2. INSPECTION DESCRIPTION

2.1 Inspection Team

An HDR inspection team, led by Thomas D. Howell, P.E., and including Darin L. Splittgerber, P.E., and technicians Anthony C. Boro and Sean S. Saab, performed the field inspection from October 6 to October 9, 2008. Mr. Splittgerber was a member of the 1998, 2000 and 2006 inspection team for HDR Engineering, Inc. Davis Erection Company, Inc. of Omaha, Nebraska, provided the rigging, traffic control, safety boat for the inspection. Davis Erection contracted with McClain and Co., Inc. to provide a snooper truck (50' reach) and operator with a bucket attachment for the underside inspection of the bridge. Traffic control and snooper bucket operation was performed by Bill Harden and the boat operator was Willie Bleich, both of Davis Erection, Inc. The snooper trucker was driven by Gary Oels. The weather during the one-week inspection period was seasonable and varied from cloudy with rain to clear and sunny skies with temperature ranging from 50 to 70 degrees.

2.2 Complex Bridge Inspection Procedures

The inspection was completed according to the State of Nebraska Department of Roads Bridge Inspection Manual and Coding Guide and the Bridge Inspector's Training Manual. Prior to beginning the inspection, the 2006 Inspection Report and Supplementary Inventory & Assessment (SI&A) Report were reviewed. Detailed inspection notes and representative photographs were taken during the inspection. Many of the photos shown in this report are taken at same locations as the previous inspections. This allows a comparison of the current observed condition versus the previous condition. The following is a detailed description of the in-depth inspection procedures.

Concrete Segmental Box Girder Superstructure

The exterior surfaces of the concrete box girder (girder webs, bottom of bottom flange and underside of deck overhangs) were visually inspected by two HDR inspectors in a three-man bucket of a snooper truck with a bucket operator. The snooper truck was operating from the bridge deck and safety signs and traffic control were used for the right traffic lane closure. The HDR inspectors and bucket operator utilized fall protection body harnesses and were tied off to the snooper bucket while inside the snooper bucket. On days when inspection of the exterior surface of the concrete box over the river was performed, a boat and boatman was provided on the Missouri River. The inspectors sounded certain portions of the structure with hammers to probe for concrete delaminations and spalling. Cracks in the concrete were measured and the lengths noted in the inspection notes. Surface efflorescence at the concrete cracks was also noted. A feeler gauge was used to measure cracks that were wider than a hairline crack. Concrete cracks noted in the previous inspections were generally located and checked for additional crack length or crack enlargement.

The interior surfaces of the concrete box girder (girder webs, top of bottom flange and underside of top flange) were visually inspected by two HDR inspectors. NDOR

maintenance personnel provided the padlock key to the access door for the inside of the box girder structure. The interior surfaces were inspected using electric flood lights and ladders as necessary to gain access to all surfaces. The inspectors sounded certain portions of the structure with hammers to probe for concrete delaminations and spalling. Cracks in the concrete were measured and the lengths noted in the inspection notes. Surface efflorescence was also noted. A feeler gauge was used to measure cracks that were wider than a hairline crack. Concrete cracks noted in the previous inspections were generally highlighted with a black marker and checked and noted for additional crack length or crack enlargement.

The concrete pier diaphragms, abutment diaphragm and the interior post-tensioning anchor blocks were inspected inside the box girder using similar techniques of sounding the concrete for delamination and noting additional concrete cracks.

Safe Entry Inside Box Girder

Under OSHA definitions, the box girder for the Nebraska City Bridge could potentially be considered an Enclosed or Confined Space. To be considered as an Enclosed or Confined Space all of the following must apply:

1. The space is large enough and so confined that a worker can bodily enter and perform assigned work.
2. The space has limited or restricted means of entry or exit, and
3. It is not designed for continuous human occupancy.

Although the first two requirements definitely apply, normally if a space has interior lighting and electrical outlets, it can be considered adequate for human occupancy. However, since this was obviously not the intent of the design, it has been treated as an Enclosed or Confined Space by HDR staff. Although the structure has been treated as an Enclosed or Confined Space, it does not necessarily mean that the work area poses a hazard. For classification as a Permit Required Confined Space, any of the following must apply:

1. The space contains or has potential to contain a hazardous atmosphere (i.e. hydrogen sulfide, carbon monoxide, methane, explosive gases or oxygen deficiency)
2. The space contains a material with potential for engulfment (i.e. grain, solids, water, etc.)
3. The space has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or a floor that slopes downward and tapers to a smaller cross section.
4. The space contains any other recognized serious safety or health hazard.

