

# LAMPIRAN

## **SURAT KETERANGAN TUGAS AKHIR**

Sesuai dengan persetujuan dari Ketua Jurusan Teknik Sipil, Fakultas Teknik, Universitas Kristen Maranatha, melalui surat No.1316/TA/FTS/UKM/II/2012, dengan ini saya selaku Pembimbing Tugas Akhir memberikan tugas kepada:

**Nama : Frans Octavianus Manoppo**

**NRP : 0721010**

untuk membuat Tugas Akhir bidang Geoteknik dengan judul:

**STUDI PENGARUH DIAMETER PONDASI TIANG TERHADAP PEMANCANGAN PADA TANAH PASIR**

Pokok pembahasan Tugas Akhir adalah sebagai berikut:

1. Pendahuluan
2. Studi Pustaka
3. Persiapan Pengujian
4. Analisis dan Hasil
5. Kesimpulan dan Saran

Hal – hal lain yang dianggap perlu dapat disertakan untuk melengkapi penulisan Tugas Akhir ini.

Bandung, 3 Desember 2012



Hanny Juliany Dani, ST., MT

Pembimbing

## **SURAT KETERANGAN SELESAI TUGAS AKHIR**

Yang bertanda tangan di bawah ini selaku Dosen Pembimbing Tugas Akhir dari mahasiswa:

**Nama : Frans Octavianus Manoppo**

**NRP : 0721010**

Menyatakan bahwa Tugas Akhir dari mahasiswa tersebut diatas dengan judul:

**STUDI PENGARUH DIAMETER PONDASI TIANG TERHADAP PEMANCANGAN PADA TANAH PASIR**

dinyatakan selesai dan dapat diajukan pada Ujian Sidang Tugas Akhir (USTA).

Bandung, 13 Desember 2012



Hanny Juliany Dani, ST., MT

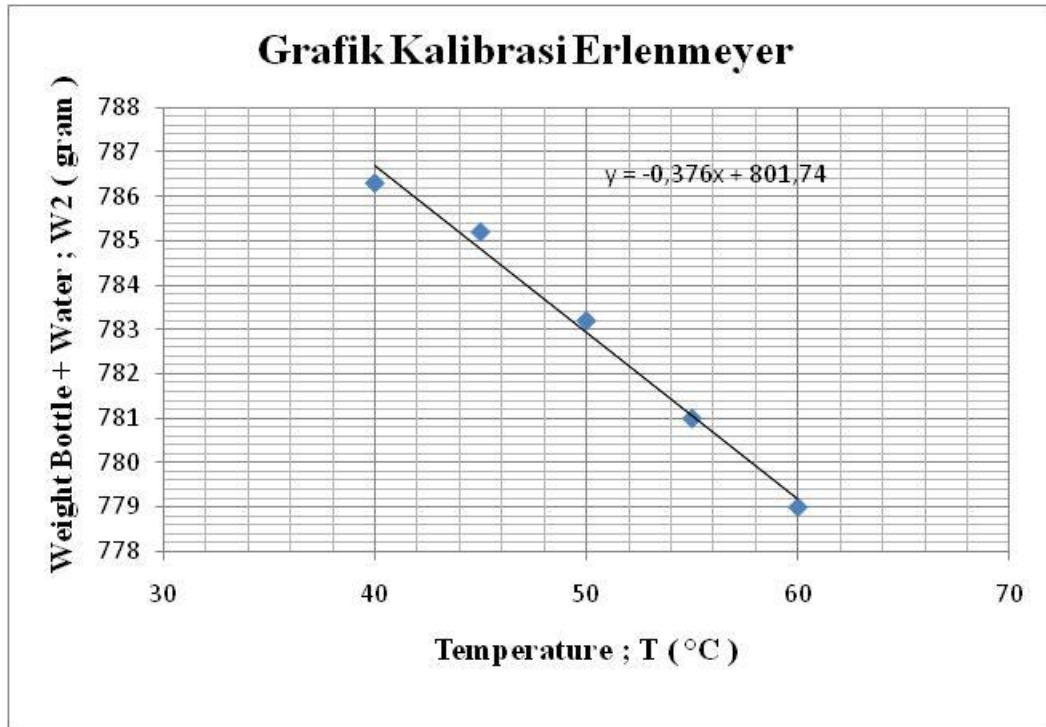
Pembimbing

Lampiran L1 Berat Jenis Tanah (kalibrasi Erlenmayer)

## ERLENMEYER CALIBRATION

Form No. :  
Test No. : 1  
Date : 5 Juli 2012  
Tested by : Frans Octavianus M.

Determination	1	2	3	4	5
Wt. Bottle + Water; W2 (gr)	779	781	783,2	785,2	786,3
Temperature; T (°C)	60	55	50	45	40





**Lampiran L3 Sieve Analysis Test**

**SIEVE ANALYSIS**

Soil Sample : Pasir Trass	Form No. :
Location : Sumedang	Test No. :
Boring No. : - depth : m	Date :
Sample No. : Gs :	Tested by : Frans Octavianus M.

