

## **BAB VI**

### **KESIMPULAN DAN SARAN**

#### **6.1 Kesimpulan**

Pada penelitian ini tanah yang digunakan adalah tanah dengan sifat *inorganic slit*. Tanah dengan sifat inorganic silt merupakan tanah tidak cukup baik dalam hal konstruksi. Untuk memperkuat daya dukung tanah tersebut, maka peneliti menambahkan bahan aditif yaitu serbuk cangkang telur ayam dan abu cangkang sawit sebagai bahan stabilisasi tanah lempung. Berdasarkan penelitian yang telah dilakukan, peneliti merekomendasikan pemakaian kadar serbuk cangkang telur ayam sebanyak 12,97% dan pemakaian abu cangkang sawit sebanyak 17,65%. Hal ini dikarenakan nilai kuat tekan bebas dari sampel tersebut adalah yang paling tinggi dengan waktu pemeraman 7 hari sebesar 1,387 kg/cm<sup>2</sup>. Pada waktu pemeraman 14 hari menghasilkan nilai kuat tekan bebas sebesar 1,585 kg/cm<sup>2</sup>. Sedangkan pada waktu pemeraman 28 hari menghasilkan nilai kuat tekan bebas sebesar 1,976 kg/cm<sup>2</sup>.

#### **6.2 Saran**

Secara akademis, bagi peneliti yang ingin melakukan penelitian mengenai pencampuran bahan aditif agar dapat memperhatikan lokasi dari bahan yang digunakan. Hal ini dimaksudkan agar mempercepat proses pencarian data.

Secara praktis, diharapkan kontraktor yang hendak membuat jalan raya di provinsi Kalimantan Barat agar dapat mempertimbangkan pemakaian kadar serbuk cangkang telur ayam dan abu cangkang sawit.



## DAFTAR PUSTAKA

- Bella, R. A., Bunganaen, W., & Sogen, P. M. (2015). Identifikasi Kerusakan Konstruksi Akibat Potensi Pengembangan Tanah Lempung Ekspansif di Desa Oebelo, Volume IV, No. 2.
- Chen, F.H. (1975), *Foundation on Expansive Soil*, Development in Geotechnical Engineering12, Esevier Scientific Publishing Company, Amsterdam.
- Endriani, D. (2012). “Pengaruh Penambahan Abu Cangkang Sawit Terhadap Daya Dukung dan Kuat Tekan pada Tanah Lempung Ditinjau dari Uji UCT dan CPT Labiratorium”. Universitas Sumatera Utara. Kota Medan.
- Gultom, M. (2016) “Pemanfaatan Limbah Serbuk Cangkang Telur Ayam Sebagai Pengganti Kapur Terhadap Produktivitas Rumpu Paspalum Notatum dan Digitaria Milanjiana Pada Tanah Ultisol”. Universitas Sumatera Utara. Kota Medan.
- Hardiyatmo, H.C. 2001. *Prinsip-prinsip Mekanika Tanah dan Soal Peyeleaian 1*, Beta Offset, Yogyakarta.
- Holtz, R.D. and Kovacs, W.D., (1981), *An Introduction to Geotechnical Engineering*, Prentice Hall Civil Engineering and Engineering Mechanic Series.
- Kusuma, R. I, dkk. (2015). *Stabilisasi Tanah Lempung dengan Menggunakan Abu Sawit Terhadap Nilai Kuat Tekan Bebas*. Indonesia: Universitas Sultan Ageng Tirtayasa.

Pokaton, I. E, Kaseke, O. H & Elisabeth, L. (2015). Pengaruh Kandungan Material Plastis terhadap Nilai CBR Lapis Pondasi Agregat Kelas S. Manado, Indonesia: Universitas Sam Ratulangi.

Retno, E. (2019). Tanah Gambut: Anugerah atau Musibah?. Indonesia. Diakses dari <https://www.kompasiana.com/edho/5d6b7f97097f3626a9302c93/tanah-gambut-anugrah-atau-musibah-pada-24-September-2019>.

Sardana, Y. W. (2018). Laporan Praktikum Mekanika Tanah. Indonesia.





### HASIL PEMERIKSAAN KADAR AIR

Kode Cawan		A1	A2
Berat Cawan Kosong	$w_c$	9.74	10.20
Berat Cawan + Tanah Basah	$w_1$	38.58	36.28
Berat Cawan + Tanah Kering	$w_2$	38.06	35.85
Berat Air	$w_w = w_1 - w_2$	0.52	0.43
Berat Tanah Kering	$w_s = w_2 - w_c$	28.32	25.65
Kadar Air	$w = \frac{w_w}{w_s} \times 100\%$	1.84	1.68
Kadar Air Rata-Rata		1.76	




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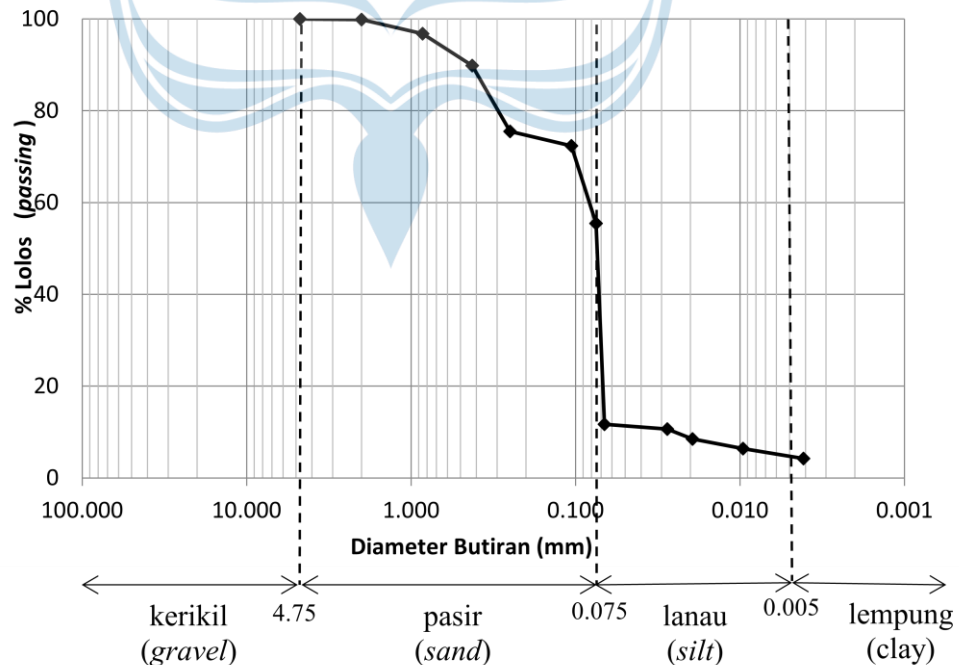
**HASIL PEMERIKSAAN BERAT JENIS**

	No Picnometer	A1	A2
w1	Berat Picnometer kosong	32.47	31.32
w2	Berat Picnometer+Tanah Kering	60.37	56.73
w3	Berat Picnometer+Tanah+Air	100.35	97.60
w4	Berat Picnometer+Air	82.71	81.62
T	Temperatur	27°	27°
A	w2-w1	27.90	25.41
B	w3-w4	17.64	15.98
C	A-B	10.26	9.43
G	Berat Jenis = A / C	2.72	2.69
	Berat Jenis Rata-rata	2.71	
	Berat Jenis Tanah pada 27.5°C	2.7072	
	$G_{27.5} = G \times \frac{\gamma_w(t^{\circ}C)}{\gamma_w(27.5^{\circ}C)}$		



### HASIL PEMERIKSAAN ANALISA SARINGAN

No. Sieve	Ukuran Butiran (mm)	Berat Saringan	Berat Saringan dan tanah	Berat Tertahan	Berat Lolos	Prosentase Lolos
a	B	c	d	e	f	g
				(d - c)	J - e	(f / J) x 100
4	4.750	585.400	585.400	0.000	100.00	100.00
10	2.000	530.730	530.830	0.100	99.90	99.90
20	0.850	487.680	490.800	3.120	96.78	96.78
40	0.425	436.350	443.290	6.940	89.84	89.84
60	0.250	435.820	450.170	14.350	75.49	75.49
140	0.106	427.430	444.390	16.960	58.53	58.53
200	0.075	415.790	418.840	3.050	55.48	55.48
Pan				55.480		
Jumlah, J=				100.000		





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### HASIL PEMERIKSAAN HYDROMETER

Tipe Hidrometer	152	Berat Sampel Kering Oven	W= 100 gr
Koreksi Meniskus	m= 1	K****	1.0236
Berat Jenis Tanah	G= 2.7072	Reagen	Na <sub>2</sub> SiO <sub>3</sub> / NaPO <sub>3</sub>
Koreksi Hidrometer 152	a= 1.0236 (DAFTAR 1)	Banyak reagen	2 sendok makan

Tanggal	Jam	Waktu (menit)	Pembacaan Suspensi	Pembacaan Cairan	Temperatur °C	Pembacaan Terkoreksi meniskus	Kedalaman Efektif	Konstan	Diameter Butir (mm)	Pembacaan Terkoreksi	% Lebih Kecil
		T	R1	R2	t °C	R' = R1+m	L* (mm)	Kh**	D	R = R1 - R2	p*** (%)
16/09/19	12:33	2	13	1	25	14	140	0.01264	0.1058	13	13.8580
16/09/19	12:36	5	12	1	26	13	142	0.01253	0.0668	11	11.7260
16/09/19	13:01	30	11	1	25	12	143	0.01267	0.0277	10	10.6600
16/09/19	13:31	60	10	1	26	11	145	0.01253	0.0195	8	8.5280
16/09/19	16:41	250	7	1	27	8	150	0.01239	0.0096	6	6.3960
17/09/19	12:31	1440	6	2	25	7	152	0.01267	0.0041	4	4.2640

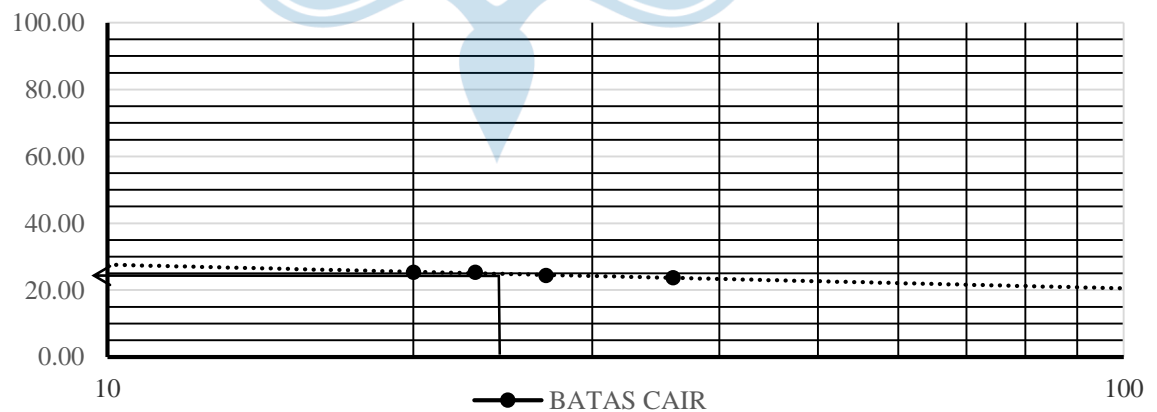
<p>* : dibaca dari daftar 2 berdasarkan R'</p> <p>** : dibaca dari daftar 3 berdasarkan t dan G</p> <p>*** : dihitung berdasarkan rumus</p> <p>151: <math>p = K_{151} (R - 1)</math></p> <p>152: <math>p = K_{152} \times R</math></p>	<p>****:</p> $K_{152} = \frac{a}{W} \times 100$	$D = K \sqrt{\frac{L}{T}}$	
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**HASIL PEMERIKSAAN BATAS CAIR DENGAN KADAR 5,26% SERBUK CANGKANG TELUR AYAM**

Target Pukulan			15-20	21-24	26-30	31-40				
Jumlah Pukulan			20	23	27	36				
Kode Cawan			A5	A6	B5	B6	C5	C6	D5	D6
1	Berat Cawan Kosong	$w_c$	10.56	10.20	17.00	14.86	10.25	10.27	10.16	10.17
2	Berat Cawan + Tanah Basah	$w_1$	17.43	16.48	23.38	21.04	25.16	24.25	15.84	18.14
3	Berat Cawan + Tanah Kering	$w_2$	16.04	15.21	22.08	19.80	22.26	21.50	14.76	16.60
4	Berat Air	$w_w = w_1 - w_2$	1.39	1.27	1.30	1.24	2.90	2.75	1.08	1.54
5	Berat Tanah Kering	$w_s = w_2 - w_c$	5.48	5.01	5.08	4.94	12.01	11.23	4.60	6.43
6	Kadar Air	$w = \frac{w_w}{w_s} \times 100\%$	25.36	25.35	25.59	25.10	24.15	24.49	23.48	23.95
	Kadar Air Rata-Rata		25.36		25.35		24.32		23.71	



Batas Cair (Liquid

Limit, LL) = 24.8

$w_{10} = 27$

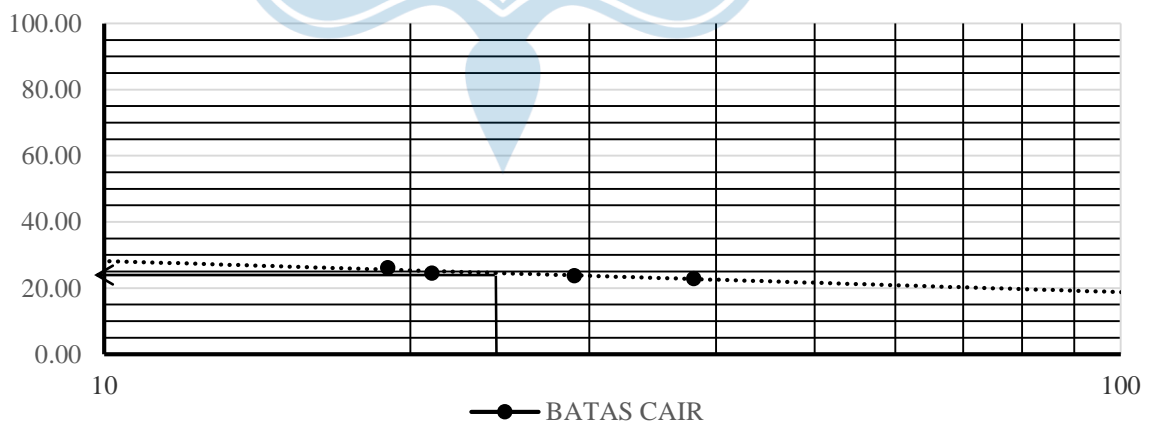
$w_{100} = 21$

$w_{10} - w_{100} = 6$



**HASIL PEMERIKSAAN BATAS CAIR DENGAN KADAR 11,11% SERBUK  
 CANGKANG TELUR AYAM**

Target Pukulan			15-20		21-24		26-30		31-40	
Jumlah Pukulan			20		23		27		36	
Kode Cawan			A5	A6	B5	B6	C5	C6	D5	D6
1	Berat Cawan Kosong	$w_c$	10.56	10.20	17.00	14.86	10.25	10.27	10.16	10.17
2	Berat Cawan + Tanah Basah	$w_1$	17.43	16.48	23.38	21.04	25.16	24.25	15.84	18.14
3	Berat Cawan + Tanah Kering	$w_2$	16.04	15.21	22.08	19.80	22.26	21.50	14.76	16.60
4	Berat Air	$w_w = w_1 - w_2$	1.39	1.27	1.30	1.24	2.90	2.75	1.08	1.54
5	Berat Tanah Kering	$w_s = w_2 - w_c$	5.48	5.01	5.08	4.94	12.01	11.23	4.60	6.43
6	Kadar Air	$w = \frac{w_w}{w_s} \times 100\%$	25.36	25.35	25.59	25.10	24.15	24.49	23.48	23.95
	Kadar Air Rata-Rata		25.36		25.35		24.32		23.71	

