

2009 Annual Inspection of the Detroit-Superior Bridge CUY-6-1456 SFN 1800930

Supplemental Report of 2009 Inspection Results

No new types of deficiencies were found during this year's inspection. Overall, the findings were reconfirmation of the deficiencies found during the 2008 inspection and a few new instances or locations of the same types of deficiencies that were found in 2008. The following is a brief listing of specific deficiencies found during the inspection that more fully explain the ratings that were given in the BR-86.

Deck

The deck items as a whole – wearing surface, railing, expansion joints and drainage – are all in good condition with few deficiencies. The underside of the deck has areas of spalling with exposed rebar, mostly in the west vaults. The exposed rebar has typically been cleaned and coated with a corrosion inhibitor, and although some points of corrosion staining are showing through on some of these, overall the repair is performing well and the exposed bars have not developed significant amounts of new corrosion.

Floorbeams (Concrete Arch Spans)

Floorbeam 17 in span 3 between the NI and SI column lines has multiple long cracks in the bottom face and E & W faces near bottom, indicating ongoing corrosion of the main reinforcement. The same is occurring at Floorbeam 9, span 3.

Floorbeam 11 in span 5 between the NI and SI lines has a transverse crack across the bottom face and extending up the vertical faces, indicating it has been overloaded at some point. Many floorbeams have had vertical cracks epoxy-injected, incl. most of the floorbeams in span 11, and Floorbeams 12 through 15 in span 5.

Some of the retrofitted concrete floorbeams with widened flanges are developing delaminations or spalls in the repaired areas. This occurs at:

- Floorbeams 8, 9 & 15 in span 2 between SI & SE
- Floorbeam 7 in span 10, between SE & SI
- Floorbeams 8 & 13 thru 17 in span 3, between SE & SI
- Floorbeams 3 & 7 in span 11 between NE & NI
- Floorbeams 3 & 12 in span 12 between SE & SI
- Floorbeams 4 & 5 between NE & NI, and Floorbeams 6 & 7 between SE & SI in span 13.

The north cantilever of Floorbeam 4 in span 13 is spalled with exposed rebar on the bottom face.

Floorbeams (Steel Truss Arch Span)

The floorbeams of the lower-level deck have heavy previous section loss in many locations.

In the upper deck, previous corrosion is re-activating on the sections of the top flanges of the floorbeams that are inside truss members (e.g., the end of floorbeam 4 inside U4-L4); these areas collect debris and retain moisture. Nearly all the floorbeams have some area of heavy previous section loss where corrosion is starting again, but the most corroded are Floorbeams 1, 3, 6, 9, 10, 12, 11', 10', 8', 6' and 4'. Large corrosion holes through the floorbeam webs near the stringer E & F and P & R connections are especially common.

In some cases, re-activating pack rust between components is causing cracks in welds, such as at the S end of Floorbeam 10'.

Also, several floorbeams have field-welded patches to holes that were flame-cut into the webs for access during construction. These thick field welds are now cracking - all the cracks observed are following the path of the weld and not propagating into other parts of the floorbeam web.

Stringers

Both flanges of the stringers of the lower-level utility deck typically have heavy section losses at the sliding stringer bearings (stress relief joints). This pre-dates the rehabilitation and is not a new condition.

Truss Verticals

As noted in 2008, pitting and corrosion is re-activating between the batten plates and the other components on several verticals, especially near the splash zone of the deck. 2 rivets are missing on exterior angle at top of U2'-L2', N truss. U6'-L6' has 3 missing rivets at the top, E face (condition predates last painting). During this year's inspection, these deficiencies were confirmed and it was also found that a previously cleaned and painted corrosion hole in the stay plate at the bottom of U6-L6 of the S truss is actively corroding again.

