An Overview

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INDUSTRIAL COMMERCIAL RESIDENTIAL

ABOVE GROUND BELOW GROUND

Stabilising Solutions for the Building Industry

CONTENTS

OVERVIEW

THE PRODUCTS

HELITIES

HeliTies are available:

- in Grade 304 and Grade 316 stainless steel
- in 6mm and 8mm diameters
- in lengths ranging from 70mm to 300mm
- with no points, 1 point or 2 points

Other diameters and lengths are available as a special order.

Used either on their own as a 'dry fix' or with resin or cementitious grout, HeliTies can be used in a variety of applications ranging from the simple nail to wall ties, roof fixings etc.

HELITIE BAR

HeliTie Bar is available:

- in Grade 304 and Grade 316 stainless steel
- in 3mm, 4.5mm, 6mm, 8mm, 10mm and 12mm diameters
- in different lengths ranging from 400mm to 3M. It is also available in 10M lengths for Approved Installers of the HeliTie System of Reinforcement.

With such a range of availability the HeliTie Bar can be designed to meet any requirements.

HeliTie Bar was originally designed to get a fixing into end grain of timber. It was then discovered that it was also excellent to get a fixing into masonry which opened up a host of applications for which it is well suited. The HeliTie Bar is a very simple but effective system of tying timber to timber, timber to masonry and masonry to masonry.

HELIGROUT 25

HeliGrout is available in 1 litre, 3 litre and 6 litre tubs. HeliGrout has been specially formulated to bond equally well to masonry as with the HeliTie, thereby bonding the HeliTie Bar to the substrate.

Structural reinforcement is only as good as the bond of the HeliTie Bar to the masonry.

GROUNDSCREW

FEATURES

- The GroundScrew is a top quality ScrewPile System, individually engineered, customised and manufactured to our Clients' requirements for each project.
- The GroundScrew is a hot finish seamless round hollow section with a one or more helices welded to it. It is constructed of ASTM A Gr106-B/C grade carbon steel, which is of excellent quality. It can be galvanised if conditions necessitate this.
- The GroundScrew is available in diameters from 60mm to 1M with one or more helices. A variety of combinations of diameters and helices ensure that each GroundScrew will perform to requirements for either small or large projects.

- The GroundScrew is a tried and tested system; it has been used very successfully in North America and beyond for the past 16 years in all types of substrates and conditions from tundra in Alaska to the swamps in Florida.
- The GroundScrew can be inserted well beyond the recognised depth where heave and desiccation can take place.

Uses

New Build

- The GroundScrew can be used in new build situations; a ring beam can be constructed on top to provide a well founded base for single and multi storey structures.
- The GroundScrew can be inserted well beyond the depth achievable with traditional foundations.
- The GroundScrew is extremely quick to install, especially compared with traditional methods, thereby saving in time and labour costs.
- No time is wasted waiting for concrete to cure.
- The GroundScrew is excellent for brown field sites.

Remedial

- The GroundScrew can be used in remedial situations even to the point where a building can be jacked up using our specially designed capping detail.
- The GroundScrew can be installed in areas where height restriction is a factor.
- There is minimum disturbance to the soil and the structure.
- There is also minimum disturbance to the inhabitants of the structure.

Other

- The GroundScrew can be used in compression as a normal load bearing pile or in tension as a soil nail or tie-back to support, for example, earth retaining walls.

Insertion

- The GroundScrew requires no grouting or other processes.
- The GroundScrew can easily be battered into position if necessary, making it ideal for tie-backs.
- The GroundScrew is extremely easy to install using conventional machinery.
- The GroundScrew can be screwed accurately into position ensuring perfect placement.
- The GroundScrew is screwed, with maximum energy efficiency, into the ground using a torque motor as opposed to being vibrated into position.
- Gauges monitor the torque and provide a guide to the load capacity being borne by the GroundScrew.
- Sections of the GroundScrew are connected with either high tensile bolts, for the smaller diameter GroundScrews, or welding for the larger diameter GroundScrews.
- Various capping details are available for both new build and remedial applications.

ENVIRONMENTAL

- The GroundScrew is very environmentally friendly.
- There is very little or no spoil removal and hence no landfill.
- Transport and fuel implications associated with spoil removal are also reduced.
- The quantities of sand, cement and water required in traditional foundations are not required.
- The GroundScrew can be removed and reused which makes it ideal for temporary buildings.
- The GroundScrew can be positioned adjacent to trees and shrubs with minimal damage.

Each GroundScrew is individually engineered, customised and manufactured to our Clients' requirements for each project *–bring us your proposal and we shall provide you with an engineered specification*.

TOOLING AND ACCESSORIES

We can provide you with accessories and all associated tooling of the highest quality with which to use our range of products.

THE SERVICE

We pride ourselves on our efficiency and the high service we offer our clients.

THE PRICE

We will not be beaten on price.

THE QUALITY

We will not be beaten on quality. You will note at the back of this brochure the results of tests carried out at Darmstadt University on our HeliTie Bar and HeliGrout.

This brochure is designed to give you a flavour of how you can use our products. Should you require further specific or technical information please do not hesitate to contact us.

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HeliTie Bar

HELITIE BAR

Introduction

The HeliTie Bar is a Grade 304 austenitic stainless steel reinforcing material that has many unique properties. Being rolled from a plain round wire the fins are work-hardened to a very high level whilst the core remains relatively soft. The subsequent extrusion process puts the fins into tension and the core into compression. The tensile strength of the base material is more than doubled during the manufacturing process. The deformation of the fins makes the bonding characteristics of the helical bar far superior to alternative standard reinforcing materials. Grade 316 steel is available for special requirements.

Technical

The University of Darmstadt has performed independent tests on helical bar material to ascertain its tensile loadings. A full report of this testing including the methods employed, is available on request, but a summary is given in the table below. One of the properties of the helical bar material is that it performs similar to a strong coiled spring when it is stressed within its elastic limit. All of the load calculations for the design are based within this elastic limit.

Sizes

Helical Bar Diameter	Tensile kN	Cross-Sectional Area mm^2
6mm	7.78	8.49
8mm	9.61	10.19
10mm	12.53	13.88

The HeliTie Bar is available in three different diameters of 6mm, 8mm and 10mm for use in different applications. Lengths are available from 1 metre up to 10 metres long.

Uses

The uses for HeliTie Bar are both wide and varied and they can be utilised in new build and for many specialised refurbishment requirements.

In general terms the 6mm HeliTie Bar is used for the reinforcing of existing masonry structures. The helical bar combined with a cementitious grout, HeliGrout 25, can be installed into existing masonry with very little disturbance to create beams which span over window or door openings or over soft areas of ground when footings have failed. It can also be used to create lintels. Crack stitching can be achieved by using 1M HeliTie bars.

The 8mm HeliTie Bar is used for new build masonry reinforcing. The larger fin dimensions gives a much better bond into a standard building mortar than the alternative round section wire. The increase in the tensile strength during the manufacturing process also requires less material to be used.

For heavy duty applications the 10mm HeliTie Bar is in a class of its own. Very strong in tensile and shear, when combined with the bonding capabilities makes this a truly versatile product.

Special Features

- Grade 304 or 316 austenitic stainless steel
- Excellent bonding capabilities
- Coiled spring properties within elastic limit
- High stress material
- No sudden or catastrophic failure point
- Lengths up to 10M - less wastage
- Less intrusive than standard repairs

Close Up of HeliTie Bar

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HeliGrout 25

HELIGROUT 25

Introduction

HeliGrout 25 is a non-shrink, pumpable, thixotropic, high performance, cement-based grout suitable for injection with a hand applicator.

The 16 litre bucket contains the dry powder and liquid component individually packed to make either 3 or 6 litres of injectable grout.

The low liquid to powder ratio ensures a thixotropic grout which develops its compressive strength rapidly. It is designed to fill all the voids into which it is injected and the bond stress is greatly enhanced by its expansive properties.

Uses

HeliGrout 25 is suitable for bonding metal components into most masonry substrates including concrete, brick, stone, blocks etc. It is designed for use with the other helical stainless steel products - helical bar, brick bars and some wall ties - as a bonding agent. Further details can be obtained separately on these products.

HeliGrout 25 has been found to be an ideal alternative product to polyester resin and is particularly useful when fire risks are an issue, for example replacement wall ties on high rise structures. Being non-flammable and odourless the grout does not have the inherent drawbacks of many resin based alternatives.

Packaging

The packaging of the grout ensures that consistent results are obtained with every mix. There is nothing to leave out and, more importantly, nothing to add. Contractor error is therefore practically eliminated.

The grout is available in three different sizes; 1L contains enough mixture for 1 litre, 3L contains enough mixture for 3 litres of grout whilst 6L contains two packs of each 3L component and hence products 6 litres of usable grout. All sizes are packaged in a bucket for a clean mix every time.

Allow 1L for 3 x 1M lengths of HeliTie Bar

Allow 3L for 10 x 1M lengths of HeliTie Bar

Allow 6L for 20 x 1M lengths of HeliTie Bar

Storage

The HeliGrout 25 buckets may be stacked up to 4 high and should be kept in dry conditions. A temperature range of 5°C to 35°C is ideal and should be maintained.

Performance Data

The table below gives the typical compressive strength development at 20°C with 100mm cubes cast under restraint and wet cured.

1 Day	3 Days	28 Days
11.01 N/mm^2	22.4 N/mm^2	29 N/mm^2

HeliTie Bar and HeliGrout 25 in The HeliTie CrackStitching Kit

Why HeliGrout?

HeliGrout has been specially formulated to bond equally well to masonry as with the HeliTie, thereby bonding the HeliTie Bar to the substrate.

Structural reinforcement is only as good as the bond of the HeliTie Bar to the surrounding masonry.

Special Features

- Thixotropic - will not drip when used overhead
- Non-Shrink - increases bond stress
- Fully packaged for consistent mixing
- Easily pumpable over long distances
- Fills voids when injected
- Non-flammable material

Fixings

NAILS

Material:
6mm or 8mm HeliTies 1 Point
lengths 70mm to 300mm

A Nail that thinks it's a Screw!

