

Vapor Lock™ 20/21

ULTRA-LOW PERMEABILITY ♦ SHRINKAGE REDUCING
WATER/DAMP PROOFING ADMIXTURE

Product Applications -

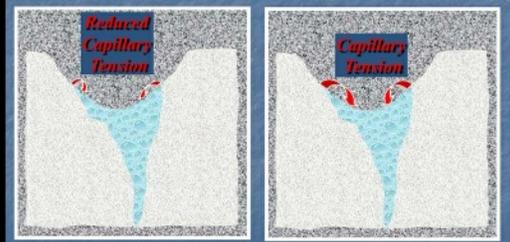
Vapor Lock changes the pore structure of enhanced concrete almost immediately. Because of the relatively large amount of “extra” c-s-h created and enhanced with Vapor Lock, we find a far less developed capillary/pore structure in the cement matrix, from the plastic stage through the hardened stage, even many years later. Vapor Lock imparts characteristics that allow the engineer/specifier to replace certain conventional systems, saving substantial time and money -

- A true **Durability** admixture; creating an Ultra Low Permeability piece of concrete with less long-term Drying Shrinkage,
- Ancillary benefits of a sealed capillary structure allow for the elimination of conventional topical sealers and coatings,
- Serves as a Stand Alone Waterproofing system (Membrane Free Construction) or acts in concert with traditional membrane systems (Belt-and-Suspenders),
- A denser, “Non-Sweating”, more monochromatic color; either in horizontal or vertical construction.

Conventional Shrinkage Reducing Admixtures

Traditional SRAs use harsh chemicals to change the surface tension of water which is designed to reduce stress on the water leaving the pore/capillary structure during curing/drying. This alone is rarely effective and needs to be incorporated with substantial mid and high range water reducers/plasticizers. Often, given enough time, the long-term shrinkage curve closes as months and years go by, lowering the overall effectiveness. Also, it is not uncommon to lose about 10% of 28 Day compressive strengths of a mix.

Shrinkage-Reducing Admixtures:
Mechanism



Vapor Lock™ As a Shrinkage Reducing Admixture -

Because of the mechanics of Vapor Lock disrupting the formation of the capillary system in concrete (smaller and non-connecting pore structure) coupled with an Internal Cure component that allows for greater product development (greater cement particle hydration), the natural shrinkage/creep that normally occurs in concrete is lowered by 15% - 25%.

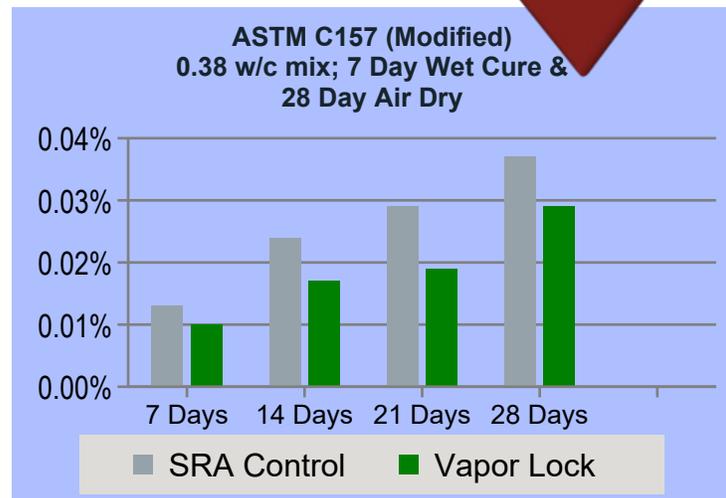
A 5,000 psi mix using an established shrinkage reducing admixture....and the same mix with the SRA removed and Vapor Lock added -

28-Day (3 specimen average)

