



## GFRP Curved Surfaces

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**Overview** | *The complex geometries which can be observed in curved structures pose challenges in developing a feasible building envelope using conventional building materials such as steel and concrete. This project investigated the suitability of glass fibre reinforced polymers (GFRP) to the load bearing envelopes of curved structures through a series of analytical models, numerical models material properties experiments and full scale mock-up tests on individual panels.*

**Main Outcomes** | *A design tool was set up which enables the designer to use the finite element analysis model of a monolithic curvilinear surface, which preserves the architect's geometry exactly, to establish the preliminary sizes of the individual constituent panels which would make up the surface on site. Two mock-up panels were tested, the numerical models provided a very good prediction of the shear lag observed in the panels, but the numerical models were unable to predict the vertical deflections due to the significant shear slip in the panels. This result highlighted the importance of accurately predicting the degree of composite action in GFRP panel.*

**Future Work** | *(1) Refinement of the design tool which has been set up is needed though further work into producing more efficient and accurately modelled panel connection designs; (2) an optimised panel design which uses a foamed core sandwich concept to reduce the depth of the panel; (3) an accurate method for predicting the extent of composite action which can be relied upon to increase the stiffness of the panel.*

Industrial Partner | *Newtecnic*

