

Effect of Cenospheres on Flyash Brick Properties

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ABSTRACT

In January 2006, the National Science Foundation awarded Freight Pipeline Company (FPC) with a Small Business Innovation Research (SBIR) Phase II grant. This grant enabled FPC to continue testing the durable 100% flyash brick developed during Phase I in an effort to achieve commercialization by 2008.

As part of the Phase II research, the possibility of replacing a portion of the flyash with cenospheres to improve certain properties of the brick was studied. Bricks containing 5-20% cenospheres by weight were produced and tested for compressive strength and freeze/thaw durability according to the ASTM standard for fired clay brick. The freeze/thaw test results show that bricks containing the proper ratio of cenospheres to flyash exhibit excellent freeze/thaw durability without the use of air entrainment. The number of freeze/thaw cycles passed by these cenosphere containing bricks well exceed the 50 cycles required by ASTM for classification as a severe weather brick.

As expected, the addition of cenospheres to flyash bricks results in a significant decrease in brick density. This is beneficial for both financial and technical reasons. The lower weight per brick reduces shipping and labor costs while at the same time allowing greater architectural design flexibility. While the decrease in density does correspond to a decrease in strength, at 20% flyash replacement the compressive strength was well above the 3,000 psi required by ASTM for severe weather classification.

In addition to the improved freeze/thaw durability and lowered density, the use of cenospheres in flyash bricks are expected to produce other benefits as well such as improved thermal insulating properties. While the technical aspect of adding cenospheres to flyash brick is promising, the current market value of cenospheres makes adding them impractical. In the future as the price decreases, adding cenospheres may become a viable option for producing quality flyash bricks.

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