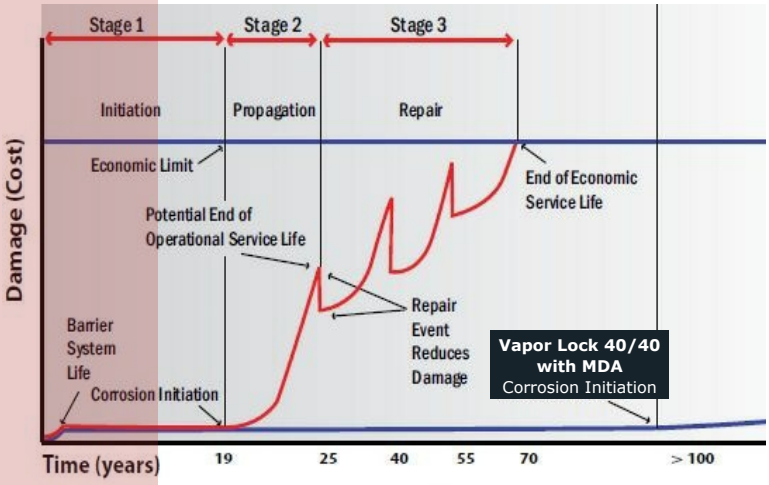
Vapor Lock™ 40/40

ASTM C494 - Type S

CORROSION INHIBITING ADMIXTURE

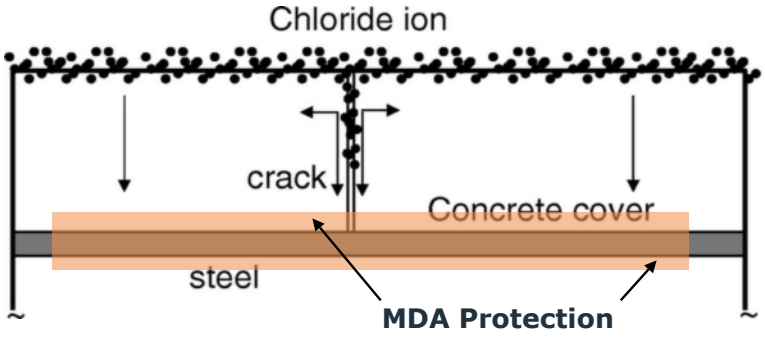
Protects both the Initiation & Propagation phases of Corrosion with MDA

Vapor Lock 40/40 is the first, dual action, maximum performance Corrosion Inhibiting concrete admixture in the marketplace. Vapor Lock 40/40 has the same base of delivery as the 20/21 formula (Ultra Low Permeability & Shrinkage Reducing) coupled with a state-of-the-art ferrous coating that dramatically slows the oxidation process. This coating is robust, works at the nano-level, and is "self healing" in nature. This encapsulating film is effective well after a crack develops in the cement matrix. This second sphere of protection does not change the set-neutral effects of the Vapor Lock 40/40 formula. All of the features and benefits of regular Vapor Lock are still present and working.



Vapor Lock 40/40 addresses corrosion of steel within concrete from both stages; *initiation* and *propagation*. First, the unsurpassed Shrinkage Reduction and Ultra Low Permeability fight to keep the constant and passive levels in and around the steel/concrete matrix. And if that balance is interrupted and the electro-chemical process begins, it is greatly slowed by the film coating supplied by Vapor Lock's second sphere of protection.

This second sphere of "post crack" protection *Maximum Dual Action* (*MDA*), is the key to true Corrosion Protection. It is the hardest part of mixing proven chemistry with technology that does not adversely affect concrete's characteristics and ultimate performance, something other products can't say….



"Easily the most effective concrete admixture in the marketplace to date. Coupled with a sound mix design can approach doubling the expected life cycle of all concrete structures…."

An industry standard protocol/test for concrete "resistivity" is the ASTM C1202 - Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration or Rapid Chloride Permeability test. This involves epoxy around a round 4" specimen, with a 60-volt charge attached to it and moving salt water back and forth through the specimen. The total ion movement (which chloride ions are part of) is measured after 6 hours. The fine folks at Grace do a good job explaining the pros & cons of this protocol - https://gcpat-tools.com/construction/en-ca/Documents/TB-0100CPT.pdf

We took a solid 0.38 w/cm mix (straight cement) and performed Rapid Chloride Ion tests at one and two months. The results are below -

Rapid Chloride Permeability of Concrete				ASTM C 1202
Location of Specimen within Cylinder	Top			
Discription of Specimen				
Presence of Reinforcing Steel	No	Location of Reinforcing Steel	N/A	
Presence of Overlay	No	Thickness of Overlay	N/A	
Presence of Surface Treatment	No	Thickness of Surface Treatment	N/A	
Test Date 1	1/13/2017	Test Date 2		2/14/2017
Test Age 1 (Days)	29	Test Age 2 (Days)		61
Test Period (Hours)	6 hours	Test Period (Hours)		6 hours
Total Charge Passed (Coulomb)	1157.41	Total Charge Passed (Coulomb)		761.38

The highlighted areas above show 1,157 coulombs passed at one month, towards the bottom of the Low side of Chloride Permeability and 761 at the two month mark - solidly in the Very Low range or *"internally-sealed concrete"* - An astute way to describe the solid combination of Ultra Low Permeability and natural Corrosion control from Vapor Lock.

