

Short Course | Partial saturation influences on the strength, critical state and CPT interpretations in silty tailings (The short course will be in english)

- **Adrian R. Russell**, Professor of Geotechnical Engineering at UNSW, Australian Research Council

| **DATE:** november 12, 2024 | **DURATION:** Half Day

| **MINIMUM PARTICIPANTS:** 15 | **MAXIMUM PARTICIPANTS:** 30

FEE: USD 200

INTRODUCTION/SUMMARY

Silty tailings inside a storage facility (TSF) may have a variety of saturated and unsaturated states. Large sections may have air and water in the pores, and negative water pressure (suction). This course shows how engineers can deal with these properties when assigning strengths for use in stability analyses and when characterising the tailings using the CPT.

Participants will learn the main aspects of unsaturated soil and tailings mechanics, relevant to the high degrees of saturation in a TSF. They will learn about strength and propensity for static liquefaction when unsaturated. Stress-strain behaviours will be understood, relevant to a constant mass (closed-system) condition which may prevail during a fast-loading event. They will learn how peak and post-liquefaction strengths, for unsaturated conditions, relate to strengths for saturated conditions on charts that incorporate measures of initial state.

Participants will also learn how CPT results, in a variety of saturated and unsaturated states, may be interpreted using a state parameter-based approach. Cone penetration resistances are altered by the presence of air in the pores, and by suction's enhancement of stiffness and strength, when the tailings are unsaturated. It will be shown how the penetration resistances can be normalised using the initial mean effective stress to establish relationships with the initial state parameter. It will also be shown how a relationship is unique for a given air content. Participants will come to understand why the relationships are bound by, and in some cases become equal to, those for saturated drained and undrained conditions.

COURSE TOPICS

- Strength and stability of tailings and tailings storage facilities when unsaturated.
- Conditions necessary for static-liquefaction to occur, and determinations of post-liquefaction strengths when unsaturated.
- How CPT results are affected by the tailings being unsaturated, and how unsaturated tailings may be characterized.

SPEAKERS

Adrian R. Russell

The course will be delivered by Adrian R. Russell, a Professor of Geotechnical Engineering at UNSW Sydney and an Australian Research Council (ARC) Future Fellow. His expertise is in laboratory element testing of soils and tailings, laboratory controlled CPTs and earthquake simulation, particle and pore geometry characterization, unsaturated soil mechanics and cavity expansion theory, and knowledge transfer to industry.

Professor Russell is an Australian representative on TC106 and TC221, which are International Technical Committees on unsaturated soil mechanics and tailings within the ISSMGE. He does expert review work on the stability of tailings storages and serves on Independent Tailings Review Boards. He is also on Editorial Boards of Geotechnique, Computers and Geotechnics and the International Journal of Rock Mechanics and Mining Sciences.



He was awarded his PhD in 2005 and BE in 1998, each by UNSW Sydney. His first academic appointment was a lectureship at the University of Bristol in the UK (2003-2007). This was followed by a move UNSW Sydney where he has been ever since.