

USE OF HIGH-CARBON FLY ASH IN MANUFACTURING CONDUCTIVE CLSM AND CONCRETE

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SYNOPSIS

Presented in this paper are results of an experimental work conducted for the study of feasibility of using high-carbon fly ash in manufacturing electrically conductive controlled low-strength materials (CLSM) and concrete. The loss on ignition (LOI) of the fly ash was greater than 12%. For this study, three CLSM mixtures and three concrete mixtures were used. For the CLSM mixtures, high-carbon fly ash content was varied from 22% to 93% of the total solid materials (cement + fly ash + sand + stone). One CLSM mixture was made without aggregates, another contained fine aggregate, and the third contained fine and coarse aggregates. For all the concrete mixtures, the high-carbon fly ash content was kept at 43% by mass of total cementitious materials. In one of the concrete mixtures, steel fibers were also used. In another concrete mixture, taconite (iron ore) pellets were used as coarse aggregate. The CLSM and concrete mixtures did not contain any chemical admixtures. Electrical resistance of moist-cured (saturated) and air-cured specimens of CLSM and concrete mixtures were measured at 3, 7, 14, and 28 days. The CLSM showed approximately 5 to 15 times lower electrical resistance than the concrete. Electrical resistance of concrete reduced by half upon inclusion of approximately 3% steel fibers by mass of concrete or upon replacement of natural coarse aggregate with taconite pellets. This study also shows that high-carbon fly ash can be used in manufacturing conductive flowable slurry (CLSM) and concrete. Such materials can be used for conducting electrical charge from lightening to the ground more safely.