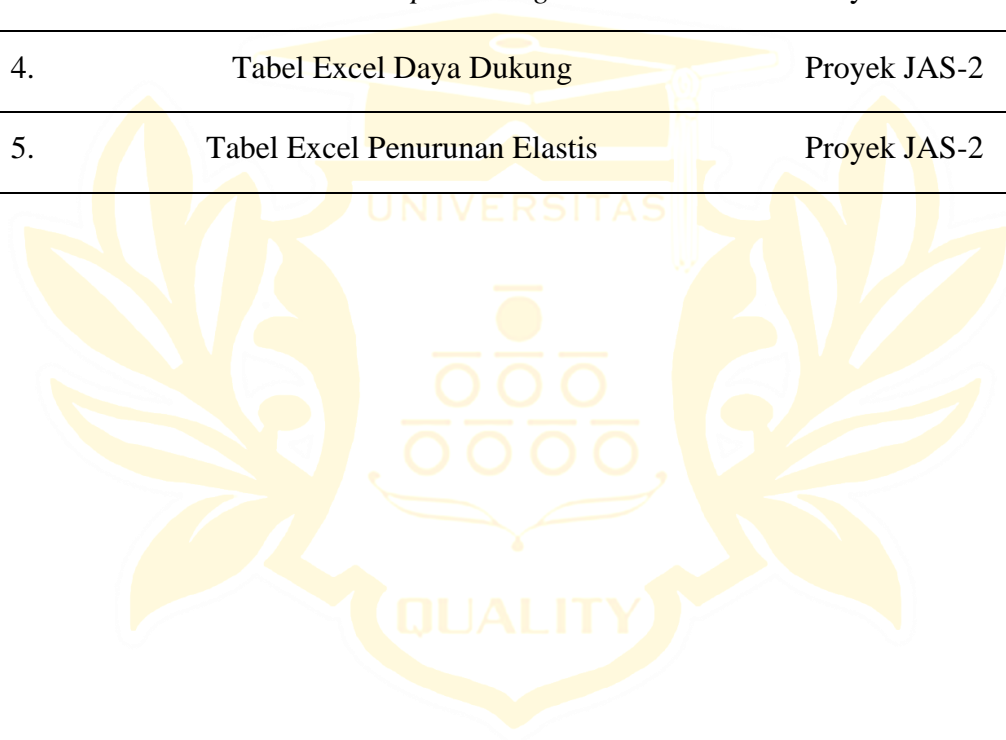


LAMPIRAN

No.	Data Lampiran	Keterangan
1.	Hasil Pengujian <i>PDA test</i>	Proyek JAS-2
2.	Foto Dokumentasi Lapangan	Proyek JAS-2
3.	Gambar <i>Shop Drawing</i>	Proyek JAS-2
4.	Tabel Excel Daya Dukung	Proyek JAS-2
5.	Tabel Excel Penurunan Elastis	Proyek JAS-2



LAPORAN
PILE DRIVING ANALYZER (PDA)
10-135/PDA-HKM/XI/2020
(ABT1-3, PILAR 1-8, P2-9, P3-15, P4-11, P5-9, ABT2-8)

Proyek :
JAS - 2 BH 38
Dolok Merawan, Provinsi Sumatera Utara, 23 Oktober s/d 18 November
2020



Pemberi Kerja :
PT. TIGA PUTRA MANDIRI JAYA



PT. HARISTA KARSA MANDIRI

Office :

Jl. Sapta Taruna No. 1/10-A Tangkerang Utara
Pekanbaru - 28289 Phone/Fax : 0761 7870723

email : info@haristakarsa.com

website : www.harista-karsa.com

Workshop :

Jl. Parit Indah (depan Pengadilan Agama) Tangkerang Labuai
Pekanbaru - 28289 Phone : 0761 8525043

Protected :



Pile Driving Analyzer



PT. HARISTA KARSA MANDIRI
Jl. Sapta Taruna I/10A Tangkerang Utara Pekanbaru
Phone/Fax : +62 761 7870723
email : info@haristakarsa.com
website : www.harista-karsa.com

Pekanbaru, 23 November 2020

Kepada,

PT. TIGA PUTRA MANDIRI JAYA
proyek " **JAS - 2 BH 38** "
berlokasi di Dolok Merawan, Provinsi Sumatera Utara

Di Tempat

Dengan hormat,

Bersama ini kami sampaikan laporan hasil pengujian tiang Borepile dengan metode Pile Driving Analyzer (PDA Test) & Capwap Analysis yang dilakukan pada proyek " **JAS - 2 BH 38** " berlokasi di Dolok Merawan, Provinsi Sumatera Utara.

Hasil pengujian dari 7 (Tujuh) tiang Borepile ABT1-3, PILAR 1-8, P2-9, P5-9, P3-15, P4-11, ABT2-8 dengan metode Pile Driving Analyzer (PDA Test) & Analisis Capwap kami sajikan dalam laporan ini. Kapasitas yang diperoleh dari pengujian PDA adalah kapasitas tiang tunggal; dalam menentukan kapasitas ijin tiang perlu mempertimbangkan faktor lain seperti panjang tiang dan kondisi tanah, pengaruh kelompok tiang dan kualitas pelaksanaan tiang pancang. Hasil pengujian ini dapat mewakili pondasi lainnya yang dikerjakan dengan metode yang sama dan dalam kondisi tanah yang dipilih.

Demikian hasil pengujian kami sajikan, atas perhatian dan kerjasamanya kami ucapkan terima kasih.

PT. HARISTA KARSA MANDIRI

Dr. Ir. Harnedi Maizir, MT
Direktur Utama

Pile Driving Analyzer



Jl. Saptia Taruna I/10A Tangkerang Utara Pekanbaru
Phone/Fax : +62 761 7870723
email : info@haristakarsa.com
website : www.harista-karsa.com

I. PENDAHULUAN

Berdasarkan permintaan PT. TIGA PUTRA MANDIRI JAYA, Pile Driving Analyzer (PDA) Test telah dilakukan pada tanggal 23 Oktober 2020 s/d tanggal 18 November 2020 di proyek "JAS - 2 BH 38" yang berlokasi di Dolok Merawan, Provinsi Sumatera Utara.

II. LINGKUP PEKERJAAN

Pengujian menggunakan alat PDA ini dilakukan pada 7 (Tujuh) titik Borepile; Ø800 mm. Karakteristik palu yang digunakan dalam tes ini adalah: Drop Hammer dengan berat 6 ton. Data tiang uji dapat dilihat pada tabel di bawah ini.

Tabel 1 ; Data Tiang Uji

No	Nama Tiang	Panjang Total(m); Dimensi (mm)	Panjang Embedment Tiang (m)	Panjang Penetrasi Tiang (m)	Hammer (ton)	Tanggal Pemancangan	Tanggal Pengujian
1	ABT1-3	23; Ø800	21.9	21.5	Drop 6	25/09/20	23/10/20
2	PILAR 1-8	20; Ø800	19	18.6	Drop 6	25/09/20	23/10/20
3	P2-9	20; Ø800	18.8	18.5	Drop 6	07/10/20	04/10/20
4	P3-15	20; Ø800	18.9	18.6	Drop 6	02/10/20	30/10/20
5	P4-11	20; Ø800	18.85	18.5	Drop 6	19/10/20	16/11/20
6	P5-9	20; Ø800	19	18.5	Drop 6	21/10/20	18/11/20
7	ABT2-8	24; Ø800	22.8	22.5	Drop 6	14/10/20	11/11/20

Hasil uji PDA dan Capwap Analysis disajikan dalam laporan ini didasarkan pada konfigurasi tiang yaitu ; diameter tiang, ketebalan tiang dan panjang tiang (panjang total dan panjang tertanam/penetrasi) dan rincian data lain yang diberikan oleh PT. TIGA PUTRA MANDIRI JAYA dan digunakan dengan itikad baik. Informasi yang salah, tidak lengkap atau tidak akurat dapat mempengaruhi hasil pengujian.

Pile Driving Analyzer

III. PEMASANGAN INSTRUMEN

Pada dasarnya, pengujian dinamis dilakukan untuk menghitung aksial tekan dan kapasitas daya dukung tiang tersebut. Jika ada terjadi pembengkokan (*bending*), data yang direkam akan tidak simetris sementara lentur yang parah dapat menyebabkan 'rata-rata' strain yang akan terdistorsi. Oleh karena itu, instrumen (strain transducers and accelerometers) yang dipasang pada tiang uji harus terpasang dengan baik sehingga efek *bending* dapat dihindarkan pada saat pengujian dilakukan.

IV. PELAKSANAAN PENGUJIAN DAN KUALITAS DATA

Pengujian PDA dilaksanakan berdasarkan ASTM D4945-08.

Pengetestan dinamik pada tiang pancang ini menggunakan konsep 1(satu) dimensi gelombang yang diakibatkan oleh pukulan pada tiang tersebut. Dengan demikian tiang yang dipukul akan memberikan energi tertentu yang menghasilkan kapasitas (daya dukung) tiang. Kualitas dari catatan tergantung pada instalasi instrumen serta kinerja komputer dan sistem elektronik. Jika instrumen tidak terpasang dengan benar atau sistem komputer tidak bekerja seperti yang diharapkan, masalah dapat dideteksi dengan memeriksa catatan ditampilkan di layar. Selama pengujian di proyek ini, semua sistem elektronik bekerja dengan baik.

V. INTERPRETASI DATA

Berdasarkan catatan 'F (force) dan 'V '(velocity), kapasitas tiang dapat diperkirakan di lokasi, selama pengujian, menggunakan 'Metode Kasus' (*Case Method*). 'Metode Kasus' memberikan perkiraan kasar di lokasi kapasitas tiang yang dapat berguna untuk mendapatkan 'gambaran besar' dari kapasitas tiang. Namun, itu tidak didasarkan pada model tanah-tiang yang memadai yang mampu mensimulasikan interaksi tanah-struktur dinamis yang kompleks yang terjadi selama pemancangan tiang.

Oleh karena itu, catatan dinamis yang diperoleh dari PDA akan dianalisis lebih lanjut menggunakan perangkat lunak CAPWAP. Analisis ini memberikan prediksi kapasitas tiang pancang serta estimasi distribusi resistensi tanah yang dimobilisasi berdasarkan kecocokan terbaik antara catatan 'F' dan 'V' yang dihitung dan diukur.

Pile Driving Analyzer

HASIL TES

VI.A Kinerja Palu/Hammer

Kinerja palu pada dasarnya adalah energi dampak yang diterima (EMX) tiang selama pengujian dilakukan (diukur pada tiang) dengan Drop Hammer 6 ton.

Tabel 2 ; Ringkasan dari transfer rata-rata efisiensi energy

Hammer Type	Nama Tiang	Rata-rata Energi Potensial (ton.m)	Rata-rata Energi Ditransfer (ton.m)	Rata-rata Efisiensi Energi Ditransfer (%)
Drop 6 ton	ABT1-3	$6 \times 1.7 = 10.2$	3.06	30.00
	PILAR 1-8	$6 \times 1.7 = 10.2$	1.68	16.47
	P2-9	$6 \times 1.7 = 10.2$	3.71	36.37
	P3-15	$6 \times 1 = 6$	0.53	08.83
	P4-11	$6 \times 1.2 = 7.2$	0.73	10.13
	P5-9	$6 \times 1.5 = 9$	2.43	27.00
	ABT2-8	$6 \times 1.7 = 10.2$	3.02	29.60

Sebagai referensi, pada lampiran B menunjukkan statistik efisiensi energi ditranfer berdasarkan jenis palu yang disusun oleh GRL & Associates, USA dari praktek di seluruh dunia.

VI.B Integritas Tiang

Analisis integritas tiang menggunakan PDA didasarkan pada :

- Karakteristik kurva F (gaya) dan V (kecepatan). Jika tiang memiliki cacat, kurva 'F' menurun dan kurva 'V' meningkat pada waktu yang sama.
- Jika kurva yang dijelaskan pada poin a, sejauh mana cacat tiang dapat dinilai dengan nilai BTA, yang memberikan perkiraan sisa luasan penampang lintang sebagai persentase dari luas penampang asli/rencana.

Inspeksi dari 'F' dan 'V' dari tes yang dilakukan tidak menunjukkan karakteristik yang dijelaskan diatas. Dengan kata lain integritas tiang baik pada saat pengujian.

Pile Driving Analyzer

VI.C Kapasitas Tiang

Secara teknis, pemilihan catatan PDA selanjutnya dianalisis menggunakan program CAPWAP ditentukan oleh kualitas rekaman dan biasanya terkait dengan energi maksimum yang ditransfer (EMX) dari pukulan dengan panjang penetrasi tiang.

ABT1-3

Nomor tiang ABT1-3 (Borepile; Ø800 mm, L = 23 m - Panjang Penetrasi 21.5 m) dimana hasil analisa menunjukkan kapasitas tiang uji (bearing capacity) sebesar 394.2 Ton dengan tahanan friksi sebesar 365.5 Ton dan tahanan ujung sebesar 28.7 Ton; Penurunan total sebesar 5.7 mm dengan penurunan tetap sebesar 4 mm.

PILAR 1-8

Nomor tiang PILAR 1-8 (Borepile; Ø800 mm, L = 20 m - Panjang Penetrasi 18.6 m) dimana hasil analisa menunjukkan kapasitas tiang uji (bearing capacity) sebesar 382.4 Ton dengan tahanan friksi sebesar 366.4 Ton dan tahanan ujung sebesar 16.1 Ton; Penurunan total sebesar 5.0 mm dengan penurunan tetap sebesar 0 mm.

P2-9

Nomor tiang P2-9 (Borepile; Ø800 mm, L = 20 m - Panjang Penetrasi 18.5 m) dimana hasil analisa menunjukkan kapasitas tiang uji (bearing capacity) sebesar 401.5 Ton dengan tahanan friksi sebesar 355.9 Ton dan tahanan ujung sebesar 45.6 Ton; Penurunan total sebesar 8.1 mm dengan penurunan tetap sebesar 0 mm.

P3-15

Nomor tiang P3-15 (Borepile; Ø800 mm, L = 20 m - Panjang Penetrasi 18.6 m) dimana hasil analisa menunjukkan kapasitas tiang uji (bearing capacity) sebesar 356.6 Ton dengan tahanan friksi sebesar 311.2 Ton dan tahanan ujung sebesar 45.4 Ton; Penurunan total sebesar 4.4 mm dengan penurunan tetap sebesar 0 mm.

P4-11

Nomor tiang P4-11 (Borepile; Ø800 mm, L = 20 m - Panjang Penetrasi 18.5 m) dimana hasil analisa menunjukkan kapasitas tiang uji (bearing capacity) sebesar 372.5 Ton dengan tahanan friksi sebesar 322.1 Ton dan tahanan ujung sebesar 50.4 Ton; Penurunan total sebesar 4.8 mm dengan penurunan tetap sebesar 6 mm.

Pile Driving Analyzer

P5-9

Nomor tiang P5-9 (Borepile; Ø800 mm, L = 20 m - Panjang Penetrasi 18.5 m) dimana hasil analisa menunjukkan kapasitas tiang uji (bearing capacity) sebesar 416.9 Ton dengan tahanan friksi sebesar 305.2 Ton dan tahanan ujung sebesar 111.7 Ton; Penurunan total sebesar 6.6 mm dengan penurunan tetap sebesar 0 mm.

ABT2-8

Nomor tiang ABT2-8 (Borepile; Ø800 mm, L = 24 m - Panjang Penetrasi 22.5 m) dimana hasil analisa menunjukkan kapasitas tiang uji (bearing capacity) sebesar 475.6 Ton dengan tahanan friksi sebesar 381.6 Ton dan tahanan ujung sebesar 94.0 Ton; Penurunan total sebesar 7.6 mm dengan penurunan tetap sebesar 6 mm.

