Structure Maintenance Bulletin

Michigan Dept. of Transportation
Winter 2011

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Carpenter Road HLH

While traveling northbound I-75 on December 15 a severe crack was noticed on the south fascia beam over the right lane. The Bay Region Bridge Engineer immediately notified local police and Carpenter Road was closed. Soon afterward, the right and center northbound lanes were closed for an emergency inspection. The inspection determined that the east portion of the beam was bent 8" to the north, while the west portion was bent 3". The fracture extended through the entire stringer causing the beam to drop from the non-composite deck. Making the situation even more serious was the fact that only one intermediate diaphragm was located on the east side of the separation, and two of the three stitch welds connecting the diaphragm clip to the fascia beam were cracked. The Statewide Overhead Sign Crew and Bridge Crew were contacted immediately to perform temporary repairs. During the afternoon the sign crew removed the large overhead sign connected to the fascia beam to reduce the load on the newly cantilevered section. Afterward, all northbound traffic was detoured to I-475 and the bridge crew went to work installing temporary supports before performing a series of heat cycles to realign the separated web and flange for a splice plate. Without realigning the beam, a temporary bolted repair would have been difficult to install. In single digit temperatures, the crew worked through the night to install plates to the web and bottom flange before repairing several stitch welds. By rush hour the next morning traffic was restored to I-75.

Span 3-W Beam 1-S cracked in half from high load impact

Heat straightening beam to install plates on web and flange

Tightening temporary bolted repair to stabilize beam

2011 Spring Bascule Bridge Cleaning

Each spring, the Central Maintenance reach-all crew makes a bi-annual loop through the Lower Peninsula to clean eleven bascule bridges. In addition to the underbridge unit and arrow boards, a truck mounted water tank is transported to provide the potable water supply. Usually local fire departments and the region staff also help wash the largest structures since open riveted steel decking requires a large quantity of water to properly clean. The schedule is determined according to demand for the underbridge units, and the availability of C&T staff to perform annual inspections. The tentative schedule this year will be conducted as follows:

April 4	B01-09042	Bay City
April 5	B01-09042	Bay City
April 6	B01-09042	Bay City
April 7	B01-09032	Bay City
April 11	B01-77032	Port Huron
April 12	B02-77052	St. Clair
April 13	B04-82071	Fort Street
April 14	B04-82071	Fort Street
April 18	B01-11053	St. Joseph
April 19	B05-11013	Benton Harbor
April 25	B03-16081	Cheboygan
April 26	B01-15012	Charlevoix
April 27	B01-51011	Manistee
May 2	B02-70014	Grand Haven
May 3	B02-70014	Grand Haven

Thumb Culvert Soil Stabilization

Bay Region bridge inspectors discovered two cracks in a three sided 1946 culvert that were large enough to allow backfill material to flow through. Since the Zilwaukee bridge crew is experienced in crack injection they offered to mitigate the problem. Rather than using a two-component epoxy adhesive to simply seal the concrete, the crew decided to use a hydrophobic polyurethane grout to fill the cracks as well as any voids that may have existed behind the concrete. The material was injected by drilling 5/8" diameter holes at approximately forty-five degree angles to intersect the cracks in the center of the walls. The number of fill injection ports installed is project specific, and determined by the wall thickness and crack width. For this project ports were spaced at approximately 6" apart alternating on opposite sides of the crack. Prior to pumping the material, hydraulic cement was spread across the area to help retain the grout and decrease waste. After installing the ports and mixing for approximately three minutes, the fluid was injected in a specific sequence at approximately 1000 psi. Areas that bled through the fast setting cement offered a visual sign that the liquid was spreading at a sufficient rate. Other locations that did not build pressure were filled again until refusal. Once the grout cures it exhibits a compressive strength above 1500 psi, a tensile strength of approximately 250 psi, and zero shrinkage by weight or volume. The grout cannot be used for every situation where a washout occurs, but in certain instances it can prevent the need for costly pavement removal and excavation resulting from erosion.

Southwest Region PCI Metal Mesh Panels

Until late last fall metal mesh panels to protect motorists from falling concrete had only been installed on bridges with rolled steel beams. The Southwest Region bridge crew noticed a PCI beam structure that had a deteriorated deck and decided to take on the challenge of utilizing the panels to prevent repeated scaling. Measurements of the web to web spacing were taken by the bridge crew to determine the panel width and provided to Central Maintenance. Following bid solicitation and fabrication, the ready to be installed panels were delivered approximately eight weeks later.

