

# anti-corrosion times

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

Published by CRSI—Epoxy Coating Committees 933 N. Plum Grove Road, Schaumburg, IL 60173-4758 312-517-1200

## FROM PUBLIC EYESORE TO SEASHORE BEAUTY



Before—and after (model). Credit for this dramatic transformation goes to the State Coastal Conservancy, the Montecito Community Foundation, the Santa Barbara County Art Program, local citizens—and the architect and engineer.



## Beach pathway transformed by R/C concrete stairway

You can see the problem the community of Montecito, California had with this access to a public beach. The rough, steep grade made walking difficult and dangerous—and invited graffiti.

The solution was the design and construction of a functional set of steps into a 100-foot long stairway that, in addition to accommodating a sewage pumping station and other unsightly existing utilities, fanned out as it descended making places for sitting, resting, tanning and sunset watching.

The stairway design was conceived by the architectural firm of Appleton Associates, Inc., Venice, California as a place where the man-made meets and gives way to the natural. As one approaches the beach, the clean lines and regular geometry of the steps incorporate rough sandstone boulders which are part of the native beach environment.

*continued on page 3*



View of completed heliport from an incoming helicopter. Moored near downtown Vancouver, the heliport can be moved to another location if site priorities change.

## World's 1st floating concrete heliport

### Fast-track schedule turns design into operating Heliport in just 6 months

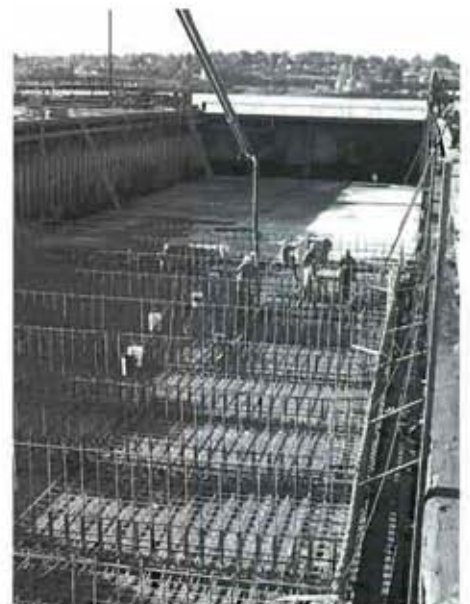
Imagine a floating concrete structure as large as a football field ready to land three helicopters—constructed from start to finish in less than half a year!

That's the record of this new facility built for the Port of Vancouver, British Columbia, Canada. The heliport is made up of three landing pads sized so they could be constructed as individual pontoons in a nearby drydock and floated out to be joined together. The resulting structure is approximately 282-feet by 108-feet with a depth of 6-feet.

The design was developed by Taylor Peach and Associates, Ltd., Vancouver. Plans called for filling the pontoons with blocks of styrofoam to insure positive flotation so that water could not accumulate in the cells. Epoxy-coated Grade 60 reinforcing steel was specified to improve the durability of the structure in this corrosive marine environment. Two hundred and ninety-five tons of epoxy-coated rebar were used. Nearly 1,500 cubic feet of 6,000 psi concrete were required.

The builder, Dillingham Construction Ltd., North Vancouver, reports that the use of

reinforced concrete in connection with styrofoam blocks for positive flotation has proven to be an economical and durable solution for such an application.



With epoxy-coated reinforcing steel in place in the sides and internal longitudinal walls, one-half of the pontoon is ready for concrete to be pumped for the base slab. (Photos courtesy Dillingham Construction Ltd.)

# Anchorage International Airport parking garage warms hearts of travelers with its efficiency



Designed for operation in a cold, harsh climate, Anchorage Airport nevertheless presents a warm, pretty picture.

## State-of-the-art facility overcomes climate and seismic challenges

The Anchorage International Airport is big time in aviation circles. It ranks second in number of revenue passengers among the nation's 36 medium-sized air traffic hubs. It's first among all U.S. airports for amount of in-transit freight.

With statistics like these, you can understand the need for a parking garage to cope with its 5-million passengers per year. Spurred by a demand to expand its parking facilities to relieve congestion and discomfort of outside winter parking, the airport authorities embarked on a \$25 million program that included design and construction of a 1,200 car parking garage.

The State Department of Transportation and Public Facilities and the airport management selected the Seattle parking and structural engineering firm of N.G. Jacobson & Associates, Inc. as the prime designer of the \$18 million garage facility. Working with McCool-McDonald of Alaska, Architects, and N.G. Jacobson & Associates, Inc., Seattle, Consulting Engineers, a dramatic and highly efficient parking structure came into being—in record time.

The final design of the four-level reinforced concrete structure included two relatively flat interior helical parking ramps instead of spiral ramps which, in Anchorage's climate, would have been inoperable during freeze cycles and ice-fog periods. Another design consideration was the garage's location in one of the highest-risk seismic zones in the Anchorage area. This required extraordinary earthquake engineering that resulted in a stiff shear wall design. Static seismic horizontal design forces used amounted to 37% gravity or 2.5 times the Zone IV Seismic Code.



