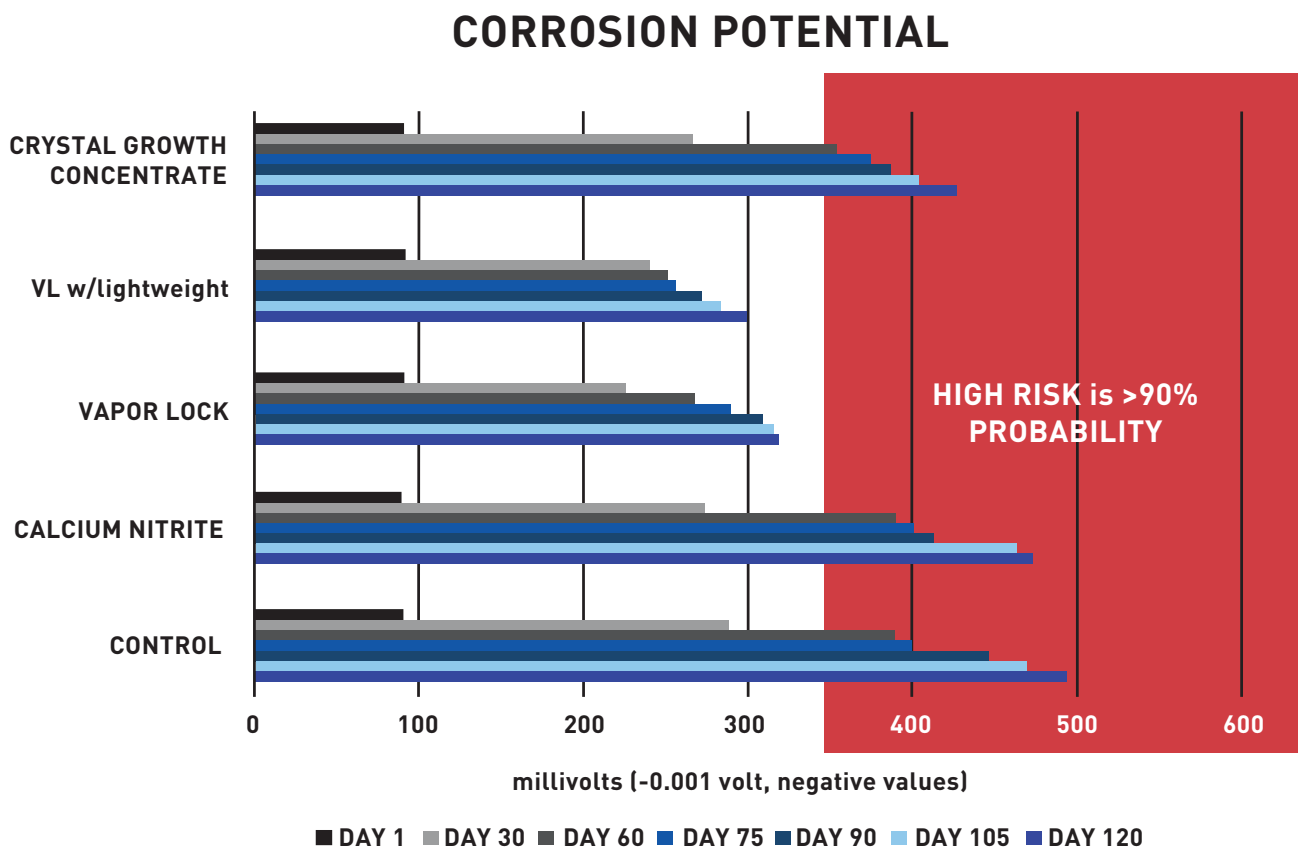
INDEPENDENT TESTING RESULTS

Product Group: Vapor Lock™ 20/20



ASTM Standards Tests and Results		
ASTM DESIGNATION	**TITLE**	**RESULTS**
C494/C494M Type S	Standard Specification for Chemical Admixtures for Concrete	Pass
NSF-61	Standard Approval Testing for use with Potable Drinking Water	Pass
C39/C39M	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens	2.1-.5% Increase over Control-28 days
C78/C78M	Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)	4-1% Increase over Control-28 days

