

2013 MSc Research Grant Scheme – Executive Summary

Project title:

Innovative grid steel structures in fibre reinforced polymer composites

University:

University of Bradford

Supervisor:

Ashraf Ashour

Contact details:

EDT1, School of Engineering Design and Technology, University of Bradford, Bradford, West Yorkshire, BD7 1DP

Telephone: 01274 233 870

Email: a.f.ashour@bradford.ac.uk

Students: Richard Lang

Project summary:

Grid shells provide a highly structurally efficient, lightweight and elegant solution to span a very large area, and in the past have been constructed from timber or steel.

The aim of this project is to investigate the feasibility of using fibre reinforced polymer composites in grid shell construction, and what the advantages of various FRP materials might be, such that grid shells would be optimally constructed from FRPs.

Initial research was carried out into the design and construction of current grid shell structures, in order to understand how FRPs might be implemented most effectively. Upon completion several FEA models were developed to test form finding in FRP grid shells and investigate the effects of likely loading scenarios. Long term bending tests were carried out on FRP samples in the laboratory, in order to determine the possible effects of long term bending loads on structural members in an FRP grid shell.

This project found that it is indeed possible to construct grid shells from FRPs, and that the advantages certain FRPs have over more traditional materials are far more suitable in grid shell construction in both the short term and long term.

There is currently much scope for further research into FRP grid shell construction, and it is hoped that this project will generate further interest in the research area, ultimately leading to the codifying of a more rigorous design methodology, and hopefully to the commercial construction of an FRP grid shell.