

September 3, 2015

Tim Nelson  
Minnesota Department of Transportation (MnDot)  
Golden Valley Central Construction Office  
2055 North Lilac Drive  
Golden Valley, MN 55422

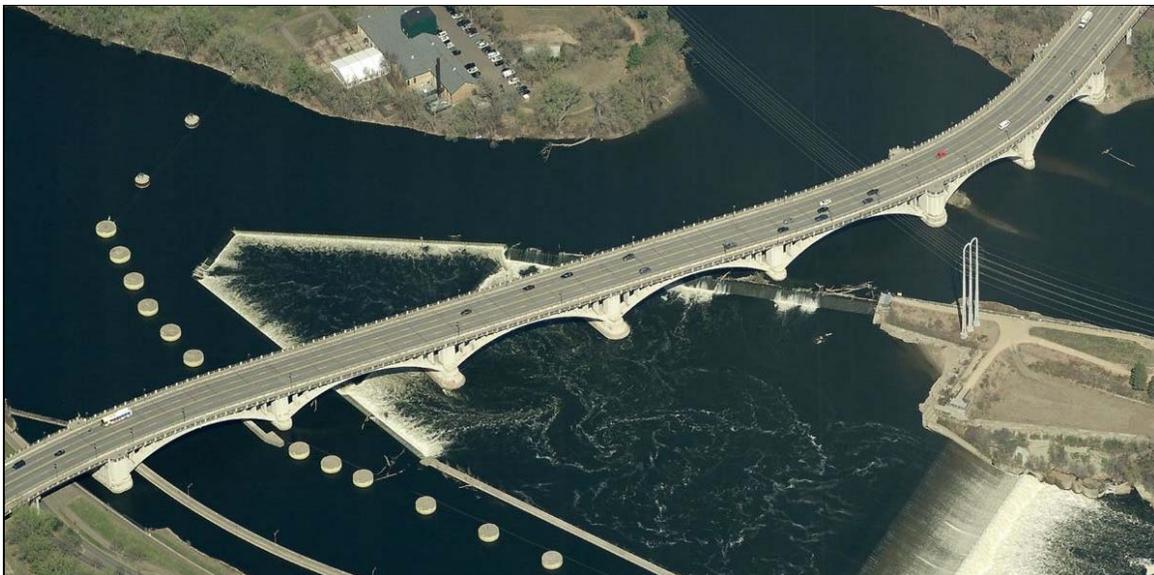
**Re: Bridge No. 2440 Rehabilitation Dive Inspection Summary for 2015**

AMI Project # 141122

Mr. Nelson:

This letter is written in regards to the rehabilitation of bridge number 2440 which crosses the Mississippi River in Minneapolis, MN. Three of the eight concrete bridge piers were to be rehabilitated above and below the waterline. This letter will summarize the work completed and the construction changes which occurred below the waterline on bridge piers #1, 2, & 5 during the 2015 construction season.

This letter summarized the final inspections performed after the concrete pier rehabilitation has been completed. A detailed description of the defects documented during the inspection process can be viewed in the Field Notes of the attached documents. This letter is a summary of the inspections and should be used in conjunction with the attached documents and the previous inspection letter titled "Bridge No. 2440 Rehabilitation Dive Summary for 2014" dated February 24<sup>th</sup>, 2015. An aerial view of the bridge can be seen in Picture #1 below and the location of the piers can be seen on S1.0 in the attached drawings.



Picture 1: Aerial view of bridge no. 2440

## Bridge Pier #1

Bridge pier #1 was located on the far west side of the river. Deteriorated concrete was to be removed and rehabilitated with new concrete and stainless steel rebar at two different locations below the waterline. The two different areas of deteriorated concrete were located near the waterline and the mudline. The rehabilitation of the deteriorated concrete near the waterline was completed in 2014 and described in the previous inspection letter.

The rehabilitation of the deteriorated concrete near the mudline was completed during the 2015 construction season. Before the start of construction, areas of soft concrete was documented at the base of the pier, so the limits of the concrete removal and the required number of horizontal dowels were changed depending on the void height and penetration. Originally, the plans had two horizontal dowels epoxied into the vertical face of the concrete pier at 4'-0" on-center. But if the height of the void exceeded 3'-0" and the penetration of the void exceeded 1'-0", an additional horizontal dowel was to be installed at 2'-0" on-center. The revised details also limited the removal of the soft concrete to 3'-0" horizontally. See revised sheet No 5 of the MnDot plan set in the attached documents for additional details. During AMI's inspection, the additional dowels at 2'-0" on-center were not installed yet. Also, the spacing of the typical dowels exceeded the 4'-0" max spacing by 2" at one location on the south side of the pier.