Tabel 3 ; Ringkasan Kapasitas Tiang

Nama Tiang	Kapasitas Tiang (ton)					Catatan
	PDA	CAPWAP Analysis				
		Daya Dukung (ton)	Tahanan Friksi (ton)	Tahanan Hujung (ton)	Penurunan (mm)	
ABT1-3	409	394.2	365.5	28.7	4	Restrike test*)
PILAR 1-8	394	382.4	366.4	16.1	0	Restrike test*)
P2-9	409	401.5	355.9	45.6	0	Restrike test*)
P3-15	388	356.6	311.2	45.4	0	Restrike test*)
P4-11	384	372.5	322.1	50.4	6	Restrike test*)
P5-9	438	416.9	305.2	111.7	0	Restrike test*)
ABT2-8	499	475.6	381.6	94.0	6	Restrike test*)

*)Diminta oleh PT. TIGA PUTRA MANDIRI JAYA

Pile Driving Analyzer

VI. KESIMPULAN

Tes dinamik dengan menggunakan Pile Dynamic Analyzer (PDA) dan CAPWAP Analysis pada tiang Borepile proyek " JAS - 2 BH 38 " berlokasi di Dolok Merawan, Provinsi Sumatera Utara, perkiraan hasil tes kapasitas daya dukung tiang dapat dilihat pada **Tabel 3** diatas.

Pekanbaru, 23 November 2020

PT. HARISTA KARSA MANDIRI



PT. HARISTA KARSA MANDIRI

Ir. Yon Subagiono
Field Engineer



PT. HARISTA KARSA MANDIRI

Dr. Ir. Harnedi Maizir, MT
Geotechnical Engineer

Pile Driving Analyzer

APPENDIX A PDA Test Result & CAPWAP Analysis

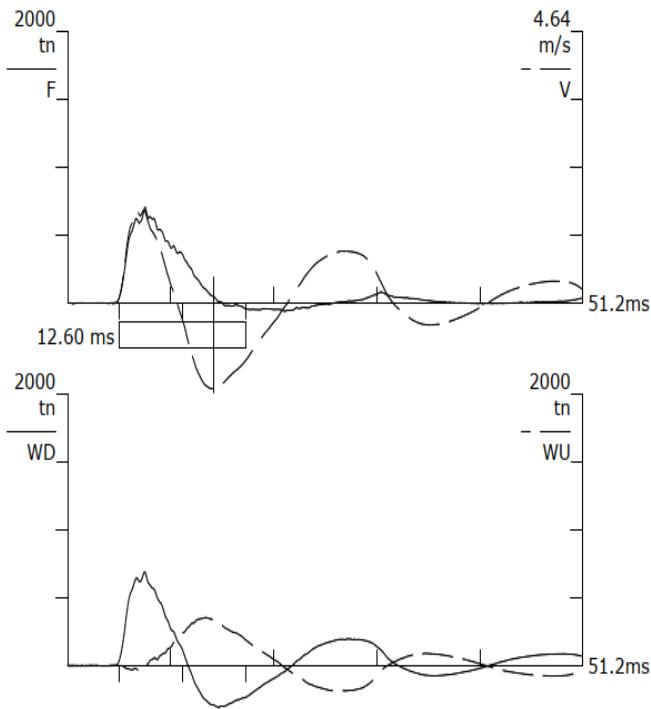
PT Delta Systech Indonesia

JAS-2 BH38
PDA OP: ul

PILE DRIVING ANALYZER @
Version 2016.125.001

Abt1-3_2

Borepile dia.800 Drop 6

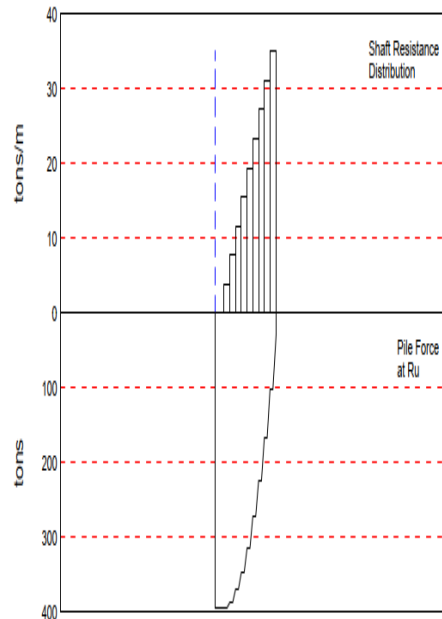
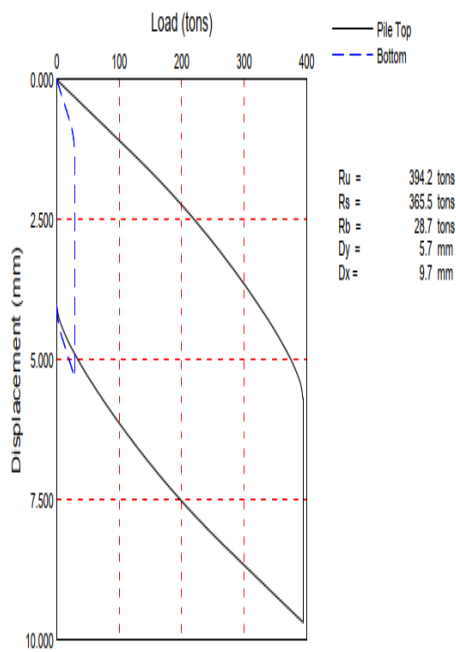
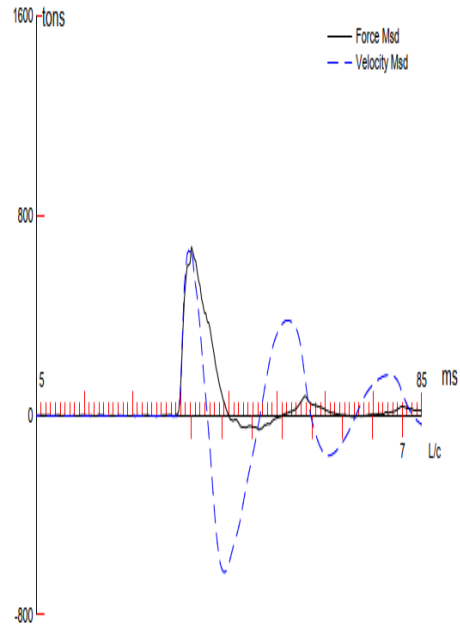
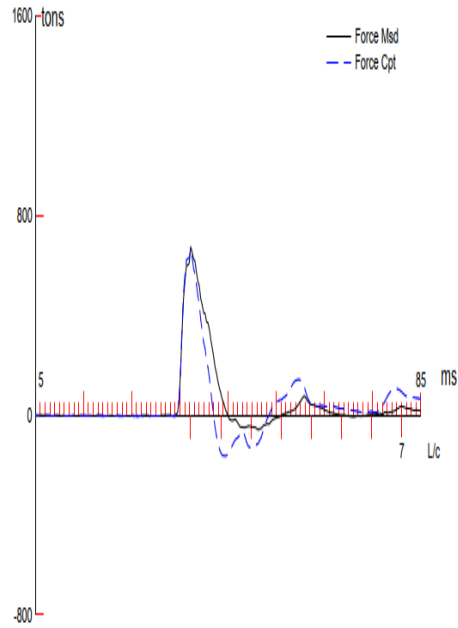


BN 1
23/10/2020 17:44:34
RMX 409 tn
STK 0.0 m
BTA 19.0 (%)
CSX 13.7 MPa
TSX 9.6 MPa
EMX 3.06 tn-m
DFN 4 mm
DMX 5 mm
JC 0.60 []

LE 21.9 m
AR 5026.55 cm²
EM 300 t/cm²
SP 2.40 t/m³
WS 3500.0 m/s
EA/C 431.1 tn-s/m
LP 21.5 m

F34 A34

F3: [T205] 144.6 (1.05)
F4: [T204] 145 (1.05)
A3: [K11308] 406 mv/5000g's (0.95)
A4: [K11304] 361 mv/5000g's (0.95)



JAS-2 BH38 ; Pile: Abt1-3_2 Test: 23-Okt-2020 17:44:
 Borepile dia.800 Drop 6 ; Blow: CAPWAP (R) 2006-3
 PT Delta Systech Indonesia OP: ul

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 394.2; along Shaft 365.5; at Toe 28.7 tons

Soil Sgmt No.	Dist. Below Gages m	Depth Below Grade m	Ru tons	Force in Pile tons	Sum of Ru tons	Unit Resist. (Depth) tons/m	Unit Resist. (Area) tons/m ²	Smith Damping Factor s/m
				394.2				
1	3.1	2.7	0.0	394.2	0.0	0.00	0.00	0.000
2	5.2	4.8	8.1	386.1	8.1	3.89	1.55	1.313
3	7.3	6.9	16.3	369.8	24.4	7.79	3.10	1.313
4	9.4	9.0	24.4	345.4	48.7	11.68	4.65	1.313
5	11.5	11.1	32.5	312.9	81.2	15.58	6.20	1.313
6	13.6	13.2	40.6	272.3	121.8	19.47	7.75	1.313
7	15.6	15.2	48.7	223.6	170.6	23.37	9.30	1.313
8	17.7	17.3	56.9	166.7	227.4	27.26	10.85	1.313
9	19.8	19.4	65.0	101.8	292.4	31.15	12.40	1.313
10	21.9	21.5	73.1	28.7	365.5	35.05	13.95	1.313
Avg. Shaft			36.6			17.00	6.76	1.313
Toe			28.7				57.04	1.313

Soil Model Parameters/Extensions	Shaft	Toe
Quake (mm)	1.004	1.004
Case Damping Factor	1.113	0.087
Unloading Quake (% of loading quake)	34	30
Reloading Level (% of Ru)	100	100
Soil Plug Weight (tons)		1.76

CAPWAP match quality = 16.10 (Wave Up Match) ; RSA = 0
 Observed: final set = 4.000 mm; blow count = 250 b/m
 Computed: final set = 3.000 mm; blow count = 333 b/m
 max. Top Comp. Stress = 0.134 tons/cm² (T= 37.8 ms, max= 1.050 x Top)
 max. Comp. Stress = 0.141 tons/cm² (Z= 7.3 m, T= 39.6 ms)
 max. Tens. Stress = -0.062 tons/cm² (Z= 9.4 m, T= 48.9 ms)
 max. Energy (EMX) = 4.22 tonne-m; max. Measured Top Displ. (DMX)= 5.30 mm

JAS-2 BH38 ; Pile: Abt1-3_2 Test: 23-Okt-2020 17:44:
 Borepile dia.800 Drop 6 ; Blow: CAPWAP (R) 2006-3
 PT Delta Systech Indonesia OP: ul

EXTREMA TABLE

File Sgmt No.	Dist. Below Gages	max. Force	min. Force	max. Comp. Stress	max. Tens. Stress	max. Trnsfd. Energy	max. Veloc.	max. Displ.
	m	tons	tons	tons/cm ²	tons/cm ²	tonne-m	m/s	mm
1	1.0	672.5	-158.8	0.134	-0.032	4.22	1.6	6.027
2	2.1	675.6	-190.9	0.134	-0.038	4.22	1.6	5.921
3	3.1	681.0	-224.3	0.135	-0.045	4.21	1.5	5.793
4	4.2	690.2	-247.0	0.137	-0.049	4.20	1.5	5.642
5	5.2	700.6	-275.1	0.139	-0.055	4.19	1.5	5.471
6	6.3	691.5	-283.0	0.138	-0.056	3.96	1.4	5.291
7	7.3	706.2	-300.1	0.141	-0.060	3.94	1.4	5.093
8	8.3	680.1	-290.8	0.135	-0.058	3.55	1.4	4.887
9	9.4	698.4	-310.4	0.139	-0.062	3.54	1.3	4.662
10	10.4	656.9	-288.4	0.131	-0.057	3.07	1.3	4.444
11	11.5	677.6	-304.0	0.135	-0.060	3.05	1.2	4.206
12	12.5	622.2	-256.0	0.124	-0.051	2.58	1.1	3.969
13	13.6	644.6	-260.5	0.128	-0.052	2.56	1.1	3.728
14	14.6	577.3	-220.1	0.115	-0.044	2.12	1.0	3.647
15	15.6	602.1	-237.7	0.120	-0.047	2.11	1.0	3.602
16	16.7	529.0	-198.5	0.105	-0.039	1.69	0.9	3.609
17	17.7	558.0	-208.3	0.111	-0.041	1.68	0.8	3.616
18	18.8	463.3	-154.9	0.092	-0.031	1.26	0.8	3.644
19	19.8	438.8	-166.0	0.087	-0.033	1.25	0.9	3.650
20	20.9	322.1	-99.9	0.064	-0.020	0.79	1.0	3.662
21	21.9	253.7	-99.0	0.050	-0.020	0.22	1.0	3.648
Absolute	7.3			0.141			(T =	39.6 ms)
	9.4				-0.062		(T =	48.9 ms)

JAS-2 BH38 ; Pile: Abt1-3_2 Test: 23-Okt-2020 17:44:
 Borepile dia.800 Drop 6 ; Blow: CAPWAP (R) 2006-3
 PT Delta Systech Indonesia OP: ul

CASE METHOD										
J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	738.8	683.9	628.9	574.0	519.0	464.1	409.1	354.2	299.2	244.3
RX	749.2	686.5	628.9	574.0	519.0	464.1	409.1	354.2	299.2	244.3
RU	1053.9	1030.5	1007.0	983.6	960.1	936.7	913.2	889.8	866.4	842.9

RAU = 0.0 (tons); RA2 = 144.5 (tons)

Current CAPWAP Ru = 394.2 (tons); Corresponding J(RP) = 0.63; J(RX) = 0.63

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS
m/s	ms	tons	tons	tons	mm	mm	mm	tonne-m	tons
1.58	37.54	673.2	615.1	703.8	5.297	4.020	4.000	3.1	659.3

PILE PROFILE AND PILE MODEL

Depth	Area	E-Modulus	Spec. Weight	Perim.
m	cm ²	tons/cm ²	tons/m ³	m
0.00	5026.55	300.1	2.403	2.513
21.90	5026.55	300.1	2.403	2.513

Toe Area 0.503 m²

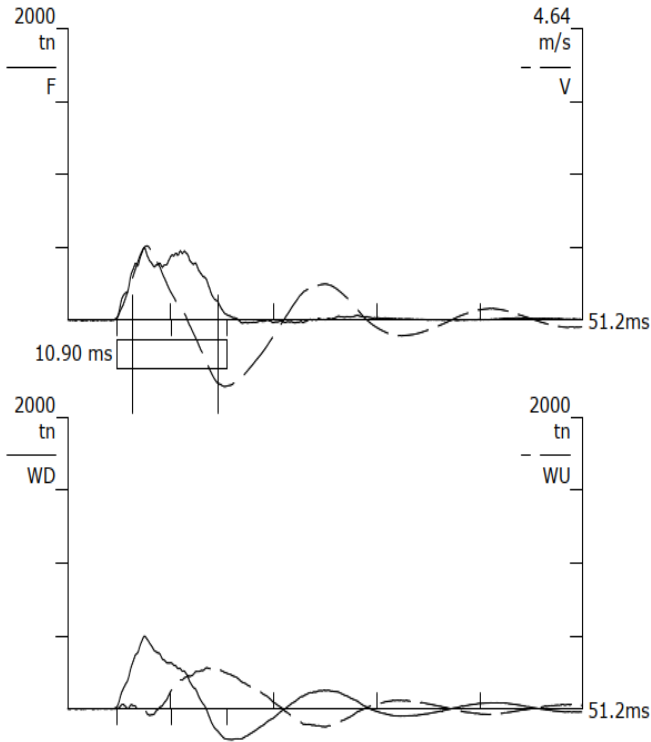
Top Segment Length 1.04 m, Top Impedance 431.05 tons/m/s

