

CARACAL

ENGINEERING

Pile Testing Report

Project:

Element 6 – Phase 2

Client:

Soventix

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00

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Introduction and Overview

The purpose of this document is to report on the fixed tilt ground mount solar PV structure pile foundation tests conducted in the actual location planned for the Element six phase 2 project located at Element Six Springs Complex. The tests were performed on two separate occasions due to changes in the founding method required and the first rammed pile tests were conducted on 2022/12/14 and the second set of augured pile tests were conducted between 2023/01/11 and 2023/01/25. The testing was conducted in order to determine the appropriate founding method for the piles and the associated optimum embedment depth for the piles and ensure that the design forces to be experienced during the lifetime of the solar PV project (25-year design life).


The design loads were evaluated by means of the loading considerations as noted in appendix A. The maximum foundation reactions have been taken for a 24x3P table comprising of five equal spans of 4.85m and a total of 12 foundations per table. The testing was conducted utilizing lip channel piles directly rammed into the ground as well as embedded in concrete in order to determine the founding method to be selected for the project implementation.

The test results and recommendations for the pile testing can be found in section 4 which details the outcomes of the tests and conclusion regarding the suitability of rammed piles for the foundations for the project.

The below figure 1 indicates the area where the site is located and where the tests were conducted.



Figure 1: Element Six - site location

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1 Test Locations

1.1 Site Overview

The tests conducted on the site took place on the natural ground surface with low vegetation present but prior to any substantial civil works being conducted. The ground conditions on site and the tests conducted indicate that the area has been previously disturbed or built upon as there were areas with building rubble materials identified and the loose nature of the soil in parts looked to have been filled in the past.

1.2 Test Locations


The locations where the test piles were planned to be located are indicated below in figure 2 and appendix B. These test positions were distributed around the site in order to achieve a homogeneous distribution of samples with adequate statistical relevance. The testing was conducted in three procedures as detailed in the test procedure outlined in section 3 below.

For the Element Six site a total of 12 test positions were planned, however 10 test positions were tested due to the similarity of results obtained with varying embedment depths and founding methods. There were 4 rammed pile tests conducted and tested under procedure 1 and 2 loading only. The remaining 9 tests were conducted by means of the foundation posts placed into augured 250mm holes filled with a 15MPa site batched concrete and allowed to cure for 7 days. The augured and concrete tests were conducted on depths of 1.0m, 1.25m and 1.5m. embedment depth tested with depths of 1.5m, 1.8m, 2.0m and 2.4m. The locations for the 24 test positions are indicated below in figure 2 and appendix B with each pile planned to have been tested with procedures 1, 2 and 3. Once test procedure 1 was completed and successfully reached the minimum of the 100% of the design load, then test procedure 2 was conducted and if the minimum of the design load of 100% was reached successfully then procedure 3 was conducted until the point of total failure of the pile. If the pile failed immediately during ramming or with procedures 1 or 2, the test was stopped due the subsequent results not having any relevance as the pile had already failed.

- Test procedure 1 – Vertical uplift test
- Test Procedure 2 – Lateral load test
- Test Procedure 3 – Ultimate vertical test



Figure 2: Pile Test Locations

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2 Test Procedure and Methodology

The testing methodology described below conforms with general standards for pile testing and is specific to the geotechnical evaluation required by Caracal Engineering for the evaluation of the pile integrity and embedment depth selection.

The posts that were be utilized for the pile tests were Lipped C Channel sections, size 125x50x20x3 (S355JR material grade). These test piles were founded by means of free rammed foundations as well as encased in concrete filled augured holes as per the details above and expressed in the test sheets. Tests were conducted on the piles based on the below procedures in order to confirm the optimal founding method and embedment depth across the site.

2.1 Machinery

- Drilling machine
- Counterweight

2.2 Equipment

The testing equipment to be used are listed below:

1. Custom built tripod for application of vertical force
2. Digital Dial Gauges (deflection measurement)
3. Electronic Load Cell
4. Hydraulic cylinder for controlled load application
5. Vertical plate grab, slings, shackles, and chains

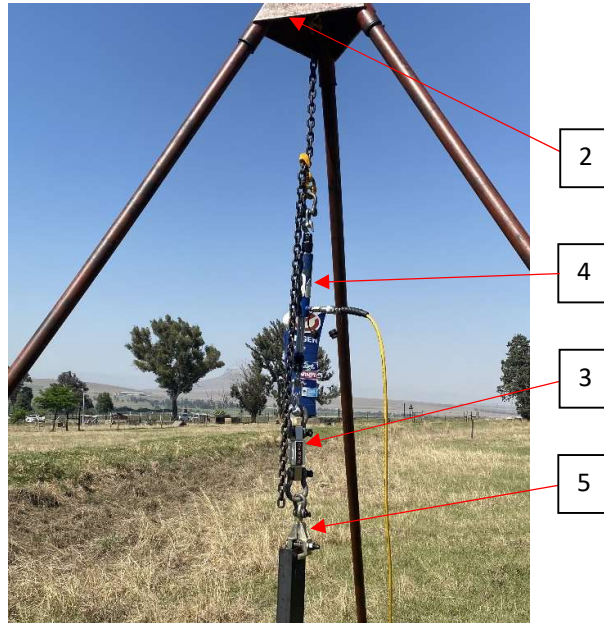


Figure 3: General test setup

2.3 Testing Procedure 1 – Vertical uplift test

- The purpose of test procedure 1 is in order to determine that the 100% maximum vertical design force to be experienced by the most extreme loaded rear foundation will be able to be resisted by the interaction between the soil and installed pile.
- This test is performed by placing the tripod and hydraulic cylinder needed to exert the vertical force in a position 90 degrees directly above the post to be tested.
- The assembly of the hydraulic cylinder and load cell are to be connected to the foundation post by means of a vertical plate grab as per figure 4 below.



Figure 4: Vertical uplift test setup 1

- The magnetic base of dial gauge is to be attached to the side of the lip channel foundation and the height recorded. The dial gauge is to be positioned onto a plate in order to avoid inaccurate readings due to displacement of the soil during testing. The dial gauge must be set to be 90 degrees and vertical such that the vertical displacement can be measured. Setup as per the below figure 5.



Vertical dial gauge set up

Steel sections used as outriggers to avoid interference from ground movement

Figure 5: Dial gauge measuring setup

- Loading of the piles tested is to be implemented as per the load steps as per table 1 below. The load is to be applied and maintained for at least 1 minute or once the deflection of the pile has stabilized prior to reading the displacement on the dial gauge in order to ensure that the pile has settled at the specific load step. Once the displacement reading has been taken, the next load increment can be applied.

If the pile continues to be displaced at the load step, the displacement reading is to be taken at 3 minutes from the initial load application time and move onto the next load step.
- When the loading has commenced the vertical dial gauge readings are to be taken at increments as per table 1 below.

Failure for the vertical test is defined when there is a vertical displacement greater than 25mm.

The test procedure must be stopped if the displacement exceeds 25mm before reaching a load increment.

On release of all applied load, whether due to failure of the pile or completion of the test at the 100% load step, the displacement of the pile is to be recorded such as to determine the amount of total displacement of the pile after the full loading event.

Table 1: Test Procedure 1 - Vertical Uplift Test - Load increments

Procedure 1 - Load Steps			
Load step	Design Load %	kN	kg
1	6.6%	0.98	100
2	13.1%	1.96	200
3	19.7%	2.94	300
4	26.2%	3.92	400
5	32.8%	4.91	500
6	39.3%	5.89	600
7	45.9%	6.87	700
8	52.5%	7.85	800
9	59.0%	8.83	900
10	65.6%	9.81	1000
11	72.1%	10.79	1100
12	78.7%	11.77	1200
13	85.2%	12.75	1300
14	91.8%	13.73	1400
15	98.4%	14.72	1500
16	100.0%	14.96	1525
Release			0

- Once the 100% of the design load is reached without exceeding 25mm of displacement, the test is deemed successful, and the final displacement is recorded once the load is released. A successful test is achieved when the load step for the 100% design load is sustained without the displacement exceeding 25mm. Once the pile tested is successful for procedure 1, then procedure 2 can be conducted on the same pile. If the pile tested fails to reach the minimum of the 100% design load, the pile embedment depth needs to be increased until procedure 1 is successful.

2.4 Testing Procedure 2 –Lateral load test

- The purpose of test procedure 2 is in order to determine that the 100% maximum horizontal design force and moment to be experienced by the most extreme loaded front foundation will be able to be resisted by the interaction between the soil and installed pile.
- This test is performed by placing the counterweight (ramming machine) and hydraulic cylinder needed to exert the horizontal force in a position levelled horizontally as per the below figures.
- The assembly of the chain block and load cell are to be connected to the foundation post by means of a sling or appropriate assembly as per figure 6 below. The position of the lateral load application point is to be 840mm above ground level in order to obtain the correct ratio between horizontal load and resultant moment at the base of the pile tested.



Figure 6: Lateral load test setup 1

- The magnetic base of dial gauge is to be attached to a reference plate in order to avoid inaccurate readings due to displacement of the soil during testing. The dial gauge must be set to be horizontally level and the dial gauge needle positioned onto the back side of the foundation post (the opposite lip of the channel from where the load is being applied) such that the horizontal displacement can be measured. The height that this is to be placed at is 50mm above the ground level such as to measure the displacement as close to the base of the post as possible. Setup as per the below figure 7.

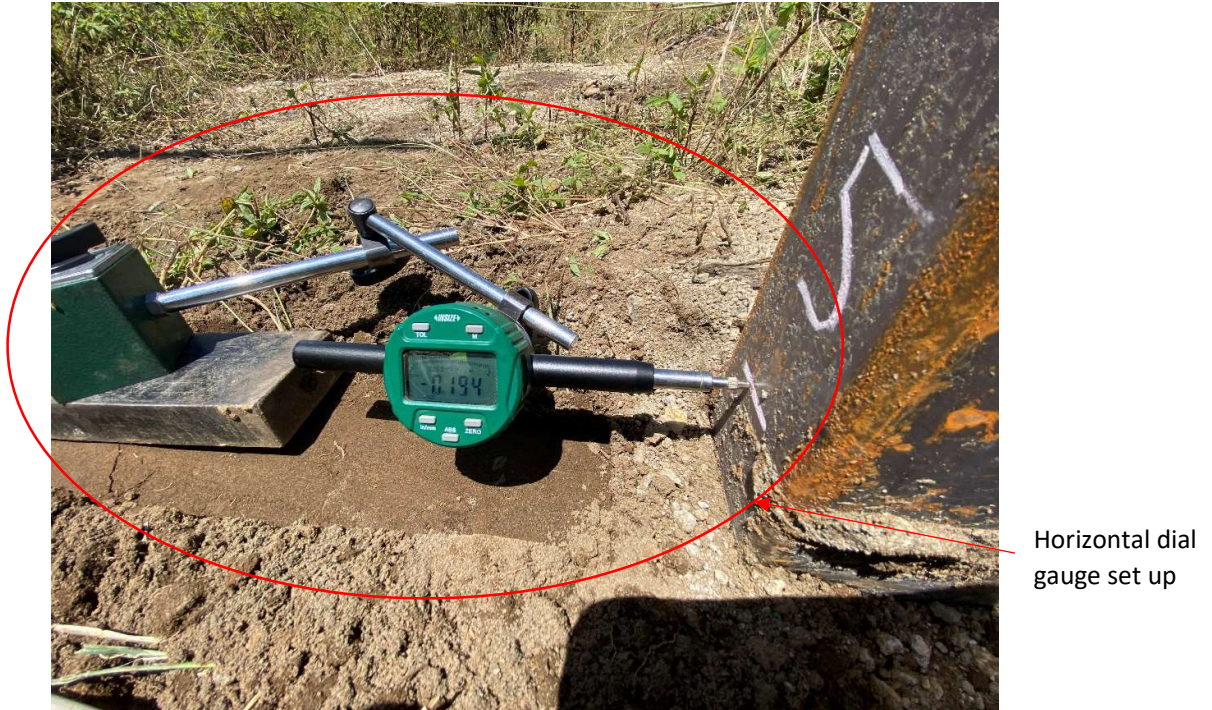


Figure 7: Dial gauge positioned 50mm above ground level

- Loading of the piles tested is to be implemented as per the load steps as per table 2 below. The load is to be applied and maintained for at least 1 minute or once the deflection of the pile has stabilized prior to reading the displacement on the dial gauge. If the pile continues to be displaced at the load step, the displacement reading is to be taken at 3 minutes from the initial load application time and move onto the next load step. Loading is to be started and the horizontal readings measured at the increments as per table 2 below. Failure for the horizontal test is defined when there is a horizontal displacement greater than 30mm. Testing must be stopped if the displacement exceeds 30mm before reaching a load increment. On release of all applied load, whether due to failure of the pile or completion of the test at the 150% load step, the displacement of the pile is to be recorded such as to determine the amount of total displacement of the pile after the full loading event.


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Table 2: Test Procedure 2 – Lateral Load Test - Load increments

Procedure 2 - Load Steps - height at 880mm			
Load step	Design Load %	kN	kg
1	9.6%	0.98	100
2	19.2%	1.96	200
3	28.8%	2.94	300
4	38.4%	3.92	400
5	47.9%	4.91	500
6	57.5%	5.89	600
7	67.1%	6.87	700
8	76.7%	7.85	800
9	86.3%	8.83	900
10	95.9%	9.81	1000
11	100.0%	10.23	1043
12	105.5%	10.79	1100
13	115.1%	11.77	1200
14	124.7%	12.75	1300
15	134.3%	13.73	1400
16	143.8%	14.72	1500
11	150.0%	15.35	1564
Release			0

- Once the 150% of the design load is reached without exceeding 30mm of displacement, the test is deemed successful, and the final displacement is recorded once the load is released.


