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anti-corrosion times

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

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OLD, WOOD RAILROAD TRESTLE GOING THROUGH METAMORPHOSIS TO CONCRETE

Closeup showing new concrete section adjoining old, original wood span.

A 5 1/2-mile long wood trestle provides a vital short-cut rail link across Lake Ponchatrain between New Orleans and Slidell, Louisiana and points north.

The replacement of old, rotting wood piles, which number in the thousands, is an ongoing process. How to upgrade this essential rail route without interrupting frequent freight crossings was the dilemma faced by engineers of the Norfolk-Southern Railway.

Their clever solution was to construct new piers midway between old timber piers. A few ties are removed and steel pipe piling is driven 70 to 85-feet. The top 35-feet of each pile is precast concrete with epoxy-coated rebar because of the corrosive salt water environment.

The six pile concrete bent and steel bent in place ready to receive poured-in-place concrete cap.

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Here's a switch!

Creek passes *over* new Utah interstate

Salt Lake City is getting a new concrete interstate beltway to speed traffic flow. The 6-lane highway will largely be depressed to minimize sights and sounds to nearby homeowners.

Therein was the problem for the Utah Department of Transportation: What to do about a live stream in the path of the highway. Being depressed, the highway couldn't go over the stream as is usually done. This stream had to pass *over* the roadway.

The clever answer was a box flume to carry the creek at grade over the roadway. The Utah DOT's design resulted in a 355-foot long by 50-foot wide box section flume of distinctive appearance. Made up of three cells, the center cell is the only cell that carries water during low water flow. At high water stage, all three cells go into action.

The flume was constructed on grade to reduce scaffolding costs. A concrete slab was placed for use as a form. The floor of the box flume was poured on the slab. Walls were then formed and poured in place, after which the top was formed and cast. When the box flume was completed, the grade was excavated from below the structure and the concrete slab was removed. Over 191 tons of Grade 60 epoxy-coated rebar and 17 tons of plain rebar went into the flume, abutments and center pier of the handsome structure.

The Utah DOT is now specifying epoxy-coated rebar for virtually all highway structures where exposure to deicing salts can pose future maintenance problems. "The cost of epoxy-coating today is so little extra, it just makes good sense to include this protection in concrete structures," reports James W. Golden, Deputy Chief Structural Engineer, Utah DOT.

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Flume was built on grade to facilitate construction and excavated for I-70 to pass beneath it.

Indianapolis airport goes big time with major runway and parking expansion

A new concourse with 13 gates, a second 10,000-foot runway and a new 1,850 car parking garage will pay returns to this growing Indiana transportation hub well into the next century with increased capacity and efficiency.

The $17.9 million, five-level concrete garage features two helical access ramps. A unique feature is that the garage incorporates a roadway with two lanes on the third level that parallels the current upper level terminal roadway. This doubles the length of curb space for passenger use on the upper level. Three enclosed pedestrian bridges will link the third level of the garage to the second level of the terminal building.

Fink Roberts & Petrie, Indianapolis, were the structural engineers. Browning Day Mullins Dierdorf, Indianapolis, was the architect.

The garage structure includes 660-tons of epoxy-coated reinforcing steel in its 1,060 total rebar tonnage. Epoxy-coated rebar was specified for concrete in all support beams, slabs and in both helical ramps. Both top and bottom rebar in the ramps, the beams and the slabs are epoxy-coated. This extensive use of epoxy-coated reinforcing steel is valuable protection against corrosion that could be caused by Indianapolis' frigid, snow-filled winters and its effective deicing program.

(Photos courtesy Construction Digest Magazine.)

The striking modern design of the new Indianapolis airport parking structure.

