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- Full scale testing proves design for HPC box girders
- Precast three-sided arch-h-box tunnel provides quick access for parking
- FRP composites extend service life of concrete structures
- ABCD Bridge Seminar celebrates Engineer's Week
- PCA Bridge Design Competition for engineering students
- Liners protect concrete from corrosive attack
- Design Handbook now available on CD-ROM from PCI
- Corrosion Program weighs prevention
- Owner's high cost of air: views from the editor
- Calendar of Coming Events

"Precast Concrete is durable, economical and constructable."
Full scale testing proves design for HPC box girders

Full scale static and dynamic testing proves all of the design parameters for HPC box girders, as reported in the November/December 2000 issue of *PCI Journal*.

The tests were conducted in 1998 by the University of Cincinnati in conjunction with the Ohio Department of Transportation (ODOT) on a new bridge that had been converted from a three to a single span design using adjacent type B42-48 girders.

**10 ksi concrete and 0.6" strand**
The ODOT section differs from the AASHTO standard in that it has a 5" instead of 5.5" bottom flange. Using HPC with design strengths of 8 ksi at release and 10 ksi at 56 days, with a single layer of 32 each 0.6" diameter strand, the designers were able to extend the normal span for this section from 110' to 115.5'.

**Load transfer also proven**
A secondary objective of the investigation was to check the load transfer between girders with experimental mid-depth shear keys. A total of 57 vibrating wire strain gages and 12 bonded foil strain gages were imbedded inside the girders. Testing of prototype girders confirmed cracking, ultimate loads, and losses, were within standards.

Erection, installation of ties and grouting of the keyways was conducted in a typical two phase sequence to maintain traffic over half of the existing and the new bridges.
Precast three-sided arch-box tunnel provides quick access for parking

Precast concrete three-sided arch-box sections are credited with increasing head room and saving construction time on a new tunnel which provides access to new parking areas at the Buffalo Niagara International Airport in Buffalo, NY. All of the 27 sections were set in one day for the 160' long tunnel which was opened on September 1st of last year.

The units provide a 36’ clear inside dimension which allows for a 24’ roadway and 6’ sidewalks. They sit on 3’ high pedestal walls to provide 14’ clear height from the roadway. They are patented and marketed under the name of Con/Span.

The alternate design for precast was submitted and accepted after bids were received for a cast-in-place design. The three-sided sections were designed for H20 loadings. Earth fill on top of the sections supports the roadway. The arch sections react with the surrounding soil permitting longer spans with a relatively thin section.

The owner for this project was The Niagara Frontier Transportation Authority. The engineer was TVGA Engineering & Surveying and the contractor was DiPizio Construction. The precast supplier was BridgeTek New York. Riefler Concrete cast the Con Span sections at their plant in Hamburg, NY.
Fiber reinforced polymer (FRP) composites which have been used for years in the aerospace industry, are now being used to extend the service life of concrete structures. Several research projects using FRP on NYSDOT bridges were reported at the ABCD Bridge Seminar in Albany, on February 13th.

**Flexure, shear and confinement**
FRP's can be used for flexural, shear, and confinement reinforcing on the exterior of distressed concrete members. A wet layup technique is normally used for installation of FRP reinforcing. After restoring the surface of the concrete, a primer is rolled on followed by application of an epoxy putty filler. The first layer of resin is then rolled on followed by installation of the FRP fabric, and a second layer of resin. The process for installation of the fabric can be repeated to develop the required level of reinforcing and is known as the wet layup process.

The fabrics can be made with carbon fibers, E-glass fibers, and Aramid fibers. Systems will generally achieve sufficient cure for loading within 24 hours depending on the temperature.

More information on the testing and evaluation of FRP systems by NYSDOT can be obtained by calling 518-457-5826.
ABCD Bridge Seminar celebrates Engineer's Week

Over 100 attended a half day ABCD Bridge Seminar to celebrate Engineer's Week held at the Marriot Hotel in Albany on February 13th.

Speakers included Sreenivas Alampalli from the Research Division at NYSDOT; Tim Beach, Vice President of Con/Span Bridge Systems in Dayton Ohio; and Pat Loftus, President of High Steel Structures.

An overview of several recent and ongoing research projects by NYSDOT was provided by Alampalli. Tim Beach described the advantages of using rigid frame and arch type bridge systems.

Pat Loftus reported on a tour of "state of the art" steel fabrication plants in Japan and Europe, that was conducted in 1999. Of particular note was the automated welding procedures, and differences in code standards. Adoption of ISO 9000 QA/QC standards are common.
PCA Bridge Design Competition for engineering students

The first Bridge Design Awards Competition for engineering students in the US or Canada has been announced by the Portland Cement Association, (PCA).

Entries must include drawings and supporting calculations for a 450' crossing that meets certain design criteria. The number of spans and type of superstructure, are the designer's choice.

