# TECHNICAL RESEARCH ON THE NEW WEB STRUCTURE USING ULTRA HIGH STRENGTH FIBER REINFORCED CONCRETE

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Composite bridges have received a great deal of attention in recent years for the contribution this structural system can make to decreasing concrete bridge weight and streamlining the construction process. As one example of a composite bridge, the authors developed a butterfly web bridge in which the web is replaced with steel formed into the shape of a butterfly (**Photo 1**). In this structure, the steel panels forming the web are cut so as to appear pinched in the center, giving a butterfly-wing shape and eliminating the need to join the panels at the site. The steel panels are embedded directly into the upper and lower concrete slabs and perforated steel ribs are used for connection. This simplifies the construction process, with even the machining of the steel panels themselves involving only cutting.

This study proposes replacing these steel web sections with butterfly panels approximately 100 mm in thickness fabricated from ultra-high-strength fiber-reinforced concrete (UFC), with the aim of improving durability.

In this work, shear tests were conducted with half-size UFC butterfly panels in order to evaluate the shear behavior of such a structure (**Photo 2**). The results confirmed that the required shear capacity could be obtained if member thickness is appropriate for the level of compression stress and if appropriate reinforcement with prestressing steel is provided on the tension side of the panels (**Photo 3**). In addition, of a virtual model of an entire bridge having this web structure was implemented using non-linear FEM analysis in order to evaluate the behavior of the bridge system as a whole. Based on these results, the authors propose a design method for this new structural system.

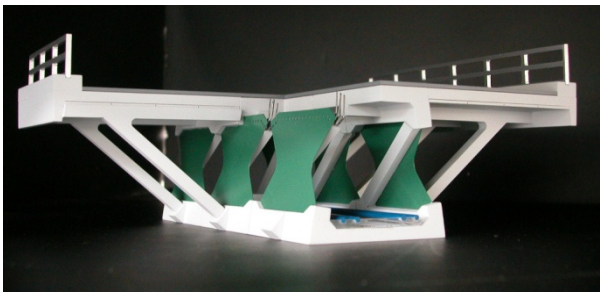

**Photo 1** Butterfly web bridge

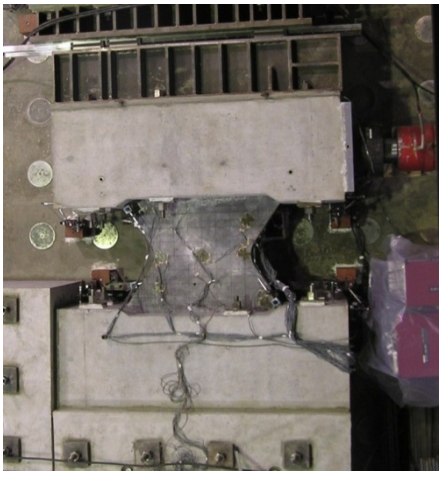

**Photo 2** Overview of test

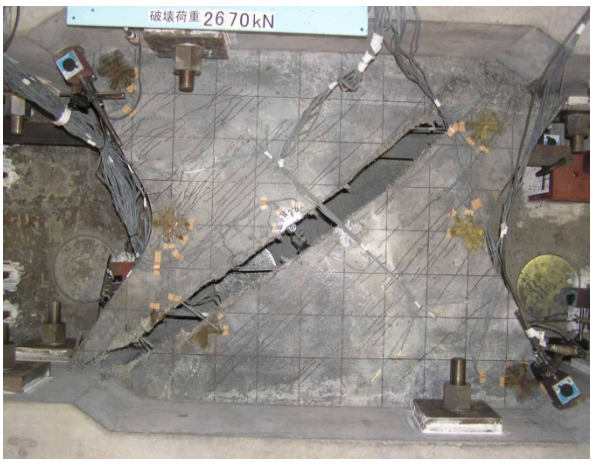


**Photo 3** Overall view of failure condition