

LAMPIRAN

Lampiran 1. Pengujian Kadar Air Tanah Asli (*Undisturbed Sample*)

Container no. (cup)		1	2	3
Mass of cup + wet soil	gram	21.6	23.56	21.93
Mass of cup + dry soil	gram	16.8	18.1	16.9
Mass of cup	gram	5.48	6.05	5.95
Mass of dry soil, Ms	gram	11.28	12.1	11.0
Mass of water, Mw	gram	4.84	5.4	5.0
Water content, w %	%	42.91	44.83	45.94
WC Average, %	%		44.56	



Lampiran 2. Pengujian Berat Isi Tanah (*Undisturbed Sample*)

Ring No.		I	II
Mass of wet soil + ring	gram	36.20	36.60
Mass of ring	gram	18.5	18.5
Diameter ring	cm	2.3	2.3
Height of ring	cm	2.6	2.6
Volume of ring	cm ³	10.81	10.81
Mass of soil	gram	17.70	18.10
Soil unit weight (γ)	gr/cm ³	1.638	1.675
Water content	%	44.56	44.56
Dry density of soil, (ρ_d)	gr/cm ³	1.133	1.159
Average soil unit weight	gr/cm ³	1.656	
Average Dry density of soil	gr/cm ³	1.146	



Lampiran 3. Pengujian Berat Jenis Tanah Asli (*Specific Gravity*)
SNI 1964 : 2008 (ASTM D 854 – 58)

Nomor contoh dan kedalaman		-	
Nomor piknometer		A 6	A 10
Berat piknometer + tanah	W_2 (gram)	69.78	70.36
Berat piknometer	W_1 (gram)	49.66	50.35
Berat tanah	$W_t = W_2 - W_1$ (gram)	20.12	20.01
Temperatur °C		27	
Berat piknometer + air + tanah pada temperatur 27 °C	W_3 (gram)	160.91	161.52
Berat piknometer + air	W_4	149.18	149.87
Faktor Kalibrasi		0.9965	
Berat piknometer + air pada 27 °C	W_5 (gram)	148.66	149.35
$W_6 = W_t + W_5$	(gram)	168.78	169.36
Berat jenis (G_s)	$\frac{W_t}{W_6 - W_3}$	2.557	2.554
Rata - rata (G_s)		2.556	

Tabel Hubungan antara Kerapatan Relatif Air dan Faktor Konversi K dalam Temperatur

No.	Temperatur, derajat Celcius	Hubungan kerapatan relatif air	Faktor koreksi K
1.	18	0,9986244	1,0004
2.	19	0,9984347	1,0002
3.	20	0,9982343	1,0000
4.	21	0,9980233	0,9998
5.	22	0,9978019	0,9996
6.	23	0,9975702	0,9993
7.	24	0,9973286	0,9991
8.	25	0,9970770	0,9989
9.	26	0,9968156	0,9986
10.	27	0,9965451	0,9983
11.	28	0,9962652	0,9980
12.	29	0,9959761	0,9977
13.	30	0,9956780	0,9974

Sumber: SNI 1964 (2008:4)

Lampiran 4. Analisa Saringan dan Hydrometer

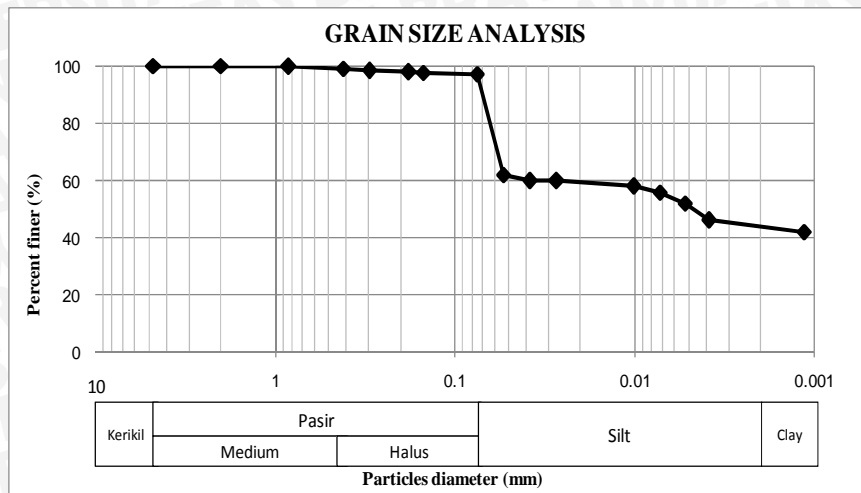
Analisa Saringan (*Grain Size*)

Sieve		Indiv. WT Retained	Acc. WT Retained	Retained (%)	Finer (%)
Sieve No.	Diameter (mm)	(gram)	(gram)		
4	4.75	0	0	0.0	100
10	2	0.03	0.03	0.02	99.99
20	0.84	0.61	0.64	0.32	99.68
40	0.42	1.27	1.91	0.96	99.05
50	0.3	1.47	3.38	1.69	98.31
80	0.18	1.02	4.40	2.20	97.80
100	0.15	0.53	4.93	2.47	97.54
200	0.075	1.02	5.95	2.98	97.03
Pan		194.05	200.00	100	0.00

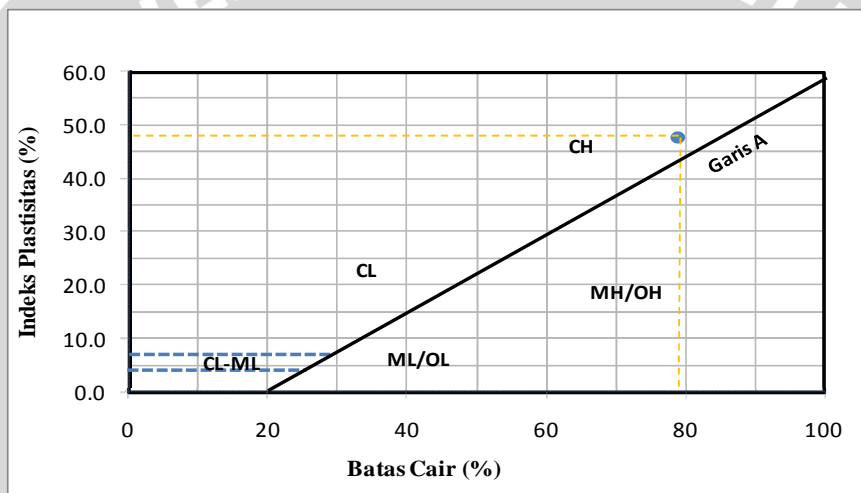
Analisa Hydrometer

Tipe hydrometer	:	151 H	Gs	:	2.556
Berat contoh tanah	:	50 gr	Ct 26	:	0.00165
Koreksi meniscus	:	0.001	a	:	1.023
Koreksi nol hydrometer	:	-0.0005			

Elapsed time	Temp.	Actual Hyd. Reading (Ra)	Hyd. Correction Reading (Rc)	Finer	Meniscus Correction (R)	Effective Depth (L)	V = L/t	K From table	Diameter (D)	Acc. Finer
(min)	(°C)			(%)		(cm)			(mm)	(%)
0	26	1.029	1.0312	63.72	1.030	8.4	-	-	-	61.82
0.5	26	1.029	1.0312	63.72	1.030	8.4	16.8	0.0131	0.0537	61.82
1	26	1.028	1.0302	61.67	1.029	8.6	8.6	0.0131	0.0384	59.84
2	26	1.028	1.0302	61.67	1.029	8.6	4.3	0.0131	0.0272	59.84
15	26	1.027	1.0292	59.63	1.028	8.9	0.5933	0.0131	0.0101	57.86
30	26	1.026	1.0282	57.58	1.027	9.2	0.3067	0.0131	0.0073	55.87
60	26	1.024	1.0262	53.49	1.025	9.7	0.1617	0.0131	0.0053	51.90
120	26	1.021	1.0232	47.36	1.022	10.5	0.0875	0.0131	0.0039	45.95
1440	26	1.019	1.0212	43.26	1.020	11	0.0076	0.0131	0.0011	41.98



Gambar.Distribusi Butiran Hasil Uji Analisa Saringan dan Hydrometer



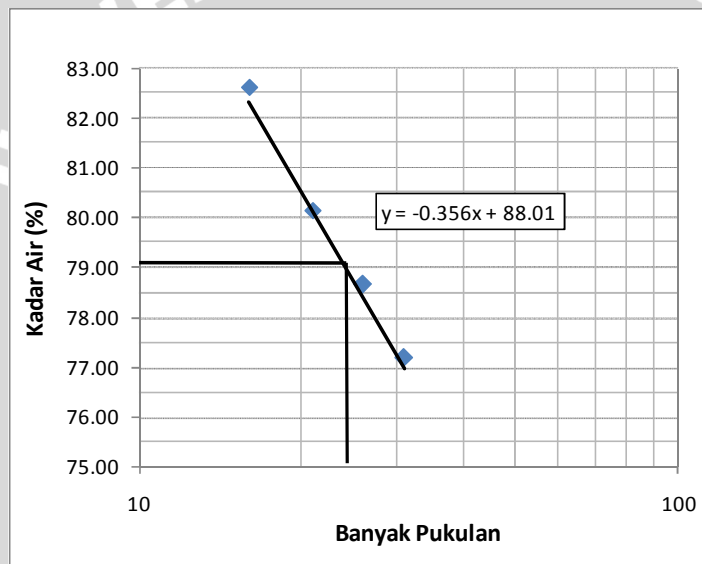
Gambar.Grafik Klasifikasi Tanah Berdasarkan Sistem *Unified*

Berdasarkan pembacaan grafik tersebut, tanah termasuk jenis lempung anorganik dengan plastisitas sangat tinggi (CH).

