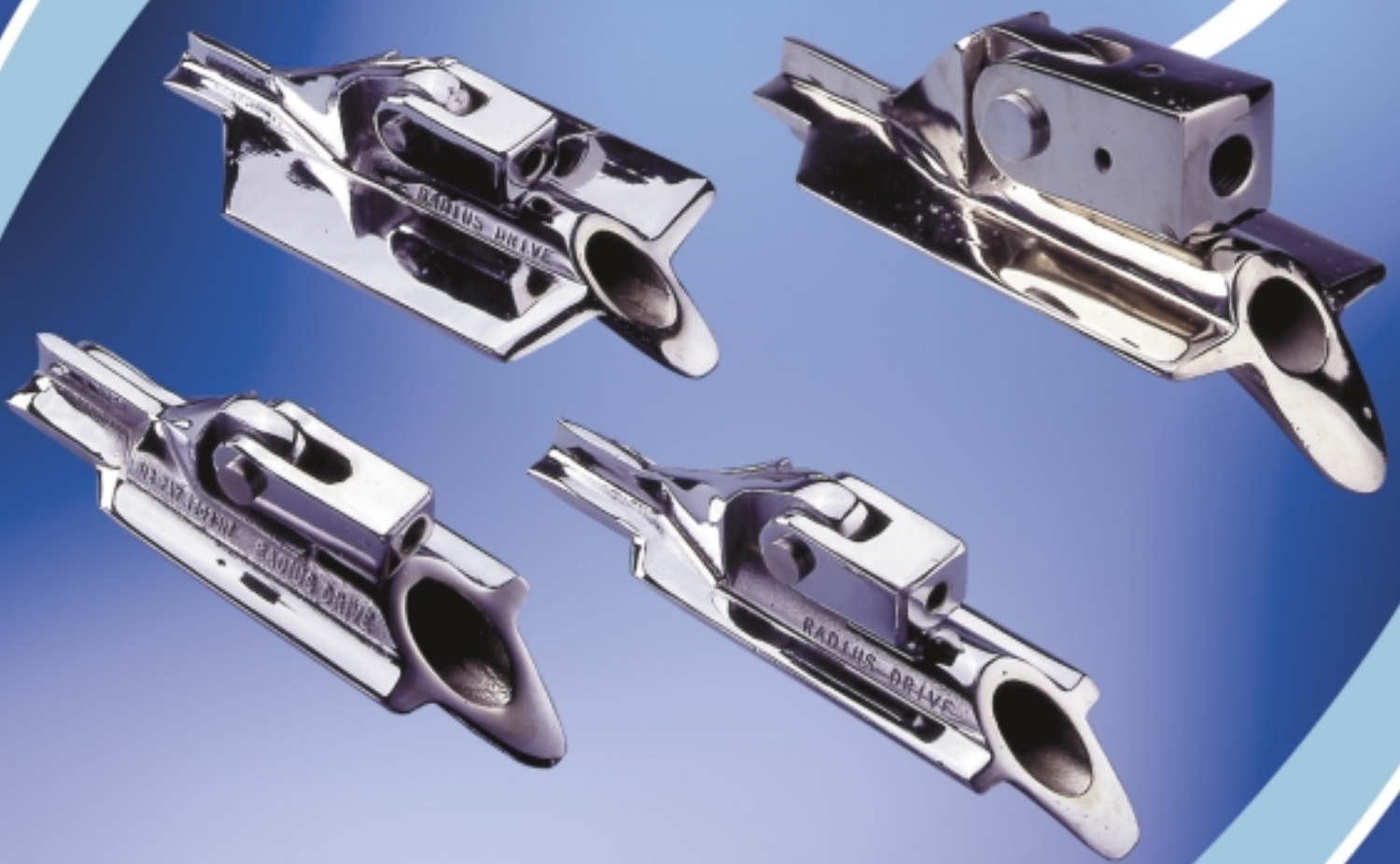


ANCHOR SYSTEMS (EUROPE) LTD



Products, Applications and
Technical Information

DUCKBILL®
Ground Anchor Systems

**HELICAL ANCHORS
& ANCHOR BOLTS**



Anchor Systems (Europe) Ltd supplies mechanical and grouted anchor systems for a wide range of temporary and permanent works. It is the exclusive UK supplier of the well proven and versatile range of Duckbill ground anchors which have been employed worldwide for a multitude of structural and groundwork applications.



