Technology that Extends the Service Life of Concrete Structures

# MCI®

## MIGRATING CORROSION INHIBITORS
FROM GREY TO GREEN


CORTEC CORPORATION
Environmentally Safe VpCI®/MCI® Technologies

ISO/IEC-17025 LABORATORY TESTING CERTIFIED
ENVIRONMENTAL ISO 14001 CERTIFIED SYSTEM REGISTERED
ISO 9001 CERTIFIED QUALITY SYSTEM REGISTERED

## A Revolutionary Way to Extend the Service Life of Concrete Structures. Simple...Sure...Safe.

**Cortec's patented MCI® (Migrating Corrosion Inhibitors) technology protects reinforcing metal in concrete from corrosion. MCIs rehabilitate existing concrete structures and extend the life span of new structures. Often, corroding rebar in deteriorating concrete is the cause of costly repairs, financial losses, injuries and deaths, but Cortec® has the corrosion solution. Cortec® MCI® products for concrete maintain structural integrity, rehabilitate vulnerable structures, and alleviate environmental concerns. A unique feature of MCI® is that the inhibitor will migrate a considerable distance through concrete to protect embedded ferrous metals.**

# Causes of Corrosion:

Reinforcement in new concrete is generally protected from corrosion due to the high alkaline nature of the concrete itself. The high pH of the concrete (usually greater than 12.5) causes a passive oxide film to form on the steel. Environmental factors can affect this protective oxide film and induce the formation of corrosion cells. Once corrosion starts, some parts of the reinforcement become anodic, discharging iron ions (current) into the electric cell. Steel areas that receive this current are the cathodic areas of the corrosion cell. This is where hydroxide ions are formed. Iron and hydroxide ions react to form iron hydroxide, FeOH, which further oxidizes 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:

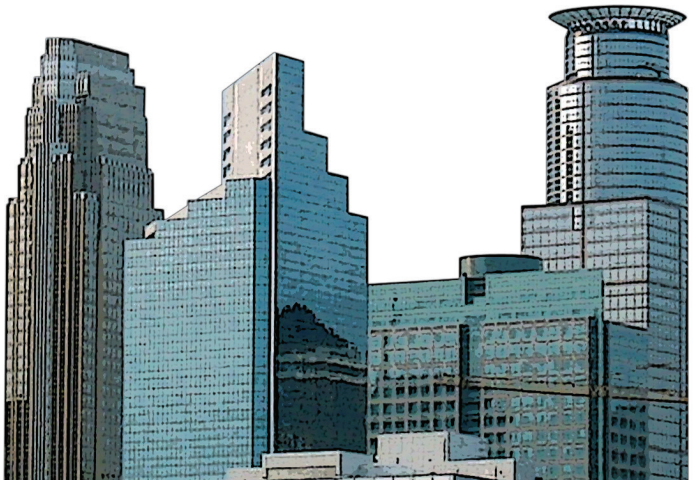
Chloride ions can penetrate the passive oxide film on the reinforcement. They combine with iron ions to form a soluble iron chloride complex that carries the iron into the concrete for later oxidation (rust). Once chlorides reach a level of about 0.15% (water soluble chloride by mass of cement) in the 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 in the concrete such as calcium hydroxide, to form carbonates. This reaction significantly lowers the 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 calcareous aggregates. They also reduce the pH of the concrete, allowing the corrosion process to begin. 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.



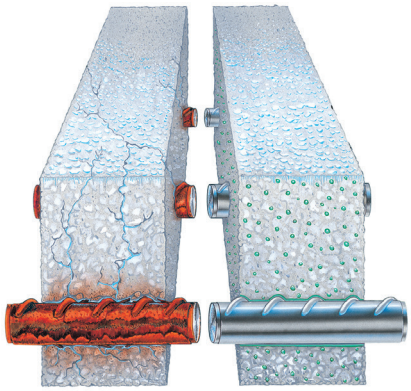
Once a concrete structure is built, it's impossible to coat the reinforcing steel with fusion-bonded epoxy to protect it from corrosion. Cathodic protection is ineffective unless the steel reinforcement is electrically continuous.

Cortec® MCI®, however, can be easily added to new concrete or used for rehabilitation and 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 come in 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.

# Comparison of Cortec® MCI® Admixtures to Other Inhibitors:

| Feature | Cortec® MCI® Inhibitor | Calcium Nitrite: |
|---|---|---|
| Environmentally friendly, derived from renewable resources | True | False |
| Used in small quantities—less than 1.5 pints/yd3 (1 liter/m3) | True | False |
| Required dosage rate is not affected by expected chloride exposure | True | False |
| Ability to migrate through concrete in a vapor phases at ambient temperatures | True | False |
| Does not increase shrinkage compared to a control | True | False |
| Does not require adjustments to concrete mix design (chemical or water) | True | False |
| Does not affect concrete resistivity | True | False |
| Does not accelerate concrete set time | True | False |
| Has UL approval to meet NSF Standard 61 (contact w/potable water) | True | False |
| Spills can be flushed with large quantities of water down drain | True | False |



# Summary of Data Involving Cortec® MCI® 2005 NS in Concrete

| | Control | MCI® 2005 NS |
|---|---|---|
| Air Content (AEC)* | 6.2% | 6.3% |
| (NEAC) | 2.7% | 2.5% |
| Std. Dev. | 1.8 | 2.4 |
| Compressive Strength (psi) 6 x 12 inch cylinders | | |
| @7 days (AEC) | 3550 | 3630 |
| (NAEC) | 3610 | 4180 |
| @28 days (AEC) | 4760 | 5030 |
| (NAEC) | 5180 | 6120 |
| Flexural Strength, psi, ASTMC192, C78 | | |
| @7 days (AEC) | 610 | 610 |
| (NAEC) | 720 | 720 |
| @28 days (AEC) | 720 | 720 |
| (NAEC) | 820 | 820 |
| Setting Time, ASTM C403 | | |
| Setting Time, Hour: Minutes | | |
| Initial (AEC) | 3:28 | 3:37 |
| (NEAC) | 3:35 | 3:35 |
| Final (AEC) | 4:55 | 5:07 |
| (NEAC) | 4:58 | 4:55 |
| Slump (AEC) | 3 1/3” | 3 1/4” |
| (NEAC) | 3 1/4” | 3” |
| Freeze Thaw, ASTM C666, Method A | | |
| Relative Durability | | 100% |

