PROVINCIA DI MATERA

CONSOLIDAMENTO E MESSA IN SICUREZZA DELLA SP 95 MONTALBANO JONICO E DELLA SP 73 SCANZANO MARE

PROGETTO ESECUTIVO

Committente:

PROVINCIA DI MATERA

Progettazione:

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Elaborato:

Prog-95-05

Scala: //

Titolo:

Progetto interventi su SP95:

FASCICOLO DI CALCOLO DELLE STRUTTURE

Emissione:	00	Data:	Agosto 2021	Codice:	//
Revisione:	01	Data:	Marzo 2022	Codice:	//

Tabulati di calcolo

Comune: Montalbano Jonico;
Latitudine: 40.288222
Longitudine: 16.577642
Tipo di opera: gabbioni in pietrame
Destinazione d'uso: Muro di sostegno
Classe d'uso: III
Vita Nominale: 50 anni

La presente relazione è redatta allo scopo di riportare i tabulati di calcolo inerenti le verifiche strutturali condotte nell'ambito del **progetto per la realizzazione di un'opera di sostegno in gabbioni da realizzarsi lungo un tratto della SP 95 ubicata nel Comune di Montalbano Jonico (MT).**

Spinta e forze

Simbologia adottata

Ic	Indice della combinazione
A	Tipo azione
I	Inclinazione della spinta, espressa in [°]
V	Valore dell'azione, espressa in [kg]
C_X, C_Y	Componente in direzione X ed Y dell'azione, espressa in [kg]
P_X, P_Y	Coordinata X ed Y del punto di applicazione dell'azione, espressa in [m]

Ic	A	V	I	C_X	C_Y	P_X	P_Y
		[kg]	*[°]*	*[kg]*	*[kg]*	*[m]*	*[m]*
1	Spinta statica	2531	17.33	2416	754	0.50	-1.61
	Peso/Inerzia muro			0	11875/0	-1.00	-1.26
	Peso/Inerzia terrapieno			0	875/0	0.25	-0.53
	Risultante forze sul muro			0	1365	--	--
2	Spinta statica	1921	17.33	1834	572	0.50	-1.61
	Incremento di spinta sismica		484	462	144	0.50	-1.54
	Peso/Inerzia muro			884	11875/442	-1.00	-1.26
	Peso/Inerzia terrapieno			65	875/33	0.25	-0.53
	Risultante forze sul muro			78	1050	--	--
3	Spinta statica	1921	17.33	1834	572	0.50	-1.61
	Incremento di spinta sismica		345	329	103	0.50	-1.54
	Peso/Inerzia muro			884	11875/-442	-1.00	-1.26
	Peso/Inerzia terrapieno			65	875/-33	0.25	-0.53
	Risultante forze sul muro			78	1050	--	--
4	Spinta statica	2532	14.02	2457	613	0.50	-1.59
	Peso/Inerzia muro			0	11875/0	-1.00	-1.26
	Peso/Inerzia terrapieno			0	875/0	0.25	-0.53
	Risultante forze sul muro			0	1050	--	--
5	Spinta statica	1921	17.33	1834	572	0.50	-1.61
	Incremento di spinta sismica		484	462	144	0.50	-1.54
	Peso/Inerzia muro			884	11875/442	-1.00	-1.26
	Peso/Inerzia terrapieno			65	875/33	0.25	-0.53
	Risultante forze sul muro			78	1050	--	--
6	Spinta statica	1921	17.33	1834	572	0.50	-1.61
	Incremento di spinta sismica		345	329	103	0.50	-1.54
	Peso/Inerzia muro			884	11875/-442	-1.00	-1.26
	Peso/Inerzia terrapieno			65	875/-33	0.25	-0.53
	Risultante forze sul muro			78	1050	--	--
7	Spinta statica	2531	17.33	2416	754	0.50	-1.61
	Peso/Inerzia muro			0	11875/0	-1.00	-1.26
	Peso/Inerzia terrapieno			0	875/0	0.25	-0.53
	Risultante forze sul muro			0	1365	--	--
8	Spinta statica	1921	17.33	1834	572	0.50	-1.61
	Incremento di spinta sismica		759	724	226	0.50	-1.54
	Peso/Inerzia muro			1326	11875/663	-1.00	-1.26
	Peso/Inerzia terrapieno			98	875/49	0.25	-0.53
	Risultante forze sul muro			117	1050	--	--

Ic	A	V	I	Cx	Cy	Px	Py
		[kg]	[°]	[kg]	[kg]	[m]	[m]
9	Spinta statica	1921	17.33	1834	572	0.50	-1.61
	Incremento di spinta sismica		557	532	166	0.50	-1.54
	Peso/Inerzia muro			1326	11875/-663	-1.00	-1.26
	Peso/Inerzia terrapieno			98	875/-49	0.25	-0.53
	Risultante forze sul muro			117	1050	--	--
10	Spinta statica	1921	17.33	1834	572	0.50	-1.61
	Peso/Inerzia muro			0	11875/0	-1.00	-1.26
	Peso/Inerzia terrapieno			0	875/0	0.25	-0.53
	Risultante forze sul muro			0	1050	--	--
11	Spinta statica	1753	17.33	1674	522	0.50	-1.60
	Peso/Inerzia muro			0	11875/0	-1.00	-1.26
	Peso/Inerzia terrapieno			0	875/0	0.25	-0.53
	Risultante forze sul muro			0	1050	--	--
12	Spinta statica	1303	17.33	1243	388	0.50	-1.54
	Peso/Inerzia muro			0	11875/0	-1.00	-1.26
	Peso/Inerzia terrapieno			0	875/0	0.25	-0.53
	Risultante forze sul muro			0	1050	--	--
13	Spinta statica	1303	17.33	1243	388	0.50	-1.54
	Incremento di spinta sismica		121	116	36	0.50	-1.54
	Peso/Inerzia muro			461	11875/230	-1.00	-1.26
	Peso/Inerzia terrapieno			34	875/17	0.25	-0.53
	Risultante forze sul muro			41	1050	--	--
14	Spinta statica	1303	17.33	1243	388	0.50	-1.54
	Incremento di spinta sismica		71	68	21	0.50	-1.54
	Peso/Inerzia muro			461	11875/-230	-1.00	-1.26
	Peso/Inerzia terrapieno			34	875/-17	0.25	-0.53
	Risultante forze sul muro			41	1050	--	--

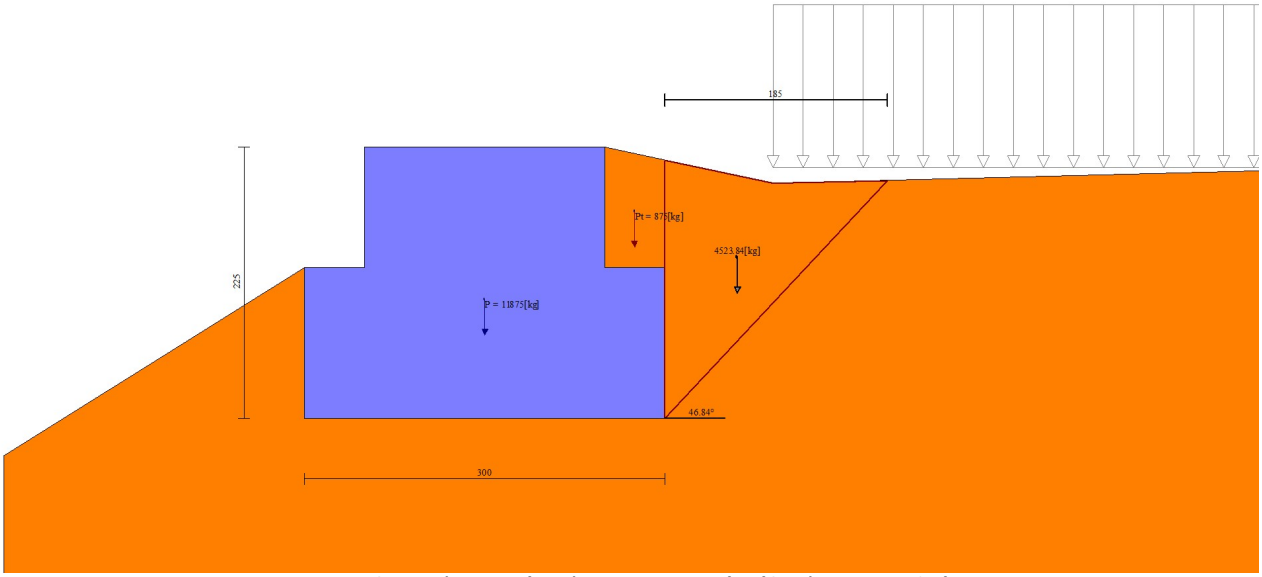

Fig. 1 - Cuneo di spinta (combinazione statica) (Combinazione n° 1)

