



Slope Stabilization

Reference Details:

Recent projects for permanent soil nails utilising DYWI Drill Anchor include:
 (Please follow underlined links to more detailed information)

Channel Tunnel Rail Link:

- [Shortlands Junction und North Downs Tunnel](#)

Network Rail (Great Western Zone):

- Lavington Embankment
- Salford Cutting
- Westerleigh Embankment
- Woodborough Cutting

Network Rail (Midlands Zone):

- Shilton Embankment
- Grantham Embankment

Network Rail (Southern Zone):



DYWI[®] Drill Anchor Soil Nails - The preferred solution for stabilisation of Railway Embankments

Over recent years, the DYWI[®] Drill Anchor Soil Nail has become the preferred solution on many railway embankments. Key clients include: Network Rail, Channel Tunnel Rail Link and London Underground. The system combines efficiency with ease of installation and is often the soil nail of choice for rail embankments made up of fill materials. DYWI[®] Drill Anchor Soil Nails are typically installed using the simultaneous drill and grout method. This technique enables the drilling to be combined with the grouting, ensuring that grout is placed at all points within the borehole as well as enabling faster rates of installation to be achieved. During drilling, the grout is circulated within the borehole, with a small return at the mouth of the borehole. The injection of grout in the borehole provides two functions: to mix with the drill spoil to form a solid grout bulb, as well as acting as a partial flush for the lighter drill cuttings.

Drilling equipment generally comprises of a tracked drilling rig with a top hammer (drifter). The top hammer enables the hollow bar soil nails to be installed using rotary percussion, this method offers high rates of production as well as good directional stability in mixed fills. For restricted access locations (cliffs or restricted workspace), hand held hammer drills provide an alternative for installing the soil nails. Drilling contractors are now widely familiar with DYWI[®] Drill Anchors, with the system often referred to as "The Driller's Dream".

The most popular DYWI[®] Drill Anchor Soil Nail is the R32N, followed by R25N and R32S. All the bars can be supplied as plain, part galvanised or fully galvanised, with matching fittings and bearing plates. Drill bits are selected in accordance with the ground conditions, key criteria being: drilling efficiency and grout flush. The drill bit of choice for mixed fill embankments (gravel and clay) is the 2 stage cross-cut retroflush bit. This drill bit is available in a range of cutting diameters to suit the different soil conditions and nail loadings. For harder ground, or where boulders are present, a range of Tungsten Carbide drill bits are available, either with a flat face or drop centre profile.

For permanent soil nailing applications, either 60 years (earthworks) or a 120 years, the use of DYWI[®] Drill Anchor Soil Nails is carefully assessed in respect of: degree of risk, aggressivity of soils, load, and lifespan. The majority of soil nailing applications are typically classified by the engineer as: low risk, lightly loaded passive installations, and are usually located in inland regions. Within this context, it is normally possible to achieve the necessary lifespan through a combination of sacrificial corrosion allowance (from the cross sectional area of the bar), with additional supplementary protection provided by galvanising. In high risk applications (e.g. within the close proximity of a structure) or in aggressive environments (e.g. coastal works), a higher level of corrosion protection is generally required i.e. Double Corrosion Protection (see DSI factory pregrouted systems).

Galvanised DYWI[®] Drill Systems are supplied in two formats: "top bar galvanised" with lower bars as plain, or "fully galvanised". The "top bar galvanised" option enables the bar section in the



- Earlswood Embankment
- Croydon Track Alignment

Network Rail (East Anglia, Scotland, South West)

most critical area (at the soil /air interface) to be provided with supplementary corrosion protection; the lower bars (plain bars) are less affected by corrosion (due to the reduced levels of oxygen within the borehole) and are therefore able to achieve the required lifespan through sacrificial corrosion allowance only. For installations requiring greater protection, the "fully galvanised" system offers additional protection.

Testing of soil nails has also become a regular requirement by engineers and contractors on most projects. DSI Stressing and Testing Services Division are well established in providing site assistance and soil nail testing services for a range of soil nailing applications including: grid formats, nailed gabions, track ballast retention, remedial works. The testing of soil nails requires a stable bearing surface, aligned perpendicular to the angle of installation. As soil nails are generally tested against a soft face (as opposed to a concrete face, for ground anchors), it is essential that the temporary bearing platform has sufficient bearing area and is correctly aligned. The key criteria for soil nail testing is to establish the achievable bond stress in the stable zone of the nail (not the wedge zone). Hollow bar soil nails are fully bonded installations (it is not possible to control the grouted zone using simultaneous drill and grout installation), it is therefore important that the influence of bond in the wedge zone is subtracted from the overall test load achieved, to ensure that the true capacity of the bond in the stable zone is quantified.

In summary, DYWI[®] Drill Anchor Soil Nails offer a quick and effective solution that can be installed into loose or collapsing ground without the need for a casing. The simultaneous drill and grout installation method ensures that the borehole is fully grouted and helps to further consolidate the surrounding ground. DYWI[®] Drill Anchor Soil Nails are suitable for use in permanent applications where the soil nail is classified as a low risk, lightly loaded passive installation. The use of DYWI[®] Drill Anchor Soil Nails on major infrastructure projects (Railways and Highways) is now well established and will continue to grow as more engineers and clients become aware of its benefits.

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