Lampiran 5. Pengujian Batas-batas Atterberg

Pengujian Batas Cair Tanah

Nomor cawan		I	II	III	IV
Berat cawan + tanah basah (gram)		20.37	20.76	23.75	19.71
Berat cawan + tanah kering (gram)		13.72	14.02	15.94	13.76
Berat cawan (gram)		5.67	5.61	6.01	6.05
Berat tanah kering (gram)		8.05	8.41	9.93	7.71
Berat air (gram)		6.65	6.74	7.81	5.95
Kadar air, w %		82.61	80.14	78.65	77.17
Banyak pukulan		16	21	26	31



Gambar. Pengujian Batas Cair

Nilai batas cair (LL) = **79.11 %**

Pengujian Batas Plastis Tanah

Nomor cawan		I	II	III
Berat cawan + tanah basah	(gram)	10.96	12.44	11.94
Berat cawan + tanah kering	(gram)	9.68	10.95	10.51
Berat cawan	(gram)	5.49	6.22	6.02
Berat tanah kering	(gram)	4.19	4.73	4.49
Berat air	(gram)	1.28	1.49	1.43
Kadar air, w %		30.55	31.50	31.85
Kadar air rata-rata		31.30		

Nilai batas plastis (PL) = **31.30 %**

Nilai indeks plastisitas tanah (PI) = LL – PL

$$= 79.11 - 31.30 = \mathbf{47.81 \%}$$

Pengujian Batas Susut Tanah

Nomor Cawan		1
Berat Cetakan	gr	19.17
Berat Cawan + Tanah Basah	gr	56.82
Berat Cawan + Tanah Kering	gr	42.59
Berat Tanah Basah (m ₁)	gr	37.65
Berat Air	gr	14.23
Berat Tanah Kering (m ₂)	gr	23.42
Volume Tanah Basah (V)	ml	25
Volume Tanah Kering (V _s)	ml	14
Kadar Air (w)	%	60.76
SL = $(w - ((V - V_s) / m_2)) * 100\%$	%	13.79

Nilai batas susut (SL) = **13.79 %**

Rekapitulasi Batas-batas *Atterberg* :

LL (%)	PL (%)	SL (%)	PI (%)
79.11	31.30	13.79	47.81

Lampiran 6. Pemeriksaan Pemadatan Standar Laboratorium Tanah Asli

Diketahui:

Berat cetakan = 4600 gram

Diameter cetakan = 15,5 cm

Tinggi cetakan = 11 cm

Kadar air:

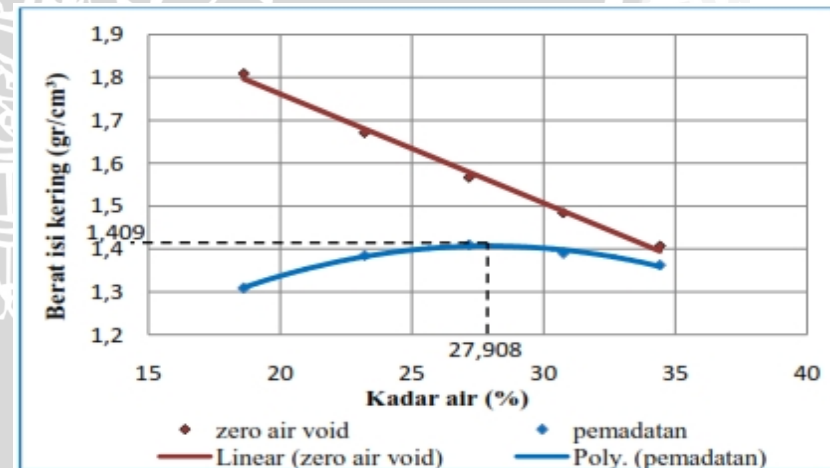
Penambahan Air	ml	400			550			700			850			1000		
		Atas	Tengah	Bawah	Atas	Tengah	Bawah	Atas	Tengah	Bawah	Atas	Tengah	Bawah	Atas	Tengah	Bawah
Beratcawan	gr	4,00	4,00	4,00	3,90	4,00	4,00	4,00	4,10	8,20	4,00	7,80	4,00	3,90	4,10	8,10
berattanahbasah+cawan	gr	18,10	14,70	18,10	21,30	26,90	20,70	30,60	36,30	37,00	48,90	42,60	28,50	34,90	34,70	37,10
berattanahkering+cawan	gr	15,90	13,00	15,90	18,10	22,70	17,40	24,80	29,50	30,90	38,30	34,50	22,70	27,00	26,80	29,70
beratair(Ww)	gr	2,2	1,7	2,2	3,2	4,2	3,3	5,8	6,8	6,1	10,6	8,1	5,8	7,9	7,9	7,4
berattanahkering(Ws)	gr	11,9	9	11,9	14,2	18,7	13,4	20,8	25,4	22,7	34,3	26,7	18,7	23,1	22,7	21,6
Kadarair	%	18,487	18,889	18,487	22,535	22,460	24,627	27,885	26,772	26,872	30,904	30,337	31,016	34,199	34,802	34,259
kadarairrata-rata	%	18,621			23,207			27,176			30,752			34,420		

Berat isi:

PenambahanAir	ml	400	550	700	850	1000
beratcetakan	gr	2580	2580	2580	2580	2580
berattanahbasah+cetakan	gr	5800	6120	6300	6350	6380
berattanahbasah	gr	3220	3540	3720	3770	3800
Isicetakan	cm ³	2074,559	2074,5588	2074,5588	2074,559	2074,559
beratisibasah(yw)	gr/cm ³	1,552	1,706	1,793	1,817	1,832
beratisi kering(yd)	gr/cm ³	1,308	1,385	1,410	1,390	1,363

Zero Air Void:

PenambahanAir	ml	400	550	700	850	1000
kadarair(w)	%	18,621	23,207	27,176	30,752	34,420
GS	gr/cm ³	2,730	2,730	2,730	2,730	2,730
beratjenisair(yw)		1	1	1	1	1
beratjeniszeroairvoid(yzav)		1,810	1,671	1,567	1,484	1,407



Perhitungan berat isi kering maksimum:

$$y = -0,001125x^2 + 0,062794x + 0,531061$$

$$\frac{dy}{dx} = -0,00225x + 0,06279 = 0$$

$$x = 27,908$$

Sehingga,

$$y = -0,001125.(27,908)^2 + 0,06279.(27,908) + 0,531061$$

$$y = 1,4073$$

Maka diperoleh kadar air optimum (OMC) sebesar 27,908% dan berat isi kering maksimum (γ_d) sebesar 1,407 gr/cm³.

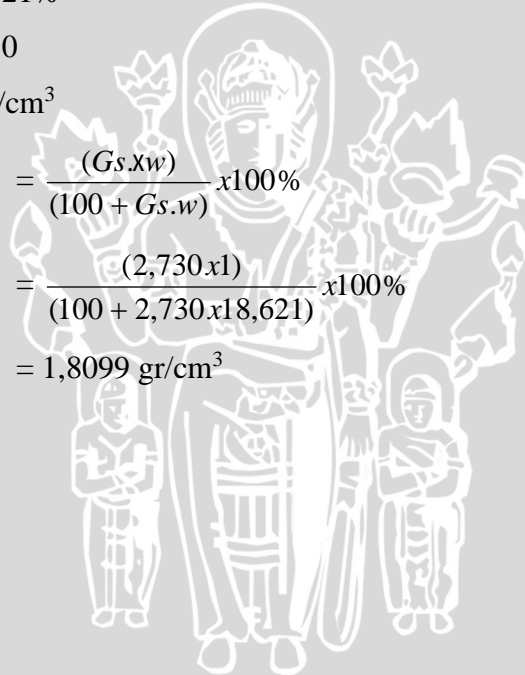
Perhitungan zero air void:

$$\text{Kadar air (w)} = 18,621\%$$

$$\text{Berat jenis (Gs)} = 2,730$$

$$\text{Berat jenis air } (\gamma_w) = 1 \text{ gr/cm}^3$$

$$\begin{aligned} \text{Kepadatan kering } \gamma_{zav} (\gamma_{zav}) &= \frac{(G_s \cdot w)}{(100 + G_s \cdot w)} \times 100\% \\ &= \frac{(2,730 \cdot 18,621)}{(100 + 2,730 \cdot 18,621)} \times 100\% \\ &= 1,8099 \text{ gr/cm}^3 \end{aligned}$$



**Lampiran 7. Pemeriksaan Pemadatan Standar Tanah Stabilisasi Kapur
(Metode B)**

Blows/ Layer = 56 x
 No. of Layers = 3
 Wt. of Hammer = 2.5 kg
 Berat Mold = 6060 gram
 Diameter Mold = 15.4 cm
 Tinggi cetakan = 10.9 cm

Kadar air :