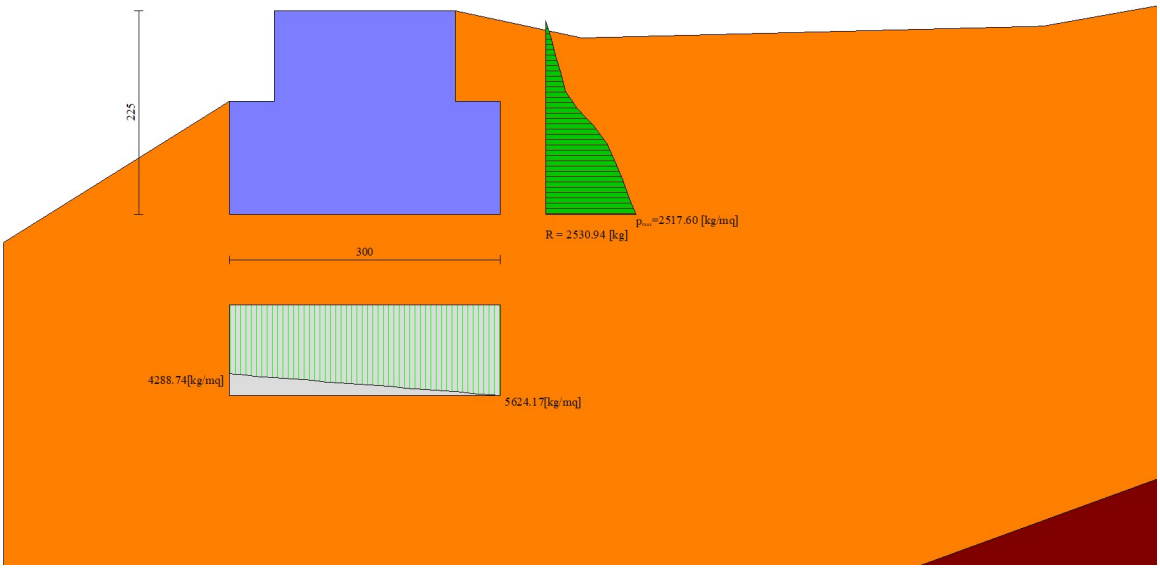

Fig. 2 - Diagramma delle pressioni (combinazione statica) (Combinazione n° 1)

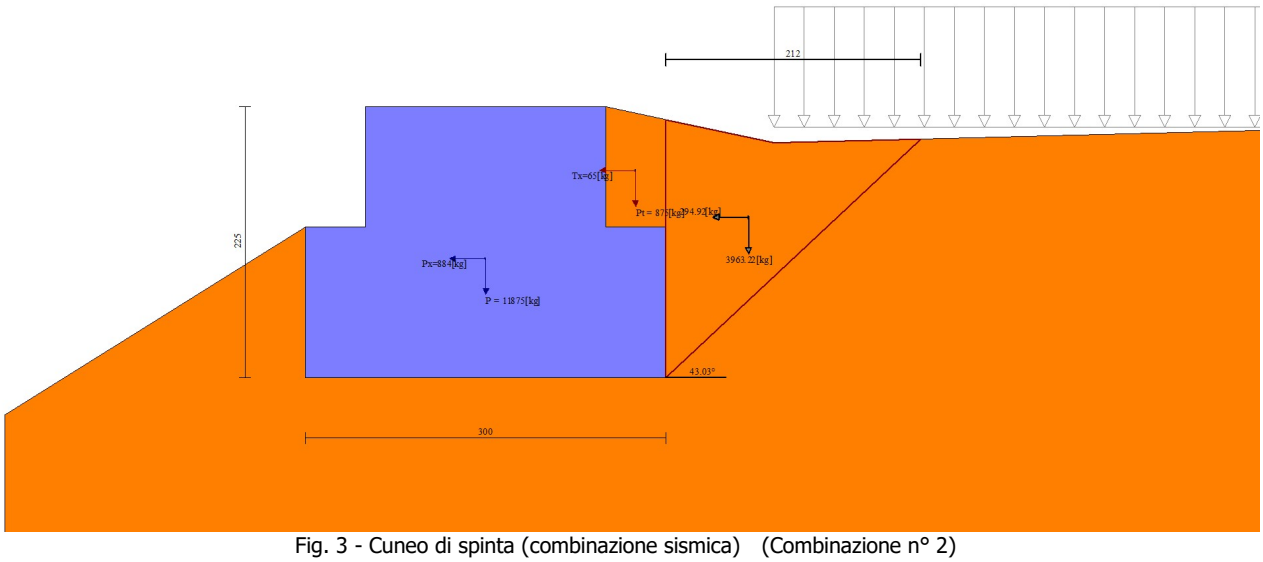

Fig. 3 - Cuneo di spinta (combinazione sismica) (Combinazione n° 2)

Fig. 4 - Diagramma delle pressioni (combinazione sismica) (Combinazione n° 2)

Sollecitazioni

Elementi calcolati a trave

Simbologia adottata

N Sforzo normale, espresso in [kg]. Positivo se di compressione.
T Taglio, espresso in [kg]. Positivo se diretto da monte verso valle
M Momento, espresso in [kgm]. Positivo se tende le fibre contro terra (a monte)

Paramento

Combinazione n° 1 - STR (A1-M1-R3)

n°	X	N	T	M
	[m]	*[kg]*	*[kg]*	*[kgm]*
1	0.00	1365	0	-341
2	-0.10	1766	4	-342
3	-0.20	2169	14	-345
4	-0.30	2574	31	-348
5	-0.40	2981	56	-351
6	-0.50	3390	87	-354
7	-0.60	3802	125	-355
8	-0.70	4215	170	-355
9	-0.80	4631	222	-351
10	-0.90	5049	281	-345
11	-1.00	5469	347	-334
12	-1.00	6355	348	-1478
13	-1.10	6969	395	-1463
14	-1.20	7593	473	-1457
15	-1.30	8226	582	-1455
16	-1.40	8869	722	-1456
17	-1.50	9519	883	-1451
18	-1.60	10172	1054	-1435
19	-1.70	10828	1236	-1406
20	-1.80	11487	1429	-1363
21	-1.90	12150	1631	-1305
22	-2.00	12816	1844	-1231

Combinazione n° 2 - STR (A1-M1-R3) H + V

n°	X	N	T	M
	[m]	[kg]	[kg]	[kgm]
1	0.00	1050	78	-263
2	-0.10	1451	112	-254
3	-0.20	1854	153	-245
4	-0.30	2260	202	-233
5	-0.40	2668	259	-219
6	-0.50	3078	324	-200
7	-0.60	3491	396	-178
8	-0.70	3906	476	-150
9	-0.80	4324	564	-116
10	-0.90	4744	659	-76
11	-1.00	5167	763	-28
12	-1.00	6053	830	-1146
13	-1.10	6671	934	-1086
14	-1.20	7297	1065	-1027
15	-1.30	7932	1222	-966
16	-1.40	8574	1405	-900
17	-1.50	9222	1606	-823
18	-1.60	9874	1818	-730
19	-1.70	10529	2041	-621
20	-1.80	11187	2274	-493
21	-1.90	11848	2517	-347
22	-2.00	12513	2770	-180

Combinazione n° 3 - STR (A1-M1-R3) H - V

n°	X	N	T	M
	[m]	[kg]	[kg]	[kgm]
1	0.00	1050	78	-263
2	-0.10	1451	111	-254
3	-0.20	1854	152	-244
4	-0.30	2259	200	-233
5	-0.40	2666	254	-218
6	-0.50	3076	316	-199
7	-0.60	3488	385	-177
8	-0.70	3902	461	-149
9	-0.80	4318	545	-115
10	-0.90	4737	635	-75
11	-1.00	5157	732	-28
12	-1.00	6043	799	-1142
13	-1.10	6659	897	-1083
14	-1.20	7283	1021	-1024
15	-1.30	7915	1171	-964
16	-1.40	8555	1345	-899
17	-1.50	9201	1538	-825
18	-1.60	9850	1741	-735
19	-1.70	10502	1953	-629
20	-1.80	11156	2175	-506
21	-1.90	11814	2407	-365
22	-2.00	12475	2649	-205

Combinazione n° 10 - SLER

n°	X	N	T	M
	[m]	[kg]	[kg]	[kgm]
1	0.00	1050	0	-263
2	-0.10	1450	3	-263
3	-0.20	1853	11	-265
4	-0.30	2256	24	-268
5	-0.40	2662	43	-270
6	-0.50	3069	67	-272
7	-0.60	3478	96	-273
8	-0.70	3888	131	-273
9	-0.80	4300	171	-270
10	-0.90	4714	216	-265
11	-1.00	5129	267	-257
12	-1.00	6015	267	-1388
13	-1.10	6625	302	-1376
14	-1.20	7243	360	-1371
15	-1.30	7868	442	-1369
16	-1.40	8500	548	-1370
17	-1.50	9137	670	-1366
18	-1.60	9777	800	-1353
19	-1.70	10420	938	-1331

n°	X	N	T	M
	[m]	*[kg]*	*[kg]*	*[kgm]*
20	-1.80	11065	1084	-1299
21	-1.90	11712	1238	-1255
22	-2.00	12362	1399	-1199

