

Design Philosophy

Alexander Mitchell (a blind brick-maker) invented the screw pile in the 1830s and used them for marine structures (Maplin Sands Lighthouse in 1838) some of which are still in use. We manufacture and install piles in the same way as Mitchell, the only change being the use of hydraulic equipment to provide (and measure) the applied torque instead of a team of men turning a capstan.

Extensive testing allowed Hoyt and Clemence to develop the simple formula which connects installation torque to pile capacity. This relationship has been tested both practically and theoretically, and shown to be a consistently reliable and accurate method.

Success in pile installation depends on selection of the correct piles plus use of the extensive range of torque heads available from Ultimate Screw Piling. In many situations the higher initial cost of a screw pile is more than offset by much faster installation, no concrete (or very little) and no spoil disposal. To fully utilise the time savings it is essential that the installation equipment is easy to use, fast in operation, reliable and, when used correctly, safe. Ultimate Screw Piling's experience in developing new methods of torque head mounting and innovative combinations of motors and gearboxes gives pile installers the best possible solutions.

Installation Torque Vs Anchor Capacity

The idea that the amount of torsional force required to install a foundation anchor relates to the ultimate capacity of the foundation in tension or compression has long been promoted by the screw piling industry. Precise definition of the relationship for all possible variables remains to be achieved. However, simple where tools are available from empirical relationships have been used for a number of years.

Recommended reading on the subject is in the paper "Uplift Capacity of Helical Anchors in Soil" by R.M. Hoyt and S.P. Clemence (Bulletin 29001).

It gives the formula for the torque/anchor capacity as:

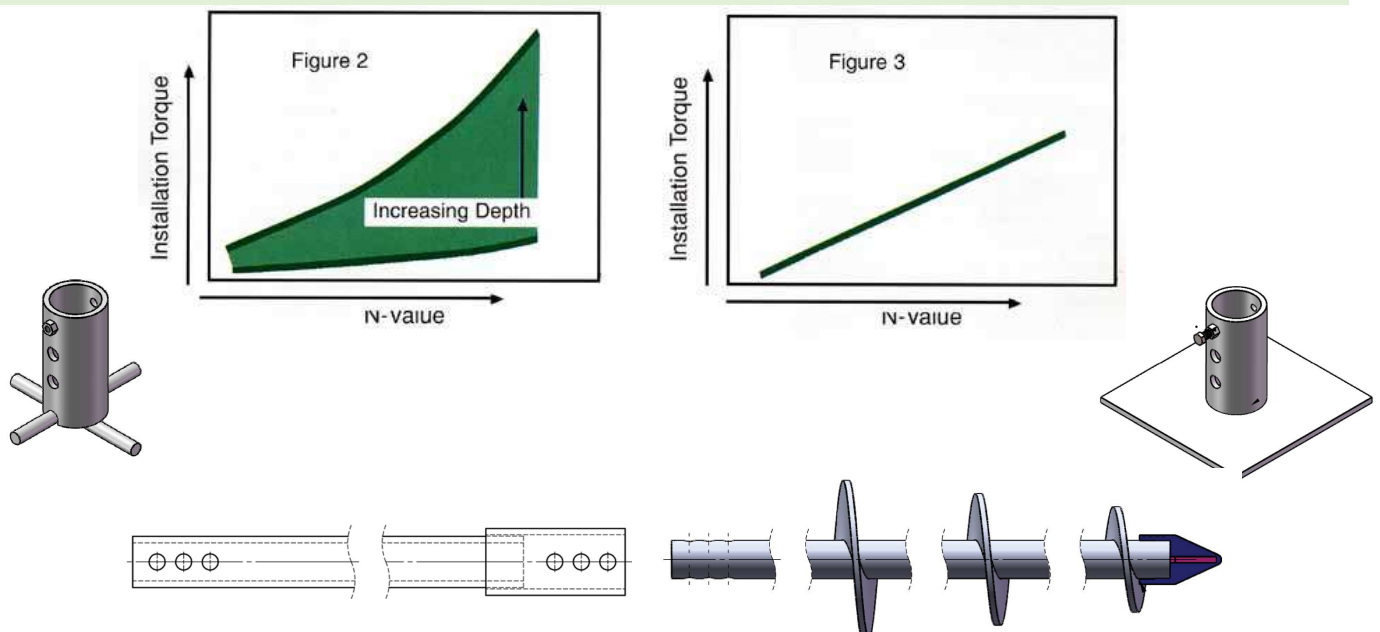
$$Q_u = K_t \times T$$

Q_u = ultimate uplift capacity [lb. (kN)]

K_t = empirical torque factor [ft.⁻¹ (m⁻¹)]

T = average installation torque [ft.-lb. (kN-m)]

The value of K_t may range from 25 to 30 m⁻¹, depending on soil conditions and anchor design (principally the shaft size). The value of K_t may range from 25 to 30 m⁻¹, depending on soil conditions and anchor design (principally the shaft size).



