C-45

YAYASAN PERGURUAN "CIKINI"
INSTITUT
SAINS DAN TEKNOLOGI
NASIONAL
I S T N

FAKULTAS TEKNIK SIPIL
DAN PERENCANAAN
JURUSAN TEKNIK SIPIL

PENUGASAN

No : 07-11/PM/LM/XI/2012

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 DED Jembatan Jeliteng
Lokasi	:	Kec. Rajeg. Kab. Tangerang.
Pemberi Tugas	:	PT. Almafyani Perkasa

Dengan jadwal pelaksanaan pekerjaan selama 25 hari kerja

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, 07 September 2012
Ketua Prodi Teknik Sipil

Ir. Marsiano MT

NIP : 01.83332

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

LEMBAR PENGESAHAN
PENGABDIAN PADA MASYARAKAT

ISTN

PENYELIDIKAN TANAH DED JEMBATAN JALITENG
Lokasi : Kec. Rajeg, Kab. Tangerang

Oleh :
Idrus Ir, M.Sc

Mengetahui :
Ketua Jurusan Teknik Sipil

Ir. Marsiano MT

Program Studi Teknik Sipil
Institut Sain dan Teknologi Nasonal
Jakarta 2012

PENGABDIAN PADA MASYARAKAT
F.T.S.P - IS.T.N

FINAL REPORT

SOIL INVESTIGATION

PROJECT : DED JEMBATAN JALITENG

LOCATION/SITE :
KEC. RAJEG. KAB. TANGERANG

ISTN *Soil Mechanics Laboratory*
2012

SARITAMA PURNAMA PT

JALAN PELITA I NO. 38 KEBAYORAN LAMA, JAKARTA SELATAN

Kepada Yth ;

Kepala Laboratorium

Mekanika Tanah, ISTN.

Up. Bp. Ir. Idrus MSc.

di Jakarta.

Perihal : *Permohonan untuk mengadakan Penyelidikan Tanah.*

Dengan Hormat,

Sehubungan dengan pekerjaan **Detail Engineering Desain Jembatan Jaliteng** pada Dinas Binamarga dan Pengairan Kabupaten Tangerang, yang berlokasi di Kecamatan Rajeg, Kabupaten Tangerang, bersama ini kami bermaksud ingin melakukan penyelidikan tanah pada paket pekerjaan tersebut diatas.

Untuk melengkapi data pekerjaan, terlampir gambar lay out jembatan Jaliteng.

Demikian kami sampaikan, atas perhatian dan kerjasamanya diucapkan terimakasih.

Jakarta , 01 Nopember 2012.

Hormat kami,

Div. Perencanaan.

Slamet Suprihadi.

LABORATORIUM MEKANIKA TANAH
INSTITUT SAINS DAN TEKNOLOGI NASIONAL
KAMPUS ISTN BHUMI SRENGSENG INDAH JALAN MOCH KAHFI 2 JAGAKARSA – JAKARTA 12640
TELPON. 021 98189554 FAX . 021 78893379

Jakarta , 22 Desember 2012

No : 22-12-1/FR/LM/XII/2002

KEPADA YTH.

PT. SARITAMA PURNAMA

Perihal : Laporan akhir penyelidikan tanah Perencanaan DED Jemb. Jaliteng, Kec. Rajeg, Kab. Tangerang.

Dengan hormat,

Bersama ini kami, sampaikan hasil Final Report Penyelidikan Tanah pada Proyek Perencanaan DED Jemb. Jaliteng, Kec. Rajeg, Kab. Tangerang, Banten.
Penyelidikan tanah ini terdiri dari Penyelidikan tanah di lapangan yang terdiri dari :

- 2 titik Bor Dalam
- 2 titik CPT 2,5 tonf

serta penyelidikan di Laboratorium, berupa uji index properties dan mechanical properties.

Hasil lengkap dalam bentuk laporan akhir dan rekomendasi penggunaan pondasi dapat dilihat dalam laporan berikut.

Atas kerjasamanya kami ucapkan terima kasih

LABORATORIUM MEKANIKA TANAH ISTN

Direktur

(Idrus Muhammad Ir. M.Sc)
Reg LPJK No: 1.2.500.2.31.09.03.000007

DAFTAR ISI

Covering Letter

I. PENDAHULUAN.....1

II. PENYELIDIKAN DI LAPANGAN.....2

2.1 Peralatan.....2

2.2 Metode Pelaksanaan.....3

2.3 Jumlah dan Hasil Penyelidikan.....5

III. PENELITIAN DI LABORATORIUM.....6

Jenis dan Jumlah Pengujian di Laboratorium

IV. KESIMPULAN DAN REKOMENDASI.....7

4.1 Kondisi Lapisan Tanah 7

4.2 Rekomendasi Daya Dukung Pondasi 8

4.3 Seismicity.....10

4.4 Profil tanah berdasarkan The UBC 1997.....11

ATTACHMENT

- ✓ Denah Lay-out
- ✓ Bor Log
- ✓ Cone Penetration Test
- ✓ Data Laboratorium
  - ✓ Index Properties
  - ✓ Atterberg Limit
  - ✓ Soil Classification
  - ✓ Grained Size Distribution
  - ✓ Direct Shear
  - ✓ Consolidation
- ✓ Site Photograph

FINAL REPORT
SOIL INVESTIGATION
Proyek : DED Jembatan Jaliteng
Lokasi : Kecamatan Rajeg, Kabupaten Tangerang

I. PENDAHULUAN :

Sehubungan dengan permohonan dari PT. Saritama Purnama kepada Laboratorium Mekanika Tanah ISTN untuk melakukan pekerjaan penyelidikan tanah pada prorek DED Jembatan Jaliteng, Dinas Binamarga dan Pengairan Kabupaten Tangerang Banten, maka kami akan melaporkan pekerjaan tersebut dalam Final Report (Laporan Akhir) dari hasil pekerjaan pengujian sondir / CPT pada pekerjaan tersebut.

Pekerjaan dilapangan telah kami laksanakan pada tanggal 08 – 13 November 2012, yang dilanjutkan dengan pekerjaan di Laboratorium .

Jumlah titik pengujian yang dilakukan :

- 2 (dua) titik bor dalam
- 26 (dua puluh enam) pengujian SPT
- 6 (enam) Undisturbed sampling dan pengujian laboratorium
- 2 (dua) titik CPT / Sondir kapasitas 2,5 tonf

Pada laporan akhir ini meliputi hasil penyelidikan di Laboratorium dan lapangan lapangan guna mengetahui mechanical properties dan physical properties. Dari pengujian CPT/sondir didapat informasi tentang kondisi lapisan tanah (konsistensi tanah) secara visual hingga kedalaman lapisan tanah keras yang ditunjukkan dengan tahanan ujung konus > 100 kg/cm^2.

Dari pengujian Bored Dalam, dapat ditentukan ketebalan lapisan tanah keras dengan consistencinya yang dilakukan dengan uji Standard Penetration Test.

II. PELAKSANAAN DILAPANGAN (SITE INVESTIGATION)

Pelaksanaan penyelidikan tanah di lapangan pada proyek ini meliputi:

1. Deep Booring (Bor Dalam)
2. Standard Penetration Test
3. Cone Penetration Test (CPT)/ Sondir

2.1. Peralatan

1. 1 (satu) alat bor dalam type Cano lengkap dengan thin walied sampler (tabung contoh) dengan diameter 75 mm panjang 60 cm tebal tabung 2,00 mm.
2. 1 (satu) unit alat pompa air lengkap.
3. 1 (satu) unit alat SPT lengkap.
4. 1 (satu) unit alat CPT/Sondir kapasitas 2,5 tonf

2.2. Metode Pelaksanaan

Semua pelaksanaan pekerjaan dilapangan, peralaan yang digunakan , mengikuti standard American Standard for Testing Material (A.S.T.M) , dan juha mengacu kepada Standard Nasional Indonesia (SNI). Antara lain :

1. Deep Boring

Pengeboran dilakukan secara terus menerus dengan cara Rotary Core Drilling dengan menggunakan Single Core Barrel.

Deskripsi lapisan tanah secara visual dilakukan terus menerus sepanjang lubang pengeboran. Semua contoh tanah dari hasil Coring, Shoe SPT, disimpan dalam kantong plastik tertutup, lengkap dengan keterangannya

Untuk mengatasi kelongsoran dinding tanah setelah dilakukan pengeboran, adakalanya digunakan cassing (pipa pelindung) dengan diameter 100 mm.

Pada titik DB-3, dilkaukan Back Fill Mateial setebal 4 meter, agar terhundar dari genangan air bila banjir datang.

2. Undisturbed Sampling

Pengambilan contoh tanah tidak terganggu / asli (Undisturbed sampler) tidak dapat dilaksanakan dengan menggunakan "Shelby Type Thin Walled Tube Samplers" dan dilakukan sesuai dengan persayaratan prosedur percobaan dari ASTM D1587.

Tabung yang sudah terisi contoh tanah akan ditutup kedua ujungnya dengan campuran paraffin ditambah damar 2-3%, dimasukkan kedalam kantong plastic lengkap dengan keterangannya, kemudian disimpan dan dihindarkan dari kemungkinan terjadinya benturan-benturan atau tumbukan serta panas sinar

matahari secara langsung. Kemudian contoh tanah tersebut dikirim ke laboratorium.

3. Standard Penetration Test

SPT dilakukan pada saaat pengeboran berlangsung pada interval kedalaman 2,00 meter. Berat hammer SPT sebesar 140 lbs dijatuhkan bebas pada ketinggian 30 inches secara semi automatis.

Pada pengujian SPT dihitung jumlah pukulan (N) pada 3 kali penetrasi 15 cm, dimana nilai N-SPT diambil dengan menjumlahkan jumlah pukulan pada 2 x 15 cm penetrasi terakhir (Penetrasi 15 cm pertama tidak dihitung)

Hasil uji SPT ini dinyatakan dalam N-SPT yang hasilnya disajikan dalam boring log terlampir, dan digambarkan secara visual konsistensi lapisan tanah dengan nilai N-SPT terhadap kedalaman.

Secara umum, seluruh pengujian dilapangan mengikuti standard uji dari American Standard for Testing Material (ASTM)

4. Cone Penetration Test (Sondir)

Konus yang digunakan adalah friction conus (biconus) dengan luas penampang 10 cm^2 , luas selimut geser 120 cm^2 .

Pekerjaan sondir dilakukan secara terus menerus dengan interval 20 cm kedalaman (penetrasi) sampai menunjukan jumlah tahanan konus dan geser maksimum sebesar 250 kg/cm^2, atau sampai kedalaman maksimum 30 meter.

Data yang disajikan dari pengujian ini adalah grafik dari nilai tahanan ujung konus (qc) dan total friction (tf) terhadap kedalaman , sampai dengan kedalaman maksimum dari kapasitas alat sondir (maks 30 meter).

Juga ditampilkan grafik antara kedalaman dengan ratio friction / qonus resistance (%) guna memprediksi jenis lapisan tanah yang ada.

2.3 Jumlah dan Hasil Penyelidikan .

Uji Depth Boring Booring sebanyak 1 (satu) titik

No Depth Boring	Kedalaman (meter)	UD Sampling (Tabung)	SPT (Test)	Muka Air Tanah (m)
DB-1	-27,00	3	13	-3,00
DB-2	-27,00	3	13	-3,70

- CPT / Sondir sebanyak 2 (dua) titik.

Titik	Kedalaman (m) qc > 100 kg/cm^2	Tahanan Lekat (kg/cm')	Muka Air Tanah (m)
1	12,00	1973	--
2	11,80	1748	--

III. PENELITIAN DI LABORATORIUM

Penelitian di laboratorium dilakukan dengan menggunakan contoh tanah tidak terganggu (undisturbed sampling) yang berasal dari Thin Walled Tube Sampler. Uji Laboratorium yang dilakukan meliputi Soil Properties yang meliputi index properties , shear strength properties dan compressibility properties.

Penelitian dari contoh tanah tidak terganggu (undisturbed sample) dilakukan dengan persyaratan prosedur dari ASTM (American Standard for Testing Material), yang meliputi

1. Penentuan Kadar Air Tanah Asli (wn)
2. Penentuan berat isi tanah (γ)
3. Penentuan berat isi tanah kering (γd)
4. Penentuan berat jenis (Specific Gravity, Gs)
5. Shear Strength by Direct Shear Test

Jenis dan Jumlah Pengujian di Laboratorium

JENIS PENGUJIAN	Jumlah	Sample
1. Index Properties (Wn, γ, γd, Gs, e, Sr,n)	6	Und isturbed
2. Grained size distribution	6	Undisturbed
3. Atterberg Limits	6	Undisturbed
4.Consolidation	6	Undisturbed
5.Direch Shear Test	6	Undisturbed

IV . KESIMPULAN DAN REKOMENDASI :

4.1. Kondisi lapisan tanah.

Dari hasil pengujian sebanyak 2 (dua) bor dalam dan 2 titik CPT , secara umum kondisi lapisan tanah seperti berikut :

- Dari permukaan tanah hingga kedalaman -4,00 meter dijumpai lapisan tanah Lempung berwarna coklat tua dengan konsistensi lunak.
- Pada kedalaman -4,00 meter sampai dengan -10,00 meter, konsistensi tanah sedang.
- Pada kedalaman -10,00 meter sampai dengan -12,00 meter berupa lapisan lempung kelanauan dengan konsistensi kaku.
- Pada kedalaman -12,00 meter sampai dengan -14,00 meter dijumpai lapisan Lanau Coklat dengan konsistensi sangat kaku.
- Lapisan tanah keras yang ditunjukkan dengan N-SPT > 30 , dijumpai mulai kedalaman -14,00 meter hingga akhir pengeboran -27,00 meter , di titik DB-2 dan -20,00 meter pada titik DB-1 berupa lapisan Lanau berwarna abu-abu.
- Muka air tanah ditemui pada kedalaman -3,00 meter sampai – 3,70 meter dari permukaan tanah saat pengeboran dilakukan.

