On Tuesday, September 29th, just as the guys were rolling back into the yard from their daily work, we received a call that an inspector found a crack in one of the gusset plates that connects a floorbeam to the vertical hanger on the Robert Moses Causeway bridge over Fire Island Inlet [BIN 1058770]. This is a steel arch bridge that was built in 1962 and is the only connecting link between Fire Island and the Mainland.

We put together a crew and headed out for the bridge to find that one of the two gusset plates connecting the vertical hanger to the floorbeam and tie box was completely severed and the hanger was oscillating/twisting like a stop sign in the wind. Pack rust and section loss where the 7/16" thick gusset plate connects to the tie box increased the stress and caused a fatigue crack to form. That evening the crew welded the crack shut with a partial penetration weld to stop the twisting of the hanger plate and also welded a temporary splice plate across the crack to restore some of the redundancy afforded by the second gusset plate. The other gusset plate was inspected and found to be undamaged.

The bridge was posted with a 5 ton weight restriction (enforced by the local police) and the traffic lane directly adjacent to the damaged area was closed to traffic until more permanent repairs could be made. A jacking frame was devised and MO Structures reviewed and approved the jacking plan in 1 day. The frame was installed by the weekend to shore up the damaged area and remove the dead load in the hanger so that a replacement gusset plate could be installed and the original load distribution between the two gusset plates could be restored. Four (4) hydraulic hollow cylinder jacks with 1.25" diameter threaded rods were used to jack the 100 kip dead load out of the hanger. A manifold was utilized to insure that each jack was loaded equally.

With jacking complete, the crew was free to place our snooper closer to the damaged area and remove the existing rivets that held the original gusset plate in place. Once removed, holes were match drilled in a new 5/8" thick gusset plate and the heavier gusset plate was installed. New 1" diameter A325 high strength bolts were used to connect the new gusset plate using the “turn-of-the-nut method” in the Steel Construction Manual. Once all bolts were properly installed the jacking frame was removed and the repair area was repaintec with 2 coats of calcium sulfonate paint.
The Transportation Maintenance Skills Instructors have been working on various projects in R6. The first project involved forming and pouring concrete pads at several locations along the Route 17 (I-86) corridor. They were designed in such a fashion that the VMS boards can be placed on the pad, secured with chains that were cast into the concrete pad preventing theft or damage from high winds. The Boards were also grounded to prevent damaged by a lightning strikes. The instructors conducted a classroom session followed by actual OJT to construct, install / load the forms and finish / cure the concrete. The class consisted of various bridge and residency staff from the shops around the region. After the first 5 pads were poured with the instructors, the remainder of the ~ 17 pad locations will be completed by the various residencies. Each pad consisted of 2.25 cu/yds of concrete, reinforcing steel and other various hardware. (chain, lumber, fasteners etc.). The project is running successfully due to the efforts of all involved, including, but not limited to: R6 Residency & Bridge Crews, R6 Fleet Admininstration, as well as staff from the regional office and the R6 TMC.

The second project also involved a “form & pour” type training. The Penn Yan Residency received a notification of “an emergency repair needed” on a culvert within their jurisdiction. A large pothole had formed due to a void in the backwall. Fill material was spilling through the void, undermining the roadway. The Skills Instructors provided “just-in-time training” through a classroom session of appropriate topics then carried the training into the field. The culvert was a “jack-arch” and presented several challenges based on the design and repair needs. With ingenuity, the forms were fabricated and installed. Loading the forms was accomplished by drilling “core” holes in the deck. 3.25 cu/yds. of concrete were used to complete the pour. The forms were removed and the culvert re-inspected. R6 Bridge Maintenance assisted by providing some materials not normally stocked at the residency. Once again, cooperation was the driving factor in order to complete the job.

We, the bridge maintenance engineers of NYSDOT hold these truths to be self-evident: all joints leak, all concrete cracks, and rust never sleeps. We will strive to capitalize our way out of maintenance and maintain our way out of capital. It is our endeavor to educate others that a bridge is as important to a highway as a diamond is to a ring.
Overcoming Moisture in Concrete Deck Repairs

In an attempt to be able to repair concrete decks when moisture is an issue, Region 9 Bridge Maintenance contacted Ceratech, who stated they had a product for this use, and they were willing to donate some material for a product demonstration.

