

CAPABILITY STATEMENT

BELPILE



BELPILE.COM



LOCALLY
OWNED AND OPERATED



30 YEARS
PILING EXPERIENCE



OVER 1000
PROJECTS COMPLETED



PROVEN
COST EFFECTIVE RECORD



ENGINEERING
TEAM IN-HOUSE



COMMITTED
TO HEALTH AND SAFETY



COMPANY OVERVIEW

Belpile is a proudly Australian, privately owned, piling contractor that was established in 1987 in Queensland. In 1994 operations commenced in Perth, Western Australia, where the business now has its head office which is the centre of operations. Since commencement, Belpile has safely and successfully completed over 1090 piling projects around Western Australia, South Australia, Queensland, NSW and Victoria. In 2017 Belpile established a second office in South Australia. Belpile have provided cost effective foundation and ground retention solutions across several markets, including small to large residential buildings, medium to high rise commercial structures and public and industrial infrastructure. We have a modern fleet of conventional and limited access piling machines equipped with the latest in automated monitoring technology.

Belpile are an engineering oriented piling contractor driven by the quality and performance of our work. We currently have a dedicated team of in-house geotechnical engineers who frequently provide innovative, cost effective, foundation and retention solutions for our customers. Our design expertise is backed up through an extensive library of static load testing and a comprehensive understanding of geotechnical conditions/problems. Belpile are active participants in the technical community for piling and deep foundations, presenting regularly at conferences across Australia and assisting with a range of research and development projects undertaken in co-operation with the University of Western Australia.





COMMITMENT TO OCCUPATIONAL HEALTH & SAFETY

Belpile highest priority is the health and wellbeing of its employees. We are committed to providing a safe working environment for our team and our clients. A pro-active safety culture is evident within our organisation, with individuals encouraged and empowered to take action where health and safety is concerned.

Belpile have a well developed occupational health and safety management plan, and a robust set of policies and procedures based on 30 years of industry experience. In addition to ongoing training of staff/operators and implementation of our OHSE management plan, Belpile have an independent specialist HSE consulting team to assist in reviewing policies, procedures and undertake routine audits and inspections.

PRODUCTS AND CAPABILITIES



CONTINUOUS FLIGHT AUGER SYSTEMS

Belpile provide a wide variety of Continuous Flight Auger (CFA) piling systems which are suitable for conventional headroom and limited access applications.

The core products and services we can provide include:

- **Foundation piling** – including small to large diameter CFA or enlarged base 'Belpiles'
- **Ground retention systems** – including contiguous and secant pile walls with temporary ground anchors or propping systems where required

- **Limited access piling** – specialist machinery to allow pile installation in headroom as low as 2.0m and restricted access as narrow as 1.2m
- **Top down and high precision (low tolerance) piling** for cast in plunge columns and hold down assemblies

Belpile can provide a range of auger sizes and equipment, with the capability of installing straight shaft CFA piles ranging from 250mm to 1050mm diameter. Our enlarged base pile capability also offers additional versatility.

Dependent on ground conditions, our machinery has the capacity to construct piles up to 18m deep.

Belpile have always placed a high priority on installation monitoring and have extensive experience in the design and implementation of monitoring systems. Our modern rigs are equipped with the latest in automated monitoring technology (Jean Lutz) to provide a superior level of quality control. These electronic data-logging systems continuously monitor piles during construction, providing real time measurements of drilling torque, penetration rates, concrete pressure, volume and extraction rates. Belpile have the capability to provide real time monitoring data from our machines remotely.

Extensive
monitoring
experience
using the latest
technology



THE 'BELPILE' – ENLARGED BASE PILING

Used in conjunction with our bentonite management equipment, our machines can install under-reamed 'Belpiles' in a range of sizes. This is a patented enlarged base technique developed and refined by Belpile over the past 30 years. The technique is based upon a traditional cast in place grout/concrete CFA type pile with an added operation forming the base enlargement. Bentonite support fluid is used to maintain stability of the pile shaft and bell during construction of the pile. This means the Belpile can be utilised in unstable soil conditions either above or below the ground water table. The load carrying behaviour of Belpiles in both uplift and compression has been tested and researched extensively in conjunction

with the University of Western Australia and Queensland University of Technology.