2.5 Testing Procedure 3 – Ultimate vertical test

- The purpose of test procedure 3 is in order to determine the maximum vertical force that the pile is able to resist after being loaded vertically to 100% of the design load and horizontally to 150% of the design load. This test is continued to the point of complete pile failure or when the loading is unsafe to be continued in order to establish the overall factor of safety that exists for the soil resistance to uplift in a worst-case scenario.

Table 3: Test Procedure 3 – Ultimate Vertical Load Test - Load increments

Procedure 3 - Load Steps			
Load step	Design Load %	kN	kg
1	9.8%	1.47	150
2	19.7%	2.94	300
3	29.5%	4.41	450
4	39.3%	5.89	600
5	49.2%	7.36	750
6	59.0%	8.83	900
7	68.9%	10.30	1050
8	78.7%	11.77	1200
9	88.5%	13.24	1350
10	98.4%	14.72	1500
11	100.0%	14.96	1525
12	108.2%	16.19	1650
13	118.0%	17.66	1800
14	127.9%	19.13	1950
15	137.7%	20.60	2100
16	147.5%	22.07	2250
17	157.4%	23.54	2400
18	167.2%	25.02	2550
19	177.1%	26.49	2700
20	186.9%	27.96	2850
21	196.7%	29.43	3000
Release			0

- The testing is to be conducted as per test procedure 1 above to the point at which the displacement of the post exceeds 25mm vertically. The vertically applied load can be increased beyond the 150% design load until a 25mm vertical displacement is reach or deemed unsafe to continue.
A successful test is achieved when the load step for the 100% design load is sustained without the displacement exceeding 25mm.

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3 Test Results and Findings

3.1 Summary of Test Results

A total of 13 tests were conducted and located at 10 test positions and distributed throughout the field as per figure 2 and appendix B. Two different tests were conducted due to the results of the first test method.

The first test method comprised of 4 tests conducted by means of direct free ramming of the foundation posts on 2022/12/14. These foundation test posts were rammed to a depth of 1.8m for piles at positions TP02, TP08 and TP11 and to a depth of 1.6m for the pile at position TP12.

The second test method comprised of 250mm diameter augured holes to varying depths in which the foundation posts were placed and concreted into the holes by means of a minimum strength of 15MPa site batched concrete mix. The foundation posts were cast in concrete on 2023/01/11 and allowed to cure for 7 days and tested on 2023/01/24 and 2023/01/25. Foundation posts embedded at positions TP 03, TP04 and TP 05 were embedded to a depth of 1.0m. Foundation posts embedded at positions TP 01, TP05 and TP 12 were embedded to a depth of 1.25m. Foundation posts embedded at positions TP 02, TP09 and TP 10 were embedded to a depth of 1.5m.

Table 4 and 5 below indicate the summary of the test results for the pile tests for the direct ramming method and augured and concreted foundations. The test results for each pile test can be found in Appendix C along with the Pile Load vs Displacement graphs which are contained within Appendix D.

The test piles tested after direct ramming of the foundations we only tested under procedures 1 and 2 due to the fact that under test procedure 1, none of the test piles were able to reach the 100% load as per the prescripts defined above.


Augured and concreted test posts TP05 and TP10 were not tested under test procedure 3 as the posts were severely deformed and twisted after conducting test procedure 2 due to the fact that the test apparatus was set up slightly off centre and subsequently applying an abnormal torsion to the foundation posts. These test posts would have yielded unusable data due to the deformation of the posts and hence no further testing was conducted on them. These test images can be seen in appendix E below.

Table 4: Pile Test Results Summary – Rammed Pile Tests

GRM-212-Soventix - Element 6 - Phase 2 - Rammed Pile Test Results Summary								
Pile test	Desired load		Maximum load attained					
			Procedure 1			Procedure 2		
	Section size	Embedment depth (mm)	100%	14.96	1525	100%	10.23	1043
			Design Load %	kN	kg	Design Load %	kN	kg
TP02 - Rammed	Lip C Channel 125x50x20x3mm	1800	34%	5.09	519	60%	6.13	625
TP08 - Rammed	Lip C Channel 125x50x20x3mm	1800	46%	6.88	701	106%	10.87	1108
TP11 - Rammed	Lip C Channel 125x50x20x3mm	1800	29%	4.37	445	60%	6.17	629
TP12 - Rammed	Lip C Channel 125x50x20x3mm	1600	73%	10.96	1117	88%	8.96	913
	Minimum	1600	29%	4.37	445	60%	6.13	625
	Maximum	1800	73%	10.96	1117	106%	10.87	1108
	Average	1750	46%	6.82	696	79%	8.03	819

Table 5: Pile Test Results Summary – Augured & Concrete Pile Tests

GRM-212-Soventix - Element 6 - Phase 2 - Auger holes with Concrete Pile Test Results Summary											
Pile test	Desired load		Maximum load attained								
			Procedure 1			Procedure 2			Procedure 3		
	Section size	Embedment depth (mm)	100%	14.96	1525	100%	10.23	1043	100%	14.96	1525
			Design Load %	kN	kg	Design Load %	kN	kg	Design Load %	kN	kg
TP01	Lip C Channel 125x50x20x3mm	1250	100%	15.01	1530	125%	12.79	1304	199%	29.73	3031
TP02	Lip C Channel 125x50x20x3mm	1500	100%	15.00	1529	126%	12.89	1314	198%	29.57	3014
TP03	Lip C Channel 125x50x20x3mm	1000	100%	14.99	1528	116%	11.88	1211	118%	17.72	1806
TP04	Lip C Channel 125x50x20x3mm	1000	100%	14.96	1525	126%	12.89	1314	198%	29.63	3020
TP05	Lip C Channel 125x50x20x3mm	1250	100%	15.00	1529	116%	11.89	1212			
TP08	Lip C Channel 125x50x20x3mm	1000	102%	15.28	1558	126%	12.94	1319	201%	30.02	3060
TP09	Lip C Channel 125x50x20x3mm	1500	100%	15.00	1529	116%	11.91	1214	198%	29.68	3025
TP10	Lip C Channel 125x50x20x3mm	1500	100%	14.97	1526	126%	12.86	1311			
TP12	Lip C Channel 125x50x20x3mm	1250	101%	15.08	1537	126%	12.90	1315	188%	28.19	2874
	Minimum	1000	100%	14.96	1525	116%	11.88	1211	118%	17.72	1806
	Maximum	1500	102%	15.28	1558	126%	12.94	1319	201%	30.02	3060
	Average	1250	100%	15.03	1532	123%	12.55	1279	186%	27.79	2833

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3.2 Conclusion and Recommendations

The initial rammed pile tests conducted did not yield favourable results and the weak soil nature was noted during the ramming process due to the speed and ease at which the posts were rammed into the soil. Due to the unfavourable results attained for the rammed piles, an alternative founding method needed to be investigated as ramming deeper piles would not be economical as well as exceed the limits of the height of the ramming machine and subsequently require split foundations which would once again not be economical for the project. Test post TP08 was the only rammed test post that passed the test criteria for the horizontal test procedure 2. On average, the rammed piles achieved a 46% of the designed vertical uplift load and 79% of the designed horizontal load and as such proves not to be a viable founding solution.

The augured and concreted pile tests were thereafter conducted as the added surface area and subsequent skin friction would allow for a greater load capacity for the piles. The three embedment depths tested being 1.0m, 1.25m and 1.5m passed all test procedures that were tested for with the exception of test posts TP05 and TP10 which twisted severely during the horizontal test procedure 2 due to an eccentric load being applied in error. The results of these piles were still favourable and overall, the average horizontal load resisted was 123% compared to the design load and 186% of the vertical design load.

In conclusion, the above test procedures, and recommendations for the Caracal Engineering fixed tilt solar PV ground mount system foundations to be comprised of lip C channels placed within predrilled/augured holes of a 250mm diameter and a depth of 1.0m filled with 15MPa to 20MPa concrete. With all the above considerations this founding method and procedure is shown to be an adequate means of resisting the design loading reactions expected to be experienced by the structures during their 25-year design life. All details and specific test requirements are specific to the Caracal Engineering fixed tilt ground mount structure and this report should only be utilized for the specific Caracal Engineering structure specified for the project.



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Appendix A – Loading Parameters

Appendix A - Wind Load Calculations
Based on SANS 10160-3:2019

Wind Classification	
Structure Class	A
Terrain Category	B
Structure Height, z	3.1 m
Return Period	25 Years
Province	Gauteng
Municipality	Ekurhuleni
Fundamental Wind Speed, $v_{b,0}$	36 m/s
Site Altitude	1620 m
Canopy Type	Monopitch Canopy
Table Inclination	20 °
Structure type	Ground Mount

Module Specifications	
Supplier	JA Solar
Range	Deep Blue 3.0
Number	JAM72530-540/MR
Module Wp	540 Wp
Length	2278 mm
Width	1134 mm
Thickness	35 mm
Mass	28.1 kg
Panel Weight/m2	0.107 kN/m2

Wind Speed Classification	
Basic Wind Speed	$v_b = C_{prob} \cdot v_{b,0}$
K	0.20
C_{prob}	0.96
v_b	34.55 m/s

$$C_{prob} = \left[\frac{1 - K \cdot \ln\{-\ln(1-p)\}}{1 - K \cdot \ln\{-\ln(0.98)\}} \right]^n$$

Peak Wind Speed	
$c_r(z)$	0.88
$c_o(z)$	1.00
$v_{b,peak} = 1.0 \cdot v_b$	34.55 m/s
$v_p(z) = c_r(z) \cdot c_o(z) \cdot v_{b,peak}$	30.43 m/s

$$c_r(z) = 1,36 \cdot \left(\frac{z - Z_0}{z_g - Z_0} \right)^\alpha$$

Wind Pressure	
ρ_{air}	0.99 kg/m ³
$q_p(z) = 1/2 \cdot \rho_{air} \cdot v_p^2(z)$	456 N/m ²
ϕ	0.00
C_f for Max. all ϕ	0.80
C_f for $\phi = 0$	-1.30
C_f for $\phi = 1$	-1.40
C_f	-1.30
Downward $q_f = C_f \cdot q_p(z)$	365 N/m ²
Upward $q_f = C_f \cdot q_p(z)$	-593 N/m ²

Maximum module pressure				
Load orientation	Permissible pressure	Applied pressure - Zone A	Unit of measure	Check
Upward load	-2400	-1369.1	Pa (N/m ²)	OK!
Downward load	5400	1286.9	Pa (N/m ²)	OK!

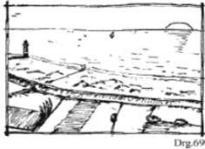

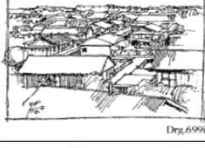

UDL (In relation to the inclination of the module)				
	Trib. Width (m)	Dead Load - DL (kN/m)	Upward wind load - Wld (kN/m)	Downward wind load - Wld (kN/m)
Purlin 1 (external)	1.139	0.122	-0.676	0.416
Purlin 2 (internal)	1.149	0.123	-0.682	0.419
Purlin 3 (mid)	0	0.000	0.000	0.000

Frictional wind force						
Frictional force	C_{fr}	0.020				
Configuration	Modules in length	Width	Table Length (m)	Frictional force Purlin 1 (kN)	Frictional force Purlin 2 (kN)	Frictional force Purlin 3 (kN)
1	24		27.676	0.288	0.290	0.000
2	16		18.444	0.192	0.193	0.000
3						
4						
5						
6						

Load Combinations
LC1: 1,35DL
LC2: 1,2DL + 1,6WL _d
LC3: 0,9DL + 1,6WL _u
LC4: 1,2DL + 1,6WL _f
LC2sls: 1,1DL + 0,6WL _d
LC3sls: 1DL + 0,6WL _u
LC4sls: 1,1DL + 0,6WL _f

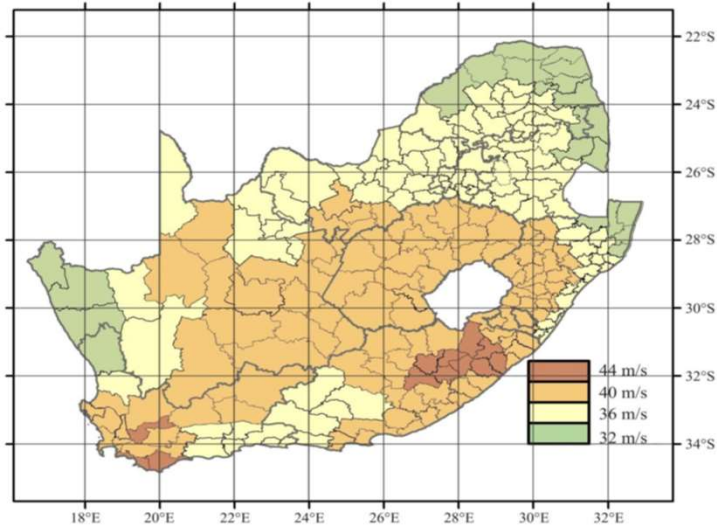
Terrain Categories From SANS 10160-3:2019

Table 2 — Terrain categories

1	2	3
Category	Description	Illustration
A	Flat horizontal terrain with negligible vegetation and without any obstacles (for example coastal areas exposed to open sea or large lakes)	 Drg.6099
B	Area with low vegetation such as grass and isolated obstacles (for example trees and buildings) with separations of at least 20 obstacle heights	 Drg.6099a
C	Area with regular cover of vegetation or buildings or with isolated obstacles with separations of maximum 20 obstacle heights (such as villages, suburban terrain and permanent forest)	 Drg.6099b
D	Area in which at least 15 % of the surface is covered with buildings and their average height exceeds 15 m	 Drg.6099c

NOTE 1 A certain amount of a reduction in loading for category D can be obtained (see 7.3.5) by using a procedure described in B.5, which takes into account the vertical displacement of the peak wind pressure profile, within an environment with closely spaced obstructions.

