

Sol-load

AXIALLY LOADED PILE ANALYSIS

Axial pile — input example

ANALYSIS REPORT

Number SL-001

Notes. Illustrative input; verify site parameters before design.

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1. Model 2D

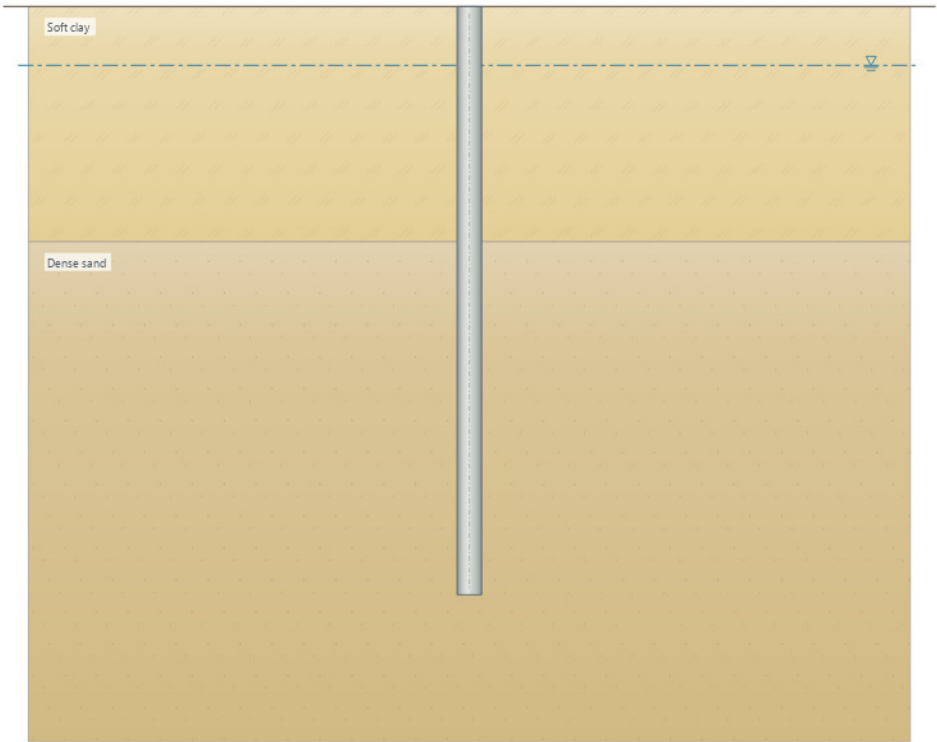


Figure 1. Model 2D

2. Model 3D

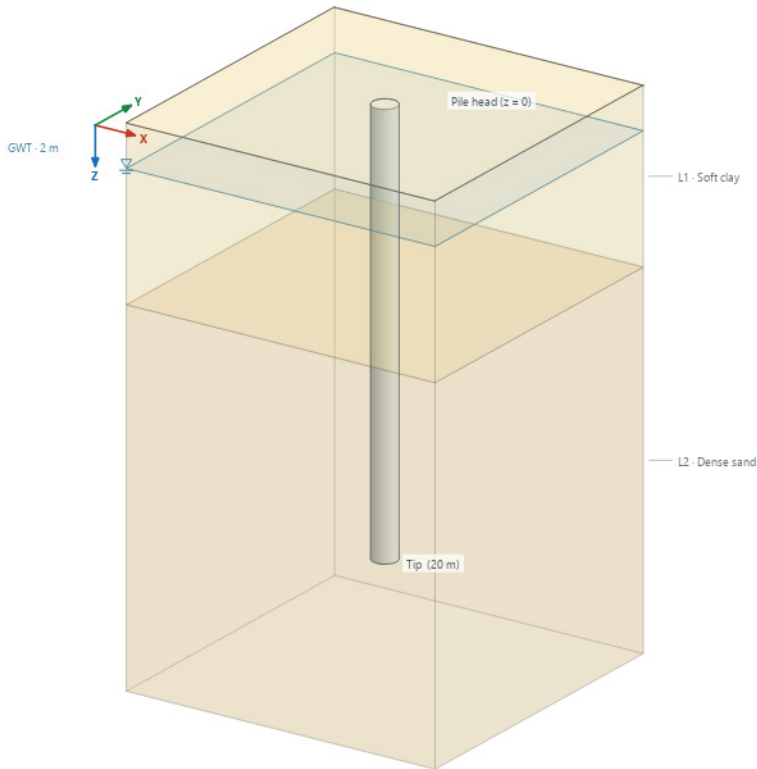


Figure 2. Model 3D

3. Analysis settings

Setting	Value
Analysis	Capacity + Settlement
Installation	Driven pile
Methods	API, USACE, FHWA
Transfer basis	API
Design basis	Nominal

4. Load Cases

Name	Head load (kN)
Service	800
Test	1200

Head load · Compression

5. Soil parameters · Soft clay

Parameter (SI)	Value
Name	Soft clay
Soil model	Clay
Total unit weight (kN/m³)	18
Saturated unit weight (kN/m³)	20
Undrained strength at top (kPa)	25
Undrained strength at bottom (kPa)	40
Friction angle (°)	32
SPT N60	20
OCR / yield stress ratio	1
Lateral coefficient K ₀	0.5
Interface friction angle (°)	25
Adhesion factor α	0
Unit shaft resistance / limit (kPa)	60
Unit tip resistance / limit (kPa)	2000
API N _q	0
Plasticity index (%)	0
Remoulded strength for plug (kPa)	0
Clay strain ε ₅₀	0.01
API peak movement (mm)	0
API clay residual ratio	0.9
Critical toe movement (mm)	0
Toe law with Mosher t-z	Vijayvergiya (1977)
USACE N _q	0
USACE K	0
FHWA N _q '	0
USACE critical depth (m)	0
USACE long-pile adhesion	No
Interface dilation (mm)	0.02
FHWA Nordlund Kδ	0
FHWA correction C _f	0
