Practicing Engineering Series

Geotechnical Instrumentation and Testing in Myanmar

18 May 2024, FMES-MSCE Knowledge Sharing Seminar

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What is Instrument?

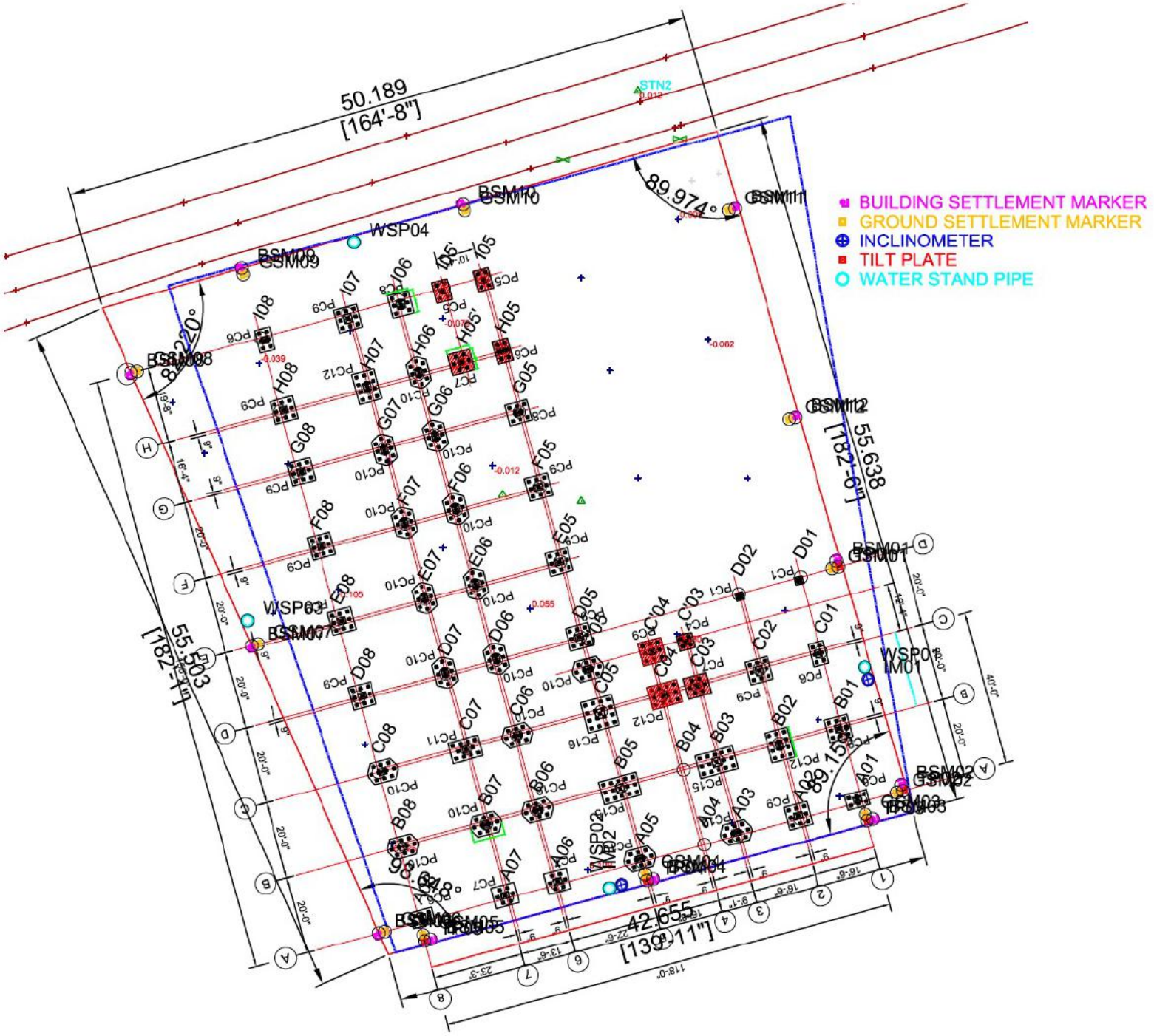
- It is a kind of measuring device
- It is a combination of physical/mechanical and electrical/electronic parts.
- It connects to Data Logger or Monitoring Device and Computer. It can be small, medium, large scale.
- It can be one time application or reusable.
- Some of them are:

(1) Tiltmeter (2) Piezometer (3) Inclinometer (4) Strain Gauge (5) Pressure Transducer (6) Load Cell (7) Linear Variation Displacement Transducer, LVDT, etc.

TESTING

- **Scope of Work:** instrument + monitoring unit for tilting, leveling, inclination, settlement, loading, etc. for various engineering requirements such as building tilting, settlement, lateral movement, Pile Integrity, Pile Capacity (static and dynamic), etc.
- **Duty:** Public Safety
- **Responsibility:** Implementation in difficult situation, application in Permit to Work System.
- **Skills:** Task Risk Assessment, Field Oriented, Practicing in HSE Policy, Working at Height.
- **Ultimate Goal:** Safe and Durable working environment.

Figure 1: Instrumentation Plan



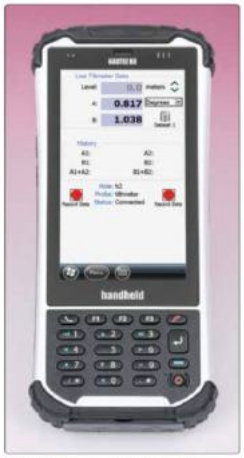
MEMS Digital Tiltmeter

Applications

The Model 6101D MEMS Digital Tiltmeter is designed to measure tilt in structures including...

- Buildings
- Dams
- Embankments
- Slopes
- Excavation walls
- Open pits

• Model 6101D MEMS Digital Tiltmeter shown with Model 6201-1C Ceramic Tiltplate.



• Model FPC-2 Field PC showing a Live Tiltmeter Data reading screen shot.

Tilt Plate

• Model 6201-1C Ceramic, 6201-1A Anodized Aluminum and 6201-1S Stainless Steel Tiltplates (tiltplates are permanently attached to structure being monitored).

Tilt Plate Installation Photo

Figure 5: Tiltmeter Monitoring Photos

Tilt Plate Monitoring Record (Tilt Plate - 02) (Zealax Hotel)

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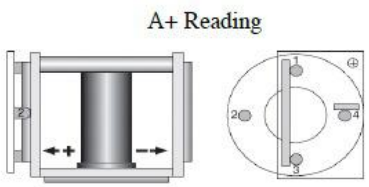
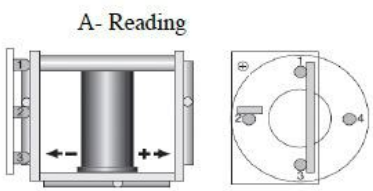
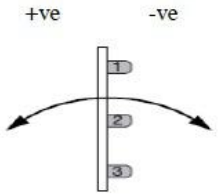
Location : Ahlone
Installed On: 15/08/23
Initial Reading On: 18/08/23
Last Reading On: 25/10/23

Project: 1B + 6S RCC Buidling
Consultant : SDG Group
Client : SunShine Survey
Limit: 0.78 °

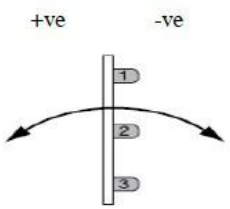
Date & Time	Reading		Face Difference	Tilt	Cummulative Tilt in Degree °	Cummulative Tilt in Minute '	Cummulative Tilt in Second ''	Remark
	A+	A-						
18/08/2023 15:05:18	-122	65	-187	-0.1071	0.0000	0.0000	0.00	Initial Reading
23/08/2023 15:12:02	-110	76	-186	-0.1066	0.0006	0.0344	2.06	Sheet Piling Initiated
30/08/2023 10:58:13	-111	78	-189	-0.1083	-0.0011	-0.0688	-4.13	
06/09/2023 12:12:44	-98	42	-140	-0.0802	0.0269	1.6157	96.94	
13/09/2023 12:09:44	-129	69	-198	-0.1134	-0.0063	-0.3782	-22.69	Sheet Piling Finished
20/09/2023 12:09:44	-119	70	-189	-0.1083	-0.0011	-0.0688	-4.13	
27/09/2023 12:09:44	-141	73	-214	-0.1226	-0.0155	-0.9282	-55.69	
05/10/2023 11:11:37	-126	86	-212	-0.1215	-0.0143	-0.8594	-51.57	Before Excavation
11/10/2023 11:11:37	-116	83	-199	-0.1140	-0.0069	-0.4125	-24.75	Excavation Initiated
19/10/2023 14:30:50	-124	80	-204	-0.1169	-0.0097	-0.5844	-35.07	During Back Filling
25/10/2023 11:23:13	-123	69	-192	-0.1100	-0.0029	-0.1719	-10.31	Backng Filling Completed
02/11/2023 11:39:34	-124	74	-198	-0.1134	-0.0063	-0.3782	-22.69	Piling Initiated

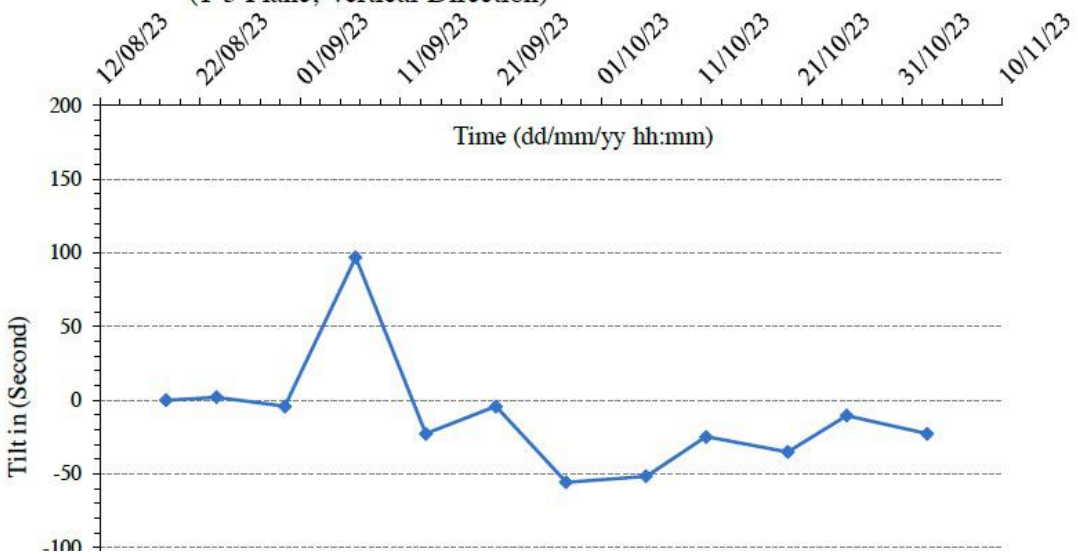






Tilt Plate Chronological Record in Vertical Plane
(1-3 Plane, Vertical Direction)





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ISO 9001:2015 Certified

MEMS PORTABLE TILT METER TEST REPORT

Type : MEMS TILT METER
Model Number : Geokon 6101-D
Serial Number : 1820838
Max: Capacity : 0 ~ 15°
Ambient Temp : 27.5 Deg C

Calibration No : CSC- 54-23-Tilt-Meter-1820838
Calibration Date : 21-Aug-23
Technician : Aung Htet
Checked By : Daw Yi Yi Khin
Recommended Next Calibration: 20-08-2024

*This calibration has been carried out by using **Digitial Total Station** calibrated by **Geo Applied International**, Model: **CTS-632R6**, SN: **242974**, Dated: **12-07-2023**.*

Applied Tilt (°Degree)	*** Reading from Tilt-Meter A-Axis (Digits) ***			Change	Linearity (% Max: Load)
	Cycle 1	Cycle 2	Avg:		
0.00000	70	70	70	0	
0.01667	82	81	82	12	0.39
0.03333	94	93	94	12	1.23
0.05000	105	106	106	12	2.07
0.06667	115	116	116	10	1.10
0.08333	125	126	126	10	0.13
0.10000	136	134	135	10	1.28
0.11667	148	145	147	12	0.90
0.13333	160	157	159	12	0.06
0.15000	171	172	172	13	1.69
0.16667	182	182	182	11	1.17

Gauge Factor : **0.0015** **Degree/Digit**

Calculated Tilt (°Degree) = G * (R_1 - R_0)

* Note : The above calibration uses a linear regression method. The Zero Reading shown is ideal for straight line computation and does not usually agree with the actual no-load reading.

** Linearity = ((Calculated Tilt - Applied Tilt) / Max. Applied Tilt) x 100%

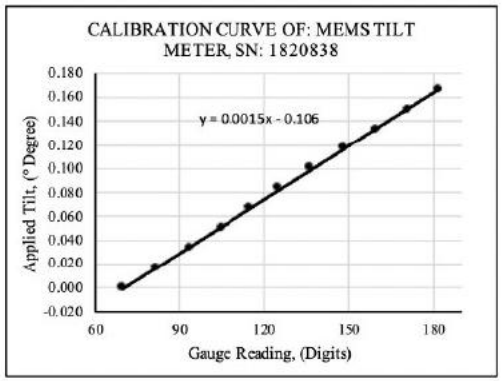


Figure 6: Casagrande Piezometer & Water Level Monitoring

Solinst®

Coaxial Cable Water Level Meter

More Info | Instructions | Get Quote

Model 102 Data Sheet

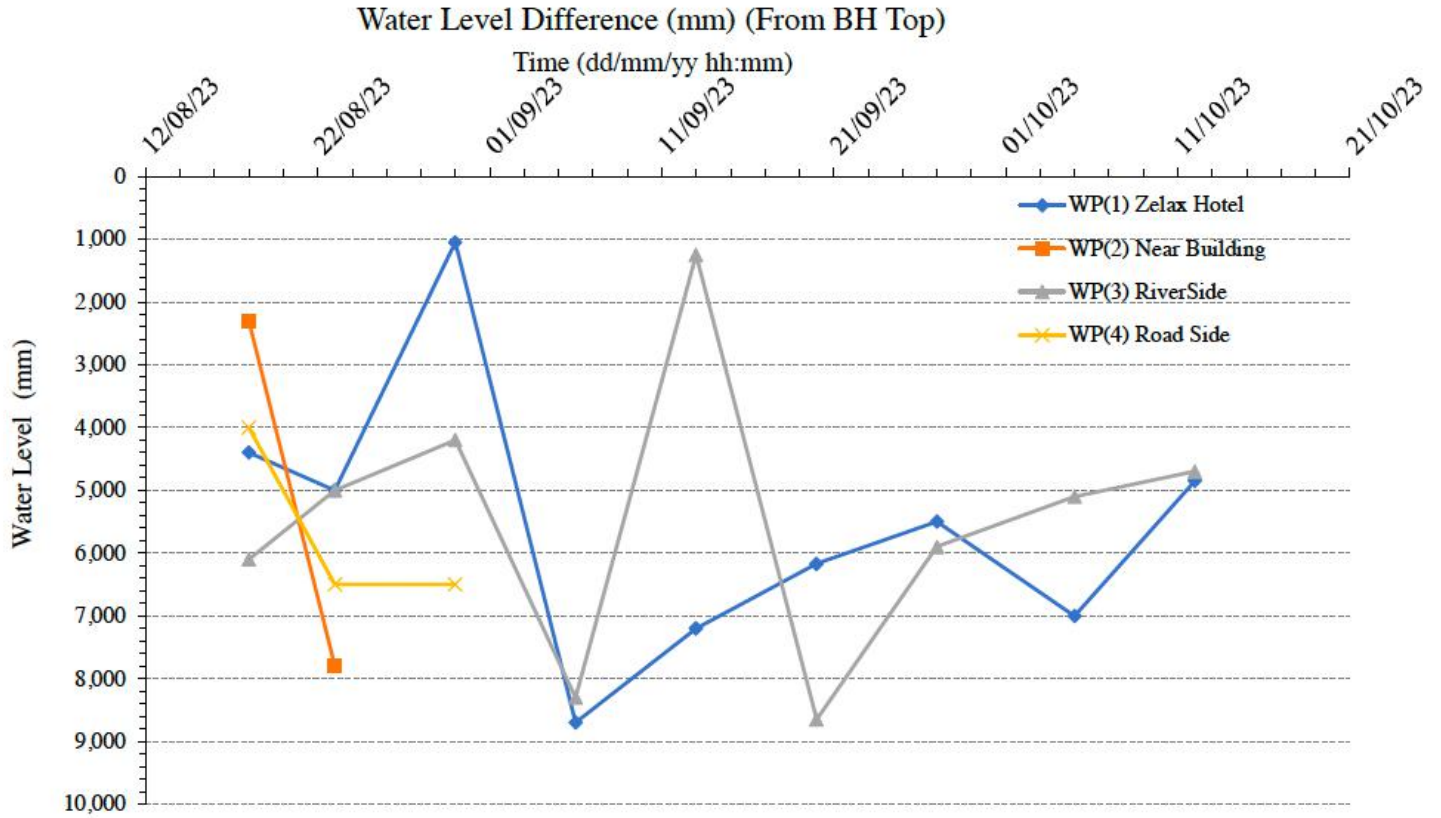
Water Stand Pipe (Water Level Monitoring Record)

CSC TBWT CONSULTING ENGINEERS

Location : Ahlone
Installed On: 15,16,17,18-08-2023
Initial Reading On: 18/08/23
Last Reading On: 12/10/23

Project: 1B + 6S RCC Buidling
Consultant : SDG Group
Client : SunShine Survey

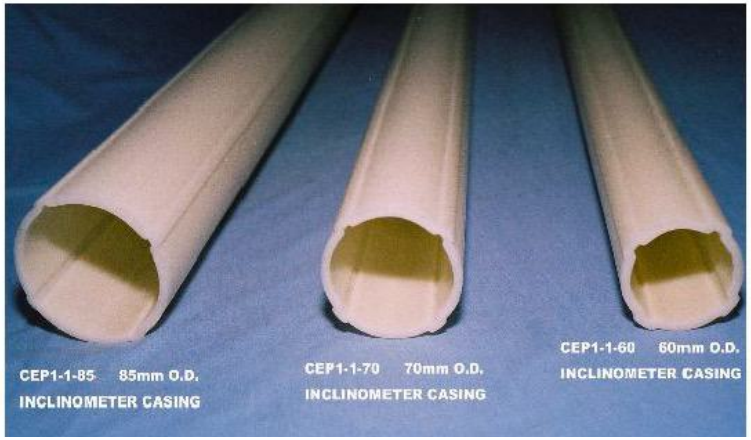
Date & Time	Water Level Reading (mm) (From BH Top)				Water Level Difference frm Initial Reading (mm)				Remark
	WP(1) Zelax Hotel	WP(2) Near Building	WP(3) RiverSide	WP(4) Road Side	WP(1)	WP(2)	WP(3)	WP(4)	
18/08/23	4,400	2,300	6,100	4,000	0	0	0	0	Initial Reading
23/08/23	5,000	7,800	5,000	6,500	600	5,500	-1,100	2,500	
30/08/23	1,050		4,200	6,500	-3,350		-1,900	2,500	
06/09/23	8,700		8,300		4,300		2,200		WP(2) flooded due to close Sheet Piling.
13/09/23	7,200		1,250		2,800		-4,850		WP(4) flooded due to possible pipe leak.
20/09/23	6,170		8,650		1,770		2,550		
27/09/23	5,500		5,900		1,100		-200		
05/10/23	7,000		5,100		2,600		-1,000		
12/10/23	4,850		4,700		450		-1,400		



Inclinometer Casing Installation & Drilling Rig

Figure A2: Inclinometer Casing Specification

CEP



Digital Inclinometer System

Applications

The Model GK-604D Digital Inclinometer System is used to determine and measure the lateral movements in and around...

- Landslides
- Unstable Slopes
- Dam Embankments
- Landfills
- Slurry walls
- Caissons
- Piles
- Sheet Piling
- Tunnels

• Model GK-604D Digital Inclinometer System.

System Components

• Model 6100D Digital Inclinometer Probe.

