



PENUGASAN
No : 26-10PM/LM/X/94

Ketua Program Studi Teknik Sipil, Fakultas Teknik Sipil dan Perencanaan Institut Sains dan Teknologi Nasional Jakarta menugaskan kepada :

Ir. Idrus, MSc Staff Jurusan Teknik Sipil

Untuk melakukan pekerjaan Penyelidikan Tanah sebagai bentuk kegiatan **Pengabdian Pada Masyarakat** pada :

Nama Pekerjaan : Penyelidikan Tanah GIS 150 KV
Lokasi : Teluk Naga, Tangerang
Pemberi Tugas : PT.Meta Epsi

Dengan jadwal pelaksanaan pekerjaan selama 12 hari kerja (80 Jam), 2 hari di lapangan dan 10 hari di Laboratorium

Kepada Ir. Idrus MSc diberikan kepercayaan penuh untuk melakukan pekerjaan Pengabdian Pada Masyarakat tersebut dan bertanggung jawab atas segala sesuatu mengenai pekerjaan tersebut

Kepada pelaksana tugas ini akan diberikan honorarium sesuai dengan ketentuan yang berlaku di Laboratorium Mekanika Tanah Institut Sains dan Teknologi Nasional.

Penugasan ini berlaku sejak dikeluarkan sampai dengan berakhirnya jangka waktu penyusunan Laporan Akhir (Final Report) diterima oleh pemberi kerja dengan baik.

Jakarta, 26 Oktober 1994
Kaprosdi Teknik Sipil



Ir. Ari Mulyo Diah Utami MT
NIP : 01.83332

Tembusan :

1. Dekan FTSP-ISTN (sbg laporan)
2. Ka. Lab. Mekanika Tanah ISTN
3. Arsip

LEMBAR PENGESAHAN PENGABDIAN PADA MASYARAKAT



PENYELIDIKAN TANAH GIS 150 kV
Lokasi : Teluk Naga, Tangerang

Oleh :
Idrus Ir, M.Sc

Mengetahui :
Ketua Jurusan Teknik Sipil



Ir. Arimulyo Diah Utami, M.T

Program Studi Teknik Sipil
Institut Sain dan Teknologi Nasional
Jakarta 1994

SURAT PERJANJIAN KERJASAMA

SPK No : 25-10.1/ME/X/94

Pada hari ini, Selasa tanggal Dua Puluh Lima bulan Oktober tahun Seribu Sembilan Ratus Sembilan Puluh Empat (25-10-1994) yang bertanda tangan dibawah ini :

PIHAK I

Dalam hal ini bertindak sebagai Pemilik PT. Meta Epsi yang beralamat di Jl. Mayjen D.I. Panjaitan Kav. 2, Jakarta Timur 13350

Selanjutnya dalam perjanjian ini disebut sebagai **Pihak Pertama**

PIHAK II

Dalam hal ini bertindak sebagai Pelaksana Soil Investigasi yaitu Laboratorium Mekanika Tanah ISTN

Selanjutnya disebut sebagai **Pihak Kedua**

Kedua belah pihak telah sepakat untuk mengadakan perjanjian kerja pengujian Soil Investigasi pada :

Proyek : GIS 150 kV Teluk Naga

Lokasi : Tangerang

Demikian surat perjanjian kerja sama ini kami buat dengan sebenar-benarnya.

Jakarta, 25 Oktober 1994

PIHAK KEDUA

Laboratorium Mekanika Tanah ISTN

PIHAK PERTAMA

PT. Meta Epsi



(.....)

Ir. Idrus MSc

Kepala Laboratorium

70/94.

FINAL REPORT

SOIL INVESTIGATION

PROJECT : GARDU INDUK SEKUNDER 150 KV

TELUK NAGA

LOCATION : TELUK NAGA, TANGERANG WEST - JAVA

29/11



LABORATORIUM MEKANIKA TANAH
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INSTITUT SAINS DAN TEKNOLOGI NASIONAL - JAKARTA
Kampus ISTN Bhumi Srengseng Telp. 7270092, Fax. 7270090



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Kampus ISTN Bhumi Srengseng Telp. 7270092

29-11.1/FR/LM/XI/94

Page 1

Jakarta, November 29 th 1994

No : 29-11.1/FR/LM/XI/94
Atch : 1 (one) document
Subject : Submittal letter of the soil investigation
work at GIS 150 KV Teluk Naga, Tangerang.

To:

Director of PT. META EPSI

at

Jakarta.

Dear Sir,

We are pleased to submit herewith our Final Report on Soil Investigation for The Secondary Relay Station (Gardu Induk Sekunder) 150 KV at your plant in Teluk Naga Tangerang, West Java.

This soil investigation was performed in accordance with our agreement between PT. META EPSI Jakarta and Soil Mechanics Laboratory of ISTN Jakarta..

We appreciated the opportunity to work on this project and please do not hesitate to call us if you have any question regarding this final report.

Thank you for your kind attention and cooperation.

Your sincerely,

SOIL MECHANICS LABORATORY OF I.S.T.N
Chief Executive

Ir. Idrus M.Sc
Geotechnical Engineers

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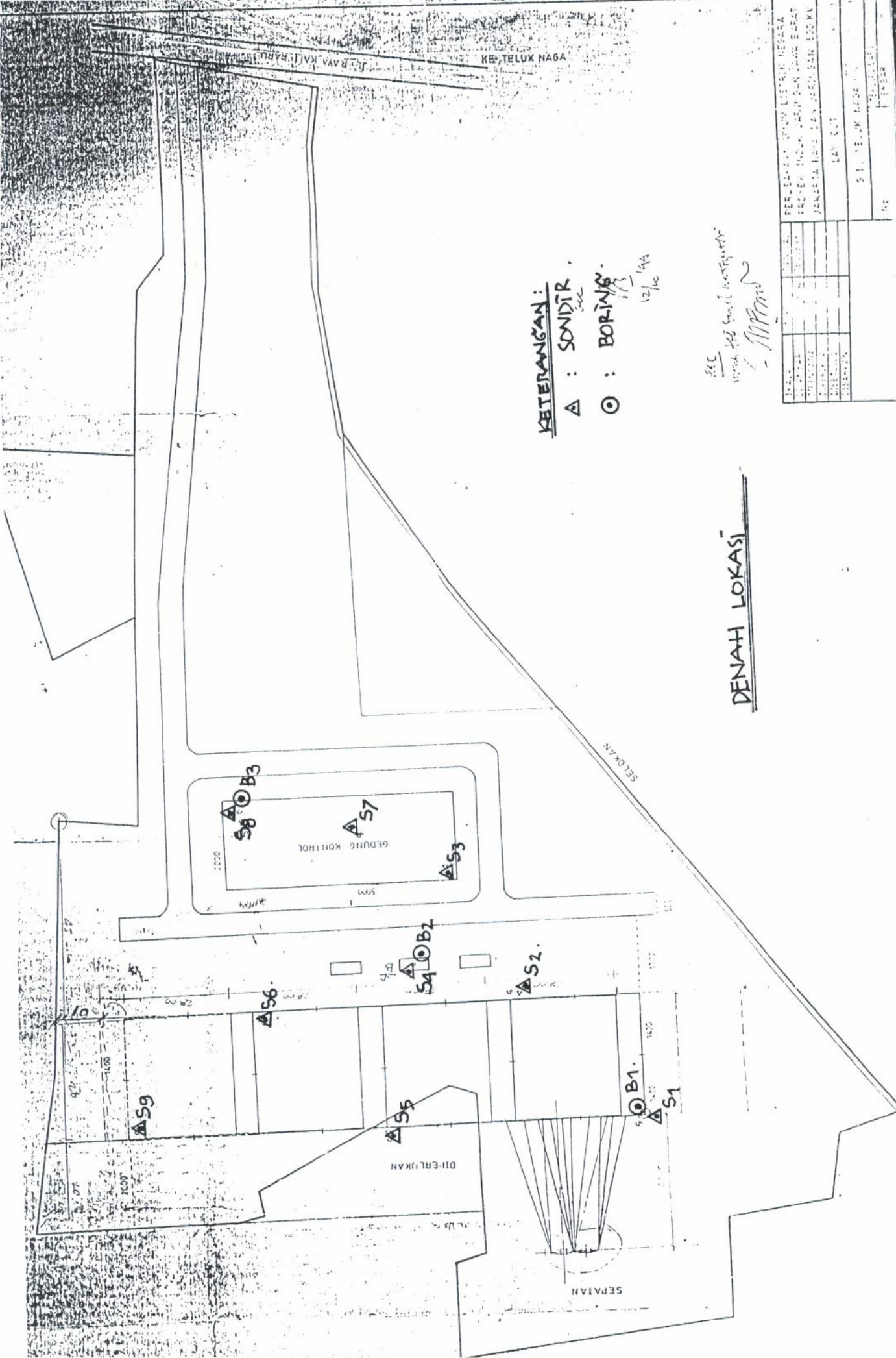


LIST OF FIGURE

FIGURE 1 : LOCATION OF CPT AND BORING POINTS



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KETERANGAN:

- △ : SONDIR
- : BORING

SEC
 untuk test awal konfigurasi
 M. M. M.

DENAH LOKASI

NO. SURvei	PERUSAHAAN	PROJEK	NO. SKEMA
1000	PT. TELUK NAGA	PERENCANAAN DAN KONSTRUKSI	1000
NO. GAMBAR	NO. LEMBAR	NO. KEMBAR	NO. KEMBAR
1000	1000	1000	1000
NO. SKEMA	NO. LEMBAR	NO. KEMBAR	NO. KEMBAR
1000	1000	1000	1000
NO. SKEMA	NO. LEMBAR	NO. KEMBAR	NO. KEMBAR
1000	1000	1000	1000
NO. SKEMA	NO. LEMBAR	NO. KEMBAR	NO. KEMBAR
1000	1000	1000	1000
NO. SKEMA	NO. LEMBAR	NO. KEMBAR	NO. KEMBAR
1000	1000	1000	1000

KE-TELUK NAGA

KAYU KALIPARU

SELAKAN

GEDUNG KONTROL

DII-ERLUKAN

SEPAIAN

LIST OF APPENDIX

1. Geological Boring Log
2. Diagram of Cone Penetrometer Test
3. Summary of Laboratory Result Test
4. Index Properties of Soil
5. Atterberg limits of Soil
6. Grained Sizes Distribution of Soil
7. Plastisity Chart
8. Triaxial UU Test
9. Consolidation Test



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I. INTRODUCTION

This Soil Investigation was meant to fulfil a work agreement between Soil Mechanics Laboratory of ISTN Jakarta and PT. META EPSI Jakarta, to carry out site and laboratory investigation for The Secondary Relay Station (Gardu Induk Sekunder) 150 KV project in Teluk Naga, Tangerang, West Java.

This soil investigation is to obtain the technical data result of subsurface soil condition especially surrounding the bearing capacity of soil to Foundation design of the Secondary Relay Station (Gardu Induk Sekunder) 150 KV project in Teluk Naga, Tangerang.

The soil investigation consisted of 9 (nine) points of CPT Test with 2,5 tons capacity and 3 (three) points of The shallow boring (Hand boring).

The duties of Soil Mechanics Laboratory of ISTN were to carry out Geotechnical Investigation such as field work, laboratory testing and also evaluate the soil condition and parameter design.

Field investigation activities had be done on October 27 th 1994 to 28 th 1994.



II. SCOPE OF WORK

The scope of work consist of 9 (nine) points of 2,5 tons CPT Test (Cone Penetration Test) and 3 (three) points of the Shallow Boring and taking undisturbed and disturbed samples for soil description and laboratory test.

3 (three) points of the shallow boring.

Code	Depth (m)	UD Sampling
B-1	-3.45	2
B-2	-3.45	2
B-3	-3.45	2

9 (nine) points of CPT Test.

Code	The max.depth qc > 100 kg/cm ²	Total Friction kg/cm ²
S 1	-19.00 m	> 2000
S 2	-10.00 m	1000
S 3	-10.20 m	920
S 4	- 9.20 m	1000
S 5	-10.60 m	1200
S 6	-10.60 m	1200
S 7	-10.20 m	1000
S 8	- 9.60 m	900
S 9	-13.00 to 15.50 m	1000



III. METHODE OF TESTING

In generally this investigation were carry out in two stage of work in example : Field work and laboratory testing.

Detail of investigation methods were as follows :

3.1. Field Work.

To Achieve the representative geotechnical properties, 3 (three) points of booring and 9 (nine) points of CPT test were carry out which the location were shown in figure 1 .

a. Boring by using the coring system (iwan auger)

The aim of this boring was to obtain the accurate information on the soil condition beneath the surface regarding it's engineering viewpoint either obtained from visual description, and taking , undisturbed samples for laboratory testing on an undisturbed samples to find out the visual description.

The mentioned boring was carry out by using rotary boring / manual (hand booring) with iwan auger.

During boring, the following testings were executed :

- . Taking Undisturbed sample.
- . Taking Disturbed sample from auger Iwan



b. Taking of Undisturbed Samples.

The taking of undisturbed samples were meant to obtain relative original soil samples. samples were taken by using special equipment, passed to the desired soil depth by using the pressure from the manual equipment).

Equipment used was the thin wall tube sample, according to ASTM Standard No: D.1587.

Sealing was immediately effected on obtained soil samples, by applying parafine at both ends of the tube.

c. Cone Penetration Test (CPT).

Dutch Cone Penetration Test had been carried out in accordance with the requirements of ASTM Standard D.3441, of 2,5 tonf capacity, equipped with rod and friction cone. The CPT had been performed continuously from the ground surface to the top of hard layer soil with cone penetration resistance (q_c) value exceeding 200 kg/cm² or 20 meters maximum depth.

The recording had been taken every 20 cm penetration rate.

The data obtained from the test had been of cone penetration resistance and total friction as well.



3.2. Laboratory Test and Analysis

All laboratory test had been performed in Soil Mechanics Laboratory of National Institute of Science and Technology at Jakarta (ISTN). The all test had been conducted in accordance with ASTM requirements.

For Undisturbed sampling, following index properties tests had been carried out :

- . Determination of Natural water content
- . Determination of Specific gravity
- . Determination of Atterberg limits.
- . Determination of Plasticity index
- . Determination of Grained sizes distribution by sieve analysis and Hydrometer analysis.

And also the engineering properties test had been carried out in addition to the test listed above :

- . Determination of wet density and dry density
- . Determination of degree of saturation
- . Determination shear strength by Triaxial UU Test.
- . Determination of Compression Index with Consolidation test



IV. GEOTECHNICAL CONDITION

4.1. The subsoil condition

From the field exploratory test data with CPT test and boring test, the subsoil condition could be explained as follows :

- From the top of soil below to - 1.00 meter (average) was found Clayey silt or silty clay with medium to stiff consistency and highly plasticity.
- From -1.00 meter to -10.00 meter the consistency has to be very soft to soft.
- A hard layer , where the cones resistance > 100 kg/cm² was found in - 10.00 to -11.00 meter.
- Especially at S1 , the thickness of the hard layer only 1.00 meter. And at S9, the thickness of the hard layer 2.50 meter.
- The existing ground water surface was found in -2.00 meter depth (average) from ground surface when the site job has been done.



V. RECOMMENDATION

With the subsoil condition as described above, it was recommended to use parameter design, especially the allowable bearing capacity to use the foundation design.

Using Mini Precast Driven Pile :

- The total of pile length is variously between -12.00 to more 15.00 meter (S1 and S9) or until a hard layer.
 - Driven to hard layer (final set max 1 cm / last 10 (ten) blow) .
 - Allowable Axial Load / 1 (one) pile is :
- Used formula :

$$P_{all} = \frac{Q_c \cdot A}{3} + \frac{T_f \cdot S}{5}$$

Dimension of Pile (cm)	(A) cm ²	(S) cm	Soil Parameter will be recommended		P _{all} (Kg)
			Q _c Kg/cm ²	T _f Kg/cm ²	
20x20	400	80	100	700	24533 P = 22.5 t
28x28x28	339	84	100	700	23060 P = 22.5 t



Where :

- A = Cross section in cm^2
 (S) = Circumference in cm
 Q_c = The qonus resistance at soil bearing layer
 (Kg/cm^2)
 T_f = Total friction from top to soil bearing layer
 (Kg/cm^2)

- For goup pile, the distance beetwen pile to pile is minimum 3ϕ , where ϕ is diameter of pile.

Using the Shallow Foundation

Soil Parameter will be recommended :

Cohession	= 0.2 t/m ²	N_c	= 12
ϕ	= 15 degree	N_q	= 4.5
γ	= 0.713 t/m ³	N_γ	= 2.5

Used formula from Terzaghi :

For square footing (B x B)

$$q_u = 1.3 C N_c + \gamma D N_q + 0.4 \gamma B N_\gamma$$

For strip footing

$$q_u = C N_c + \gamma D N_q + 0.5 \gamma B N_\gamma$$

Where : N_c N_q and N_γ is bearing capacity factor .

C = Cohession (t/m²)

γ = Unit weight of soil ,effective. (t/m³)

D = Depth of base foundation from groun surface (m)

B = Width of foundation (m)



Type of Foundation : Square footing

Depth (D)	Allowable Bearing Capacity (t/m ²)	
	Width of Foundation (m)	
	1.50	2.00
1.00	2.47	2.58

Type of Foundation : Continuous footing

Depth (D)	Allowable Bearing Capacity (t/m ²)	
	Width of Foundation (m)	
	1.50	2.00
1.00	2.32	2.46

Remarks :

- Below the base foundation , should be added 20 cm thick of compacted gravel.
- The consolidation settlement should be calculated below the base foundation until the depth of 4 times of foundation width. ($D = 4 B$)

We propose that for the soil as described above , to use mini pile (driven piles) more effectively than the shallow foundation

SOIL MECHANICS LABORATORY OF ISTN
Chief Executive

Ir. Idrus M.Sc
Geotechnical Engineer



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USING THE SHALLOW FOUNDATION

SHALLOW FOUNDATION ANALYSIS

Proyek : GIS 150 KV TELUK NAGA , TANGERANG
Lokasi : TANGERANG, JAWA BARAT.

Soil Data		Bearing Capacity Factor	
Cohesion (t/m^2)	0.2	Nc :	12
Internal angle friction (Degree)	15	Nq :	4.5
Density of soil (t/m^3) (Effective)	0.713	Ng :	2.5
LOCAL FAILURE			

Type of Foundation : Square footing

DEPTH (D) meter	Allowable Bearing Capacity (t/m^2) Width of Fondation = B (m)				
	1.00	1.25	1.50	2.00	3.00
1.00	2.35	2.41	2.47	2.58	2.82
1.25	2.61	2.67	2.73	2.85	3.09
1.50	2.88	2.94	3.00	3.12	3.36
2.00	3.42	3.48	3.54	3.65	3.89

Type of Foundation : Continuous footing

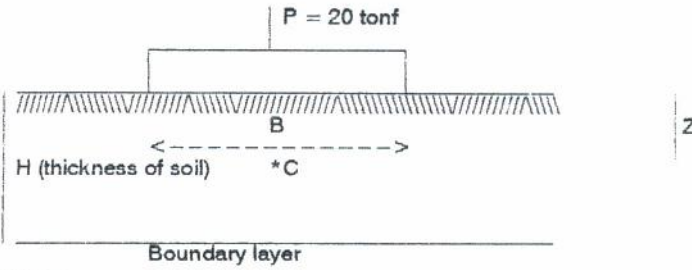
DEPTH (D) meter	Allowable Bearing Capacity (t/m^2) Width of Fondation = B (m)				
	1.00	1.25	1.50	2.00	3.00
1.00	2.17	2.24	2.32	2.46	2.76
1.25	2.43	2.51	2.58	2.73	3.03
1.50	2.70	2.78	2.85	3.00	3.30
2.00	3.24	3.31	3.38	3.53	3.83



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CONSOLIDATION SETTLEMENT ANALYSIS (Estimated)

Project : G.I.S 150 KV TELUK NAGA , TANGERANG.



