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## LAMPIRAN

<b>SPECIFIC GRAVITY TEST RESULTS</b>							
PROJECT	: SOIL INVESTIGATION REPORT PENRILITIAN LERENG						
LOCATION	:-						
QUARRY	:-						
BORING DEPTH	:-						
TESTING METHOD	: ASTM D 854-58(72)				TESTED BY	: AKHIRUL	
LABORATORY	: HASANUDDIN UNIVERSITY				DATE	: NOVEMBER 1 2021	
Sample	-	1					
Sample Depth & Inclination	m						
Number of Volumetric Flask	-	A	B				
Weight of Vol. Flask + Soil (W2)	Gram	32.05	38.68				
Weight of Vol. Flask (W1)	Gram	22.05	28.68				
Weight of Soil	Gram	10.00	10.00				
Temperature, T (oC)	Degree	28.0	28.0				
Weight of Vol. Flask+Water at T (W4)	Gram	72.84	77.69				
Weight of Vol. Flask+Water+Soil (W3)	Gram	78.90	83.87				
Unit Weight of Water at T, $\gamma_T$	Gram/Cm <sup>3</sup>	0.99624	0.99624				
Temp. Corr. Coefficient, $\alpha = \gamma_T / \gamma_{20}^{oC}$	-	0.99803	0.99803				
Weight of Dry Soil, Ws	Gram	9.78	9.98				
Specific Gravity of Soil ( $G_s = \alpha \cdot W_s / W_u$ )	-	2.624	2.621				
Average of Gs	-	2.622					
Remarks:	Unit Weight of Water, $\gamma_{w,20}^{oC} = 0.99821$						

**TEST RESULTS OF GENERAL PROPERTIES**  
(Wet Density, Water Content, Dry Density, Porosity, & Degree of Saturation)

PROJECT	: SOIL INVESTIGATION REPORT		
LOCATION	: SULSEL		
BORING DEPTH	: -		
TESTING METHOD	: ASTM D 2216-(98), D 2937-(71), AASHTO T100-71	TESTED BY	Muh. Akhirul Tri Putra
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	30/11/2021



Bore Hole No.	-									KETERANGAN
Sample	-									
Sample Depth & Inclination	m									
Ring / Container Number	-	9	10							
Weight of Ring, (1)	Gram	38.88	37.79							
Weight of Container, (2)	Gram	18.92	8.08							
Weight of Ring+Container+Wet Soil, (3)	Gram	144.46	137.26							
Weight of Wet Soil, (4)={(3)-(2)-(1)}	Gram	86.66	91.39							
Volume of Soil or Ring, (5)	cm <sup>3</sup>	51.48	56.62							
Weight of Ring+Container+Dry Soil, (6)	Gram	113.61	100.95							
Weight of Dry Soil, (7)={(6)-(2)-(1)}	Gram	55.81	55.08							
Weight of Water, (8)=(4)-(7)	Gram	30.85	36.31							
Specific Gravity, G <sub>s</sub>	-	2.720	2.720							
Volume of Dry Soil, (9)=(7)/G <sub>s</sub>	cm <sup>3</sup>	20.52	20.25							
Volume of Pore, (10)=(5)-(9)	cm <sup>3</sup>	30.97	36.37							
Void Ratio, e = (10)/(9)	-	1.51	1.80							
Wet Density, $\gamma_{wet}=(4)/(5)$	Gr/cm <sup>3</sup>	1.683	1.614							
Water Content, w=(8)/(7)*100%	%	55.28	65.92							
Dry Density, $\gamma_d=\gamma_{wet}/(1+w)$	Gr/cm <sup>3</sup>	1.084	0.973							
Porosity, n=(10)/(5)*100%	%	60.15	64.24							
Degree of Saturation, Sr=(8)/(10)*100%	%	99.62	99.83							

ATTERBERG LIMITS TEST													
PROJECT	:	SOIL INVESTIGATION REPORT PENELITIAN											
LOCATION	:	-											
QUARRY	:	-											
SAMPLING DEPTH	:	-											
TESTING METHOD	:	ASTM D 424-59, D 4318-(00), AASHTO T89/T90						TESTED BY	: AKHIRUL TRI PUTRA				
LABORATORY	:	HASANUDDIN UNIVERSITY						DATE	: NOVEMBER 2021				
Sample No.	:	01											
Depth of Sample	:	-											
	Unit	Plastic Limit				Liquid Limit						Shrinkage Limit	
Test Number	-	1	2	1	2	3	4	1					
Number of Blows	N	-	-	18	24	28	30	-					
Container No. or Can No.	-	A1	A2	B1	B2	C1	C2	D1	D2	E1	E2	F1	
Weigh of Wet Soil+Can, W1	gram	10.76	10.52	14.68	16.30	15.94	19.35	16.29	16.09	14.62	13.74	55.57	
Weigh of Dry Soil+Can, W2	gram	10.10	9.90	12.41	13.70	13.45	15.70	13.80	13.62	12.65	12.06	32.97	
Weigh of Water, Ww=W1-W2	gram	0.66	0.62	2.27	2.60	2.49	3.65	2.49	2.47	1.97	1.68	22.6	
Weigh of Can, W3	gram	8.45	8.35	7.99	8.57	8.47	8.41	8.60	8.41	8.37	8.44	10.41	
Weigh of Dry Soil, Ws=W2-W3	gram	1.65	1.55	4.42	5.13	4.98	7.29	5.20	5.21	4.28	3.62	22.56	
Water Content, $\omega=Ww/Ws*100\%$	%	40.00	40.00	51.36	50.68	50.00	50.07	47.88	47.41	46.03	46.41	100.18	
Average of Water Content, w	%	40.00		51.02		50.03		47.65		46.22		100.18	
Weigh of Can+Hg, W1	gram											424	
Weigh of Shrink dish	gram											29	
Weight of displaced Hg + Shrink dish	gram											244	
Hg content	gr/cm <sup>3</sup>											13.6	
Volume of Wet Soil	cm <sup>3</sup>											30.41	
Volume of Dry Soil	cm <sup>3</sup>											14.60	
Shrinkage Limit	%											30.10	
Average of Shrinkage Limit	%											30.10	

ATTERBERG LIMITS TEST													
PROJECT	:	SOIL INVESTIGATION REPORT PENELITIAN											
LOCATION	:	-											
QUARRY	:	-											
SAMPLING DEPTH	:	-											
TESTING METHOD	:	ASTM D 424-59, D 4318-(00), AASHTO T89/T90						TESTED BY	: AKHIRUL TRI PUTRA				
LABORATORY	:	HASANUDDIN UNIVERSITY						DATE	: NOVEMBER 2021				

Sample No.	:	01										
Depth of Sample	:	-										
	Unit	Plastic Limit				Liquid Limit						Shrinkage Limit
Test Number	-	1	2	1	2	3	4	1				
Number of Blows	N	-	-	18	24	28	30	-				
Container No. or Can No.	-	A1	A2	B1	B2	C1	C2	D1	D2	E1	E2	
Weigh of Wet Soil+Can, W1	gram	10.76	10.52	14.68	16.30	15.94	19.35	16.29	16.09	14.62	13.74	
Weigh of Dry Soil+Can, W2	gram	10.10	9.90	12.41	13.70	13.45	15.70	13.80	13.62	12.65	12.06	
Weigh of Water, Ww=W1-W2	gram	0.66	0.62	2.27	2.60	2.49	3.65	2.49	2.47	1.97	1.68	
Weigh of Can, W3	gram	8.45	8.35	7.99	8.57	8.47	8.41	8.60	8.41	8.37	8.44	
Weigh of Dry Soil, Ws=W2-W3	gram	1.65	1.55	4.42	5.13	4.98	7.29	5.20	5.21	4.28	3.62	
Water Content, $\omega=Ww/Ws*100\%$	%	40.0	40.0	51.4	50.7	50.0	50.1	47.9	47.4	46.0	46.4	
Average of Water Content, w	%	40.00		51.02		50.03		47.65		46.22		

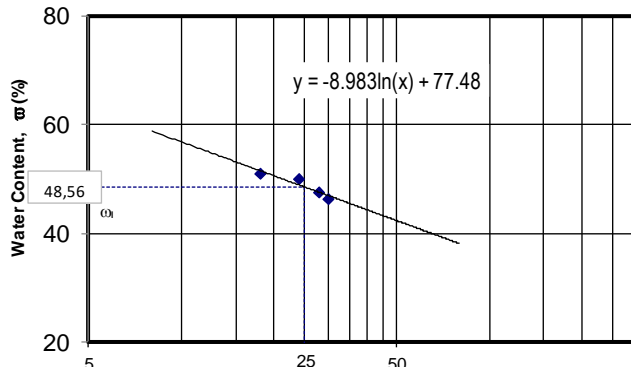
## ATTERBERG LIMITS TEST

PROJECT	: SOIL INVESTIGATION REPORT PENELITIAN		
LOCATION	: -		
QUARRY	: -		
SAMPLING DEPTH	: -		
TESTING METHOD	: ASTM D 424-59, D 4318-(00), AASHTO T89/T90	TESTED BY	: AKHIRUL TRI PUTRA
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	: NOVEMBER 2021