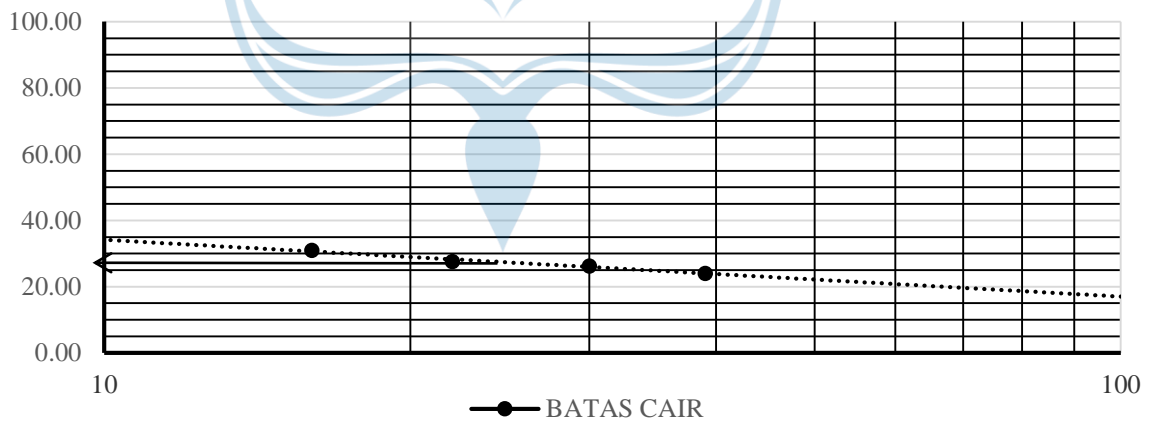


Batas Cair (Liquid  
 Limit, LL) = 24.9  
 $w_{10} = 27$   
 $w_{100} = 19$   
 $w_{10} - w_{100} = 8$



**HASIL PEMERIKSAAN BATAS CAIR DENGAN KADAR 17,65% SERBUK  
 CANGKANG TELUR AYAM**

Target Pukulan			15-20		21-24		26-30		31-40	
Jumlah Pukulan			19		21		29		38	
Kode Cawan			A10	A11	B10	B11	C10	C11	D10	D11
1	Berat Cawan Kosong	$w_c$	10.44	10.42	10.07	10.28	10.28	10.56	10.28	10.28
2	Berat Cawan + Tanah Basah	$w_1$	17.50	20.57	19.06	18.60	16.99	14.77	19.86	19.12
3	Berat Cawan + Tanah Kering	$w_2$	16.04	18.46	17.29	16.96	15.69	13.97	18.09	17.46
4	Berat Air	$w_w = w_1 - w_2$	1.46	2.11	1.77	1.64	1.30	0.80	1.77	1.66
5	Berat Tanah Kering	$w_s = w_2 - w_c$	5.60	8.04	7.22	6.68	5.41	3.41	7.81	7.18
6	Kadar Air	$w = \frac{w_w}{w_s} \times 100\%$	26.07	26.24	24.52	24.55	24.03	23.46	22.66	23.12
	Kadar Air Rata-Rata		26.16		24.53		23.74		22.89	



Batas Cair  
 (Liquid Limit,  
 LL) = 27.5  
 $w_{10} = 34$   
 $w_{100} = 17$   
 $w_{10} - w_{100} = 17$



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**HASIL PEMERIKSAAN BATAS PLASTIS DENGAN KADAR 5,26% SERBUK  
 CANGKANG TELUR AYAM**

Kode Cawan		BP5	BP6
Berat Cawan Kosong	$w_c$	10.44	10.32
Berat Cawan + Tanah Basah	$w_1$	17.23	18.42
Berat Cawan + Tanah Kering	$w_2$	16.66	17.69
Berat Air	$w_w = w_1 - w_2$	0.57	0.73
Berat Tanah Kering	$w_s = w_2 - w_c$	6.22	7.37
Kadar Air	$w = \frac{w_w}{w_s} \times 100\%$	9.16	9.91
Batas Plastis		9.53	



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**HASIL PEMERIKSAAN BATAS PLASTIS DENGAN KADAR 11,11% SERBUK**

**CANGKANG TELUR AYAM**

Kode Cawan		BP10	BP11
Berat Cawan Kosong	$w_c$	10.41	10.25
Berat Cawan + Tanah Basah	$w_1$	18.52	16.48
Berat Cawan + Tanah Kering	$w_2$	17.63	15.67
Berat Air	$w_w = w_1 - w_2$	0.89	0.81
Berat Tanah Kering	$w_s = w_2 - w_c$	7.22	5.42
Kadar Air	$w = \frac{w_w}{w_s} \times 100\%$	12.33	14.94
Batas Plastis		13.64	



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**HASIL PEMERIKSAAN BATAS PLASTIS DENGAN KADAR 17,65% SERBUK**

**CANGKANG TELUR AYAM**

Kode Cawan		BP15	BP16
Berat Cawan Kosong	$w_c$	10.30	10.48
Berat Cawan + Tanah Basah	$w_1$	20.14	18.53
Berat Cawan + Tanah Kering	$w_2$	18.84	17.67
Berat Air	$w_w = w_1 - w_2$	1.30	0.86
Berat Tanah Kering	$w_s = w_2 - w_c$	8.54	7.19
Kadar Air	$w = \frac{w_w}{w_s} \times 100\%$	15.22	11.96
Batas Plastis		13.59	



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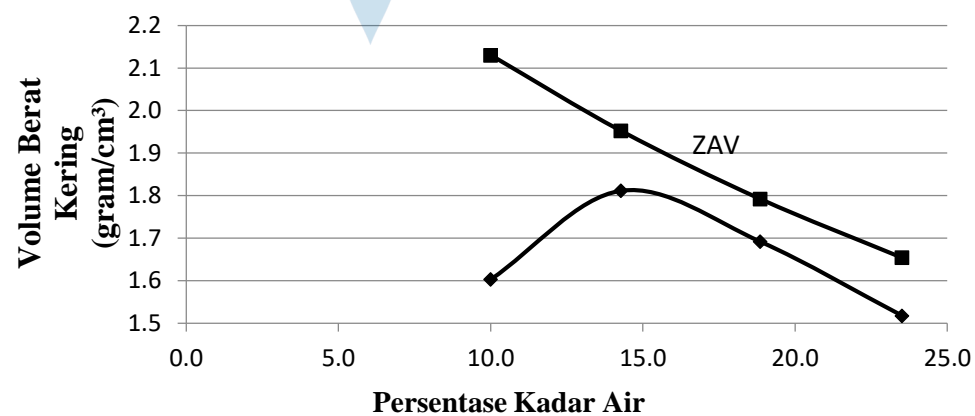
### HASIL PEMERIKSAAN PEMADATAN

Nomor Percoban	100 ml		200 ml		300 ml		400 ml		500 ml		600 ml			
Berat Silinder + Tanah Padat (gram)	$W_A$		2962	2989	3048	3300	3251	3139						
Berat Silinder (gram)	$W_B$		1601	1601	1601	1601	1601	1601	1601	1601	1601	1601		
Berat Tanah Padat, W (gram)	$W = W_A - W_B$		1361	1388	1447	1699	1650	1538						
Berat Volume Basah ( $gr/cm^3$ )			1.66	1.69	1.76	2.07	2.01	1.87						
Nomor Cawan Timbang	100A	100B	200A	200B	300A	300B	400A	400B	500A	500B	600A	600B		
Berat Cawan Kosong	$W_c$		11.17	10.55	10.24	10.24	10.10	11.08	10.28	10.32	10.56	11.13	10.31	10.17
Berat Cawan + Tanah Basah	$W_1$		22.59	24.92	18.66	17.54	20.66	22.41	21.16	22.49	28.31	29.56	28.97	30.78



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Berat Cawan + Tanah Kering	$W_2$	22.13	24.41	18.15	17.08	19.69	21.39	19.79	20.98	25.46	26.67	25.44	26.83
Berat Air	$W_w = W_1 - W_2$	0.46	0.51	0.51	0.46	0.97	1.02	1.37	1.51	2.85	2.89	3.53	3.95
Berat Tanah Kering	$W_s = W_2 - W_c$	10.96	13.86	7.91	6.84	9.59	10.31	9.51	10.66	14.90	15.54	15.13	16.66
Kadar Air		4.17	3.68	6.45	6.73	10.11	9.89	14.41	14.17	19.13	18.60	23.33	23.71
Kadar Air Rata-Rata (%)		3.9241		6.5863		10.0040		14.2855		18.8623		23.5203	
Berat Volume Tanah Kering		1.5959		1.5869		1.6029		1.8116		1.6916		1.5173	







**HASIL PEMERIKSAAN KUAT TEKAN BEBAS TANAH ASLI PADA WAKTU PEMERAMAN 7 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 7 Oktober 2019

Diameter spesimen : 5,701 cm

Tinggi spesimen,  $L_0$  : 8,388 cm

Berat spesimen : 344,83 gram

Luas mula-mula,  $A_0$  : 17,9174 cm<sup>2</sup>

Volume spesimen,  $V$  : 214,203 cm<sup>3</sup>

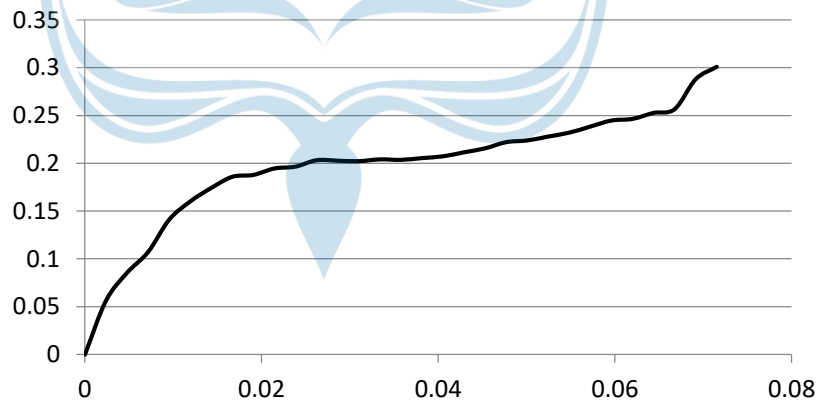
Berat Volume,  $\gamma$  : 1,60983 gram/cm<sup>3</sup>

Perubahan Tinggi		Luas Penampang			Beban		Tekanan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$a \times 10^{-3}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	F	g	h
0	0	0	0	0	0		0
20	0.02	0.00238	0.99762	17.9603	23	1.012	0.05635
40	0.04	0.00477	0.99523	18.0033	35	1.54	0.08554
60	0.06	0.00715	0.99285	18.0465	44	1.936	0.10728
80	0.08	0.00954	0.99046	18.09	58	2.552	0.14107
100	0.10	0.01192	0.98808	18.1336	66	2.904	0.16014
120	0.12	0.01431	0.98569	18.1775	72	3.168	0.17428
140	0.14	0.01669	0.98331	18.2216	77	3.388	0.18593
160	0.16	0.01907	0.98093	18.2658	78	3.432	0.18789
180	0.18	0.02146	0.97854	18.3104	81	3.564	0.19464
200	0.20	0.02384	0.97616	18.3551	82	3.608	0.19657
220	0.22	0.02623	0.97377	18.4	85	3.74	0.20326
240	0.24	0.02861	0.97139	18.4452	85	3.74	0.20276



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260	0.26	0.031	0.969	18.4906	85	3.74	0.20227
280	0.28	0.03338	0.96662	18.5362	86	3.784	0.20414
300	0.30	0.03577	0.96423	18.582	86	3.784	0.20364
320	0.32	0.03815	0.96185	18.6281	87	3.828	0.2055
340	0.34	0.04053	0.95947	18.6744	88	3.872	0.20734
360	0.36	0.04292	0.95708	18.7209	90	3.96	0.21153
380	0.38	0.0453	0.9547	18.7677	92	4.048	0.21569
400	0.40	0.04769	0.95231	18.8146	95	4.18	0.22217
420	0.42	0.05007	0.94993	18.8619	96	4.224	0.22394
440	0.44	0.05246	0.94754	18.9093	98	4.312	0.22804
460	0.46	0.05484	0.94516	18.957	100	4.4	0.2321
480	0.48	0.05722	0.94278	19.005	103	4.532	0.23846
500	0.50	0.05961	0.94039	19.0532	106	4.664	0.24479
520	0.52	0.06199	0.93801	19.1016	107	4.708	0.24647
540	0.54	0.06438	0.93562	19.1503	110	4.84	0.25274
560	0.56	0.06676	0.93324	19.1992	112	4.928	0.25668
580	0.58	0.06915	0.93085	19.2484	126	5.544	0.28802
600	0.60	0.07153	0.92847	19.2978	132	5.808	0.30097





**HASIL PEMERIKSAAN KUAT TEKAN BEBAS DENGAN KADAR 12,97%  
 SERBUK CANGKANG TELUR AYAM DAN 5,88% ABU CANGKANG SAWIT  
 PADA WAKTU PEMERAMAN 7 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 7 Oktober 2019

Diameter spesimen : 5,648 cm

Tinggi spesimen,  $L_0$  : 9,819 cm

Berat spesimen : 372,58 gram

Luas mula-mula,  $A_0$  : 17,7509 cm<sup>2</sup>

Volume spesimen,  $V$  : 246,105 cm<sup>3</sup>

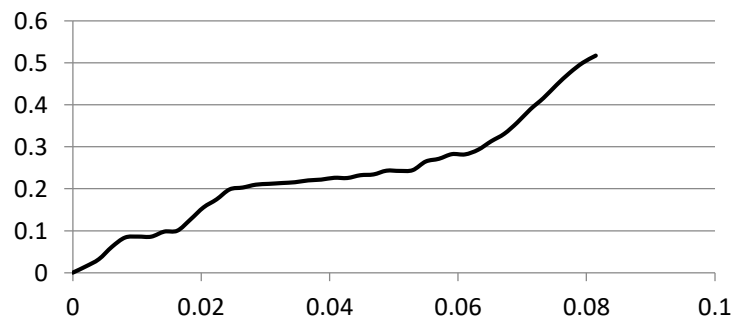
Berat Volume,  $\gamma$  : 1,5139 gram/cm<sup>3</sup>

