THE AGGREGATE

2nd Quarter 2010

The International Concrete Repair Institute • Baltimore/Washington DC Chapter
www.icribwchapter.org

IN THIS ISSUE

CHAPTER OFFICERS

Preservation of Stone Masonry Aqueducts On the Chesapeake and Ohio Canal - Part One

By Denis J. McMullan, P.E. & Douglas E. Bond, P.E.

History of C&O Canal Aqueducts

The Chesapeake and Ohio Canal (C&O Canal), extending from Washington, DC to Cumberland, Maryland, is one of the most popular parks in the National Park System. Each year thousands of park visitors use the park's towpath to bike, hike, jog, and ride or otherwise use this park. But the use of this park is very dependent on towpath continuity. And towpath continuity is dependent on maintaining and rehabilitating the twelve aqueducts along the canal. Collapse of one or more of these historic aqueducts would severe the canal's towpath and would greatly limit the public's enjoyment of this park. This fact had led to intensive efforts to preserve and rehabilitate *see Preservation - page 6*

Meridian Hill Park – Washington, DC

National Park Service - Historic Concrete Repair

Project Profile

Meridian Hill Park is located between 15th & 16th street in NW Washington, DC and is part of the Rock Creek Park system. It consist of large upper park with a mall, a lodge trellis sitting area and a broad terrace overlooking the lower park and a lower water cascade of linked basins, symmetric stairways and a large reflecting pool surrounded by a plaza. The concrete elements at the park were constructed from 1912 through 1936 using cutting edge finishing techniques for the period. The National Park service took control of the park in 1933 and has managed it ever since. *see Meridian Hill - page 11*

ICRI-BW CHAPTER CONTINUING EDUCATION SCHOLARSHIP PROGRAM

The Baltimore-Washington DC Chapter is proud to announce the 2010 Scholarship Program! We are currently accepting applications. Applications are to be received or postmarked by ***June 4, 2010***. One of the scholarships awarded will be dedicated to an applicant that is in the concrete repair industry.

Please visit our website, www.icribwchapter.org, for more information and to download the application!

If you have any questions, please contact Patrick O'Malley, 410-298-2669

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Providing a Clear Egress

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ICRI MISSION STATEMENT

The mission of the International Concrete Repair Institute is to be a leading resource for education and information to improve the quality of repair, restoration, and protection of concrete and other structures in accordance with consensus criteria.
ICRI is an organization composed of Engineers, Consultants, Contractors, Manufacturers and other Material Suppliers, Property Managers and Owners all working together for the betterment of the industry and of all involved. Providing an open forum to speak about our work, new technologies and methods, exchange ideas.
Creating and following standards to produce the best results for all involved.

PRESIDENT'S MESSAGE

Happy spring to all ICRI Baltimore Washington DC Chapter members! The wonderful spring weather we had in the past several weeks is a welcome change to the cold and snow that we experienced this winter. Hopefully this change in weather and the upbeat outlook on the economy will bring more work to our industry this spring.

As most of you know, our February dinner meeting was rescheduled due to one of the several large snow storms that hit the Baltimore-Washington DC area. However, we had over 110 attendees for the rescheduled ICRI/ACI joint dinner meeting held on March 4th. This was an astonishing turnout. Thank you to all that attended. The speaker, Mr. Andrew Michlus from Freyssinet, spoke about inspection and repairs to post tensioned concrete.

The next ICRI Baltimore-Washington DC Chapter dinner meeting will be held on Thursday May 6, 2010. It is our pleasure to have Peter Craig and Monica Rourke, two former ICRI National Presidents, present on moisture related problems with concrete floors. This same program was very well attended in other parts of the country and our board has worked diligently to bring this program to our chapter. I invite you to bring other contractors, engineers, material suppliers or owners from our industry that may be interested in this topic. We are always excited to have new members join our chapter and we hope that our dinner meetings will allow members to increase their knowledge, network with others and grow professionally.

The ICRI 2010 Spring Convention is scheduled for April 14-16, 2010 in Myrtle Beach. The convention theme is Aesthetics in Concrete Repair. Our chapter typically has a great turnout at the conventions; I hope that this convention will be no exception. Registration information for the convention can be found in this issue of the Aggregate.

Several of our very successful chapter programs are getting ready to kick off with the start of spring and summer. The first is the Baltimore-Washington DC Chapter Scholarship Program. Our chapter provides multiple scholarships to ICRI BW Chapter members and their families for educational purposes every year. Interested members can contact Pat O'Malley (pomalley@c-p-rinc.com) or see the information contained in this issue of the aggregate. Another upcoming program is the Baltimore-Washington DC Chapter Local Outstanding Project Awards program. Oscar Valenzuela will be coordinating this effort in 2010. Application information will be sent out in early summer to all of the chapter members. The top three projects will be featured at our November dinner meeting. Last but not least, our community outreach committee is lining up several projects for this year at Carver Vo-Tech and Habitat for Humanity of Garrett County. Information on how you can volunteer and help these causes will be presented at our May dinner meeting.

Our board is always looking for members to get more involved with our chapter activities. We are interested to hear your ideas on how to make this chapter better. Please feel free to contact me at mnachman@tadjerco.com with your ideas or if you would like to become more involved with the chapter activities. As always, all information related to our chapter can be found at www.icribwchapter.org.

Matt Nachman
Tadher-Cohen-Edelson Associates, Inc.