Soil Parameter :

Initial Void Ratio (e _o) =	1.0600	
Effective Volume Weigth of soil (t/m ³)	0.7200	
Compression Index, C _c	0.4510	
Coefficient of Consolidation, C _v in cm ² /sec	0.0050	15.552 (m ² /years)
Thickness of soil layer in meter (H)	8.0000	
Depth of the middle layer Z, in meter	4.0000	
Swelling Index, C _s	0.0360	
Preconsolidation pressure, P _c (t/m ²)	13.0000	

Foundation Data :

Axial Load in ton	20
Width of Foundation (B) in meter	2.00
Depth of Boundary Layer in meter	8.00

Time of Settlement :

$$t = \frac{T_v \times H_{dr}^2}{C_v}$$

$$S_c = \frac{H \times C_c}{1 + e_o} \log \frac{P_o + dq}{P_o} \quad \text{(Normally consolidation)}$$

$$S_c = \frac{H \times C_s}{1 + e_o} \log \frac{P_o + dq}{P_o} \quad \text{(Over consolidation, where } P_o + dq < P_c)$$

$$S_c = \frac{H \times C_s}{1 + e_o} \log \frac{P_c}{P_o} + \frac{H \times C_c}{1 + e_o} \log \frac{P_o + dq}{P_c} \quad \text{(Over consolidation, where } P_o + dq > P_c)$$

$$dq = \frac{I_r \times Q \times 4}{I_r} = 0.03$$

(Normally consolidation)

Q (t/m ²)	dq (t/m ²)	P _o (t/m ²)	H (meter)	C _c	e _o	S _c (meter)
5.00	0.60	2.88	8.00	0.4510	1.0600	0.1439

(Over consolidation, where P_o + dq < P_c)

Q (t/m ²)	dq (t/m ²)	P _o (t/m ²)	H (meter)	C _s	e _o	S _c (meter)
5.00	0.60	2.88	8.00	0.0360	1.0600	0.0115

(Over consolidation, where P_o + dq > P_c)

Q (t/m ²)	P _c (t/m ²)	P _o (t/m ²)	H (meter)	C _s	e _o	S _c (meter)
5.00	13.00	2.88	0.00	0.0360	1.0600	0.0000

Q (t/m ²)	dq (t/m ²)	P _o (t/m ²)	H (meter)	C _c	e _o	S _c (meter)
5.00	0.60	2.88	0.00	0.4510	1.0600	0.0000

Settlement (S_c) = 1.15 Cm

T _v 90	H _{dr} (meter)	C _v m ² /yr	t year
0.848	8.00	15.55	3.49



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GEOLOGICAL BORING LOG

OBJECT	GI TELUK NAGA	Started OKTOBER 27 1994	Drawn by RAHARDJO S Ir.	Bore Hole Number B-1.
LOCATION	TELUK NAGA TANGERANG.	Finished OKTOBER 27 1994	Checked by RAHARDJO S Ir.	
TOTAL DEPTH	-3.45 meter	Tested by Amin Mr.	Approved by	Date NOVEMBER 2 1994
ELEVATION	0.00	Av. GWT		

No	Depth	Elev.	Thickness	Soil Symbol	Soil Classification	Colour	In Place Observation	Density or Consistency	Sample	Standard Penetration Test (N Value)										
										Number of Blows	Every 15 cm	30 Cm	10	20	30	40	50	60		
1																				
2	0.50					Coklat	Lempung(urugan)	Lepas												
3																				
4	1.00																			
5																				
6	1.50					abu-abu	Lempung	Lekat												
7																				
8	2.00								UDE											
9																				
10	2.50																			
11																				
12	3.00					Abu-abu berpasir	Lempungberpasir	Lepas												
13																				
14	3.45								UDE											
15																				
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25																				
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27																				
28																				
29																				
30																				

Clay		Gravel	
Silt		Rock	
Sand		Organic	



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GEOLOGICAL BORING LOG

OBJECT	GI TELUK NAGA	Started OKTOBER 27 1994	Drawn by RAHARDJO S Ir.	Bore Hole Number B-2.
LOCATION	TELUK NAGA TANGERANG.	Finished OKTOBER 27 1994	Checked by RAHARDJO S Ir.	
TOTAL DEPTH	--3.45 meter	Tested by Amin Mr.	Approved by	
ELEVATION	0.00	Av. GWT	Date NOVEMBER 2 1994	

No	Depth	Elev.	Thickness	Soil Symbol	Soil Classification	Colour	In Place Observation	Density or Consistency	Sample	Standard Penetration Test (N Value)							
										Number of Blows							
										Every 15 cm	30 Cm	10	20	30	40	50	60
1	0.50			[Pattern]		Coklat	Lempung(urugan)	Lepas									
2	1.00			[Pattern]													
3	1.50			[Pattern]		abu-abu	Lempung	Lekat									
4	2.00			[Pattern]					UDE								
5	2.50			[Pattern]													
6	3.00			[Pattern]		Abu-abu berpasir	Lempungberpasir	Lepas									
7	3.45			[Pattern]					UDE								
8																	
9																	
10																	
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Clay	[Pattern]	Gravel	[Pattern]
Silt	[Pattern]	Rock	[Pattern]
Sand	[Pattern]	Organic	[Pattern]



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GEOLOGICAL BORING LOG

OBJECT	GI TELUK NAGA	Started OKTOBER 27 1994	Drawn by RAHARDJO S Ir.	Bore Hole Number B-3.
LOCATION	TELUK NAGA TANGERANG.	Finished OKTOBER 27 1994	Checked by RAHARDJO S Ir.	
TOTAL DEPTH	-3.45 meter	Tested by Amin Mr.	Approved by	
LOCATION ELEVATION	0.00	Av. GWT	Date NOVEMBER 2 1994	

No	Depth	Elev.	Thickness	Soil Symbol	Soil Classification	Colour	In Place Observation	Density or Consistency	Sample	Standard Penetration Test (N Value)							
										Number of Blows							
										Every 15 cm	30 Cm	10	20	30	40	50	60
	0.50			[Pattern]		Coklat	Lempung(urugan)	Lepas									
	1.00			[Pattern]													
	1.50			[Pattern]		abu-abu	Lempung	Lekat									
	2.00			[Pattern]					UDS								
	2.50			[Pattern]													
	3.00			[Pattern]		Abu-abu berpasir	Lampungberpasir	Lepas									
	3.45			[Pattern]					UDS								
5																	
6																	
7																	
8																	
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20																	

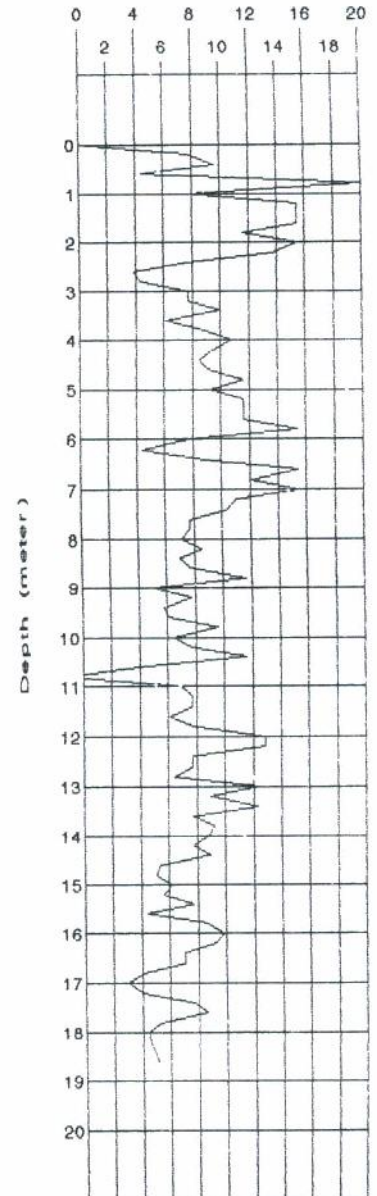
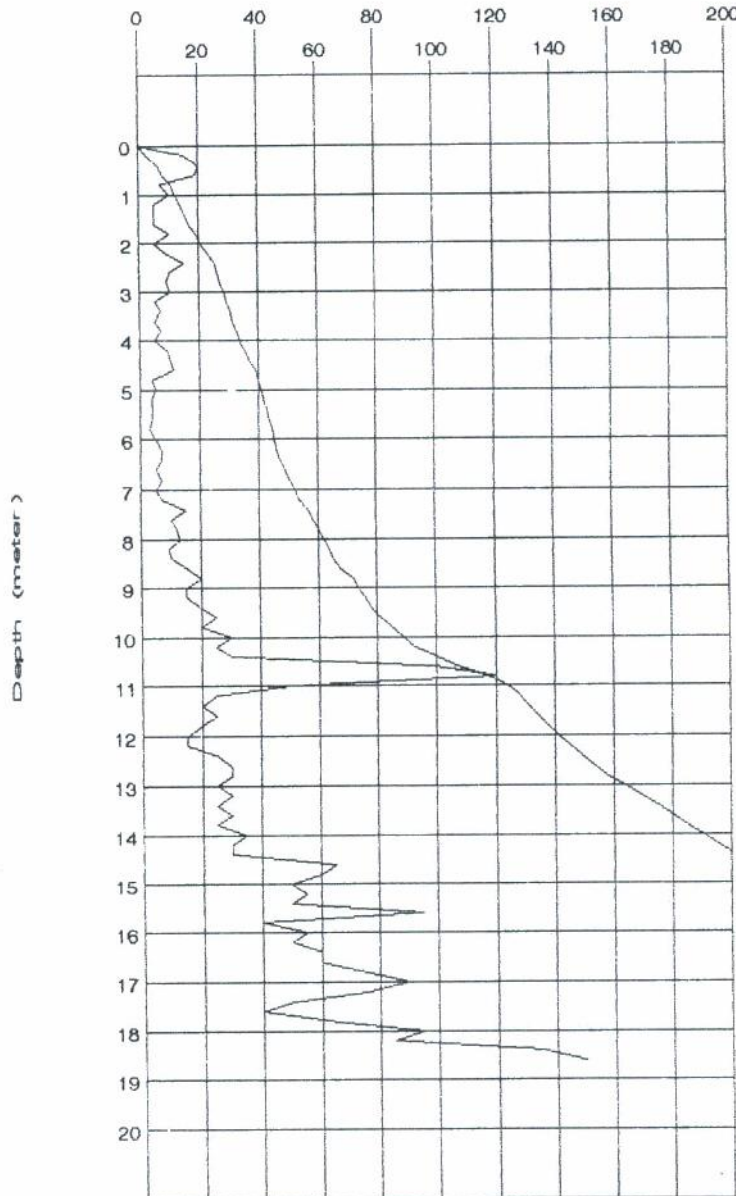
Clay	[Pattern]	Gravel	[Pattern]
Silt	[Pattern]	Rock	[Pattern]
Sand	[Pattern]	Organic	[Pattern]

CONE PENETRATION TEST

SONDIR No : S-1	D1. qonus : 3.45	DATE OF TESTED : Oktober 27 1994
PROJECT : PLN GI.TELUK NAGA	D2. jacket : 3.60	TESTED BY : NE'AN Mr.
LOCATION : TELUK NAGA TANGERANG	H. jacket : 10.71	CHECKED BY : MA.ONTOWIRYO Ir.
	Ratio (R) : 12.96	
	Elevation (meter) : 0.00	
	G.W.L (- meter) : 1.40	

Qc (Kg/cm²) and Tf (Kg/cm' x 10)

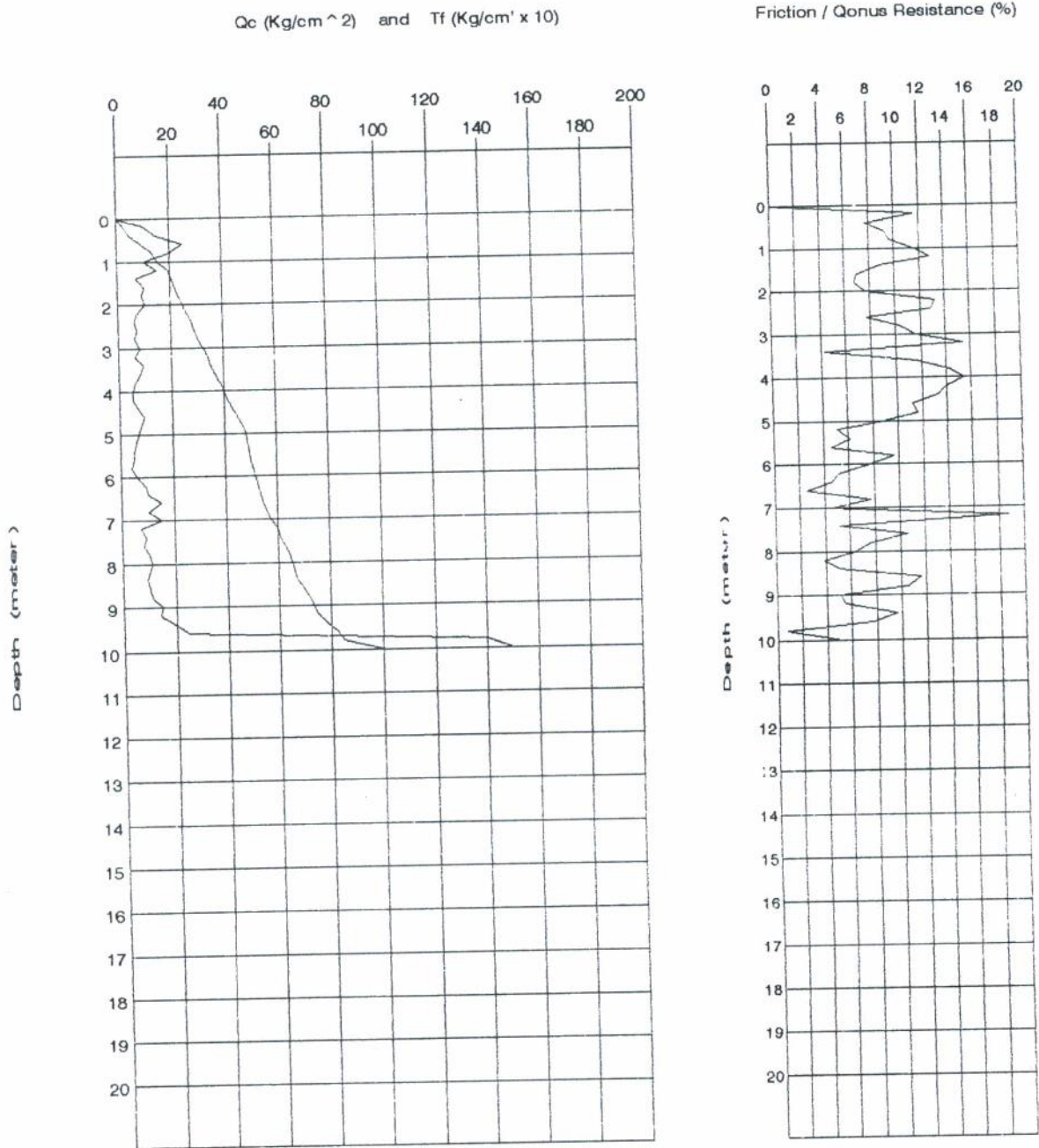
Friction / Qonus Resistance (%)



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CONE PENETRATION TEST

SONDIR No : S-2	D1. qonus : 3.45	DATE OF TESTED : Oktober 27 1994
PROJECT : PLN GI.TELUK NAGA	D2. jacket : 3.60	TESTED BY : NE'AN Mr.
LOCATION : TELUK NAGA TANGERANG	H. jacket : 10.71	CHECKED BY : MA.ONTOWIRYO Ir.
	Ratio (R) : 12.96	
	Elevation (meter) : 0.00	
	G.W.L (- meter) : 1.40	



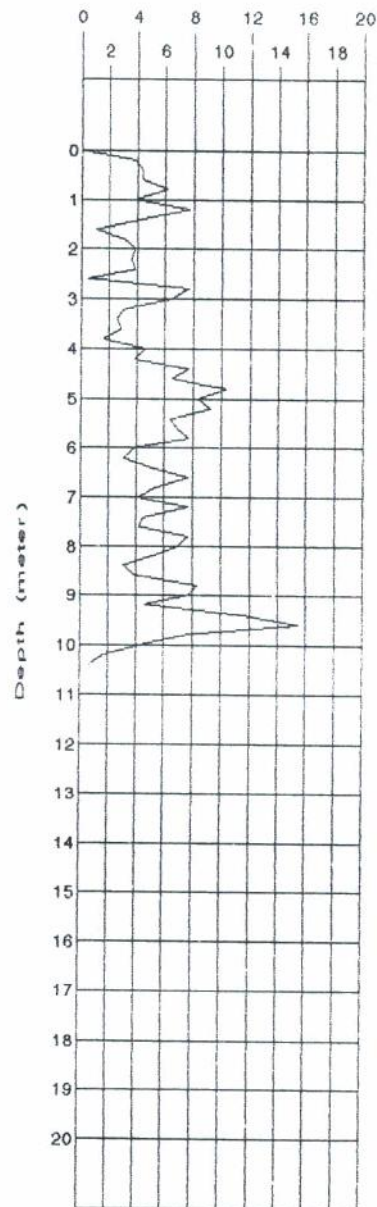
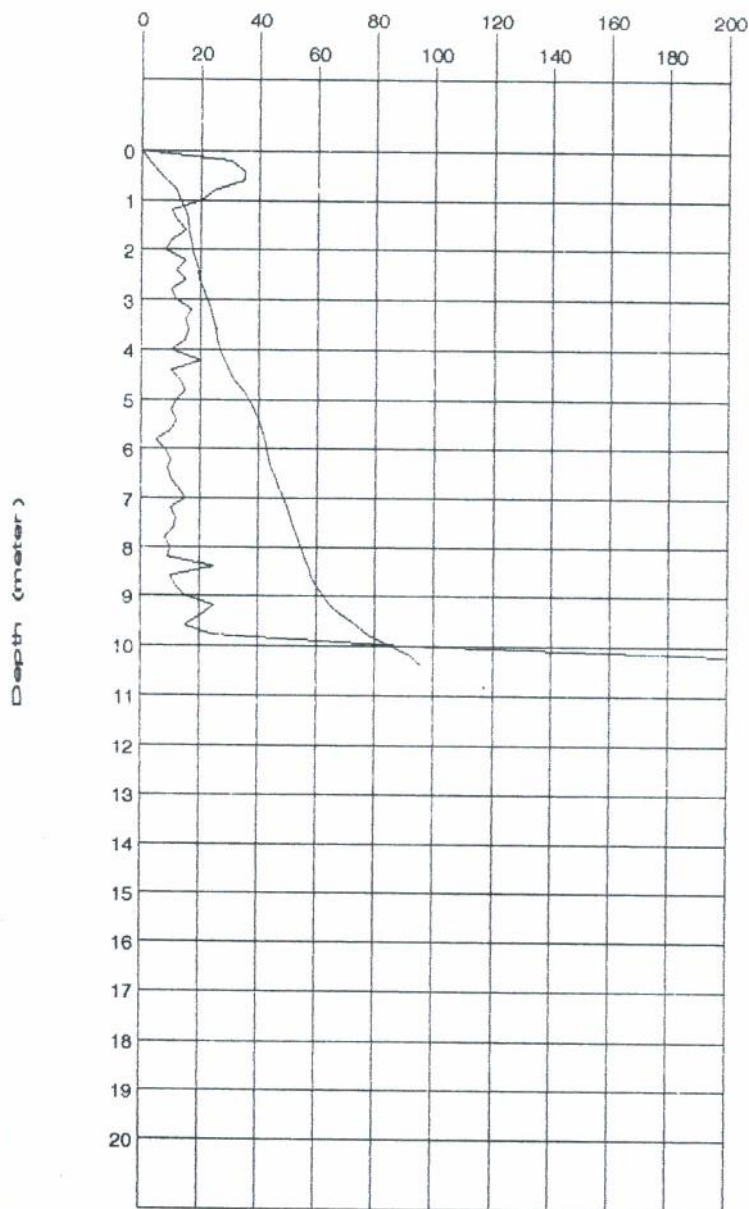
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CONE PENETRATION TEST

SONDIR No : S-3 PROJECT : PLN GI.TELUK NAGA LOCATION : TELUK NAGA TANGERANG	D1. qonus : 3.45 D2. jacket : 3.60 H. jacket : 10.71 Ratio (R) : 12.96 Elevation (meter) : 0.00 G.W.L. (- meter) : 2.80	DATE OF TESTED : Oktober 28 1994 TESTED BY : NE'AN Mr. CHECKED BY : MA.ONTOWIRYO Ir.
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Qc (Kg/cm²) and Tf (Kg/cm' x 10)

