

CHAPTER V

CONCLUSION AND SUGGESTION

V.1. CONCLUSION

Based on the result of research and discussion that have been explained in the previous chapter, several conclusions can be concluded as follows:

1. Water addition to clay causes the increment of clay unit weight.
Addition of water will increase the unit weight.
2. Clay reaches the optimum moisture content when added with 901.54 ml of water. With MDD 1.18 gram/cm³ and OMC 32.24%.
3. Cement addition increases the shear strength and cohesion of clay soil at the maksimum 8% percentage of cement, above that percentage, the shear strength and the cohesion of clay soil will be decreased.
4. Cement and fly ash addition increases the shear strength and cohesion of clay soil, at the optimum percentage of 8% cement and 12% fly ash, above this percentage of fly ash, the values of shear strength and cohesion below the 0% of fly ash (without fly ash addition), so addition of cement above 8% percentage and fly ash above 12% percentage are useless.
5. The increment of clay cohesive value caused by hydration reaction.
6. The shear strength and cohesion of clay soil + cement + fly ash reach its optimum values at 14 day of curing time period, rather than 1 day and 7 day of curing time period.

V.2. SUGGESTION

Based on the result of research that has been done, several suggestions can be made for the next researcher, as follows:

1. Fly ash, as waste material, can be used as clay soil stabilizer. In this case, this stabilization test helped with the addition of cement to increased the pozzolanic reaction. For another research, can be used another pozzolanic material that cheaper than cement, or without additive pozzolan, but greater quality of fly ash (F class of fly ash, for example).
2. In this research the curing time period only 14 days, for the next research, it is suggested to extend the curing time period until 28 days. Please consider that hydration needs a long period to take place.

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D = 7,15 cm
 Lo = 10,89 cm
 B = 755,00 gr

Ao = 40,131 cm²
 V = 437,028 cm³
 γ = 1,728 gr/cm³

Day = 0
 SM = 0%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	40,1312	0	0,0000	0,0000
75	0,075	0,0069	0,9931	40,4095	54	2,4545	0,0607
150	0,15	0,0138	0,9862	40,6917	82	3,7273	0,0916
225	0,225	0,0207	0,9793	40,9778	103	4,6818	0,1143
300	0,3	0,0275	0,9725	41,2680	119	5,4091	0,1311
375	0,375	0,0344	0,9656	41,5624	132	6,0000	0,1444
450	0,45	0,0413	0,9587	41,8610	142	6,4545	0,1542
525	0,525	0,0482	0,9518	42,1639	151	6,8636	0,1628
600	0,6	0,0551	0,9449	42,4712	161	7,3182	0,1723
675	0,675	0,0620	0,9380	42,7830	170	7,7273	0,1806
750	0,75	0,0689	0,9311	43,0994	178	8,0909	0,1877
825	0,825	0,0758	0,9242	43,4206	185	8,4091	0,1937
900	0,9	0,0826	0,9174	43,7466	191	8,6818	0,1985
975	0,975	0,0895	0,9105	44,0775	198	9,0000	0,2042
1050	1,05	0,0964	0,9036	44,4135	204	9,2727	0,2088
1125	1,125	0,1033	0,8967	44,7546	211	9,5909	0,2143
1200	1,2	0,1102	0,8898	45,1010	216	9,8182	0,2177
1275	1,275	0,1171	0,8829	45,4528	222	10,0909	0,2220
1350	1,35	0,1240	0,8760	45,8101	228	10,3636	0,2262
1425	1,425	0,1309	0,8691	46,1731	231	10,5000	0,2274
1500	1,5	0,1377	0,8623	46,5419	236	10,7273	0,2305
1575	1,575	0,1446	0,8554	46,9166	239	10,8636	0,2316
1650	1,65	0,1515	0,8485	47,2974	242	11,0000	0,2326
1725	1,725	0,1584	0,8416	47,6845	245	11,1364	0,2335
1800	1,8	0,1653	0,8347	48,0779	248	11,2727	0,2345
1875	1,875	0,1722	0,8278	48,4779	250	11,3636	0,2344
1950	1,95	0,1791	0,8209	48,8846	257	11,6818	0,2390
2025	2,025	0,1860	0,8140	49,2982	259	11,7727	0,2388
2100	2,1	0,1928	0,8072	49,7188	260	11,8182	0,2377
2175	2,175	0,1997	0,8003	50,1467	261	11,8636	0,2366
2250	2,25	0,2066	0,7934	50,5820	261	11,8636	0,2345
2325	2,325	0,2135	0,7865	51,0249	261	11,8636	0,2325
2400	2,4	0,2204	0,7796	51,4757	261	11,8636	0,2305
2475	2,475	0,2273	0,7727	51,9344	261	11,8636	0,2284
2550	2,55	0,2342	0,7658	52,4015	261	11,8636	0,2264

α = 50 °
 φ = 10 °
 (45 + ½ φ) = 50 °
 rad (45 + ½ φ) = 0,8727

tg (45 + ½ φ) = 1,1918
 q_u = 0,2390 (kg/cm²)
 c = 0,1003 (kg/cm²)

D = 6,82 cm
 Lo = 12,96 cm
 B = 772,50 gr

Ao = 36,512 cm²
 V = 473,199 cm³
 γ = 1,633 gr/cm³

Day = 0
 SM = 8%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	36,5122	0	0,0000	0,0000
25	0,025	0,0019	0,9981	36,5828	80	3,6364	0,0994
50	0,05	0,0039	0,9961	36,6536	150	6,8182	0,1860
75	0,075	0,0058	0,9942	36,7248	205	9,3182	0,2537
100	0,1	0,0077	0,9923	36,7962	255	11,5909	0,3150
125	0,125	0,0096	0,9904	36,8678	305	13,8636	0,3760
150	0,15	0,0116	0,9884	36,9398	350	15,9091	0,4307
175	0,175	0,0135	0,9865	37,0120	395	17,9545	0,4851
200	0,2	0,0154	0,9846	37,0845	430	19,5455	0,5271
225	0,225	0,0174	0,9826	37,1573	460	20,9091	0,5627
250	0,25	0,0193	0,9807	37,2304	495	22,5000	0,6043
275	0,275	0,0212	0,9788	37,3038	530	24,0909	0,6458
300	0,3	0,0231	0,9769	37,3775	560	25,4545	0,6810
325	0,325	0,0251	0,9749	37,4514	585	26,5909	0,7100
350	0,35	0,0270	0,9730	37,5257	615	27,9545	0,7449
375	0,375	0,0289	0,9711	37,6002	626	28,4545	0,7568
400	0,4	0,0309	0,9691	37,6750	634	28,8182	0,7649
425	0,425	0,0328	0,9672	37,7502	634	28,8182	0,7634
450	0,45	0,0347	0,9653	37,8256	634	28,8182	0,7619
475	0,475	0,0367	0,9633	37,9014	634	28,8182	0,7603
500	0,5	0,0386	0,9614	37,9774	634	28,8182	0,7588
525	0,525	0,0405	0,9595	38,0538	634	28,8182	0,7573
550	0,55	0,0424	0,9576	38,1304	634	28,8182	0,7558
575	0,575	0,0444	0,9556	38,2074	634	28,8182	0,7543
600	0,6	0,0463	0,9537	38,2847	634	28,8182	0,7527
625	0,625	0,0482	0,9518	38,3623	634	28,8182	0,7512
650	0,65	0,0502	0,9498	38,4402	634	28,8182	0,7497
675	0,675	0,0521	0,9479	38,5184	634	28,8182	0,7482
700	0,7	0,0540	0,9460	38,5969	634	28,8182	0,7466
725	0,725	0,0559	0,9441	38,6758	634	28,8182	0,7451
750	0,75	0,0579	0,9421	38,7550	634	28,8182	0,7436
775	0,775	0,0598	0,9402	38,8345	634	28,8182	0,7421
800	0,8	0,0617	0,9383	38,9144	634	28,8182	0,7406
825	0,825	0,0637	0,9363	38,9945	634	28,8182	0,7390
850	0,85	0,0656	0,9344	39,0750	634	28,8182	0,7375