Control w/ SRA = 0.037% change

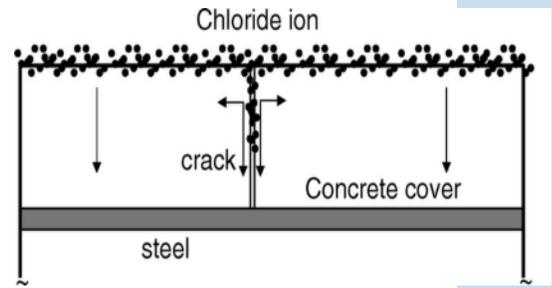
Vapor Lock enhanced; 0.029% change

**A REDUCTION
of
22%**



Vapor Lock™ 20/21 As a Shrinkage Reducing Admixture, continued -

Long-Term Drying Shrinkage, has become the newest and largest focus for those putting forth *High Performance Concrete* mix designs. Shrinkage is directly correlated to cracking and thus “weakening” the concrete protection that surrounds and encases structural steel. Cracks are the enemy of **Durable Concrete** and facilitate the intrusion of chlorides and other detrimental elements inwards towards the steel reinforcement.



ASTM C157, “Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete” is a rather long test protocol (one year plus) with a 28-Day curing period. For these reasons, testing (particularly project based) has a modified and condensed protocol. Caltrans has an effective protocol - Modified C157 that deals with a 7 Day wet cure and then a 28-Day air cured set of three averaged, 11.5” specimens (either 3” cubed or 4” cubed defined by top agg. size). So in practical terms you are getting a 35-Day average with more practical curing. This is the protocol our testing lab partners have adopted and comparisons we make.



CASE STUDY

WHERE: San Diego International Airport

WHEN: First deck pour, April 30, 2017

HOW BIG: 3 Levels, 2,683 stalls (1,700 covered stalls), 1,269,000 sq.ft.

HOW MUCH:
Total Cost - \$128,000,000

Swinerton Builders and Watry Design working together with the Airport Authority, ultimately chose a cast-in-place, post tensioned design. Both 2nd and 3rd level decks and all of the ramps utilized the Vapor Lock 20/21 concrete admixture throughout - an **Integral Solution** to both shrinkage & corrosion protection. About 25,000 cubic yards. The mix was provided by Hanson Aggregates, a 5,000 psi mix (2,750 psi @ 3 days) and a **0.036% Shrinkage specification**.

The finish entailed a beautiful 14” rotary swirl by hand - March 1, 2018, was the opening.

Project Manager, Gary Conover, can be emailed with specific questions - GConover@swinerton.com



After the concrete and steel contracts get let, the next big ticket item is usually the water proofing contract. In dense, metropolitan areas with extremely high property values, buildings and structures are designed to go high and start well below grade. Conventional water/damp proofing has always revolved around installing membranes and coatings to protect concrete and steel. With the water proofing

contractor making several movements usually around the concrete, steel, shoring and plumbing installers. Because of this factor, damage to conventional membranes is all too frequent and requires "perfect" installation. Membranes are never a LEED product/system, are prone to weather delays, and difficult to repair.



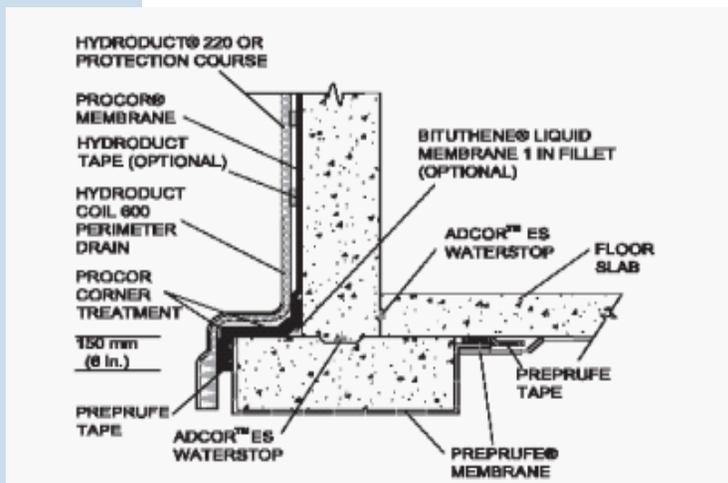
The picture to the left is exaggerated, but indicative of what happens dozens of times during the normal construction cycle. We've all seen it. What we don't always see...is someone coming back to fix it!