**SOIL SAMPLE WEIGHT:** Container Number :

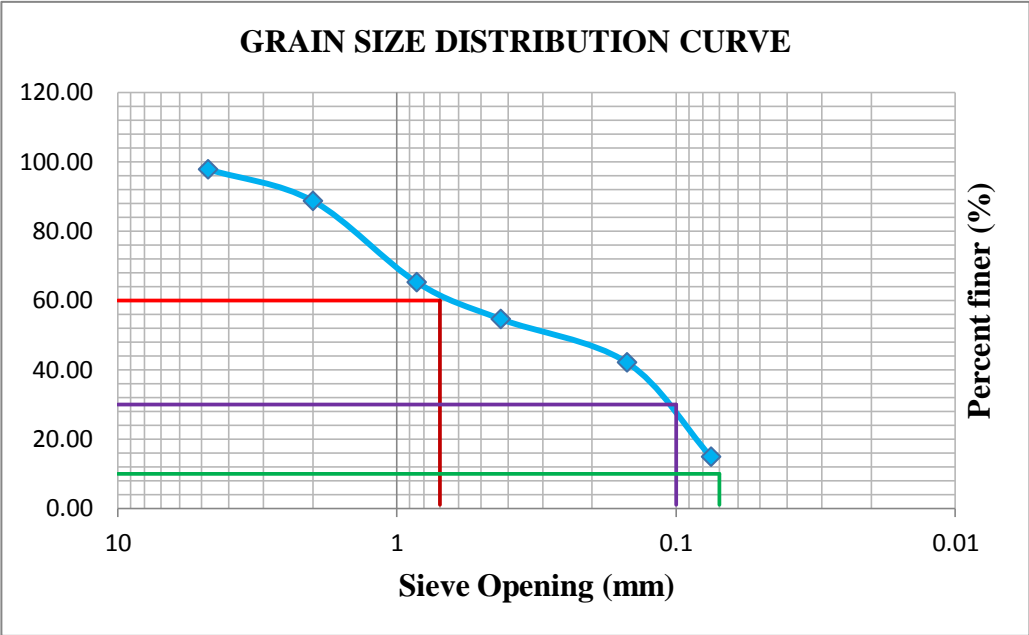
Weight Container ; ( W1 ) = 813,20 gram

Weight Container + Dry Soil ; ( W2 ) = 213,20 gram

Weight of Dry Soil Used ; ( W3 ) = 600,00 gram

Sieve No	Sieve Opening (mm)	Wt. Sieve (gram)	Wt. Sieve + Soil (gram)	Wt. Soil Retained (gram)	Percent Retained ( % )	Percent Cumulative ( % )	Percent Finer ( % )
<b>4</b>	<b>4,750</b>	507,9	521	13,1	2,22	2,22	97,78
<b>10</b>	<b>2,000</b>	450,3	504,2	53,9	9,12	11,34	88,66
<b>25</b>	<b>0,850</b>	420,8	559,4	138,6	23,44	34,78	65,22
<b>40</b>	<b>0,425</b>	293	355,8	62,8	10,62	45,4	54,6
<b>100</b>	<b>0,150</b>	330	404	74	12,52	57,92	42,08
<b>200</b>	<b>0,075</b>	299,1	460	160,9	27,21	85,13	14,88
<b>Pan</b>		367,5	455,5	88	14,88	100,00	0,00
				$\Sigma = 591,3$	100,00		

Lampiran L4 Grain Size Distribution Curve



Keterangan:

- $D_{60} = 0,7 \text{ mm}$
- $D_{30} = 0,1 \text{ mm}$
- $D_{10} = 0,07 \text{ mm}$

**Lampiran L5 Berat Isi Tanah**

**UJI BERAT ISI TANAH**

**(Cohesionless / Cohesive) Soil**

Soil Sample : Pasir Trass lolos ayakan #25 #40	Form No. :
Location : Sumedang	Test No. :
Boring No. : - depth : m	Date :
Sample No. : Gs :	Tested by : Frans Octavianus M.

No	1
Tinggi mold, t (cm)	11,677
Diameter mold, d (cm)	10,01
Volume mold, V (cm <sup>3</sup> )	918,479
Berat mold, W1 (gr)	4214
Berat tanah kering + mold, W2 (gr)	5562
Berat tanah kering, Ws = W2 - W1 (gr)	1348
Berat isi tanah maks (gr/cm <sup>3</sup> )	1,46764

No	2
Tinggi mold, t (cm)	11,677
Diameter mold, d (cm)	10,01
Volume mold, V (cm <sup>3</sup> )	918,479
Berat mold, W1 (gr)	4214
Berat tanah kering + mold, W2 (gr)	5449
Berat tanah kering, Ws = W2 - W1 (gr)	1235
Berat isi tanah min (gr/cm <sup>3</sup> )	1,34461

**Lampiran L6 Direct Shear Test (Normal Stress = 0,1 kg/cm<sup>2</sup>)**



## DIRECT SHEAR TEST

(Cohensionless / Cohesive) Soil

Soil Sample : Pasir lolos ayakan #25	Form No. :
Location : Sumedang	Test No. :
Boring No. : depth : - m	Date :
Sample No. : 2,66 GS :	Tested by : Frans Octavianus M.

SOIL SPECIMEN :	WATER CONTENT DETERMINATION :
Diameter ; ( D ) = 6,372 cm	Container No :
Height ; ( t ) = 1,91 cm	Wt. of Container ; W1 = 63,500 gram
Area ; ( A ) = 31,889 cm <sup>2</sup>	Wt. Cont + Wet Soil ; W2 = 155,000 gram
Volume ; ( V ) = 60,908 cm <sup>3</sup>	Wt. Cont + Dry Soil ; W3 = 137,000 gram
Wet Density ; ( $\gamma_{wet}$ ) = 1,360 gr/cm <sup>3</sup>	Wt. of Water ; WW = 18,000 gram
Dry Density ; ( $\gamma_{dry}$ ) = 1,093 gr/cm <sup>3</sup>	Wt. of Dry Soil ; WS = 73,500 gram
Void Ratio ; ( e ) = 0,900	WATER CONTENT ; w = 24,490 %
Porositas ; ( n ) = 1,8	
Sr = 72,381 %	STRAIN RATE = 2,865 % / min
NORMAL STRESS = 0,1 Kg/cm <sup>2</sup>	RING CONSTANT = 0,13 Kg/div

Elapsed Time (min)	Horiz Dial	Strain (%)	Vertical Dial	Vertical Displacement	Proving Ring Dial (div)	Shear Force (kg)	Shear Stress (kg/cm <sup>2</sup> )
	10	0,399	0	0	5	0,65	0,020
	20	0,797	0	0	7,5	0,975	0,031
	30	1,196	0	0	9	1,17	0,037
	40	1,594	0	0	12	1,56	0,049
	50	1,993	0	0	14	1,82	0,057
	60	2,392	0	0	16	2,08	0,065
	70	2,790	0	0	17	2,21	0,069
	80	3,189	0	0	18	2,34	0,073
	90	3,588	4,5	0,00236	18,5	2,405	0,075
	100	3,986	8	0,00419	19	2,47	0,077
	110	4,385	8	0,00419	19,2	2,496	0,078
	120	4,783	8	0,00419	19,8	2,574	0,081
	130	5,182	9	0,00471	20,5	2,665	0,084
	140	5,581	10	0,00524	20	2,6	0,082
	150	5,979	12	0,00628	19,5	2,535	0,079
	160	6,378	13	0,00681	19	2,47	0,077
	170	6,777	14	0,00733	18	2,34	0,073
	180	7,175	14,5	0,00759	17,5	2,275	0,071
	190	7,574	15,5	0,00812	17	2,21	0,069
	200	7,972	16	0,00838	16	2,08	0,065
4,73	210	8,371	17	0,00890	15	1,95	0,061

**Lampiran L7 Direct Shear Test (Normal Stress = 0,2 kg/cm<sup>2</sup>)**

**DIRECT SHEAR TEST**

**(Cohesionless / Cohesive) Soil**

Soil Sample : Pasir lolos ayakan #25	Form No. :
Location : Sumedang	Test No. :
Boring No. : m	depth : - Date :
Sample No. : 2,66	GS : Tested by : Frans Octavianus M.