Figure 4: Inclinometer Monitoring Photos

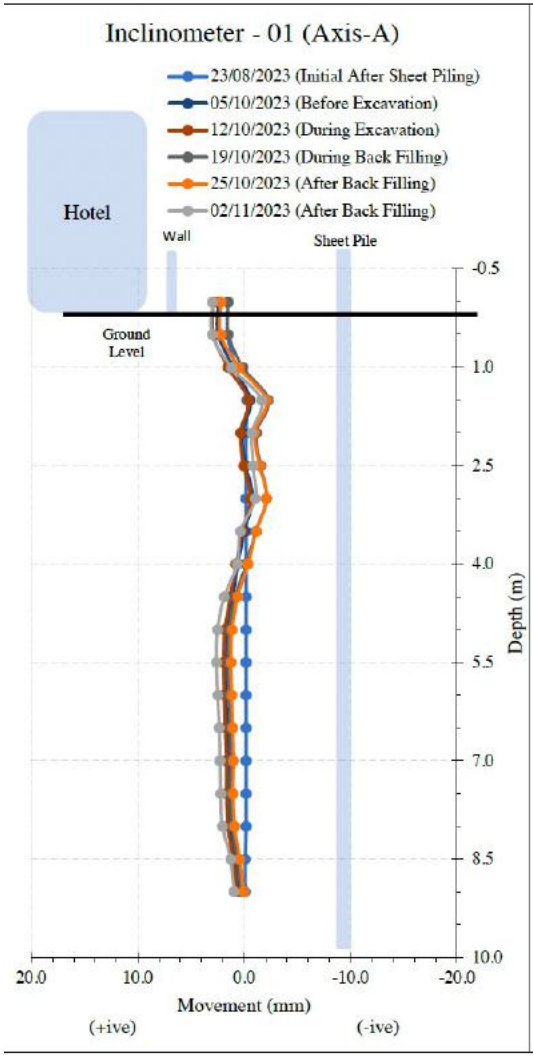
Inclinometer Monitoring Record (Inclinometer - 01)

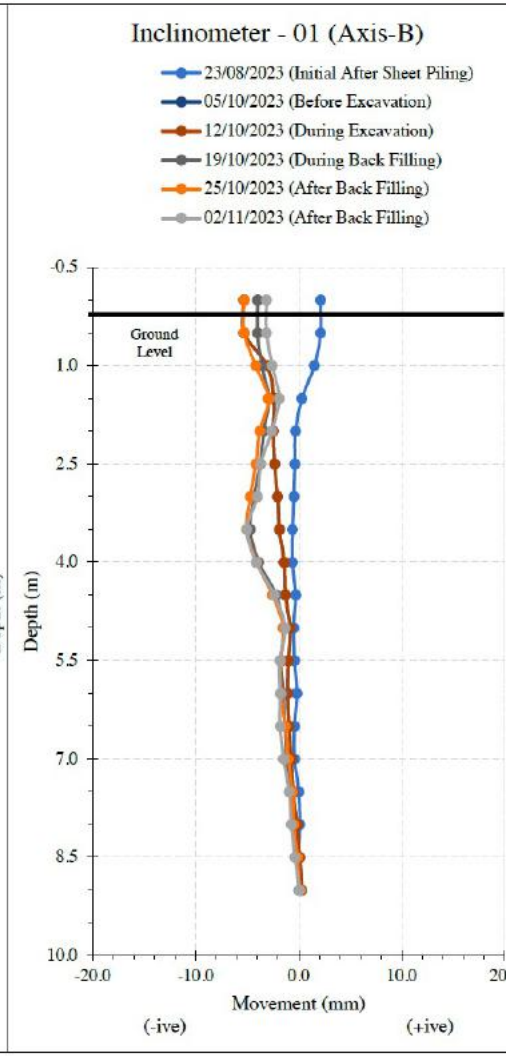
Location : Ahlone
Installed On: 15/08/23
Initial Reading On: 19/08/23
Last Reading On: 25/10/23

Project: 1B + 6S RCC Buidling
Consultant : SDG Group
Client : SunShine Survey
Hole Depth : 12m (Only 9m Readable)
A-axis Max Movement : 0 ~ 5 mm
B-axis Max Movement : 0 ~ 5 mm

N : 1857989.510
E : 193577.814
Z : 5.179

Remark: ***(Sheet Piling Works completed)***
(Excavation Works completed & Backfilling On Going)
(Data From Initial(After Sheet Piling), Before Excavation, After Excavation are displayed)





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ISO 9001:2015 Certified

MEMS INCLINOMETER TEST REPORT

Type : MEMS INCLINOMETER
Model Number : Geokon 6100-D
Serial Number : 1306731
Max: Capacity : 0 ~ 30°
Ambient Temp : 27.9 Deg C

Calibration No : CSC- 55-23-Inclinometer-1306731
Calibration Date : 21-Aug-23
Technician : Aung Htet
Checked By : Daw Yi Yi Khin
Recommended Next Calibration: 20-08-2024

*This calibration has been carried out by using **Calibrated LVDT** , Model: **SDP_C100** , SN: **BAB141539** , traceable to Cert No: **CSC-51-23-LVDT-BAB141539** , Dated: **02-07-2023.***

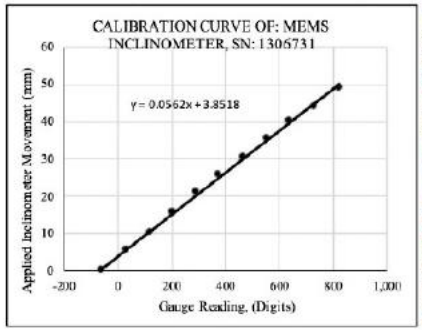
Applied Inclinometer Casing Movement (mm)	*** Reading from Inclinometer A-Axis (Digits) ***			Change	Linearity (% Max : Load)
	Cycle 1	Cycle 2	Avg:		
0.00	-58	-60	-59	0	
5.30	33	35	34	93	0.19
10.00	118	120	119	85	0.03
15.46	204	206	205	86	1.32
20.86	289	290	290	85	2.62
25.80	373	377	375	86	2.90
30.50	463	468	465	90	2.15
35.50	551	560	556	90	2.01
40.16	635	640	637	82	2.15
44.08	725	735	730	93	0.45
49.08	815	830	823	93	0.87

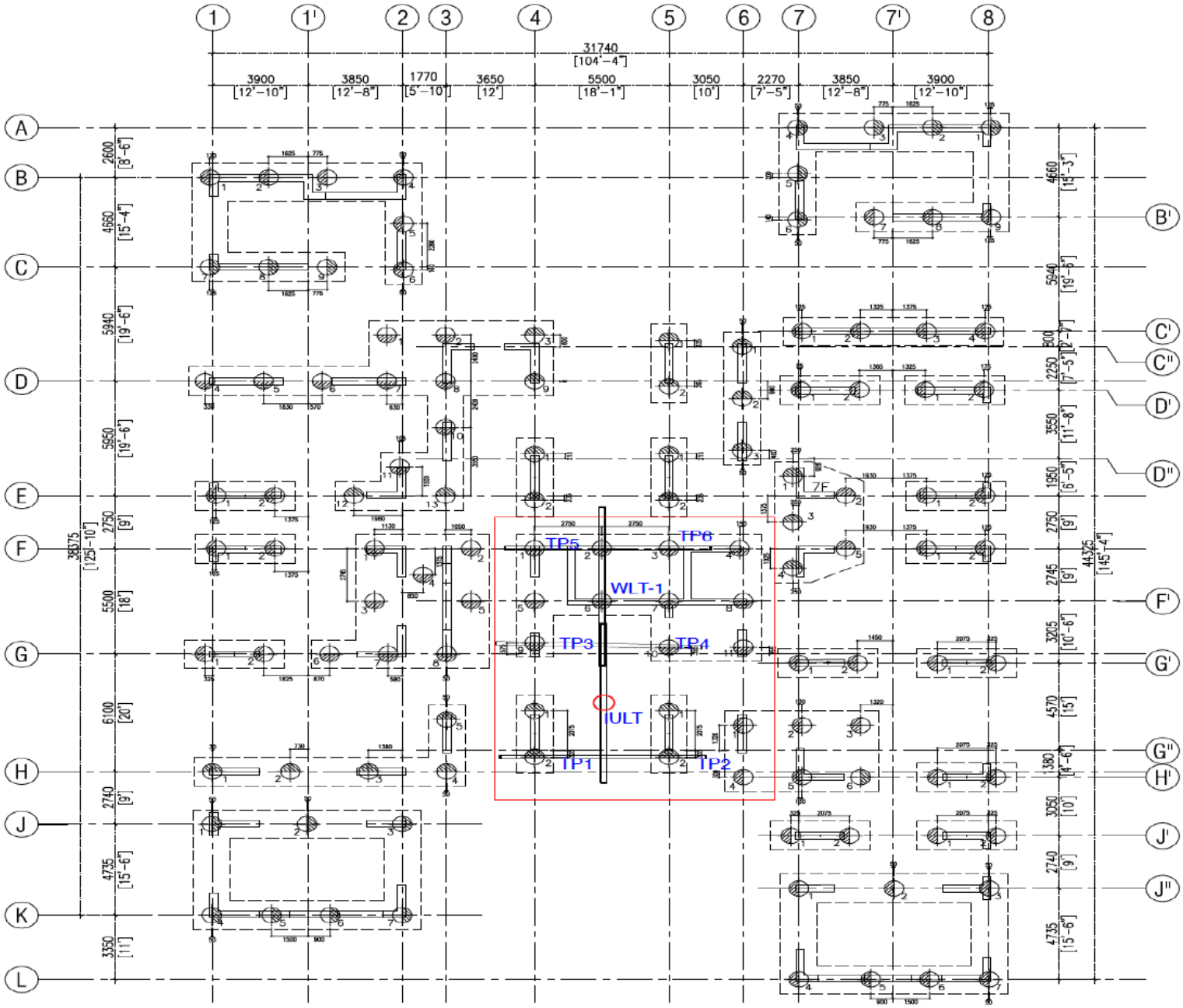
Gauge Factor : **0.0562** **mm/Digit**

Calculated Displacement (mm) = G * (R_1 - R_0)

* Note : The above calibration uses a linear regression method. The Zero Reading shown is ideal for straight line computation and does not usually agree with the actual no reading.

** Linearity = ((Calculated Displacement - Applied Displacement) / Max. Applied Displacement) x 100%



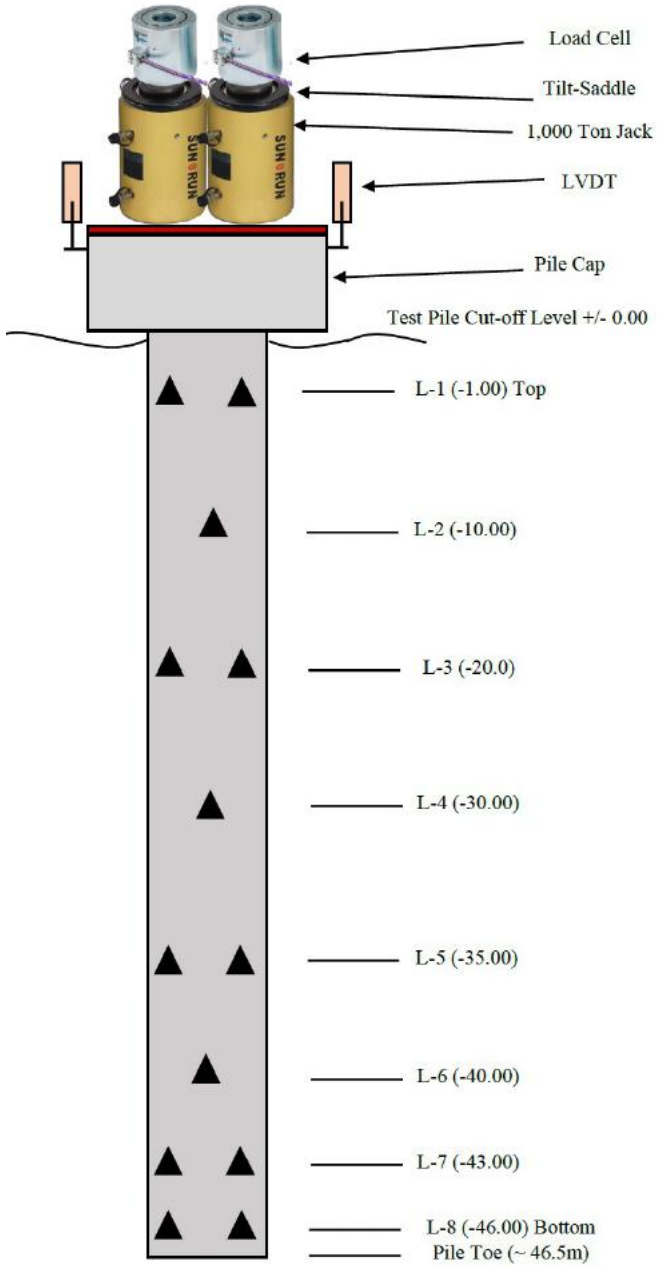


PILING LAYOUT PLAN

REFERENCE BORE HOLE (ZONE C1)	SIZE OF BORED PILE	WORKING LOAD PER PILE	ESTIMATED PILE PENETRATION FROM PILE CUT-OFF LEVEL (-1.20m FROM GROUND FLOOR LEVEL)	NO. OF PILE
BH 17,18,19,20	⌀ 800ø	380t	46.5 M	121
			TOTAL NO. OF PILE	121

NOTE: LIFT PILECAP CUT-OFF LEVEL (-2.9m FROM GROUND FLOOR LEVEL) TO BE VERIFIED WITH M&E

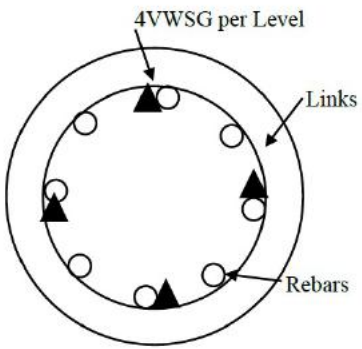
Figure 2: Instrumentation Detail for 800mm Dia: Bored Pile (ULT-Test Only)



Longitudinal Cross Section

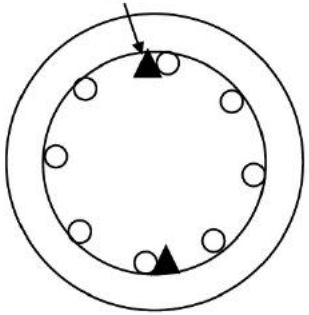
(Scale = None)

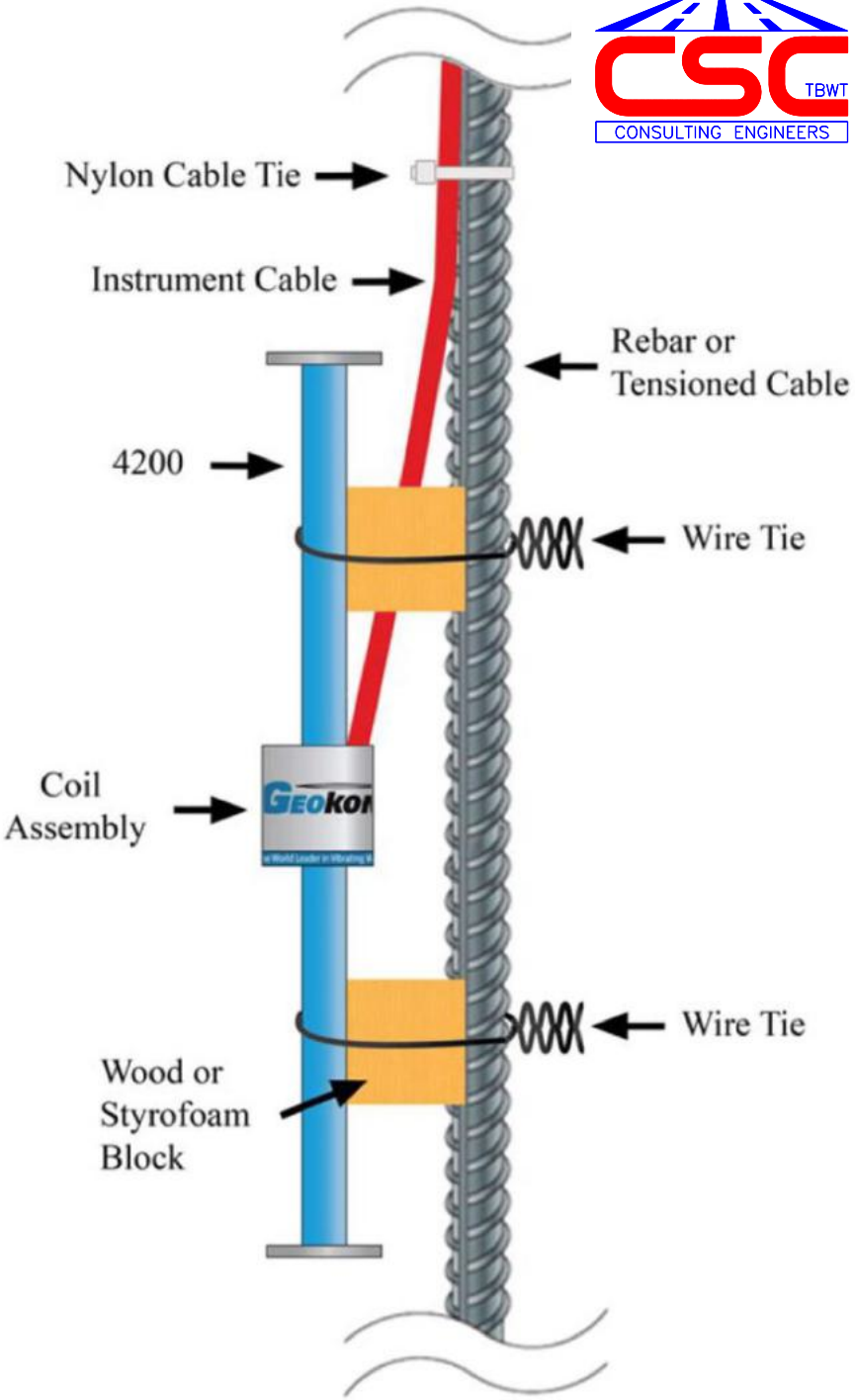
Cross Section @ L-1 & L-8



Cross Section @ L-2 ~ L-7

2VWSG per Level on Alternate Side





Concrete Embedment Strain Gages

Applications

The Model 4200, 4202 and 4210 are designed to measure strains in or on...

- **Foundations**
- **Piles**
- **Bridges**
- **Dams**
- **Containment vessels**
- **Tunnel liners**
- **Mass concrete with coarse aggregates**
- **Laboratories and/or where space limitations exist (Model 4202)**

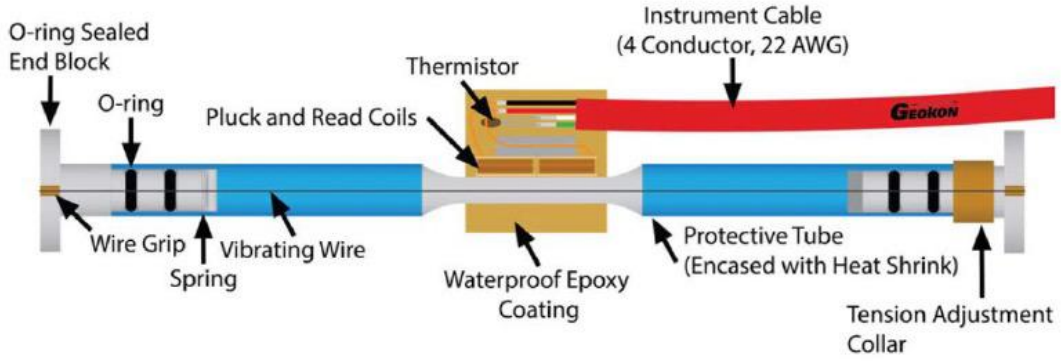
Model 4202 (front), Model 4200 (center) and Model 4210 (rear) Concrete Embedment Strain Gages.

