GRAY
PLANT
MOOTY

INVESTIGATIVE REPORT TO JOINT COMMITTEE TO INVESTIGATE THE I-35W BRIDGE COLLAPSE

APPENDIX: Volume II

MAY 2008

Appendix Volumes II and III

Interview Exhibits From Recorded Interviews

Tab Number	Transcript Exhibit Number	Description of Exhibit
34	1 – All interviews	Witness Protocol for Interviews
35	2 – Jerome Adams; 2 & 3 Richard Arnebeck; 2 – Dale Dombroske; 3 – Daniel Dorgan (vol 1); 2 – Beverly Farraher; 2 – Kevin Gray; 2 – Abigail McKenzie; 2 – Khani Sahebjam; 2 – Roger Schultz; 2 – Kevin Western; 2 – Robert Winter	Organization charts for Minnesota Department of Transportation, Mn/DOT Metro District and Metro Bridge
36	3 – Jerome Adams	12/3/02 J. Adams email regarding Rescheduled SP 2783-draft I-35W at Mississippi Bridge Replacement
37	4 – Jerome Adams; 15 – Gary Peterson	7/24/06 Mn/DOT minutes regarding Br. 9340 TH 35W over the Mississippi River Investment Strategy
38	5 – Jerome Adams	1/22/07 J. Adams email regarding SP 2783-116 TH 35W Br. 9340 Plating Project Changes with attached URS Bridge 9340 Study
39	6 – Jerome Adams	6/15/07 Mn/DOT Project Management Schedules and project documentation
40	4 – Richard Arnebeck; 3 – Vance Desens; 4 – Kurt Fuhrman; 3 – Bill Nelson	7/19/07 memorandum regarding Guidelines for In-Depth Inspection of Fracture Critical and other Non-Redundant Bridges and for Underwater Inspections with attached 7/10/07 Quality Assurance Plan, Bridge Office

Tab Number	Transcript Exhibit Number	Description of Exhibit
41	5 – Richard Arnebeck; 3 – Mark Pribula; 3 – Khani Sahebjam	7/20/05 memorandum regarding "Critical Deficiencies" found during bridge inspections
42	2 – Vance Desens; 3 – Kurt Fuhrman; 2 – Bill Nelson; 2 – Mark Pribula	9/23/02 memorandum regarding Guidelines for In-Depth Inspection of Fracture Critical Bridges and Underwater Inspections with attached 9/23/02 Quality Assurance Plan
43	4 – Vance Desens	Minnesota Department of Transportation Bridge Inspections Manual (Version 1.3 – November, 2006)
44	5 – Vance Desens; 14 – Daniel Dorgan (vol 2); 5 – Todd Niemann; 4 – James Pierce	10/18/93 Bridge Inspection Report
45	6 – Vance Desens	4/3/00 Bridge Inspection Report
46	7 – Vance Desens	5/17/02 Bridge Inspection Report
47	8 – Vance Desens	6/13/03 Bridge Inspection Report
48	9 – Vance Desens; 9 – Kurt Fuhrman; 5 – Mark Pribula	9/2001 Fracture Critical Bridge Inspection Report
49	10 – Vance Desens; 10 – Kurt Fuhrman; 6 – Todd Niemann	6/2003 Fracture Critical Bridge Inspection
50	11 – Vance Desens; 16 – Daniel Dorgan (vol 2); 12 – Kurt Fuhrman; 3 – James Pierce	6/2006 Fracture Critical Bridge Inspection (In-Depth)
51	12 – Vance Desens	5/2007 Fracture Critical Bridge Inspection (Annual Report) (Draft – cover and signature pages only)
52	13 – Vance Desens	12/19/06 G. Peterson email regarding Bridge #9340
53	3 – Dale Dombroske	6/2005 Fracture Critical Bridge Inspection (Annual

Tab Number	Transcript Exhibit Number	Description of Exhibit
		Report)
54	2 – Eric Embacher; 2 – Barry Nelson	6/6/07 Minutes of Preconstruction Meeting, Attendance Record and Agenda, regarding 35W Bridge 9340
55	3 – Eric Embacher; 3 – Barry Nelson	6/14/07 Construction Project Schedule materials
56	4 – Eric Embacher; 4 – Barry Nelson	7/31/07 Weekly Meeting Attendance Sheet
57	5 – Eric Embacher; 5 – Barry Nelson	9/7/06 E. Embacher memorandum regarding I-35W Bridge Rehabilitation and Concrete Pavement Rehabilitation
58	6 – Eric Embacher; 6 – Barry Nelson	6/29/07 E. Embacher letter regarding Shop Drawings
59	7 – Eric Embacher; 7 – Barry Nelson	Chart regarding Southeast (Mendota Heights) Resident Office – 2008
60	8 – Eric Embacher; 8 – Barry Nelson	Organization chart for Mendota Resident Office
61	3 – Beverly Farraher; 2 – Jack Pirkl	Organizational chart of Maintenance Operations
62	4 – Beverly Farraher; 3 – Jack Pirkl	Organization charts of Maintenance Operations and Metro Bridge
63	2 – Kurt Fuhrman	9/23/02 Quality Assurance Plan, Office of Bridges and Structures
64	5 – Kurt Fuhrman	1982 – 1985 Bridge Inspection Report
65	6 – Kurt Fuhrman; 15 – Daniel Dorgan (vol 2)	9/28 – 29/94 Report of the 1994 Annual Fracture Critical Inspection for Bridge No. 9340
66	7 – Kurt Fuhrman	7/12/96 Bridge Inspection Report
67	8 – Kurt Fuhrman	8/4/97 Bridge Inspection Report

Tab Number	Transcript Exhibit Number	Description of Exhibit
68	11 – Kurt Fuhrman; 7 – Arlen Ottman; 1 – Daniel Dorgan (vol 2); 4 – Don Flemming; 4 – David Long; 4 – Brett McElwain; 4 – Ed Zhou	6/9 – 13/2003 Fatigue Evaluation, Bridge 9340
69	3 – Kevin Gray; 4 – Abigail McKenzie	Chart of Transportation Funding Sources
70	3 – Abigail McKenzie	Organization chart of Planning, Modal and Data Management Division, Office of Investment Management
71	5 – Abigail McKenzie	Chart of Mn/DOT's Planning & Programming Process
72	6 – Abigail McKenzie	Mn/DOT Revenue Forecast: 2009 - 2028
73	4 – Kevin Gray	FY 2006 HSOP – Bridge
74	5 – Kevin Gray; 3 – Roger Schultz	4/17/06 Technical Memorandum regarding Bridge Preservation, Improvement and Replacement Guidelines for Fiscal Year 2006 through 2008
75	6 – Kevin Gray; 5 – Robert McFarlin	11/2/05 Transportation Program Committee (TPC) Meeting Minutes with attachments
76	7 – Kevin Gray	1/5/06 Transportation Program Committee (TPC) Meeting Minutes with attachments
77	8 – Kevin Gray; 6 – Robert McFarlin	1/5/06 List - Statewide Bridge Preservation Fund
78	9 – Kevin Gray	Presentation: "Future Trends in Condition and Investment Needs"
79	10 – Kevin Gray; 7 – Robert McFarlin	2/27/06 Bridge Report for Commissioner's Staff Meeting
80	11 – Kevin Gray; 8 – Robert McFarlin	5/4/83 Mn/DOT Policy Position Statement and Guideline regarding Trunk Highways Bonds, Criteria for Issuance

Tab Number	Transcript Exhibit Number	Description of Exhibit
81	12 – Kevin Gray; 9 – Robert McFarlin	Mn/DOT Draft Policy Position Statement and Guideline regarding Debt Management
82	13 – Kevin Gray; 10 – Robert McFarlin	7/06 Mn/DOT Draft Position Statement and Guideline regarding Trunk Highway Fund Balance
83	14 – Kevin Gray; 11 – Robert McFarlin	7/06 Mn/DOT Draft Policy Position Statement and Guideline regarding Federal Advance Construction
84	2 – Lowell Johnson	Special Counsel's Second Request for Production of Documents to the Minnesota Department of Transportation, Request 17
85	3 – Lowell Johnson	9/17/79 Bridge Rating and Load Posting Report
86	4 – Lowell Johnson	12/14/95 Bridge Rating and Load Posting Report
87	5 – Lowell Johnson	Input data from Bars report
88	6 – Lowell Johnson	8/17/97 Summary of Rating Calculations – Structure Member Inventory and/or Operating Analysis for Structure 9340
89	7 – Lowell Johnson	12/11/95 Summary of Rating Calculations – Structure Member Inventory and/or Operating Analysis
90	8 – Lowell Johnson	10/17/02 L. Johnson email regarding Br. 4654 Stillwater
91	9 – Lowell Johnson	8/16/05 L. Johnson email regarding Br. 4654 Stillwater
92	2 – Paul Kivisto	5/4/01 D. Dorgan memorandum regarding Metro Region Fracture Critical Bridge Repair Recommendations with attached 5/4/01 D. Dorgan memorandum re: Br #9600 Repair of Water Leakage Inside the Box Tie Girder

Tab Number	Transcript Exhibit Number	Description of Exhibit
93	3 – Paul Kivisto; 2 – James Lilly; 2 – Todd Niemann; 2 – Gary Peterson; 3 – Kevin Western; 2 – Daniel Dorgan (vol 1)	Organization charts of Bridge Office
94	4 – Paul Kivisto; 2 – Todd Niemann	10/23/98 D. Flemming memorandum regarding 9340 Cracks In Approach Span Girders, North End of Bridge Near Pier 9
95	5 – Paul Kivisto	11/23/98 Meeting Minutes regarding Bridge #9340
96	6 – Paul Kivisto	11/28/01 S. Hunt email regarding Discussion of Possible Additional Fatigue Investigation Work on Br. 9340
97	7 – Paul Kivisto	11/25/02 R. Cekalla memorandum regarding Rescheduled SP 2783 draft I-35W at Mississippi Bridge Replacement
98	8 – Paul Kivisto	12/3/02 P. Kivisto memorandum regarding Draft RFI for Consultant Study on Br. #9340
99	3 – James Lilly	2003 Graph: Age Profile by Area of Structures, Trunk Highways Only, Structures 10 Ft and Over
100	4 – James Lilly	James A. Lilly, P. E. resume
101	2 – Robert McFarlin	2/28/2008 Organization chart – R. McFarlin Commissioner of Transportation
102	3 – Robert McFarlin	8/1/06 Organization chart – C. Molnau Commissioner of Transportation
103	4 – Robert McFarlin	2/93 Organization chart – J. Denn Commissioner of Transportation

Tab Number	Transcript Exhibit Number	Description of Exhibit
104	4 – Bill Nelson; 6 – Don Flemming; 6 – David Long; 6 - Brett McElwain; 6 – Ed Zhou	12/13/06 E. Zhou email regarding Recommended Actions for Br. 9340
105	3 – Todd Niemann; 4 – Arlen Ottman; 4 – Gary Peterson; 6 – Mark Pribula	12/1/97 G. Peterson memorandum regarding Installation of Strain Gauges to Measure Stress in Floorbeam Connections
106	4 – Todd Niemann; 3 – Arlen Ottman; 3 – Gary Peterson; 7 – Mark Pribula	12/17/97 B. Miller memorandum regarding Installation of Strain Gauges to Measure Stress in Floorbeam Connection
107	2 – Arlen Ottman	A. Ottman relevant experience summary
108	5 – Arlen Ottman	10/14/98 M. Pribula memorandum regarding Cracked Welds in Approach Spans & Diaphragms at Pier #9
109	6 – Arlen Ottman	11/5/98 P. Kivisto email regarding Br 9340, TH 35W over Mississippi, Short and Long Range Plan
110	8 – Arlen Ottman	8/13/06 DLD – Comments on Executive Summary – Bridge 9340 Study with attached 7/06 Draft Report Table of Contents and 6/06 Executive Summary
111	5 – Gary Peterson; 2 – Daniel Dorgan (vol 2)	5/2000 HNTB report – Proposed tasks to evaluate and increase the redundancy of Mn/DOT Bridge No. 9340
112	6 – Gary Peterson; 3 – Daniel Dorgan (vol 2)	Handwritten note regarding attached 9/5/00 S. Olson letter of transmittal and drawings
113	7 – Gary Peterson; 4 – Daniel Dorgan (vol 2)	List of Bridge 9340 Outstanding Issues
114	8 – Gary Peterson; 5 – Daniel Dorgan (vol 2)	10/2001 HNTB Proposal for Structural Evaluation of Bridge 9340

Tab Number	Transcript Exhibit Number	Description of Exhibit
115	9 – Gary Peterson; 6 – Daniel Dorgan (vol 2)	11/8/01 Handwritten notes
116	10 – Gary Peterson	11/28/01 S. Hunt email regarding Discussion of Possible Additional Fatigue Investigation Work on Br 9340, with handwritten notes
117	11 – Gary Peterson; 7 – Daniel Dorgan (vol 2)	11/28/01 Discussion Points, I-35W over Mississippi River Bridge (from R. Johnson)
118	8 – Daniel Dorgan (vol 2);	12/3/01 J. Fredrick email regarding Br. 9340 35W/Mississippi River in downtown Mpls.
119	12 – Gary Peterson; 9 – Daniel Dorgan (vol 2)	12/14/01 Handwritten notes from meeting at Waters Edge
120	10 – Daniel Dorgan (vol 2); 15 – Don Flemming	11/7/06 G. Peterson email regarding RFP for a monitoring system, with handwritten notes
121	11 – Daniel Dorgan (vol 2)	1/10/07 G. Peterson email regarding Bridge 9340 plating contract scope of work
122	12 – Daniel Dorgan (vol 2)	1/17/07 G. Peterson email regarding 9340 plating scope, with handwritten notes
123	13 – Daniel Dorgan (vol 2)	Mn/DOT In-Depth Fracture Critical Bridge Inspection, Quality Assurance of Inspections Performed by Mn/DOT Districts, with attached 7/30/02 D. Weiszhaar Technical Memorandum regarding Guidelines for In-Depth Inspection of Fracture Critical Bridges and Underwater Inspections

Tab Number	Transcript Exhibit Number	Description of Exhibit
124	13 – Gary Peterson	5/9 Office Information Memo to Bob from S. Pierson, with attached 4/18/05 D. Flemming letter attaching 4/18/05 URS Meeting Minutes for Evaluation of Bridge 9340 – Progress Meeting 4
125	14 – Gary Peterson	4/3/06 Mn/DOT Meeting Minutes regarding Bridge Preservation Recommendations for Bridge Number 9340
126	16 – Gary Peterson	11/1/06 Mn/DOT Minutes regarding Br. 9340 TH 35W over the Mississippi River Investment Strategy
127	2 – James Pierce	6/15/06 Bridge Inspection Report
128	2 – Scott Pierson	8/4/04 D. Flemming email regarding attached meeting Minutes of Evaluation of Bridge 9340 – Progress Meeting 1
129	3 – Scott Pierson	11/17/04 URS Meeting Minutes of Evaluation of Bridge 9340 – Progress Meeting 2
130	4 – Scott Pierson	1/10/05 URS Meeting Minutes of Evaluation of Bridge 9340 – Progress Meeting 3
131	5 – Scott Pierson	2/7/05 E. Zhou email regarding Request for Information with attached S. Pierson memorandum regarding Request for Information Verification with Mn/DOT (revised 1/24/05)
132	6 – Scott Pierson	4/4/05 URS Meeting Minutes of Evaluation of Bridge 9340 – Progress Meeting 4

Tab Number	Transcript Exhibit Number	Description of Exhibit
133	7 – Scott Pierson	3/24/06 D. Flemming letter regarding Preliminary Recommendations for Bridge 9340
134	2 – Geoffrey Prelgo	8/16/06 Preliminary Meeting Minutes – Staging of 35W Rehab Project, Traffic Detours and Timing Issues
135	3 – Geoffrey Prelgo	8/24/05 Meeting Minutes - Staging of 35W Rehab Project, Construction Issues, Clarification of Job Scope and Guard Rail
136	4 – Mark Pribula	9/26/01 Bridge Inspection Report
137	2 – Don Flemming; 2 – David Long; 2 – Brett McElwain; 2 – Ed Zhou	3/28/03 URS Report – Fatigue Evaluation Bridge 9340, 35W Over Mississippi River
138	3 – Don Flemming; 3 – David Long; 3 – Brett McElwain; 3 – Ed Zhou	5/21/03 E. Zhou fax regarding Inspection Check List for Bridge 9340 with attached Inspection List for 6/9 – 13/03 and drawings
139	5 – Don Flemming; 5 – David Long; 5 – Brett McElwain; 5 – Ed Zhou	11/17/04 E. Zhou email regarding Final Minutes
140	7 – Don Flemming; 7 – David Long; 7 – Brett McElwain; 7 – Ed Zhou	12/18/06 E. Zhou email regarding Retrofit Recommendations
141	8 – Don Flemming; 8 – David Long; 8 – Brett McElwain; 8 – Ed Zhou	2/1/07 B. McElwain email regarding MnDOT Bridge 9340 Retrofit Design
142	9 – Don Flemming; 9 – David Long; 9 – Brett McElwain; 9 – Ed Zhou	7/19/07 D. Flemming email regarding 9340

Tab Number	Transcript Exhibit Number	Description of Exhibit
143	10 – Don Flemming; 10 – David Long; 10 – Brett McElwain; 10 – Ed Zhou	9/6/05 handwritten notes – Evaluation of I-35W Bridge, Notes from Meeting
144	11 – Don Flemming; 11 – David Long; 11 – Brett McElwain	6/23/06 B. McElwain email regarding Br. 9340 TH 35W over the Mississippi River investment strategy
145	12 – Don Flemming; 12 – David Long	5/17/05 D. Long email regarding Bridge 9340
146	13 – Don Flemming	11/30/98 E. Power letter regarding working relationship with HDR Engineering, Inc., and attaching report on Allegheny River bridge
147	14 – Don Flemming	9/1/06 D. Flemming email regarding Response to MnDOT comments
148	16 – Don Flemming	2/27/06 E. Zhou email regarding Bridge 9340 Preliminary Recommendation

GP:2370953 v1

WITNESS PROTOCOL FOR INTERVIEWS

1. Authority. We are with the Gray Plant Mooty ("GPM") law firm. GPM has been retained by the Minnesota Legislature to conduct an independent investigation into the collapse of the I-35W Bridge. The Minnesota Legislature has asked us to provide a report of our investigation by May 1, 2008. We will be asking you questions concerning the Bridge collapse and related policies, practices and legislative oversight issues.

2. Purpose. The purpose of this interview is to determine what you might know about the matters we are investigating.

3. Confidentiality. During the time our investigation is active, the information that interviewees provide to us is not public information. The information you provide may no longer be confidential once we submit a report to the Legislature.

4. Process. You are required to answer our questions truthfully. A court reporter is present to record our conversation. Either during this interview or later in our investigation, we may determine that we need to verify certain information. If that occurs, we may ask you for a further recorded statement, a signed affirmation or an oath statement.

5. Post-Interview Contact. We view this process as an on-going dialogue. If you think of anything after this interview that you want to tell us about, please call or e-mail us. Likewise, we hope that you will respond to us if we call or e-mail you with follow-up questions or clarifications.

GP:2315038 v1

EXHIBIT

1

EXHIBIT

2

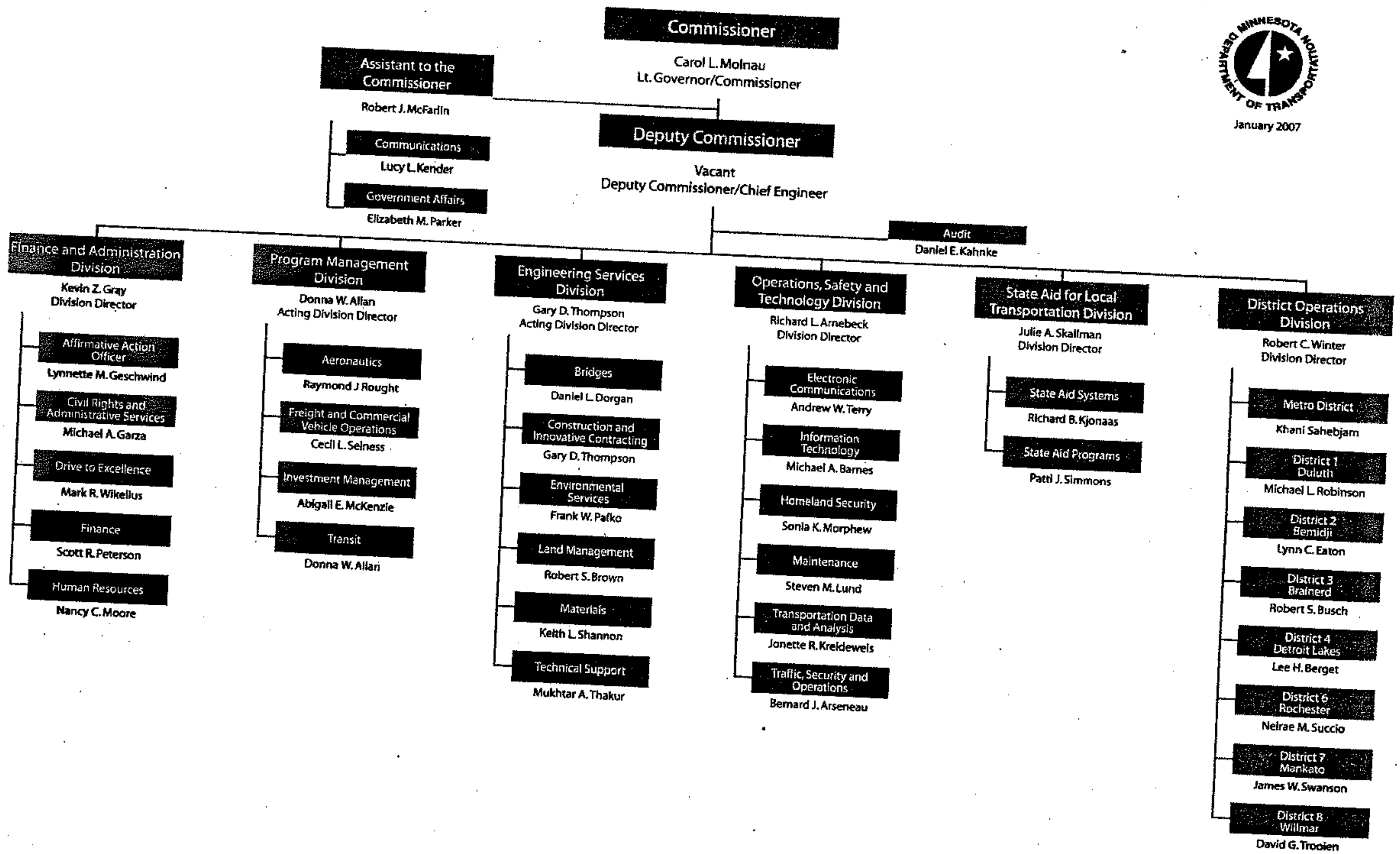
Minnesota Department of Transportation

- **Commissioner** — Robert J. McFarlin, Acting Commissioner
  - **Assistant to the Commissioner** — Vacant
    - Government Affairs — Elizabeth M. Parker
    - Communications — Lucy L. Kender
  - **Deputy Commissioner** — Lisa J. Freese, Deputy Commissioner
    - Civil Rights — Hope J. Jensen
    - Audit — Daniel E. Kahnke
    - **Finance and Administration Division** — Kevin Z. Gray, Division Director
      - Finance — Scott R. Peterson
      - Affirmative Action — Lynnette M. Geschwind
      - Drive to Excellence — Mark R. Wikelius
      - Human Resources and Administration — Mark R. Wikelius
    - **Planning, Modal and Data Management Division** — Timothy A. Henkel, Division Director
      - Investment Management — Abigail E. McKenzie
      - Aeronautics — Gary E. Workman
      - Transit — Judith A. Ellison (Acting)
      - Freight and Commercial Vehicle Operations — Cecil L. Selness
      - Transportation Data and Analysis — Jonette R. Kreideweis
      - Decision Support — Michael A. Barnes
    - **Engineering Services Division** — Richard L. Arnebeck, Division Director
      - Bridges — Daniel L. Dorgan
      - Construction and Innovative Contracting — Thomas D. Ravn
      - Environmental Services — Frank W. Pafko
      - Land Management — Robert S. Brown
      - Materials — Keith L. Shannon
      - Technical Support — Mukhtar A. Thakur
    - **State Aid for Local Transportation Division** — Julie A. Skallman, Division Director
      - State Aid Systems — Richard B. Kjonaas
      - State Aid Programs — Patti J. Loken
      - Electronic Communications — Mark A. Gieseke
    - **Operations Division** — Robert C. Winter, Division Director
      - Metro District — Khani Sahebjam
      - District 1 Duluth — Michael L. Robinson
      - District 2 Bemidji — Lynn C. Eaton
      - District 3 Brainerd — Robert S. Busch
      - District 4 Detroit Lakes — Lee H. Berget
      - District 6 Rochester — Nelrae M. Succio
      - District 7 Mankato — James W. Swanson
      - District 8 Willmar — David G. Trooien
      - Traffic, Safety and Operations — Bernard J. Arseneau
      - Maintenance — Steven M. Lund

February 2008

Minnesota Department of Transportation

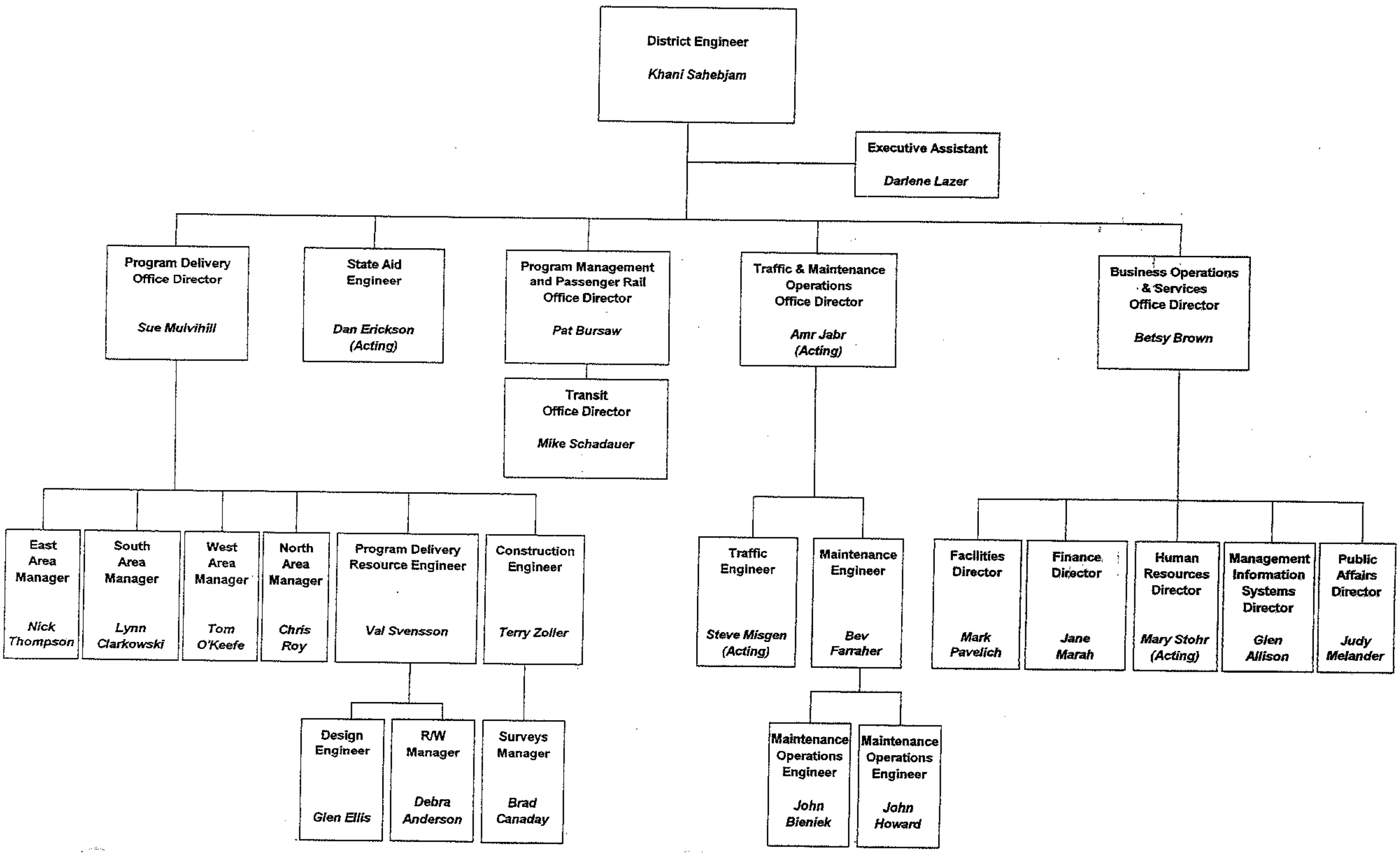
January 2007



Mn/DOT - METRO DISTRICT

METRO MANAGEMENT TEAM

10/3/07



G0-2h

Metro Bridge

Jack Pirkl
Principal Engineer
651-234-7937

Philip Erickson
Bridge
Superintendent
651-234-7939

Bruce Andersen
Bridge Office
Coordinator
651-775-0327

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Mike Ramberg
Plymouth
952-476-3261

6
Transportation
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Pat Stoddard
Tim Lassere
Mark Holden
Jay Kroevel
George Hickey

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Larry Keller
Mendota
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Transportation
Generalist Seniors

Dirk Johnson
VACANT
Paul Szurek
Rich Ellinghuysen
Mike Anderson
Scott Theisen

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Dale Domdroske
Spring Lake
Park
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7
Transportation
Generalist Seniors

Farrell Potter
Mike Palmer - 1-22-08 Retire
VACANT
Jon Hanson
Jerald Olson
VACANT
Michael Kolinski

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Roger Hoff
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7
Transportation
Generalist Seniors

Mike Bruhn
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Jim Kosiowski
Glen Haugen
Wayne Tennison
VACANT
Pat O'Brien

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John Lundeen
Eden Prairie
952-828-6747

6
Transportation
Generalist Seniors

Charles Engels
Merrill Evans
William Schact
Mike Farrell
VACANT
Robert Lehrke

11/5/2007 Source: Phil Erickson, Metro bridge superintendent

From: Jerome Adams
To: Adams, Jerome; Cekalla, Ray; Conf Rm Waters Edge 206; Herman, Michael; OKeefe, Thomas; Roy, Chris
Date: 12/3/02
Time: 1:00PM - 2:00PM
Subject: RESCHEDULED SP 2783-draft I-35W at Mississippi bridge replacement
Place: Conf Rm Waters Edge 206

I have been assinged as the project manager. This meeting is primarily to bring me up to speed on this project. I am basically asking how we get started on this project and what is my role in the short term immediate future.

First I understand Chris Roy will be the Area Engineer instead of John Griffith, so John's attendance is not required.

Tom and Ray: Consultant services needs us to estimate the consultants needed and cost of their services for the next three years. This is just a planning and preliminary estimate. Would you two tell me what consultants you think we may need? Do you have an idea of how much they would cost? I could do a estimate based off of LWD cost estimating if you don't know.

Other agenda items:

- what is our immediate course of action.
- who is going to draw up scoping layouts to reduce dozens of possible alternatives down to about 3 (MNDOT or consultant).
- do we need one group (MNDOT or consultant) to come up with inovative bridge design and how to stage construction, and then one group (MNDOT or consultant) to figure out how the new bridges impact the interchanges to the north and south? When do we do this?
- what is our general plan of action for dealing with the controversy of this project. I expect the project to be controversial because I imagine several properties will need to be acquired for construction staging plus the construction congestion that will be created.
- When do we begin public scoping?

Thank you.

Free Field 1: MNDOT
Free Field 2: Busy
Private Flag: 1

Jerome Adams, P.E.
Senior Engineer
MNDOT
Metro Design
1500 West County Rd. B2
Roseville, MN 55113
Office: 651-582-1320 Fax: 651-634-2162
E-mail: jerome.adams@dot.state.mn.us

CC: Griffith, John

EXHIBIT
3

Minnesota Department of Transportation

Metropolitan District – Waters Edge
Jerome Adams, P.E.
Design
1500 West County Road B2
Roseville, MN 55113

Office: 651-582-1320
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Minutes

July 24, 2006
8:30 AM to 9:30 AM
Waters Edge Conf. Rm. 148
Subject: Br. 9340 TH 35W over the Mississippi River investment strategy
Attendees:

Jerome Adams, Meeting chair/recorder	Dale Dombroske – Metro Maintenance
Paul Kivisto – Oakdale Bridge	Gary Peterson – Oakdale Bridge
Geoff Prelgo – Metro Design	Mark Pribula – Metro Bridge Maintenance
Roger Schultz – Metro Bridge Maintenance	

1.0 Br. 9340 Fatigue Study Briefing

Gary and Paul summarized the Draft Final Report of the Br. 9340 Fatigue Study by URS. In general, the report says that the structure is sound with a low risk of structural failure. To further reduce the risk of failure the report recommends structural steel reinforcement and a new concrete bridge deck.

2.0 Base 15 year bridge investment strategy

It now seems certain that the BASE investment strategy for Bridge 9340 over the next 15 years will be the following. I call it the BASE investment strategy, because this represents the bare minimum that would occur. See the following sections for additional considerations and work.

2.1 2007: On SP 2783-107 a 2" concrete deck scarify with 2" low slump concrete deck overlay including some full depth deck patching at a cost of $3.5 million will occur. This will extend the life of the bridge to the year 2022.

2.2 2012: If it is decided to replace the entire bridge in 2022, then that decision must be made in the year 2012. This will allow 10 years for Mn/DOT to program funds and develop this complex project. If the decision is to redeck the bridge in 2022, then that decision can be made in 2017.

2.3 2017: Make final decision to redeck the bridge in 2022 at a cost of $13 million. This gives 5 years to program the funds and develop the project.

2.4 2022: Either redeck the bridge or replace the bridge.

3.0 Structural steel reinforcement

The URS report recommends that high tensile strength steel plates be bolted onto 20 of the steel members on the bridge. These 20 members are the most at risk of failure due to the loading they endure. This work will further reduce the risk of a structural steel failure. A rough estimate for this work is $2 million dollars.

EXHIBIT
4

4.0 What does "low risk of structural failure" mean?

The URS report says that the bridge is sound, but also determines that the bridge is Fracture Critical, which means that failure of part of the arch truss could cause the entire span or several spans of the bridge to collapse.

So what are the chances that one of the spans will fail? The URS report says that the risk is low. What does that mean? We know that the bridge was built in the 1960's. This means that the grade of the steel and the construction techniques for assembling the steel do not meet the standards that we would require today. Although it is unlikely that a crack would form due to the low stresses in the truss members, the possibility of crack formation resulting from flaws in materials or workmanship cannot be completely ruled out. Crack formation in any of the 16 fracture critical members identified by URS could lead to the collapse or partial collapse of the bridge if not discovered and repaired promptly.

The rate of crack growth is directly related to stress in the bridge member. Based on the low stresses discussed in the URS report, Mn/DOT engineers feel more confident that a crack in a critical steel member can be found before it reaches a critical length. An inspection program which closely inspects the 20 critical members on a regular basis will need to be developed.

5.0 What's the implication of a steel member failing due to a crack?

It's likely the bridge will be closed to all traffic until the significance of the crack can be discerned. This means that Interstate 35W will be completely closed in both directions at the Mississippi River until the problem is either fixed, or until it is determined that it can be partially opened. The duration of time the bridge could be restricted ranges from one month to the time necessary to reconstruct the bridge. See the "Steel Reinforcement Options" section below.

At the very worst, cracks could grow rapidly until the member failed which is likely to result in sudden collapse or partial collapse of the bridge.

6.0 What's the resolution to finding a crack on the bridge?

Small cracks can be ground out or the crack can sometimes be stopped by drilling a hole at the tip of the crack. It's often necessary to plate over larger cracks in order to transfer stresses through the cracked member should the crack continue to grow. The URS proposal is to bolt high strength plates onto the sides of critical members to fully replace strength of the critical member should it crack, and making the member redundant (not susceptible to failure) if the crack became critical. URS recommends plating over 20 members to in order to prevent possible failure, or to prevent disruption to traffic that would result if a crack were discovered in a critical member.

7.0 Winter weather and choosing when to reinforce the bridge.

If we choose to program a project to reinforce the steel now, then Mn/DOT can choose the exact time, conditions, and manner that the work will be prosecuted to maximize cost effectiveness, quality, and safety. If we wait until an inspection finds a crack before we reinforce the steel, then random chance and weather will dictate the time, conditions, and manner that the work will be prosecuted. This will negatively impact cost, quality, and safety.

Bridge inspections do not occur in the winter for safety reasons, such as icy roads that cause crashes, and frigid temperatures that make it impossible to operate the equipment. However, it is more likely that a crack will cause a failure in the steel during the winter, because the cold temperatures make the steel more brittle.

The weather may make it difficult or impossible to repair any cracks in the winter. It may be difficult or impossible to mobilize a crane on a barge on the frozen river below. Frigid temperatures, storms, snow, and ice may make it difficult or impossible to prosecute the work either safely or effectively. It may also be difficult to execute an emergency contract and mobilize a contractor in the middle of the winter.

This could mean that we have to wait one, two, or even three months to fix the problem, and depending on the severity the bridge could be closed for that entire time.

8.0 Ordering reinforcing steel

The steel needed to reinforce the bridge is a special high tensile steel. This steel needs to be ordered from overseas. The order will take 3 to 4 months to fill. If we wait until a crack occurs and then order the steel then it will take 3 to 4 months just for the steel to arrive, and the bridge will be closed for that entire time.

9.0 Steel Reinforcement Options

Based on the information above we arrive at the following options.

9.1 Inspect steel and do not order steel reinforcement

9.1.1 Benefit: Don't have to pay for steel, stockpile steel, or install steel.

9.1.2 Risk: If a crack is found it will take 4 months to order steel and reinforce the bridge, and the bridge will be closed to traffic for this duration. But there is a further risk that the damage is beyond fixing, and the bridge will have to be condemned. This means 35W will be closed for a minimum 5 years until a new bridge is finished.

9.2 Inspect steel, order and stockpile steel reinforcement

9.2.1 Benefit: Purchase price of steel will be cheaper now than in the future. Steel will be on hand for immediate use for an emergency repair. Do not have to spend the money to actually install the steel right now. Under an emergency contract we MIGHT be able to have the bridge closed for only one month weather and contractor availability permitting.

9.2.2 Risk: Cracks grow more rapidly in the winter when working conditions are tough at best. Bridge inspections do not occur in the winter, so there is some risk between the theorized formation of the crack in the winter, and the time we inspect the bridge later in the year. The bridge will be closed until the work is complete. But there is a further risk that the damage is beyond fixing, and the bridge may have to be condemned. This means 35W will be closed for a minimum 5 years until a new bridge is finished.

9.3 Install reinforcement steel right now.

9.3.1 Benefit: Risk of a crack forming between now and 2022 is greatly reduced. Mn/DOT gets to choose the ideal time and circumstances for prosecuting the work.

9.1.2 Risk: Must pay approximately 2 million dollars to get the job done.

10.0 Next Steps

Bridge office will develop costs for the various options listed above and present them to Metro in September 2006. At that time Metro and the Bridge Office will work together to develop the preferred alternative and pursue the programming of the work. This includes the creation of an aggressive inspection program for the bridge.

CC: Tom O'Keefe

From: Jerome Adams
To: Bartelt, Mitch; Dalton, Richard; Dockter, Timothy; Don_Flemming@urscorp.com; Engh, Michael; Griffith, John; Herman, Michael; Kivisto, Paul; Kordosky, Steve; Lunceford, Marv; Parzyck, Rebecca; Peterson, Gary; Pribula, Mark; Reynolds, Michael J; Schultz, Dan
Date: 1/22/2007 8:43:20 AM
Subject: SP 2783-116 TH 35W Br. 9340 plating project changes

The bridge office has asked to delay this project for one year. This spring they want to ascertain if inspection will be adequate for the bridge. See the email below and the attachment for details.

As a result we need to do the following:

Environmental Documentation: (Rick Dalton, Deb Bunde, Mitch Bartelt) All environmental documentation work will stop.

Right Of Way: (Becky Parzyck) I am still waiting to hear from bridge on this issue. I think there is value in getting the titles and parcels identified under that bridge for future reference. I will try to resolve this issue by talking with Metro Bridge Maintenance, Oakdale Bridge, and Metro R/W offices.

Funding & Letting: (Marv Lunceford, Roger Schultz) Marv: Please change the Letting to Oct. 2008 and shift the money to FY 2009. Discuss the money issue with Roger. Remember there is a chance this project will be cancelled entirely, but we won't know until summer 2007.

Contractor Advice: (Steve Kordosky) Steve: You can stop your work on getting contractor advice on how to prosecute this work.

Traffic Control: (Mike Engh, Mike Reynolds, Tim Dockter) The delayed letting would result in summer 2009 construction.

Jerome Adams, P.E.
Senior Engineer
MNDOT
Metro Design
1500 West County Rd. B2
Roseville, MN 55113
Office: 651-582-1320 Fax: 651-634-2162
E-mail: jerome.adams@dot.state.mn.us

>>> Gary Peterson 1/18/2007 1:36 PM >>>
Jerome, as we discussed, the Bridge Office recently received the attached revision to the consultant's report on fatigue and fracture susceptibility of the truss on bridge 9340. Additional members have been added, above the 32 that we had originally discussed. However the consultant also modified his recommendations to clarify the size of a flaw that would need to be detected during visual or NDT inspection of members. They also clarified that there was no preferred method to address the possibility of collapse resulting from growth of a critically sized weld flaw. Both the plating and NDT inspection options should be effective in minimizing risk, however he cautioned that drilling holes for plate installation may become an issue because drilling could introduce new defects.

The Bridge Office and the consultant discussed the revision at length in a meeting yesterday. The result of the discussion was the Bridge Office believes the plating project planned prior to receiving this revised information may not be necessary. This spring, we would like to coordinate with Metro inspection staff to make an in-depth visual and NDT inspection of identified truss members located under the south end of the bridge. If it is determined after the inspection that we are confident welds can indeed be fully inspected and are free of critical sized flaws, the identified members on the remainder of the bridge will be scheduled for in-depth inspection and the plating project will be determined unnecessary. Until that final determination is made we recommend you suspend work on the plating project and postpone

EXHIBIT
5

possible letting until 2009.

I've talked to Roger Schultz briefly about this delay. My recommendation to him was for him to substitute another project for the 2008 plating project, and that if possible, he should identify some FY 2009 BIP projects that could be postponed if a plating project was deemed necessary to be let in 2009.

We regret the additional work this has caused you and others in the district, but I'm sure you agree that based on this new information its appropriate that we postpone the project until we can determine if another option may as safe and a more cost effective approach.

Call me if you need any additional information or would like to discuss these issues further.

Gary Peterson
Bridge Construction & Maintenance Engineer
Mn/DOT Bridge Office
3485 Hadley Avenue North
Oakdale MN 55128
(651) 747-2107

Recommendations on Truss Members Retrofit

The following table lists the identified 13 fracture critical truss members on one half of each truss. Due to the double symmetry of the deck truss, there are a total of 52 fracture critical main truss members on the bridge structure. Figure 1 shows all the fracture critical members on one truss, or 26 members. These include the corresponding chord members on the opposing side of the zero-force vertical from the fracture critical members identified by the redundancy analysis.

Table. Infinite Fatigue Life Check of Fracture Critical Members on One Half of Each Truss

Truss Member	Dead Load Axial Stress	*Fatigue Guide Specs* Fatigue Truck Method				*LRFR Manual* Fatigue Truck Method			
		LL+I Stress Range S_r I = 10%	Factored Stress Range R_sS_r	Limiting Stress Range S_{FL} Cat. D	Limiting Stress Range S_{FL} Cat. E	LL+I Stress Range Δf I = 15%	Max Stress Range Factored $2.0R_s\Delta f$	Fatigue Threshold $(\Delta f)_{th}$ Cat. D	Fatigue Threshold $(\Delta f)_{th}$ Cat. E
	(ksi)	(ksi)	(ksi)	(ksi)	(ksi)	(ksi)	(ksi)	(ksi)	(ksi)
L1-L2	1.50	1.53	2.58	2.60	1.60	1.63	3.10	7.00	4.50
L2-L3	1.50	1.42	2.38	2.60	1.60	1.51	2.86	7.00	4.50
U0-U1	9.76	1.19	2.00	2.60	1.60	1.30	2.48	7.00	4.50
U1-U2	8.54	0.68	1.15	2.60	1.60	0.74	1.41	7.00	4.50
U4-U5	11.61	1.17	1.97	2.60	1.60	1.25	2.37	7.00	4.50
U5-U6	10.95	1.16	1.95	2.60	1.60	1.24	2.35	7.00	4.50
L11-L12	15.73	0.71	1.20	2.60	1.60	0.75	1.42	7.00	4.50
L12-L13	15.73	0.71	1.19	2.60	1.60	0.75	1.42	7.00	4.50
L13-L14	17.54	0.58	0.97	2.60	1.60	0.61	1.16	7.00	4.50
U6-U7	18.06	0.38	0.65	2.60	1.60	0.41	0.78	7.00	4.50
U7-U8	18.58	0.43	0.73	2.60	1.60	0.46	0.88	7.00	4.50
U8-U9	17.45	0.36	0.61	2.60	1.60	0.39	0.74	7.00	4.50
U9-U10	17.33	0.34	0.58	2.60	1.60	0.36	0.69	7.00	4.50

The table also summarizes AASHTO criteria for infinite fatigue life check in accordance with the Fatigue Guide Specifications and the LRFR Manual using the fatigue truck method. The Fatigue Guide Specifications is more conservative than the LRFR Manual in that it applies a 1.75 reliability factor (vs. 1.0 in LRFR) to the calculated stress range due to the fatigue truck for fracture critical members and uses an infinite fatigue life limiting stress range of 0.367 times (vs. 0.5 times in LRFR) the constant amplitude fatigue threshold developed from fatigue tests. As shown in the table, all members satisfy the LRFR requirements for infinite fatigue life although the first six members fail to satisfy the Fatigue Guide Specifications for the Category E fatigue detail (U1-U2 is included in this group because of its counterpart U0-U1).

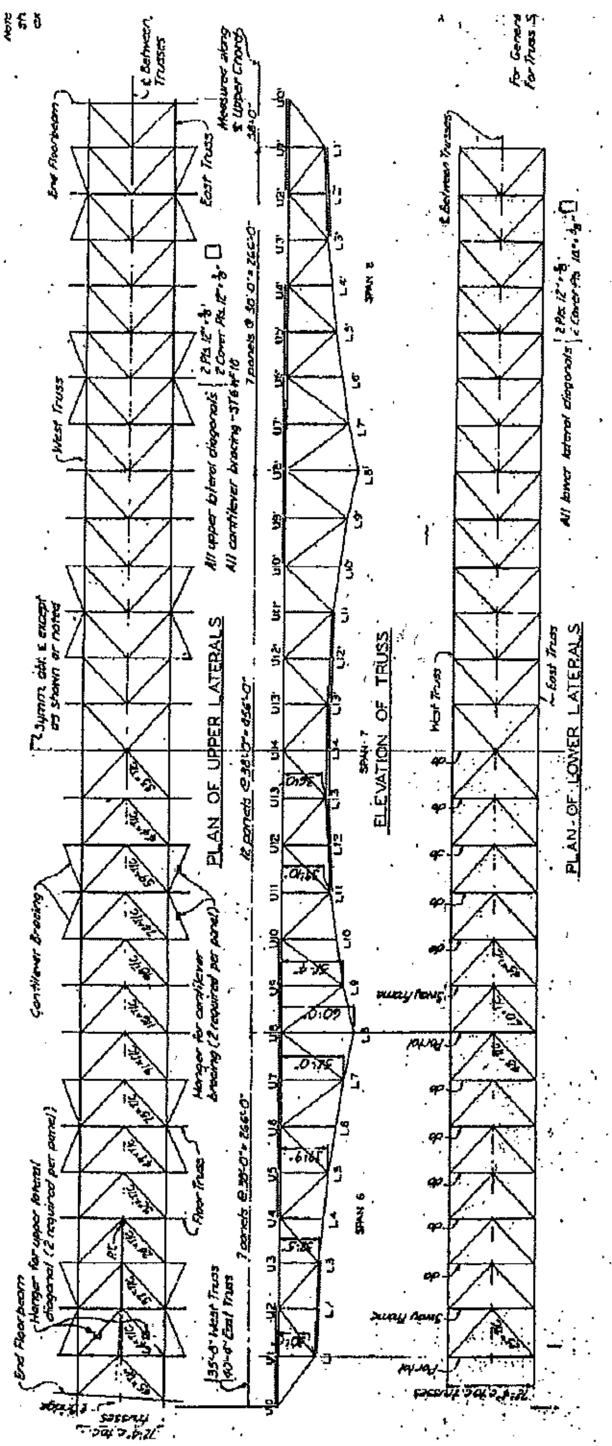


Figure 1: Deck Truss Framing Plan and Elevation from Original Contract Plans (Highlighted Members are Identified Fracture Critical Members)

The fracture critical members can be divided into two general groups: (1) relatively more fatigue sensitive members (L1-L2, L2-L3, U0-U1, U1-U2, U4-U5, and U5-U6), these members are subject to higher fatigue load stress ranges, not satisfying the Fatigue Guide Specifications' infinite fatigue life check for Category E, but are subjected to lower total stresses and have thinner web plates that are more forgiving for brittle fracture; and (2) relatively more fracture sensitive members (L11-L12, L12-L13, L13-L14, U6-U7, U7-U8, U8-U9, and U9-U10), these members have larger cross sections and are subject to very low fatigue load stress ranges, satisfying all AASHTO infinite fatigue life checks for Category E, but are subjected to higher total stresses and have thicker web plates that do not tolerate the existence of through-thickness cracks before the occurrence of brittle fracture.

It is very important to emphasize that neither a fatigue crack would propagate under repeated fluctuating load nor a brittle fracture would occur under some heavy load without a preexisting flaw or crack. As the results of a fracture mechanics analysis indicated in Section 9, the dimensions of preexisting cracks need to be quite large in order to propagate under the traffic load and grow to a critical size to induce a brittle fracture of the truss chord web plate. Since the locations of fatigue susceptible details are clearly known on Bridge 9340, one alternative retrofit approach to steel plating is to perform an in-depth non-destructive examination (NDE) of all the suspected details for existing cracks and flaws. For any weld-induced flaws or cracks discovered by the NDE efforts, a suitable procedure (e.g. grinding) should be carried out to remove the sources of localized stress concentration. After all the fracture critical members are assured of no existence of measurable cracks or flaws, confidence should be obtained for these members for infinite fatigue life under the traffic load.

Based on the analysis results described in this report, three equally viable retrofit approaches are recommended as follows:

(1) Steel plating of all 52 fracture critical truss members. This approach will provide member redundancy to each of the identified fracture critical members via additional plates bolted to the existing webs. The critical issue of this approach is to ensure that no new defects

are introduced to the existing web plates through the drilled holes. This approach is generally most conservative but its relatively high cost may not be justified by the actual levels of stresses the structure experiences.

(2) Non-destructive examination (NDE) and removal of all measurable defects at suspected weld details of all 52 fracture critical truss members. The critical issue of this approach is to ensure that no measurable defects are missed by the NDE efforts. The fracture mechanics analysis has indicated that the dimensions of preexisting surface cracks need to be at least one quarter of the web plate thickness in order to grow and subsequently cause member fracture under the traffic load. This approach is most cost efficient.

(3) A combination of the above two approaches: steel plating of the 24 more fatigue sensitive members (L1-L2, L2-L3, U0-U1, U1-U2, U4-U5, and U5-U6 in each half of each truss), and NDE of the 28 more fracture sensitive members (L11-L12, L12-L13, L13-L14, U6-U7, U7-U8, U8-U9, and U9-U10 in each half of each truss).

SP: 2783-102   **Hwy: 35W**   Top of BRIDGE   District List

CUR BRG #: 9340   **SP:** 2783-102   **HWY:** 35W   **BRG STATUS:** Active   **BRG LET:** 1-1-49
OLD BRG #: 9340   **DST:** M   **CNTY:** Hennepin   **DST STATUS:** Propos   **CUR.LET:** 1-1-49
DESCRIPTION: TH 35W OVER RR, BLUFF STREET, MISSISSIPPI RIVER & 2ND AVE, 1.0 MI NE OF JCT OF TH 94
PROG: ZE   **BRG WRK TYP:** New Bridge   **BRIDGE COST:** $95,000,000 E
MI: **DST WRK TYP:** Grade, Surface, and Bridge   **BRG COST DATE:** 1-11-07
DESIGN ORG: TH-Consultant   **FIN DSN GRP:** Unknown   **PROJ CURR COST:** $0
SPEC GRP: Unknown   **DST PRE PRJ MGR:** Adams, Jerome   **CURR COST DATE:** 4-9-04
FUNDS: **DST FIN DES PRJ MGR:** Adams, Jerome   **R/W COST:** $0
SECONDARY WRK TYPES: **PLANS READY DATE:**
ASSOCIATED SPs: 2783-(9340G)
TIES:
NOTE: URS STEEL REINFORE PROJECT - DEVELOP PLANS FOR PLATING OF SEVERAL OF THE TRUSS MEMEBERS OF THE BRIDGE

ACT NUM	DESCRIPTION	DUR	% COM	REM DUR	EARLY START	EARLY FINISH	LATE START	LATE FINISH	TOTAL FLOAT	ACTUAL START	ACT FIN
1002	STRUCTURE SCOPING	180	10	162	6-16-07	11-24-07	11-29-45	5-9-46	14046	1-10-07	
1002-1011	CONSULTANT ACQUISITI	180	0	180	6-16-07	12-12-07	11-7-48	5-5-49	15120		
1041	BRIDGE SURVEYS	90	0	90	11-25-07	2-22-08	5-10-46	8-7-46	14046		
1075	STRUCTURE RECOMMENDA	90	0	90	11-25-07	2-22-08	6-28-46	9-25-46	14095		
1191	FOUNDATION RECOMMEND	180	0	180	5-3-08	10-29-08	3-8-47	9-3-47	14188		
1259	BRIDGE HYDRAULICS LE	70	0	70	2-23-08	5-2-08	8-8-46	10-16-46	14046		
1260	PRELIMINARY STRUCTUR	360	0	360	5-3-08	4-27-09	10-17-46	10-11-47	14046		
1260-1011	CONSULTANT ACQUISITO	180	0	180	6-16-07	12-12-07	11-7-48	5-5-49	15120		
1270	FINAL STRUCTURE PLAN	360	0	360	4-28-09	4-22-10	10-12-47	10-5-48	14046		
1270-1011	CONSULTANT ACQUISITI	180	0	180	6-16-07	12-12-07	11-7-48	5-5-49	15120		
1301	STRUCTURES PS&E	21	0	21	4-23-10	5-13-10	10-23-48	11-12-48	14063		
1310	LETTING	28	0	28	12-5-48	1-1-49	12-5-48	1-1-49	0		

======== END OF 2783-9340G ========

EXHIBIT
6

9340_F089_008.pdf

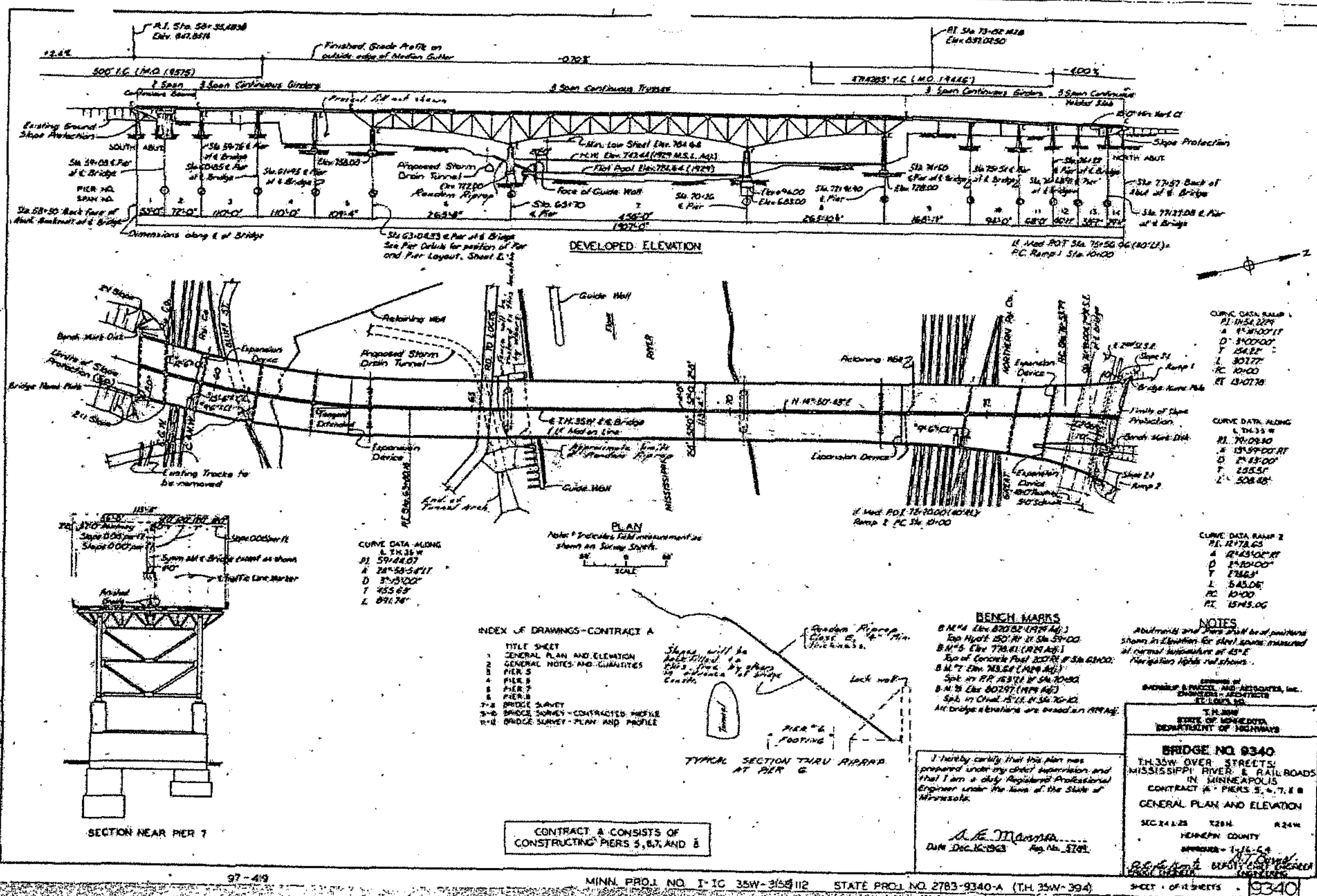
SP: 2783-102 Proj Seq: 21721 Hwy: 35W Top of METRO District List

SP: 2783-102 **HWY:** 35W **CNTY:** Hennepin **STATUS:** Propos **ORG.LET:** 10-19-12 **CUR.LET:** 1-1-49
DESCRIPTION: REPLACE BR. 9340 OVER MISSISSIPPI RIVER INCLUDING MAJOR
REDESIGN/RECONSTRUCTION OF FREEWAY TO BRIDGE
PROGRAM: ZE **WRK TYPE:** Grade, Surface, and Bridge **ORG.COST:** $0
MI: **BEG.RF.PNT:** **COST EST CHANGE:** 04-09-04 **CUR.COST:** $0
FY: 49 **END RF.PNT:** **AUTH DATE:** **AGREE AMT:** $0
AREA ENG: Griffith, J. **PARCELS:** **RELOCS:** **R/W COST:** $0
PREL. PROJ. MGR: Adams, Jerome **FIN. DES. PROJ. MGR:** Adams, Jerome **RES. ENG:**
DESIGN ENG: Herman, M. **FUND DESIGNATORS:** **PLANS READY DATE:**
SECONDARY WRK TYPES:
NOTE:
JOB NUMBERS: 2783-(9340STUDY): BRS=T57301, 2783-102: P=T59853
ASSOCIATED SPs: 2783-(9340STUDY)
TIES:

ACT NUM	DESCRIPTION	DUR	% COM	REM DUR	EARLY START	EARLY FINISH	LATE START	LATE FINISH	TOTAL FLOAT	ACTUAL START	ACTUAL FINISH
----	--------------------	---	---	----	--------	--------	--------	--------	-------	--------	------
1001	START	0	100	0		8-25-02			0	8-25-02	8-25-
1002	STRUCTURE STUDY	180	0	180	10-24-06	4-21-07	10-9-41	4-6-42	12769		
1003	PROJECT SCOPING	120	0	120	1-6-07	5-5-07	12-22-41	4-20-42	12769		
1015	TRAFFIC FORECASTS	120	100	0		7-1-03			0	3-27-03	7-1-
1018	PHOTOGRAMMETRIC BASE	400	100	0		6-18-04			0	3-2-04	6-18-
1020	PRELIM DESIGN MAPPIN	180	100	0		7-1-03			0	1-26-03	7-1-
1030	CONTROL SURVEYS	90	100	0		7-1-03			0	4-26-03	7-1-
1032	DISTRICT LAND SURVEY	90	30	63	5-5-11	7-6-11	10-9-47	12-10-47	13306	6-23-04	
1040	FINAL DESIGN SURVEYS	90	0	90	1-5-11	4-4-11	4-9-48	7-7-48	13609		
1050	SCOPING DOCUMENT	180	0	180	1-1-08	6-28-08	4-21-42	10-17-42	12529		
1051	PUBLIC SCOPING MEETI	60	0	60	6-29-08	8-27-08	10-18-42	12-16-42	12529		
1052	SCOPING DECISION DOC	90	0	90	8-28-08	11-25-08	12-17-42	3-16-43	12529		
1054M	SCOPING COMPLETE	0	0	0	11-25-08	11-25-08	3-17-43	3-17-43	12529		
1080	PRELIM GEOMETRIC LAY	360	0	360	11-26-08	11-20-09	3-17-43	3-10-44	12529		
1085	CULTURAL RESOURCES D	240	0	240	10-22-09	6-18-10	4-30-44	12-25-44	12609		
1086	ECONOMIC ANALYSIS	90	0	90	3-16-09	6-13-09	12-12-43	3-10-44	12689		
1090	SPECIAL PROJECT DOCU	365	0	365	10-27-08	10-26-09	5-11-43	5-9-44	12614		
1100	DRAFT ENBIRONMENTAL	200	0	200	11-26-08	6-13-09	8-24-43	3-10-44	12689		
1110	PUBLIC HEARING ON DE	60	0	60	11-21-09	1-19-10	3-11-44	5-9-44	12529		
1111	Public Hearing, on a	90	0	90	10-22-09	1-19-10	6-29-44	9-26-44	12669		
1113	Public Information M	120	0	120	6-29-08	10-26-08	1-6-43	5-5-43	12609		
1120	FINAL EIS	200	0	200	1-20-10	8-7-10	5-10-44	11-25-44	12529		
1121	ADEQUACY DETERMINATI	90	0	90	8-8-10	11-5-10	11-26-44	2-23-45	12529		
1122	RECORD OF DECISION	30	0	30	11-6-10	12-5-10	2-24-45	3-25-45	12529		
1129	Environmental Assess	360	0	360	10-27-08	10-21-09	5-6-43	4-29-44	12609		

1131	EIS Need Decision	90	0	90	1-20-10	4-19-10	9-27-44	12-25-44	12669		
1132	Finding of No Signif	90	0	90	6-19-10	9-16-10	12-26-44	3-25-45	12609		
1135M	ENVIRONMENTAL DOCUME	0	0	0	12-5-10	12-5-10	3-26-45	3-26-45	12529		
1140	FINAL GEOMETRIC LAYO	150	0	150	8-8-10	1-4-11	3-26-45	8-22-45	12649		
1141	PRELIM HYDRAULICS DE	240	0	240	5-25-09	1-19-10	12-26-44	8-22-45	12999		
1150	PROJECT DESIGN MEMO	240	0	240	12-6-10	8-2-11	3-26-45	11-20-45	12529		
1160	FINAL DESIGN MAPPING	180	100	0		7-1-03			0	1-26-03	7-1-
1170	PAVEMENT TYPE SELECT	180	0	180	1-5-11	7-3-11	2-19-46	8-17-46	12829		
1180	MATERIALS DESIGN REC	180	0	180	1-5-11	7-3-11	2-19-46	8-17-46	12829		
1182	MATERIALS SURVEY AND	90	0	90	9-22-10	12-20-10	4-20-46	7-18-46	12994		
1190	FOUNDATION RECOMMEND	180	0	180	9-22-10	3-20-11	3-5-49	8-31-49	14044		
1194	UTILITY IDENTIFICATI	158	0	158	5-6-07	10-10-07	3-13-46	8-17-46	14191		
1195	UTILITY COORDINATION	169	0	169	4-29-12	10-14-12	4-4-48	9-19-48	13124		
1196	UTILITY VERIFICATION	30	0	30	10-15-12	11-13-12	9-20-48	10-19-48	13124		
1200	CONSTRUCTION LIMITS	360	0	360	5-5-11	4-28-12	8-23-45	8-17-46	12529		
1200M	CONSTR LIMITS COMPLE	0	0	0	4-28-12	4-28-12	8-18-46	8-18-46	12529		
1210	TITLE ORDER	84	0	84	4-29-12	7-21-12	5-15-47	8-6-47	12799		
1220	R/W PACKAGE	150	0	150	6-28-12	11-24-12	7-14-47	12-10-47	12799		
1225	PLATS-PRELIM. & FINA	90	0	90	7-22-12	10-19-12	12-11-47	3-9-48	12925		
1230	R/W PREACQUISITION	180	0	180	10-26-12	4-23-13	11-11-47	5-8-48	12799		
1235	VALUATION	150	0	150	11-25-12	4-23-13	12-11-47	5-8-48	12799		
1240	REAL ESTATE PURCHASE	240	0	240	3-25-13	11-19-13	4-9-48	12-4-48	12799		
1249	FINAL HYDRAULICS DES	360	0	360	5-5-11	4-28-12	7-14-47	7-7-48	13219		
1250	ROAD PLANS	720	0	720	4-29-12	4-18-14	8-18-46	8-6-48	12529		
1253	TIME & TRAFFIC	15	0	15	4-4-14	4-18-14	9-21-48	10-5-48	12589		
1254	TRAFFIC CONTROL PLAN	90	0	90	1-5-11	4-4-11	6-24-48	9-21-48	13685		
1255	SIGNING PLANS	90	0	90	4-29-12	7-27-12	6-24-48	9-21-48	13205		
1256	TRAFFIC MANAGEMENT S	90	0	90	4-29-12	7-27-12	7-8-48	10-5-48	13219		
1274	PAVEMENT MARKING PLA	60	0	60	4-29-12	6-27-12	7-24-48	9-21-48	13235		
1275	PROJECT TURN IN	14	0	14	4-19-14	5-2-14	10-6-48	10-19-48	12589		
1280	PERMITS	120	0	120	3-20-14	7-17-14	7-8-48	11-4-48	12529		
1290	AGREEMENTS - COOPERA	45	0	45	4-19-14	6-2-14	10-14-48	11-27-48	12597		
1298M	R/W SPECIAL PROVISIO	0	0	0	5-26-14	5-26-14	11-12-48	11-12-48	12589		
1300	P S & E	46	0	46	5-3-14	6-17-14	10-20-48	12-4-48	12589		
1310	LETTING	28	0	28	12-5-48	1-1-49	12-5-48	1-1-49	0		
1320M	R/W ACQUISITION COMP	0	0	0	8-31-49	8-31-49	9-27-49	9-27-49	0		

== END OF 2783-102 ==


DEVELOPED ELEVATION
Finished Grade Profile on outside edge of Median Gutter
3 Span Continuous Girders
3 Span Continuous Trusses
Existing Ground
Slope Protection
SOUTH ABUT.
NORTH ABUT.
PIER NO.
SPAN NO.
Dimensions along ℄ of Bridge
Proposed Storm Drain Tunnel
Random Riprap
Face of Guide Wall
PLAN
Guide Wall
Retaining Wall
Expansion Device
RIVER
MISSISSIPPI
NORTHERN PACIFIC
Bench Mark Disk
Bridge Name Plate
Existing Tracks to be removed
End of Tunnel Arch
SCALE
CURVE DATA ALONG ℄ T.H.35 W
CURVE DATA RAMP 1
CURVE DATA RAMP 2
SECTION NEAR PIER 7
INDEX OF DRAWINGS-CONTRACT A
TITLE SHEET
1 GENERAL PLAN AND ELEVATION
2 GENERAL NOTES AND QUANTITIES
PIER 5
PIER 6
PIER 7
PIER 8
BRIDGE SURVEY
BRIDGE SURVEY - CONTRACTED PROFILE
BRIDGE SURVEY - PLAN AND PROFILE
TYPICAL SECTION THRU RIPRAP AT PIER 6
Lock wall
Tunnel
CONTRACT A CONSISTS OF CONSTRUCTING PIERS 5, 6, 7, AND 8
BENCH MARKS
All bridge elevations are based on 1929 Adj.
NOTES
Navigation lights not shown.
I hereby certify that this plan was prepared under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.
Date Dec. 16-1963
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
BRIDGE NO. 9340
T.H.35W OVER STREETS: MISSISSIPPI RIVER & RAILROADS IN MINNEAPOLIS
GENERAL PLAN AND ELEVATION
HENNEPIN COUNTY
97-419
MINN. PROJ. NO. I-IG 35W-3(58)112
STATE PROJ. NO. 2783-9340-A (T.H. 35W-394)
9340

Bridge **9340** 12/11/2001

TH 35W over streets, Mississippi river and RR

Assume new length same as inplace 1907 ft

Talked to Ray

The inplace bridge has 2 deck trusses supporting the 2 way traffic. If the bridge has to be kept open for traffic, it will be a major problem

Main span probably PT box (456')

	No	Width	Total
		Feet	Feet
Lanes	10	12	120
Outside shoulder	2	10	20
Inside shoulder	2	10	20
Median barrier	1	3	3
Outside barriers	2	1.5	3
			166

Assuming PT box= $170 per sqft.

Traffic and staging $30 per sqft
$200

Total cost= $63,312,400 Includes removal cost

Inplace bridge removal cost= $ 2,190,000.00

Bridges & Structures Header - Project: 2783-102 - REPLACE BR. 9340 OVER MIS - <Update>

File Edit Help

neral

Project Information

Status:	Proposed	Route Type:	Interstate	Sequence Number:	21721
District:	Metro	Route #:	35W	Let Date:	1/1/49
				Plans Ready Date:	

Bridge Information

Structure #:	9340	Br Plans Ready Date:	
Old #:	9340	Bridge Work Type:	New Bridge
SP #:	2783-(9340G)	Br Proj Manager:	K. Western
Status:	Active	Br Pre-Design Unit:	T. Styrbicki
Beam Type:		Br Pre-Des Consultant:	
Design Org:	TH-Consultant	Br Final Design Unit:	Unknown
Let Date:	1/1/49	Br Final Des Consultant:	
		Spec Pkg:	Unknown

Description: TH 35W OVER RR, BLUFF STREET, MISSISSIPPI RIVER & 2ND AVE, 1.0 MI NE OF JCT OF TH 94

Estimates

	$$$	Date		$$$	Date		
Program:	$95,000,000.0	1/11/07	Schedule:			Preconstruction Job Number:	
Preliminary:			Actual Cost:			Construction Job Number:	
						Bridge Study Job Number:	

start | Novell Group... | Artemis Proje... | 5 Citrix ICA... | FPMS Report... | 1:43 PM

9340_F094_001.pdf

1-11-2007 **REQUEST TO ADD A PROJECT OR BRIDGE TO THE PPMS SYSTEM**

Request Submitted By:	TOM STYRBICKI	Anticipated Letting Date:	1/1/49
New Bridge Number:	-	Bridge SP:	
Old Bridge Number:	9340	Low SP:	2783-102
Job Number:		Federal Project Number:	
Trunk Highway:	TH 35W = 394		
Other Tied SP or Bridge:			
Work Type:	01 – NEW BRIDGE		
Description:	TH 35W Over RR, Bluff Street, Mississippi River and 2nd Ave.		
Location:	1.0 Mile NE of the Junction of T.H. 94		
Type of Structure:	Unknown		
Number of Lanes:		Length of Bridge:	
Outside Shoulders:		Inside Shoulders:	
Median:		Trail:	
Type of Barrier:		Number of Barriers:	
Choose One of the Following for Design Organization:			
~~TH – Mn/DOT~~	TH – Consultant	~~TH – Partnership~~	~~State Aid – Partnership~~
~~TH – By Others~~	~~TH – Border Bridge~~	~~TH – Design/Build~~	
Bridge Project Manager:	KEVIN WESTERN	Consultant:	
Estimated Construction Cost:	$ 95,000,000	Preliminary Duration:	

Comments:

Estimate For Mississippi River Bridge Only. Project Will Also Include Major Reconstruction Of Approach Freeway And Adjacent Interchanges.

1002-1011	Consultant Acquisition	180	
1002	Structure Study	180	
1041	Bridge Surveys	120	
1075	Structure Recommendation	90	
1191	Foundation Recommendation	180	
1259	Bridge Hydraulics Letter	45	we have 70
1002-1260	Consultant Acquisition	180	
1260	Preliminary Structure Plan	360	
1002-1270	Consultant Acquisition	180	
1270	Final Structure Plan	360	
1301	Structures PS&E	21	
1310	Letting	28	

Distribution: Original to Jackie Frederick
Copy to Project Manager

S:\Design\Prelim\Projects by SP\2\2783\102\Inplace 9340\PPMS add Bridge Project Form - 9340.doc

9340_F094_001.pdf

HENNEPIN CO. #9340

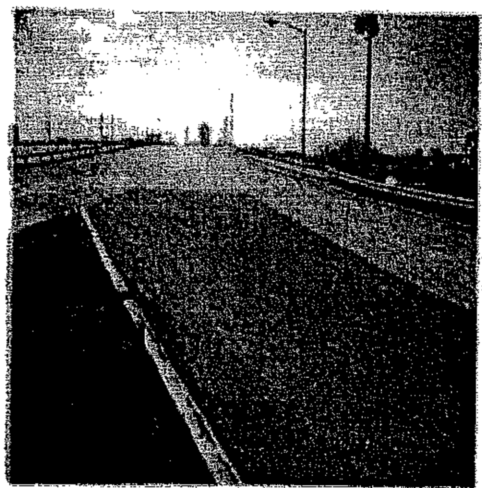
TH 35 / 2nd St.

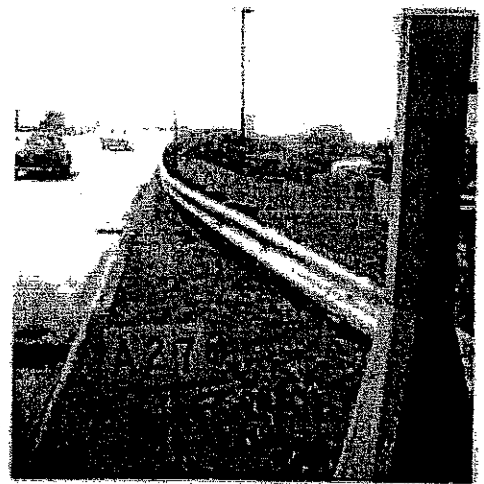
L: 1907 W: 113 Area 219086

14-SPAN STL DECK TRUSS, 9135

2771074

2771075





Errupler

Yr BR# Area Cost SF Cost

98 SE 90589 536 44756 ~~###~~ 286,000 6.39 SE COUNTY BR 1971

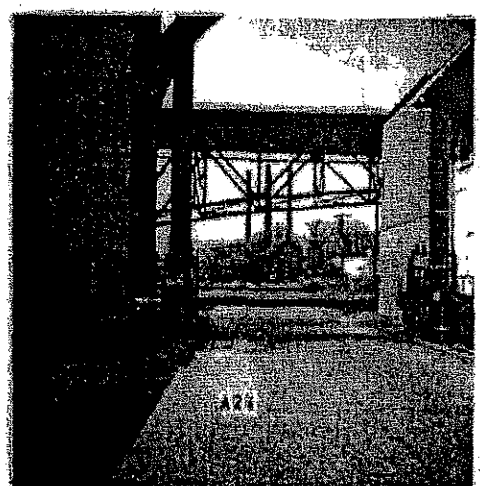
? 9330 45617 796,000 3.32 SE CITY

78 5?28 36278 254,000 7.00

2771076

2771077

USE #10



NW 1971 WNW 1971

219,085 × $10 = 2,190,000.00 , 12/13/2001

(Staging during removal

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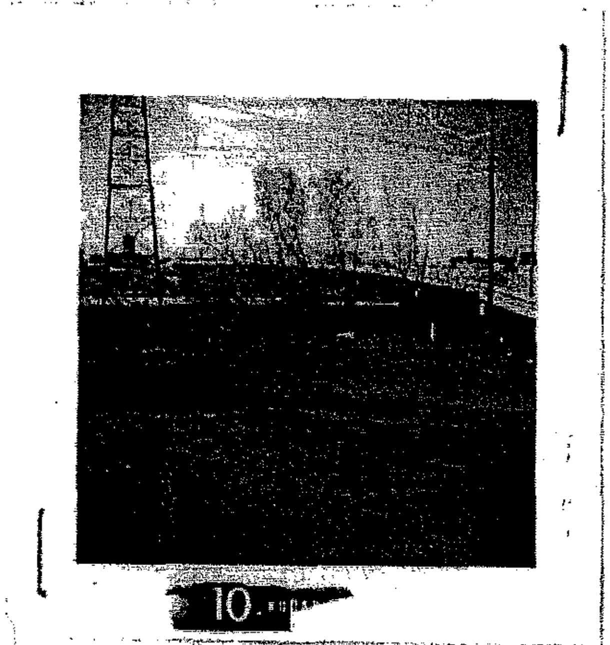
HENN. Co #9340

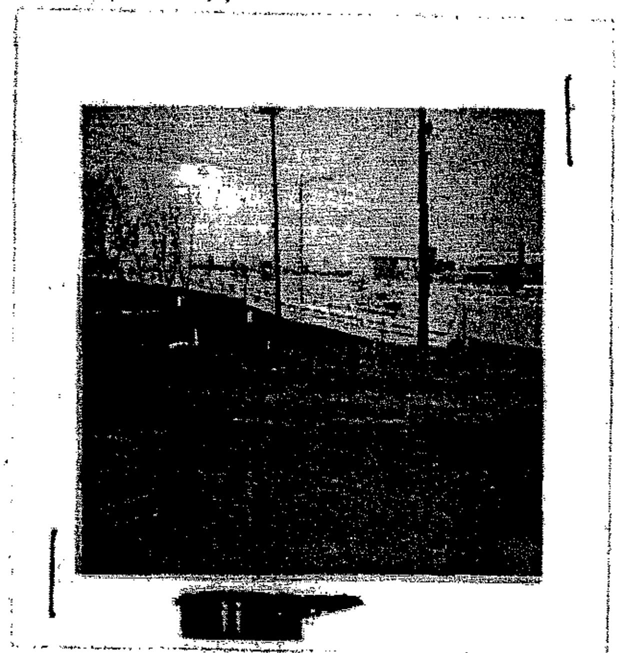
35W/Miss. River at 24/25-29-24 ('67)

2771070



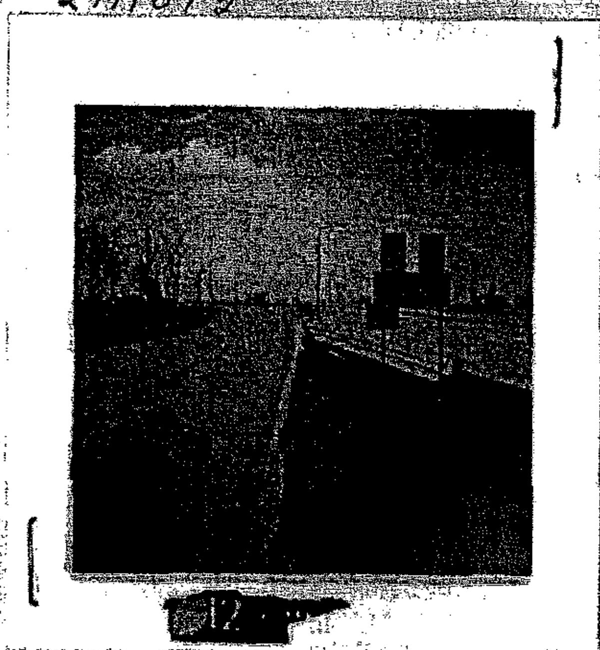
SE 1971

2771071



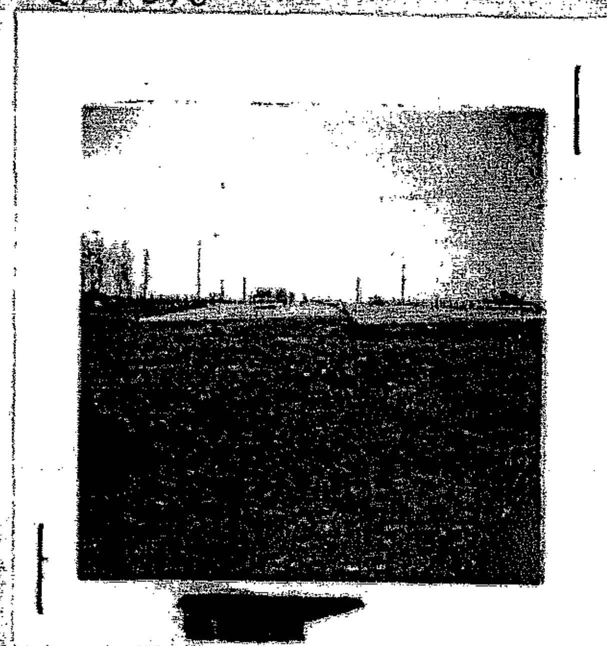
S 1971

2771072



SW 1971

2771073



SSE 1971

1998 MINNESOTA DEPARTMENT OF TRANSPORTATION - STRUCTURE INVENTORY

DISTRICT JURISDICTION 05-18-1998

*** IDENTIFICATION ***

Br.No. 9340 (2)

District 5 Maint Area

County HENNEPIN

City MINNEAPOLIS

Township

MSAS Route 227 Number MAIN LINE Function

Rdwy Type 2 WAY ROAD

2ND ST SE UNDER TH 35W
Name of Feature Crossed

AT JCT TH 35W
Descriptive Location

Sec 25 Twp 029 Rge 24W

Reference Pt 000+00.670

44deg 58'42" Latitude 93deg 14'42" Longitude

Detour Length . . . 00 Mi

STATE HWY Maint Resp STATE HWY Owner

Nat'l Hwy System . . NO

17 URBAN COLLECTOR
Functional Classification

Year Built 1967 Rem

Date Open to Traffic 01/67

Lanes ON Br UNDER 02

2800 A.D.T. Hcadt 1995 Year

Rdwy Appr Width 048

Median Shld Surf

Skew 00

Strahnet NO Temp.

