

# **Concrete Craftsmanship Series**

## **Curing why and how....**

### **Concrete Curing**

In order for properly designed concrete to develop to its full potential, it must be cured. The major concerns about in-place concrete are low strength, durability and cracking. Although there are many types of cracks and reasons for them, our concern here is with plastic shrinkage and drying shrinkage cracking.

Portland cement needs water in order to form the paste or glue that holds the aggregates together. Normally, there is more water in the designed mixture than is needed to hydrate the cement. This is called water of convenience and is added into the design and compensated for, so that the concrete can be placed with a reasonable amount of labor. Concrete is sold by volume or by the cubic yard, so the combined materials being cement, sand, rock, water and air entrainment when used equals 27 cubic feet or 1 cubic yard.

For example: A cubic yard containing 500 lbs. cement and 28 gallons of water only needs 15 gallons of water to hydrate the cement. The remaining 13 gallons of water is referred to as water of convenience for added workability. This water of convenience occupies 1.7 cubic feet of the 27 cubic feet total.

The process of curing helps maintain moisture in the concrete.

This in turn results in higher strengths due to keeping the hydration process active for a longer period of time and reducing the evaporation rate which shrinkage.

The two systems of maintaining a satisfactory moisture content are 1) the continuous or frequent application of water through ponding, sprays, steam or saturated cover materials such as burlap or cotton mats, rugs, earth sand, sawdust and straw or hay and 2) the prevention of excessive loss of water from the concrete by means of materials such as sheets of reinforced paper or plastic or by the application of a membrane-forming curing compound to the freshly placed concrete.

All of these methods are self-explanatory except for the liquid membrane types. ASTM C309 stipulates that curing compounds must be membrane forming. This can be a permanent membrane or one that dissipates (breaks down over time).

Note: If subsequent cementitious, penetrating, epoxy or urethane coatings are going to be applied, water curing, plastic sheeting or dissipating membrane cures should be used because they will not interfere with the bonding of these toppings. The permanent membrane cures should be used in areas where carpet or vinyl tile will be the final floor finish. The reason for this is that they help isolate the carpet or tile from any efflorescence that may form on the concrete surface. White pigmented (wax based cures) are most often used in paving situations due to the higher reflectivity.

Regardless of chosen curing method, it should be started immediately following the final troweling or brooming. This insures the best possible opportunity for the concrete to develop to its fullest potential.

\*Hydration – The chemical reaction between hydraulic cement and water.