

# **UTILIZATION OF USED FOUNDRY SAND: CHARACTERIZATION AND PRODUCT TESTING**

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## **ABSTRACT**

This report contains information on the work carried out for characterization of the foundry by-products produced by Falk Corporation, Milwaukee, WI; Maynard Steel Casting Co., Inc., Milwaukee, WI; and Waupaca Foundry, Inc., Waupaca, WI; and clean/new sand supplied by Badger Mining Corporation, Fairwater, WI. This report details determination of chemical and physical properties of foundry operation by-products. A detailed microscopic analysis was also carried out as a part of this characterization study. Based on the characterization in this Phase II studies, selected used foundry sands were used to make and test trial concrete batches in the CBU laboratories.

In the Phase III, a laboratory study was conducted with a view to investigate the performance of fresh and hardened concrete products containing discarded foundry sands as a replacement of fine aggregates. A control concrete mix was proportioned to achieve a 28-day age compressive strength of 6000 psi. Additional concrete mixes were proportioned to replace 25% and 35% of regular concrete sand with used foundry sands by weight. Concrete performance was evaluated with respect to compressive strength, tensile strength and modulus of elasticity. At the 28-day age, concrete containing used foundry sands showed about 25% lower values than concrete without foundry sand. However, it is expected that this shortfall can be overcome by use of chemical and powder additives to concrete. This will be investigated in the next year's testing program. Phase I activities report, detailing current state of the world-wide knowledge, was prepared and finalized earlier before starting work described in this report.

Three mortar mixes were also designed to make concrete bricks and blocks and test them to determine compressive strength, absorption and bulk density. Used foundry sands were used as a partial replacement of the regular concrete sand. A technical feasibility of utilizing discarded foundry sand has been established with this preliminary research (Phase III).

This report also contains proposed work plan for foundry by-products utilization in a detailed laboratory work phase (configuration of Phase III).