PROTECRETE®
CONCRETE'S BEST SOLUTION

Top 20 Advantages to Using Densifier for Rebar

1. Stops corrosion of embedded steel
2. One-time permanent application saves you money
3. Significantly densifies concrete
4. Waterproofs concrete internally as well as externally
5. Makes concrete virtually impermeable
6. Doesn't harm the environment *or the person who applies it*
7. Doesn't change surface traction
8. Reduces dusting
9. Preserves concrete's integrity
10. Improves thermal resistance
11. Increases acid/chemical resistance
12. Improves surface bond quality
13. Provides internal humidity stability
14. Restricts vapors transmission
15. Adds surface abrasion resistance
16. Increases strengths
17. Eliminates internal water migration
18. Lowers chemical reaction potential
19. Lowers creep deformation potential
20. Alleviates carbonation effects, if any

Densifier for Rebar will improve your concrete and preserve the embedded steel within. It's the double-duty solution.

CONCRETE & TILE TECHNOLOGY, INC. 6501 GEIL LANE LOUISVILLE, KY 40219 502.964.5557 888.754.2914 FAX 502.964.9930

1. Product:
DENSIFIER FOR REBAR, a permanent waterproofer with an embedded steel preservative. Also formerly known as PROTECRETE-D+SPP Densifier plus Steel Preservative Penetrant.

2. Manufacturer:
Applied Concrete Technology, Inc.
1840 North Fernandez Avenue
Arlington Heights, IL 60004
847.253.0496 or 800.228.6694
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3. Description/Basic Use /Limitations:
Description: DENSIFIER FOR REBAR is a water-clear, odorless, non toxic, non flammable, non VOC, non VOS colloidal liquid which is environmentally neutral and user friendly.

Basic Use For Embedded Steel Corrosion Protection: DENSIFIER FOR REBAR readily enters into bare Portland cement concrete, penetrating to extraordinary depths through its open paths of reticulation. DENSIFIER FOR REBAR permeates the concrete eliminating existing embedded steel corrosion conductive conditions which may exist, whether active or as yet inactive. This action prevents, arrests or at least significantly retards corrosive activity in areas treated with DENSIFIER FOR REBAR.

Generally, either water/moisture (H_2O) as electrolyte, or molecular oxygen (O_2) is necessary for corrosion to exist; i.e. (a) H^+ (aqueous hydrogen) ion strengthens /accelerates corrosive reactions; (b) certain kinds of metals retard or hinder corrosion while other types of metals accelerate it.

Since corrosion exists when the metal being corroded is iron and the corroding agent is oxygen, theories of how and why steel corrosion occurs are numerous. The observed facts are that H_2O and O_2 are necessary. H^+ (aq) speeds up the reaction; and strains (as are produced when the metals are bent) usually accelerate the reaction. An interpretation of these observations are: (1) the iron (embedded steel) acts as an anode to give up two electrons and form Fe^{+2} (ferrous) ion: (2) the electrons are picked up by the H^+ ions to form transient neutral H atoms;

(3) the H atoms are immediately oxidized by O_2 to form H_2O;

(4) the Fe^{+2} is oxidized by O_2 in the presence of H_2O to form rust.

Incidentally, rust is not a simple compound but seems to be and indefinite hydrate of Fe_2O_3. Acids catalyze rust formation because they furnish H^+ to accept electrons from the iron (embedded steel), causing it to dissolve faster. Oxygen gas is necessary to oxidize Fe^{+2} to Fe_2O_3. The presence of water facilitates migration of Fe^{+2} from the reaction site. The resulting reduction in Fe^{+2} concentration allows more to be formed. Subsequently, embedded steel corrosion can be prevented or greatly reduced, by simply cutting off or restricting the O_2 or H_2O supply.

DENSIFIER FOR REBAR does just that plus provides many other benefits to discourage steel corrosion. It neutralizes existing acids. It deaerates rust buildup (if present), providing an environment which allows steel's oxide layer to permanently posture itself in an Fe_2O_3 non corrosive mode.

DENSIFIER FOR REBAR's especially formulated, internally generated, very insoluble colloidal precipitate is also permanently deposited in the concrete's previously open paths of reticulation. It penetrates down to the embedded steel, causing corrosion to be permanently deprived of its necessary ingredient, which is electrolyte.

Basic use as integral sealer, densifier and waterproofer:

DENSIFIER FOR REBAR applied to Portland cement concrete integrally waterproofs, densifies and preserves concrete as well as its embedded steel. These attributes are beneficial to concrete of any age, old or new, at any point during concrete's useful lifespan. It provides concrete with an effective chloride ion / contaminate barrier, reducing concrete's vapor transmission rate, diminishing its permeability factor. Actions which preserve integrity while also extending concrete's useful lifespan potential. It also further improves the concrete's abrasion resistance, as well as its acid/chemical potential damage resistance.

Applied to the surface of a concrete installation, it permeates to extraordinary depths. As DENSIFIER FOR REBAR permeates/penetrates while still in liquid form, it reacts with concrete's interior constituents. This reaction prolifically converts DENSIFIER FOR REBAR's extremely low solids colloidal liquid to a 100% solids C-S-H material. It becomes an integral part of the concrete itself. DENSIFIER FOR REBAR's integrally generated C-S-H will now occupy concrete's accessible pore spaces which were previously voids.