Table: Chloride Permeability Based on Charge Passed

Charge Passed (Coulombs)	Chloride Permeability	Typical of
>4,000	High	High W/C ratio (>0.60) conventional PCC
2,000–4,000	Moderate	Moderate W/C ratio (0.40–0.50) conventional PCC
1,000–2,000	Low	Low W/C ratio (<0.40) conventional PCC
100–1,000	Very Low	Latex-modified concrete or internally-sealed concrete
<100	Negligible	Polymer-impregnated concrete, Polymer concrete

Hawaiian Gardens Casino - Opened August of 2016 Vapor Lock enhanced floors throughout the $90 Million, 200,000 sq.ft., 2-story casino as well as this beautiful water feature at the entrance. 24/7 usage with numerous flooring options.

Swinerton Builders photo.

Another protocol that can be helpful to infer corrosion inhibiting characteristics is ASTM C441-11 *Test Method for Effectiveness of Pozzolans or Ground Blast-Furnace Slag in Preventing Excessive Expansion of Concrete Due to the Alkali-Silica Reaction.* An interesting procedure where glass is pulverized and added at over 200% per the amount of cement (an absurd amount used to speed up a long process), and mortar bars are prepared - proportions below in Table 1. Both control and Vapor Lock enhanced samples are cast, cured in a moisture room for 24 hours, and then stored at 100 degrees F for 14 days. Results are in Table 2 -

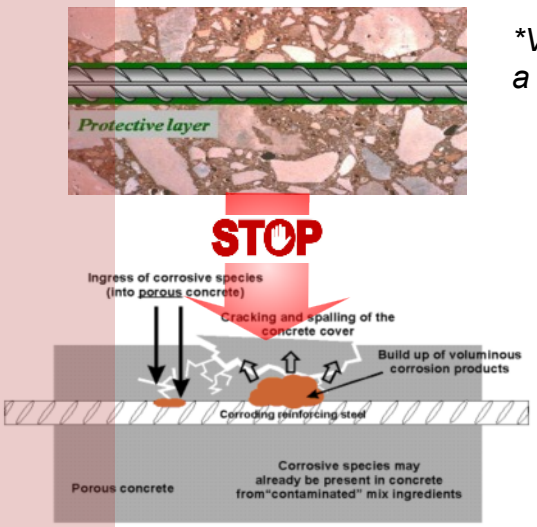
Table 1 – C441 Mix Proportions

Material (g)	Control	Vapor Lock 20/20
Buzzi Cement	400	400
Vapor Lock	0	0.26
Graded Pyrex Glass	900	900
Water	217	218
Flow (100 – 115 %)	103	100

Table 2 – Expansion Due to ASR Test Results (%)

	Length (inches)		Length Change (%)
	Initial	14 Days	
Control 1	0.0536	0.0576	0.044
Control 2	0.0640	0.0678	0.042
Control 3	0.0655	0.0679	0.028
		Average	**0.038**
17-124-1VL	0.0724	0.0740	0.020
17-124-2VL	0.0665	0.0677	0.016
17-124-3VL	0.0600	0.0614	0.018
Reference	0.0438	0.0434	---
		Average	**0.018**
	Reduction of Mortar Expansion as % of Control		**52.6**

As you can see, there was on average just over 50% reduction in the mortar expansion of the Vapor Lock enhanced specimens. The less developed pore structure of Vapor Lock concrete can resist/slow the destructive Alkali Silica Reaction all too common in certain areas of the country. The Portland Cement Association has a good piece that explains ASR in more detail - http://www.cement.org/docs/default-source/fc_concrete_technology/is413-02---diagnosis-and-control-of-alkali-aggregate-reactions-in-concrete.pdf Clearly this much glass in the mix throws the mortar into a hyper-agitated state (normal shrinkage of mortar + the glass expansion), yet another way to illustrate a pore structure restricting both ingress and egress within the concrete/cement matrix.



**Vapor Lock 40/40 can be budgeted in the fourteen cents ($0.14) a sq.ft., per inch of concrete thickness, installed, range.*

Jim Kaylor
Technical Mgr. - Pacific Region
jkaylor@spgGoGreen.com
310.650.4263