

Use of High-Calcium Fly Ash in Cement-Based Construction Materials

By T.R. Naik, and S.S. Singh

Reference: CBU-1994-08

ABSTRACT

This paper provides the state-of-the-art information on high-calcium, ASTM Class C fly ash use in cement-based construction materials, such as high-performance concrete, ready-mixed concrete, and low-strength flowable concrete. The major topics included are: properties of fly ash, effects of fly ash inclusion on fresh and hardened concrete and controlled low-strength materials (CLSM); and, future research needs. The fresh concrete properties discussed are workability, water requirement, bleeding, segregation, air content, time of set, and temperature effect. The hardened concrete properties such as compressive strength, splitting tensile strength, flexural strength, modulus of elasticity, creep and shrinkage, permeability, freezing and thawing resistance, abrasion resistance, salt scaling resistance, sulfate resistance, alkali-silica reaction, carbonation and corrosion of steel in concrete, abrasion resistance, and fatigue strength are described. It is shown that high-strength/high-durability/high-performance concrete containing significant amounts (up to 40% cement replacement levels) of Class C fly ash can be manufactured for strength levels up to 100 MPa. Future research efforts should be directed towards use of high-lime fly ash in blended cements with minimum (less than 10%) portland cement in the blend.