Concrete Mixture

INTRODUCTION

ACI 211.1 states: "Concrete is composed principally of aggregates, Portland cement, and water, and many contain other cementitious materials and/or chemical admixtures. It will contain some amount of entrapped air and may also contain purposely entrained air obtained by use of admixture or air-entraining cement. Chemical admixtures are frequently used to accelerate, retard, improve workability, reduce mixing water requirements, increase strength, or alter other properties of the concrete. The selection of concrete proportions involves a balance between economy and requirements of placeability, strength, durability, density, and appearance."

BASIC RELATIONSHIP

ACI 211.1 states: "Concrete proportions must be selected to provide workability, consistency, density, strength, and durability, for the particular application.

• ***Workability***: The property of the concrete that determines its capacity to be placed and consolidated properly and be finished without harmful segregation.

• ***Consistency***: It is the relative mobility of the concrete mixture, and measured in terms of the slump; the greater the slump value the more mobile the mixture.

• ***Strength***: The capacity of the concrete to resist compression at the age of 28 days.

• ***Water-cement (w/c) or water-cementitious (w/(c+p)) ratio***: Defined as the ratio of weight of water to the weight of cement, or the ratio of weight of water to the weight of cement plus added pozzolan. Either of these ratios is used in mix design and considerably controls concrete strength.

• ***Durability***: Concrete must be able to endure severe weather conditions such as freezing and thawing, wetting and drying, heating and cooling, chemicals, deicing agents, and the like. An increase of concrete durability will enhance concrete resistance to severe weather conditions.

• ***Density***: For certain applications concrete may be used primarily for its weight characteristics. Examples are counterweights, weights for sinking pipelines under water, shielding from radiation, and insulation from sound.

• ***Generation of heat***: If the temperature rise of the concrete mass is not held to a minimum and the heat is allowed to dissipate at a reasonable rate, or if the concrete is subjected to severe differential or thermal gradient, cracking is likely to occur

EFFECTS OF CHEMICAL ADMIXTURES ON CONCRETE PROPORTIONS

ACI 211.1 states: "Chemical admixtures, pozzolanic, and other materials can be added to concrete mix to alter some properties or to produce desired characteristics. Additives are used to affect the workability, consistency, density, strength, and durability of the concrete."

DESIGN PARAMETERS

ACI 211.1 states: "The procedure for selection of mix proportions is applicable to normal weight concrete. Estimating the required batch weights for the concrete involves a sequence of logical straightforward steps. Some or all of the following specifications are required (Depending on the design); maximum water-cement or water-cementitious material ratio, minimum cement content, air content, slump, maximum size of aggregate, strength, and admixtures."