<b>SOIL SPECIMEN :</b>	<b>WATER CONTENT DETERMINATION :</b>
Diameter ; ( D ) = 6,372 cm	Container No :
Height ; ( t ) = 1,91 cm	Wt. of Container ; W1 = 63,500 gram
Area ; ( A ) = 31,889 cm <sup>2</sup>	Wt. Cont + Wet Soil ; W2 = 155,000 gram
Volume ; ( V ) = 60,908 cm <sup>3</sup>	Wt. Cont + Dry Soil ; W3 = 137,000 gram
Wet Density ; ( $\gamma_{wet}$ ) = 1,360 gr/cm <sup>3</sup>	Wt. of Water ; WW = 18,000 gram
Dry Density ; ( $\gamma_{dry}$ ) = 1,093 gr/cm <sup>3</sup>	Wt. of Dry Soil ; WS = 73,500 gram
Void Ratio ; ( e ) = 0,900	WATER CONTENT ; w = 24,490 %
Porositas ; ( n ) = 1,8	
Sr = 72,381 %	STRAIN RATE = 2,806 % / min
NORMAL STRESS = 0,2 Kg/cm <sup>2</sup>	RING CONSTANT = 0,13 Kg/div

Elapsed Time (min)	Horiz Dial	Strain (%)	Vertical Dial	Vertical Displacement	Proving Ring Dial (div)	Shear Force (kg)	Shear Stress (kg/cm <sup>2</sup> )
	10	0,399	-1,5	-0,000785	9	1,17	0,037
	20	0,797	-2	-0,001047	11	1,43	0,045
	30	1,196	-1	-0,000524	15	1,95	0,061
	40	1,594	3	0,001571	19	2,47	0,077
	50	1,993	4	0,002094	21	2,73	0,086
	60	2,392	9	0,004712	23	2,99	0,094
	70	2,790	11,5	0,006021	26	3,38	0,106
	80	3,189	18	0,009424	27	3,51	0,110
	90	3,588	21	0,010995	28	3,64	0,114
	100	3,986	22	0,011518	29	3,77	0,118
	110	4,385	22,5	0,011780	29	3,77	0,118
	120	4,783	26	0,013613	28	3,64	0,114
	130	5,182	30	0,015707	27	3,51	0,110
	140	5,581	32	0,016754	27	3,51	0,110
	150	5,979	34	0,017801	25	3,25	0,102
	160	6,378	36	0,018848	24	3,12	0,098
	170	6,777	38	0,019895	22	2,86	0,090
	180	7,175	39	0,020419	20	2,6	0,082
4,83	190	7,574	42	0,021990	20	2,6	0,082

**Lampiran L8 Direct Shear Test (Normal Stress = 0,3 kg/cm<sup>2</sup>)**

**DIRECT SHEAR TEST**

**(Cohesionless / Cohesive) Soil**

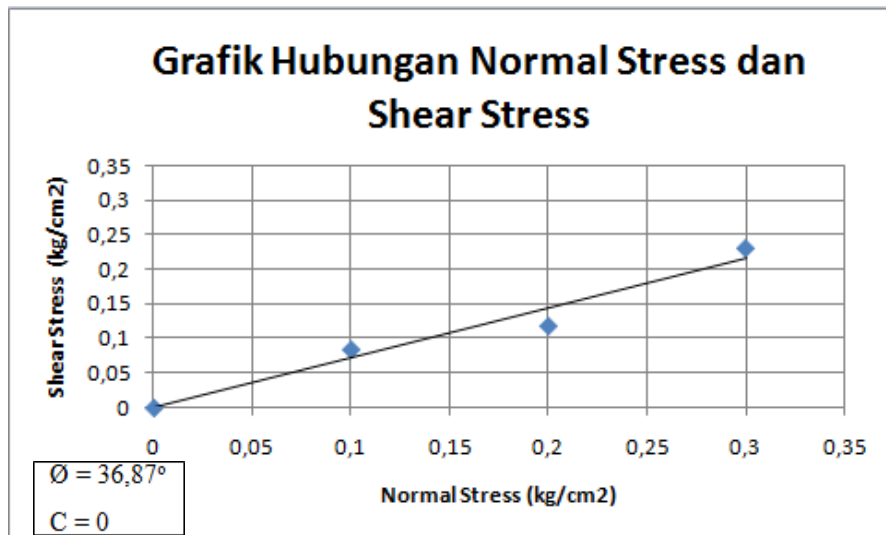
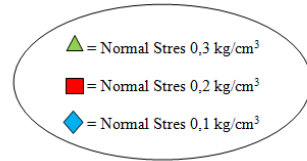
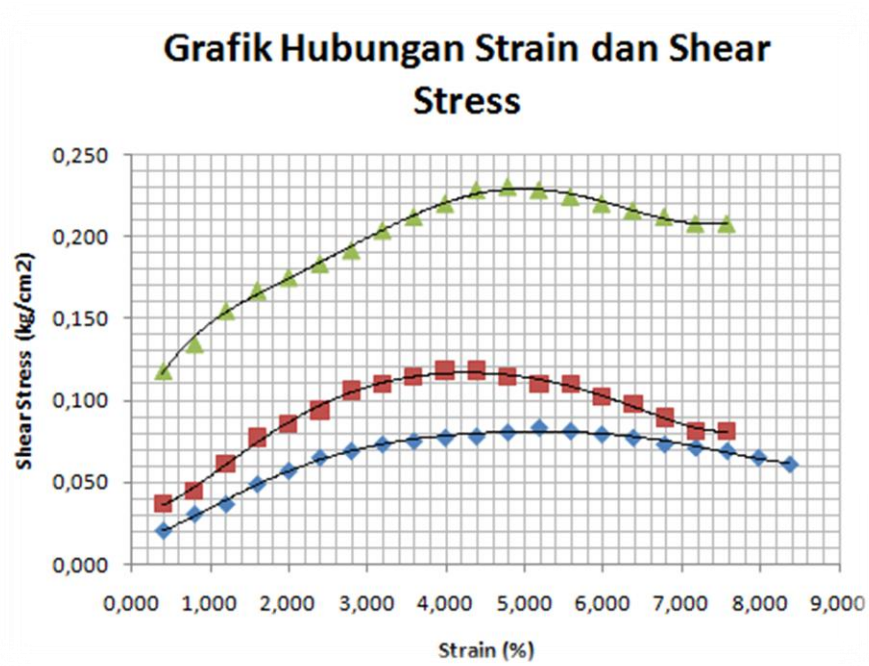
Soil Sample : Pasir lolos ayakan #25	Form No. :
Location : Sumedang	Test No. :
Boring No. : m	depth : - Date :
Sample No. : 2,66	GS : Tested by : Frans Octavianus M.