Perubahan Tinggi			Luas Penampang		Beban		Tekanan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$\frac{a \times 10^{-3}}{10^{-3}}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.00204	0.99796	17.7871	6	0.264	0.01484
40	0.04	0.00407	0.99593	17.8235	13	0.572	0.03209
60	0.06	0.00611	0.99389	17.86	25	1.1	0.06159
80	0.08	0.00815	0.99185	17.8967	34	1.496	0.08359
100	0.10	0.01018	0.98982	17.9335	35	1.54	0.08587
120	0.12	0.01222	0.98778	17.9705	35	1.54	0.0857
140	0.14	0.01426	0.98574	18.0076	40	1.76	0.09774
160	0.16	0.01629	0.98371	18.0449	41	1.804	0.09997
180	0.18	0.01833	0.98167	18.0823	52	2.288	0.12653
200	0.20	0.02037	0.97963	18.1199	64	2.816	0.15541
220	0.22	0.02241	0.97759	18.1577	72	3.168	0.17447



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240	0.24	0.02444	0.97556	18.1956	82	3.608	0.19829
260	0.26	0.02648	0.97352	18.2337	84	3.696	0.2027
280	0.28	0.02852	0.97148	18.2719	87	3.828	0.2095
300	0.30	0.03055	0.96945	18.3103	88	3.872	0.21147
320	0.32	0.03259	0.96741	18.3488	89	3.916	0.21342
340	0.34	0.03463	0.96537	18.3876	90	3.96	0.21536
360	0.36	0.03666	0.96334	18.4264	92	4.048	0.21968
380	0.38	0.0387	0.9613	18.4655	93	4.092	0.2216
400	0.40	0.04074	0.95926	18.5047	95	4.18	0.22589
420	0.42	0.04277	0.95723	18.5441	95	4.18	0.22541
440	0.44	0.04481	0.95519	18.5836	98	4.312	0.23203
460	0.46	0.04685	0.95315	18.6233	99	4.356	0.2339
480	0.48	0.04888	0.95112	18.6632	103	4.532	0.24283
500	0.50	0.05092	0.94908	18.7033	103	4.532	0.24231
520	0.52	0.05296	0.94704	18.7435	104	4.576	0.24414
540	0.54	0.055	0.945	18.7839	113	4.972	0.26469
560	0.56	0.05703	0.94297	18.8245	116	5.104	0.27114
580	0.58	0.05907	0.94093	18.8652	121	5.324	0.28221
600	0.60	0.06111	0.93889	18.9061	121	5.324	0.2816
620	0.62	0.06314	0.93686	18.9472	126	5.544	0.2926
640	0.64	0.06518	0.93482	18.9885	135	5.94	0.31282
660	0.66	0.06722	0.93278	19.03	143	6.292	0.33064
680	0.68	0.06925	0.93075	19.0716	155	6.82	0.3576
700	0.70	0.07129	0.92871	19.1135	169	7.436	0.38905
720	0.72	0.07333	0.92667	19.1555	181	7.964	0.41576
740	0.74	0.07536	0.92464	19.1977	195	8.58	0.44693
760	0.76	0.0774	0.9226	19.2401	208	9.152	0.47567
780	0.78	0.07944	0.92056	19.2826	219	9.636	0.49972
800	0.80	0.08147	0.91853	19.3254	227	9.988	0.51683





**HASIL PEMERIKSAAN KUAT TEKAN BEBAS DENGAN KADAR 12,97%  
 SERBUK CANGKANG TELUR AYAM DAN 11,76% ABU CANGKANG SAWIT  
 PADA WAKTU PEMERAMAN 7 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 8 Oktober 2019

Diameter spesimen : 5,732 cm

Tinggi spesimen,  $L_0$  : 8,456 cm

Berat spesimen : 362,54 gram

Luas mula-mula,  $A_0$  : 18,0149 cm<sup>2</sup>

Volume spesimen,  $V$  : 218,294 cm<sup>3</sup>

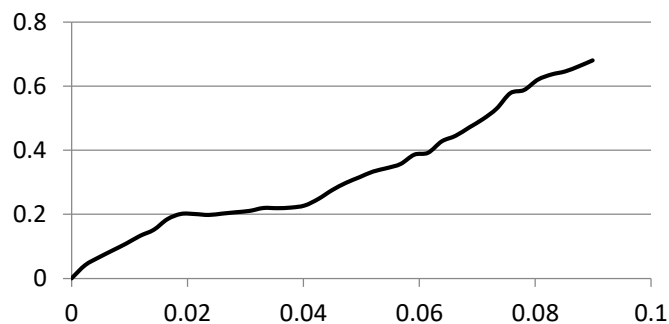
Berat Volume,  $\gamma$  : 1,66079 gram/cm<sup>3</sup>

Perubahan Tinggi		Luas Penampang			Beban		Tegangan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$\frac{a \times 10^{-3}}{10^{-3}}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.00237	0.99763	18.0576	17	0.748	0.04142
40	0.04	0.00473	0.99527	18.1005	27	1.188	0.06563
60	0.06	0.0071	0.9929	18.1436	36	1.584	0.0873
80	0.08	0.00946	0.99054	18.1869	45	1.98	0.10887
100	0.10	0.01183	0.98817	18.2304	55	2.42	0.13274
120	0.12	0.01419	0.98581	18.2742	63	2.772	0.15169
140	0.14	0.01656	0.98344	18.3181	77	3.388	0.18495
160	0.16	0.01892	0.98108	18.3623	84	3.696	0.20128
180	0.18	0.02129	0.97871	18.4067	84	3.696	0.2008
200	0.20	0.02365	0.97635	18.4513	83	3.652	0.19793
220	0.22	0.02602	0.97398	18.4961	85	3.74	0.20221



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240	0.24	0.02838	0.97162	18.5411	87	3.828	0.20646
260	0.26	0.03075	0.96925	18.5863	89	3.916	0.21069
280	0.28	0.03311	0.96689	18.6318	93	4.092	0.21962
300	0.30	0.03548	0.96452	18.6775	93	4.092	0.21909
320	0.32	0.03784	0.96216	18.7234	94	4.136	0.2209
340	0.34	0.04021	0.95979	18.7695	97	4.268	0.22739
360	0.36	0.04257	0.95743	18.8159	106	4.664	0.24788
380	0.38	0.04494	0.95506	18.8625	118	5.192	0.27525
400	0.40	0.0473	0.9527	18.9093	128	5.632	0.29784
420	0.42	0.04967	0.95033	18.9564	136	5.984	0.31567
440	0.44	0.05203	0.94797	19.0037	144	6.336	0.33341
460	0.46	0.0544	0.9456	19.0512	149	6.556	0.34412
480	0.48	0.05676	0.94324	19.099	155	6.82	0.35709
500	0.50	0.05913	0.94087	19.147	168	7.392	0.38607
520	0.52	0.06149	0.93851	19.1953	171	7.524	0.39197
540	0.54	0.06386	0.93614	19.2438	187	8.228	0.42757
560	0.56	0.06623	0.93377	19.2925	195	8.58	0.44473
580	0.58	0.06859	0.93141	19.3415	207	9.108	0.4709
600	0.60	0.07096	0.92904	19.3907	219	9.636	0.49694
620	0.62	0.07332	0.92668	19.4402	234	10.296	0.52962
640	0.64	0.07569	0.92431	19.49	256	11.264	0.57794
660	0.66	0.07805	0.92195	19.54	261	11.484	0.58772
680	0.68	0.08042	0.91958	19.5902	276	12.144	0.6199
700	0.70	0.08278	0.91722	19.6407	284	12.496	0.63623
720	0.72	0.08515	0.91485	19.6915	289	12.716	0.64576
740	0.74	0.08751	0.91249	19.7426	297	13.068	0.66192
760	0.76	0.08988	0.91012	19.7939	306	13.464	0.68021





**HASIL PEMERIKSAAN KUAT TEKAN BEBAS DENGAN KADAR 12,97%  
 SERBUK CANGKANG TELUR AYAM DAN 17,65% ABU CANGKANG SAWIT  
 PADA WAKTU PEMERAMAN 7 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 8 Oktober 2019

Diameter spesimen : 5,646 cm

Tinggi spesimen,  $L_0$  : 8,873 cm

Berat spesimen : 384,13 gram

Luas mula-mula,  $A_0$  : 17,7446 cm<sup>2</sup>

Volume spesimen,  $V$  : 222,237 cm<sup>3</sup>

Berat Volume,  $\gamma$  : 1,72847 gram/cm<sup>3</sup>

Perubahan Tinggi			Luas Penampang		Beban		Tegangan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$\frac{a \times 10^{-3}}{10^{-3}}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.00225	0.99775	17.7847	15	0.66	0.03711
40	0.04	0.00451	0.99549	17.8249	24	1.056	0.05924
60	0.06	0.00676	0.99324	17.8654	33	1.452	0.08127
80	0.08	0.00902	0.99098	17.906	39	1.716	0.09583
100	0.10	0.01127	0.98873	17.9468	48	2.112	0.11768
120	0.12	0.01352	0.98648	17.9878	62	2.728	0.15166
140	0.14	0.01578	0.98422	18.029	72	3.168	0.17572
160	0.16	0.01803	0.98197	18.0704	82	3.608	0.19966
180	0.18	0.02029	0.97971	18.112	91	4.004	0.22107
200	0.20	0.02254	0.97746	18.1538	104	4.576	0.25207
220	0.22	0.02479	0.97521	18.1957	107	4.708	0.25874



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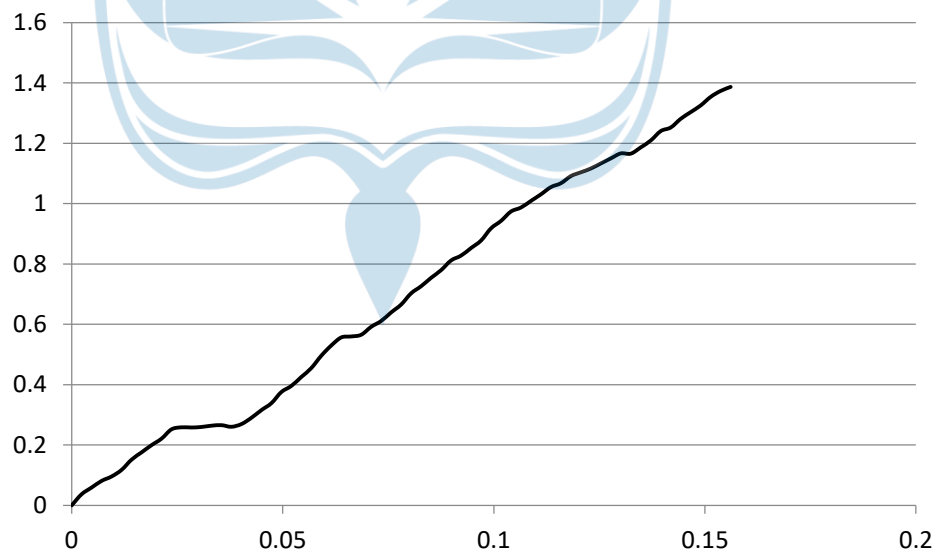
240	0.24	0.02705	0.97295	18.2379	107	4.708	0.25814
260	0.26	0.0293	0.9707	18.2802	108	4.752	0.25995
280	0.28	0.03156	0.96844	18.3228	110	4.84	0.26415
300	0.30	0.03381	0.96619	18.3655	111	4.884	0.26593
320	0.32	0.03606	0.96394	18.4085	109	4.796	0.26053
340	0.34	0.03832	0.96168	18.4516	113	4.972	0.26946
360	0.36	0.04057	0.95943	18.495	122	5.368	0.29024
380	0.38	0.04283	0.95717	18.5385	133	5.852	0.31567
400	0.40	0.04508	0.95492	18.5823	143	6.292	0.3386
420	0.42	0.04733	0.95267	18.6262	159	6.996	0.3756
440	0.44	0.04959	0.95041	18.6704	168	7.392	0.39592
460	0.46	0.05184	0.94816	18.7148	181	7.964	0.42555
480	0.48	0.0541	0.9459	18.7594	194	8.536	0.45503
500	0.50	0.05635	0.94365	18.8042	212	9.328	0.49606
520	0.52	0.0586	0.9414	18.8492	227	9.988	0.52989
540	0.54	0.06086	0.93914	18.8945	239	10.516	0.55657
560	0.56	0.06311	0.93689	18.9399	241	10.604	0.55988
580	0.58	0.06537	0.93463	18.9856	244	10.736	0.56548
600	0.60	0.06762	0.93238	19.0315	256	11.264	0.59186
620	0.62	0.06987	0.93013	19.0776	265	11.66	0.61119
640	0.64	0.07213	0.92787	19.124	278	12.232	0.63962
660	0.66	0.07438	0.92562	19.1705	290	12.76	0.6656
680	0.68	0.07664	0.92336	19.2173	307	13.508	0.70291
700	0.70	0.07889	0.92111	19.2644	318	13.992	0.72632
720	0.72	0.08115	0.91885	19.3116	331	14.564	0.75416
740	0.74	0.0834	0.9166	19.3591	343	15.092	0.77958
760	0.76	0.08565	0.91435	19.4068	358	15.752	0.81167
780	0.78	0.08791	0.91209	19.4548	366	16.104	0.82777
800	0.80	0.09016	0.90984	19.503	378	16.632	0.85279
820	0.82	0.09242	0.90758	19.5514	390	17.16	0.87769
840	0.84	0.09467	0.90533	19.6001	409	17.996	0.91816
860	0.86	0.09692	0.90308	19.649	421	18.524	0.94274
880	0.88	0.09918	0.90082	19.6982	436	19.184	0.9739
900	0.90	0.10143	0.89857	19.7476	443	19.492	0.98706
920	0.92	0.10369	0.89631	19.7973	454	19.976	1.00903
940	0.94	0.10594	0.89406	19.8472	465	20.46	1.03088
960	0.96	0.10819	0.89181	19.8973	477	20.988	1.05481
980	0.98	0.11045	0.88955	19.9477	484	21.296	1.06759