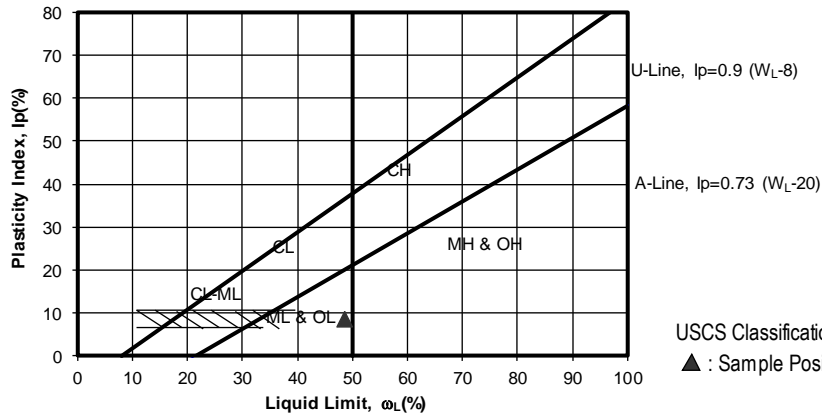
Sample No.	:	01									
Depth of Sample	:	-									
	Unit	Plastic Limit				Liquid Limit					
Test Number	-	1	2	1		2		3		4	
Number of Blows	N	-	-	18		24		28		30	
Container No. or Can No.	-	A1	A2	B1	B2	C1	C2	D1	D2	E1	E2
Weight of Wet Soil+Can, W1	gram	10.76	10.52	14.68	16.30	15.94	19.35	16.29	16.09	14.62	13.74
Weight of Dry Soil+Can, W2	gram	10.10	9.90	12.41	13.70	13.45	15.70	13.80	13.62	12.65	12.06
Weight of Water, Ww=W1-W2	gram	0.66	0.62	2.27	2.60	2.49	3.65	2.49	2.47	1.97	1.68
Weight of Can, W3	gram	8.45	8.35	7.99	8.57	8.47	8.41	8.60	8.41	8.37	8.44
Weight of Dry Soil, Ws=W2-W3	gram	1.65	1.55	4.42	5.13	4.98	7.29	5.20	5.21	4.28	3.62
Water Content, $\omega = Ww/Ws * 100\%$	%	40.0	40.0	51.4	50.7	50.0	50.1	47.9	47.4	46.0	46.4
Average of Water Content, w	%	40.00		51.02		50.03		47.65		46.22	

**Chart for Liquid Limit Determination**



Atterberg Limits	Value
Plastic Limit, $\omega_p$ (%)	40.00
Liquid Limit, $\omega_L$ (%)	48.56
Plastic Index, $I_p = \omega_L - \omega_p$	8.56
Shrinkage Limit, $\alpha_s$ (%)	30.10

**Chart for the Unified Soil Classification System**



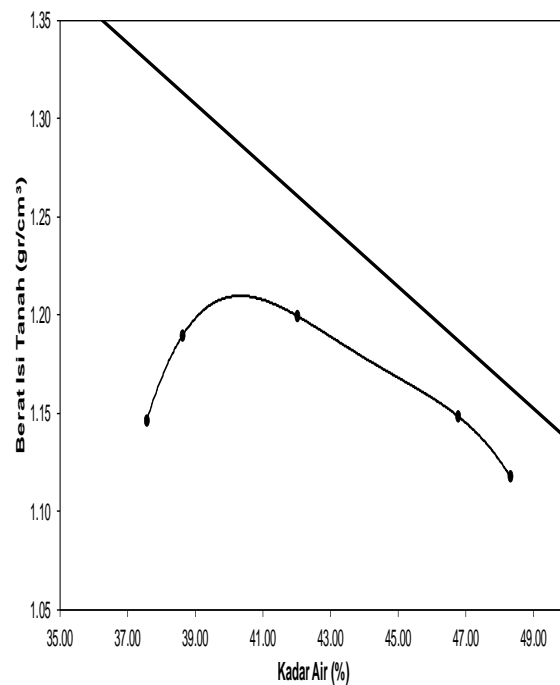
COMPACTION TEST RESULTS											
PROJECT	: SOIL INVESTIGATION REPORT PENELITIAN										
LOCATION	:										
QUARRY	:										
SAMPLE / SAMPLE NO.	: TANAH ASLI										
TESTING METHOD	: ASTM D 698/ D 1567	TESTED BY	: AKHIRUL								
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	: 2021								
Berat tanah	gram	2000	2000	2000	2000	2000					
Kadar air mula-mula	%	20.44	20.44	20.44	20.44	20.44					
Penambahan air	ml	350	400	450	500	550					
Kadar air akhir	%	41.51	44.53	47.54	50.55	53.56					
<b>Berat Isi Basah (Wet density)</b>											
No. Mould	-	1	2	3	4	5					
Berat Mould	gram	1915	1915	1915	1915	1915					
Berat tanah basah + Mould	gram	3498	3570	3625	3607	3579					
Berat tanah basah, $W_{wet}$	gram	1583	1655	1710	1692	1664					
Volume Mould	cm <sup>3</sup>	1004	1004	1004	1004	1004					
Berat Volume Basah	gr/cm <sup>3</sup>	1.577	1.649	1.703	1.685	1.657					
<b>Kadar Air (Water Content)</b>											
No. Container	-	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B
Berat tanah basah + Container	gram	45.98	32.19	36.18	36.84	33.76	35.65	41.40	37.33	38.69	38.75
Berat tanah kering + Container	gram	35.71	25.63	28.50	28.84	26.43	27.79	30.96	28.03	28.81	28.90
Berat air	gram	10.27	6.56	7.68	8	7.33	7.86	10.44	9.3	9.88	9.85
Berat container	gram	8.75	7.92	8.30	8.44	9.06	9.01	8.30	8.44	8.45	8.42
Berat tanah kering	gram	26.96	17.71	20.2	20.4	17.37	18.78	22.66	19.59	20.36	20.48
Kadar air	%	38.09	37.04	38.02	39.22	42.20	41.85	46.07	47.47	48.53	48.10
Kadar air rata-rata	%	37.57		38.62	42.03	46.77	48.31				
<b>Berat Isi Kering (Dry Density)</b>											
Berat tanah basah, $W_{wet}$	gram	1583	1655	1710	1692	1664					
Kadar air rata-rata	%	37.57	38.62	42.03	46.77	48.31					
Berat kering	$W_{dry} = \frac{W_{wet}}{1 + \left(\frac{W}{100}\right)}$	gram	1150.71	1193.93	1204.00	1152.80	1121.97				
Volume Mould	cm <sup>3</sup>	1003.94	1003.94	1003.94	1003.94	1003.94					
Berat isi kering	$\gamma_{dry} = \frac{W_{dry}}{V_{mould}}$	gr/cm <sup>3</sup>	1.15	1.19	1.20	1.15	1.12				
$\gamma_{zav} = \gamma_w(w+(1/G_s))$	gr/cm <sup>3</sup>	1.33	1.31	1.26	1.19	1.16					

Berat jenis (Gs) = 2.664

Jadi, kadar air optimum dicapai pada saat 42.03 % dan berat isi kering 1.199 gr/cm<sup>3</sup>

Diketahui :	A	B
Berat container kosong	15.47	15.55
Berat container + tanah	70.10	61.88
Berat container + tanah setelah dioven	60.91	53.95
Kadar Air	20.22	20.65
Kadar Air rata-rata	20.44	

Grifik Hubungan Kadar Air dengan Berat Isi Kering Tanah



Penambahan air cbr = 1075 gr

### COMPACTION TEST RESULTS

PROJECT	: SOIL INVESTIGATION REPORT PENELITIAN				
LOCATION	:				
SAMPLE	: TANAH + 1% ZEOLIT				
SAMPLE NO	:				
TESTING METHOD	: ASTM D 698/ D 1567	TESTED BY	: AKHIRUL		
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	: 2021		



Berat tanah + Zeolit 6%	gram	2000	2000	2000	2000	2000
Kadar air mula-mula	%	17.92	17.92	17.92	17.92	17.92
Penambahan air	ml	350	400	450	500	550
Kadar air akhir	%	38.56	41.51	44.46	47.40	50.35

#### Berat Isi Basah (Wet density)

No. Mould	-	1	1	2	3	4
Berat Mould	gram	1917	1917	1917	1917	1917
Berat tanah basah + Mould	gram	3555	3609	3653	3623	3587
Berat tanah basah, $W_{wet}$	gram	1638	1692	1736	1706	1670
Volume Mould	cm <sup>3</sup>	996	996	996	996	996
Berat Volume Basah	gr/cm <sup>3</sup>	1.644	1.698	1.742	1.712	1.676

#### Kadar Air (Water Content)

No. Container	-	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B
Berat tanah basah + Container	gram	50.75	49.44	58.32	64.70	57.99	52.75	42.06	49.15	45.19	40.48
Berat tanah kering + Container	gram	41.19	40.61	46.60	50.96	45.35	41.66	33.82	38.75	37.96	31.09
Berat air	gram	9.56	8.83	11.72	13.74	12.64	11.09	8.24	10.4	7.23	9.39
Berat container	gram	15.31	15.25	15.89	15.27	15.30	15.04	15.35	15.60	14.96	15.30
Berat tanah kering	gram	25.88	25.36	30.71	35.69	30.05	26.62	18.47	23.15	23	15.79
Kadar air	%	36.94	34.82	38.16	38.50	42.06	41.66	44.61	44.92	31.43	59.47
Kadar air rata-rata	%	35.88		38.33	41.86	44.77	45.45				