<b>SOIL SPECIMEN :</b>	<b>WATER CONTENT DETERMINATION :</b>
Diameter ; ( D ) = 6,372 cm	Container No :
Height ; ( t ) = 1,91 cm	Wt. of Container ; W1 = 63,500 gram
Area ; ( A ) = 31,889 cm <sup>2</sup>	Wt. Cont + Wet Soil ; W2 = 155,000 gram
Volume ; ( V ) = 60,908 cm <sup>3</sup>	Wt. Cont + Dry Soil ; W3 = 137,000 gram
Wet Density ; ( $\gamma_{wet}$ ) = 1,360 gr/cm <sup>3</sup>	Wt. of Water ; WW = 18,000 gram
Dry Density ; ( $\gamma_{dry}$ ) = 1,093 gr/cm <sup>3</sup>	Wt. of Dry Soil ; WS = 73,500 gram
Void Ratio ; ( e ) = 0,900	WATER CONTENT ; w = 24,490 %
Porositas ; ( n ) = 1,8	
Sr = 72,381 %	STRAIN RATE = 2,806 % / min
NORMAL STRESS = 0,3 Kg/cm <sup>2</sup>	RING CONSTANT = 0,13 Kg/div

Elapsed Time (min)	Horiz Dial	Strain (%)	Vertical Dial	Vertical Displacement	Proving Ring Dial (div)	Shear Force (kg)	Shear Stress (kg/cm <sup>2</sup> )
	10	0,399	-1	-0,000524	29	3,77	0,118
	20	0,797	-1	-0,000524	33	4,29	0,135
	30	1,196	-1	-0,000524	38	4,94	0,155
	40	1,594	-1	-0,000524	41	5,33	0,167
	50	1,993	-1	-0,000524	43	5,59	0,175
	60	2,392	-1	-0,000524	45	5,85	0,183
	70	2,790	-1	-0,000524	47	6,11	0,192
	80	3,189	-1	-0,000524	50	6,5	0,204
	90	3,588	-1	-0,000524	52	6,76	0,212
	100	3,986	-1	-0,000524	54	7,02	0,220
	110	4,385	0	0,000000	56	7,28	0,228
	120	4,783	1	0,000524	56,5	7,345	0,230
	130	5,182	3	0,001571	56	7,28	0,228
	140	5,581	5	0,002618	55	7,15	0,224
	150	5,979	6	0,003141	54	7,02	0,220
	160	6,378	9	0,004712	53	6,89	0,216
	170	6,777	12	0,006283	52	6,76	0,212
	180	7,175	14	0,007330	51	6,63	0,208
4,83	190	7,574	15	0,007853	51	6,63	0,208

**Lampiran L9 Grafik Direct Shear**

Normal Stress (kg/cm <sup>2</sup> )	Shear Stress pada saat runtuh (kg/cm <sup>2</sup> )
◆ 0,1	0,084
■ 0,2	0,118
▲ 0,3	0,230



**Lampiran L10 Pengujian Pukulan Tiang pada: D = 1,5 cm; D = 3 cm; dan D = 4,5 cm**

Date : 24 Oktober 2012

Diketahui:

Ukuran bak pasir dengan panjang 60 cm, lebar 60 cm, dan tinggi 45 cm.

$$\begin{aligned}\text{Volume bak pasir} &= p \times l \times t \\ &= 60 \times 60 \times 45 \\ &= 162000 \text{ cm}^3\end{aligned}$$

$$\gamma_{\min} = 1,34461 \frac{\text{gr}}{\text{cm}^3}$$

$$\gamma_{\max} = 1,46764 \frac{\text{gr}}{\text{cm}^3}$$

- Dr 30%

$$\text{Dr} = \frac{\gamma_n - \gamma_{\min}}{\gamma_{\max} - \gamma_{\min}} \times \frac{\gamma_{\max}}{\gamma_n}$$

$$30\% = \frac{\gamma_n - 1,34461}{0,12303} \times \frac{1,46764}{\gamma_n}$$

$$\gamma = 1,37930 \frac{\text{gr}}{\text{cm}^3}$$

$$\begin{aligned}w &= \text{volume bak pasir} \times \gamma \\ &= 162000 \times 1,37930 \\ &= 223446,6 \text{ gram} = 223,5 \text{ kg}\end{aligned}$$

- Dr 40%

$$\text{Dr} = \frac{\gamma_n - \gamma_{\min}}{\gamma_{\max} - \gamma_{\min}} \times \frac{\gamma_{\max}}{\gamma_n}$$

$$40\% = \frac{\gamma_n - 1,34461}{0,12303} \times \frac{1,46764}{\gamma_n}$$

$$\gamma = 1,39126 \frac{\text{gr}}{\text{cm}^3}$$

$$\begin{aligned}w &= \text{volume bak pasir} \times \gamma \\ &= 162000 \times 1,39126\end{aligned}$$



$$= 225384,12 \text{ gram} = 225,4 \text{ kg}$$

- Dr 60%

$$\text{Dr} = \frac{\gamma_n - \gamma_{min}}{\gamma_{mak} - \gamma_{min}} \times \frac{\gamma_{mak}}{\gamma_n}$$

