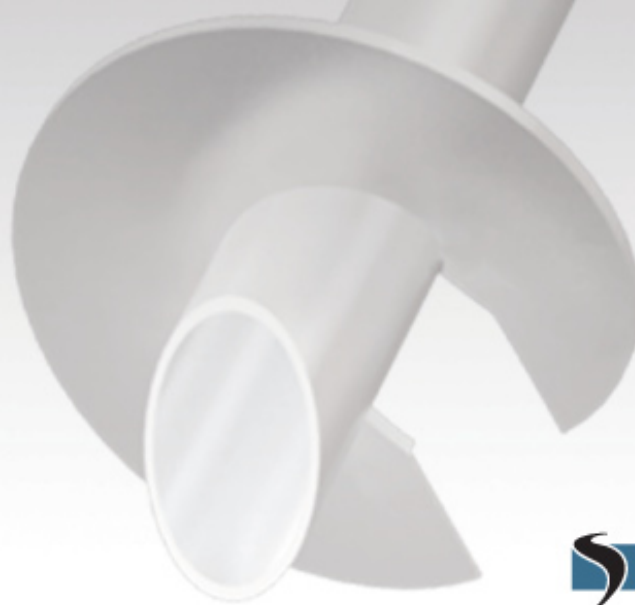




SCREWPILES

Complete Solutions to Foundation Problems



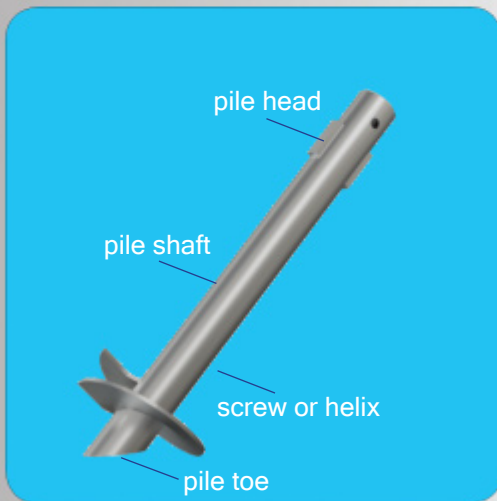
overview

This information pack will provide you with a general overview of screw piles, their benefits and applications. We recommend you obtain further information via our website www.screwpile.com.au or by contacting us directly.

Screwpile Australia has been designing, supplying and installing steel screw piles for the building industry in Perth, Western Australia since 1992. Extensive research, development and testing have resulted in a reliable, fast and cost effective piling system which offers many advantages over other conventional piling methods.

Screw piles have a wide range of applications both in compression and tension loading. Screw piles are individually designed based on the required load carrying capacity and the existing ground conditions.

Please consider using Screw piles in your next project, and discover the benefits and cost savings.



what is a screw pile?



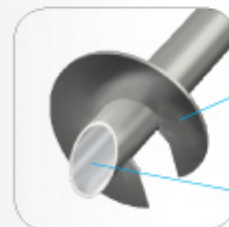
Pile Head

The pile head allows the connection of the pile to the structure over. It also allows the pile to be driven by rotary hydraulic equipment. Many pile head configurations are possible depending on the type of structure over and the loads required. Allowance for installation tolerance must be considered when designing this connection.



Pile Shaft or Column

The pile shaft allows the load being carried to be transferred to the helix plate. It is commonly a circular hollow section which has been designed to suit the load carrying capacity and also the torsional capacity required during installation.



Screw or Helix

The screw is more commonly called the helix. This is a profile cut steel plate that has been pressed into a spiral shape and welded onto the pile shaft. It is principally the end bearing element of the pile. Therefore the diameter and plate thickness is determined by the required load carrying capacity along with the soil type and profile. It also provides the mechanism by which the screw pile is installed.

Pile Toe

The pile toe typically is cut on 45 deg and left open, a soil plug quickly forms during installation. If corrosion or ground water is an issue this can be plugged by seal welding a steel blank in the end. For very hard ground or limestone special hardened teeth can be welded on to assist the piles installation.

screwpile technology

The technology involved in screwpiling is not so much in the manufacturing of the product but rather in the specialised engineering design.