Map of the fundamental value of the basic wind speed, $V_{b,0}$
From SANS 10160-3:2019





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Appendix B – Pile Test Locations

- NOTES:**
- Starting position of first foundations to be determined and confirmed on site.
 - Levels and fall of site to be confirmed and adjustments made accordingly.

Table Details

Solar Module	JA Solar JAM72S30-540/MR
Module Capacity	540Wp
Total Modules	3360
Module Dimensions	2278x1134x35mm
Module orientation	Portrait
Table angle	20°
Clearance Height	0.6m
Founding method	TBC

Client approval

Client	Soventix
Date	
Name	
Designation	
Signature	

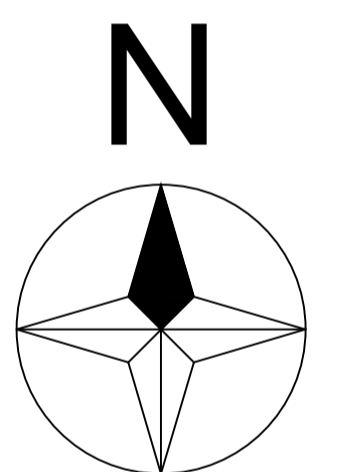
Element 6 - Phase 2

Test Pile Coordinates

Name	Latitude	Longitude
TP01	26° 17' 44.9"S	28° 27' 28.8"E
TP02	26° 17' 44.9"S	28° 27' 31"E
TP03	26° 17' 44.9"S	28° 27' 33.1"E
TP04	26° 17' 44.9"S	28° 27' 35.3"E
TP05	26° 17' 46"S	28° 27' 28.8"E
TP06	26° 17' 46"S	28° 27' 31"E
TP07	26° 17' 46"S	28° 27' 33.1"E
TP08	26° 17' 46"S	28° 27' 35.3"E
TP09	26° 17' 47.4"S	28° 27' 28.8"E
TP10	26° 17' 47.4"S	28° 27' 31"E
TP11	26° 17' 47.4"S	28° 27' 33.1"E
TP12	26° 17' 47.4"S	28° 27' 35.3"E



Proposed Pile Test Positions
Scale 1:500



CARACAL
ENGINEERING

TITLE: ELEMENT 6 - PHASE 2
FIXED TILT GROUND MOUNT
PROPOSED PILE TEST POSITIONS

CATEGORY:	Ground Mount	MATERIAL:	Steel S355
COUNTRY:	South Africa	CITY/TOWN:	Ekuruleni
PROJECT SIZE:	1814.40 kWp	TOTAL MODULES:	3360

SIZE: A1
DRAWING NO: CE-CRM-AS-212-0A

No.	Date	Drawn	Description

ISSUED FOR: Information
PAGE: A of X
REVISION: 00

PR. ENG. APPROVAL	
Name	
Reg. no.	
Date	
Signature	



Soventix – Element 6 – Phase 2

Pile Testing Report

Document Number: CE-GRM-212-Soventix - Element 6 – Pile Test Report

Rev. 00

Rev Date: 06/02/2023

Appendix C – Pile Test Results

Caracal Engineering - Pile Test Report

Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP01
Testing date:	Concrete cast 2023/01/11 - Testing 2023/01/24 & 2023/01/25	Latitude (N/S)	26° 17' 44.9"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 28.8"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Auger hole with concrete filling
Total Pile length (mm)	3000	Rammed	
Pile Embedded Depth (mm)	1250	Pre-drilled	X
Vertical Load Application Height (mm)	1750	Hole Diameter	250
Horizontal Load Application Height (mm)	880	Drill Diameter	250
Vertical Measurement Height (mm)	100	Drill Depth	1250
Horizontal Measurement Height (mm)	50	Filling	Concrete
Comments:			



Test Procedure 1						Test Procedure 2						Test Procedure 3								
Vertical test up to 100% of design load						Horizontal test up to 150% of design load applied at 880mm above NGL						Vertical test to failure								
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	135	0.06		1	9.6%	0.98	100	130	0.16		1	9.8%	1.47	150	190	-0.04	
2	13.1%	1.96	200	238	0.08		2	19.2%	1.96	200	227	0.4		2	19.7%	2.94	300	337	-0.05	
3	19.7%	2.94	300	341	0.11		3	28.8%	2.94	300	305	0.65		3	29.5%	4.41	450	485	-0.06	
4	26.2%	3.92	400	426	0.14		4	38.4%	3.92	400	424	1.13		4	39.3%	5.89	600	618	-0.07	
5	32.8%	4.91	500	538	0.17		5	47.9%	4.91	500	519	1.58		5	49.2%	7.36	750	758	-0.07	
6	39.3%	5.89	600	616	0.18		6	57.5%	5.89	600	614	2.09		6	59.0%	8.83	900	910	-0.06	
7	45.9%	6.87	700	745	0.22		7	67.1%	6.87	700	729	2.84		7	68.9%	10.30	1050	1086	-0.02	
8	52.5%	7.85	800	837	0.21		8	76.7%	7.85	800	822	3.32		8	78.7%	11.77	1200	1218	0	
9	59.0%	8.83	900	962	0.24		9	86.3%	8.83	900	915	3.9		9	88.5%	13.24	1350	1358	0.02	
10	65.6%	9.81	1000	1060	0.26		10	95.9%	9.81	1000	1019	4.84		10	98.4%	14.72	1500	1522	0.07	
11	72.1%	10.79	1100	1115	0.27		11	100.0%	10.23	1043	1046	5.12		11	100.0%	14.96	1525	1532	0.1	
12	78.7%	11.77	1200	1250	0.3		12	105.5%	10.79	1100	1116	6		12	108.2%	16.19	1650	1668	0.15	
13	85.2%	12.75	1300	1327	0.31		13	115.1%	11.77	1200	1215	7.13		13	118.0%	17.66	1800	1860	0.23	
14	91.8%	13.73	1400	1417	0.36		14	124.7%	12.75	1300	1304	8.46	Test stopped due to counterweight moving under load application	14	127.9%	19.13	1950	1972	0.29	
15	98.4%	14.72	1500	1517	0.43		15	134.3%	13.73	1400				15	137.7%	20.60	2100	2160	0.36	
16	100.0%	14.96	1525	1530	0.48		16	143.8%	14.72	1500				16	147.5%	22.07	2250	2272	0.46	
Release			0	0	0.18		11	150.0%	15.35	1564				17	157.4%	23.54	2400	2428	0.58	
							Release			0	0	3.15		18	167.2%	25.02	2550	2571	0.7	
														19	177.1%	26.49	2700	2760	0.89	
														20	186.9%	27.96	2850	2863	1.06	
														21	196.7%	29.43	3000	3031	1.25	
														Release			0	0	0.26	

Caracal Engineering - Pile Test Report



Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP02 - Rammed
Testing date:	2022/12/14	Latitude (N/S)	26° 17' 44.9"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 31"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Direct free ramming
Total Pile length (mm)	3000	Rammed	X
Pile Embedded Depth (mm)	1800	Pre-drilled	
Vertical Load Application Height (mm)	1200	Hole Diameter	
Horizontal Load Application Height (mm)	880	Drill Diameter	
Vertical Measurement Height (mm)	100	Drill Depth	
Horizontal Measurement Height (mm)	50	Filling	
Comments:	Soft ground conditions and fast ramming up to 1600mm. Strong conditions and slow ramming during the final 200mm.		

Test Procedure 1						Test Procedure 2						Test Procedure 3								
Vertical test up to 100% of design load						Horizontal test up to 150% of design load applied at 880mm above NGL						Vertical test to failure								
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	163	0.37		1	9.6%	0.98	100				1	9.8%	1.47	150			
2	13.1%	1.96	200	210	1.45		2	19.2%	1.96	200	228	5.86		2	19.7%	2.94	300			
3	19.7%	2.94	300	316	2.16		3	28.8%	2.94	300	324	9.15		3	29.5%	4.41	450			
4	26.2%	3.92	400	421	9.53		4	38.4%	3.92	400	423	13.5		4	39.3%	5.89	600			
5	32.8%	4.91	500	519	23.95	Pile deflection exceeded limit of 25mm prior to next load increment	5	47.9%	4.91	500	515	18.87		5	49.2%	7.36	750			
6	39.3%	5.89	600				6	57.5%	5.89	600	625	26.79		6	59.0%	8.83	900			
7	45.9%	6.87	700				7	67.1%	6.87	700	710	32.21	Deflection limit exceeded	7	68.9%	10.30	1050			
8	52.5%	7.85	800				8	76.7%	7.85	800	812	45.25		8	78.7%	11.77	1200			
9	59.0%	8.83	900				9	86.3%	8.83	900				9	88.5%	13.24	1350			
10	65.6%	9.81	1000				10	95.9%	9.81	1000				10	98.4%	14.72	1500			
11	72.1%	10.79	1100				11	100.0%	10.23	1043				11	100.0%	14.96	1525			
12	78.7%	11.77	1200				12	105.5%	10.79	1100				12	108.2%	16.19	1650			
13	85.2%	12.75	1300				13	115.1%	11.77	1200				13	118.0%	17.66	1800			
14	91.8%	13.73	1400				14	124.7%	12.75	1300				14	127.9%	19.13	1950			
15	98.4%	14.72	1500				15	134.3%	13.73	1400				15	137.7%	20.60	2100			
16	100.0%	14.96	1525				16	143.8%	14.72	1500				16	147.5%	22.07	2250			
Release			0				11	150.0%	15.35	1564				17	157.4%	23.54	2400			
							Release			0	0	33.46		18	167.2%	25.02	2550			
														19	177.1%	26.49	2700			
														20	186.9%	27.96	2850			
														21	196.7%	29.43	3000			
														Release			0			

Caracal Engineering - Pile Test Report



Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP02
Testing date:	Concrete cast 2023/01/11 - Testing 2023/01/24 & 2023/01/25	Latitude (N/S)	26° 17' 44.9"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 31"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Auger hole with concrete filling
Total Pile length (mm)	3000	Rammed	
Pile Embedded Depth (mm)	1500	Pre-drilled	X
Vertical Load Application Height (mm)	1500	Hole Diameter	250
Horizontal Load Application Height (mm)	880	Drill Diameter	250
Vertical Measurement Height (mm)	100	Drill Depth	1500
Horizontal Measurement Height (mm)	50	Filling	Concrete
Comments:			

Test Procedure 1							Test Procedure 2							Test Procedure 3						
Vertical test up to 100% of design load							Horizontal test up to 150% of design load applied at 880mm above NGL							Vertical test to failure						
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	163	0.06		1	9.6%	0.98	100	114	0.29		1	9.8%	1.47	150	164	0.12	
2	13.1%	1.96	200	222	0.07		2	19.2%	1.96	200	214	0.69		2	19.7%	2.94	300	367	0.27	
3	19.7%	2.94	300	313	0.08		3	28.8%	2.94	300	325	1.36		3	29.5%	4.41	450	469	0.34	
4	26.2%	3.92	400	417	0.1		4	38.4%	3.92	400	404	2.04		4	39.3%	5.89	600	642	0.51	
5	32.8%	4.91	500	530	0.13		5	47.9%	4.91	500	521	3.18		5	49.2%	7.36	750	756	0.63	
6	39.3%	5.89	600	630	0.15		6	57.5%	5.89	600	617	4.16		6	59.0%	8.83	900	928	0.86	
7	45.9%	6.87	700	735	0.17		7	67.1%	6.87	700	723	5.42		7	68.9%	10.30	1050	1055	1.06	
8	52.5%	7.85	800	820	0.19		8	76.7%	7.85	800	811	6.29		8	78.7%	11.77	1200	1205	1.27	
9	59.0%	8.83	900	928	0.21		9	86.3%	8.83	900	904	7.75		9	88.5%	13.24	1350	1368	1.5	
10	65.6%	9.81	1000	1027	0.24		10	95.9%	9.81	1000	1011	9.99		10	98.4%	14.72	1500	1531	1.75	
11	72.1%	10.79	1100	1142	0.28		11	100.0%	10.23	1043	1049	10.76		11	100.0%	14.96	1525	1535	1.9	
12	78.7%	11.77	1200	1222	0.31		12	105.5%	10.79	1100	1123	12.26		12	108.2%	16.19	1650	1660	2.09	
13	85.2%	12.75	1300	1318	0.39		13	115.1%	11.77	1200	1216	14.18		13	118.0%	17.66	1800	1841	2.25	
14	91.8%	13.73	1400	1428	0.45		14	124.7%	12.75	1300	1314	16.95	Test stopped due to counterweight moving under load application	14	127.9%	19.13	1950	1978	2.5	
15	98.4%	14.72	1500	1519	0.52		15	134.3%	13.73	1400				15	137.7%	20.60	2100	2116	2.68	
16	100.0%	14.96	1525	1529	0.57		16	143.8%	14.72	1500				16	147.5%	22.07	2250	2272	3.13	
Release			0	0	0.12		11	150.0%	15.35	1564				17	157.4%	23.54	2400	2452	3.42	
							Release			0	0	0.688		18	167.2%	25.02	2550	2531	3.69	
														19	177.1%	26.49	2700	2719	3.96	
														20	186.9%	27.96	2850	2852	4.38	
														21	196.7%	29.43	3000	3014	4.89	
														Release			0	0	2.85	