INDEPENDENT TESTING RESULTS

Product Group: Vapor Lock™ 20/20

ASTM Standards Tests and Results		
ASTM DESIGNATION	**TITLE**	**RESULTS**
C138/C138M	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete	1% Decrease over control-28 days
C143/C143M	Standard Test Method for Slump of Hydraulic- Cement Concrete	0% Change against Control
C157/C157M	Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete	-0.021% Avg 3 Tests
C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method	0.3% Increase over Control
C403/C403M	Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance	Initial set Vapor Lock decreased setting time by 1 minute
C403/C403M	Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance	Final set Vapor Lock decreased setting time by 2 minutes
C666/C666M	Standard 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
D7102-06	Standard Test Method for determining the adhesive and cohesive	Pass

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

		MIX PROPORTIONS (LBS/YDS)		
MATERIAL		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
ADMIXTURES	GS	ADMIXTURE DOSAGE		
Vapor Lock™ (oz/yd)	1.085	-	61.1	-
Other (oz/yd)	0.7	-	-	64.6
PLASTIC PROPERTIES				
Slump (inches)		3½	4	4
Unit Weight (pcf)		146.5	145.5	145.5
Air Content (%)		0.7	1.3	1.2

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^3/sec)	0.365	0.222	0.287
Water Permeability (ft^3/sec)/ft^2 (ft head/ft)	1.99E-11	1.21E-11	1.56E-11
Total Change in Volume of Water based on Readings (cm^3)	199.50	94.97	168.31
Total Volume of Water Passed through Specimen (cm^3)	0	0	0

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 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 (ft^3/sec)	0.314	0.416	0.365
Water Permeability (ft^3/sec)/ft^2 (ft head/ft)	1.71 E-11	2.27 E-11	1.99 E-11
Total Change in Volume of Water based on Readings (cm^3)	119.81	279.19	199.50
Total Volume of Water Passed through Specimen (cm^3)	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^3/sec)	0.172	0.271	0.222
Water Permeability (ft^3/sec)/ft^2 (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^3)	74.05	115.89	94.97
Total Volume of Water Passed through Specimen (cm^3)	0	0	0

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 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^3/sec)	0.348	0.225	0.287
Water Permeability (ft^3/sec)/ft^2 (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^3)	238.83	97.79	168.31
Total Volume of Water Passed through Specimen (cm^3)	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

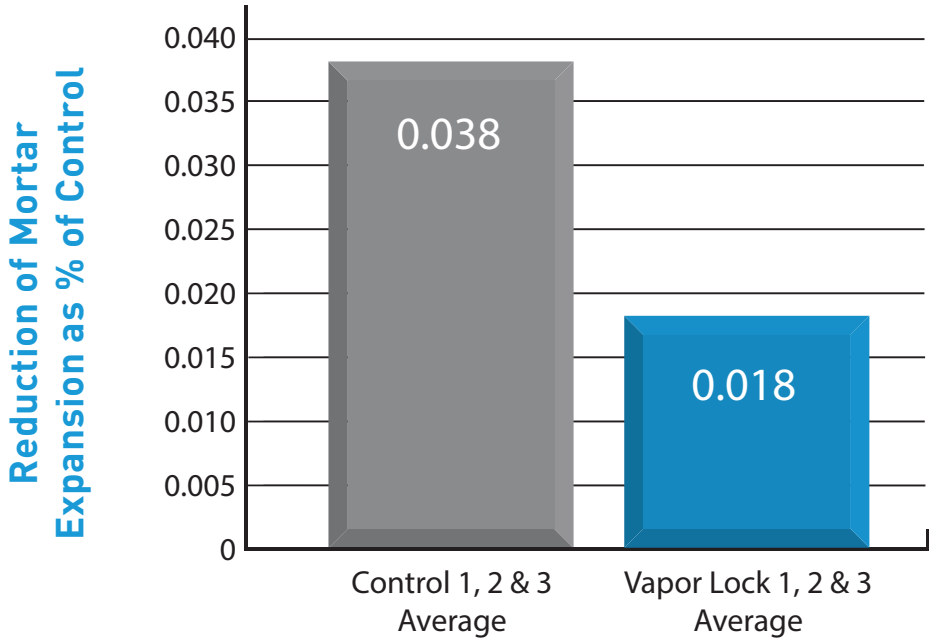
Table 2 – Expansion Due to ASR Test Results (%)

