**Concrete Phases, Combining With Crystal Lok®**

*The major phases of Portland cement are:
tricalcium silicate ($3CaO•SiO_2$),
dicalcium silicate ($2CaO•SiO_2$),
tricalcium aluminate ( $3CaO•Al_2O_3$) and
a ferrite phase of average composition $4CaO•Al_2O_3•Fe_2O_3$.
Tricalcium silicate and dicalcium silicate together make up 75-80% of Portland cement. *

Wet cement mixtures form calcium silicate hydrate (CSH) which has a greater volume than the unhydrated cement particles. The created CSH fills in porosity and makes concrete strong and rigid. Also formed is hydrated lime $Ca(OH)_2$. This $Ca(OH)_2$ is soluble in water and is easily attacked by water, acids and other chemicals and produces efflorescence.*

Applying Crystal Lok® to the concrete reduces the amount of $Ca(OH)_2$ by reacting with $Ca(OH)_2$ to form additional CSH, not otherwise available for strength and waterproofing.

The Crystal Lok® treated concrete becomes impermeable, resistant to chemicals and increases durability.

$$Ca(OH)_2 + \text{Crystal Lok®} = CSH + \text{free Na or NaOH}$$

CRYSTAL LOK® converts to CSH inside pores, capillaries, voids & hairline cracks, essentially making concrete where there was hydrated lime. This CSH gel and resulting crystalline structures are insoluble in water and are highly resistant to acid and other chemical attack. The free Na is incorporated into the CSH or reacts with $CO_2$ from the atmosphere forming $Na_2CO_2$.

CRYSTAL LOK® is proven to reduce permeability to zero in ASTM grades of structural concrete from 2000 through 6000 psi strengths, including Class F fly ash formulations.

Concrete porosity varies between concretes and within any one pour of concrete, because of varying water-to-weight ratios, amount of working, quality and type of aggregates, temperature and other factors.

Standard concrete can contain up to 40% $Ca(OH)_2$ contributing to porosity as it dissolves.* Life effectiveness of the concrete can only be increased by converting that $Ca(OH)_2$ to CSH. Using Crystal Lok® to replace $Ca(OH)_2$ with CSH increases density. Voids and passages are filled with CSH to stop liquids movement and increase the water and chemical resistance of the concrete while allowing a reduced moisture vapor to move through the structure for strength.

* Ramachandran, V. S. Concrete Admixtures Handbook; Second Edition; Institute for Research in Construction, National Research Council Canada, Ottawa, Ontario, Canada; Noyes Publications; 1995