Caracal Engineering - Pile Test Report



Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP03
Testing date:	Concrete cast 2023/01/11 - Testing 2023/01/24 & 2023/01/25	Latitude (N/S)	26° 17' 44.9"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 33.1"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Auger hole with concrete filling
Total Pile length (mm)	3000	Rammed	
Pile Embedded Depth (mm)	1000	Pre-drilled	X
Vertical Load Application Height (mm)	2000	Hole Diameter	250
Horizontal Load Application Height (mm)	880	Drill Diameter	250
Vertical Measurement Height (mm)	100	Drill Depth	1000
Horizontal Measurement Height (mm)	50	Filling	Concrete
Comments:			

Test Procedure 1							Test Procedure 2							Test Procedure 3						
Vertical test up to 100% of design load							Horizontal test up to 150% of design load applied at 880mm above NGL							Vertical test to failure						
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	118	0.04		1	9.6%	0.98	100	110	0.8		1	9.8%	1.47	150	171	-0.21	
2	13.1%	1.96	200	217	-0.03		2	19.2%	1.96	200	221	1.57		2	19.7%	2.94	300	329	-0.39	
3	19.7%	2.94	300	313	-0.02		3	28.8%	2.94	300	324	2.77		3	29.5%	4.41	450	465	-0.85	
4	26.2%	3.92	400	439	-0.01		4	38.4%	3.92	400	411	4.06		4	39.3%	5.89	600	629	-1.58	
5	32.8%	4.91	500	525	0		5	47.9%	4.91	500	518	5.76		5	49.2%	7.36	750	757	-2.01	
6	39.3%	5.89	600	630	-0.03		6	57.5%	5.89	600	616	7.69		6	59.0%	8.83	900	915	-2.36	
7	45.9%	6.87	700	727	-0.03		7	67.1%	6.87	700	706	8.9		7	68.9%	10.30	1050	1055	-2.52	
8	52.5%	7.85	800	829	0		8	76.7%	7.85	800	822	12.85		8	78.7%	11.77	1200	1229	-2.48	
9	59.0%	8.83	900	912	0.02		9	86.3%	8.83	900	912	15.67		9	88.5%	13.24	1350	1365	-2.31	
10	65.6%	9.81	1000	1056	0.08		10	95.9%	9.81	1000	1010	19.96		10	98.4%	14.72	1500	1521	-2	
11	72.1%	10.79	1100	1132	0.13		11	100.0%	10.23	1043	1047	21.34		11	100.0%	14.96	1525	1526	-1.85	
12	78.7%	11.77	1200	1262	0.2		12	105.5%	10.79	1100	1104	23.79		12	108.2%	16.19	1650	1658	-1.11	
13	85.2%	12.75	1300	1329	0.26		13	115.1%	11.77	1200	1211	31.09		13	118.0%	17.66	1800	1806	0.09	
14	91.8%	13.73	1400	1466	0.34		14	124.7%	12.75	1300	1310	40.96		14	127.9%	19.13	1950			
15	98.4%	14.72	1500	1515	0.42		15	134.3%	13.73	1400				15	137.7%	20.60	2100			
16	100.0%	14.96	1525	1528	0.5		16	143.8%	14.72	1500				16	147.5%	22.07	2250			
Release			0	0	0.13		11	150.0%	15.35	1564				17	157.4%	23.54	2400			
							Release			0	0	28.7		18	167.2%	25.02	2550			
														19	177.1%	26.49	2700			
														20	186.9%	27.96	2850			
														21	196.7%	29.43	3000			
														Release			0			

Caracal Engineering - Pile Test Report



Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP04
Testing date:	Concrete cast 2023/01/11 - Testing 2023/01/24 & 2023/01/25	Latitude (N/S)	26° 17' 44.9"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 35.3"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Auger hole with concrete filling
Total Pile length (mm)	3000	Rammed	
Pile Embedded Depth (mm)	1000	Pre-drilled	X
Vertical Load Application Height (mm)	2000	Hole Diameter	250
Horizontal Load Application Height (mm)	880	Drill Diameter	250
Vertical Measurement Height (mm)	100	Drill Depth	1000
Horizontal Measurement Height (mm)	50	Filling	Concrete
Comments:	Auger to 1000mm with hard rock at base		

Test Procedure 1							Test Procedure 2							Test Procedure 3						
Vertical test up to 100% of design load							Horizontal test up to 150% of design load applied at 880mm above NGL							Vertical test to failure						
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	121	0.06		1	9.6%	0.98	100	105	0.02		1	9.8%	1.47	150	174	-0.04	
2	13.1%	1.96	200	218	0.08		2	19.2%	1.96	200	223	0.61		2	19.7%	2.94	300	310	-0.06	
3	19.7%	2.94	300	316	0.1		3	28.8%	2.94	300	322	1.32		3	29.5%	4.41	450	475	-0.06	
4	26.2%	3.92	400	414	0.12		4	38.4%	3.92	400	419	2.03		4	39.3%	5.89	600	632	-0.04	
5	32.8%	4.91	500	514	0.22		5	47.9%	4.91	500	330	2.97		5	49.2%	7.36	750	765	-0.02	
6	39.3%	5.89	600	610	0.29		6	57.5%	5.89	600	617	3.79		6	59.0%	8.83	900	944	0.03	
7	45.9%	6.87	700	711	0.36		7	67.1%	6.87	700	718	4.92		7	68.9%	10.30	1050	1067	0.06	
8	52.5%	7.85	800	817	0.3		8	76.7%	7.85	800	819	6.24		8	78.7%	11.77	1200	1224	0.14	
9	59.0%	8.83	900	912	0.56		9	86.3%	8.83	900	917	8.46		9	88.5%	13.24	1350	1365	0.22	
10	65.6%	9.81	1000	1018	0.72		10	95.9%	9.81	1000	1017	10.95		10	98.4%	14.72	1500	1506	0.29	
11	72.1%	10.79	1100	1115	0.84		11	100.0%	10.23	1043	1044	11.36		11	100.0%	14.96	1525	1530	0.42	
12	78.7%	11.77	1200	1216	0.95		12	105.5%	10.79	1100	1123	12.72		12	108.2%	16.19	1650	1689	0.46	
13	85.2%	12.75	1300	1308	1.08		13	115.1%	11.77	1200	1211	14.5		13	118.0%	17.66	1800	1831	0.53	
14	91.8%	13.73	1400	1416	1.21		14	124.7%	12.75	1300	1314	16.61		14	127.9%	19.13	1950	1960	0.67	
15	98.4%	14.72	1500	1510	1.34		15	134.3%	13.73	1400				15	137.7%	20.60	2100	2119	0.75	
16	100.0%	14.96	1525	1525	1.51		16	143.8%	14.72	1500				16	147.5%	22.07	2250	2270	0.88	
Release			0	0	0.28		11	150.0%	15.35	1564				17	157.4%	23.54	2400	2428	1.04	
							Release			0	0	7.47		18	167.2%	25.02	2550	2551	1.17	
														19	177.1%	26.49	2700	2731	1.32	
														20	186.9%	27.96	2850	2855	1.45	
														21	196.7%	29.43	3000	3020	1.6	
														Release			0	0	-0.37	

Caracal Engineering - Pile Test Report



Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP05
Testing date:	Concrete cast 2023/01/11 - Testing 2023/01/24 & 2023/01/25	Latitude (N/S)	26° 17' 46"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 28.8"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Auger hole with concrete filling
Total Pile length (mm)	3000	Rammed	
Pile Embedded Depth (mm)	1250	Pre-drilled	X
Vertical Load Application Height (mm)	1750	Hole Diameter	250
Horizontal Load Application Height (mm)	880	Drill Diameter	250
Vertical Measurement Height (mm)	100	Drill Depth	1250
Horizontal Measurement Height (mm)	50	Filling	Concrete
Comments:	Test procedure 3 not conducted as post was severely twisted after the lateral test due to test apparatus positioned slightly off centre when testing this adding a torsion to the post		

Test Procedure 1						Test Procedure 2						Test Procedure 3								
Vertical test up to 100% of design load						Horizontal test up to 150% of design load applied at 880mm above NGL						Vertical test to failure								
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	120	0.05		1	9.6%	0.98	100	118	0.11		1	9.8%	1.47	150			
2	13.1%	1.96	200	233	0.07		2	19.2%	1.96	200	208	0.36		2	19.7%	2.94	300			
3	19.7%	2.94	300	321	0.1		3	28.8%	2.94	300	314	0.77		3	29.5%	4.41	450			
4	26.2%	3.92	400	423	0.13		4	38.4%	3.92	400	421	1.56		4	39.3%	5.89	600			
5	32.8%	4.91	500	550	0.16		5	47.9%	4.91	500	509	2.36		5	49.2%	7.36	750			
6	39.3%	5.89	600	641	0.18		6	57.5%	5.89	600	610	3.24		6	59.0%	8.83	900			
7	45.9%	6.87	700	751	0.21		7	67.1%	6.87	700	719	4.48		7	68.9%	10.30	1050			
8	52.5%	7.85	800	836	0.23		8	76.7%	7.85	800	818	5.72		8	78.7%	11.77	1200			
9	59.0%	8.83	900	940	0.26		9	86.3%	8.83	900	923	6.99		9	88.5%	13.24	1350			
10	65.6%	9.81	1000	1083	0.31		10	95.9%	9.81	1000	1026	8.37		10	98.4%	14.72	1500			
11	72.1%	10.79	1100	1145	0.34		11	100.0%	10.23	1043	1047	8.76		11	100.0%	14.96	1525			
12	78.7%	11.77	1200	1239	0.4		12	105.5%	10.79	1100	1111	9.66		12	108.2%	16.19	1650			
13	85.2%	12.75	1300	1305	0.46		13	115.1%	11.77	1200	1212	11.6		13	118.0%	17.66	1800			
14	91.8%	13.73	1400	1411	0.54		14	124.7%	12.75	1300				14	127.9%	19.13	1950			
15	98.4%	14.72	1500	1518	0.66		15	134.3%	13.73	1400				15	137.7%	20.60	2100			
16	100.0%	14.96	1525	1529	0.75		16	143.8%	14.72	1500				16	147.5%	22.07	2250			
Release			0	0	0.34		11	150.0%	15.35	1564				17	157.4%	23.54	2400			
							Release			0	0	11.6		18	167.2%	25.02	2550			
														19	177.1%	26.49	2700			
														20	186.9%	27.96	2850			
														21	196.7%	29.43	3000			
														Release			0			

Caracal Engineering - Pile Test Report



Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP08 - Rammed
Testing date:	2022/12/14	Latitude (N/S)	26° 17' 46"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 35.3"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Direct free ramming
Total Pile length (mm)	3000	Rammed	X
Pile Embedded Depth (mm)	1800	Pre-drilled	
Vertical Load Application Height (mm)	1200	Hole Diameter	
Horizontal Load Application Height (mm)	880	Drill Diameter	
Vertical Measurement Height (mm)	100	Drill Depth	
Horizontal Measurement Height (mm)	50	Filling	
Comments:	Soft ramming conditions experienced to the full depth of 1.8m		

Test Procedure 1						Test Procedure 2						Test Procedure 3								
Vertical test up to 100% of design load						Horizontal test up to 150% of design load applied at 880mm above NGL						Vertical test to failure								
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	125	0.09		1	9.6%	0.98	100	123	2.09		1	9.8%	1.47	150			
2	13.1%	1.96	200	235	0.16		2	19.2%	1.96	200	210	3.59		2	19.7%	2.94	300			
3	19.7%	2.94	300	316	0.22		3	28.8%	2.94	300	306	5.16		3	29.5%	4.41	450			
4	26.2%	3.92	400	432	1.08		4	38.4%	3.92	400	459	6.52		4	39.3%	5.89	600			
5	32.8%	4.91	500	536	4.08		5	47.9%	4.91	500	519	7.56		5	49.2%	7.36	750			
6	39.3%	5.89	600	601	6.9		6	57.5%	5.89	600	633	9.62		6	59.0%	8.83	900			
7	45.9%	6.87	700	701	24.04	Pile deflection exceeded limit of 25mm prior to next load increment	7	67.1%	6.87	700	720	12.15		7	68.9%	10.30	1050			
8	52.5%	7.85	800				8	76.7%	7.85	800	803	14.24		8	78.7%	11.77	1200			
9	59.0%	8.83	900				9	86.3%	8.83	900	906	18.16		9	88.5%	13.24	1350			
10	65.6%	9.81	1000				10	95.9%	9.81	1000	1002	23.53		10	98.4%	14.72	1500			
11	72.1%	10.79	1100				11	100.0%	10.23	1043	1050	26.4		11	100.0%	14.96	1525			
12	78.7%	11.77	1200				12	105.5%	10.79	1100	1108	29.92		12	108.2%	16.19	1650			
13	85.2%	12.75	1300				13	115.1%	11.77	1200	1203	39.25		13	118.0%	17.66	1800			
14	91.8%	13.73	1400				14	124.7%	12.75	1300				14	127.9%	19.13	1950			
15	98.4%	14.72	1500				15	134.3%	13.73	1400				15	137.7%	20.60	2100			
16	100.0%	14.96	1525				16	143.8%	14.72	1500				16	147.5%	22.07	2250			
Release			0				11	150.0%	15.35	1564				17	157.4%	23.54	2400			
							Release			0	0	23.54		18	167.2%	25.02	2550			
														19	177.1%	26.49	2700			
														20	186.9%	27.96	2850			
														21	196.7%	29.43	3000			
														Release			0			