Duckbill mechanical ground anchors provide an efficient, reliable and cost-effective means of stabilising stone and masonry structures as well as slopes and embankments consisting of virtually any displaceable substrate. Immediate proof loads up to 300kN are achievable on a single anchor in the correct ground conditions and grouted mechanical anchors, a concept developed by Anchor Systems, further increases their effectiveness in weak substrates.

As part of its on-going programme of improving Duckbill performance, Anchor Systems was also instrumental in the design and application of complete stainless steel anchor assemblies, incorporating high yield bars, to enhance their strength, durability and overall life expectancy. It also originated the Combi-Tec system of fully concealed anchor installation, with no external plates, for listed, historic and sensitive structures.

Comprehensive Service

Advice and specification assistance

Our technical team is available to provide advice on appropriate anchor schemes. To prepare a specification it is essential to establish: load requirements with safety factors; soil characteristics; soil report; bore hole logs if available; installation depth of anchor and setting out; design life of the system; top end termination.

Site testing

The anchor system should always be proof tested on site prior to commencement of the main works to confirm the holding capacity of the anchor in the prevailing substrate.

Installation service

For those clients requiring a complete supply and installation service we can offer a list of approved contractors for most areas.

Equipment hire

For clients involved in one-off installation or who do not intend to purchase equipment we offer for hire all the necessary tools and equipment to undertake anchor installation.



Formed in 1995, Anchor Systems offers a comprehensive advice, design, specification and site testing service. It supplies ground anchors, helical anchors and concrete anchor bolts to principle contractors or direct to clients throughout the UK, Ireland and parts of mainland Europe.

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Applications

Structural Stabilisation

Slope Stabilisation

Erosion Control

Temporary Structures

Underwater Fixtures

Reliable

Providing immediate, simple and very effective stabilisation, Duckbill mechanical ground anchors have wide ranging applications for both temporary and permanent works and have proved themselves to be reliable under virtually all displaceable ground conditions.

Cost-effective

With rapid installation, they are both efficient and cost-effective and have been successfully employed around the world for stabilising structures and sloping ground, securing temporary works, erosion control and underwater projects.

Versatile

Duckbill anchors can be supplied in anodised aluminium, galvanised cast iron and complete stainless steel assemblies. They are available in a range of sizes and offer a choice of termination plates, including a fully concealed top termination with the Combi-Tec system, making them ideal for historic or listed structures.



- Sheet piles and trench sheeting
- Retaining walls
- Road and rail embankments and cuttings
- Bridge abutments
- Lock and canal walls
- Tunnel linings
- Gabion baskets
- Revetment matting
- Coastal defences
- Cliff stabilisation
- Overhead gantries
- Geotextiles and bio rolls
- Scaffolding
- Guyed structures and masts
- Temporary relocatable structures
- Pipelines and buoys
- Seabed matting
- Floating docks
- Tree kits
- Ski mats
- Security chains and locks
- Covered tennis courts

The Range

Anchor Type

Tie Bars & Tendons

DB68

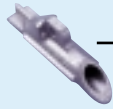
Material:
Aluminium
Load range:
1 – 5 kN



Tendons:
Paracore; Stainless Steel; MS Galvanised

MR68

Material:
Cast Iron SG
Load range:
1 – 5 kN



Tie Bar:
Carbon Steel
Tendons:
Paracore; Stainless Steel; MS Galvanised

DB88

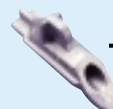
Material:
Aluminium
Load range:
5 – 10 kN



Tendons:
Paracore; MS Galvanised

MR88

Material:
Cast Iron SG
Load range:
5 – 12 kN



Tie Bar:
Carbon Steel
Tendons:
Paracore; Stainless Steel; MS Galvanised

MR4

Material:
Cast Iron SG
Load range:
10 – 20 kN



Tie Bar:
H.Y. Carbon Steel
Tendons:
Stainless Steel; MS Galvanised

MR3

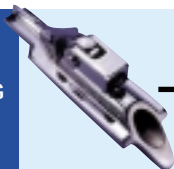
Material:
Stainless Steel; Cast Iron SG
Load range:
15 – 30 kN



Tie Bars:
H.Y. Carbon Steel; Stainless Steel
Tendons:
Stainless Steel; MS Galvanised

MR2

Material:
Stainless Steel; Cast Iron SG
Load range:
30 – 50 kN



Tie Bars:
H.Y. Carbon Steel; Stainless Steel
Tendons:
Stainless Steel; MS Galvanised