Combinazione n° 11 - SLEF

n°	X	N	T	M
	[m]	*[kg]*	*[kg]*	*[kgm]*
1	0.00	1050	0	-263
2	-0.10	1450	3	-263
3	-0.20	1853	11	-265
4	-0.30	2256	24	-268
5	-0.40	2662	43	-270
6	-0.50	3069	67	-272
7	-0.60	3478	96	-273
8	-0.70	3888	131	-273
9	-0.80	4300	171	-270
10	-0.90	4714	216	-265
11	-1.00	5129	267	-257
12	-1.00	6015	267	-1388
13	-1.10	6622	293	-1373
14	-1.20	7237	342	-1364
15	-1.30	7858	412	-1359
16	-1.40	8486	504	-1357
17	-1.50	9119	611	-1351
18	-1.60	9755	728	-1339
19	-1.70	10393	853	-1319
20	-1.80	11034	985	-1289
21	-1.90	11677	1125	-1249
22	-2.00	12322	1272	-1198

Combinazione n° 12 - SLEQ

n°	X	N	T	M
	[m]	*[kg]*	*[kg]*	*[kgm]*
1	0.00	1050	0	-263
2	-0.10	1450	3	-263
3	-0.20	1853	11	-265
4	-0.30	2256	24	-268
5	-0.40	2662	43	-270
6	-0.50	3069	67	-272
7	-0.60	3478	96	-273
8	-0.70	3888	131	-273
9	-0.80	4300	171	-270
10	-0.90	4714	216	-265
11	-1.00	5129	267	-257
12	-1.00	6015	267	-1388
13	-1.10	6623	295	-1373
14	-1.20	7235	334	-1360
15	-1.30	7850	386	-1349
16	-1.40	8469	449	-1337
17	-1.50	9091	520	-1322
18	-1.60	9714	598	-1302
19	-1.70	10340	680	-1277
20	-1.80	10967	769	-1246
21	-1.90	11596	864	-1209
22	-2.00	12226	964	-1165

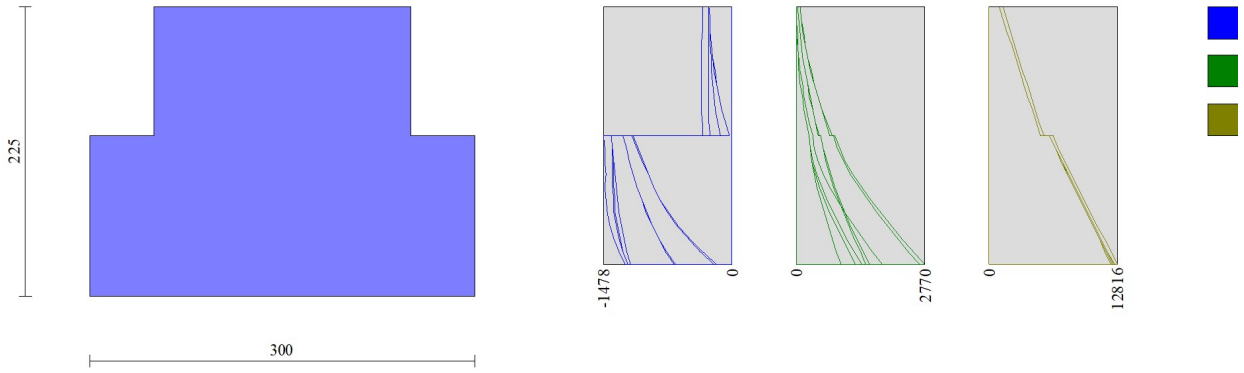

Fig. 5 - Paramento (Inviluppo)

Verifiche strutturali

Paramento in pietrame

Simbologia adottata

n°	indice sezione
Y	ordinata sezione espressa in [m]
As	area sezione reagente espresso in [cmq]
e	eccentricità espresso in [cm]
σ	tensione espressa in [kg/cmq]
Rt	resistenza ai carichi orizzontali espressa in [kg]
Et	Azione orizzontale espressa in [kg]
FSsco	fattore di sicurezza allo scorrimento (Rt/Et)
Ms	momento stabilizzante espresso in [kgm]
Mr	momento ribaltante espresso in [kgm]
FSrib	fattore di sicurezza a ribaltamento (Ms/Mr)

Combinazione n° 1 - STR (A1-M1-R3)

n°	Y	As	e	σ	Rt	Et	FSsco	Ms	Mr	FSrib
	[m]	*[cmq]*	*[cm]*	*[kg/cmq]*	*[kg]*	*[kg]*		*[kgm]*	*[kgm]*	
1	0.00	20000	-25.00	0.12	1365.00	0.00	100.000	1023.75	0.00	100.000
2	-0.10	20000	-19.38	0.14	1765.69	3.51	503.755	1425.54	0.12	12213.448
3	-0.20	20000	-15.89	0.16	2168.57	14.02	154.674	1831.70	0.93	1961.661
4	-0.30	20000	-13.52	0.18	2573.62	31.46	81.808	2242.18	3.15	712.134
5	-0.40	20000	-11.78	0.20	2980.79	55.74	53.481	2656.93	7.45	356.779
6	-0.50	20000	-10.44	0.22	3390.11	86.89	39.015	3075.98	14.51	211.938
7	-0.60	20000	-9.34	0.24	3801.60	124.97	30.420	3499.34	25.04	139.758
8	-0.70	20000	-8.41	0.26	4215.24	169.97	24.799	3927.03	39.71	98.884
9	-0.80	20000	-7.58	0.28	4631.04	221.90	20.870	4359.03	59.23	73.595
10	-0.90	20000	-6.82	0.30	5049.01	280.75	17.984	4795.36	84.28	56.898
11	-1.00	20000	-6.10	0.32	5469.13	346.53	15.783	5236.01	115.55	45.312
12	-1.00	30000	-23.26	0.31	6354.89	347.53	18.286	10389.71	116.25	89.375
13	-1.10	30000	-20.99	0.33	6968.99	394.63	17.660	11325.55	153.06	73.994
14	-1.20	30000	-19.19	0.35	7592.84	473.01	16.052	12285.79	196.14	62.639
15	-1.30	30000	-17.69	0.37	8226.34	582.28	14.128	13270.14	248.60	53.380
16	-1.40	30000	-16.41	0.39	8869.36	722.06	12.283	14278.28	313.49	45.546
17	-1.50	30000	-15.24	0.41	9518.83	882.54	10.786	15302.57	393.55	38.883
18	-1.60	30000	-14.10	0.43	10171.79	1054.16	9.649	16335.55	490.20	33.324
19	-1.70	30000	-12.98	0.45	10828.06	1236.41	8.758	17376.82	604.53	28.745
20	-1.80	30000	-11.86	0.47	11487.50	1428.83	8.040	18426.03	737.57	24.982
21	-1.90	30000	-10.74	0.49	12150.11	1631.39	7.448	19483.15	890.34	21.883
22	-2.00	30000	-9.60	0.51	3999.07	1844.12	2.169	20548.19	1063.86	19.315

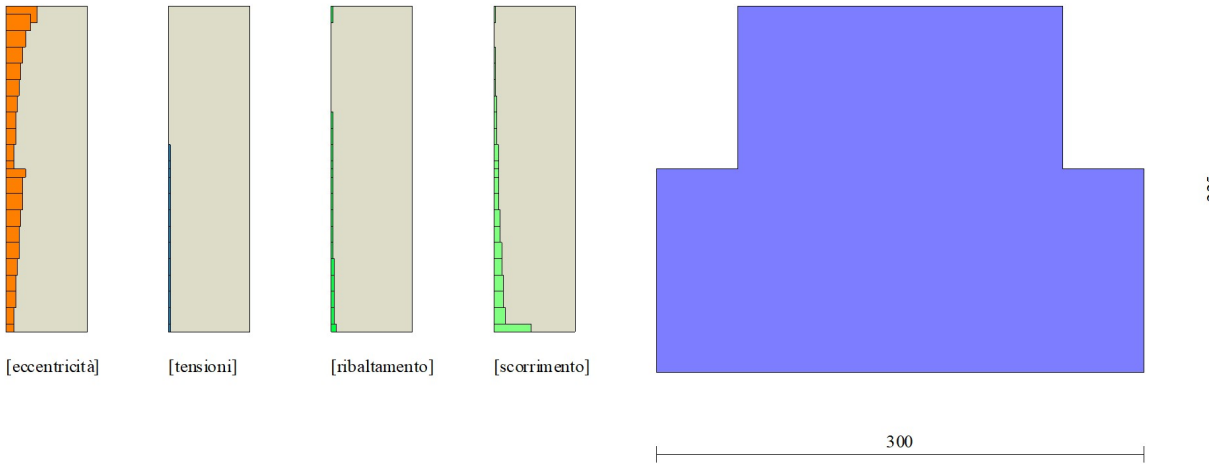

Fig. 6 - Verifiche paramento pietrame (Combinazione n° 1)

