



September 17, 2009

Michael Nearing, P.E.
City of Ann Arbor – Project Management Unit
100 N. Fifth Ave.
Ann Arbor, MI 48104

Re: **Stadium Blvd. over State St. Bridge Condition**

Dear Mr. Nearing:

Per your request I performed an intermediate inspection of the Stadium Blvd. over State St. Bridge on September 15, 2009. We coordinated this inspection with the City's maintenance crew, who periodically removes loose concrete from the bridge, in order to pool resources and minimize disruption to the travelling public. You had stated that you were concerned with the continued deterioration of the bridge, particularly the 5th beam in from the southern face of the superstructure. Even though this inspection will not be officially recorded with MDOT, I performed a complete safety inspection using MDOT and NBIS standards for a routine inspection.

Bridge Condition

In general the bridge was in slightly, although noticeably, worse condition than it was during my last intermediate inspection performed on February 10, 2009, and my last routine inspection performed on October 22, 2008. I was a little surprised to notice any deterioration since February because typically most deterioration takes place during the winter months due to freeze/thaw cycles and the application of deicing salt.

The superstructure is in critical condition, and it continues to show more deterioration from previous inspections than other components of the bridge. The 5th beam from the southern face of the bridge was still the worst beam (for more discussion on this beam please refer to my letter to you dated February 12, 2009). It still has 7 exposed/broken prestressing strands and 7/8" of deflection relative to the two adjacent beams. For reference there was no relative deflection noted in October 2008 and 7/8" of relative deflection noted in February of 2009. Existing spalls in the beams are growing and new spalls are forming; 11 out of 16 beams now have spalls large enough to expose prestressing strands. For reference, in October of 2008 only 8 beams had exposed prestressing strands. In general the worst conditions can be found in the southeast quadrant of the superstructure. This is the low corner of the bridge so water tends to collect there and infiltrate the beams causing the damage.

The wearing surface of the bridge was still in poor condition, however little if any change has occurred since the previous routine inspection. The asphalt is excessively cracked and patched, which is the primary reason water leaks onto the beams below.

The abutments were still in fair condition. Some additional area of delaminated concrete was detected from the last routine inspection, however this was not enough to change the overall condition rating of the substructure.

Existing Safety Measures

Currently there are load and lane restrictions in place in an effort to safely extend the service life of the structure until funding can be secured to replace the bridge. In addition, City maintenance crews have been removing loose concrete from the bridge periodically in an effort to prevent it from falling on vehicles and pedestrians on State Street.

The bridge is posted for the following load restrictions: 19-ton single unit trucks, 24-ton double unit trucks, and 26-ton triple unit trucks. I have reviewed the load rating calculations used to establish these restrictions and am of the opinion that the assumptions that were made are still representative of the bridge conditions. In addition, I spent some time standing on the bridge to feel its response as several small trucks passed over it and was satisfied with the amount of deflection/vibration that I felt. Based on review of the load rating calculations and observations made in the field, I feel that the load restrictions currently in place are appropriate and don't recommend lowering them.

In addition to the load restrictions the bridge has been reduced to 2 lanes, one in each direction. Traffic has been shifted to the northern half of the bridge in order to keep as much load off of the most critical beams as possible. This is an effective measure since the northern beams are in considerably better condition than the southern beams, and should be continued.

In an effort to protect traffic on State Street underneath the bridge City maintenance crews have been removing loose concrete and prestressing strands from the beams so that they can't fall on vehicles or people. Since we coordinated my inspection with one of their trips to the bridge I was able to observe their efforts. They utilized a Dewalt electric chipping hammer, which appeared to be perfectly suited for the task. It was powerful enough to remove loose concrete, but light enough not to damage sound concrete. I believe that under the circumstances this is the best possible measure that can be undertaken, and should continue.

Additional Safety Measures

I feel that the existing safety measures are effective, but I still have a couple concerns.

First, the City's maintenance crews are doing an excellent job of removing loose chunks of concrete from the beams, but there are limits to how often they can perform this work. Accessing the bridge to remove the loose concrete is a complicated process involving heavy equipment and disruption to State Street traffic. Since they can not be on site continually there is still a possibility (albeit a much smaller possibility) that a large piece of concrete from a beam could fall and injure someone.

And second, barrels are the only thing keeping traffic from driving over the worst beams. The barrels can be bumped or moved out of alignment, so there is no guarantee that they will remain in the correct location and keep traffic where it is intended to be. For example, I heard a rumor that someone tried to open up the closed lanes when traffic was backed up before or after the last UM football game. I don't know if this actually happened or not, but it is certainly a feasible scenario. With the condition of the 5th beam continuing to deteriorate it is critical that we ensure traffic stays off of this section of the bridge.

For a solution to these concerns I would recommend that the 5 southernmost beams be removed from the bridge. They no longer serve their function, they represent a safety concern for traffic on State Street, they require excessive attention from maintenance crews, and if left in place they could tempt someone who doesn't know better to drive over them. This would necessitate replacing the barrels with temporary concrete barrier to protect traffic on Stadium Blvd. from the drop-off. The temporary barrier would need to have appropriate tapers each side of the bridge, and Type 3 barricades should be placed to cordon off the drop-offs at the abutments. The advantages to this course of action are improved safety and a reduction in maintenance efforts.

As an alternative to this recommendation the City could remove only the 5th beam, which is by far in the worst condition and represents the biggest concern to public safety. In addition to the above requirements the gap between beam #4 and beam #6 would need to be covered with something to prevent people or debris from falling through. Ideally I would prefer to see the 5 southernmost beams removed, but I understand that in reality that may not be the most feasible solution. If the City feels that removing only the 5th beam would prove a more economical alternative I believe that will still greatly alleviate the risks associated with falling concrete.

Regardless of which alternative is pursued the work probably doesn't need to be done immediately, but with the understanding that it will take some time to prepare a bid package, receive bids from contractors, and complete the work I do recommend that the process begin as soon as possible with a goal of removing the beam(s) before winter. If I can be of any other assistance, or if you have any additional questions please let me know.

Sincerely,

NORTHWEST CONSULTANTS, INC.



Jon Drummond, P.E.
Bridge Project Manager

cc: File