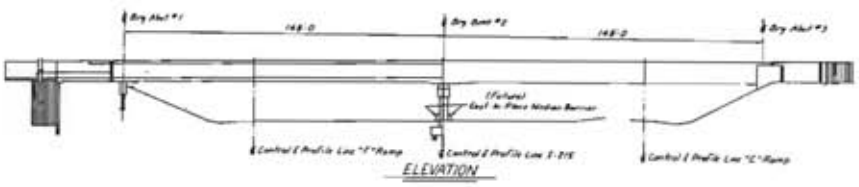
Level two of the garage with epoxy-coated rebar being placed.

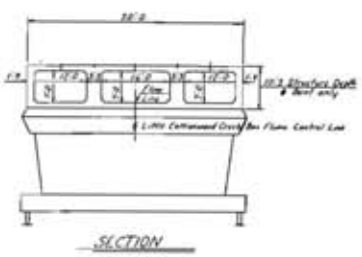
Forming the concrete columns for the 5-level structure.

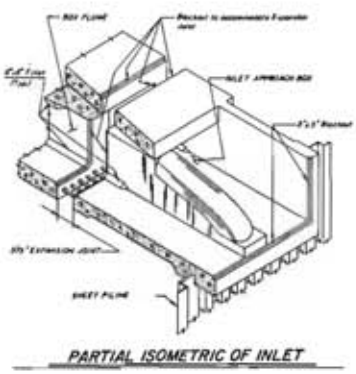
Utah Interstate - *continued from page 1*

In beautiful Utah mountainous setting, the creek sweeps over I-70.

Note the decorative concrete achieved by use of textured form liners.

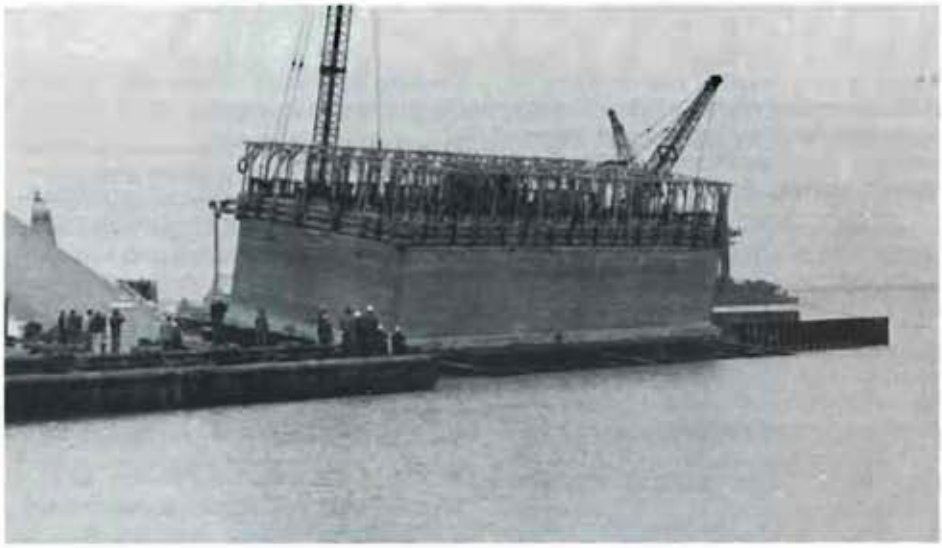




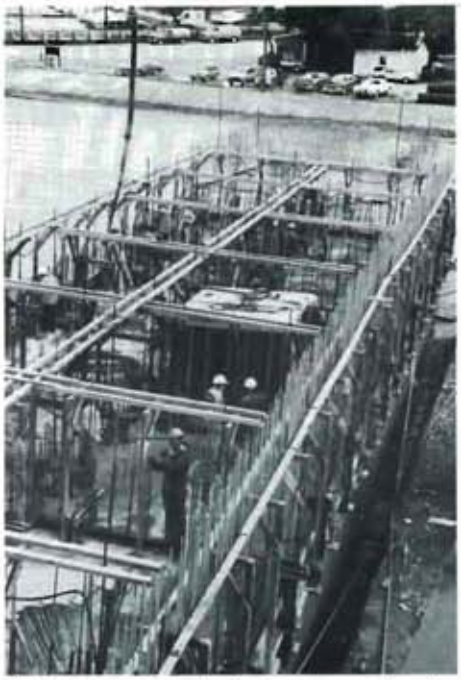


(Photos courtesy Utah DOT)

Salt shipments no corrosion threat to Canadian concrete wharf



Launching completed 900-ton concrete wharf.



