BLADE PILE
New Zealand

Technical Presentation – Site Specific Pile Design to New Zealand Standards

AS/NZ 2159

1.

Blade Pile

A superior ‘screw in pile’ or an alternative to concrete piers, driven piles or grout piles.

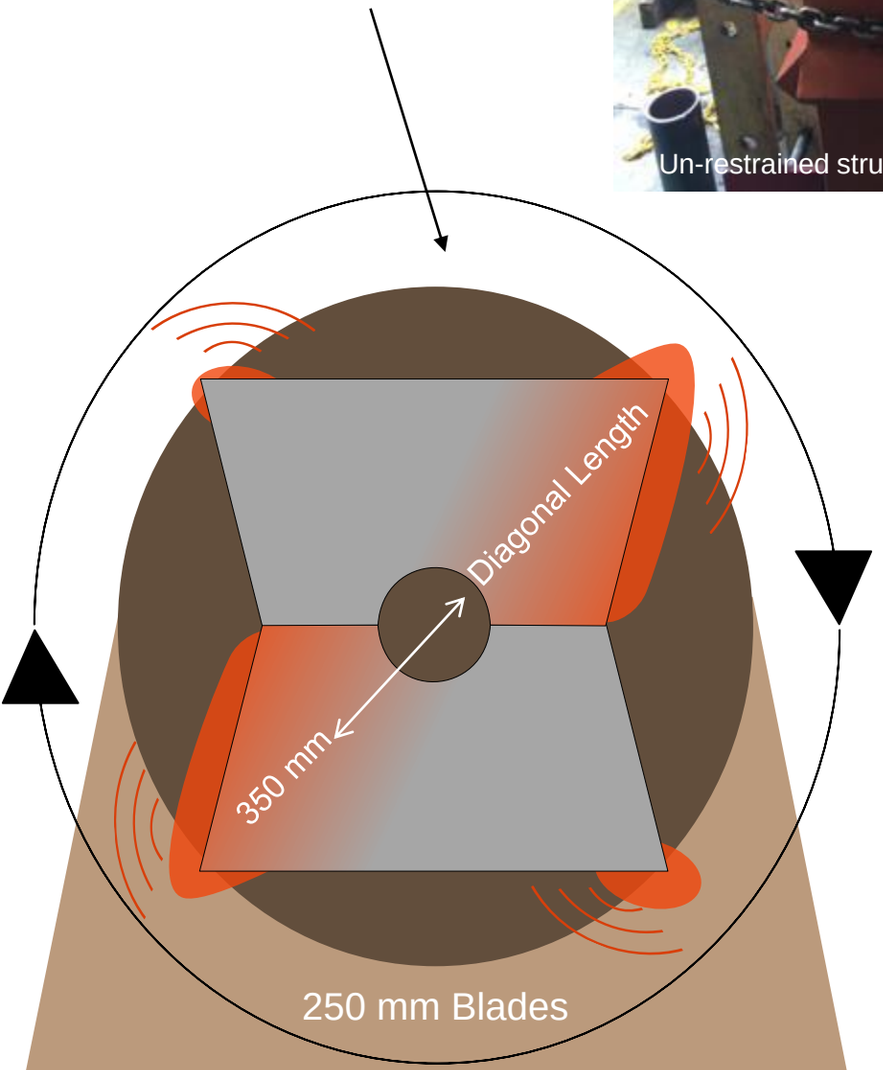
- Rapid & precise installation.
- Measures soil strength during installation.
- Superior capacity, when compared to bored piers or screw piles.
- Fully compliant to all New Zealand standards - AS/NZ 2159-2009 & AS/NZ 2870-2011.
- Removable, reusable or recyclable. No site/environmental damage after design life.

Blades vs. Helix Testing

4 x Cutting point creates ‘active pulse’ to vibrate pile head through hard materials and cobbles.

Un-restrained structural limit testing in QLD Australia 2015

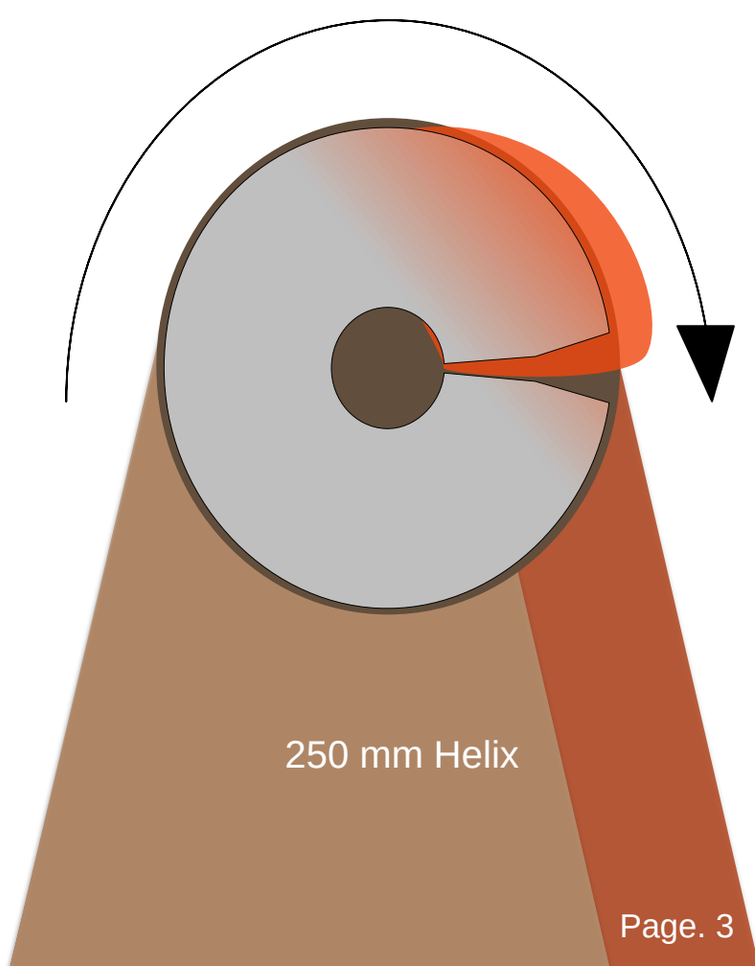
Blade Pile vs. Screw Pile comparison testing in QLD Australia 2008.



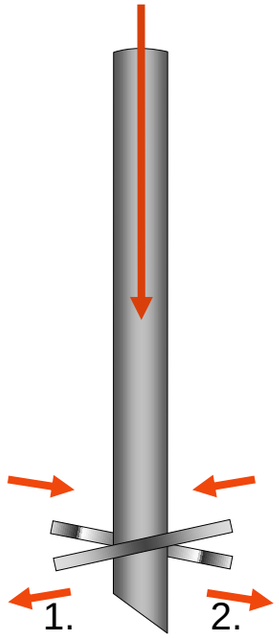
Blade Piles provide a significant increase in bearing plate area, when compared to an equivalent size screw pile helix.

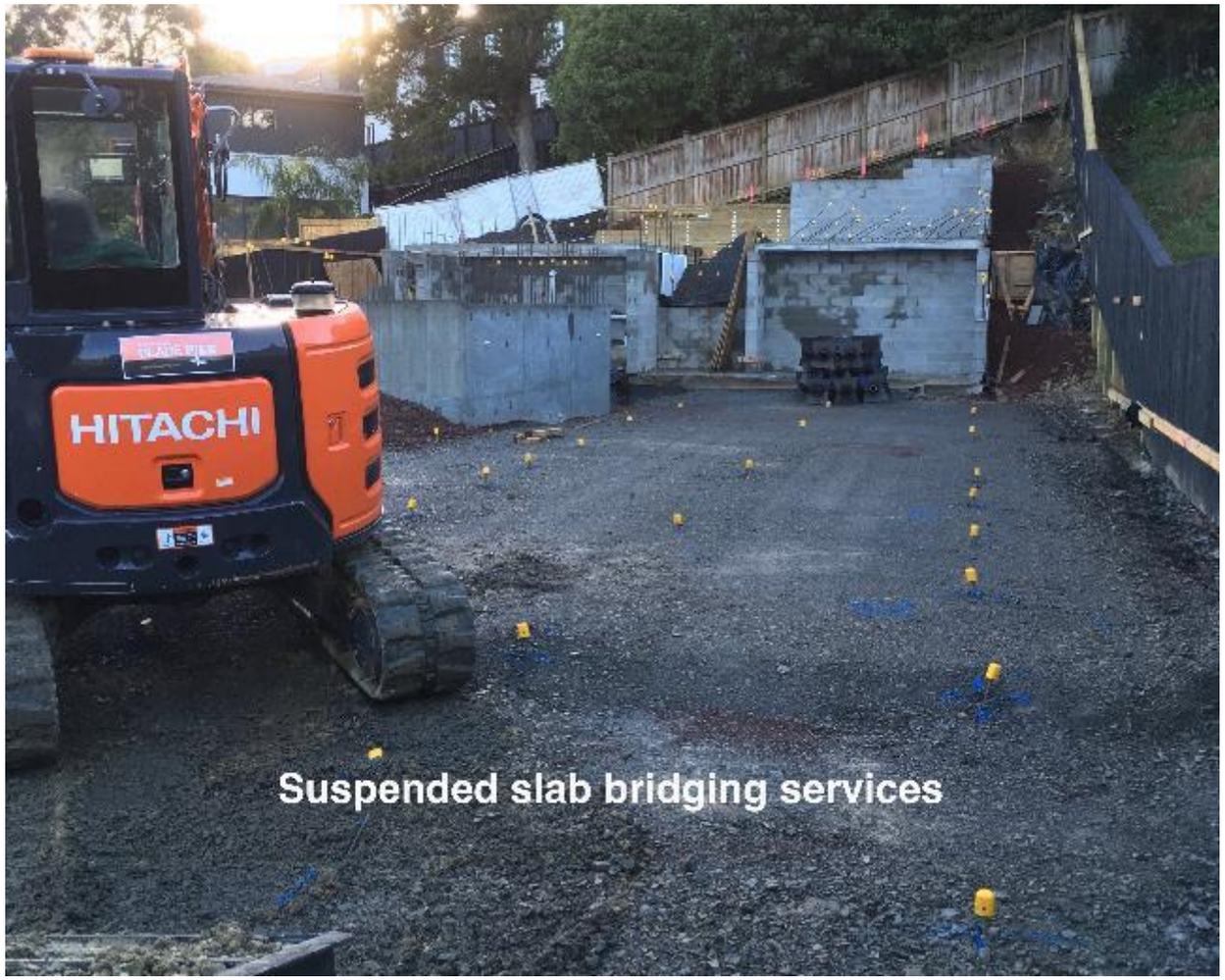
The larger Blades radiate out and into an enlarged pressure wave for improved load capacity.

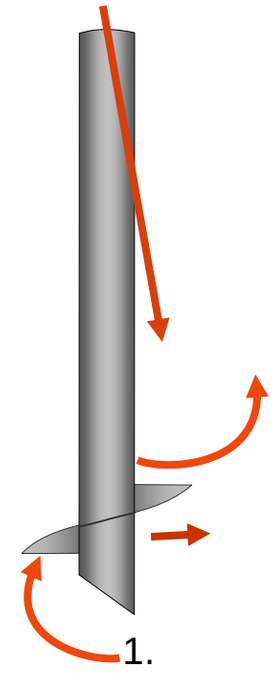
Testing confirms the Twin Blade design has less soil ‘bulking out’ during installation, for less geotechnical disturbance and improved load bearing capacity.

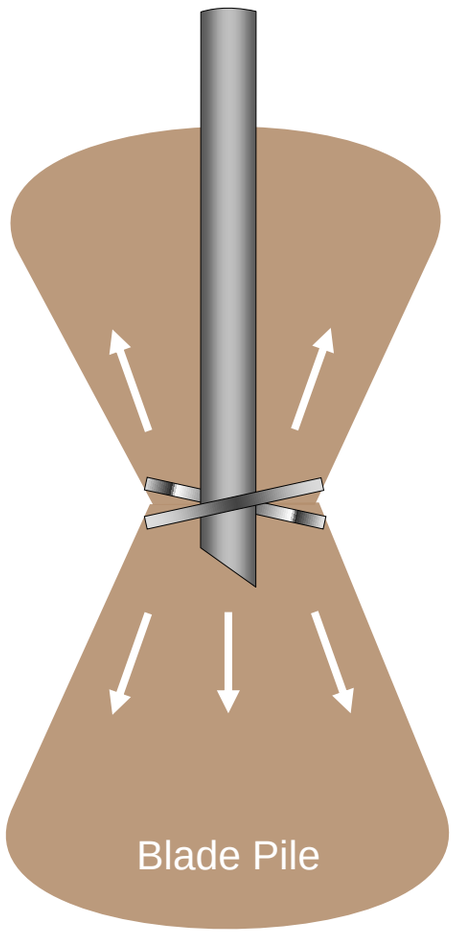


Blades vs. Helix









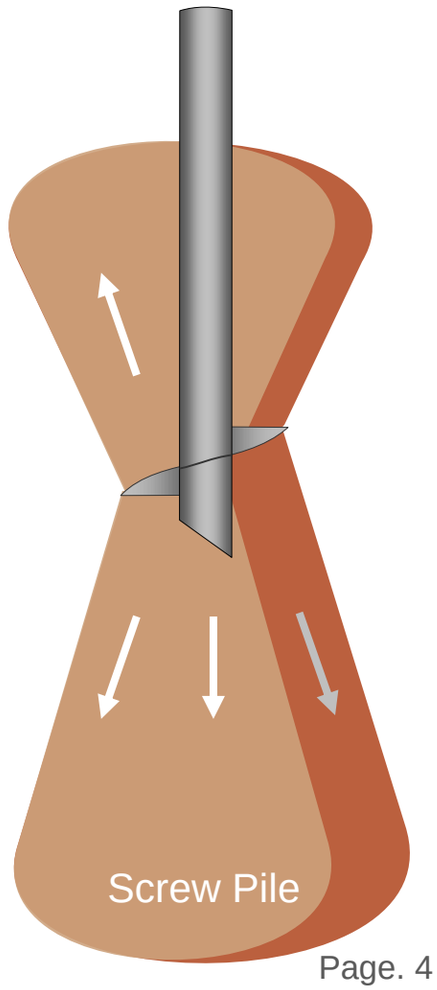
Screw piles have one leading edge with a curved pitched helix that augers the soil during install. The single leading edge induces out of round forces.

With soil settlement over time, the bearing capacity will slowly ‘grow’ back into place around the helix area (shaded Orange in diagram).

Twin Blade Piles counter balance each other for improved verticality. The Blades ‘sliver’ into the soil with less disturbance for improved ‘end bearing’ load capacity.

Blade Piles are manufactured from true 350 Grade seamless steel tube (Average Yield Strength 450 Mpa) for a higher torsional install capacity.

Blade Piles provide a level verticality & positioning for finite tolerance structures, that is simply unattainable with screw piles.

