Marine Application Benefits

In recent years, Spray Applied CNS of concrete structures has been widely adopted as a protective measure for concrete structures in salt containing environments. Since the protective efficiency of such a polymer-based surface treatment may be reduced over time due to weathering, most types of such treatments need to be reapplied from time to time in order to ensure proper long-term protection. In order to reduce the effect of weathering and thus increase the duration of the protective effect, the hydrophobic system should penetrate the concrete substrate as deep as possible.

SA CAM 110 is the answer to the question of how the life span of critical infrastructure can be extended. By closing capillary pore space with hydration products that are improved forms of calcium silicate hydrates, the CNS material provides a solution that relies on the science of concrete rather than the introduction of a foreign substance or coating. The Port of Marseille has chosen to become a leader in planning for sustainable, long-lasting construction by first testing CNS in a full-scale application and presently specifying CNS as the primary concrete treatment pavement replacement project beginning in 2017.

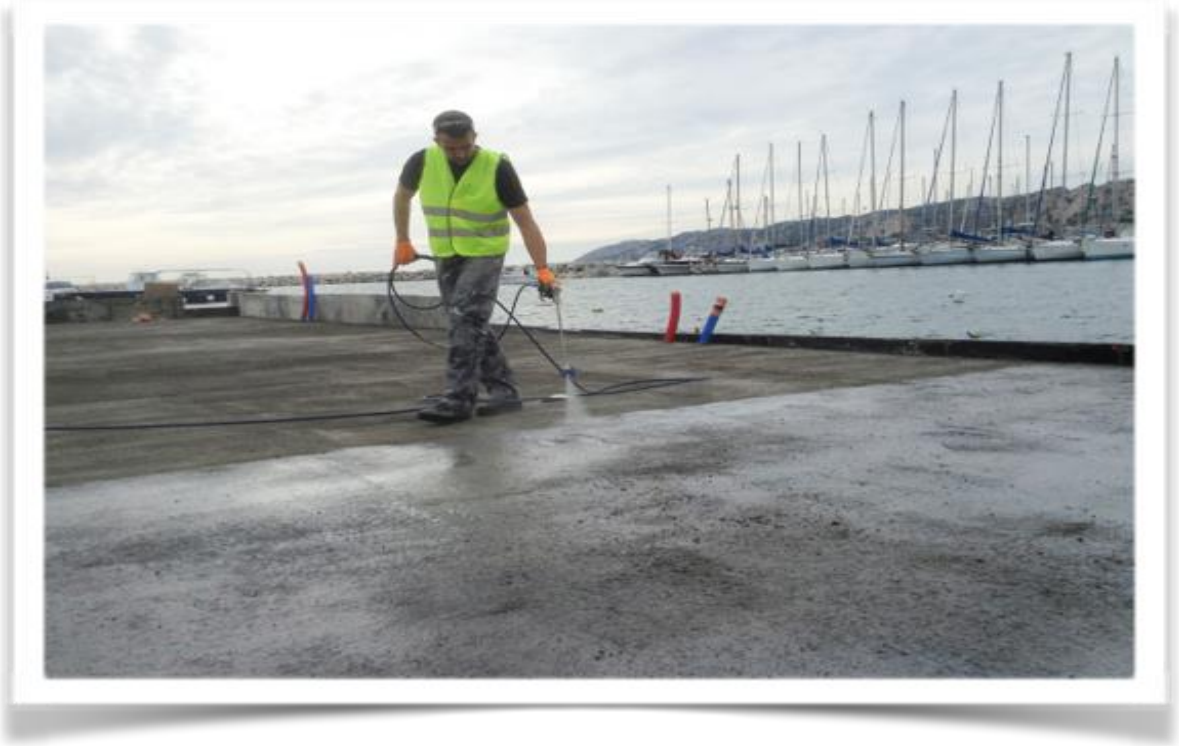

Figure 1 Spray Applied CNS Marseille Harbor

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CAM 110 and SA CAM 110 Additional Benefits (CNS)

- ✓ Time-of-Placement Enhanced Curing (50%+ Time Reduction)
- ✓ Compressive Strength (9-20% Increase)
- ✓ Flexural Strength (10-15% Increase *)
- ✓ Abrasion Loss (50%+ Reduction)
- ✓ Chloride Content (23-45 % Reduction *)
- ✓ Water Penetration (27-100% Reduction *)
- ✓ Freeze-Thaw Resistance (85% Improvement)
- ✓ Remediation Waterproofing
- ✓ Enhanced Resistance to Salt and/or Chemical Attack
- ✓ Reinforcing Steel Protection
- ✓ Coatings & Coverings Protection
- ✓ Minimized Shrinkage Cracking & Slab Curling
- ✓ Densification
- ✓ Strengthening & Surface Hardening

