

# Best Practices for Concrete Pumping

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**Kyle A. Riding, Ph.D., P.E.**

**Jan Vosahlik**

*Kansas State University Transportation Center*

**Dimitri Feys, Ph.D.**

*Missouri University of Science and Technology*

**Travis Malone, P.E.**

**Will Lindquist, Ph.D., P.E.**

*Kansas Department of Transportation*

## Introduction

Pumping is one of the major placement techniques used in the concrete industry to deliver concrete from the mixing truck to the formwork. Although concrete pumping has been used to place concrete since the 1960s, there is still a lack of exact knowledge supported by research evidence as to what affects concrete pumpability and how pumping changes concrete properties.

## Project Description

A three-phase research study was carried out to (1) investigate performance of pumped concrete in field conditions, (2) identify concrete properties affecting pumpability, and (3) assess the effects of pumping on the concrete air void system. In the first phase of the research program, six Kansas Department of Transportation (KDOT) project sites were visited during the summer of 2015, and concrete was sampled before and after pumping. In addition to measuring fresh concrete properties as well as performing hardened air void analysis of all sampled mixtures, rheological and tribological tests were performed on sampled concrete. The second phase of the study consisted of a full-scale controlled pumping experiment. During the experiment, three different concrete mixtures were pumped, and both fresh and hardened properties of the concrete were determined. Additionally, the pumping system was equipped with strain gauges to measure pumping pressures. Finally, the third phase of the study consisted of measuring the rheological and tribological properties of 35 concrete mixtures in order to determine the effect of various concrete components on pumpability.

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## Project Results

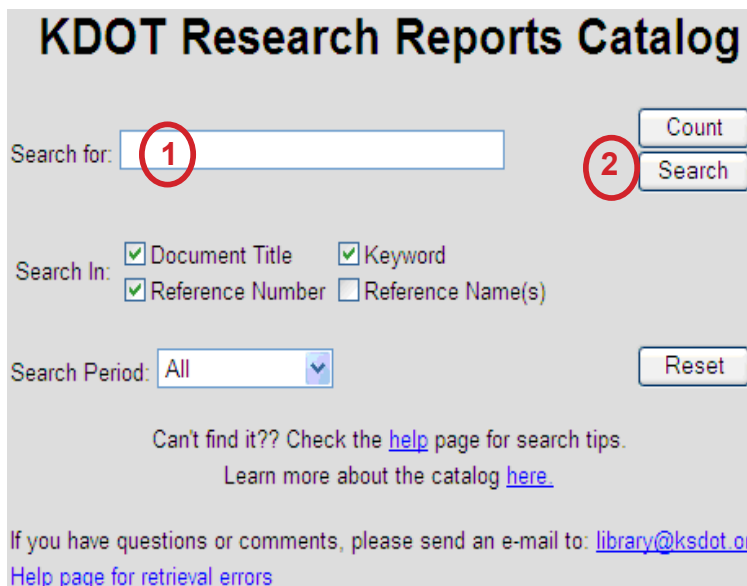
Based on the project findings, it is recommended that KDOT implement the following:

1. Do not use the Super Air Meter (SAM) number as a quality control requirement for pumped concrete.
2. Investigate the use of nanoclay particles to improve pumpability of concrete containing low paste volumes.
3. When having issues with pumpability of a mixture, lower the percentage of coarse aggregate and raise the corresponding percentage of fine aggregate in the concrete mixture. This is often possible with little impact on the paste volume.
4. Sample concrete from the formwork rather than directly from the pump discharge.

## Project Information

For information on this report, please contact Mustaque Hossain, Ph.D., P.E.; Kansas State University, 2124 Fiedler Hall, Manhattan, KS 66506; (785) 532-1576 phone; [mustak@ksu.edu](mailto:mustak@ksu.edu).

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