

Use of Residual Solids from Pulp and Paper Mills for Enhancing Strength and Durability of Ready-Mixed Concrete

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ABSTRACT

This project is proposed to provide a practical solution to disposal problems for pulp and paper mill by-products and provide an economical source of fiber reinforcement for ready-mixed concrete production. The first year's project activities are directed toward optimizing mixture proportions and production technologies under controlled laboratory conditions. Fibrous residuals generated from pulp and paper mills will be used for the first year's activities. The second year's activities (Year 2) involve study of market acceptance as well as market barriers for the use of residual solids in the ready-mixed concrete. Economic impact will be studied and additional specialized tests will be conducted. The activities proposed for the third year (Year 3) will involve pilot-scale production at ready-mixed concrete manufacturing plants and cast-concrete products (bricks, blocks, and paving stones) with concrete mixtures containing pulp and paper mill by-products. A number of cost-effective concrete products could then be manufactured using pulp and paper mill residual solids. As a result, large amounts of such by-products that are currently being landfilled can be utilized in the manufacture of concrete products. Specifically, the goals of this project will be:

- (1) Monitor new literature and research for specifications and other requirements for concrete with residual solids.
- (2) Collect laboratory performance data for high-strength/high-performance/high-quality/high-durability concrete containing residual solids.
- (3) Conduct tests for physical, chemical, and morphological properties of residual solids to ensure that the residual solids will have the desirable characteristics for the intended field application in various types of ready-mixed concrete production.
- (4) Conduct a market study to understand market acceptance as well as market barriers for the use of residual solids in ready-mixed concrete. Evaluate economic impact.
- (5) Conduct specialized long-term and durability laboratory tests on concrete containing residual solids.
- (6) Conduct field performance evaluation for production of ready-mixed concrete with residual solids and construction demonstration.
- (7) Provide practical production and construction information to potential users, producers, engineers, owners, paper industry officials, government officials, and others regarding ready-mixed concrete with residual solids. Prepare information on various options for use, mixture proportioning, and results of field demonstration projects. Conduct technology transfer workshops for products containing residual solids (for example, in conjunction with field demonstrations).
- (8) Provide guidelines for mixture proportioning for production of ready-mixed concrete with residual solids for manufacturers.

(9) Produce draft specifications for residual solids use to guide pulp and paper mills, ready-mixed concrete producers, and other users in potential applications and to satisfy other requirements such as strength and durability.

(10) Work with selected pulp and paper mills to implement this new technology in their geographical area.