α = 65 °
 φ = 40 °
 (45 + ½ φ) = 65 °
 rad (45 + ½ φ) = 1,1345

tg (45 + ½ φ) = 2,1445
 q_u = 0,7649 (kg/cm²)
 c = 0,1783 (kg/cm²)

D = 6,92 cm
 Lo = 12,86 cm
 B = 776,00 gr

Ao = 37,591 cm²
 V = 483,418 cm³
 γ = 1,605 gr/cm³

Day = 0
 SM = 12%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	37,5908	0	0,0000	0,0000
25	0,025	0,0019	0,9981	37,6640	21	0,9545	0,0253
50	0,05	0,0039	0,9961	37,7375	28	1,2727	0,0337
75	0,075	0,0058	0,9942	37,8113	45	2,0455	0,0541
100	0,1	0,0078	0,9922	37,8854	58	2,6364	0,0696
125	0,125	0,0097	0,9903	37,9598	68	3,0909	0,0814
150	0,15	0,0117	0,9883	38,0345	80	3,6364	0,0956
175	0,175	0,0136	0,9864	38,1094	90	4,0909	0,1073
200	0,2	0,0156	0,9844	38,1847	110	5,0000	0,1309
225	0,225	0,0175	0,9825	38,2602	127	5,7727	0,1509
250	0,25	0,0194	0,9806	38,3361	128	5,8182	0,1518
275	0,275	0,0214	0,9786	38,4122	135	6,1364	0,1598
300	0,3	0,0233	0,9767	38,4887	152	6,9091	0,1795
325	0,325	0,0253	0,9747	38,5655	165	7,5000	0,1945
350	0,35	0,0272	0,9728	38,6425	172	7,8182	0,2023
375	0,375	0,0292	0,9708	38,7199	174	7,9091	0,2043
400	0,4	0,0311	0,9689	38,7976	174	7,9091	0,2039
425	0,425	0,0330	0,9670	38,8756	174	7,9091	0,2034
450	0,45	0,0350	0,9650	38,9539	174	7,9091	0,2030
475	0,475	0,0369	0,9631	39,0325	174	7,9091	0,2026
500	0,5	0,0389	0,9611	39,1115	174	7,9091	0,2022
525	0,525	0,0408	0,9592	39,1908	174	7,9091	0,2018
550	0,55	0,0428	0,9572	39,2703	174	7,9091	0,2014
575	0,575	0,0447	0,9553	39,3503	174	7,9091	0,2010
600	0,6	0,0467	0,9533	39,4305	174	7,9091	0,2006
625	0,625	0,0486	0,9514	39,5111	174	7,9091	0,2002
650	0,65	0,0505	0,9495	39,5920	174	7,9091	0,1998
675	0,675	0,0525	0,9475	39,6732	174	7,9091	0,1994
700	0,7	0,0544	0,9456	39,7548	174	7,9091	0,1989
725	0,725	0,0564	0,9436	39,8367	174	7,9091	0,1985
750	0,75	0,0583	0,9417	39,9189	174	7,9091	0,1981
775	0,775	0,0603	0,9397	40,0015	174	7,9091	0,1977
800	0,8	0,0622	0,9378	40,0844	174	7,9091	0,1973
825	0,825	0,0642	0,9358	40,1677	174	7,9091	0,1969
850	0,85	0,0661	0,9339	40,2513	174	7,9091	0,1965

α = 60 °
 φ = 30 °
 (45 + ½ φ) = 60 °
 rad (45 + ½ φ) = 1,0472

tg (45 + ½ φ) = 1,7321
 q_u = 0,2043 (kg/cm²)
 c = 0,0590 (kg/cm²)

D = 6,73 cm
 Lo = 8,80 cm
 B = 445,50 gr

Ao = 35,555 cm²
 V = 312,883 cm³
 γ = 1,424 gr/cm³

Day = 0
 SM = 16%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	35,5549	0	0,0000	0,0000
25	0,025	0,0028	0,9972	35,6562	35	1,5909	0,0446
50	0,05	0,0057	0,9943	35,7581	65	2,9545	0,0826
75	0,075	0,0085	0,9915	35,8606	72	3,2727	0,0913
100	0,1	0,0114	0,9886	35,9636	85	3,8636	0,1074
125	0,125	0,0142	0,9858	36,0672	88	4,0000	0,1109
150	0,15	0,0170	0,9830	36,1715	93	4,2273	0,1169
175	0,175	0,0199	0,9801	36,2763	94	4,2727	0,1178
200	0,2	0,0227	0,9773	36,3818	95	4,3182	0,1187
225	0,225	0,0256	0,9744	36,4879	95	4,3182	0,1183
250	0,25	0,0284	0,9716	36,5945	95	4,3182	0,1180
275	0,275	0,0313	0,9688	36,7019	95	4,3182	0,1177
300	0,3	0,0341	0,9659	36,8098	95	4,3182	0,1173
325	0,325	0,0369	0,9631	36,9184	95	4,3182	0,1170
350	0,35	0,0398	0,9602	37,0276	95	4,3182	0,1166
375	0,375	0,0426	0,9574	37,1375	95	4,3182	0,1163
400	0,4	0,0455	0,9545	37,2480	95	4,3182	0,1159
425	0,425	0,0483	0,9517	37,3592	95	4,3182	0,1156
450	0,45	0,0511	0,9489	37,4711	95	4,3182	0,1152
475	0,475	0,0540	0,9460	37,5836	95	4,3182	0,1149
500	0,5	0,0568	0,9432	37,6968	95	4,3182	0,1146
525	0,525	0,0597	0,9403	37,8107	95	4,3182	0,1142
550	0,55	0,0625	0,9375	37,9253	95	4,3182	0,1139
575	0,575	0,0653	0,9347	38,0405	95	4,3182	0,1135
600	0,6	0,0682	0,9318	38,1565	95	4,3182	0,1132
625	0,625	0,0710	0,9290	38,2732	95	4,3182	0,1128
650	0,65	0,0739	0,9261	38,3906	95	4,3182	0,1125
675	0,675	0,0767	0,9233	38,5087	95	4,3182	0,1121
700	0,7	0,0795	0,9205	38,6276	95	4,3182	0,1118
725	0,725	0,0824	0,9176	38,7472	95	4,3182	0,1114
750	0,75	0,0852	0,9148	38,8675	95	4,3182	0,1111
775	0,775	0,0881	0,9119	38,9886	95	4,3182	0,1108
800	0,8	0,0909	0,9091	39,1104	95	4,3182	0,1104
825	0,825	0,0938	0,9063	39,2330	95	4,3182	0,1101
850	0,85	0,0966	0,9034	39,3564	95	4,3182	0,1097