Thursday, May 6, 2010
Holiday Inn College Park
10000 Baltimore Blvd.
College Park, MD
301-345-6700

Exit 25 (Baltimore Blvd. North US 1) off Beltway, Hotel on Left

Advance Reservations by 04-29-10:	$40
After 04-29-10:	$50

4:00	Board Meeting
5:30	Social Hour
6:30	Dinner & Presentation

Our Featured Speakers

Peter Craig
Concrete Constructives

Monica Rourke
Dryworks, Inc

Monica Rourke is the owner and President of *Dry Works, Inc.*, providing contracting and materials consulting for moisture control, testing, and leak repair of concrete structures. She has concentrated her efforts on material consulting and contracting services as it relates to moisture mitigation and leak repair. She currently participates in several collaborative ventures including professional services with government agencies and private firms either as a consultant, instructor, or seminar speaker. Monica has given numerous presentations on pavement preservation, leak repair technologies, review of successful case histories and product analysis covering concrete moisture mitigation projects. She currently serves on the ICRI National Board of Directors; she is the Current Chair of the ICRI National Committee on Certification; and she is the National Chairperson of the ICRI Administration & Technical Committees.

Peter A. Craig is a Concrete Floor Specialist with *Concrete Constructives.* He has over 37 years experience as concrete construction and repair specialist. In addition to providing consulting and quality assurance services for specialized aspects of concrete construction, maintenance, repair & protection, he is an instructor for ICRI Concrete Moisture Testing Certification Program; He works with the American Society for Testing & Materials (ASTM); the American Concrete Institute (ACI); and Construction Specifications Institute (CSI). He has eleven nationally published articles and 5 videos. He has been a guest speaker at over 100 technical conferences and meetings for the past 15 years. He is a 2008-2009 Contributing Editor for Concrete Surfaces Magazine.

ICRI-BWC IS PROUD TO PRESENT OUR MEETING SPONSOR:

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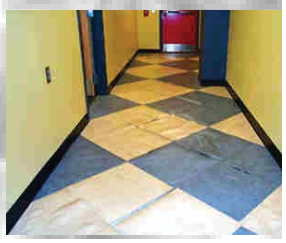
Case studies will be presented!



REGISTRATION DEADLINE IS **April 29, 2010** NO-SHOWS WILL BE BILLED

Please email (pomalley@c-p-rinc.com) or print this page and fax to ***Pat O'Malley***, Secretary, at 410-298-4086 no later than April 29, 2010. Checks to ICRI BWC may be turned in at the meeting or mailed with your form to:

Pat O'Malley, Secretary
ICRI BW Chapter
c/o Concrete Protection & Restoration, Inc.
6737 Dogwood Road
Baltimore, MD 21207

You may also register and pay online at

www.ICRIBWChapter.org

Name: _____
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Guest Names: _____
_____
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2010 CHAPTER SPONSORS

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2010 ICRI-BWC MEMBERSHIP & SPONSORSHIP

ICRI-BWC NEEDS YOUR HELP!

We have a great year ahead of us and need your help to make it happen!

To this end, the Board of Directors of the Baltimore/Washington, DC Chapter is pleased to present a new and expanded sponsorship program for the chapter. This plan will afford increased exposure for the companies to our membership and, in addition, provide an additional revenue source to expand and enhance the member service program of our chapter.

BENEFITS OF MEMBERSHIP

- Industry Recognition
- Peer Networking
- Concrete Repair Bulletin and the Aggregate
- Technical Support
- Discounted Pricing

These are just some of the reasons for becoming a member of ICRI and the Baltimore/Washington, DC Chapter!

BECOME A SPONSOR!

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VISIT OUR WEBSITE FOR MORE INFORMATION!

WWW.ICRIBWCHAPTER.ORG

Preservation

these 175-year old structures.

Construction of the 185 mile long Chesapeake and Ohio Canal began in 1828 in Georgetown, District of Columbia, and was intended to reach the Ohio River but was never completed beyond Cumberland, Maryland. The C&O Canal system included eleven stone aqueducts and one timber trough aqueduct, designed to carry the canal and boats across the major river tributaries that drain into the Potomac River along the canal's route.