	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
AVERAGE			0.038
17-124- IVL	0.0724	0.0740	0.020
I 7-124-2VL	0.0665	0.0677	0.016
17-124-3VL	0.0600	0.0614	0.018
Reference	0.0438	0.0434	---
AVERAGE			**0.01**
REDUCTION OF MORTAR EXPANSION AS % OF CONTROL			**52.6**

REPORT FOR VAPOR LOCK ASTM C441 TESTING TEC SERVICES

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

Expansion Due to ASR



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

Test Results are provided in the table below

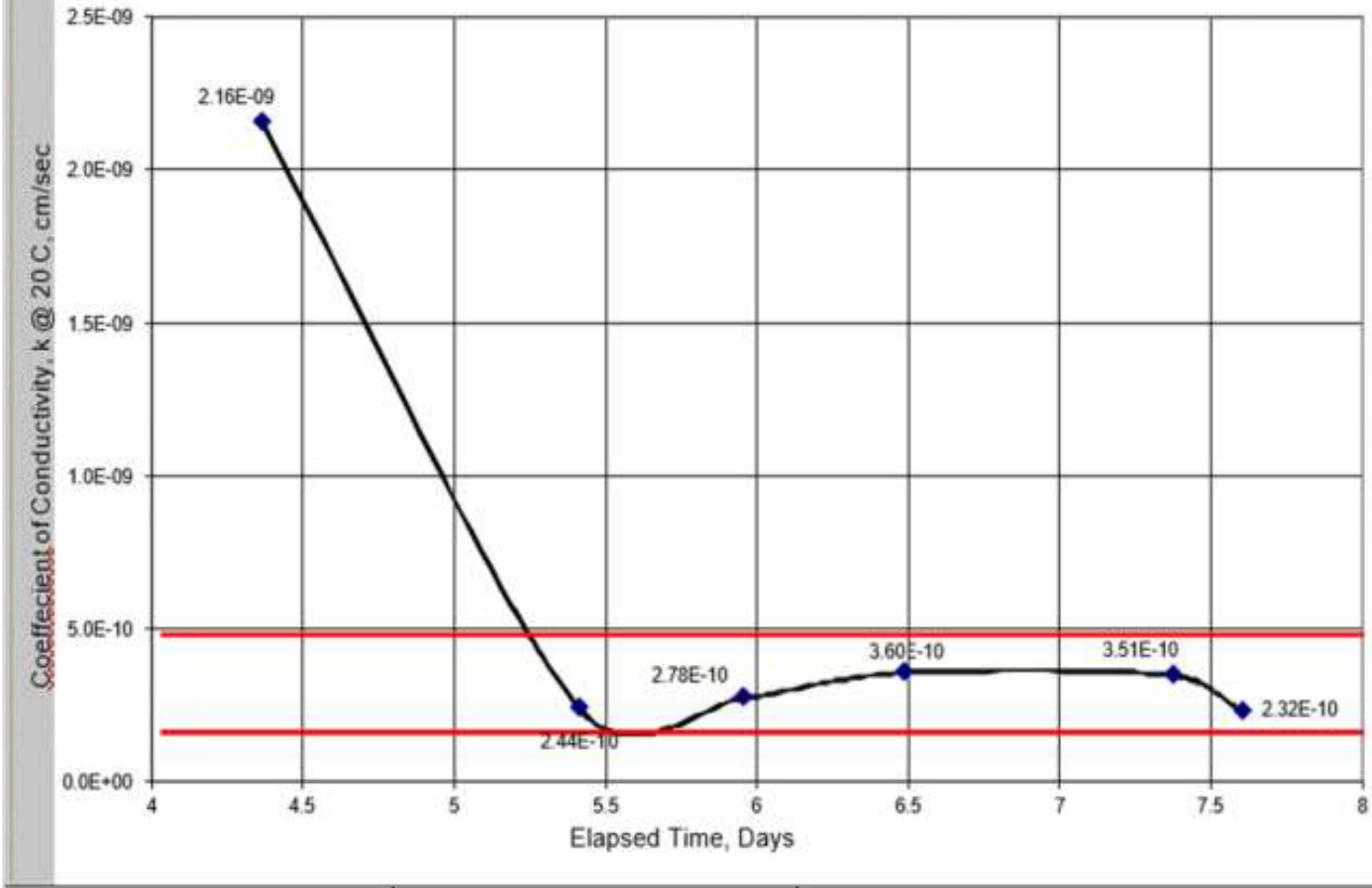
CONCRETE MIX INFORMATION							Charge Passed in 6 hours (coulombs)	Age at Test (days)
ID NO.	MIX CODE	DATE CAST	DESIGN STRENGTH (MPA)	AIR CONTENT (%)	SLUMP (MM)	CEMENT TYPE		
2421	612401	Fe 1 7/16	35	5.8	85	GU	1045	68
2422							1071	91