Vibrating Wire Readout

Figure 1: Model 4200 and 4200L Vibrating Wire Strain Gage

Figure 5: Attaching Model 4200 Strain Gages to ULT Pile Rebar Cage

2 VWSGs Layer (Middle Layers)



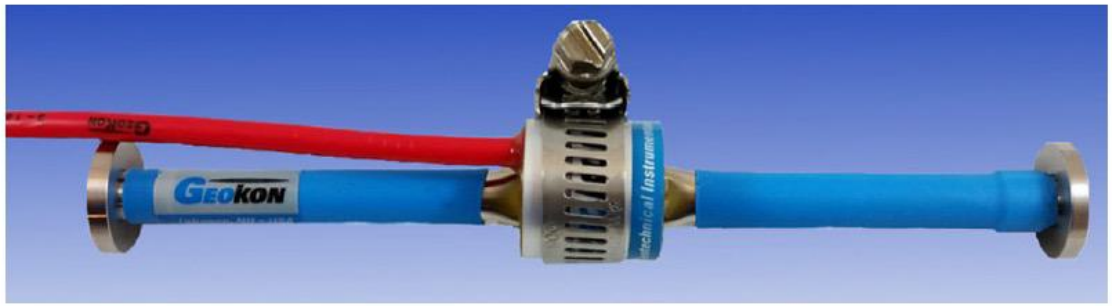


Figure 6: Attaching Cables Rebar Cage

7: Rebar Cage Lowering to BH & Lapping Area

Figure 9: Water Resistant DT Connectors

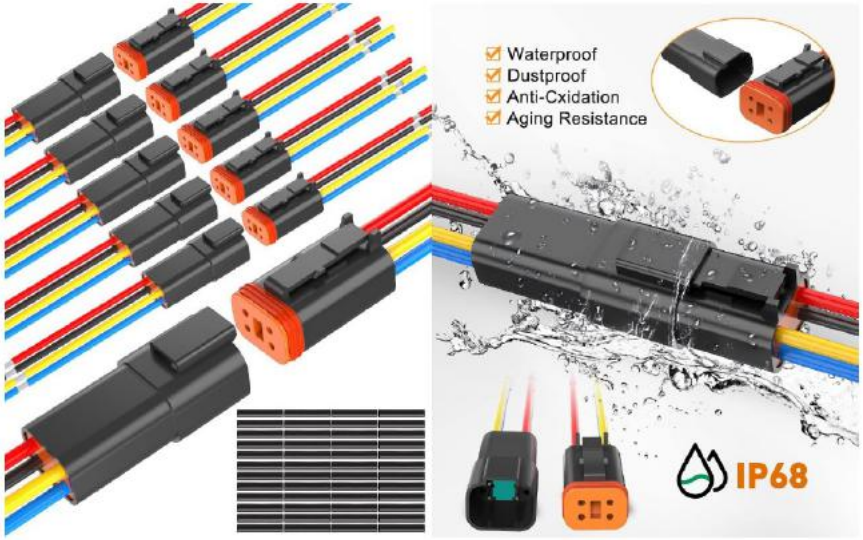


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Figure 8: Last Cage & Sensors Checking after Concreting


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Static Load Test for Bored Pile, City Loft West

Figure F1: ULT Test Inverted Beam System Setup

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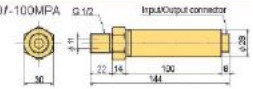
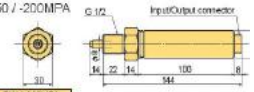
PWH-PA High capacity Pressure Transducer 70~200MPa

PWH-70/-100MPA



PWH-150 / -200MPA



The PWH-PA high-capacity pressure transducer has a sealed structure made with high-strength stainless steel. Using this highly sensitive transducer, stable high-accuracy measurement can be made over a long period of time. It is used to control plant or production lines, to measure jack pressure, and for various other applications.
Protection ratings: IP65 equivalent

■ SPECIFICATIONS

TYPE	PWH-70MPA	PWH-100MPA	PWH-150MPA	PWH-200MPA
Capacity	70MPa	100MPa	150MPa	200MPa
Rated Output	1mV/V(2000×10⁻⁶ strain) ±1%			
Non-linearity	0.2%RO			
Hysteresis	0.2%RO			
Repeatability	0.3%RO			
Temperature effection zero	0.02%RO/°C			
Temperature effection span	0.02%/°C			
Compensated temperature range	-10 ~ +80°C			
Allowable temperature range	-20 ~ +70°C			
Over load	150%			
Ultimate overloading	300%			
Input/Output resistance	350Ω±1%			

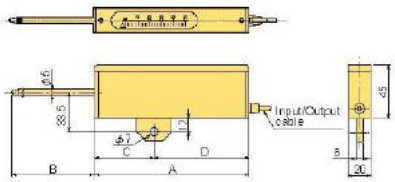
High capacity
Available for many fields of industrial application such as plant, production line, jack pressure, etc.

Load Cells

DISPLACEMENT TRANSDUCERS

SDP-C Displacement Transducer 50/100mm

General purpose



The SDP-C displacement transducer is a general-purpose, strain gauge type transducer. Designed with a strain-generating cantilever, it is able to make stable measurement while maintaining the high sensitivity to minuscule displacements.

Protection ratings: IP40 equivalent

■ Dimensions

TYPE	A	B	C	D
SDP-50C	130	70	50	80
SDP-100C	220	120	90	130

■ SPECIFICATIONS

TYPE	SDP-50C	SDP-100C
Capacity	50mm	100mm
Rated Output	2.5mV/V(5000×10⁻⁶ strain) ±0.2%	
Sensitivity(×10⁻⁶ strain)mm	100	50
Non-linearity	0.2%RO	
Spring force	5.9N	
Frequency response	1Hz	
Allowable temperature range	0 ~ +60°C (no condensation)	
Input/Output resistance	350Ω	
Recommended exciting voltage	2V or less	
Allowable exciting voltage	5V	
Weight	250g	350g

Supplied cable :
CTE-4V10NJ-STB (φ5mm 0.3mm² 4-core shielded vinyl cable 10m)

CR1000 Measurement and Control Datalogger

The CR1000 provides precision measurement capabilities in a rugged, battery-operated package. It consists of a measurement and control module and a wiring panel. Standard operating range is -25° to +50°C; an optional extended range of -55° to +85°C is available.

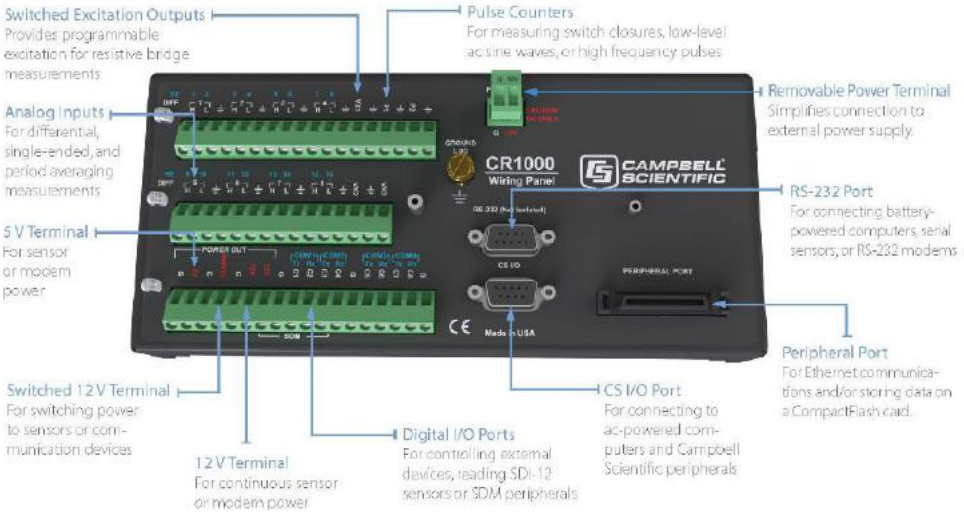



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Figure 3: Test Pile Preparations

Figure F4: Level Checking

CIVIL SOLUTION CONSULTANTS LTD.
Operation Off: No.413-414,Aung Thitsar St., 48 Ward, North Dagon Township, Yangon, Myanmar,11421.
Tel.: +95-9-5003281, +95-9-5077153, +95-9-798476843
ISO 9001:2015 Certified E-mail: csc1999@gmail.com; info@csc1999.com; Web: www.csc1999.com

LINEAR VARIATION DISPLACEMENT TRANSDUCER CALIBRATION

Type : LVDT
Model Number : SDP-C100
Serial Number : BAB141544
Max. Range : 0 ~ 100 mm
Cable Length : 0.5 m

Calibration No : CSC-46-23-LVDT-BAB141544
Calibration Date : 03-July-2023
Ambient Temp : 35.49 Deg C
Technician : Thant Zin Zaw
Checked By : Daw Yi Yi Khin

This calibration has been carried out by using ***Glass Plates*** calibrated by Department of Research & Innovations, traceable to Cert No: ***DRI/NSOD/23/J-0113-0125*** Dated: 23-***03-2023***,

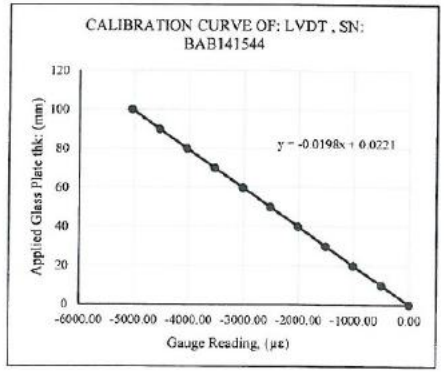
Applied Glass Plates (mm)	*** Reading from CR-800/1000 Datalogger (or) Reading from TC32K (με) ***			Change	Linearity (% Max: Displacement)
	Cycle 1(up)	Cycle 2(down)	Avg:		
0.00	0	0	0.00	0	
10.00	-507	-505	-506.00	-506	0.02
20.00	-1011	-1006	-1008.50	-503	-0.03
30.00	-1514	-1506	-1510.00	-502	-0.10
40.00	-2019	-2009	-2014.00	-504	-0.12
50.00	-2527	-2516	-2521.50	-508	-0.07
60.00	-3028	-3021	-3024.50	-503	-0.11
70.00	-3537	-3528	-3532.50	-508	-0.06
80.00	-4040	-4035	-4037.50	-505	-0.06
90.00	-4545	-4538	-4541.50	-504	-0.08
100.00	-5044	-5044	-5044.00	-503	-0.13

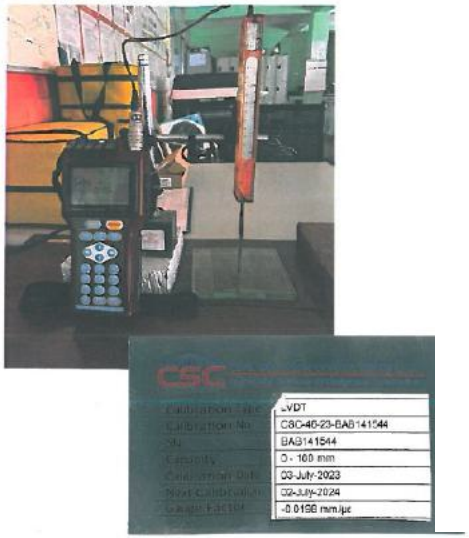
Gauge Factor : -0.0198 mm/με **Regression Zero Reading:** 0.02

Calculated Displacement (mm) = G * (R_1 - R_0)

* Note : The above calibration uses a linear regression method. The Zero Reading shown is ideal for straight line computation and does not usually agree with the actual no-load reading.

** Linearity = ((Calculated Disp: - Applied Disp:) / Max. Applied Disp:) x 100%





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Tel.: +95-9-5003281, +95-9-5077153, +95-9-798476843
ISO 9001:2015 Certified E-mail: csc1999@gmail.com; info@csc1999.com; Web: www.csc1999.com

PRESSURE TRANSDUCER CALIBRATION REPORT

Type : Pressure Transducer
Brand : TML
PG SN : CHT211012
Max. Range : 0 ~ 70 MPa
Ambient Temp : 33.21 Deg C

Calibration No : CSC-65-23-TML-PT-CHT211012
Calibration Date : 09/Sep/2023
Technician : Aung Htet
Checked By : Daw Yi Yi Khin
Next Calibration : 08/Sep/2024

This calibration has been carried out by using referenced ***Pressure Gauge Calibrated By Department of Research & Innovation***, Serial No: ***1104972768***, traceable to Cert No: ***P-030-23*** *Dated:* ***23-03-2023.***

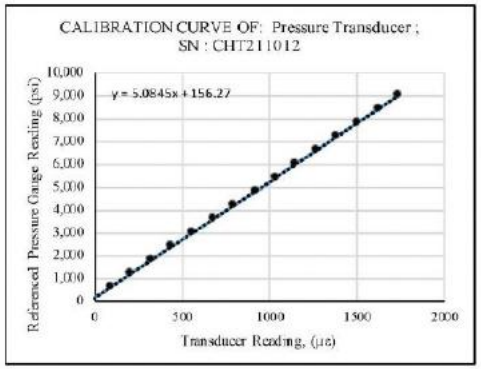
Referenced Gauge Reading (Bar)	*** Reading from Pressure Transducer / TC-32K Readout (με) ***			Change	Linearity
	Cycle 1	Cycle 2	Avg:		
0	-32	-32	-32		
600	88	87	88	119.5	0.08
1200	205	205	205	117.5	0.06
1800	320	322	321	116.0	-0.06
2400	439	440	440	118.5	-0.03
3000	559	561	560	120.5	0.11
3600	679	681	680	120.0	0.22
4200	794	797	796	115.5	0.08
4800	918	921	920	124.0	0.42
5400	1032	1035	1034	114.0	0.19
6000	1144	1147	1146	112.0	-0.14
6600	1268	1269	1269	123.0	0.14
7200	1385	1384	1385	116.0	0.02
7800	1501	1501	1501	116.7	-0.05
8400	1620	1622	1621	119.8	0.05
9000	1738	1740	1739	118.0	0.05

Gauge Factor : 5.0845 psi/με **Regression Zero Reading:** 156.27

Calculated Pressure (psi) = G * (R_1 - R_0)

* Note : The above calibration uses a linear regression method. The Zero Reading shown is ideal for straight line computation and does not usually agree with the actual no-load reading.

** Linearity = ((Calculated Pressure - Applied Pressure) / Max. Applied Pressure) x 100%



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Tel.: +95-9-5003281, +95-9-5077153, +95-9-798476843

ISO 9001:2015 Certified

LOAD CELL GAUGE FACTOR DETERMINTION

Type : Resistance Wire Load Cell
Model Number : CEP
Serial Number : 2521
Max: Capacity : 0 ~ 1000 Tons
Jack Eff: Area : 227.19 in2
PG SN: : 1106164807

Calibration No : CSC-63-23-CEP-2521-RWLC
Calibration Date : 07/09/2023
Ambient Temp : 34.0 Deg C
Technician : AH
Checked By : Daw Yi Yi Khin
Recommended Next Calibration : 06/09/2024

*This calibration has been carried out by using **Pressure Gauge** calibrated by DRI, Serial No: 1106164807, Accuracy: ... Cert No: **P-065-23/26-06-2023**.*

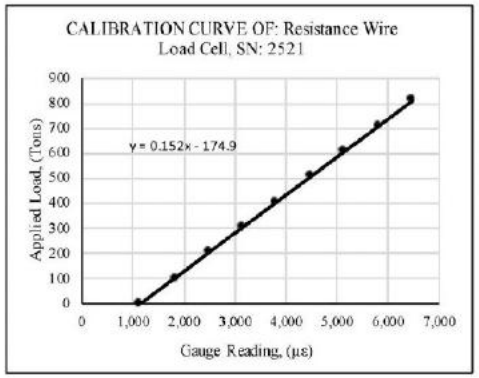
Applied Pressure (PSI)	Applied Loading (Ton)	*** Reading from CR-800/1000 Datalogger (or) TC-32K Readout (με) ***			Change	Linearity (% Max: Load)
		Cycle 1	Cycle 2	Avg:		
0.00	0	1137	1137	1137	0	
1,000	101	1830	1830	1830	693	0.53
2,000	203	2489	2489	2489	659	0.31
3,000	304	3151	3151	3151	662	0.26
4,000	406	3816	3816	3816	665	0.15
5,000	507	4488	4495	4492	676	0.36
6,000	609	5156	5130	5143	651	-0.01
7,000	710	5824	5818	5821	678	0.24
8,000	811	6492	6486	6489	668	0.31
0.00	0	1138	1138	1138		

Gauge Factor : 0.1520 tons/με **Regression Zero Reading:** 1138.00

Calculated Load (Tons) = G * (R_1 - R_0)

* Note : The above calibration uses a linear regression method. The Zero Reading shown is ideal for straight line computation and does not usually agree with the actual no-load reading.

** Linearity = ((Calculated Load - Applied Load) / Max. Applied Load) x 100%



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Operation Off: No.413-414,Aung Thitsar St., 48 Ward, North Dagon Township, Yangon, Myanmar,11421.
Tel.: +95-9-5003281, +95-9-5077153, +95-9-798476843

ISO 9001:2015 Certified

LOAD CELL GAUGE FACTOR DETERMINTION

Type : Resistance Wire Load Cell
Model Number : CEP
Serial Number : 2522
Max: Capacity : 0 ~ 1000 Tons
Jack Eff: Area : 227.19 in2
PG SN: : 1106164807

Calibration No : CSC-64-23-CEP-2522-RWLC
Calibration Date : 07/09/2023
Ambient Temp : 34.7 Deg C
Technician : AH
Checked By : Daw Yi Yi Khin
Recommended Next Calibration : 06/09/2024

*This calibration has been carried out by using **Pressure Gauge** calibrated by DRI, Serial No: 1106164807, Accuracy: ... Cert No: **P-065-23/26-06-2023**.*

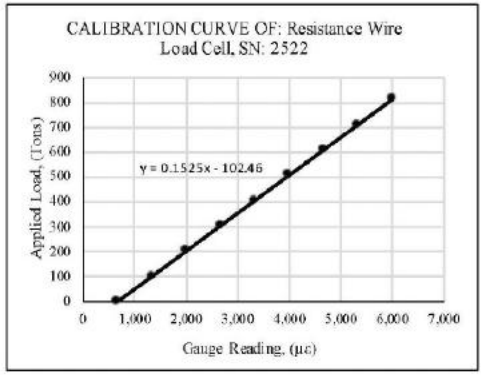
Applied Pressure (PSI)	Applied Loading (Ton)	*** Reading from CR-800/1000 Datalogger (or) TC-32K Readout (με) ***			Change	Linearity (% Max: Load)
		Cycle 1	Cycle 2	Avg:		
0.00	0	666	666	666	0	
1,000	101	1329	1350	1340	674	0.21
2,000	203	2006	2004	2005	666	0.15
3,000	304	2670	2667	2669	664	0.17
4,000	406	3344	3336	3340	672	0.22
5,000	507	4010	3970	3990	650	-0.01
6,000	609	4680	4646	4663	673	0.07
7,000	710	5350	5307	5329	665	0.13
8,000	811	6019	5969	5994	665	0.19
0.00	0	666	668	667		

Gauge Factor : 0.1525 tons/με **Regression Zero Reading:** 668.00

Calculated Load (Tons) = G * (R_1 - R_0)

* Note : The above calibration uses a linear regression method. The Zero Reading shown is ideal for straight line computation and does not usually agree with the actual no-load reading.