4.2. Rekomendasi Daya Dukung Pondasi

Dari keadaan lapisan tanah seperti dijelaskan diatas, maka dapat kami sarankan untuk pondasi jembatan tersebut dsapat digunakan pondasi sbb :

PONDASI TIANG PANCANG

Jika menggunakan pondasi tiang pancang, dapat dilakukan dengan ketentuan sbb :

- Kedalaman pemancangan sampai tanah keras (14,00 meter), atau maksimal penetrasi tiang pada 10 pukukan hammer terakhir adalah 1,00 cm (1 cm for the last ten blows)
- Untuk perencanaan pondasi Group Pile, jarak tiang pancang ke tiang pancang minimal 3 D, dimana D adalah dimensi tiang yang digunakan
- Kapasitas Daya dukung pondasi Pile Group harus diperhitungkan effisiensi group sesuai format/susunan group pile yang dipakai
- Kapasitas daya dukung aksial tekan yang diizinkan sbb:

PONDASI BORED PILE

Dapat dilakukan dengan ketentuan sbb :

- Diamater Bored Pile minimum yang digunakan 60 cm, 80 cm atai 100 cm)
- Kedalaman pengeboran minimum -20 meter
- Pekerjaan pengeboran menggunakan coring atau wash boring dengan memperhatikan kebersihan lubang pengeboran sebelum pengecoran dilakukan.
- Pengecoran harus menggunakan pipa tremy.
- Pekerjaan pengeboran harus diawasi oleh seorang akhi geoteknik yang berpengalaman dan mempunyai kopetensi yang baik dalam mengawasi pekerjaan bored pile.
- Mutu concrete yang disarankan minimal fc'=30 Mpa, dengan menggunakan tulang yang mencukupi.
- Pile cap pondasi bored pile serta Tie Beam yang dipakai harus cukup kaku.
- Daya Dukung Aksial Tekan pondasi Bored Pile Tunggal, dapat dihitung dengan formula dari Reese and Wright sbb :
- **Qu = 7 Nb. Ap + 0,32 N As (Tonf) untuk Nb < 60**
- **Qu = 400. Ap + {0,024 (N -53) +17,2} As (Tonf) untuk Nb > 60**

dimana :

Qu = Daya Dukung Ultimate (tonf)

Nb = Nilai N SPT pada ujung tiang , yang dihitung dari rata-rata N_1 SPT 10 D Diatas dasar pondasi, rata-rata N_2 SPT 4 D dibawah dasar pondasi,

D adalah diamater pondasi Bored Pile yang dipakai.

Nb = ½ (N_1 + N_2)

Ap= Luas penampang Ujung Tiang (m^2)

N = Nilai N- SPT rata-rata sepanjang tiang

As = Luas selimut tiang (m^2).

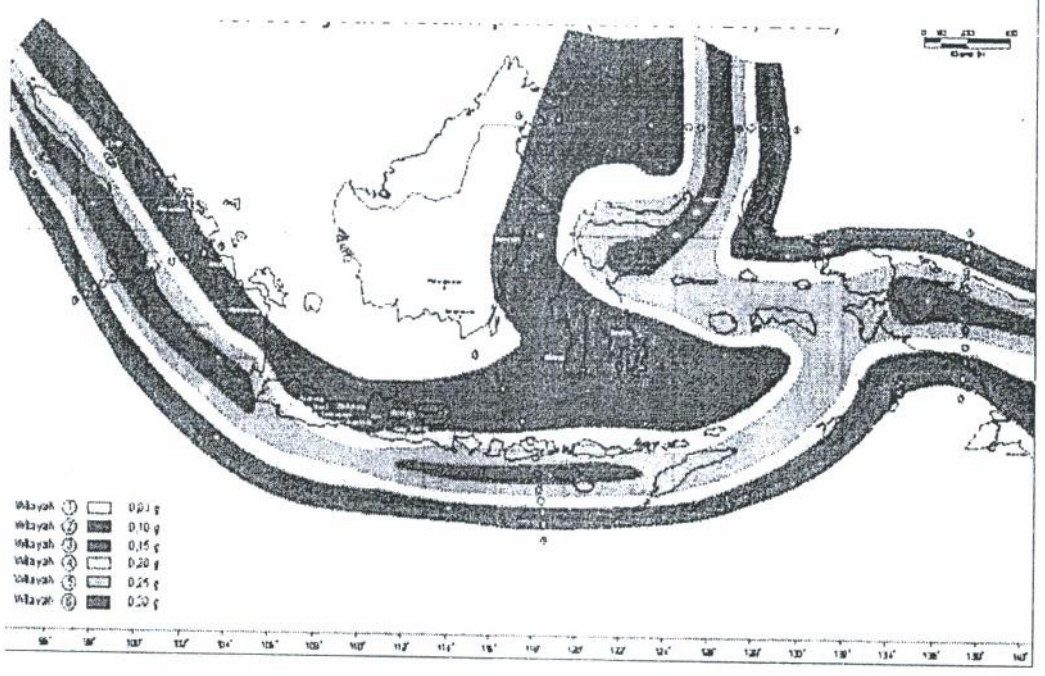
Axial Load Capacity of Singgle Drivel Pile dan Bored Pile (see attachment)

4.3 Seismicity

Standar Nasional Indonesia, SNI 03-1723-2002, Tata cara perencanaan ketahanan gempa untuk bangunan gedung, BSN.

Dari standard SNI tersebut diatas , maka pada lokasi proyek tersebut termasuk Wilayah 4 dengan percepatan pada batuan dasar dibawah lokasi tersebut adalah a = **0.20 g** untuk periode ulang 500 tahun

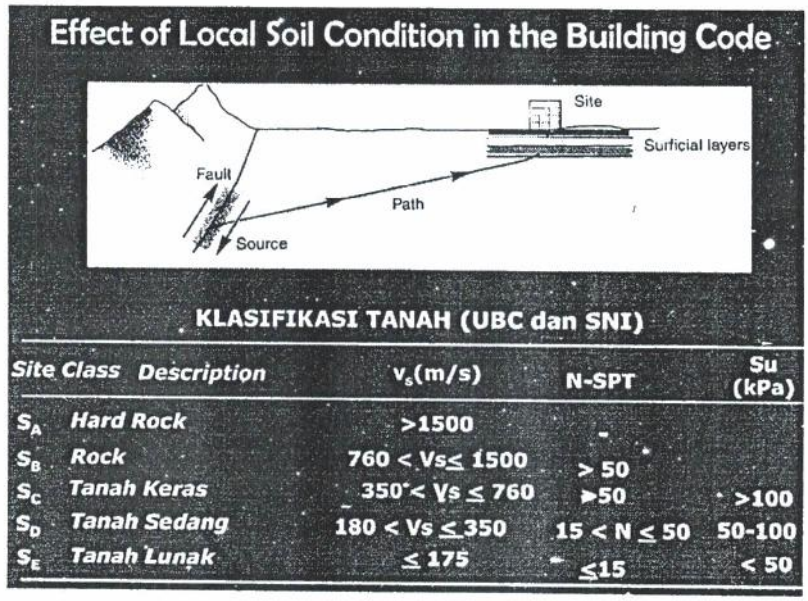
Figure 1 : Maxium Peak Ground Acceleration at bedrock S_B for Indonesia for 500-years return period (SNI 03-1726. 2002)



4.4 Profil tanah berdasarkan The UBC 1997

Berdasarkan Building Code (UBC) 1997 Klasifikasi konsistenci tanah dibagi menjadi 6 Class sbb

Table : Soil Profile based on UBC 1997



Factor pembesaran percepatan di permukaan / dasar bangunan

Site Class	Percepatan di batuan dasar			
	a=0,075	a=0,15	a=0,20	a=0,3
	Factor Pengali di permukaan / dasar bangunan			
A Hard Rock	0,8	0,8	0,8	0,8
B Rock	1,0	1,0	1,0	1,0
C Hard Soil	1,1	1,2	1,2	1,0
D Medium Soil	1,5	1,5	1,5	1,2
E , Soft Soil	2,4	2,0	1,7	1,2

"a" max surface = factor pengali x "a" bed rock

Dari permukaan tanah sampai dengan elevasi -27,00 meter dijumpai suatu nilai NSPT rata-rata N=25,30 , Berdasarkan UBC 1997, termasuk kategori ***tanah sedang*** dimana 15 <N SPT < 50

Sehingga percepatan di permukaan tanah / dasar bangunan, menjadi

a suface = 1,2 x 0,20 = 0,24 g

Jakarta, Desember 2012

ISTN Soil Mechanic Laboratory

Director

Ir. Idrus. M.Sc (Geotechnical Engineer)
No Reg :1.2.500.2.31.09.03.000007

USING SPT - DATA
BORED HOLE NUMBER DB-1
USING CORE BORING
Unit Weight 2,4 t/m^3

PROJECT Jjemb. Jaliteng, Kec Rajeg, Kab. Tangerang
OBJECT BRIDGE Pier / Abudment Foundation
LOCATION TANGERANG , BANTEN , INDONESIA

BORING LOG

PROJECT	JEMBATAN KRESEK BALARAJA	COORDINATES E	BORING METHODE Wash Boring	Length: Dia Of Cassing
CLIENT		N	SAMPLING METHODE	Driller Supri
		ELEVATION : -1,70 m	Thin Walled / Shelby Tube	Date of Tested
LOCATION	Kresek, Balaraja, Banten	GWL from GS -3,00 m	SPT Automatic Hammer	08 to 11 Nov 2012
BORE HOLE NO	DB-1	DRILLING MACHINE TYPE	Kano / Custom	Checked Muhtarom
DEPTH	26,50 meter	TYPE OF CORING BARREL :		Page 1 : 2

DEPTH (m)	LOG	USCS	DESCRIPTION	U.D Sample Depth(m)	N - SPT I (0-15)	II (15-30)	III (30-45)	N Value	N - SPT DIAGRAM 10 20 30 40 50 60
0,00									
			CLAY, Black with some yellow coloured,						
-1,00			Very Soft Consistency and High plasticity						
-2,00				1,50 - 2,00					
					1	1	1	2	
-3,00									
-4,00				3,50 - 4,00					
		CH	Dark Brown Coloured , Very Soft Consistency		1	1	1	2	
-5,00									
-6,00				5,50 - 6,00					
			Brownish Yellow and Greenish Grey Coloured		1	2	2	4	
-7,00			Soft Consistency						
-8,00									
					2	2	3	5	
-9,00									
-10,00									
		ML	SANDY SILT , Grey Colcured, Stiff Consistency		3	5	7	12	
-11,00									
-12,00									
					5	8	10	18	
-13,00									
		MH	SILT , Brown Coloured , Very Stiff Consistency						
-14,00									
			Hard Consistency		10	15	18	33	
-15,00									
-16,00			SANDY SILT , Greu Coloured , Very Stiff Consistency						
					8	10	15	25	
-17,00		ML							
-18,00			Brown Cilours, Very Stiff Consistency						
					10	12	15	27	
-19,00									
-20,00									
					15	18	21	39	
-21,00									
-22,00									
		CL	SILT, Dark Grey Coloured , Hard Consistency		18	21	31	52	
-23,00									
-24,00									
					18	23	31	54	
-25,00									
		CL	SILT, Dark Grey Coloured , Hard Consistency						
-26,00									
					18	22	34	56	
-27,00			End of boring						

USING SPT - DATA
BORED HOLE NUMBER DB-2
USING CORE BORING
Unit Weight 2,4 t/m^3

PROJECT Jjemb. Jaliteng, Kec Rajeg, Kab. Tangerang
OBJECT BRIDGE Pier / Abudment Foundation
LOCATION TANGERANG , BANTEN , INDONESIA

BORING LOG

PROJECT	JEMBATAN KRESEK BALARAJA	COORDINATES E	BORING METHODE Wash Boring	Length/Dia Of Cassing
CLIENT		N	SAMPLING METHODE	Driller : Supri
LOCATION	Kresek, Balaraja, Banten	ELEVATION : -0,80 m	Thin Walled / Shelby Tube	Date of Tested
BORE HOLE NO	DB-2	GWL from GS -3,70 m	SPT Automatic Hammer	11 to 13 Nov 2012
DEPTH	26.50 meter	DRILLING MACHINE TYPE	Kano / Custom	Checked : Muhtarom
		TYPE OF CORING BARREL :		Page : 1 / 2

DEPTH	LOG	USCS	DESCRIPTION	U.D Sample Depth(m)	N - SPT I (0-15)	II (15-30)	III (30-45)	N Value	N - SPT DIAGRAM 10 20 30 40 50 60
0,00									
-1,00									
-2,00			CLAY , Blackish Dark Brown Coloured,	1,50 - 2,00					
-3,00			Very Soft Consistency		1	1	1	2	
-4,00				3,50 - 4,00					
-5,00		CH			1	1	2	3	
-6,00				5,50 - 6,00					
-7,00			Yellowish Brown Coloured , Medium Consistency		2	3	4	7	
-8,00									
-9,00					2	3	5	8	
-10,00									
-11,00		CH	SILTY CLAY, Grey Coloured , Stiff Consistency		3	5	7	12	
-12,00									
-13,00			SILT, Brown Coloured , Very Stiff Consistency		6	8	13	21	
-14,00		MH							
-15,00		ML	CLAYEY SILT , Grey Coloured , Hard Consistency		10	14	18	32	
-16,00									
-17,00			SILT , Light Grey Coloured , Hard Consistency		10	15	17	32	
-18,00									
-19,00			Grey and Brownish Yellow Coloured , Hard Consistency		10	13	18	31	
-20,00									
-21,00					15	19	27	46	
-22,00									
-23,00		ML	Dark Grey Coloured , Hard Consistency		18	22	29	51	
-24,00									
-25,00			Dark Grey Coloured, Hard Consistency		18	24	31	55	
-26,00		ML	SILT , Dark Grey Coloured, Hard Consistency						
-27,00					18	25	31	56	
-28,00			End of boring						