Great for fixing to blockwork!
Great for fixing into timbers!

Great for fixing skirting, battens, wallplates!

The list is endless!

- Fast and easy to install.
- Simply hammer the HeliTie into the block.
- Strong no-bend Grade 304 stainless steel. Grade 316 available.
- Corrosion resistant.
- Because of its shape the HeliTie fixes along the whole of its length.
- There is no head so it does not split battens.
- Hand or powered tooling available for longer lengths.
- Recommended by leading insulation Manufacturers.
- Meets requirements of NHBC.
- Hand and power tools available for longer lengths and to speed installation.

Standard Sizes Available	***6mm***	***8mm***
HeliTies 1 Point	70mm	80mm
	100mm	100mm
Ideal for ***nails***	120mm	180mm
roofs fixings	140mm	200mm
wall ties	160mm	220mm
	180mm	240mm
	200mm	260mm
	220mm	280mm
	240mm	300mm
	260mm	
	280mm	
	300mm	

HeliTies are also available in 6mm and 8mm with No Points or 2 Points to suit all applications.
Other lengths available to order.

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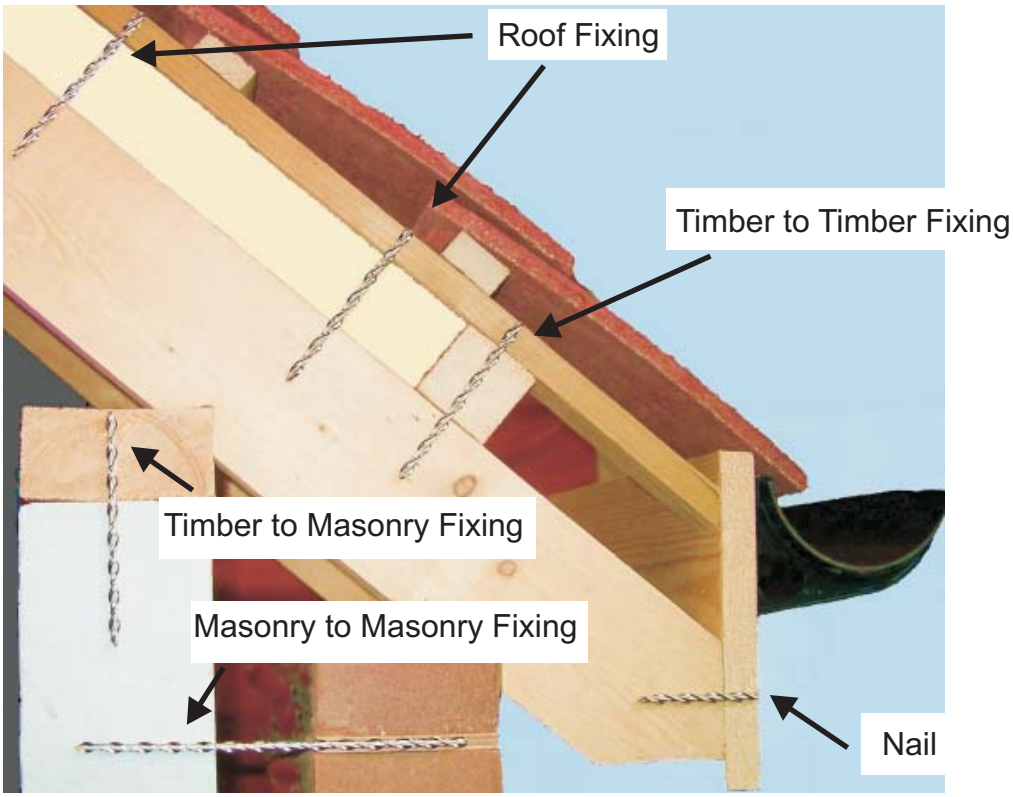
WARM ROOF FIXINGS

Material:
6mm or 8mm HeliTies 1 Point
lengths 70mm to 300mm



- Fast and easy to install.
- Doesn't crush insulation.
- Also ideal for flat roofs.
- No head - so it doesn't split battens.
- Resists wind suction.
- Supports sliding loads.
- Fixes along the whole length of the tie.
- Recommended by leading insulation Manufacturers.
- Meets requirements of NHBC.
- Strong no-bend Grade 304 corrosion resistant stainless steel. Grade 316 and new extra strong also available.
- Hand or powered tooling available for longer lengths to speed installation.

How long should my HeliTie Roof Fixing be?

Batten/ Counterbatten Thickness		Insulation Thickness		Thickness of any additional material, eg plywood etc		35mm embedment in rafter (25mm in oak)		**Length of HeliTie required**
Example								
25mm	+	50mm	+	10mm	+	35mm	=	**120mm**

Please call us to find out how many you need.

HeliTies are available in sizes as for nails, see previous page. HeliTies are also available with 2 Points. Non standard lengths available to order. Please contact us for our specification service.

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WALL TIES

Material:
6mm or 8mm HeliTies
lengths 200mm to 300mm

New Build Application - Ideal for mortar beds that do not course. Example shows 6mm HeliTie Point being driven directly into blockwork using a Hand Suport Tool. The HeliTie is equally effective for tying into timber stud constructions.

Remedial Application - There are instances where existing wall ties have failed due to corrosion or where there is poor density. The usual evidence is horizontal cracking in the brickwork. This example shows an 8mm HeliTie 1 Point being driven directly into brickwork using a Power Supoort Tool 2. The HeliTie is equally effective in blockwork.

Benefits

- Cost effective.
- Ideal for Thin-Joint Blockwork. Extremely quick and easy to install.
- Can be used in bricks, blocks (including hollow blocks), aircrete, concrete, hard mortar and timber.
- Can be installed close to edge of masonry or timber.
- No need to pre-drill in autoclaved blocks.
- Does not impair thermal properties of insulation, simply hammer in the HeliTie through the insulation into the block.
- Minimal disfigurement to structure.
- Minimal disruption to residents.
- Restrains brickwork whilst allowing the natural movement of the construction.
- Ideal where the joints of the inner and outer leaves of masonry do not course.
- Pull out testing of HeliTies can easily be carried out on site after installation to ensure Structural Engineer's satisfaction.
- Hand and high quality power support tools available to speed installation - PST 2 (professional) or PST 3.

Features

- Strong no-bend 8mm stainless steel HeliTie.
- Grade 304 corrosion resistant stainless steel (Grade 316 also available).
- Simple, one piece design.
- Multi-drip along full length of tie.
- HeliTies eliminate the need for grouts, resin or mechanical devices in normal substrates.
- Can be installed in cavity or solid masonry constructions.
- Tested and proven technology.
- Perfect Pitch engineering so that excellent pull-out test figures are attained.
- Recommended by leading block and insulation manufacturers.
- Meets requirements of NHBC.
- HeliTies to DD140 Type 2.
- Latest Certification based on the DIN NORM 1053 from the DIBT (Deutsches Institut fur Bautechnik) [Euro Code]
- Resistant to the passage of sound Part E.

Guidelines

- Minimum 70mm insertion in the inner leaf [softblock (AAC)].
- Minimum 70mm outer leaf.
- Small diameter pilot hole of 6mm may be required depending on substrate.

FLEXICLIP

Our FlexiClips, for new build applications, easily twist onto our ties and are suitable for all types of insulation.

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What size HeliTie do I need?

REMEDIAL

Allow min 70mm embedment into inner leaf		Cavity Width		Width of Outer Leaf		**Length of HeliTie required**
Example						
70mm	+	50mm	+	100mm	=	**220mm x 8mm HeliTie 1 Point**

NEW BUILD

Allow min 70mm embedment into inner leaf		Cavity Width		Allow min 70mm embedment into outer leaf		**Length of HeliTie required**
Example						
70mm	+	50mm	+	70mm	=	**200mm x 6mm HeliTie 1 Point**

New Build - Remedial - Thin Joint - Brickwork - Blockwork - Timber Stud with Brick Face?

Tell us what you want and we'll tell you what you need!

Standard Sizes Available

HeliTies 6mm and 8mm

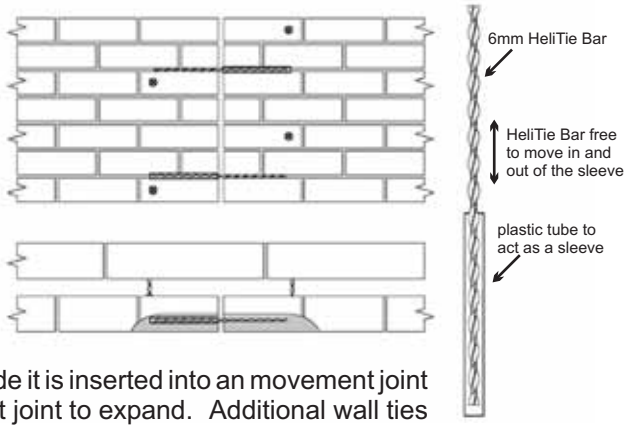
200mm
220mm
240mm
260mm
280mm
300mm

HeliTies are available with No Points, 1 Point or 2 Points to suit all applications.
Other lengths are available to order.

MOVEMENT JOINT APPLICATION - PREVENTION OF LATERAL MOVEMENT

Movement Joint discreetly hidden behind downpipe

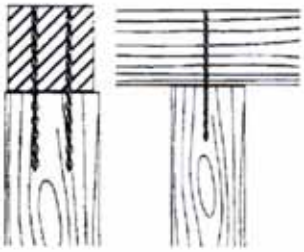
The common problem with movement joints is when the walls move out of alignment. Where there is no movement joint or where the existing movement joint is faulty, our solution, using HeliTie Bar, prevents lateral movement in the wall. Once the vertical slot has been cut, a horizontal slot is cut into the mortar bed every 6 courses or 450mm apart. On one side of the movement joint the HeliTie Bar is fixed with HeliGrout and on the other side it is inserted into an movement joint sleeve thereby allowing the movement joint to expand. Additional wall ties are inserted every 300mm along the vertical length of the movement joint.



