

## TECHNICAL DATA SHEET

### **Identification: VAPOR LOCK™ 40/40**

<b>What it does:</b>	Maximum Dual Action - CORROSION INHIBITOR Protecting steel against corrosion in concrete from the Initiation & Propagation phases
<b>Application/uses:</b>	Any Concrete that Requires an Ionic Steel Protective Coating and a Total Moistures Ingress / Egress solution
<b>Company Name:</b>	Biorok
<b>ABN:</b>	86 158 108 091 – Under License from SPG
<b>Address:</b>	Suite 3, Level 1, 42-44 Waymouth Street, Adelaide 5000
<b>Web:</b>	www.biorok.com.au
<b>Phone:</b>	+61 08 8212 4052

### **DESCRIPTION**

Vapor Lock™ 40/40 Corrosion Inhibiting & Waterproofing Concrete Admixture is a ready to use concrete admixture that uses Volatile Organic Compound (VOC) free proprietary technologies that act as a powerful corrosion inhibitor while water and vapour proofing concrete. This corrosion resistant protection reaction is a permanent self-healing Nano technology and integral component of the finished concrete.

### **BASIC USES**

Vapor Lock™ 40/40 utilizes proprietary water-soluble compounds that encapsulates reinforcement steel with a robust impermeable coating that stops oxidation. This coating operates in the cracked concrete environment to dramatically slow the oxidation of exposed steel reinforcement. Additional proprietary components have an inorganic chemical reaction with components of the cement and utilizes the water of convenience to eliminate the route of water ingress/egress. Vapor Lock™ 40/40 should be added to concrete whenever steel reinforcement is in the concrete or superior water proofing, extended service life, chemical resistance and densification are desired.

### **MAJOR ADVANTAGES OF Vapor Lock™ 40/40**

- ❖ Virtually eliminates oxidation of steel reinforcement
  - Inside the concrete matrix
  - Exposed steel reinforcement in cracked concrete
- ❖ Water proofs concrete
- ❖ Improved concrete strength
- ❖ Increased tensile strength
- ❖ Increased abrasion resistance
- ❖ Requires no additional Chemical Curing
- ❖ 58% reduction of Alkaline Silica Re- action (ASR)
- ❖ Effective in reducing:
  - Corrosion of unexposed & exposed steel reinforcement
  - Plastic & Drying shrinkage cracking
  - Efflorescence
  - Freeze-thaw spalling
  - Delamination
  - Slab curl

## TECHNICAL DATA SHEET

### TECHNICAL AND PRODUCT DATA

- ◆ Appearance: Translucent
- ◆ Odour: None
- ◆ Toxicity: None
- ◆ Flammability: None
- ◆ Ph: Alkaline
- ◆ Shelf Life: 1 year
- ◆ Freeze Temp: 0°C
- ◆ Storage Temp: Min/ 1.7 °C
- ◆ Solvent: None. Water base
- ◆ Hazardous Vapors: None
- ◆ Capillary Break: Calcium Silicate Hydrate (C-S-H)
- ◆ Packaging: 1040 Litre IBC

## TECHNICAL DATA SHEET

ASTM Designation	Title	Results
C39/C39M	Test Method for Compressive Strength of Cylindrical Concrete Specimens	2.1-.5% Increase over Control-28 days
C78	Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)	4-1% Increase over Control-28 days
C138/C138M	Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete	1% Decrease over control-28 days
C143/C143M	Test Method for Slump of Hydraulic- Cement Concrete	0% Change against Control
C157/C157M	Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete	-0.021% Avg 3 Tests
C231	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method	0.3% Increase over Control
C403/C403M	Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance	Initial set Vapor Lock decreased setting time by 1 minute
C403/C403M	Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance	Final set Vapor Lock decreased setting time by 2 minutes
C666/C666M	Test Method for Resistance of Concrete to Rapid Freezing and Thawing	1.1% Improved Durability Factor over Control
D5084	Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter	40% Increase Over other WVRA Products
D5084	Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter	500% Increase over Crystalline Growth Admixture
D5084	Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter	1,000% Increase Over Control
C494/C494M	Standard Specification for Chemical Admixtures for Concrete	Pass
NSF-61	Approval Testing for use with Potable Drinking Water	Pass
D7102-06	Standard Test Method for determining the adhesive and cohesive	Pass