AXIAL BEARING CAPACITY OF SINGGLE DRIVEN PILE FOR DB-1 SOIL DATA

Unit Weight of Concrete : 2,4 t/m^3

Depth meter	N-SPT	L of Pile	N average	Nb
0,00				
1,00				
2,00	2		2,00	2,00
3,00				
4,00	2		2,00	2,67
5,00				
6,00	4		2,67	3,67
7,00				
8,00	5		3,25	7,00
9,00				
10,00	12		5,00	11,67
11,00				
12,00	18		7,17	21,00
13,00				
14,00	33		10,86	25,33
15,00				
16,00	25		12,63	28,33
17,00				
18,00	27		14,22	30,33
19,00				
20,00	39		16,70	39,33
21,00				
22,00	52		19,91	48,33
23,00				
24,00	54		22,75	54,00
25,00				
26,00	56		25,31	36,67
27,00				
28,00				
29,00				
30,00				
31,00				
32,00				
33,00				
34,00				
35,00				
36,00				
37,00				
38,00				
39,00				
40,00				
41,00				

Pile Dimension	meter	P ult tonf	P all Comp. tonf , SF 3,0	P all Tension tonf , SF 6,0
Dia of Pile m L of Pile m	0,35 14	130,85	42,54	6,11
Dia of Pile m L of Pile m	0,4 14	165,46	53,75	7,07
Dia of Pile m L of Pile m	0,45 14	204,04	66,23	8,05
Dia of Pile m L of Pile m	**0,5** 14	246,59	80,00	9,05
Dia of Pile m L of Pile m	0,55 14	293,13	95,05	10,08
Dia of Pile m L of Pile m	0,6 14	343,64	111,38	11,13
Squareof Pile L of Pile m	0,3 14	127,68	41,77	6,58
Squareof Pile L of Pile m	0,4 14	210,77	68,85	9,00
Squareof Pile L of Pile m	0,5 14	314,13	102,51	11,53
Squareof Pile L of Pile m	0,6 14	437,76	142,75	14,18

Qu = 40 Nb. Ap + 0,2 N As (Tonf)

AXIAL BEARING CAPACITY OF SINGGLE DRIVEN PILE FOR DB-2 SOIL DATA

Unit Weight of Concrete : 2,4 t/m^3

Depth meter	N-SPT	L of Pile	N average	Nb	Pile Dimension	meter	P ult tonf	P all Comp. tonf , SF 3,0	P all Tension tonf , SF 6,0
0,00									
1,00									
2,00	2		2,00	2,50	Dia of Pile m	0,35	146,35	47,71	6,77
3,00					L of Pile m	14			
4,00	3		2,50	4,00					
5,00					Dia of Pile m	0,4	185,05	60,28	7,62
6,00	7		4,00	6,00	L of Pile m	14			
7,00									
8,00	8		5,00	9,00	Dia of Pile m	0,45	228,20	74,29	8,90
9,00					L of Pile m	14			
10,00	12		6,40	13,67					
11,00					Dia of Pile m	0,5	275,80	89,73	10,00
12,00	21		8,83	21,67	L of Pile m	14			
13,00									
14,00	32		12,14	28,33	Dia of Pile m	0,55	327,84	106,62	11,12
15,00					L of Pile m	14			
16,00	32		14,63	31,67					
17,00					Dia of Pile m	0,6	384,34	124,95	12,26
18,00	31		16.44	36,33	L of Pile m	14			
19,00									
20,00	46		19,40	42,67	Squareof Pile	0,3	142,80	46,81	7,30
21,00					L of Pile m	14			
22,00	51		22,27	50,67					
23,00					Squareof Pile	0,4	235,73	77,17	9,96
24,00	55		25,00	54,00	L of Pile m	14			
25,00									
26,00	56		27,38	37,00	Squareof Pile	0,5	351,33	114,91	12,73
27,00					L of Pile m	14			
28,00									
29,00					Squareof Pile	0,6	489,60	160,03	15,62
30,00					L of Pile m	14			
31,00									
32,00					**Qu = 40 Nb. Ap + 0,2 N As (Tonf)**				
33,00									
34,00									
35,00									
36,00									
37,00									
38,00									
39,00									
40,00									
41,00									

AXIAL BEARING CAPACITY OF SINGGLE BORED PILE FOR DB-1 SOIL DATA

Depth meter	N-SPT	L of Pile	N average	Nb
0,00				
1,00				
2,00	2		2,00	2,00
3,00				
4,00	2		2,00	2,67
5,00				
6,00	4		2,67	3,25
7,00				
8,00	5		3,25	5,75
9,00				
10,00	12		5,00	9,75
11,00				
12,00	18		7,17	17,00
13,00				
14,00	33		10,86	22,00
15,00				
16,00	25		12,63	25,75
17,00				
18,00	27		14,22	31,00
19,00				
20,00	39		16,70	35,75
21,00				
22,00	52		19,91	43,00
23,00				
24,00	54		22,75	50,25
25,00				
26,00	56		25,31	40,50
27,00				
28,00			23,50	27,50
29,00				
30,00			21,93	14,00
31,00				
32,00			20,56	0,00
33,00				
34,00			19,35	0,00
35,00				
36,00			18,28	0,00
37,00				
38,00			17,32	0,00
39,00				
40,00			16,45	0,00
41,00				

Pile Dimension	meter	P ult tonf	P all Comp. tonf , SF 3,0	P all Tension tonf , SF 6,0
Dia of Pile m	0,6	161,87	53,96	22,11
L of Pile m	16			
Dia of Pile m	0,8	233,64	77,88	30,28
L of Pile m	16			
Dia of Pile m	1	314,32	104,77	38,85
L of Pile m	16			
Dia of Pile m	0,6	258,52	86,17	35,82
L of Pile m	20			
Dia of Pile m	0,8	370,09	123,36	48,77
L of Pile m	20			
Dia of Pile m	1	494,37	164,79	62,21
L of Pile m	20			
Dia of Pile m	0,6	412,30	137,43	57,58
L of Pile m	24			
Dia of Pile m	0,8	586,68	195,56	77,97
L of Pile m	24			
Dia of Pile m	1	779,53	259,84	98,97
L of Pile m	24			

Qu = 7 Nb. Ap + 0,32 N As (Tonf) Nb < 60

Qu = 400. Ap+{0,024 (N -53) +17,2} As (Tonf) Nb > 60

AXIAL BEARING CAPACITY OF SINGGLE BORED PILE FOR DB-2 SOIL DATA

Depth meter	N-SPT	L of Pile	N average	Nb	Pile Dimension	meter	P ult tonf	P all Comp. tonf , SF 3,0	P all Tension tonf , SF 6,0
0,00									
1,00									
2,00	2		2,00	2,50	Dia of Pile m	0,6	187,59	62,53	25,32
3,00					L of Pile m	16			
4,00	3		2,50	4,00					
5,00					Dia of Pile m	0,8	270,79	90,26	34,57
6,00	7		4,00	5,00	L of Pile m	16			
7,00									
8,00	8		5,00	7,50	Dia of Pile m	1	364,33	121,44	44,21
9,00					L of Pile m	16			
10,00	12		6,40	12,00					
11,00					Dia of Pile m	0,6	299,48	99,83	41,25
12,00	21		8,83	18,25	L of Pile m	20			
13,00									
14,00	32		12,14	24,25	Dia of Pile m	0,8	428,45	142,82	56,00
15,00					L of Pile m	20			
16,00	32		14,63	29,00					
17,00					Dia of Pile m	1	571,98	190,66	71,26
18,00	31		16,44	35,25	L of Pile m	20			
19,00									
20,00	46		19,40	40,00	Dia of Pile m	0,6	448,32	149,44	63,00
21,00					L of Pile m	24			
22,00	51		22,27	45,75					
23,00					Dia of Pile m	0,8	636,24	212,08	85,21
24,00	55		25,00	52,00	L of Pile m	24			
25,00									
26,00	56		27,38	40,50	Dia of Pile m	1	843,40	281,13	108,02
27,00					L of Pile m	24			
28,00			25,43	27,75					
29,00									
30,00			23,73	14,00					
31,00					Qu = 7 Nb. Ap + 0,32 N As (Tonf) Nb < 60				
32,00			22,25	0,00					
33,00									
34,00			20,94	0,00	Qu = 400. Ap+{0,024 (N -53) +17,2} As (Tonf) Nb > 60				
35,00									
36,00			19,78	0,00					
37,00									
38,00			18,74	0,00					
39,00									
40,00			17,80	0,00					
41,00									

LAMPIRAN

BORING LOG
CPT / SONDIR
SUMMARY LAB TEST
Weight- Volume relationship
Atterberg Limits
Soil Classification
Grained Sizes Distribution
Direct Shear Test
Triaxial UU Test
Consolidation Test
Site Phorograph

BORING LOG

PROJECT	JEMBATAN KRESEK BALARAJA	COORDINATES	BORING METHODE	Length/Dia Of Cassing
		E	Wash Boring	
CLIENT	PT. SARITAMA PURNAMA	N	SAMPLING METHODE	Driller : Supri
		ELEVATION : -1,70 m	Thin Walled / Shelby Tube	Date of Tested
LOCATION	Kresek, Balaraja, Banten	GWL from GS -3,00 m	SPT Automatic Hammer	08 to 11 Nov 2012
BORE HOLE NO	DB-1	DRILLING MACHINE TYPE	Kano / Custom	Checked : Muhtarom
DEPTH	26,50 meter	TYPE OF CORING BARREL :		Page : 1 / 2

DEPTH (m)	LOG	USCS	DESCRIPTION	U.D Sample Depth(m)	N - SPT I (0-15)	N - SPT II (15-30)	N - SPT III (30-45)	N Value	N - SPT DIAGRAM (10 20 30 40 50 60)
0,00									
			CLAY, Black with some yellow coloured,						
-1,00			Very Soft Consistency and High plasticity						
-2,00				1,50 - 2,00					
					1	1	1	2	
-3,00									
-4,00				3.50 - 4,00					
		CH	Dark Brown Coloured , Very Soft Consistency		1	1	1	2	
-5,00									
-6,00				5,50 - 6,00					
			Brownish Yellow and Greenish Grey Coloured		1	2	2	4	
-7,00			Soft Consistency						
-8,00									
					2	2	3	5	
-9,00									
-10,00									
		ML	SANDY SILT , Grey Coloured, Stiff Consistency		3	5	7	12	
-11,00									
-12,00									
					5	8	10	18	
-13,00									
		MH	SILT , Brown Coloured , Very Stiif Consistency						
-14,00									
			Hard Consistency		10	15	18	33	
-15,00									
-16,00			SANDY SILT , Greu Coloured , Very Stiff Consistency						
					8	10	15	25	
-17,00		ML							
-18,00			Brown Ciloure, Very Stiff Consistency						
					10	12	15	27	
-19,00									
-20,00									
					15	18	21	39	
-21,00									
-22,00									
		CL	SILT, Dark Grey Coloured , Hard Consistency		18	21	31	52	
-23,00									
-24,00									
					18	23	31	54	
-25,00									

N - SPT

Remarks : Ground Surface Bore Hole elevation is -1,70 meter from surface road (0,00 meter)

Clay	Silt	Sand	Gravel	Organic matter

BORING LOG

PROJECT	JEMBATAN KRESEK BALARAJA 0	COORDINATES E	BORING METHODE Wash Boring	Length/Dia Of Cassing
CLIENT ,	PT. SARITAMA PURNAMA 0	COORDINATES N	SAMPLING METHODE Thin Walled / Shelby Tube	Driller : Supri
LOCATION	Kresek, Balaraja, Banten	ELEVATION : -1,70 m	SPT Automatic Hammer	Date of Tested 08 to 11 Nov 2012
BORE HOLE NO	DB-1	GWL from GS -3,00 m	DRILLING MACHINE TYPE Kano / Custom	Checked : Muhtarom
DEPTH	26,50 meter	TYPE OF CORING BARREL : Singgle Core Barrel		Page : 2 / 2

DEPTH (m)	LOG	USCS	DESCRIPTION	U.D Sample Depth(m)	N - SPT I (0-15)	II (15-30)	III (30-45)	N Value	N - SPT DIAGRAM 10 20 30 40 50 60
-25,00	\\\\\\\\\								
	\\\\\\\\\	CL	SILT. Dark Grey Coloured , Hard Consistency						
-26,00	\\\\\\\\\								
	\\\\\ ⊗				18	22	34	56	
-27,00			End of boring						
-28,00									
-29,00									
-30,00									
-31,00									
-32,00									
-33,00									
-34,00									
-35,00									
-36,00									
-37,00									
-38,00									
-39,00									
-40,00									
-41,00									
-42,00									
-43,00									
-44,00									
-45,00									
-46,00									
-47,00									
-48,00									
-49,00									
-50,00									

⊗ N-SPT

Remarks : Ground Surface Bore Hole elevation is -1,70 meter from surface road (0,00 meter)

IIIIIIIII Clay | \\\\\\\ Silt | :::::::: Sand | 0 0 0 0 Gravel | vvvvvv Organic matter

BORING LOG

PROJECT	JEMBATAN KRESEK BALARAJA	COORDINATES	BORING METHODE	Length/Dia Of Cassing
		E	Wash Boring	
CLIENT	PT. SARITAMA PURNAMA	N	SAMPLING METHODE	Driller : Supri
LOCATION	Kresek, Balaraja, Banten	ELEVATION : -0,80 m	Thin Walled / Shelby Tube	Date of Tested
BORE HOLE NO	DB-2	GWL from GS -3,70 m	SPT Automatic Hammer	11 to 13 Nov 2012
DEPTH	26,50 meter	DRILLING MACHINE TYPE Kano / Custom		Checked : Muhtarom
		TYPE OF CORING BARREL :		Page : 1 / 2