File Damping 2.0 %, Time Incr 0.298 ms, Wave Speed 3500.0 m/s, 2L/c 12.5 ms

PT Delta Systech Indonesia

JAS-2 BH38
PDA OP: ul

PILE DRIVING ANALYZER @
Version 2016.125.001
Pilar1-8_1
Borepile Dia.800 Drop6

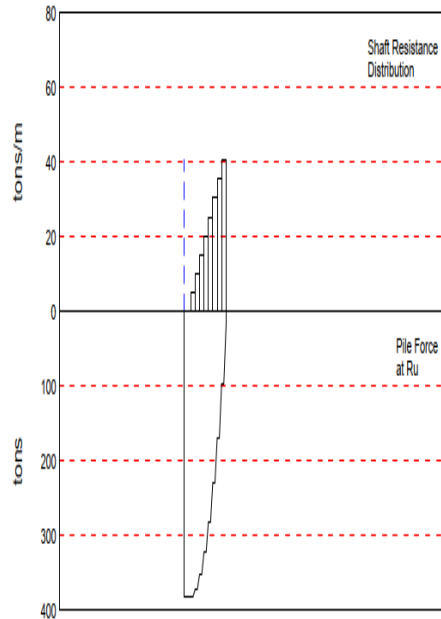
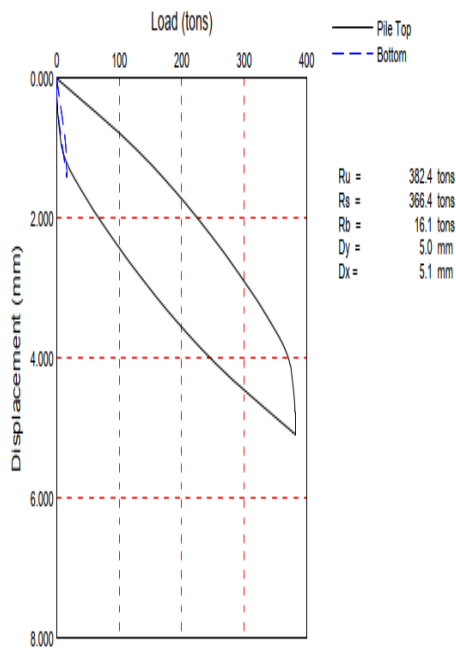
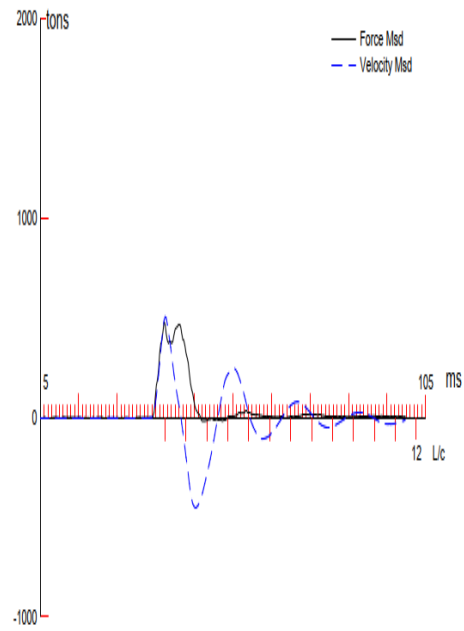
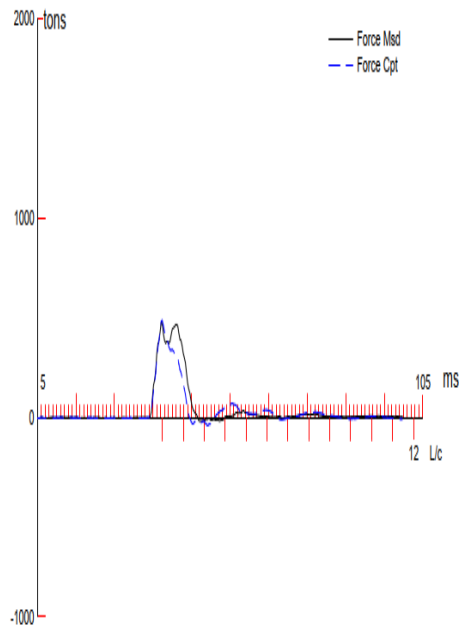


BN 1
23/10/2020 23:32:23
RMX 394 tn
STK 0.0 m
BTA 43.0 (%)
CSX 9.7 MPa
TSX 6.5 MPa
EMX 1.68 tn-m
DFN 0 mm
DMX 4 mm
JC 0.60 []

LE 19.0 m
AR 5026.55 cm²
EM 300 t/cm²
SP 2.40 t/m³
WS 3500.0 m/s
EA/C 431.1 tn-s/m
LP 18.6 m

F34 A34

F3: [T205] 144.6 (1.47)
F4: [T204] 145 (1.47)
A3: [K11308] 406 mv/5000g's (0.87)
A4: [K11304] 361 mv/5000g's (0.87)



JAS-2 BH38; Pile: Pilar1-8_1
 Borepile Dia.800 Drop6; Blow: 1
 PT Delta Systech Indonesia

Test: 23-Okt-2020 23:32:
 CAPWAP (R) 2006-3
 OP: ul

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 382.4; along Shaft 366.4; at Toe 16.1 tons									
Soil Sgmnt No.	Dist. Below Gages	Depth Below Grade	Ru tons	Force in Pile tons	Sum of Ru tons	Unit Resist. (Depth) tons/m	Unit Resist. (Area) tons/m ²	Smith Damping Factor s/m	Quake mm
				382.4					
1	3.0	2.6	0.0	382.4	0.0	0.00	0.00	0.000	0.400
2	5.0	4.6	10.2	372.2	10.2	5.10	2.03	1.313	0.401
3	7.0	6.6	20.4	351.9	30.5	10.18	4.05	1.313	0.401
4	9.0	8.6	30.5	321.3	61.1	15.27	6.08	1.313	0.401
5	11.0	10.6	40.7	280.6	101.8	20.35	8.10	1.313	0.401
6	13.0	12.6	50.9	229.8	152.7	25.44	10.12	1.313	0.401
7	15.0	14.6	61.0	168.7	213.7	30.53	12.15	1.313	0.401
8	17.0	16.6	71.2	97.5	284.9	35.61	14.17	1.313	0.401
9	19.0	18.6	81.4	16.1	366.4	40.70	16.20	1.313	0.401
Avg. Shaft			40.7			19.70	7.84	1.313	0.401
Toe			16.1				31.95	1.313	1.004
Soil Model Parameters/Extensions						Shaft	Toe		
Case Damping Factor						1.116	0.049		
Unloading Quake			(% of loading quake)			100	30		
Reloading Level			(% of Ru)			100	100		
Unloading Level			(% of Ru)			76			
Soil Plug Weight			(tons)				3.62		
CAPWAP match quality = 11.19 (Wave Up Match) ; RSA = 0									
Observed: final set				= 0.100 mm;	blow count		= 10000 b/m		
Computed: final set				= 1.532 mm;	blow count		= 653 b/m		
Replay Factor: F3:1.470; F4:1.470; V3:0.870; V4:0.870;									
max. Top Comp. Stress				= 0.097 tons/cm ²	(T= 38.0 ms, max= 1.087 x Top)				
max. Comp. Stress				= 0.106 tons/cm ²	(Z= 7.0 m, T= 39.7 ms)				
max. Tens. Stress				= -0.038 tons/cm ²	(Z= 9.0 m, T= 50.6 ms)				
max. Energy (EMX)				= 2.03 tonne-m;	max. Measured Top Displ. (DMX)= 4.30 mm				

JAS-2 BH38; File: Pilar1-8_1
 Borepile Dia.800 Drop6; Blow: 1
 PT Delta Systech Indonesia

Test: 23-Okt-2020 23:32:
 CAPWAP (R) 2006-3
 OP: ul

EXTREMA TABLE

Pile Sgmt No.	Dist. Below Gages m	max.	min.	max.	max.	max.	max.	max.
		Force tons	Force tons	Comp. Stress tons/cm ²	Tens. Stress tons/cm ²	Trnsfd. Energy tonne-m	Veloc. m/s	Displ. mm
1	1.0	489.7	-66.2	0.097	-0.013	2.03	1.1	4.949
2	2.0	493.6	-94.2	0.098	-0.019	2.03	1.1	4.789
3	3.0	501.8	-119.6	0.100	-0.024	2.03	1.1	4.612
4	4.0	510.0	-143.1	0.101	-0.028	2.03	1.1	4.416
5	5.0	524.6	-165.7	0.104	-0.033	2.02	1.0	4.207
6	6.0	512.2	-165.3	0.102	-0.033	1.87	1.0	3.985
7	7.0	532.2	-174.5	0.106	-0.035	1.87	1.0	3.744
8	8.0	500.9	-169.5	0.100	-0.034	1.63	0.9	3.500
9	9.0	525.1	-190.3	0.104	-0.038	1.63	0.9	3.255
10	10.0	477.6	-175.6	0.095	-0.035	1.36	0.8	3.041
11	11.0	503.0	-188.5	0.100	-0.037	1.35	0.8	2.836
12	12.0	443.3	-153.3	0.088	-0.030	1.10	0.7	2.717
13	13.0	468.8	-158.0	0.093	-0.031	1.09	0.7	2.624
14	14.0	410.2	-112.9	0.082	-0.022	0.85	0.6	2.564
15	15.0	437.2	-117.4	0.087	-0.023	0.85	0.5	2.496
16	16.0	343.9	-81.3	0.068	-0.016	0.62	0.5	2.458
17	17.0	343.5	-96.8	0.068	-0.019	0.61	0.5	2.417
18	18.0	233.0	-53.4	0.046	-0.011	0.36	0.5	2.419
19	19.0	230.2	-60.4	0.046	-0.012	0.06	0.6	2.416
Absolute	7.0			0.106			(T =	39.7 ms)
	9.0				-0.038		(T =	50.6 ms)

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	603.5	568.7	533.8	498.9	464.1	429.2	394.3	359.5	324.6	289.7
RX	603.5	568.7	533.8	498.9	464.1	429.2	394.3	359.5	324.6	289.7
RU	917.5	914.1	910.6	907.1	903.7	900.2	896.8	893.3	889.8	886.4

RAU = 0.0 (tons); RA2 = 280.0 (tons)

Current CAPWAP Ru = 382.4 (tons); Corresponding J(RP) = 0.63; J(RX) = 0.63

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS
m/s	ms	tons	tons	tons	mm	mm	mm	tonne-m	tons
1.18	37.71	509.9	442.2	498.3	4.301	0.157	0.100	1.7	765.0

JAS-2 BH38; File: Pilar1-8_1
 Borepile Dia.800 Drop6; Blow: 1
 PT Delta Systech Indonesia

Test: 23-Okt-2020 23:32:
 CAPWAP (R) 2006-3
 OP: ul

PILE PROFILE AND PILE MODEL

Depth m	Area cm ²	E-Modulus tons/cm ²	Spec. Weight tons/m ³	Perim. m
0.00	5026.55	300.1	2.403	2.513
19.00	5026.55	300.1	2.403	2.513

Toe Area 0.503 m²

Top Segment Length 1.00 m, Top Impedance 431.05 tons/m/s

Pile Damping 2.0 %, Time Incr 0.286 ms, Wave Speed 3500.0 m/s, 2L/c 10.9 ms

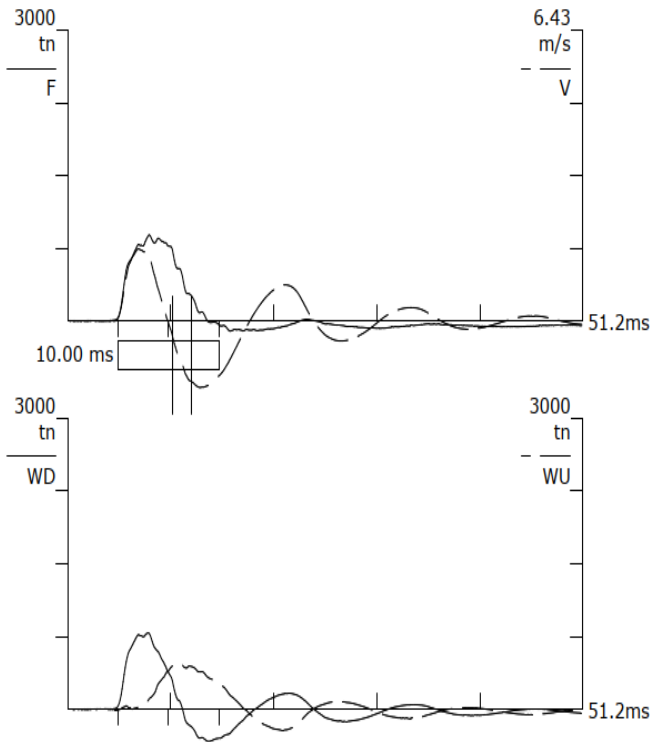
PT Delta Systech Indonesia

Jas-2 BH-38
PDA OP: ul

PILE DRIVING ANALYZER @
Version 2016.125.001

P2-9

Borepile Dia.800 Drop 6

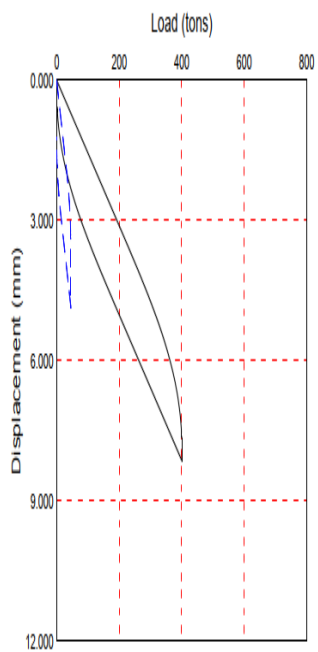
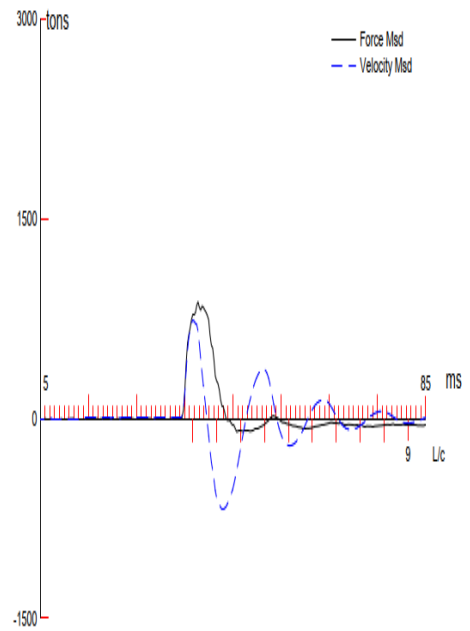
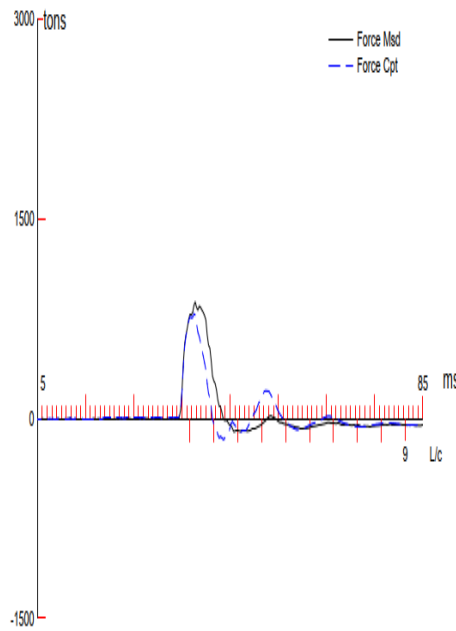


BN 2
04/11/2020 18:14:48
RMX 409 tn
STK 0.0 m
ETR 14.5 (%)
CSX 17.4 MPa
TSX 10.7 MPa
EMX 3.71 tn-m
DFN 0 mm
DMX 5 mm
JC 0.60 []

LE 18.8 m
AR 5026.55 cm²
EM 352 t/cm²
SP 2.40 t/m³
WS 3787.8 m/s
EA/C 466.5 tn-s/m
LP 18.5 m

