

CHARACTERIZING THE PARTICLE RETENTION ABILITY OF GEOTEXTILES: AOS, EOS, FOS

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This technical note focuses on the various test methods available past and present, which have been used to characterize the soil particle retention ability of various geotextiles.

Woven monofilament geotextiles are 2-dimensional products with a distinct orientation of fibers, uniform opening size and a relatively high percent open area. These products typically have an apparent opening size (AOS) larger than or equal to 0.21 mm (#70 sieve) and a percent open area (POA) of at least 4%. In filtration and drainage applications, a geotextile with a higher POA will be less susceptible to long-term clogging or blinding.

Nonwoven geotextiles are 3-dimensional products with a random orientation of fibers and random opening size. These products typically have an AOS less than or equal to 0.21 mm (#70 sieve).

The opening size of geotextiles was measured by the equivalent opening size (E.O.S.) method (Test Method CW02215-77) until 1988 in Canada and 1993 in the U.S.A. The E.O.S. of a geotextile is determined by dry sieving uniform particles (glass beads or sand) of a known standard sieve size through the geotextile. Successively finer sizes are tested to find the smallest size of particles that have 5% or less by mass passing through the geotextile. The value obtained is expressed either as a US Sieve Number and/or in millimeters. Assuming that geotextiles and screen mesh (sieves) have comparable retention ability, the EOS was a rational means of correlating fabric pore structure to an equivalent mesh size.

The U.S.A adopted the Apparent Opening Size (AOS) method (Test Method ASTM D 4751-99a) in 1993. This test method, although similar to the E.O.S. method, is used to indicate the AOS in a geotextile that reflects the approximate largest opening dimension available for soil to pass through. The AOS is also determined by dry sieving uniform sized glass beads of a known standard sieve size through the geotextile until the weight of beads passing through the geotextile is 5% or less. Its value is expressed as a US Sieve Number and/or in millimeters.

The Ontario Ministry of Transportation and Communications along with many Eastern Provinces adopted the Filtration Opening Size (FOS) method (CAN CGSB 148.1 n^o 10) in 1990. The FOS of a geotextile is determined by wet sieving a well-graded mixture of glass beads through a geotextile. The glass beads are forced through the geotextile under hydrodynamic forces rather than by a shaking action. The geotextile specimens are alternately plunged in and out of a water tank for exactly 1000 cycles. At the end of the test, the water in which the specimens have been immersed is decanted and the glass beads retained on the geotextile sample are collected. The beads collected are then graded to obtain a particle size distribution. The bead diameter equal to ninety five percent retention by the geotextile sample (the d₉₅ of the glass beads) is determined and is expressed in microns.

For comparison purposes EOS and AOS values can be interchanged. However this cannot be said for the relationship between EOS/AOS and FOS. The values obtained from FOS testing are very different from those obtained from the EOS/AOS test method.

For example, a medium weight nonwoven geotextile with AOS of 0.150mm (150microns) could have an FOS of 0.080mm (80microns).

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