

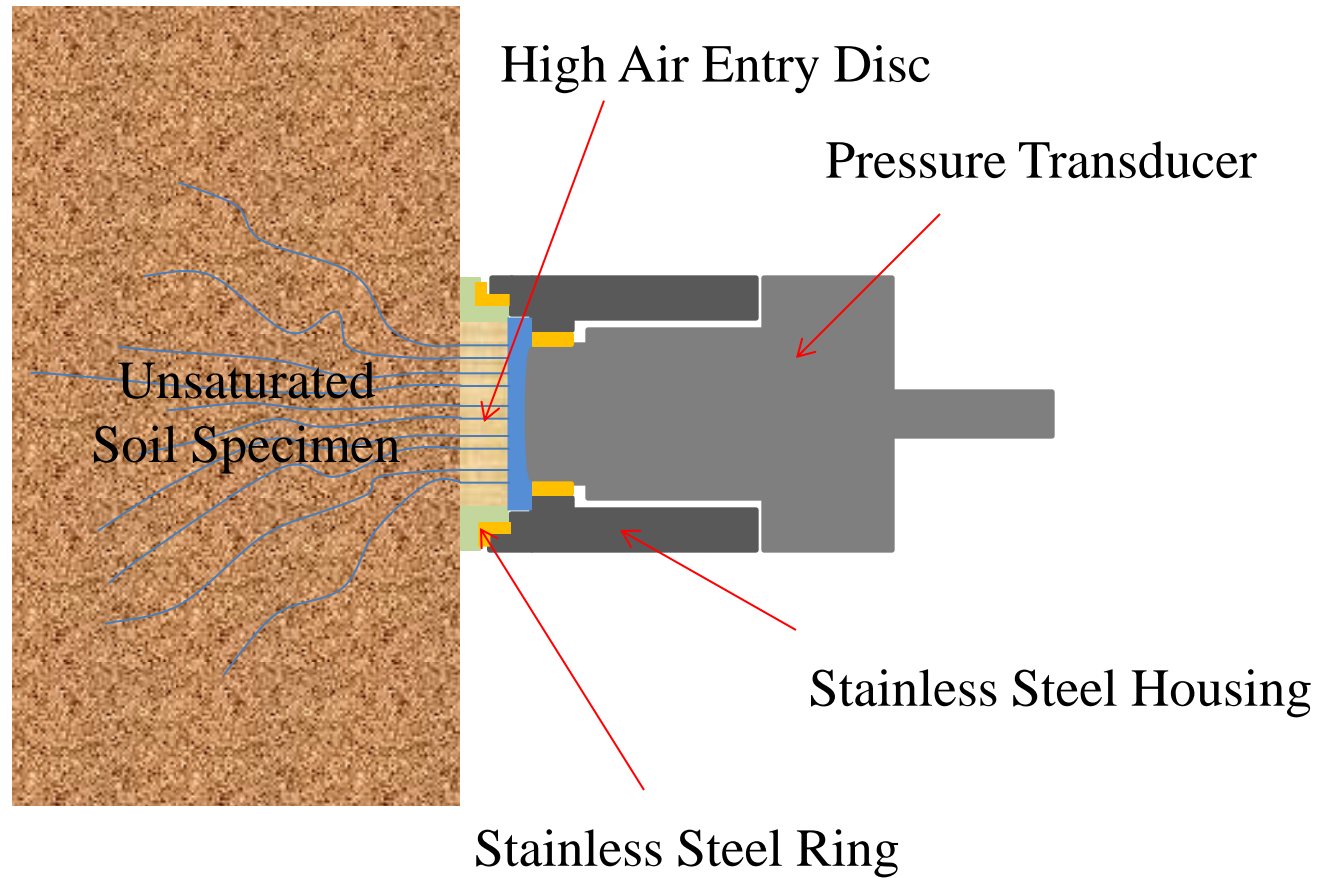
Development of a New High-suction Tensiometer

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Background

- Suction-controlled triaxial test for unsaturated soil behavior characterization is very time consuming,
- Direct measurement of matric suction on unsaturated soils in laboratory is still a great challenge for researchers,
- Suction measurement on unsaturated soils during undrained triaxial testing under confined and unconfined conditions, and
- Very few commercial high-suction tensiometers are available.