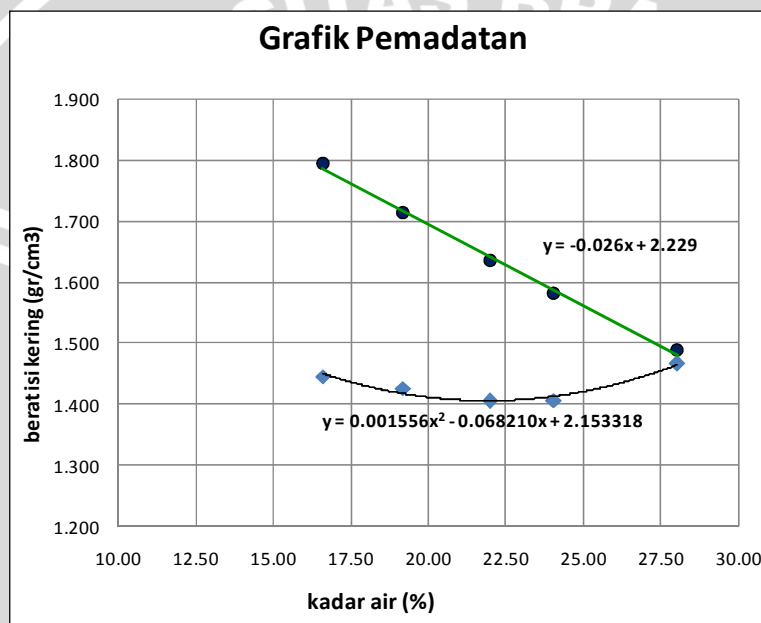
Penambahan Air	ml	400			500			600			700			900		
		Atas	Tengah	Bawah	Atas	Tengah	Bawah	Atas	Tengah	Bawah	Atas	Tengah	Bawah	Atas	Tengah	Bawah
berat cawan	gr	5.47	5.72	6.22	5.55	5.45	5.56	4.20	5.94	5.70	5.87	6.07	4.22	4.04	4.14	4.16
berat tanah basah + cawan	gr	26.54	33.37	27.83	31.58	24.61	33.55	33.25	27.68	26.84	33.33	24.48	41.26	32.00	44.20	42.85
berat tanah kering + cawan	gr	23.57	29.40	24.75	27.42	21.54	28.98	28.00	23.78	23.02	28.01	20.92	34.02	26.00	35.34	34.30
berat air (Ww)	gr	2.97	3.97	3.08	4.16	3.07	4.57	5.25	3.9	3.82	5.32	3.56	7.24	6	8.86	8.55
berat tanah kering (Ws)	gr	18.10	23.68	18.53	21.87	16.09	23.42	23.8	17.84	17.32	22.14	14.85	29.8	21.96	31.2	30.14
kadar air	%	16.409	16.765	16.622	19.021	19.080	19.513	22.059	21.861	22.055	24.029	23.973	24.295	27.322	28.397	28.368
kadar air rata-rata	%	16.60			19.20			21.99			24.10			28.03		

Berat isi :

Penambahan Air	ml	400	500	600	700	900
berat cetakan	gr	6060	6060	6060	6060	6060
berat tanah basah + cetakan	gr	9480	9510	9540	9600	9870
berat tanah basah	gr	3420	3450	3480	3540	3810
isi cetakan	cm ³	2029.26	2029.260	2029.2595	2029.2595	2029.2595
berat isi basah (yw)	gr/cm ³	1.685	1.700	1.715	1.744	1.878
berat isi kering (yd)	gr/cm ³	1.445	1.426	1.406	1.406	1.466

Zero air void :

Penambahan Air	ml	400	500	600	700	900
kadar air (w)	%	16.60	19.20	21.99	24.10	28.03
GS		2.556	2.556	2.556	2.556	2.556
berat jenis air (γ_w)	gr/cm ³	1	1	1	1	1
berat jenis zero air void (γ_{zav})	gr/cm ³	1.795	1.714	1.636	1.582	1.489



Lampiran 8. Pemeriksaan *California Bearing Ratio (CBR)* Tanah Stabilisasi Kapur

Jenis tanah = Tanah lempung ekspansif + 10% kapur

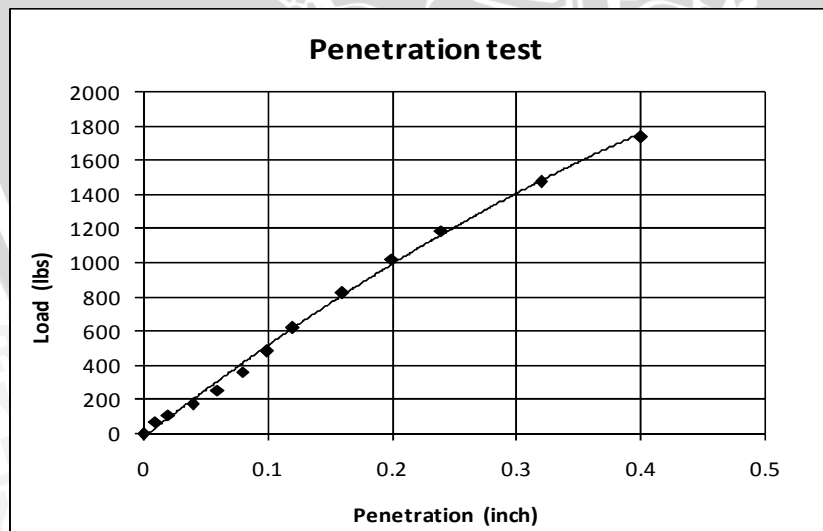
Penambahan air = 400 ml

Kadar air = 16,60 %

Kepadatan isi kering = 1,445 gr/cm³

Penetration test

Penetration Dial (mm)	Penetration Dial (inch)	Dial Reading	Load (lbs)
0	0	0.0	0
0.25	0.01	6.0	70
0.5	0.02	9.5	111
1	0.04	15.0	175
1.5	0.06	22.0	256
2	0.08	31.0	361
2.5	0.1	41.5	483
3	0.12	53.0	617
4	0.16	71.0	827
5	0.2	88.0	1025
6	0.24	102.0	1188
8	0.32	127	1480
10	0.4	149.5	1742



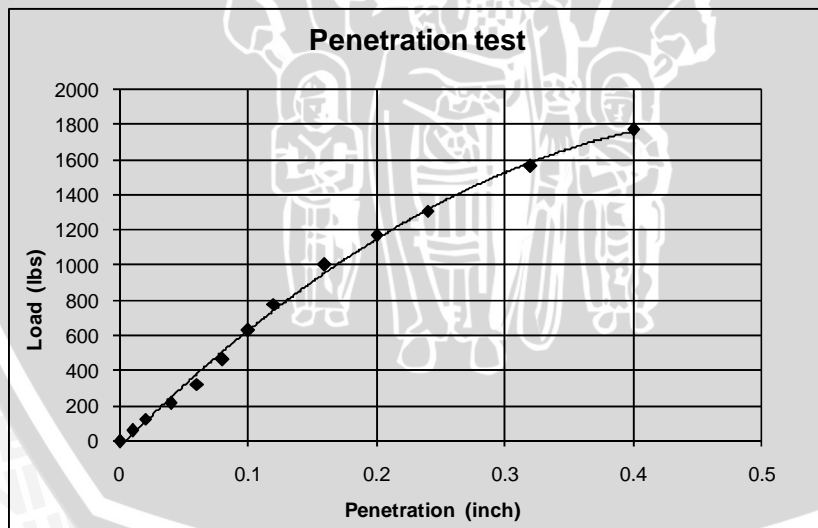
CBR Value

Penetration Dial	Load (lbs)	CBR Value (%)
0.1"	483.48	16.116
0.2"	1025.20	22.782

Jenis tanah = Tanah lempung ekspansif + 10% kapur
 Penambahan air = 500 ml
 Kadar air = 19,20 %
 Kecepatan isi kering = 1,426 gr/cm³

Penetration test

Penetration Dial (mm)	Penetration Dial (inch)	Dial Reading	Load (lbs)
0	0	0	0
0.25	0.01	5.0	58
0.5	0.02	11.0	128
1	0.04	18.5	216
1.5	0.06	28.0	326
2	0.08	40.0	466
2.5	0.1	54.0	629
3	0.12	67.0	781
4	0.16	86.0	1002
5	0.2	100.5	1171
6	0.24	112.5	1311
8	0.32	134	1561
10	0.4	152	1771



CBR Value

Penetration Dial	Load (lbs)	CBR Value (%)
0.1"	629.10	20.970
0.2"	1170.83	26.018

Jenis tanah = Tanah lempung ekspansif + 10% kapur

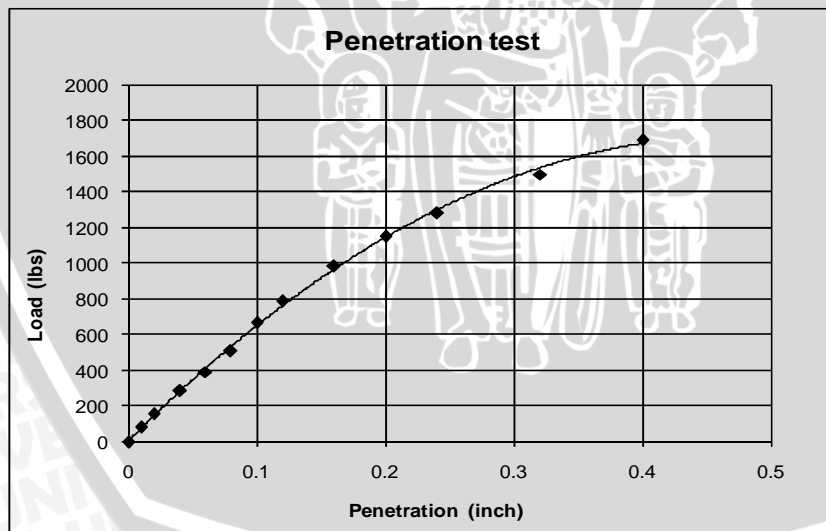
Penambahan air = 600 ml

Kadar air = 21,99 %

Kepadatan isi kering = 1,406 gr/cm³

Penetration test

Penetration Dial (mm)	Penetration Dial (inch)	Dial Reading	Load (lbs)
0	0	0.0	0
0.25	0.01	7.0	82
0.5	0.02	13.5	157
1	0.04	25.0	291
1.5	0.06	34.0	396
2	0.08	44.0	513
2.5	0.1	57.5	670
3	0.12	68.0	792
4	0.16	85.0	990
5	0.2	99.0	1153
6	0.24	110.5	1287
8	0.32	129	1503
10	0.4	145.5	1695