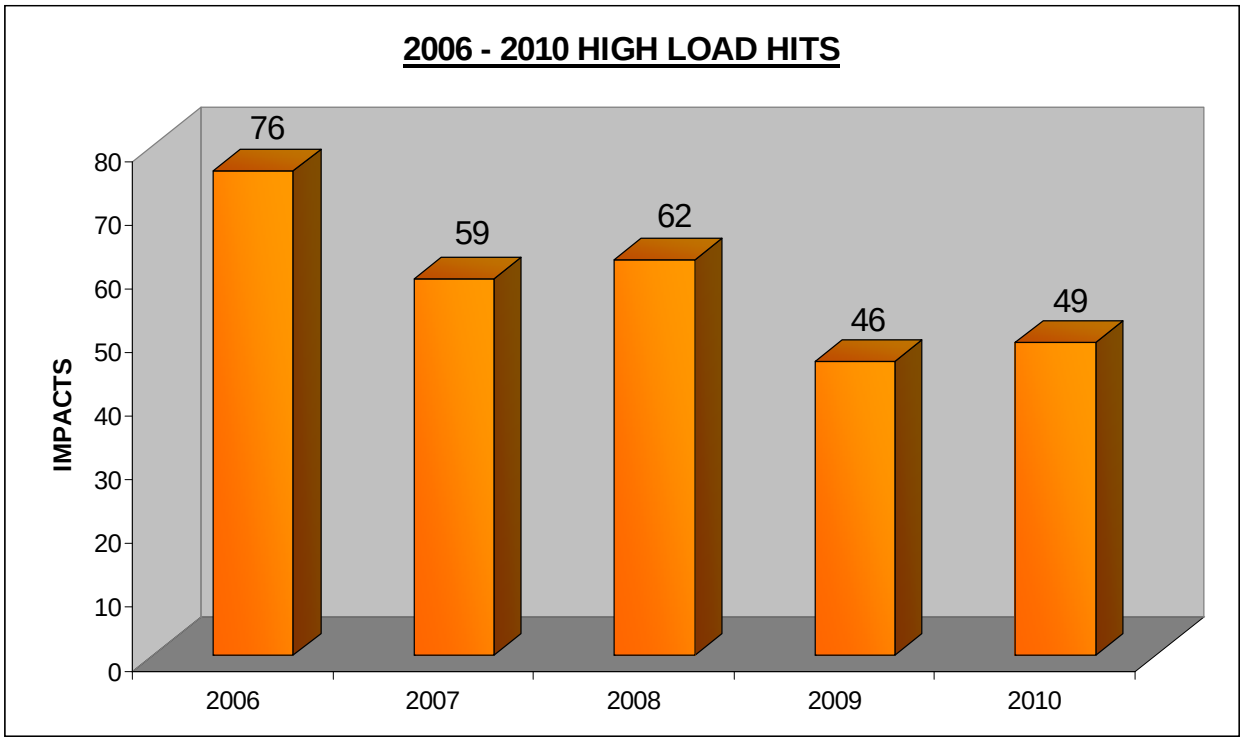
To date, bridge supervisors and crew workers have been very pleased with previous installations completed in the Metro and Grand Regions. The ability to place the panels relatively easily from a scissor bed or two man bucket truck and then slide them across the bay on steel stringers eliminates the need for closing every lane beneath a structure. Several supervisors have said that they were able to accomplish entire structures in half a day, which significantly increases mobility and crew efficiency.

While installing the panels at the PCI beam structure, several lessons were learned that will aid future installations. After hoisting the sections into a bay there is less room to tilt them horizontally in place. Although the concrete beams may be just as deep as steel, the thick top flange decreases the amount of space available. Also, the web to web spacing in a single bay may vary slightly causing a problem. The panels were measured to rest on the junction from the web to the bottom flange. A narrow deviation in width may not allow a panel to rest horizontally at each junction, or if the

bay becomes wider too much space creates a loose fit that could potentially allow the panel to flip and fall out from concrete impact. Finally, the panels will not normally require brackets or anchors if multiple bay measurements are taken. Investing additional time measuring the bays will eliminate or decrease the need to secure the panels saving additional time and expenses. Look for additional information regarding the testing of wider panels, as well as an installation at a structure with vertical web stiffeners this summer.

