro inferiore  $y_i$  55.76 m  
 Ascissa vertice destro superiore  $x_s$  86.68 m  
 Ordinata vertice destro superiore  $y_s$  126.52 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.]

## Dati generali

Tipo opera: 2 - Opere ordinarie  
 Classe d'uso: Classe II  
 Vita nominale: 50.0 [anni]  
 Vita di riferimento: 50.0 [anni]

## Parametri sismici su sito di riferimento

Categoria sottosuolo: B  
 Categoria topografica: T1

S.L. Stato limite	TR Tempo ritorno [anni]	ag [m/s <sup>2</sup> ]	F0 [-]	TC* [sec]
S.L.O.	30.0	0.35	2.43	0.21
S.L.D.	50.0	0.46	2.4	0.23
S.L.V.	475.0	1.27	2.44	0.27
S.L.C.	975.0	1.65	2.48	0.28

## Coefficienti sismici orizzontali e verticali

Opera: Stabilità dei pendii e Fondazioni

S.L. Stato limite	amax [m/s <sup>2</sup> ]	beta [-]	kh [-]	kv [sec]
S.L.O.	0.42	0.2	0.0086	0.0043
S.L.D.	0.552	0.2	0.0113	0.0056
S.L.V.	1.524	0.24	0.0373	0.0186
S.L.C.	1.98	0.24	0.0485	0.0242

Coefficiente azione sismica orizzontale 0.0373  
 Coefficiente azione sismica verticale 0.0186

## Vertici profilo

N	X m	y m
1	-40.0	0.0
2	30.0	0.0
3	80.4	25.2
4	82.4	25.2
5	86.4	26.2
6	88.46	27.23
7	121.94	35.6
8	124.0	35.6
9	124.0	35.6
10	165.28	35.6

## Falda

Nr.	X (m)	y (m)
1	-40.0	30.2
2	0.0	30.2



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3	165.28	30.2
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## Vertici strato .....1

N	X (m)	y (m)
1	-40.0	0.0
2	30.0	0.0
3	80.4	25.2
4	82.4	25.2
5	86.4	26.2
6	122.0	35.1
7	165.28	35.1

## Coefficienti parziali per i parametri geotecnici del terreno

Tangente angolo di resistenza al taglio 1.25

Coesione efficace 1.25

Coesione non drenata 1.4

Riduzione parametri geotecnici terreno Si

## Stratigrafia

c: coesione; cu: coesione non drenata; Fi: Angolo di attrito; G: Peso Specifico; Gs: Peso Specifico Saturo; K: Modulo di Winkler

Strato	c (kg/cm <sup>2</sup> )	cu (kg/cm <sup>2</sup> )	Fi (°)	G (Kg/m <sup>3</sup> )	Gs (Kg/m <sup>3</sup> )	K (Kg/cm <sup>3</sup> )	Litologia	
1			26	1800.00	1900	0.00	Suolo	
2			40	2000	2100	0.00	Ghiaia e sabbia	

## Risultati analisi pendio [NTC 2008: [A2+M2+R2]]

Fs minimo individuato 1.25

Ascissa centro superficie 18.15 m

Ordinata centro superficie 119.45 m

Raggio superficie 113.25 m

(ID=165) xc = 18.153 yc = 119.445 Rc = 113.247 Fs=1.25

Nr.	B m	Alfa (°)	Li m	Wi (Kg)
1	0.54	18.66	0.57	25.88
2	0.54	18.95	0.57	76.33
3	0.54	19.24	0.57	125.0
4	0.54	19.53	0.57	171.9
5	0.54	19.81	0.57	217.0
6	0.54	20.1	0.57	260.3
7	0.54	20.39	0.57	301.79
8	0.54	20.68	0.57	341.47
9	0.54	20.97	0.57	379.31
10	0.54	21.26	0.58	415.31
11	0.54	21.55	0.58	449.46