DEPTH (m)	LOG	USCS	DESCRIPTION	U.D Sample Depth(m)	N - SPT I (0-15)	N - SPT II (15-30)	N - SPT III (30-45)	N Value	N - SPT DIAGRAM (10 20 30 40 50 60)
0,00									
-1,00									
-2,00				1,50 - 2,00					
-3,00			CLAY , Blackish Drak Brown Coloured, Ver Soft Consistency		1	1	1	2	
-4,00				3.50 - 4,00					
-5,00		CH			1	1	2	3	
-6,00				5,50 - 6,00					
-7,00			Yellowish Brown Coloured , Medium Consistency		2	3	4	7	
-8,00									
-9,00					2	3	5	8	
-10,00									
-11,00		CH	SILTY CLAY, Grey Coloured , Stiff Consistency		3	5	7	12	
-12,00									
-13,00		MH	SILT, Brown Coloured , Very Stiff Consistency		6	8	13	21	
-14,00									
-15,00		ML	CLAYEY SILT , Grey Coloured , Hard Consistency		10	14	18	32	
-16,00									
-17,00			SILT , Litght Grey Coloured , hard Consistency		10	15	17	32	
-18,00									
-19,00			Grey and Brownish Yellow Coloured , Hard Consistency		10	13	18	31	
-20,00									
-21,00					15	19	27	46	
-22,00									
-23,00		ML	Dark Grey Coloured , Hard Consistency		18	22	29	51	
-24,00									
-25,00			Dark Grey Coloured, Hard Consistency'		18	24	31	55	

Remarks Ground Surface Bore Hole elevation is -0.80 meter from surface road (0.00 meter)

N - SPT

Clay | Silt | Sand | Gravel | Organic matter

BORING LOG

PROJECT	JEMBATAN KRESEK BALARAJA 0	COORDINATES		BORING METHODE	Length/Dia Of Cassing
		E		Wash Boring	
CLIENT ,	PT. SARITAMA PURNAMA 0	N		SAMPLING METHODE	Driller : Supri
		ELEVATION : -0,80 m		Thin Walled / Shelby Tube	Date of Tested
LOCATION	Kresek, Balaraja, Banten	GWL from GS -3,70 m		SPT Automatic Hammer	11 to 13 Nov 2012
BORE HOLE NO	DB-2	DRILLING MACHINE TYPE	Kano / Custom		Checked : Muhtarom
DEPTH	26,50 meter	TYPE OF CORING BARREL : Singgle Core Barrel			Page : 2 / 2

DEPTH	LOG	USCS	DESCRIPTION	U.D Sample Depth(m)	N - SPT I (0-15)	N - SPT II (15-30)	N - SPT III (30-45)	N Value	N - SPT DIAGRAM (10 20 30 40 50 60)
-25,00									
-26,00		ML	SILT , Dark Grey Coloured, Hard Consistency'		18	25	31	56	
-27,00			End of boring						
-28,00									
-29,00									
-30,00									
-31,00									
-32,00									
-33,00									
-34,00									
-35,00									
-36,00									
-37,00									
-38,00									
-39,00									
-40,00									
-41,00									
-42,00									
-43,00									
-44,00									
-45,00									
-46,00									
-47,00									
-48,00									
-49,00									
-50,00									

N-SPT

Remarks : Ground Surface Bore Hole elevation is -0,80 meter from surface road (0,00 meter)

Clay | Silt | Sand | Gravel | Organic matter

CPT DATA *ISTN Soil Mechanics Laboratory*

Biconnus data :
Area End of Connus (A1) Friction Area (A2)
A1 = 10 cm^2 A2 = 120 cm^2

CPT No : S-1 **Project : Jembatan Kresek Balaraja**

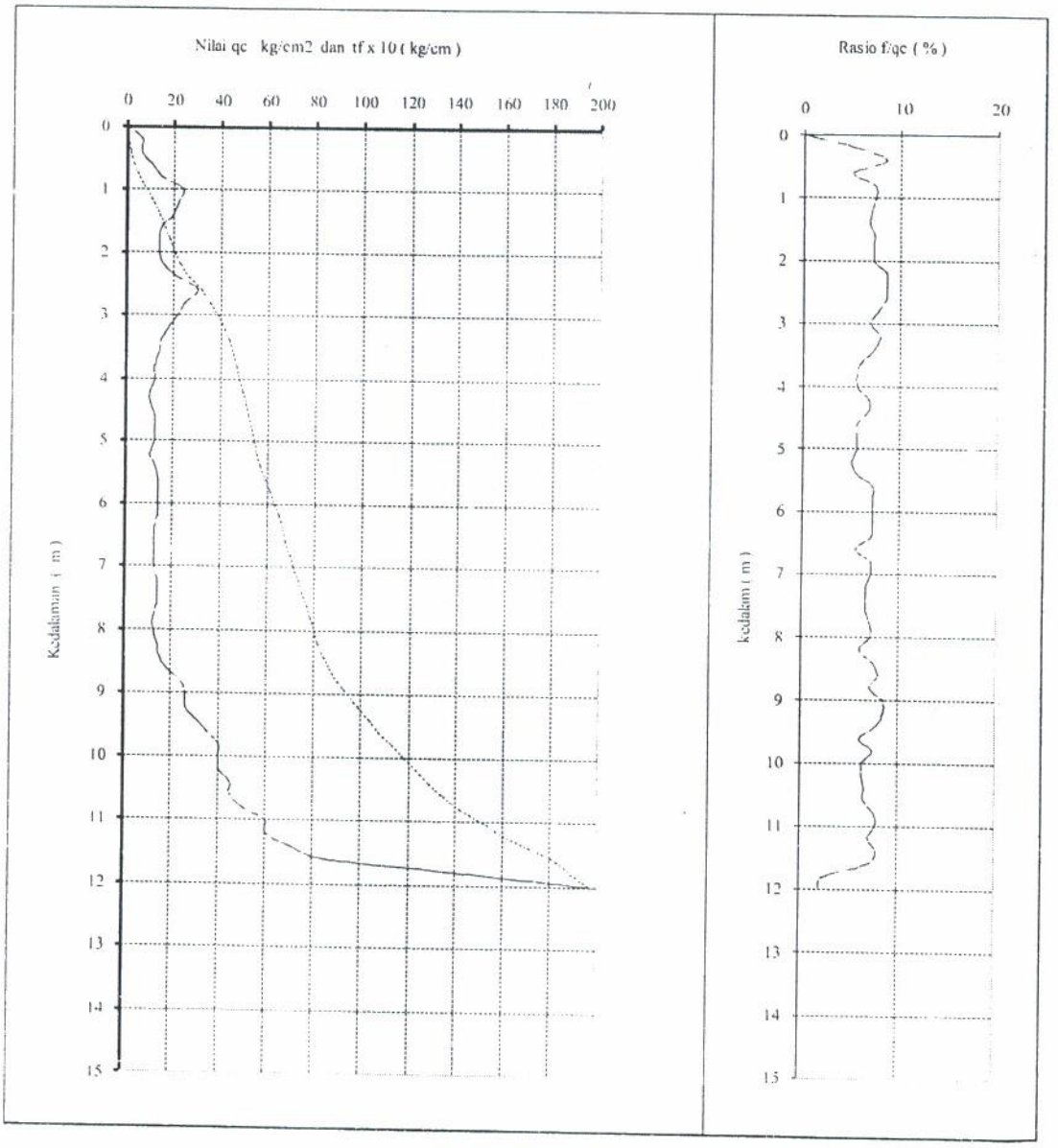
Depth	qc	qt	f	tf	tf/10	f/qc
0,00	0	0	0	0	0	0
0,20	6	10	0,33	6,67	0,67	5,56
0,40	6	12	0,50	16,67	1,67	8,33
0,60	10	16	0,50	26,67	2,67	5,00
0,80	15	28	1,08	48,33	4,83	7,22
1,00	24	45	1,75	83,33	8,33	7,29
1,20	22	40	1,50	113,33	11,33	6,82
1,40	20	36	1,33	140,00	14,00	6,67
1,60	15	28	1,08	161,67	16,17	7,22
1,80	14	26	1,00	181,67	18,17	7,14
2,00	14	26	1,00	201,67	20,17	7,14
2,20	16	32	1,33	228,33	22,83	8,33
2,40	22	44	1,83	265,00	26,50	8,33
2,60	30	60	2,50	315,00	31,50	8,33
2,80	25	48	1,92	353,33	35,33	7,67
3,00	22	40	1,50	383,33	38,33	6,82
3,20	18	35	1,42	411,67	41,17	7,87
3,40	15	28	1,08	433,33	43,33	7,22
3,60	14	24	0,83	450,00	45,00	5,95
3,80	12	20	0,67	463,33	46,33	5,56
4,00	12	20	0,67	476,67	47,67	5,56
4,20	10	18	0,67	490,00	49,00	6,67
4,40	10	18	0,67	503,33	50,33	6,67
4,60	12	20	0,67	516,67	51,67	5,56
4,80	12	20	0,67	530,00	53,00	5,56
5,00	12	20	0,67	543,33	54,33	5,56
5,20	10	16	0,50	553,33	55,33	5,00
5,40	12	20	0,67	566,67	56,67	5,56
5,60	14	26	1,00	586,67	58,67	7,14
5,80	14	26	1,00	606,67	60,67	7,14
6,00	14	26	1,00	626,67	62,67	7,14
6,20	14	26	1,00	646,67	64,67	7,14
6,40	12	22	0,83	663,33	66,33	6,94
6,60	12	20	0,67	676,67	67,67	5,56
6,80	12	22	0,83	693,33	69,33	6,94
7,00	12	22	0,83	710,00	71,00	6,94
7,20	14	25	0,92	728,33	72,83	6,55
7,40	14	25	0,92	746,67	74,67	6,55
7,60	14	25	0,92	765,00	76,50	6,55
7,80	12	22	0,83	781,67	78,17	6,94
8,00	12	22	0,83	798,33	79,83	6,94
8,20	14	24	0,83	815,00	81,50	5,95
8,40	15	28	1,08	836,67	83,67	7,22
8,60	18	35	1,42	865,00	86,50	7,87
8,80	24	44	1,67	898,33	89,83	6,94
9,00	26	52	2,17	941,67	94,17	8,33
9,20	26	52	2,17	985,00	98,50	8,33
9,40	30	58	2,33	1031,67	103,17	7,78
9,60	35	60	2,08	1073,33	107,33	5,95
9,80	40	75	2,92	1131,67	113,17	7,29
10,00	40	70	2,50	1181,67	118,17	6,25
10,20	40	70	2,50	1231,67	123,17	6,25

10,40	45	80	2,92	1290,00	129,00	6,48
10,60	45	80	2,92	1348,33	134,83	6,48
10,80	50	95	3,75	1423,33	142,33	7,50
11,00	60	115	4,58	1515,00	151,50	7,64
11,20	60	110	4,17	1598,33	159,83	6,94
11,40	70	135	5,42	1706,67	170,67	7,74
11,60	85	155	5,83	1823,33	182,33	6,86
11,80	140	180	3,33	1890,00	189,00	2,38
12,00	200	250	4,17	1973,33	197,33	2,08

CONE PENETRATION TEST

ISTN Soil Mechanics Laboratory

SONDIR NO	: S-1	D1 (Qonus)	3.54 cm
PROJECT	: Jembatan Kresek Balaraja	D2 (Jacked)	3.56 cm
LOCATION	: Tangerang, Banten	H (jacked)	10.8 cm
DATE OF TESTED	: 08 Nopember 2012	Ratio (R)	
TESTED BY	: Nirman Mr.	Elevation (- 0.00)	
CHECKED BY	: GEOINVES	G W L (-)	- m



CPT DATA *ISTN Soil Mechanics Laboratory*

Biconnus data :