#### Berat Isi Kering (Dry Density)

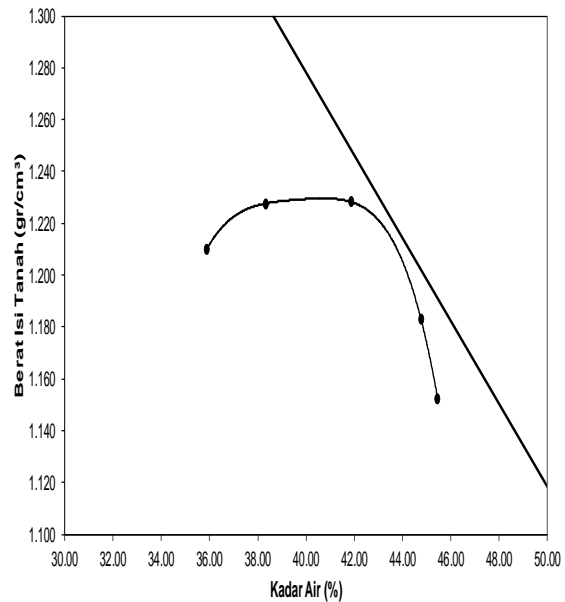
Berat tanah basah, $W_{wet}$	gram	1638	1692	1736	1706	1670
Kadar air rata-rata	%	35.88	38.33	41.86	44.77	45.45
Berat kering						
$W_{dry} = \frac{W_{wet}}{1+w}$	gram	1205.48	1223.15	1223.73	1178.43	1148.15
Volume Mould	cm <sup>3</sup>	996.31	996.31	996.31	996.31	996.31
Berat isi kering						
$\gamma_{dry} = \frac{W_{dry}}{V_{mould}}$	gr/cm <sup>3</sup>	1.210	1.228	1.228	1.183	1.152
$\gamma_{zav} = \gamma_w(w+(1/G_s))$	gr/cm <sup>3</sup>	1.35	1.30	1.25	1.20	1.19

Berat jenis ( $G_s$ ) = 2.605

Jadi, kadar air optimum dicapai pada saat 41.86 % dan berat isi kering 1.228 gr/cm<sup>3</sup>

Diketahui :	A	B
Berat container kosong	15.28	15.35
Berat container + tanah	77.96	81.81
Berat container + tanah setelah dioven	68.31	71.84
Kadar Air	18.20	17.65
Kadar Air rata-rata	17.92	

**Grafik Hubungan Kadar Air dengan Berat Isi Kering Tanah**

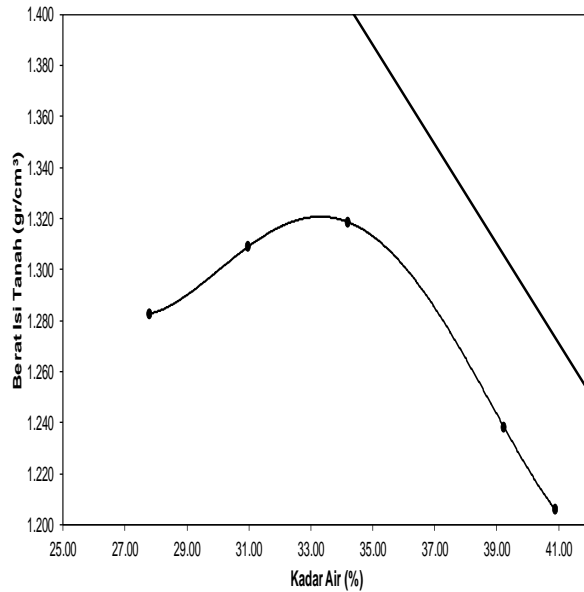




COMPACTION TEST RESULTS											
PROJECT	: SOIL INVESTIGATION REPORT PENELITIAN										
LOCATION	:										
SAMPLE	: TANAH + 3% ZEOLIT										
SAMPLE NO	:										
TESTING METHOD	: ASTM D 698/ D 1567			TESTED BY	: AKHIRUL						
LABORATORY	: HASANUDDIN UNIVERSITY			DATE	: 2021						
Berat tanah + Zeolit 4%	gram	2000	2000	2000	2000	2000					
Kadar air mula-mula	%	4.16	17.92	17.92	17.92	17.92					
Penambahan air	ml	300	350	400	450	500					
Kadar air akhir	%	19.79	38.56	41.51	44.46	47.40					
<b>Berat Isi Basah (Wet density)</b>											
No. Mould	-	1	2	3	4	5					
Berat Mould	gram	1917	1917	1917	1917	1917					
Berat tanah basah + Mould	gram	3550	3625	3680	3635	3610					
Berat tanah basah, $W_{wet}$	gram	1633	1708	1763	1718	1693					
Volume Mould	cm <sup>3</sup>	996	996	996	996	996					
Berat Volume Basah	gr/cm <sup>3</sup>	1.639	1.714	1.770	1.724	1.699					
<b>Kadar Air (Water Content)</b>											
No. Container	-	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B
Berat tanah basah + Container	gram	50.97	42.81	64.55	65.18	47.77	68.47	49.64	52.59	44.64	51.19
Berat tanah kering + Container	gram	43.24	36.80	53.44	52.98	39.54	54.79	39.96	42.19	36.05	40.75
Berat air	gram	7.73	6.01	11.11	12.2	8.23	13.68	9.68	10.4	8.59	10.44
Berat container	gram	15.31	15.25	15.89	15.27	15.30	15.04	15.35	15.60	14.96	15.30
Berat tanah kering	gram	27.93	21.55	37.55	37.71	24.24	39.75	24.61	26.59	21.09	25.45
Kadar air	%	27.68	27.89	29.59	32.35	33.95	34.42	39.33	39.11	40.73	41.02
Kadar air rata-rata	%	27.78		30.97		34.18		39.22		40.88	
<b>Berat Isi Kering (Dry Density)</b>											
Berat tanah basah, $W_{wet}$	gram	1633	1708	1763	1718	1693					
Kadar air rata-rata	%	27.78	30.97	34.18	39.22	40.88					
Berat kering	$W_{dry} = \frac{W_{wet}}{1+w}$	gram	1277.95	1304.12	1313.87	1233.99	1201.77				
Volume Mould	cm <sup>3</sup>	996.31	996.31	996.31	996.31	996.31					
Berat isi kering	$\gamma_{dry} = \frac{W_{dry}}{V_{mould}}$	gr/cm <sup>3</sup>	1.283	1.309	1.319	1.239	1.206				
$\gamma_{zav} = \gamma_w(w+(1/G_s))$	gr/cm <sup>3</sup>	1.53	1.46	1.40	1.31	1.28					
Berat jenis (Gs) = 2.676											
Jadi, kadar air optimum dicapai pada saat 34.18 % dan berat isi kering 1.319 gr/cm <sup>3</sup>											

Diketahui :	A	B
Berat container kosong	15.28	15.35
Berat container + tanah	77.96	81.81
Berat container + tanah setelah dioven	68.31	71.84
Kadar Air	18.20	17.65
Kadar Air rata-rata	17.92	

Grafik Hubungan Kadar Air dengan Berat Isi Kering Tanah



## COMPACTION TEST RESULTS

PROJECT	: SOIL INVESTIGATION REPORT PENELITIAN				
LOCATION	:				
SAMPLE	: TANAH + 5% ZEOLIT				
SAMPLE NO					
TESTING METHOD	: ASTM D 698/ D 1567	TESTED BY	: AKHIRUL		
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	: 2021		



Berat tanah + Zeolit 5%	gram	2000	2000	2000	2000	2000
Kadar air mula-mula	%	17.92	17.92	17.92	17.92	17.92
Penambahan air	ml	300	350	400	450	500
Kadar air akhir	%	35.61	38.56	41.51	44.46	47.40

### Berat Isi Basah (Wet density)

No. Mould	-	1	2	3	4	5
Berat Mould	gram	1917	1917	1917	1917	1917
Berat tanah basah + Mould	gram	3374	3472	3646	3633	3597
Berat tanah basah, $W_{wet}$	gram	1457	1555	1729	1716	1680
Volume Mould	cm <sup>3</sup>	996	996	996	996	996
Berat Volume Basah	gr/cm <sup>3</sup>	1.462	1.561	1.735	1.722	1.686

### Kadar Air (Water Content)

No. Container	-	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B
Berat tanah basah + Container	gram	46.46	60.19	39.91	43.02	43.85	35.12	50.98	61.96	54.60	57.11
Berat tanah kering + Container	gram	40.59	51.75	34.74	36.94	36.40	30.00	40.60	48.33	42.64	44.37
Berat air	gram	5.87	8.44	5.17	6.08	7.45	5.12	10.38	13.63	11.96	12.74
Berat container	gram	15.31	15.25	15.89	15.27	15.30	15.04	15.35	15.60	14.96	15.30
Berat tanah kering	gram	25.28	36.5	18.85	21.67	21.1	14.96	25.25	32.73	27.68	29.07
Kadar air	%	23.22	23.12	27.43	28.06	35.31	34.22	41.11	41.64	43.21	43.83
Kadar air rata-rata	%	23.17		27.74	34.77	41.38	43.52				

### Berat Isi Kering (Dry Density)

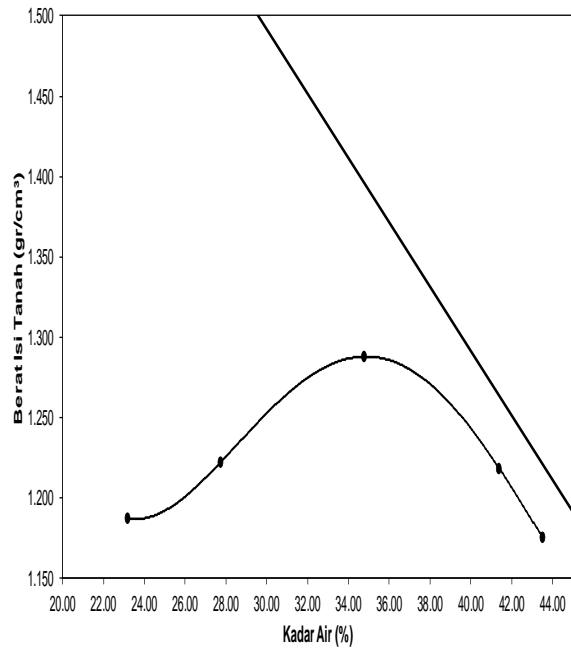
Berat tanah basah, $W_{wet}$	gram	1457	1555	1729	1716	1680
Kadar air rata-rata	%	23.17	27.74	34.77	41.38	43.52
Berat kering $W_{dry} = \frac{W_{wet}}{1+w}$	gram	1182.90	1217.30	1282.96	1213.78	1170.60
Volume Mould	cm <sup>3</sup>	996.31	996.31	996.31	996.31	996.31
Berat isi kering $\gamma_{dry} = \frac{W_{dry}}{V_{mould}}$	gr/cm <sup>3</sup>	1.187	1.222	1.288	1.218	1.175
$\gamma_{zav} = \gamma_w / (w + 1/G_s)$	gr/cm <sup>3</sup>	1.64	1.53	1.38	1.26	1.23