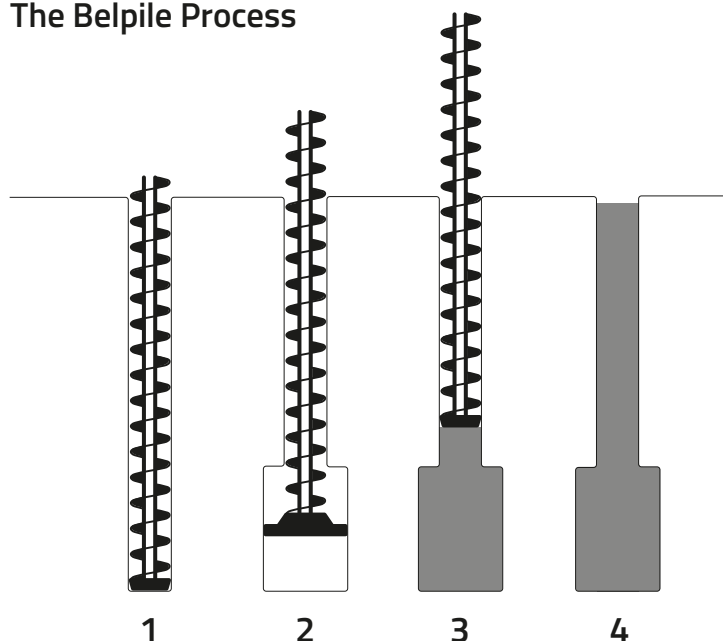
The Belpile can be a highly cost effective foundation solution, affording enhanced capacity piles without the need to extend deep below-the-ground surface. The Belpile system facilitates a significant advantage in limited access applications and is a product in high demand for applications such as 'retro-fit' building upgrades and scenarios where superior uplift resistance is required. They can be particularly useful in limited access applications such as 'retro-fit' building upgrades and scenarios where superior uplift resistance is required. Enlarged base Belpiles have also been instrumental in the development of the top down



construction technique and are well suited to this application.

Belpiles have been an effective foundation solution on several hundred projects in Western Australia and Queensland. Standard sizes include (shaft/base) diameters of 300/600mm, 350/700mm, 450/850mm and 500/950mm. One of the primary advantages of the Belpile is being able to install high capacity piles with comparatively lighter equipment.

The Belpile Process



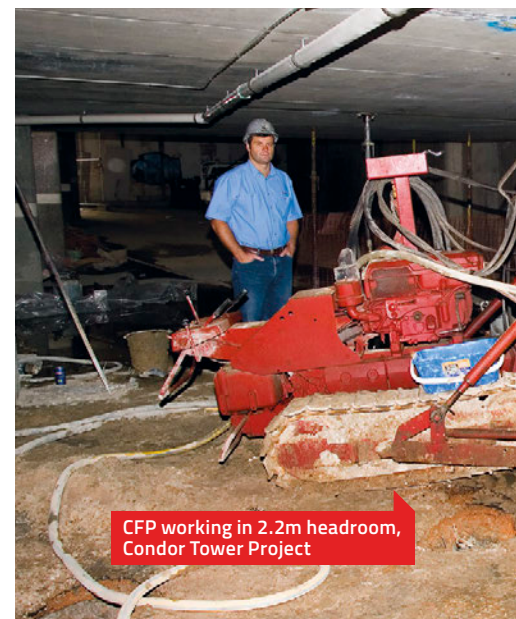
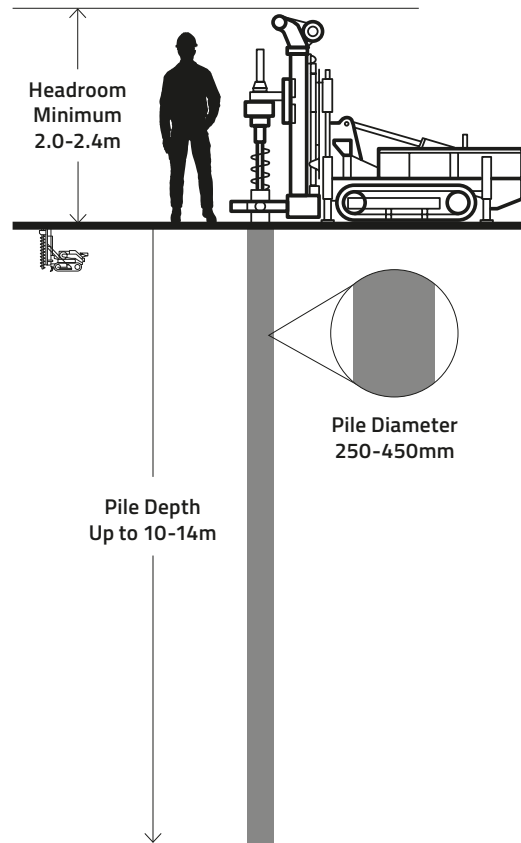
A patented
enlarged base
piling technique
developed and
refined by Belpile
over the past
30 years

