CRSI CONCRETE REINFORCING STEEL INSTITUTE

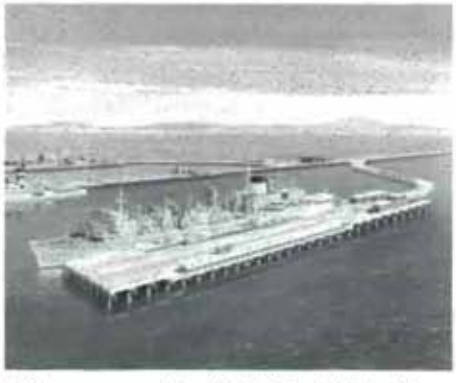
Vol. 9, No. 1
Spring, 1991

anti-corrosion times

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

Published by CRSI, 933 N. Plum Grove Road, Schaumburg, IL 60173-4758 708-517-1200

Innovative Navy Pier Design Saves Time, Costs



With an approach trestle that is 1,500-feet long connecting the 945-foot long pier, epoxy-coated reinforcing steel was specified for all cast-in-place concrete beams and other critical areas to protect against possible corrosion in the harsh marine environment.

Epoxy-coated Rebar Figures in Plans

The Navy's fast combat support ships have a new high-tech home in Colts Neck, New Jersey—the $50,000,000 Pier 4 and Trestle 4 at Naval Weapons Station Earle.

Navy engineers collaborating with consulting engineers, Han-Padron Associates, New York City, devised an original design having a number of unique features that make the 945-foot long by 154-foot wide pier highly efficient operationally and extremely cost effective. The most noticeable feature of the pier is its partial double deck. All piping, conduits, hoses and cables are located on a lower utility deck below the railroad loading platforms along each edge of the pier; out of the way of cargo handling operations.

Other innovative features of the pier include the elimination of all batter piles; the use of 35-foot pile bent spacing; extensive use of precast, prestressed and cast-in-place concrete elements and the use of epoxy-coated reinforcing steel. The result of these features is a pier that is 45-feet longer and 14-feet wider than that on which the Navy's estimated construction cost was based and has wider railroad car loading decks,

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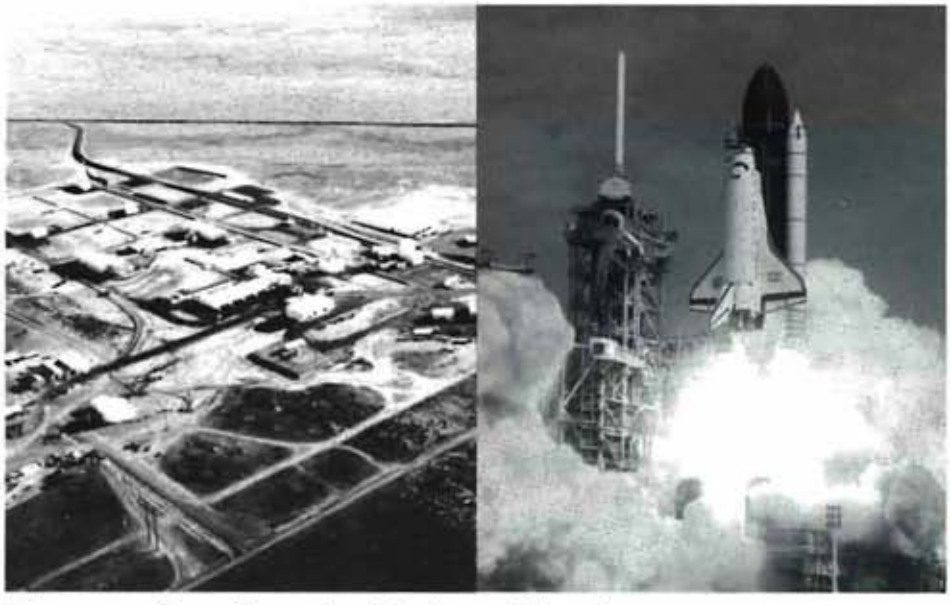


Epoxy Coating is Rebar Must for New Rocket Fuel Plant

Rockets aren't noted for their low fuel consumption. It takes a lot of solid fuel to propel them on their military and NASA missions.

