LISTATO DI CALCOLO – FASE 1 – SEZ H – COESIONE 0

ANALISI SUPERFICIE GENERICHE 1 – 2 – 3

SUPERFICIE 1 – Linea separatrice SUBSTRATO ROCCIOSO e CAPPELLACCIO DI ALTERAZIONE

SUPERFICIE 2 – Linea separatrice CAPPELLACCIO DI ALTERAZIONE e COLTRE NATURALE

SUPERFICIE 3 – Linea separatrice COLTRE NATURALE e MATERIALE OGGETTO DI DEPOSITO

Analisi di stabilità dei pendii con: JANBU (1956)

Lat./Long.	44.416126/9.128522
Normativa	NTC 2008
Numero di strati	4.0
Numero dei conci	25.0
Grado di sicurezza ritenuto accettabile	1.1
Coefficiente parziale resistenza	1.1
Analisi	Condizione drenata
Superficie di forma generica	

Coefficienti sismici [N.T.C.]

Dati generali

Tipo opera:	2 - Opere ordinarie
Classe d'uso:	Classe I
Vita nominale:	50.0 [anni]
Vita di riferimento:	35.0 [anni]

Parametri sismici su sito di riferimento

Categoria sottosuolo:	C
Categoria topografica:	T3

S.L. Stato limite	TR Tempo ritorno [anni]	ag [m/s²]	F0 [-]	TC* [sec]
S.L.O.	30.0	0.27	2.5	0.2
S.L.D.	35.0	0.29	2.52	0.2
S.L.V.	332.0	0.73	2.53	0.28
S.L.C.	682.0	0.96	2.5	0.29

Coefficienti sismici orizzontali e verticali

Opera: Stabilità dei pendii e Fondazioni

S.L. Stato limite	amax [m/s²]	beta [-]	kh [-]	kv [sec]
S.L.O.	0.486	0.2	0.0099	0.005
S.L.D.	0.522	0.2	0.0106	0.0053
S.L.V.	1.314	0.2	0.0268	0.0134
S.L.C.	1.728	0.2	0.0352	0.0176

Coefficiente azione sismica orizzontale 0.027
Coefficiente azione sismica verticale 0.01 3

Vertici profilo

N	X m	y m
1	0.0	0.0
2	5.02	2.5
3	10.01	2.0
4	15.11	1.47
5	16.36	1.44

6	18.66	2.93
7	21.06	7.15
8	22.59	7.61
9	26.5	8.1
10	32.75	9.52
11	40.67	11.99
12	40.78	12.47
13	44.4	12.47
14	44.4	18.47
15	63.16	25.54
16	63.25	25.67
17	68.85	25.67
18	68.85	29.67
19	71.75	31.66
20	75.51	31.66
21	75.89	32.65
22	79.52	32.65
23	79.52	36.65
24	83.49	38.64
25	88.14	38.73
26	88.15	38.76
27	91.8	38.76
28	91.8	42.76
29	95.64	44.36
30	104.22	44.36
31	104.22	48.36
32	115.54	50.26
33	121.1	50.26
34	121.74	51.53
35	125.19	51.53
36	125.19	55.53
37	132.31	58.76
38	137.8	58.76
39	137.88	58.93
40	141.61	58.93
41	141.61	62.93
42	145.87	64.54
43	157.55	64.54
44	158.91	64.53
45	177.39	74.2
46	193.32	74.24
47	200.49	76.54
48	213.94	78.54
49	249.11	99.04
50	253.94	99.04
51	276.96	112.54
52	310.48	116.18
53	316.72	116.18
54	343.88	133.02
55	433.8	133.0 2

Falda

Nr.	X (m)	y (m)
1	0.0	0.0
2	5.02	2.5
3	10.01	2.0
4	15.11	1.47
5	16.36	1.44
6	18.66	2.93
7	20.45	6.09
8	102.78	22.6