LIMITED ACCESS/RESTRICTED HEADROOM PILING

Belpile are industry leaders in limited access piling capability, having completed a number of large projects within existing basements and limited access applications. With a drive for more sustainable, environmentally friendly development, a number of re-usable buildings are requiring upgraded foundations to enable additional floors to be added above the existing structure. This technique was employed using Belpile foundations on the Condor Tower project in Perth, subsequently receiving an engineering excellence award for urban renewal from Engineers Australia.

Our mini-pile rigs are designed to pass through narrow openings and can operate in headroom as low as 2.0m. With the introduction of our latest machine (Hutte HBR203) we now have the capability of installing 250-450mm diameter piles up to 10-14m deep (depending on ground conditions). Coupled with our enlarged base solutions, Belpile can provide higher capacity piles within limited access for a more cost effective solution.

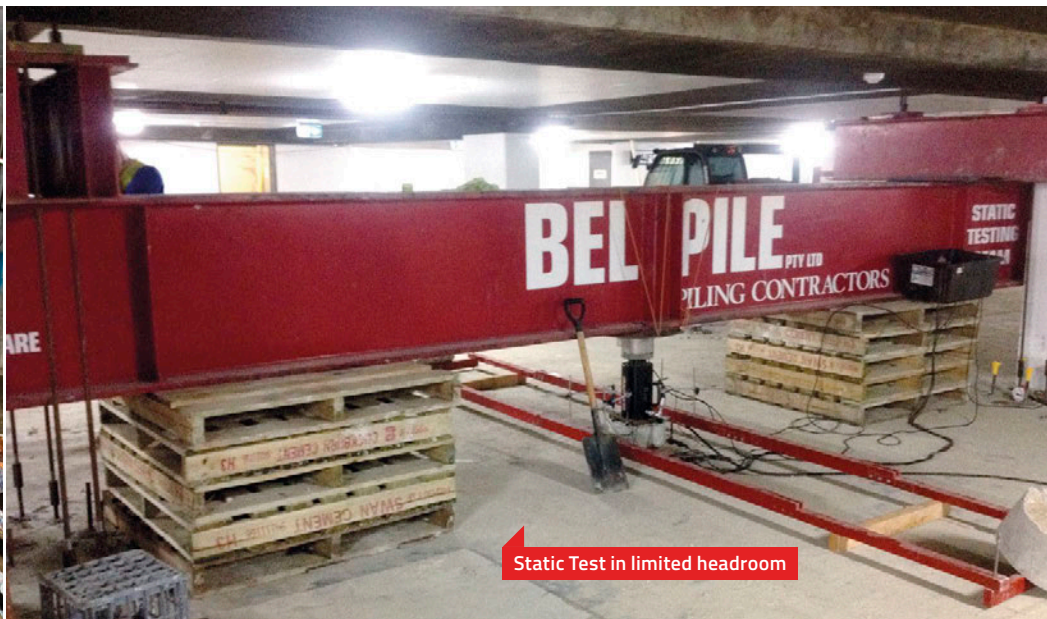
Restricted Headroom Capabilities





Belpile can provide higher capacity piles within limited access for a more cost effective solution

HBR 203 working in 2.8m headroom, Midland WA Project



Static Test in limited headroom

GROUND RETENTION SOLUTIONS

Belpile have extensive experience in the design and construction of piled ground retention solutions including contiguous and secant pile walls for applications above and below the groundwater table in a variety of soil and soft rock conditions. We can provide cantilever, temporary propped and anchored solutions to suit a range of excavation depths and meet project specific requirements.

Belpile can provide contiguous piling from 300-750mm diameter and secant pile walls from 450-750mm. In 2016, Belpile developed an in-house ground anchor capability, which has been successfully implemented in a number of projects.

Use of CFA methodology provides a low vibration/noise solution with minimal ground disturbance

Our engineering team can design temporary propping and grouted ground anchors to minimise wall size where basements have dimensional constraints. With the application of shotcrete and adequate waterproofing, piled walls can serve both a temporary and permanent retention function, eliminating time and cost associated with construction secondary internal skin walls.

Our contiguous/secant pile walls are installed using the CFA methodology, providing a low vibration/noise solution with minimal ground disturbance in comparison to driven pile techniques. This is particularly beneficial in urban areas where adjacent structures are present. Piled walls also provide a much stiffer form of ground retention, minimising the risk of ground/structure movements during excavation.