** Linearity = ((Calculated Load - Applied Load) / Max. Applied Load) x 100%



2: Observed Applied Load vs Pile Top Settlement (Summary)

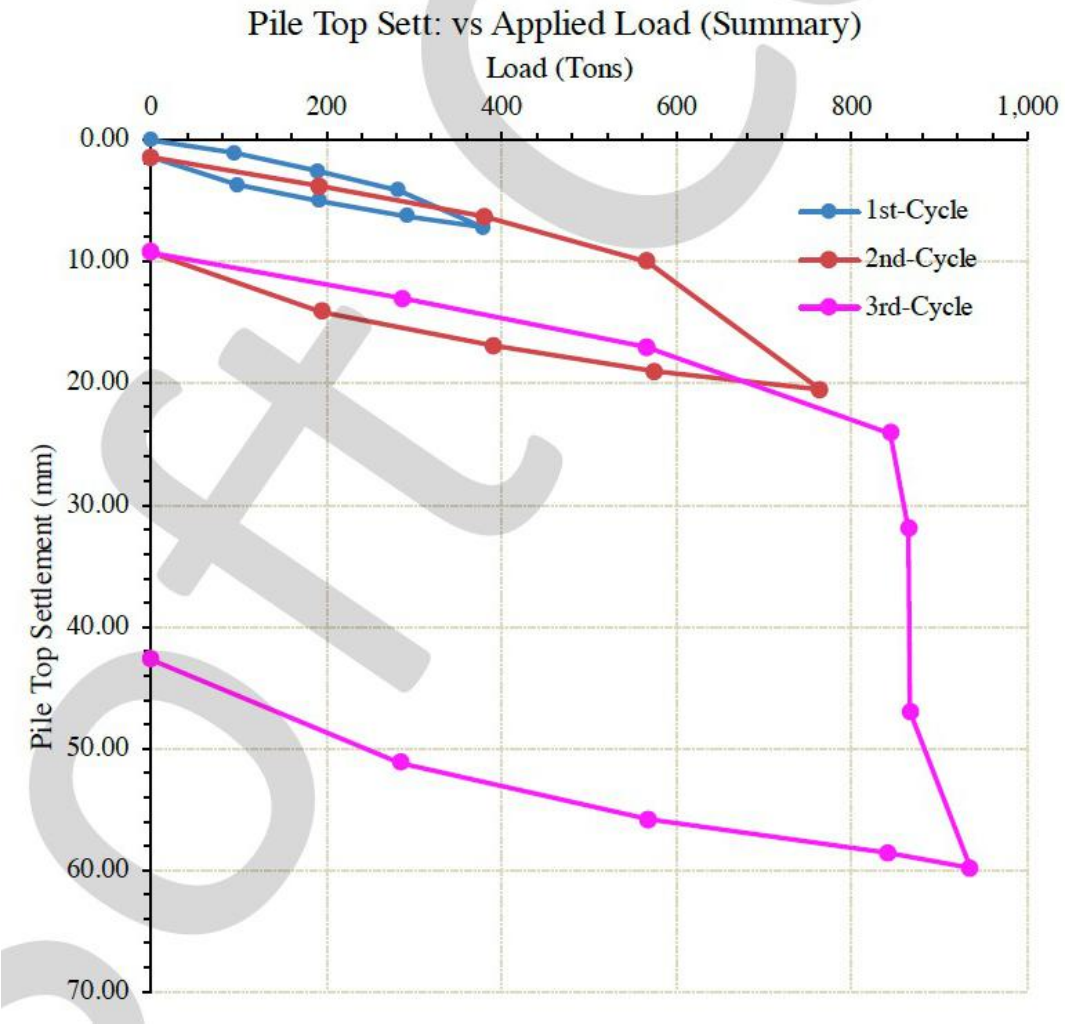


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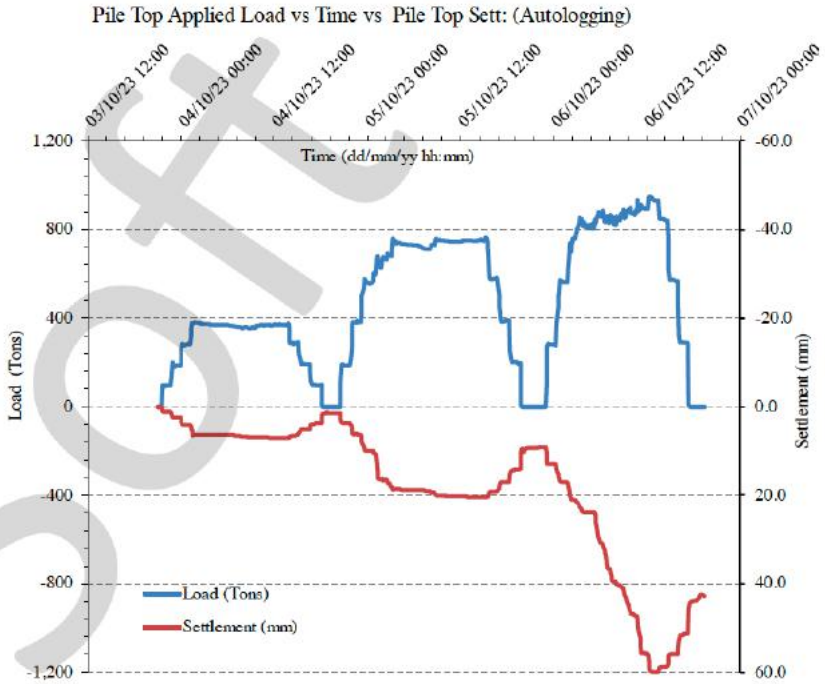
Figure A4: Pile Top Applied Load vs Time vs Top Settlement (Auto Logging)



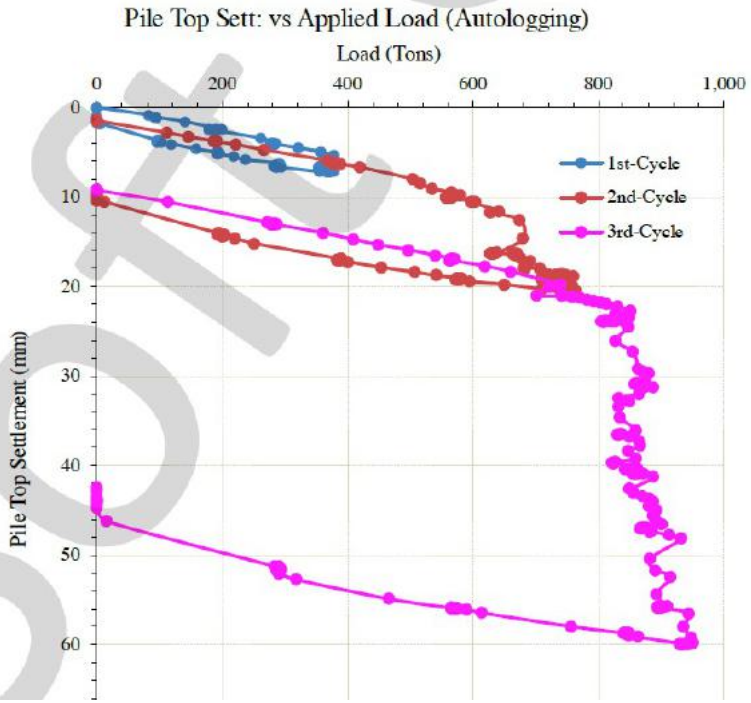
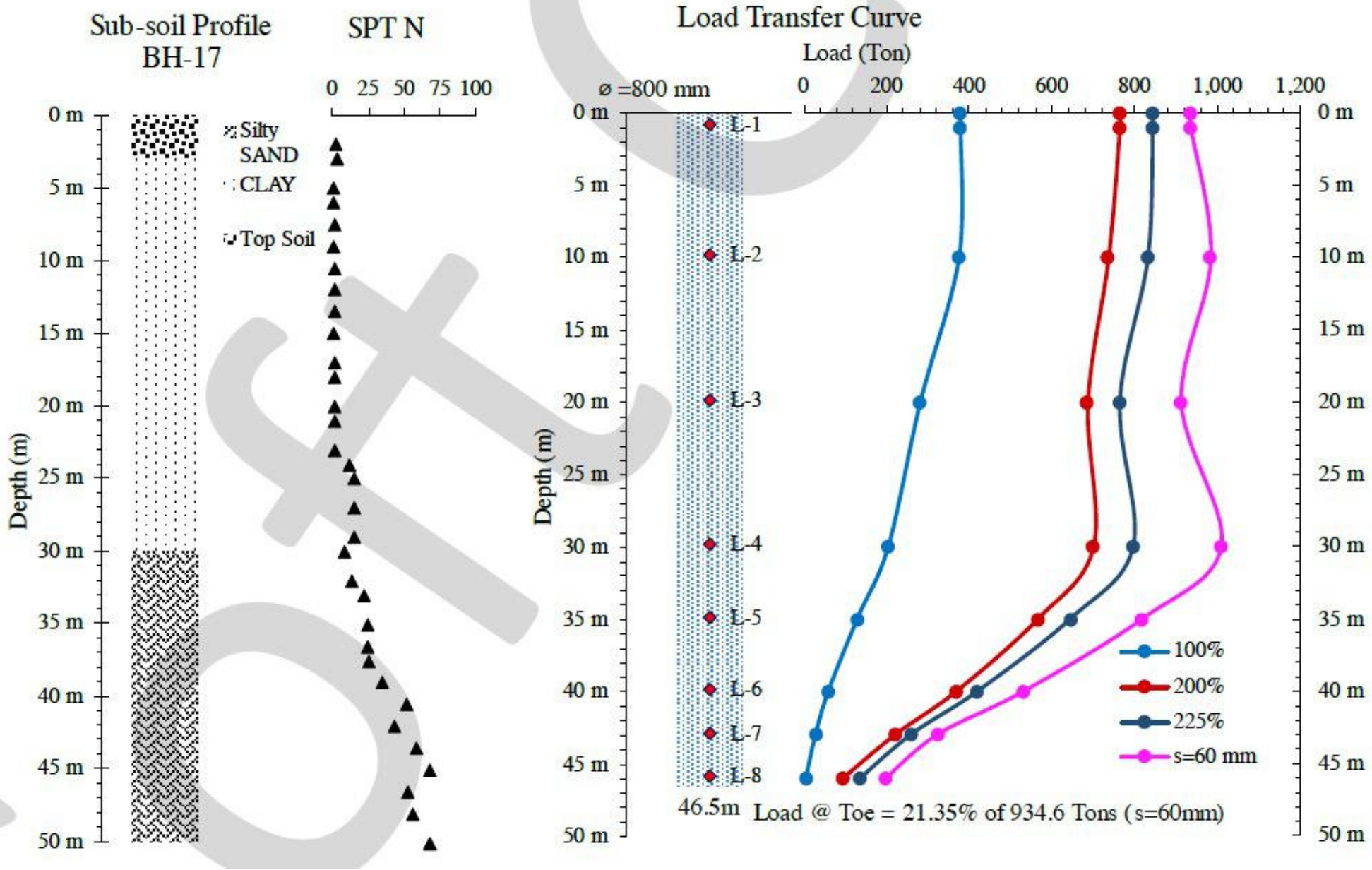
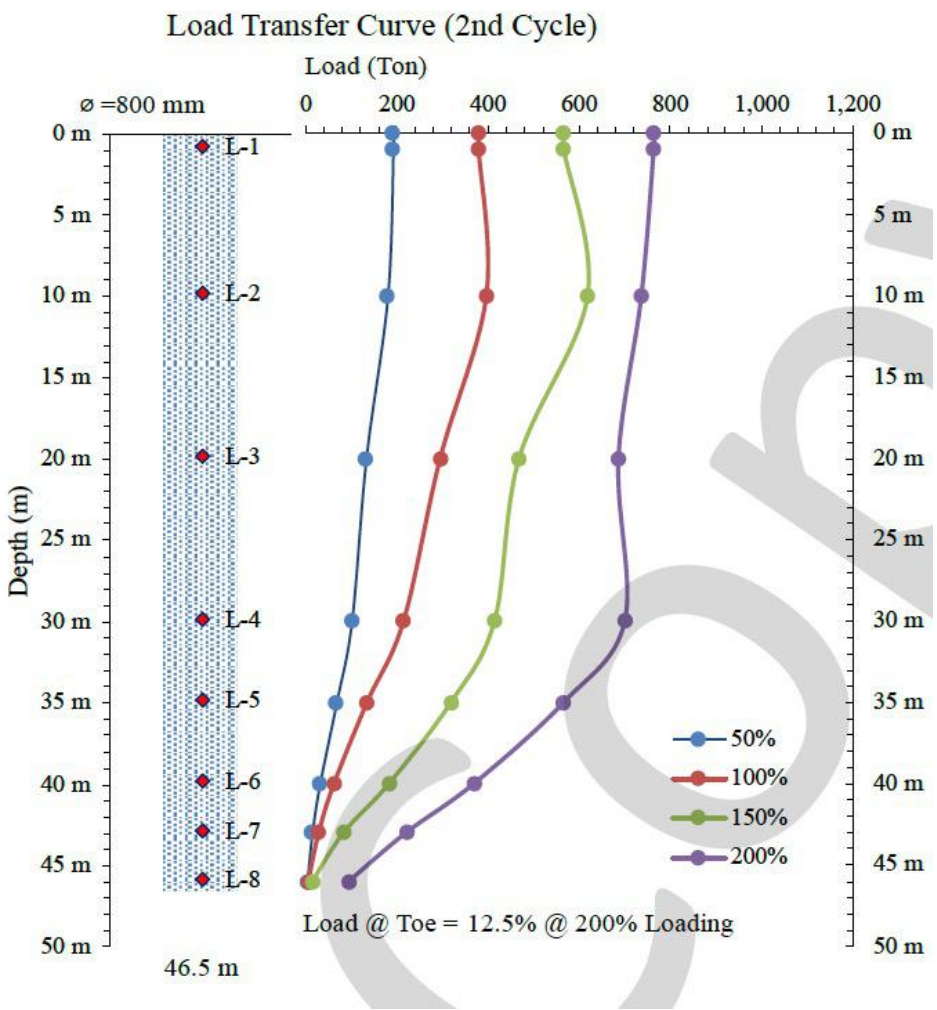


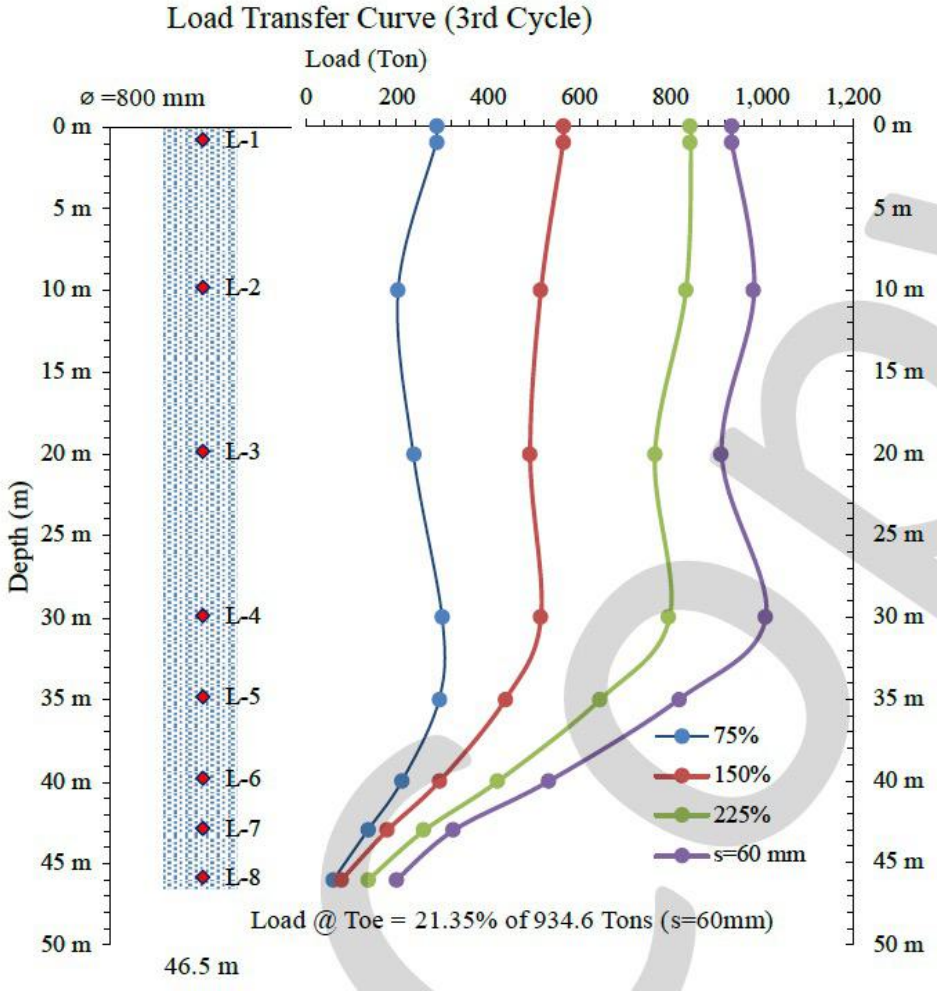
Figure 1: Load Transfer Curve (Summary) with Sub Soil Data BH-17



Load Transfer Curve and Unit Skin Friction of 2nd Loading Cycle



Load Transfer Curve and Unit Skin Friction of 3rd Loading Cycle

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HPBC inspection; Static Pile Load Test for bored pile
ASTM D1143

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The Central Project


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The Yoma Land Project

Static Load Test for Press Pile, Thilawa SEZ

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STATIC PILE LOAD TEST WITH KENTLEDGE SYS

Shangrila Kandawgyi Project

STATIC PILE LOAD TEST WITH INVERTED BEAM SYSTEM

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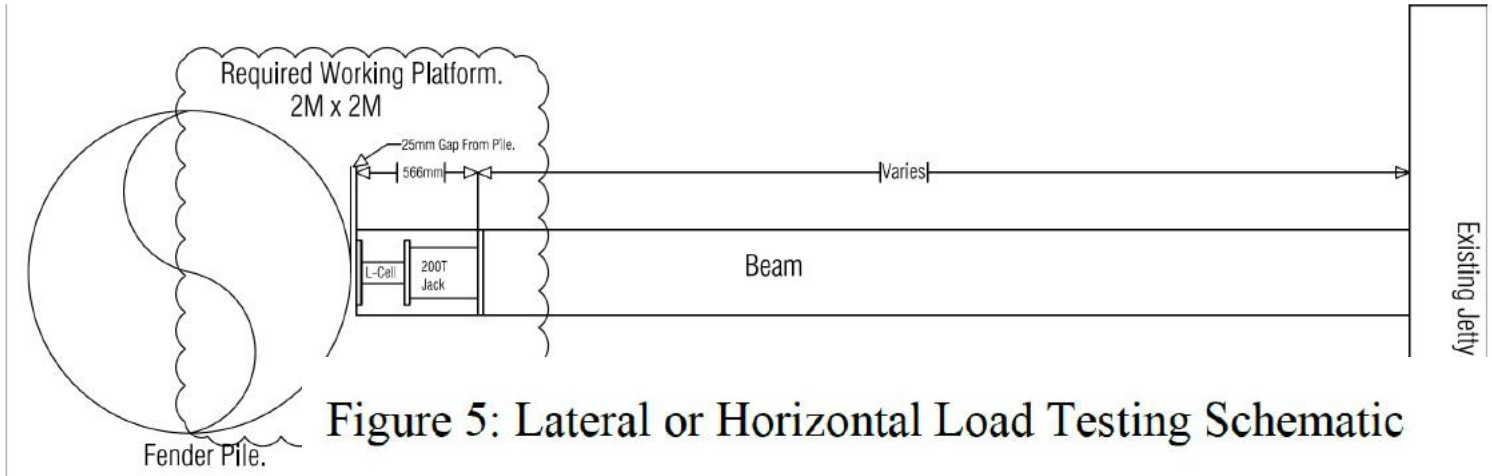
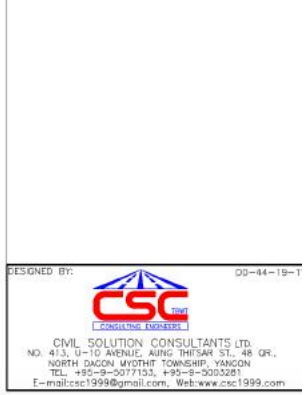
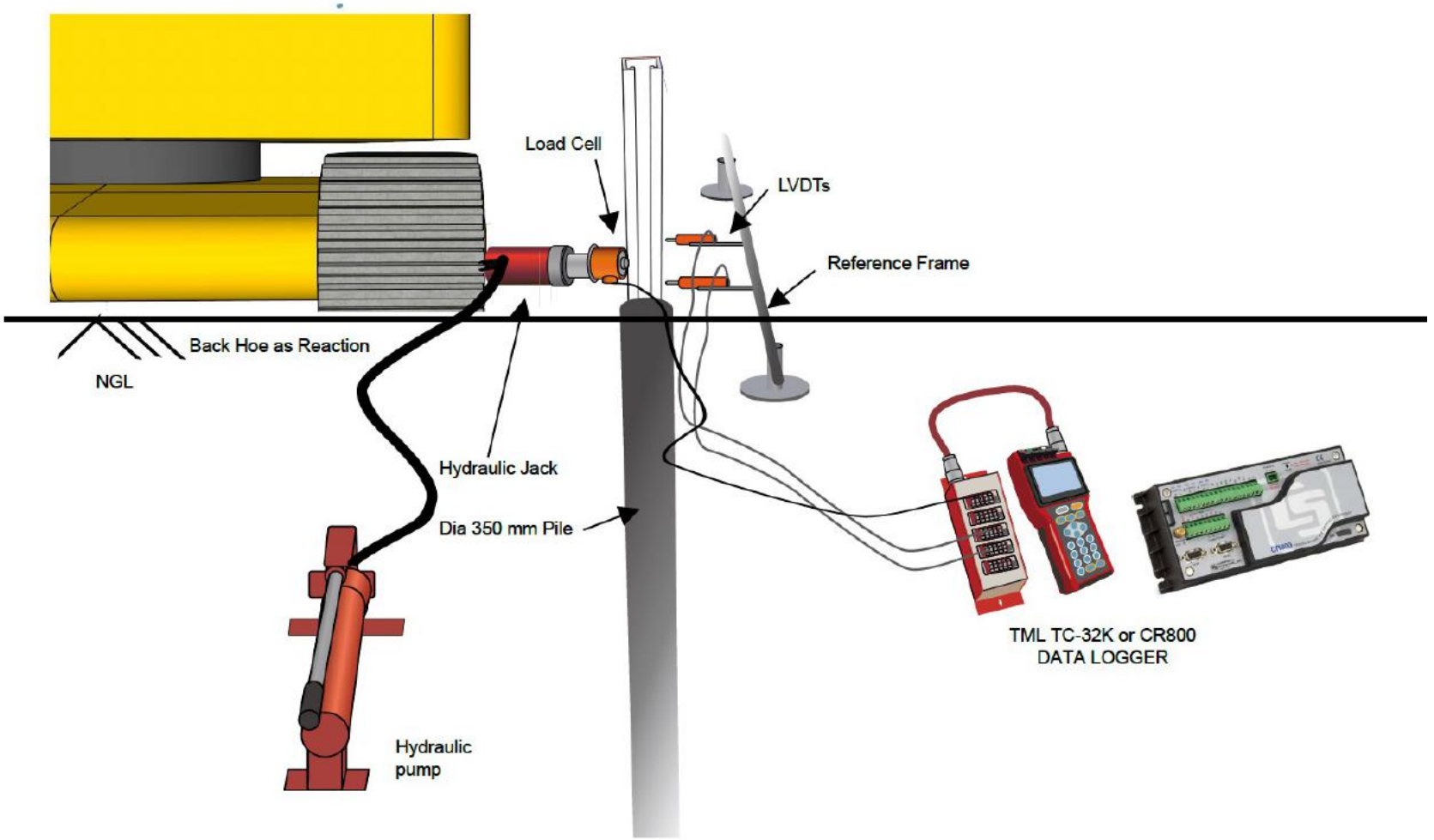


