

# Aggregate Freeze-Thaw Testing and D-Cracking Field Performance: 30 Years Later

Report Number: FHWA-KS-14-04 • Publication Date: September 2014

**Heather A. K. McLeod, Ph.D., P.E.**

**Joshua Welge, P.E.**

**Robert Henthorne, P.G.**

*Kansas Department of Transportation*

*Bureau of Research*

## Introduction

Premature deterioration of concrete pavement due to D-cracking has been a problem in Kansas since the 1930s. The Kansas Department of Transportation (KDOT) has made significant efforts, including five extensive studies into the phenomenon of D-Cracking, to mitigate the problem.

Kansas geology includes mineable limestone coarse aggregates with variable durability in the eastern portion of the state. Due to this variability and historically poor D-cracking field performance, KDOT initiated intensive identification and tracking of individual mined beds, as well as frequent durability testing during production in the 1980s.

Past changes in quarry production observation and QA/QC programs appear to have had some effect on the quality of pavements produced; however KDOT recognized that with the desire for longer lasting pavements, modifications to past testing of aggregate freeze-thaw durability are required to assess aggregate sources and achieve a longer exhibited pavement lives.



**D-Cracking in Kansas**

---

## Project Description

D-cracking field performance of concrete pavements containing limestone coarse aggregates was investigated in 2010-2012. Results of this investigation indicate that the rate of D-cracking decreased, but the minimum rate of D-cracking presence in concrete pavements is more than 30%.

## Project Results

In reaction to the results of the 2010-2012 study, KDOT implemented changes aimed at mitigating the risk of D-cracking. Implementation actions included increasing the number of freeze-thaw cycles for aggregate in concrete prisms from 300 to 660 cycles, freeze-thaw testing of all aggregate types (not just limestone) in concrete, focusing aggregate sampling at the point of concrete production, and including an “acceptable field-performance history” criterion for concrete aggregates. Ongoing research is being conducted to develop new methods to identify durable aggregates and faster testing techniques.

## Project Information Contact

For information on this report, please contact Joshua Welge, P.E., Field Engineering Administrator, District One, Area Six, Kansas Department of Transportation; 1290 S. Enterprise, Olathe, Kansas 66061; 913.764.4525; Joshua.Welge@ksdot.org

---

**KDOT Research Reports Catalog**

Search for:

Search In:  Document Title  Keyword  
 Reference Number  Reference Name(s)

Search Period:

Can't find it?? Check the [help](#) page for search tips.  
Learn more about the catalog [here](#).

If you have questions or comments, please send an e-mail to: [library@ksdot.org](mailto:library@ksdot.org)  
[Help page for retrieval errors](#)

## Directions for Downloading the Full Report

To download the full report, visit <http://www.ksdot.org/burmatres/kdotlib2.asp> and do the following:

1. Enter KS-14-04 in the search box.
2. Click the Search button to the right of the search box.
3. You may have to scroll to find the specific report.
4. To download the report, click on the title of the report to open the PDF file and save it to your hard drive.

If you have any questions, please email us at [library@ksdot.org](mailto:library@ksdot.org).