

## PRE-STRESS LOSSES IN FRP REINFORCED ELEMENTS AT NORMAL AND ELEVATED TEMPERATURES

DoS: Dr Ted Donchev, School of Civil Engineering and Construction, Faculty of SEC.

Second Supervisor: Dr Diana Petkova

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 Basalt are the 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 pre-stressing 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 pre-tensioned FRP reinforced beams and to investigate long term behaviour, specifically the losses of pre-stress. It is interdisciplinary project combining knowledge and expertise in Structural Engineering (as Pre-stressing Elements) and the innovative usage of HighTech/Nano materials (as FRP reinforcement). 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 and could benefit widely the construction industry both in UK and worldwide.

Method :

The proposed research will be laboratory based experimental investigation. On first stage the aim will be to develop medium scale samples of pre-tensioned beams with different degree of pre-stressing and different size of basalt FRP (BFRP) reinforcement. For casting of such beams special steel formwork with pre-stressing 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 pre-stressing, 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.

Additional investigation both as experimental and theoretical modelling of the effects of loss of pre-stress with utilisation of existing environmental chamber in Structures lab is planned.

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

The project is already sponsored with BFRP reinforcement from MagmaTech Ltd in aspect of materials and from Institution of Structural Engineers in aspect of support for producing the formwork. Possible cooperation on international level for the theoretical modelling with University of Gerona in Spain is expected.