$$60\% = \frac{\gamma_n - 1,34461}{0,12303} \times \frac{1,46764}{\gamma_n}$$

$$\gamma = 1,41582 \frac{\text{gr}}{\text{cm}^3}$$

$$w = \text{volume bak pasir} \times \gamma$$

$$= 162000 \times 1,41582$$

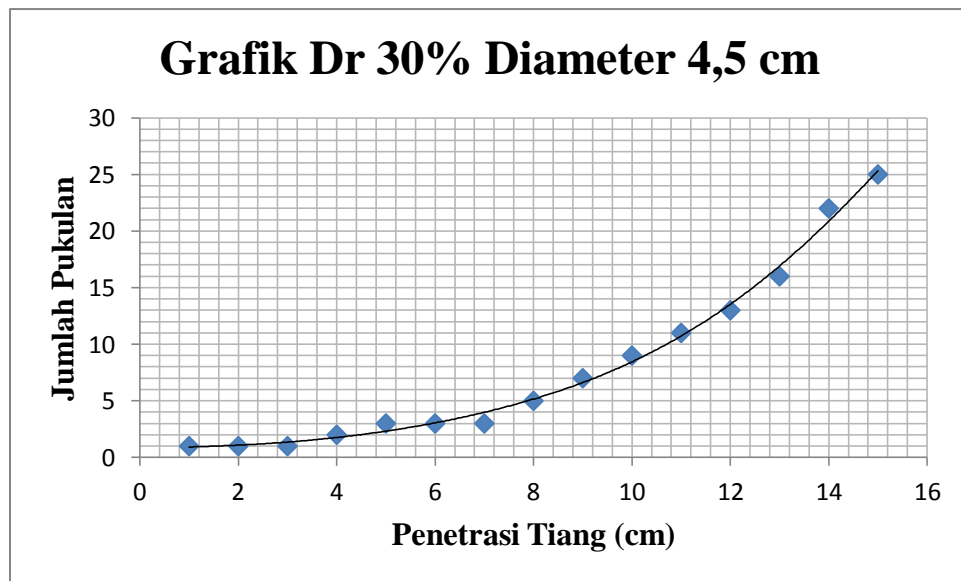
$$= 229362,84 \text{ gram} = 229,4 \text{ kg}$$

Lampiran L11 Test Pemancangan Tiang Dengan Dr 30% dan Grafik

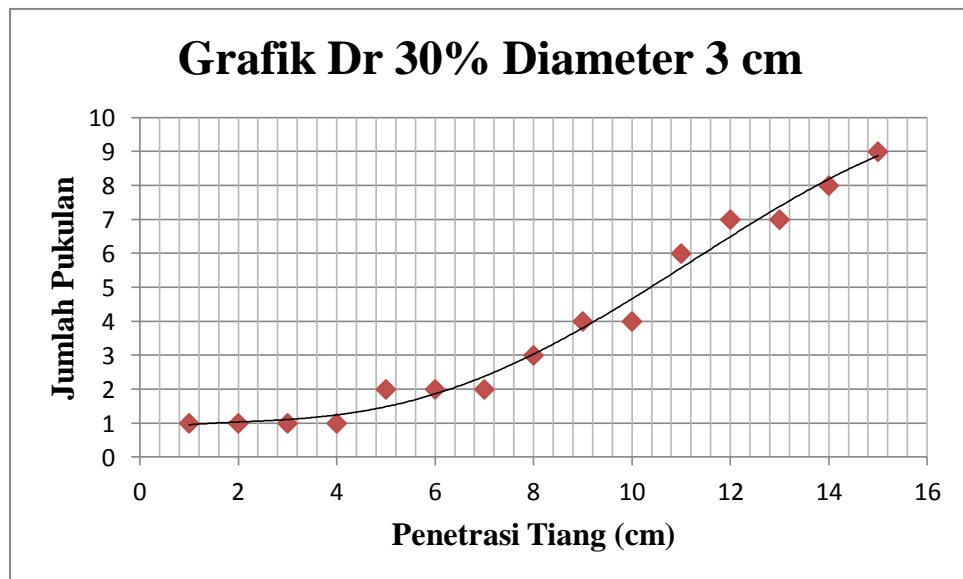
**TEST PEMANCANGAN TIANG Dr 30%**

Date : 31 Oktober 2012

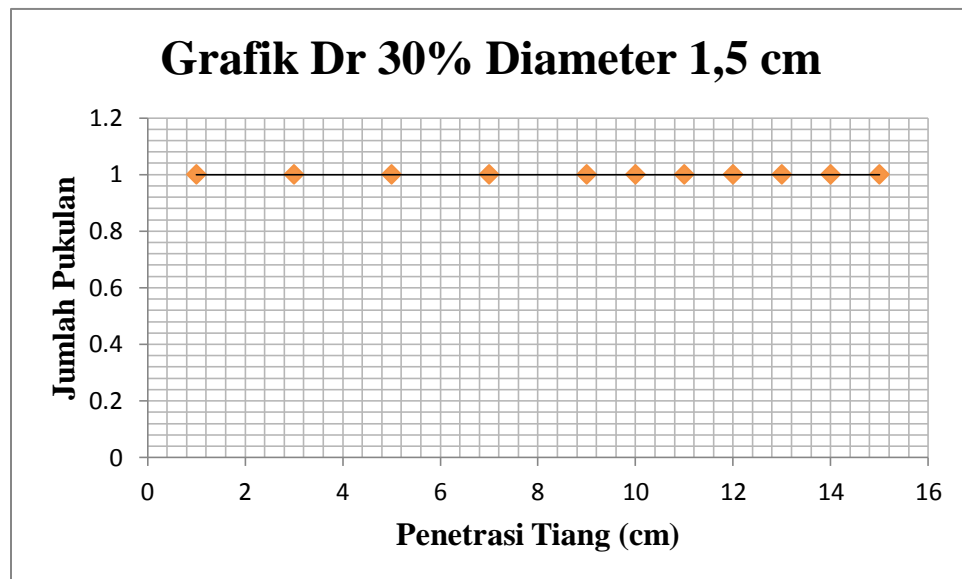
Diameter	Penetrasi Tiang	Jumlah Pukulan
4,5 cm	1 cm	1
	2 cm	1
	3 cm	1
	4 cm	2
	5 cm	3
	6 cm	3
	7 cm	3
	8 cm	5
	9 cm	7
	10 cm	9
	11 cm	11
	12 cm	13
	13 cm	16
	14 cm	22
	15 cm	25



Diameter	Penetrasi Tiang	Jumlah Pukulan
3 cm	1 cm	1
	2 cm	1
	3 cm	1
	4 cm	1
	5 cm	2
	6 cm	2
	7 cm	2
	8 cm	3
	9 cm	4
	10 cm	4
	11 cm	6
	12 cm	7
	13 cm	7
	14 cm	8
	15 cm	9



Diameter	Penetrasi Tiang	Jumlah Pukulan
1,5 cm	1 cm	1
	2 cm	
	3 cm	1
	4 cm	
	5 cm	1
	6 cm	
	7 cm	1
	8 cm	
	9 cm	1
	10 cm	1
	11 cm	1
	12 cm	1
	13 cm	1
	14 cm	1
	15 cm	1