Caracal Engineering - Pile Test Report



Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP08
Testing date:	Concrete cast 2023/01/11 - Testing 2023/01/24 & 2023/01/25	Latitude (N/S)	26° 17' 46"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 35.3"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Auger hole with concrete filling
Total Pile length (mm)	3000	Rammed	
Pile Embedded Depth (mm)	1000	Pre-drilled	X
Vertical Load Application Height (mm)	2000	Hole Diameter	250
Horizontal Load Application Height (mm)	880	Drill Diameter	250
Vertical Measurement Height (mm)	100	Drill Depth	1000
Horizontal Measurement Height (mm)	50	Filling	Concrete
Comments:	Auger to 1000mm. Rock below 1000mm and could not auger further		

Test Procedure 1						Test Procedure 2						Test Procedure 3								
Vertical test up to 100% of design load						Horizontal test up to 150% of design load applied at 880mm above NGL						Vertical test to failure								
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	119	0.04		1	9.6%	0.98	100	125	0.4		1	9.8%	1.47	150	169	0.1	
2	13.1%	1.96	200	218	0.06		2	19.2%	1.96	200	227	0.82		2	19.7%	2.94	300	310	0.15	
3	19.7%	2.94	300	308	0.07		3	28.8%	2.94	300	330	1.46		3	29.5%	4.41	450	464	0.22	
4	26.2%	3.92	400	416	0.08		4	38.4%	3.92	400	412	2.02		4	39.3%	5.89	600	621	0.3	
5	32.8%	4.91	500	520	0.09		5	47.9%	4.91	500	524	2.81		5	49.2%	7.36	750	772	0.38	
6	39.3%	5.89	600	625	0.1		6	57.5%	5.89	600	615	3.63		6	59.0%	8.83	900	920	0.44	
7	45.9%	6.87	700	712	0.11		7	67.1%	6.87	700	727	4.77		7	68.9%	10.30	1050	1055	0.49	
8	52.5%	7.85	800	845	0.18		8	76.7%	7.85	800	824	5.9		8	78.7%	11.77	1200	1229	0.58	
9	59.0%	8.83	900	938	0.2		9	86.3%	8.83	900	921	7.17		9	88.5%	13.24	1350	1368	0.65	
10	65.6%	9.81	1000	1024	0.24		10	95.9%	9.81	1000	1017	8.75		10	98.4%	14.72	1500	1532	0.72	
11	72.1%	10.79	1100	1130	0.3		11	100.0%	10.23	1043				11	100.0%	14.96	1525	1532	0.77	
12	78.7%	11.77	1200	1255	0.37		12	105.5%	10.79	1100	1145	13.4		12	108.2%	16.19	1650	1650	0.85	
13	85.2%	12.75	1300	1365	0.46		13	115.1%	11.77	1200	1224	13.98		13	118.0%	17.66	1800	1842	0.85	
14	91.8%	13.73	1400	1455	0.52		14	124.7%	12.75	1300	1319	15.74		14	127.9%	19.13	1950	1960	0.93	
15	98.4%	14.72	1500	1551	0.58		15	134.3%	13.73	1400				15	137.7%	20.60	2100	2140	1.09	
16	100.0%	14.96	1525	1558	0.6		16	143.8%	14.72	1500				16	147.5%	22.07	2250	2257	1.2	
Release			0	0	0.2		11	150.0%	15.35	1564				17	157.4%	23.54	2400	2432	1.45	
							Release			0	0	7.15		18	167.2%	25.02	2550	2561	1.78	
														19	177.1%	26.49	2700	2719	2.15	
														20	186.9%	27.96	2850	2864	2.4	
														21	196.7%	29.43	3000	3060	2.99	
														Release			0	0	1.54	

Caracal Engineering - Pile Test Report



Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP09
Testing date:	Concrete cast 2023/01/11 - Testing 2023/01/24 & 2023/01/25	Latitude (N/S)	26° 17' 47.4"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 28.8"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Auger hole with concrete filling
Total Pile length (mm)	3000	Rammed	
Pile Embedded Depth (mm)	1500	Pre-drilled	X
Vertical Load Application Height (mm)	1500	Hole Diameter	250
Horizontal Load Application Height (mm)	880	Drill Diameter	250
Vertical Measurement Height (mm)	100	Drill Depth	1500
Horizontal Measurement Height (mm)	50	Filling	Concrete
Comments:			

Test Procedure 1							Test Procedure 2							Test Procedure 3						
Vertical test up to 100% of design load							Horizontal test up to 150% of design load applied at 880mm above NGL							Vertical test to failure						
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	137	0.09		1	9.6%	0.98	100	128	0.28		1	9.8%	1.47	150	155	-0.01	
2	13.1%	1.96	200	248	0.12		2	19.2%	1.96	200	242	0.68		2	19.7%	2.94	300	360	0.01	
3	19.7%	2.94	300	343	0.15		3	28.8%	2.94	300	305	0.99		3	29.5%	4.41	450	481	-0.02	
4	26.2%	3.92	400	417	0.18		4	38.4%	3.92	400	426	1.81		4	39.3%	5.89	600	638	-0.01	
5	32.8%	4.91	500	554	0.25		5	47.9%	4.91	500	526	2.78		5	49.2%	7.36	750	785	-0.04	
6	39.3%	5.89	600	627	0.28		6	57.5%	5.89	600	632	3.73		6	59.0%	8.83	900	980	-0.02	
7	45.9%	6.87	700	742	0.31		7	67.1%	6.87	700	719	4.6		7	68.9%	10.30	1050	1058	0.01	
8	52.5%	7.85	800	822	0.34		8	76.7%	7.85	800	833	5.66		8	78.7%	11.77	1200	1221	0.03	
9	59.0%	8.83	900	927	0.37		9	86.3%	8.83	900	930	6.72		9	88.5%	13.24	1350	1350	0.09	
10	65.6%	9.81	1000	1013	0.39		10	95.9%	9.81	1000	1015	7.69		10	98.4%	14.72	1500	1511	0.14	
11	72.1%	10.79	1100	1173	0.44		11	100.0%	10.23	1043	1044	8.32		11	100.0%	14.96	1525	1538	0.18	
12	78.7%	11.77	1200	1242	0.46		12	105.5%	10.79	1100	1125	9.32		12	108.2%	16.19	1650	1666	0.21	
13	85.2%	12.75	1300	1327	0.49		13	115.1%	11.77	1200	1214	11.01		13	118.0%	17.66	1800	1845	0.29	
14	91.8%	13.73	1400	1465	0.55		14	124.7%	12.75	1300				14	127.9%	19.13	1950	1964	0.36	
15	98.4%	14.72	1500	1517	0.59		15	134.3%	13.73	1400				15	137.7%	20.60	2100	2117	0.42	
16	100.0%	14.96	1525	1529	0.6		16	143.8%	14.72	1500				16	147.5%	22.07	2250	2265	0.5	
Release			0	0	0.17		11	150.0%	15.35	1564				17	157.4%	23.54	2400	2412	0.57	
							Release			0	0	8.06		18	167.2%	25.02	2550	2585	0.69	
														19	177.1%	26.49	2700	2787	0.8	
														20	186.9%	27.96	2850			
														21	196.7%	29.43	3000	3025	1.13	
														Release			0	0	0.3	

Caracal Engineering - Pile Test Report



Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP10
Testing date:	Concrete cast 2023/01/11 - Testing 2023/01/24 & 2023/01/25	Latitude (N/S)	26° 17' 47.4"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 31"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Auger hole with concrete filling
Total Pile length (mm)	3000	Rammed	
Pile Embedded Depth (mm)	1500	Pre-drilled	X
Vertical Load Application Height (mm)	1500	Hole Diameter	250
Horizontal Load Application Height (mm)	880	Drill Diameter	250
Vertical Measurement Height (mm)	100	Drill Depth	1500
Horizontal Measurement Height (mm)	50	Filling	Concrete

Comments: Test procedure 3 not conducted as post was severely twisted after the lateral test due to test apparatus positioned slightly off centre when testing this adding a torsion to the post

Test Procedure 1						Test Procedure 2						Test Procedure 3								
Vertical test up to 100% of design load						Horizontal test up to 150% of design load applied at 880mm above NGL						Vertical test to failure								
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	111	0.05		1	9.6%	0.98	100	116	0.24		1	9.8%	1.47	150			
2	13.1%	1.96	200	252	0.12		2	19.2%	1.96	200	227	0.8		2	19.7%	2.94	300			
3	19.7%	2.94	300	365	0.17		3	28.8%	2.94	300	326	1.45		3	29.5%	4.41	450			
4	26.2%	3.92	400	456	0.2		4	38.4%	3.92	400	428	2.36		4	39.3%	5.89	600			
5	32.8%	4.91	500	538	0.24		5	47.9%	4.91	500	532	3.28		5	49.2%	7.36	750			
6	39.3%	5.89	600	630	0.29		6	57.5%	5.89	600	624	4.08		6	59.0%	8.83	900			
7	45.9%	6.87	700	746	0.34		7	67.1%	6.87	700	710	4.96		7	68.9%	10.30	1050			
8	52.5%	7.85	800	865	0.39		8	76.7%	7.85	800	817	6.46		8	78.7%	11.77	1200			
9	59.0%	8.83	900	939	0.43		9	86.3%	8.83	900	931	8.21		9	88.5%	13.24	1350			
10	65.6%	9.81	1000	1056	0.46		10	95.9%	9.81	1000	1013	9.4		10	98.4%	14.72	1500			
11	72.1%	10.79	1100	1115	0.49		11	100.0%	10.23	1043	1048	10.24		11	100.0%	14.96	1525			
12	78.7%	11.77	1200	1234	0.54		12	105.5%	10.79	1100	1135	11.11		12	108.2%	16.19	1650			
13	85.2%	12.75	1300	1366	0.6		13	115.1%	11.77	1200	1212	12.3		13	118.0%	17.66	1800			
14	91.8%	13.73	1400	1420	0.65		14	124.7%	12.75	1300	1311	13.98		14	127.9%	19.13	1950			
15	98.4%	14.72	1500	1518	0.71		15	134.3%	13.73	1400				15	137.7%	20.60	2100			
16	100.0%	14.96	1525	1526	0.74		16	143.8%	14.72	1500				16	147.5%	22.07	2250			
Release			0	0	0.13		11	150.0%	15.35	1564				17	157.4%	23.54	2400			
							Release			0	0	4.61		18	167.2%	25.02	2550			
														19	177.1%	26.49	2700			
														20	186.9%	27.96	2850			
														21	196.7%	29.43	3000			
														Release			0			

Caracal Engineering - Pile Test Report



Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP11 - Rammed
Testing date:	2022/12/14	Latitude (N/S)	26° 17' 47.4"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 33.1"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Direct free ramming
Total Pile length (mm)	3000	Rammed	X
Pile Embedded Depth (mm)	1800	Pre-drilled	
Vertical Load Application Height (mm)	1200	Hole Diameter	
Horizontal Load Application Height (mm)	880	Drill Diameter	
Vertical Measurement Height (mm)	100	Drill Depth	
Horizontal Measurement Height (mm)	50	Filling	
Comments:	Soft ramming conditions experienced to the full depth of 1.8m		

Test Procedure 1						Test Procedure 2						Test Procedure 3								
Vertical test up to 100% of design load						Horizontal test up to 150% of design load applied at 880mm above NGL						Vertical test to failure								
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	111	0.14		1	9.6%	0.98	100	124	3.06		1	9.8%	1.47	150			
2	13.1%	1.96	200	242	0.99		2	19.2%	1.96	200	225	5.82		2	19.7%	2.94	300			
3	19.7%	2.94	300	312	2.84		3	28.8%	2.94	300	331	10.34		3	29.5%	4.41	450			
4	26.2%	3.92	400	445	16.2	Pile deflection exceeded limit of 25mm prior to next load increment	4	38.4%	3.92	400	423	14.56		4	39.3%	5.89	600			
5	32.8%	4.91	500				5	47.9%	4.91	500	514	19.83		5	49.2%	7.36	750			
6	39.3%	5.89	600				6	57.5%	5.89	600	629	26.88		6	59.0%	8.83	900			
7	45.9%	6.87	700				7	67.1%	6.87	700	718	33.95		7	68.9%	10.30	1050			
8	52.5%	7.85	800				8	76.7%	7.85	800				8	78.7%	11.77	1200			
9	59.0%	8.83	900				9	86.3%	8.83	900				9	88.5%	13.24	1350			
10	65.6%	9.81	1000				10	95.9%	9.81	1000				10	98.4%	14.72	1500			
11	72.1%	10.79	1100				11	100.0%	10.23	1043				11	100.0%	14.96	1525			
12	78.7%	11.77	1200				12	105.5%	10.79	1100				12	108.2%	16.19	1650			
13	85.2%	12.75	1300				13	115.1%	11.77	1200				13	118.0%	17.66	1800			
14	91.8%	13.73	1400				14	124.7%	12.75	1300				14	127.9%	19.13	1950			
15	98.4%	14.72	1500				15	134.3%	13.73	1400				15	137.7%	20.60	2100			
16	100.0%	14.96	1525				16	143.8%	14.72	1500				16	147.5%	22.07	2250			
Release			0				11	150.0%	15.35	1564				17	157.4%	23.54	2400			
							Release			0	0	24.21		18	167.2%	25.02	2550			
														19	177.1%	26.49	2700			
														20	186.9%	27.96	2850			
														21	196.7%	29.43	3000			
														Release			0			