GENERAL TIMBER TO TIMBER FIXINGS

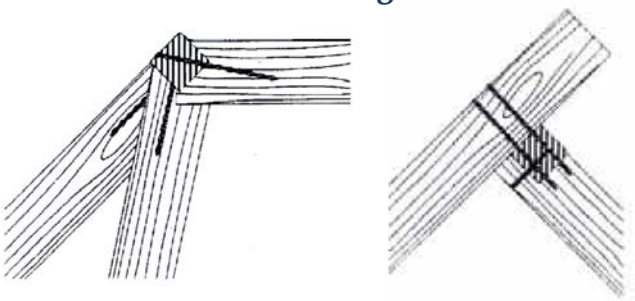
Material:
6mm or 8mm HeliTies 1 Point
lengths 70mm to 300mm

Standard Fixing of Perpendicular Timbers



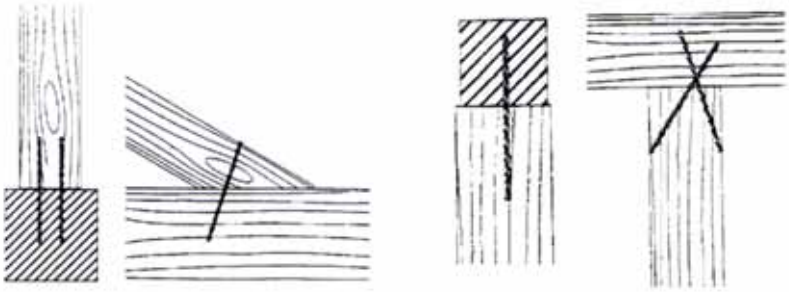
The HeliTie must be inserted to a minimum depth of 150mm into the timber. Minimum of 2 fixings per joint. Minimum depth of fixing to be two thirds of the overall depth.

Standard Fixing of Timbers



The HeliTie must be inserted to a minimum depth of 150mm into the timber. Minimum of 2 fixings per timber of each joint. Minimum depth of fixing to be two thirds of the overall depth.

Standard Fixing of Angled/Upright Timbers



The HeliTie must be inserted to a minimum depth of 150mm into the timber. Minimum of 2 fixings per joint. Minimum depth of fixing to be two thirds of the overall depth.

Features and Benefits

- HeliTies are excellent as a timber to timber fixing, masonry to masonry fixing and timber to masonry fixing.
- Grade 304 Stainless Steel - Grade 316 available to order
- A pilot hole is usually only necessary in dense timber such as oak.
- It is not necessary to pre-drill in carcassing timber.
- HeliTies are excellent in achieving a fixing into end grain of timber.
- HeliTies, by their design, fix along the whole length of the tie.
- HeliTies have no head and consequently do not split timbers.
- As HeliTies have no head there are no unsightly bolts and washers.
- Specialist power support tooling is recommended, ie PST2 (to which extensions can be attached) or the basic model PST3, both with SDS connections.
- All fixings can be tested with a Helical Systems Load Test Unit.

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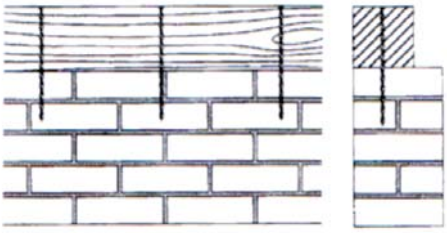
GENERAL TIMBER TO MASONRY FIXINGS

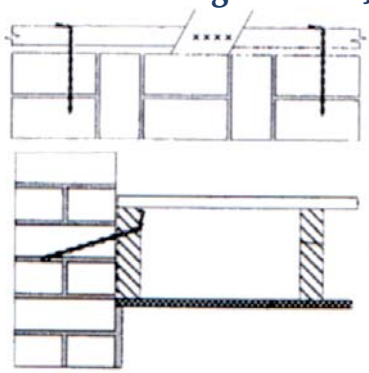
Material:
6mm or 8mm HeliTies 1 Point
lengths 70mm to 300mm

Securing Wall Plate to Top of Wall



The HeliTie must be inserted to a minimum depth of 150mm into the wall. If necessary, a pilot hole of 5-6mm is drilled to accept the 8mm HeliTie. Minimum of 450mm fixing centres.

Installation through Side of Joist



The HeliTie must be inserted to a minimum depth of 150mm into the wall. If necessary, a pilot hole of 5-6mm is drilled to accept the 8mm HeliTie. Minimum of 450mm fixing centres.

Features and Benefits

- HeliTies are excellent as a timber to timber fixing, masonry to masonry fixing and timber to masonry fixing.
- Grade 304 Stainless Steel - Grade 316 available to order
- A pilot hole is usually only necessary in hard substrate.
- It is not necessary to pre-drill in autoclaved lightweight blockwork, ie Celcon or Thermalite.
- HeliTies, by their design, fix along the whole length of the tie.
- As HeliTies have no head there are no unsightly bolts and washers.
- Specialist power support tooling is recommended, ie PST2 (to which extensions can be attached) or the basic model PST3, both with SDS connections.
- All fixings can be tested with a Helical Systems Load Test Unit.

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Structural Reinforcement

CRACKSTITCHING

Material:
6mm HeliTie Bar
Length: 1M, 1.5M and 3M

Masonry may crack for a variety of reasons. Traditionally, the solution has been to remove the fractured brickwork and to replace with new, hoping that the problem that caused the cracking does not recur. Other methods used to disguise or hide cracking include: rendering, pebbledashing, hanging tiles etc. A recent development has been the use of polyester and epoxy resins. These materials can only bond the fractured surfaces of the bricks together, they cannot add strength to the surrounding brickwork.

The combined use of **HeliTie Bar** and **HeliGrout 25** not only provides added tensile strength to the brickwork but can provide reinforcement to a larger area whilst allowing the natural movement of the materials within the structure.

Step by Step Guide

Step 1

Slots are raked out or cut into horizontal mortar joint to a depth of between 25-35mm and at 450mm or 6 brick courses vertical spacing.

Step 2

The slots are then vacuumed out and thoroughly flushed with water.

Step 3

The 2 part HeliGrout 25 is mixed in the tub provided.

Step 4

A bead of **HeliGrout 25** is inserted into the back of the slot using a grout gun.

Step 5

The **HeliTie Bar** is pushed into the grout to obtain good coverage.

Step 6

A bead of **HeliGrout 25** is inserted over the exposed rod and iron into the slot using a finger trowel.

Step 7

The slot is filled with **HeliGrout 25** leaving sufficient depth for repointing.

Step 8

A colour matched mortar is used to repair fractured bricks.

Step 9

The slot is then repointed matched as closely as possible to existing.

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Before

After

The result shows that it is very difficult to see where the repair has taken place.

Guidelines:

- HeliTie Bar to extend a minimum of 400mm each side of the crack.
- Where a crack is within 400mm of the end of a wall, the HeliTie Bar is to be continued for at least 100mm around the corner and fixed into the adjoining wall.
- Where a crack is within 400mm of an opening the HeliTie Bar is to be bent and fixed into the reveal.

NB:

HeliGrout 25 has been specially formulated to be used in conjunction with the HeliTie Bar to install a crackstitch. We shall not be held responsible for any failure of the crackstitch where materials other than the recommended HeliGrout 25 has been used to install the HeliTie Bar.

Mini CrackStitching Kit

HeliGrout Gun with Mortar Nozzle

Mini CrackStitching Kit - 3 x 1M lengths of 6mm HeliTie Bar + 1L HeliGrout 25
Midi CrackStitching Kit - 10 x 1M lengths of 6mm HeliTie Bar + 3L HeliGrout 25
Maxi CrackStitching Kit - 20 x 1M lengths of 6mm HeliTie Bar + 6L HeliGrout 25

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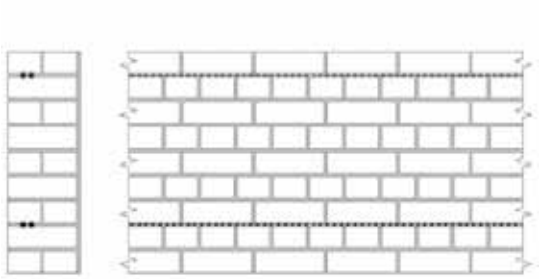
BEAMING

Material:
6mm HeliTie Bar

What is it?

A load bearing masonry beam can be created by slitting along the mortar bed and inserting two lengths of 6mm HeliTie Bar together with HeliGrout 25 - what is known as a chord. Between 1 and 14 courses apart another chord of twin 6mm HeliTie Bar and HeliGrout 25 is installed and a load bearing beam is created.



This beaming technique can then be used for a variety of applications:

- To replace a failed lintel.
- To create a lintel where a new opening is required or an existing one is to be extended.
- To strap a flank wall where severe bowing has taken place
- To spread the load over a piling system, whether in an underpinning application or a soil nail or tie-back situation.

Works in Progress

This example shows a block of garages with a badly cracking and subsiding flank wall. Piles were inserted and beaming and crackstitching was carried out - or overpinning.

The first picture shows slitting taking place, the second picture shows the bar inserted and the final picture shows the completed job.

The example below shows a failed arch. A load bearing beam was inserted above the arch and the brick soldiers were pinned, using CemFix (see later), up into the beam.

Before

After

Before

After

The example to the left shows a front bay falling away from the main structure. Beaming was carried out to tie the whole of the bay back into the structure.

A wall was being undermined by a listed tree. The defective wall required demolition and rebuilding. However, the tree was to be left intact and furthermore the roots were to remain undamaged.

Whilst the tree was being protected by corrogated sheeting, piling was carried out either side of the tree roots and a load bearing beam was installed as the wall was being rebuilt.

This picture was taken a day after the installation of the piles and beam and the mortar were still green!