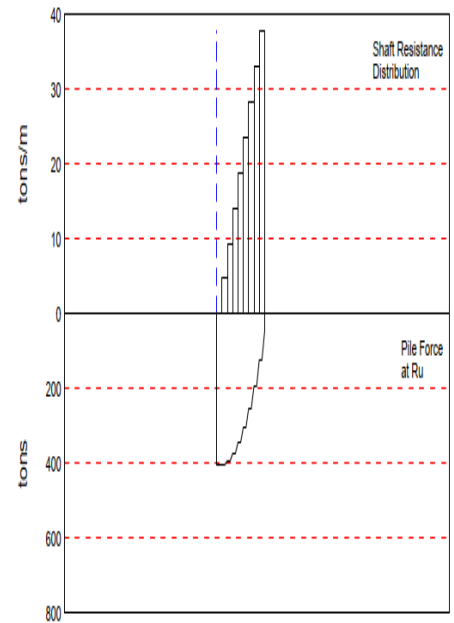
F34 A34

F3: [T205] 144.6 (0.95)
F4: [T204] 145 (0.95)
A3: [K11308] 406 mv/5000g's (1)
A4: [K11304] 361 mv/5000g's (1)



— Pile Top
 - - - Bottom

 Ru = 401.5 tons
 Rs = 355.9 tons
 Rb = 45.6 tons
 Dy = 8.1 mm
 Dx = 8.1 mm



Jas-2 BH-38 ; File: P2-9 Test: 04-Nov-2020 18:14:
 Borepile Dia.800 Drop 6 ; Blow: CAPWAP (R) 2006-3
 PT Delta Systech Indonesia OP: ul

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 401.5; along Shaft 355.9; at Toe 45.6 tons

Soil Sgmt No.	Dist. Below Gages m	Depth Below Grade m	Ru tons	Force in Pile tons	Sum of Ru tons	Unit Resist. (Depth) tons/m	Unit Resist. (Area) tons/m ²	Smith Damping Factor s/m
				401.5				
1	2.1	1.8	0.0	401.5	0.0	0.00	0.00	0.000
2	4.2	3.9	9.9	391.6	9.9	4.73	1.88	1.313
3	6.3	6.0	19.8	371.9	29.7	9.46	3.77	1.313
4	8.4	8.1	29.7	342.2	59.3	14.20	5.65	1.313
5	10.4	10.1	39.5	302.7	98.9	18.93	7.53	1.313
6	12.5	12.2	49.4	253.2	148.3	23.66	9.42	1.313
7	14.6	14.3	59.3	193.9	207.6	28.40	11.30	1.313
8	16.7	16.4	69.2	124.7	276.8	33.13	13.18	1.313
9	18.8	18.5	79.1	45.6	355.9	37.86	15.06	1.313
Avg. Shaft			39.5			19.24	7.65	1.313
Toe			45.6				90.72	0.787

Soil Model Parameters/Extensions	Shaft	Toe
Quake (mm)	3.663	2.783
Case Damping Factor	1.002	0.077
Unloading Quake (% of loading quake)	90	100
Reloading Level (% of Ru)	100	100
Unloading Level (% of Ru)	98	
Soil Plug Weight (tons)		3.79

CAPWAP match quality = 12.09 (Wave Up Match) ; RSA = 0
 Observed: final set = 0.100 mm; blow count = 10000 b/m
 Computed: final set = 1.102 mm; blow count = 908 b/m
 max. Top Comp. Stress = 0.158 tons/cm² (T= 38.1 ms, max= 1.063 x Top)
 max. Comp. Stress = 0.168 tons/cm² (Z= 6.3 m, T= 39.7 ms)
 max. Tens. Stress = -0.080 tons/cm² (Z= 8.4 m, T= 46.3 ms)
 max. Energy (EMX) = 4.71 tonne-m; max. Measured Top Displ. (DMX) = 5.29 mm

Jas-2 BH-38 ; File: P2-9 Test: 04-Nov-2020 18:14:
 Borepile Dia.800 Drop 6 ; Blow: CAPWAP (R) 2006-3
 PT Delta Systech Indonesia OP: ul

EXTREMA TABLE

Pile Sgmt No.	Dist. Below Gages	max. Force	min. Force	max. Comp. Stress	max. Tens. Stress	max. Trnsfd. Energy	max. Veloc.	max. Displ.
	m	tons	tons	tons/cm ²	tons/cm ²	tonne-m	m/s	mm
1	1.0	792.8	-156.3	0.158	-0.031	4.71	1.6	6.458
2	2.1	802.7	-217.2	0.160	-0.043	4.71	1.6	6.330
3	3.1	813.4	-267.5	0.162	-0.053	4.71	1.6	6.178
4	4.2	830.1	-316.4	0.165	-0.063	4.70	1.6	6.005
5	5.2	817.7	-347.1	0.163	-0.069	4.53	1.5	5.818
6	6.3	842.4	-376.8	0.168	-0.075	4.53	1.5	5.616
7	7.3	808.8	-381.7	0.161	-0.076	4.24	1.5	5.410
8	8.4	837.6	-403.3	0.167	-0.080	4.24	1.4	5.178
9	9.4	785.1	-398.5	0.156	-0.079	3.91	1.4	4.922
10	10.4	816.6	-400.6	0.162	-0.080	3.91	1.3	4.637
11	11.5	748.8	-388.2	0.149	-0.077	3.55	1.3	4.484
12	12.5	783.2	-383.2	0.156	-0.076	3.55	1.2	4.510
13	13.6	733.8	-366.2	0.146	-0.073	3.13	1.2	4.633
14	14.6	780.6	-351.3	0.155	-0.070	3.13	1.1	4.757
15	15.7	674.9	-310.0	0.134	-0.062	2.55	1.0	4.896
16	16.7	679.1	-272.8	0.135	-0.054	2.55	1.2	5.016
17	17.8	524.1	-233.2	0.104	-0.046	1.71	1.4	5.144
18	18.8	440.2	-178.4	0.088	-0.036	0.47	1.4	5.234
Absolute	6.3			0.168			(T = 39.7 ms)	
	8.4				-0.080		(T = 46.3 ms)	

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	833.2	762.5	691.8	621.2	550.5	479.9	409.2	338.5	267.9	197.2
RX	833.2	762.5	691.8	621.2	550.5	479.9	409.2	338.5	267.9	197.2
RU	1134.9	1094.4	1053.9	1013.4	972.9	932.4	891.9	851.4	810.9	770.4

RAU = 0.0 (tons); RA2 = 332.8 (tons)

Current CAPWAP Ru = 401.5 (tons); Corresponding J(RP)= 0.61; J(RX) = 0.61

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS
m/s	ms	tons	tons	tons	mm	mm	mm	tonne-m	tons
1.60	36.95	746.9	792.9	890.9	5.289	0.053	0.100	3.7	1376.6

Jas-2 BH-38 ; File: P2-9 Test: 04-Nov-2020 18:14:
 Borepile Dia.800 Drop 6 ; Blow:CAPWAP(R) 2006-3
 PT Delta Systech Indonesia OP: ul

PILE PROFILE AND PILE MODEL

Depth m	Area cm ²	E-Modulus tons/cm ²	Spec. Weight tons/m ³	Perim. m
0.00	5026.55	351.5	2.403	2.513
18.80	5026.55	351.5	2.403	2.513

Toe Area 0.503 m²

Top Segment Length 1.04 m, Top Impedance 466.50 tons/m/s

File Damping 2.0 %, Time Incr 0.276 ms, Wave Speed 3787.8 m/s, 2L/c 9.9 ms

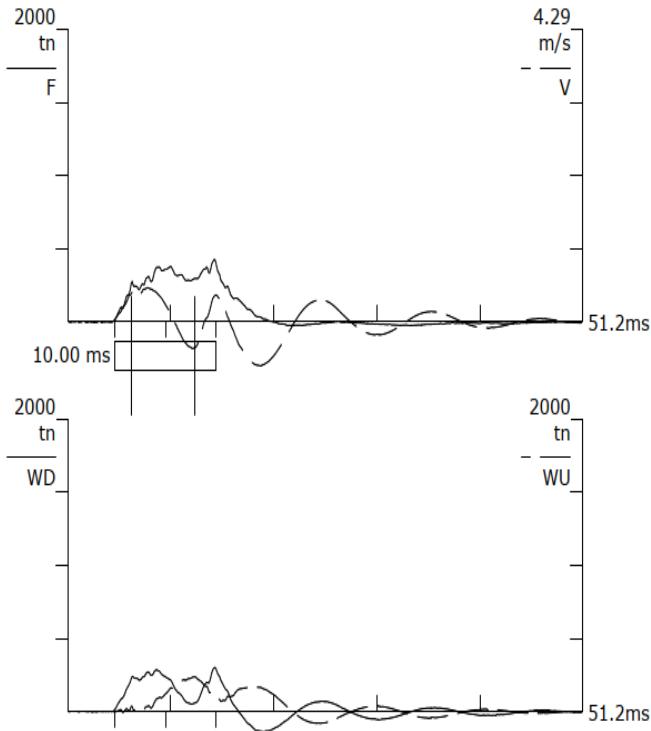
PT Delta Systech Indonesia

Jas-2 BH-38
PDA OP: ul

PILE DRIVING ANALYZER @
Version 2016.125.001

P3-15_1

Borepile Dia.800 Drop 6

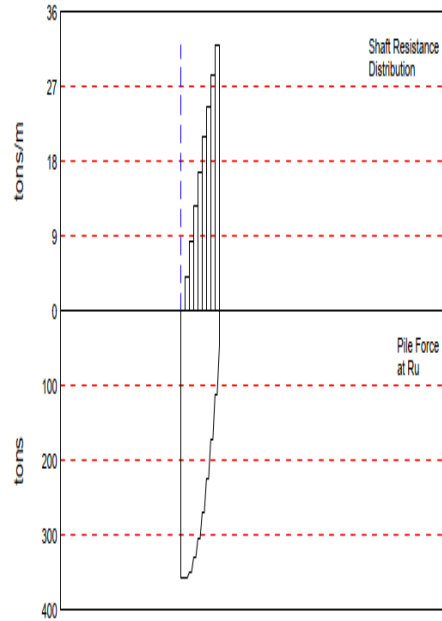
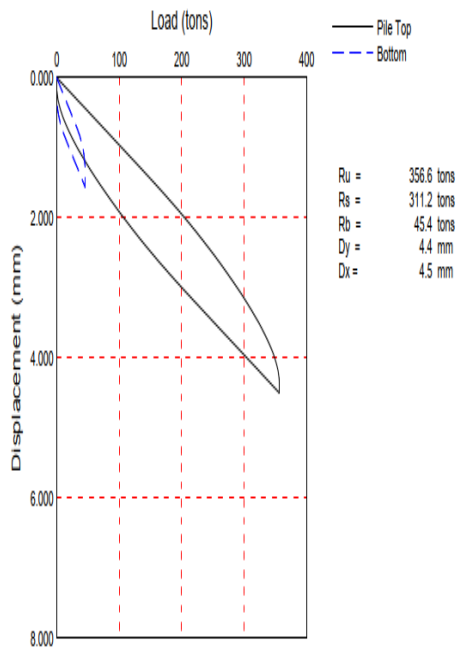
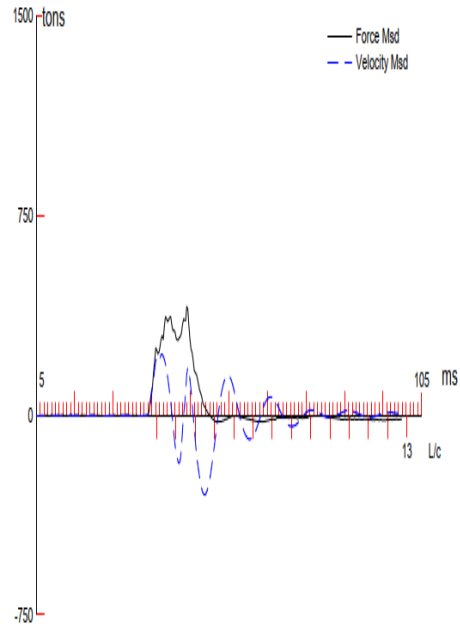
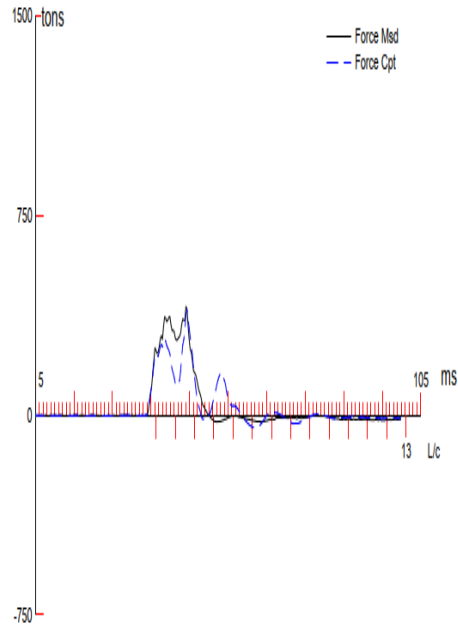


BN 1
30/10/2020 15:51:37
RMX 388 tn
STK 0.0 m
ETR 2.9 (%)
CSX 8.3 MPa
TSX 4.3 MPa
EMX 0.53 tn-m
DFN 0 mm
DMX 2 mm
JC 0.55 []

LE 18.9 m
AR 5026.55 cm²
EM 352 t/cm²
SP 2.40 t/m³
WS 3787.8 m/s
EA/C 466.5 tn-s/m
LP 18.6 m

F34 A34

F3: [T205] 144.6 (0.95)
F4: [T204] 145 (0.95)
A3: [K11308] 406 mv/5000g's (1)
A4: [K11304] 361 mv/5000g's (1)



Jas-2 BH-38 ; File: P3-15_1 Test: 30-Okt-2020 15:51:
 Borepile Dia.800 Drop 6 ; Blow: CAPWAP (R) 2006-3
 PT Delta Systech Indonesia OP: ul

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 356.6; along Shaft 311.2; at Toe 45.4 tons

Soil Sgmt No.	Dist. Below Gages m	Depth Below Grade m	Ru tons	Force in Pile tons	Sum of Ru tons	Unit Resist. (Depth) tons/m	Unit Resist. (Area) tons/m ²	Smith Damping Factor s/m	Quake mm
				356.6					
1	2.1	1.8	0.0	356.6	0.0	0.00	0.00	0.000	1.180
2	4.2	3.9	8.8	347.8	8.8	4.20	1.67	1.313	1.181
3	6.3	6.0	17.7	330.1	26.5	8.41	3.35	1.313	1.181
4	8.4	8.1	26.5	303.6	53.0	12.61	5.02	1.313	1.181
5	10.5	10.2	35.3	268.3	88.3	16.81	6.69	1.313	1.181
6	12.6	12.3	44.1	224.2	132.4	21.02	8.36	1.313	1.181
7	14.7	14.4	51.8	172.4	184.2	24.65	9.81	1.313	1.155
8	16.8	16.5	59.8	112.6	244.0	28.50	11.34	1.313	1.144
9	18.9	18.6	67.2	45.4	311.2	31.98	12.72	1.313	1.123
Avg. Shaft			34.6			16.73	6.66	1.313	1.157
Toe			45.4				90.40	1.313	1.004

Soil Model Parameters/Extensions	Shaft	Toe
Case Damping Factor	0.876	0.128
Unloading Quake (% of loading quake)	100	42
Reloading Level (% of Ru)	100	100
Soil Plug Weight (tons)		3.81