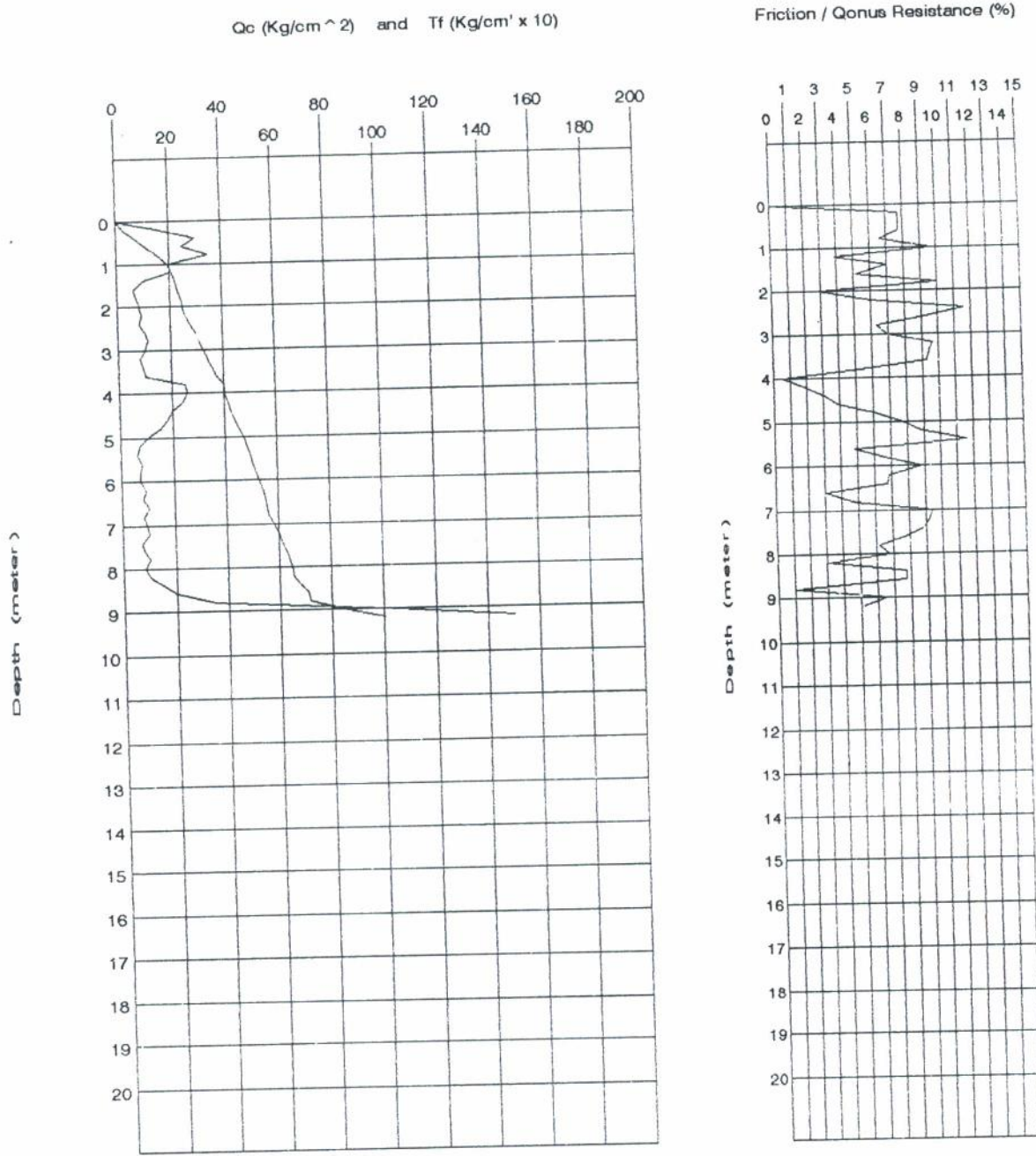
Friction / Qonus Resistance (%)



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CONE PENETRATION TEST

SONDIR No : S-4	D1. qonus : 3.45	DATE OF TESTED : Oktober 27 1994
PROJECT : PLN GI.TELUK NAGA	D2. jacket : 3.60	TESTED BY : NE'AN Mr.
LOCATION : TELUK NAGA TANGERANG	H. jacket : 10.71	CHECKED BY : MA.ONTOWIRYO Ir.
	Ratio (R) : 12.96	
	Elevation (meter) : 0.00	
	G.W.L (- meter) : 2.00	



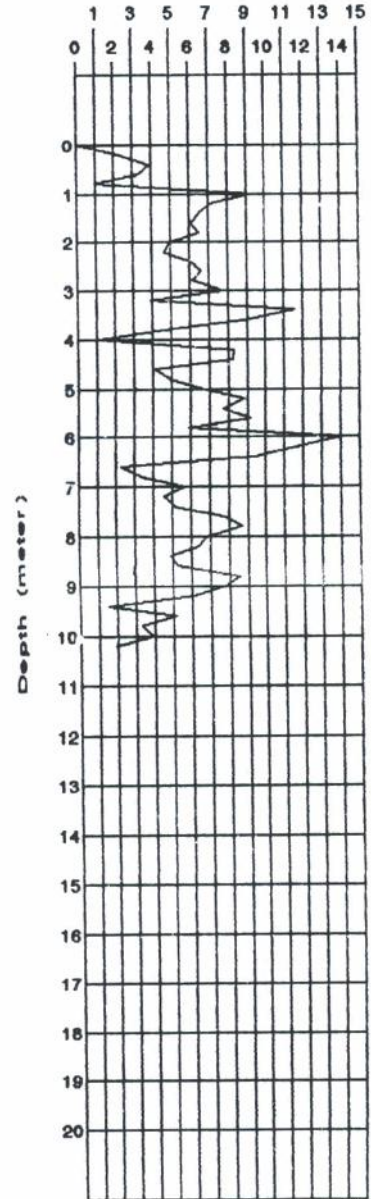
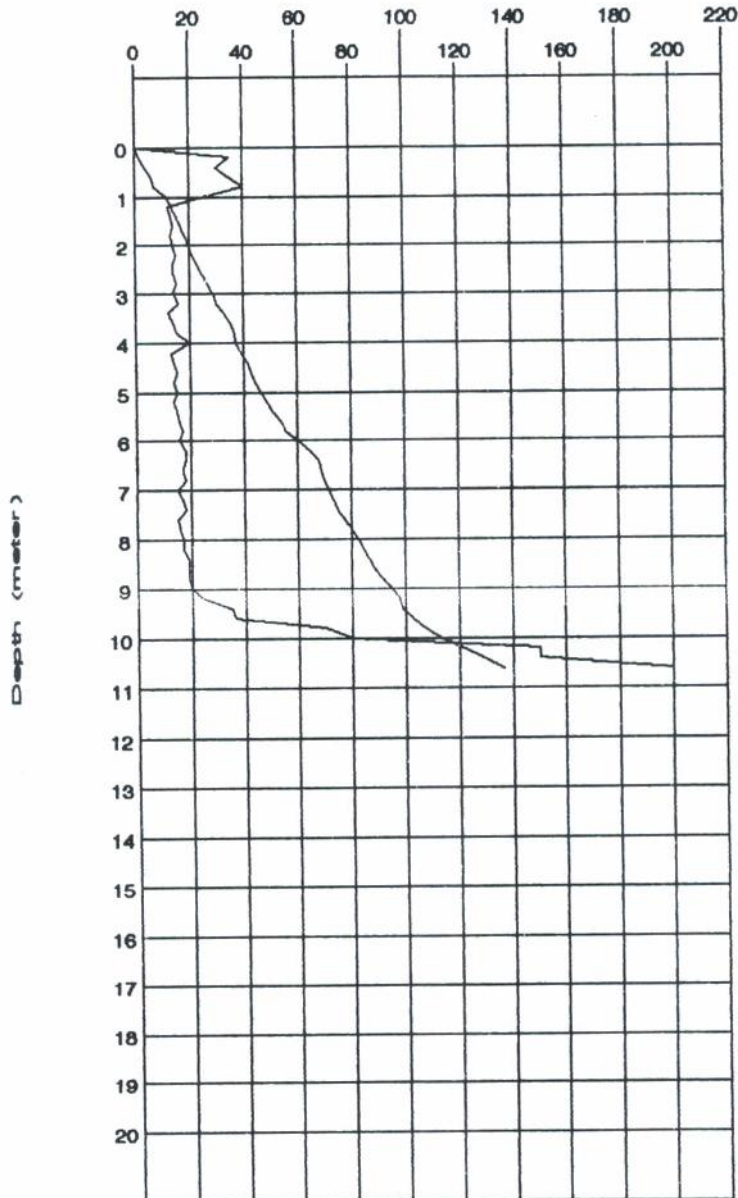
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CONE PENETRATION TEST

BONDIR No : S-5	D1. qonus : 3.45	DATE OF TESTED : Oktober 27 1994
PROJECT : PLN GI. TELUK NAGA	D2. jacket : 3.60	TESTED BY : NE'AN Mr.
LOCATION : TELUK NAGA TANGERANG	H. jacket : 10.71	CHECKED BY : MA ONTOWIRYO Ir.
	Ratio (R) : 12.86	
	Elevation (- meter) : 0.00	
	G.W.L. (- meter) : 2.00	

Qc (Kg/cm²) and Tf (Kg/cm' x 10)

Friction / Qonus Resistance (%)



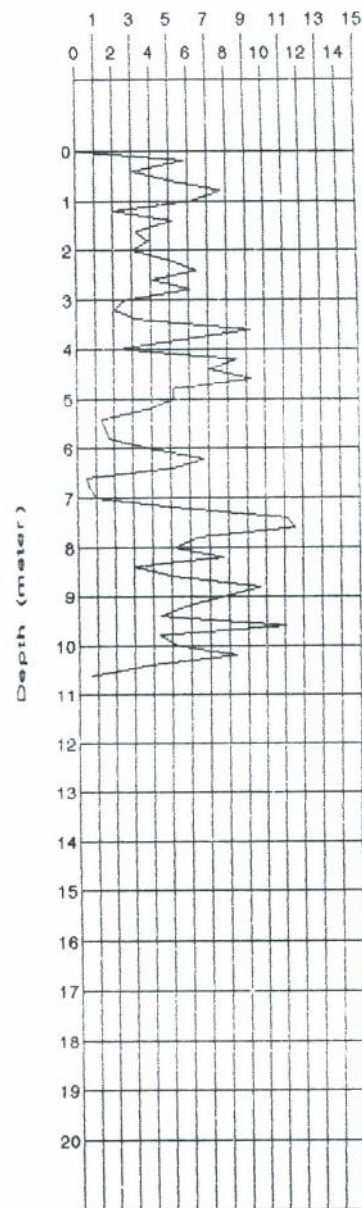
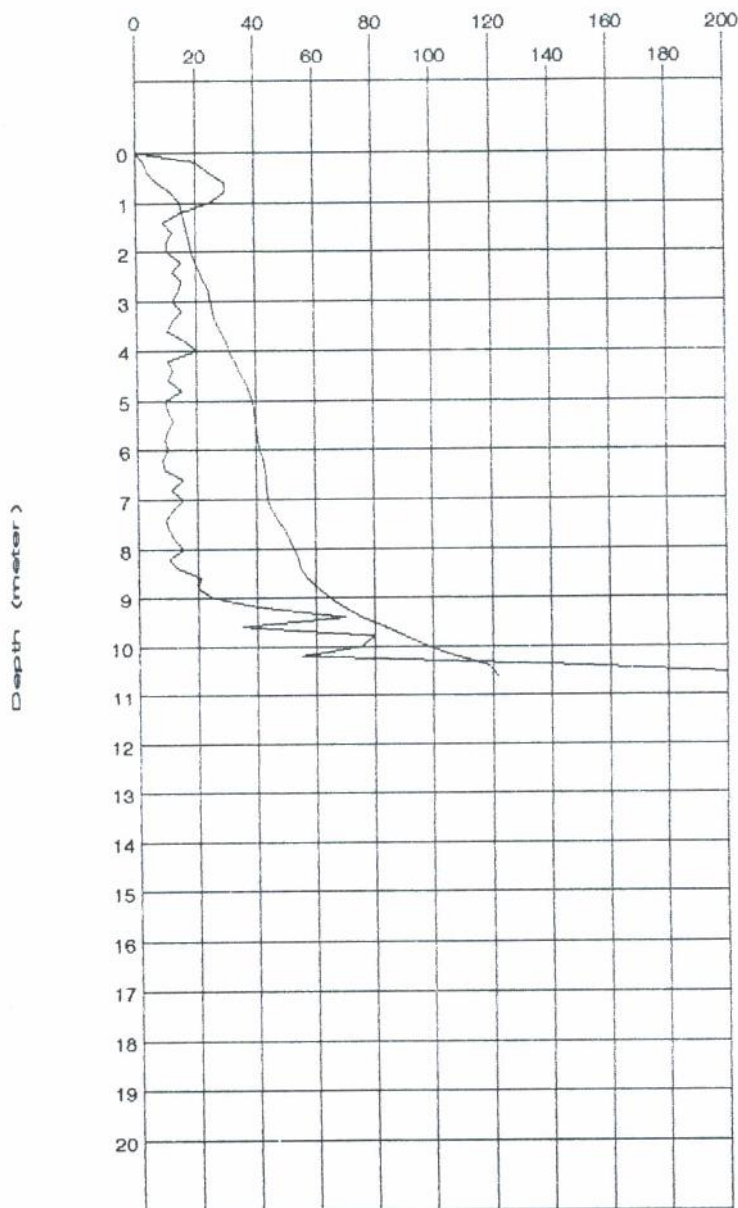
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CONE PENETRATION TEST

BONDIR No : S-8 PROJECT : PLN GI.TELUK NAGA LOCATION : TELUK NAGA TANGERANG	D1. qonus : 3.45 D2. jacket : 3.60 H. jacket : 10.71 Ratio (R) : 12.96 Elevation (meter) : 0.00 G.W.L. (- meter) : 0.00	DATE OF TESTED : Oktober 27 1994 TESTED BY : NE'AN Mr. CHECKED BY : MA.ONTOWIRYO Ir.
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Qc (Kg/cm²) and Tf (Kg/cm' x 10)

Friction / Qonus Resistance (%)



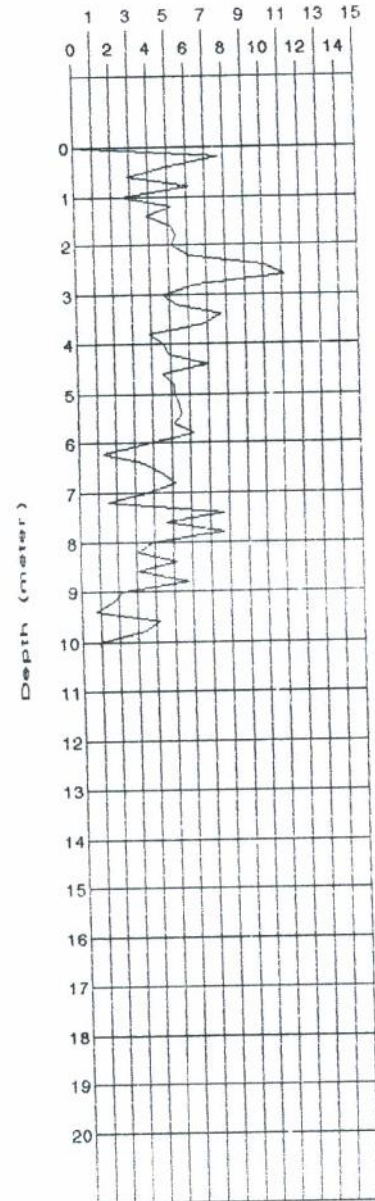
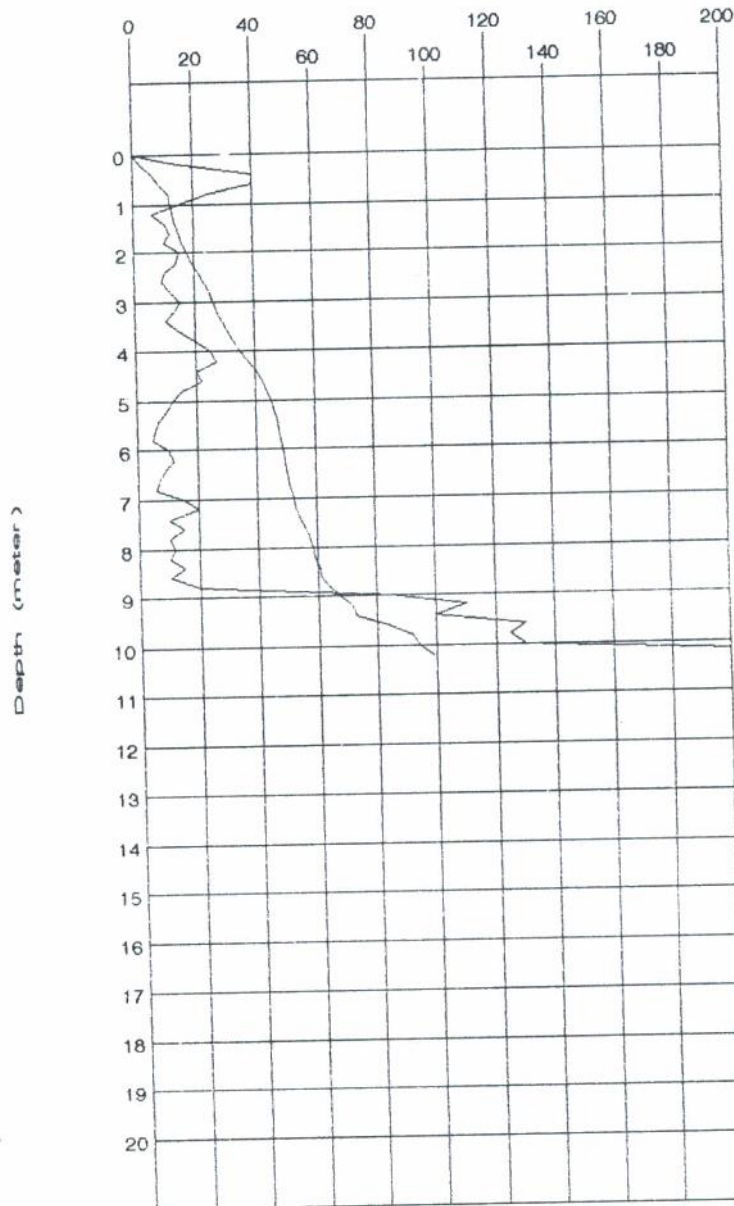
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CONE PENETRATION TEST

SONDIR No : S-7	D1. qonus : 3.45	DATE OF TESTED : Oktober 28 1994
PROJECT : PLN GI.TELUK NAGA	D2. jacket : 3.60	TESTED BY : NE'AN Mr.
LOCATION : TELUK NAGA TANGERANG	H. jacket : 10.71	CHECKED BY : MA.ONTOWIRYO Ir.
	Ratio (R) : 12.96	
	Elevation (meter) : 0.00	
	G.W.L (- meter) : 0.00	

Qc (Kg/cm²) and Tf (Kg/cm' x 10)

Friction / Qonus Resistance (%)



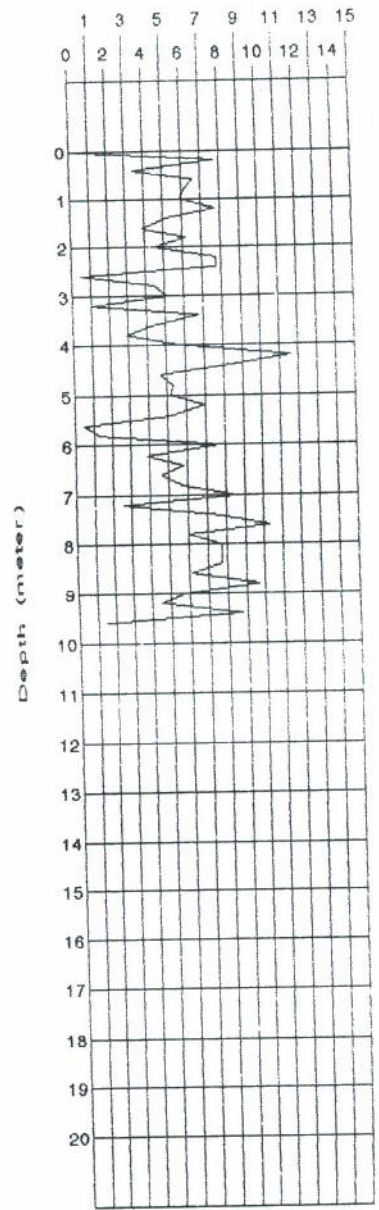
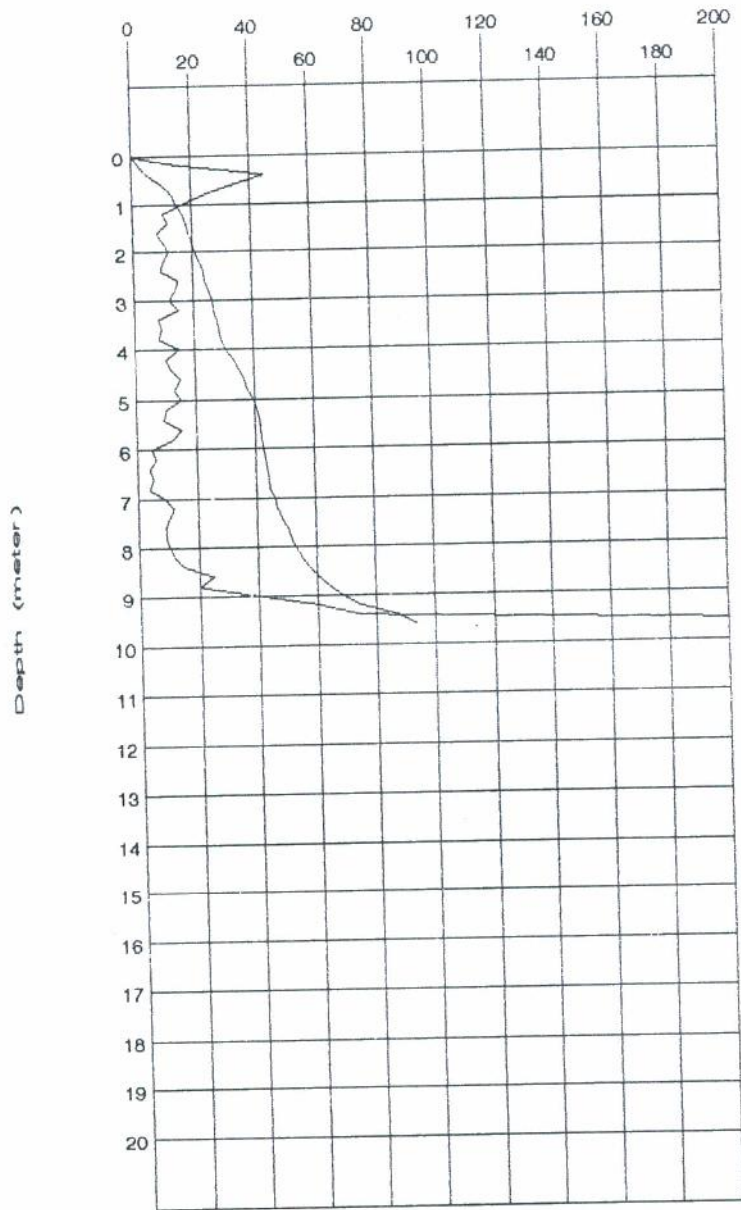
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CONE PENETRATION TEST