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12	0.54	21.85	0.58	481.75
13	0.54	22.14	0.58	512.16
14	0.54	22.43	0.58	540.7
15	0.54	22.73	0.58	567.32
16	0.54	23.02	0.58	592.05
17	0.54	23.32	0.58	614.84
18	0.54	23.61	0.59	635.71
19	0.54	23.91	0.59	654.62
20	0.54	24.21	0.59	671.57
21	0.54	24.5	0.59	686.55
22	0.54	24.8	0.59	699.53
23	0.54	25.1	0.59	710.52
24	0.54	25.4	0.59	719.49
25	0.54	25.7	0.6	726.42
26	0.54	26.0	0.6	731.3
27	0.54	26.31	0.6	734.13
28	0.54	26.61	0.6	734.87
29	0.54	26.91	0.6	733.51
30	0.54	27.22	0.6	730.03
31	0.54	27.52	0.6	724.44
32	0.54	27.83	0.61	716.69
33	0.54	28.14	0.61	706.76
34	0.54	28.45	0.61	694.67
35	0.54	28.75	0.61	680.36
36	0.54	29.06	0.61	663.82
37	0.54	29.38	0.62	645.04
38	0.54	29.69	0.62	624.01
39	0.54	30.0	0.62	600.68
40	0.54	30.31	0.62	575.04
41	0.54	30.63	0.62	547.07
42	0.54	30.94	0.63	516.76
43	0.54	31.26	0.63	484.07
44	0.54	31.58	0.63	448.97
45	0.54	31.9	0.63	411.45
46	0.54	32.22	0.63	371.49
47	0.54	32.54	0.64	329.05
48	0.54	32.86	0.64	284.11
49	0.53	33.18	0.63	233.4
50	0.54	33.51	0.65	108.31

## Sforzi sui concii

Nr.	Xi (Kg)	Ei (Kg)	Xi-1 (Kg)	Ei-1 (Kg)	N'i (Kg)	Ti (Kg)	Ui (Kg)
1	-0.59	3.56	0.0	0.0	23.65	12.7	0.0
2	-5.11	14.11	-0.59	3.56	72.17	38.76	0.0
3	-13.55	30.87	-5.11	14.11	119.03	63.92	0.0
4	-25.34	53.0	-13.55	30.87	163.71	87.92	0.0
5	-39.94	79.7	-25.34	53.0	206.25	110.76	0.0
6	-56.83	110.22	-39.94	79.7	246.69	132.48	0.0
7	-75.53	143.82	-56.83	110.22	285.02	153.06	0.0
8	-95.62	179.83	-75.53	143.82	321.32	172.56	0.0
9	-116.67	217.61	-95.62	179.83	355.57	190.95	0.0
10	-138.29	256.53	-116.67	217.61	387.81	208.27	0.0
11	-160.16	296.03	-138.29	256.53	418.08	224.52	0.0



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12	-181.93	335.57	-160.16	296.03	446.38	239.72	0.0
13	-203.3	374.66	-181.93	335.57	472.72	253.86	0.0
14	-224.03	412.82	-203.3	374.66	497.16	266.99	0.0
15	-243.86	449.62	-224.03	412.82	519.68	279.08	0.0
16	-262.58	484.68	-243.86	449.62	540.32	290.17	0.0
17	-279.97	517.6	-262.58	484.68	559.06	300.23	0.0
18	-295.91	548.08	-279.97	517.6	575.97	309.31	0.0
19	-310.23	575.83	-295.91	548.08	591.02	317.39	0.0
20	-322.79	600.55	-310.23	575.83	604.21	324.48	0.0
21	-333.52	622.05	-322.79	600.55	615.61	330.6	0.0
22	-342.31	640.09	-333.52	622.05	625.15	335.72	0.0
23	-349.12	654.54	-342.31	640.09	632.92	339.89	0.0
24	-353.9	665.25	-349.12	654.54	638.87	343.09	0.0
25	-356.64	672.13	-353.9	665.25	643.02	345.32	0.0
26	-357.31	675.1	-356.64	672.13	645.36	346.57	0.0
27	-355.95	674.13	-357.31	675.1	645.94	346.88	0.0
28	-352.57	669.22	-355.95	674.13	644.7	346.22	0.0
29	-347.24	660.39	-352.57	669.22	641.7	344.61	0.0
30	-340.02	647.72	-347.24	660.39	636.9	342.03	0.0
31	-330.97	631.29	-340.02	647.72	630.31	338.49	0.0
32	-320.19	611.24	-330.97	631.29	621.92	333.99	0.0
33	-307.81	587.74	-320.19	611.24	611.75	328.52	0.0
34	-293.92	560.97	-307.81	587.74	599.77	322.09	0.0
35	-278.69	531.17	-293.92	560.97	585.99	314.69	0.0
36	-262.24	498.61	-278.69	531.17	570.4	306.32	0.0
37	-244.75	463.58	-262.24	498.61	552.98	296.96	0.0
38	-226.4	426.42	-244.75	463.58	533.75	286.64	0.0
39	-207.36	387.52	-226.4	426.42	512.67	275.31	0.0
40	-187.83	347.26	-207.36	387.52	489.73	263.0	0.0
41	-168.04	306.1	-187.83	347.26	464.94	249.68	0.0
42	-148.19	264.53	-168.04	306.1	438.27	235.36	0.0
43	-128.53	223.07	-148.19	264.53	409.71	220.02	0.0
44	-109.28	182.27	-128.53	223.07	379.24	203.66	0.0
45	-90.72	142.74	-109.28	182.27	346.84	186.26	0.0
46	-73.09	105.11	-90.72	142.74	312.51	167.82	0.0
47	-56.68	70.08	-73.09	105.11	276.21	148.33	0.0
48	-41.76	38.37	-56.68	70.08	237.93	127.78	0.0
49	-28.73	11.13	-41.76	38.37	194.87	104.65	0.0
50	0.0	0.0	-28.73	11.13	70.41	37.81	0.0