	07/02/16	07/09/16	07/16/16	07/23/16
Mix Design	Ave. 7 days in Air Storage	Ave. 1 4 days in Air Storage	Ave. 21 days in Air Storage	Ave. 28 days in Air Storage
RRM0938 with Vapor Lock™	0.010%	0.017%	0.019%	0.029%
RRM0938 with no Vapor Lock™	0.013%	0.024%	0.029%	0.037%

REPORT FOR VAPOR LOCK ASTM C441 TESTING TEC SERVICES

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

D5084 Testing		
SAMPLE LOCATION	**SAMPLE DESCRIPTION**	**MIX DESIGN**
Roof Level Suspended Slab	Concrete cylinder with Vapor Lock	V6000PT2

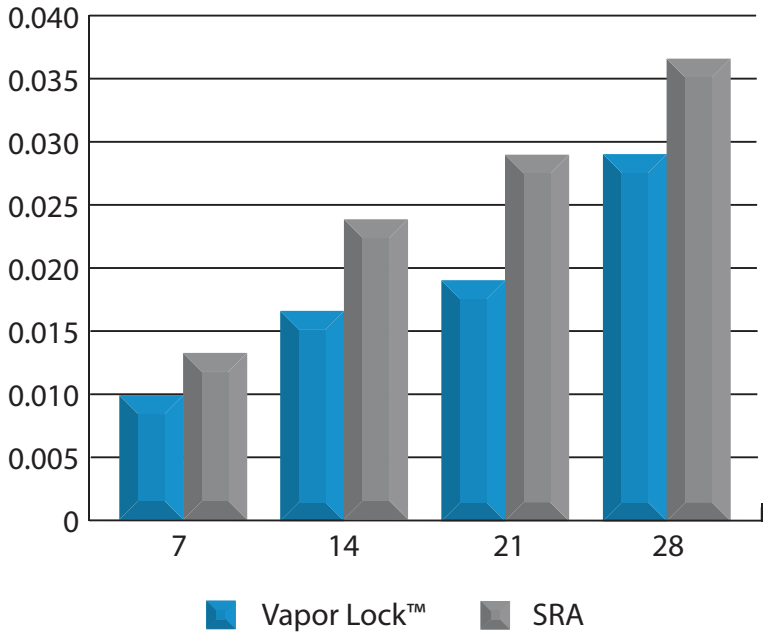


Sample Preparation		Test Conditions		Coefficient of Conductivity, k@20C, cm/sec
SSD Density (pcf)	150.0	Cell Pressure (psi):	115.0	Average of last 4 test cycles
Diameter (in.)	4.004	Back Pressure (psi):	95.0	0.000000000320
Sample Height (in.)	2.048	B-value:	0.95	3.20E-10
		Consol. stress (psi):	20.0	
		Hydraulic Gradient:	143.8	
		Pressure Head (psi):	10.0	
		Start temperature (°C):	21.1	
		End temperature (°C):	21.7	

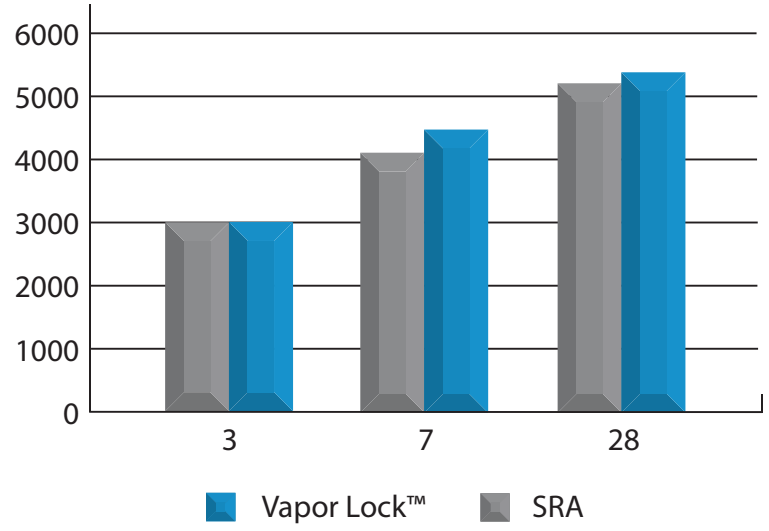
REPORT FOR VAPOR LOCK ASTM C441 TESTING TEC SERVICES

