

PEM TEST FOR WORKABILITY: THE VKELLY TEST



Why do we need this test?

One of the six critical concrete mixture properties defined under the Performance Engineered Mixtures (PEM) program is workability. For slipform pavements, this is defined by the need for the mixture to be fluid when in the paver and able to stand up when the machine moves on. With increasingly complex mixtures and placement processes, the need is increasing to measure how a mixture responds to vibration. The Vibrating Kelly Ball (VKelly) test meets that need.

The VKelly test is primarily intended for the mixture proportioning and approval stage of a project when selecting aggregate systems and the cementitious contents of a mixture. Developing a workable mixture during this stage results in several improvements that can lead to savings:

- Reduced cementitious content
- Reduced finishing effort
- Improved ride
- Improved durability

What does the test tell us?

Mixtures with similar slumps may respond very differently when a vibrator is applied to a mixture. The VKelly test directly measures how fluid a mixture becomes when it is vibrated.

How do we run the test?

A vibrator with a small head connected to a controlled speed motor is bolted to a conventional Kelly ball:

1. The speed at which the ball sinks with the vibrator running at 8,000 rpm is recorded for 36 seconds.
2. The slope of the line of depth versus square root of time is reported as a VKelly index.

What do the numbers mean?

- A VKelly index of 0.6 in./√sec or below indicates that the mixture will be difficult to consolidate.
- A value above 1.1 in./√sec has been tied to mixtures prone to edge slump.

What do I need?



VKelly test



VKelly index was measured on successive truckloads

More information?

The method is fully described in AASHTO TP 129, Standard Method of Test for Vibrating Kelly Ball (VKelly) Penetration in Fresh Portland Cement Concrete. Additional resources, including a demonstration video, are available at <https://cptechcenter.org/performance-engineered-mixtures-pem/pem-test-methods/>.

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