Principle

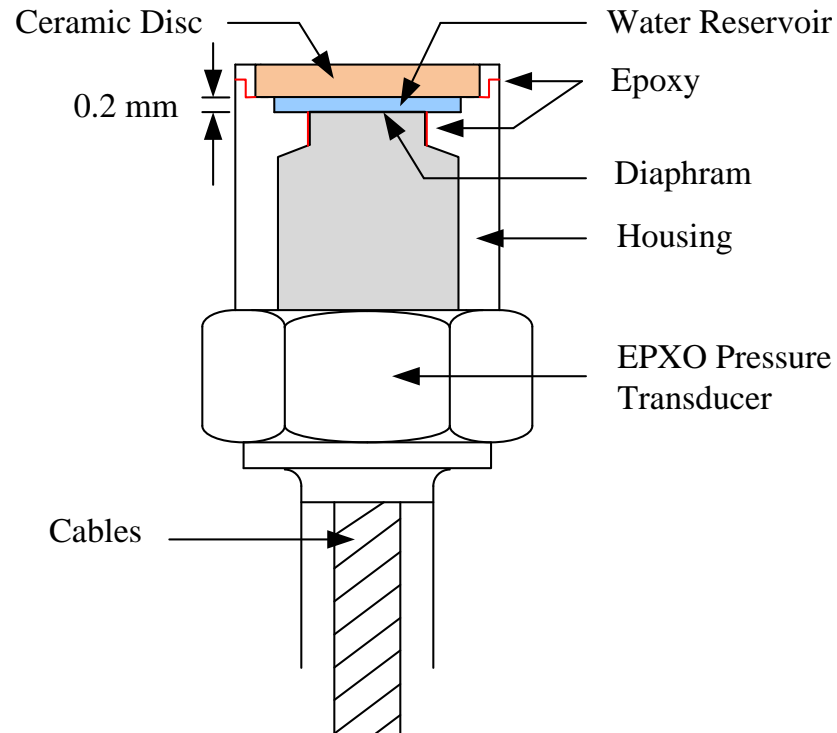


$$S_u = u_a - u_w$$

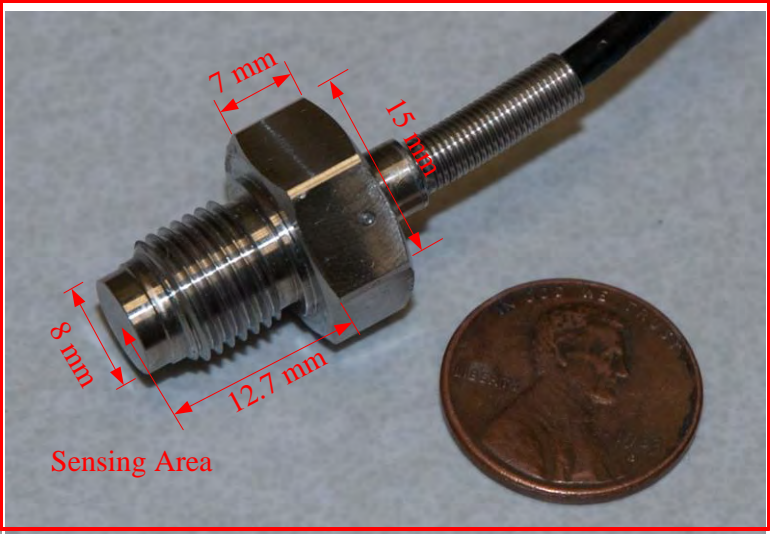
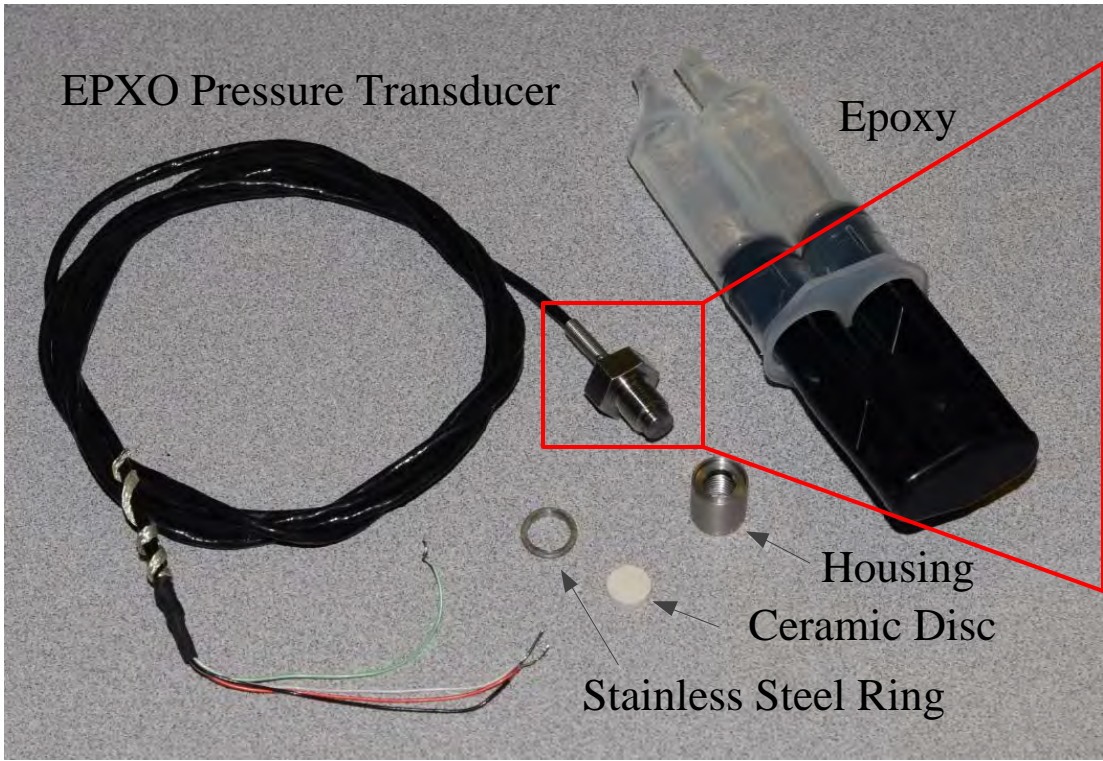
Literature Review