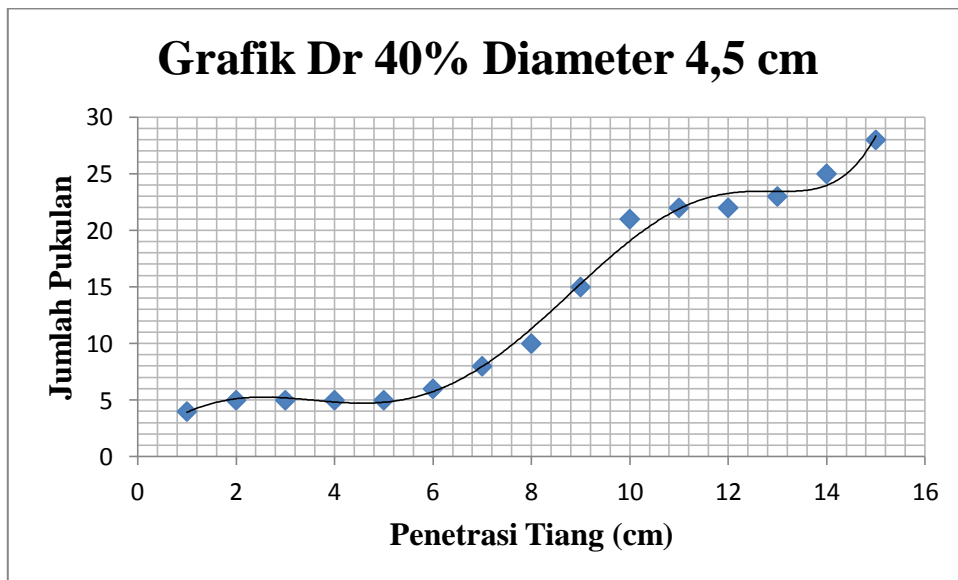


Lampiran L12 Test Pemancangan Tiang Dengan Dr 40% dan Grafik

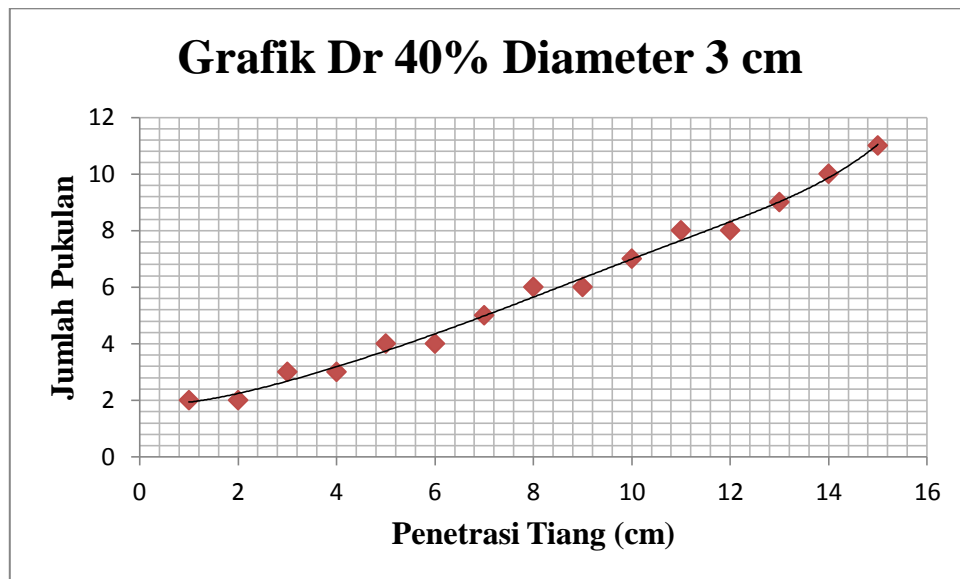
**TEST PEMANCANGAN TIANG Dr 40%**

Date : 24 Oktober 2012

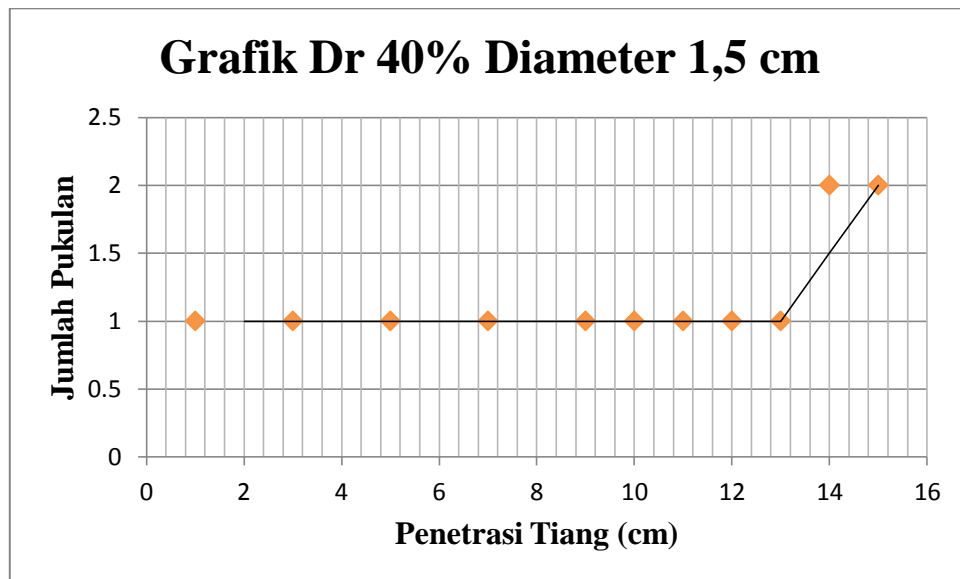
Diameter	Penetrasi Tiang	Jumlah Pukulan
4,5 cm	1 cm	4
	2 cm	5
	3 cm	5
	4 cm	5
	5 cm	5
	6 cm	6
	7 cm	8
	8 cm	10
	9 cm	15
	10 cm	21
	11 cm	22
	12 cm	22
	13 cm	23
	14 cm	25
	15 cm	28



Diameter	Penetrasi Tiang	Jumlah Pukulan
3 cm	1 cm	2
	2 cm	2
	3 cm	3
	4 cm	3
	5 cm	4
	6 cm	4
	7 cm	5
	8 cm	6
	9 cm	6
	10 cm	7
	11 cm	8
	12 cm	8
	13 cm	9
	14 cm	10
	15 cm	11



Diameter	Penetrasi Tiang	Jumlah Pukulan
1,5 cm	1 cm	1
	2 cm	
	3 cm	1
	4 cm	
	5 cm	1
	6 cm	
	7 cm	1
	8 cm	
	9 cm	1
	10 cm	1
	11 cm	1
	12 cm	1
	13 cm	1
	14 cm	2
	15 cm	2

