

# Pro-Seal Mineral Reaction Suppressant System (Type I)



**Pro-Seal D-Nano-MIP®** Step 1: D-Nano-MIP a deep penetrating, reaction, suppressant

**Pro-Seal S-Nano-MIP®** Step 2: S-Nano-MIP a surface penetrating, reaction, suppressant

**Pro-Seal D-Nano-MIP®** is a single component nano-meso inorganic reaction suppressant that penetrates deep into a concrete substrate reacting with existing chemistry. It suppresses and/or blocks chloride, sulfide and carbonate reactions while increasing the pH in older concrete when used as step one of the Pro-Seal® Type I Mineral Reaction Suppressant System for concrete.

\*A Polycarbon/polycarbonate integrated technology.

- Potable water friendly
- No V.O.C.
- Leaves a clear natural finish with no film or membrane on the surface
- Provides a prepared surface for better bonding of Step 2, **Pro-Seal S-Nano-MIP®** step 2 of the **Pro-Seal Mineral Reaction Suppressant System**
- Protects concrete from the its ARA in situ matrix
- Forms a hydrostatic barrier in concrete that greatly reduces mineral reaction stimulation from vapor drive and moisture
- Greatly reduces or stops mineral salt reaction protecting the concrete paste and offers passive corrosion protection to existing rebar.

**Applications:** A Typical use of the Pro-Seal Mineral reaction suppressant System is to slow down concrete deterioration from chloride, sulfide and carbonation reactions (chloride attack) in large capital projects allowing them up to 20 years to fund for, plan and execute significant concrete structure repairs under controlled financial circumstances.

## Technical

Information	Value
Material	1 Part
Mix Time	N/A
Appearance	Liquid
Cure Time	48 hours walk able
Full Cure	14 days
Freezing Temp	32°F
Boiling Point	212°F
Flammability	None
Environmental Hazards	None
Shelf Life	2 Years when stored properly
Packaging	1gal(3.8L) 5gal(20L) 55gal(200L) drums, totes

## Specifications: System cured 6 hours (stressed)

Concrete Specimens System Tested as Follows		
ASTM	Data	Value
C 67 Sec. 13	Decreased Absorption	>95%
C 67 Sec. 14	Decreased Suction	>95%
C 67 Sec. 29	Efflorescence	None
C 67 Sec. 06	Compressive Strength	@ 8 Days +15%
C 67 Sec. 06	Compressive Strength	@ 31 Days +23%
G23 Sec. 69 E42 Sec. 65	Artificial Weathering <exchanges / formations> 180 days exposure	Gypsum none Ca Alum none Ca Sulfate trace Sodium Hydrox trace
C 666	Freeze-Thaw Damage	>95% Improved Resistance
C 666 using 8 % NaCl	Salt Attack In Presence Of Moisture	>100% Improved Resistance
Orf Method	Dusting Due To Abrasion	100% Improved Resistance

\* Data based on laboratory tested materials.

**Pro-Seal S-Nano-MIP®** is a single component one-coat application nano-meso inorganic chemical reaction suppressant surface treatment that penetrates into the concrete substrate surface cross linking with **Pro-Seal D-Nano-MIP®** penetrating, in situ mineral reaction suppressant.

When used as Step 2: **Pro-Seal S-Nano-MIP®** completes the **Pro-Seal Mineral Reaction Suppressant System (Type I)** These materials are part of the **Pro-Seal CCPS system Type II (Chemical Cathodic Protection System Type II)** for longer term suppressant of severe chemical/mineral reaction environments to prolong concrete life and diminish rebar corrosion.

\*Polycarbon/polycarbonate integrated technology.

- Prevents surface moisture penetration
- Prevents surface vapor penetration
- Prevents surface chloride, sulfide and carbonate penetration
- Retards pitting, rusting and dusting
- Resists penetration of many oils, acids, greases and other reactive chemicals and mineral salts
- U.V. Impervious
- Long lasting
- Salt water resistant seal
- Zero V.O.C.