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LOAD BEARING HELITIE MASONRY BEAM

Example 1 - Masonry Beam

Simply supported
Span 1.8M
Self weight - 0.16kN/M
Strength - 35 N/mm²
Density - 1500 kg/m³

The two course deep clay brick beam, reinforced in the bottom bedjoint and the top bedjoint with two pieces of 6mm HeliTie Bar, achieved a maximum point loading of **21.21kN.**

At a deflection of 20mm the brick beam achieved a loading of **15.76kN**.

Example 2 - Autoclaved (Aircrete) Beam (lightweight block)

Simply supported
Span 1.5M
Self weight - 0.58kN/M
Strength 3.5 N/mm²
Density - 600 kg/m³

There were two aircrete beams tested and they failed at a maximum load of 12.12kN and 11.52kN. respectively. It was decided to take the average loading of these for the sake of accuracy, therefore **11.82kN.**

Measuring Equipment

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BOWFIX

Material:
8mm HeliTie Bar 1 Point
lengths 400mm to 1M

Introduction

The cause of bowing walls in many old buildings may well be due to the fact that there is no mechanical connection between the floor and ceiling joists and the masonry. The traditional method of connection has been to rely on friction due to gravity. When this frictional resistance is released, due to movement over the years within the timbers or masonry, it can leave a freestanding wall of considerable height that is very susceptible to bowing.

The problem of bowing walls has been addressed in the past by the use of S or X ties (hoop irons) bonded right through the building with bars to connect the front and rear walls or the two side walls together. The BowFix uses the same principles as this proven but unsightly method of restraint for bowing walls. The advantage of the BowFix is that it can be installed remedially and externally and uses the existing structural members to provide the necessary stability.

The current method of standard repair is to introduce a galvanised strap tying the floor to the wall. This involves removing furniture, carpets, skirtings and floorboards, the chasing out of plaster, the fixing with plugs and screws or nails and the subsequent making good. Therefore, although the product itself is very cheap the disruption involved during the installation makes this a very expensive option which relies on the holding capacity of plastic plugs and screws.

The System

The BowFix is available in 8mm helical stainless steel. Installation is performed from outside the building through a 12mm hole in the building fabric. It must be emphasised that a check must be made for any services that may run through the floor or ceiling cavity. It is quite common for wiring to be present and is certainly not unknown to have water pipes for the heating system or even a mains water pipe in this location. It is recommended that checks are made in this area with the use of a boroscope.

The connection to the wall is either made into the second floor joist, if they run parallel with the wall, or into the ends of the floor joists if they run into the wall. A proof test of the connection into the timber can be made immediately after installation using a load test unit.

Installation Procedure

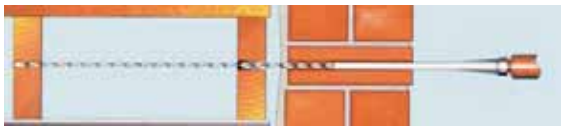
Before carrying out any works check in the floor and wall cavities for any services with the use of a boroscope or removal of a floor board.

Locate and mark the positions of joists on the external wall. Drill a clearance hole (normally 12mm) through the masonry in line with the centre of the joists. Ensure that the holes line up with the joist and continue to drill the hole through the first joist. Blow out hole to clear any dust or debris.

Insert the BowFix into the driving tool, push the tool and tie into the drilled hole and, using the SDS hammer drill, drive the BowFix into the second floor joist for a minimum depth of 50mm.

Remove the BowFix drive tool from the hole.

Note
At this stage a tensile test may be performed to prove the fixing of the tie.



HeliResin or HeliGrout 25 is used to bond the BowFix to the wall to complete the installation. Make good at surface of all holes and leave ready for any decoration.

Utilising Structural Elements

By utilising the existing structural elements of the building the solution is simple, cost-effective, less disruptive and much quicker to install.

If the BowFix is fitted into the side of the second floor joist the strength and load sharing is achieved via the floorboards on top of the joists and the ceiling boards below the joists crossing from one joist to the next. The old connecting bar is effectively replaced by the floor and ceiling boards already in place.

When the joists run into the wall and sit in pockets within the masonry the fixing is achieved with a short BowFix being fixed into the end grain of each joist. he full installation process is described overleaf.

Uses

The availability of testing after installation makes this a versatile and effective repair method for stabilising bowed walls. It must be borne in mind that a Bowfix will NOT pull a bowed wall back to its original position, it is designed to stabilise walls in their current positions.

Proof test requirements are discussed more fully overleaf, but a loading of no more than 1kN should be sufficient for most situations. It must be understood that this is a proof load and not a test to failure. If high loadings are required this can be achieved by introducing more BowFix.

Testing

It is recommended that each BowFix is proof tested using a load test unit. The actual tensile loading required for stabilising a bowed wall is surprisingly low.

Considering a wall of 5M height and bowing outwards at its mid point by 50mm, it is straightforward to calculate, by using a triangle of forces, that a horizontal load of 1kN is sufficient to cope with a vertical load of 50kN or 5 tonnes. With BowFixes fixed at 600mm centres a load resistance in excess of 8 tonnes per metre run is easily achieved.

Materials

BowFix are manufactured from Grade 304 or Grade 316 austenitic stainless steel. The 8mm diameter tie has a tensile strength in excess of 11.5kN. The manufacturing process produces very hard fins, that are able to cut a thread into the timber, and a soft and flexible core. The near leaf fixing is achieved by the use of HeliResin or HeliGrout 25.

Special Features

- Fixes into end grain and side grain
- Easily tested after installation
- Quick and easy installation
- Installation undertaken externally
- Minimal disruption to building occupants
- One piece design, no moving parts to lose
- Virtually invisible and unobtrusive

BowFix into End Grain

BowFix into Side of Joist

CEMFIX

Material:
8mm HeliTie Bar No Points
lengths 400mm to 900mm

Introduction

Originally developed in conjunction with British Rail, this method of pinning delaminated rings in masonry arches has now become widely accepted as a simple and economic solution. CemFix are also used in standard construction repair techniques for bonding across cracks in masonry and as a restraint for bowing solid walls.

The 8mm diameter austenitic grade 304 stainless steel helical reinforcing bar is combined with a unique formula of pumpable, thixotropic, non-shrink cementitious grout, HeliGrout 25. As the installation of the CemFix is via a 12-16mm diameter drilled hole, the potential disfiguration to the structure is considerably minimised, and the installation time is greatly reduced. This is especially important where access and working times are restricted.

Performance Requirements

Because of the method of installing CemFix it is not possible to perform random non-destructive site tests. Bond strengths can, however, be checked prior to the full installation programme. An overlong tie can be installed as normal leaving a short length (50-75mm) proud of the surface. A lightweight test unit can then be used to determine the tensile loading. The full cure time for the cementitious grout is 28 days, but testing can generally be performed after 10 days. To check the flow of the grout into any voids requires destructive testing methods and is normally only performed in critical situations.

Fixing Details

The only restriction on the length of tie that may be fixed is the length of hole that can be drilled. In general terms this is restricted to 1.5M. The insertion hole is varied from 12-16mm diameter and is formed with a SDS hammer drill. To ensure a good bond strength between the cementitious grout and the substrate it is necessary to thoroughly wet the drilled hole before the installation of the Cemfix.

Installation of the tie is performed very simply by the use of a manual or mechanically aided installation gun kit. The cementitious grout is installed under pressure and flows readily under light pressure to fill any voids in the masonry structure. Full installation details are given overleaf.

Installation Procedure

Drill a clearance hole (13-16mm diameter depending on the material and the length of CemFix to be used) through outer leaf of wall and three quarters of the way into the inner leaf. Blow out any debris and thoroughly flush with water.

Mix cementitious grout and load into gun with required length of correct size extension nozzle already attached. Pump cementitious grout to outlet of nozzle. Insert the nozzle to the full depth of drilled hole and pump grout to fill hole. Keep light pressure on gun to ensure that all voids are filled with grout.

Push the CemFix into the grout-filled hole.

Remove any excess cementitious grout. Make good at surface of all holes and leave ready for decoration.

Materials

The compatibility of the cementitious grout and the 8mm helical stainless steel bar have been assessed and approved to work together. Whilst the HeliGrout 25 is a high strength material, >25 Newtons per mm^2, by incorporating the flexible and elastic helical bar the treated structure is permitted a degree of movement. From early tests it was found that too high a strength grout did not allow natural movement of materials within the structure and further cracking occurred. The main purpose of the grout is to bond the HeliTie Bar to the substrate and have similar characteristics as the surrounding substrate; in essence, to restrain but not to stiffen the masonry to the point of further cracking or failure.

Experience has shown that allowing continual but controlled movement in a structure is very beneficial to its long term life. A heavy duty anchor that attempts to stop movement altogether has been shown to store up potential problems, and may even end in a sudden and catastrophic failure.

HeliGrout 25 is formulated to produce a thixotropic material that flows readily under pressure, allowing rapid void filling in deep holes, but will not drip if used overhead. The initial cure time is very rapid and a non-shrink agent ensures that a good even bond is achieved. It is supplied as a complete material in either 6 litre or 3 litre packs offering a consistent mixture time after time.

No extra material is required and a clean mixing bucket is available for each mix. The working life of the material can be extended by re-agitation and will be in excess of 30 minutes.

The helical bar is a grade 304 stainless steel material with a very pronounced profile to ensure a good bond with the cementitious grout. Being stainless steel the issue of 'coverage' requirements does not arise.

