Chapter 6
Case Histories

6.1
New Construction

CASE HISTORY

MCI®-2000

DATE
July 1996

CORTEC REPRESENTATIVE
Quidelit S.A.

CUSTOMER
Mapreco- Large shipper/distributor of bulk materials

LOCATION
Guayaquil City, Ecuador

PRODUCT
MCI®-2000

PROBLEM
Mapreco was constructing a new precast concrete building by the ocean. To reduce the weight of the structure, the rebar in the precast panels had very little concrete cover, leaving the rebar susceptible to chloride attack and corrosion.

APPLICATION
Mapreco added MCI®-2000 to the concrete and poured it into the precast forms.

CONCLUSION
MCI®-2000 added immediate protection to the rebar in the concrete precast panels. This increased the durability and extended the life of the structure in its harsh marine environment.

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Environmentally Safe VpCI®/MCI® Technologies

MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

MCI®-2002 Concrete Admixture

PROBLEM
The Engineering firm had to solve the problem of how to economically protect concrete pilings that were used to stabilize the foundation of apartment buildings. The buildings were being built in an area where the soil was reclaimed from the ocean and the water table was 3 feet below the grade and brackish.

APPLICATION
MCI®-2002 was added to the concrete design mix at 3 pints/cubic yard (1.86 liters/cubic meter) for over 400 pilings manufactured on-site.

CONCLUSION
The pilings were installed, stabilizing the foundation. The MCI®-2002 had no effect on the physical properties of the complex concrete design mix. The mix withstood the force of the pile driver and has been protecting the structural steel reinforcing from corrosion ever since, even in this harsh environment.

DATE
May 1997

CORTEC REPRESENTATIVE
Jose Lillo, Wilson Walton International

CUSTOMER
Canal Point Condominiums

PROJECT
Corrosion Protection of Concrete Pilings

LOCATION
Venezuela

PRODUCTS
MCI®-2002 Concrete Admixture
(MCI® in micro silica slurry)

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MIGRATORY CORROSION INHIBITOR™
(MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

MCI® 2005 NS

DATE
October 2001 - April 2002

CUSTOMER
Wells Fargo

CORTEC DISTRIBUTOR
Larry Nelson
Enduracon Technologies

LOCATION
2800 4th Street, Minneapolis, MN

STRUCTURAL ENGINEER
Meyer, Borgman, and Johnson

CONTRACTOR
M.A. Mortenson

CONCRETE SUPPLIER
Aggregate Industries

PROJECT
An 1,800 vehicle, six-level parking garage to be completed within one year of project start. Official start date was June 18th, 2001; half of the ramp opened April 1, 2002. Each pour of the total 22,000 cubic yards of concrete must meet or exceed 3,000-psi strength within 18 to 24 hours. The post-tensioned structure required approximately 3,750 gallons of Cortec® MCI® 2005 NS and 21,875 gallons of Enduracon HR Superplasticizer.

A calcium nitrite based corrosion inhibitor was used on the first two floors of the structure. It did not meet the required 24-hour minimum strengths, and also had shrinkage cracking. The project reverted back to the originally specified MCI® 2005 NS, and was able to meet the required specifications were met. Shrinkage cracking was eliminated with the use of the MCI® product, even in sub-zero temperatures.

CONTINUED ON BACK

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CONCLUSION

MCI® 2005 NS reduced the effects of shrinkage and cracking, of particular concern for this project due to the fast strength gain the Enduracon HR produced. The project's construction superintendent reported, in observations from under the decks, that much less cracking due to shrinkage occurred than he has seen on projects with other corrosion inhibitors. The concrete set up so uniformly, finishing, float work, and brooming operations were completed on one end of the deck while pouring continued on the other end. Even with the low water content, the mix exhibited excellent finishing properties, and there was no need for an evaporation surface retardant.

The predictable setting time, the early strength and the concrete's finishing quality decreased overtime and significantly helped to keep this project ahead of schedule.

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Proven products for the fast track

Concrete gains strength within 24 hours to keep project ahead of schedule

Quality suppliers, quality materials and the latest innovations in concrete technology contributed to M.A. Mortenson Co. bringing the Wells Fargo Home Mortgage parking garage in Minneapolis in ahead of schedule.

The concrete set up so uniformly, finishing, float work and brooming operations were completed on one end of a deck while pouring continued on the other end. Even with the low water content, the mix exhibited excellent finishing properties and the need for an evaporation surface retardant was very minimal.

The innovative concrete mix was low in water content, but flowed easily and consistently.

Objective:

Complete an 1,800-vehicle, six-level parking garage within one year of project start. Each deck pour of the total 22,000 yards of concrete must meet or exceed 3,000 psi strength within 18 to 24 hours.

Project:

The Wells Fargo Parking Garage is adjacent to the newly renovated home of the Wells Fargo Home Mortgage division in the Phillips neighborhood of Minneapolis. Official starting day was June 18, 2001; half of the ramp opened May 1, 2002, and the remaining sections were completed ahead of schedule.

Team meets success with right combination of new concrete technology

With 365 days to construct a six-level post tension parking garage, concrete specifications called for a high early, innovative concrete mix. The assignment was to create a mix utilizing Type III cement that would achieve strength within 18 to 24 hours, rather than the typical three days. The mix also had to minimize shrinkage while not compromising quality. The solution? A team of construction specialists put together a new – and successful – combination of corrosion inhibiting and superplasticizing chemicals that met the project's strict schedule and quality requirements. The 3,000 psi goal was met within 18 hours for some pours, with the average at 20 to 24 hours.

Key ingredients were Cortec Corp.'s MCI-2005 NS, a liquid admixture that provides corrosion protection, and Enduracon Technologies' Enduracon HR, a liquid superplasticizer that achieves early strength, workability and predictable setting times.

Project Stats

Owner:

Wells Fargo Home Mortgage

Structural Engineer:

Meyer Borgman & Johnson, Inc.

Minneapolis

Contractor:

M.A. Mortenson Co., Minneapolis

Concrete Supplier:

Aggregate Industries, Minneapolis

Concrete Pumping:

E-con-Placer, St. Paul

Concrete Corrosion Inhibitor:

Cortec Corporation, St. Paul

Concrete Superplasticizer:

Enduracon Technologies, St. Paul

Perspectives:

"Independent test data indicates that the MCI 2005 NS provides effective corrosion protection with no increase to the shrinkage potential to the mix design."
-Mike Ramerth, P.E., structural engineer with Meyer, Borgman & Johnson, Inc.

"There is far less shrinkage from a visual standpoint. These products performed, and have higher strength gaining properties using Type III cement."
-Mike Anderson, superintendent for M.A. Mortenson Co.

"Enduracon Technologies' support, both at the plant and in the field, was outstanding. Aggregate Industries appreciates having Enduracon supply these types of projects."
-Mark Bintzler, director of technical services for Aggregate Industries

"These products are doing what they were promoted to do. They're a good combination to work with."
-Pete Nelson, project manager for M.A. Mortenson Co.

"The Enduracon HR superplasticized concrete provided our pumps with a very workable, fluid and cohesive mix. This concrete mix enabled us to pump at lower pressures, providing a significant increase in productivity."
-Rob Tousignant, president of operations for E-Con-Placer.

The Cortec-Enduracon combination offers results

MCI-2005 NS is a proven, long-term corrosion protection inhibitor that doubles the time to initiation of corrosion and reduces the corrosion rate up to five times over the life of the structure. It also reduces the effects of shrinkage and cracking, of particular concern for this project due to the fast strength gain the Enduracon HR produced. The project's construction superintendent reported, in observations from under the decks, that much less cracking due to shrinkage occurred than he has seen on projects with other corrosion inhibitors.

The predictable setting time, the early strength and the concrete's finishing quality decreased overtime and significantly helped keep the project four weeks ahead of schedule.

For more information

on how you could benefit from the innovative products available from Cortec Corporation and Enduracon Technologies, contact:

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ENDURACON
Concrete Performance Products

P.O. Box 14372
St. Paul, MN 55114
612.865.6638
Fax 651.452.4387
enduracon.com

CASE HISTORY

Construction of the World's Largest Mosque

DATE
Summer 2003

CUSTOMER
The Grand Mosque

LOCATION
United Arab Emirates

CORTEC DISTRIBUTOR
Gulf Sail Engineering, Abu Dhabi

CORTEC PRODUCTS
MCI®-2021, MCI®-Architectural Coating White

APPLICATION
Two coats of MCI®-2021 were applied to the concrete surface. Total consumption of approximately 150 square feet per gallon (3.7 square meters per liter) was used. This was followed by an application of MCI®-Architectural Coating in white. One coat was applied to the building, and two coats were applied on the domes.

CONCLUSION
Cortec® Corporation's environmentally friendly, water-based products formed a protective barrier to the concrete surface, providing mixed (anodic and cathodic) corrosion protection to embedded reinforcement and forming a protective barrier against carbonation and the intrusion of chlorides, all while allowing the concrete to breathe. The coatings were also UV and thermally stable once cured.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

Construction of Parkway Technology Campus

DATE
September 2001

CUSTOMER
Private Chemical Manufacturer

CORTEC DISTRIBUTOR
Larry Nelson
Enduracon Technologies

LOCATION
St. Paul, Minnesota

PRODUCTS
MCI®-2007 Super Corr™ & MCI®-2022 Sealer

APPLICATION
MCI®-2007 Super Corr™ is a water-reducing liquid admixture containing Cortec's exclusive migratory corrosion inhibiting technology. When incorporated into the concrete mix, MCI®-2007 Super Corr™ seeks out and forms a corrosion inhibiting, protective layer on metals. When used with repair mortars and grouts, MCI®-2007 will migrate to reinforcement in undisturbed concrete, providing effective corrosion protection to reinforcement already in place. MCI®-2007 is dosed at a rate of 3 to 4 pints per cubic yard and was added at 3 pints per cubic yard to the interior slab of concrete on this application.

MCI®-2022 Sealer is a waterborne, water-repelling sealer for concrete, brick, and other masonry applications. It was applied to the interior concrete slab surfaces after they had cured for 28 days. It was also sprayed onto the exterior walls of the building at a coverage rate of 150 square feet per gallon to prevent corrosion of the pre-cast panels. This increases the density of the concrete, seals surface pores while preventing intrusion of chloride and carbonation and protects from the ingress of wind-driven rain.

CONCLUSION
MCI®-2007 Super Corr™ was chosen for its superplasticizing properties, without affecting air entrainment of the concrete, and because it does not contain any nitrite based compounds. MCI®-2007 is organic, safe and environmentally friendly. It can increase compressive strengths 20-40%, and can increase flexural strengths 10-20% depending on overall mix design.
Concrete surfaces treated with MCI®-2022 Sealer are fully breathable and their natural moisture-vapor transmission is not affected. The migrating corrosion inhibitors in MCI®-2022 will migrate to embedded reinforcement to provide corrosion protection.

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CASE HISTORY

Protection of Building Windows

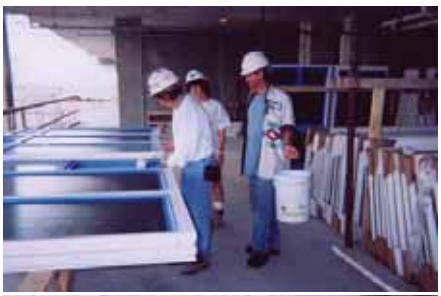
DATE
April 2003

CUSTOMER
Private Developer

CORTEC DISTRIBUTOR
Coastal Construction

LOCATION
Orlando, FL

PRODUCTS
MCI® Peel-off Coating



PROBLEM

During construction and restoration projects, it is necessary to mask off all glass surfaces to protect them from debris and chemical etching. Typically, a masking tape and plastic film is used to protect windows and glass doors while the construction takes place. This is a labor-intensive process that is not always effective since the plastic is susceptible to tearing. An alternative method was desired for protecting glass surfaces during construction projects.

APPLICATION

MCI® Peel-off Coating was chosen as a possible alternative to using plastic film, or masking film during a construction project. It is a liquid strippable coating that will not etch glass and is easily removed once cured. For this application, the window frames were taped using a masking tape. Then, the glass surfaces were coated with MCI® Peel-off Coating by roller and the coating was allowed to dry before installation of the windows. When the project was complete, the peel-off coating was easily removed by simply peeling it from the surface. The coating was then discarded as non-hazardous, solid waste.

CONCLUSION

MCI® Peel-off Coating works extremely well as a masking product for glass surfaces during construction or restoration projects. It protects the covered surfaces from debris and chemical etching, is easy to apply, and easy to remove. It provided cost savings by reducing labor, and by providing a more effective method of protection.

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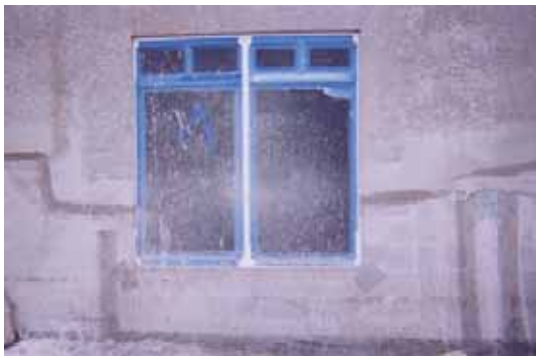

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CASE HISTORY

Construction of Parking Garage

DATE
Late Summer 2004

LOCATION
Northern Kentucky

DISTRIBUTOR
Oakley Specialty Products

SPECIFYING ENGINEER
Ted Verst, KZF Design

GENERAL CONTRACTOR
Messer Construction Company

READY MIX SUPPLIER
Moraine Materials

PRODUCTS
MCI®-2005 NS

APPLICATION
With the construction of a new addition to an exisiting parking garage, MCI®-2005 NS was chosen over competitors because of its long term performance benefits and ease of use (it did not effect the physical properties of the concrete mix design).

CONCLUSION
Independent testing proved that MCI®-2005 NS had no effect on the concrete mix properties.

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CASE HISTORY

BURJ KHALIFA TOWER
(Burj Dubai)
The World's Tallest Building

DATE
January 2004 - January 2010

DISTRIBUTOR
United Corrosion Technologies

LOCATION
Dubai, UAE

DEVELOPER
EMAAR Properties

CONSTRUCTION MANAGER
Turner

PRODUCTS
MCI® 2005

CONTRACTOR
Samsung Corporation

CONCRETE CONTRACTOR
Unimix (Universal Concrete Products, LLC)

ARCHITECT
Skidmore, Owens, and Merrill (SOM)

INDEPENDENT VERIFICATION & TESTING AUTHORITY
GHD

APPLICATION
Cortec's MCI® 2005 was incorporated in the concrete mix design for the podium structure. The building sits on a concrete and steel podium with 192 piles descending to a depth of more than 50 meters (164 feet). A total of 45,000 m^3 of concrete was used in the foundations with a weight in excess of 110,000 tonnes (121,254 US tons).

WHY MCI® WAS CHOSEN
EMAAR properties engaged GHD to review the proposed design and assess the durability of the materials required to provide the 100 year design life. After a thorough review of multiple technologies, MCI® 2005 was chosen as an additional layer of protection in the substructure which is exposed to harsh groundwater conditions. The groundwater in the are contains more chloride than seawater as well as other contaminants.

CONCLUSION
Burj Khalifa's construction used 330,000 m^3 (431,500 yd^3) of concrete, 55,000 tonnes (60,627 US tons) of steel rebar, and 22 million man- hours to complete. Burj Khalifa is expected to hold up to 35,000 people at any one time and has a 100 year design life.

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MCI® MIGRATING CORROSION INHIBITORS FROM GREY TO GREEN

OTHER BURJ KHALIFA FACTS

The Burj Khalifa structure has set quite a few records including:

- Tallest skyscraper to top of spire: 828 m (2,717 ft)
- Tallest structure ever built: 828 m (2,717 ft)
- Tallest extant structure: 828 m (2,717 ft)
- Tallest freestanding structure: 828 m (2,717 ft)
- Building with most floors: 160
- World's highest elevator installation, situated inside a rod at the very top of the building
- World's fastest elevators at speeds of 64 km / h (40 mph) or 18 m / s (59 ft / s)
- Highest vertical concrete pumping (for a building): 606 m (1,988 ft)
- Highest vertical concrete pumping (for any construction): 606 m (1,988 ft)
- The first world's tallest structure in history to include residential space
- Highest outdoor observation deck in the world (124th floor) at 442 m (1,450 ft)
- World's highest mosque (located on the 158th floor)
- World's highest installation of an aluminum and glass facade, at a height of 512 m (1,680 ft)
- World's highest swimming pool (76th floor)

CASE HISTORY

West Road Bridge Construction

DATE
2005 - 2007

DISTRIBUTOR
Structural Materials and Restoration Technologies (S.M.A.R.T.)

SPECIFYING ENGINEER
Hamilton County Bridge Engineer: Steve Mary

READY MIX SUPPLIER
Moraine Materials

CONTRACTOR
Sunessis and Other General Contractors

LOCATION
Hamilton County, Ohio

CUSTOMER
Hamilton County

PRODUCTS
MCI® 2005NS

PROBLEM
This was a new construction application to prevent future corrosion problems. Initiated by the customer, the engineer specified that all new bridge constructions have a 100 year service life.

APPLICATION
MCI® 2005NS was used in conjunction with epoxy coated steel in the design building process to help achieve the necessary service life requirements.

CONCLUSION
The project was completed with no adverse effects on the mix design. The ready mix suppliers were pleased with the ease of dosage as well as its lack of adverse effects on the mix design.

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CASE HISTORY

Elliot Bridge Construction

DATE
2005 - 2007 (Ongoing Project)

DISTRIBUTOR
Structural Materials and Restoration Technologies (S.M.A.R.T.)

SPECIFYING ENGINEER
Hamilton County Bridge Engineer: Steve Mary

READY MIX SUPPLIER
Moraine Materials

LOCATION
Hamilton County, Ohio

CUSTOMER
Hamilton County

PRODUCTS
MCI® 2005 NS

PROBLEM
The customer needed a new construction application to prevent future corrosion problems.

APPLICATION
Hamilton County specifies new bridge construction to have a 100 year service life. MCI® 2005 NS is used together with epoxy coated steel in the design build process to help achieve the necessary service life requirements.

CONCLUSION
MCI® 2005 NS did not affect the mix design properties. Ready Mix Suppliers were pleased with its ease of use, low dosage rate, and lack of adverse effects on the concrete mix properties

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

PRINCESS TOWER
(The World's Tallest Residential Building)

DATE
2005 - 2009

DISTRIBUTOR
United Corrosion Technologies

LOCATION
Dubai, UAE

DEVELOPER
TAMEER Holding

CONSULTANT
Adnan Safarini

PRODUCTS
MCI®-2005

CONTRACTOR
Arabian Construction Company

CONCRETE CONTRACTOR
Readymix Beton, LLC

APPLICATION
Cortec's MCI®-2005 was incorporated in the concrete mix design for the raft foundation. At 380 m (1246.72 feet) high, the Princess Tower will be the tallest residential building in the world.

CONCLUSION
Cortec's MCI®-2005 was chosen not only for its unsurpassed performance in the protection of rebar in concrete, but also because it is an environmentally friendly product, non-toxic, and is bio-based (produced from sugar beets which is a renewable resource).

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CASE HISTORY

Penescal II

DATE
July 2009 - December 2009

CUSTOMER
Alternative Energy Institute

DISTRIBUTOR
General Resource Technology

SPECIFYING ENGINEER
Barr Engineering

CONTRACTOR
MA Mortenson

READY MIX SUPPLIER
Golden Spread Ready Mix

LOCATION
Sarita, TX

PRODUCTS
MCI® 2005 NSB

PROBLEM
Hot ambient weather, high humidity, brackish ground water, and salt air created an extremely corrosive environment for this structure and the reinforcing steel.

APPLICATION
MCI® 2005 NSB was chosen over Calcium Nitrite (CNI) because of CNI's effect on slump loss and set time acceleration during the long haul times to the job site. MCI® 2005 NSB was dosed at 1.5 pints for each cubic yard of concrete in order to protected embedded reinforcement.

CONCLUSION
Cortec's MCI® 2005 NSB was a great product for this project given the conditions and challenges. The low dosage rate was beneficial due to high volume of daily concrete production that the project demanded. That and normal set times made it easier to store more product on-site and keep up with the daily concrete production in a very remote location. The presence of chlorides in this aggressive environment made MCI® the ideal choice to prevent corrosion of the reinforcing steel.

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CASE HISTORY

Iceland Apartment Complex Protection

DATE
October - December 2007

DISTRIBUTOR
Hagædi ehf

CONTRACTOR
Matthias Eyjolfsson

CUSTOMER
Idnbjorg ehf

LOCATION
Reykjanesbaer

PRODUCTS
MCI®-2005 NS
MCI®-2005 AL

PROBLEM
The new apartment complex was being built close to the ocean, which caused a harsh environment for concrete and embedded reinforcement. The owner wanted bulletproof corrosion protection.