Figure 5: Lateral or Horizontal Load Testing Schematic





Myanmar Petroleum Products Storage and Distribution Terminal Thilawa Project
Thanlyin, Myanmar
(Horizontal Load Test Photographs)

System

Hydraulic Jacks, & LVDTs

Operating Electric Pump

Data Logger Panel

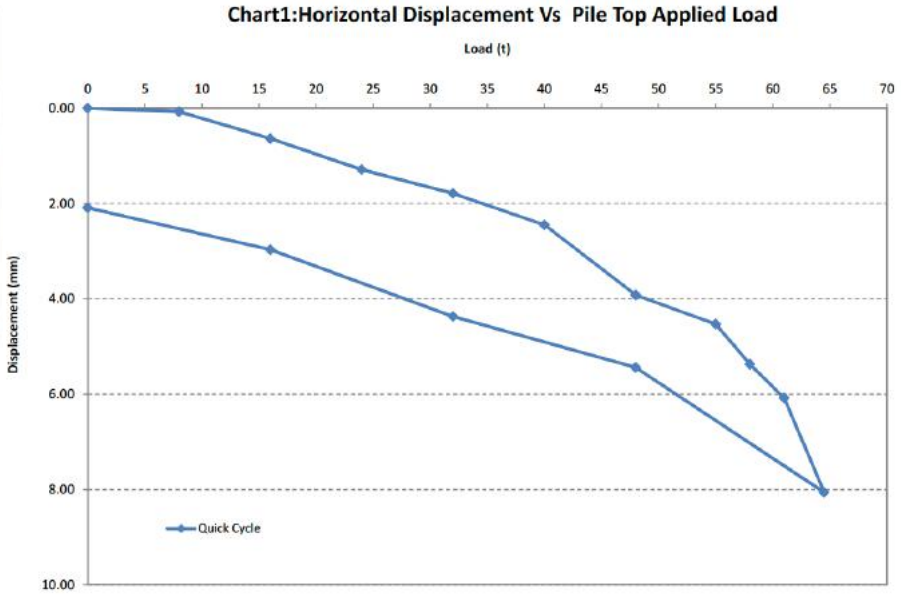
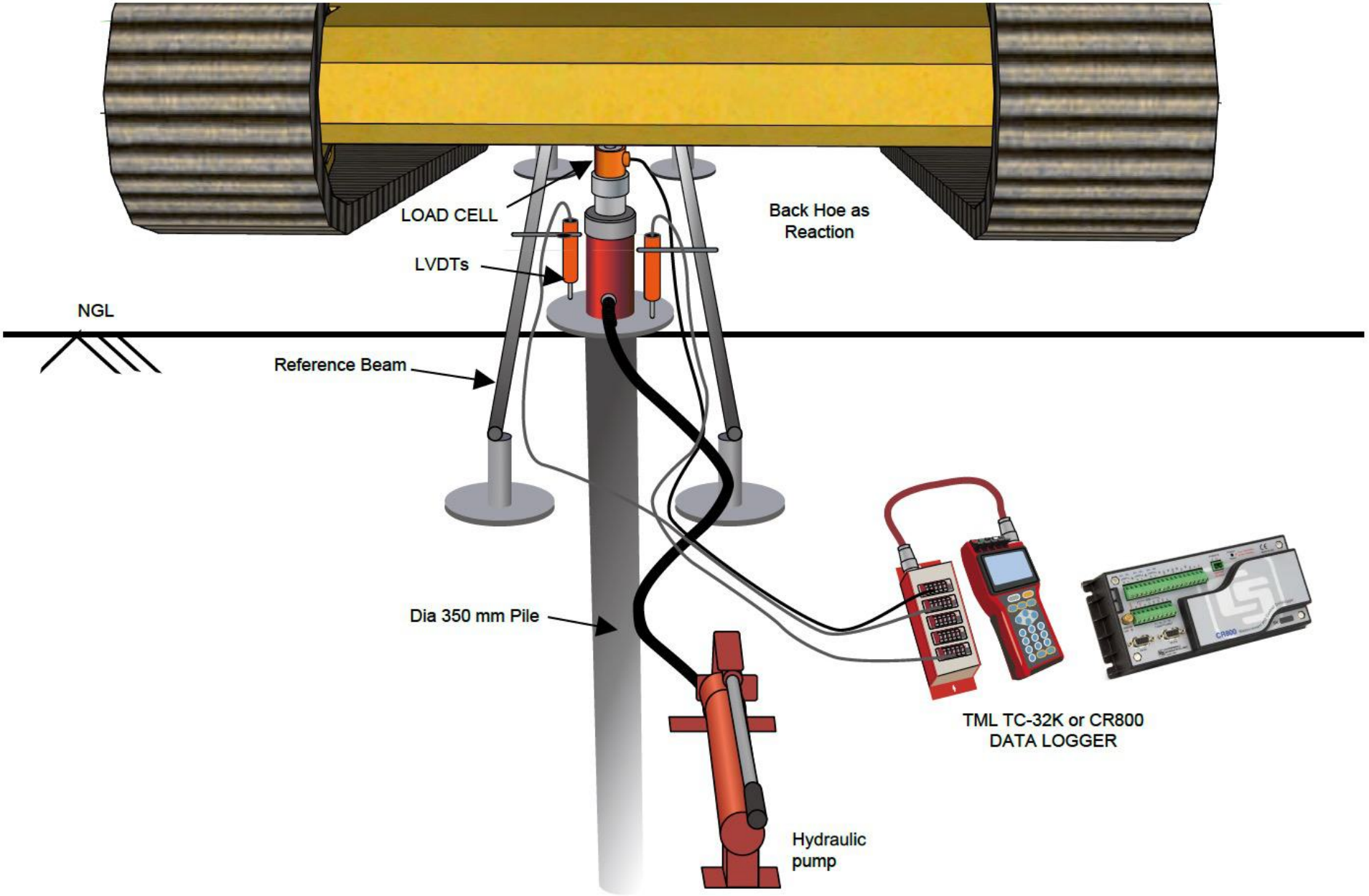


Figure 3: Compression Load Testing Schematic



Myanmar Petroleum Products and Distribution Terminal Thilawa Project, Thanlyin, Myanmar
(Static Axial Compression Load Test Photographs)

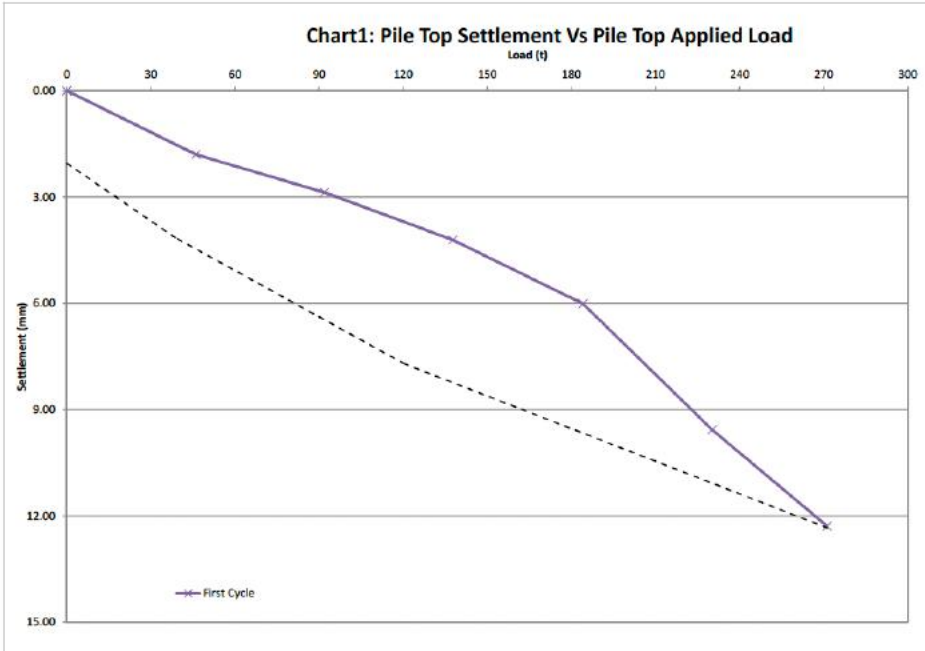
CSC TBWT CONSULTING ENGINEERS

Kentledge System

Hydraulic Jacks, Load Cells & LVDTs

Operating Electric Pump

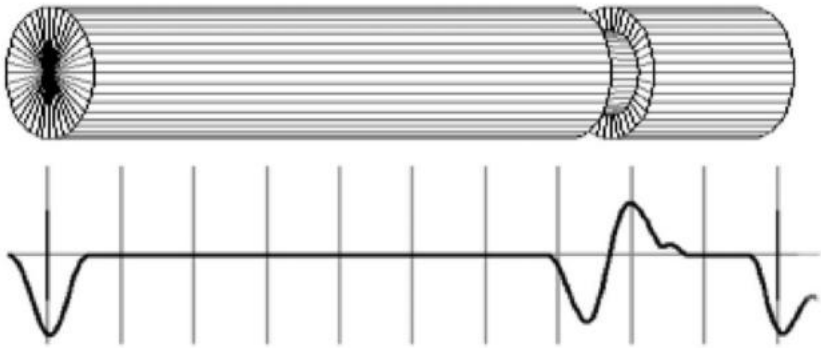
Data Logger Panel



: PIT/SIT Testing Photo on Bored Pile / Spun Pile

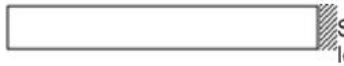
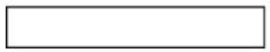
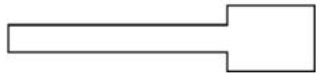
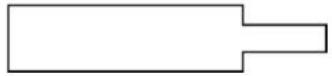
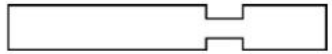
PET Equipment

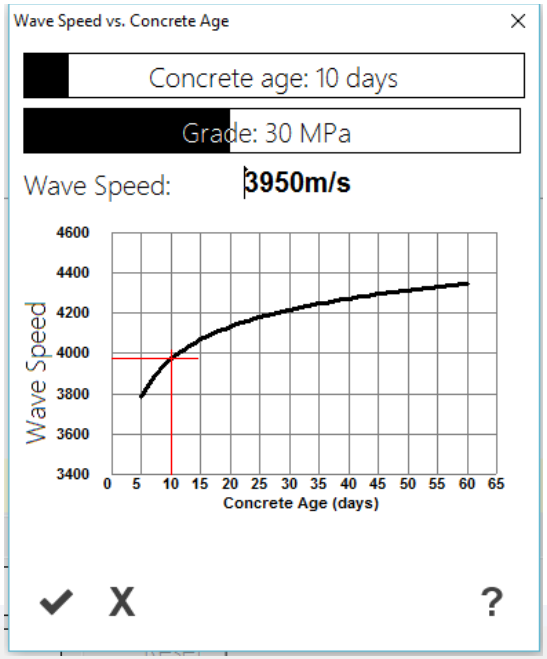
A synthetic pile and the reflectogram



ASTM D5882

Table 1: Typical reflectograms

PILE PROFILE	DESCRIPTION	REFLECTOGRAM
	Straight pile, free end, length as expected	
	Straight pile, fixed end, length as expected	
	Straight pile, free end, shorter than expected	
	Increased impedance	
	Decreased impedance	
	Locally increased impedance	
	Locally decreased impedance	
	Multiple reflections from mid-length discontinuity - toe reflection indiscernible	
	Irregular profile - irregular reflectogram	



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PIT test at Mawlamyine Bridge

PILETEST
Take a Deeper Look

ASTM D 5882 – 07
Compliance Statement

I hereby confirm that the **PET** system, running **PET** Version 3.0.0 (or higher) meets, or exceed, the requirements of ASTM Standard D5882-07.

Date: 1/1/2008

Joram M. Amir
President
Piletest.com

A4: PET Equipment Calibration Report

PILETEST
Take a Deeper Look

Developing, manufacturing and marketing of deep foundations quality assurance NDT equipment since 1996

PET system S/N	25332 (3322)
Date	2022-07-12

Declaration of conformance TO ASTM D5882-16

I hereby confirm that the above PET system running PET Version 3.02 (or higher) complies with the requirements of ASTM Standard **D5882-16**.

CERTIFICATE OF In-house CALIBRATION

Calibration Date	2022-07-12
Valid till:	2025-07-12

I hereby certify that the above PET sensor was successfully calibrated according to all the requirements of ASTM standard D5882-16 using the in-house method CALPT02.

Erez I. Amir
President

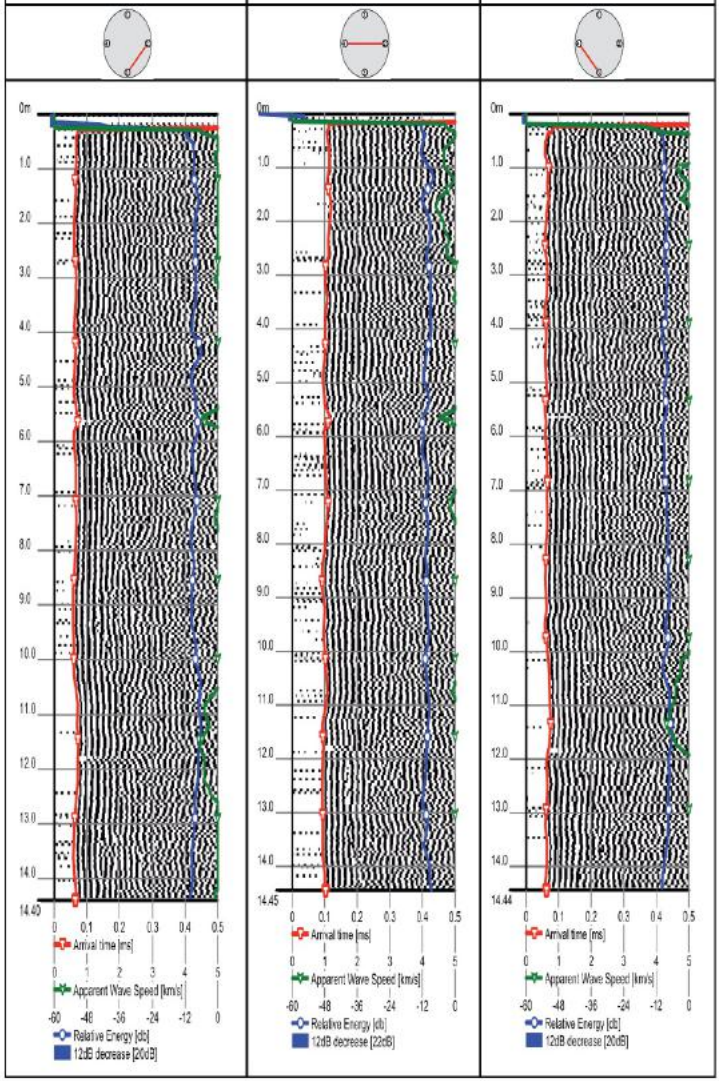
ASTM D6760

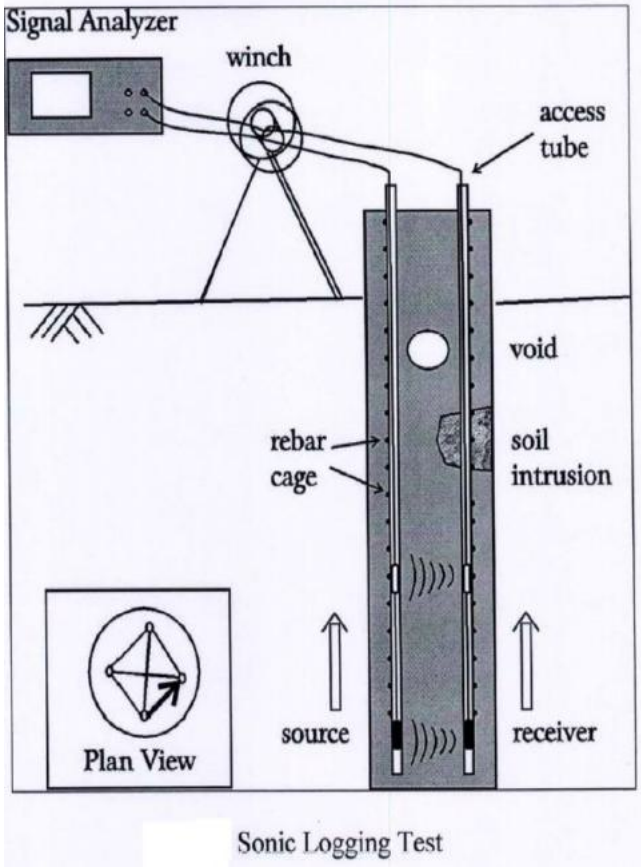
SONIC LOGGING TEST (ULTRASONIC CROSS-HOLE)

CSC TBWT
CONSULTING ENGINEERS

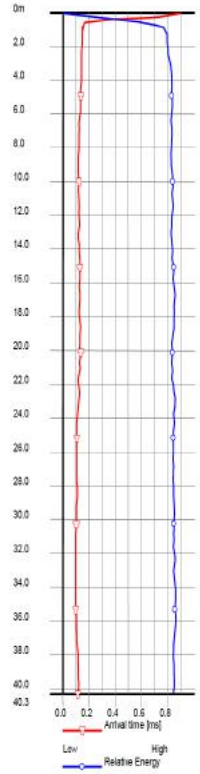
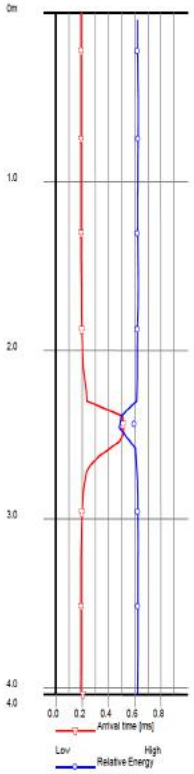
P2-BP1
2/20/19
Diameter: 0.80m

