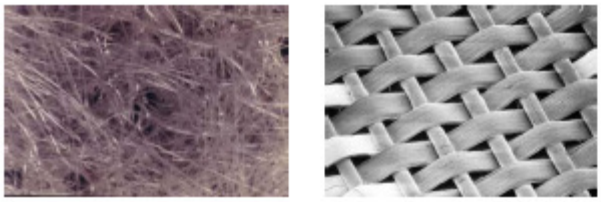
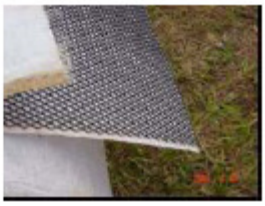
Geosynthetics in Drainage and Filtration

Geosynthetics can be effectively used as drains and filters in civil and environmental works in addition to or in substitution to traditional granular materials. Geosynthetics are easier to install in the field and often cost-effective in situations were granular materials available do not meet design specifications, are scarce or have their use restricted by environmental legislations.



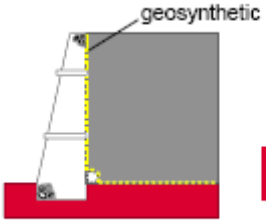
Nonwoven and woven geotextiles (enlarged view)(*)



Geocomposite for drainage

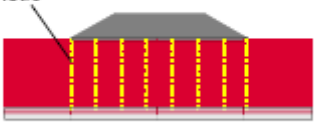
Geosynthetics for drainage and filtration

Geotextiles and geocomposites for drainage are the types of geosynthetics used for drainage and filtration. These materials can be used in works such as retaining structures, embankments, erosion control, waste disposal areas, etc.



Retaining structures

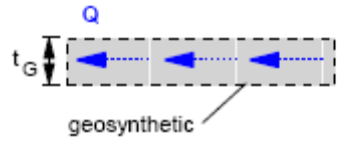
Pavements



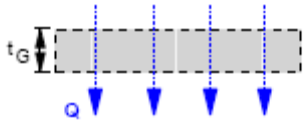
Radial drainage

Geosynthetics applications as drains and filters

As a drain, a geosynthetic can be specified to attend hydraulic requirements that allow free flow of liquids or gases throughout or across its plane.



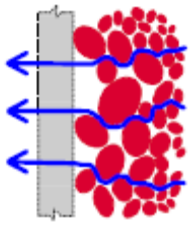
Flow along the geosynthetic plane



Flow normal to the geosynthetic plane

Geotextile filters have to attend criteria that assure that the base soil will be retained with unimpeded water flow. Available retention criteria establishes that

$$FOS \leq n\ D_s$$



where FOS is the geotextile filtration size, which is associated to pore and constriction sizes in the geotextile, n is a number which depends on the criterion used and D_s is a representative dimension of the base soil grains (usually D_{85}, which is the diameter for which 85% in weight of the soil particles are smaller than that diameter).

The filter has also to be considerably more permeable than the base soil throughout the project life time. Therefore, the permeability criterion for geotextiles establishes that

$$k_G \geq N\, k_s$$

where k_G is the geotextile coefficient of permeability, N is a number that depends on the project characteristics (typically varying between 10 and 100) and k_s is the permeability coefficient of the base soil.

Clogging criteria require that the geotextile will not clog and are based on relations between geotextile filtration opening size and soil particle diameters that should be allowed to pipe trough the geotextile. Performance filtration tests can also be carried out in the laboratory to evaluate the compatibility between a soil and a candidate geotextile filter.

If properly specified and installed, geosynthetics can provide cost-effective solutions for drainage and filtration in civil and environmental engineering works. Additional information on the use of geosynthetics in such applications and in other fields of geotechnical and geoenviromental engineering can be found at www.geosyntheticssociety.org.

(*) Woven geotextile photograph from "Geotextiles Handbook", by T.S. Ingold and K.S. Miller, Thomas Telford London, 1988.

Data provided with compliments www.geosyntheticssociety.org and R. Frobel.

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