APPLICATION
The concrete walls contain MCI®-2005 NS, while the flat concrete roofs all contain MCI®-2005 AL along with Xypex Waterproofing Admixture.

CONCLUSION
The addition of the corrosion inhibitor admixtures with the waterproofing admixture will provide the owner with very good corrosion protection for a long period of time.

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CASE HISTORY

North-South Roadway Bridge Deck

DATE
August 2008

DISTRIBUTOR
Bonded Materials

SPECIFYING ENGINEER
KSF Inc.

READY MIX SUPPLIER
Island Ready Mix

CUSTOMER/OWNER
Hawaii DOT

CONTRACTOR
Kiewit Pacific

LOCATION
Oahu, Hawaii
East & Westbound H2 Roadway

PRODUCTS
MCI®-309
MCI®-2005 NS
MCI® Mini Grenades®

PROBLEM

New construction application: Post tensioned cables were shipped from the mainland with no corrosion protection and inserted into steel ducts in the girders of the bridge. Because they were to sit for a period of time before grouting, corrosion of strands was a concern. MCI®-309 was fogged into the ducts to provide temporary corrosion protection to the cables.

Due to the corrosive nature of the environment, MCI®-2005 NS was also added to the ready mix concrete placed for the new bridge deck, to extend the life expectancy of the structure. MCI® Mini Grenades were used in hand lay-up and mortars to exposed tie in reinforcing steel specifically at junction points in areas where direct pour of ready mix concrete was not feasible.

APPLICATION

Temporary Protection of Post Tensioned Cables: MCI®-309 powder was fogged into girders at a rate of 0.5 ounces/cubic foot (500g/m^3) after placement of the post tensioned cables. Dosing was done by using a low pressure air flow of 35 psi to fog the powder from one end of the girder to the other.

A hose attached to the air compressor was inserted a short distance into the girder duct and rags or absorbent pads were used to seal the opening of the duct around this hose to prevent MCI®-309 powder from blowing back out of the hole. Inspection at the opposite end of the girder was done to ensure that once the powder reached the end, air flow was stopped and only little material was lost out of the opposing side.

Long Term Protection of the Bridge Deck: MCI®-2005 NS was added to the ready mix concrete at the batch plant with the mixing water at a rate of 1.5 pt/yd^3 (1 l/m^3). MCI®-2005 NS does not change the setting time of the concrete or adversely affect any other properties of the mix. Unlike the calcium nitrite based corrosion inhibitor used on previous projects, MCI®-2005 NS did not increase shrinkage cracking of the deck.

CONCLUSION

Cortec® MCI®-309, MCI®-2005 NS, and MCI® Mini Grenades were able to provide temporary and long term protection to the North South Roadway Bridge. These products are environmentally friendly and easy to use.

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MCI® MIGRATING CORROSION INHIBITORS FROM GREY TO GREEN

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Why MCI® Chosen?

MCI®-309 can provide up to 24 months of temporary protection to the un-grouted cables when properly applied. Most importantly, MCI®-309 did not need to be removed from the ducts prior to tensioning/grouting. MCI®-309 was compatible with the grout, meaning it did not affect its setting time or other mechanical properties, nor did it affect bond strength.

MCI®-2005 NS and MCI® Mini Grenades were able to provide long term corrosion protection to the concrete deck without any adverse effects of the mix design.

All of the MCI® products were easy to apply and environmentally friendly. Hawaii DOT has since implemented the use of MCI® products on other projects statewide.

MCI®
MIGRATING CORROSION INHIBITORS
FROM GREY TO GREEN

CASE HISTORY

New Construction Preservation Using MCI® CorShield®

DATE
June 2009

DISTRIBUTOR
United Corrosion Technologies

CUSTOMER
Dubai Properties Group

CONTRACTOR
Laing O'Rourke

CONSULTANT
GHD

LOCATION
Dubai, U.A.E.

PRODUCTS
MCI® CorShield®

PROBLEM

Dubai Properties Group is developing the Mohammed Bin Rashid al-Maktoum Academic Medical City in Dubai Healthcare. This development includes the construction of the University Hospital built over an area of 130,000 m^2 (1,399,308 ft^2).

Construction started in 2007 but as the economic crisis struck Dubai, construction was put on hold.

Recognizing the corrosive environment of the UAE where salt laden air is combined with high levels of humidity and temperature, GHD sought a method of preserving the exposed steel reinforcement while construction work was suspended.

The solution was recognized in Cortec's MCI® CorShield® which is a waterborne preservative that provides protection to metals in unsheltered environments.

APPLICATION

MCI® CorShield® was tested in accordance to ASTM A944-99 at American Engineering Testing, Inc. which concluded that "MCI® CorShield® bond strength of the reinforcing steel bars to the concrete was equal or better than the control." This allowed it not to have to be removed prior to future concrete embedment.

The exposed steel was treated with an application of MCI® CorShield® in June 2009.

CONCLUSION

The site was inspected two years after treatment and the steel was found to be in the same original condition.

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6.2
Concrete Repair & Restoration

CASE HISTORY

Charleswood Bridge Restoration

DATE
October 1994 - October 1995

CORTEC® REPRESENTATIVE
Building Products

LOCATION
Winnipeg, Canada

PRODUCTS
MCI®-2000
MCI®-2020

PROJECT
Charleswood Bridge. A totally unique bridge in all of North America, built by private industry in twelve months from October 1994 to October 1995. The bridge has been leased to the city of Winnipeg for roughly 20 years.

APPLICATION
MCI®-2000 was used in bridge decking (340 liters). MCI®-2020 was used in above ground sign support columns (20 liters).

COMMENTS
Provincial and civic government engineers are recommending Cortec® MCI® in all bridge projects. City of Winnipeg will use MCI®-2020 to treat a number of bridges in the Spring of 1996.

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CASE HISTORY

Bridge Restoration

DATE
May 1993

CUSTOMER
Province of Alberta, Canada
Transportation & Utilities

CONTACT PERSON
Paul Carter
Bridge Maintenance Engineer

LOCAL REPRESENTATIVE
Brendan McKinnon

LOCATION
Bridge Section; Alberta, Canada

PRODUCT
MCI®-2020

HISTORY OF ACCOUNT
Black top was removed from existing bridges, Cortec® MCI®-2020 was applied, then a concrete overlay was laid.

HOW ACCOUNT WAS DISCOVERED
Cortec® sales lead, follow-up mailings, and continuous personal calls by Brendan McKinnon

DECISION MAKERS
Bridge Maintenance Engineer & Executive Director of Engineering / J. Ramotar

PROTECTED OBJECT
Rebar in existing bridges before concrete overlay applied

APPLICATION
Black top removed - area sandblasted, MCI®-2020 applied - residue removed - overlay applied.

ENVIRONMENT
Outdoor year-round

LENGTH OF PROTECTION
As long as possible

INSPECTION /REDOSING
Regular inspection

QUANTITY PER ORDER
Eighteen - 55 gallon drums

COMPETITION
Grace Chemical - "Post Right"

REASON CORTEC® SELECTED
Test studies showed Cortec® MCI®-2020 to be superior.

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CASE HISTORY

Train Shed Protection

DATE
December 1994

CORTEC® REPRESENTATIVE
Mandryk Products & Services

CUSTOMER
Shipper/Distributor of bulk minerals

LOCATION
Northern Ontario, Canada

PRODUCT
MCI®-2020

APPLICATION
MCI®-2020 was applied to a 10'x10' area 12-04-94 to test effects of MCIs in stopping the ongoing corrosion.

PROBLEM
The concrete was delaminating in rail beams and floors of train sheds where hopper cars unload to a conveyer below. Potash penetrated concrete causing rebar to rust, thus leading to the delamination of the concrete. Galvanic corrosion readings ran from 0.25 at the outside wall to a substantial 0.45 - 0.63 at the railroad 10 feet away.

TEST RESULTS
Ontario North Engineering took cores in April of 1995 and had them analyzed. Test results indicated that the MCI®-2020 had in fact stopped corrosion. Other testing done by engineering firms confirmed that the MCIs do not allow chlorides to penetrate a treated surface.

COMMENTS
A contractor was commissioned to remove and patch delaminated/spalling concrete and apply Cortec® MCI®-2020 to the beams and floor in the repair area, then sandblast, and apply an Amerlock coating.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

PENTAGON:

Restoration of all exterior walls

DATE
April 2003
Ongoing for next 8-10 years

CUSTOMER
US Government

CORTEC® REPRESENTATIVE
Neil Savitch, Construction Specialties
Mark Stover, PMPSI

SPECIFYING ENGINEER
Eric L Edelson, P.E.
Tadjer-Cohen-Edelson Associates, Inc.

CONTRACTOR
Concrete Protection and Restoration

LOCATION
Washington, DC

PRODUCT
MCI® -2020 V/O

PROBLEM
Corrosion of embedded reinforcing steel was causing spalling on the walls. It was determined that the cause was carbonation to a 3.5 inch depth on the walls, which lowered the pH of the concrete.

APPLICATION
The repair design parameters included: a minimum 20 year design life, stop water absorption into the walls, must reduce or stop corrosion, and that the appearance of the walls be changed as little as possible, or not at all. The repair program prior to coating included 1,000,000 ft^2 of surface area with 200,000 ft^2 of hand patches.

CONCLUSION
MCI®-2020 V/O and ChemMaster's Colorsil were chosen to repair and protect the walls based on their 20 year warranties and the fact that together they could fulfill the other specified repair design requirements.

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CASE HISTORY

VpCI™-423/MCI®-2023/MCI®-2038/MCI®-2039

PROBLEM

The cooling towers of this processing facility had severe concrete deterioration, spalling and corrosion damage. The question was if the structural integrity of the towers could be saved at a substantial cost saving over replacement cost.

APPLICATION

The spalling, cracked and loose concrete was removed by jet blasting. VpCI™-423 Gel Rust Remover was used to remove heavy corrosion from the rebar. MCI®-2023 was used to immediately protect exposed and cleaned rebar from corrosion. MCI®-2039 and MCI®-2038 were used in combination to repair concrete, protect structural steel from corrosion and restore structural integrity. To protect areas that were structurally sound, and did not require repair, a topical application of MCI®-2020 was spray applied to the concrete surface. MCI®-2020 will migrate through the concrete and provide protection to the structural steel.

CONCLUSION

The contractor was able to restore and renovate the cooling towers, bring back both structural integrity and aesthetics. This was done at a substantial saving to the owners over replacement.

DATE

1995

CORTEC® REPRESENTATIVE

Dario Rosignoli
Tecnochem Italiana Srl

CUSTOMER

TISZAI VEGYI KOMBINAT RT

PROJECT

COOLING TOWERS
Repair and Renovation of concrete.

LOCATION

BERUHAZASI FOOSZTALY
HUNGARY

PRODUCTS

VpCI™-423
MCI®-2023
MCI®-2038
MCI®-2039

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CASE HISTORY

VpCI™-389/MCI®-2000/ MCI®-2020/MCI®-2023/ MCI®-2038/MCI®-2039

DATE
1994, 1995 & 1996

CORTEC® REPRESENTATIVE
Dario Rosignoli
Tecnochem Italiana Srl

CUSTOMER
Autobrennero SPA
Italy

PROJECT
Ponte Po Bridge and Viaducts
Repairs and Restoration

LOCATION
ITALY

PRODUCTS
VpCI™-389
MCI®-2023
MCI®-2000
MCI®-2038
MCI®-2020
MCI®-2039

PROBLEM
Through years of weathering and chemical attack the bridge and viaduct's concrete, structural steel and rebars were corroding. This corrosion was placing the bridge and viaduct structural integrity and life expectancy in jeopardy.

APPLICATION
VpCI™-389 and MCI®-2023 was used to treat exposed rebar after jet blasting the area. MCI®-2039 & MCI®-2038 Repair Mortars were used to repair and finish deteriorated concrete areas. MCI®-2020 was then sprayed on bridge surfaces, as topical treatment, to protect unexposed rebar and structural steel.

CONCLUSION
Successful repair and restoration of bridge and viaduct system. With the use of MCI® products the aesthetic value and life expectancy of the bridge and viaduct system were extended and enhanced.

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CASE HISTORY

VpCI™-386
MCI®-2023
MCI®-2038
MCI®-2039

DATE
1996

CORTEC® REPRESENTATIVE
Dario Rosignoli
Tecnochem Italiana Srl

PROJECT
REPAIR AND RENOVATION OF CONCRETE SURFACE

LOCATION
SEZANA, SLOVENIJA

PRODUCTS
VpCI™-386
MCI®-2023
MCI®-2038
MCI®-2039

PROBLEM
Corrosion, carbonation and chemical attack had deteriorated the concrete walls to where the structural integrity was compromised.

APPLICATION
The spalling, cracked and loose concrete was removed by jet blasting. VpCI™-386 and MCI®-2023 were applied to immediately protect exposed rebar. In severely damaged areas, wire reinforcing mesh was required by the Structural Engineer to give additional structural value. MCI®-2039 and MCI®-2038 were used in combination to repair and finish the concrete surface, protect structural steel from corrosion and restore structural integrity.

CONCLUSION
The Structural Engineer and Contractor were able to restore the structural integrity of the concrete walls. By incorporating MCI® products and ingenuity into the project, the goals of structural integrity, aesthetics and an unequaled resistance to corrosion were achieved.

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CASE HISTORY

MCI®-2020
MCI®-2038

PROBLEM
The building was beginning to show signs of minor corrosion and carbonation. To protect their investment, the owners wanted to inititate a preventive maintenance program before problems became serious and expensive.

APPLICATION
Minor repairs were made to the exterior concrete surface using MCI®-2038 finish mortar. The exterior surface was then cleaned, and a topical application of MCI®-2020 was sprayed on the surface. The building was then painted with a methyl-methacrylic paint.

CONCLUSION
The MCI®-2020 was able to penetrate the concrete and migrate to the steel reinforcing. Upon contact with the reinforcing steel, MCI®-2020 formed a monomolecular layer of protection that will reduce corrosion dramatically. By identifying a potential problem, initiating a preventive maintenance program and choosing the right products, the building owners were able to avoid expensive renovation cost, effectively control life cycle building costs and save money now and in the future.

DATE
1995

CORTEC® REPRESENTATIVE
Dario Rosignoli
Tecnochem Italiana Srl

PROJECT
Via Motta Building

LOCATION
LUGANO
SWITZERLAND

PRODUCTS
Cortec® MCI® 2020
Cortec® MCI® 2038

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CASE HISTORY

MCI®-2000

DATE
1995-1996

CORTEC® REPRESENTATIVE
Dario Rosignoli
Tecnochem Italiana Srl

CUSTOMER
National Highways
Switzerland

LOCATION
SWITZERLAND

PRODUCT
MCI®-2000

PROJECT
Melide Viaducts

PROBLEM
Switzerland National Highways Department was looking for a product that would enable them to repair and build curbstones while protecting the rebar from corrosion.

APPLICATION
MCI®-2000 was added, as an admixture, to a special formulated concrete at the rate of 1.5 liters per cubic meter of concrete.

CONCLUSION
By combining MCI®-2000 with a special formulated concrete mix the repair contractor was able to meet and exceed the highway department's specific requirements while protecting the rebar.

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CASE HISTORY

VpCI™-389, MCI®-2023 & MCI®-2038

PROJECT
CIVIL BUILDING "MONICA"
REPAIR OF CONCRETE FACADES

PROBLEM
Years of weathering, acid rain and carbon dioxide attack contributed to spalling, deep carbonation and corrosion of the structural steel rebar in the concrete facades of this highly visible building.

APPLICATION
After spalled and loose areas of concrete were removed and cleaned, VpCI™-389 and MCI®-2023 was used to coat the exposed rebar. MCI®-2038 Finishing Mortar was then used to repair and as a finish texture for all areas of the facades.

CONCLUSION
Successful repair and restoration of the buildings facade while protecting the structural steel from corrosion. MCI®-2038 Mortar had superior adhesion. The ease and speed of application decreased repair cost due to increased hourly production while revitalizing the exterior appearance of the building.

DATE
1995

CORTEC® REPRESENTATIVE
Dario Rosignoli
Tecnochem Italiana Srl

CUSTOMER
Private

LOCATION
LUGANO
SWITZERLAND

PRODUCTS
VpCI™-389
MCI®-2023
MCI®-2038

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CASE HISTORY

Gerland Stadium Repair

DATE
March 1998

CUSTOMER
Gerland Stadium of Lyons

DISTRIBUTOR
EffiScience

LOCATION
Lyons, France

PRODUCT
MCI®-2021

PROBLEM
Engineers of the Gerland Stadium in Lyons, France needed a repair system to prevent further corrosion of the stadium. The stadium would be holding the Football World Cup Games 1998. The contractor wanted a good product at a reasonable price, with quick delivery and technical assistance. He also wanted to work with a company with the capacity to react to his needs.

APPLICATION
EffiScience proposed the use of Cortec® MCI®-2021, a new product at a reasonable price. MCI®-2021 was chosen for this application because it could be used as a sealer as well as for repair.

CONCLUSION
Cortec® Corporation was able to deliver the product in half the time their competitors required. MCI®-2021 was supplied to the Gerland Stadium in less then 2 weeks.

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CASE HISTORY

MCI®-2020

DATE
December 1997

CUSTOMER
Restek Inc.

CORTEC® REPRESENTATIVE
Lance Croft

LOCATION
Oklahoma City, OK

PRODUCT
MCI®-2020

PROBLEM
A downtown six-story parking garage was deteriorating. Restek needed to repair and preserve the ramp from further corrosion

APPLICATION
Restek teamed up with Zahl-Ford engineers and consultants, who were familiar with Cortec® MCI® technology. They repaired the spalled concrete and then they sprayed Cortec® MCI®-2020 on the underside of each parking level.

CONCLUSION
MCI®-2020 protected the parking garage rebar from further corrosion with Cortec's Migratory Corrosion Inhibitor technology, which will extend the life of reinforced concrete structures.
MCI® -2020 was also proven effective by the Strategic Highway Research Program funded by the Federal government and state DOTs.

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CASE HISTORY

Beachfront Highrise Resort

DATE
June 2003

CUSTOMER
Sea Side Corrosion

LOCATION
Santa Rosa Beach, FL

ENVIRONMENT
Beach Front: Ocean Salt Spray

PRODUCT
GalvaCorr®

PROBLEM
Corrosion of embedded reinforcing steel was causing spalling of concrete on the walls, ceilings, and floors of balconies at this beach side resort.

APPLICATION
The repair design parameters required that rebar corrosion be stopped to eliminate continuous hand patching that has been going on. It also required that no visual inconsistencies would remain after top coating the GalvaCorr® product and that protection would last at least 5-7 years. The GalvaCorr® coating was hand applied with a roller at 8 mils thickness and electrically connected to the rebars.

CONCLUSION
Cortec® GalvaCorr® was selected for this project based on its immediate corrosion supression and ease of application in overhead areas. There are thirty-three balconies to be done at this resort, with a total of ten resorts in all.

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CASE HISTORY

MCI-2026
Primer & Floor Coating

DATE
March 2003

CUSTOMER
Hospital Mechanical Rooms

DISTRIBUTOR
L & M Distributors

LOCATION
Waconia, MN

PRODUCT
MCI®-2026 Primer
MCI®-2026 Floor Coating

PROBLEM
Degradation of concrete floors due to exposure to water treatment chemicals and mechanical damage.

APPLICATION
Concrete surface was prepared as stated on the product data sheets. One coat of MCI®-2026 Primer was applied followed by one coat of MCI®-2026 Floor Coating. The MCI®-2026 Floor Coating was shaded a darker color to designate walkway areas.

CONCLUSION
Customer was happy with the application and product performance. The MCI®-2026 Primer and MCI®-2026 Floor Coating provided a clean, hygienic surface while being chemical and wear resistant.

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CASE HISTORY

CHINA RAILROAD BRIDGE

PROBLEM

Xuzhou Railroad Bridge, which is 1080 meters long with 108 arches, was built in the 1980's. Contamination of the concrete structure occurred over the years due to leaking of corrosive materials from trains. Corrosion of embedded reinforcement has led to deterioration of the structure. Inspections have shown that over 50% of the bridge is in an active state of corrosion, leaving the bridge owner with two choices: replace all of the beams and rebuild the bridge, or repair with new technology. After extensive research and evaluation, repairs using Cortec® Corporation's MCI® products were accepted. The repair project started in 1999 and continued thru 2002.