Plan Available CENTRAL

*** STRUCTURE DATA ***

18 HWY/HY,RR,S
Type of Service

Type Main Span . . 404
RIVETED ST CONT DK TRUSS
FRICT'N WARREN W/VERT

Type Appr Span . . 401
ST CONT BM SPAN

Fract Critl TRUSS

Specl Feat ~~Member Proc Date~~

~~Culvert Type~~ Length Ft

No Spans 03 Main 11 Appr 014 Total

Length 456.0 Max Spn 1,907.0 Ft Total

Sdwlk Wid Lt 01.5 Rt 01.5

Rdwy Width UNDER 48.4
If Divided Nb-Eb ~~Sb-Wb~~

Deck Width (Out-Out) VARY 113.3 Ft

Vert Clear Over Ft Ft

Vert Clear Under 15.4 Ft Ft
Feat = HWY

Max Vert Clear 15.8 Ft Ft

Underclear Lat Rt 14.6 Lt

Type Wearing Surface CONCRETE

Depth of W.C.& Fill . . 00.17 Ft

LOW SLUMP CONC OVERLAY 1978
Deck Protection System-Yr

Coated Rebar

RAILINGS: TYPE 12 12

Condition 6 6

Base Height 1'06" 1'06"

Curb Height . . 08" 08"

Approach Guardrails 0

Suff Rating 49.0 S.D. Status

*** SUBSTRUCTURE DATA ***

Abut CONCRETE FTNG/PILE

Pier CONCRETE SPRD/ROCK
Mater'l Foundat'n

*** WATERWAY DATA ***

A04/95 UW Insp L/93 Scour ~~Dr Area~~

Waterway Opening 50000

Navig Cntrl/Prot YES-1

Vert 064 Horiz 0400

*** APPROACH PANELS ***

	Type	Cond	Length
Near	1D	H	65
Far	1D	H	75

*** PAINT DATA ***

Yr Pntd 1968

Type . . 1L

Area 490200

% Unsound 20

*** EXPANSION * * DEVICE ***

Type . . . H0

Condition 1

Yr Instl 78

*** CAPACITY RATINGS ***

Design Load . HS20+MOD

Operating . . HS 33.0

Inventory . . HS 20.0

Posting . LEGAL

Rating Date . . 12/95

Need New Rating NO

*** CONDITION CODES ***

219086 Structure Area 201509 Rdwy Area

Deck CONC/CIP Material 05.00 %Unsd 6

Superstructure . . . 4

Substructure 6

Channel & Protection 8

Culvert & Wall . . N

Inspection Date 08/04/97

Insp. Freq. 12 Plan

*** APPRAISAL RATINGS ***

Structure Evaluation 4

Deck Geometry . . . 4

Underclearances . . 4

Safe Load Capacity 7

Waterway Adequacy 8

Approach Alignment 8

*** * BRIDGE SIGNS * ***

Posted Load 0 Traffic 0

Horizontal 0 Vertical 0

*** IMPROVEMENT DATA ***

Prop Work OTHER

Prop Structure BRIDGE

Length 1907 Width 58

Proj ADT Yr

Appr Rdwy Work

Bridge Cost $ 2,013,000

Appr Cost $,000

Project Cost $,000

Year of Data 1991 (C)

2938-1-REV. 3-71

CS 2783

Party No. A

Party Chief WAS

Driver DLZ

MINNESOTA HIGHWAY DEPARTMENT
OFFICE OF PROGRM PLANNING
DESG LOAD HS20
ROAD INVENTORY
BRIDGE SHEET

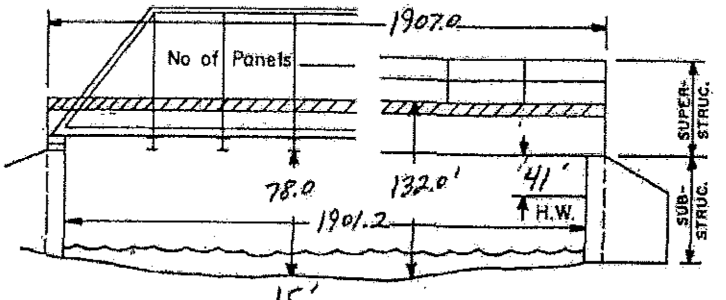
TH Road No. 35W

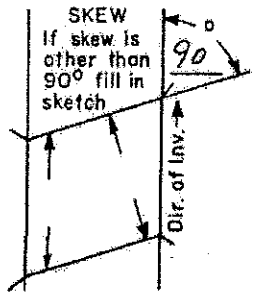
Date 5-4-71

County HENNEPIN

Sec.-Twp.-Rg. 25-29-24 MINNEAPOLIS

Area of Opening 50,000 sq ft ±





Bridge No. 9340

Replaced

Posted Load Limits

Year Built 1967 Remodeled

No. Traffic Lanes 8

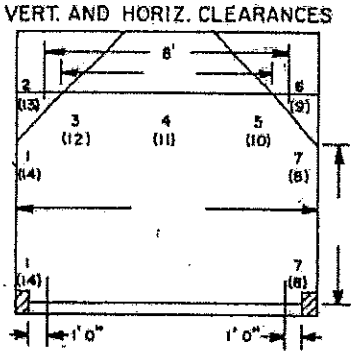
Name of Stream MISSISSIPPI RIVER + RR + STREETS

Mile Point 18.43

Location 0.4 MI S. OF JCT TH 47

Depth of Water 15'

VERT. AND HORIZ. CLEARANCES



If 3 to 5 is less than 8' take height at 1,2,3,5,6,7 and 8,9,10,12,13 & 14. If more than 8' take height at 1,3,5,7, and 8,10,12, & 14. If no knee braces, take height at 1,4,7,8,11 and 14. Points 8,9,10,11,12,13, & 14 are at far portal.

Near	Far
1.	8.
2.	9.
3.	10.
4.	11.
5.	12.
6.	13.
7.	14.

MULTIPLE SPANS REQUIRE DETAILED SKETCH ON REVERSE SIDE ☒

Sketch north arrow in relation to direction of survey	Spans No.	Spans Length	TYPE OF STRUCTURE AND DESCRIPTION (material, beams, stringers, etc.)	
TOTAL	5	451.1	CONTINUOUS STEEL BEAM SPAN	Tr.
TOTAL	3	987.6	CONTINUOUS STEEL DECK TRUSS	Tr.
TOTAL	3	330.1	CONT STEEL BEAM SPAN	Tr.
TOTAL	3	132.4	CONT CONCRETE VOIDED SLAB SPAN	Tr.
				Tr.
			(SEE BACK)	Tr.
Total	14	1901.2	Measure spans in direction of inventory	

ROADWAY APPROACH WIDTH: NEAR 52 FAR 52

		DESCRIPTION		Width Between
SUPERSTRUCTURE	Curbs	L. PCC	R. PCC	2 @ 52.0
	Railings	L. PCC + PIPE	R. PCC + PIPE	2 @ 55.0
	Sidewalk	L. NONE	R. NONE	
	Deck	Tr. PCC	Width (out-to-out): 113.3	
		Surfacing: NONE	Width of median strip: 4.0'	
SUBSTRUCTURE	Abutments	Tr. 2 PCC		
	Wingwalls	Tr. 4 PCC		
	Pilings, Piers, etc.	Tr. SEE BACK		

TYPES OF BRIDGE STRUCTURES

1. Concrete
2. Concrete Cont.
3. Steel
4. Steel Cont.
5. Prestress
6. Prestress Cont.
7. Timber
8. Masonry
9. Wrought Iron, Cast Iron-Aluminum
0. Other

01. Beam Span
02. Low Truss
03. High Truss
04. Deck Truss
05. Thru Girder
06. Deck Girder
07. Box Girder
08. Rigid Frame
09. Slab Span
10. Slab Span-Voided
11. Channel Span
12. Arch
13. Box Culvert
14. Pipe Culvert
15. Pipe Arch
16. Pedestrian
17. Tunnel
18. Movable
19. Other

Indicate size for types 13,14 & 15, i.e., C108, 12' ϕ or 11'-7" X 7'-5".

Also indicate barrel length.

Encircle "Tr." if timber is treated.

BRIDGE DESCRIPTION ABBREVIATIONS

∠ Iron	Angle Iron	I	I-Beam
B.H.	Bulkhead	Lam.	Laminated
Bit.	Bituminous	M.P.	Metal Plate
Caps	Caps	O.C.	On Center
℄	Centerline	P.B.	Pile Bent
[	Channel Beam	P.C.C	Portland Cement Conc.
C.M.	Corrugated Metal	S.C.	Sectional Concrete
Def.	Deformed	S.	Steel
D. or ϕ	Diameter	Str.	Stringer
Fl. Bm.	Floor Beam	T.	Timber
F.B.	Frame Bent	W/	With

Example-if the description under Piling, Piers, Etc., reads: 2-7-12" T.P.B. W/12" x 12" T. Caps — 1-4-8" I.P.B. W/8" I Cap, it would indicate that two of the piers were pile bents and were made up of 7-12" diameter timber piles, with 12" x 12" timber caps and that one pier had 4-8" I-beam piles with an 8" I-beam cap.

Field Photo Identification No. A-26

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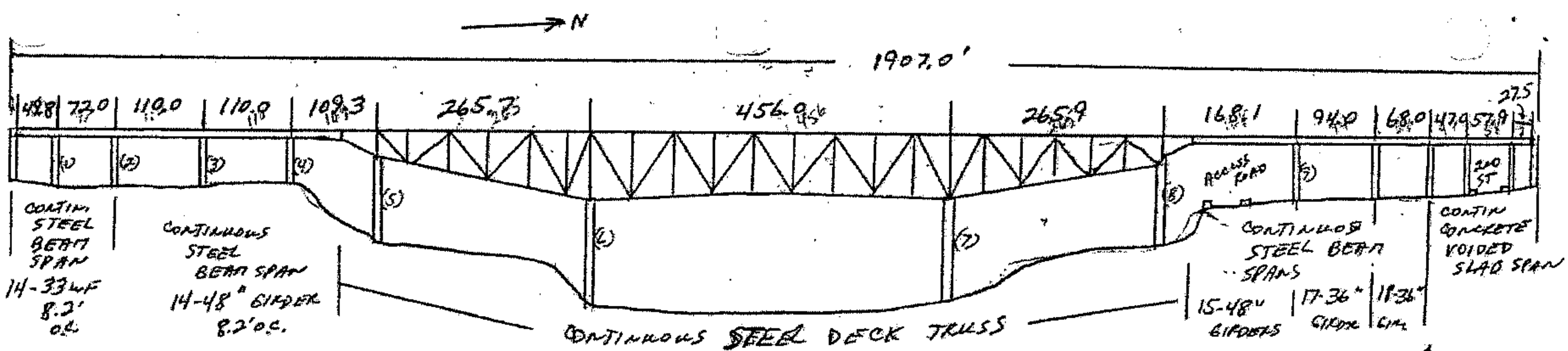


PIERS 1-3 --- 4-3'ø pcc col w/3'X5' pcc cap w/2'X4' pcc coll strut

PIER 4 --- 4-3.5'ø pcc col w/3.5'X5' pcc cap

PIER 5 --- 2-8'ø pcc col

PIER 6 --- 2-10.5'ø pcc col on 30' high 12' wide pcc pedestal

PIER 7 --- 2-10.5'ø pcc col on 26' high 12' wide pcc pedestal

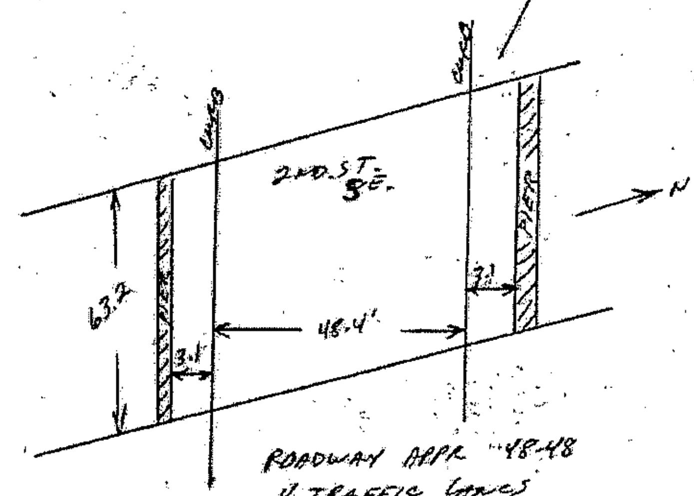
PIER 8 --- 2-8'ø pcc col

PIER 9 --- 4-3.5'ø pcc col w/3.5'X5' pcc cap w/3.5'X4' pcc coll strut

PIER 10 --- 6-3.5'ø pcc col w/3.5'X5' pcc cap w/3.5'X4' pcc coll strut

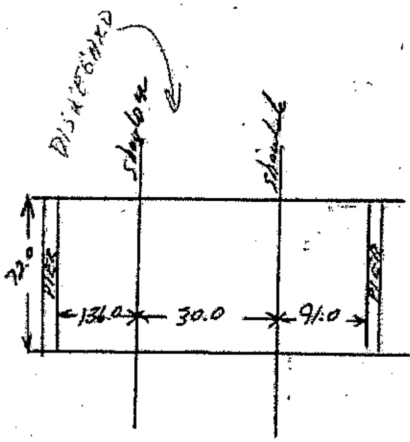
PIER 11 --- 7-3'ø pcc col w/3'X4' pcc cap

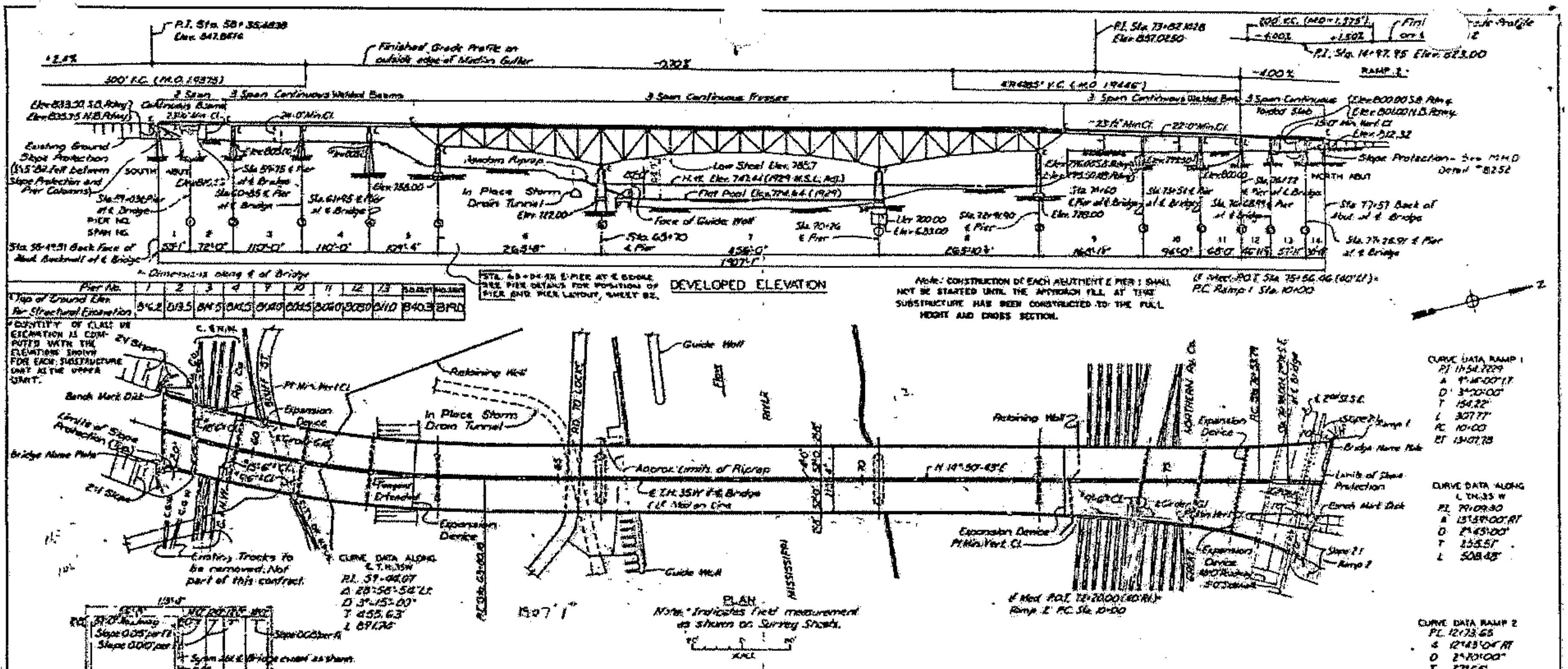
PIERS 12+13 --- 9-2.5'ø pcc col.



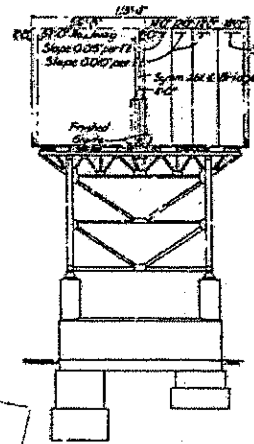
ROADWAY APPR 48-48
4 TRAFFIC LANES

VERT
NW.
1 = 18+
3 = 17.60
5 = 16.80
6 = 17.50
8 = 16.42
10 = 15.90





Note: Construction of each abutment & pier 1 shall not be started until the approach fill at that substructure has been constructed to the full height and cross section.



INDEX OF DRAWINGS

	TITLE SHEET
1	GENERAL PLAN AND ELEVATION
2	GENERAL NOTES AND QUANTITIES
3 AND 4	DECK DETAILS AT PIERS AND ABUTMENTS
5 AND 6	SOUTH ABUTMENT
7	PIER 1
8	PIERS 2 & 3
9	PIER 4
10	BAR LIST AND QUANTITIES PIERS 1 THRU 4
11	PIER 9
12	PIER 10
13	PIER 11
14	NORTH ABUTMENT
15	BAR LIST AND QUANTITIES PIERS 9 THRU 11 AND NORTH ABUTMENT
16 THRU 19	SOUTH APPROACH SPANS STRUCTURAL STEEL DETAILS
20 AND 21	DECK TRUSS SPANS STRESS SHEET
22	DECK TRUSS SPANS FRAMING PLAN AND FLOOR TRUSS LAYOUT
23	DECK TRUSS SPANS STRINGER DETAILS
24 AND 25	DECK TRUSS SPANS FLOOR TRUSS DETAILS
26	DECK TRUSS SPANS END FLOORBEAM-SOUTH END
27	DECK TRUSS SPANS END FLOORBEAM-NORTH END
28	DECK TRUSS SPANS TRUSS DETAILS-L0 TO L7
29	DECK TRUSS SPANS TRUSS DETAILS-L3 TO L6
30	DECK TRUSS SPANS TRUSS DETAILS-L7 TO L10
31	DECK TRUSS SPANS TRUSS DETAILS-U1 TO L14
32	DECK TRUSS SPANS PORTALS U1 AND U8
33	DECK TRUSS SPANS SWAY FRAMES
34 AND 35	DECK TRUSS SPANS INSPECTION WALKWAY DETAILS
36 THRU 38	DECK TRUSS SPANS BEARING ASSEMBLIES
39 THRU 43	NORTH APPROACH GIRDER SPANS STRUCTURAL STEEL DETAILS
44 THRU 47	NORTH APPROACH VOIDED SLAB SPANS SLAB DETAILS
48 AND 49	NORTH APPROACH VOIDED SLAB SPANS PIERS 12 AND 13
50	ROADWAY EXPANSION DEVICE NEAR PIER 2
51	ROADWAY EXPANSION DEVICE NEAR PIER 5
52	ROADWAY EXPANSION DEVICE NEAR PIER 9
53	ROADWAY EXPANSION DEVICE CASTINGS
54	ROADWAY EXPANSION DEVICE AT PIER 11
55	SOUTH APPROACH SPANS SLAB DETAILS
56 AND 57	DECK TRUSS SPANS SLAB DETAILS
58	NORTH APPROACH GIRDER SPANS SLAB DETAILS
59	SLAB DETAILS
60	CONCRETE PLACING SEQUENCE, DEFLECTION ORDINATES AND EDGE OF SLAB ORDINATES
61	3-LINE FLAT TYPE STEEL RAIL AND PARAPET
62	HANDRAIL AND GUARDRAIL DETAILS
63	BAR LIST AND QUANTITIES SPANS 1 THRU 14
64 AND 65	DRAINAGE DETAILS
66 AND 67	PROFILE DATA
68	ELECTRICAL PLAN & ELEMENTARY DIAGRAM
69	ELECTRICAL SECTIONS AND DETAILS
70	NAVIGATION LIGHTING AND UNDERPASS LIGHTING DETAILS
71 THRU 81	DETAILS
82	SUBSTRUCTURE LAYOUT
83 AND 84	BRIDGE SURVEY
85 THRU 87	BRIDGE SURVEY CONTRACTED PROFILE
88 THRU 91	BRIDGE SURVEY PLAN AND PROFILE
92 THRU 94	UTILITY LAYOUT

CONTRACT B

CONTRACT B CONSISTS OF CONSTRUCTING SOUTH AND NORTH ABUTMENTS, PIERS 1,2,3,4,9,10,11,12 AND 13, AND SUPERSTRUCTURE.

BENCH MARKS

B.M. #4 Elev. 820.82 (1929 Adj.)
Top Hyd. 150' Rt. ℄ Sta. 59+00.
B.M. #5 Elev. 770.41 (1929 Adj.)
Top of Concrete Post 200' Rt. ℄ Sta. 62+00.
B.M. #7 Elev. 743.64 (1929 Adj.)
Spk. in P.P. 163' Lt. ℄ Sta. 70+50.
B.M. #8 Elev. 807.97 (1929 Adj.)
Spk. in Chest. 15' Lt. ℄ Sta. 76+10.
All bridge elevations are based on 1929 Adj.

NOTES

Abutments and Piers shall be at positions shown in Elevation for steel spans measured at normal temperature of 45° F.
Navigation lights not shown.

I hereby certify that this plan was prepared under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

A. E. Maranna
Date 3-4-1965 Reg. No. 5789

BRIDGE NO. 9340

T.H. 35W & CR. RAILROADS, BLUFF ST., MISSISSIPPI RIVER AND 2ND ST. S.E. IN MINNEAPOLIS

GENERAL PLAN AND ELEVATION

SEC. 24 & 25 T29N R.24W
HENNEPIN COUNTY
APPROVED - 6-12-65
DEPUTY CHIEF ENGINEER

EVIEW RRT. 59 - 003 MINN. PROJ. NO. I-IG 35W-3(53)112 STATE PROJ. NO. 2783-08 (T.H. 35W-394) SHEET 1 OF 94 SHEETS 9340

9340_F094_001.pdf

MINNESOTA DEPARTMENT OF TRANSPORTATION
Program Support Division
Technical Memorandum No. 07-10-B-02
July 19, 2007

To: Distribution 57, 612, 618, 650

From: Rick Arnebeck
Division Director
Engineering Services

Subject: Guidelines for In-Depth Inspection of Fracture Critical and other Non-Redundant Bridges and for Underwater Inspections

Expiration
This Technical Memorandum supersedes Technical Memorandum No. 02-22-B-01 and it will expire July 19, 2012 unless superseded prior to that date.

Implementation
This policy and its instructions are effective immediately.

Introduction
This Technical Memorandum provides guidelines to be used for In-Depth Inspection of Fracture Critical and other Non-Redundant Bridges and for Underwater Inspections.

Purpose
The In-Depth and Underwater Bridge Inspection Program is a joint effort of the Bridge Office (BO), the District Offices, and local government agencies. The purpose of this program is to ensure the safety of bridges with fracture critical and underwater members in accordance with Minnesota Statutes 165 and Minnesota Rule 8810, as well as complying with federal regulations and guidelines, which require appropriate inspection of bridge members. (National Bridge Inspection Standards, Title 23, Code of Federal Regulation, Part 650).

Guidelines

Definition
A Fracture Critical (FC) Bridge is a bridge that is not load path redundant and that has at least one fracture critical member or member component. Fracture critical members or member components (FCM's) are steel tension members or steel tension components of members whose failure would be expected to result in collapse of the bridge (Ref: AASHTO Manual for Maintenance Inspection of Bridges – 1994, www.transportation.org). A FCM lacks redundancy if when it fails, there is no alternate load path or member to which the failed member can shed its load.

Bridges that require underwater inspection have members that cannot be visibly evaluated during periods of low flow or examined by feel for condition, integrity and safe load capacity, due to excessive water depth or turbidity.

- MORE -

EXHIBIT
4

General Guidelines for In-Depth Inspection of Fracture Critical and other Non-Redundant Bridges

Inspection under these guidelines will apply to all bridges, except those bridges that carry only railroad and or pedestrian traffic, that have members determined to be fracture critical or with special features. The Bridge Office will evaluate all bridges that are not load path redundant to determine if and where fracture critical members are present. The frequency of in-depth inspection of each non-redundant member will be based upon the criticality and condition of the member. In-depth inspections of non redundant bridge members that are determined to be fracture critical will be scheduled at intervals not to exceed 24 months. In depth inspections of bridge members that are determined not to be fracture critical based on an evaluation of their internal or structural load redundancy or which are located on very low volume local roads and are determined to have negligible risk of failure will be scheduled at intervals not to exceed 5 years for bridges on local roads, and 4 years for bridges on Trunk Highways. All non-redundant bridges shall have Routine Inspections performed every year. Special in-depth inspections of other structures may be required to monitor a particular known or suspected deficiency.

The Bridge Office will, for all Non Redundant and FC bridges, monitor the In-Depth Inspection Program, maintain information files on the bridges, and assure the quality of 3rd party or district inspections in accordance with the attached Quality Assurance Plan. The Bridge Office will maintain a list of the following for those bridges which contain Non-Redundant and FCM's and those which contain unique or special features requiring additional attention during inspection to ensure the safety of such bridges (e.g. pin and hanger details and steel pier caps):

- Location and description of such members for each bridge
- In-depth or special feature inspection frequency
- Inspection procedure(s)
- Date of the last inspection
- Description of inspection findings
- Description of any follow-up action resulting from the most recent inspection

In-depth inspections are the responsibility of the Bridge Office. The Bridge Office will delegate these inspections if requested by the District. Currently, the Bridge Office will conduct these inspections in Districts 1, 2, 3, 4, 7, and 8. Districts 6 and Metro will conduct these inspections in their District. Scheduling priority for inspections will be given to large and complex bridges. For inspections conducted by the District, the Bridge Office will offer planning assistance as well as on-site inspection assistance. Traffic control and access equipment (man-lift, etc.) remain the District's responsibility regardless of participation by the Bridge Office.

The Bridge Office will provide a wide range of services to the Districts and local governments in support of in-depth inspections, including: identification of FCM's, training, on-site inspections, and non-destructive testing (NDT). Training provided to the Districts will include inspection procedures for FCM's, procedures for basic NDT methods, and identification of non-redundant bridges, FCM's and critical details.

Inspector Qualifications

In-depth inspections shall be conducted under the direct supervision of individuals which have been certified as, either, Mn/DOT Bridge Safety Team Leaders in accordance with the Mn/DOT Bridge Inspector Certification Program. Only qualified American Society for Non-Destructive Testing (ASNT) Level II or III technicians shall conduct NDT services, by ultrasonic methods.

Inspection Procedures and Reporting
In-depth inspections shall be conducted using under-bridge inspection units (snoopers), man-lifts, boats, ladders or any means necessary to visually inspect all FC members from a distance not to exceed 600 mm **(24 in.)**.

Field inspections should be conducted in a systematic and organized manner that will be efficient and minimize the possibility of any bridge item being overlooked. All inspections shall be conducted following appropriate Mn/DOT safety guidelines for both the employee and the public. Critical findings shall be reported within 24 hours to the District, County, or City Bridge Engineer and to the Bridge Office Bridge Inspection Engineer and/or Bridge Construction and Maintenance Engineer. Detailed and narrative reports including sketches and photographs shall be provided to the Bridge Office and the District Bridge Engineer upon completion of the inspection. Reports shall include such items as:

- Identification of FCM's, special features, and/or critical details
- Description of areas visually inspected
- Description of areas tested by NDT methods
- Amount of corrosion and associated field measurements of loss of section
- Description of fatigue prone areas
- Length and extent of cracking present, and
- Extent of external damage due to impact or external factors

General Guidelines for Underwater Inspection
National Bridge Inspection Standards (NBIS) require inspection of all bridges as needed, not to exceed five (5) years in frequency to determine the condition of the underwater portion of the substructures with certainty. Certain underwater structural elements may be inspected at intervals, not to exceed seventy-two months, with written FHWA approval. Minnesota defines a bridge as needing underwater inspection when, "the water depth is such that the underwater portions of a substructure cannot routinely be inspected using waders during periods of low water depth." There are currently about 165 bridges carrying traffic on the trunk highway system in Minnesota that require special underwater inspections. The frequency of underwater inspection will be based upon the criticality and condition of the members underwater.

Underwater inspections shall be both a visual and a tactile inspection of the entire underwater portion of the substructure. Inspections shall include checking all concrete for erosion, wear, abrasion, scaling, spalling, exposure, and deterioration, and for any exposed reinforcing steel and all cracking. All exposed structural steel and piling shall be checked for misalignment and loss of section. All timber shall be sounded and checked for presence of bores, decay, and weathering. The channel bottom shall also be inspected for presence, size, condition of riprap, and for any evidence of scour.

The Bridge Office will, for all Trunk Highway bridges, monitor and conduct the underwater inspection program and maintain information files on the bridges. These underwater inspections will normally be performed by diving contracts administered by the Bridge Office. The Bridge Office will maintain a list of the following for those bridges which require underwater inspections:

- Location of the bridge and member to be inspected
- Type of foundation
- Bottom of foundation elevation or pile tip elevation
- Depth soundings at bridge as well as upstream and downstream of bridge
- Type and frequency of required inspections
- Inspection procedure(s)
- Date of last inspection
- Special equipment requirements
- Description of inspection findings
- Description of any follow-up action(s) resulting from most recent inspection

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Inspector Qualifications for Underwater Inspections
Underwater inspections shall be conducted under the direct supervision of individuals, which have been certified as, either, Mn/DOT Bridge Inspection Team Leader or have minimum NBIS Bridge Team Leader qualifications. The underwater inspector must have knowledge and experience in bridge inspection and must also be an experienced and accomplished diver.

Underwater inspections should be conducted in a systematic and organized manner that will be efficient and minimize the possibility of any underwater bridge item being overlooked. All inspections shall be conducted following appropriate OSHA safety guidelines for both the diver and the public. Critical findings shall be reported immediately to the Bridge Office Bridge Inspection Engineer and/or Bridge Construction and Maintenance Engineer. Detailed and narrative reports including sketches, photographs, and/or videotapes shall be provided to the Bridge Office upon completion of the inspection. Reports shall include recommendations on condition assessment, repairs, and time interval for the next inspection.

Questions
Any questions regarding the content of this Technical Memorandum should be directed to **Todd L. Niemann, Structural Metals and Bridge Inspection Engineer, Bridge Office at (651) 366-4567.**

Any questions regarding the publication of this Technical Memorandum should be directed to Sophia Wicklund, Design Standards Unit at (651) 336-4701 or Michael Elle, Design Services Engineer at (651) 366-4622. A link to all active Memoranda and a list of historical Technical Memoranda can be found at: http:/www.dot.state.mn.us/atoz.html

Attachment
Quality Assurance Plan - Mn/DOT In-Depth Fracture Critical Bridge Inspection Program

- END-

Quality Assurance Plan
Bridge Office

Mn/DOT In-Depth and Fracture Critical Bridge Inspection Program
July 10, 2007

Introduction and Purpose
This policy outlines Mn/DOT's Quality Assurance Plan regarding in-depth and fracture critical bridge inspections. The Bridge Office carries overall responsibility for administering the fracture critical inspection program. As detailed in this plan, Quality Assurance will be accomplished via review of all inspection reports, joint inspections of selected bridges, and Federal Highway Administration (FHWA) compliance reviews to National Bridge Inspection Standards.

In-depth and Fracture Critical Inspection Teams in District 6 (Rochester) perform in-depth and fracture critical bridge inspections on all bridges (district and local jurisdiction) within their district. Similar teams in the Metro Division perform in-depth and fracture critical bridge inspections on all Metro Trunk Highway bridges. The Bridge Office performs all other in-depth and fracture critical inspections for District and Local Agency bridges.

Fracture Critical Definition
The Bridge Office determines which bridges are designated as non-redundant and fracture critical in accordance with Technical Memorandum 07-10-B-02 dated July 19, 2007 and state and federal guidelines. A fracture critical bridge is a steel structure, subject to dynamic cyclic loading, which has at least one tension member or member component, whose failure would be expected to result in the collapse of the bridge.

Inspection Frequency & Scheduling
The Bridge Office determines the frequency of in-depth inspections (typically four (4) or five (5) year intervals), and tracks when inspections are due and when they have been completed. At the beginning of each inspection season, the Bridge Office will notify inspection teams which bridges are due for in-depth inspections. The Office/District responsible for performing the inspection is responsible for the planning and scheduling during a given season, and submits the schedule to the Bridge Office.

In accordance with current State law, the maximum interval for Routine Inspections of Non-redundant bridges is one year. Routine Inspections are required to include inspection of Fracture Critical and other non-redundant members.

Qualifications of Inspectors
The Bridge Office is responsible for reviewing the inspector's qualifications. The lead inspector must be certified (by Mn/DOT) as a Bridge Safety Team Leader. Completion of the FHWA training class

"Inspection of Fracture Critical Bridge Members" and the Mn/DOT Bridge Inspection Proficiency Examination is required. Only individuals qualified as American Society for Non-Destructive Testing (ASNT) Level II or III technicians, shall conduct non-destructive testing (NDT), by ultrasonic methods.

Bridge Office Participation in Inspections
The Bridge Office will participate in one or more inspections performed by other Districts. This will typically be on major structures, or on bridges with significant structural deficiencies, deterioration, or damage. The purpose of these joint inspections is two-fold;

1) the utilization of in-depth fracture critical inspectors from both the district and the Bridge Office expedites the inspection and reduces the time that traffic restrictions are needed, and,

2) joint inspections allows the Bridge Office to observe inspections procedures for consistency. The Bridge Office will provide NDT assistance as required for the Districts, Counties, or Municipalities.

Review of Inspection Reports

Within 6 months of performing an in-depth inspection the inspection team shall submit a detailed written report, including sketches and photographs of the inspection [independent of the annual PONTIS safety inspection report] to the State Bridge Inspection Engineer. The format of the report shall be similar to the reports developed by the Bridge Office. Due to the safety concerns with bridge fatigue issues the Bridge Office will review all in-depth inspection reports. The Bridge Office Bridge Inspection Engineer and Regional Construction Engineer shall review the Trunk Highway bridge reports. Within thirty (30) days of its receipt, the Bridge Office Bridge Inspection Engineer will forward written comments as necessary to the inspection team regarding the findings, recommendations, or conclusions. The Bridge Office Bridge Inspection Engineer shall date and sign the file copy of the report upon conclusion of their reviews. The Bridge Office will maintain reports on file for all fracture critical bridges statewide.

Fracture Critical members must be inspected from an arms length distance every 24 months. When the arms length inspection is combined with the routine inspection, the inspector's notes for PONTIS Element 966 Fracture Critical Smart Flag shall note that members were inspected at arms length, the date of the inspection, and any change in condition from that noted in the last in-depth inspection report. Whether the fracture critical inspection is done as part of a routine inspection, or as part of an in-depth inspection, the date of the fracture critical inspection shall be recorded in the Mn/DOT Structure Inventory Report.

"Critical" Findings

A critical finding for the purpose of fracture critical inspection shall be defined as any condition that in the judgment of the inspection team leader, may, if not corrected in a timely manner, cause the failure of all or part of the bridge. Critical findings shall be reported within 24 hours to the District, County, or City Bridge Engineer and to the Bridge Office Bridge Inspection Engineer or Regional Construction Engineer.

The Bridge Office will confer with appropriate District/County/City staff to develop short and long-term strategies to correct the problem and will conduct compliance reviews to ensure that the bridge owner has completed recommended actions and/or repairs.

FHWA Annual Audits

The Federal Highway Administration (FHWA) conducts annual compliance reviews of the bridge inspection programs of Mn/DOT's Central Office, Districts, and Counties. The Bridge Office also participates in these audits. Review of the fracture critical inspection process is included within the scope of these audits.

MINNESOTA DEPARTMENT OF TRANSPORTATION
Engineering Services Division
Technical Memorandum No. 05-02-B-02
July 20, 2005

To: Distribution 57, 612, 618, 650

From: Douglas Differt
Deputy Commissioner/Chief Engineer

Subject: "Critical Deficiencies" found during bridge inspections

Expiration
This is a new Technical Memorandum and will expire July 20, 2010 unless superseded prior to this date.

Implementation
This policy and its instructions are effective immediately.

Introduction
This Technical Memorandum establishes a formal procedure for responding, reporting, and documenting "Critical Deficiencies" found during scheduled bridge inspections.

Purpose
The Federal Highway Administration requires that all states develop a process to monitor critical deficiencies found during bridge inspections. This Technical Memorandum is intended to provide the necessary guidelines to fulfill the FHWA requirements. The guidelines described in this document are based on the "**Critical Deficiency Procedures"** as outlined in Section 1.8.1.4 of the AASHTO Manual for Condition Evaluation of Bridges which states:

> Critical structural and safety related deficiencies found during the field inspection and/or evaluation of a bridge should be brought to the attention of the Bridge Owner immediately if a safety hazard is present. Bridge Owners should implement standard procedures for addressing such deficiencies, including:
>
> - Immediate critical deficiency reporting steps
> - Emergency notification to police and public
> - Rapid evaluation of the deficiencies found
> - Rapid implementation of corrective or protective actions
> - A tracking system to ensure adequate follow-up actions
> - Provisions for identifying other bridges with similar structural details with follow-up inspections

It is recognized nationally that some past bridge failures may have been prevented if prompt attention had been given to concerns noted on bridge inspection reports. To ensure public safety, it is essential that "Critical Deficiencies" not only be brought to the attention of those responsible but that these findings are reviewed to confirm that all necessary corrective actions have been completed.

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EXHIBIT
5

Guidelines

For the purpose of this Technical Memorandum, the following definitions shall apply.

Critical Deficiency: A "Critical Deficiency" is defined as any condition discovered during a scheduled bridge inspection that threatens public safety and, if not promptly corrected, could result in collapse or partial collapse of a bridge. Critical findings include structural conditions and scour or hydraulic conditions that are found to be critical during the inspection or that are likely to become critical to the stability of the bridge before the next regularly scheduled inspection.

Hazardous Deficiency: A Hazardous Deficiency is defined as an element level condition found during a regularly scheduled bridge inspection that may be hazardous to public safety, but IS NOT expected to lead to collapse or partial collapse of the bridge. While any "Hazardous Deficiency" found during a bridge inspection should immediately reported to the bridge owner (or appropriate authority), the Mn/DOT Bridge Office requires no subsequent documentation.

Bridge: A "bridge" is defined as any bridge, culvert, tunnel, or other structure listed on the Mn/DOT Bridge Inventory.

Bridge Inspection: A "bridge inspection" includes any routine inspection, special inspection, hands-on Fracture Critical inspection, or underwater inspection performed on a bridge.

Bridge Inspector: A "Bridge Inspector" is defined as the inspection team leader which is a certified Level 2, Level N or Level E inspector - this includes inspectors employed by Mn/DOT, Counties, Cities, or by private consultants.

Engineer: The "Engineer" is defined as the supervising registered Professional Engineer of the entity listed on the Mn/DOT Bridge Inventory as having "report jurisdiction" for the bridge. In most cases, this will be the Mn/DOT District Bridge Engineer, the County Engineer, or the City Engineer.

Bridge Owner: The "Bridge Owner" is defined as the entity listed on the Mn/DOT Bridge Inventory as the Owner of the bridge.

Mn/DOT Bridge Inspections Engineer: The "Mn/DOT Bridge Inspection Engineer" refers to the State Bridge Inspection Engineer who is the primary statewide contact for reporting Critical Bridge Deficiencies.

Mn/DOT Bridge Inspection Engineer
3485 Hadley Ave. North
Oakdale, MN 55128
(651) 747-2132

Critical Deficiency Process: The following guidelines outline and describe the procedures to be followed if a Critical Deficiency is observed during a bridge inspection. These guidelines are divided into three parts, Responsibilities of the Bridge Inspector, Responsibilities of the Engineer with Reporting Jurisdiction, and Responsibilities of the Mn/DOT Bridge Inspection Engineer.

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Part 1 - Responsibilities of the Bridge Inspector: Upon discovery of a "Critical Deficiency"; the Bridge Inspector is responsible for the following:

1) **Emergency Bridge Closure:** If the observed condition is severe enough to warrant immediate closure of the bridge (or immediate restriction of traffic above or below the bridge), the Bridge Inspector shall immediately take any actions necessary to ensure public safety.

2) **Prompt Notification of the Engineer:** Upon discovery of a Critical Deficiency, the Bridge Inspector shall promptly notify the Engineer. The inspector should identify the bridge number, bridge location, and clearly and accurately describe the critical condition.

3) **Inspection Report:** In addition to the prompt verbal notification, the following written documentation must be completed:

   a) If the Critical Deficiency is observed during a routine (NBI/PONTIS) inspection, the inspector should rate the "Critical Finding Smart Flag" (PONTIS element #964) as "Condition State 2", and briefly describe the critical finding (if necessary, supplemental notes, sketches, photos, and measurements should be included to fully describe the situation) and submit the inspection to the Engineer.

   b) If the Critical Deficiency is observed during a hands-on Fracture Critical inspection, underwater inspection, or other special inspection, the inspector must submit a brief written statement or report describing the condition (as described in step 2 above) to the Engineer within 48 hours after finding the Critical Deficiency.

Part 2 - Responsibilities of the Engineer: Upon being notified of a Critical Deficiency, the Engineer is responsible for the following...

1) **Rapid Evaluation:** The Engineer is required to quickly assess the situation to confirm or refute the finding, and to initiate necessary traffic restrictions to safeguard the public. If in doubt, the Engineer should temporarily close or restrict traffic on the bridge, then contact a consulting bridge engineer, the Mn/DOT Bridge Inspection Engineer, or the Mn/DOT Bridge Office (651) 747-2100 for assistance. If the Engineer determines that the condition reported is not a Critical Deficiency, the "Critical Finding Smart Flag" (PONTIS element #964) can be changed back to "Condition State 1" after discussing with the inspector (the Mn/DOT Bridge Office requires no subsequent documentation).

2) **Traffic Control & Public Notification:** The Engineer shall be responsible for coordinating all necessary traffic control (such as load restrictions, lane or bridge closures, or detours). The Engineer shall also be responsible for the public notification of any traffic restrictions.

3) **Immediate Notification of the Bridge Owner:** If the bridge owner (as listed on the Mn/DOT Inventory) is different than the entity with "report jurisdiction", the Engineer shall be responsible for informing the Bridge Owner that a Critical Deficiency has been found.

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4) **Submittal of Inspection Report to the Mn/DOT Bridge Inspection Engineer:** Within 7 days after a Critical Deficiency has been reported, the Engineer must notify Mn/DOT's Bridge Inspections Engineer of the finding and must submit a copy of the inspection report.

5) **Rapid Implementation of Corrective Action:** The Engineer is responsible for promptly scheduling repairs to the bridge. If the bridge remains open to traffic, the Engineer is responsible for determining the proper load rating for the bridge, and ensuring that the rating is adequately posted.

6) **Resolution of Deficient Status:** After repairs have been completed, the Engineer should change the "Critical Finding Smart Flag" (PONTIS element #964) rating to "Condition State 1", and add a brief description of the corrective actions taken in the inspection notes for that smart flag. A copy of the revised inspection report must then be submitted to the Mn/DOT Bridge Inspection Engineer.

7) **Updating of the Bridge Inventory:** If the bridge load rating is permanently reduced, the Engineer must submit a new load rating to the Mn/DOT Bridge Inspection Engineer. If the bridge is closed to traffic, the Engineer must notify the Mn/DOT Bridge Inspection Engineer.

Part 3 - Responsibilities of the Mn/DOT Bridge Office:

1) **Provide Immediate Assistance:** Requests for assistance in evaluating a Critical Deficiency should be directed to the Mn/DOT Bridge Inspection Engineer (or, if not available, to other available resources within the Mn/DOT Bridge Office) - such requests will be given priority over other work. If a Critical Deficiency is confirmed, a brief written report should be filed with the Mn/DOT Bridge Inspections Engineer. Requests for assistance with follow-up inspections should be directed to the Mn/DOT Bridge Office Bridge Inspection Unit. Requests for repair recommendations should be directed to the Mn/DOT Regional Bridge Construction Engineer (651) 747-2100.

2) **Recording the Critical Finding:** Upon receipt of a written or oral report or the Bridge Inspection Report describing the Critical Deficiency from the Engineer, the Mn/DOT Bridge Inspection Engineer will enter the bridge number and date of the inspection in a Critical Deficiency Log, will create a separate file for the bridge to track resolution of the problem, and will require the critical finding to be entered promptly into the PONTIS Bridge Management System. The Critical Deficiency Log will be available upon request.

3) **Follow-up:** The Mn/DOT Bridge Inspection Engineer shall monitor the situation as necessary until the situation has been resolved and written notification of corrective action has been received. If notification is not received within 30 days, the Bridge Inspections Engineer shall contact the Engineer (or Bridge Owner) for further information.

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4) **Documenting the Resolution of the Deficiency:** After the notification of corrective action has been received from the Engineer, the Mn/DOT Bridge Inspection Engineer shall enter the date of resolution in the Critical Finding Log and shall file all related documents.

5) **Updating of the Bridge Inventory:** Upon notification that a bridge has been closed, or that a bridge load rating has been permanently reduced, or that repairs have been completed, the Mn/DOT Bridge Inspection Engineer will forward the information to the Bridge Management Unit so the bridge inventory can be properly updated.

6) **Annual Reporting of Critical Bridge Deficiency Status:** Prior to May 1st of each year (which coincides with the annual submittal of the bridge inspection data to the FWHA), the Mn/DOT Bridge Inspections Engineer will report the status of Critical Bridge Deficiencies to the State Bridge Engineer. The status of Critical Deficiencies that have been logged during the past year, and any additional bridges in the PONTIS database with Element #964 in Condition State 2 will be included in the report.

Questions

Any questions regarding this Technical Memorandum should be directed to **Todd Niemann, Mn/DOT Bridge Inspection Engineer, 3485 Hadley Ave. North, Oakdale, MN 55128, (651) 747-2132**. Any questions regarding the publication and distribution of this Technical Memorandum should be referred to Benjamin Christensen, Design Standards Unit at (651) 284-3447, or Mohammad Dehdashti, Design Standards Engineer at (651) 296-4859. All active Memoranda and a list of historical Technical Memoranda can be viewed at http://www.dot.state.mn.us/tecsup/tmemo/index.html

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Minnesota Department of Transportation
Program Support Division
Technical Memorandum No. 02-22-B-01
September 23, 2002

To: Distribution 57, 612, 618, 650

From: Richard Stehr
Assistant Commissioner, Program Support Group

Subject: Guidelines for In-Depth Inspection of Fracture Critical Bridges and Underwater Inspections

Expiration
This Technical Memorandum supersedes Technical Memorandum No. 96-03-B-01 and will expire September 1, 2006 unless superseded prior to that date.

Implementation
This policy and its instructions are effective immediately.

Introduction
This Technical Memorandum provides guidelines to be used for In-Depth Inspection of Fracture Critical Bridges and Underwater Inspections.

Purpose
The In-Depth Fracture Critical and Underwater Bridge Inspection Program is a joint effort of the Office of Bridges and Structures (OBS), the District Offices, and local government agencies. The purpose of this program is to ensure the safety of bridges with fracture critical and underwater members in accordance with Minnesota Statutes 165 and Minnesota Rule 8810, as well as complying with federal regulations and guidelines, which require appropriate inspection of bridge members. (National Bridge Inspection Standards, Title 23, Code of Federal Regulation, Part 650).

Definition
A Fracture Critical (FC) Bridge has at least one fracture critical member or member component. Fracture critical members or member components (FCM's) are steel tension members or steel tension components of members whose failure would be expected to result in collapse of the bridge (Ref: AASHTO Manual for Maintenance Inspection of Bridges – 1994, www.aashto.org). A FCM lacks redundancy if when it fails, there is no alternate load path or member to which the failed member can shed its load.

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2

Bridges that require underwater inspection have members that cannot be visibly evaluated during periods of low flow or examined by feel for condition, integrity and safe load capacity, due to excessive water depth or turbidity.

General Guidelines for In-Depth Fracture Critical Inspection

Inspection under these guidelines will apply to all bridges, except those bridges that carry only railroad and or pedestrian traffic, that have members determined to be fracture critical. There are currently about five hundred (500) bridges designated as FC carrying public highway traffic in Minnesota. The frequency of in-depth inspection of each FCM will be based upon the criticality and condition of the member. The maximum interval between in-depth inspections will be five (5) years. Special inspection of other structures may be required to monitor a particular known or suspected deficiency.

State Trunk Highway bridges will be scheduled on a four (4) year plan and Local System bridges will be scheduled on a five (5) year plan.

The Office of Bridges and Structures will, for all FC bridges, monitor the In-Depth Inspection Program, maintain information files on the bridges, and assure the quality of 3rd party or district inspections in accordance with the attached Quality Assurance Plan. The OBS will maintain a list of the following for those bridges which contain FCM's and those which contain unique or special features requiring additional attention during inspection to ensure the safety of such bridges (e.g. pin and hanger details and steel pier caps):

- Location and description of such members for each bridge
- In-depth or special feature inspection frequency
- Inspection procedure(s)
- Date of the last inspection
- Description of inspection findings
- Description of any follow-up action resulting from the most recent inspection

In-depth FC inspections are the responsibility of the Office of Bridges and Structures. The OBS will delegate these inspections if requested by the District. Currently, the OBS will conduct these inspections in Districts 1, 2, 3, 4, 7, and 8. Districts 6 and Metro will conduct these inspections in their District. Scheduling priority for inspections will be given to large and complex bridges. For inspections conducted by the District, the OBS will offer planning assistance as well as on-site inspection assistance. Traffic control and access equipment (man-lift, etc.) remain the District's responsibility regardless of participation by the OBS.

The OBS will provide a wide range of services to the Districts and local governments in support of in-depth FC inspections, including: identification of FCM's, training, on-site inspections, and non-destructive testing (NDT). Training provided to the Districts will include inspection procedures for FCM's, procedures for basic NDT methods, and identification of FC bridges, FCM's and critical details.

Inspector Qualifications
In-depth FC inspections shall be conducted under the direct supervision of individuals which have been certified as, either, Mn/DOT Level II or E Bridge Inspectors in accordance with the Mn/DOT Bridge Inspector Certification Program. Only qualified American Society for Non-Destructive Testing (ASNT) Level II or III technician shall conduct NDT services, by ultrasonic methods.

Inspection Procedures and Reporting
In-depth inspections shall be conducted using under-bridge inspection units (snoopers), man-lifts, boats, ladders or any means necessary to visually inspect all FC members from a distance not to exceed 600 mm **(24 inches)**.

Field inspections should be conducted in a systematic and organized manner that will be efficient and minimize the possibility of any bridge item being overlooked. All inspections shall be conducted following appropriate Mn/DOT safety guidelines for both the employee and the public. Critical findings shall be reported within 24 hours to the District, County, or City Bridge Engineer and to the OBS Bridge Inspection Engineer and/or Bridge Construction and Maintenance Engineer. Detailed and narrative reports including sketches and photographs shall be provided to the OBS and the District Bridge Engineer upon completion of the inspection. Reports shall include such items as:

- identification of FCM's
- description of areas visually inspected
- description of areas NDT inspected
- amount of corrosion and associated field measurements of loss of section
- description of fatigue prone areas
- length and extent of cracking present, and
- extent of external damage due to impact or external factors

General Guidelines for Underwater Inspection

National Bridge Inspection Standards (NBIS) require inspection of all bridges as needed, not to exceed five (5) years in frequency to determine the condition of the underwater portion of the substructures with certainty. Minnesota defines a bridge as needing underwater inspection when, "the water depth is such that the underwater portions of a substructure cannot routinely be inspected using waders during periods of low water depth." There are currently about 150 bridges carrying traffic on the trunk highway system in Minnesota that require special underwater inspections. The frequency of underwater inspection will be based upon the criticality and condition of the members underwater.

Underwater inspections shall be both a visual and a tactile inspection of the entire underwater portion of the substructure. Inspections shall include checking all concrete for erosion, wear, abrasion, scaling, spalling, exposure, and deterioration, and for any exposed reinforcing steel and all cracking. All exposed structural steel and piling shall be checked for misalignment and loss of section. All timber shall be sounded and checked for presence of bores, decay, and weathering. Channel bottom shall also be inspected for presence, size, condition of riprap, and for any evidence of scour.

The Office of Bridges and Structures will, for all Trunk Highway bridges, monitor and conduct the underwater inspection program and maintain information files on the bridges. These underwater inspections will normally be performed by diving contracts administered by the OBS. The OBS will maintain a list of the following for those bridges which require underwater inspections:

- Location of the bridge and member to be inspected
- Type of foundation
- Bottom of foundation elevation or pile tip elevation
- Depth soundings at bridge as well as upstream and downstream of bridge
- Type and frequency of required inspections
- Inspection procedure(s)
- Date of last inspection
- Special equipment requirements
- Description of inspection findings
- Description of any follow-up action(s) resulting from most recent inspection

Inspector Qualifications for Underwater Inspections
Underwater inspections shall be conducted under the direct supervision of individuals, which have been certified as, either, Mn/DOT Level II or have minimum NBIS Bridge Team Leader qualifications. The underwater inspector must have knowledge and experience in bridge inspection and must also be an experienced and accomplished diver.

Inspection Procedures and Reporting for Underwater Inspections
Underwater inspections shall be conducted by experienced divers using proper inspection equipment necessary to properly inspect, at arm's length, all portions of the bridge that are underwater as well as the streambed. All inspections shall be performed in accordance with the latest edition of the AASHTO Manual for Condition Evaluation of Bridges as well as the FHWA Bridge Inspector's Training Manual.

Underwater inspections should be conducted in a systematic and organized manner that will be efficient and minimize the possibility of any underwater bridge item being overlooked. All inspections shall be conducted following appropriate OSHA safety guidelines for both the diver and the public. Critical findings shall be reported immediately to the OBS Bridge Inspection Engineer and/or Bridge Construction and Maintenance Engineer. Detailed and narrative reports including sketches, photographs, and/or videotapes shall be provided to the OBS upon completion of the inspection. Reports shall include recommendations on condition assessment, repairs, and time interval for the next inspection.

Questions
Any questions regarding the content of this Technical Memorandum should be directed to Todd L. Niemann, Structural Metals and Bridge Inspection Engineer, Office of Bridges and Structures at (651) 747-2132.

Any questions regarding the publication of this Technical Memorandum should be directed to Mohammad Dehdashti, Design Standards Engineer at (651) 296-4859.

Attachment
<u>Quality Assurance Plan - Mn/DOT Fracture Critical Bridge Inspection Program</u>

-END-

Quality Assurance Plan
Office of Bridges and Structures

Mn/DOT Fracture Critical Bridge Inspection Program
September 23, 2002

Introduction and Purpose
This policy outlines Mn/DOT's Quality Assurance Plan regarding in-depth fracture critical bridge inspections. The Office of Bridges and Structures (OBS) carries overall responsibility for administering the fracture critical inspection program. As detailed in this plan, Quality Assurance will be accomplished via review of all inspection reports, joint inspections of selected bridges, and the Federal Highway Administration (FHWA) auditing for compliance with National Bridge Inspection Standards.

Fracture Critical Inspection Teams in District 6 (Rochester) perform in-depth fracture critical bridge inspections on all bridges (district and local jurisdiction) within their district. Similar teams in the Metro Division perform in-depth fracture critical bridge inspections on all Metro Trunk Highway bridges. OBS performs all other fracture critical inspections for District and Local Agency bridges.

Fracture Critical Definition
The OBS determines which bridges are designated as fracture critical in accordance with Technical Memorandum 02-22-B-01 dated September 23, 2002 and state and federal guidelines. A fracture critical bridge is a steel structure, subject to dynamic cyclic loading, which has at least one tension member or member component, whose failure would be expected to result in the collapse of the bridge.

Inspection Frequency & Scheduling
The OBS determines the frequency of inspections (typically four (4) or five (5) year intervals), and tracks when inspections are due and when they have been completed. At the beginning of each inspection season, the OBS will notify fracture critical inspection teams which bridges are due for in-depth inspections. The Office/District responsible for performing the inspection is responsible for the planning and scheduling during a given season, and submits the schedule to the Bridge Office.

Qualifications of Inspectors
The OBS is responsible for reviewing the inspector's qualifications. The lead inspector must be certified (by Mn/DOT) as a Level 2 bridge inspector, or must be a registered engineer. Completion of the FHWA training class "Inspection of Fracture Critical Bridge Members" is required. Only individuals qualified as American Society for Non-Destructive Testing (ASNT) Level II or III technicians, shall conduct non-destructive testing (NDT), by ultrasonic methods.

Bridge Office Participation in Inspections
The OBS will participate in one or more inspections performed by other Districts. This will typically be on major structures, or on bridges with significant structural deficiencies, deterioration, or damage. The purpose of these joint inspections is two-fold;

1) the utilization of fracture critical inspectors from both the district and the OBS expedites the inspection and reduces the time that traffic restrictions are needed, and,
2) joint inspections allows the OBS to observe inspections procedures for consistency. The OBS will provide NDT assistance as required for the Districts, Counties, or Municipalities.

Review of Inspection Reports
Within 6 months of performing an in-depth inspection the inspection team shall submit a detailed written report, including sketches and photographs, of the inspection, independent of the annual safety inspection report, (PONTIS), to the State Bridge Inspection Engineer. The format of the report shall be similar to the reports developed by the OBS. Due to the safety concerns with bridge fatigue issues the OBS will review all in-depth inspection reports. The OBS Bridge Inspection Engineer and Regional Construction Engineer shall review the reports. Within thirty (30) days of its receipt, the OBS Bridge Inspection Engineer will forward written comments as necessary to the inspection team regarding the findings, recommendations, or conclusions. The OBS Bridge Inspection Engineer and Regional Construction Engineer shall date and sign the file copy of the report upon conclusion of their reviews. The OBS will maintain reports on file for all fracture critical bridges statewide.

"Critical" Findings
A critical finding for the purpose of fracture critical inspection shall be defined as any condition that in the judgment of the inspection team leader, may, if not corrected in a timely manner, cause the failure of all or part of the bridge. Critical findings shall be reported within 24 hours to the District, County, or City Bridge Engineer and to the OBS Bridge Inspection Engineer or Regional Construction Engineer. The Bridge Office will confer with appropriate District/County/City staff to develop short and long-term strategies to correct the problem and will conduct audits to ensure that the bridge owner has completed recommended actions and/or repairs.

FHWA Annual Audits
The Federal Highway Administration (FHWA) conducts annual audits of the bridge inspection programs of Mn/DOT's Central Office, Districts, and Counties. The OBS also participates in these audits. Review of the fracture critical inspection process is included within the scope of these audits.

Minnesota Department of Transportation

BRIDGE INSPECTION MANUAL

(Version 1.3 - November, 2006)

EXHIBIT

4

TABLE OF CONTENTS

Page

Section 1: Introduction

This manual is intended to provide a comprehensive guide for the inspection (and condition rating) of in-service bridges and culverts in Minnesota. This manual includes the NBI condition rating guidelines, the PONTIS element condition rating guidelines, and explanations of other bridge inventory items displayed on the Mn/DOT Bridge Inspection Report. This manual was developed by the Mn/DOT Bridge Office - to offer corrections, comments, or questions - please contact Pete Wilson at (615) 747-2141, or via email at **pete.wilson@dot.state.mn.us** This manual replaces an earlier draft version (posted on April 4, 2005) - it can be downloaded online on the Mn/DOT Bridge Office web site: **http://www.dot.state.mn.us/bridge** - it is listed under "Documents, Downloads, Forms, and Links".

A bridge inspection includes examining the structure, evaluating the physical condition of the structure, and reporting the observations and evaluations on the bridge inspection report. Bridge inspections serve two purposes - to **ensure the safety** of the structure, and to **identify maintenance needs** for the structure. Mn/DOT currently uses two separate condition rating systems for bridges and culverts - the NBI condition ratings and the PONTIS element condition ratings.

- The NBI condition ratings describe the general overall condition of a bridge (see Section 2). This rating system was developed by the Federal Highway Administration (FHWA), and is outlined in the "FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges". The NBI condition ratings are used to calculate the "Bridge Sufficiency Rating", which determines funding eligibility and priority for bridge replacement and rehabilitation

- The PONTIS condition ratings divide a bridge into separate elements, which are then rated individually based upon the severity and extent of any deterioration (see Section 3). This rating system was developed by the American Association of State Highway and Transportation Officials (AASHTO), and is outlined in the "AASHTO Guide for Commonly Recognized (CoRe) Structural Elements". The PONTIS condition ratings provide input data for a Bridge Management System (BMS) which can be used to identify present maintenance needs, and is intended to provide cost-effective options for long-range bridge maintenance and improvement programs (using computer projections of future deterioration).

Mn/DOT Bridge Inspection Office Contacts

Work Area	Name	Phone
Bridge Inspection Program Manager	Gary Peterson	(651) 747-2101
Bridge Management Unit (PONTIS entry, Bridge Inspection Reports, and Structure Inventory Reports)	Jim Pierce	(651) 747-2119
	Marcie Kennedy	(651) 747-2120
	Thomas Martin	(651) 747-2121
	Thomas Davidson	(651) 747-2122
Bridge Inspection Unit (Fracture Critical Bridge Inspection, Non-Destructive Testing, and Inspector Certification)	Todd Niemann	(651) 747-2132
	Pete Wilson	(651) 747-2141
	Ken Rand	(651) 747-2144
	Bill Nelson	(651) 747-2145
Bridge Load Rating Unit (Bridge Load Ratings and Load Postings)	Lowell Johnson	(651) 747-2118
	Ed Lutgen	(651) 747-2124
Bridge Hydraulics Unit (Scour Analysis & Scour Action Plans)	Andrea Hendrickson	(651) 747-2161
Bridge State Aid Unit (State Aid Funding Eligibility)	Dave Conkel	(651) 747-2151

Section 2: NBI Condition Ratings

2.1 NBI Bridge Condition Ratings

The NBI condition ratings describe the general overall condition of a bridge (or culvert) - these ratings are displayed on the Mn/DOT Bridge Inspection Report, and must be reviewed during each inspection. The NBI ratings are a key component of the "Bridge Sufficiency Rating", which is used to establish funding eligibility and priority for bridge replacement and rehabilitation. There are 5 NBI condition ratings - they are rated on a numerical scale of 1 to 9 (with 9 being "new" condition).

- NBI Deck Condition Rating (FHWA Item #58)
- NBI Superstructure Condition Rating (FHWA Item #59)
- NBI Substructure Condition Rating (FHWA Item #60)
- NBI Channel & Channel Protection Condition Rating (FHWA Item #61)
- NBI Culvert Condition Rating (FHWA Item #62)

A bridge is typically rated in three components (deck, superstructure, and substructure) - if the bridge spans over a waterway, the channel (FHWA Item #61) must also be rated.

- FHWA Item #58 describes the general overall condition of the deck (or slab) - this includes the underside of the deck and the wearing surface. While the deck includes the railings, curbs, sidewalks, expansion joints, and deck drains - these items should not be considered in this rating.

- FHWA Item #59 describes the general condition of the superstructure - this includes all structural components (slabs, arches, trusses, girders, or beams) located above (and including) the bearings. This rating should consider any deterioration, distress, misalignment, or collision damage.

- FHWA Item #60 describes the general overall condition of the substructure - this includes all structural components (piers, abutments, pilings, or footings) located below the bearings. This rating should consider any settlement, tipping, misalignment, undermining, or scour. Wingwalls or retaining walls (up to the first expansion or construction joint) can be included in this rating.

Culverts are rated as a single component (FHWA Item #62) - if water flows through a culvert, the channel (FHWA Item #61) must also be rated. The NBI Culvert Condition Rating describes the general overall condition of the culvert. This rating should consider the condition of the culvert barrel, joints and seams, as well as any deflection, distortion, misalignment, settlement, scour, or voiding of backfill. Headwalls, wingwalls or aprons (up to the first construction joint) should be included in this rating.

The NBI condition ratings are entered in PONTIS on the "Condition" display screen (use the drop-down selection screen). The NBI ratings from the previous inspection should carry over when adding a new inspection report. The following general guidelines apply to the NBI Condition Ratings...

- New bridges (or culverts) are entered as condition "9".
- If an NBI rating does not apply, it should be entered as "N" (not "Unknown - NBI").
- While repaired bridge components should typically not be rated higher than condition "7", reconstructed bridge components can be rated as condition "9".
- An NBI rating of condition "5" or less implies that repairs are recommended (NBI ratings of condition "5" or less will also reduce the bridge sufficiency rating).
- An NBI rating of condition "3" or less implies that immediate repairs (or a new load rating) may be necessary.
- Temporary supports (shoring, bracing, or underpinning) should not improve the NBI rating.
- The load carrying capacity should not be considered when determining the NBI condition ratings.

2.1.1 NBI Deck Condition Rating (FHWA Item #58)

This rating should reflect the overall general condition of the deck (or slab) - this includes the underside of the deck and the wearing surface. The condition of the railings, sidewalks, curbs, expansion joints and deck drains should not be considered in this rating.

Code	Deck Condition Description
N	**Not Applicable:** Use for culverts or bridges without decks (such as filled spandrel arches).
9	**Excellent Condition:** Deck is new condition (recently constructed).
8	**Very Good Condition:** Deck has superficial deterioration. • Concrete: superficial cracking, scale or wear (no leaching, delamination, spalling, or patches). • Timber: superficial weathering - isolated splitting. • Steel: no corrosion (paint/protection system remains sound).
7	**Good Condition:** Deck has minor (isolated) deterioration. • Concrete: minor cracking, scale, or wear (isolated leaching, delamination, or spalling). • Timber: minor weathering or splitting (no decay or crushing) - all planks are secure. • Steel: minor paint failure or corrosion (no section loss) - all connections are secure.
6	**Satisfactory Condition:** Deck has minor to moderate deterioration (no repairs are necessary). • Concrete: moderate cracking, scale, or wear (minor leaching, delamination, or spalling). • Timber: moderate weathering or splitting (isolated decay or crushing) - some planks may be slightly loose. • Steel: moderate paint failure and/or surface corrosion (minor section loss) - some connections may have worked loose.
5	**Fair Condition:** Deck has moderate deterioration (repairs may be necessary). • Concrete: extensive cracking, scale, or wear (moderate leaching, delamination, or spalling). • Timber: extensive weathering or splitting (moderate decay or crushing) - some planks may be loose, broken, or require replacement. • Steel: extensive paint failure and/or surface corrosion (moderate section loss) - several connections may be loose or missing, but all deck components remain secure.
4	**Poor Condition:** Deck has advanced deterioration (replacement or overlay should be planned). • Concrete: advanced cracking, scale, or wear (extensive leaching, delamination, of spalling - isolated full-depth failures may be imminent). • Timber: advanced weathering, splitting, or decay - numerous planks may be loose, broken, or require replacement. • Steel: advanced corrosion (significant section loss) - deck components may be loose or slightly out of alignment.
3	**Serious Condition:** Deck has severe deterioration - immediate repairs may be necessary. • Concrete: severe leaching, water saturation, delamination or spalling - full-depth failures may be present. • Timber: severe splitting, crushing or decay - majority of planks may need replacement. • Steel: severe and section loss - deck components may be severely out of alignment.
2	**Critical Condition:** Deck has failed - it may be necessary to close the bridge until repairs are completed.
1	**"Imminent" Failure Condition:** Bridge is closed - corrective action is required to open to restricted service.
0	**Failed Condition:** Bridge is closed - deck replacement is necessary.

2.1.2 NBI Superstructure Condition Rating (FHWA Item #59)

This rating should reflect the overall general condition of the superstructure - this includes all structural components located above (and including) the bearings.

Code	Superstructure Condition Description
N	**Not Applicable:** Use for culverts.
9	**Excellent Condition:** Superstructure is in new condition (recently constructed).
8	**Very Good Condition:** Superstructure has superficial deterioration.
7	**Good Condition:** Superstructure has minor (isolated) deterioration. • Steel: minor corrosion, little or no section loss. • Concrete: minor scaling or non-structural cracking (isolated delamination or spalling). • Timber: minor weathering or splitting (no decay or crushing). • Masonry: minor weathering or cracking (joints have little or no deterioration).
6	**Satisfactory Condition:** Superstructure has minor to moderate deterioration. Members may be slightly bent or out of alignment - connections may have minor distress. • Steel: moderate corrosion (section loss or fatigue cracks in non-critical areas). • Concrete: moderate scaling or non-structural cracking (minor delamination or spalling). • Timber: moderate weathering or splitting (minor decay or crushing). • Masonry: moderate weathering or cracking (joints may have minor deterioration).
5	**Fair Condition:** Superstructure has moderate deterioration. Members may be bent, bowed, or out of alignment - some bolts, rivets, or connectors may be loose or missing, but connections remain intact. • Steel: extensive corrosion (initial section loss in critical stress areas). Fatigue cracks (if present) have been arrested or are not likely to propagate into critical stress areas. • Concrete: extensive scaling or cracking (structural cracks may be present), moderate spalling or delamination (reinforcement may have some section loss). • Timber: extensive weathering or splitting (moderate decay or crushing). • Masonry: extensive weathering or cracking (joints may have slight separation or offset).
4	**Poor Condition:** Superstructure has advanced deterioration. Members may be significantly out of alignment - connections failure may be imminent. Bearings may be severely restricted. • Steel: significant section loss in critical stress areas. Un-arrested fatigue cracks exist that may likely propagate into critical stress areas. • Concrete: advanced scaling, cracking, or spalling (significant structural cracks may be present - exposed reinforcement may have significant section loss). • Timber: advanced splitting (extensive decay or significant crushing). • Masonry: advanced weathering or cracking (joints may have separation or offset).
3	**Serious Condition:** Superstructure has severe deterioration - immediate repairs or structural evaluation may be required. Members may severely out of alignment - connections or bearings may have failed. • Steel: severe section loss or fatigue cracks in critical stress areas. • Concrete: severe structural cracking or spalling. • Timber: severe splitting, decay, or crushing. • Masonry: severe cracking, offset or misalignment.
2	**Critical Condition:** Superstructure has critical deterioration - primary structural elements may have failed (severed, detached or critically misaligned). Immediate repairs may be required to prevent collapse or closure. The load-carrying capacity may be severely reduced.
1	**"Imminent" Failure Condition:** Bridge is closed - superstructure in no longer stable (corrective action might return the structure to restricted service).
0	**Failed Condition** - Bridge is closed - superstructure is beyond the point of corrective action.

2.1.3 NBI Substructure Condition Rating (FHWA Item #60)

This rating should reflect the overall general condition of the substructure - this includes all structural components located below the bearings.

<table>
<tr><th>Code</th><th>Substructure Condition Description</th></tr>
<tr><td>N</td><td>Not Applicable: Use for culverts or tunnels.</td></tr>
<tr><td>9</td><td>Excellent Condition: Substructure is in new condition (recently constructed).</td></tr>
<tr><td>8</td><td>Very Good Condition: Substructure has superficial deterioration.</td></tr>
<tr><td>7</td><td>Good Condition: Substructure has minor (isolated) deterioration.
Concrete: minor cracking, leaching, or scale (isolated delaminations or spalls).
Steel: minor paint failure and/or surface corrosion (little or no section loss).
Timber: minor weathering or splitting (no decay or crushing).
Masonry: minor weathering or cracking (joints have little or no deterioration).</td></tr>
<tr><td>6</td><td>Satisfactory Condition: Substructure has minor to moderate deterioration. Scour or erosion (if present) is minor and isolated. There may be slight movement or misalignment.
Concrete: moderate scaling, cracking, or leaching (minor delamination or spalling).
Steel: moderate paint failure and/or surface corrosion (minor section loss).
Timber: moderate weathering or splitting (minor decay or crushing).
Masonry: moderate weathering or cracking (joints may have minor deterioration).</td></tr>
<tr><td>5</td><td>Fair Condition: Substructure has moderate deterioration - repairs may be necessary. There may be moderate scour, erosion, or undermining. There may be minor settlement, movement, misalignment, or loss of bearing area.
Concrete: extensive scaling, cracking or leaching (isolated structural cracks may be present) - there may be moderate delamination or spalling.
Steel: extensive paint failure and/or surface corrosion (moderate section loss).
Timber: extensive weathering or splitting (moderate decay or crushing).
Masonry: extensive weathering or cracking (joints may have slight separation or offset).</td></tr>
<tr><td>4</td><td>Poor Condition: Substructure has advanced deterioration - repairs may be necessary to maintain stability. There may be extensive scour, erosion, or undermining. There may be significant settlement, movement, misalignment, or loss of bearing area.
Concrete: advanced scaling, cracking, or leaching (significant structural cracks may be present) - there may be extensive delamination or spalling.
Steel: advanced corrosion (significant section loss).
Timber: advanced splitting (significant decay or crushing).
Masonry: advanced weathering or cracking (joints may have separation or offset).</td></tr>
<tr><td>3</td><td>Serious Condition: Substructure has severe deterioration. Immediate corrective action may be required. Scour, erosion, or undermining may have resulted in severe settlement, movement, misalignment, or loss of bearing area.
Concrete: severe spalling or structural cracking.
Steel: severe section loss.
Timber: severe decay or crushing.
Masonry: severe cracking, offset or misalignment.</td></tr>
<tr><td>2</td><td>Critical Condition: Substructure has critical damage or deterioration (near the point of collapse) - it may be necessary to close the bridge until corrective action is completed. Scour may have removed substructure support.</td></tr>
<tr><td>1</td><td>Imminent Failure Condition: Bridge is closed to traffic due to substructure failure - corrective action may restore the bridge to light service.</td></tr>
<tr><td>0</td><td>Failed Condition: Bridge is closed due to substructure failure - beyond corrective action (replacement required).</td></tr>
</table>

2.1.4 NBI Channel/Channel Protection Condition Rating (FHWA Item #61)

This rating should reflect the overall general condition of the waterway flowing below the bridge (or running through the culvert) - even if the channel is occasionally dry. This rating can be based upon findings from routine visual inspections, soundings, or underwater inspections.

This rating includes the channel and banks below the bridge, as well as immediately upstream and downstream of the bridge (typically those areas visible from the bridge). Changes in the channel - such as aggradation (rising of the channel due to sedimentation), degradation (lowering of the channel due to erosion), or lateral stream migration that might adversely affect the bridge should be considered in this rating. The presence drift in the channel, debris lodged against the bridge, or sediment inside culvert barrels should also be considered in this rating. *Note: if the bridge is over a waterway that requires a bridge permit for navigation (FHWA Item #38 coded as "1"), the condition of substructure protection devices (such as dolphins, fenders, and shear walls) must be rated using FHWA Item #111.*

Code	Channel Condition Description
N	**Not Applicable:** Bridge is not over a waterway.
9	**Excellent Condition:** There are no noticeable or noteworthy deficiencies.
8	**Very Good Condition:** Channel banks are protected (or well vegetated) - there is little or no erosion. Control structures and protection devices (if present) have little or no deterioration. Any drift or debris in the channel is incidental. Culvert barrel has little or no sediment.
7	**Good Condition:** Channel has no notable aggradation, degradation, or lateral movement. There is no notable scour around the bridge substructure. The banks may have minor erosion - bank protection (if any) may have minor deterioration. Control structures and/or protection devices may have minor deterioration. There may be minor drift or debris in the channel. Culvert barrel may have minor sediment.
6	**Satisfactory Condition:** Channel may have minor aggradation, degradation, or lateral movement. The channel banks may have moderate erosion or slumping - bank protection may have moderate deterioration. Control structures and/or protection devices may have moderate deterioration. Drift or debris in the channel may be slightly restricting the channel. Culvert barrel may have moderate sediment.
5	**Fair Condition:** Channel may have moderate aggradation, degradation, or lateral movement, but the bridge and approaches have not yet been adversely affected. The channel banks may have extensive erosion - the bank protection may have extensive deterioration. Control structures and/or protection devices may have extensive deterioration, but are functioning as intended. Debris in the channel (or sediment in the culvert barrel) is restricting the channel and should be removed.
4	**Poor Condition:** Aggradation, degradation, or lateral movement of the channel may be adversely affecting the bridge and/or approaches. Channel banks may have severe erosion - the bank protection may have severe deterioration. Control structures and/or protection devices may be deteriorated to the extent that they are no longer functioning as intended. Large accumulations of debris or sediment are severely restricting the channel, and should be removed immediately.
3	**Serious Condition:** Aggradation, degradation, or lateral movement has altered the channel to the extent that the bridge (or approach roadway) is threatened. Bank protection has failed. Control structures and/or protection devices have been destroyed.
2	**Critical Condition:** Aggradation, degradation, or lateral movement has altered the channel to the extent that the bridge is near a state of collapse. It may be necessary to close the bridge until corrective action is completed.
1	**Bridge closed due to channel failure:** Corrective action may restore bridge to light service.
0	**Bridge closed due to channel failure:** Replacement necessary.

2.1.5 NBI Culvert Condition Rating (FHWA Item #62)

This rating should reflect the overall general condition of the culvert. If a structure is classified as a "culvert", the NBI condition ratings for deck, superstructure, and substructure must all be rated as "N".

Code	Culvert Condition Description
N	**Not Applicable:** Structure is not a culvert.
9	**Excellent Condition:** Culvert is new condition (recently constructed).
8	**Very Good Condition:** Culvert has superficial and/or isolated deterioration.
7	**Good Condition:** Culvert has minor (isolated) deterioration. Joints are sound and properly aligned (no leakage or backfill infiltration). Footings have no undermining. • Concrete/Masonry: minor weathering/scaling, cracking, or leaching (isolated spalling) • Steel: minor corrosion (little or no section loss) - barrel has no distortion. • Timber: minor splitting (no decay, crushing, or sagging).
6	**Satisfactory Condition:** Culvert has minor to moderate deterioration. Joints may have minor separation or misalignment (slight leakage or backfill infiltration). • Concrete/Masonry: moderate weathering/scaling, cracking, or leaching (minor spalling). • Steel: moderate corrosion (minor section loss) - barrel may have minor distortion (seams may have minor distress, but no cracking). • Timber: moderate splitting (minor decay, crushing, or sagging).
5	**Fair Condition:** Culvert has moderate deterioration - repairs may be required, but the culvert is structurally sound and functioning as intended. Joints may have separation or misalignment (moderate leakage or backfill infiltration). Footings may be partially undermined (minor settlement). Embankments remain intact (roadway has no notable settlement). • Concrete/Masonry: extensive weathering/scaling, cracking, or leaching (moderate spalling). • Steel: extensive corrosion (any significant section loss is isolated) - barrel may have moderate distortion (seams may have missing bolts or isolated cracking). • Timber: extensive splitting (moderate decay, crushing, or sagging).
4	**Poor Condition:** Culvert has advanced deterioration - structural evaluation or repairs may be necessary (the structural integrity and/or functional capacity of the culvert may be slightly reduced). Footings may have significant undermining or settlement. Loss of backfill may have resulted in slight settlement of the roadway or embankment. • Concrete/Masonry: advanced weathering, cracking, leaching, or scaling (significant spalling). Joints may have significant separation, misalignment, or leakage. • Steel: advanced corrosion (significant section loss) - barrel may have significant distortion (seams may have extensive cracking or isolated failures). • Timber: advanced splitting (significant decay, crushing, or sagging).
3	**Serious Condition:** Culvert has serious deterioration - immediate repairs or corrective action may be required (the structural integrity and/or functional capacity of the culvert may be significantly reduced). Joints may have severe deterioration, misalignment, offset, separation, or leakage. Loss of backfill may have resulted in significant settlement or undermining of the roadway or embankment. Footings may have severe undermining or settlement. • Concrete/Masonry: severe weathering, cracking, or spalling. • Steel: severe section loss - barrel may have severe distortion (seams may have failed). • Timber: severe decay, crushing, or sagging.
2	**Critical Condition:** Culvert has critically advanced deterioration (near the point of collapse) - it may be necessary to close the roadway until corrective action is completed.
1	**"Imminent" Failure Condition:** Culvert is closed - corrective action may restore to light service
0	**Failed Condition:** Culvert is closed - replacement is necessary.

2.2 Bridge Appraisal Ratings & Other Items

The Mn/DOT Bridge Inspection Report displays two of the NBI Bridge Appraisal Ratings, as well as some additional structure inventory items. This section includes explanations of some of these items - they should be periodically reviewed for accuracy.

2.2.1 Waterway Adequacy Appraisal Rating (FHWA Item #71)

This rating is a general assessment of the waterway opening with respect to the passage of flow through the bridge. This rating is based upon the frequency of "overtopping" of the bridge and approach (and the resultant traffic delays). The functional class of the roadway is also taken into consideration. *When entering new inspections into the PONTIS database, this item is displayed under the "Condition" tab.* Site conditions may warrant somewhat higher or lower ratings than indicated by the table (e.g. flooding of an urban area due to a restricted bridge opening). "Freeboard" is defined as the distance from the bottom of the superstructure to the water surface (at the water level of the 50-year frequency design storm). The descriptions given in the table mean the following...

Chances of Overtopping	Traffic Delays
Remote: greater than 100 years	Insignificant: Minor inconvenience (impassable for a few hours)
Slight: 11 to 100 years	Significant: Traffic delays of up to several days
Occasional: 3 to 10 years	Severe: Long-term traffic delays with resulting hardship
Frequent: less than 3 years	

Waterway Adequacy Appraisal Rating (FHWA Item #71)			
Functional Classification			Description
Principal Arterials - Interstates, Freeways, or Expressways	Other Principal and Minor Arterial and Major Collectors	Minor Collectors and Local Roads	
N	N	N	Bridge not over a waterway.
9	9	9	Bridge deck and roadway approaches above floodwater elevations (high water). Chance of overtopping is remote.
8	8	8	Bridge deck above roadway approaches. Slight chance of overtopping roadway approaches. Greater than 3 ft. of freeboard.
6	6	7	Bridge deck above roadway approaches. Slight chance of overtopping bridge deck and roadway approaches. 2 to 3 ft. of freeboard.
4	4	6	Bridge deck above roadway approaches. Occasional overtopping of roadway approaches with insignificant traffic delays. 1 to 2 ft. of freeboard.
3	4	5	Bridge deck above roadway approaches. Occasional overtopping of roadway approaches with significant traffic delays. Less than 1 ft. of freeboard.
2	3	4	Occasional overtopping of roadway approaches with significant traffic delays.
2	2	3	Frequent overtopping of roadway approaches with significant traffic delays.
2	2	2	Occasional or frequent overtopping of bridge deck and roadway approaches with severe traffic delays.
0	0	0	Bridge closed.

2.2.2 Approach Roadway Alignment Appraisal Rating (FHWA Item #72)

FHWA Item #72 is a general assessment of the approach roadway alignment - this item identifies those bridges that do not function properly or adequately due to the approach alignment. While this rating will typically remain constant, it should be reviewed if the bridge approaches have been reconstructed. This rating only applies to the roadway passing over the bridge (not the roadway passing below the bridge). Railroad or pedestrian bridges crossing over a roadway should be rated as "N".