Since the inception of screwpiling in Australia (1992) Screwpile Australia has resulted in screwpiles being used in a wide range of innovative piling projects.

Soil types and profiles play an important role in the design and performance of a Screwpile which can be used in both sand and clay. Screwpiles are screwed into the ground much like giant self tapping screws via rotary hydraulics attached to specialised earthmoving equipment such as bobcats (skid steers), mini excavators or large excavators depending on the capacity and size of the screwpile required.

During installation of the screwpile the torque is monitored to ensure that sufficient load capacities are achieved. Our research and development has established a direct relationship between installation torque and screwpile capacity. Constant torque monitoring provides an accurate indication of existing ground profiles and founding soil capacities.

Screwpiles are available from 1.5 to 20 metres in lengths of 0.5 metre increments for capacities of up to 750Kn SWL in compression & 600Kn SWL in tension.

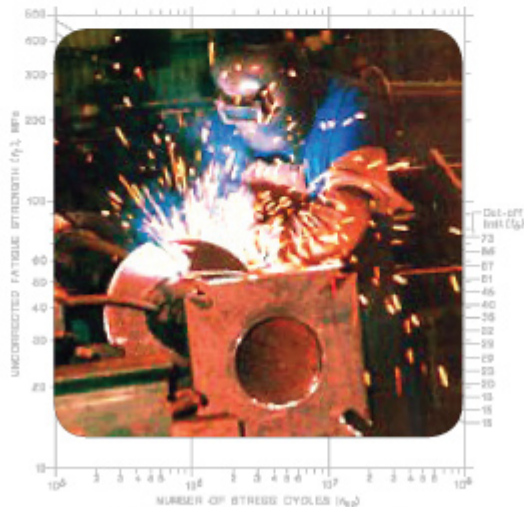


FIGURE 11.6.1 S-N CURVE FOR NORMAL STRESS

the benefits of using screwpiles

Few industries are as demanding on time and cost saving initiatives as is the building/construction industry. Whilst in most cases construction conditions above ground are predictable, enabling construction schedules to be met, the same cannot be said for below ground work. Screwpiles provide engineers and builders with a system of piling that is both performance predictable and offers fast simple solutions should variable or unexpected poor soil conditions be encountered during installation.

Many of the following problems are encountered due construction which can lead to increased costs and or time delays:

No Dewatering required

Screwpiles are unaffected by the existing ground water levels which can cause collapse to standard augered holes. Liners, dewatering or grout is then required to prevent this collapse and enable the placement of concrete. All of which can result in extra time, costs, equipment, safety hazards and rubbish.

Minimal noise / Vibration free

Construction noise is an important issue for all site workers as well as residents, especially in built up areas. Vibration can cause major structural damage to adjoining structures resulting in expensive repair work being required. Because screwpiles are installed using rotary hydraulics there is minimal noise and vibration generated. In a recent project 12 x 6M deep screwpiles were installed only 10M away from an operating restaurant without any interruptions to their business.

Sustainability and Environmental Issues

With ever decreasing global resources designers are now more concerned with building sustainability and whole of life costs for a project. Screwpiles can be removed and reused or recycled at the end of a project making them ideal for temporary structures such as remote work camps or transportable homes. Screwpiles can be installed in environmentally sensitive areas such as lakelands and parks with minimal impact on the surrounding flora and fauna.

No Spoil, Concrete or Reinforcement required.

Augered pile holes generate excess soil which requires disposal, concrete and the reinforcement is then required to be placed in the hole which can be a difficult and labour intensive operation. Screwpiles are a one pass operation saving time and money.

Cost Effective with fast installation

Screwpiles will not only be generally cheaper than other forms of piling they will reduce the time onsite significantly. Contact us today to discuss your next project and the benefits we can offer you.



The use of screw piles

Screw piles can be used in a wide range of applications either in compression or tension. They can provide a quick, cost effective piling solution.

- Commercial and Industrial Piling
- Sewer Piles and Earth Reinforcement
- Luxury and Residential buildings
- Boardwalks & Eco Sensitive Areas
- Transportable/Remote Buildings
- Communications/Lighting Towers
- Pipeline/Conveyors
- Lighting and Signage



- Soil Stabilisation
- Moorings
- Bridges/Tunnels
- Retaining/Temporary Shoring



More than ever, building construction projects require strong foundations. Foundation systems must be reliable, cost effective, and be completed within the required construction schedule.