SONDIR No : S-8	D1. qonus : 3.45	DATE OF TESTED : Oktober 27 1994
PROJECT : PLN GI.TELUK NAGA	D2. jacket : 3.60	TESTED BY : NE'AN Mr.
LOCATION : TELUK NAGA TANGERANG	H. jacket : 10.71	CHECKED BY : MA.ONTOWIRYO Ir.
	Ratio (R) : 12.96	
	Elevation (meter) : 0.00	
	G.W.L (- meter) : 2.60	

Qc (Kg/cm²) and Tf (Kg/cm' x 10)

Friction / Qonus Resistance (%)



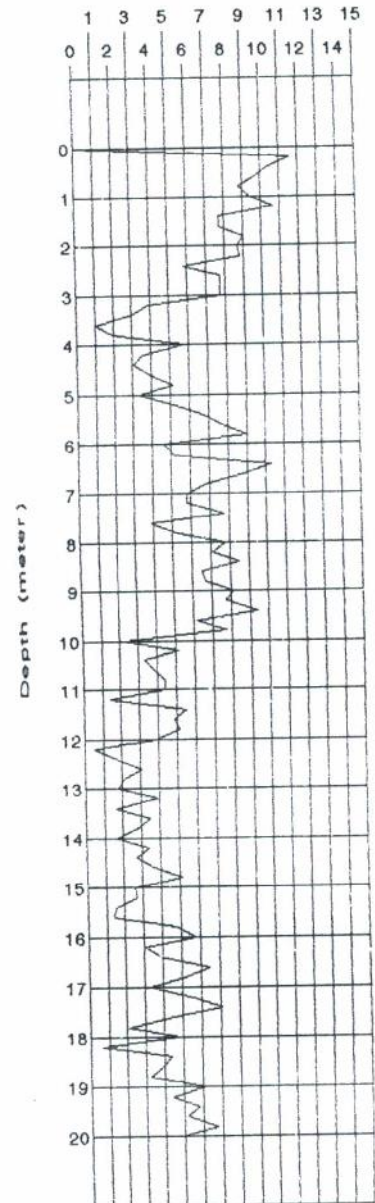
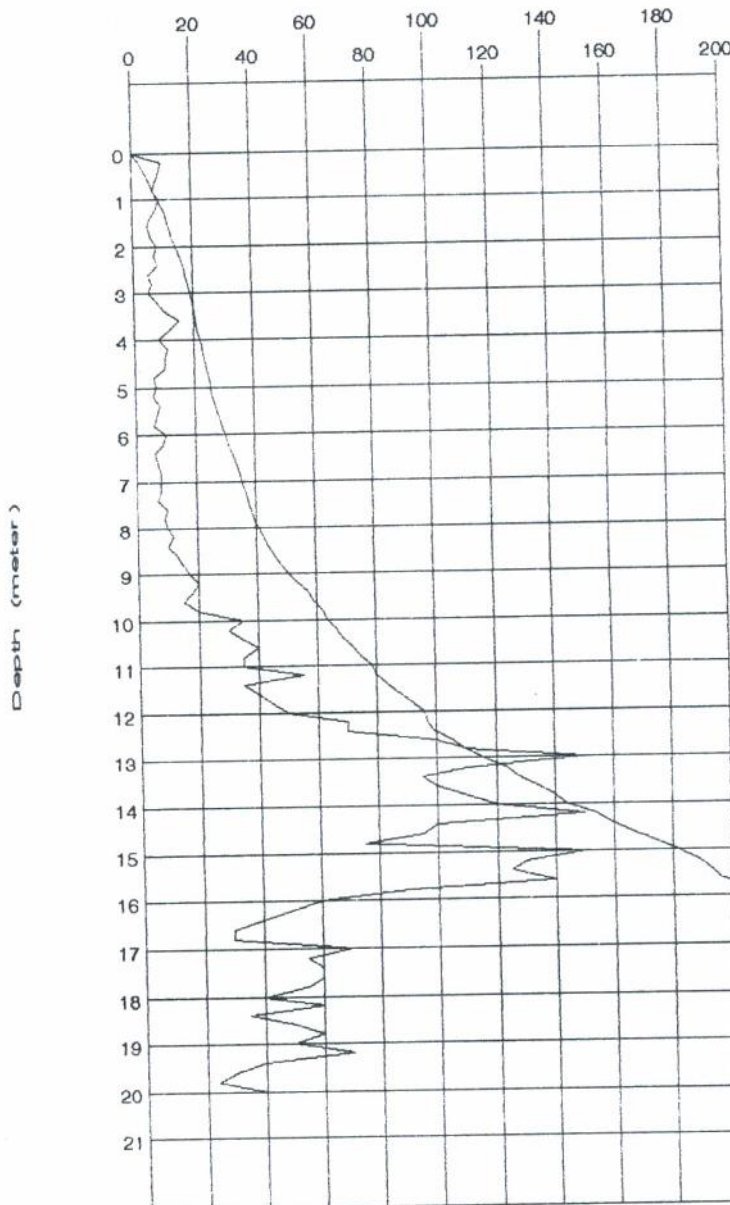
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CONE PENETRATION TEST

SONDIR No : S-9	D1. qonus : 3.45	DATE OF TESTED : Oktober 27 1994
PROJECT : PLN GI.TELUK NAGA	D2. jacket : 3.60	TESTED BY : NE'AN Mr.
LOCATION : TELUK NAGA TANGERANG	H. jacket : 10.71	CHECKED BY : MA.ONTOWIRYO Ir.
	Ratio (R) : 12.96	
	Elevation (meter) : 0.00	
	G.W.L (- meter) : 2.00	

Qc (Kg/cm²) and Tf (Kg/cm' x 10)

Friction / Qonus Resistance (%)



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LABORATORY TESTING RESULTS

PROJECT : GARDU INDUK TELUK NAGA
 LOCATION : TANGERANG, JAWA BARAT .
 BORING : B.1 , 2 , 3 .

SAMPLE NO	sample type	classification symbol	INDEX PROPERTIES									
			W _n %	$\gamma_{m \text{ wet dry}}$ t/m ³	G _s	e	S _r %	W _p %	W _L %	P _i %	GRAIN SIZE	
											SIEVE %	HYDRO %
100 a 45.	U		40,15	$\frac{1,713}{1,211}$	2,412	0,9992	96,92	31,06	130,11	99,05	29	71
100 a 45.	U		42,289	$\frac{1,698}{1,181}$	2,427	1,0631	96,54	27,48	101,51	74,03	26	74
200 a 45	U		39,156	$\frac{1,749}{1,237}$	2,513	1,0390	94,71	40	115,89	75,89	37,5	62,5
200 a 45	U		38,018	$\frac{1,759}{1,273}$	2,459	0,9394	99,52	29,03	92,10	63,07	24	76
300 a 45	U		41,482	$\frac{1,754}{1,204}$	2,664	1,2211	90,50	33,10	103,02	69,84	24	76



LABORATORY TESTING RESULTS

PROJECT : GARJU INDUK TELUK NAGA
 LOCATION : TANGERANG, JAWA BARAT .
 BORING : B.3 .

SAMPLE DEPTH (m)	sample type	classification symbol	INDEX PROPERTIES									
			W _n %	$\gamma_{m\text{wet}}^{\text{dry}}$ t/m ³	G _s	e	S _r %	W _p %	W _L %	P _i %	GRAIN SIZE	
											SIEVE %	HYDRO %
B.3 2,00 /d 2,45	U		94,502	$\frac{1,481}{0,758}$	2,698	2,5721	99,13	25,71	86,19	60,48	36	64



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LABORATORY TESTING RESULTS

PROJECT : GARDU INDUK TELUK NAGA
 LOCATION : TANGERANG, JAWA BARAT .
 BORING : B.1, B.2, B.3.

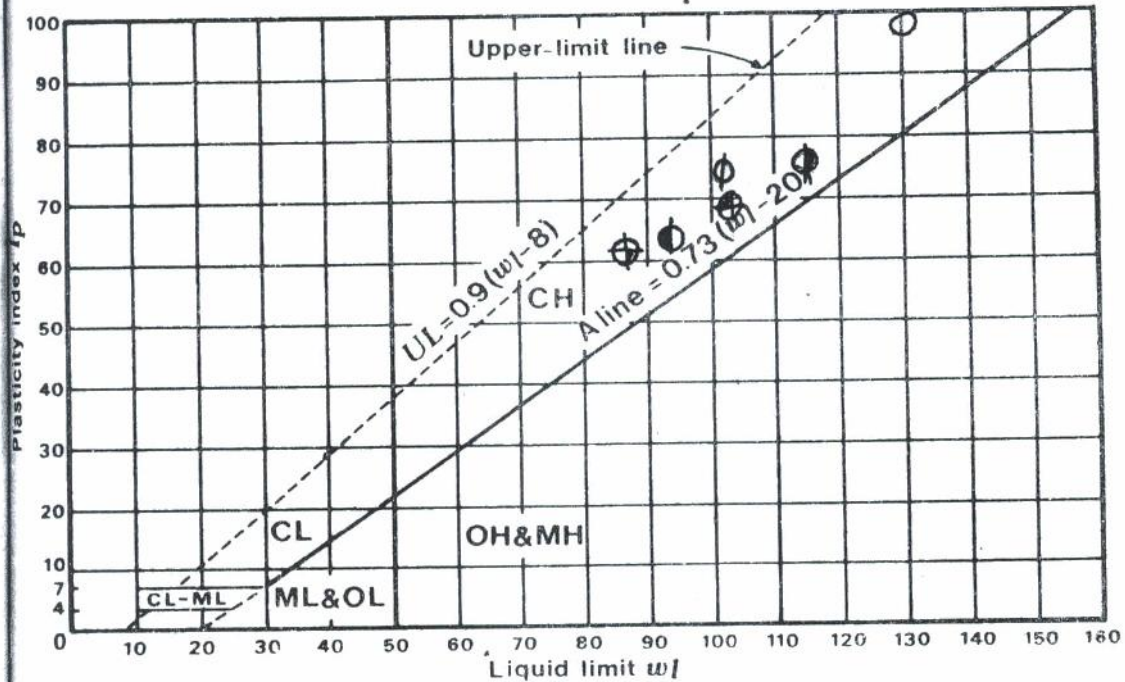
Sample Depth (m)	sample type		classifica- tion symbol	ENGINEERING PROPERTIES					
				Shear strength				Compressibility	
				C , C' (kg/cm ²)	ϕ , ϕ' (°)	q_{uu} (kg/cm ²)	S_t	C_c	C_v (cm ² /sec)
B.1 2,00 s/d 2,45.	U		0,016	13,5°	-	-	1,021	5,4 x 10 ⁻³	
B.1 3,00 s/d 3,45	U		0,02	17,5°	-	-	0,416	4,687 x 10 ⁻³	
B.2 2,00 s/d 2,45	U		0,04	15°	-	-	0,451	5,36 x 10 ⁻³	
B.2 3,00 s/d 3,45	U		0,05	18°	-	-	0,44	4,5 x 10 ⁻³	
B.3 2,00 s/d 2,45	U		0,015	17°	-	-	0,523	4,44 x 10 ⁻³	
B.3 3,00 s/d 3,45	U		0,025	17°	-	-	0,41	5,79 x 10 ⁻³	



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Project : GARDU INDUK TELUK NAGA
Location : TANGERANG , JAWA BARAT .
Test By : Ir. S Hanny E
Date of Test : Nopember 1994 .

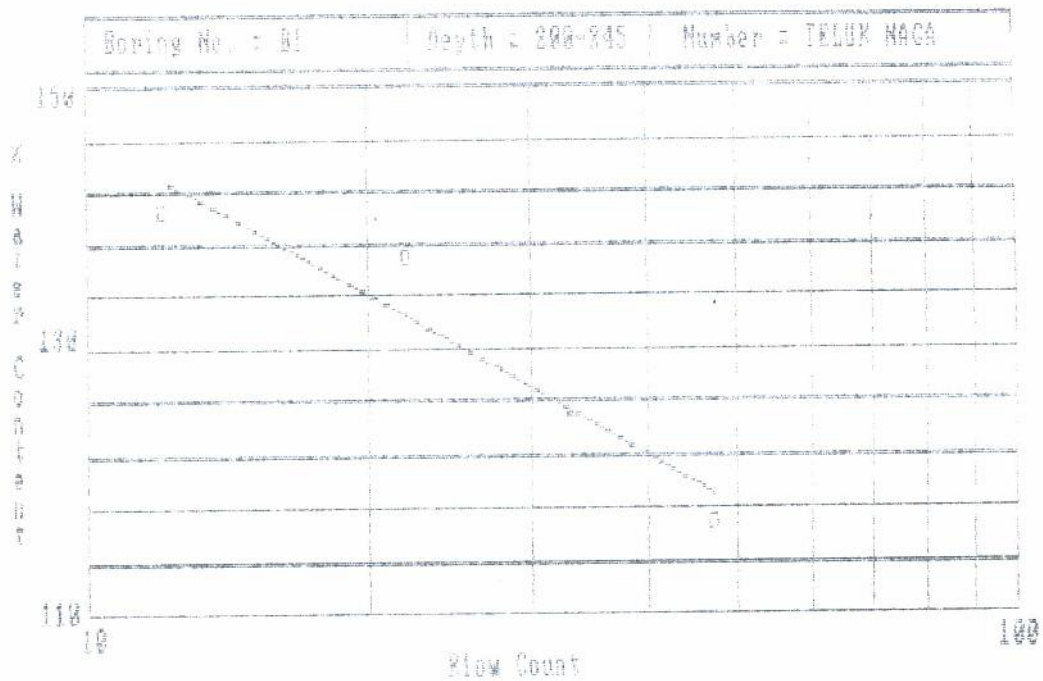
PLASTICITY CHART



Boring No.	Depth (M)	Symbol	WL (%)	WP (%)	IP (%)	Unified Classification
B.1	200 - 245	○	130,11	31,06	99,05	CH
	300 - 345	⊖	101,51	27,48	74,03	CH
B.2	200 - 245	⊖	115,89	40	75,89	CH
	300 - 345	⊖	92,10	29,03	63,07	CH
B.3	150 - 195	⊖	103,02	33,10	69,84	CH
	200 - 245	⊖	86,19	25,71	60,48	CH



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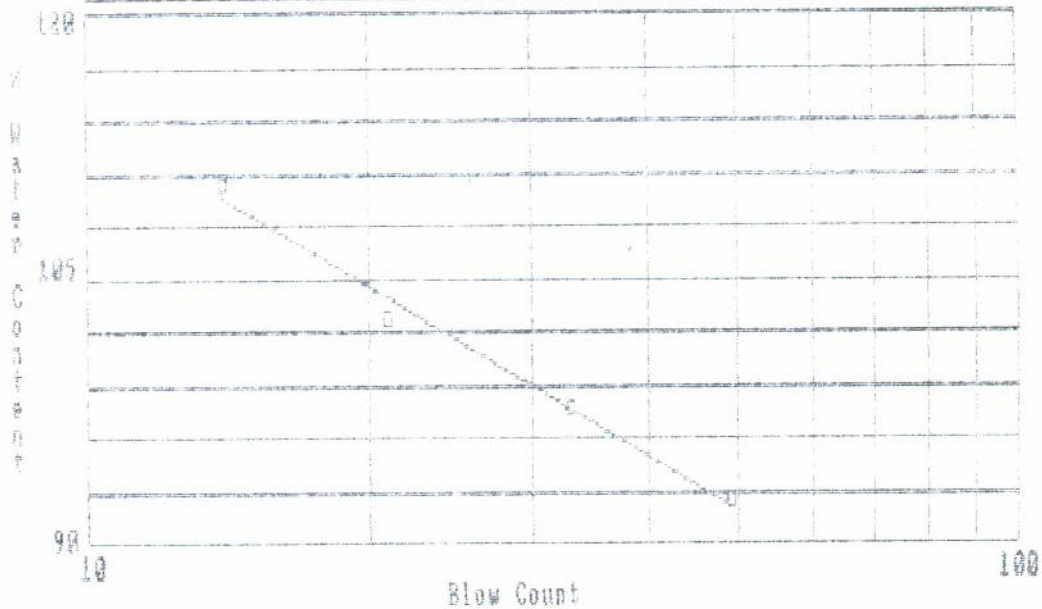


Sample no.	1	2	3	4				
% Water content	116.90	125.46	136.93	140.33				
Blow count	47	33	22	12				
Regression equation					Coefficient of determination			
$W = -40.217 * \log N + 185.3325$					$R^2 = .9053$ ** Excellent Test			
Liquid Limit = 40.11					Flow Index = -40.83			
Input plastic Limit = 31.86					Toughness Index = -3.46			
Plasticity Index = 99.05					Shrinkage Limit = 11.97			
Input natural water content = 40.15					Liquidity Index = .80			
Boring No. = B1			Depth = 200-245		Number = TELUK NAGA			



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Boring No. = B 1 Depth = 300-345 Number = TELUK NAGA

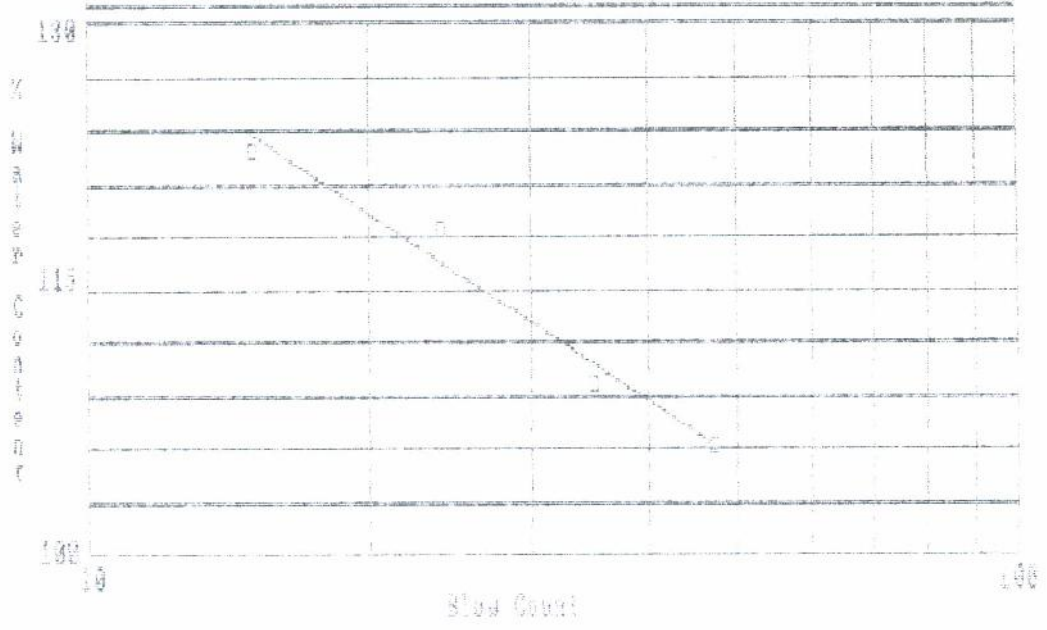


Sample no.	1	2	3	4				
% Water content	93.45	97.90	102.70	118.34				
Blow count	49	28	21	14				
Regression equation					Coefficient of determination			
$W = -31.9875 * \log H + 146.2243$					$R^2 = .9872$ ** Excellent Test			
Liquid limit = 101.51					Flow index = -31.99			
Input plastic limit = 37.48					Toughness index = -3.31			
Plasticity index = 74.03					Shrinkage limit = 13.94			
Input natural water content = 42.265					Liquidity index = .2			
Boring No. = B 1			Depth = 300-345		Number = TELUK NAGA			



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Boring No. = B 11 Depth = 200-245 Number = TELUK NAGA

