The Institution of Structural Engineers

International HQ
11 Upper Belgrave Street
London SW1X 8BH
United Kingdom
tel: +44 (0)20 7235 4535
fax: +44 (0)20 7235 4294
mail@istructe.org
www.istructe.org

2013/14 Undergraduate Research Grant Scheme

Project title: Developing of pretensioned RC beams with BFRP reinforcement

University: Kingston University

Supervisor: Ted Donchev

Student: tba

Aims of research:
Fibre Reinforced Polymers (FRP) are getting popular as reinforcement for Reinforced Concrete (RC) elements mainly due to lack of corrosion and strength higher than steel. From different types of FRP materials Glass and Basal are most attractive from economical point of view. The main limitation for their wider application is their relatively low Young modulus, allowing high deformations and developing of intensive cracking.

One of possible approaches to overcome this problem is via introducing prestressing in the reinforcement. Having in mind high ultimate resistance of such reinforcement and the significant spare capacity such approach could be very beneficial.

The aim of the proposed research is to investigate the opportunity to develop precast pretensioned BFRP reinforced beams. Positive results of such investigation will be significant step in direction of wider application of precast BFRP reinforced beams and floor panels in the future.

The project is already sponsored with BFRP reinforcement from MagmaTech Ltd.

Description of method:
The proposed research will be laboratory based experimental investigation. On first stage the aim will be to develop medium scale samples 2.5 m long pretensioned beams with different degree of prestressing and different size of basalt FRP (BFRP) reinforcement. For casting of such beams special steel formwork with prestressing devices will be developed. The cured beams will be tested on four point bending and obtained results will be compared with steel reinforced beams and BFRP reinforced beams without prestressing, acting as control samples. Testing of small samples from the concrete and the reinforcement for estimation and verification of material properties is planned as well.

The funding, if allocated, will be used for developing of steel formwork and prestressing devices, which will be used many times both for this and future investigations in this area.

The obtained results will be published on international conferences/journals and further practical application of such elements will be envisaged.

Benefits to structural engineering:
The successful completion of the project will allow for more effective practical usage of FRP reinforcement for elements loaded on bending. Possible further development of pretensioned precast FRP reinforced elements for advanced flooring systems is taken in consideration.

Proposed finish date: May 2014