*AEC = air entrained concrete
NAEC = non-air entrained concrete

# How Does MCI® Technology Work?

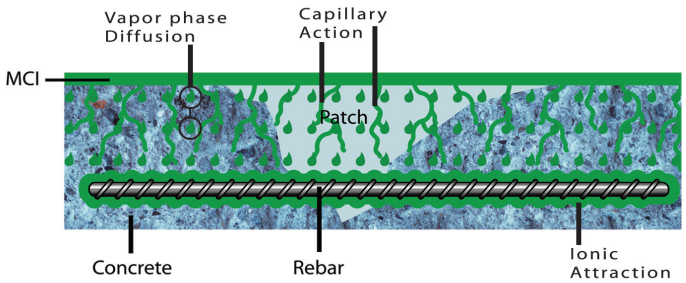
The corrosive effects of carbonation and chlorides cause a breakdown of the natural passivating layer on steel in concrete. MCI's provide protection because of their ability to migrate to the depth of the metal, and form a protective, molecular layer on steel when they come into contact with it.

**1.** MCI® move as a liquid into the concrete matrix. In new construction, MCI® is admixed either with the batch water or directly into a mixer. For existing structures, MCI applied to the surface is drawn into the concrete via capillary action—the concrete acts like a sponge, drawing MCI inside.

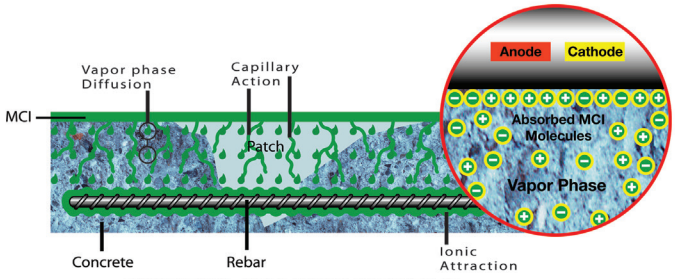
**2.** MCI® move in a vapor phase throughout the concrete pore structure. This movement is governed by Fick's Law, meaning molecules move randomly throughout the matrix from areas of high concentration to areas of low concentration.

**3.** When MCI® come into contact with steel, it has an ionic attraction to it, and forms it's 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.




**MIGRATING CORROSION INHIBITORS**



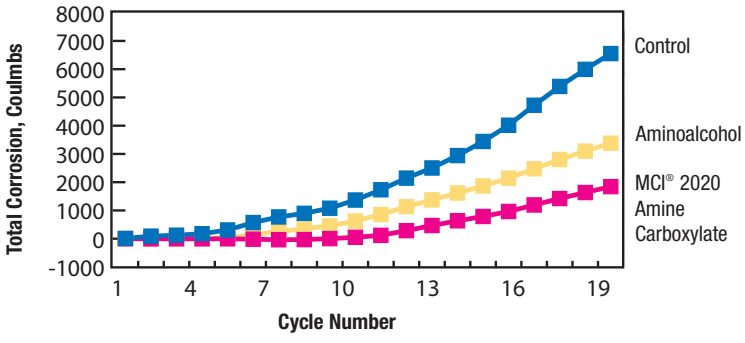

**MIGRATING CORROSION INHIBITORS**

# Competitor Comparisons

Time and time again, MCI® products are shown to outperform the competition. Whether using surface applied MCI® 2020 on existing structures to extend the life of a repair or using MCI® 2005 series admixtures to greatly increase the expected service life of a new structure, you can be sure that Cortec® MCI® will provide you with superior corrosion protection.

