

ENVIRONMENTAL IMPACT ASSESSMENT OF CONTROLLED LOW STRENGTH MATERIALS INCORPORATING FLY ASH AND FOUNDRY SAND

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ABSTRACT

This project was conducted to evaluate the environmental impact of Controlled Low Strength Materials (CLSM) incorporating fly ash and foundry sand. Two different flowable fly ash slurry reference mixtures were proportioned for strength levels in the range of 0.3 to 0.7 MPa (50 to 100 psi), at 28 days, using two sources of ASTM Class F fly ash. For each reference mixture, other mixtures were proportioned using two sources of foundry sand as a replacement of fly ash in the range of 30 to 85%.

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 characteristics. All CLSM mixtures made with and without foundry sand were evaluated for settlement, setting and hardening characteristics, compressive strength, permeability, and leachate characteristics. The leachate results of these CLSM-making materials were below the Enforcement Standard of the Wisconsin Department of Natural Resources (WDNR) Groundwater Quality Standard. They also met practically all the parameters of the Drinking Water Standards.

Generally, compressive strength of the flowable slurry materials increased with age and was found to vary between 0.3 and 0.7 MPa (50 to 100 psi) for the mixtures tested at 28 days. The leachate results of all the CLSM mixtures made with and without foundry sand were below the Enforcement Standard, and they also met practically all the parameters of the Drinking Water Standards. Generally, addition of the foundry sand caused substantial reduction in concentration of the elements that are considered hazardous in accordance with WDNR Groundwater Quality Standard. Therefore, the use of foundry sand may provide favorable environmental impact.