FHWA tip coefficient α _t	0
FHWA limiting tip resistance (kPa)	0

Parameter (SI)	Value
Tomlinson graph	Automatic
Vary parameters through each layer	No
LRFD shaft factor of this layer	0
LRFD tip factor of this layer	0
User method unit shaft resistance (kPa)	0
User method unit tip resistance (kPa)	0
t-z law of this layer	Automatic

6. Soil parameters · Dense sand

Parameter (SI)	Value
Name	Dense sand
Soil model	Sand
Total unit weight (kN/m ³)	20
Saturated unit weight (kN/m ³)	20
Undrained strength at top (kPa)	25
Undrained strength at bottom (kPa)	40
Friction angle (°)	36
SPT N60	35
OCR / yield stress ratio	1
Lateral coefficient K ₀	0.5
Interface friction angle (°)	25
Adhesion factor α	0
Unit shaft resistance / limit (kPa)	60
Unit tip resistance / limit (kPa)	2000
API N _q	0
Plasticity index (%)	0
Remoulded strength for plug (kPa)	0
Clay strain ε ₅₀	0.01
API peak movement (mm)	0
API clay residual ratio	0.9
Critical toe movement (mm)	0
Toe law with Mosher t-z	Vijayvergiya (1977)
USACE N _q	0
USACE K	0
FHWA N _q '	0
USACE critical depth (m)	0
USACE long-pile adhesion	No
Interface dilation (mm)	0.02
FHWA Nordlund K _δ	0
FHWA correction C _f	0
FHWA tip coefficient α _t	0
FHWA limiting tip resistance (kPa)	0
Tomlinson graph	Automatic
Vary parameters through each layer	No
LRFD shaft factor of this layer	0
LRFD tip factor of this layer	0
User method unit shaft resistance (kPa)	0
User method unit tip resistance (kPa)	0