MR1

Material:
Stainless Steel; Cast Iron SG
Load range:
50 – 90 kN



Tie Bars:
H.Y. Carbon Steel; Stainless Steel
Tendons:
Stainless Steel; MS Galvanised

SR1

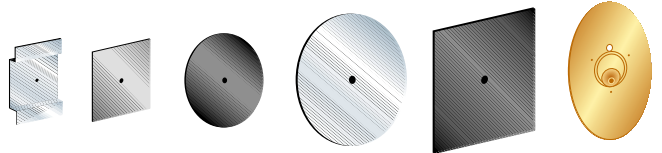
Material:
Cast Iron SG
Load range:
60 – 300 kN



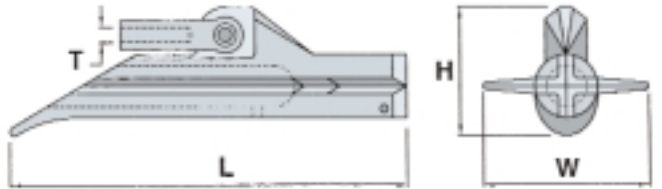
Tie Bar:
H.Y. Carbon Steel

Load Bearing and Pattress Plates

Load bearing top termination or pattress plates are custom made to individual sizes, shapes and materials to suit customers' specific individual requirements.



Anchor Sizes



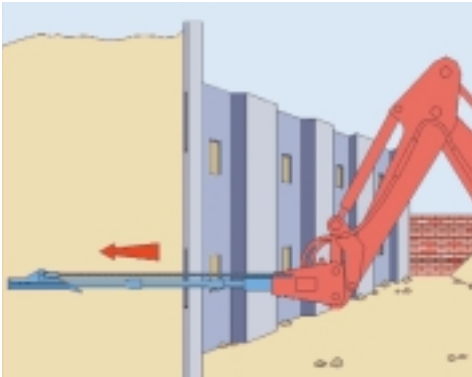
ANCHOR	L-mm	W-mm	H-mm	Sq.mm	T-mm
SR1	533	180	170	74000	up to 28
MR1	362.5	175	107.5	46875	15, 16 & 20
MR2	362.5	87.5	107.5	25625	15, 16 & 20
MR3	290	87.5	97.5	21250	12 & 15
MR4	200	62.5	95	10625	12 & 15
MR88	158	48	65	6250	12



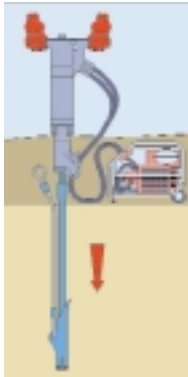
Anchor load ranges are for guidance only

Installation

Machine Mounted

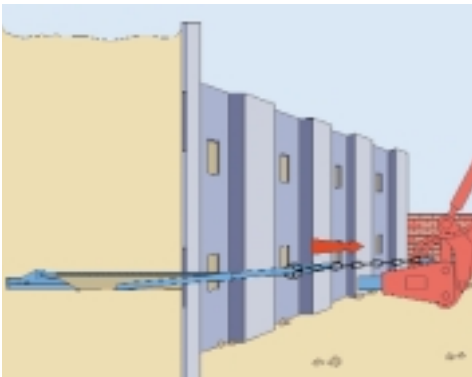


Hand Held

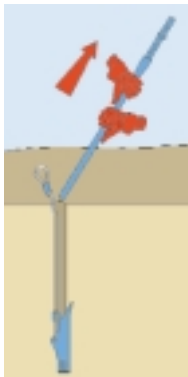


Duckbill anchors are designed to be driven into the ground using hydraulic or pneumatic equipment, with little or no disruption to the structure or surrounding area.

Machine Mounted

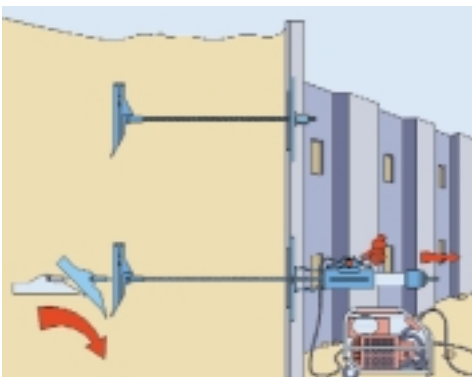


Hand Held

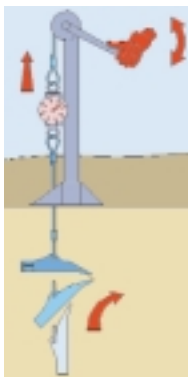


Once the anchor has been driven to the required depth the drive rod is removed.