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1000	1.00	0.1127	0.8873	19.9984	496	21.824	1.09129
1020	1.02	0.11496	0.88504	20.0494	503	22.132	1.10388
1040	1.04	0.11721	0.88279	20.1005	510	22.44	1.11639
1060	1.06	0.11946	0.88054	20.152	519	22.836	1.13319
1080	1.08	0.12172	0.87828	20.2037	528	23.232	1.14989
1100	1.10	0.12397	0.87603	20.2557	537	23.628	1.16649
1120	1.12	0.12623	0.87377	20.308	538	23.672	1.16565
1140	1.14	0.12848	0.87152	20.3605	549	24.156	1.18642
1160	1.16	0.13073	0.86927	20.4133	561	24.684	1.20921
1180	1.18	0.13299	0.86701	20.4663	577	25.388	1.24048
1200	1.20	0.13524	0.86476	20.5197	584	25.696	1.25226
1220	1.22	0.1375	0.8625	20.5733	599	26.356	1.28108
1240	1.24	0.13975	0.86025	20.6272	611	26.884	1.30333
1260	1.26	0.142	0.858	20.6814	623	27.412	1.32544
1280	1.28	0.14426	0.85574	20.7359	638	28.072	1.35379
1300	1.30	0.14651	0.85349	20.7906	649	28.556	1.3735
1320	1.32	0.14877	0.85123	20.8457	657	28.908	1.38676





**HASIL PEMERIKSAAN KUAT TEKAN BEBAS DENGAN KADAR 12,97%  
 SERBUK CANGKANG TELUR AYAM DAN 23,53% ABU CANGKANG SAWIT  
 PADA WAKTU PEMERAMAN 7 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 8 Oktober 2019

Diameter spesimen : 5,682 cm

Tinggi spesimen,  $L_0$  : 8,513 cm

Berat spesimen : 380,5 gram

Luas mula-mula,  $A_0$  : 17,8577 cm<sup>2</sup>

Volume spesimen,  $V$  : 215,948 cm<sup>3</sup>

Berat Volume,  $\gamma$  : 1,762 gram/cm<sup>3</sup>

Perubahan Tinggi			Luas Penampang		Beban		Tekanan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$a \times 10^{-3}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.00235	0.99765	17.8998	24	1.804	0.10078
40	0.04	0.0047	0.99530	17.942	41	2.42	0.13488
60	0.06	0.00705	0.99295	17.9845	55	2.596	0.14435
80	0.08	0.0094	0.9906	18.0271	59	2.64	0.14645
100	0.10	0.01175	0.98825	18.07	60	2.728	0.15097
120	0.12	0.0141	0.9859	18.113	62	2.772	0.15304
140	0.14	0.01645	0.98355	18.1563	63	2.816	0.1551
160	0.16	0.01879	0.98121	18.1998	64	2.904	0.15956
180	0.18	0.02114	0.97886	18.2435	66	3.036	0.16642
200	0.20	0.02349	0.97651	18.2873	69	3.124	0.17083
220	0.22	0.02584	0.97416	18.3315	71	3.212	0.17522



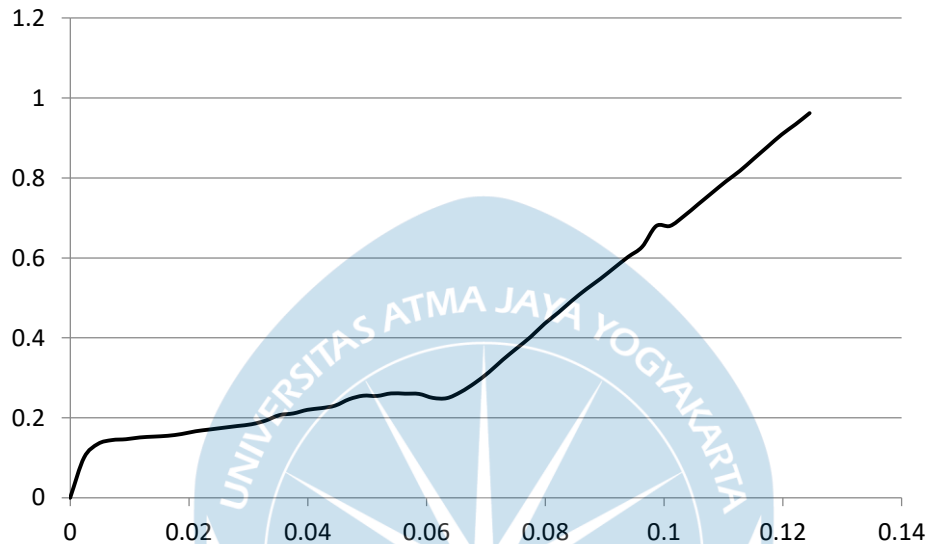
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240	0.24	0.02819	0.97181	18.3758	73	3.3	0.17958
260	0.26	0.03054	0.96946	18.4203	75	3.388	0.18393
280	0.28	0.03289	0.96711	18.465	77	3.564	0.19301
300	0.30	0.03524	0.96476	18.51	81	3.828	0.20681
320	0.32	0.03759	0.96241	18.5552	87	3.916	0.21105
340	0.34	0.03994	0.96006	18.6006	89	4.092	0.21999
360	0.36	0.04229	0.95771	18.6462	93	4.18	0.22417
380	0.38	0.04464	0.95536	18.6921	95	4.312	0.23069
400	0.40	0.04699	0.95301	18.7382	98	4.62	0.24656
420	0.42	0.04934	0.95066	18.7845	105	4.796	0.25532
440	0.44	0.05169	0.94831	18.831	109	4.796	0.25469
460	0.46	0.05404	0.94596	18.8778	109	4.928	0.26105
480	0.48	0.05638	0.94362	18.9248	112	4.928	0.2604
500	0.50	0.05873	0.94127	18.972	112	4.928	0.25975
520	0.52	0.06108	0.93892	19.0195	108	4.752	0.24985
540	0.54	0.06343	0.93657	19.0672	108	4.752	0.24922
560	0.56	0.06578	0.93422	19.1151	115	5.06	0.26471
580	0.58	0.06813	0.93187	19.1633	125	5.5	0.28701
600	0.60	0.07048	0.92952	19.2118	137	6.028	0.31377
620	0.62	0.07283	0.92717	19.2604	151	6.644	0.34496
640	0.64	0.07518	0.92482	19.3094	164	7.216	0.3737
660	0.66	0.07753	0.92247	19.3586	177	7.788	0.4023
680	0.68	0.07988	0.92012	19.408	192	8.448	0.43528
700	0.70	0.08223	0.91777	19.4577	205	9.02	0.46357
720	0.72	0.08458	0.91542	19.5076	219	9.636	0.49396
740	0.74	0.08693	0.91307	19.5578	232	10.208	0.52194
760	0.76	0.08928	0.91072	19.6082	244	10.736	0.54752
780	0.78	0.09162	0.90838	19.659	257	11.308	0.57521
800	0.80	0.09397	0.90603	19.7099	270	11.88	0.60274
820	0.82	0.09632	0.90368	19.7612	282	12.408	0.6279
840	0.84	0.09867	0.90133	19.8127	306	13.464	0.67956
860	0.86	0.10102	0.89898	19.8645	307	13.508	0.68001
880	0.88	0.10337	0.89663	19.9165	319	14.036	0.70474
900	0.90	0.10572	0.89428	19.9688	333	14.652	0.73374
920	0.92	0.10807	0.89193	20.0214	347	15.268	0.76258
940	0.94	0.11042	0.88958	20.0743	361	15.884	0.79126
960	0.96	0.11277	0.88723	20.1275	374	16.456	0.81759
980	0.98	0.11512	0.88488	20.1809	389	17.116	0.84813



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1000	1.00	0.11747	0.88253	20.2346	404	17.776	0.87849
1020	1.02	0.11982	0.88018	20.2886	419	18.436	0.90869
1040	1.04	0.12217	0.87783	20.3429	432	19.008	0.93438
1060	1.06	0.12452	0.87548	20.3975	446	19.624	0.96208





**HASIL PEMERIKSAAN KUAT TEKAN BEBAS TANAH ASLI PADA WAKTU PEMERAMAN 14 HARI**

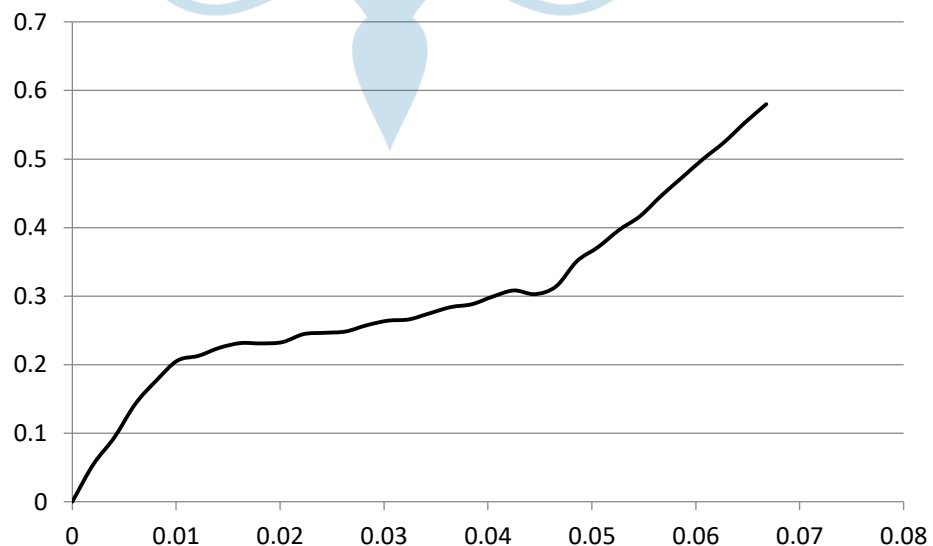
Asal Tanah : Kendawangan, Kalimantan Barat  
 Kedalaman : 1 m  
 Tanggal : 14 Oktober 2019  
 Diameter spesimen : 5,653 cm  
 Tinggi spesimen,  $L_0$  : 9,883 cm  
 Berat spesimen : 382,72 gram  
 Luas mula-mula,  $A_0$  : 17,7666 cm<sup>2</sup>  
 Volume spesimen,  $V$  : 248,148 cm<sup>3</sup>  
 Berat Volume,  $\gamma$  : 1,5423 gram/cm<sup>3</sup>

Perubahan Tinggi		Luas Penampang			Beban		Tekanan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$a \times 10^{-3}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.00202	0.99798	17.8026	22	0.968	0.05437
40	0.04	0.00405	0.99595	17.8388	38	1.672	0.09373
60	0.06	0.00607	0.99393	17.8751	58	2.552	0.14277
80	0.08	0.00809	0.99191	17.9116	72	3.168	0.17687
100	0.10	0.01012	0.98988	17.9482	84	3.696	0.20593
120	0.12	0.01214	0.98786	17.9849	87	3.828	0.21284
140	0.14	0.01417	0.98583	18.0219	92	4.048	0.22462
160	0.16	0.01619	0.98381	18.0589	95	4.18	0.23146
180	0.18	0.01821	0.98179	18.0962	95	4.18	0.23099
200	0.20	0.02024	0.97976	18.1335	96	4.224	0.23294
220	0.22	0.02226	0.97774	18.1711	101	4.444	0.24456
240	0.24	0.02428	0.97572	18.2088	102	4.488	0.24647



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260	0.26	0.02631	0.97369	18.2466	103	4.532	0.24838
280	0.28	0.02833	0.97167	18.2846	107	4.708	0.25748
300	0.30	0.03036	0.96964	18.3228	110	4.84	0.26415
320	0.32	0.03238	0.96762	18.3611	111	4.884	0.266
340	0.34	0.0344	0.9656	18.3996	115	5.06	0.27501
360	0.36	0.03643	0.96357	18.4382	119	5.236	0.28398
380	0.38	0.03845	0.96155	18.477	121	5.324	0.28814
400	0.40	0.04047	0.95953	18.516	126	5.544	0.29942
420	0.42	0.0425	0.9575	18.5551	130	5.72	0.30827
440	0.44	0.04452	0.95548	18.5944	128	5.632	0.30289
460	0.46	0.04654	0.95346	18.6339	133	5.852	0.31405
480	0.48	0.04857	0.95143	18.6735	149	6.556	0.35109
500	0.50	0.05059	0.94941	18.7133	158	6.952	0.3715
520	0.52	0.05262	0.94738	18.7533	169	7.436	0.39652
540	0.54	0.05464	0.94536	18.7934	178	7.832	0.41674
560	0.56	0.05666	0.94334	18.8337	191	8.404	0.44622
580	0.58	0.05869	0.94131	18.8742	203	8.932	0.47324
600	0.60	0.06071	0.93929	18.9149	215	9.46	0.50013
620	0.62	0.06273	0.93727	18.9557	226	9.944	0.52459
640	0.64	0.06476	0.93524	18.9968	239	10.516	0.55357
660	0.66	0.06678	0.93322	19.038	251	11.044	0.5801





**HASIL PEMERIKSAAN KUAT TEKAN BEBAS DENGAN KADAR 12,97%  
 SERBUK CANGKANG TELUR AYAM DAN 5,88% ABU CANGKANG SAWIT  
 PADA WAKTU PEMERAMAN 14 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 14 Oktober 2019

Diameter spesimen : 5,754 cm

Tinggi spesimen,  $L_0$  : 9,328 cm

Berat spesimen : 378,97 gram

Luas mula-mula,  $A_0$  : 18,084 cm<sup>2</sup>

Volume spesimen,  $V$  : 242,657 cm<sup>3</sup>

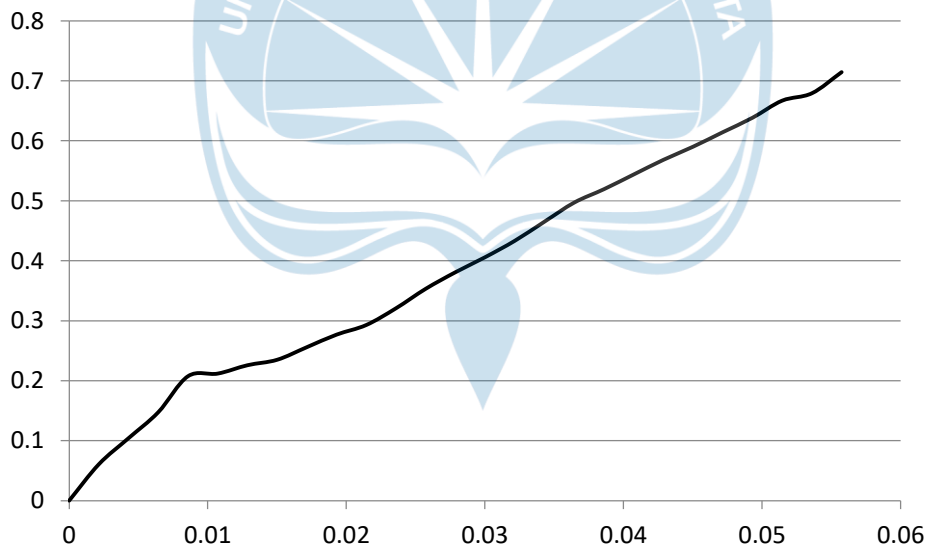
Berat Volume,  $\gamma$  : 1,56175 gram/cm<sup>3</sup>