Numero di superfici esaminate...(193)

N°	Xo	Yo	Ro	Fs
1	25.8	55.8	60.6	1.93
2	29.6	59.3	64.2	1.79
3	33.4	55.8	60.6	1.76
4	37.2	59.3	59.1	1.48
5	41.0	55.8	50.5	1.38
6	44.8	59.3	54.1	1.48
7	48.6	55.8	45.5	1.36
8	52.4	59.3	49.0	1.51
9	56.2	55.8	40.4	1.36

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10	60.0	59.3	43.9	1.57
11	63.8	55.8	40.4	1.68
12	67.6	59.3	38.9	1.74
13	71.5	55.8	35.3	1.87
14	75.3	59.3	38.9	2.08
15	79.1	55.8	35.3	2.25
16	82.9	59.3	33.8	2.12
17	86.7	55.8	30.3	2.28
18	25.8	62.8	67.7	1.86
19	29.6	66.4	66.2	1.37
20	33.4	62.8	62.7	1.42
21	37.2	66.4	61.1	1.35
22	41.0	62.8	57.6	1.41
23	44.8	66.4	56.1	1.34
24	48.6	62.8	52.5	1.42
25	52.4	66.4	51.0	1.34
26	56.2	62.8	47.5	1.47
27	60.0	66.4	51.0	1.63
28	63.8	62.8	47.5	1.74
29	67.6	66.4	46.0	1.81
30	71.5	62.8	42.4	1.93
31	75.3	66.4	46.0	2.11
32	79.1	62.8	42.4	2.26
33	82.9	66.4	40.9	2.18
34	86.7	62.8	37.4	2.31
35	29.6	73.5	73.3	1.39
36	33.4	69.9	69.7	1.44
37	37.2	73.5	68.2	1.39
38	41.0	69.9	59.6	1.27
39	44.8	73.5	63.2	1.41
40	48.6	69.9	59.6	1.48
41	52.4	73.5	58.1	1.45
42	56.2	69.9	54.6	1.54
43	60.0	73.5	58.1	1.69
44	63.8	69.9	49.5	1.73
45	67.6	73.5	53.0	1.88
46	71.5	69.9	49.5	1.98
47	75.3	73.5	53.0	2.15
48	79.1	69.9	49.5	2.26
49	82.9	73.5	48.0	2.22
50	86.7	69.9	44.4	2.33
51	25.8	77.0	76.8	1.34
52	29.6	80.5	75.3	1.28
53	33.4	77.0	71.7	1.33
54	37.2	80.5	70.2	1.26
55	41.0	77.0	66.7	1.33
56	44.8	80.5	70.2	1.46
57	48.6	77.0	61.6	1.32
58	52.4	80.5	65.2	1.52
59	56.2	77.0	61.6	1.60
60	60.0	80.5	65.2	1.75





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61	63.8	77.0	56.6	1.78
62	67.6	80.5	60.1	1.94
63	71.5	77.0	56.6	2.03
64	75.3	80.5	60.1	2.17
65	79.1	77.0	51.5	2.07
66	82.9	80.5	54.7	2.26
67	86.7	77.0	50.9	2.33
68	22.0	87.6	87.4	1.33
69	25.8	84.1	83.9	1.37
70	29.6	87.6	82.4	1.32
71	33.4	84.1	78.8	1.38
72	37.2	87.6	77.3	1.31
73	41.0	84.1	73.8	1.39
74	44.8	87.6	77.3	1.51
75	48.6	84.1	68.7	1.43
76	52.4	87.6	72.2	1.58
77	56.2	84.1	68.7	1.67
78	60.0	87.6	67.2	1.78
79	63.8	84.1	63.6	1.85
80	67.6	87.6	67.2	1.99
81	71.5	84.1	63.6	2.08
82	75.3	87.6	67.2	2.19
83	79.1	84.1	58.6	2.13
84	82.9	87.6	61.1	2.26
85	86.7	84.1	57.2	2.34
86	18.2	91.1	91.0	1.29
87	22.0	94.7	94.5	1.36
88	25.8	91.1	85.9	1.27
89	29.6	94.7	89.4	1.36
90	33.4	91.1	85.9	1.42
91	37.2	94.7	84.4	1.38
92	41.0	91.1	80.8	1.44
93	44.8	94.7	79.3	1.41
94	48.6	91.1	75.8	1.51
95	52.4	94.7	79.3	1.65
96	56.2	91.1	75.8	1.72
97	60.0	94.7	74.3	1.83
98	63.8	91.1	70.7	1.91
99	67.6	94.7	74.3	2.03
100	71.5	91.1	70.7	2.11
101	75.3	94.7	73.7	2.21
102	79.1	91.1	64.9	1.91
103	82.9	94.7	71.8	2.37
104	86.7	91.1	67.8	2.45
105	18.2	98.2	98.0	1.32
106	22.0	101.8	96.5	1.26
107	25.8	98.2	93.0	1.31
108	29.6	101.8	96.5	1.40
109	33.4	98.2	87.9	1.30
110	37.2	101.8	91.5	1.43
111	41.0	98.2	87.9	1.50