This rating is based upon the speed reduction required (due to the vertical or horizontal approach alignment) by a typical vehicle using the roadway. *Note: Speed reductions necessary due to structure width shall not be considered when evaluating this item.*

Approach Roadway Alignment Appraisal Rating (FHWA Item #72)	
Code	**Description**
N	Not Applicable (use for railroad or pedestrian bridges)
9	**This value of rating code not used**
8	No speed reduction required
7	Minor sight distance problems with no speed reduction required
6	Very minor speed reduction required (0-3 MPH for a typical vehicle using the roadway)
5	Minor speed reduction required (3-5 MPH for a typical vehicle using the roadway)
4	Significant speed reduction required (5-10 MPH for a typical vehicle using the roadway)
3	Intolerable alignment requiring a substantial reduction in the operating speed (10-20 MPH for a typical vehicle using the roadway)
2	Severe vertical or horizontal alignment problems, such as a sharp vertical or horizontal curve immediately adjacent to the bridge (Speed reduction of 20 MPH or greater for a typical vehicle using the roadway)
1	**This value of rating code not used**
0	Bridge Closed

2.2.3 Bridge Deficiency Status

If a bridge (or culvert) has been designated as Structurally Deficient or Functionally Obsolete, this will be displayed on the Mn/DOT Bridge Inspection Report (this is automatically calculated). The FHWA designates a bridge as "Structurally Deficient" if it meets one of the following conditions:

1. An NBI condition rating of "4" or less for the Deck, Superstructure, Substructure), or (Culvert); or
2. An NBI appraisal rating of "2" or less for Item #67 (Structural Evaluation) or Item #71 (Waterway Adequacy).

The FHWA designates a bridge as "Functionally Obsolete" if it has an appraisal rating of "3" or less for Item #67 (Structural Evaluation), Item #68 (Deck Geometry), Item #69 (Vertical & Horizontal Underclearances), Item #71 (Waterway Adequacy), or Item #72 (Approach Roadway Alignment). *Note: a bridge designated as "structurally deficient" is excluded from consideration as being "functionally obsolete".*

2.2.4 Bridge Sufficiency Rating

The bridge sufficiency rating is a based upon a percentage scale of 0%-100% (with 100% being an entirely sufficient bridge). The bridge sufficiency rating is used to establish funding eligibility and priority for bridge replacement and rehabilitation. As a general rule, a sufficiency rating of 80% or less is required to be eligible for bridge rehabilitation, and a sufficiency rating of 50% or less is required to be eligible for bridge replacement. *Note: The bridge sufficiency rating is only calculated for bridges (or culverts) that carry vehicular traffic - it is not calculated for railroad or pedestrian bridges.*

The bridge sufficiency rating is calculated automatically by PONTIS - it utilizes a complex formula that takes into consideration the structural adequacy, functional capacity, and essentiality for public use of the bridge. This rating takes into consideration such factors as the NBI condition ratings (NBI condition ratings of "5" or less will reduce the bridge sufficiency rating), the load-carrying capacity, the NBI appraisal ratings, the average daily traffic, and detour length. The sufficiency rating formula is explained in Appendix B of the FHWA Recording & Coding Guide.

2.3.5 Mn/DOT Scour Code

The Mn/DOT scour code indicates the current status of the bridge regarding it's vulnerably to scour - the scour code (along with an abbreviated description) is displayed on Mn/DOT Inspection Report.

Code	Mn/DOT Scour Code Description
A	Bridge is not over a waterway.
B	Bridge is closed to traffic; field review indicates that failure of piers and/or abutments due to scour is imminent or has occurred.
C	Bridge is closed to traffic for reasons other than scour. Prior to reopening, the bridge must be evaluated for scour and the scour code must be updated.
D	Bridge is scour critical; field review indicates that extensive scour has occurred at bridge foundations. Immediate action is required to provide scour countermeasures.
E	Culvert structure. Scour calculation, evaluation, and/or screening have not been made. *Note: the FHWA does not require scour evaluation of structures less than 20 feet in length.*
F	Bridge Structure. Scour calculation, evaluation, and/or screening have not been made. All substructure foundations are known.
G	Scour calculation, evaluation and/or screening have not been made. Bridge on unknown foundations.
H	Bridge foundations (including piles) are well above flood water elevations.
I	Bridge screened, determined to be low risk for failure due to scour.
J	Bridge screened - determined to be scour susceptible.
K	Bridge screened, determined to be of limited risk to public, monitor in lieu of evaluation and close if necessary.
L	Scour evaluation complete, bridge judged to be low risk for failure due to scour.
M	Bridge foundations determined to be stable for calculated scour conditions; calculated scour depth from the scour prediction equations is above top of footing.
N	Bridge foundations determined to be stable for calculated scour conditions; calculated scour depth from the scour prediction equations is within limits of footing or piles.
O	Bridge foundations determined to be stable for predicted scour conditions; scour action plan requires additional action.
P	Countermeasures have been installed to correct a previously existing problem with scour. Bridge is no longer scour critical. Scour countermeasures should be inspected at least once every 4 years and after major flows, or as recommended in the Scour Action Plan. Report

Code	Mn/DOT Scour Code Description
	any changes that have occurred to countermeasures.
R	Bridge has been evaluated and is scour critical. Scour Action Plan recommends monitoring the bridge during high flows and closing if necessary.
U	Bridge has been evaluated and is scour critical. Scour Action Plan recommends this bridge as a priority for installation of countermeasures. Until countermeasures are installed, monitor bridge during high flows and close if necessary.

The FHWA requires that all bridges over water with a length of 20 feet or greater be evaluated for scour - in Minnesota, this process consists of an initial scour screening, and if necessary, a more thorough scour evaluation. The scour evaluation manual can be downloaded from the Mn/DOT web site (it is listed under "Documents, Downloads, Forms, and Links") - this manual also outlines scour action plans and scour monitoring. As of a result of a scour evaluation, a bridge may determined to be at low risk for scour failure, limited risk for scour failure, or scour critical. However, the inspector should be aware that scour problems can develop even on bridges listed as "low risk".

- If the Mn/DOT scour code is listed as F, G, or J, additional scour analysis is required.
- If the Mn/DOT scour code is listed as D, R or U - the bridge has been determined to be "scour critical". A scour critical bridge has abutment or pier foundations rated as unstable due either to observed scour, or scour potential (as determined from a scour evaluation).
- If the Mn/DOT scour code is listed as G, K, O, P, R, or U, the bridge must have a "scour action plan" on file to outline procedures for monitoring or closure during high water events.
- If the Mn/DOT scour code is listed as B, D, O, or U, the NBI Substructure rating may need to be revised to reflect the severity of any actual scour.
- If the Mn/DOT scour code is listed as D, G, K, O, P, R or U, the PONTIS Scour smart flag (element #361) will automatically be added to the inspection report.

2.2.6 Structure Open, Posted, or Closed to Traffic

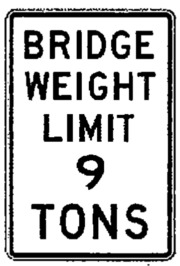
This item describes the current operational status of the structure (opened, posted, or closed to traffic) - it corresponds with FHWA Item #41. The inspector should verify that this item is correct - the item is coded as follows (only an abbreviated description will be displayed on the Mn/DOT Inspection Report).

Code	Description
A	Bridge is open to traffic (no load restrictions) - this can include pedestrian bridges or railroad bridges.
B	Bridge is open to traffic - load posting is recommended but has not been legally implemented (all signs not in place).
D	Bridge is open to traffic, but would be posted or closed without temporary shoring or supports.
E	Bridge is open to traffic, but is a temporary structure intended to carry legal loads until the original structure is rehabilitated (or a new structure is constructed).
G	New structure - not yet open to traffic.
K	Bridge is closed to all traffic.
P	Bridge is posted with a load restriction. This includes bridges with more than one restriction, or temporary bridges with a load restriction.
R	Bridge is posted with other load-capacity restrictions (such as speed, number of vehicles on bridge, etc.).

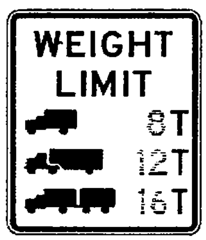
2.2.7 Bridge Signage (Required)

The bridge inspection report displays any signage (load posting, traffic control, horizontal control, or vertical clearance) required at the bridge site. This is based upon current structure inventory information - it is the responsibly of the agency with inspection jurisdiction to verify these signing requirements. Sign standards and guidelines are outlined in the **Mn/DOT Traffic Engineering Manual** and the **Minnesota Manual on Uniform Traffic Control Devices**. Any bridge signage item listed as "unknown" should be revised.

Load Posting Signs: Every bridge must be rated (in accordance with the AASHTO Manual for Condition Evaluation and Load & Resistance Factor Rating of Highway Bridges) to determine its safe live load carrying capacity. If maximum legal load exceeds the bridge capacity at the operating load level, the bridge must be posted with a weight restriction. A new load rating is required if the structure has deteriorated significantly (since the last rating), has been severely damaged, has a significant increase in dead load (such as a new overlay), or if the allowable legal load is increased. The recent Timber Hauler's Bill has resulted in some bridge being posted with a "Permit Weight Limit", that otherwise would not have a weight restriction.

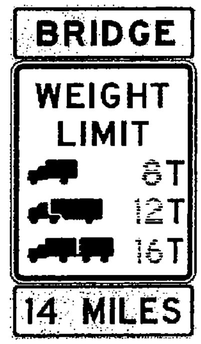


R12-1A
24" x 26"



R12-5
30" x 36"

R12-5
Permit
36" x 36"



R12-5
Supplements
30" x 9"

R12-X2
60" x 36"

Load posting signs (R12-1A, R12-5 or R12-5 Permit) must be placed either on or immediately in front of the bridge. Advanced signs (R12-5 Supplement or R12-X2) should be placed at the nearest intersecting road (or a wide point in the road) at which an overweight vehicle can detour or turn around. Requirements for load posting signs are coded and displayed as follows...

Load Posting Signage (Required)		
Code	**Description**	**Display**
0	No Load Posting Signs are Required	NOT REQUIRED
1	Vehicle Limit Only (type R12-1A)	VEHICLE ONLY
2	Vehicle and Semi-Trailer Limits (such as type R12-5)	VEHICLE & SEMI
3	Bridge Closed (type R11-2A)	BRIDGE CLOSED
4	Permit Weight Limit (type R12-5 Permit)	PERMIT

Traffic Control Signs: Some bridges require traffic control signs (speed or lane restrictions) that are related to weight restrictions. Bridge speed limits signs (type R2-X5) may be required to reduce impact loads (this refers only to a speed limit less than the speed limit on the approach roadways). Narrow bridges may require lane restriction signs such as "Trucks Must Not Meet on Bridge" (type R12-X3) or "Vehicles Must Not Meet on Bridge" (type R12-X3A). Requirements for traffic control signs are coded and displayed as follows...

R12-5
24" x 36"

R12-X3
36" x 24"

R12-X3
42" x 24"

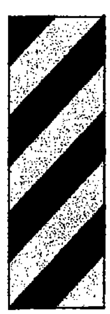
Traffic Control Signage (Required)		
Code	**Description**	**Display**
0	No Traffic Restriction Signs Required	NOT REQUIRED
1	Bridge Speed Limit (Type R2-X5)	SPEED LIMIT
2	Lane Restriction (Trucks or Vehicles Must Not Meet on Bridge)	ONLY 1 TRUCK
3	Combination of 1 & 2	SPEED LIMIT & 1 TRUCK

Horizontal Control Signs: Abutments, piers, trusses, or railings located within the width of the approach shoulders should be delineated by Type 3 Object Markers (OM-3L, OM-3C, or OM-3R). These signs have alternating black & yellow stripes sloping downward toward the side of the obstruction on which traffic is to pass.

Type 3 Object Markers
(12" x 36")

OM-3L

OM-3C



OM-3R

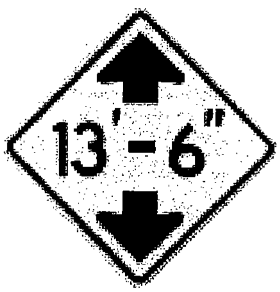
W5-2
(36" x 36")

W5-3
(36" x 36")

A narrow bridge sign (type W5-2 or W5-2A) should be placed in advance of any bridge (or culvert) with a clearance width less than the approach roadway width. A one lane bridge sign (W5-3) should be placed in advance of 2-lane bridges (or culverts) with a clearance width of 18 ft. or less. Requirements for horizontal control signs are coded and displayed as follows...

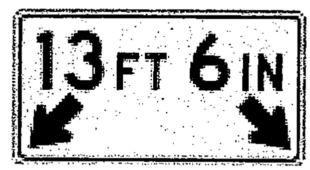
Horizontal Clearance Signage (Required)		
Code	**Description**	**Display**
0	No Horizontal Clearance Signs Required	NOT REQUIRED
1	Type 3 Object Markers (Hazard Markers)	OBJECT MARKERS
2	Width Restrictions (Narrow Bridge or One Lane Bridge)	WIDTH RESTRICTION
3	Combination of 1 & 2	OBJECT MARKERS & WIDTH

Vertical Clearance Signs: The maximum vehicle height in the state of Minnesota is 13'-6". Low clearance signs (type W12-2 or W12-2P) must be placed either on or immediately in front of any bridge with a vertical clearance of 14'-6" or less. On arch bridges (or when the underclearance varies greatly), the W12-X-2 Vertical Clearance sign shall be used (the arrow indicates the location of the height specified on the sign). Advanced signs should be placed at the nearest intersecting road (or wide point in the road) at which an over height vehicle can detour or turn around.



W12-2
36" x 36"

W12-2P
84" x 24"



W12-X2
48" x 24"

Low clearance signs should display the vertical clearance to the nearest 1" (not exceeding the actual clearance) - an additional 3" allowance for frost heaving should be reflected in the signing. Bridge clearances should be checked periodically (especially if the roadway has been resurfaced), and the <u>current posted clearance should be noted on the inspection report</u>! Requirements for vertical clearance signs are coded and displayed as follows...

Vertical Clearance Signage (Required)		
Code	**Description**	**Display**
N	Not Applicable (no vertical restrictions)	NOT APPLICABLE
0	No Vertical Clearance Signs Required (underclearance is 14'-6" or greater)	NOT REQUIRED
1	Vertical Clearance Restriction on Roadway (type W12-2 or W12-2p)	ROADWAY RESTRICTION
2	Vertical Clearance Restriction on Shoulder (Arch Bridges - type W12-X2)	SHOULDER RESTRICTION

2.2.8 Unsound Deck Percentage

This item represents the amount of unsound (deteriorated) wearing surface, expressed as a percentage of the total deck area. This item only applies to concrete decks (and concrete slabs), and should correlate with the condition rating of the corresponding PONTIS concrete deck (or slab) element. This quantity may be estimated from field observations, or calculated from a deck condition survey (such as chaining or ground penetrating radar). "Unsound" wearing surface includes areas with delamination, spalling, potholes, severe scale, or other significant deterioration. Temporary patches (such as those performed by maintenance personal) should be considered to be unsound. Long-term patches (such as those performed under a mill & patch contract) should not be considered to be unsound until these repaired areas have begun to deteriorate.

2.2.9 Unsound Paint Percentage

This item indicates the quantity of "unsound" (deteriorated) paint, expressed as a percentage of the total painted area. The painted area only includes painted steel structural members such as beams, trusses, or arches (do not include bridge railings). This estimated percentage is based upon the area of deteriorated paint and rust that must be removed to apply a new paint system. This includes areas with complete paint system failure (exposed and rusted metal), or areas with finish coat deterioration (flaking, cracking, blistering, or severe staining).

Section 3: PONTIS Element Condition Ratings

3.1 Introduction to PONTIS Element Condition Ratings

3.1.1 Background of PONTIS

The PONTIS condition ratings provide a detailed condition evaluation of the bridge by dividing the bridge into separate elements, which are then rated individually based upon the severity and extent of any deterioration. This rating system was developed by the American Association of State Highway and Transportation Officials (AASHTO), and is outlined in the "AASHTO Guide for Commonly Recognized (CoRe) Structural Elements".

PONTIS element condition ratings provide input data for a Bridge Management System (BMS) which allows computer projections of deterioration rates, providing cost-effective options for bridge maintenance, rehabilitation, or replacement. PONTIS is intended to be a source of information (and qualitative backing) for engineers and managers responsible for long-range bridge improvement programs. Mn/DOT adopted an element based bridge inspection format in 1994 to comply with the 1991 Inter-Modal Surface Transportation Efficiency Act (ISTEA), which mandated that all states develop and implement a Bridge Management System (BMS) by October of 1998.

An "element" refers to structural members (beams, pier columns, decks, etc.), or any other components (railings, expansion joints, approach panels, etc.) commonly found on a bridge. This manual includes approximately 150 elements - this includes the AASHTO CoRe (commonly recognized) elements, as well as elements added by Mn/DOT to better represent the bridge types and components found in Minnesota.

3.1.2 PONTIS Element Types

PONTIS elements are divided into five groups, depending upon their structural function...

- Deck Elements (decks, slabs, railings, and expansion joints)
- Superstructure Elements (girders, beams, arches, trusses, and bearings)
- Substructure Elements (abutments, wingwalls, pilings, columns, pier caps and pier walls)
- Culvert Elements (culverts and culvert headwalls/wingwalls)
- Miscellaneous Elements ("smart flags" and miscellaneous bridge elements)

PONTIS elements are also divided into six material groups - the condition rating descriptions (and rating scales) will vary according to the material type.

- Painted Steel
- Unpainted Weathering Steel
- Reinforced Concrete
- Pre-stressed (or Post-Tensioned) Concrete
- Timber
- Masonry, Other Material, or Combination of Materials

Note: "Smart Flag" elements identify conditions or problems present on a bridge that are not adequately addressed by the conventional PONTIS elements. Some smart flags refer to specific problems that may warrant special attention or follow-up action, while some smart flags provide detailed information about the condition of specific bridge elements or materials.

3.1.3 PONTIS Element Quantities & Ratings

PONTIS element quantities may be expressed in two ways…

- Linear Feet (LF) elements display the total length of the element present on the bridge. For example, on a 100 ft. long bridge with five beam lines, the beam quantity would be 500 LF.
- Each (EA) elements display the total quantity of the element present on the bridge. For example, on a bridge with three piers (and three columns on each pier), the column quantity would be "9".

PONTIS elements are rated on a scale of 1-2, 1-3, 1-4, or 1-5 (depending upon the element type and material). In all cases, condition state 1 is the best condition, with condition state 3, 4, or 5 being the worst condition (this is the reverse of the NBI condition ratings).

If the severity of deterioration varies within a particular element, it may be rated using more than one condition state. For example, on a bridge with 500 LF of beams, 250 LF could be rated as condition state 1, 150 LF could be rated as condition state 2, and 100 LF could be rated as condition state 3. Elements expressed as an "Each" (EA) quantity can also be rated using more than one condition state (but only if the total quantity is greater than one). For example, on a bridge with 9 columns, five could be rated as condition state 1, three could be rated as condition state 2, and one could be rated as condition state 3. *Note: while deck elements are displayed as a "SF" quantity, the entire quantity must be rated as one condition state.*

3.1.4 PONTIS Element Display and Entry

Only the PONTIS elements that have been entered for a bridge will be displayed on the Mn/DOT Bridge Inspection Report. The display order is determined by the element structural type - deck elements will be displayed first, followed by superstructure elements, substructure elements, culvert elements and then miscellaneous elements. The element condition ratings for the current inspection (as well as the previous inspection) will be displayed on the inspection report (in "LF" or "Each quantity). Inspection notes pertaining to each element are displayed directly below each element.

When entering a new inspection report into the PONTIS system, elements may be added, deleted, or edited the on the "Condition" Display screen. *Note: be sure that the arrow cursor along the left side of the display screen is aligned with the proper element.*

- Elements may be added by clicking on the "Create Element" button - the element can then be selected from the drop-down list (the element quantity and environment factor should also be entered).
- To change the quantity or environment factor for an existing element, click on the "Edit Element" button.
- Elements can be deleted by clicking on the "Remove Element" button.
- Element condition ratings can be changed by clicking on the "up/down" arrows for each condition state. *Note: Be aware that elements may be displayed as either "Quantity" or "Percent" (there is a selection box on the display screen).*
- Element inspection notes can be entered by clicking on the icon near the lower left corner of the display screen (check to see that the arrow cursor is aligned with the proper element). *Note: general inspection notes are entered on the "Notes" display screen.*

3.1.5 Structure Units

Large or complex bridges that incorporate more than one structure type can be divided into structure units (a structure unit may consist of an individual span or a group of spans with the same structure type). *Note: if you wish to divide a bridge into structure units, please contact the Mn/DOT Bridge Data Office.*

3.2 Mn/DOT PONTIS Element List

This element list is arranged in groups based upon the element type or the material - this is essentially the same order in which the element condition rating descriptions are arranged in this manual. Each PONTIS element is assigned a number (based upon the AASHTO CoRe element numbering system). AASHTO CoRe deck elements are numbered between 1 and 99, AASHTO CoRe superstructure elements are numbered between 100 and 199, and AASHTO CoRe substructure elements are numbered between 200 and 299. Smart Flag elements (and elements added by Mn/DOT) are numbered between 300 and 999.

Mn/DOT PONTIS Element List

Element #	Element Description	Element Type	Units	Rating Scale	Page
Concrete Decks					
12	Top of Concrete Deck with Uncoated Rebar (No Overlay)	Deck	Each	1-5	25
13	Bituminous Overlay (Concrete Deck)	Deck	Each	1-5	26
14	Bituminous Overlay with Membrane (Concrete Deck)	Deck	Each	1-5	26
18	Latex, Epoxy, or Thin Overlay (Concrete Deck)	Deck	Each	1-5	26
22	Low Slump Overlay (Concrete Deck with Uncoated Rebar)	Deck	Each	1-5	25
26	Top of Concrete Deck with Epoxy Reinforcement (No Overlay)	Deck	Each	1-5	25
27	Top of Concrete Deck with Cathodic Protection System	Deck	Each	1-5	25
377	Low Slump Overlay (Concrete Deck with Epoxy Rebar)	Deck	Each	1-5	25
Concrete Slabs					
38	Top of Concrete Slab with Uncoated Rebar (No Overlay)	Deck	Each	1-5	25
39	Bituminous Overlay (Concrete Slab)	Deck	Each	1-5	26
40	Bituminous Overlay with Membrane (Concrete Slab)	Deck	Each	1-5	26
44	Latex, Epoxy, or Thin Overlay (Concrete Slab)	Deck	Each	1-5	26
48	Low Slump Overlay (Concrete Slab with Uncoated Rebar)	Deck	Each	1-5	25
52	Top of Concrete Slab with Epoxy Reinforcement (No Overlay)	Deck	Each	1-5	25
53	Top of Concrete Slab with Cathodic Protection System	Deck	Each	1-5	25
378	Low Slump Overlay (Concrete Slab with Epoxy Rebar)	Deck	Each	1-5	25
405	Top of CIP Concrete Voided Slab (No Overlay)	Deck	Each	1-5	25
406	Low Slump Overlay (CIP Concrete Voided Slab)	Deck	Each	1-5	25
Timber Decks & Slabs					
31	Timber Deck (No Overlay)	Deck	Each	1-4	27
32	Timber Deck with Bituminous (AC) Overlay	Deck	Each	1-4	27
54	Timber Slab (No Overlay)	Deck	Each	1-4	27
55	Timber Slab with Bituminous (AC) Overlay	Deck	Each	1-4	27
Other Deck Types					
28	Steel Grid Deck - Open	Deck	Each	1-5	28
29	Steel Grid Deck - Concrete Filled	Deck	Each	1-5	28
30	Corrugated, Orthotropic, Exodermic, or Other Deck	Deck	Each	1-5	28
401	Steel Ballast Plate Deck (Railroad Bridges)	Deck	Each	1-5	29
Deck Joints					
300	Strip Seal Deck Joint	Deck	LF	1-3	30
301	Poured Deck Joint	Deck	LF	1-3	30
302	Compression Seal Deck Joint	Deck	LF	1-3	31
303	Assembly Deck Joint (with or without seal)	Deck	LF	1-3	31
304	Open Deck Joint	Deck	LF	1-3	32
410	Modular Deck Joint	Deck	LF	1-3	32
411	Open Finger Deck Joint	Deck	LF	1-3	33
412	Approach Relief Joint	Deck	LF	1-3	33
Roadway Approaches					
320	Concrete Approach Slab (Bituminous Wearing Surface)	Deck	Each	1-4	34
321	Concrete Approach Slab (Concrete Wearing Surface)	Deck	Each	1-4	34
407	Bituminous Approach Roadway	Deck	Each	1-4	34
408	Gravel Approach Roadway	Deck	Each	1-4	34

Mn/DOT PONTIS Element List					
Element #	**Element Description**	**Element Type**	**Units**	**Rating Scale**	**Page**
Bridge Railings					
330	Metal Bridge Railing (Uncoated or Unpainted)	Deck	LF	1-4	35
331	Reinforced Concrete Bridge Railing	Deck	LF	1-4	35
332	Timber Bridge Railing	Deck	LF	1-3	36
333	Masonry, Other, or Combination Material Bridge Railing	Deck	LF	1-3	36
334	Metal Bridge Railing (Coated or Painted)	Deck	LF	1-5	37
409	Chain Link Fence	Deck	LF	1-5	37
Painted Steel Elements					
102	Painted Steel Box Girder	Superstructure	LF	1-5	38
107	Painted Steel Girder or Beam	Superstructure	LF	1-5	38
113	Painted Steel Stringer	Superstructure	LF	1-5	38
121	Painted Steel Through Truss - Bottom Chord	Superstructure	LF	1-5	38
126	Painted Steel Through Truss - Upper Members	Superstructure	LF	1-5	38
131	Painted Steel Deck Truss	Superstructure	LF	1-5	38
141	Painted Steel Arch	Superstructure	LF	1-5	38
152	Painted Steel Floorbeam	Superstructure	LF	1-5	38
202	Painted Steel Column	Substructure	Each	1-5	38
231	Painted Steel Pier Cap	Substructure	LF	1-5	38
384	Painted Steel Arch Spandrel Column	Superstructure	Each	1-5	38
419	Painted Steel Piling	Substructure	Each	1-5	38
Unpainted (Weathering) Steel Elements					
101	Unpainted (Weathering) Steel Box Girder	Superstructure	LF	1-4	39
106	Unpainted (Weathering) Steel Girder or Beam	Superstructure	LF	1-4	39
112	Unpainted (Weathering) Steel Stringer	Superstructure	LF	1-4	39
120	Unpainted (Weathering) Steel Through Truss - Bottom Chord	Superstructure	LF	1-4	39
125	Unpainted (Weathering) Steel Through Truss - Upper Members	Superstructure	LF	1-4	39
130	Unpainted (Weathering) Steel Deck Truss	Superstructure	LF	1-4	39
140	Unpainted (Weathering) Steel Arch	Superstructure	LF	1-4	39
151	Unpainted (Weathering) Steel Floorbeam	Superstructure	LF	1-4	39
201	Unpainted (Weathering) Steel Column	Substructure	Each	1-4	39
225	Unpainted (Weathering) Steel Piling	Substructure	Each	1-4	39
230	Unpainted (Weathering) Steel Pier Cap	Substructure	LF	1-4	39
413	Unpainted (Weathering) Steel Arch Spandrel Column	Superstructure	Each	1-4	39
Reinforced Concrete Elements					
105	Reinforced Concrete Box Girder	Superstructure	LF	1-4	40
110	Reinforced Concrete Girder or Beam	Superstructure	LF	1-4	40
116	Reinforced Concrete Stringer	Superstructure	LF	1-4	40
144	Reinforced Concrete Arch	Superstructure	LF	1-4	40
155	Reinforced Concrete Floorbeam	Superstructure	LF	1-4	40
205	Reinforced Concrete Column	Substructure	Each	1-4	40
210	Reinforced Concrete Pier Wall	Substructure	LF	1-4	40
215	Reinforced Concrete Abutment	Substructure	LF	1-4	40
220	Reinforced Concrete Footing	Substructure	Each	1-4	40
227	Reinforced Concrete Piling	Substructure	Each	1-4	40
234	Reinforced Concrete Pier Cap	Substructure	LF	1-4	40
375	Precast Concrete Channels	Superstructure	LF	1-4	40
385	Reinforced Concrete Arch Spandrel Column	Superstructure	Each	1-4	40
387	Reinforced Concrete Wingwall	Substructure	Each	1-4	40
414	Reinforced Concrete Arch Spandrel Wall	Superstructure	LF	1-4	40

Mn/DOT PONTIS Element List					
Element #	**Element Description**	**Element Type**	**Units**	**Rating Scale**	**Page**
Prestressed Concrete Elements					
104	Prestressed Concrete Box Girder	Superstructure	LF	1-4	41
109	Prestressed Concrete Girder or Beam	Superstructure	LF	1-4	41
115	Prestressed Concrete Stringer	Superstructure	LF	1-4	41
143	Prestressed Concrete Arch	Superstructure	LF	1-4	41
154	Prestressed Concrete Floorbeam	Substructure	LF	1-4	41
204	Prestressed Concrete Column	Substructure	Each	1-4	41
226	Prestressed Concrete Piling	Substructure	Each	1-4	41
233	Prestressed Concrete Pier Cap	Substructure	LF	1-4	41
374	Prestressed Concrete Double, Quad, Bulb, or Inverted Tees	Superstructure	LF	1-4	41
402	Prestressed Concrete Voided Slab Panels	Superstructure	LF	1-4	41
Timber Elements					
111	Timber Girder or Beam	Superstructure	LF	1-4	42
117	Timber Stringer	Superstructure	LF	1-4	42
135	Timber Arch or Truss	Superstructure	LF	1-4	42
156	Timber Floorbeam	Superstructure	LF	1-4	42
206	Timber Column	Substructure	Each	1-4	42
216	Timber Abutment	Substructure	LF	1-4	42
228	Timber Piling	Substructure	Each	1-4	42
235	Timber Pier Cap	Substructure	LF	1-4	42
386	Timber Wingwall	Substructure	Each	1-4	42
415	Timber Transverse Stiffener Beam (Timber Slabs)	Deck	LF	1-4	42
Masonry, Other, or Combination Material Elements					
145	Masonry, Other, or Combination Material Arch	Superstructure	LF	1-4	43
211	Masonry, Other, or Combination Material Pier Wall	Substructure	LF	1-4	43
217	Masonry, Other, or Combination Material Abutment	Substructure	LF	1-4	43
416	Masonry, Other, or Combination Material Pier Cap	Substructure	LF	1-4	43
417	Masonry, Other, or Combination Material Column	Substructure	Each	1-4	43
418	Masonry, Other, or Combination Material Wingwall	Substructure	Each	1-4	43
420	Masonry, Other, or Combination Material Arch Spandrel Wall	Superstructure	LF	1-4	43
Other Structural Elements					
310	Elastomeric (Expansion) Bearing	Superstructure	Each	1-3	46
311	Expansion Bearing	Superstructure	Each	1-3	47
312	Enclosed/Concealed Bearing	Superstructure	Each	1-3	48
313	Fixed Bearing	Superstructure	Each	1-3	48
314	Pot Bearing	Superstructure	Each	1-3	49
315	Disk Bearing	Superstructure	Each	1-3	49
160	Pin & Hanger (or Hinge Pin) Assembly - Unpainted	Superstructure	Each	1-4	50
161	Pin & Hanger (or Hinge Pin) Assembly - Painted	Superstructure	Each	1-5	50
373	Steel Hinge Assembly	Superstructure	Each	1-5	54
379	Concrete Hinge Assembly	Superstructure	Each	1-4	55
146	Steel Cable (Bare)	Superstructure	Each	1-4	56
147	Steel Cable (Coated or Encased)	Superstructure	Each	1-5	56
380	Secondary Structural Elements	Superstructure	Each	1-5	57
382	Cast-In-Place (CIP) Piling	Substructure	Each	1-4	58
381	Tunnel	Superstructure	LF	1-4	58
Culvert Elements					
240	Steel Culvert	Culvert	LF	1-4	62
241	Reinforced Concrete Culvert	Culvert	LF	1-4	62
242	Timber Culvert	Culvert	LF	1-4	63
243	Masonry, Other, or Combination Material Culvert	Culvert	LF	1-4	63
388	Culvert Wingwall, Headwall, or Other End Treatment	Culvert	Each	1-4	64
421	Culvert Footing	Culvert	LF	1-4	65

Mn/DOT PONTIS Element List					
Element #	**Element Description**	**Element Type**	**Units**	**Rating Scale**	**Page**
Smart Flags					
356	Fatigue Cracking Smart Flag	Miscellaneous	Each	1-3	66
357	Pack Rust Smart Flag	Miscellaneous	Each	1-4	67
358	Concrete Deck Cracking Smart Flag	Miscellaneous	Each	1-4	67
359	Underside of Concrete Deck Smart Flag	Miscellaneous	Each	1-5	68
360	Substructure Settlement & Movement Smart Flag	Miscellaneous	Each	1-3	68
361	Scour Smart Flag	Miscellaneous	Each	1-3	69
362	Traffic Impact Smart Flag	Miscellaneous	Each	1-3	69
363	Section Loss Smart Flag	Miscellaneous	Each	1-4	70
964	Critical Finding Smart Flag	Miscellaneous	Each	1-2	70
965	Concrete Shear Cracking Smart Flag	Miscellaneous	Each	1-4	71
966	Fracture Critical Smart Flag	Miscellaneous	Each	1-3	71
Other Items					
981	Signing	Miscellaneous	Each	1-3	72
982	Approach Guardrail	Miscellaneous	Each	1-3	72
983	Plowstraps	Miscellaneous	Each	1-3	72
984	Deck & Approach Drainage	Miscellaneous	Each	1-3	73
985	Slopes & Slope Protection	Miscellaneous	Each	1-3	73
986	Curb & Sidewalk	Miscellaneous	Each	1-3	.74
987	Roadway over Culvert	Miscellaneous	Each	1-3	74
988	Miscellaneous Items	Miscellaneous	Each	1-3	74

3.3 PONTIS Deck & Slab Elements

This section includes PONTIS element rating descriptions for decks, slabs, deck joints, bridge approaches, and bridge railings.

3.3.1 Rating Procedures for Concrete Decks & Slabs

Concrete deck (and slab) elements are selected based upon the wearing surface material (low slump concrete, bituminous, etc.), as well as the type of corrosion prevention system (such as epoxy coated reinforcement). In this manual, the condition rating descriptions for concrete deck and slab elements are divided into four groups...

- Section 3.3.2: Concrete decks & slabs without overlays
- Section 3.3.3: Concrete decks & slabs with low slump overlays
- Section 3.3.4: Concrete decks & slabs with latex or epoxy overlays
- Section 3.3.5: Concrete decks & slabs with bituminous overlays

All concrete deck and slab elements are rated on a scale of 1 to 5 (with 1 being "very good" condition and 5 being the worst condition). Although the quantity is displayed in square ft., the entire quantity must be rated as a single condition state. *Note: The condition ratings for concrete decks & slabs are based solely upon the condition of the wearing surface! Smart Flag element #359 (Underside of Deck/Slab) must be rated to describe the condition of the supporting concrete deck (or slab)!*

The condition ratings for concrete deck elements are based upon the percentage of unsound wearing surface (this item is displayed on the header of the Bridge Inspection Report). This quantity may be estimated from field observations, or calculated from a deck condition survey (such as chaining or ground penetrating radar). "Unsound" wearing surface includes areas with delamination, spalling, potholes, severe scale, or other significant deterioration. Temporary patches (such as those performed by maintenance personal) should be considered to be unsound. Long-term patches (such as those performed under a mill & patch contract) should not be considered to be unsound until these repaired areas have begun to deteriorate.

If the deck has a concrete wearing surface, Smart Flag element #358 (Deck Cracking) must also be rated. This smart flag is not required for decks with bituminous overlays (or if the wearing surface is covered in gravel).

The wearing surface type, depth, and year of installation should be displayed on the Mn/DOT Structure Inventory Report - if not, this information should be noted on the inspection report. The inspector should note any changes in the type or depth of the wearing surface (a new overlay may require a new deck element, and any increase in the wearing surface depth will require a new load rating). While the presence of gravel is not a consideration when selecting deck elements, the gravel depth should be noted on the inspection report (excessive gravel may reduce the load rating).

The deck protection system (and year of installation) should also be displayed on the Mn/DOT Structure Inventory Report Virtually all bridge decks constructed in Minnesota since 1980 have epoxy coated reinforcement - however, decks constructed in the early 1980's often had epoxy coated reinforcement on the top mat only (uncoated reinforcement was used on the lower mat). These bridge decks tend to have increased deterioration (rust staining and delamination) on the underside. Decks with bituminous overlays often have a waterproof membrane to protect the underlying deck - the plans may have to be reviewed to determine the proper deck element.

3.3.2 Concrete Decks & Slabs (Without Overlays)

These elements describe the condition of the top (wearing) surface on concrete decks (or slabs) that do not have an overlay. This can also include concrete decks (or slabs) covered with gravel. *Note: Smart Flag element #359 (Underside of Deck or Slab) must be also be rated to describe the condition of the supporting concrete deck (or slab)! Smart Flag element #358 (Deck Cracking) should also be rated.*

#12: Top of Concrete Deck with Uncoated Rebar (No Overlay)
#26: Top of Concrete Deck with Epoxy Rebar (No Overlay)
#27: Top of Concrete Deck (with Cathodic Protection System)
#38: Top of Concrete Slab with Uncoated Rebar (No Overlay)
#52: Top of Concrete Slab Epoxy Rebar (No Overlay)
#53: Top of Concrete Slab (with Cathodic Protection System)
#405: Top of Cast-in-Place Concrete Voided Slab (No Overlay)

Condition State 1: Top (wearing) surface of deck has no spalls, delaminations, or temporary patches.

Condition State 2: The combined area of unsound wearing surface (spalls, delaminations, temporary patches, etc.) is less than 2% of the total deck area.

Condition State 3: The combined area of unsound wearing surface (spalls, delaminations, temporary patches, etc.) is between 2% and 10% of the total deck area.

Condition State 4: The combined area of unsound wearing surface (spalls, delaminations, temporary patches, etc.) is between 10% and 25% of the total deck area.

Condition State 5: The combined area of unsound wearing surface (spalls, delaminations, temporary patches, etc.) is greater than 25% of the total deck area.

3.3.3 Concrete Decks & Slabs (Low Slump Overlays)

These elements describe the condition of low slump concrete overlays on concrete decks (or slabs). *Note: Smart Flag element #359 (Underside of Deck or Slab) must be also be rated to describe the condition of the supporting concrete deck (or slab)! Smart Flag element #358 (Deck Cracking) must also be rated.*

#22: Low Slump Overlay (Concrete Deck with Uncoated Rebar)
#48: Low Slump Overlay (Concrete Slab with Uncoated Rebar)
#377: Low Slump Overlay (Concrete Deck with Epoxy Rebar)
#378: Low Slump Overlay (Concrete Slab with Epoxy Rebar)
#406: Low Slump Overlay (Cast-in-Place Concrete Voided Slab)

Condition State 1: Low slump overlay has no spalls, delaminations, or temporary patches.

Condition State 2: The combined area of unsound wearing surface (spalls, delaminations, temporary patches, etc.) is less than 2% of the total deck area.

Condition State 3: The combined area of unsound wearing surface (spalls, delaminations, temporary patches, etc.) is between 2% and 10% of the total deck area.

Condition State 4: The combined area of unsound wearing surface (spalls, delaminations, temporary patches, etc.) is between 10% and 25% of the total deck area.

Condition State 5: The combined area of distressed or unsound wearing surface (spalls, delaminations, patches, etc.) is greater than 25% of the total deck area.

3.3.4 Concrete Decks & Slabs (Latex or Epoxy Overlays)

These elements describe the condition of latex, epoxy, or thin (less than 1") overlays on concrete decks (or slabs). Epoxy & Latex overlays were used sparingly in Minnesota in the 1970's & 1980's, but are now seldom used. *Note: Smart Flag element #359 (Underside of Deck or Slab) must be also be rated to describe the condition of the supporting concrete deck (or slab)!*

#18: Latex, Epoxy, or Thin Overlay (Concrete Deck)
#44: Latex, Epoxy, or Thin Overlay (Concrete Slab)

Condition State 1: Latex/Epoxy overlay has no spalls, delaminations, or patches.

Condition State 2: The combined area of unsound wearing surface (spalls, delaminations, temporary patches, etc.) is less than 2% of the total deck area.

Condition State 3: The combined area of unsound wearing surface (spalls, delaminations, temporary patches, etc.) is between 2% and 10% of the total deck area.

Condition State 4: The combined area of unsound wearing surface (spalls, delaminations, temporary patches, etc.) is between 10% and 25% of the total deck area.

Condition State 5: The combined area of unsound wearing surface (spalls, delaminations, temporary patches, etc.) is greater than 25% of the total deck area.

3.3.5 Concrete Decks & Slabs (Bituminous Overlays)

These elements describe the condition of bituminous overlays on concrete decks (or slabs). The plans should be referenced to determine if there is a waterproof membrane below the overlay (the presence of epoxy-coated reinforcement is not a consideration with these elements). *Note: Smart Flag element #359 (Underside of Deck or Slab) must be also be rated to describe the condition of the supporting concrete deck (or slab)! Smart Flag Element #358 (Deck Cracking) should not be used for bituminous overlays.*

#13: Bituminous Overlay (Concrete Deck)
#14: Bituminous Overlay with Membrane (Concrete Deck)
#39: Bituminous Overlay (Concrete Slab)
#40: Bituminous Overlay with Membrane (Concrete Slab)

Condition State 1: Bituminous overlay has no potholes, spalls, or temporary patches.

Condition State 2: The combined area of unsound wearing surface (potholes, spalls, temporary patches, etc.) is less than 2% of the total deck area.

Condition State 3: The combined area of unsound wearing surface (potholes, spalls, temporary patches, etc.) is between 2% and 10% of the total deck area.

Condition State 4: The combined area of unsound wearing surface (potholes, spalls, temporary patches, etc.) is between 10% and 25% of the total deck area.

Condition State 5: The combined area of unsound wearing surface (potholes, spalls, temporary patches, etc.) is greater than 25% of the total deck area.

3.3.6 Timber Decks & Slabs

These elements apply to timber decks or slabs - this includes timber, bituminous or gravel wearing surfaces. This includes timber plank decks, glue-lam deck panels, and nail laminated timber decks or slabs. All of these elements are an "each" item (the quantity will be displayed as the deck area in square ft.) - they are rated on a scale of 1-4 (the entire deck/slab area must be rated under a single condition state).

- **Element #31: Timber Deck (No Overlay)**
- **Element #32: Timber Deck with Bituminous (AC) Overlay**
- **Element #54: Timber Slab (No Overlay)**
- **Element #55: Timber Slab with Bituminous (AC) Overlay**

Timber plank decks are typically comprised of transverse timber planks, and longitudinal planks called runners (on which the vehicles ride).

Glulam timber deck panels are usually 4 ft. wide and are installed transverse to the direction of traffic. Glulam timber deck panels are often used for temporary bridges, and often have a bituminous overlay.

Nailed laminated decks consist of transverse timbers (with the wide dimension in the vertical position) that are nailed to the adjacent timbers. These decks often have a bituminous overlay.

Nail laminated timber slabs are similar to nail laminated decks, except the timbers are longitudinal, and serve as the primary superstructure element. The timbers are generally much larger than those on a nail laminated deck. These slabs often have a bituminous wearing surface. Note: timber slabs will often have a transverse stiffener beam running below the slab near the center of the span - these can be rated using element #415.

Condition State 1: Timber deck/slab has little or no deterioration. Timber components may have superficial weathering or splitting - there is no decay, crushing, or sagging. All deck/slab components are properly orientated and solidly connected. The wearing surface may have superficial deterioration. Running planks/plates (if present) are in good condition and soundly attached. Bituminous overlay (if present) is in good condition - there are no potholes.

Condition State 2: Timber deck/slab has minor to moderate deterioration. Timber components may have moderate weathering or splitting - there may be minor decay, crushing, or sagging. Some deck/slab components may be slightly loose or out of alignment. The wearing surface may have moderate deterioration. Running planks/plates may be slightly loose, but are still functioning as intended. Bituminous overlay may have moderate cracking - there may be some minor spalls or potholes.

Condition State 3: Timber deck/slab has extensive deterioration - repairs may be necessary, but the load-carrying capacity of the deck has not been significantly reduced. Timber components may have extensive weathering or splitting - there may be decay, crushing, or sagging. Some deck/slab components may be missing, loose, or out of alignment. The wearing surface may have extensive deterioration. Running planks/plates may be out of alignment (some sections may be missing). Bituminous overlay may have extensive cracking, delamination, or potholes.

Condition State 4: Timber deck/slab has severe or critical deterioration. Full-depth failures may be present - immediate repairs may be necessary. Timber components may have severe decay, crushing, or sagging.

3.3.7 Other Deck Types

- **Element #28: Steel Grid Deck - Open**
- **Element #29: Steel Grid Deck - Concrete Filled**

Element #28 applies to open grid steel deck, Element #29 refers to steel grid decks that have been fully or partially filled with concrete. Steel grid panels may be welded, riveted, or bolted - the top edges are often serrated to improve traction. Both of these elements are an "each" item (the quantity will be displayed as the deck area in square ft.). All of theses elements are rated on a scale of 1-5 (the entire deck area must be rated under a single condition state). *Note: The rating should take into consideration any deck support components that are not addressed by other PONTIS elements.*

Condition State 1: Steel grid deck has little or no deterioration. The paint or galvanizing system (if present) remains sound - there is no notable corrosion. All deck supports and connections (welds, rivets, bolts, etc.) are in good condition. Concrete filler (if any) is in good condition.

Condition State 2: Steel grid deck has minor deterioration. Paint or galvanizing system (if present) may have some failure - surface corrosion may be present. Deck supports and connections may have minor deterioration, but remain sound. Concrete filler (if any) may have minor deterioration, but remains intact.

Condition State 3: Steel grid deck has moderate deterioration. Paint or galvanizing system (if present) may have moderate failure - surface corrosion may be prevalent, but any section loss is incidental. Deck supports and connections may have moderate deterioration or isolated failure (cracked welds or broken rivets), but the grid panels remain secure and in proper alignment. Concrete filler (if any) may have moderate deterioration - the concrete may have broken out in some locations.

Condition State 4: Steel grid deck has extensive deterioration. Paint or galvanizing system (if present) may have complete failure. There may be extensive surface corrosion or measurable section loss. Failure of support components and connections may have resulted in some grid panels coming slightly loose or out alignment. Concrete filler (if any) may have extensive deterioration - the concrete may have broken out in numerous locations.

Condition State 5: Steel grid deck has severe or deterioration - immediate repairs may be required. The steel grid panels may have severe section loss (areas may have rusted through). Failure of support components and connections may have resulted in some grid panels coming severely loose or out of alignment. Most of the concrete filler may be missing.

Element #30: Corrugated, Orthotropic, Exodermic, or Other Deck

This element applies corrugated decks, orthotropic decks, or any deck type not adequately described by the other deck elements. This element is an "each" item (the quantity will be displayed as the deck area in square ft.). This element is rated on a scale of 1-5 (the entire deck area must be rated under a single condition state).

- Corrugated decks are typically comprised of corrugated steel forms (with concrete or bituminous fill), in which the steel forms provide the primary structural support.
- An Orthotropic deck typically consists of a steel plate that has been stiffened by closely spaced ribs. An orthotropic deck acts integrally with the superstructure.
- An Exodermic deck is a recently developed modular design that combines a steel grid with a reinforced concrete deck (advantages include light weight and rapid construction). This design has only been used on a limited basis in Minnesota.

Condition State 1: Deck has little or no deterioration. Paint or galvanizing system (if present) remains sound - there is no notable corrosion. The wearing surface (or filler material) is sound, with no notable deterioration.

Condition State 2: Deck has minor deterioration. Paint or galvanizing system (if present) may have some failure - surface corrosion may be present. Wearing surface (or filler material) may have minor deterioration (cracking, spalling, or potholes).

Condition State 3: Deck has moderate deterioration. Paint or galvanizing system (if present) may have moderate failure - surface corrosion may be prevalent, but any section loss is incidental. Wearing surface (or filler material) may have moderate deterioration (cracking, spalling, or potholes) - but the underlying deck forms are not exposed.

Condition State 4: Deck has extensive deterioration. Paint or galvanizing system (if present) may have complete failure. There may be extensive surface corrosion or measurable section loss. Wearing surface (or filler material) may have extensive deterioration - the underlying deck may be exposed.

Condition State 5: Deck has severe deterioration - immediate repairs may be required. Steel deck components may have severe section loss (areas may have rusted through). Wearing surface (or filler material) may have severe deterioration - a significant portion of the underlying decking may be exposed.

Element #401: Steel Ballast Plate Deck (Railroad Bridges)

This element applies to steel ballast plate decks (commonly used on railroad bridges). These decks consist of steel plates attached directly to the superstructure (they are often connected with clips that allow the deck to expand independently from the superstructure). The steel ballast plate is typically covered with a waterproof membrane and rock ballast (the railroad ties are placed on the ballast). This element is an "each" item (the quantity will be displayed as the deck area in square ft.). This element is rated on a scale of 1-5 (the entire deck area must be rated under a single condition state). *Note: The inspector should note if the railroad tracks are active, abandoned, or removed.*

Condition State 1: Steel ballast plate deck has little or no deterioration. Paint system (if present) remains sound - there is no notable corrosion. There is no deck leakage. All ballast clips (or other deck connections) are secure. Rock ballast and wearing surface (if present) have no notable deterioration.

Condition State 2: Steel ballast plate deck has minor deterioration. Paint system (if present) may have some failure - surface corrosion may be present. There may be minor deck leakage. A small number of ballast clips (or other connections) may be loose or missing. Rock ballast and wearing surface (if present) may have minor deterioration.

Condition State 3: Steel ballast plate deck has moderate deterioration. Paint system (if present) may have moderate failure - surface corrosion may be prevalent, but any section loss is incidental. There may be moderate deck leakage. Several ballast clips (or other connections) may be loose or missing. Rock ballast and wearing surface (if present) may have moderate deterioration.

Condition State 4: Steel ballast plate deck has extensive deterioration. Paint system (if present) may have complete failure. There may be extensive surface corrosion or measurable section loss. There may be extensive deck leakage. A significant number of ballast clips (or other connections) may be loose or missing. Rock ballast and wearing surface (if present) may have extensive deterioration.

Condition State 5: Steel ballast plate railroad deck has severe deterioration - immediate repairs may be required. Steel deck components may have severe section loss (areas may have rusted through), or may be loose or out of alignment.

3.3.8 Deck Joints

All deck joint elements are rated on a scale of 1-3. A rating of condition "3" typically indicates that joint repairs or replacement are required. The quantity is listed as linear feet, measured along the full length of the expansion joint (this includes the roadway, as well as joints through railings, medians, and sidewalks).

Deck joints should be inspected not only for leakage, but also for proper function (evidence of expansion and contraction). Deck joints should be examined for skew, offset, or any evidence that the joint is restricted or is beyond the limits of expansion. *Note: deck expansion joints that are tightly closed, vertically offset, or have excessively large gaps may indicate more severe structural problems (such as substructure movement).*

Element #300: Strip Seal Deck Joint

This element applies to deck joints that utilize a waterproof gland (typically a "V" shaped neoprene seal), held in place by a steel extrusion anchored to the bridge deck.

Condition State 1: Strip seal joint has little or no deterioration - there is no leakage. The gland is sound and securely anchored. The joint anchorage and adjacent deck remain sound and intact. The joint is properly aligned and functioning as intended. Debris in the joint (if any) is not causing any problems.

Condition State 2: Strip seal joint has moderate deterioration - minor leakage may be evident. The gland may be partially pulled out. The joint anchorage may be slightly damaged. The adjacent deck may have minor spalling. The joint may be slightly out of alignment (skewed, offset, or near limits of expansion), but the function of the joint has not been significantly impaired. Debris in the joint may be causing problems.

Condition State 3: Strip seal joint has severe deterioration - there may be significant leakage (joint repair or replacement may be required). The gland may be punctured, torn, or pulled loose. The joint anchorage may be damaged or deteriorated to the extent that the gland can no longer be properly anchored. The adjacent deck may have severe spalling. The joint may be severely out of alignment, or the function of the joint may be significantly impaired.

Element #301: Poured Deck Joint

This element applies to deck joints filled with a poured or extruded sealant. This element typically refers to saw & seal joints (above piers or along end blocks), but can also include median joints.

Condition State 1: Poured joint has little or no deterioration - there is no leakage. The joint sealant is properly adhered. The adjacent deck is sound and intact. The joint is properly aligned and functioning as intended.

Condition State 2: Poured joint has moderate deterioration - minor leakage may be evident. The joint sealant may have minor adhesion failures. The adjacent deck may have minor cracking or spalling.

Condition State 3: Poured joint has severe deterioration - there may be significant leakage (joint repair or replacement may be required). The joint sealant may have failed. The adjacent deck may have severe cracking or spalling.

Element #302: Compression Seal Deck Joint

This element applies to deck joints consisting of a pre-formed elastic compression seal - this includes seals with a solid or hollow cross-section. The joint may or may not include steel protection angles.

Condition State 1: Compression joint has little or no deterioration - there is no leakage. The compression seal is sound and securely anchored. Protection angles (if present) are in good condition. The adjacent deck remains sound and intact. The joint is properly aligned and functioning as intended. Debris in the joint (if any) is not causing any problems.

Condition State 2: Compression joint has moderate deterioration - minor leakage may be evident. The compression seal may be slightly loose or out of position. Protection angles (if present) may have minor damage. The adjacent deck may have minor spalling. The joint may be slightly out of alignment (skewed, offset, or near limits of expansion), but the function of the joint has not been significantly impaired. Debris in the joint may be causing problems.

Condition State 3: Compression seal joint has severe deterioration - there may be significant leakage (joint repair or replacement may be required). The compression seal may be punctured, torn, or out of position. Protection angles (if present) may have severe damage. The adjacent deck may have severe spalling. The joint may be severely out of alignment - the function of the joint may be significantly impaired.

Element #303: Assembly Deck Joint (with or without seal)

This element applies to deck joints consisting of an assembly mechanism (with or without a seal). This includes deck joints comprised of sliding steel plates, anchored rubber seals, or any joint that is not adequately described by the other deck joint elements.

Condition State 1: Assembly joint has little or no deterioration. If the joint is sealed, there is no leakage. All joint components are sound and securely anchored. Steel components have little or no corrosion. The adjacent deck remains sound and intact. The joint is properly aligned and functioning as intended. Debris in the joint (if any) is not causing any problems.

Condition State 2: Assembly joint has moderate deterioration. If the joint is sealed, minor leakage may be evident. Joint components may be loose. Steel components may have moderate corrosion and/or section loss. The adjacent deck may have minor spalling. The joint may be slightly out of alignment (skewed, offset, or near limits of expansion), but the function of the joint has not been significantly impaired. Debris in the joint may be causing problems.

Condition State 3: Assembly joint has severe deterioration (joint repair or replacement may be required). Seals (if present) may have failed. Joint components may be missing. Steel components may have severe section loss. The adjacent deck may have severe spalling. The joint may be severely out of alignment - the function of the joint may be significantly impaired.

Element #304: Open Deck Joint

This element applies to open deck joints (with or without steel protection angles).

Condition State 1: Open deck joint has little or no deterioration. Protection angles (if present) are sound and securely anchored. The adjacent deck is sound. The joint is properly aligned and functioning as intended.

Condition State 2: Open deck joint has moderate deterioration. Protection angles (if present) may have moderate corrosion damage or may have started to loosen - some anchor bolts may be loose, broken or missing. The adjacent deck may have minor spalling. The joint may be slightly out of alignment (skewed, offset, or near limits of expansion), but the function of the joint has not been significantly impaired.

Condition State 3 Open deck joint has severe deterioration - joint repair or replacement may be required. Protection angles may be severely damaged or missing. The adjacent deck may have severe spalling. The joint may be significantly out of alignment, or the function of the joint may be significantly impaired.

Element #410: Modular Deck Joint

This element applies to "Modular" deck joints (typically found only on long span bridges). Modular deck joints are comprised of two or more adjacent waterproof seals ("V" strip or compression seal). The seals are typically anchored by steel extrusions cast into the deck, and supported from below by beams. The support beams often have an independent expansion bearing system, and incorporate equalizer springs & guide systems to keep the seals equally spaced and in proper alignment.

Condition State 1: Modular deck joint has little or no deterioration - there is no leakage. The seals are sound and securely anchored. All joint components (extrusion/joint anchorage, support beams, equalizers, and guide systems) are sound and intact. The adjacent deck is sound. The joint is properly aligned and functioning as intended. Debris in the joint (if any) is not causing any problems.

Condition State 2: Modular deck joint has moderate deterioration - minor leakage may be evident. The seals may be partially pulled out, slightly loose or out of position. Some joint equalizers (or other guide system components) may be loose, damaged or missing. All joint support beams remain sound and intact. The joint anchorage may be slightly damaged. The adjacent deck may have minor spalling. The joint may be slightly out of alignment (skewed, offset, or near limits of expansion), but the function of the joint has not been significantly impaired. Debris in the joint may be causing problems.

Condition State 3: Modular deck joint has severe deterioration - there may be significant leakage (joint repair or replacement may be required). The seals may be partially punctured, torn, pulled loose, or out of position. The joint equalizer/guide system may be severely deteriorated or no longer functioning. Joint support beams may be loose, jammed, or otherwise inoperative. The joint anchorage may be damaged or deteriorated to the extent that the gland can no longer be properly anchored. The adjacent deck may have severe spalling. The joint may be severely out of alignment - the function of the joint may be significantly impaired.

Element #411: Open Finger Deck Joint

This element applies to open finger deck joints. These are typically used on longer spans where a large amount of expansion is expected.

Condition State 1: Open finger deck joint has little or no deterioration. All "fingers" are intact. The expansion plates are securely anchored. The adjacent deck is sound. The joint is properly aligned and functioning as intended.

Condition State 2: Open finger deck joint has moderate deterioration. Some "fingers" may be broken off. The expansion plates may have started to loosen - some anchor bolts may be loose, broken or missing (welds may have broken). The adjacent deck may have minor spalling. The joint may be slightly out of alignment (skewed, offset, or near limits of expansion), but the function of the joint has not been significantly impaired.

Condition State 3: Open finger deck joint has severe deterioration - repair or replacement may be required. A significant number of "fingers" may be broken off. Expansion plates may be loose or missing - a large number of anchor bolts may be loose, broken or missing. The adjacent deck may have severe spalling. The joint may be severely out of alignment - the function of the joint may be significantly impaired.

Element #412: Approach Relief Joint

This element applies to approach slab relief joints (designed to prevent damage to the bridge due to expansion of the adjacent roadway). They are used when a concrete approach slab meets an adjacent concrete roadway (on top of the sill). A typical relief joint is 4" wide and consists of preformed polystyrene filler with a hot poured seal.

Condition State 1: Approach relief joint has little or no deterioration. Joint seal and filler remain intact. Joint has not closed significantly. The adjacent roadway & approach are in good condition.

Condition State 2: Approach relief joint has moderate deterioration. Joint seal and/or filler material may be missing - the joint may be filled with debris. The joint may be partially closed, but can still accommodate additional expansion. The adjacent roadway & approach may have minor spalling.

Condition State 3: Approach relief joint has severe deterioration - repair or replacement may be required. The joint may be closed (or nearly closed), with no room for additional expansion. The adjacent roadway may have severe spalling.

3.3.9 Roadway Approach Elements

These elements apply to approach slabs and the roadway approaches to the bridge. These elements are only intended to rate the condition of the approach - geometric problems should be addressed using the Approach Roadway Alignment Appraisal Rating (FHWA Item #72). These elements are "each" items (rated on a scale of 1-4). The quantity will typically be "2" (one for each end of the bridge) - they can be rated under separate condition states. If the bridge has a divided median or ramp, the quantity can be increased to rate each panel separately.

- **Element #320: Concrete Approach Slab (Bituminous Wearing Surface)**
- **Element #321: Concrete Approach Slab (Concrete Wearing Surface)**
- **Element #407: Bituminous Approach Roadway**
- **Element #408: Gravel Approach Roadway**

Note: an "approach slab" is a short concrete paving segment between the end of the bridge and the approach roadway (usually supported by the abutment parapet at the bridge end, and a concrete sill at the roadway end). When approach slabs are present, select the element that best describes the wearing surface present on the approach slab. If approach slabs are not present, the "approach roadway" elements can be used (this typically includes the approach roadway extending approximately 20 ft. from the end of the bridge).

Condition State 1: Approach has little or no deterioration. There is no settlement or undermining - the ride transitions smoothly on/off the bridge deck. Concrete approaches may have superficial cracking or wear - there are no delaminations or spalls. Bituminous approaches are smooth and even - there are no potholes. Gravel approaches are evenly graded.

Condition State 2: Approach has minor to moderate deterioration. There may be slight settlement or undermining, but traffic impact on the bridge has not been significantly increased. Concrete approaches may have moderate cracking, scaling, or wear - there may be minor delamination or spalling. Bituminous approaches may have moderate cracking, or may be slightly uneven - potholes may be present. Gravel approaches may be moderately rutted or eroded.

Condition State 3: Approach has extensive deterioration - repairs may be required. Settlement or undermining may have significantly increased traffic impact on the bridge. Concrete approaches may have extensive scaling or cracking (cracking may extend through the underlying slab) - there may be significant delamination or spalling. Bituminous approaches may have extensive cracking or potholes - or may be uneven. Gravel approaches may have extensive rutting or erosion.

Condition State 4: Approach has severe or critical deterioration - immediate repairs may be required. Settlement or undermining may have severely increased traffic impact on the bridge. Deterioration of the wearing surface may be severe enough to present a traffic hazard.

3.3.10 Bridge Railing Elements

Select the railing element that best describes the type of railing present on the bridge (some bridges have more than one railing type). All railing elements are based upon a "linear feet" quantity (the rating scale varies). The quantity is measured along the length of the railing, and can include railing mounted on the wingwalls and approaches.

Element #330: Metal Bridge Railing (Uncoated or Unpainted)

This element applies to metal railings that are not (and have never been) coated or painted.

Condition State 1: Uncoated metal railing has little or no deterioration. There may be minor surface corrosion, but there is no section loss. Railing may have superficial impact damage.

Condition State 2: Uncoated metal railing has minor to moderate deterioration. There may be surface corrosion, but any section loss is incidental. All connections and anchorages are sound and intact. Railing may have minor impact damage.

Condition State 3: Uncoated metal railing has extensive deterioration. There may be extensive surface corrosion or measurable section loss. Connections or anchorages may have some deterioration or distress (may be starting to work loose). Railing may have moderate impact damage - structural components may be slightly bent or out of alignment.

Condition State 4: Uncoated metal railing has severe or critical deterioration - immediate repairs or may be required. There may be advanced corrosion or significant section loss. Connections or anchorages may have failed. Railing may have severe impact damage - structural components may be severely bent or torn loose.

Element #331: Reinforced Concrete Bridge Railing

This element applies to all bridge railings constructed entirely of reinforced concrete.

Condition State 1: Concrete railing has little or no deterioration. There may be superficial cracking, scaling, pop-outs, leaching, or staining, but there is no delamination or spalling. There may be superficial impact damage.

Condition State 2: Concrete railing has minor to moderate deterioration. There may be cracking, scaling, leaching, staining, delamination or spalling (there is little or no exposed reinforcement). There may be impact damage (cracks, gouges, or spalls).

Condition State 3: Concrete railing has extensive deterioration. There may be extensive cracking, scaling, leaching, staining, delamination or spalling (exposed rebar may have minor section loss). There may be extensive impact damage (cracks, gouges, or spalls).

Condition State 4: Concrete railing has severe or critical deterioration - immediate repairs may be required. There may be severe structural cracking or scaling. There may be extensive delamination or spalling (exposed rebar may have significant section loss). There may be severe impact damage.

Element #332: Timber Bridge Railing

This element applies to bridge railings comprised entirely of timber.

Condition State 1: Timber railing has minor deterioration. There may be minor weathering or cracking - but there is no decay or structural distress (crushing or sagging). All connections and anchorages are sound & intact. Railing may have minor impact damage - but all components are intact and properly aligned.

Condition State 2: Timber railing has moderate deterioration. There may be extensive weathering or cracking - there may be some decay or structural distress (minor crushing or sagging). Connections or anchorages may have some deterioration, but remain intact. Railing may have moderate impact damage (gouges or cracks) - structural components may be slightly out of alignment.

Condition State 3: Timber railing has severe or critical deterioration - immediate repairs may be required. There may be severe decay, crushing, or sagging (significant loss of cross-sectional area). Connections or anchorages may have failed. Railing may have severe impact damage - structural components may be severely damaged or torn loose.

Element #333: Masonry, Other, or Combination Material Railing

This element applies to bridge railings constructed of any combination of materials (concrete, steel, aluminum, timber, etc.), or any railing type that cannot be adequately described by the other railing elements.

Condition State 1: Railing has minor deterioration. Concrete may have minor cracking, scaling, leaching, or spalling (no exposed rebar). Steel may have minor surface corrosion - paint/coating system (if present) may have minor deterioration. Timber may have minor weathering or cracking - but there is no decay, crushing, or sagging. All connections and anchorages are sound and intact. Railing may have minor impact damage - but all components are intact and properly aligned.

Condition State 2: Railing has moderate deterioration. Concrete may have moderate cracking, scaling, leaching, or spalling (with exposed rebar). Steel may have moderate corrosion (some section loss) - paint/coating system (if present) may have extensive failure. Timber components may have extensive weathering or cracking - there may be decay, crushing, or sagging. Connections or anchorages may be deteriorated or may have started to work loose. Railing may have moderate impact damage - structural components may be slightly bent. Non-structural attachments (such as glare screen paddles) may have broken off.

Condition State 3: Railing has severe or critical deterioration - immediate repairs may be required. Concrete may have severe cracking or spalling (exposed rebar may have significant section loss). Steel may have severe corrosion or significant section loss. Timber may have severe decay, crushing, or sagging. Connections or anchorages may have failed. Railing may have severe impact damage - structural components may be severely bent, fractured, or torn loose.

Element #334: Metal Bridge Railing (Coated or Painted)

This element applies to metal railings that have been painted, galvanized or otherwise coated.

Condition State 1: Coating system has little or no deterioration - there is no corrosion or impact damage.

Condition State 2: Coating system has minor deterioration - there may be minor surface corrosion (no section loss). Connections and anchorages are sound and intact. Railing may have minor impact damage.

Condition State 3: Coating system has moderate deterioration - surface corrosion may be prevalent, but any section loss is incidental. Connections and anchorages may have minor deterioration. Railing components may be slightly bent or out of alignment.

Condition State 4: Coating system has extensive deterioration - there may be extensive surface corrosion (or measurable section loss). Connections and anchorages may be working loose. Railing components may be significantly bent or out of alignment.

Condition State 5: Coated metal railing severe deterioration - immediate repairs may be required. There may be severe section loss. Connections or anchorages may have failed. Railing may have severe impact damage - structural components may be severed, torn loose, or missing.

Element #409: Chain Link Fence

This element applies to chain link fence (including galvanized or vinyl coated fence).

Condition State 1: Chain link fence has little or no deterioration. Galvanizing or vinyl coating (if present) is sound and functioning (no corrosion).

Condition State 2: Chain link fence has minor deterioration. Coating system may have minor failure - surface rust may be present (no section loss). Fence posts (and other components) remain in proper alignment (connections remain sound). The fence fabric may have minor snags.

Condition State 3: Chain link fence has moderate deterioration. Coating system may have moderate failure - surface rust may be prevalent, but any section loss is incidental. Fence posts (and other components) may be slightly bent or out of alignment (connections may be working loose). The fence fabric may have minor snags or holes - areas may be stretched or deformed, but the fence fabric remains attached.

Condition State 4: Chain link fence has extensive deterioration. Coating system may have extensive failure - there may be measurable section loss. Connections may have failed - fence components may be loose or missing. Fence posts may be severely bent - anchorages may be Fence posts (and other components) may be significantly bent or out of alignment (connections may be loose). The fence fabric may have numerous snags or holes - areas may be significantly stretched, or deformed, or coming loose.

Condition State 5: Chain link fence has severe deterioration - immediate repairs may be required. Fence posts may be loose or missing. Fence posts may be severely bent - anchorages may be working loose. The fence fabric may be loose, severely deformed, or missing.

3.4 PONTIS Structural Elements (Grouped by Material Type)

This section includes rating descriptions for PONTIS structural elements (mainly superstructure and substructure). The elements are grouped by material type (painted steel, unpainted weathering steel, reinforced concrete, pre-stressed concrete, timber, or masonry/other material).

3.4.1 Painted Steel Elements

These elements apply to structural members that have been painted (even if the paint system has completely failed). This includes any type of paint system, and any type of steel.

- **Element #102: Painted Steel Box Girder (LF)**
- **Element #107: Painted Steel Girder or Beam (LF)**
- **Element #113: Painted Steel Stringer (LF)**
- **Element #121: Painted Steel Through Truss - Bottom Chord (LF)**
- **Element #126: Painted Steel Through Truss - Upper Members (LF)**
- **Element #131: Painted Steel Deck Truss (LF)**
- **Element #141: Painted Steel Arch (LF)**
- **Element #152: Painted Steel Floorbeam (LF)**
- **Element #202: Painted Steel Column (EA)**
- **Element #231: Painted Steel Pier Cap (LF)**
- **Element #384: Painted Steel Arch Spandrel Column (EA)**
- **Element #419: Painted Steel Piling (EA)**

Condition State 1: Painted steel element has little or no deterioration. The paint system may have minor fading, salt film, or chalking, but there is no corrosion. There is no section loss (this includes repainted areas).

Condition State 2: Painted steel element has minor deterioration. The paint system may have moderate deterioration (chalking, peeling, blistering or other distress), but any exposed steel is limited. Surface corrosion (freckled rust) may be present, but there is no flaking rust. Repainted areas may have minor section loss. All connections are sound - element is in proper position and alignment. *Note: elements that have been repaired or reinforced should generally not be rated above Condition 2.*

Condition State 3: Painted steel element has moderate deterioration. The paint system may have extensive deterioration. Surface corrosion (freckled rust) may be prevalent - there may be isolated flaking rust (with minor section loss). Repainted elements may have measurable section loss in non-critical locations. Connections may have minor distress - element may be slightly out of alignment.

Condition State 4: Painted steel element has extensive deterioration - repairs may be required, but the load-carrying capacity of the element has not been significantly reduced. There may be severe corrosion, with extensive flaking rust. While there may be significant section loss, structural analysis is not yet required (section loss is less than 10% of the effective section). Connections may have started to come loose - element may be out of proper position or alignment.

Condition State 5: Painted steel element has severe or critical deterioration. The load-carrying capacity has been significantly reduced - structural analysis or immediate repairs may be required. Section loss may exceed 10% of the effective section. There may be severe impact damage. Element may be severely damaged, severed, or severely out of alignment. Connections may have failed.

3.4.2 Unpainted Weathering Steel Elements

These elements apply only to structural members constructed of unpainted weathering steel (such as Mn/DOT Spec. #3309). *Note: if portions of the element have been painted (such as high corrosion areas along the fascia or within 7 ft. of deck joints), the entire member can be rated as "unpainted" (it is not necessary to rate the same member using two separate elements).*

- **Element #101: Unpainted (Weathering) Steel Box Girder (LF)**
- **Element #106: Unpainted (Weathering) Steel Girder or Beam (LF)**
- **Element #112: Unpainted (Weathering) Steel Stringer (LF)**
- **Element #120: Unpainted (Weathering) Steel Through Truss - Bottom Chord (LF)**
- **Element #125: Unpainted (Weathering) Steel Through Truss - Upper Members (LF)**
- **Element #130: Unpainted (Weathering) Steel Deck Truss (LF)**
- **Element #140: Unpainted (Weathering) Steel Arch (LF)**
- **Element #151: Unpainted (Weathering) Steel Floorbeam (LF)**
- **Element #201: Unpainted (Weathering) Steel Column (EA)**
- **Element #225: Unpainted (Weathering) Steel Piling (EA)**
- **Element #230: Unpainted (Weathering) Steel Pier Cap (LF)**
- **Element #413: Unpainted (Weathering) Steel Arch Spandrel Column (EA)**

Condition State 1: Unpainted weathering steel element has little or no deterioration. The protective oxide coating is uniform and tightly adhered. Corrosion has not progressed beyond the intended layer of surface rust - there is no notable section loss. Painted areas (if any) have little or no deterioration.

Condition State 2: Unpainted weathering steel element has minor to moderate deterioration. The protective oxide coating has partially failed - the surface may be dusty or granular. While corrosion may have progressed beyond the surface layer, any section loss is incidental. Painted areas (if any) may have minor to moderate deterioration. Element is in proper position and alignment - all connections are sound. *Note: elements that have been repaired or reinforced should generally not be rated above Condition State 2.*

Condition State 3: Unpainted weathering steel element has extensive deterioration, but the load-carrying capacity of the member has not been significantly reduced. The protective oxide coating has extensive failure - the surface may be flaking off. There may be extensive corrosion. While there may be significant section loss, structural analysis is not yet required (section loss is less than 10% of the effective section). Painted areas (if any) may have extensive or complete failure. Element may be slightly out of position or alignment - connections may have started to come loose.

Condition State 4: Unpainted weathering steel element has severe or critical deterioration. The load-carrying capacity of the member has been significantly reduced - structural analysis or immediate repairs may be required. The protective oxide coating has failed. Section loss may exceed 10% of the effective section. The element may be severely damaged or significantly out of position or alignment - connections may have failed.

3.4.3 Reinforced Concrete Elements

These elements apply to structural members constructed of cast-in-place or pre-cast reinforced concrete (not pre-stressed or post-tensioned concrete).

- **Element #105: Reinforced Concrete Box Girder (LF)**
- **Element #110: Reinforced Concrete Girder or Beam (LF)**
- **Element #116: Reinforced Concrete Stringer (LF)**
- **Element #144: Reinforced Concrete Arch (LF)**
- **Element #155: Reinforced Concrete Floorbeam (LF)**
- **Element #205: Reinforced Concrete Column (EA)**
- **Element #210: Reinforced Concrete Pier Wall (LF)**
- **Element #215: Reinforced Concrete Abutment (LF)**
- **Element #220: Reinforced Concrete Footing (EA)**
- **Element #227: Reinforced Concrete Piling (EA)**
- **Element #234: Reinforced Concrete Pier Cap (LF)**
- **Element #375: Pre-cast Concrete Channels (LF)**
- **Element #385: Reinforced Concrete Arch Spandrel Column (EA)**
- **Element #387: Reinforced Concrete Wingwall (EA)**
- **Element #414: Reinforced Concrete Arch Spandrel Wall (LF)**

Condition State 1: Reinforced concrete element has little or no deterioration. There may be superficial cracking, leaching, staining, or surface scale - there is no notable delamination or spalling. The member has no impact damage or repair patches.

Condition State 2: Reinforced concrete element has minor to moderate deterioration. There may be moderate cracking, leaching, staining, or surface scale. Minor delaminations or spalls may be present, but there is little or no exposure of steel reinforcement. Element is in proper position and alignment - all connections are sound. Repair patches (if any) remain sound. *Note: elements that have been repaired or reinforced should generally not be rated above Condition 2.*

Condition State 3: Reinforced concrete element has extensive deterioration, but the load-carrying capacity of the element has not been significantly reduced. There may be extensive cracking, leaching, staining, or scale. Structural cracking (from shear or flexure) may be present. Delaminations and spalls may be prevalent. Exposed reinforcement may have corrosion, but any section loss is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge. Element may be slightly out of position or alignment - connections may have started to come loose.

Condition State 4: Reinforced concrete element has severe or critical deterioration. The load-carrying capacity of the element has been significantly reduced - structural analysis or immediate repairs may be required. Severe structural cracking (from shear or flexure) may be present. Spalling may be extensive or severe - exposed reinforcement may have significant section loss. The element may be severely damaged or significantly out of position or alignment - connections may have failed.

3.4.4 Prestressed Concrete Elements

These elements apply to structural members constructed of either prestressed or post-tensioned concrete.

- **Element #104: Prestressed Concrete Box Girder (LF)**
- **Element #109: Prestressed Concrete Girder or Beam (LF)**
- **Element #115: Prestressed Concrete Stringer (LF)**
- **Element #143: Prestressed Concrete Arch (LF)**
- **Element #154: Prestressed Concrete Floorbeam (LF)**
- **Element #204: Prestressed Concrete Column (EA)**
- **Element #226: Prestressed Concrete Piling (EA)**
- **Element #233: Prestressed Concrete Pier Cap (LF)**
- **Element #374: Prestressed Concrete Double, Quad, Bulb, or Inverted Tees (LF)**
- **Element #402: Prestressed Concrete Voided Slab Panels (LF)**

In a properly designed pre-stressed member, structural cracking (flexure or shear) should not develop under normal service loads. On pre-stressed concrete members, all cracks are significant - they should be measured and documented. Cracks provide openings for water and chlorides, which can lead to stress corrosion - the inspector should note any rust stains that may indicate corrosion of the pre-stressing strands.

Condition State 1: Pre-stressed concrete element has little or no deterioration. There is no notable cracking, staining, delamination or spalling. The member has no impact damage or repair patches.

Condition State 2: Pre-stressed concrete element has minor deterioration. There may be minor (non-structural) cracking, leaching, staining, or surface scale. There is no structural cracking (from shear or flexure). Minor delaminations or spalls may be present, but there is no exposure of the tensioning steel. Element is in proper position and alignment - all connections are sound. Repair patches (if any) remain sound. *Note: elements that have been repaired or reinforced should generally not be rated above Condition 2.*

Condition State 3: Pre-stressed concrete element has moderate deterioration, but the load-carrying capacity of the element has not been significantly reduced. There may be moderate cracking, leaching, staining, or scale. Structural cracking (from shear or flexure) may be present. Delaminations and spalls may be present. While the tensioning steel may be exposed, any section loss is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge. Element may be slightly out of position or alignment - connections may have started to come loose.

Condition State 4: Pre-stressed concrete element has severe or critical deterioration. The load-carrying capacity of the element has been significantly reduced - structural analysis or immediate repairs may be required. Severe structural cracking (from shear or flexure) may be present. Spalling may be extensive or severe - exposed tensioning steel may have significant section loss. The element may be severely damaged or significantly out of position or alignment - connections may have failed.

3.4.5 Timber Elements

These elements apply to timber structural members of any type - this includes sawn, glue-lam, or stress-laminated timber members.

- **Element #111: Timber Girder or Beam (LF)**
- **Element #117: Timber Stringer (LF)**
- **Element #135: Timber Truss or Arch (LF)**
- **Element #156: Timber Floorbeam (LF)**
- **Element #206: Timber Column (EA)**
- **Element #216: Timber Abutment (LF)**
- **Element #228: Timber Piling (EA)**
- **Element #235: Timber Pier Cap (LF)**
- **Element #386: Timber Wingwall (EA)**
- **Element #415: Timber Transverse Stiffener Beam - Timber Slab Spans (LF)**

Condition State 1: Timber element has little or no deterioration. There may be superficial cracks, splits, or checks. There is no decay, fire damage, or structural distress (crushing or sagging). There is no impact damage.

Condition State 2: Timber element has minor to moderate deterioration. There may be moderate cracking or splitting. There may be minor decay or fire damage, but there is no significant structural distress (crushing, or sagging). Element is in proper position and alignment - all connections are sound. Repaired/reinforced areas (if any) remain sound. *Note: elements that have been repaired or reinforced should generally not be rated above Condition 2.*

Condition State 3: Timber element has extensive deterioration - repairs may be required, but the load-carrying capacity has not been significantly reduced. There may be extensive cracking or splitting. Decay, infestation, or fire damage may have resulted in a slight reduction of cross-sectional area. There may be slight crushing or sagging. Element may be slightly out of position or alignment - connections may have started to come loose.

Condition State 4: Timber element has severe or critical deterioration (significant loss of cross-sectional area). The load-carrying capacity of the element has been significantly reduced - structural analysis or immediate repairs may be required. Timber element may have severe cracking or structural failure. There may be advanced decay, infestation, or fire damage. There may be severe crushing or sagging. The element may be severely damaged or significantly out of position or alignment - connections may have failed.

3.4.6 Masonry, Other, or Combination Material Elements

These elements apply to masonry of any type, shape, or configuration. These elements can also apply to structural elements constructed of any material (or combination of materials) not adequately described by the other elements. *Note: masonry arches with spans of less than 20 ft. can be rated using PONTIS Element #243 (Masonry or Other Material Culvert).*

- **Element #145: Masonry, Other, or Combination Material Arch (LF)**
- **Element #211: Masonry, Other, or Combination Material Pier Wall (LF)**
- **Element #217: Masonry, Other, or Combination Material Abutment (LF)**
- **Element #416: Masonry, Other, or Combination Material Pier Cap (LF)**
- **Element #417: Masonry, Other, or Combination Material Column (EA)**
- **Element #418: Masonry, Other, or Combination Material Wingwall (EA)**
- **Element #420: Masonry, Other, or Combination Material Arch Spandrel Wall (LF)**

Condition State 1: Element has little or no deterioration - there may be superficial defects or staining. Masonry may have minor weathering - masonry blocks are properly aligned (mortar joints are sound) Timber may have minor cracks or splits. Concrete may have superficial cracking or scale. Steel has little or no corrosion. Protective coatings (if any) remain sound.

Condition State 2: Element has minor to moderate deterioration (no repairs are necessary). Masonry may have moderate spalling, cracking, or weathering. Masonry blocks may be slightly offset or out of alignment. Mortar joints may have moderate deterioration, leakage or weed intrusion. Timber may have moderate splitting, decay or fire damage, but there is no crushing or sagging. Concrete may have moderate cracking, scaling, leaching, or staining - there may be some delamination or spalling. Steel may have moderate corrosion (little or no section loss). Protective coatings (if any) may have moderate failure. Repaired/reinforced areas (if any) remain sound. *Note: elements that have been repaired or reinforced should typically not be rated above Condition State 2.*

Condition State 3: Element has extensive deterioration - repairs may be required, but the load-carrying capacity of the element has not been significantly reduced. Masonry may have extensive spalling, cracking, or weathering. Masonry blocks may have measurable offset, tipping, or settlement. Mortar joints may have extensive deterioration (severe leakage or weed intrusion). Timber may have extensive cracking or splitting, significant decay or fire damage, or slight crushing or sagging. Concrete may have extensive cracking, scaling, leaching, or rust/water staining. Delamination and spalling may be prevalent (exposed reinforcement may have section loss). Steel components may have extensive corrosion (moderate section loss). Protective coatings (if any) may have complete failure.

Condition State 4: Element has severe damage or deterioration. The load-carrying capacity of the element has been significantly reduced - structural analysis or immediate repairs may be required. Masonry blocks may have severe deterioration, offset, tipping, or settlement. Concrete may have severe structural cracking or spalling. Timber may have severe structural decay (significant loss of cross-sectional area), cracking, sagging, or crushing. Steel components may have severe section loss.

3.5 Other PONTIS Structural Elements

This section includes ratings descriptions for PONTIS elements that could not be adequately described by the material groupings (Section 3.4). This includes bridge elements (bearings, pin & hanger assemblies, and hinge bearings) where the condition descriptions emphasize proper function, as well as elements for steel cables, tunnels, cast-in-place piling, and secondary members.

3.5.1 Bearings

There are six bearing elements - they are all rated on a scale of 1-3, and are listed as an "each" quantity (the plans may need to be referenced to determine the type and quantity of bearing elements).

