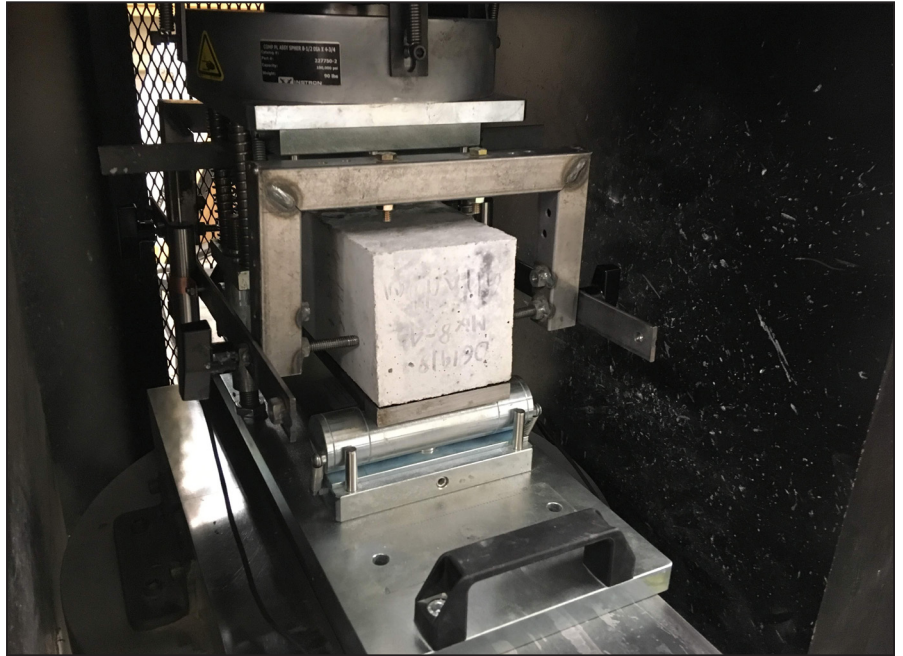


MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 18-371 (project 564) | December 2018

Quantifying the Range of Variability in the Flexural Strength of Fiber Reinforced Concrete using Monte Carlo Simulation



the **ISSUE**

Many laboratory studies have shown erratic flexural strength among replicate fiber reinforced concrete (FRC) specimens, leading to unreliable claims about the performance of a certain FRC elements in the field. Consequently, there is a need to mitigate this issue by either eliminating this variability or quantifying it statistically.

the **RESEARCH**

A load-deflection relationship coupled with Monte Carlo (MC) simulation was used to generate theoretical average residual strength (ARS) values. These values were used to predict a range of variabilities for several confidence levels. Experimental data of eight FRC mixes were used to evaluate the performance of the Monte Carlo prediction tool. Four mixes were prepared by the research team while the data for the other four were obtained from a previous study.

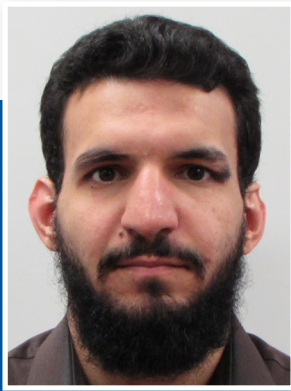


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University of Wyoming



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Project Title

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the FINDINGS

Experimental ARS values obtained in this study confirms the issue of significant variability among replicates. Predictions obtained through MC simulation succeeded in quantifying the range of variability in ARS for some mixes but failed for others. Oversimplification of the underlying model of the MC simulation is believed to be the main reason behind failed predictions.

the IMPACT

While not a perfect prediction tool, the MC tool developed in this study can be used to get an idea about the ARS value of FRC members reinforced with steel fibers. This study will serve as a first step towards better understanding the flexural behavior of FRC structural members. Consequently, it will aid in predicting its performance in the field.

For more information on this project, download the entire report at <http://www.ugpti.org/resources/reports/details.php?id=931>

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.



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