Berat jenis ( $G_s$ ) = 2.653

Jadi, kadar air optimum dicapai pada saat 34.77 % dan berat isi kering 1.288 gr/cm<sup>3</sup>

Diketahui :	A	B
Berat container kosong	15.28	15.35
Berat container + tanah	77.96	81.81
Berat container + tanah setelah dioven	68.31	71.84
Kadar Air	18.20	17.65
Kadar Air rata-rata	17.92	

**Grafik Hubungan Kadar Air dengan Berat Isi Kering Tanah**

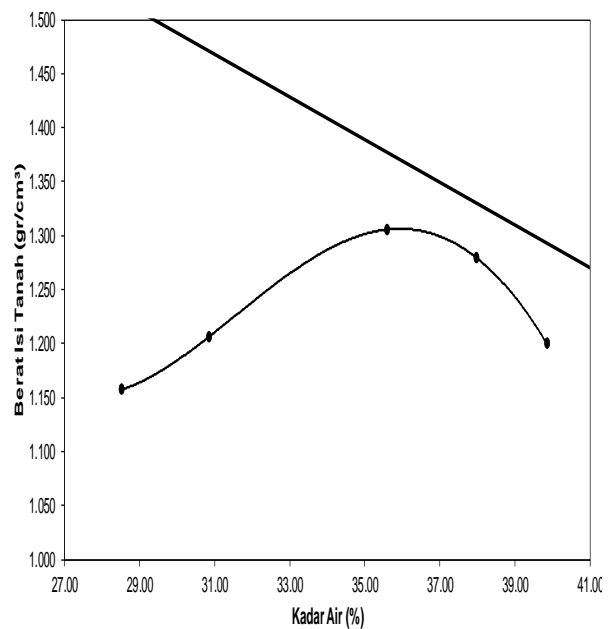


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COMPACTION TEST RESULTS												
PROJECT	: SOIL INVESTIGATION REPORT PENELITIAN											
LOCATION	:											
SAMPLE	: TANAH + 7% ZEOLIT											
SAMPLE NO	:											
TESTING METHOD	: ASTM D 698/ D 1567		TESTED BY		: AKHIRUL							
LABORATORY	: HASANUDDIN UNIVERSITY		DATE		: 2021							
Berat tanah + Zeolit 7%	gram	2000	2000	2000	2000	2000						
Kadar air mula-mula	%	17.92	17.92	17.92	17.92	17.92						
Penambahan air	ml	350	400	450	500	550						
Kadar air akhir	%	38.56	41.51	44.46	47.40	50.35						
<b>Berat Isi Basah (Wet density)</b>												
No. Mould	-	1	2	3	4	5						
Berat Mould	gram	1917	1917	1917	1917	1917						
Berat tanah basah + Mould	gram	3399	3490	3681	3676	3589						
Berat tanah basah, $W_{wet}$	gram	1482	1573	1764	1759	1672						
Volume Mould	cm <sup>3</sup>	996	996	996	996	996						
Berat Volume Basah	gr/cm <sup>3</sup>	1.487	1.579	1.771	1.766	1.678						
<b>Kadar Air (Water Content)</b>												
No. Container	-	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B	
Berat tanah basah + Container	gram	42.55	39.94	60.53	52.92	52.72	69.25	52.17	48.70	74.33	57.79	
Berat tanah kering + Container	gram	36.54	34.43	49.97	44.07	42.88	55.04	42.05	39.58	57.40	45.69	
Berat air	gram	6.01	5.51	10.56	8.85	9.84	14.21	10.12	9.12	16.93	12.1	
Berat container	gram	15.31	15.25	15.89	15.27	15.30	15.04	15.35	15.60	14.96	15.30	
Berat tanah kering	gram	21.23	19.18	34.08	28.8	27.58	40.00	26.7	23.98	42.44	30.39	
Kadar air, w	%	28.31	28.73	30.99	30.73	35.68	35.53	37.90	38.03	39.89	39.82	
Kadar air rata-rata, w	%	28.52		30.86		35.60		37.97		39.85		
<b>Berat Isi Kering (Dry Density)</b>												
Berat tanah basah, $W_{wet}$	gram	1482	1573	1764	1759	1672						
Kadar air rata-rata	%	28.52	30.86	35.60	37.97	39.85						
Berat kering												
$W_{dry} = \frac{W_{wet}}{1+w}$	gram	1153.14	1202.07	1300.87	1274.94	1195.54						
Volume Mould	cm <sup>3</sup>	996.31	996.31	996.31	996.31	996.31						
Berat isi kering												
$\gamma_{dry} = \frac{W_{dry}}{V_{mould}}$	gr/cm <sup>3</sup>	1.157	1.207	1.306	1.280	1.200						
$\gamma_{zav} = \gamma_w(w+(1/G_s))$	gr/cm <sup>3</sup>	1.52	1.47	1.37	1.33	1.30						
Berat jenis (Gs) = 2.685												
Jadi, kadar air optimum dicapai pada saat 35.60 % dan berat isi kering 1.306 gr/cm <sup>3</sup>												


Diketahui :	A	B
Berat container kosong	15.28	15.35
Berat container + tanah	77.96	81.81
Berat container + tanah setelah dioven	68.31	71.84
Kadar Air	18.20	17.65
Kadar Air rata-rata	17.92	

Grifik Hubungan Kadar Air dengan Berat Isi Kering Tanah



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### CBR (SOAKED) LABORATORY TEST RESULT

PROJECT	: SOIL INVESTIGATION REPORT	
LOCATION	:	
SAMPLE / SAMPLE NO.	: TANAH ASLI	
TESTING METHOD	: ASTM D-1883-73	
LABORATORY	: HASANUDDIN UNIVERSITY	
	TESTED BY : AKHIRUL	
	DATE : MARET 2022	

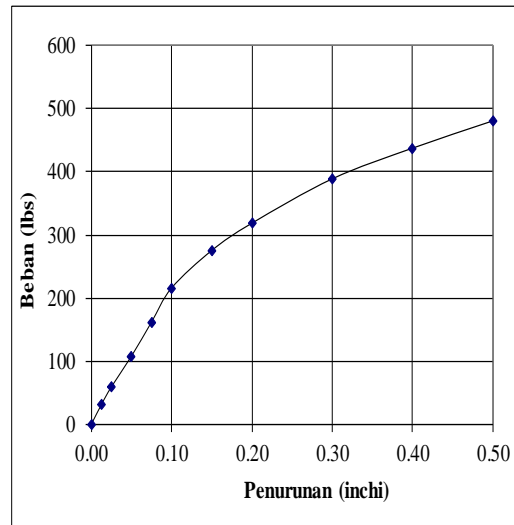
#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

		Sebelum	Sesudah
A. Berat Cetakan	gram	4139	4139
B. Berat Tanah Basah + Cetakan	gram	7498	6994
C. Berat Tanah Basah	gram	3359	2855
D. Volume Cetakan	cm <sup>3</sup>	2148	2148
E. Berat Isi Basah, $\gamma_{wet} = W_{wet}/V_{mould}$	gram/cm <sup>3</sup>	1.564	1.329
F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet}/(1+w)$	gram/cm <sup>3</sup>	1.094	1.297

Penetrasi : 56 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0
0.25	0.013	6	32.4
0.5	0.025	11	59.4
1	0.050	20	108
1.5	0.075	30	162
2	0.100	40	216
3	0.150	51	275.4
4	0.200	59	318.6
6	0.300	72	388.8
8	0.400	81	437.4
10	0.500	89	480.6



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Sesudah
Berat tanah basah + Container	gram	68.35	78.51
Berat tanah kering + Container	gram	52.32	76.95
Berat air	gram	16.03	1.56
Berat container	gram	15.01	15.40
Berat tanah kering	gram	37.31	61.55
Kadar air, $w$	%	42.95	2.53

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	216.000	7.20	7.20
0.2	318.600	7.08	

### CBR TEST RESULTS

PROJECT	: SOIL INVESTIGATION			TESTED BY	AKHIRUL
LOCATION	:			DATE	FEBRUARI 2022
SAMPLING	: TANAH + 1% ZEOLIT 0 HARI				
TESTING METHOD	: ASTM D 1883-73				
LABORATORY	: HASANUDDIN UNIVERSITY				

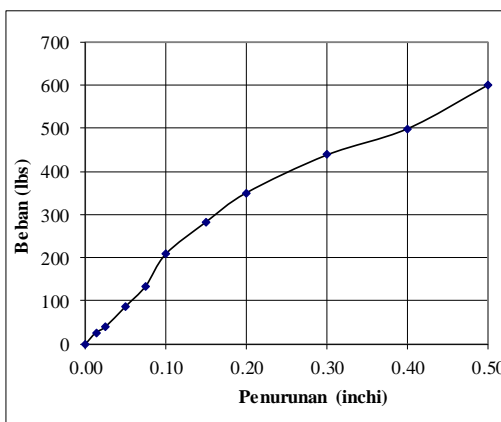
#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

Tanggal	24/10	25/10	26/10	27/10		Sebelum	Sesudah	
Jam	9.21	9.21	9.21	9.21	A. Berat Cetakan	gram	4197	4197
Pembacaan, mm	0.10	0.78	0.99	0.99	B. Berat Tanah Basah + Cetakan	gram	7893	7945
Swelling Sw= $\frac{\Delta h}{h_0} \times 100\%$	0.15	1.15	1.46	1.46	C. Berat Tanah Basah	gram	3696	3748
					D. Volume Cetakan	cm <sup>3</sup>	2121.9869	2122
					E. Berat Isi Basah, $\gamma_{wet} = W_{wet} / V_{mould}$	gram/cm <sup>3</sup>	1.742	1.766
					F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet} / (1 + \omega)$	gram/cm <sup>3</sup>	1.228	1.275