α = 55 °
 φ = 20 °
 (45 + ½ φ) = 55 °
 rad (45 + ½ φ) = 0,9599

tg (45 + ½ φ) = 1,4281
 q_u = 0,1187 (kg/cm²)
 c = 0,0416 (kg/cm²)

D = 6,94 cm
 Lo = 11,78 cm
 B = 729,50 gr

Ao = 37,808 cm²
 V = 445,383 cm³
 γ = 1,638 gr/cm³

Day = 0
 SM = 8%
 FA = 0%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	37,8084	0	0,0000	0,0000
25	0,025	0,0021	0,9979	37,8888	100	4,5455	0,1200
50	0,05	0,0042	0,9958	37,9696	200	9,0909	0,2394
75	0,075	0,0064	0,9936	38,0507	310	14,0909	0,3703
100	0,1	0,0085	0,9915	38,1321	400	18,1818	0,4768
125	0,125	0,0106	0,9894	38,2139	500	22,7273	0,5947
150	0,15	0,0127	0,9873	38,2961	575	26,1364	0,6825
175	0,175	0,0149	0,9851	38,3786	670	30,4545	0,7935
200	0,2	0,0170	0,9830	38,4614	750	34,0909	0,8864
225	0,225	0,0191	0,9809	38,5446	820	37,2727	0,9670
250	0,25	0,0212	0,9788	38,6282	900	40,9091	1,0590
275	0,275	0,0233	0,9767	38,7121	970	44,0909	1,1389
300	0,3	0,0255	0,9745	38,7965	1.040	47,2727	1,2185
325	0,325	0,0276	0,9724	38,8811	1.100	50,0000	1,2860
350	0,35	0,0297	0,9703	38,9662	1.170	53,1818	1,3648
375	0,375	0,0318	0,9682	39,0516	1.230	55,9091	1,4317
400	0,4	0,0340	0,9660	39,1374	1.300	59,0909	1,5098
425	0,425	0,0361	0,9639	39,2235	1.340	60,9091	1,5529
450	0,45	0,0382	0,9618	39,3101	1.390	63,1818	1,6073
475	0,475	0,0403	0,9597	39,3970	1.395	63,4091	1,6095
500	0,5	0,0424	0,9576	39,4843	1.395	63,4091	1,6059
525	0,525	0,0446	0,9554	39,5720	1.395	63,4091	1,6024
550	0,55	0,0467	0,9533	39,6601	1.395	63,4091	1,5988
575	0,575	0,0488	0,9512	39,7486	1.395	63,4091	1,5953
600	0,6	0,0509	0,9491	39,8375	1.395	63,4091	1,5917
625	0,625	0,0531	0,9469	39,9268	1.395	63,4091	1,5881
650	0,65	0,0552	0,9448	40,0165	1.395	63,4091	1,5846
675	0,675	0,0573	0,9427	40,1066	1.395	63,4091	1,5810
700	0,7	0,0594	0,9406	40,1970	1.395	63,4091	1,5775
725	0,725	0,0615	0,9385	40,2879	1.395	63,4091	1,5739
750	0,75	0,0637	0,9363	40,3793	1.395	63,4091	1,5703
775	0,775	0,0658	0,9342	40,4710	1.395	63,4091	1,5668
800	0,8	0,0679	0,9321	40,5631	1.395	63,4091	1,5632
825	0,825	0,0700	0,9300	40,6557	1.395	63,4091	1,5597
850	0,85	0,0722	0,9278	40,7487	1.395	63,4091	1,5561

α = 50 °
 φ = 10 °
 (45 + ½ φ) = 50 °
 rad (45 + ½ φ) = 0,8727

tg (45 + ½ φ) = 1,1918
 q_u = 1,6095 (kg/cm²)
 c = 0,6753 (kg/cm²)

D = 6,91 cm
 Lo = 13,77 cm
 B = 807,00 gr

Ao = 37,482 cm²
 V = 516,131 cm³
 γ = 1,564 gr/cm³

Day = 0
 SM = 8%
 FA = 12%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	37,4823	0	0,0000	0,0000
25	0,025	0,0018	0,9982	37,5504	125	5,6818	0,1513
50	0,05	0,0036	0,9964	37,6189	240	10,9091	0,2900
75	0,075	0,0054	0,9946	37,6875	330	15,0000	0,3980
100	0,1	0,0073	0,9927	37,7565	410	18,6364	0,4936
125	0,125	0,0091	0,9909	37,8256	465	21,1364	0,5588
150	0,15	0,0109	0,9891	37,8951	580	26,3636	0,6957
175	0,175	0,0127	0,9873	37,9647	700	31,8182	0,8381
200	0,2	0,0145	0,9855	38,0347	760	34,5455	0,9083
225	0,225	0,0163	0,9837	38,1049	840	38,1818	1,0020
250	0,25	0,0182	0,9818	38,1753	930	42,2727	1,1073
275	0,275	0,0200	0,9800	38,2461	1.010	45,9091	1,2004
300	0,3	0,0218	0,9782	38,3171	1.100	50,0000	1,3049
325	0,325	0,0236	0,9764	38,3883	1.200	54,5455	1,4209
350	0,35	0,0254	0,9746	38,4598	1.280	58,1818	1,5128
375	0,375	0,0272	0,9728	38,5316	1.350	61,3636	1,5926
400	0,4	0,0290	0,9710	38,6036	1.430	65,0000	1,6838
425	0,425	0,0309	0,9691	38,6760	1.510	68,6364	1,7747
450	0,45	0,0327	0,9673	38,7486	1.630	74,0909	1,9121
475	0,475	0,0345	0,9655	38,8214	1.715	77,9545	2,0080
500	0,5	0,0363	0,9637	38,8946	1.820	82,7273	2,1270
525	0,525	0,0381	0,9619	38,9680	1.885	85,6818	2,1988
550	0,55	0,0399	0,9601	39,0417	1.885	85,6818	2,1946
575	0,575	0,0418	0,9582	39,1156	1.885	85,6818	2,1905
600	0,6	0,0436	0,9564	39,1899	1.885	85,6818	2,1863
625	0,625	0,0454	0,9546	39,2644	1.885	85,6818	2,1822
650	0,65	0,0472	0,9528	39,3392	1.885	85,6818	2,1780
675	0,675	0,0490	0,9510	39,4143	1.885	85,6818	2,1739
700	0,7	0,0508	0,9492	39,4897	1.885	85,6818	2,1697
725	0,725	0,0527	0,9473	39,5654	1.885	85,6818	2,1656
750	0,75	0,0545	0,9455	39,6414	1.885	85,6818	2,1614
775	0,775	0,0563	0,9437	39,7176	1.885	85,6818	2,1573
800	0,8	0,0581	0,9419	39,7942	1.885	85,6818	2,1531
825	0,825	0,0599	0,9401	39,8710	1.885	85,6818	2,1490
850	0,85	0,0617	0,9383	39,9482	1.885	85,6818	2,1448