- **Element #310 - Elastomeric (Expansion) Bearings**
- **Element #311 - Expansion Bearings**
- **Element #312 - Enclosed or Concealed Bearings**
- **Element #313 - Fixed Bearings**
- **Element #314 - Pot Bearings**
- **Element #315 - Disk Bearings**

Bearings should be examined for deterioration, function, alignment, as well as the soundness of the anchorage and substructure support. All of these factors should be taken into consideration when rating a bearing element. The primary function of a bearing is to transmit loads from the superstructure to the substructure - there are two basic types of bearings, expansion and fixed...

- Expansion bearings permit longitudinal movement of the superstructure due to thermal expansion and contraction. Most expansion bearings allow for rotation of the superstructure due to live load deflection - some are designed to restrict lateral movement of the superstructure.

- Fixed bearings resist longitudinal movement of the superstructure due to thermal expansion and contraction. Most fixed bearings allow for rotation of the superstructure due to live load deflection, and to resist lateral movement of the superstructure.

Bearings can also be designed to resist uplift or seismic forces. Restraining bearings prevent uplift of the superstructure - uplift forces may be present on curved bridges, anchor spans, steel pier caps, or on short end spans of continuous bridges. An uplift restraint system typically consists of tension members (such as anchor bolts or eyebars), and may incorporate a counterweight. Isolation bearings protect the superstructure from seismic forces - as Minnesota is considered to be at low risk for seismic activity, seismic isolation bearings are not required.

A bearing assembly typically consists of the following components...

- **Sole Plate:** The sole plate protects the superstructure member, and transfers load from the superstructure to the bearing.

- **Bearing:** The bearing transfers load from the sole plate to the masonry plate. Bearings may incorporate sliding plates, rollers, rockers, pins, or elastomeric pads to allow for longitudinal or rotational movement of the superstructure.

- **Masonry Plate:** The masonry plate distributes load from the bearing to the supporting substructure unit (abutment, pier, or footing). Some bearings bear directly upon the bearing seat

- **Anchorage:** Bearings that resist longitudinal or lateral movement (or uplift forces) require an anchorage system - this typically consists of steel rods drilled (or cast) into the substructure unit.

Thermal Expansion & Contraction: The magnitude of longitudinal movement is dependant upon three factors - the coefficient of thermal expansion (steel and concrete are similar), the temperature range, and the contributing structure length. As the temperature in Minnesota may range from -30 degrees F up to 110 Degrees F, this works out to be around 1-1/8" for every 100 ft. of structure length.

In Minnesota, expansion bearing are designed to be in the neutral (centered) position at approximately 40 degrees F. Measurements should typically be referenced to this neutral alignment - measurements should be taken to the nearest 1/8", and the temperature at the time of the measurement should be recorded.

Inspection of Bridge Bearings: The importance of inspecting and properly maintaining bridge bearings should not be underestimated - seemingly minor bearing problems can become worse if ignored, eventually resulting in serious problems for the bridge.

- Bearing malfunction or misalignment can damage adjacent deck, superstructure, or substructure elements.
- Loss of bearing area (or anchorage failure) can result in collapse of a span.
- Severe bearing misalignment may indicate significant problems elsewhere on the bridge (such as substructure settlement or tipping).

The most common bearing malfunction is the seizing (or "freezing") of expansion bearings due to corrosion or debris. Bearings are typically located below deck joints, a highly corrosive environment. Debris (such as sand, dirt, and flaking rust) can restrict expansion, accelerate corrosion, increase wear, and prevent adequate inspection of the bearing. Sliding plate, roller, and rocker bearings provide numerous locations for debris and moisture to collect. Expansion bearings should be examined for any obvious visual evidence of recent movement (such as scraped paint, wear, or fretting rust). If none is present, the inspector should take bearing measurements, or examine adjacent bridge components (such as deck joints, railings, or curb plates) for evidence of recent expansion or contraction.

Bearing malfunction can also result from bearing components that are worn, misaligned, broken, loose, or missing. Contact surfaces (plates, rollers, rockers, and pins) should be examined for wear and freedom of movement. Loose bearing components may be identified by noise (or movement) when the bridge is subjected to live loads.

Thermal expansion or contraction which exceeds the bearing design limits can result in bearing failure - sliding plates may tip and lock, or rocker bearings may bind. The adjacent deck, superstructure, and substructure should be examined for contacting surfaces that might be preventing proper expansion.

Expansion bearings are typically restrained from lateral movement by guide tabs, keeper bars, pintles, or pin caps. Guide tabs should be examined for binding (particularly on skewed or curved bridges). Keeper bars on roller bearings can seize due to corrosion or debris (failure of keeper bars can result in roller misalignment). Pintles can shear off (an exposed pintle may indicate excessive longitudinal movement).

Note: Lateral restraint is sometimes provided by shear keys (or shear lugs) that are separate from the bridge bearings (these are often incorporated with the end diaphragms). As there is not yet a specific PONTIS element for these items, they can be rated using Element #380 (Secondary Structural Elements).

Uplift restraint devices typically incorporate tension members (such as eyebars or threaded rods) - they should be examined for section loss, cracking, binding, or connection failure.

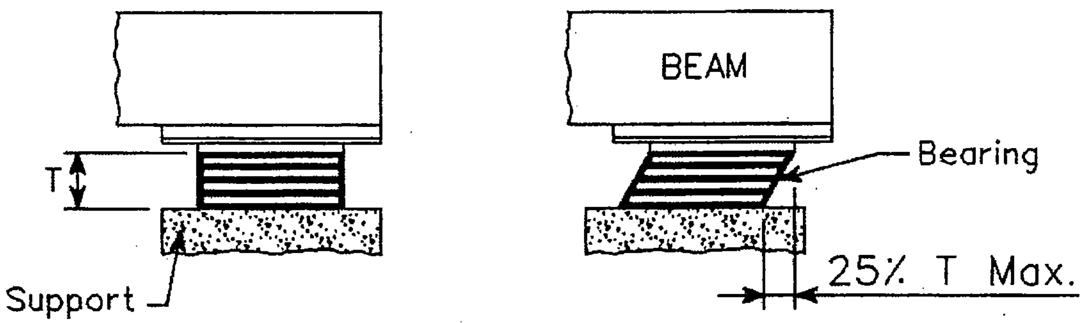
The bearing seat and anchorage should be examined for any deterioration or distress. Cracking or spalling of the bearing seat may indicate bearing failure - deterioration of the bearing seat can eventually result in loss of bearing area. Anchor bolts that are bent (or contacting the ends of slotted plates) may indicate excessive expansion or substructure movement. As only the upper portion of anchor bolts are visible for inspection, nondestructive testing may be necessary.

Element #310 - Elastomeric (Expansion) Bearings

This element applies to rectangular elastomeric bearing pads that facilitate expansion via deformation. Mn/DOT spec. #3741 covers elastomeric bearing pads - they are comprised of alternating layers of elastomer (100% virgin chloroprene) and 1/8" thick steel plates, which are bonded together. Older bridges may have solid (non-reinforced) pads, or pads laminated with fiberglass plates.

A curved steel pintle plate is usually placed on top of the pad to allow rotation due to deflection (in some cases this is vulcanized to the pad). Elastomeric expansion bearings may be restrained against lateral movement or uplift forces.

Elastomeric bearings generally require less maintenance than mechanical expansion bearings, as they are less susceptible to debris and corrosion. Elastomeric pads should be examined for splitting, tearing, delamination, or excessive bulging. Elastomeric bearings can accommodate longitudinal movement up to approximately 25% of the pad thickness - the longer the span, the thicker the pad required. While the pad deformation and orientation should correspond with the current temperature, the orientation also depends upon the temperature when the bearing was installed. As elastomeric pads have a tendency to "walk" out from beneath the sole plate, any movement or misalignment should be noted.



Condition State 1: Elastomeric expansion bearing is in good condition and is functioning as intended. The bearing pad is properly positioned - deformation and orientation is appropriate for the current temperature. The elastomeric covering may have superficial deterioration (the steel reinforcement layers are not exposed). Pintle plates, restraints, or anchor bolts (if present) are sound, properly positioned, and functioning as intended. The bearing seat is in good condition (there is no loss of bearing area).

Condition State 2: Elastomeric expansion bearing has moderate deterioration - bearing function may be slightly impaired. Bearing pad deformation may be near the design limits (25% of the pad thickness), or the orientation may be inappropriate for the current temperature (resetting may be recommended). The pad may have bulged, deformed laterally, or moved slightly out of position. The elastomeric covering may have split or torn (steel reinforcement layers may be exposed). Pintle plates, restraints, or anchor bolts (if present) may have moderate deterioration, slight binding, or may be slightly out of position). The bearing seat may have moderate deterioration (there may be a slight loss of bearing area).

Condition State 3: Elastomeric expansion bearing has severe deterioration - resetting or replacement may be required. Bearing pad deformation may be beyond the design limits (25% of the pad thickness) - the pad may severely bulged or significantly out of position. The elastomeric covering may have failed (steel reinforcement layers may have severe corrosion or de-bonding). Pintle plates, restraints, or anchor bolts (if present) may have failed, or may be significantly out of position. Bearing seat may have severe deterioration (there may be significant loss of bearing area) - supplemental supports or load restrictions may be warranted.

Element #311 - Expansion Bearings

This element applies to mechanical expansion bearings of any type - such as sliding plate bearings, rocker bearings, or roller bearings. Expansion bearings allow for longitudinal movement of the superstructure due to thermal expansion and contraction. Most expansion bearings allow rotation of the superstructure due to live load deflection - some may be designed to restrict lateral movement or uplift forces.

- Sliding plate bearings allow longitudinal movement by one steel plate sliding upon another (a curved pintle plate is sometimes included to allow for rotation). Sliding plate bearings often incorporate bronze plates or lubricants to facilitate movement. Lateral restraint may be provided by guide tabs, or by anchor bolts extending up through slotted slates.

- A roller bearing consists of a horizontal steel cylinder that "rolls" between the sole plate and masonry plate as the superstructure expands and contracts. The bearing may have a single or multiple rollers ("rollernest bearing"). Lateral restraint may be provided by pintles (on the top & bottom of the roller), or keeper bars attached the ends of the rollers.

- Rocker bearings are typically comprised of a curved rocker plate (bearing on the masonry plate), that is connected to the sole plate with an upper pin. The bearing may have a single or multiple rockers ("rockernest bearing"). Lateral restraint may be provided by pintles (attached to the masonry plate), pin caps, or anchor bolts extending up through slotted slates.

Condition State 1: Expansion bearing is in good condition and is functioning as intended. Bearing alignment is within design limits and is appropriate for the current temperature. Bearing assembly is relatively free of debris (no restriction of movement). Paint system (if present) may have some deterioration - corrosion may be present, but there is no significant section loss. Lubrication system (if any) is functioning properly. All bearing components (sliding plates, rockers, rollers, pins, etc.) are intact and properly positioned. Lateral guide/restraint system (or uplift restraint system, if present) is in good condition. Anchor bolts are bearing seat are sound (there is no loss of bearing area).

Condition State 2: Expansion bearing has moderate deterioration - bearing function may be slightly restricted (cleaning, painting, or lubrication may be recommended). Bearing alignment may be at or near the design limits (or inappropriate for the current temperature), but is still tolerable. Bearing assembly may have extensive corrosion (section loss may be present), or may be covered with debris. Lubrication system may have failed. Primary bearing components (sliding plates, rockers, rollers, pins, etc.) may be moderately worn or slightly out of alignment. Secondary bearing components (cotter pins, etc.) may be loose or missing. The lateral guide/restraint system (guide tabs, keeper bars, pintles, pin caps, etc.) may be moderately worn or slightly out of alignment (there may be minor binding). Uplift restraint system (if present) may have moderate deterioration, but is still functioning as intended. Anchor bolts may be corroded or bent, but remain intact. The bearing seat may have moderate deterioration (there may be a slight loss of bearing area).

Condition State 3: Expansion bearing has severe deterioration, and is no longer functioning as intended (repair or replacement may be necessary). Bearing alignment may be beyond design limits. Bearing mechanism may be frozen (seized) or severely restricted due to corrosion or debris. Primary bearing components (sliding plates, rockers, rollers, pins, etc.) may severe section loss, wear, or misalignment - they may have jammed, come loose or otherwise failed. The lateral guide/restraint system (guide tabs, keeper bars, pintles, or pin caps) may have sheared off, bound, or otherwise failed. Uplift restraint system may have failed. Anchor bolts may have failed. Bearing seat may have severe deterioration (there may be significant loss of bearing area) - supplemental supports or load restrictions may be warranted.

Element #312 - Enclosed or Concealed Bearings

This element applies to bearing assemblies that are enclosed or concealed, and are not visible for detailed inspection. This can include either fixed or expansion bearings.

Condition State 1: Enclosed/Concealed bearing is in good condition and is functioning as intended. Horizontal, lateral and vertical alignment is within limits and is appropriate for the current temperature. The bearing seat is sound (there is no loss of bearing area).

Condition State 2: Enclosed/Concealed bearing has moderate deterioration (repairs may be recommended). Horizontal, lateral or vertical alignment may be near design limits (or inappropriate for the current temperature). The bearing seat may have moderate deterioration (there may be a slight loss of bearing area).

Condition State 3: Enclosed/Concealed bearing has severe deterioration - repair or replacement may be necessary. Horizontal, lateral or vertical alignment may be beyond the design limits. Bearing seat may have severe deterioration (there may be significant loss of bearing area) - supplemental supports or load restrictions may be warranted.

Element #313 - Fixed Bearings

This element applies to bearings that are fixed against longitudinal movement of the superstructure. Fixed bearings may incorporate a pin or a thin elastomeric pad to allow rotational movement (from live load deflection of the superstructure). Fixed bearings are typically designed to resist transverse movement, and may be designed to resist uplift forces.

Condition State 1: Fixed bearing is in good condition and is functioning as intended. Bearing assembly is relatively free of debris (no restriction of movement). Paint system (if present) may have some deterioration - corrosion may be present, but there is no significant section loss. All bearing components are intact and properly positioned. Anchor bolts are bearing seat are sound (there is no loss of bearing area).

Condition State 2: Fixed bearing has moderate deterioration - cleaning or painting may be recommended. Bearing assembly may have extensive corrosion (section loss may be present), or may be covered with debris. Primary bearing components (castings, pins, pads, etc.) may be moderately worn or slightly out of alignment. Secondary bearing components (cotter pins, lead plates, sole plate bolts, etc.) may be working out, loose, or missing. Anchor bolts may be corroded, but remain intact. The bearing seat may have moderate deterioration (there may be a slight loss of bearing area).

Condition State 3: Fixed bearing has severe deterioration, and is no longer functioning as intended (repair or replacement may be necessary). Primary bearing components may have severe section loss, wear, misalignment, or may have otherwise failed. Anchor bolts may have failed. Bearing seat may have severe deterioration (there may be significant loss of bearing area) - supplemental supports or load restrictions may be warranted.

Element #314: Pot Bearings
Element #315: Disk Bearings

Pot and Disk bearings allow for multi-dimensional rotational movement - these are specialized bearings used only for high loads (long spans, steel pier caps, or railroad bridges). Pot/Disk bearings may be either fixed or expansion.

- Pot bearings consist of a shallow steel piston that rests within a steel cylinder (which contains a confined elastomer). Typically, only the perimeter edge of the elastomer is visible for inspection.

- Disc bearings consist of a shallow steel piston that rests within a steel cylinder (which contains a hard plastic disc. Typically, the disc is enclosed within the assembly and is not visible for inspection. *Note: high load bearings which utilize a semi-spherical steel bearing plate can also be considered to be a "Disc" bearing.*

The upper piston plate should be properly seated (and positioned) within the lower cylinder plate. Any exposed portions of the elastomer or disc should be examined for splitting, tearing, or extrusion.

On expansion Pot bearings, the upper plate typically has a stainless steel plate (with a "mirror finish") welded to the underside, while the lower plate typically has PFTE (polytetrafluoroethylene) bonded to the top surface. This combination provides an extremely low friction sliding surface (lubrication is not required). The upper sliding plate should be examined evidence of separation (such as cracked welds) of the stainless steel - the extent of any recent movement can often be determined by examining the stainless steel plate. The lower plate should be examined for any de-bonding of the PTFE. Expansion Pot bearings may be "guided" (lateral movement is restricted) or "non-guided" (free to move laterally). On unguided expansion bearings, note any evidence of lateral movement. On guided expansion bearings, look for evidence of wear, binding, or deterioration of the guide system.

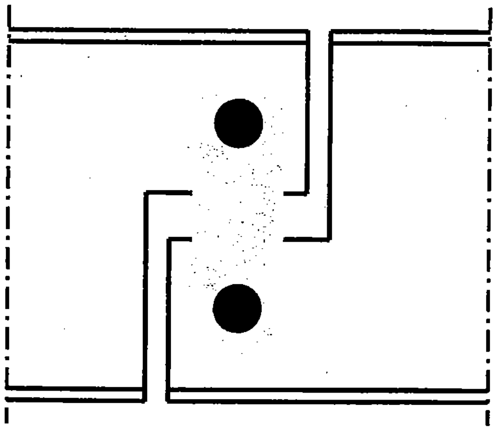
Condition State 1: Pot/Disc bearing is in good condition and is functioning as intended. On expansion bearings, alignment is within design limits and is appropriate for the current temperature. Bearing is free of corrosion and debris (no restriction of movement). All bearing components are properly aligned and properly seated. Confined elastomer has little or no deterioration - there is no evidence of the elastomer extruding from the cylinder. Guide/restraint devices (if present) are intact and are functioning properly. Anchor bolts are bearing seat are sound (there is no loss of bearing area).

Condition State 2: Pot/Disc bearing has moderate deterioration - bearing function may be slightly restricted (cleaning or repair may be recommended). On expansion bearings, alignment may be near design limits (or inappropriate for the current temperature), but is still tolerable. Bearing assembly may have corrosion or may be covered with debris (there may be a slight restriction of movement). Primary bearing components (piston, cylinder, sliding plate, etc.) may be slightly tipped, offset, or out of alignment. Confined elastomer may have some deterioration, or may have started to extrude along the edge of the cylinder. Guide/restraint devices (if present) may be worn, loose, or out of alignment (there may be minor binding). Anchor bolts may be corroded, but remain intact. The bearing seat may have moderate deterioration (there may be a slight loss of bearing area).

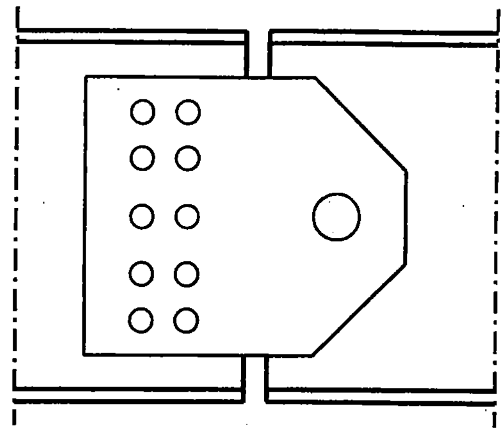
Condition State 3: Pot/Disc bearing has severe deterioration, and is no longer functioning as intended (repair or replacement may be necessary). On expansion bearings, alignment may be beyond design limits. Bearing mechanism may be frozen (seized) or severely restricted Primary bearing components may severe section loss, wear, or misalignment - they may have jammed, come loose or otherwise failed. Confined elastomer may have severe deterioration, or may be actively extruding from the cylinder. Guide/restraint devices (if present) may have failed. Anchor bolts may have failed. Bearing seat may have severe deterioration (there may be significant loss of bearing area) - supplemental supports or load restrictions may be warranted.

3.5.2 Pin & Hanger (or Fixed Pin) Assemblies

On continuous steel bridges with cantilever or suspended spans (where the end of one span is supported by an adjacent span), the connection detail may consist of a pinned assembly. A pin & hanger assembly typically consists of two vertical hanger plates with pinned connections at the top and bottom - this allows both rotation and longitudinal movement of the superstructure. A fixed pin assembly typically consists of a single pin - this allows rotation, but restricts longitudinal movement of the superstructure.



Pin & Hanger Assembly



Fixed Pin Assembly

Pinned assemblies are relatively rare in Minnesota - most are found on multiple girder/beam bridges constructed from 1935-1975, but some can be found on long-span two-girder or truss bridges (on truss bridges, the hanger member may be similar to other truss members). On any bridge that carries highway traffic, pinned assemblies are considered to be "special features", and require periodic ultrasonic examination (see Mn/DOT Tech Memo #02-22-B-01). On two-girder or truss bridges (that carry highway traffic), pinned assemblies are considered to be "fracture critical" members - the failure of a pin or hanger plate could result in the collapse of a span.

On a typical suspended span, one end is supported by fixed pin assemblies, while the expansion end is supported by pin & hanger assemblies To prevent lateral movement of the superstructure, the expansion end will often incorporate a guide/restraint system (such as a wind transfer pin assembly). Some bridges in Minnesota (particularly along the Red River Valley) have "swivel hinges" - the center girder will have a fixed pin assembly, while the other girders will all have pin & hanger assemblies.

Pinned assemblies should be examined for deterioration, function, alignment, as well as the soundness of the superstructure support. All of these factors should be taken into consideration when rating a pinned assembly. All components of a pinned assembly (pins, plates, pin caps, nuts, washers, spacers, etc.) should be examined for wear, corrosion, defects, cracks, bending, loosening or misalignment. *Note: Severe pack rust can deform hanger plates or result in failure of pinned connections.*

Periodic measurements should be taken to verify the proper function of pin & hanger assemblies (be sure to record the temperature at the time of inspection). As a frozen pin will transfer additional bending stresses to the hanger plates, any significant restriction of a pin & hanger assembly should be identified and analyzed immediately. *Note: While the presence of fretting rust (a red-colored dust resulting from the wearing of steel surfaces) indicates that recent movement has occurred, it may also indicate inadequate lubrication.*

Element #161: Pin & Hanger (or Fixed Pin) Assembly

- **Element #160: Pin & Hanger (or Fixed Pin) Assembly - Unpainted Weathering Steel**
- **Element #161: Pin & Hanger (or Fixed Pin) Assembly - Painted Steel**

There are two AASHTO CoRe elements for pinned assemblies. However, Mn/DOT only uses Element #161 (Element #160 should not be used - the condition rating description for this element is not included in this manual). Element #161 should be used for all pin & hanger (or fixed pin) assemblies - this is an "each" item, a single condition state must be determined for each pinned assembly.

Condition State 1: Pinned assembly has little or no deterioration - it is free of debris and properly aligned. All components (pins, plates, pin caps, nuts, washers, spacers, etc.) are in good condition. Paint system (if present) is sound - there is no notable corrosion (or section loss). Supporting steel superstructure has little or no deterioration.

Condition State 2: Pinned assembly has minor deterioration. There may be minor debris, but there is no restriction of movement - lubrication system (if present) is functioning properly. Assembly components (pins, plates, pin caps, nuts, washers, spacers, etc.) may have minor wear or deterioration, but remain in proper position. Longitudinal alignment is within design limits and is appropriate for the current temperature. Lateral restraint/guide systems (if present) are functioning as intended - there is no notable lateral misalignment. Paint system (if present) may have some deterioration - corrosion may be present, but any section loss (or pack rust) is incidental. Supporting steel superstructure may have minor deterioration.

Condition State 3: Pinned assembly has moderate deterioration, but is still functioning as intended. Debris or corrosion may have resulted in a slight restriction of movement (cleaning and/or lubrication may be recommended). Pins or plates may have moderate wear (fretting rust may be present). Primary connections (nuts, pin caps, etc.) remain intact - secondary components (washers, spacers, cotter pins, etc.) may be loose or misaligned. Longitudinal alignment may be near the design limits, or may be somewhat inappropriate for the current temperature. Lateral restraint/guide systems may be worn or loose - there may be slight lateral misalignment. Paint system (if present) may have extensive deterioration - surface corrosion may be prevalent (notable section loss or pack rust may be present). Supporting steel superstructure may have moderate deterioration.

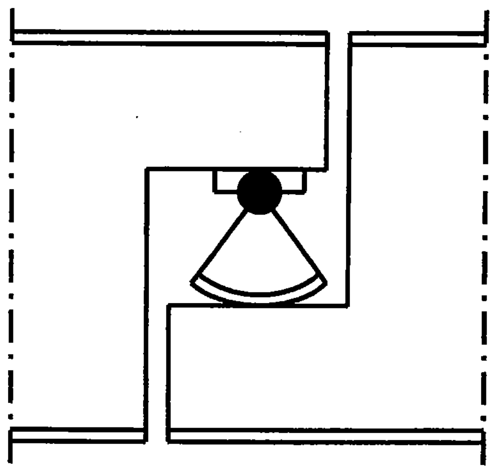
Condition State 4: Pinned assembly has extensive deterioration - the function may be impaired, but the load-carrying capacity has not been significantly reduced. Debris or corrosion may be restricting movement (cleaning and/or lubrication may be required). Pins or plates may have extensive wear or slight deformation (cracks or other defects may be present). Primary connections (nuts, pin caps, etc.) may have started to work loose - secondary components (washers, spacers, cotter pins, etc.) may be missing. Longitudinal alignment may be at the design limits (contacting or binding), or may be completely inappropriate for the current temperature. Lateral restraint/guide systems may have failed, or there may be excessive lateral misalignment. Paint system (if present) may have failed - there may be extensive corrosion, with significant section loss (or pack rust). Supporting steel superstructure may have extensive deterioration.

Condition State 5: Pinned assembly has severe or critical deterioration. The load-carrying capacity has been significantly reduced - structural analysis or immediate repairs may be required. Movement may be completely restricted (assembly may be frozen or binding). Pins or plates may have severe wear, deformation, or cracking. There may be severe longitudinal or lateral misalignment. Primary connections may have failed. There may be severe section loss or pack rust. Supporting steel superstructure may have severe or critical deterioration.

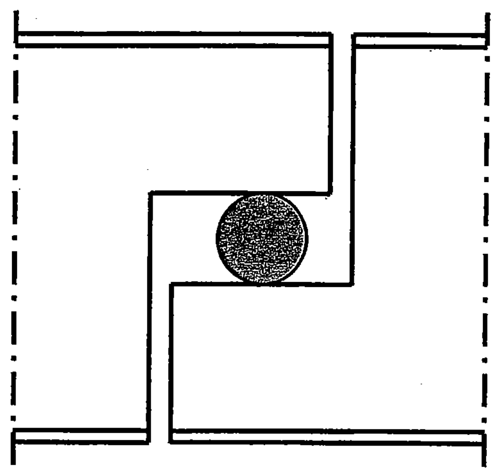
3.5.3 Hinge Bearing Assemblies

On continuous bridges with cantilever or suspended spans (where the end of one span is supported by an adjacent span), the connection detail may consist of a hinge bearing assembly. Hinge bearings may be expansion (permitting longitudinal movement of the superstructure) or fixed (resisting longitudinal movement of the superstructure). Most hinge bearings are designed to allow rotation of the superstructure due to live load deflection - some are designed to restrict lateral movement of the superstructure. Hinge bearings can include a wide variety of bearing assembly types (rocker, roller, sliding plate, or elastomeric pad).

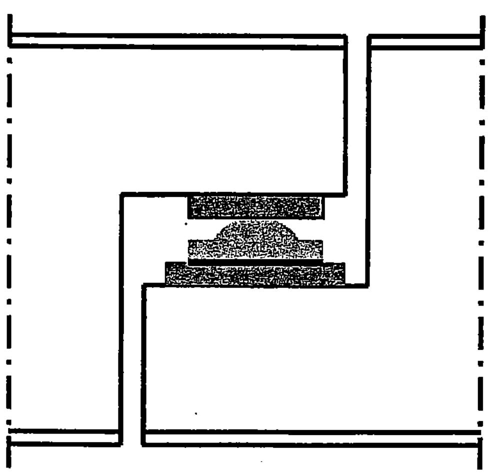
In Minnesota, hinge bearings are very common on steel multi-beam bridges constructed in the 1960's and 1970's - they can also be found on concrete box girder and steel truss bridges (they are seldom used in new bridges). Incorporating a hinge bearing simplifies structural analysis, as by allowing rotation, the bending moments are isolated. Hinge bearings are typically "cantilevered" (offset from the piers), to reduce deterioration of the substructure from leaking deck joints.



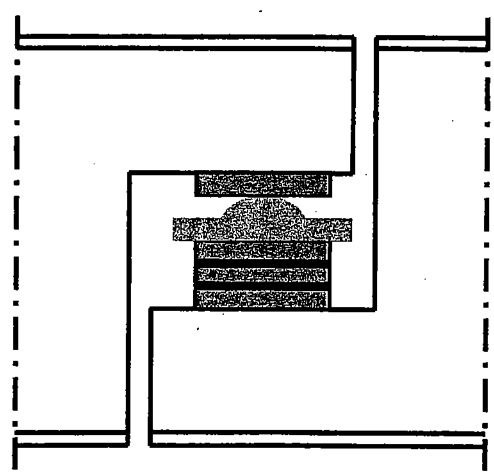
Rocker Hinge Bearing



Roller Hinge Bearing



Sliding Plate Hinge Bearing



Elastomeric Hinge Bearing

While hinge bearing assemblies are not classified as "special features" (like pin & hanger assemblies), these details should be given special attention during each inspection. A malfunctioning hinge bearing could result in damage to adjacent deck, superstructure, or substructure elements. Misalignment of a hinge bearing may indicate significant problems elsewhere on the bridge (such as substructure settlement or tipping).

As there are no AASHTO CoRe elements to rate the condition of hinge bearing assemblies, Mn/DOT has added two PONTIS elements...

- **Element #373: Steel Hinge Assembly (Painted or Unpainted)**
- **Element #379: Concrete Hinge Assembly**

Element #373 applies to hinge bearings on steel superstructures (it is rated on a scale of 1-5); Element #379 applies to hinge bearings on concrete superstructures (it is rated on a scale of 1-4). Hinge bearing assemblies should be examined for deterioration, function, alignment, as well as the soundness of the superstructure support. All of these factors should be taken into consideration when rating a hinge bearing element.

During a routine inspection, hinge bearings are typically observed from ground level (binoculars are helpful). If problems are observed during a routine inspection, an in-depth inspection (using some type of access equipment) should be scheduled. The following items should be emphasized when inspecting a hinge bearing assembly...

- Hinge bearing assemblies should be examined for corrosion or debris. Adjacent deck joints and deck drainage systems should be examined for leakage, clogging, or other malfunction that might be subjecting the hinge bearing to excessive water, salt, or debris.

- The hinge bearing components (rockers, rollers, sliding plates, elastomeric pads, pins, nuts, washers, cotter pins, spacers & guide tabs) should be examined for wear, corrosion, defects, cracks, bending, loosening or misalignment. Excessive movement (or noise) at the hinge bearing under live loads may indicate bearing malfunction.

- On expansion hinge bearings, proper function is a primary concern - the inspector should verify that longitudinal movement is not restricted (any significant restriction should be identified and analyzed immediately). Obvious visual evidence of recent movement (such as scrape marks on contact surfaces) should be noted. The adjacent superstructure and deck should be examined for any evidence of contacting (or binding) that might be restricting expansion. To verify proper function, periodic measurements should be taken (preferably at a clean, easily identifiable location) - be sure to record the temperature when the measurements were taken. If the hinge bearings cannot be accessed up-close, measurements can be taken at adjacent deck joints, curb plates, or railings.

- The longitudinal and lateral alignment of the hinge bearing should be observed and noted (any significant misalignment should be identified and analyzed immediately). On expansion hinge bearings, the longitudinal alignment should be appropriate for the current temperature, and the alignment of adjacent hinge bearings should be similar.

- Like any bearing assembly, the condition of the bearing support member is also of concern, and may affect the rating. The superstructure adjacent to the hinge bearing assembly should be examined for deterioration (or evidence of structural distress). On steel beams, the webs, flanges, and bearing stiffeners should be examined for corrosion, section loss, bulking, or cracking. On concrete box girders, the concrete surfaces should be examined for structural cracking, leaching, rust staining, delamination, or spalling (internal inspection of the hinge area is recommended).

Element #373: Steel Hinge Assembly (Painted or Unpainted)

This element applies to hinge bearing assemblies on steel girders, beams, stringers, trusses (or other steel bridges). This includes hinge bearing assemblies of any type (rocker, roller, sliding plate, or elastomeric pad), and includes both expansion and fixed hinge bearing assemblies. While this element typically refers to cantilever hinges on steel beams or girders, it can be used to rate any bearing assembly where a steel superstructure element bears upon another steel superstructure element. This is an "each" item, a single condition state must be determined for each hinge assembly.

Condition State 1: Steel hinge bearing assembly has little or no deterioration - it is free of debris and properly aligned. All bearing components (rockers, rollers, sliding plates, pads, pins, nuts, washers, cotter pins, etc.) are in good condition. Paint system (if present) is sound - there is no notable corrosion. Supporting steel superstructure has little or no deterioration.

Condition State 2: Steel hinge bearing assembly has minor deterioration. There may be minor debris, but there is no restriction of movement - lubrication system (if present) is functioning properly. Bearing components (rockers, rollers, sliding plates, pads, pins, nuts, washers, cotter pins, etc.) may have minor wear or deterioration, but remain in proper position. Longitudinal alignment is within design limits and is appropriate for the current temperature. Lateral restraint/guide systems (if present) are functioning as intended - there is no notable lateral misalignment. Paint system may have some deterioration - corrosion may be present, but any section loss is incidental. Supporting steel superstructure may have minor deterioration.

Condition State 3: Steel hinge bearing assembly has moderate deterioration, but is still functioning as intended. Debris or corrosion may have resulted in a slight restriction of movement (cleaning and/or lubrication may be recommended). Primary bearing components (rockers, rollers, sliding plates, elastomeric pads, pins, etc.) may have moderate wear (or deterioration), or slight misalignment. Secondary bearing components (bolts, nuts, washers, spacers, guides, cotter pins, etc.) may be loose or missing. Longitudinal alignment may be near the design limits, or may be somewhat inappropriate for the current temperature. Lateral restraint/guide systems may be worn, loose, or slightly binding - there may be slight lateral misalignment. Paint system may have extensive deterioration - surface corrosion may be prevalent (notable section loss may be present). Supporting steel superstructure may have moderate deterioration.

Condition State 4: Steel hinge bearing assembly has extensive deterioration - bearing function may be impaired, but the load-carrying capacity has not been significantly reduced. Debris or corrosion may be restricting movement (cleaning and/or lubrication may be required). Primary bearing components (rockers, rollers, sliding plates, elastomeric pads, pins, etc.) may have extensive wear (or deterioration), or may be misaligned. Longitudinal alignment may be at the design limits (contacting or binding), or may be completely inappropriate for the current temperature. Lateral restraint/guide systems may have failed, or there may be excessive lateral misalignment. Paint system may have failed - there may be extensive corrosion, with significant section loss. Supporting steel superstructure may have extensive deterioration.

Condition State 5: Steel hinge bearing assembly has severe or critical deterioration. The load-carrying capacity has been significantly reduced - structural analysis or immediate repairs may be required. Bearing movement may be completely restricted (primary bearing components may be frozen, binding, or severely out of alignment.). Longitudinal or lateral misalignment may have resulted in significant loss of bearing area. There may be severe section loss. Supporting steel superstructure may have severe or critical deterioration.

Element #379: Concrete Hinge Assembly

This element applies to hinge bearing assemblies on concrete box girders (or other concrete bridges). This includes hinge bearing assemblies of any type (rocker, roller, sliding plate, or elastomeric pad), and includes both expansion and fixed hinge bearing assemblies. While this element typically refers to cantilever hinges on concrete box girders, it can be used to rate any bearing assembly where a concrete superstructure element bears upon another concrete superstructure element. This is an "each" item, a single condition state must be determined for each hinge assembly (if the quantity of individual bearings cannot be determined, the entire hinge joint can be rated as one unit).

Condition State 1: Concrete hinge bearing assembly has little or no deterioration. There may be minor debris, but there is no restriction of movement - lubrication system (if present) is functioning properly. All bearing components (rockers, rollers, sliding plates, pads, pins, nuts, washers, cotter pins, etc.) are in good condition. Longitudinal alignment is within design limits and is appropriate for the current temperature. Lateral restraint/guide systems (if present) are functioning as intended - there is no notable lateral misalignment. Supporting concrete superstructure may have superficial cracking or staining, but there are no delaminations, spalls, or repair patches.

Condition State 2: Concrete hinge bearing assembly minor to moderate deterioration, but is still functioning as intended. Debris or corrosion may have resulted in a slight restriction of movement (cleaning and/or lubrication may be recommended). Primary bearing components (rockers, rollers, sliding plates, elastomeric pads, pins, etc.) may have moderate wear, moderate deterioration, or slight misalignment. Secondary bearing components (bolts, nuts, washers, spacers, guides, cotter pins, etc.) may be loose or missing. Longitudinal alignment may be near the design limits, or may be somewhat inappropriate for the current temperature. Lateral restraint/guide systems may be worn or loose - there may be slight lateral misalignment. Supporting concrete superstructure may have moderate cracking, scaling, leaching, or staining. There may be some delamination & spalling - but any exposure of reinforcement or tensioning steel is limited. Patched areas (if any) remain sound.

Condition State 3: Concrete hinge bearing assembly has extensive deterioration - the function may be impaired, but the load-carrying capacity has not been significantly reduced. Debris or corrosion may be restricting movement (cleaning and/or lubrication may be required). Primary bearing components (rockers, rollers, sliding plates, elastomeric pads, pins, etc.) may have extensive wear, extensive deterioration, or significant misalignment. Longitudinal alignment may be at the design limits (contacting or binding), or may be completely inappropriate for the current temperature. Lateral restraint/guide systems may have failed, or there may be excessive lateral misalignment. Supporting concrete superstructure may have extensive scale, cracking, leaching, or rust/water staining. There may be significant delamination & spalling (exposed reinforcement or tensioning system may have some section loss). Structural cracks (shear or flexure) may be present.

Condition State 4: Concrete hinge bearing assembly has severe or critical deterioration. The load-carrying capacity has been significantly reduced - structural analysis or immediate repairs may be required. Bearing movement may be completely restricted (primary bearing components may be frozen, binding, or severely out of alignment.). Longitudinal or lateral misalignment may have resulted in significant loss of bearing area. Supporting concrete superstructure may have severe structural cracking or spalling (exposed reinforcement or tensioning system may have significant section loss).

3.5.4 Steel Cables

Steel cables are used in suspension bridges, cable-stayed bridges, and tied arch bridges. The rating of a steel cable should take into consideration both the condition of the cable, as well as the condition of the cable anchorage.

Element #146: Steel Cable - Uncoated

This element applies to bare steel cables (such as suspension, hanger, or tie cables) that serve as a primary structural element on a bridge. The quantity is expressed as an each item.

Condition State 1: Steel cable (including cable anchorages) has little or no corrosion.

Condition State 2: Steel cable may have moderate surface corrosion (no section loss). Cable banding is intact. Cable anchorages have no evidence of distress.

Condition State 3: Steel cable may extensive surface corrosion, but any section loss is incidental (the load carrying capacity has not been reduced). There may be minor wear or abrasion at contact points. Cable banding may have started to loosen. Cable anchorages may show evidence of loosening or slight slippage.

Condition State 4: Steel cable may have advanced corrosion (significant section loss). The load carrying capacity has been reduced - structural analysis or immediate repairs may be required. Cable may have severe wear or abrasion at contact points. Cable banding may have failed - cable strands may be loose or broken. Cable anchorages may have significant slippage.

Element #147: Steel Cable - Coated or Encased

This element applies to coated steel cables (such as suspension, hanger, or tie cables) that serve as a structural element on a bridge. This can include cables that are painted, galvanized, covered with a protective sheathing, or encased in a conduit. The quantity is expressed as an each item.

Condition State 1: Cable coating (or encasement) is sound and functioning as intended to protect the cable (and cable anchorages) - there is no corrosion.

Condition State 2: Cable coating (or encasement) may have minor deterioration (peeling, cracking, fading, etc.) - surface corrosion may have formed.

Condition State 3: Cable coating (or encasement) has moderate deterioration - surface corrosion may be prevalent, but there is no section loss. Cable may have superficial wear or abrasion at contact points. Cable anchorages have no evidence of distress.

Condition State 4: Cable coating (or encasement) has extensive deterioration. There may be extensive surface corrosion, but any section loss is incidental (the load carrying capacity has not been reduced). There may be minor wear or abrasion at contact points. Cable banding may have started to loosen. Cable anchorages may show evidence of loosening or slight slippage.

Condition State 5: Coated steel cable may have advanced corrosion (significant section loss). The load carrying capacity has been reduced - structural analysis or immediate repairs may be required. Cable may have severe wear or abrasion at contact points. Cable banding may have failed - cable strands may be loose or broken. Cable anchorages may have significant slippage.

3.5.5 Secondary Structural Elements

Element #380: Secondary Structural Elements

This element applies to any type of secondary structural element. This can include superstructure members such as diaphragms, lateral bracing, struts, truss portal & sway bracing, or shear keys. This can include substructure elements such as pier crash struts or cross bracing. This can include specialized elements on movable spans (such as sheaves, trunnions, turntables, or counterweights). This includes any material (or combination of materials). The quantity is expressed as an each item - the quantity can be listed as "1" (it isn't necessary to count the total number of secondary elements on a bridge).

Condition State 1: Secondary elements have little or no deterioration. Steel members have little of no corrosion - the paint system (if present) is sound & functioning. Concrete members may have superficial cracking. Timber members may have superficial cracking or splitting. All connections are sound (no evidence of distress).

Condition State 2: Secondary elements have minor to moderate deterioration. Steel members may have moderate paint failure or surface rust - there may be minor flaking or pack rust, but only minimal section loss. Concrete surfaces may have moderate staining, scale, cracking, or leaching - there may be minor delaminations & spalls, but there is minimal exposure of reinforcement. Timber members may have moderate cracks, splits, checks, decay, or fire damage - but there is no evidence of structural distress (crushing or sagging). Connections may show have minor distress. There may be superficial traffic impact damage (minor gouges, spalls, or scrapes), but there is no significant out of plane bending. The element may have been repaired, or had some sections replaced. Any patched, spliced, or reinforced areas are sound.

Condition State 3: Secondary elements have extensive deterioration, but the element is still functioning as intended. Steel members & connections may have extensive corrosion, with measurable section loss. Concrete surfaces may have extensive scale, cracking, or leaching/rust staining. Delamination & spalling may be prevalent (exposed rebar may have measurable section loss). Timber members may have extensive splits, checks, decay, or fire damage - there may be some sagging or crushing. There may be moderate traffic impact damage (significant cracking or spalling) - the member may be bent out of plane. Repaired or reinforced areas may have been re-damaged or began to deteriorate. Connections may be loosening.

Condition State 4: Secondary elements have severe damage deterioration. Element is no longer functioning as intended - structural analysis or immediate repairs may be required. Steel members & connections may have advanced corrosion, with severe section loss. There may be significant fatigue cracks. Concrete surfaces may have severe structural cracking or extensive spalling (exposed rebar may have severe section loss). Timber members may have severe structural cracking, sagging, or advanced decay. There may be severe traffic impact damage - members may be severed or bent severely out of plane, connections may have been torn loose. Connections may have failed.

3.5.6 Cast-in-Place (CIP) Piling

Element #382 (Cast-in-Place Piling): This element applies to steel shell piling (typically cylindrical in cross-section) that are filled with concrete after being driven. The quantity is expressed as an each item.

Condition State 1: CIP piling has little or no deterioration. Paint system (if present) remains sound. The steel shell may have minor staining or corrosion, but there is no section loss. There is no notable marine growth. Piling is relatively straight and properly positioned.

Condition State 2: CIP piling has minor to moderate deterioration. Paint system (if present) may have moderate deterioration. The steel shell may have moderate surface corrosion, but any section loss is minor. Marine growth may be present. Piling may be slightly bowed, bent, or out of position.

Condition State 3: CIP piling has extensive deterioration, but the load-carrying capacity has not been significantly reduced. Paint system may have failed. The steel shell may have extensive flaking rust (with significant section loss), but there is no exposure of the concrete fill. There may be extensive marine growth. Piling may be significantly bowed, bent, or out of position.

Condition State 4: CIP Piling has severe or critical deterioration. The load-carrying capacity of the piling has been significantly reduced - immediate repairs or structural analysis may be required. The steel shell may have advanced corrosion (with severe section loss) - the concrete fill may be exposed. Piling may be severely bowed, bent, or out of position.

3.5.7 Tunnels

Element #381 (Tunnels): This element applies to roadway tunnels of any type or material. This element includes tunnels constructed by boring, blasting, or by "cut and fill". Tunnels are typically constructed of (or lined with) reinforced concrete - exposed surfaces often protected with tile. The quantity is expressed as a "linear ft." item and is rated on a scale of 1-4.

Condition State 1: Tunnel has little or no deterioration. Tiles surfaces are sound (there may be superficial scraping, staining, or discoloration). Concrete surfaces may have superficial cracking, scaling, or leaching (there are no notable delaminations or spalls). Joints have no notable leakage, separation, offset, or misalignment.

Condition State 2: Tunnel has minor to moderate deterioration. Tile surfaces may have moderate staining, discoloration, or deterioration - some tiles may be cracked, delaminated, loose, or missing. Concrete surfaces may have moderate cracking, scaling, or leaching. There may be minor delamination or spalling - any exposure of reinforcement is minimal. Joints may have minor leakage, separation, offset, or misalignment (there is no notable backfill infiltration).

Condition State 3: Tunnel has extensive deterioration, but the function or structural capacity of the tunnel has not been significantly impaired. Tile surfaces may have extensive deterioration - numerous tiles may be cracked, delaminated, loose, or missing. Concrete surfaces may have extensive cracking, scaling, or leaching. There may be significant structural cracking. Delamination or spalling may be prevalent (exposed rebar may have measurable section loss). Joints may have significant leakage, separation, offset, or misalignment (there may be minor backfill infiltration).

Condition State 4: Tunnel has severe or critical deterioration. The function or structural capacity of the tunnel has been severely impacted - immediate repairs or structural analysis may be required. Tile surfaces may have complete failure (the majority of tiles are missing). Concrete surfaces may have severe scaling or spalling (exposed reinforcement may have significant section loss). There may be severe structural cracking. Joints may have failed - there may be severe leakage, separation, offset, or misalignment (there may be significant backfill infiltration).

3.6 PONTIS Culvert Elements

3.6.1 Inspection Procedures for Culverts

While the FHWA requires inspection of any structure with a total length of 20 ft. or greater, Minnesota State law requires inspection of any structure with a total length of 10 ft. or greater - thus, the Mn/DOT structure inventory includes many small (10-20 ft.) culverts.

While culverts are typically designed to allow drainage below a roadway embankment, they may also serve as underpasses for vehicles, pedestrians, or livestock. Culverts are designed to support the dead load of the embankment material as well as live loads from traffic. If the embankment fill is more than 3 ft. deep, the fill is likely the primary load.

Culverts are constructed of a variety of materials, including concrete (cast-in-place or precast), corrugated steel plate, stone masonry, timber, or aluminum. The size and shape of a culvert is usually determined by the hydraulic requirements (the opening must be large enough to carry the design discharge). Culvert shapes include arch culverts, box culverts, round pipe culverts, pipe-arch culverts, or elliptical culverts. A culvert may consist of a single barrel or multiple barrels.

Culverts can be structurally classified as either "flexible" or "rigid". Steel culverts are typically considered to be flexible - a flexible culvert derives a significant amount of structural strength from the surrounding soil (the lateral soil pressure helps to resist vertical loads). Concrete culverts are typically considered to be rigid - a rigid culvert provides its own structural strength, and does not necessarily require embankment fill.

A complete culvert inspection should include examining the culvert barrel, end treatments, waterway, embankment slopes, and the roadway. Ideally, a walk-through inspection of the entire the culvert barrel should be conducted during low water conditions (high water or ice can prevent inspection of critical areas). If an adequate walk-through inspection cannot be performed, it should be noted in the inspection report, and a complete inspection should be performed when conditions allow. If necessary, an underwater inspection may need to be performed.

During culvert inspection, two main items need to be determined - the hydraulic performance and the structural condition...

Hydraulic Performance: Poor hydraulic performance can result in excessive ponding, flooding of adjacent properties, or washouts of the embankment and roadway. The inspector should note any conditions that might reduce the hydraulic performance of the culvert.

- Poor horizontal or vertical channel alignment can reduce hydraulic efficiency, increase sedimentation, or accelerate embankment erosion. Culverts on flat grades may have excessive sediment, culverts on steep grades may have outlet scour.

- Accumulation of debris at the inlet (or excessive sedimentation within the barrel) can reduce the culvert's hydraulic capacity, accelerate embankment erosion, or alter the channel alignment. While some sedimentation is inevitable, any excessive sedimentation should be noted.

- Changes in land use such as wetland drainage, deforestation, or increased development can significantly increase the runoff (and resultant discharge) that a culvert must carry. Channel changes upstream (or immediately downstream) of the culvert can result in overtopping of the roadway. The inspector should note the high water elevation (or freeboard), as well as any evidence of overtopping.

Structural Condition: Although culverts generally deteriorate at a slower rate than bridges, poor structural condition can eventually result in load restrictions or failure. The inspector should note any evidence of structural deterioration or distress - this includes material deterioration, barrel shape, and joint misalignment/separation. Photographs are useful for comparison to previous (or future) inspections.

Material Deterioration: The inspector should inspect all visible surfaces of the culvert, and note both the extent and severity of any significant material deterioration.

- Concrete culverts should be examined for scaling, cracking, leaching, rust stains, delaminations, or spalls. Severe cracking may indicate uneven settlement or structural overloading (from traffic or excessive earth pressure). Any significant spalling (with exposed reinforcing steel) should be documented. Connection bolts on pre-cast concrete culverts should be examined for corrosion.

- Steel culverts should be examined for corrosion (particularly along the waterline). Bolted seams should be examined for cusping, loose or missing bolts, and cracking around bolt holes.

- Timber culverts should be examined for weathering, warping, decay, fire damage, insect damage, or loose connections. Defects or connections can provide openings for moisture (and eventually decay) - any evidence of decay (such as fruiting bodies, staining, or surface depressions) should be noted.

- Masonry culverts should be examined for weathering, cracks, spalls, crushing, or misalignment of the masonry blocks. The mortar joints should be examined for any deterioration.

- Aluminum culverts are relatively resistant to corrosion, but will corrode rapidly in highly alkaline environments. Bolted seams should be checked with a torque wrench (125 ft-lbs to 150 ft-lbs).

Barrel Shape: As flexible culverts (steel, aluminum, or timber) rely upon the surrounding soil to provide lateral support, embankment stability is essential. Deflection or distortion of the barrel may indicate instability of the supporting soil, and may reduce the load-carrying capacity of the culvert. Significant changes in the barrel shape should be noted (and verified with field measurements).

- Deflection is caused differential long-term settlement over the length of the culvert (from embankment pressure). As the center of the embankment will settle more than the side slopes, culverts often end up with a low spot below the center of the roadway (steel culverts are often designed with a camber to compensate for this).

- Distortion is any deviation from the design cross-section of the culvert barrel, which should be symmetrical, with even curvature. Barrel distortion may be caused by uneven settlement, overloading, or from damage during the initial backfilling. Distortion is more common on culverts with less than 3 ft. of embankment fill.

Joint Misalignment & Separation: Joint misalignment or separation may be caused by improper installation, undermining, uneven settlement, or embankment failure. Leaking joints (exfiltration or infiltration) can eventually result in severe undermining or even culvert failure.

- Exfiltration is water leaking out of the culvert barrel - this can lead to "piping" (water flowing along the outside of the culvert barrel), which can eventually erode the supporting soil. The inspector should look for leaking joints and observe the culvert ends for evidence of piping.

- Infiltration is water leaking into the culvert - this can also erode the supporting soil. Infiltration can be difficult to detect, as the backfill deposits are often washed away. The inspector should look for staining at the joints on the sides and top of the culvert, or depressions above the culvert.

3.6.2 Condition Rating Guidelines for Culverts

Like bridges, culverts must be rated using both the NBI and PONTIS element condition ratings...

NBI Condition & Appraisal Ratings: The overall structural condition of a culvert should be rated using the NBI Culvert Rating (FHWA Item #62 - see Section 2.1.5). The NBI condition ratings for deck, superstructure, and substructure (FHWA Items #58, 59, and 60) should all be listed as "N".

If the culvert is designed to carry water (even when the channel running through the culvert is normally dry), the channel should be rated using NBI Channel & Channel Protection Condition Rating (FHWA Item #61- see Section 2.1.4). This rating should reflect the channel alignment, as well as the presence of any sedimentation or debris. Note: If FHWA Item #61 is rated, the Waterway Adequacy Appraisal Rating (FHWA Item #71- see Section 2.2.1) must also be rated - this rating is primarily based upon the frequency of overtopping of the roadway during high water events.

PONTIS Element Condition Ratings: The condition of the culvert barrel should be rated using one of the four AASHTO CoRe Elements (depending upon the material type). The quantity is expressed in linear feet, as measured along the length of the barrel (multiplied by the number of barrels). If the condition varies along the length of the culvert barrel, more than one condition state may be used (all culvert barrel elements are rated on a scale of 1-4).

- **Element #240 - Steel Culvert (LF)**
- **Element #241 - Concrete Culvert (LF)**
- **Element #242 - Timber Culvert (LF)**
- **Element #243 - Masonry, Combination, or Other Material Culvert (LF)**

Mn/DOT has added Element #388 to rate the condition of the headwalls, wingwalls, and aprons (or any other type of culvert end treatment), and has added Element #421 to rate the condition of culvert footings.

The condition of the roadway above the culvert should be rated using Element #987 (roadway over culvert). The inspector should note any settlement or cracking of the roadway, as this may indicate culvert distortion (or voiding of backfill). On flexible (steel) culverts; look for settlement above the centerline of the culvert. On rigid (concrete) culverts, look for settlement along the edges of the culvert. If applicable, the inspector should also rate Element #981 (signing) and Element #982 (approach guardrail).

The condition of the culvert embankment slopes should be rated using Element #985 (slopes & slope protection) - embankment erosion may be the result of channel scour or roadway drainage. If scour is present, Element #361 (scour smart flag) should be also be rated, if slope erosion is due to roadway drainage, Element #984 (deck & approach drainage) should also be rated.

Related Structure Inventory Items: The Mn/DOT structure inventory includes three culvert items - the culvert type, the culvert barrel length, and the culvert fill depth. The culvert type item describes the culvert material, barrel dimensions, and number of barrels. The culvert barrel length item indicates the culvert barrel length (to the nearest foot) as measured along the centerline of the culvert. These two inventory items should correlate with the PONTIS elements selected for the culvert.

The culvert fill depth item indicates the total depth of fill material (including the wearing surface, if any) that is supported by the culvert. This item is displayed to feet (rounded to the hundreds of a foot). The inspector should note the culvert fill depth on the inspection report, as this may affect the load-carrying capacity of the culvert. For example, if the roadway has been widened (and the culvert extended), the embankment depth may increase significantly.

3.6.3 Steel Culverts (Element #240)

This element applies to steel culverts of any type or shape.

Condition State 1: Steel culvert has little or no deterioration. The barrel has no deflection or distortion. The protective coating (if any) is sound. There may be minor staining or surface corrosion, but there is no section loss. All seams and joints are sound - there is no distress or leakage.

Condition State 2: Steel culvert has minor to moderate deterioration. The barrel may have slight deflection or distortion. The protective coating (if any) may have moderate deterioration. There may be moderate surface corrosion or minor section loss (surface pitting). Bolted seams may have minor distress, but all bolts are secured, and there is no cracking around the bolt holes. Joints may have minor leakage, but there is no backfill infiltration.

Condition State 3: Steel culvert has extensive deterioration, but the function or structural capacity of the culvert has not been significantly impaired. The barrel may have measurable deflection or distortion (sagging, flattening, or buckling). The protective coating may have failed. There may be extensive surface corrosion or measurable section loss. Bolted seams may have obvious distress (seams may be cusped or cocked). Bolts may be loose or misaligned - cracks may have formed around the bolt holes. Joints may have moderate leakage - there may be minor backfill infiltration.

Condition State 4: Steel culvert has severe or critical deterioration. The function or structural capacity of the culvert has been severely impacted - immediate repairs or structural analysis may be required. The barrel may have severe deflection or distortion (sagging, buckling, or crown reversal). There may be advanced corrosion & severe section loss (large sections rusted through). Bolted seams may have failed. Joints may have severe leakage or separation - there may be significant backfill infiltration.

3.6.4 Concrete Culverts (Element #241)

This element applies to reinforced concrete culverts (pre-cast or cast-in-place) of any type or shape.

Condition State 1: Concrete culvert has little or no deterioration. There may be superficial cracking, scaling, leaching, or staining (there are no delaminations or spalls). Joints have no leakage, separation, offset, or misalignment. Connection bolts (if any) may have minor surface corrosion.

Condition State 2: Concrete culvert has minor to moderate deterioration. There may be moderate cracking, scaling, leaching, or staining. There may be minor delamination or spalling - but any exposure of reinforcement is minimal. Joints may have minor leakage, separation, offset, or misalignment (there is no backfill infiltration). Connection bolts may have moderate corrosion.

Condition State 3: Concrete culvert has extensive deterioration, but the function or structural capacity of the culvert has not been significantly impaired. There may be extensive cracking, scaling, leaching or staining. Structural cracking may be present. Delamination & spalling may be prevalent (exposed rebar may have section loss). Joints may have moderate leakage, separation, offset, or misalignment (there may be minor backfill infiltration). Connection bolts may have severe corrosion (or other distress).

Condition State 4: Concrete culvert has severe or critical deterioration. The function or structural capacity of the culvert has been severely impacted - immediate repairs or structural analysis may be required. There may be severe structural cracking. There may be severe scaling or spalling (exposed reinforcement may have significant section loss). Joints may have severe leakage, separation, offset, or misalignment (there may be significant backfill infiltration). Connection bolts may have failed.

3.6.5 Timber Culverts (Element #242)

This element applies to timber culverts of any type or shape.

Condition State 1: Timber culvert has little or no deterioration. The barrel has no distortion or deflection. There may be superficial weathering, splitting, cracking, or staining. There is no decay, fire damage, structural distress, or leakage. Timber members are properly aligned and orientated, connections are secure.

Condition State 2: Timber culvert has minor to moderate deterioration. Barrel may have slight deflection or distortion. There may be moderate weathering, cracking, or splitting. There may be minor decay, fire damage, or structural distress. There may be minor leakage, but there is no backfill infiltration. Timber members may be slightly warped, separated, offset or out of alignment. Connections may have minor deterioration or distress, but fasteners remain secure.

Condition State 3: Timber culvert has extensive deterioration, but the function or structural capacity of the culvert has not been significantly impaired. Barrel may have measurable deflection or distortion. There may be extensive weathering, cracking, or splitting. There may be moderate decay, fire damage, or structural distress (slight crushing or sagging). There may be moderate leakage (or evidence of backfill infiltration). Timber members may be significantly warped, separated, offset or out of alignment. Connections may have moderate deterioration or distress (fasteners may be loose).

Condition State 4: Timber culvert has severe or critical deterioration. The function or structural capacity of the culvert has been severely impacted - immediate repairs or structural analysis may be required. Barrel may have severe deflection or distortion. Timber members may have severe cracking, fire damage, or structural failure (significant crushing or sagging). There may be severe leakage or backfill infiltration. Connections may have failed. Timber members may be broken, missing, or severely out of alignment.

3.6.6 Masonry, Other, or Combination Material Culverts (Element #243)

This element includes masonry arch culverts, aluminum box culverts, or any other culvert not adequately described by elements #240, #241, or #242.

Condition State 1: Culvert has little or no deterioration - the barrel has no deflection or distortion. Joints have no leakage. Masonry may have superficial cracking (mortar joints are sound). Steel (or aluminum) may have surface corrosion. Concrete may have superficial cracking or scale. All members are properly aligned and orientated. All connections are secure.

Condition State 2: Culvert has minor to moderate deterioration - the barrel may have slight deflection or distortion. Joints may have minor leakage, but there is no backfill infiltration. Masonry may have moderate cracking or spalling (mortar joints may have minor deterioration). Steel (or aluminum) may have moderate surface corrosion, with minor surface pitting. Concrete may have moderate scaling or cracking - there may be minor delamination or spalling. Members may be slightly warped, separated, offset, or out of alignment. Connections may have minor deterioration or distress, but fasteners remain secure.

Condition State 3: Culvert has extensive deterioration, but the function or structural capacity of the culvert has not been significantly impaired. The barrel may have measurable deflection or distortion. Joints may have moderate leakage (or evidence of backfill infiltration). Masonry may have extensive cracking or spalling (mortar joints may have significant deterioration). Steel (or aluminum) may have extensive corrosion, with measurable section loss. Concrete may have extensive scaling, or cracking - delamination & spalling may be prevalent (exposed rebar may have section loss). Members may be significantly warped, separated, offset, or out of alignment. Connections may have moderate deterioration or distress (fasteners may be loose).

Condition State 4: Culvert has severe or critical deterioration. The function or structural capacity of the culvert has been severely impacted - immediate repairs or structural analysis may be required. Barrel may have severe deflection or distortion. Joints may have severe separation, leakage or backfill infiltration. Masonry may have severe cracking or spalling - mortar joints may have failed. Steel (or aluminum) may have advanced corrosion, with severe section loss. Concrete may have severe structural cracking or extensive spalling (exposed rebar may have severe section loss). Members may be broken, missing, or severely out of alignment. Connections may have failed.

3.6.7 Culvert End Treatments (Element #388)

This element applies to culvert headwalls, wingwalls, or other end treatments - this includes any material (or combination of materials). The quantity is expressed as an "each" item - on a typical culvert, the quantity will be "2" (one for each end).

Condition State 1: Culvert headwall, wingwall, or end treatment has little or no deterioration. - There may be superficial weathering or staining. Timber may have superficial cracking or splitting. Steel may have minor surface corrosion. Concrete may have superficial cracking or scale. Masonry may have minor cracking (mortar joints are sound). There is no separation, movement, tipping, settlement, or undermining.

Condition State 2: Culvert headwall, wingwall, or end treatment has minor to moderate deterioration. Timber may have moderate cracking or splitting - there may be some minor decay or fire damage, but no evidence of structural distress (crushing, or sagging). Steel may have moderate surface corrosion, minor surface pitting, or isolated areas of flaking/pack rust. Concrete may have moderate cracking, scaling, leaching, or rust/water staining - there may be some surface delamination or spalling. Masonry may have moderate spalling, splitting, or weathering (mortar joints may have moderate deterioration). Protective coatings (if any) may have minor/moderate failure. Any structural repairs (patches or reinforced sections) remain sound. There may be minor settlement, movement, tilting or separation. The apron may have minor undermining.

Condition State 3: Culvert headwall, wingwall, or other end treatment has extensive deterioration, but the function of the culvert has note been significantly impaired. Repairs may be required. Timber may have extensive splits, checks, decay, or fire damage - there may be some sagging or crushing. Steel may have extensive corrosion, with measurable section loss. Concrete may have extensive scale, cracking, or leaching/rust staining. Delamination & spalling may be prevalent (exposed rebar may have measurable section loss). Masonry may have extensive spalling, splitting, cracking, or weathering. Masonry joints may have extensive deterioration – courses may have slight separation or offset. Protective coatings (if any) may have complete failure. Structural repairs (patches or reinforced sections) may have begun to deteriorate. Wingwalls may have (significant) measurable settlement, movement, tilting, or separation. The apron may have moderate undermining.

Condition State 4: Culvert headwall, wingwall, or end treatment has severe deterioration, the function or structural capacity of the culvert has been severely impacted - immediate repairs or structural analysis may be required. Timber may have severe structural cracking or advanced decay – there may be severe sagging or crushing. Steel may have advanced corrosion, with severe section loss. Concrete may have severe structural cracking or extensive spalling (exposed rebar may have severe section loss). Masonry may have severe spalling, cracking, splitting, or weathering. Mortar joints may have severe deterioration - masonry courses may have severe separation or offset. Wingwalls may have severe settlement, movement, tilting, or separation. The apron may be severely undermined.

3.6.8 Culvert Footing (Element #421)

This element applies to culvert footings of any material (typically concrete or masonry). This is a "linear ft." item, and is rated on a scale of 1-4. This element allows the footings on arch culverts (or any footing-supported culvert) to be rated separately from the remainder of the culvert barrel. This element should only be used when the footing (or pedestal extending up from the footing) is above the ground line and is visible for inspection. *Note: Element #220 (Reinforced Concrete Footing) should not be used for culverts, as it is classified as a substructure element.*

Condition State 1: Culvert footing has little or no deterioration. Concrete may have superficial cracking, scaling, leaching, or staining (there are no delaminations or spalls). Masonry may have superficial cracking (mortar joints are sound). There is no settlement or undermining.

Condition State 2: Culvert footing has minor to moderate deterioration. Concrete may have moderate cracking, scaling, leaching, or staining. There may be minor delamination or spalling - but any exposure of reinforcement is minimal. Masonry may have moderate cracking or spalling (mortar joints may have minor deterioration). There may be minor settlement or undermining.

Condition State 3: Culvert footing has extensive deterioration, but the function or structural capacity of the culvert has not been significantly impaired. Concrete may have extensive cracking, scaling, leaching or staining. Structural cracking may be present. Delamination & spalling may be prevalent (exposed rebar may have section loss). Masonry may have extensive cracking or spalling (mortar joints may have significant deterioration). There may be significant settlement or undermining.

Condition State 4: Culvert footing has severe or critical deterioration. The function or structural capacity of the culvert has been severely impacted - immediate repairs or structural analysis may be required. Concrete may have severe structural cracking, or severe spalling (exposed reinforcement may have significant section loss). Masonry may have severe spalling, cracking, splitting, or weathering. Mortar joints may have severe deterioration - masonry courses may have severe separation or offset. There may be severe settlement or undermining.

3.7 PONTIS Smart Flag Elements

PONTIS "Smart Flag" elements identify conditions or problems present on a bridge that are not adequately addressed by conventional PONTIS element language. Some smart flags refer to specific problems that may warrant special attention or follow-up action, while some smart flags provide detailed information about the condition of specific bridge elements or materials. Mn/DOT currently has eleven PONTIS Smart Flag elements...

- **Element #356** Fatigue Cracking Smart Flag
- **Element #357** Pack Rust Smart Flag
- **Element #358** Concrete Deck Cracking Smart Flag
- **Element #359** Underside of Concrete Deck Smart Flag
- **Element #360** Substructure Settlement & Movement Smart Flag
- **Element #361** Scour Smart Flag
- **Element #362** Traffic Impact Smart Flag
- **Element #363** Section Loss Smart Flag
- **Element #964** Critical Finding Smart Flag
- **Element #965** Concrete Shear Cracking Smart Flag
- **Element #966** Fracture Critical Smart Flag

While the rating scales for PONTIS Smart Flag elements vary, they are all listed as an "each" item - the quantity should be entered as "1" (there is no need to calculate quantities).

The inspector should be familiar with all of the PONTIS Smart Flag elements, and review them during each inspection to ensure that all PONTIS Smart Flag elements which pertain to the bridge are displayed (and properly rated). Most PONTIS Smart Flag elements are not automatically displayed on the Mn/DOT Bridge Inspection Report - the inspector must determine when they should be added and rated. The exceptions are Smart Flag #964 (displayed on all inspection reports), Smart Flag #361 (displayed on all scour critical bridges), and Smart Flag #966 (displayed on all fracture critical bridges).

3.7.1 Fatigue Cracking Smart Flag (Element #356)

This smart flag only applies to steel elements that serve as primary bridge supports - it should only be used if fatigue cracking is actually present. While cracked tack welds should be noted in the inspection report, they should not be considered in this rating unless they have propagated into the base metal.

Condition State 1: Fatigue cracking has been arrested (drilled or ground out). Any resultant damage to the steel element has been repaired (the element may still be fatigue prone).

Condition State 2: Fatigue cracking exists and has not been arrested. *Note: this condition state is normally used when fatigue cracking is initially observed, or when additional fatigue cracking is observed (after repairs).*

Condition State 3: Fatigue cracking has seriously damaged a steel bridge element. Immediate repairs or structural analysis may be required.

3.7.2 Pack Rust Smart Flag (Element #357)

This smart flag only applies to pack rust on steel elements or connections. Pack rust is corrosion between adjacent steel surfaces that results in deformation due to the expansion of oxidized steel. Pack rust commonly occurs at pinned or riveted truss connections, between splice plates, and along the edge of built-up riveted members. Pack rust causes additional stress to the connection, and may result in the failure of pins, rivets, bolts, or welds. *Note: the presence of pack rust typically indicates the presence of section loss.*

Condition State 1: Pack rust has started to form on a steel element or connection (rust staining is evident along the edges or seams).

Condition State 2: Pack rust has started to distress a steel element or connection (there may be minor spreading, swelling, or scalloping).

Condition State 3: Pack rust has resulted in significant distress to a steel element or connection. There may be significant spreading, swelling, or scalloping - steel members may be significantly deformed or distorted. However, all connectors (pins, rivets, or bolts) remain intact.

Condition State 4: Pack rust has resulted in severe distress to a steel element or connection. Immediate repairs or structural analysis may be required. Steel members may be severely deformed or distorted, or connectors (pins, rivets, or bolts) may have failed.

3.7.3 Concrete Deck Cracking Smart Flag (Element #358)

This smart flag is used to rate the extent and severity of cracking in concrete wearing surfaces - if the deck has a bituminous or gravel wearing surface, there is no need to use this smart flag. Cracking of the wearing surface will eventually result in chloride contamination of the underlying concrete deck, and corrosion of the reinforcing steel. This smart flag can be used to track preventative maintenance (crack sealing), which can increase the service life of the deck. The condition state language for this smart flag is below is based upon the following general definitions...

> ***Crack Width:*** *"hairline cracks" are those too narrow to practically measure, "moderate cracks" are those large enough to measure, and "severe" cracks are those greater than ¼" in width (or otherwise deemed "severe" by the judgment of the inspector).*
>
> ***Crack Density:*** *"minor" crack density is an approximate spacing of 10 ft. or greater, "moderate" density is a spacing of 5-10 ft., and "severe" density is a spacing of 5 ft. or less (or otherwise deemed "severe" by the judgment of the inspector).*

Condition State 1: Concrete wearing surface has cracks, but the cracks are either sealed or insignificant in size and density.

Condition State 2: Concrete wearing surface has unsealed cracks of moderate size ***or*** density.

Condition State 3: Concrete wearing surface has unsealed cracks of moderate size ***and*** density.

Condition State 4: Concrete wearing surface has unsealed cracks of severe size and/or density.

3.7.4 Underside of Concrete Deck Smart Flag (Element #359)

This smart flag element is used to rate the condition of the underside of concrete decks and slabs - this can include the deck overhangs (copings). As this smart flag is used by the PONTIS NBI translator, it must be rated for all bridges with a concrete deck or slab (even if the underside of the deck is concealed by stay-in-place forms). This smart flag should typically not be used for bridges with an integral superstructure & deck (such as pre-cast channels, pre-stressed tees, or pre-stressed voided slabs).

"Distressed area" refers to leaching (efflorescence), salt/ water saturation, rust stains, delaminations, spalls, temporary repair patches, or other significant deterioration observed on the underside of a concrete deck or slab.

Condition State 1: Underside of deck (or slab) has little or no distress. There may be superficial cracking and/or light leaching, but there is no notable spalling or delamination. Stay-in-place forms have no corrosion.

Condition State 2: Underside of deck (or slab) has minor distress (less than 2% of the total area). There may be minor cracking, leaching, salt/water saturation, rust staining, spalling, or delamination. Stay-in-place forms may have surface corrosion, but there is no section loss.

Condition State 3: Underside of deck (or slab) has moderate distress (less than 10% of the total area). There may be moderate cracking, leaching, salt/water saturation, rust staining, spalling, or delamination. Stay-in-place forms may have surface corrosion (there may be some section loss). There are no full-depth failures (or impending failures) - no structural underpinning is present.

Condition State 4: Underside of deck (or slab) has extensive distress (between 10% and 25% of the total area). There may be extensive cracking, leaching, salt/water saturation, rust staining, spalling, or delamination. There may be impending full-depth failures - structural underpinning may be present. Stay-in-place forms may have severe corrosion and/or extensive section loss.

Condition State 5: Underside of deck (or slab) has severe distress (more than 25% of the total area). There may be cracking, leaching, salt/water saturation, rust staining, spalling, or delamination. There may be full-depth failures - structural underpinning may be required. Stay-in-place forms may have failed.

3.7.5 Substructure Settlement & Movement Smart Flag (Element #360)

This smart flag only applies to bridge substructure elements (piers, abutments, or wingwalls) that show evidence of settlement, movement, or rotation. It is intended to identify bridges that are experiencing settlement and to provide some measure of the magnitude of that settlement.

Condition State 1: Substructure elements have visible settlement, movement or rotation. The settlement has been arrested, appears to have stabilized, or is minor.

Condition State 2: Substructure elements have continuing settlement, movement or rotation. If not arrested, this could adversely impact the structural integrity of the bridge.

Condition State 3: Substructure elements have severe settlement, movement or rotation - structural analysis may be warranted.

3.7.6 Scour Smart Flag (Element #361)

This smart flag applies to scour - the erosion of streambeds and banks due to flowing water. It is intended to identify bridges that are experiencing scour (or have a history of scour problems) and to provide some measure of the magnitude of scour. This smart flag is also used to identify bridges that are scour critical, or require scour monitoring during high water (scour action plans). *Note: if the Mn/DOT Scour Code is listed as D, G, K, O, P, R or U, this smart flag will automatically be added.*

During each routine inspection, substructure components that are submerged in water should be investigated for scour by wading and probing. If the channel is too deep for wading, the underwater inspection report should be reviewed to determine the condition rating for this smart flag.

Condition State 1: Scour exists, but is of little concern to the structural integrity of the bridge. *Note: bridges with a Mn/DOT Scour Code of D, G, K, O, P, R or U can be rated as condition 1, even if no scour is currently present at the bridge site.*

Condition State 2: Scour exists that, if left unchecked, could adversely impact the structural integrity of the bridge.

Condition State 3: Scour exists that is significant enough to warrant analysis of the structure.

3.7.7 Traffic Impact Smart Flag (Element #362)

This smart flag applies to primary structural bridge elements (typically superstructure) that have traffic impact damage. While this typically refers to damage from high loads, it can include impact damage from other causes (flood debris, ice dams, etc.). The inspector should note any recent (or previously un-recorded) damage, and note any repairs. This smart flag should remain even after repairs have been made to provide a history of impact damage to the structure. *Note: This smart flag does not apply to damaged railings or guardrail.*

Condition State 1: Impact damage has been repaired (superficial damage may be present). Steel members have been straightened and/or reinforced. Concrete members have been patched (there is no exposed reinforcement or tensioning cables).

Condition State 2: Impact damage has occurred, but the structural integrity of the element (or bridge) has not been significantly reduced. Steel members may be bent out of plane. Concrete members may be spalled (exposed reinforcement or tensioning cables are still intact).

Condition State 3: Impact damage has occurred and the strength of the member is impaired. Analysis is warranted to ascertain the serviceability of the bridge.

3.7.8 Section Loss Smart Flag (Element #363)

This smart flag only applies to primary steel bridge elements that have section loss due to corrosion. Section loss is typically expressed as a percentage of the total cross-section area of the member (the percentages in the rating descriptions are included as a general guideline). *Note: the presence of flaking rust or pack rust indicates that at least some section loss is present.*

Condition State 1: Steel element has minor section loss (less than 2% of the total cross-section area). If the steel element has been recently repainted, any previously existing section loss has been reinforced (or is less than 5% of the total cross-section area).

Condition State 2: Steel element has moderate section loss (from 2% to 5% of the total cross-section area). If the steel element has been recently repainted, any previously existing section loss is not severe enough to warrant structural analysis (less than 10% of the effective section).

Condition State 3: Steel element has significant section loss, but structural analysis is not yet warranted (section loss is less than 10% of the total cross-section area) or structural analysis has determined that the existing section loss has not significantly reduced the structural integrity of the element.

Condition State 4: Steel element has severe section loss (more than 10% of the total cross-section area). The load-carrying capacity of the element has been significantly reduced - structural analysis or immediate repairs may be required.

3.7.9 Critical Finding Smart Flag (Element #964)

This smart flag indicates if a critical finding was observed during the inspection. A critical finding (or deficiency) is any structural condition that, if not promptly corrected, could result in collapse (or partial failure) of the bridge. This <u>does not</u> include safety-related problems (such as damaged railings, guardrails, etc.) - while such hazards should be reported and addressed promptly, they are not expected to result in collapse of the bridge, and are not considered to be critical findings.

Note: this smart flag must be included and rated on all bridge inspection reports - Mn/DOT Technical Memorandum TM-05-02-B-02 outlines the reporting and follow-up procedures for a critical finding.

Condition State 1: No critical findings were observed during the inspection.

Condition State 2: A critical finding was observed during the inspection. *The condition should be thoroughly documented, and the Engineer (and Bridge Owner) should be notified immediately. It may be necessary to restrict traffic until further evaluation can be made or until the situation is corrected.*

3.7.10 Concrete Shear Cracking Smart Flag (Element #965)

This smart flag only applies to reinforced concrete or pre-stressed concrete superstructure elements with existing shear cracks. Shear cracking can result form inadequate shear reinforcement, and typically appear as diagonal cracks near the supports (inclined towards the center of the span).

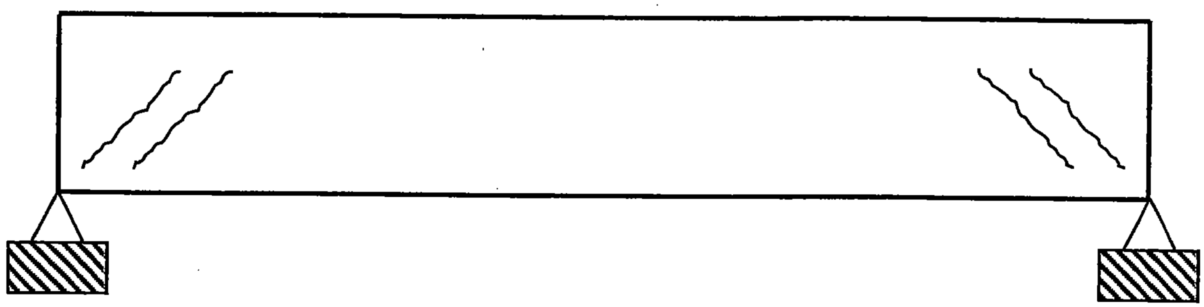


Diagram of anticipated shear crack locations in a simple span reinforced concrete beam.

Condition State 1: Shear cracking is present, but the cracking is isolated and minor (hairline).

Condition State 2: Shear cracking may be present in several locations, but the cracking is minor (no measurable offset along the crack). Minor leaching or rust staining may be present along the cracks.

Condition State 3: Shear cracking may be widespread or significant (measurable offset along the crack). Extensive leaching or rust staining may be present along the cracks. However, the structural integrity of the bridge has not been significantly reduced. Any severe shear cracks have been repaired and/or reinforced.

Condition State 4: Shear cracking is severe (significant offset along the crack). Shear cracking may be severe enough to reduce the structural integrity of the bridge. Immediate repairs or structural analysis may be required.

3.7.11 Fracture Critical Smart Flag (Element #966)

This smart flag identifies those bridges classified as "fracture critical". The intent of this smart flag is to insure that that all fracture critical members are visually examined during each routine inspection, and to identify problems discovered between "in-depth" inspections. Refer to the plans (or the fracture critical report) to identify the fracture critical members.

Note: A "fracture critical" bridge has at least one fracture critical member (a steel tension member whose failure would be expected to result in collapse of the bridge). Only bridges carrying vehicular traffic are considered to be "fracture critical" (pedestrian and railroad bridges are excluded).

Condition State 1: Bridge is "fracture critical" - all fracture critical members are structurally sound (no significant damage or deterioration).

Condition State 2: Bridge is "fracture critical" - fracture critical member(s) have damage or deterioration, but the members have either been repaired or structural analysis has determined that the member is stable for the anticipated loading (the bridge may have been posted with a load restriction).

Condition State 3: Bridge is "fracture critical" - damage or deterioration to fracture critical members warrants structural analysis or immediate repairs.

3.8 Other PONTIS Bridge Elements

These elements were added by Mn/DOT to rate the condition of items not addressed by the CoRe elements. They are all rated on a scale of 1-3 - the quantity can be listed as "1 each" (there is no need to calculate quantities).

3.8.1 Signing (Element #981)

This element applies to any signing mounted on a bridge, or any signing related to the bridge. This can include load posting signs, vertical or horizontal clearance signs, hazard markers, speed limit signs, plow markers, advance warning signs, informational signs, changeable message signs, etc. *Note: the required signage is displayed on the header of the inspection report (see section 2.2.7), and is automatically displayed in the signing element notes (this is based upon current structure inventory data).* <u>The inspector should note the actual load rating (in Tons) and/or posted vertical clearance (in Feet/Inches) on the inspection report.</u>

Condition State 1: All required signing is present and is in good condition (there may be superficial damage or deterioration).

Condition State 2: All required signing is present - signs may have some damage or deterioration (slightly bent or faded), but remain readable.

Condition State 3: Signing *(excluding vertical clearance or load posting signage)* is absent, or existing signing is damaged or deteriorated to the extent that repair or replacement is required.

Condition State 4: *Required vertical clearance signing is absent, incorrect, or existing signing is damaged or deteriorated to the extent that repair or replacement is required.*

Condition State 5: *Required load posting signing is absent, incorrect, or existing signing is damaged or deteriorated to the extent that repair or replacement is required.*

3.8.2 Approach Guardrail (Element #982)

This element rates the condition of guardrail above or below the bridge. This includes all types of guardrail (plate beam or cable), as well as guardrail end treatments and crash attenuators. *Note: if guardrail is absent (and should be installed), this element could be rated as "3".*

Condition State 1: All required guardrail is present, is in good condition, and is functioning as intended to protect vehicles from impacting the bridge.

Condition State 2: Guardrail may have moderate damage or deterioration, but is still functioning as intended to protect vehicles from impacting the bridge.

Condition State 3: Guardrail has severe damage or deterioration - repair or replacement is required (possible traffic hazard).

3.8.3 Plowstraps (Element #983)

Plowstraps (or "plow fingers") are small steel plates welded to expansion joints to prevent snowplow damage to the joint - they are common on strip seal expansion joints.

Condition State 1: All required plowstraps are present.

Condition State 2: Some plowstraps are missing and need replacement.

Condition State 3: Most plowstraps are missing and need replacement.

3.8.4 Deck & Approach Drainage (Element #984)

This element rates the condition, function, and adequacy of the drainage system. This includes drainage of the deck & approaches, and can include areas adjacent to (or below) the bridge. This includes items such as deck drains, inlets, scuppers, grates, drain troughs, downspouts, catch basins, spillways, splash aprons, ditches, or holding ponds. *Note: downspouts should extend far enough to prevent runoff from falling onto the superstructure.*

Condition State 1: Drainage system is in good condition and functioning as intended. There is no notable ponding or drainage-related slope erosion.

Condition State 2: Drainage system is inadequate or is not functioning properly. The drainage system may be clogged with debris - flushing or cleaning may be required. There may be ponding on the deck, approaches, or below the bridge. Misdirected runoff may be contributing to deterioration of bridge components or slope erosion. Drainage components may be damaged or deteriorated, but remain intact.

Condition State 3: Drainage system has failed - repairs are required. Severe ponding may present a traffic hazard. Misdirected runoff may have resulted in significant deterioration of bridge components, or may have resulted in severe slope erosion. Drainage components may be disconnected, missing, or severely deteriorated.

