



Concrete: World's most used construction material



CONCRETE is basically a mixture of two components: aggregates and cement paste. The cement paste, comprised of Portland cement and water, binds the aggregates into a rocklike mass as the paste hardens because of the chemical reaction of the cement and water.

Aggregates are generally divided into fine and coarse. Aggregates make up about 60% to 75% of the total volume of concrete, so their selection is important. The paste is mainly composed of cementitious materials & water. The absolute volume of cement is usually 7% to 15%.

The quality of the concrete depends upon the quality of the paste and aggregate and the bond between the two. The quality of hardened concrete is strongly influenced by the amount of water used in concrete. The water content influences compressive and flexural strength, permeability, resistance to weathering, bond between concrete and reinforcement.

The freshly mixed (plastic) and hardened properties of concrete may be changed by adding chemical admixture to the concrete, usually in liquid form, during batching. Chemical admixtures are commonly used to adjust setting time or hardening, reduce water demand, increase workability.

After completion of proper proportioning, batching-mixing, placing, consolidating, finishing, and curing, concrete hardens into a strong, noncombustible, durable, abrasion-resistant, and watertight building material that requires little or no maintenance. Furthermore, concrete is an excellent building material because it can be formed into a wide variety of shapes, colors, and textures.

Hydration is another property of cementitious materials (Cement) for strength development. Portland cement is a mixture of many compounds. Among them four of these make up 90% or more of the weight of Portland cement: Tricalcium silicate (C3S), Dicalcium silicate (C2S), Tricalcium aluminate (C3A), and tetra-calcium aluminoferrite (C4AF). Each type of Portland cement contains the same four major compounds, but in different proportions.

The two calcium silicates react with water to form two new compounds: calcium hydroxide and calcium silicate hydrate. The engineering properties of concrete setting and hardening, strength and dimensional stability depend



primarily on calcium silicate hydrate. It is the heart of concrete.

Knowledge of the rate of reaction between cement and water is important. The initial reaction must be slow enough to allow time for the concrete to be transported and placed. Once the concrete has been placed and finished, however, rapid hardening is desirable.

Gypsum, added at the cement acts as a regulator of the initial rate of setting of Portland cement. Other factors that influence the rate of hydration include cement fineness, admixtures, amount of water added, and temperature of the materials at the time of mixing.

Concrete's versatility, durability and economy have made it the world's most used

construction material. The essential properties for concrete are durability and strength. The durability of concrete defined as the ability of concrete to resist weathering action, chemical attack, and abrasion while maintaining its desired engineering properties.

Strength and durability are the two important properties of concrete. They are

like two legs of a human body. In Bangladesh with the availability of good cement, good strength of concrete can be obtained if reasonable care is taken.

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