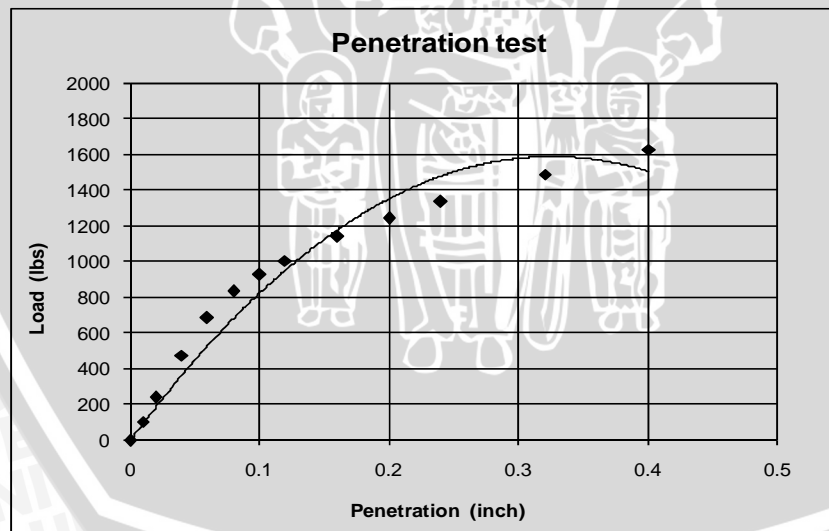
CBR Value

Penetration Dial	Load (lbs)	CBR Value (%)
0.1"	669.88	22.329
0.2"	1153.35	25.630

Jenis tanah = Tanah lempung ekspansif + 10% kapur
 Penambahan air = 700 ml
 Kadar air = 24,10 %
 Kepadatan isi kering = 1,406 gr/cm³

Penetration test

Penetration Dial (mm)	Penetration Dial (inch)	Dial Reading	Load (lbs)
0	0	0.0	0
0.25	0.01	9.0	105
0.5	0.02	20.5	239
1	0.04	41.0	478
1.5	0.06	59.0	687
2	0.08	71.5	833
2.5	0.1	79.5	926
3	0.12	86.5	1008
4	0.16	98.0	1142
5	0.2	107.0	1247
6	0.24	115.0	1340
8	0.32	128	1491
10	0.4	140	1631



CBR Value

Penetration Dial	Load (lbs)	CBR Value (%)
0.1"	926.18	30.873
0.2"	1246.55	27.701

Jenis tanah = Tanah lempung ekspansif + 10% kapur

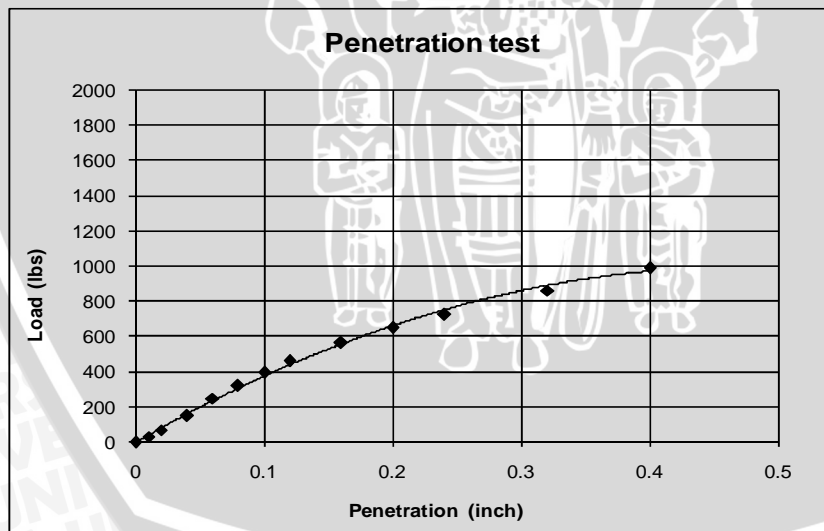
Penambahan air = 900 ml

Kadar air = 28,03 %

Kepadatan isi kering = 1,466 gr/cm³

Penetration test

Penetration Dial (mm)	Penetration Dial (inch)	Dial Reading	Load (lbs)
0	0	0.0	0
0.25	0.01	3.0	35
0.5	0.02	6.0	70
1	0.04	13.0	151
1.5	0.06	21.5	250
2	0.08	27.5	320
2.5	0.1	34.0	396
3	0.12	39.5	460
4	0.16	48.5	565
5	0.2	56.0	652
6	0.24	62.5	728
8	0.32	74	862
10	0.4	85	990



CBR Value

Penetration Dial	Load (lbs)	CBR Value (%)
0.1"	396.10	13.203
0.2"	652.40	14.498

Tabel Rekapitulasi Nilai CBR Tanah Stabilisasi

No. Sampel	Kadar air (w) (%)	Berat Isi Kering (ρ) (gr/cm ³)	CBR Value (0.1") (%)
1	16.60	1.445	16.12
2	19.20	1.426	20.97
3	21.99	1.406	22.33
4	24.10	1.406	30.87
5	28.03	1.466	13.20

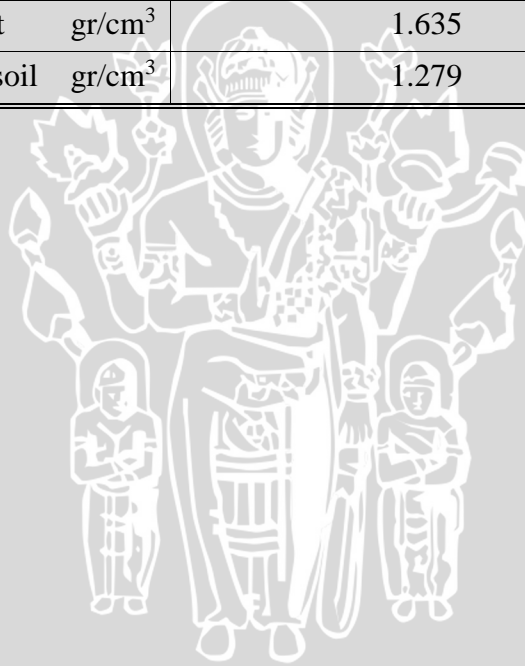


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Lampiran 9. Hasil Uji *Density* pada Tanah Model (Tanah Dasar)

Ring No.		I	II	III	IV
Mass of wet soil + ring	gram	35.95	35.34	35.87	35.18
Mass of dry soil + ring	gram	32.05	31.62	31.98	31.35
Mass of ring	gram	18.06	18.06	18.06	17.84
Diameter ring	cm	2.3	2.3	2.3	2.3
Height of ring	cm	2.60	2.60	2.60	2.55
Volume of ring	cm ³	10.80	10.80	10.80	10.59
Mass of wet soil	gram	17.89	17.28	17.81	17.34
Mass of dry soil	gram	13.99	13.56	13.92	13.51
Mass of water	gram	3.90	3.72	3.89	3.83
Water content	%	27.88	27.43	27.95	28.35
Soil unit weight (γ)	gr/cm ³	1.656	1.600	1.649	1.637
Dry density of soil, (γ_d)	gr/cm ³	1.295	1.255	1.289	1.275
Average soil unit weight	gr/cm ³	1.635			
Average dry density of soil	gr/cm ³	1.279			



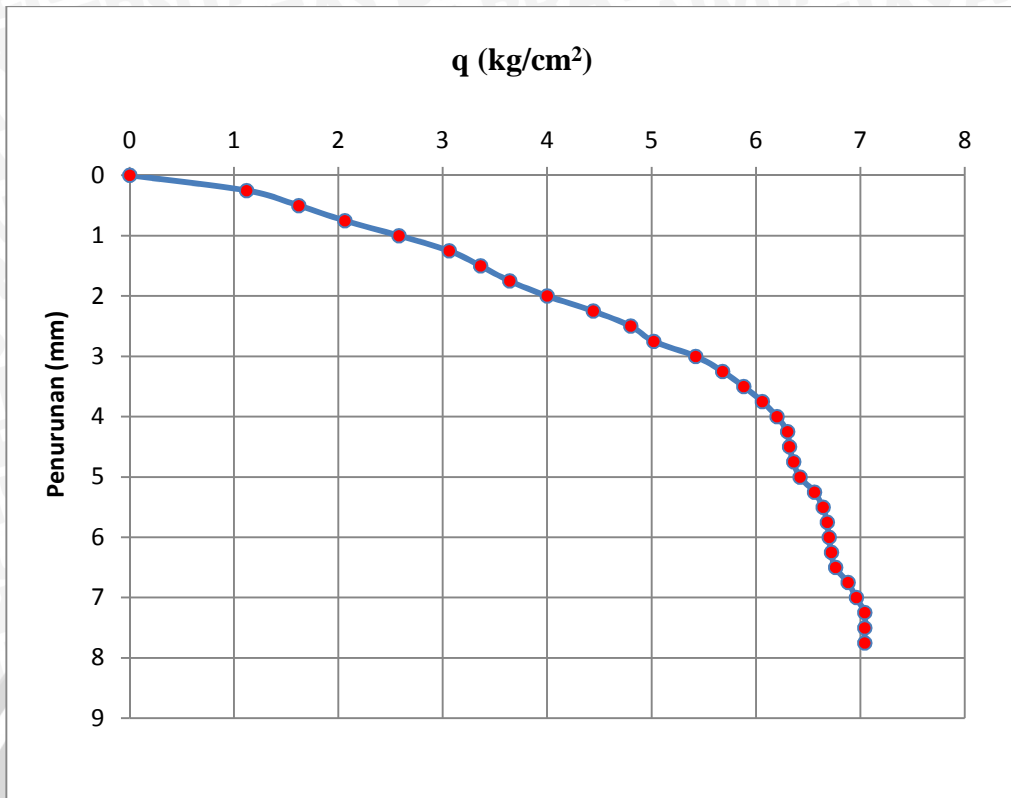
Lampiran 10. Hasil Uji Pembebanan (*Load Test*)