Combinazione n° 2 - STR (A1-M1-R3) H + V

n°	Y	As	e	σ	Rt	Et	FSsco	Ms	Mr	FSrib
	[m]	*[cmq]*	*[cm]*	*[kg/cmq]*	*[kg]*	*[kg]*		*[kgm]*	*[kgm]*	
1	0.00	20000	-25.00	0.09	1050.00	78.14	13.438	787.50	0.00	100.000
2	-0.10	20000	-17.53	0.11	1450.82	111.77	12.980	1189.54	9.42	126.264
3	-0.20	20000	-13.20	0.13	1854.07	153.22	12.101	1596.44	22.59	70.663
4	-0.30	20000	-10.32	0.15	2259.74	202.40	11.165	2008.18	40.29	49.841
5	-0.40	20000	-8.19	0.17	2667.80	259.26	10.290	2424.70	63.29	38.312
6	-0.50	20000	-6.51	0.18	3078.27	323.82	9.506	2846.04	92.35	30.819
7	-0.60	20000	-5.09	0.20	3491.15	396.12	8.813	3272.20	128.24	25.515
8	-0.70	20000	-3.84	0.22	3906.45	476.15	8.204	3703.19	171.75	21.562
9	-0.80	20000	-2.69	0.23	4324.16	563.93	7.668	4139.01	223.64	18.508
10	-0.90	20000	-1.60	0.25	4744.28	659.45	7.194	4579.66	284.68	16.087
11	-1.00	20000	-0.54	0.26	5166.82	762.70	6.774	5025.15	355.65	14.129
12	-1.00	30000	-18.94	0.28	6052.66	829.83	7.294	10027.87	388.11	25.838
13	-1.10	30000	-16.29	0.29	6670.71	934.20	7.141	10973.60	476.00	23.054
14	-1.20	30000	-14.08	0.31	7297.02	1065.07	6.851	11939.99	575.64	20.742
15	-1.30	30000	-12.18	0.33	7931.51	1222.13	6.490	12926.82	689.67	18.743
16	-1.40	30000	-10.49	0.35	8574.09	1405.09	6.102	13933.85	820.69	16.978
17	-1.50	30000	-8.92	0.36	9222.37	1606.34	5.741	14955.15	971.02	15.402
18	-1.60	30000	-7.39	0.38	9874.05	1818.49	5.430	15984.95	1142.00	13.997
19	-1.70	30000	-5.89	0.39	10529.01	2041.15	5.158	17022.95	1334.70	12.754
20	-1.80	30000	-4.41	0.41	11187.14	2273.97	4.920	18068.88	1550.16	11.656
21	-1.90	30000	-2.93	0.42	11848.44	2516.95	4.707	19122.74	1789.38	10.687
22	-2.00	30000	-1.44	0.43	3904.53	2770.10	1.410	20184.52	2053.38	9.830

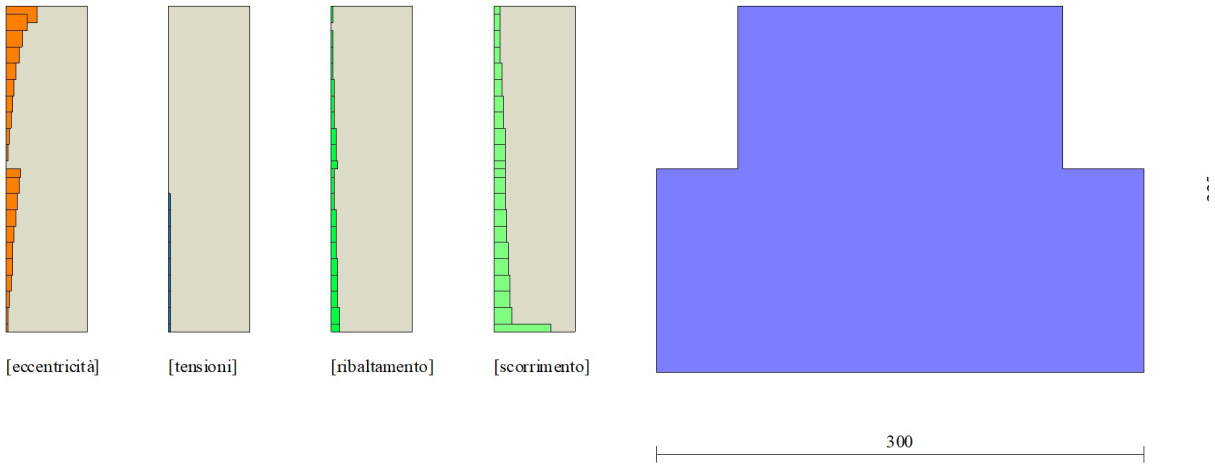

Fig. 7 - Verifiche paramento pietrame (Combinazione n° 2)

Combinazione n° 3 - STR (A1-M1-R3) H - V

n°	Y	As	e	σ	Rt	Et	FSsco	Ms	Mr	FSrib
	[m]	*[cmq]*	*[cm]*	*[kg/cmq]*	*[kg]*	*[kg]*		*[kgm]*	*[kgm]*	
1	0.00	20000	-25.00	0.09	1050.00	78.14	13.438	787.50	0.00	100.000
2	-0.10	20000	-17.52	0.11	1450.72	111.47	13.014	1189.35	9.41	126.379
3	-0.20	20000	-13.19	0.13	1853.69	152.01	12.195	1595.69	22.51	70.883
4	-0.30	20000	-10.30	0.15	2258.89	199.67	11.313	2006.48	40.02	50.138
5	-0.40	20000	-8.17	0.17	2666.29	254.40	10.481	2421.67	62.64	38.659
6	-0.50	20000	-6.48	0.18	3075.90	316.23	9.727	2841.30	91.09	31.194
7	-0.60	20000	-5.06	0.20	3487.74	385.20	9.054	3265.38	126.06	25.903
8	-0.70	20000	-3.81	0.22	3901.81	461.29	8.458	3693.92	168.29	21.950
9	-0.80	20000	-2.67	0.23	4318.10	544.52	7.930	4126.90	218.47	18.890
10	-0.90	20000	-1.59	0.25	4736.62	634.88	7.461	4564.33	277.32	16.459
11	-1.00	20000	-0.55	0.26	5157.36	732.37	7.042	5006.22	345.55	14.488
12	-1.00	30000	-18.90	0.28	6043.15	799.38	7.560	10004.12	377.95	26.470
13	-1.10	30000	-16.26	0.29	6659.21	897.37	7.421	10944.86	462.48	23.665
14	-1.20	30000	-14.06	0.31	7283.35	1021.25	7.132	11905.81	558.10	21.333
15	-1.30	30000	-12.18	0.33	7915.47	1170.72	6.761	12886.71	667.38	19.309
16	-1.40	30000	-10.51	0.35	8555.48	1345.47	6.359	13887.34	792.85	17.516
17	-1.50	30000	-8.96	0.36	9201.02	1537.92	5.983	14901.77	936.79	15.907
18	-1.60	30000	-7.46	0.38	9849.76	1740.65	5.659	15924.23	1100.47	14.470
19	-1.70	30000	-5.99	0.39	10501.59	1953.29	5.376	16954.41	1284.90	13.195
20	-1.80	30000	-4.54	0.41	11156.41	2175.49	5.128	17992.05	1491.06	12.067
21	-1.90	30000	-3.09	0.42	11814.20	2407.23	4.908	19037.14	1719.89	11.069
22	-2.00	30000	-1.64	0.43	3892.69	2648.54	1.470	20089.69	1972.34	10.186

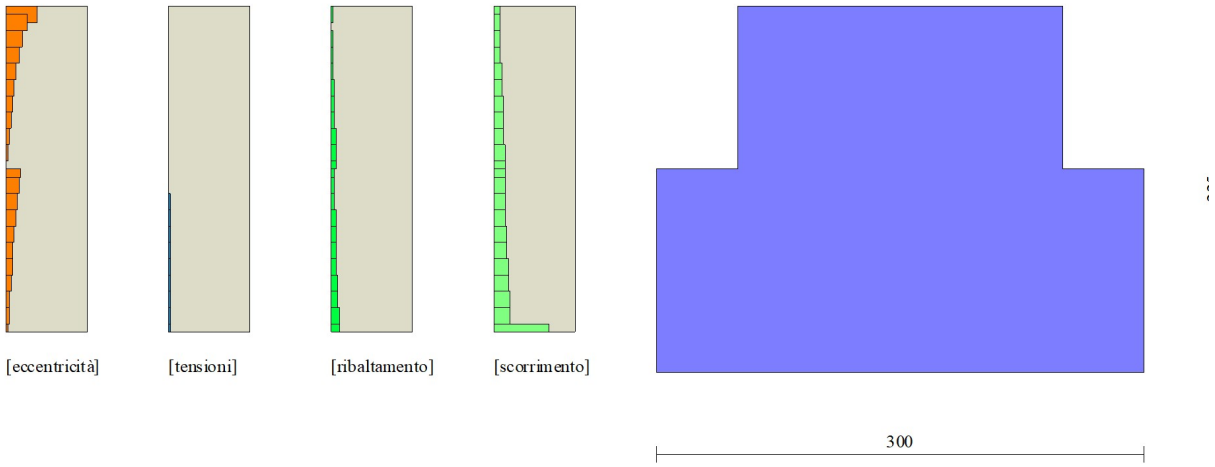

Fig. 8 - Verifiche paramento pietrame (Combinazione n° 3)