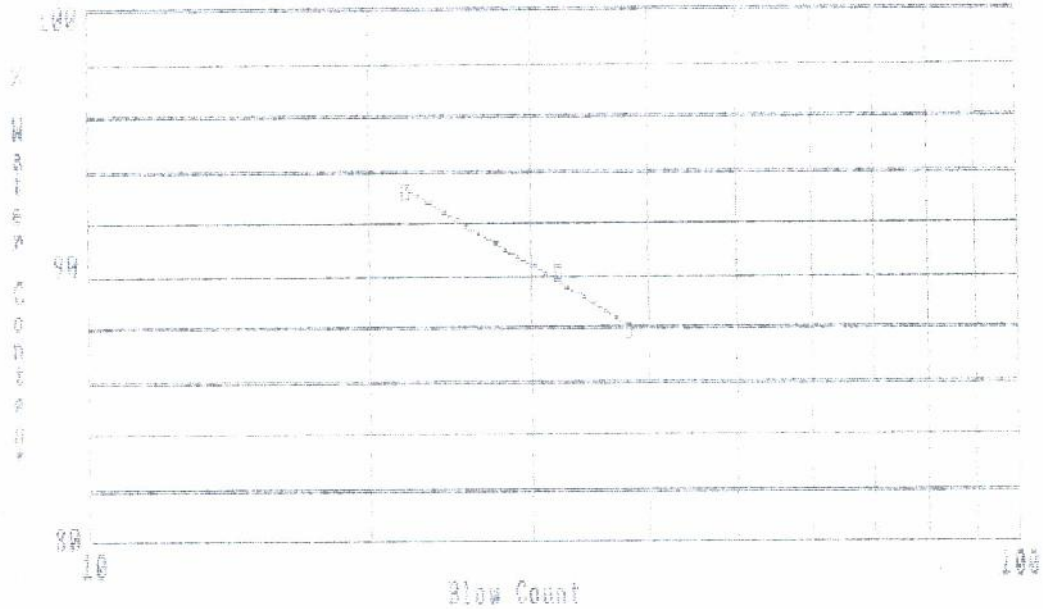


Sample no.	1	2	3	4				
% Water content	106.15	109.72	118.37	123.90				
Blow count	47	35	24	15				
Regression equation					Coefficient of Determination			
$W = -35.3414 * \log N + 155.2993$					$R^2 = 0.978 \Rightarrow$ Excellent test			
Liquid limit = 115.33					Flow index = -35.34			
Input plastic limit = 49					Toughness index = -2.15			
Plasticity index = 75.89					Shrinkage limit = 17.36			
Input natural water content = 39.156					Liquidity index = -0.81			
Boring No. = B 11 Depth = 200-245 Number = TELUK NAGA								



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Boring No. = B 11 Depth = 300-345 Number = TELUK NAGA

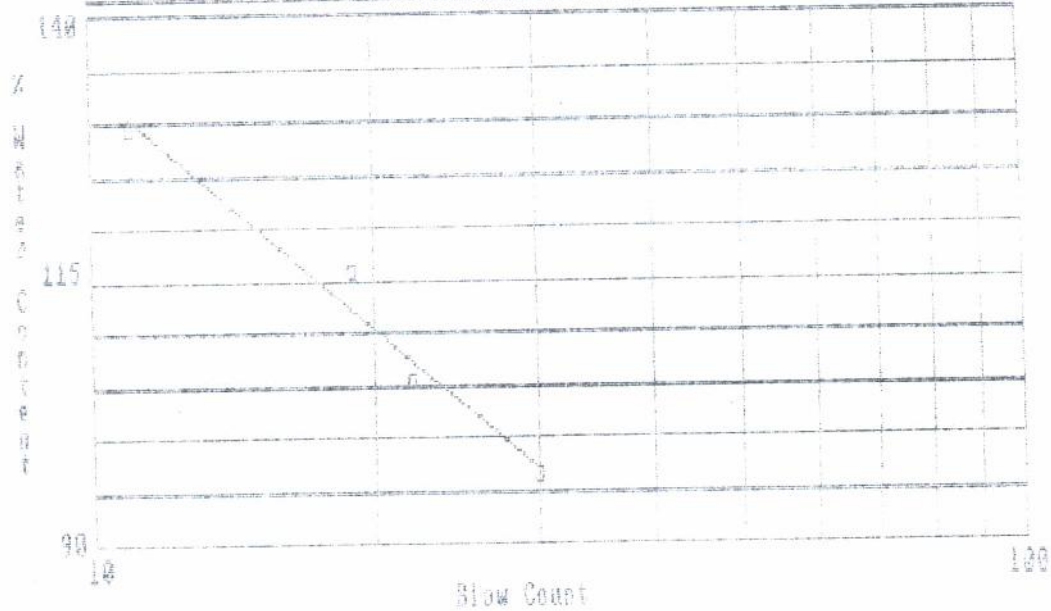


Sample no.	1	2	3				
% Water content	87.91	90.18	93.21				
Blow count	28	33	33				
Regression equation				Coefficient of determination			
$W = -31.8887 * \log N + 123.3762$				$R^2 = .9878$ ** Excellent Test			
Liquid limit = 92.1				Flow index = -21.2			
Input plastic limit = 29.23				Toughness index = -3.09			
Plasticity index = 63.87				Shrinkage limit = 11.65			
Input natural water content = 30.010				Liquidity index = .14			
Boring No. = B 11			Depth = 300-345		Number = TELUK NAGA		



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Boring No. = B 111 Depth = 150-195 Number = TELUK NAGA

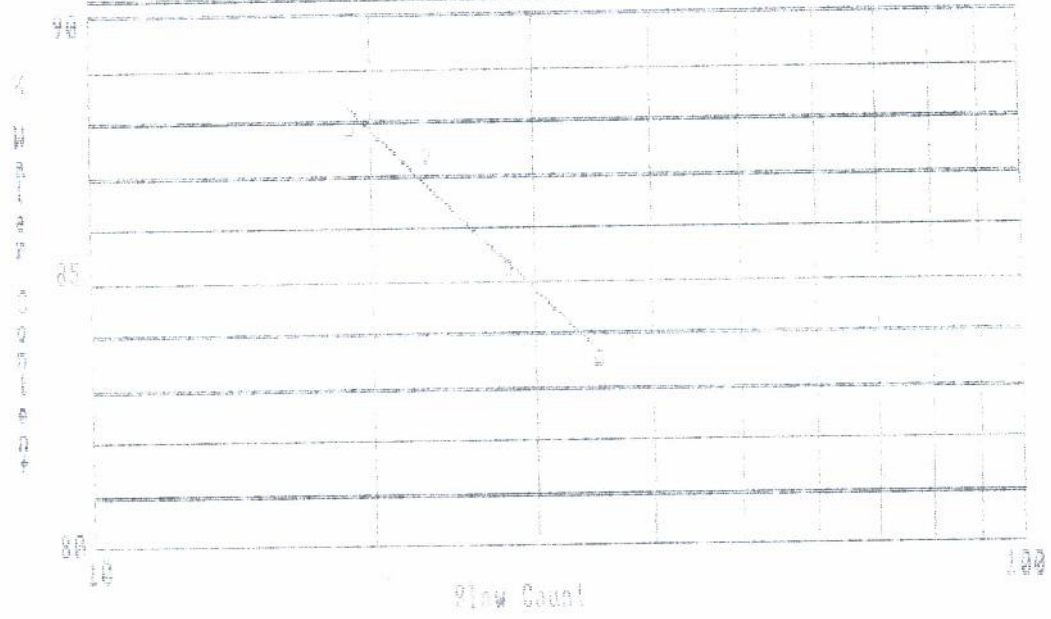


Sample no.	1	2	3	4			
% Water content	96.30	105.41	115.71	129.83			
Blow count	30	22	19	11			
Regression equation				Coefficient of determination			
$W = -76.4777 * \log d + 209.9296$				$R^2 = .9703$ ** Excellent test			
Liquid Limit = 103.03				Flow index = 76.48			
Input plastic limit = 33.10				Toughness index = -.91			
Plasticity index = 69.94				Shrinkage limit = 15.86			
Input natural water content = 11.432				Liquid Limit = 13			
Boring No = B 111		Depth = 150-195		Number = Teluk Naga			



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Boring No. = B 111 Depth = 200-245 Number = TELUK NAGA

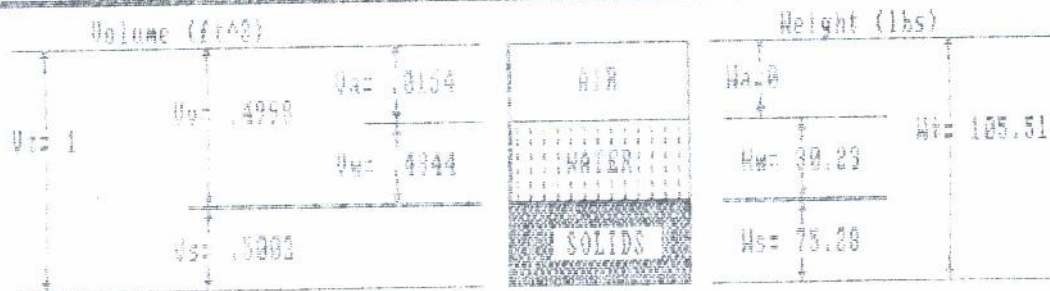


Sample no.	1	2	3	4				
% Water content	89.50	88.33	87.35	87.89				
Blow count	35	38	33	19				
Regression equation					Coefficient of Determination			
$W = -17.2250 * \log N + 110.2675$					$R^2 = .8689$ ** Excellent best			
Liquid limit = 86.11					Flow index = 17.23			
Input plastic limit = 35.71					Toughness index = -3.51			
Plasticity index = 50.40					Shrinkage limit = 12.87			
Input natural water content = 94.502					Liquidity index = 1.14			
Boring No. = B 111			Depth = 200-245		Number = TELUK NAGA			



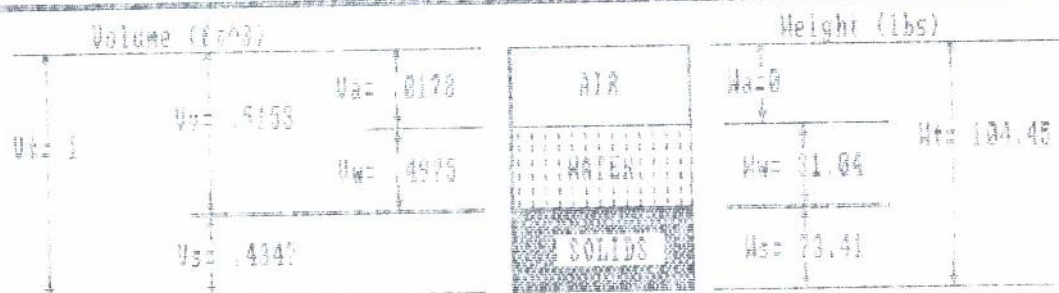
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Boring No. = 8.1	Depth = 200 - 245	Number = GIS TELUK NAGA
Mass Unit Weight (pcf)	Water Content (%)	Specific Gravity of Solids
185.51	48.15	2.412



Void Ratio	0.9992	% Saturation	96.92
Porosity (%)	49.98	Dry Unit Wt (pcf)	75.28
Sat. Unit Wt (pcf)	106.47	Boqy. Unit Wt (pcf)	44.07

Boring No. = 8.1	Depth = 300 - 345	Number = GIS TELUK NAGA
Mass Unit Weight (pcf)	Water Content (%)	Specific Gravity of Solids
184.45	42.389	3.427

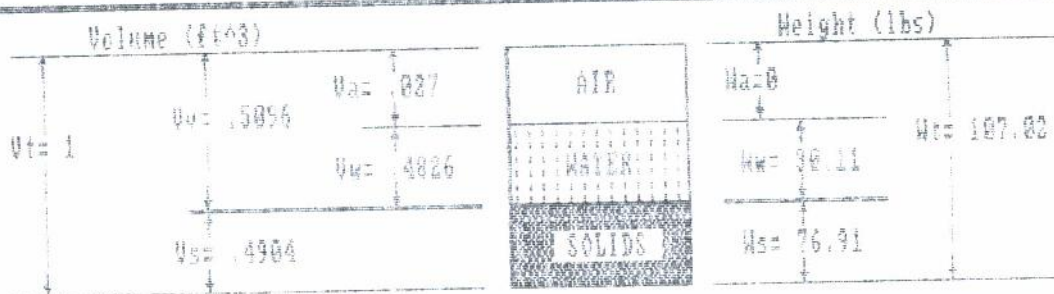


Void Ratio	1.0631	% Saturation	96.54
Porosity (%)	51.53	Dry Unit Wt (pcf)	73.41
Sat. Unit Wt (pcf)	105.56	Boqy. Unit Wt (pcf)	43.16



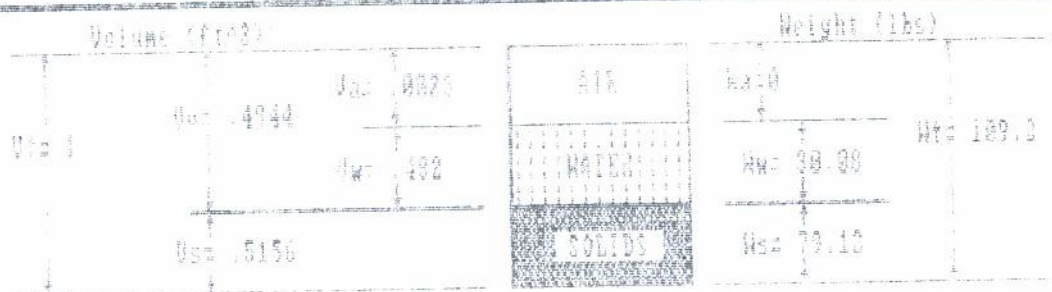
LABORATORIUM MEKANIKA TANAH
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INSTITUT SAINS DAN TEKNOLOGI NASIONAL - JAKARTA
 Kampus ISTN Bhumi Serengseng Telp. 7270092, Fax. 7270090

Boring No. = B.2	Depth = 300 - 345	Number = GIS TELUK NAGA
Mass Unit Weight (pcf)	Water Content (%)	Specific Gravity of Solids
107.03	39.156	2.513



Void Ratio	1.0390	% Saturation	94.71
Porosity (%)	50.96	Dry Unit Wt (pcf)	76.91
Sat. Unit Wt (pcf)	108.79	Bovy. Unit Wt (pcf)	46.90

Boring No. = B.2	Depth = 300 - 345	Number = GIS TELUK NAGA
Mass Unit Weight (pcf)	Water Content (%)	Specific Gravity of Solids
109.3	38.018	2.459



Void Ratio	0.9394	% Saturation	90.51
Porosity (%)	48.64	Dry Unit Wt (pcf)	79.10
Sat. Unit Wt (pcf)	109.34	Bovy. Unit Wt (pcf)	46.94



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Boring No. = B.3	Depth = 150 -195	Number = GIS TELUK NAGA
Mass Unit Weight (pcf)	Water Content (%)	Specific Gravity of Solids
105.89	41.483	2.664



Void Ratio	1.2212	% Saturation	90.54
Porosity (%)	54.98	Dry Unit Wt (pcf)	74.84
Sat. Unit Wt (pcf)	109.15	Bouy. Unit Wt (pcf)	46.75

Boring No. = B.3	Depth = 200 -245	Number = GIS TELUK NAGA
Mass Unit Weight (pcf)	Water Content (%)	Specific Gravity of Solids
91.67	94.502	2.698



Void Ratio	2.5701	% Saturation	99.13
Porosity (%)	72.01	Dry Unit Wt (pcf)	47.13
Sat. Unit Wt (pcf)	92.06	Bouy. Unit Wt (pcf)	29.66



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TRIAXIAL TEST.

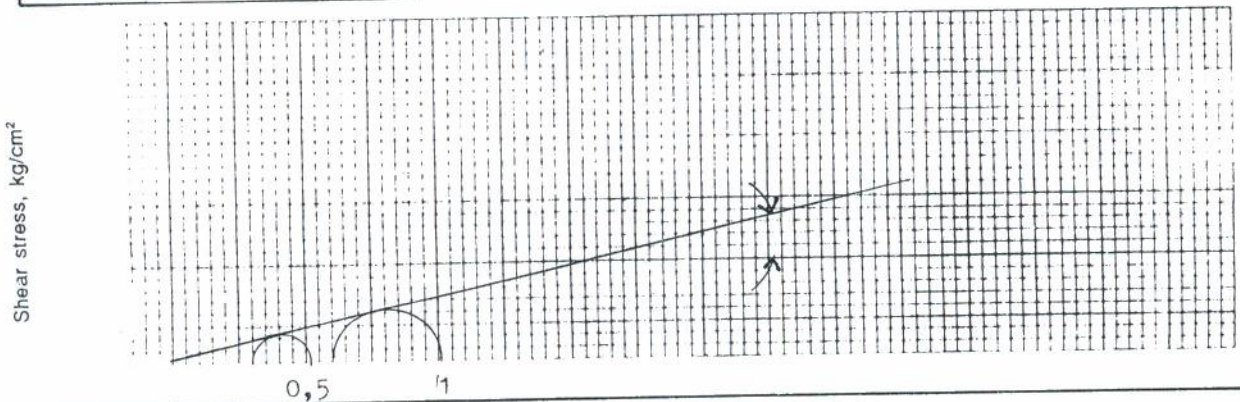
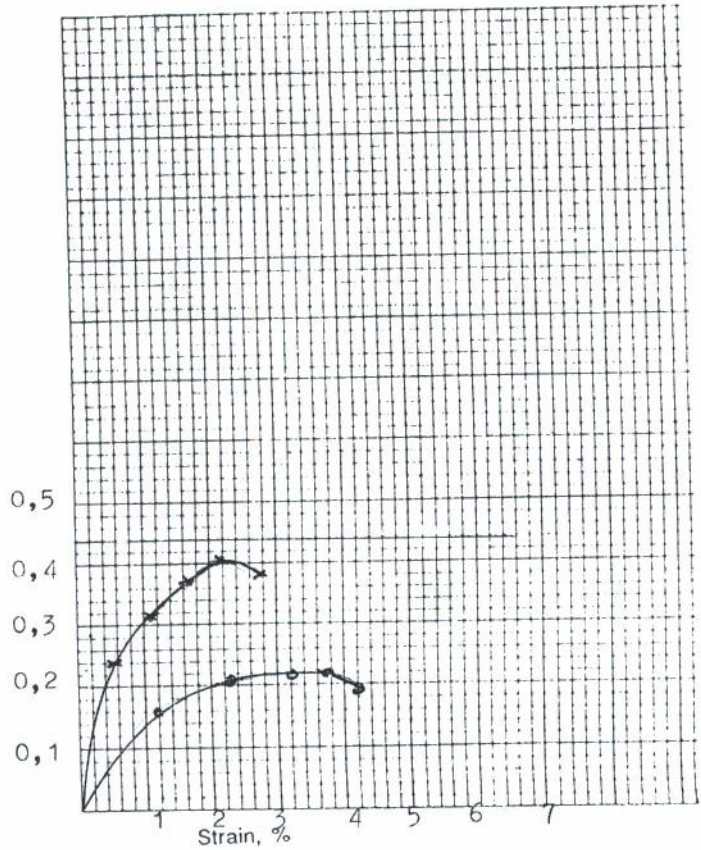
Project : GARJU INDUK TELUK NAGA
 Location : TANGERANG JABAR .
 Boring no : B.I (200-245)cm.
 Test By : Ir. Rahardjo. S

Data :

1. Machine LRC :
2. Sample dia : 3,50 cm.
 Sample ht : 7,05 cm.

	1	2	3	4
σ_3	0,3	0,6		
σ	0,22	0,41		
σ_1	0,52	1,01		
U				

γ wet :		ton/m ³
γ dry :		ton/m ³
w :		%
c :	0,016	kg/cm ²
ϕ :	13,5°	
Sr :		%



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TRIAXIAL TEST.

Project : GARDU INDUK TELUK WAGA

Location : TANGERANG JABAR

Boring no : B.I (300-345)cm.

Test By : Ir. Rahardjo. S

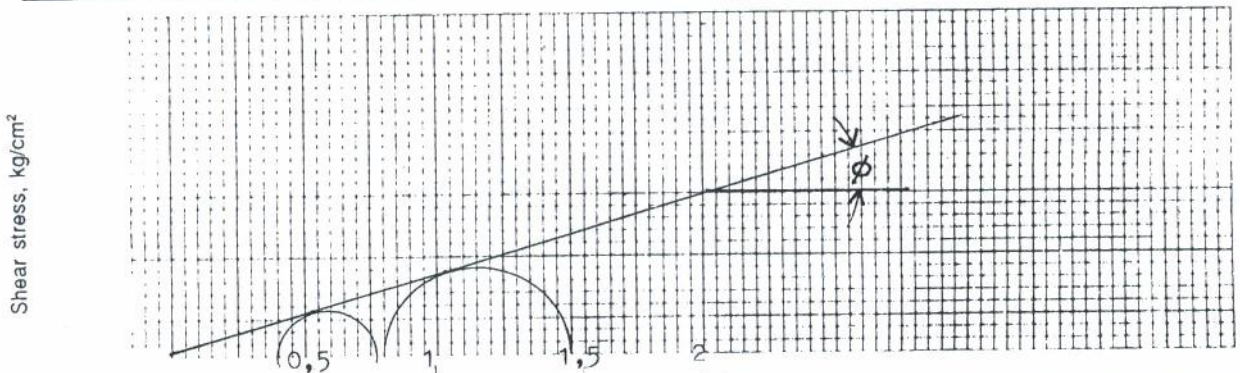
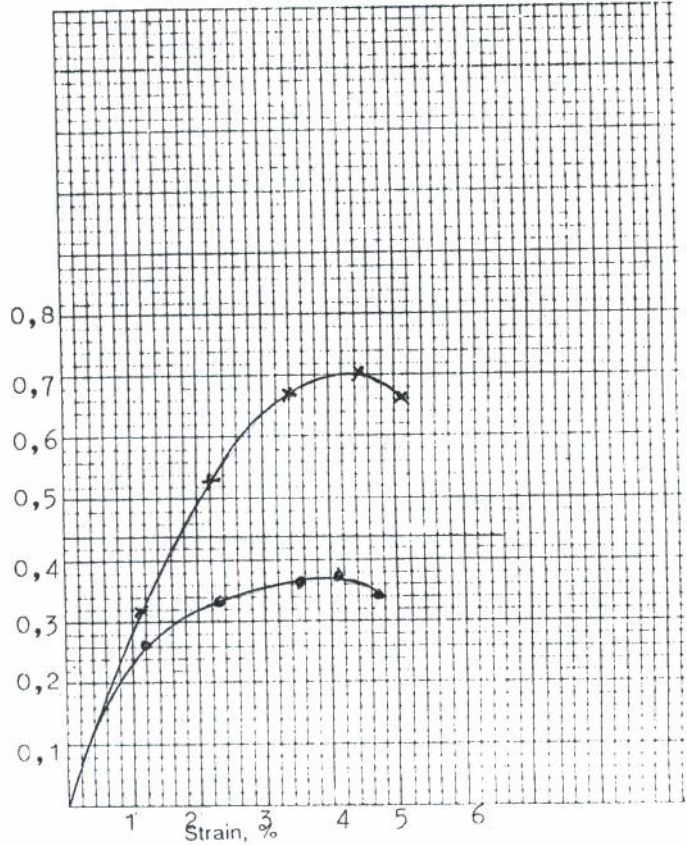
Data :

1. Machine LRC :
2. Sample dia : 3,50 cm.
Sample ht : 7,05 cm

	1	2	3	4
σ_3	0,4	0,8		
σ	0,37	0,70		
σ_1	0,77	1,5		
U				

γ wet :		ton/m ³
γ dry :		ton/m ³
w :		%
c :	0,02	kg/cm ²
ϕ :	17,5°	
Sr :		%

Deviator stress, ΔU



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TRIAXIAL TEST.

