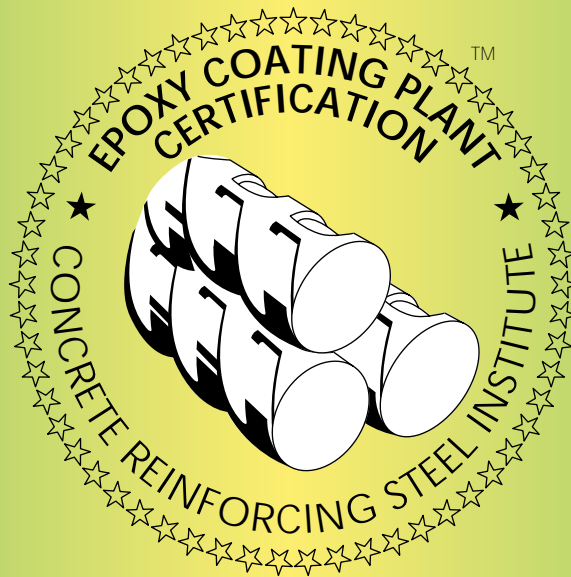


*NEW, IMPROVED ECR FOR THE 21ST CENTURY*

*SECURE CONTINUAL AND DRAMATIC  
QUALITY IMPROVEMENTS*

# **CRSI EPOXY PLANT CERTIFICATION PROGRAM**



**Concrete Reinforcing Steel Institute**



Epoxy-coated rebar



The CRSI fusion-bonded epoxy coating applicator plant certification program is a voluntary industry-sponsored program. It has been extremely effective at improving the quality of epoxy-coated rebar. Developed to provide an independent certification, the program outlines the basic requirements for a quality control program to ensure that a plant and its employees are trained, equipped and capable of producing fusion bonded epoxy-coated reinforcing steel bars in conformance with the latest industry standards and recommendations. The program is a process certification, not a product quality guarantee. It is intended to supplement not replace the acceptance testing of materials.

### Purpose

- ➔ To ensure that coating applicator plants have the capabilities and quality control procedures in place to assure a high level of excellence in material produced and delivered to the job site.
- ➔ To assist plant management in achieving a high level of excellence in the plant and its operations.
- ➔ To provide recognition to plants which demonstrate a high degree of excellence.

### Scope

CRSI's Plant Certification Program extends only to epoxy coating application procedures and materials within the examined coating plant. It is expressly intended to cover procedures and events related to the application of the coating, and not to the fabrication of bars, either before or after coating.

### Inspections

Certification of a plant is based on inspections by an independent testing agency contracted by CRSI. Each plant is inspected on an unannounced basis a minimum of one time a year. Twenty percent of the plants, selected at random, receive a second unannounced inspection. In addition, a particular plant may be inspected more frequently if CRSI receives information from specifiers that the plant is experiencing quality problems.

### Recordkeeping

To retain their certification, plants are required to maintain detailed quality control records daily for each production shift. These records are open for review by the independent testing agency and form an important part of the plant's evaluation during an inspection.

### Quality Standards

The Certification Program's quality control procedures and associated technical criteria are based on ASTM standard specifications for epoxy-coated rebar. However, in many cases, the certification standards are tighter and more stringent than standard specifications. Areas evaluated in the program include:

- ✓ Quality control policies and procedures
- ✓ Handling and storage practices
- ✓ Surface preparation
- ✓ Curing
- ✓ Holiday testing
- ✓ Thickness measurement
- ✓ Adhesion testing

Several new tests not currently required by most standard specifications have been introduced as quality control procedures in the CRSI Certification Program. Examples of required tests include: the back-side contamination test, the chloride detection test, the copper sulfate test and the cathodic disbondment test. Requirements of the Certification Program are continually being improved to reflect current research and quality improvements in the industry.

### Quality Pays . . .

#### Benefits of Quality Control and Certification

Good quality control does make a difference. Adoption of the stringent quality control procedures set forth in the CRSI Certification Program has resulted in significant and continuing quality improvements. Recent Federal Highway Administration process reviews have noted "significant differences in quality" between certified and noncertified plants.

# PLANT CERTIFICATION OF EPOXY-COATED REBAR



In 1992, CRSI conducted a quality control survey of eighteen epoxy coating applicator plants (thirteen of which were CRSI certified). Each plant submitted quality control data for a minimum of 30 days of production. A comparison of the quality control capabilities of certified plants to noncertified plants in terms of controlling film thickness showed that noncertified plants had 73% more variability.