3.8.5 Slopes & Slope Protection (Element #985)

This element rates the condition of the slopes and slope protection - this includes unprotected (bare dirt) slopes. While this typically refers to the slopes in front of abutments, it can also include abutment side slopes, slopes around piers, or culvert embankments. Slope protection may consist of concrete paving, precast concrete blocks, bituminous-coated aggregate, loose riprap, grouted riprap, gabions, revet mattresses, or any material intended to protect the slope from erosion. *Note: slope erosion may be related to deck drainage or scour - the inspector should attempt to determine (and note) the cause of any slope erosion.*

Condition State 1: Slopes are in good condition - there is no notable erosion. Substructure is adequately protected (no exposure of footings or pilings). Slope protection (if present) may have superficial deterioration (there is no notable settlement, heaving, or undermining).

Condition State 2: Slopes may have minor to moderate erosion. Footings (or pilings) may be slightly exposed, but there is no significant undermining or loss of backfill. Slope protection (if present) may have moderate deterioration - there may be settlement, heaving, or undermining.

Condition State 3: Slopes may have severe erosion - repairs are required. Footings may be significantly undermined - there may be significant loss of backfill. Slope protection (if present) may be severely deteriorated - there may be significant settlement, heaving, or undermining.

3.8.6 Curb & Sidewalk (Element #986)

This element rates the condition of the sidewalk & curb on the bridge (or approaches). This includes any materials. This generally does not apply to a sidewalk running below the bridge, unless there are problems directly related to the bridge.

Condition State 1: Sidewalks and curbs are in good condition - there may be minor (superficial) damage or deterioration.

Condition State 2: Sidewalks and/or curbs have moderate damage or deterioration. Concrete may have cracking, spalling, or delamination. Timber may have cracking, splitting or decay.

Condition State 3: Sidewalks and/or curbs have severe damage or deterioration (repairs are required).

3.8.7 Roadway over Culvert (Element #987)

This element rates the condition of the roadway running above a culvert. Cracking or settlement of the roadway above a culvert may be the result of culvert settlement, barrel distortion, or voiding of backfill. On flexible (steel) culverts; look for cracking and settlement above the centerline of the culvert. On rigid (concrete) culverts, look for cracking and settlement along the edges of the culvert. Note: This element can also be used to rate the condition of the roadways associated with structures which do not have decks (such as filled spandrel arch bridges or tunnels).

Condition State 1: Roadway above culvert is in good condition. The paving may have minor cracking, but there is no settlement.

Condition State 2: Roadway above culvert has moderate cracking (or other deterioration). There may slight settlement.

Condition State 3: Roadway above culvert has severe cracking (or other deterioration) - there may be significant settlement.

3.8.8 Miscellaneous Items (Element #988)

This element can be used to rate the condition of any bridge feature not adequately described by the other elements & smart flags. This may include lighting (such as roadway lighting, signal lights, river navigation lights, pedestrian lighting, aesthetic lighting, or aircraft warning lights). This may include utilities (such as gas mains or electrical conduits). This element can also be used to address maintenance needs (such as flushing, tree trimming or graffiti).

Condition State 1: Minor damage or deterioration.

Condition State 2: Moderate damage or deterioration.

Condition State 3: Severe damage or deterioration - repairs may be required.

Appendix: Bridge Components & Structure Types

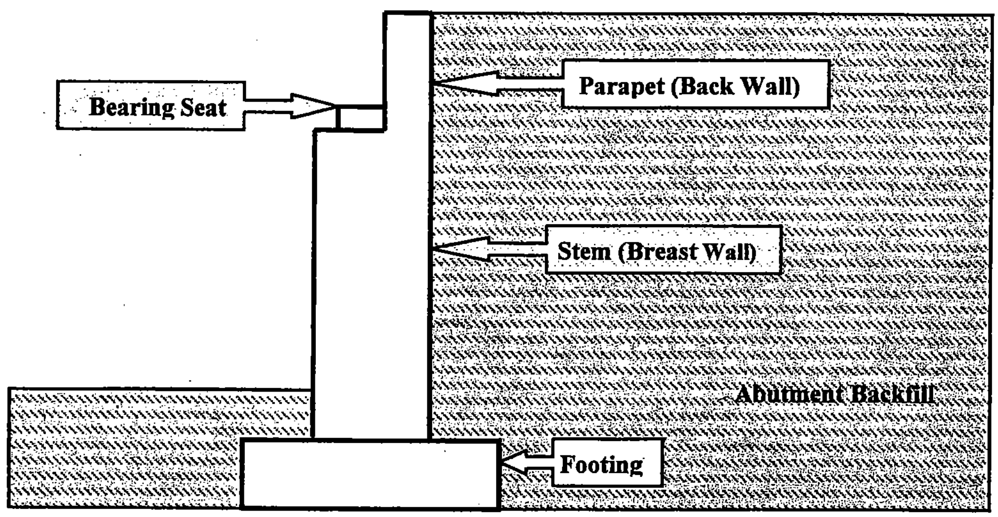
Note: This appendix is incomplete - it will eventually include general inspection procedures and condition rating guidelines for common bridge superstructure type, this will essentially be a condensed version of the guidelines in the Bridge Inspector's Reference Manual (BIRM).

A.1 Substructure Components

This section includes general inspection procedures and condition rating guidelines for substructure components (abutments, piers, and wingwalls). This includes general descriptions and terminology, as well as guidelines for the proper selection of PONTIS elements (and determining quantities).

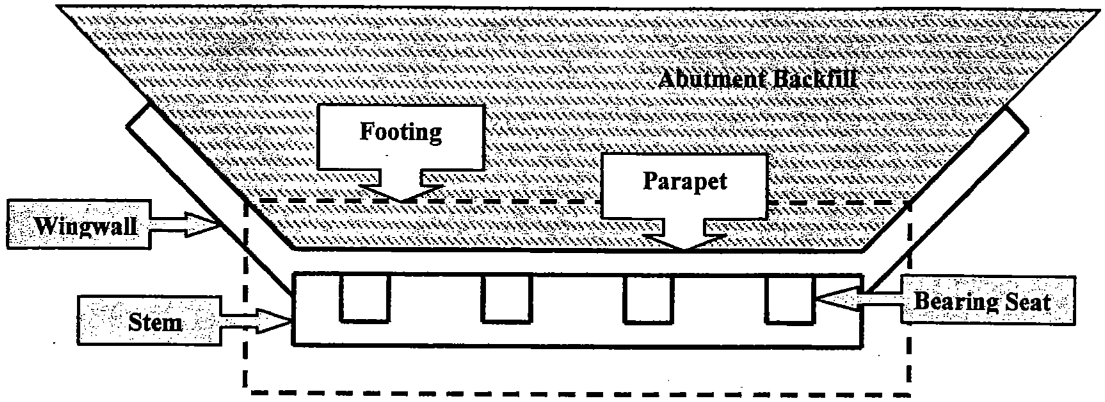
A.1.1 Condition Rating Procedures for Abutments

Components of a Concrete Abutment: Most abutments are constructed of reinforced concrete - while the overall configuration will vary, most concrete abutments share these typical components...



Cross-section (side view) of a Typical Concrete Abutment

- **Stem:** The abutment stem (or breast wall) is the primary component of the abutment - it transmits the load of the bridge superstructure to the footing, and retains the abutment backfill.
- **Bearing Seat:** The bearing seat provides a horizontal bearing area for the superstructure.
- **Parapet:** The parapet (or back wall) prevents backfill soil from sliding onto the bearing seat, and provides support for the deck expansion joint (or approach slab).
- **Footing:** The footing transmits the weight of the abutment, the soil loads, and the load of the bridge superstructure to the supporting soil. A footing may be supported by piling, or may transfer these loads directly to the supporting soil or rock ("spread footing").
- **Wingwall:** A wingwall is typically a short retaining wall extending from each end of the abutment which is intended to retain the side slope. The wingwall configuration will vary according the height of the abutment and the site conditions.



Plan View of a Typical Concrete Abutment

Inspection Procedures for Concrete Abutments:

- Note any concrete deterioration (cracking, leaching, rust staining, delamination or spalling).
- Note any evidence of deck joint leakage (such as staining on the abutment face or debris on the bearing seat).
- Weep holes (typically located near the base of the stem) should be examined for proper function.
- Note any distress on the parapet (cracking, spalling or tipping) resulting from the superstructure contacting the parapet or from approach pavement thrust.
- Note any evidence of settlement, rotation, or other movement.
- Note any deterioration of the slope protection, slope erosion, undermining, or footing/piling exposure.
- If the abutment is submerged in water, probe along the front face for any evidence of scour (review the underwater inspection report, if applicable).

Condition Rating Procedures for Concrete Abutments: An abutment has two basic functions - to support for the bridge superstructure, and to retain the abutment backfill. The condition ratings should reflect not only the condition of the visible concrete surfaces, but also the ability of the abutment to perform these two basic functions. The condition rating descriptions for reinforced concrete elements are outlined in Section 3.4.3.

- Element #215 (Reinforced Concrete Abutment) should be used to rate the abutment stem, seat, and parapet). This is a "linear foot" item - the quantity is determined by measuring horizontally across the front face of the abutment (excluding the wingwalls).

- Mn/DOT has added element #387 (Reinforced Concrete Wingwall) to rate the wingwalls. This is an "each" item (a single condition state must be determined for each wingwall) - the quantity will typically be "4" (one wingwall at each corner).

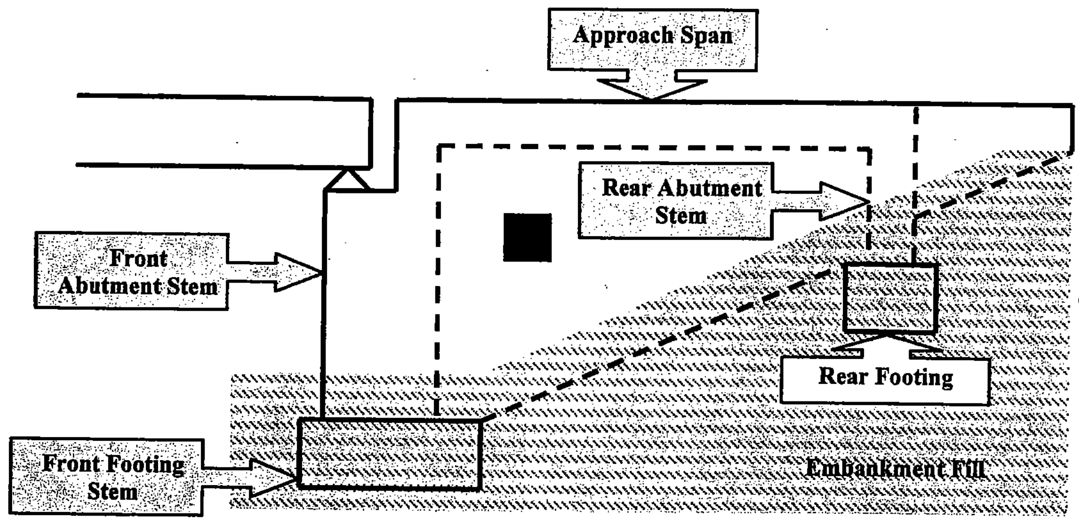
- As the footings (and pilings) supporting a concrete abutment are typically not visible for inspection, they are typically not rated. If the abutment footing is visible for inspection, it can be rated using element #220 (Reinforced Concrete Footing) - this is an "each" item.

- If settlement, rotation, or other movement of the abutment is evident, the Settlement Smart Flag (element #360) must be rated accordingly (see Section 3.7.5). If scour is present, the Scour Smart Flag (element #361) must be rated accordingly (see Section 3.7.6).

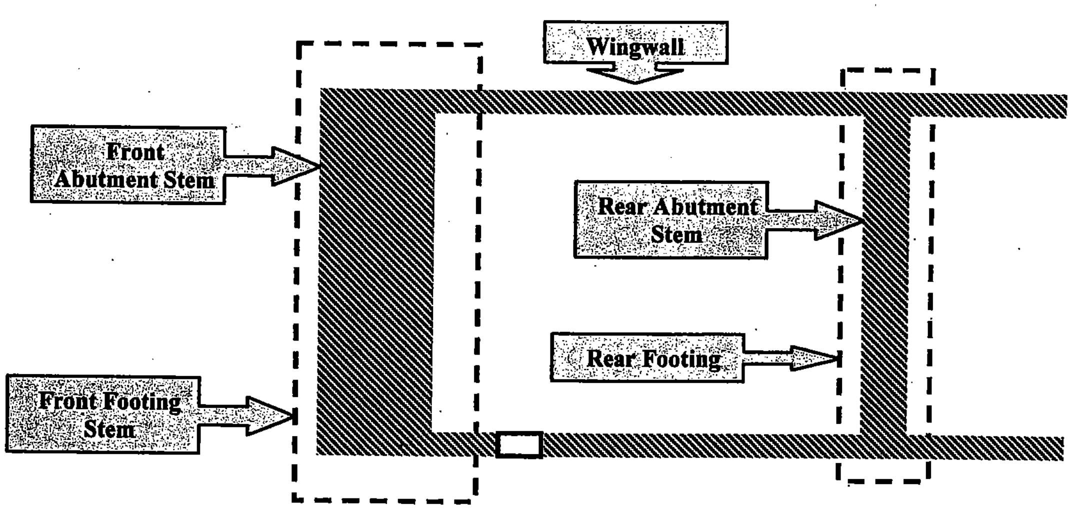
- Element #985 (Slopes & Slope Protection) should be used to rate the condition of the abutment slopes (and slope protection, if any).

Hollow Concrete Abutments: Hollow "U-Type" concrete abutments are actually an enclosed approach span (typically a cast-in-place concrete T-girder or slab span). The wingwalls enclose the sides of the span, creating a "hollow" abutment that appears to be solid (access hatches are typically located on the wingwalls or parapets). These are designed to reduce the dead load (as opposed to a solid abutment) and subsequent settlement of the abutment. *Note: periodic internal inspections are required to assess the condition of the interior elements - confined space entry procedures may be required.*

Element #215 (Reinforced Concrete Abutment) should be used to rate the front abutment stem (including the seat and parapet) as well as the rear abutment stem - the LF quantity will be twice that of conventional abutment. Element #387 (Reinforced Concrete Wingwall) should be used to rate the condition of the sidewalls. An element must also be selected to rate the enclosed approach span - depending upon the span type, this may include beam, deck, or slab elements.

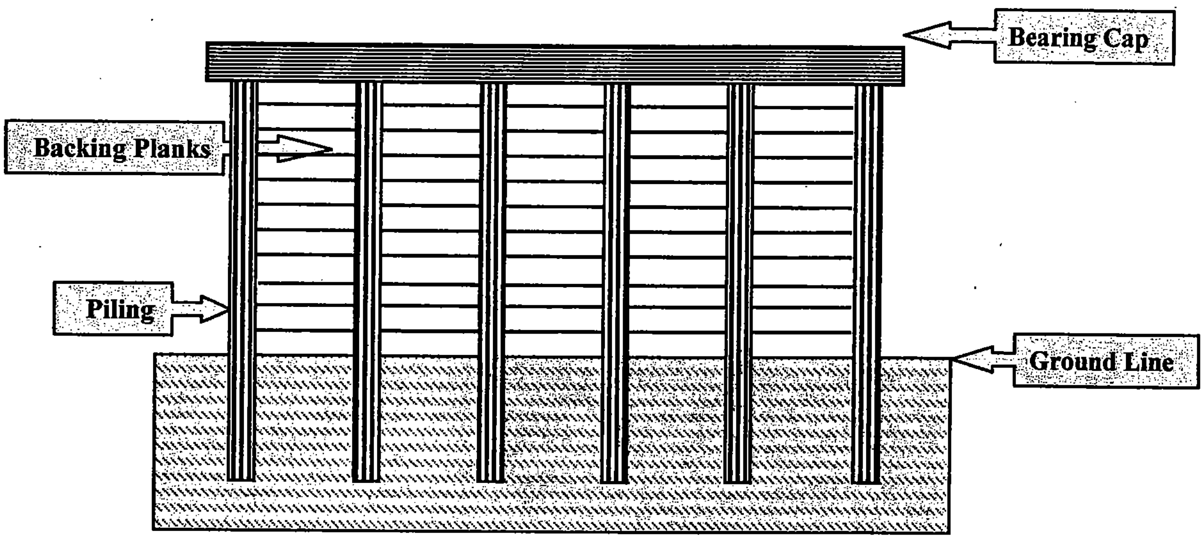


Elevation View of a Hollow Concrete Abutment



Section View (Looking Down) of a Hollow Concrete Abutment

Condition Rating Procedures for Timber Abutments: Timber abutments are typically comprised of three main components (backfill planks, bearing cap, and piling), which are rated using separate PONTIS elements. These components may be connected with bolts, lag screws, nails, spikes, or drift pins (cap to piling connections are often reinforced with steel straps). The inspector should determine the condition of each element (see Section 3.4.5 for timber element rating descriptions), as well as the overall orientation and stability of the abutment. The presence of failed connections or misaligned members should be reflected in the element ratings. *Note: If the abutment has tipped, rotated, or settled, the settlement smart flag (element #360) should be appropriately rated.*



Front View of a Typical Timber Abutment

- **Backfill Planks:** The backfill planks retain the abutment backfill and transfer the earth pressure forces to the piling - they should be inspected for bulging, gaps, or voided backfill. Element #216 (Timber Abutment) should primarily reflect the condition of the backfill planks, but should also reflect the overall structural condition of the abutment. This is a linear ft. item (measured along the front face of the abutments (excluding the wingwalls).

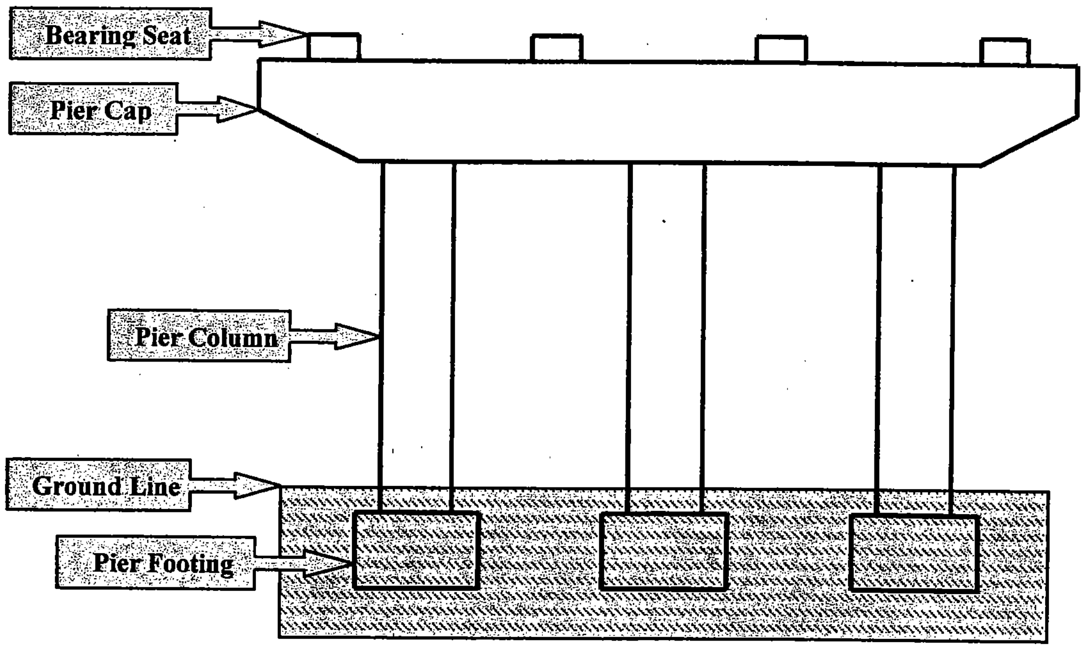
- **Bearing Cap:** The bearing cap provides a bearing seat for the superstructure, and transfers the superstructure loads to the piling. Element #235 (Timber Pier Cap) should be used to rate the condition of the abutment bearing cap. This is a "linear ft." item (measured along the length of the cap) - the total element quantity should include the pier caps (if any). *Note: If the cap is comprised another material (such as steel or concrete), the appropriate cap element should be selected.*

- **Piling:** The piling transmit the superstructure load to the supporting soil. To resist the horizontal force resulting from earth pressure, abutment piling may incorporate steel cable tie-back systems. Element #228 (Timber Piling) should be used to rate the condition of the abutment piling. This is an "each" item - the total element quantity should include the pier piling (if any), but not the wingwall piling. *Note: If the piling are comprised another material (such as steel or concrete), the appropriate piling element should be selected.*

- **Wingwalls:** Mn/DOT has added element #386 (Timber Wingwall) to rate the wingwalls, the quantity is expressed as an "each" item - on a typical bridge, this quantity will typically be "4" (one wingwall at each corner). The wingwall piling can be included in this element (there is no need to include them in the total piling quantities).

A.1.2 Condition Rating Procedures for Piers

Concrete Column Pier: The most common pier configuration is a reinforced concrete "column pier", which is comprised of two or more columns (bearing on footings), which support a bearing cap. These piers are typically cast-in-place, and are tied together with steel reinforcement to create a rigid frame.



Typical Concrete "Column Pier" Configuration

- **Pier Cap:** The pier cap is the upper horizontal portion of the pier that supports the superstructure - they are subjected to bending and shear forces. The pier cap (including the bearing seats) is rated using element #234 (Reinforced Concrete Cap) - this is a "linear foot" quantity (measured along the length of the cap).

- **Pier Columns:** The vertical pier columns transfer the superstructure load from the pier cap to the pier footing - they are primarily subjected to compression forces. Pier columns are rated using element #205 (Reinforced Concrete Column) - this is an "each" item, a single condition rating must be determined for each column. If there are protective crash struts (or barriers) between the pier columns, they can be rated using element #380 (Secondary Structural Elements) - this is an "each" item, the quantity can simply be left as "1" (there is no need to add them up them).

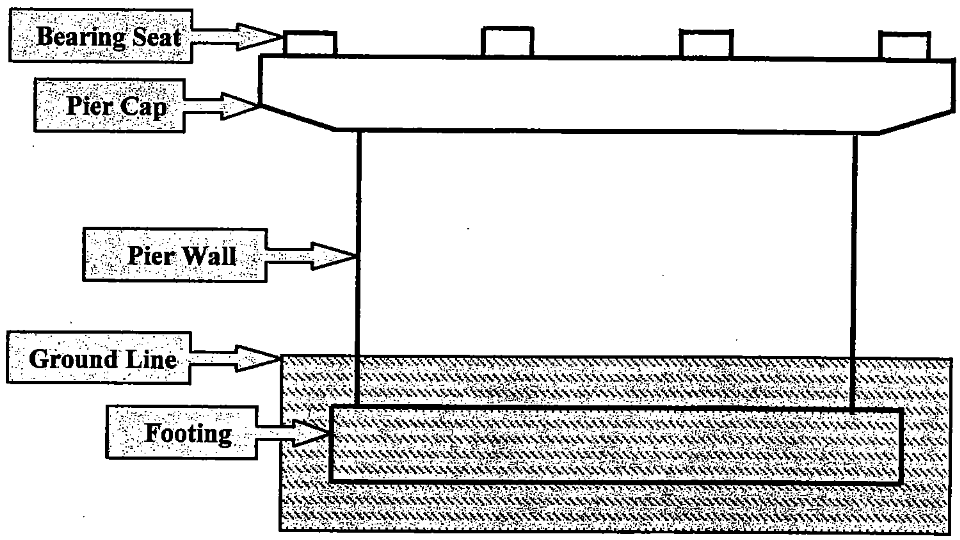
- **Pier Footings:** As pier footings are typically below grade and not visible for inspection, they are typically not rated.

Inspection Procedures for Concrete Piers:

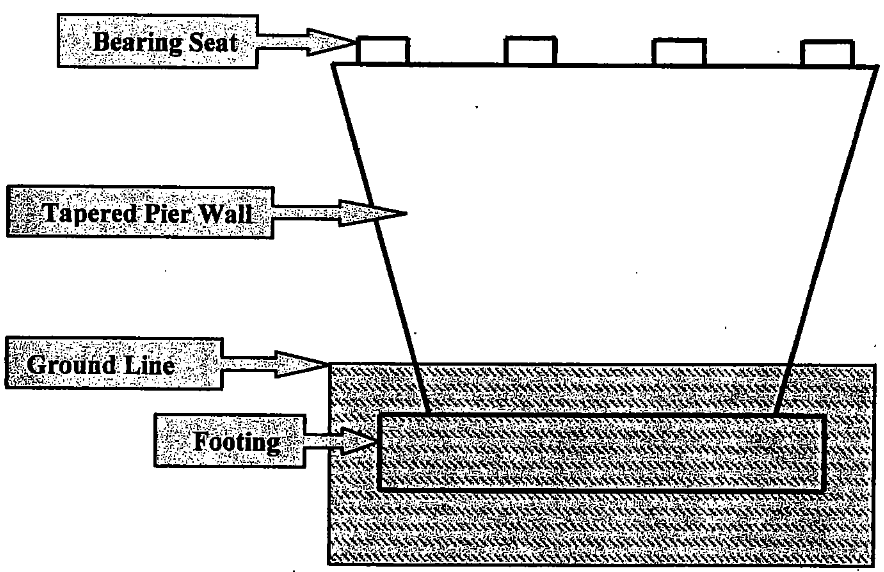
- Note any concrete deterioration (cracking, leaching, rust staining, delamination or spalling).
- Note any evidence of deck joint leakage (staining on the cap or debris on the bearing seat).
- Note any evidence of settlement, tipping, rotation, or other movement.
- If the pier is submerged in water, the perimeter of the pier should be probed for evidence of scour, undermining, or footing/piling exposure (refer to the underwater inspection report, if applicable).
- Note the presence and condition of any pier protection components (such as dolphins, fenders, or crash struts).

Concrete Pier Walls: Another common reinforced concrete pier configuration is a "pier wall", which is supported by a solid shaft (instead of separated columns) - the shaft may be straight (vertical) or tapered. Element #210 (Reinforced Concrete Pier Wall) should be used to rate any pier supporting element that is 10 ft. or greater in width. This is a "linear ft." quantity (measured horizontally along the face of the pier wall (on tapered pier walls, use the widest dimension).

A pier wall may or may not include a pier cap. If a pier cap is present, element #234 (Reinforced Concrete Cap) should be used to rate the cap and bearing seats. If no cap is present, the bearing seats can be included with element #210 (Reinforced Concrete Pier Wall). As pier footings are typically below grade and not visible for inspection, they are typically not rated.



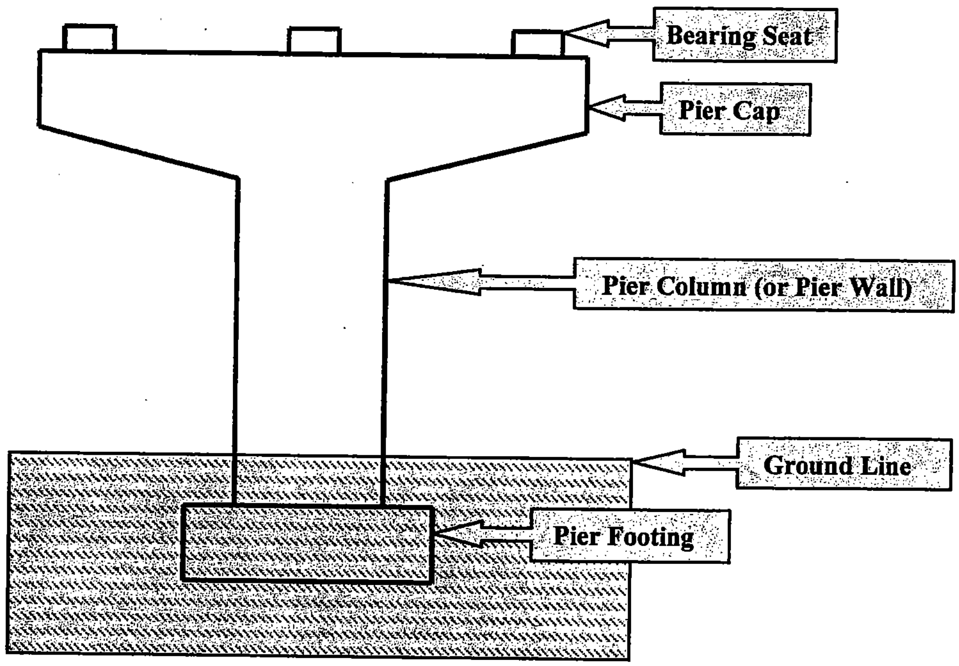
Concrete Pier Wall - Straight (Vertical) Shaft with Pier Cap



Concrete Pier Wall - Tapered Shaft without Pier Cap

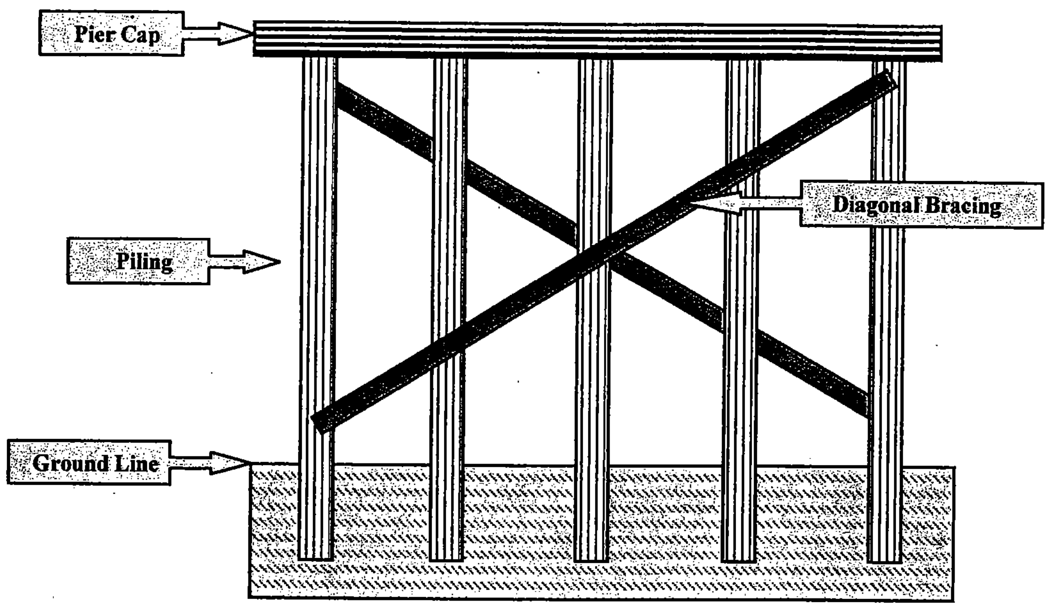
Hammerhead Pier: A "hammerhead pier" consists of a single column with a relatively wide cantilevered pier cap. Element #234 (Reinforced Concrete Cap) should be used to rate the cap and bearing pedestals - this is a "linear foot" quantity (measured along the length of the cap). The cantilever portion of the cap should be examined for any evidence of structural distress (such as shear cracking).

Element #205 (Reinforced Concrete Column) will typically be used to rate the column - this is an "each" item. However, if the vertical support is 10 ft. or greater in width, it should be rated using element #210 (Reinforced Concrete Pier Wall) - this is a "linear foot" item. As pier footings are typically below grade and not visible for inspection, they are typically not rated.



Typical "Hammerhead" Pier Configuration

Pile Bent Piers: Piers comprised of two or more piling supporting a pier cap are known as pile bents - while these are typically comprised of timber, they may include steel or concrete members. The inspector should determine the condition of each element, as well as the overall orientation and stability of the pier. The presence of failed connections or misaligned members should be reflected in the element ratings. *Note: If the pier has tipped, settled, or moved the settlement smart flag (element #360) should be appropriately rated.*



Pile Bent Pier

Piling: Pier piling transmit the superstructure load from the pier cap to the supporting soil (they are mainly subjected to compression forces). Piling should be examined for impact damage or deterioration (particularly along the waterline or ground line). If the piling are submerged in water, the adjacent stream bottom should be probed for evidence of scour (refer to the underwater inspection report, if applicable). Mn/DOT six piling elements - they are all "each" items, a single condition rating must be determined for each pile.

- Element #225: Unpainted (Weathering) Steel Piling
- Element #226: Prestressed Concrete Piling
- Element #227: Reinforced Concrete Piling
- Element #228: Timber Piling
- Element #382: CIP (Cast-in-place) Piling
- Element #419: Painted Steel Piling

Pier Cap: The pier cap provides a bearing seat for the superstructure, and transfers the superstructure loads to the piling. The connections between the cap and piling should be examined for any deterioration or distress. On a pile bent pier, the cap will typically be rated using element #230 (Unpainted Weathering Steel Pier Cap, element #231 (Painted Steel Pier Cap), element #234 (Reinforced Concrete Pier Cap), or element #235 (Timber Pier Cap). These are linear ft. items (measured along the length of the cap) - the total element quantity should include the abutment bearing caps (if any).

Pier Bracing: To prevent buckling, timber pier pilings are often reinforced with diagonal bracing - these should be examined for deterioration, impact damage, or connection failure. Bracing members can be rated using element #380 (Secondary Structural Elements) - this is an "each" item, the quantity can simply be left as "1" (there is no need to count up the separate members).

Prime Contractor	S.P. Number	District Number
AMES CONST CO INC	3806-0052	01
HARDRIVES INC	7305-0080	03
BAUERLY BROS INC	8601-0048	03
ROCHESTER SAND & GRAVEL DIV MA1	7903-0036	06
ULLAND BROTHERS INC	6935-0086	01
THORSON A DIVISION OF NORTHSTAR	0410-0039	02
MATHIOWETZ CONSTRUCTION CO	4013-0043	07
MATHIOWETZ CONSTRUCTION CO	0702-0108	07
SOUTHERN MINNESOTA CONSTR CO	0714-0028	07
THORSON INC	0406-0042	02
CENTRAL SPECIALTIES INC	2106-0030	04
DUININCK BROTHERS INC	3408-14	08
THE MATHIOWETZ CONST CO	8103-47	07
RILEY BROS CONSTRUCTION INC	4812-0049	03

Location
LOCATED ON TH 61 FROM SO LIMITS OF BEAVER BAY TO CHAPINS CURVE
LOCATED ON TH 23 FROM 0.4 MI NE OF TH 94 TO 0.3 MI W OF 10TH AVE S IN WAITE PARK
LOCATED ON TH 12 FROM 13TH AVE IN HOWARD LAKE TO 0.1 MI W OF CO RD 110 W OF MONTROSE
ON TH 60 FROM JCT TH 63 IN ZUMBRO FALLS TO JCT TH 61 IN WABASHA
TH 169NB & SB FROM 500 FT SOUTH OF JCT TH 169 & TH 73 RAMP TO 500 FT SOUTH OF CO RD 109
LOCATED ON TH 71 FROM TURTLE RIVER TO JCT OF TH 72 AND ON TH 72 FROM JCT OF TH 71 TO 1.04 MILES NORTH
LOCATED ON TH 19 FROM 3825 FT WEST TO 2533 EAST OF TH 169 AND ON TH 169 FROM 2000 FT SOUTH TO 4152 FT NORTH OF TH 19
LOCATED ON TH 14 FROM 0.06 MILE EAST OF JCT TH 60 TO 0.50 MILE EAST OF JCT CO RD 60
ON TH 22 FROM BLUE EARTH CSAH 12 TO BR 07036 IN BLUE EARTH COUNTY
LOCATED ON TH 2 FROM 1.76 MILES W. OF CO RD 91 TO WILTON IN CLEARWATER & BELTRAMI COUNTIES
TH 27 FROM MCKAY AVE IN ALEXANDRA TO W CORP LIMITS OF THE CITY OF OSAKIS
LOCATED ON TH 23 FROM JCT TH 71 TO 0.14 MILE SOUTH OF CSAH 31 RT
LOCATED ON TH 14, FROM CORD 37 TO 2500 FEET SOUTH OF CSAH 2
LOCATED ON TH 169 FROM 2.0 MILES SO. OF ONAMIA TO 0.15 MILE SO OF THE NORTH JCT OF TH 27

Type work performed	Date Bids opened
GRADING,	5/24/1996
GRADING,	3/28/1997
GRADING,	7/28/2000
GRADING,	2/23/2001
RUBBLIZE	7/27/2001
BIT MILL &	12/14/2001
GRADING,	3/8/2002
GRADING,	3/29/2002
GRADING,	4/23/1999
GRADING,	5/28/1999
GRADING,	4/27/2001
GRADING,	12/20/2002
GRADING,	2/27/2004
GRADING,	1/30/1998

Mn/DOT OFFICE OF BRIDGES AND STRUCTURES

Bridge No.: 9340 Bridge Inspection Report Oct 18, 1993

Road System:01 ISTH
Road Number:35W
City:
Township:
Maint. Area / District: 5A
Control Section :2783

County :27 HENNEPIN
Load Posting(Tons) :LEGAL
Reference Point :018.538
Deck Area (Sq.Ft.) :205956
Painted Area (Sq.Ft.) :490200
Crew No. :2

Location:1.0 MI NE OF JCT TH 94
Feature Crossed:OV RR & MISS R & 2ND ST
Bridge Type :RIVETED ST CONT DK.TRUSS
Min. Vert (Und/Und) :15.2
Min. Vert (Over/Over) :
Inspection Classification :A

NO	ITEM	RATINGS				%PCT	QUANT	UNIT
	SUBSTRUCTURE	6	6	6	6			
1	Abutments	7	7	7	7			
2	Piers	6	6	6	6			
3	Bridge Seats	8	8	8	8			
	SUPERSTRUCTURE	4	4	4	4			
4	Trusses	7	7	7	7			
5	Girders	N	N	N	N			
6	Floor Beams	7	7	6	6			
7	Stringers or Beams	8	8	8	8			
8	Bearing Devices	4	4	4	4			
9	Arches	N	N	N	N			
10	Fascia Beams	8	8	8	8			
11	Diaphragms	8	8	8	8			
12	Spandrel Columns	8	8	8	8			
	DECK	6	6	6	6			
13	Structural Slab	6	6	6	6	1	2059.	sqft
14	Wearing Surface	7	7	7	7			
15	Curb & Walk	7	7	7	7			
16	Railing	4	4	4	4			
17	Expansion Joints	6	6	6	6			
18	Bridge Deck Drains	6	6	6	6			
19	Median							
	AREA UNDER BRIDGE	8	8	8	8			
20	Channel & Protection	8	8	8	8			
21	Fenders							
22	Roadway,Railway,Other	8	8	8	8			
23	Slopes & Berms	8	8	8	8			
	CULVERT & WALL	N	N	N	N			
24	Barrel & Floor	N	N	N	N			
25	Apron,Wingwall,Headwall	N	N	N	N			
	APPROACH ROADWAY	7	7	7	7			
26	Approach Near (S or W)	7	7	7	7			
27	Approach Far (N or E)	7	7	7	7			
	OTHER	5	5	5	5			
28	Signing	8	8	8	8			
29	Retaining Wall	N	N	N	N			
30	Guardrail	8	8	8	8			
31	Fence	8	8	8	8			
32	Paint	5	5	5	5	8	39216	sqft
33	Plow Straps	N	N	N	N			
34	Drainage	6	6	6	6			
35	Miscellaneous							

COMMENTS

BRIDGE 9340 YEAR '93
Bridge 9340 Year 92
Bridge 9340 Year 90
Bridge 9340 Year 88
Bridge 9340 Year 87

62 SNOOPER INSPECTION 9/21/91

1.) SO. ABUT. BRIDGE SEAT CRACKED & DISCOLORED

4,58

1.) NORTH APPROACH SPANS PIERS HAVE BEEN PATCHED EXTENSIVELY WITH SHOT-CRETE - BUT OTHER AREAS ARE IN NEED OF PATCHING.

58

1.) PIER 7 (FIXED PIER ON NO. EDGE OF RIVER) WEST COLUMN IS CRACKED VERTICALLY THROUGH COLUMN

62

1.) LAST FOUR BEARING PLATES SOUTH ABUTMENT WEST SIDE ARE QUITE RUSTY.

20

1) NO. END OF WEST TRUSS CONNECTION TO FLOOR BEAN EXTENSIVE CORROSION UNDER JOINT - NEEDS SPOT BLAST AND PAINT OR SEVERE CORROSION WILL RESULT WITHIN 5 YEARS (BY 1997).

20

1) WEST MAIN TRUSS, LOWER CHORD 2 FLOOR TRUSSES SO. OF PIER 1 - 1/8 IN. L OF S.

20

1) WEST TOP CHORD OVER NO. PIER - TACK WELD TRANS. TO TOP FLG OF CHORD HOLDING FILL PLT. (BAD SITUATION BUT NO CRACKS).

29,8

1.&4.) KNEE BRACING ON SOUTH EAST BEARING & BEAM HAS BEEN REPLACE BY BRIDGE CREW AND SEEMS TO BE WORKING WELL.

8,29

1.&4.) THERE IS A COATING OF PIGEON DUNG ON STEEL WITH NEST AND HEAVY BUILDUP ON THE INSIDE HOLLOW BOX SECTIONS.
MODERATE TO SEVERE RUSTING OF CONNECTIONS UNDER MEDIAN.

33

1) FIRST SPAN
FLOOR TRUSS #3 - CENTER BAD WELD UNDERCUT IN

INSPECTOR	YEAR	REVIEWED BY
CHESTER MARTIN	1991	LARRY LEHRKE
CHAS. MARTIN &J. ANDERSON	1991	LARRY LEHRKE
MORAVEC, MARTIN & ALNANNN	1993	
MORAVEC, MARTIN & WAKS	1993	TERRY MORAVEC

EXHIBIT
5

FLANGE.
FLOOR TRUSS #4 - TOP CORD TACK WELD CRACKED.

SECOND SPAN

FLOOR TRUSS #5 - TOP CORD AT CENTER HAS PLATE WELDED TO BOTTOM FLANGE - LONGITUDINAL.
FLOOR TRUSS #6 - AT TOP OF CORD CENTER THERE IS A FOUR WAY DIAGONAL MEMBER THAT ARE WELDED TRANSVERSE TO BOTTOM FLANGE.
FLOOR TRUSS #10,11,12 - AT TOP OF CORD, CENTER DIAGONAL STIFFENER PLATE HAS A WELD TRANSVERSE TO BOTTOM FLANGE.
FLOOR TRUSS #13 - SAME AS ABOVE TRANSVERSE AND HEAVY RUST AT MEDIAN, AT END OF BOTTOM FLANGE IS A LOSS OF SECTION OF 25% FROM PACK RUST ON DIAGONAL PLATE AT CENTER TOP CORD.

THIRD SPAN

FLOOR TRUSS #1 - TOP CORD AT CENTER PLATE TO DIAGONALS HAS A TRANSVERSE TACK WELD TO BOTTOM FLANGE.
FLOOR TRUSS #2 - HEAVY PACK RUST WITH LOSS OF SECTION ON TOP AND BOTTOM CORD AT CENTER AND PLATE TO DIAGONAL.
FLOOR TRUSS #3 - AT CENTER TOP CORD EIGHTH STRINGER BOLT HEAD BROKE OFF AT BEARING AND WELD AT DIAGONAL PLATE TO BOTTOM FLANGE TRANS.

33
) 1992 INSPECTION
CONNECTION FLOOR BEAM(MULTI TO TRUSS) NORTH END
CRACK IN STIFFENER WHERE TRUSS PASSES THROUGH FLOOR BEAM. DRILLED OUT
CONNECTION FLOOR BEAM, SOUTH END
CRACK IN WEB AT WEST CONNCTION. GROUND OUT

79
7) MODERATE TO SEVERE RUST UNDER MEDIAN AND EXPANSION AREAS ON CONSTRUCTION.

79
7.) RUST ON TOP FLANG UNDER DECK CONCRETE SPAN 2, 7, 10, 11, 22. PACK RUST ON H-BEAM STRINGER AT SPAN 4.

7) 8 1ST MULTI-BEAM SPAN NO. OF TRUSS - GOUGES IN BTM OF ALL BEAMS OVER ROUDWAY.

96
? ~~8~~.) BEARINGS ON SPAN # 1 CANTILEVER SECTION ARE CLOSED TIGHT AT 60 DEGREES F.

96
? ~~8~~.) BEARING PINS ON TRUSS BEARING ASSEMBLIES AT ENDS OF TRUSS SHOULD BE REPLACED WITH SLIGHTLY LONGER BOLTS TO ALLOW FOR THERMAL THRUST (ON EVEN EXPANSION - DUE TO TEMPERATURE DIFFERENCES BETWEEN GIRDERS AND TRUSS COMPONENTS.)

159
~~13~~) STRUCTURAL SLAB UNDER THE MEDIAN OVERHANGS (AND OUTSIDE OVERHANGS) IS SPALLING AWAY WITH NORTH BOUND 2100 SQ. FT. OF SPALL. SOUTH BOUND 1000 SQ FT OF SPALL. 50 S.F. OF LOOSE CONCRETE ON BOTTOM OF MEDIAN OVER NORTH ACCESS ROAD AND PARKING LOT ON SOUTH END OF BRIDGE.

159
~~13~~) LOOSE CONCRETE AT CENTER MEDIAN OVER DUMP AREA AND ROAD ALONG RIVER - NORTH BANK (S.E. MPLS SIDE)

158
~~14~~.) 3000 L.F +OR- OF SLIGHT TO MODERATE TRANSVERSE CRACKS. 25 SF OF CRACKED AND DELAM. NORTH BOUND EAST TWO LANES, REMOVED AND PATCHED. 122

~~4~~) 122 3 S.F. SPALL S.B. LEFT CENTER LANE NEAR NO. FINGER JOINT.

186
~~15~~.) CURBS STARTING TO SPALL ALSO.

104
~~16~~.) 25% CONCRETE RAILING UNSOUND.
SEVERE CRACKING OF WEST RAIL DUE TO TRAFFIC DAMAGE WHICH HAS BROKEN ONE POST ON WEST SIDE AT SOUTH END AND ONE BROKEN POST ON NORTH END EAST SIDE.

90
~~17~~.) APPEARS TO BE PAVEMENT THRUST FROM BOTH ENDS OF THE BRIDGE. WHILE RELIEF JOINTS HAVE BEEN CUT IN PAVEMENT THEY ALSO SHOULD BE CUT IN CURBS AND

MEDIANS. NORTH BOUND ALL EXPANSION JOINTS ARE STARTING TO PULL OUT.

8 ~~22~~. 6-8% PAINT UNSOUND Approach Spans

~~23~~.) 184 DRAINAGE SYSTEM WHERE DOWN PIPES ARE USED ARE PLUGGED. MOST OF DRAINAGE DEVICES ON BRIDGE ARE PLUGGED & GROWING VEGETATION.
20 L.F. OF HORZ. CRACKS IN NORTH SLOPE. 185

188 ~~31~~.) WIRE FENCE DOWN AT SOUTH ABUTMENT ON BOTH SIDES.

20 ~~32~~.) PAINT IS 20% UNSOUND.

20 ~~32~~.) PAINT UNDER MEDIAN JOINT IS IN POOR CONDITION WITH SMALL AREAS OF PACKRUST. THESE AREAS SHOULD BE CLEANED AND REPAINTED.

184 ~~34~~.) DRAINAGE TROUGH UNDER HINGE JOINT ON THE SOUTH END OF THE MAIN TRUSS BROKE LOOSE FROM ITS MOUNTINGS.

188 ~~35~~.) LIGHT BASE ON P.G. GROUT ERODED, SHOULD BE REPAIRED. LIGHT BASE COVERS MISSING AND WIRES EXPOSED.

OTE: RELIEF JOINTS ARE NEEDED ON BOTH ENDS OF BRIDGE. IN CURBS AND MEDIAN.

NOTE: LIGHT BASE ON P.G. GROUT ERODED. THIS SHOULD BE REPAIRED.

NOTE: LIGHT BASE COVERS MISSING AND WIRES EXPOSED.

NOTE: MODERATE TO SEVERE RUST UNDER MEDIAN AND EXPANSION AREAS ON CROSS TRUSSES.

NOTE: DRAIN OVER THE RIVER IS PLUGGED.

NOTE: RUBBER GLAND AT SOME EXP. JOINTS STARTING TO LET

LOOSE AND LEAK.

WESTSIDE:

LOOSE BOLT 2ND INTERIOR STRINGER BEARING AT V18

NICK ON BOTTOM OF DIAGONAL L15 - 14

NICK ON BOTTOM OF LOWER CORD L15 - 14

2 NICKS IN DIAGONAL L15 - V12

NICK IN BOTTOM OF TOP CORD L10 - V8

NICK IN BOTTOM OF H SECTION TOP OF FLOOR BEAM V6

NICK IN TOP OF H SECTION BOTTOM FLOOR BEAM V6

ADDITIONAL COMMENTS FROM OCTOBER 13-18. 1993 SNOOPER INSPECTION.

20 ~~1~~) DOWNSTREAM TRUSS AT L11 INSIDE GUSSET PLATE HAS LOSS OF SECTION 18" LONG AND UP TO 3/16" DEEP (ORIGINAL THICKNESS = 1/2").

DOWNSTREAM TRUSS AT L13 THE LOWER HORIZ. BRACE BETWEEN THE TRUSSES HAS 3/16" SECTION LOSSAT RIVITED ANGLE.

TOP CORD OF UPSTREAM TRUSS JUST NO. OF NORTH RIVER PIER - POSSIBLE CRACKS IN WELD OF WEST BAFFLE GUSSET TO TOP FLANGE. CAN'T GET TO IT. CHECK AT NEXT IN DEPTH INSPECTION, POSSIBLE ULTRA-SONIC INSPECTION.

33~~0~~) AT FLOOR TRUSE #11 AT STRINGER #11 THERE IS A CRACK IN THE WELD FROM THE BEARING BLOCK TO THE TOP FLANGE OF THE FLOOR TRUSS.

AT FLOOR BEAM U7 UPSTREAM SIDE DIAGONAL TO THE NORTH HAS EXCESSIVE PLAY & MOVEMENT AT UPPER PIN - PIN SHOWS LIGHT WEAR, 1/8" GAP.

FLOOR TRUSS #1 - COTTER PIN MISSING ON PIN HOLDING SWAY BRACE TO LOWER CHORD.

4TH FLOOR TRUSS FROM NORTH - COTTER PIN MISSING IN PIN CONNECTING THE BRACE TO THE BOTTOM CHORD OF THE FLOOR TRUSS.

FLOOR TRUSS OVER NORTH RIVER PIER - 4 BLOTS CONNECTING FLOOR BEAMS #'S 4 & 5 TO THE FLOOR TRUSS WERE MISSING AND REPLACE THIS SPRING DURING THE BRIDGE WASHING; 2 WITH 3/4" BOLTS AND 2 WITH 3/4" REDI-ROD. THE REDI-ROD SHOULD BE REPLACE WITH BOLTS.

79~~7~~) AT (U5)(U10) WELD AT TOP FLANGE TO STRINGER BEARING BLOCK NEEDS CRACK GROUND OFF SOUTH SIDE. AT (5)(U11) WELDS AT BOTTOM FLANGE OF TOP CHORD OF FLOOR TRUSS #5 TO BEARING BLOCK TO TOP CHORD OF EAST MAIN TRUSS NEED CRACKS AT WELDS GRUOND OUT.

CRACKED WELD AT BOTTOM FLANGE OF STRINGER #9 TO PINNED DIAGONAL BETWEEN FLOORTRUSSES #'S 8 & 9.

AT (5)(U3) 3 - 7/8" X 8" BOLS MISSING FROM BEARING BLOCK.

96
~~8~~) MULTI-GRIDGE AREA AT SO. END - CANT. HINGES ARE IN FULL EXPANSION AND NOT WORKING. GRIDGER ENDS ARE IN CONTACT.

PIER #4 - EXPANSION BEARINGS APPEAR TO BE FROZEN.

154
~~18~~) DRAIN OVER HUNCH IS PLUGGED.

08/02/2007
Crew Number: 7627
Inspector: INSPECTOR

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 04-03-2000**

County: HENNEPIN
City: MINNEAPOLIS
Township:
Section: 25 Township: 029N Range: 24W
Span Type: CSTL BEAM SPAN
NBI Deck: 5 Super: 4 Sub: 6 Chan: 8 Culv: N

Location: 1.0 MI NE OF JCT TH 94
Route: ISTH 35W Ref. Pt.: 018+00.538
Control Section: 2783 Maint. Area: METRO
Local Agency Bridge Nbr:

Length: 1,907.0 ft
Deck Width: 113.3 ft (Varies)
Rdwy. Area / Pct. Unsnd: 201,511 sq ft
Paint Area / Pct. Unsnd: 490,200 sq ft 15 %

Open, Posted, Closed: OPEN

Appraisal Ratings - Approach: 8 Waterway: 8
MN Scour Code: L-STBL;LOW RISK
Def. Stat: S.D. Suff. Rate:

Required Bridge Signs - Load Posting: NOT REQUIRED Traffic: NOT REQUIRED
Horizontal: NOT REQUIRED Vertical: NOT APPLICABLE

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
22	LS O/L (CONC DECK)	2	04-03-2000	219,086 SF	0	0	219,089	0	0
			04-05-1999	219,086 SF	0	0	219,089	0	0

Notes: 122) 3 lanes + on/off ramp each direction (2 ft. shoulders). [1978] Low slump overlay (extensive full-depth repairs). [1993] Minor spalls & patched areas along finger joints. [1998] Median copings replaced (stay-in-place steel forms), exterior copings patched with "gunnite". [1998] Partial chaining of NBL found 1,665 SF of delamination & 47 SF of spall. [1999] Ground penetrating radar survey (FWHA) found deck to be 6% unsound.

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
48	LS O/L (CONC SLAB)	2	04-03-2000	219,086 SF	0	219,089	0	0	0
			04-05-1999	219,086 SF	0	219,089	0	0	0

Notes: 148) Spans #12-14 have a 2 ft. deep CIP concrete voided slab (continuous).

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
300	STRIP SEAL JOINT	2	04-03-2000	946 LF	746	50	150	N/A	N/A
			04-05-1999	946 LF	908	38	0	N/A	N/A

Notes: 90) [1978] Strip seals (Type "H") installed at abutments, Pier #11, and stringer expansion joints (7 joints total). [1998] South Abutment joint (SB) repaired with new product (hot pour with steel mesh) - steel extrusion was too corroded to install new gland. [1995/2000] Pier #11 joint has numerous leaks (SB & NB), glands in the stringer joints have pulled out in scattered locations.

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
301	POURED DECK JOINT	2	04-03-2000	1,017 LF	0	356	661	N/A	N/A
			04-05-1999	1,017 LF	0	356	661	N/A	N/A

Notes: 91) Deck has 1,017 LF of transverse poured joints. [1997] All have leaching below (with some deck spalling).

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
303	ASSEMBLY DECK JOINT	2	04-03-2000	326 LF	0	326	0	N/A	N/A
			04-05-1999	326 LF	218	108	0	N/A	N/A

Notes: 93) Open finger joints at truss ends and Span #2 hinge. [1998] Rubber "skirts" installed below truss end finger joints.

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
321	CONC APPROACH SLAB	2	04-03-2000	4 EA	0	4	0	0	N/A
			04-05-1999	4 EA	0	4	0	0	N/A

Notes: 100) [1991] All 4 approach panels have transverse cracks (relief joints need re-sealing).

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
331	CONCRETE RAILING	2	04-03-2000	7,628 LF	7,628	0	0	0	N/A
			04-05-1999	7,628 LF	7,628	0	0	0	N/A

Notes: 102) [1998] Railings re-constructed. Split median J-rail installed (with removeable pre-cast caps). Exetrior railings (originally Code #12) were retrofit (32" high concrete face added, horizontal steel railings removed).

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
107	PAINTED STEEL GIRDER	2	04-03-2000	10,596 LF	1,272	7,947	1,377	0	0
			04-05-1999	10,596 LF	0	9,113	1,377	106	0

Notes: [1968] Bridge painted with lead base system. [98/2000] Numerous fatigue cracks found in approach spans. Cracks were located at negative moment diaphragm connections where the stiffener was not welded to the top flange. In Span #9, the 3rd beam from the east had a 4 ft. long crack in the web (it was reinforced with bolted plates). Most existing cracks were drilled out, and the diaphragm connections were lowered to reduce stress levels. Approach spans have welded beams (depth transitions from 48" to 33"), with riveted connections. Spans #1 & 2 have 33" deep rolled beams with welded cover plates (square ends). [1995] Beams have minor chalking throughout, fascia beams have flaking rust along the bottom flange. [1999] Beams along median (and at hinge) re-painted. Beam ends at hinge have moderate surface pitting. Spot painting contract: truss ends, hinge joints, and area below median painted with Zinc system. Paint system is 15% unsound.

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 04-03-2000**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
113	PAINT STEEL STRINGER	2	04-03-2000	14,896 LF	1,788	12,960	0	149	0
			04-05-1999	14,896 LF	0	14,747	0	149	0
	Notes: 79) 27" deep rolled stringers (truss spans). [1995] Stringers have corrosion at expansion joints. [1999] Median stringers re-painted. [1991/2000] Stringer/Floorbeam connections are "working" - several bolts are loose or missing.								
131	PAINT STL DECK TRUSS	2	04-03-2000	2,127 LF	0	0	1,914	213	0
			04-05-1999	2,127 LF	0	0	1,914	213	0
	Notes: 20/156/157/161) Main truss members have numerous poor weld details (some cracked tack welds). [1995] Interiors of truss members have severe pigeon debris. [1999] Pigeon screens placed on truss member openings. [1995] Truss members have corrosion at the floorbeam & sway brace connections (with pack rust & some surface pitting).								
152	PAINT STL FLOORBEAM	2	04-03-2000	3,348 LF	0	2,645	703	0	0
			04-05-1999	3,348 LF	0	2,645	703	0	0
	Notes: 33/156/161) [1986] Crossbeam web stiffeners cracked at SE rocker hinge (rocker bearing had frozen) - cracks were welded/drilled out, and bracing was added (attached to approach span beams). [1992/98] Several cracks found in crossbeam & end floorbeam at the NE rocker hinge - some crackes were drilled out, and bracing was added (attached to approach span beams). [1998/99] End floorbeams & "crossbeams re-painted - the face exposed to the open finger joints have extensive section loss (surface pitting & holes in stiffeners). 33/50/161) Floorbeam trusses have numerous poor weld details (plug welds & tack welds in tension zones). [1994] Floorbeam trusses have chalking throughout. [1999] Median portions of floorbeam trusses (and sway braces) re-painted - some areas had severe section loss (holes)								
373	STEEL HINGE	2	04-03-2000	18 EA	0	4	0	0	14
			04-05-1999	18 EA	0	0	0	4	14
	Notes: 46) [1986] SE crossbeam rocker hinge pin replaced. [1999] Crossbeam rocker hinge bearings re-painted (all show evidence of recent movement). [1995] Span #2: all hinge bearings are locked in full expansion (beam ends contacting). [1999] Span #2 hinge bearings re-painted.								
380	SECONDARY ELEMENTS	2	04-03-2000	1 EA	0	0	1	0	N/A
			04-05-1999	1 EA	0	0	1	0	N/A
	Notes:								
311	EXPANSION BEARING	2	04-03-2000	125 EA	81	44	0	N/A	N/A
			04-05-1999	125 EA	83	42	0	N/A	N/A
	Notes: 96) [1994/2000] Some abutmenet bearings are rusty (joints leaking). [1996] South Abutment bearings are in full contraction. [1994] Main truss roller bearings have moderate corrosion.								
313	FIXED BEARING	2	04-03-2000	35 EA	35	0	0	N/A	N/A
			04-05-1999	35 EA	35	0	0	N/A	N/A
	Notes:								
205	CONCRETE COLUMN	2	04-03-2000	52 EA	49	3	0	0	N/A
			04-05-1999	52 EA	50	2	0	0	N/A
	Notes: 58) [1969] Pier #9: East column damaged by train derailment (minor scrapes & spalls). [1993] Pier #7: west column has a vertical crack. [2000] Pier #11: west column has a minor spall. 58/160) [1996] Pier #1 has tipped slightly northward - likely related to hinge failure in Span #2 (South Abutment bearings are in full contraction).								
210	CONCRETE PIER WALL	2	04-03-2000	168 LF	168	0	0	0	N/A
			04-05-1999	168 LF	168	0	0	0	N/A
	Notes:								
215	CONCRETE ABUTMENT	2	04-03-2000	255 LF	230	26	0	0	N/A
			04-05-1999	255 LF	255	0	0	0	N/A
	Notes: 62) [1991] Both Abutments have minor cracking & staining.								
234	CONCRETE CAP	2	04-03-2000	819 LF	680	139	0	0	N/A
			04-05-1999	819 LF	680	139	0	0	N/A
	Notes: 41) [1998] Pier #11: Cap has extensive "gunnite" repairs.								

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 04-03-2000**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
356	FATIGUE CRACKING	2	04-03-2000	1 EA	0	1	0	N/A	N/A
			04-05-1999	1 EA	0	0	1	N/A	N/A
	Notes:								
357	PACK RUST	2	04-03-2000	1 EA	0	1	0	0	N/A
			04-05-1999	1 EA	0	1	0	0	N/A
	Notes:								
358	CONC DECK CRACKING	2	04-03-2000	1 EA	0	1	0	0	N/A
			04-05-1999	1 EA	0	1	0	0	N/A
	Notes: 158) [1993] Overlay has 3,000 LF of transverse cracks. [1998] Cracks sealed.								
359	CONC DECK UNDERSIDE	2	04-03-2000	1 EA	0	0	1	0	0
			04-05-1999	1 EA	0	1	0	0	0
	Notes: 159) [1997/98] Underside of deck has a moderate amount of transverse leaching cracks, with some areas of leaching map cracks & spalling (particularly in the north approach spans). [1998] Removal of median copings damaged deck in adjacent bays (some areas have been patched).								
360	SETTLEMENT	2	04-03-2000	1 EA	1	0	0	N/A	N/A
			04-05-1999	1 EA	1	0	0	N/A	N/A
	Notes:								
363	SECTION LOSS	2	04-03-2000	1 EA	0	1	0	0	N/A
			04-05-1999	1 EA	0	1	0	0	N/A
	Notes:								
981	SIGNING	2	04-03-2000	1 EA	1	0	0	0	0
			04-05-1999	1 EA	0	1	0	0	0
	Notes: 181) OH Sign bridge mounted on exterior railings at north end of truss, sign post mounted on west rail at south end of truss.								
982	GUARDRAIL	2	04-03-2000	1 EA	1	0	0	N/A	N/A
			04-05-1999	1 EA	1	0	0	N/A	N/A
	Notes: 182) [1998] Approach guardrail repaired (new impact attenuator at NB off ramp).								
984	DRAINAGE	2	04-03-2000	1 EA	0	0	1	N/A	N/A
			04-05-1999	1 EA	0	0	1	N/A	N/A
	Notes: 184) Pier #6: horizontal drain trough has inadequate slope (usually clogged). [1998/99] Drain troughs below truss end finger joints removed & replaced with rubber "skirts". [2000] "Skirts" above crossbeam rockers are clogged.								
985	SLOPES	2	04-03-2000	1 EA	1	0	0	N/A	N/A
			04-05-1999	1 EA	1	0	0	N/A	N/A
	Notes: 185) [1994] North Abutment slope paving has 20 LF of horizontal cracks.								
986	CURB & SIDEWALK	2	04-03-2000	1 EA	0	1	0	N/A	N/A
			04-05-1999	1 EA	0	1	0	N/A	N/A
	Notes: 186) [1993] Curb below exterior railings have spalling & delamination.								
988	MISCELLANEOUS	2	04-03-2000	1 EA	0	1	0	N/A	N/A
			04-05-1999	1 EA	0	1	0	N/A	N/A
	Notes: 188) Rail mounted deck lighting, under deck lighting, and river navigation lights. [1994] Light post on west rail ("W5/3 L") has a 6" vertical split (plow damage). [1999] Automated de-icing system installed on deck (control room constructed on NW approch corner).								

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 04-03-2000**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5

General Notes: *Bridge #9340, Year 2000 Bridge Constructed In 1967. See "Fracture Critical" Report for additional information.

Inspector's Signature

Reviewer's Signature / Date

08/02/2007
Crew Number: 7627
Inspector: DISTRICT5

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 05-17-2002**

County: HENNEPIN
City: MINNEAPOLIS
Township:
Section: 25 Township: 029N Range: 24W
Span Type: CSTL BEAM SPAN
NBI Deck: 5 Super: 4 Sub: 6 Chan: 8 Culv: N

Location: 1.0 MI NE OF JCT TH 94
Route: ISTH 35W Ref. Pt.: 018+00.538
Control Section: 2783 Maint. Area: METRO
Local Agency Bridge Nbr:

Length: 1,907.0 ft
Deck Width: 113.3 ft (Varies)
Rdwy. Area / Pct. Unsnd: 201,511 sq ft
Paint Area / Pct. Unsnd: 490,200 sq ft 15 %

Open, Posted, Closed: OPEN
Appraisal Ratings - Approach: 8 Waterway: 8 MN Scour Code: L-STBL;LOW RISK Def. Stat: S.D. Suff. Rate: 50.0
Required Bridge Signs - Load Posting: NOT REQUIRED Traffic: NOT REQUIRED
Horizontal: NOT REQUIRED Vertical: NOT APPLICABLE

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
22	LS O/L (CONC DECK)	2	05-17-2002	1 SF	0	0	1	0	0
			09-26-2001	1 SF	0	0	1	0	0
	Notes: 3 lanes + on/off ramp each direction (2 ft. shoulders). [1978] Low slump overlay (extensive full-depth repairs). [1993] Minor spalls & patched areas along finger jonts. [1998] Median copings replaced (stay-in-place steel forms), exterior copings patched with "gunnite". [1998] Partial chaining of NBL found 1,665 SF of delamination & 47 SF of spall. [1999] Ground penetrating radar survey (FWHA) found deck to be 6% unsound.								
48	LS O/L (CONC SLAB)	2	05-17-2002	1 SF	0	1	0	0	0
			09-26-2001	1 SF	0	1	0	0	0
	Notes: Spans 12 - 14 have a 2 ft. deep CIP concrete voided slab (continuous).								
300	STRIP SEAL JOINT	2	05-17-2002	946 LF	906	0	40	N/A	N/A
			09-26-2001	946 LF	906	40	0	N/A	N/A
	Notes: [1978] Type H strip seal @ abutments, Pier 11, and stringer expansion joints (7 joints total). [1998] South Abutment joint (SBL) repaired with new product (hot pour with steel mesh). Steel extrusion was too corroded to install new gland. [1995/2000] Pier 11 joint has numerous leaks (SBL & NBL), glands in the stringer joints have pulled out in scattered locations.								
301	POURED DECK JOINT	2	05-17-2002	1,017 LF	1,017	0	0	N/A	N/A
			09-26-2001	1,017 LF	1,017	0	0	N/A	N/A
	Notes: Deck has 1,017 LF of transverse poured joints. [1997] All have leaching below (with some deck spalling).								
303	ASSEMBLY DECK JOINT	2	05-17-2002	326 LF	191	110	25	N/A	N/A
			09-26-2001	326 LF	216	110	0	N/A	N/A
	Notes: Open finger joints at truss ends and Span 2 hinge. [1998] Rubber "skirts" installed below truss end finger joints.								
321	CONC APPROACH SLAB	2	05-17-2002	4 EA	0	4	0	0	N/A
			09-26-2001	4 EA	0	4	0	0	N/A
	Notes: [1991] All 4 approach panels have transverse cracks (relief joints need re-sealing).								
331	CONCRETE RAILING	2	05-17-2002	7,628 LF	7,628	0	0	0	N/A
			09-26-2001	7,628 LF	7,628	0	0	0	N/A
	Notes: [1998] Railings re-constructed. Split median J-rail installed (with removeable pre-cast caps). Exterior railings (originally Code 12) were retrofit (32" high concrete face added, horizontal steel railings removed).								
107	PAINTED STEEL GIRDER	2	05-17-2002	10,596 LF	0	9,086	1,400	110	0
			09-26-2001	10,596 LF	0	9,086	1,400	110	0
	Notes: [1968] Bridge painted with Lead base system. [98/2000] Numerous fatigue cracks found in approach spans. Cracks were located at negative moment diaphragm connections where the stiffener was not welded to the top flange. In Span 9, the 3rd beam from the east had a 4 ft. long crack in the web (it was reinforced with bolted plates). Most existing cracks were drilled out, and the diaphragm connections were lowered to reduce stress levels. Approach spans have welded beams (depth transitions from 48" to 33"), with riveted connections. Spans 1 & 2 have 33" deep rolled beams with welded cover plates (square ends). [1995] Beams have minor chalking throughout, fascia beams have flaking rust along the bottom flange. [1999] Beams along median (and at hinge) re-painted. Beam ends at hinge have moderate surface pitting. Spot painting contract: truss ends, hinge joints, and area below median painted with zinc system. Paint system is 15% unsound.								

EXHIBIT 7

08/02/2007
Crew Number: 7627
Inspector: DISTRICT5

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 05-17-2002**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
113	PAINT STEEL STRINGER	2	05-17-2002	14,896 LF	0	14,746	0	150	0
			09-26-2001	14,896 LF	0	14,746	0	150	0
	Notes: 27" deep rolled stringers (truss spans). [1995] Stringers have corrosion at expansion joints. [1999] Median stringers re-painted. [1991/2000] Stringer/Floorbeam connections are "working". Several bolts are loose or missing.								
131	PAINT STL DECK TRUSS	1	05-17-2002	2,127 LF	0	0	1,912	215	0
			09-26-2001	2,127 LF	0	0	1,912	215	0
	Notes: Main truss members have numerous poor weld details (some cracked tack welds). [1995] Interiors of truss members have severe pigeon debris. [1999] Pigeon screens placed on truss member openings. [1995] Truss members have corrosion at the floorbeam & sway brace connections (with pack rust & some surface pitting).								
152	PAINT STL FLOORBEAM	2	05-17-2002	3,348 LF	0	2,623	725	0	0
			09-26-2001	3,348 LF	0	2,623	725	0	0
	Notes: [1986] Crossbeam web stiffeners cracked at SE rocker hinge (rocker bearing had frozen). Cracks were welded/drilled out, and bracing was added (attached to approach span beams). [1992/98] Several cracks found in crossbeam & end floorbeam at the NE rocker hinge. Some cracks were drilled out, and bracing was added (attached to approach span beams). [1998/99] End floorbeams & "crossbeams re-painted. The face exposed to the open finger joints have extensive section loss (surface pitting & holes in stiffeners). Floorbeam trusses have numerous poor weld details (plug welds & tack welds in tension zones). [1994] Floorbeam trusses have chalking throughout. [1999] Median portions of floorbeam trusses (and sway braces) re-painted. Some areas had severe section loss (holes).								
373	STEEL HINGE	2	05-17-2002	18 EA	0	4	0	0	14
			09-26-2001	18 EA	0	4	0	0	14
	Notes: [1986] SE crossbeam rocker hinge pin replaced. [1999] Crossbeam rocker hinge bearings re-painted (all show evidence of recent movement). [1995] Span 2: all hinge bearings are locked in full expansion (beam ends contacting). [1999] Span 2 hinge bearings re-painted.								
380	SECONDARY ELEMENTS	2	05-17-2002	1 EA	0	0	1	0	N/A
			09-26-2001	1 EA	0	0	1	0	N/A
	Notes: [1995] Pinned braces between floorbeam truss & stringers are working.								
311	EXPANSION BEARING	2	05-17-2002	125 EA	81	44	0	N/A	N/A
			09-26-2001	125 EA	81	44	0	N/A	N/A
	Notes: [1994/2000] Some abutment bearings are rusty (joints leaking). [1996] South Abutment bearings are in full contraction. [1994] Main truss roller bearings have moderate corrosion.								
313	FIXED BEARING	2	05-17-2002	35 EA	35	0	0	N/A	N/A
			09-26-2001	35 EA	35	0	0	N/A	N/A
	Notes:								
205	CONCRETE COLUMN	2	05-17-2002	52 EA	49	3	0	0	N/A
			09-26-2001	52 EA	49	3	0	0	N/A
	Notes: [1969] Pier 9: East column damaged by train derailment (minor scrapes & spalls). [1993] Pier 7: west column has a vertical crack. [2000] Pier 11: west column has a minor spall. 58/160) [1996] Pier 1 has tipped slightly northward. Likely related to hinge failure in Span 2 (South Abutment bearings are in full contraction).								
210	CONCRETE PIER WALL	2	05-17-2002	168 LF	168	0	0	0	N/A
			09-26-2001	168 LF	168	0	0	0	N/A
	Notes:								
215	CONCRETE ABUTMENT	2	05-17-2002	255 LF	255	0	0	0	N/A
			09-26-2001	255 LF	255	0	0	0	N/A
	Notes: [1991] Both Abutments have minor cracking & staining.								
234	CONCRETE CAP	2	05-17-2002	819 LF	669	150	0	0	N/A
			09-26-2001	819 LF	669	150	0	0	N/A
	Notes: [1998] Pier 11: Cap has extensive "gunnite" repairs.								

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 05-17-2002**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
356	FATIGUE CRACKING	2	05-17-2002	1 EA	0	1	0	N/A	N/A
			09-26-2001	1 EA	0	1	0	N/A	N/A
	Notes: [1998/2000] Numerous fatigue cracks found in approach spans. Cracks were located at negative moment diaphragm connections where the stiffener was not welded to the top flange. In Span 9, the 3rd beam from the east had a 4 ft. long crack in the web (it was reinforced with bolted plates). Most existing cracks were drilled out, and the diaphragm connections were lowered to reduce stress levels.								
357	PACK RUST	2	05-17-2002	1 EA	0	1	0	0	N/A
			09-26-2001	1 EA	0	1	0	0	N/A
	Notes: [1995] Truss members have corrosion at the floorbeam & sway brace connections (with pack rust & some surface pitting).								
358	CONC DECK CRACKING	2	05-17-2002	1 EA	0	1	0	0	N/A
			09-26-2001	1 EA	0	1	0	0	N/A
	Notes: [1993] Overlay has 3,000 LF of transverse cracks. [1998] Cracks sealed.								
359	CONC DECK UNDERSIDE	2	05-17-2002	1 EA	0	0	1	0	0
			09-26-2001	1 EA	0	0	1	0	0
	Notes: [1997/98] Underside of deck has a moderate amount of transverse leaching cracks, with some areas of leaching map cracks & spalling (particularly in the north approach spans). [1998] Removal of median copings damaged deck in adjacent bays (some areas have been patched).								
360	SETTLEMENT	2	05-17-2002	1 EA	1	0	0	N/A	N/A
			09-26-2001	1 EA	1	0	0	N/A	N/A
	Notes:								
363	SECTION LOSS	2	05-17-2002	1 EA	0	1	0	0	N/A
			09-26-2001	1 EA	0	1	0	0	N/A
	Notes:								
964	CRITICAL FINDING	2	05-17-2002	1 EA	1	0	N/A	N/A	N/A
	Notes: DO NOT DELETE THIS CRITICAL FINDING SMART FLAG.								
981	SIGNING	2	05-17-2002	1 EA	1	0	0	0	0
			09-26-2001	1 EA	1	0	0	0	0
	Notes: OH Sign bridge mounted on exterior railings at north end of truss, sign post mounted on west rail at south end of truss.								
982	GUARDRAIL	2	05-17-2002	1 EA	1	0	0	N/A	N/A
			09-26-2001	1 EA	1	0	0	N/A	N/A
	Notes: [1998] Approach guardrail repaired (impact attenuator at NB off ramp).								
984	DRAINAGE	2	05-17-2002	1 EA	0	0	1	N/A	N/A
			09-26-2001	1 EA	0	0	1	N/A	N/A
	Notes: Pier 6: Horizontal drain trough has inadequate slope (usually clogged). [1998/99] Drain troughs below truss end finger joints removed & replaced with rubber "skirts". [2000] "Skirts" above crossbeam rockers are clogged.								
985	SLOPES	2	05-17-2002	1 EA	1	0	0	N/A	N/A
			09-26-2001	1 EA	1	0	0	N/A	N/A
	Notes: [1994] North Abutment slope paving has 20 LF of horizontal cracks.								
986	CURB & SIDEWALK	2	05-17-2002	1 EA	0	1	0	N/A	N/A
			09-26-2001	1 EA	0	1	0	N/A	N/A
	Notes: [1993] Curb below exterior railings have spalling & delamination.								

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 05-17-2002**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
988	MISCELLANEOUS	2	05-17-2002	1 EA	0	1	0	N/A	N/A
			09-26-2001	1 EA	0	1	0	N/A	N/A

Notes: Rail mounted deck lighting, under deck lighting, and river navigation lights. [1994] Light post on west rail ("W5/3 L") has a 6" vertical split (plow damage). [1999] Automated de-icing system installed on deck (control room constructed on NW approch corner).

General Notes: *Bridge #9340, Year 2002 Bridge Constructed in 1967. See "Fracture Critical" Report for additional information.

Inspector's Signature

Reviewer's Signature / Date

08/02/2007
Crew Number: 7627
Inspector: METRO

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 06-13-2003**

County: HENNEPIN
City: MINNEAPOLIS
Township:
Section: 25 Township: 029N Range: 24W
Span Type: CSTL BEAM SPAN
NBI Deck: 5 Super: 4 Sub: 6 Chan: 8 Culv: N

Location: 1.0 MI NE OF JCT TH 94
Route: ISTH 35W Ref. Pt.: 018+00.538
Control Section: 2783 Maint. Area: METRO
Local Agency Bridge Nbr:

Length: 1,907.0 ft
Deck Width: 113.3 ft (Varies)
Rdwy. Area / Pct. Unsnd: 201,511 sq ft 6 %
Paint Area / Pct. Unsnd: 490,200 sq ft 15 %

Open, Posted, Closed: OPEN

Appraisal Ratings - Approach: 8 Waterway: 8
MN Scour Code: L-STBL;LOW RISK Def. Stat: S.D. Suff. Rate: 50.0

Required Bridge Signs - Load Posting: NOT REQUIRED Traffic: NOT REQUIRED
Horizontal: NOT REQUIRED Vertical: NOT APPLICABLE

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
22	LS O/L (CONC DECK)	2	06-13-2003	201,853 SF	0	0	201,853	0	0
			05-17-2002	1 SF	0	0	1	0	0
	Notes: 3 lanes + on/off ramp each direction (2 FT shoulders). [1978] Low slump overlay (extensive full depth repairs). [1993] Spalls & patched areas along finger jonts. [1998] Median copings replaced (stay-in-place steel forms), exterior copings patched with "gunnite". [1998] Partial chaining of NBL found 1,665 SF of delamination & 47 SF of spall. [1999] Ground penetrating radar survey (FWHA) found deck to be 6% unsound.								
48	LS O/L (CONC SLAB)	2	06-13-2003	17,233 SF	0	17,233	0	0	0
			05-17-2002	1 SF	0	1	0	0	0
	Notes: Spans 12 - 14 have a 2 ft. deep CIP concrete voided slab (continuous).								
300	STRIP SEAL JOINT	2	06-13-2003	946 LF	852	0	94	N/A	N/A
			05-17-2002	946 LF	906	0	40	N/A	N/A
	Notes: [1978] Type H strip seal at abutments, pier 11, and stringer expansion joints (7 total). [1998] Strip gland replaced at pier 11, north abutment. South abutment joint (SBL) repaired with new product (hot pour with steel mesh). Steel extrusion was too corroded to install new gland. [1995] Pier 11 joint has numerous leaks (SBL & NBL), glands in the stringer joints have pulled out in scattered locations.								
301	POURED DECK JOINT	2	06-13-2003	1,017 LF	1,000	0	17	N/A	N/A
			05-17-2002	1,017 LF	1,017	0	0	N/A	N/A
	Notes: Deck has 1,017 LF of transverse poured joints. [1997] All have leaching below (with some deck spalling).								
303	ASSEMBLY DECK JOINT	2	06-13-2003	326 LF	191	110	25	N/A	N/A
			05-17-2002	326 LF	191	110	25	N/A	N/A
	Notes: Open finger joints at truss ends and span 2 hinge. [1998] Rubber "skirts" installed below truss end finger joints.								
321	CONC APPROACH SLAB	2	06-13-2003	4 EA	0	4	0	0	N/A
			05-17-2002	4 EA	0	4	0	0	N/A
	Notes: [1991] All 4 approach panels have transverse cracks (relief joints need re-sealing).								
331	CONCRETE RAILING	2	06-13-2003	7,831 LF	7,831	0	0	0	N/A
			05-17-2002	7,628 LF	7,628	0	0	0	N/A
	Notes: [1998] 4018 LF Railings re-constructed. 3813 LF Split median J-rail installed (with removeable pre-cast caps). Exterior railings (originally code 12) were retrofit (32" high concrete face added, horizontal steel railings removed).								
107	PAINTED STEEL GIRDER	2	06-13-2003	10,596 LF	0	9,000	1,400	110	86
			05-17-2002	10,596 LF	0	9,086	1,400	110	0
	Notes: [1968] Bridge painted with lead base system. [98/2000] Numerous fatigue cracks found in approach spans. Cracks were located at negative moment diaphragm connections where the stiffener was not welded to the top flange. In span 9, the 3rd beam from the east had a 4 FT long crack in the web (it was reinforced with bolted plates). Most existing cracks were drilled out, and the diaphragm connections were lowered to reduce stress levels. Approach spans have welded beams (depth transitions from 48" to 33"), with riveted connections. Spans 1 & 2 have 33" deep rolled beams with welded cover plates (square ends). [1995] Beams have minor chalking throughout, fascia beams have section loss: flaking & surface rust along the bottom flange. [1999] Beams along median (and at hinge) re-painted. Beam ends at hinge have section loss, moderate surface pitting. Spot painting contract: truss ends, hinge joints, and area below median painted with zinc system. Paint system is 15% unsound.								