# Pro-Seal Mineral Reaction Suppressant System (Type I)



**Pro-Seal D-Nano-MIP<sup>®</sup>** Step 1: Nano-MIP a deep penetrating, reaction, suppressant

**Pro-Seal S-Nano-MIP<sup>®</sup>** Step 2: Nano-MIP a surface penetrating, reaction, suppressant

## Technical

Information	Value
Material	1 part
Mix time	N/A
Appearance	Liquid
V.O.C.	None
Cure time walk	45 minutes
Cure time complete	96 hours
Flash point	500°F
Specific gravity	8.46
Stain resistance	Excellent
System Penetrates	Penetrator DP-36 <sup>+</sup> > 36 in or 1m Sealer SP-12 <sup>+</sup> >225 mils or 6.35mm
Coverage rate	Average 450 ft <sup>2</sup> / gal 45 m <sup>2</sup> /L
Packaging:	1 gal(3.8L), 5 gal(20L) 55 gal(200L), totes

## Specifications: System Cured 96 hours

ASTM/Test	Data	Value
C 67 Water absorption	48 hours submersion 5 hours @ boiling point	Low air content .10%
C 67 Water absorption	48 hours submersion 5 hours @ boiling point	Normal air content .18%
C 67 Freeze/thaw	Ponded with 8% CaCl <sub>2</sub> 15 hours freeze 32°F 7 hours thaw ambient 100 cycles	No damage
C 67 2 Freeze/thaw	Chloride content non-air entrained	<1.0% @ 2.45 cm
C 67 2 Freeze/thaw	Chloride content air entrained	<1.0% @ 2.45 cm
G 23-69	Inspection	Visual
E 42-65 accelerated weathering	4000 hours slight film loss water uptake (retained at 4000 hours) permeability	<0.55%
E 42-65 accelerated weathering	Chloride weathered	<0.50%
E 42-65 accelerated weathering	Chloride un weathered	< 1.05%
E 42-65 accelerated weathering	CO <sub>2</sub> weathered	<2.0%
E 42-65 accelerated weathering	CO <sub>2</sub> un weathered	<.70%

\* Data based on laboratory tested materials. Field application results may vary.



## Chemical Resistance

Cured Material	Rating
.05% phosphoric acid	Excellent
15% citric acid	Excellent
.05% oxalic acid	Good
.04% sulfuric acid	Good
Caustic soda	Fair
Caustic pot ash	Fair
.05% hydrofluoric acid	Poor
15% hydrochloric acid	Excellent

\* Data based on laboratory tested materials. Field application results may vary.

**Limited Warranty:** We warrant our product to be free of defects in material and workmanship; and to be in accordance with our company quality control standards. All data, statements, and recommendations, made herein are based upon information we believe to be reliable, but are made without any representation, guarantee, or warranty of accuracy. Our products are sold on the condition that the user himself will evaluate them, as well as our recommendations, to determine their suitability for the user's own purpose before adoption. Also, statements regarding the use of our products or processes are not to be construed as recommendations for their use in violation of any patent rights or in violation of any applicable laws or regulations. Liability under any condition shall be limited to replacement of material only.

**Technical Support:** Contact our technical department at 800.349.7325, [information@prosealproducts.com](mailto:information@prosealproducts.com) or visit our website for additional information.

**Extended Warranties:** 5 to 20 year Limited Warranties available when the Pro-Seal Mineral Reactive Suppressant System is applied per manufacturers guide specification by an Authorized Pro-Seal Applicator.

**Cautions:** Keep out of reach of children. May cause skin or eye irritation. This product may be harmful if swallowed. Do not induce vomiting. Use in well ventilated areas. Contact a physician immediately and always seek a physician's advice regarding first aid. Use only in commercial or industrial applications. Use only on intended surfaces. Contact manufacturer for specific application uses. See material safety data sheet for additional cautions.

# Pro-Seal Mineral Reaction Suppressant System (Type I)



## Pro-Seal D-Nano-MIP® Step 1: D-Nano-MIP a deep penetrating, reaction, suppressant

## Pro-Seal S-Nano-MIP® Step 2: S-Nano-MIP surface penetrating, reaction, suppressant

Below are excerpts of a controlled field test report, from a long term, control field test. The test was performed off of the coastal waters of the south east coast of the U.S.A. under sub-tropical climatic, shallow saltwater, conditions. There is no perfect solution for the egress of chemical mineral reaction in concrete under these difficult conditions. You will note in the tables below a significant impediment of chloride attack advance under the conditions at the field test sites.

These kinds of performance of the **Pro-Seal Chemical Mineral Reaction Suppressant System**, Type I or Type II, will allow the asset owner(s) the time to carefully plan and budget for future repairs and replacement costs. The ability to suppress chemical mineral reaction is a critical advantage of the Pro-Seal systems especially when considering large infrastructure life cycle cost of ownership, whether the asset is new construction or pre-existing with existing damage present at the time of application.

