ISSMGE FOUNDATION
REPORT ON CONFERENCE ATTENDANCE

Your Name: David H Marx	***Your Organization:*** The University of Pretoria, South Africa	***Date of report:*** 2016/09/02
Conference Title: N.A.	***Location of Conference:*** *Cambridge, England*	***Dates of Conference:*** *30/06/2016-31/08/2016*

What you learned:

My Master's research is on the optimal geogrid reinforcement of landfill clay liners. As part of my research at the University of Pretoria I conducted centrifuge modelling of clay liners subject to voids underneath. The Schofield Centre at the University of Cambridge has a long history of testing clay models. Consequently, I could draw on their experience to help analyse my centrifuge clay liners. Secondly, one of the PhD Students, Talia da Silva, is conducting research on (reinforced) clay liners spanning local voids. There is a strong correlation between the work she is doing and what I have done in South Africa.

During my time in Cambridge we conducted three 1G tests and three centrifuge tests on clay liners spanning a trap door. A narrow trapdoor, a wide trapdoor and a wide trapdoor with a layer of sand overburden were investigated. Preliminary analysis indicates that the clay liners are surprisingly resilient – a 1 m thick clay liner spanned over a 2 m void even after an hour of creep was allowed. The liner spanning the wide trapdoor failed. Furthermore, the addition of overburden pressure changed the failure mechanism significantly.

The second part of the work we conducted was bending beam flexure test on clay beams. These tests were done to characterize the behaviour of the clay in tension and to complement the bending beam tests I conducted in South Africa. We investigated three and four point tests, a range of loading rates, two different consolidation pressures for the kaolin beams (500 kPa and 750 kPa) and notched and un-notched beams. Inducing a stress concentration in the beam with notch significantly changed the type of fracture. We developed a simple script to track the position of the neutral axis, as well as the strain distribution in the beam, as the crack propagated. We are planning to report on these results, together with the tests I conducted in South Africa, in a journal article.

Finally, I also attended a conference for graduates on expanding skill hosted by Division D of the Department of Engineering, Cambridge. I learned valuable lessons from attending the workshops on negotiation and one on entrepreneurship.

People you met:

Dr Mohammed Elshafie (Laing O'Rourke Lecturer in Construction Engineering) and a number of future geotechnical engineers amongst others: Talia da Silva (the effect of local voids on the existing soil profile), Chan Ye Gue (tunnelling near existing tunnels), Stefan Ritter (tunnelling below buildings), Njemile Faustin (deep circular shafts in sand and clay), April

Bowman (temporary aircraft runways) and Stephan van Eeden (pressuremeter testing in oily sands).

Main features of the visit:

1. Centrifuge modelling of clay liners spanning voids.
2. Flexural tests on clay beams.
3. PIV analysis and strain calculations of the beams.
4. Attendance of the Division D Expanding skills Conference

Your comments on the visit:

My visit to the University of Cambridge's Schofield centre was a rare opportunity realised by the funding of the ISSMGE Foundation. I gained valuable experience on working with clays in the centrifuge and centrifuge modelling in general. Perhaps most valuable are the people I have met and the influence they may have on my career as a geotechnical engineer. It was a privilege to work and live in a country so different from my own. The quality of my Master's dissertation will surely benefit from the visit.

Please attach short report (maximum 400 words) suitable for publication in the ISSMGE Bulletin:

The Schofield centre at the University of Cambridge, England was visited from the 30th of June 2016 to the 31st of August 2016. The purpose of the visit was twofold: to conduct centrifuge modelling of clay liners spanning cavities with me Talia da Silva and to discuss the results of the centrifuge modelling and material tests conducted at the University of Pretoria. This was done to complement and improve my Master's dissertation on the optimal geogrid reinforcement of piggyback landfill liners.

In the first week of the visit I attended a conference on expanding skills, hosted by the Department of Engineering's Division D. The workshops on negotiation and entrepreneurship were valuable learning experiences.

In the subsequent weeks the preparation for centrifuge tests were completed. Three tests were conducted: a clay liner spanning a narrow void, a liner spanning a wide void and finally a liner spanning a wide void, subject to overburden pressure. These tests simulated landfill liners, in various stages of commissioning, subject to local voids.

From each of the clay liners tested, samples were extracted for bending beam flexural tests. An additional set of samples were prepared at a higher consolidation pressure. The test conducted at the University of Cambridge, together with those conducted at the University of Pretoria, investigated the flexural behaviour of kaolin clay beams for: three and four point bending tests; 500 kPa, 610 kPa and 700 kPa consolidation pressures; very slow (0.0167 mm/min), slow (1 mm/min), medium (3 mm/min) and fast loading rates (10 mm/min); notched and unnotched beams. These results will be reported in a future publication.

I am grateful to the ISSMGE Foundation for helping to realise my visit to the University of Cambridge's Schofield centre. I gained valuable experience on working with clays in the centrifuge and centrifuge modelling in general. Perhaps more valuable were the people I

have met and the influence they may have on my career as a geotechnical engineer. It was a privilege to work and live in a country so different from my own. The quality of my Master's dissertation will surely benefit from the visit.