EXHIBIT 8

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 06-13-2003**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
113	PAINT STEEL STRINGER	2	06-13-2003	14,896 LF	0	14,700	0	150	46
			05-17-2002	14,896 LF	0	14,746	0	150	0
	Notes: 27" deep rolled stringers (truss spans). [1995] Stringers have section loss, flaking & surface rust corrosion at expansion joints. [1999] Median stringers re-painted. [91/2000] Stringer/floorbeam connections are "working". Several bolts are loose or missing.								
131	PAINT STL DECK TRUSS	1	06-13-2003	2,127 LF	0	0	1,880	215	32
			05-17-2002	2,127 LF	0	0	1,912	215	0
	Notes: Main truss members have numerous poor weld details (some cracked tack welds). [1995] Interiors of truss members have section loss, flaking & surface rust, severe pigeon debris, at the floorbeam & sway frame brace connections (with pack rust & surface pitting). [1999] Pigeons screens placed on truss member openings.								
152	PAINT STL FLOORBEAM	2	06-13-2003	3,348 LF	0	2,000	725	600	23
			05-17-2002	3,348 LF	0	2,623	725	0	0
	Notes: [1986] Crossbeam web stiffeners cracked at SE rocker hinge (rocker bearing had frozen). Cracks were welded/drilled out, and bracing was added (attached to approach span beams). [1992/98] Several cracks found in crossbeam & end floorbeam at the NE rocker hinge. Some cracks were drilled out, and bracing was added (attached to approach span beams). [1998/99] End floorbeams & "crossbeams re-painted. The face exposed to the open finger joints have extensive section loss (surface pitting & holes in stiffeners). Floorbeam trusses have numerous poor weld details, section loss, flaking & surface rust, some have holes, (plug welds & tack welds in tension zones). [1994] Floorbeam trusses have chalking throughout. [1999] Median portions of floorbeam trusses (and sway braces) re-painted.								
373	STEEL HINGE	2	06-13-2003	18 EA	0	4	0	0	14
			05-17-2002	18 EA	0	4	0	0	14
	Notes: [1986] SE crossbeam rocker hinge pin replaced. Section loss at hinges, (open finger joint) steel has flaking & surface rust. [1999] Crossbeam rocker hinge bearings re-painted (all show evidence of recent movement). [1995] Span 2: all hinge bearings are locked in full expansion (beam ends contacting). [1999] Span 2 hinge bearings re-painted.								
380	SECONDARY ELEMENTS	2	06-13-2003	1 EA	0	0	1	0	N/A
			05-17-2002	1 EA	0	0	1	0	N/A
	Notes: [1995] Pinned braces between floorbeam truss & stringers are working.								
311	EXPANSION BEARING	2	06-13-2003	125 EA	75	44	6	N/A	N/A
			05-17-2002	125 EA	81	44	0	N/A	N/A
	Notes: [94/2000] Some abutment bearings are rusty (joints leaking). [1996] South abutment bearings are in full contraction. [1994] Main truss roller bearings have section loss: flaking & surface rust, moderate corrosion.								
313	FIXED BEARING	2	06-13-2003	35 EA	35	0	0	N/A	N/A
			05-17-2002	35 EA	35	0	0	N/A	N/A
	Notes:								
205	CONCRETE COLUMN	2	06-13-2003	52 EA	49	3	0	0	N/A
			05-17-2002	52 EA	49	3	0	0	N/A
	Notes: [1969] Pier 9: east column damaged by train derailment (minor scrapes & spalls). [1993] Pier 7: west column has a vertical crack. [2000] Pier 11: west column has a minor spall. [1996] Pier 1 has tipped slightly northward. Likely related to hinge failure in span 2 (south abutment bearings are in full contraction).								
210	CONCRETE PIER WALL	2	06-13-2003	168 LF	168	0	0	0	N/A
			05-17-2002	168 LF	168	0	0	0	N/A
	Notes:								
215	CONCRETE ABUTMENT	2	06-13-2003	255 LF	230	25	0	0	N/A
			05-17-2002	255 LF	255	0	0	0	N/A
	Notes: [1991] Both abutments have minor cracking & staining.								
234	CONCRETE CAP	2	06-13-2003	819 LF	669	150	0	0	N/A
			05-17-2002	819 LF	669	150	0	0	N/A

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 06-13-2003**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
	Notes: [1998] Pier 11: cap has extensive "gunnite" repairs.								
356	FATIGUE CRACKING	2	06-13-2003	1 EA	0	1	0	N/A	N/A
			05-17-2002	1 EA	0	1	0	N/A	N/A
	Notes: [98/2000] Numerous fatigue cracks found in approach spans. Cracks were located at negative moment diaphragm connections where the stiffener was not welded to the top flange. In span 9, the 3rd beam from the east had a 4 FT long crack in the web (it was reinforced with bolted plates). Most existing cracks were drilled out, and the diaphragm connections were lowered to reduce stress levels.								
357	PACK RUST	2	06-13-2003	1 EA	0	0	1	0	N/A
			05-17-2002	1 EA	0	1	0	0	N/A
	Notes: [1995] Truss members have flaking & surface rust corrosion at the floorbeam & sway brace connections (with pack rust & some section loss, surface pitting).								
358	CONC DECK CRACKING	2	06-13-2003	1 EA	0	1	0	0	N/A
			05-17-2002	1 EA	0	1	0	0	N/A
	Notes: [1993] Overlay has 3,000 LF of transverse cracks. [1998] Cracks sealed.								
359	CONC DECK UNDERSIDE	2	06-13-2003	1 EA	0	0	1	0	0
			05-17-2002	1 EA	0	0	1	0	0
	Notes: [1997/98] Underside of deck has a moderate amount of transverse leaching cracks, with some areas of leaching map cracks & spalling (particularly in the north approach spans). [1998] Removal of median copings damaged deck in adjacent bays (some areas have been patched).								
360	SETTLEMENT	2	06-13-2003	1 EA	1	0	0	N/A	N/A
			05-17-2002	1 EA	1	0	0	N/A	N/A
	Notes:								
363	SECTION LOSS	2	06-13-2003	1 EA	0	1	0	0	N/A
			05-17-2002	1 EA	0	1	0	0	N/A
	Notes: Section loss: pitting, flaking & surface rust on steel.								
964	CRITICAL FINDING	2	06-13-2003	1 EA	1	0	N/A	N/A	N/A
			05-17-2002	1 EA	1	0	N/A	N/A	N/A
	Notes:								
981	SIGNING	2	06-13-2003	1 EA	1	0	0	0	0
			05-17-2002	1 EA	1	0	0	0	0
	Notes: OH sign bridge mounted on exterior railings at north end of truss, sign post mounted on west rail at south end of truss.								
982	GUARDRAIL	2	06-13-2003	1 EA	1	0	0	N/A	N/A
			05-17-2002	1 EA	1	0	0	N/A	N/A
	Notes: [1998] Approach guardrail repaired (impact attenuator at NB off ramp).								
984	DRAINAGE	2	06-13-2003	1 EA	0	0	1	N/A	N/A
			05-17-2002	1 EA	0	0	1	N/A	N/A
	Notes: Pier 6: horizontal drain trough has inadequate slope (usually clogged). [1998/99] Drain troughs below truss end finger joints removed & replaced with rubber "skirts". [2000] "Skirts" above crossbeam rockers are clogged.								
985	SLOPES	2	06-13-2003	1 EA	1	0	0	N/A	N/A
			05-17-2002	1 EA	1	0	0	N/A	N/A
	Notes: [1994] North abutment slope paving has 20 LF of horizontal cracks.								
986	CURB & SIDEWALK	2	06-13-2003	1 EA	0	1	0	N/A	N/A
			05-17-2002	1 EA	0	1	0	N/A	N/A

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 06-13-2003**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
	Notes: [1993] Curb below exterior railings have spalling & delamination.								
988	MISCELLANEOUS	2	06-13-2003	1 EA	0	1	0	N/A	N/A
			05-17-2002	1 EA	0	1	0	N/A	N/A
	Notes: Rail mounted deck lighting, under deck lighting, and river navigation lights. [1994] Light post on west rail ("W5/3 L") has a 6" vertical split (plow damage). [1999] Automated de-icing system installed on deck (control room constructed on NW approch corner).								

General Notes: *Bridge #9340, Year 2003
Bridge constructed in 1967.

See "Fracture Critical" report for additional information.

Inspectors: K Fuhrman, V Desens.

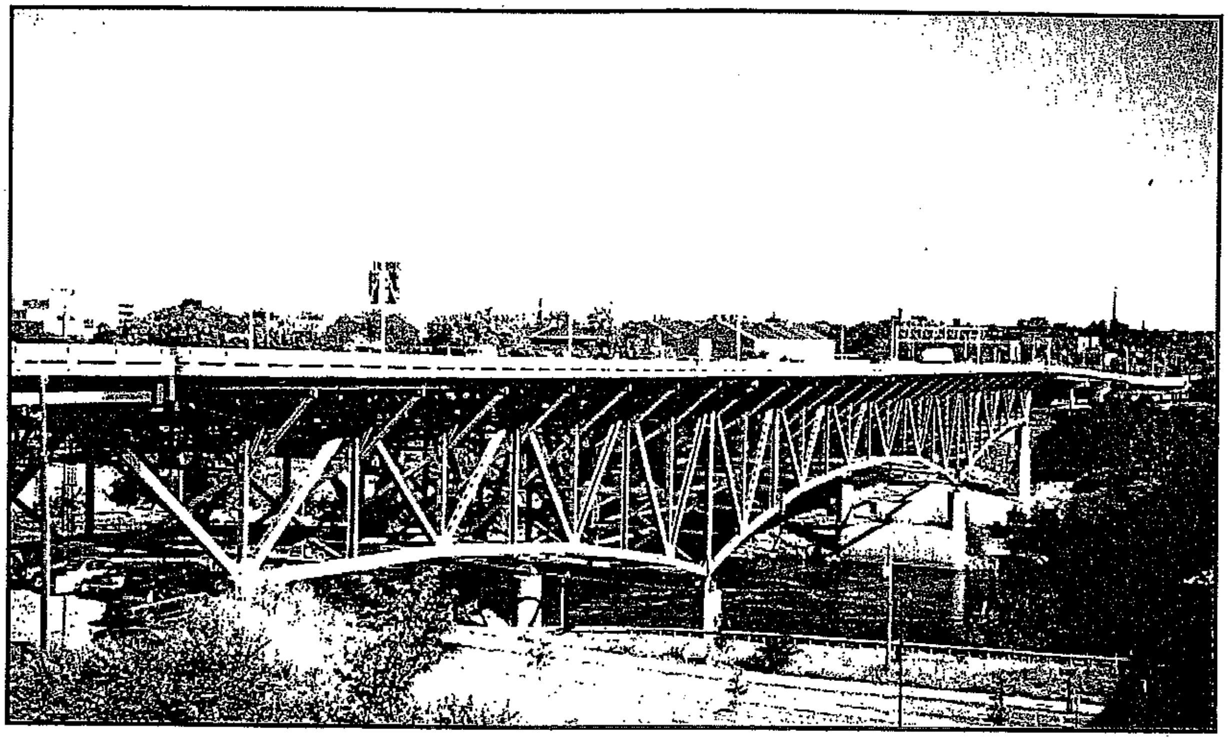
Inspector's Signature

Reviewer's Signature / Date

Fracture Critical
Bridge Inspection Report

Annual

September 2001



Bridge # 9340

I-35W over the Mississippi River at Minneapolis, Mn

Prepared For

Minnesota Department of Transportation
Office of Bridges & Structures
Oakdale, MN 55128

EXHIBIT
9

Prepared By

Minnesota Department of Transportation
Metro Division
Maintenance Operations, Bridge Inspection
Roseville, MN 55113

Structure Investigation Information

Inspection Date: Main Truss Spans: September 24, 25, & 26, 2001
Steel Approach Spans (Spring): June 11, 2001
Steel Approach Spans (Fall): September 24 & 26, 2001
Inspection Team: Mark Pribula, Kurt Fuhrman, Vance Desens, Ken Rand, Mike Palmer,
Inspection Report Author: Kurt Fuhrman
Bridge Maintenance Sub Area: Spring Lake Park
Access Equipment Used: Reach-All A-75 (Mn/DOT),
Reach-All UB60 (City of St. Paul)
Skyjack 66 ft. Snorkel Lift

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Licensed Professional Engineer under the laws of the State of Minnesota

Mark Pribula — Mark Pribula
21102 — Registration No.
1/23/02 — Date

Table of Contents

Executive Summary

The "Federal Aid Highway Act of 1968" directed the establishment a national bridge inspection program. Accordingly, the Minnesota Department of Transportation, Metro Division Bridge Inspection Unit conducted an annual inspection of the main truss spans and the in-depth inspection of the approach spans of bridge # 9340 over the Mississippi River at Minneapolis, Mn. The bridge also crosses over several roadways, Minnesota Commercial Railroad tracks, & parking lots.

Constructed in 1967, the bridge has 14 spans, with a total length of 1,907 feet. The split deck has three through lanes each direction with an acceleration/deceleration lane and 2-ft shoulders. The bridge deck widens at the north end to accommodate on & off ramps, and curves slightly at the south end. The main river spans (Spans #6-8) are "Fracture Critical" steel deck trusses. They are comprised of welded "built-up" members and are 456 ft. long. The truss is approximately 60 ft. deep at Piers #6 & 7. The two main trusses are connected by welded floorbeam trusses, which cantilever beyond the truss on both sides and support the 27" deep rolled beam roadway stringers. At each end of the main truss spans, the truss supports the adjacent approach spans with a unique "crossbeam" configuration. The approach span beams frame into a "crossbeam", which is supported by rocker bearings on the cantilever truss ends. The approach spans (Spans #1-5 & 9-11) have 48" deep, welded plate beams, which transition into 33" deep welded & rolled steel beams (connections are riveted). The far north spans (Spans #12-14) are cast-in-place concrete voided slabs.

Due to several factors (including mist from nearby St. Anthony Falls), the bridge deck frequently ices over and becomes quite treacherous. In 1999, an automated de-icing system was installed on the deck (spray nozzles installed in the deck and railings). The systems controls and storage tanks are located on the north end just off the freeway entrance ramp from East University to South I-35W.

During the 1998 inspection numerous fatigue cracks were found in the approach spans (Spans #3-5 and #9 & 10). The cracks were located in negative moment regions where the diaphragm web stiffener was not welded to the top flange. At one location, the web had cracked through entirely. Most existing cracks were drilled out, and the fractured beam was reinforced with bolted plates. To reduce the stress levels, the diaphragms were lowered. Due to the widespread cracking, these areas should be inspected in-depth on an annual basis. The area below includes a contract parking lot (used mainly by U of M students) and the Minnesota Commercial Railroad: (651) 646-2010.

The truss end rocker bearings (and main truss bearings) should be measured for movement during each annual inspection. The truss end floorbeams & approach end "crossbeams" should be closely inspected (they have section loss & fatigue cracks).

The hinge joint in Span #2 is in locked in full expansion, several beam-ends are contacting, and the hinge bearings are "frozen" and no longer functioning. Consequently, Pier #1 has tipped slightly to the north, and the South Abutment bearings are in full contraction. This area should be thoroughly inspected.

Four stringer connection bolts need replacement (all in the NBL). At Panel Point #8, Stringer #2 has two loose bolts, and the bearing block has rotated. This will likely require jacking the superstructure. Stringer bolts also need replacement at Panel Point #8, Stringer #4 (south side), and at Panel Point #11, Stringer #3.

Several strip seal joints are leaking (the glands have ripped or pulled out). Attempts were made to replace these joints during the 1998 repair contract, but the steel extrusions, which anchor the gland, had severe corrosion, and new glands could not be installed. Instead, a new product was used at the South Abutment (SBL). This utilized a hot pour seal with wire mesh reinforcing (the final product looks similar to a strip seal gland). We should monitor this joint to see how well this new gland repair performs. and consider using it at other locations.

The rubber "skirts" sections above the truss end rockers (installed in 1999) tend to fill with debris - these should be flushed out annually. The horizontal drain troughs at Pier #6 are clogged because of an inadequate slope.

Bridge Inspection Recommendations

These recommendations refer to specific areas where fatigue cracks and other deficiencies were discovered during the 2001 inspection.

Long Term Repair Recommendations

- The long term plans for this river crossing need to be defined (replacement, re-decking. Etc.). Due to the "Fracture Critical" configuration of the main river spans (and the problematic "crossbeam" details), and fatigue cracking in the approach spans - eventual replacement of the entire structure would be preferable.

- If bridge replacement is significantly delayed, the bridge should be re-decked (the design of the main river spans do not allow for deck widening). Any re-decking contract should also include a complete re-painting of the superstructure, elimination of the hinge joint in Span #2, and reconfiguration of the deck drainage system.

- Depending on the projected date of bridge replacement, the bridge deck will eventually require a partial overlay repair contract (the expansion joints should also be replaced).

Immediate Maintenance Recommendations

- Four stringer connection bolts need replacement (all in the NBL). At Panel Point #8, Stringer #2 has 2 loose bolts, and the bearing block has rotated (this will likely require jacking the superstructure). Stringer bolts also need replacement at Panel Point #8, Stringer #4 (south side), and at Panel Point #11, Stringer #3.

- Several strip seal joints are leaking (the glands have ripped or pulled out). Attempts were made to replace these joints during the 1998 repair contract, but the steel extrusions which anchor the gland had severe corrosion, and new glands could not be installed. Instead, a new product was used at the South Abutment (SBL) - this utilized a hot pour seal with wire mesh reinforcing (the final product looks similar to a strip seal gland). We should monitor this joint to see how well this new gland repair performs., and consider using it at other locations.

- The rubber "skirts" sections above the truss end rockers (installed in 1999) tend to fill with debris - these should be flushed out annually. The horizontal drain troughs at Pier #6 have inadequate slope, and are clogged.

Areas of Concern for Future Inspections

- During the 1998 inspection, numerous fatigue cracks were found in the approach spans (Spans #3-5 and #9-10). The cracks were located in negative moment regions where the diaphragm web stiffener was not welded to the top flange (at one location the web had cracked through entirely). Most existing cracks were drilled out, and the fractured beam was reinforced with bolted plates. To reduce the stress levels, the diaphragms were lowered. Due to the widespread cracking, these areas should be inspected in-depth on an annual basis. The area below includes a contract parking lot (used mainly by U of M students) and the Minnesota Commercial Railroad: (651) 646-2010.

- The truss end rocker bearings (and main truss bearings) should be measured for movement during each annual inspection. The truss end floorbeams & approach end "crossbeams" should be closely inspected (they have section loss & fatigue cracks).

- The hinge joint in Span #2 is in locked in full expansion several beam ends are contacting, and the hinge bearings are "frozen" and no longer functioning. Consequently, Pier #1 has tipped slightly to the north, and the South Abutment bearings are in full contraction. This area should be thoroughly inspected.

For information that is more detailed and recommendations, please refer to the appropriate sections in the text of the report.

Bridge Description

Bridge #9340 was constructed in 1967, and has 14 spans, with a total length of 1,907 feet. The split deck has three through lanes each direction (along with an acceleration/deceleration lane). The shoulders are only 2 ft. wide. The bridge deck widens at the north end (to accommodate on & off ramps), and curves slightly at the south end.

The main river spans (Spans #6-8) are "Fracture Critical" steel deck trusses comprised of "built-up" welded members and 456 ft. long. The truss is approximately 60 ft. deep at Piers #6 & 7. The two main trusses are connected by welded floorbeam trusses, which cantilever beyond the truss on both sides, and support the 27" deep rolled beams roadway stringers.

At each end of the main truss spans, the truss supports the adjacent approach spans with a unique "crossbeam" configuration. The approach span beams frame into a "crossbeam", which is supported by rocker bearings on the cantilever truss ends. The approach spans (Spans #1-5 & 9-11) have 48" deep welded plate beams, which transition into 33" deep welded & rolled steel beams (connections are riveted). The far north spans (Spans #12-14) are cast-in-place concrete voided slabs.

Due to several factors (including mist from nearby St. Anthony Falls), the bridge deck frequently ices over and becomes quite treacherous. In 1999, an automated de-icing system was installed on the deck (spray nozzles installed in the deck and railings) – the control room is located at the northwest approach corner.

Bridge Deck NBI Code #5 (Fair Condition)

The split deck has 3 through lanes each direction (along with an acceleration/deceleration lane) - the shoulders are only 2 ft. wide.. A low slump concrete overlay (along with numerous full-depth deck repairs) was placed on the deck in 1978. In 1998, the median copings were replaced (steel stay-in-place forms), and the exterior copings were patched with shot-crete.

Wearing Surface: The overlay has some minor spalls and patched areas around the finger joints, and 3,000 LF of transverse cracks (sealed in 1998). The overlay has several patched areas, and some spalls (additional patching is typically required each year). A partial chaining of the northbound deck in 1998 found 1,665 SF of delamination & 47 SF of spall. In 1999, the Federal Highway Administration conducted a ground penetrating radar survey, using the experimental "HERMES" system. The radar survey found the overlay to have 6.14% delamination. The overlay had numerous repair patches in 2001.

Structural Slab: The underside of the deck has a moderate amount of transverse leaching cracks, with some areas of leaching map cracks & spalling (particularly in the south approach spans). In 1998, the median coping overhangs were replaced (steel stay-in-place forms), and the exterior copings were repaired with shot-crete. During the median slab removal, the bays adjacent to the median were damaged - some of the "stool" concrete along the stringers & beams has spalled off (exposed rebar), and in some locations, the spalling extends into the underside of the deck. Some of these areas were patched by the contractor.

Open Finger Expansion Joints: The deck has 3 open finger joints (at each end of the truss spans and above the hinge joint in Span #2). In 1999, rubber "skirts" were installed below the truss end finger joints (the drain troughs were removed).

Strip Seal Expansion Joints: There are strip seal joints at the abutments, Pier #11, and at 5 stringer joints in the main truss spans (these were installed in 1978). The strip seal glands have pulled out (joints leaking) in several locations. The steel extrusions, which anchor the glands, have severe section loss, making gland replacement impossible. In 1998, the South Abutment gland (SBL) was patched using an experimental system - hot poured seal with wire mesh reinforcement.

Poured Deck Joints: The deck has several transverse poured joints (from staged deck construction). All of these joints are leaching below - at some joints, the deck is spalling below.

Exterior Railings: The original exterior Code #12 railings were retrofit in 1998 - a 32" high concrete face was installed in front of the existing concrete rail base (the horizontal steel rails were removed). The curb along the railing has moderate cracking, delamination and spalling.

Median Railings: J-rail (Code #22) was installed along the split median in 1998. The railings above the truss spans have removable pre-cast concrete caps, which are intended to prevent further corrosion damage to the superstructure below.

Bridge Superstructure NBI Code #4 (Poor Condition)

Paint System: The bridge was originally painted with a lead-base system in 1968. In 1999, the bridge was partially re-painted with a zinc system. Areas painted included the entire superstructure below and along the open median, and below the open finger deck joints.

Currently, the overall paint system is approximately 15% unsound. The truss members have corrosion and pack rust at the floorbeam & sway frame connections, and there is paint failure & corrosion in scattered locations. The floorbeam trusses & stringer ends have corrosion at the stringer expansion joints. Some of the areas re-painted in 1999 had severe section loss. This includes the sections of the floorbeam trusses & sway bracing located below the median, and the truss end floorbeams & "crossbeams" (located below open finger joints).

Main Truss Members The two steel deck trusses are comprised of "built-up" welded members connections include both rivets and bolts. While most truss members are welded box beams, some tension vertical & diagonal members are welded "H" beams. The truss members have numerous poor weld details. The vertical "H" beam truss members have transverse welds at the floorbeam connections. The box beam truss members have welded interior stiffeners. Some of these have tack welded tabs (many of these tack welds have cracked). Some box beams have tack welds, or tack welded backer bars along the interior corners. The truss members have corrosion at the floorbeam and sway frame connections (pack rust is forming between the connection plates), there is paint failure, surface rust, and flaking rust is scattered locations. The interiors of the box members have severe pigeon debris. In 1999, screens were placed over openings in the truss members to prevent pigeon access (this unfortunately prevents inspection of the interiors).

Floorbeam Trusses: There are 27 floorbeam trusses connecting the main deck trusses. These trusses are comprised of rolled H-beams (welded connections). The floorbeam trusses cantilever beyond the main truss on both sides (connected to the main truss, vertical members with bolts & rivets). The floorbeam truss members have numerous poor welding details – including plug welded web reinforcement plates, and tack welds & welded connection plates located in tension zones. Some of the top chord splices are offset vertically (up to ½" – from original construction) - the splice plates are bent. The floorbeam trusses below stringer joints have severe flaking rust. There is pack rust and surface pitting at the main truss connections. In 1999, the floorbeam sections below the median were re-painted some areas have section loss (holes).

Stringers: There are 14 steel stringers (27" deep rolled beams) bearing on the floorbeam trusses. They are continuous except for five stringer expansion joints. The stringer ends have corrosion at the expansion joints. The stringers adjacent to the median were re-painted in 1999. The bolted connections to the floorbeam trusses are "working" and some bolts are loose or missing.

Lateral & Sway Bracing: The main deck trusses have both upper and lower horizontal diagonal bracing. There is also a vertical sway frame running below each floorbeam truss - the median portion of these sway frames were re-painted in 1999, some areas have section loss (holes). Each floorbeam truss has 2 diagonal braces, which connect the bottom chord to Stringers #4 & 11. The pinned connections on these braces are "working" and at least one cotter pin is missing.

Truss Bearing Assemblies: The truss spans have six "geared roller-nest" bearing assemblies, and two fixed bearing assemblies. The truss bearings have moderate corrosion, the bearings at Piers #3 & 8 are functioning properly (checked during each annual inspection), but the bearings at Pier #6 show no obvious signs of movement (difficult to reach with snooper).

End Floorbeams & Crossbeams: At each end of the main truss, the multi-beam approach spans terminate by framing into a "crossbeam". The crossbeams are supported by rocker bearings mounted on the cantilever truss ends. There is an open finger expansion joint above these members. This area was re-painted in 1998-1999, and rubber "skirts" were installed below the finger joint in an attempt to prevent future corrosion damage.

End Floorbeams: The two end floorbeams are welded plate girders (they connect the main truss ends). The end floorbeams were re-painted in 1998/1999. The sides facing the open finger joints have extensive section loss (surface pitting at the base of the web, and holes in the base of the vertical stiffeners). In 1998, fatigue cracks were found in two stiffener welds directly above the NE rocker bearing.

Crossbeams & Rocker Bearings: The two "cross-beams" are welded plate girders each one is supported by two "rocker" bearings attached to the cantilever ends of the main truss. These rocker bearings are built into the crossbeam web except the southeast rocker, which, due to the bridge super-elevation, connects to the bottom flange of the crossbeam. The crossbeams & rocker bearings were re-painted in 1998/1999. The faces exposed to the finger joints have extensive surface pitting with some areas of severe section loss (holes at the base of stiffeners). The rocker bearings are measured & checked for movement during each annual inspection. All four bearings appear to be functioning (obvious signs of movement).

In 1986, the southeast rocker bearing "froze", resulting in damage to the crossbeam (2 cracked vertical web stiffeners). The rocker-bearing pin was replaced this required closing I-35W and jacking up the span. The crossbeam was repaired and the cracks in the web stiffeners were welded, crack ends drilled out, and stiffeners reinforced with angle plates. The connection was also reinforced by installing braces between the crossbeam and Beams #2 & 3.

In 1992, a crack was found in a crossbeam stiffener weld above the northeast rocker bearing (it was drilled out). In 1997, at the same location, a weld between a vertical & horizontal stiffener was found cracked through entirely. Cracks were also discovered at the end of horizontal stiffeners near the northeast & southwest rocker bearings. Strain gauges were installed to analyze stresses, crack ends were drilled out, and the northeast connection was reinforced by installing bracing between the crossbeam and 2 stringers.

Steel Multi-Beam Approach Spans (Spans #1-5 & #9-11): The approach spans have welded beams - the depth transitions from 48" to 33" (connections are riveted). The south span has 33" deep rolled beams with welded cover plates (square ends). Spans #1 - 5 have 14 beams (with a hinge joint in Span #2). In Spans-#9 - 11, the deck widens from 15 to 18 beams. The fascia beams have flaking rust along the bottom flange - the beams adjacent to the median were re-painted in 1999.

In 1998, fatigue cracks were found in several beam webs. These cracks were located in negative moment regions at the top of the diaphragm connections. At one location the web had cracked through entirely and were caused by out of plane bending in locations were the web stiffener was not rigidly connected to the top flange. After stain gauge analysis by the University of Minnesota, the diaphragm connections were modified (they were lowered, using only four bolts at each connection). Most existing cracks were drilled out (some were too small to reach), and the fractured beam was reinforced with bolted plates.

In Span #2 (multi-beam approach span), there is a cantilever expansion hinge (sliding plate bearings). The joint is closed beyond tolerable limits, possibly due to substructure movement & pavement thrust and is no longer functioning. Some beam ends are contacting, and some bearing plates have tipped (preventing the joint from reopening). The hinge area was re-painted in 1999 (open finger joint above). The beam ends have moderate surface pitting.

Approach Span Bearings: The steel beam approach spans have a total of 90 sliding plate bearing assemblies and 33 fixed plate bearing assemblies. The piers with fixed bearings have expansion bearings on the fascias.

Voided Concrete Slab North Approach Spans (Spans #12 –14): The far north approach spans consist of cast-in-place concrete continuous "voided" slabs (2 ft deep). A northbound off ramp splits off to form Bridge #9340A. The slab rests on sliding plate bearings at Pier #11 and the North Abutment (total of 29 assemblies). Piers #12 & #13 are cast directly into the slab (no bearings). These spans are in generally good condition. Spalling along the exterior and median copings was patched with shot-crete in 1998.

Bridge Substructure NBI Code #6 (Satisfactory Condition)

Abutments: The abutments have minor vertical cracking, with some staining (from leaking deck joints).

Truss Span Piers: Piers #6 & 7 (main river span) have two concrete columns resting on a pier wall. The west column on Pier #7 has a minor vertical crack. Piers #5 & 8 have 2 concrete columns connected with an upper strut. The column on Pier #8 has been reinforced with a concrete "jacket". [2001] Underwater inspections conducted by Collins Engineers, Inc. in 2000 found Pier 7 to be in good condition with no defects of structural significance. A 3x3-foot area of light scaling, with a maximum of 1" of penetration was observed on the south side of the upstream pier nose. Collins recommends inspecting the substructure unit at the normal 5-year inspection interval.

Approach Span Piers: The piers supporting the steel spans (Piers #1 - 5 & #9 -11) consist of concrete columns with a cap (those adjacent to railroad tracks have lower struts). The pier columns supporting the voided slab spans (Piers #12 & 13) are cast directly into the slab (no cap). Pier #1 has tipped slightly to the north – this is related to the hinge failure in Span #2. The east column on Pier #9 has minor scrapes & spalls from a train derailment in 1969. Pier #11 has extensive shot-crete repairs (leaking deck joint above).

Other Bridge Elements

Approach Panels: All approach panels are concrete. Each approach panel has a transverse crack, and there are some minor spalls at the joints. The relief joints need to be resealed (the north approach (SBL and on ramp) has no relief joint).

Channel & Protection: NBI Code #8 (Very Good Condition). The bridge is located just downstream from the Lower St. Anthony Lock & Falls - the flow is very turbulent. At normal river level, clearance below the truss is approximately 60 feet. Pier #7 is the only pier in the channel (along the east bank) - typically, the water depth along the west face is only 1-2 feet (we do not conduct underwater inspections). Due to the extreme turbulence, sonar readings of the channel cross-section cannot be taken.

Signing: There is an overhead sign bridge structure (running across the entire deck) mounted on the exterior railings at Truss Panel Point #2' (north end of truss). There is a signpost mounted on the west railing at Truss Panel Point #6 (south end of truss).

Guardrail: In 1998, the approach guardrails were repaired (a new impact attenuator was installed at the northbound off ramp to University Ave.).

Drainage: Several deck drains drop directly into the river. The drain troughs at Pier #6 have inadequate slope, and tend to fill-up with debris. In 1998-99, the drain troughs below the arch end finger joints were removed, and replaced with rubber "skirts". The skirt sections above the truss end rockers tend to fill with debris. These should be flushed annually.

Slope Protection: The concrete slope paving (both abutments) is in good condition.

Lighting: The bridge has rail mounted deck lighting, under deck lighting (Span #13), and river navigation lighting. The lighting above the parking lots in Spans #11 & 12 is maintained by "Metal Matic Inc.". A light post on the west railing (W 5/3 L) has a 6" vertical split from plow damage.

Miscellaneous: The area below the south approach spans (Spans #2 –5) is leased out as a parking lot (used mainly by U of M students). The area below Spans #11 & 12 is used for parking by Metal Matic Inc. The U.S. Army Corps of Engineers is stockpiling material from river dredging below Span #8. There is a catwalk (for navigation light maintenance) running below the median of the truss spans - the catwalk is being accessed by graffiti "artists" at Pier #5.

De-icing System: In 1999, an automated de-icing system was installed on the deck (spray nozzles installed in the deck and railings). A control room was constructed at the NW approach corner.

Bridge Snooper Field Investigation

Northbound & southbound inspection notes are combined. Beams are numbered from the east (see framing plan).

South Abutment: Strip seal deck joint above. [1998] Gland in (SBL) was patched using an experimental system. Hot poured seal with wire mesh reinforcement. Fourteen sliding plate bearing assemblies. [1995] The bearings are corroded and in full contraction (related to hinge failure in Span #2, and tipping of Pier #1). The seat area is cracked and discolored.

Span #1 (Steel Multi-beam): 14 beams, 33" deep rolled beams with welded cover plates (square ends). [1996] East fascia beam has flaking rust. [1978] Three west bays have some full depth deck patches. [1998] "Stool" concrete is spalling off adjacent to median beams. [1999] Beams 6, 7, 8, & 9 are re-painted.

Pier #1: 10 fixed, and 4 sliding plate bearing assemblies. Pier consists of 4 concrete columns and cap, with a RR crash strut between the columns. [1996] Pier has tipped slightly to the north (measured with plumb bob). [1999] Bearings 6, 7, 8, &. 9 are re-painted.

Span #2 (Steel Multi-beam): 14 beams (33" deep rolled beam with welded cover plates) - the beams transition to 48" deep welded beams north of the hinge joint. [1996] Flaking rust on bottom flange at girder transitions. [1997] Conduit is loose below median. [1978] Some full depth deck repairs. [1998] "Stool" concrete is spalling off adjacent to median beams. [1999] Beams 6, 7, 8, & 9 are re-painted.

Hinge Joint (12 ft. South of Pier #2): Open finger joint above. [1994] The hinge assemblies (particularly SBL) are expanded beyond tolerance (the sliding plates extend 1-3/4" beyond the base plates). At Beam #10, the sliding plate has tipped (falling off the base plate) and is preventing the joint from opening. Several beam ends are contacting at the top flange or at the web. [1999] Hinge area re-painted. [2000] Beam ends have moderate surface pitting, debris has begun to build up on hinge area.

Pier #2: 14 sliding plate bearing assemblies. Pier consists of four concrete columns and cap, with a RR crash strut between the columns. [1997/2000] Bearings have corrosion, east end of cap has 6 SF of delamination. [1999] Bearings 6, 7, 8, &. 9 are re-painted.

Span #3 (Steel Multi-beam): Over Bluff St. 14 beams (48" deep welded plate beams). [1978] Three west bays have some full depth deck patches. [1997] Second bay from east has 20 SF of leaching map cracks. [1998] "Stool" concrete spalling off (some loose concrete) adjacent to median beams. [1999] Beams 6, 7, 8, & 9 are re-painted.

Diaphragm line just north of Pier #2: [1999] Diaphragms lowered, although the connections have a "positive moment" configuration stiffeners welded to the top flange.

Diaphragm line just south of Pier #3: *Denotes locations where cracks were found in 1998. [1999] Diaphragms lowered.

Diaphragm Crack Locations Pier #3 Southside	
*Denotes locations where cracks were found in 1998.	
Girder Location	**Crack Description and or Repair Description**
G1 (East Fascia NB)	[1999/2000] ¼" crack on top of interior stiffener weld
G2 (NB)	* [1998] Two 2" holes drilled in web
G3 (NB)	* [1998] Two 1/4" intersecting diagonal holes drilled in top of stiffener welds.
G4 (NB)	* [1998] Two 2" holes drilled in web.
G5 (NB)	* [1998] Two 2" holes drilled in web.
G6 (NB)	[1998] One 2" hole drilled in web. [2000] Other end of crack is turning downward into the web (will be drilled out in spring 2000)
G7 (NB)	* [1998] One 2" hole drilled in web (other end of crack was ground out).
G8 (SB)	
G9 (SB)	
G10 (SB)	
G11 (SB)	
G12 (SB)	* [1998] Two 2" holes drilled in web & 1 hole drilled in stiffener. [1999] Crack extends 1" beyond the hole (ground out).
G13 (SB)	
G14 (West Fascia SB)	* [1998] One 2" hole drilled in web. [2000] ¾" horizontal crack on exterior flange/web weld (may eventually need drilling), small diagonal crack on at top of interior stiffener weld.

Pier #3: 10 fixed plate, and four sliding plate bearing assemblies. Pier has four concrete columns and a cap. [1999] Bearings 6, 7, 8, &. 9 are re-painted.

Span #4 (Steel Multi-beam): Over contract parking lot. 14 beams (48" deep welded plate beams). [1978] Full depth deck repairs (2nd & 3rd bays from the east). [1998] Underside of deck 200 LF of transverse leaching cracks, and 200 SF of spall (exposed rebar) below a transverse poured joint (full width of deck). [2000] 4th bay from west has 20 SF of severe leaching. [1999] Beams 6, 7, 8, & 9 are re-painted.

Diaphragm line just north of Pier #3: [1998/99] Diaphragms lowered (strain gauges placed on beams #2 & 6). *Denotes locations where cracks were found in 1998.

Diaphragm Crack Locations Pier #3 Northside	
*Denotes locations where cracks were found in 1998.	
Girder Location	**Crack Description and or Repair Description**
G1 (East Fascia NB)	
G2 (NB)	
G3 (NB)	* [1998/2000] ½" crack in top flange/web weld (West side), small crack in stiffener weld (East side).
G4 (NB)	* [1998/2000] 1" crack in top flange/web weld (East Side)
G5 (NB)	
G6 (NB)	[1999/2000] 3/8" crack in top of stiffener weld.
G7 (NB)	
G8 (SB)	
G9 (SB)	
G10 (SB)	
G11 (SB)	* [1988] Two 2" holes drilled in web
G12 (SB)	* [1988] Two 2" holes drilled in web.
G13 (SB)	
G14 (West Fascia SB)	* [1988] Two 2" holes drilled in web

Diaphragm line just south of Pier #4: [1999] Diaphragms lowered, even though the connections have a "positive moment" configuration (stiffeners welded to the top flange).

Pier #4: 14 sliding plate expansion-bearing assemblies. [1997] Bearings have light rust. Pier consists of 4 concrete columns and cap. [1999] Bearings 6, 7, 8, &. 9 are re-painted.

Span #5 (Multi-beam/Deck Truss): Over contract parking lot. 14 beams (48" deep welded plate beams bolted onto the crossbeam). [1996] Four conduit clamps missing (NB fascia beam). Median girder has impact damage (parking lot below). [1978] Underside of deck has some full depth patches (2 west bays). [1997] Deck leaching near the finger joint. [1998] Bay just east of median has severe spalling on "stool" and the adjacent deck is cracked (photo). [1999] Beams 6, 7, 8, & 9 are re-painted.

Diaphragm line just north of Pier #4: *Denotes locations where cracks were found in 1998.

Diaphragm Crack Locations Pier #4 Northside	
*Denotes locations where cracks were found in 1998.	
Girder Location	**Crack Description and or Repair Description**
G1 (East Fascia NB)	
G2 (NB)	
G3 (NB)	* [1988] Two 2" holes drilled in web.
G4 (NB)	* [1988] Two 2" holes drilled in web
G5 (NB)	
G6 (NB)	
G7 (NB)	* [1988] Two 2" holes drilled in web. [2001] Small crack at the top of the stiffener weld
G8 (SB)	
G9 (SB)	
G10 (SB)	* [1988] Two 2" holes drilled in web.
G11 (SB)	[1999/2000] Small cracks at top of stiffener weld.
G12 (SB)	* [1988] Two 2" holes drilled in web & 1/4" hole drilled in stiffener weld
G13 (SB)	* [1999/2000] Small cracks at top of stiffener weld.
G14 (West Fascia SB)	[1999] Small crack at top of interior stiffener weld

Main Truss Spans (NBL East Truss)

Stringers are numbered from the east (see framing plan).

Crossbeam: [1986] The SE rocker froze, damaging the east end of the crossbeam (cracked web stiffeners). The bridge was jacked up (I-35W closed to traffic) - the SE rocker pin was replaced, cracks in two stiffeners were welded and drilled out, and bracing was added between the crossbeam and Beams #3 & 4. [1998/99] Crossbeam re-painted, the side facing the finger joint has section loss.

Gap between Crossbeam & Floorbeam (East End)	
Date	**Measurement**
September, 1998	16-5/8"
April, 1999	17-13/16"
April, 2000	18"
September, 2001	18 1/16"

Panel Point #0 (Beginning of East Truss): Open finger joint above. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris (need flushing). [1998/99] End floorbeam re-painted - there is section loss at the base of the stiffeners.

Panel Point #1, (East Truss, Pier #5):

Pier #5: Two "rollernest" bearing assemblies. [2000] Bearings show signs of recent movement. Pier consists of two concrete columns connected by a strut. The catwalk can be accessed by climbing onto the strut (debris piled at base).

Span #6 (Deck Truss): [1997] West River Parkway constructed below bridge. [1999] The floorbeam trusses and sway bracing located below the median and the Beams 6, 7, 8, & 9 are re-painted.

Panel Point #2 (East Truss):

Panel Point #3 (East Truss): Floorbeam truss (near center) has an undercut weld in the flange.

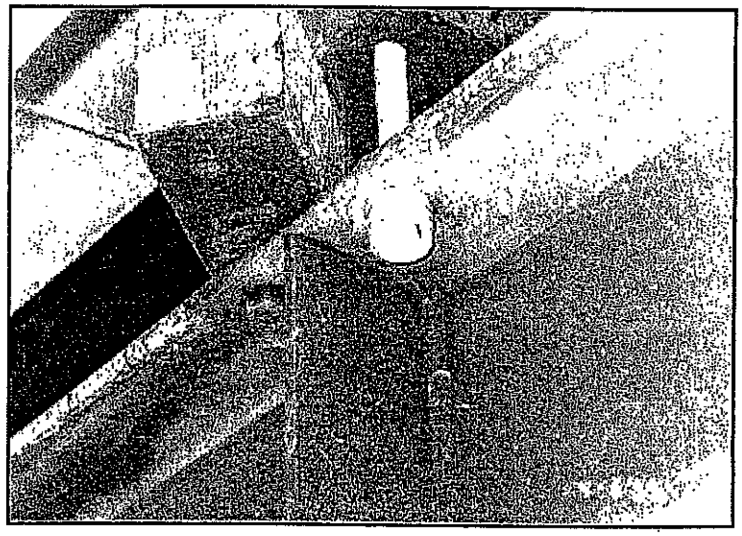
Panel Point #4 (East Truss, Stringer Joint): Strip seal deck joint above. [1999] 1 ft. of gland pulled out @ centerline. [1996] The floorbeam truss bottom chord/vertical member connection gusset plate has a weld overlap. [1999] Junction box along catwalk has cover missing. [2000] Concrete in joint at east end.

Panel Point #5 (East Truss): [1997] Cracked tack weld between the floorbeam truss top chord and a stringer bearing pedestal. [1999] Tack welds ground out @ Stringer #3 (photo), cracked tack welds remain @ Stringer #4 (photo).

Panel Point #6 (East Truss): [1994] Floorbeam truss top chord (bottom flange) has a poor quality weld at the end of a connection plate. [1999] Stringer #5 bearing pedestal has a cracked tack weld. [2000] Floorbeam truss diagonal member U10/L10 (near the bottom chord connection) has a 4" long gouge (possible crack) along a connection weld – should be ground out (photos).

Panel Point #7 (East Truss):

Panel Point #8 (East Truss, Pier #6, Stringer Joint): Strip seal and deck drain above. [1999] Joint is leaking. [1998] Stringer #4: bolt missing at south floorbeam connection. [1994] Stringer #2 (south side): one bolt is missing and the nut is missing from the other bolt - the bearing block has rotated. [2000] Missing bolt was replaced in 1999, but the bearing block was not returned to it's proper position – now bolt bolts are loose, needs repair (photos).



Panel Point #8, Stringer #2

Pier #6 (Downtown side of Mississippi): Two "rollernest" bearing assemblies. [1997] Bearings have moderate corrosion and show no signs of movement (need to check!). Pier consists of two concrete columns with a pier wall at the base. [1997] The drain pipes are clogged (top & bottom @ median).

Span #7 (Deck Truss): [1999] The floorbeam trusses and sway bracing located below the median and the Beams 6, 7, 8, & 9 are re-painted.

Panel Point #9 (East Truss):

Panel Point #10 (East Truss): Navigation light. [1999] Strain gauges installed on truss top chord member U9/U10 (U of M research project). [2000] Graffiti on top gusset plate.

Panel Point #11 (East Truss): Section loss at gusset plate, bottom chord. [2000] Stringer #3 has a bolt missing at the floorbeam connection.

Panel Point #12 (East Truss): [1999] Truss bottom chord member L12/L13 has a cracked tack weld at an interior stiffener.

Panel Point #13 (East Truss): Deck drains (falls directly into river). [1993] Bottom chord gusset plate has section loss. [1999] Truss bottom chord member L13/L14 has cracked tack welds at two interior stiffeners.

Panel Point #14 (East Truss, Midspan, Stringer Joint): Strip seal joint above. Sway frame rusty. [1999] Truss bottom chord member L14/L13' has a cracked tack weld at an interior stiffener.

Panel Point #13' (East Truss): Floorbeam truss top chord has a ground out spot near Stringer #4. [1996] Truss bottom chord member L13'/L12' has a cracked tack weld at an interior stiffener.

Panel Point #12' (East Truss): [1999] Deck (east bay) has 15 SF of water saturation. [1998] Truss bottom chord member L12'/L11' has a cracked tack weld at an interior stiffener.

Panel Point #11' (East Truss):

Panel Point #10' (East Truss):

Panel Point #9' (East Truss): Deck drains (falls directly into river).

Panel Point #8' (East Truss, Pier #7, Stringer Joint): Red navigation light. Strip seal deck joint above. Floorbeam truss has severe rust below the median. [1993] North side: bolts replaced with "redi-rod" at Stringer #4, bolts replaced at Stringer #5.

Pier #7 (East bank of Mississippi): Two fixed bearing assemblies. Pier consists of two concrete columns with a pier wall at the base. [1997] West column has a full-height leaching crack on the south face.

Span #8 (Deck Truss): [1999] The floorbeam trusses and sway bracing located below the median and the Beams 6, 7, 8, & 9 are re-painted.

Panel Point #7' (East Truss):

Panel Point #6' (East Truss): [1996/98] Stinger #4 connection to the floorbeam truss is "working". The SW bolt is loose.

Panel Point #5' (East Truss): [2001] Underside of the deck has 30 SF of water saturation.

Panel Point #4' (East Truss, Stringer Joint): Strip seal deck joint above. Truss diagonal member U4'/L3' has backer bars along the interior edges. [2001] Both connection plates, the top chord, and floorbeam have flaking rust.

Panel Point #3' (East Truss): Top chord of the floorbeam truss has an "incomplete" weld along the top edge of the web reinforcement plate.

Panel Point #2' (East Truss): Overhead sign bridge mounted on exterior railings. [1999] Deck in Bay #3 has 100 SF of water saturation (photos).

Pier #8: 2 "rollernest" bearing assemblies, they have light rust. [2000] East truss rocker shows recent movement. Pier consists of two concrete columns connected by an upper strut. Columns have concrete "jackets" around them.

Panel Point #1' (East Truss, Pier #8): [2000] Graffiti on bottom of truss (above bearing).

Panel Point #0' (End of East Truss): Open finger joint above. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris (need flushing). [1998/99] Floorbeam re-painted, side facing finger joint has section loss (holes in web stiffeners) - photos. [1998] North face (directly above east rocker bearing): two horizontal welds (between stiffener plates) have cracked through entirely (photos).

** [2000] Gap between crossbeam & floorbeam (at rocker bearing) was 3-5/8" @ 40° Degrees F.

Crossbeam: [1998/99] Crossbeam re-painted. Side facing finger joint has section loss (pitting at base of stiffeners). [1992] North face: a crack in the crossbeam web stiffener (above the rocker at the Beam #12 connection) was drilled out. [1997/98] North face: weld above east rocker bearing (between the horizontal & center vertical stiffener) has cracked through entirely (the weld end at the crossbeam web was partially drilled out). [1998] North face: cracks at both ends of the horizontal stiffener (above rocker bearing) were drilled out (two small holes drilled in crossbeam web at each location). [1998] Bracing installed between crossbeam (above east rocker) and Beams #3 & 5.

North Approach Spans

Northbound & southbound inspection notes are combined. Beams are numbered from the east (see framing plan).

Span #9 (Multi-beam): The multi-beam spans resume (48" deep welded beams bolted onto the crossbeam) - NB bridge has 8 beams, SB bridge has 7 beams. There are two active railroad tracks below. [1999] Beams 6, 7, 8, & 9 are re-painted.

Diaphragm line just south of Pier #9: *Denotes locations where cracks were found in 1998. [1999] Diaphragms lowered.

Diaphragm Crack Locations Pier #9 Southside	
*Denotes locations where cracks were found in 1998.	
Girder Location	**Crack Description and or Repair Description**
G1 (East Fascia NB)	[2000] Exterior top flange/web weld has a ½" indication.
GC (NB)	
G2 (NB)	* [1998] 4 ft. long inverted "U" shaped crack in web (reinforced with bolted plates).
G3 (NB)	
G4 (NB	* [1998/2000] Small crack in top flange/web weld.
G5 (NB)	
G6 (NB)	
G7 (NB)	
G8 (SB)	* [1998] Small crack in top flange/web weld. [2000] No cracks found.
G9 (SB)	* [1998] Crack in top of stiffener weld.
G10 (SB)	
G11 (SB)	* [1998/2000] Small crack in top of stiffener weld (East side).
G12 (SB).	* [1998/2000] Small crack in top of stiffener weld (East side)
G13 (SB):	
G14 (West Fascia SB)	

Pier #9: 13 fixed, and four sliding plate bearing assemblies. Pier consists of four columns and cap, with a RR crash strut between the columns. [1969] East column damaged by train derailment - the column has minor scrapes and spalls (downspout had to be reconnected). [1999] Bearings 6, 7, 8, &. 9 are re-painted.

Span #10 (Steel multi-beam): NB bridge has 10 beams, SB bridge has seven beams (the welded beams transition from 48" to 33" depth just north of pier). Active railroad tracks below (one track splits into two). [1999] Beams 6, 7, 8, & 9 are re-painted.

Diaphragm line just north of Pier #9: *Denotes locations where cracks were found in 1998. [1999] Diaphragms lowered.

Diaphragm Crack Locations Pier #9 Northside	
*Denotes locations where cracks were found in 1998.	
Girder Location	**Crack Description and or Repair Description**
G1 (East Fascia NB)	
G1B (NB)	Stiffeners are welded to the top flange (positive moment).
GC (NB)	
G1D (NB)	Stiffeners are welded to the top flange (positive moment)
G2 (NB)	
G3 (NB)	
G4 (NB	* [2000] Two 2" holes drilled in web.
G5 (NB)	* [2000] Two 2" holes drilled in web.
G6 (NB)	
G7 (NB)	
G8 (SB)	
G9 (SB)	* [1998/2000] Cracks in top flange/web weld & top of stiffener weld (west side).
G10 (SB)	* [2000] Two 2" holes drilled in web.
G11 (SB)	* [1998/2000] Small crack in top of stiffener weld (East side).
G12 (SB).	* [2000] Two 2" holes drilled in web.
G13 (SB)	
G14 (West Fascia SB)	

Diaphragm line just south of Pier #10: [1999] Diaphragms were inverted & lowered (even though the beam connections have a "positive moment" configuration (welded to top flange). [2000] Beam #6 appears to be "working" at the top connection.

Pier #10: 18 sliding plate expansion bearings. Pier has 5 columns & cap with a RR crash strut between the columns. [1999] Bearings 6, 7, 8, & 9 are re-painted.

Span #11 (Steel Multi-beam): NB bridge has 11 beams, SB bridge has 7 beams, parking lot below. [1999] Beams 6, 7, 8, & 9 are re-painted.

Diaphragm line just north of Pier #10: [1999] Diaphragms were inverted & lowered (even though the beam connections have a "positive moment" configuration (welded to top flange).

Pier #11: Beginning of the NB off ramp to University Ave. (Br. #9340A). Strip seal deck joint above. [1995/2000] Gland is leaking in several locations (NB & SB). Eighteen sliding plate bearings for the steel beams and 15 sliding plate bearings for the slab span. Pier consists of seven columns and a cap. [1998] Extensive shot-crete repairs on cap. [2000] West column has 1 SF spall. [1999] Sliding plate bearings for the steel beams are re-painted.

Span #12 (Concrete Voided Slab Span): Parking lot below. [1998] Shot-crete repairs along the median and exterior copings.

Pier #12: Pier consists of 6 columns (integral with the slab span deck - no bearings).

Span #13 (Concrete Voided Slab Span): 2nd St. passes below. [1998] Shot-crete repairs along the median and exterior copings.

Pier #13: Pier consists of 6 columns (integral with the slab span deck - no bearings).

Span #14 (Concrete Slab Span): [1998] Shot-crete repairs along median and exterior copings.

North Abutment: Strip seal deck joint above. Fourteen sliding plate bearing assemblies. [2000] NB joint leaking at both ends (bearings rusty).

Main Truss Spans (SBL: West Truss)

Stringers are numbered from the east (from original plans).

Crossbeam: [1998/99] Crossbeam re-painted (side facing finger joint has section loss). [1999] The bolted connection between Beam #12 and the crossbeam was re-tensioned (the connection had been "working").

** [2000] Gap between crossbeam & floorbeam (at rocker bearing) measured at 3-9/16" (45° Degrees F.).
** [2001] Gap between crossbeam & floorbeam (at rocker bearing) measured at 3 ½" (45" Degrees F.).

Panel Point #0' (End floorbeam, beginning of West Truss): Open finger deck above. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris (need flushing). [1998/99] Floorbeam re-painted (side facing finger joint has section loss on stiffeners). [1996] The floorbeam/truss connection has severe corrosion (surface pitting on plates & bolts). [1997] Conduit running along catwalk is hanging loose, and has pulled out at the floorbeam (photo).

Panel Point #1' (West Truss, Pier #8):

Pier #8: See NB notes. [1999] West truss bearing shows signs of recent movement.

Span #8 (Deck Truss): [2001] Underside of the deck has 16SF of water saturation.

Panel Point #2' (West Truss): Overhead sign bridge mounted on exterior railings.

Panel Point #3' (West Truss): The floorbeam truss (top flange of upper chord) has an ugly weld below the connection to Stringer #11.

Panel Point #4' (West Truss, Stringer Joint): Strip seal deck joint above. Truss diagonal member U4'/L3' has backer bars along interior edges.

Panel Point #5' (West Truss):

Panel Point #6' (West Truss): [1996/98] Stringer #11, one bolt replaced in 1998 at the floorbeam connection two bolts are still loose. [1997] Stringer #10: 2 south bolts are loose at the floorbeam connection. [1999] Stringer #9: one south bolt is loose at the floorbeam connection

Panel Point #7' (West Truss): [1997] Top chord/floorbeam truss connection has a cracked tack weld on the interior. [1999] Wind bracing gusset plate at Stringer #14 has loose bolts.

Panel Point #8' (West Truss, Pier #7, Stringer Joint): Strip seal deck joint above. [1998] Stringer #11: bolt replaced at floorbeam truss connection. Below Stringer #13, the diagonal brace between top and bottom chord of the floorbeam truss is bent (from original construction). [2001] Heavy flaking rust at the truss bottom chord/sway frame connection.

Pier #7: See NB notes.

Span #7 (Deck Truss):

Panel Point #9' (West Truss):

Panel Point #10' (West Truss): [1994] Stringer #13: Loose bolt at floorbeam truss connection. Top chord (U10'/U11') has 6 nicks on the exterior (15 ft. south of U10').

Panel Point #11' (West Truss): Nick in the truss bottom chord L11' /L12'.

Panel Point #12' (West Truss): Truss diagonal member U12' /L13' has 3 "nicks". The truss bottom chord L12'/L13' has a nick.

Panel Point #13' (West Truss):

Panel Point #14 (West Truss, Midspan, Stringer Joint): Strip seal deck joint above. Deck drains on both sides. [1994] Stringer #11 has flaking rust near the joint (gland pulled out above). Tack welds along the sway frame/truss, bottom chord, gusset plate. [1999] Bottom chord member L14/L13' has a cracked tack weld at an interior stiffener.

Panel Point #13 (West Truss): [1999] Pack rust at the truss bottom chord/sway frame connection (plates are spread 3/4" - photo). [1996/99] Bottom chord member L13 /L14 has cracked tack welds at two internal stiffeners.

Panel Point #12 (West Truss): [1996] Bottom chord member L12 /L13 has a cracked tack weld at the internal stiffener.

Panel Point #11 (West Truss): [1998] Stringer #11: 3 bolts replaced at the floorbeam truss connection, the SE bolt is too short (inadequate threads) – the stringer has lifted 3/32" off the bearing block (south side).

Panel Point #10 (West Truss): Truss top chord U10/U9 has two spots ground out.

Panel Point #9 (West Truss): Truss diagonal L9/U8 has a spot ground out.

Panel Point #8 (West Truss, Pier #6, Stringer Joint): Strip seal above - [1996] 8 ft of the gland is pulled out (right gutterline). Deck drains & horizontal troughs. [1996] Drain clogged at median. [1999] Standing water in east grate.

Pier #6: See NB notes.

Span #6:

Panel Point #7 (West Truss):

Panel Point #6 (West Truss): Sign post mounted on railing, overhead sign above. Floorbeam truss top chord (U5/ U4) has gouges in the bottom flange at the end of the connection plate, the bottom chord of the floorbeam truss has 3 spots ground out. Floorbeam truss top chord is offset vertically ¼" at the splice (from construction).

Panel Point #5 (West Truss): Truss top chord member U5/U6 has backer bars along the interior corners.

Panel Point #4 (West Truss, Stringer Joint): Strip seal deck joint. Truss top chord member U4/U5 has backer bars along the interior corners. [1998] Stringer #10: bolt replaced at south floorbeam, truss connection. [2000] Lighting conduit is held up with tie wire.

Panel Point #3 (West Truss): Truss diagonal member L3/U4 has backer bars along the interior corners. Truss bottom chord L2/L3 has a nick.

Panel Point #2 (West Truss): [1996] Floorbeam truss member L2/U3 has a welding flaw (no crack, MT 1997).

Pier #5: See NB notes.

Panel Point #1 (West truss, Pier #5): [1994] Diagonal brace (floorbeam to stringer) has a cotter pin missing at the floorbeam truss connection. [1998] Deck drain detached from downspout (originally drained into storm sewer).

Panel Point #0 (End Floorbeam, end of West Truss): Open finger deck joint above. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris (need flushing). [1997] The floorbeam horizontal stiffener is bent down directly above the rocker bearing (photo). [1998/99] Floorbeam re-painted - side facing finger joint has section loss (pitting).

*[2000] Gap between crossbeam & floorbeam (west end) measured at 16-1/2" (50 Degrees F.).

Crossbeam: [1997] Cracks found at the end of the horizontal crossbeam stiffener near the rocker (partially ground out). [1998/99] Crossbeam re-painted, the side facing finger joint has section loss (pitting, with holes in the base of stiffeners).

Span #5 (Deck Truss/Steel Multi-beam): The multi-beam spans resume at Panel Point #0.

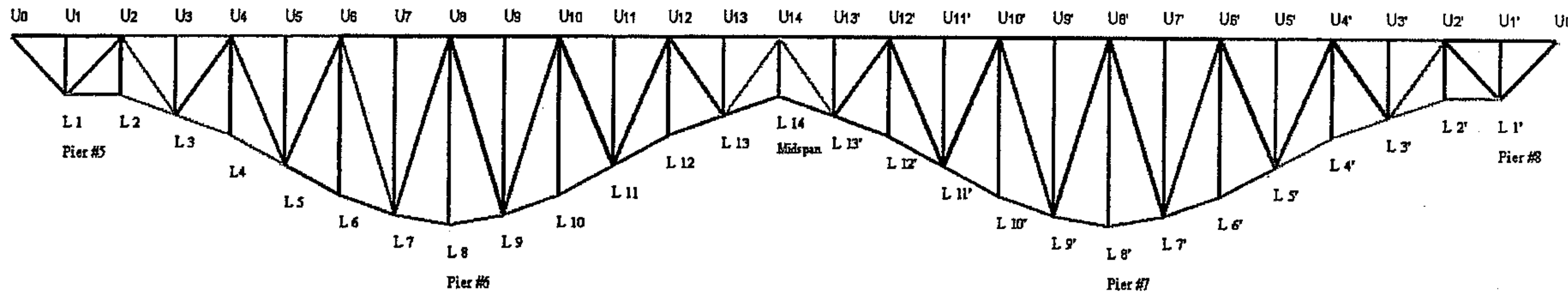
See NB Notes for South Approach Spans

Previous Snooper Inspections

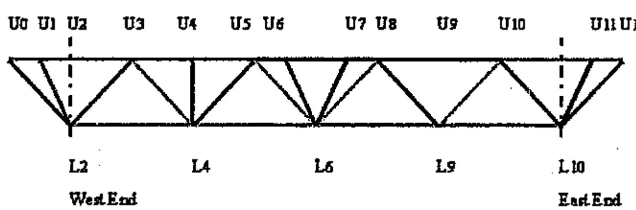
2000 Mark Pribula, Kurt Fuhrman, Pete Wilson, Marc Beucler, Mike Palmer, Wayne Tennison Pete Wilson, George Morelli, Rebecca Lane
1999 Kurt Fuhrman, Bill Nelson, Ken Rand, Mike Schadegg, Pete Wilson
1998 Mark Pribula, Terry Moravec, Eric Evens, Kurt Fuhrman, Pete Wilson, Jerry Anderson
1997* Mark Pribula, Terry Moravec, Eric Evens, Kurt Fuhrman, Pete Wilson, John Peterson
1996 Terry Moravec, Eric Evens, Kurt Fuhrman, Pete Wilson
1994 Terry Moravec, Kurt Fuhrman, Pete Wilson
1993 Terry Moravec, Chas Martin, Tom Waks
1991 Chester Martin, Chas Martin, Jerry Anderson
1988 Chester Martin

***Denotes an "In-Depth" Inspection**

Truss Diagram



Mainspan



Floor Beam Truss

Legend

- Blue Compression
- Red Tension
- Orange Reversal
- Black Secondary Member

Trunk Highway I-35W
Minnesota Department of Transportation
Bridge Inspection, Maintenance Operations
Metro Division

Bridge No. 9340

I-35W over the Mississippi River

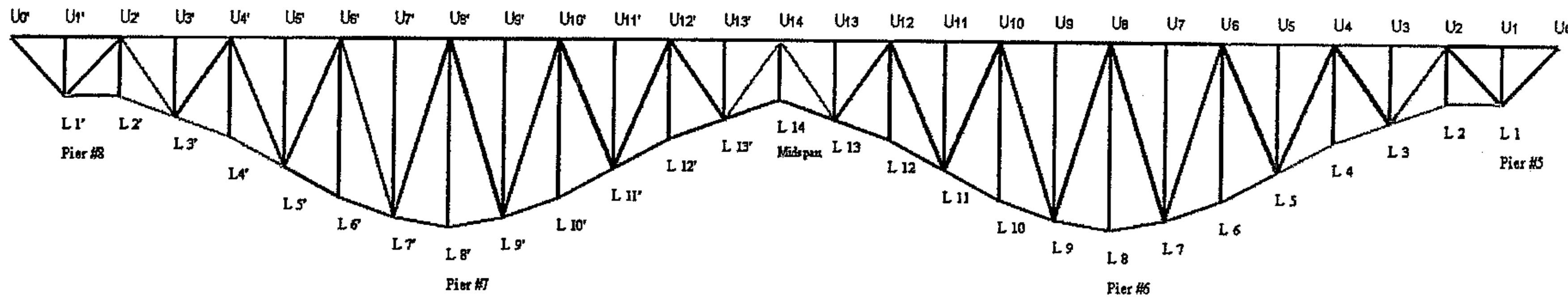
at Minneapolis, MN

Northbound Truss Diagram

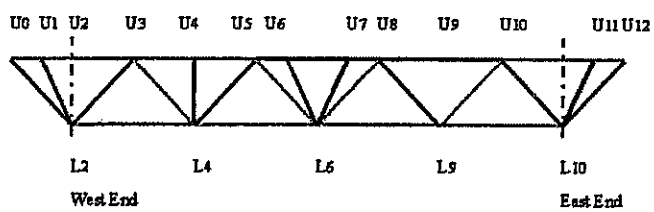
Sec's 24 & 25 T. 29 N R. 24 W
Hennepin Co. MN.

Dr.	Date 1/23/02	9340
Chk.		

Truss Diagram



Mainspan



Floor Beam Truss

Legend

- Blue Compression
- Red Tension
- Orange Reversal
- Black Secondary Member

Trunk Highway I-35W
Minnesota Department of Transportation
Bridge Inspection, Maintenance Operations
Metro Division

Bridge No. 9340

I-35W over the Mississippi River

at Minneapolis, MN

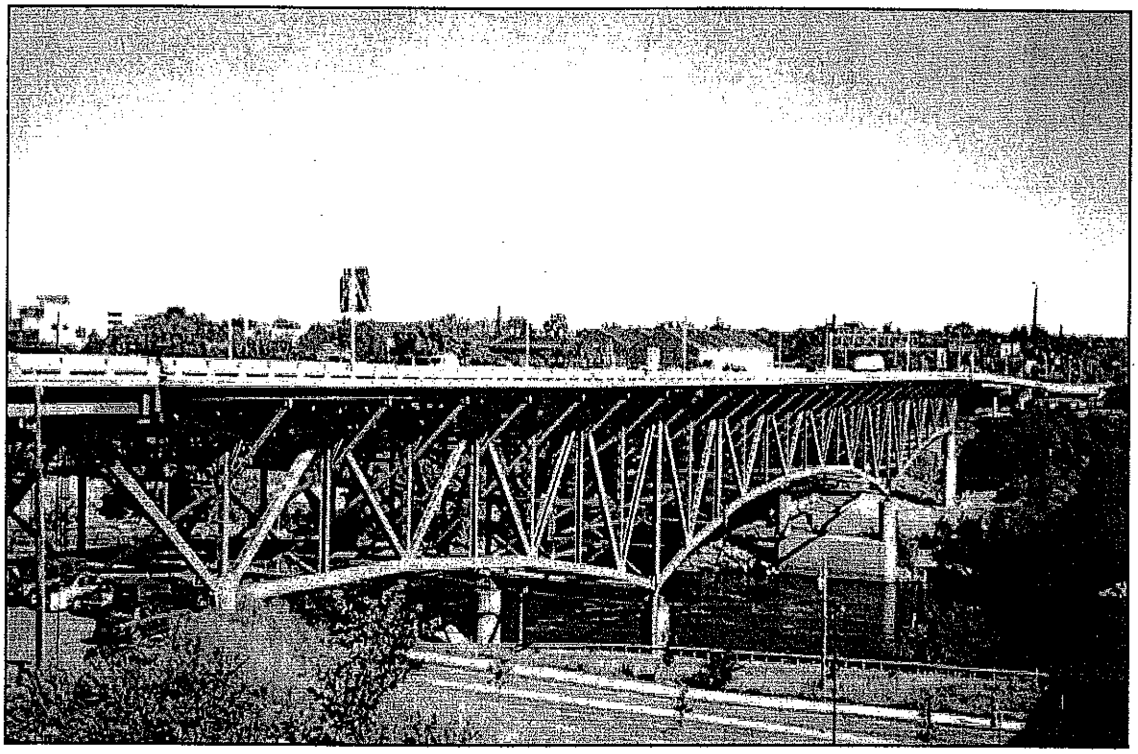
Southbound Truss Diagram

Sec's 24 & 25 T. 29 N R. 24 W
Hennepin Co. MN.

Dr.	Date 1/23/02	9340
Chk.		

FRACTURE CRITICAL BRIDGE INSPECTION

In-Depth Report



BRIDGE # 9340 (SQUIRT BRIDGE)

I-35W over the Mississippi River at Minneapolis, MN

JUNE 2003

Prepared For

Minnesota Department of Transportation
Office of Bridges & Structures

Prepared By

Minnesota Department of Transportation Metro District
Maintenance Operations, Bridge Inspection

EXHIBIT
10

STRUCTURE INVESTIGATION INFORMATION

MN/DOT BRIDGE #9340 (SQUIRT BRIDGE) I-35W OVER THE MISSISSIPPI RIVER AT MINNEAPOLIS, MN

JUNE 2003

Inspection Date: Main Truss Spans: June 9, 10, 11, 12, & 13, 2003
Steel Approach Spans: June 9, & 12, 2003
Inspection Team: Mark Pribula, Kurt Fuhrman, Vance Desens, Pete Wilson, Bill Nelson,
Inspection Report Author: Kurt Fuhrman, Vance Desens
Bridge Maintenance Sub Area: Spring Lake Park
Access Equipment Used: Reach-All UB50 (Mn/DOT), Aspen A75 (Mn/DOT)

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Licensed Professional Engineer under the laws of the State of Minnesota

Mark Pribula	21102 Registration No.	Date

Table of Contents

EXECUTIVE SUMMARY

The "Federal Aid Highway Act of 1968" directed the establishment a national bridge inspection program. Accordingly, the Minnesota Department of Transportation, Metro Division Bridge Inspection Unit conducted an annual inspection of the main truss spans and the in-depth inspection of the approach spans of Bridge # 9340 over the Mississippi River at Minneapolis, Mn. The bridge also crosses over several roadways, Minnesota Commercial Railroad tracks, & parking lots.

Constructed in 1967, the bridge has 14 spans, with a total length of 1,907 feet. The split deck has three through lanes each direction with acceleration/deceleration lanes and 2 ft. shoulders. The bridge deck widens at the north end to accommodate on & off ramps, and curves slightly at the south end. Spans #6 - 8, the main river spans, are "Fracture Critical" steel deck trusses. They are comprised of welded "built-up" members and are 988 ft. long. The truss is approximately 60 ft. deep at piers #6 & 7. The two main trusses are connected by welded floor beam trusses, which cantilever beyond the truss on both sides and support the 27" deep rolled beam roadway stringers. At each end of the main truss spans, the truss supports the adjacent approach spans with a unique "crossbeam" configuration. The approach span beams frame into a "crossbeam", which is supported by rocker bearings on the cantilever truss ends. Spans #1 - 5 & 9 - 11, the approach spans, have 48" deep, welded plate beams, which transition into 33" deep welded & rolled steel beams. Connections are riveted. Spans #12 - 14, the far north spans, are cast-in-place concrete voided slabs.

Due to several factors, including mist from nearby St. Anthony Falls, the bridge deck frequently ices over and becomes quite treacherous. In 1999, an automated de-icing system was installed on the deck with spray nozzles installed in the deck and railings. The systems controls and storage tanks are located on the north end just off the freeway entrance ramp from East University to South I-35W.

During the 1998 inspection numerous fatigue cracks were found in Spans #3 - 5 and #9 & 10, the approach spans. The cracks were located in negative moment regions where the diaphragm web stiffener was not welded to the top flange. At one location, the web had cracked through entirely. Most existing cracks were drilled out, and the fractured beam was reinforced with bolted plates. To reduce the stress levels, the diaphragms were lowered. Due to the widespread cracking, these areas should be inspected in-depth on an annual basis. The area below includes a contract parking lot, used mainly by U of M students, and the Minnesota Commercial Railroad: (651) 646-2010.

The truss end rocker bearings & main truss bearings should be measured for movement during each annual inspection. The truss end floor beams & approach end "crossbeams" should be closely inspected. They have section loss & fatigue cracks.

The hinge joint in span #2 is locked in full expansion, several beam-ends are contacting, and the hinge bearings are "frozen" and no longer functioning. Consequently, pier #1 has tipped slightly to the north, and the south abutment bearings are in full contraction. This area should be thoroughly inspected.

Four-stringer connection bolts, all in the NBL, need replacement. At panel point #8, stringer #2, has two loose bolts and the bearing block has rotated. Stringer bolts also need replacement at panel point #8, stringer #4, south side, and at panel point #11, stringer #3. This will likely require jacking the superstructure.

Several strip seal joints are leaking with glands ripped or pulled out. Attempts were made to replace these joints during the 1998 repair contract, but the steel extrusions, which anchor the gland, had severe corrosion, and new glands could not be installed. Instead, a new product was used at the south abutment, in SBL. This utilized a hot pour seal with wire mesh reinforcing. The final product looks similar to a strip seal gland. We should monitor this joint to see how well this new gland repair performs and consider using it at other locations.

The rubber "skirts", installed in 1999, above the truss end rockers tend to fill with debris. This should be flushed out annually. The horizontal drain troughs at pier #6 are clogged because of an inadequate slope.

BRIDGE INSPECTION RECOMMENDATIONS

This recommendation listing refers to specific areas where fatigue cracks and other deficiencies were located during the 2003 inspection. Bridge inspection lists these deficiencies in the highest priority first.

Long Term Repair Recommendations

1) The long term plans for this river crossing need to be defined with replacement, re-decking, etc. Due to the "Fracture Critical" configuration of the main river spans and the problematic "crossbeam" details, and fatigue cracking in the approach spans, eventual replacement of the entire structure would be preferable.

2) If bridge replacement is significantly delayed, the bridge should be re-decked. The design of the main river spans do not allow for deck widening. Any re-decking contract should also include a complete re-painting of the superstructure, elimination of the hinge joint in span #2, and reconfiguration of the deck drainage system.

3) Depending on the projected date of bridge replacement, the bridge deck will eventually require a partial overlay repair contract. The expansion joints should also be replaced.

Immediate Maintenance Recommendations

1) Four-stringer connection bolts, all in the NBL, need replacement. At panel point #8, stringer #2 has 2 loose bolts, and the bearing block has rotated. This will likely require jacking the superstructure. Stringer bolts also need replacement at panel point #8, stringer #4, south side, and at panel point #11, stringer #3.

2) Several strip seal joints are leaking. The glands have ripped or pulled out. Attempts were made to replace these joints during the 1998 repair contract, but the steel extrusions, which anchor the gland, had severe corrosion, and new glands could not be installed. Instead, a new product was used at the, SBL, south abutment. This utilized a hot pour seal with wire mesh reinforcing. The final product looks similar to a strip seal gland. We should monitor this joint to see how well this new gland repair performs, and consider using it at other locations.

3) The rubber "skirts" sections above the truss end rockers, installed in 1999, tend to fill with debris. These should be flushed out annually. The horizontal drain troughs at pier #6 have inadequate slope, and are clogged.

Areas of Concern for Future Inspections

1) During the 1998 inspection, numerous fatigue cracks were found in spans #3 - 5 and #9 - 10, the approach spans. The cracks were located in negative moment regions where the diaphragm web stiffener was not welded to the

top flange. At one location the web had cracked through entirely. Most existing cracks were drilled out, and the fractured beam was reinforced with bolted plates. To reduce the stress levels, the diaphragms were lowered. Due to the widespread cracking, these areas should be inspected in-depth on an annual basis. [2003] Span 3, stringer #7 NB, has a 1 1/2" crack in the web with one 2" hole drilled. It is recommended to drill a 2" hole at the other end. The area below includes a contract parking lot, used mainly by U of M students, and the Minnesota Commercial Railroad: (651) 646-2010.

2) The truss end rocker bearings & main truss bearings should be measured for movement during each annual inspection. The truss end floor beams & approach end "crossbeams" should be closely inspected. They have section loss, had flaking rust & fatigue cracks (open finger joint).

3) The hinge joint in span #2 is locked in full expansion several beam-ends are contacting, and the hinge bearings are "frozen" and no longer functioning. Consequently, pier #1 has tipped slightly to the north, and the south abutment bearings are in full contraction. This area should be thoroughly inspected.

For information that is more detailed and recommendations, please refer to the appropriate sections in the text of the report.

BRIDGE DESCRIPTION

Bridge #9340 was constructed in 1967, and has 14 spans, with a total length of 1,907 feet. The split deck has three through lanes each direction & also acceleration/deceleration lanes. The shoulders are only 2 ft. wide. The bridge deck widens at the north end to accommodate on & off ramps, and curves slightly at the south end.

Spans #6 - 8, are "Fracture Critical" steel deck trusses, comprised of "built-up" welded members. Steel deck truss spans are 988 ft long. Span #7 is 456 ft. long. The truss is approximately 60 ft. deep at piers #6 & 7. The two main trusses are connected by welded floor beam trusses, which cantilever beyond the truss on both sides, and support the 27" deep rolled beams roadway stringers.

At each end of the main truss spans, the truss supports the adjacent approach spans with a unique "crossbeam" configuration, (open finger joint). The approach span beams frame into a "crossbeam", which is supported by rocker bearings on the cantilever truss ends. Spans #1 - 5 & 9 - 11, the approach spans, have 48" deep welded plate beams, which transition into 33" deep welded & rolled steel beams. The connections are riveted. Spans #12 - 14, the far north spans, are cast-in-place concrete voided slabs.

Due to several factors, including mist from nearby St. Anthony Falls, the bridge deck frequently ices over and becomes quite treacherous. In 1999, an automated de-icing system was installed on the deck, with spray nozzles installed in the deck and railings. Control room is located at the northwest approach corner.

BRIDGE DECK: NBI CONDITION CODE 5

The split deck has 3 through lanes each direction, with acceleration/deceleration lanes. Shoulders are only 2 ft. wide. A low slump concrete overlay, with numerous full-depth deck repairs, was placed on the deck in 1978. In 1998, the median copings were replaced with steel stay-in-place forms, and the exterior copings were patched with shot-crete.

Wearing Surface: The overlay has some minor spalls and patched areas around the finger joints, and 3,000 LF of transverse cracks, sealed in 1998. The overlay has several patched areas, and some spalls. Additional patching is typically required each year. A partial chaining of the northbound deck in 1998 found 1,665 SF of delamination & 47 SF of spall. In 1999, the Federal Highway Administration conducted a ground penetrating radar survey, using the experimental "HERMES" system. The radar survey found the overlay to have 6.14% delamination. [2001] The overlay has 15,250 SF of concrete repair patches.

Structural Slab: The underside of the deck has a moderate amount of transverse leaching cracks, with some areas of leaching map cracks & spalling, particularly in the south approach spans. In 1998, the median coping overhangs were replaced with steel stay-in-place forms, and the exterior copings were repaired with shotcrete. During the median slab removal, the bays adjacent to the median were damaged - some of the "stool" concrete along the stringers

& beams has spalled off with exposed rebar; and in some locations, the spalling extends into the underside of the deck. [2001] The structural slab has 1,200 SF full depth repair patches.

Open Finger Expansion Joints: The deck has 3 open finger joints, above the hinge joint in span #2, & at each end of the truss spans. In 1999, rubber "skirts" were installed below the truss end finger joints & the drain troughs were removed.

Strip Seal Expansion Joints: There are strip seal joints at the abutments, pier #11, and at five stringer joints in the main truss spans. These were installed in 1978. The strip seal glands have pulled out, with joints leaking, in several locations. The steel extrusions, which anchor the glands, have severe section loss, making gland replacement impossible. In 1998, the south abutment, SBL, gland was patched using an experimental system. Hot poured seal with wire mesh reinforcement.

Poured Deck Joints: The deck has several transverse poured joints, from staged deck construction. All of these joints are leaching below; & at some joints the deck is spalling below.

Exterior Railings: The original exterior code #12 railings were retrofit in 1998. A 32" high concrete face was installed in front of the existing concrete rail base. The horizontal steel rails were removed. The curb along the railing has moderate cracking, delamination and spalling. The curb has 800 LF reconstructed in 2001.

Median Railings: Code #22, type "J"-rail, was installed along the split median in 1998. The railings above the truss spans have removable pre-cast concrete caps, which are intended to prevent further corrosion damage to the superstructure below.

BRIDGE SUPERSTRUCTURE: NBI CONDITION CODE 4

Paint System: Bridge was originally painted with a lead base system in 1968. In 1999, the bridge was partially re-painted with a zinc system. Areas painted included the entire superstructure below and along the open median, and below the open finger deck joints.

Currently, the overall paint system is approximately 15% unsound. The truss members have surface rust corrosion and pack rust at the floorbeam & sway frame connections, and there is paint failure & surface rust corrosion in scattered locations. The floorbeam trusses & stringer ends have surface rust corrosion at the stringer expansion joints. Some of the areas re-painted in 1999 have severe section loss. This includes the sections of the floorbeam trusses & sway bracing located below the median, and the truss end floor beams & "crossbeams", located below the open finger joints.

Main Truss Members The two steel deck trusses are comprised of "built-up" welded members; connections include both rivets and bolts. While most truss members are welded box beams, some tension vertical & diagonal members are welded "H" beams. The truss members have numerous poor weld details. The vertical "H" beam truss members have transverse welds at the floor beam connections. The box beam truss members have welded interior stiffeners. Some of these have tack-welded tabs. Many of these tack welds have cracked. Some box beams have tack welds, or tack welded backer bars along the interior corners. The truss members have surface rust corrosion at the floor beam and sway frame connections. Pack rust is forming between the connection plates. There is paint failure, surface rust, and section loss, flaking rust in scattered locations. The interiors of the box members have severe pigeon debris. In 1999, screens were placed over openings in the truss members to prevent pigeon access. This unfortunately prevents inspection of the interiors.

Floor Beam Trusses: There are 27 floorbeam trusses connecting the main deck trusses. These trusses are comprised of rolled H-beams with welded connections. The floorbeam trusses cantilever beyond the main truss on both sides. They are connected to the main truss, vertical members with bolts & rivets. The floorbeam truss members have numerous poor welding details, including plug welded web reinforcement plates, and tack welds & welded connection plates located in tension zones. Some of the top chord splices are offset vertically, up to ½" – from original construction. The splice plates are bent. The floorbeam trusses below stringer joints have section loss, severe flaking rust. There is pack rust and surface pitting at the main truss connections. In 1999, the floor beam sections below the median were re-painted. Some areas have section loss with holes.

Stringers: There are 14 steel stringers, 27" deep rolled beams, bearing on the floorbeam trusses. They are continuous except for five stringer expansion joints. The stringer ends have surface rust corrosion at the expansion joints. The stringers adjacent to the median were re-painted in 1999. The bolted connections to the floorbeam trusses are "working" and some bolts are loose or missing.

Lateral & Sway Bracing: The main deck trusses have both upper and lower horizontal diagonal bracing. There is also a vertical sway frame running below each floorbeam truss - the median portion of these sway frames were re-painted in 1999, some areas have section loss with holes. Each floorbeam truss has 2 diagonal braces, which connect the bottom chord to stringers #4 & 11. The pinned connections on these braces are "working" and at least one cotter pin is missing.

Truss Bearing Assemblies: The truss spans have six "geared roller-nest" bearing assemblies, and two fixed bearing assemblies. The truss bearings have section loss, flaking & surface rust; moderate corrosion, the bearings at piers #5 & 8 are functioning properly. They are checked during each annual inspection. The bearings at pier #6 show no obvious signs of movement, difficult to reach with snooper.

End Floor Beams & Crossbeams: At each end of the main truss, the multi-beam approach spans terminate by framing into a "crossbeam". The crossbeams are supported by rocker bearings mounted on the cantilever truss ends. There is an open finger expansion joint above these members, severe section loss on steel. This area was re-painted in 1998 - 1999, and rubber "skirts" were installed below the finger joint in an attempt to prevent future corrosion damage.

End Floor Beams: The two end floor beams are welded plate girders. They connect the main truss ends. The end floor beams were re-painted in 1998/1999. The sides facing the open finger joints have extensive section loss with surface pitting at the base of the web, and holes in the base of the vertical stiffeners. In 1998, fatigue cracks were found in two stiffener welds directly above the NE rocker bearing.

Crossbeams & Rocker Bearings: The two "cross-beams" are welded plate girders each one is supported by two "rocker" bearings attached to the cantilever ends of the main truss. These rocker bearings are built into the crossbeam web except the southeast rocker, which, due to the bridge super-elevation, connects to the bottom flange of the crossbeam. The crossbeams & rocker bearings were re-painted in 1998/1999. The faces exposed to the finger joints have extensive surface pitting with some areas of severe section loss with holes at the base of stiffeners. The rocker bearings are measured & checked for movement during each annual inspection. All four bearings appear to be functioning. They show obvious signs of movement.

In 1986, the southeast rocker bearing "froze", resulting in damage to the crossbeam with two cracked vertical web stiffeners. The rocker-bearing pin was replaced. This required closing I - 35W and jacking up the span. The crossbeam was repaired and the cracks in the web stiffeners were welded, crack ends drilled out, and stiffeners reinforced with angle plates. Installing braces between the crossbeam and beams #2 & 3 also reinforced the connection.