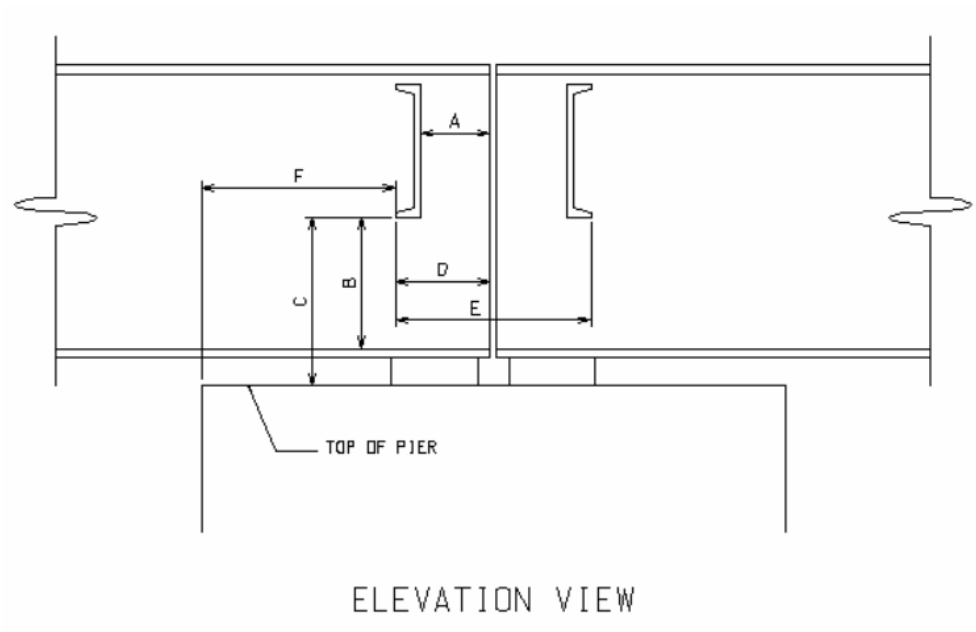
2010 High Load Hits

A slight increase in the number of high load impacts were reported during the 2010 calendar year when compared to 2009. When a structure is hit and damage occurs it is important for the Region Bridge Engineer or Inspector, as well as Central Maintenance to evaluate the affected components in a timely manner. Please contact Central Maintenance if you need assistance performing an inspection.



Short-Height Temporary Support Information

If you suspect temporary supports may be required during an arms-length inspection please submit a sketch of the area to be supported. Including the measurements in the corresponding diagram with a RFA will expedite response time and may eliminate multiple site visits. For questions, or a letter size version of the sketch please contact Christopher Idusuyi at (517) 242-5783.



2010 Floodcoat Cost and Application Rates

The average square foot and gallon material costs were updated for both thin-epoxy overlays and healer sealers based on 2010 pricing. The application rates were adjusted as well to reduce the chance of a shortage during the bridge maintenance season. The unexpected shortages last year were due to the use of a less expensive aggregate that consumed more material than expected. Though aggregate performance is of no concern, we will discontinue use due to the increase in epoxy consumption. As a reminder, if you have any remaining red flint floodcoat aggregate please use it on the second course overlay instead of the first to conserve epoxy and reduce costs.

2010 Flood Coat Epoxy Cost And Application Data

	2010 Epoxy Cost	Application Rate For Estimating Order	Approved Products	Manufacturer's Application Rate	Mix Ratio	Shelf Life	Approved Fine Aggregate
Healer Sealer	$27 / Gallon	75 Sft. / Gallon	Unitex Bridge Seal	65 - 100 Sft. / Gallon	1.0 A : 1.0 B	1 Year	Cheboygan Mason Sand
			Poly-Carb Mark-127	100 - 150 Sft. / Gallon	2.0 A : 1.0 B	2 Years	Technisand 1L5W
	$0.36 / Sft.		Euclid Dural 335	100 - 200 Sft. / Gallon	4.0 A : 1.0 B	1 Year	
			Sika Sikadur 55 SLV	100 - 150 Sft. / Gallon	2.5 A : 1.0 B	2 Years	Sand Products AFS 50