A vital ingredient of today's powerful solid rocket fuel is ammonium perchlorate which functions as an oxidizer in the fuel mixture. To help satisfy the increasing demand for this fuel compound and to replace an earlier plant destroyed in a May, 1988 explosion, a new plant was constructed in Cedar City, Utah by Pacific Engineering & Production Company, Henderson, Nevada to produce ammonium perchlorate in crystalline form.

In designing the new plant for producing the pungent compound, special consideration had to be given to the extremely corrosive nature of ammonia. Therefore, the designers, Stearns-Roger Division of United Engineers and Constructors, Inc., Denver, specified that virtually all the concrete reinforcing steel be epoxy coated.

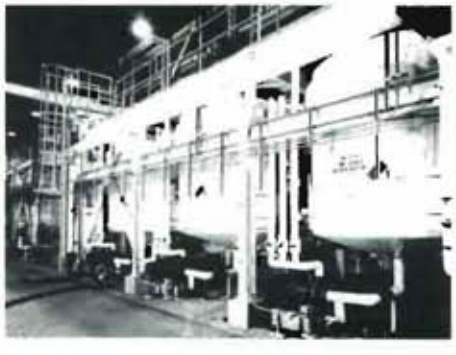
Photo Above: The sprawling new ammonium perchlorate plant now producing this vital essential for rocket motor fuel.

Photo Right: View inside of plant showing crystalizers used in production of ammonium perchlorate.

(Photos courtesy United Engineers & Constructors and NASA)

This meant that nearly all of the 300 tons of rebar used in the plant's construction was fusion-bonded epoxy-coated to assure maximum protection against corrosion in this extremely adverse environment.

***Ammonium perchlorate** is an interesting chemical. Its primary feature is that it contains a lot of oxygen. It is mixed with polymers and small amounts of other ingredients to form a solid rubber-like material, which is a solid propellant. When ignited, the large amount of oxygen in the ammonium perchlorate supports the violent burning of the other constituents in the propellant and the desired thrust is obtained.*



"Instant" Breakwater Creates New Harbor for British Columbia Town

The new harbor created by anchoring six units in place.

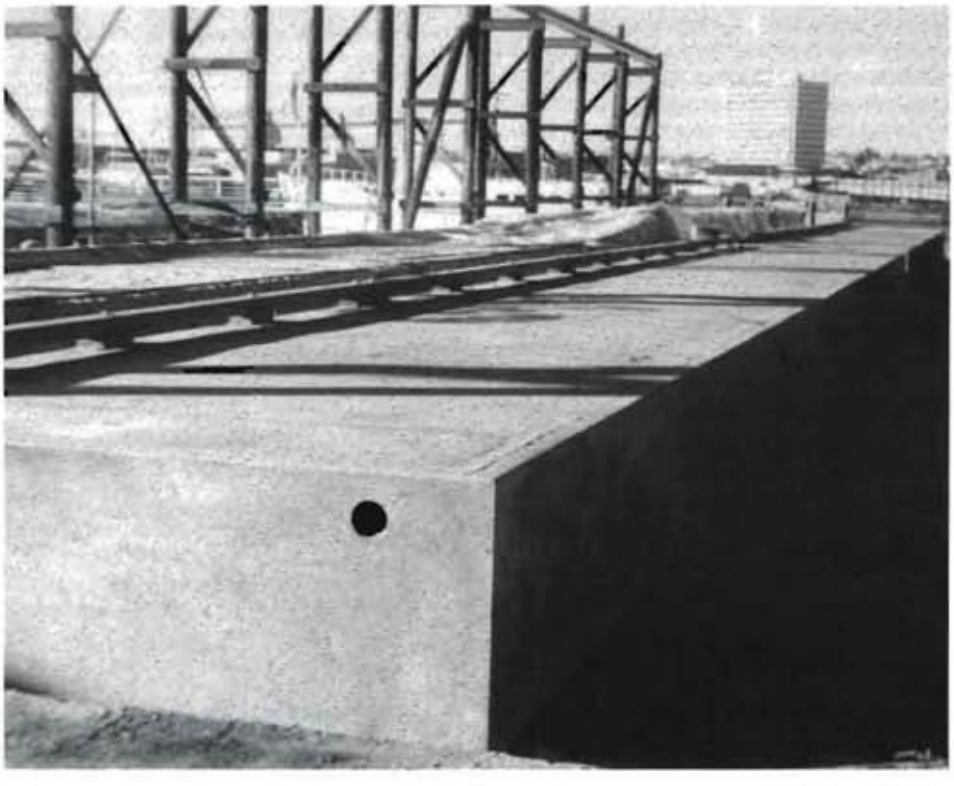
Floating concrete structures towed to location supply answer

500 miles up the Pacific coast from Vancouver, British Columbia there's a brand new marina in a brand new harbor attracting fishermen and business to the town of Kitimat, B.C.