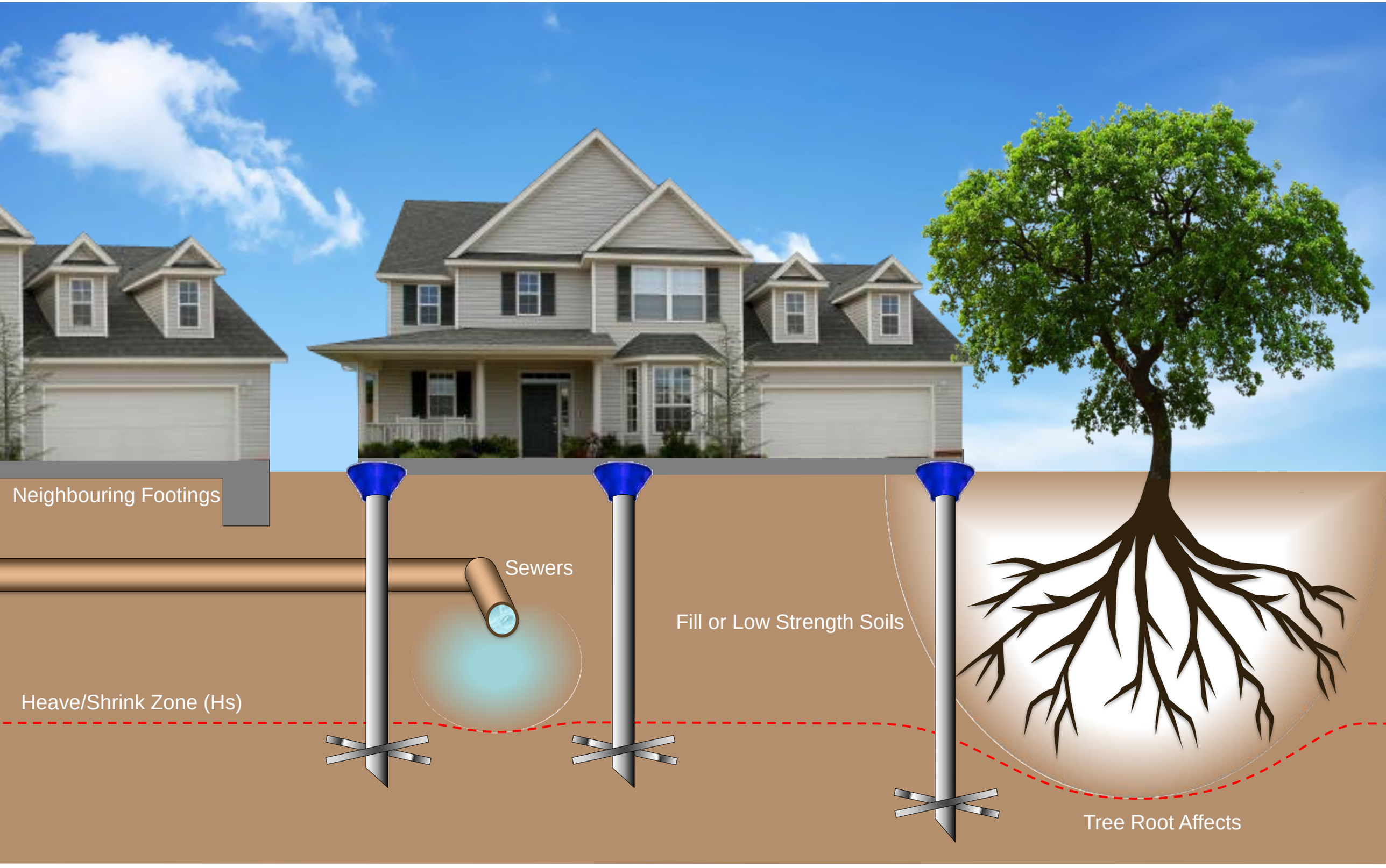


Patented - Slip Joint Pile Cap

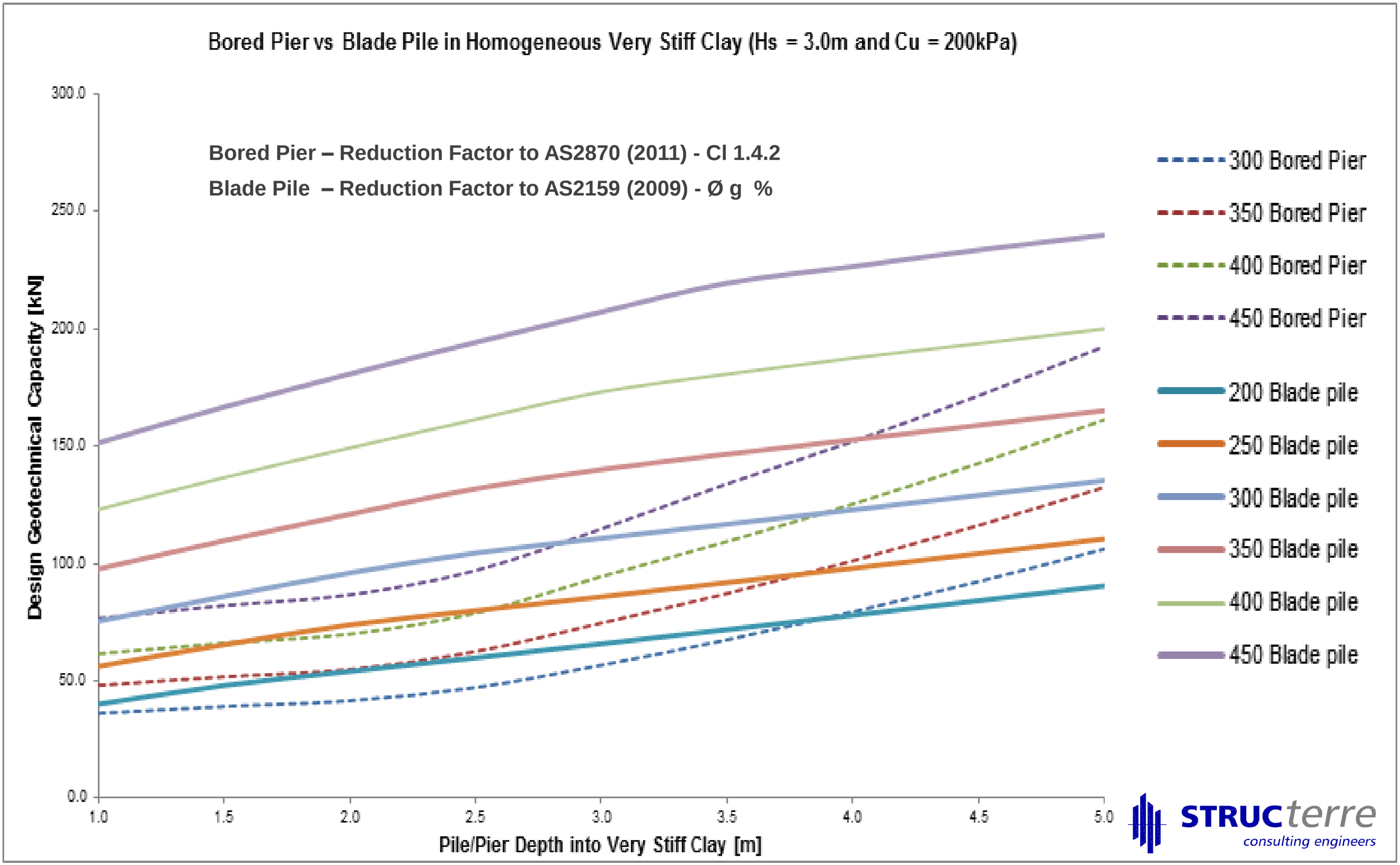
When combining with the Slip Joint Pile Cap & Blade pile with a raft slab design, the ’Pile Cap Slab System’ is created.

The Blade Pile & Slip Joint Cap is deemed to comply as an isolated ‘Bored Pier’ substitute, maintaining AS2870 compliance.

Blade Pile & Pile Cap – A solution for all types of problem sites



Bored Pier vs. Blade Pile & Pile Cap – Blade Piles offer a superior Alternative to Concrete



2.

The Bracing Pile

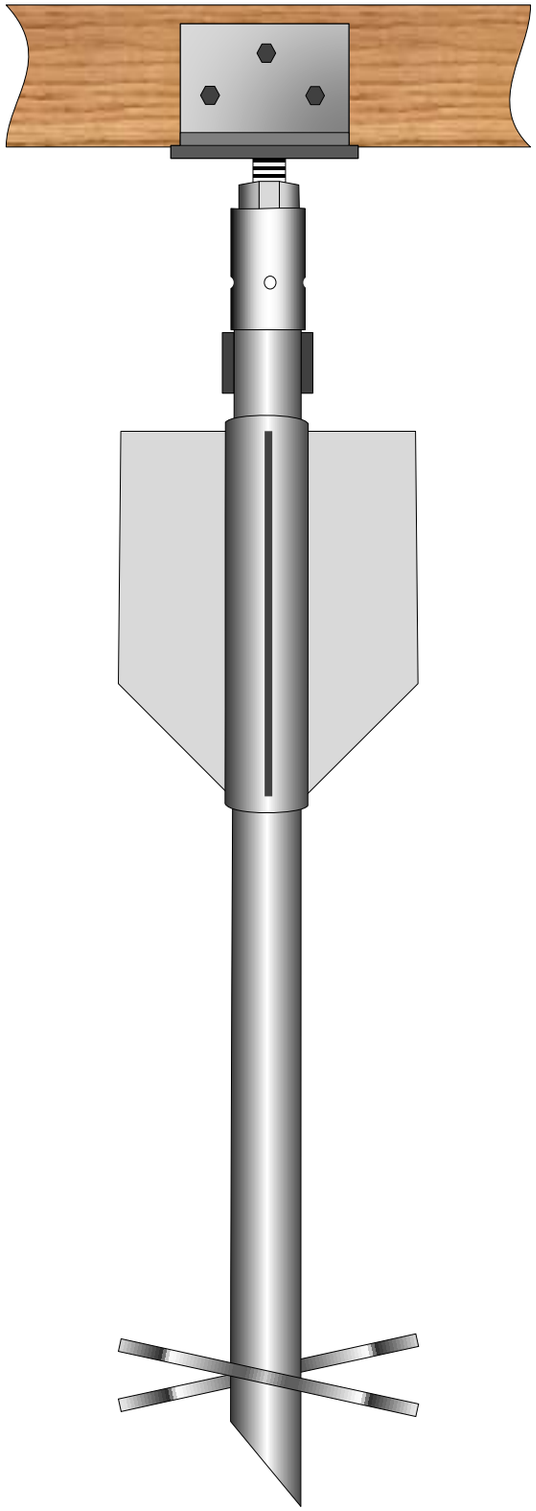
The Bracing Pile is used to support lateral loads. The pile and unique bracing ‘Wing Assembly’ are embedded into the ground, providing support for all types of above ground loads.

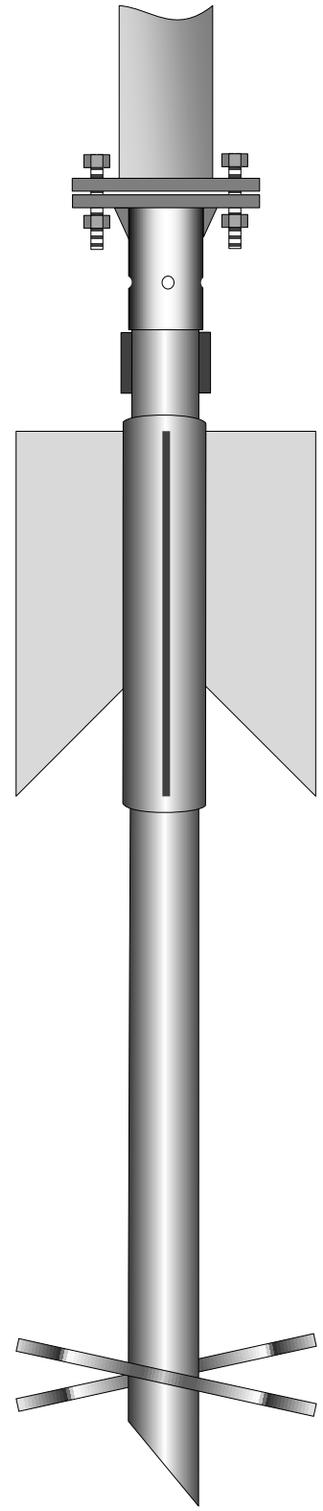
The Bracing Pile generates high levels of lateral load capacity to obtain the optimum structure to pile, to soil interface.

The Bracing Piles can include any type of fixed, fused or adjustable top support system to facilitate easy on site installation, using less time and resources than traditional methods.

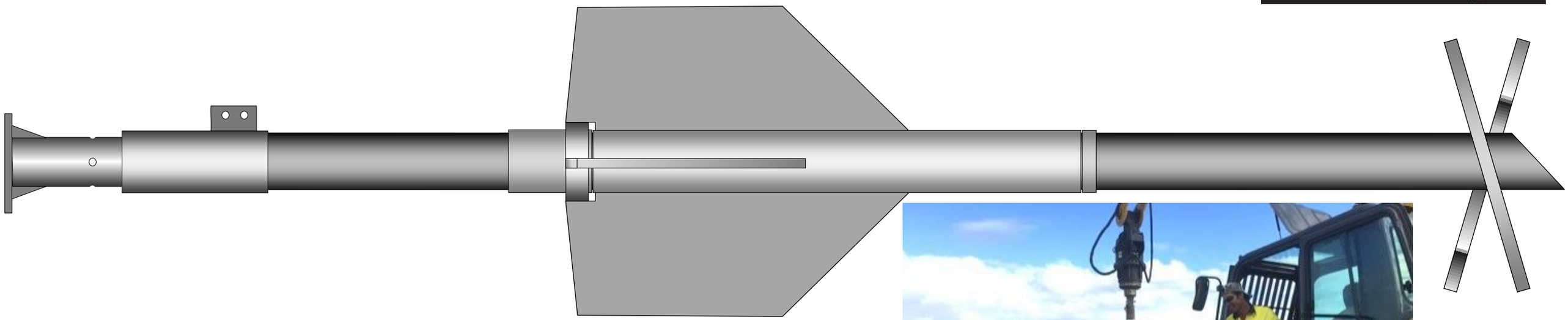
- Flexible top plate designs allow shim or thread lock adjustment after installation.
- Can also Incorporate cable slots for electrical power supply.
- Removable, reusable or recyclable. No site/environmental damage after design life.