Area End of Connus (A1) A1 = 10 cm^2

Friction Area (A2) A2 = 120 cm^2

CPT No : S-2 **Project :** Jembatan Kresek Balaraja

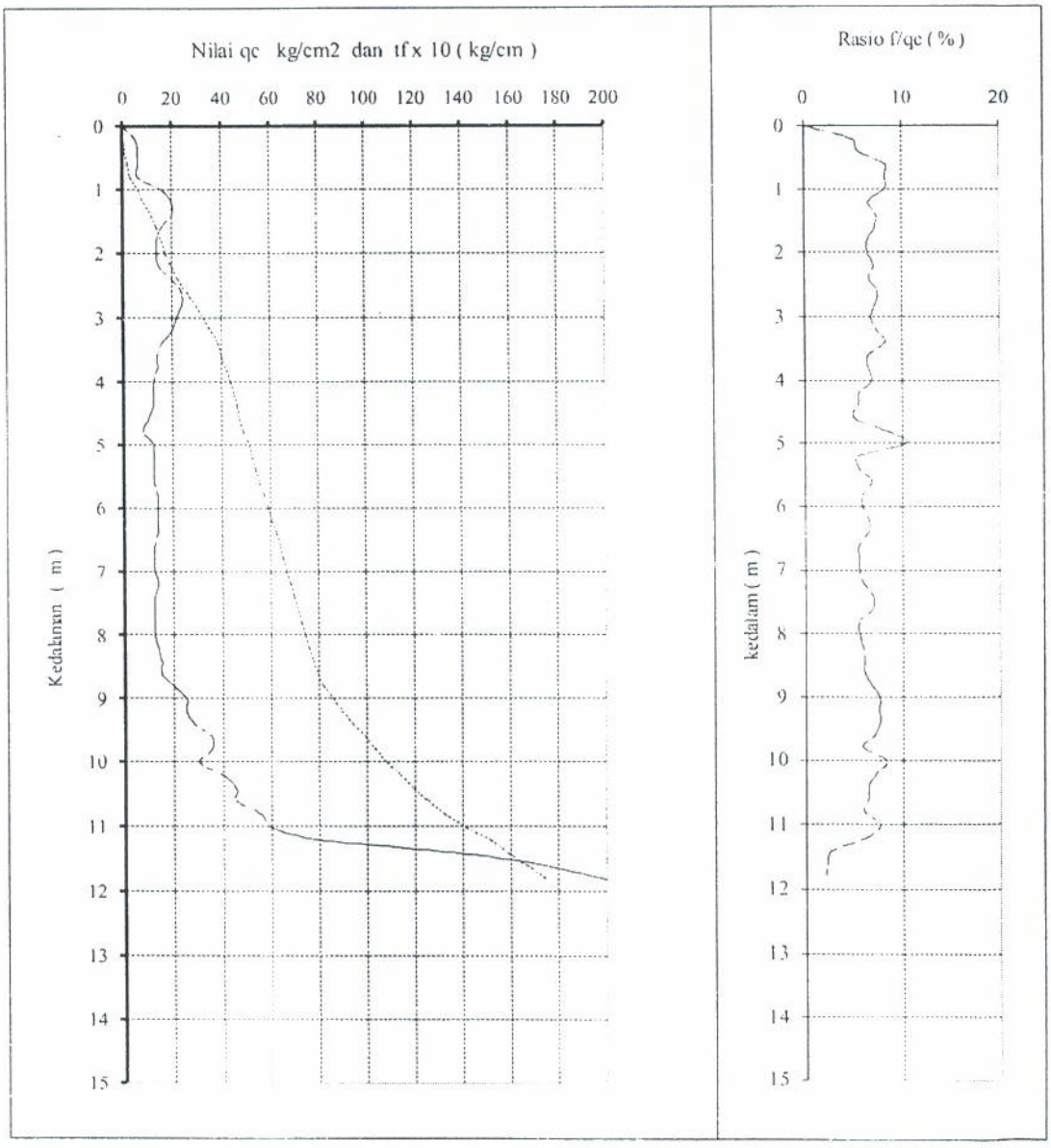
Depth	qc	qt	f	tf	tf/10	f/qc
0,00	0	0	0	0	0	0
0,20	5	8	0,25	5,00	0,50	5,00
0,40	6	10	0,33	11,67	1,17	5,56
0,60	6	12	0,50	21,67	2,17	8,33
0,80	6	12	0,50	31,67	3,17	8,33
1,00	16	32	1,33	58,33	5,83	8,33
1,20	20	36	1,33	85,00	8,50	6,67
1,40	20	38	1,50	115,00	11,50	7,50
1,60	16	30	1,17	138,33	13,83	7,29
1,80	14	25	0,92	156,67	15,67	6,55
2,00	14	25	0,92	175,00	17,50	6,55
2,20	15	28	1,08	196 67	19,67	7,22
2,40	20	36	1,33	223,33	22,33	6,67
2,60	24	46	1,83	260,00	26,00	7,64
2,80	24	45	1,75	295,00	29,50	7,29
3,00	22	40	1,50	325,00	32,50	6,82
3,20	20	38	1,50	355,00	35,50	7,50
3,40	16	32	1,33	381,67	38,17	8,33
3,60	14	25	0,92	400,00	40,00	6,55
3,80	14	25	0,92	418,33	41,83	6,55
4,00	12	22	0,83	435,00	43,50	6,94
4,20	12	20	0,67	448,33	44,83	5,56
4,40	12	20	0,67	461,67	46,17	5,56
4,60	10	16	0,50	471,67	47,17	5,00
4,80	8	16	0,67	485,00	48,50	8,33
5,00	12	27	1,25	510,00	51,00	10,42
5,20	12	20	0,67	523,33	52,33	5,56
5,40	12	20	0,67	536,67	53,67	5,56
5,60	12	22	0,83	553,33	55,33	6,94
5,80	14	24	0,83	570,00	57,00	5,95
6,00	14	24	0,83	586,67	58,67	5,95
6,20	14	25	0,92	605,00	60,50	6,55
6,40	14	25	0,92	623,33	62,33	6,55
6,60	12	20	0,67	636,67	63,67	5,56
6,80	12	20	0,67	650,00	65,00	5,56
7,00	12	20	0,67	663,33	66,33	5,56
7,20	14	24	0,83	680,00	68,00	5,95
7,40	12	22	0,83	696,67	69,67	6,94
7,60	12	22	0,83	713,33	71,33	6,94
7,80	12	20	0,67	726,67	72,67	5,56
8,00	12	20	0,67	740,00	74,00	5,56
8,20	14	24	0,83	756,67	75,67	5,95
8,40	15	26	0,92	775,00	77,50	6,11
8,60	15	26	0,92	793,33	79,33	6,11
8,80	20	36	1,33	820,00	82,00	6,67
9,00	25	48	1,92	858,33	85,83	7,67
9,20	25	48	1,92	896,67	89,67	7,67
9,40	28	54	2,17	940,00	94,00	7,74
9,60	35	65	2,50	990,00	99,00	7,14
9,80	35	60	2,08	1031,67	103,17	5,95
10,00	30	60	2,50	1081,67	108,17	8,33
10,20	40	75	2,92	1140,00	114,00	7,29

10,40	45	80	2,92	1198,33	119,83	6,48
10,60	45	80	2,92	1256,67	125,67	6,48
10,80	55	95	3,33	1323,33	132,33	6,06
11,00	60	115	4,58	1415,00	141,50	7,64
11,20	80	140	5,00	1515,00	151,50	6,25
11,40	140	185	3,75	1590,00	159,00	2,68
11,60	175	220	3,75	1665,00	166,50	2,14
11,80	200	250	4,17	1748,33	174,83	2,08

CONE PENETRATION TEST

ISTN Soil Mechanics Laboratory

SONDIR NO	: S-2	D1 (Qonus)	3.54 cm
PROJECT	: Jembatan Kresek Balaraja	D2 (Jacked)	3.56 cm
LOCATION	: Tangerang, Banten	H (jacked)	10.8 cm
DATE OF TESTED	: 08 Nopember 2012	Ratio (R)	
TESTED BY	: Nirman Mr.	Elevation (- 0.00)	
CHECKED BY	: GEOINVES	G W L (-)	- m



LABORATORIUM MEKANIKA TANAH
INSTITUT SAINS DAN TEKNOLOGI NASIONAL
KAMPUS ISTN BHUMI SRENGSENG INDAH JALAN MOCH KAHFI 2 JAGAKARSA – JAKARTA 12640
TELPON. 021 98189554 FAX . 021 78893379

LABORATORY TESTING RESULTS

Project	Jembatan Kresek Rajeg	Bor Hole No	DB-1 UDS-1
Location	Balaraja, Tangerang	Checked By	*Singgih S.*

ITEM OF TEST	PARAMETER	Unit	Depth 1.50 - 2.00	Depth	Depth
INDEX PROPERTIES					
	Water Content (Wn)	%	28,571		
	Unit Weight of Soil (γ)	gr/cm^3	1,736		
	Unit Weight of Dry Soil (γd)	gr/cm^3	1,350		
	Specific Gravity	-	2,643		
	Void Ratio (e)	-	0,958		
	Porosity (n)	-	0,489		
	Degree of Saturation (Sr)	%	78,839		
	Liquid Limit (LL)	%	48,320		
	Plastic Limit (PL)	%	38,462		
	Plastisity Index (PI)	%	9,858		
GRAINED SIZE DISTRIBUTION					
	Gravel	%	1,60		
	Sand	%	9,35		
	Silt	%	34,05		
	Clay	%	55,00		
	Organic Matter	%	-	-	-
SHEAR STRENGTH PARAMETER					
	Unconfined Compression Test				
	Ultimate Axial Strength (qu)	Kg/cm^2	-	-	-
	Cohession Undrained (Cu)	Kg/cm^2	-	-	-
	Sensitivity (St)	-	-	-	-
	Direct Shear Test				
	Cohession Undrained (Cu)	Kg/cm^2	0,66	-	-
	Angle of Internal Friction (Ø)	Degree	21,644	-	-
	Triaxial UU Test				
	Cohession Undrained (Cu)	Kg/cm^2	-		
	Angle of Internal Friction (Ø)	Degree	-		
	Triaxial CU Test				
	Cohession Undrained Total (Cu)	Kg/cm^2	-	-	-
	Angle of Internal Friction Total (Ø)	Degree	-	-	-
	Cohession Undrained Eff. (Cu')	Kg/cm^2	-	-	-
	Angle of Internal Friction Eff. (Ø')	Degree	-	-	-
COMPRESSIBILITY					
	Praconsolidation Pressure (Pc)	Kg/cm^2	1,49		
	Compression Index (Cc)	-	0,40		
	Coef. Of Consolidation (Cv)	Cm^2/sec	$0,38 X10^{-3}$		
	Rebound Index (Cr)	-	0,105		

LABORATORIUM MEKANIKA TANAH
INSTITUT SAINS DAN TEKNOLOGI NASIONAL
KAMPUS ISTN BHUMI SRENGSENG INDAH JALAN MOCH KAHFI 2 JAGAKARSA – JAKARTA 12640
TELPON. 021 98189554 FAX . 021 78893379

LABORATORY TESTING RESULTS

Project	Jembatan Kresek Rajeg	Bor Hole No	DB-1 UDS-2
Location	Balaraja, Tangerang	Checked By	*Singgih S.*

ITEM OF TEST	PARAMETER	Unit	Depth 3.50 - 4.00	Depth	Depth
INDEX PROPERTIES					
	Water Content (Wn)	%	64,391		
	Unit Weight of Soil (γ)	gr/cm^3	1,576		
	Unit Weight of Dry Soil (γd)	gr/cm^3	0,959		
	Specific Gravity	-	2,627		
	Void Ratio (e)	-	1,739		
	Porosity (n)	-	0,635		
	Degree of Saturation (Sr)	%	97,247		
	Liquid Limit (LL)	%	92,750		
	Plastic Limit (PL)	%	62,376		
	Plastisity Index (Pi)	%	30,374		
GRAINED SIZE DISTRIBUTION					
	Gravel	%	0,00		
	Sand	%	7,05		
	Silt	%	55,95		
	Clay	%	37,00		
	Organic Matter	%	-	-	-
SHEAR STRENGTH PARAMETER					
	Unconfined Compression Test				
	Ultimate Axial Strength (qu)	Kg/cm^2	-	-	-
	Cohession Undrained (Cu)	Kg/cm^2	-	-	-
	Sensitivity (St)	-	-	-	-
	Direct Shear Test				
	Cohession Undrained (Cu)	Kg/cm^2	0,25	-	-
	Angle of Internal Friction (Ø)	Degree	8,751	-	-
	Triaxial UU Test				
	Cohession Undrained (Cu)	Kg/cm^2	-		
	Angle of Internal Friction (Ø)	Degree	-		
	Triaxial CU Test				
	Cohession Undrained Total (Cu)	Kg/cm^2	-	-	-
	Angle of Internal Friction Total (Ø)	Degree	-	-	-
	Cohession Undrained Eff. (Cu')	Kg/cm^2	-	-	-
	Angle of Internal Friction Eff. (Ø')	Degree	-	-	-
COMPRESSIBILITY					
	Praconsolidation Pressure (Pc)	Kg/cm^2	2,14		
	Compression Index (Cc)	-	0,58		
	Coef. Of Consolidation (Cv)	Cm^2/sec	$0,44 \times 10^{-3}$		
	Rebound Index (Cr)	-	0,133		

LABORATORIUM MEKANIKA TANAH
INSTITUT SAINS DAN TEKNOLOGI NASIONAL
KAMPUS ISTN BHUMI SRENGSENG INDAH JALAN MOCH KAHFI 2 JAGAKARSA – JAKARTA 12640
TELPON. 021 98189554 FAX . 021 78893379

LABORATORY TESTING RESULTS

Project	Jembatan Kresek Rajeg	Bor Hole No	DB-1 UDS-3
Location	Balaraja, Tangerang	Checked By	*Singgih S.*

ITEM OF TEST	PARAMETER	Unit	Depth 5.50 - 6.00	Depth	Depth
INDEX PROPERTIES					
	Water Content (W_n)	%	53,806		
	Unit Weight of Soil (γ)	gr/cm^3	1,573		
	Unit Weight of Dry Soil (γd)	gr/cm^3	1,023		
	Specific Gravity	-	2,627		
	Void Ratio (e)	-	1,569		
	Porosity (n)	-	0,611		
	Degree of Saturation (Sr)	%	90,099		
	Liquid Limit (LL)	%	82,020		
	Plastic Limit (PL)	%	54,444		
	Plastisity Index (PI)	%	27,576		
GRAINED SIZE DISTRIBUTION					
	Gravel	%	0,00		
	Sand	%	6,45		
	Silt	%	44,55		
	Clay	%	49,00		
	Organic Matter	%	-	-	-
SHEAR STRENGTH PARAMETER					
	Unconfined Compression Test				
	Ultimate Axial Strength (qu)	Kg/cm^2	-	-	-
	Cohession Undrained (Cu)	Kg/cm^2	-	-	-
	Sensitivity (St)	-	-	-	-
	Direct Shear Test				
	Cohession Undrained (Cu)	Kg/cm^2	0,58	-	-
	Angle of Internal Friction (Ø)	Degree	26,048	-	-
	Triaxial UU Test				
	Cohession Undrained (Cu)	Kg/cm^2	-		
	Angle of Internal Friction (Ø)	Degree	-		
	Triaxial CU Test				
	Cohession Undrained Total (Cu)	Kg/cm^2	-	-	-
	Angle of Internal Friction Total (Ø)	Degree	-	-	-
	Cohession Undrained Eff. (Cu')	Kg/cm^2	-	-	-
	Angle of Internal Friction Eff. (Ø')	Degree	-	-	-
COMPRESSIBILITY					
	Praconsolidation Pressure (Pc)	Kg/cm^2	1,75		
	Compression Index (Cc)	-	0,55		
	Coef. Of Consolidation (Cv)	Cm^2/sec	$0,40 X10^{-3}$		
	Rebound Index (Cr)	-	0,075		

LABORATORIUM MEKANIKA TANAH
INSTITUT SAINS DAN TEKNOLOGI NASIONAL
KAMPUS ISTN BHUMI SRENGSENG INDAH JALAN MOCH KAHFI 2 JAGAKARSA – JAKARTA 12640
TELPON. 021 98189554 FAX . 021 78893379

LABORATORY TESTING RESULTS

Project	Jembatan Kresek Rajeg	Bor Hole No	DB-2 UDS-1
Location	Balaraja, Tangerang	Checked By	*Singgih S.*

