

Establishing quality compliance criteria for concrete in Eastern Saudi Arabia

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Abstract:

This research, which is entitled “Establishing Quality Compliance Criteria for Concrete in Eastern Saudi Arabia,” was carried out under Applied Research Income Grants Program of the Research Institute at KFUPM, approved in the year 2002-2003, as Project # ARI-022.

In spite of the considerable research work in the area of concrete durability in the aggressive environmental conditions of the Arabian Gulf, there is a lack of pertinent quality compliance criteria for the locally-produced concrete. Compressive strength of concrete is often considered as the unique quality criterion. As a result, the concrete suppliers try to achieve only the target strength without any proper consideration to the durability aspects. Therefore, in most cases, the concrete constructions fail, by one way or another, in durability thereby leading to disputes on the quality compliance between the concrete suppliers and the end users.

The proposed research work aimed at developing appropriate concrete quality compliance criteria through an extensive experimental investigation using typical materials available in eastern Saudi Arabia. The experimental program consisted of testing the concrete specimens prepared with different mix proportions. Type I cement, Abu-Hadriyah aggregates and dune sand were invariably used in the mixes and the variables were: four levels of water to cementitious materials (w/cm) ratio, three levels of cementitious materials content, and three types of plain and blended cements (Type I, Type I + 7.5% silica fume and Type I + 20% of fly ash). Data were developed through the experimental program pertinent to: (1) compressive strength; (2) pulse velocity; (3) rebound hammer; (4) water penetration; (5) rapid chloride permeability; (6) Chloride diffusion; (7) corrosion potentials; and (8) corrosion current density.

Correlations between the results of various tests and the concrete mix parameters and compliance criteria in terms of both the strength and durability indices were established for concrete produced using eastern Saudi ingredients.