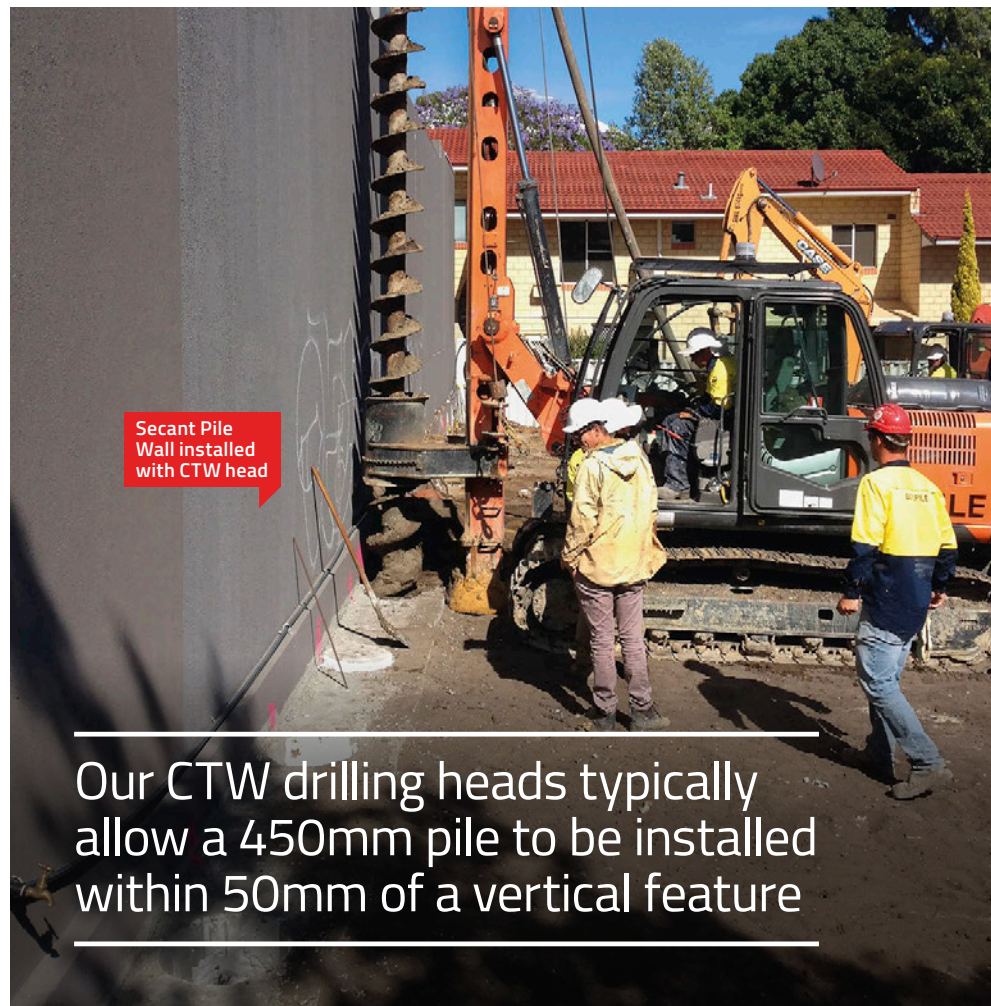


CLOSE TO THE WALL (CTW) APPLICATIONS

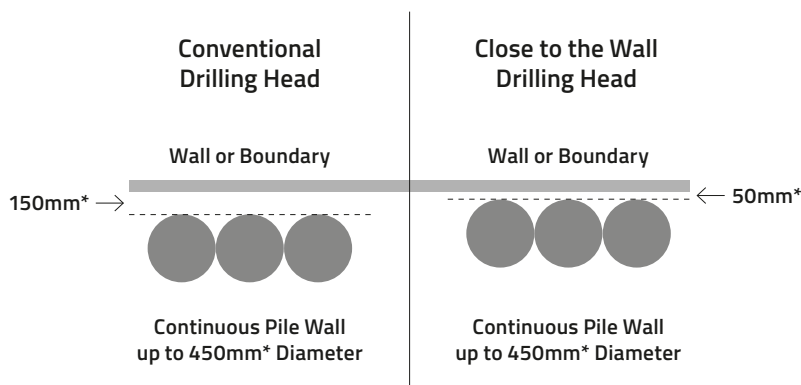
Belpile has made a significant investment in Close to the Wall (CTW) technology and currently has multiple machines with this capability. CTW drilling heads can assist in saving basement space on urban sites where adjacent structures limit conventional machinery from installing piles on boundary.

