

Lightweight advanced composite bridge decks

A key challenge facing modern bridge engineers is the acceleration of bridge construction (to reduce costs from traffic flow disruption during construction) without compromising the structural integrity of the completed bridges. Another challenge is reduction of maintenance costs for the bridges once in service.

Both demands may be met using advanced composite decks for traffic bridges. Fabricated commonly by pultruding glass fibre reinforced polymer composites into modular units, these decks can accelerate construction due to the modularity and to low weight (only 20% that of concrete decks). The modularity also improves site safety. These composites are also corrosion-resistant, which could lead to reduced maintenance strategies compared to other deck types.

Bridges using advanced composites for the deck and/or the main beams have been built in, for example, the USA, UK and Spain. But despite its obvious advantages, this novel bridge technology is not yet mainstream. A key issue is the absence of relevant design standards based on underpinning research, especially where fatigue performance is concerned.

This situation has triggered a project to construct and test a large-scale bridge specimen with composite decking at the Structures laboratory of the University of Bristol. The specimen is 8 m long, 3.7 m wide and comprises ASSET composite decking (provided by Fiberline Composites of

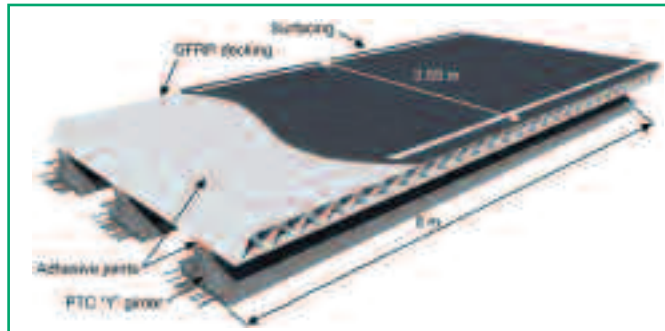
Denmark) spanning across pre-tensioned concrete (PTC) main beams.

The PTC beams match the corrosion resist-

ance of the decking and also improve stiffness. One novelty is that only adhesive connections are used between deck units and to connect the deck to the main beams. This further simplifies and accelerates construction. The project is supported by the Highways Agency, the Institution of Civil Engineers R&D Fund, Network Rail, Mouchel, Tarmac and Weber.

The specimen will be subjected to over 100 million cycles of full-scale, code-specified fatigue wheel loading. The large plan area of deck will be exploited to investigate the effects on deck performance of different surfacings. Finally, the specimen will be loaded to failure.

Structural response is being recorded using state-of-the-art instrumentation and data acquisition equipment. Interpretation of the test outputs will underpin design guidelines for short and long term actions of this innovative bridge form.



(Top) Schematic of Test Specimen
(Above) Specimen in Test Frame at Bristol University

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