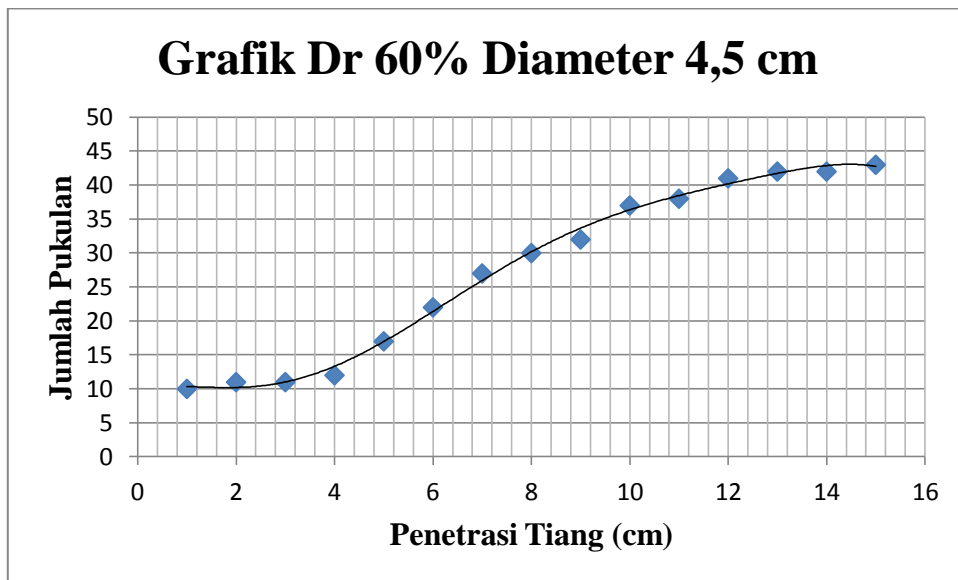


Lampiran L13 Test Pemancangan Tiang Dengan Dr 60% dan Grafik

**TEST PEMANCANGAN TIANG Dr 60%**

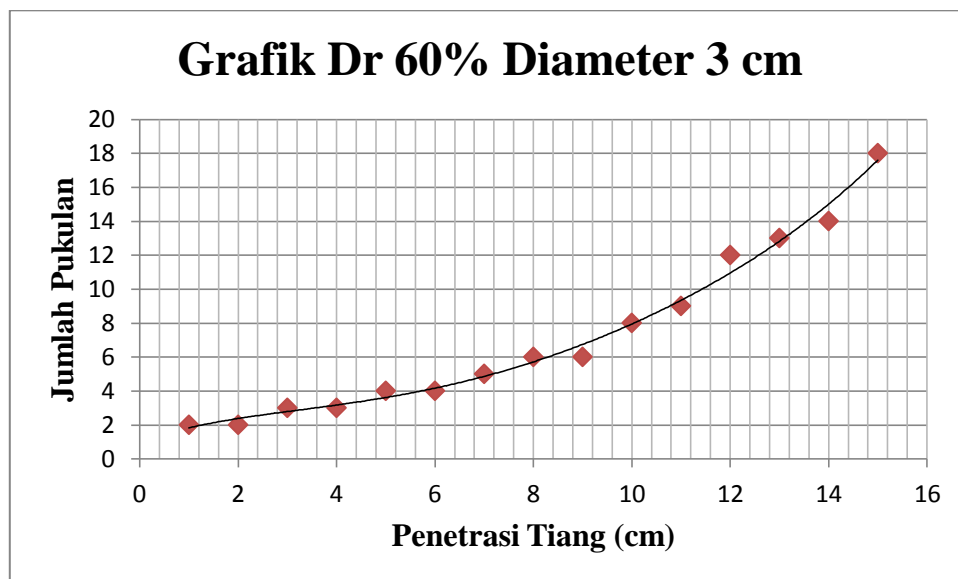
Date : 29 Oktober 2012

Diameter	Penetrasi Tiang	Jumlah Pukulan
4,5 cm	1 cm	10
	2 cm	11
	3 cm	11
	4 cm	12
	5 cm	17
	6 cm	22
	7 cm	27
	8 cm	30
	9 cm	32
	10 cm	37
	11 cm	38
	12 cm	41
	13 cm	42
	14 cm	42
	15 cm	43

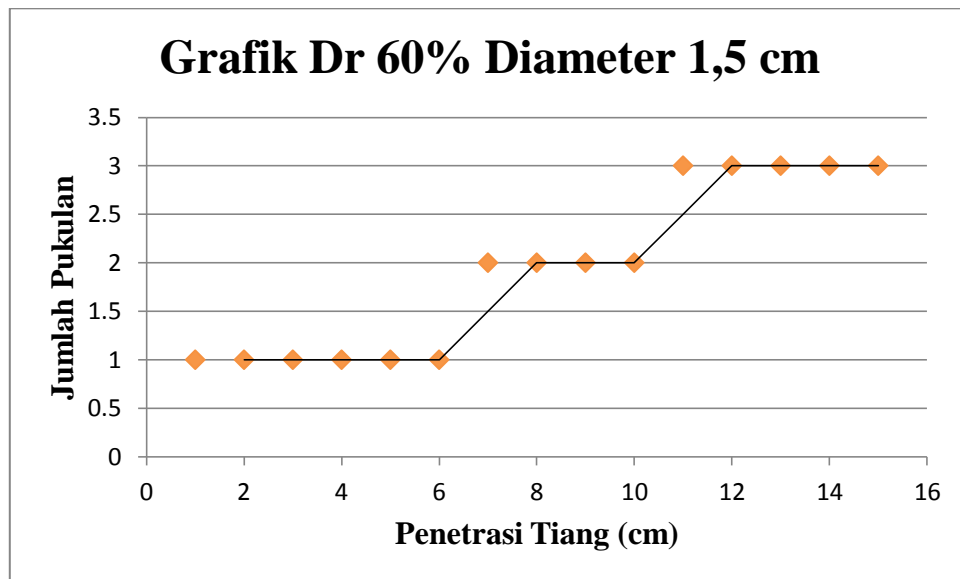




Diameter	Penetrasi Tiang	Jumlah Pukulan
3 cm	1 cm	2
	2 cm	2
	3 cm	3
	4 cm	3
	5 cm	4
	6 cm	4
	7 cm	5
	8 cm	6
	9 cm	6
	10 cm	8
	11 cm	9
	12 cm	12
	13 cm	13
	14 cm	14
	15 cm	18