Perubahan Tinggi		Luas Penampang			Beban		Tekanan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$a \times 10^{-3}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.00214	0.99786	18.1229	25	1.1	0.0607
40	0.04	0.00429	0.99571	18.1619	43	1.892	0.10417
60	0.06	0.00643	0.99357	18.2011	61	2.684	0.14746
80	0.08	0.00858	0.99142	18.2404	86	3.784	0.20745
100	0.10	0.01072	0.98928	18.28	88	3.872	0.21182
120	0.12	0.01286	0.98714	18.3197	94	4.136	0.22577
140	0.14	0.01501	0.98499	18.3596	98	4.312	0.23486
160	0.16	0.01715	0.98285	18.3996	107	4.708	0.25588
180	0.18	0.0193	0.9807	18.4398	116	5.104	0.27679
200	0.20	0.02144	0.97856	18.4802	123	5.412	0.29285
220	0.22	0.02358	0.97642	18.5208	135	5.94	0.32072



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240	0.24	0.02573	0.97427	18.5616	149	6.556	0.3532
260	0.26	0.02787	0.97213	18.6025	161	7.084	0.38081
280	0.28	0.03002	0.96998	18.6436	172	7.568	0.40593
300	0.30	0.03216	0.96784	18.6849	184	8.096	0.43329
320	0.32	0.03431	0.96569	18.7264	198	8.712	0.46523
340	0.34	0.03645	0.96355	18.7681	212	9.328	0.49701
360	0.36	0.03859	0.96141	18.8099	222	9.768	0.5193
380	0.38	0.04074	0.95926	18.852	233	10.252	0.54382
400	0.40	0.04288	0.95712	18.8942	244	10.736	0.56822
420	0.42	0.04503	0.95497	18.9366	254	11.176	0.59018
440	0.44	0.04717	0.95283	18.9792	265	11.66	0.61436
460	0.46	0.04931	0.95069	19.0221	276	12.144	0.63842
480	0.48	0.05146	0.94854	19.065	289	12.716	0.66698
500	0.50	0.0536	0.9464	19.1082	295	12.98	0.67929
520	0.52	0.05575	0.94425	19.1516	311	13.684	0.71451







**HASIL PEMERIKSAAN KUAT TEKAN BEBAS DENGAN KADAR 12,97%  
 SERBUK CANGKANG TELUR AYAM DAN 11,76% ABU CANGKANG SAWIT  
 PADA WAKTU PEMERAMAN 14 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 15 Oktober 2019

Diameter spesimen : 5,663 cm

Tinggi spesimen,  $L_0$  : 9,088 cm

Berat spesimen : 384,2 gram

Luas mula-mula,  $A_0$  : 17,798 cm<sup>2</sup>

Volume spesimen,  $V$  : 228,995 cm<sup>3</sup>

Berat Volume,  $\gamma$  : 1,6777 gram/cm<sup>3</sup>

Perubahan Tinggi		Luas Penampang			Beban		Tekanan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$a \times 10^{-3}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.0022	0.9978	17.8373	13	0.572	0.03207
40	0.04	0.0044	0.99560	17.8767	25	1.1	0.06153
60	0.06	0.0066	0.9934	17.9163	43	1.892	0.1056
80	0.08	0.0088	0.9912	17.9561	59	2.596	0.14458
100	0.10	0.011	0.989	17.996	77	3.388	0.18826
120	0.12	0.0132	0.9868	18.0362	89	3.916	0.21712
140	0.14	0.0154	0.9846	18.0765	96	4.224	0.23367
160	0.16	0.01761	0.98239	18.117	101	4.444	0.2453
180	0.18	0.01981	0.98019	18.1576	106	4.664	0.25686
200	0.20	0.02201	0.97799	18.1985	106	4.664	0.25628
220	0.22	0.02421	0.97579	18.2395	111	4.884	0.26777

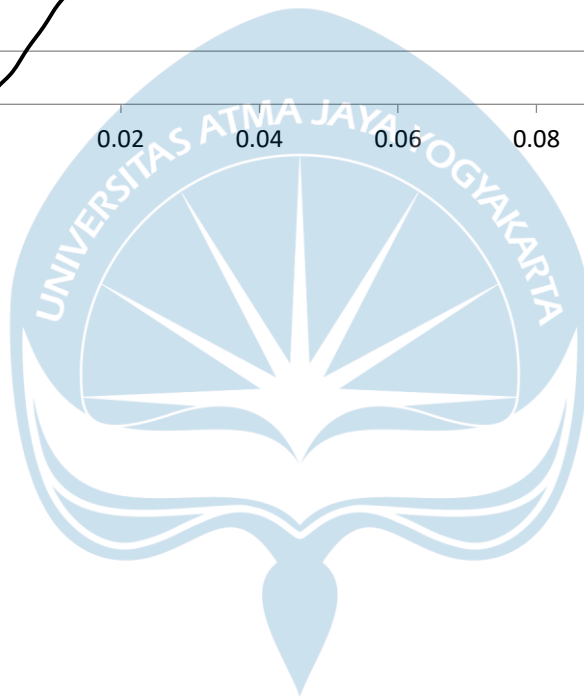
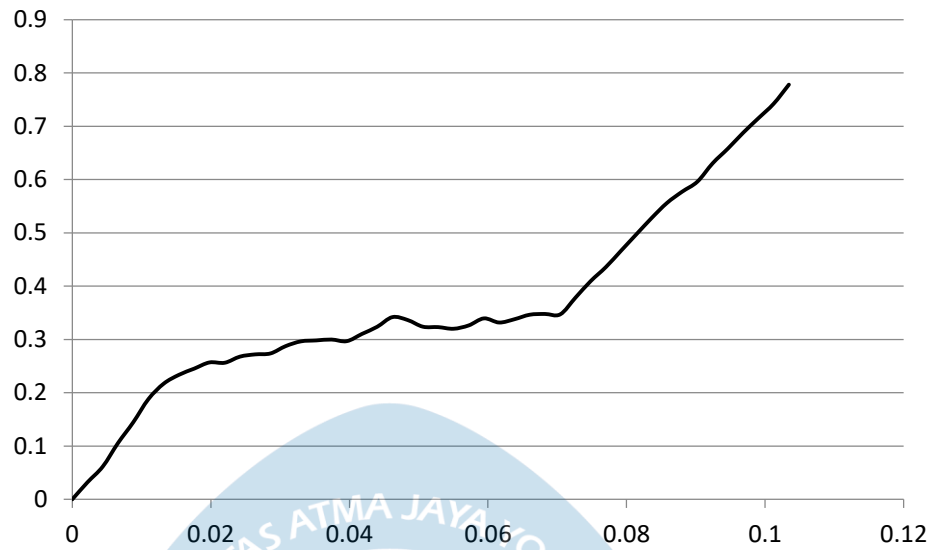


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240	0.24	0.02641	0.97359	18.2808	113	4.972	0.27198
260	0.26	0.02861	0.97139	18.3222	114	5.016	0.27377
280	0.28	0.03081	0.96919	18.3638	120	5.28	0.28752
300	0.30	0.03301	0.96699	18.4056	124	5.456	0.29643
320	0.32	0.03521	0.96479	18.4476	125	5.5	0.29814
340	0.34	0.03741	0.96259	18.4897	126	5.544	0.29984
360	0.36	0.03961	0.96039	18.5321	125	5.5	0.29678
380	0.38	0.04181	0.95819	18.5747	131	5.764	0.31032
400	0.40	0.04401	0.95599	18.6174	137	6.028	0.32378
420	0.42	0.04621	0.95379	18.6604	145	6.38	0.3419
440	0.44	0.04842	0.95158	18.7035	143	6.292	0.33641
460	0.46	0.05062	0.94938	18.7469	138	6.072	0.32389
480	0.48	0.05282	0.94718	18.7905	138	6.072	0.32314
500	0.50	0.05502	0.94498	18.8342	137	6.028	0.32006
520	0.52	0.05722	0.94278	18.8782	140	6.16	0.3263
540	0.54	0.05942	0.94058	18.9223	146	6.424	0.33949
560	0.56	0.06162	0.93838	18.9667	143	6.292	0.33174
580	0.58	0.06382	0.93618	19.0113	146	6.424	0.3379
600	0.60	0.06602	0.93398	19.0561	150	6.6	0.34635
620	0.62	0.06822	0.93178	19.1011	151	6.644	0.34783
640	0.64	0.07042	0.92958	19.1463	151	6.644	0.34701
660	0.66	0.07262	0.92738	19.1918	165	7.26	0.37829
680	0.68	0.07482	0.92518	19.2374	179	7.876	0.40941
700	0.70	0.07702	0.92298	19.2833	191	8.404	0.43582
720	0.72	0.07923	0.92077	19.3294	205	9.02	0.46665
740	0.74	0.08143	0.91857	19.3757	219	9.636	0.49732
760	0.76	0.08363	0.91637	19.4222	233	10.252	0.52785
780	0.78	0.08583	0.91417	19.469	246	10.824	0.55596
800	0.80	0.08803	0.91197	19.516	256	11.264	0.57717
820	0.82	0.09023	0.90977	19.5632	265	11.66	0.59602
840	0.84	0.09243	0.90757	19.6106	281	12.364	0.63048
860	0.86	0.09463	0.90537	19.6583	294	12.936	0.65804
880	0.88	0.09683	0.90317	19.7062	308	13.552	0.6877
900	0.90	0.09903	0.90097	19.7543	321	14.124	0.71498
920	0.92	0.10123	0.89877	19.8027	334	14.696	0.74212
940	0.94	0.10343	0.89657	19.8513	351	15.444	0.77799



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**HASIL PEMERIKSAAN KUAT TEKAN BEBAS DENGAN KADAR 12,97%  
 SERBUK CANGKANG TELUR AYAM DAN 17,65% ABU CANGKANG SAWIT  
 PADA WAKTU PEMERAMAN 14 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 15 Oktober 2019

Diameter spesimen : 5,673 cm

Tinggi spesimen,  $L_0$  : 8,738 cm

Berat spesimen : 388,94 gram

Luas mula-mula,  $A_0$  : 17,8294 cm<sup>2</sup>

Volume spesimen,  $V$  : 220,954 cm<sup>3</sup>

Berat Volume,  $\gamma$  : 1,76027 gram/cm<sup>3</sup>

Perubahan Tinggi			Luas Penampang		Beban		Tekanan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$a \times 10^{-3}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	F	g	h
0	0	0	0	0	0		0
20	0.02	0.00229	0.99771	17.8703	12	0.528	0.02955
40	0.04	0.00458	0.99542	17.9114	22	0.968	0.05404
60	0.06	0.00687	0.99313	17.9527	32	1.408	0.07843
80	0.08	0.00916	0.99084	17.9942	45	1.98	0.11004
100	0.10	0.01144	0.98856	18.0358	56	2.464	0.13662
120	0.12	0.01373	0.98627	18.0777	67	2.948	0.16307
140	0.14	0.01602	0.98398	18.1197	75	3.3	0.18212
160	0.16	0.01831	0.98169	18.162	81	3.564	0.19623
180	0.18	0.0206	0.9794	18.2044	85	3.74	0.20544
200	0.20	0.02289	0.97711	18.2471	86	3.784	0.20738
220	0.22	0.02518	0.97482	18.2899	88	3.872	0.2117



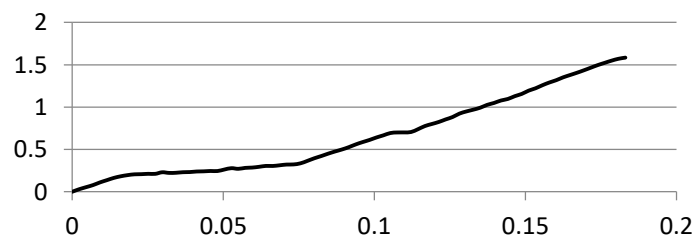
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240	0.24	0.02747	0.97253	18.333	88	3.872	0.2112
260	0.26	0.02976	0.97024	18.3762	96	4.224	0.22986
280	0.28	0.03204	0.96796	18.4197	93	4.092	0.22215
300	0.30	0.03433	0.96567	18.4633	94	4.136	0.22401
320	0.32	0.03662	0.96338	18.5072	97	4.268	0.23061
340	0.34	0.03891	0.96109	18.5513	98	4.312	0.23244
360	0.36	0.0412	0.9588	18.5956	101	4.444	0.23898
380	0.38	0.04349	0.95651	18.6401	102	4.488	0.24077
400	0.40	0.04578	0.95422	18.6848	104	4.576	0.24491
420	0.42	0.04807	0.95193	18.7297	104	4.576	0.24432
440	0.44	0.05035	0.94965	18.7748	112	4.928	0.26248
460	0.46	0.05264	0.94736	18.8202	119	5.236	0.27821
480	0.48	0.05493	0.94507	18.8658	116	5.104	0.27054
500	0.50	0.05722	0.94278	18.9116	121	5.324	0.28152
520	0.52	0.05951	0.94049	18.9576	123	5.412	0.28548
540	0.54	0.0618	0.9382	19.0038	127	5.588	0.29405
560	0.56	0.06409	0.93591	19.0503	132	5.808	0.30488
580	0.58	0.06638	0.93362	19.097	132	5.808	0.30413
600	0.60	0.06867	0.93133	19.144	136	5.984	0.31258
620	0.62	0.07095	0.92905	19.1911	140	6.16	0.32098
640	0.64	0.07324	0.92676	19.2385	141	6.204	0.32248
660	0.66	0.07553	0.92447	19.2862	147	6.468	0.33537
680	0.68	0.07782	0.92218	19.334	160	7.04	0.36412
700	0.70	0.08011	0.91989	19.3821	174	7.656	0.395
720	0.72	0.0824	0.9176	19.4305	186	8.184	0.42119
740	0.74	0.08469	0.91531	19.4791	199	8.756	0.44951
760	0.76	0.08698	0.91302	19.5279	211	9.284	0.47542
780	0.78	0.08927	0.91073	19.577	222	9.768	0.49895
800	0.80	0.09155	0.90845	19.6263	235	10.34	0.52684
820	0.82	0.09384	0.90616	19.6759	250	11	0.55906
840	0.84	0.09613	0.90387	19.7257	263	11.572	0.58665
860	0.86	0.09842	0.90158	19.7758	275	12.1	0.61186
880	0.88	0.10071	0.89929	19.8261	289	12.716	0.64138
900	0.90	0.103	0.897	19.8767	301	13.244	0.66631
920	0.92	0.10529	0.89471	19.9275	314	13.816	0.69331
940	0.94	0.10758	0.89242	19.9787	318	13.992	0.70035
960	0.96	0.10986	0.89014	20.03	319	14.036	0.70075
980	0.98	0.11215	0.88785	20.0817	322	14.168	0.70552