Machine Mounted



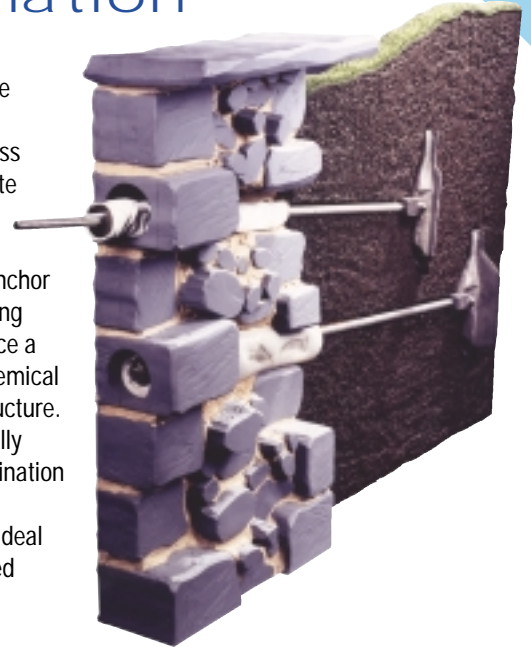
Hand Held



A tensile load is applied to the attached tie bar or tendon. This rotates the anchor into the locked position for maximum load holding capacity. The anchor is then proof tested to the designed loading requirements before the top termination is fitted, as specified by the civil or structural engineer.

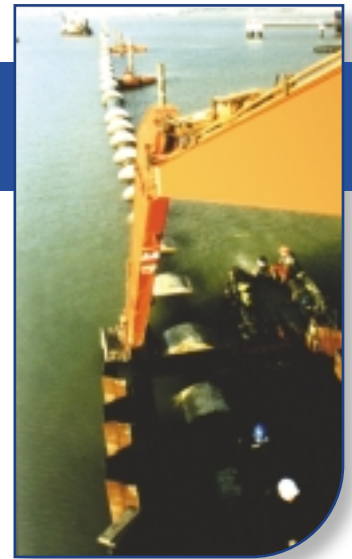
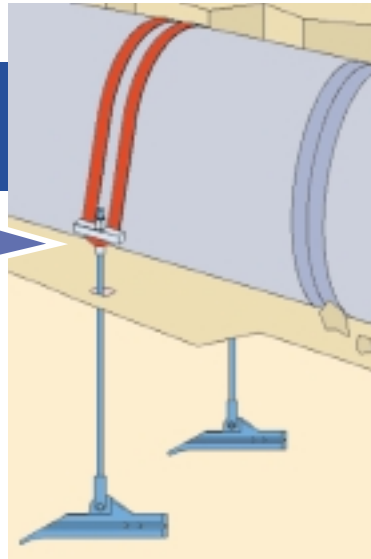
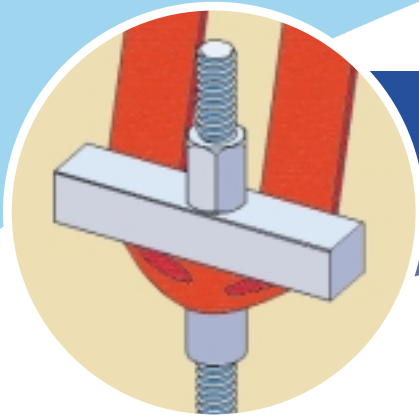
Combi-Tec concealed top termination

Developed by Anchor Systems, the Combi-Tec system comprises a stainless steel tube, front plate and polyester sock which is inserted over the installed anchor before pressure filling with grout to produce a mechanical and chemical bond within the structure. This provides a totally concealed top termination for Duckbill ground anchors, making it ideal for historic and listed structures



1. Remove stone or brick or core drill clearance hole
2. Position anchor for installation
3. Drive in anchor to required depth
4. Insert Combi-Tec sock over Duckbill anchor
5. Inflate sock by injecting cementitious grout and leave to cure
6. Tension anchor to working load and secure to recessed front plate with load nut
7. Crop excess bar, mortar around Combi-Tec
8. Replace cored material and make good





Pipeline Anchoring System

- for land or underwater applications
- corrosion resistant components
- Kevlar webbing connects pairs of anchors to secure pipeline