ITEM OF TEST	PARAMETER	Unit	Depth 1.50 - 2.00	Depth	Depth
INDEX PROPERTIES					
	Water Content (Wn)	%	42,953		
	Unit Weight of Soil (γ)	gr/cm^3	1,763		
	Unit Weight of Dry Soil (γd)	gr/cm^3	1,233		
	Specific Gravity	-	2,646		
	Void Ratio (e)	-	1,145		
	Porosity (n)	-	0,534		
	Degree of Saturation (Sr)	%	99,244		
	Liquid Limit (LL)	%	62,220		
	Plastic Limit (PL)	%	41,176		
	Plastisity Index (PI)	%	21,044		
GRAINED SIZE DISTRIBUTION					
	Gravel	%	2,30		
	Sand	%	17,50		
	Silt	%	40,70		
	Clay	%	39,50		
	Organic Matter	%	-	-	-
SHEAR STRENGTH PARAMETER					
	Unconfined Compression Test				
	Ultimate Axial Strength (qu)	Kg/cm^2	-	-	-
	Cohession Undrained (Cu)	Kg/cm^2	-	-	-
	Sensitivity (St)	-	-	-	-
	Direct Shear Test				
	Cohession Undrained (Cu)	Kg/cm^2	-	-	-
	Angle of Internal Friction (Ø)	Degree	-	-	-
	Triaxial UU Test				
	Cohession Undrained (Cu)	Kg/cm^2	0,253		
	Angle of Internal Friction (Ø)	Degree	6,00		
	Triaxial CU Test				
	Cohession Undrained Total (Cu)	Kg/cm^2	-	-	-
	Angle of Internal Friction Total (Ø)	Degree	-	-	-
	Conession Undrained Eff. (Cu')	Kg/cm^2	-	-	-
	Angle of Internal Friction Eff. (Ø')	Degree	-	-	-
COMPRESSIBILITY					
	Praconsolidation Pressure (Pc)	Kg/cm^2	1,49		
	Compression Index (Cc)	-	0,40		
	Coef. Of Consolidation (Cv)	Cm^2/sec	$0,47 \times 10^{-3}$		
	Rebound Index (Cr)	-	0,105		

LABORATORIUM MEKANIKA TANAH
INSTITUT SAINS DAN TEKNOLOGI NASIONAL
KAMPUS ISTN BHUMI SRENGSENG INDAH JALAN MOCH KAHFI 2 JAGAKARSA – JAKARTA 12640
TELPON. 021 98189554 FAX . 021 78893379

LABORATORY TESTING RESULTS

Project	Jembatan Kresek Rajeg	Bor Hole No	DB-2 UDS-2
Location	Balaraja, Tangerang	Checked By	*Singgih S.*

ITEM OF TEST	PARAMETER	Unit	Depth 3.50 - 4.00	Depth	Depth
INDEX PROPERTIES					
	Water Content (Wn)	%	43,254		
	Unit Weight of Soil (γ)	gr/cm^3	1,771		
	Unit Weight of Dry Soil (γd)	gr/cm^3	1,236		
	Specific Gravity	-	2,647		
	Void Ratio (e)	-	1,141		
	Porosity (n)	-	0,533		
	Degree of Saturation (Sr)	%	100,349		
	Liquid Limit (LL)	%	96,775		
	Plastic Limit (PL)	%	48,582		
	Plastisity Index (PI)	%	48,193		
GRAINED SIZE DISTRIBUTION					
	Gravel	%	0,35		
	Sand	%	17,35		
	Silt	%	14,30		
	Clay	%	68,00		
	Organic Matter	%	-	-	-
SHEAR STRENGTH PARAMETER					
	Unconfined Compression Test				
	Ultimate Axial Strength (qu)	Kg/cm^2	-	-	-
	Cohession Undrained (Cu)	Kg/cm^2	-	-	-
	Sensitivity (St)	-	-	-	-
	Direct Shear Test				
	Cohession Undrained (Cu)	Kg/cm^2	-	-	-
	Angle of Internal Friction (Ø)	Degree	-	-	-
	Triaxial UU Test				
	Cohession Undrained (Cu)	Kg/cm^2	0,203		
	Angle of Internal Friction (Ø)	Degree	6,75		
	Triaxial CU Test				
	Cohession Undrained Total (Cu)	Kg/cm^2	-	-	-
	Angle of Internal Friction Total (Ø)	Degree	-	-	-
	Cohession Undrained Eff. (Cu')	Kg/cm^2	-	-	-
	Angle of Internal Friction Eff. (Ø')	Degree	-	-	-
COMPRESSIBILITY					
	Praconsolidation Pressure (Pc)	Kg/cm^2	0,75		
	Compression Index (Cc)	-	0,79		
	Coef. Of Consolidation (Cv)	Cm^2/sec	$0,45 X10^{-3}$		
	Rebound Index (Cr)	-	0,38		

LABORATORIUM MEKANIKA TANAH
INSTITUT SAINS DAN TEKNOLOGI NASIONAL
KAMPUS ISTN BHUMI SRENGSENG INDAH JALAN MOCH KAHFI 2 JAGAKARSA – JAKARTA 12640
TELPON. 021 98189554 FAX . 021 78693379

LABORATORY TESTING RESULTS

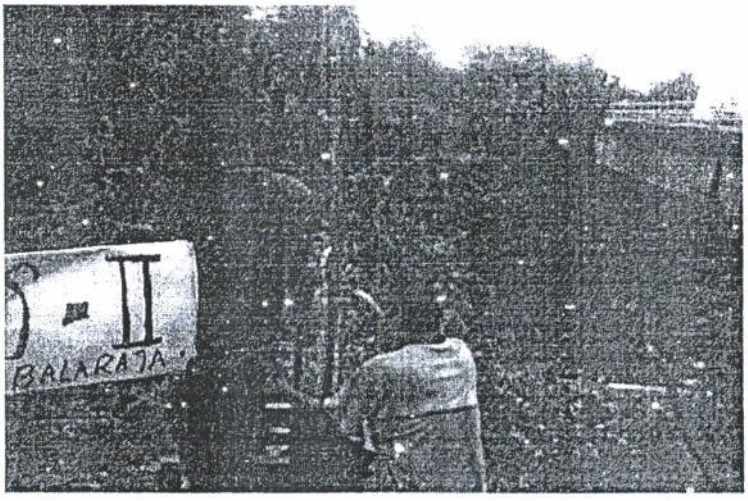
Project	Jembatan Kresek Rajeg	Bor Hole No	DB-2 UDS-3
Location	Balaraja, Tangerang	Checked By	*Singgih S.*

ITEM OF TEST	PARAMETER	Unit	Depth 5.50 - 6.00	Depth	Depth
INDEX PROPERTIES					
	Water Content (Wn)	%	25,164		
	Unit Weight of Soil (γ)	gr/cm^3	1,716		
	Unit Weight of Dry Soil (γd)	gr/cm^3	1,371		
	Specific Gravity	-	2,641		
	Void Ratio (e)	-	0,927		
	Porosity (n)	-	0,481		
	Degree of Saturation (Sr)	%	71,707		
	Liquid Limit (LL)	%	75,005		
	Plastic Limit (PL)	%	37,919		
	Plastisity Index (PI)	%	37,086		
GRAINED SIZE DISTRIBUTION					
	Gravel	%	0,00		
	Sand	%	16,35		
	Silt	%	15,65		
	Clay	%	68,00		
	Organic Matter	%	-	-	-
SHEAR STRENGTH PARAMETER					
	Unconfined Compression Test				
	Ultimate Axial Strength (qu)	Kg/cm^2	-	-	-
	Cohession Undrained (Cu)	Kg/cm^2	-	-	-
	Sensitivity (St)	-	-	-	-
	Direct Shear Test				
	Cohession Undrained (Cu)	Kg/cm^2	-	-	-
	Angle of Internal Friction (Ø)	Degree	-	-	-
	Triaxial UU Test				
	Cohession Undrained (Cu)	Kg/cm^2	1,310		
	Angle of Internal Friction (Ø)	Degree	5,85		
	Triaxial CU Test				
	Cohession Undrained Total (Cu)	Kg/cm^2	-	-	-
	Angle of Internal Friction Total (Ø)	Degree	-	-	-
	Cohession Undrained Eff. (Cu')	Kg/cm^2	-	-	-
	Angle of Internal Friction Eff. (Ø')	Degree	-	-	-
COMPRESSIBILITY					
	Praconsolidation Pressure (Pc)	Kg/cm^2	1,97		
	Compression Index (Cc)	-	0,51		
	Coef. Of Consolidation (Cv)	Cm^2/sec	$0,39 \times 10^{-3}$		
	Rebound Index (Cr)	-	0,1		

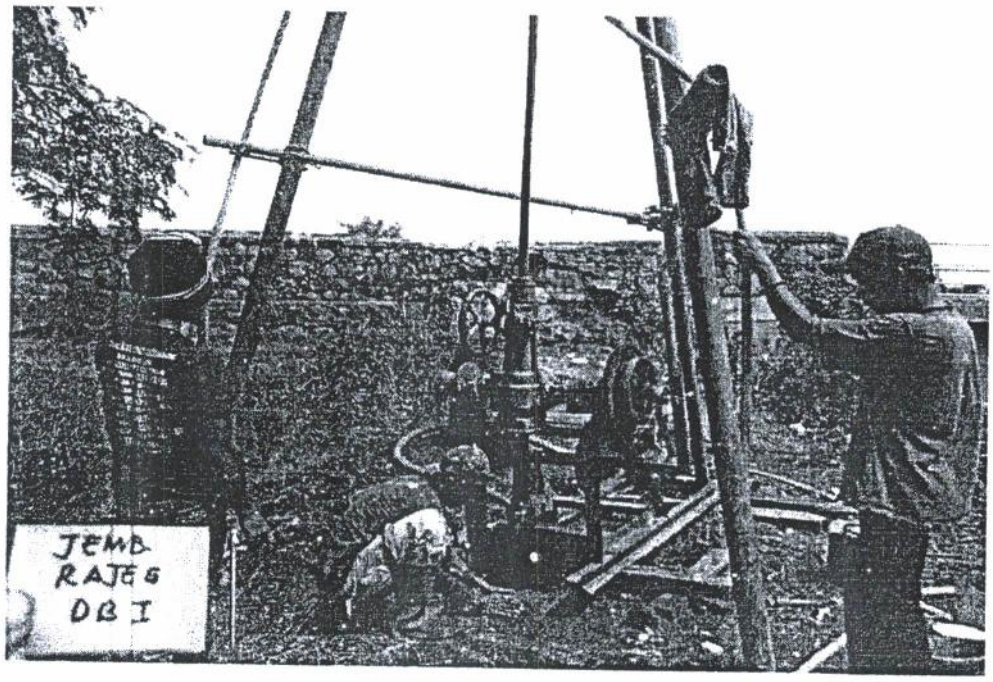
FOTO SITE : JEMBATAN KRESEK BALARAJA

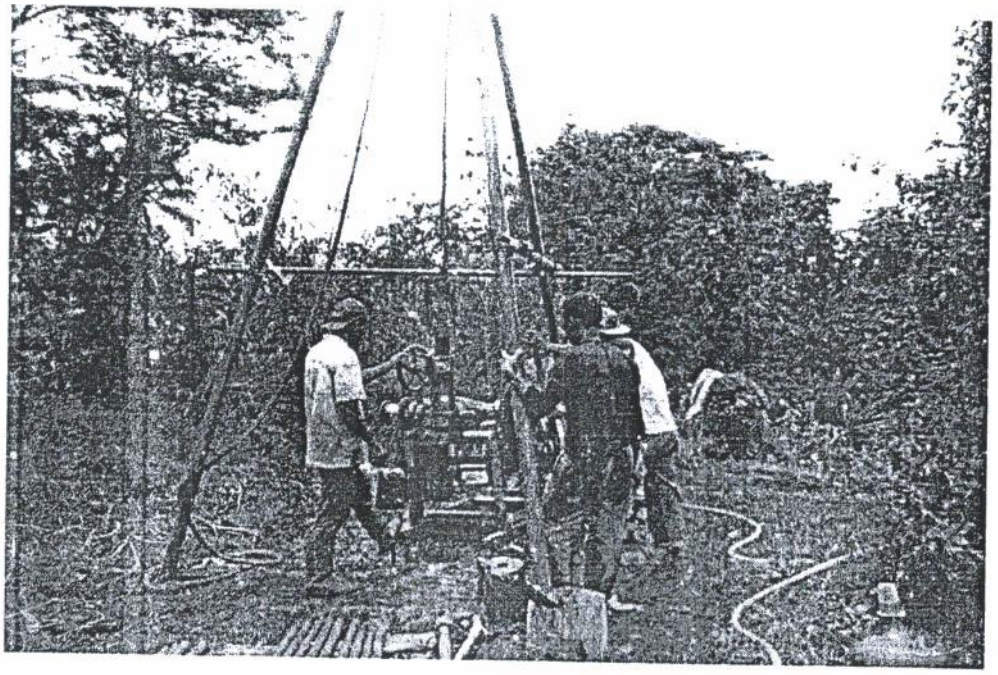
TANGERANG, BANTEN

S-1



S-2


JEMB
RAJEG
DB I



PROPOSED USE CTB FOR WIDENING ROAD CONSTRUCTION IN STA 7+820 TO 8+062
(Including JICT Road Internal Arrangement)

by : Idrus Ir. M.Sc
Jakarta ,Tanjung Priok , 11 Februari 2013, JAYA OBAYASHI CORP – JAKON

Abstract :
The use of cement has been widely used for several improvements soil properties, soil properties would be better used as a material for subgrade, subbase and basecourse material. In the case of widening and addition of elevation of the road surface in JICT (STA 7+820 until 8+062) , where Concrete Treated Base (CTB) has been used in road construction basecourse existing, need to be assessed basecourse type that will be used in the widening and the addition of the elevation of the road. In the following article we try to explain the benefits of the use of cement, especially to find a solution in determining basecourse material.

