The Pioneer Of Geosynthetics

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Technical Note

Using GRI GC-8 for Drainage Products

GRI GC-8, "Determination of the Allowable Flow Rate of a Drainage Geocomposite" is a design guide used to obtain the factor of safety needed for a specified drainage geocomposite. This guide does not address the required flow rate as determined by the design engineer, but the required flow rate as needed to determine the total factor of safety. Several factors are taken into account to measure the true allowable flow rate by placing the material under site specific conditions for a long-term testing period.

GRI GC-8 requires that a base line flow rate be determined. This is an actual "design transmissivity test" where the specified drainage geocomposite is placed under the maximum anticipated field load and uses the site-specific boundary conditions and gradient. The seat time is 100 hours. Typically, manufacturers will only complete an "index transmissivity test" which consists of 15 minute to 1 hour seat times with the drainage product placed between stainless steel plates. Due to capacity and the amount of drainage material manufactured each day, manufacturers cannot perform CQA transmissivity testing with a lengthy seat time or with boundary conditions. A 100 hour transmissivity test will have to be performed at a third party laboratory. Only one test is required per project.

Creep deformation is also addressed in GRI GC-8. This is performed only on the drainage core and not the entire geocomposite. GRI GS-4, "Test Method for Time Dependent (Creep) Deformation Under Normal Pressure", or ASTM D 6364 "Standard Test Method for Determining the Short-Term Compression Behavior of Geosynthetics" are the suggested test methods to be used to measure creep behavior. Some manufacturers may have this information, however, the maximum anticipated field load may vary from project to project and the manufacturer may not have that site-specific information. A third party laboratory can perform this testing. Only one test is required per project, using the expected maximum anticipated field load.

Core clogging is addressed in this guide as well. Two types of clogging have to be determined: chemical and biological clogging. Chemical clogging results when the drainage core is clogged with precipitates. This usually occurs with high alkaline soils and turbid liquids. Biological clogging takes place when growth of organisms and roots extend through the geotextile that is bonded to the geonet core. Both clogging mechanisms are site-specific and depend on other critical aspects such as vegetation, rainfall and cover soil type. GRI GC-8 has provided a table as a guide to determine the reduction factors for biological and chemical clogging.

Once all of the information is collected and determined, the following equation is used to determine the allowable flow rate of a drainage geocomposite:

$$q_{allow} = q_{100} [1/ RF_{CR} \times RF_{CC} \times RF_{BC}]$$

Where:

q_{allow} = allowable flow rate

q_{100} = initial flow rate determined under simulated conditions for 100-hour duration

RFCR = reduction factor for creep to account for long-term behavior

RFCC = reduction factor for chemical clogging

RFBC = reduction factor for biological clogging

Once q_{allow} is determined, the following equation is used to determine the product-specific and site-specific factor of safety:

$$FS = q_{allow}/q_{reqd}$$

In conclusion, GRI GC-8 is a non-biased, industry standard guide that is used to provide the appropriate data needed to determine the allowable flow rate of a drainage geocomposite. All long term testing should be completed prior to material production. This testing should not be included in the project specifications of MQA procedures.

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