9	102.8	22.6
10	159.6	45.8
11	159.6	45.8
12	294.28	96.5
13	294.29	96.5
14	330.58	115.8
15	330.6	115.8
16	363.07	120.8
17	363.1	120.8
18	414.33	131.5
19	433.8	136.4 5

Vertici strato 1

N	X (m)	y (m)
1	0.0	0.0
2	5.02	2.5
3	5.02	2.5
4	10.01	2.0
5	15.11	1.47
6	16.36	1.44
7	18.66	2.93
8	21.06	7.15
9	22.59	7.61
10	26.5	8.1
11	32.75	9.52
12	42.61	12.6
13	48.71	13.21
14	53.26	14.02
15	58.12	15.53
16	64.29	17.64
17	70.5	18.02
18	81.13	21.02
19	93.9	23.5
20	101.03	24.85
21	109.98	30.03
22	118.88	31.91
23	128.0	36.58
24	139.9	40.13
25	142.92	40.79
26	159.6	43.29
27	172.1	48.29
28	184.1	53.29
29	192.1	58.29
30	200.1	63.29
31	216.6	68.29
32	239.1	73.29
33	264.1	78.29
34	274.1	83.29
35	284.1	88.29
36	292.6	93.29
37	300.6	98.29
38	308.1	103.29
39	318.1	108.29
40	330.6	113.29
41	363.1	118.29
42	370.6	123.29
43	375.1	128.29
44	375.1	128.29
45	375.1	128.29
46	433.51	133. 0

Vertici strato 2

N	X	y

	(m)	(m)
1	0.0	0.0
2	5.02	2.5
3	5.02	2.5
4	10.01	2.0
5	15.11	1.47
6	16.36	1.44
7	18.66	2.93
8	19.56	4.52
9	22.25	5.7
10	66.68	13.34
11	100.36	19.1
12	118.09	19.1
13	161.53	39.47
14	200.09	51.87
15	224.02	63.38
16	261.26	69.58
17	289.18	80.21
18	310.9	95.71
19	344.58	107.22
20	376.94	110.76
21	433.51	116.0 2

Vertici strato 3

N	X (m)	y (m)
1	0.0	-10.56
2	13.59	-7.3
3	29.81	-2.65
4	33.05	-1.72
5	39.85	0.02
6	54.66	2.02
7	70.5	4.15
8	87.26	6.45
9	90.23	7.38
10	93.4	8.38
11	96.57	9.37
12	100.79	10.7
13	108.18	13.01
14	111.13	14.19
15	115.57	15.33
16	117.58	15.96
17	119.26	16.49
18	124.31	18.08
19	127.17	18.98
20	131.46	20.67
21	138.89	23.6
22	144.47	25.8
23	150.88	28.32
24	155.61	30.19
25	163.73	33.38
26	171.63	36.49
27	179.77	39.7
28	185.34	41.9
29	192.38	44.67
30	194.63	45.56
31	202.06	48.48
32	207.37	50.36
33	212.01	51.32
34	216.59	52.5
35	222.0	53.88
36	224.95	55.07
37	226.44	55.02

38	230.89	56.16
39	236.44	57.58
40	243.1	59.29
41	251.98	61.57
42	265.52	65.03
43	273.41	67.06
44	277.44	68.18
45	285.22	71.4
46	299.4	77.28
47	308.54	81.07
48	314.66	83.6
49	327.98	89.12
50	334.95	91.81
51	377.91	98.27
52	396.1	101.0
53	414.03	103.62
54	433.51	106.0 6