Parameter (SI)	Value
t-z law of this layer	Automatic

7. Capacity settings

Parameter	Value
Transfer basis	API
Design basis	Nominal
Tip averaging radius (D)	0
Ignore shaft resistance above (m)	0
Include pile weight and buoyancy	No
Capacity step (0 = automatic) (m)	0
Print every N capacity steps	1
USACE critical depth	Diameter
Clay toe, ICP / Fugro / UWA	Undrained

8. Load transfer

Parameter	Value
Shaft t-z curves	Automatic
Tip Q-w curve	Automatic
Model	Soil models
Clay	API
Sand	API

9. Solver

Parameter	Value
Number of pile increments	100
Maximum number of iterations	500
Convergence tolerance (relative force)	1e-05
Align increments to soil boundaries and movement changes	No

10. Tip-movement profiles (input)

Profile	Tip movement (mm)
Tip step 1	0.00254
Tip step 2	0.0254
Tip step 3	0.254
Tip step 4	0.762
Tip step 5	1.778
Tip step 6	2.54
Tip step 7	5.08
Tip step 8	12.7
Tip step 9	127

11. Output depths of t-z curves

Depth (m)
0
4
8
12
20

12. Pile geometry

Section	Shape	Length (m)	Diameter / depth (mm)	Bottom diameter (mm)
Concrete pile	Circular	20	600	600

13. Pile geometry · continued

Section	Width (mm)	Wall (mm)	Perimeter (m)	Bearing area (m²)
Concrete pile	600	12	1.88496	0.282743

Section	Nordlund type
Concrete pile	Automatic

14. Pile properties

Section	Material	E (MPa)	E at bottom (MPa)	Unit weight (kN/m³)
Concrete pile	Concrete	30000	30000	24

15. Pile properties · continued

Section	Input area (m²)	Input perimeter (m)	Input bearing area (m²)
Concrete pile	0.02	1.6	0

For circular, pipe and rectangular sections, area and perimeter are calculated from dimensions. Input bearing area 0 uses the section default.

16. Pile / water settings

Setting	Value
Free length (m)	0
Batter from vertical (degrees)	0
Tip condition	Closed end
Water table	Yes
Water depth (m)	2

17. Soil Layers

Layer	Thickness (m)	Material
1	8	Soft clay
2	17	Dense sand

18. Computed results

Report display units: SI

FHWA coefficients left at 0 use the charts of the method (Nordlund, Thurman, Meyerhof, Tomlinson); each clay stratum uses Tomlinson graph A below sand, B when its top is soft ($s_u < 38.3042$ kPa), otherwise C, unless chosen per layer.

USACE coefficients left at 0: sand N_q from the Terzaghi-Peck chart (0-50 deg), K from the layer K_0 (0.8 when blank), critical depth 10/15/20 B by friction angle.