The box girder for the Nebraska City Bridge does not contain material with potential for engulfment. Although the cross section does taper slightly as you move away from the piers, the cross section never comes close to the size that an entrant could be trapped or asphyxiated due to the reduced size. Also, no other serious safety or health hazards are present. Therefore, the only potential criteria that could categorize the box girder of the Nebraska City Bridge as a Permit Required Confined Space might be if the space contained a hazardous atmosphere.

To test this criterion for a potential hazardous atmosphere, qualified HDR staff did test the atmosphere of the box with a 4-way gas meter prior to entering the box. This air quality test was performed prior to a previous inspection (2000) of this structure by HDR. Once the access hatch was open, the meter probe was inserted into the box and the atmosphere was tested for oxygen content, combustibles, carbon monoxide and hydrogen sulfide in accordance with HDR Safety Procedure No. 1. The test showed no evidence of a hazardous atmosphere.

The box girder for the Nebraska City Bridge is completely open to the atmosphere at the east end and has adequate openings at the west abutment location to allow an exchange of air. Furthermore, the only perceived hazardous atmosphere generator would be carbon monoxide fumes from the vehicles using the bridge. Because there is no access hatch or manhole into the box from the upper deck that could allow infiltration of carbon monoxide into the box, and because these fumes can readily disperse in the surrounding atmosphere and would not have the opportunity to collect in the box through the end openings, there is no perceived danger of a change to the status of the interior box environment with regard to a hazardous atmosphere. As such, subsequent testing of the box atmosphere was not deemed necessary for future bridge inspections by HDR.

Prestressed Concrete I-Girder Approach Spans

The concrete I-girder spans (girders and deck underside) were visually inspected by two HDR inspectors in a three-man bucket of a snooper truck with a bucket operator. The prestressed I-girders were checked for cracking and concrete spalling. The concrete cracks and surface efflorescence on the underside of the deck between the girders and the condition of the deck overhangs were also visually inspected and noted.

Bridge Deck, Barrier Rail and Expansion Joints

The roadway traffic lanes were visually inspected utilizing traffic control lane closures needed for the snooper truck operations. Some areas of the bridge deck with transverse, longitudinal cracks and areas of delamination previously identified were sounded with a hammer. The general condition of the concrete barrier at the outside of the bridge and in the median was visually inspected. All expansion joints were inspected using the snooper bucket at Pier Nos. 4 and 8. At the abutments the underside of the expansion joints was visible from the ground near the abutment backwall.

Bearings

The pot bearings which support the segmental box girder were inspected with the snooper bucket during the inspection of the outside surfaces of the bridge. The condition of the pot bearings was noted, and the horizontal translation distance from centerline bearing was measured. The bearing pads and bearing plates under the prestressed I-girders were also inspected.

Substructure Elements

All above-ground and above water portions of the substructure were inspected within the operating limits of equipment provided. The snooper bucket was used to visually

inspect the top portions of all piers in the river and the approach spans. A boat was used to access the portions of the river piers near the waterline. The bottom of the approach span piers and bridge abutments were visually inspected by walking around the base of each pier, abutment and wingwall. The accessible concrete surfaces were sounded occasionally with a hammer to check for concrete delamination and spalls. The areas of delamination, concrete spalls and concrete cracks were measured and noted.

Miscellaneous Inspections Items

The concrete approach slabs and metal beam guard fence at the east and west abutments were inspected at the same time as the bridge deck. Approach slabs were visually checked for settling and concrete spalling. The adequacy of the metal beam guard fence was also inspected. The river navigation lights and deck drains were inspected during the exterior inspection of the box girder. The inspectors checked to see if the navigation lights were functioning at night from a visual observation from the adjacent river bank. The conduit inside the box girder and between the girders of the approach spans was visually inspected and no non-destructive testing was performed on the conduit. The condition of the shotcrete slope protection at the west abutment was inspected and the overall condition was noted.

The local NDOR maintenance personnel in Nebraska City were contacted in order to identify any changes or maintenance performed on the bridge since the 2006 inspection. During the inspection, NDOR personnel were notified regarding the broken modular expansion device at Pier No. 4. More detail regarding these particular inspection findings are noted in the following pages of the report.