## TECHNICAL DATA SHEET

Report of Results for Concrete Permeability Testing

Product: Vapor Lock Testing Program  
 TEC Services Project No: TEC  
 16-1345 TEC Services Laboratory No: 17-124

**Table 1 – Concrete Theoretical Mix Designs and Plastic Properties**

<b>MATERIA L</b>	<b>Mix Proportions (lbs/yd<sub>3</sub>)</b>		
	17-124-C (Control Mix)	17-124-V (Vapor Lock)	17-124-E (Other)
Lehigh Type I/II Cement	611	611	611
Vulcan - Lithonia Quarry #57	1,720	1,720	1,720
Lambert Sand	1,248	1,248	1,248
Water	324	321	320
Total	3,903	3,900	3,899
Designed Air Content (%)	2.0	2.0	2.0
Designed Unit Weight (pcf)	144.56	144.43	144.41
<b>Admixtures</b>	<b>Gs</b>	<b>Admixture Dosage</b>	
Vapor Lock (oz/yd <sub>3</sub> )	1.085	-	61.1
Other (oz/yd <sub>3</sub> )	1.085	-	64.6
<b>Plastic Properties</b>			
Slump (inches)	3 ½	4	4
Unit Weight (pcf)	146.5	145.5	145.5
Air Content (%)	0.7	1.3	1.2

## TECHNICAL DATA SHEET

**Table 2 – Results Summary of CRD-C 48-92 Water Permeability Testing**

Specimen Set ID	17-124-C (Control Mix)	17-124-V (Vapor Lock)	17-124-E (Other)
Age at time of Testing (days)	28	28	28
Test Duration (days)	28	28	28
Diameter (in.)	6.00	6.00	6.00
Length (in.)	6.00	6.00	6.00
Flow Rate for Last 5 Days of Testing (ft <sup>3</sup> /sec):	0.365	0.222	0.287
Water Permeability (ft <sup>3</sup> /sec)/ft <sup>2</sup> (ft head/ft):	1.99E-11	1.21E-11	1.56E-11
Total Change in Volume of Water based on Readings (cm <sup>3</sup> )	199.50	94.97	168.31
Total Volume of Water Passed through Specimen (cm <sup>3</sup> )	0	0	0

## TECHNICAL DATA SHEET

Report of Results for Concrete Permeability Testing Continued

**Table 3 – Results of CRD-C 48-92 Water Permeability Testing of the Control Mix**

Specimen Set ID	17-124-C1	17-124-C2	Average
Age at time of Testing (days)	28	28	28
Test Duration (days)	28	28	28
Diameter (in.)	6.00	6.00	6.00
Length (in.)	6.00	6.00	6.00
Flow Rate for Last 5 Days of Testing	0.314	0.416	0.365
Water Permeability (ft <sup>3</sup> /sec)/ft <sup>2</sup> (ft	1.71 E-11	2.27 E-11	1.99 E-11
Total Change in Volume of Water based on Readings (cm <sup>3</sup> )	119.81	279.19	199.50
Total Volume of Water Passed through Specimen (cm <sup>3</sup> )	0	0	0

**Table 4 – Results of CRD-C 48-92 Water Permeability Testing of the Vapor Lock**

Specimen Set ID	17-124-V1	17-124-V2	Average
Age at time of Testing (days)	28	28	28
Test Duration (days)	28	28	28
Diameter (in.)	6.00	6.00	6.00
Length (in.)	6.00	6.00	6.00
Flow Rate for Last 5 Days of Testing (ft <sup>3</sup> /sec):	0.172	0.271	0.222
Water Permeability (ft <sup>3</sup> /sec)/ft <sup>2</sup> (ft head/ft):	9.40 E-12	1.48 E-11	1.21 E-11
Total Change in Volume of Water based on Readings (cm <sup>3</sup> )	74.05	115.89	94.97
Total Volume of Water Passed through Specimen (cm <sup>3</sup> )	0	0	0

