FUSION BONDED COATERS ASSOCIATION FBCA

anti-corrosion times

Reporting on industry news, noteworthy applications and new developments of the fusion bonded coating system for corrosion prevention

VOL. 2 NO. 1 — JANUARY 1984 PUBLISHED BY FUSION BONDED COATERS ASSOCIATION

New officers elected

At its November 1983 annual meeting in Chicago, the Fusion Bonded Coaters Association elected officers to serve the coming year:

H. Blair Trimble

Brad J. McFadden

President:
H. Blair Trimble
Steel Service Company
Division of Gold Fields American Industries, Inc.
Knoxville, Tennessee

Vice President:
Brad J. McFadden
Epoxicote Rebar, Inc.
Stoney Creek, Ontario

Secretary/Treasurer:
Edward W. Gleason
MCP Facilities Corporation
Glen Head, New York

Director:
Hal E. Reed
Dura Coating, Inc.
Eugene, Oregon

At the same meeting, FBCA's 1984 budget plan was approved. It includes provision for continued research and needs accompanying the rapidly growing use of epoxy-coated steel and other imbedments. More specifically, the association's 1984 program calls for:

- 2 issues of Anti-Corrosion Times
- Wide dissemination of relevant technical/specification data among specifiers.
- Seminar participation at World of Concrete, Washington, D.C., March 1.
- Exhibits at the World of Concrete and ASCE's Structures Congress III, San Francisco, October 1-3, 1984.
- Supportive efforts to WRI, CRSI, ACI, NACE, ASTM, ASSHTO and FHWA in the interest of Specifications, Codes and Standards development.

New waste treatment plant safeguards its future with epoxy coated rebar

Dynamic Calgary is one of Canada's fastest growing cities. Population is already past the half-million mark. Smart planning has kept its wastewater treatment facilities ahead of demand.

Now, Calgary is readying itself for even more future growth with a big $107 million dollar plant expansion program. It's constructing an addition to its Bonnybrook Sewage Treatment Plant that will double its capacity — over 450,000 cubic meters a day. For the new secondary facilities, 55,000 cubic yards of concrete and nearly 6,000 tons of reinforcing steel will be required.

Calling on the latest technology in plant design, it will be the largest in Alberta with jet aeration. This very efficient treatment method creates a high oxygen environment in the aeration tanks — which could be bad news for the steel reinforcing in these concrete tanks.

Engineers spec epoxy-coating

To ward off possible future rebar corrosion problems, all concrete in contact with sewage is reinforced with epoxy-coated rebar. This simple expedient adds little to total cost but can prevent costly plant shutdowns and rebuilding in the future. The fusion bonded epoxy-coating on rebar prevents corrosive elements from reaching the steel. So, corrosion can't get started to expand the diameter of rebar, causing a tremendous pressure build-up on the surrounding concrete. Spalling, cracking and ultimate failure would be the result.

So well documented is the performance of epoxy-coating of rebar in waste treatment plants, ACI Committee Report No. ACI 350R-83 states in paragraph 5.3, "Types of Protection", "When special protection is required for the reinforcing bars, epoxy-coated bars are preferable."

Project: Bonnybrook Sewage Treatment Plant, Calgary
Owner: The City of Calgary
Architect: Graham McCord, Architects
Consulting Engineers: Reid Crowther and Partners, Ltd. in association with Underwood, McLellan, Ltd.
General Contractor: Pigott Construction, Ltd.

Fusion bonded epoxy industry has come of age

1973 - 1983 marks a decade of progress toward solution of the nation's concrete bridge deck deterioration dilemma. It was in 1973 that epoxy-coated rebars were first placed in an actual bridge deck installation. The experimental project, located in the state of Pennsylvania, culminated 3 years of meticulous research conducted under the critical eye of the Federal Highway Administration.

Positive field evaluation of this project signaled the "go ahead" for the fusion bonded epoxy system of corrosion prevention and led to its rapid implementation throughout the United States and Canada. Today's mature rebar epoxy-coating industry evolved from a few sparsely located pipe coaters, who responded quickly and well — but who were not totally prepared to cope with suddenly heightened demands for service and quality on a strange new product — reinforcing steel.

As we look back now, that "learning-curve" period was one of frustration for coating applicators, mill producers and fabricators of rebar — as well as end users. Authoritative specifications were virtually non-existent. Disparity of critical knowledge and understanding between supplier and user prevailed. Rejections were rampant and costly.