BIN 1094912, I88 over Rt. 41 was chosen. An overnight lane closure was utilized, the existing bad concrete was removed and prepped, then the patch poured and completed the next day. The material donated by Ceratech was Pavemend SL. It is a cementitious based rapid setting, semi leveling, pre-extended structural repair concrete. High early compressive strength is obtained with this material (>2500psi/90 minutes), which facilitates in re-opening the road to traffic quickly. The material can be mixed in a bucket with a drill & paddle, and cleans up with water. The feedback from the crew has been positive (mostly commenting on the material not being moisture sensitive and the easy clean up). The performance of the repair location has also been positive to date, with no visible signs of failure, cracking, etc… For more info on this product see www.ceratechinc.com

Bridge Crew Hours Increasing

The Regional Bridge Maintenance Engineers (RBMEs) are allocated money for material and tools to execute their program, but successful completion is dependant on crew hours. More people means more hours and more hours means more accomplishments. RBMEs schedule work by available hours, not by dollars.

Each crew member represents approximately 1,000 hours for which they are available to work on bridges. The chart indicates that each year since 1991, the bridge program has lost over 19,000 hours. This doesn’t correlate to a staffing loss of 19 each year. Typically, retirements occur in the spring and hiring occurs in the fall. Though there has been a loss of staff, the majority of the hours are lost because of the hiring schedule.

That schedule was revised a few years ago. Hiring bridge crew personnel when positions became vacant, instead of waiting until snow and ice season has a direct benefit in the number of hours to perform bridge work. The current trend is 6,000 hours over the 1991-2005 period average. If the number of crews is not to be increased, the RBMEs are hopeful current hiring schedules can be maintained.
Longitudinal Crack Sealing on Prestressed Box Beam Bridges

NYSDOT Region 4 Bridge Maintenance has initiated a program to seal the longitudinal cracks on the concrete wearing surfaces of adjacent prestressed box beam bridges. The goal is to seal these working cracks to keep leakage from prematurely deteriorating the prestressed beams. Once these beams begin to deteriorate it is impossible to properly evaluate or repair them because the only visible section is the bottom surface.

The initial 1980’s details had small, partial-depth shear keys between the beams and very little reinforcing tying the beams together. As more bridges were built, improvements were introduced to minimize the cracking. However, the cracking has persisted albeit not as severely. Sealing these cracks has posed a challenge for Bridge Maintenance. The live load forces that initiated the crack continue working. Rigid patches have been tried only to re-crack along the same line or in the concrete adjacent to it. Any type of suitable repair needs to be flexible.

The option chosen by R4 is to rout the crack surface and pour in highway crack filler. The crack filler is very pliable. Routing is employed to create a reservoir to better handle the movement of the crack and it is also easier to prepare the routed surface to accept the sealer. The crews use a Crafco Model 200 Pavement Cutter to rout the cracks. The routing bit creates a recess 5/8” wide by ½” deep. When using the router, the operator walks backwards and pulls it towards him. The router is easily pivoted to follow the crack. There were some problems with routing bits breaking. The routed surface is then sandblasted to create the proper texture. Final preparation is to blow out the crack with a gas powered blower. The slot must be dry for the sealant to adhere.

The crack sealant used conforms to ASTM 6690 Type 2 (NYS Spec. 702-0700). The sealer is heated in a Crafco Super Shot 125 melter and spread using a 2” diameter swivel applicator. To facilitate solidifying of the sealant, either black beauty sandblast sand was sprinkled or soapy water was sprayed on the surface. The sealant has an expected service life of 5-7 years.

This job was quick and simple to perform. It was by far the cheapest alternative and is maintenance friendly. Early indications are that the sealant is doing its job. The Region is hopeful that this will help extend the service life of these bridges for many years.