Truss Diagonals

As noted in 2008, pack rust and pitting is re-activating on the lacing bars on U1-L2, U2-L3, U3-L4, U2'-L3' and U1'-L2', N truss, near the splash zone. Pitting and corrosion is re-activating between the batten plates and the other components on several members, especially near the splash zone of the deck. The bottom batten plate of U1-L2 has 100% section loss in the bottom of the plate.

New instances of this activity that were noted during the 2009 inspection include reactivation of the corrosion on L5'-U4' of the upstream (south) truss.

Truss Upper Chords

The paint is cracked and surface rust is occurring at U8, S. truss. Pack rust (up to 1/2") is re-activating at U10, S. truss; and on U11-U12, N. truss.

Truss Lower Chords

The reactivation of the previously painted pack rust and pitting is especially noticeable on the lower chords of the trusses. During last year's inspection it was already noted on the lacing bars on L8-L9, L9-L10 & L5'-L6' of the N truss. Pack rust has been re-activating between all the components inside the L2 and L2' panel points, N truss; and there is active corrosion on the diaphragm plates inside L5-L6 of the N. truss and in L8'-L9' of the N. truss.

The 2009 inspection confirmed all of these instances and also found that:

- Corrosion is reactivating on L5'-L6' and L7'-L8' of the S truss.
- Pack rust is re-activating under the lacing bars of L9'-L8' of the S truss and L8-L9, L10'-L9' and L9'-L8' of the N truss.

- There is laminating corrosion on the insides between the bearing stiffeners, somewhat heavier on the upstream (south) bearing stiffeners than on the downstream bearing stiffeners.

Truss Sway Bracing

The top gusset plates at the sway bracing connections have tears (construction damage) at U9', S. truss and at U5, N. truss. The tear in the U9' gusset plate was already noted last year, but neither of these tears is believed to be new. Corrosion is re-activating on the sway bracing connection to U2'-L2'. Also, there is laminating corrosion up to 1/8" thick on the sway bracing gusset plate at L10 of the N truss.

Truss Upper Lateral Bracing

Light pack rust is typical at upper lateral bracing connection gusset plates.

Paint

It was noted during last year's inspection that the paint is failed inside the N truss panel points L6, L7, L9, L8', and L7', where the water ponds, and that corrosion is re-activating on both of the floor systems in the areas of previous heavy section loss, especially near the connections of Stringers E, F, P and R to the floorbeams.

The paint is continuing to deteriorate on the truss member components. This is mostly seen on the batten plates and lacing bars (especially on the lower chords) where water tends to pond. Also, the pins and nuts at panel points L6' and L11' of the north (downstream) truss are unpainted, and the paint is peeling on the pin caps at L0 of the N truss.