Typically, our close to wall set-up allows a 450-600mm pile to be installed within approximately 50mm of a vertical feature, as compared to conventional drilling heads which are likely to achieve 150mm or greater.

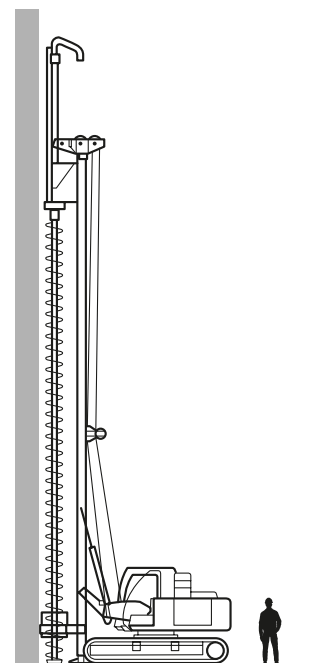
CTW equipment can be particularly useful for basement construction projects with architectural space limitations and tilt panel/ prefabricated construction projects where foundation piles are required close to a boundary.



Close to the Wall Capabilities



*Typical



TOP DOWN CONSTRUCTION AND LIMITED TOLERANCE PILING

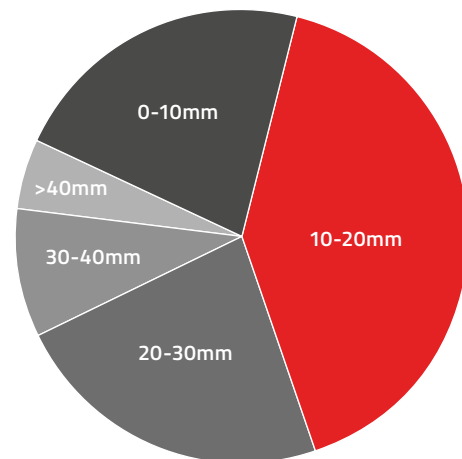
Belpile has been at the forefront of the development of the “Top-Down” system of basement construction in Perth and has successfully completed several small and large scale projects including the 500 Hay Street redevelopment and Cockburn Gateway Stage 2 shopping centre development.

This form of construction has the potential to create significant time/cost savings, particularly on construction projects with large or multi-level basements. Typically, this construction method involves casting structural steel sections or ‘plunge columns’ onto piles whilst maintaining an extremely tight plan position and verticality tolerance. Belpile has developed specialist installation technology and procedures to minimise plan/verticality deviation which allows plunge columns to be installed over multiple basement levels.

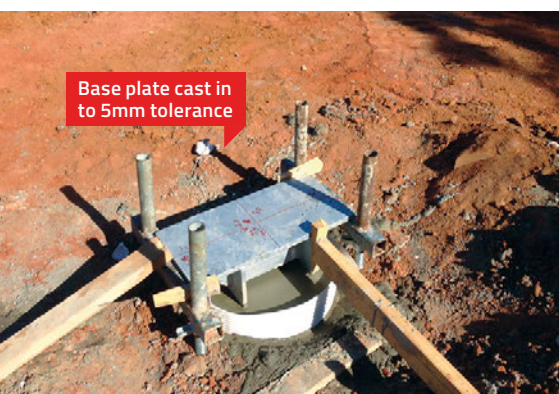
Belpile also has significant experience in the positioning of cast in plates and anchor bolt assemblies to minimal tolerances, simplifying some types of construction.

