

# Concrete Craftsmanship Series

## Chemical Admixtures why and how....

### Chemical Admixtures

**Air Entrainment** – A must for exterior concrete in climate subject to freezing and thawing, entrained air generates tiny voids within the concrete which provides room for expansion of freezing crystals within the cement paste without damaging the concrete. Also increases workability and helps reduce segregation and bleeding. Typically Arkansas has more freeze/thaw cycles than many areas of the country, which is why proper air entrainment is essential in our area for all exposed exterior concrete.

\* Caution: Air entrained concrete should not be machine trowel finished at any time.

**Accelerator** – These admixtures are used to speed up the setting time of concrete. There are two primary reasons for doing this;

- To offset the slower setting times due to colder temperatures
- To speed up the setting process (even in warm weather) so the concrete can be put into service faster

The most common accelerator is calcium chloride available in both liquid and dry form. Not recommended for use in reinforced concrete in moist environments due to its promotion of corrosion of steel. There are other types of accelerators that are non-chloride. These are generally classified as noncorrosive and are recommended for use in reinforced concrete in moist environments.

Some accelerators in both the chloride and non-chloride types have water reducing capabilities.

\*The term anti-freeze should not be used in describing either of these products because they will not lower the freezing point of concrete.

**Water Reducers** – These admixtures do exactly what the name implies. For a given concrete mix the addition of a water reducer will decrease the amount of water in the mix while still achieving the same consistency of the concrete (i.e. slump). For example, a normal range water reducer will reduce the water content of a yard of concrete by a minimum of 5% while a high range water reducer will reduce the water content by a minimum of 12%.

(For illustrative purposes only)

To achieve a 4" slump:

- A plain 3000 psi concrete mix without water reducers may require 30 gallons of water
- A 3000 psi mix with a normal range water reducer would only require a maximum 28.5 gallons of water
- A 3000 psi mix with a high range of water reducer would only require a maximum of 26.5 gallons of water

\*End result\*

*Water demand goes down, slump stays the same, strength goes up*

OR

- 3000 psi plain concrete mix without water reducers with 30 gallons of water = 4" slump
- 3000 psi concrete with 30 gallons of water and normal range water reducer = approximately 5 ½ slump
- 3000 psi concrete with 30 gallons of water and high range water reducer = approximately 8 ½ slump

**\*End Result\***

*Water content stays same, slump goes up and strength typically stays the same or increases slightly*

**Retarders-** These admixtures are used to help offset the effects of higher temperatures. By retarding or delaying the setting time, two benefits are achieved:

- Higher Strengths
- Longer working time

Virtually all retarders marketed today have water reducing capabilities.

**Slump:** The slump test is the most generally accepted method used to measure the consistency of concrete. The test equipment consists of a slump cone (a metal conical mold 12 inch high, with an 8 inch diameter base and 4 inch diameter top) and a steel rod. The slump is the vertical distance the concrete settles, measured to the nearest ¼ inch from the top of the slump cone to the displaced original center of the subsided concrete.

The is a publication of the Quality Concrete Committee information herein is consistent with materials published by the American Concrete Institute, Portland Cement Association and the National Ready Mixed Concrete Association.