α = 55 °
 φ = 20 °
 (45 + ½ φ) = 55 °
 rad (45 + ½ φ) = 0,9599

tg (45 + ½ φ) = 1,4281
 q_u = 2,1988 (kg/cm²)
 c = 0,7698 (kg/cm²)

D = 6,75 cm
 Lo = 13,82 cm
 B = 799,50 gr

Ao = 35,767 cm²
 V = 494,294 cm³
 γ = 1,617 gr/cm³

Day = 0
 SM = 8%
 FA = 24%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	35,7666	0	0,0000	0,0000
25	0,025	0,0018	0,9982	35,8314	150	6,8182	0,1903
50	0,05	0,0036	0,9964	35,8964	310	14,0909	0,3925
75	0,075	0,0054	0,9946	35,9617	470	21,3636	0,5941
100	0,1	0,0072	0,9928	36,0273	600	27,2727	0,7570
125	0,125	0,0090	0,9910	36,0930	720	32,7273	0,9067
150	0,15	0,0109	0,9891	36,1590	830	37,7273	1,0434
175	0,175	0,0127	0,9873	36,2253	930	42,2727	1,1669
200	0,2	0,0145	0,9855	36,2918	1.045	47,5000	1,3088
225	0,225	0,0163	0,9837	36,3585	1.150	52,2727	1,4377
250	0,25	0,0181	0,9819	36,4255	1.230	55,9091	1,5349
275	0,275	0,0199	0,9801	36,4927	1.425	64,7727	1,7749
300	0,3	0,0217	0,9783	36,5602	1.450	65,9091	1,8028
325	0,325	0,0235	0,9765	36,6279	1.450	65,9091	1,7994
350	0,35	0,0253	0,9747	36,6959	1.450	65,9091	1,7961
375	0,375	0,0271	0,9729	36,7641	1.450	65,9091	1,7928
400	0,4	0,0289	0,9711	36,8326	1.450	65,9091	1,7894
425	0,425	0,0308	0,9692	36,9014	1.450	65,9091	1,7861
450	0,45	0,0326	0,9674	36,9704	1.450	65,9091	1,7828
475	0,475	0,0344	0,9656	37,0396	1.450	65,9091	1,7794
500	0,5	0,0362	0,9638	37,1092	1.450	65,9091	1,7761
525	0,525	0,0380	0,9620	37,1789	1.450	65,9091	1,7728
550	0,55	0,0398	0,9602	37,2490	1.450	65,9091	1,7694
575	0,575	0,0416	0,9584	37,3193	1.450	65,9091	1,7661
600	0,6	0,0434	0,9566	37,3899	1.450	65,9091	1,7628
625	0,625	0,0452	0,9548	37,4607	1.450	65,9091	1,7594
650	0,65	0,0470	0,9530	37,5318	1.450	65,9091	1,7561
675	0,675	0,0488	0,9512	37,6032	1.450	65,9091	1,7528
700	0,7	0,0507	0,9493	37,6748	1.450	65,9091	1,7494
725	0,725	0,0525	0,9475	37,7468	1.450	65,9091	1,7461
750	0,75	0,0543	0,9457	37,8190	1.450	65,9091	1,7428
775	0,775	0,0561	0,9439	37,8914	1.450	65,9091	1,7394
800	0,8	0,0579	0,9421	37,9642	1.450	65,9091	1,7361
825	0,825	0,0597	0,9403	38,0372	1.450	65,9091	1,7328
850	0,85	0,0615	0,9385	38,1106	1.450	65,9091	1,7294

α = 60 °
 φ = 30 °
 (45 + ½ φ) = 60 °
 rad (45 + ½ φ) = 1,0472

tg (45 + ½ φ) = 1,7321
 q_u = 1,8028 (kg/cm²)
 c = 0,5204 (kg/cm²)

D = 6,79 cm
 Lo = 13,77 cm
 B = 803,00 gr

Ao = 36,192 cm²
 V = 498,360 cm³
 γ = 1,611 gr/cm³

Day = 0
 SM = 8%
 FA = 36%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	36,1917	0	0,0000	0,0000
25	0,025	0,0018	0,9982	36,2575	75	3,4091	0,0940
50	0,05	0,0036	0,9964	36,3236	150	6,8182	0,1877
75	0,075	0,0054	0,9946	36,3899	250	11,3636	0,3123
100	0,1	0,0073	0,9927	36,4565	380	17,2727	0,4738
125	0,125	0,0091	0,9909	36,5233	480	21,8182	0,5974
150	0,15	0,0109	0,9891	36,5903	580	26,3636	0,7205
175	0,175	0,0127	0,9873	36,6576	660	30,0000	0,8184
200	0,2	0,0145	0,9855	36,7251	715	32,5000	0,8850
225	0,225	0,0163	0,9837	36,7929	720	32,7273	0,8895
250	0,25	0,0182	0,9818	36,8609	750	34,0909	0,9249
275	0,275	0,0200	0,9800	36,9292	820	37,2727	1,0093
300	0,3	0,0218	0,9782	36,9978	890	40,4545	1,0934
325	0,325	0,0236	0,9764	37,0666	965	43,8636	1,1834
350	0,35	0,0254	0,9746	37,1356	1.000	45,4545	1,2240
375	0,375	0,0272	0,9728	37,2049	1.000	45,4545	1,2217
400	0,4	0,0290	0,9710	37,2745	1.000	45,4545	1,2195
425	0,425	0,0309	0,9691	37,3443	1.000	45,4545	1,2172
450	0,45	0,0327	0,9673	37,4144	1.000	45,4545	1,2149
475	0,475	0,0345	0,9655	37,4848	1.000	45,4545	1,2126
500	0,5	0,0363	0,9637	37,5554	1.000	45,4545	1,2103
525	0,525	0,0381	0,9619	37,6263	1.000	45,4545	1,2081
550	0,55	0,0399	0,9601	37,6974	1.000	45,4545	1,2058
575	0,575	0,0418	0,9582	37,7688	1.000	45,4545	1,2035
600	0,6	0,0436	0,9564	37,8405	1.000	45,4545	1,2012
625	0,625	0,0454	0,9546	37,9125	1.000	45,4545	1,1989
650	0,65	0,0472	0,9528	37,9848	1.000	45,4545	1,1967
675	0,675	0,0490	0,9510	38,0573	1.000	45,4545	1,1944
700	0,7	0,0508	0,9492	38,1301	1.000	45,4545	1,1921
725	0,725	0,0527	0,9473	38,2031	1.000	45,4545	1,1898
750	0,75	0,0545	0,9455	38,2765	1.000	45,4545	1,1875
775	0,775	0,0563	0,9437	38,3501	1.000	45,4545	1,1853
800	0,8	0,0581	0,9419	38,4241	1.000	45,4545	1,1830
825	0,825	0,0599	0,9401	38,4983	1.000	45,4545	1,1807
850	0,85	0,0617	0,9383	38,5728	1.000	45,4545	1,1784

$$\begin{aligned}
 \alpha &= 60^\circ & \text{tg}(45 + \frac{1}{2}\phi) &= 1,7321 \\
 \phi &= 30^\circ & q_u &= 1,2240 \text{ (kg/cm}^2\text{)} \\
 (45 + \frac{1}{2}\phi) &= 60^\circ & c &= 0,3533 \text{ (kg/cm}^2\text{)} \\
 \text{rad}(45 + \frac{1}{2}\phi) &= 1,0472
 \end{aligned}$$

