

Use of the tensile strength of water for the direct measurement of high soil suction: Reply¹

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The authors express their appreciation for the additional information provided by the Discussers on the subject of the tensile strength of water. This is a new subject area to the geotechnical literature and one that initially appears to go counter to the basic physics related to the behaviour of water. The test results and findings of the ongoing research program on this subject, at Imperial College, U.K., have proven to be extremely valuable in better understanding the behaviour of water that has been conditioned through the use of pressurization process.

The Discussers have pointed out that the sustainable tension in the direct measurement, high suction probe appears to be related to the air entry value of the ceramic. All of the tests performed by the authors were performed using a 1500 kPa ceramic. The maximum sustainable tension appeared to be limited by the ceramic; however, a repeated cavitation of the sensor appeared to reduce the maximum sustainable tension. Also, different ceramics with the same air entry value (i.e., 1500 kPa) often produced a different response both in terms of magnitude and response pattern. For example, in one case, it was not possible to sustain a maxi-

imum tension in excess of 300 kPa, no matter what attempts were made to pressurize and saturate the system. Even with the use of 10 000 kPa, the maximum sustainable tension could not be increased, no matter what attempts were made to saturate the system.

The experience of the authors was that the 24 h pressurization period did not provide much advantage over the 12 h or even the 6 h pressurization period.

The Discussers have emphasized the benefit of having a small water compartment. The authors found it difficult to determine the exact amount of water in the compartment, but a space ranging from 0.1 to 0.3 mm would appear to be favorable.

Further studies, over a long period of time — under both field and in situ conditions — will prove extremely valuable in encouraging the direct measurement of high tensions in the water phase (i.e., high soil suctions). The Imperial College Suction Probe, as well as other probes, are indeed a welcome device in the application of unsaturated soil mechanics to geotechnical engineering.

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