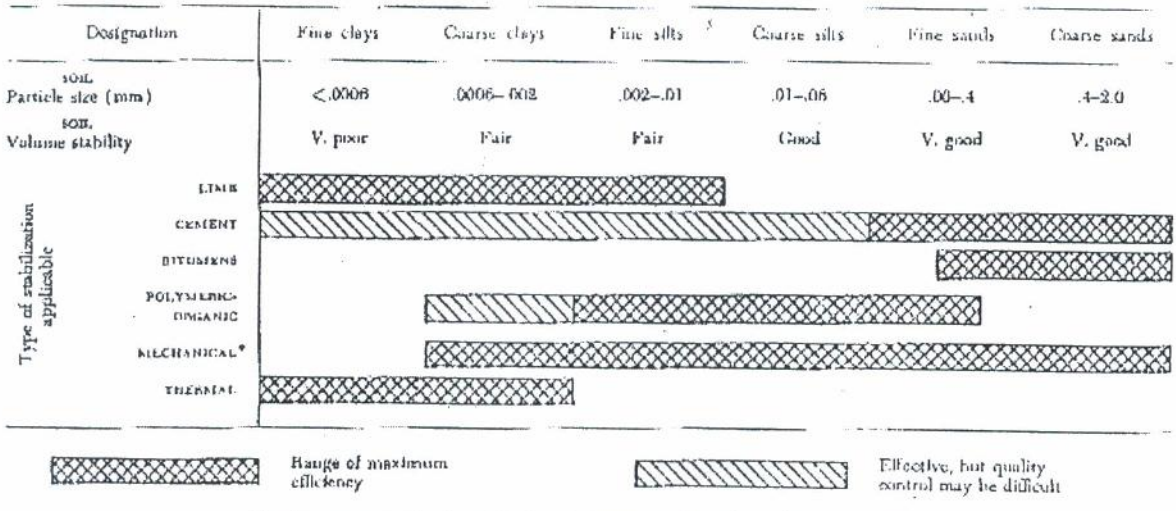
1. APPLICABILITY OF SOIL STABILIZATION METHODS

Application of soil stabilization methods depends on two main things, grained size distribution of soil and material stabilization(cement, lime, bitumens, etc)

It is perhaps appropriate to note , whilst discusing stabilization methods generally, the comparable range of application of these methods. Thus is done in Table 1. it will be seen that reasonable justification exists for such generalization as " use lime for clays and cement for sands ", but no less care should be exercised when stabilizing than with any other construction technique.

In table1, it cemen utilization for soil stabilization materials can be used for all types of soil, but it gets better results when used for soil with coarse gradation (granular soil).

Table 1 : Applicability os Stabilizaztion Methods



* I.e. improvement of soil grading by mixing-in gravels, sands or clays as appropriate

2. CEMENT STABILIZATION

When a material or combination of materials with adequate mechanical stability cannot be obtained, or where enhanced strength or resistance to water softening is required , and it may be advisable to consider stabilization by the addition of cement.

Cement stabilization is widely used for road construction . The technique of cement stabilization involves breaking up (pulverizing) the soil, adding the cement, usually by spreading on the surface of the loose soil, mixing the cement with the soil than watering and compacting until minimum 95% from the maximum dry density in laboratory compaction test.

The additional of even small quantities of cement, up to 2 percent, will modify the properties of gthe soil, whereas large amounts will radically after the properties. a clean gravel with 5 to 10 percent of cement will behave almost like concrete, and indeed may often be referred to as "lean" or "rolled" concrete.

3. SOME REFERENCE SOIL STABILIZATION WITH CEMENT

As the main reference is the use of Cement on existing conditions at the site JICT the CTB layer, by mixing cement with aggregate and water, as thick as 90 cm. Test Californoa bearing ratio (CBR) field has been done on the surface of the CTB to the results CBR value greater than 140%. However, because the work is already done for so long (over 10 years) then we do not get data on the percentage of usage of cement. But the soil is used in the form of granular soil (Gravelly Sand).

Here is the result of other references on cement stabilization :

Table 2 : Typical Properties of Soil Cement Stabilization

Soil Type	Strength Range (1)	E value	CBR (2)	Permeability	Thermal Expansion	Volume Change (3)	Comments	Use
Well graded gravel sand clay, sand or gravels	28-100 (400-1500) and more. Ratio of wet/dry strength 1.1.5	7.25×10^4	More than 300	High Decreased by cement 35×10^{-4} unstabilized 18×10^{-4} stabilized		Very small less than 1% (Concrete 0.1%)	Testsand) Wide use as wide bases Suitable for bituminous stabilization	Base for heavy traffic
Silty sands silty clays sand and gravel	17-35 (250-500)	7×10^4	300	High Decreased by cement		Small	Good material	Base for heavy traffic
Silty sandy clays heavy gravel sands	7-17 (100-250)	$3.5-7 \times 10^4$	200	5×10^{-4} unstabilized 0.1×10^{-4} stabilized	10×10^{-6} 7×10^{-6}		Compaction difficulties in sands	Sub-base for light traffic
Silts, silty clays, very poorly graded soils	3.5-10.5 (50-150)	Less than 3.5×10^4	Up to 100	Low Increased by cement		Moderate		Low grade sub base
Heavy clays organic and calcareous rich soils	1-<7 (<100) Ratio of wet/dry strength 1.3	Up to 1.4×10^4	Up to 50	Very low (10^{-7}) decreased by cement (10^{-8})	10×10^{-6}	High Not May be increased by cement	Extensive difficulty in mixing Use of lime Excessive lime Note Special treatment for organic and sulphate soils	Possibly for upgrading subgrades

NOTES

(1) Strength given as 28 day splitting tensile for 7 days cure at constant temperature and moisture content appropriate economic cement content density and moisture content tested. Ratio of U.C.S. to flexural about 4.5 in sand 2.1 in gravels Ratio to U.C.S. to I.T.S. about 10:1

(2) From flexure tests Ratio of static to dynamic values about 1.1 Poissons ratio ranges from 0.1 to 0.3

(3) Approximate figures for mixes with 7 days U.C.S. of 250 psi (accepted U.C.S. for base construction)

(4) Coefficients for concrete 3.5×10^{-6} Concrete 9×10^{-6}

(5) Only very limited data

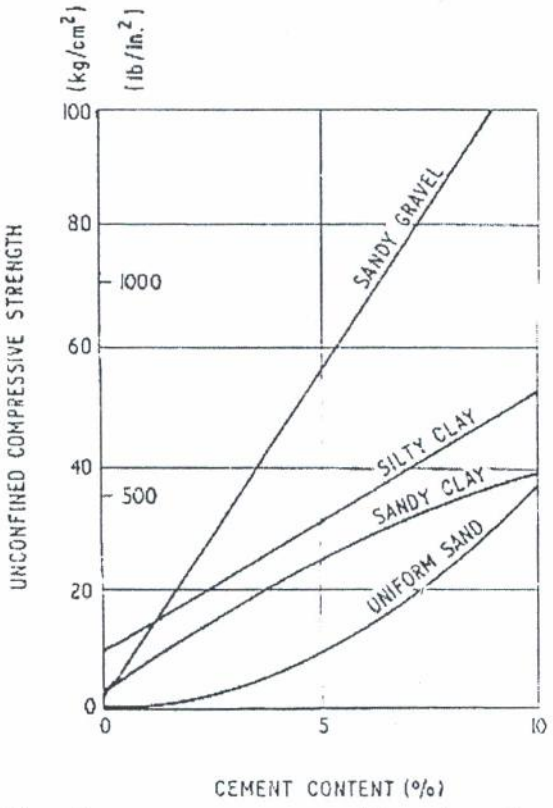


Figure 1 : Effect of cement content on strength for various soil stabilized with ordinary Portland Cement (PC) and cured for 7 days at 25°C, contant moisture content (after Metcalf)

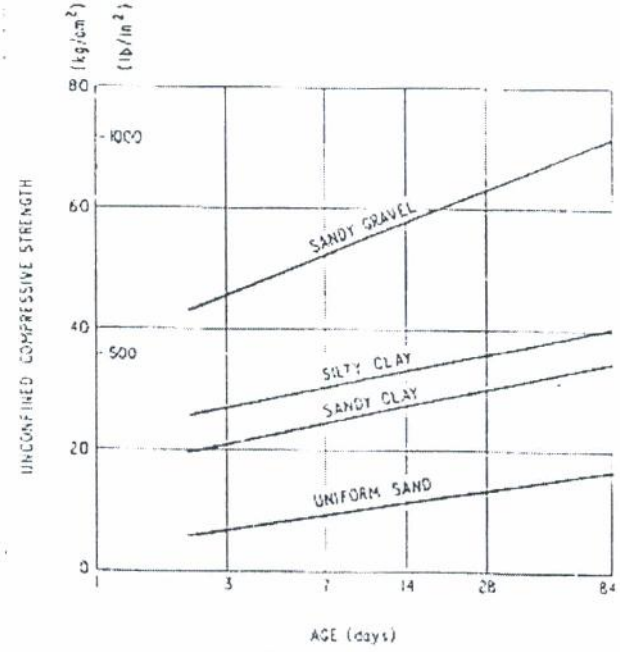


Figure 2 : Effect of age o strength of various soil stabilized with 5 % cement (after Metcalf)

Table 3 : Cement Content for various soil types for pavement construction

Soil Type	Cement Requirement (per cent)
Fine crushed rock	½- 2 [1]
Well graded sandy clay gravels	2- 4
Well graded sand	2- 4
Poorly graded sand	4- 5 [2]
Sandy clay	4- 6
Silty clay	6- 8
Heavy clay	8-12
Very heavy clay	12-15 [3]
Organic soils	10-15 [4]

[1] Used as a construction expedient to aid "set up" on compaction, to reduce sensitivity to compaction moisture content and prevent ravelling under construction traffic

[2] Compaction may be very difficult, and segregation of the cement may occur.

[3] Mixing may be very difficult – pretreatment with lime may help.

[4] Pretreatment with lime or addition of 2 per cent calcium chloride may help

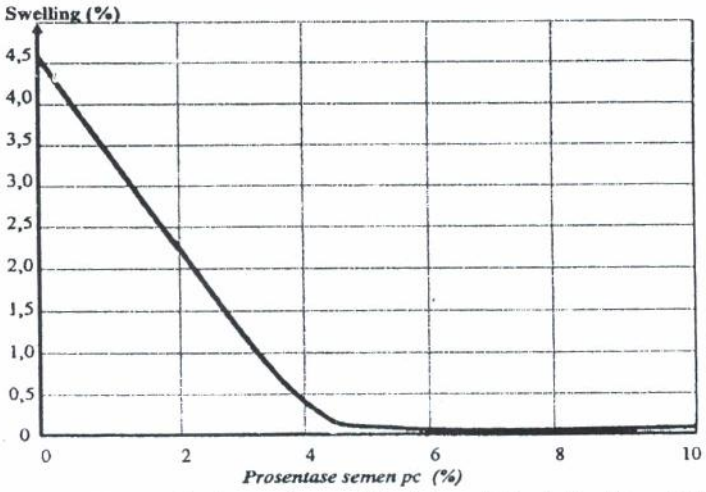


Figure 3 : Effect PC for decreasing swelling in Losari Clay (after Idrus 1990)

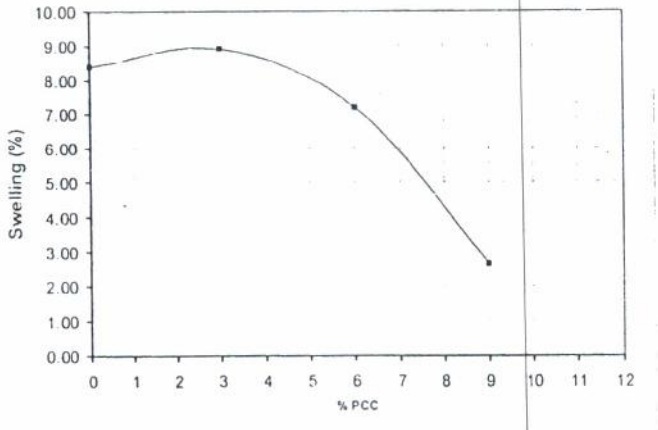


Figure 4 : Swelling effect on using PC in Deltamas/ Cikarang Clay (after idrus 2006)

4. DESIGN EXISTING ROAD

Design of existing roads in the area JICT (STA 7 +820 to 8 +062) can be seen in Figure 5 below:

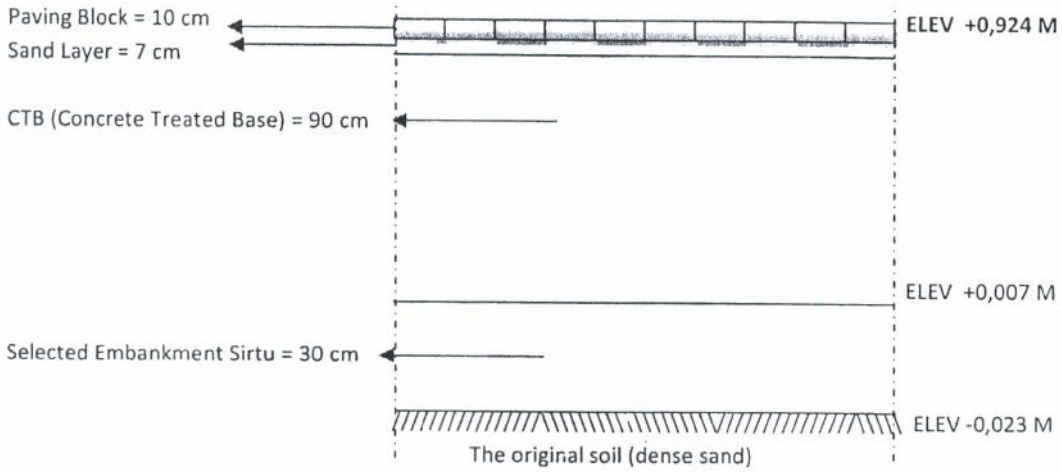


Figure 5 : The existing road construction in STA 7+820 JICT

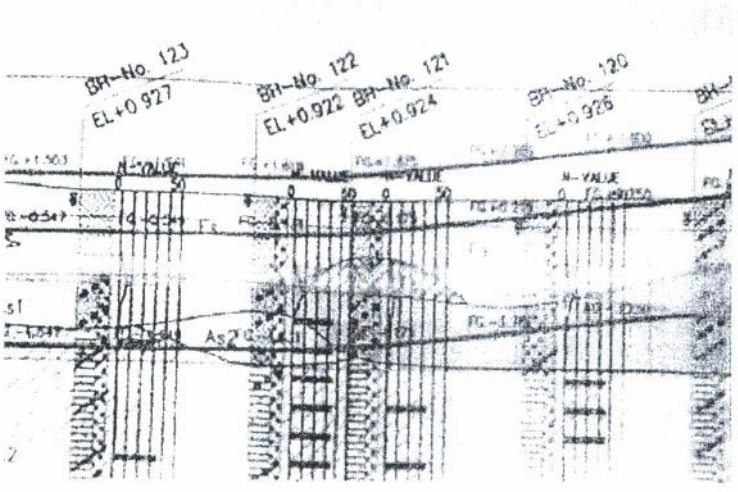


Figure 6 : Sub Soil Condition around STA 7+820

Sub-Soil Description .

