



## URBAN INSTITUTE IRELAND

### Development and Uses of the UCD Hollow Cylinder Apparatus

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The presentation will describe the development of a versatile hollow cylinder torsional apparatus (Fig. 1) at UCD in the 1990's, and its subsequent use in studying the yield behaviour of sand under generalised stress (multi-directional loading) conditions.

The apparatus, which derives its name from the geometry of the test specimen (a hollow cylinder, Fig. 2), is the state-of-the-art for testing geomaterials. Hydrostatic confining pressures are applied to its inner and outer wall surfaces, and an axial load and a torque are applied along the length of the specimen. The apparatus is a significant advancement on the traditional apparatus for strength measurement which are, at best, limited to axi-symmetric loading conditions.

In practice, the principal stress axes at a point in the ground rotate during loading (Fig. 3 shows how the apparatus can simulate the changing stress regime at a point remote from the centreline of an embankment during construction). Other applications, including a study of the yield behaviour of sedimentary sand deposits, and the validation of existing 2D yield criteria for 3D stress conditions, will be described.

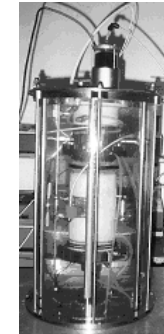


Figure 1

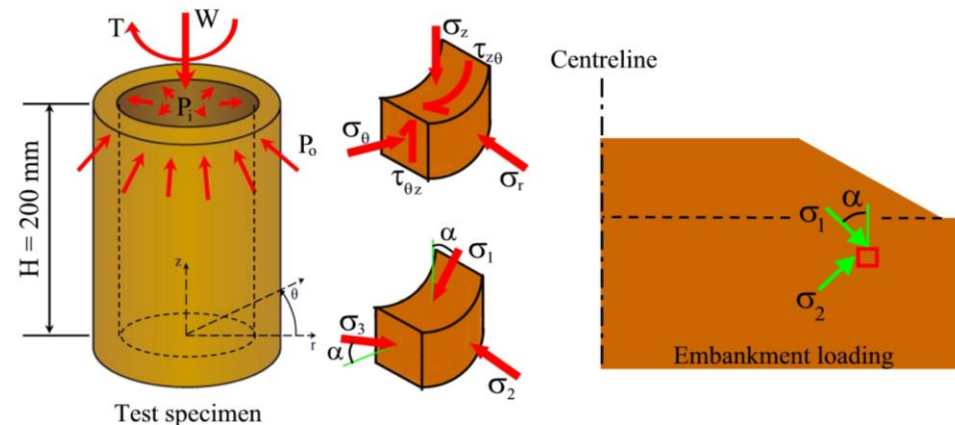


Figure 2

Figure 3