High Yield Bars

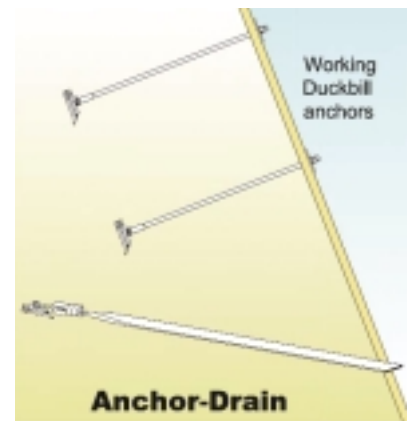


- carbon steel for temporary applications
- stainless steel for permanent and corrosive situations
- stainless steel tensile strength in excess of 650N/mm²
- can be cut on site without damaging thread
- anchors can be simply extended as required by means of a threaded coupler
- system can be safely grouted to enhance performance
- enables anchors to be re-tensioned, if necessary

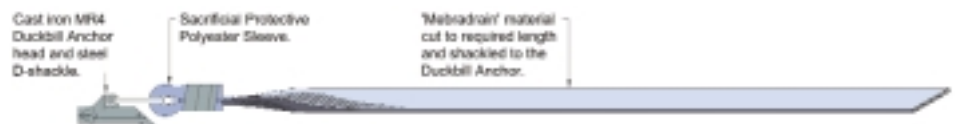
Anchor Drains

Duckbill Anchor Drains are a quick, simple and effective means of reducing water puddling within clay slopes and behind retaining walls.

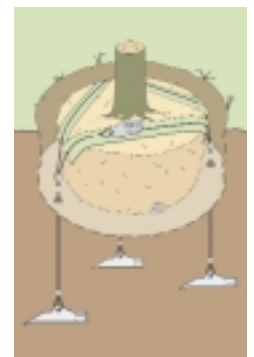
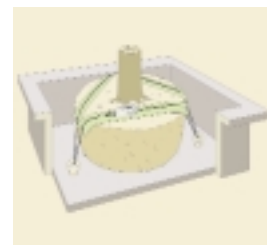
A length of 'Colbond' wicking material is secured to the Duckbill anchor bar by means of cable ties and strain relief nuts. Once the anchor has been installed in the normal way the drive rod is withdrawn and the Anchor Drain provides an instant drainage channel.



- ideal for road and railway embankments and retaining walls
- relieves puddle pressure
- prevents ground becoming saturated
- helps avoid embankment failure
- rapidly and easily installed
- simple, effective and economical
- available in cast iron with carbon steel bar or stainless steel



Tree Anchoring Systems



- traditional or Paracore tree kits
- robust and easy to install
- no special tensioning tools needed
- anchor points hidden below ground
- easily re-tensioned or de-tensioned

Design & Performance

Considerations

Load Range

From 0-300kN subject to ground conditions

Required Life Span/ Material Specification

1. Long Term corrosion resistance for up to and in excess of 120 years using Grade 304 or Grade 316 passive stainless steel.
2. Medium Term up to and in excess of 40 years using cast iron galvanised anchors fitted with stainless steel tendons.
3. Short Term, i.e. temporary works, using cast iron galvanised anchors with either carbon steel high yield bars or galvanised tendons.
4. Light Weight anchors are normally supplied in LM 25 aluminium.

N.B. All of the above are subject to prevailing ground conditions and the presence of any aggressive properties such as acids or stray electrical currents. Insulators or insulating membranes should always be used to separate dissimilar metals.

Performance Requirements

Working and proof loads are achieved by selection of the appropriate anchor for the ground conditions. All components, including tie bar details, are designed to a safety factor as agreed with the specifier.

Programme Considerations

The simplicity of the system and its speed of load application make the Duckbill system a favourite for tight programme situations.

Visual Appearance

Top terminations for tie bars and tendons can be varied to suit the situation. These can be fully concealed for visually unobtrusive stabilisation of historic or listed structures. Pattress plates in various sizes, shapes and materials are available to suit specific requirements.