D = 6,93 cm
 Lo = 11,74 cm
 B = 703,00 gr

Ao = 37,700 cm²
 V = 442,593 cm³
 γ = 1,588 gr/cm³

Day = 7
 SM = 8%
 FA = 0%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	37,6995	0	0,0000	0,0000
25	0,025	0,0021	0,9979	37,7800	153	6,9545	0,1841
50	0,05	0,0043	0,9957	37,8608	305	13,8636	0,3662
75	0,075	0,0064	0,9936	37,9419	473	21,5000	0,5667
100	0,1	0,0085	0,9915	38,0234	609	27,6818	0,7280
125	0,125	0,0106	0,9894	38,1053	762	34,6364	0,9090
150	0,15	0,0128	0,9872	38,1875	880	40,0000	1,0475
175	0,175	0,0149	0,9851	38,2700	1019	46,3182	1,2103
200	0,2	0,0170	0,9830	38,3529	1145	52,0455	1,3570
225	0,225	0,0192	0,9808	38,4362	1248	56,7273	1,4759
250	0,25	0,0213	0,9787	38,5198	1370	62,2727	1,6166
275	0,275	0,0234	0,9766	38,6038	1482	67,3636	1,7450
300	0,3	0,0256	0,9744	38,6882	1583	71,9545	1,8599
325	0,325	0,0277	0,9723	38,7729	1674	76,0909	1,9625
350	0,35	0,0298	0,9702	38,8580	1780	80,9091	2,0822
375	0,375	0,0319	0,9681	38,9435	1780	80,9091	2,0776
400	0,4	0,0341	0,9659	39,0293	1780	80,9091	2,0730
425	0,425	0,0362	0,9638	39,1156	1780	80,9091	2,0685
450	0,45	0,0383	0,9617	39,2022	1780	80,9091	2,0639
475	0,475	0,0405	0,9595	39,2892	1780	80,9091	2,0593
500	0,5	0,0426	0,9574	39,3766	1780	80,9091	2,0548
525	0,525	0,0447	0,9553	39,4643	1780	80,9091	2,0502
550	0,55	0,0468	0,9532	39,5525	1780	80,9091	2,0456
575	0,575	0,0490	0,9510	39,6411	1780	80,9091	2,0410
600	0,6	0,0511	0,9489	39,7300	1780	80,9091	2,0365
625	0,625	0,0532	0,9468	39,8194	1780	80,9091	2,0319
650	0,65	0,0554	0,9446	39,9092	1780	80,9091	2,0273
675	0,675	0,0575	0,9425	39,9993	1780	80,9091	2,0228
700	0,7	0,0596	0,9404	40,0899	1780	80,9091	2,0182
725	0,725	0,0618	0,9382	40,1809	1780	80,9091	2,0136
750	0,75	0,0639	0,9361	40,2723	1780	80,9091	2,0091
775	0,775	0,0660	0,9340	40,3641	1780	80,9091	2,0045
800	0,8	0,0681	0,9319	40,4564	1780	80,9091	1,9999
825	0,825	0,0703	0,9297	40,5490	1780	80,9091	1,9953
850	0,85	0,0724	0,9276	40,6421	1780	80,9091	1,9908

α = 55 °
 φ = 20 °
 (45 + ½ φ) = 55 °
 rad (45 + ½ φ) = 0,9599

tg (45 + ½ φ) = 1,4281
 q_u = 2,0822 (kg/cm²)
 c = 0,7290 (kg/cm²)

D = 6,89 cm
 Lo = 13,75 cm
 B = 752,00 gr

Ao = 37,266 cm²
 V = 512,402 cm³
 γ = 1,468 gr/cm³

Day = 7
 SM = 8%
 FA = 12%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	37,2656	0	0,0000	0,0000
25	0,025	0,0018	0,9982	37,3335	320	14,5455	0,3896
50	0,05	0,0036	0,9964	37,4016	650	29,5455	0,7900
75	0,075	0,0055	0,9945	37,4700	920	41,8182	1,1160
100	0,1	0,0073	0,9927	37,5386	1165	52,9545	1,4107
125	0,125	0,0091	0,9909	37,6075	1450	65,9091	1,7526
150	0,15	0,0109	0,9891	37,6766	1630	74,0909	1,9665
175	0,175	0,0127	0,9873	37,7460	1800	81,8182	2,1676
200	0,2	0,0145	0,9855	37,8156	1990	90,4545	2,3920
225	0,225	0,0164	0,9836	37,8855	2100	95,4545	2,5196
250	0,25	0,0182	0,9818	37,9557	2310	105,0000	2,7664
275	0,275	0,0200	0,9800	38,0261	2310	105,0000	2,7613
300	0,3	0,0218	0,9782	38,0968	2310	105,0000	2,7561
325	0,325	0,0236	0,9764	38,1677	2310	105,0000	2,7510
350	0,35	0,0255	0,9745	38,2390	2310	105,0000	2,7459
375	0,375	0,0273	0,9727	38,3104	2310	105,0000	2,7408
400	0,4	0,0291	0,9709	38,3822	2310	105,0000	2,7356
425	0,425	0,0309	0,9691	38,4542	2310	105,0000	2,7305
450	0,45	0,0327	0,9673	38,5265	2310	105,0000	2,7254
475	0,475	0,0345	0,9655	38,5990	2310	105,0000	2,7203
500	0,5	0,0364	0,9636	38,6718	2310	105,0000	2,7152
525	0,525	0,0382	0,9618	38,7450	2310	105,0000	2,7100
550	0,55	0,0400	0,9600	38,8183	2310	105,0000	2,7049
575	0,575	0,0418	0,9582	38,8920	2310	105,0000	2,6998
600	0,6	0,0436	0,9564	38,9659	2310	105,0000	2,6947
625	0,625	0,0455	0,9545	39,0402	2310	105,0000	2,6895
650	0,65	0,0473	0,9527	39,1147	2310	105,0000	2,6844
675	0,675	0,0491	0,9509	39,1894	2310	105,0000	2,6793
700	0,7	0,0509	0,9491	39,2645	2310	105,0000	2,6742
725	0,725	0,0527	0,9473	39,3399	2310	105,0000	2,6690
750	0,75	0,0545	0,9455	39,4155	2310	105,0000	2,6639
775	0,775	0,0564	0,9436	39,4915	2310	105,0000	2,6588
800	0,8	0,0582	0,9418	39,5677	2310	105,0000	2,6537
825	0,825	0,0600	0,9400	39,6443	2310	105,0000	2,6486
850	0,85	0,0618	0,9382	39,7211	2310	105,0000	2,6434