Cockburn Gateway Project Survey

Deviation from plan position
of 273 surveyed piles



Average deviation 18mm



LIMESTONE AND SOFT ROCK SITES

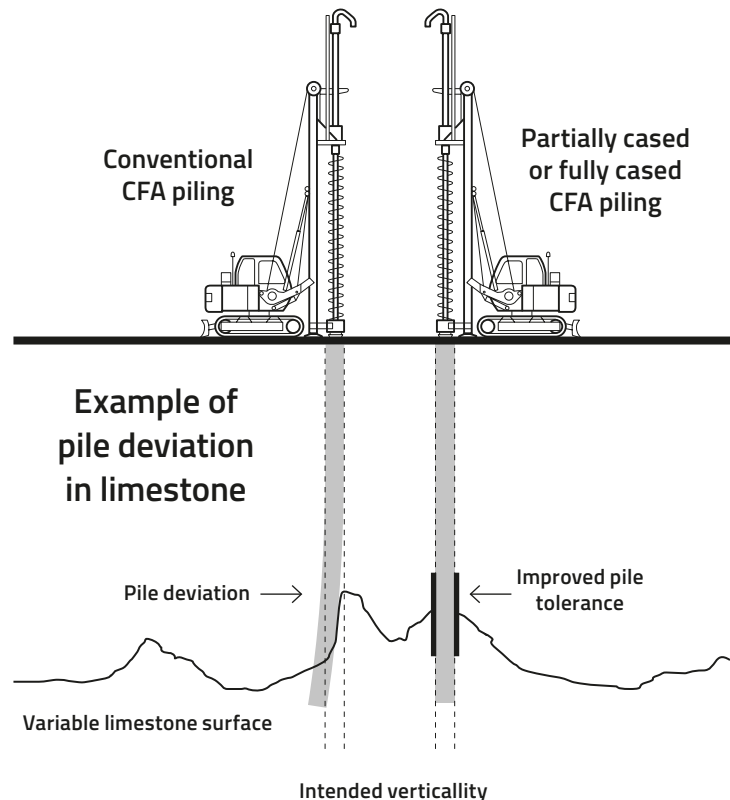
Belpile has significant experience in the design and installation of piling at limestone sites. Undertaking conventional CFA piling in hard limestone can be problematic, often resulting in piles deviating outside acceptable positional or verticality tolerance. This can result in costly remedial works after excavation or encroachment on basement space. Belpile have developed specialised limestone drilling techniques

to reduce pile deviations. This involves a partially cased pre-drilling system to overcome pinnacles/undulations prior to pile installation. Belpile has also employed a fully cased CFA system (double rotary) whereby a casing is advanced full depth ahead of the auger string. In both techniques, the additional stiffness provided by the casing minimises deviation of the drilling tools, resulting in improved pile tolerance.



Belpile often recommend undertaking trial drilling on limestone sites. This approach often assists in reducing project risk by adequately quantifying achievable production rates prior to commencing works. This allows an accurate construction time frame to be provided to the builder/client and also allows refinement of project pricing, often resulting in savings passed on to clients.

Belpile have developed specialised limestone drilling techniques to reduce pile deviations





**TECHNICAL
CAPABILITIES**

DESIGN EXPERTISE

Belpile has developed a reputation for providing practical front end and detailed engineering advice for both engineering consultants and builders. We specialise in design and construct projects, using our technical ability to maximise design efficiency. All of our design solutions are fully certified/guaranteed and based on the requirements of Australian Standards, namely AS2159, AS3600, AS4678, as well as other international standards and best practice guidelines.

Our in-house engineers have honours or postgraduate degrees in civil engineering, specialising in geotechnics and foundation

design. Our engineers are actively involved in research relating to Belpile products, which has been ongoing for the past 25 years. Current research underway is focusing on refining design parameters for CFA piles in Perth soils based on an extensive database of static load tests.

Belpile has compiled an extensive library of geotechnical reports, installation records and full scale load test results which is integrated with modern mapping software to provide a valuable tool for front end engineering. This often allows Belpile to implement more feasible, cost effective design solutions at the planning stage of projects.

Our engineering team have access to an array of modern engineering software to undertake foundation and retaining wall designs, including Oasys Frew, Alp, Slope, Plaxis, Piglet and Ratz. We have vast experience in soil/structure modelling for most foundation and retention situations. Most importantly, we regularly calibrate our design solutions with full scale testing and monitoring.

Belpile also frequently implement third party design reviews undertaken by industry experts at the University of Western Australia.

Our in-house engineers have honours or postgraduate degrees in civil engineering, specialising in geotechnics and foundation design



LOAD TESTING AND PERFORMANCE MONITORING

Belpile has an unrivaled willingness to undertake static load tests in order to confirm and improve design solutions. On larger projects, undertaking early works load testing can result in significant cost savings, due to the design benefits outlined in AS2159.

Belpile has an extensive library of full scale static load tests in a variety of soil conditions which have formed and refined our design knowledge. We routinely instrument (strain gauge) our static load tests to allow more accurate assessment of pile shaft/base contribution in various materials. Belpile frequently predict pile capacity to within 10% in Perth soils.

Belpile are also capable of undertaking high strain dynamic load tests and low strain pile integrity testing (PET).

High strain dynamic tests are usually “calibrated” with static load tests in accord with industry best practice.

