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Geosynthetics — Test method for the determination of water discharge capacity for prefabricated vertical drains

Géosynthétiques — Méthode d'essai pour la détermination de la capacité de décharge d'eau des drains verticaux préfabriqués

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Foreword

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 221, *Geosynthetics*.

Introduction

Prefabricated vertical drains (PVDs) are used to accelerate the settlement of soils under a given surcharge loading. Discharge capacity is, therefore, one of the most important properties for PVDs. The discharge capacity decreases gradually due to alteration in shape of core materials under soil pressure and deformation of the geotextile filter into the core structure as time passes.

In highly compressible soils (e.g. peat and gyttja) the relative compression that takes place during the consolidation process, may cause more or less significant buckling of the drains.

In less compressible soils (settlements lower than 20 %), the buckled test is not relevant.

Geosynthetics — Test method for the determination of water discharge capacity for prefabricated vertical drains

1 Scope

This International Standard specifies a test method for determining the water discharge capacity of prefabricated vertical drains (PVDs), which can be used for conformance and acceptance testing.

This is an index test.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5813, *Water quality — Determination of dissolved oxygen — Iodometric method*

ISO 9862, *Geosynthetics — Sampling and preparation of test specimens*

EN 15237, *Execution of special geotechnical works — Vertical drainage*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
prefabricated vertical drain
PVD
drainage composite with a rectangular cross-section, with a width of typically 100 mm installed vertically into soil to provide drainage for accelerated consolidation of soils usually consisting of a central core with a channel system surrounded by a filter sleeve or with a filter adhered to it

Note 1 to entry: Other wordings like wick drain, band drain, strip drain are also used.

3.2
confined length
length of the part of the specimen exposed to pressure

3.3
filter length
length of the filter around or on the specimen

3.4
index discharge capacity of a PVD
q_w
volume of water which flows out of the PVD per unit time under a specified hydraulic gradient

Note 1 to entry: It is expressed in ml/s.

3.5
hydraulic gradient
i
ratio of the total head loss across the specimen to the filter length in the flow direction

Note 1 to entry: The filter length would be shorter than the core length and longer than the confined length.

4 Principle

The factors affecting the discharge capacity of PVDs measured according to this International Standard are limited to the intrusion of the filter into the core linked to the filter stiffness, the drainage core stiffness, creep and geometry of the core to some extent and creep of the geotextile filter to some extent, confining pressure, and hydraulic gradient.

PVD is enveloped by a flexible rubber membrane to simulate the deformation of the geotextile filter into the core structure and the discharge capacity is determined in straight and buckled conditions.

5 Apparatus and materials

5.1 Discharge capacity apparatus

5.1.1 The discharge capacity apparatus satisfies the following requirements.

a) The apparatus shall be capable of maintaining a constant head loss at different water levels, at least those corresponding to hydraulic gradients of 0,1 and 1,0, simulating the pressure arising from the earth mass when PVDs are mounted vertically within the ground to serve as discharging interstitial water, and testing PVDs in straight and buckled conditions.

b) The apparatus is mainly comprised of a pressure cell, a water supply portion (see Figure 1) and buckling device (see Figure 2). The buckling device is used to simulate the deformation of PVDs due to the relative compression in highly compressible soils. The pressure cell shall be capable of inserting the buckling device and maintain mounted specimens in straight and buckled conditions.

c) The distance between the two slots used to insert the specimen in the cell shall be (300 ± 10) mm.

5.1.2 A system allowing to adjust the head loss up to 500 mm shall be used.

5.1.3 The buckling device satisfies the following requirements.

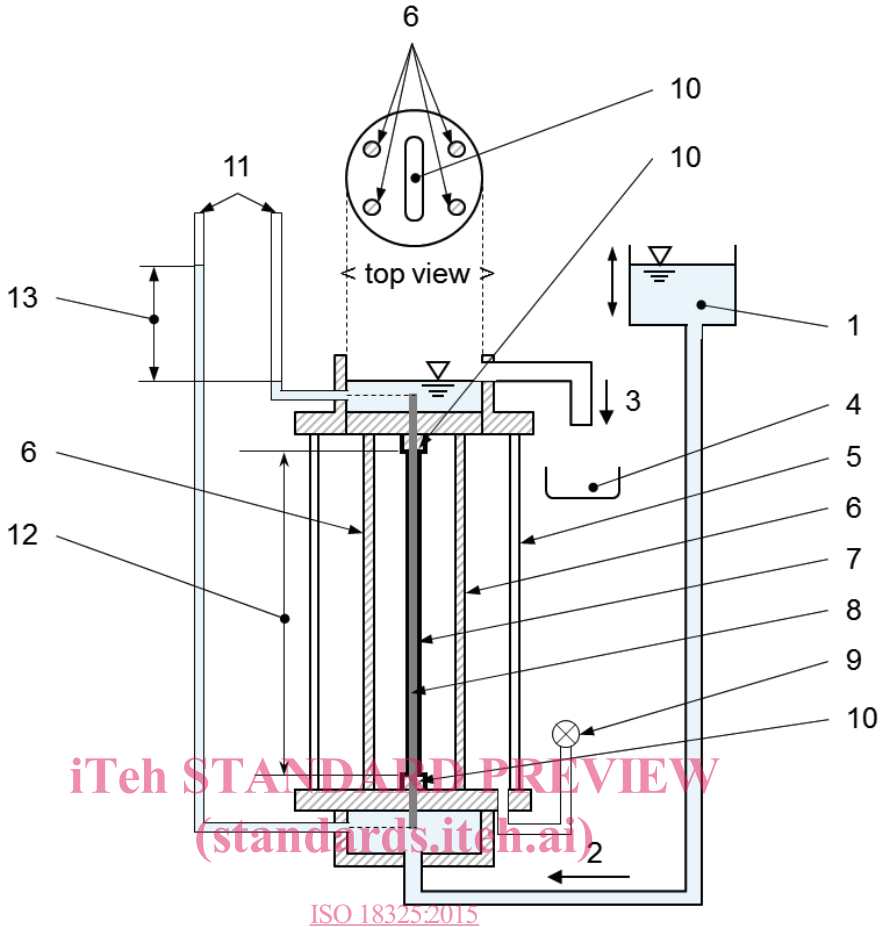
a) The device is capable of buckling the specimen and maintaining the shape of the buckled specimen. It is mainly comprised of supporters, guide frames, central and fixing pins and pushing rod (see Figure 2).

b) The guide frame shall be fixed and supported inside the pressure cell.

c) The guide frames shall consist of two holes and one slit to tie fixing pins and move the central pin. The distance between two holes shall be (60 ± 0,1) mm and the length of slit should be greater than 60 mm in order to set up 60 mm and 55 mm of A and B respectively.

d) The diameters of fixing pins and central pin shall be (5 ± 0,5) mm.

NOTE Other pin diameters can be selected with the agreement of all concerned persons or parties, provided that the pin diameter used is given in the test report.



Key

1	water reservoir	8	specimen (PVD)
2	water inlet	9	pressure controller
3	water outlet	10	slots
4	equipment for determining the amount of water	11	manometers
5	pressure cell	12	confined length, (300 ± 10) mm
6	supporters	13	head loss (Δh)
7	flexible membrane		

Figure 1 — Example of discharge capacity apparatus