CemFix are inserted to stabilise delaminating arch rings on a road over rail bridge in Thurston, Suffolk

CemFix Grout Gun with Attachment and Pinning Nozzle

Special Features

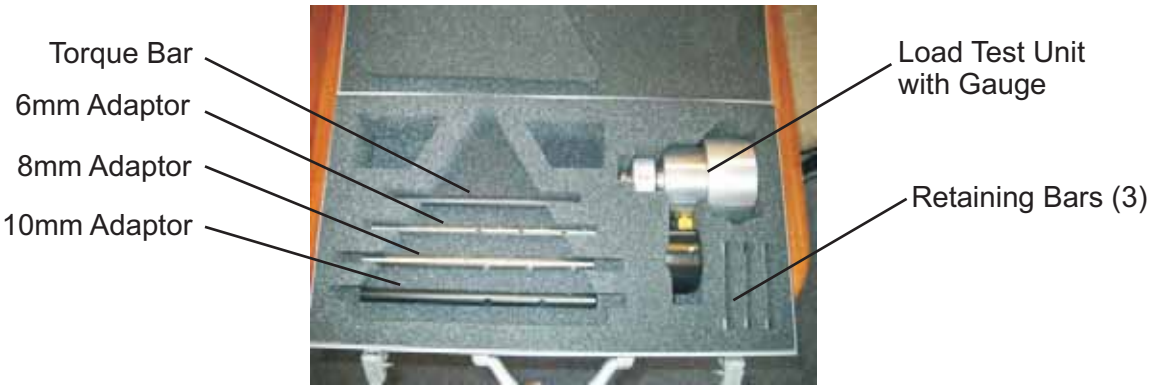
- Minimal disfiguration to structures
- Quick and easy to install
- Cementitious grout fills any voids
- Lightweight installation equipment
- Strong yet flexible fixing
- Range of lengths to suit application

Helical Systems

Testing Equipment

TESTING

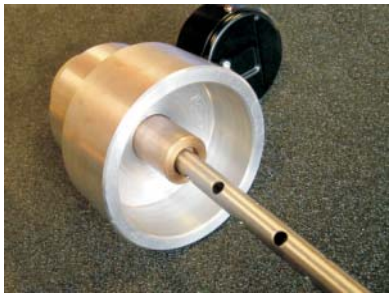
LOAD TEST UNIT for testing HeliTies



Pull out tests can be carried out on 6mm, 8mm and 10mm HeliTies with this Load Test Unit.

1 Leave a minimum of 50mm of fixed HeliTie exposed.

2 Twist the correct diameter adaptor over HeliTie (if possible remove any burrs at the end of the tie)



3 Place Load Test Unit over the Adaptor so that the Unit and Gauge is practically seated against the wall.

4 Insert a Retaining Bar through the Adaptor in the brass coupling

5 Insert the Torque Bar in the hole beneath the brass coupling.
6 Tighten
7 Readings will be indicated on the Gauge

NB

For most applications (buildings under 30M high and in areas with a maximum wind speed of less than 46M per second), the minimum tensile proof load is 1kN based on a tie density of 2.5 per M^2 {900mm x 450mm (diamond pattern)centres}. This excludes cladding and substrates below 100mm deep. If 1kN cannot be achieved it may be necessary to close up the tie density.

Helical Systems

Product Brochure

PRODUCTS

HeliTie Bar

Helical Stainless Steel Reinforcing Bar
Standard Grade 304 (Grade 316 available as special order)

Diameters available = 6mm and 8mm. Other diameters available on request.

Lengths available = up to 3M

HeliGrout 25

A very high performance, non-shrink, non-gassing thixotropic, cement-based grout for use with the application of the HeliTie Bar. Each tub contains the dry powder and liquid component individually packed to ensure that consistent results are obtained with every mix.

Available in 1L, 3L and 6L tubs.

CrackStitching Kits

Available in following sizes:

Mini - 3 x 1M HeliTie Bar + 1L tub HeliGrout
Midi - 10 x 1M HeliTie Bar + 3L tub HeliGrout
Maxi - 20 x 1M HeliTie Bar + 6L tub HeliGrout

Full instructions are enclosed in each kit together with health and safety details.

The HeliGrout Gun

Used to insert HeliGrout 25. The HeliGrout Gun is boxed and comprises:
Gun Frame
Gun Barrel - 500ml
Mixing Paddle
Black plastic cone nozzle
Grey plastic cone nozzle
Black metal grout nozzle

Black Metal Grout Nozzle

Insert on the end of the HeliGrout Gun for ease of inserting HeliGrout 25 into bedjoints.

The HeliGrout Gun - Professional

Used to insert HeliGrout 25. Available:
Adaptor
Black metal grout nozzle

Quick release making it particularly suitable for CemFix applications.

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Pinning Nozzle

Pinning nozzle with adaptor, plated for long life and easy cleaning. For use with the HeliGrout Gun to insert CemFix with HeliGrout to repair separating masonry, delaminating brickwork and to reconnect walls.

Available in 300mm, 600mm and 900mm lengths.

Adaptors

Adaptors for the HeliGrout Gun and HeliGrout Gun Professional for use with the Pinning Nozzle.

HeliTies

Grade 304 helical stainless steel ties for use as nails, fixings and ties. Grade 316 available as a special order.
Available in 6mm and 8mm diameter.
Available with 1 point and 2 points.
6mm - available in 70m and 100-300mm in even sizes.
8mm - available 180-300mm in even sizes.
Other sizes and lengths available on request.

Hand Support Tool

For manual insertion of HeliTies. Available in 6mm or 8mm diameters and in various lengths to suit requirements.

Power Support Tool (PST3)

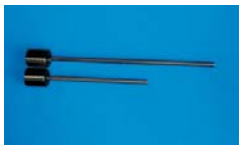
SDS drill attachment for power driven insertion of HeliTies.

Available in 6mm or 8mm diameters.

Power Support Tool (PST2 - Professional)

SDS drill attachment for power driven insertion of HeliTies and BowFix. Sprung loaded with 45° angle for easy view.

Available in 6mm or 8mm diameters.



Extensions for Power Support Tool (Professional)

Ideal for the insertion of BowFix and long HeliTies.
Available in 6mm or 8mm diameters.
Available in 250mm and 400mm lengths. Other lengths available on request.

Power Drill Extension with Key

SDS power support drill extension for pilot holes for small drill bits (4mm inner diameter). For use where small pilot holes are required for inserting HeliTies or BowFix.

Available for 8mm HeliTies and BowFix 250mm and 400mm lengths. Other lengths available on request.

CemFix Ties

8mm diameter Grade 304 helical stainless steel no point ties used to reconnect walls, repair separated masonry and for delaminating brickwork.
Available in lengths 400-900mm in standard sizes of 100mm units. Other lengths available on request.

BowFix Ties

8mm diameter Grade 304 helical stainless steel 1 point ties used to stabilise bowed walls into joist ends or joist sides. Designed for fixing into timber, especially into end grain.
Available in lengths 400-1M in standard sizes of 100mm units. Other lengths available on request.

Power Support Tool (PST1) for use with BowFix Ties and Wall Ties for Thin Joint Insertion

SDS drill attachment for power driven insertion of BowFix.
Available in 300mm, 600mm and 900mm lengths. Other lengths available on request.

Polyester Resin

Polyester Resin used mainly with insertion of BowFix.
Available in 380ml Cartridge.
Comes with mixing nozzle.
Additional nozzles and extension nozzles available.

Resin Gun

For use with 380ml Cartridge of Resin.

Grout Insertion Tool for Sock Ties

Used with the HeliGrout Gun to pump HeliGrout into sock.

FlexiClip

Specially designed for use with HeliTies. To hold insulation in position.

Suitable for 6mm and 8mm HeliTies.

Sock

Ideal for fixing HeliTies into hollow blocks (pots).

Movement Joint Sleeve

Ideal as a lateral restraint to a movement joint. For use with 6mm HeliTies.

Other Tooling available on request

Metal Detector
Borescope
Pneumatic Spoil Cleaner
Water Pump and Associated Equipment
Load Test Unit
Load Test Key

Helical Systems

GroundScrew

GROUNDSCREW - SCREW PILED FOUNDATIONS

PERFECT for:

- New Housing Developments
- Wind Turbines
- Telecommunications Masts
- Temporary Buildings
- Foundation Reinforcement for Additional Storeys
- Geo-thermal Projects
- Anchors for Pipeline Saddle Straps
- Footbridges and Walkways
- Gantries
- Signs, Signals and Hoardings
- Street Furniture
- Earth Retaining Walls and Embankments
- Areas with high water content
- Areas where trees or tree roots pose a problem

No job too small .....

All necessary Engineering Design provided.
Installation arranged through Licensed Installers.
Capping Details and Ground Beam Details designed and manufactured for Pile 'N' Build.

All we require is a load plan and soil analysis to include SPT 'N' count and we will do the rest!

No job too BIG!

Once you have used our GroundScrew for your foundations you will not go back to traditional footings!

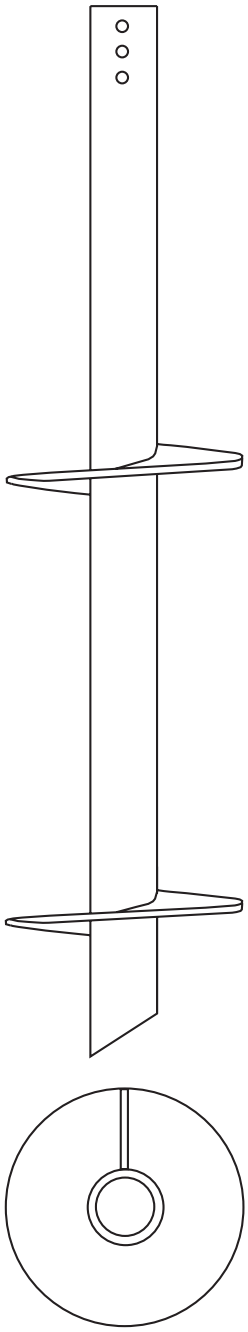
Helical Systems

Tel: +44 (0) 1959 541148
enq@helicalsystems.co.uk

An Introduction to GroundScrews

The GroundScrew is a top quality screw piling system, individually engineered, customised and manufactured to individual Client's requirements for each project. The GroundScrew is a hot finish seamless round hollow section with a one or more helices welded to it. It is constructed of ASTM A Gr106-B/C grade boiler plate steel, which is of excellent quality. It can be galvanised if conditions necessitate this. Once inserted, the GroundScrew is capable of withstanding loads in compression and in tension.