Lateral Load Piling – Certified, Fast, Adjustable & Cost Efficient

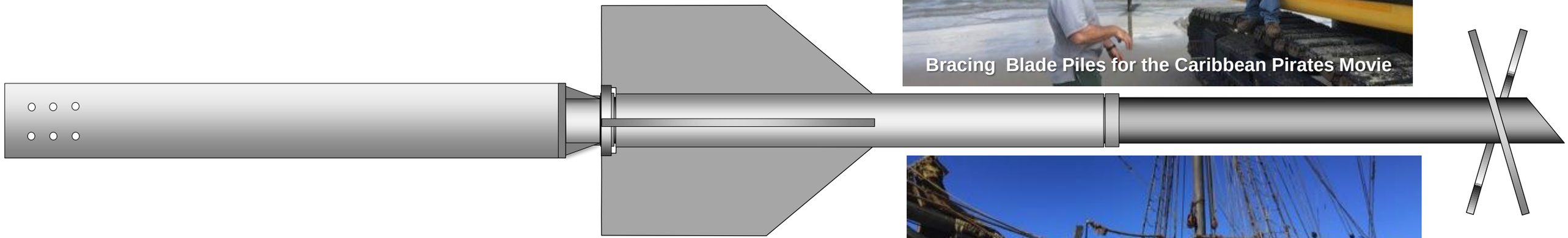




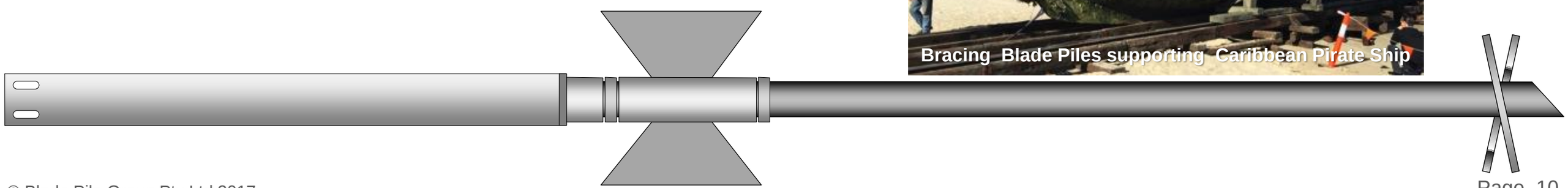
World Leading Technology – A Geodynamic Design for Every Need



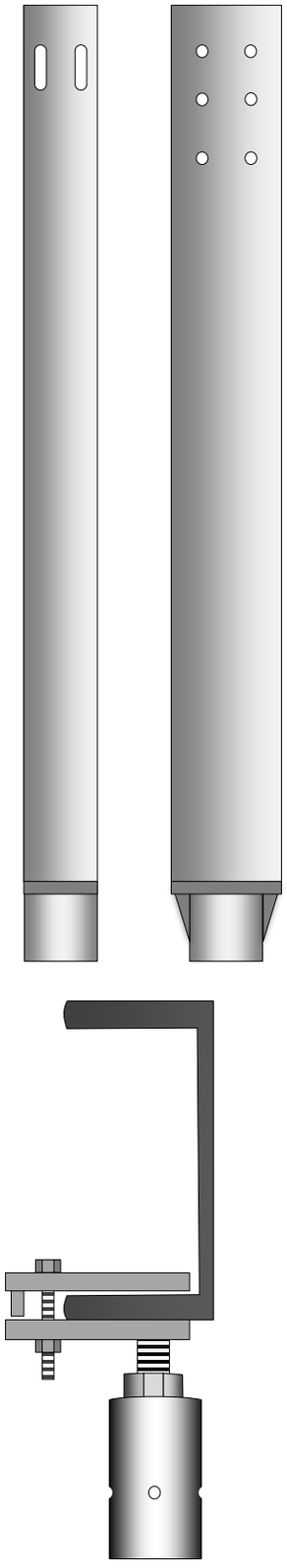
Bracing Blade Piles for the Caribbean Pirates Movie



Bracing Blade Piles supporting Caribbean Pirate Ship



Pile Connection Innovation – A Solution Designed & Fabricated for All Needs



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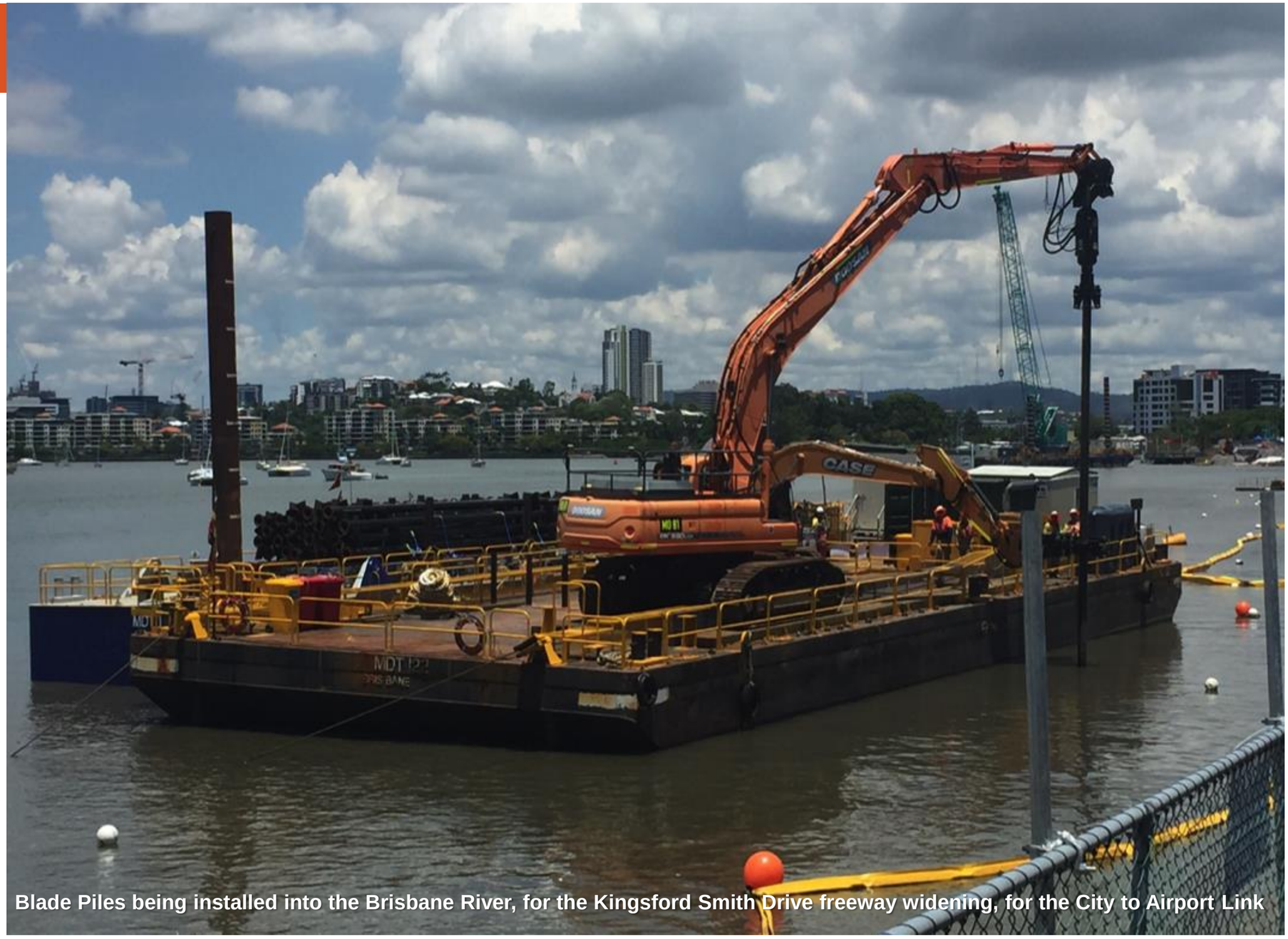
3.

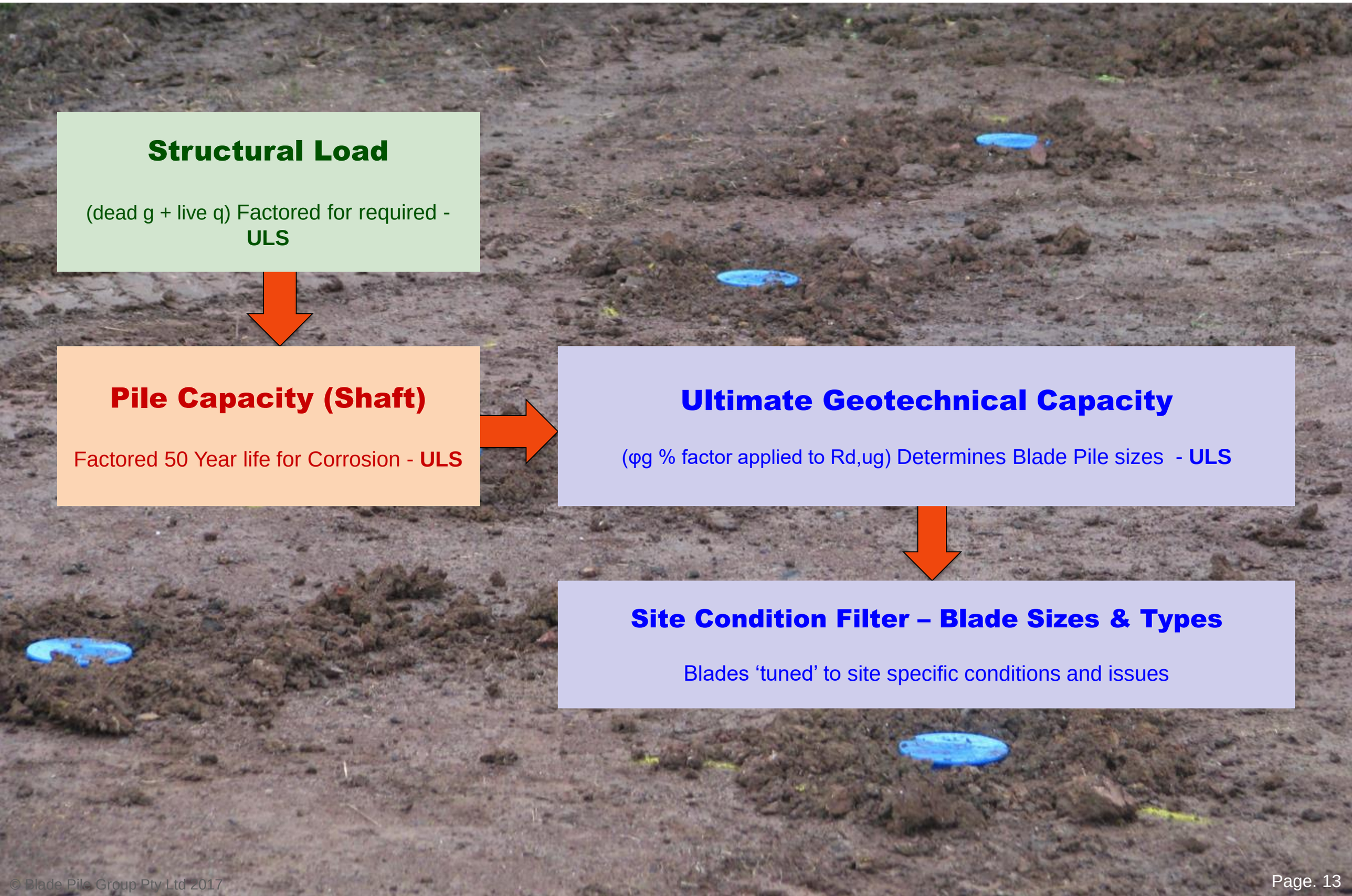
Pile Performance



Blade Piles being installed into the Brisbane River, for the Kingsford Smith Drive freeway widening, for the City to Airport Link

Blade Pile Analysis – Ensures ULS is met, with optimum design for site conditions

BLADE PILE New Zealand



Structural Load

(dead g + live q) Factored for required - **ULS**

Pile Capacity (Shaft)

Factored 50 Year life for Corrosion - **ULS**

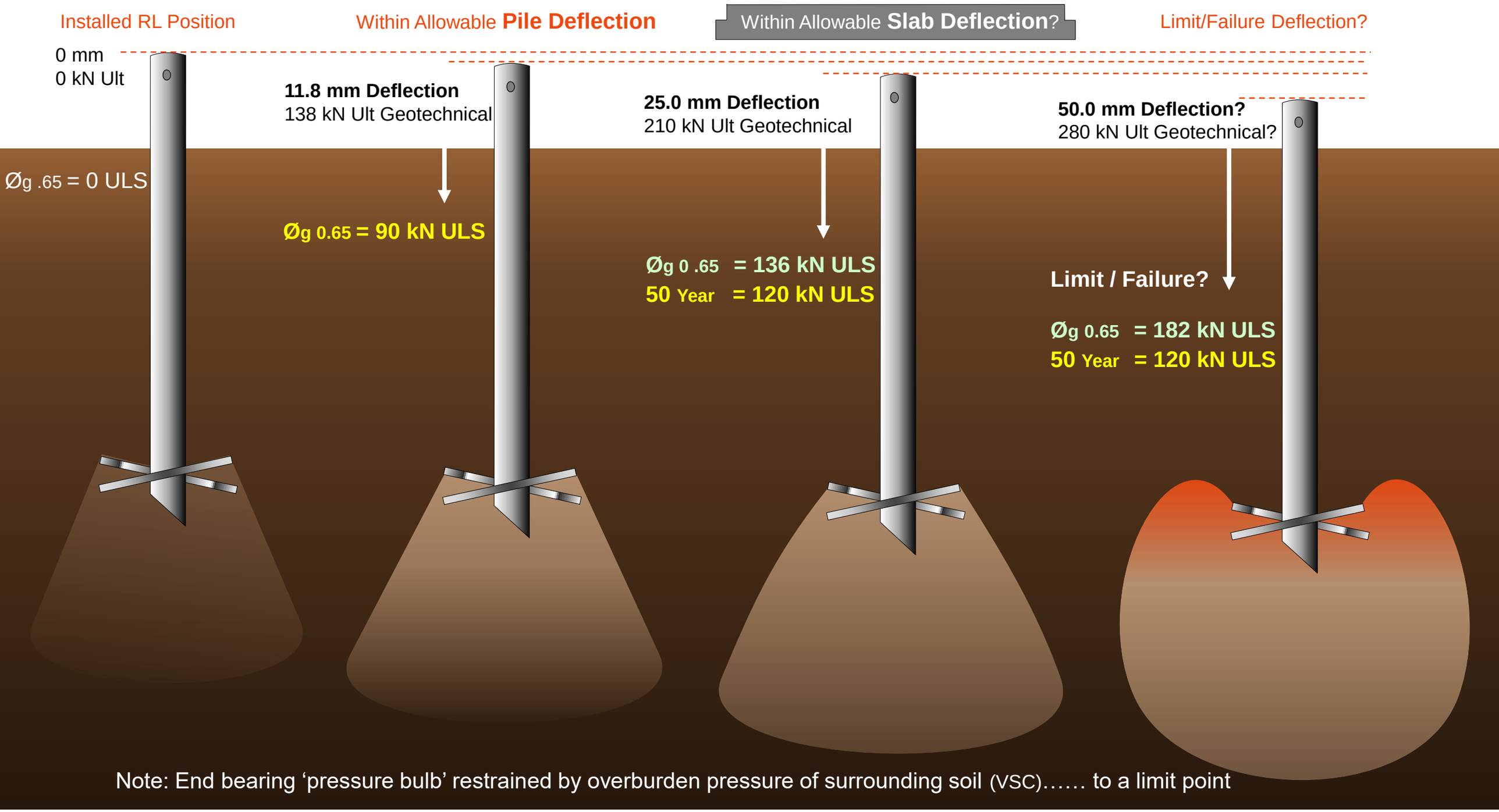
Ultimate Geotechnical Capacity

(φg % factor applied to Rd,ug) Determines Blade Pile sizes - **ULS**

Site Condition Filter – Blade Sizes & Types

Blades ‘tuned’ to site specific conditions and issues

Pile Testing For Deflections – Optimising end bearing ‘pressure bulb’



Øg allowed solely from ‘on site’ AS2159 static load pile testing - 1.0% = 0.55, 2.0% = 0.65, 3.0% = 0.71, 4.0% = 0.76 (% of total piles).