- Hasil Uji Beban pada Tanah Asli

Faktor kalibrasi alat LVDT = 0,005

Pembacaan LVDT	Interval ()	Penurunan (s)	Beban (P)	Luas Pelat (A)	Daya Dukung (q)
		mm	kg	cm ²	kg/cm ²
A	= A ± 50	s = x 0.005	P	A = 5 x 5	q = P/A
4500	0	0	0	25	0
4450	50	0.25	28	25	1.12
4400	100	0.5	40.5	25	1.62
4350	150	0.75	51.5	25	2.06
4300	200	1	64.5	25	2.58
4250	250	1.25	76.5	25	3.06
4200	300	1.5	84	25	3.36
4150	350	1.75	91	25	3.64
4100	400	2	100	25	4
4050	450	2.25	111	25	4.44
4000	500	2.5	120	25	4.8
3950	550	2.75	125.5	25	5.02
3900	600	3	135.5	25	5.42
3850	650	3.25	142	25	5.68
3800	700	3.5	147	25	5.88
3750	750	3.75	151.5	25	6.06
3700	800	4	155	25	6.2
3650	850	4.25	157.5	25	6.3
3600	900	4.5	158	25	6.32
3550	950	4.75	159	25	6.36
3500	1000	5	160.5	25	6.42
3450	1050	5.25	164	25	6.56
3400	1100	5.5	166	25	6.64
3350	1150	5.75	167	25	6.68
3300	1200	6	167.5	25	6.7
3250	1250	6.25	168	25	6.72
3200	1300	6.5	169	25	6.76
3150	1350	6.75	172	25	6.88
3100	1400	7	174	25	6.96
3050	1450	7.25	176	25	7.04
3000	1500	7.5	176	25	7.04
2950	1550	7.75	176	25	7.04

$q_u = 7.04 \text{ kg/cm}^2$

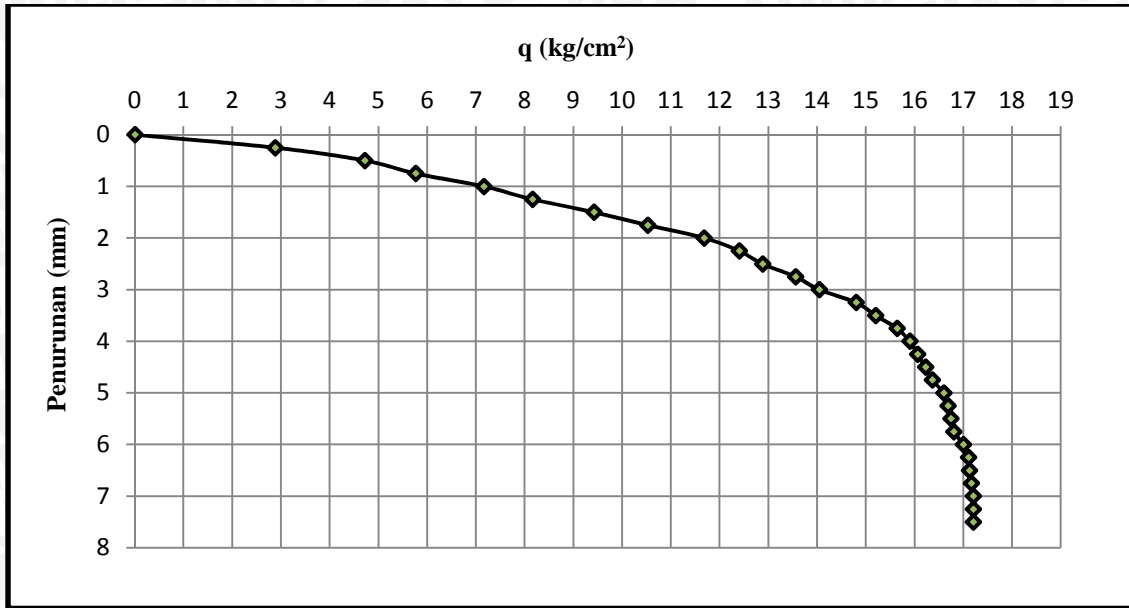


- Hasil Uji Beban pada Tanah Stabilisasi Kolom DSM Tipe Panels Diameter 4,5 cm

1. Variasi : $L = 1D$ (3 cm) ; $D_f = 10$ cm

Pembacaan LVDT	Interval ()	Penurunan (s) mm	Beban (P) kg	Luas Pelat (A) cm^2	Daya Dukung (q) kg/cm^2
A	$= A \pm 50$	$s = x \cdot 0.005$	P	$A = 5 \times 5$	$q = P/A$
2950	0	0	0	25	0
2900	50	0,25	72	25	2,88
2850	100	0,5	118	25	4,72
2800	150	0,75	144	25	5,76
2750	200	1	179	25	7,16
2700	250	1,25	204	25	8,16
2650	300	1,5	235,5	25	9,42
2600	350	1,75	263	25	10,52
2550	400	2	292	25	11,68
2500	450	2,25	310	25	12,4
2450	500	2,5	322	25	12,88
2400	550	2,75	339	25	13,56
2350	600	3	351	25	14,04
2300	650	3,25	370	25	14,8
2250	700	3,5	380	25	15,2
2200	750	3,75	391	25	15,64
2150	800	4	397,5	25	15,9
2100	850	4,25	401,5	25	16,06
2050	900	4,5	405,5	25	16,22
2000	950	4,75	409	25	16,36
1950	1000	5	415	25	16,6
1900	1050	5,25	417	25	16,68
1850	1100	5,5	418,5	25	16,74
1800	1150	5,75	420	25	16,8
1750	1200	6	425	25	17
1700	1250	6,25	427,5	25	17,1
1650	1300	6,5	428	25	17,12
1600	1350	6,75	429	25	17,16
1550	1400	7	430	25	17,2
1500	1450	7,25	430	25	17,2
1450	1500	7,5	430	25	17,2

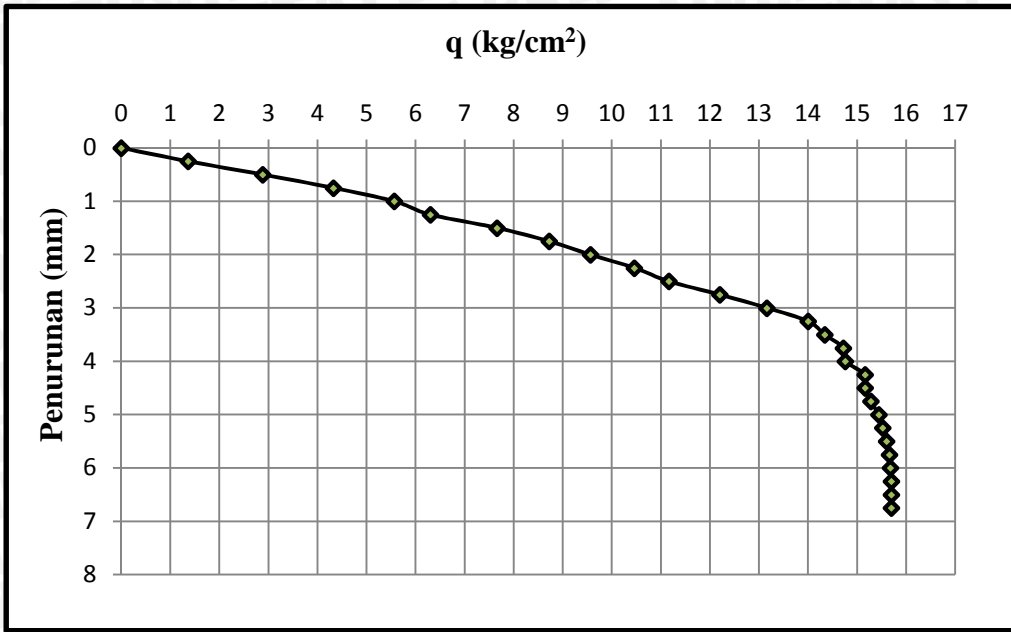
$$q_u = 17,2 \text{ kg/cm}^2$$



2. Variasi : $L = 1.25D$ (3,75 cm) ; $D_f = 10$ cm

Pembacaan LVDT	Interval ()	Penurunan (s) mm	Beban (P) kg	Luas Pelat (A) cm ²	Daya Dukung (q) kg/cm ²
A	= A ± 50	s = x 0.005	P	A = 5 x 5	q = P/A
1100	0	0	0	25	0
1050	50	0,25	34	25	1,36
1000	100	0,5	72	25	2,88
950	150	0,75	108	25	4,32
900	200	1	139	25	5,56
850	250	1,25	157,5	25	6,3
800	300	1,5	191,5	25	7,66
750	350	1,75	218	25	8,72
700	400	2	239	25	9,56
650	450	2,25	261,5	25	10,46
600	500	2,5	279	25	11,16
550	550	2,75	305	25	12,2
500	600	3	329	25	13,16
450	650	3,25	350	25	14
400	700	3,5	358,5	25	14,34
350	750	3,75	368	25	14,72
300	800	4	369	25	14,76
250	850	4,25	379	25	15,16
200	900	4,5	379	25	15,16
150	950	4,75	382	25	15,28
100	1000	5	386	25	15,44
50	1050	5,25	388	25	15,52
0	1100	5,5	390	25	15,6
-50	1150	5,75	391,5	25	15,66
-100	1200	6	392	25	15,68
-150	1250	6,25	392,5	25	15,7
-200	1300	6,5	392,5	25	15,7
-250	1350	6,75	392,5	25	15,7

