ANTI-CORROSION TIMES

REPORTING ON INDUSTRY NEWS, NOTEWORTHY APPLICATIONS & NEW DEVELOPMENTS ON FUSION BONDED EPOXY COATINGS FOR CORROSION PROTECTION ON STEEL REBAR.

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In this edition

Major D.C. airports use epoxy in $2.1 billion expansion

As the capitol of the United States of America, it can be successfully argued that Washington, D.C. is one of the most important cities on Earth. It stands to reason then, that each year millions of people from all over the world fly into and out of the Nation's Capitol, using either Washington, D.C. National Airport or Dulles International Airport in nearby Chantilly, Virginia.

Congested almost to the breaking point, the two airports are currently in the midst of a $2.1 billion expansion program, under that leadership of the Metropolitan Washington Airports Authority (MWAA).

The combined expansion of the two major airports is one of the largest publicly funded construction programs ever undertaken in the United States. The effort involves 159 projects, including multimillion dollar taxiways, parking garages, and road improvements. The focal points are a new one million square foot passenger terminal at D.C. National and two new matching wings at the original Dulles terminal, each 300,000 square feet in size.

A major obstacle in the expansion of the airports has been the need to keep the facilities operating at or near one hundred percent capacity during the construction. At D.C. National, for example, taxis are rerouted while permanent roadways are being built in from of the new terminal building.

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DC area airport improvements . . . continued from page 1

Barriers separate planes being boarded by passengers from a crane that is lifting huge sections of the terminal's curtain wall, just 30 feet away.

Temporary tunnels have been opened for pedestrian access, and construction is underway for the Washington, D.C. subway to stop right in the lobby of the new terminal.

Because of anticipated continued expansion at Dulles, there is no end in sight to the work there. When Dulles airport was conceived in 1960, its designer envisioned a 1,200 foot long terminal building. Tight federal funding and skepticism about air traffic projections cut the terminal down to 600 feet. Now, 36 years later, work is nearing completion on the two 320 foot long wings which will complete the designer's original vision.

D.C. National Airport was built in 1941 just across the Potomac River from the Nation's Capitol in Alexandria, Virginia. Wedged into an 860 acre site, the facility handled 15.5 million passengers last year. Many experts believe that is about as much traffic as can be expected from the 55 year old airport.

That is why most growth plans are being focused on Dulles. With 13.3 million passengers last year and traffic expected to increase at a rate of 5% per year, the MWAA wants to have the ability to process a combined total of 55 million passenger trips per year through the two airports.

10,800 tons of reinforcing steel were used in the two airports. Of the total tonnage of rebar used in the projects, 4,700 tons were epoxy-coated. Used in all outside areas susceptible to corrosion from deicing salts, epoxy coating was the chosen product for protection and life-cycle costs. Areas of use included roads around the terminals, bridge decks, parking decks and other outside areas.

The new wings to the Dulles Terminal Building presented a formidable challenge. The contract specified that the additions had to perfectly match the existing contemporary structure, which was built over 30 years ago.

Minneapolis, MN based M.A. Mortenson, the prime contractor on the Dulles job, constructed special jigs on the job site into which all fabricated reinforcing steel sections had to fit perfectly.

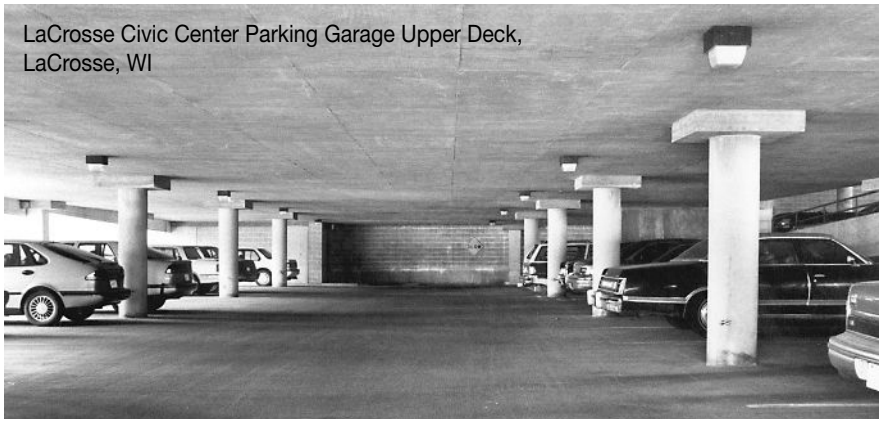
Much of the fabricated rebar by the Charlotte Division for the above-ground work at Dulles was #18 size bar, where a tolerance of plus or minus 2 to 3 inches is usually acceptable. In this case, however, the bends had to be exact. To assure the big bars would meet the contractor's rigid specifications, the fab team used the blueprints to make templates in the division fabricating shop. Some were made of plywood, while others were painted on the shop floor. With the templates, it was easier to guarantee that every bar sent to the job site was bent to the exact standards of the contractor.