We specialise in:

- Multi story buildings with high load capacity.
- Soil anchoring and earth stabilisation.
- Industrial and commercial piling, mine sites, water pipelines, factory buildings.
- Infrastructure projects including bridges.

Benefits of Screw Piling includes:

- Excellent for sand and high water tables.
- No vibration and no noise created during pile installation
- Fastest pile installation method available
- Long pile lengths - 30m plus
- Massive reduction in concrete required compared to traditional augured piles

how is a screwpile installed?

Bobcat or Skid Steer

Screwpile capacity = 5t SWL 3.5M long (unspliced).

Used for smaller piles, underpinning work and transportable piles. Good maneuverability and size to access tight locations or minimum available headroom.

bobcat



Mini Excavator – 5t

Screwpile capacity = 15t SWL 6.0M long (unspliced with extension boom).

Used for medium sized piles, domestic sewer, light commercial and industrial piling.

Rubber tracks easy mob / demob, good reach and power size ratio.



5t Mini Excavator

5t Mini Excavator with extension boom.



25t - Excavator

Screwpile capacity = 75t SWL 7.0M long (unspliced). Used for large commercial and industrial piles. With steel tracks, protection of pavement and underground services is required. Large installation torques can be generated by the 130t specialised powerhead.



shoring

Screwpile Australia now offers shoring systems to fully complement screwpiles. This is done through our wholly owned subsidiary ShoreTec Piling.



quality

Screwpile Australia is recognised throughout Australia as being the experts in Screw-piling Technology. Extensive research, product development and testing has and continues to develop Screw-piles as a diverse, predictable and cost effective piling system. Throughout Australia and the World engineers and designers are specifying screw-piling for major projects. Builders and Construction companies therefore need to be ensured that any screw-piling used meets the Australian Standard Codes AS2159 (Piling Code) and AS4100 (Steel Structures Code).

Screwpile Australia now provides engineers and designers with a downloadable specification and drawing notes for use. This specification and notes are a recommendation only, designed to assist in the documentation to ensure screw-piles will meet the require standards.

The use of second hand materials

It is the policy of Screwpile Australia and their associated Engineering firms NOT to design, use, or certify compliance of "pre-used" & "unidentified steel" for structural applications. Recent use of second hand steel tube for a number of screw-piling projects has raised a number of concerns as to whether its use is acceptable, ethical or structurally sound.

The Australian Standards are an integral part of the construction industry and ensures correct procedures are adhered to and structural integrity is achieved. Without compliance to the relevant codes there is the potential for exploitation, poor construction methods with Quality Assurance impossible.



Issues to consider when using second hand steel

Australian Standard "AS4100 -1990 Steel Structures" states clearly as to the use of such steel in construction. Compliance requirements of AS4100, Clause 2.2.3 relates to the requirements of "unidentified steels". In order for "pre-used" or "unidentified steels" to be certified by a CPEng, as complying with the relevant codes, the above clause requires that yield stress $f_y = 170 \text{ MPa}$ be used where no mill quality certificate is available. (i.e. 50% of mill certified product)

- Whether the actual client has been or should be advised that second hand steel is being used on their new project.
- If ex-drill or bore casing is being used has the pile shaft been de-magnetised, (magnetism affects the molecular structure of steel which in turn can affect the weldability of the material.
- Second hand steel generally has suffered pitting and scaling due to exposure prior to being reused, this can result in a loss of strength and serviceability of the product.
- Without individual testing and re-certification, it is beyond the control of the Project Certifying Engineer or the Builder, but that is not to say it is beyond their Duty of Care, to ensure that only quality product is used on their projects.
- Who is ultimately responsible for allowing second hand steel tube to be used?

durability and corrosion

Corrosion

The use of steel underground is not new. Countless thousands of kilometres of steel pipework are buried throughout the world, supplying vital utility services such as water and gas. Yes, steel will corrode but with an understanding of the mechanism of corrosion and a simple soil test, engineers can safely predict its life span. There are a number of misconceptions or myths associated with the use of Steel Screw-piles and Soil types

Concrete versus Steel

It is not correct to assume that concrete piles automatically have a greater durability than steel, a concrete pile relies on its reinforcement for performance and therefore is subject to the same underground conditions as steel piles especially if the cover to the reinforcement is not correct specified or obtained during construction.