APPLICATION

Areas in a state of active corrosion (corrosion potential less than –350mV) were treated by removing all spalled concrete, cleaning rust from exposed rebar using proper tools and chemical rust removers, and applying MCI®-2020 to the repair sections. MCI®-2000 admixture was added to repair mortars, which were applied to the surface of rebar by brush, and then trowelled into repair patch areas. An application of MCI®-2021 sealer to the entire surface completed this part of the repairs.

Areas showing corrosion potentials between –200mV to –350mV (50% probability of active corrosion) were treated by applying MCI®-2020 into cracks, sealing the cracks with a low viscosity epoxy, and finally, applying MCI®-2021 sealer to the entire surface.

Areas showing corrosion potentials higher than –200mV (less than 10% probability of corrosion) were treated with an application of MCI®-2020 followed by MCI®-2021 sealer.

CONCLUSION

Follow-up testing at 180, 270 and 780 days respectively after the repair showed that the corrosion potential in active areas was reduced dramatically. The corrosion current density, I_{corr}, decreased from an I_{corr} >2.0 mA / cm before treatment to an I_{corr} = 0.17 – 0.15 mA / cm after treatment, effectively controlling corrosion.

DATE

October 1999

CUSTOMER

Jinan Railroad Bureau

DISTRIBUTOR

Beijing Jiagong Huachuang Engineering Technology LTD

LOCATION

Xuzhou, China

PRODUCTS

MCI®-2000, 2020, 2021

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CASE HISTORY

MCI®-2020, MCI®-2038 & MCI®-2039

DATE
Spring 1998

CORTEC® REPRESENTATIVE
Munday Sales

CUSTOMER
Major power supplier

PRODUCTS
MCI®-2020
MCI®-2038
MCI®-2039

PROBLEM
A major power supplier experienced corrosion- induced spalls on the concrete of its cooling towers. Exposure to the elements, chlorides and carbonation added to the contamination of the structure. The engineer in charge of the project was looking for high quality repair materials to repair and prevent further damge to the towers.

APPLICATION
The power supplier sprayed MCI®-2020 into the cavity of the spalled area. Then MCI®-2038 and MCI®-2039 was used to fill the damaged concrete. Finally, they sprayed MCI®-2020 on the surrounding area to help prevent accelerated corrosion caused by the ring anode effect.

REASON CORTEC® SELECTED
Cortec® MCI® products repaired the damaged cooling towers. They also prevent further corrosion damage to the structure with proven Migratory Corrosion Inhibitor technology.

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CASE HISTORY

MCI®-2038

DATE
March 1998

CORTEC® REPRESENTATIVE
Sintecno S.A.

CONTRACTOR
Tekat S.A.

PROJECT
Rehabilitation of a hospital building

LOCATION
Athens, Greece

PRODUCT
Cortec® MCI®-2038

PROBLEM
An Athens hospital building needed concrete repair on corroded rebar and deteriorated concrete. Not only did the damage need to be repaired, but also something needed to be done to prevent corrosion-induced damage from returning.

APPLICATION
The architect chose Cortec® MCI®-2038 Passivating Grout to repair and protect the rebar. The damaged area was cleaned and all loose concrete was removed. Then the two parts of MCI®-2038 were mixed in a power mixer and applied by trowel.

CONCLUSION
MCI-2038 repaired the hospital's damaged concrete. MCI®-2038 will prevent corrosion of the rebar for up to fifty years. Tekat S.A. chose Cortec® products for the hosptial repair because Cortec's specialization and superiority in corrosion prevention.

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CASE HISTORY

MCI®-2038

DATE
May 1997

CORTEC® REPRESENTATIVE
Sintecno S.A.

CUSTOMER
Hochtief

PROJECT
El Venizelos airport

LOCATION
Sparta, Greece

PRODUCT
Cortec® MCI®-2038

PROBLEM
The El Venizelos airport in Sparta, Greece had deficient concrete casting indoors. Rebar under the concrete had corroded, causing spalls. They needed a way to prevent any further corrosion-induced damage.

APPLICATION
Cortec® offered MCI®-2038, a finish repair mortar system to protect the rebar from further corrosion. The two part mix of powder and resin contains Cortec's patented Migratory Corrosion Inhibitors, which form a molecular barrier on metal surfaces. Loose deteriorated concrete and dirt was removed from the damaged areas. After the loose rust was removed, MCI®-2038 was applied.

CONCLUSION
MCI®-2038 was an effective choice to prevent further corrosion on the rebar. The Migratory Corrosion Inhibitors will form a self-replenishing protective layer.

REASON CORTEC® SELECTED
The customer chose Cortec® products because of Cortec's focused specialization in corrosion control products.

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Environmentally Safe VpCI® MCI® Technologies

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CASE HISTORY

MCI®-2000

DATE
May 1998

CUSTOMER
Arco

CORTEC® REPRESENTATIVE
Sintecno

PROJECT
Greek Parliament

LOCATION
Athens, Greece

PRODUCT
Cortec® MCI®-2000

PROBLEM
A section of the Greek Parliament building had corroded rebar. As a result, the surrounding concrete expanded and deteriorated. Arco needed a method of preventing this damage from occurring again.

APPLICATION
Cortec® offered MCI®-2000, a corrosion preventative concrete admixture. This admixture contains Cortec's patented Migratory Corrosion Inhibitors, which form a molecular barrier on metal surfaces. MCI®-2000 was mixed into the repair mortar and brushed onto the metal rebar.

CONCLUSION
Cortec's corrosion solution, MCI®-2000, prevented further corrosion damage to the rebar of the Greek Parliament building—without affecting the physical properties of the concrete.

REASON CORTEC® SELECTED
The customer chose Cortec® because of their specialization in corrosion control products.

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CASE HISTORY

MCI®-2020, MCI®-2023 & MCI®-2038

DATE
April 1998

CUSTOMER
Sparakis

CORTEC® REPRESENTATIVE
Sintecno

PROJECT
Naval station

LOCATION
Crete, Greece

PRODUCTS
Cortec® MCI®-2020
Cortec® MCI®-2023
Cortec® MCI®-2038

PROBLEM
The Naval station in Crete was suffering from internal corrosion damage. The reinforcements in the concrete had corroded and caused spalls in the concrete. Sparakis needed to repair the damage and prevent more from occurring.

APPLICATION
Sparakis chose Cortec® Migratory Corrosion Inhibitor products to repair and protect. First, Sparakis removed the spalled concrete and then the cavity was sprayed thoroughly with MCI®-2020 corrosion inhibitor liquid. Then MCI®-2023 was applied as a bonding agent. After the 2023 was applied, MCI®-2038 Repair Mortar was used to fill the area. Finally, when the 2038 had set, a finishing spray of MCI®-2020 covered the repaired section and the surrounding area.

CONCLUSION
The combination of Cortec® MCI® products provided a complete system to repair and protect the naval station. Cortec's variety of products prevented corrosion in every step of the repair.

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CASE HISTORY

MCI®-2000 & MCI®-2020

DATE
September 1999

DISTRIBUTOR
Interaqua

CUSTOMER
City of Novorossiysk

LOCATION
Black Sea, Russia

PRODUCTS
Cortec® MCI®-2000
Cortec® MCI®-2020

PROBLEM
The city needed to protect an eroding concrete bridge foundation. The unusually adverse weather conditions threatened the integrity of this 35-year-old structure. They wanted an immediate repair solution. Even more importantly, they wanted to protect the structure from further deterioration. Otherwise, they faced the even greater expense of replacement.

Environmental conditions included: Throughout the year the air was very humid and chloride-saturated, and the concrete surfaces cycled between wet and dry. Typical summers averaged high humidity and high temperature readings. Typical winters had numerous freeze-thaw cycles. Salt water spray was aided by high wind speeds of up to 50 miles per hour.

BACKGROUND
A foundation target site was chosen. This site was the most deteriorated and had a history of being continuously soaked by sea water. The concrete foundation was divided into three distinct target sites. The joints served as lines of demarcation. These sites varied in thickness and elevation. The target site surface layers were extremely damaged. Concrete surface damage averaged, 1-2 mm deep. After closer inspection, it was determined these structures were built with poor quality (low-density) concrete. Additionally, over the structure's lifetime, various repair compounds had been applied, which incorporated ingredients with a low compression tolerance. The summary of primary corrosion issues included:

1. There was an ongoing washout of water-based compounds from the concrete.

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2. The bridge suffered substantial severe corrosion of internal steel bars (rebar). The damaged concrete no longer protected the reinforcing steel and was determined to be the main cause of damage.

3. The concrete surface exhibited severe cracks, crevasses and spalling. Considering the very high level of chloride ions in the concrete, repairing the damaged areas wouldn't stop the total corrosion problem. Therefore, it was decided to repair the entire concrete foundation in order to prevent the further penetration of existing moisture sources.

4. The choice of materials and technology for reconstruction was based on several critical criteria:

a. Stopping corrosion process of reinforced steel (rebar).

b. Provide good adhesion with the repaired areas of the "old" concrete.

c. The repair materials should provide high water coverage, durability, and stability in aggressive environments.

PREPARATION

The prep work included:

1. Removal of the protective concrete layer, which exhibited large areas of severe rust, with low adhesion and high levels of salt residue. The depth of concrete damage was from 25 to 500 mm. In some places the damaged concrete reached into the second line of rebar.

2. Sandblasting the rust from the rebar. Rust destroyed rebar was replaced with new rebar. Newly exposed rebar was protected with an inhibitor within two hours in order to prevent the onset of new oxidation. It was concluded that for future repairs, the corrosion inhibitors must be applied on the exposed rebar immediately.

APPLICATION

a. MCI®-2020 was applied onto the prepared concrete surface in order to provide protection of the rebar after the repair work was finished.

b. Next, the prepared surface was coated with the primer that included Z-40 and fibers. The thickness of the applied primer is 3-4 mm.

c. Then a water-resistant layer was applied. This was a poly-cement that included fibers, migrating corrosion inhibitor MCI®- 2000 and a Xypex concentrate. This served as the base for the hydro-insulation layer.

d. Next the hydro-insulation layer was applied. This was a poly-cement material with the addition of Z-40. The ratio of cement to sand was 1:1.5. The thickness of the layer was 5 mm. There were at least two layers applied.

e. Lastly, a final clear coat sealer was applied, which worked as a water and salt repellant.

CONCLUSION

The repair procedure, along with the Cortec® leading technology products, provides a high quality, long-term repair, as well as a visually attractive service site. The following suggestions were made for future applications:

a. Use more Migrating Corrosion Inhibitors in order to prevent corrosion on the exposed rebar.

b. During surface preparation, use Cortec® rust remover, which would allow faster and better preparation.

c. Detail the concrete joints with additional protective layers.

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CASE HISTORY

Plankenton Avenue Parking Ramp Preservation

DATE
Spring 1999

DISTRIBUTOR
The Glenrock Company

LOCATION
Milwaukee, WI

PRODUCT
MCI®-2020

PROBLEM
City of Milwaukee-Plankenton Avenue Parking Ramp was deteriorating from deicing salt being carried on automobiles and the steel rebar was corroding. The ramp is located in the heart of downtown Milwaukee and is a valuable source of revenue. The city wanted a fast and economical way to renovate and protect the parking ramp with the least amount of down time. The specifying engineer and the city wanted to renovate the structure with the best products and procedures. MCI®-2020 was an important part of the renovation system.

APPLICATION
MCI®-2020 was applied to the concrete decks by the renovation contractor at the rate of 150 square feet per gallon (4m /liter^2).

CONCLUSION
The MCI® migrated through the concrete to form a protective, corrosion-inhibiting barrier on the structural steel. MCI®-2020 was chosen as part of the system because its corrosion inhibiting properties will extend the life of the structure and reduce maintenance.

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MCI® MIGRATING CORROSION INHIBITORS FROM GREY TO GREEN

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CASE HISTORY

MCI®-2020, MCI®-2023 & MCI®-2038

Before

After

DATE
Summer 1997

CUSTOMER
Gianna Kopoulos Dimitris

CORTEC® REPRESENTATIVE
Sintecno S.A.

LOCATION
Katsini Building

PRODUCTS
MCI®-2020
MCI®-2023
MCI®-2038

PROBLEM
The Katsini Building was suffering from corroded rebar which was causing the concrete to expand and deteriorate.

APPLICATION
Cortec® MCI® products were chosen to repair and protect the concrete. The damaged concrete was first removed and the cavity was generously sprayed with MCI®-2020 corrosion inhibitor liquid. The MCI®-2023 was then applied as the bonding agent. The next step used MCI®-2038 Repair Mortar to fill in the area. After the MCI®-2038 had set, a finishing spray of MCI®-2020 covered the repair section and the surrounding area.

CONCLUSION
The MCI® products improved the condition of the concrete in the Katsini Building. Not only were the trouble areas repaired but the Cortec® corrosion protection will help prevent further damage.

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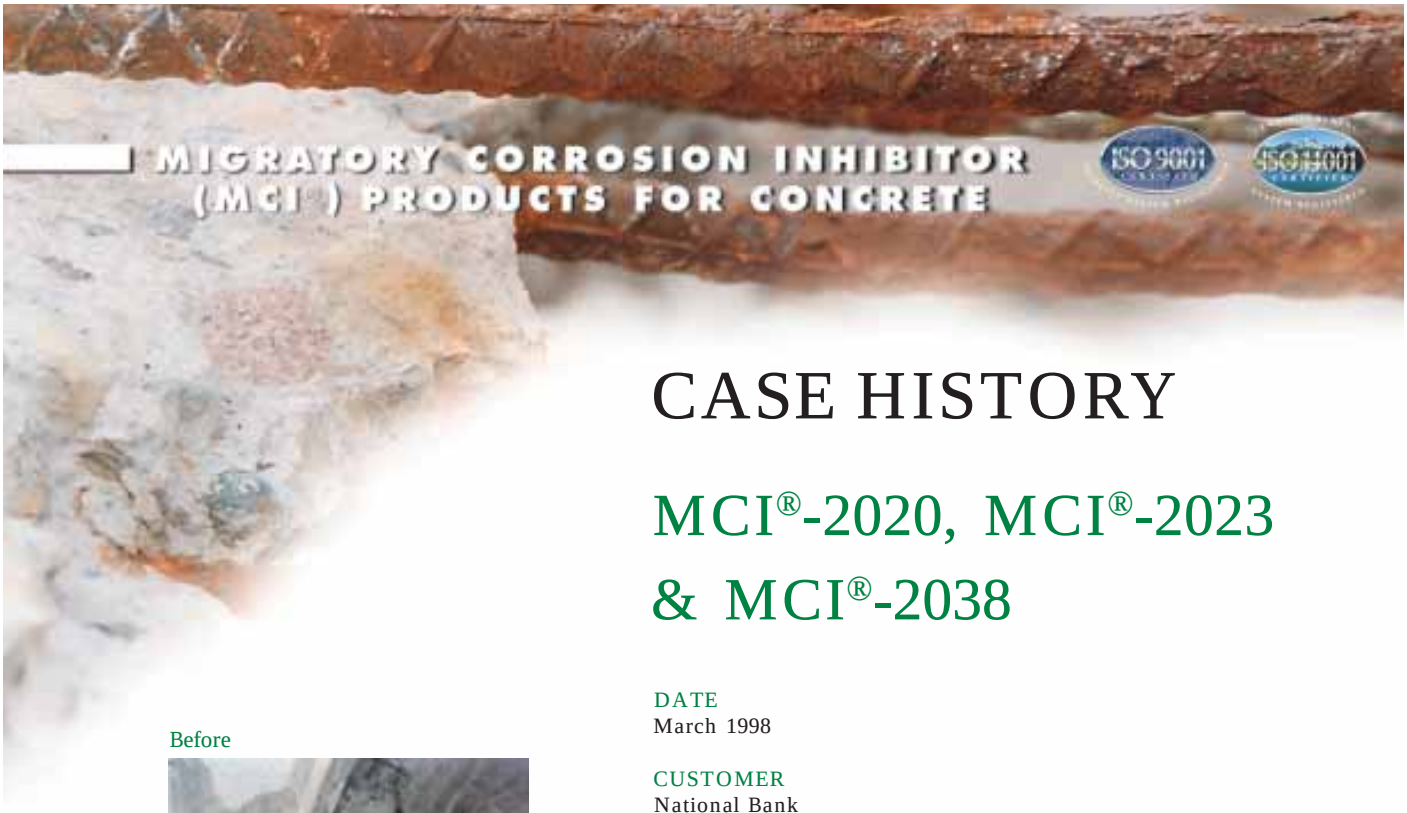

CASE HISTORY

MCI®-2020, MCI®-2023 & MCI®-2038

Before

After

DATE
March 1998

CUSTOMER
National Bank

CORTEC® REPRESENTATIVE
Sintecno S.A.

LOCATION
Vati Building

PRODUCTS
MCI®-2020
MCI®-2023
MCI®-2038

PROBLEM
The Vati Building was suffering from corroded rebar which was causing the concrete to expand and deteriorate.

APPLICATION
Before applying any of the MCI® products the spalled concrete was removed. Then the cavity was sprayed with MCI®-2020 corrosion inhibitor liquid and the bonding agent, MCI®-2023, was applied. Next, MCI®-2038 repair mortar was used to fill the area. After that had set, a finishing spray of MCI®-2020 covered the repaired section and the surrounding area.

CONCLUSION
The Vati Building is now repaired and protected against corrosion with the effective, long-lasting Cortec® MCI® products

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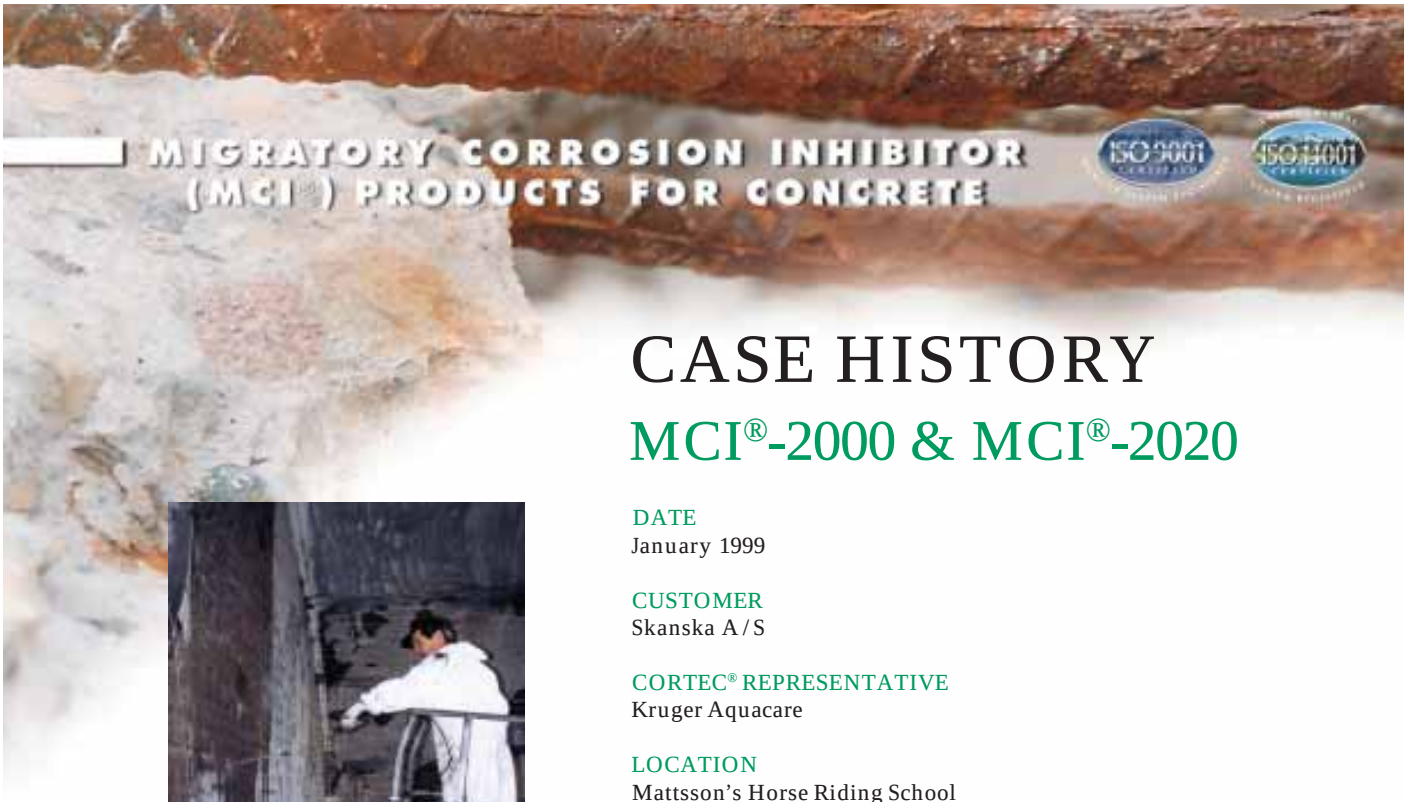

CASE HISTORY

MCI®-2000 & MCI®-2020

DATE
January 1999

CUSTOMER
Skanska A/S

CORTEC® REPRESENTATIVE
Kruger Aquacare

LOCATION
Mattsson's Horse Riding School
Klampenborg, Denmark

PRODUCTS
MCI®-2000
MCI®-2020

PROBLEM
Mattsson's Horse Riding School, which was made entirely from concrete, was beginning to deteriorate. Built by famous architect, Arne Jacobsen, the building was approxiamtely 60 years old when restoration was needed. The building is exposed to a salt water environment close to the Oeresund coast. The building also suffered from ammonia and heavy traffic due to the horses riding and activity at the stables.