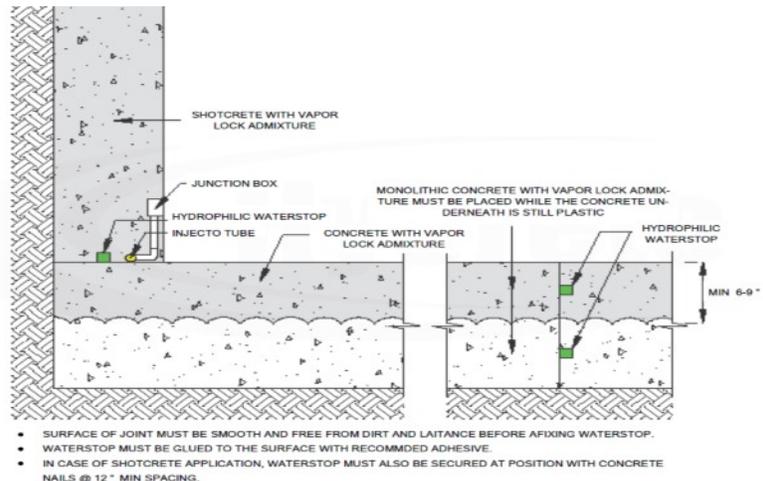
Integral Concrete Waterproofing is the mindset of taking concrete from a permeance (measured by US Perms) from the 5 US Perms to 60 US Perms area, down to the 0.02 US Perm level, consistently. A complete revolution in the way you view concrete as a building material. Because of this "new" building material, conventional systems can be modified and/or eliminated. Below, a detail for a popular waterproofing system that's been around for years and their wall/slab recommendations; tapes, liquids

& sheet membranes folded, tucked and overlapped in perfect sequence. On the right, a wall/mat slab detail that contains Integral Concrete Waterproofing (As well as Shrinkage Reducing & Corrosion Inhibiting) admixture. Chances are you've seen a lot of details in your line of work....now which detail in your mind, has the highest risk of ruin?? Yes, that's a readily available "swellstop" material on the right or an "injecto tube" installed in high risk areas.

Popular Membrane/Waterproofing System



Integral Concrete Waterproofing System



- **Mat (Raft) Foundations - High Density Polyethylene (HDPE);** Typically a leading candidate for use in Mat or Raft (also called “Boat Foundations”). This system can be easily replaced with Integral Waterproofing in only the top 6 inches of the total depth (usually 2 - 5 feet thick). Lower Heat of Hydration and a complete Water/Damp Proofing will be achieved.
- **Walls; Poured-in-Place or Structural Shotcrete - Bentonite Panels/Sheets;** Bentonite has historically been the choice for blindside applications (waterproofing is installed first, with concrete being installed next) and is marketed by numerous manufacturers. Unfortunately, Shotcrete is almost impossible to adhere to bentonite. There have been numerous applications of using Integral Waterproofing in concrete walls (and hillside pinnings) for over a decade now.
- **Podium/Plaza Decks - Hot Applied Coatings;** It's not uncommon to place a slightly thinner section containing all the necessary structural steel first. Then install a hot applied, asphaltic coating (and very often a drain board to physically evacuate water) with a topping slab to follow. With proper slope-to-drain, Integral Waterproofed concrete can replace this system - in one lift.



CASE STUDY

"Membrane Free" Construction

The developers and Allgire Construction working within a fixed budget, replaced ALL vertical membranes and utilized Vapor Lock in the 12" thick structural shotcrete walls. Located in Downtown San Diego (16th & Market St.) They were working with a seasonal 7 foot water table. No over-excavation was required, as piles were placed, then wooden lagging, and then reinforcement. The waterproofing was added with the concrete - **\$200,000 less and three weeks in savings.**

Nook East Village; San Diego, CA

Owner - Trestle Development
G/C - Allgire Construction
Architect - Joseph Wong Design & Associates
Concrete Contractor - Thunder-Jones Concrete
Shotcrete Contractor - Nationwide Shotcrete
Ready Mix - Cemex; Mission Valley Plant



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