## TECHNICAL DATA SHEET

Report of Results for Concrete Permeability Testing Continued

**Table 5 – Results of CRD-C 48-92 Water Permeability Testing of the Other Mix**

Specimen Set ID	17-124-E1	17-124-E2	Average
Age at time of Testing (days)	28	28	28
Test Duration (days)	28	28	28
Diameter (in.)	6.00	6.00	6.00
Length (in.)	6.00	6.00	6.00
Flow Rate for Last 5 Days of Testing (ft <sup>3</sup> /sec):	0.348	0.225	0.287
Water Permeability (ft <sup>3</sup> /sec)/ft <sup>2</sup> (ft head/ft):	1.90 E-11	1.23 E-11	1.56 E-11
Total Change in Volume of Water based on Readings (cm <sup>3</sup> )	238.83	97.79	168.31
Total Volume of Water Passed through Specimen (cm <sup>3</sup> )	0	0	0

Report for Vapor Lock ASTM C441 Testing TEC Services

Project No: TEC 16-1345 TEC Services Laboratory No: 17-124

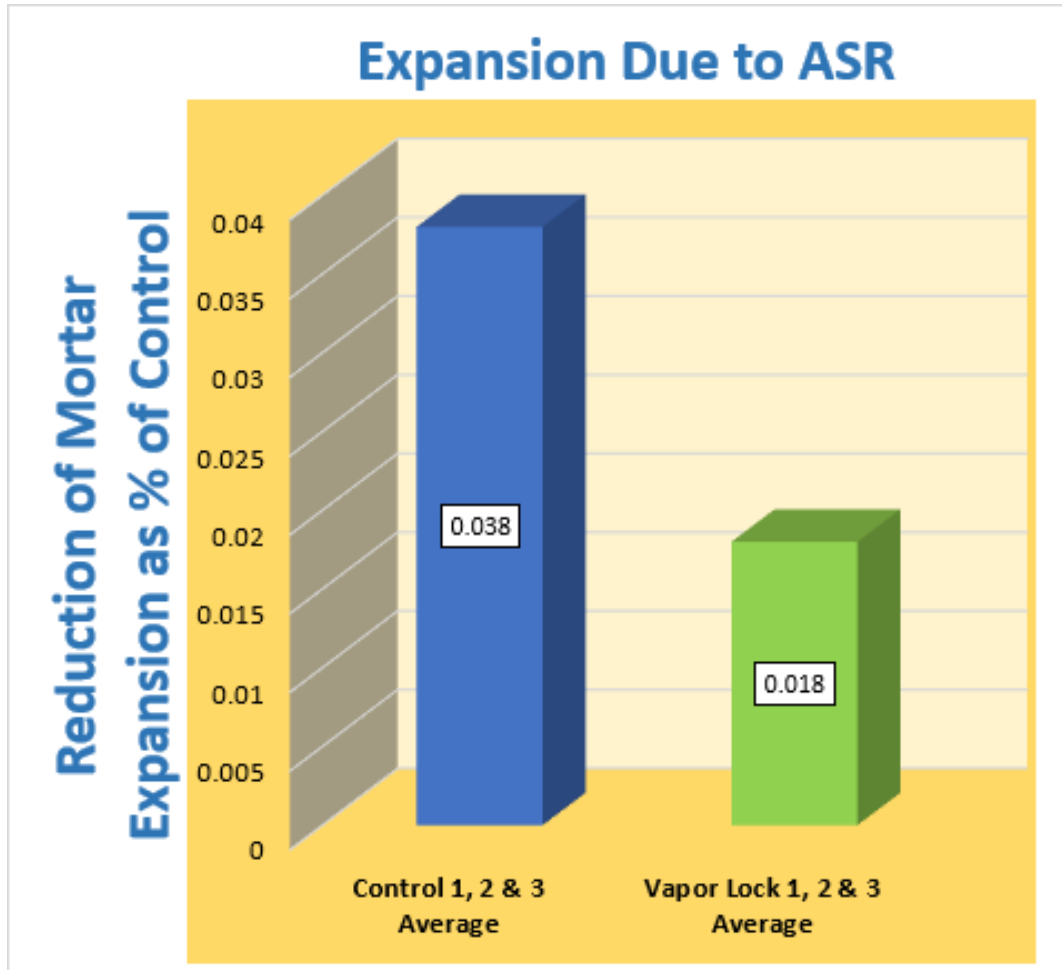
**Table 1 – C441 Mix Proportions**

Material	Control	Vapor Lock
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