Profile: 23	Profile: 24	Profile: 34
14.40m	14.45m	14.44m
Distance: 0.30m	Distance: 0.50m	Distance: 0.30m
Filter: 2	Filter: 2	Filter: 2





Sonic Logging Test

Figure 1	Figure 2
	

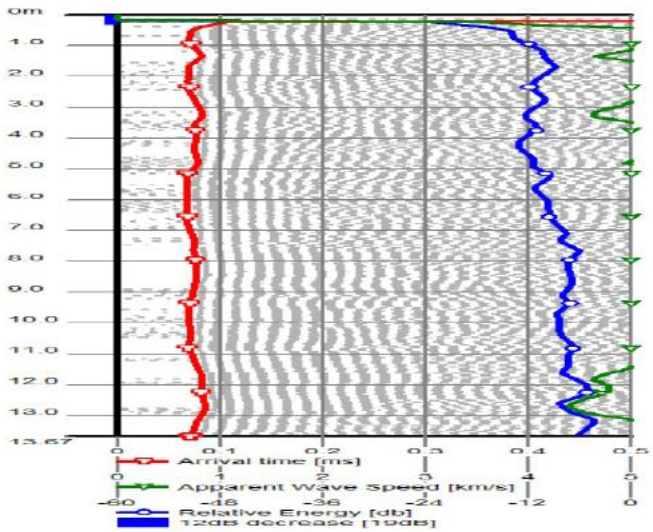
Testing

CHUM System

CSC TBWT CONSULTING ENGINEERS

Shay Gyi Bridge Project, Yargyi-Kalaywa Road

Transducers



Results

PDA and DLT

ALLNAMICS PDR PILE TESTING SYSTEM for PDA and DLT

Pile Driving Analysis (PDA)
and
Dynamic Load Testing (DLT)

The Hague Office
Waterpas 98
2495 AT The Hague
The Netherlands
Tel: +31703077490

Heemskerk Office
De Trompet 1585
1967 DB Heemskerk
The Netherlands
Tel: +31251245752

Tyler Office
1411 Cumberland Rd
Tyler, TX 75703
U.S.A.
Tel: +19032160038

Singapore Office
3 Joo Koon Crescent
629008 Singapore
Tel: +6597713635

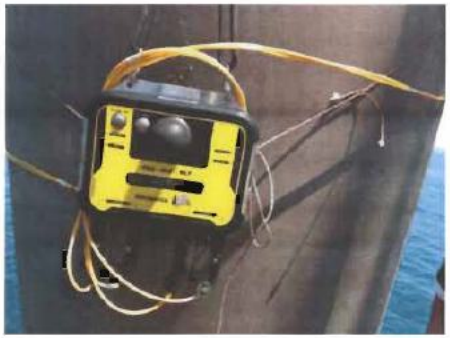
info@allnamics.eu
www.allnamics.eu

Combined acceleration strain transducers, multipurpose template, for transducer mounting and transport and transducers connectors with protection caps.

ALLNAMICS PDR PILE TESTING SYSTEM for PDA and DLT

Features:

- WiFi or ethernet connection to a Windows PC laptop
- 4 channels (easy upgrade to 8 channel monitoring under development)
- Adjustable sample rate (up to 48 kHz per channel)
- 24 bit conversion
- Internal Solid State recorder for signal backup
- 6 hrs operational battery life (16 hrs standby)
- Class IP67 housing
- Robust design with easy magnetic stowaway system for excess cable
- Fully compatible with intelligent combined transducers (USID)
- Integrated test box (to automatically check the transducers during mounting)
- Software program for monitoring, processing and reporting included




Typical PDA Test ASTM D-4945
GeoLab Myanmar Co., Ltd.
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GEOLAB (MYANMAR) CO., LTD.
Foundation Soil and Concrete Specialist
HYUNDAI

DYNAMIC PILE LOAD TEST FOR PUSHED PILE

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DYNAMIC PILE LOAD TEST FOR BORED PILE

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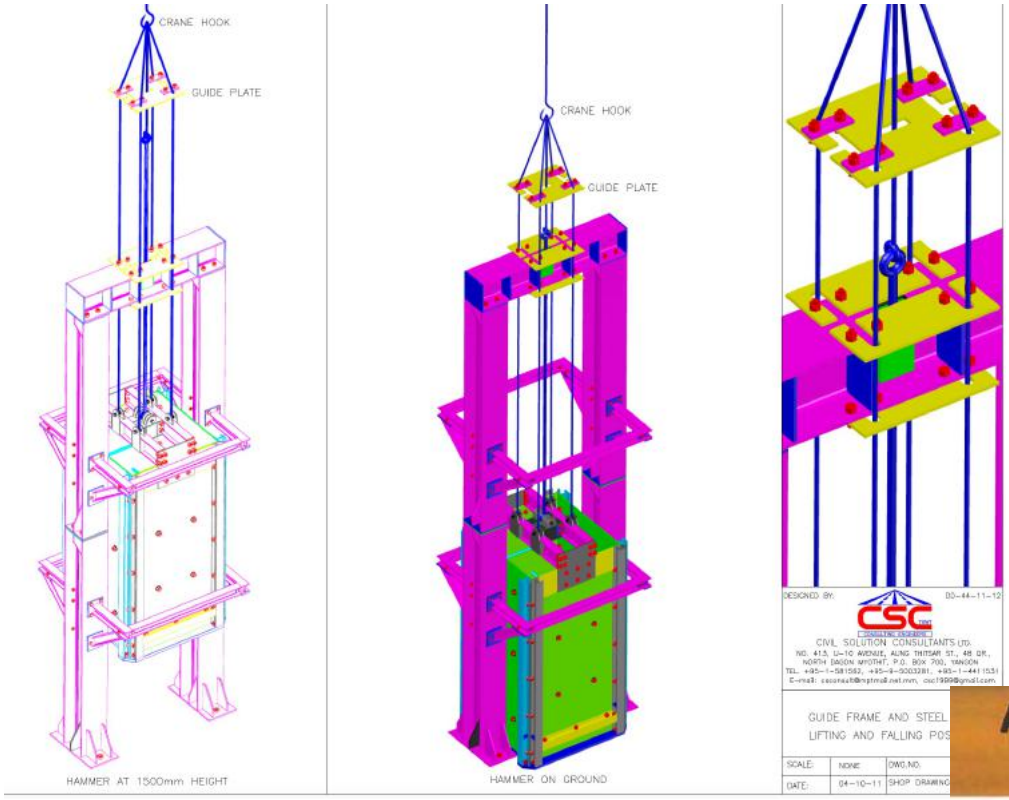
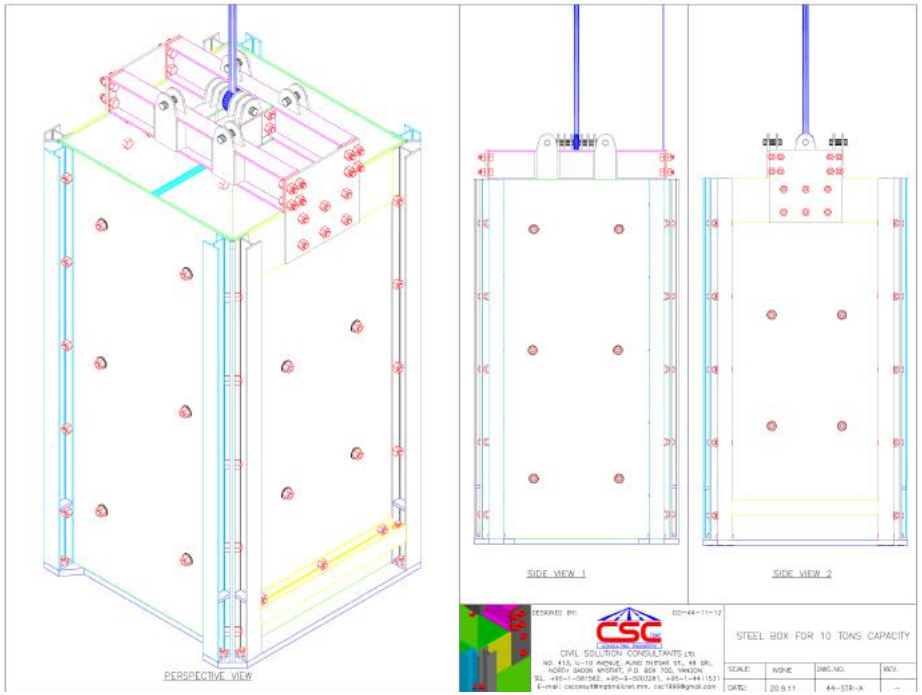
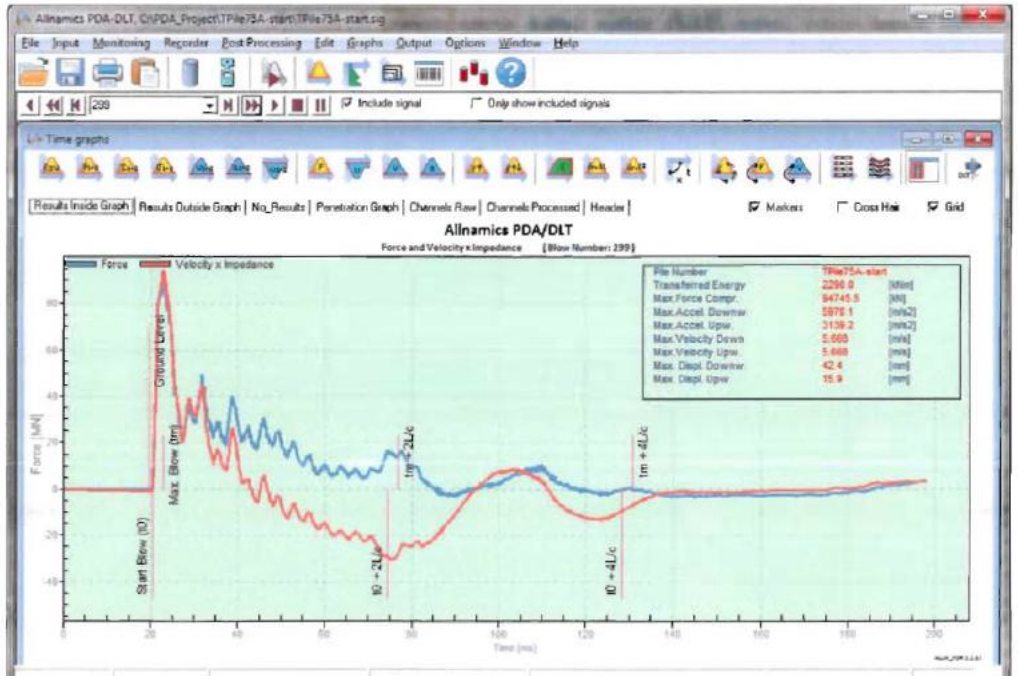
Pile Dynamic Analysis

Dynamic Load Test

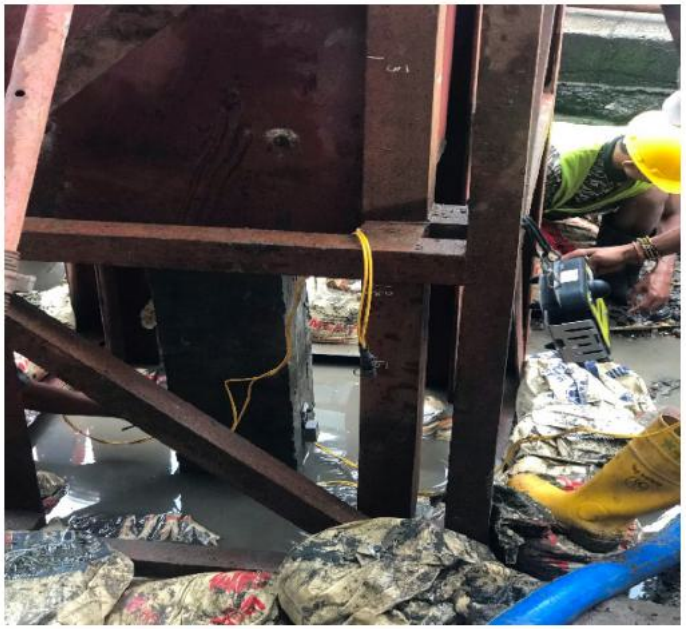


ALLNAMICS PDR PILE TESTING SYSTEM for PDA and DLT





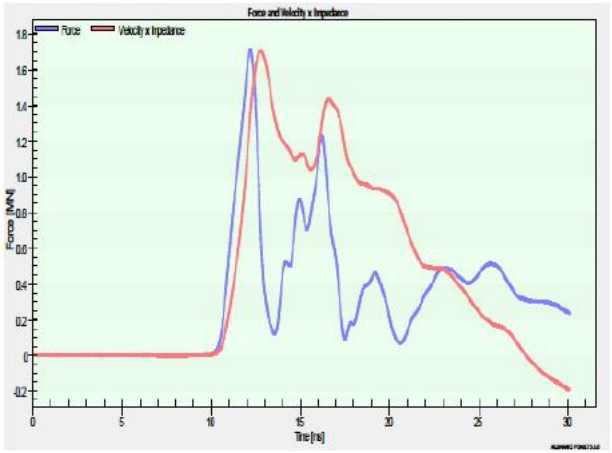
Test Pile

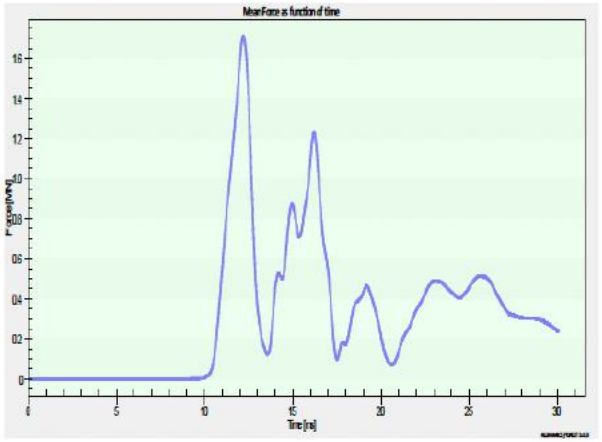


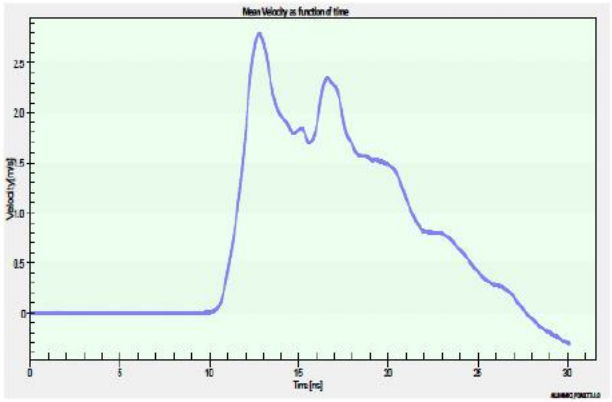
PDA-DLT Equipment

PDA Monitoring Results: P3-No.5

Pile No.	: P3-No.5	
Date of Testing	: 13.8.2019	
Pile Penetration	: 7.25	(m)
Measured Length	: 7.45	(m)
Total Length	: 8.00	(m)
Transferred Energy	: 12.4	(kNm)
Stat: Resistance RMX	: 1059.0	(kN)







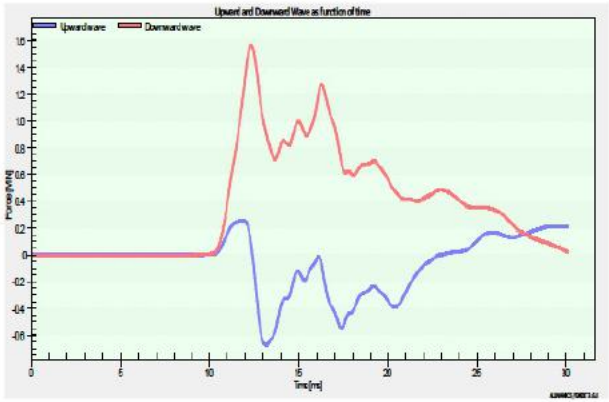


Table 1. Summary of Pile Record

Pile No.	Date Driven	Total Length (m)	Measured Length (m)	Penetration (m)	Working Load(kN)
P3-No.5	25.7.2019	8.00	7.45	7.25	400
P1-No.5	31.7.2019	8.00	7.35	7.10	400
L1-No.5	30.7.2019	8.20	7.50	7.20	400
P1-No.3	31.7.2019	7.50	6.80	6.60	400

Table 2. Summary of Field Results

Pile No.	Date Tested	Field Static Resistance (kN)	Max. Comp: Stress (MPa)	Transferred Energy (kNm)	Pile Integrity (BTA %)
P3-No.5	13.8.2019	1059.0	27.3	12.4	100%
P1-No.5	15.8.2019	700.1	21.4	18.5	100%
L1-No.5	13.8.2019	773.8	20.2	11.1	100%
P1-No.3	13.8.2019	629.8	18.7	11.7	100%

Table 3. Summary of Signal Matching Results

Pile No.	Skin Friction Mobilized(kN)	Toe Resistance Mobilized(kN)	Total Resistance (kN)	Pile Head Settlement@ WL (mm)	Pile Head Settlement@ 2WL (mm)
P3-No.5	487	563	1050	1.68	5.52
P1-No.5	209	563	772	3.16	8.73
L1-No.5	249	563	811	2.72	8.85
P1-No.3	230	442	672	3.15	7.61

CALIBRATION SHEET

PDA-STRAIN SENSOR

Transducer information:

Serial number : S019
Manufacturer : Allnamics Pile Testing Experts
Calibration factor : 4.76 (mV/V, @ 2000 uE)
Zero balance : 0.46 mV/V
Calibration date : 30-04-2018
Calibrated by : MVE

1) The end user is responsible for a recalibration of the transducer.