The internal C-S-H production does not generate heat during its liquid to solids conversion and will not ever generate internal expansion pressures.

Internally produced C-S-H precipitated from DENSIFIER FOR REBAR has its own pore network. It contains uniform pore sizes much smaller than treated concrete's microporosity. The C-S-H barrier remains resilient and allows the concrete to breath, expand and contract as it needs to.

A DENSIFIER FOR REBAR treatment does not deleteriously affect the surface traction quality. It even enhances the concrete's surface bond quality. Areas treated need only to be closed during treatment and can be open to traffic immediately after treatment.

NOTE: For more information see the DENSIFIER FOR REBAR data sheet.

Limitations: DENSIFIER FOR REBAR contacting glass should be removed before being allowed to air dry, since glass can become etched. DENSIFIER FOR REBAR may dull the shine on aluminum, however, aluminum's integrity remains intact. Do not apply on frozen concrete or when ambient temperature is freezing or below.

4. Technical Data:
Physical: Liquid
Color: Water-Clear
Odor: None
pH: ± 12
Flammability: None
Hazardous Vapors: None
Cleanup Solvent: Water

5. Installation:
Note: In hot climates, mist-wet the surface with water and remove any puddles prior to application.

a. Use medium- to high-pressure airless sprayer complete with a 24-inch wand and a .019 fan tip spray jet.

b. Hold spray tip 6 inches from surface.

c. Apply to the point of concrete saturation twice in back-to-back applications. To do this, visually establish a start and finish point during the first application, then prior to relocating the spray equipment, apply to same area again using the start and finish points previously established.

d. Each application should be at the rate of 200 square feet per gallon with an overlapping spray pattern of approximately 10% to 15%. Therefore, estimate volume needed at the rate of 100 square feet per gallon.

e. Begin applying at the lowest level elevation. For example, walls and slopes should be applied side to side, from the bottom up.

f. Use overlapping patterns of north and south, east and west strokes.

g. Wax, paint or anything else restricting access to concrete's interior must be chemically or mechanically removed for DENSIFIER FOR REBAR to penetrate.

h. Do not apply on frozen substrate or when temperature is near freezing.

i. When applying paint, adhesives or other coatings, wait 24 hours after sealing with DENSIFIER FOR REBAR, then thoroughly vacuum OR flush surface with water and allow to dry before coating.

j. For very oily/greasy surfaces, use DENSIFIER PLUS CLEANER (or clean with detergent and high pressure hot water) prior to application.

k. DENSIFIER FOR REBAR may etch glass or dull shiny aluminum and can be difficult to remove from other surfaces once it dries. Cover surrounding surfaces or rinse immediately if sprayed with product.

l. DENSIFIER FOR REBAR is safe to use and environmentally friendly. We do recommend use of a painter's mask during application. Refer to MSDS.

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How Densifier for Rebar removes agents which corrode imbedded steel

A technical explanation of how PROTECRETE's Densifier for Rebar stops or virtually prevents the corrosion of imbedded steel

The most common and frequent forms of corrosion of Portland cement concrete's imbedded steel is caused by a flow of electric current, usually, but not necessarily, generated within the concrete itself. Electrical potential differences can occur in various areas throughout concrete containing imbedded metals for several diverse reasons; variable moisture content, oxygen concentration, electrolyte concentration, or contact of dissimilar metals, etc. Inside reinforced concrete prior to corroding, a corrosion cell may be formed along imbedded steel through the formation of an anode where corrosion occurs and a cathode where no corrosion occurs. However, for corrosion cells to become active there has to be electrolyte present. Electrolyte can be any liquid which is capable of conducting electrical current through ionic flow, such as rain water, etc. The electrolyte acts as a sink for steel's electrons, the higher concentration of ionized substances. Chlorides from salt or calcium cause the electrolyte to be more potent or stronger. This allows even more electron flow from the steel, further accelerating corrosive activity rates.

Electrolyte activated corrosion cells subsequently produce pits in the corroding imbedded steel. However, the integrity loss due to pitting/corrosion is of much greater consequence in concrete utilizing prestressing cables than in concrete with reinforcing bars. A catastrophic failure may occur in stressed cables as the cable's cross section becomes reduced or weakened sufficiently by corrosion or embrittlement due to hydrogen evolution caused by the corrosive processes. On the other hand, concrete surrounding the imbedded steel reinforcement bar is often cracked as a result of corrosion's expansive forces from a load bearing standpoint long before the loss of steel's integrity becomes critical. In such cases, repairs are often necessary due to concrete bond loss, cracks, or spalling, making corrosion, in either instance, very costly.