α = 60 °
 φ = 30 °
 (45 + ½ φ) = 60 °
 rad (45 + ½ φ) = 1,0472

tg (45 + ½ φ) = 1,7321
 q_u = 2,7664 (kg/cm²)
 c = 0,7986 (kg/cm²)

D = 6,80 cm
 Lo = 13,84 cm
 B = 764,00 gr

Ao = 36,298 cm²
 V = 502,370 cm³
 γ = 1,521 gr/cm³

Day = 7
 SM = 8%
 FA = 24%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	36,2984	0	0,0000	0,0000
25	0,025	0,0018	0,9982	36,3641	310	14,0909	0,3875
50	0,05	0,0036	0,9964	36,4300	600	27,2727	0,7486
75	0,075	0,0054	0,9946	36,4962	930	42,2727	1,1583
100	0,1	0,0072	0,9928	36,5626	1.150	52,2727	1,4297
125	0,125	0,0090	0,9910	36,6292	1.425	64,7727	1,7683
150	0,15	0,0108	0,9892	36,6961	1.600	72,7273	1,9819
175	0,175	0,0126	0,9874	36,7633	1.600	72,7273	1,9783
200	0,2	0,0145	0,9855	36,8306	1.600	72,7273	1,9746
225	0,225	0,0163	0,9837	36,8983	1.600	72,7273	1,9710
250	0,25	0,0181	0,9819	36,9661	1.600	72,7273	1,9674
275	0,275	0,0199	0,9801	37,0343	1.600	72,7273	1,9638
300	0,3	0,0217	0,9783	37,1026	1.600	72,7273	1,9602
325	0,325	0,0235	0,9765	37,1713	1.600	72,7273	1,9565
350	0,35	0,0253	0,9747	37,2402	1.600	72,7273	1,9529
375	0,375	0,0271	0,9729	37,3093	1.600	72,7273	1,9493
400	0,4	0,0289	0,9711	37,3787	1.600	72,7273	1,9457
425	0,425	0,0307	0,9693	37,4484	1.600	72,7273	1,9421
450	0,45	0,0325	0,9675	37,5183	1.600	72,7273	1,9384
475	0,475	0,0343	0,9657	37,5885	1.600	72,7273	1,9348
500	0,5	0,0361	0,9639	37,6589	1.600	72,7273	1,9312
525	0,525	0,0379	0,9621	37,7296	1.600	72,7273	1,9276
550	0,55	0,0397	0,9603	37,8006	1.600	72,7273	1,9240
575	0,575	0,0415	0,9585	37,8718	1.600	72,7273	1,9204
600	0,6	0,0434	0,9566	37,9433	1.600	72,7273	1,9167
625	0,625	0,0452	0,9548	38,0151	1.600	72,7273	1,9131
650	0,65	0,0470	0,9530	38,0872	1.600	72,7273	1,9095
675	0,675	0,0488	0,9512	38,1595	1.600	72,7273	1,9059
700	0,7	0,0506	0,9494	38,2321	1.600	72,7273	1,9023
725	0,725	0,0524	0,9476	38,3050	1.600	72,7273	1,8986
750	0,75	0,0542	0,9458	38,3781	1.600	72,7273	1,8950
775	0,775	0,0560	0,9440	38,4516	1.600	72,7273	1,8914
800	0,8	0,0578	0,9422	38,5253	1.600	72,7273	1,8878
825	0,825	0,0596	0,9404	38,5993	1.600	72,7273	1,8842
850	0,85	0,0614	0,9386	38,6736	1.600	72,7273	1,8805

α = 60 °
 φ = 30 °
 (45 + ½ φ) = 60 °
 rad (45 + ½ φ) = 1,0472

tg (45 + ½ φ) = 1,7321
 q_u = 1,9819 (kg/cm²)
 c = 0,5721 (kg/cm²)

D = 6,76 cm
 Lo = 13,74 cm
 B = 786,00 gr

Ao = 35,873 cm²
 V = 492,890 cm³
 γ = 1,595 gr/cm³

Day = 7
 SM = 8%
 FA = 36%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	35,8726	0	0,0000	0,0000
25	0,025	0,0018	0,9982	35,9380	175	7,9545	0,2213
50	0,05	0,0036	0,9964	36,0036	340	15,4545	0,4292
75	0,075	0,0055	0,9945	36,0695	550	25,0000	0,6931
100	0,1	0,0073	0,9927	36,1356	710	32,2727	0,8931
125	0,125	0,0091	0,9909	36,2020	890	40,4545	1,1175
150	0,15	0,0109	0,9891	36,2686	1.070	48,6364	1,3410
175	0,175	0,0127	0,9873	36,3354	1.150	52,2727	1,4386
200	0,2	0,0146	0,9854	36,4025	1.220	55,4545	1,5234
225	0,225	0,0164	0,9836	36,4698	1.310	59,5455	1,6327
250	0,25	0,0182	0,9818	36,5374	1.070	48,6364	1,3311
275	0,275	0,0200	0,9800	36,6053	1.070	48,6364	1,3287
300	0,3	0,0218	0,9782	36,6733	1.070	48,6364	1,3262
325	0,325	0,0237	0,9763	36,7417	1.070	48,6364	1,3237
350	0,35	0,0255	0,9745	36,8103	1.070	48,6364	1,3213
375	0,375	0,0273	0,9727	36,8791	1.070	48,6364	1,3188
400	0,4	0,0291	0,9709	36,9483	1.070	48,6364	1,3163
425	0,425	0,0309	0,9691	37,0176	1.070	48,6364	1,3139
450	0,45	0,0328	0,9672	37,0873	1.070	48,6364	1,3114
475	0,475	0,0346	0,9654	37,1572	1.070	48,6364	1,3089
500	0,5	0,0364	0,9636	37,2273	1.070	48,6364	1,3065
525	0,525	0,0382	0,9618	37,2977	1.070	48,6364	1,3040
550	0,55	0,0400	0,9600	37,3684	1.070	48,6364	1,3015
575	0,575	0,0418	0,9582	37,4394	1.070	48,6364	1,2991
600	0,6	0,0437	0,9563	37,5106	1.070	48,6364	1,2966
625	0,625	0,0455	0,9545	37,5821	1.070	48,6364	1,2941
650	0,65	0,0473	0,9527	37,6539	1.070	48,6364	1,2917
675	0,675	0,0491	0,9509	37,7260	1.070	48,6364	1,2892
700	0,7	0,0509	0,9491	37,7983	1.070	48,6364	1,2867
725	0,725	0,0528	0,9472	37,8709	1.070	48,6364	1,2843
750	0,75	0,0546	0,9454	37,9438	1.070	48,6364	1,2818
775	0,775	0,0564	0,9436	38,0169	1.070	48,6364	1,2793
800	0,8	0,0582	0,9418	38,0904	1.070	48,6364	1,2769
825	0,825	0,0600	0,9400	38,1641	1.070	48,6364	1,2744
850	0,85	0,0619	0,9381	38,2381	1.070	48,6364	1,2719

α = 65 °
 φ = 40 °
 (45 + ½ φ) = 65 °
 rad (45 + ½ φ) = 1,1345

tg (45 + ½ φ) = 2,1445
 q_u = 1,6327 (kg/cm²)
 c = 0,3807 (kg/cm²)