19. Capacity

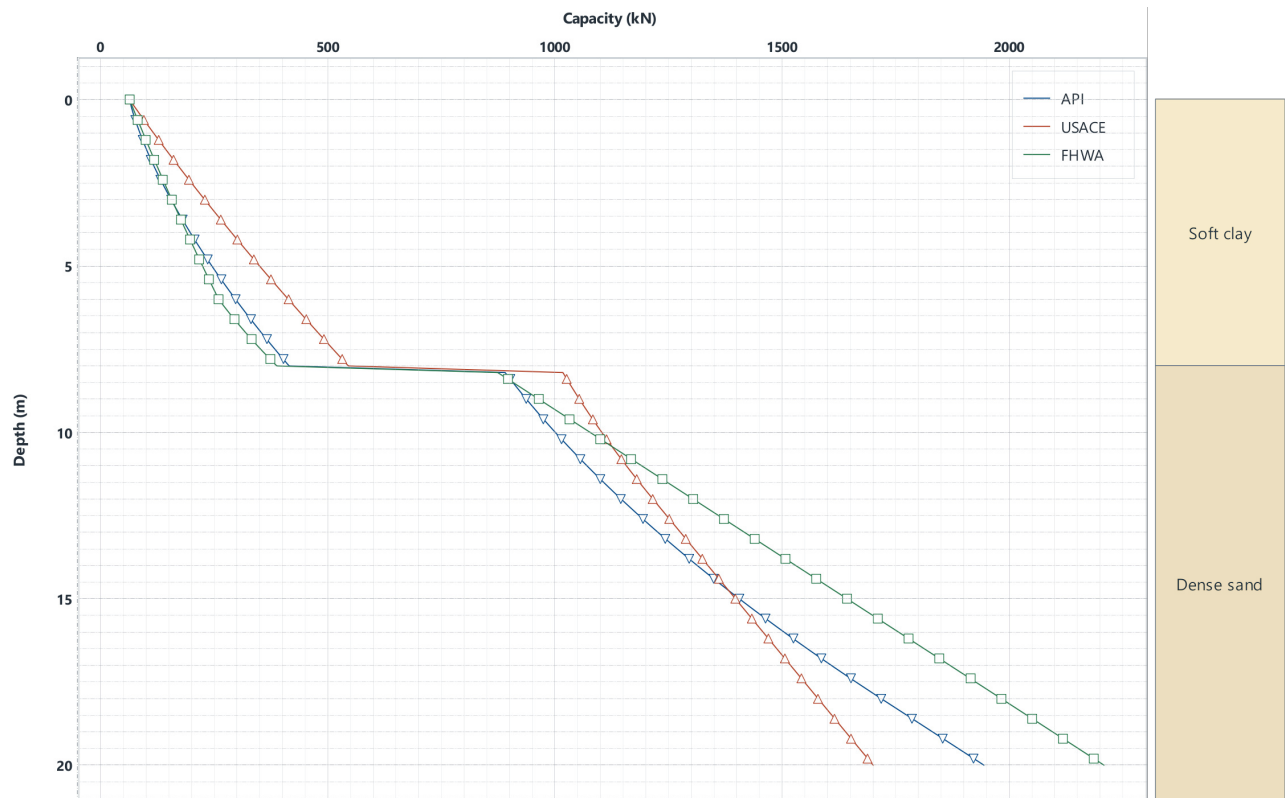


Figure 3. Capacity

19.1 Capacity at pile tip

Method	Shaft (kN)	Tip (kN)	Weight (kN)	Nominal (kN)
API	1378.6832	565.48668	0	1944.1699
USACE	1134.9249	565.48668	0	1700.4116
FHWA	1643.0142	565.48668	0	2208.5008

19.2 Capacity at pile tip

Method	Design shaft (kN)	Design tip (kN)	Design (kN)	Distance along pile (m)
API	1378.6832	565.48668	1944.1699	20
USACE	1134.9249	565.48668	1700.4116	20
FHWA	1643.0142	565.48668	2208.5008	20

19.3 Capacity at pile tip

Method	Depth (m)	Unit shaft resistance (kPa)
API	20	60
USACE	20	32.159724
FHWA	20	60