Now there is an effective alternative to helplessly allowing this corrosive destruction to run rampant. The alternative is in the form of a non-toxic, environmentally and user friendly solution, PROTECRETE Densifier for Rebar. It is spray-applied to the concrete's surface as a remedial (apparent corrosion taking place) treatment or as a preventative treatment (no visible signs of corrosion as yet). It readily penetrates deep into the concrete being treated. As a remedial treatment, PROTECRETE Densifier for Rebar arrests or greatly retards destructive corrosion activity through subsequent removal of electrolyte, oxide (scale) deaeration, and oxygen deprivation at the steel's surface. Also, as a side benefit, PROTECRETE Densifier for Rebar diminishes water soluble chloride content to varying degrees, depending on pore accessibility, permeability, chloride content, and etc.

Where imbedded steel is not yet corroding, PROTECRETE Densifier for Rebar works to prevent corrosive processes from commencing by neutralizing acids (if any) which are mainly responsible for pitting, oxygen deprivation, and conversion of steel's protective oxide coating from a two valence oxide to a three valence one.

Following an application, the internally generated insoluble residue subsequently left in PROTECRETE Densifier for Rebar's penetrating reticulation route permanently deprives treated areas of their main ingredient for corrosion, which is electrolyte.

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ASTM C-114

RE: PROTECRETE Densifier for Rebar Water Soluble Chloride Ion Modified ASTM C-114 Test.
Excerpted from a document originating at a reputable unbiased testing laboratory,
(Testing laboratory name is kept undisclosed pursuant to initiator's request).

This letter represents a summary of testing services provided relative to determining water soluble chloride ions in various concrete specimens.

The testing was performed on a concrete parking garage deck being repaired for a University Performing Arts Hall. Our company was providing construction inspection and testing to this project.

Initially, samples for chloride ion testing were hammer drilled from spare test cylinders cast from the delivered concrete. Subsequent test specimens were drilled after 12 months ± from the top three to four inches in the areas of the parking deck where the concrete used to make the cylinders was placed. The deck had been reportedly treated with Densifier for Rebar by the contractor.

Actual testing was done by another laboratory through agreement with ours. The results are:

WATER SOLUBLE CHLORIDE ION*

Pour Date	% of Total Sample		Calculated % of Cementious Fraction	
	1990	**1991**	**1990**	**1991**
07/31/90	0.026	0.035	0.19	0.21
	0.026	< 0.002	0.19	< 0.012
08/01/90	0.029	0.003	0.21	0.018
	0.024	0.007	0.18	0.042
08/23/90	0.032	0.002	0.24	0.012
	0.041	0.013	0.30	0.078
08/24/90	0.032	0.003	0.24	0.018
	0.043	< 0.002	0.32	< 0.012

** By Potentiometric with Silver Nitrate (Modified ASTM C-114).*

NOTE: Based on these results, Densifier for Rebar appears not only to prevent an increase of chloride ion content in concrete exposed to deicers and vehicular traffic, but also reduce the amount already present.

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AASHTO T-260 FOR CORROSION

RE: PROTECRETE Densifier for Rebar Chloride Content AASHTO T-260 Corrosion Test.
Excerpted from a document originating at a reputable unbiased testing laboratory,
(Testing laboratory name is kept undisclosed pursuant to initiator's request).

As requested, we have completed corrosion tests on 2 cores obtained from the reinforced concrete roof slab of the carport at the subject project. The carport is approximately 24 years old, only a few yards from the Atlantic Ocean, and displayed extensive corrosion related damage. A portion of the slab was treated with PROTECRETE Densifier for Rebar. We obtained one core from the treated area and one core from the untreated area. The cores were then brought to our laboratory and tested for compressive strength, total chloride content and depth of carbonation.

The test results did not indicate Densifier for Rebar had any effect on the concrete vis-a-vis its strength and depth of carbonation. However, the total chloride content was markedly reduces in the treated core. The effect of the treatment seemed to have extended to over 3 inches beneath the slab surface.

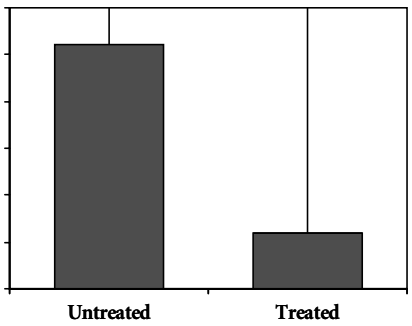
Based on the test results, in our opinion, Densifier for Rebar does appear to have the ability to reduce soluble chloride content in concrete. We appreciate the opportunity to be of service.

Yours truly,
Staff Engineer

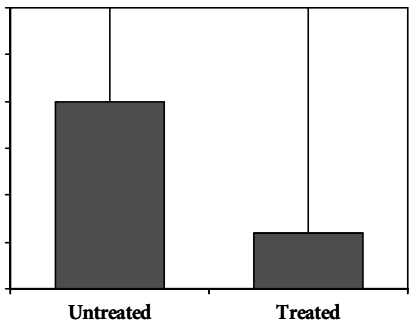
NOTE: The test document, in its original form, is on file and can be verified.

TOTAL CHLORIDE CONTENT TEST RESULTS:

Sample #1 - From Each Core,
One Inch From Top of Deck.



Sample #2 - From Each Core,
Three Inches From Top of Deck.



NOTE: Total chlorides were determined in accordance with AASHTO T-260. ACI recommends the percentage of total chlorides present in concrete not to be no more than 0.15.