CNS has been shown to purge salt from pore space. CNS has been demonstrated to improve hardened properties of concrete including increasing compressive strength and reducing chloride permeability, among other beneficial effects. CNS accomplishes this primarily through a high level of pozzolanic activity made possible by the very small particle size of CNS. The increased pozzolanic activity culminates in C-S-H growth in pore space, effectively closing capillary voids.

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Saving of chemical agent by using SA CAM 110 & CAM 110

- ✓ Densifier can be eliminated
- ✓ Waterproofing Treatments eliminated
- ✓ Water Reducers eliminated
- ✓ Inhibitors can be completely eliminated.
- ✓ Eliminate the need for secondary coatings in some applications.
- ✓ Plasticizers usage reduced 20 to 40%
- ✓ Elimination of curing agents.

€/$

Further savings directly caused by usage of CAM 110 & SA CAM 110

Labor cost - Yes, we can reduce Labor Cost (COST SAVINGS)

- Reduced application cost.
- Elimination of water placement cost.
- One-time application cost, that last the Lifetime of the design never has to be renewed.

Turnaround time - Yes, we can reduce turnaround times by 40-50% (COST SAVINGS)

- Reduction of time off site – 1 hour till foot traffic, 4 days for point load.
- Reduction of the 28-day cure time.
- Floor installation in 14 days from time of concrete placement.

Net cost saver - We are a net cost saver not an additional cost factor

- Elimination of ongoing maintenance cost.
- Extended project life.
- Reduction of Carbon Footprint.
- Zero VOC's. Less CO2 consumption.

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Silicate (Old technology) VERSUS Colloidal Silica (New technology)

Why are silicates and colloidal silica (SA CAM 110 & CAM 110) used for waterproofing, and why should they not be considered equals?

Both are widely marketed as penetrating reactive sealers because they react with unreacted alkalis in the concrete capillary and pore space to form Calcium Silicate Hydrate (CSH) – the "glue" that holds concrete together. However, the degree of surface penetration, completeness of the reactions, and long-term performance are very different. Silicates, in addition to being more viscous than colloidal silica, react quickly with alkalis upon contacting the concrete surface. The poorly distributed and formed crystalline gel at the surface hinders the penetration of the viscous solution, thus limiting its waterproofing effectiveness and longevity. Variable-sized pores, ranging from very small to very large. This causes the crystalline gel to be temporary, at best. As water migrates through the larger gel pores, the gel can erode and eventually will fail at a rate dependent on the volume of water and its driving force passing through the concrete.

Reference Projects – CAM 110, SA CAM 110 and CNS (Colloidal Nano Silica)

CAM 110 and SA CAM 110 – (Colloidal Nano Silica)

Figure 2Port of Marseille – France. See below.

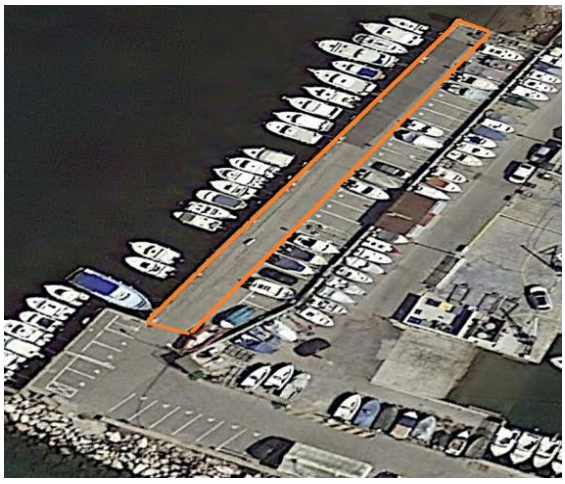

Figure 3 Ariel view of initial application Marseille harbor

Port of Marseille – France – Materials receiving area, placement was for 23cm of RCC placed in two lifts to assure proper compaction of materials. Project has been in place since late fall 2017.

- ✓ Amari Airbase – Estonia, NATO AB – CAM 110 and SA CAM 110 were included in the design to reduce the number of expansion and cut joints along with providing additional material improvements. **Pictures not allowed to show.**