20. Load-settlement

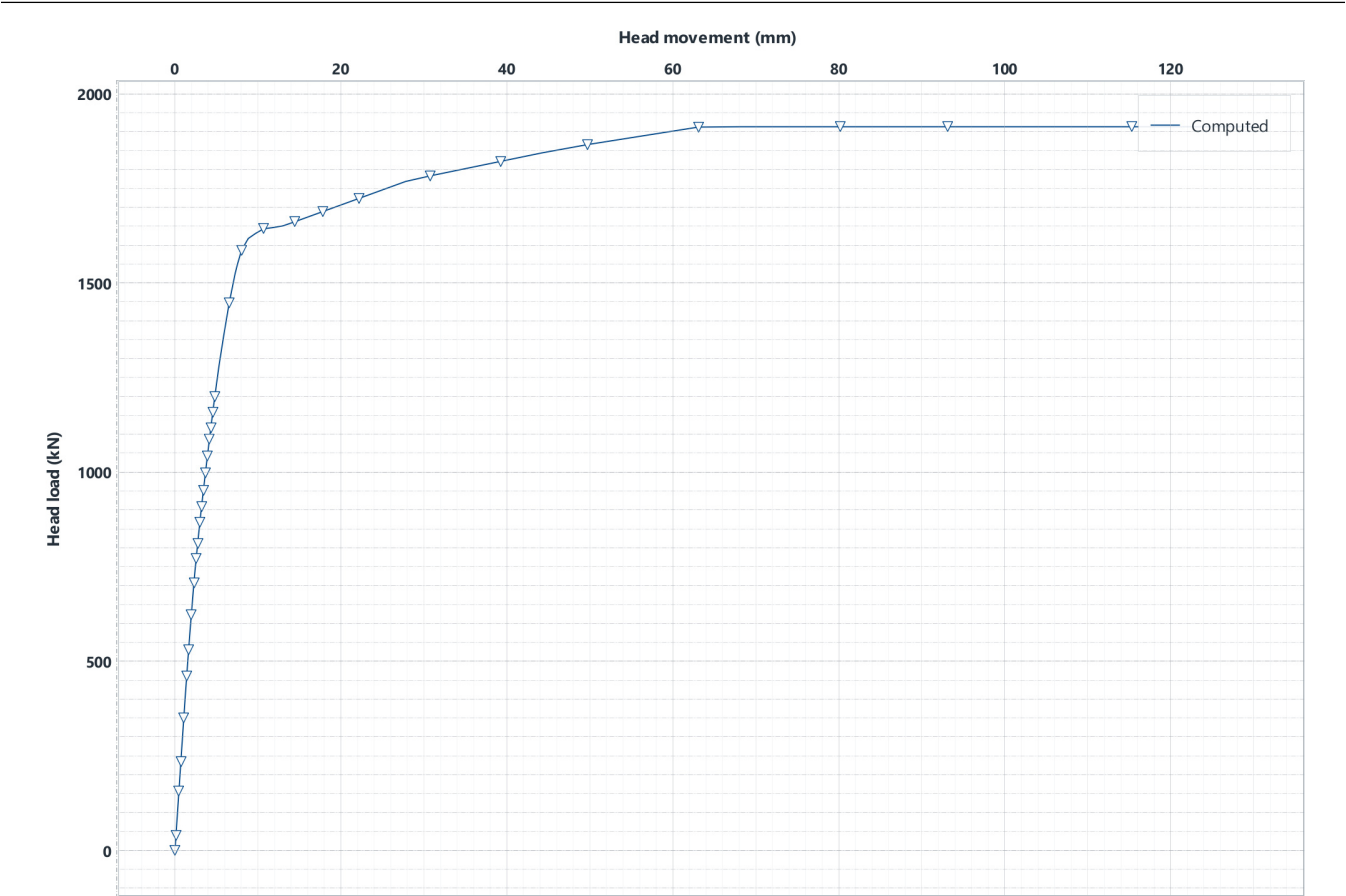


Figure 4. Load-settlement

20.1 Load cases

Case	Head load (kN)	Head movement (mm)	Tip load (kN)	Tip movement (mm)
Service	800.00067	2.6856051	146.33223	1.4315862
Test	1200.0062	4.7997945	178.42955	2.9300636

20.2 Load cases

Case	Shaft force (kN)	Weight (kN)	Maximum N (kN)	Maximum N (kN)
Service	653.66844	0	800.00067	800.00067
Test	1021.5767	0	1200.0062	1200.0062

20.3 Load cases

Case	Neutral depths (m)	Balance error (kN)	Control	Target
Service	—	1.1368684e-13	Head load	800 kN
Test	—	2.2737368e-13	Head load	1200 kN

