

Anchor Post Foundation Solution

DESIGN, PERFORMANCE,
APPLICATIONS AND SERVICES



ABOUT ANCHOR SYSTEMS (INTERNATIONAL) LTD

Anchor Systems (International) Ltd specialises in the design, manufacture and supply of earth anchoring systems and solutions worldwide. Our Vulcan range of Earth Anchors have been designed in house and are the largest and most versatile globally, and extensively utilised for many universal applications.

Established in 1995, Anchor Systems have become the ‘Go To’ experts for mechanical earth anchoring solutions in the civil engineering and geotechnical world. Renowned for providing top quality products along with a first-class service – we have gained a reputation of always providing our clients with trusted solutions to fit their requirements as well as their budget.

At Anchor Systems we pride ourselves on providing full support as part of our service, which we believe goes above and beyond that of our competitors. This starts from the initial enquiry where we work with our clients to gain a full understanding of what they are trying to achieve and how they like to work. We then offer full support and advice throughout the design and ordering process and even when our client has received their goods – we don’t leave it there. We go on to offer support, training and on-site supervision and will always make sure our clients are completely happy throughout the whole process. We can also provide clients with bespoke designed products that can be unique to them and their project.

ANCHOR POST

Our Anchor Post is a versatile and adaptable foundation system for small to medium lightweight structures such as signage posts and lighting columns. Since its inception in 2007, London Underground have utilised the Anchor Post as a replacement for traditional concrete foundation bases and have installed 40,000+ systems to date, for various structures and applications.

Our patented Anchor Post is ideal for situations that require a fast and efficient installation process due to time and access constraints. The installation of an Anchor Post does not require the use of heavy machinery and can usually be driven into the ground within 1 to 8 minutes. Along with the added benefit of being able to continue with your installation immediately, without the need for drying and curing times associated with a traditional concrete base.

- No concrete means no drying or curing times
- Speed and ease of installation
- Full installation can be completed in one visit
- Installed using hand held equipment
- No digging required
- 50-year design life
- Multiple sizes
- Multiple designs already available
- Versatile and adaptable
- Bespoke designs available
- Training available
- Large stock holding of all installation equipment for hire or purchase
- Installation guides and other relevant documentation available on request

INSTALLATION



Mark out the position of the Anchor Post and scan the ground to check for buried services.



The drive steel is inserted into our specialised breaker and then in turn inserted into the aperture of the Anchor Post. The whole thing is then stood up by two operatives, placing the tip of the Anchor Post onto the marked position.



Once the Anchor Post has been positioned level, the breaker is started through either the activation of the anti-vibration handles or the remote trigger. The vertical alignment of the Anchor Post will need to be checked and adjusted every 300mm to 400mm as the post is driven. When the desired depth has been reached, the breaker and drive steel are extracted.



The Anchor Post is now ready for the structure to be mounted, either directly on top or via a bespoke interface plate. A small excavation may be required to aid the positioning of the fixings that join the Anchor Post to the structure.

Full installation methodology is available on request.

Resistance to Vertical Loads

The Anchor Posts are designed to resist both vertical and horizontal actions, including the associated destabilising moments. Compressive forces are resisted by a combination of end bearing and shaft resistance acting over the installed length of the post. Tensile forces are resisted entirely by the shaft resistance.

For designs carried out in accordance with BS EN1997-1 (Eurocode 7), the design (i.e. 'factored') vertical actions must not exceed the design resistance of the Anchor Post. The design actions, $F_{c;d}$ and $F_{t;d}$ include appropriate partial load factors. For geotechnical assessment, the partial factor set for Design Approach 1, Combination 2 is usually critical and therefore, the design actions should be factored by partial factor set A2 (i.e. $\gamma_{G_1} = 1.0$ and $\gamma_{G_2} = 1.3$). The design resistances are calculated using partial factor set R4.

Calculated design resistances for compressive and tensile forces for the three main types of Anchor Post are shown in the tables below. The 'coarse grained' soils table is applicable to sands and gravels and assumes the water table is below the base of the Anchor Post. The 'fine grained' soils table is applicable to silts and clays. Greater resistances than those shown in these tables may be justified by load testing a number of the installed Anchor Posts.

