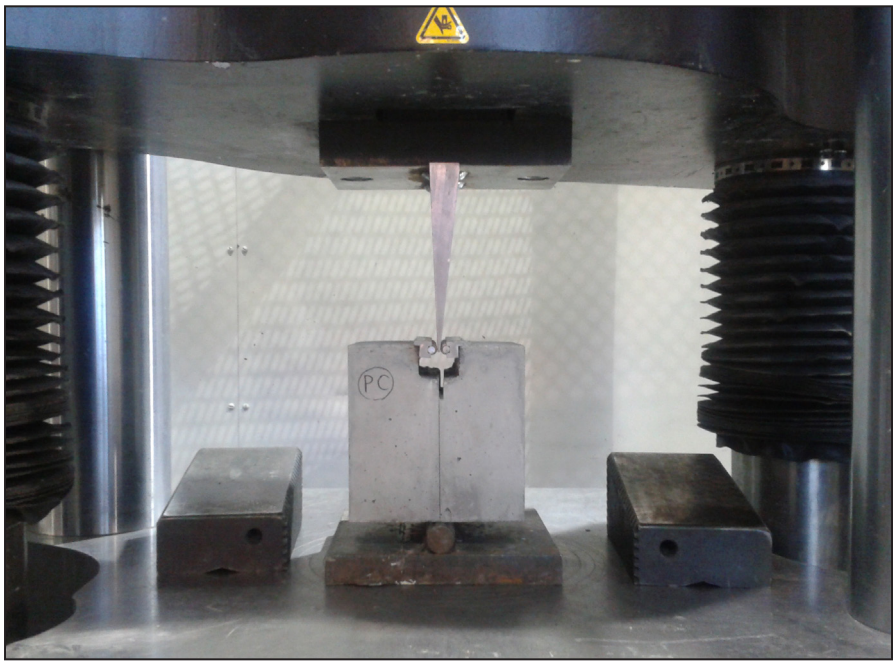
MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 17-319 (project 419) | March 2017

Cracking and Debonding of a Thin Fiber Reinforced Concrete Overlay



the ISSUE

Fiber reinforced concrete has been used in bonded resurfacing overlays and assumed to have improved performance as well as be cost-effective. The benefit of improved toughness by incorporating fibers, is proven to reduce cracking, yet other deformation characteristics and the bond interaction to the underlying layer is unknown.

the RESEARCH

The following are objectives of this study:

1. Investigate the impact of incorporating fibers on the mechanical properties of the bond by means of a wedge splitting test and a shear bonding test.
2. Investigate and characterize the effect of fiber on debonding behavior with experimental tests.
3. Develop a finite element model which predicts effects of debonding through shear or lift-off.

MOUNTAIN-PLAINS CONSORTIUM REGION 8

A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

Colorado State University
North Dakota State University
South Dakota State University
University of Colorado Denver
University of Denver
University of Utah
Utah State University
University of Wyoming

Lead Investigator(s)

Amanda Bordelon
bordelon@civil.utah.edu
University of Utah

Project Title

Cracking and Debonding of a Thin Fiber Reinforced Concrete Overlay

Research Assistant(s)

Min Ook Kim

Sponsors | Partners

University of Utah

Utah Department of Transportation

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the **FINDINGS**

Experimental tests found that the tensile interfacial energy increased with fiber-reinforcement. Also bond tests indicated that interfacial fracture occurred through the overlay mixture and was proportional to the number of fibers which intersected the fracture path near this interface.

The finite element analysis verified that crack width, vertical lift off, and debonding length all decrease as the fracture energy across a joint increases or as the interfacial tensile bond increases.

the **IMPACT**

Through this project, a series of testing systems were designed and built at the University of Utah lab to evaluate shear and lift-off performance of two-layer pavement systems. These can be used by future university, DOT, and other contracted projects for research and quality control measurements. The finalized testing systems and any limitations of using them can be found in the report.

The user element subroutine with the finite element modeling can be also similarly reproduced for future projects to improve validation and characterization of alternative pavement layer systems without extensive experimental testing always needed.

For more information on this project, download the entire report at http://www.ugpti.org/resources/reports/details.php?id=872

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.