Duckbill Ultimate Holding Capacities in kNs

COMMON SOIL TYPE Description	GEOLOGICAL SOIL Classification	Typical Blow Count 'N'	MR-88	MR-4	MR-3	MR-2	MR-1	SR1
Very Dense and/or Cemented Sands; Coarse Gravel and Cobbles	Caliche; Nitrate-Bearing Gravel/Rock	60-100+	20	45	55	90	100	300
Dense Fine Sand; Very Hard Silts and Clays	Basal Till; Boulder Clay Caliche; Weathered Rock	40-60	20	40	50	80	100	250
Dense Clays; Sands and Gravels; Hard Silts and Clays	Glacial Till; Weathered Shales; Schist Gneiss; Siltstone	35-50	18	35	45	75	95	250
Medium Dense Sandy Gravel; Very Stiff to Hard Silts and Clays	Glacial Till; Hardpan	25-40	16	30	40	60	90	180
Medium Dense Course Sand and Sandy Gravel; Stiff to Very Stiff Silts and Clays	Saprolites; Residual Soils	14-25	14	25	35	60	80	180
Loose to Medium Dense Fine to Coarse Sand; Firm to Stiff Clays and Silts	Dense Hydraulic Fill; Compacted Fill; Residual Soils	7-14	12	20	30	50	70	150
Loose Fine Sand; Aluvium; Soft-Firm Clays; Varied Clays; Fill	Flood Plain Soils; Lake Clays; Adobe; Gumbo Fill	4-8	4-7	7-11	13-22	22-26	50	100
Peat; Organic Silts; Inundates; Silts; Fly Ash	Miscellaneous Fill; Swamp Marsh	0-5	0.9-4	1.3-7	3.5-13	9-22	13-37	20-60

N.B. For guidance purposes only – True capacity must be tested with a load locker

Tests have conclusively shown that if an anchor is grouted into poor ground, the results achieved are very good. Details are available upon request.
Note: All underground work requires proper safety and location procedures. do not install an anchor until you know what is below the surface. It is imperative in all cases that all anchors are fully load locked before being put into service.

Corrosion susceptibility of metals

LEAST SUSCEPTIBLE to corrosive attack (more noble)

- Platinum
- Gold
- Silver
- Stainless Steel, Type 316 (passive) - Duckbills**
- Stainless steel, Type 304 (passive)
- Titanium and its alloys
- Monel
- Copper-nickel alloys
- Copper
- Aluminium bronzes
- Gunmetals
- Brasses
- Tin
- Lead
- Stainless steel, Type 316 (active)
- Stainless steel, Type 304 (active)
- Lead/tin solder, 50/50
- Stainless steel, Type 410 (active)
- Cast iron
- Mild steel
- Cadmium
- Aluminium and its alloys
- Zinc and its alloys
- Magnesium and its alloys

MOST SUSCEPTIBLE to corrosive attack (less noble)

Duckbill



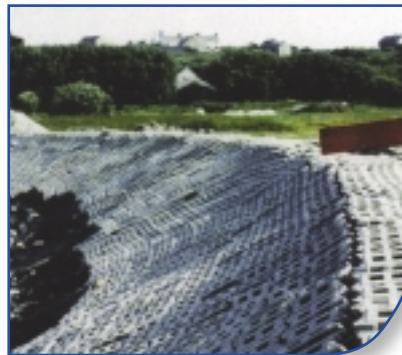
Sheet Piling
Docklands Light Railway



Geotextiles
Merstham Cutting, Croydon



Gabion Baskets
Nelson Close, Exeter



Revetment Matting
St Agnes, Scilly Isles



Guyed Structures
Telegraph Poles, Network Rail



Embankment Stabilisation
The A2 at Boughton



Cliff Stabilisation
Nefyn, Gwynedd, North Wales

Projects



Tennis Court Covers
Garrison Tennis Club, Strasbourg, France



Scaffolding
Power lines crossing railway tracks



Bridge Abutments
London to Brighton Mainline



Temporary Relocatable Structures
Chelsea Flower Show



Retaining Walls
Merthyr Vale



Tree Kits
New Business Park

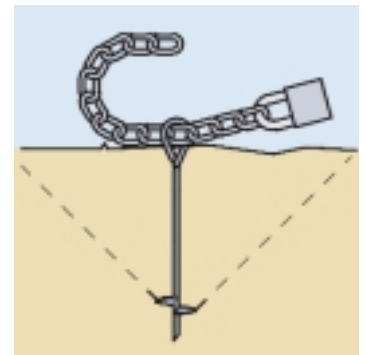
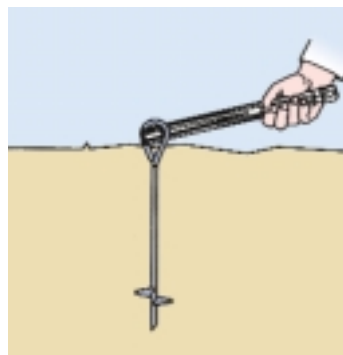
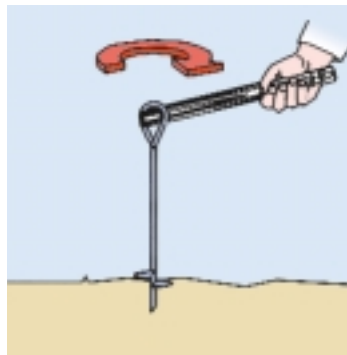
Helical