The purpose of the competition is to recognize excellence in design using LFRD Bridge Design Specifications. Three awards of excellence and cash prizes of $2,500 will be made. For further information contact Shri Bhide at the PCA at shri_bhide@portcement.org.
Liners protect concrete from corrosive attack

Concrete Protective Liners, CPL’s protect drainage structures from corrosive attach by chemical, biological and environmental conditions. According to a recent paper by William R. Tone from Valrico, FL it is possible to add 100+ years to the design life of drainage structures by covering critical areas within a CPL.

The standard thickness CPL used for lining manholes is 2-3 mm. CPL's are defined as an extruded thermoplastic sheet liner with integral anchors which are extruded as one with the liner during the manufacturing process. High Density Polyethylene (HDPE) or Polypropylene Random Co Polymer (PPR) are normally used with municipal waste water applications.

**MICC from sulfuric acid attack**

Microbially Induced concrete corrosion (MICC) occurs when sulfuric acid, generated by raw sewage, reacts with cementitious material in the concrete. Depending on details of the system including factors such as height of the water table and turbulence in the sewage flow, or in areas near a lift station, use of CPL may be warranted. Drying out of a system can increase the problems with MICC, so that as more water infiltration is eliminated, more acid is produced with the system. Some experts estimate 10% of all manholes in New York State are vulnerable to corrosive attack.

Key concerns in specifying CPL include selecting the correct material that will, resist the anticipated corrosive attack, handle expected or unexpected back pressure, and resist abrasion. The CPL should also have high impact strength at low temperatures and be non toxic. Requiring manufactured certified installation of the CPL is also critical to success. Special attention should be paid to the welding and testing requirements.

Contact the following for more information regarding CPL systems and installation;

**Agru Sure Grip Liners**  
The James Co 203-453-2202  
Jefferson Concrete 315-788-4171

**Corr-Tite Liners**  
Resicon USA 603-938-6223 (on the web [www.resiconusa.com](http://www.resiconusa.com))

are available to university students as part of the free distribution program of PCI. For more information on the program and how to obtain the books contact Paul Johal at PCI at 312-360-3213.
Design Handbook now available on CD-ROM from PCI

The *PCI Design Handbook*, MNL-120-99, Fifth Edition is now available on CD-ROM from *PCI*. The electronic version includes the print edition’s greatly improved, enlarged and updated design information for both prestressed and non-prestressed structural and architectural precast concrete products.

The 690 page CD-ROM handbook is fully searchable and printable, and includes;

- Forty references
- The *PCI Hollowcore Manual*
- The *PCI Tolerance Manual*

The electronic edition is one CD-ROM and requires Windows 95 or later and either Internet Explorer or Netscape. The handbook is available at a cost of $25.00 per copy plus shipping and handling. To order a copy or for more information contact *PCI* at 312-786-0353.
Corrosion Program weighs prevention

LIFE-365 is a software program that compares life-cycle costs of corrosion protection systems for concrete structures. It was developed in hopes that it will be accepted by ACI as an industry standard. It can be obtained free of charge by contacting Master Builders at 216-831-5500, Grace Construction Products at 617-498-4493 of the Silica Fume Association at 440-834-1697.
Owner's high cost of air: views from the editor

Given the problems precasters and contractors have with controlling air in concrete, an article "Get the Air Out", by Suprenant and Malisch in the October issue of The Concrete Producer caught our attention. Many owners think air is free and essential regardless of exposure.

Field surveys and lab tests show however, that non-air-entrained concrete with a low water-cement ratio, performs quite well in exposure conditions such as beams, columns, and walls, that are not saturated prior to freeze thaw cycles or direct application of deicing salts. For example, the Illinois Tollway built 50 bridges back in 1957 and 1958 with prestressed girders cast with non-air-entrained concrete. The girders has a 4000 psi release and 5000 psi 28 day compressive strength. Twenty of those bridges were visually inspected 25 years later, and the durability of the girders was found to be excellent. Some had already received new decks to replace the original decks that had failed.

PCA funded tests in 1960 and 1978 on moist-cured and steam-cured concrete with low water-cement ratios, showed that non-air entrained concretes were very frost resistant even though the air-void spacing factor was found to be 0.02". Apparently, the usual requirements for air-void systems do not apply due to the reduced freezable water content and to the increased tensile strength of high quality concretes. The results can be significant for products such as bridge members, certain garage members, wall panels and sound walls. Marginally low air tests, should not be grounds for arbitrary rejection of product. It only adds to the owner's high cost of air.
Calendar of Coming Events

February 22, PCANY Annual Meeting, (8:30 AM - 3:00 PM)
Turf Inn, Albany, NY
Accommodations: 518-458-7250

February 27 - March 2, World of Concrete Exhibits and Seminars
Las Vegas, NV
Info: 800-837-0870 ext. 2653
e-mail woc@hanleywood.com

PCI Digital Information Sharing Workshop
Westin Atlanta Airport Hotel
Info: 312-786-0300 Room Reservations: 404-762-7676

ACI Spring Meeting
Philadelphia Marriott Hotel, Philadelphia, PA
Info: 248-848-3795 Room Reservations: 800-320-5744

PCI Committee Days
Holiday Inn Mart Plaza, Chicago, IL
Info: 312-786-0300 Room Reservations: 312-836-9142