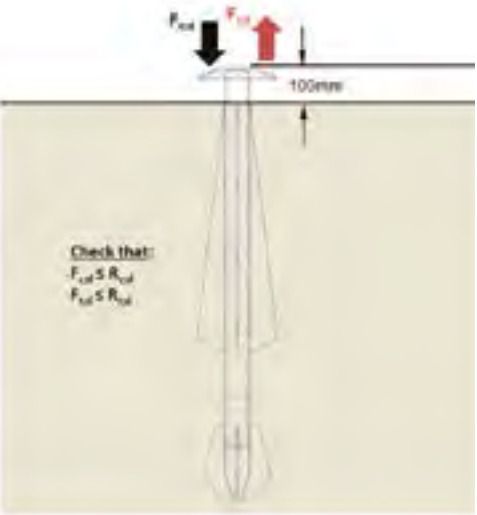
Coarse grained soils - Design axial resistance ($R_{c;d}$ - Compression / $R_{t;d}$ - Tension)

Soil Classification	Friction angle ϕ'_{sk} (°)	1.0m Anchor Post		1.2m Anchor Post		1.5m Anchor Post	
		$R_{c;d}$ (kN)	$R_{t;d}$ (kN)	$R_{c;d}$ (kN)	$R_{t;d}$ (kN)	$R_{c;d}$ (kN)	$R_{t;d}$ (kN)
BS EN1997-2							
Loose	30	1.0	0.6	1.7	1.0	4.2	2.8
Medium dense	32	1.3	0.7	2.2	1.1	5.1	3.2
	34	1.6	0.8	2.7	1.3	6.1	3.6
Dense	36	2.0	0.9	3.6	1.4	7.6	4.1
	38	2.7	1.0	4.8	1.6	9.6	4.6
Very dense	40	3.7	1.2	6.7	1.8	12.7	5.2

Fine grained soils - Design axial resistance ($R_{c;d}$ - Compression / $R_{t;d}$ - Tension)

Strength description	Undrained shear strength $c_{u;k}$ (kPa)	1.0m Anchor Post		1.2m Anchor Post		1.5m Anchor Post	
		$R_{c;d}$ (kN)	$R_{t;d}$ (kN)	$R_{c;d}$ (kN)	$R_{t;d}$ (kN)	$R_{c;d}$ (kN)	$R_{t;d}$ (kN)
BS EN1997-2							
Low strength	20	1.0	0.6	1.6	1.1	4.4	3.2
Medium strength	40	2.0	1.3	3.3	2.1	8.9	6.4
High strength	75	3.2	2.0	5.4	3.4	14.3	10.2
	100	3.9	2.4	6.5	4.0	17.0	12.0

Vertical actions applied to Anchor Post –
Design axial compression, $F_{c;d}$ and tension $F_{t;d}$



Resistance to Horizontal Loads

For horizontal actions, the Anchor Post may be designed according to BS EN1997-1 as a laterally loaded pile. Alternatively, a simplified approach may be adopted using the method in BD94-17 - Design of Minor Structures, for planted columns and posts. This approach uses characteristic (i.e. 'unfactored') actions and three soil qualities defined as 'Poor', 'Average' and 'Good'.