Photographs from visit: Insert here or attach to email

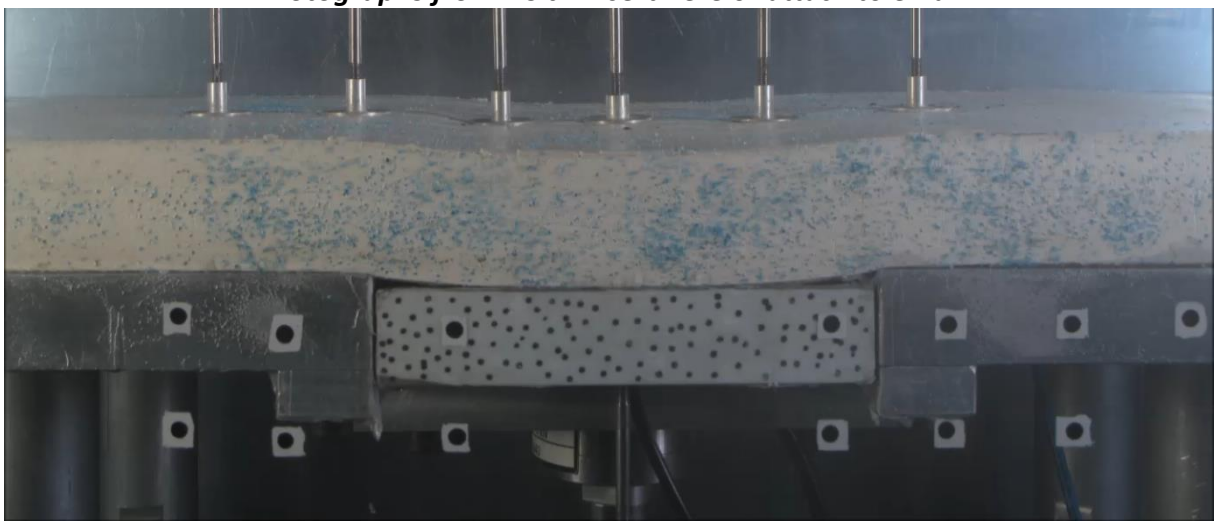

Figure 1- Centrifuge test of clay liner over local void

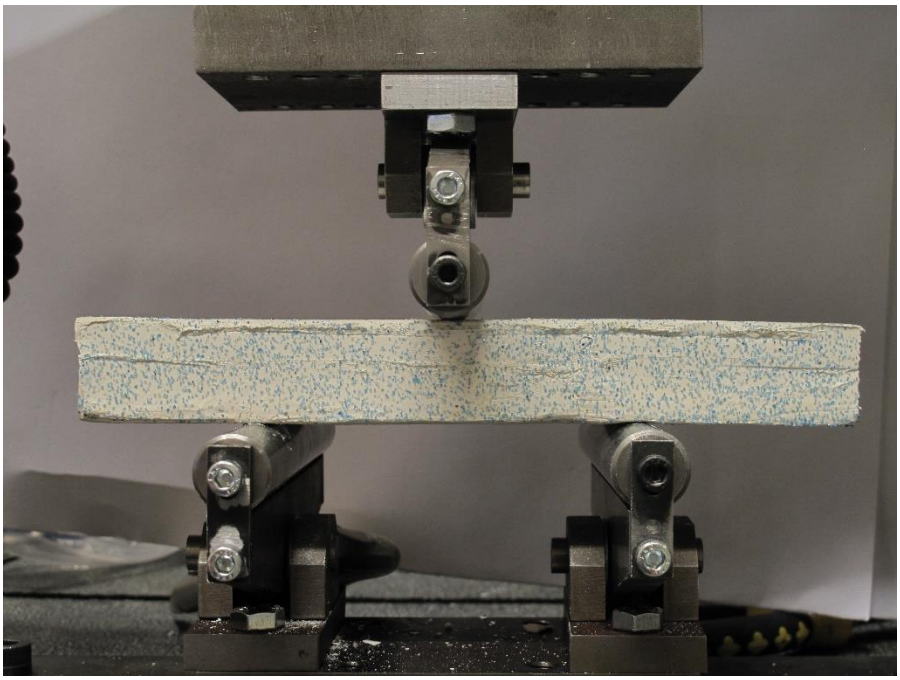

Figure 2 - Three point bending test on clay beams

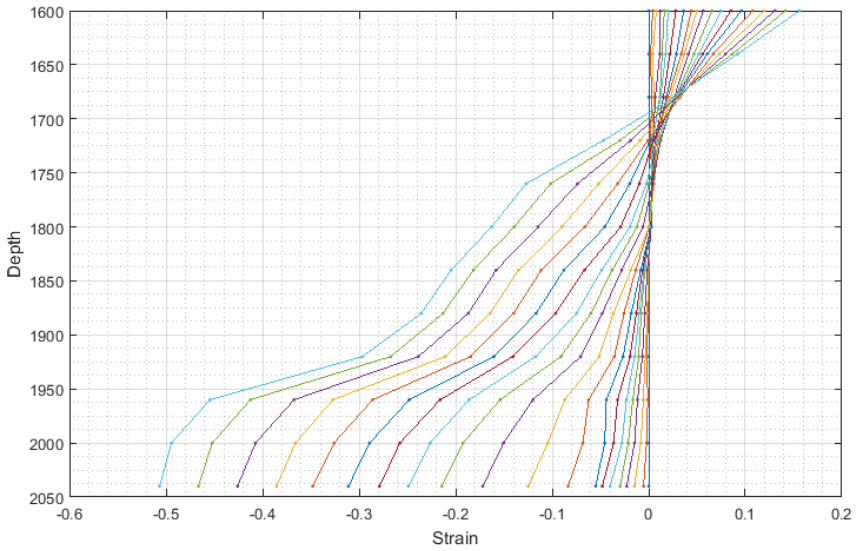

Figure 3 - Horizontal strain distribution through clay beams at various stages of bending

Figure 4 - Attendance of a formal dinner at Trinity College