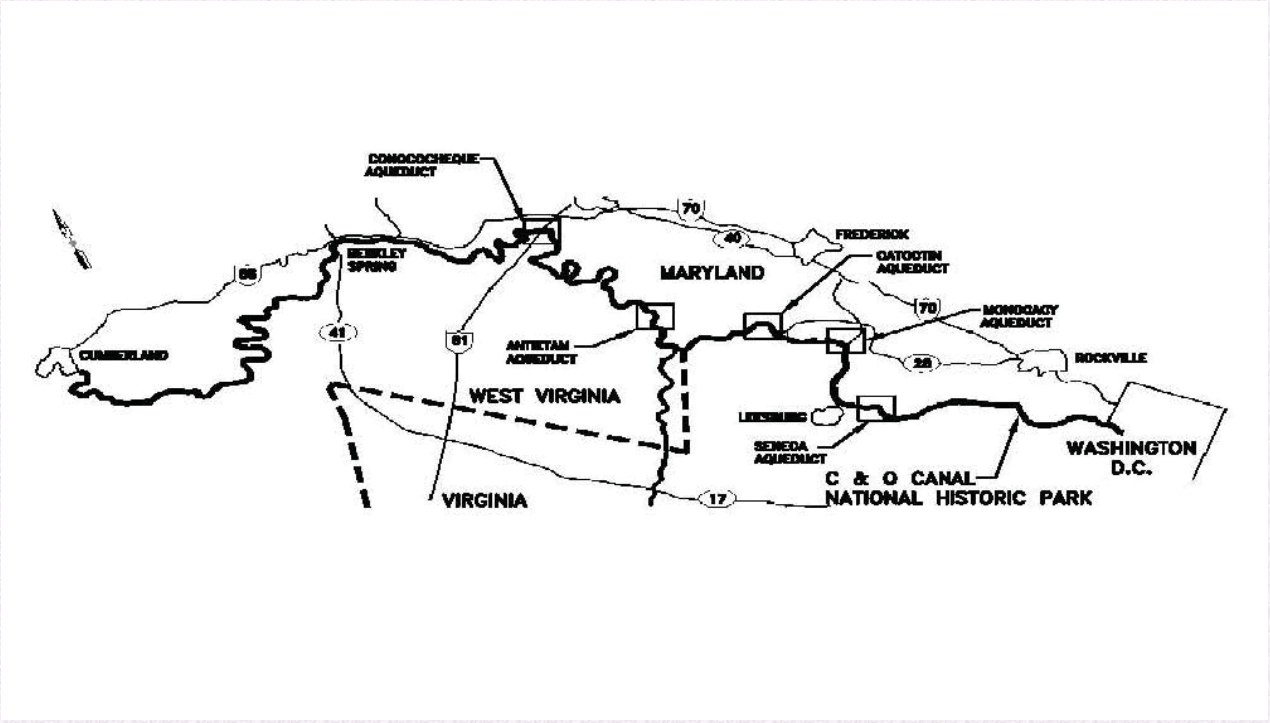

Figure 1 - Map of C & O Canal

The C&O Canal depended on the Potomac River for its water supply which was both an advantage and a liability since the Potomac River is prone to severe flooding. The need to keep the level of the canal close to the level of the Potomac River and to keep the river tributaries navigable required careful attention to elevations and forced the designers to minimize the depth of the arch structures.

The Seneca Creek Aqueduct, designed by C&O Canal chief engineer Benjamin Wright, was the first aqueduct to be built on the canal. Construction commenced on November 27, 1828 and was completed in 1832. The aqueduct was a three-equal span segmented circular arch design. Each span was thirty three feet with a rise of seven feet and eight inches. The west arch collapsed during a heavy flood in 1971 after which the National Park Service stabilized the structure by installing temporary steel beams across the missing span[1].

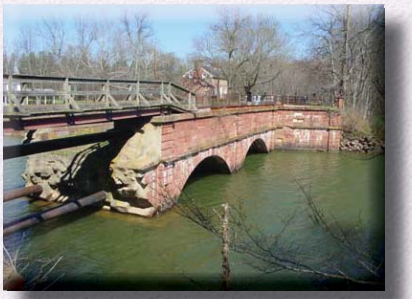

Figure 2 - The Seneca Aqueduct

The Monocacy Aqueduct was the second and largest of the eleven aqueducts erected along the canal. Also designed by Benjamin Wright it is often described by many historians as one of the finest canal features in the United States. This aqueduct is considered an icon of early American civil engineering. Its construction was begun in 1829 and was completed four years later in 1833. The aqueduct has six piers, two abutments, and seven, fifty-four foot arches, each with a rise of nine feet. The length of this aqueduct is 438 feet, and the total length of the structure including abutments is 516 feet. [8]

Figure 3 - The Monocacy Aqueduct with steel bracing and flood debris

The Monocacy Aqueduct is sited at the mouth of the Monocacy River adjacent to the Potomac River. The aqueduct is frequently flooded, and is subjected to impact from debris that is washed against the structure on its upstream side. The National Park 4 Service (NPS) had long been concerned about the structural stability of the aqueduct, and following the 1972 Hurricane Agnes flood, the Federal Highway Administration designed and installed internal grouted rods in the arch barrel and an external steel and wood banding system to temporarily stabilize the structure.

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Figure 4 - Completed stabilization of the Monocacy Aqueduct

In June 1998, the National Trust for Historic Preservation identified the Monocacy Aqueduct as one of the eleven most endangered historic structures in the United States. This led to a major construction effort in 2003/2004 which stabilized the aqueduct and enabled the obtrusive external steel banding to be removed.

Aqueduct number three is located at the Catoctin Creek and was constructed from 1832 to 1834. The stone masonry aqueduct was ninety two feet long between abutments and had three arches. The center arch was elliptical in form with a fourty-foot span and ten-foot rise. Elliptical arches are rare among aqueducts. There are only four elliptical arches out of twenty two arches on the C&O Canal. They were most likely utilized to provide larger hydraulic opening but also possibly for aesthetic reasons. The two side arches were semicircular with a twenty-foot span and a ten-foot rise. The center elliptical arch 5 had a pronounced sag as early as the 1940's and probably earlier. The arch continued to sag until October 31, 1973 when it fell during a local flood and caused the consequent collapse of the west arch. The remaining east arch, wing walls, and east and west abutments remained standing but are vulnerable to further deterioration. [9]

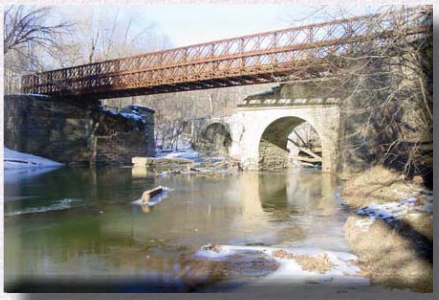

Figure 5 - The Catoctin Aqueduct

Figure 6 - The Antietam Aqueduct

Aqueduct number four is located at the mouth of the Antietam Creek. Built in 1834 it is 140 feet long and has three elliptical arches. The parapet walls were partially destroyed during the Civil War and then repaired in-kind. [5] The towpath parapet wall has deteriorated over the last several years with many displaced stones. Efforts are underway by the NPS to stabilize the structure.