During construction, all deliveries had to be made promptly at 6:00 a.m. Trucks were scheduled to leave the fabricating plants either the day before or drive through the night to meet the pre-dawn schedule.

Most of the difficulties associated with these airport projects have been overcome as work nears completion on the current phases of construction.

Thanks to Ameristeel Corporation for their help with this article, which is based on an article originally published in the February 1997 Ameristeel Journal. ♦

Epoxy-coated reinforcement performs well in parking garages



LaCrosse Civic Center Parking Garage Upper Deck, LaCrosse, WI

Epoxy-Coated Reinforcing Steel in Parking Garages report is now available. This 8-page report details the performance of epoxy-coated reinforcement in 19 parking garages built in Wisconsin, Minnesota, Nebraska, South Dakota and Michigan in the 1980s. They were among the first parking garages built using epoxy-coated rebar for decks in freeze-thaw climates, where deicing salts historically cause corrosion problems.

All 19 parking garages are still in good shape today, with owners and engineers generally satisfied with the performance of the epoxy-coated rebar.

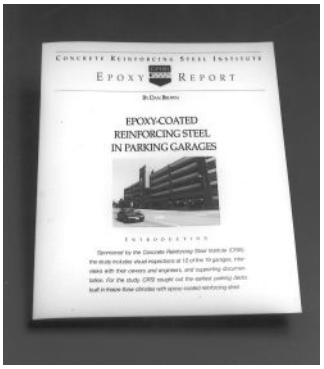
This parking garage report contrasts the corrosion performance of these epoxy-coated decks to garages built with uncoated reinforcing steel in parking deck slabs. In a strong testimonial, the owners and engineers of these structures continue to specify epoxy-coated reinforcing for new parking garages.

University of Minnesota Parking Garage, Washington Avenue, Minneapolis, MN

The general belief by users is that epoxy coating will add at least 10 to 15 years of protection to the 15 years it takes chlorides to reach black bars and speed corrosion.

Charter Parking Garage at Mayo Clinic, Rochester, MN

To receive a free copy of this report, contact CRSI and ask for the Epoxy-Coated Reinforcing Steel in Parking Garages. ♦



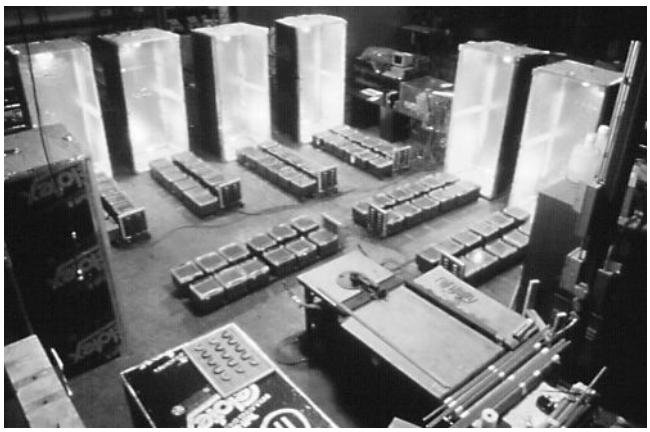
Epoxy-coated rebar for the 21st century shows improvement in $1.2 million research program

In the last decade major changes and advances have taken place in the production and use of epoxy-coated rebar. Epoxy powder manufacturers and epoxy coating applicators have both made significant strides to improve the material and the quality of the products as a whole. These advances should generally improve the performance of epoxy-coated rebar in severe corrosive conditions.

Research studies have confirmed the quality improvement and have substantiated the resulting positive effect on performance.

