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Research Notes

PAV TPF 1566: V-Kelly Slipform Paving Vibration Test, TPF-5(498)

Testing innovative technologies related to asphalt and concrete paving in partnership with the Federal Highway Administration (FHWA).

Pavement

May 2025

Project Title:
PAV TPF 1566: V-Kelly Slipform Paving Vibration Test, TPF-5(498)

Task Number: 4185

Start Date: April 1, 2023

Completion Date: June 30, 2026

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WHAT IS THE NEED?

Traditionally, concrete workability has been assessed by the slump test or Kelly ball penetration test. However, it has been noted that these traditional workability tests did not consider the effect of vibration on consolidation, and therefore, did not provide a complete picture of the workability of a slipform paving concrete mixture under vibration. The Vibrating Kelly Ball (V-Kelly) test was developed by Iowa State University with the support from FHWA to provide agencies and contractors a tool that can report how a slipform paving mixture responds to vibration. Through a previous pooled fund project on the development of implementation of performance engineered mixture (PEM) design of paving concrete, this new test method has been evaluated in the laboratory and field conditions in many participating states, including the California Department of Transportation (Caltrans). Initial evaluation by agencies has shown that the V-Kelly does provide useful quantitative data on how a mixture will perform under a paving machine and that it could distinguish between workability of mixtures with similar slumps. On the other hand, there was another common feedback that indicated that, while seemingly technically sound, the test was sometimes challenging to operate due to some issues with the testing device. As a result, a need for a separate new pooled fund study has been called to improve the current test device and procedures for more successful implementation of the V-Kelly test method.

WHAT ARE WE DOING?

This is a new two-year pooled fund project starting from FY 22/23. Each participating state is required to contribute $10,000 per year or a total of $20,000 for the two-year period. Caltrans was one of the participating agencies of the previous pooled fund study that evaluated the V-Kelly and other

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test methods for the performance-engineered mixture (PEM) design of paving concrete. We will continue to participate in this new pooled fund study and provide technical overview and inputs throughout the process of the update and practical implementation of the improved V-Kelly test method.

WHAT IS OUR GOAL?

The study goal is to achieve the practical implementation of improved V-Kelly test method. The following study outcomes are anticipated:

- Improved V-Kelly device that is more user friendly and can be handled by one person in the lab or the field.
- Revised AASHTO TP 129, Provisional Standard Method of Test for V-Kelly Penetration in Fresh Portland Cement Concrete.
- Technical guidance on how to interpret the test results and improve mixture proportioning and field operations.

WHAT IS THE BENEFIT?

With the participation in this proposed pooled fund study, Caltrans will be able to make sure that the effects of California specific concrete materials and mixtures behaviors are to be properly considered when improving the V-Kelly test device and procedures.

WHAT IS THE PROGRESS TO DATE?

MNDOT Data have been analyzed and correlated with viscosity. Additional lab tests have been conducted. A larger head has been ordered for use in higher slump mixtures

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