The fifth aqueduct to be built by the C&O Canal Company was the three span Conococheaque Creek aqueduct. This aqueduct was also damaged during the Civil War with both Union and Confederate troops attempting to unsuccessfully destroy it. In the spring of 1865, the berm or upstream side of the aqueduct fell into the Conococheaque Creek, briefly halting travel on the Canal. The cause of the collapse was believed to be the cumulative result of freezing and thawing coupled with the effect of damage 6 during the Civil War. The wall was soon fixed, with a "wooden trunk", which was subsequently rebuilt with stone in 1870.

Figure 7 - Wooden Wall Repairs at the Conocheague Aqueduct

Figure 8 - The Conococheaque Aqueduct

In 1920, this rebuilt stone parapet also collapsed and was replaced with a wood sheet wall supported on cantilevered timber beams set into concrete on the prism floor, which only lasted a few more years.

The arches of the remaining aqueducts, 6 through 11, are mostly intact although one is supported by steel bracing. The loss of the berm parapet and spandrel wall was a common failure for the C&O canal aqueducts. Of the 11 stone aqueducts, seven no longer have the berm parapet and upstream spandrel wall.

Disastrous floods and storms have been a part of the history of the C&O Canal since its very inception. During some storms, such as the giant flood of 1889, the Potomac River crested at 44 feet above the low-water mark, which would have overtopped all aqueducts in the area. Damage from flooding in 1924 caused the abandonment of the canal which by then was owned by the Baltimore and Ohio (B&O) Railroad.

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Construction / Technology

The designers of the C&O Canal aqueducts faced the challenges of building durable, watertight structures that would provide adequate clearances over the Potomac's major tributaries and yet maintain an elevation for the canal that could use gravity feed from the Potomac River. The structures would need to be robust enough to withstand frequent flooding from the Potomac River together with often severe winters and the associated internal expansive forces from ice build up.

Figure 9 - McMullan & Associates' Engineer checking ice on arch soffit of the Monocacy Aqueduct

The foundations needed to withstand scouring forces from the river and be rigid enough to prevent settlement of the piers and abutments.

Soil borings have indicated that the piers and abutments were usually founded on relatively solid rock that was close to the surface. Underwater investigations have generally revealed little to moderate erosion of the rock at the interface with the foundation stones. This is supported by very few instances of significant settlement problems. The only known significant foundation problem occurred at the west pier of the Catoctin Aqueduct.

Stone for most of the aqueducts was obtained locally but in some instances stone was obtained a considerable distance from the aqueduct. For example, granitite for the Catoctin Aqueduct was transported by the B&O Railroad from Ellicott Mills Quarry near Baltimore. The Antietam Aqueduct is constructed of Tomstown Dolomite from a quarry three quarters of a mile to the east; the Conococheague Aqueduct uses limestone cut from a quarry three miles away.

The quality of local stone was often a matter of dispute. The initial construction of the piers for the Monocacy Aqueduct used stone from Nelson's Quarry located at nearby Sugar Loaf Mountain, four miles east of the aqueduct. However this stone turned out to be of such poor quality that the contractor was forced to dismantle the first three piers and rebuild them using a harder quartzite stone from Johnson's Quarry approximately halfway between the aqueduct and Nelson's quarry. [4]

The discovery and use of natural cement, also known as "hydraulic cement", that sets under water made the construction of shallow watertight arch structures feasible on the C&O Canal. 9

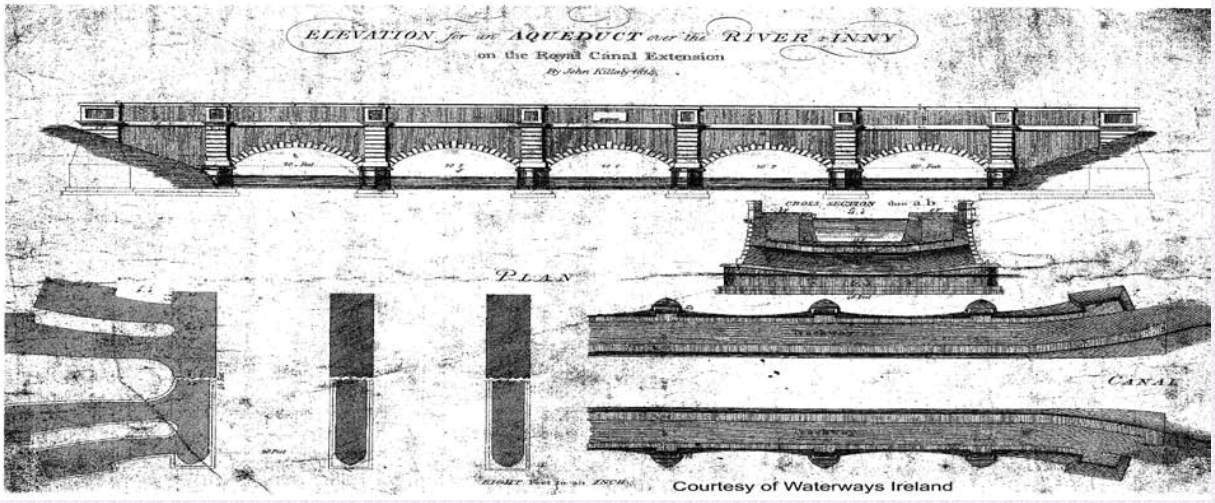

Figure 10 - Greater heights of spandrel walls at the Aqueduct over the River Inny, Ireland

Other earlier canals relied on a thick clay layer between the prism floor and the top of the arch barrel for waterproofing. This resulted in a greater height of spandrel wall between the top of the arch and the water table and short span heavy structures, such as the five span aqueduct, over the River Inny (ca 1700's), on the Royal Canal Extension in Ireland.