	2010 Epoxy Cost	Application Rate For Estimating Order	Approved Products	Manufacturer's Application Rate	Mix Ratio	Shelf Life	Approved Fine Aggregate
Epoxy Overlay	$ 20 / Gallon	25 Sft. / Gallon	Unitex Propoxy Type III	1st 40 Sft. / Gallon 2nd 20 Sft. / Gallon	1.0 A : 1.0 B	2 Years	Best Sand #612 Quartz
			Poly-Carb Flexogrid Mark-154	1st 35 Sft. / Gallon 2nd 15 Sft. / Gallon	1.0 A : 1.0 B	1 Year	Unimin Corp. EP-5 Mod. Quartz
			Poly-Carb Flexogrid Mark-163	1st 35 Sft. / Gallon 2nd 15 Sft. / Gallon	2.0 A : 1.0 B	2 Years	
			Euclid Flexolith 216	1st 40 Sft. / Gallon 2nd 30 Sft. / Gallon	1.0 A : 1.0 B	2 Years	Manuf. Min. BT-6X10 River Rock
	$ 0.80 / Sft.		E-Bond 526-Lo-Mod	1st 40 Sft. / Gallon 2nd 20 Sft. / Gallon	1.0 A : 1.0 B	1 Year	Humble Size #7 Chipped Flint
			Axson Akabond 811	1st 35 Sft. / Gallon 2nd 15 Sft. / Gallon	1.0 A : 1.0 B	1 Year	

Reach-all Requests

Please remember that two underbridge units are available for your needs, so please don't hesitate to contact us. Requests are usually fulfilled in the order they are received; although special arrangements will be made to accommodate a critical concern. Bascule bridge cleaning and inspections usually occur during the months of April and September, and the rest of the year is utilized for Region inspections, Consultant inspections, and bridge repairs. To schedule a unit please contact Aaron Porter at (517) 242-5788 or Corey Rogers at (517) 930-2768.

Typical PRJ Installation Timeline

The amount of pavement relief joint installations continues to grow and there are often many questions related to the duration of the projects. Each location has its own unique obstacles to contend with such as traffic volume, layout, and other coinciding conditions. In many cases the experience of the maintenance crew workers, saw cutting contractor, and even weather can determine if the tasks will be completed earlier or later than expected. To increase awareness and help out Region personnel with scheduling crews and lane closures we have created a typical project timeline for a common three lane freeway in an urban area. The durations listed are for an average project with a maintenance crew consisting of five to six people, as well as two additional support persons from Central Maintenance.

Typical PRJ Installation Timeline (cont.)

Activity 1. Maintaining Traffic – Initial Setup 1 to 2 Hours

Once arriving at the site with the devices loaded it may take one to two hours to close the right or left and center lane. Closing ramps, placing detours, and loading signs and channelizing devices are not included in the duration for this activity.

Activity 2. Saw Cutting Pavement – Phase 1 0.50 Hours

This activity includes the time required to mark the joint location(s) and perform full depth saw cutting of the roadway and any adjoining curb and gutter. The saw cutting of concrete barrier wall or raised median will significantly increase the duration of this activity. A sixty pound hammer and air compressor should be on site to provide assistance if the blade becomes wedged in the pavement.

Activity 3. Concrete Removal – Phase 1 0.75 Hours

The removal of concrete utilizing a skid-steer mounted jackhammer substantially reduces the amount of time and effort to open a void for the insertion of material. Sections of the saw cut material are usually broken into eighteen inch lengths, pried loose using the equipment, and then loaded by hand into a stake truck.

Activity 4. Installing Relief Joint – Phase 1 0.75 Hours

Flex-Lok, Evazote, and Ceramar are three commonly used relief joint products. While each has its own unique advantages, the placement of Evazote requires mixing a two-part epoxy and additional placement effort. Sandblasting the vertical joint edges to remove dirt, debris and contaminants is necessary for the material to bond well.

Activity 5. Maintaining Traffic – Switch Setup 1 to 2 Hours

A wide variance in the amount of time for the activity is used because many variables are unknown until the location is determined. Ramps and heavy traffic flow in the influence area usually increase the amount of time needed.

Activity 6. Saw Cutting Pavement – Phase 2 0.50 Hours

Again, this activity includes the time required to mark the joint location(s) and perform full depth saw cutting of the roadway and any adjoining curb and gutter. It is important to expedite the previous activities so additional stand-by charges are not incurred from the contractor.

Activity 7. Concrete Removal – Phase 2 0.75 Hours

The removal of concrete utilizing a skid-steer mounted jackhammer substantially reduces the amount of time and effort to open a void for the insertion of material. An increase in crew size and duration is needed if sixty pound hammers are used to remove the concrete.

Activity 8. Installing Relief Joint – Phase 2 0.75 Hours

The installation of the relief joint is a simple process that may go much quicker than the expected duration. When preparing to press it into place it is necessary to examine the void and make sure all rebar and noncompressibles have been removed otherwise the material may never become compressed.