One of the research programs is currently in its final phases. Funded by the Federal Highway Administra-tion (FHWA), the study is in its fourth and final phase of a $1.2 million dollar investigation aimed at giving state transportation officials guidance and material specifications to build corrosion-resistant decks and bridges designed for up to 100-year service lives. Wiss, Janney, Elstner Associates (WJE) Northbrook, Illinois, was awarded a five-year contract by FHWA in 1993 to conduct the study.

During the first two years of the study, 60 types of rebar were submitted by interested parties from the U.S., Canada, France, Germany, Japan and the United Kingdom. The 60 types were categorized into three groups: organic (epoxy) coated, inorganic coated or metallic clad and solid metallic. Straight and bent bars were tested in cathodic disbondment tests as described by AASHTO and ASTM, as well as solution testing to study coating adhesion. The ten that performed the best were picked for further evaluation.



Conventional uncoated reinforcement was also included as a control in Phase IV. The focus of the test is on corrosion resistance characteristics of both bent and straight #5 bars placed in concrete slabs to mimic placement in bridge decks.

Preliminary results have concluded that concrete bridge decks can achieve longer design life in bridge decks when using epoxy-coated rebar. Present findings point to better performance when both bridge top and bottom mat layers use epoxy-coated bar. Coating both mats as well as proper handling and repair can make a major difference in performance. Final testing will provide additional information for the FHWA to update design criteria for long-life, corrosion-resistant decks and other structures.

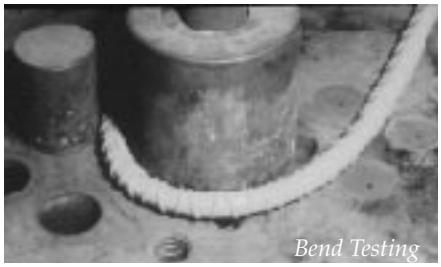
Final results of all the tests will be published in 1998. ♦

CRSI Plant Certification Program maximizes benefits to users

The CRSI fusion-bonded coating applicator plant certification program is reviewed in this new 4-page, 4-color brochure recently produced by the CRSI Epoxy Technical committee.

Explained in detail is the purpose of the certification program, a voluntary control program, open to all epoxy coating plants, with inspections done by an independent testing agency contracted by CRSI. The certification program is expressly designed to cover the procedures and events related to coating application, not to the fabrication of bars, either before or after coating.

An overview of the program includes sections on record keeping, quality standards and the benefits of quality control and certification. The certification program has resulted in even more stringent standards.

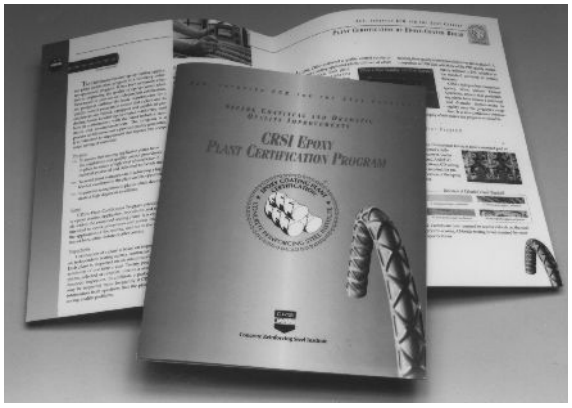


Bend Testing

Standards are based on ASTM standard specifications for epoxy-coated rebar. CRSI's independent inspection agency, Wiss, Janney, Elstner Associates reports that participating plants have shown continual dramatic improvement in quality since the start of the program, which has resulted in changes to specifications.

Because of the program's success and its resulting high quality, many government agencies and private specifiers have required CRSI certification as a means of assuring quality into the 21st Century. 95% of the epoxy-coated rebar plants in North America are now certified. They are responsible for over 90% of epoxy-coated reinforcement production.

For more information on the CRSI Voluntary Certification Program for Fusion Bonded Coated Application Plants, or for the free brochure, CRSI Epoxy Plant Certification Program, contact: Theodore L. Neff, P.E., CRSI Certification Program Administrator. ♦



For a complete, current listing of certified plants in the U.S.A. and Canada, visit the

CRSI Website: www.crsi.org

Epoxy-coated rebar helps add longevity to this parking facility restoration

Pavement problems plagued the Government Center Parking Structure, located in downtown Grand Rapids, Michigan, for much of its 23 years in use. The 960 space parking facility primarily serves patrons using the adjoining City Hall, the County Building and Plaza and the surrounding downtown area. Pavement deterioration was attributed to high concentration of road salts tracked in by vehicles. In addition, original ramp floors were flat, causing a drainage problem. Compounding the problem was water run-off, containing vehicle fluids, to the city's storm-water sewer system.

