

# Lean Green and Mean (LGM) Concrete

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## ABSTRACT

Sustainability is currently a factor of extreme importance for the concrete industry. Presently, standard practice limits the replacement of cement with fly ash to only about 25 percent. High Volume Fly Ash (HVFA) concrete has recently gained popularity for a resource-efficient concrete application. However, HVFA concrete contains at least 50 percent by mass of the cementitious material content that is fly ash. Therefore, many producers have a desire to be more “green” but are constrained from using HVFA due to its tendencies for slower setting times. In this study two types of LGM mixtures, one containing Class F fly ash and one tertiary mix containing Class F fly ash and slag cement, were compared with an East Tennessee commercial mixture. To ensure statewide applicability each mixture was produced with both river sand and manufactured limestone sand as the fine aggregate. The LGM mixtures reached higher long-term compressive strengths, due to the pozzolanic properties of the fly ash and the lower w/cm ratios. In addition, all four LGM mixes produced one-day compressive strengths exceeding 750 psi (5.17 MPa), which is considered the minimum strength for wrecking concrete forms. The compressive strength of the LGM mixtures all exceed 5000 psi (34.47 MPa) at 28-days. Also, the water permeable void contents and absorptions were lower for the LGM mixtures at all ages, indicating that the durability of the LGM is superior to that of the East Tennessee mixtures. Overall, the LGM mixtures exhibit comparable costs, increased compressive strengths, and enhanced durability properties.

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