

USE OF LIMESTONE QUARRY BY-PRODUCTS FOR DEVELOPING ECONOMICAL SELF-COMPACTING CONCRETE

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ABSTRACT

The scope of this research was to determine the usefulness of limestone-quarry by-product material in the development of economical self-compacting concrete (SCC). Class C fly ash was also used and it was received from a power plant in Wisconsin. The main objective of this project was to evaluate the possibility for using these materials to reduce costs of expensive chemical admixtures needed for the manufacturing of self-compacting concrete. Use of quarry fines and Class C fly ash in self-compacting concrete is expected to provide significant economic benefits to quarries, coal-fired power plants, and concrete producers. Based on the extensive laboratory work, it was concluded that the limestone-quarry fines and Class C fly ash have high potential for utilization in the manufacturing of self-compacting concrete (SCC). The test data collected indicate that these materials can be used in the manufacturing of economical SCC in several different ways. When quarry fine material was used for the substitute of natural sand, it reduced the requirement of chemical admixtures, high-range water-reducing admixture (HRWRA) and viscosity-modifying admixture (VMA), without affecting the strength of SCC. The 28-day compressive strength of the mixtures made with sand replaced with quarry fines was in the range of 7,500 psi and 9,000 psi, qualifying the mixtures to be classified as high-strength SCC (≥ 6500 psi). Also by using Class C fly ash for the replacement of up to 55% of total cement by mass, high-strength SCC with the 28-day strength in the range of 9,000 psi and 10,000 psi was produced in an economical way. In conclusion, the use of quarry fines and Class C fly ash significantly reduced the amount of expensive chemical admixtures such as HRWRA and VMA in producing SCC.