Combinazione n° 7 - EQU (A1-M1-R3)

n°	Y	As	e	σ	Rt	Et	FSsco	Ms	Mr	FSrib
	[m]	*[cmq]*	*[cm]*	*[kg/cmq]*	*[kg]*	*[kg]*		*[kgm]*	*[kgm]*	
1	0.00	20000	-25.00	0.12	1365.00	0.00	100.000	1023.75	0.00	100.000
2	-0.10	20000	-19.38	0.14	1765.69	3.51	503.755	1425.54	0.12	12213.448
3	-0.20	20000	-15.89	0.16	2168.57	14.02	154.674	1831.70	0.93	1961.661
4	-0.30	20000	-13.52	0.18	2573.62	31.46	81.808	2242.18	3.15	712.134
5	-0.40	20000	-11.78	0.20	2980.79	55.74	53.481	2656.93	7.45	356.779
6	-0.50	20000	-10.44	0.22	3390.11	86.89	39.015	3075.98	14.51	211.938
7	-0.60	20000	-9.34	0.24	3801.60	124.97	30.420	3499.34	25.04	139.758
8	-0.70	20000	-8.41	0.26	4215.24	169.97	24.799	3927.03	39.71	98.884
9	-0.80	20000	-7.58	0.28	4631.04	221.90	20.870	4359.03	59.23	73.595
10	-0.90	20000	-6.82	0.30	5049.01	280.75	17.984	4795.36	84.28	56.898
11	-1.00	20000	-6.10	0.32	5469.13	346.53	15.783	5236.01	115.55	45.312
12	-1.00	30000	-23.26	0.31	6354.89	347.53	18.286	10389.71	116.25	89.375
13	-1.10	30000	-20.99	0.33	6968.99	394.63	17.660	11325.55	153.06	73.994
14	-1.20	30000	-19.19	0.35	7592.84	473.01	16.052	12285.79	196.14	62.639
15	-1.30	30000	-17.69	0.37	8226.34	582.28	14.128	13270.14	248.60	53.380
16	-1.40	30000	-16.41	0.39	8869.36	722.06	12.283	14278.28	313.49	45.546
17	-1.50	30000	-15.24	0.41	9518.83	882.54	10.786	15302.57	393.55	38.883
18	-1.60	30000	-14.10	0.43	10171.79	1054.16	9.649	16335.55	490.20	33.324
19	-1.70	30000	-12.98	0.45	10828.06	1236.41	8.758	17376.82	604.53	28.745
20	-1.80	30000	-11.86	0.47	11487.50	1428.83	8.040	18426.03	737.57	24.982
21	-1.90	30000	-10.74	0.49	12150.11	1631.39	7.448	19483.15	890.34	21.883
22	-2.00	30000	-9.60	0.51	3999.07	1844.12	2.169	20548.19	1063.86	19.315

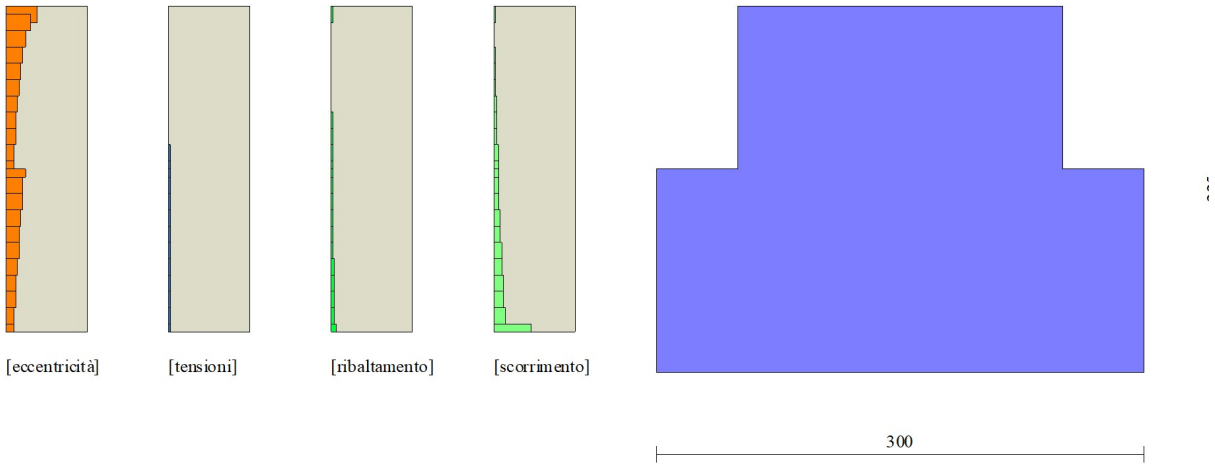

Fig. 9 - Verifiche paramento pietrame (Combinazione n° 7)

Combinazione n° 8 - EQU (A1-M1-R3) H + V

n°	Y	As	e	σ	Rt	Et	FSsco	Ms	Mr	FSrib
	[m]	*[cmq]*	*[cm]*	*[kg/cmq]*	*[kg]*	*[kg]*		*[kgm]*	*[kgm]*	
1	0.00	20000	-25.00	0.09	1050.00	117.20	8.959	787.50	0.00	100.000
2	-0.10	20000	-17.22	0.11	1451.03	166.39	8.720	1189.96	14.09	84.458
3	-0.20	20000	-12.65	0.13	1854.92	224.76	8.253	1598.15	33.55	47.634
4	-0.30	20000	-9.55	0.15	2261.66	292.23	7.739	2012.02	59.30	33.930
5	-0.40	20000	-7.23	0.16	2671.21	368.74	7.244	2431.53	92.24	26.361
6	-0.50	20000	-5.35	0.18	3083.60	454.32	6.787	2856.70	133.27	21.435
7	-0.60	20000	-3.73	0.19	3498.83	549.00	6.373	3287.56	183.31	17.934
8	-0.70	20000	-2.27	0.21	3916.90	652.80	6.000	3724.10	243.27	15.309
9	-0.80	20000	-0.91	0.22	4337.81	765.70	5.665	4166.32	314.05	13.267
10	-0.90	20000	0.40	0.24	4761.56	887.70	5.364	4614.22	396.56	11.636
11	-1.00	20000	1.68	0.27	5188.16	1018.81	5.092	5067.81	491.71	10.306
12	-1.00	30000	-16.90	0.27	6074.07	1119.16	5.427	10081.42	540.14	18.664
13	-1.10	30000	-14.08	0.29	6696.61	1260.22	5.314	11038.36	658.76	16.756
14	-1.20	30000	-11.68	0.30	7327.84	1429.14	5.127	12017.04	792.86	15.157
15	-1.30	30000	-9.60	0.32	7967.68	1625.62	4.901	13017.23	945.22	13.772
16	-1.40	30000	-7.71	0.33	8616.02	1849.37	4.659	14038.67	1118.57	12.551
17	-1.50	30000	-5.94	0.35	9270.49	2092.78	4.430	15075.47	1315.38	11.461
18	-1.60	30000	-4.20	0.36	9928.79	2348.44	4.228	16121.82	1537.11	10.488
19	-1.70	30000	-2.48	0.37	10590.80	2616.00	4.048	17177.44	1784.99	9.623
20	-1.80	30000	-0.77	0.38	11256.41	2895.08	3.888	18242.06	2060.17	8.855
21	-1.90	30000	0.94	0.40	11925.61	3185.68	3.744	19315.67	2363.81	8.171
22	-2.00	30000	2.66	0.44	3931.21	3487.82	1.127	20398.27	2697.06	7.563

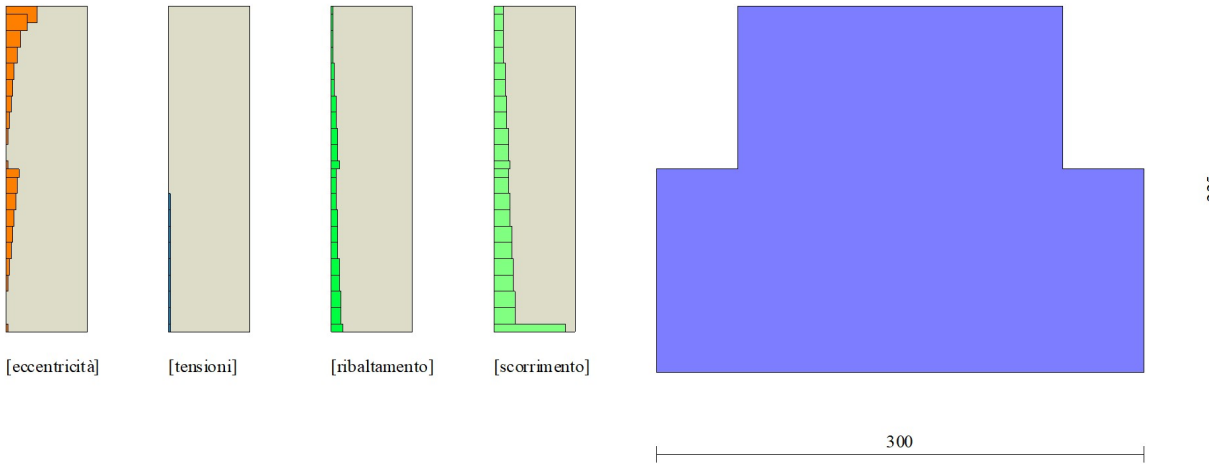

Fig. 10 - Verifiche paramento pietrame (Combinazione n° 8)

