**CEE JRI IAG MEETING 21-01-10**
**Joint Phd Students Poster Abstracts**

**Bank Protection for Jamuna River in Bangladesh**
***Aysha Akter*** (Supervisors: Pender, Wright and Crapper)
Major rivers like the Jamuna in Bangladesh suffer from enormous erosion rates, resulting in a reduction in available riverbank sites for human habitation and agriculture. Such rivers have highly unstable bed profiles and planforms. On the Jamuna River, erosion rates of 1km/year is not unusual. In some parts of the world, sediment filled geotextile bags are commonly used to prevent coastal erosion (e.g. Australia, Germany) and riverbank erosion (e.g. China, Bangladesh). Whilst this technology is relatively inexpensive, and ideally suited to applications along the Jamuna riverbank, the failure mechanisms associated with such protection schemes are not well understood, and significant performance problems continue to occur. The aim of this study is to develop a numerical model for the design of riverbank protection using sand filled geotextile bags (Geobags).

A physical model study is being carryed out to record the bag movement and associated hydraulic parameters. Data from the physical model are being used to calibrate an existing numerical simulation model (EDEM by DEMSolutions). After assessment of the suitability of the commercial software (EDEM), a summary report will be prepared stating the practical design guidance on Geobag structure.

**Towards best management of runoff in new developments**
***Nicolas Bastien*** (Supervisors: Arthur, Scholz and Wallis)
The underlying philosophy of the presented poster is the view that the development of a surface water management plan at an early stage, coupled with advances in how the treatment train is modelled, would help optimise water management and planning objectives. To support this research, the Dalmarnock Road regeneration site in Glasgow is being developed as a case study. Based on an initial surface water management plan, possible development opportunities, and land use characteristics were used to option potential source and site controls. Based on the resultant analysis, the proposed poster focus on the holistic modelling of potential SuDS benefits which comprise the following components: (a) hydrologic performance analysed using Infoworks CS 9.0 (b) SuDS treatment train water quality performance assessed using MUSIC 3.01 (c) whole life cost comparisons; and (d) land take being optimised using the hydrologic and water quality modelling results. Significant special water quality and hydrologic benefits can be achieved by objectively optimizing the SuDS treatment train. These benefits can be used to reduce regional control size, making land use more profitable for developers but still satisfying environmental regulator objectives.

**An Analytical Method for Interpretation of Interfacial Stresses from Experiments in a Plated beam**
***Vijayabaskar Narayanamurthy*** (Supervisors: Chen and Cairns)
External bonding of fibre reinforced polymer (FRP) composite or steel plate is a popular technique for strengthening reinforced concrete or metallic beams. Debonding along the plate-beam interface due to high interfacial shear and normal stresses can lead to premature failure of this hybrid beam. Many analytical and experimental studies have been conducted during the last few decades to quantify these interfacial stresses. In almost all experimental studies, the strains measured on the bottom face of the plate are used to deduce the interfacial shear stresses near the plate end assuming that the plate is under pure tension. The peeling effect between the adherends due to bending deformation has been ignored in this traditional interpretation for the sake of simplicity. This leads to error in the interpreted interfacial shear stress. This research presents a new analytical method to deduce both the interfacial shear and normal stresses from the measured plate strains. The interfacial stresses from this method are compared with the interpreted results of experiments from Jones et al. (1988) and with the analytical solution of Narayanamurthy et al. (2009).

**A New Load Type for OpenSees**
***Jian Zhang*** (Supervisors: Usmani, May and Pankaj)
OpenSees (Open System for Earthquake Engineering Simulation) is an object-oriented framework for finite element analysis. A key feature of OpenSees is the interchangeability of components and the ability to integrate existing libraries and new components into the framework without the need to change the existing code. a new load type named “Beam3dTempLoad” has been developed and added into OpenSees. It has been proved to be acceptable after comparing the benchmark results with ABAQUS.

**Numerical analysis of train-bridge dynamic interaction in frequency domain**
***Lei Mao*** (Supervisors: Lu and Woodward)
The dynamic interaction between a moving train and a railway bridge is a very important topic concerning the bridge dynamic response, condition assessment and monitoring. Many existing studies on the train-bridge

dynamic interactions are based on the time-domain response histories and the response amplitudes. In fact, studying the railway bridge response in the frequency domain can bring significant insights into the behaviour of the train-bridge interacting system under a trainload excitation, which in turn helps establish a clear understanding of the potential resonance effect, as well as extract the resonance frequencies of the combined dynamic system. Extending from some simplified theoretical work by other researchers, this particular study develops a numerical model for the simulation of a more realistic train-bridge dynamic system under moving trainload excitations. The model is then employed to conduct a systematic parametric study to investigate the frequency characteristics, including the so-called "driving frequency" and "dominant frequency" arising from the excitations, and their relationships with the varying influencing parameters.

**Sustainable water and sanitation solutions for the developing world**
***Alison Furber*** (Supervisors: Crapper and Jowitt)
This project addresses the question of how we educate the engineers of the future to be more effective in providing water and sanitation solutions to the developing world. At present many such interventions fail, despite the wide range of technology and international goodwill available. It is hypothesized that a more effective approach to engineering education might result in a better involvement of engineers leading to more sustainable solutions.