Concrete Property Test

Workability 1-5: Vibrator Monitoring

National Concrete Pavement Technology Center

www.cptechcenter.org

Purpose – Why Do This Test?

Proper vibration is essential to providing long-term durability for a portland cement concrete pavement. Excessive vibration can adversely affect the entrained air properties of the concrete, resulting in premature failure due to freeze-thaw deterioration. Segregation is also an unwanted by-product of excessive vibration. A pavement that is segregated has an excess of paste in the upper portion and a highly permeable matrix of coarse aggregate in the lower portion; strength is reduced, and the pavement is left susceptible to the intrusion of unwanted fluids. A pavement that is undervibrated will have excessive voids, resulting in reduced strength and durability.

Principle – What is the Theory?

Automatic vibrator monitors provide real-time feedback to the paver operator, as well as the capability to download vibrator frequency data for further analysis. Each mixture will react differently to vibration. In general, gap-graded mixtures will segregate more easily than dense-graded mixtures. Pavement thickness and paver velocity are also factors that should be considered when determining a maximum vibrator frequency. Some state departments of transportation (DOTs) specify a maximum vibrator frequency in the range of 7,000 to 9,000 vpm.

Test Procedure – How is the Test Run?

Vibrator monitoring is not a test. Rather, it is a continuous process check. The hardware provides alarms to warn the operator when pre-programmed specification limits are exceeded. Because a paver operator has many duties besides watching the vibrator monitor, it is important to download and review the data daily.

Test Apparatus

- Vibrator monitor.
- Portable computer for daily analysis.

Test Method – Refer to Manufacturer's Recommendations

Output – How Do I Interpret the Results?

Graphing the daily vibrator monitor data as shown in figure 1 provides a quick check of whether vibrators are malfunctioning or set at too high of a frequency.

Construction Issues – What Should I Look For?

Vibration issues are difficult to identify from simply observing the freshly placed pavement. Segregation may be recognized in cores taken from the hardened pavement. However, underconsolidation due to a "dead" vibrator is more difficult to identify unless a core is coincidentally taken in the path of the "dead" vibrator. In short, vibrator monitors provide the best and quickest feedback about potential consolidation issues in the pavement.

continued on next page

FOR MORE INFORMATION

CP Tech Center | Iowa State University | 2711 S. Loop Dr. Suite 4700, Ames, IA 50010-8664 | 515-294-5798

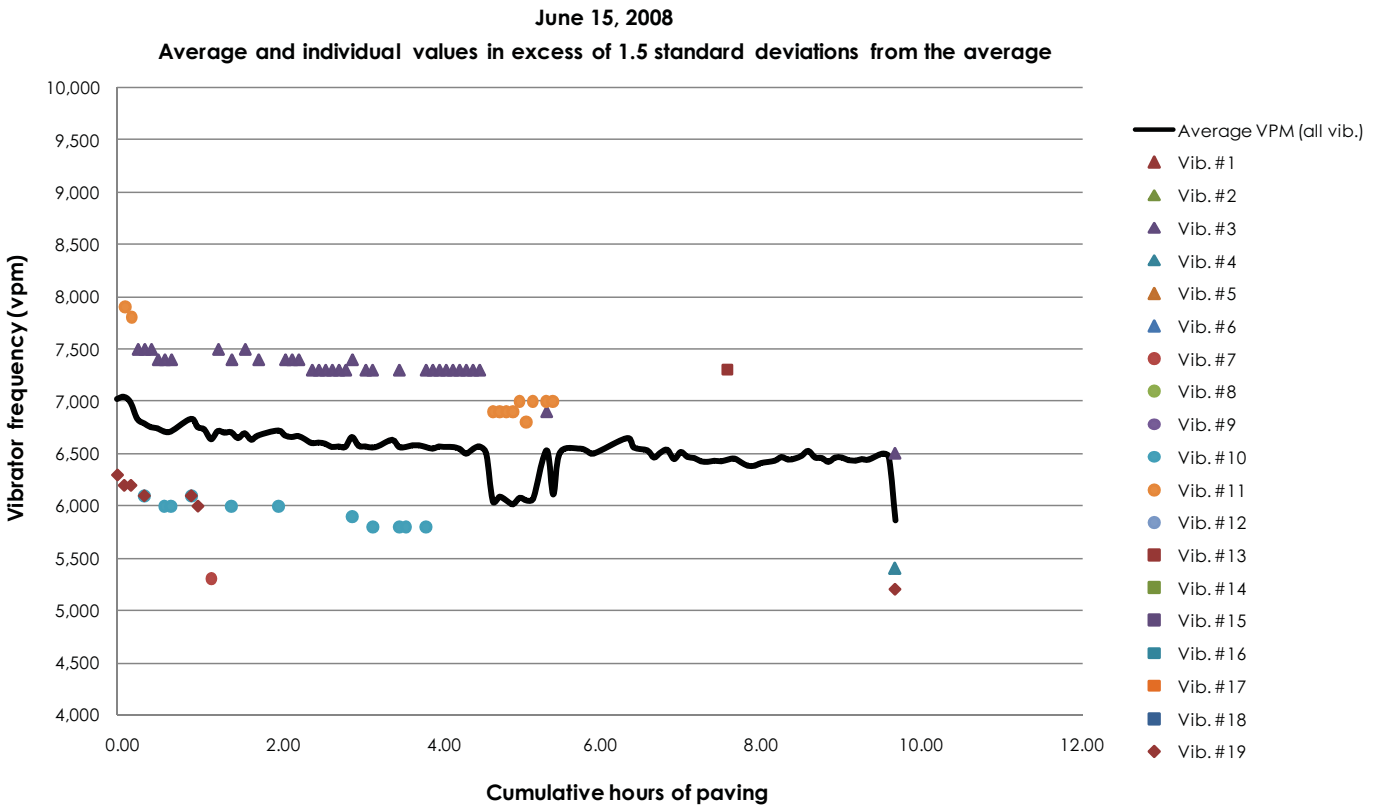

Figure 1. Vibrator frequency (data points at 5 min. intervals)

APRIL 2008

ctre Center for Transportation Research and Education

Iowa State University

This test summary is one of a set of summaries originally published in chapter 7 of the *Testing Guide for Implementing Concrete Paving Quality Control Procedures* (Fick, G., Iowa State University, Ames, Iowa, 2008). The testing guide is a product of a 17-state, Federal Highway Administration pooled-fund project, Material and Construction Optimization for Prevention of Premature Pavement Distress in PCC Pavements, TPF-5(066). The project was managed by the National Concrete Pavement Technology Center at Iowa State University.