

## Vertical Drainage



# MebraDrain®



## Where and when should vertical drainage be used?

Ground improvement using vertical drains is used where compressible soils are saturated, such as clay and peaty soils. These kinds of soils are characterised by a particularly weak structure and a large pore space, which is usually filled with water (porewater). When a heavy load, such as a road embankment, or other structure is placed on top of a clay or silty clay soil, considerable settlement may occur due to squeezing out of excess porewater, the soft soil consolidates. This kind of settlement often causes serious construction problems.

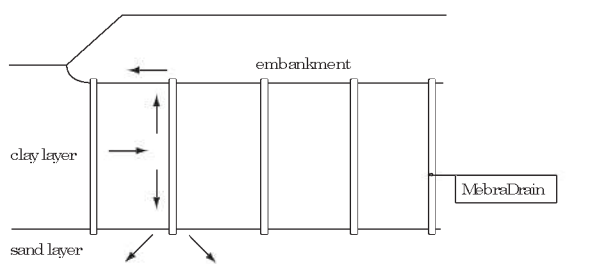
## MebraDrain: a solid ground improvement

The load placed on the soil is initially carried by excess pressure in the porewater. This increases the porewater pressure. If the soil is not very permeable, the porewater pressure will decrease over a long period of time because the porewater is only able to drain

away very slowly. Increased porewater pressure can cause subsoil instability, which can lead to development of slip planes. This instability decreases the allowable rate of fill placement in embankments. A vertical drainage system reduces construction time, through giving improved dissipation of excess pore water pressure and reduces the risk of instability problems.

## Vertical drains accelerate consolidation

In order to expedite the settlement process and reduce pore water pressure it is necessary to shorten the flow path of the pore water through the soil. This can be achieved by placing vertical drains at regular spacings in the soil. The presence of this drainage system enables the over-pressurised pore water to flow to the nearest drain horizontally and escape freely. By using vertical drains the time needed for the consolidation process can usually be reduced from decades to one year or less. Using a vacuum system the atmospheric pressure can be used instead of or in combination with of surcharge. Vacuum may also be used where a surcharge may cause instability due to the increased height.

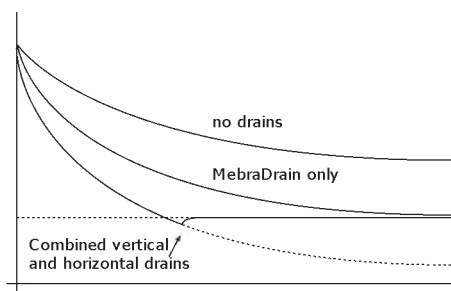


Vertical drainage



**Soil improvement using vertical drains has already been used for many civil engineering projects. Frequently occurring examples are:**

- construction of roads, railways, airports and dykes.
- land reclamation projects
- harbour construction
- residential and industrial sites
- pre-loading of sites for storage
- degassing land fills



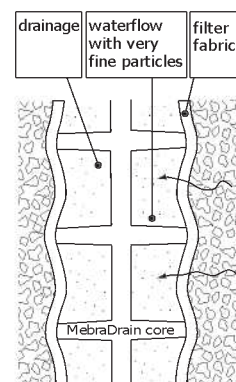
### MebraDrain

MebraDrain is a pre-fabricated drain strip that is highly suited to vertical drainage. The flexible core is made out of high-quality polypropylene. Both sides of this core has grooves which run its entire length through which the water can flow unhindered. This core is wrapped in a strong and durable filter made out of non-woven polypropylene, which combines high water permeability with excellent filtration

characteristics. MebraDrain is available with two different cores. Type MD7007 has a crenellated core that is extremely resistant to high soil pressures. Type MD88 has a herringbone-shaped core that is highly flexible and is therefore well suited to areas where large relative settlement occurs. MD88 is made in a number of versions that are suitable for applications up to 65 m deep. Both types are available with a filter that can be adjusted to the soil condition. MebraDrain is constantly monitored for quality during the production process.

### Ground stabilisation throughout the world

In a short space of time, MebraDrain has become one of the most frequently used vertical drainage systems in the world. The varied application of MebraDrain in large numbers of projects through the world provides a clear proof of the faith that clients and consultants have in this product. World-wide, more than 400 million metres of MebraDrain have by now been installed. By applying MebraDrain you can be assured of high quality product.



**Filter function**



#### **The advantages of the MebraDrain system are:**

- small disturbance of the different soil layers
- guaranteed water drainage, even at high soil pressure and distortion
- core and filter membrane can be adapted to specific soil conditions
- short consolidation period by using small drain distance
- fast installation: average of 8,000 metres per installation unit
- no water required for installation
- installation is possible to a drain depth of 65 m
- easy-to-monitor installation

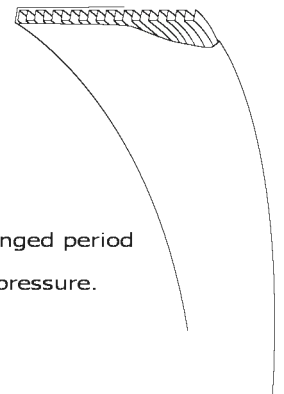
#### **Filter membrane**

The filter membrane has an important key function. It consists of thermally-bonded polypropylene fibres with a random structure, known by the tradename Typar. Contrary to woven materials that provide a straight passages through the filter structure, through which soil particles can force their way, the MebraDrain filter has a random structure which enables the filter to restrict the movement of the soil particles and to prevent clogging. In general a filter is required that prevents clogging by soil particles but that is sufficiently permeable. MebraDrain's filter structure meets these requirements. When the compressible subsoil contains horizontal soil layers

that are very permeable, pressurised pore water will seek out these layers and use this route to the closest drain. In order to optimise the use of these permeable layers the permeability of the filter must be at least as high as the permeability of these layers. MebraDrain has a filter with a high relative permeability level enabling effective drainage also in layered soils.

#### **Other important requirements that a filter needs to meet are:**

- high mechanical strength
- high resistance to bacteria and micro-organisms
- resistant to acids, solvents, etc.
- no loss of strength over a prolonged period
- creep resistant also under high pressure.

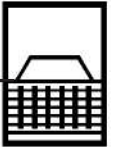


#### **Laboratory tests**

The properties and functions of MebraDrain have been researched in well-known independent laboratories. Reports of these tests, where the drainage capacity of the drain both in elongated and buckled form is recorded, are available. Extensive reports are also available of field tests and finished projects, as well as a calculation program for calculating the most economical drain spacing.



## MebraDrain Technical Specifications



Please contact our office in Amsterdam for the latest specifications.