Culvert Repairs

Region 9, Liberty Bridge Crew, Culvert (CIN) 970085, Rt. 52 over Unknown Creek, Jeffersonville, Sullivan County: This 15 foot span structure was built in 1985. Inspectors found a large crack in the top slab directly under the fog line. Region 9 Structures designed a repair procedure. The general intent of the repair was to install a W beam (W 10x45) as a support under the deck of the culvert. The beam is supported on structural W shapes (W 8x31) which are anchored into the abutments with 1” diameter anchor bolts, approximately 15” long (12” embedded into the abutment). One inch (1”) thick plates were placed between the bottom flange of the W 10x45 and the top of the W 8x31’s.

The near edge of the W 10x45 was placed at 62” from the existing fascia. An approximate ½” mortar bed was placed between the top of the W 10x45 and the bottom of the deck. All of the steel incorporated into the repair was painted with a NYSDOT Approved List paint prior to completion of the repair.

Region 9, Hancock Bridge Crew with Delaware South Residency, red flag Culvert (CIN) 940025 repair on Rt. 8 in Town of Deposit, Delaware County: This structure experienced a failed wingwall. Work included MPT, demolition of failed

continued on page 5
Overdue Flags

Flags are issued through the inspection system and overdue red flags are reported by the Structures Division in their monthly State of Bridge Evaluations report.

A number of flags listed may have been resolved within the required six week time frame but because the effort was not properly documented the flag remained overdue. Other issues that influence timely resolution are: preparation of repair procedures; access issues due to the limited number of UBIUs; unknown or uncertain repair approaches (particularly for pre-stress box beams); and limited lane closure allowances.

### RED FLAGS ISSUED BETWEEN 1/01/2009 & 9/01/2009

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Critical Bridges

Acting Commissioner Stan Gee provided testimony to representatives of the NYS Legislature. Included in his presentation is a graphic showing NYS highway bridges with "Critical Condition Needs" grouped by AADT and detour length. Critical Condition Needs are those bridges that have critical elements rated less than "3". The elements are: Abutment and Pier Stems, Structural Deck, Primary Member, Pier Cap and Column and Abutment and Pier Pedestals on Fracture critical bridges.

The list is derived from current bridge inspection data for all bridges in NY.

Culvert Repairs (continued from page 4)

wingwall, and construction of the new wingwall. As you can tell pictures, the locals were happy to have us in town fixing this culvert.

Region 7, Peru Bridge Crew, Culvert (CIN) C720114, Rt. 86, Saranac Lake, Franklin County. This structure was in need of a fascia repair and widening. Work involved repair of both fascias; two spalled areas on the north stem; pumping of grout into the void behind stem; and minor wingwall patching. Fascias were widened 18" to accommodate future culvert rail realignment, as the culvert rail posts will be moved outward during an upcoming rustic guiderail replacement contract (mainline guiderail currently narrows roadway as it crosses culvert). One unique aspect of the project was how the crew built the fascia formwork supports. Because of the water depth and a stream bed of deep silt, staging could not be set up in the stream. A floating platform built on plastic dock floats was used for access. Formwork consisted of 6” x 6” galvanized box beam fastened to the culvert. The fascia widening proposal was designed in house by the ARBME and submitted to the Regional Structures Group for review, who in turn used Mathcadd to check/revise the proposal.

Team Work
Crown Point—Lessons Learned?

The press has battered the Department over the problems with the Crown Point bridge in Essex County. Though the story is well covered in the Capital District press, it is barely mentioned in other areas of the state and it has gotten almost no national attention. Nonetheless, it is a significant story that should produce a “lessons learned”.

The Crown Point bridge was inaugurated by Franklin D. Roosevelt in 1929. The unique steel truss-arch superstructure sits atop 127 foot tall piers built without reinforcing steel and made of concrete without air-entrainment. Even at that time, the design was questioned as standards had already moved to reinforced construction and air entrained concrete.

The inspection process cannot be faulted. NYSDOT and many other states exceed the National Bridge Inspection Standards in performing element-level inspections. NYSDOT is also a lead state in providing load ratings and a vulnerability assessment of all highway structures. Critical findings, those potentially placing users at risk, are indentified, tracked, and resolved. In extreme cases, the process allows for the immediate closure of the bridge. That system worked.