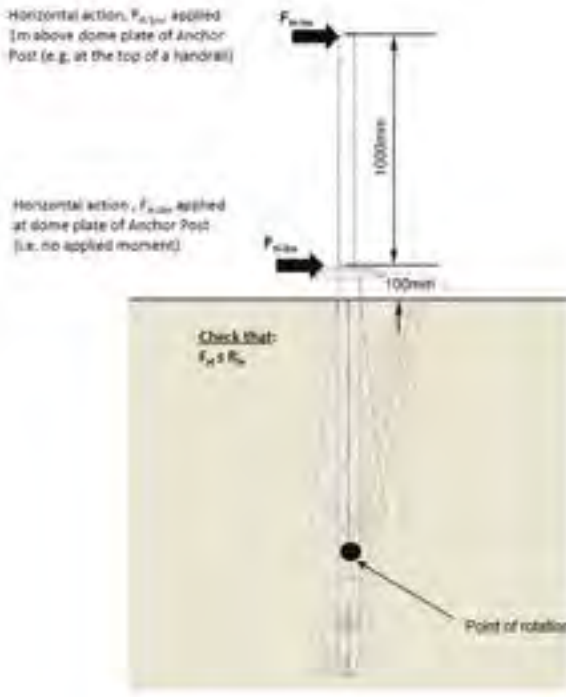
Soil quality description from Table 3 of BD94-17	
Good	Compact, well-graded sand and gravel, hard clay, well-graded fine and coarse sand, decomposed granite rock and soil. Good soils drain well.
Average	Compact fine sand, medium clay, compact well drained sandy loam, loose coarse sand and gravels. Average soils drain sufficiently well that water does not stand on the surface.
Poor	Soft clay, clay loam, poorly compacted sand, clays containing a large amount of silt and vegetable matter, and made-up ground. Where the Quality is unknown, it shall be taken as Poor.

Calculated resistances for horizontal forces for the three main types of Anchor Post are shown in the table below. This table includes values for the load applied at the top of the Anchor Post and 1m above the dome plate. The resistances are calculated using the BD94-17 method for the three soil qualities defined in Table 3.

Where the quality of the foundation soil is unknown, assume 'Poor' quality. The calculated resistances in this table should be compared with the characteristic (i.e. unfactored) horizontal loads applied to the Anchor Post. It is assumed that the top of the dome plate projects no more than 100mm above ground level.

Horizontal resistance (R_{H-0m} - At 0.0m / R_{H-1m} - At 1.0m)

Quality of soil (Table 3 of BD94-17)	1.0m Anchor Post		1.2m Anchor Post		1.5m Anchor Post	
	$R_{H-0m}; k$ (kN)	$R_{H-1m}; k$ (kN)	$R_{H-0m}; k$ (kN)	$R_{H-1m}; k$ (kN)	$R_{H-0m}; k$ (kN)	$R_{H-1m}; k$ (kN)
Poor	1.4	0.6	2.3	1.1	4.2	2.2
Average	2.3	0.1	3.9	1.8	7.1	3.3
Good	3.8	1.6	6.3	2.3	7.7	3.3



NOTE: R_H - The lateral resistance of highlighted values are limited by the moment capacity of the CHS steel post sections

In situations where suitable ground investigation has been carried out, a more rigorous analysis to BS EN1997-1 may allow higher characteristic horizontal loads and/or moments to be resisted. Greater resistances than those shown in this table may be justified by load testing a number of the installed Anchor Posts.