CAPWAP match quality = 17.06 (Wave Up Match) ; RSA = 0
 Observed: final set = 0.100 mm; blow count = 10000 b/m
 Computed: final set = 0.443 mm; blow count = 2256 b/m
 max. Top Comp. Stress = 0.081 tons/cm² (T= 44.9 ms, max= 1.012 x Top)
 max. Comp. Stress = 0.082 tons/cm² (Z= 2.1 m, T= 45.2 ms)
 max. Tens. Stress = -0.021 tons/cm² (Z= 10.5 m, T= 52.7 ms)
 max. Energy (EMX) = 0.82 tonne-m; max. Measured Top Displ. (DMX)= 1.95 mm

Jas-2 BH-38 ; File: P3-15_1 Test: 30-Okt-2020 15:51:
 Borepile Dia.800 Drop 6 ; Blow: CAPWAP (R) 2006-3
 PT Delta Systech Indonesia OP: ul

EXTREMA TABLE

Pile Sgmt No.	Dist. Below Gages m	max.	min.	max.	max.	max.	max.	max.
		Force tons	Force tons	Comp. Stress tons/cm ²	Tens. Stress tons/cm ²	Trnsfd. Energy tonne-m	Veloc. m/s	Displ. mm
1	1.0	408.9	-55.0	0.081	-0.011	0.82	0.6	3.233
2	2.1	413.9	-63.4	0.082	-0.013	0.81	0.6	3.107
3	3.1	409.9	-70.2	0.082	-0.014	0.80	0.5	2.989
4	4.2	391.9	-75.3	0.078	-0.015	0.78	0.5	2.860
5	5.2	371.8	-70.6	0.074	-0.014	0.74	0.5	2.730
6	6.3	384.4	-71.8	0.076	-0.014	0.72	0.5	2.590
7	7.3	363.5	-58.9	0.072	-0.012	0.65	0.5	2.460
8	8.4	375.1	-87.1	0.075	-0.017	0.63	0.4	2.321
9	9.4	338.3	-89.9	0.067	-0.018	0.55	0.4	2.197
10	10.5	351.9	-107.8	0.070	-0.021	0.55	0.4	2.062
11	11.5	306.4	-101.6	0.061	-0.020	0.46	0.4	1.930
12	12.6	327.1	-104.2	0.065	-0.021	0.46	0.4	1.785
13	13.6	287.6	-99.8	0.057	-0.020	0.38	0.3	1.641
14	14.7	315.0	-91.6	0.063	-0.018	0.38	0.3	1.485
15	15.7	275.6	-84.3	0.055	-0.017	0.31	0.4	1.411
16	16.8	286.5	-59.7	0.057	-0.012	0.31	0.3	1.373
17	17.8	203.7	-61.9	0.041	-0.012	0.23	0.4	1.358
18	18.9	183.9	-40.2	0.037	-0.008	0.12	0.4	1.338
Absolute	2.1			0.082			(T = 45.2 ms)	
	10.5				-0.021		(T = 52.7 ms)	

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	348.9	336.5	324.2	311.8	299.5	287.2	274.8	262.5	250.1	237.8
RX	452.9	440.9	428.9	416.9	405.0	393.0	383.6	374.3	365.1	356.9
RU	570.1	579.9	589.7	599.5	609.3	619.1	628.9	638.6	648.4	658.2

RAU = 0.0 (tons); RA2 = 430.6 (tons)

Current CAPWAP Ru = 356.6 (tons); Corresponding J(RP)= 0.00; matches RX9 within 5%

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS
m/s	ms	tons	tons	tons	mm	mm	mm	tonne-m	tons
0.50	36.59	222.0	250.3	426.2	1.949	0.090	0.100	0.5	517.0

Jas-2 BH-38 ; File: P3-15_1 Test: 30-Okt-2020 15:51:
 Borepile Dia.800 Drop 6 ; Blow: CAPWAP (R) 2006-3
 PT Delta Systech Indonesia OP: ul

PILE PROFILE AND PILE MODEL

Depth m	Area cm ²	E-Modulus tons/cm ²	Spec. Weight tons/m ³	Perim. m
0.00	5026.55	351.5	2.403	2.513
18.90	5026.55	351.5	2.403	2.513

Toe Area 0.503 m²

Top Segment Length 1.05 m, Top Impedance 466.50 tons/m/s

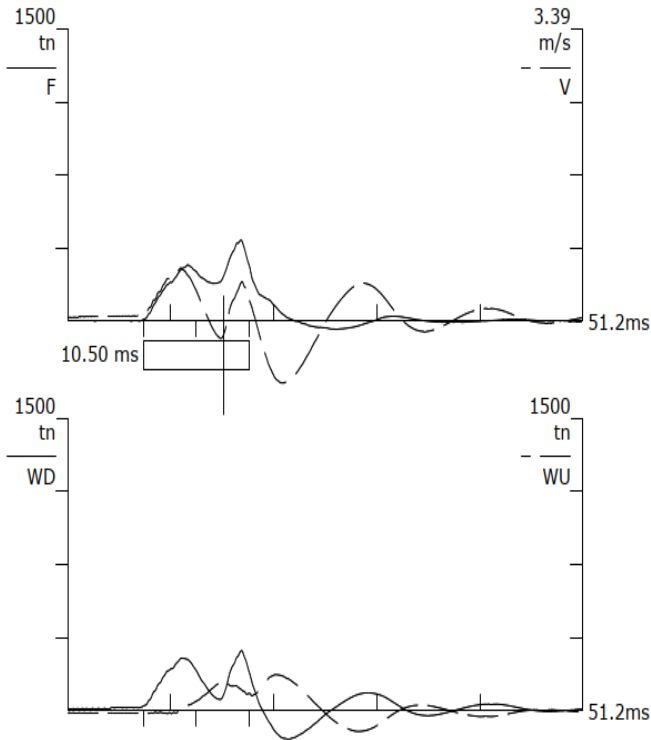
Wave Speed 3787.8 m/s, 2L/c 10.0 ms

PT Delta Systech Indonesia

JAS-2 BH-38
PDA OP: UL

PILE DRIVING ANALYZER @
Version 2010.101.005

P4-11_2
BOREPILE DIA.800 DROP 6

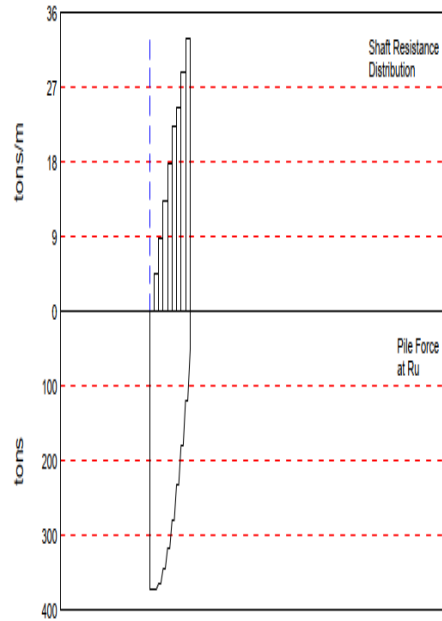
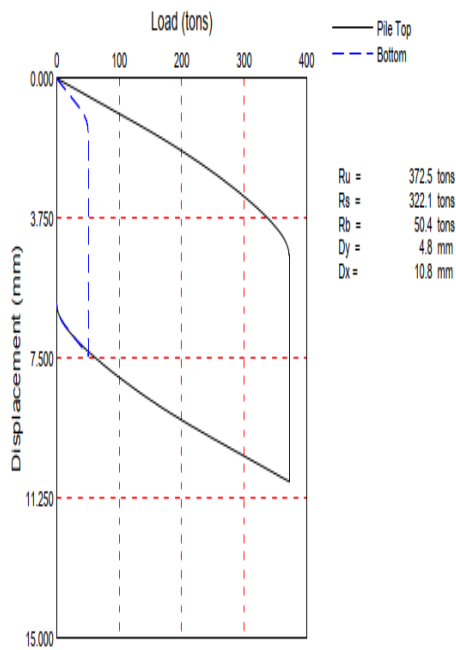
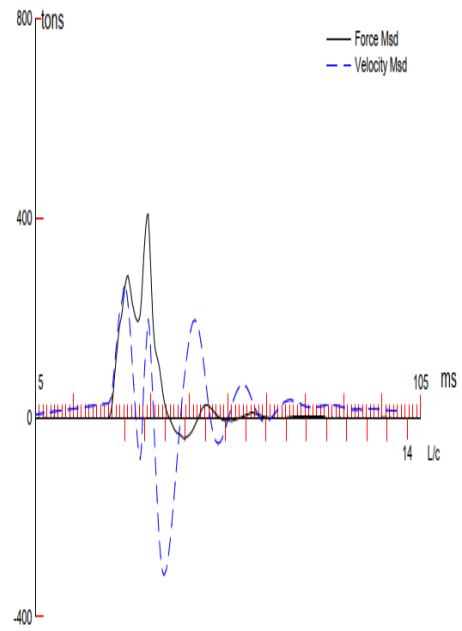
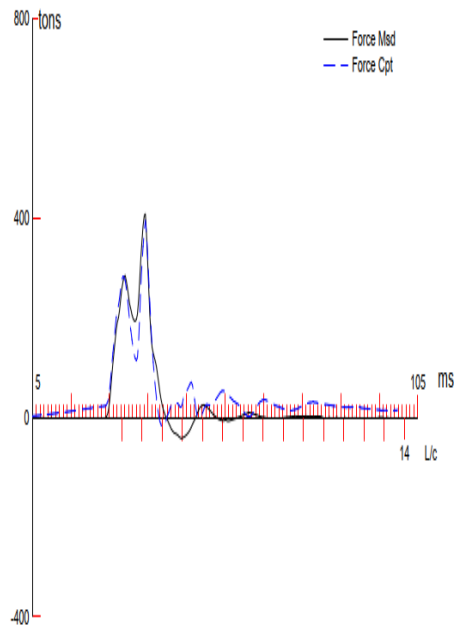


BN 1/2
16/11/2020 16:35:40
RMX 384 tn
STK 0.0 m
ETR 4.0 (%)
CSX 8.1 MPa
TSX 5.0 MPa
EMX 0.73 tn-m
DFN 6 mm
DMX 6 mm
JC 0.50 []

LE 18.9 m
AR 5026.55 cm²
EM 317 t/cm²
SP 2.40 t/m³
WS 3600.0 m/s
EA/C 442.9 tn-s/m
LP 18.5 m

F34 A34

F3: [I940] 93.7 (1.1)
F4: [I955] 92.9 (1.1)
A3: [K4294] 380 mv/5000g's (0.95)
A4: [K4295] 380 mv/5000g's (0.95)



JAS-2 BH-38; Pile: P4-11_2
 BOREPILE DIA.800 DROP 6; Blow: 2
 PT Delta Systech Indonesia

Test: 16-Nov-2020 16:35:
 CAPWAP (R) 2006-3
 OP: UL

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 372.5; along Shaft 322.1; at Toe 50.4 tons

Soil Sgmt No.	Dist. Below Gages m	Depth Below Grade m	Ru tons	Force in Pile tons	Sum of Ru tons	Unit Resist. (Depth) tons/m	Unit Resist. (Area) tons/m ²	Smith Damping Factor s/m	Quake mm
				372.5					
1	2.1	1.7	0.0	372.5	0.0	0.00	0.00	0.000	1.004
2	4.2	3.8	9.4	363.1	9.4	4.49	1.79	1.313	1.004
3	6.3	5.9	18.8	344.3	28.2	8.99	3.58	1.313	1.004
4	8.4	8.0	28.2	316.1	56.4	13.47	5.36	1.313	1.004
5	10.5	10.1	37.6	278.5	94.1	17.96	7.15	1.313	1.004
6	12.6	12.2	47.0	231.4	141.1	22.45	8.93	1.313	1.004
7	14.7	14.3	51.5	179.9	192.6	24.59	9.78	1.313	0.916
8	16.8	16.4	60.5	119.5	253.0	28.87	11.49	1.313	0.922
9	18.9	18.5	69.1	50.4	322.1	32.98	13.12	1.313	0.922
Avg. Shaft			35.8			17.41	6.93	1.313	0.957
Toe			50.4				100.27	1.313	1.081

Soil Model Parameters/Extensions	Shaft	Toe
Case Damping Factor	0.955	0.149
Unloading Quake (% of loading quake)	30	30
Reloading Level (% of Ru)	100	100
Resistance Gap (included in Toe Quake) (mm)		0.077

CAPWAP match quality = 19.48 (Wave Up Match) ; RSA = 0
 Observed: final set = 6.000 mm; blow count = 167 b/m
 Computed: final set = 1.122 mm; blow count = 891 b/m
 max. Top Comp. Stress = 0.080 tons/cm² (T= 34.9 ms, max= 1.013 x Top)
 max. Comp. Stress = 0.081 tons/cm² (Z= 6.3 m, T= 36.4 ms)
 max. Tens. Stress = -0.022 tons/cm² (Z= 12.6 m, T= 44.8 ms)
 max. Energy (EMX) = 0.82 tonne-m; max. Measured Top Displ. (DMX)= 6.02 mm

JAS-2 BH-38; File: P4-11_2
 BOREPILE DIA.800 DROP 6; Blow: 2
 PT Delta Systech Indonesia

Test: 16-Nov-2020 16:35:
 CAPWAP (R) 2006-3
 OP: UL

EXTREMA TABLE

Pile Sgmt No.	Dist. Below Gages m	max.	min.	max.	max.	max.	max.	max.
		Force tons	Force tons	Comp. Stress tons/cm ²	Tens. Stress tons/cm ²	Trnsfd. Energy tonne-m	Veloc. m/s	Displ. mm
1	1.0	402.6	-16.9	0.080	-0.003	0.82	0.6	3.373
2	2.1	406.6	-26.5	0.081	-0.005	0.82	0.6	3.232
3	3.1	406.7	-53.4	0.081	-0.011	0.82	0.5	3.087
4	4.2	407.5	-78.6	0.081	-0.016	0.82	0.5	2.933
5	5.2	398.8	-87.0	0.079	-0.017	0.74	0.5	2.774
6	6.3	407.8	-105.2	0.081	-0.021	0.74	0.5	2.608
7	7.3	390.0	-94.1	0.078	-0.019	0.62	0.5	2.445
8	8.4	395.9	-102.3	0.079	-0.020	0.62	0.4	2.270
9	9.4	367.0	-77.4	0.073	-0.015	0.50	0.4	2.103
10	10.5	379.6	-100.9	0.076	-0.020	0.49	0.4	1.931
11	11.5	337.9	-90.4	0.067	-0.018	0.38	0.3	1.786
12	12.6	345.0	-108.9	0.069	-0.022	0.38	0.3	1.658
13	13.6	275.4	-83.6	0.055	-0.017	0.29	0.3	1.576
14	14.7	269.6	-95.2	0.054	-0.019	0.29	0.3	1.514
15	15.7	197.5	-58.7	0.039	-0.012	0.21	0.3	1.469
16	16.8	189.6	-61.9	0.038	-0.012	0.21	0.3	1.400
17	17.8	142.6	-19.4	0.028	-0.004	0.13	0.4	1.354
18	18.9	158.5	-29.9	0.032	-0.006	0.06	0.3	1.292
Absolute	6.3			0.081			(T = 36.4 ms)	
	12.6				-0.022		(T = 44.8 ms)	

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	433.3	423.3	413.3	403.3	393.3	383.3	373.3	363.2	353.2	343.2
RX	433.7	423.3	413.3	403.3	393.3	383.3	373.3	363.2	353.2	343.2
RU	530.5	530.2	529.9	529.6	529.3	529.0	528.8	528.5	528.2	527.9

RAU = 0.0 (tons); RA2 = 293.8 (tons)

Current CAPWAP Ru = 372.5 (tons); Corresponding J(RP) = 0.61; J(RX) = 0.61

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS
m/s	ms	tons	tons	tons	mm	mm	mm	tonne-m	tons
0.62	28.51	272.8	260.7	416.3	6.015	6.015	6.000	0.7	122.1

JAS-2 BH-38; Pile: P4-11_2
 BOREPILE DIA.800 DROP 6; Blow: 2
 PT Delta Systech Indonesia