Penetrasi : 56 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0.00
0.25	0.013	4	26.9772
0.5	0.025	6	40.4658
1	0.050	13	87.6759
1.5	0.075	20	134.886
2	0.100	31	209.0733
3	0.150	42	283.2606
4	0.200	52	350.7036
6	0.300	65	438.3795
8	0.400	74	499.0782
10	0.500	89	600.2427



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Sesudah
Berat tanah basah + Container	gram	58.12	25.79
Berat tanah kering + Container	gram	45.92	20.10
Berat air	gram	12.21	5.69
Berat container	gram	15.17	5.15
Berat tanah kering	gram	30.75	14.95
Kadar air, $\omega$	%	41.89	38.06

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	209.073	6.97	7.79
0.2	350.704	7.79	

### CBR TEST RESULTS

PROJECT	:	TESTED BY	: AKHIRUL
LOCATION	:	DATE	: FEBRUARI 2022
SAMPLING	: TANAH + 3% ZEOLIT 0 HARI		
TESTING METHOD	: ASTM D 1883-73		
LABORATORY	: HASANUDDIN UNIVERSITY		

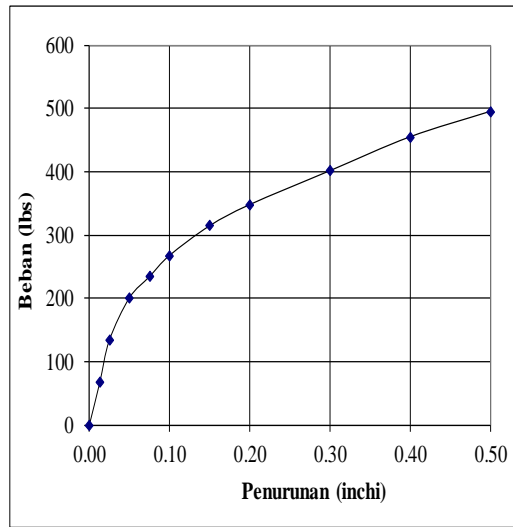
#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

		Sebelum	Setelah
A. Berat Cetakan	gram	4152	4294
B. Berat Tanah Basah + Cetakan	gram	8027	8549
C. Berat Tanah Basah	gram	3875	4255
D. Volume Cetakan	cm <sup>3</sup>	2207	2207
E. Berat Isi Basah, $\gamma_{wet} = W_{wet}/V_{mould}$	gram/cm <sup>3</sup>	1.756	1.928
F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet}/(1+\omega)$	gram/cm <sup>3</sup>	1.309	1.361

Penetrasi : 56 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0.00
0.25	0.013	10	67
0.5	0.025	20	134
1	0.050	30	201
1.5	0.075	35	234.5
2	0.100	40	268
3	0.150	47	314.9
4	0.200	52	348.4
6	0.300	60	402
8	0.400	68	455.6
10	0.500	74	495.8



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Setelah
Berat tanah basah + Container	gram	58.12	50.55
Berat tanah kering + Container	gram	47.17	37.20
Berat air	gram	10.96	13.35
Berat container	gram	15.17	5.16
Berat tanah kering	gram	32.00	32.04
Kadar air, $\omega$	%	34.18	41.67

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	268.000	8.93	8.93
0.2	348.400	7.74	

### CBR TEST RESULTS

PROJECT	: SOIL INVESTIGATION REPORT	TESTED BY	: AKHIRUL
LOCATION	:	DATE	: FEBRUARI 2022
SAMPLING	: TANAH + 5% ZEOLIT 0 HARI		
TESTING METHOD	: ASTM D 1883-73		
LABORATORY	: HASANUDDIN UNIVERSITY		

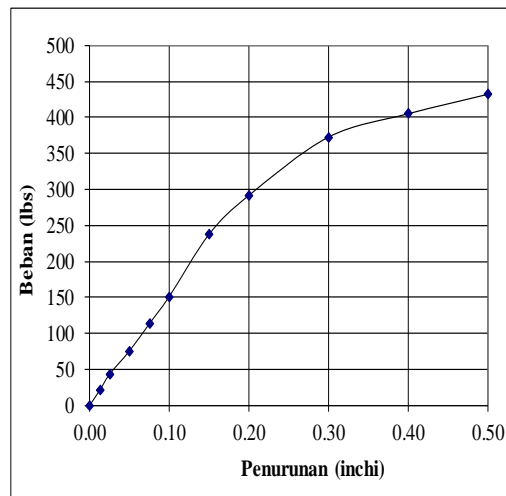
#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

		Sebelum	Sesudah
A. Berat Cetakan	gram	4152	4152
B. Berat Tanah Basah + Cetakan	gram	7867	8081
C. Berat Tanah Basah	gram	3715	3929
D. Volume Cetakan	cm <sup>3</sup>	2207	2207
E. Berat Isi Basah, $\gamma_{wet} = W_{wet}/V_{mould}$	gram/cm <sup>3</sup>	1.684	1.781
F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet}/(1+w)$	gram/cm <sup>3</sup>	1.255	1.219

Penetrasi : 56 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0.00
0.25	0.013	4	21.6
0.5	0.025	8	43.2
1	0.050	14	75.6
1.5	0.075	21	113.4
2	0.100	28	151.2
3	0.150	44	237.6
4	0.200	54	291.6
6	0.300	69	372.6
8	0.400	75	405
10	0.500	80	432



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Sesudah
Berat tanah basah + Container	gram	58.12	42.10
Berat tanah kering + Container	gram	47.17	31.38
Berat air	gram	10.96	10.73
Berat container	gram	15.17	8.11
Berat tanah kering	gram	32.00	23.27
Kadar air, $w$	%	34.18	46.09

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	151.200	5.04	6.48
0.2	291.600	6.48	

### CBR TEST RESULTS

PROJECT	: SOIL INVESTIGATION REPORT		
LOCATION	:		
SAMPLING	: TANAH + 7% ZEOLIT 0 HARI		
TESTING METHOD	: ASTM D 1883-73	TESTED BY	: AKHIRUL
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	: FEBRUARI 2022

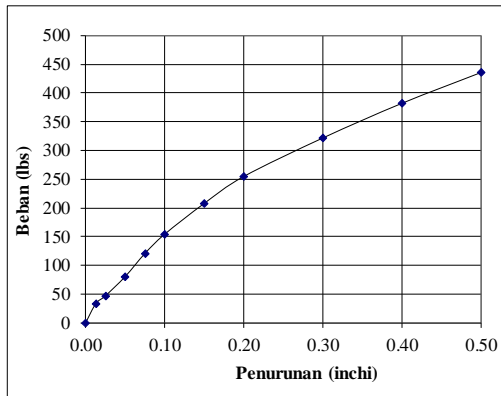
#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

		Sebelum	Sesudah
A. Berat Cetakan	gram	4204	4204
B. Berat Tanah Basah + Cetakan	gram	8213	8475
C. Berat Tanah Basah	gram	4009	4271
D. Volume Cetakan	cm <sup>3</sup>	2207	2207
E. Berat Isi Basah, $\gamma_{wet} = W_{wet}/V_{mould}$	gram/cm <sup>3</sup>	1.817	1.936
F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet}/(1+w)$	gram/cm <sup>3</sup>	1.338	1.325

Penetrasi : 56 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0.00
0.25	0.013	5	33.5
0.5	0.025	7	46.9
1	0.050	12	80.4
1.5	0.075	18	120.6
2	0.100	23	154.1
3	0.150	31	207.7
4	0.200	38	254.6
6	0.300	48	321.6
8	0.400	57	381.9
10	0.500	65	435.5



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Sesudah
Berat tanah basah + Container	gram	69.90	42.10
Berat tanah kering + Container	gram	52.91	31.38
Berat air	gram	16.99	10.73
Berat container	gram	5.43	8.11
Berat tanah kering	gram	47.49	23.27
Kadar air, $w$	%	35.82	46.09

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	154.100	5.14	5.66
0.2	254.600	5.66	



### CBR (SOAKED) LABORATORY TEST RESULT

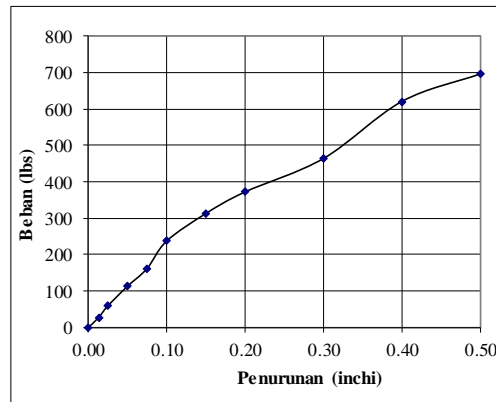
PROJECT	: SOIL INVESTIGATION REPORT		
LOCATION	:		
SAMPLE / SAMPLE NO.	: TANAH + 1% ZEOLIT 7 HARI	TESTED BY	: AKHIRUL
TESTING METHOD	: ASTM D-1883-73	DATE	: FEBRUARI 2022
LABORATORY	: HASANUDDIN UNIVERSITY		



#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

Tanggal	11/22/21	11/23	11/24	11/25		Sebelum	Sesudah
Jam	13.10	13.10	13.10	13.10	A. Berat Cetakan	gram	4050
Pembacaan, mm	0.34	0.66	0.82	0.91	B. Berat Tanah Basah + Cetakan	gram	7725
Swelling Sw= $\Delta h/h_0 \times 100\%$	6.025	11.696	14.531	16.126	C. Berat Tanah Basah	gram	3675
					D. Volume Cetakan	cm <sup>3</sup>	2148
<b>Penetrasi : 56 Pukulan</b>					E. Berat Isi Basah, $\gamma_{wet} = W_{wet} / V_{mould}$	gram/cm <sup>3</sup>	1.711
<b>Proving ring Calibration 50 KN cap, lbs/Dev = 5.4</b>					F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet} / (1 + \omega)$	gram/cm <sup>3</sup>	1.207