Technology to uncover pre-emergent conditions is just becoming available. Embedded sensor technologies, nondestructive testing tools, and health monitoring systems are still new, expensive, and subject to interpretation.

Maintenance treatments could not overcome the design flaws of the piers. The failure to keep to a maintenance schedule did not close the bridge, though it probably did contribute.

Historic underfunding and an episodic commitment to preventive maintenance have lead to investment goals that categorize bridges by system classification. Interstate bridges take precedence over rural collectors. Performance measures that aim to reduce the number of deficient bridges pushes funding toward deficient bridges. As deficiencies continue occur, preventive maintenance projects are compromised. Painting programs, for instance are reduced or eliminated to fund replacement projects, in turn leading to more deficiencies, response maintenance, and increased costs.

The State’s infrastructure continues to age. Most of our highway system was built on a lowest-cost design policy of the time 50 to 60 years ago. Bridges age like cars. Year to year the deterioration may not be noticeable, but then, suddenly, everything begins to fall apart.

Elected officials readily committed the NYSDOT to replacing the Crown Point bridge. The estimated price tag of $67M will impact the bridge program in other Regions, unless additional money is found. Meanwhile, the public can expect more bridge closings and load postings.

The mobility and reliability of the transportation system was compromised at Crown Point. A 100 mile detour is unacceptable. As bridge managers we have to do better. We have a very good safety-based program that identifies manifest deterioration and structural vulnerabilities. However, we need to strengthen programs that identify latent defects and looming concerns to avoid sudden disruptions in mobility. Early interventions are less expensive and of shorter duration than reconstruction projects.

The safety of the public is tantamount. Competing needs, resource constraints, staffing short falls, aging infrastructure, and missed intervention opportunities all contributed to Crown Point closure. What will be the lessons learned from the Crown Point affair? ~Pete Weykamp, P.E.

Forming Tips

R3’s Butternut crew offers a tip on how to efficiently install forms. Position the form and drill a 5/16” hole. Place a duplex nail and a length of 14 gauge copper wire through a washer, then through the small piece of wood. The nail and wire can be tapped into good concrete with a hammer. Place as many as needed.

This will frees up third person to pull the temporary connection, drill the 5/8” hole, set mollys and screw in the Richmond rods. All three crew members are productive.

Know This Bridge?

BIN 4443220: a steel truss lift bridge carries Rt 31F (Main St) over the Barge Canal in the Village of Fairport. Built in 1914, the bridge carries 11,000 vehicles per day. An annual art show attracts 250,000 patrons to the village.
Bridge Maintenance engineers differ in how they carry out the bridge washing program. Some RBMEs feel the washing program is best carried out by contractors, leaving more complex work to their capable crews. Others believe washing is a good spring time activity that provides a quick look at a number of bridges, gets the crews back into the bridge mode after a winter behind the plow, and is one of the few activities that can be done when funding for repair materials is held up. RBME’s are also concerned about the workmanship on the part of washing contractors. They would rather spend the preventive maintenance dollars elsewhere.

Crews ensure the scuppers are open, the curbs and joints are cleaned, and the salts are flushed off the superstructure. Equally important but difficult to achieve is the removal of debris from the bridge seats and pier caps. Debris holds in moisture which promotes the corrosion process. Inadequate access to these areas of the bridge hinders the work.

RBMEs are currently discussing the value of manually flushing contaminants off the deck versus the cleansing provided by the summer rains. Some are asking if it might be better to reduce the deck washing hours and increase efforts in the providing better cleaning of the substructure.

Changes to the current washing specification as suggested by the RBMEs have been forwarded to the Structures Division for review and implementation. The suggestions include more emphasis on substructure cleaning and disposal of debris. The revised specification is schedule for formal review in late December.

Bay Bridge Story (A San Francisco Treat)

An interested and astute observer has chronicled the events of the cracked eyebars on the San Francisco Bay Bridge. Tony Alfrey, a research physicist and electrical engineer pursued the story using information from the internet and his own deductions. His friends encouraged him to post his detailed interpretation of the events. His very interesting page entitled “The Famous Bay Bridge Crack” can be found at:

http://www.sci-experiments.com/BrokenBridge/BrokenBridge.html