APPLICATION
Initially, spalled and deteriorated concrete was removed. MCI®-2000 was mixed in with Fosroc product at 0.6 liters/m^2 concrete to make the repair. MCI®-2020 was then directly applied onto all of the damaged concrete and corroded steelbars. MCI®-2020 was also applied as a surface treatment all over the surface inside the horseriding hall.

CONCLUSION
Cortec®MCI® products helped to preserve the concrete in the Mattsson Horse Riding School. Not only were the trouble areas repaired, but also the corrosion protection provided by Cortec® products will help prevent further damage.

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CASE HISTORY

MCI®-2005, MCI®-2020 & MCI®-2023

DATE
December 1999

CUSTOMER
Concrete Bridge Structures
Japan Railway West

LOCATION
Sanyo Sinkannsen Bullet Train - Japan

CORTEC PRODUCTS
MCI®-2005
MCI®-2020
MCI®-2023

PROBLEM
Seashore Sand (NaCl content is 2-3 kg/m^3) was used in the concrete for construction of the bullet train bridges. Water to concrete ratios exceeded 70%, which created poor quality concrete. The structure exhibited numerous spalled areas with exposed corroded rebar. Not only did the spalled and corroded areas need repair, but they also needed to be protected from further corrosion.

APPLICATION
The MCI® products selected for this project were:

- MCI®-2023: 32.90 kg
- MCI®-2020: 31.02 kg
- MCI®-2005: 3.69 kg

(mixed with Tough Ace Emulsion produced by LION Co.)

CONCLUSION
More than sixty treatment products developed by fifteen manufacturers were examined for the project. Out of the systems and products tested, Cortec® MCI® products offered the highest performance levels and were chosen for corrosion control of the Bullet Train structures.

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CASE HISTORY

HPRS™
High Performance Repair Systems

DATE
January 1999

CUSTOMER
The Rudolph Tegners Museum

CORTEC REP
Kruger Aquacare

LOCATION
North Seeland, Denmark

CORTEC PRODUCTS
MCI®-2020
MCI®-2023
MCI®-2038
MCI®-2039
VpCI®-386

PROBLEM
The Rudolph Tegners Museum is a concrete structure that was built in 1937. Severe corrosion to the rebar within the building's concrete was causing concern regarding the structure's integrity. The Museum is located on the Atlantic North Sea coast, which is subjected to harsh salt water and frost environment.

SOLUTION AND APPLICATION
Economical and effective HPRS™ was chosen to solve the corrosion problems. Application was as follows:

1. Scarify and remove all deteriorated concrete.
2. Apply MCI®-2023 as a cementitious coating for rebar.
3. Apply MCI®-2020 as a topical migrating corrosion inhibitor for the concrete.
4. Apply MCI®-2039 repair mortar (fluid mixture applied by brush) for adhesiveness.
5. MCI®-2039 repair mortar (mixture of normal consistency for application by trowel or spray) is applied for build-up.
6. MCI®-2038 finishing mortar is applied for smoothing surface and/or for leveling.
7. VpCI®-386 is applied last for final aesthetics and topical protection seal.

CONCLUSION
Cortec offered a superior repair system. The MCI® and VpCI® products were very flexible and easy to use. The corrosion problems of The Rudolph Tegners Museum were corrected along with the prevention of any future corrosion.

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CASE HISTORY

Randolph Avenue Bridge Restoration

DATE
1986, Update 2011

CUSTOMER
Minnesota D.O.T. Study Project

LOCATION
Randolph Avenue Over I-35E
St. Paul, MN

PRODUCT
MCI®-2000

HISTORY
The Randolph Avenue bridge deck was rehabilitated in 1986. This was a repair project involving a patch and overlay using low slump, dense concrete (LSDC). The original concrete was removed from the deck above the first layer of reinforcing steel and was milled to a depth of 0.5 inches (13 mm). The LSDC was used over the entire bridge deck. The concrete on the westbound lanes contained MCI®-2000, a corrosion inhibiting concrete admixture, dosed at 1 pint/yd^3 (0.6 L/m^3). The same concrete was used on the eastbound lanes, but without the Migrating Corrosion Inhibitor (MCI®). These eastbound lanes have served as a control for all chloride samples taken, and corrosion rate and half-cell potential readings performed since the repair was completed.

PROJECT UPDATE
In 2011 all readings taken on the treated areas of the bridge were much lower than the readings taken on the control side. Additionally, all three control locations had average corrosion rate readings that would be considered active, whereas the treated side readings were all in the passive range. This indicates the corrosion inhibiting admixture is functioning as expected.

Figure 1 (Page 2) shows the comparison of corrosion rate readings on the control side versus the treated side. Prior to 2007, both sides of the bridge showed average corrosion rates in the passive range, however the treated side exhibited 40% lower readings. Now that the control side has entered active corrosion, the treated side is exhibiting corrosion rates that are approximately 85% less.

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MCI® MIGRATING CORROSION INHIBITORS FROM GREY TO GREEN

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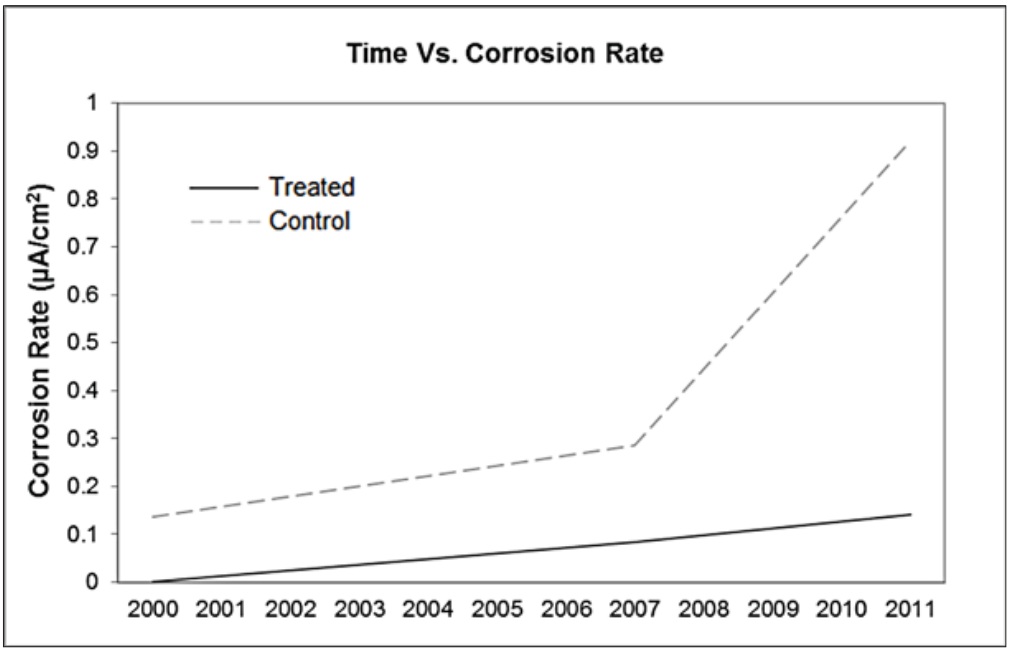

Figure 1: Average corrosion rates of the Randolph Avenue Bridge

The time versus average half-cell potential results, shown in Figure 2, shows that the potential for corrosion within the bridge is higher on the control side and has been for 20 years. This data along with the rest of the supporting information suggests that levels of corrosion in the treated side are lower than in the control.

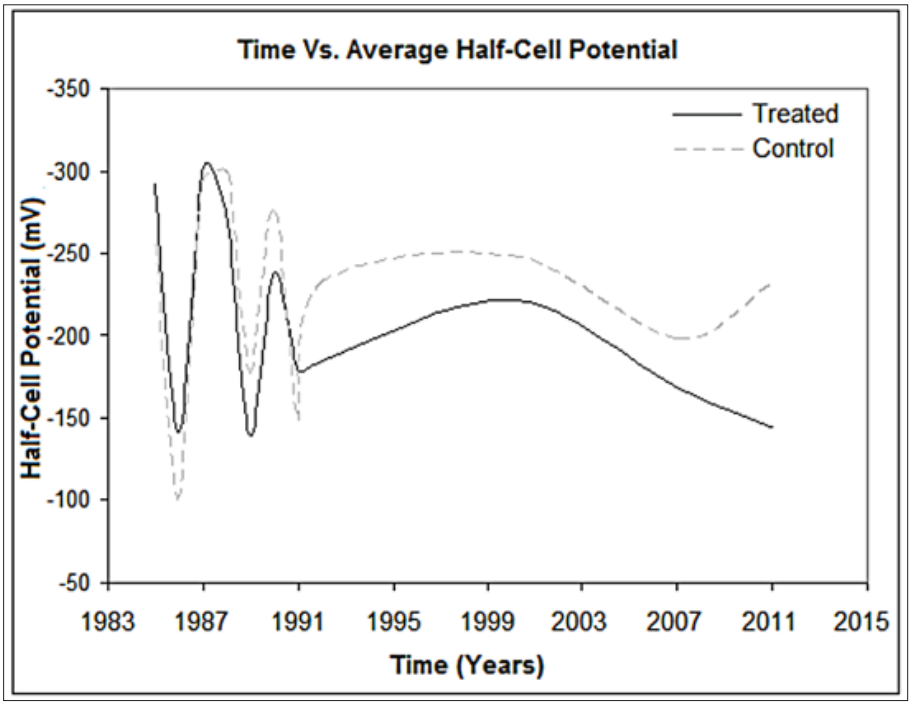

Figure 2: Average half-cell potentials of the Randolph Avenue Bridge

CASE HISTORY

VpCI®-386/ MCI®-2000/ MCI®-2020

DATE
June 1996

CORTEC REPRESENTATIVE
Quidelit S.A.

CUSTOMER
Elecdor

PROJECT
Repair of High Voltage, High Tension Electric Transmission Line Support Poles

LOCATION
Quayaquil City, Ecuador

PRODUCTS
VpCI®-386
MCI®-2000
MCI®-2020

PROBLEM

The electric transmission support poles are made of precast concrete. Years of exposure to chloride and carbonation attack caused concrete spalls and cracks on many of the poles. The spalling cracks compromised the ability of the poles to structurally support their loads. To compound the problem, the rural local of the poles made access difficult.

APPLICATION

The loose, damaged sections of concrete were removed. VpCI®-386 was applied to the rebar with a brush. MCI®-2000 was added to the repair mortar to repair the area. A cementitious coating of MCI®-2020 and a cement wash were brush applied as a finish coat, giving additional protection and an esthetically pleasing appearance.

CONCLUSION

To replace a power pole in the field would have cost $900. By using Cortec's MCI®-2000, MCI®-2020 and VpCI®-386, the poles were brought back to almost new condition at a cost of $250 – a savings of $650 per pole.

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CASE HISTORY

VpCI®-386

Water-based barrier coating for concrete

DATE
May 1996

CUSTOMER
Private Chemical Manufacturer

PROJECT
Protection of concrete and masonry walls

LOCATION
St. Paul, Minnesota

PRODUCTS
VpCI®-386, Water-based barrier coating for concrete

PROBLEM
The chemical manufacturer had just completed an expansion, Phase 3, to their existing plant using masonry and precast concrete panels. The existing building was experiencing signs of weathering and rust stains had started to show on some precast panels where the rebars had insufficient concrete coverage. The problem was how to inhibit the corrosion, protect the building and tie the existing building and new addition together to be esthetically pleasing structure.

APPLICATION
The entire structure was pressure washed to remove any dirt and dust. A 2-coat application of custom mixed colors (grey, tan, green, and blue) of VpCI®-386 was applied using an airless sprayer. VpCI®-386 was chosen because it is an environmentally friendly water-based coating that provides superior outdoor protection, corrosion inhibiting properties, ease of application and quick clean-up.

CONCLUSION
The VpCI®-386 covered all block, rack pre-cast concrete panels and metals with a smooth even coating that was easy to apply and clean-up. The plant now looks like new and is esthically pleasing with no distinction between the old and new construction. Corrosion has been stopped and the structure is protected from further damage from carbonation and the elements.

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CASE HISTORY

River Bridge Restoration

DATE
June 1996

CORTEC® REPRESENTATIVE
Quidelit S.A.

CUSTOMER
Medina & Medina Associates

LOCATION
Guayaquil City, Equador

PRODUCTS
VpCI®-365
MCI®-2020

PROBLEMS
River Bridge "5 de Junio", located in the heart of Guayaquil City was built 30 years ago. Chlorides and carbonation attack had deteriorated the concrete and corroded the structural steel. The municipality needed an environmentally safe product to extend the life of the structure, protect the reinforcing steel, and allow the concrete to breathe.

APPLICATION
After sandblasting, VpCI®-365 was brush applied to the structural steel beams of the bridge. MCI®-2020 was then sprayed onto the concrete.

CONCLUSION
The needs of the municipality were met and their problems solved with the use of Cortec® products. The use of VpCI®-365 and MCI®-2020 extended the useful life expectancy of the bridge while protecting the environment. In 2008, the Guayaquil Municipality sent engineers to check the conditions of the bridge, finding that 13 years later the bridge is in perfect condition.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

MCI®-2020, MCI®-2038, CorrVerter

DATE
August 2001

CUSTOMER
Spring Screen Factory

CORTEC DISTRIBUTOR
Warm Island Material Co

LOCATION
Kaohsing, Taiwan

PROBLEM
Concrete spalling due to rebar corrosion. This corrosion was due to hydrochloric acid fumes.

ENVIRONMENT
Close interior factory buliding

APPLICATION
Spalled concrete along with dust and loose aggregates were removed. Corrverter was applied to rebar before the application of MCI® 2020. After the MCI® 2020 was applied MCI® 2038 Repair grout was used.

CONCLUSION
Cortec® MCI® products were selected after the barrier coatings that were used initially failed. The building was returned to a like new spall free condition, with an added long term corrosion protection.

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CORTEC CORPORATION
Environmentally Safe VpCI®/MCI® Technologies

MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

MCI® 2020, 2022, 2023, 2038

DATE
July 2000

CUSTOMER
Eidistorg Parking lot/ sublevel garages

CORTEC DISTRIBUTOR
Em ehf

LOCATION
Setjarnares, Iceland

PROBLEM
Water was leaking from an above ground parking lot into sublevel garages through cracks and faulty joints in the concrete.

APPLICATION
1. The entire surface was pressure washed at 150 bar.

2. MCI®-2023 passivating grout was applied as a primer to joints and corners of the parking lot, followed by a top coating of MCI®-2038 finish repair mortar.

3. MCI®-2020, a water based, topically applied, migrating corrosion inhibitor, was sprayed over the entire surface and allowed to penetrate for three days.

4. After the three- day waiting period, the entire surface was again pressure washed at 150 bar.

5. MCI®-2022, a silane/siloxane based sealer containing migrating corrosion inhibitors, was sprayed over the entire surface.

CONCLUSION
All leakage stopped immediately after the repairs were made. There is still no leakage 3 years after the application.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

MCI® 2020, 2023, 2038

DATE
September 2002

CUSTOMER
DePere Waste Water Treatment Plant

CORTEC DISTRIBUTOR
Sun Equipment and Supply

LOCATION
DePere, WI

PROBLEM
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.

ENVIRONMENT
Outdoor wastewater storage tanks

APPLICATION
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. After application of the Cortec® products, two coats of coal tar epoxy were applied.

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

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CASE HISTORY

Structural Repairs to Trinmar Platform 15

APPLICATOR
Corrosion & Environmental Services Limited

LOCATION
Trinidad, West Indies

PRODUCT
VpCI®-611
MCI®-2023
MCI®-2020
MCI®-2039
MCI®-2021

PROBLEM
Trinmar has extensive Offshore Oil Production in the Gulf of Paria in Trinidad and Tobago. Some of the production platforms are over thirty years old and chloride attack has caused extensive rebar corrosion to the piles and pile caps; resulting in spalling of the concrete.

APPLICATION
1. Spalling concrete was hydroblasted at 20,000 psi.
2. VpCI®-611 was applied to protect against rebar flash rusting.
3. MCI®-2023 was applied to exposed rebars.
4. MCI®-2020 was sprayed on spalled areas.
5. A tie coat of MCI®-2039 was brush applied for adhesion.
6. MCI®-2039 was trowel applied in lifts of 2" and built up to 6" in some areas.
7. MCI®-2020 was then sprayed on entire surface.
8. After fourteen days, MCI®-2021 was sprayed on entire surface.

CONCLUSION
The HPRS® system has performed to customers satisfaction. An extensive repair program for Offshore Platforms has been put in place and Cortec's MCI® HPRS® repair system has been specified.

DATE
July 2002

CUSTOMER
Petrotrin - Trinmar Operations
Mr. Ken McCree
Infrastructure Maintenance Coordinator
Construction Engineering & Inspection

CORTEC REPRESENTATIVE
Corrosion & Environmental Services Ltd.
Motilal Supersad

MAIN CONTRACTOR
AR Singh Contractors Limited

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MCI® MIGRATING CORROSION INHIBITORS FROM GREY TO GREEN

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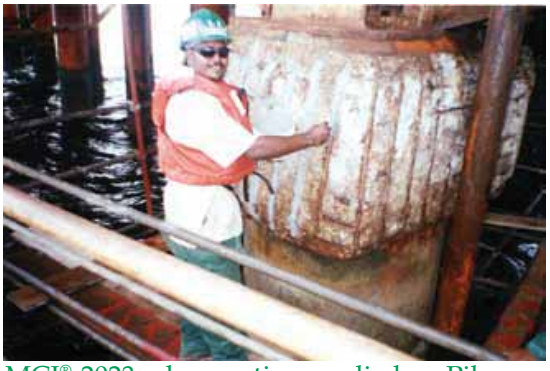
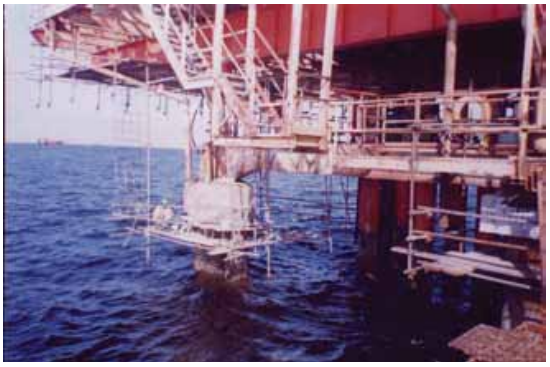
Trinmar Platform 15

Piles being driven into the sea bed

Mixer and MCI® - Repair materials



MCI®-2023 rebar coating applied on Pile-cap



Pile-cap being repaired with HPRS®

MCI® - 2039 Tie Coat

MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

Carbonation and Spalling of Concrete

PROBLEM

Carbonation and spalling of the concrete. MCI®-2020 containing a fugitive dye was sprayed on the entire structure including the parking garage. The structure has a bush hammered finish. This irregular finish acts to hold moisture, salt and volcanic emissions in the facade, leading to corrosion of embedded reinforcement. Since the project is located on a Pacific Island, a high degree of moisture laden trade winds strike the structure. In addition, over the last 10-12 years, Hawaii has experianced a high degree of volcanic activity which contributes to acid rain.

APPLICATION

MCI®-2020 with a fugitive dye was applied to the structure at 150ft^2/gal (3.68 m^2/L)

CONCLUSION

The process of determining which products would be used on the entire structure was made by doing a 6 month performance test of Cortec® and competitive products. Evaluated products were: SIKA Ferrogard® 903, Surtrete, Protectosil CIT (Dynasilane) and Chemtrete. The last two products were not included in the 6 month performance test as they were not considered as inhibitors for this project. A culmination of tests showed that 30 days after the application, noticeable drop off of inhibitor activity of all brands was uniform. After 60 days other brands continued to decline. Cortec® MCI®-2020 followed the trend, but at a much lower level of decline than the competition. After 90 days an additional drop off was recorded for other inhibitors, but Cortec's MCI®-2020's rate stayed consistant. At 180 days, MCI®-2020's rate remained consistant and actually showed an increase in the rate of reducing corrosion activity. Cortec® MCI® not only outperformed the other tested products, but also saved money due to the fact that MCI®-2020 does not etch glass, while other tested inhibitors do. No masking of windows was required, and there was no chance of a liability suit due to damaged automotive or building glass from other buildings in the general area.
(Estimated cost to mask the glass and then remove it after the project was finished on a building this size was $10 - $20,000.00 US.)