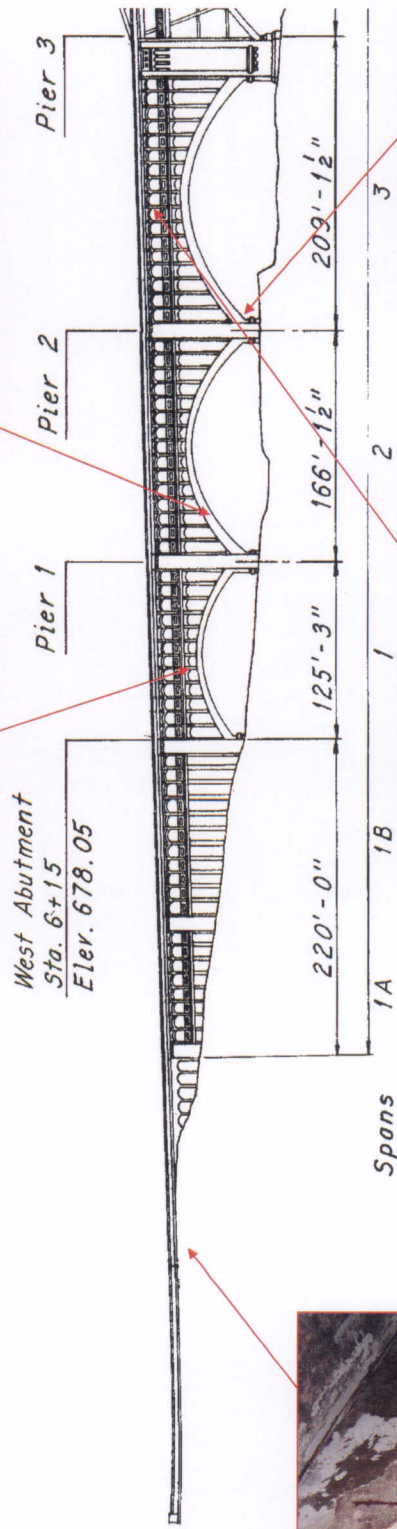
Bearings

The previously noted cracks in the pin washers at the bearings have not changed since the 2008 inspection.

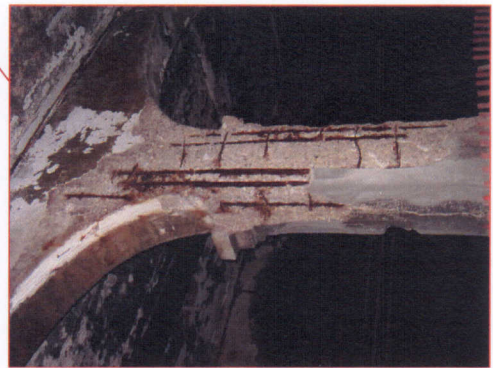
Delamination on north exterior arch..



Cracking in north exterior arch..



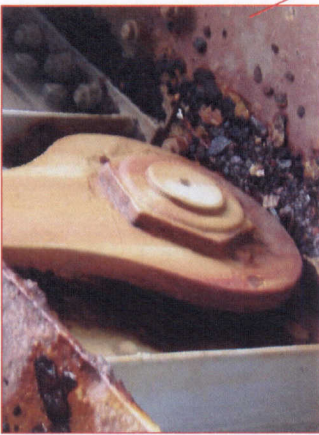
Typical condition of columns in far back of the vaults on the west side of the bridge. This part of the vaults is past the restored area that is used for tours...



Spall with exposed rebar on underside of arch between 3-NI-10 and 3-NI-11..



Map cracking in north exterior arch..



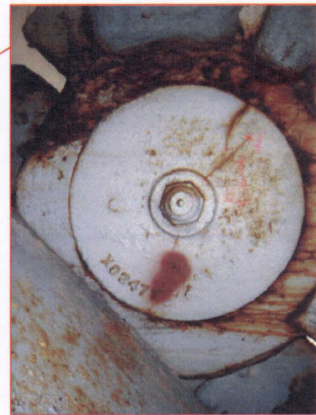
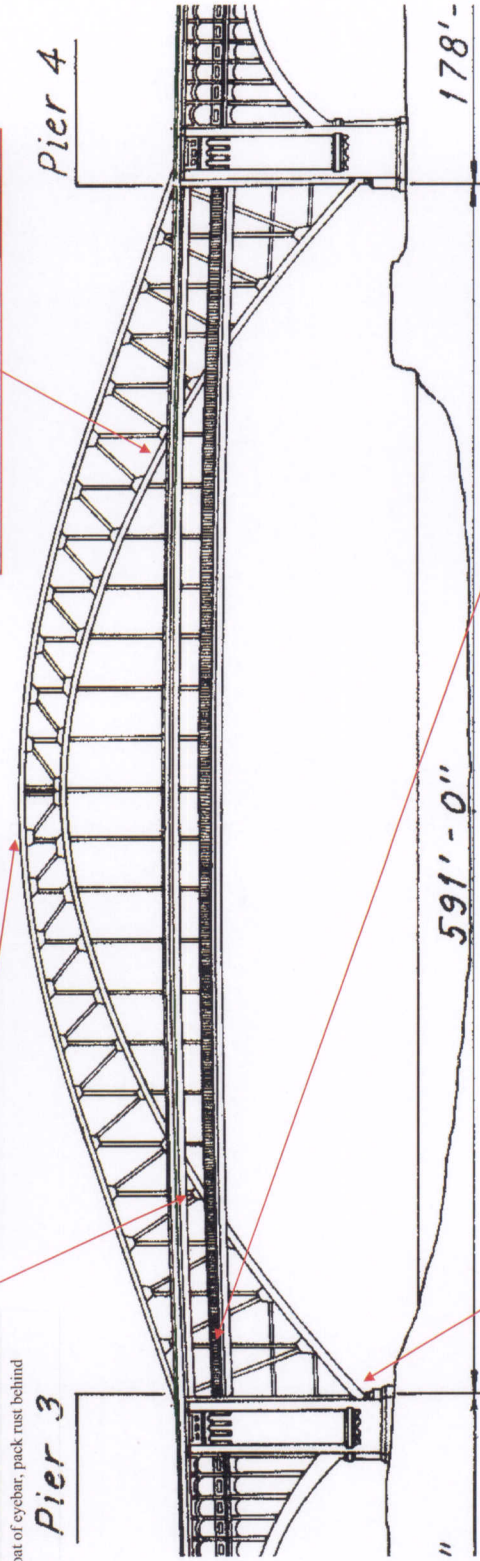
Rust staining over top coat of eyebolt, pack rust behind eyebolt (typical).



