The Pioneer Of Geosynthetics

S I N C E 1 9 7 2

Technical Note

Specifying Transmissivity for Drainage Products

GSE geonet. GSE geocomposite.

ASTM D 4716, Standard Test Method for Determining the (In Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head is the standard testing procedure used to test hydraulic transmissivity for geosynthetic drainage materials. Hydraulic transmissivity is defined as "the quantity of water that passes through a test specimen in a specific time interval under a specific normal stress and a specific hydraulic gradient", where "the hydraulic gradient and specimen contact surfaces are selected by the user to model a given set of field parameters as closely as possible.

ASTM recognizes two types of testing when using ASTM D 4716. They are index testing and design testing. An index test is a procedure that is used to establish order for a large set of data with respect to the property of interest. Measuring hydraulic transmissivity using an index test places the net or composite between stainless steel plates with a 15 minute seat time. Manufacturers will use an index testing for quality control purposes. Boundary conditions of an index test are between stainless steel plates, therefore, would not be specified. A design transmissivity test is the type of test an engineer uses to simulate field conditions in the lab. When specifying a transmissivity test, five essential factors must be known. The five important factors to specify are:

- Product Type
- Boundary Conditions
- Normal Load (Pressure)
- Hydraulic Gradient
- Seat Time

PRODUCT TYPE

When specifying a drainage product, the type of geonet and geocomposite for the intended project should be identified. The structure of the geonet, such as bi planar or tri planar should be known, as well as the physical properties of the geonet. Not only does the geonet have properties that must be specified, if a composite is going to be used, the filtration properties of the geotextile (apparent opening size, permittivity and weight per unit area) must be specified.

BOUNDARY CONDITIONS

Boundary conditions are the surrounding materials (i.e., textile, geomembrane, sand, aggregate) of the drainage layer in the intended application. Boundary conditions can significantly impact the performance of the drainage material, therefore, should be utilized in a design test. For example, if a composite is going to be used in sand, combined with a light load, the intrusion factor of the sand and textile will be simulated in a design transmissivity test. In order to duplicate project conditions, site specific soils should be utilized when possible.

NORMAIL LOAD (PRESSURE)

A normal load is the pressure that is expected to be placed on the drainage geonet and geocomposite in project specific conditions. Specified normal loads should be equivalent to the maximum anticipated field load with the appropriate factors of safety, and be appropriate for the intended application. For example, in a bioreactor application, densification due to the compaction and saturation cycles should be taken into account. If the application is the drainage layer of a landfill cap, the normal load will generally be below 1,000 psf.

HYDRAULIC GRADIENT

Hydraulic gradient simulated the slope angle of the application in a transmissivity test. The value specified for the test should be equivalent to the slope angle of the project. Most landfill applications range between a gradient of 0.02 and 0.33, however, if there is a possibility of soil saturation during a heavy rainfall event, it should be noted that saturated soil produces an effective gradient of 1.0. If that set of conditions is expected, it should be considered in the design phase of the project when choosing the gradient for testing.

SEAT TIME

When specifying a seat time, it should be sufficient to allow the material to reach equilibrium under an applied load. The longer the seat time, the more time is allowed for the material to compress under the applied load to give a more realistic transmissivity

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value over time. Design transmissivity tests should have a 100 hour seat time. A seat time of 100 hours shows an increasing rate of decreasing transmissivity, whereas after 100 hours, the transmissivity decreases at a much slower rate.

Each of the above five factors affects the results of a transmissivity test. The chart below describes those effects:

NORMAL LOAD INCREASES	TRANSMISSIVITY DECREASES
GRADIENT INCREASES	TRANSMISSIVITY DECREASES
SEAT TIME INCREASES	TRANSMISSIVITY DECREASES
BOUNDARY CONDITIONS INCREASES (SOFTNESS)	TRANSMISSIVITY DECREASES

TN16 SpecifyingTransmissivity R01/15/10

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