DATE
February 2003

CORTEC REP
Rich Moran - Corrosion Cops

CUSTOMER
Pacific Tower

LOCATION
Honolulu, Hawaii

PRODUCT
MCI®-2020

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

Building Facade Restoration

DATE
Spring 2003

LOCATION
Cincinnati, OH

PROJECT
Park Edin

DISTRIBUTOR
Oakley Specialty Products

SPECIFYING ENGINEER
John Grier Architects

CONTRACTOR
Walter Associates

PRODUCTS
MCI®-2020 V/O

PROBLEM
Engineer wanted a corrosion inhibitor; however, there were concerns over environmental friendliness. The building had exterior air conditioning units, so any product applied had to be non-hazardous, so as not to affect any of the building's occupants should an air condioning unit be turned on during the application. There was also concern over the windows in the building as well as the new landscaping surrounding the area of application. The applied inhibitor should not etch the glass windows nor affect the landscaping.

APPLICATION
MCI®-2020 V/O was applied as a one coat application at a rate of 150 square feet per gallon to the building.

CONCLUSION
MCI®-2020 V/O was chosen because of its environmentally friendliness and UL approval to meet NSF Standard 61 requirements for potable water. MCI®-2020 V/O did not require masking of the windows and had no effect on the landscaping. The contractor was also pleased that the MCI®-2020 V/O could be applied as a one coat application, which provided a savings in labor costs.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

Repair of Condo Balconies

DATE
Fall 2003

LOCATION
Cincinnati, OH

PROJECT
Adam's Landing Condominiums

CONTRACTOR
Hummel Restoration

CUSTOMER
Adam's Landing Board

PROJECT MANAGER
Scott Whittle

PRODUCTS
MCI®-2019

PROBLEM
Condominium Complex needed their balconies repaired. Overhead patching and caulking was completed, and followed by a sealer treatment. The owner wanted a product that was a corrosion inhibitor and water repellant that could be applied in one step, so MCI-2019 was chosen

APPLICATION
MCI®-2019 was applied as a water repellant containing Cortec's Migrating Corrosion Inhibitors

CONCLUSION
Owner stated that they were very pleased with the MCI®-2019 application and performance during the course of the project.

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CASE HISTORY

High Rise Building Restoration

DATE
July 2004 - November 2004

LOCATION
Dayton, OH

PROJECT
Grand Avenue High Rise

DISTRIBUTOR
Rae Jean Nicholl
Oakley Specialty Products

CONTRACTOR
Bill Walter
Walter Associates Inc.

CUSTOMER
Dayton Metropolitan Housing Authority

SPECIFIYING ENGINEER
MRB Inc. & Oregon Group Architects

PRODUCTS
MCI®-2020 V/O and MCI®-2005 Gel

SOLUTION & APPLICATION
Horizontal concrete precast at floor levels supports brick in fill. Lack of proper flashing details along with highly porous concrete is allowing water to enter matrix and interior.

CONCLUSION
All repairs have been proven successful. Cores were extracted and tested to prove migration of MCI®-2020 V/O

WHY MCI WAS CHOSEN
Cortec's MCI®-2020 V/O and MCI®-2005 Gel have had past success with the manufacturer and the distributor.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

Restoration of Building Facade

DATE
June 2003 - August 2004

LOCATION
Dayton, OH

PROJECT
Montgomery County Administration Building

DISTRIBUTOR
Rae Jean Nicholl
Oakley Specialty Products

CONTRACTOR
Bill Walter
Walter Associates Inc.

CUSTOMER
Montgomery County

SPECIFIYING ENGINEER
MRTS Inc. (Masonry Restoration Technologies & Services, Inc.)

PRODUCTS
MCI®-2020 V/O

SOLUTION & APPLICATION
First, the removal all loose concrete was done, then exposed steel was treated and patched with a polymer modified mortar. MCI®-2020 V/O was then applied. A block filler was then applied to close pores, followed by, two coats of an elastomeric coating.

CONCLUSION
The project was successful with no water penetration.

WHY MCI WAS CHOSEN
Cortec's MCI®-2020 V/O has had past success with the manufacturer and the distributor.

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CASE HISTORY

Restoration of Marquette Manor

DATE
June 2002 - October 2003

LOCATION
Cincinnati , OH

PROJECT
Marquette Manor

DISTRIBUTOR
Rae Jean Nicholl
Oakley Specialty Products

CONTRACTOR
Bill Walter
Walter Associates Inc.

CUSTOMER
Cincinnati Metropolitan Housing Authority

ARCHITECT
Emilio Fernandez
SFA - Cincinnati

PRODUCTS
MCI®-2020 V/O

SOLUTION & APPLICATION
The existing coating failed and was subsequently stripped off to absolute virgin concrete. All delaminations were patched with a polymer modified mortar. The structure was then treated with MCI®-2020 V/O and coated with an elastomeric coating.

CONCLUSION
There are no leaks to the inside of the building or evidence of the same into the concrete. Independent lab results on core extractions showed a 3" migration of MCI®-2020 V/O.

WHY MCI WAS CHOSEN
Cortec's MCI®-2020 V/O has had past success with the manufacturer and the distributor.

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CASE HISTORY

Building Façade Restoration

PROJECT
Building Façade Restoration

DATE
November 2004

CORTEC REP.
CorteCros Co. Ltd.

CUSTOMER
Zagreb Electrical and Information Faculty

LOCATION
Zagreb, Croatia

PRODUCTS
MCI®-2023, MCI®-2020 V/O and MCI®-Architectural Coating

PROBLEM
The concrete exterior of the building was seriously damaged. Rebar and other steel components were exposed in many locations on the façade. The customer wanted complete restoration of the exterior building surface to include a corrosion inhibitor and coating of the façade.

APPLICATION
Concrete surface were cleaned with a high pressure water blast. MCI-2023 was coated on to all exposed rebar and steel components, followed by MCI-2020 V/O as a one coat application to all concrete surfaces. Spalled areas were patched with a finish repair mortar, and a one coat application of MCI-Architectural Coating in grey completed the project.

CONCLUSION
The MCI®materials were chosen because of their environmental friendliness. MCI®-2020V/O was chosen because it did not require masking of the buildings windows. The customer was also pleased that the MCI®-2020 V/O could be applied as a one coat application, which meant a significant savings in labor costs. MCI®-Architectural Coating provided an aesthetically pleasing appearance that is both UV and thermally stable.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

Inland Steel Building

DATE
1984

CUSTOMER
Inland Steel

LOCATION
Chicago, IL

PRODUCT
MCI®-2020

BACKGROUND

Inland Steel Headquarters is one of the original high rise buildings of the Chicago skyline located on the famous Monroe Street. Built between 1954-1958, it stands 332 feet high, (100,0m) having 19 floors with a surface area of 309,660 sq. ft. (28.618 sq. m.). The building is one of the National Registry of historic places, having been designed by the world renown architect, Lou Sullivan and appears in many architectural reviews as being a predecessor of the high rises of downtowns such as Chicago and New York.

PROBLEM

CORTEC® Corporation was approached in 1983 by Dr. Robert Legault, one of Inland Steel's key corrosion scientists to assist in solving a corrosion problem with their headquarters building. The problem was attributed to a variety of factors, some of them influenced by the design (galvanic corrosion between structural steel and stainless steel "skin") and some of them caused by lake effect (humid conditions due to the proximity of Lake Michigan).

CONCLUSION

As a result of the joint effort between CORTEC's staff and Inland Steel's team, a unique system was devised to preserve the integrity of the building: MCI®-2020 has been injected in critical areas where the occurrence of corrosion was the greatest, in the order of magnitude 200+ Mils (4000 microns). The injection was accomplished using a high pressure portable sprayer on the locations around the perimeter of the building, from every second floor of the thirty-two floors. The

CONTINUED ON BACK

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CONTINUED

injections were completed in less than two weeks and have been repeated every second year since 1984.
To document the success of the MCI®-2020 protection method, Inland Steel engineers have developed corrosion monitoring systems using atmospheric rate measurements on sites throughout the building. The late Dr. Legault was a world renown scientist in the field of atmospheric corrosion of metals and his results have shown that MCI®-2020 has almost completely stopped further corrosion of the structural steel and thus preserved the structural integrity of this historic building.

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CASE HISTORY

American Center Building

Plaza/Parking Deck

DATE
October 2004

DISTRIBUTOR
Corrosion Control Systems, Inc.

CUSTOMER
Redico Management

PRODUCT
MCI® 2020

LOCATION
Southfield, MI

PROBLEM
Improper drainage caused water contaminated with de-icing salts to pond and leak through cracks and defective expansion joints. Resulting corrosion caused damage to plaza concrete and structural concrete beams and columns.

APPLICATION
Replaced defective expansion joints, repaired plaza and structural concrete. MCI® 2020 was applied on all areas where corrosion is anticipated, and installed membrane water proofing on plaza surface.

CONCLUSION
Due to the successful application of the MCI® 2020 on this structure since 1996, further damage has been minimized on areas treated with MCI® 2020, while areas repaired using other products are displaying corrosion damage. In 2006, the customer will proceed with repairing the parking deck ceiling using the MCI® systems approach.

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CASE HISTORY

DTE Energy / Great Lakes Steel Coke Battery
Concrete Tower Wall Restoration

DATE
Summer 2004
Periodic Projects since 1998

DISTRIBUTOR
CCS, Inc.

CUSTOMER
DTE Energy

LOCATION
Great Lakes Steel Engineering

OWNER
DTE Energy

PRODUCT
MCI® 2020

PROBLEM
Corrosive environment of plant causes reinforcement damage, resulting in concrete damage and necessary repairs.

APPLICATION
Removed deteriorated concrete and reinforcement. Sand-blasted and prepared areas, applied MCI® 2020 and patched delaminated areas with Tamms Dural Top Gel.

CONCLUSION
Previous repairs utilizing MCI® since 1998 have provided very satisfactory results for the plant.

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CASE HISTORY

Cumberland Tech Center
Masonry Screen Wall Restoration

PROBLEM
Segmental precast concrete wall was under going significant damage from corrosion. Embedded reinforcement corroded, causing cracking and spalling throughout.

APPLICATION
Repaired spalled concrete units with Tamms Dural Top Gel. Injected cracks with epoxy resin, and applied MCI 2020 to both sides of the wall, followed by an application of Tammscoat, which is a decorative and protective coating.

CONCLUSION
This screen wall was exposed to continuous moisture and road salts over many winter seasons. The chloride content in the wall is high and caused significant corrosion damage. Four years (winter cycles) after repair, evidence of continued corrosion damage is difficult to find.

DATE
Summer 2002

DISTRIBUTOR
C.C.S., INC.

CUSTOMER
Levine Property

PRODUCT
MCI® 2020

LOCATION
Southfield, MI

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

City of Detroit, Fire Station #6

Concrete Floor Restoration

DATE
1998

CORTEC® DISTRIBUTOR
CCS, Inc.

LOCATION
Fort Street & Congress
Downtown Detroit

CUSTOMER
City of Detroit

PRODUCT
MCI® 2000

PROBLEM
Age & road salts resulted in significant deterioration of the street level supported floor slab used by the station fire trucks.

APPLICATION
Removed damaged concrete and corroded reinforcement as required. Sandblasted surface and placed a conventional concrete mix containing MCI® 2000 admixture.

CONCLUSION
A December 2005 site visit indicated that MCI® 2000 is performing as anticipated, with no visible corrosion problems in the new station floor.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

Lapeer County Courthouse Restoration

DATE
1997

LOCATION
Lapeer, MI

PROJECT
Lapeer County Courthouse Restoration

SPECIFYING ENGINEER
THA Architects and Engineers

DISTRIBUTOR
CCS, INC.

CONTRACTOR
State Contractors

OWNER
Lapeer County, MI

PRODUCT
MCI 2021

PROBLEM
The mortar and brick were porous allowing the ingress of moisture and the effects of carbonation to damage the brickwork.

SOLUTION & APPLICATION
MCI 2021 was applied in two applications to increase the density of the mortar, while sealing the brick to protect it from further environmental effects.

CONCLUSION
The restoration included the application of a masonry coating after the repair and sealing of the exterior walls. The application of MCI 2021 with the coating application have provided an effective method to restore the building to date, based on a January 2006 site visit.

WHY WAS MCI CHOSEN?
MCI 2021 was specified by THA Architects and Engineers, because of MCI's physical properties that provide protection for the brickwork.

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CASE HISTORY

University of Michigan
Utility Tunnel Restoration

DATE
2001

CUSTOMER
University of Michigan

CORTEC® DISTRIBUTOR
CCS, Inc.

LOCATION
Ann Arbor, Michigan

PRODUCTS
MCI®-2000

PROBLEM
The University utility tunnels contain high pressure steam lines. Long term exposure to high humidity and temperature in conjunction with leaking expansion joints and cracks caused severe damage to the cast-in-place concrete walls, ceiling and floor.

APPLICATION
MCI®-2000 was included in the concrete mix used for the tunnel reconstruction phases. MCI®-2020 was used to treat concrete that required repair (patching), particularly the walls and ceilings.

CONCLUSION
Continued specification of MCI's by Cummins and Barnard, Inc. and the contractor, Barton Malow, indicates their confidence in the MCI® inhibitors and success of the repair method.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

Washtenaw County Courthouse Parking Deck Restoration

DATE
1997

LOCATION
Ann Arbor, Michigan

PROJECT
Washtenaw County Courthouse Parking Deck Restoration

SPECIFYING ENGINEER
BEI Associates, Inc.

DISTRIBUTOR
CCS, INC.

CONTRACTOR
Mark 1 Contracting

OWNER
Washtenaw County, Michigan

PRODUCT
MCI 2020, MCI 2000, MCI 2021

PROBLEM
Significant damage of the floor slabs due to corrosion of reinforcing steel.

SOLUTION & APPLICATION
A systems approach to inhibit corrosion with MCI products was used in the repair plan. After removal of the delaminated concrete surface, MCI 2020 was sprayed on the concrete substrate to migrate to the reinforcing steel, which was still embedded in chloride contaminated concrete. MCI 2000 admixture was added to the repair concrete mix to provide corrosion protection to the steel mesh in lieu of epoxy coated reinforcing, providing a significant cost savings to the owner. Upon completion of all work the new surface was sprayed with MCI 2021 to seal and densify the surface while also providing additional MCI corrosion inhibiting action.

CONCLUSION
No problems with the placement of the concrete with MCI 2000 occurred during the construction, and a recent site visit in January 2006 indicates no visible sign of concrete problems.

WHY WAS MCI CHOSEN?
The MCI systems approach was chosen due to the past performance of the products, the user-friendly characteristics for placement and finishing, and the dual inhibitor action of the products.

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ch277 (01/06)

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CASE HISTORY

United States Coast Guard Base, Detroit

Concrete Pier Repair - Reconstruction

DATE
Summer 2005

LOCATION
E. Jefferson, Detroit, Michigan, Detroit River

PROJECT
United States Coast Guard Base Detroit

SPECIFYING ENGINEER
U.S.C.G._C.E.U.
(Cleveland Engineering Unit)

DISTRIBUTOR
CCS, INC.

CONTRACTOR
CCS, INC.

OWNER
U.S.C.G.

PRODUCT
MCI® 2005 NS

PROBLEM
The primary reason for the pier repair was due to impact by ships, with the secondary reasons being age and corrosion. At least two previous repairs did not hold up.

APPLICATION
A valued added alternative by C.C.S., Inc. to use MCI® 2005 NS in the new concrete mix design at 1 ½ pints per cubic yard was accepted by the Coast Guard. A portion at the end of the pier was completely reconstructed.

CONCLUSION
The plastic and hardened physical characteristics of the concrete with MCI® 2005 NS were all very satisfactory. High strengths were achieved with no cracking indicated 30 days after placement.

WHY WAS MCI® CHOSEN?
The design group of the U.S.C.G. chose the use of MCI® to obtain long-term service of the pier.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

Riverhouse Co-Op Apartment Parking Structure Restoration

DATE
1997

LOCATION
Jefferson Ave, Detroit, Michigan

PROJECT
Riverhouse Co-Op Apartment Parking Structure Restoration

SPECIFYING ENGINEER
Carl Bobish Engineering

DISTRIBUTOR
CCS, INC.

CONTRACTOR
Calculus Construction Company, Inc.

OWNER
Riverhouse Co-Op

PRODUCT
MCI 2000

PROBLEM
The first supported level of the parking deck suffered extreme corrosion damage due to heavy exposure to road salt and improper drainage. Damage to the structural slab extending up to 5" in depth, well beyond the top layer of rebar.

SOLUTION & APPLICATION
The concrete mix design including MCI 2000 and the deck slab was laid out to provide proper drainage. Nearly 500 cubic yards of concrete with MCI 2000 were placed without complications or inconsistencies in batching, pumping, placement and finishing.

CONCLUSION
The deck was inspected in December of 2005 and showed little sign of any problems on the level repaired with MCI 2000. The engineer and contractor responsible for the repair of the second supported level in winter of 2005 resisted attempts to use MCI. DCI was used in the mix design, and less than a year later heavy cracking has occurred.

WHY WAS MCI CHOSEN?
Carl Bobish Engineering contacted C.C.S., Inc. in 1997 to compare MCI with other inhibitors. He chose MCI 2000. The 2005 deck repair design was not by prepared by Carl Bobish Engineering.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

Macomb County Courthouse Restoration

DATE
1997

LOCATION
Mount Clemens, MI

PROJECT
Macomb County Courthouse Restoration

SPECIFYING ENGINEER
Testing Engineers and Consultants, Inc.

DISTRIBUTOR
CCS, INC.

CONTRACTOR
Calculus Construction Company, Inc.

OWNER
Macomb County, MI

PRODUCT
MCI 2020

PROBLEM
Corrosion of embedded reinforcement due to the inadequate concrete cover led to the damage on the precast concrete façade. The damage was particularly great at the cornice and on the upper portions of the building.

SOLUTION & APPLICATION
Deterioated areas of concrete were removed to sound concrete. The areas were prepared with shotblasting and were then treated with MCI 2020. Patches were done using a cement based repair morter containing MCI inhibitors.

CONCLUSION
A January 2006 inspection of the site showed that the repairs were intact and there was no visual evidance of corrosion or other problems.

WHY WAS MCI CHOSEN?
Testing Engineers and Consultants, Inc. feared that the expensive repairs would not provide the long term service required if MCI was not chosen as an integral part of the repair methodology. Many repairs on high-rise structures soon fail due to the ring anode effect (corrosion activity caused by a difference in corrosion potential between the new repair material and the existing concrete.)

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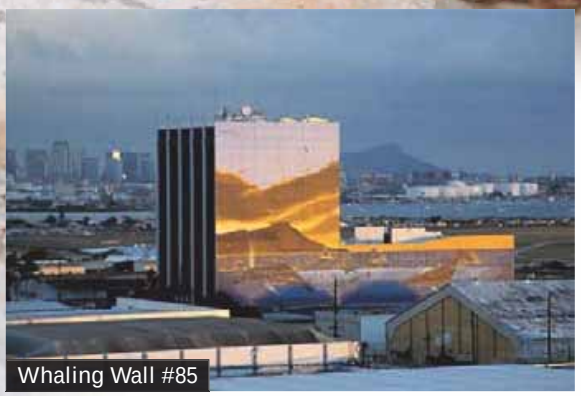
Whaling Wall #85


Whaling Wall #86


Whaling Wall #88

CASE HISTORY

World Renown Wyland Murals Protected with Cortec's MCI® Architectural Coating!

DATE
November 2000

CUSTOMER
Wyland Foundation

LOCATION
Florida / Hawaii

PRODUCTS
MCI® Architectural Coating

APPLICATION
The Wyland Foundation has been painting larger than life murals as a method to increase the public's awareness of environmental conservation. In total, 93 walls have been completed to date with plans to complete 100 walls by the year 2008. In some areas, these walls are exposed to high levels of UV exposure and harsh environmental elements. As a result, The Wyland Foundation was looking for a clear coat that could be applied over the murals and provide additional protection.

Cortec® Corporation became a sponsor of the Wyland Foundation in 2000, and has been working with them since that time to help protect the murals they create. For a number of the walls including WW85, WW86 and WW88, MCI® Architectural Coating was chosen as the product used to protect the murals. In total, more than 200,000 square feet (20,000 square meters) have been clear coated using MCI® Clear Coating.