Pack rust beginning to reactivate in some locations between truss member components.



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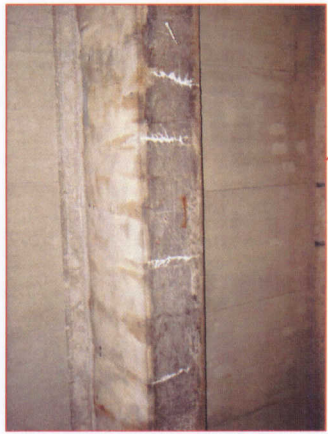
Cracked pin cap at skewback – no measurable change in the cracks from previous inspections (SW skewback).

4 ELEVATION

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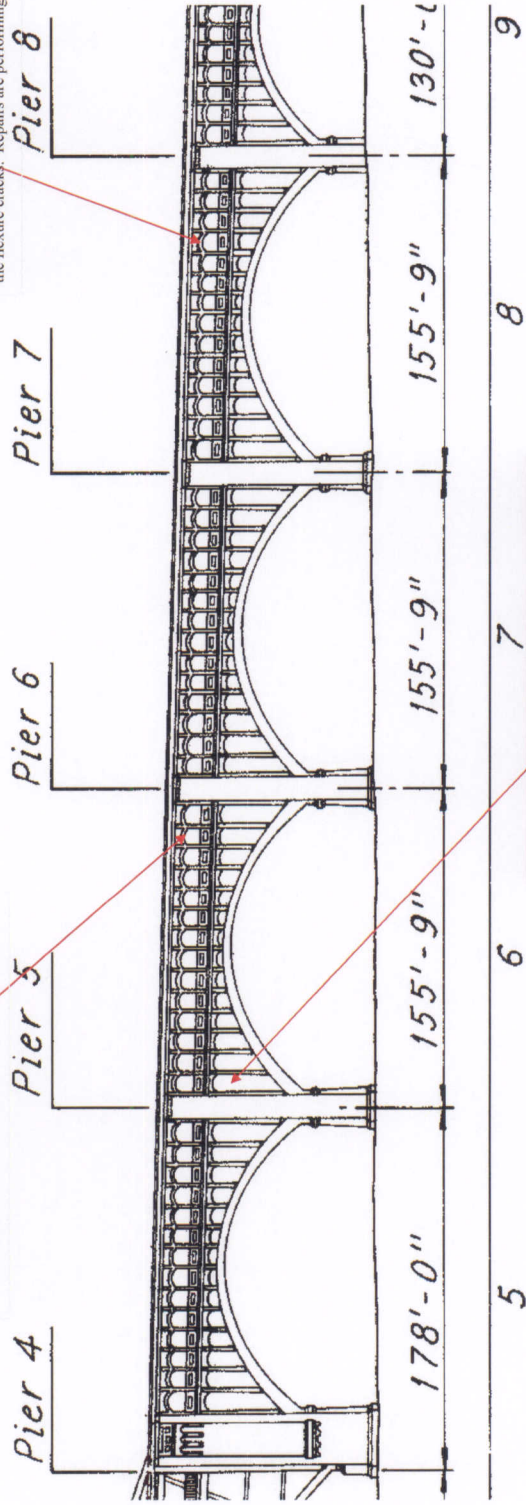
Typical reactivation of pack rust between plates of vertical (U1-L1 south truss shown here).