In 2013, Belpile was the first piling contractor in WA to undertake a RIMCELL Test, a method which involves loading the pile from the base rather than the pile head.

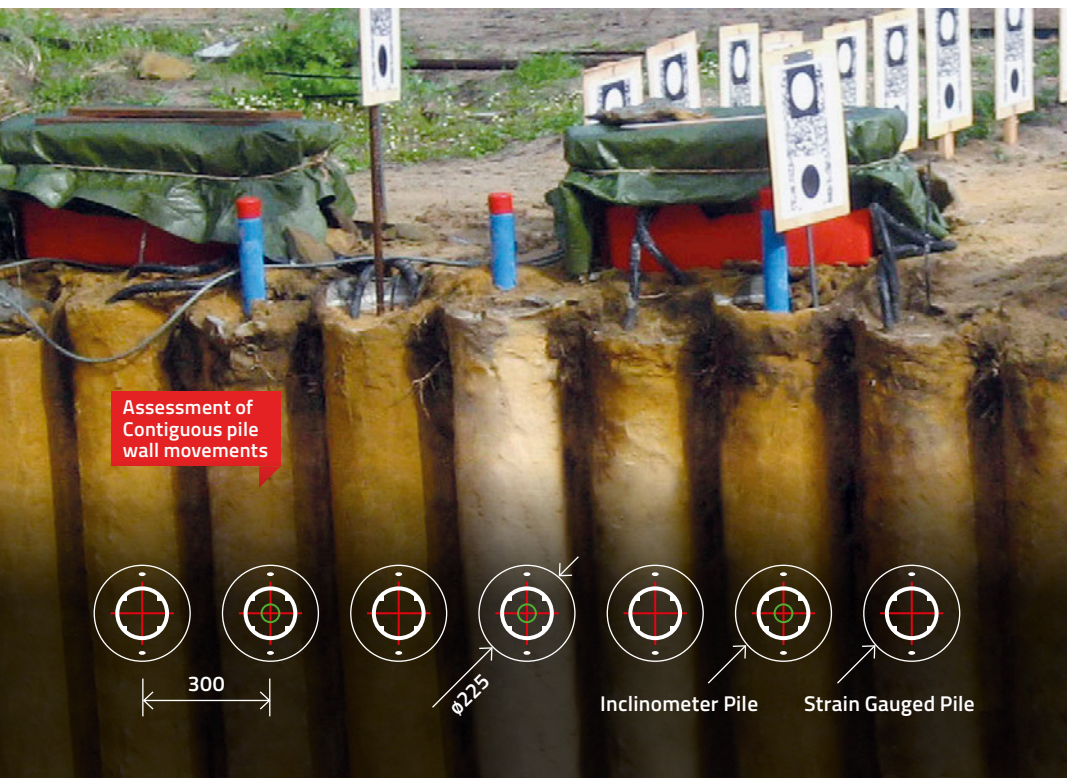
Belpile has also undertaken extensive performance monitoring on contiguous/secant walls to allow more adequate prediction of ground movements during excavation which may impact adjacent structures. This database of information is invaluable in predicting performance on future projects.



Belpile frequently predict pile capacity to within 10% in Perth soils



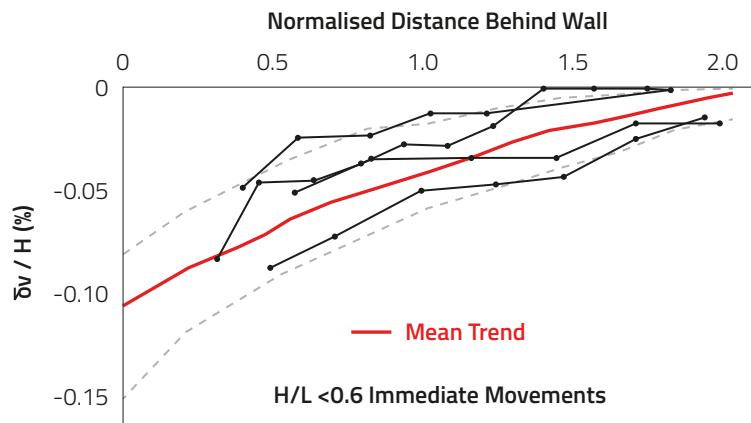
RESEARCH AND DEVELOPMENT



Belpile has developed a strong association with The University of Queensland and The University of Western Australia over the past 20 years.

Professor Barry Lehane, post graduate and undergraduate students have undertaken studies on the load displacement behaviour of Belpile products in numerous soils and limestone around the Perth area. These studies have included assessments of the vertical and lateral load carrying capacity in relation to cone penetration test data and assessment of vertical/lateral ground movements due to excavation in front of contiguous pile walls.