Natural cement is made from naturally occurring limestone with appropriate argillaceous properties. It was therefore important for the early C&O engineers to find suitable limestone on the Potomac Valley. They conducted field testing of local limestone deposits to identify good candidates for the production of natural cements. Botelor's Mill, located immediately south of Shephardstown, was the first natural cement mill built in the Potomac Valley. It provided natural cement to the Monocacy Aqueduct and numerous other structures along the C&O Canal. After completion of the canal

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this industry continued. Eleven cement mills were eventually constructed to produce the large quantities of natural cement needed. The Round Top Cement Mill west of Hancock, Maryland was one of the largest. [3]

Once the foundation stones had been laid, most likely inside timber cofferdams, the piers and abutments were brought up in rough cut stone faced with solid cut stone to the springline. Above the springline, the finish of the exterior stones was a higher quality. The solid cut stone in the piers stopped at the intersection of the extrados of the arches. The triangular volume between the adjacent arches was filled with mortared stone fill 10 as can be seen in the exposed pier at the Conococheague Aqueduct.

Figure 11 - Interior mortared stone fill at the Conococheaque Aqueduct

The arch geometry was formed in wood planking on timber centering that was removed upon completion of the structure.

Aqueduct Arch Dimensions			
Aqueduct	Span	Rise	Rise to Span
Seneca	33	8	1 : 4.1
Monocacy	54	9	1 : 6
Catoctin (Left/Right)	20	10	1 : 2
Catoctin (Center)	40	10	1 : 4
Antietam (Left/Right)	28	7	1 : 4
Antietam (Center)	40	7	1 : 5.7
Conocheague	60	15	1 : 4
Licking Creek	70	14	1 : 5
Tonoloway Creek	80	20	1 : 4
Sideling Hill	70	12	1 : 5.8
Fifteen Mile	50	12	1 : 4.2
Town Creek	60	15	1 : 4
Evitts Creek	70	14	1 : 5

Figure 12 - The Aqueduct Rise/Span Ratios

The semicircular arch that occurs in a few locations on the C&O Canal, with a rise to span ratio of 1:2 is the strongest shape of the arches used. However, this form results in short spans with numerous and expensive piers. The segmental circular arch was very commonly used on the C&O Canal with rise to span ratios varying from 1:4 to 1:6 for the Tonoloway Aqueduct and the Monocacy Aqueduct respectively. This shape provided a more efficient use of materials, longer spans, and sufficient hydraulic openings for high water conditions. In a few locations, namely at the Antietam and the Catoctin Aqueducts, elliptical arches were employed.

A lot of attention was paid to the detailing of the ring stones (voussiers) and the keystones. At the Catoctin Aqueduct the ringstones have a margin around the four sides and a raised rock face finish. Voussiers varied in height with the maximum at the springline and tapering to a minimum at the crown. This was applied even to the smaller circular arches on the Catoctin Aqueduct.

After the arch barrel was laid the spandrel walls were constructed on the voussiers in a repetitive ashlar pattern. Spandrel stones were twelve inches to eighteen inches in depth with a regular pattern of header stones roughly four feet deep tying the spandrel stones to the stone fill.

The stone fill often referred to as “rubble fill” was actually carefully laid up large and small stones with mortared joints. After a section was laid for the day, hydraulic cement grout was poured into any small voids or holes left in the fill.

Once the stone fill and the spandrel walls had reached the height of the bottom of the prism, a decorative water table stone was set in the spandrel walls. The interior wall face stones of the towpath and berm parapets were started on the mortared stone fill and each of the four walls was carried up another six to seven feet to provide parapets that contained the waterway. The same mortared stone fill was used between the parapet walls. This was then covered by large twelve inch thick coping stones, usually six feet by three feet, that cantilevered six to ten inches over the spandrel wall.

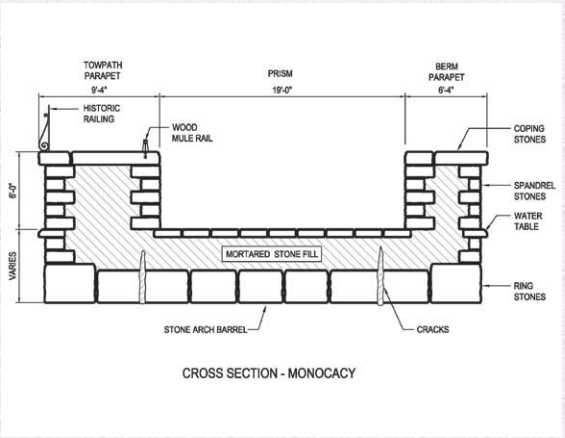

Figure 13 - Cross section of the Monocacy Aqueduct

A decorative wrought iron railing was installed on the towpath parapet along the river side and a wooden mule guide rail installed on the canal side. Timber rub rails were also installed on the inside face of the towpath walls to protect the boats.