If it is true that miracles stem from man's God-given ingenuity, industry developments that followed the stumbling start-up period can be appropriately termed "miraculous". Independently and collectively, all constituents of the specifying/marketing/construction endeavor worked constructively to make "order out of chaos". Indeed, it was a noteworthy era of innovation and adaptation.

Rigid specs demand exacting quality

Cooperative efforts of FHWA, ASSHTO, CRSI, FBCA and individual states brought governing specifications into being. Today, very few products are so completely and rigidly controlled through authoritative specifications. Though minor variances between specs (ASTM, ASSHTO, Individual states) exist, each calls out essentially the same inviolable rules that dictate unequivocal terms of in-plant quality control.

In like manner, as the market grew and manifested its long-term durability, rebar producers and fabricators, powder manufacturers, coating applicators and equipment manufacturers pooled resources to come forth with a product that satisfied stringent quality demands of the specifier and end user.

Modern high productivity plants

Today, each rebar epoxy-coating plant utilizes only FHWA approved coating powder materials. Their initial step in production is to blast the virgin steel surface to a specified "near white" finish; thereby providing the desired cleanliness and prescribed anchor-pattern for optimal coating adherence.

Thereafter, the bars are automatically conveyed through preheating and powder application units, where the powder coating is electrostatically sprayed-on at a precisely controlled temperature. Spray guns are strategically affixed circumferentially around the bar surfaces to achieve uniform coating thickness.

As the coated bar emerges, an in-line holiday detector electrostatically monitors for voids not discernable to the naked eye. Coating thickness is measured at this point, as well. Adhesion of coating is evaluated by bending the coated bar 120°. Finally, handling and packaging procedures guard against damage in transit to jobsite.

Applicator plants strategically located

Contrary to the initial disparity of coating facilities and their remoteness, newcomers have strategically located plants with respect to the market place. In servicing the market place, the coating applicator, the rebar producer and fabricator operate, essentially, as one entity — to the end of "single responsibility" for product quality and acceptance.

Today's wide usage of epoxy-coated reinforcing steel speaks well of the industry's progress. Forty-four states now specify epoxy-coated rebars for new bridge deck construction wherever environmental circumstances suggest the need for protection against salt-induced corrosion. In the past year, new applications beyond bridge deck, per se, have come to light; i.e., sewage and water treatment plants, dolos, precast channel roof decks, reinforcement for earth retention, etc.

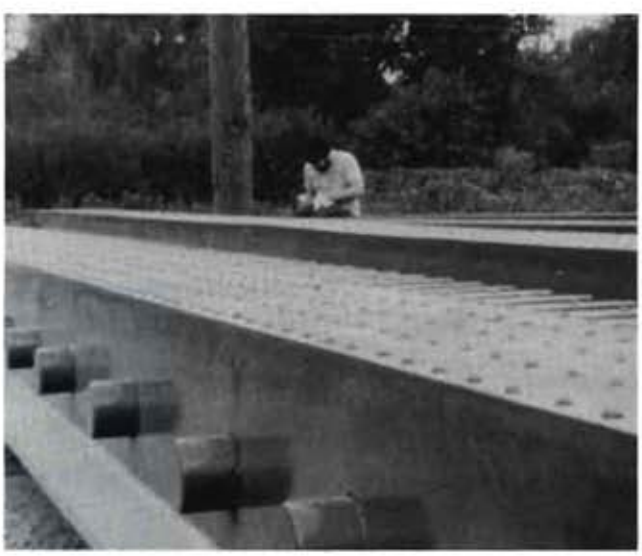
Epoxy coated systems widely accepted

Use of the epoxy coated rebar system of corrosion prevention is authorized for selected application by the American Concrete Institute, such as Committee 345 Concrete Bridge Construction and Maintenance, Committee 350 Concrete Sanitary Engineering Structures, and Standard Building Code Committee 318. Also, Engineering Data Reports 14 and 19 by the Concrete Reinforcing Steel Institute contribute significantly toward orderly standard practices in the industry, specification development and use of the system.