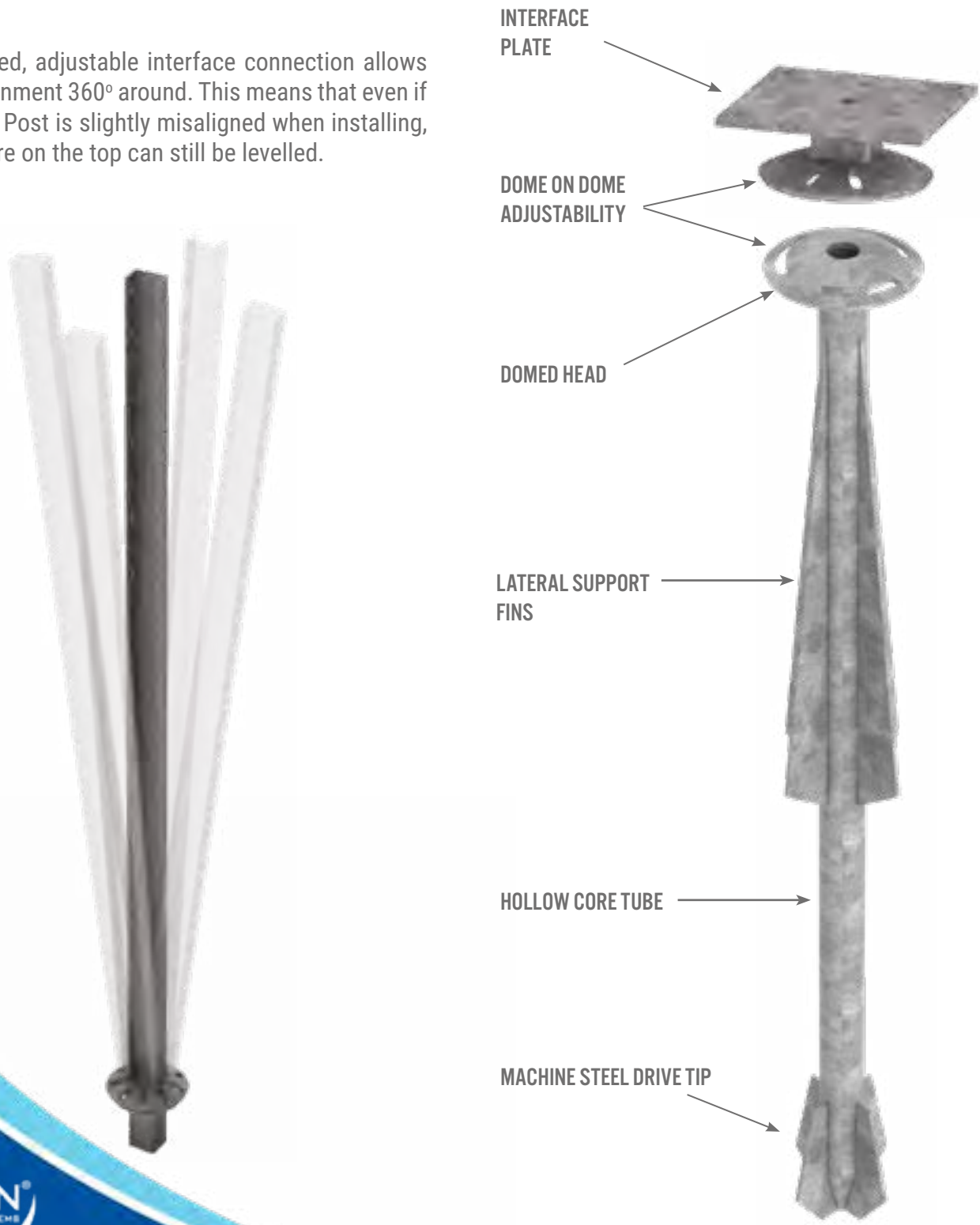
Horizontal action applied to Anchor Post - F_H

Performance

Anchor Posts come in a variety of different sizes and designs for different uses and applications. They can be designed to work singularly or be combined with each other to suit larger structures.

The domed head of the Anchor Post allows the structure to be adjusted level if the Anchor Post does not get driven into the ground squarely and therefore negates the need for shims that would otherwise be used to perform this task. The Anchor Post can also be designed to marry up to any structure using a bespoke designed interface plate when required, allowing for any flexibility and adjustment needed for a precise installation.

The patented, adjustable interface connection allows for a 7° alignment 360° around. This means that even if the Anchor Post is slightly misaligned when installing, the structure on the top can still be levelled.



Performance

All of our Anchor Posts have been independently tested and are approved by London Underground. Certification is available on request.



The Anchor Post has been designed for different purposes in varying ground conditions along with bespoke inter-face plates which are made to suit your project requirements.

Cable Route Management System – CRMS

The original reason for Anchor Post concept was established when TfL approached Anchor Systems in 2007 to develop a cabling infrastructure system that could be installed quicker than a concrete foundation in varying soil structures.



Anchor Systems, within a year, had created through design, prototyping and testing, the Anchor Post solution. The system performance is based on rapid installation with minimum maintenance.