The existing harbor was poorly protected by derelict barges and several floating log bundle breakwaters which offered little protection during heavy wave action for approximately 80 small craft vessels.

The M. K. Bay Harbor improvement project involved dredging a harbor basin at a more protected site adjacent to the existing location and installing a new floating concrete breakwater to provide protection from severe local wave action. The floating breakwater consists of six 75-foot long floating concrete units approximately 10-feet wide and 3-feet 4-inches in depth. The building of these impressive structures was contracted to CEFER DESIGNS LTD., a British Columbia company that specializes in construction of custom floating marine structures.

Construction photo of one of the large breakwater units prior to launching.



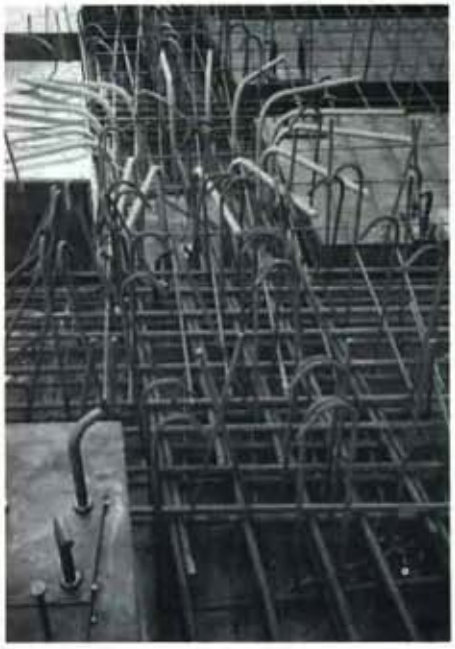
The breakwater units were constructed using 3½-inch thick concrete that encased expanded polystyrene foam blocks. The concrete was reinforced with epoxy-coated rebar—an added protective measure to minimize the corrosive attack of the harsh salt water environment in the event of concrete damage. These units were towed to the site and secured to vertical steel pipe piles with ring connectors attached to breakwater floats.

The overall planning, engineering and project management, including the dredging of the harbor basin and installation of the new concrete floating breakwater, was funded by the Canadian government through the Department of Fisheries and Oceans. The Canada Department of Public Works provided the overall project management. The project manager was A. Fakidis, P.E. Several Vancouver, B.C. consultants were used to assist with planning and design including Triton Consultants (Coastal) and Golder & Associates.

(Photos courtesy Canada Department of Public Works. Department of Fisheries and CEFER Designs Ltd.)

The completed addition to the coal-fired heating plant with large enclosed area housing the filtration equipment. Note the coal piled around the support columns.

Design of the hefty columns called for epoxy-coated reinforcing steel to help maintain lasting concrete integrity.



Power Plant Upgrades Environmental Protection with Filtration System Installed above Coal Storage

The University of Wisconsin-Madison heats most of the buildings on its sprawling campus with steam generated by a large central heating plant. Anxious to take advantage of the latest technology in controlling emissions from the coal plant's stack, the University undertook an ambitious project to greatly reduce particulates released into the atmosphere.

This involved installation of a filtering system to "vacuum" out pollutants such as flyash. To enclose the filtration system, a large elevated platform had to be built over the coal storage pile. On this was installed the new filtration system that enabled the University to exceed even the most stringent requirements for air quality.

The structural engineers for the elevated platform were Mead & Hunt, Inc., Madison. The design involved constructing twenty-five R/C columns 42-inches in diameter and 30-feet high. These support a 14,000 square-foot slab on which the filtration system is installed.

The engineers were concerned with the effects of the sulphur content in the coal when it is piled high around the columns. To alleviate any possible future corrosion of the steel reinforcement in the columns and platform, all rebar was required to be fusion bonded epoxy coated. Experience has shown that this protection method is the most cost effective and lasting for concrete installations confronted with corrosion conditions.

(Photos courtesy Mead & Hunt, Inc.)