Although the builders made every effort to ensure a water tight structure, it was a very difficult task. The aqueduct prisms constantly leaked. On the C & O Canal several different methods of waterproofing

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were tried. At the Conococheague Aqueduct, the prism floor was overlaid with hard burnt brick laid on one edge on a bed of mortar one inch deep. Cement grout was then poured over the bricks to fill any gaps and provide an additional layer of protection. [6] On the Monocacy Aqueduct, the photographic and other historic documents strongly suggests that two inch wood planking was used. At the Catoctin Aqueduct, there is a two inch deep and one inch wide slot on the inside face of the parapet walls at the prism floor elevation suggesting that wood planking was also used here as a waterproof barrier.

After a collapse of the Catoctin Aqueduct berm parapet, and during the rebuilding effort, Chief Engineer Fisk in 1838 decided to use a new product "American Cement" patented by Thomas C. Coyle. Nine hundred and twenty four barrels of this cement were used in the reconstruction. This product contained resin and tar, and must have been applied hot as there were costs for the kettles noted. [10] Test pits in the prism revealed a layer of this 'resin cement' at the floor level.

In some locations, deteriorated stone masonry was replaced with Portland-Cement based concrete. At the Monocacy Aqueduct, a section of the berm parapet was rebuilt with concrete.

Concrete was also used to fill voids and cracks. There was one crack in the arch barrel under the berm parapet at the Monocacy Aqueduct that appears to have been filled from above, probably by removing a section of the berm and pouring the concrete into the open crack. Concrete was also used to repair voids or deteriorated foundations as occurred at Pier #6 at the Monocacy Aqueduct.

To limit displacement of the coping stones, iron cramps were inserted into recesses in the surfaces of the coping stones to tie the stones together. At the Monocacy Aqueduct, in addition to the iron cramps, diamond shaped iron pins between the coping stones were used to limit differential lateral movements of the coping stones.

Figure 14 Iron cramps between coping stones at the Monocacy Aqueduct

This ends Part One. Look for Part Two in the 3rd Quarter Aggregate!

References:

[1].Fields, Thomas E. *Historic Structures Report Seneca Creek Aqueduct and Lock 24 (Riley's Lock),*

Chesapeake and Ohio Canal National Historical Park, 1979

[2].Hahn, Thomas F. *Tow Path Guide to the C&O Canal,* published by the American Canal and Transportation

Center, 1988.

[3].Hahn, Thomas, F.; Kemp, Emory L. *Cement Mill's Along the Potomac River* Institute for the History of

Technology & Industrial Archaedogy Monograph Series Vol. 2 Number 1 – 1994

[4].Kapsch, Robert J. Phd; Kapsch, Elizabeth Perry. *Monocacy Aqueduct on the Chesapeake & Ohio Canal,* Medley

Press, 2005

[5].Luzader, John F. *Historic Structures Report, The Antietam Aqueduc, Chesapeake and Ohio Canal National*

Historical Park, 1964.

[6].Luzader, John F. *Historic Structures Report Conococheaque Aqueduct Chesapeake & Ohio Canal,* 1963

[7].Luzader, John F. *Historic Structures Report, The Conococheague Aqueduct,* Chesapeake and Ohio Canal,

National Historical Park 1961

[8].Official National Park Handbook, *Chesapeake and Ohio Canal* by National Park Service.

[9].Unrau, Harlan D. *Historic Structures Report, The Catoctin Aqueduct, Chesapeake and Ohio Canal National*

*Historical Park,*1976.

[10].Unrau, Harlan D. *Historic Structure Report the Catoctin Aqueduct* Chesapeake and Ohio Canal National Historical Park, 1976

Meridian Hill

Eastern Waterproofing & Restoration's began work in spring 2007 involving large areas of slab on grade replacement with various finishes including exposed aggregate and steel trowel with intricate tooling. Included in our scope of work was the recasting of exposed aggregate beams supporting the lodge roof along with other various shapes throughout the park. NPS specifications called for multiple mix designs with select aggregates, specialized cements, and specific dyes were used to match the existing as closely as possible. To help stream line this process EW&R collaborated with US Concrete Products and came up with a custom sand / cement / dye pre-bagged mix that would only require the addition of aggregates. This enabled the crew to work at a steady pace as well as always having the fresh mix. Initially the NPS had concerns regarding quality control and consistent color matching. US Concrete Products assisted us in providing detailed product data sheets showing mix designs along with in field representation to quell their reservations of using a bagged mix.

As with any project there are frustrating moments getting samples approved prior to starting. Extensive samples needed formulated, cast and finished to match each specified area of repair. Samples would be cured on site and reviewed by the NPS after seven days. If passed we could proceed with that particular work scope, if rejected it meant back to the drawing board. The level of detail expected of our crew in matching 90 year old weathered exposed aggregate was a bit trying at first. However, as we matched and completed each scope item we began to find that making.

Our biggest challenge by far was finding matching aggregate pulled from the local quarries almost a century ago. Similar aggregate samples were located as far as Ohio as well as some help from local quarries. There were several mix designs that called for such small quantities of certain color stone that would make or break a sample. Other challenges included timing of the removing retarders to expose the aggregates. This was compounded by temperature fluctuation from area to area with the same finish. We overcame this by pouring a small area in a small boxed form that we would spot test to ensure the finish was precise.

