ARDOT TRC TRANSPORTATION RESEARCH COMMITTEE

PROBLEM STATEMENT
No. 14

RESEARCH PROBLEM STATEMENT

DATE: 09/07/2018	**PROJECT AREA:** Materials

TITLE: Fly Ash Carbon Content Dye Test

PROBLEM STATEMENT:

Fly ash is a supplementary cementitious material capable of improving concrete quality while reducing its cost. As fly ash is a byproduct of coal fired power plants, its quality control for use in concrete is not a priority. A drawback of this is that the carbon content of fly ash can vary between and within shipments and suppliers. When concrete is to be air entrained, excess carbon content can adsorb air entraining admixtures (AEAs), making it difficult to select a proper dosage of AEA. Several test methods have been proposed (foam test, iodine tests), but these methods have drawbacks. What is needed is a test that can provide accurate and reproducible information on the carbon content of fly ash and whether it is likely to de-train air. What is proposed is a simple dye test, where a standard mixture of the constituent materials is prepared, and a standard amount of dye is added to the mixture. After a prescribed period of time, the final color of the resulting mixture is compared to a color wheel. This color will be correlated to lab testing of a variety of air entrained concrete mixtures to determine if the test can accurately predict if the fly ash will de-train air.

OBJECTIVES:

Locally available materials will be gathered for the concrete mixtures in this study. Fly ash producers will be engaged to obtain a variety of fly ash samples representing different amounts of carbon. These materials will be used to make standard ARDOT S(AE) mixes and the amount of air entrainer needed to reach 6% air will be recorded. A variety of dye tests will be performed on the fly ash samples, and the results will be compared to the concrete air tests to determine if there is a correlation. To validate the test, UV absorbance spectra will be measured to ensure the repeatability of the test and develop the color wheel. Based on this work, results obtained from the dye test can be used as an acceptance criteria for fly ash.

FORM OF RESEARCH IMPLEMENTATION AND RETURN ON INVESTMENT:

This new testing paradigm can be put to use by ARDOT, concrete contractors, and fly ash suppliers. It represents a simple, accurate, and reproducible test method that will facilitate better quality control of air entrained concrete containing fly ash. If fewer trucks are rejected based on the criterion with regard to the air content, this test could help save time and cost on construction projects.

Estimated Project Duration: 24 **Months**

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Standing Subcommittee Ranking	Advisory Council Ranking	Statement Combined with Statement Number(s)
1/7	7/37	