Helical screw-in anchors are a quick, simple and reliable means of creating secure fixing points in the ground. Manufactured from galvanised steel, they consist of an anchor shaft with an angled disk at the lower end. The upper end of the shaft, depending on usage, has either a closed eye for cable or chain connections or is threaded for securing plates and nuts.

Installation

Installation is either by hand or by powered augering but requires no large or expensive equipment. The achievable holding capacity is dependent upon the ground conditions but with the correct anchor in the right conditions holding capacities of up to 50kNs are attainable. As the anchors are screwed in they can, when not in use, be unscrewed for re-use at other locations.

With their ease of operation, helical anchors are ideal for confined spaces and avoid damage both to the soil structure or crops and to nearby structures and can be loaded to their full capacity immediately after installation.



Anchor holding capacity (pull out strength) in kN, depending on nature of soil, diameter of anchor disk and installation depth

Determination of soil types

Type A

Heavy soil, dense, fat clay, very dried-out, mixed with pebbles, detritic matter or gravel

Type B

Gravel mixed with sand, medium grained gravel (semi heavy soil)

Type C

Coarse grained, well settled gravelly sand

Type D

Agglomerate soils, of medium consistence soft clay, marl argillaceous loess

Type E

Primary backfill, low consistency grounds, fine grained

Diameter of anchor disk in mm	Installation depth in mm	Types of soil / Pull out strength in kN				
		A	B	C	D	E
80	400	6.0	5.0	4.0	3.0	2.0
110	600	9.0	8.0	6.0	5.0	4.0
150	1200	17.0	14.0	11.0	9.0	7.0

Anchors

Anchor selection

The length and diameter of the shaft and the diameter and thickness of the anchor disk are dependent upon the anchor's purpose, the screw-in depth and the required holding capacity. Anchor Systems can advise on the most suitable type and size of anchor but will require information on its intended use, loading capacity and the ground conditions present.



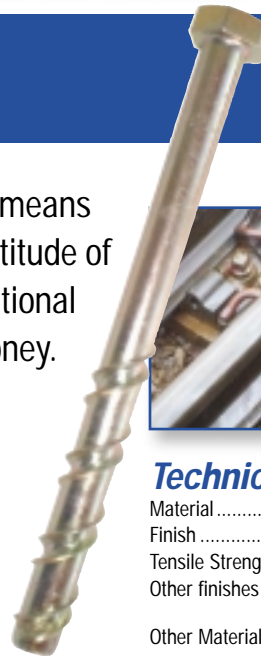
Anchor Bolts

Excalibur® anchor bolts are an innovative and versatile means of rapidly securing into any substrate. They have a multitude of uses and are rapidly installed without any need for additional fixings or special tools – which saves both time and money.

- require no through-bolts, sleeves, resins or 'drop-ins'
- effective in bricks, blocks, wood and all grades of structural concrete
- unique twin helical thread provides secure, reliable fixing
- high tensile strength and shear loadings
- British designed and manufactured
- universal screw-in anchor bolt for all sectors of industry

Manufactured from zinc and yellow passivated boron steel, Excalibur anchor bolts are available in a range of lengths, diameters and head styles providing them with an extensive range of applications, including:

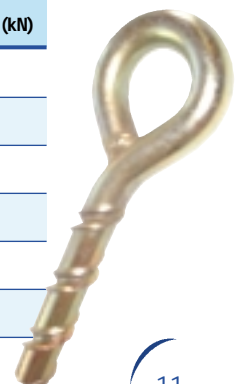
- Aerials
- Balustrades
- Cable trays
- Crash barriers
- Curtain walling
- Ducting
- Fencing & handrails
- Fire escapes
- Ladder restraints
- Machine anchors
- Park benches
- Playground equipment
- Signage
- Stadium seating
- Tanks



Technical data

MaterialBaron Stell BS3111/9/2.1.A
 FinishZinc and yellow passivated
 Tensile StrengthCase hardened
 Other finishesOther platings and finishes are available to special order subject to quantity
 Other MaterialsStainless Steel