Treated			Chloride Content (kg/m <sup>3</sup> )					A		
Bridge Name	Initial Exposure Years Pre-test	Total Exposure Years	Initial Chloride Content (kg/m <sup>3</sup> )	Test Year-5 (kg/m <sup>3</sup> )	Test Year-10 (kg/m <sup>3</sup> )	Test Year-15 (kg/m <sup>3</sup> )	Test Year-20 (kg/m <sup>3</sup> )	Average Chlorides Accumulation (kg/m <sup>3</sup> )	Lowest pH recorded (omega pH)	Water Chloride Content (ppm)
Bridge 1 column set			TYPE 1 - 2 step Chemical Corrosion Control System					a1		
GB16	17	37	0.339	0.370	0.366	0.397	0.408	0.0520	11.90	31072
GB17			0.313	0.330	0.349	0.355	0.374		11.54	
GB18			0.319	0.339	0.346	0.355	0.373		11.98	
GB19			0.296	0.311	0.325	0.333	0.349		12.09	
GB20			0.335	0.342	0.343	0.349	0.358		12.04	
Bridge 2 column set			TYPE 2 - 4 step (FULL) Chemical Corrosion Control System					a2		
SS16	5	25	0.107	0.118	0.138	0.153	0.164	0.046	12.49	30769
SS17			0.135	0.141	0.158	0.166	0.165		12.58	
SS18			0.106	0.115	0.129	0.137	0.150		12.50	
SS19			0.137	0.151	0.162	0.171	0.177		12.57	
SS20			0.118	0.137	0.149	0.161	0.171		12.38	

Table 1b. Treated concrete performance. The weight data from Table 1 has been converted to metric in this table.

Un-Treated			Chloride Content (kg/m <sup>3</sup> )					B		
Bridge Name	Initial Exposure Years Pre-test	Total Exposure Years	Initial Chloride Content (kg/m <sup>3</sup> )	Test Year-5 (kg/m <sup>3</sup> )	Test Year-10 (kg/m <sup>3</sup> )	Test Year-15 (kg/m <sup>3</sup> )	Test Year-20 (kg/m <sup>3</sup> )	Average Chlorides Accumulation (kg/m <sup>3</sup> )	Lowest pH recorded (omega pH)	Water Chloride Content (ppm)
Bridge 1 column set			UNTREATED CONCRETE					b1		
GB10	17	37	0.339	0.429	0.564	0.990	1.404	1.0618	9.980	31072
GB11			0.313	0.449	0.527	0.949	1.260		10.240	
GB12			0.319	0.457	0.583	0.948	1.318		10.010	
GB13			0.296	0.430	0.562	0.926	1.207		10.420	
GB14			0.335	0.460	0.521	0.943	1.722		9.760	
Bridge 2 column set			UNTREATED CONCRETE					b2		
SS10	5	25	0.107	0.355	0.434	0.568	1.175	1.1193	11.390	30769
SS11			0.135	0.319	0.454	0.581	1.260		10.280	
SS12			0.106	0.352	0.426	0.552	1.108		10.800	
SS13			0.137	0.329	0.459	0.587	1.057		10.550	
SS14			0.118	0.315	0.446	0.577	1.600		9.880	

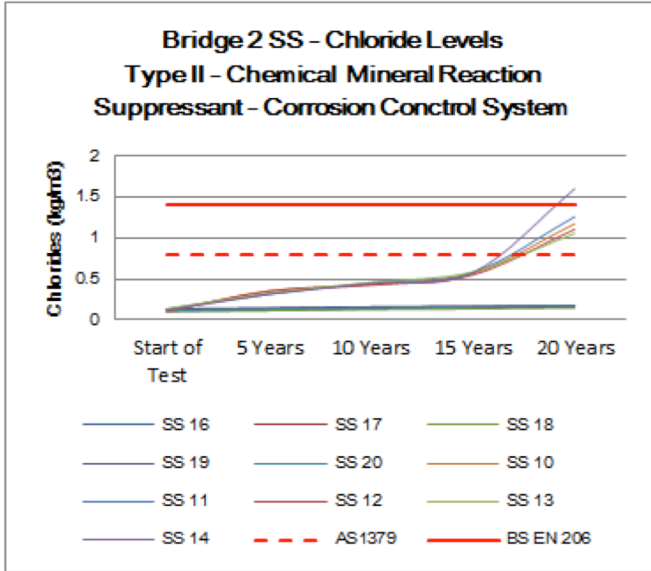
Table 2. Untreated concrete performance. Above is recorded the findings of the acid soluble chloride content gain period to period. Also noted is the lowest recorded pH per core per column.