Vertici superficie Nr...1

N	X m	y m
1	17.27	2.14
2	26.86	0.43
3	39.85	0.02
4	54.66	2.02
5	70.5	4.15
6	87.26	6.45
7	90.23	7.38
8	93.4	8.38
9	96.57	9.37
10	100.79	10.7
11	108.18	13.01
12	111.13	14.19
13	115.57	15.33
14	117.58	15.96
15	119.26	16.49
16	124.31	18.08
17	127.17	18.98
18	131.46	20.67
19	138.89	23.6
20	144.47	25.8
21	150.88	28.32
22	155.61	30.19
23	163.73	33.38
24	171.63	36.49
25	179.77	39.7
26	185.34	41.9
27	192.38	44.67
28	194.63	45.56
29	202.06	48.48
30	207.37	50.36
31	212.01	51.32
32	216.59	52.5
33	222.0	53.88
34	224.95	55.07
35	226.44	55.02
36	230.89	56.16
37	236.44	57.58
38	243.1	59.29
39	251.98	61.57
40	265.52	65.03
41	273.41	67.06

42	277.44	68.18
43	285.22	71.4
44	299.4	77.28
45	308.54	81.07
46	314.66	83.6
47	327.98	89.12
48	334.95	91.81
49	357.78	100.53
50	380.61	112.19
51	405.32	128.03
52	413.36	132.85
53	413.56	133.1

Vertici superficie Nr...2

N	X m	y m
1	20.25	5.89
2	22.25	5.7
3	66.68	13.34
4	100.36	19.1
5	118.09	19.1
6	161.53	39.47
7	200.09	51.87
8	224.02	63.38
9	261.26	69.58
10	289.18	80.21
11	310.9	95.71
12	344.58	107.22
13	363.1	118.29
14	370.6	123.29
15	378.99	132.5
16	379.46	133.12

Vertici superficie Nr...3

N	X m	y m
1	39.95	11.88
2	48.71	13.21
3	53.26	14.02
4	58.12	15.53
5	64.29	17.64
6	70.5	18.02
7	81.13	21.02
8	93.9	23.5
9	101.03	24.85
10	109.98	30.0
11	118.88	31.91
12	128.0	36.58
13	139.9	40.13
14	142.92	40.79
15	159.6	43.29
16	172.1	48.29
17	184.1	53.29
18	192.1	58.29
19	200.1	63.29
20	216.6	68.29
21	239.1	73.29
22	264.1	78.29
23	274.1	83.29
24	284.1	88.29

25	292.6	93.29
26	300.6	98.29
27	303.97	100.54
28	308.1	103.29
29	318.1	108.29
30	330.6	113.29
31	363.1	118.29
32	370.6	123.29
33	378.99	132.5
34	379.52	133.12

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/cm²)	cu (kg/cm²)	Fi (°)	G (Kg/m³)	Gs (Kg/m³)	K (Kg/cm³)	Litologia	
1	0		29.60	1837	2063	0.00		
2	0		26.51	1695	1905	0.00		
3	0.3305		30.52	2402	2698	0.00		
4	0.4352		33.31	2402	2698	0.00		

Muri di sostegno - Caratteristiche geometriche

N°	x (m)	y (m)	Base mensola a valle (m)	Base mensola a monte (m)	Altezza muro (m)	Spessore testa (m)	Spessore base (m)	Peso specifico (Kg/m³)
1	44.4	12.47	0	0.1	6	2	4	2800
2	79.52	32.65	0	0.1	4	3	4	2800
3	91.8	38.76	0	0.1	4	3	4	2800
4	104.22	44.35	0	0.1	4	3	4	2800
5	125.19	51.53	0	0.1	4	3	4	2800
6	141.61	58.93	0	0.1	4	3	4	2800
7	68.85	25.67	0	0.1	4	3	4	280 0

Pali...

N°	x (m)	y (m)	Diametro (m)	Lunghezza (m)	Inclinazione (°)	Interasse (m)
1	41.34258	10.96566	0.2	6	90	3.6
2	43.73619	10.96566	0.2	6	90	3.6

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.