FBCA has become industry spokesman

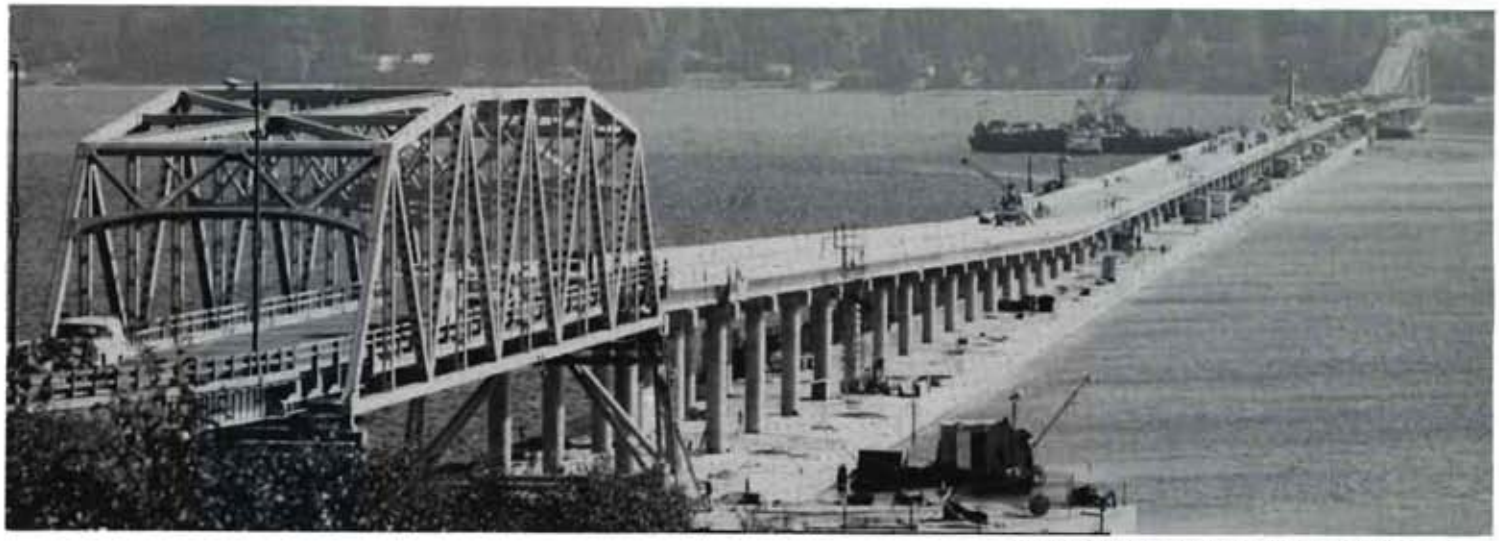
The Fusion Bonded Coaters Association was spawned in the mid-70's in response to the obvious need for specification development and collective industry effort. At this juncture, the association, like the industry itself, has "come of age".

H. Blair Trimble



Get's better all the time!

Now, to protect bridge decks from one end to the other, they're even epoxy coating the expansion joints. These large 42' long x 3'3", 11,000 lb. assemblies were blasted to "near white", convection heated and epoxy-coated in an inline continuous operation. The top surface has a sand finish in the powder to impart traction. They're for the Woodrow Wilson Bridge, Washington, D.C., over the Potomac River.



Completed 6,471 foot floating bridge with 3,775 foot rebuilt section.

World's largest floating structure is concrete . . . with epoxy-coated rebar to prevent corrosion dangers

On February 13, 1979, a 100-year storm funneled down the Hood Canal with wind gusts up to 90 mph. In its path was the world's largest floating structure — the Hood Canal bridge linking the Seattle, Washington area with the Olympic Peninsula.

Finally, the combination of wind, tidal current and flooding of some of the large concrete pontoons spelled its doom. A 4,000 foot segment of the 1.3 mile structure collapsed and sank.

New bridge won't suffer same fate.

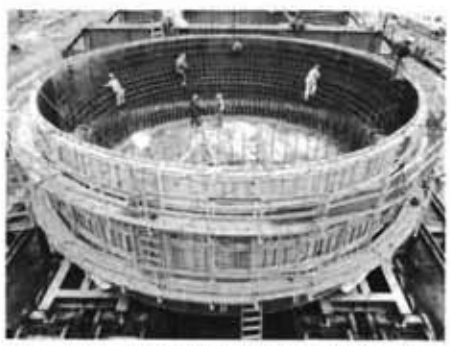
The new bridge section was designed with wider, deeper, stronger pontoons, roadway superstructure and anchors. And, because this is a tidal installation, the huge 360' long x 60' wide x 18' deep pontoons were of composite construction with cast-in-place and precast concrete elements reinforced with epoxy-coated rebar. The same applies to the 24 super-sized reinforced concrete bucket-shaped anchors. Altogether, over 6,000 tons of epoxy coated rebar and 115 miles of post-tensioned duct were used. Built at the Port of Tacoma, the twelve completed football field long pontoons and twenty-six anchors were towed to the bridge site and secured in place.