- Ridley and Burland 1993
- Guan and Fredlund 1997
- Meilani et al. 2002
- Tarantino and Mongiovi 2002
- Take and Bolton 2003
- Lourenco et al. 2006
- Cui et al. 2008

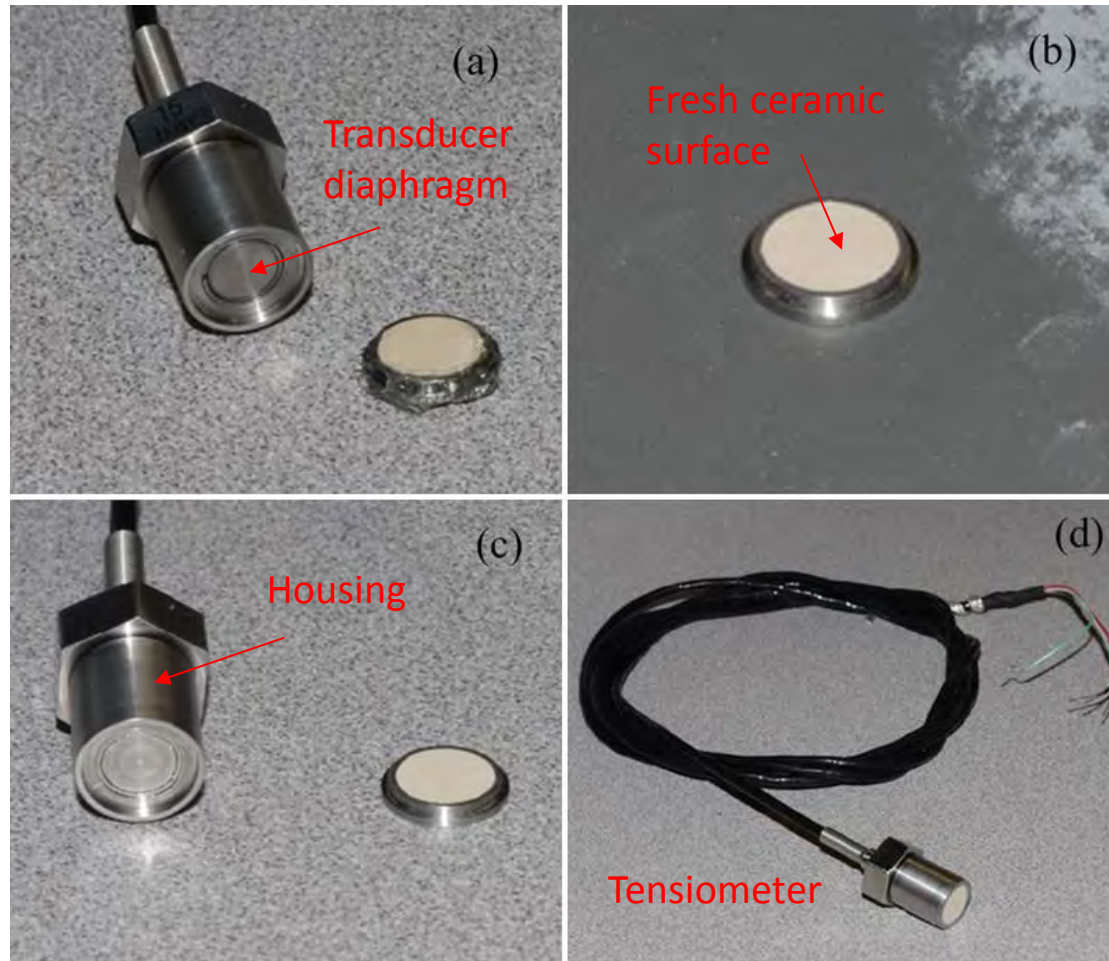
