Project proposal template – Faculty studentships Summer 2014

Project title	Earthquake resistant Design of Prestressed Concrete Elements	*Director of Study*	Professor Costas Georgo
Second Supervisor	Dr Ted Donchev	*School*	Civil Engineering and
Other members of supervisory team	Dr Dianna Petkova	*Any requirements from applicant (eg degree in specific subject area)*	

Project summary

(max 1,000 characters)

Prestressed concrete beams are traditionally used in both building and bridge construction. However the European Seismic Code EN1998 doesn't allow the use of energy-dissipation in the design of prestressed concrete beams / girders and their supporting columns / piers. As a result if prestressed concrete elements are used to support seismic loading they will have to be designed elastically to EC1998 and end up a lot more conservative and expensive. Nevertheless recent tests in Japan have demonstrated that prestressing has a beneficial effect in the cyclic behaviour of bridge piers and, it is possible to dissipate energy by creating plastic hinges at the ends of a prestressed beam when combining a less eccentric placement of tendons with larger quantities of ordinary ductile reinforcement. Should the scope of EN1998 be extended to cover these energy-dissipation characteristics of prestressed concrete elements in their design?

Based on latest experimental and analytical work on the behaviour of prestressed concrete elements, it is proposed to develop a set of lab prestressed concrete beams with various dimensions / reinforcement and apply a series of gravity and seismic actions to them. The test results would be calibrated against existing test results and verified with analytical models in ANSYS FE software. In addition to the immediate benefit of this work to the EN1998 provisions, the research outcomes would improve the economy, sustainability and seismic safety of prestressed concrete buildings and bridges. Valuable partners from the industry might support this R&D effort.