The new $60 million, 2-lane span comprising 3,775 feet of the bridge total 6,471 feet floating length was reopened in November, 1982. This new, much heavier design can survive winds of 83 mph. for a full hour plus 110 mph. gusts.

Design: Raymond Technical Facilities and Parsons, Brinkerhoff, Quade & Douglass, a joint venture.

Prime Contractor: J. A. Jones Construction Company.

Iron workers setting epoxy-coated rebar on one of the six pontoons constructed at same time.



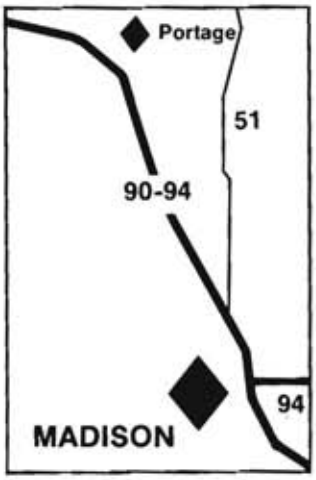
The design and huge size of the bridge's anchors are apparent in this fabrication view.

Football field size pontoon with superstructure/ roadbed is floated up Puget Sound to bridge site.

AD TELLS HOW TO BRIDGE THE BRIDGE GAP

ENGINEERING NEWS-RECORD in 1983 carried a record-size supplement, "It's time to rebuild with versatile, durable concrete". Telling America how to build new bridges quickly, economically and durably was this full color ad sponsored by FBCA and CRSI (Concrete Reinforcing Steel Institute). The ad reported on CRSI's new, short and medium span bridge program that offers design concepts of 3 types of structures to aid states and counties speed up their bridge programs.

The FBCA message told how highway officials can assure long-time, low-maintenance bridge deck service by use of fusion bonded epoxy-coated rebar where corrosion can be a problem. The FBCA ad was the third highest producer of inquiries in the entire section, evidencing the high interest in epoxy-coated reinforcing steel for concrete structures.



Route of Interstate 90-94 from Madison to Portage being reconstructed as continuously reinforced concrete pavement. Photo is of typical Wisconsin Interstate freeway.

Wisconsin recycles busy interstate highway

Fusion bonded epoxy used to protect 16,000 tons of rebar in chloride impregnated concrete

The thirty mile stretch of 4-lane divided interstate highway between Madison and Portage, Wisconsin, wasn't up to the times. The original jointed wire reinforced concrete slab which had exceeded its design life was breaking up. It also needed a 3rd lane in each direction to handle the 32,000 plus vehicles a day (30% trucks).

The Wisconsin Department of Transportation decided the one new lane and rebuilt double lanes *this time* would be continuously reinforced pavement. It was the surest way of giving tax-paying motorists the best, most lasting highway for the money. This decision was also reaffirmed by the highly satisfactory performance of a 23-year old, 4.2 mile section of continuously reinforced concrete pavement on the same interstate route.

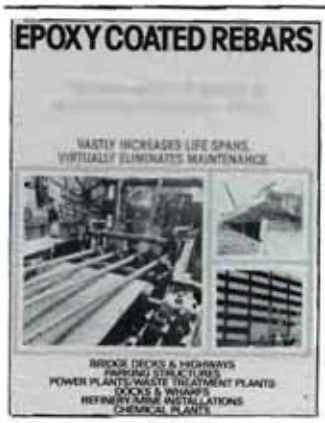
One Problem

The idea of recycling the old concrete into aggregate for the new pavement meant potential savings. The only problem was that in this northern midwest state, years of pavement de-icing had left the old concrete with an abnormally high content of sodium chloride penetration. This would have posed an increased corrosion hazard for the rebar in the new pavement.

Obvious solution was to specify epoxy-coated reinforcing steel. This simple, economical step meant reuse of thousands of tons of old, crushed concrete. It also saved hauling away and disposing of mountains of old concrete — and the severe congestion this would have caused in a heavily traveled and built-up area.

FHWA approved, epoxy-coated rebars are deemed more cost effective than any other corrosion preventative system. They're being specified in state after state to guard bridges, parking structures and other projects in corrosive environments.

For more information on fusion bonded epoxy-coated reinforcing steel, ask for color brochure. For more information on continuously reinforced concrete pavement, write: Concrete Reinforcing Steel Institute, 933 N. Plum Grove Road, Schaumburg, IL 60195.



The 1-2-3's of fusion bonded epoxy-coating

— Ask for Brochure.

