For years, MDOT has employed a proactive approach to protecting motorists from falling spalled concrete caused by freeze thaw cycles. The utilization of plywood as an acceptable barrier became common practice due to its availability, cost, and relative strength. Since it can quickly be altered to fit the specific area required, bulk amounts of material could simply be taken into the field and used to span the bays on many structures in a single day.

Unfortunately, much of the plywood installed years ago is still in service today due to a deficiency in capital for widespread rehabilitation projects. In some instances, inspectors have had difficulty inspecting the bottom surface of a deck and/or beams. Temporarily removing the plywood is not an option because of the time, disruption to traffic, and costs it would incur. Another option tested has been to utilize a camera fitted on a pole, but diaphragms divide the bays and block the ability to view a substantial portion of the span.

While searching for an alternative means to keep the public safe, and provide a clear line of sight for bridge inspectors, two prototypes of alternative false decking have been developed. Both styles will allow bridge inspectors to inspect the bottom surface of the deck, as well as stringers at midspan.

The first alternative utilizes heavy industrial chain link fabric attached to a metal frame. The frame was comprised of 2” square, 16 gauge tube with a center brace and ninety degree welded ends. Each panel was 4’ long and wide enough to accommodate typical stringer spacing. The chain link fabric selected was 1” x 9 gauge galvanized wire secured to
the frame by 2” galvanized clamps. The 1” was chosen to keep stones larger than 3/4” from passing through. Each assembled panel weighs approximately 90 pounds and can easily be handled by two workers.

With the help of the Statewide Bridge Crew, four tests were conducted to determine if the panels would be adequate in service. The first test performed simulated the impact of a 3” thick section of concrete falling onto the entire panel. Rather than using a large section of concrete, a 4’ x 6’ x 1” steel plate weighing 982 pounds was utilized. The plate was dropped from a height of 3’ and no deformation or damage occurred. The second test run was very similar to the first, except the plate was rotated perpendicular so the force would impact the cross members only. This time a minimal amount of damage occurred and the cross members were bent 1.25”.

The third test was different than the previous two, and used a smaller plate to determine if the shear strength of the mesh fabric was adequate. A 3’ x 3’ x 1” steel plate weighing 370 pounds was placed 3’ above the panel and oriented with a point facing down to penetrate the mesh. When the plate penetrated the mesh it caused a 3” tear in the fabric and broke one of the 2” clamps, but it successfully absorbed the impact and the plate was contained on the panel.

The panel was also tested using 80 pound sacks of concrete. Eighteen bags totaling 1440 pounds were placed on the panel for the static test and less than a 0.25” of deflection occurred in the frame.

The second alternative tested utilized a narrower frame and flattened expanded metal in lieu of the chain link fabric. The frame was the same size with a center brace, but was made from 1.5” square, 11 gauge tube. The half inch of extra space will allow for clearance between the beam flanges and diaphragms. Flattened 1.5” nine gauge
Alternative False Decking (cont.)

expanded metal with 1” x 2.5” openings was welded to the frame rather than using brackets. Tests conducted on the expanded metal panel were identical to the ones performed earlier. No damage occurred as a result of the parallel frame test. After performing the perpendicular frame test, measurements were taken to determine the amount the braces were bent. All three cross members were bent approximately 4.5” with no broken welds at the frame connections or the expanded metal connections. Damage from the shear test included a 5” x 5” tear in the mesh; however, no welds were broken and the plate was contained on the panel.

Both false decking alternatives increase mobility since the panels are constructed off-site and built to the corresponding bay widths of a particular structure. Less time spent disrupting traffic also means labor costs attributed with installing the false decking will be decreased as well. Inspectors will benefit by being able to view the stringers, and underside of the deck. Both styles of panels will be put into service in the Metro Region this spring to test installation practices. Look for a revised Permanent False Decking special provision soon.

Leaching Abutment Cracks

Ever wonder why the road surface beneath many overpasses is in such distraught shape? Of course one reason is that water from deck drains above the shoulder may be migrating to the road surface and causing distress. Another less common, and very damaging condition, occurs when water leaches from the joints in an abutment. The water may be naturally occurring or from a plugged drain tile located behind the abutment. This condition is taking place on many structures over recessed highways, the majority located in Wayne County. To help control the problem there, a hydrophilic material was used on several structures. In order to seal the joint a small hole is drilled into the concrete near the crack to enable the installation of an injection port for attaching a hose.

The material is then pumped in until refusal. This forces the water into the drain tile which then drains to the stormwater system. Prior to placing the material it is important to determine where the water is coming from and if the issue can be resolved by simply cleaning out stormwater pipes and/or catch basins.