Combinazione n° 9 - EQU (A1-M1-R3) H - V

n°	Y	As	e	σ	Rt	Et	FSsco	Ms	Mr	FSrib
	[m]	*[cmq]*	*[cm]*	*[kg/cmq]*	*[kg]*	*[kg]*		*[kgm]*	*[kgm]*	
1	0.00	20000	-25.00	0.09	1050.00	117.20	8.959	787.50	0.00	100.000
2	-0.10	20000	-17.21	0.11	1450.90	165.97	8.742	1189.70	14.08	84.525
3	-0.20	20000	-12.63	0.13	1854.39	223.06	8.314	1597.09	33.44	47.763
4	-0.30	20000	-9.52	0.15	2260.47	288.40	7.838	2009.63	58.92	34.110
5	-0.40	20000	-7.19	0.16	2669.09	361.94	7.374	2427.29	91.33	26.576
6	-0.50	20000	-5.30	0.18	3080.29	443.70	6.942	2850.07	131.51	21.673
7	-0.60	20000	-3.68	0.19	3494.06	533.71	6.547	3278.01	180.26	18.185
8	-0.70	20000	-2.23	0.21	3910.40	631.98	6.188	3711.11	238.42	15.566
9	-0.80	20000	-0.88	0.22	4329.33	738.51	5.862	4149.35	306.80	13.524
10	-0.90	20000	0.41	0.24	4750.82	853.29	5.568	4592.75	386.25	11.891
11	-1.00	20000	1.67	0.27	5174.90	976.33	5.300	5041.30	477.57	10.556
12	-1.00	30000	-16.84	0.27	6060.76	1076.51	5.630	10048.14	525.91	19.106
13	-1.10	30000	-14.03	0.29	6680.51	1208.63	5.527	10998.12	639.83	17.189
14	-1.20	30000	-11.66	0.30	7308.69	1367.76	5.344	11969.16	768.29	15.579
15	-1.30	30000	-9.59	0.32	7945.21	1553.61	5.114	12961.05	914.00	14.181
16	-1.40	30000	-7.74	0.33	8589.96	1765.87	4.864	13973.54	1079.59	12.943
17	-1.50	30000	-5.99	0.34	9240.59	1996.94	4.627	15000.70	1267.44	11.835
18	-1.60	30000	-4.29	0.36	9894.77	2239.42	4.418	16036.77	1478.95	10.843
19	-1.70	30000	-2.61	0.37	10552.40	2492.94	4.233	17081.44	1715.25	9.959
20	-1.80	30000	-0.94	0.38	11213.37	2757.13	4.067	18134.45	1977.40	9.171
21	-1.90	30000	0.73	0.40	11877.66	3032.00	3.917	19195.78	2266.48	8.469
22	-2.00	30000	2.40	0.44	3914.63	3317.55	1.180	20265.44	2583.55	7.844

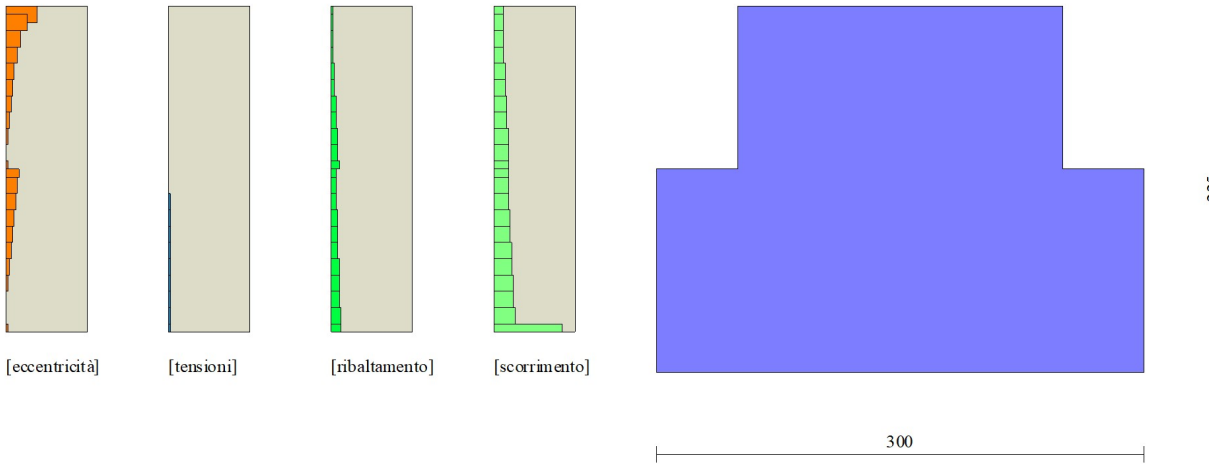

Fig. 11 - Verifiche paramento pietrame (Combinazione n° 9)

Combinazione n° 10 - SLER

n°	Y	As	e	σ	Rt	Et	FSsco	Ms	Mr	FSrib
	[m]	*[cmq]*	*[cm]*	*[kg/cmq]*	*[kg]*	*[kg]*		*[kgm]*	*[kgm]*	
1	0.00	20000	-25.00	0.09	1050.00	0.00	100.000	787.50	0.00	100.000
2	-0.10	20000	-18.15	0.11	1450.44	2.70	537.957	1188.78	0.09	13240.533
3	-0.20	20000	-14.31	0.13	1852.57	10.78	171.775	1593.43	0.72	2218.432
4	-0.30	20000	-11.86	0.15	2256.35	24.20	93.239	2001.40	2.42	826.359
5	-0.40	20000	-10.15	0.17	2661.78	42.87	62.084	2412.66	5.73	421.170
6	-0.50	20000	-8.87	0.19	3068.86	66.84	45.914	2827.21	11.16	253.237
7	-0.60	20000	-7.86	0.21	3477.60	96.13	36.175	3245.09	19.26	168.485
8	-0.70	20000	-7.02	0.24	3888.00	130.75	29.736	3666.30	30.55	120.014
9	-0.80	20000	-6.28	0.26	4300.06	170.69	25.192	4090.83	45.56	89.787
10	-0.90	20000	-5.62	0.28	4713.79	215.96	21.827	4518.68	64.83	69.700
11	-1.00	20000	-5.01	0.29	5129.18	266.56	19.242	4949.85	88.89	55.686
12	-1.00	30000	-23.08	0.29	6014.86	267.31	22.501	9933.38	89.42	111.084
13	-1.10	30000	-20.77	0.31	6624.99	301.70	21.959	10859.30	117.64	92.306
14	-1.20	30000	-18.93	0.33	7242.63	360.17	20.109	11804.01	150.50	78.430
15	-1.30	30000	-17.40	0.35	7867.70	442.41	17.784	12767.27	190.40	67.056
16	-1.40	30000	-16.11	0.37	8500.09	548.14	15.507	13748.85	239.68	57.363
17	-1.50	30000	-14.95	0.40	9137.44	669.76	13.643	14742.83	300.44	49.070
18	-1.60	30000	-13.84	0.42	9777.43	799.85	12.224	15743.41	373.78	42.119
19	-1.70	30000	-12.78	0.44	10419.95	938.05	11.108	16750.32	460.52	36.372
20	-1.80	30000	-11.74	0.46	11064.90	1083.99	10.208	17763.27	561.46	31.638
21	-1.90	30000	-10.71	0.47	11712.25	1237.68	9.463	18782.27	677.36	27.729
22	-2.00	30000	-9.70	0.49	3857.44	1399.12	2.757	19807.30	809.01	24.483

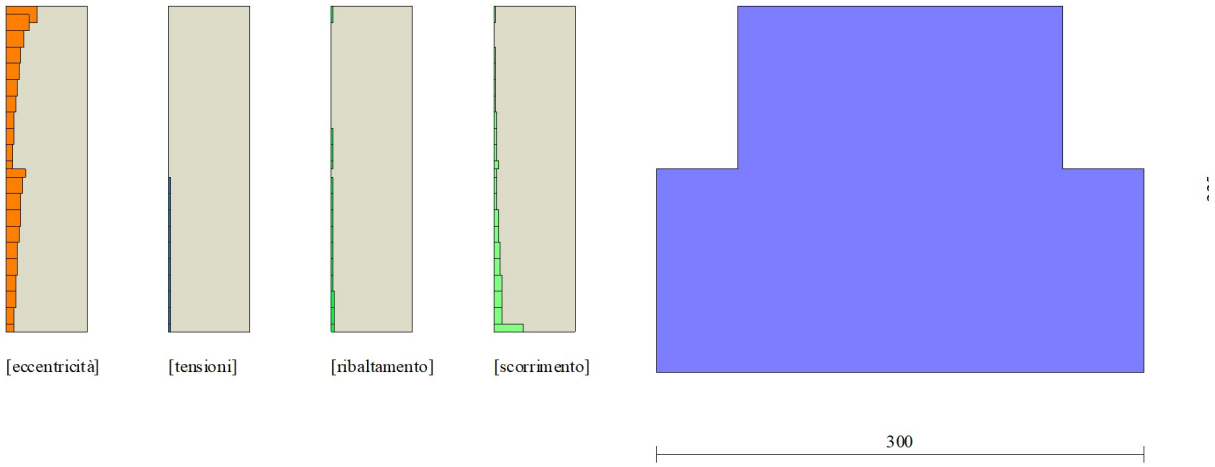

Fig. 12 - Verifiche paramento pietrame (Combinazione n° 10)