<b>Average</b>			0.038
17-124- IVL	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	---
<b>Average</b>			<b>0.018</b>
<b>Reduction of Mortar Expansion as % of Control</b>			<b>52.6</b>

## TECHNICAL DATA SHEET



Rapid Chloride Permeability in accordance with Carbonate Silicate (CSA) A23.2-23C Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration

**The Test Results are provided in the table below**

Concrete Mix Information							Charge Passed in 6 hours (coulombs)	Age at Test (days)
ID No.	Mix Code	Date Cast	Design Strength (MPa)	Air Content (%)	Slump (mm)	Cement Type		
2421	612401	Fe 1	35	5.8	85	GU	1045	68
2422		7/16					1071	91

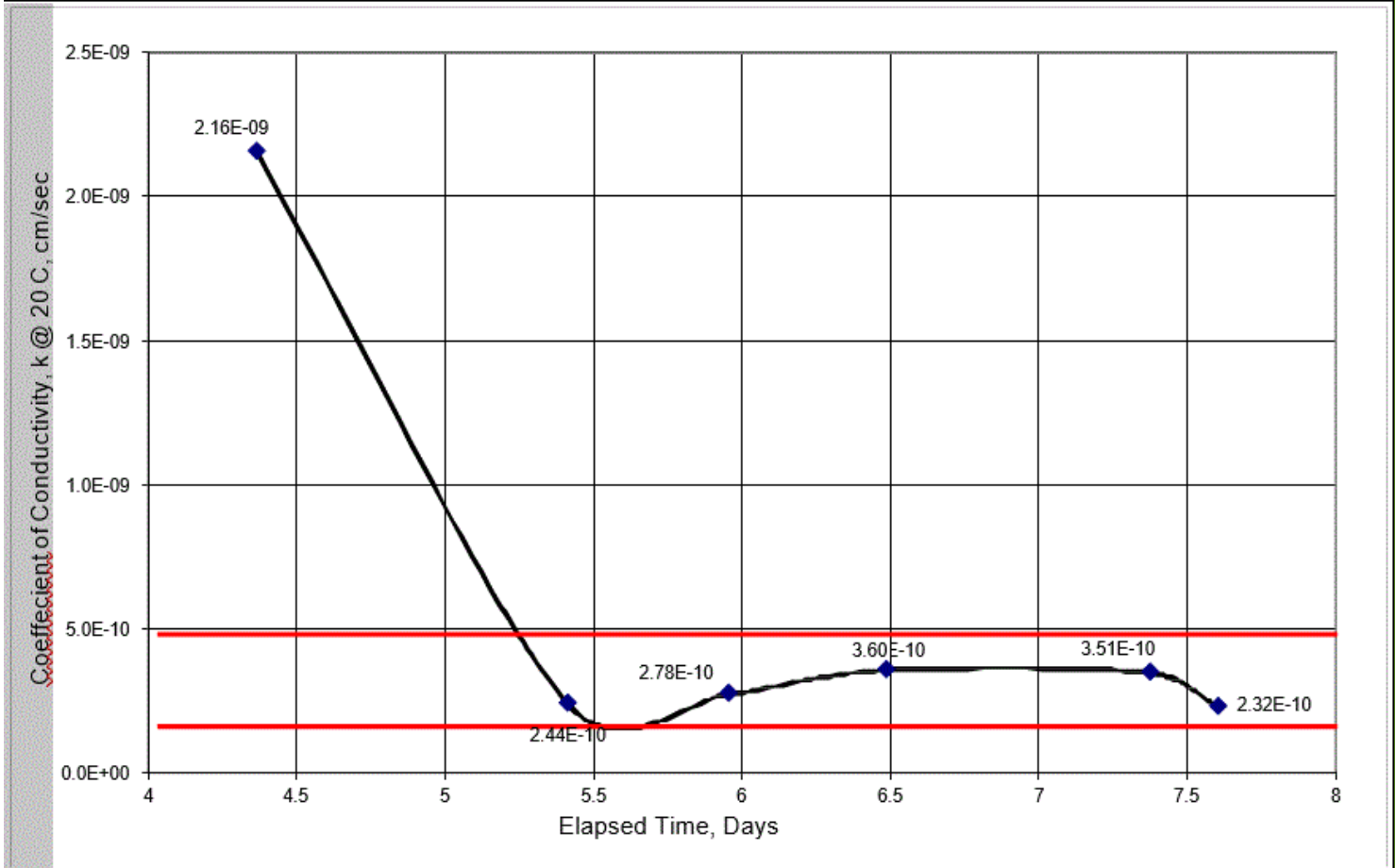
	07/02/16	07/09/16	07/16/16	07/23/16
Mix Design	Ave. 7 days in Air Storage	Ave. 14 days in Air Storage	Ave. 21 days in Air Storage	Ave. 28 days in Air Storage
RRM09038 (with Vapor Lock)	0.010%	0.017%	0.019%	0.029%
RRM09038 (with no Vapor Lock)	0.013%	0.024%	0.029%	0.037%