4.

Design Data

- The current level of residential Geotechnical investigations (AS2870) is inadequate for AS2159. Bore logs need to find natural material and properly verify a soil strength.
- Accurate (SLS or ULS) specified pile loads are essential, for pile design calculations.
- Generalised load specifications simply forces Blade Pile to over-design with larger, deeper piles, therefore wasting critical resources and costs.

Geotech Reporting Issue – Low Cost AS2870 Geotech reporting is high risk & high cost

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PENETROMETER (D.C.P)

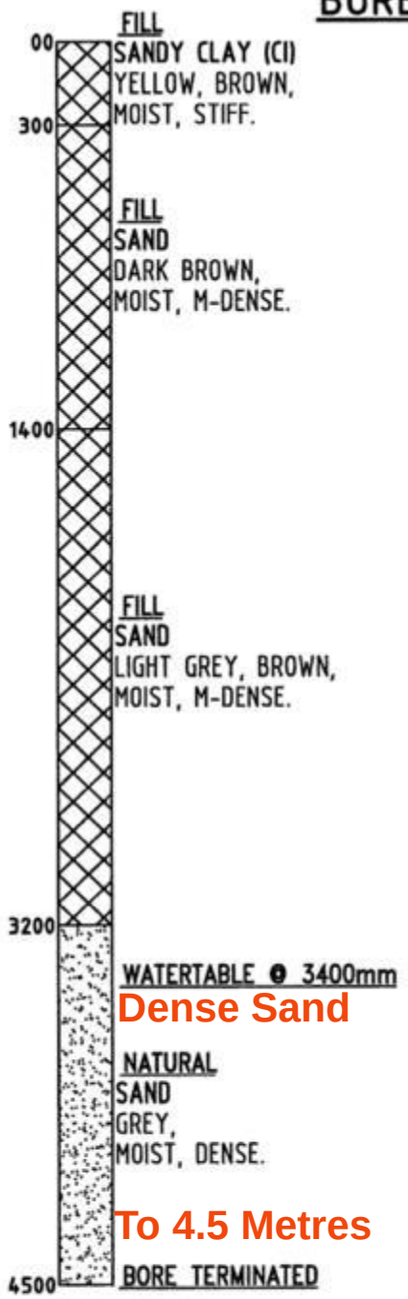
No. OF BLOWS	HOLE 1	HOLE 2
00 - 200		6
200 - 400		8
400 - 600		7
600 - 800		9
800 - 1000		8
1000 - 1200		8
1200 - 1400		
1400 - 1600		
1600 - 1800		
1800 - 2000		
2000 - 2200		
2200 - 2400		
2400 - 2600		
2600 - 2800		
2800 - 3000		

PENETROMETER (D.C.P)

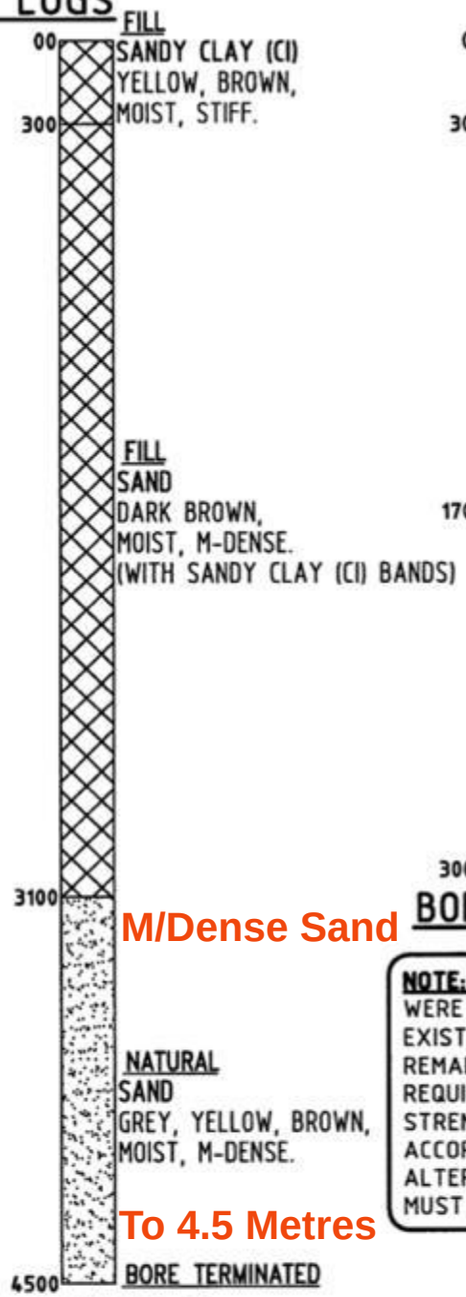
No. OF BLOWS	HOLE 3	HOLE 4
00 - 200		
200 - 400		
400 - 600		
600 - 800		
800 - 1000		
1000 - 1200		
1200 - 1400		
1400 - 1600		
1600 - 1800		
1800 - 2000		
2000 - 2200		
2200 - 2400		
2400 - 2600		
2600 - 2800		
2800 - 3000		

NOTE:
ALL DIMENSIONS SHOWN ARE APPROXIMATE ONLY.

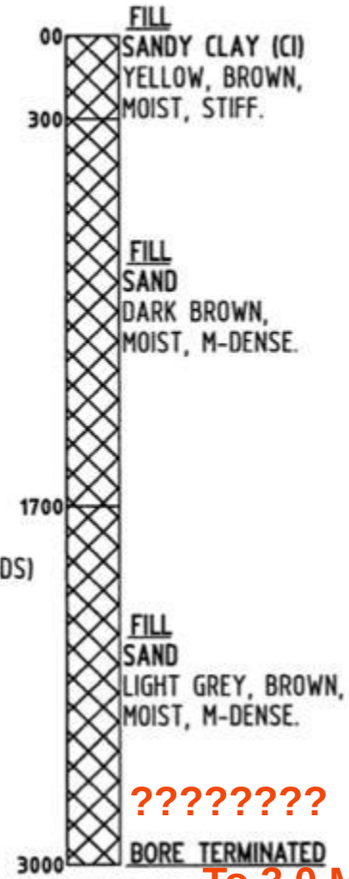
BORE LOGS



BOREHOLE 1

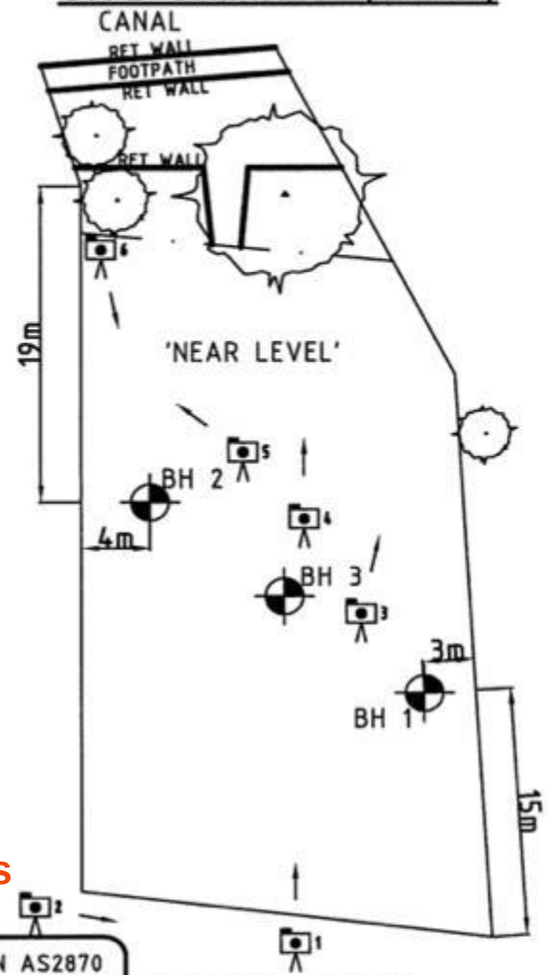


BOREHOLE 2



BOREHOLE 3 To 3.0 Metres

SITE SKETCH (N.T.S.)



NOTE: TREES WITHIN LIMITS OUTLINED IN AS2870 WERE NOTED AT THE TIME OF THIS SOIL TEST. IF EXISTING TREES OF POTENTIAL INFLUENCE ARE TO REMAIN ENGINEERING ASSESSMENT WILL BE REQUIRED TO ASCERTAIN IF ADDITIONAL SLAB STRENGTHENING OR PIERS ARE REQUIRED IN ACCORDANCE WITH AS2870-2011 APPENDIX (CH). ALTERNATIVELY, REMOVAL OF INFLUENTIAL TREES MUST OCCUR PRIOR TO CONSTRUCTION.

Geotech Reporting Solution – Deeper, more precise Geotech reduces risk & cost

BLADE PILE New Zealand

STRUCterre consulting engineers

Job number:	43237-15RS	Logged
Site Address:	Lot 25 - RP205543	Checked
	186 Morala Avenue, Runaway Bay	
Date:	23/12/2015	

Borehole 1

Depth (M)	Description	PSP	qa
0.0–0.3	**FILL: Clayey Silty SAND** (SC) Loose to Medium Dense With Gravel, Brown-Grey-Yellow, Moist	8 / 8 / 4 / 5	110
0.4–2.3	**FILL: Silty SAND** (SP) Loose to Medium Dense Brown-Grey, Moist	5 / 6 / 5 / 6	130
1.2–2.3	**FILL: Silty SAND** (SM) Medium Dense Light Yellow-Light Grey, Moist		
2.4–4.0	**Silty SAND** (SM) Loose Dark Brown-Dark Grey, Wet		
4.0–4.8	**Silty SAND** (SM) Medium Dense Dark Grey-Brown, Wet (watertable @ 4.0m)		
4.8–5.5	**Silty SAND** (SM) Medium Dense Dark Grey, Wet		

Borehole 1 - Continued

Depth (M)	Description	PSP	qa
5.5–7.0	END OF BORE HOLE @ 7.0m		

To 7.0 Metres

BH 1 (BH 1)

Front of site

Loose Sand

M/Dense Sand

STRUCterre consulting engineers

Job number:	43237-15RS	Logged
Site Address:	Lot 25 - RP205543	Checked
	186 Morala Avenue, Runaway Bay	
Date:	23/12/2015	

Borehole 2

Depth (M)	Description	DCP	qa
0.0–0.3	**FILL: Clayey Silty SAND** (SC) Loose to Medium Dense With Gravel, Brown-Grey-Yellow, Moist		
0.4–2.3	**FILL: Silty SAND** (SP) Loose to Medium Dense Brown-Grey, Moist		
1.2–2.3	**FILL: Silty SAND** (SM) Medium Dense Light Yellow-Light Grey, Moist		
2.4–4.0	**Silty SAND** (SM) Loose Dark Brown-Dark Grey, Wet		
4.0–4.8	**Silty SAND** (SM) Medium Dense Dark Grey-Brown, Wet		
4.8–5.5	**Silty SAND** (SM) Medium Dense Dark Grey, Wet		

Borehole 2 - Continued

Depth (M)	Description	DCP	qa
5.5–7.0	END OF BORE HOLE @ 7.0m		

To 7.0 Metres

BH 2 (BH 3)

Middle of site

Loose Sand

M/Dense Sand

STRUCterre consulting engineers

Job number:	43237-15RS	Logged
Site Address:	Lot 25 - RP205543	Checked
	186 Morala Avenue, Runaway Bay	
Date:	23/12/2015	

Borehole 3

Depth (M)	Description	DCP	qa
0.0–0.3	**FILL: Clayey Silty SAND** (SC) Loose to Medium Dense With Gravel, Brown-Grey-Yellow, Moist	5 / 5	
0.2–2.3	**FILL: Silty SAND** (SP) Loose to Medium Dense Brown-Grey, Moist	6 / 5 / 6 / 7 / 7 / 8 / 8	130 / 160 / 180
1.2–2.3	**Silty SAND** (SM) Medium Dense Light Yellow-Light Grey, Moist		
2.0–4.4	**Silty SAND** (SM) Loose Dark Brown-Dark Grey, Wet		
4.4–5.2	**Silty SAND** (SM) Medium Dense Dark Grey-Brown, Wet		
5.2–5.5	**Silty SAND** (SM) Medium Dense Dark Grey, Wet		

Borehole 3 - Continued

Depth (M)	Description	DCP	qa
5.5–7.0	END OF BORE HOLE @ 7.0m		

To 7.0 Metres

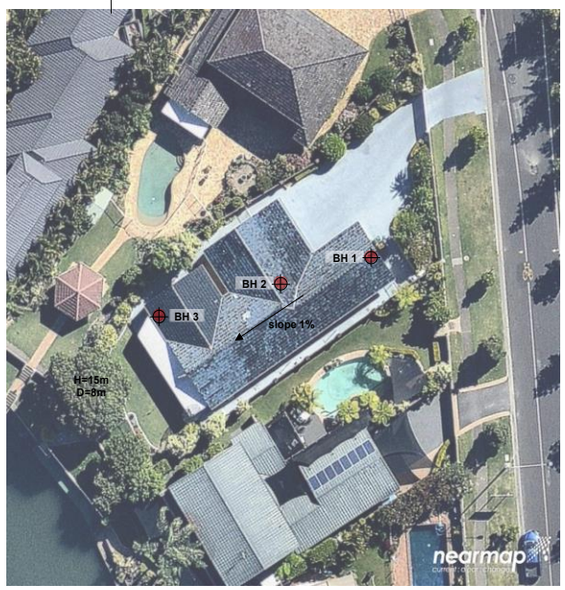
BH 3 (BH 2)

Back of site

Loose Sand

M/Dense Sand

Site Sketch Not to scale



SITE INVESTIGATION & CLASSIFICATION REPORT

CLIENT: **Blade Pile QLD Pty Ltd**
13 Alex Fisher Drive
BURLEIGH HEADS QLD 4220

JOB NUMBER: **43237-15RS** (Revision A)

SITE ADDRESS:

DATE: 12 January 2016

SITE CLASSIFICATION: **Class P** – due to trees (refer note)
Class P – due to fill
(class S properties, excluding trees)
Note: house removal, refer note

Site Photo

Terms

DCP:	Dynamic cone penetrometer (blows/100mm)
H_s:	AS2870 Depth of design soil suction change (mm), or HEDRA/QBCC update 2015.
H_c:	Depth of cracking (mm)
I_{ps}:	Estimated Shrink-swell index (%/pF)
I_{ss}:	Shrink-swell index (%/pF)
PP:	Pocket penetrometer bearing pressure (kPa)
q_a:	Allowable bearing pressure (kPa)
UTP:	Unable to penetrate
HWR:	Highly weathered rock
y_s:	Characteristic surface movement (mm)
y_t:	Potential additional surface movement due to trees (mm)