Project : GARDU INDUK TELUK NAGA
 Location : TANGERANG JABAR .
 Boring no : B.2 (200-245)cm.
 Test By : Ir. Rahardjo. S

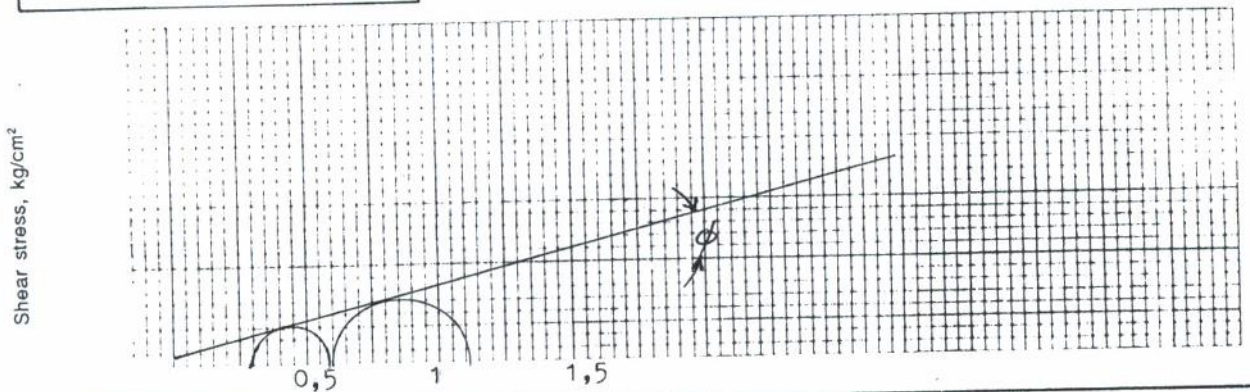
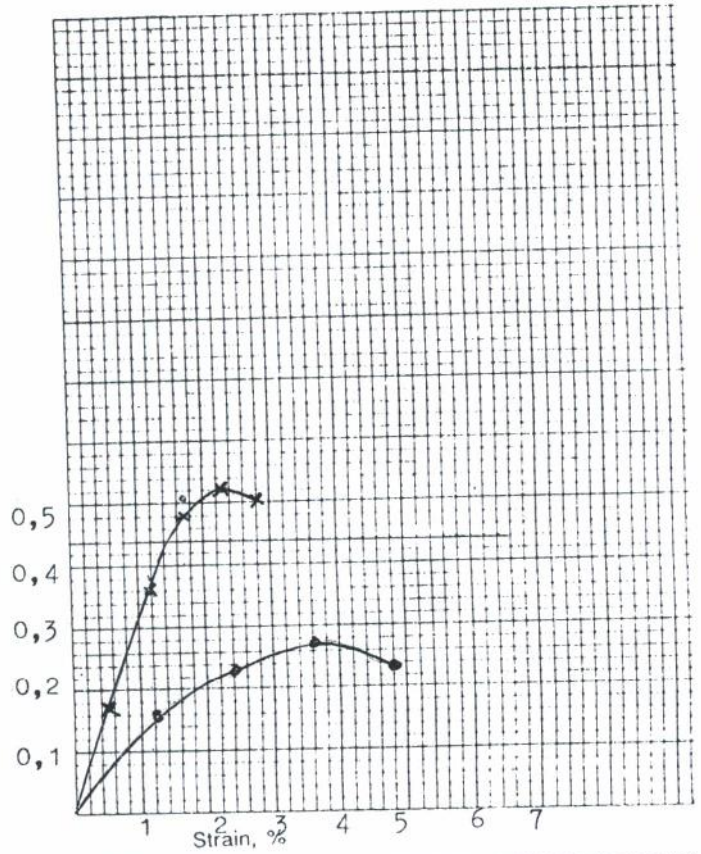
Data :

1. Machine LRC : 3,50 cm.
2. Sample dia : 3,50 cm.
- Sample ht : 6,75 cm .

	1	2	3	4
σ_3	0,3	0,6		
σ	0,27	0,52		
σ_1	0,57	1,12		
U				

γ wet :		ton/m ³
γ dry :		ton/m ³
w :		%
c :	0,04	kg/cm ²
ϕ :	15°	
Sr :		%

Deviator stress,
 ——— AU



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TRIAXIAL TEST.

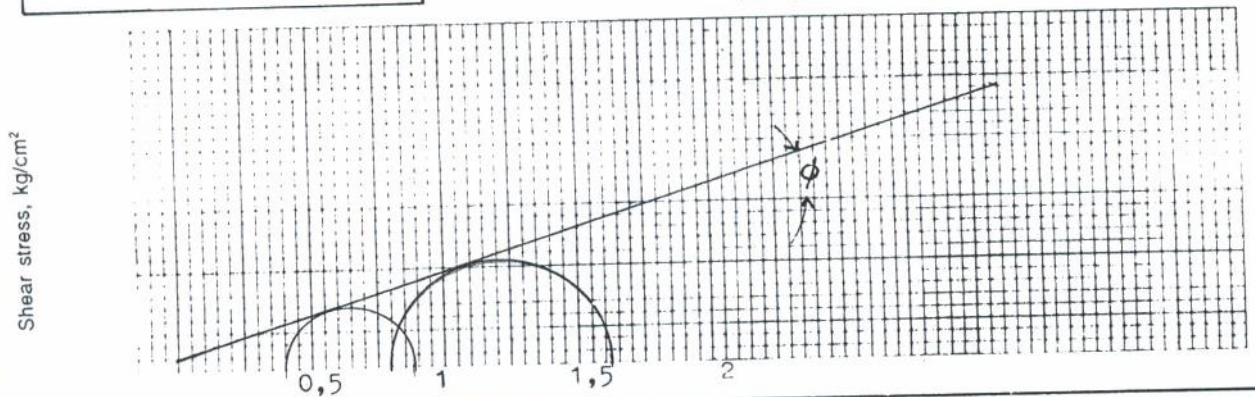
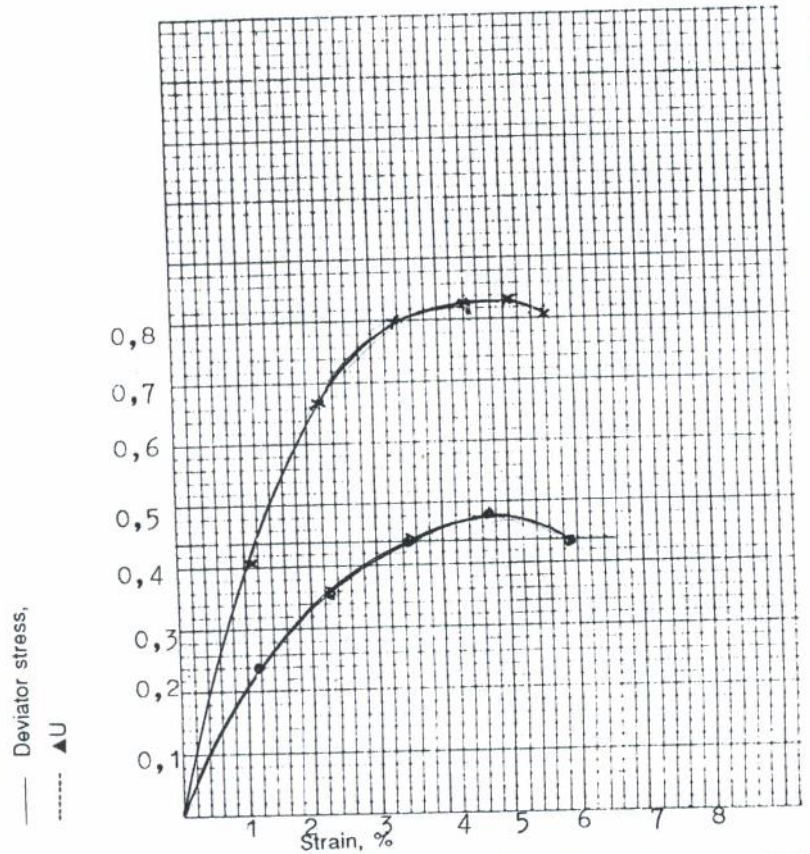
Project : GARDU INDUK TELUK NAGA
 Location : TANGERANG JABAR .
 Boring no : B.2 (300-345)cm.
 Test By : Ir. Rahardjo. S

Data :

1. Machine LRC :
2. Sample dia : 3,50 cm .
- Sample ht : 7,02 cm .

	1	2	3	4
σ_3	0,4	0,8		
σ	0,48	0,83		
σ_1	0,88	1,63		
U				

γ wet :		ton/m ³
γ dry :		ton/m ³
w :		%
c :	0,05	kg/cm ²
ϕ :	18°	
Sr :		%



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TRIAXIAL TEST.

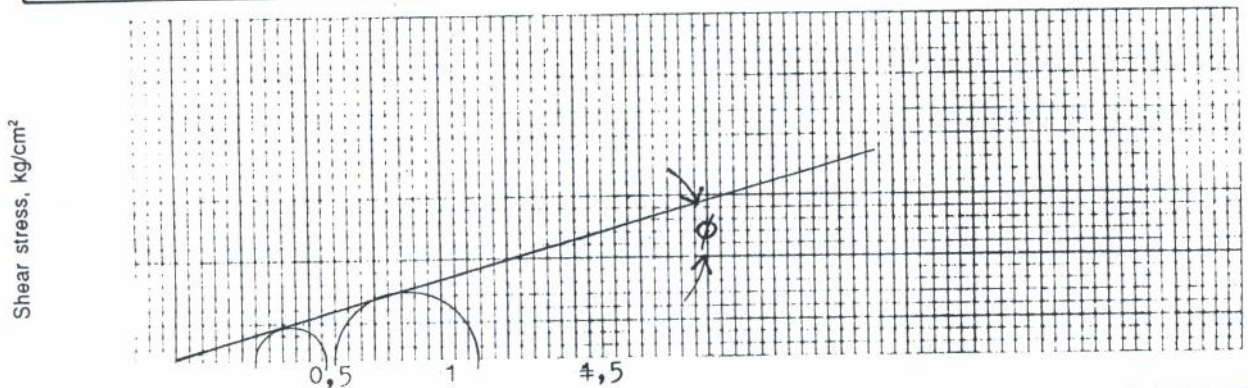
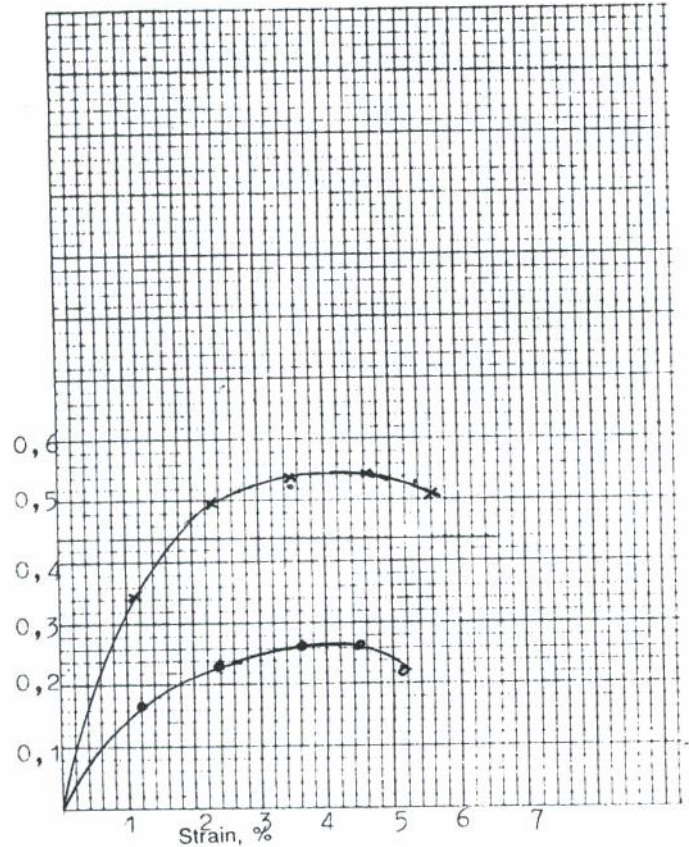
Project : GARDU INDUK TELUK NAGA
 Location : TANGERANG JABAR .
 Boring no : B.3 (200-245)cm.
 Test By : Ir. Rahardjo. S

Data :

1. Machine LRC :
2. Sample dia : 3,50 cm.
 Sample ht : 6,75 cm.

	1	2	3	4
σ_3	0,3	0,6		
σ	0,26	0,54		
σ_1	0,56	1,14		
U				

γ wet :		ton/m ³
γ dry :		ton/m ³
w :		%
c :	0,015	kg/cm ²
ϕ :	17°	
Sr :		%



TRIAXIAL TEST.

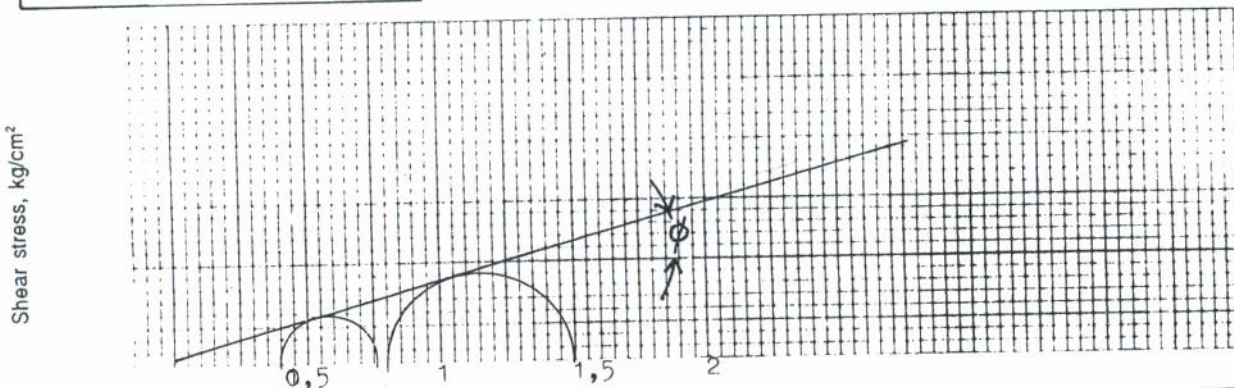
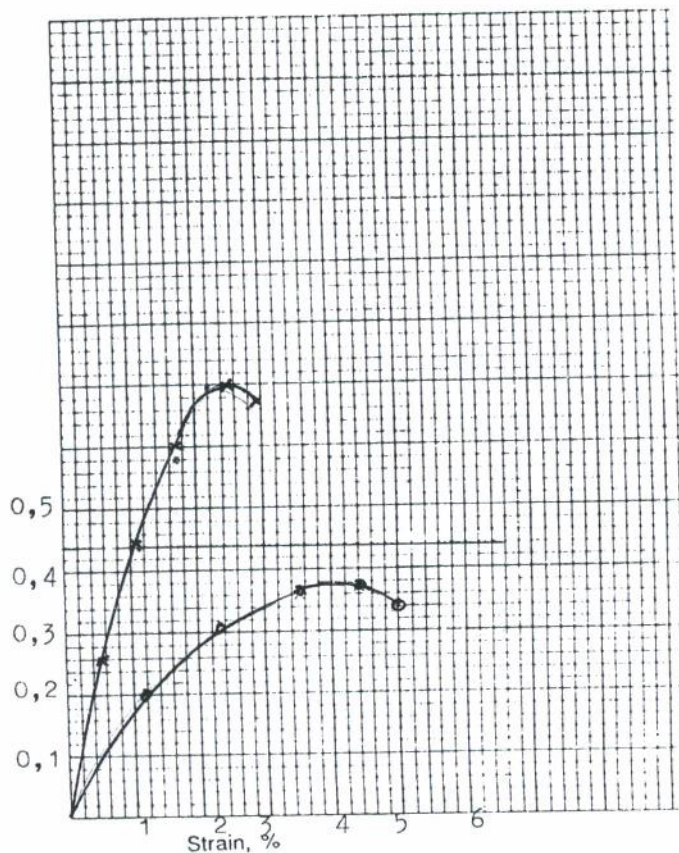
Project : GARLU INDIK TELUK NAGA
 Location : TANGERANG JABAR .
 Boring no : B.3 (300-345)cm.
 Test By : Ir. Rahardjo. S .

Data :

1. Machine LRC :
2. Sample dia : 3,50 cm .
 Sample ht : 7,01 cm.

	1	2	3	4
σ_3	0,4	0,8		
σ	0,37	0,70		
σ_1	0,77	1,50		
U				

γ wet :		ton/m ³
γ dry :		ton/m ³
w :		%
c :	0,025	kg/cm ²
ϕ :	17°	
Sr :		%

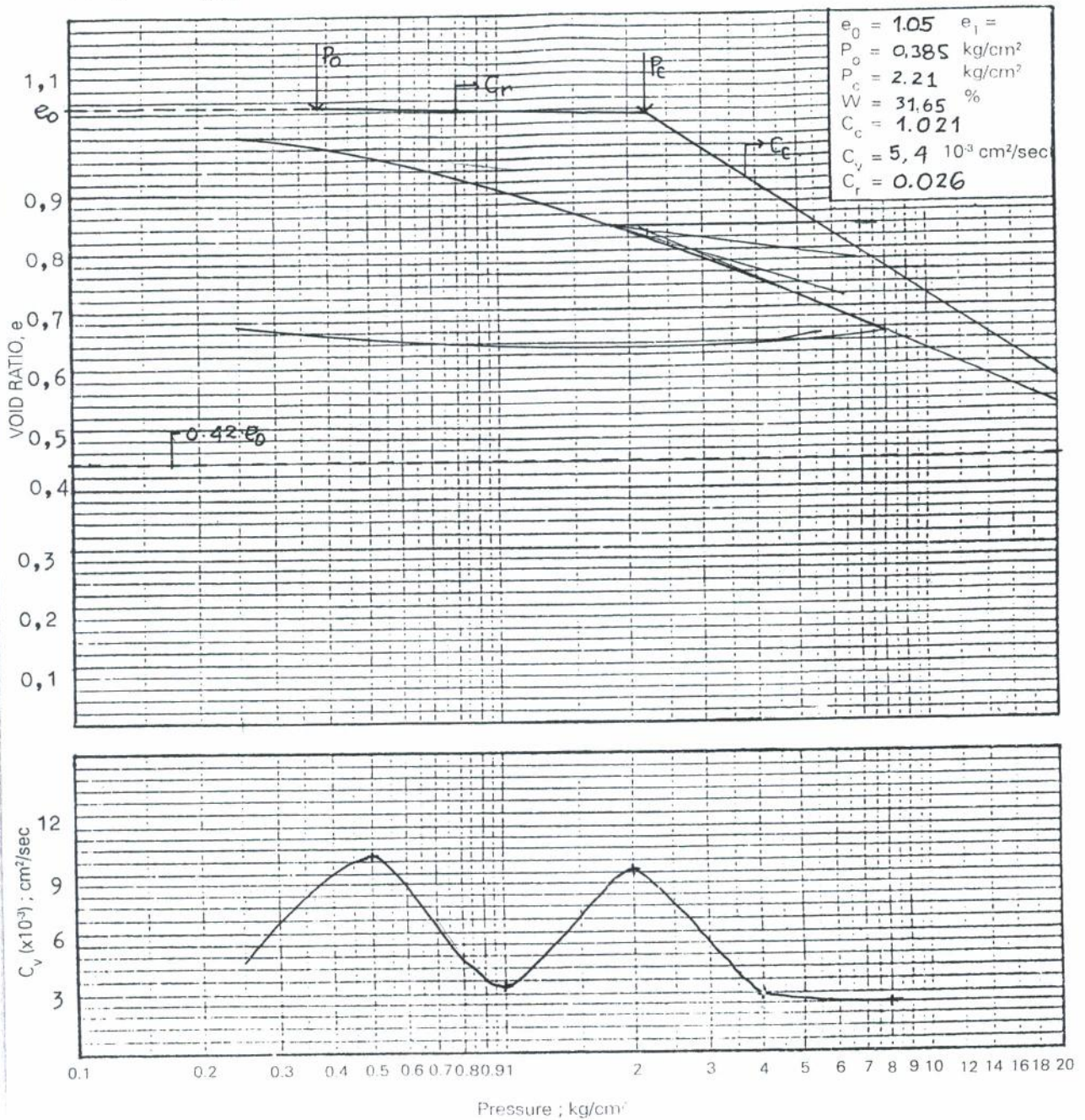




CONSOLIDATION TEST

Project : GI TEIUK NAGA
 Location : TANGERANG JAWA BARAT
 Boring no. : B.1

Depth of Sample : 200-245.
 Date of test : Nopember 1994.
 Test by : Ir. Fauzi Buldan.