Typical GroundScrew Profile - Lead Section



Sizing

The GroundScrew is available in diameters from 60mm to 1M with one or more helices. The shaft size and the numbers and sizes of helices are dependent on soil conditions and the required capacity of the pile. The size of the helices are also dependent on the diameter of the shaft and vice versa. Extensions are bolted on to the lead pile to achieve the required depth. This variety of combinations of diameters and helices ensure that each GroundScrew will perform to requirements for either small or large projects.

Specification

The bearing capacity of the GroundScrew, which is the capacity of soil to support the loads applied to the ground, depends on various factors which therefore determine the specification of the GroundScrew:

- The load and the type of loading must be determined; the dead load, the live load and the safety factor.
- There must be an analysis carried out on the soil; preferably a bore hole log to include an SPT 'N' count, to determine the soil type, description, classification, surface water, water table levels and the depth of possible desiccation, heave or frost penetration.
- The size of the GroundScrew is then calculated, ie the shaft size, helix size, number of helices, material thickness, the cross section and length of the GroundScrew, the embedment depth, of the GroundScrew.
- The positions of the GroundScrew are then decided and whether they are to be inserted vertically, horizontally or battered into position (at an angle).
- The estimate torque during installation is then calculated.

The embedment depth is very much dependent on the soil conditions but can easily be inserted beyond the depth at which desiccation or heave takes place and well beyond the depth achievable with traditional foundations. The GroundScrews, by their design, are easy to install, cause little or no disturbance to the soil and can be placed accurately at a given point on the site as shown in the previous graphics. The GroundScrews are inserted using a torque motor mounted onto conventional machinery and can be installed at any angle, whether vertically, horizontally or battered. This makes the GroundScrew ideal for use either in compression or in tension, eg soil stabilisation/embankments. Readings taken from the torque motor during GroundScrew installation provide a check on the soils and the engineering calculated from the geotechnical report.

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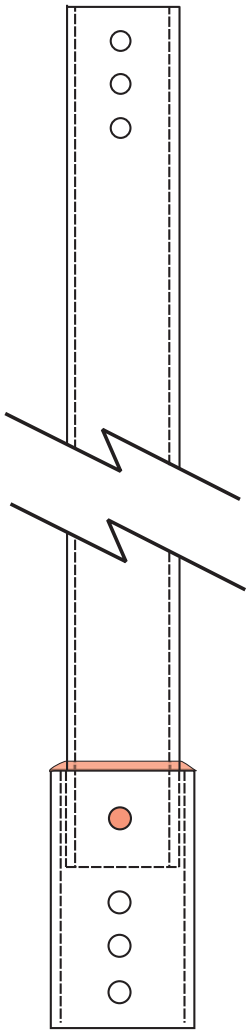
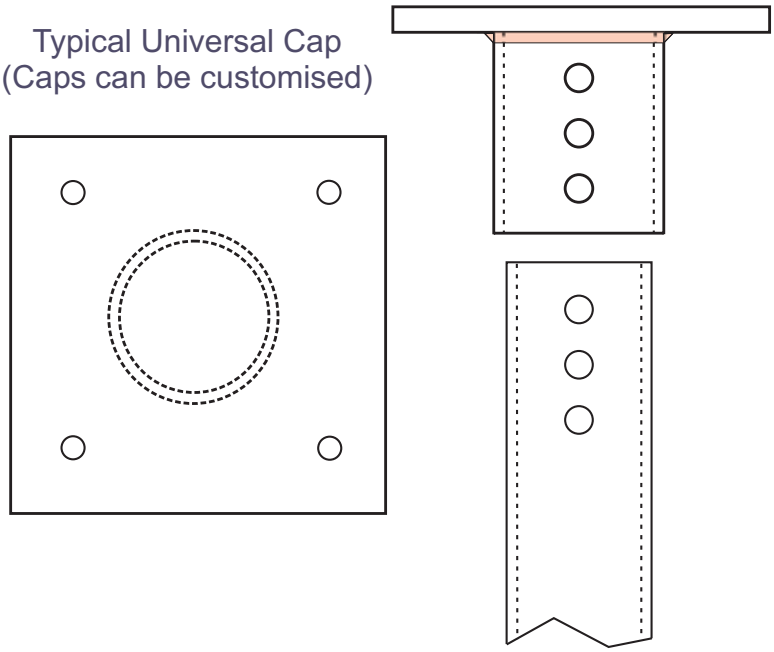
Typical GroundScrew
Profile - Extension



Typical Universal Cap
(Caps can be customised)



History

Screw piles were first used in the 19th and 20th Century and there is a well known landmark in England, Brighton Pier, where screw piles were used in the late 19th Century. Since the advent of the mechanical age screw piles have become more popular, especially in North America where they have been tried and tested very successfully for over 20 years in all types of substrates and conditions from tundra in Alaska to the swamps in Florida. First used in the utility industry, the GroundScrews are now used in a myriad of applications which have been demonstrated in the enclosed graphics.

Corrosion

GroundScrews can be galvanised to offer protection against corrosion if soil conditions necessitate this. However, it is popularly misconceived that the rate of corrosion is far greater than it actually is.

Investigations carried out by the National Bureau of Standards for the US Department of Commerce found that experiments made with bare steel in various types of soil verified that corrosion is never totally uniform. Samples of bare steel were allowed to corrode for 6 years, one in sand and one in clay. The mean rates of metal consumption were 0.01 mm/year in sand and 0.03 mm/year in clay. The highest rate of metal consumption in the most corrosive soil was up to 0.09 mm/year.

Should extra protection of the steel be required there are two ways that this can be carried out; galvanising and/or cathodic protection.

A galvanised coating will prevent pitting in the steel when it is in soil just as it does when it is exposed to above ground conditions. The expected life for a galvanised GroundScrew is calculated using a conservative coating thickness of 200 μm. The actual coating thickness of the GroundScrew is thicker than this and therefore the life expectancy is greater. The galvanised coating will provide 50-100 years of corrosion free service.

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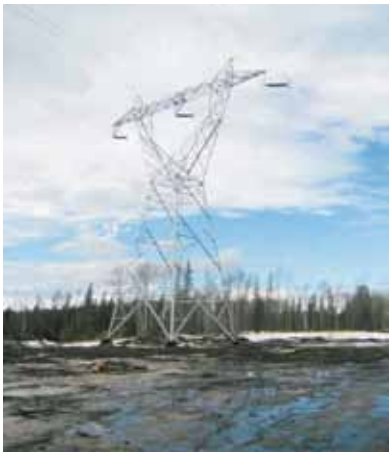
GroundScrews are suitable for
any soil condition, any weather, any temperatures



No spoil, no wet trades leading to reduced
labour and transport costs and no curing time

GroundScrews are available
in various shaft diameters with
various numbers and sizes of helices

The GroundScrew can be inserted
vertically, horizontally or battered
(at an angle) making it ideal for soil
stabilisation of embankments -
perfect placement every time

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Prefabricated unit lowered onto GroundScrew caps - from start to finish this supermarket extension was completed and handed over to the client within 2 weeks from possession of site

Simple installation process for new build applications with choice of prefabricated capping details and beaming techniques

Easy and quick insertion, virtually no spoil

Simple insertion, low manpower requirement

Minimum disruption to soil, trees and other structures

GroundScrews are 'screwed in' creating less noise and no vibration - hence minimum disturbance to nearby residents

Height restriction no problem - GroundScrews were inserted to support a newly to be constructed mezzanine floor via piers inside an industrial unit

Accurate flights in the soil denoting superb load bearing characteristics

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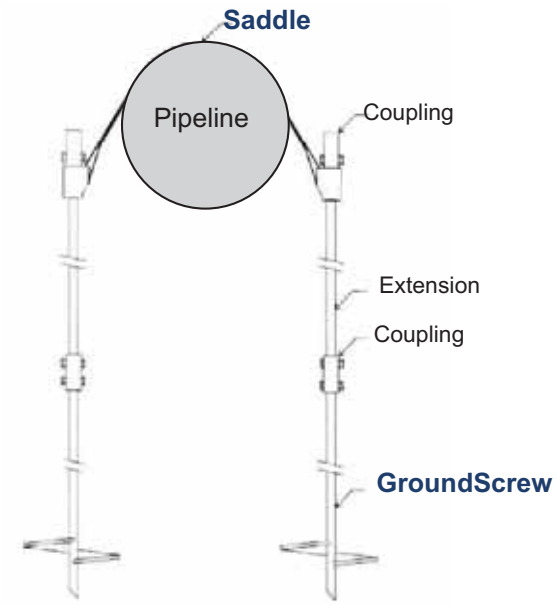
Torque readings taken on site to verify engineering

Can be removed and re-used - ideal for temporary buildings

Can be used in remedial and retrofit applications - whatever the size



GroundScrews used in the oil industry - here as a pipeline anchoring system

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A Summary ...

FEATURES

- The GroundScrew is a top quality ScrewPile System, individually engineered, customised and manufactured to our Clients' requirements for each project.
- The GroundScrew is a hot finish seamless round hollow section with a one or more helices welded to it. It is constructed of ASTM A Gr106-B/C grade boiler plate steel, which is of excellent quality. It can be galvanised if conditions necessitate this.
- The GroundScrew is available in diameters from 60mm to 1M with one or more helices. A variety of combinations of diameters and helices ensure that each GroundScrew will perform to requirements for either small or large projects.
- The GroundScrew is a tried and tested system; it has been used very successfully in North America and beyond for the past 16 years in all types of substrates and conditions from tundra in Alaska to the swamps in Florida.
- The GroundScrew can be inserted well beyond the recognised depth where heave and desiccation can take place.

USES

NEW BUILD

- The GroundScrew can be used in new build situations; a ring beam can be constructed on top to provide a well founded base for single and multi storey structures.
- The GroundScrew can be inserted well beyond the depth achievable with traditional foundations.
- The GroundScrew is extremely quick to install, especially compared with traditional methods, thereby saving in time and labour costs.
- No time is wasted waiting for concrete to cure.
- The GroundScrew is excellent for brown field sites.

