

## **SECTION 1 – PREFABRICATED VERTICAL DRAINS**

### **1.1 GENERAL**

Prefabricated vertical drains shall be installed in the areas shown on the drawings for the purpose of accelerating the consolidation settlement and at the same time achieving a gain in strength of the soft compressible soils beneath.

The method of construction adopted shall not damage any geotechnical instruments located at the vicinity. Any damaged installations shall be repaired or replaced and the costs of this and delays to the programme shall be borne by the Contractor.

The drain spacing and depth may be increased or decreased depending on the subsoil conditions encountered. The Contractor shall allow in his rates for any such adjustment to drain spacing and depth and no further claims for time or cost shall be allowed.

### **1.2 PREFABRICATED VERTICAL DRAINS**

The prefabricated vertical drains shall consist of a polymer core and an external non-woven filter membrane and shall comply with the following general requirements: -

Properties	Value
1. Composition of drain core	Corrugated extruded continuous channel high molecular polypropylene
2. Composition of filter jacket	Non woven spunbonded continuous filament 100% polypropylene.
3. Chemical Resistance	Excellent
4. Width of drain	$100 \pm 5$ mm
5. Thickness of drain	$3.3 \pm 0.2$ mm
6. Tensile Strength (ASTM D-5035)	$2.0 \pm 0.2$ kN
7. Elongation @ 1 kN (ASTM D-5034)	< 10%
8. Discharge capacity (straight) at $i = 0.5$ , 350kPa vertical pressure tested in marine clay (ASTM D-4716)	$45 \times 10^{-6}$ m <sup>3</sup> /s
9. Discharge capacity (deformed) under 22% relative compression under 200kPa vertical pressure at $i = 0.5$ tested in marine clay (ASTM D-4716)	$40 \times 10^{-6}$ m <sup>3</sup> /s
10. Permeability of filter (ASTM D-4991)	$> 2.0 \times 10^{-4}$ m/s
11. Trapezoidal tear strength of filter (ASTM D-4533)	80 N
12. Grab tensile strength (MD) of filter (ASTM D-4632)	300 N
13. Pore size O95 (AOS) of filter (ASTM D-4751)	75 microns

## **1.6 INSTALLATION OF DRAINS**

The installation procedure shall be such as to ensure that no damage or 'kinks' will be developed in the drains. Installation of the drains shall be by the displacement method using a cable driven machine of sufficient capacity to install the drain housed within a mandrel through the replacement fill and geotextile and the underlying soft compressible layers beneath and subsequently to retract the mandrel. Installation of the drains and retraction of the mandrel shall be carried out in a single downward and single upward stroke and no alternative raising and lowering of the mandrel shall be permitted. The size and shape of the mandrel and end shoe shall be as close as possible to the size and shape of the drains in order to reduce disturbance to the soil. The length of the mandrel shall not be less than the maximum length of the drain.

Where a level platform is provided, the maximum deviation of the drains from the vertical shall be 1 horizontal in 75 vertical unless otherwise specified.

The depth and spacing of the drains shall be as shown on the Drawings and neither the depth nor the spacing shall be varied without the prior agreement of the S.O. The setting out Drawing shall be prepared by the Contractor and submitted to the S.O. one week before installation works commence.

The S.O. shall be satisfied that the drains have successfully penetrated the underlying soft compressible layer. Where an unforeseen obstruction is encountered the rig shall be stopped and if practicable a shorted drain installed and the Contractor shall inform the S.O. without delay. An alternative drain shall then be attempted at a distance of not more than 300 mm from the aborted drain. If this alternative placement fails, the Contractor shall continue with the other drains and the S.O. will decide what measures to adopt in the area of the obstructed drain.

Unless otherwise specified the Contractor shall cut prefabricated drains at not less than 150 mm above the working surface.

## **1.7 PREDRILLING**

Where predrilling is required to enable the Contractor's placement apparatus to penetrate other than soft soils, the predrilling unit shall be capable of pre-drilling the ground for the placement apparatus so that the latter may place the drain to the specified depth without damaging it. The cost for predrilling shall be allowed for in the rates for installing vertical drains.

## **1.8 DISPOSAL OF ARISING**

The Contractor shall ensure that the arisings from the placement operations cause the minimum contamination of the working surface. The Contractor shall remove the arisings.

Surface depressions around the installations shall be made good by the Contractor with the specified material before he commences the Works over the treated area.

## **1.9 METHOD STATEMENTS**

The Contractor shall provide detailed method statement one week before commencement of work with respect to: -

- the type of prefabricated vertical drain proposed
- the size of the drain and method of construction
- a capacity statement of the firm's ability to carry out these works
- the level of supervision and staffing provided
- the number of rigs used to install drains
- steps to be taken to avoid damage to instruments