Test: 16-Nov-2020 16:35:
 CAPWAP (R) 2006-3
 OP: UL

PILE PROFILE AND PILE MODEL

Depth m	Area cm ²	E-Modulus tons/cm ²	Spec. Weight tons/m ³	Perim. m
0.00	5026.55	317.2	2.400	2.513
18.85	5026.55	317.2	2.400	2.513

Toe Area 0.503 m²

Top Segment Length 1.05 m, Top Impedance 442.86 tons/m/s

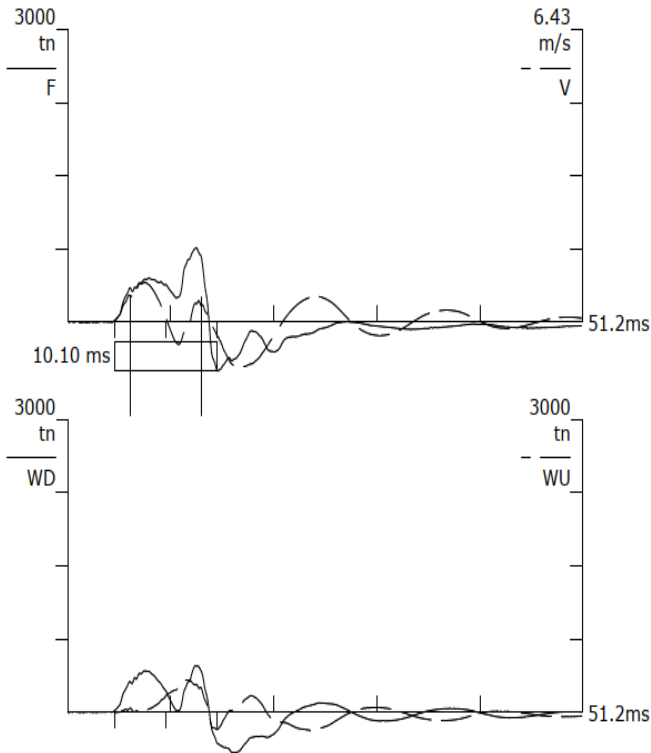
Pile Damping 2.0 %, Time Incr 0.291 ms, Wave Speed 3600.0 m/s, 2L/c 10.5 ms

PT Delta Systech Indonesia

Jas-2 BH-38
PDA OP: ul

PILE DRIVING ANALYZER @
Version 2016.125.001
P5-9

Borepile Dia.800 Drop 6

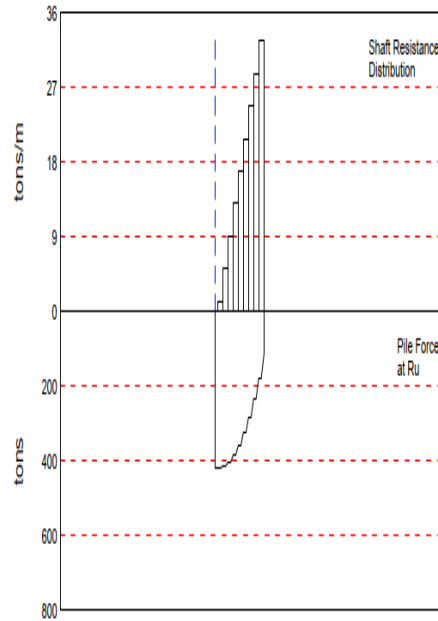
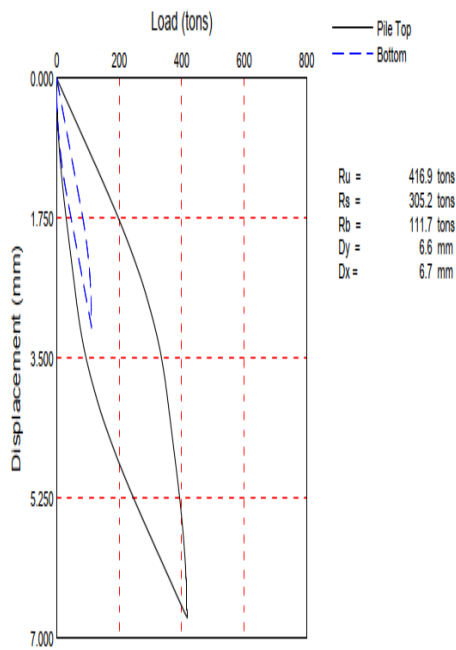
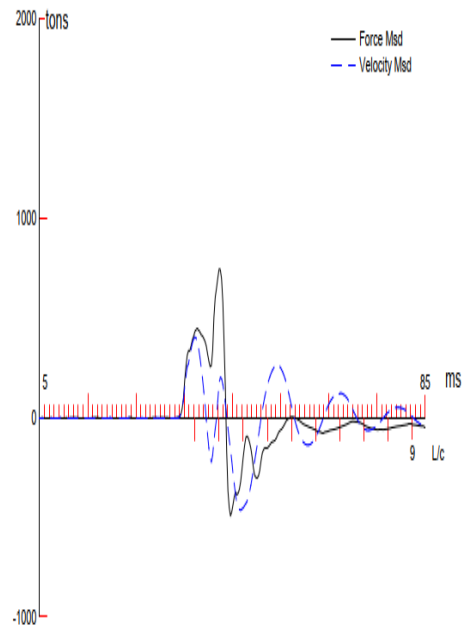
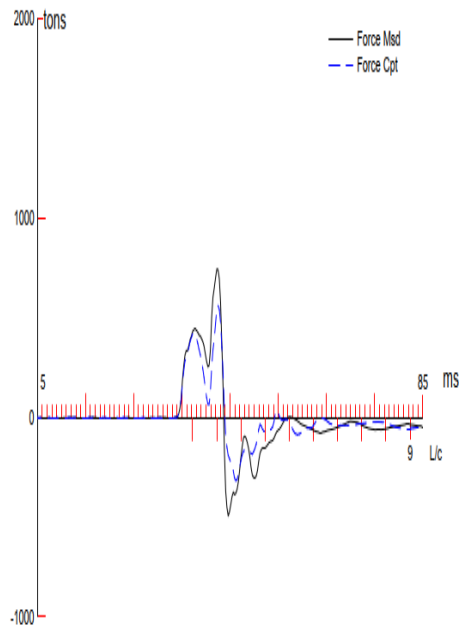


BN 2
18/11/2020 15:21:08
RMX 438 tn
STK 0.0 m
ETR 13.5 (%)
CSX 14.8 MPa
TSX 11.8 MPa
EMX 2.43 tn-m
DFN 0 mm
DMX 3 mm
JC 0.60 []

LE 19.0 m
AR 5026.55 cm²
EM 352 t/cm²
SP 2.40 t/m³
WS 3787.8 m/s
EA/C 466.5 tn-s/m
LP 18.5 m

F34 A34

F3: [T205] 144.6 (0.95)
F4: [T204] 145 (0.95)
A3: [K11308] 406 mv/5000g's (1)
A4: [K11304] 361 mv/5000g's (1)



Jas-2 BH-38; Pile: P5-9
 Borepile Dia.800 Drop 6; Blow: 2
 PT Delta Systech Indonesia

Test: 18-Nov-2020 15:21:
 CAPWAP (R) 2006-3
 OP: ul

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 416.9; along Shaft 305.2; at Toe 111.7 tons									
Soil Sgmnt No.	Dist. Below Gages	Depth Below Grade	Ru tons	Force in Pile tons	Sum of Ru tons	Unit Resist. (Depth) tons/m	Unit Resist. (Area) tons/m ²	Smith Damping Factor s/m	Quake mm
				416.9					
1	3.0	2.5	2.6	414.3	2.6	1.04	0.42	1.313	1.004
2	5.0	4.5	10.4	403.9	13.0	5.21	2.07	1.313	1.004
3	7.0	6.5	18.3	385.6	31.3	9.13	3.63	1.313	1.004
4	9.0	8.5	26.1	359.6	57.4	13.05	5.19	1.313	1.004
5	11.0	10.5	33.9	325.6	91.3	16.95	6.75	1.313	0.819
6	13.0	12.5	41.7	283.9	133.0	20.87	8.30	1.313	0.686
7	15.0	14.5	49.6	234.3	182.6	24.79	9.86	1.313	0.671
8	17.0	16.5	57.4	176.9	240.0	28.69	11.42	1.313	0.658
9	19.0	18.5	65.2	111.7	305.2	32.61	12.98	1.313	0.731
Avg. Shaft			33.9			16.50	6.56	1.313	0.762
Toe			111.7				222.26	1.500	2.318
Soil Model Parameters/Extensions						Shaft	Toe		
Case Damping Factor						0.859	0.359		
Damping Type							Smith		
Unloading Quake			(% of loading quake)			30	100		
Reloading Level			(% of Ru)			100	100		
Resistance Gap (included in Toe Quake) (mm)							0.001		
Soil Plug Weight			(tons)				1.14		
CAPWAP match quality = 14.51 (Wave Up Match) ; RSA = 0									
Observed: final set				= 0.100 mm;		blow count = 10000 b/m			
Computed: final set				= 0.100 mm;		blow count = 9999 b/m			
max. Top Comp. Stress				= 0.114 tons/cm ² (T= 43.0 ms, max= 1.050 x Top)					
max. Comp. Stress				= 0.120 tons/cm ² (Z= 4.0 m, T= 43.8 ms)					
max. Tens. Stress				= -0.076 tons/cm ² (Z= 11.0 m, T= 49.9 ms)					
max. Energy (EMX)				= 2.99 tonne-m; max. Measured Top Displ. (DMX)= 2.81 mm					

Jas-2 BH-38; Pile: P5-9
 Borepile Dia.800 Drop 6; Blow: 2
 PT Delta Systech Indonesia

Test: 18-Nov-2020 15:21:
 CAPWAP (R) 2006-3
 OP: ul

EXTREMA TABLE

Pile Sgmt No.	Dist. Below Gages m	max. Force tons	min. Force tons	max.		max. Trnsfd. Energy tonne-m	max. Veloc. m/s	max. Displ. mm
				Comp. Stress tons/cm ²	Tens. Stress tons/cm ²			
1	1.0	574.6	-307.9	0.114	-0.061	2.99	0.9	4.566
2	2.0	587.4	-304.9	0.117	-0.061	2.99	0.9	4.413
3	3.0	597.7	-319.4	0.119	-0.064	2.99	0.9	4.255
4	4.0	603.3	-323.5	0.120	-0.064	2.93	0.8	4.112
5	5.0	601.3	-326.3	0.120	-0.065	2.92	0.8	3.990
6	6.0	560.6	-339.2	0.112	-0.067	2.73	0.8	3.872
7	7.0	551.8	-358.1	0.110	-0.071	2.73	0.8	3.736
8	8.0	534.2	-336.1	0.106	-0.067	2.44	0.7	3.603
9	9.0	552.5	-348.2	0.110	-0.069	2.44	0.7	3.472
10	10.0	504.9	-352.3	0.100	-0.070	2.10	0.7	3.345
11	11.0	514.6	-380.1	0.102	-0.076	2.10	0.7	3.201
12	12.0	473.1	-356.3	0.094	-0.071	1.75	0.6	3.057
13	13.0	496.0	-376.9	0.099	-0.075	1.74	0.6	2.893
14	14.0	452.8	-309.4	0.090	-0.062	1.39	0.5	2.734
15	15.0	480.1	-295.9	0.096	-0.059	1.38	0.6	2.562
16	16.0	428.3	-202.7	0.085	-0.040	1.04	0.6	2.489
17	17.0	405.3	-229.8	0.081	-0.046	1.04	0.6	2.438
18	18.0	268.0	-151.9	0.053	-0.030	0.68	0.6	2.423
19	19.0	274.6	-146.6	0.055	-0.029	0.28	0.5	2.406
Absolute	4.0			0.120			(T =	43.8 ms)
	11.0				-0.076		(T =	49.9 ms)

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	559.7	530.9	502.1	473.3	444.5	415.7	386.9	358.1	329.3	300.5
RX	586.6	561.4	536.6	511.8	487.1	462.3	437.6	412.8	388.1	363.3
RU	427.4	385.3	343.3	301.3	259.2	217.2	175.1	133.1	91.1	49.0

RAU = 0.0 (tons); RA2 = 379.1 (tons)

Current CAPWAP Ru = 416.9 (tons); Corresponding J(RP)= 0.50; J(RX) = 0.68

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS
m/s	ms	tons	tons	tons	mm	mm	mm	tonne-m	tons
0.88	37.49	410.0	437.8	756.8	2.810	0.100	0.100	2.4	1668.9

Jas-2 BH-38; Pile: P5-9
 Borepile Dia.800 Drop 6; Blow: 2
 PT Delta Systech Indonesia

Test: 18-Nov-2020 15:21:
 CAPWAP (R) 2006-3
 OP: ul

PILE PROFILE AND PILE MODEL

Depth m	Area cm ²	E-Modulus tons/cm ²	Spec. Weight tons/m ³	Perim. m
0.00	5026.55	351.5	2.403	2.513
19.00	5026.55	351.5	2.403	2.513

Toe Area 0.503 m²

Top Segment Length 1.00 m, Top Impedance 466.50 tons/m/s

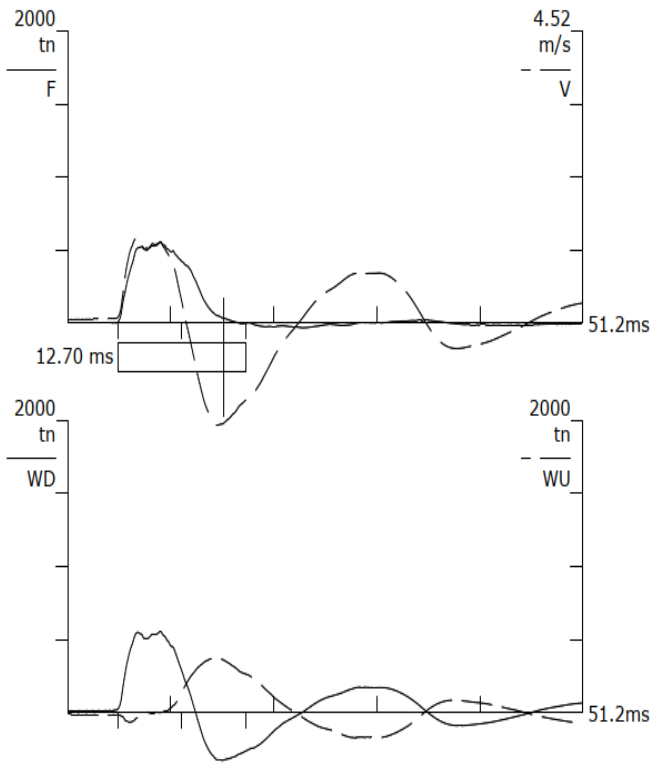
Pile Damping 2.0 %, Time Incr 0.264 ms, Wave Speed 3787.8 m/s, 2L/c 10.0 ms