**Cracked Beam Testing of Surface Treatments**

**Amine Based Products**
**(3.5% NaCl)**

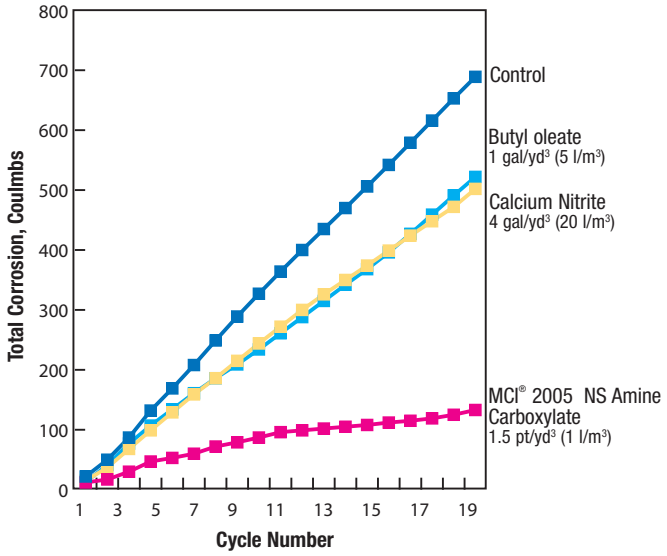



**Above:** Wiss, Janney, Elstner Associates, Inc.
January 1995, WJE No: 922041

**Right:** American Engineering and Testing
August 2003, AET Job No:05-01171

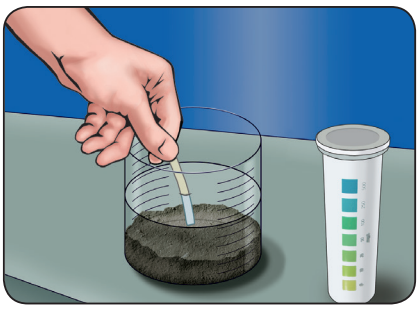
**Cracked Beam Testing of Admixtures**

**MCI® 2005 NS vs. Competition**
**(6% NaCl)**

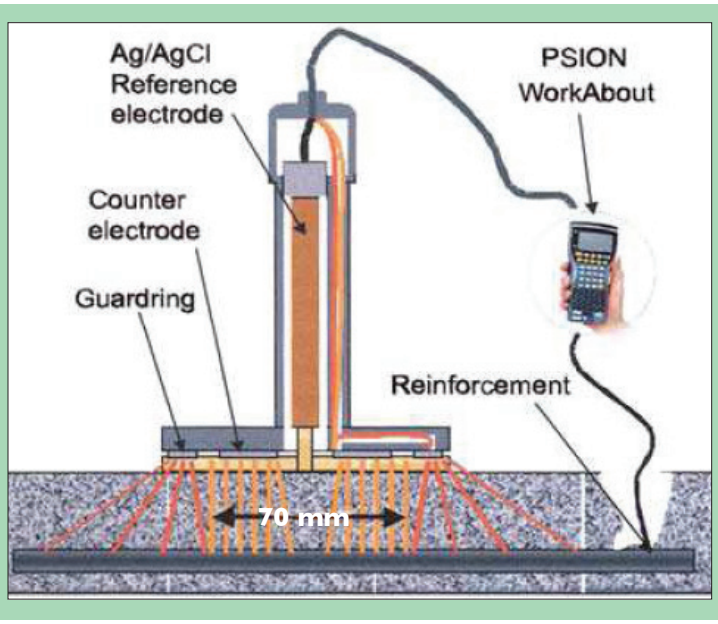


# Testing of Migrating Corrosion Inhibitors

The effectiveness of Migrating Corrosion Inhibitors can be monitored in many ways. A Quaternary Ammonium Compounds (QAC) test kit is a simple test method to show the presence of our surface applied MCI® in concrete structures. QAC's are a component of the MCI® product chemistry. While this test is not quantitative, it can verify the presence of inhibitor in the structure and can be monitored to show migration of MCI® to the depth of the reinforcement.

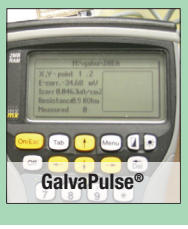


Use the manufacturer's instructions for the EM Quant QAC test sticks to analyze each slurry solution/extraction.



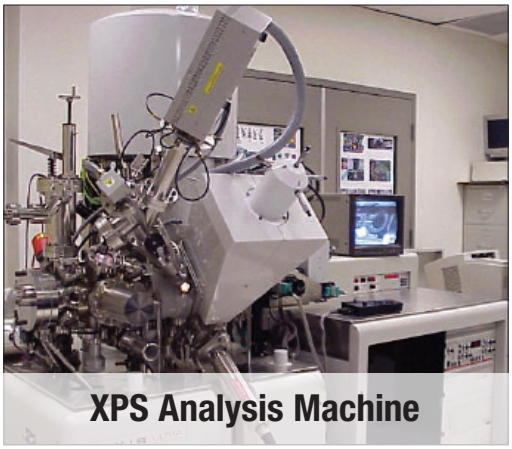

Testing the effectiveness of MCI® can be done by monitoring actual corrosion rates of embedded reinforcement. A control reading can be taken, and then subsequent readings can be performed after application of MCI®. This will show what the rate was initially, how low it drops after application of inhibitor, and allow you to determine when you should reapply more inhibitor for additional corrosion protection. There are several different pieces of equipment that use linear polarization to monitor corrosion rates of metallic reinforcement in concrete. These include: Gecor® 6, Gecor® 8, GalvaPulse®, and embedded corrosion rate sensors such as Corrator Probes.


Corrator Probes

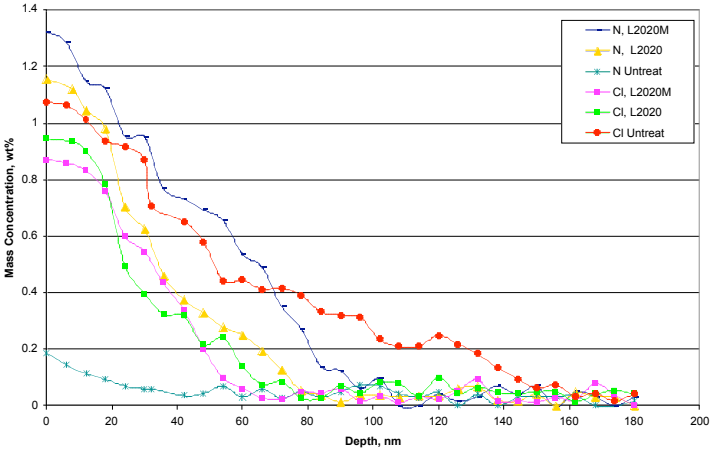

GalvaPulse®


Gecor® 6

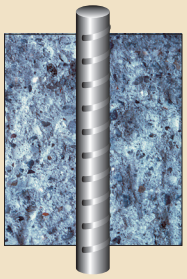
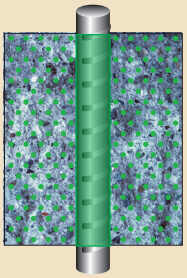
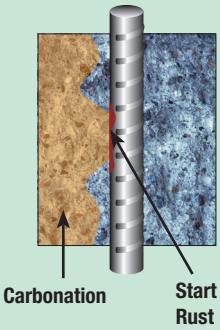
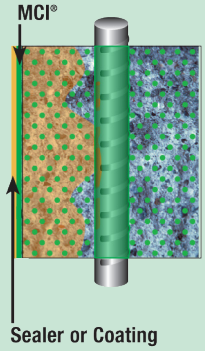
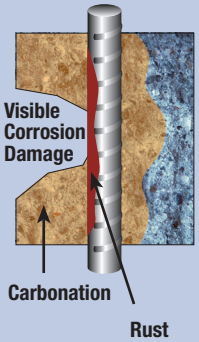
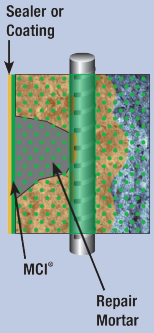
The molecular bond MCI® forms on embedded metals has been verified using X-ray Photoelectron Spectroscopy (XPS) which takes a picture of the metal and can show the depth at which molecules adsorb onto it. This test showed that not only did the MCI® migrate through the concrete, it also adsorbed onto the metal to a deeper depth than chlorides, effectively mitigating corrosion. Contact Cortec® Technical Service if you need more detailed information on testing Migrating Corrosion Inhibitors.