After the contractor installed the concrete seal at the base of the pier, AMI inspected the bottom seal for voids, areas of concrete washout, or areas of soft concrete. One area of soft concrete was documented at station 0+67 on the west side of the pier. The area of soft concrete was approximately 2'-0" in diameter with a maximum depth of  $\frac{3}{4}$ " to 1". The concrete in this area was slightly above the top of the permanent concrete forms and did not extend below the top of the forms.

During the 2014 construction season, AMI documented an area of concrete washout which exposed some of the newly installed rebar at station 0+35 on the west side of the pier. The contractor installed a small form around this area and placed additional concrete to fill the void. AMI re-inspected this area after the smaller form has been removed and found no deficiencies.

## Bridge Pier #2

Bridge pier #2 was located directly to the east of pier #1. The required concrete rehabilitation for pier #2 was similar to pier #1 but the construction documents only required that vertical concrete face near the waterline be rehabilitated. During AMI's last site visit in 2014, the concrete forms were still present on the downstream half of the pier, so AMI was unable to inspect the new concrete in these areas. With the concrete forms now removed, AMI inspected the remaining portions of the pier and no deficiencies were documented.

## Bridge Pier #5

Bridge pier #5 was located just to the east of the horseshoe dam. The required rehabilitation work for pier #5 included filling the scour hole below the pier with concrete and rehabilitating an area of deteriorated concrete on the east side of the pier.

The bottom seal on pier #5 was completed during the 2014 construction season. AMI inspected the bottom concrete seal in 2015 to document any voids, areas of concrete washout, or areas of soft concrete. Two areas of soft concrete were documented on the east side of the pier. The first area was located at station 0+38 and was approximately 2'-0" to 2'-6" in diameter with a maximum depth of 5" to 6". The concrete in this area was slightly built up above the top of the permanent forms, so the area of soft concrete only extends approximately 2" to 3" below the top of the forms.

The second area of soft concrete was located at station 0+28 and was approximately 3'-0" by 3'-0". The area of soft concrete was approximately 5" to 8" deep but the concrete was also built up above the top of the permanent forms in this area. Therefore, the area of soft concrete only extends approximately 3" to 5" below the forms.

During AMI's last inspection, a new void was documented on the east side of the pier. The void was approximately 5'-0" to 6'-0" long with a maximum height of 1'-1" and maximum penetration of 2'-0". The start of the void was located at station 0+67 on the vertical face of the pier directly above the new grout bags. The new void is located in an area of soft concrete and was likely scoured out due to the altered water flow around the pier from the new concrete seal located just upstream.

Lastly, the construction documents call out an area of deteriorated concrete on the east side of the pier which AMI and the contractor were unable to locate during the 2014 & 2015 construction season. This was determined to be a mistake in the construction documents and no additional concrete rehabilitation was performed on pier #5 during the 2015 construction season.

This letter and the previous letter titled "Bridge No. 2440 Rehabilitation Dive Summary for 2014" summarize the completed rehabilitation work on piers #1, #2, & #5 for Bridge No. 2440. Both letters and their attached documents should be used in conjunction for a complete summary of the bridge pier rehabilitation. If you have any questions or comments please contact myself at (715) 718-2193 ext. 17.