PT Delta Systech Indonesia

JAS-2 BH-38
PDA OP: UL

PILE DRIVING ANALYZER ®
Version 2010.101.005

ABT2-8_1
BOREPILE DIA.800 DROP 6

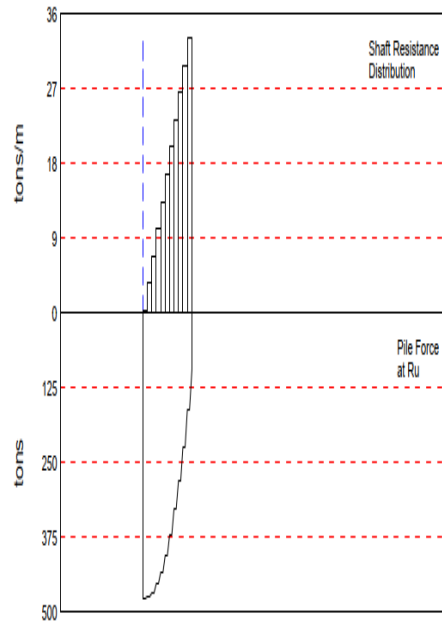
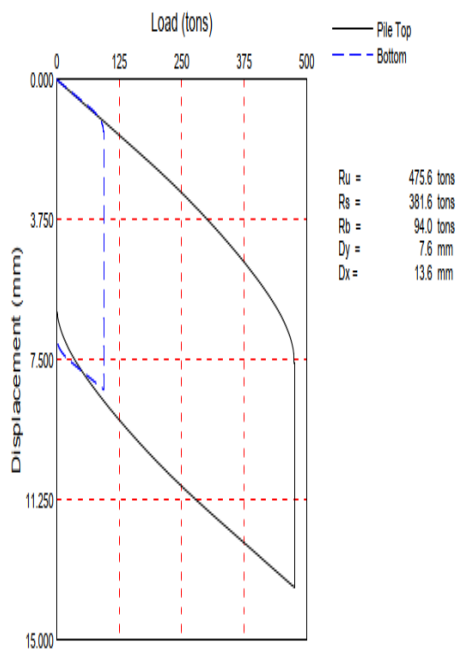
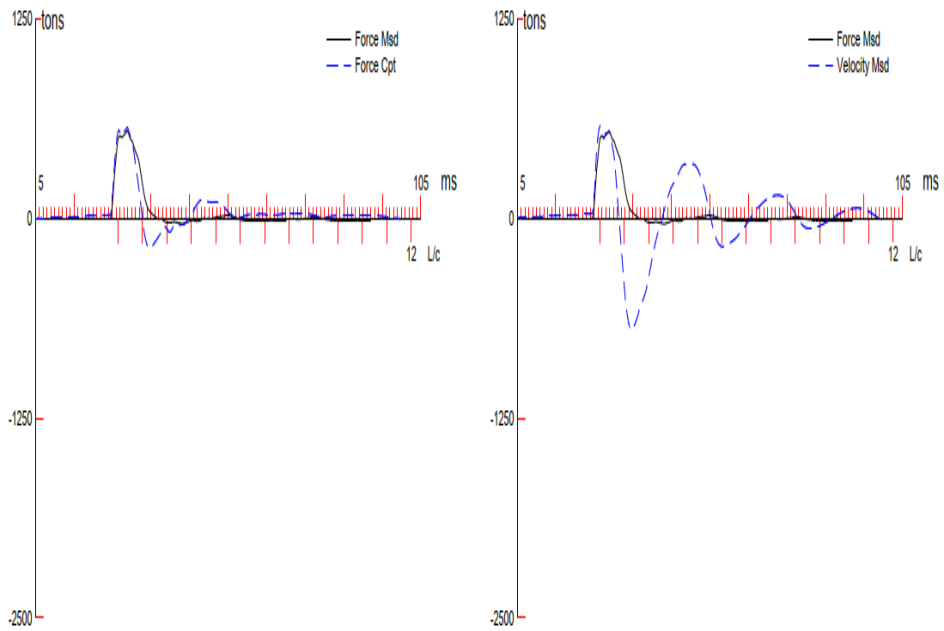


BN 1/2
11/11/2020 16:18:09
RMX 499 tn
STK 0.0 m
ETR 16.8 (%)
CSX 10.8 MPa
TSX 9.7 MPa
EMX 3.02 tn-m
DFN 6 mm
DMX 7 mm
JC 0.55 []

LE 22.8 m
AR 5026.55 cm²
EM 317 t/cm²
SP 2.40 t/m³
WS 3600.0 m/s
EA/C 442.9 tn-s/m
LP 22.5 m

F34 A34

F3: [I940] 93.7 (1)
F4: [I955] 92.9 (1)
A3: [K4294] 380 mv/5000g's (1)
A4: [K4295] 380 mv/5000g's (1)



JAS-2 BH-38; Pile: ABT2-8_1
 BOREPILE DIA.800 DROP 6; Blow: 2
 PT Delta Systech Indonesia

Test: 11-Nov-2020 16:18:
 CAPWAP (R) 2006-3
 OP: UL

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 475.6; along Shaft 381.6; at Toe 94.0 tons

Soil Sgmt No.	Dist. Below Gages m	Depth Below Grade m	Ru tons	Force in Pile tons	Sum of Ru tons	Unit Resist. (Depth) tons/m	Unit Resist. (Area) tons/m ²	Smith Damping Factor s/m
				475.6				
1	2.1	1.8	0.7	474.9	0.7	0.39	0.16	1.197
2	4.1	3.8	7.5	467.4	8.2	3.61	1.44	1.197
3	6.2	5.9	14.3	453.1	22.5	6.89	2.74	1.197
4	8.3	8.0	21.1	432.0	43.6	10.18	4.05	1.197
5	10.4	10.1	27.9	404.1	71.5	13.46	5.35	1.197
6	12.4	12.1	34.7	369.4	106.2	16.73	6.66	1.197
7	14.5	14.2	41.5	327.9	147.6	20.02	7.96	1.197
8	16.6	16.3	48.3	279.6	195.9	23.29	9.27	1.197
9	18.7	18.4	55.1	224.5	251.0	26.58	10.58	1.197
10	20.7	20.4	61.9	162.7	312.9	29.86	11.88	1.197
11	22.8	22.5	68.7	94.0	381.6	33.14	13.19	1.197
Avg. Shaft			34.7			16.96	6.75	1.197
Toe			94.0				186.93	1.313

Soil Model Parameters/Extensions	Shaft	Toe
Quake (mm)	1.759	1.060
Case Damping Factor	1.031	0.279
Unloading Quake (% of loading quake)	87	105
Reloading Level (% of Ru)	100	100
Resistance Gap (included in Toe Quake) (mm)		0.056
Soil Plug Weight (tons)		3.75

CAPWAP match quality = 22.10 (Wave Up Match) ; RSA = 0
 Observed: final set = 6.000 mm; blow count = 167 b/m
 Computed: final set = 1.896 mm; blow count = 528 b/m
 max. Top Comp. Stress = 0.116 tons/cm² (T= 29.4 ms, max= 1.067 x Top)
 max. Comp. Stress = 0.123 tons/cm² (Z= 6.2 m, T= 30.8 ms)
 max. Tens. Stress = -0.051 tons/cm² (Z= 10.4 m, T= 41.5 ms)
 max. Energy (EMX) = 4.25 tonne-m; max. Measured Top Displ. (DMX)= 7.28 mm

JAS-2 BH-38; Pile: ABT2-8_1
 BOREPILE DIA.800 DROP 6; Blow: 2
 PT Delta Systech Indonesia

Test: 11-Nov-2020 16:18:
 CAPWAP (R) 2006-3
 OP: UL

EXTREMA TABLE

Pile Sgmt No.	Dist. Below Gages m	max.	min.	max.	max.	max.	max.	max.
		Force tons	Force tons	Comp. Stress tons/cm ²	Tens. Stress tons/cm ²	Trnsfd. Energy tonne-m	Veloc. m/s	Displ. mm
1	1.0	580.9	-175.4	0.116	-0.035	4.25	1.2	6.434
2	2.1	590.2	-165.9	0.117	-0.033	4.25	1.2	6.301
3	3.1	598.3	-183.0	0.119	-0.036	4.22	1.2	6.150
4	4.1	610.3	-199.6	0.121	-0.040	4.22	1.2	5.984
5	5.2	605.4	-204.2	0.120	-0.041	4.03	1.2	5.813
6	6.2	619.9	-222.3	0.123	-0.044	4.03	1.1	5.623
7	7.3	602.6	-219.7	0.120	-0.044	3.72	1.1	5.428
8	8.3	619.5	-245.9	0.123	-0.049	3.72	1.1	5.216
9	9.3	590.8	-240.5	0.118	-0.048	3.35	1.1	5.003
10	10.4	609.6	-257.3	0.121	-0.051	3.34	1.0	4.779
11	11.4	571.9	-231.7	0.114	-0.046	2.94	1.0	4.552
12	12.4	592.4	-247.1	0.118	-0.049	2.94	1.0	4.286
13	13.5	545.1	-216.4	0.108	-0.043	2.55	0.9	4.024
14	14.5	567.6	-236.8	0.113	-0.047	2.55	0.9	3.828
15	15.5	543.3	-223.9	0.108	-0.045	2.19	0.8	3.715
16	16.6	573.0	-235.9	0.114	-0.047	2.19	0.8	3.591
17	17.6	495.8	-219.0	0.099	-0.044	1.85	0.8	3.481
18	18.7	477.7	-217.5	0.095	-0.043	1.84	0.7	3.370
19	19.7	407.5	-195.9	0.081	-0.039	1.51	0.7	3.315
20	20.7	438.2	-181.1	0.087	-0.036	1.51	0.7	3.281
21	21.8	364.3	-152.1	0.072	-0.030	1.16	0.7	3.290
22	22.8	318.8	-121.6	0.063	-0.024	0.77	0.7	3.284
Absolute	6.2			0.123			(T =	30.8 ms)
	10.4				-0.051		(T =	41.5 ms)

JAS-2 BH-38; Pile: ABT2-8_1
 BOREPILE DIA.800 DROP 6; Blow: 2
 PT Delta Systech Indonesia

Test: 11-Nov-2020 16:18:
 CAPWAP (R) 2006-3
 OP: UL

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	711.0	672.5	633.9	595.4	556.8	518.3	479.8	441.2	402.7	364.1
RX	711.0	672.5	633.9	595.4	556.8	518.3	479.8	441.2	402.7	364.1
RU	1122.5	1125.1	1127.7	1130.3	1132.9	1135.5	1138.1	1140.7	1143.3	1145.9

RAU = 0.0 (tons); RA2 = 180.6 (tons)

Current CAPWAP Ru = 475.6 (tons); Corresponding J(RP) = 0.61; J(RX) = 0.61

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS
m/s	ms	tons	tons	tons	mm	mm	mm	tonne-m	tons
1.32	26.77	584.7	511.8	555.6	7.277	5.995	6.000	3.0	455.5

PILE PROFILE AND PILE MODEL

Depth	Area	E-Modulus	Spec. Weight	Perim.
m	cm ²	tons/cm ²	tons/m ³	m
0.00	5026.55	317.2	2.400	2.513
22.80	5026.55	317.2	2.400	2.513