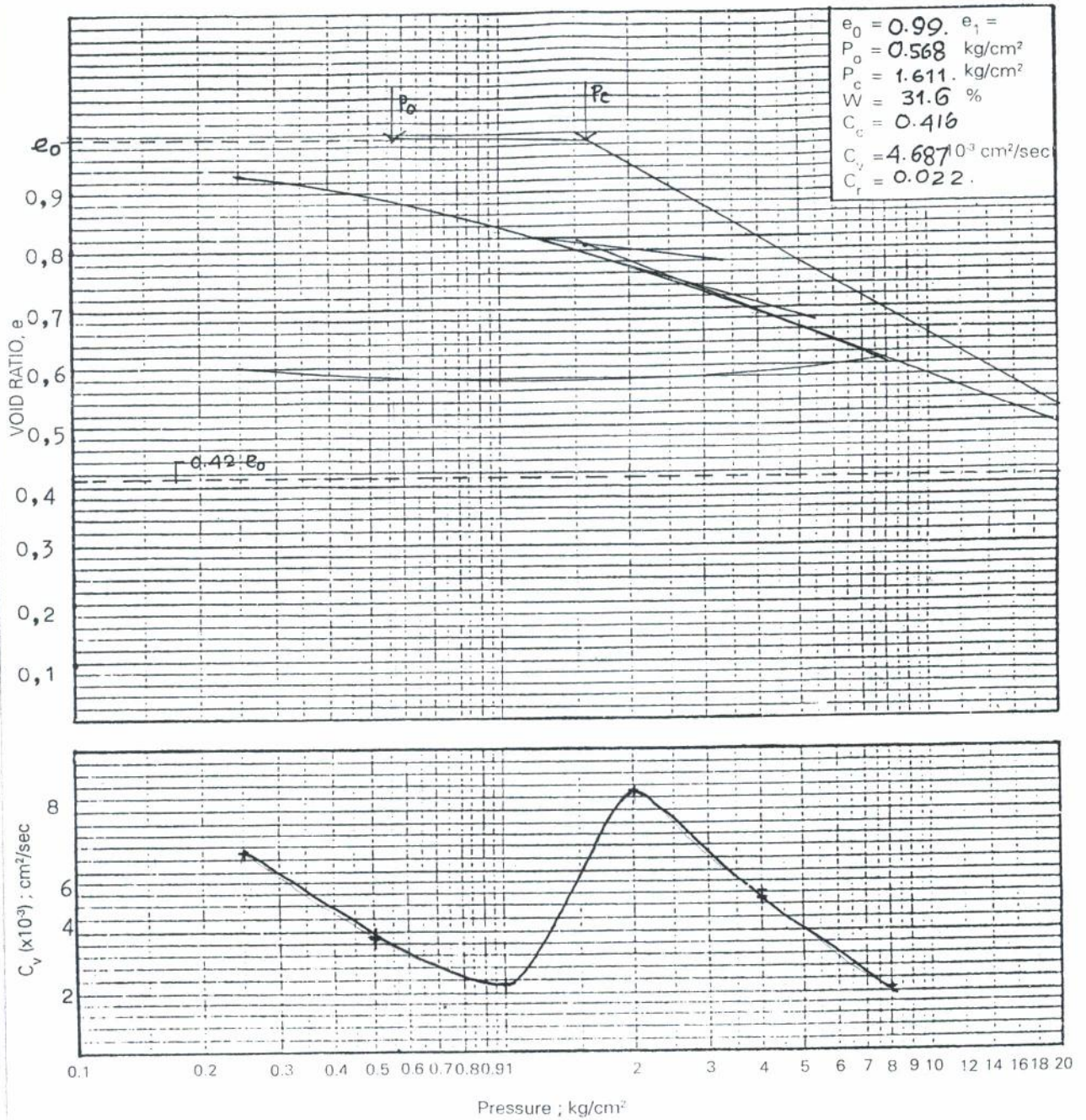




CONSOLIDATION TEST

Project : GI Teluk Naga
 Location : TANGERANG JAWA BARAT
 Boring no. : B.1

Depth of Sample : 300-345
 Date of test : Nopember 1994.
 Test by : Ir. Fauzi Buldan .

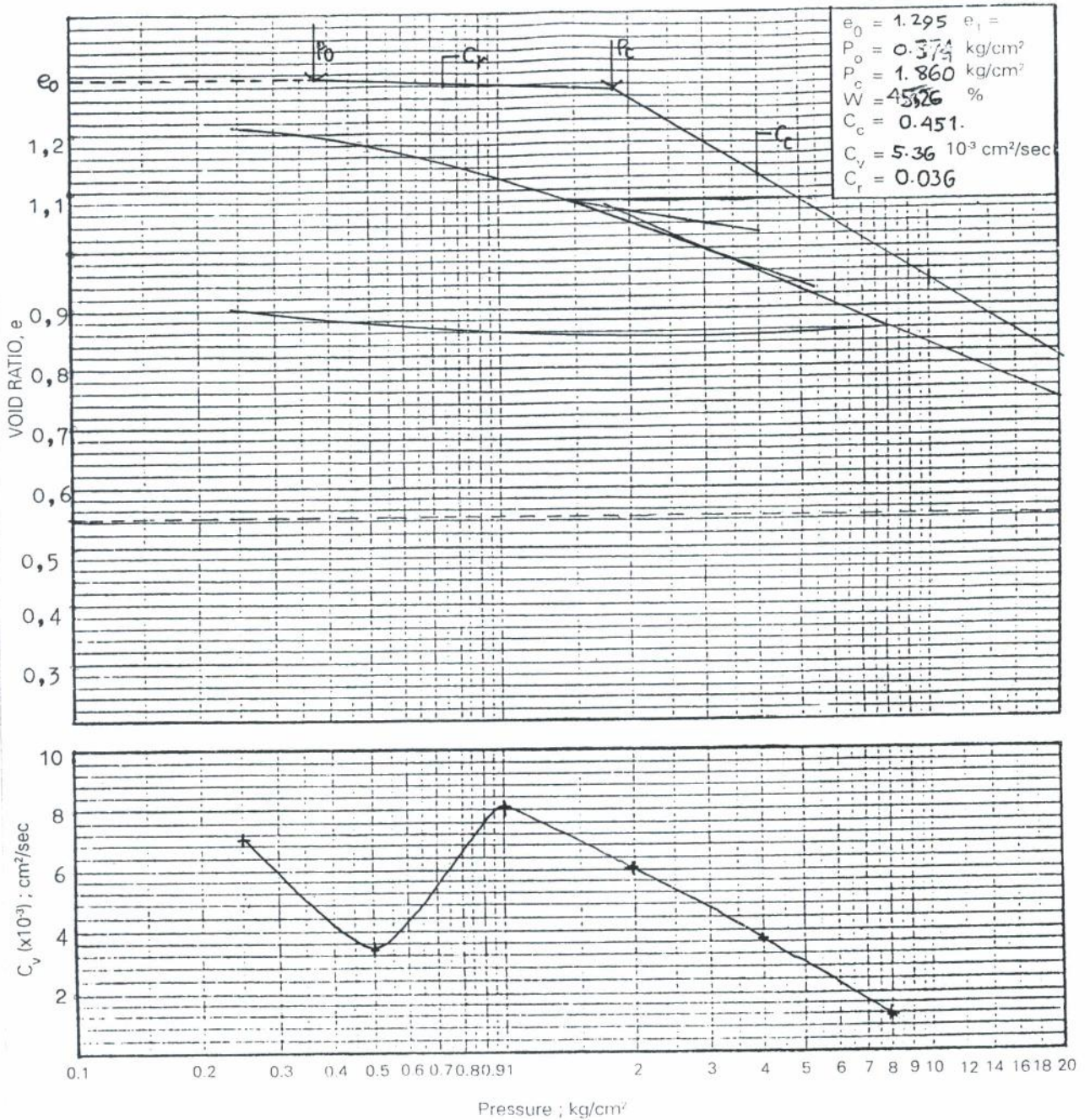




CONSOLIDATION TEST

Project : GI TELUK NAGA
 Location : TANGERANG JAWA BARAT
 Boring no. : B.2

Depth of Sample : 200-245 .
 Date of test : November 1994.
 Test by : Ir. Fauzi Buldan.

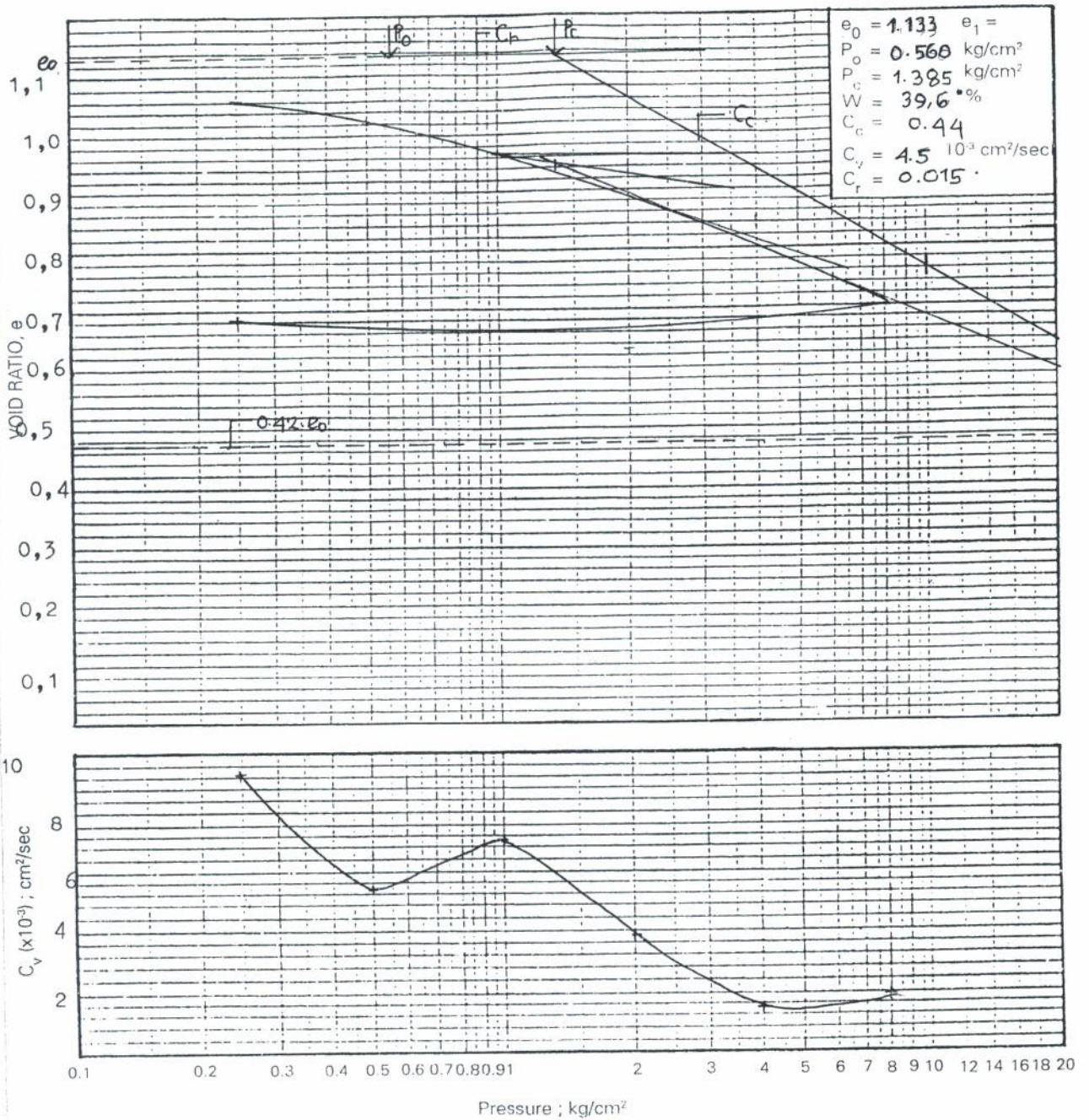




CONSOLIDATION TEST

Project : GI TELUK NAGA
 Location : TANGERANG JAWA BARAT
 Boring no. : B.2

Depth of Sample : 300-345.
 Date of test : Nopember 1994.
 Test by : Ir. Fauzi Buldan .

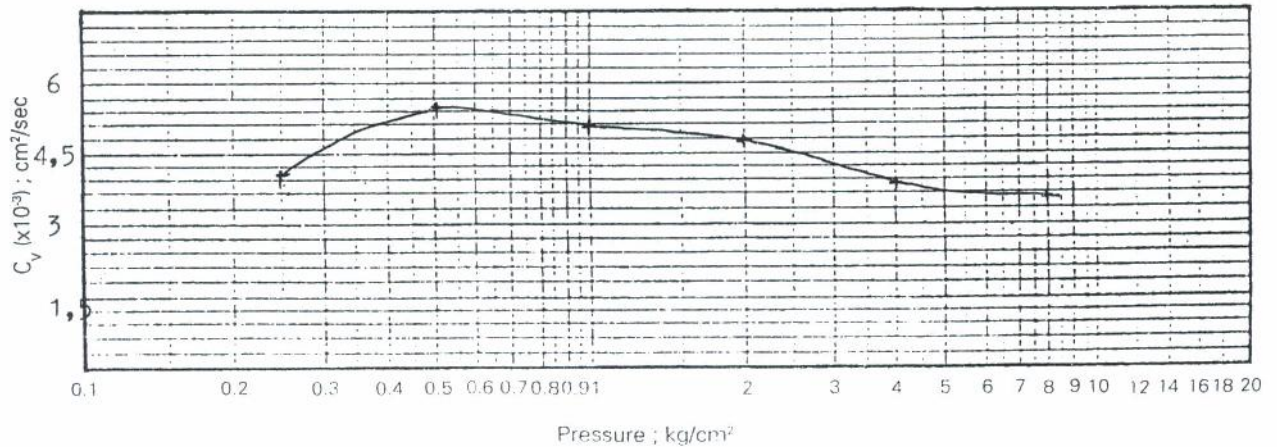
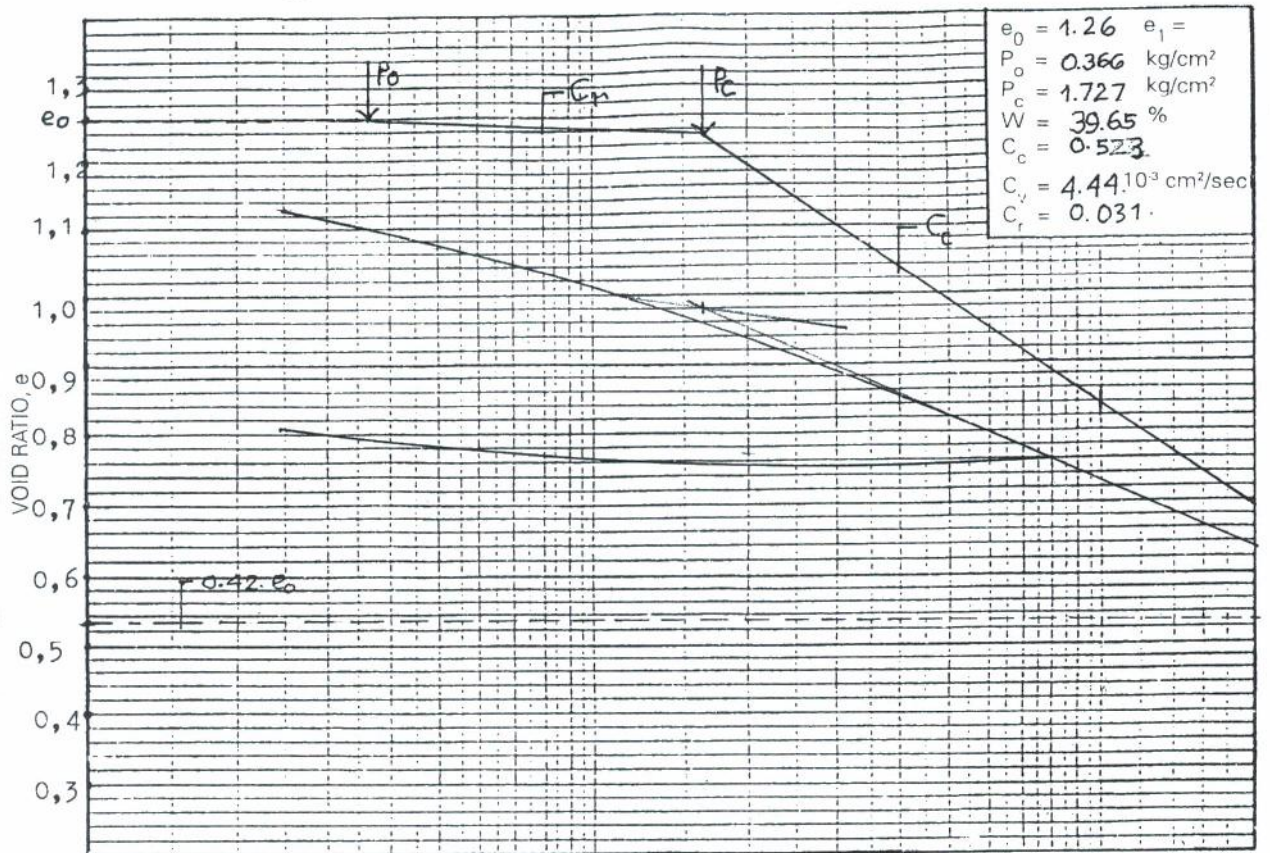




CONSOLIDATION TEST

Project : GI TELUK NAGA
 Location : TANGERANG JAWA BARAT
 Boring no. : B.3

Depth of Sample : 200-245.
 Date of test : Nopember 1994.
 Test by : Ir. Fauzi Buldan.



