NEW ZEALAND GEOTECHNICAL SOCIETY INC

A Collaborating Technical Society of The Institution of Professional Engineers New Zealand

Auckland Branch Presentation
Tuesday 31st March 2020
University of Auckland
ALR5 Lecture Theatre (421W-301)
Architecture and Planning building,
26 Symonds Street, Auckland
Refreshments: 5.30pm
Presentation: 6.00pm
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The shrink swell test of determining Expansive Site Soil Classes is Fatally Flawed.

Presented by Nick Rogers, Tonkin & Taylor

The shrink swell test, which combines both the shrink strain and the swell strain, was developed in Australia in the 1980s. This test now underpins a codified approach to the foundation design of lightweight buildings on expansive (reactive) soils in Australia and New Zealand.

The foundations for thousands of houses and other lightweight structures are designed in accordance with AS 2870:2011 based on the site soil class derived from the shrink swell index (I_SS) as determined by the shrink swell test, AS 1289:2003. A major appeal of the shrink swell test is that, with AS 2870:2011, there is clear foundation design guidance for any particular site soil-class.

Auckland, like many of the cities in Australia, is underlain by expansive soils. The requirement for shrink swell testing has been codified and mandated in New Zealand since 2011. As a result, there is now a substantial dataset of shrink swell test results in New Zealand, as well as in Australia (where the test has been utilised in the assessment of expansive soils for the last 30 years).

A fundamental rationale for using the shrink swell test is that it evaluates the soil over both wetting (swell) and drying (shrink) phases, so the result is independent of the initial moisture state of the soil sample, and defines a unique soil class related to the fundamental properties of the soil.

However, recent analysis of shrink swell indices from an Auckland dataset of a site of single geological origin identified a significant variation in the shrink swell index values that are not independent but rather are correlated with the initial moisture content of the test samples.

Subsequent analyses of other datasets showed a similar trend, strongly suggesting that the soil classes are being largely influenced by the initial moisture content, rather than by differences in the soil properties. Simply put, the wetter the soil, the higher the shrink swell index.

This presentation sets out the results of a critical examination of datasets of shrink swell tests undertaken in Auckland, New Zealand and Victoria, Australia and concludes that in these datasets the shrink swell test has a significant shrink strain bias which makes it unreliable as the sole basis for foundation design guidance on expansive soils.

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