High-suction Tensiometer Design



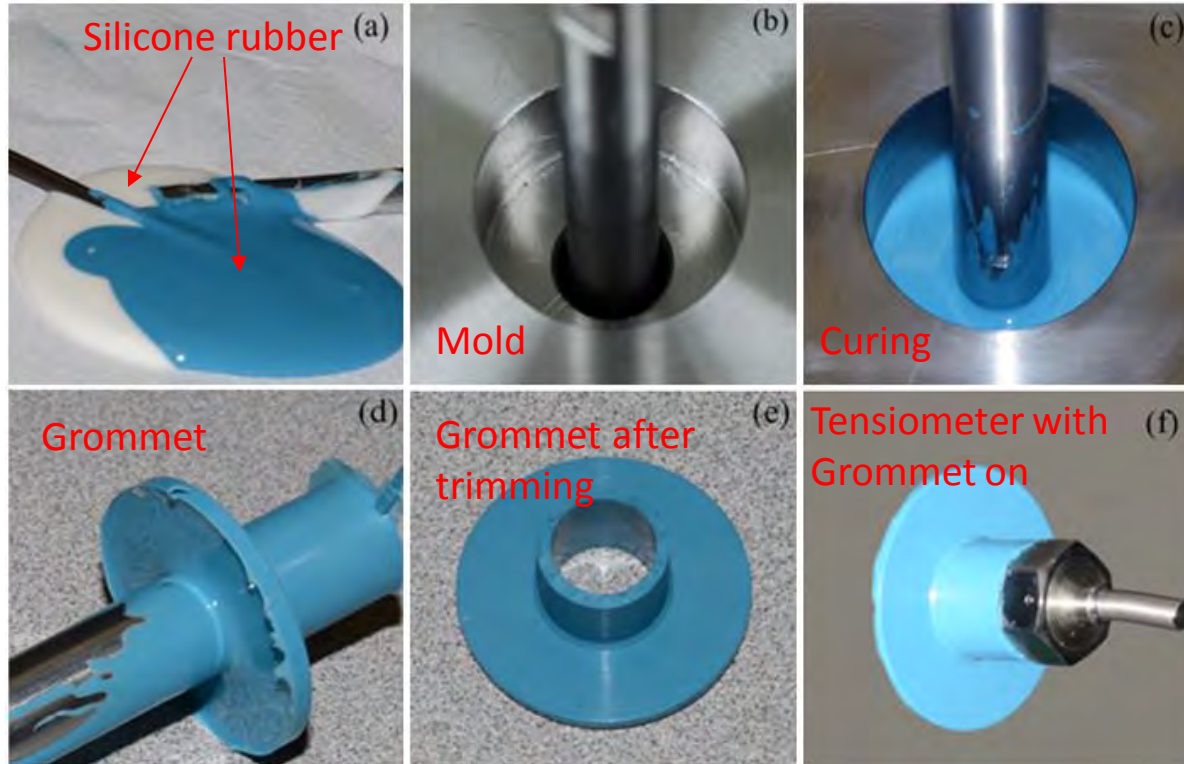
High-suction Tensiometer Fabrication



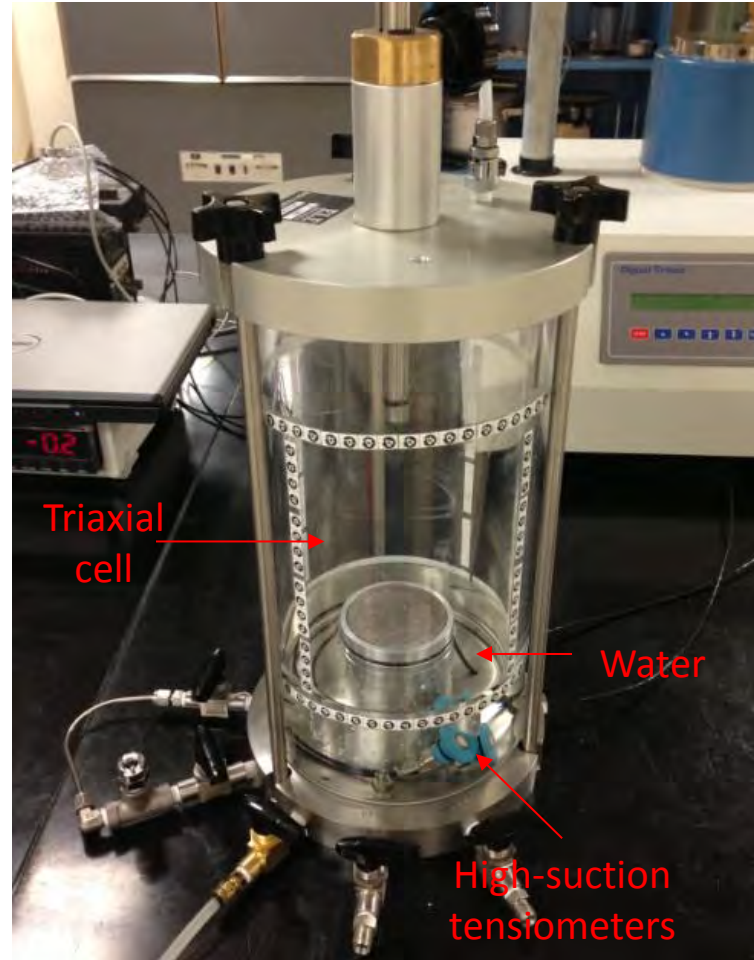
High-suction Tensiometer Fabrication