Caracal Engineering - Pile Test Report



Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP12 - Rammed
Testing date:	2022/12/14	Latitude (N/S)	26° 17' 47.4"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 35.3"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Direct free ramming
Total Pile length (mm)	3000	Rammed	X
Pile Embedded Depth (mm)	1600	Pre-drilled	
Vertical Load Application Height (mm)	1400	Hole Diameter	
Horizontal Load Application Height (mm)	880	Drill Diameter	
Vertical Measurement Height (mm)	100	Drill Depth	
Horizontal Measurement Height (mm)	50	Filling	
Comments:	Foundation post severely out of plumb after ramming completed		

Test Procedure 1						Test Procedure 2						Test Procedure 3								
Vertical test up to 100% of design load						Horizontal test up to 150% of design load applied at 880mm above NGL						Vertical test to failure								
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	121	0		1	9.6%	0.98	100	130	4.07		1	9.8%	1.47	150			
2	13.1%	1.96	200	219	0.03		2	19.2%	1.96	200	231	6.98		2	19.7%	2.94	300			
3	19.7%	2.94	300	305	0.01	Foundation post straightening under load application	3	28.8%	2.94	300	315	9.91		3	29.5%	4.41	450			
4	26.2%	3.92	400	415	0.97		4	38.4%	3.92	400	415	12.79		4	39.3%	5.89	600			
5	32.8%	4.91	500	538	1.5		5	47.9%	4.91	500	526	16.1		5	49.2%	7.36	750			
6	39.3%	5.89	600	614	2.99		6	57.5%	5.89	600	620	19.06		6	59.0%	8.83	900			
7	45.9%	6.87	700	716	4.64		7	67.1%	6.87	700	714	20.23		7	68.9%	10.30	1050			
8	52.5%	7.85	800	807	7.91		8	76.7%	7.85	800	814	26.98		8	78.7%	11.77	1200			
9	59.0%	8.83	900	922	12.16		9	86.3%	8.83	900	913	29.66		9	88.5%	13.24	1350			
10	65.6%	9.81	1000	1019	16.05		10	95.9%	9.81	1000	1026	35.93		10	98.4%	14.72	1500			
11	72.1%	10.79	1100	1117	24.73		11	100.0%	10.23	1043				11	100.0%	14.96	1525			
12	78.7%	11.77	1200				12	105.5%	10.79	1100				12	108.2%	16.19	1650			
13	85.2%	12.75	1300				13	115.1%	11.77	1200				13	118.0%	17.66	1800			
14	91.8%	13.73	1400				14	124.7%	12.75	1300				14	127.9%	19.13	1950			
15	98.4%	14.72	1500				15	134.3%	13.73	1400				15	137.7%	20.60	2100			
16	100.0%	14.96	1525				16	143.8%	14.72	1500				16	147.5%	22.07	2250			
Release			0				11	150.0%	15.35	1564				17	157.4%	23.54	2400			
							Release			0	0	23.5		18	167.2%	25.02	2550			
														19	177.1%	26.49	2700			
														20	186.9%	27.96	2850			
														21	196.7%	29.43	3000			
														Release			0			

Caracal Engineering - Pile Test Report



Site:	GRM-212-Soventix - Element 6 Phase 2	Pile Identification	TP12
Testing date:	Concrete cast 2023/01/11 - Testing 2023/01/24 & 2023/01/25	Latitude (N/S)	26° 17' 47.4"S
Tested by and signature:	Hendri Visser	Longitude (E/W)	28° 27' 35.3"E
Pile Profile	Lip C Channel 125x50x20x3mm	Founding Type	Auger hole with concrete filling
Total Pile length (mm)	3000	Rammed	
Pile Embedded Depth (mm)	1250	Pre-drilled	X
Vertical Load Application Height (mm)	1750	Hole Diameter	250
Horizontal Load Application Height (mm)	880	Drill Diameter	250
Vertical Measurement Height (mm)	100	Drill Depth	1250
Horizontal Measurement Height (mm)	50	Filling	Concrete
Comments:	Augered hole to a depth of 1250mm with some rock		

Test Procedure 1						Test Procedure 2						Test Procedure 3								
Vertical test up to 100% of design load						Horizontal test up to 150% of design load applied at 880mm above NGL						Vertical test to failure								
Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Horizontal Displacement (mm)	Comments	Load step	Design Load %	kN	kg	Actual Load cell Reading (kg)	Vertical Displacement (mm)	Comments
1	6.6%	0.98	100	121	0.02		1	9.6%	0.98	100	119	0.4		1	9.8%	1.47	150	152	-0.04	
2	13.1%	1.96	200	229	0.03		2	19.2%	1.96	200	206	0.81		2	19.7%	2.94	300	340	-0.11	
3	19.7%	2.94	300	311	0.04		3	28.8%	2.94	300	311	1.38		3	29.5%	4.41	450	455	-0.14	
4	26.2%	3.92	400	417	0.03		4	38.4%	3.92	400	423	2.14		4	39.3%	5.89	600	640	-0.18	
5	32.8%	4.91	500	515	0.03		5	47.9%	4.91	500	514	2.89		5	49.2%	7.36	750	760	-0.17	
6	39.3%	5.89	600	655	0.04		6	57.5%	5.89	600	627	4.19		6	59.0%	8.83	900	916	-0.17	
7	45.9%	6.87	700	710	0.04		7	67.1%	6.87	700	716	5.28		7	68.9%	10.30	1050	1056	-0.17	
8	52.5%	7.85	800	824	0.03		8	76.7%	7.85	800	816	6.74		8	78.7%	11.77	1200	1236	-0.18	
9	59.0%	8.83	900	964	0.01		9	86.3%	8.83	900	920	8.21		9	88.5%	13.24	1350	1358	-0.17	
10	65.6%	9.81	1000	1093	0.09		10	95.9%	9.81	1000	1013	9.93		10	98.4%	14.72	1500	1566	-0.1	
11	72.1%	10.79	1100	1143	0.14		11	100.0%	10.23	1043	1041	11.38		11	100.0%	14.96	1525	1532	-0.1	
12	78.7%	11.77	1200	1264	0.2		12	105.5%	10.79	1100	1116	12.55		12	108.2%	16.19	1650	1668	-0.04	
13	85.2%	12.75	1300	1362	0.26		13	115.1%	11.77	1200	1214	15.35		13	118.0%	17.66	1800	1829	-0.03	
14	91.8%	13.73	1400	1437	0.3		14	124.7%	12.75	1300	1315	21.33		14	127.9%	19.13	1950	1953	0.04	
15	98.4%	14.72	1500	1500	0.36		15	134.3%	13.73	1400				15	137.7%	20.60	2100	2152	0.23	
16	100.0%	14.96	1525	1537	0.45		16	143.8%	14.72	1500				16	147.5%	22.07	2250	2261	0.42	
Release			0	0	0.24		11	150.0%	15.35	1564				17	157.4%	23.54	2400	2445	0.69	
							Release			0	0	13.23		18	167.2%	25.02	2550	2579	1.06	
														19	177.1%	26.49	2700	2725	1.39	
														20	186.9%	27.96	2850	2874	2.21	
														21	196.7%	29.43	3000			
														Release			0			



Soventix – Element 6 – Phase 2

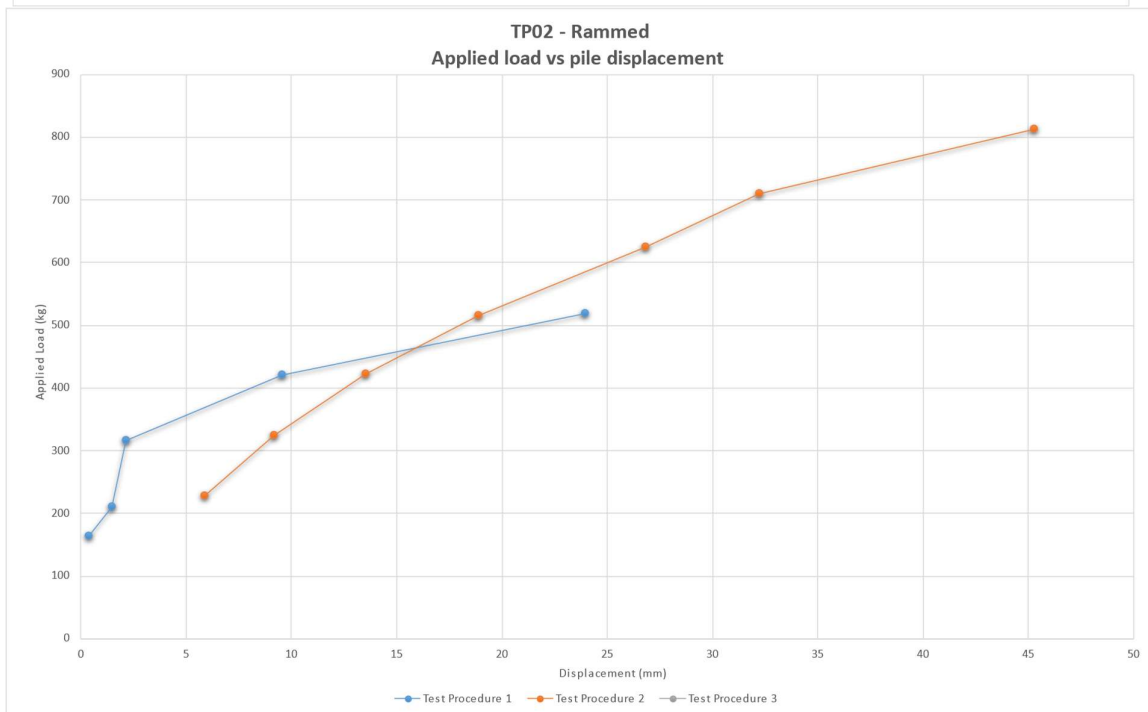
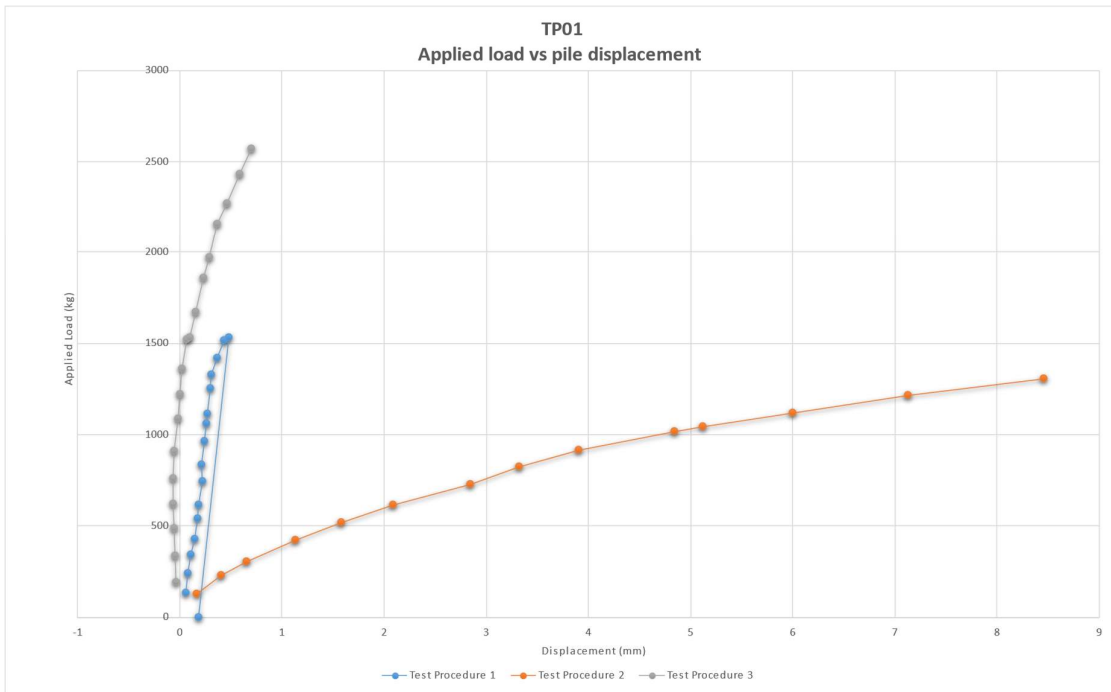
Pile Testing Report