D = 6,97 cm
 Lo = 11,78 cm
 B = 689,00 gr

Ao = 38,136 cm²
 V = 449,242 cm³
 γ = 1,534 gr/cm³

Day = 14
 SM = 8%
 FA = 0%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	38,1360	0	0,0000	0,0000
25	0,025	0,0021	0,9979	38,2171	264	12,0000	0,3140
50	0,05	0,0042	0,9958	38,2986	528	24,0000	0,6267
75	0,075	0,0064	0,9936	38,3804	819	37,2273	0,9700
100	0,1	0,0085	0,9915	38,4625	1056	48,0000	1,2480
125	0,125	0,0106	0,9894	38,5450	1320	60,0000	1,5566
150	0,15	0,0127	0,9873	38,6279	1518	69,0000	1,7863
175	0,175	0,0149	0,9851	38,7111	1769	80,4091	2,0772
200	0,2	0,0170	0,9830	38,7947	1980	90,0000	2,3199
225	0,225	0,0191	0,9809	38,8786	1980	90,0000	2,3149
250	0,25	0,0212	0,9788	38,9629	1980	90,0000	2,3099
275	0,275	0,0233	0,9767	39,0476	1980	90,0000	2,3049
300	0,3	0,0255	0,9745	39,1326	1980	90,0000	2,2999
325	0,325	0,0276	0,9724	39,2180	1980	90,0000	2,2949
350	0,35	0,0297	0,9703	39,3038	1980	90,0000	2,2899
375	0,375	0,0318	0,9682	39,3899	1980	90,0000	2,2848
400	0,4	0,0340	0,9660	39,4765	1980	90,0000	2,2798
425	0,425	0,0361	0,9639	39,5634	1980	90,0000	2,2748
450	0,45	0,0382	0,9618	39,6507	1980	90,0000	2,2698
475	0,475	0,0403	0,9597	39,7384	1980	90,0000	2,2648
500	0,5	0,0424	0,9576	39,8264	1980	90,0000	2,2598
525	0,525	0,0446	0,9554	39,9149	1980	90,0000	2,2548
550	0,55	0,0467	0,9533	40,0038	1980	90,0000	2,2498
575	0,575	0,0488	0,9512	40,0930	1980	90,0000	2,2448
600	0,6	0,0509	0,9491	40,1827	1980	90,0000	2,2398
625	0,625	0,0531	0,9469	40,2727	1980	90,0000	2,2348
650	0,65	0,0552	0,9448	40,3632	1980	90,0000	2,2298
675	0,675	0,0573	0,9427	40,4540	1980	90,0000	2,2247
700	0,7	0,0594	0,9406	40,5453	1980	90,0000	2,2197
725	0,725	0,0615	0,9385	40,6370	1980	90,0000	2,2147
750	0,75	0,0637	0,9363	40,7291	1980	90,0000	2,2097
775	0,775	0,0658	0,9342	40,8216	1980	90,0000	2,2047
800	0,8	0,0679	0,9321	40,9146	1980	90,0000	2,1997
825	0,825	0,0700	0,9300	41,0080	1980	90,0000	2,1947
850	0,85	0,0722	0,9278	41,1018	1980	90,0000	2,1897

α = 55 °
 φ = 20 °
 (45 + ½ φ) = 55 °
 rad (45 + ½ φ) = 0,9599

tg (45 + ½ φ) = 1,4281
 q_u = 2,3199 (kg/cm²)
 c = 0,8122 (kg/cm²)

D = 6,94 cm
 Lo = 13,76 cm
 B = 725,00 gr

Ao = 37,808 cm²
 V = 520,244 cm³
 γ = 1,394 gr/cm³

Day = 14
 SM = 8%
 FA = 12%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	37,8084	0	0,0000	0,0000
25	0,025	0,0018	0,9982	37,8772	200	9,0909	0,2400
50	0,05	0,0036	0,9964	37,9463	410	18,6364	0,4911
75	0,075	0,0055	0,9945	38,0156	625	28,4091	0,7473
100	0,1	0,0073	0,9927	38,0852	800	36,3636	0,9548
125	0,125	0,0091	0,9909	38,1550	990	45,0000	1,1794
150	0,15	0,0109	0,9891	38,2251	1100	50,0000	1,3080
175	0,175	0,0127	0,9873	38,2955	1320	60,0000	1,5668
200	0,2	0,0145	0,9855	38,3661	1470	66,8182	1,7416
225	0,225	0,0164	0,9836	38,4369	1620	73,6364	1,9158
250	0,25	0,0182	0,9818	38,5081	1800	81,8182	2,1247
275	0,275	0,0200	0,9800	38,5795	1925	87,5000	2,2680
300	0,3	0,0218	0,9782	38,6511	2070	94,0909	2,4344
325	0,325	0,0236	0,9764	38,7230	2225	101,1364	2,6118
350	0,35	0,0254	0,9746	38,7952	2.415	109,7727	2,8295
375	0,375	0,0273	0,9727	38,8677	2.605	118,4091	3,0465
400	0,4	0,0291	0,9709	38,9404	2.710	123,1818	3,1633
425	0,425	0,0309	0,9691	39,0134	2.710	123,1818	3,1574
450	0,45	0,0327	0,9673	39,0867	2.710	123,1818	3,1515
475	0,475	0,0345	0,9655	39,1603	2.710	123,1818	3,1456
500	0,5	0,0363	0,9637	39,2341	2.710	123,1818	3,1397
525	0,525	0,0382	0,9618	39,3082	2.710	123,1818	3,1337
550	0,55	0,0400	0,9600	39,3826	2.710	123,1818	3,1278
575	0,575	0,0418	0,9582	39,4573	2.710	123,1818	3,1219
600	0,6	0,0436	0,9564	39,5322	2.710	123,1818	3,1160
625	0,625	0,0454	0,9546	39,6075	2.710	123,1818	3,1101
650	0,65	0,0472	0,9528	39,6830	2.710	123,1818	3,1041
675	0,675	0,0491	0,9509	39,7588	2.710	123,1818	3,0982
700	0,7	0,0509	0,9491	39,8349	2.710	123,1818	3,0923
725	0,725	0,0527	0,9473	39,9113	2.710	123,1818	3,0864
750	0,75	0,0545	0,9455	39,9880	2.710	123,1818	3,0805
775	0,775	0,0563	0,9437	40,0650	2.710	123,1818	3,0745
800	0,8	0,0581	0,9419	40,1423	2.710	123,1818	3,0686
825	0,825	0,0600	0,9400	40,2199	2.710	123,1818	3,0627
850	0,85	0,0618	0,9382	40,2977	2.710	123,1818	3,0568

α = 60 °
 φ = 30 °
 (45 + ½ φ) = 60 °
 rad (45 + ½ φ) = 1,0472

tg (45 + ½ φ) = 1,7321
 q_u = 3,1633 (kg/cm²)
 c = 0,9132 (kg/cm²)