XPS Analysis Machine

XPS Depth Profile (Ar at 4 kV, 15 mA)
Untreated, Inhibitor A and B Concrete Samples after 450 days of testing



# MCI® Product Application Guide

| | Condition of Structure | Objectives & Requirements | MCI® Protection | Features & Benefits |
|---|---|---|---|---|
| **STAGE 1**<br>New Concrete |  <br>• Aggressive Environment<br>• Insufficient Concrete Cover | • Extend useful service life<br>• Protect from premature corrosion<br>• Preserve the natural appearance of the concrete |  <br>• MCI® 2005 series admixtures can double to triple the time to corrosion initiation, and once corrosion starts, they can cut rates by more than 5 times compared to a control | • Low Dosage Rate<br>• UL Certified to meet NSF Standard 61 Requirements<br>• No affect on concrete mix design<br>• No affect on concrete properties<br>• Can double the service life of many new structures |
| **STAGE II**<br>Existing Structures, No Visible Corrosion Damage |  <br>• Concrete structures without protective coatings<br>• Aggressive environment<br>• Initiation of corrosion<br>• No spalling or cracking | • Slow the rate of corrosion<br>• Protect against possible concrete damage<br>• Protect against further corrosion due to carbonation and/or chloride penetration |  <br>• Application of a MCI® 2020 Series surface applied product by spray, brush or roller<br>• Followed by an application of an anticarbonation coating such as MCI® Architectural Coating OR application of a sealer such as MCI® 2018, 2019, 2021, or 2022 | • High coverage rate<br>• Minimal or no concrete removal<br>• Non-destructive<br>• Extends the time to next repair of the structure<br>• Fewer coats means lower labor costs than competitor products<br>• Can be 10 times less costly than a Stage III repair!<br>• MCI® 2020 Series meets NSF Standard 61 requirements |
| **STAGE III**<br>Existing Structures, Visible Corrosion Damage |  <br>• Concrete surface with visible corrosion damage (i.e. spalling and cracking), repairs are necessary<br>• High level of chlorides at depth of reinforcement | • Repair of damaged surfaces<br>• Long term protection against future exposure of contaminants<br>• Enhanced protection against the continuing damage of latent corrosion<br>• Reduced risk of ring-anode (insipient anode) effect |  <br>• Cleaning of exposed reinforcement with Cortec's VpCI® 423, or use of Cortec's VpCI® CorrVerter®<br>• Application of Cortec's MCI® 2023 grout to exposed reinforcement and repair area<br>• Application of Cortec® MCI® 2039 repair mortar<br>• Application of Cortec® MCI® 2038 Finish repair mortar<br>• Application of Cortec's MCI® 2020 to entire surface area<br>• Application of Cortec® Coating or Sealer | • Aesthetically pleasing restoration of structure to a safe condition<br>• Complete repair and protection against latent corrosion damage<br>• Can more than double the life of the repair (based on G109 testing)<br>• MCI® 2020 Series is UL certified to meet NSF Standard 61 requirements |

## Relevant Case Histories

### Construction of Wells Fargo Parking Garage, MCI® 2005 NS (214)

An 1,800 vehicle, six-level parking garage needed all of it's 22,000 cubic yards of concrete to meet or exceed 3,000 psi strength within 18 to 24 hours.

A calcium nitrite based corrosion inhibitor didn't meet the required 24 hour minimum strengths, and also had shrinkage cracking. MCI® 2005 NS met the required specifications, reduced shrinkage by 30%, and eliminated shrinkage cracking even in sub-zero temperatures.

**See also:**
- China Railroad Bridge, MCI® 2000, 2020, 2021 (092)
- Concrete Bridge Foundation, MCI® 2000, 2020 (119)
- Concrete Railway Bridge, MCI® 2005, 2020, 2023 (139)
- City Street Bridge Deck, MCI® 2000 (211)
- Construction of Parkway Technology Campus, MCI® 2007 Super Corr™, 2022 Sealer (238)

### Pentagon: Restoration of All Exterior Walls MCI® 2020 V/O (046)

Corrosion of embedded reinforcing steel was causing spalling on the walls. Carbonation (up to 3.5 in) on the walls lowered the pH of the concrete causing the corrosion.

The requirements included: a minimum 20 year design life, stop water absorption, reduce or stop corrosion, and maintain the appearance of the walls. The repair program consisted of 200,000 $ft^2$ of surface hand patch repair and over 1,000,000 $ft^2$ treated with MCI® 2020 V/O, and a silicate based coating.

MCI® 2020 V/O was chosen to protect and repair the walls based on its warranty and its fulfillment of the other specified repair design requirements.

**See also:**
- China Railroad Bridge, MCI® 2000, 2020, 2021 (092)
- Parking Ramp, MCI® 2020 (121)
- Concrete Railway Bridge, MCI® 2005, 2020, 2023 (139)
- Construction of the World's Largest Mosque, MCI® 2021, MCI® Architectural Coating White (236)
- Inland Steel Building, MCI® 2020 (263)

### DePere Waste Water Treatment Tanks MCI® 2020, 2023, 2038 (219)

The outdoor waste water tanks were originally constructed in 1939, and no repairs had been made in almost 20 years. Corroding and spalled areas, as well as exposed rebar had to be repaired.