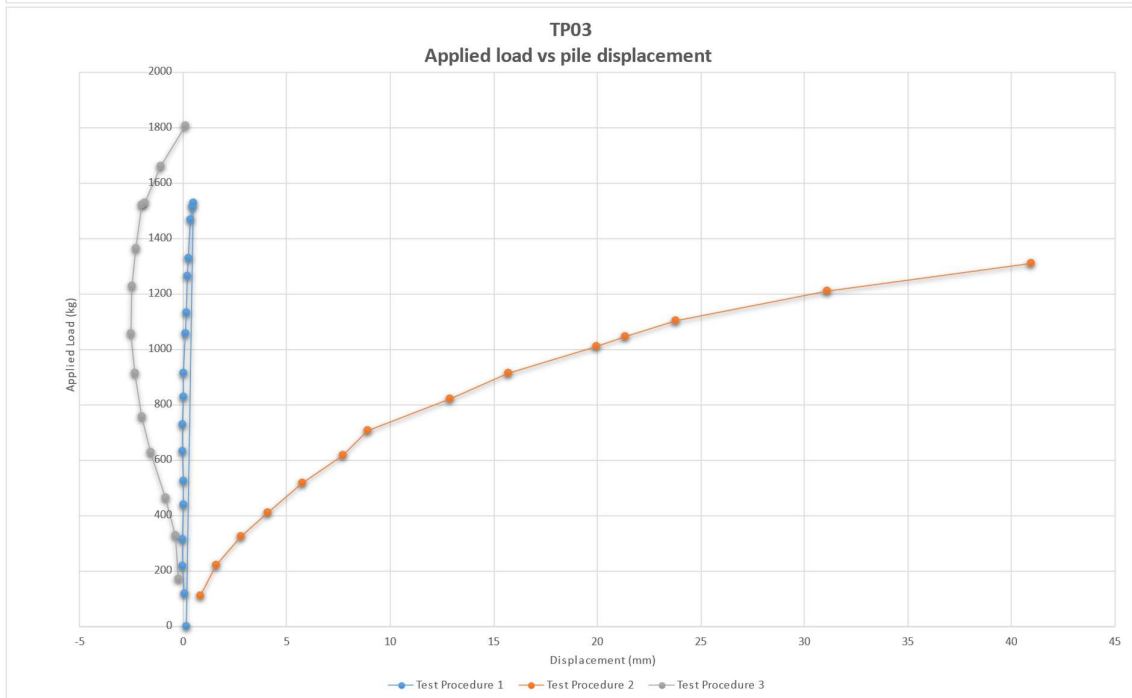
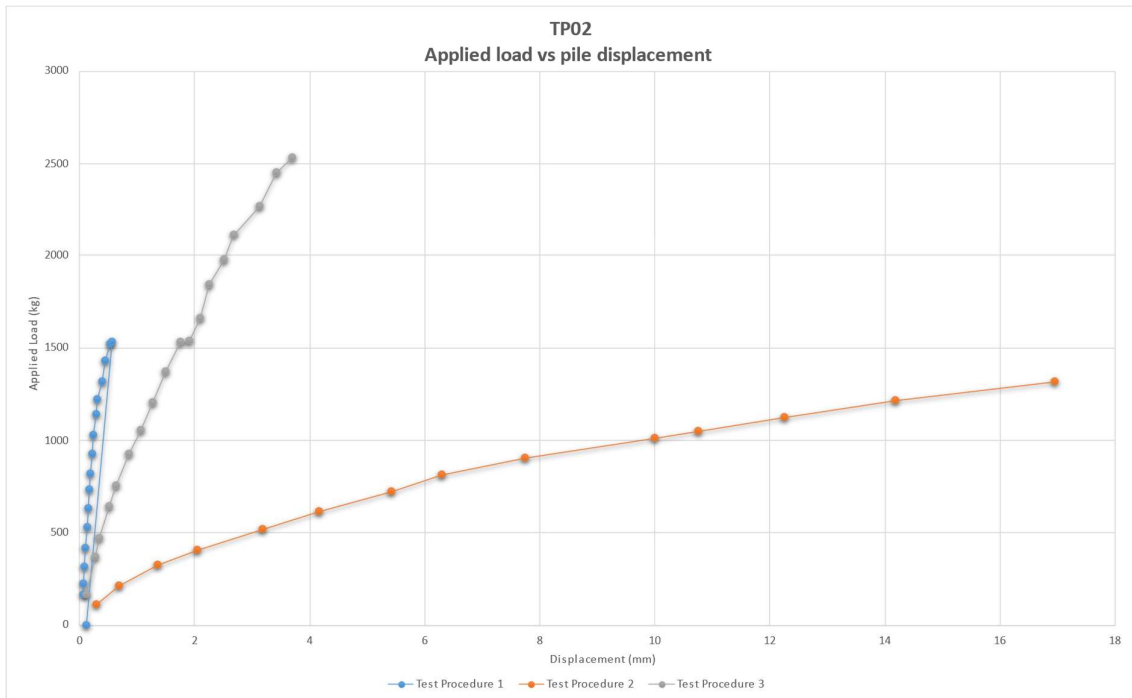
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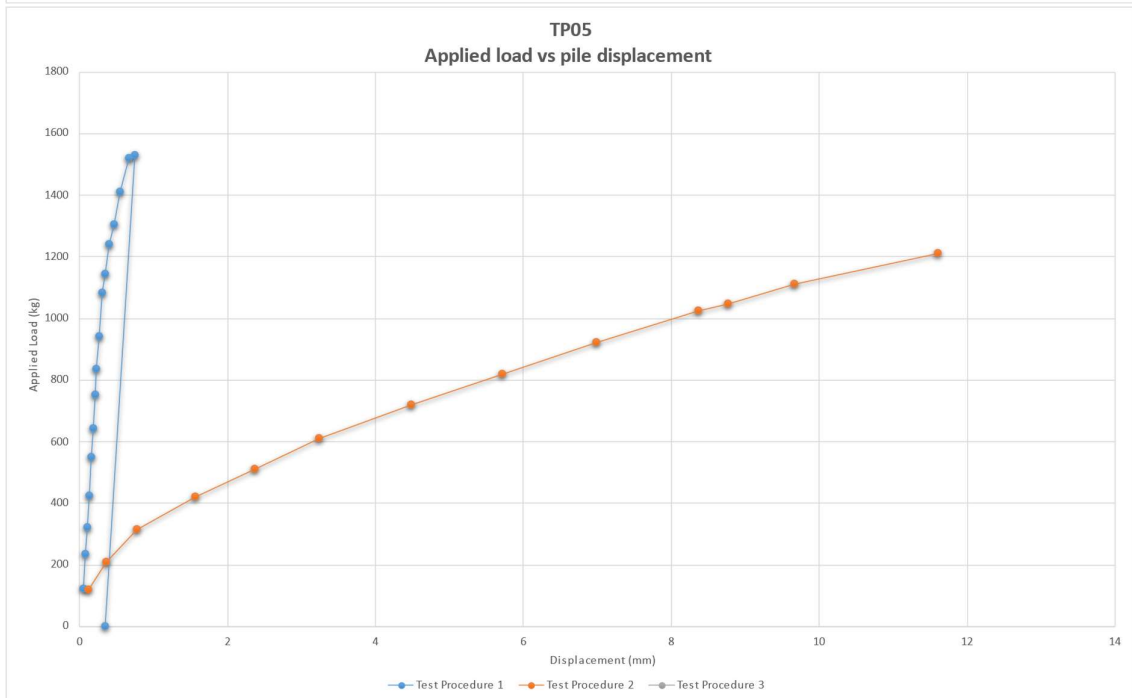
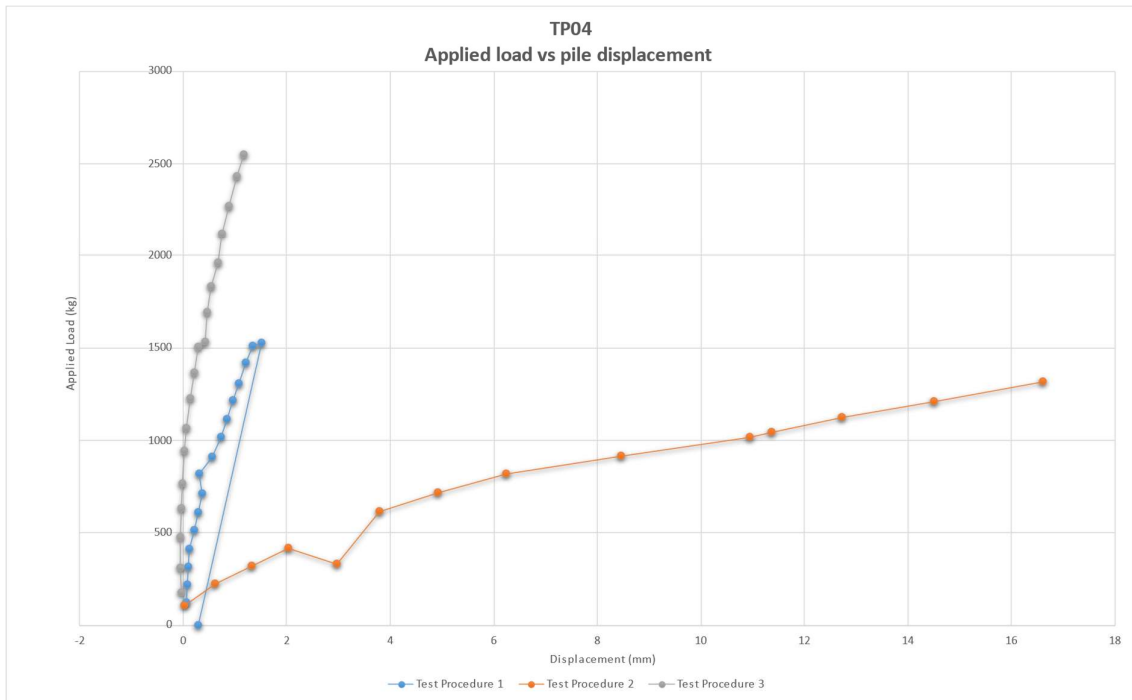
Rev. 00