It is important to Belpile that research is applied practically to commercial applications to ensure our clients can benefit from the outcomes





MACHINERY AND EQUIPMENT

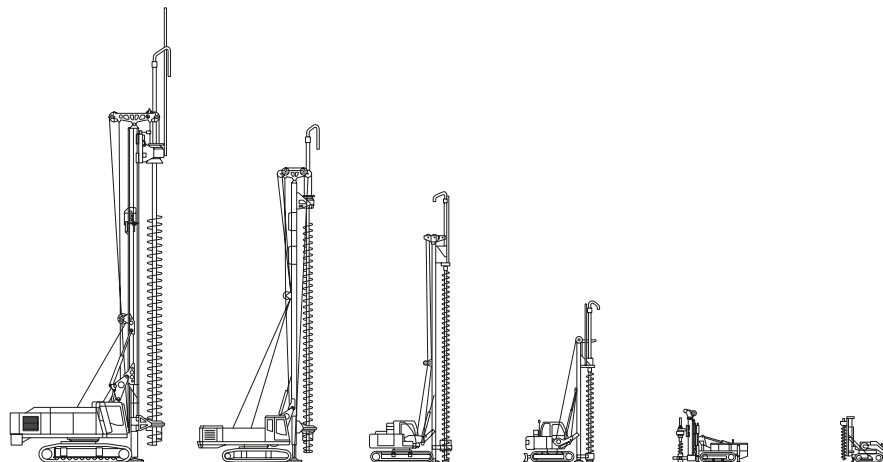
Belpile Owned

Our current modern fleet of rigs and specialist equipment ranges from mini-pile rigs for confined space work to self-erecting track-mounted hydraulic drilling rigs. In addition, a full range of bentonite plant and equipment is available to enable uncased piles to be constructed in unstable soil conditions. All Belpile machinery and equipment is fully owned and operated by Belpile personnel.

Extended Capability

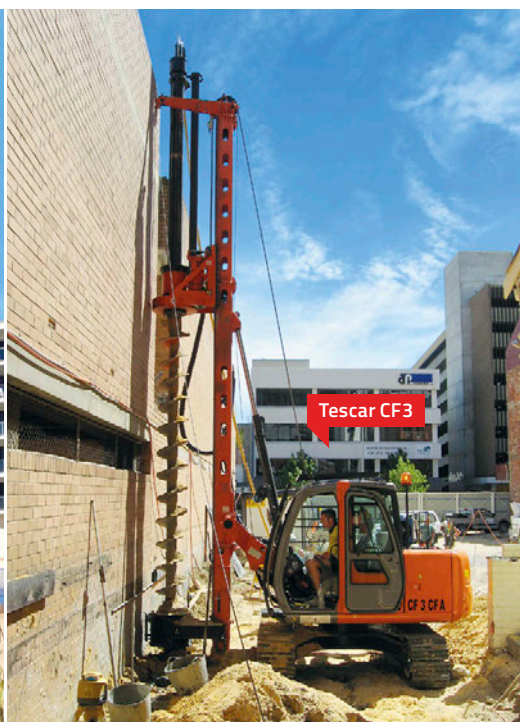
Belpile also have several options for hired plant due to our alignment with other industry sources. This extended capability includes large CFA/bored piling equipment and ensures we can provide our clients added flexibility where multiple rigs are required. Using hired plant, Belpile have previously installed CFA piles up to 1050mm diameter to 18m depth.

BELPILE OWNED MACHINERY



Machine	MAIT HR180	MAIT HR130	Tescar CF6	Tescar CF3	Hutte BR203	CFP
Operating Weight	60t	35t	20t	12t	6.2t*	1.3t*
Typical Pile Sizes	450-1200mm	350-750mm	350-600mm	350-600mm	300-600mm	300mm
Pile Depth	Deep	Deep	Mid	Mid/Shallow	Mid/Shallow	Mid/Shallow
Conventional CFA Piles	•	•	•	•		
Sectional CFA Piles					•	•
Cased CFA Piles	•	•				
Enlarged Base Piles	•	•	•	•	•	•
Contiguous/Secant Piling	•	•	•	•	•	•
Light Weight Machine			•	•	•	•
Close to Wall Applications		•	•			
Limited Headroom/Access				•	•	•

*Powerpack weight additional





**SAFE.
LOCAL.
INNOVATIVE.**

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