

PEM TEST FOR WORKABILITY: THE BOX 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 while in the paver and able to stand up when the machine moves on. With increasingly complex mixtures and placement processes, the need to measure how a mixture responds to vibration is also increased. The Box Test meets that need.

The Box 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 mix during this stage results in several improvements that can lead to savings:

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

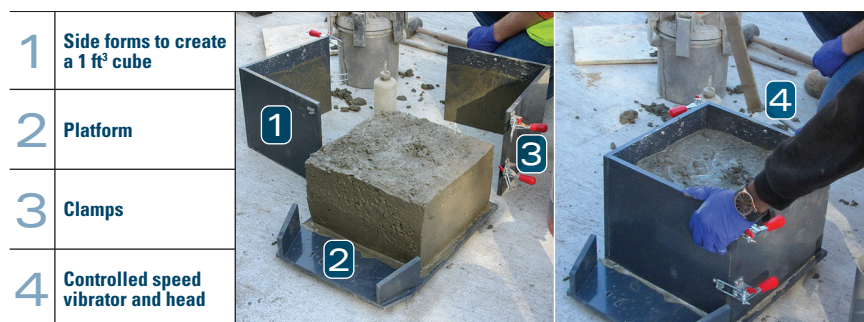
What does the test tell us?

Mixtures with similar slumps may respond very differently when a vibrator is used during placement. The Box Test indicates how well a mixture will be consolidated with a given amount of energy and if it is prone to edge slump.

How do we run the test?

1. A 12 x 12 x 12 in. box is partially filled with concrete.
2. A controlled speed vibrator running at 12,500 vpm is put into the mixture and withdrawn in 6 seconds total time.
3. The forms are immediately removed.
4. The formed surfaces are inspected to assess voids and edge slump.

What do I need?

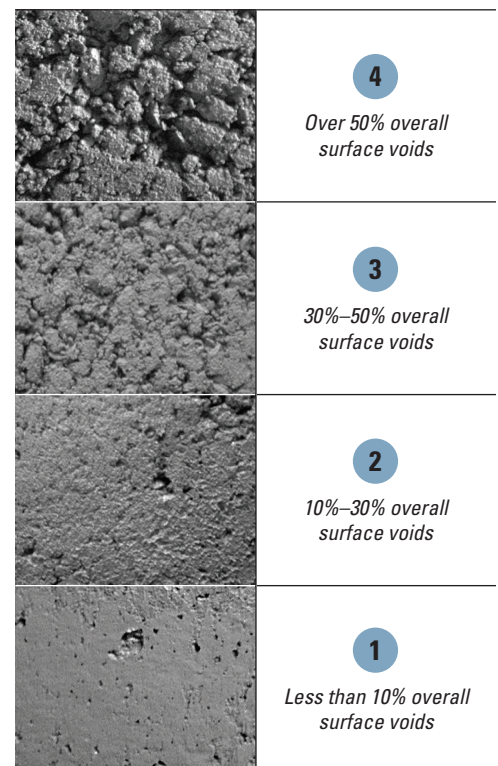


Box Test equipment

What do the numbers mean?

The following metrics are desirable:

- Edge slump less than 0.25 in. (6 mm)
- A ranking of 2 or less, based on the following illustration (indicating less than 30% surface voids)



Surface void ranking

More information?

The method is fully described in AASHTO TP 137, Box Test in Slip Form Paving of Fresh Portland Cement Concrete, with other resources available at <https://cptechcenter.org/performance-engineered-mixtures-pem/pem-test-methods/>.