Throughout all phases of reconstruction, sound planning kept sixty percent of the parking spaces open at all times. Full and partial slab removal began the restoration process.

To solve the drainage problem, new sloped floors rerouted the run-off to the city's sanitary sewer, allowing treatment before release.

Quality concrete, epoxy-coated rebar and a waterproof coating were used in combination to maintain cost-effectiveness, minimize maintenance and maximize the life expectancy of this restoration.

Three primary construction repair techniques were used in combination to restore, protect and extend the life of the rehabilitated structure. New decks were constructed with high quality concrete. Epoxy-coated reinforcing steel was used to minimize corrosion. The finished deck floors were protected with a waterproof coating.

All solutions were implemented to help reduce permeability to road salts, control run-off and reduce the rate of deterioration for the structure in the future.

The parking garage restoration allowed the city to solve deterioration problems, correct noise pollution caused by the ventilation system, and at the same time, upgrade the facility to modern standards.

Restoration was required to extend the life of the existing parking facility and for the convenience and safety of those who use the garage in downtown Grand Rapids, Michigan. ♦

Epoxy-coated rebar is the corrosion protection of choice for a variety of projects

A survey, recently completed by an outside firm for CRSI, revealed that over half the respondents use epoxy-coated rebar in their projects. 65% specified this corrosion protection material for more than one type of project.

Epoxy coating is used in a variety of structures. As expected, epoxy-coated rebar was favored most in bridge construction—by 58% of respondents. The following graph and list also reveal an increase among other projects.

Type of projects

Bridges 71 (58%)

Parking Garages 36 (30%)

Marine Structures.....32 (26%)

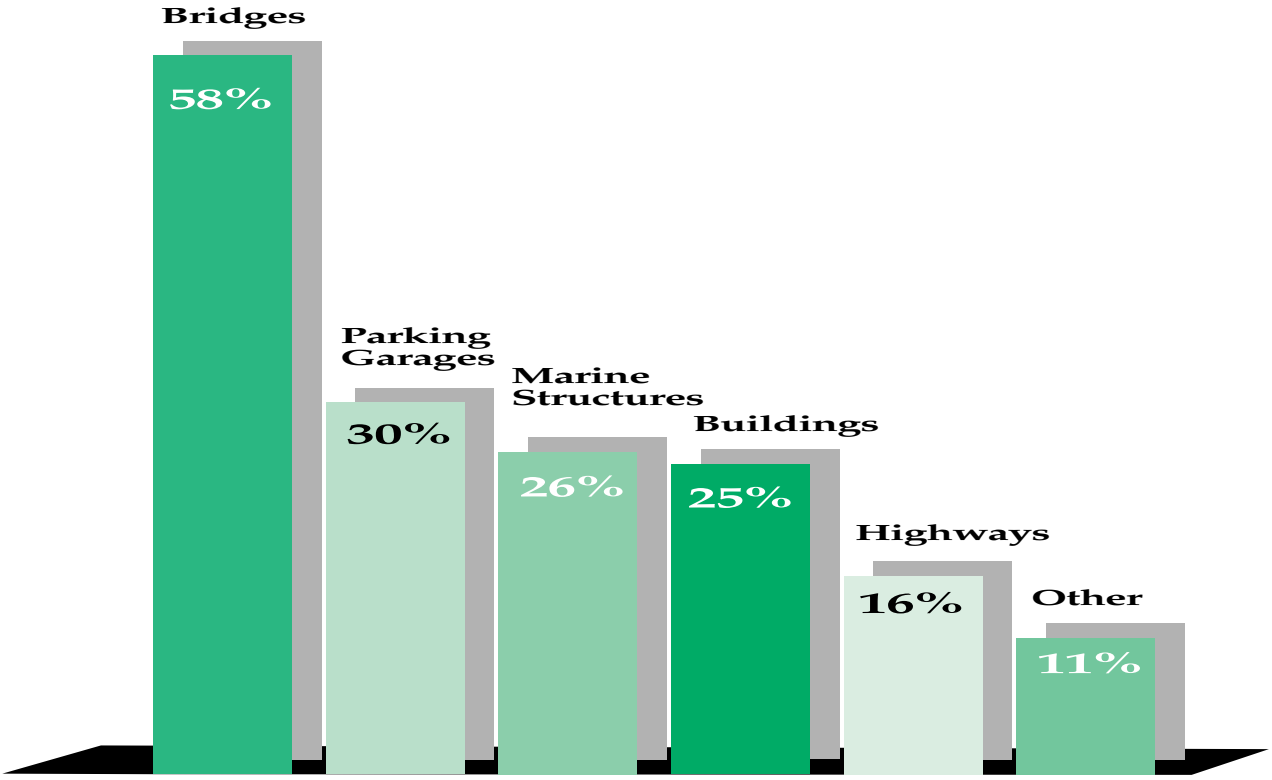
Buildings 31 (25%)