# Pro-Seal Mineral Reaction Suppressant System (Type I)



**Pro-Seal DP-36<sup>Plus</sup>®** Step 1: Nano-MIP a deep penetrating, reaction, suppressant polymer

**Pro-Seal SP-12<sup>Plus</sup>®** Step 2: Nano-MIP surface penetrating, reaction, suppressant polymer

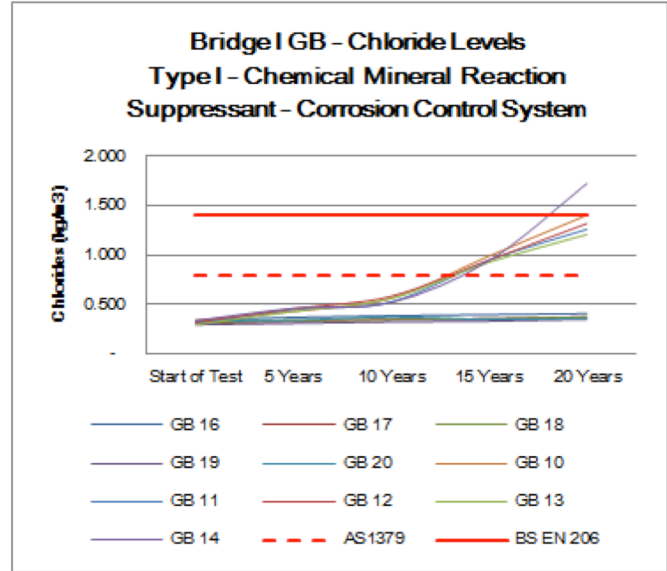


**Chart 1.** Visual presentation of the increase in the chloride concentration over the test period.

Type I treated concrete to chloride gain in untreated concrete

$$is; \frac{(\delta b1)}{\delta a1} \times 100\% = 2043\%$$

Type I performed admirably considering Bridge 2 column sets were not treated until their 17<sup>th</sup> year of exposure to the shallow saltwater and climatic conditions of the location site. The treatment will need to be repeated within the next five year period from the end of this test to maintain the ability to suppress the chemical mineral reactivity within the concrete matrix.

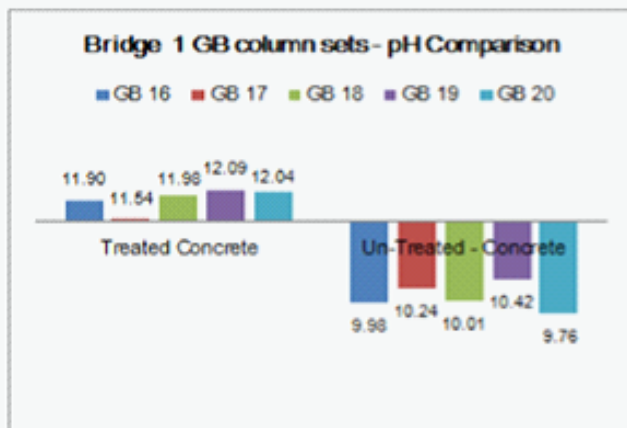


**Chart 2.** Visual presentation of the increase in the chloride concentration over the test period

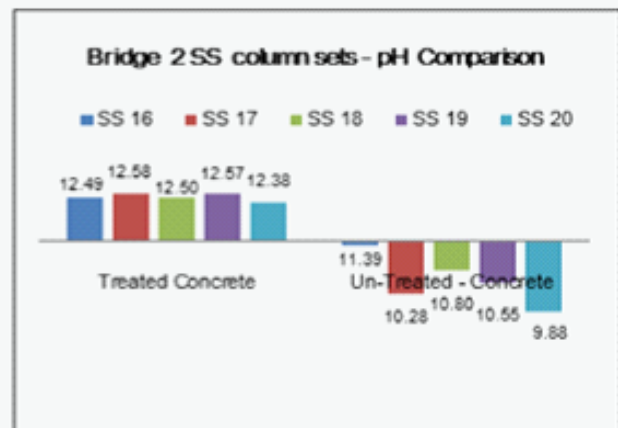
Type 2 treated concrete to chloride gain in untreated concrete

$$is; \frac{(\delta b2)}{\delta a2} \times 100\% = 2444\%$$

Type II a onetime application in contrast will perform many times longer. As a practical matter there are limitations regarding where this system may be applied. Type 2 may not be applied to horizontal load bearing concrete surfaces such as vehicle traffic surfaces in a parking structure. Type I may be applied to such structures. Contact Pro-Seal technical for guide specifications.



**Chart 3.** pH levels of the concrete samples at the end of the 20 year test for Bridge 1 GB column sets.



**Chart 4** pH levels of the concrete samples at the end of the 20 year test for Bridge 2 SS column sets