Concrete was sandblasted and pressure washed. Exposed rebar was coated with MCI® 2023 and spalled areas were repaired with MCI® 2038. This was followed by an application of MCI® 2020 to the entire surface area of the tanks.

Customer was very satisfied with the application and products used. They purchased more products to repair other tanks after the success of this project.

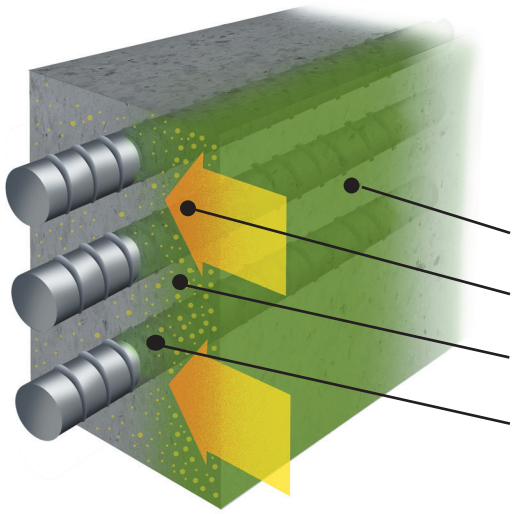
**See also:**
- HPRS™: High Performance Repair Systems, MCI® 2020, 2023, 2038, 2039, VpCI-386 (150)
- Concrete Spalling Due to Hydrochloric Acid Fumes, MCI® 2020, 2038, CorrVerter® (217)
- Leaking Parking Garage, MCI® 2020, 2022, 2023, 2038 (218)

# Diffusion Through Concrete

## *Migrating Corrosion Inhibitors for Reinforced Concrete*

*B. A. Miksic, FNACE, D. Bjegovic, L . Sipos*
*(printed in ConChem-Journal, 2/93)*

The diffusion rate of MCI® for two different types of concrete was determined using the mix designs (Table 1). Two concrete specimens were placed into a specially designed diffusion cell where they acted as a membrane between two solutions for a 21-day test period (Figure 1). For optimal results, the concentration MCI® was tested at three-day intervals. Every three days, a 15mL aliquot was taken for concentration determination, and after each measurement, the fluid was returned to the cell. An ORION 95-12 Ag/AgCl electrode containing 0.1 M $NH_4Cl$ solution was used for determination of MCI® concentration. Concentration of the inhibitor in the concrete over time was found using electrode potential readouts and a calibration diagram (Figure 2).




MCI® concentration increases with time, showing that the MCI® diffuses through the concrete (Figure 2). Using experimentally obtained data, the coefficient of diffusion was calculated (Figure 3 and Table 2). This data demonstrates the migratory nature of MCIs and proves that they can be used for protection against chloride induced corrosion and carbonation.

| General Composition | | T-1 | T-2 |
|---|---|---|---|
| Components | Units | | |
| Concrete | $kg/m^3$ | 380 | 380 |
| Water | $l/m^3$ | 209 | 171 |
| Aggregate | $kg/m^3$ | 1720 | 1823 |
| W/C | % | 0.55 | 0.45 |
| Consistency of Settling | cm | 14.5 | 4.5 |

**Table 1** Composition of Concrete

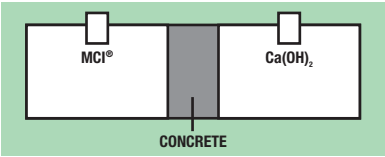



**Figure 1** Diffusion Cell

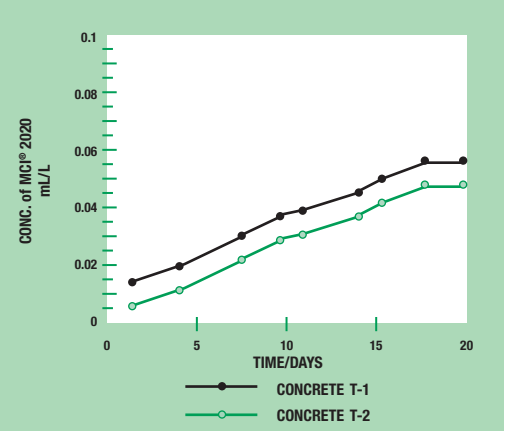



**Figure 2** Calibration Diagram

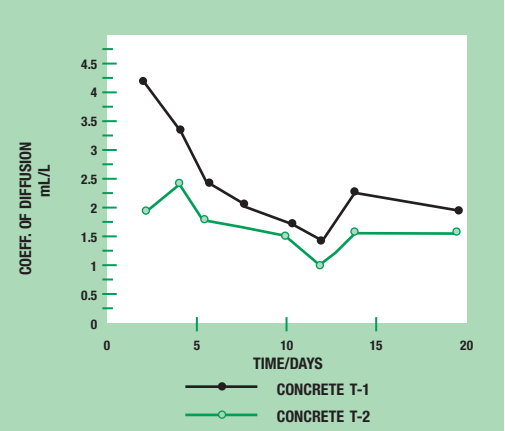



**Figure 3** Calibration Diagram

| Coefficient of Diffusion $cm^2/s^{-1}$ | | | |
|---|---|---|---|
| Concrete Sample | Data No. | Middle Value | Standard Deviation |
| T-1 | 5 | $1.78x10^{-12}$ | $0.30x10^{-12}$ |
| T-2 | 5 | $1.45x10^{-12}$ | $0.23x10^{-12}$ |