Laboratory test results

H_s (mm):	**1700**
H_c (mm):	**850**
Sample:	**A**
I_{ps} (%/pF):	**0.1**
y_s (mm):	**0 to 5**
y_t (mm):	**0**

Pile Loads Issue – Generalised higher loads = Waste & Higher Costs

FOUNDING MATERIALS
ALL FOOTINGS REQUIRED INTO
FIRM NATURAL GROUND.
(VIA 100KN S.W.L SCREW PIERS WHERE NECESSARY)
SLAB REQUIRED INTO
FIRM NATURAL GROUND.
(VIA 75KN S.W.L SCREW PIERS WHERE NECESSARY)

EXISTING FILL MATERIALS
(PRIOR TO CUT/FILL)
TO APPROX. **3000** mm

R.C. SLAB (ON GROUND)
100mm THICK
SL72 FABRIC
20 TOP COVER (INTERNAL)
40 TOP COVER (EXTERNAL)

EDGE THICKENING
ET: **300** DEEP x **300** WIDE (3L11TM)

INTERNAL BEAM
IB: **250** DEEP x **300** WIDE (3L8TM)

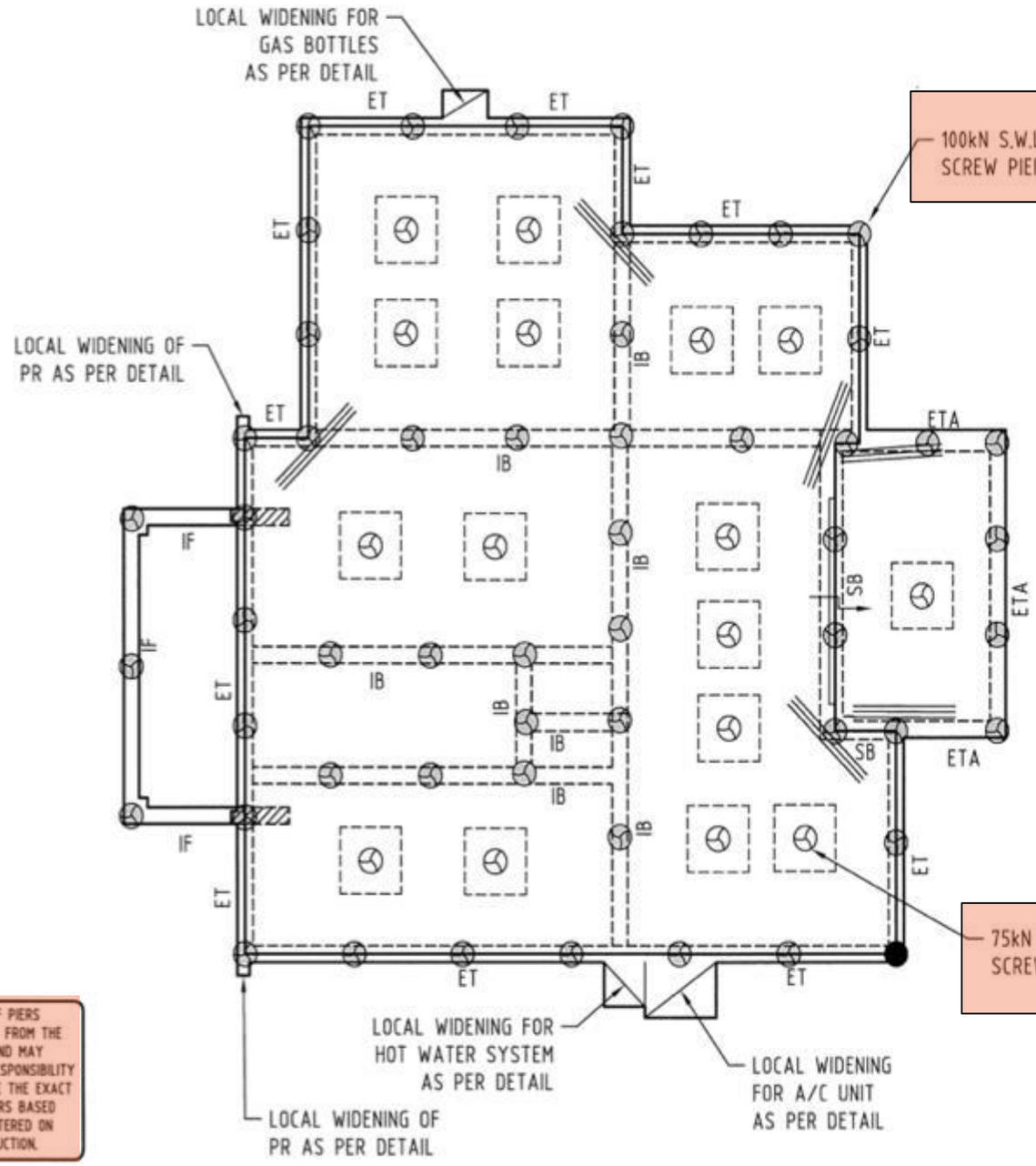
RE-ENTRANT CORNERS
DENOTES **3L11TM** x 2000 LONG TIED TO UNDERSIDE OF SLAB REINF. (TYP. ALL RE-ENTRANT & RECESS CORNERS)

ISOLATED STRIP FOOTINGS
IF: **450** DEEP x **300** WIDE (MIN)
(REFER TYPICAL ISOLATED FOOTING DETAILS EXACT WIDTH AS PER ARCH. DRAWINGS.)

WHERE WALLS ARE LOAD BEARING AND ARE NOT SUPPORTED WITHIN 1m OF AN INTERNAL BEAM OR A POINT LOAD IS SUPPORTED BY SLAB ONLY CONTACT ENGINEER IMMEDIATELY FOR POSSIBLE REDESIGN.

NOTE:
- SCREW PIERS ARE TO BE DESIGNED BY THE PILING CONTRACTOR. THE CONTRACTOR SHALL SUPPLY FORM 15 & FORM 16 CERTIFICATES FROM A PRACTICING RPEQ ENGINEER CERTIFYING THAT THE DESIGN AND THE PIERS IN THEIR INSTALLED LOCATIONS ARE STRUCTURALLY ADEQUATE. TO CARRY THE SPECIFIED LOADS.
- PIERS DESIGN LIFE TO BE 50 YEARS IN THE GROUND CONDITIONS ON SITE.
- PIERS ARE TO APPLY NO MOMENT TO THE SLAB OR FOOTING.
- CERTIFICATION OF LOAD CARRYING IS REQUIRED, REFERENCE TO TORQUE DIAL GAUGE READINGS ONLY IS NOT ACCEPTABLE.
- THE PILING CONTRACTOR MUST ENSURE AN APPROPRIATE SIZE HELIX IS USED ON SITE TO AVOID THE POTENTIAL OF EXCESSIVELY DEEP PILES.

THE NUMBER AND LOCATION OF PIERS SHOWN HAVE BEEN ESTIMATED FROM THE LIMITED SITE INVESTIGATION AND MAY DIFFER ON SITE. IT IS THE RESPONSIBILITY OF THE BUILDER TO DETERMINE THE EXACT NUMBER AND LOCATION OF PIERS BASED UPON THE CONDITIONS ENCOUNTERED ON SITE AT THE TIME OF CONSTRUCTION.



100kN S.W.L. FOOTING SCREW PIER (TYPICAL) **= 100 kN Un-factored**

75kN S.W.L. SLAB SCREW PIER (TYPICAL) **= 75 kN Un-Factored**

Providing the wrong pile loads for each location, means the client pays for piles that they don't need

Specified Pile Loads Solution – Calculated pile loads = No Waste & Lower Costs

BLADE PILE New Zealand

43249-15RS SKETCH SK1
PILE LOCATION

STRUCterre consulting engineers
Job No: 43249
Date: 22/12/2015
The competent person responsible for the certification of this document:
Name: Adam Buckley RPEQ: 14481
Signature: Sheet: 1 of 1
67 Links Avenue North, Eagle Farm Email: brisbane@structerre.com.au
PH: (07) 3307 8300 Fax: (07) 3307 8301 ABN: 99 115 038 429 ACN: 115 038 429

NOTES

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INTERNAL BEAM
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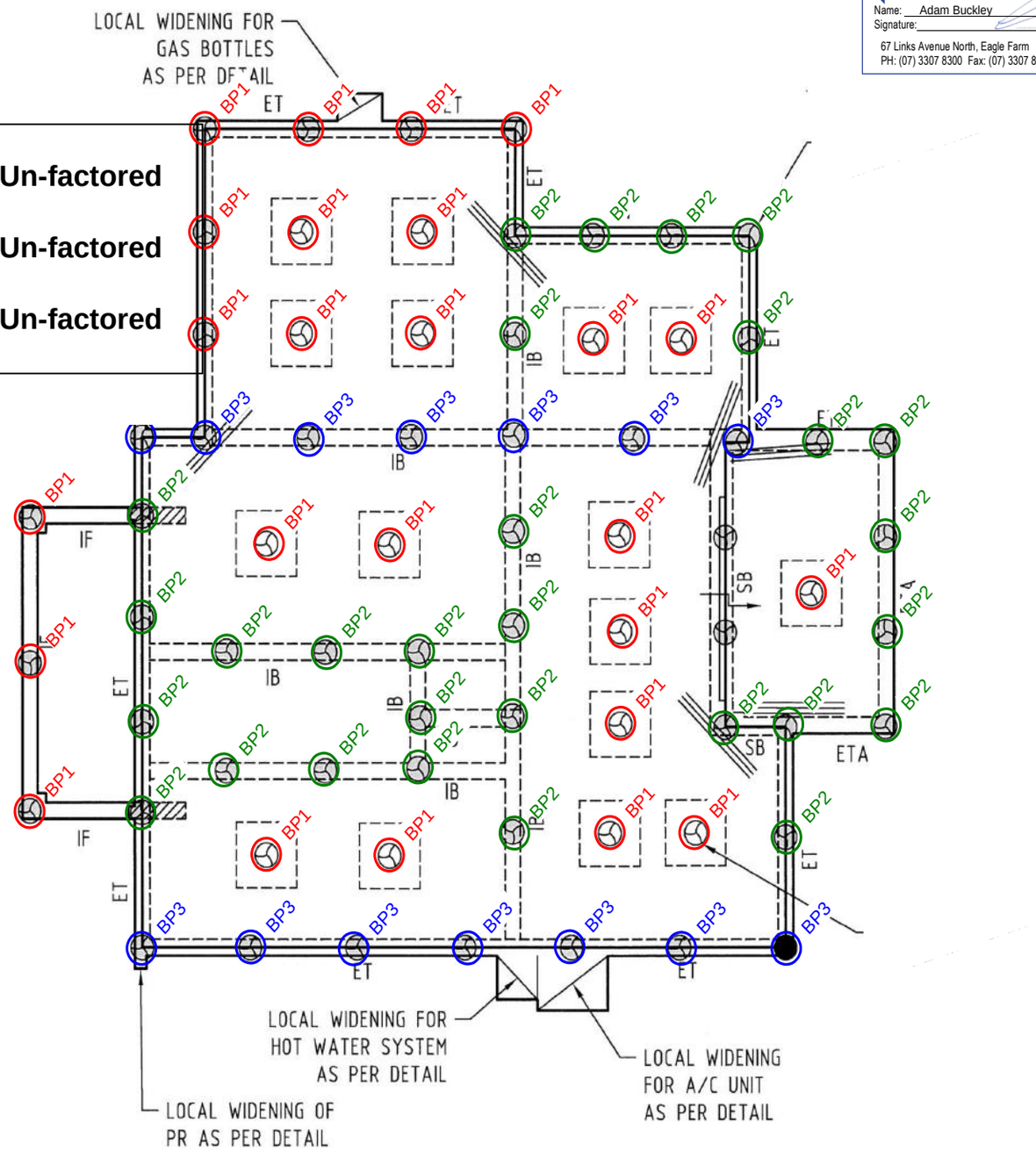
BP1 = 50 kN ULS PILE **= 37 kN Un-factored**
BP2 = 75 kN ULS PILE **= 55 kN Un-factored**
BP3 = 90 kN ULS PILE **= 67 kN Un-factored**



Calculating the correct pile load for each location, means the right piles at the right cost for the client

Technical Design Manual

Blade Pile Geotechnical Designs - Piling & Foundation Systems

STRUCterre consulting engineers

Residential | Geotechnical | Commercial & Infrastructure | Inspect & Investigate | Energy Assessment | Environmental

www.bladepile.com - info@bladepilegroup.com.au

Blade Pile Systems - 2016 Technical Design Manual

BLADE PILE Group ™

Blade Pile Group - PH +61 75593 8788 - 13 Alex Fisher Drive
Burleigh Heads QLD 4220 - PO Box 4478 RTC QLD 4230 Australia
www.bladepile.com - info@bladepilegroup.com.au

This Technical Design Manual (TDM) has been created for use in the determination, application and design of Blade Piles, Slip Joint Pile Caps, Piled Slab Systems, Lateral Bracing Piles and connections for Residential, Commercial, Industrial and Civil Construction projects.

Design information, methodologies, calculations and recommendations documented within this TDM are in accordance with the relevant Australian Standards, to ensure that proper compliance & certification can be achieved for the mandatory requirements of those standards.