Combinazione n° 11 - SLEF

n°	Y	As	e	σ	Rt	Et	FSsco	Ms	Mr	FSrib
	[m]	*[cmq]*	*[cm]*	*[kg/cmq]*	*[kg]*	*[kg]*		*[kgm]*	*[kgm]*	
1	0.00	20000	-25.00	0.09	1050.00	0.00	100.000	787.50	0.00	100.000
2	-0.10	20000	-18.15	0.11	1450.44	2.70	537.957	1188.78	0.09	13240.533
3	-0.20	20000	-14.31	0.13	1852.57	10.78	171.775	1593.43	0.72	2218.432
4	-0.30	20000	-11.86	0.15	2256.35	24.20	93.239	2001.40	2.42	826.359
5	-0.40	20000	-10.15	0.17	2661.78	42.87	62.084	2412.66	5.73	421.170
6	-0.50	20000	-8.87	0.19	3068.86	66.84	45.914	2827.21	11.16	253.237
7	-0.60	20000	-7.86	0.21	3477.60	96.13	36.175	3245.09	19.26	168.485
8	-0.70	20000	-7.02	0.24	3888.00	130.75	29.736	3666.30	30.55	120.014
9	-0.80	20000	-6.28	0.26	4300.06	170.69	25.192	4090.83	45.56	89.787
10	-0.90	20000	-5.62	0.28	4713.79	215.96	21.827	4518.68	64.83	69.700
11	-1.00	20000	-5.01	0.29	5129.18	266.56	19.242	4949.85	88.89	55.686
12	-1.00	30000	-23.08	0.29	6014.84	267.24	22.507	9933.32	89.42	111.083
13	-1.10	30000	-20.73	0.31	6622.36	293.26	22.582	10852.72	117.23	92.573
14	-1.20	30000	-18.84	0.33	7236.81	341.50	21.191	11789.45	148.76	79.254
15	-1.30	30000	-17.30	0.35	7858.11	411.68	19.088	12743.30	186.20	68.440
16	-1.40	30000	-15.99	0.37	8486.16	503.52	16.854	13714.04	231.73	59.181
17	-1.50	30000	-14.82	0.39	9119.06	610.86	14.928	14696.88	287.31	51.153
18	-1.60	30000	-13.73	0.41	9754.91	727.68	13.405	15687.11	354.10	44.302
19	-1.70	30000	-12.69	0.43	10393.39	852.90	12.186	16683.90	432.99	38.532
20	-1.80	30000	-11.68	0.45	11034.14	985.43	11.197	17686.38	524.75	33.704
21	-1.90	30000	-10.70	0.47	11677.18	1125.28	10.377	18694.58	630.12	29.668
22	-2.00	30000	-9.73	0.49	3845.11	1272.44	3.022	19708.48	749.82	26.284

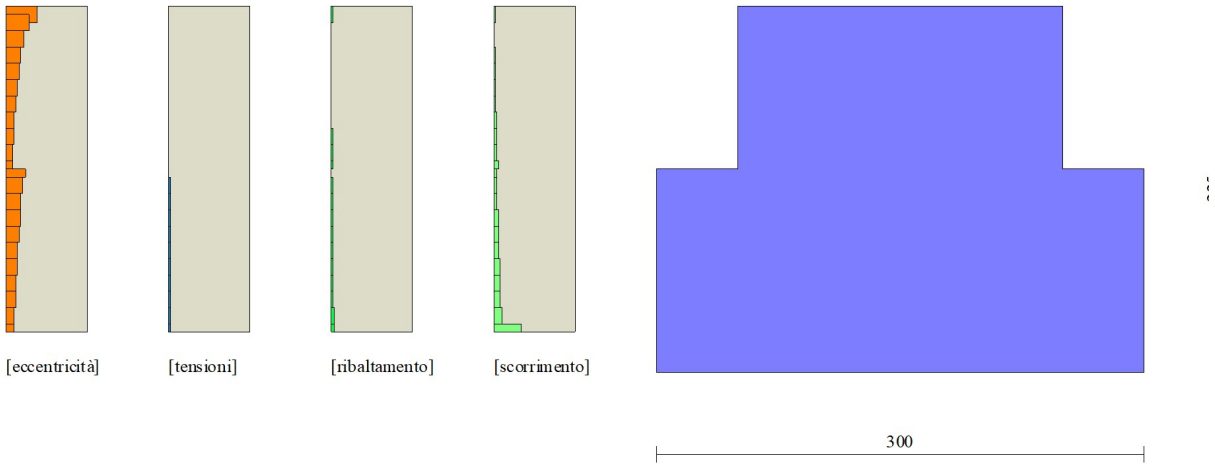

Fig. 13 - Verifiche paramento pietrame (Combinazione n° 11)

Combinazione n° 12 - SLEQ

n°	Y	As	e	σ	Rt	Et	FSsco	Ms	Mr	FSrib
	[m]	*[cmq]*	*[cm]*	*[kg/cmq]*	*[kg]*	*[kg]*		*[kgm]*	*[kgm]*	
1	0.00	20000	-25.00	0.09	1050.00	0.00	100.000	787.50	0.00	100.000
2	-0.10	20000	-18.15	0.11	1450.44	2.70	537.957	1188.78	0.09	13240.533
3	-0.20	20000	-14.31	0.13	1852.57	10.78	171.775	1593.43	0.72	2218.432
4	-0.30	20000	-11.86	0.15	2256.35	24.20	93.239	2001.40	2.42	826.359
5	-0.40	20000	-10.15	0.17	2661.78	42.87	62.084	2412.66	5.73	421.170
6	-0.50	20000	-8.87	0.19	3068.86	66.84	45.914	2827.21	11.16	253.237
7	-0.60	20000	-7.86	0.21	3477.60	96.13	36.175	3245.09	19.26	168.485
8	-0.70	20000	-7.02	0.24	3888.00	130.75	29.736	3666.30	30.55	120.014
9	-0.80	20000	-6.28	0.26	4300.06	170.69	25.192	4090.83	45.56	89.787
10	-0.90	20000	-5.62	0.28	4713.79	215.96	21.827	4518.68	64.83	69.700
11	-1.00	20000	-5.01	0.29	5129.18	266.56	19.242	4949.85	88.89	55.686
12	-1.00	30000	-23.08	0.29	6014.86	267.31	22.502	9933.37	89.42	111.084
13	-1.10	30000	-20.74	0.31	6622.83	294.78	22.467	10853.90	117.40	92.454
14	-1.20	30000	-18.80	0.33	7234.56	334.28	21.642	11783.82	148.72	79.235
15	-1.30	30000	-17.18	0.35	7849.99	385.67	20.354	12723.01	184.58	68.928
16	-1.40	30000	-15.78	0.37	8469.09	448.80	18.871	13671.36	226.17	60.448
17	-1.50	30000	-14.54	0.39	9090.85	520.47	17.467	14626.37	274.54	53.276
18	-1.60	30000	-13.40	0.41	9714.31	597.57	16.256	15585.61	330.34	47.181
19	-1.70	30000	-12.35	0.43	10339.54	680.34	15.198	16549.28	394.12	41.990
20	-1.80	30000	-11.36	0.45	10966.61	769.03	14.260	17517.57	466.47	37.554
21	-1.90	30000	-10.43	0.47	11595.53	863.63	13.427	18490.46	547.97	33.744
22	-2.00	30000	-9.53	0.49	3815.09	964.14	3.957	19467.97	639.22	30.456

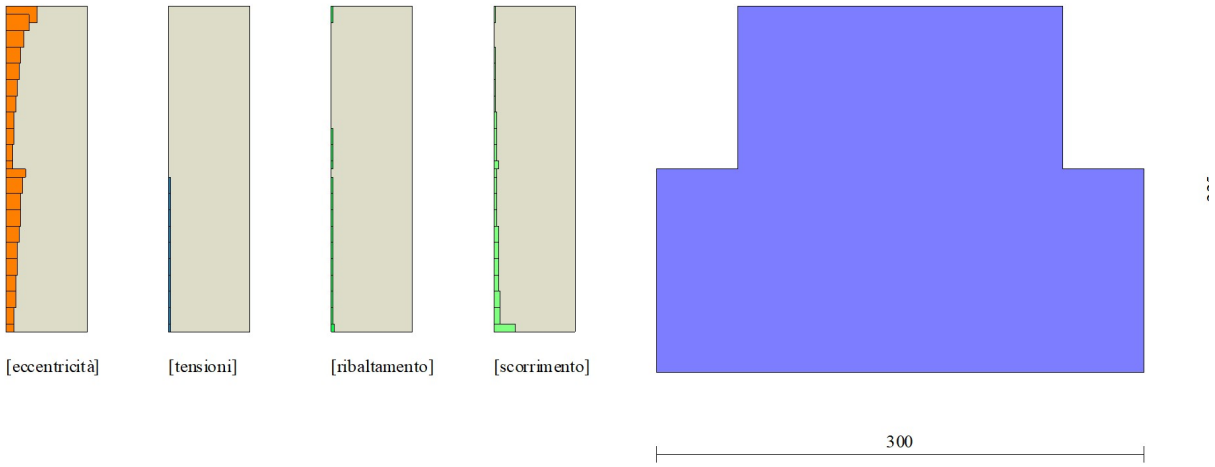

Fig. 14 - Verifiche paramento pietrame (Combinazione n° 12)