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0
0.25	0.013	5	27
0.5	0.025	11	59.4
1	0.050	21	113.4
1.5	0.075	30	162
2	0.100	44	237.6
3	0.150	58	313.2
4	0.200	69	372.6
6	0.300	86	464.4
8	0.400	115	621
10	0.500	129	696.6



Grafik Hubungan Penurunan - Beban

Kadar Air			
No. Container	-	Sebelum	Sesudah
Berat tanah basah + Container	gram	32.32	39.98
Berat tanah kering + Container	gram	27.44	29.19
Berat air	gram	4.88	10.79
Berat container	gram	14.64	7.94
Berat tanah kering	gram	12.80	21.25
Kadar air, $\omega$	%	38.13	50.91

Perhitungan CBR			
Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	237.600	7.92	8.28
0.2	372.600	8.28	

### CBR TEST RESULTS

PROJECT	: SOIL INVESTIGATION REPORT		
LOCATION	:		
SAMPLING	: TANAH + 3% ZEOLIT 7 HARI		
TESTING METHOD	: ASTM D 1883-73	TESTED BY	: AKHIRUL
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	: FEBRUARI 2022

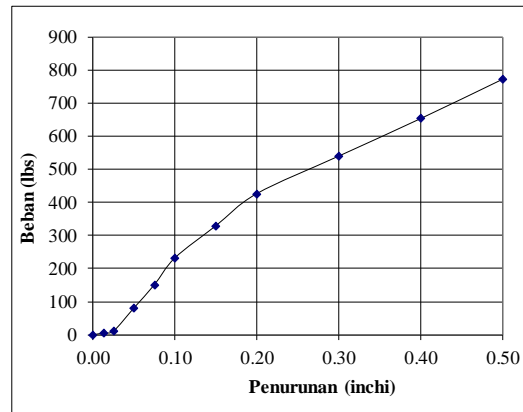
#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

		Sebelum	Sesudah
A. Berat Cetakan	gram	4090	4090
B. Berat Tanah Basah + Cetakan	gram	7890	8238
C. Berat Tanah Basah	gram	3800	4148
D. Volume Cetakan	cm <sup>3</sup>	2122	2122
E. Berat Isi Basah, $\gamma_{wet} = W_{wet} / V_{mould}$	gram/cm <sup>3</sup>	1.791	1.955
F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet} / (1 + \omega)$	gram/cm <sup>3</sup>	1.330	1.394

**Penetrasi : 56 Pukulan**

**Proving ring Calibration 50 KN cap, lbs/Dev = 5.4**

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0.00
0.25	0.013	1	5.4
0.5	0.025	2	10.8
1	0.050	15	81
1.5	0.075	28	151.2
2	0.100	43	232.2
3	0.150	61	329.4
4	0.200	79	426.6
6	0.300	100	540
8	0.400	121	653.4
10	0.500	143	772.2



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Sesudah
Berat tanah basah + Container	gram	53.92	31.73
Berat tanah kering + Container	gram	41.41	24.10
Berat air	gram	12.52	7.63
Berat container	gram	5.15	5.15
Berat tanah kering	gram	36.26	18.95
Kadar air, $\omega$	%	34.67	40.26

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	232.200	7.74	9.48
0.2	426.600	9.48	

### CBR TEST RESULTS

PROJECT	: SOIL INVESTIGATION REPORT		
LOCATION	:		
SAMPLING	: TANAH + 5% ZEOLIT 7 HARI		
TESTING METHOD	: ASTM D 1883-73	TESTED BY	: AKHIRUL
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	: FEBRUARI 2022

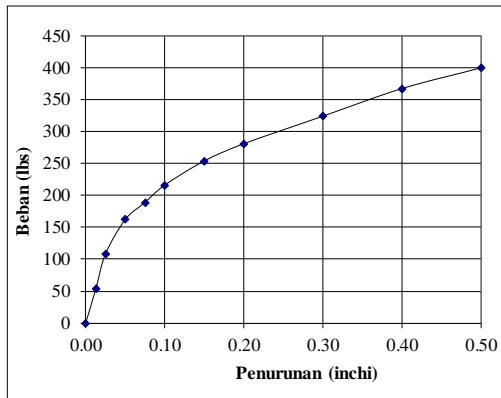
#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

		Sebelum	Sesudah
A. Berat Cetakan	gram	4204	4204
B. Berat Tanah Basah + Cetakan	gram	8023	8690
C. Berat Tanah Basah	gram	3819	4486
D. Volume Cetakan	cm <sup>3</sup>	2207	2207
E. Berat Isi Basah, $\gamma_{wet} = W_{wet}/V_{mould}$	gram/cm <sup>3</sup>	1.731	2.033
F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet}/(1+\omega)$	gram/cm <sup>3</sup>	1.285	1.338

Penetrasi : 56 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0.00
0.25	0.013	10	54
0.5	0.025	20	108
1	0.050	30	162
1.5	0.075	35	189
2	0.100	40	216
3	0.150	47	253.8
4	0.200	52	280.8
6	0.300	60	324
8	0.400	68	367.2
10	0.500	74	399.6



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Sesudah
Berat tanah basah + Container	gram	69.90	42.07
Berat tanah kering + Container	gram	53.40	30.29
Berat air	gram	16.50	11.78
Berat container	gram	5.43	7.65
Berat tanah kering	gram	47.98	22.65
Kadar air, $\omega$	%	34.73	52.02

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	216.000	7.20	7.20
0.2	280.800	6.24	

### CBR (SOAKED) LABORATORY TEST RESULT

PROJECT : SOIL INVESTIGATION REPORT  
 LOCATION :  
 SAMPLE / SAMPLE NO. : TANAH + 7% ZEOLIT 7 HARI  
 TESTING METHOD : ASTM D-1883-73  
 LABORATORY : HASANUDDIN UNIVERSITY

TESTED BY : AKHIRUL  
 DATE : FEBRUARI 2022



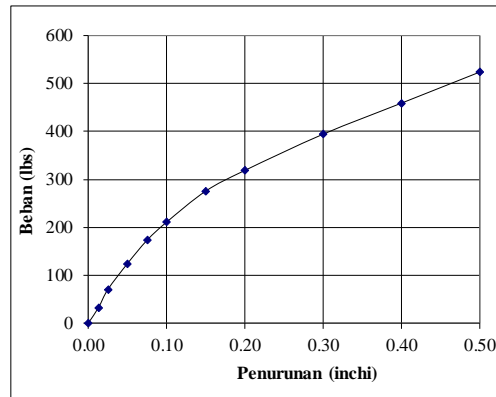
#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

Penetrasi : 56 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

		Sebelum	Setelah
A. Berat Cetakan	gram	4050	4050
B. Berat Tanah Basah + Cetakan	gram	7823	7976
C. Berat Tanah Basah	gram	3773	3926
D. Volume Cetakan	cm <sup>3</sup>	2148	2148
E. Berat Isi Basah, $\gamma_{wet} = W_{wet}/V_{mould}$	gram/cm <sup>3</sup>	1.757	1.828
F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet}/(1+w)$	gram/cm <sup>3</sup>	1.293	1.324

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0
0.25	0.013	6	32.4
0.5	0.025	13	70.2
1	0.050	23	124.2
1.5	0.075	32	172.8
2	0.100	39	210.6
3	0.150	51	275.4
4	0.200	59	318.6
6	0.300	73	394.2
8	0.400	85	459
10	0.500	97	523.8



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container		Sebelum	Setelah
Berat tanah basah + Container	gram	44.71	41.67
Berat tanah kering + Container	gram	35.18	32.38
Berat air	gram	9.53	9.30
Berat container	gram	8.02	7.93
Berat tanah kering	gram	27.17	24.45
Kadar air, $w$	%	35.08	38.06

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	210.600	7.02	7.08
0.2	318.600	7.08	

### CBR (SOAKED) LABORATORY TEST RESULT

PROJECT : SOIL INVESTIGATION REPORT  
 LOCATION :  
 SAMPLE / SAMPLE NO. : TANAH + 1% ZEOLIT 14 HARI  
 TESTING METHOD : ASTM D-1883-73  
 LABORATORY : HASANUDDIN UNIVERSITY

TESTED BY : AKHIRUL  
 DATE : MARET 2022



#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

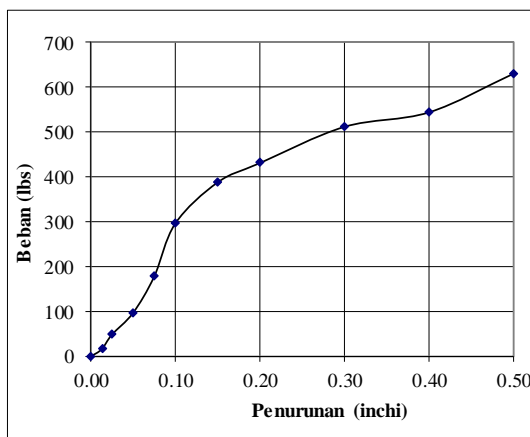
Tanggal	11/22/21	11/23	11/24	11/25		
Jam	13.10	13.10	13.10	13.10	Sebelum	Sesudah
Pembacaan, mm	0.34	0.66	0.82	0.91	A. Berat Cetakan	gram
Swelling Sw= $\Delta h/h_0 \times 100\%$	6.025	11.696	14.531	16.126	B. Berat Tanah Basah + Cetakan	gram
					C. Berat Tanah Basah	gram