Full-color brochure illustrates both the corrosion problem and fusion bonded epoxy-coating solution. Also, methods of manufacturing and applying epoxy-coatings.

Write FBCA for "Epoxy Coated Rebar — the once and for all solution."

Rebar tending: quite an art

The above captioned one-page article from TRNews, September-October, 1983, courtesy of the Transportation Research Board, provides interesting commentary on the derivation of epoxy-coated rebars as a viable solution to the problem of premature deterioration of concrete bridge decks. In effect, the article constitutes high praise for the Federal Highway Administration's research efforts that led to a solution of the nation's costly bridge deck problem.

In brief, it states, "In the early 1970's . . . FHWA decided to build on one of the conclusions made in NCHRP Report 23; . . . that for new reinforced concrete construction, a protective coating (asphalt-epoxy) is the best single means for keeping steel from corroding.

"At that time, no specifications existed . . . therefore, the need was there to develop specifications for the type of coating that would provide a permanent barrier to the transmission of the chloride ions to the surface of the reinforcing steel and be durable enough to allow coating of the steel before fabrication.

"Specifications were developed and (an economical) coating process was identified. Attention was directed to application methods and surface preparation . . .

"FHWA continued research to further verify the long-term durability of the epoxy-coating material (electro-statically applied by the fusion bonded coating process) . . .

"Analysis of life-cycle costs indicates that the use of epoxy-coated reinforcing steel in both mats of a typical bridge deck results in significant savings compared with any other option available to designers. Based on current U.S. construction of approximately 2.5 million yds.^{2} per year of bridge deck requiring a protective system, the estimated costs over the design life of the bridges for epoxy-coated rebar are approximately $5 million per year below those for any other system . . .

". . . Currently, epoxy-coated reinforcing steel is being specified by more than 40 of 50 state highway agencies. Use of epoxy-coated rebar has spread beyond bridge decks and substructures to . . . parking garages, marine structures, waste-water treatment plants, cooling towers and subways."

See us in booth 3126
World of Concrete

FBCA presents epoxy-coating update at World of Concrete convention

The Fusion Bonded Coaters Association is a double feature participant of the 1984 World of Concrete, Washington, D.C. — with both an exhibit and seminar involvement. The 18,000 plus visitors will have the opportunity to see a timely FBCA exhibit staffed by specialists who will show how fusion bonded epoxy-coated reinforcing steel can greatly prolong the service life of bridge decks and other concrete structures subjected to corrosive environments. Experts also will present new, official test results as evidence that coated rebar can protect America's vast investment in new and rehabilitated bridges now underway.

FBCA has seminar speaker

Robert T. Stafford, Executive Director of FBCA, will join other industry experts in a new World of Concrete seminar on, "How to avoid steel corrosion problems in concrete". Contractors and engineers will hear of the progress in safeguarding concrete structures through the simple expedient of using epoxy-coated rebar.

6 states go route of 2 mats epoxy-coated for bridge decks

Though FHWA considers "top mat only" epoxy-coated rebars as a bonified, cost-effective corrosion prevention system for concrete bridge decks, at least a half dozen states are now specifying top and bottom mats epoxy-coated. Florida was the first state to go the route of the 2-mat system — also specifying epoxy coating for abutments, bents and piers, as well. In light of lower unit costs for epoxy-coating (reflecting significant productivity gains, together with increased competitive circumstances in today's market) and FHWA's willingness to approve the two-mat system, Illinois elected last July to pay a slight premium for the added measure of assurance and life predictability.

In the U.S. Department of Transportation's *PUBLIC ROADS*, June, '83 issue, FHWA research data* published indicates bridge deck life predictability when top mat is epoxy-coated at 11-1/2 times uncoated rebar; both mats coated with epoxy, 41 times!

Published by
FUSION BONDED COATERS ASSOCIATION
21 Spinning Wheel Road
Suite 8K
Hinsdale IL 60521 312/920-1411
R. T. Stafford, *Executive Director*

*Reprints available from FBCA Headquarters upon request at no charge. The article is entitled "Corrosion of Nonspecification Epoxy-Coated Rebars in Salty Concrete".

Fish treated to fancy home in new Omaha aquarium

Epoxy-coated rebar to keep it fancy-free.

Omaha's Henry Doorly Zoo soon will have a new 100,000 gallon salt-water aquarium. There will be 10 concrete and glass tanks in free-form design to provide the sea life a natural environment — and give spectators clear views of the many species who will call the aquarium home.