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

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



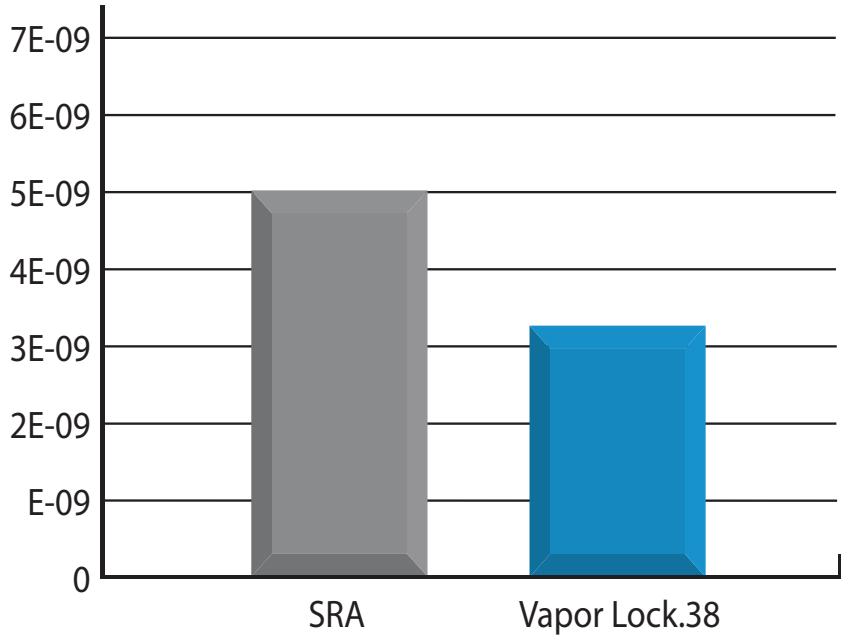
Strength testing shows Vapor Lock™ increased strength by an average 4%



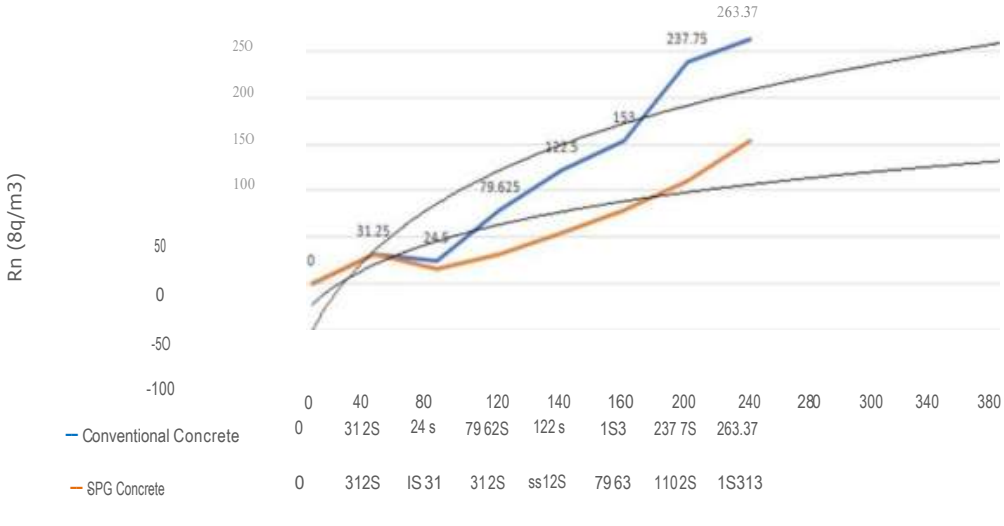
REPORT FOR VAPOR LOCK ASTM C441 TESTING TEC SERVICES

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

D5084 Test Results



Radon Concentration in Receiving Compartment



0	40	80	120	140	160	200	240	280	300	340	380	