$$q_u = 15.7 \text{ kg/cm}^2$$

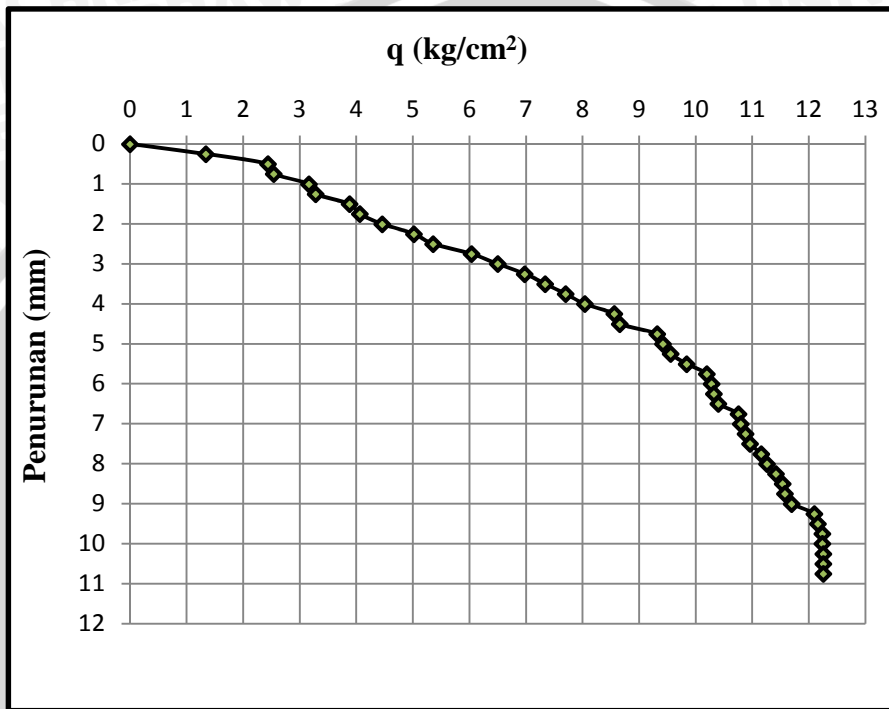


3. Variasi : $L = 1,5D$ (4,5 cm) ; $D_f = 10$ cm

Pembacaan LVDT	Interval ()	Penurunan (s)	Beban (P)	Luas Pelat (A)	Daya Dukung (q)
		mm	kg	cm ²	kg/cm ²
A	= A ± 50	s = x 0.005	P	A = 5 x 5	q = P/A
750	0	0	0	25	0
700	50	0,25	33,5	25	1,34
650	100	0,5	61	25	2,44
600	150	0,75	63,5	25	2,54
550	200	1	79	25	3,16
500	250	1,25	82	25	3,28
450	300	1,5	97	25	3,88
400	350	1,75	101,5	25	4,06
350	400	2	111,5	25	4,46
300	450	2,25	125,5	25	5,02
250	500	2,5	134	25	5,36
200	550	2,75	151	25	6,04
150	600	3	162,5	25	6,5
100	650	3,25	174,5	25	6,98
50	700	3,5	183,5	25	7,34
0	750	3,75	192,5	25	7,7
-50	800	4	201	25	8,04
-100	850	4,25	214	25	8,56
-150	900	4,5	216,5	25	8,66
-200	950	4,75	233	25	9,32
-250	1000	5	235,5	25	9,42
-300	1050	5,25	239	25	9,56
-350	1100	5,5	246	25	9,84
-400	1150	5,75	255	25	10,2
-450	1200	6	257	25	10,28
-500	1250	6,25	258	25	10,32
-550	1300	6,5	260	25	10,4
-600	1350	6,75	269	25	10,76
-650	1400	7	270	25	10,8
-700	1450	7,25	272	25	10,88
-750	1500	7,5	274	25	10,96
-800	1550	7,75	279	25	11,16
-850	1600	8	281,5	25	11,26
-900	1650	8,25	285,5	25	11,42
-950	1700	8,5	288,5	25	11,54
-1000	1750	8,75	289,5	25	11,58
-1050	1800	9	292,5	25	11,7
-1100	1850	9,25	302,5	25	12,1

-1150	1900	9,5	304	25	12,16
-1200	1950	9,75	306	25	12,24
-1250	2000	10	306	25	12,24
-1300	2050	10,25	306,5	25	12,26
-1350	2100	10,5	306,5	25	12,26
-1400	2150	10,75	306,5	25	12,26

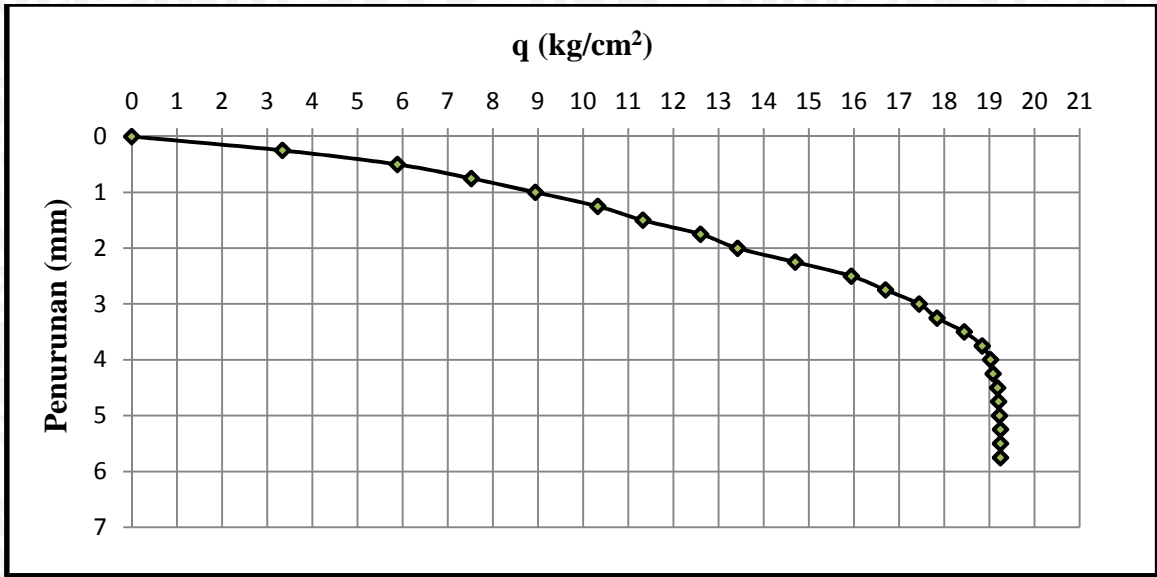
$$q_u = 12.26 \text{ kg/cm}^2$$



4. Variasi : $L = 1D (3 \text{ cm}) ; D_f = 15 \text{ cm}$

Pembacaan LVDT	Interval ()	Penurunan (s)	Beban (P)	Luas Pelat (A)	Daya Dukung (q)
		mm	kg	cm ²	kg/cm ²
A	= A ± 50	s = x 0.005	P	A = 5 x 5	q = P/A
400	0	0	0	25	0
350	50	0,25	83,5	25	3,34
300	100	0,5	147	25	5,88
250	150	0,75	188	25	7,52
200	200	1	223,5	25	8,94
150	250	1,25	258	25	10,32
100	300	1,5	283	25	11,32
50	350	1,75	315	25	12,6
0	400	2	335,5	25	13,42
-50	450	2,25	367,5	25	14,7
-100	500	2,5	398,5	25	15,94
-150	550	2,75	417,5	25	16,7
-200	600	3	436	25	17,44
-250	650	3,25	446	25	17,84
-300	700	3,5	461	25	18,44
-350	750	3,75	471	25	18,84
-400	800	4	475,5	25	19,02
-450	850	4,25	477	25	19,08
-500	900	4,5	479,5	25	19,18
-550	950	4,75	480	25	19,2
-600	1000	5	480,5	25	19,22
-650	1050	5,25	481	25	19,24
-700	1100	5,5	481	25	19,24
-750	1150	5,75	481	25	19,24

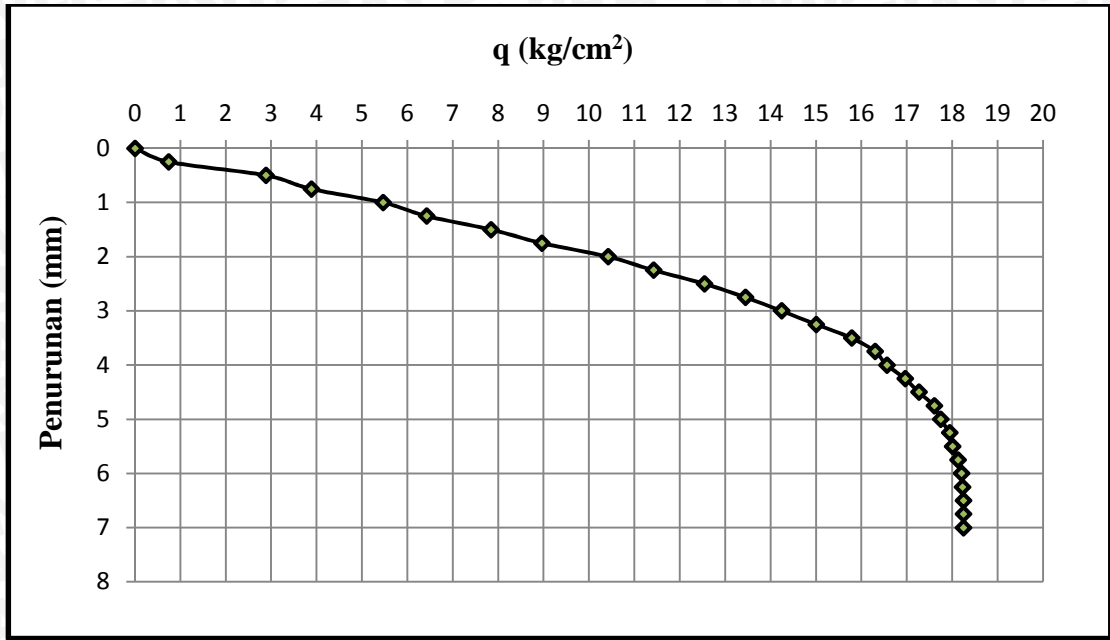
$$q_u = 19,24 \text{ kg/cm}^2$$



5. Variasi : $L = 1,25D$ (3,75 cm) ; $D_f = 15$ cm

Pembacaan LVDT	Interval ()	Penurunan (s)	Beban (P)	Luas Pelat (A)	Daya Dukung (q)
		mm	kg	cm ²	kg/cm ²
A	= $A \pm 50$	s = $x \cdot 0.005$	P	$A = 5 \times 5$	$q = P/A$
650	0	0	0	25	0
600	50	0,25	18,5	25	0,74
550	100	0,5	72	25	2,88
500	150	0,75	97	25	3,88
450	200	1	136,5	25	5,46
400	250	1,25	160,5	25	6,42
350	300	1,5	196	25	7,84
300	350	1,75	224	25	8,96
250	400	2	260,5	25	10,42
200	450	2,25	285,5	25	11,42
150	500	2,5	313,5	25	12,54
100	550	2,75	336	25	13,44
50	600	3	356	25	14,24
0	650	3,25	375	25	15
-50	700	3,5	394,5	25	15,78
-100	750	3,75	407,5	25	16,3
-150	800	4	414	25	16,56
-200	850	4,25	424	25	16,96
-250	900	4,5	431,5	25	17,26
-300	950	4,75	440	25	17,6
-350	1000	5	443,5	25	17,74
-400	1050	5,25	448,5	25	17,94
-450	1100	5,5	450	25	18
-500	1150	5,75	453	25	18,12
-550	1200	6	455	25	18,2
-600	1250	6,25	455,5	25	18,22
-650	1300	6,5	456	25	18,24
-700	1350	6,75	456	25	18,24
-750	1400	7	456	25	18,24