In 1992, a crack was found in a crossbeam stiffener weld above the northeast rocker bearing, which was drilled out. In 1997, at the same location, a weld between a vertical & horizontal stiffener was found cracked through entirely. Cracks were also discovered at the end of horizontal stiffeners near the northeast & southwest rocker bearings. Strain gauges were installed to analyze stresses, crack ends were drilled out, and installing bracing between the crossbeam and 2 stringers reinforced the northeast connection.

Steel Multi-Beam Approach Spans (spans #1 - 5 & #9 - 11): The approach spans have welded beams - the depth transitions from 48" to 33". Connections are riveted. The south span has 33" deep rolled beams with welded cover plates (square ends). Spans #1 - 5 have 14 beams (with a hinge joint in span #2). In spans-#9 - 11, the deck widens from 15 to 18 beams. The fascia beams have section loss, flaking rust along the bottom flange - the beams adjacent to the median were re-painted in 1999.

In 1998, fatigue cracks were found in several beam webs. These cracks were located in negative moment regions at the top of the diaphragm connections. At one location the web had cracked through entirely and was caused by out of plane bending in locations where the web stiffener was not rigidly connected to the top flange. After stain gauge analysis by the University of Minnesota, the diaphragm connections were modified. They were lowered, using only four bolts at each connection. Most existing cracks were drilled out. Some were too small to reach, and the fractured beam was reinforced with bolted plates.

In span #2, multi-beam approach span, there is a cantilever expansion hinge with sliding plate bearings. The joint is closed beyond tolerable limits, possibly due to substructure movement & pavement thrust and is no longer functioning. Some beam-ends are contacting, and some bearing plates have tipped, preventing the joint from reopening. The hinge area, with open finger joint above, was re-painted in 1999. The beam-ends have section loss, moderate surface pitting.

The north approach spans have lateral & diagonal bracing welded to the web.

Approach Span Bearings: The steel beam approach spans have a total of 90 sliding plate bearing assemblies and 33 fixed plate bearing assemblies. The piers with fixed bearings have expansion bearings on the fascias.

Voided Concrete Slab North Approach Spans (Spans #12 – 14): The far north approach spans consist of cast-in-place concrete continuous "voided" slabs. They are 2 ft deep. Northbound off ramp splits off to form Bridge #9340A. The slab rests on sliding plate bearings at pier #11 and the north abutment. There are 29 bearing assemblies. Piers #12 & #13 are cast directly into the slab with no bearings. These spans are in generally good condition. Spalling along the exterior and median copings was patched with shotcrete in 1998. [2001] Light fixtures at Metal Matic Incorporated parking lot.

BRIDGE SUBSTRUCTURE: NBI CONDITION CODE 6

Abutments: The abutments have vertical cracking, with some staining from leaking deck joints.

Truss Span Piers: Piers #6 & 7, main river span, have two concrete columns resting on a pier wall. The west column on pier #7 has a minor vertical crack. Piers #5 & 8 have two concrete columns connected with an upper strut. The column on pier #8 has been reinforced with a concrete "jacket". [2001] Underwater inspection conducted by Collins Engineers, Inc. in 2000 found pier 7 to be in good condition with no defects of structural significance. A 3 x 3 foot area of light scaling, with a maximum of 1" of penetration was observed on the south side of the upstream pier nose. Collins recommends inspecting the substructure unit at the normal 5 year inspection interval.

Approach Span Piers: Piers #1 - 5 & #9 - 11, piers supporting the steel spans, consist of concrete columns with a cap. Those adjacent to railroad tracks have lower struts. The pier columns supporting the voided slab spans (piers #12 & 13) are cast directly into the slab with no cap. Pier #1 has tipped slightly to the north. This is related to the hinge failure in span #2. The east column on pier #9 has minor scrapes & spalls from a train derailment in 1969. Pier #11 has extensive shotcrete repairs from leaking deck joint above.

OTHER BRIDGE ELEMENTS

Approach Panels: All approach panels are concrete. Each approach panel has a transverse crack, and there are some minor spalls at the joints. The relief joints need to be resealed. North approach, SBL and on ramp, has no relief joint. [2001] South approach panel was scarified and a low slump overlay was installed.

Channel & Protection: NBI code #8 which is very good condition. The bridge is located just downstream from the Lower St. Anthony Lock & falls - the flow is very turbulent. At normal river level, clearance below the truss is approximately 60 feet. Pier #7 is the only pier in the channel, along the east bank. Typically, the water depth along the west face is only 1 -

2 feet. Mn/Dot does not conduct underwater inspections. Due to the extreme turbulence, sonar readings of the channel cross-section cannot be taken.

Signing: There is an overhead sign bridge structure running across the entire deck, mounted on the exterior railings at truss panel point #2' at north end of truss. There is a signpost mounted on the west railing at truss panel point #6 at south end of truss.

Guardrail: In 1998, the approach guardrails were repaired. Impact attenuator was installed at the northbound off ramp to University Avenue.

Drainage: Several deck drains drop directly into the river. The drain troughs at pier #6 have inadequate slope, and tend to fill up with debris. In 1998-99, the drain troughs below the arch end finger joints were removed, and replaced with rubber "skirts". The skirt sections above the truss end rockers tend to fill with debris. These should be flushed annually.

Slope Protection: The concrete slope paving, at both abutments, is in good condition.

Lighting: Rail mounted deck lighting, under deck lighting in span #13, and river navigation lighting. "Metal Matic Inc." maintains the lighting above the parking lots in spans #11 & 12. A light post, W 5/3 L, on the west railing, has a 6" vertical split from plow damage.

Miscellaneous: The area below spans #2 - 5, the south approach spans, is leased out as a parking lot & used mainly by U of M students. [2003] This parking lot has been barricaded from use. Metal Matic Inc uses the area below spans #11 & 12 for parking. The U.S. Army Corps of Engineers is stockpiling material from river dredging below span #8. There is a catwalk, for navigation light maintenance, running below the median of the truss spans. Catwalk is being accessed by graffiti "artists" at pier #5. [2002] East coping has conduit.

De-icing System: In 1999, an automated de-icing system was installed on the deck, with spray nozzles installed in the deck and railings. Control room was constructed at the NW approach corner.

BRIDGE SNOOPER FIELD INVESTIGATION

Approach Spans:
Northbound & southbound inspection notes are combined. Plans have beams numbered from the east.

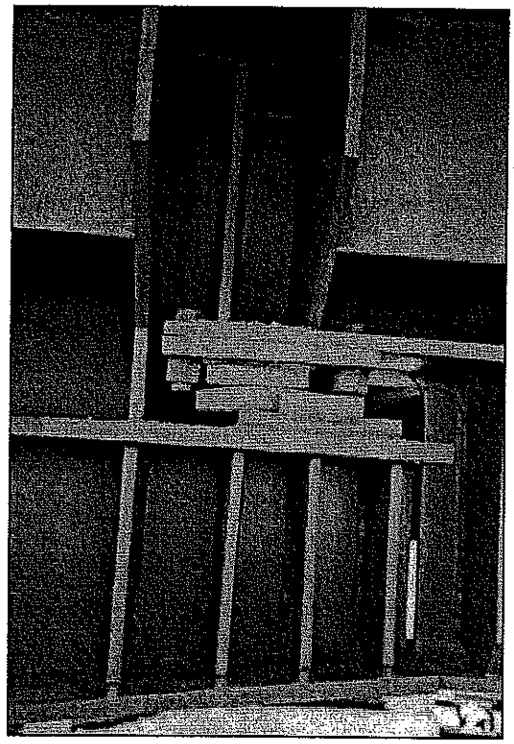
South Abutment:
Strip seal deck joint above. [1998] SBL Gland was patched using an experimental joint, hot poured seal with wire mesh reinforcement, and fourteen sliding plate bearing assemblies. [1995] Bearings are corroded and in full contraction from hinge failure in span #2, and tipping of pier #1. The seat area is cracked and discolored. [2003] 72 LF random cracks: south abutment.

Span #1 (Steel Multi-beam):
Span is 53 FT long with 14 beams, 33" deep rolled beams, with welded cover plates with square ends. [1996] East fascia beam has section loss, flaking rust. [2003] Surface rust: on the beams. [1978] 3 West bays have 300 SF full depth deck patches. [1998] "Stool" concrete is spalling off adjacent to median beams. [1999] Beams 6, 7, 8, & 9 were re-painted.

Pier #1:
10 Fixed; & 4 sliding plate bearing assemblies. Pier consists of 4 concrete columns and cap, with a railroad crash strut between the columns. [1996] Pier has tipped slightly to the north (measured with plumb bob). [1999] Bearings 6, 7, 8, &. 9 were re-painted.

Span #2 (Steel Multi-beam):
Span is 72 FT long with 14 beams; 33" rolled beams with welded cover plates, some with square end welded cover plates, the beams transition to 48" welded beams north of the hinge joint. [1978] 350 SF: full depth deck repairs. [1997] Conduit is loose below median. [1998] "Stool" concrete is spalling off adjacent to median beams. [1999] Beams 6, 7, 8, & 9 were re-painted. [96/2003] Bottom flange at girder transitions & at hinge has section loss, flaking rust.

Hinge Joint (12 ft. South of Pier #2):
Hinge joint has open finger joint above. [94/2002] Hinge assemblies are expanded beyond tolerance; sliding plates extend 4" beyond the base plates, reducing bearing capacity. At beam #10, the sliding plate has tipped, falling off the base plate, and is preventing the joint from opening. [1999] Hinge area re-painted. [2000] Beam-ends have section loss, moderate surface pitting; debris has begun to build up on hinge area. Additionally, the tops of the beam-ends are contacting at the top flange or at the web along this joint.



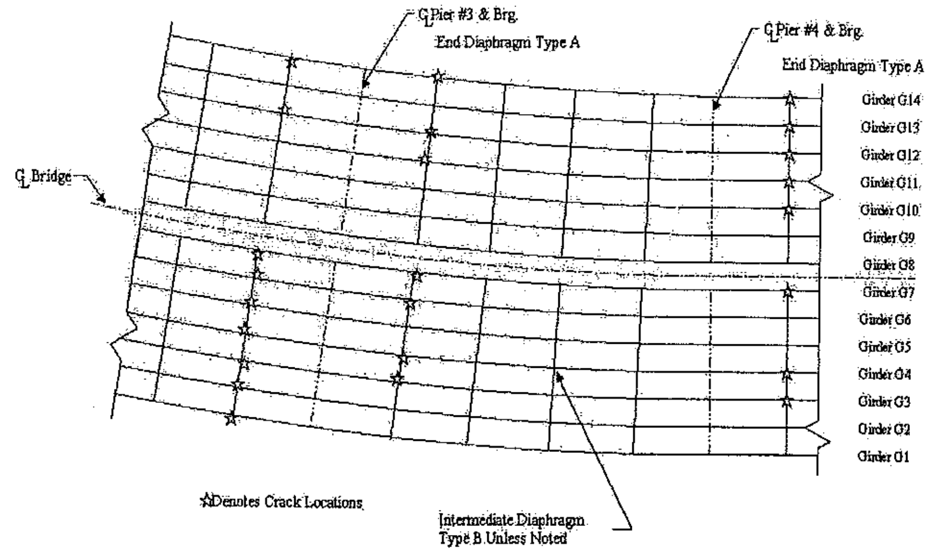
Hinge Bearing Sole Plate

Pier #2:
Pier consists of four concrete columns, 14 sliding plate bearing assemblies, and cap, with a railroad crash strut between the columns. [97/2000] Bearings have surface rust corrosion; east end of cap has 6 SF of delamination. [1999] Bearings 6, 7, 8, &. 9 re-painted. [2003] East end of cap, south face has 10 SF of map cracking.

Span #3 (Steel Multi-beam):
Over Bluff St. Span is 110 FT long with fourteen, 48" deep welded plate beams. [1978] The 3 west bays have some full depth deck patches. [1997] Second bay from east has 20 SF of leaching map cracks. [1998] "Stool" concrete: spalling off adjacent to median beams. [1999] Beams 6, 7, 8, & 9 re-painted.

Diaphragm Line North of Pier #2:
[99/2003] Diaphragms lowered, although the connections have a "positive moment" configuration stiffeners welded to the top flange, no cracks.

Diaphragm Line South of Pier #3:
Refer to chart titled **Diaphragm Crack Locations South of Pier #3** for crack locations, description & repair. [1999] Diaphragms lowered.



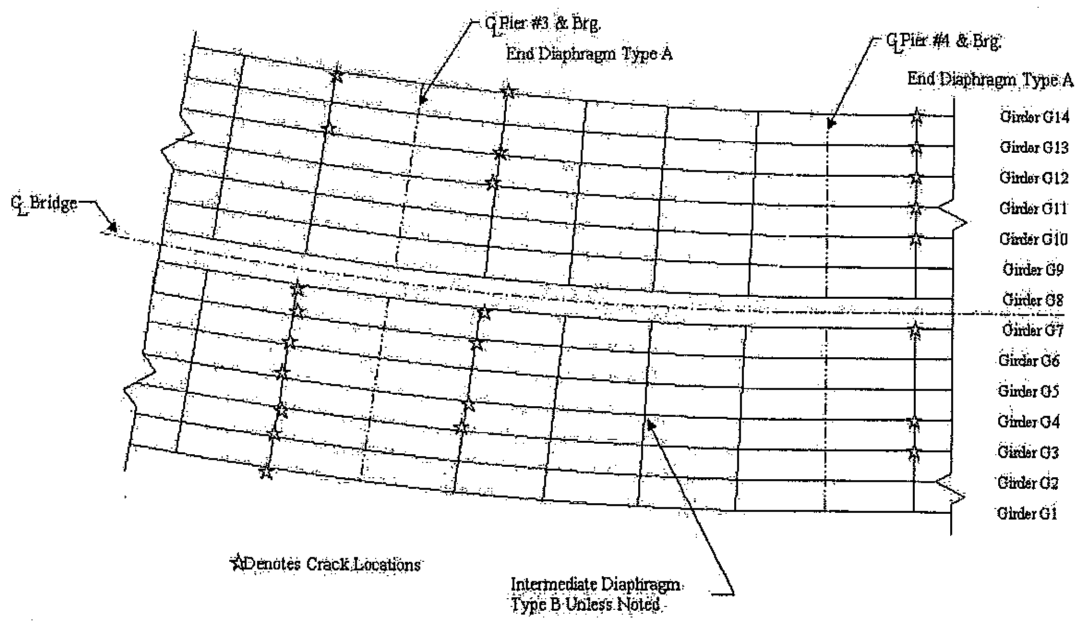
Diaphragm Crack Locations South of Pier #3	
Girder Location	**Crack Description and or Repair Description**
G1 (East Fascia NB)	[99/2000] ¼" crack on top of interior stiffener weld. [2003] No change.
G2 (NB)	* [1998] Two 2" holes drilled in web. Crack is contained.
G3 (NB)	* [1998] Two ¼" intersecting diagonal holes drilled in top of stiffener welds. [2003] No crack.
G4 (NB)	* [1998] Two 2" holes drilled in web. Crack is contained.
G5 (NB)	* [1998] Two 2" holes drilled in web. Crack is contained.
G6 (NB)	[1998] One 2" hole drilled in web. [2000] Other end of crack is turning downward into the web & was drilled out. Crack is contained.
G7 (NB)	* [1998] One 2" hole drilled in web & other end of crack was ground out. [2003] The ground out end is cracked, visible on both sides web, should be drilled out.
G8 (SB)	
G9 (SB)	
G10 (SB)	
G11 (SB)	
G12 (SB)	* [1998] Two 2" holes drilled in web & 1 hole drilled in stiffener. [1999] Crack extends 1" beyond the hole (ground out). [2003] No change.
G13 (SB)	
G14 (West Fascia SB)	* [1998] One 2" hole drilled in web. [2000] ¾" horizontal crack on exterior flange/web weld (may eventually need drilling), small diagonal crack on at top of interior stiffener weld. [2003] No change.

***Denotes locations where cracks were found in 1998.**

Pier #3:
10 fixed plate, and four sliding plate bearing assemblies. Pier has four concrete columns and a cap. [1999] Bearings 6, 7, 8, &. 9 were re-painted.

Span #4 (Steel Multi-beam):
Over contract parking lot & Bluff St. Span is 110 FT long with fourteen 48" deep welded plate beams. [1978] Second & third bays from the east have full depth deck repairs. [1998] Underside of deck has 200 LF of transverse leaching cracks, 200 SF of spall with exposed rebar below a transverse poured joint, full width of deck. [2000] Fourth bay from west has 20 SF of severe leaching. [1999] Beams 6, 7, 8, & 9 were re-painted.

Diaphragm Line North of Pier #3:
Refer to chart titled **Diaphragm Crack Locations North of Pier #3** for crack locations, description &repair. [1998/99] Diaphragms lowered with strain gauges placed on beams #2 & 6. *Denotes locations where cracks were found in 1998.



Diaphragm Crack Locations North of Pier #3	
Girder Location	**Crack Description and or Repair Description**
G1 (East Fascia NB)	
G2 (NB)	Strain gauges on both faces.
G3 (NB)	* [98/2000] West side, top flange web weld has ½" crack. Eastside, stiffener weld has a small crack. [2003] No change.
G4 (NB)	* [1999] West face, top of stiffener weld small crack. [2003] Crack is growing down toe of weld ¾", drill out.
G5 (NB)	* [2003] Small crack at the top of stiffener weld.
G6 (NB)	* [1999] Small crack at top of stiffener weld. Strain gauges on the east face. [2003] No change.
G7 (NB)	* [2003] Small crack at the top of the interior stiffener weld.
G8 (SB)	
G9 (SB)	
G10 (SB)	
G11 (SB)	* [1998] Two 2" holes drilled in web. Crack is contained.
G12 (SB)	* [1998] Two 2" holes drilled in web. Crack is contained.
G13 (SB)	
G14 (West Fascia SB)	* [1998] Two 2" holes drilled in web. Crack is contained.

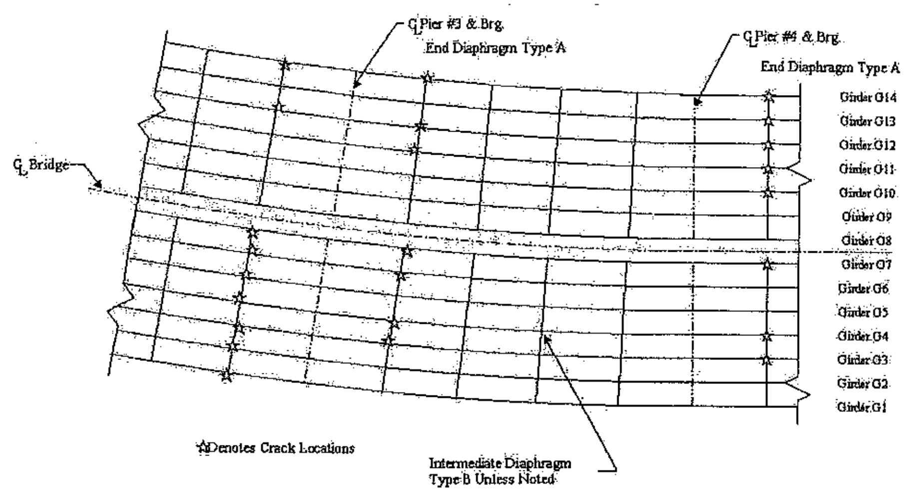
***Denotes locations where cracks were found in 1998.**

Diaphragm Line South of Pier #4:
[1999] Diaphragms lowered, even though the connections have a "positive moment" configuration. Stiffeners are welded to the top flange.

Pier #4:
14 Sliding plate expansion bearing assemblies. [1997] Bearings have surface rust. Pier consists of 4 concrete columns and cap. [1999] Bearings 6, 7, 8, &. 9 were re-painted.

Span #5 (Multi-beam/Deck Truss):
Over contract parking lot; span is 109 FT long with fourteen, 48" deep welded plate beams bolted onto the crossbeam. [1996] 4 conduit clamps missing on NB fascia beam. Median girder has impact damage from parking lot below. [1978] Underside of deck is leaching at the finger joint, has two full depth patches in the west bays. [1998] Bay just east of median has severe spalling on "stool" and the adjacent deck is cracked. [1999] Beams 6, 7, 8, & 9 were re-painted.

Diaphragm Line North of Pier #4:
Refer to chart titled **Diaphragm Crack Locations North of Pier #4** for crack locations, description &repair.



Diaphragm Crack Locations North of Pier #4	
Girder Location	**Crack Description and or Repair Description**
G1 (East Fascia NB)	
G2 (NB)	
G3 (NB)	* [1998] Two 2" holes drilled in web. Crack is contained.
G4 (NB)	* [1998] Two 2" holes drilled in web. Crack is contained.
G5 (NB)	
G6 (NB)	
G7 (NB)	* [1998] Two 2" holes drilled in web. [2001/03] Both sides, small crack at top of stiffener weld.
G8 (SB)	
G9 (SB)	
G10 (SB)	* [1998] Two 2" holes drilled in web. Crack is contained.
G11 (SB)	[99/2000] Small crack at top of stiffener weld. [2003] No change.
G12 (SB)	* [1998] Two 2" holes drilled in web & ¼" hole drilled in stiffener weld. Crack is contained.
G13 (SB)	* [99/2000] Small crack at top of stiffener weld. [2003] No change.
G14 (West Fascia SB)	[1999] Small crack at top of interior stiffener weld. [2003] No change.

***Denotes locations where cracks were found in 1998.**

Main Truss Spans (Northbound, East Truss)
Stringers are numbered from the east (see framing plan).

Crossbeam:
[1986] The SE rocker bearing froze, damaging the east end of the crossbeam, resulting in cracked web stiffeners. The bridge was jacked up. I - 35W was closed to traffic. SE rocker pin was replaced, cracks in two stiffeners were welded and drilled out, and bracing was added between the crossbeam and beams #3 & 4. [1998/99] Crossbeam was repainted; the side facing the finger joint has section loss.

Gap between Crossbeam & Floorbeam (East End)	
Date	**Measurement**
September, 1998	16-5/8"
April, 1999	17-13/16"
April, 2000	18"
September, 2001	18-1/16"
June, 2003	16-7/8"

Panel Point #0 (Beginning of East Truss):
Expansion joint has open finger joint above. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris; needs to be flushed. [1998/99] End floorbeam was repainted; section loss at the base of the stiffeners. [2002] Water saturation between stringers 2 thru 4 at panel points 0 to 1.

Panel Point #1 (East Truss, Pier #5):

Pier #5:
Bearing assemblies have two "rollernest". Climbing onto the pier strut at this location accesses the catwalk. Debris piled at pier strut base allow for unauthorized access. [2002] Bearings show signs of recent movement.

Span #6 (Deck Truss):
Span is 266 FT long with seven floorbeam trusses. [1997] West River Parkway constructed below bridge. [1999] Floorbeam truss's, sway bracing located below the median and beams 6, 7, 8, & 9 were re-painted.

Panel Point #2 (East Truss):

Panel Point #3 (East Truss):
Floorbeam truss, near center, has an undercut weld in the flange.

Panel Point #4 (East Truss Stringer Joint):
Strip seal deck joint above. [1999] 1 ft. of gland pulled out at centerline. [1996] Floorbeam truss bottom chord/vertical member connection gusset plate has a weld overlap. [1999] Junction box cover is missing at catwalk. [2000] Concrete in joint at east end.

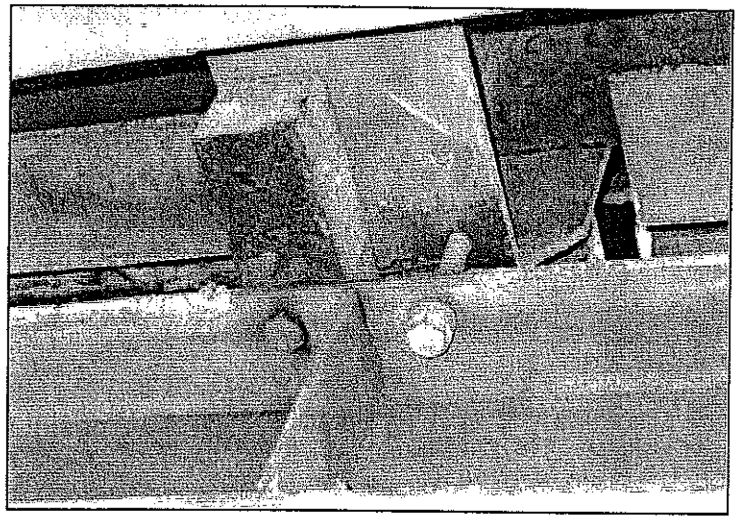
Panel Point #5 (East Truss):
[1997] Cracked tack weld between the floorbeam truss top chord and a stringer bearing pedestal. [1999] Tack welds ground out at stringer #3, cracked tack welds remain at stringer #4.

Panel Point #6 (East Truss):
[1994] Floorbeam truss top chord, bottom flange, has a poor quality weld at the end of a connection plate. [1999] Stringer #5 bearing pedestal has a cracked tack weld. [2000] Floorbeam truss diagonal member U10/L10, near the bottom chord connection, has a 4" long gouge with possible crack along

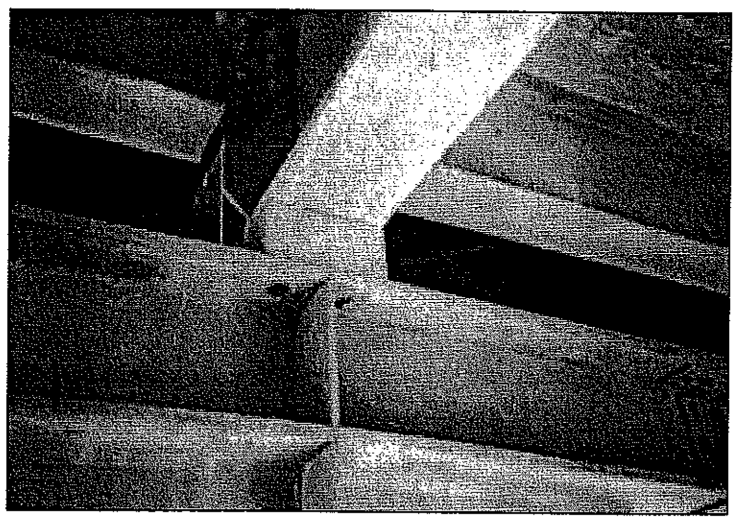
a connection weld, should grind out. [2003] Top chord of the floorbeam truss, just east of east truss, has an old dent on the top flange.

Panel Point #7 (East Truss): [2003] Top chord of the floorbeam truss, just east of east truss, has an old dent on the top flange.

Panel Point #8 (East Truss Pier #6 Stringer Joint):
Strip seal and deck drain above. [94/2003] Joint is leaking, small hole & membrane has pulled out. Stringer #4: one bolt broken off at south floorbeam connection. Deck drain is plugged solid. Stringer #2 (south side): one bolt is missing and the nut is missing from the other bolt. The bearing block has rotated 90°. [1999] Missing bolt replaced. [2000] Bolts are loose, needs repair. Vertical truss member has section loss, moderate flaking rust. Floorbeam bottom chord & middle bracing connection plate has moderate section loss, severe flaking rust. Middle bracing connection plate has ½ " spread from pack rust. Underside of the deck has 50 SF of water saturation.



Stringer 2 Bearing Block Rotated



Stringer 4 Bolt Missing

Pier #6 (Downtown, West Bank of Mississippi):
Pier consists of two concrete columns with a pier wall at the base, two "rollernest" bearing assemblies. [1997] Bearings have surface rust, moderate corrosion and show no signs of movement. [1997] Deck drain downspouts are clogged, top & bottom at median.

Span #7 (Deck Truss):
Span is 456 FT long with 12 floorbeam trusses. [1999] Floorbeam truss's, sway bracing located below the median and the beams 6, 7, 8, & 9 were re-painted.

Panel Point #9 (East Truss): [2003] Floorbeam bottom chord connection plate has a cracked tack weld on the south side. Underside of the deck has 20 SF of water saturation.

Panel Point #10 (East Truss):
Red navigation light for Mississippi river channel. [1999] Strain gauges installed on truss top chord member U9/U10, L9/U10 &L9/L10 from U of M research project.

Panel Point #11 (East Truss):
Section loss: at gusset plate bottom chord. [2000] Stringer #3 has a bolt missing at the floorbeam connection.

Panel Point #12 (East Truss):
[1999] Truss bottom chord member L12/L13 has a cracked tack weld at an interior stiffener.

Panel Point #13 (East Truss):
Water from deck drains fall directly into river. [99/2002] Bottom chord gusset plate has section loss, flaking & pack rust. Truss bottom chord member L13/L14 has cracked tack welds at two interior stiffeners.

Panel Point #14 (East Truss Midspan Stringer Joint):
Strip seal expansion joint on the deck. Sway frame rusty. [1999] Truss bottom chord member L14/L13' has a cracked tack weld at an interior stiffener. [2002/03] Floorbeam bottom chord & middle bracing connection plate has ½ " pack rust. Underside of the deck has 4 SF of delamination.

Panel Point #13' (East Truss):
Floorbeam truss top chord has a ground out spot near stringer #4. [1996] Truss bottom chord member L13'/L12' has a cracked tack weld at an interior stiffener. [2003] Truss bottom chord connection plate has ½ " pack rust. Underside of the deck has 20 SF of water saturation.

Panel Point #12' (East Truss):
[99/2003] Underside of the deck has 65 SF of water saturation. [1998] Truss bottom chord member L12'/L11' has a cracked tack weld at an interior stiffener.

Panel Point #11' (East Truss):

Panel Point #10' (East Truss):
[2003] Underside of the deck has 1 SF of spall with exposed rebar. Light pole, W5L3, has 1 LF crack.

Panel Point #9' (East Truss):
Water from deck drains fall onto the steel & directly into river. [2002] Bottom chord member L9'/L8' has section loss, flaking rust.

Panel Point #8' (East Truss Pier #7 Stringer Joint):
Red navigation light for Mississippi river channel. Strip seal expansion joint on the deck. [93/2003] Floorbeam truss has section loss, moderate flaking rust. North side: bolts replaced with "threaded-rod" at stringer #4, bolts replaced at stringer #5. Underside of the deck has 80 SF of water saturation.

Pier #7 (East Bank of Mississippi):
Two fixed bearing assemblies. Pier consists of two concrete columns with a pier wall at the base. [1997] West column has a full height, leaching crack on the south face.

Span #8 (Deck Truss):
Span is 266 FT long with seven floorbeam trusses. [1999] Floorbeam truss's, sway bracing located below the median and the beams 6, 7, 8, & 9 were re-painted.

Panel Point #7' (East Truss):
[2003] Underside of the deck has 240 SF of water saturation, & 80 SF of delamination.

Panel Point #6' (East Truss):
[1996/98] Stinger #4 connection to the floorbeam truss is "working". The SW bolt is loose. [2003] Underside of the deck has 10 SF of water saturation.

Panel Point #5' (East Truss):
[2001] Underside of the deck has 30 SF of water saturation.

Panel Point #4' (East Truss Stinger Joint):
Strip seal expansion joint on the deck. Truss diagonal member U4'/L3' has backer bars along the interior edges. [2001/03] Strip seal has 3 LF of gland pulled out. Truss connection plates, the top chord, and floorbeam have moderate section loss, severe flaking rust. Bottom connection plates have ½" pack rust.

Panel Point #3' (East Truss):
Center lane has road sensors on the deck surface. Top chord of the floorbeam truss has an "incomplete" weld along the top edge of the web reinforcement plate.

Panel Point #2' (East Truss):
Overhead sign mounted on exterior railings. [1999] Deck in bay #3 has 100 SF of water saturation. [2003] Bottom connection plates have ½" pack rust.

Pier #8:
Two "rollernest" bearing assemblies, have surface rust. [2000] East truss rocker shows recent movement. Pier consists of two concrete columns connected by an upper strut. Columns have concrete "jackets" around them with vertical cracks.

Panel Point #1' (East Truss Pier #8):
[2000] Bottom of truss above bearing has graffiti.

Panel Point #0' (End of East Truss):
Joint has open finger joint above. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris, need to be flushed. [1998/99] Floorbeam re-painted, side facing finger joint has section loss with holes in web stiffeners. [1998] North face, directly above east rocker bearing, has two horizontal welds between stiffener plates. They have cracked through entirely.

** [2000] Gap between crossbeam & floorbeam (at rocker bearing) was 3-5/8" at 40° F.

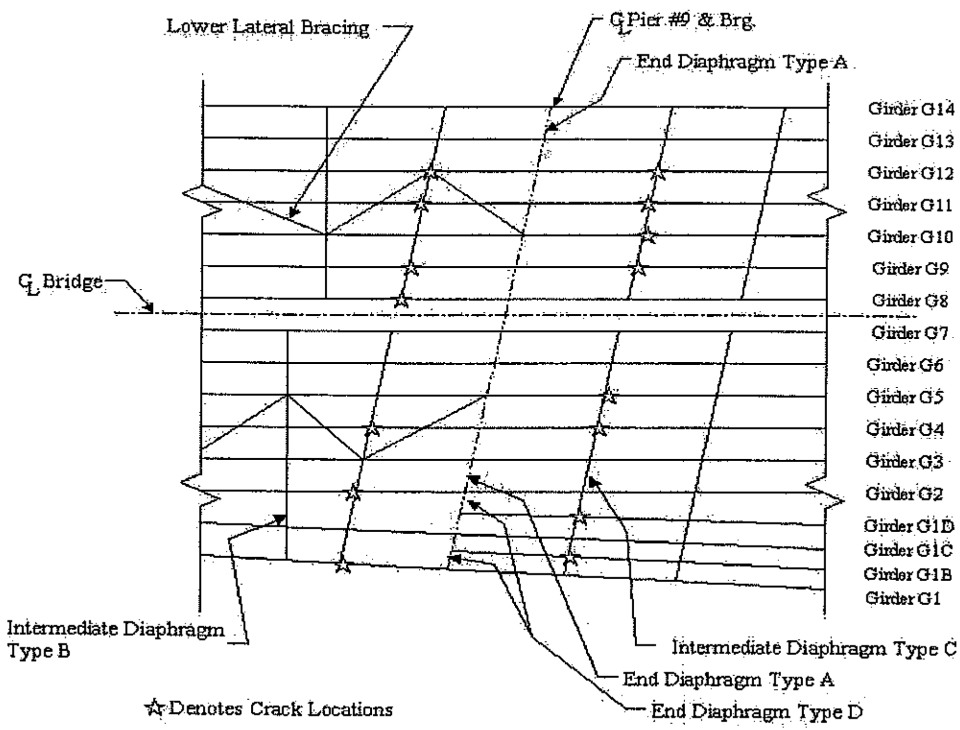
Crossbeam:
[1998/99] Crossbeam re-painted. Side facing finger joint has section loss, with pitting at base of stiffeners. [1992] North face has crack in the crossbeam web stiffener, above the rocker at the beam

#12 connection. This was drilled out. [1997/98] North face: weld above east rocker bearing, between the horizontal & center vertical stiffener, has cracked through entirely. Weld end at the crossbeam web was partially drilled out. [1998] North face has cracks at both ends of the horizontal stiffener, above rocker bearing. They were drilled out with two small holes drilled in crossbeam web at each location. [1998] Bracing installed between crossbeam, above east rocker, and beams #3 & 5.

Approach Spans:
Northbound & southbound inspection notes are combined. Plans show beams are numbered from the east.

Span #9 (Multi-beam):
Span is 168 FT long with one floorbeam truss at pier #8, fourteen 48" deep welded plate beams bolted onto the crossbeam. Multi-beam spans resume. NB has 8 beams. SB has 7 beams. There are two active railroad tracks below. [1999] Beams 6, 7, 8, & 9 are re-painted. Lateral bracing welded to web & stiffener. [2002] Underside of deck at the south end, in NBL, has 150 SF of water saturation near the spray head. In the SBL 2nd & 3rd bays from west are large areas of salt and water saturation. [2003] Conduit: at east side bottom of deck.

Diaphragm Line South of Pier #9:
Refer to chart titled **Diaphragm Crack Locations South of Pier #9** for crack locations, description & repair. [1999] Diaphragms lowered.



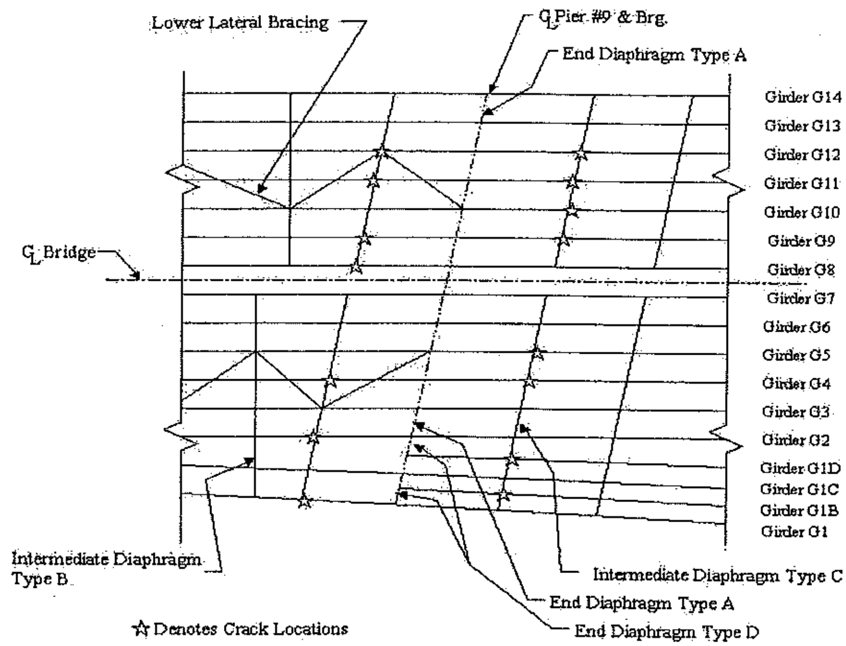
Diaphragm Crack Locations South of Pier #9	
Girder Location	Crack Description and or Repair Description
G1 (East Fascia NB)	[2000] Exterior top flange/web weld has a ½" indication. [2003] No change.
GC (NB)	
G2 (NB)	* [1998] 4 ft. long inverted "U" shaped crack in web (reinforced with bolted plates).
G3 (NB)	
G4 (NB	* [98/2000] Small crack in top flange/web weld. [2003] No change.
G5 (NB)	
G6 (NB)	
G7 (NB)	
G8 (SB)	
G9 (SB)	* [1998] Crack in top of stiffener weld. [2003] No change.
G10 (SB)	
G11 (SB)	* [98/2000] Small crack in top of stiffener weld (east side). [2003] No change.
G12 (SB).	* [98/2000] Small crack in top of stiffener weld (east side). [2003] No change.
G13 (SB):	
G14 (West Fascia SB)	

***Denotes locations where cracks were found in 1998**

Pier #9:
Plate bearing assemblies have 13 fixed, and four sliding. Pier consists of four columns and cap, with a railroad crash strut between the columns. Deck drain: downspout. [1969] East column damaged by train derailment - the column has minor scrapes and spalls. Downspout had to be reconnected. [1999] Bearings 6, 7, 8, &. 9 were re-painted.

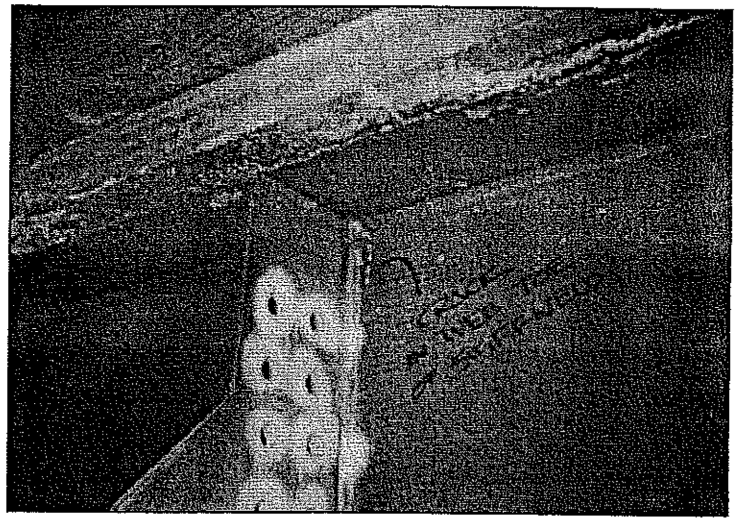
Span #10 (Steel Multi-beam):
Span is 94 FT long with 17 steel beams. NB has 10 beams; SB has 7 beams (the welded beams transition from 48" to 33" depth just north of pier) with active railroad tracks below. One track splits into two. [1999] Beams 6, 7, 8, & 9 were re-painted. [2003] Conduit: at east side bottom of deck.

Diaphragm Line North of Pier #9:
Refer to chart titled **Diaphragm Crack Locations North of Pier #9** for crack locations, description & repair. [1999]
Diaphragms lowered.

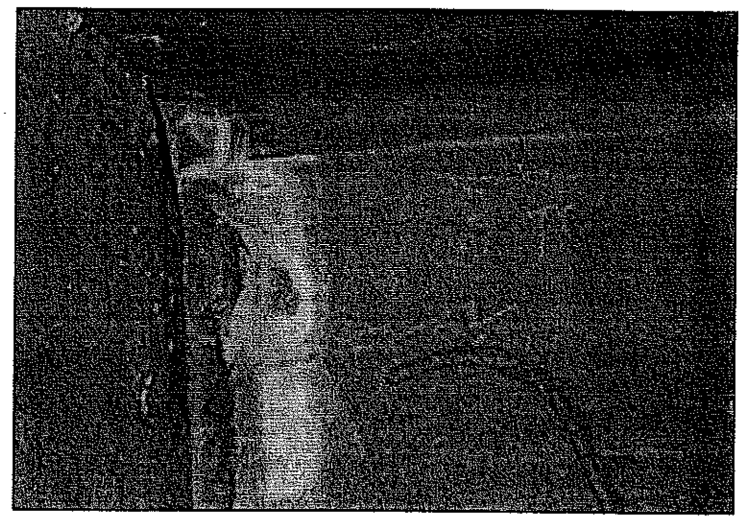


Diaphragm Crack Locations North of Pier #9	
Girder Location	**Crack Description and or Repair Description**
G1 (East Fascia NB)	
G1B (NB)	Stiffeners are welded to the top flange (positive moment).
GC (NB)	
G1D (NB)	Stiffeners are welded to the top flange (positive moment)
G2 (NB)	
G3 (NB)	
G4 (NB	* [2000] Two 2" holes drilled in web. Crack contained.
G5 (NB)	* [2000] Two 2" holes drilled in web. Crack contained.
G6 (NB)	
G7 (NB)	
G8 (SB)	
G9 (SB)	* [98/2000] Crack in top flange/web weld & top of stiffener weld (west side). [2003] No change.
G10 (SB)	* [2000] Crack in top flange/ web weld (east side) This crack has grown; see photos.
G11 (SB)	* [2000] Two 2" holes drilled in web. Crack contained.
G12 (SB).	* [2000] Two 2" holes drilled in web. Crack contained.
G13 (SB)	
G14 (West Fascia SB)	

***Denotes locations where cracks were found in 1998**



Girder #10 Vertical Stiffener/Girder Web



Girder #10 Vertical Stiffener/Girder Web

Diaphragm Line South of Pier #10:
[1999] Diaphragms were inverted & lowered, even though the beam connections have a "positive moment" configuration. Connections welded to top flange. [2000] Beam #6 appears to be "working" at the top connection.

Pier #10:
Pier has 5 columns & cap with a RR crash strut between the columns and 18 sliding plate expansion bearings. [1999] Bearings 6, 7, 8, & 9 were re-painted. [2003] North face of cap has 20 SF of delamination.

Span #11 (Steel Multi-beam):
Span is 68 FT long with 18 steel beams. Northbound has 11 beams; southbound has 7 beams, and the parking lot below. [1999] Beams 6, 7, 8, & 9 were re-painted. [2003] Conduit: east side bottom of deck.

Diaphragm Line North of Pier #10:
[1999] Diaphragms were inverted & lowered, even though the beam connections have "positive moment" configuration. Connections welded to top flange.

Pier #11:
Beginning: NB off ramp to University Avenue. (Br. #9340A). Strip seal deck joint above. The slab span consists of 18 sliding plate bearings, (steel beams) and 15 sliding plate bearings (voided slab). The pier consists of seven columns and a cap. [95/2000] Gland is leaking in several locations (NB & SB). [1998] Extensive shotcrete repairs on pier cap. [2000] West column has 1 SF spall. [1999] Sliding plate bearings for the steel beams were re-painted.

Span #12 (Concrete Voided Slab Span):
Parking lot: below. [1998] Shotcrete repairs along the median and exterior copings.

Pier #12:
Pier consists of 6 columns (integral with the slab span deck, no bearings).

Span #13 (Concrete Voided Slab Span):
2nd St. passes below. [1998] Shotcrete repairs along the median and exterior copings.

Pier #13:
Pier consists of 6 columns (integral with the slab span deck, no bearings).

Span #14 (Concrete Voided Slab Span):
[1998] Shotcrete repairs were done along median and exterior copings.

North Abutment:
Strip seal deck joint above with 14 sliding plate bearing assemblies. [2000] NB joint leaking at both ends. Bearings are rusty.

Main Truss Spans (Southbound West Truss)
Plans show stringers are numbered from the east.

Crossbeam:
[1998/99] Crossbeam re-painted. Side facing finger joint has section loss. [1999] Bolted connection between beam #12 and the crossbeam was re-tensioned. Connection had been "working".

** [2000] Gap between crossbeam & floorbeam, at rocker bearing, measured at 3-9/16".
** [2001/03] Gap between crossbeam & floorbeam, at rocker bearing, measured at 3-½".

Panel Point #0' (End Floorbeam Beginning West of Truss):
Open finger joint on the deck. [1996] Floorbeam/truss connection has section loss, severe corrosion with surface pitting on plates & bolts. [1997] Conduit running along catwalk is hanging loose, and has pulled out at the floorbeam. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris; needs to be flushed. [1998/99] Floorbeam re-painted. Side facing finger joint has section loss on stiffeners. [2002] High spots of fingers torched off right lane & shoulder.

Panel Point #1' (West Truss Pier #8):

Pier #8:
See NB notes. [1999] West truss bearing shows signs of recent movement.

Span #8 (Deck Truss):
Span is 266 FT long with seven floorbeam trusses. [2002] Underside of the deck has 150 SF of water saturation and numerous full depth repairs.

Panel Point #2' (West Truss):
Overhead sign on bridge mounted on exterior railings. [2002] Bolts are "working" at stringer #11.

Panel Point #3' (West Truss):
The floorbeam truss, top flange of upper chord, has an ugly weld below the connection to stringer #11. [2003] Stringer #12 has connection bolts "working".

Panel Point #4' (West Truss Stringer Joint):
Strip seal deck joint above. Truss diagonal member U4'/L3' has backer bars along interior edges. [2003] Floorbeam truss bottom chord at Stringer #11 connection: have section loss, moderate flaking rust.

Panel Point #5' (West Truss):
[2002] Sprayer fitting corroded.

Panel Point #6' (West Truss):
[1996/98] Stringer #11, one bolt replaced in 1998 at the floorbeam connection. [1997] Stringer #10, the two south bolts are loose at the floorbeam connection. [99/2003] Stringer #9, south face, has one bolt loose at the floorbeam connection.

Panel Point #7' (West Truss):
[1997] Top chord/floorbeam truss connection has a cracked tack weld on the interior. [1999] Wind bracing gusset plate, at stringer #14 has loose bolts. [2002] Stringer #14 was installed crooked.

Panel Point #8' (West Truss Pier #7 Stringer Joint):
Strip seal deck joint above. [1998] Stringer #11: bolt replaced at floorbeam truss connection. Below stringer #13, the diagonal brace between top and bottom chord of the floorbeam truss is bent, from original construction. [2001] Truss bottom chord/sway frame connection has section loss, heavy flaking rust.

Pier #7:
See NB notes. [2002] West column has vertical leaching cracks.

Span #7 (Deck Truss):
Span is 456 FT long with 12 floorbeam trusses.

Panel Point #9' (West Truss):
[2001] Truss bottom chord/sway frame connection has section loss, heavy flaking rust. [2002] Section loss: heavy flaking rust on truss bottom chord, L8'/L9'.

Panel Point #10' (West Truss):
[1994] Stringer #13: loose bolt at floorbeam truss connection. Top chord (U10'/U11') has 6 nicks on the exterior, 15 ft. south of U10'.

Panel Point #11' (West Truss):
Nick in the truss bottom chord L11'/L12'

Panel Point #12' (West Truss):
Truss diagonal member U12'/L13' has 3 "nicks". The truss bottom chord L12'/L13' has a nick.

Panel Point #13' (West Truss):

Panel Point #14 (West Truss Midspan Stringer Joint):
Strip seal deck joint above. Deck drains on both sides. [1994] Stringer #11 has section loss, flaking rust near the joint from gland pulled out above. Tack welds along the sway frame/truss, bottom chord, and gusset plate. [1999] Bottom chord member L14/L13' has a cracked tack weld at an interior stiffener. [2003] Stringer #14 connection, south side of the floorbeam, has a cracked tack weld.

Panel Point #13 (West Truss):
[1999] Truss bottom chord/sway frame connection plates have ¾ " pack rust. [1996/99] Bottom chord member L13/L14 has cracked tack welds at two internal stiffeners.

Panel Point #12 (West Truss):
[1996] Bottom chord member L12/L13 has a cracked tack weld at the internal stiffener.

Panel Point #11 (West Truss):
[1998] Stringer #11 has three bolts replaced at the floorbeam truss connection; the SE bolt is too short with inadequate threads. Stringer has lifted 3/32" off the bearing block on the south side.

Panel Point #10 (West Truss):
Truss top chord U10/U9 has two spots ground out.

Panel Point #9 (West Truss):
Truss diagonal L9/U8 has a spot ground out.

Panel Point #8 (West Truss Pier #6 Stringer Joint):
Strip seal expansion joint on the deck. [1996] Gland has 8 ft pulled out in right gutter line. Deck drains. [96/2003] Drain clogged at median, horizontal trough, standing water in east grate.

Pier #6:
See NB notes.

Span #6:
Span is 266 FT long with seven floorbeam trusses.

Panel Point #7 (West Truss):
[2002] Underside of the deck has 20 SF of water saturation at stringer 12 thru 14.

Panel Point #6 (West Truss):
Overhead sign mounted on railing. Floorbeam truss top chord (U5/U4) has gouges in the bottom flange at the end of the connection plate; the bottom chord of the floorbeam truss has 3 spots ground out. Floorbeam truss top chord is offset vertically ¼" at the splice from construction.

Panel Point #5 (West Truss):
Truss top chord member U5/U6 has backer bars along the interior corners.

Panel Point #4 (West Truss Stringer Joint):
Strip seal expansion joint on the deck, Truss top chord member U4/U5 has backer bars along the interior corners. [1998] Stringer #10: bolt replaced at south floorbeam, truss connection. [2000] Lighting conduit is held up with tie wire.

Panel Point #3 (West Truss):
Truss diagonal member L3/U4 has backer bars along the interior corners. Truss bottom chord L2/L3 has a nick.

Panel Point #2 (West Truss):
[1996] Floorbeam truss member L2/U3 has a welding flaw. [1997] No crack! Magnetic particle tested.

Pier #5:
See NB notes. Access ladder to catwalk removed.

Panel Point #1 (West Truss Pier #5):
[1994] Diagonal brace, floorbeam to stringer, has a cotter pin missing at the floorbeam truss connection. [1998] Deck drain detached from downspout, originally drained into storm sewer.

Panel Point #0 (End Floorbeam End of West Truss):
Open finger joint on the deck. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings: filled with debris, needs to be flushed. [1997] Floorbeam horizontal stiffener is bent directly above the rocker bearing. [1998/99] Floorbeam re-painted, side facing finger joint has section loss, pitting.

*[2000] Gap between crossbeam & floorbeam, at west end, measures 16-½".

Crossbeam:
[1997] Cracks found at the end of the horizontal crossbeam stiffener near the rocker were partially ground out. [1998/99] Crossbeam re-painted, the side facing finger joint has section loss, pitting with holes in the base of stiffeners, pitting on bottom flange at median.

Span #5(Deck Truss Multi-beam):
The multi-beam spans resume at panel point #0.

See NB Notes for South Approach Spans

PREVIOUS SNOOPER INSPECTIONS

2002* Mark Pribula, Kurt Fuhrman, Pete Wilson, Jerry Oldeen, Bruce Anderson, Mike Palmer

2001 Marl Pribula, Kurt Fuhrman, Vance Desens, Ken Rand, Mike Palmer

2000 Mark Pribula, Kurt Fuhrman, Pete Wilson, Marc Beucler, Mike Palmer, Wayne Tennison Pete Wilson, George Morelli, Rebecca Lane

1999 Kurt Fuhrman, Bill Nelson, Ken Rand, Mike Schadegg, Pete Wilson

1998 Mark Pribula, Terry Moravec, Eric Evens, Kurt Fuhrman, Pete Wilson, Jerry Anderson

1997* Mark Pribula, Terry Moravec, Eric Evens, Kurt Fuhrman, Pete Wilson, John Peterson

1996 Terry Moravec, Eric Evens, Kurt Fuhrman, Pete Wilson

1994 Terry Moravec, Kurt Fuhrman, Pete Wilson

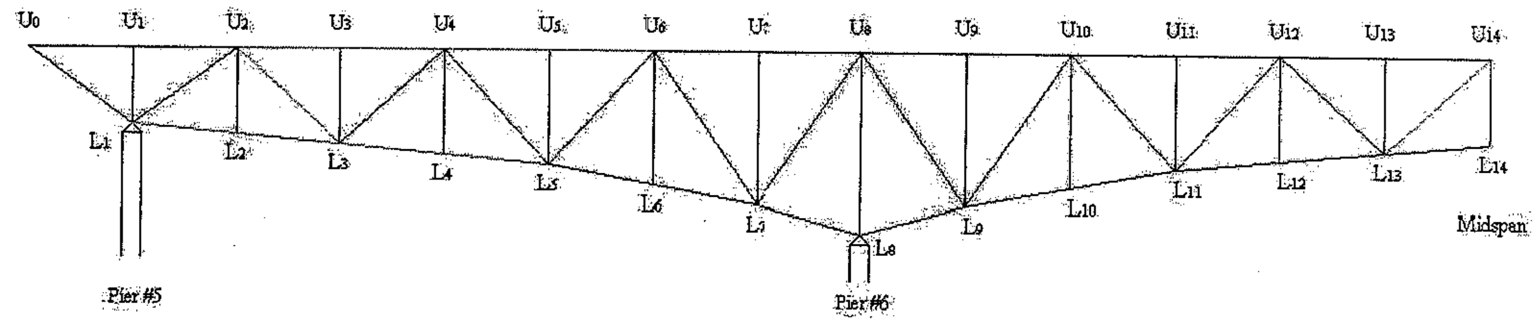
1993 Terry Moravec, Chas Martin, Tom Waks

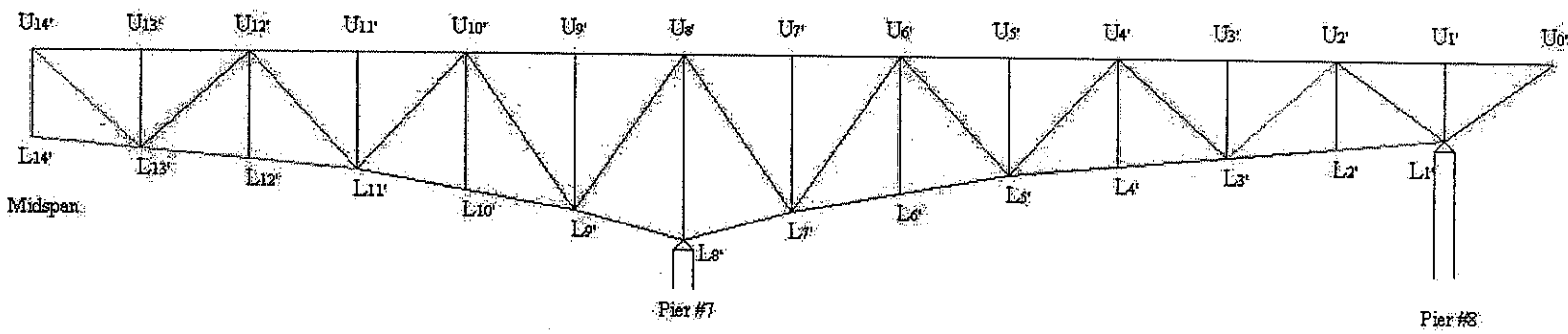
1991 Chester Martin, Chas Martin, Jerry Anderson

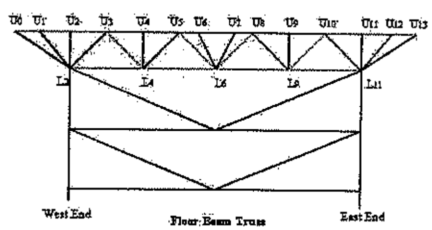
1988 Chester Martin

***Denotes an "In-Depth" Inspection**

TRUSS DIAGRAM







Legend

Blue Compression
Red Tension
Orange Reversal
Black Secondary Member

Bridge No. 9340

I-35W over the Mississippi River at Minneapolis, MN

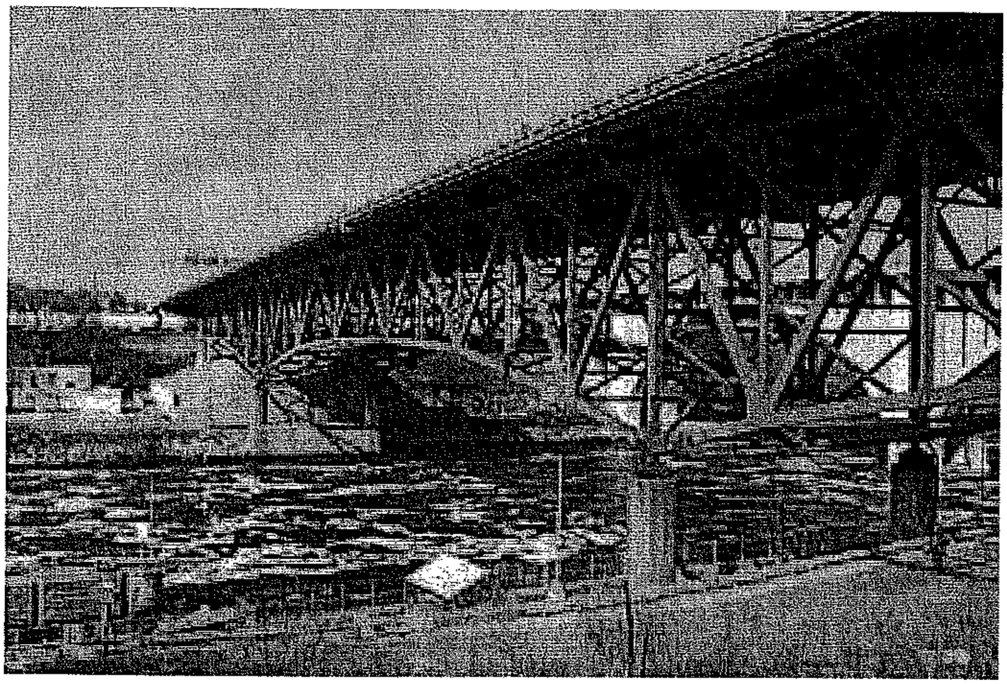
Truss Diagram

Date 1/22/03

9340

FRACTURE CRITICAL BRIDGE INSPECTION

In-Depth Report



BRIDGE # 9340 (SQUIRT BRIDGE)

I-35W over the Mississippi River at Minneapolis, MN

JUNE 2006

Prepared For

Minnesota Department of Transportation
Office of Bridges & Structures

Prepared By

Minnesota Department of Transportation Metro District
Maintenance Operations, Bridge Inspection

EXHIBIT

11

STRUCTURE INVESTIGATION INFORMATION

MN/DOT BRIDGE #9340 (SQUIRT BRIDGE)
I-35W OVER THE MISSISSIPPI RIVER AT MINNEAPOLIS, MN

JUNE 2006

Inspection Date: June 5 - 9, & 12 - 15, 2006
Inspection Team: Mark Pribula, Kurt Fuhrman, Vance Desens, Mike Palmer, & Khaled Shouman, Michael Koffski
Inspection Report Author: Kurt Fuhrman & Vance Desens
Bridge Maintenance Sub Area: Spring Lake Park
Access Equipment Used: Aspen A75 (Mn/DOT)
Reach-All UB50 (Mn/DOT)

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Licensed Professional Engineer under the laws of the State of Minnesota

	21102	
Mark Pribula	Registration No.	Date

Table of Contents

EXECUTIVE SUMMARY

The "Federal Aid Highway Act of 1968" directed the establishment a national bridge inspection program. Accordingly, the Minnesota Department of Transportation, Metro Division Bridge Inspection Unit conducted an annual inspection of Bridge # 9340 over the Mississippi River at Minneapolis, MN. The bridge also crosses over several roadways, Minnesota Commercial Railroad tracks, & parking lots.

Constructed in 1967, the bridge has 14 spans, with a total length of 1,907 feet. The split deck has three through lanes each direction with acceleration/deceleration lanes and 2 ft. shoulders. The bridge deck widens at the north end to accommodate on & off ramps, and curves slightly at the south end. Spans #6 - 8, the main river spans, are "Fracture Critical" steel deck trusses. They are comprised of welded "built-up" members and are 988 ft. long. The truss is approximately 60 ft. deep at piers #6 & 7. The two main trusses are connected by welded floor beam trusses, which cantilever beyond the truss on both sides and support the 27" deep rolled beam roadway stringers. At each end of the main truss spans, the truss supports the adjacent approach spans with a unique "crossbeam" configuration. The approach span beams frame into a "crossbeam", which is supported by rocker bearings on the cantilever truss ends. Spans #1 - 5 & 9 - 11, the approach spans, have 48" deep, welded plate beams, which transition into 33" deep welded & rolled steel beams. Connections are riveted. Spans #12 - 14, the far north spans, are cast-in-place concrete voided slabs.

Due to several factors, including mist from nearby St. Anthony Falls, the bridge deck frequently ices over and becomes quite treacherous. In 1999, an automated de-icing system was installed on the deck with spray nozzles installed in the deck and railings. The systems controls and storage tanks are located on the north end just off the freeway entrance ramp from East University to South I-35W.

- If bridge replacement is significantly delayed, the bridge should be re-decked. The design of the main river spans do not allow for deck widening. Any re-decking contract should also include a complete re-painting of the superstructure, elimination of the hinge joint in span #2, and reconfiguration of the deck drainage system.

- Every two years the plastic pigeon screens are removed on all tension and reversal members to visually inspect the truss box girder member's internal diaphragms. Any questionable welding flaws discovered during this inspection were tested with magnetic particle equipment.

- Fatigue cracks at girder #1C (NBL), crack at the diaphragm bottom cutout, NE side measures 2" ("front face") and NW side measures 2-½" ("back face"). Fatigue cracks a girder #3 (NBL), crack at the diaphragm bottom cutout, measures 1-½" (both sides). The cracks are located in negative moment regions where the diaphragm web stiffener was not welded to the top flange and were pervious fatigue cracks occurred and were repaired in 1998 and 1999. These areas should be inspected next year for any lengthening of the cracks and drilling of possible stress relief holes.

- Span 3, stringer #7 NB, has a 1-½" crack in the web with one 2" hole drilled. It is recommended to drill a 2" hole at the other end.

- During the 1998 inspection, numerous fatigue cracks were found in spans #3 - 5 and #9 - 10, the approach spans. The cracks were located in negative moment regions where the diaphragm web stiffener was not welded to the top flange. At one location the web had cracked through entirely. Most existing cracks were drilled out, and the fractured beam was reinforced with bolted plates. To reduce the stress levels, the diaphragms were lowered. Due to the widespread cracking, these areas should be inspected in-depth on an annual basis.

BRIDGE INSPECTION RECOMMENDATIONS

This recommendation listing refers to specific areas where fatigue cracks and other deficiencies were located during the 2006 inspection. Bridge inspection lists these deficiencies in the highest priority first.

Long Term Repair Recommendations

- The long term plans for this river crossing need to be defined with replacement, re-decking, etc. Due to the "Fracture Critical" configuration of the main river spans and the problematic "crossbeam" details, and fatigue cracking in the approach spans, eventual replacement of the entire structure would be preferable.

- If bridge replacement is significantly delayed, the bridge should be re-decked. The design of the main river spans do not allow for deck widening. Any re-decking contract should also include a complete re-painting of the superstructure, elimination of the hinge joint in span #2, and reconfiguration of the deck drainage system.

- Depending on the projected date of bridge replacement, the bridge deck will eventually require a partial overlay repair contract. The expansion joints should also be replaced.

Immediate Maintenance Recommendations

- Every two years the plastic pigeon screens are removed on all tension and reversal members to visually inspect the truss box girder member's internal diaphragms. Any questionable welding flaws discovered during this inspection were tested with magnetic particle equipment.

- Fatigue cracks at girder #1C (NBL), crack at the diaphragm bottom cutout, NE side measures 2" ("front face") and NW side measures 2-½" ("back face"). Fatigue cracks a girder #3 (NBL), crack at the diaphragm bottom cutout, measures 1-½" (both sides). The cracks are located in negative moment regions where the diaphragm web stiffener was not welded to the top flange and were pervious fatigue cracks occurred and were repaired in 1998 and 1999. These areas should be inspected next year for any lengthening of the cracks and drilling of possible stress relief holes.

- Four-stringer connection bolts, all in the NBL, need replacement. At panel point #8, stringer #2 has 2 loose bolts, and the bearing block has rotated. This will likely require jacking the superstructure. Stringer bolts also need replacement at panel point #8, stringer #4, south side, and at panel point #11, stringer #3.

- Several strip seal joints are leaking. The glands have ripped or pulled out. Attempts were made to replace these joints during the 1998 repair contract, but the steel extrusions, which anchor the gland, had severe corrosion, and new glands could not be installed. Instead, a new product was used at the, SBL, south abutment. This utilized a hot pour seal with wire mesh reinforcing. The final product looks similar to a strip seal gland. We should monitor this joint to see how well this new gland repair performs, and consider using it at other locations.

- The rubber "skirts" sections above the truss end rockers, installed in 1999, tend to fill with debris. These should be flushed out annually. The horizontal drain troughs at pier #6 have inadequate slope, and are clogged.

Areas of Concern - Future Inspections

- Span 3, stringer #7 NB, has a 1-½" crack in the web with one 2" hole drilled. It is recommended to drill a 2" hole at the other end.

- During the 1998 inspection, numerous fatigue cracks were found in spans #3 - 5 and #9 - 10, the approach spans. The cracks were located in negative moment regions where the diaphragm web stiffener was not welded to the top flange. At one location the web had cracked through entirely. Most existing cracks were drilled out, and the fractured beam was reinforced with bolted plates. To reduce the stress levels, the diaphragms were lowered. Due to the widespread cracking, these areas should be inspected in-depth on an annual basis.

- The truss end rocker bearings & main truss bearings should be measured for movement during each annual inspection. The truss end floor beams & approach end "crossbeams" should be closely inspected. They have section loss, had flaking rust & fatigue cracks (open finger joint).

- The hinge joint in span #2 is locked in full expansion several beam-ends are contacting, and the hinge bearings are "frozen" and no longer functioning. Consequently, pier #1 has tipped slightly to the north, and the south abutment bearings are in full contraction. This area should be thoroughly inspected.

For information that is more detailed and recommendations, please refer to the appropriate sections in the text of the report.

BRIDGE DESCRIPTION

Bridge #9340 was constructed in 1967, and has 14 spans, with a total length of 1,907 feet. The split deck has three through lanes each direction & also acceleration/deceleration lanes. The shoulders are only 2 ft. wide. The bridge deck widens at the north end to accommodate on & off ramps, and curves slightly at the south end.

Spans #6 - 8 are "Fracture Critical" steel deck trusses, comprised of "built-up" welded members. Steel deck truss spans are 988 ft long. Span #7 is 456 ft. long. The truss is approximately 60 ft. deep at piers #6 & 7. The two main trusses are connected by welded floor beam trusses, which cantilever beyond the truss on both sides, and support the 27" deep rolled beams roadway stringers.

At each end of the main truss spans, the truss supports the adjacent approach spans with a unique "crossbeam" configuration, (open finger joint). The approach span beams frame into a "crossbeam", which is supported by rocker bearings on the cantilever truss ends. Spans #1 - 5 & 9 - 11, the approach spans, have 48" deep welded plate beams, which transition into 33" deep welded & rolled steel beams. The connections are riveted. Spans #12 - 14, the far north spans, are cast-in-place concrete voided slabs.

Due to several factors, including mist from nearby St. Anthony Falls, the bridge deck frequently ices over and becomes quite treacherous. In 1999, an automated de-icing system was installed on the deck, with spray nozzles installed in the deck and railings. Control room is located at the northwest approach corner.

BRIDGE DECK: NBI CONDITION CODE 5

Split deck has 3 through lanes each direction, with acceleration/deceleration lanes. Shoulders are only 2 ft. wide. A low slump concrete overlay, with numerous full-depth deck repairs, was placed on the deck in 1978. In 1998, the median copings were replaced with steel stay-in-place forms, and the exterior copings were patched with shot-crete.

Wearing Surface: Overlay has some minor spalls and patched areas around the finger joints, and 3,000 LF of transverse cracks, sealed in 1998. The overlay has several patched areas, and some spalls. Additional patching is typically required each year. A partial chaining of the northbound deck in 1998 found 1,665 SF of delamination & 47 SF of spall. In 1999, the Federal Highway Administration conducted a ground penetrating radar survey, using the experimental "HERMES" system. The radar survey found the overlay to have 6.14% delamination. [2001] Overlay has 15,250 SF of concrete repair patches.

Structural Slab: Underside of the deck has a moderate amount of transverse leaching cracks, with some areas of leaching map cracks & spalling, particularly in the south approach spans. In 1998, the median coping overhangs were replaced with steel stay-in-place forms, and the exterior copings were repaired with shotcrete. During the median slab removal, the bays adjacent to the median were damaged - some of the "stool" concrete along the stringers & beams has spalled off with exposed rebar; and in some locations, the spalling extends into the underside of the deck. [2001] Structural slab has 1,200 SF full depth repair patches.

Open Finger Expansion Joints: Deck has three open finger joints, one above the hinge joint in span #2, & one at each end of the truss spans. In 1999, rubber "skirts" were installed below the truss end finger joints & the drain troughs were removed.

Strip Seal Expansion Joints: Strip seal, type "H" joints at the abutments, pier #11, and at five stringer joints in the main truss spans. These were installed in 1978. Strip seal glands have pulled out, with joints leaking, in several locations. Steel extrusions, which anchor the glands, have severe section loss, making gland replacement impossible. In 1998, the south abutment, SBL, gland was patched using an experimental system. Hot poured seal with wire mesh reinforcement.

Poured Deck Joints: The deck has several transverse poured joints, from staged deck construction. All of these joints are leaching below; & at some joints the deck is spalling below.

Exterior Railings: The original exterior code #12 railings were retrofit in 1998. A 32" high concrete face was installed in front of the existing concrete rail base. The horizontal steel rails were removed. The curb along the railing has moderate cracking, delamination and spalling. The curb has 800 LF reconstructed in 2001.

Median Railings: Code #22, type "J"-rail, was installed along the split median in 1998. The railings above the truss spans have removable pre-cast concrete caps, which are intended to prevent further corrosion damage to the superstructure below.

BRIDGE SUPERSTRUCTURE: NBI CONDITION CODE 4

Paint System: Bridge was originally painted with a lead base system in 1968. In 1999, the bridge was partially re-painted with a zinc system. Areas painted included the entire superstructure below and along the open median, and below the open finger deck joints.

Currently, the overall paint system is approximately 15% unsound. The truss members have surface rust corrosion and pack rust at the floorbeam & sway frame connections, and there is paint failure & surface rust corrosion in scattered locations. The floorbeam trusses & stringer ends have surface rust corrosion at the stringer expansion joints. Some of the areas re-painted in 1999 have severe section loss. This includes the sections of the floorbeam trusses & sway bracing located below the median, and the truss end floor beams & "crossbeams", located below the open finger joints.

Main Truss Members The two steel deck trusses are comprised of "built-up" welded members; connections include both rivets and bolts. While most truss members are welded box beams, some tension vertical & diagonal members are welded "H" beams. The truss members have numerous poor weld details. The vertical "H" beam truss members have transverse welds at the floor beam connections. The box beam truss members have welded interior stiffeners. Some of these have tack-welded tabs. Many of these tack welds have cracked. Some box beams have tack welds, or tack welded backer bars along the interior corners. The truss members have surface rust corrosion at the floor beam and sway frame connections. Pack rust is forming between the connection plates. There is paint failure, surface rust, and section loss, flaking rust in scattered locations. The interiors of the box members have severe pigeon debris. In 1999, screens were placed over openings in the truss members to prevent pigeon access. This unfortunately prevents inspection of the interiors. During the 2004 inspection, & every two years after, the plastic pigeon screens are removed on all tension and reversal members to visually inspect the member's internal diaphragms. Any questionable welding flaws discovered during this inspection were tested with magnetic particle equipment.

Floor Beam Trusses: There are 27 floorbeam trusses connecting the main deck trusses. These trusses are comprised of rolled H-beams with welded connections. The floorbeam trusses cantilever beyond the main truss on both sides. They are connected to the main truss, vertical members with bolts & rivets. The floorbeam truss members have numerous poor welding details, including plug welded web reinforcement plates, and tack welds & welded connection plates located in tension zones. Some of the top chord splices are offset vertically, up to ½" – from original construction. The splice plates are bent. The floorbeam trusses below stringer joints have section loss, severe flaking rust. There is pack rust and surface pitting at the main truss connections. In 1999, the floor beam sections below the median were re-painted. Some areas have section loss with holes.

Stringers: There are 14 steel stringers, 27" deep rolled beams, bearing on the floorbeam trusses. They are continuous except for five stringer expansion joints. The stringer ends have surface rust corrosion at the expansion joints. The stringers adjacent to the median were re-painted in 1999. The bolted connections to the floorbeam trusses are "working" and some bolts are loose or missing. [2006] Fascia stringers have minor section loss, with moderate flaking rust along the bottom flange.

Lateral & Sway Bracing: The main deck trusses have both upper and lower horizontal diagonal bracing. There is also a vertical sway frame running below each floorbeam truss - the median portion of these sway frames were re-painted in 1999, some areas have section loss with holes. Each floorbeam truss has 2 diagonal braces, which connect the bottom chord to stringers #4 & 11. The pinned connections on these braces are "working" and at least one cotter pin is missing.

Truss Bearing Assemblies: The truss spans have six "geared roller-nest" bearing assemblies, and two fixed bearing assemblies. The truss bearings have section loss, flaking & surface rust; moderate corrosion, the bearings at piers #5 & 8 are functioning properly. They are checked during each annual inspection. The bearings at pier #6 show no obvious signs of movement, difficult to reach with snooper.

End Floor Beams & Crossbeams: At each end of the main truss, the multi-beam approach spans terminate by framing into a "crossbeam". The crossbeams are supported by rocker bearings mounted on the cantilever truss ends. There is an open finger expansion joint above these members, severe section loss on steel. This area was re-painted in 1998 - 1999, and rubber "skirts" were installed below the finger joint in an attempt to prevent future corrosion damage.

End Floor Beams: The two end floor beams are welded plate girders. They connect the main truss ends. The end floor beams were re-painted in 1998/1999. The sides facing the open finger joints have extensive section loss with surface pitting at the base of the web, and holes in the base of the vertical stiffeners. In 1998, fatigue cracks were found in two stiffener welds directly above the NE rocker bearing.

Crossbeams & Rocker Bearings: The two "cross-beams" are welded plate girders each one is supported by two "rocker" bearings attached to the cantilever ends of the main truss. These rocker bearings are built into the crossbeam web except the southeast rocker, which, due to the bridge super-elevation, connects to the bottom flange of the crossbeam. The crossbeams & rocker bearings were re-painted in 1998/1999. The faces exposed to the finger joints have extensive surface pitting with some areas of severe section loss with holes at the base of stiffeners. The rocker bearings are measured & checked for movement during each annual inspection. All four bearings appear to be functioning. They show obvious signs of movement.

In 1986, the southeast rocker bearing "froze", resulting in damage to the crossbeam with two cracked vertical web stiffeners. The rocker-bearing pin was replaced. This required closing I - 35W and jacking up the span. The crossbeam was repaired and the cracks in the web stiffeners were welded, crack ends drilled out, and stiffeners reinforced with angle plates. Installing braces between the crossbeam and beams #2 & 3 also reinforced the connection.

In 1992, a crack was found in a crossbeam stiffener weld above the northeast rocker bearing, which was drilled out. In 1997, at the same location, a weld between a vertical & horizontal stiffener was found cracked through entirely. Cracks were also discovered at the end of horizontal stiffeners near the northeast & southwest rocker bearings. Strain gauges were installed to analyze stresses, crack ends were drilled out, and installing bracing between the crossbeam and 2 stringers reinforced the northeast connection.

Steel Multi-Beam Approach Spans (spans #1 - 5 & #9 - 11): The approach spans have welded beams - the depth transitions from 48" to 33". Connections are riveted. The south span has 33" deep rolled beams with welded cover plates (square ends). Spans #1 - 5 have 14 beams (with a hinge joint in span #2). In spans-#9 - 11, the deck widens from 15 to 18 beams. The fascia beams have minor section loss, with moderate flaking rust along the bottom flange - the beams adjacent to the median were re-painted in 1999.

In 1998, fatigue cracks were found in several beam webs. These cracks were located in negative moment regions at the top of the diaphragm connections. At one location the web had cracked through entirely and was caused by out of plane bending in locations where the web stiffener was not rigidly connected to the top flange. After stain gauge analysis by the University of Minnesota, the diaphragm connections were modified. They were lowered, using only four bolts at each connection. Most existing cracks were drilled out. Some were too small to reach, and the fractured beam was reinforced with bolted plates.

In span #2, multi-beam approach span, there is a cantilever expansion hinge with sliding plate bearings. The joint is closed beyond tolerable limits, possibly due to substructure movement & pavement thrust and is no longer functioning. Some beam-ends are contacting, and some bearing plates have tipped, preventing the joint from reopening. The hinge area, with open finger joint above, was re-painted in 1999. The beam-ends have section loss, moderate surface pitting.

The north approach spans have lateral & diagonal bracing welded to the web.

Approach Span Bearings: The steel beam approach spans have a total of 90 sliding plate bearing assemblies and 33 fixed plate bearing assemblies. The piers with fixed bearings have expansion bearings on the fascias.

Voided Concrete Slab North Approach Spans (Spans #12 – 14): The far north approach spans consist of cast-in-place concrete continuous "voided" slabs. They are 2 ft deep. Northbound off ramp splits off to form Bridge #9340A. The slab rests on sliding plate bearings at pier #11 and the north abutment. There are 29 bearing assemblies. Piers #12 & #13 are cast directly into the slab with no bearings. These spans are in generally good condition. Spalling along the exterior and median copings was patched with shotcrete in 1998. [2001] Light fixtures at Metal Matic Incorporated parking lot.

BRIDGE SUBSTRUCTURE: NBI CONDITION CODE 6

Abutments: The abutments have vertical cracking, with some staining from leaking deck joints.

Truss Span Piers: Piers #6 & 7, main river span, have two concrete columns resting on a pier wall. The west column on pier #7 has a minor vertical crack. Piers #5 & 8 have two concrete columns connected with an upper strut. The column on pier #8 has been reinforced with a concrete "jacket". [2001] Underwater inspection conducted by Collins Engineers, Inc. in 2000 found pier 7 to be in good condition with no defects of structural significance. A 3 x 3 foot area of light scaling, with a maximum of 1" of penetration was observed on the south side of the upstream pier nose. Collins recommends inspecting the substructure unit at the normal 5 year inspection interval. [2004] The concrete surfaces below the water are in good condition. Minor scaling was found above the, but not of the quantity or depth as noted in the previous report the total area was 2 feet square and ¼" deep penetration. No significant changes in the structure or channel condition since last inspection by Ayres Associates.

Approach Span Piers: Piers #1 - 5 & #9 - 11, piers supporting the steel spans, consist of concrete columns with a cap. Those adjacent to railroad tracks have lower struts. The pier columns supporting the voided slab spans (piers #12 & 13) are cast directly into the slab with no cap. Pier #1 has tipped slightly to the north. This is related to the hinge failure in span #2. The east column on pier #9 has minor scrapes & spalls from a train derailment in 1969. Pier #11 has extensive shotcrete repairs from leaking deck joint above.

OTHER BRIDGE ELEMENTS

Approach Panels: All approach panels are concrete. Each approach panel has a transverse crack, and there are some minor spalls at the joints. The relief joints need to be resealed. North approach, SBL and on ramp, has no relief joint. [2001] South approach panel was scarified and a low slump overlay was installed.

Channel & Protection: NBI code #8 which is very good condition. The bridge is located just downstream from the Lower St. Anthony Lock & falls - the flow is very turbulent. At normal river level, clearance below the truss is approximately 60 feet. Pier #7 is the only pier in the channel, along the east bank. Typically, the water depth along the west face is only 1 - 2 feet. Mn/Dot does not conduct underwater inspections. Due to the extreme turbulence, sonar readings of the channel cross-section cannot be taken.

Signing: There is an overhead sign bridge structure running across the entire deck, mounted on the exterior railings at truss panel point #2' at north end of truss. There is a signpost mounted on the west railing at truss panel point #6 at south end of truss.

Guardrail: In 1998, the approach guardrails were repaired. Impact attenuator was installed at the northbound off ramp to University Avenue. Both approach medians of I-35W & the SE, SW corners have plate beam guardrail.

Drainage: Several deck drains drop directly into the river. The drain troughs at pier #6 have inadequate slope, and tend to fill up with debris. In 1998-99, the drain troughs below the arch end finger joints were removed, and replaced with rubber "skirts". The skirt sections above the truss end rockers tend to fill with debris. These should be flushed annually.

Slope Protection: The concrete slope paving, at both abutments, is in good condition.

Lighting: Rail mounted deck lighting, under deck lighting in span #13, and river navigation lighting. "Metal-Matic Inc." maintains the lighting above the parking lots in spans #11 & 12. A light post, W 5/3 L, on the west railing, has a 6" vertical split from plow damage.

Miscellaneous: The former "U of M" parking lot area below spans #2 - 5 has been barricaded from use while the parking lot area below spans #11 & 12 continues to be used by Metal Matic Inc employees. The U.S. Army Corps of Engineers is stockpiling river debris material below span #8 this material is approximately 10 to 15 feet below the bottom truss diagonals (2003). The navigation light maintenance catwalk, which is below the median of the truss spans, is being accessed by graffiti "artists" at pier #5.

De-icing System: In 1999, an automated de-icing system was installed on the deck, with spray nozzles installed in the deck and railings and a pump house/control room was constructed at the NW approach corner.

BRIDGE SNOOPER FIELD INVESTIGATION

Northbound & southbound inspection notes are combined. Plans have beams numbered from the east. Exterior of west rail, east & west coping have conduit full length of bridge.