- From existing ground to -4,00 meter depth , it is silty sand or sand with dense to very dense consistency
- From -4,00 meter to -6,00 meter, it is silty sand with medium consistency

4. SUGGESTED USING BASE COURSE WITH CTB.(CONCLUTION)

In the case of widening of existing roads in the STA and +820 to 8 +062, we recommend using the same base course with the existing base course using Conctere Treated Base (CTB) of at least 90 cm thick. The reason is that in order to obtain the same behavior on a layer of base course while receiving the vehicle load.

To create a layer of CTB in this case, to consider some of the following:

- Selected sub-base material (aggregate), a Gravelly sand (gravel)
- The use of portland cement by a certain percentage. In this case, we recommend using 8% cement by weight of dry aggregate used
- The implementation method of mixing aggregate with cement in the field
- The addition of water (if required) and compaction.
- Perform compaction layer by layer (30 cm / layer), up to 90 cm thickness CTB.
- Perform quality controle in the field CBR test a few days after the compaction from the field.
- After CTB thickness is reached (90 cm), above given Lean Concrete Wet 10 cm, then use the plastic polyethene 120 µ coating.
- After a layer of plastic polyethene 120 µ, then rigid concrete pavement with 35 cm thick and 5 cm above the coated asphalt surfacing layer.

Drawing road construction suggested the following:

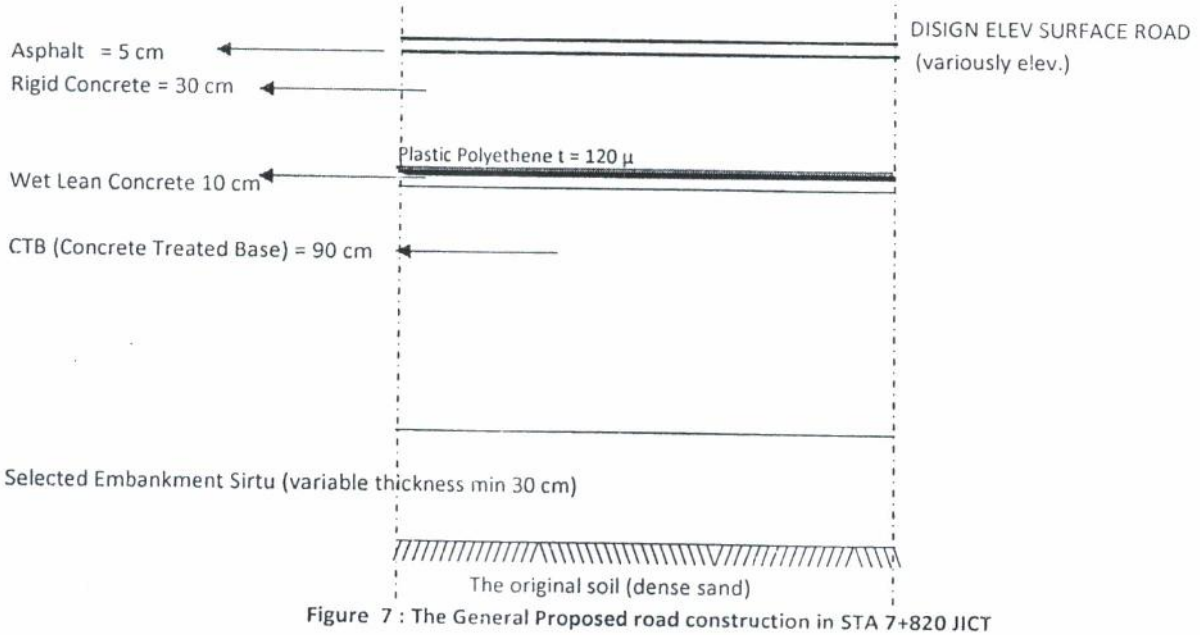


Figure 7 : The General Proposed road construction in STA 7+820 JICT

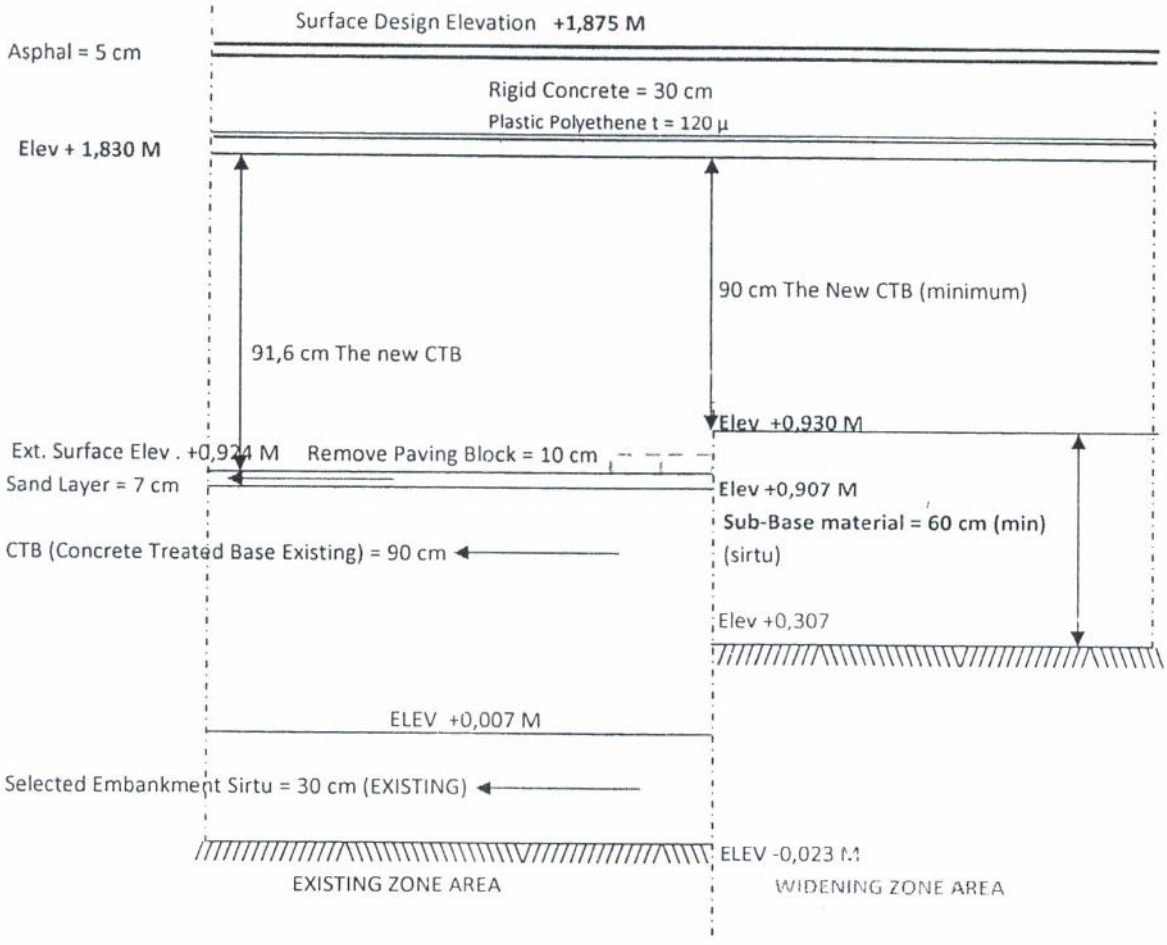


Figure 8 : The Proposed Road Construction in STA 7+820 JICT

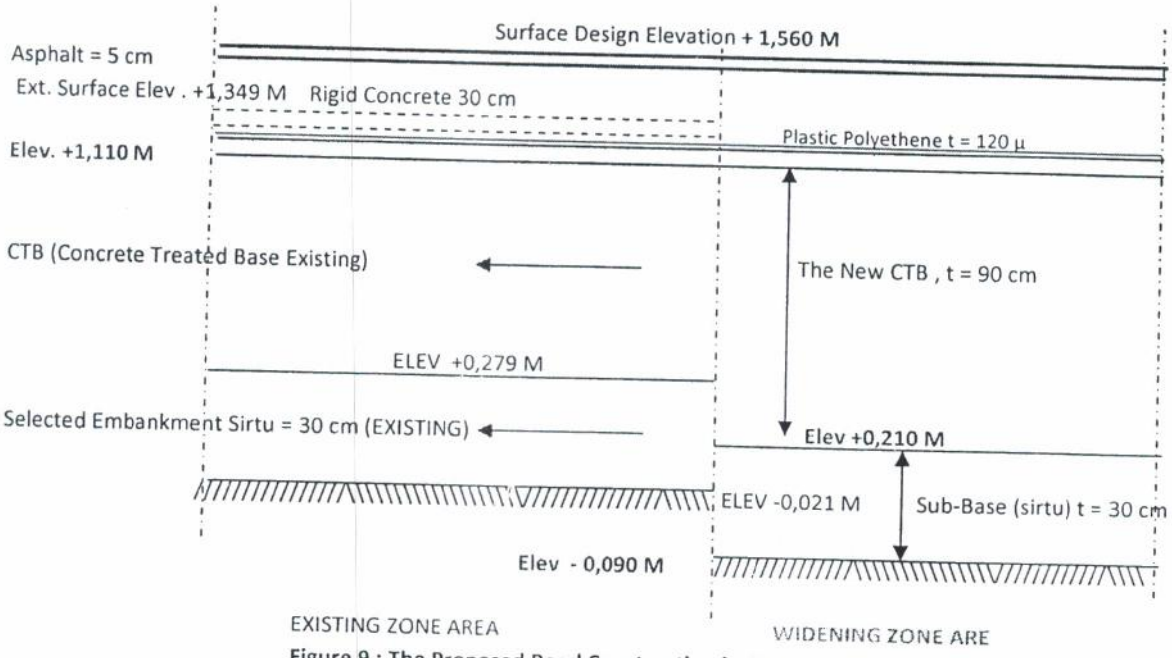


Figure 9 : The Proposed Road Construction in STA 8+000 JICT

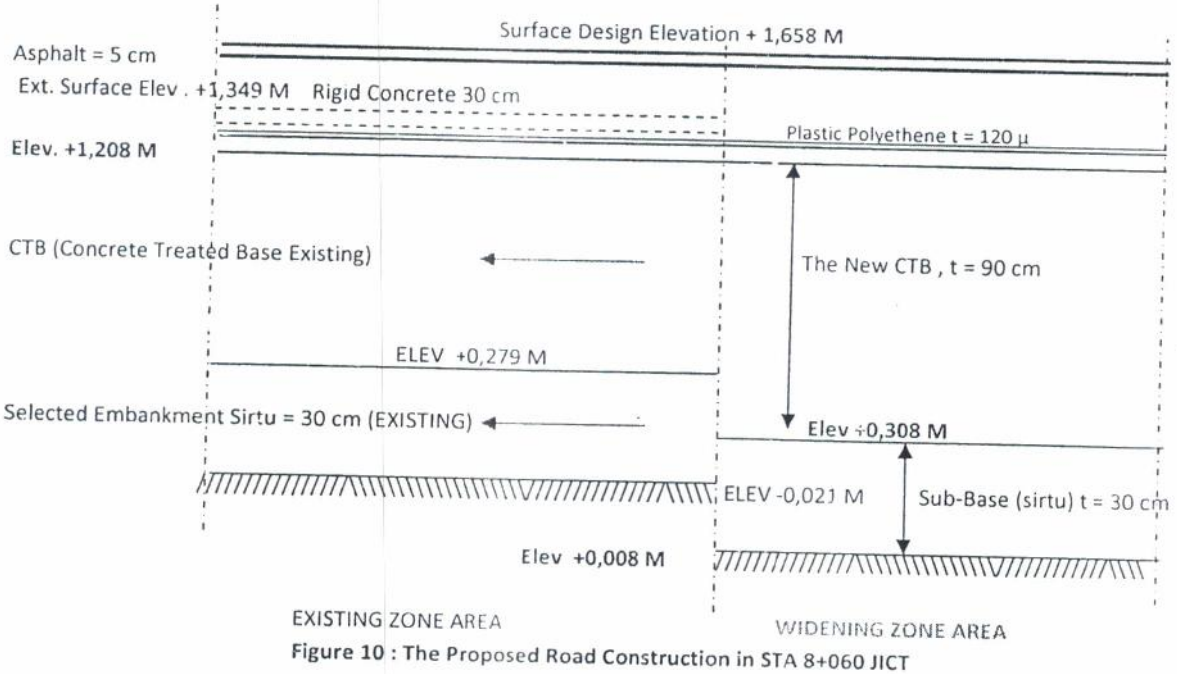


Figure 10 : The Proposed Road Construction in STA 8+060 JICT