Concrete and cement are not the same thing; cement is actually just a component of concrete. Concrete is made up of three basic components: water, aggregate (rock, sand, or gravel) and Portland cement. Cement, usually in powder form, acts as a binding agent when mixed with water and aggregates. This combination, or concrete mix, will be poured and harden into the durable material with which we are all familiar.

There are three basic ingredients in the concrete mix:

Portland Cement

Water

Aggregates (rock and sand)

Portland Cement - The cement and water form a paste that coats the aggregate and sand in the mix. The paste hardens and binds the aggregates and sand together.

Water - Water is needed to chemically react with the cement (hydration) and too provide workability with the concrete. The amount of water in the mix in pounds compared with the amount of cement is called the water/cement ratio. The lower the w/c ratio, the stronger the concrete. (higher strength, less permeability)

Aggregates - Sand is the fine aggregate. Gravel or crushed stone is the coarse aggregate in most mixes.

**Desired Properties of Concrete:**

1. The concrete mix is workable. It can be placed and consolidated properly by workmen.

2. Desired qualities of the hardened concrete are met: for example, resistance to freezing and thawing and deicing chemicals, water tightness (low permeability), wear resistance, and strength. Know what you are trying to achieve with the concrete.

3. Economy. Since the quality depends mainly on the water to cement ratio, the water requirement should be minimized to reduce the cement requirement (and thus reduce the cost).

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