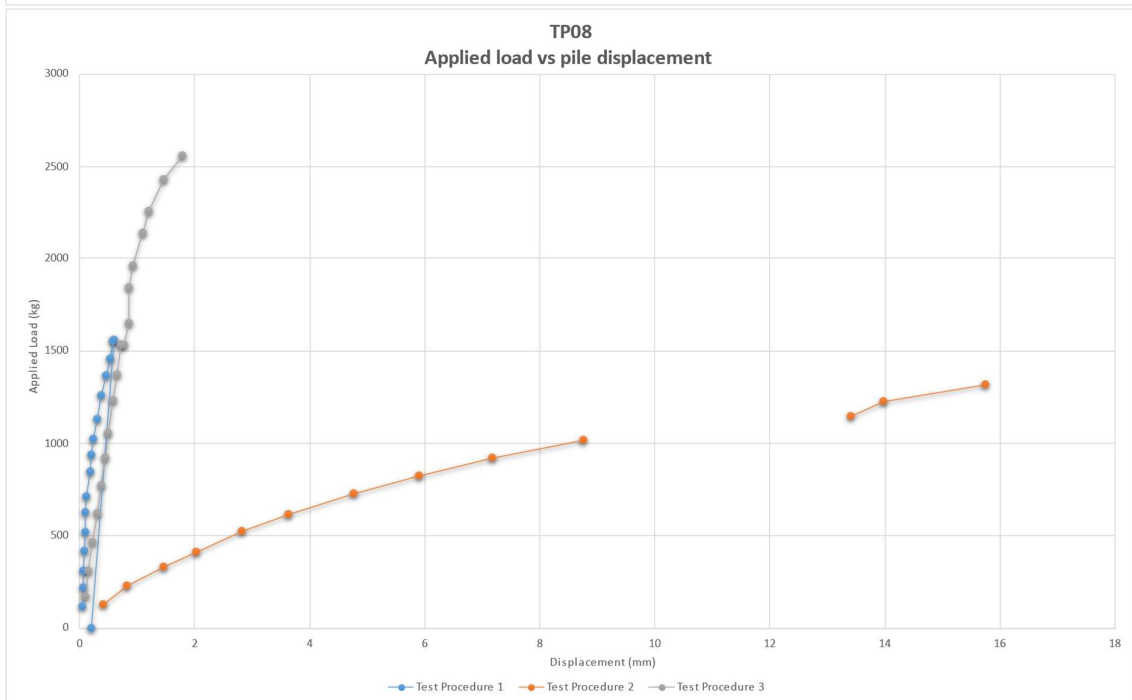
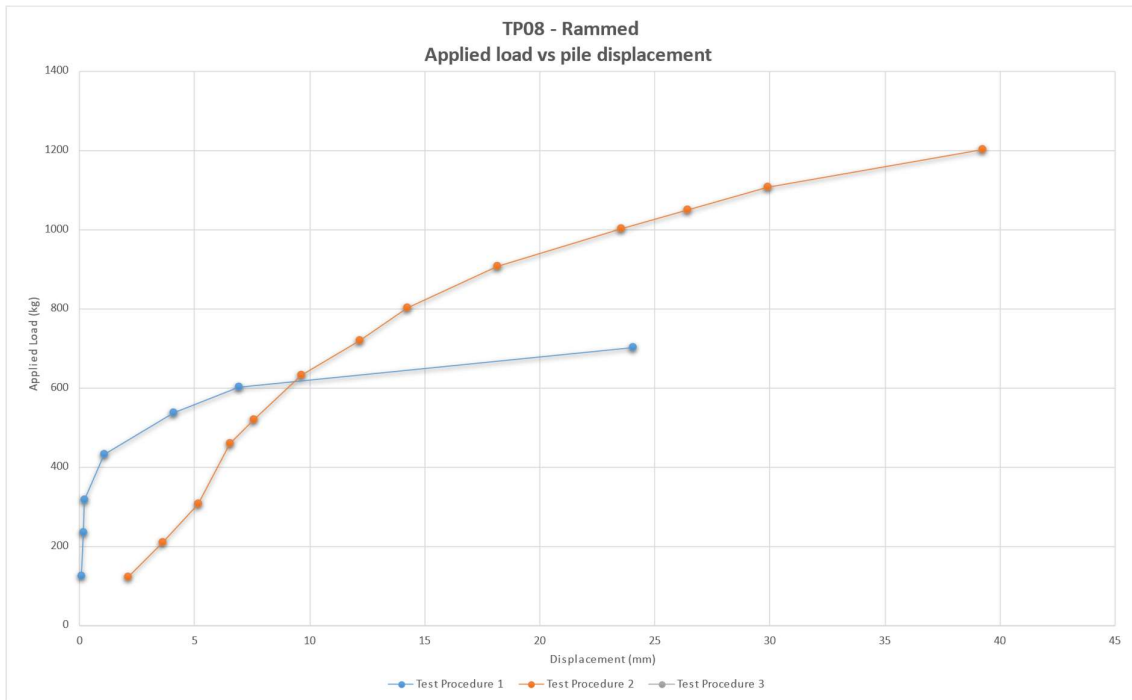
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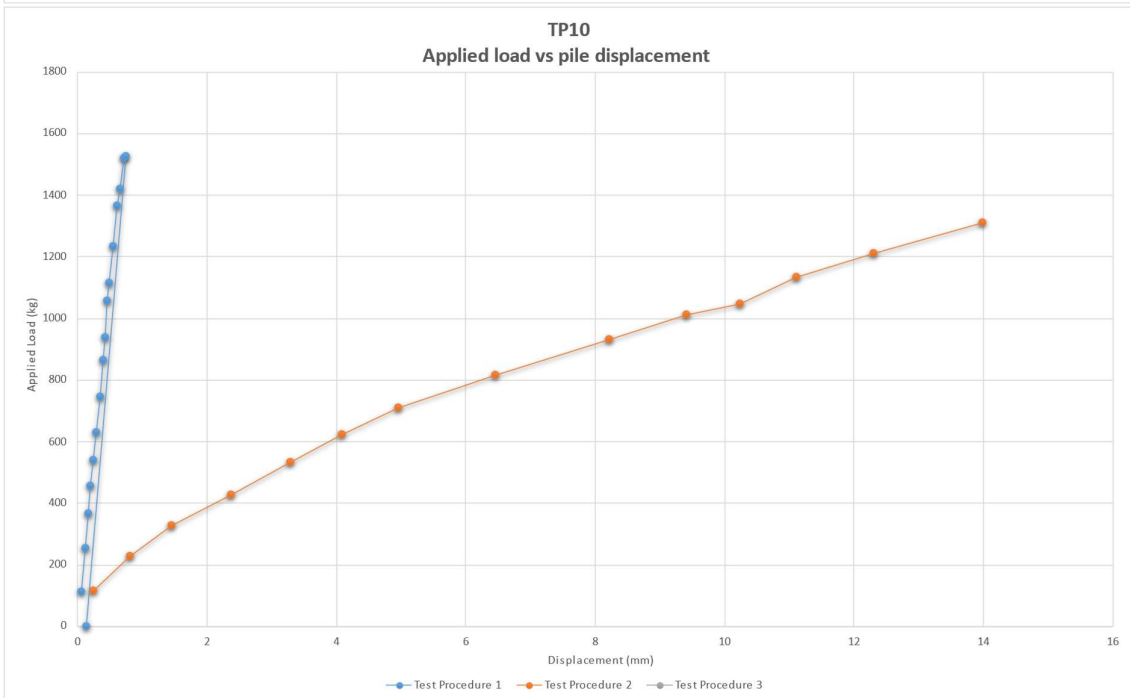
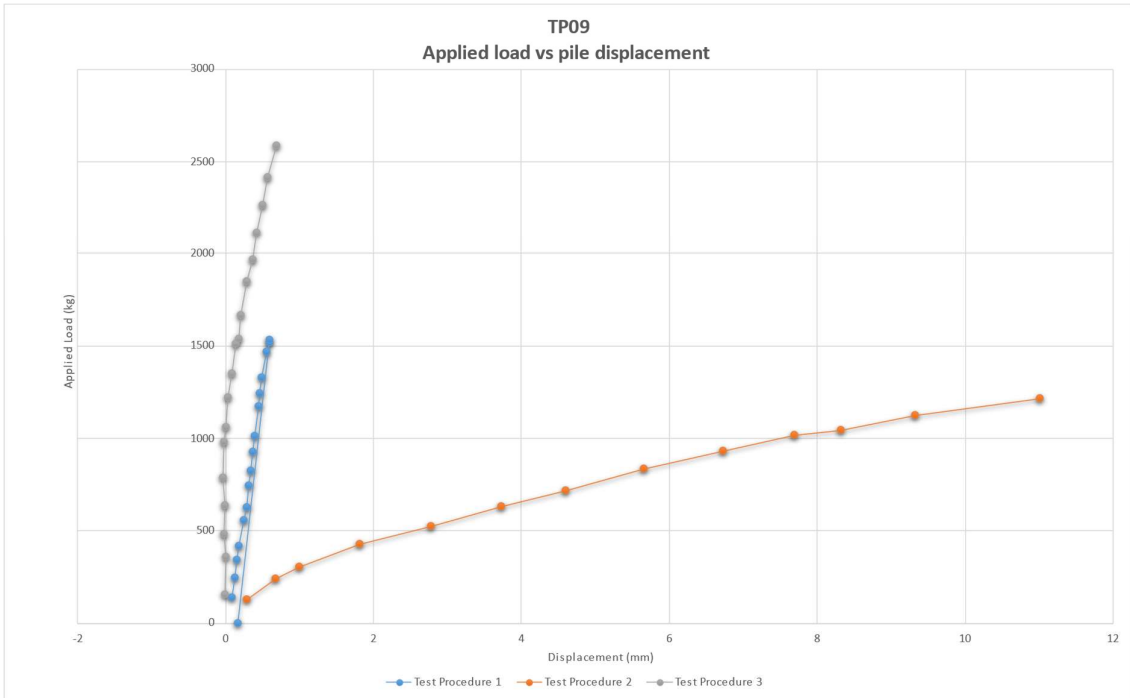
Appendix D– Load vs Displacement Graphs

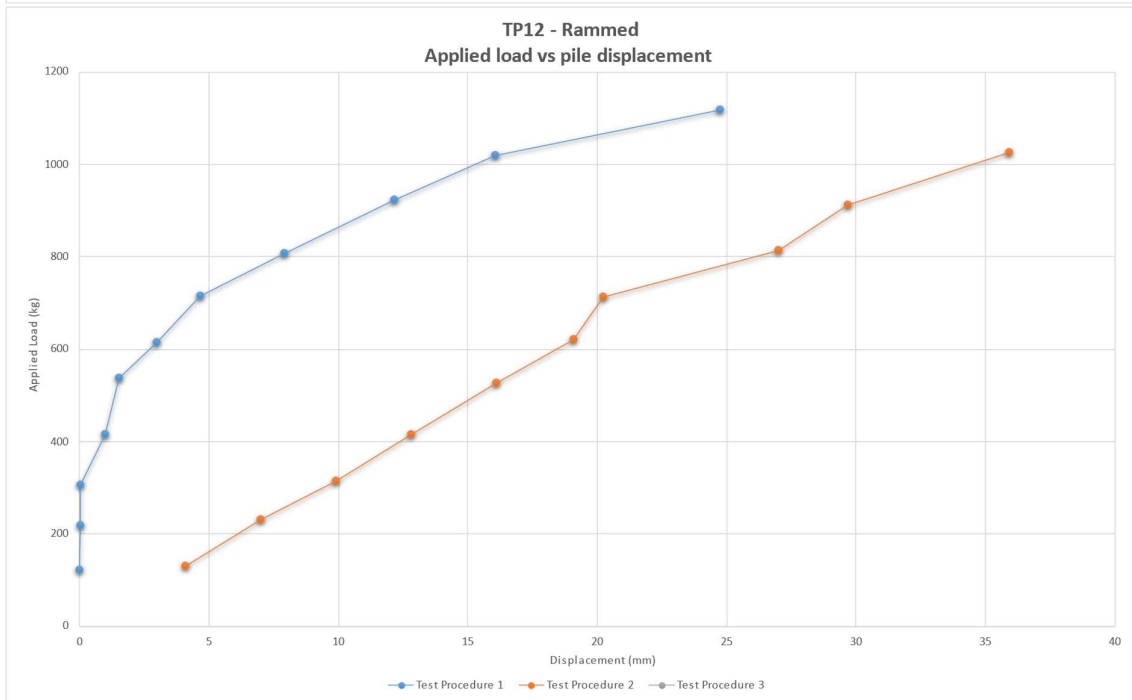
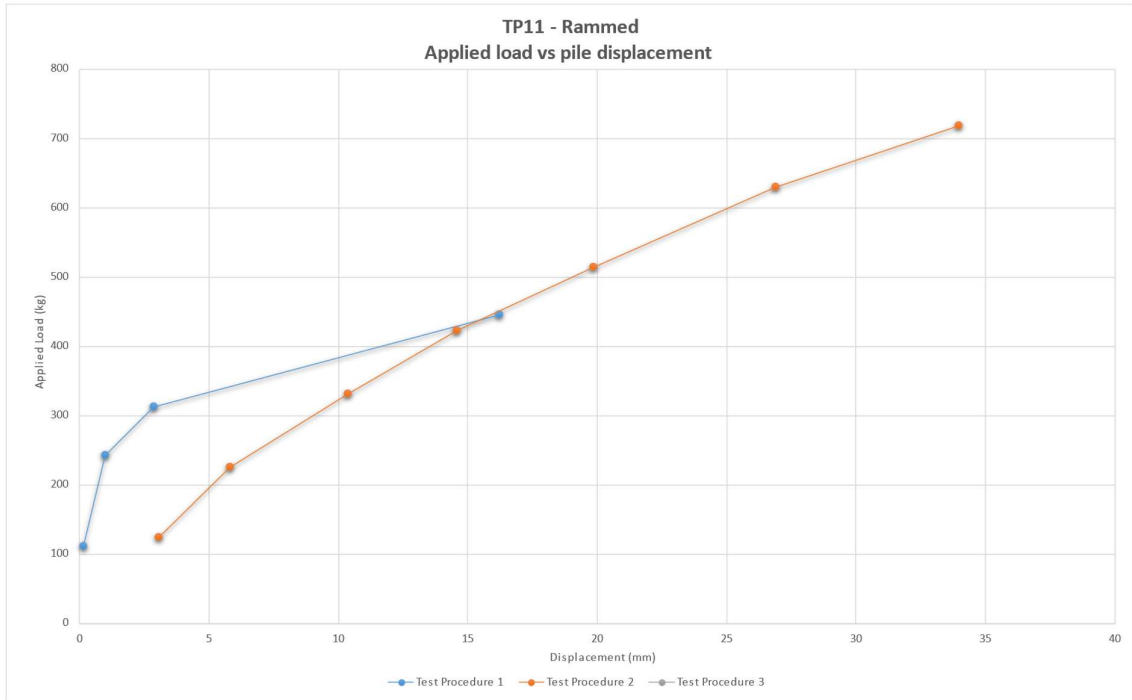


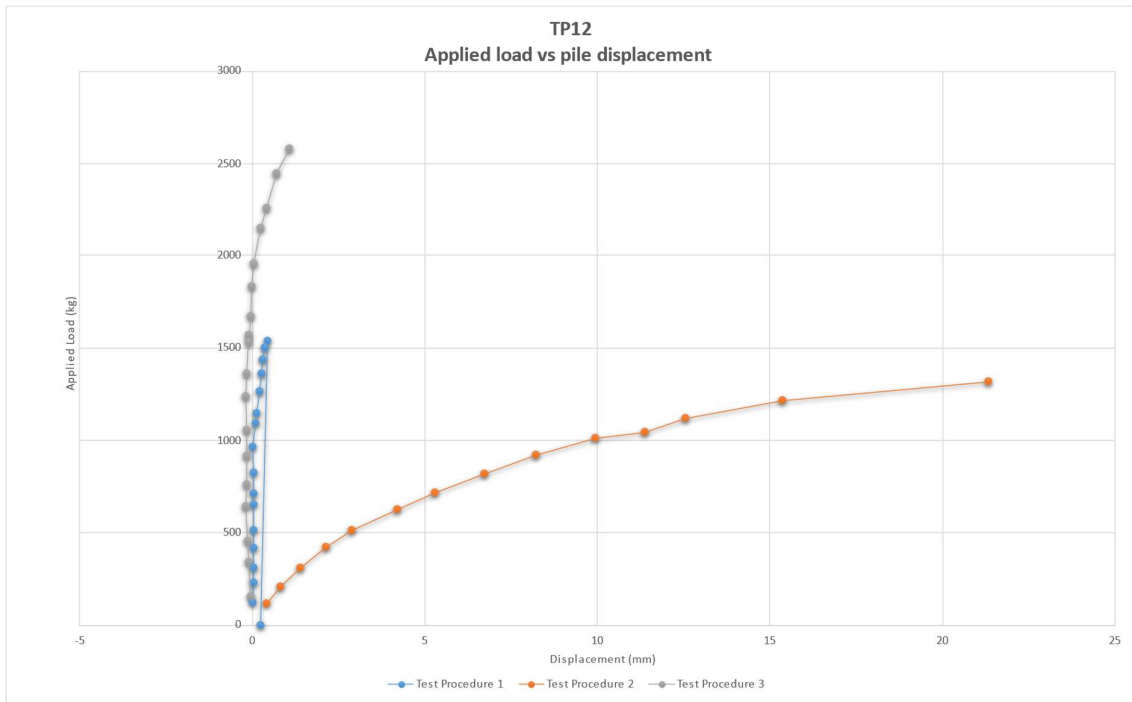












Appendix E– Site Testing Images