As the project came to a conclusion in early 2009 the working relationship EW&R enjoyed with the National Park Service throughout this project was exceptional as well as the help from US Concrete Products with innovative thinking . We look forward working together on future projects.

Patrick McBreen
Senior Project Manager
Eastern Waterproofing & Restoration Co. Inc.

Upcoming Chapter Events

May 6	**ICRI-BWC Membership Meeting** **Holiday Inn, College Park, MD**
Sept. 16	**ICRI-BWC Membership Meeting** **Snyders, Baltimore, MD**
Oct. 7	**ICRI-BWC Annual Golf Tournament** *Glendale Country Club*
Nov. 4	**ICRI-BWC 2010 Awards Banquet** **Holiday Inn, College Park, MD**

Upcoming National Events

Oct. 20-22, 2010	**ICRI 2010 Fall Convention** *Theme: "Transportation Structures"* *Omni William Penn Hotel* *Pittsburgh, PA*
Mar. 15-18, 2011	**ICRI 2011 Spring Convention** *Expanded 3-Day Event!* *Theme: TBD* *The Westin Galleria, Houston* *Houston, TX*

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SAFETY COLUMN

Providing a Clear Egress

By David Caple

Many restoration projects involve conditions that make entering and exiting the jobsite complicated.

A few things to consider:

Complications can include storage of debris, equipment, materials, and use of shoring and formwork to name a few. When walking a jobsite the field managers should assess the site for situations where this hazard may arise. OHSA states in its rules that a contractor shall provide and maintain free and unobstructed egress from all parts of an occupied building. In addition, exits shall be marked by readily visible signs. In recent talks with other local safety professionals this is an item that OSHA has been citing frequently, most recently. Here are a few tips that could help you avoid costly fines, penalties and losses.

Simple Solutions:

For example, jobsites with tight shoring designs can be confusing in an emergency when an employee must exit the building through the work area. Marking the clear path through the jungle of shoring with "caution tape" or similar product is an easy and effective way to designate the proper route for egress. These isles must be kept clear of debris or other trip hazards. If a repair location falls in line with an exit sign or the conduit to the exit sign is damaged during demolition appropriate temporary measures need to be taken to mark the exit until the sign can be properly repaired or replaced. Never use a fire exit for storage and never lock or fasten a fire exit in a manner that restricts free escape from the inside when the building is or could be occupied.

Conclusion:

Field managers should be encouraged to review the emergency action plan for the jobsite with their employees. If your job doesn't have a plan, look for assistance from the safety department, a safety consultant, or management. You can help avoid injuries in the event of evacuation by following these few tips.

For more information or to recommend a topic for a future publication contact me at d.p.caple@gmail.com

David Caple, COHC, CEAS, a Construction Safety and Health Specialist, is the Principal Member of Pinnacle Safety Network, LLC. He has over 15 years experience in a combination of structural restoration and safety.

LEGAL COLUMN

Pay-if-Paid Clause:
Contract Mechanism for Shifting Non-Payment Risks

By Jennifer A. Mahar, Esquire

In today's economy, one of the greatest risks on a Project is the Owner's ability to pay. From a contract perspective, this risk ordinarily weighs heaviest on the contractor who contracts directly with the Owner compared to the contractor's lower-tiered subcontractors and suppliers who expect payment from the contractor.

The Pay-if-Paid clause is a contract mechanism used to shift the risk of Owner non-payment due to the Owner's financial insolvency to lower-tiered subcontractors and suppliers. When included in a subcontract between the contractor and a lower-tiered subcontractor or supplier, the Pay-if-Paid clause does not require the contractor to make payment to the subcontractor or supplier until the contractor receives payment from the Owner. Receipt of payment from the Owner is a condition precedent to the contractor's payment obligations to the subcontractor (i.e., the subcontractor will not be paid if the Owner does not pay the contractor). Pay-if-Paid clauses are enforceable in Maryland, Virginia, and the District of Columbia provided the clause's contract language is clear and unequivocal in expressing the contracting parties' intent to shift the credit risk of the Owner's insolvency to the lower-tiered subcontractor or supplier. One example of a Pay-if Paid clause enforced by the Maryland courts reads: "It is specifically understood and agreed that the payment to the trade contractor is dependent, as a condition precedent, upon the construction manager receiving contract payments, including retainer from the owner." See Gilbane Building Company v. Brisk Waterproofing Company, Inc., 86 Md. App. 21 (1991).

A Pay-if-Paid clause is not an automatic defense to the payment claim of a lower-tiered subcontractor or supplier. The circumstances surrounding the Owner's failure to make payment to the contractor must be examined. For example, if the Owner's nonpayment is due to the contractor's performance failures (i.e., defective work backcharges), and not the Owner's financial insolvency, then the Pay-if-Paid clause will not operate to relieve the contractor of its payment obligations to its subcontractors and suppliers.As always it is important to read your contract carefully and understand the terms which govern either your obligations to make payment to your subcontractors or suppliers, if you are the contractor, or your receipt of payment, if you are a subcontractor or supplier.

For further questions, Jennifer can be reached at

jmahar@smithpachter.com

or 703-847-6300.