STRUCterre consulting engineers

Residential | Geotechnical | Commercial & Infrastructure | Inspect & Investigate | Energy Assessment | Environmental

Perth | Brisbane | Sydney | Bunbury | Geraldton | Gold Coast | Albany | Karratha

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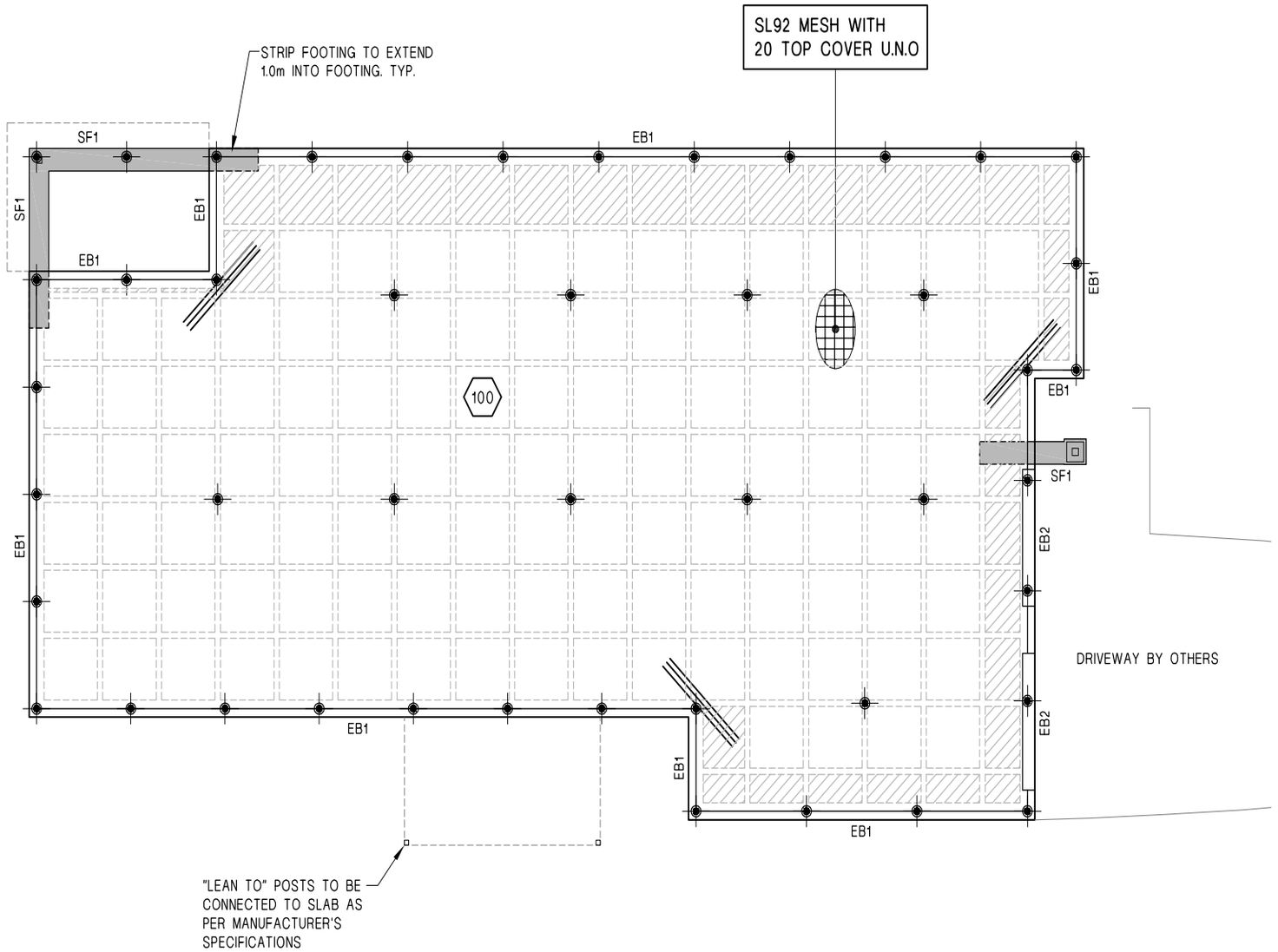
Phone (+617) 3307 8300 | Fax (+617) 3307 8301 | Email brisbane@structerr e.com.au | Web www.structerre.com.au
ABN 99 115 038 429 Structerre WBA Pty Ltd ACN 115 038 429 trading as Structerre Consulting Engineers (QLD)

Pile Cap Slab System – Waffle Raft Slab, Blade Piles & Slip Joint Pile Cap



FOOTING & SLAB PLAN
SCALE 1:100

LEGEND:	REFER DWG 'S2' FOR STANDARD FTG/SLAB SECTIONS REFER DWG 'S3' FOR TYPICAL FTG/SLAB DETAILS
100	INDICATES SLAB THICKNESS
EB1,EB2	EDGE BEAM
IB1	INTERNAL BEAM
SF1	STRIP FOOTING
+	BLADE PILES BY OTHERS, WITH SWL OF 70 kN IN COMPRESSION FOUNDED INTO NATURAL GROUND.
//	3-N12 TRIMMER BARS, 2.0m LONG LAID BENEATH MAIN SLAB MATT

BLADE PILE NOTES:

BLADE PILE MINIMUM CAPACITY U.N.O	70 kN

1. TEST BLADE PILES ARE TO BE CONDUCTED PRIOR TO THE CONFIRMATION OF THE BLADE PILE DESIGN BY THE ENGINEER
2. THE TREATMENT OF THE BLADE PILES SHALL BE AS PER AS 2159 OR EQUIVALENT
3. ALL BLADE PILES ARE TO BE 350 GRADE U.N.O
4. ALL BLADE PILES MUST HAVE A MINIMUM DEPTH OF 3m.

SITE CLASSIFICATION: E CLASS
ys = 105 - 110

SOIL TEST BY: Structerre WBA Pty Ltd
15/03/13

CONCRETE GRADE: 20MPa
SLUMP: 100mm
AGG: 20mm

ALL CONCRETE IS TO BE MECHANICALLY VIBRATED DURING CONCRETE POUR

RECOMMENDED FOUNDING MATERIAL:
NATURAL VERY STIFF SILTY CLAY.

THE CUT/FILL LINE SHOWN IS APPROXIMATE ONLY. IF VARIES PLEASE CONSULT ENGINEER FOR FURTHER ADVICE.

ENSURE STEPDOWNS, PENETRATIONS AND SLAB THICKENINGS ARE INSTALLED IN ACCORDANCE WITH THE ARCHITECTURAL PLANS.

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DO NOT SCALE OFF ENGINEERING DRAWINGS

File: R:\ACAD Standards\Drawings\ Frames\ A3std\SWBA-GFE_B.dwg (LANDSCAPE, 19 DECEMBER 2011 - ARS-DW)

Revision Details

No.	Description	Date	Job No.	Name
0	CONSTRUCTION ISSUE	29/04/13		TMH

STRUCterre consulting engineers
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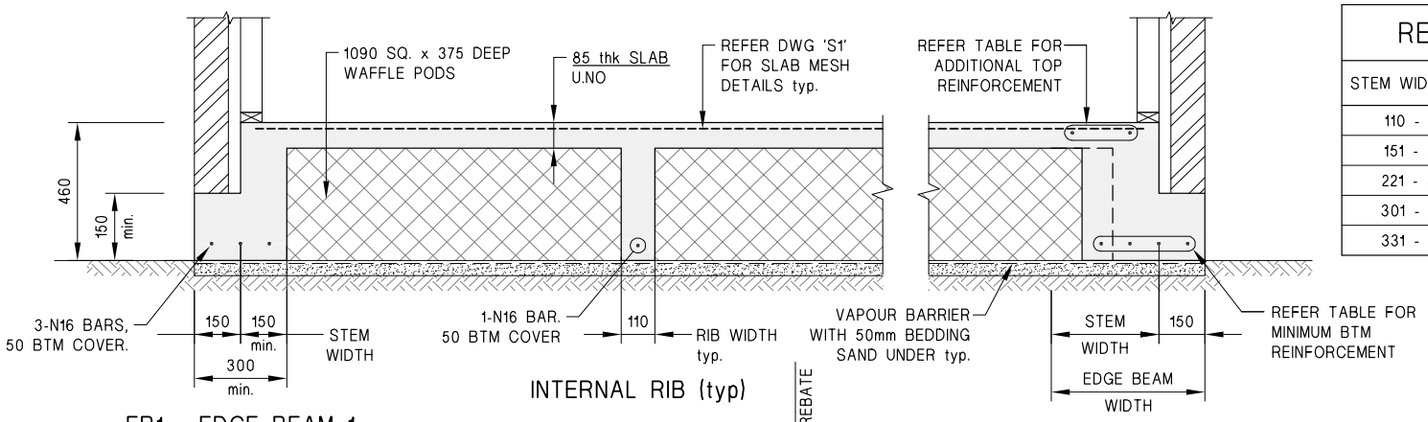
67 Links Avenue North
PO Box 621
EAGLE FARM 4009
ph: (07) 3307 8300
fax: (07) 3307 8301
web: www.structerre.com.au
email: brisbane@structerre.com.au

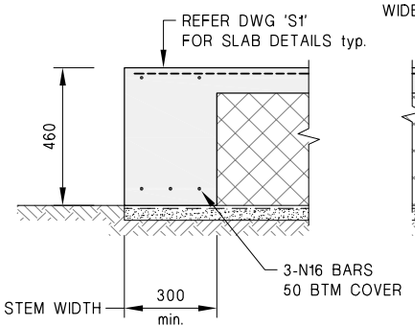
Project: ROSEWOOD QUEENSLAND
Client:
Drawing: FOOTING & SLAB PLAN
Authorised by: S. Avery
Sid Avery
MIEAust RPEQ, No. 6523
Project No.: EXAMPLE 4
Rev.: 0
Scale: 1:100
Date: 29/04/13
Designed: TMH
Drawn: TMH
Checked: SA
Dwg No.: S1

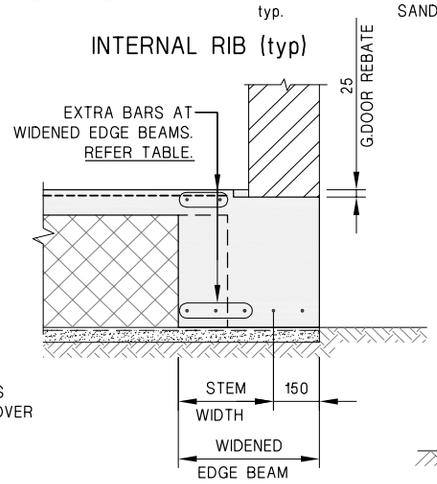
Pile Cap Slab System – Waffle Raft Slab, Blade Piles & Slip Joint Pile Cap

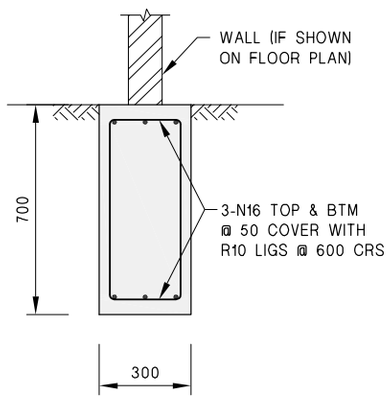


REINFORCEMENT FOR WIDENED BEAMS:

STEM WIDTH (mm)	ADDITIONAL TOP BARS	EDGE BEAM WIDTH (mm)	MINIMUM BTM BARS
110 - 150	0	110 - 150	1
151 - 220	1	151 - 220	2
221 - 300	2	221 - 300	3
301 - 330	2	301 - 330	3
331 - 440	3	331 - 440	4







NOTE:

REINFORCEMENT COVER:
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TRENCH MESH AND BARS
UP TO 12mm DIA: 500mm LAP MIN.
BARS UP TO 16mm DIA: 600 LAP MIN.
SLAB MESH: 2 BAR LAP MIN.

WET AREA SET-DOWNS:
PLACE 1-N12 BAR, 1200mm LONG, AT ALL RE-ENTRANT CORNERS OF WET AREAS.

TILED AREAS:
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DAMP PROOF COURSE:
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email: brisbane@structerre.com.au

Project: ROSEWOOD QUEENSLAND
Client:

Drawing: FOOTING & SLAB STANDARD SECTIONS

Authorised by: S. Avery
Sid Avery
MIEAust RPEQ. No. 6523

Project No.: EXAMPLE 4
Rev.: 0
Scale: 1:20
Date: 29/04/13
Designed: TMH
Drawn: TMH
Checked: SA
Dwg No.: S2

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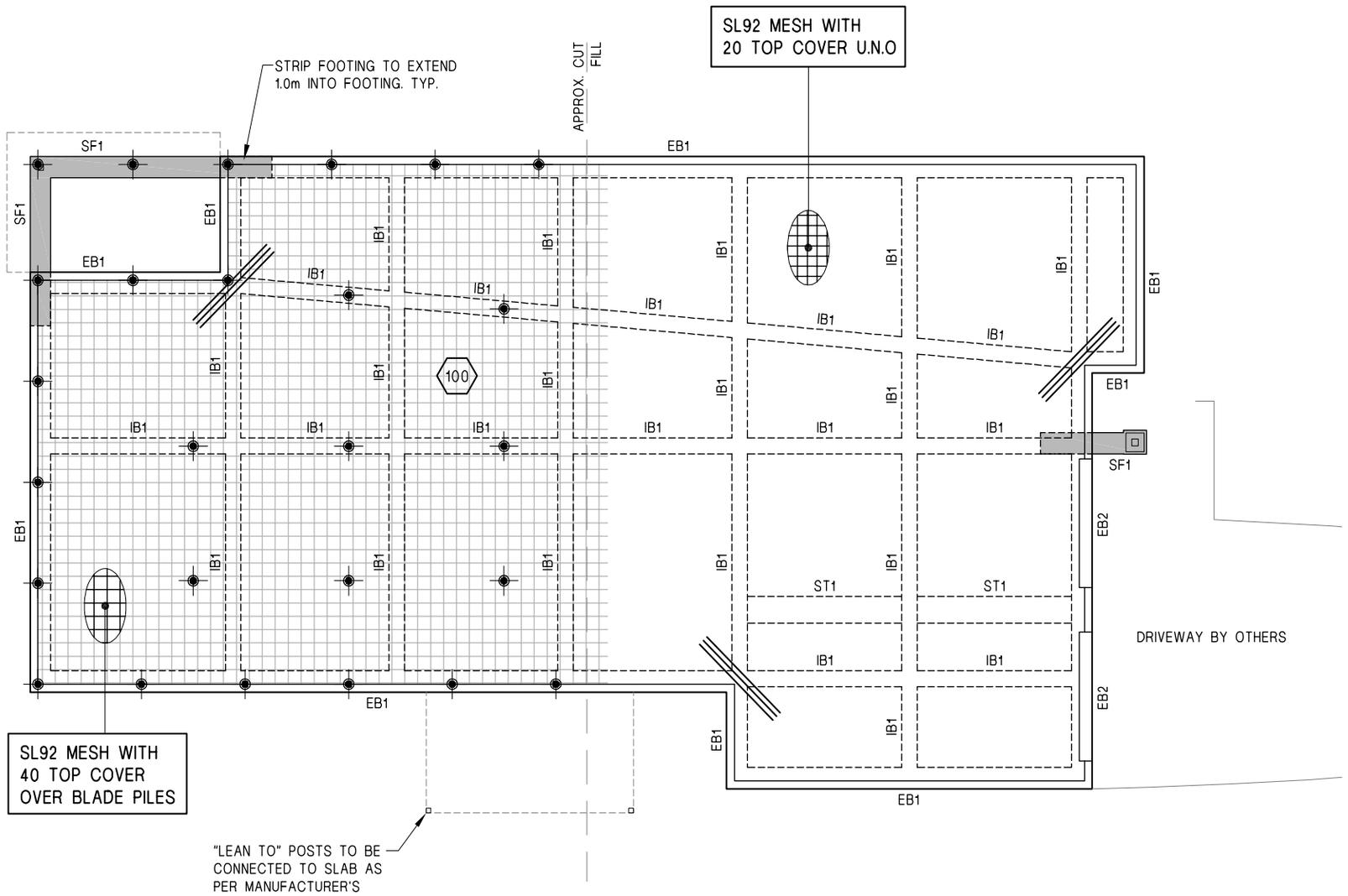
Pile Cap Slab System – Conventional Raft Slab, Blade Piles & Slip Joint Pile Cap



FOOTING & SLAB PLAN
SCALE 1:100

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EB1,EB2	EDGE BEAM
IB1	INTERNAL BEAM
SF1	STRIP FOOTING
ST1	SLAB THICKENING
⊕	BLADE PILES BY OTHERS, WITH SWL OF 70 kN IN COMPRESSION FOUNDED INTO NATURAL GROUND.
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ys = 105 - 110

SOIL TEST BY: Structerre WBA Pty Ltd
15/03/13

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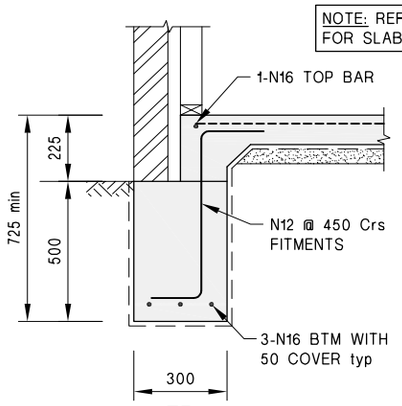
email: brisbane@structerre.com.au