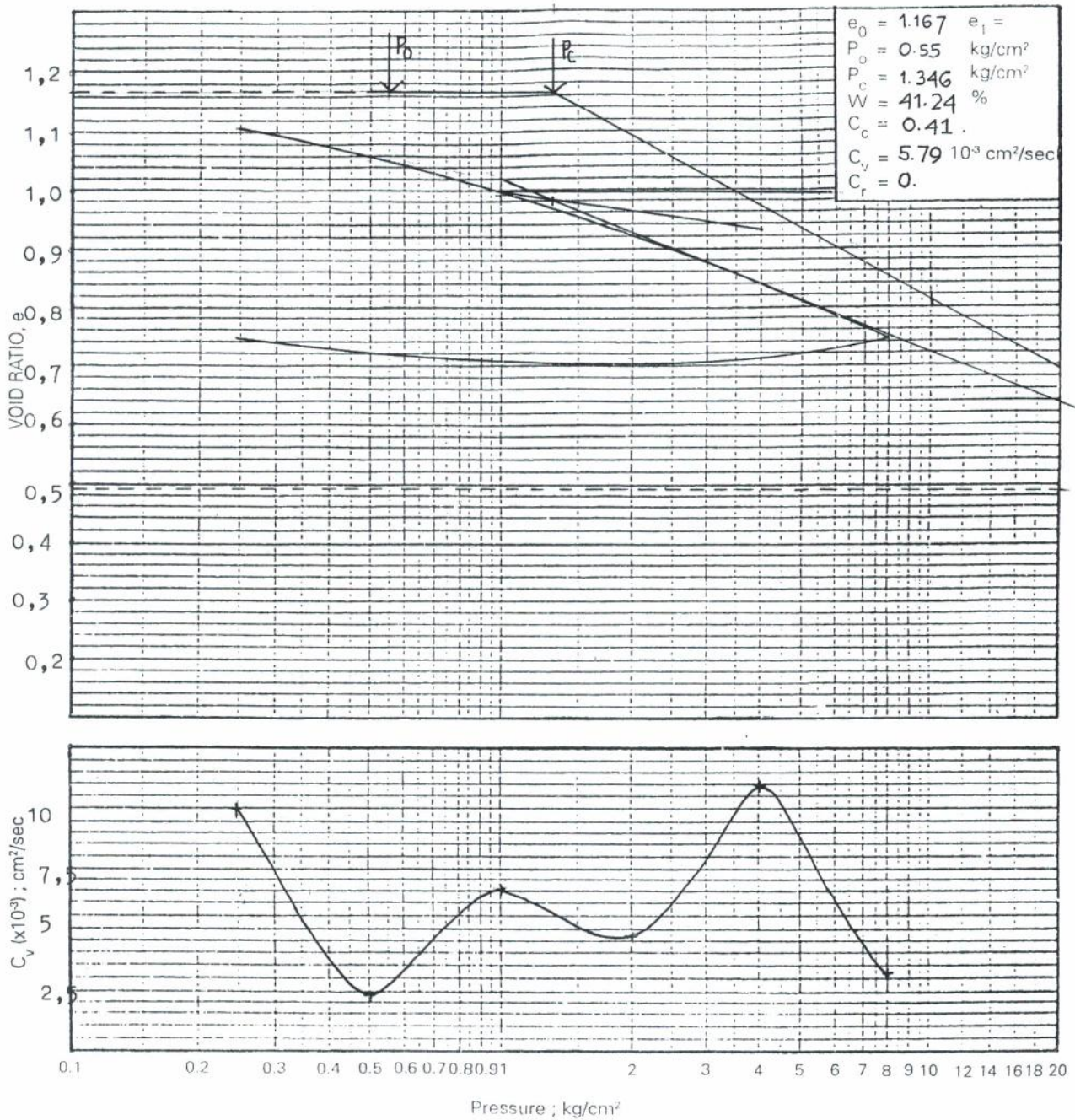


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CONSOLIDATION TEST

Project : GI TELUK NAGA
 Location : TANGERANG JAWA BARAT.
 Boring no. : B.3

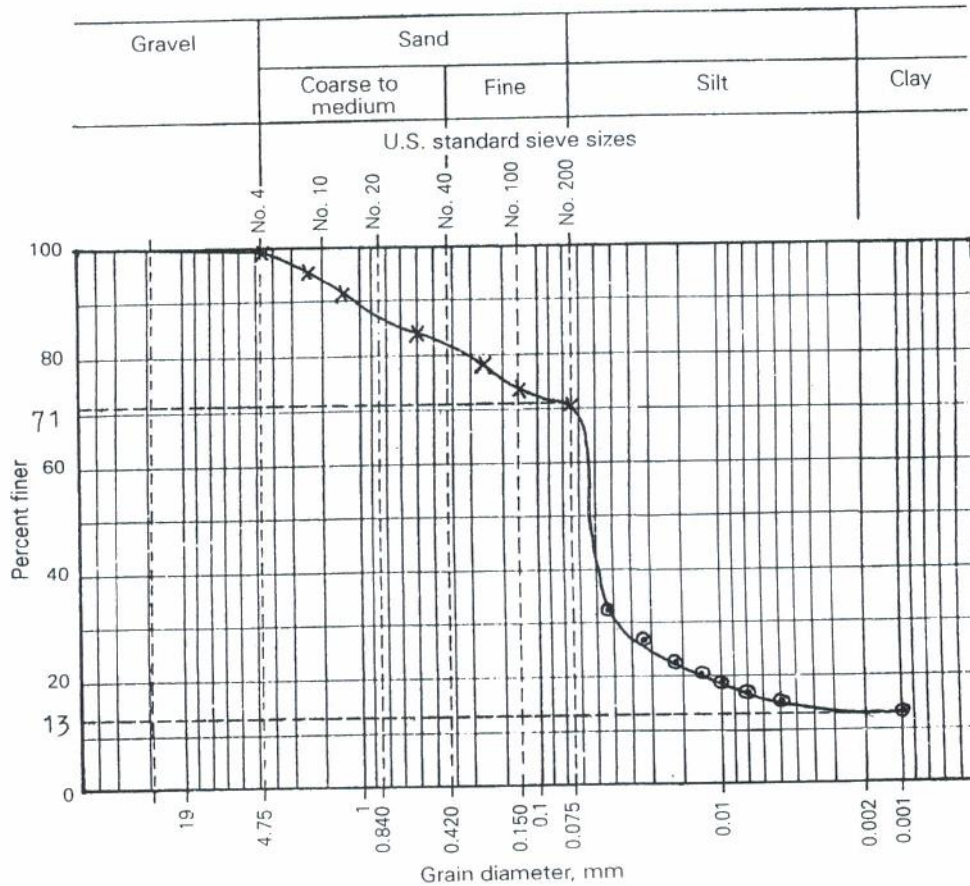
Depth of Sample : 300-345.
 Date of test : Nopember 1994
 Test by : Ir. Fauzi Buldan.





GRAIN SIZE DISTRIBUTION

Project GARDU INDUK TELUK NAGA Job No. _____
Location of Project Tangerang Jabar Boring No. B.1 Sample No. 1
Description of Soil _____ Depth of Sample 200 - 245
Tested By Rr Prihadini Date of Testing Nopenber 1994.



Visual soil description _____

Soil classification _____

System Hydrometer & sieve analysis

Gravel : 0 %.

Sand : 29 %.

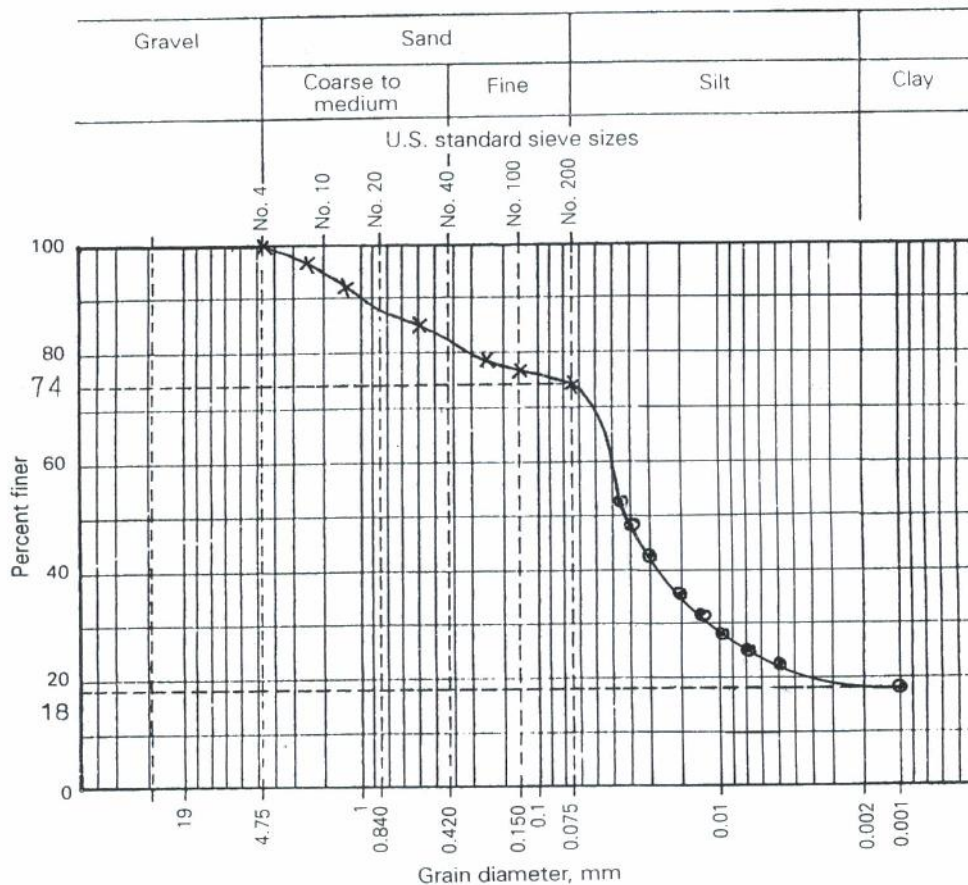
Silt : 58 %.

Clay : 13 %.



GRAIN SIZE DISTRIBUTION

Project GARDU INDUK TELUK NAGA Job No. _____
Location of Project TENGERANG JABAR Boring No. B.1 Sample No. 2
Description of Soil _____ Depth of Sample 300 - 345
Tested By Rr Prihadini Date of Testing Nopember 1994



Visual soil description _____

Soil classification _____

System Hydrometer & Sieve analysis

Gravel : 0 %.

Sand : 16 %.

Silt : 56 %.

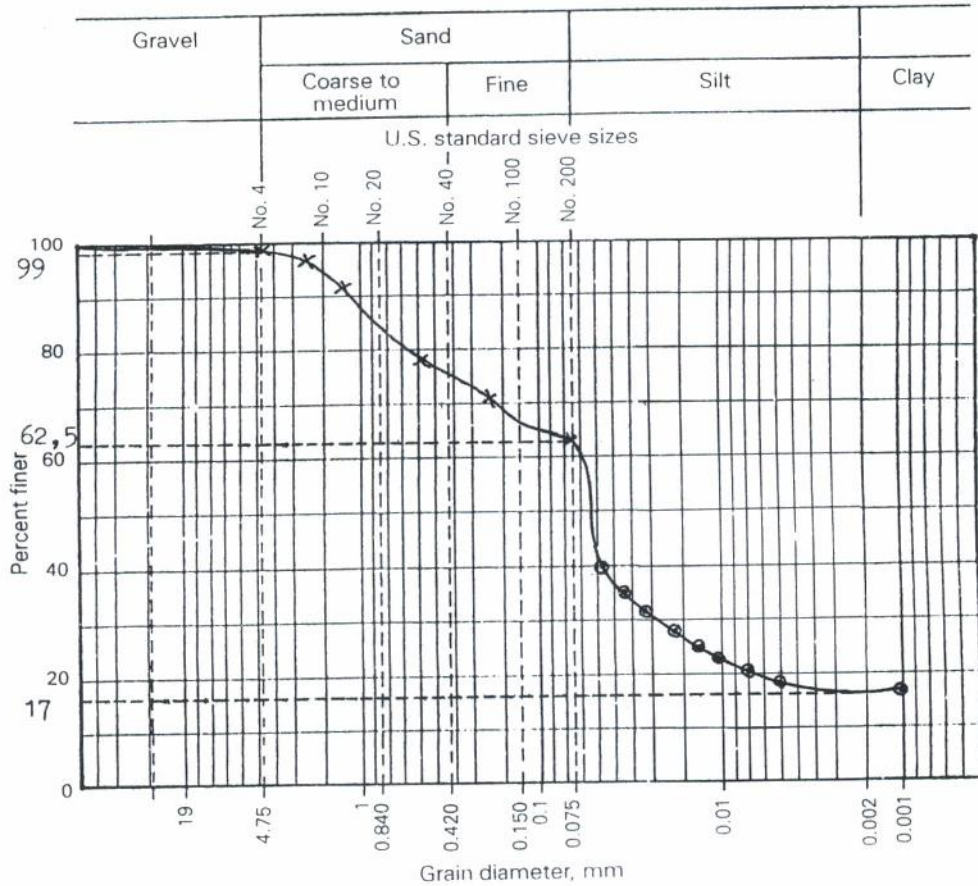
Clay : 18 %.



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GRAIN SIZE DISTRIBUTION

Project GARDU INDUK TELUK NAGA Job No. _____
Location of Project TANGERANG JABAR Boring No. B.2 Sample No. 1
Description of Soil _____ Depth of Sample 200 - 245 .
Tested By Rr Prihadini Date of Testing Nopember 1994 .



Visual soil description _____

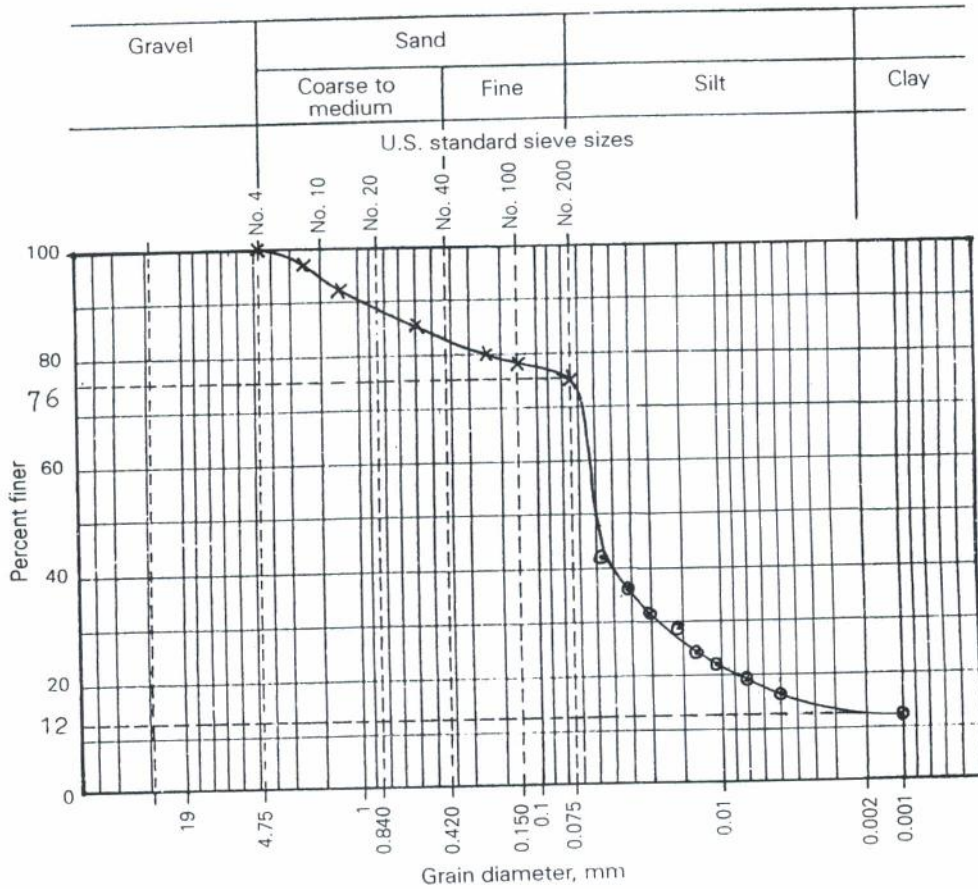
Soil classification _____ System Sieve analysis & Hydrometer

Gravel : 1 % Sand : 36,5 %
Silt : 45,5 % Clay : 17 %



GRAIN SIZE DISTRIBUTION

Project GARJU INDIK TELUK NAGA Job No. _____
 Location of Project TANGERANG JABAR Boring No. B.2 Sample No. 2
 Description of Soil _____ Depth of Sample 300 - 345 .
 Tested By Rr Prihadini Date of Testing November 1994 .



Visual soil description _____

Soil classification _____ System Hydrometer & Sieve analysis

Gravel : 0 %.

Sand : 24 %.

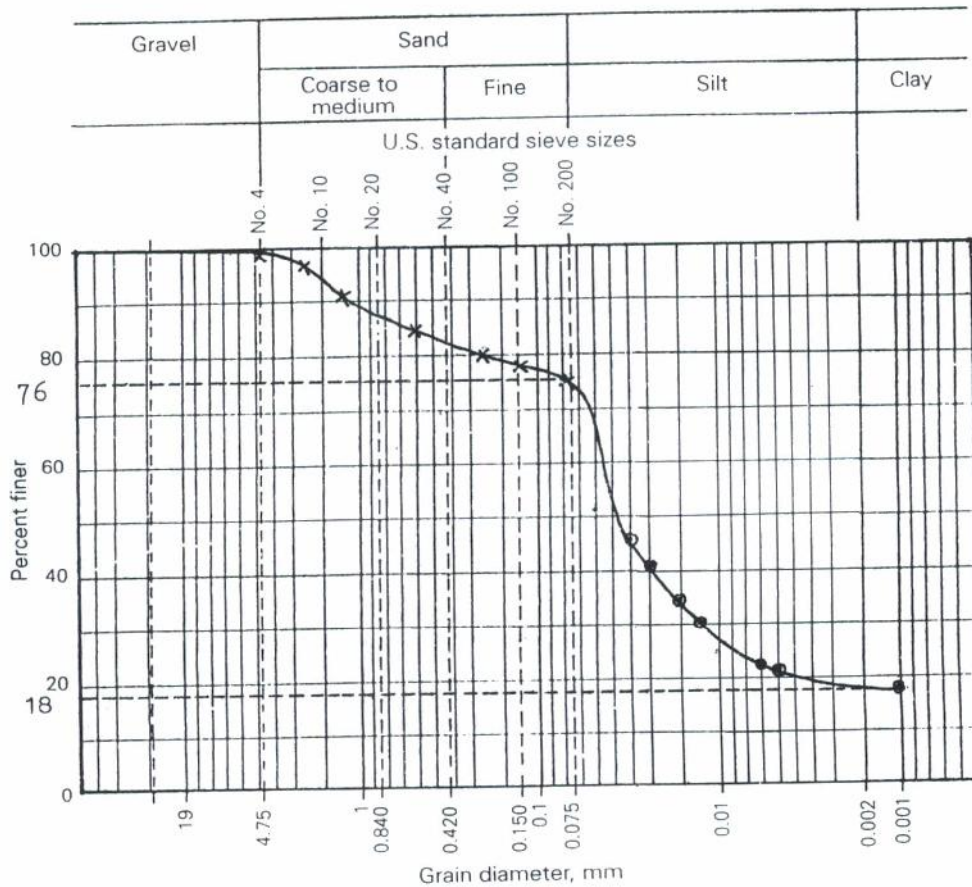
Silt : 64 %.

Clay : 12 %.



GRAIN SIZE DISTRIBUTION

Project GARDU INLUK TELUK NAGA Job No. _____
Location of Project TANGERANG JABAR Boring No. B.3 Sample No. 1
Description of Soil _____ Depth of Sample 200-245
Tested By Rr Prihadini Date of Testing November 1997



Visual soil description _____

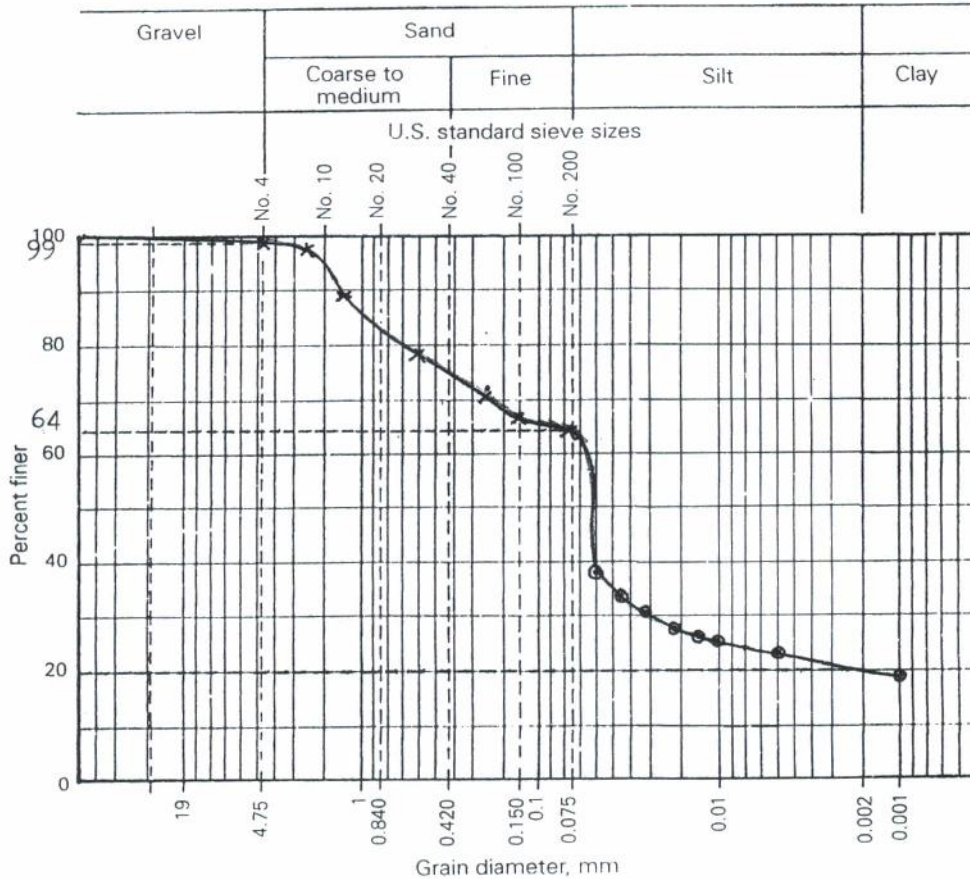
Soil classification _____
System Hydrometer & Sieve analysis

Gravel : 0 %.
Sand : 24 %.
Silt : 58 %.
Clay : 18 %.



GRAIN SIZE DISTRIBUTION

Project GARDU INDUK TELUK NAGA Job No. _____
 Location of Project TANGERANG JABAR Boring No. B.3 Sample No. 2
 Description of Soil _____ Depth of Sample 300 - 345
 Tested By Rr Prihadini Date of Testing November 1994.



Visual soil description _____

Soil classification _____ System Hydrometer & Sieve analysis

Gravel : 1 %.

Sand : 35 %.

Silt : 44 %.

Clay : 20 %.