Typical sensor specification:

Model : 4 Foil gages TLM FLA-2-350-23
Manufacturer : TLM, Allnamics
Range : +/- 1500 uε
Zero : +/- 10 mV
Excitation : 10 V
Input impedance : 350 Ω
Output impedance : 350 Ω
Max rating : +/-4000 uε
Non-linearity : 1 % FS
Operating range : -20 to 60 °C

Calibration equip. : Traceable to Metric Control

Wiring and mounting:

Signal	Sensor	Cable	Connector
+V	Red	Red	A
+S	Blue	Green	B
-S	White	White	C
-V	Black	Blue	E
		Shield	F

Connector : MIL-C-26482, 10-06, male plug
Cable : 4x AWG24/7, PUR, water blocking, Allnamics.
SID : Sensor Identification
Dimensions : 122x40x10 mm (lxbxh)
IP class : 66
Mounting : 2x DIN 912, M8
Span : 65 mm

Allnamics Pile Testing Experts B.V.
Address : Waterpas 98
2495 AT The Hague
The Netherlands
Web : www.allnamics.eu
Tel. : +31 – 70 - 3077499

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Allnamics

Figure 4: Tension or Uplift Load Testing Schematic

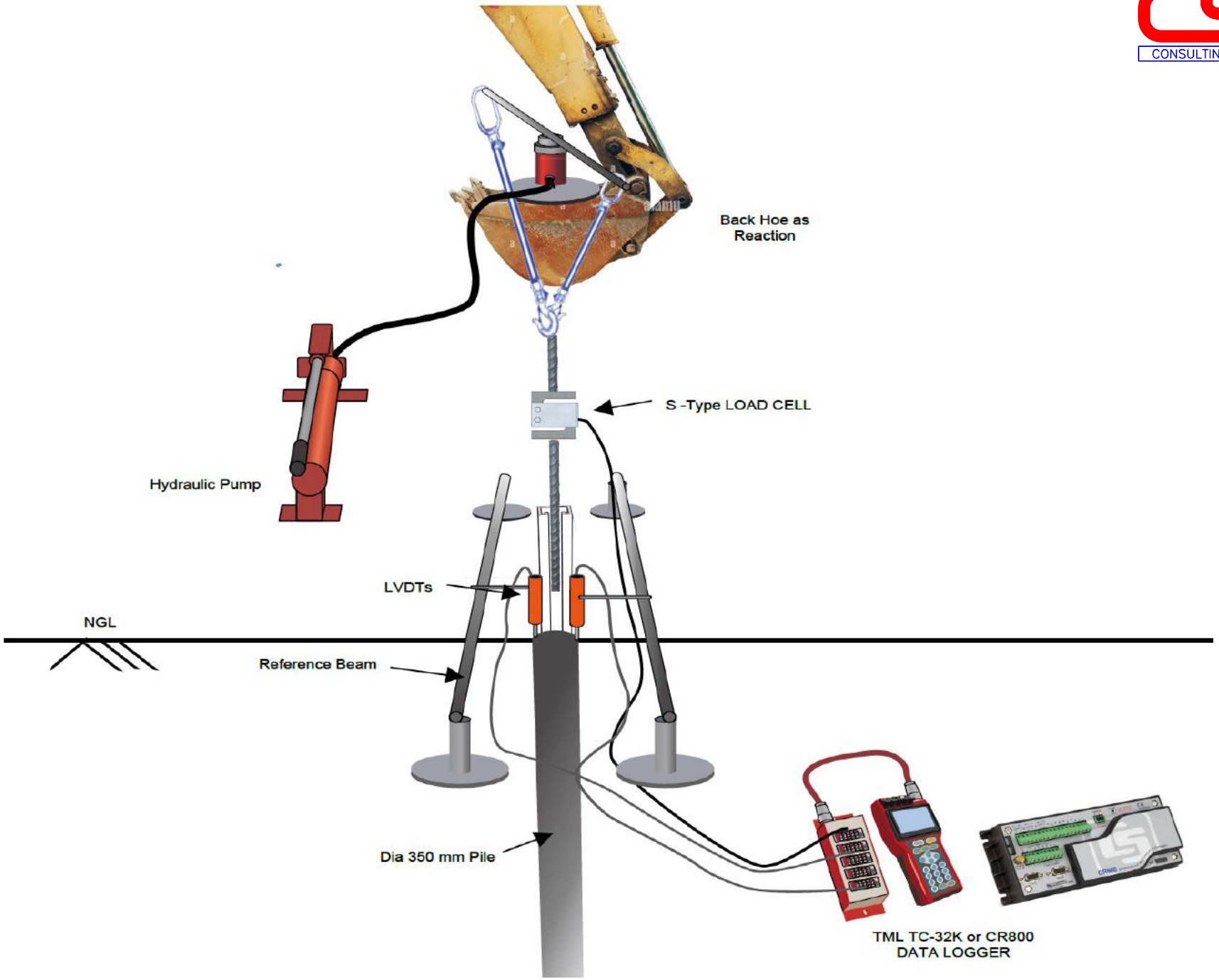
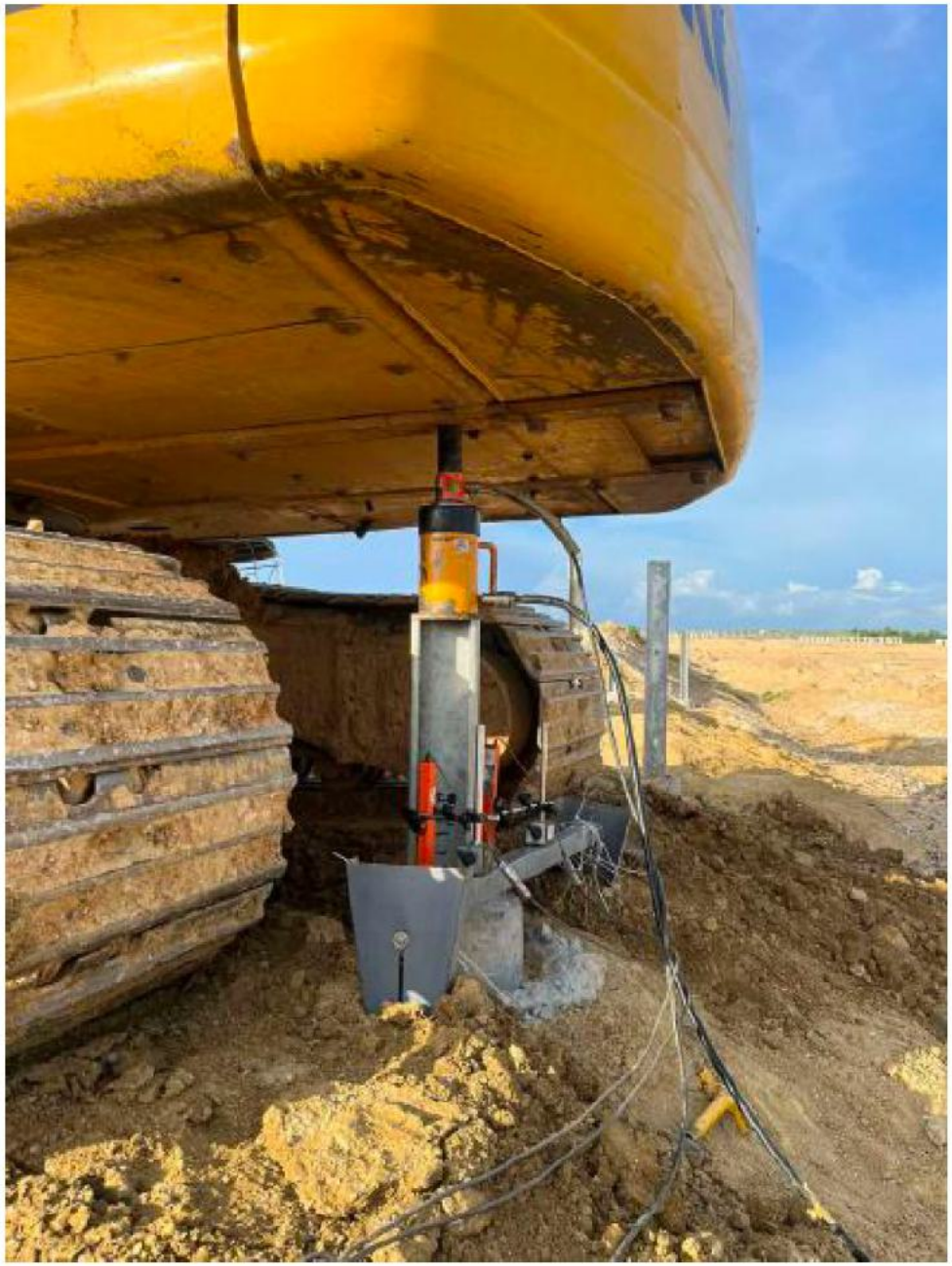
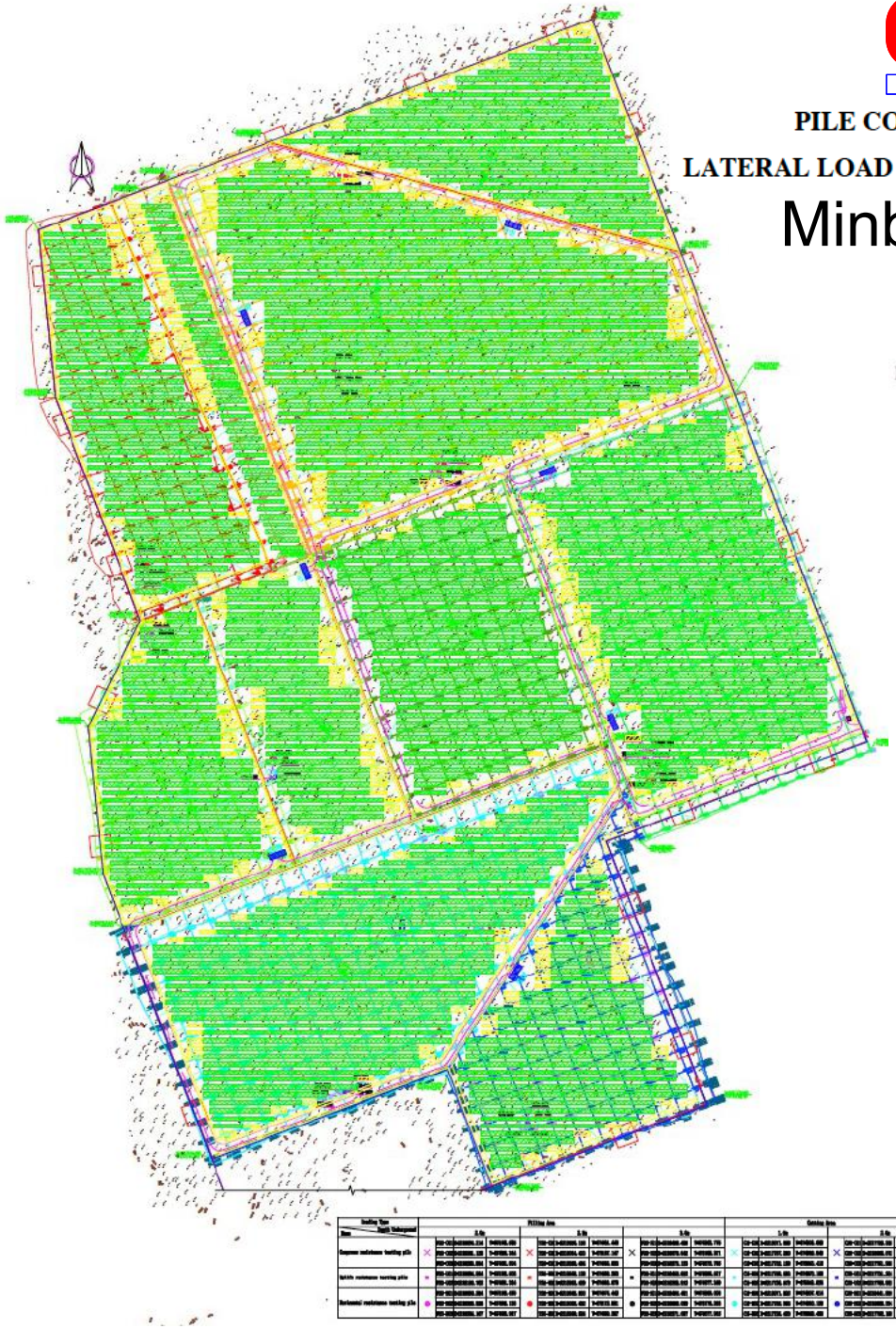


Figure G1: Compression Test & Lateral Test



G3: Tension Test

Figure A1: Test Pile Locations



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PILE COMPRESSION LOAD TESTS,

LATERAL LOAD TESTS & PULLOUT TESTS REPORT

Minbu Solar Firm

Figure 2: F30-C03 (Compression Test 300% Result)

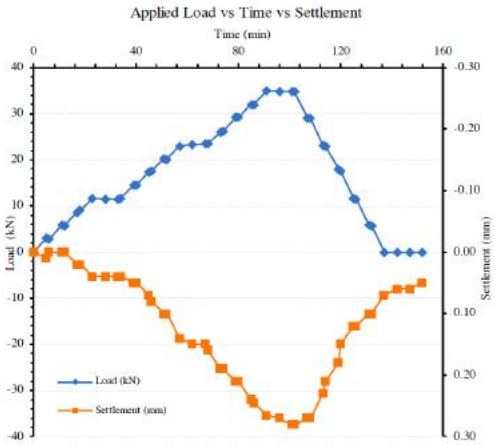


Figure 3: F25-H01 (Lateral Test 300% Result)

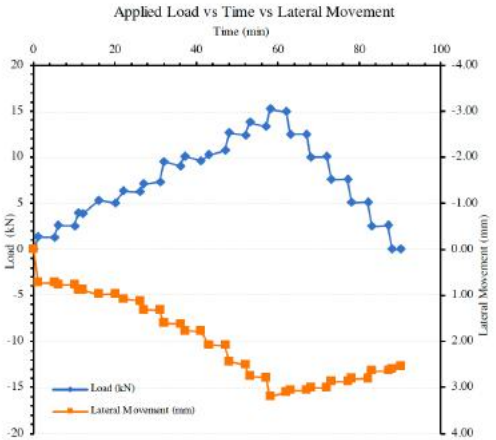
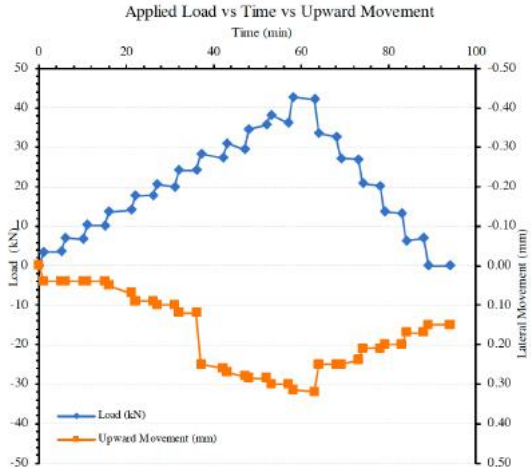


Figure 5: F20-U01 (Tension Test 300% Result)



Minbu Solar Farm Project, Phase 2, Magway Region

Proposed Loading Cycle For Tension/Pull out Test on 350mm Dia Pile

1st Cycle Working Load =	13.7	kN	1.37	tonnes
Times =	3.0			
2nd Cycle Test Load =	27.4	kN	2.74	tonnes
3rd Cycle Test Load =	41.1	kN	4.11	tonnes

Jack Model : CSLRG

QUICK LOAD TEST (QLT)

Shanxi Construction & Investment Group (Myanmar) Co., Ltd.

(11/07/2022) Rev01

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Minimum Loading times for pile test

Test Load as %WL	Min Holding	Recording	kN	Min (kN)	Max (kN)	kN	Min (tonne)	Max (tonne)	REMARKS
0%	-	-	0.00	0.0	0.0	0.00	0.0	0.0	
25%	4min	4min (2)	3.43	3.2	3.6	3.4	0.3	0.4	
50%	4min	4min (2)	6.85	6.6	7.2	6.9	0.7	0.7	
75%	4min	4min (2)	10.28	9.8	10.8	10.3	1.0	1.1	
100%	**5min**	**(3)**	**13.70**	**13.0**	**14.4**	**13.7**	**1.3**	**1.4**	
125%	4min	4min (2)	17.13	16.2	18.0	17.1	1.6	1.8	
150%	4min	4min (2)	20.55	19.6	21.6	20.6	2.0	2.2	
175%	4min	4min (2)	23.98	22.8	25.2	24.0	2.3	2.5	
200%	**5min**	**(3)**	**27.40**	**26.0**	**28.8**	**27.4**	**2.6**	**2.9**	
225%	4min	4min (2)	30.83	29.3	32.3	30.8	2.9	3.2	
250%	4min	4min (2)	34.25	32.6	36.0	34.3	3.3	3.6	
275%	4min	4min (2)	37.68	35.8	39.6	37.7	3.6	4.0	
300%	**5min**	**(3)**	**41.10**	**39.0**	**43.2**	**41.1**	**3.9**	**4.3**	
250%	4min	4min (2)	34.25	32.6	36.0	34.3	3.3	3.6	
200%	4min	4min (2)	27.40	26.0	28.8	27.4	2.6	2.9	
150%	4min	4min (2)	20.55	19.6	21.6	20.6	2.0	2.2	
100%	4min	4min (2)	13.70	13.0	14.4	13.7	1.3	1.4	
50%	4min	4min (2)	6.85	6.6	7.2	6.9	0.7	0.7	
0%	**5min**	**(5)**	**0.00**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	

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Notes:

(1). The loading for quick load test shall applied in at least 2 increments.

(2). For each load increment, the load shall be maintained for minimum period of 5min. or until equilibrium is reached whichever is greater. Equilibrium shall mean a rate of settlement not exceeding 0.25mm in one increment.

(3). The full test load shall remain in place for a minumum period of 5min. or until final equilibrium is reach. Recording shall be recorded in 4min. interval.

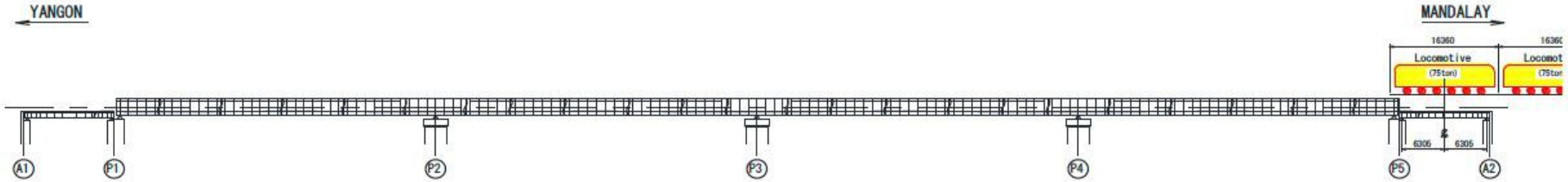
(4). The full test load shall then be unloaded in not less than 2 decrements with intervals of not less than 5min., with recovery being measured at each unloading stage. Recording shall be recorded in 4 minutes interval.

(5). The final rebound shall be recorded in 5min after the entire load has been removed.