Installing epoxy-coated reinforcing steel on the third level. N. G. Jacobson & Associates specialize in the design of parking structures and specify epoxy-coated rebar for parking decks; even in warmer climates like Seattle where saltwater proximity could spell future problems.

To provide maximum protection against corrosion problems that could develop from Anchorage's harsh northern winters and deicing demands, engineers at N. G. Jacobson specified epoxy-coating for all reinforcing steel in the top 3-inches of concrete in the ramps. It was also specified for beams. This meant that 30% of the 2,040 tons of reinforcing steel that went into the parking structure received this cost-effective corrosion prevention system.

The structural engineers of this *triple award-winning*\* garage went to the limit in providing lasting assurance against future problems with belt and suspenders protection. This included waterproofing decks with a membrane with rubberized asphaltic wearing surface. Unbonded post-tensioning in the girders and slabs is encapsulated in water-tight, non-conductive enclosures.

Today, Anchorage can boast of having one of America's most beautiful, practical and *protected* parking structures. And, it was constructed in just 13 months for \$16.6 million — \$1.4 million below the owner's budget. Very sharp, Anchorage!

*\*Institutional & Municipal Parking Congress Category II for Best Design Over 500 Spaces; Institutional & Municipal Parking Congress; Consulting Engineers Council of Washington.*



## Heading home to new sub base

### Huge new Kings Bay, Georgia complex gives Trident subs royal treatment

One of the largest peace-time construction projects in U.S. naval history is nearing completion. It's the Trident Atlantic Coast Strategic Submarine Base at Kings Bay, Georgia.

This newest link in America's national defense chain covers 12,000 acres and includes support facilities for one squadron of Trident ballistic missile-carrying submarines. These denizens of the deep displace 18,700 tons submerged, are 560 feet in length and are as heavy as a naval cruiser.

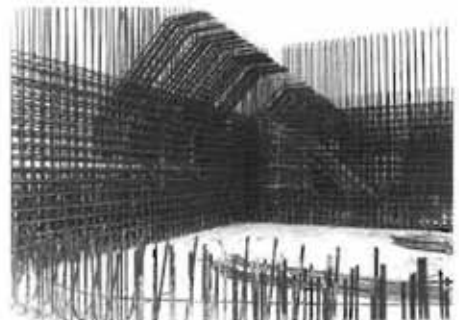
To service these submarines, a \$93.3 million 100-foot by 700-foot drydock is nearing completion. This consists of a reinforced concrete graving dock with pumping station, steel and concrete caisson closure gates.

There's a \$32.2 million 736-foot by 150-foot refit wharf consisting of a reinforced concrete deck on concrete piles. The complex also includes a \$26.8 million tender mooring facility with concrete platform for submarine tenders and four submarines.

This enormous building project used epoxy-coated reinforcing steel in critical areas to battle the threat of destructive corrosion.

(Photos courtesy Florida Steel Corporation)

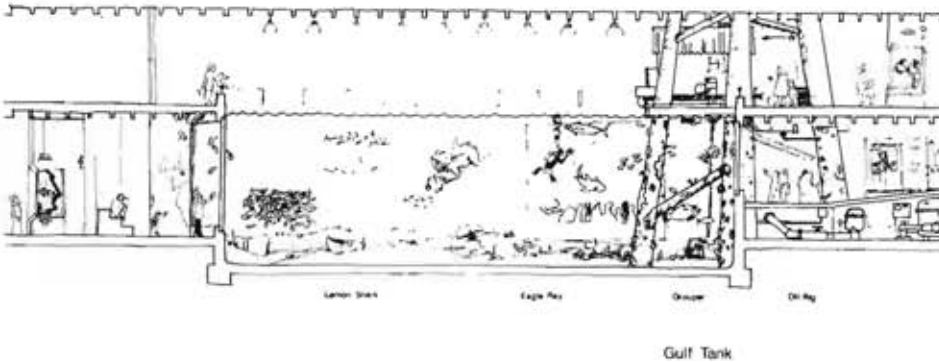
This huge lattice of reinforcing steel is part of the re-entry body complex.



# Unique new aquarium rising on New Orleans riverfront



Artist's rendering of the aquarium from the foot of New Orleans' famed Canal Street. Its location on the Mississippi River adjoining the French Quarter is another plus.



Realism in the Gulf tank is further achieved by showing the base of an oil drilling rig.

## Designers defuse corrosion threat with epoxy-coated rebar

Oceans, rivers and lakes make up the largest habitat for living things on earth. They are home for the majority of species. That's why marine life, with its endless variety of sizes, shapes and colors, has always been such an immense fascination to us.

Soon, in New Orleans, in a new world class aquarium, the mysteries of the seas, lakes and rivers will be center stage attractions. More than having just tanks of fish for viewing, the Aquarium of the Americas will communicate its message about aquatic environments largely through living, active exhibits and displays.

Planned to embrace sea life exhibits from the North Pacific waters to Cape Horn at the southern tip of South America, it will also take visitors into an Amazon River rain forest and through the Caribbean to reveal their aquatic creatures—and environments.

