

# ULTRA-HIGH PERFORMANCE CONCRETE SHEAR KEYS IN CONCRETE BRIDGE SUPERSTRUCTURE

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**T**his research investigated the use of locally produced ultra-high performance concrete (UHPC) as a grouting material to repair deteriorated shear keys. Shear keys are used in adjacent girder superstructures to produce monolithic behavior and load transfer across the structure. Shear key durability is a concern since shear key degradation can jeopardize the integrity of the structure. Transportation agencies in the United States have reported that 75% of distress in adjacent girder bridges is due to cracking and de-bonding along shear keys. Previous research has shown that locally produced UHPC has excellent mechanical and durability properties. UHPC has also been shown to have good bonding characteristics that are desirable in a potential grouting material. Several tests were conducted to evaluate the potential of UHPC as a shear key grout material. Bond strength between UHPC grout and substrate concrete was evaluated using slant-shear and direct tension tests. Results showed that adequate bond was achieved at seven days. Low strengths at 28 days were observed due to the low strength of the substrate concrete. Shrinkage of UHPC grout was also investigated. Shrinkage at 28 days was less than 600  $\mu$  strain which is acceptable for repair practices. Full-scale testing was used to evaluate load-deflection behavior of channel girder assemblages with grouted shear keys. Results showed that UHPC grout and non-shrink grout had similar mechanical performance. Excellent bond was achieved with all grouts, even with minimal surface preparation. In fact, the shear keys remained bonded to the girders even when service load deflections were exceeded and no lateral restraint, such as post-tensioning, was provided. The similar performances of the non-shrink grout and the UHPC grout indicates that UHPC grout does not provide a mechanical benefit over the non-shrink grout.

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