Superficie Nr...1 Fattore di sicurezza=1.31

Nr.	B m	Alfa (°)	Li m	Wi (Kg)	Kh•Wi (Kg)	Kv•Wi (Kg)	c (kg/cm²)	Fi (°)	Ui (Kg)	N'i (Kg)	Ti (Kg)
1	15.84	-6.8	15.96	265226.3	7161.11	3447.94	0.26	25.2	5890.7	186005.3	109189.9
2	15.84	3.7	15.88	517665.8	13976.98	6729.66	0.26	25.2	9493.0	356580.6	175770.1
3	15.84	7.7	15.99	733279.0	19798.53	9532.63	0.26	25.2	11087.3	529836.3	246029.9
4	15.84	7.8	15.99	980526.8	26474.22	12746.85	0.26	25.2	12118.6	750699.9	333843.1

5	15.84	13.6	16.3	1095108.0	29567.91	14236.4	0.26	25.2	12301.2	837742.4	376251.4
6	15.84	18.0	16.66	1210865.0	32693.36	15741.25	0.26	25.2	11353.3	950537.8	432049.4
7	15.84	17.2	16.58	1072352.0	28953.52	13940.58	0.26	25.2	12803.3	801293.2	368425.8
8	15.84	21.5	17.03	1182299.0	31922.07	15369.89	0.26	25.2	13706.2	885258.8	414904.9
9	15.84	21.5	17.03	1135363.0	30654.81	4759.72	0.26	25.2	13936.6	838187.3	394990.9
10	15.84	21.5	17.03	1098105.0	29648.85	14275.37	0.35	27.7	0.0	989685.3	519898.6
11	15.84	21.5	17.03	1045017.0	28215.46	13585.22	0.26	25.2	13623.5	758735.3	361378.2
12	15.84	20.7	16.94	904062.4	24409.69	11752.81	0.35	27.7	0.0	812999.4	434058.8
13	15.84	14.3	16.35	885064.4	23896.74	11505.84	0.26	25.2	14412.9	607530.3	284035.7
14	15.84	13.7	16.31	1063997.0	28727.93	13831.96	0.26	25.2	16426.2	746863.1	339620.3
15	15.84	14.4	16.36	1209642.0	32660.32	15725.34	0.26	25.2	18430.5	852088.1	383495.7
16	15.84	14.4	16.36	1275103.0	34427.77	16576.33	0.26	25.2	20335.1	885176.6	396940.7
17	15.84	19.5	16.81	1390738.0	37549.91	18079.59	0.26	25.2	21458.5	966751.9	443148.8
18	15.84	22.5	17.15	1278277.0	34513.48	16617.6	0.35	27.7	0.0	1153334.0	601711.6
19	15.84	22.5	17.15	1195017.0	32265.46	15535.22	0.26	25.2	23244.6	755925.0	363047.9
20	15.84	21.9	17.08	1174531.0	31712.33	15268.9	0.35	27.7	0.0	1059070.0	554463.0
21	15.84	20.9	16.96	1268373.0	34246.06	16488.84	0.26	25.2	23008.4	828621.0	389283.8
22	15.84	24.2	17.36	1048638.0	28313.24	13632.3	0.26	25.2	18865.4	683792.5	336975.2
23	15.84	27.5	17.86	730650.4	19727.56	9498.46	0.26	25.2	14220.3	455802.1	246653.7
24	15.84	32.7	18.82	438184.9	11830.99	5696.4	0.0	21.8	8326.7	299805.6	118630.2
25	15.84	32.0	18.69	143450.0	3873.15	1864.85	0.0	21.8	1600.7	115268.1	45275.7