Respectfully Submitted,

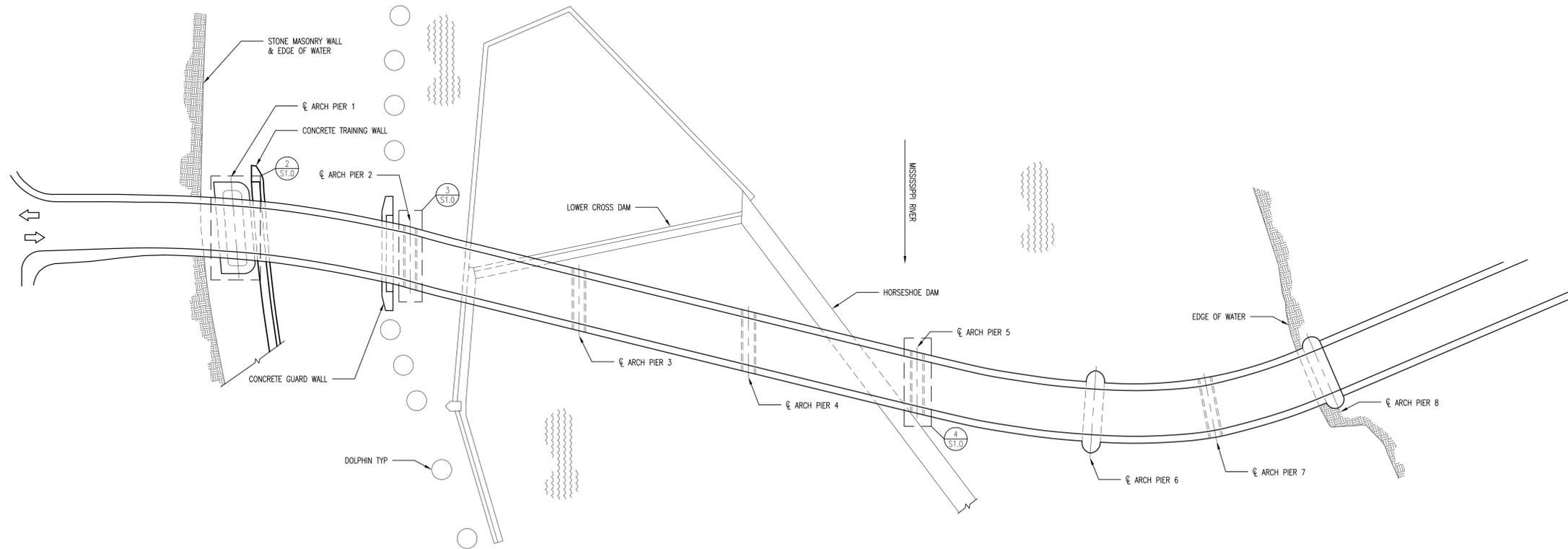


Chase Dewhirst, PE

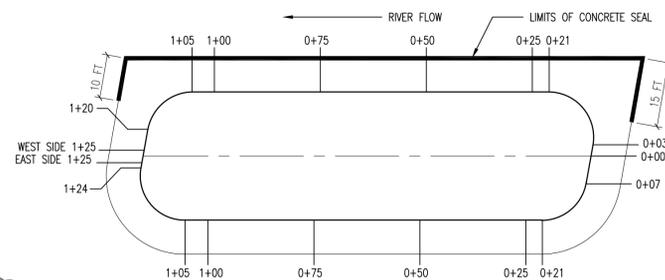
Reviewed By,  
Chad W. Scott, PE  
Principal

Attachments:

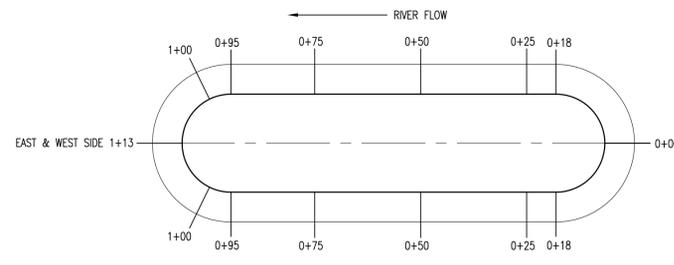
- AMI Drawings: S1.0 (Revised)
- AMI Field Notes: 7/14/15 & 7/31/15
- MnDot Bridge No 2440: Sheet No. 5 (Revised)



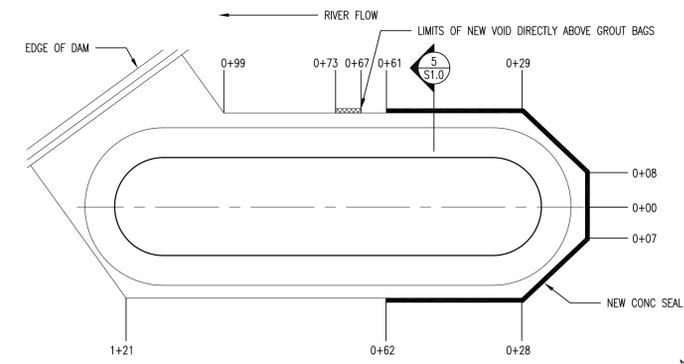
1 GENERAL PLAN  
S1.0 SCALE: 1" = 40'-0"