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1000	1.00	0.11444	0.88556	20.1336	338	14.872	0.73867
1020	1.02	0.11673	0.88327	20.1857	356	15.664	0.77599
1040	1.04	0.11902	0.88098	20.2382	368	16.192	0.80007
1060	1.06	0.12131	0.87869	20.2909	380	16.72	0.82401
1080	1.08	0.1236	0.8764	20.3439	395	17.38	0.85431
1100	1.10	0.12589	0.87411	20.3972	409	17.996	0.88228
1120	1.12	0.12818	0.87182	20.4507	429	18.876	0.923
1140	1.14	0.13046	0.86954	20.5045	442	19.448	0.94847
1160	1.16	0.13275	0.86725	20.5587	453	19.932	0.96952
1180	1.18	0.13504	0.86496	20.6131	465	20.46	0.99257
1200	1.20	0.13733	0.86267	20.6678	482	21.208	1.02614
1220	1.22	0.13962	0.86038	20.7227	494	21.736	1.0489
1240	1.24	0.14191	0.85809	20.778	509	22.396	1.07787
1260	1.26	0.1442	0.8558	20.8336	519	22.836	1.09611
1280	1.28	0.14649	0.85351	20.8895	536	23.584	1.12899
1300	1.30	0.14878	0.85122	20.9456	550	24.2	1.15537
1320	1.32	0.15106	0.84894	21.0021	570	25.08	1.19417
1340	1.34	0.15335	0.84665	21.0589	585	25.74	1.22229
1360	1.36	0.15564	0.84436	21.116	604	26.576	1.25857
1380	1.38	0.15793	0.84207	21.1734	621	27.324	1.29049
1400	1.40	0.16022	0.83978	21.2311	636	27.984	1.31807
1420	1.42	0.16251	0.83749	21.2891	654	28.776	1.35168
1440	1.44	0.1648	0.8352	21.3474	669	29.436	1.3789
1460	1.46	0.16709	0.83291	21.4061	684	30.096	1.40595
1480	1.48	0.16938	0.83062	21.4651	700	30.8	1.43489
1500	1.50	0.17166	0.82834	21.5244	717	31.548	1.46569
1520	1.52	0.17395	0.82605	21.584	734	32.296	1.49629
1540	1.54	0.17624	0.82376	21.644	749	32.956	1.52264
1560	1.56	0.17853	0.82147	21.7043	764	33.616	1.54882
1580	1.58	0.18082	0.81918	21.765	777	34.188	1.57078
1600	1.60	0.18311	0.81689	21.8259	786	34.584	1.58454





**HASIL PEMERIKSAAN KUAT TEKAN BEBAS DENGAN KADAR 12,97%  
 SERBUK CANGKANG TELUR AYAM DAN 23,53% ABU CANGKANG SAWIT  
 PADA WAKTU PEMERAMAN 14 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 15 Oktober 2019

Diameter spesimen : 5,696 cm

Tinggi spesimen,  $L_0$  : 8,991 cm

Berat spesimen : 389,88 gram

Luas mula-mula,  $A_0$  : 17,9017 cm<sup>2</sup>

Volume spesimen,  $V$  : 229,199 cm<sup>3</sup>

Berat Volume,  $\gamma$  : 1,701105 gram/cm<sup>3</sup>

Perubahan Tinggi		Luas Penampang			Beban		Tekanan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$a \times 10^{-3}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.00222	0.99778	17.9416	14	0.616	0.03433
40	0.04	0.00445	0.99555	17.9817	30	1.32	0.07341
60	0.06	0.00667	0.99333	18.022	45	1.98	0.10987
80	0.08	0.0089	0.9911	18.0624	57	2.508	0.13885
100	0.10	0.01112	0.98888	18.1031	65	2.86	0.15798
120	0.12	0.01335	0.98665	18.1439	79	3.476	0.19158
140	0.14	0.01557	0.98443	18.1849	85	3.74	0.20567
160	0.16	0.0178	0.9822	18.2261	86	3.784	0.20761
180	0.18	0.02002	0.97998	18.2674	91	4.004	0.21919
200	0.20	0.02224	0.97776	18.309	90	3.96	0.21629
220	0.22	0.02447	0.97553	18.3507	91	4.004	0.21819



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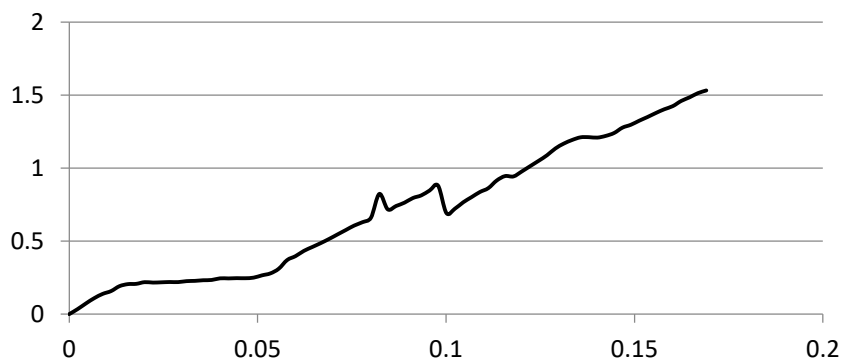
240	0.24	0.02669	0.97331	18.3927	92	4.048	0.22009
260	0.26	0.02892	0.97108	18.4348	92	4.048	0.21958
280	0.28	0.03114	0.96886	18.4771	95	4.18	0.22623
300	0.30	0.03337	0.96663	18.5197	96	4.224	0.22808
320	0.32	0.03559	0.96441	18.5624	98	4.312	0.2323
340	0.34	0.03782	0.96218	18.6053	99	4.356	0.23413
360	0.36	0.04004	0.95996	18.6484	104	4.576	0.24538
380	0.38	0.04226	0.95774	18.6917	104	4.576	0.24481
400	0.40	0.04449	0.95551	18.7352	105	4.62	0.24659
420	0.42	0.04671	0.95329	18.7789	105	4.62	0.24602
440	0.44	0.04894	0.95106	18.8229	106	4.708	0.25012
460	0.46	0.05116	0.94884	18.867	107	5.016	0.26586
480	0.48	0.05339	0.94661	18.9113	114	5.28	0.2792
500	0.50	0.05561	0.94439	18.9559	120	5.896	0.31104
520	0.52	0.05784	0.94216	19.0006	134	7.04	0.37051
540	0.54	0.06006	0.93994	19.0456	160	7.568	0.39736
560	0.56	0.06228	0.93772	19.0908	172	8.272	0.4333
580	0.58	0.06451	0.93549	19.1362	188	8.8	0.45986
600	0.60	0.06673	0.93327	19.1818	200	9.328	0.48629
620	0.62	0.06896	0.93104	19.2276	212	9.9	0.51488
640	0.64	0.07118	0.92882	19.2737	225	10.516	0.54562
660	0.66	0.07341	0.92659	19.3199	239	11.132	0.57619
680	0.68	0.07563	0.92437	19.3664	253	11.748	0.60662
700	0.70	0.07786	0.92214	19.4131	267	12.232	0.63009
720	0.72	0.08008	0.91992	19.4601	278	12.848	0.66022
740	0.74	0.0823	0.9177	19.5072	292	16.06	0.82328
760	0.76	0.08453	0.91547	19.5546	365	14.036	0.71778
780	0.78	0.08675	0.91325	19.6023	319	14.52	0.74073
800	0.80	0.08898	0.91102	19.6501	330	15.004	0.76356
820	0.82	0.0912	0.9088	19.6982	341	15.664	0.7952
840	0.84	0.09343	0.90657	19.7466	356	16.06	0.81331
860	0.86	0.09565	0.90435	19.7951	365	16.764	0.84687
880	0.88	0.09788	0.90212	19.844	381	17.468	0.88027
900	0.90	0.1001	0.8999	19.893	397	13.772	0.6923
920	0.92	0.10232	0.89768	19.9423	313	14.388	0.72148
940	0.94	0.10455	0.89545	19.9918	327	15.312	0.76591
960	0.96	0.10677	0.89323	20.0416	348	16.06	0.80133
980	0.98	0.109	0.891	20.0917	365	16.808	0.83657





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1000	1.00	0.11122	0.88878	20.1419	382	17.38	0.86288
1020	1.02	0.11345	0.88655	20.1925	395	18.48	0.91519
1040	1.04	0.11567	0.88433	20.2433	420	19.14	0.9455
1060	1.06	0.1179	0.8821	20.2943	435	19.14	0.94312
1080	1.08	0.12012	0.87988	20.3456	435	19.888	0.97751
1100	1.10	0.12234	0.87766	20.3972	452	20.68	1.01386
1120	1.12	0.12457	0.87543	20.449	470	21.472	1.05003
1140	1.14	0.12679	0.87321	20.5011	488	22.308	1.08814
1160	1.16	0.12902	0.87098	20.5535	507	23.32	1.1346
1180	1.18	0.13124	0.86876	20.6061	530	24.068	1.168
1200	1.20	0.13347	0.86653	20.659	547	24.64	1.1927
1220	1.22	0.13569	0.86431	20.7122	560	25.08	1.21088
1240	1.24	0.13792	0.86208	20.7656	570	25.168	1.212
1260	1.26	0.14014	0.85986	20.8193	572	25.168	1.20888
1280	1.28	0.14236	0.85764	20.8733	579	25.476	1.2205
1300	1.30	0.14459	0.85541	20.9276	590	25.96	1.24047
1320	1.32	0.14681	0.85319	20.9822	609	26.796	1.27708
1340	1.34	0.14904	0.85096	21.037	620	27.28	1.29676
1360	1.36	0.15126	0.84874	21.0922	635	27.94	1.32466
1380	1.38	0.15349	0.84651	21.1476	649	28.556	1.35032
1400	1.40	0.15571	0.84429	21.2033	664	29.216	1.3779
1420	1.42	0.15794	0.84206	21.2593	678	29.832	1.40324
1440	1.44	0.16016	0.83984	21.3156	690	30.36	1.42431
1460	1.46	0.16238	0.83762	21.3722	709	31.196	1.45965
1480	1.48	0.16461	0.83539	21.4291	723	31.812	1.48452
1500	1.50	0.16683	0.83317	21.4864	739	32.516	1.51333
1520	1.52	0.16906	0.83094	21.5439	750	33	1.53176





**HASIL PEMERIKSAAN KUAT TEKAN BEBAS TANAH ASLI PADA WAKTU PEMERAMAN 28 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 28 Oktober 2019

Diameter spesimen : 5,667 cm

Tinggi spesimen,  $L_0$  : 9,86 cm

Berat spesimen : 383,81 gram

Luas mula-mula,  $A_0$  : 17,8106 cm<sup>2</sup>

Volume spesimen,  $V$  : 248,799 cm<sup>3</sup>

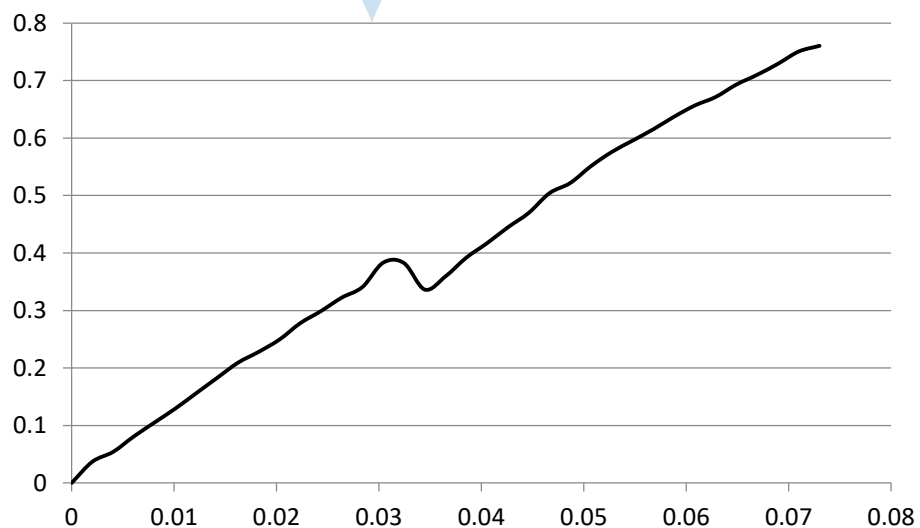
Berat Volume,  $\gamma$  : 1,54265 gram/cm<sup>3</sup>

Perubahan Tinggi		Luas Penampang			Beban		Tekanan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$a \times 10^{-3}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.00203	0.99797	17.8468	15	0.66	0.03698
40	0.04	0.00406	0.99594	17.8831	22	0.968	0.05413
60	0.06	0.00609	0.99391	17.9196	33	1.452	0.08103
80	0.08	0.00811	0.99189	17.9563	43	1.892	0.10537
100	0.10	0.01014	0.98986	17.9931	53	2.332	0.12961
120	0.12	0.01217	0.98783	18.03	64	2.816	0.15618
140	0.14	0.0142	0.9858	18.0671	75	3.3	0.18265
160	0.16	0.01623	0.98377	18.1044	86	3.784	0.20901
180	0.18	0.01826	0.98174	18.1418	94	4.136	0.22798
200	0.20	0.02028	0.97972	18.1793	103	4.532	0.24929
220	0.22	0.02231	0.97769	18.217	115	5.06	0.27776
240	0.24	0.02434	0.97566	18.2549	124	5.456	0.29888



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260	0.26	0.02637	0.97363	18.2929	134	5.896	0.32231
280	0.28	0.0284	0.9716	18.3311	142	6.248	0.34084
300	0.30	0.03043	0.96957	18.3695	160	7.04	0.38324
320	0.32	0.03245	0.96755	18.408	160	7.04	0.38244
340	0.34	0.03448	0.96552	18.4467	141	6.204	0.33632
360	0.36	0.03651	0.96349	18.4855	151	6.644	0.35942
380	0.38	0.03854	0.96146	18.5245	165	7.26	0.39191
400	0.40	0.04057	0.95943	18.5637	176	7.744	0.41716
420	0.42	0.0426	0.9574	18.603	188	8.272	0.44466
440	0.44	0.04462	0.95538	18.6425	199	8.756	0.46968
460	0.46	0.04665	0.95335	18.6822	214	9.416	0.50401
480	0.48	0.04868	0.95132	18.722	222	9.768	0.52174
500	0.50	0.05071	0.94929	18.762	235	10.34	0.55111
520	0.52	0.05274	0.94726	18.8022	246	10.824	0.57568
540	0.54	0.05477	0.94523	18.8425	255	11.22	0.59546
560	0.56	0.0568	0.9432	18.883	264	11.616	0.61516
580	0.58	0.05882	0.94118	18.9237	274	12.056	0.63708
600	0.60	0.06085	0.93915	18.9646	283	12.452	0.65659
620	0.62	0.06288	0.93712	19.0057	290	12.76	0.67138
640	0.64	0.06491	0.93509	19.0469	300	13.2	0.69303
660	0.66	0.06694	0.93306	19.0883	308	13.552	0.70996
680	0.68	0.06897	0.93103	19.1299	317	13.948	0.72912
700	0.70	0.07099	0.92901	19.1716	327	14.388	0.75048
720	0.72	0.07302	0.92698	19.2136	332	14.608	0.7603





**HASIL PEMERIKSAAN KUAT TEKAN BEBAS DENGAN KADAR 12,97%  
 SERBUK CANGKANG TELUR AYAM DAN 5,88% ABU CANGKANG SAWIT  
 PADA WAKTU PEMERAMAN 28 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 28 Oktober 2019

