

# **CONTROLLED LOW STRENGTH MATERIALS INCORPORATING FOUNDRY SAND AND FLY ASH**

By Tarun R. Naik and Shiw S. Singh

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## **ABSTRACT**

This project was conducted to evaluate the use of used foundry sand and fly ash in Controlled Low Strength Materials (CLSM). Two different flowable fly ash slurry reference mixtures were proportioned for strength levels in the range of 0.34 to 0.69 MPa, 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, fly ash, clean foundry sand, and used foundry sand, were tested for various properties, including their leachate characteristics. All CLSM mixtures made with and without foundry sand were evaluated for settlement, setting and hardening, compressive strength, permeability, drying shrinkage, and leachate characteristics. The leachate results of these materials were below the enforcement standard of the Wisconsin Department of Natural Resources (WDNR) Groundwater Quality Standard. They also met requirements of almost all parameters of the Drinking Water Standard. Generally, compressive strength of the flowable slurry materials increased with age and was found to vary between 0.34 and 0.69 MPa for the mixtures tested at 28 days. The permeability values for the mixtures tested varied from  $3 \times 10^{-6}$  to  $74 \times 10^{-6}$  cm/s. Generally, addition of the foundry sand caused substantial reduction in the concentration of the chemical elements that are considered hazardous in accordance with WDNR Groundwater Quality Standard.