

# MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 24-518 (project 562) | March 2024

Evaluation of Durability and Structural Performance of Concrete with Embedded Inductive Coils



## the ISSUE

An inductive power transfer system (IPTS) may be one way to address the range and battery life issues currently limiting widespread adoption of electric vehicles (EVs). An IPTS would allow transfer of power from infrastructure elements like pavement to EVs. However, the durability and survivability of embedded electrified inductive coils in concrete pavement is unknown.

## the RESEARCH

To investigate the durability of the technology, two full-size slabs were cast with working electronics. The slabs were structurally tested while monitoring electrical parameters. The primary focus of this work was to study the durability of the concrete slabs. The secondary focus of the study was to determine how well the technology works under a variety of realistic loadings.

Both slabs with the embedded IPTS were subjected to high-cycle fatigue loading and then underwent monotonic loading to failure to confirm material properties.



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

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North Dakota State University  
South Dakota State University

University of Colorado Denver  
University of Denver  
University of Utah

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### Project Title

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## the FINDINGS

During the fatigue testing, both slabs experienced minor cracking; however, it was not until the upper limits of static testing that major failures occurred. Throughout the experiment, the embedded IPTS proved to be resilient and suffered little degradation in performance. The IPTS embedded in these concrete pads demonstrated reasonable durability with promise as a viable solution to the EV infrastructure's growing needs.

## the IMPACT

This study is an early work in the many electrical architectures that may be incorporated into actual charging applications. The findings regarding increased concrete durability are important for future work in this area.

For more information on this project, download the Main report at <https://www.ugpti.org/resources/reports/details.php?id=1198>

For more information or additional copies, visit the Web site at [www.mountain-plains.org](http://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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