INDUSTRY OUTREACH

Carver Vocational Technical High School

April 1, 2010

There are a number of programs and initiatives that the Carver Vo-Tech Advisory Board is spear-heading as well as looking for greater industry-wide participation from ICRI-BW Chapter members. First, we have volunteered the services of Charles Brienza, Safety Director of Concrete Protection to provide OSHA ten (10) hour training for all senior students that are in the Carpentry, Masonry and Electrical disciplines of the Construction Trade Classes. In addition there are two (2) teachers that are taking the classes as they joined Carver after the Advisory Board had ABC provide free OSHA ten-hour training in the summer of 2008. In spite of the bad weather that delayed the start of the training, all participants will be able to receive their certificates before the end of the school year.

The faculty and administration of Carver have set-up two programs for the Spring for their students that the Advisory Board is fully supporting and looking for additional volunteers to participate to and enhance the programs. A Senior Exit Interview Clinic is being held on Friday, April 23rd from 8:15 to 2:30PM. The objective is to provide the students with mock interviews, assessment of their strengths and weaknesses and an evaluation of the student. The program is reaching out to Carver alumni, community members and business professionals to make the day a success for the students. Anybody interested can contact Pat O'Malley for more details.

Additionally, the Carver's Administration in conjunction with the Advisory Board is looking for volunteers to speak to the Construction Trade Classes in their Career Awareness and Exploration Speaker Series. Speakers are needed to help assist the students at Carver to become more aware of the construction trades and opportunities that may be available to them upon graduation or paths of additional education or training that will avail them opportunities in the future. Volunteers/speakers can set their time and dates based upon availability from now until the end of the school year. Presentations can range from 30 to 60 minutes and can be given to any and all of the trade classes.

The Adopt a Hallway program continues to progress under the direction of the Skills USA students enrolled at Carver. They are forming teams of students, administrators and faculty to work on punch-list and related projects to build unity and trade skills. We are planning a "major" project; the repair/renovation of the school's snack stand and outside storage shed at the athletic field.
Lastly the Advisory Board continues to work with both the administration at Carver and the Baltimore City School Board to complete the renovations of the various construction trade classrooms and labs to enable the respective programs to achieve their NCCER certification.

Garrett County Habitat for Humanity

April 1, 2010

Habitat for Humanity is a nonprofit, Christian ministry that seeks to eliminate poverty and homelessness. This is accomplished through the efforts of volunteers, working alongside of the prospective Habitat homeowners, to build the Habitat house. In addition to volunteer labor, donations of money and materials are also accepted to help build the Habitat homes.

Once again, the ICRI-BW Chapter plans to assist the Garrett County Habitat for Humanity Organization. Members from the ICRI-BW Chapter will be travelling to McHenry, MD to assist the local Habitat for Humanity Chapter there with rebuilding a home.

The outing is currently scheduled from Thursday, July 15th thru Saturday, July 17th.

This will be a great opportunity for ICRI-BW Chapter members to work together for a worthy cause.

Those interested in participating should contact Patrick O'Malley at 410-298-2669 for more information.

March 4th Meeting Wrap-Up

ICRI-BWC Survives Snowmageddon

It is true all good things come to those who wait. The joint ICRI-BWC/ACI dinner meeting scheduled for February 11th 2010 was canceled due to the blizzard. The re-scheduled meeting turned out to be a great success.

The event, held at the Holiday Inn in College Park, Maryland, was sold out! We had over 113 attendees, 83 from ICRI-BWC and 30 from ACI. The topic at the dinner meeting was Inspection, Monitoring and Repair Techniques of Post-Tensioning Tendons, Multi-Strand, Mono-Strand and Stay Cables.

Our guest speakers were Andrew Micklus & Dominique Deschamps of Freyssinet. Following the technical presentation, there was ample opportunity to ask questions related to specific projects.

Attendees gather for social hour and a drink prior to the dinner meeting

Tom Ouska and Matt Nachman present plaque to the Presenters, Andrew Micklus and Carla Ramo of Freyssinet

Tom Ouska, Cindy Nunn, Rick Edelson enjoying dinner

ICRI-BWC Secretary Pat O'Malley has a laugh with former Board Member Brent Stephens

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410-298-2669
pomalley@c-p-rinc.com

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jwhitton@calindman.com

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erigsbee@csgengineer.com

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Kenseal Construction Products Corp.
703-263-0730
brian@kenseal.com

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Smislova, Kehnemui & Associates
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cindys@skaengineers.com

Oscar Valenzuela
Smislova, Kehnemui & Associates
301-881-1441
oscarv@skaengineers.com

Mike Prizzi
Metro Sealant & Waterproofing Supply
410-789-7400
mikeprizzi@metrosealant.com

Mike Miller
Structural Preservation Systems
410-796-5000
mmiller@structural.net

Dan Anagnos
Neogard Corporation
410-418-4527
dananagnos@msm.com

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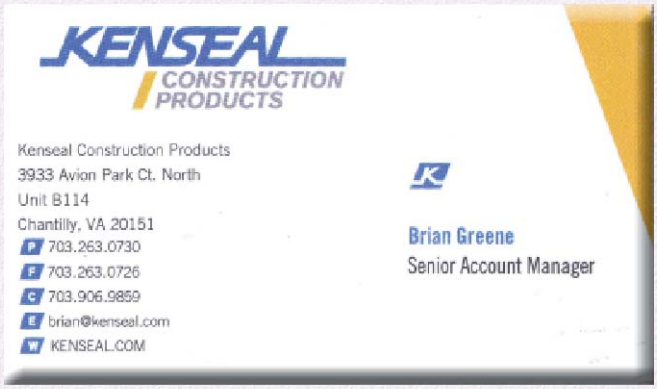

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