CONCLUSION
The murals that have been coated with MCI® Clear Coat have stood up well to the environmental conditions to which they are exposed. We will continue to work with the Wyland Foundation where protection of their murals is required.

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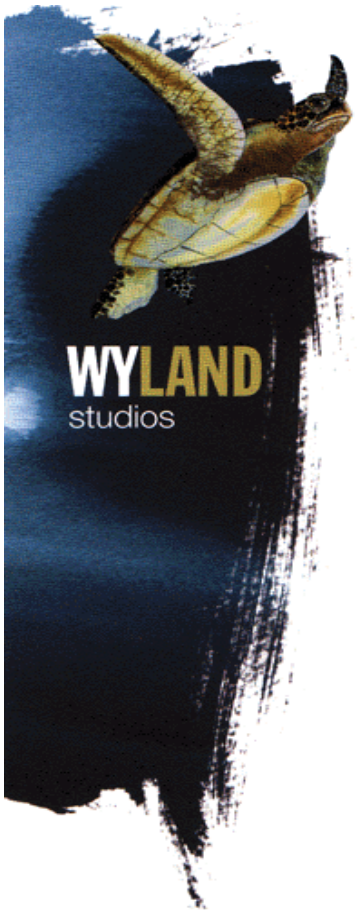

Boris Miksic
Cortec Corporation
4119 White Bear Parkway
St. Paul, MN 55110

15 November 2000

Aloha Boris,

I would like to extend my thanks to you for supporting the Wyland Foundation during the creation of Wall #86, "Manatee Sanctuary", at the Homosassa Springs State Wildlife Park in Homosassa, Florida. Having now painted 86 of my intended 100 monumental lifesize marine-life murals, I am extremely pleased with the performance of Cortec's VCI-386 clearcoat product.

I am most proud of the fact that these life size murals will inspire thousands of people to respect, protect and preserve our oceans, lakes, rivers, streams, ponds, wetlands and all the marine life that dwells within. It is sure to be a Florida landmark for years to come.

On behalf of the Wyland Foundation, we thank you and invite you to join us in the future as we continue our mission of bridging the worlds of art and science. Together we can inspire generations around the globe to explore and care about our oceans and its magnificent sea life. One person can make a difference!

Mahalo,

Wyland

5 columbia . aliso viejo . california 92656 . tel: 949.643.7070 . fax: 949.643.7099 . e-mail: wyland@wylandgalleries.com www.wyland.com

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CASE HISTORY

MCI® 2020 V/O

DATE
September 2005

CUSTOMER
Government of Manitoba

LOCATION
Portage La Prairie, Manitoba
Canada

PRODUCT
MCI ® 2020 V / O

DISTRIBUTOR
Specialty Construction Products, LTD

SPECIFYING ENGINEER
A.F. Eshmade & Associates

CONTRACTOR
Concrete Restoration Services, LTD

PROBLEM
Corrosion of rebar in steam services tunnels.

APPLICATION
Cortec® MCI® 2020 V / O was applied at 150 ft^2 / gallon (3.68 m^2 / liter) to ceiling and walls of tunnels, as proposed by Specialty Construction Products, to stop ongoing corrosion of reinforcement.

WHY MCI® WAS CHOSEN?
To reduce corrosion activity of embedded reinforcement.

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CASE HISTORY

MCI® 2020 V/O

DATE
August 2005

CUSTOMER
Health Sciences Center

LOCATION
Winnipeg, Manitoba
Canada

PRODUCT
MCI ® 2020 V / O

DISTRIBUTOR
Specialty Construction Products, LTD

SPECIFYING ENGINEER
Concrete Restoration Services, LTD

CONTRACTOR
Concrete Restoration Services, LTD

PROBLEM
Spalled concrete showed evidence of reinforcement corrosion in concrete walls.

APPLICATION
Spalls were repaired with patching mortar. Cortec® MCI® 2020 V/O was applied by roller to all floor bands around the building at a rate of 150 ft^2/gallon (3.68 m^2/liter). Following treatment of concrete bands with Cortec® MCI® 2020 V/O, the surface was rinsed off with water and allowed to dry. A coating of Tamms Primer and two coats of Tamms coating was applied to the entire structure.

WHY MCI® WAS CHOSEN?
Corrosion of the reinforcement concerned the owner of future performance of the structure. As a preventative measure, CRS recommended Cortec® MCI® 2020 V/O to mitigate corrosion of embedded reinforcement on the project.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

MCI® 2020 V/O
MCI® Mini Grenades

DATE
July-September 2005

CUSTOMER
Hartford Investments L&D

LOCATION
Winnipeg, Manitoba
Canada

PRODUCTS
MCI ®2020 V/O
MCI® Mini Grenades

DISTRIBUTOR
Specialty Construction Products, LTD

SPECIFYING ENGINEER
Kemp Engineering

READY MIX SUPPLIER
City Mix Concrete

CONTRACTOR
Concrete Restoration Services, LTD

PROBLEM
Corrosion of reinforcement in parkade deck.

APPLICATION
Removal of concrete with hydrodemolition. Cortec® Mini Grenades were used in cement/slurry bond coat to treat remaining concrete slabs lower steel. All top reinforcement was replaced with FRP. Cortec® MCI®2020 V/O was applied to the soffit of the same area to treat all lower steel for future corrosion activity.

WHY MCI® WAS CHOSEN?
To preserve and protect the lower reinforcement from ongoing future corrosion activity.

CONCLUSION
Excellent application for both products in Parkade Restoration applications.

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CASE HISTORY

Parking Structure Concrete Repair

DATE
September 2006

CUSTOMER
Wayne State University

LOCATION
Detroit, Michigan

DISTRIBUTOR
C.C.S., Inc.

CONTRACTOR
Walbridge Aldinger

READY MIX SUPPLIER
Koenig Fuel & Supply Company

SPECIFYING ENGINEER
Desai-Nasr Consulting Engineers

PRODUCTS
MCI® 2020
MCI® 2005

PROBLEM

The precast, pre-topped, twin tee concrete parking structure was completed in 2001. Many areas of the cast-in-place concrete were found to be of poor quality as the result of large air void content, a high water / cement ratio of up to 0.53, carbonated surface to 5.8" deep, and poor compressive strength of 2,500 to 3,800 psi. Significant deterioration had taken place in a very short period of time, including extensive corrosion of the reinforcement, particularly on the top level. Also, as a result of the high permeability of the porous concrete, chlorides (de-icing compounds) penetrated the cast-in-place concrete and contaminated the precast in which it had contact, resulting in corrosion of the precast reinforcement.

APPLICATION

Complete replacement of the cast-in-place concrete areas was specified for the correction. There were two areas of concern for the repair scope. One was the replacement of the defective cast-in-place concrete and the other was the chloride contaminated, precast concrete. The solutions were to replace the cast-in-place concrete with a high quality concrete with MCI® 2005 Corrosion Inhibiting Admixture and treat the surfaces of the adjacent precast concrete with MCI® 2020 Topically Applied Corrosion Inhibitor to protect the reinforcement.

WHY MCI® WAS CHOSEN

To provide a quality concrete repair design that ensured the completed project would stand up to the demands of time. Parking structures must be resilient to extremes of use, climate changes, chloride contamination, and carbonation effects.

CONCLUSION

Desai-Nasr Consulting Engineers, in conjunction with C.C.S., Inc. included MCIs into the repair design as an important addition to a high quality concrete replacement mix and for the treatment of the existing precast concrete for protection of the reinforcement. Parking is a very significant part of day-to-day life in and around the W.S.U. Campus, as it is in many areas of the country, and W.S.U. is very demanding when it comes to maintenance of their parking assets. The repair project was completed by Labor Day of 2006, just prior to the return of the students, meeting the required deadline.

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CASE HISTORY

Protection & Repair with HPRS® System

DATE
2005 - 2006

CUSTOMER
Port Ploce

LOCATION
Croatia

CORTEC® REPRESENTATIVE
CorteCros Co. LTD

PRODUCTS
MCI®-2023
MCI®-2020 Powder
MCI®-2006 NS
MCI®-2022
MCI®-EcoCure
MCI®-Architectural Coating

PROBLEM
For over 20 years Port Ploce had not received any maintenance to the modules and was in much need of repair and protection. Some parts of the modules were exposed to chloride, causing rebar corrosion and mechanical damage to the surfaces of the modules; which resulted in the spalling of the concrete.

APPLICATION
The concrete surface of the modules was prepared with a high pressure water jet, which removed the deteriorated material. MCI®-2023 was applied to the exposed rebar; and the entire concrete surface was treated with two coats of MCI®-2020 powder, diluted with water (1:4). The concrete surface and exposed reinforcing steel were then treated with repair mortar containing MCI®-2006 NS. The manual application was 1-3 layers depending on the total thickness of the mortar layer; in some areas the mortar was 8cm thick.

The concrete surfaces on the face side of the wharf were exposed to constant air circulation, causing the surface to dry too fast. To protect the surface until it was fully cured, one coat of MCI® EcoCure was applied. The wharf face of the surface was then treated with two coats of MCI® Architectural Coating in white.

The concrete surfaces on the soffit, and the interior of the structure were protected with a coat of MCI®-2022.

CONCLUSION
The customer was very satisfied with the application of the Cortec® HPRS® system, and the performance of the products. The Cortec® HPRS® system was an acceptable and effective system to protect and repair reinforced concrete structures.

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CASE HISTORY

Copley Place Mall Loading Dock

DATE
January 2007

DISTRIBUTOR
Structural Materials and Restoration Technologies
(S.M.A.R.T.)

SPECIFYING ENGINEER
THP, Ltd.

CONTRACTOR
Brisk Water Proofing

LOCATION
Boston, Massachusetts

CUSTOMER
Copley Place Mall

PRODUCTS
MCI® 2020 IPA

PROBLEM
There was corrosion and deterioration of the concrete in the loading dock area of the mall. A product was needed that would be easy to apply and quick drying so the loading dock would not have to be closed down.

APPLICATION
The surface of the loading dock was water-blasted to remove any dirt, oil, grease, or previous sealers and coatings. After the area was dry, MCI® 2020 IPA was sprayed onto the surface and allowed to dry overnight.

CONCLUSION
MCI® 2020 IPA was easy to apply and allowed a quick and permanent solution to their corrosion problem. MCI® 2020 IPA gave their engineer a confidence in the corrosion protection that could not be found anywhere else.

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CASE HISTORY

Miami Valley Hospital Garage Restoration

LOCATION
Dayton, Ohio

CUSTOMER
Miami Valley Hospital

SPECIFYING ENGINEER
THP Limited, Inc.

READY MIX SUPPLIER
Moraine Materials

CONTRACTOR
Lithko Restoration Technologies

PROBLEM
Miami Valley Hospital Garage is a pre-topped, precast, double tee garage. The top level had an existing membrane, which was removed. The underlying precast double tees had advanced corrosion which lead to full depth concrete slab repairs being needed.

APPLICATION
MCI® 2020M was applied to the slab surface. MCI® 2020VO was then applied to the visibly distressed areas. MCI® 2005NS was added to the new ready mixed concrete for the patches.

CONCLUSION
Cortec® provided an efficient, cost effective, high performance corrosion protection system that was easy to apply. Cortec® products provided a proven superior method for restoring and preventing corrosion; and are environmentally friendly.

DATE
December 28, 2006

DISTRIBUTOR
Structural Materials and Restoration Technologies (S.M.A.R.T.)

PRODUCTS
MCI® 2020M
MCI® 2020VO
MCI® 2005NS

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

Repair of San Agustin Church

DATE
March 2008

DISTRIBUTOR
M.R.F. Inc.

SPECIFYING ENGINEER
Architect Luis A. Torres

CUSTOMER
San Juan Archdiocese Catholic Church

LOCATION
San Juan, Puerto Rico

PRODUCT
MCI®-2020
MCI®-2311
MCI®-2022

PROBLEM
A 100 year old church standing less than 300 feet from the ocean was exposed to the daily sea breezes and started showing signs of deterioration due to corroded rebar. The structure was in urgent need of repair before the damage became irreversible.

APPLICATION
First, MCI®-2020 was applied on the precasts and the walls to allow the inhibitors to migrate through the concrete to treat the steel reinforcement bars. The second step was to repair the damage by applying MCI®-2311, a single component, cement-based mortar. This was followed by a saturation of MCI®-2022, a water-based, water-repelling sealer.

CONCLUSION
The architect searched and evaluated all the alternatives available on the market and selected Cortec's products because of their superior corrosion inhibition properties, excellent performance, and easy application.

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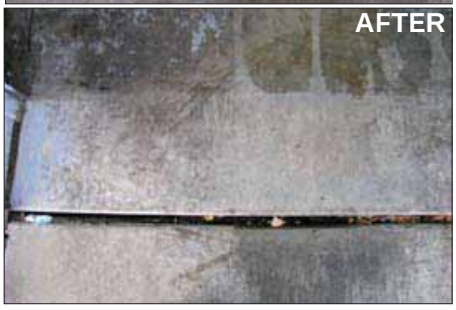

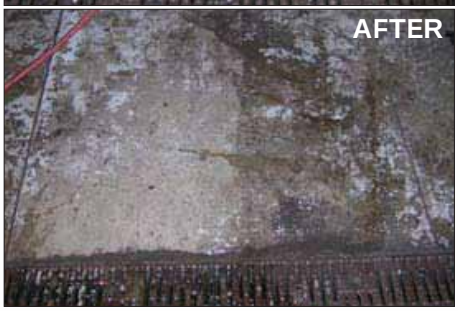

CASE HISTORY

MCI®-2061

DATE
February 2008

CUSTOMER
Smith Nielsen Automotive Service

LOCATION
Vadnais Heights, MN

PRODUCTS
MCI® - 2061

PROBLEM
The customer's concrete floors were regularly being stained with automotive fluids and oil.

APPLICATION
MCI®-2061 mixed with water was applied to half of the stained concrete by pouring and brushing on the surface, allowing it to stand for 20 minutes, and then the area was brushed with a broom for 30 seconds. The solution was then sprayed off with a hose, and excess water was removed with a squeegee.

CONCLUSION
MCI®-2061 is an environmentally friendly alternative that eliminates the need for harsh solvent-based and alkaline cleaners. It solved the customers problem by removing the stains and improving the appearance of the concrete it cleaned.

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MCI® MIGRATING CORROSION INHIBITORS FROM GREY TO GREEN

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CASE HISTORY

Rehabilitation of the Cooling Tower for Repsol YPF-Tarragona Refinery

DATE
2008 - 2009

DISTRIBUTOR
Quimilock, s.a.u

SPECIFYING ENGINEER
Repsol YPF

READY MIX SUPPLIER
Quimilock

CONTRACTOR
HCC & Quimilock

CUSTOMER
Repsol YPF-Tarragona Refinery

LOCATION
La Pobla de Mafumet (Tarragona) Spain

PRODUCTS
MCI®-2020
Q-2023
Q-2039 T
Anti-Carbonation Coating

PROBLEM

The deterioration of a concrete cooling tower at the Repsol YPF Refinery had occurred from the aggressive environment; which included heavy thermal gradients and constant humidity changes. Spalling of the concrete occurred due to generalized corrosion on the reinforcing steel. The corrosion also affected the strength of the rebar and caused a decrease in the tower's structural integrity. In addition to the evident damage, the goal was to passivate any potential corrosion that was not yet visible.

APPLICATION

In order to make the repairs needed to the damaged areas, the following steps were taken:

- Using a very high pressure sprayer (35,000 psi), the spalling concrete and corrosion were removed.
- Q-2023 grout (equivalent to MCI®-2023) was applied to passivate corrosion on the rebar.
- Q-2039 T, a polymeric mortar similar to MCI®-2039, was used to return the concrete structure to its original shape.
- MCI®-2020 was applied to the entire structure using an airless sprayer at the recommended dosage rate.
- Carbon fiber reinforcement, followed by an acrylic, anti-carbonation coating (similar to MCI® Architectural Coating) was applied to restore the structural integrity of the main support beams for the ventilation chimneys.

CONCLUSION

Cortec's MCI®-2020 was applied to over 2,000 linear meters of concrete pillars along with over 5,000 linear meters of concrete beams in the building. About 1,500 m^2 of concrete slab was repaired using Quimilock's mortar followed by Cortec's MCI®-2020.

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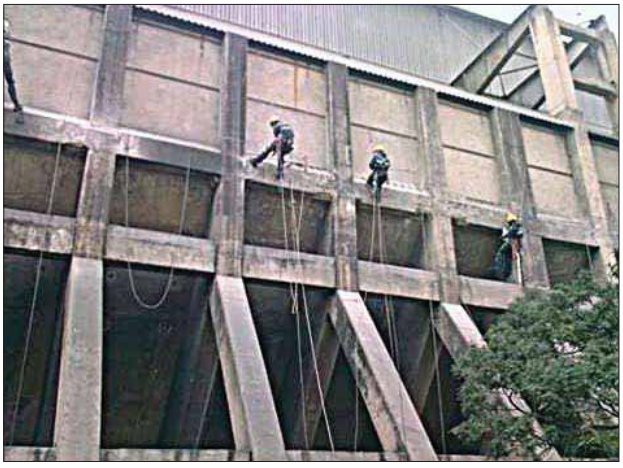
MCI® MIGRATING CORROSION INHIBITORS FROM GREY TO GREEN

CASE HISTORY



Kriel Power Station Repair

DATE
March 2008 - December 2008

DISTRIBUTOR
StonCor Africa - An RPM Company

SPECIFYING ENGINEER
Kriel Power Station CED (Civil Engineering Department)

CUSTOMER
Eskom

CONTRACTOR
Sky Riders

LOCATION
Kriel, South Africa

PRODUCT
MCI®-2006 NS*
MCI®-2020*

PROBLEM
The Coal Staiths at Kriel Power Station needed to be repaired and then coated in order to prolong the lifespan of the structures.

APPLICATION
Defective concrete was removed and replaced with repair mortars containing MCI-2006 NS. The corrosion inhibitor was added to the repair mortar mixes prior to application to add corrosion protection to the reinforcement within, and surrounding the patch. After all patchwork was completed, both of the structures were then coated with MCI-2020 to ensure corrosion rate reduction on the rest of the embedded reinforcement.

CONCLUSION
The project was completed successfully.

*More specifically, two repair mortars, Pro-Struct 528 VO MCI® +- 12m³ and PRo-Struct 531 MCI® +- 1.5m³, containing MCI® -2006 NS and a surface applied product, Pro-Struct MCI® -2020 +- 2750 Lt, containg MCI® -2020.

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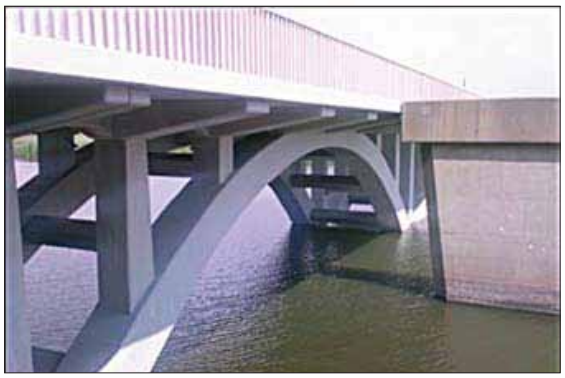
CASE HISTORY

Brune Bridge Repair



DATE
October 2007 - November 2008

DISTRIBUTOR
StonCor Africa - An RPM Company

SPECIFYING ENGINEER
Nyeleti Consulting

CONTRACTOR
Stefanutti & Bressan

CUSTOMER
SANRAL
(South African National Roads Agency Limited)

LOCATION
Nkangala Region of Mpumalanga Province

PRODUCTS
MCI® - 2006 NS
MCI® - 2020

PROBLEM
Corrosion had caused cracking and spalling of the concrete on the Brune Bridge, requiring extensive repairs and alterations.

APPLICATION
The Pro-Struct 531 M-GP was extended with 12.5 kg of 6.2 mm stone and used for repairs above water. The same was done with Pro-Struct 531 MCI®, below water. The entire bridge was then coated with Pro-Struct MCI®-2020 to prevent corrosion, and then Pro-Struct 684/4 kitty wake grey.

CONCLUSION
The project was a huge success and has won the Fulton Awards for Unique Design Aspects and Constructing Techniques.