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Sample Location	Sample Description	Mix Design
Roof Level Suspended Slab	Concrete cylinder with Vapor Lock	V6000PT2

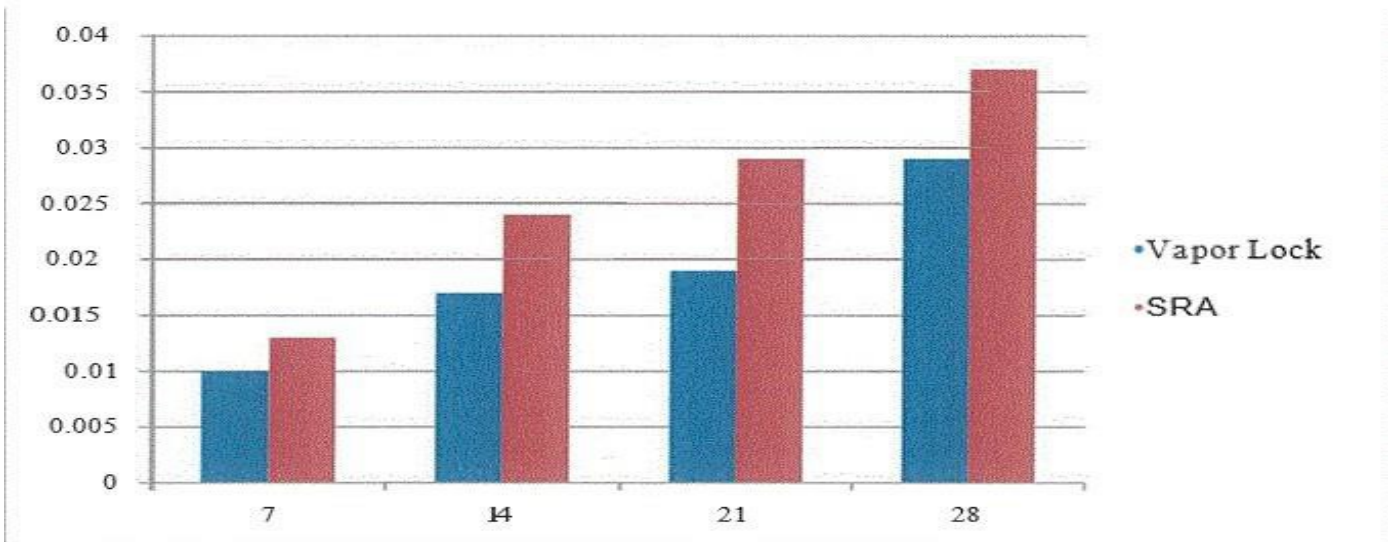
D5084 Testing



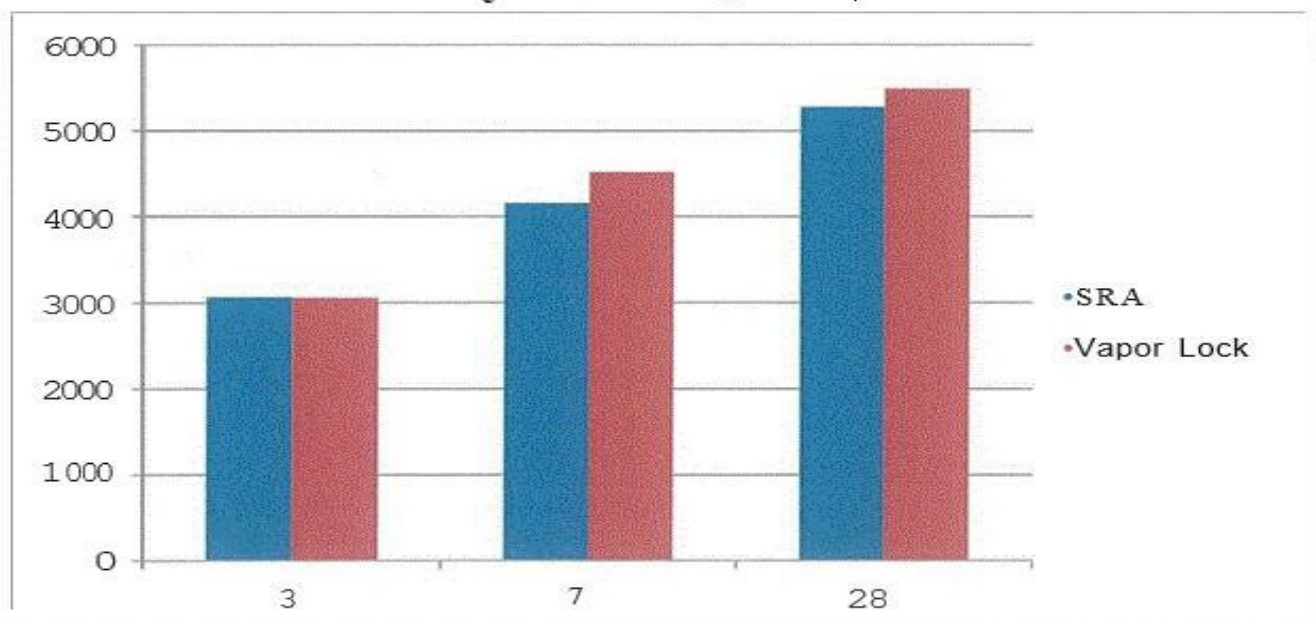
Sample Preparation		Test Conditions		Coefficient of Conductivity, k@20C, cm/sec
SSD Density (pcf)	150.0	Cell Pressure (psi):	115.0	Average of last 4 test cycles
Diameter (in.)	4.004	Back Pressure (psi):	95.0	0.00000000320
Sample Height (in.)	2.048	B-value:	0.95	3.20E-10
		Consol. stress (psi):	20.0	
		Hydraulic Gradient:	143.8	
		Pressure Head (psi):	10.0	
		Start temperature (°C):	21.1	
		End temperature (°C):	21.7	

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Shrinkage comparison with SRA & Vapor Lock shows an average 27% decrease in shrinkage when using Vapor Lock

