

DEVELOPMENT OF MANUFACTURING TECHNOLOGY FOR FLOWABLE SLURRY CONTAINING FOUNDRY SAND AND FLY ASH

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Reference: CBU-1994-03

ABSTRACT

This project was conducted to establish mixture proportion technology for flowable slurry incorporating foundry sand and fly ash. In this work, two different flowable fly ash slurry mixtures were proportioned for strength levels in the range of 50-100 psi at 28 days using two sources of ASTM Class F fly ash. The first mixture containing Oak Creek fly ash was proportioned to obtain a flow/spread of 16 ± 1 in., and the second mixture with Port Washington fly ash was proportioned to have a flow of 11 ± 2 in. These mixtures were used as reference mixtures for this study. The other mixtures contained used and clean foundry sand as a replacement of fly ash. For each mixture design, fly ash was replaced with foundry sand at four different levels (30, 50, 70, and 80%).

The ingredients of the slurry mixtures such as fly ash, clean foundry sand, and used foundry sand were tested for their physical and chemical properties, and leachate behavior. The leachate results of these materials based on one observation showed that these materials, except the Port Washington fly ash, met the drinking water standards. These materials were found to be appropriate for manufacture of flowable slurry materials. Various flowable mixtures made with and without foundry sand were evaluated for settlement, setting and hardening characteristics, compressive strength, permeability, length change (drying shrinkage), and leachate characteristics.

Generally compressive strength of the flowable slurry materials increased with age and was found to vary between 40-100 psi for the mixtures tested at 28 days. The permeability of the flowable fill mixtures was negatively affected by increases in either water to cementitious materials ratio or foundry sand content. However, more tests are needed to evaluate environmental impacts of these materials for use in Controlled Low Strength Materials (CLSM).

The Oak Creek fly ash mixtures made with and without foundry sand conformed to the requirements of the drinking water standards. However, most of the mixtures made with the Port Washington fly ash fail to do so for selenium. In general, addition of the foundry sands caused substantial reduction in concentration of the elements that are considered hazardous in accordance with drinking water standards. Therefore, the use of foundry may provide favorable environmental impact.