Signal Post Replacement Solution

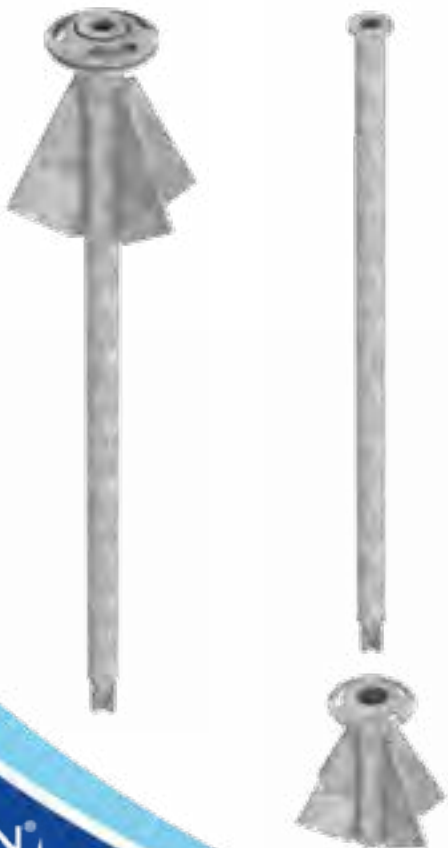
Anchor Systems were challenged with providing an engineered design for the Fog Repeater replacement program. For some time, it has been identified that the Fog Repeater signals were failing due to the carbonation of the aging concrete that has been in use for over 100 years in some instances.

Anchor Systems designed and developed a solution for TfL, where a Telescopic Foundation System, which utilises four Anchor Posts along with an adaptable common base which can be installed over the existing footprint of the original concrete foundation. Using this system allows the signal head to remain in the existing position which has been imperative to London Underground Signals. The unique design allowed for a large amount of versatility that was required to span known and unknown obstacles in the ground and negated the need to reposition the whole structure. We also have a design in place that allows a smaller post to be mounted on a single 1.5 metre Anchor Post without the need for the Telescopic Base. This system can be utilised and adapted to provide a cost-effective foundation system for most columns, antennas and masts.



Multi Piece Anchor Post System (MPAP)

Our Multi-Piece Anchor Post was designed as a safe system to drive between existing cable runs that are heavily loaded on both sides with cables. This particular Anchor Post eradicates any risk of the fins damaging the cables. This system allows the pin to be driven on its own, between the cables and through the fin section of the Anchor Post after it has been placed on the ground directly under the cables. This system has been successfully used on London Underground, since 2014, for replacing the thousands of failing CAT 4 concrete posts.



2Fin Multi Piece Anchor Post System

Our 2 fin Anchor Post System was engineered and developed to help increase the cabling capacity along the current and existing cable routes for London Underground.

This particular Anchor Post can be driven within the tight space between cables on each side of an existing cable run and can either be used to provide extra support or to increase the capacity directly above. This design has resulted in major benefits and huge cost savings as the alternative was to replace the entire cable run for a larger new one.



Telescopic Foundation System for Cable Bridges

TfL had designed a steel framework for transitioning cables from bridge MR7A onto track level between northbound Metropolitan and Jubilee lines. The designed concrete foundation solution would normally require the removal and re-routing of the existing drainage that was running through this area of the track.



The ground condition in this area was contaminated and therefore any earth and ballast removal and disposal would be problematic. The required installation position for the cable framework was in close proximity to the track and therefore any excavation required for a traditional concrete foundation could potentially undermine the lines.

Anchor Systems designed and developed the Telescopic Base Foundation System to fit within this limited space and with its telescopic legs also provided sufficient adjustment to allow the system to be installed over the existing drainage that was found to be an issue for a traditional concrete foundation to be used. As there isn't a need for any excavation with the Telescopic Foundation System, the sleepers and track were not compromised during installation at any time.



Anchor Base For Sheds & Garden Rooms

At Anchor Systems, we have developed a foundation solution ideal for temporary and permanent structures such as sheds and contemporary garden rooms. Our system eliminates the need to use a traditional concrete base and its associated draw backs.

Our anchors require no heavy machinery, can be installed using hand held equipment and are perfect for installations where access is limited with the added benefit of no soil disturbance or mess.

Compared to traditional methods of laying foundations, our anchoring system is far quicker and easier to install, requires no drying time or earth removal and comes with the added benefit and option to remove the structure and return the ground to its original state. Full Anchor Base brochure is available on request.