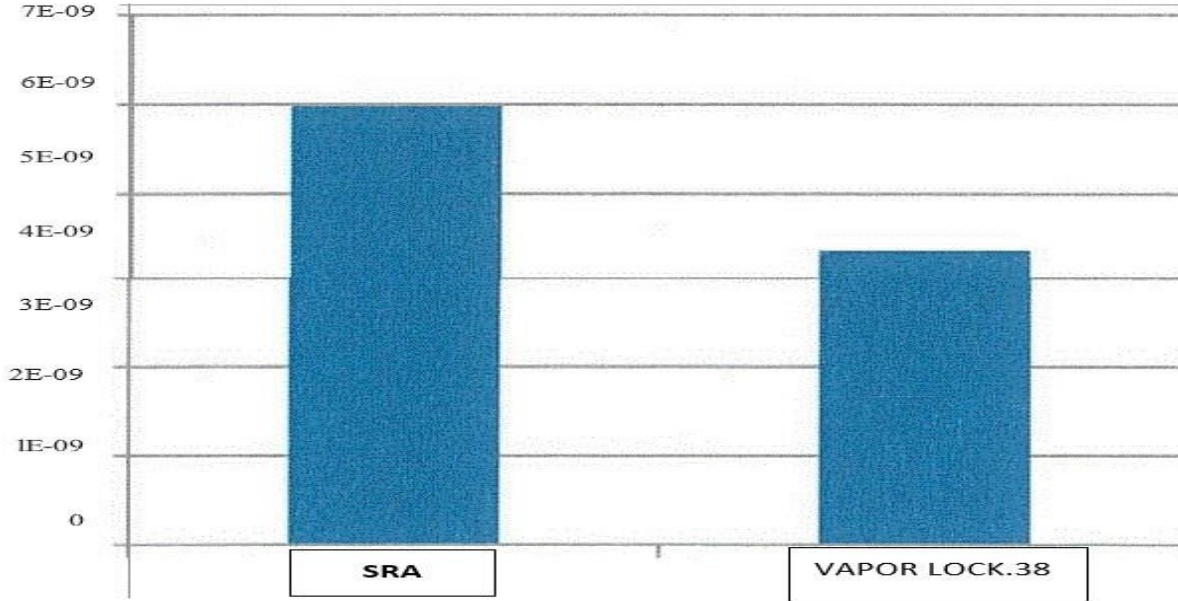


**Strength testing shows Vapor Lock increased strength by an average 4%**



# TECHNICAL DATA SHEET

## 5084 Test Results



### Radon Concentration in Receiving Compartment



	0	40	80	120	140	160	200	240	280	300	340	380
Conventional Concrete	0	31.25	24.5	79.625	122.5	153	237.75	263.37				
SPG Concrete	0	31.25	15.31	31.25	55.125	79.63	110.25	153.13				

## **TECHNICAL DATA SHEET**

### **APPLICATION INSTRUCTIONS**

Normal or lightweight concrete-Vapor Lock™ 40/40 is dosed at 650 ml per 100 kg of cementitious materials and should be added with the head water. SPG will examine and approve all mix designs.

This dose needs to be accurate to minus 0% plus 3%. Vapor Lock™ 40/40 must be administered by a concrete ready-mix provider or professional that is Certified by SPG to work with this material and is aware of and follows all the protocols established by SPG.

### **SPECIAL HANDLING**

Discard any frozen or separated, visually observable, product.

### **SAFETY**

Please refer to SDS at [www.spgGoGreen.com](http://www.spgGoGreen.com) or contact SPG.

### **WARRANTY DISCLAIMER**

The information herein is to assist customers in determining whether our products are suitable for their application. Our products are intended for sale to industrial and commercial customers. We request that customers inspect and test our products before use and satisfy themselves as to the contents and suitability. We warrant that our products will meet our written specifications. Nothing herein shall constitute a warranty expressed or implied, including any warranty of merchantability or fitness, nor is protection from any loss or patent to be inferred. The exclusive remedy for all proven claims is replacement of our materials and in no event shall we be liable for special, incidental or consequential damages.