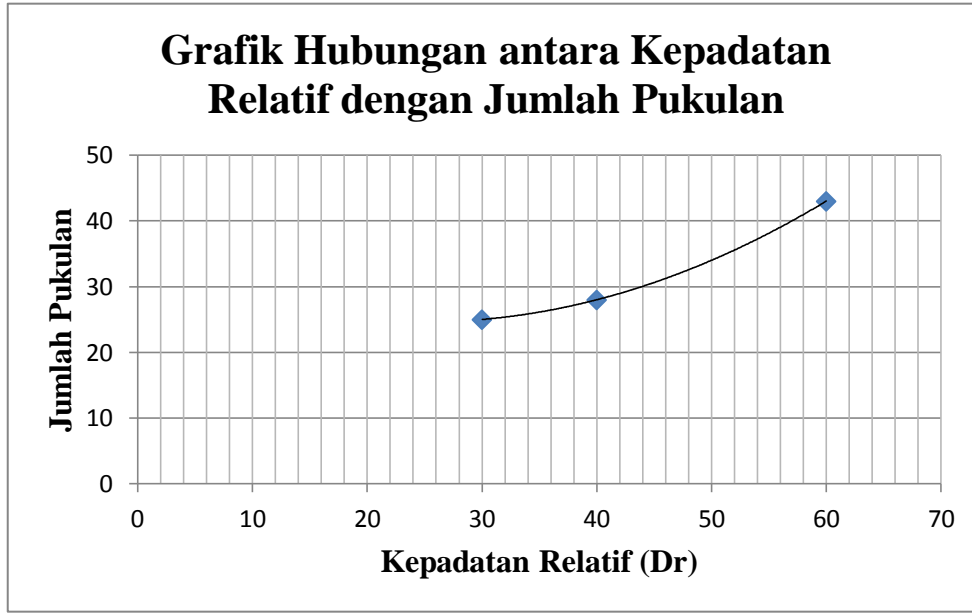


Diameter	Penetrasi Tiang	Jumlah Pukulan
1,5 cm	1 cm	1
	2 cm	1
	3 cm	1
	4 cm	1
	5 cm	1
	6 cm	1
	7 cm	2
	8 cm	2
	9 cm	2
	10 cm	2
	11 cm	3
	12 cm	3
	13 cm	3
	14 cm	3
	15 cm	3

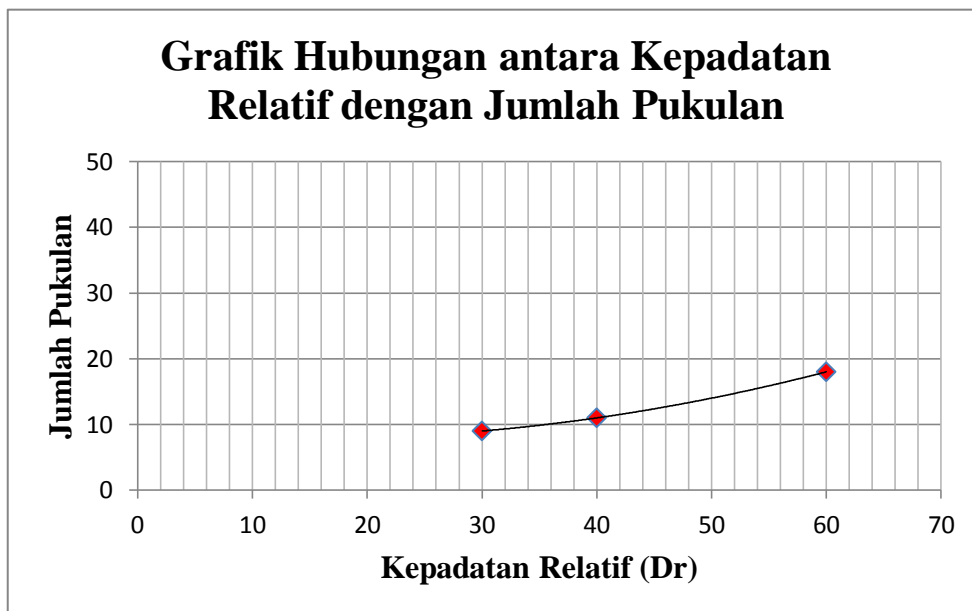


**Lampiran L14 Hubungan Kepadatan Relatif dengan Jumlah Pukulan**

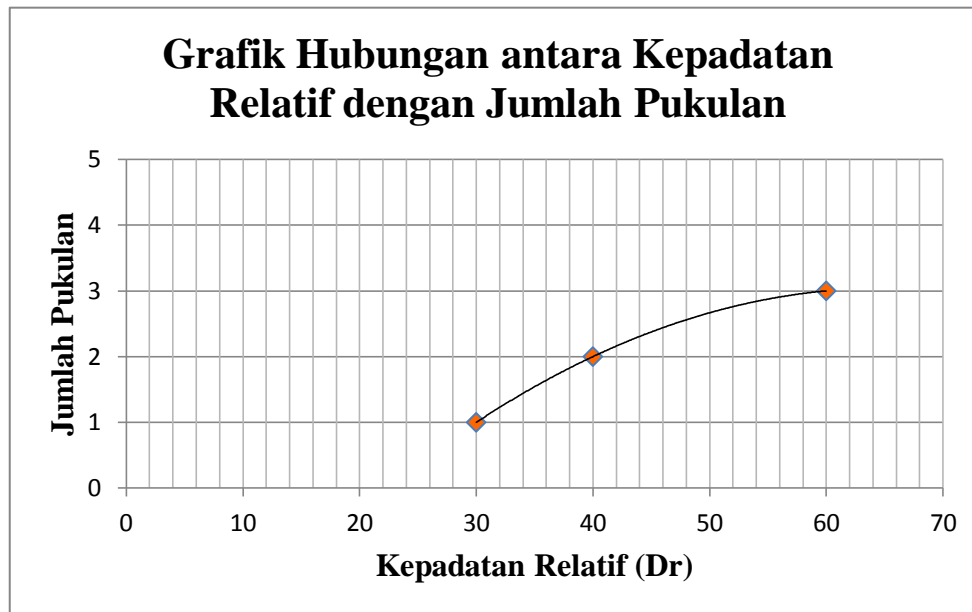
A. Diameter 4,5 cm



B. Diameter 3 cm



C. Diameter 1,5 cm



**Lampiran L15 Gambar alat – alat pengujian**

**1. Berat Jenis Tanah (*Spesific Grafity*)**



Erlenmeyer



Thermometer

**2. Distribusi Ukuran Butir (*Sieve Analysis*)**



Mesin Pengguncang



Susunan Tapis

### 3. Berat Isi Tanah



Mold

Jangka sorong

### 4. Uji Geser Langsung (*Direct Shear*)



Shear box bagian atas

Pembebanan

Shear box bagian bawah  
& blok pengaku



Alat *Direct Shear*