

2013 MSc Research Grant Scheme – Executive Summary

Project title:

Fibre reinforced polymer grids as shear reinforcement in fabric formed concrete beams

University:

University of Bath

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Project summary:

The implementation of FRP reinforcement in concrete members present serious problems with respect to its concrete bond and anchorage, resultant from stress concentrations along the fibres, particularly at bends, due to FRPs' anisotropic linear-elastic non-plastic properties.

Furthermore, the fabrication and installation of conventional individual shear links in a structural member can be very challenging, owing to the management of different stirrups' shapes and sizes. The intent of this research was to analyse, through experimental testing of beams and analytical analysis using ACI 440, the capacity of continuous rectangular CFRP spirals as shear reinforcement in concrete beams. Six spiral cages with three distinct configurations were fabricated and tested within concrete beams, with their reinforcing capacities compared to each other and to ACI 440 analysis. The results point to significant discrepancies with the use of the lower bound theory of plasticity used by ACI 440. Where ACI 440 suggests the optimum shear link configuration to be perpendicular to the shear path, this research conclusively found the optimum shear link configuration to be parallel with the applied load, perpendicular to the axis of the beam. Finally, this research has ultimately found continuous rectangular CFRP spirals to be a successful alternative to individual stirrups in transversely reinforcing concrete beams.