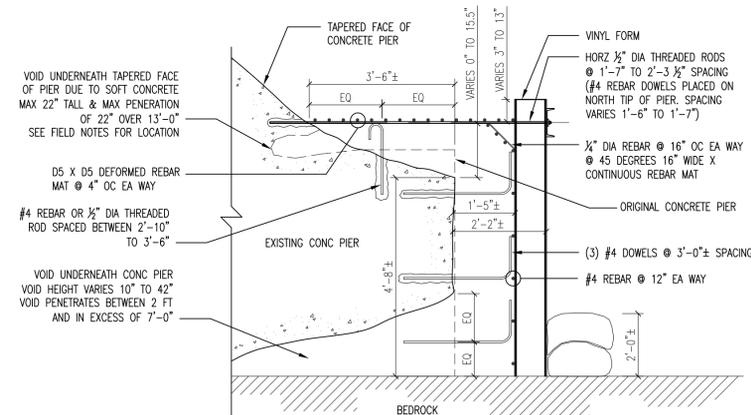
1 2 PIER 1 SECTION  
S1.0 SCALE: 1" = 20'-0"



3 PIER 2 SECTION  
S1.0 SCALE: 1" = 20'-0"



1 4 PIER 5 SECTION  
S1.0 SCALE: 1" = 20'-0"



5 PIER 5 DETAIL  
S1.0 SCALE: 1" = 2'-0"



REV. BY:	DESCRIPTION
CAD	2015 CONSTRUCTION SUMMARY

Minnesota Department of Transportation  
 Bridge No # 2440  
 Dive Inspection  
 Saint Paul, Minnesota

General Plan & Section Details

JOB No: 141122  
 DATE: 2/24/15  
 DRAWN BY: PJB  
 DESIGNED BY: CAD

SHEET:  
**S1.0**



Team Leader: Chase Dewhirst  
 Inspection Date: 7/14/2015  
 Inspection Time: 12:30 PM to 1:45 PM  
 Inspection Type: Level 1  
 Water Elevation:

Side of Concrete Pier	Station / Location Along Concrete Pier	Video Tape Time Ref.	Depth (ft)	Buckling Present	Spalling		Cracking Present	Holes		Construction Deficiency	Debris		Other Damage	Addn'l Note Sheet No.	Comments	
					Present	Size (width x height x pen)		Present	Size		Present	Type				
<b>PIER #1 VISUAL INSPECTION - Dive #1</b>																
East	1+25	19:46:30	-	-	-	-	-	-	-	-	-	-	-	-	-	- Downstream tip of pier. No void present & vertical face of pier buried
East	-	31:52:51	-	-	-	-	-	-	-	-	-	-	-	-	-	- Concrete over pour from diagonal face to horizontal face. Rubble from 4" to 6" in diameter along mudline.
East	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- Horizontal and vertical face of pier buried and not exposed
East	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- Diver dug down approximately 5 inches and felt intersection of diagonal and vertical face of pier
West	-	-	-	-	-	-	-	X	See Comments	-	-	-	-	-	-	- Void begins at approximately 5'-6" north of upstream tip of pier. Max limits of concrete repair is 4'-0" tall and penetrates the pier approximately 3'-2.5". Horizontal surface not present with (2) horizontal dowels embedded into vertical face of pier. Contractor still needs to install third horizontal dowel due to height of void. Dowels extend out approximately 25 inches from vertical face.
West	-	-	-	-	-	-	-	X	See Comments	-	-	-	-	-	-	- Vertical face of footing becomes present at approximately 2'-0" north of upstream tip of pier. Face is 2'-11" tall
West	-	-	-	-	-	-	-	X	See Comments	-	-	-	-	-	-	- Void is present at very base of pier. Void is a couple inches tall and penetration varies 2" to 7"
West	-	-	-	-	-	-	-	X	See Comments	-	-	-	-	-	-	- Bottom void progressively gets bigger as diver moves downstream. At upstream tip of pier, the void is 5" tall with penetration of 18". The overall height of vertical wall repair is approximately 2'-8" tall.
West	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- Horizontal dowels at 4'-0" OC horizontally. Contractor still needs to install horizontal dowels at 2'-0" when height of repair exceeds 3'-0" and penetrations exceeds 2'-0"
West	0+45	-	-	-	-	-	-	X	See Comments	-	-	-	-	-	-	- Void is 7" tall with a penetration of 1'-6"
West	0+55	-	-	-	-	-	-	X	See Comments	-	-	-	-	-	-	- Vertical concrete repair is 3'-2" tall with (2) horizontal dowels installed. Third dowel yet to be installed
West	0+62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- Rebar dowel installed at angle parallel to diagonal face with 2" edge distance & bottom void disappears
West	0+78	-	-	-	-	-	-	X	See Comments	-	-	-	-	-	-	- Void at base of pier is 8" tall with a penetration of 1'-4". Total height of chipped away concrete is 3'-0" tall.
West	1+00	-	-	-	-	-	-	X	See Comments	-	-	-	-	-	-	- Void at base of pier is 6" tall with a penetration of 7". Total height of chipped away concrete is 3'-3" tall.
West	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- Bottom void is cleaned out. One horizontal dowel spacing is 4'-7" at downstream tip of pier.
South	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- Bottom void is not cleaned out at South-West corner of foundation
South	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- Horizontal spacing of horizontal bars is approximately 4'-2".