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112	44.8	101.8	86.4	1.51
113	48.6	98.2	82.9	1.57
114	52.4	101.8	86.4	1.70
115	56.2	98.2	82.9	1.77
116	60.0	101.8	81.3	1.89
117	63.8	98.2	77.8	1.95
118	67.6	101.8	86.4	2.06
119	71.5	98.2	77.7	2.14
120	75.3	101.8	79.8	2.24
121	79.1	98.2	75.8	2.30
122	82.9	101.8	78.0	2.38
123	86.7	98.2	73.9	2.44
124	14.3	108.8	107.1	1.27
125	18.2	105.3	105.1	1.35
126	22.0	108.8	103.6	1.30
127	25.8	105.3	100.1	1.36
128	29.6	108.8	98.5	1.28
129	33.4	105.3	95.0	1.37
130	37.2	108.8	98.5	1.49
131	41.0	105.3	95.0	1.54
132	44.8	108.8	93.5	1.56
133	48.6	105.3	89.9	1.63
134	52.4	108.8	93.5	1.75
135	56.2	105.3	84.9	1.82
136	60.0	108.8	93.5	1.92
137	63.8	105.3	89.9	1.99
138	67.6	108.8	92.8	2.09
139	71.5	105.3	88.6	2.16
140	75.3	108.8	86.1	2.26
141	79.1	105.3	82.0	2.31
142	82.9	108.8	84.3	2.38
143	86.7	105.3	79.7	2.41
144	14.3	115.9	113.7	1.29
145	18.2	112.4	111.6	1.37
146	22.0	115.9	110.7	1.35
147	25.8	112.4	107.1	1.40
148	29.6	115.9	105.6	1.36
149	33.4	112.4	102.1	1.43
150	37.2	115.9	105.6	1.53
151	41.0	112.4	97.0	1.50
152	44.8	115.9	100.5	1.62
153	48.6	112.4	97.0	1.69
154	52.4	115.9	100.5	1.80
155	56.2	112.4	97.0	1.86
156	60.0	115.9	100.5	1.96
157	63.8	112.4	96.9	2.02
158	67.6	115.9	98.7	2.11
159	71.5	112.4	94.6	2.19
160	75.3	115.9	92.4	2.28
161	79.1	112.4	88.4	2.33
162	82.9	115.9	90.5	2.37

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163	86.7	112.4	85.6	2.41
164	14.3	123.0	120.3	1.32
165	18.2	119.4	113.2	1.25
166	22.0	123.0	117.6	1.39
167	25.8	119.4	114.2	1.44
168	29.6	123.0	112.7	1.42
169	33.4	119.4	109.1	1.48
170	37.2	123.0	112.7	1.58
171	41.0	119.4	104.1	1.56
172	44.8	123.0	107.6	1.68
173	48.6	119.4	104.1	1.73
174	52.4	123.0	107.6	1.84
175	56.2	119.4	104.1	1.90
176	60.0	123.0	107.1	1.98
177	63.8	119.4	102.9	2.04
178	67.6	123.0	104.8	2.14
179	71.5	119.4	100.6	2.22
180	75.3	123.0	98.8	2.29
181	79.1	119.4	94.8	2.33
182	82.9	123.0	96.5	2.37
183	86.7	119.4	91.5	2.35
184	18.2	126.5	119.9	1.28
185	25.8	126.5	116.2	1.34
186	33.4	126.5	116.2	1.53
187	41.0	126.5	111.2	1.61
188	48.6	126.5	111.2	1.78
189	56.2	126.5	111.2	1.93
190	63.8	126.5	109.0	2.07
191	71.5	126.5	102.8	2.26
192	79.1	126.5	101.2	2.32
193	86.7	126.5	97.5	2.10

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