



Project Number
BEB28

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Development of a Test to Quantify Organic Content in Silica Sand

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Current Situation

Portland cement concrete is composed of at least four main ingredients: Portland cement, water, coarse aggregate (rocks), and fine aggregate (sand). Fine aggregates may contain organic material, which can inhibit cement hydration reactions, increase setting time, or cause a loss in strength. Identifying the type and amount of organic material in sand provides useful information about whether cement strength or setting time may be adversely affected by the sand.

Currently, the Florida Department of Transportation (FDOT) uses AASHTO T21 to screen sand for organic content. If they are found to have excessive organic material, AASHTO T71 is used to determine if the fine aggregate negatively impacts the concrete's strength.

New testing methods offer rapid measurement, automation, and allow for greater sampling throughput. Previous research identified the Walkley Black test and elemental analysis of carbon test as potential replacements for the AASHTO T21 and T71. This research determined whether those tests could do so.



As part of a recent study, researchers at the University of Florida found that the presence of sand in concrete does not impact the strength of concrete.

Research Objectives

The objective of this project was to determine whether a modified Walkley Black test or elemental analysis of carbon test can be used as a substitute test for the AASHTO T21 or AASHTO T71 tests.

Project Activities

After a literature review of previous research identifying potential replacement tests, the University of Florida research team tested 18 sand samples from Florida and Georgia with T71, T21, the modified Walkley Black, and elemental analysis via combustion.

The team then conducted additional tests to evaluate the concentration of other elements that may interfere with concrete setting, including zinc, boron, and phosphorus. The team also evaluated how each sand sample influenced cement hydration.

Project Conclusions and Benefits

The research recommended that the modified Walkley Black method and elemental analysis via combustion can be adopted to measure carbon content in sands in lieu of AASHTO T21. However, neither test was suitable to replace AASHTO T71. The fine aggregates did not cause any issue with cement hydration or interference with the cement hydration reaction. Any mortar strength loss must have been due to other factors that should be investigated in the future.

For more information, please see fdot.gov/research.