Project: ROSEWOOD QUEENSLAND
Client:
Drawing: FOOTING & SLAB PLAN
Authorised by: S. Avery — Sid Avery, MIEAust RPEQ. No. 6523
Project No.: EXAMPLE 3 — Rev.: 0
Scale: 1:100 — Date: 29/04/13
Designed: TMH
Drawn: TMH
Checked: SA
Dwg No.: S1

File: R:\ACAD Standards\Drawingh Frames\A3stdSWBA-GFE_B.dwg (LANDSCAPE , 19 DECEMBER 2011 - ARS-DW)

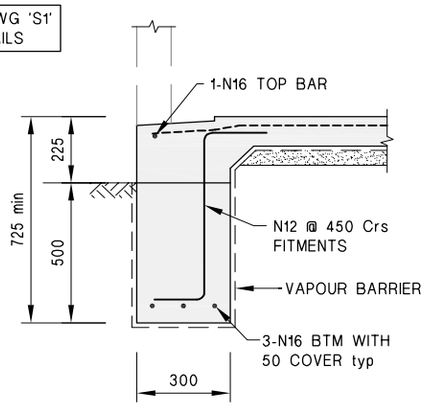
Pile Cap Slab System – Conventional Raft Slab, Blade Piles & Slip Joint Pile Cap

NOTE: REFER DWG 'S1' FOR SLAB DETAILS

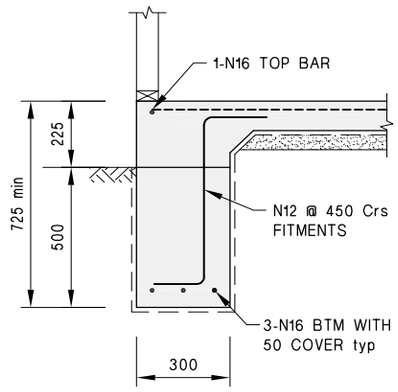


EB1

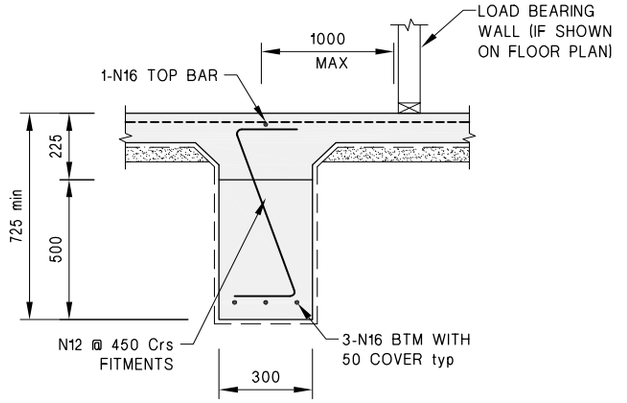
NOTE: IF A MINIMUM OF 75mm OF CONCRETE IS EXPOSED AFTER LANDSCAPING, NO FURTHER TREATMENT AT PERIMETER IS REQUIRED TO PROVIDE TERMITE PROOFING.



EB2 - EDGE BEAM (FOR GARAGE RECESS)

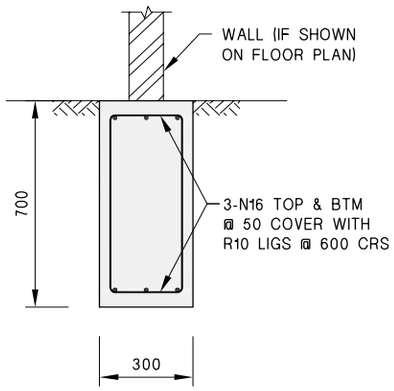


EB3 - EDGE BEAM (CLAD FRAME)



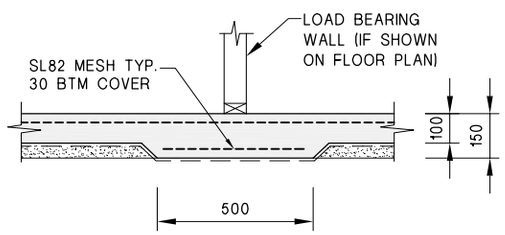
IB1 - INTERNAL BEAM

NOTE: IF INTERNAL BEAMS ARE POURED SEPARATELY TO THE SLAB, FITMENTS SHALL BE USED TO CONNECT THE SLAB TO THE INTERNAL BEAM

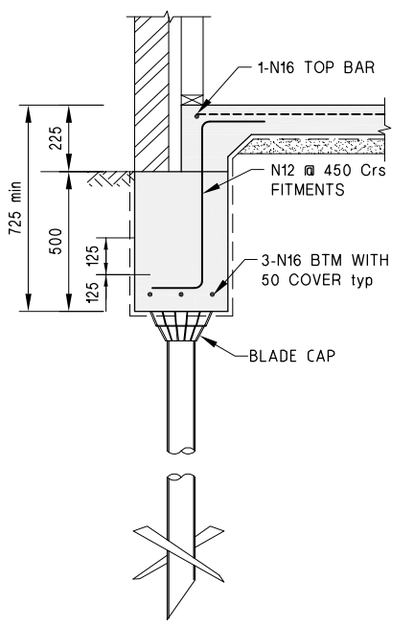


SF1 - STRIP FOOTING

NOTE: SF1 MAY BE WIDENED FOR ENGAGED PIERS AND TO SUPPORT COLUMNS

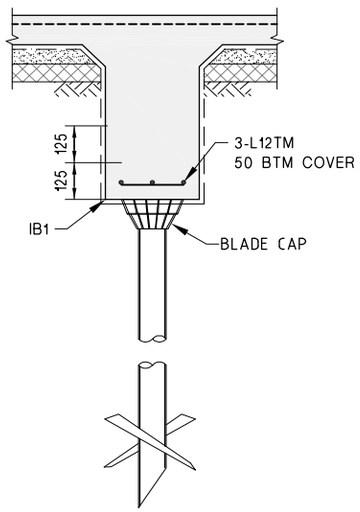


ST1 - INTERNAL SLAB THICKENING FOR LOAD-BEARING WALLS



EDGE BEAM 'EB1' WITH BLADE PILE DETAIL

SCALE 1:20



INTERNAL BEAM 'IB1' WITH BLADE PILE DETAIL

SCALE 1:20

NOTE:

REINFORCEMENT COVER:
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Project: ROSEWOOD QUEENSLAND
Client:
Drawing: FOOTING & SLAB STANDARD SECTIONS
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Project No.: EXAMPLE 3 | Rev.: 0
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Designed: TMH
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Checked: SA
Dwg No.: S2

File: R:\ACAD Standards\Drawings\ Frames\ A3std\SWBA-GFE_B.dwg (LANDSCAPE , 19 DECEMBER 2011 - ARS-PW)

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Adelaide South Australia 5000
Australia

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F +61 8 8237 9778
E adelaide@ap.aurecongroup.com
W aurecongroup.com

22 November 2011
Project No. 214714

Trista Technology Pty Ltd
Level 2/389 Scottsdale Drive
Robina Qld 4226

Attention: Kym Plotkin, CEO

Dear Sir,

Subject: Pile Cap Slab Footing System

We confirm that we have examined the Pile Cap Slab System and have successfully carried out designs of residential footings using this method of footing construction.

The Pile Cap Slab Footing System comprises several elements as follows:

1. A 350 grade high tensile steel shaft with a high tensile twin blade at the base which has a cutting edge at 45°(Plate A). This blade pile falls under the classification of a "steel screw pile" by AS 2159-2009 "Piling – design and installation", Section 1.3.32. It is an alternative method of piling to the conventional steel screw pile with a helical circular base, a timber pile, and a bored and cast-insitu concrete pile. Plate B shows the installation of a Blade Pile.

Plate A – Blade Pile	Plate B – Installation of Blade Pile

2. A pile cap made of high density PVC which provides an enlarged support to the surface footing (Plate C). The pile cap has a slip joint that accommodates soil heave. The pile cap also provides a compression only connection to the surface footing.

Plate C – Pile caps in place	Plate D – Waffle raft on blade piles and pile caps

3. A surface footing which is either a conventional stiffened slab system (such a waffle raft, such as shown in Plate D) designed for the reactive soil movement for the site, or alternatively a suspended reinforced concrete slab supported on the blade piles and pile caps, and cast on void forms comprising collapsible polystyrene "Star Pods". For the former system, the blade pile and pile cap minimises the development of edge settlement of the stiffened shallow footing. For the latter system, the blade pile and pile cap enables the floor slab to be suspended above the reactive soil movements.

The design of the Pile Cab Slab System will follow the intention of AS2870-2011 "Residential Slabs and Footings" Section 4.8, i.e. the design is to be in accordance with engineering principles.

Informative design procedures are given in AS2870-2011 Section G6.

In particular, the Pile Cap Slab System can be designed to meet the following design requirements:

- The pile must have an adequate compressive structural and geotechnical strength,
- The pile must have adequate tensile structural and geotechnical strength,
- The pile must have adequate flexural (bending) structural strength,
- The pile cap can be designed to accommodate the expected soil swell for the site,
- The pile cap can be designed to carry the compressive load from the surface footing,
- The pile must be adequately anchored in the soil. In the case of reactive sites, the pile must be founded in the stable zone below the depth of reactive soil movements,
- When the Pile Cap Slab System is used to suspend the floor slab above the reactive soil, the footing must be isolated from the reactive soil, and
- There must be isolation and flexibility of the services connecting to the structure supported on the Pile Cap Slab System.

With the above design requirements being met, we have found the Pile Cap Slab System to be a very effective method of footing construction.

Yours sincerely
Aurecon Australia Pty Ltd

Dr. Peter W. Mitchell
Technical Leader Ground Engineering

6.

Pile Testing

Blade Pile Group and its associated companies understand the importance of ongoing independent structural & geotechnical testing of foundation products and are now able to assist other parties in acquiring expert pile testing services.

Independent verification and certification of Blade Pile Group products continues to be carried out by some of Australia's leading engineers, testing laboratories and consulting engineering companies.

Some of the parties that have worked with Blade Pile to provide testing include Structerre Consulting Engineers, GHD Consulting Engineers WA, Aurecon SA, Prompt Certification WA, URS SA, University of South Australia, Griffith University QLD, ALS Group, Foundations Specialist Group, Alfa Labs QLD and Dr. Peter Mitchell.

The Blade Pile Group and its associated companies have now established pile testing services for other parties. Our group works directly with certifying engineers in Australia and overseas, to ensure independent, accurate & reliable certification services that meet all Standards, Building Codes and regulatory requirements.

BLADE PILE New Zealand

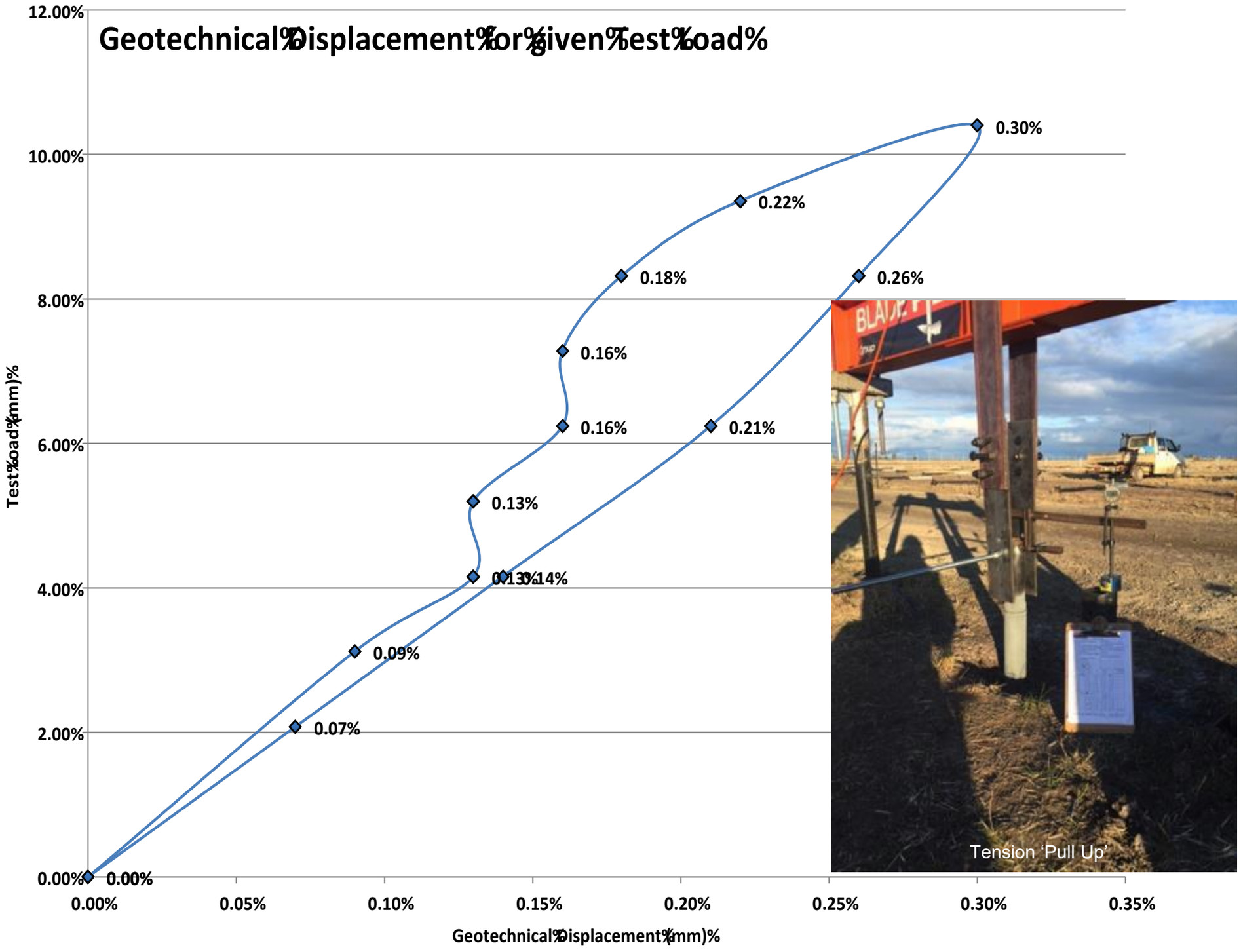
Tension Test

Test Stage: 1 Test Number: 45 Date: 20.08.15 Pile Type: [redacted]

Site Address: [redacted]

Client/Project Details: [redacted] Test Pile Position: PS01N3T12P07

Each No.	Test Load kN	Displacement NGL
1	0.00	0.00
2	3.12	0.09
3	4.16	0.13
4	5.20	0.13
5	6.24	0.16
6	7.28	0.16
7	8.32	0.18
8	9.36	0.22
9	10.40	0.30
10	8.32	0.26
11	6.24	0.21
12	4.16	0.14
13	2.08	0.07
14	0.00	0.00
15		