REMEDIAL

- The GroundScrew can be used in remedial situations even to the point where a building can be jacked up using our specially designed capping detail.
- The GroundScrew can be installed in areas where height restriction is a factor.
- There is minimum disturbance to the soil and the structure.
- There is also minimum disturbance to the inhabitants of the structure.

OTHER

- The GroundScrew can be used in compression as a normal load bearing pile or in tension as a soil nail or tie-back to support, for example, earth retaining walls.

INSERTION

- The GroundScrew requires no grouting or other processes.
- The GroundScrew can easily be battered into position if necessary, making it ideal for tie-backs.
- The GroundScrew is extremely easy to install using conventional machinery.
- The GroundScrew can be screwed accurately into position ensuring perfect placement.
- The GroundScrew is screwed, with maximum energy efficiency, into the ground using a torque motor as opposed to being vibrated into position.
- Gauges monitor the torque and provide a guide to the load capacity being borne by the GroundScrew.
- Sections of the GroundScrew are connected with either high tensile bolts, for the smaller diameter GroundScrews, or welding for the larger diameter GroundScrews.
- Various capping details are available for both new build and remedial applications.

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ENVIRONMENTAL

- The GroundScrew is very environmentally friendly.
- There is very little or no spoil removal and hence no landfill.
- Transport and fuel implications associated with spoil removal are also reduced.
- The quantities of sand, cement and water required in traditional foundations are not required.
- The GroundScrew can be removed and reused which makes it ideal for temporary buildings.
- The GroundScrew can be positioned adjacent to trees and shrubs with minimal damage.

Are you looking for a foundation solution for your next project?

Helical Systems

REMEDIAL APPLICATION

EXTERNAL SEQUENCE

Step 1 - Foundations are exposed. Beaming has already been inserted above proposed GroundScrews to prevent point loading and further movement during works.

Step 2 - Initial GroundScrew positioned and inserted.

Step 3 - The verticality of the GroundScrew is monitored.

The GroundScrew is positioned close to the wall to reduce the bending moment.

Step 4 - Hydraulic oil pressure is monitored and loadings can be correlated to ascertain the eventual loadings that can be carried by the GroundScrew.

Step 5 - The GroundScrew is fully inserted into the ground.

Step 6 - Once the GroundScrew is fully inserted the capping detail is assembled. A load bearing plate is rotated underneath the footings.

Step 7 - The plate is fully rotated under the footing.

Step 8 - Once the capping detail has been fully assembled, a jack is positioned on top of the GroundScrew and the plate is raised to the underside of the footing. If necessary, the building can be raised in unison with the other GroundScrews .

Step 9 - Once the plate of the capping detail is locked into position, the jack is removed and concrete is poured to protect the GroundScrew capping assembly.

Step 10 - The works are complete with minimum disruption and the area restored within a short period of time. The chalet bungalow is situated on a slope with very high plastic clay.

Helical Systems

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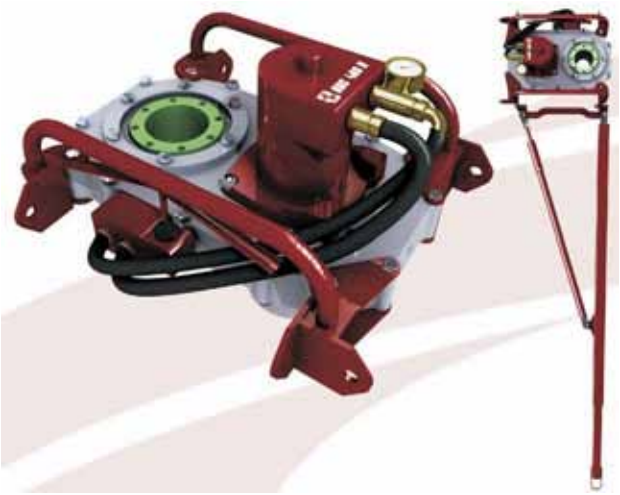
Difficult to Access Areas No Problem - GroundScrews can be installed using a handheld hydraulic driver



This handheld hydraulic driver utilises a separate powerpack, allowing the GroundScrew to be used in confined spaces or areas of limited access.

Installation torque up to 4000 Nm

Ideal for GroundScrews 60mm diameter - max capacity 120 kN

Through head allows user to install longer piles in one piece

Instant torque readout from calibrated gauge

Quiet operation - powerpack can be away from the operation area and idles when not driving the GroundScrew

Helical Systems

REMEDIAL APPLICATION

INTERNAL SEQUENCE

incorporating a new rail and block floor

Step 1 - Masonry beaming with HeliTie Bar is carried out to the inner leaf first to spread the load and repair cracks.

Step 2 - The original concrete slab floor is removed and a trench dug to receive GroundScrews to support a new rail and block floor.

Step 3 - The GroundScrews can be inserted with a mini digger which easily accesses via normal door openings.

Step 4 - The GroundScrews are driven in.

Step 5 - The verticality of the GroundScrew is monitored.

Step 6 - Caps are placed on top of the GroundScrews.

Step 7 - Levels are monitored.

Step 8 - A concrete beam and rails are installed.

Step 9 - The rails are inserted into the external walls supported by the GroundScrews.

Step 10 - Blocks are inserted into the rails and the floors screeded and walls plastered.

Step 11 - The works are completed speedily, cost effectively with minimum spoil removal.

Helical Systems

Test Results

Staatliche Materialprufungsanstalt Darmstadt
Leitung: Prof. Dr.-Ing. C. Berger
Grafenstr. 2
64283 Darmstadt
Abteilung Metalle

TEST REPORT M 01 0363
1. Issue

Customer: HELICAL SYSTEMS LTD (in association with Brutt Saver GmbH)
The Old Police Station
195 Main Road
Biggin Hill
Kent
TN16 3JU
United Kingdom

Date of Order: 20.02.2001 Order Number: 1265-16-02.2001

Order: Tension Tests performed on Parts of “HeliTie Bar-System”

Parts tested:	Pos.	Number	Object[1)]
	1	10	“HeliTie Bar-System”:10 x 400 NG No. 97 E 17812
	2	10	“HeliTie Bar-System”: 8 x 400 NG No. 00 E 17236
	3	10	“HeliTie Bar-System”: 6 x 400 NG No. 00 E 17236
	4		various pipe segments and casting resin

[1)] specifications according to customer

Selection of Tested Parts: Delivered by Customer

Date of Receipt: 20.03.01 3 pages
Darmstadt 04.04.01 3 charts

Signed: Dr. Ing. R. Landgrebe
Dipl.Ing. J. Karnes

1. Tested Material

The customer provided helically-shaped, profiled parts of bars, 400 mm long and with an external diameter of 6, 8 and 10mm. According to the customer, these parts are specified as “HeliTie Bar-System” made of 1.4567 (304 Cu) and are used to repair cracks in walls and masonry. Pipe parts with inner diameters corresponding to all bar sizes and casting resin were also made available. By means of the pipe parts and the casting resin, the material to be tested had to be fixed inside a testing device and exposed to tension in order to determine tensile strength, resistance to rupture and the “rigidity module”, comparable to the E-Module, of the material.

2. Tests Performed and Results

The cross-sectional areas of the bar parts of the “HeliTie Bar-System” were determined by means of density (7,86 g/cm^3), mass and length parameters of the sample material. Subsequently, the parts were filled on both ends with casting resin into segments of about 50 mm. Thus prepared, the material was then fixed inside a testing device and exposed to stress to rupture. Rigidity characteristics $Rp_{0,2}$ and R_m, as well as ultimate strength (elongation) A_{100mm} were determined. The “rigidity module” of the samples in relation to the cross-section was calculated between the tension limits as indicated in the charts below. The material tested, rigidity values, ultimate strength and “rigidity modules” are given in charts 1 to 3. The charts also show mean values x, standard deviations s and the 5% - fraction values.

Chart 1: Tension Tests performed on “HeliTie Bar-System” 10x400 NG No. 97E17812

Pos.	Sample Cross Section mm^2	Elongation Limit $Rp_{0,2}$ N/mm^2	Tensile Strength R_m N/mm^2	Ultimate Strength A_{100mm} %	Rigidity Module Tension Limits 10 N/mm^2 to 200 N/mm^2 N/mm^2
1	13,92	670	907	---[1)]	14620
2	13,77	---[2)]	889	3,5	---[2)]
3	13,83	695	902	3,0	150760
4	13,81	662	900	---[1)]	142030
5	13,88	673	902	3,0	148010
6	14,04	655	918	5,5	136590
7	13,97	643	918	5,0	150310
8	13,82	644	890	---[1)]	151610
9	13,81	668	897	---[1)]	143510
10	13,91	696	909	5,0	149590
x s $F_{5\%}$	---	667 19,22 629	903 9,92 883	4,24 1,20 3,44	146114 5141 135832

1) Sample rupture close to point of fixation
2) Elongation device on sample slipped out of place

Chart 2: Tension Tests performed on “HeliTie Bar System” 8x400 NG No. 00E17236

Pos.	Sample Cross Section mm^2	Elongation Limit $Rp_{0,2}$ N/mm^2	Tensile Strength R_m N/mm^2	Ultimate Strength A_{100mm} %	Rigidity Module Tension Limits 125 N/mm^2 to 300 N/mm^2 N/mm^2
1	10,15	---[2)]	944	---[1)]	---[2)]
2	10,19	796	948	---[1)]	169420
3	10,24	769	939	---[1)]	145850
4	10,28	791	959	4,0	151090
5	10,20	748	946	4,0	143720
6	10,23	772	950	---[1)]	148500
7	10,15	755	945	4,5	143900
8	10,13	755	928	4,0	143190
9	10,14	753	935	5,5	145120
10	10,23	770	941	4,5	148530
x s $F_{5\%}$	---	768 16,94 734	943 8,54 926	4,7 0,63 3,44	148813 8171 132571

1) Sample rupture close to point of fixation
2) Elongation device on sample slipped out of place

Chart 3: Tension Tests performed on “HeliTie Bar System” 6x400 NG No. 00E17236

Pos.	Sample Cross Section mm^2	Elongation Limit $Rp_{0,2}$ N/mm^2	Tensile Strength R_m N/mm^2	Ultimate Strength A_{100mm} %	Rigidity Module Tension Limits 125 N/mm^2 to 300 N/mm^2 N/mm^2
1	8,52	772	916	---[1)]	156330
2	8,36	749	900	---[1)]	151600
3	8,52	793	940	---[1)]	156950
4	8,55	760	922	4,5	162470
5	8,54	771	910	---[1)]	153260
6	8,54	775	918	5,0	155270
7	8,57	761	911	5,0	158700
8	8,44	766	934	---[1)]	158670
9	8,46	---[2)]	912	5,5	156590
10	8,37	775	910	---[1)]	152850
x s $F_{5\%}$	---	786 13,29 741	917 11,79 894	5,12 0,48 4,16	156269 3236 149797

1) Sample rupture close to point of fixation
2) Elongation device on sample slipped out of place

Translation of the German Original
(SA 09.10.01)

MATERIALFORSCHUNGS-UND PRUFUNGSANSTALT FUR DAS BAUWESEN LEIPZIG e. V.