Peat and Acid Sulphate Soils

Because peat is found during investigation, it is wrong to therefore assume a greater corrosion classification exists. Left undisturbed a site corrosion classification of 'non aggressive' can and often exists. It is recommended that a simple soil test be done to confirm the site's soil classification as outlined AS 2159 Section 6 for use in the design of any piling.

Acid Sulfate Soil (ASS) is the name given to sediment and soil containing iron sulfides (principally contain iron pyrite or iron di-sulfide). The relatively restricted conditions under which ASS are formed limit their formation to low-lying parts of coastal flood plains, rivers and creeks. This will include areas with saline or brackish water such as deltas, coastal flats, back swamps and seasonal or permanent freshwater swamps which were formerly brackish.

The exposure of pyrite in these soils to oxygen by drainage or excavation, leads to the generation of sulfuric acid. Acidic leachate can dissolve clay and release toxic concentrations of aluminum, iron and other metals into waterbodies.

Galvanised Steel Piles

Steel requires oxygen, moisture and the presence of dissolved salts to corrode. If any one of these is absent, the corrosion reaction will cease or proceed very slowly. Steel corrodes quickly in acidic environments and slowly or not at all as alkalinity is increased.

Zinc requires the presence of stable oxide films on its surface to provide its corrosion resistance. It performs best in neutral pH environments although it can tolerate exposures in the range from pH 5.5 to pH 12. In the absence of air, the stable oxide films do not form on the zinc surface, and corrosion can be accelerated if moisture is present under these conditions.

For this reason, galvanised steel is the best combination where structures are partly buried and partly exposed to the atmosphere, as the zinc provides the durability above ground while the steel performs predictably in-ground.

Galvanising versus Extra Steel

Based on a Site Soil Corrosion Classification of 'Mild', steelwork galvanised with a minimum thickness of 85 microns will result in extra 12 years of pile life based on loss of 6 microns per year. Providing an additional 2mm of steel thickness will result in an extra 60 years of pile life based on a loss of 30 microns per year. Therefore we recommend extra steel be used to extend the screw-pile design life rather than galvanising unless the pile is to be exposed to the air.

screwpile research & testing

File Testing

A large number of full scale screwpile tests both tension and compression have been performed under independent engineering supervision in accordance with AS2159 in sands and clay. Data has indicated that the performance of screwpiles can be predicted using conventional Geotechnical theory and site specific geotechnical information. Please be aware that full pile testing to Australian Standards involves incremental loading and recording over a continuous 12 hour period, including setup and removal allow an additional minimum of 3 days onsite if pile testing is to be undertaken.



Compression testing



Tension testing



Torque v Load Capacity

Testing together with research carried out on work performed by Screwpile Australia indicates that there is a predictable relationship between the installation torque and load carrying capacity of the screwpile. The installation torque is a measure of the shear and frictional resistance of the soil profile when calibrated against test data. Screwpiles work particularly well when compared to alternative tension piles due to the large ratio of under-ream diameter to shaft diameter.

Engineering Certification

Screwpiles are designed and certified by Screwpile Australia's certified practising consulting engineers in accordance with the relevant Australian codes. Our engineers have considerable experience in the design and use of screwpiles in a wide range of soil types and applications.

Screwpile certification consists of the following information :-

- File loads and Design life (supplied by project engineers)
- Site specific geotechnical investigation and/or an EFCT probe to a depth of at least 2M greater than the final pile embedment. (supplied by the builder or client if available)
- Screwpile design and calculations including File/Footing connection detail
- Installation log (supplied by Accredited Screwpile installer)

Publications available

SPA RH01: Foundation and Anchoring Systems for Remote Housing and Transportables.

SPA ESE: Piling systems for Eco-Sensitive Environments

SPA CIP: Commercial and Industrial Piling

For complete solutions to foundation problems contact



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