Combinazione n° 13 - SLEQ H + V

n°	Y	As	e	σ	Rt	Et	FSsco	Ms	Mr	FSrib
	[m]	*[cmq]*	*[cm]*	*[kg/cmq]*	*[kg]*	*[kg]*		*[kgm]*	*[kgm]*	
1	0.00	20000	-25.00	0.09	1050.00	40.75	25.767	787.50	0.00	100.000
2	-0.10	20000	-17.82	0.11	1450.55	59.30	24.462	1189.00	4.95	240.358
3	-0.20	20000	-13.72	0.13	1853.00	83.93	22.078	1594.29	12.05	132.301
4	-0.30	20000	-11.04	0.15	2257.32	114.58	19.701	2003.34	21.92	91.408
5	-0.40	20000	-9.10	0.17	2663.50	151.18	17.619	2416.10	35.14	68.754
6	-0.50	20000	-7.61	0.19	3071.55	193.75	15.853	2832.60	52.32	54.139
7	-0.60	20000	-6.39	0.21	3481.47	242.35	14.365	3252.84	74.05	43.925
8	-0.70	20000	-5.33	0.23	3893.27	296.96	13.110	3676.85	100.94	36.425
9	-0.80	20000	-4.39	0.24	4306.95	357.59	12.044	4104.61	133.59	30.726
10	-0.90	20000	-3.52	0.26	4722.51	424.23	11.132	4536.12	172.59	26.283
11	-1.00	20000	-2.68	0.28	5139.94	496.89	10.344	4971.38	218.55	22.747
12	-1.00	30000	-20.88	0.28	6025.66	532.14	11.324	9960.39	235.67	42.264
13	-1.10	30000	-18.36	0.30	6635.90	590.13	11.245	10886.59	291.62	37.331
14	-1.20	30000	-16.25	0.32	7250.11	660.85	10.971	11822.71	354.00	33.397
15	-1.30	30000	-14.44	0.34	7868.24	744.14	10.574	12768.63	424.08	30.109
16	-1.40	30000	-12.85	0.36	8490.25	839.85	10.109	13724.26	503.10	27.280
17	-1.50	30000	-11.42	0.37	9115.14	944.81	9.648	14687.08	592.19	24.801
18	-1.60	30000	-10.08	0.39	9741.94	1055.88	9.226	15654.68	692.07	22.620
19	-1.70	30000	-8.82	0.41	10370.73	1173.31	8.839	16627.25	803.37	20.697
20	-1.80	30000	-7.62	0.42	11001.57	1297.35	8.480	17604.96	926.72	18.997
21	-1.90	30000	-6.47	0.44	11634.48	1427.99	8.147	18587.82	1062.79	17.490
22	-2.00	30000	-5.35	0.45	3828.55	1565.23	2.446	19575.84	1212.25	16.148

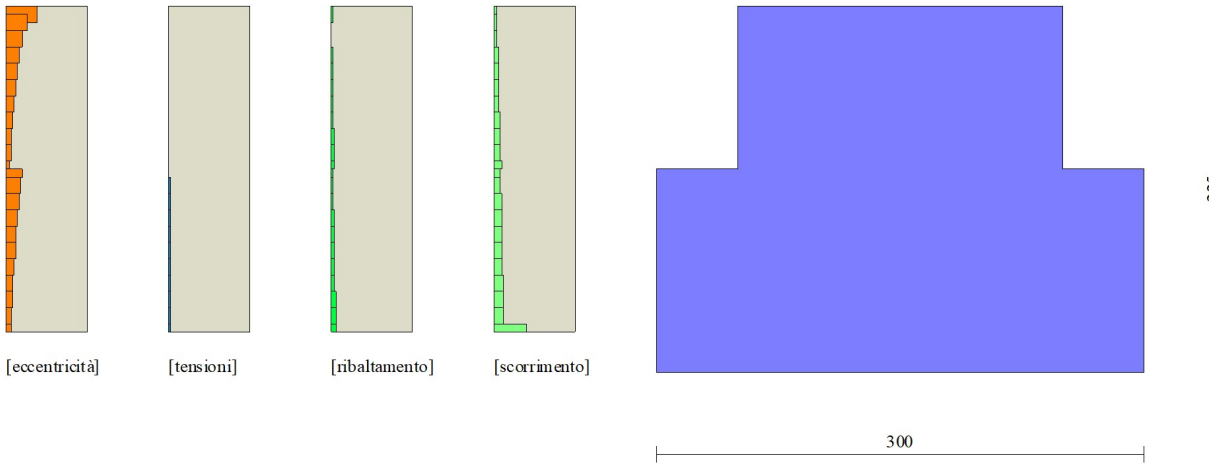

Fig. 15 - Verifiche paramento pietrame (Combinazione n° 13)

Combinazione n° 14 - SLEQ H - V

n°	Y	As	e	σ	Rt	Et	FSsco	Ms	Mr	FSrib
	[m]	*[cmq]*	*[cm]*	*[kg/cmq]*	*[kg]*	*[kg]*		*[kgm]*	*[kgm]*	
1	0.00	20000	-25.00	0.09	1050.00	40.75	25.767	787.50	0.00	100.000
2	-0.10	20000	-17.82	0.11	1450.50	59.15	24.521	1188.91	4.94	240.574
3	-0.20	20000	-13.71	0.13	1852.82	83.35	22.229	1593.93	12.01	132.696
4	-0.30	20000	-11.03	0.15	2256.91	113.28	19.924	2002.53	21.79	91.917
5	-0.40	20000	-9.09	0.17	2662.78	148.86	17.888	2414.66	34.83	69.321
6	-0.50	20000	-7.60	0.19	3070.42	190.14	16.148	2830.34	51.72	54.726
7	-0.60	20000	-6.37	0.21	3479.85	237.14	14.674	3249.59	73.01	44.507
8	-0.70	20000	-5.32	0.23	3891.06	289.87	13.423	3672.42	99.29	36.987
9	-0.80	20000	-4.38	0.24	4304.06	348.33	12.356	4098.83	131.12	31.260
10	-0.90	20000	-3.52	0.26	4718.85	412.51	11.439	4528.80	169.08	26.786
11	-1.00	20000	-2.69	0.28	5135.43	482.42	10.645	4962.36	213.73	23.218
12	-1.00	30000	-20.87	0.28	6021.13	517.61	11.633	9949.06	230.83	43.102
13	-1.10	30000	-18.35	0.30	6630.42	572.56	11.580	10872.88	285.18	38.127
14	-1.20	30000	-16.25	0.32	7243.59	639.94	11.319	11806.40	345.64	34.158
15	-1.30	30000	-14.45	0.34	7860.59	719.61	10.923	12749.50	413.45	30.837
16	-1.40	30000	-12.87	0.36	8481.38	811.42	10.453	13702.07	489.82	27.974
17	-1.50	30000	-11.44	0.37	9104.96	912.17	9.982	14661.62	575.86	25.460
18	-1.60	30000	-10.11	0.39	9730.35	1018.75	9.551	15625.72	672.26	23.243
19	-1.70	30000	-8.87	0.41	10357.65	1131.40	9.155	16594.55	779.61	21.286
20	-1.80	30000	-7.69	0.42	10986.91	1250.37	8.787	17568.31	898.53	19.552
21	-1.90	30000	-6.55	0.44	11618.15	1375.65	8.446	18547.00	1029.65	18.013
22	-2.00	30000	-5.45	0.45	3822.91	1507.24	2.536	19530.60	1173.59	16.642

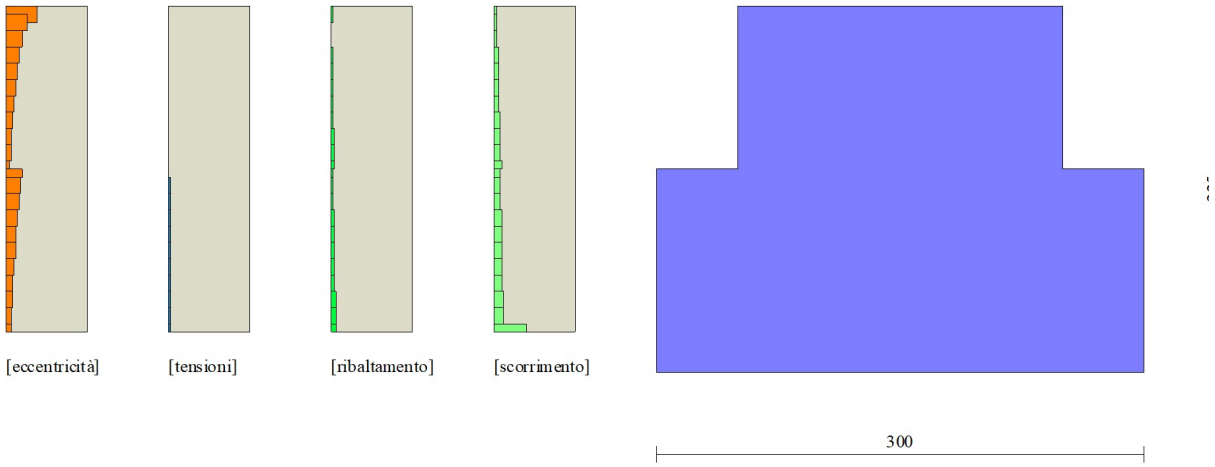

Fig. 16 - Verifiche paramento pietrame (Combinazione n° 14)

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