**Table 2** MCI® Coefficient of Diffusion

| | | Product | Description | Approximate Dosage Rate | Packaging |
|---|---|---|---|---|---|
| Admixtures | Amino-Alcohol Based | MCI®-2000 | Liquid, aminoalcohol based concrete admixture. Patented. | 1 pt/yd$^3$ (0.62 l/m$^3$) | 5 gal (19 l) pails, 55 gal (208 l) drums |
| | | MCI®-2001 | Powder, fumed silica/MCI®-2000 combination. Patented. | 3 lb/yd$^3$ (1.78 kg/m$^3$) | 5 lb (2.3 kg) boxes, 50 lb (22.7 kg) and 100 lb (45.4 kg) drums |
| | Amine Carboxylate Based | MCI®-2005 | Liquid, amine carboxylate based concrete admixture. Can retard concrete setting time 3-4 hours at 70ºF (21ºC). Patented. | 1 pt/yd$^3$ (0.6 l/m$^3$) | 5 gal (19 l) pails, 55 gal (208 l) drums 275 gal (1040 l) totes |
| | | MCI®-2005 NS | Liquid, normal set version of MCI®-2005. Can not be frozen. Patented. | 1.5 pts/yd$^3$ (1 l/m$^3$) | 5 gal (19 l) pails, 55 gal (208 l) drums 275 gal (1040 l) totes |
| | | MCI®-2005 AL | Liquid, normal set version of MCI®-2005 with less ammonia odor. Patented. | 1.5 pts/yd$^3$ (1 l/m$^3$) | 5 gal (19 l) pails, 55 gal (208 l) drums 275 gal (1040 l) totes |
| | | MCI®-2006 | Powder, amine carboxylate based concrete admixture. Can retard concrete setting time 3-4 hours at 70ºF (21ºC). Patented. | 1 lb/yd$^3$ (0.6 kg/m$^3$) | 5 lb (2.3 kg) boxes, 50 lb (22.7 kg) and 100 lb (45.4 kg) drums. |
| | | MCI®-2006 NS | Powder, normal set version of MCI®-2006. Patented. | 1 lb/yd$^3$ (0.6 kg/m$^3$) | 5 lb (2.3 kg) boxes, 50 lb (22.7 kg) and 100 lb (45.4 kg) drums. |
| | Specialty | MCI®-2012 IntegRepel | A concrete waterproofing admixture designed for protection of steel reinforcement . | 1.7 qt/yd$^3$ (2.1 l/m$^3$) | 5 gal (19 l) pails, 55 gal (208 l) drums, 275 gal (1040 l) totes |
| | | MCI® Grenades® | MCI®-2006 NS powder pre-measured into water soluble bags for admixing into concrete. | 1 grenade/ yd$^3$ | 20 grenades/ carton |
| | | MCI® Grenades®-Metric | MCI®-2006 NS powder pre-measured into water soluble bags for admixing into concrete. | 1 grenade/ m$^3$ | 20 grenades/ carton |
| | | MCI® Mini Grenades® | MCI®-2006 NS powder pre-measured into water soluble bags for admixing into concrete. | 1 per 0.5-0.6 ft$^3$ (1 per 0.0015 m$^3$) | 100 grenades/ carton |
| | | MCI® Fiber Grenades® | MCI®-2006 NS powder and MCI® Fibers pre-measured into water soluble bags for admixing into concrete. | 2 grenades/ yd$^3$ | 20 grenades/ carton |
| | | MCI® Metric Fiber Grenades® | MCI®-2006 NS powder and MCI® Fibers pre-measured into water soluble bags for admixing into concrete. | 2 grenades/ m$^3$ | 20 grenades/ carton |
| | | MCI® Fibers | Mono-filament polypropylene-based fibers containing Migratory Corrosion Inhibitors (MCI®). | 1.5 lbs/yd$^3$ (910 g per m$^3$) | 5 lb (2.3 kg) boxes, 50 lbs (22.7 kg) and 100 lbs (45.4 kg) drums |
| | Superplasticizers with Amine Carboxylate Based MCI® | MCI®-2007 SuperCorr™ | Liquid, melamine based superplasticizer with MCI®. Patented. | 3-4 pts/yd$^3$ (1.5-2 l/m$^3$) | 5 gal (19 l) pails, 55 gal (208 l) drums |
| | | MCI®-2007 P | Powder, polycarboxylate based superplasticizer with MCI®, which reduces mixing water by 20-30% depending on cement type. | 16-27 oz/yd$^3$ (0.6 - 1.0 kg/m$^3$) | 5 lb (2.3 kg) boxes, 50 lbs (22.7 kg) and 100 lbs (45.4 kg) drums |
| | | MCI®-2008 ViaCorr™ | Powder, polycarboxylate based superplasticizer for self compacting, self leveling concrete with MCI®. | 0.4-0.6% by weight of concrete mix | 50 lbs (22.7 Kg) and 100 lbs (45.4 Kg) drums |
| | | MCI®-2008 L | Liquid, polycarboxylate based superplasticizer for self compacting, self leveling concrete with MCI®. | 0.4-0.6% by weight of concrete mix | 5 gal (19 l) pails 55 gal (208 l) drums |