Cracks with efflorescence on bottom face of floorbeam, extending up the sides.



Most floorbeams in this span have been epoxy-injected at the flexure cracks. Repairs are performing well.



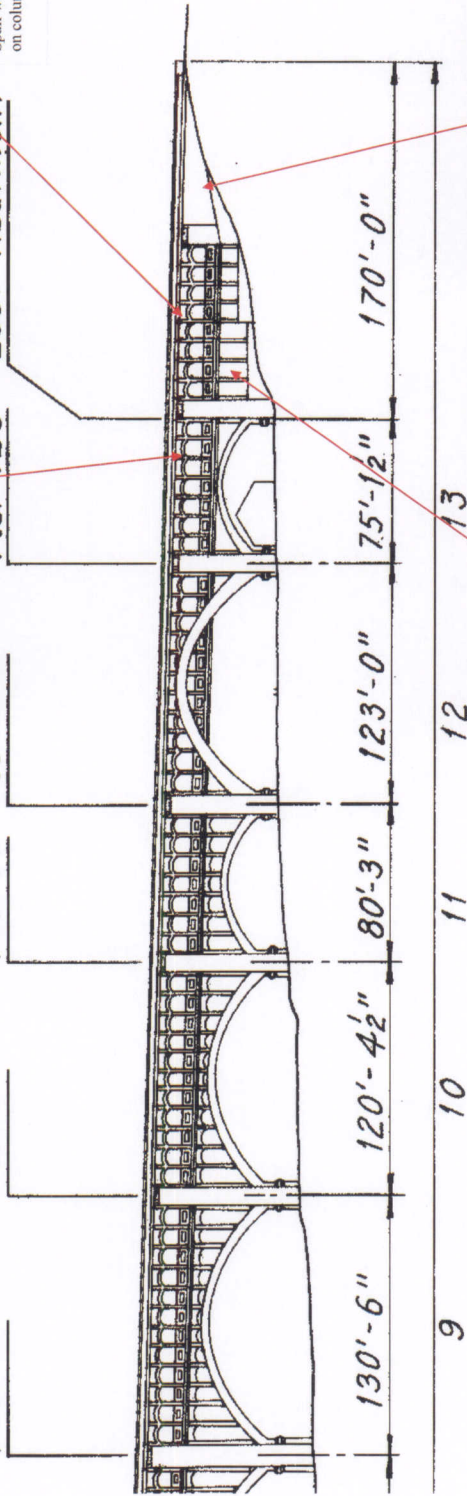
Spall due to crushing on north face, pier 5.

4'x3' delamination on the bottom of floorbeam E near column S13-6NE, with exposed corroded rebar.



Spall with exposed rebar on column ES-5, SE

Pier 8 Pier 9 Pier 10 Pier 11S Pier 12S East Abutment



Block wall between arches has developed some cracks and mortar finish coat is spalling/peeling off.



Heavy scaling, cracking and efflorescence, column ES-18, SE