Placing epoxy-coated rebar preparatory to slipforming the concrete walls.

The city of Goderich, Ontario needed a new wharf to berth large cargo vessels. Among these are ships transporting bulk salt. And, therein lies the problem: How to protect the 700-foot long concrete docking facility from the corrosive effects of salt spilled during unloading operations.

The answer was to specify epoxy coating for all reinforcing steel used in the upper sections and decks of the wharf.

Rather than build the wharf in the water where it was to be located, Public Works, Canada, Marine Division, Ottawa and the contractor, Cartier-McNamara Corp., Whitby, Ontario cleverly planned for *dry land* construction.

The concept was the same as for large ships: Build them ashore in a dry dock and then skid them into the water. To build this wharf, they carried innovation still further. They called on the modern slipform method of pouring the concrete sections. This is similar to the way concrete buildings and silos are being built today.

Forms were set around the sides of each section after reinforcing steel was in place. Concrete was then poured to one-third of the wharf height. The forms were then raised and the structure was "launched" by tipping it onto a greased slipway. It was then towed to a nearby working location where the forms were then "slipped" upward in two sequences to pour the walls to their total height.

This procedure was repeated until seven sections were ready to be towed into position and sunk to form the completed wharf. The heavy structure had to be corrosion resistant and be able to withstand buffeting from large ships and ice. This dictated reinforced concrete design with 200 tons of epoxy-coated rebar in the critical upper portion and decks where continuous exposure to destructive chlorides could otherwise spell future maintenance problems.

(Data and photos courtesy Reinforcing Steel Institute of Ontario)