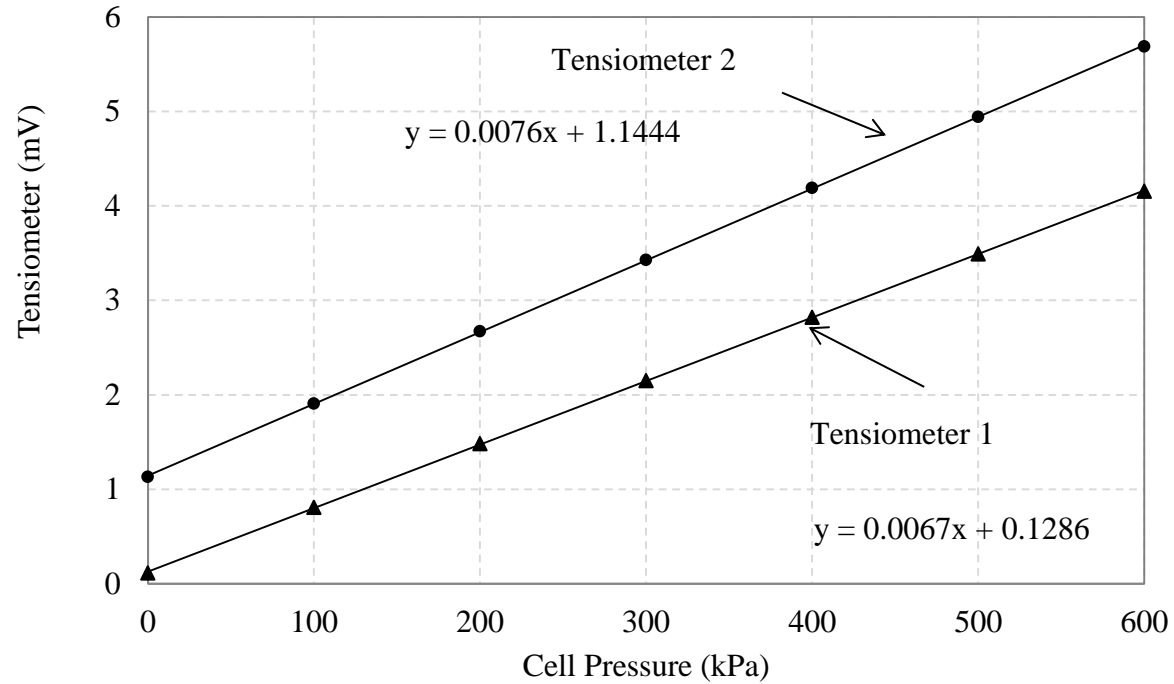
Grommet Fabrication



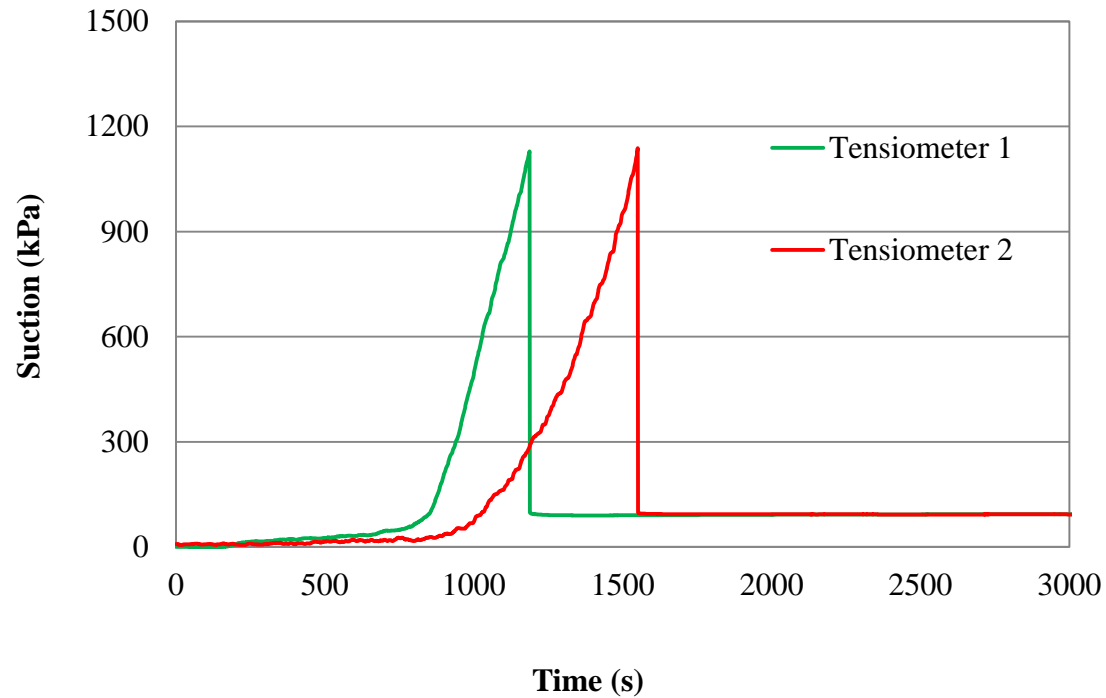
Saturation



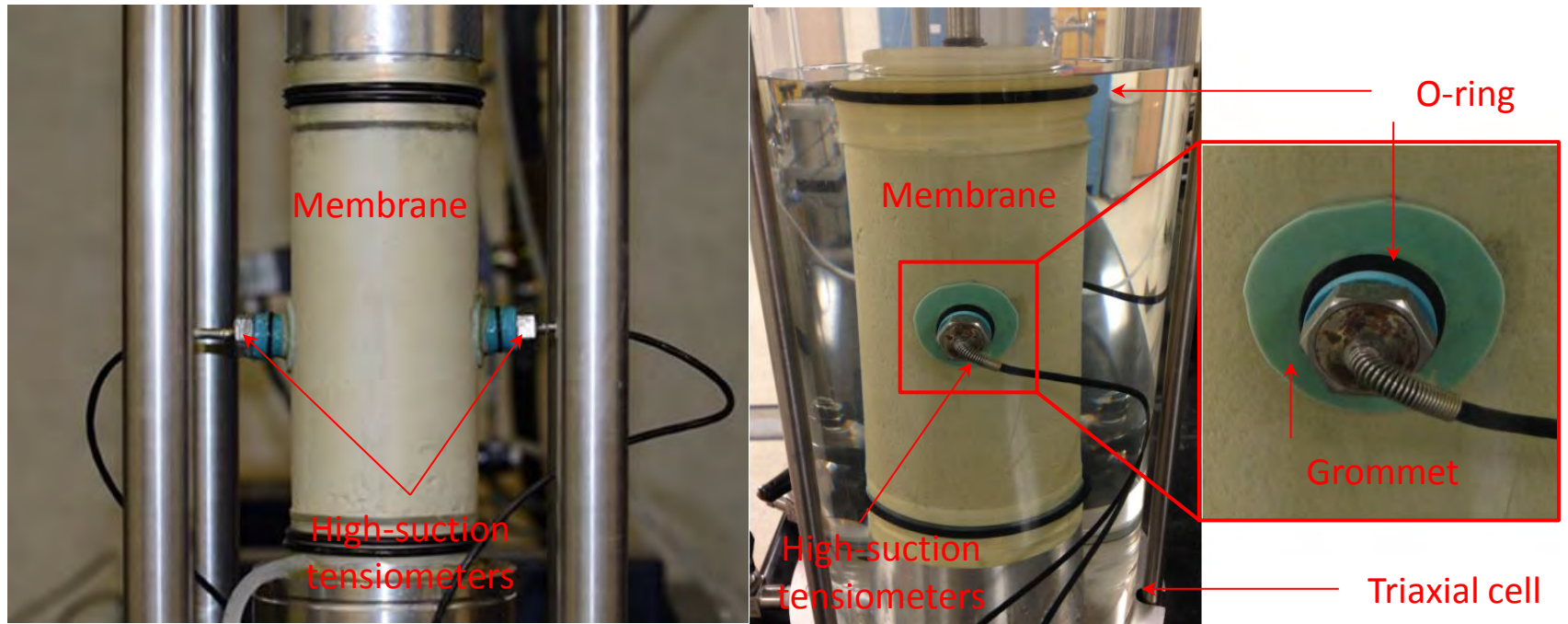
Calibration



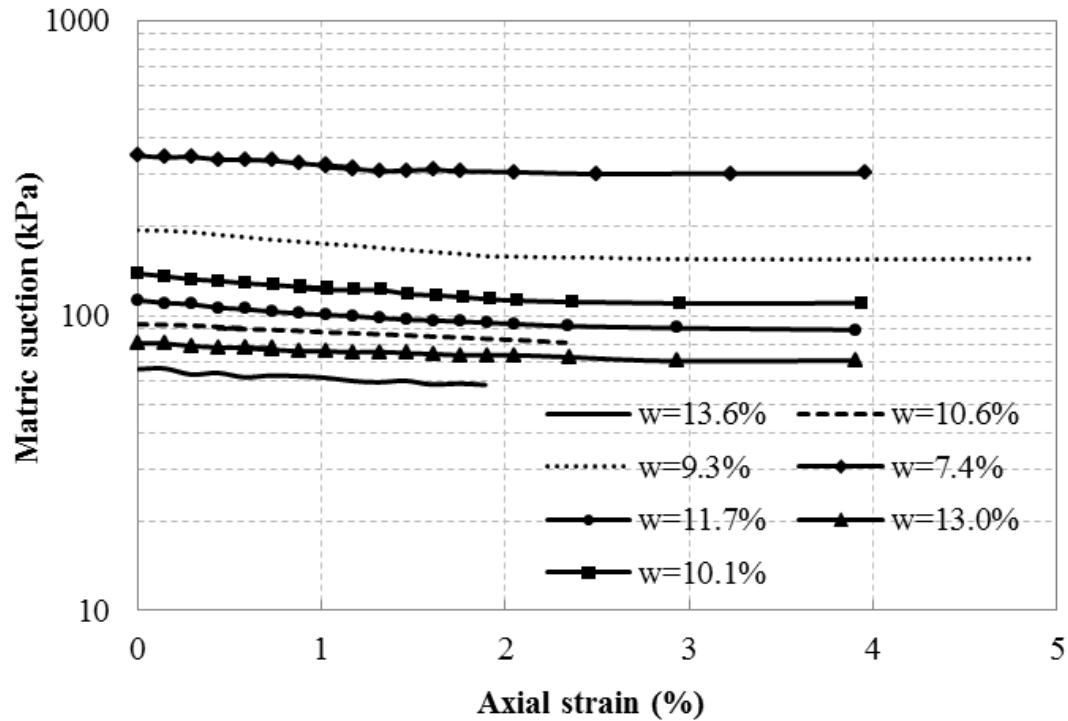
