

# SGE EARTHWORKS AND SOIL STABILISATION

## VERTICAL BAND DRAINS

### What they are:


Prefabricated Vertical Drains (PVD), also called Wick Drains, are prefabricated drain strips consisting of a polypropylene core extruded into a configuration to transmit a maximum water flow on both sides of the core. The core is wrapped in a non-woven filter, ultrasonically welded together at the edges. Ground improvement using PVD is applied in areas with compressible water saturated soils such as peat, clay and silty clays, where significant settlements may occur. In addition, increased pore pressure may cause instability of the soil which can result in slip plane failures.

Since water is effectively incompressible, soils must be drained in order for the soil skeleton to support the weight of a new loading condition such as a road embankment, a hydraulic fill or a dike. The prefabricated vertical drains are installed vertically into soft soils in order to shorten the path water must travel, thus accelerating the consolidation. By shortening the drainage path by means of PVD in finesoils, such as silts and clays, it only takes weeks or months instead of years, for the water to escape and the soil to realign into a configuration capable of supporting the new loads. The advantage of using CeTeau-Drain is the reduced construction time and the elimination of the risk of slip plane failure due to maximum efficiency in discharging pore water, whereby the filter jacket provides the optimum filtration and permeability.

### What they Do:

Vertical drains are mostly used to shorten the settlement period and thus reduce the construction period of a project, and to avoid post-construction differential settlements. By applying a temporary preload on top of the embankment or fill, the consolidation period can be reduced even more. On top of that, a part of the secondary settlement is also eliminated. Especially for peat soils, an extra preload can be very effective.



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## Vertical Drains

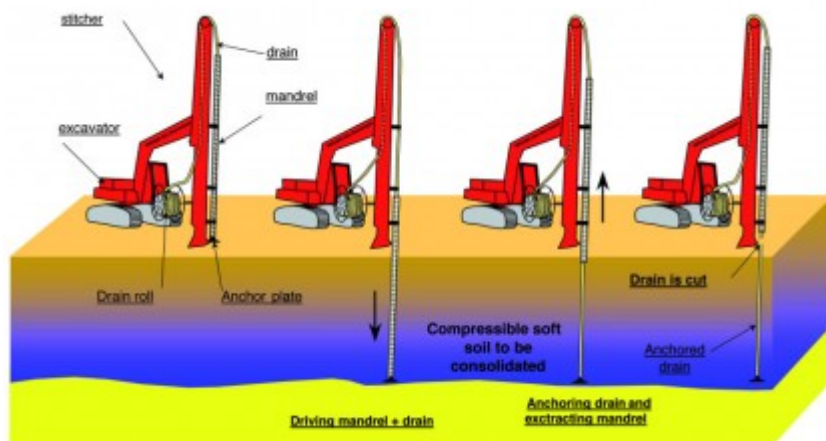
**Vertical Drains, also known as Wick Drains or Band Drains, are used to accelerate the consolidation of embankments built of fine grain soils. This is normally to expedite construction and limit long term settlement.**

The construction of a new embankment or structure induces additional stresses on the ground that can create unacceptable long term settlements during the life of an embankment or structure. A preloading programme can be designed to induce these settlements in an accelerated time frame and minimise the long term residual settlements to be within acceptable limits.

Fine grained soils such as Clays and Silts are usually saturated and therefore, settlements can only occur if the excess water is expelled through the voids in the soil grains and particles. These soils also tend to have a low permeability, and so the reduction of pore water pressure can be a slow process.

Vertical drains consist of a flat or cylindrical plastic core wrapped in a geotechnical fabric, and allow water to drain up through the centre of the drain. These come in a variety of sizes and shapes to meet a variety of soil and site conditions.

Vertical drains can be used to increase the rate of consolidation, delivering substantial programme savings for the build times of earth embankments for many types of land raising schemes.

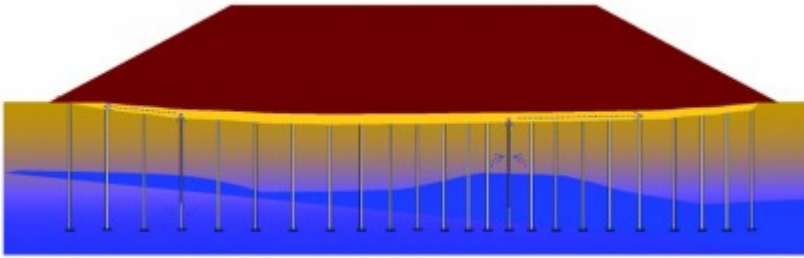


Prefabricated vertical drains are installed by pushing a hollow steel mandrel, which house the drain material, and are set out on a grid pattern.

The mandrel is driven into the ground by the rig, once at the required depth the mandrel is removed, leaving the vertical drain anchored by a steel anchor plate that holds the drain securely in place.

The mandrel can penetrate soils up to a tip resistance of 5MPa, firmer soils can be penetrated by the use of vibrators or pre-drilling.

A temporary surcharge embankment needs to be combined with the installation of the Vertical Drains in order to expedite full or partial primary consolidation, as well as induce several years of secondary consolidation settlement. Placement of the embankment and the additional temporary surcharge embankment are placed in phases, to avoid the risk of slip failure.



Real time monitoring of the geotechnical parameters, including pore pressures and horizontal displacement, are monitored throughout the consolidation period. These instruments are installed to validate the design and the safe phasing of the embankment construction. These results will also be used to back analyse the design and assess the consolidation process