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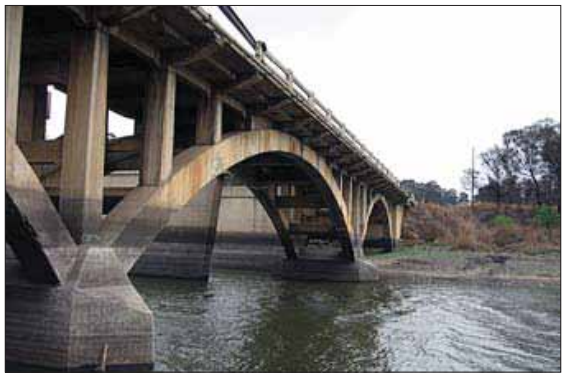

CASE HISTORY

Runib Switchyard Foundation Repair

DATE
November 2008 - March 2009

DISTRIBUTOR
United Corrosion Technologies

CONTRACTOR
Arabian Industries

CUSTOMER
Petroleum Development of Oman (PDO)

CONSULTANT
Worley Parsons

LOCATION
Runib, Oman

PRODUCTS
MCI® 2020
CorrVerter®
MCI® Mini-Grenades

PROBLEM

The concrete foundations at PDO's Runib Switchyard were experiencing visible cracking, spalling, and delamination. The structures were over twenty years old, with repairs made in 2002 - some of which had already failed again. The main threat to the structural integrity of buildings in this region lies in the highly saline soil and shallow groundwater. The prevalence of Sabkha in the Gulf region introduces highly corrosive mineral deposits in the soil with salinity levels exceeding three times that in seawater.

APPLICATION

A field investigation was done by United Corrosion Technologies to determine the cause of the failure and it was confirmed that failure was due to the ingress of chlorides from the soil. A repair methodology was developed to prevent structural failures, extend the switchyards service life, and allow for safe application in the live station.

United Corrosion Technologies provided a supervisor to oversee the project and to assure that all procedures were strictly followed.

1. The foundations were excavated to allow for chiseling of all spalled and delaminated concrete.

2. Cortec's MCI® 2020 was applied to all exposed concrete surfaces, and CorrVerter® was applied to all exposed rebar. CorrVerter® was selected because it can be applied directly to rusted steel, avoiding the use of abrasive blasting which was not permitted in the live Switchyard.

3. Shuttering and repair with Unicrete 500 microconcrete reinforced with MCI® Mini-Grenades.

4. The repair was allowed to cure and a waterproofing agent was applied.

CONCLUSION

It was estimated that concrete foundations were given an extended service life of 30 years after the repair. This extended service life is derived from the proper execution of repair utilizing patented MCI® technology. Cortec's patented MCI® technology protects reinforcing metal in concrete from corrosion therefore extending its service life. Being bio-based, it is environmentally friendly and safe. It is NSF-61 certified for use with potable water.

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CASE HISTORY

New Drinking Water Reservoir in Guayaquil City

DATE
October 2007

DISTRIBUTOR
Codemet

SPECIFYING ENGINEER
Interagua Projects Department

READY MIX SUPPLIER
Hormigones Hercules

CONTRACTOR
Conciva

CUSTOMER
Interagua

LOCATION
Guayaquil City, Ecuador

PRODUCTS
MCI®-2005 NS

PROBLEM
The construction of a new 4,500 m^3 (5,886 yd^3) drinking water reservoir had been proposed and the best protection was needed to extend the service life as long as possible.

APPLICATION
Over 850 cubic meters of reinforced concrete was poured using MCI®-2005 NS at a dosage rate of 1 liter per cubic meter (1.5 pints per cubic yard).

CONCLUSION
The UL NSF Standard 61 approval of MCI®-2005 NS solidified this project and will continue to be a selling point for future reservoirs.

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CASE HISTORY

Northwest Paper Mill Recovery Boiler Concrete Slab Replacement

DATE
Fall 2006

CUSTOMER
Pulp & Paper Mill

REPRESENTATIVE
Alpine Summit Enterprises Inc.

CONTRACTOR
Inducco, Inc.

LOCATION
Pacific Northwest United States

PRODUCTS
MCI® 2005 AL

PROBLEM

A paper mill, located in the Pacific Northwest region of the United States, was experienceing corrosion from sulphur dioxide gas, SO_2. Concrete was in danger of falling 25 feet between deck levels. Concrete curbs were severely deteriorated and drainage needed to be re-sloped. Wall cladding would be difficult to remove because it was transite, a combination of asbestos and cement. Therefore, the customer determined that the anchoring needed to stay.

APPLICATION

MCI® 2005 AL was used as an admixture in all of the concrete to protect against SO_2 corrosion and the ring anode effect at the transite anchors.

CONCLUSION

Cortec® products provided a solution to the customer where they were able to repair the concrete slabs and they did not need to disturb the asbestos cladding.

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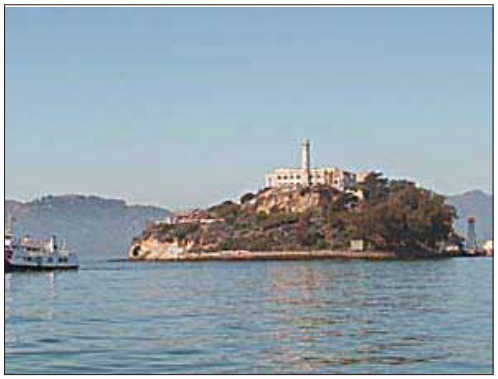

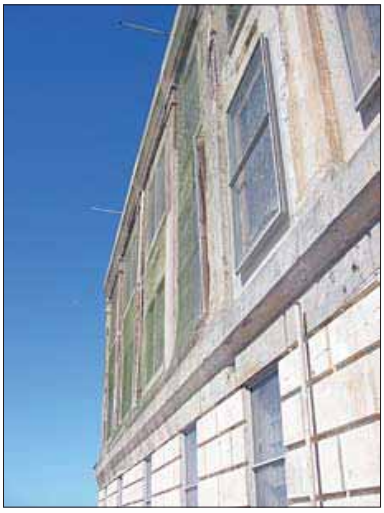

CASE HISTORY

Emergency Stabilization of Alcatraz

DATE
Spring 2008

CUSTOMER/ SPECIFYING ENGINEER/ CONTRACTOR
National Park Service

LOCATION
San Francisco Bay, CA

PRODUCTS
MCI® 2020
CorrVerter®

PROBLEM
Alcatraz Island is the site of the well known Alcatraz Federal Penitentiary. This island is located in the center of San Francisco Bay and being surrounded by salt water and fog year round causes numerous corrosion issues for the current stewards of Alcatraz, the National Park Service (NPS). Alcatraz Island receives over a million tourist visitors a year and their safety is paramount to the NPS staff. When the NPS noticed the potential hazard of loose concrete on walls of the main prison building high above the open visitor areas, they contacted their Cortec® distributor for solutions. The hazardous falling concrete had to be removed and the corrosion slowed with a limited budget. Further complicating the work schedule is the fact that Alcatraz is also a sanctuary for seabirds such as cormorants and pigeon guillemots, and for waterbirds such as snowy egrets and black-crowned night herons. Nesting birds are censused on a yearly basis, and management actions are adjusted to avoid disturbance during this sensitive time. Therefore work is prohibited from February through September.

APPLICATION
To slow corrosion the NPS staff removed the loose spalled concrete and applied CorrVerter® to the exposed steel then the entire area was treated with MCI® 2020 to address corrosion that was undoubtedly beneath the surface.

CONCLUSION
Cortec® products were very easy to apply, cost effective and, allowed the treatment of larger areas thus providing a cost savings to the NPS for future repair projects.

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CASE HISTORY

Repair of Corredor Sur-Tramo Marino Bridge

DATE
May 2009

CUSTOMER
ICA PANAMA, S.A.

SPECIFYING ENGINEER
Enrique Escobar - Roger Bellido

CONTRACTOR
Winston AB Ingenieros, S.A.

LOCATION
Panama City, Panama

PRODUCTS
MCI® 2020 V/O
MCI® 2023

PROBLEM
The precast beams of the Corredor Sur-Tramo Marino bridge were showing signs of corrosion from 10 years of exposure to the extreme surrounding environment. The bridge had to be repaired and protected from future corrosion problems.

APPLICATION
The concrete beams were cleaned and prepared. All spalls and areas where corrosion was evident were chipped out. Rebar was exposed and rust was removed mechanically; in some places the rebar was replaced. Two coats of MCI® 2023 were applied on the exposed rebar, a repair mortar was used to patch the spalled areas, and a single coat of MCI® 2020 V/O was applied to the beams. Finally, the beams were painted with an epoxy protective coating.

CONCLUSION
Cortec® products were very easy to apply, especially in the job conditions where the crew had to work. The Customer was satisfied with the performance and characteristics of both products from Cortec®.

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CASE HISTORY

Restoration of Steam Vats

DATE
February 2008

CONTRACTOR
Fairchild Protective Coatings

CUSTOMER
Roseboro Lumber

LOCATION
Springfield, OR

PRODUCTS
MCI®-2020
MCI®-2023
MCI®-2702

PROBLEM
Steam vats that process logs into lumber had severe concrete deterioration. The customer was considering tearing them down.

APPLICATION
The corroded concrete was removed, and the surfaces were treated with MCI®-2020. The rebar was coated with MCI®-2023. Spalled areas were patched with MCI®-2702. The contractor then epoxy injected structural cracks and coated the interior for chemical resistance and to brighten the spaces.

CONCLUSION
The contractor believed MCI® to be the best choice to truly mitigate corrosion on these heavily damaged structures.

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CASE HISTORY

Wilton Manors Bridge

DATE
July 2010

DISTRIBUTOR
Advanced Corrosion Technologies

SPECIFYING ENGINEER
BD Coatings, LLC

CONTRACTOR
Edward A. Matson

CUSTOMER
City of Wilton Manors

LOCATION
Wilton Manors, Florida

PRODUCTS
MCI®-2023
MCI®-2039
MCI®-2020 V/O

PROBLEM
The bridge was spanning a salt water canal which exposed it to severe elements. Corrosion of reinforcement led to deterioration and spalling of the underside. Tidal changes in the area required the repair to be timed with the tide levels.

APPLICATION
At low tide the dirt, grime, and loose concrete was removed. Then MCI®-2023 was applied by brush to all exposed rebar and damaged areas. The next day a second coat of MCI®-2023 was applied just before applying MCI®-2039 repair mortar. After curing the repair mortar MCI®-2020 V/O was applied to the underside of the bridge.

CONCLUSION
Cortec® MCI® products were selected because of their ability to decrease corrosion rates and migrate through the existing concrete to embedded reinforcement. MCI® products were easily applied and will provide many years of protection. The City of Wilton Manors anticipates additional prolonged life for the bridge and reduced maintenance expenses.

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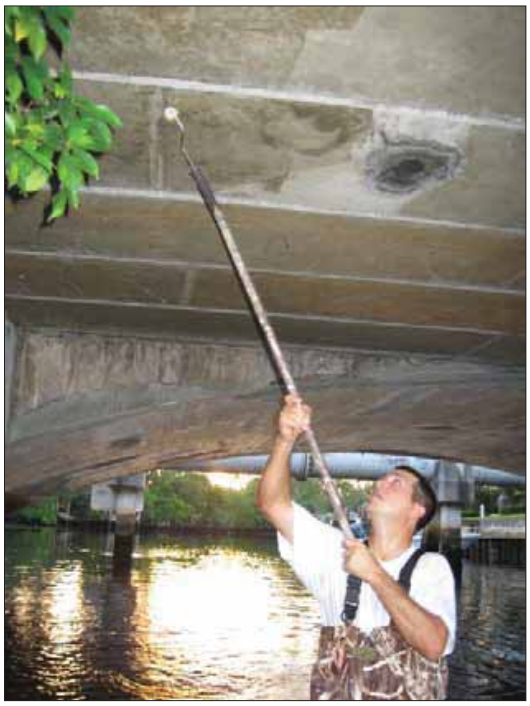
MATSON
GENERAL CONTRACTORS



CASE HISTORY

Las Olas Isles Residential Restoration

DATE
July 2011

DISTRIBUTOR
S.M.A.R.T. Distribution with
Advanced Corrosion Technologies, LLC

SPECIFYING ENGINEER
BD Coatings LLC

CONTRACTOR
Edward A. Matson

CUSTOMER
Private Home Owner

LOCATION
Fort Lauderdale, FL

PRODUCTS
MCI®-2020 V/O
MCI®-2005 NS
MCI®-2246
VpCI®-422
VpCI®-415

PROBLEM

A multi-million dollar waterfront residence built in 1940 and located in Fort Lauderdale was experiencing severe concrete deterioration from:

- Abundance of chlorides (sea salt) due to coastal location
- Moisture and humidity in the air:
  - Δ Makes the chlorides "sticky"- holding them on the surface of concrete
  - Δ Provides electrolyte to keep the corrosion cell working
- Little rain to clean the surfaces

The owners of the property loved the residence and wanted it restored and protected.

APPLICATION

Because of the extent of the spalling, some columns and beams were deemed too deteriorated and were replaced. Crews then followed ICRI Guidelines for making structural repairs using VpCI®-422 to clean the rebar, VpCI®-415 to neutralize, MCI®-2246 bonding agent and a modified repair mortar. MCI®-2020 V/O was then applied to all concrete grade beams, tie beams, and columns.

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CONCLUSION

MCI® products were selected because of their ability to migrate through the existing concrete and decrease corrosion rate. MCI® products were easily applied and will provide many years of protection. The home owner anticipates an additional prolonged life for their home and reduced maintenance expenses in the future. They also believe the MCI® application will be a helpful advantage if they ever decide to sell the property.

BEFORE

AFTER

CASE HISTORY

Madrid Potable Water Reservoir: Canal Isabel II

DATE
2005

DISTRIBUTOR
Quimilock s.a.

LOCATION
Madrid, Spain

PRODUCTS
MCI® - 2006

PROBLEM

The need for landscaping on the third potable water reservoir of Canal Isabel II lead to an increase of weight on the brick columns that have been in place since 1912. This meant additional reinforcements were required on 1536 of its columns. Steel tubes (type S 355 J2) with a diameter of 163.3 mm were drilled into the columns to provide strength. Q-2030 mortar, containing MCI®-2006, was used to bond the steel to the interior of the brick columns.

APPLICATION

The reason for selecting this type of mortar was based on its excellent properties for filling voids with difficult access and for its corrosion resistance in extreme environments. These columns must support a lot of weight while also being exposed to the presence of sodium hypochlorite in the water and the phenomena of differential aeration at the interface of air and water.

CONCLUSION

The addition of MCI®-2006 into this mortar amplified the corrosion resistance necessary for this extreme environment and also increased the service life of this century old potable water tank. MCI®-2006 was chosen for this application not only because of its corrosion inhibition, but also because of its NSF Standard 61 approval for use with potable (drinking) water.

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CASE HISTORY

Washington St. & Senate Avenue Parking Facilities Preservation

DATE
2012

LOCATION
Indianapolis, IN

CUSTOMER
Indiana Finance Authority

SPECIFYING ENGINEER
Arsee Engineers

CONTRACTOR
Glenroy Construction

APPLICATOR
FE Gates

DISTRIBUTORS
- S.M.A.R.T.

(Structural Materials & Restoration Technologies, LLC)

- CMA Supply Company

MANUFACTURES REPRESENTATIVE
J.N. Lucas & Associates, Inc.

PRODUCTS
MCI®-2019 W FD

PROBLEM
The parking garage was in need of repair consisting of miscellaneous crack injection, repair/replacement of expansion joints, pavers, concrete deck toppings, and sealing the concrete deck with a corrosion inhibitor water repellent with a fugitive dye. This repair was the second phase consisting of 380,500 square feet, (35,300 square meters).

APPLICATION
Following repairs, the concrete deck surfaces were blastracked and MCI®-2019 W FD was applied at 150 square feet per gallon (3.68 meter squared per liter) with a low pressure garden nozzle spray. MCI®-2019 W FD was applied on the weekends and the garage was opened for vehicular traffic on Monday morning.

CONCLUSION
The initial phase consisted of over 500,000 square feet (46, 465 square meters) and was completed in 2007. Due to the success of the first phase and durability thus far, MCI®-2019 W FD was chosen as the water repellent/corrosion inhibitor for the second phase of the project. The installation was successful and the garage was opened on schedule.

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HONDA

CASE HISTORY

New Construction: Monteverde Gas Terminal Pipeway Protection

DATE
March - April 2011

DISTRIBUTOR
CODEMET

CUSTOMER
FLOPEC - Ecuadorian State Petroleum Fleet

SPECIFYING ENGINEER
Not Specified

READY MIX SUPPLIER
RIPCONCIV

CONTRACTOR
EQUITRANSA

LOCATION
Monteverde

PRODUCTS
MCI®-2005 NS

PROBLEM
New construction of gas terminal located on the oceanfront. The corrosive environment created a need for additional protection for embedded reinforcement.

APPLICATION
MCI®-2005 NS - 4,000 liters

MCI®-2005 NS was added to the ready mix concrete used in the foundations of liquid gas tanks and in the concrete pipeways.

CONCLUSION
MCI®-2005 NS did not have any adverse effects on the concrete mix design or finish properties. The addition of MCI®-2005 NS is expected to greatly extend the useful service life of these concrete super structures.

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CASE HISTORY

Holot Water Tower Preservation

DATE
2011

DISTRIBUTOR
Glimmer Industrial Consultation

ENTREPRENEUR
Meniv-Rishon LTD

ENGINEER
Yitzhak S. Lameey Engineers

CONSTRUCTOR
Lesico LTD

LOCATION
Rishon-Le'zion, Israel

PRODUCTS
MCI®-2020

PROBLEM
The 40 year old water tower developed cracking due to corrosion and leaks necessitating repair.

APPLICATION
First, all delaminated, unstable concrete was removed. Exposed reinforcing steel was cleaned and new concrete patches were placed. The entire structure was then treated with two coats of MCI®-2020 with a total dosage rate of 3.68 square meters per liter (150 square feet/gallon). Following MCI®-2020 application, bi-component PU paint was applied.

CONCLUSION
MCI®-2020 was chosen over the competitor product (Ferrogard 903) due to its superior corrosion protection, better coverage rate with fewer required coats, and ANSI-certification.

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Drums of MCI®-2020 waiting application

Demonstrating MCI®-2020 application on 1 Square Meter

MCI®-2020 demonstration two weeks from application - almost undetectable

Holot Tower during restoration

Demonstrating MCI®-2020 application on 1 square meter

CASE HISTORY

South Water Tower Preservation

DATE
2009

DISTRIBUTOR
Glimmer Industrial Consultation

ENTREPRENEUR
Mey-Herzlia LTD

ENGINEER
Horwitz Buch Engineering LTD

CONSTRUCTOR
Reshef H. Contractors (1990) LTD

LOCATION
92 Yehuda Hanasi St., Herzlia, Israel

PRODUCTS
MCI®-2020

PROBLEM
This 25 year old water tower developed corrosion cracking, spalling and water leaks necessitating repair.

APPLICATION
First, all delaminated, unstable concrete was removed. Exposed reinforcing steel was cleaned and new concrete patches were placed. The entire structure was then treated with two coats of MCI®-2020 with a total dosage rate of 3.68 square meters per liter (150 square feet/ gallon). Following MCI®-2020 application, bi-component PU paint was applied.

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South Tower during application.

South Tower during application.

South Tower prior to application.

CASE HISTORY

North Water Tower Preservation

DATE
2008

DISTRIBUTOR
Glimmer Industrial Consultation

ENTREPRENEUR
Mey-Herzlia LTD

ENGINEER
Horwitz Buch Engineering LTD

CONSTRUCTOR
Reshef H. Contractors (1990) LTD

LOCATION
48 Ha'alia Hanasi St., Herzlia, Israel

PRODUCTS
MCI®-2020

PROBLEM
This 50 year old water tower developed corrosion cracking, spalling and water leaks necessitating repair.

APPLICATION
First, all delaminated, unstable concrete was removed. Exposed reinforcing steel was cleaned and new concrete patches were placed. The entire structure was then treated with two coats of MCI®-2020 with a total dosage rate of 3.68 square meters per liter (150 square feet/ gallon). Following MCI®-2020 application, bi-component PU paint was applied.

CONCLUSION
MCI®-2020 was chosen over the competitor product (Ferrogard 903) due to its superior corrosion protection, better coverage rate with fewer required coats, and ANSI-certification.

