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PRESS RELEASE



Cortec® Presents New MCI® Admixtures Brochure: Simple, Sure, Safe Technology For Extending Concrete Service Life!

Cortec's updated MCI® Admixtures brochure presents a revolutionary way to extend the service life of reinforced concrete structures. Among the more than 50 patents that Cortec® has earned in corrosion inhibiting technology, MCI® Technology offers innovative protection for metal reinforcement in concrete.

Corroded rebar is often the cause of concrete deterioration, which can in turn lead to costly repairs, financial losses, injury, or even death. Cortec's MCI® products have the unique ability to migrate through concrete to protect embedded ferrous metals and extend the lifespan of new or existing concrete structures.



As the brochure explains, three major causes of corrosion in concrete are chlorides, carbonation, and industrial pollutants. Though the high pH of new concrete initially offers a safe environment for steel


Causes of Corrosion in Concrete

New concrete initially provides an excellent protective atmosphere for steel. The concrete's high alkalinity or pH causes a passive oxide film to form on steel rebar, protecting it from corrosion. However, environmental factors such as chlorides, carbonation, and industrial pollutants can lower the pH or compromise the passive oxide layer, putting reinforcing steel at greater risk for corrosion.

The corrosion process itself involves an electrochemical reaction in which parts of the rebar become active "anodic" points. Ions at these points flow to "cathodic" points where they react to form rust. Once started, the rate of corrosion is affected by the concrete's electrical resistivity, moisture content, and the rate at which oxygen migrates through the concrete to the steel. As rust formation continues, it can take up to four times the volume originally occupied by the embedded reinforcement, causing cracking and spalling of the concrete.

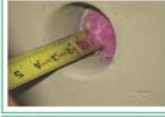
Chlorides

Chloride ions can penetrate the passive oxide film on concrete reinforcement. Once chloride reach a certain level in the concrete, corrosion starts. Concrete can be exposed to chlorides from several different sources, including chloride-containing set accelerators, deicing salts, seawater, and airborne salts.




Carbonation

Carbonation is the process by which carbon dioxide in the air reacts with hydroxides (such as calcium hydroxide) in the concrete to form carbonates. This reaction significantly lowers concrete pH. When the pH of concrete surrounding embedded reinforcing steel drops below 12, the protective oxide layer is lost, and the corrosion process begins.



Acid Rain/Industrial Pollutants

Acids attack concrete by dissolving the cement paste and certain aggregates. They also reduce the pH of the concrete, allowing the corrosion process to begin, similar to the carbonation process. Pollutants such as sulfate attack the concrete by reacting with hydrated compounds in the hardened cement paste. These reactions can lead to disintegration of the concrete, making embedded reinforcement more susceptible to corrosive attack.



Once a concrete structure is built, it is impossible to coat the reinforcing steel with fusion-bonded epoxy to protect it from corrosion. Cathodic protection in rebar requires the steel reinforcement to be electrically continuous, and must be constantly monitored. Cortec® MCI®, however, can be easily added to new concrete or used for rehabilitation. It will not delay construction or increase construction costs other than the small cost of the material. Unlike standard inorganic inhibitors, Cortec® MCIs do not have to be in direct contact with the reinforcing steel upon application because they can migrate to the steel and protect it.

When specified in new construction, Cortec's MCI® line of concrete admixtures offers reinforcing steel superior corrosion protection against carbonation and chloride attack.

rebar, the previously mentioned environmental factors can lower pH or compromise the protective passive oxide layer that naturally forms on embedded reinforcement. This allows an electrochemical reaction to take place between anodic and cathodic points on the metal, resulting in corrosion. As rust builds up and expands in volume, concrete cracking and spalling occur.

While other corrosion treatments are costly or impossible to apply once a concrete structure has been built, MCI® can be easily admixed into new concrete or applied to existing structures at minimal cost. MCI's ability to migrate through concrete means it can protect reinforcing metal without being applied directly to rebar, providing corrosion protection that is superior to standard inorganic inhibitors.

MCIs are mixed inhibitors that offer corrosion protection at both the anode and cathode. As shown in brochure images, MCI® in the vapor phase migrates through the concrete pore structure until it comes into contact with embedded metal, forming a protective molecular layer on its surface. This ionic attraction allows MCI® to penetrate into the surface of the metal deeper than water, chlorides or other aggressive contaminants.

Past tests have determined that MCI® admixtures are effective for periods in excess of 30 years. Additional tests have shown that MCI® admixtures do not compromise the physical properties of concrete. In fact, MCI® products have repeatedly exceeded ASTM test requirements for compressive and flexural strengths.

A helpful guide at the end of the brochure describes MCI® product characteristics, dosage, and application. Where appropriate, these products can be applied with Cortec's portable and direct feed dispensing systems for dosing admixtures into concrete.

What is MCI®?

MCIs are based on amine technology (amine alcohols and amine carboxylates). They are classified as mixed inhibitors, meaning they affect both anodic and cathodic portions of a corrosion cell. MCIs adsorb onto metals, forming a protective molecular layer on metal surfaces. This film prevents corrosive elements from further reacting with embedded reinforcement and also reduces existing corrosion rates.

How Do MCI® Admixtures Migrate into Concrete?

- 1) MCI® moves as a liquid into the concrete matrix. MCI® is admixed either with the batch water or directly into a mix. With adequate mixing, the inhibitor is dispersed through the concrete.
- 2) MCI® moves in a vapor phase throughout the concrete pore structure. This movement is governed by Fick's Law, meaning molecules move randomly throughout the matrix from areas of high concentration to areas of low concentration.
- 3) When MCI® comes in contact with steel, it has an ionic attraction to it, and forms its protective molecular layer. MCI's affinity to the metal is stronger than water, chlorides, and other corrosive contaminants.
- 4) Independent testing has confirmed that MCI® can adsorb onto metal to a depth of 75-85 nm, forming a layer that is between 20 and 100 Å thick. In the same testing, chlorides were shown to penetrate only 60 nm deep. This confirmed the ability of MCI® to displace chlorides on the metal surface and provide protection even in their presence.