**Framework built and installed
in under 2 hours**

Project Report

London Underground has been working with Lineworx Ltd to update the current cable carrying system. There are many areas of failing existing concrete cable posts that have been identified as requiring replacement as they are beyond economical repair. Lineworx were asked to create a solution with due consideration to the associated risks and costs of such a large project and decided that the introduction of the patented Anchor Post into the design was the most beneficial option.

Anchor Systems (ASIL) worked with Lineworx to create a solution that considered all of London Underground's requirements. The solution had to tick all boxes, especially ones concerning cost, installation methodology, health & safety, maintenance and durability.

SOLUTION

ASIL developed the Anchor Post to create a foundation solution that could be rapidly and easily installed whilst reducing the overall risk to the installation team as well as the existing infrastructure. The Multi-Piece Anchor Post formed part of this overall solution due to its unique design and allowed the Anchor Post to be driven in between an existing, heavily loaded cable run whilst greatly reducing the risk of cable damage.

The overall solution included an Anchor Post as the foundation, a cable post as the main supporting structure which combines with a Back Plate and J Hangers to directly support the existing cables. All parts were designed to be retro-fitted with ease and speed whilst providing a system with a design life of at least 50 years, which met with London Undergrounds requirements.

This system was introduced into the London Underground network in 2014 and continually gets implemented into a continuing works program that is replacing all failing concrete cable posts.

CLIENT

London Underground Limited

CONTRACTOR

Skanska

SUB CONTRACTOR

Arbourtech Services Limited

SUPPLIER

ASIL/Lineworx

SYSTEMS USED

- 906 Cat 4 posts on the Metropolitan Line
- 531 on the District Line
- 851 on the Central Line

LOCATION

Open Track Section – Various Locations



Anchor Post

CONCRETE CABLE POST REPLACEMENT CAT 4 METROPOLITAN / DISTRICT / CENTRAL LINES



Handrails

Anchor Posts have been used extensively as a foundation solution for handrails and hoardings to form protective barriers on the rail network. They can easily and rapidly be installed in long and straight runs, sloped banks and undulating ground conditions and have enough adjustability to always accurately interface with the above ground infrastructure.



Walkways

The Anchor Post has and can be successfully used as an alternative to traditional concrete foundations to support structures including walkways, cable stiles and embankment steps and is so versatile and easy to install that it can often mean that an installation can be completed in one visit.



Signage

Perfect as a foundation base for signage, the Anchor Post can quickly be installed with lightweight, handheld equipment giving the installer the ability to mount the signage immediately without the need to wait for a concrete base to dry and cure, thus, saving time and money.



Signage for this School was easily and quickly installed.



Anchor posts are ideal for highways signage and are more environmentally friendly than the concrete base alternative.



A sign being placed in a newly paved area. The Anchor Post solution was ideal as it created minimal disruption to the paving.

Other Uses

The Anchor Post is so versatile and easy to install – it can easily be used as a foundation solution to almost any small to medium lightweight structure. Since 2007, it has been used in many applications including park benches, security lighting posts, sculptures and shelters.



A wooden bus shelter supported by four Anchor Posts.



A trackside toolbox mounted on Anchor Posts.



Solar powered security light installed without any disruption to the surrounding area or ground.



Interactive light art installation by Hackney Council in public park.

Anchor Systems (International) Ltd offer bespoke training packages for our entire product range including the Anchor Post and Vulcan Earth Anchor® and their respective applications and uses. Training can either be carried out on-site or at our Head Office in West Sussex near Gatwick and can be tailored to your specific requirements.

At the end of a successful training session, each trainee will be issued an Anchor Systems Training Passport, detailing the completed competence on the back – similar to a British driving license. The Training Passports are monitored regularly, by Anchor Systems, regarding the renewal dates for each competence.



