

# **WHAT YOU SHOULD KNOW FOR ACHIEVING DURABLE CONCRETE CONSTRUCTION**

by Tarun R. Naik

Reference: CBU-1997-13

## **ABSTRACT**

Durability of properly designed and constructed concrete structures depends primarily upon the quality of the materials of construction and other simple steps. Concrete construction can last 100 years or more if five simple "rules" are followed: (1) materials selection; (2) design; (3) construction; (4) quality management; and, (5) timely evaluation, maintenance, and repairs. This is a holistic approach. Most mistakes are made in satisfactorily following rule #1 and 4. Conventional mixture proportioning technique used for production of high-strength concrete does not guarantee long-term durability of concrete. Concrete mixtures must be proportioned to attain desired workability, high-dimensional stability, high-strength, and high-durability related properties; i.e., high-quality concrete (HQC). However, mixture proportioning requirements for HQC must be varied according to the type and expected use of the concrete construction. HQC mixtures must have high-quality constituent materials: durable aggregates, low heat of hydration cement, mineral additives, and chemical admixtures. A strict quality control is also needed in various aspects of the production of HQC. Research conducted at the UWM Center for By-Products Utilization, and elsewhere, have demonstrated that HQC mixtures can be proportioned to obtain strength in excess of 150 MPa (20,000 psi) and service life of 100 plus years. Pyramids in Mexico and elsewhere were constructed with high-quality mortar. They are many centuries old. The construction contract, for the tunnel between England and France, required 100 plus years performance, which was achieved with HQC and the five steps program advocated in this paper. Many hydroelectric dams, in the USA and elsewhere in the World, were constructed with HQC and the five steps program decades ago.