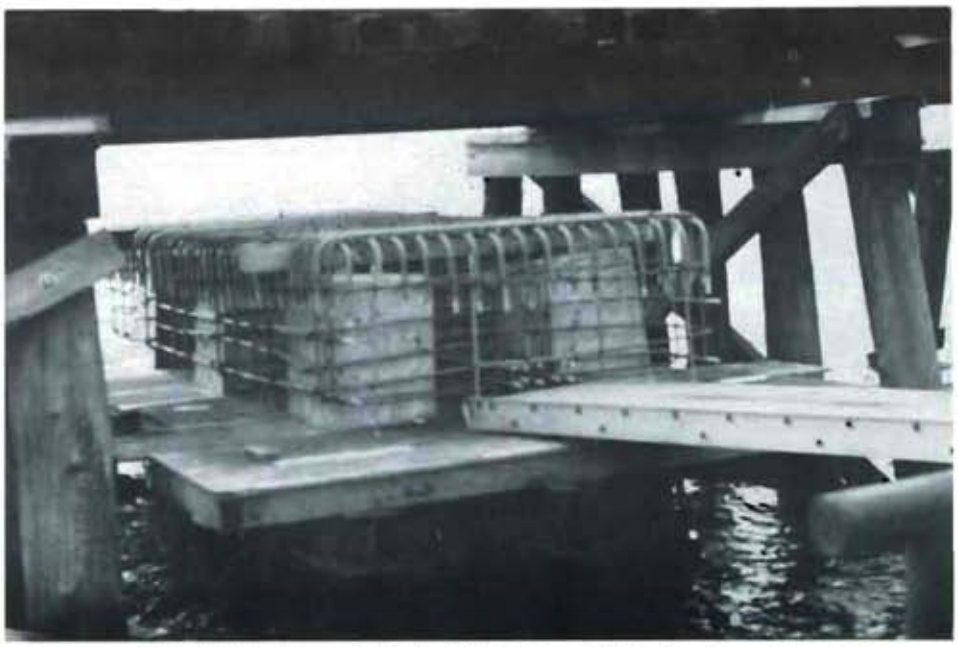
Trestle - *continued from page 1*

Epoxy-coated rebar enters picture

Because the new trestle sections are designed to provide an 80-year life expectancy, special consideration was given to prevent future corrosion problems. This includes the specification of epoxy coating for all rebar used in the cast-in-place pier caps. These caps are placed around the six-pile bents. The rugged design caps are cast around heavily reinforced rebar cages with concrete that is brought out on the trestle by ready-mix trucks carried on rail flat cars.

The old timber is then cut away and the rails, with ties still attached, are lifted up 8-inches, and a half-width precast concrete box beam is slipped underneath on each side. Rails and ties are lowered onto the beams, ballast is placed between the ties and the span is ready for traffic.

(Photos courtesy PCA and Louisiana Contractor Magazine)



Rebar cage of Grade 60 epoxy-coated steel in place ready for forming and pouring.

Parking structure built up/down for right smart time-cost savings

Rendering of Milwaukee Theatre District

There's a very unusual project rising in Milwaukee called the Milwaukee Theater District. It's a $100 million complex encompassing a 28-story office tower, 220-room hotel, theater and 2-story retail structure.

To provide convenient parking, the complex includes an 800 car four-level reinforced concrete facility constructed in a unique way. It's built upside down!

Designed by Skidmore, Owings & Merrill, the parking garage goes underground to gain valuable topside space. The general contractor, Morse/Diesel Inc., called on an innovative construction technique to do the job efficiently and economically. The technique is called the up/down construction method. Instead of excavating down the entire four levels and then starting to build up, they literally built it while proceeding downward, which also allowed them to construct upwards simultaneously.

First they excavated down 1-story and then poured a reinforced concrete slab over a pan-and-joist system. This became the first level. Earlier, concrete caissons had been sunk 100 feet. After this first slab was completed with Grade 60 epoxy-coated reinforcing steel, they tunneled under the slab to the depth required for the next level down. Then the pan and joist system was again set in place and the second slab was poured. This procedure was repeated for the four levels which go 44-feet below grade.

With Milwaukee's rugged, snowy winters, the designers wisely specified that all Grade 60 rebar in ramps and columns in the parking structure be epoxy-coated for positive, lasting protection against corrosion problems that could result from tracked in deicing salts.

Developer of the multi-use project is Trammell Crow Company, Dallas. Concrete contractor is J. H. Findorff & Son, Inc., Madison, Wisconsin.

(Photos courtesy Morse/Diesel Inc.)

While excavating goes on, epoxy-coated rebar is placed on one level (right) as downward progress starts. ▲

Epoxy-coated rebar being placed on one of the four ramp levels. ▼

Covers 11 Corrosion protective systems

Protective Systems For New Prestressed and Substructure Concrete

This 126-page report, sponsored by U.S. Department of Transportation, Federal Highway Administration, will be of interest to bridge engineers and designers of conventionally reinforced and prestressed concrete structures exposed to salts from winter deicing or from ocean marine environments.

Eleven corrosion protection systems were evaluated utilizing different concrete water/cement ratios, different clear covers over the embedded steels, epoxy-coated bars and prestressing strands, galvanized bars, conventional bars and prestressing strands, a calcium nitrite corrosion-inhibiting admixture, a silane surface sealer, a methacrylate coating for concrete, and a concrete containing a silica fume admixture. The tests involved two separate one-year long accelerated laboratory investigations which utilized realistic saltwater exposure conditions.

For a copy of this valuable addition to your library, ask for Report FHWA/RD-86/193, National Technical Information Service, Springfield, VA 22161 or contact CRSI.

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