$$q_u = 18,24 \text{ kg/cm}^2$$

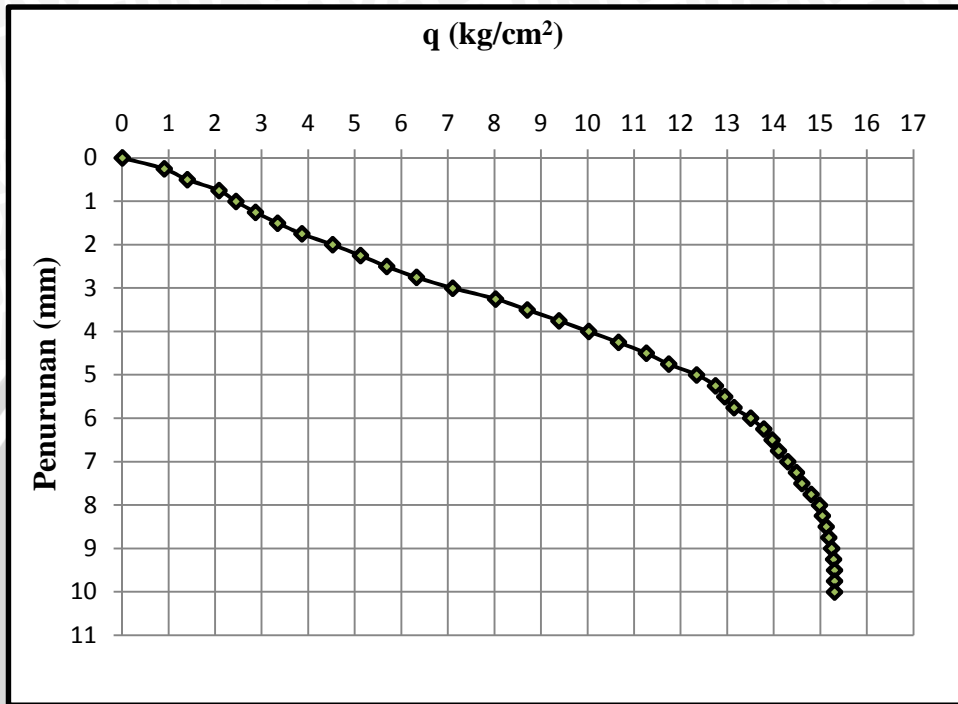


6. Variasi : $L = 1,5D$ (4,5 cm) ; $D_f = 15$ cm

Pembacaan LVDT	Interval ()	Penurunan (s)	Beban (P)	Luas Pelat (A)	Daya Dukung (q)
		mm	kg	cm ²	kg/cm ²
A	= $A \pm 50$	s = $x 0.005$	P	$A = 5 \times 5$	$q = P/A$
400	0	0	0	25	0
350	50	0,25	22,5	25	0,9
300	100	0,5	35	25	1,4
250	150	0,75	52	25	2,08
200	200	1	61	25	2,44
150	250	1,25	71,5	25	2,86
100	300	1,5	83,5	25	3,34
50	350	1,75	96,5	25	3,86
0	400	2	113	25	4,52
-50	450	2,25	128	25	5,12
-100	500	2,5	142	25	5,68
-150	550	2,75	158	25	6,32
-200	600	3	177,5	25	7,1
-250	650	3,25	200,5	25	8,02
-300	700	3,5	217,5	25	8,7
-350	750	3,75	234,5	25	9,38
-400	800	4	250,5	25	10,02
-450	850	4,25	266,5	25	10,66
-500	900	4,5	281,5	25	11,26
-550	950	4,75	293,5	25	11,74
-600	1000	5	308,5	25	12,34
-650	1050	5,25	318,5	25	12,74
-700	1100	5,5	323,5	25	12,94
-750	1150	5,75	328,5	25	13,14
-800	1200	6	337,5	25	13,5
-850	1250	6,25	344,5	25	13,78
-900	1300	6,5	349	25	13,96
-950	1350	6,75	352,5	25	14,1
-1000	1400	7	357,5	25	14,3
-1050	1450	7,25	362	25	14,48
-1100	1500	7,5	365	25	14,6
-1150	1550	7,75	370	25	14,8
-1200	1600	8	374,5	25	14,98
-1250	1650	8,25	376	25	15,04
-1300	1700	8,5	378	25	15,12
-1350	1750	8,75	379,5	25	15,18
-1400	1800	9	381	25	15,24
-1450	1850	9,25	382	25	15,28
-1500	1900	9,5	382,5	25	15,3

-1550	1950	9,75	382,5	25	15,3
-1600	2000	10	382,5	25	15,3

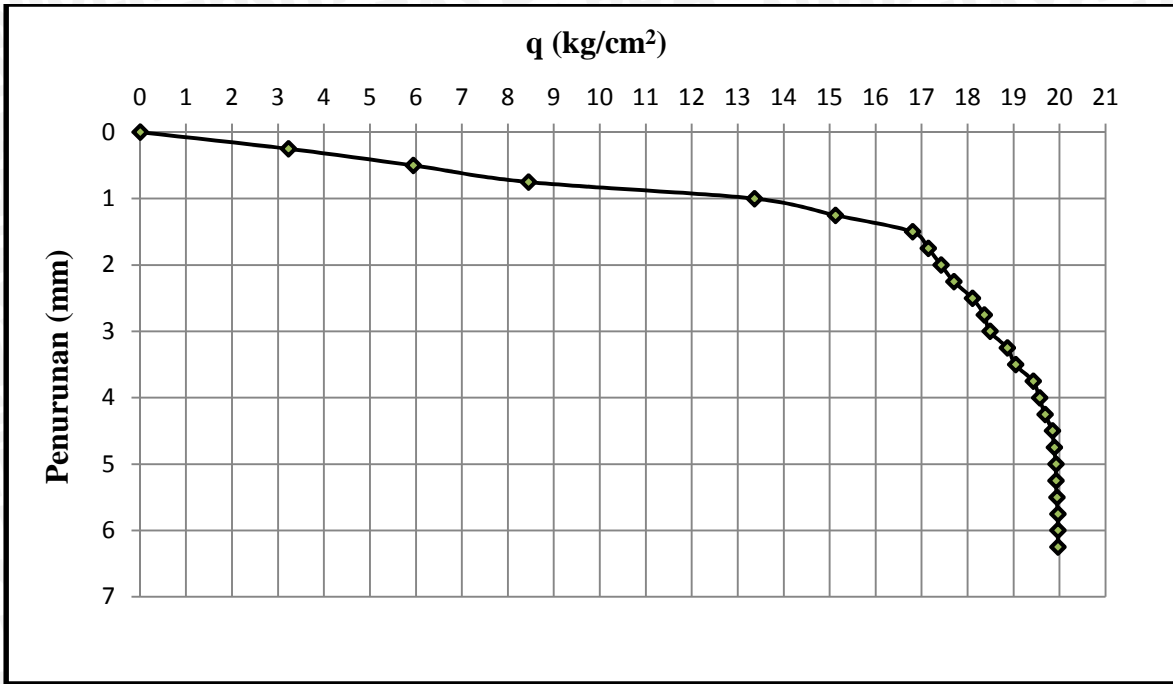
$$q_u = 15,3 \text{ kg/cm}^2$$



7. Variasi : $L = 1D (3 \text{ cm}) ; D_f = 20 \text{ cm}$

Pembacaan LVDT	Interval (Δ)	Penurunan (s)	Beban (P)	Luas Pelat (A)	Daya Dukung (q)
		mm	kg	cm ²	kg/cm ²
A	$\Delta = A \pm 50$	$s = \Delta \times 0.005$	P	$A = 5 \times 5$	$q = P/A$
1600	0	0	0	25	0
1550	50	0,25	80,5	25	3,22
1500	100	0,5	148,5	25	5,94
1450	150	0,75	211	25	8,44
1400	200	1	334	25	13,36
1350	250	1,25	378	25	15,12
1300	300	1,5	420	25	16,8
1250	350	1,75	428,5	25	17,14
1200	400	2	435,5	25	17,42
1150	450	2,25	442,5	25	17,7
1100	500	2,5	452,5	25	18,1
1050	550	2,75	459	25	18,36
1000	600	3	462	25	18,48
950	650	3,25	471,5	25	18,86
900	700	3,5	476	25	19,04
850	750	3,75	485,5	25	19,42
800	800	4	489	25	19,56
750	850	4,25	492	25	19,68
700	900	4,5	496	25	19,84
650	950	4,75	497	25	19,88
600	1000	5	498	25	19,92
550	1050	5,25	498	25	19,92
500	1100	5,5	498,5	25	19,94
450	1150	5,75	499	25	19,96
400	1200	6	499	25	19,96
350	1250	6,25	499	25	19,96