73 x 6.0mm Screw Piles Product Page

SPECIFICATION	Definition	73 x 6.0mm
Wall thickness	Thickness of the screw pile tube wall	6mm
Torque Limit	The ability of the pile to transmit torque is always the limiting factor. This is therefore the ultimate practical pile install torque capacity.	9kNm
Ultimate strength single helix	This figure shows the load which can be supported by a single helix- most piles use multiple helixes, but if a single one has to support more load, although non standard, this can be accommodated.	100kN
Empirical torque factor Kt (Kt m ⁻¹)	This is the “Empirical Torque Factor” expressed in metric units when torque is measured in kNm and force in kN. Its value decreases as pile diameter and helix plate thickness increases. This is due to a combination of skin friction and the energy needed to displace the soil.	28 m ⁻¹

Installation Equipment

The 76 x 6.0mm screw piles can be installed using the hand held torque head or an excavator mounted torque head

- 1) The handheld torque head is compact in size and allows it to fit through doorways therefore is very useful on sites with limited access. Its is driven from a hydraulic powerpack.
- 2) The excavator mounted torque head fits excavators from 5-13 tonne.

Both machines offer torque read outs, allowing the pile capacity to be calculated instantly

	9kNm Excavator or Hand Held
Ultimate Capacity (un-factored) @ 9kNm torque	250kN
Safe Working Load (2.5 FOS) @ 9kNm torque	100kN

Description

- 1) Unfactored load (SLS) is the maximum load that the pile will take before deflection exceeds standard limits
- 2) FOS – factor of safety if the ratio between the unfactored load (SLS) and the safe working load (ULS)
- 3) Safe Working Load – The actual load the pile is taking, when the building is being used

Pile Life and Corrosion

In most conditions, provided the top 2 metres are galvanised the pile life will be in excess of 100 years. Where the soil resistivity is less than 10 Ohm– further steps must be taken. This means salt water, wet peat and where soils are subject to saturation. For more information please contact our chartered USP so we can resolve with our Chartered Geotechnical Engineers. All screw pile components are galvanised with 100 microns

The estimated life is based on the assumption that a loss of 40% in thickness is acceptable without adverse effect on structural integrity. The atmospheric exposed areas of the piles are coated with high build zinc rich coating system or galvanised. There is a safety factor of x2 included for the anode design to take account

Tube Specification	EN-10210 S355 J2H
Helix Specification	EN-10025 S275 JR
Fastener Specification	ISO M20GR8.8

An example of a torque reading from an installation:- A gauge reading of 6.5kNm means an Ultimate Capacity of 180kN and Safe Working Load of 73kN with an FOC of 2.5

73 x 9.5mm Screw Piles Product Page

SPECIFICATION	Definition	73 x 9.5mm
Wall thickness	Thickness of the screw pile tube wall	9.5mm
Torque Limit	The ability of the pile to transmit torque is always the limiting factor. This is therefore the ultimate practical pile install torque capacity.	20kNm
Ultimate strength single helix	This figure shows the load which can be supported by a single helix- most piles use multiple helixes, but if a single one has to support more load, although non standard, this can be accommodated.	224kN
Empirical torque factor Kt (Kt m ⁻¹)	This is the “Empirical Torque Factor” expressed in metric units when torque is measured in kNm and force in kN. Its value decreases as pile diameter and helix plate thickness increases. This is due to a combination of skin friction and the energy needed to displace the soil.	28 m ⁻¹

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	8.7kNm Hand Held	20kNm Excavator Mounted
Ultimate Capacity (un-factored) @ 20kNm torque		560kN
Ultimate Capacity (un-factored) @ 8.7kNm torque	245kN	
Safe Working Load (2.5 FOS) @ 20kNm torque		225kN
Safe Working Load (2.5 FOS) @ 8.7kNm torque	100kN	

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