Testing for Alkali Silica Reactivity

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An alkali-silica reaction takes place when the alkali in cement reacts with the reactive silica in the aggregate to form a gel which absorbs water. This process causes the concrete to crack and eventually fail if it is not constantly repaired. ASR is a large scale problem for both structural and financial reasons. Due to the cracking and damaging of concrete many cost issues arise. Multiple projects that should have a long life span have that span cut in half. The testing of ASR is a very long process. It is as long as it is because the reaction does not occur immediately. This causes projects to be built with aggregate that is reactive without being known. The current testing takes a year at minimum. The year that it takes to test forces a project to be put on hold. Beams were created and tested in compliance with ASTM C1293-05. The test involves the creation of bars with a cross sectional area of 3 square inches and a length of 11.25 inches. After a period of 24 hours, the molds will be stripped and the bars will be removed and measured for initial length. Drying ovens will be preheated at temperatures of 100, 120, 160, and 180 degrees Fahrenheit. The bars will be in the ovens for 28 days being tested at 7, 14, 21, and 28 days. The results will be recorded in order to calculate the percent change over the 28 day test period. A change in .04 percent in length change in a year’s period would show that an aggregate is considered potentially reactive. Two different aggregates have been tested; one known to be ASR reactive, one known to not be ASR reactive. Alkali silica reaction testing takes up to a year and can continue to be tested for longer periods of time. The goal of this project is to determine if the length of the ASTM testing can be decreased by increasing the temperature from the standard of the length testing to a shorter time allowing for shorter tests and quicker field response to ASR problems.

At Wentworth Institute of Technology this ASR project is part of the EPIC (Externally-collaborative project-based interdisciplinary curricula) learning program. The EPIC program is a way where this team can work on research with outside mentors. Wentworth Students have been assisted by employees of the Grace Company in order to guide and help achieve the goals.