Superficie Nr...2 Fattore di sicurezza=1.16

Nr.	B m	Alfa (°)	Li m	Wi (Kg)	Kh•Wi (Kg)	Kv•Wi (Kg)	c (kg/cm²)	Fi (°)	Ui (Kg)	N'i (Kg)	Ti (Kg)
1	14.36	7.8	14.5	37791.19	1020.36	491.29	0.0	21.8	643.5	27414.1	10350.3
2	14.36	9.8	14.57	154326.3	4166.81	2006.24	0.26	25.2	1308.7	122031.3	91394.6
3	14.36	9.8	14.57	298509.6	8059.76	3880.63	0.26	25.2	1719.7	252428.2	149891.3
4	14.36	9.7	14.57	499184.2	13477.97	6489.4	0.26	25.2	2135.9	436126.6	232267.0
5	14.36	9.7	14.57	639110.2	17255.97	8308.43	0.26	25.2	2558.7	562406.4	288898.4
6	14.36	5.6	14.43	745321.5	20123.68	9689.18	0.26	25.2	3508.7	665944.0	331769.0
7	14.36	5.2	14.42	796106.9	21494.89	10349.39	0.0	21.8	7297.4	671356.4	252174.0
8	14.36	25.1	15.86	929620.9	25099.77	12085.07	0.0	21.8	9144.9	750110.3	309922.2
9	14.36	25.1	15.86	923606.0	24937.36	12006.88	0.0	21.8	8276.4	756178.8	312429.4
10	14.36	23.9	15.71	738553.9	19940.96	9601.2	0.26	25.2	7586.5	561372.2	314178.0
11	14.36	17.8	15.09	760988.7	20546.7	9892.85	0.26	25.2	7585.0	589151.8	312889.7
12	14.36	17.8	15.09	724843.9	19570.79	9422.97	0.0	21.8	8373.1	566887.3	222757.7
13	14.36	21.7	15.46	636815.0	17194.01	8278.6	0.0	21.8	8607.2	480777.9	193619.8
14	14.36	25.7	15.94	533685.1	14409.5	6937.91	0.0	21.8	7696.6	397946.9	165189.7
15	14.36	12.6	14.72	630378.9	17020.23	8194.93	0.26	25.2	8042.1	472680.7	251530.8
16	14.36	9.5	14.56	780377.2	21070.19	10144.9	0.26	25.2	10646.0	586907.7	299637.8
17	14.36	12.1	14.69	863402.6	23311.87	11224.23	0.0	21.8	13315.7	636374.8	243479.0
18	14.36	20.8	15.37	974543.1	26312.66	12669.06	0.26	25.2	14446.8	690105.7	367230.6
19	14.36	25.4	15.89	915259.6	24712.01	11898.38	0.0	21.8	13714.2	675192.7	279537.1
20	14.36	35.5	17.64	723832.3	19543.47	9409.82	0.26	25.2	11534.9	497536.4	323963.5
21	14.36	23.2	15.62	541093.4	14609.52	7034.22	0.26	25.2	10975.1	336815.0	204083.3
22	14.36	18.9	15.18	596697.7	16110.84	7757.07	0.26	25.2	13085.8	364101.1	209871.3
23	14.36	24.2	15.75	679232.4	18339.28	8830.02	0.0	21.8	10161.3	500547.2	205340.7
24	14.36	31.3	16.8	480264.0	12967.13	6243.43	0.0	21.8	4781.6	392381.0	171704.5
25	14.36	43.1	19.68	177453.6	4791.25	2306.9	0.0	24.4	0.0	173788.0	101446.6

Superficie Nr...3 Fattore di sicurezza=1.27

Nr.	B m	Alfa (°)	Li m	Wi (Kg)	Kh•Wi (Kg)	Kv•Wi (Kg)	c (kg/cm²)	Fi (°)	Ui (Kg)	N'i (Kg)	Ti (Kg)