	Bolt Dia.	Embed. Depth (mm)	Tensile Strength (kN)	Shear Strength (kN)
DIA 25N/mm ² Concrete	6	45	11.5	14.5
	8	60	21.0	25.5
60N/mm ² Concrete	10	75	33.4	46.0
	12	90	43.0	59.8
	16	120	73.0	70.0
	20	170	74.22	90.18





Anchor Systems has provided stabilisation solutions on a wide variety of major projects for an impressive list of key contractors, leading engineering consultancies, local authorities and government agencies plus a considerable number of private clients, including:

Main Contractors

- Alfred McAlpine
- John Mowlem
- Carillion
- AMEC
- Morrison Construction
- Brown & Root
- Amey
- Rock Engineering
- TJ Brent
- Celtic Rock
- Norwest Holst
- Denys, Belgium
- JN Bentley
- RMG Construction JV
- Charterbuild
- Skanska
- Birse Rail
- Laing Group
- Jackson Rail
- Kier Group
- WT Specialist Contracts
- Fondedile
- Thyssen
- Ritchies
- CAN
- Dean & Dyball
- Breheny
- May Gurney
- Miller Civil Engineering

Consultants

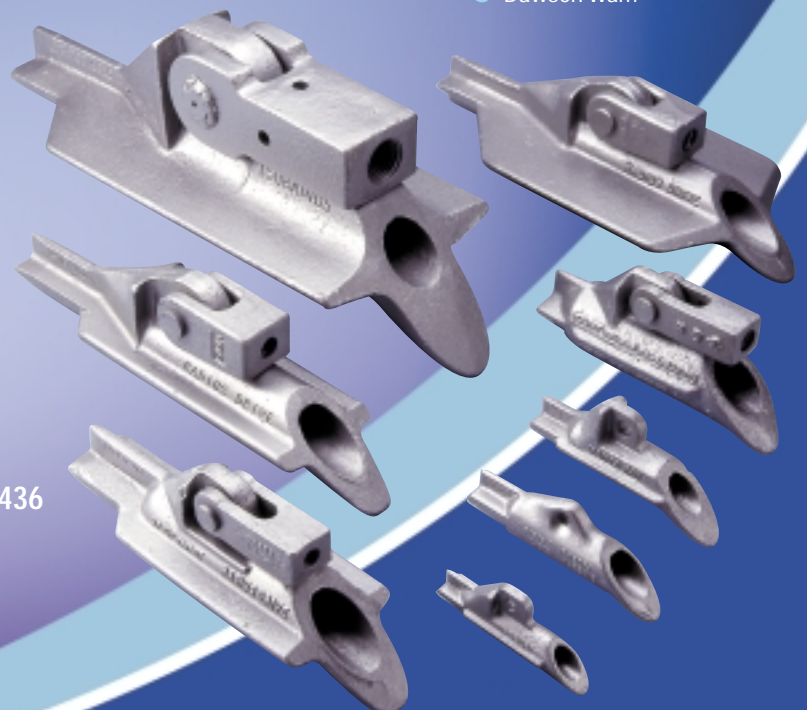
- Ove Arup
- Glamorgan Engineering Consultancy
- Anthony Hunt Assoc.
- Crouch Waterfall & Ptnrs
- Mouchel
- Atkins
- Babbie Group
- John Grimes Partnership
- Opc
- Halcrow
- ABB Lumus Global
- Scott Wilson Kirkpatrick
- Maunsell
- Capita Symonds
- Veryards
- Cass Hayward & Ptnrs

Local Authorities & Government Agencies

- The Highways Agency
- The Environment Agency
- Norwich City Council
- Rochester upon Medway City Council
- City of York Council
- Surrey County Council
- Torquay Borough Council
- Council of the Isles of Scilly
- Gwynedd Council
- Devon County Council
- Shepway District Council
- South Gloucestershire Unitary Authority
- Essex County Council
- Exeter City Council
- Plymouth City Council
- Gateshead Metropolitan Borough Council

Private Clients

- DeBoer Structures
- Arena Structures
- D&R Scaffolding
- Dixons Scaffolding
- Trad Scaffolding
- SGB Scaffolding
- Amps Scaffolding
- Network Rail
- London Underground
- British Waterways
- BT Cellnet
- Lisbon Airport Authority
- Anglian Water
- Green-Tech
- Radius Plastics
- BP, Holland
- Cable Domes
- Walter UK
- Ballymore
- Shell, Holland
- Greenfix
- Dawson Wam



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