Diameter spesimen : 5,648 cm

Tinggi spesimen,  $L_0$  : 8,887 cm

Berat spesimen : 377,4 gram

Luas mula-mula,  $A_0$  : 17,7509 cm<sup>2</sup>

Volume spesimen,  $V$  : 222,746 cm<sup>3</sup>

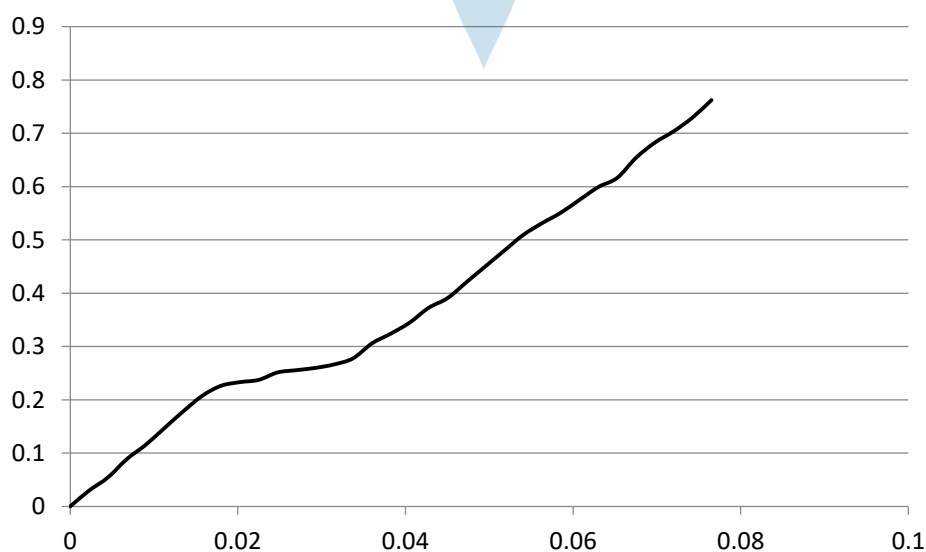
Berat Volume,  $\gamma$  : 1,69431 gram/cm<sup>3</sup>

Perubahan Tinggi		Luas Penampang			Beban		Tekanan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$a \times 10^{-3}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.00225	0.99775	17.7909	12	0.528	0.02968
40	0.04	0.0045	0.99550	17.8311	22	0.968	0.05429
60	0.06	0.00675	0.99325	17.8715	36	1.584	0.08863
80	0.08	0.009	0.991	17.9121	47	2.068	0.11545
100	0.10	0.01125	0.98875	17.9529	60	2.64	0.14705
120	0.12	0.0135	0.9865	17.9938	73	3.212	0.17851
140	0.14	0.01575	0.98425	18.035	85	3.74	0.20737
160	0.16	0.018	0.982	18.0763	93	4.092	0.22637
180	0.18	0.02025	0.97975	18.1178	96	4.224	0.23314
200	0.20	0.0225	0.9775	18.1595	98	4.312	0.23745
220	0.22	0.02476	0.97524	18.2014	104	4.576	0.25141



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240	0.24	0.02701	0.97299	18.2435	106	4.664	0.25565
260	0.26	0.02926	0.97074	18.2858	108	4.752	0.25987
280	0.28	0.03151	0.96849	18.3283	111	4.884	0.26647
300	0.30	0.03376	0.96624	18.371	116	5.104	0.27783
320	0.32	0.03601	0.96399	18.4139	128	5.632	0.30586
340	0.34	0.03826	0.96174	18.457	136	5.984	0.32421
360	0.36	0.04051	0.95949	18.5003	145	6.38	0.34486
380	0.38	0.04276	0.95724	18.5438	157	6.908	0.37252
400	0.40	0.04501	0.95499	18.5875	165	7.26	0.39059
420	0.42	0.04726	0.95274	18.6314	178	7.832	0.42037
440	0.44	0.04951	0.95049	18.6755	191	8.404	0.45
460	0.46	0.05176	0.94824	18.7198	204	8.976	0.47949
480	0.48	0.05401	0.94599	18.7643	217	9.548	0.50884
500	0.50	0.05626	0.94374	18.8091	227	9.988	0.53102
520	0.52	0.05851	0.94149	18.8541	236	10.384	0.55076
540	0.54	0.06076	0.93924	18.8992	247	10.868	0.57505
560	0.56	0.06301	0.93699	18.9446	258	11.352	0.59922
580	0.58	0.06526	0.93474	18.9902	266	11.704	0.61632
600	0.60	0.06751	0.93249	19.0361	283	12.452	0.65413
620	0.62	0.06976	0.93024	19.0821	296	13.024	0.68252
640	0.64	0.07202	0.92798	19.1284	306	13.464	0.70388
660	0.66	0.07427	0.92573	19.1749	318	13.992	0.7297
680	0.68	0.07652	0.92348	19.2216	333	14.652	0.76227





**HASIL PEMERIKSAAN KUAT TEKAN BEBAS DENGAN KADAR 12,97%  
 SERBUK CANGKANG TELUR AYAM DAN 11,76% ABU CANGKANG SAWIT  
 PADA WAKTU PEMERAMAN 28 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 29 Oktober 2019

Diameter spesimen : 5,709 cm

Tinggi spesimen,  $L_0$  : 7,621 cm

Berat spesimen : 337,1 gram

Luas mula-mula,  $A_0$  : 17,9426 cm<sup>2</sup>

Volume spesimen,  $V$  : 195,163 cm<sup>3</sup>

Berat Volume,  $\gamma$  : 1,72728 gram/cm<sup>3</sup>

Perubahan Tinggi			Luas Penampang		Beban		Tegangan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$a \times 10^{-3}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.00262	0.99738	17.9898	15	0.66	0.03669
40	0.04	0.00525	0.99475	18.0372	28	1.232	0.0683
60	0.06	0.00787	0.99213	18.085	40	1.76	0.09732
80	0.08	0.0105	0.9895	18.1329	48	2.112	0.11647
100	0.10	0.01312	0.98688	18.1811	55	2.42	0.1331
120	0.12	0.01575	0.98425	18.2296	71	3.124	0.17137
140	0.14	0.01837	0.98163	18.2784	88	3.872	0.21184
160	0.16	0.02099	0.97901	18.3273	97	4.268	0.23288
180	0.18	0.02362	0.97638	18.3766	101	4.444	0.24183
200	0.20	0.02624	0.97376	18.4261	103	4.532	0.24596
220	0.22	0.02887	0.97113	18.4759	108	4.752	0.2572



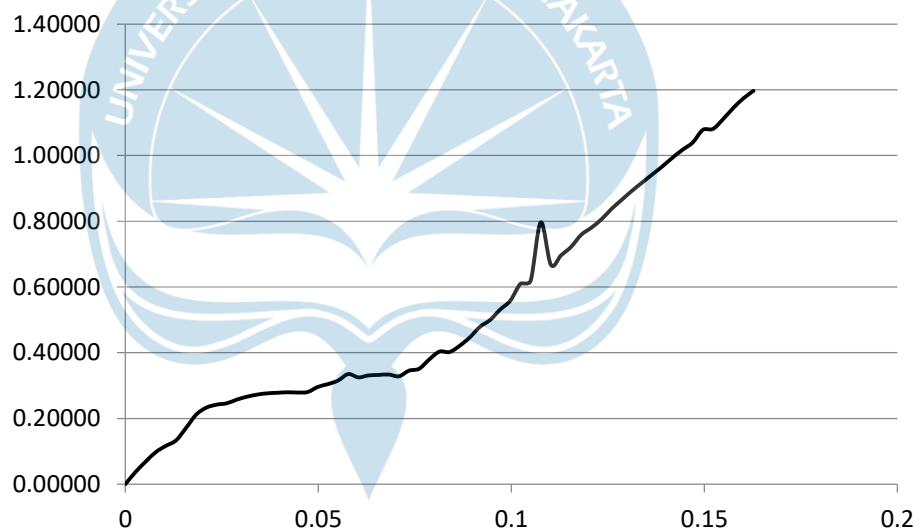
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240	0.24	0.03149	0.96851	18.526	112	4.928	0.266
260	0.26	0.03412	0.96588	18.5763	115	5.06	0.27239
280	0.28	0.03674	0.96326	18.6269	117	5.148	0.27637
300	0.30	0.03936	0.96064	18.6778	118	5.192	0.27798
320	0.32	0.04199	0.95801	18.729	119	5.236	0.27957
340	0.34	0.04461	0.95539	18.7804	119	5.236	0.2788
360	0.36	0.04724	0.95276	18.8322	120	5.28	0.28037
380	0.38	0.04986	0.95014	18.8842	127	5.588	0.29591
400	0.40	0.05249	0.94751	18.9365	131	5.764	0.30439
420	0.42	0.05511	0.94489	18.9891	136	5.984	0.31513
440	0.44	0.05774	0.94226	19.042	145	6.38	0.33505
460	0.46	0.06036	0.93964	19.0951	141	6.204	0.3249
480	0.48	0.06298	0.93702	19.1486	144	6.336	0.33089
500	0.50	0.06561	0.93439	19.2024	145	6.38	0.33225
520	0.52	0.06823	0.93177	19.2565	146	6.424	0.3336
540	0.54	0.07086	0.92914	19.3109	144	6.336	0.32811
560	0.56	0.07348	0.92652	19.3656	152	6.688	0.34536
580	0.58	0.07611	0.92389	19.4206	155	6.82	0.35117
600	0.60	0.07873	0.92127	19.4759	168	7.392	0.37955
620	0.62	0.08135	0.91865	19.5315	179	7.876	0.40325
640	0.64	0.08398	0.91602	19.5875	179	7.876	0.40209
660	0.66	0.0866	0.9134	19.6438	188	8.272	0.4211
680	0.68	0.08923	0.91077	19.7004	200	8.8	0.44669
700	0.70	0.09185	0.90815	19.7573	215	9.46	0.47881
720	0.72	0.09448	0.90552	19.8146	225	9.9	0.49963
740	0.74	0.0971	0.9029	19.8722	240	10.56	0.5314
760	0.76	0.09972	0.90028	19.9301	253	11.132	0.55855
780	0.78	0.10235	0.89765	19.9884	277	12.188	0.60976
800	0.80	0.10497	0.89503	20.047	282	12.408	0.61895
820	0.82	0.1076	0.8924	20.1059	364	16.016	0.79658
840	0.84	0.11022	0.88978	20.1652	306	13.464	0.66768
860	0.86	0.11285	0.88715	20.2249	320	14.08	0.69617
880	0.88	0.11547	0.88453	20.2849	333	14.652	0.72231
900	0.90	0.11809	0.88191	20.3452	351	15.444	0.7591
920	0.92	0.12072	0.87928	20.406	362	15.928	0.78056
940	0.94	0.12334	0.87666	20.467	375	16.5	0.80617
960	0.96	0.12597	0.87403	20.5285	391	17.204	0.83805
980	0.98	0.12859	0.87141	20.5903	405	17.82	0.86546



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1000	1.00	0.13122	0.86878	20.6525	419	18.436	0.89268
1020	1.02	0.13384	0.86616	20.7151	432	19.008	0.91759
1040	1.04	0.13647	0.86353	20.778	445	19.58	0.94234
1060	1.06	0.13909	0.86091	20.8414	458	20.152	0.96692
1080	1.08	0.14171	0.85829	20.9051	472	20.768	0.99344
1100	1.10	0.14434	0.85566	20.9692	485	21.34	1.01768
1120	1.12	0.14696	0.85304	21.0337	497	21.868	1.03966
1140	1.14	0.14959	0.85041	21.0986	517	22.748	1.07817
1160	1.16	0.15221	0.84779	21.164	520	22.88	1.08108
1180	1.18	0.15484	0.84516	21.2297	536	23.584	1.1109
1200	1.20	0.15746	0.84254	21.2958	554	24.376	1.14464
1220	1.22	0.16008	0.83992	21.3623	570	25.08	1.17403
1240	1.24	0.16271	0.83729	21.4293	583	25.652	1.19705







**HASIL PEMERIKSAAN KUAT TEKAN BEBAS DENGAN KADAR 12,97%  
 SERBUK CANGKANG TELUR AYAM DAN 17,65% ABU CANGKANG SAWIT  
 PADA WAKTU PEMERAMAN 28 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 29 Oktober 2019

Diameter spesimen : 5,704 cm

Tinggi spesimen,  $L_0$  : 8,316 cm

Berat spesimen : 380,88 gram

Luas mula-mula,  $A_0$  : 17,9269 cm<sup>2</sup>

Volume spesimen,  $V$  : 212,588 cm<sup>3</sup>

Berat Volume,  $\gamma$  : 1,79164 gram/cm<sup>3</sup>

Perubahan Tinggi			Luas Penampang		Beban		Tekanan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$a \times 10^{-3}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.00241	0.99759	17.9701	19	0.836	0.04652
40	0.04	0.00481	0.99519	18.0135	29	1.276	0.07084
60	0.06	0.00722	0.99278	18.0571	37	1.628	0.09016
80	0.08	0.00962	0.99038	18.101	44	1.936	0.10696
100	0.10	0.01203	0.98797	18.1451	52	2.288	0.12609
120	0.12	0.01443	0.98557	18.1893	63	2.772	0.1524
140	0.14	0.01684	0.98316	18.2338	71	3.124	0.17133
160	0.16	0.01924	0.98076	18.2785	81	3.564	0.19498
180	0.18	0.02165	0.97835	18.3235	88	3.872	0.21131
200	0.20	0.02405	0.97595	18.3686	89	3.916	0.21319
220	0.22	0.02646	0.97354	18.414	91	4.004	0.21744