D = 6,76 cm
 Lo = 13,88 cm
 B = 732,00 gr

Ao = 35,873 cm²
 V = 497,912 cm³
 γ = 1,470 gr/cm³

Day = 14
 SM = 8%
 FA = 24%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	35,8726	0	0,0000	0,0000
25	0,025	0,0018	0,9982	35,9373	225	10,2273	0,2846
50	0,05	0,0036	0,9964	36,0023	370	16,8182	0,4671
75	0,075	0,0054	0,9946	36,0675	600	27,2727	0,7562
100	0,1	0,0072	0,9928	36,1329	850	38,6364	1,0693
125	0,125	0,0090	0,9910	36,1986	980	44,5455	1,2306
150	0,15	0,0108	0,9892	36,2645	1.070	48,6364	1,3412
175	0,175	0,0126	0,9874	36,3307	1.200	54,5455	1,5014
200	0,2	0,0144	0,9856	36,3971	1.355	61,5909	1,6922
225	0,225	0,0162	0,9838	36,4637	1.460	66,3636	1,8200
250	0,25	0,0180	0,9820	36,5306	1.565	71,1364	1,9473
275	0,275	0,0198	0,9802	36,5977	1.620	73,6364	2,0120
300	0,3	0,0216	0,9784	36,6651	1.700	77,2727	2,1075
325	0,325	0,0234	0,9766	36,7327	1.700	77,2727	2,1036
350	0,35	0,0252	0,9748	36,8006	1.700	77,2727	2,0998
375	0,375	0,0270	0,9730	36,8687	1.700	77,2727	2,0959
400	0,4	0,0288	0,9712	36,9371	1.700	77,2727	2,0920
425	0,425	0,0306	0,9694	37,0057	1.700	77,2727	2,0881
450	0,45	0,0324	0,9676	37,0746	1.700	77,2727	2,0842
475	0,475	0,0342	0,9658	37,1437	1.700	77,2727	2,0804
500	0,5	0,0360	0,9640	37,2131	1.700	77,2727	2,0765
525	0,525	0,0378	0,9622	37,2828	1.700	77,2727	2,0726
550	0,55	0,0396	0,9604	37,3527	1.700	77,2727	2,0687
575	0,575	0,0414	0,9586	37,4229	1.700	77,2727	2,0649
600	0,6	0,0432	0,9568	37,4934	1.700	77,2727	2,0610
625	0,625	0,0450	0,9550	37,5641	1.700	77,2727	2,0571
650	0,65	0,0468	0,9532	37,6351	1.700	77,2727	2,0532
675	0,675	0,0486	0,9514	37,7063	1.700	77,2727	2,0493
700	0,7	0,0504	0,9496	37,7778	1.700	77,2727	2,0455
725	0,725	0,0522	0,9478	37,8496	1.700	77,2727	2,0416
750	0,75	0,0540	0,9460	37,9217	1.810	82,2727	2,1695
775	0,775	0,0558	0,9442	37,9940	1.810	82,2727	2,1654
800	0,8	0,0576	0,9424	38,0667	1.810	82,2727	2,1613
825	0,825	0,0594	0,9406	38,1396	1.810	82,2727	2,1571
850	0,85	0,0612	0,9388	38,2127	1.810	82,2727	2,1530

α = 60 °
 φ = 30 °
 (45 + ½ φ) = 60 °
 rad (45 + ½ φ) = 1,0472

tg (45 + ½ φ) = 1,7321
 q_u = 2,1695 (kg/cm²)
 c = 0,6263 (kg/cm²)

D = 6,76 cm
 Lo = 13,75 cm
 B = 728,00 gr

Ao = 35,873 cm²
 V = 493,248 cm³
 γ = 1,476 gr/cm³

Day = 14
 SM = 8%
 FA = 36%

Soil Length Shortening			Cross Section Area		Load		Stress
Dial Reading	ΔL	Strain ε=Δl/Lo	1 - ε	A = A _o / (1 - ε)	Dial	P	P / A
a	a x 10 ⁻³	(%)		(cm)	Reading	(kg)	(kg/cm ²)
0	0	0,0000	1,0000	35,8726	0	0,0000	0,0000
25	0,025	0,0018	0,9982	35,9380	190	8,6364	0,2403
50	0,05	0,0036	0,9964	36,0035	360	16,3636	0,4545
75	0,075	0,0055	0,9945	36,0694	480	21,8182	0,6049
100	0,1	0,0073	0,9927	36,1354	560	25,4545	0,7044
125	0,125	0,0091	0,9909	36,2017	670	30,4545	0,8412
150	0,15	0,0109	0,9891	36,2683	750	34,0909	0,9400
175	0,175	0,0127	0,9873	36,3351	860	39,0909	1,0758
200	0,2	0,0145	0,9855	36,4021	945	42,9545	1,1800
225	0,225	0,0164	0,9836	36,4694	1.035	47,0455	1,2900
250	0,25	0,0182	0,9818	36,5369	1.110	50,4545	1,3809
275	0,275	0,0200	0,9800	36,6047	1.200	54,5455	1,4901
300	0,3	0,0218	0,9782	36,6727	1.250	56,8182	1,5493
325	0,325	0,0236	0,9764	36,7410	1.285	58,4091	1,5898
350	0,35	0,0255	0,9745	36,8096	1.345	61,1364	1,6609
375	0,375	0,0273	0,9727	36,8784	1.395	63,4091	1,7194
400	0,4	0,0291	0,9709	36,9475	1.000	45,4545	1,2302
425	0,425	0,0309	0,9691	37,0168	1.000	45,4545	1,2279
450	0,45	0,0327	0,9673	37,0864	1.000	45,4545	1,2256
475	0,475	0,0345	0,9655	37,1562	1.000	45,4545	1,2233
500	0,5	0,0364	0,9636	37,2263	1.000	45,4545	1,2210
525	0,525	0,0382	0,9618	37,2967	1.000	45,4545	1,2187
550	0,55	0,0400	0,9600	37,3673	1.000	45,4545	1,2164
575	0,575	0,0418	0,9582	37,4382	1.000	45,4545	1,2141
600	0,6	0,0436	0,9564	37,5094	1.000	45,4545	1,2118
625	0,625	0,0455	0,9545	37,5808	1.000	45,4545	1,2095
650	0,65	0,0473	0,9527	37,6526	1.000	45,4545	1,2072
675	0,675	0,0491	0,9509	37,7245	1.000	45,4545	1,2049
700	0,7	0,0509	0,9491	37,7968	1.000	45,4545	1,2026
725	0,725	0,0527	0,9473	37,8694	1.000	45,4545	1,2003
750	0,75	0,0545	0,9455	37,9422	1.000	45,4545	1,1980
775	0,775	0,0564	0,9436	38,0153	1.000	45,4545	1,1957
800	0,8	0,0582	0,9418	38,0887	1.000	45,4545	1,1934
825	0,825	0,0600	0,9400	38,1624	1.000	45,4545	1,1911
850	0,85	0,0618	0,9382	38,2363	1.000	45,4545	1,1888

α = 55 °
 φ = 20 °
 (45 + ½ φ) = 55 °
 rad (45 + ½ φ) = 0,9599

tg (45 + ½ φ) = 1,4281
 q_u = 1,7194 (kg/cm²)
 c = 0,6020 (kg/cm²)