Multiple High-Rise and Park Complex Shaping New Toronto Skyline

Early construction scene showing garage area where epoxy-coated rebar was specified.

Visitors to Toronto, Canada are amazed by its soaring skyline highlighted by the world's tallest, free-standing structure—the 1,815-foot concrete CN TOWER.

Now, this city of 2,193,000 people is about to have another highly visible attraction—the Metro Hall and Marathon Buildings at MetroCentre. Metro Hall is a 27-story reinforced concrete high-rise building which will house the Metro Toronto Government. Directly adjacent to the Metro Hall are the Marathon Buildings which consist of two 15-story reinforced concrete office towers and a three-acre park and plaza in front. Total construction cost of the development is approximately $180 million.

Situated along the north coast of Lake Ontario, Toronto gets numerous snowfalls and freezing rains throughout its long winter months. To maximize protection for critical areas of the 15-story office building now under construction against the onslaught of tracked-in snow and slush, structural engineers, Yolles Partnership Limited, Toronto, called for the use of fusion bonded epoxy coating of reinforcing steel. This was specified for vehicular ramps, loading docks, trucking areas, concrete toppings on ramp slabs, curbs, walls, bollards and the like supported on parking garage slabs and ramps. Architect for the entire project is Brisbin Brook Beynon, Toronto.

(Photo courtesy Yolles Partnership Limited)

World's Busiest Airport — After Midnight Enlarges Parking, other Facilities

Air view of airport shows construction of parking garage and additional terminal driveway capacity. The airport is a base for eleven passenger airlines and fifteen all-cargo airlines.

Night and day, the Memphis International Airport is the hub of bustling flight activity.

By night, Federal Express moves over 140 million pounds of rush packages through the airport in over 60 jet flights making Memphis International Airport the world's busiest airport after midnight. By day, the airport serves the greater Memphis area with passenger and cargo flights which contribute to the city's claim of being "America's Distribution Center."

In a $150 million step toward the future, every major part of this facility is being enlarged and improved. This includes increased capacity for its vehicle parking facility to accommodate 5,000 cars. Additional terminal driveway capacity is also being added.

In expanding the two-level parking area to a three level 13-acre facility, the architect/engineers, Barge, Waggoner, Sumner & Cannon, Memphis, specified the use of epoxy-coated reinforcing steel in beams, girders and slabs as low-cost protection against possible future corrosion problems of the embedded steel.

In keeping with the airport's growing air traffic volume, an upper level enplaning roadway was added to speed up drop off for departing passengers. The 58-foot 8-inch wide, 900-foot long elevated roadway was also constructed with epoxy-coated reinforcement.

The contractor, FlintCo, Memphis, was in full accord with the wisdom of this decision based on its own observation of the added life the epoxy-coated system gives reinforced concrete structures subjected to deicing materials and repeated freeze-thaw cycles.

With such expert planning for the future, it's no wonder the Memphis International Airport can point with pride to its record of delivering the best on-time airline flight arrival performance for 1990.

(Photos courtesy Memphis-Shelby County Airport Authority and FlintCo, General Contractors)

New elevated passenger enplaning ramp nearing completion. Epoxy-coated rebar is also used here as a protective measure.

Installing epoxy-coated rebar on the new third level of the enlarged parking facility.

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improved operational features, more fendering and railroad track crossovers to accommodate a wider range of vessels; all within the Navy's budget.

Precast U-shaped pile caps served as forms for and act integrally with the cast-in-place concrete. The unique vertical pile design resulted in the use of 40% fewer piles than a conventional battered pile system for substantial time and cost savings.

(Photos courtesy Han-Padron Associates)

"Short Course" on Fusion Bonded Epoxy-Coating

Twenty-four page report discusses the increasing need to cost reinforcement in concrete subjected to chemically aggressive environments. It stresses the importance of correct specification and quality control in the coating, handling and installation of FBEC rebar.

The report summarizes existing and proposed standards. It details the importance of rebar surface preparation and application methods of the fusion bonded epoxy coating. The report also discusses the overall high performance levels of FBECR as well as responding to certain cases where problems were encountered, such as the Florida Keys bridge and a Middle East installation.

For a complimentary copy of "FBECR - The Need for Correct Specification and Quality Control" write to Transportation and Epoxy Coating, Concrete Reinforcing Steel Institute, 933 North Plum Grove Road, Schaumburg, IL 60173-4758.

Printed in U.S.A.