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240	0.24	0.02886	0.97114	18.4596	93	4.092	0.22167
260	0.26	0.03127	0.96873	18.5054	94	4.136	0.2235
280	0.28	0.03367	0.96633	18.5515	94	4.136	0.22295
300	0.30	0.03608	0.96392	18.5978	101	4.444	0.23895
320	0.32	0.03848	0.96152	18.6443	108	4.752	0.25488
340	0.34	0.04089	0.95911	18.691	112	4.928	0.26366
360	0.36	0.04329	0.95671	18.738	123	5.412	0.28882
380	0.38	0.0457	0.9543	18.7853	149	6.556	0.349
400	0.40	0.0481	0.9519	18.8327	154	6.776	0.3598
420	0.42	0.05051	0.94949	18.8804	163	7.172	0.37986
440	0.44	0.05291	0.94709	18.9284	177	7.788	0.41145
460	0.46	0.05532	0.94468	18.9765	186	8.184	0.43127
480	0.48	0.05772	0.94228	19.025	197	8.668	0.45561
500	0.50	0.06013	0.93987	19.0737	214	9.416	0.49367
520	0.52	0.06253	0.93747	19.1226	224	9.856	0.51541
540	0.54	0.06494	0.93506	19.1718	236	10.384	0.54163
560	0.56	0.06734	0.93266	19.2212	242	10.648	0.55397
580	0.58	0.06975	0.93025	19.2709	256	11.264	0.58451
600	0.60	0.07215	0.92785	19.3209	269	11.836	0.6126
620	0.62	0.07456	0.92544	19.3711	269	11.836	0.61101
640	0.64	0.07696	0.92304	19.4215	272	11.968	0.61622
660	0.66	0.07937	0.92063	19.4723	288	12.672	0.65077
680	0.68	0.08177	0.91823	19.5233	294	12.936	0.66259
700	0.70	0.08418	0.91582	19.5745	316	13.904	0.71031
720	0.72	0.08658	0.91342	19.6261	321	14.124	0.71965
740	0.74	0.08899	0.91101	19.6779	334	14.696	0.74683
760	0.76	0.09139	0.90861	19.73	349	15.356	0.77831
780	0.78	0.0938	0.9062	19.7823	361	15.884	0.80294
800	0.80	0.0962	0.9038	19.835	377	16.588	0.8363
820	0.82	0.09861	0.90139	19.8879	378	16.632	0.83629
840	0.84	0.10101	0.89899	19.9411	389	17.116	0.85833
860	0.86	0.10342	0.89658	19.9946	394	17.336	0.86703
880	0.88	0.10582	0.89418	20.0484	407	17.908	0.89324
900	0.90	0.10823	0.89177	20.1024	420	18.48	0.91929
920	0.92	0.11063	0.88937	20.1568	434	19.096	0.94737
940	0.94	0.11304	0.88696	20.2115	447	19.668	0.97311
960	0.96	0.11544	0.88456	20.2664	462	20.328	1.00304
980	0.98	0.11785	0.88215	20.3217	473	20.812	1.02413

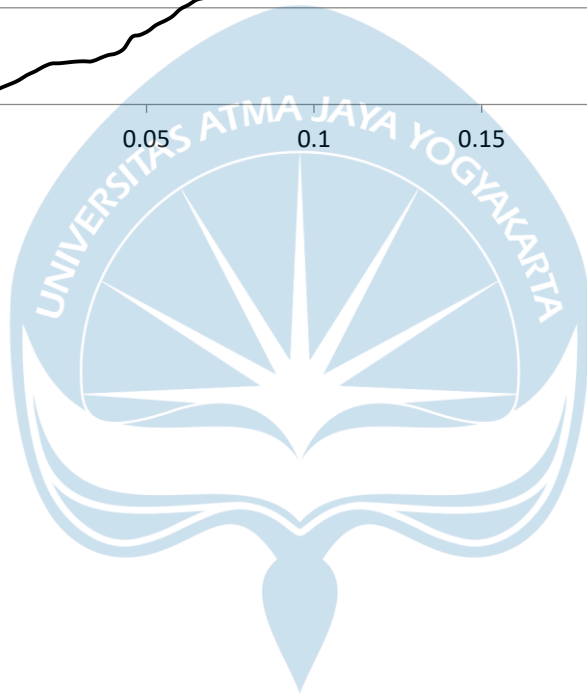
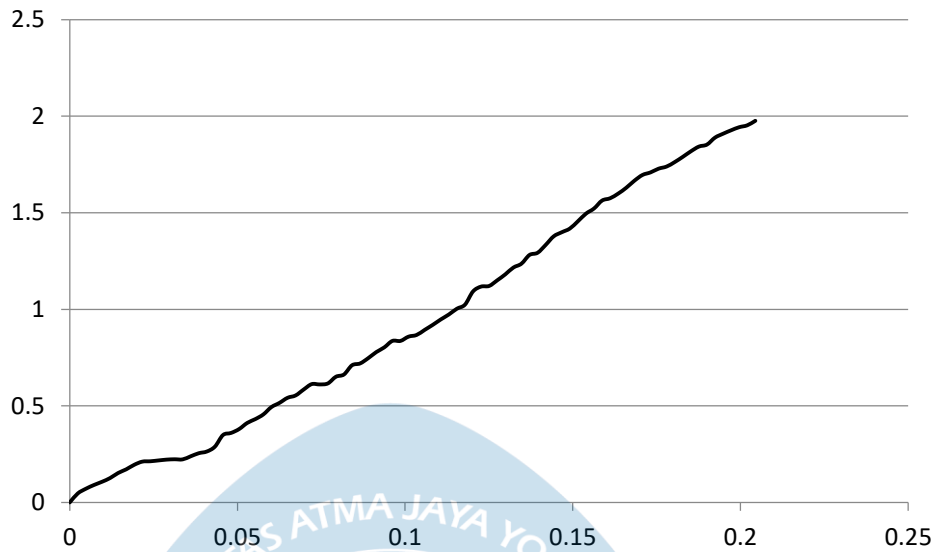


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1000	1.00	0.12025	0.87975	20.3772	506	22.264	1.09259
1020	1.02	0.12266	0.87734	20.4331	519	22.836	1.1176
1040	1.04	0.12506	0.87494	20.4892	522	22.968	1.12098
1060	1.06	0.12747	0.87253	20.5457	537	23.628	1.15002
1080	1.08	0.12987	0.87013	20.6025	553	24.332	1.18102
1100	1.10	0.13228	0.86772	20.6596	571	25.124	1.21609
1120	1.12	0.13468	0.86532	20.717	582	25.608	1.23608
1140	1.14	0.13709	0.86291	20.7748	605	26.62	1.28136
1160	1.16	0.13949	0.86051	20.8328	612	26.928	1.29258
1180	1.18	0.1419	0.8581	20.8912	633	27.852	1.33319
1200	1.20	0.1443	0.8557	20.9499	656	28.864	1.37776
1220	1.22	0.14671	0.85329	21.009	668	29.392	1.39902
1240	1.24	0.14911	0.85089	21.0684	679	29.876	1.41805
1260	1.26	0.15152	0.84848	21.1281	699	30.756	1.45569
1280	1.28	0.15392	0.84608	21.1881	720	31.68	1.49518
1300	1.30	0.15633	0.84367	21.2485	735	32.34	1.52199
1320	1.32	0.15873	0.84127	21.3093	757	33.308	1.56307
1340	1.34	0.16114	0.83886	21.3704	765	33.66	1.57508
1360	1.36	0.16354	0.83646	21.4318	779	34.276	1.5993
1380	1.38	0.16595	0.83405	21.4936	796	35.024	1.62951
1400	1.40	0.16835	0.83165	21.5558	816	35.904	1.66563
1420	1.42	0.17076	0.82924	21.6183	833	36.652	1.69542
1440	1.44	0.17316	0.82684	21.6812	842	37.048	1.70876
1460	1.46	0.17557	0.82443	21.7444	854	37.576	1.72808
1480	1.48	0.17797	0.82203	21.808	862	37.928	1.73918
1500	1.50	0.18038	0.81962	21.872	876	38.544	1.76225
1520	1.52	0.18278	0.81722	21.9364	892	39.248	1.78917
1540	1.54	0.18519	0.81481	22.0011	909	39.996	1.81791
1560	1.56	0.18759	0.81241	22.0663	924	40.656	1.84245
1580	1.58	0.19000	0.81	22.1318	932	41.008	1.8529
1600	1.60	0.19240	0.8076	22.1977	953	41.932	1.88902
1620	1.62	0.19481	0.80519	22.264	966	42.504	1.90909
1640	1.64	0.19721	0.80279	22.3307	978	43.032	1.92703
1660	1.66	0.19962	0.80038	22.3978	989	43.516	1.94287
1680	1.68	0.20202	0.79798	22.4653	997	43.868	1.9527
1700	1.70	0.20443	0.79557	22.5332	1012	44.528	1.97611



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**HASIL PEMERIKSAAN KUAT TEKAN BEBAS DENGAN KADAR 12,97%  
 SERBUK CANGKANG TELUR AYAM DAN 23,53% ABU CANGKANG SAWIT  
 PADA WAKTU PEMERAMAN 28 HARI**

Asal Tanah : Kendawangan, Kalimantan Barat

Kedalaman : 1 m

Tanggal : 29 Oktober 2019

Diameter spesimen : 5,683 cm

Tinggi spesimen,  $L_0$  : 9,016 cm

Berat spesimen : 385,5 gram

Luas mula-mula,  $A_0$  : 17,8609 cm<sup>2</sup>

Volume spesimen,  $V$  : 228,788 cm<sup>3</sup>

Berat Volume,  $\gamma$  : 1,68496 gram/cm<sup>3</sup>

Perubahan Tinggi		Luas Penampang			Beban		Tekanan (Q)
Angka Dial Vertikal	$\Delta L$ (cm)	$\epsilon$ Regangan (Strain)	Koreksi	Luas Terkoreksi A (cm <sup>2</sup> )	Angka Dial Beban	Beban P (Kg)	P/A
A	$a \times 10^{-3}$	$\Delta L/L_0$	$d = 1 - \epsilon$	$e = A_0/d$	f	g	h
0	0	0	0	0	0		0
20	0.02	0.00222	0.99778	17.9006	12	0.528	0.0295
40	0.04	0.00444	0.99556	17.9405	30	1.32	0.07358
60	0.06	0.00665	0.99335	17.9805	44	1.936	0.10767
80	0.08	0.00887	0.99113	18.0208	56	2.464	0.13673
100	0.10	0.01109	0.98891	18.0612	71	3.124	0.17297
120	0.12	0.01331	0.98669	18.1018	85	3.74	0.20661
140	0.14	0.01553	0.98447	18.1426	93	4.092	0.22555
160	0.16	0.01775	0.98225	18.1835	99	4.356	0.23956
180	0.18	0.01996	0.98004	18.2247	101	4.444	0.24384
200	0.20	0.02218	0.97782	18.266	101	4.444	0.24329
220	0.22	0.0244	0.9756	18.3076	103	4.532	0.24755



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240	0.24	0.02662	0.97338	18.3493	106	4.664	0.25418
260	0.26	0.02884	0.97116	18.3912	108	4.752	0.25838
280	0.28	0.03106	0.96894	18.4333	111	4.884	0.26495
300	0.30	0.03327	0.96673	18.4756	110	4.84	0.26197
320	0.32	0.03549	0.96451	18.5181	112	4.928	0.26612
340	0.34	0.03771	0.96229	18.5608	114	5.016	0.27025
360	0.36	0.03993	0.96007	18.6037	117	5.148	0.27672
380	0.38	0.04215	0.95785	18.6468	117	5.148	0.27608
400	0.40	0.04437	0.95563	18.6901	117	5.148	0.27544
420	0.42	0.04658	0.95342	18.7335	117	5.148	0.2748
440	0.44	0.0488	0.9512	18.7772	120	5.28	0.28119
460	0.46	0.05102	0.94898	18.8211	118	5.192	0.27586
480	0.48	0.05324	0.94676	18.8652	120	5.28	0.27988
500	0.50	0.05546	0.94454	18.9095	125	5.5	0.29086
520	0.52	0.05768	0.94232	18.954	131	5.764	0.3041
540	0.54	0.05989	0.94011	18.9988	131	5.764	0.30339
560	0.56	0.06211	0.93789	19.0437	132	5.808	0.30498
580	0.58	0.06433	0.93567	19.0888	132	5.808	0.30426
600	0.60	0.06655	0.93345	19.1342	136	5.984	0.31274
620	0.62	0.06877	0.93123	19.1798	138	6.072	0.31658
640	0.64	0.07098	0.92902	19.2256	147	6.468	0.33643
660	0.66	0.0732	0.9268	19.2716	159	6.996	0.36302
680	0.68	0.07542	0.92458	19.3178	170	7.48	0.38721
700	0.70	0.07764	0.92236	19.3643	182	8.008	0.41354
720	0.72	0.07986	0.92014	19.411	194	8.536	0.43975
740	0.74	0.08208	0.91792	19.4579	206	9.064	0.46583
760	0.76	0.08429	0.91571	19.505	217	9.548	0.48951
780	0.78	0.08651	0.91349	19.5524	230	10.12	0.51758
800	0.80	0.08873	0.91127	19.6	245	10.78	0.55
820	0.82	0.09095	0.90905	19.6478	256	11.264	0.5733
840	0.84	0.09317	0.90683	19.6959	270	11.88	0.60317
860	0.86	0.09539	0.90461	19.7442	282	12.408	0.62844
880	0.88	0.0976	0.9024	19.7927	294	12.936	0.65357
900	0.90	0.09982	0.90018	19.8415	305	13.42	0.67636
920	0.92	0.10204	0.89796	19.8905	317	13.948	0.70124
940	0.94	0.10426	0.89574	19.9398	329	14.476	0.72599
960	0.96	0.10648	0.89352	19.9893	340	14.96	0.7484
980	0.98	0.1087	0.8913	20.039	352	15.488	0.77289



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1000	1.00	0.11091	0.88909	20.089	368	16.192	0.80601
1020	1.02	0.11313	0.88687	20.1393	380	16.72	0.83022
1040	1.04	0.11535	0.88465	20.1898	390	17.16	0.84994
1060	1.06	0.11757	0.88243	20.2405	402	17.688	0.87389
1080	1.08	0.11979	0.88021	20.2915	415	18.26	0.89988
1100	1.10	0.12201	0.87799	20.3428	431	18.964	0.93222
1120	1.12	0.12422	0.87578	20.3943	446	19.624	0.96223
1140	1.14	0.12644	0.87356	20.4461	460	20.24	0.98992
1160	1.16	0.12866	0.87134	20.4982	471	20.724	1.01102
1180	1.18	0.13088	0.86912	20.5505	490	21.56	1.04912
1200	1.20	0.1331	0.8669	20.6031	506	22.264	1.08062
1220	1.22	0.13531	0.86469	20.6559	523	23.012	1.11406
1240	1.24	0.13753	0.86247	20.709	539	23.716	1.1452
1260	1.26	0.13975	0.86025	20.7624	555	24.42	1.17616
1280	1.28	0.14197	0.85803	20.8161	570	25.08	1.20484
1300	1.30	0.14419	0.85581	20.8701	586	25.784	1.23545
1320	1.32	0.14641	0.85359	20.9243	602	26.488	1.2659
1340	1.34	0.14862	0.85138	20.9788	615	27.06	1.28987
1360	1.36	0.15084	0.84916	21.0336	625	27.5	1.30743
1380	1.38	0.15306	0.84694	21.0887	637	28.028	1.32905
1400	1.40	0.15528	0.84472	21.1441	647	28.468	1.34638
1420	1.42	0.1575	0.8425	21.1998	652	28.688	1.35322
1440	1.44	0.15972	0.84028	21.2557	665	29.26	1.37657
1460	1.46	0.16193	0.83807	21.312	667	29.348	1.37706
1480	1.48	0.16415	0.83585	21.3686	683	30.052	1.40637
1500	1.50	0.16637	0.83363	21.4254	702	30.888	1.44165
1520	1.52	0.16859	0.83141	21.4826	719	31.636	1.47263
1540	1.54	0.17081	0.82919	21.5401	728	32.032	1.48709
1560	1.56	0.17303	0.82697	21.5978	742	32.648	1.51163
1580	1.58	0.17524	0.82476	21.6559	755	33.22	1.53399