Tension 'Pull Up'

BLADE PILE TEST GRAPH - Tension Test - vs.22.07.15

BLADE PILE
New Zealand

COMPRESSION TEST

Test Stage: 3 Test Number: 131 OM Date: 24.09.15 Pile Type: [redacted]

Site Address: [redacted] Install Torque:

Client/Project Details: [redacted] Test Pile Position: OM Building

Each No.	Test Load kN	Displacement NGL (mm)
0	0.00	0.00
1	33.90	1.51
2	45.20	1.87
3	56.50	2.14
4	67.80	2.45
5	79.10	2.78
6	90.40	2.95
7	101.70	3.40
8	113.00	3.74
9	90.40	3.73
10	67.80	3.56
11	45.20	3.29
12	22.60	2.96
13	0.00	2.52
14		
15		

BLADE PILE TEST GRAPH - Compression Test - vs.22.07.15

BLADE PILE New Zealand

LATERAL TEST

Test Stage: 3 **Test Number:** 38 **Date:** 17.08.15 **Pile Type:** [redacted]

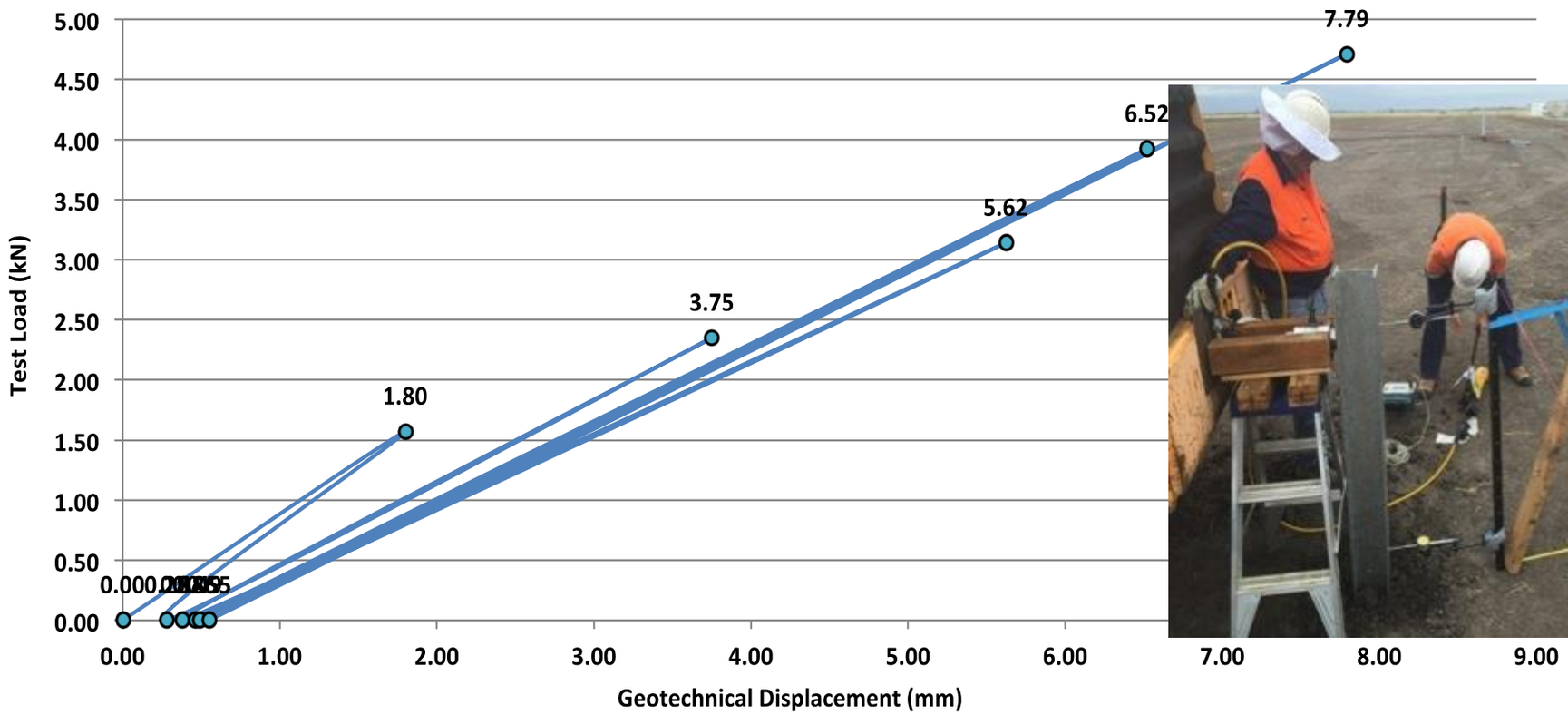
Site Address: [redacted]

Client/Project Details: [redacted] **Test Pile Position:** Pile PS01N4T13P02 - GPS East: TBA - North: TBA

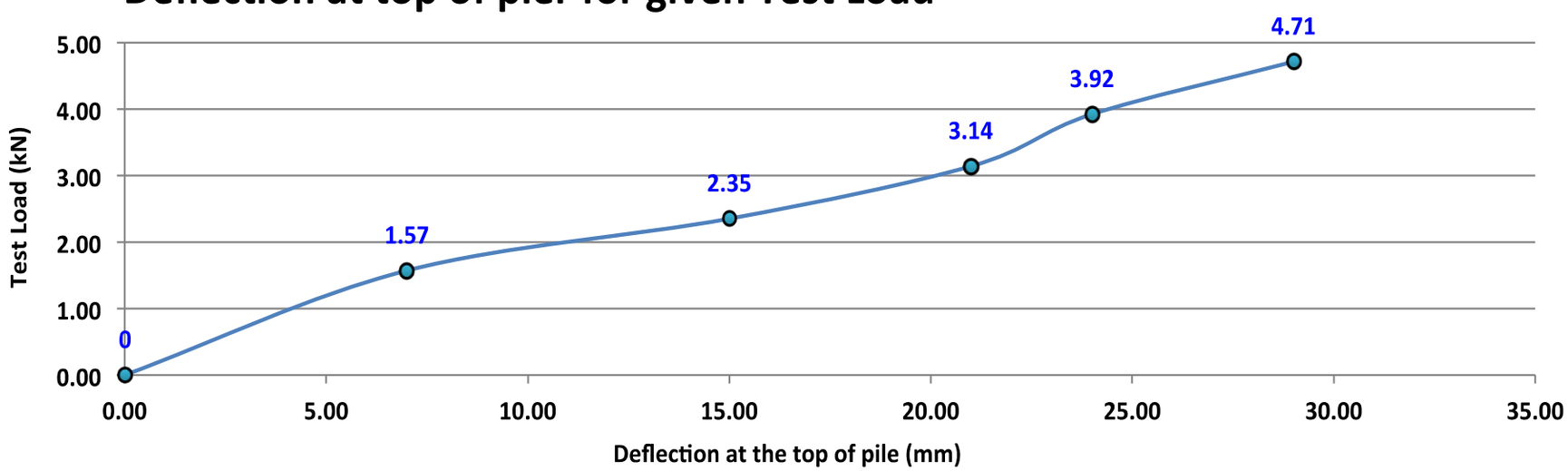
Each No.	Test Load kN	Geotechnical Displacement Bottom (mm)	Deflection Top (mm)
Start	0.00	0.00	
50%SLS	1.57	1.80	7.00
Rebound	0.00	0.28	
75%SLS	2.35	3.75	15.00
Rebound	0.00	0.38	
100% SLS	3.14	5.62	21.00
Rebound	0.00	0.46	
125% SLS	3.92	6.52	24.00
Rebound	0.00	0.49	
150% SLS	4.71	7.79	29.00
Rebound	0.00	0.55	

Summary Notes:	

Geotechnical Displacement (bottom) for given Test Load



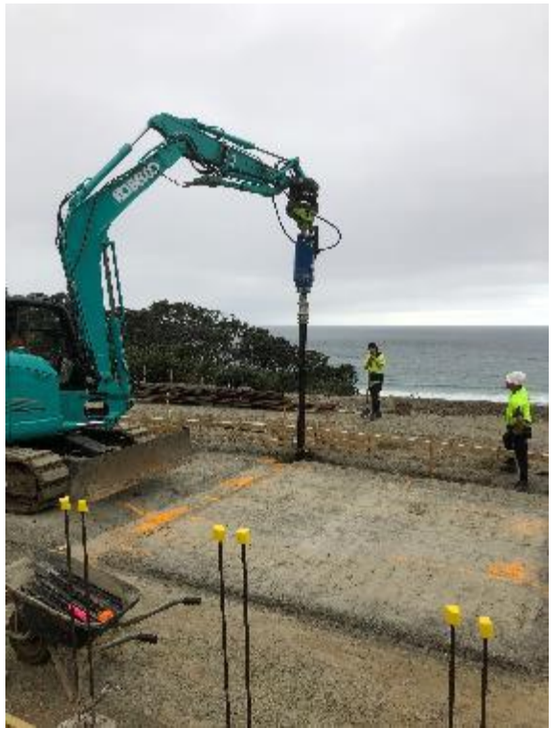
Deflection at top of pier for given Test Load



Blade Pile – Destruction Testing to Determine & Optimise Geodynamic Performance

Blade Piles are continually tested beyond their limit, to verify and certify the Blade design, fusion welded connections and there relationship with a given CHS pipe.

All these elements are designed to perform equally to there limit, with ZERO allowable tolerance for weld failure, to ensure the best possible performance in all Geotechnical environments.



Weld Limit Testing – Alfa Lab Brisbane QLD

AlfaTest Pty Ltd
A.B.N. 58 096 333 774
PO Box 229, Salisbury QLD 4107
Unit 3/121 Evans Rd, Salisbury, Qld 4107

Phone: (07) 3715 3400
Fax: (07) 3715 3401
Email: info@alfatest.com.au

AlfaTest

"Delivering Results"

MECHANICAL TESTING REPORT RE-ISSUE

AlfaTest Report No:	20150178M01 Re-issue	Date of Inspection:	20 January 2015
Location of Test:	Brisbane Laboratory, Qld	Client Order No:	01338
Client Name/Address:	Blade Pile Group Pty Ltd 13 Alex Fisher Drive, Burleigh Heads, Qld 4220		
Client Job No:	Not specified		
Project Details:	Static load testing of supplied samples		
Item Details:	M01 - 89mm diameter pipe, no gussets M02 - 89mm diameter pipe with 2 gussets M04 - 76mm diameter pipe without gussets M05 - 89mm diameter pipe with 4 gussets		
Sample Details:	Refer Test Results		

TECHNICAL DETAILS
STATIC LOAD TEST

Test Procedure:	TP 230	Test Spec:	Client's Requirements
Client Requirements:	Test and report results	Acceptance Spec:	Client's Requirements
Material Spec:	Grade 350 (Fabricated Parts)		

Test Equipment

Equipment:	Field Box	Equipment No:	480
Equipment:	700 bar Transducer	Equipment No:	543
Equipment:	5 tonne Ram	Equipment No:	570
Equipment:	Laser Distant Measurer	Equipment No:	1933

Sample Condition

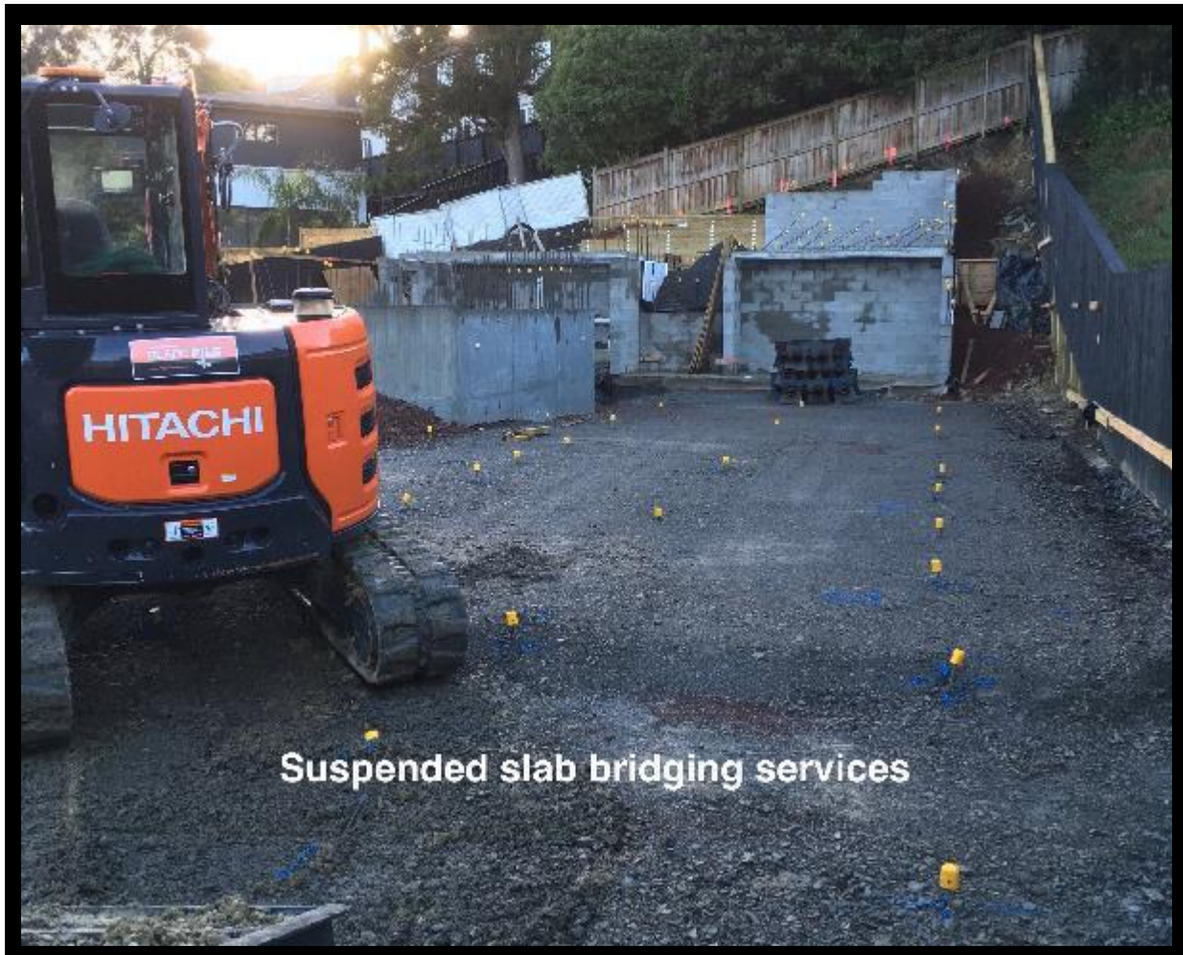
Time of Test:	01:00pm & 03:00pm, 20 January 2015		
Test Restrictions/ Deviations:	Nil		
Compliance:	Refer Test Results		

Technician/s:	Fabian Lyons George YunHui Jiang Jabin Kirk	Approved by:	Fabian Lyons
		Signature:	
		Re-issue Date:	27 January 2015

Form No: R054
Version No: 1

Torque Plastic Limit Test Moree NSW

High Torque & Speed Impact Test Moree NSW



We Thank You For Your Interest