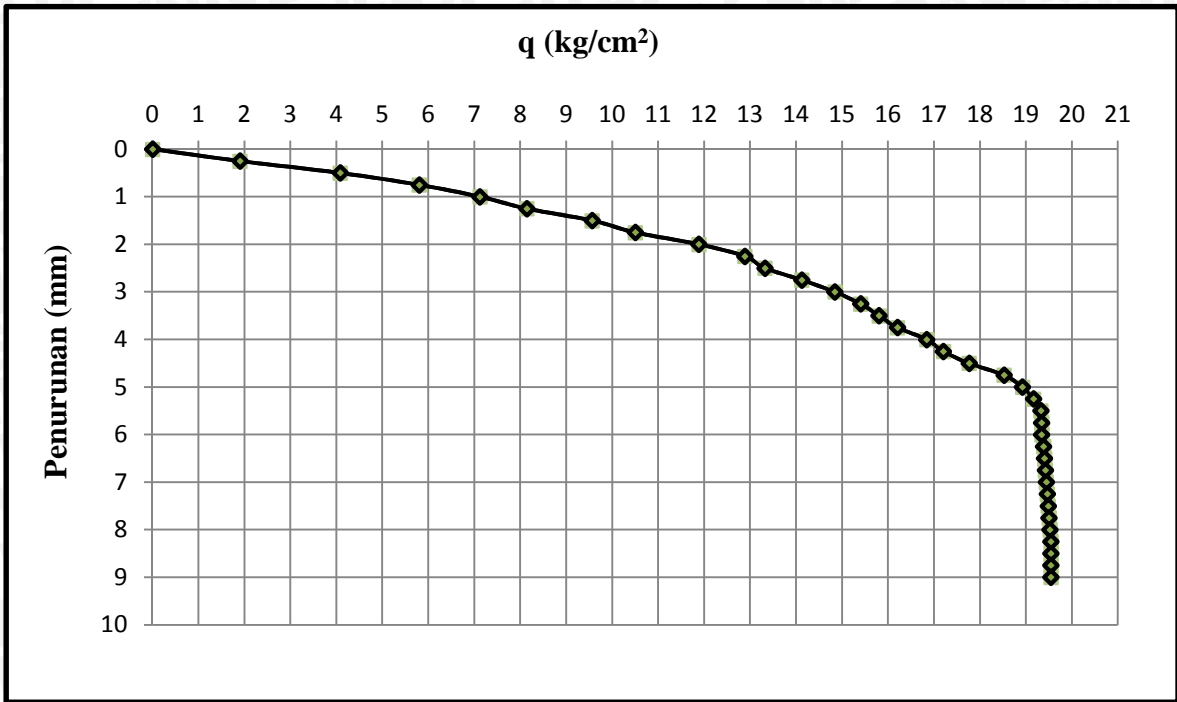
$$q_u = 19,96 \text{ kg/cm}^2$$



8. Variasi : $L = 1,25D$ (3,75 cm) ; $D_f = 20$ cm

Pembacaan LVDT	Interval ()	Penurunan (s)	Beban (P)	Luas Pelat (A)	Daya Dukung (q)
		mm	kg	cm ²	kg/cm ²
A	= A ± 50	s = x 0.005	P	A = 5 x 5	q = P/A
800	0	0	0	25	0
750	50	0,25	47,5	25	1,9
700	100	0,5	102	25	4,08
650	150	0,75	145	25	5,8
600	200	1	178	25	7,12
550	250	1,25	203,5	25	8,14
500	300	1,5	239	25	9,56
450	350	1,75	262,5	25	10,5
400	400	2	297	25	11,88
350	450	2,25	322	25	12,88
300	500	2,5	333	25	13,32
250	550	2,75	353	25	14,12
200	600	3	371	25	14,84
150	650	3,25	385	25	15,4
100	700	3,5	395	25	15,8
50	750	3,75	405	25	16,2
0	800	4	421	25	16,84
-50	850	4,25	430	25	17,2
-100	900	4,5	444	25	17,76
-150	950	4,75	463	25	18,52
-200	1000	5	473	25	18,92
-250	1050	5,25	479	25	19,16
-300	1100	5,5	483	25	19,32
-350	1150	5,75	483,5	25	19,34
-400	1200	6	483,5	25	19,34
-450	1250	6,25	484,5	25	19,38
-500	1300	6,5	485	25	19,4
-550	1350	6,75	485,5	25	19,42
-600	1400	7	486	25	19,44
-650	1450	7,25	486,5	25	19,46
-700	1500	7,5	487	25	19,48
-750	1550	7,75	487,5	25	19,5
-800	1600	8	488	25	19,52
-850	1650	8,25	488,5	25	19,54
-900	1700	8,5	488,5	25	19,54
-950	1750	8,75	488,5	25	19,54
-1000	1800	9	488,5	25	19,54

$$q_u = 19.54 \text{ kg/cm}^2$$

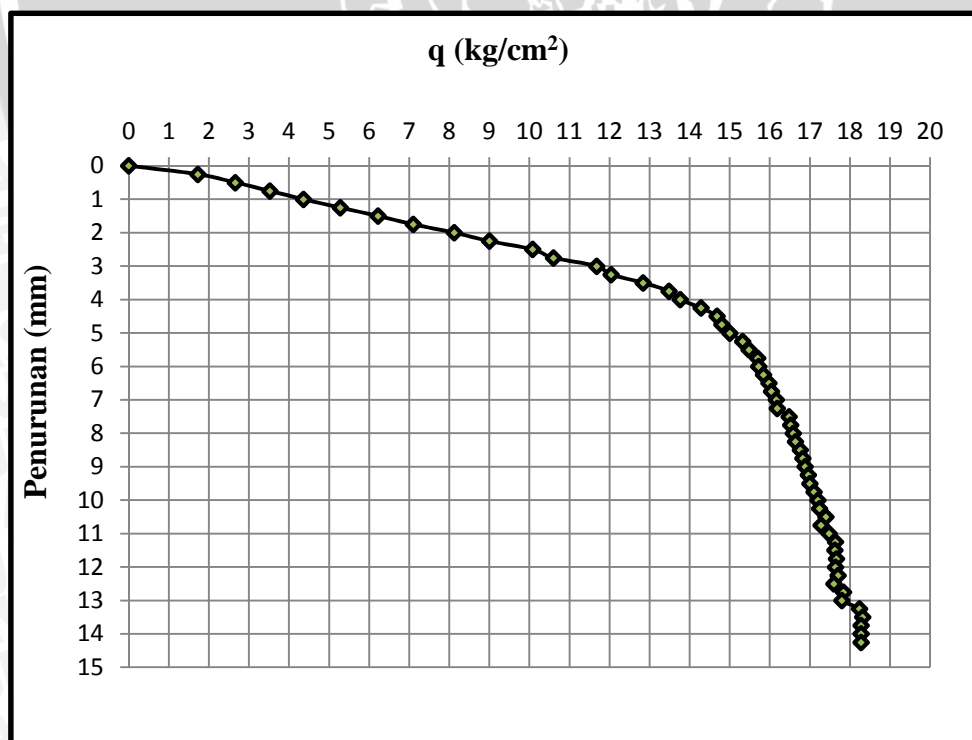


9. Variasi : $L = 1,5D$ (4,5 cm) ; $D_f = 20$ cm

Pembacaan LVDT	Interval ()	Penurunan (s)	Beban (P)	Luas Pelat (A)	Daya Dukung (q)
		mm	kg	cm ²	kg/cm ²
A	= A ± 50	s = x 0.005	P	A = 5 x 5	q = P/A
1500	0	0	0	25	0
1450	50	0,25	43	25	1,72
1400	100	0,5	66,5	25	2,66
1350	150	0,75	88	25	3,52
1300	200	1	109	25	4,36
1250	250	1,25	132	25	5,28
1200	300	1,5	155,5	25	6,22
1150	350	1,75	177,5	25	7,1
1100	400	2	203	25	8,12
1050	450	2,25	225	25	9
1000	500	2,5	252	25	10,08
950	550	2,75	265	25	10,6
900	600	3	292	25	11,68
850	650	3,25	301	25	12,04
800	700	3,5	321	25	12,84
750	750	3,75	337	25	13,48
700	800	4	344	25	13,76
650	850	4,25	357	25	14,28
600	900	4,5	367	25	14,68
550	950	4,75	370	25	14,8
500	1000	5	375	25	15
450	1050	5,25	383	25	15,32
400	1100	5,5	387	25	15,48
350	1150	5,75	392,5	25	15,7
300	1200	6	393	25	15,72
250	1250	6,25	396	25	15,84
200	1300	6,5	399,5	25	15,98
150	1350	6,75	401	25	16,04
100	1400	7	404	25	16,16
50	1450	7,25	404,5	25	16,18
0	1500	7,5	412	25	16,48
-50	1550	7,75	413	25	16,52
-100	1600	8	414,5	25	16,58
-150	1650	8,25	416	25	16,64
-200	1700	8,5	419	25	16,76
-250	1750	8,75	420,5	25	16,82
-300	1800	9	422	25	16,88
-350	1850	9,25	424	25	16,96

-400	1900	9,5	425	25	17
-450	1950	9,75	427,5	25	17,1
-500	2000	10	430	25	17,2
-550	2050	10,25	431	25	17,24
-600	2100	10,5	435	25	17,4
-650	2150	10,75	432	25	17,28
-700	2200	11	437	25	17,48
-750	2250	11,25	441	25	17,64
-800	2300	11,5	440,5	25	17,62
-850	2350	11,75	441,5	25	17,66
-900	2400	12	441	25	17,64
-950	2450	12,25	442,5	25	17,7
-1000	2500	12,5	440	25	17,6
-1050	2550	12,75	446	25	17,84
-1100	2600	13	445	25	17,8
-1150	2650	13,25	456	25	18,24
-1200	2700	13,5	458	25	18,32
-1250	2750	13,75	457	25	18,28
-1300	2800	14	457	25	18,28
-1350	2850	14,25	457	25	18,28

$q_u = 18.28 \text{ kg/cm}^2$



Lampiran 11. Dokumentasi Penelitian



Pengambilan sampel tanah di Bojonegoro



Proses Penggilingan Tanah



Proses Penjemuran Tanah



Pemadatan Tanah dalam Box



Pembuatan Kolom-Kolom DSM



Sampel mengalami Proses Curing



Pembebanan benda uji dengan *Hydraulic Jack*



Pembacaan LVDT