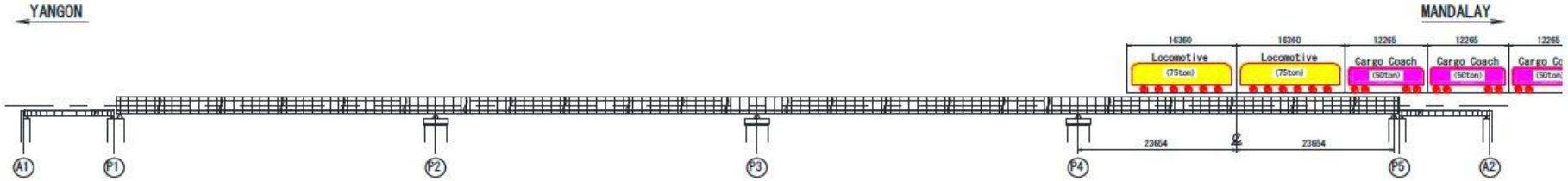
Myit-nge New Railway Bridge Project
Dynamic Load Test

Figure 6: Load Test Sequence and Cargo Arrangement for Static Load Cases

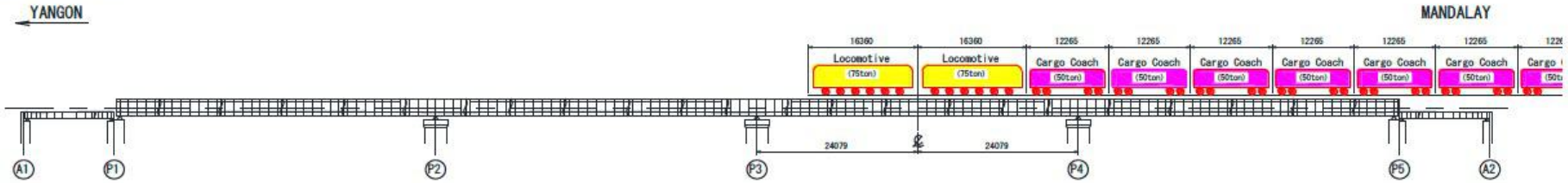
LOAD CASE-1



LOAD CASE-2



LOAD CASE-3



LOAD CASE-4

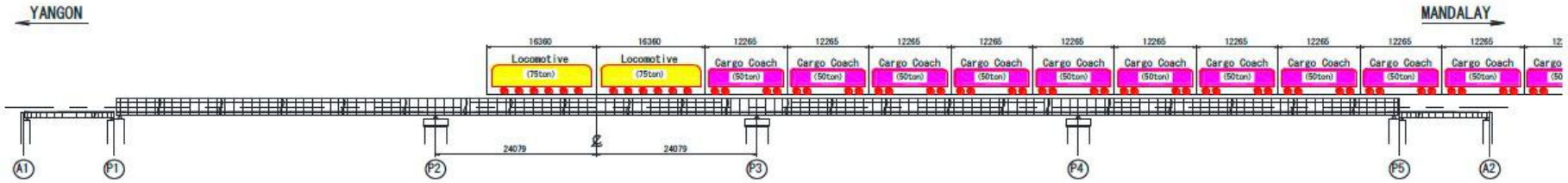


Figure 10: Load Case I

Figure 11: Load Case IV

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VWSG Installation Photos

Figure 13: Avg: Stress Intensity of Static Loading CASE I,II,III,IV

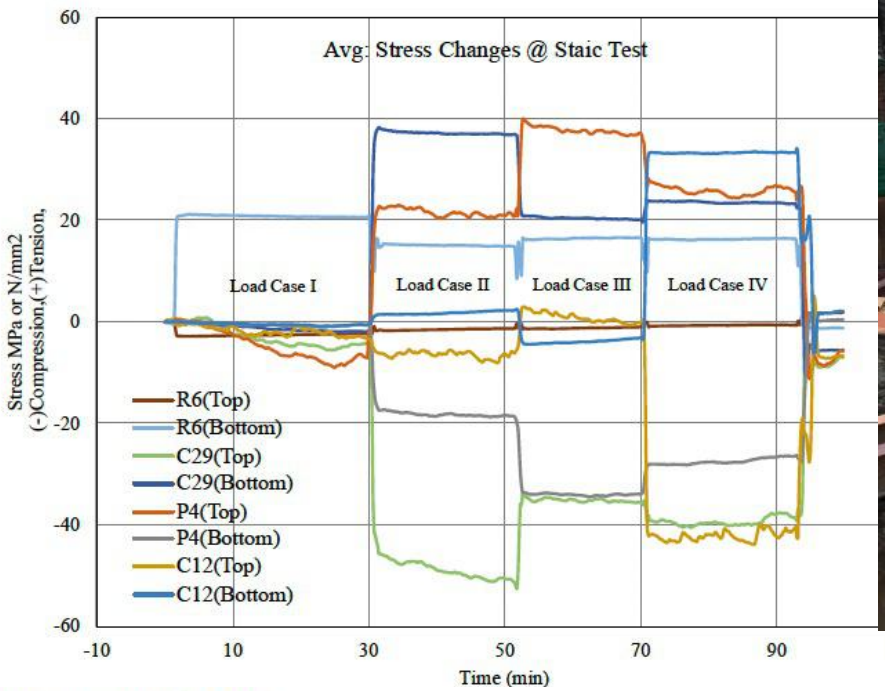
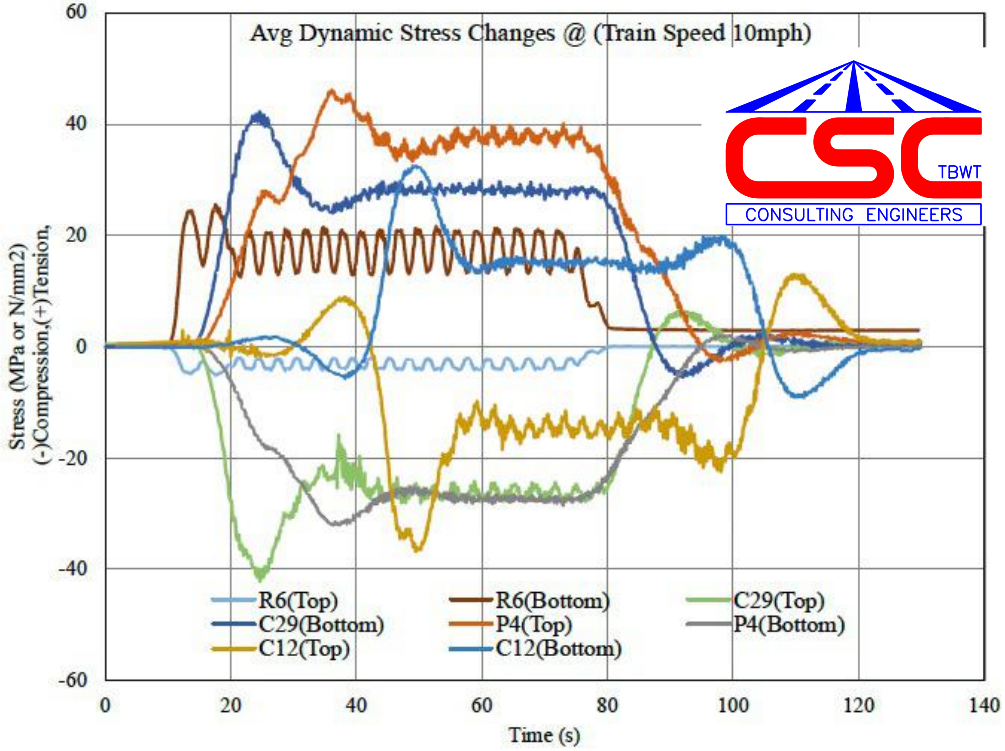


Figure 19: Dynamic Avg Stress Intensity Changes @ Train Speed 10mph

Data-Logger Set-up



A Role of Geotechnical Engineer

- **Scope of Work:** Site Investigation and Field Testing, Laboratory Testing, Design and Construction Supervision, Verified Actual Field.
- **Duty:** Must be professional, positive thinking, innovative and technical support.
- **Responsibility: Testing**, **Design**, **Site Supervision** and **Project Management** (if any).
- **Skills:** Task Risk Assessment (TRA), Field Oriented, Practicing in HSE Policy.
- **Ultimate Goal:** Environmental Prevention, Public Safety and Solution Provision.


Thank you for your attention!
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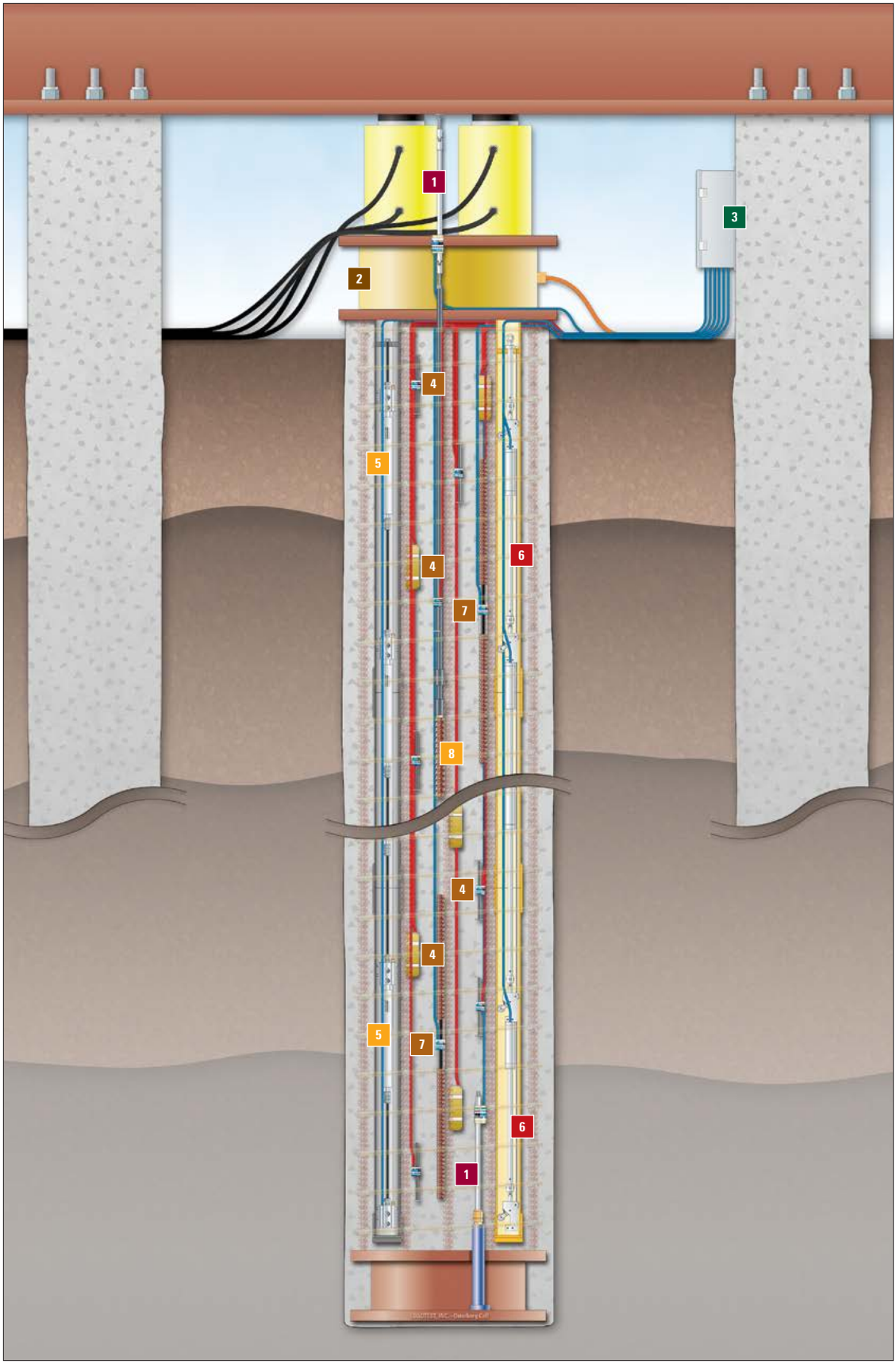
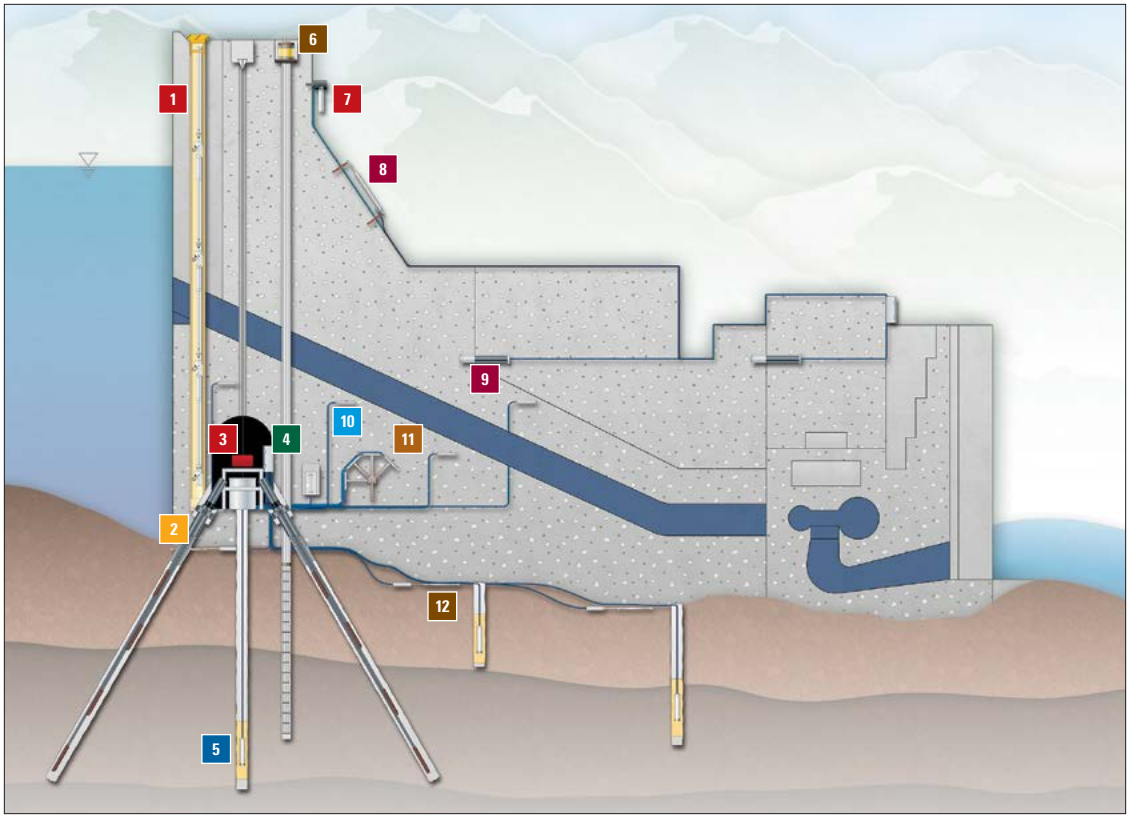
Pile Testing Instrumentation

1 Displacement Transducers | 05
2 Load Cells | 11
3 Multi-Channel Dataloggers | 18
4 Strain Gauges | 04
5 Retrievable Extensometers | 06
6 In-Place Inclinometers | 13
7 Sister Bars | 04
8 Telltales | 07



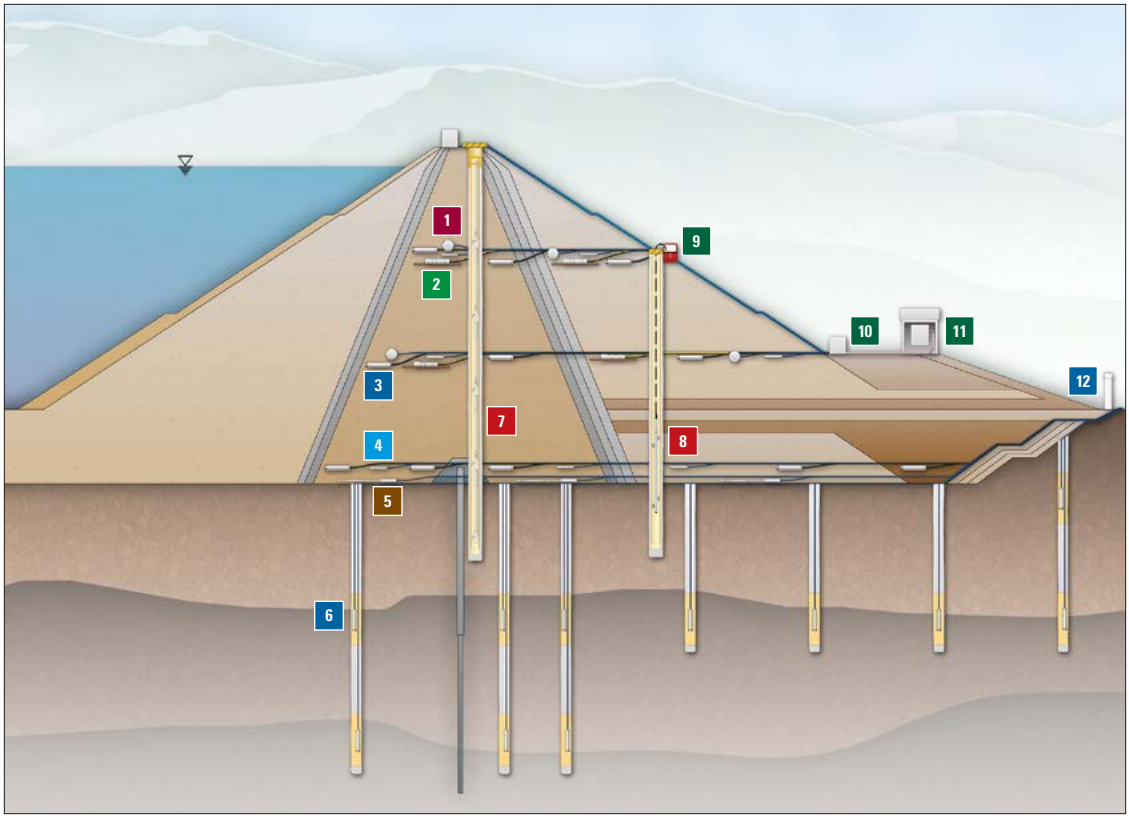
Concrete Dam Instrumentation

1 In-Place Inclinometers | 13
2 Extensometers | 06-07
3 Pendulums | 14
4 Multi-Channel Dataloggers | 18
5 Piezometers | 08-09
6 Load Cells | 11
7 Tiltmeters | 14
8 Crackmeters | 05
9 Embedment Jointmeters | 05
10 Temperature Gauges | 22
11 Embedment Strain Gauges | 04
12 Earth Pressure Cells | 11



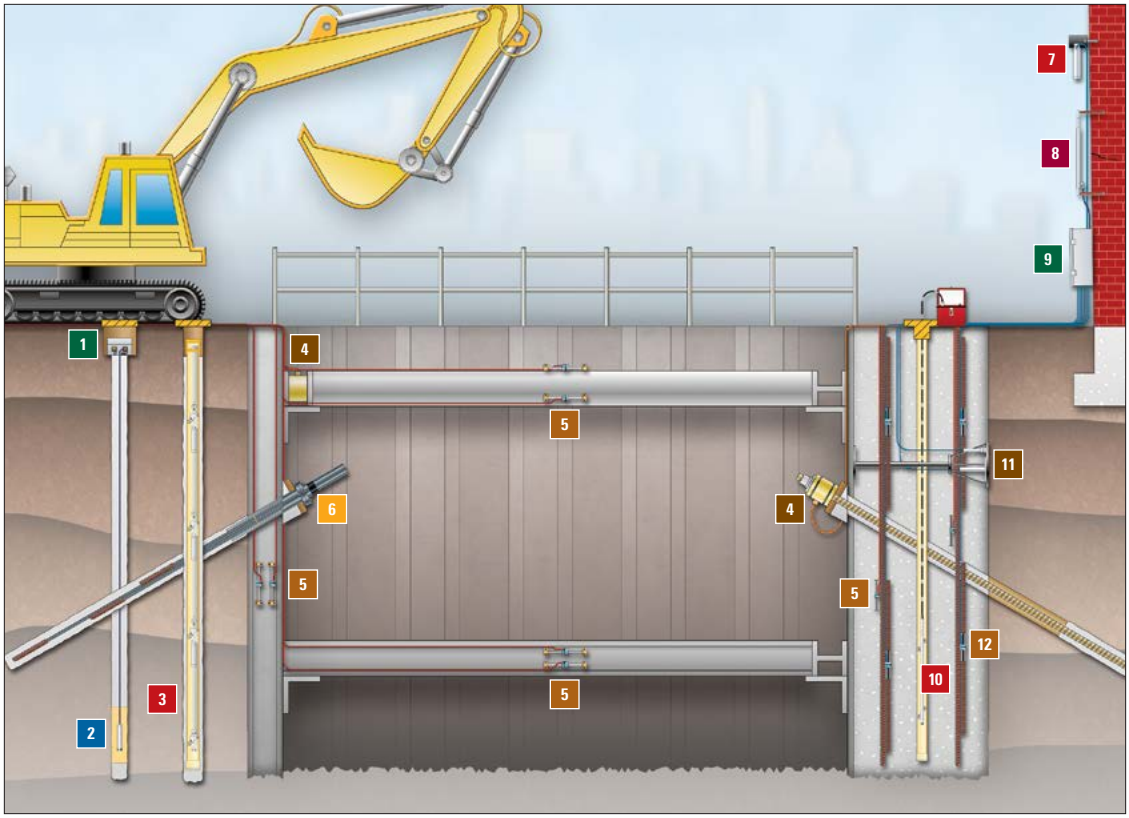
Earth Dam Instrumentation

1 Soil Strainmeters | 05
2 Settlement Sensors | 10
3 Heavy Duty Piezometers | 08
4 Temperature Gauges | 22
5 Earth Pressure Cells | 11
6 Piezometers | 08-09
7 In-Place Inclinometers | 13
8 Inclinometer Probes | 12
9 Readouts | 15-16
10 Multiplexers | 18
11 Multi-Channel Dataloggers | 18
12 Weir Monitors | 09



Deep Excavation Instrumentation

1 Single-Channel Dataloggers | 17
2 Piezometers | 08-09
3 In-Place Inclinometers | 13
4 Load Cells | 11
5 Strain Gauges | 04
6 Extensometers | 06-07
7 Tiltmeters | 14
8 Crackmeters | 05
9 Multi-Channel Dataloggers | 18
10 Inclinometer Probes | 12
11 Jackout Pressure Cells | 11
12 Sister Bars | 04



Tunnelling Instrumentation

1 Single-Channel Dataloggers | 17
2 Piezometers | 08-09
3 Extensometers | 06-07
4 Load Cells | 11
5 NATM Pressure Cells | 11
6 Strain Gauges | 04
7 Tiltmeters | 14
8 Crackmeters | 05
9 Multi-Channel Dataloggers | 18
10 In-Place Inclinometers | 13
11 Tape Extensometers | 07
12 Convergence Meters | 05