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MCI® MIGRATING CORROSION INHIBITORS FROM GREY TO GREEN

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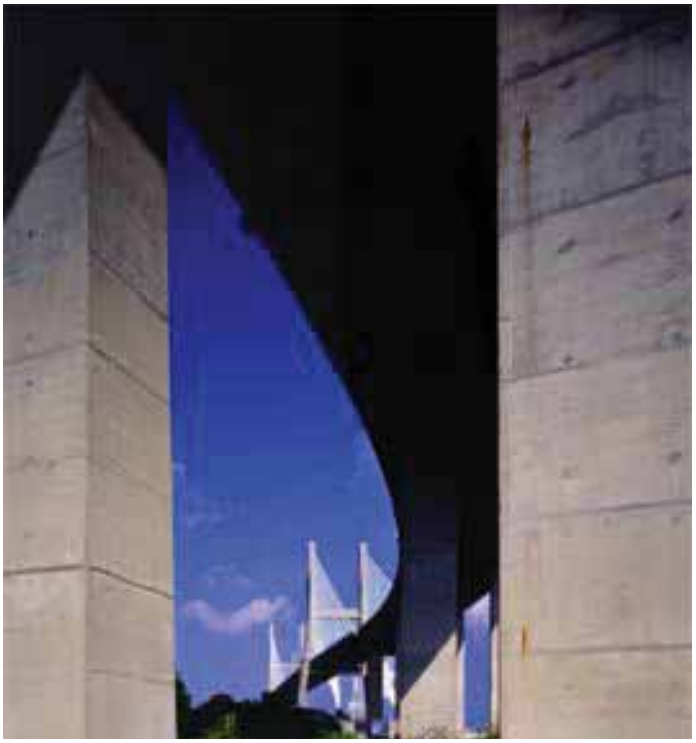
Ha'alia Hashnia Tower during preservation.

Tests of MCI®-2020 3 months after application: 5 concrete samples were taken from various locations on the tower. Vial marked 0 is reference de-ionized water. It was deducted that insufficient MCI®-2020 amount was applied at locations 1, 3, & 5, which were re-applied.

6.3
Steel Bridges



CASE HISTORY

MCI® Mini Grenades

DATE
February 17, 2003

CUSTOMER
Cochrane Bridge
AL-DOT

CORTEC® REPRESENTATIVE
DSI America

LOCATION
Mobile, Alabama

PRODUCT
MCI® Mini Grenades

PROBLEM
Voids were detected in "stay" cables on the Cochrane Bridge in Mobile, AL. Some cable strands were found (via videoscope inspection) to be exposed with no grout cover.

APPLICATION
Voids were measured and filled by "Vacuum Grouting" methods. AL-DOT approved using MCI® Mini Grenades to provide extra corrosion protection properties to DSI's DYNA Grout.

CONCLUSION
The MCI® Mini Grenades mixed well and did not alter the flow properties of the DYNA Grout.

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CASE HISTORY

MCI®-2000

DATE
February 1996

CORTEC REPRESENTATIVE
Technicoat Ltd.

CUSTOMER
City of Winnipeg

PROJECT
Main Street Bridge

LOCATION
Winnipeg, Canada

PRODUCT
MCI®-2000

PROBLEM

The Main Street Bridge Project included 3420 high tensile strength cables that needed to be stored in the bridge ducts 45 days before installation. The concern was that rust would form on the cables due to high moisture levels and fluctuating spring temperatures. A solution was required that would protect the cables initially and on a long-term basis.

APPLICATION

Using 7.4 gallons (28 liters) of MCI®-2000 to saturate large sponges, construction engineers coated the cables during the pull-through stage. Once pulled, the ducts were sealed temporary with fiberglass batts to prevent atmospheric depletion of the MCI®-2000 vapors. In April, the individual groups of cables were tensioned at more than 6000 lbs. (2722 kgs.), and grout was injects into the duct void spaces.

REASON CORTEC SELECTED

MCI®-2000 was found to be environmentally friendly and effective.

CONCLUSION

A 30-40 year life span is expected. MCI®-2000's unique easy-to-use vapor formula lasts for long periods, making it ideal for long-term projects where corrosion protection is needed.

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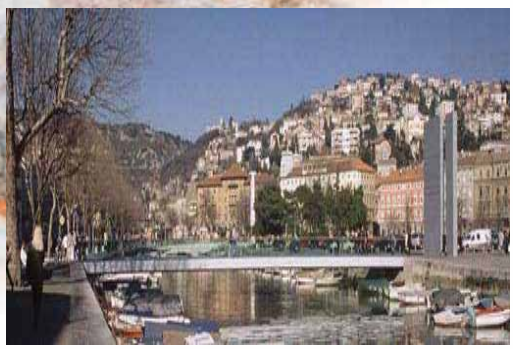
Environmentally Safe VpCI®/MCI® Technologies

MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY



Memorial Bridge
Rijeka, Croatia
MCI®-309 Powder

DATE
July 2001

CORTEC® REPRESENTATIVE
CorteCros Co. Ltd.

CUSTOMER
3. Maj Rijeka, Shipyard

PRODUCT
MCI®-309 Powder

LOCATION
Rijeka, Croatia

PROBLEM
3. Maj Rijeka Shipyard needed long term protection against corrosion of the interior of metal construction components. The requested length of protection was 3 years, with re-application of MCI®-309 Powder after that time to provide another 3 years of protection.

APPLICATION
Inside surfaces of the metal components were fogged with MCI®-309 powder. Dosage was 0.3-0.5oz / ft^3 (500 g per m^3). After fogging the inside surface, holes in the metal were sealed with a plug.

CONCLUSION
There have not been any corrosion problems since Cortec® MCI®-309 Powder was used. In 2005, the manufacturer repeated the application to provide protection for another 3 years. The application of MCI®-309 Powder every 3 years is now a part of the official maintenance procedure to protect the Memorial Bridge.

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

MCI® 2020 V/O

DISTRIBUTOR
Specialty Construction Products, LTD

SPECIFYING ENGINEER
Dillon Consulting

CONTRACTOR
Gateway Construction and Engineering

PROBLEM
Corrosion of reinforcement and post tension cables in the prestressed girders.

APPLICATION
MCI® 2020 V/O was spray applied to the girders on the first span at each end of the structure at a rate of 150 ft^2/gallon (3.68 m^2/liter).

WHY MCI® WAS CHOSEN?
Cortec® MCI® 2020 V/O was chosen (and exclusively specified with no alternates or equals) as a preventative measure to slow down corrosion activity in the post tensioned cables.

CONCLUSION
The application of MCI® 2020 V/O went as planned. The intent is to apply Cortec® MCI® 2020 V/O to the remaining girders over the next couple of years.

DATE
July 2005 - August 2006

CUSTOMER
City of Winnipeg

LOCATION
Maryland Street Bridge, Winnipeg
Canada

PRODUCT
MCI® 2020 V/O

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MIGRATORY CORROSION INHIBITOR (MCI®) PRODUCTS FOR CONCRETE

CASE HISTORY

Des Plaines Valley Bridge

DATE
2006 - 2007

DISTRIBUTOR
Structural Materials and Restoration Technologies (S.M.A.R.T.)

LOCATION
Lemont, Illinois

PRODUCTS
MCI® 309

CUSTOMER
Illinois State Tollway

SPECIFYING ENGINEER
Janssen & Spanns Engineering

READY MIX SUPPLIER
Prairie Ready Mix

CONTRACTOR
Walsh Construction Company

PROBLEM
Corrosion inhibitor was required for all post tension strands not grouted within 90 days of installation. The Fast Track schedule required second phase post tension tendons to be installed up to six months before grouting. Specifications required a corrosion inhibitor that did not require flushing of the duct prior to grouting.

APPLICATION
The ducts ranged in length from 120LF to 880LF; MCI® 309 was blown in at a rate of 0.3-0.5 oz / ft^3 (300-500g / m^3).

CONCLUSION
The flushing of the ducts would have been expensive and time consuming. Cortec® provided a product that was cost effective, easy to apply, and did not require flushing of the surface in order to proceed with the project.

FOLLOW-UP
P.T. ducts were filled with MCI® 309 in November 2006. In April 2007, an independent test lab pulled out 1/2 (440 feet/134 meters) of the strand to see if it had corroded due to moisture in the duct. It looked as good as the day it was installed (See Figures 1, 2, and 3).

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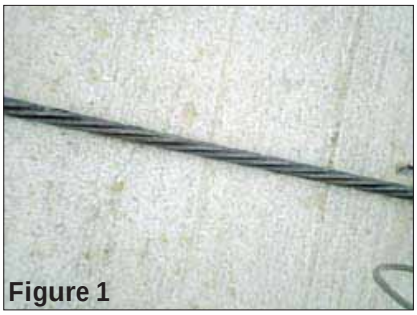

Figure 1

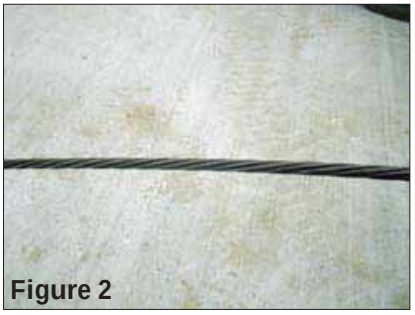

Figure 2

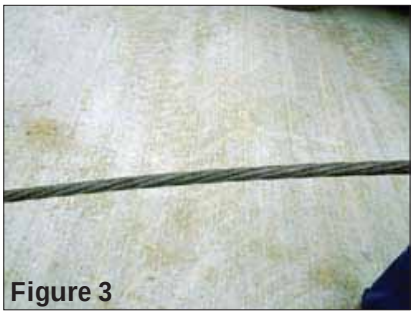

Figure 3

CASE HISTORY

Punalu'u Stream Bridge

LOCATION
Oahu, Hawaii

PRODUCTS
MCI®-309 Powder
MCI®-2005 NS

PROBLEM
Punalu'u Stream Bridge is located steps away from the Pacific Ocean. Constant trade winds coming off the ocean are at an average speed of 17 mph to 28 mph, and in winter can be as high as 40 mph. The atmosphere is highly contaminated with chlorides as well as sulfuric dioxide from the volcano located on the big island of Hawaii. Inland water reports show that rainfall is at 4.5 pH. The acid rain combines with chlorides to create a very corrosive environment.

APPLICATION
Injection of MCI®-309 with air was performed just after the post tension cables were placed. MCI®-309 does not need to be removed when the post-tension chambers are injected with grout. MCI®-309 is readily absorbed by the grout. MCI®-2005 NS admixture was admixed into the new concrete placed on the bridge.

CONCLUSION
Cortec's MCI®-309 & MCI®-2005 NS provide excellent corrosion protection in an aggressive environment. MCI® was used because it provided protection to the steel surface, greatly extending the expected service life of the structure.

DATE
May 2011

DISTRIBUTOR
Bonded Materials

CORTEC® REPRESENTATIVE
Corrosion Cops

CUSTOMER
HIDOT

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CASE HISTORY

North Kahana Stream Bridge

LOCATION
Oahu, Hawaii

PRODUCTS
MCI®-309 Powder
MCI®-2005 NS

PROBLEM
North Kahana Stream Bridge is located steps away from the Pacific Ocean. Constant trade winds coming off the ocean are at an average speed of 17 mph to 28 mph, and in winter can be as high as 40 mph. The atmosphere is highly contaminated with chlorides as well as sulfuric dioxide from the volcano located on the big island of Hawaii. Inland water reports that show rainfall is at 4.5 pH. The acid rain combines with chlorides to create a very corrosive environment.

APPLICATION
Injection of MCI®-309 with air was performed just after the post tension cables were placed. MCI®-309 does not need to be removed when the post-tension chambers are injected with grout. MCI®-309 is readily absorbed by the grout. MCI®-2005 NS admixture was admixed into the new concrete placed on the bridge.

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DATE
May 2011

DISTRIBUTOR
Bonded Materials

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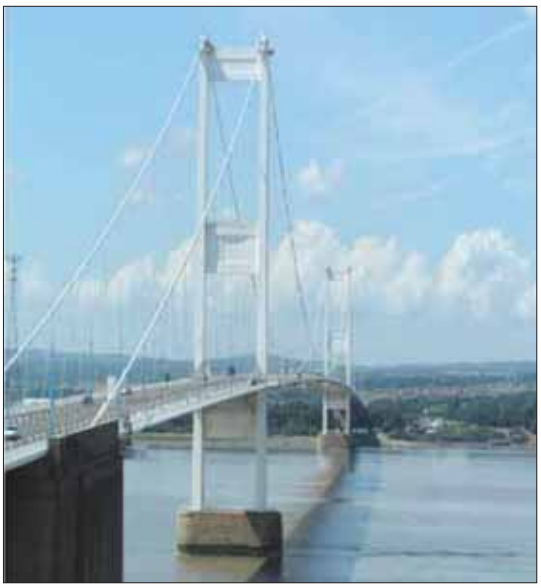
CASE HISTORY

Severn Bridge Suspension Cable Protection



DATE
July 2007

DISTRIBUTOR
Lake Chemicals

CUSTOMER
UK Highways Agency

LOCATION
Wales/England

CONSULTANT
Mott MacDonald

PRODUCTS
PTC Emitters, Patented

PROBLEM

The suspension cables on this type of bridge are known to corrode over a long period of time. The 20 inch (508 mm) diameter main cable is constructed from 8322 high tensile galvanized steel wires of 0.196 inches (4.98 mm) in diameter. The total area of the cable is 314 in^2 (202,580 mm^2) of which approximately 20% is comprised of voids. The cable is wrapped in 0.144 inch (3.66 mm) mild steel galvanized wire. Dehumidification is used to reduce the level of moisture around the cables.

It is known that the dehumidification system does not provide perfect protection. Engineers from Mott MacDonald wanted to find a way to add additional corrosion protection into the system's airflow. Mott MacDonald contacted Lake Chemical to see if Cortec® would have such an inhibitor that could be used to augment the dehumidification during the drying phase and act as a back-up during periods of shut down or maintenance when the dry air supply is not available.

Original thoughts were to fog a VpCI® powder or water based inhibitor into the system but neither of these options was acceptable to the owner. A test rig was built using VpCI® 105 emitters as the source of corrosion inhibitor to see if it would work and to ensure that the inhibitor had no detrimental effect on any of the materials/components of the cable system. The testing proved positive and there were no material incompatibilities noted. The biggest issue was then to find a way to be able to package the inhibitors to ensure that enough of them entered into the airflow and would be distributed around the cables as needed. Cortec's PTC Emitters were developed as a result of this.

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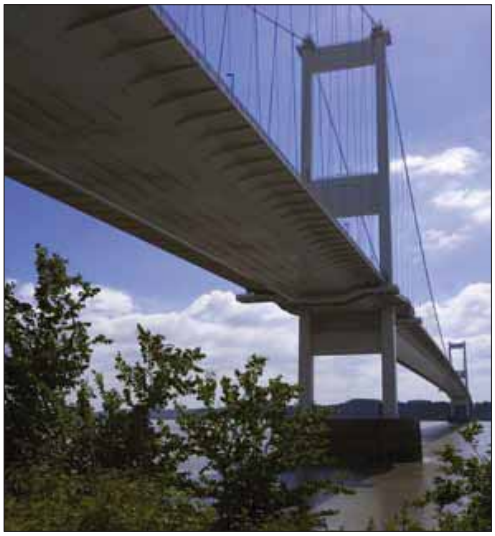

APPLICATION

A simple hatch and crate system that is a part of the main dehumidification pipework was developed. This allowed the inhibitor to be put into the airflow without disrupting the system when the product needed to be changed out. Five (5) PTC Emitters per unit are placed into a basket inside the crate with no special separation or spacing of the individual emitters being required. The dosage rate of 5 PTC Emitters per 10 injection sleeve inputs per month was determined by Mott MacDonald/Lake Chemicals.

CONCLUSION

The system has now been running for over 2 years and testing was carried out using a newly developed VpCI® sensor solution to confirm the presence of VpCI® inhibitor in and around the cable. Corrosion rate monitoring and relative humidity testing is carried out and as a supplementary precaution, longer term samples will be held in the VpCI® airstream and tested at pre-determined intervals over the operational life of the system. Control samples are being held in one of the existing plant rooms.

Update:

- Provided the PTC Emitters are changed every 3 months the corrosion rate measured by the probes remains constant.
- By using the PTC Emitters with the dehumidification system, the number of strand breakages/ year is now down to zero.

CASE HISTORY

Hakalau Seismic Retrofit

LOCATION
Hamakua Coast
Big Island, Hawaii

PRODUCTS
VpCI® CorrVerter®
MCI®-2005 NS
MCI® Mini Grenades

PROBLEM
Corrosion on the steel girders resulting from volcanic sulfuric di-oxide and chloride enriched moisture due to the close proximity of the Pacific Ocean. The steel girders had locations where clean-up of the steel was quite difficult to achieve.

APPLICATION
Cortec® VpCI® CorrVerter® was applied to prime the tough to reach tight rust areas. MCI®-2005 NS was then used as an admixture to new concrete poured to cover the foundation and first level bents to add structural strength in case of seismic activity. Some hand lay-up of mortars was performed, and Cortec® Mini Grenades were included in the mortar batches.

CONCLUSION
Cortec's VpCI® CorrVerter® provided an excellent solution for priming the rusty steel surfaces where further corrosion protection was required and good surface preparation was difficult to achieve. MCI®-2005 NS and MCI® Mini Grenades were an excellent solution due to their ease of use and ability to adhere and protect embedded steel surfaces, greatly increasing expected service life.

DATE
July 2009

DISTRIBUTOR
Bonded Materials

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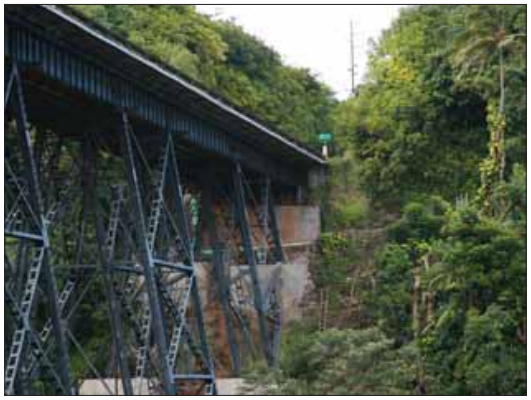

CASE HISTORY

Al Jalila Children's Specialty Hospital Construction

LOCATION
Dubai, UAE

DISTRIBUTOR
United Corrosion Technologies

CONTRACTOR
Al Futtaim Carillion

CUSTOMER
Dubai Health Authority (DHA)

CONCRETE SUPPLIER
Unibeton Ready Mix

CONSULTANT
Adnan Saffarini Engineering Consultants / Studio Altieri International

PRODUCT
MCI®-2005

PROBLEM
Al Jalila Hospital is a development of the Dubai Health Authority which has a total area of 76,500m² (818.06ft²), with the hospital building itself occupying 55,000m² (592.02ft²). This is the first hospital in the region to provide super-specialty and multi-spectrum pediatric care catering to children from newborn up to 16 years of age.

The designer of the project had special requirements for the durability of the concrete and the overall service life of the structure.

UAE's aggressive environment was one of the main considerations while designing the structure. High salinity, water table, humidity levels, and high temperatures make achieving the minimum service life requirements in Dubai a real challenge.

APPLICATION
MCI®-2005 was incorporated in the mix to enhance the durability of the concrete and to maximize the life of the structure. Cortec's MCI®-2005 is a water-based, organic, corrosion inhibiting admixture that protects metallic reinforcement in concrete structures. The patented, biobased, MCI® technology is environmentally friendly, safe, and certified to meet NSF/ANSI Standard 61 for use in potable water structures/components.

CONCLUSION
Cortec's MCI®-2005 met all the specifications the design engineering firm required.

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CASE HISTORY

Development Of Qusahwira Field

LOCATION
Abu Dhabi, UAE

DISTRIBUTOR
United Corrosion Technologies

CONTRACTOR
Consolidated Contractors International Company (CCC)

CUSTOMER
Abu Dhabi Company For Onshore Oil Operations (ADCO)

CONCRETE SUPPLIER
Consolidated Contractors International Company (CCC)

CONSULTANT
Veco Engineering

PRODUCT
MCI®-2005

PROBLEM
The project part of the Bab, Qusahwira & Bida Al-Qemzan Fields development scheme was developed, to increase production up to 1.8 million barrels a day (1.4 million barrels a day previously). The project included the development of infrastructure in Qusahwira, including building an oil gathering system and a pipeline to the Asab eld. Structures in the Abu Dhabi Western Region are prone to its aggressive environment and high salinity; the importance of oil and gas related facilities requires the design of highly durable structures.

APPLICATION
MCI®-2005 was incorporated in the concrete design to maximize the service life and minimize the amount of repairs needed. Cortec's MCI®-2005 is a water-based, organic, corrosion inhibiting admixture designed to protect metallic reinforcement in concrete structures. MCI®-2005 is a mixed inhibitor – meaning it forms a molecular layer on rebar that inhibits the corrosion reaction on both anodic and cathodic components of the corrosion cell, to dramatically extend service life. This patented MCI® technology is bio-based, safe, and environmentally friendly. It is also certi ed to meet ANSI/ NSF Standard 61 for use in potable water structures.

CONCLUSION
By including MCI®-2005 admixture into the design speci ca-tions, the infrastructure will be protected from the aggressive environments as desired.

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