Permittivity and Transmissivity

Technical Note

Permittivity (ASTM 4491 US terminology) vs perpendicular water flow to EN ISO 11058

Permittivity is quoted in units of s^{-1} (reciprocal seconds), and is calculated as flow rate/(head x area) in consistent units. The default head value for flow measurement is 50 mm, but in certain circumstances it might be less; this probably would not affect non-wovens.

Perpendicular water flow is measured at 50 mm head (flow rate/area) and is usually expressed in litres per square metre per second ($l/m^2.s$).

Numerically, the permittivity is equal to the $l/m^2.s$ value divided by 50.

The perpendicular flow rate ($l/m^2.s$) is equal to the permittivity x 50.

Example

The perpendicular water flow of NW8/8 is 115 $l/m^2.s$ to EN ISO 11058. What is its permittivity?

Answer: Its permittivity is 115/50 = 2.3 s^{-1}.

Conversely a specification calls for a permittivity of 2.0 s^{-1}. What perpendicular water flow will meet this requirement?

Answer: 2 x 50 = 100 l/m2.s therefore NW8/8 would meet specification.

Transmissivity vs in-plane water flow to EN ISO 12958

Transmissivity is quoted in units of m^2/s at a 'unit hydraulic gradient', which means that the actual flow rate measured at a hydraulic gradient of 0.1 is divided by 0.1, i.e. multiplied by 10!

Transmissivity (m^2/s) = Flow ($m^3/m.s$)/hydraulic gradient

= Flow (l/m.s) x 10^{-3}/hydraulic gradient

Example

The flow capacity of Deck 600S is given as 1.4 l/m.s at HG 1 and 0.42 l/m.s at HG 0.1, measured in accordance with EN ISO 12958 using **soft platens** and at 100 kPa confining pressure.

Transmissivity of Deck 600S = Flow (l/m/s) x 10^{-3}/Gradient

= 1.4 x 10^{-3}/1

= 1.4 x 10^{-3} m^2/s **at HG 1 and 100 kPa**

Transmissivity is not a uniform value for all hydraulic gradients; the transmissivity gets larger as the hydraulic gradient reduces. So doing the calculation again at HG 0.1:

Transmissivity of Deck 600S = 0.42 x 10^{-3}/0.1

= 4.2 x 10^{-3} m^2/s **at HG 0.1 and 100 kPa**

Conversely, a specification calls for a transmissivity of 1.3 x 10^{-2} m^2/s at HG 0.1 and 100 kPa. To obtain required flow rate in l/m.s, multiply by the HG and by 1000.

Answer: 1.3 x 10^{-2} x 0.1 x 1000 = 1.3 l/m.s **at HG 0.1 and 100 kPa** therefore Deckdrain 600S would meet specification.

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