| | | Product | Description | Approximate Dosage Rate | Packaging |
|---|---|---|---|---|---|
| Surface Treatments | Amine Carboxylate Based | MCI®-2020/ MCI®-2020 V/O | Clear, penetrating surface treatment for existing structures. Contains Migrating Corrosion Inhibitors that form a protective film on embedded metals. UL approval to meet NSF Standard 61 Certification for use on structures holding potable water. V/O Version for vertical and overhead applications. | 150 $ft^2$/gal (3.68 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums |
| | | MCI®-2020 M/ MCI®-2020 M V/O | New, ready to use version of MCI®-2020 that provides even better corrosion protection. V/O Version for vertical and overhead applications. | 150 $ft^2$/gal (3.68 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums |
| | | MCI®-2020 M SC | New, concentrated version of MCI®-2020 that provides even better corrosion protection. Dilute 1:1 with water to make ready to use product. | 150 $ft^2$/gal (3.68 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums |
| | | MCI®-2020 Powder/ MCI®-2020 V/O Powder | Powder version of MCI®-2020. One 100 lb (45.35 kg) drum makes 55 gallons (208 liters) of MCI®-2020 liquid. V/O Version for vertical and overhead applications. | 150 $ft^2$/gal (3.68 $m^2$/l) | 100 lb (45.4 kg) drums |
| | Water Repellants with MCI® | MCI®-2018/ MCI®2018 V/O | 100% solids, organosilane sealer containing MCI®. Spray, brush or roller applied. | 125-175 $ft^2$/gal (3 -4.2 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums |
| | | MCI®-2019 | VOC-exempt solvent based 40% silane sealer containing MCI®. Spray, brush or roller applied. | 125-175 $ft^2$/gal (3 - 4.2 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums |
| | | MCI®-2019 W | Water based, 40% silane sealer containing MCI®. Spray, brush or roller applied. | 125-175 $ft^2$/gal (3 - 4.2 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums |
| | | MCI®-2021 | Water based, silicate sealer containing MCI®. Spray, brush or roller applied. Patented. | 150-250 $ft^2$/gal (3.7-6.1 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums |
| | | MCI®-2022/MCI®-2022 V/O | Water based, silane/siloxane blend sealer containing MCI®. Spray, brush or roller applied. V/O Version for vertical and overhead applications. Patented. | 125-175 $ft^2$/gal (3-4.2 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums |
| | | MCI®-POWR 40 | Silane based, penetrating, oil and water repellant containing MCI®. Spray, brush or roller applied. | 125-175 $ft^2$/gal (3 - 4.2 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums |
| | | MCI®-POWR 100 | Silane based, penetrating, oil and water repellant containing MCI®. Spray, brush or roller applied. | 125-175 $ft^2$/gal (3 - 4.2 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums |
| | Coatings | MCI®- 2026 Primer HS | Two-component, chemically resistant, water based, epoxy primer for concrete. | 250-350 $ft^2$/gal (6.1-8.5 $m^2$/l) | 0.75 gal (2.3 l), 6 gal (22.7 l), 15 gal (56.8 l),165 gal (624.6 l) yield kits. |
| | | MCI®-2026 Floor Coating | Two-component, chemically resistant, 100% solids Novolac epoxy for concrete with excellent chemical and abrasion resistance. | 125-150 $ft^2$/gal (3.0-3.7 $m^2$/l) | 0.6 gal (2.27 l), 5 gal (19 l), 12.5 gal (47.3 l), 138 gal (522.4 l) yield kits. |
| | | MCI®-2027 Polyurea | Single-component polyurea that is fast drying, UV stable, and has a high gloss finish. Available in clear, grey, tan, and white. | 2-3 coats of 10 mils DFT = 112-125 $ft^2$/gal (2.7-3 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums. |
| | | MCI®-2241/2242 | Flexible and breathable waterproofing membranes based on a unique combination of acrylic emulsion, Portland cement and fine fibers. MCI®-2241 is a grey color, MCI®-2242 is white. | Each kit covers 88-100 $ft^2$ when applied at 1/16 inch thick (8 $m^2$ per 15.2 l at 1.6 mm) | Each kit yields 4 gallons (15 l). Component A is 2.3 gal (8.9 l) packaged in 5 gal (19 l) pail. Component B is 25 lb (11 kg) bags. |
| | | MCI®-EcoRainbow Architectural Coating | Clear, water-based, acrylic primer/top coat containing MCI®. Also available in white, grey, and custom colors. | 535-641 $ft^2$/gal (13-16 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums. |
| | | MCI®-Anti-Graffiti Coating | Two-component, solvent based aliphatic urethane for concrete to provide easy removal of graffiti. | 516 $ft^2$/gal at 2 mils DFT (13 $m^2$/l at 50 microns DFT) | Two 5 gal (19 l) pails (Part A and Part B) per kit. |
| | | MCI®-Wall Defense | Clear, silicone elastomer based, anti-graffiti coating for concrete, masonry, and other metal surfaces. MCI® Wall Defense does not need to be reapplied after graffiti removal. | 80-100 $ft^2$ at 12-15 mils DFT (2.0-2.5 $m^2$/l at 300-375 microns DFT) | 5 gal (19 l) pails 55 gal (208 l) drums. |