Toe Area 0.503 m²

Top Segment Length 1.04 m, Top Impedance 442.86 tons/m/s

Pile Damping 2.0 %, Time Incr 0.288 ms, Wave Speed 3600.0 m/s, 2L/c 12.7 ms

Pile Driving Analyzer

APPENDIX D Documentation

Pile Driving Analyzer



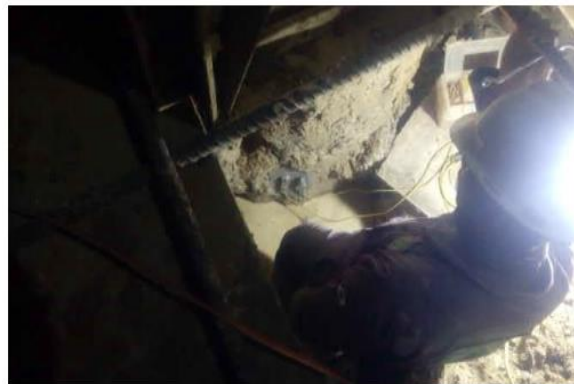
ABT1-3



Pile Driving Analyzer



PILAR 1-8



Pile Driving Analyzer



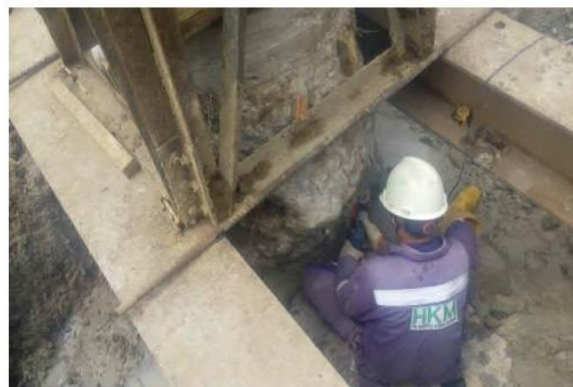
P2-9



Pile Driving Analyzer



P3-15



Pile Driving Analyzer



P4-11



Pile Driving Analyzer



P5-9

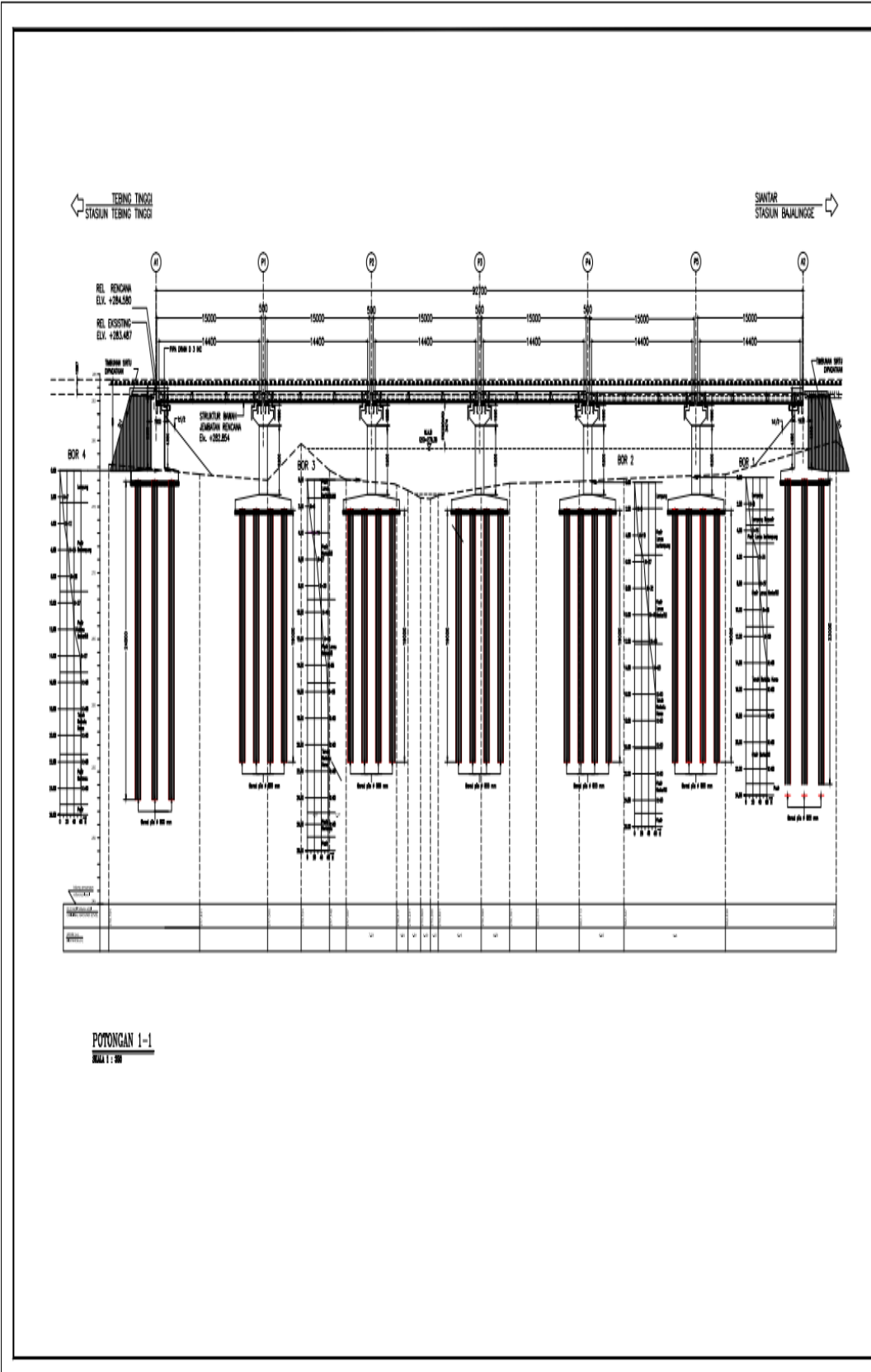


Pile Driving Analyzer



ABT2-8





Perhitungan Daya Dukung Tiang berdasarkan data SPT (BH-38)													ABT-1		
Mayerhof, 1976															
Data Tiang															
diameter =	0,8	m	8 m (10D)												
p=	2,512	m	3,2 m (4D)												
A=	0,502	m ²											Faktor Keamanan (SF) = 2,5		
Depth (m)	ΔL	Type soil	N SPT	N1	N2	N rata-rata	Cu (kN/m ²)	α	Nc	Skin Friction (kN)		End bearing (kN)	Qult (kN)	Qult (ton)	Q all (ton)
										Local	Cumm				
0			0			0,0							0	0	0
2	2	clay	7	3,50	9,5	6,5	41,51	0,55	8,5	114,7	114,7	177,3	292,0	29,2	11,7
4	2	clay	12	6,33	18,0	12,2	79,85	0,55	9	220,6	335,3	361,1	696,4	69,6	27,9
6	2	clay	24	10,75	26,0	18,4	121,86	0,55	9	336,7	672,1	551,0	1.223,0	122,3	48,9
8	2	sand	28	14,20	32,5	23,4	-	-	-	78,6	750,7	821,2	1.571,8	157,2	62,9
10	2	sand	37	21,60	39,0	30,3	-	-	-	102,0	852,6	1.598,4	2.451,0	245,1	98,0
12	2	sand	41	28,40	49,0	38,7	-	-	-	130,3	982,9	2.722,0	3.704,9	370,5	148,2
14	2	sand	57	37,40	58,5	48,0	-	-	-	161,4	1.144,3	4.215,8	5.360,1	536,0	214,4
16	2	sand	60	44,60	60,0	52,3	-	-	-	176,0	1.320,4	5.517,9	6.838,2	683,8	273,5
18	2	sand	60	51,00	60,0	55,5	-	-	-	186,8	1.507,2	6.831,4	8.338,6	833,9	333,5
20	2	sand	60	55,60	60,0	57,8	-	-	-	194,6	1.701,7	8.130,8	9.832,6	983,3	393,3
22	2	sand	60	59,40	60,0	59,7	-	-	-	201,0	1.902,7	9.447,9	11.350,6	1.135,1	454,0
24	2	sand	60	59,50	60,0	59,8	-	-	-	201,1	2.103,8	10.506,4	12.610,3	1.261,0	504,4
26	2	sand	60	60,00	60,0	60,0	-	-	-	202,0	2.305,8	11.605,4	13.911,2	1.391,1	556,4

Perhitungan Daya Dukung Tiang berdasarkan data SPT (BH-38)													P4		
Mayerhof, 1976															
Data Tiang															
diameter =	0,8	m	8 m (10D)												
p=	2,512	m	3,2 m (4D)												
A=	0,502	m ²											Faktor Keamanan (SF) = 2,5		
Depth (m)	ΔL	Type soil	N SPT	N1	N2	N rata-rata	Cu (kN/m ²)	α	Nc	Skin Friction (kN)		End Bearing (kN)	Qult (kN)	Qult (ton)	Q all (ton)
										Local	Cumm				
0			0			0,0							0	0	0
2	2	clay	5	5,00	7,5	6,3	39,82	0,55	8,5	110,0	110,0	170,0	280,1	28,0	11,2
4	2	clay	10	7,50	18,5	13,0	85,49	0,55	9	236,2	346,2	386,5	732,8	73,3	29,3
6	2	sand	27	14,00	29,5	21,8	-	-	-	73,2	419,5	382,5	801,9	80,2	32,1
8	2	sand	32	18,50	36,0	27,3	-	-	-	91,7	511,2	958,3	1.469,5	147,0	58,8
10	2	sand	40	22,80	41,5	32,2	-	-	-	108,2	619,4	1.696,0	2.315,4	231,5	92,6
12	2	sand	43	30,40	48,0	39,2	-	-	-	132,0	751,4	2.757,2	3.508,5	350,9	140,3
14	2	sand	53	39,00	56,5	47,8	-	-	-	160,7	912,1	4.198,2	5.110,3	511,0	204,4
16	2	sand	60	45,60	60,0	52,8	-	-	-	177,7	1.089,8	5.570,6	6.660,4	666,0	266,4
18	2	sand	60	51,20	60,0	55,6	-	-	-	187,2	1.277,0	6.843,7	8.120,7	812,1	324,8
20	2	sand	60	55,20	60,0	57,6	-	-	-	193,9	1.470,9	8.102,7	9.573,6	957,4	382,9
22	2	sand	60	58,60	60,0	59,3	-	-	-	199,6	1.670,5	9.384,6	11.055,0	1.105,5	442,2
24	2	sand	60	58,83	60,0	59,4	-	-	-	200,0	1.670,9	10.447,8	12.118,7	1.211,9	484,7
26	2	sand	60	60,00	60,0	60,0	-	-	-	202,0	1.872,8	11.605,4	13.478,3	1.347,8	539,1

Perhitungan Daya Dukung Tiang berdasarkan data SPT (BH-38)											ABT-2				
Mayerhof, 1976															
Data Tiang															
diameter =	0,8	m	8 m (10D)												
p =	2,512	m	3,2 m (4D)												
A =	0,502	m ²									Faktor Keamanan (SF) = 2,5				
Depth (m)	ΔL	Type soil	N SPT	N1	N2	N rata-rata	Cu (kN/m ²)	α	Nc	Skin Friction (kN)		End Bearing (kN)	Qult (kN)	Qult (ton)	Q all (ton)
										Local	Cumm				
0														0	0
2	2	clay	3	3,0	5,5	4,3	26,29	0,55	8,5	72,6	72,6	112,3	184,9	18,5	7,4
4	2	sand	8	5,5	9,5	7,5	-	-	-	25,2	97,9	131,9	229,8	23,0	9,2
6	2	sand	11	7,3	27,5	17,4	-	-	-	58,6	156,5	612,5	769,0	76,9	30,8
8	2	sand	44	16,5	46,5	31,5	-	-	-	106,0	262,5	1.661,7	1.924,2	192,4	77,0
10	2	sand	49	23,0	52,0	37,5	-	-	-	126,2	388,8	2.637,6	3.026,4	302,6	121,1
12	2	sand	55	33,4	57,0	45,2	-	-	-	152,1	540,9	3.974,0	4.514,9	451,5	180,6
14	2	sand	59	43,6	59,5	51,6	-	-	-	173,5	714,4	5.438,7	6.153,2	615,3	246,1
16	2	sand	60	53,4	60,0	56,7	-	-	-	190,9	905,3	6.979,1	7.884,4	788,4	315,4
18	2	sand	60	56,6	60,0	58,3	-	-	-	196,2	1.101,5	8.201,2	9.302,7	930,3	372,1
20	2	sand	60	58,8	40,0	49,4	-	-	-	166,3	1.267,8	7.817,8	9.085,7	908,6	363,4
22	2	sand	0	47,8	30,0	38,9	-	-	-	130,9	1.398,8	6.840,2	8.238,9	823,9	329,6
24	4	sand	60	49,8	60,0	54,9	-	-	-	369,7	1.637,5	10.622,2	12.259,7	1.226,0	490,4



Settlement (Metode Elastis, Braja.M.Das)

ABT-1

D	0,8	AP= 0,502 (luas penampang)	Es = modulus elastis tanah (joseph e bowles)
Iwp	0,85	EP = MODULUS ELASTIS TIANG	Qp = ujung tiang
μ	0,35	faktor keamanan 2	Qs = selimut tiang cp 0,09

Depth (m)	N rata-rata	qc	Es kN/m ²	Eb kN/m ²	Ep (kN/m ²)	Qp (kN/m ²)	Qs (kN/m ²)	Qwp	Qws	p (m)	Ap (m ²)	qwp	Iws	ξ	S1 (mm)	S2 (mm)	S3 (mm)	S total (mm)
0,00			0	0	0	0,0	0,0	0,0	0,0	0,0	0	0	0,0	0	0	0	0	0
2	6,50	2548	6370	63700	3,32E+07	177,3	114,7	62,6	114,7	2,51	0,502	124,53	2,55	0,5	0,014	1,167	6,424	7,605
4	12,17	4769	11923	119233,3	3,32E+07	361,1	220,6	140,4	220,6	2,51	0,502	279,48	2,78	0,5	0,060	1,399	3,598	5,056
6	18,38	7203	18008	180075	3,32E+07	551,0	336,7	214,3	336,7	2,51	0,502	426,50	2,96	0,5	0,137	1,413	2,577	4,127
8	23,35	9153	22883	228830	3,32E+07	821,2	78,6	742,6	78,6	2,51	0,502	1478,06	3,11	0,5	0,375	3,854	0,373	4,602
10	30,30	11878	29694	296940	3,32E+07	1598,4	102,0	1496,4	102,0	2,51	0,502	2978,49	3,24	0,5	0,927	5,985	0,311	7,223
12	38,70	15170	37926	379260	3,32E+07	2722,0	130,3	2591,7	130,3	2,51	0,502	5158,71	3,36	0,5	1,909	8,116	0,268	10,294
14	47,95	18796	46991	469910	3,32E+07	4215,8	161,4	4054,4	161,4	2,51	0,502	8069,99	3,46	0,5	3,467	10,247	0,238	13,952
16	52,30	20502	51254	512540	3,32E+07	5517,9	176,0	5341,8	176,0	2,51	0,502	10632,59	3,57	0,5	5,203	12,378	0,214	17,796
18	55,50	21756	54390	543900	3,32E+07	6831,4	186,8	6644,6	186,8	2,51	0,502	13225,65	3,66	0,5	7,264	14,510	0,195	21,969
20	57,80	22658	56644	566440	3,32E+07	8130,8	194,6	7936,3	194,6	2,51	0,502	15796,74	3,75	0,5	9,623	16,641	0,180	26,443
22	59,70	23402	58506	585060	3,32E+07	9447,9	201,0	9246,9	201,0	2,51	0,502	18405,51	3,84	0,5	12,316	18,772	0,167	31,255
24	59,75	23422	58555	5855500	3,32E+08	10506,4	201,1	10305,3	2103,8	2,51	0,502	20512,18	3,92	0,5	1,632	1,042	1,741	4,416

Settlement (Metode Elastis, Braja.M.Das)

P-4

D	0,8	AP= 0,502 (luas penampang)	Es = modulus elastis tanah (joseph e bowles)
Iwp	0,85	EP = MODULUS ELASTIS TIANG	Qp = ujung tiang
μ	0,35	faktor keamanan 2	Qs = selimut tiang

Depth (m)	N rata-rata	qc	Es kN/m ²	Eb kN/m ²	Ep (kN/m ²)	Qp (kN/m ²)	Qs (kN/m ²)	Qwp	Qws	p (m)	Ap (m ²)	qwp	Iws	ξ	S1 (mm)	S2 (mm)	S3 (mm)	S total (mm)
0,00			0	0	0	0,0	0,0	0,0	0,0	0,0	0	0	0,0	0	0	0	0	0
2	6,25	2450	6125	61250	3,32E+07	170,0	110,0	60,0	110,0	2,51	0,502	119,46	2,55	0,5	0,014	1,164	6,409	7,587
4	13,00	5096	12740	127400	3,32E+07	386,5	236,2	150,3	346,2	2,51	0,502	299,21	2,78	0,5	0,077	1,401	5,284	6,763
6	21,75	8526	21315	213150	3,32E+07	382,5	73,2	309,2	419,5	2,51	0,502	615,53	2,96	0,5	0,186	1,723	2,712	4,621
8	27,25	10682	26705	267050	3,32E+07	958,3	91,7	866,6	511,2	2,51	0,502	1724,93	3,11	0,5	0,538	3,854	2,077	6,469
10	32,15	12603	31507	315070	3,32E+07	1696,0	108,2	1587,8	619,4	2,51	0,502	3160,35	3,24	0,5	1,136	5,985	1,779	8,900
12	39,20	15366	38416	384160	3,32E+07	2757,2	132,0	2625,2	751,4	2,51	0,502	5225,36	3,36	0,5	2,157	8,116	1,528	11,801
14	47,75	18718	46795	467950	3,32E+07	4198,2	160,7	4037,4	912,1	2,51	0,502	8036,33	3,46	0,5	3,768	10,247	1,348	15,363
16	52,80	20698	51744	517440	3,32E+07	5570,6	177,7	5392,9	1089,8	2,51	0,502	10734,24	3,57	0,5	5,690	12,378	1,312	19,380
18	55,60	21795	54488	544880	3,32E+07	6843,7	187,2	6656,5	1277,0	2,51	0,502	13249,48	3,66	0,5	7,864	14,510	1,332	23,706
20	57,60	22579	56448	5644800	3,32E+08	8102,7	193,9	7908,8	1470,9	2,51	0,502	15742,08	3,75	0,5	1,035	1,664	1,365	4,065
24	59,42	23291	58228	582283,3	3,32E+07	10447,8	200,0	10247,8	1670,9	2,51	0,502	20397,74	3,92	0,5	15,931	20,903	1,309	38,143
26	60,00	23520	58800	588000	3,32E+07	11605,4	202,0	11403,5	1872,8	2,51	0,502	22698,00	4,00	0,5	19,216	23,034	1,368	43,617

Settlement (Metode Elastis, Braja.M.Das)

Depth (m)	N rata-rata	qc	Es kN/m ²	Eh kN/m ²	Ep (kN/m ²)	Qp (kN/m ²)	Qs (kN/m ²)	Qwp	Qws	p (m)	Ap (m ²)	qwp	Iws	ξ	S1 (mm)	S2 (mm)	S3 (mm)	S total (mm)
2	4,25	1666	4165	41650	3,32E+07	112,0	61,6	112,3	72,6	2,51	0,502	223,44	2,55	0,5	0,018	3,201	6,222	9,441
4	7,50	2940	7350	73500	3,32E+07	317,2	155,1	131,9	97,9	2,51	0,502	262,50	2,78	0,5	0,043	2,131	2,589	4,763
6	17,42	6827	17068	170683,3	3,32E+07	993,0	566,5	612,5	156,5	2,51	0,502	1219,17	2,96	0,5	0,248	4,262	1,264	5,774
8	31,50	12348	30870	308700	3,32E+07	1173,6	630,8	1661,7	262,5	2,51	0,502	3307,50	3,11	0,5	0,859	6,393	0,923	8,175
10	37,50	14700	36750	367500	3,32E+07	1579,8	685,8	2637,6	388,8	2,51	0,502	5250,00	3,24	0,5	1,696	8,524	0,957	11,177
12	45,20	17718	44296	442960	3,32E+07	2256,9	724,0	3974,0	540,9	2,51	0,502	7910,00	3,36	0,5	3,050	10,655	0,954	14,660
14	51,55	20208	50519	505190	3,32E+07	2708,3	744,6	5438,7	714,4	2,51	0,502	10825,50	3,46	0,5	4,860	12,786	0,978	18,624
16	56,70	22226	55566	555660	3,32E+07	2708,3	750,3	6979,1	905,3	2,51	0,502	13891,50	3,57	0,5	7,122	14,918	1,015	23,054
18	58,30	22854	57134	571340	3,32E+07	2708,3	741,7	8201,2	1101,5	2,51	0,502	16324,00	3,66	0,5	9,435	17,049	1,096	27,579
20	49,40	19365	48412	484120	3,32E+07	2708,3	719,2	7817,8	1267,8	2,51	0,502	15561,00	3,75	0,5	10,124	19,180	1,372	30,676
22	38,90	15249	38122	381220	3,32E+07	2708,3	684,1	6840,2	1398,8	2,51	0,502	13615,00	3,84	0,5	9,934	21,311	1,788	33,033
24	54,92	21527	53818	538183,3	3,32E+08	10622,2	369,7	10252,5	1637,5	2,51	0,502	20407,03	3,92	0,5	1,591	2,263	1,388	5,242