Maximum Attainable Pressure



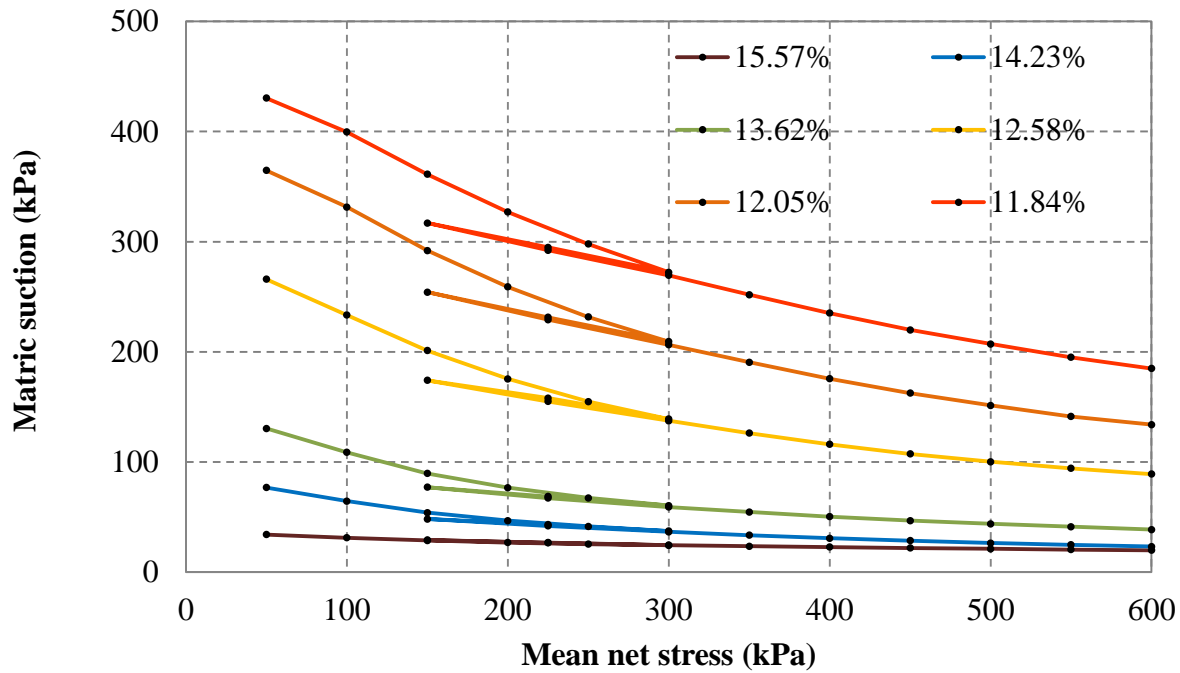
Application



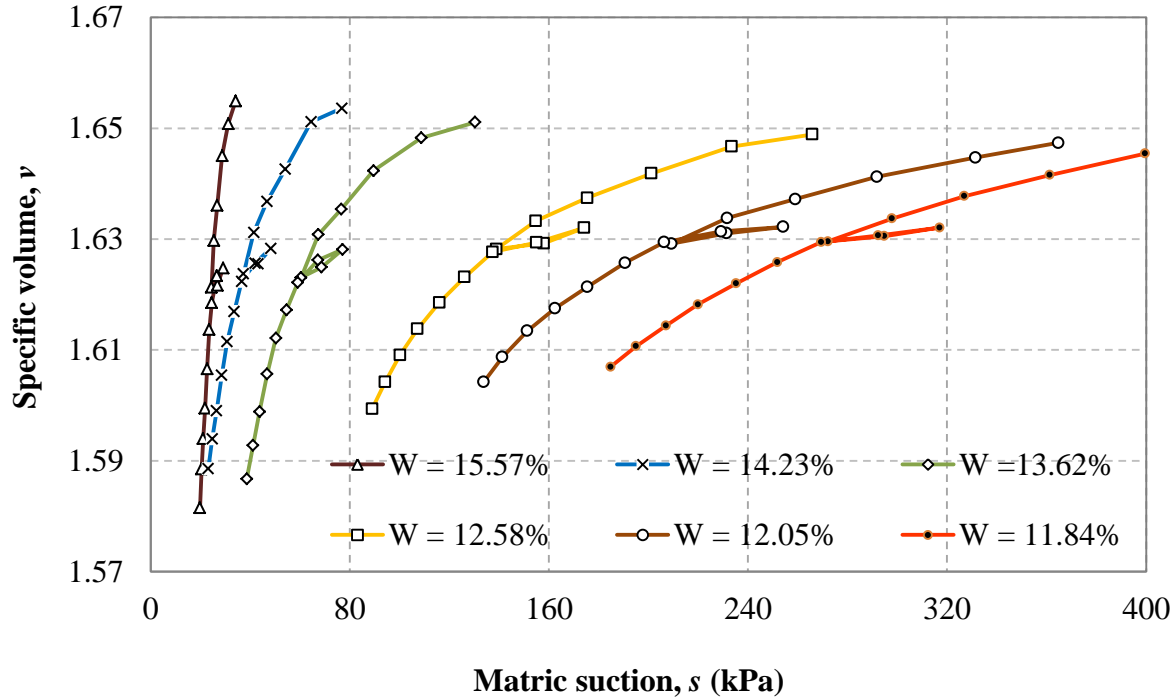
Results (Shear load)



Results (Isotropic load)



Results (Isotropic load)



Conclusions

- A new high-suction tensiometer for matric suction measurement on unsaturated soils was developed,
- After saturation and a careful calibration, the tensiometers were proved to have a maximum attainable suction at of around 1100 kPa (with 15 bar ceramic disc), and
- The undrained unconfined compression test results indicated that tensiometer is reliable and can provide repeated suction measurement results.

Questions ?