Activity 9. Maintaining Traffic – Removal 1 to 2 Hours

Once the joint has been installed there is no “cure time” requirement for the adhesive and lanes may be opened at once.

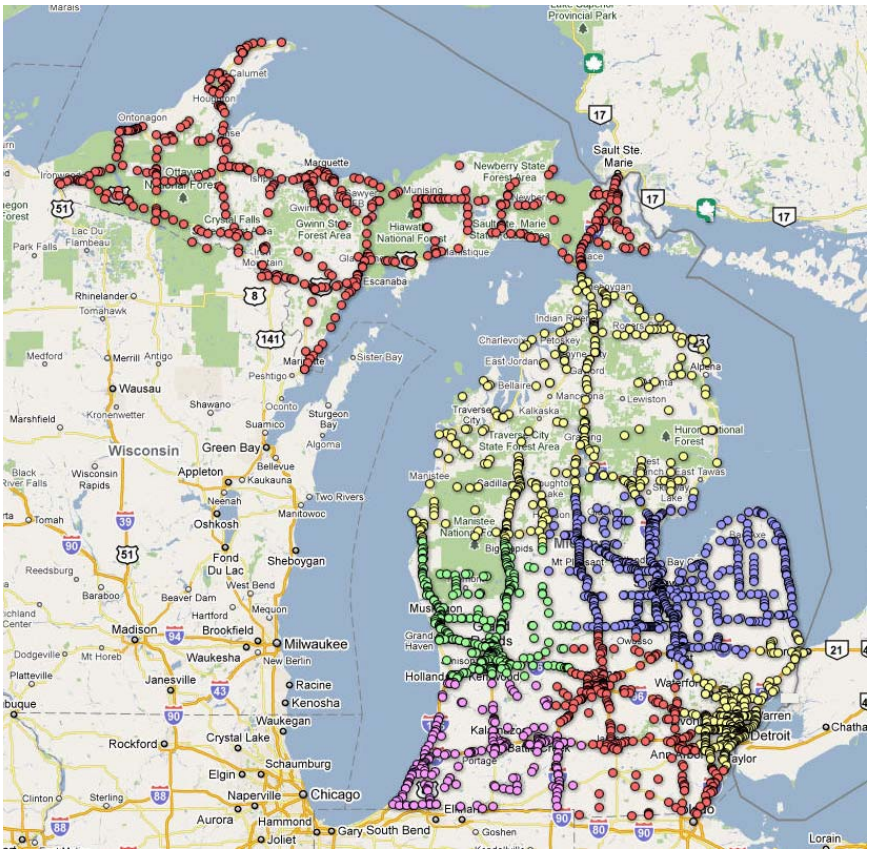
Typical PRJ Installation Timeline (cont.)

Activity 10. *Monitoring* *Life of Relief Joint*

It is important to pay close attention to the joint; annual inspections will allow the joint to be replaced prior to pavement growth distress.

It is important to have a well thought out plan for maintaining traffic. Planning the traffic control setup prior to the project can significantly reduce time and confusion in the field. If scheduling allows, it may be helpful to mark out sign locations and detour routes to avoid any possible unforeseen conflicts before performing the actual work. Signs could also be dropped off in the field or set in place and covered the day before the work is arranged to begin. The combined estimated duration for the traffic control activities range between three and six hours, while the total duration for the remaining activities is approximately four hours. Traffic control comprises a significant amount of the time in the field, and any efforts that can be made to reduce the impact to mobility will be beneficial.

Although the total duration is expected to last seven to ten hours for one typical installation, adjacent structures may be combined and completed in a similar amount of time. For instance, if two structures are separated by a divided barrier, traffic control could be setup for work to progress in one direction and then placement may begin in the opposite direction while saw cutting is being performed. This allows everyone to work with minimal delay and increases productivity by completing two structures in a similar amount of time. If you have any additional questions regarding the installation please contact one of Central Maintenance's support staff.

Bridges on Google Maps

All of the coordinates for the structures listed in Report 44 have been input into Google maps. This provides the ability to perform a search by structure number, control section, or description. Using this new tool to locate a bridge may be especially helpful in an urban area. We are working to transfer the information so it may be used on a Blackberry or similar device. If you would like a copy of the data points emailed to you for use on a computer please contact Paul Schiefer at (517) 242-5784.