(Institute for Research and Testing of Construction Material Leipzig)

Department: Construction Material
Head of Department: Dr. Ing. W. Stappenbeck

Test Report

Nr. PB 100 – 692
Dated 01.02.2001
1. Issue (4)

Client:	HELICAL SYSTEMS The Old Police Station 195 Main Road Biggin Hill Kent TN16 3JU
Request:	Testing of HeliGrout 25
Date of Request:	11/13.00
Samples Turned in on:	11.13.00
Samples:	used for making grout samples by MPA (Testing Institute)
Specification:	1 to 18
Date of Testing:	11/21/00, 11/23/00, 11/27/00, 12/18/00, 01/17/01

This Test Report consists of 4 pages and 1 attachment

Test Object: Prisms 4x4x16
HeliGrout 25

Tests performed to test: compression strength, bending strength, resistance to frost, adhesive stress

Test Regulations: in accordance with DIN 18555, part 3
DIN 52104 – B, DIN 1048, part 2

Grout Production: Date: 11/20/00
Readymix + Liquid in a mixer according to DIN 1164
mixed as indicated in mix instructions

Test Results:

Compression Strength (Development of compression after 1 to 7 days)

No.	Test Date	Testing Time Span	Dimensions h w l (mm)	Mass m	Density of raw material during testing p	Compression Rupture Strength F_o	Strength Tensile Strength $ß_o$
		Days	**mm**	**g**	**g/cm²**	**kN**	**N/mm²**
1	11/21	1	40.0/41.8/160.2	461	1.72	6.98 6.64	4.36 4.15
2	11/21	1	40.0/41.2/160.2	484	1.83	11.07 11.01	6.92 6.88
3	11/21	1	40.0/41.1/160.2	488	1.85	10.75 11.20	6.72 7.00
Mean Values					1.80	-	6.01

No.	Test Date	Testing Time Span	Dimensions h w l (mm)	Mass m	Density of raw material during testing p	Compression Rupture Strength F_o	Strength Tensile Strength $ß_o$
		Days	**mm**	**g**	**g/cm²**	**kN**	**N/mm²**
4	11/23	3	40.0/41.5/160.2	457	1.72	21.40 21.20	13.38 13.25
5	11/23	3	40.0/41.23/160.2	464	1.75	22.40 22.50	14.00 14.13
6	11/23	3	40.0/41.5/160.2	447	1.68	24.70 23.90	15.44 14.84
Mean Values					1.72		14.2

No.	Test Date	Testing Time Span	Dimensions h w l (mm)	Mass m	Density of raw material during testing p	Compression Rupture Strength F_o	Strength Tensile Strength $ß_o$
		Days	**mm**	**g**	**g/cm²**	**kN**	**N/mm²**
7	11/27	7	40.0/40.9/160.2	440	1.68	26.80 27.00	16.75 16.88
8	11/27	7	40.0/41.0/160.2	444	1.69	26.70 25.90	16.69 16.19
9	11/27	7	40.0/40.9/160.2	444	1.69	29.40 28.10	18.38 17.56
Mean Values					1.69		17.1

Resistance to Pressure. Bending Strength

No.	Test Date	Testing Time Span	Dimensions h w l	Mass	Density of raw material during testing	Bending Strength Max Load F_{az}	Tension B_{gz}	Resistance to Pressure Max. Load Tension F_o $ß_o$	
		Days	**mm**	**g**	**g/cm²**	**kN**	**N/mm²**	**Kn**	**N/mm²**
10	12/18	28	40.0/41.7/160.0	441	1.65	2.61	5.85	44.8 43.8	28.0 27.4
11	12/18	28	40.0/41.1/160.0	443	1.68	3.34	7.61	47.7 48.2	29.8 30.1
12	12/18	28	40.0/40.9/160.0	442	1.69	2.42	5.54	45.7 47.5	28.8 29.7
13	12/18	28	40.0/41.0/160.0	425	1.62	2.37	5.42	40.8 42.3	25.5 26.4
14	12/18	28	40.0/41.2/160.0	427	1.62	2.26	5.15	39.9 41.2	24.9 25.8
15	12/18	28	40.0/41.3/160.0	424	1.60	2.37	5.37	43.6 42.2	27.3 26.4
Mean Values					1.61		5.8		27.5

Frost Test according to DIN 62104 Procedure B
During 25 Test with temperatures changing between frost and defrost, no cracks or chips occurred. Water absorption remains almost the same; subsequent pressure-resistance-tests show no relevant changes compared to earlier tests.

No.	Test date	Testing Time Span	Dimensions h w l	Saturated Mass before freezing m	Saturated Mass after freezing m	Mass during Test m	Density of raw material during testing P	Resistance to Pressure max. load tension F_o	Resistance to Pressure $ß_o$
	Days	**mm**	**g**	**g**		**g**	**g/cm²**	**kN**	**N/mm²**
16	01/17	72	40.1/41.3/160.2	494	500	494	1.86	46.50 47.80	29.06 29.88
17	01/17	72	40.0/41.4/160.1	510	515	503	1.92	49.80 48.30	31.13 30.19
18	01/17	72	40.1/41.6/160.1	510	514	500	1.91	48.40 50.90	30.25 31.81
Mean Value							1.90		30.4

Supervisor. Dipl. Ing. Kuban

Seal and Segnature: Dr-Ing. Stappenbeck
Head of Department
Construction Material

Dr. rer. Nat. Huhn

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Blackburn South, Vic 3130
Email - helicalsystems@optusnet.com.au

TENSILE STRENGTH IN VARIOUS SUBTRATES

PULL OUT USING HELIGROUT 25

PROFILE	CIRCUMFERENCE mm	DRILL HOLE Dia mm	EMBEDMENT mm	PULL OUT Kn	SHEAR AREA mm^2	R_T N/mm^2
CONCRETE 15 (C15)						
8	25.13	14	150	**3.820**	3769.5	**1.010**
10	31.42	14	150	**3.833**	4713.0	**0.813**
AUTOCLAVED BLOCKS (2Mpa)						
8	25.13	14	150	**2.610**	3769.5	**0.693**
10	31.42	14	150	**2.470**	4713.0	**0.530**
BRICK (20Mpa)						
8	25.13	14	210	**5.680**	3769.5	**1.080**
10	31.42	14	210	**3.330**	4713.0	**0.510**

PULL OUT WITHOUT USING HELIGROUT 25 (DRY TIE)

BLOCK Mpa	PROFILE mm	CIRCUMFERENCE Dia mm	EMBEDMENT mm	PULL OUT Kn	SHEAR AREA mm^2	R_T N/mm^2
AUTOCLAVED BLOCKS						
2	8	25.13	150	**2.91**	3769.5	**0.772**
4	8	25.13	150	**3.85**	3769.5	**1.021**

Brutt Saver Group products are manufactured in accordance with EN ISO 9002: 1994
TZÚS Praha – Czech Republic, TSÚS Bratislava – Slovakai, ITB Waršawa – Poland,
MPA Darmstadt a MFPA Leipzig Germany, EMI Budapest - Hungary

(Testing in association with Brutt Saver Group)

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TECHNICAL PARAMETERS – TENSILE STRENGTH

PULL OUT TESTS USING HELITIE BAR

IN WOOD (PINE)

PROFILE	PROFILE – CIRCUMFERENCE mm	EMBEDMENT mm	PULL OUT Kn	SHEAR AREA mm^2	R_t N/mm2
PERPENDICULAR (Across the Grain)					
6	18.85	150	**2.700**	2827.2	**0.955**
8	25.13	150	**2.940**	3769.5	**0.781**
10	31.42	150	**3.230**	4713.0	**0.685**
PARALLEL (Along the Grain)					
6	18.85	150	**2.430**	2827.2	**0.858**
8	25.13	150	**2.230**	3769.5	**0591**
10	31.42	150	**2.640**	4713.0	**0.560**

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CORROSION RESISTANCE -
HELITIE BAR

Steel Description	Class of Corrosion Resistance - Range of Application											
	Class	Atmosphere - Corrosion Environment										
		Countryside			Town			Industry			Marine Area		
		L	M	H	L	M	H	L	M	H	L	M	H
304 Cu	II	+	+	+	+	+	o	o	o	o	o	o	o
316 L	III	+	+	+	+	+	+	+	+	o	+	+	o

L = low corrosion invasion (low temperature and humidity)
M = middle
H = high (high temperature and humidity)

+ = suitable
o = unsatisfactory

<u>Corrosion resistance – characteristics value</u>

PRE = Pitting resistance equivalent
CPT = Critical pitting temperature*
CCT = Critical crevice corrosion temperature*

*information - Steel producer

<u>Steel 316 L calculation of PRE</u>

PRE = 3.3 x 2.02 (%Mo) + 30 x 0.016 (%Ni) + 17.13 (%Cr) = 24.3

Interface Value / High corrosion invasion – 30°C
PRE (316 L) 24.3 <30

Range of Application with lower value (ppm – part per milion) of content Cl^{-1}