

Minutes for Joint Meeting between ISSMGE TC304*, TC205, TC212 and TC 302 (ISGSR 2015)

***19th TC304 meeting**

Date: 14 Oct 2015 (Wed)

Time: 6:00 – 7:00 PM

Venue: Goudriaan Room 1+2, WTC-Building (conference venue)

Attendees:

K.K. Phoon (TC304 Chair & Meeting Chair), Sami Akbas, G.L. Sivakumar Babu (TC302 Chair), Greg Baecher, Hongxin Chen, Jianye Ching, Ivan Depina, Gordon Fenton, Vaughan Griffiths, Takashi Hara, Yusuke Honjo, Jinsong Huang, Shuihua Jiang, Leena Korkiala-Tanttu, Suzanne Lacasse, Tim Länsivaara, Jinhui (Lisa) Li, Bak Kong Low, Farrokh Nadim, Lars Olsson, Trevor Orr, Yu Otake, Samuel Paikowsky, Wojciech Pula, Nick Sartain, Bernd Schuppener, Timo Schweckendiek, Roland Shöbi, Brian Simpson (TC205 Chair), Johan Spross, Armin Stuedlein, Marco Uzielli, Adriaan van Seters, Frits van Tol, Giovanna Vessia, Yu Wang, Ikumasa Yoshida, Jie Zhang, Lulu Zhang, Jason Le Masurier

1. Introduction

KK Phoon welcome attendees to the meeting and invited attendees to introduce themselves.

Attendees self-introduction

2. Summary of discussions

KK Phoon invited Brian Simpson to kick start the discussion. Brian noted that reliability theory can provide us with some useful insights, but doesn't give any direct prediction of probability of failure. He posed the question if higher β values associated with ULS its value actually means anything, and in particular whether changing the design to increase β tells us that the design is safer in any significant way. He suggested this may not be the case and opined that once the overlap between the curves is sufficiently small the likelihood of failure from some other cause becomes dominant. Brian suggested that the probability of unsatisfactory performance at the serviceability limit state (SLS) may be more meaningful, because the probability is larger and it is less dependent on probability tails of random parameters where supporting data are limited.

Bernd Schuppener added that the most important factor for the reliability of design is not the variability of the load and the resistance of the material, but the influence of the human error. This human error we covered to some unknown extent in the global safety concept. We, however, do not cover it in the design with the probabilistic reliability concept. If we arrive at the same design dimensions using both concepts, his guess is that it is due to an overcompensation by selecting too large target values of beta

In response to Brian's remark on the usefulness of β for ULS, Gordon Fenton noted that the reliability index or probability of failure is a nominal value, rather than an actual value. Notwithstanding this well known limitation, the target probability of failure can be used as a useful tool to accumulate our experiences systematically. Sam Paikowsky noted that it is difficult to characterize the probability tail statistically even if we have more than 100 data points. In spite of tail issues, Sam opined that resistance factors calibrated from data are still useful and an improvement over our traditional factor

of safety that is not linked to actual data. Suzanne Lacasse noted that it is very hard to quantify human errors and reliability theory may not be the right tool to control human errors. Farrokh Nadim noted that reliability theory cannot be expected to cover all possible uncertainties, such as unknown unknowns. Farrokh further noted that actual failure statistics are difficult to obtain, because it is natural for people to downplay failures or even avoid reporting them altogether if at all possible. KK Phoon added that this is similar to accident statistics, where near-misses are not reported as they do not result in reportable event but near-misses data are important nonetheless. Yusuke Honjo noted that the advantage of reliability-based design is that it can address quantifiable uncertainties (known unknowns) in a rational way.

Jason Le Masurier opined that it may be possible to model human errors and we may need to direct our research in this direction. Bernd wondered if we can add a new factor to account for human errors on top of the conventional load and resistance factors to cover uncertainties in loads and resistances.

KK Phoon invited Greg Baecher and Sivakumar Babu to add their views on the causes underlying actual failures. Greg noted that based on his past work on dam safety, failures usually happen when many events occur in series or simultaneously. This is a system problem and he opined that we have not progressed far in system reliability issues.

Babu gave a general introduction of the activities of the TC on Forensic Geotechnical Engineering and stated that the probabilistic design and analysis methods are very useful in forensic geotechnical engineering as well and requested that the members of TC 304 and others to contribute to the activities of TC 302. He also indicated that the probabilistic analysis of failures is a very useful component in the development of back analysis procedures.

KK Phoon summarized that the current philosophy of adjusting the target reliability index by calibration with existing practice to cover issues beyond “neat” statistics. It has been recognized since the advent of structural reliability concepts in design codes that there are other reasons for unsatisfactory performance in actual structures beyond uncertainties in loads or resistances. KK noted that Bernd’s difficult question on human errors falls into this category of “other reasons”. KK noted that the rationale for using reliability despite this known limitation is to deal with known unknowns (uncertainties quantifiable statistically from data) as rationally as possible and by doing so, sharpening our appreciation of the gap between calculate pf and observed pf. This “baseline” may point the way towards closing the gap in the future by updating reliability with more information such as monitoring or stimulating research to get a better handle on human errors. Hence, a more rational approach, be it reliability or otherwise, has a chance to improve our state of practice, although one could take a more pessimistic view that it is a bridge too far. Finally, he opined that it may not be desirable to close the gap completely, because our practice sensibly involves other quality control procedures such as education, professional certification, site supervision, monitoring, etc. to mitigate risks. This multi-pronged approach is likely to be more robust and more holistic than relying on “safe” design calculations alone. KK acknowledged that human errors is a difficult and complex issue to model, although he preferred to take a more optimistic view that we can make progress even on this front eventually. We are certainly not the only engineering discipline affected by human errors and there is a room for us to learn from other disciplines.

3. Other business

Vaughan Griffiths announced to the meeting that Georisk 2017 (also ISGSR 2017) would be held in Denver, Colorado, June 4-7 2017. KK Phoon thanked all participants for the robust debate on important issues that will point the way to future research. KK brought the meeting to a close at 7 pm.







