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Fatigue testing of steel and fiber reinforced bridge deck slabs

This report is a continuation of the Missouri Department of Transportation funded work on steel-free hybrid reinforcement systems for concrete bridge decks. Steel sometimes presents a problem as a reinforcement material, as rusting can cause cracking and loss of strength. This can be mitigated by using glass fiber reinforced polymer (GFRP) as reinforcement instead. While more expensive to purchase, it is much stronger and gives better durability. The Civil Engineering department is researching the behavior of bridge deck slabs reinforced with GFRP rebar in one phase of a project meant to evaluate their viability as a building material. Three slabs were tested; one with conventional steel reinforcement to serve as a control, one with reinforcement made entirely of GFRP, and one with both GFRP and steel reinforcement bars. They were loaded with 20 kips at a frequency of 3Hz for one million cycles. As was predicted, the deck slabs with GFRP replacing steel were more resistant to cracks and did not fail as readily. The stiffness did not decrease with loading as much in the GFRP and hybrid slabs as in the control slab.