ANCHOR POST				
ID	SYSTEM	DATE ASSESSED	EXPIRY DATE	Trainer
1	Fixed Anchor Post Installation and Single Interlocking Plate and Column Connection	11/1/18	11/1/20	Anchor Smith
2	Multi-Post Anchor Post Installation (MPP)	11/1/18	11/1/20	Anchor Smith
3	Cable Route Management System (CRMS)	N/A	N/A	Anchor Smith
4	Freeboard Beam (FBB) Installation	N/A	N/A	Anchor Smith
5	Ground Beam (GB) Installation	N/A	N/A	Anchor Smith
6	Multi-Post Single Support Anchor Post	11/1/18	11/1/20	Anchor Smith
7	MPP (Manual) partly installed (Anchor Post)	11/1/18	11/1/20	Anchor Smith

In addition to our training and design services, our on-site support has always been a key service we offer to our customers. As training services are usually in controlled environments where installations and methodology can be easily conducted, therefore, live site conditions are always varied and need to be tailored accordingly. We offer additional tool box talks and site-specific advice as well as assistance to ensure a smooth installation takes place.

We advise that we attend site for the first day(s) of the installation to allow for any additional training and advice that is required. Even though our systems are simple to install, and the plant can be easily operated, there are always a need for some 'tricks of the trade' that will help with an efficient installation process and allow newly trained installers to become more effective in a shorter time frame.

WHAT TO EXPECT

- Tool Box Talks
- On site supervision
- Training in best installation practice
- Anchor Post Testing



WHAT TO EXPECT

Training sections for each competence generally last 3-5 hours and tend to be limited to 6 personnel at a time. A typical training session would include the following:

IN CLASSROOM

- Introduction
- Presentation/Theory
- Familiarisation of plant and equipment
- Documentation overview and hand out
- Q&A

AT CONTROLLED DEMO GROUND

- Tool Box Talks
- Demonstration
- Q&A session
- Practical overview
- Supervised hands-on installation

The training session is finished off by reviewing your bespoke project requirements and discussing how we can assist you further. Any further questions you may have can also be discussed at this stage. Details for your training passports are checked and will be sent to you by post.



Installation Service & Equipment

When you purchase a product through Anchor Systems there's no need for you to shop around trying to find installation equipment or specialist installers. We can supply you with all the tools and training you need or if you require a complete supply and installation service, we have our very own list of approved and experienced contractors who have undertaken specialist training to install the Anchor Post.

SITE TESTING

The chosen anchor system should always be proof tested on site prior to starting work. Site tests are vital, especially when soil test reports are not available as they allow the confirmation of maximum loading achievable in the areas that the ground anchors are to be positioned and also allow for creep testing.

SITE PREPARATION

Before any anchor systems are installed it is always recommended to use a CAT scanner to the required depth to check for buried services.

PERSONAL PROTECTION EQUIPMENT

At Anchor Systems (International) Ltd we strongly recommend that before you install any type of below ground system that the proper safety equipment is worn. Please see below the recommended personal protection equipment –

- Hard Hat
- Safety Boots
- Goggles
- Overalls
- Ear Defenders
- Gloves

Plant

Anchor Systems (International) Ltd have created specialist installation tools that are fit for the purpose of efficiently installing the Anchor Post. All our equipment is available to either hire or to purchase. If you would like to know more about our equipment specifications, then we will happily provide you with this on request.

HANDHELD EQUIPMENT

We offer a range of handheld installation and loading equipment that is specifically designed for efficiently installing, testing and extracting the Anchor Post. We have also kept the individual plant unit weights as low as possible to ensure that our product range can be installed as easily as possible.



TRUNDLE PACK

Our focus is to ensure that the plant that we provide is both robust and quick for hand held plant installation. With this in mind, we have developed the Trundle Pack which contains all the installation equipment you require, altogether on one easy to manoeuvre trolley. The Trundle Pack has been designed for rough terrain and long-distance sites with poor access, meaning there is no need to make multiple trips back and forth to your vehicle when unloading.

- All in one installation pack
- Easy start power pack
- Easy lift points for in and out of vans
- Powerful and light weight
- Compact for tight and restricted areas
- Unleaded fuel, no need to mix up 2 stroke fuel
- Reliable and robust
- Anti-vibration breaker
- Suitable for installing Anchor Posts





FOR TECHNICAL ADVICE OR
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