Team Leader: Chase Dewhirst  
 Inspection Date: 7/31/2015  
 Inspection Time: 9:15 AM to 4:00 PM  
 Inspection Type: Level 1  
 Water Elevation:

Side of Concrete Pier	Station / Location Along Concrete Pier	Video Tape Time Ref.	Depth (ft)	Buckling Present	Spalling		Cracking Present	Holes		Construction Deficiency	Debris		Other Damage	Addn'l Note Sheet No.	Comments
					Present	Size (width x height x pen)		Present	Size		Present	Type			
<b>PIER #5 VISUAL INSPECTION - Dive #1</b>															
East	0+62	16:42:00	-	-	-	-	-	-	-	-	-	-	-	-	- Start of Inspection
East	0+65	16:42:30	-	-	-	-	-	-	-	-	-	-	-	-	- Grout bags only visible approximately 3 ft beyond end of forms (Remaining buried)
East	0+38	16:46:00	-	-	-	-	-	-	-	X	-	-	-	-	- Area of soft concrete at 2 ft out from tapered face of wall. Area is 2 ft to 2.5 ft in diameter and 5 to 6 inches deep. The concrete is slightly built up in this area so soft concrete extends 2 to 3 inches below the top of the forms.
East	0+28	16:50:30	-	-	-	-	-	-	-	X	-	-	-	-	- Area of soft concrete at corner of forms. Area is 3 ft by 3 ft with a max depth of 6 to 8 inches. The new concrete is slightly built up in this area so soft area of concrete extends 3 to 5 inches below the top of the forms.
West	0+61	16:55:00	-	-	-	-	-	-	-	-	-	-	-	-	- Edge of concrete forms on West side of pier
West	0+67	16:56:45	-	-	X	See Comments	-	-	-	-	-	-	-	-	- New void in area of soft concrete in vertical lower vertical face of concrete pier just beyond the edge of the concrete forms. Void is 3 to 4 inches tall and penetrates the pier 3 to 4 inches. Void is located just above the new grout bags installed
West	0+73	17:00:30	-	-	X	See Comments	-	-	-	-	-	-	-	-	- Void extends below mudline. Mudline consists of small concrete rubble. Void is 5 to 6 ft long with a max height of 13 inches and a max penetration of 2 ft. Void is located directly above grout bags
<b>PIER #1 VISUAL INSPECTION - Dive #2</b>															
North	-	20:21:15	-	-	-	-	-	-	-	-	-	-	-	-	- Start of Inspection at edge of the forms on the upstream (See plan for location)
West	0+32	20:29:00	-	-	X	See Comments	-	-	-	-	-	-	-	-	- Area of soft concrete. Area is approximately 2 ft in diameter with a max depth of 0.75 to 1 inch deep. Area of soft concrete does not extend below top of forms
South	-	20:37:15	-	-	-	-	-	-	-	-	-	-	-	-	- Edge of concrete forms on the downstream (See plan for location). One grout bag present beyond forms
West	0+35	20:43:45	-	-	-	-	-	-	-	-	-	-	-	-	- Repair of concrete washout is solid and does not require any additional work
<b>PIER #2 VISUAL INSPECTION - Dive #3</b>															
West	0+50	23:08:30	-	-	-	-	-	-	-	-	-	-	-	-	- Start of Inspection
East	0+45	23:12:45	-	-	-	-	-	-	-	-	-	-	-	-	- End of inspection. No deficiencies documented