Penetrasi : 56 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

D. Volume Cetakan	cm <sup>3</sup>	2148	2148
E. Berat Isi Basah, $\gamma_{wet} = W_{wet}/V_{mould}$	gram/cm <sup>3</sup>	1.471	1.756
F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet}/(1+w)$	gram/cm <sup>3</sup>	1.040	1.371

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0
0.25	0.013	3	16.2
0.5	0.025	9	48.6
1	0.050	18	97.2
1.5	0.075	33	178.2
2	0.100	55	297
3	0.150	72	388.8
4	0.200	80	432
6	0.300	95	513
8	0.400	101	545.4
10	0.500	117	631.8



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Sesudah
Berat tanah basah + Container	gram	32.00	49.41
Berat tanah kering + Container	gram	27.09	40.32
Berat air	gram	4.91	9.09
Berat container	gram	14.64	7.94
Berat tanah kering	gram	12.45	32.38
Kadar air, $w$	%	39.40	28.04

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	297.000	9.90	9.90
0.2	432.000	9.60	

### CBR TEST RESULTS

PROJECT	: SOIL INVESTIGATION REPORT		
LOCATION	:		
SAMPLING	: TANAH + 3% ZEOLIT 14 HARI		
TESTING METHOD	: ASTM D 1883-73	TESTED BY	: AKHIRUL
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	: MARET 2022

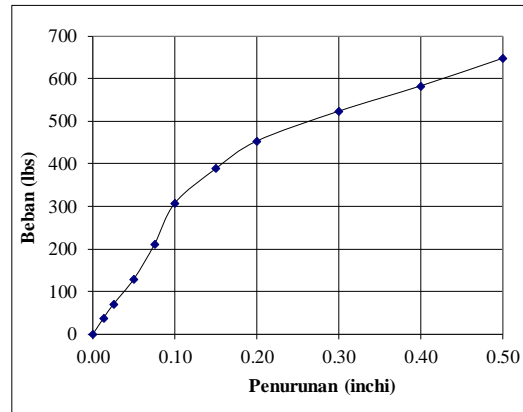
#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

Tanggal	11/20/2021	11/21/2021	11/22/2021	11/23/2021		Sebelum	Sesudah	
Jam	14.08	14.08	14.08	14.08	A. Berat Cetakan	gram	4090	4090
Pembacaan, mm	98.00	121.00	143.00	143.00	B. Berat Tanah Basah + Cetakan	gram	8319	8987
Swelling Sw= $\frac{\Delta h}{h_0} \times 100\%$	144.12	177.94	210.29	210.29	C. Berat Tanah Basah	gram	4229	4897
					D. Volume Cetakan	cm <sup>3</sup>	2122	2122
					E. Berat Isi Basah, $\gamma_{wet} = W_{wet}/V_{mould}$	gram/cm <sup>3</sup>	1.993	2.308
					F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet}/(1+o)$	gram/cm <sup>3</sup>	1.669	1.873

Penetrasi : 56 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0.00
0.25	0.013	7	37.8
0.5	0.025	13	70.2
1	0.050	24	129.6
1.5	0.075	39	210.6
2	0.100	57	307.8
3	0.150	72	388.8
4	0.200	84	453.6
6	0.300	97	523.8
8	0.400	108	583.2
10	0.500	120	648



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Sesudah
Berat tanah basah + Container	gram	45.90	51.61
Berat tanah kering + Container	gram	39.33	42.89
Berat air	gram	6.57	8.72
Berat container	gram	5.15	5.15
Berat tanah kering	gram	34.19	37.74
Kadar air, $\omega$	%	19.40	23.11

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	307.800	10.26	10.08
0.2	453.600	10.08	

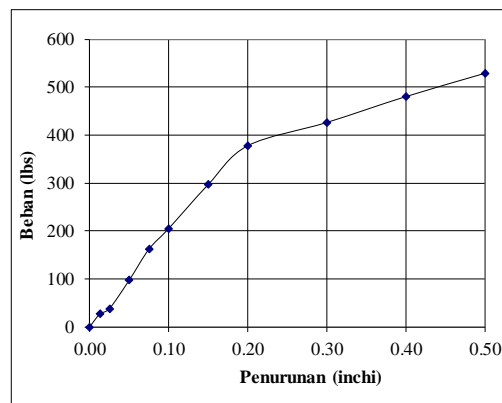
### CBR TEST RESULTS

PROJECT	: SOIL INVESTIGATION REPORT			TESTED BY	: AKHIRUL
LOCATION	:			DATE	: MARET 2022
SAMPLING	: TANAH + 5% ZEOLIT 14 HARI				
TESTING METHOD	: ASTM D 1883-73				
LABORATORY	: HASANUDDIN UNIVERSITY				

#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

Tanggal	09/20/2021	09/21/2021	09/22/2021	09/23/2021		Sebelum	Sesudah		
Jam	11.32	11.32	11.32	11.32	A. Berat Cetakan	gram	4204	4204	
Pembacaan, mm	0.98	1.67	2.34	3.00	B. Berat Tanah Basah + Cetakan	gram	7890	8238	
Swelling Sw= $\frac{h_h}{h_o} \times 100\%$	1.44	2.46	3.44	4.41	C. Berat Tanah Basah	gram	3686	4034	
<b>Penetrasi : 56 Pukulan</b>						D. Volume Cetakan	cm <sup>3</sup>	2207	2207
<b>Proving ring Calibration 50 KN cap, lbs/Dev = 5.4</b>						E. Berat Isi Basah, $\gamma_{wet} = W_{wet}/V_{mould}$	gram/cm <sup>3</sup>	1.670	1.828
						F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet}/(1+\omega)$	gram/cm <sup>3</sup>	1.455	1.449

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0.00
0.25	0.013	5	27
0.5	0.025	7	37.8
1	0.050	18	97.2
1.5	0.075	30	162
2	0.100	38	205.2
3	0.150	55	297
4	0.200	70	378
6	0.300	79	426.6
8	0.400	89	480.6
10	0.500	98	529.2



Grafik Hubungan Penurunan - Beban

Kadar Air			
No. Container	-	Sebelum	Sesudah
Berat tanah basah + Container	gram	46.44	61.84
Berat tanah kering + Container	gram	41.13	50.60
Berat air	gram	5.32	11.24
Berat container	gram	5.43	7.65
Berat tanah kering	gram	35.70	42.95
Kadar air, $\omega$	%	14.83	26.17

Perhitungan CBR			
Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	205.200	6.84	8.40
0.2	378.000	8.40	

### CBR (SOAKED) LABORATORY TEST RESULT

PROJECT : SOIL INVESTIGATION REPORT  
 LOCATION :  
 SAMPLE / SAMPLE NO. : TANAH + 7% ZEOLIT 14 HARI  
 TESTING METHOD : ASTM D-1883-73  
 LABORATORY : HASANUDDIN UNIVERSITY

TESTED BY : AKHIRUL  
 DATE : MARET 2022



#### Pemeriksaan CBR Soaked (56x Tumbukan)

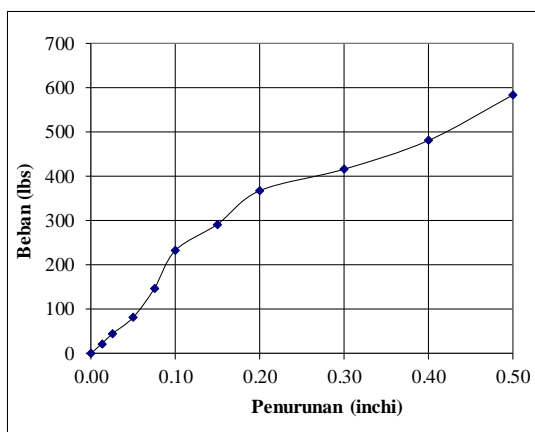
Tanggal	11/22/21	11/23	11/24	11/25		
Jam	13.10	13.10	13.10	13.10	Sebelum	Sesudah
Pembacaan, mm	0.41	0.54	0.65	0.89	A. Berat Cetakan	gram
Swelling $Sw = \frac{\Delta h}{h_0} \times 100\%$	7.266	9.569	11.519	15.772	B. Berat Tanah Basah + Cetakan	gram
					C. Berat Tanah Basah	gram

Penetrasi : 56 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

D. Volume Cetakan	cm <sup>3</sup>	2148	2148
E. Berat Isi Basah, $\gamma_{wet} = \frac{W_{wet}}{V_{mould}}$	gram/cm <sup>3</sup>	1.890	2.014
F. Berat Isi Kering, $\gamma_{dry} = \frac{\gamma_{wet}}{1+w}$	gram/cm <sup>3</sup>	1.490	1.457

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0
0.25	0.013	4	21.6
0.5	0.025	8	43.2
1	0.050	15	81
1.5	0.075	27	145.8
2	0.100	43	232.2
3	0.150	54	291.6
4	0.200	68	367.2
6	0.300	77	415.8
8	0.400	89	480.6
10	0.500	108	583.2



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Sesudah
Berat tanah basah + Container	gram	34.14	44.12
Berat tanah kering + Container	gram	28.79	34.11
Berat air	gram	5.35	10.02
Berat container	gram	8.02	7.93
Berat tanah kering	gram	20.78	26.18
Kadar air, $w$	%	25.75	38.27

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	232.200	7.74	8.16
0.2	367.200	8.16	



### CBR TEST RESULTS

PROJECT	: SOIL INVESTIGATION		
LOCATION	:		
SAMPLING	: TANAH + 1% ZEOLIT 28 HARI		
TESTING METHOD	: ASTM D 1883-73	TESTED BY	: AKHIRUL
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	: MARET 2022