20.4 Load cases

Case	Control error	Iterations
Service	0.00067168445 kN	2
Test	0.0062456776 kN	2

21. Axial force

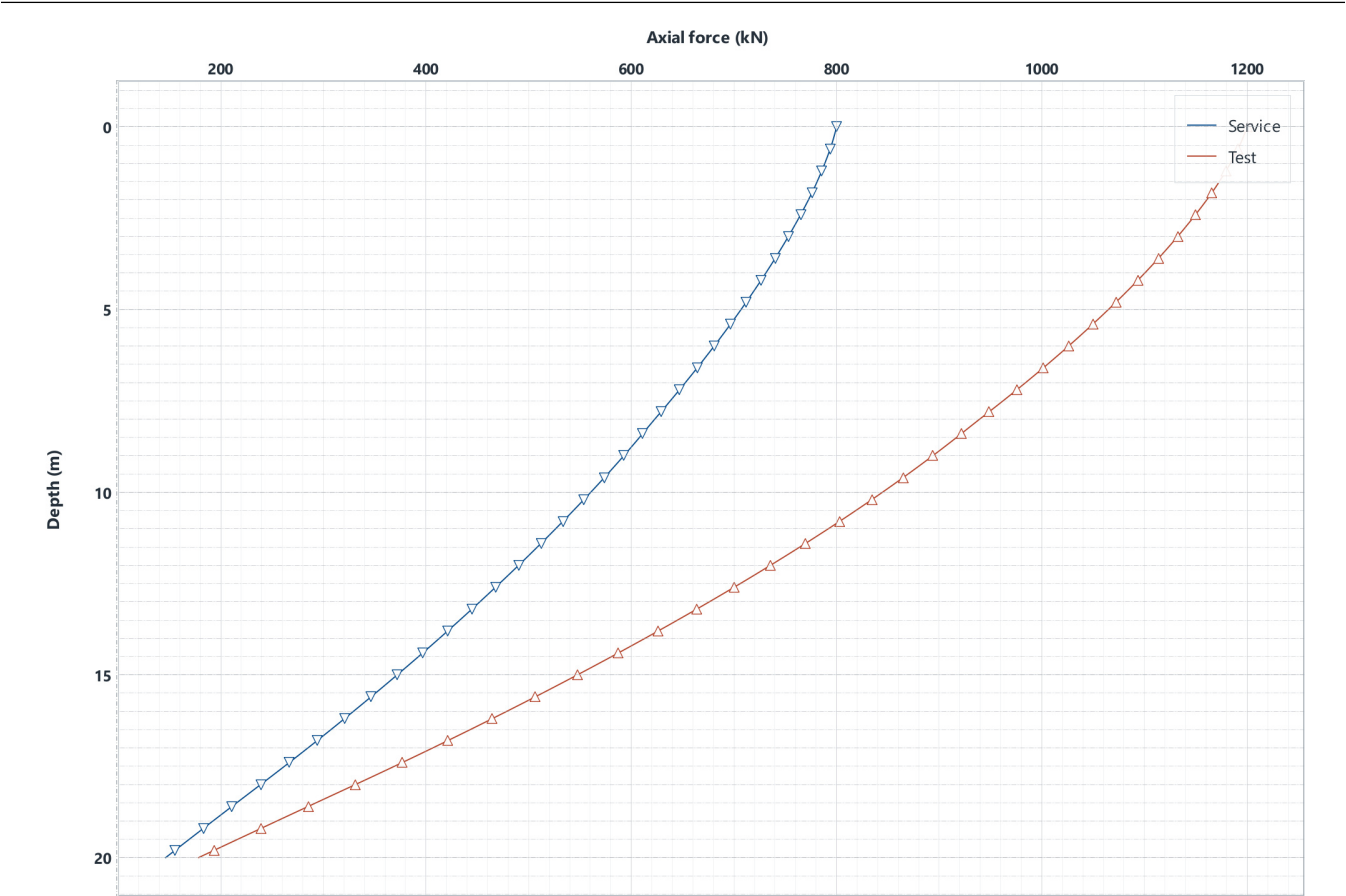


Figure 5. Axial force

22. Pile movement

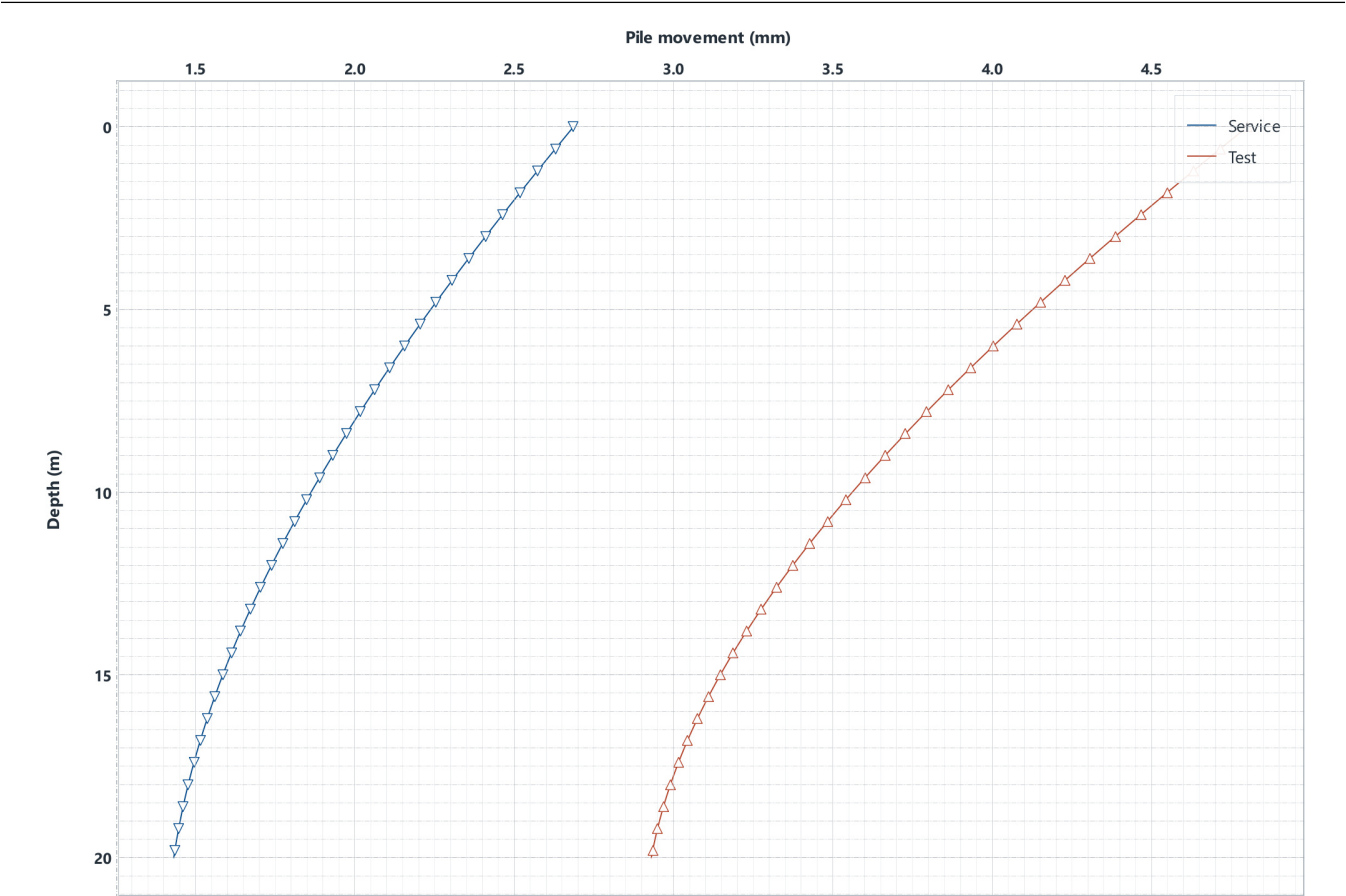


Figure 6. Pile movement