Highways 20 (16%)

Other 18 (11%)

- Sewage Treatment 5
- Retaining Walls 3
- Steam Venting Facilities 1
- Cooling Towers 1
- Exterior Stairs.....1
- Exterior Decks 1
- Fuel Tank Pads.....1
- Sidewalks 1
- Loading Docks.....1
- Pulp Mill 1
- Dam Rehab 1
- Pump Stations 1

Percentages add up to more than 100% because of multiple answers.



Recommended Practices for Fabricated Epoxy-Coated Rebar

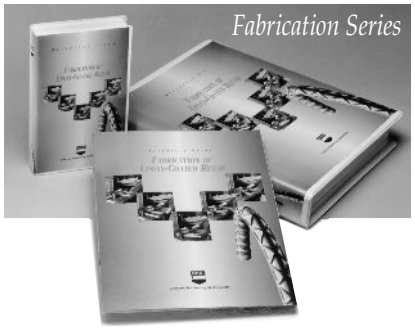
- ❑ Use CRSI Certified Plant epoxy-coaters to ensure the receipt of high quality material.
- ❑ Identify, inspect and label all material to be fabricated upon receipt.
- ❑ Instruct inspection and manufacturing personnel on the proper care and handling of epoxy-coated rebar.
- ❑ Pad or cover areas of equipment that come in contact with epoxy-coated rebar.
- ❑ Store epoxy-coated rebar inside if possible, above ground; bundle with non-abrasive material to avoid damage.
- ❑ Repair any coating damage at each manufacturing stage.
- ❑ Use recommended patching material for repairs, following manufacturers' recommendations.
- ❑ Protect all fabricated epoxy-coated rebar when moving to storage or shipping.

From the CRSI Reference Guide *Fabrication of Epoxy-Coated Rebar*

New epoxy-coated rebar videos and guides available

Fabrication

The newest series available from CRSI includes a video and a reference guide on the fabrication of epoxy-coated rebar.



The series was developed for use by inspectors, manufacturers, consultants and others involved in the fabrication of epoxy-coated rebar. The video is approximately 7-1/2 minutes long. The reference guide is fully illustrated in 12 pages. Both show the approved method of receiving, storing, shearing, bending, repairing, handling and shipping epoxy-coated rebar.

These materials were developed to help those involved in the manufacturing and fabrication of epoxy-coated rebar produce an end product that assures high quality and increases the life-cycle of concrete structures.

Field handling techniques

Introduced in 1996, the CRSI Field Handling Techniques for Epoxy-Coated Rebar series also includes video and reference guide.

This series was developed for industry users including contractors, inspectors and others involved in construction. Both the 8-1/2 minute video and 12-page reference guide give the most current information about field handling procedures. Subject matter includes receiving, inspection, long and short term storage, placing with use of accessories, inspection, field repair and guidelines for the concrete pour.

The CRSI Epoxy Coating Technical Committee produced both video and reference guide series. You can order either series.

- ❑ Reference guide .....$10 each
- ❑ Video .....$25 each

Kits are also available at a reduced rate:

- ❑ Fabrication of Epoxy-Coated Rebar Kit, video and guide.....$30
- ❑ Field Handling Techniques for Epoxy-Coated Rebar at the Job Site Kit, video and guide $30

Call, fax or write to CRSI for these new, colorfully illustrated reference materials. ♦