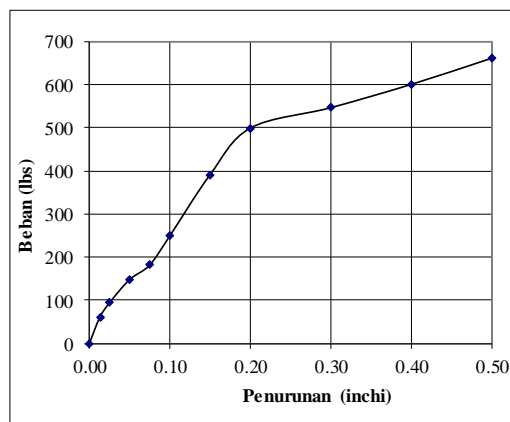
#### Pemeriksaan CBR Soaked (56x Tumbukan)

		Sebelum	Setelah
A. Berat Cetakan	gram	4197	4197
B. Berat Tanah Basah + Cetakan	gram	7792	7993
C. Berat Tanah Basah	gram	3595	3796
D. Volume Cetakan	cm <sup>3</sup>	2121.9869	2122
E. Berat Isi Basah, $\gamma_{wet} = W_{wet} / V_{mould}$	gram/cm <sup>3</sup>	1.694	1.789
F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet} / (1 + \omega)$	gram/cm <sup>3</sup>	1.200	1.338

Penetrasi : 56 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

Waktu (menit)	Penurunan (inchi)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0.00
0.25	0.013	9	60.6987
0.5	0.025	14	94.4202
1	0.050	22	148.3746
1.5	0.075	27	182.0961
2	0.100	37	249.5391
3	0.150	58	391.1694
4	0.200	74	499.0782
6	0.300	81	546.2883
8	0.400	89	600.2427
10	0.500	98	660.9414



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Setelah
Berat tanah basah + Container	gram	45.23	25.79
Berat tanah kering + Container	gram	33.48	20.60
Berat air	gram	11.75	5.19
Berat container	gram	5.10	5.15
Berat tanah kering	gram	28.38	15.45
Kadar air, $\omega$	%	41.17	33.59

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	249.539	8.32	11.09
0.2	499.078	11.09	

### CBR TEST RESULTS

PROJECT	: SOIL INVESTIGATION		
LOCATION	: TANAH + 3% ZEOLIT 28 HARI		
TESTING METHOD	: ASTM D 1883-73	TESTED BY	: AKHIRUL
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	: MARET 2022

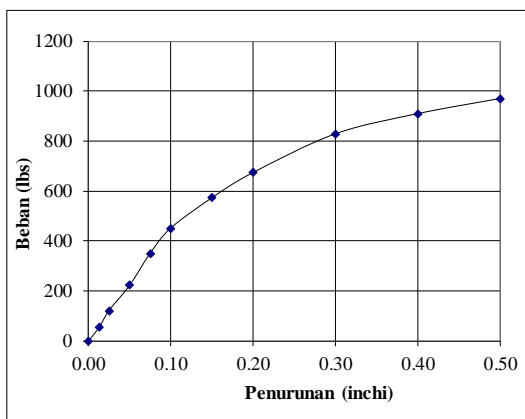
#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

		Sebelum	Setelah
A. Berat Cetakan	gram	4273	4273
B. Berat Tanah Basah + Cetakan	gram	7995	9076
C. Berat Tanah Basah	gram	3722	4803
D. Volume Cetakan	cm <sup>3</sup>	2121.99	2122
E. Berat Isi Basah, $\gamma_{wet} = W_{wet}/V_{mould}$	gram/cm <sup>3</sup>	1.754	2.263
F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet}/(1+w)$	gram/cm <sup>3</sup>	1.305	1.525

Penetrasi : 10 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER (Div)	Beban (lbs)
0.00	0.00	0	0.00
0.25	0.013	8	53.9544
0.5	0.025	18	121.3974
1	0.050	33	222.5619
1.5	0.075	52	350.7036
2	0.100	67	451.8681
3	0.150	85	573.2655
4	0.200	100	674.43
6	0.300	123	829.5489
8	0.400	135	910.4805
10	0.500	144	971.1792



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Setelah
Berat tanah basah + Container	gram	44.33	53.86
Berat tanah kering + Container	gram	35.04	39.53
Berat air	gram	9.29	14.33
Berat container	gram	7.74	8.38
Berat tanah kering	gram	27.31	31.15
Kadar air, $w$	%	34.00	46.01

#### Perhitungan CBR

Penurunan, $x$ (inchi)	Beban (lbs)	CBR (%)	NILAI CBR (%)
0.1	451.868	15.06	15.06
0.2	674.430	14.99	

CBR (SOAKED) LABORATORY TEST RESULT			
PROJECT	: SOIL INVESTIGATION REPORT		
LOCATION	:		
SAMPLE / SAMPLE NO.	: TANAH + 5% ZEOLIT 28 HARI		
TESTING METHOD	: ASTM D-1883-73	TESTED BY	: AKHIRUL
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	: MARET 2022

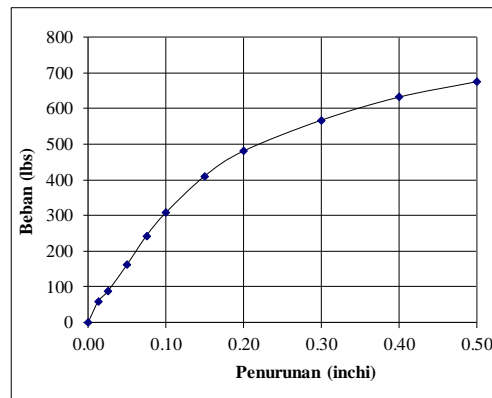


Pemeriksaan CBR Soaked (56x Tumbukan)			
		Sebelum	Sesudah
A. Berat Cetakan	gram	4009	4009
B. Berat Tanah Basah + Cetakan	gram	7563	8413
C. Berat Tanah Basah	gram	3554	4404
D. Volume Cetakan	cm <sup>3</sup>	2148	2148
E. Berat Isi Basah, $\gamma_{wet} = W_{wet} / V_{mould}$	gram/cm <sup>3</sup>	1.655	2.051
F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet} / (1 + \omega)$	gram/cm <sup>3</sup>	1.231	1.494

Penetrasi : 56 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 5.4

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER(Div)	Beban (lbs)
0.00	0.00	0	0
0.25	0.013	11	59.4
0.5	0.025	16	86.4
1	0.050	30	162
1.5	0.075	45	243
2	0.100	57	307.8
3	0.150	76	410.4
4	0.200	89	480.6
6	0.300	105	567
8	0.400	117	631.8
10	0.500	125	675



Grafik Hubungan Penurunan - Beban

**Kadar Air**

No. Container	-	Sebelum	Sesudah
Berat tanah basah + Container	gram	23.62	33.46
Berat tanah kering + Container	gram	18.89	25.75
Berat air	gram	4.73	7.72
Berat container	gram	5.01	5.06
Berat tanah kering	gram	13.88	20.69
Kadar air, $\omega$	%	34.04	37.29

**Perhitungan CBR**

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	Rata-rata
0.1	307.800	10.26	10.68
0.2	480.600	10.68	

### CBR TEST RESULTS

PROJECT	: SOIL INVESTIGATION		
COMBINATION SAMPLE	: TANAH + 7% ZEOLIT 28 HARI		
TESTING METHOD	: ASTM D 1883-73	TESTED BY	: AKHIRUL
LABORATORY	: HASANUDDIN UNIVERSITY	DATE	: MARET 2022

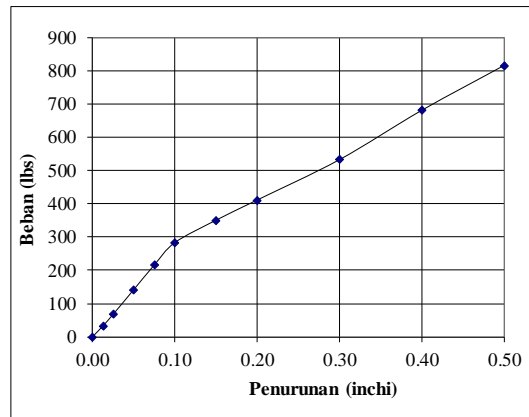
#### PEMERIKSAAN CBR SOAKED (56x Tumbukan)

		Sebelum	Setelah
A. Berat Cetakan	gram	4192	4192
B. Berat Tanah Basah + Cetakan	gram	7984	8645
C. Berat Tanah Basah	gram	3792	4453
D. Volume Cetakan	cm <sup>3</sup>	2122	2122
E. Berat Isi Basah, $\gamma_{wet} = W_{wet}/V_{mould}$	gram/cm <sup>3</sup>	1.787	2.099
F. Berat Isi Kering, $\gamma_{dry} = \gamma_{wet}/(1+w)$	gram/cm <sup>3</sup>	1.315	1.422

Penetrasi : 10 Pukulan

Proving ring Calibration 50 KN cap, lbs/Dev = 6.7443

Waktu (menit)	Penurunan (inch)	Pembacaan Dial PER (Div)	Beban (lbs)
0.00	0.00	0	0.00
0.25	0.013	5	33.7215
0.5	0.025	10	67.443
1	0.050	21	141.6303
1.5	0.075	32	215.8176
2	0.100	42	283.2606
3	0.150	52	350.7036
4	0.200	61	411.4023
6	0.300	79	532.7997
8	0.400	101	681.1743
10	0.500	121	816.0603



Grafik Hubungan Penurunan - Beban

#### Kadar Air

No. Container	-	Sebelum	Setelah
Berat tanah basah + Container	gram	64.28	70.78
Berat tanah kering + Container	gram	49.26	51.79
Berat air	gram	15.02	18.99
Berat container	gram	7.57	9.18
Berat tanah kering	gram	41.69	42.62
Kadar air, $w$	%	36.02	44.55

#### Perhitungan CBR

Penurunan, x (inchi)	Beban (lbs)	CBR (%)	NILAI CBR (%)
0.1	283.261	9.44	9.44
0.2	411.402	9.14	