2009 High Load Hit Data

During the first ten months of 2009 there were forty-four high load hits (HLHs) reported. Damage from HLHs took place in all of the regions across the state except for the North Region. Of the forty-four structures damaged, four of them had stringers composed of concrete. Damage claims were filed for many of the incidences, but some had damage that could not be differentiated from previous impacts. In those cases all of the damage to the structure still needed to be recorded, photographed, and reported so damage could be differentiated in the future. There were also four occasions where a structure had been damaged, but information recorded on the bridge inspection reports was vague and resulted in the claims not being pursued. It is always important to record the amount a beam is bent, horizontally or vertically, and define the area that has been distorted.

![Image of damaged expansion joint]

Expansion joint up-turns are often damaged this time of year during winter maintenance activities. It is important for bridge inspectors or maintenance personnel who notice such damage to report it. It is simple to repair the joint and will ensure the intended service life of the critical bridge components below. If you need assistance repairing damaged joints, please contact Corey Rogers at (517) 322-3320 or Andrew Bouvy at (517) 322-3325.
Pressure Relief Joints

When the material protecting the construction joints of a concrete road fail, debris will fill the void during cold temperatures and no longer allow expansion to occur in warmer weather. This phenomenon is referred to as pavement growth. If routine maintenance is not performed to seal the joints, there may be enough pressure to cause costly damage to the substructure and superstructure of a nearby bridge. Routine maintenance is important, but often times the roads MDOT structures carry are controlled by a county or municipality. Ten common signs of pavement growth are:

1. Expansion Joint Rail Touching: This will often be the first sign that pavement growth on the adjacent roadway is placing pressure on the structure.

2. Crushed Concrete Rail: Damaged railing may often be noticed at expansion joints or near the wingwalls.

3. Steel Pipe Handrail Separation: An easy indication that a substantial amount of stress is acting on the structure.

4. Diagonal Deck Cracking: Occurs at the tailspans.

5. Closed P&H During Cold Temperatures: If pin and hangers are closed when temperatures are cool, then the bridge will not be able to expand freely when they rise again.
Pressure Relief Joints (cont.)

6. Tilted Rockers During Cold Temperatures: If the pressure is not relieved or stopped, the beams may contact one another causing further damage.

7. Touching Beam Ends: Usually causes stress cracking at the bottom of the web.

8. Tilted Backwall (Independent): Creates a void that may be filled with adjacent subbase material and cause the approach roadway to drop.

9. Spalling Below the Beam/Exposed Anchor Bolts (Dependent): Reduced bearing will require substructure repair and/or temporary supports.

10. Low/High Approach: Further inspection is required to determine if it is a result of pavement growth or poor construction methods.

TRAINING OPPORTUNITY
NHI 130078 – Fracture Critical Techniques for Steel
April 27-29
Lansing Construction & Technology
Please contact Terri Lavoy by February 22, 2010
Pressure Relief Joints (cont.)

Pressure relief joint installation is a quick and simple process that involves full depth sawcutting of the roadway 30’ to 75’ away from the reference lines. Two marks, four inches apart, are placed across the pavement and curb as a guide for the sawing.

Once the sawing is complete, the concrete must be completely removed for the road to expand freely. Conventional jackhammers may be used to remove the material, but a skid steer mounted hammer will significantly expedite the process.

Following the removal of the concrete, the pavement surface that will come into contact with the joint must be coated with expansion joint lubricant adhesive. Finally, the last step is to coat the edges of the relief joint and press it into place.

Installing inexpensive pressure relief joints at the first sign of pavement growth will alleviate the force exerted by pavement on the structure, and eliminate future expensive repairs. If you would like to install relief joints, Central Maintenance would be happy to provide materials and assistance. Please contact Corey Rogers at (517) 322-3320 or Andrew Bouvy at (517) 242-1164.

New AT-62 Under Bridge Unit

During late November, Central Maintenance acquired a new under bridge unit to replace an aged twenty year-old unit that would require expensive refurbishing. On December 1st Mark Sandel organized an in-service training course to familiarize bridge inspectors with the controls and capabilities of the new unit. One of the most distinct new features is the advanced control system that monitors the electrical and hydraulic systems, and also provides wireless control of the unit from two locations. Another unique benefit
New AT-62 Under Bridge Unit (cont.)

is the option to deploy the platform on either side of the truck rather than just the right side. There are also automatic leveling systems equipped at turntable number two and at the platform for a quicker deployment. Unlike the previous model, boom number four has the ability to extend, which will allow access behind deep girders. A short list of the performance specifications are:

- Horiz. Underbridge Reach: 61’-9”
- Vertical Reach Down: 67’-7”
- Vertical Reach Up: 51’-6”
- Boom 1: +30 to -35 degrees
- Boom 2: 0 to -105 degrees
- Boom 3: +90 to -36 degrees
- Boom 4: +90 to -36 degrees

Comments or Suggestions?

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or
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