Salt water may be great for fish, but it's deadly to steel. To protect the reinforced concrete tank structures, all rebars are fusion bonded epoxy-coated. This way, any moisture that may penetrate the concrete to the reinforcing steel will not cause corrosion and its resultant concrete deterioration.

Epoxy-coating: It makes good sense to put it in the specs for any project when corrosion could cause trouble.

Architect: How/Nelson Associates, Inc., Omaha
Contractor: Kiewit Construction Co., Omaha

FUSION BONDED COATERS ASSOCIATION

P.O. BOX 3039 OAK BROOK, IL 60521 312/920-1411

FOR INFORMATION ON EPOXY COATED REBARS AND PROTECTIVE COATINGS FOR OTHER PRODUCTS SUBJECTED TO CORROSIVE ENVIRONMENTS CONTACT FBCA MEMBER COMPANIES

Powder Coating Applicators
(Plant Locations)

ABC COATING COMPANY, INC.

P.O. Box 9693
Tulsa, OK 74157
(918) 585-2587
Marcelo Acuna

P.O. Box 1348
Auburn, WA 98002
(206) 735-1070
Michael R. Benge

P.O. Box 248
Waxahachie, TX
75165
(214) 937-9841
Don Benge

P.O. Box 428
Brighton, CO
80601
(303) 654-0098
Gerald Campbell

AMERICAN REBAR COATERS
Div. of Hauseman Steel Corp.
11350 N. Meridian Suite 400
Carmel, IN 46032
(317) 844-6044
Lawrence A. Kubicki

BETHLEHEM STEEL CORPORATION
701 E. Third St.
Bethlehem, PA 18016
(215) 694-5711
L. Anthony Hancock

CAPROCO CORROSION PREVENTION LTD.
Box 5858, STN. "L"
Edmonton, Alta., Canada T6C 4G3
(403) 468-2878
Denis Taillon

DURA COATING INC.
P.O. Box 10051
Eugene, OR 97440
(503) 688-2466
Hal E. Reed

EPOXICOTE REBAR, INC.
318 Arvin Ave.
Stoney Creek, Ontario L8E 2M2
(416) 561-5611
Brad J. McFadden

FLORIDA STEEL CORPORATION
P.O. Box 23328
Tampa, FL 33630
(813) 621-3511
Clyde L. Roberts

GRIDCOTE CORPORATION
16795 Lark Avenue
Los Gatos, CA 95030
(408) 354-4222
Ziv Dagan

MCP FACILITIES CORPORATION

3 Park Plaza
Glen Head, NY 11545
(516) 676-7811
Edward W. Gleason

P.O. Box 150
Madison, IL 62060
(618) 451-1440
Tom Bain

MIDWEST PIPE COATING, INC.
925 Kennedy Ave.
P.O. Box 127
Schererville, IN 46375
(219) 322-4564
Robert D. Theisen

NANTUCKET REBAR SERVICES
315 Nantucket Blvd.
Scarborough, Ontario M1P 2P2
(416) 751-8780
Douglas M. Green

PROCOAT
P.O. Box 668
Walla Walla, WA 99362
(509) 525-4425
David L. Huse

SIMCOTE, INC.
P.O. Box 9
Newport, MN 55055
(612) 735-9660
John L. Simmet

STEEL SERVICE COMPANY
Div. of Gold Fields American
Industries, Inc.
P.O. Box 1882
Knoxville, TN 37901
(615) 546-5472
H. Blair Trimble

Powder Manufacturers
(Headquarters)

ARMSTRONG PRODUCTS COMPANY
P.O. Box 647
Warsaw, IN 46580
(219) 267-3226
William R. Baldwin

3M COMPANY
3M Center - Building 225-4N
St. Paul, MN 55144
(612) 733-1656
James J. McDermott

3M CANADA INC.
P.O. Box 5757
London, Ontario N6A 4T1
(519) 451-2500
David H. Weaver

ASSOCIATE MEMBERS

CASCADE STEEL ROLLING MILLS, INC.
P.O. Box 687
McMinnville, OR 97120
(503) 472-4181
Richard P. Kuntz

HERRON WIRE PRODUCTS, INC.
P.O. Box 1152
Sidell, LA 70459
(504) 649-0463
Richard F. Gallmann

PLASTI-CLAD METAL PRODUCTS, INC.
P.O. Box 121
Manasquan, NJ 08736
(201) 449-2665
Mark Matthews

RESOURCE ENGINEERING & MFG. CO.
23 West Fourth St.
Tulsa, OK 74103
(918) 234-7030
Steve O. Carlson