USE OF WE ENERGIES FLY ASH FOR DEVELOPING ECONOMICAL SELF-CONSOLIDATING CONCRETE

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ABSTRACT

TITLE:

Use of We Energies Fly Ash for Developing Economical Self-Consolidating Concrete (by Tarun R. Naik, Yoon-moon Chun, and Rudolph N. Kraus)

BACKGROUND:

To use by-product materials to reduce and/or replace concrete admixtures, particularly the viscosity modifying admixture (VMA), for producing an economical self-consolidating concrete (SCC) mixture.

OBJECTIVE:

The primary objective of this project was to evaluate and explore the possibility to use coal fly ash, limestone quarry fines, and foundry bag-house dust in the manufacturing of economical self-consolidating concrete.

CONCLUSIONS:

The We Energies fly ash and Rockwell limestone quarry fine have potential for utilization in the manufacturing of economical self-consolidating concrete. The test data collected indicate that these materials can be used in the manufacturing of economical self-consolidating concrete in different ways. SCC with the 28-day strength of more than 8000 psi can be produced in economical way by using Class C fly ash for the replacement of up to 55% of total cement by mass. When quarry fine material is used for the substitute of sand then it also reduces the requirement of chemical admixtures (i.e., superplasticizer and viscosity modifying agent). Use of Class C fly ash and quarry fines significantly reduced the amount of expensive chemical admixtures in producing SCC.

Replacement of fly ash with limestone quarry fine did not result in any appreciable benefits from the cost aspect of the self-consolidating concrete.

Foundry baghouse dust material can be also used for partial replacement of fly ash and sand together in a self-consolidating concrete. However, it did not reduce use of chemical admixtures; and, therefore, its use did not help reduce the cost of SCC directly. The replacement level could be less than 10% by mass of fly ash. The use of foundry dust drastically increases air content of the concrete. Therefore, more extensive work is scheduled before arriving at a definite conclusion regarding its use in self-consolidating concrete. Use of foundry baghouse dust should also be explored with high-LOI coal ashes to overcome its typical challenge in obtaining an adequate amount of air entrainment in concrete.