1	13.55	9.7	13.75	227898.1	6153.25	2962.68	0.0	24.4	0.0	216752.1	85642.0
2	13.55	14.7	14.01	270373.1	7300.07	3514.85	0.0	21.8	0.0	256519.9	90672.6
3	13.55	13.3	13.93	360472.2	9732.75	4686.14	0.0	24.4	0.0	339204.2	135723.7
4	13.55	11.0	13.81	463929.6	12526.1	6031.09	0.0	21.8	0.0	443187.6	154365.8
5	13.55	21.7	14.59	504061.3	13609.66	6552.8	0.0	24.4	0.0	469715.6	196917.2
6	13.55	18.0	14.25	471091.7	12719.48	6124.19	0.0	24.4	0.0	439713.7	180015.7
7	13.55	21.5	14.57	577292.6	15586.9	7504.8	0.0	21.8	0.0	546817.3	200974.3
8	13.55	12.1	13.86	625730.8	16894.73	8134.5	0.0	21.8	0.0	596295.2	208496.3
9	13.55	11.6	13.84	537532.8	14513.38	6987.93	0.0	24.4	1158.6	493298.8	196103.1
10	13.55	22.0	14.62	573875.2	15494.63	7460.38	0.0	24.4	2247.7	506414.3	212773.0
11	13.55	26.7	15.17	522453.2	14106.24	6791.89	0.0	24.4	1199.2	473803.3	206513.8
12	13.55	28.8	15.47	365890.9	9879.05	4756.58	0.0	21.8	0.0	351490.1	137181.8
13	13.55	16.8	14.16	290489.4	7843.21	3776.36	0.0	21.8	0.0	275046.0	98240.3
14	13.55	12.5	13.88	356576.1	9627.55	4635.49	0.0	21.8	45.1	338896.5	118709.5
15	13.55	12.1	13.86	486058.2	13123.57	6318.76	0.0	21.8	2188.8	434885.3	152082.7
16	13.55	11.3	13.82	597146.9	16122.97	7762.91	0.0	21.8	4483.1	511994.6	178539.1
17	13.55	19.4	14.37	658338.6	17775.14	8558.4	0.0	24.4	5837.6	540013.1	223019.1
18	13.55	26.7	15.17	699782.4	18894.13	9097.17	0.0	24.4	5138.6	589826.9	257123.6
19	13.55	31.1	15.83	542447.4	14646.08	7051.82	0.0	24.4	2744.1	477816.1	217309.9
20	13.55	31.6	15.91	368370.9	9946.01	4788.82	0.0	21.8	1233.5	341108.0	136938.0
21	13.55	24.1	14.85	230762.0	6230.58	2999.91	0.0	21.8	1240.2	203290.3	76153.9
22	13.55	14.1	13.98	327308.3	8837.32	4255.01	0.0	21.8	3172.1	269954.9	95182.2
23	13.55	8.7	13.71	441717.3	11926.37	5742.33	0.0	21.8	2512.3	391850.0	135566.0
24	13.55	14.5	14.0	369848.4	9985.91	4808.03	0.0	24.4	1799.7	324151.3	130408.5
25	13.55	43.5	18.69	160298.6	4328.06	2083.88	0.0	24.4	0.0	161395.8	86698.1

CARICO LIMITE PALI

Superficie Nr...1 Fattore di sicurezza=1.31

pali alla base x=41.34258 Y=10.96566 Plim=0.0 Kg Sbalzo del palo 0.00 m
pali alla base x=43.73619 Y=10.96566 Plim=0.0 Kg Sbalzo del palo 0.00 m

CARICO LIMITE PALI

Superficie Nr...2 Fattore di sicurezza=1.16

pali alla base x=41.34258 Y=10.96566 Plim=5056.0 Kg Sbalzo del palo 3.39 m
pali alla base x=43.73619 Y=10.96566 Plim=5056.0 Kg Sbalzo del palo 3.39 m

CARICO LIMITE PALI

Superficie Nr...3 Fattore di sicurezza=1.27

pali alla base x=41.34258 Y=10.96566 Plim=422.7 Kg Sbalzo del palo 6.44 m
pali alla base x=43.73619 Y=10.96566 Plim=422.7 Kg Sbalzo del palo 6.44 m