| | Product | Description | Approximate Dosage Rate | Packaging |
|---|---|---|---|---|
| Specialty Products | VpCI®-422/VpCI®-423/VpCI®-426 | Water-based rust removers. Removes rust stains from concrete. Also available in gel form. Rinse concrete with MCI®-2060 after application to neutralize. | 200-600 $ft^2$/gal (5-15 $m^2$/l) | 5 gal (19 l) pails, 55 gal (208 l) drums, liquid totes and bulk. |
| | MCI® Super Remover | Water-based cleaner for removal of calcium carbonate and oxides, including hardened concrete, rust on mild steels, and encrusted hard water scales. | May be used as is or diluted up to 25% | 5 gal (19 l) pails, 55 gal (208 l) drums, liquid totes and bulk. |
| | MCI® CorShield | Water-based coating or embedded reinforcement as well as offering long term (5+ years) indoor storage or short/medium term (6-24 months) outdoor storage protection. | 187-561 $ft^2$/gal (4.6-14 $m^2$/l) | |
| | VpCI®-432/433 | Paint stripper and graffiti remover. Removes paint from concrete without damage. Non-caustic, non-toxic, water cleanable. Also available in gel form. | 200-800 $ft^2$/gal (5-20$m^2$/l) | 5 gal (19 l) pails, 55 gal (208 l) drums, liquid totes and bulk. |
| | MCI®-2060 | Cleaner and degreaser that contains MCI®. It effectively cleans caked on grease, dirt, oil and mud off of concrete. | May be used as is or diluted up to 1% | 5 gal (19 l) pails, 55 gal (208 l) drums. |
| | MCI®-2061 | Cleaner and degreaser containing MCI®. Contains microorganisms that break down oils and other petroleum based materials. | Use as concentrate on oil stains, 24-48 oz/gal water for cleaning (188-375 ml/l) | 5 gal (19 l) pails, 55 gal (208 l) drums. |
| | GalvaCorr® | Four component, galvanic protection coating for concrete structures. Based on technology developed at NASA Kennedy Space Center. Installed on non-traffic bearing surfaces. | 60 $ft^2$/gal @ 24 mils (1.6 $m^2$/l @ 600 µM) | 50 lb/5 gal (22.7 kg/19 L) kits |
| | VpCI® CorrVerter® | Water-based primer for rusted or poorly prepared surfaces. Does NOT contain tannic or phosphoric acid. | 167-278 $ft^2$/gal (4.2-5.6 $m^2$/l) | 5 gal (19 l) pails. |
| | MCI® Coating for Rebar | Water based, barrier coating that provides extended outdoor protection for exposed steel and aluminum. | 300 $ft^2$/gal (7.3 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums. |
| | MCI® Coating for Rebar NT | Non-tacky version of MCI® Coating for Rebar. | 300 $ft^2$/gal (7.3 $m^2$/l) | 5 gal (19 l) pails 55 gal (208 l) drums. |
| | MCI® Peel Off Coating | Temporary, removable coating containing MCI® for protection against nicks, abrasion, scratches, etc. | 140-160 $ft^2$/gal @ 4 mils (13-15 $m^2$/l @ 100 microns) | 5 gal (19 l) pails 55 gal (208 l) drums. |
| | MCI®-2050 | Form/mold release agent containing MCI® technology. Forms a thin protective film to which concrete, asphalt, dirt or other debris will not stick. | Rates vary dependent upon substrate & desired results. ~125-150 $ft^2$/gal (3.0-3.7 $m^2$/l) | 5 gal (19 l) pails, 55 gal (208 l) drums, liquid totes and bulk. |
| | MCI® Creteskin™ | An industrial strength release agent containing MCI®. This clear protective coating inhibits the adhesion of concrete and other materials on painted and unpainted metal surfaces. | 320-640 $ft^2$/gal @ 0.5-1 mil DFT, (8-16 $m^2$/l @ 12.5-25 microns) | 5 gal (19 l) pails, 55 gal (208 l) drums, liquid totes and bulk. |
| | MCI®-309 | A corrosion inhibiting powder for protection of ferrous metals in recessed areas, interior cavities and voids. | 0.3-0.5 oz/$ft^3$ (300-500 g/$m^3$) | 5 lb (2.3 kg) boxes, 50 lb (22.7 kg) and 100 lb (45.4 kg) drums. |
| | PTC Emitters | Tyvek® pouches filled with MCI® powder for corrosion protection of post tensioned cables and other metallic components in recessed areas, interior cavities, and voids. | 1 pouch protects 35 $ft^3$ (1$m^3$) | Carton of 50 pouches |
| | MCI®-2005 Gel | MCI®-2005 in gel format for injection into existing structures. | Based on hole size and number of holes | 13 oz (384ml) tubes, 5 gal (19 l) pails, 55 gal (208 l) drums. |
| | MCI®-2020 Gel | MCI®-2020 in gel format for injection into existing structures. | Based on hole size and number of holes | 13 oz (384ml) tubes, 5 gal (19 l) pails, 55 gal (208 l) drums. |
| | MCI®-2070 | An admixture for asphalt primers used in concrete highway or street asphalt overlays to increase adhesion and effectively inhibit corrosion occurring within the concrete. | Add at a concentration level of 2-4% by weight | 5 gal (19 l) pails, 55 gal (208 l) drums |
| | MCI®-Construction Film | A polyethylene film designed for use in the construction industry which inhibits corrosion on both ferrous and nonferrous metals. | n/a | 20' x 100' sheeting, 4 mil (6.1 m x 30.48 m, 100 microns) |

| | Product | Description | Approximate Coverage Rate | Packaging |
|---|---|---|---|---|
| Repair Products | MCI®-2023 | MCI® passivating repair grout for protecting reinforcing steel in concrete. Patent Pending. | 60 $ft^2$ at a thickness of $^1/_{16}$ inch (5.6 $m^2$ at a 1.6 mm thickness) | Part A 11 lb (5kg) resin, Part B 26.5 lb (12 kg) bag powder. Yields 2.5 gal (9.4 l) |
| | MCI®-2246 | MCI® bonding agent is a unique combination of Portland cement, microsilica, epoxy, and acrylic resin. | 70-80 $ft^2$/gal at 20 mils WFT (1.6-1.8 $m^2$/l at 0.5 mm) | 2 part kit includes 1 gal jug (3.8 l) and 28 lb (13 kg) bag |
| | MCI®-Mini Grenades | MCI®-2006 NS powder pre-measured into water soluble, PVA bags. Allows you to add corrosion inhibitor to any bagged mortar or grout mix. | 1 per 0.5-0.6 $ft^3$ (1 per 0.0015 $m^3$) | 100 grenades/ carton |
| | MCI®-2039 SC | Single component, fiber reinforced MCI® repair mortar containing MCI®-Mini Grenades, fibers and polymers. | 12 $ft^2$ per bag at a ½ inch thick (1.12 $m^2$ at 12.7 mm thick). | 55 lb (25kg) bag of powder |
| | MCI®-2701 | Single component, trowel grade repair mortar with MCI®-2006 NS technology. It is a polymer-modified cement-based mortar for structurally repairing or overlaying deteriorated concrete. | 20-25 $ft^2$ per bag at ¼ inch thick (2 $m^2$ at 6 mm thick). | 60 lb bag yields 0.5 $ft^3$ (27 kg bag yields 0.014 $m^3$). |
| | MCI®-2702 | Single component, overhead repair mortar with MCI®-2006 NS technology. | 20-25 $ft^2$ per bag at ¼ inch thick (2 $m^2$ at 6 mm thick). | 50 lb bag yields 0.45 $ft^3$ (23 kg bag yields 0.013 $m^3$) |

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Distributed by:


Revised: 02/15 Supersedes: 12/12