Improvement in coating thickness control that five plants were able to achieve by imple-

menting these quality control procedures was also evaluated. A comparison of 1988 data with those of the 1992 quality control survey indicated a 23% reduction in the standard deviation of coating thickness.

CRSI's independent inspection agency, Wiss, Janney, Elstner Associates, reports that participating plants have shown a continual and dramatic improvement in quality since the program's inception. It is this continuous improvement philosophy which makes the program so valuable.

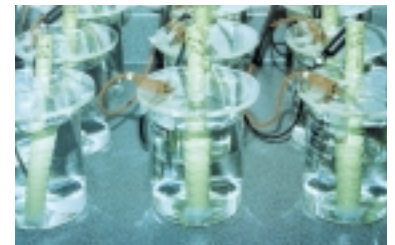


## Highlights of the Certification Program

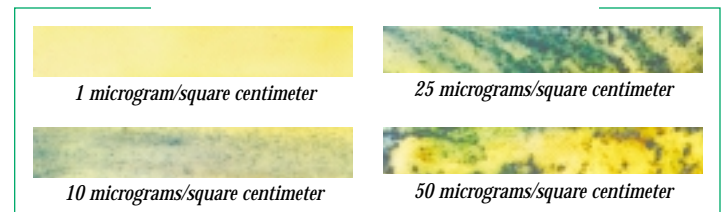
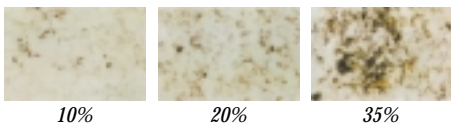
- Certified plants are now averaging less than 0.23 holidays per foot of bar. ASTM now requires not more than an average of 1 holiday per foot; in 1991 prior to implementation the limit was 2 per foot.



- *Cathodic Disbondment Testing* is now a required part of the applicator's daily quality control. Under ASTM and AASHTO specifications, CD testing is only required for pre-qualification of the epoxy powder.



- Average *Backside Contamination* (i.e. dust and other contaminants between the coating and the steel) is now 15% for certified plants. Prior to 1991 the industry averaged 40% to 50% by best estimates.

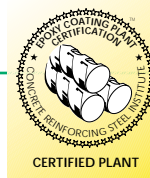


- Most of the certified plants now use actual fabrication pin diameters (i.e. 4d) in *bend testing* for routine quality control.

- Coaters are now required to test for *chloride* on the steel prior to coating. Chloride testing is not required by most specifications.



## PLANT CERTIFICATION OF EPOXY-COATED REBAR



### Program Status

As of April 1, 1997, 30 of the 35 plants in the U.S. and Canada have been certified or are pending certification. This is 95% of the epoxy-coated rebar plants in North America and represents over 90% of ECR production. Also, the program's first dowel bar coater was certified in 1996.

Many specifying government agencies and private specifiers have required CRSI certification as a means of assuring quality for ECR into the 21st century. As of January 1, 1997, ten State Departments of Transportation and two Canadian Ministries of Transportation require CRSI certification.

### Future

CRSI's ongoing goal is to improve the Certification Program to more fully satisfy specifier's needs and to provide the highest quality epoxy-coated rebar possible. Future consideration will be given to incorporate other improvements such as:

- Statistical process control concepts
- New adhesion tests
- Coverage of fabrication and field operations

CRSI is actively working with specifiers to help them assure that high quality epoxy-coated rebar is supplied. We strongly encourage specifiers to require epoxy coating rebar

suppliers to meet stringent quality control procedures such as those in the Certification Program.

### Certification Program leads ASTM Standards Changes

The CRSI Certification Program has served as a proving ground for many of the recent changes and improvements to ASTM standard specifications for epoxy-coated reinforcement.

The following are the applicable ASTM standards for epoxy-coated reinforcement and are recommended for use on most projects where corrosion of reinforced concrete is a concern:

**ASTM A775** Standard Specification for Epoxy-Coated Reinforcing Steel Bars

**ASTM A934** Standard Specification for Prefabricated Epoxy-Coated Reinforcing Steel Bars

**ASTM D3963** Standard Specification for the Fabrication and Job Site Handling of Epoxy-Coated Reinforcing Steel Bars

**ASTM A884** Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement

**ASTM A994** Standard Test Method for Comparing Bond Strength of Steel Reinforcing Bar to Concrete Using Beam-End Specimens

*For more information on the CRSI Voluntary Certification Program for Fusion Bonded Epoxy-Coated Applicator Plants, contact:*

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