Unique among the world's aquariums, the New Orleans cast-in-place reinforced concrete facility will be a subjective message about the essential quality of water in the existence and operation of all living organisms. To create this illusion, visitors will gradually experience, by means of turns in the pathway into the aquarium, the

transition from dry areas on earth to imagery of raindrops and free forms of water leading into the first exhibit with sounds and light blends—the Caribbean reef world.

Moving through this \$30 million spectacular, visitors will marvel at the fish, reptiles, amphibians and underwater habitats in the Amazon River exhibit with its tropical foliage, exotic birds and butterflies. They will then be transported back to the Mississippi River with its wide variety of fish and amphibians.

With a venture as important and ambitious as this, you can be sure the designers planned for every eventuality in its construction to assure a long lifetime of rewards to the citizens of New Orleans. One important precaution they wisely exercised was the specification of epoxy-coated reinforcing steel in all walls, beams and slabs for levels up to the third floor. They were taking no chances for problems due to the highly corrosive nature of the salt water in its holding and display tanks where water temperatures range from tropical highs to near freezing. Over 100,000 tons of Grade 60 epoxy-coated rebar will go into the completed project.

The architects for the project were the Bienville Group, a joint venture. The structural engineers were Morphy, Makofsky, Mumphy, Masson, Inc., New Orleans.

## Stairway *continued from page 1*

Site-cast, conventionally reinforced 4,000 psi concrete was chosen for the project given the rough and corrosive conditions of the seacoast environment. Color was added to the concrete and then the finished surface lightly sandblasted to make the concrete harmonize with the natural boulders and sand. The structural engineer, Stephen Perlof, Los Angeles, specified that all reinforcing steel, including deformed bars, tie wires and supports, be epoxy-coated to resist corrosion.

## SAY HELLO. . .

We are going to be at these important industry meetings. . .and look forward to your visit if you plan to attend. There will be experts on hand to answer your questions about epoxy-coated reinforcing steel.

- National Association of County Engineers, Wichita; March 28-31
- International Bridge Conference, Pittsburgh; June 12-14
- Western Bridge and Engineers Conference, Coeur d'Alene, Idaho; October 2-4
- American Society of Civil Engineers, New Orleans; October 8-12



Construction gets underway with the placement of concrete for the mat foundation.

# Famed Fisherman's Wharf fights ocean threat

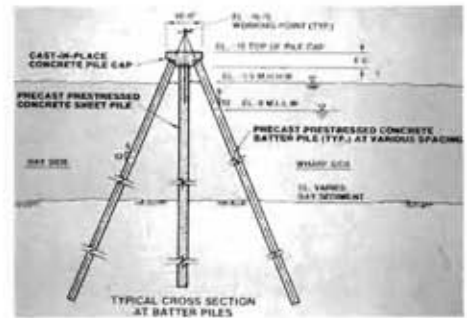


▲ Fisherman's Wharf viewed from adjacent Fort Mason. Beyond it you're looking at open sea.

▼ The husky pilecaps with their epoxy-coated reinforcing steel.



(Photos courtesy San Francisco District of the U.S. Army Corps of Engineers.)



## San Francisco beefs up harbor protection with concrete breakwater

If you've been to San Francisco, you probably have been to Fisherman's Wharf. It's one of the city's leading attractions—with a bustling fishing fleet, its noted seafood restaurants and sidewalk cafes.

Because of its location in the harbor, it was subject to continual damage from waves rolling in from the Pacific Ocean. This caused many fishing boats to leave for more protected waters; threatening the viability of Fisherman's Wharf as a valuable tourist attraction.

**Solution:** Construct a detached 1,509-foot continuous breakwater 1,200-feet offshore connecting to two piers. The job of designing this seawall and supervising its construction went to the U.S. Army Corps of Engineers, San Francisco district.

Interlocking precast prestressed concrete sheet piles were used for the project. These were supported by batter piles and capped with cast-in-place reinforced concrete. Realizing this breakwater would be subjected to continual saltwater wetting and its destructive corrosion attack, the designers specified epoxy-coating for all rebar used in the pilecaps and top 6-feet of the batter piles.

With the breakwater completed, many of the fishing boats that earlier abandoned the unprotected harbor are returning. Now there's room for berthing a 515 fishing boat fleet—sure to help return the bustling, salty atmosphere that visitors were beginning to miss at Fisherman's Wharf.

## MAJOR CONCRETE ENGINEERING CONFERENCE

CRSI is proud to be a sponsor of the National Concrete Engineering Conference to be held in Oak Brook (Chicago), Illinois on September 18-20, 1989.

This conference, sponsored by 15 associations in the concrete industry, will consist of 12 half-day sessions covering state-of-the-art information on various aspects of

concrete design directed to Civil and Structural Engineers. Topics to be covered include Concrete Bridges, Pavement Design, Slabs on Grade, High Strength Concrete, Structural Repair and Rehabilitation, Materials for Concrete, and others.

CRSI is one of the co-sponsoring Associations which include American Concrete

Pavement Association, Portland Cement Association, American Concrete Institute and National Ready Mixed Concrete Association.

For more information, contact Bud Gilley at American Concrete Institute, P.O. Box 19150, Detroit, Michigan 48219 (313) 532-2600.