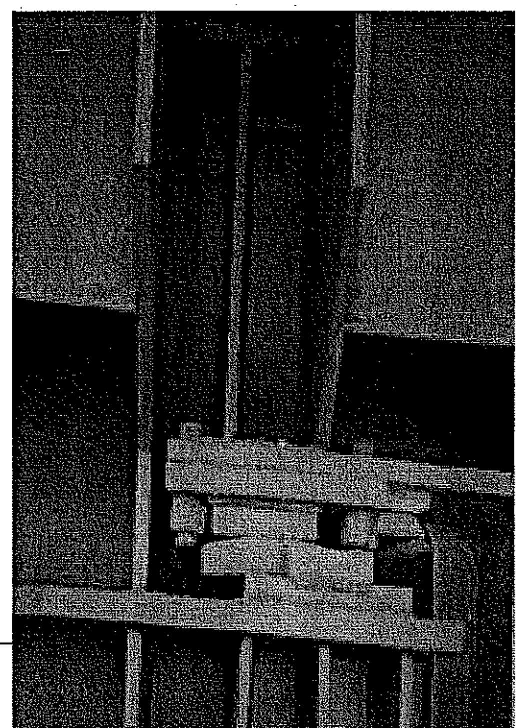
South Abutment:
Type H: strip seal deck joint above. [1995] Bearings are corroded and in full contraction from hinge failure in span #2, and tipping of pier #1. The seat area is cracked and discolored. [1998] SBL Gland was patched using an experimental joint, hot poured seal with wire mesh reinforcement, and fourteen sliding plate bearing assemblies. [2003] South abutment has 72 LF of random cracks.

Span #1 (Steel Multi-beam):
Span is 53 FT long with 14 beams, 33" deep rolled beams, with welded cover plates with square ends. [1978] 3 West bays have 300 SF full depth deck patches. [1998] "Stool" concrete is spalling off adjacent to median beams. [1999] Beams 6, 7, 8, & 9 were re-painted. [2003] Surface rust: on the beams. [96/2005] East fascia beam has section loss, flaking & surface rust on bottom flange.

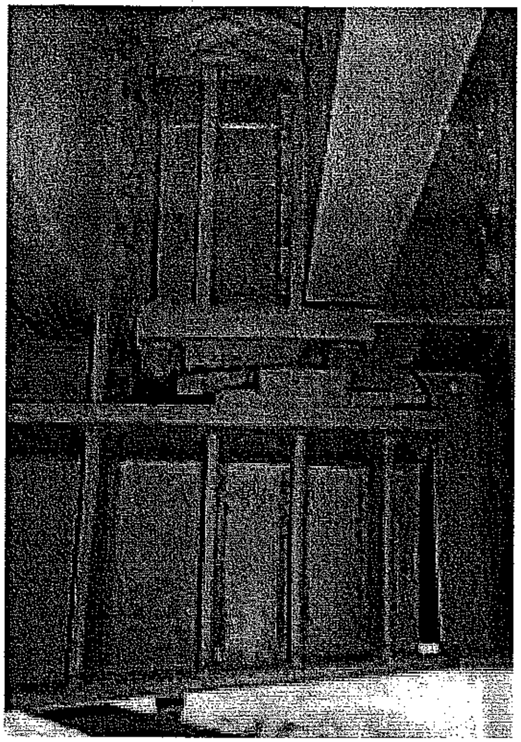
Pier #1:
10 Fixed; & 4 sliding plate bearing assemblies. Pier consists of 4 concrete columns and cap, with a railroad crash strut between the columns. [1996] Pier has tipped slightly to the north (measured with plumb bob). [1999] Bearings 6, 7, 8, &. 9 were re-painted.

Span #2 (Steel Multi-beam):
Span is 72 FT long with 14 beams; 33" rolled beams with welded cover plates, some with square end welded cover plates, the beams transition to 48" welded beams north of the hinge joint. [1978] 350 SF: full depth deck repairs. [1997] Conduit is loose below median. [1998] "Stool" concrete is spalling off adjacent to median beams. [1999] Beams 6, 7, 8, & 9 were re-painted. [96/2003] Bottom flange at girder transitions & at hinge has section loss, flaking rust. [2005] East fascia beam has section loss, flaking & surface rust on bottom flange. Beam #11 has peeling paint on the bottom flange.

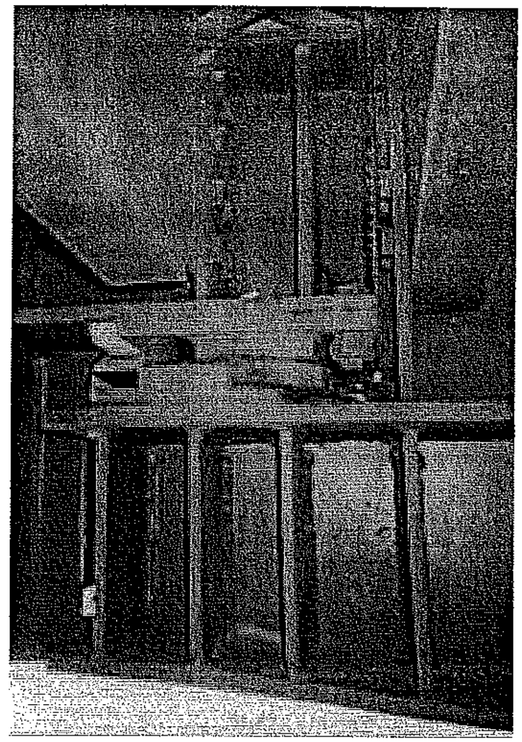
Hinge Joint (12 ft. South of Pier #2):
Hinge joint has open finger joint above. [1999] Hinge area re-painted. [2000] Beam-ends have section loss, moderate surface pitting; debris has begun to build up on hinge area. Additionally, the tops of the beam ends are contacting at the top flange or at the web along this joint. [94/2005] All hinge assemblies are expanded beyond tolerance; sliding plates extend 4" or more beyond the base plates, reducing bearing capacity. At beam #10, the sliding plate has tipped, falling off the base plate, and is preventing the joint from opening. [2005] Hinges should be flushed.



Sliding Plate @ West Fascia



Sliding Plate @ Beam 5 NBL



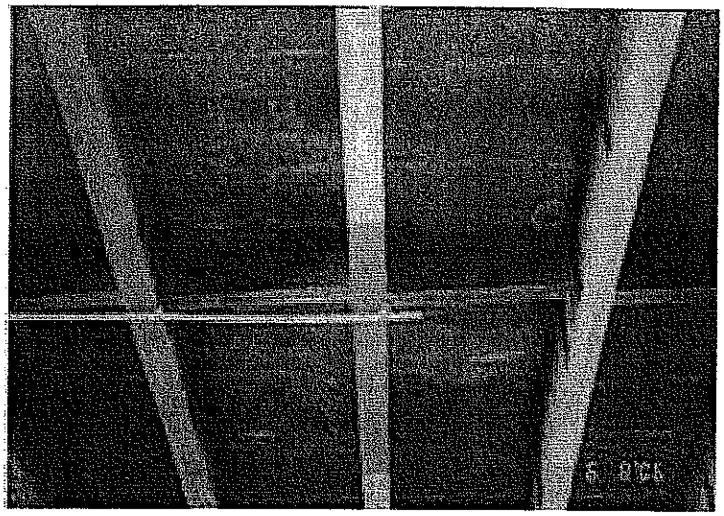
Sliding Plate @ Beam 6 NBL

Pier #2:
Pier consists of four concrete columns, 14 sliding plate bearing assemblies, and cap, with a railroad crash strut between the columns. [97/2000] Bearings have surface rust corrosion; east end of cap has 6 SF of delamination. [1999] Bearings 6, 7, 8, &. 9 re-painted. [2003] East end of cap, on south face has 2 SF of delamination, & 10 SF of map cracking.

Span #3 (Steel Multi-beam):
Over Bluff St. Span is 110 FT long with fourteen, 48" deep welded plate beams. [1978] The 3 west bays have some full depth deck patches. [1997] Second bay from east has 20 SF of leaching map cracks. [1998] "Stool" concrete: spalling off adjacent to median beams. [1999] Beams 6, 7, 8, & 9 re-painted. Diaphragm line: north of pier #2, diaphragms were lowered, although the connections have a "positive moment" configuration stiffeners welded to the top flange, no cracks. Refer to Appendix "A" **First Diaphragm South of Pier #3** graph for crack locations, description & repair to the diaphragm line. [2005] East & west fascia beam has section loss, flaking & surface rust on bottom flange.

Pier #3:
10 fixed plate, and four sliding plate bearing assemblies. Pier has four concrete columns and a cap. [1999] Bearings 6, 7, 8, &. 9 were re-painted. Vertical stiffener working: at girder 11.

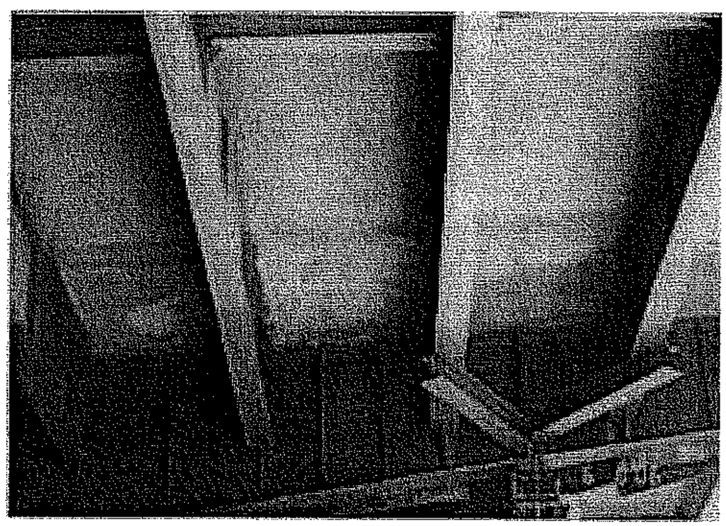
Span #4 (Steel Multi-beam):
Over contract parking lot (no access) & Bluff St. Span is 110 FT long with fourteen 48" deep welded plate beams. [1978] Second & third bays from the east have full depth deck repairs. [1998] Underside of deck has 200 LF of transverse leaching cracks, 200 SF of spall with exposed rebar below a transverse poured joint, full width of deck. [1999] Beams 6, 7, 8, & 9 were re-painted. Diaphragms lowered, even though the connections have a "positive moment" configuration. Stiffeners are welded to the top flange. Refer to Appendix "A" **First Diaphragm North of Pier #3** graph for crack locations, description & repair to the diaphragm line. [1998/99] Diaphragms lowered with strain gauges placed on beams #2 & 6 (***first diaphragm Line South of Pier #4).*** [2000] Fourth bay from west has 20 SF of severe leaching. [2005] East fascia beam has section loss, flaking & surface rust on bottom flange.



Water Saturation SBL Bays 9 & 10

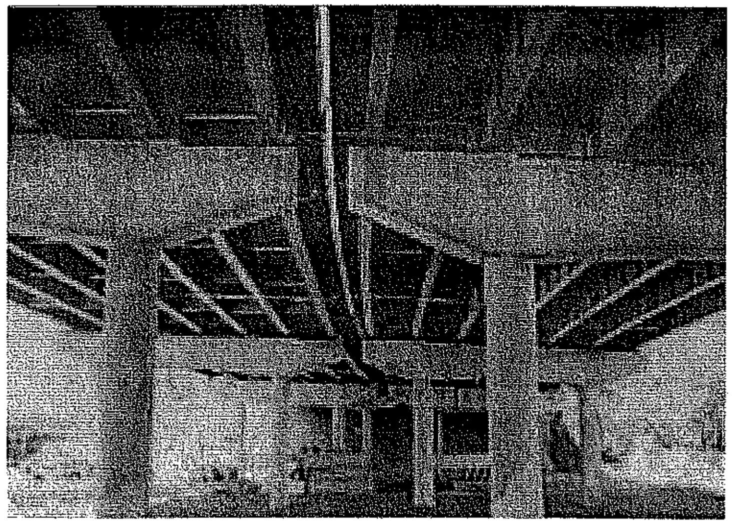
Pier #4:
14 Sliding plate expansion bearing assemblies. [1997] Bearings have surface rust. Pier consists of 4 concrete columns and cap. [1999] Bearings 6, 7, 8, &. 9 were re-painted.

Span #5 (Multi-beam/Deck Truss):
Over contract parking lot; span is 109 FT long with fourteen, 48" deep welded plate beams bolted onto the crossbeam. [1978] Underside of deck is leaching at the finger joint, has two full depth patches in the west bays. [1996] 4 conduit clamps missing on NB fascia beam. Median girder has impact damage from parking lot below. [1998] Bay just east of median has severe spalling on "stool" and the adjacent deck is cracked. [1999] Beams 6, 7, 8, & 9 were re-painted. Refer to Appendix "A" **First Diaphragm North of Pier #4** graph for crack locations, description & repair to the diaphragm line.



Water Saturation NBL Bays 2, 3 & 4

Multi-beam Spans Looking South



MAIN TRUSS (EAST TRUSS)

Crossbeam:

[1986] The SE rocker bearing froze, damaging the east end of the crossbeam, resulting in cracked web stiffeners. The bridge was jacked up. I-35W was closed to traffic. SE rocker pin was replaced, cracks in two stiffeners were welded and drilled out, and bracing was added between the crossbeam and beams #3 & 4. [1998/99] Crossbeam was repainted; the side facing the finger joint has section loss.

CROSSBEAM & FLOORBEAM GAP (EAST END)	
Date	**Measurement**
September, 1998	16-5/8"
April, 1999	17-13/16"
April, 2000	18"
September, 2001	18-1/16"
June, 2003	16-7/8"

Panel Point #0 (Beginning of East Truss):

Expansion joint has open finger joint above. [1998] Drain troughs removed. [1998/99] End floorbeam was repainted; pitting at connection, section loss at the base of the stiffeners. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris; needs to be flushed. [2002] Panel points 0 to 1 there is water saturation between stringers 2 thru 4. [2005] Stringers 2 & 3 have flaking & surface rust.

Deck Truss Looking North

Panel Point #1 (East Truss, Pier #5):
[2005] Bottom of truss diagonal L1U0 has flaking & surface rust.

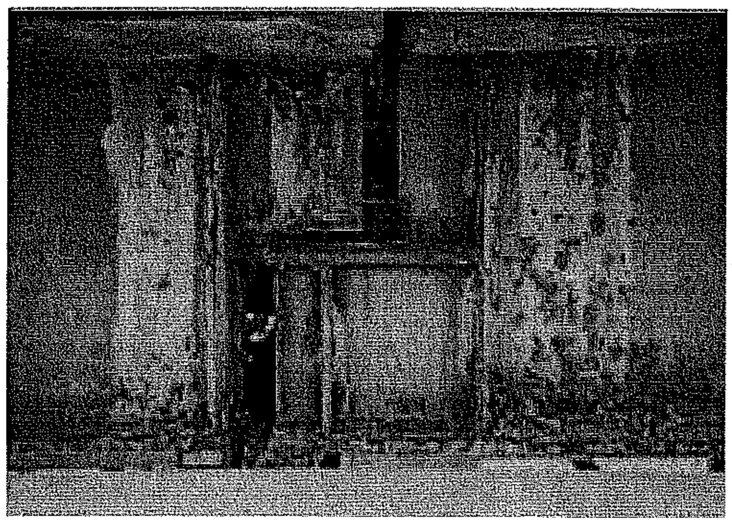
Pier #5:
Bearing assemblies have two "rollernest". Climbing onto the pier strut at this location accesses the catwalk. Debris piled at pier strut base allow for unauthorized access. [2002] Bearings show signs of recent movement.

Span #6 (Deck Truss):
Span is 266 FT long with seven floorbeam trusses. [1997] West River Parkway constructed below bridge. [1999] Floorbeam truss's, sway bracing located below the median and beams 6, 7, 8, & 9 were re-painted.

Panel Point #2 (East Truss):

Panel Point #3 (East Truss):
Floorbeam truss, near center, has an undercut weld in the flange.

Panel Point #4 (East Truss Stringer Joint):
Type H: strip seal deck joint above. [1996] Floorbeam truss bottom chord/vertical member connection gusset plate has a weld overlap. [1999] Gland has 1 LF of gland pulled out at centerline. Junction box cover is missing at catwalk. [2000] Joint gland at east end has concrete in. [2005] Pitting, flaking & surface rust exterior east truss.



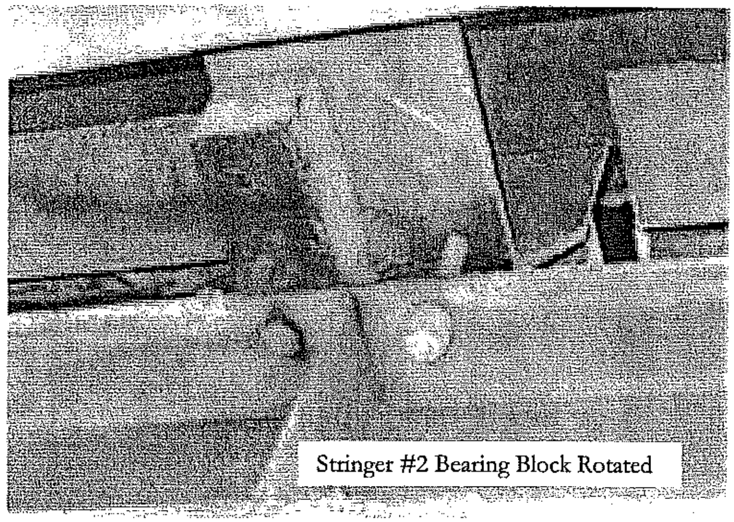
Flaking & Surface Rust Exterior East Truss

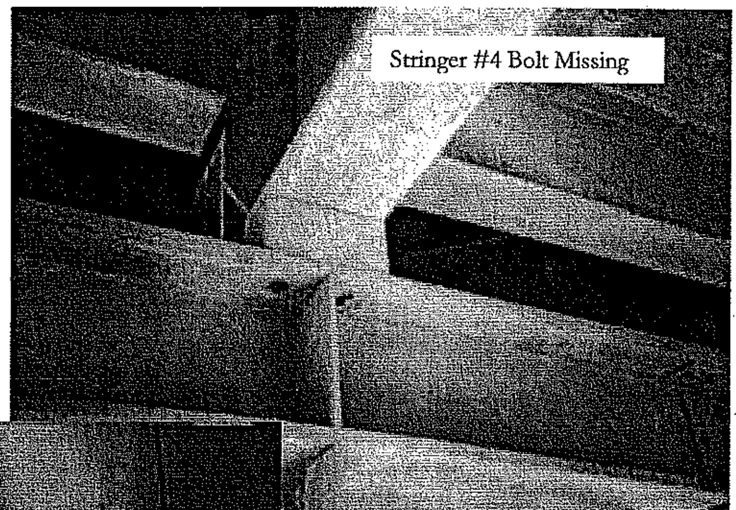
Panel Point #5 (East Truss):
[1997] Cracked tack weld between the floorbeam truss top chord and a stringer bearing pedestal. [1999] Tack welds ground out at stringer #3, cracked tack welds remain at stringer #4.

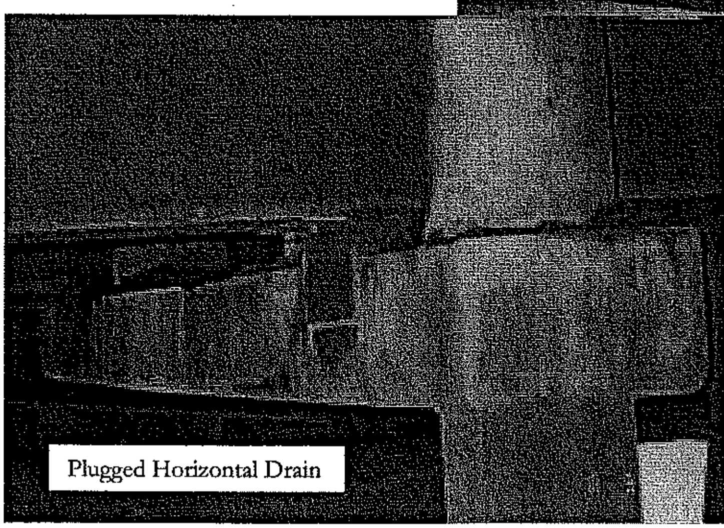
Panel Point #6 (East Truss):
[1994] Floorbeam truss top chord, bottom flange, has a poor quality weld at the end of a connection plate. [1999] Stringer #5 bearing pedestal has a cracked tack weld. [2003] Top chord of the floorbeam truss, just east of east truss, has an old dent on the top flange.

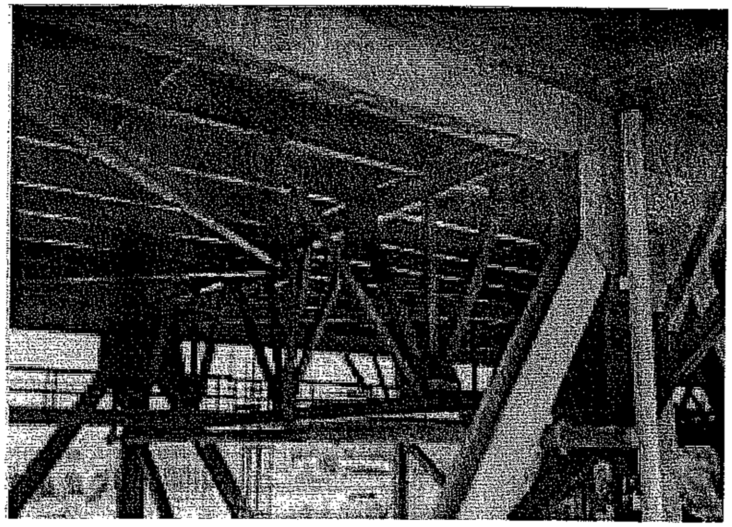
Panel Point #7 (East Truss):
[2003] Top chord of the floorbeam truss, just east of east truss, has an old dent on the top flange.

Panel Point #8 (East Truss Pier #6 Stringer Joint):
Type H: strip seal and deck drain above. [1999] Missing bolt replaced. Vertical truss member has pitting, section loss, moderate flaking rust. Floorbeam bottom chord & middle bracing connection plate has pitting, moderate section loss, severe flaking rust. Middle bracing connection plate has ½" spread from pack rust. Underside of the deck has 50 SF of water saturation. [94/2003] Joint is leaking, small hole & membrane has pulled out. Stringer #4: one bolt broken off at south floorbeam connection. Stringer #2 (south side): bearing block has rotated 90°.


Stringer #2 Bearing Block Rotated


Stringer #4 Bolt Missing

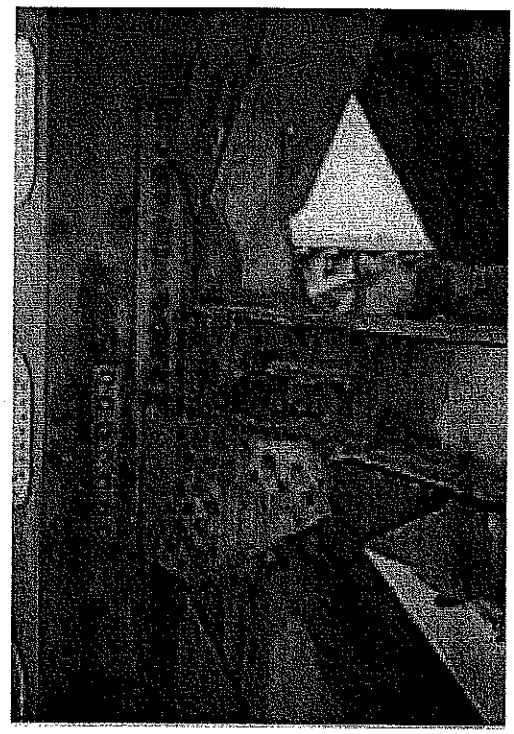

Plugged Horizontal Drain



Median Drain Plugged

Pier #6 (Downtown, West Bank of Mississippi):

Pier consists of two concrete columns with a pier wall at the base, two "rollernest" bearing assemblies. [1997] Bearings have surface rust, moderate corrosion and show no signs of movement. Deck drain downspouts are clogged, top & bottom at median. [2004] Typical condition & rust at floorbeam connection near deck drain at connection L8.



Floorbeam Truss Condition

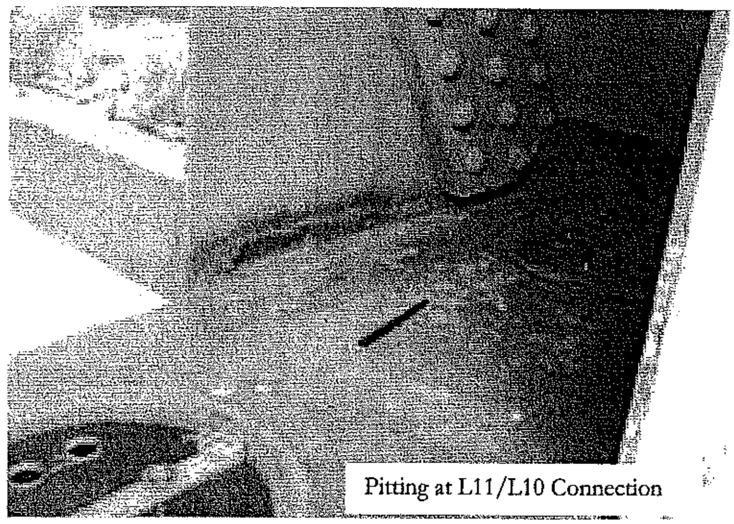
Span #7 (Deck Truss):

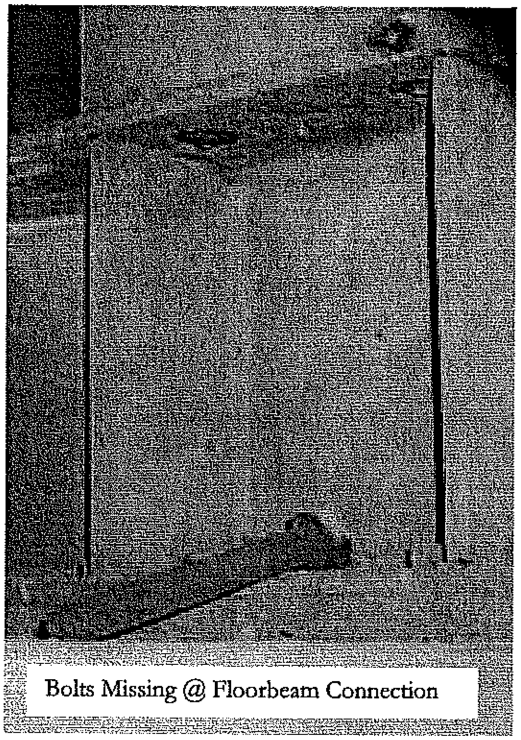
Span is 456 FT long with 12 floorbeam trusses. [1999] Floorbeam truss's, sway bracing located below the median and the beams 6, 7, 8, & 9 were re-painted.

Panel Point #9 (East Truss):
[2003] Floorbeam bottom chord connection plate has a cracked tack weld on the south side. Underside of the deck has 20 SF of water saturation.

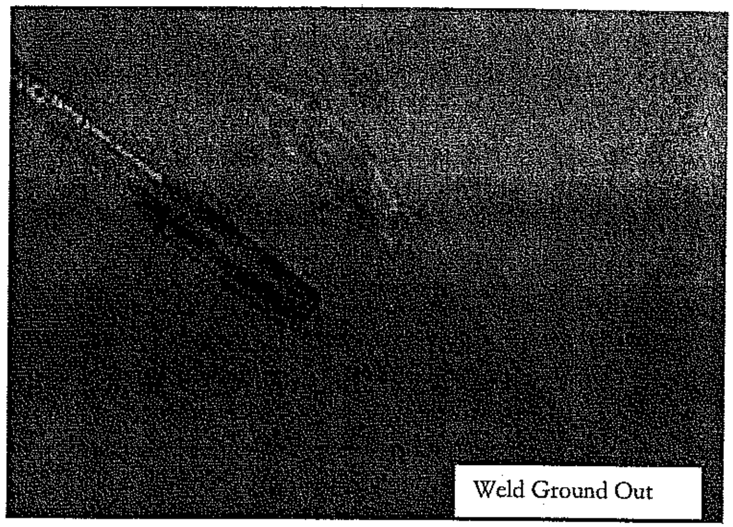
Panel Point #10 (East Truss):
Red navigation light for Mississippi river channel. [1999] Strain gauges installed on truss top chord member U9/U10, L9/U10 &L9/L10 from U of M research project.

Panel Point #11 (East Truss):
Section loss: at gusset plate bottom chord. [2004] Pitting: inside gusset plate connection at L11 toward L10. [2000/05] Stringer #3 has two bolts missing at the floorbeam connection.

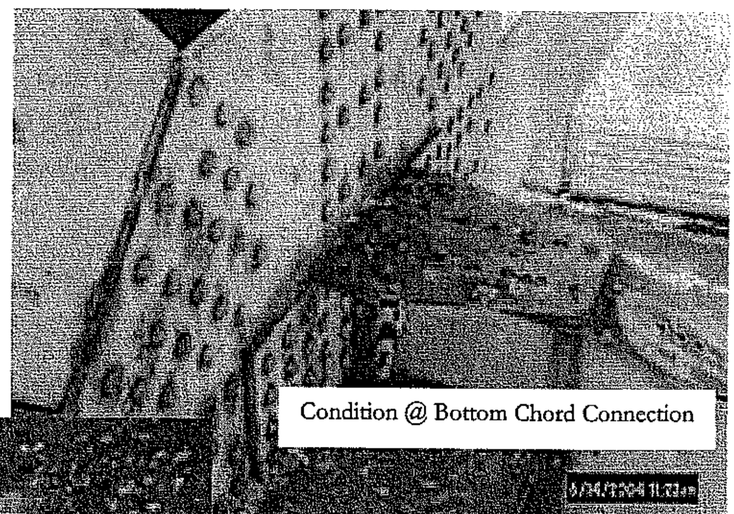

Pitting at L11/L10 Connection

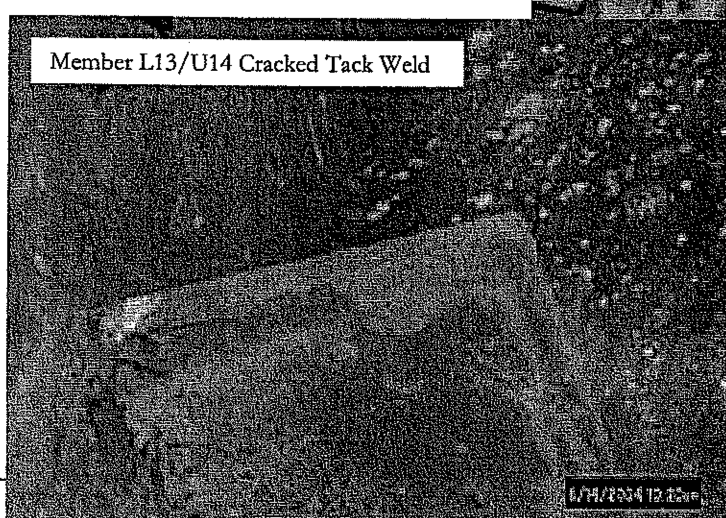

Bolts Missing @ Floorbeam Connection

Panel Point #12 (East Truss):
[1999] Truss bottom chord member L12/L13 has a cracked tack weld at an interior stiffener. [2004] Ground out pit from past inspection.

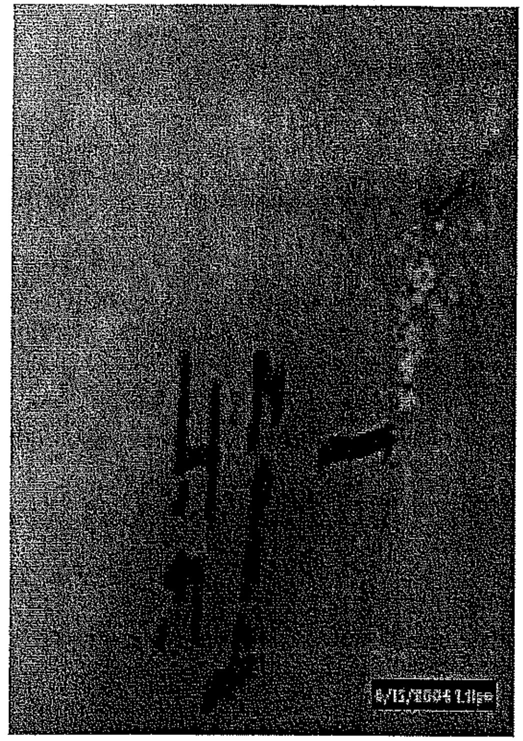

Weld Ground Out

Panel Point #13 (East Truss):
Water from deck drains fall directly into river. [1999] Truss bottom chord member L13/L14 has cracked tack welds at two interior stiffeners. [99/2002] Bottom chord gusset plate has section loss, flaking & pack rust. [2004] Bottom chord member L13/L14 has cracked tack weld at diaphragm tab. Cracked tack weld at diaphragm tab member L13/U14. See photos. [2006] Bottom chord member L13/L14 has a missing bird cover.


Condition @ Bottom Chord Connection

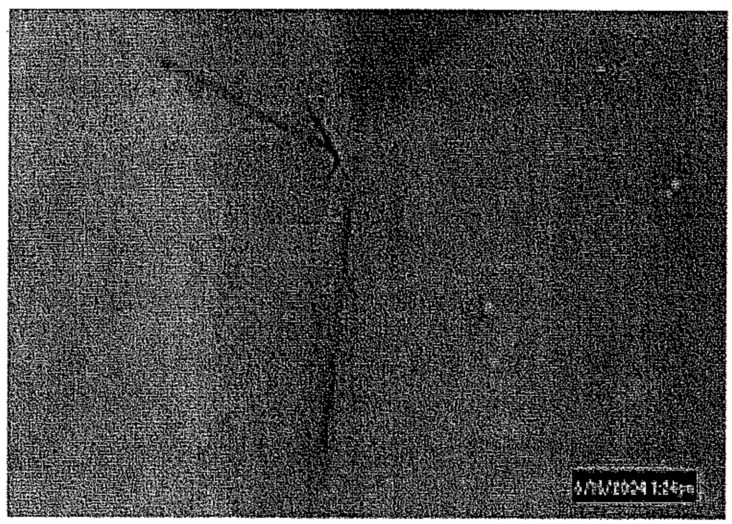

Member L13/U14 Cracked Tack Weld

Panel Point #14 (East Truss Midspan Stringer Joint):
Strip seal expansion joint on the deck. Sway frame rusty. [1999] Truss bottom chord member L14/L13' has a cracked tack weld at an interior stiffener. [2002/03] Floorbeam bottom chord & middle bracing connection plate has ½" pack rust. Underside of the deck has 4 SF of delamination. [2004] Bottom chord member L14/L13' cracked tack weld at diaphragm tab.



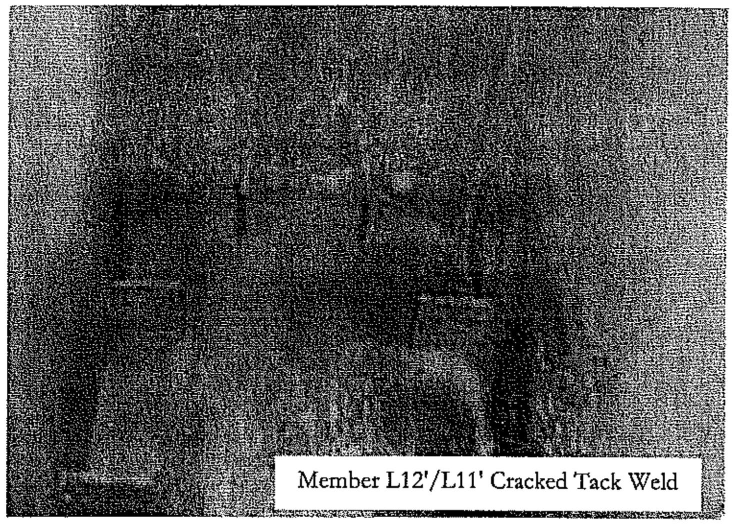
Member L14/L13' Cracked Tack Weld

Panel Point #13' (East Truss):
Floorbeam truss top chord has a ground out spot near stringer #4. [1996] Truss bottom chord member L13'/L12' has a cracked tack weld at an interior stiffener. [2003] Truss bottom chord connection plate has ½" pack rust. Underside of the deck has 20 SF of water saturation. [2004] Bottom chord member L13'/L12' has cracked tack weld at diaphragm tab.



Member L13'/L12' Cracked Tack Weld

Panel Point #12' (East Truss):
[1998] Truss bottom chord member L12'/L11' has a cracked tack weld at an interior stiffener. [99/2003] Underside of the deck has 65 SF of water saturation. [2004] Bottom chord member L12'/L11' two cracked tack weld at diaphragm tab.


Member L12'/L11' Cracked Tack Weld

Panel Point #11' (East Truss):

Panel Point #10' (East Truss):
[2003] Underside of the deck has 1 SF of spall with exposed rebar. Light pole, W5L3, has 1 LF crack.

Panel Point #9' (East Truss):
Water from deck drains fall onto the steel & directly into river. [2002] Bottom chord member L9'/L8' has section loss, flaking rust.

Panel Point #8' (East Truss Pier #7 Stringer Joint):
Red navigation light for Mississippi river channel. Type H: strip seal expansion joint on the deck. [93/2003] Floorbeam truss has section loss, moderate flaking rust. North side: bolts replaced with "threaded-rod" at stringer #4, bolts replaced at stringer #5. Underside of the deck has 80 SF of water saturation.

Pier #7 (East Bank of Mississippi):
Two fixed bearing assemblies. Pier consists of two concrete columns with a pier wall at the base. [1997] West column has a full height, leaching crack on the south face.

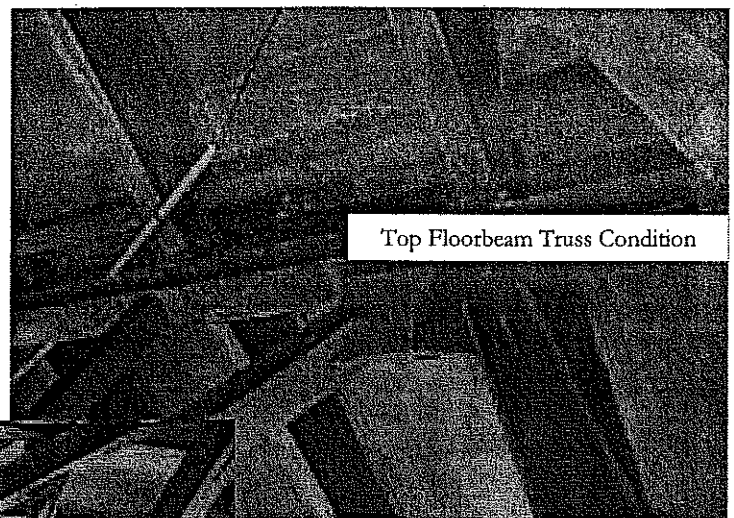
Span #8 (Deck Truss):
Span is 266 FT long with seven floorbeam trusses. [1999] Floorbeam truss's, sway bracing located below the median and the beams 6, 7, 8, & 9 were re-painted.

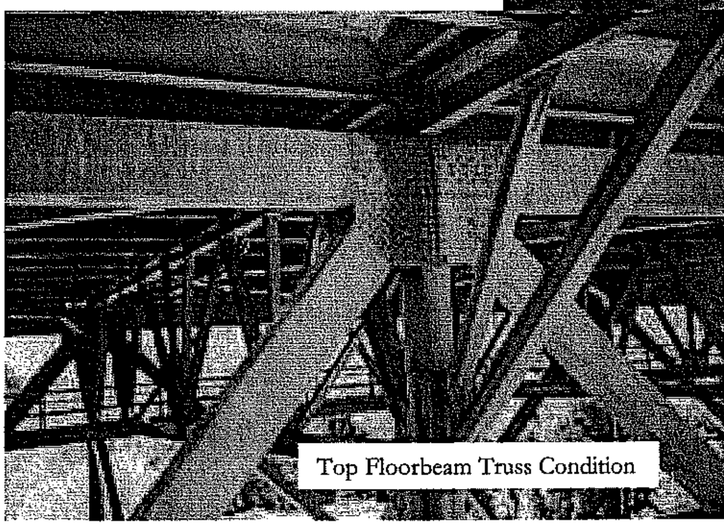
Panel Point #7' (East Truss):
[2003] Underside of the deck has 240 SF of water saturation, & 80 SF of delamination.

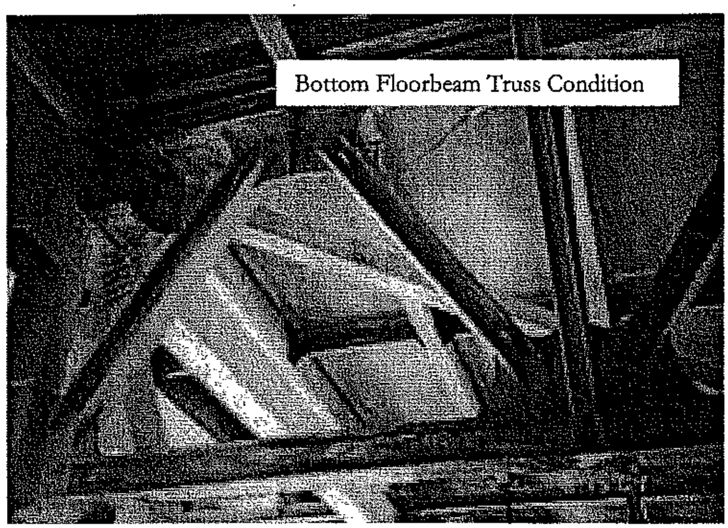
Panel Point #6' (East Truss):
[1996/98] Stinger #4 connection to the floorbeam truss is "working". The SW bolt is loose. [2003] Underside of the deck has 10 SF of water saturation.

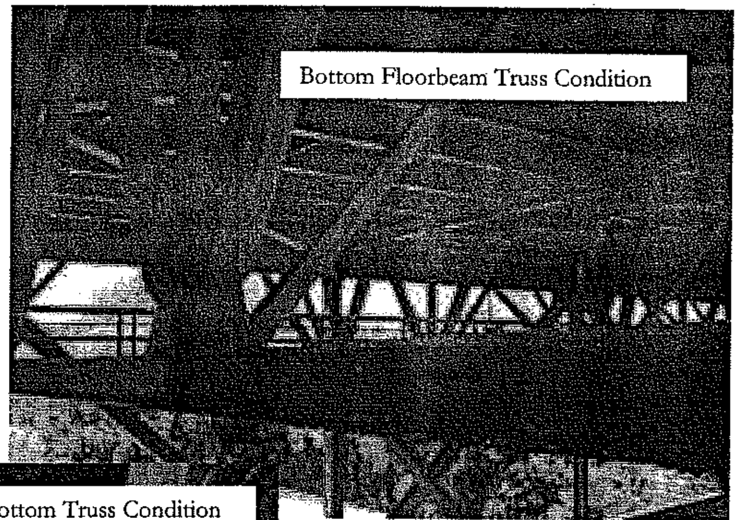
Panel Point #5' (East Truss):
[2001] Underside of the deck has 30 SF of water saturation.

Panel Point #4' (East Truss Stinger Joint):
Type H: strip seal expansion joint on the deck. Truss diagonal member U4'/L3' has backer bars along the interior edges. [01/04] Strip seal has 3 LF of gland pulled out. Truss connection plates, the top chord, and floorbeam have moderate section loss, severe flaking rust. Bottom connection plates have ½" pack rust.

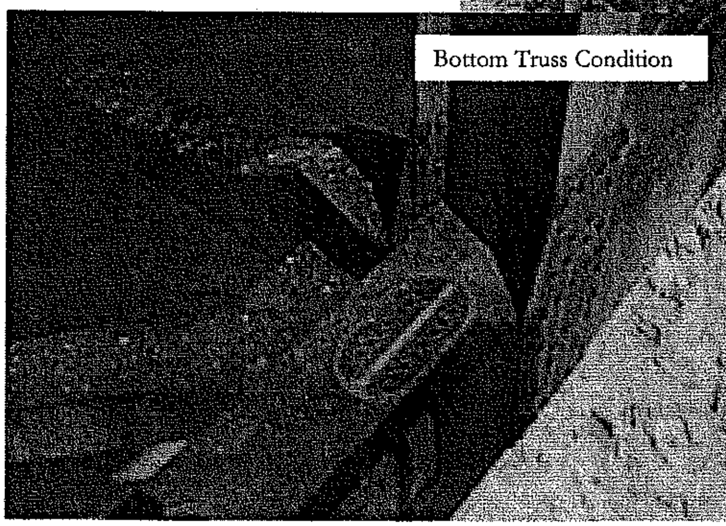

Top Floorbeam Truss Condition


Top Floorbeam Truss Condition


Bottom Floorbeam Truss Condition



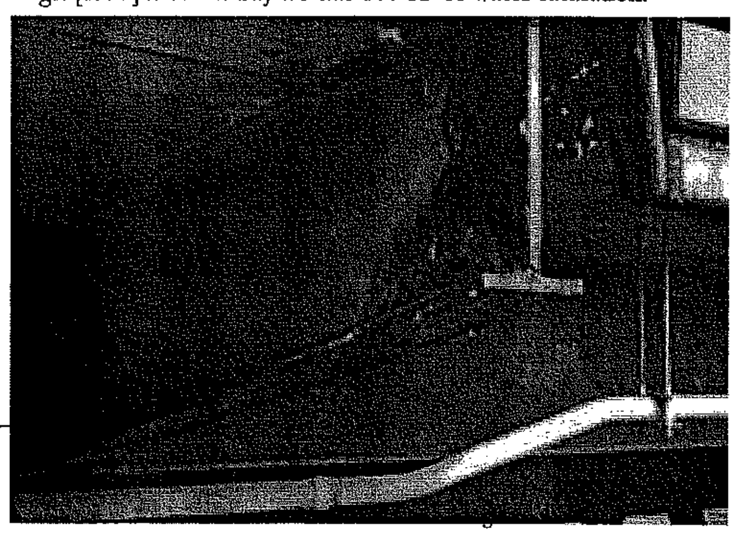
Bottom Floorbeam Truss Condition



Bottom Truss Condition

Panel Point #3' (East Truss):
Center lane has road sensors on the deck surface. Top chord of the floorbeam truss has an "incomplete" weld along the top edge of the web reinforcement plate.

Panel Point #2' (East Truss):
Overhead sign mounted on exterior railings. [1999] Deck in bay #3 has 100 SF of water saturation. [2003] Bottom connection plates have flaking rust. [2004] Area underneath overhead sign has 100 SF of water saturation. [2005] North support beam stringer has severe section loss at end.

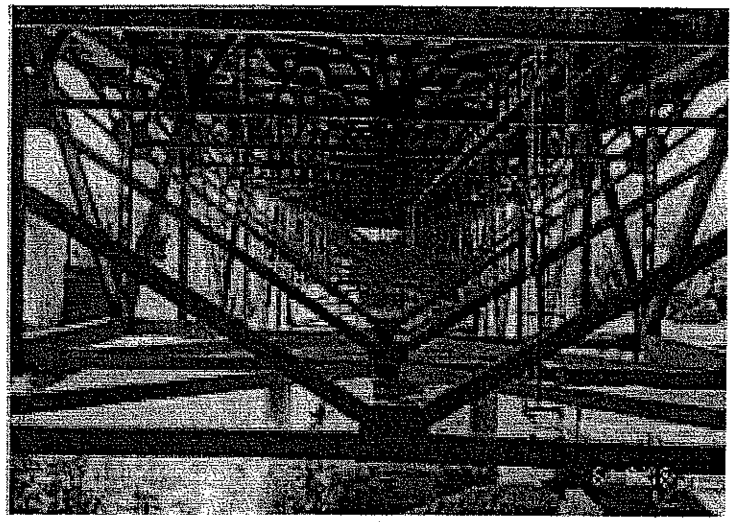


North Support Beam Stringer

Pier #8:
Two "rollernest" bearing assemblies, have surface rust. [2000/05] East truss rocker shows recent movement. Pier consists of two concrete columns connected by an upper strut. Columns have concrete "jackets" around them with vertical cracks.

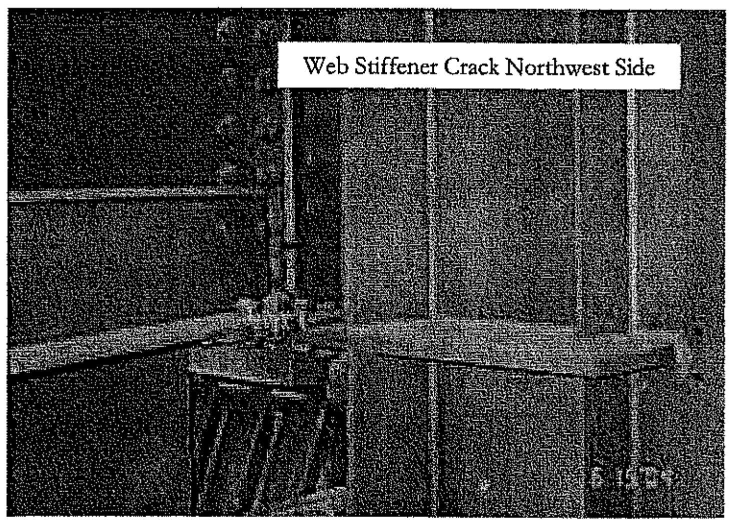
Panel Point #1' (East Truss Pier #8):
[2000] Bottom of truss above bearing has graffiti. [2005] Bottom of deck deteriorated.

Panel Point #0' (End of East Truss):
Joint has open finger joint above. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris, need to be flushed. [1998/99] Floorbeam re-painted, side facing finger joint has section loss with holes in web stiffeners. [1998] North face, directly above east rocker bearing, has two horizontal welds between stiffener plates. They have cracked through entirely. [2004] Finger joint in the SB right lane and shoulder has been ground down to prevent the snow plows catching on the joint.

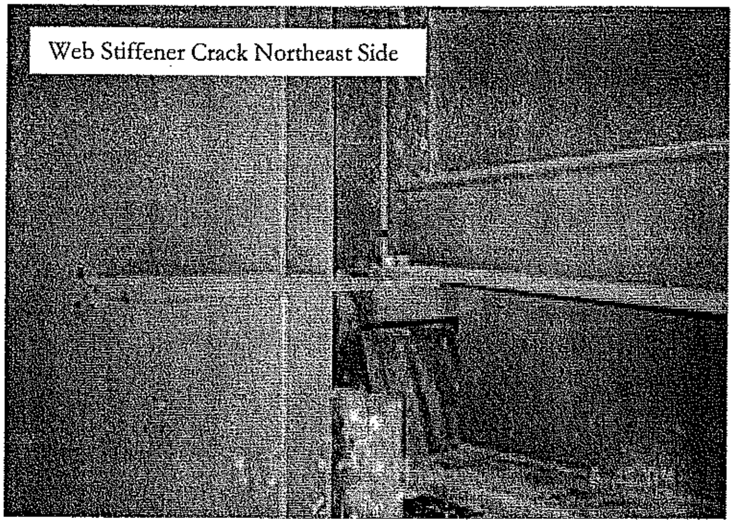


Deck Truss Looking South

Crossbeam:
[1992] North face has crack in the crossbeam web stiffener, above the rocker at the beam #12 connection. This was drilled out. [1997/98] North face: weld above east rocker bearing, between the horizontal & center vertical stiffener, has cracked through entirely. Weld end at the crossbeam web was partially drilled out. [1998] North face has cracks at both ends of the horizontal stiffener, above rocker bearing. They were drilled out with two small holes drilled in crossbeam web at each location. Bracing installed between crossbeam, above east rocker, and beams #3 & 5. [1998/99] Crossbeam re-painted. Side facing finger joint has section loss, with pitting at base of stiffeners. [1999] Bolted connection between beam #12 and the crossbeam was re-tensioned. Connection had been "working" *** [2000] Gap between crossbeam & floorbeam (at rocker bearing) was 3-5/8" at 40° F. [2001003] Gap between crossbeam & floorbeam (at rocker bearing) was 3-1/2".* [2005] Movement at east bearing.



Web Stiffener Crack Northwest Side



MAIN TRUSS SPAN (WEST TRUSS)

Panel Point #0 (End Floorbeam End of West Truss):
Open finger joint on the deck. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings: filled with debris, needs to be flushed. [1997] Floorbeam horizontal stiffener is bent directly above the rocker bearing. [1998/99] Floorbeam re-painted, side facing finger joint has section loss, pitting. [2004] Truss, top chord exterior connection plate has ⅛" deep section loss with pitting. SW rocker bearing has no movement. **[2000] Gap between crossbeam & floorbeam, at west end, measures 16-½". *[2004] Gap between crossbeam & floorbeam, at west end, measures 14-½".*

Gap between Crossbeam & Floorbeam (East End)	
Date	**Measurement**
September, 1998	16-⅝"
April, 1999	17-13/16"
April, 2000	18"
September, 2001	18-1/16"
June, 2003	16-⅞"

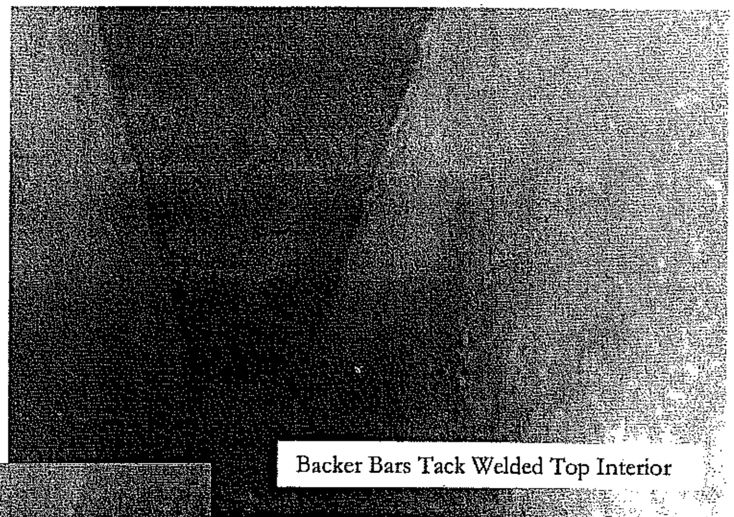
Panel Point #1 (West Truss Pier #5):
[1994] Diagonal brace, floorbeam to stringer, has a cotter pin missing at the floorbeam truss connection. [1998] Deck drain detached from downspout, originally drained into storm sewer. [2004] Truss & floorbeam top chords & interior diaphragms have flaking rust.

Pier #5:
See NB notes. Access ladder to catwalk removed.

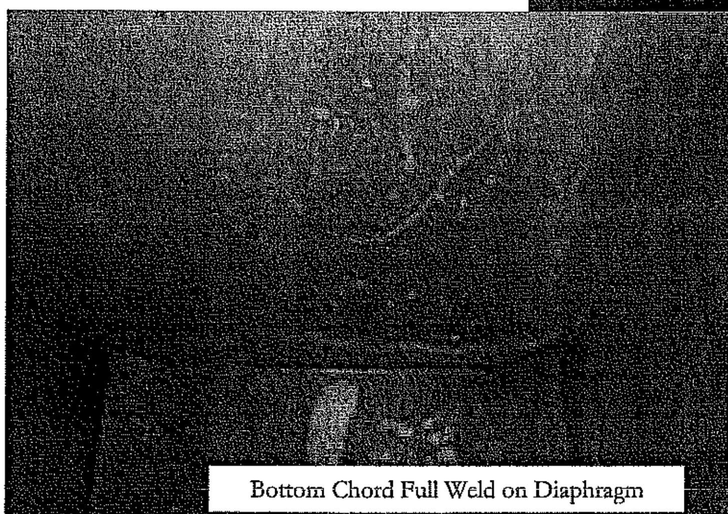
Panel Point #2 (West Truss):
[1996] Floorbeam truss member L2/U3 has a welding flaw. [1997] No crack! Magnetic particle tested. [2004] Truss & floorbeam top chords & interior diaphragms have flaking rust.

Panel Point #3 (West Truss):

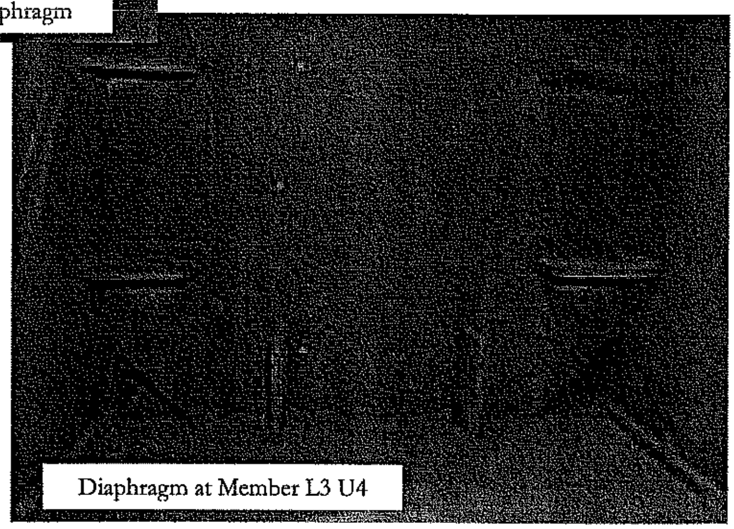
[2004] Truss bottom chord L2/L3 has a nick. Top chord U3/U4 has backer bars tack welded along the top interior corners of member. See photo. Bottom chord L4/L5 has no diaphragm tabs, full weld on side & tack welds on other. See photo. Diagonal member L3/U4 has 4 diaphragms with tabs. See photo.



Backer Bars Tack Welded Top Interior

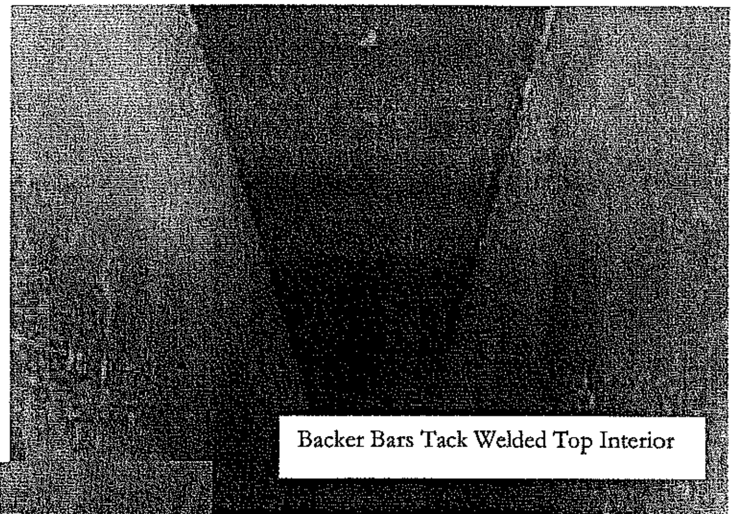


Bottom Chord Full Weld on Diaphragm

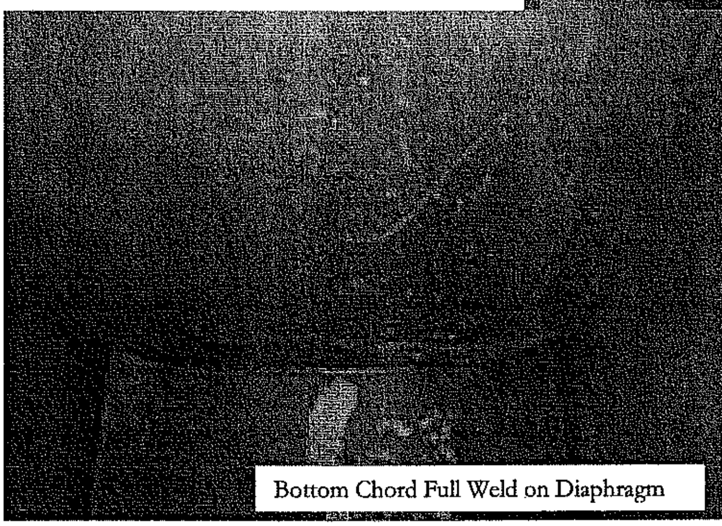


Diaphragm at Member L3 U4

Panel Point #4 (West Truss Stringer Joint):
Strip seal expansion joint on the deck, [1998] Stringer #10: bolt replaced at south floorbeam, truss connection. [2000] Lighting conduit is held up with tie wire. [2004] Stringer #11 floorbeam connection has moderate flaking rust. Truss top chord has flaking rust. Floorbeam top chord, stiffener under stringer #10 has cracked tack weld & is working. Top chord U4/U5 has backer bars tack welded along the top interior corners of member. See photo. Bottom chord L4/L5 has no diaphragm tabs, full weld on side and tack welds on other. See photo.

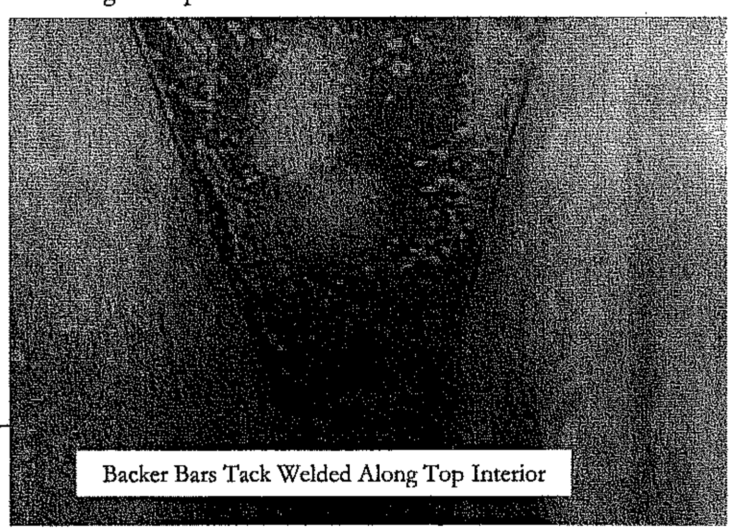


Backer Bars Tack Welded Top Interior



Bottom Chord Full Weld on Diaphragm

Panel Point #5 (West Truss):
Top chord U5/U6 has backer bars tack welded along the top interior corners of member. [2004] Truss bottom chord, bottom lateral connection plates have spread 3/16" from pack rust.



Backer Bars Tack Welded Along Top Interior

Panel Point #6 (West Truss):
Overhead sign mounted on railing. Floorbeam truss top chord (U5/U4) has gouges in the bottom flange at the end of the connection plate; the bottom chord of the floorbeam truss has 3 spots ground out. Floorbeam truss top chord is offset vertically ¼" at the splice from construction.

Panel Point #7 (West Truss):
[2002] Underside of the deck has 20 SF of water saturation at stringer 12 thru 14.

Span #6:
Span is 266 FT long with seven floorbeam trusses.

Pier #6:
See NB notes.

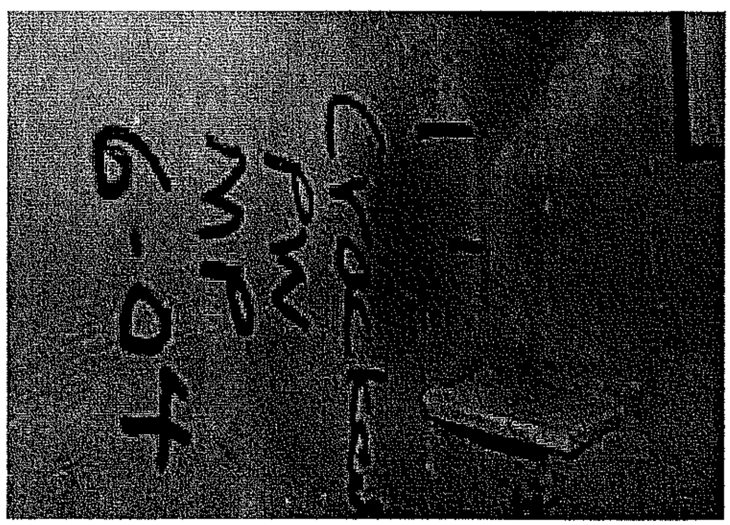
Panel Point #8 (West Truss Pier #6 Stringer Joint):
Type H: strip seal expansion joint on the deck. Deck drains. [96/2003] Drain clogged at median, horizontal trough, standing water in east grate. [96/2005] Strip seal gland has 12 LF pulled out in right gutter line. [2004/05] Vertical member L8/U8, bottom chord, & floorbeam connection plates have moderate flaking & surface rust from plugged deck drain. [2005] Stringers #10 & #11 have flaking rust on the north side.

Panel Point #9 (West Truss):
Truss diagonal L9/U8 has a spot ground out.

Panel Point #10 (West Truss):
Truss top chord U10/U9 has two spots ground out. [2005] Vertical ladder to access cat walk. Stringer #8 has some loose stool concrete.

Panel Point #11 (West Truss):
[1998] Stringer #11 has three bolts replaced at the floorbeam truss connection; the SE bolt is too short with inadequate threads. Stringer has lifted 3/32" off the bearing block on the south side. Stringer #3 has tack welds ground out.

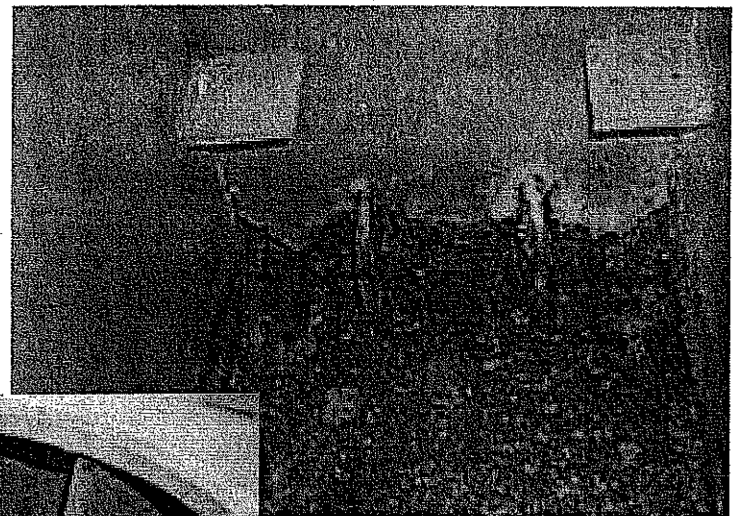
Panel Point #12 (West Truss):
[1996] Bottom chord member L12/L13 has a cracked tack weld at the internal stiffener. [2004] Bottom chord member L12/L13 has a cracked tack weld (diaphragm #2), (not at diaphragm tab). See photo.



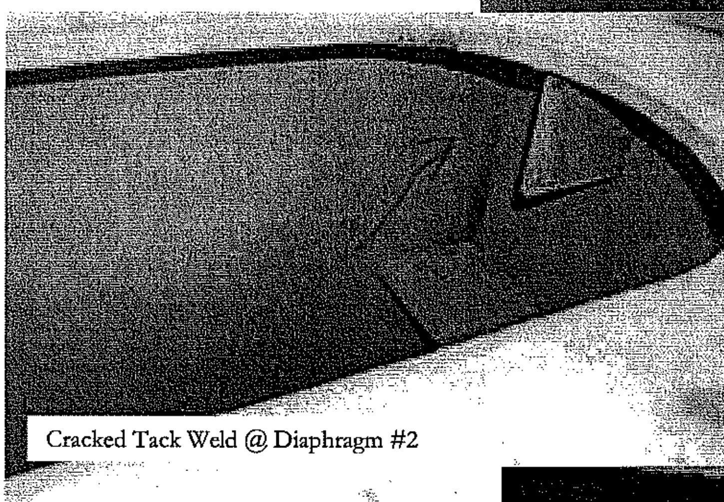
Cracked Tack Weld @ Diaphragm #2

Panel Point #13 (West Truss):

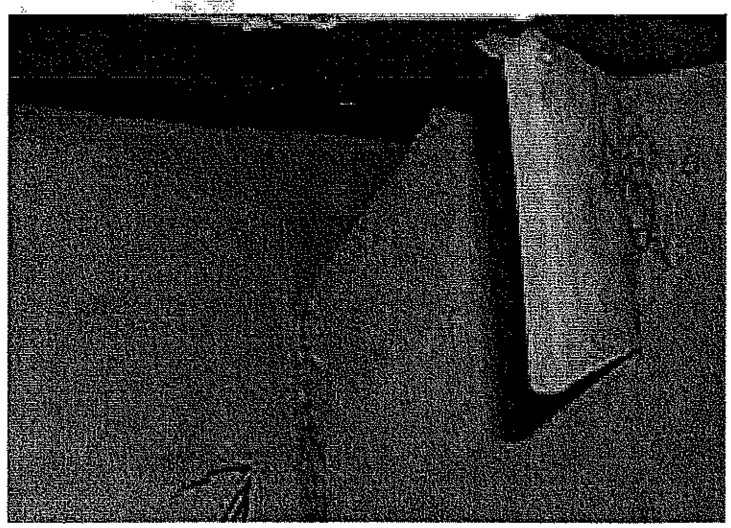
[1996/99] Bottom chord member L13/L14 has cracked tack welds at two internal stiffeners [1999] Truss bottom chord/sway frame connection plates have ¾" pack rust. [2004] Diagonal L13/U14 has corrosion from deck drain. Cracked tack weld (not at diaphragm tab). Cracked tack weld: (diaphragm #3), (not at diaphragm tab), (entire tack weld broken cleanly).



L13/U14 Corrosion @ Diaphragm

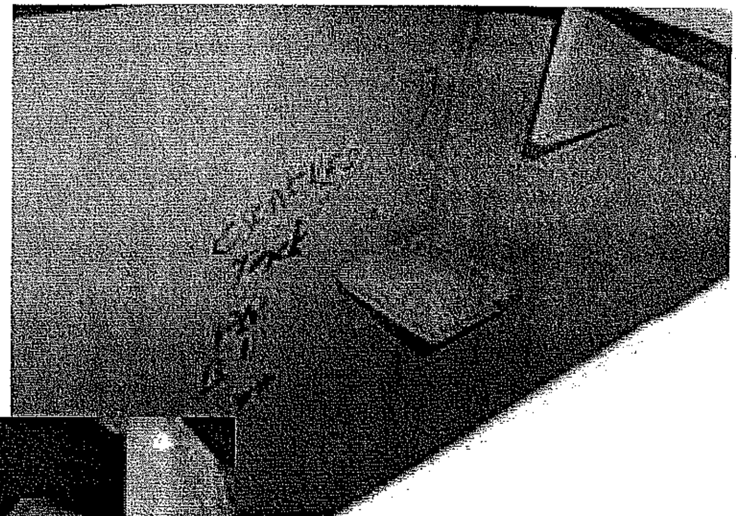


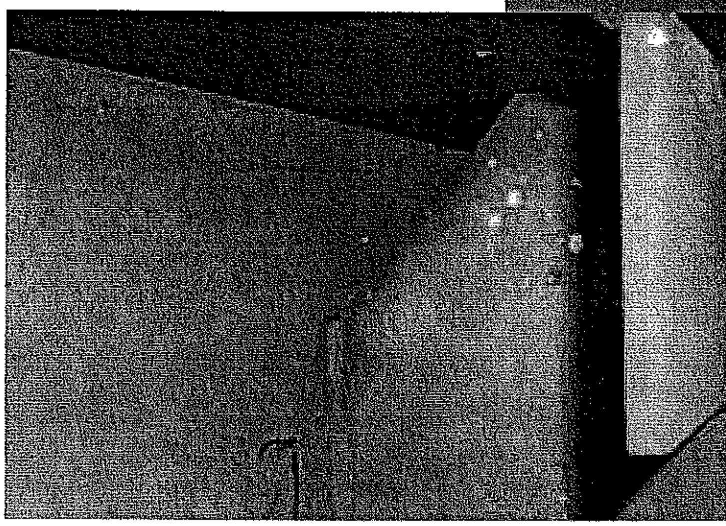
Cracked Tack Weld @ Diaphragm #2



Cracked Tack Weld @ Diaphragm #2

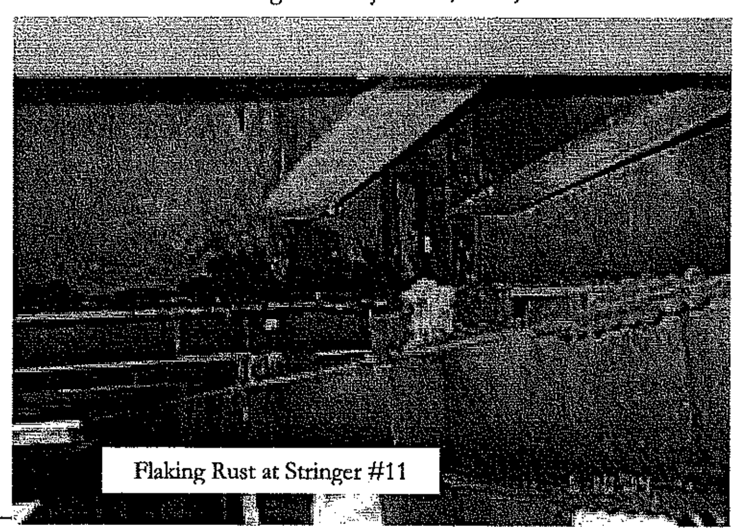
Cracked Tack Weld @ Diaphragm #3



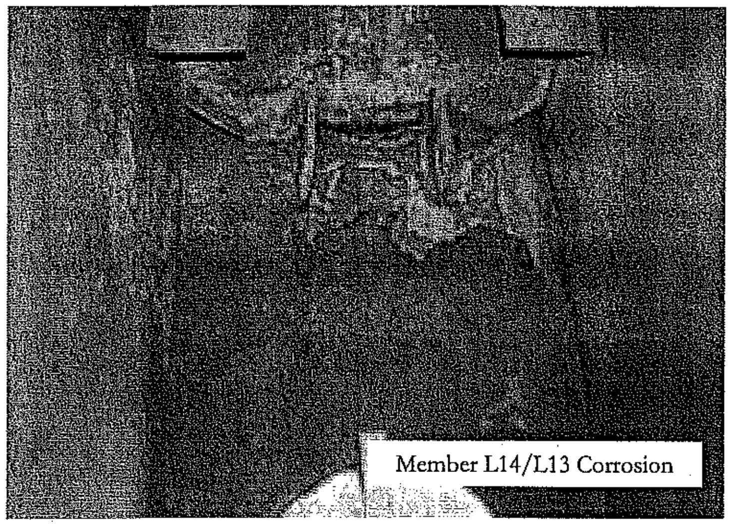


Cracked Tack Weld @ Diaphragm #3

Panel Point #14 (West Truss Midspan Stringer Joint):
Type H: strip seal deck joint above. Deck drains on both sides. [1994] Stringer #11 has section loss, flaking rust near the joint from gland pulled out above. Tack welds along the sway frame/truss, bottom chord, and gusset plate. [1999] Bottom chord member L14/L13' has a cracked tack weld at an interior stiffener. [2003] Stringer #14 connection, south side of the floorbeam, has a cracked tack weld. [2004] Bottom chord member L14/L13' has internal tack welds (full length) at interior diaphragm. Upper chord member U14/U13' has corrosion from deck drain. See photo. [2005] Strip seal gland has 10 LF pulled out. [2006] Reversible diagonal member U14/L13 has section loss with severe flaking rust.



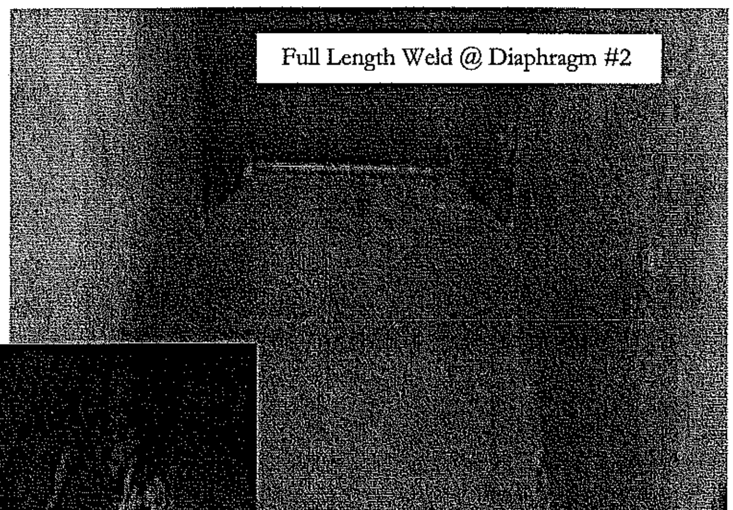
Flaking Rust at Stringer #11



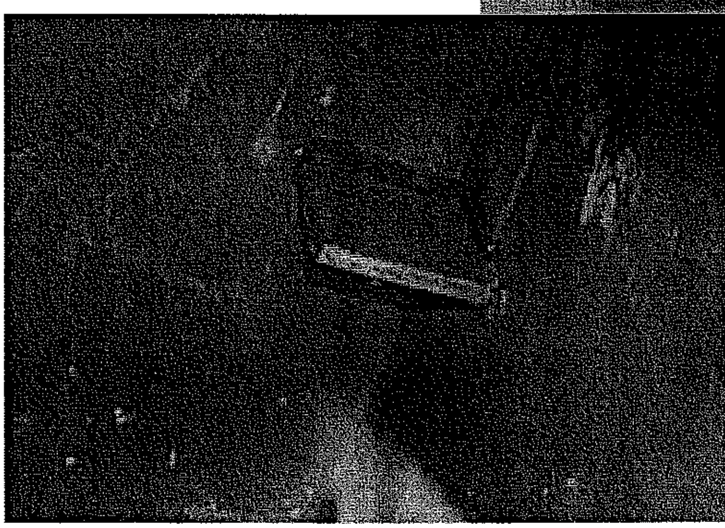
Member L14/L13 Corrosion

Panel Point #13' (West Truss):

[2004] Upper chord member U13'/U12' (diaphragm #2) has no tabs, diaphragm is welded (full length) one side only. Bottom chord member L13'/L12': cracked tack weld (diaphragm #1), (not at diaphragm tab), (clean break). See photo #2.



Full Length Weld @ Diaphragm #2



Cracked Tack Weld @ Diaphragm #1

Panel Point #12' (West Truss):
Truss diagonal member U12'/L13' has 3 "nicks". The truss bottom chord L12'/L13' has a nick.

Panel Point #11' (West Truss):
Nick in the truss bottom chord L11'/L12'

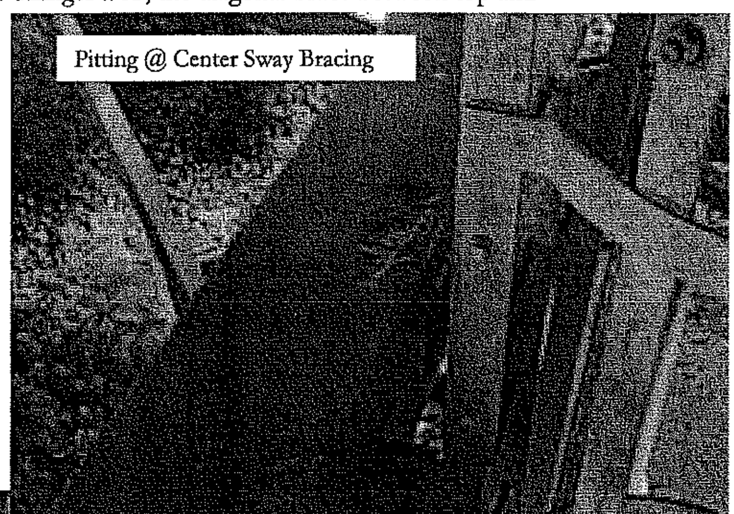
Panel Point #10' (West Truss):
[1994] Stringer #13: loose bolt at floorbeam truss connection. Top chord (U10'/U11') has 6 nicks on the exterior, 15 ft. south of U10'. [2005] Pitting bottom sway frame, 1" diameter holes intermediate & horizontal bracing.

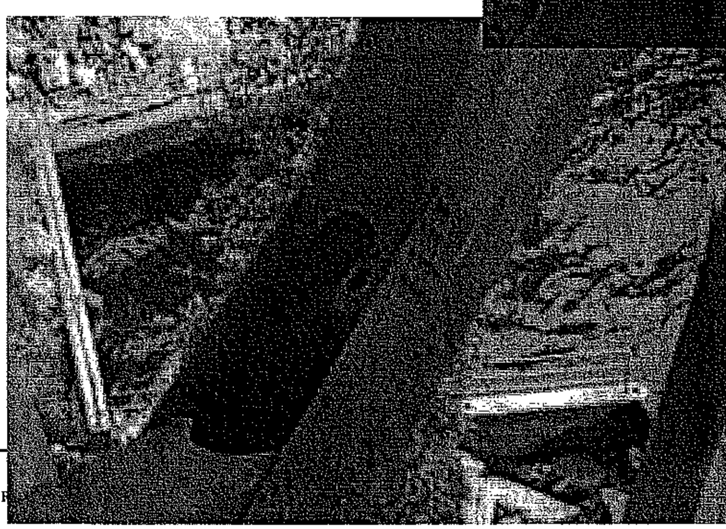
Panel Point #9' (West Truss):
[2001] Truss bottom chord/sway frame connection (gusset plates) has section loss, pitting, heavy flaking rust.

Span #7 (Deck Truss):
Span is 456 FT long with 12 floorbeam trusses.

Pier #7:
See NB notes. [2002] West column has vertical leaching cracks.

Panel Point #8' (West Truss Pier #7 Stringer Joint):
Type H: strip seal deck joint above. [1996] Below stringer #13, the diagonal brace between top and bottom chord of the floorbeam truss is bent, from original construction. [1998] Stringer #11: bolt replaced at floorbeam truss connection. [2001] Truss bottom chord/sway frame connection (gusset plates) has section loss with heavy flaking rust. [2002] Truss bottom chord, L8'/L9', has section loss with heavy flaking rust. [2004/05] Sway bracing center horizontal has 3" x 8" severe pitting & ½" diameter hole; bottom sway bracing has a 2" x 3" hole between stringer #11 & stringer #10. See photos. [2005] Strip seal gland has 5 LF pulled out & is leaking onto the crossbeam below, between stringer 10 & 11.


Pitting @ Center Sway Bracing


Hole in Bottom Member of Sway Bracing

Panel Point #7' (West Truss):
[1997] Top chord/floorbeam truss connection has a cracked tack weld on the diaphragm. [1999] Wind bracing gusset plate, at stringer #14 has loose bolts. [2002] Stringer #14 was installed crooked.

Panel Point #6' (West Truss):
[96/98] Stringer #11, one bolt replaced in 1998 at the floorbeam connection. [1997] Stringer #10, the two south bolts are loose at the floorbeam connection. [99/2003] Stringer #9, south face, has one bolt loose at the floorbeam connection. [2004] Stringer #11 has one loose bolt south side. [2006] Vertical truss tension member L6'/U6': flanges show out of plan bending.

Panel Point #5' (West Truss):
[2002] Sprayer fitting corroded.

Panel Point #4' (West Truss Stringer Joint):
Type H: strip seal deck joint above. Truss diagonal member U4'/L3' has backer bars along interior edges. [1999] Two cracked tack welds at elevation block underneath Stinger #11. [2003] Floorbeam truss bottom chord at Stringer #11 connection: have section loss, pitting, moderate flaking and surface rust.

Panel Point #3' (West Truss):
The floorbeam truss, top flange of upper chord, has an ugly weld below the connection to stringer #11. [2003] Stringer #12 has connection bolts "working".

Panel Point #2' (West Truss):
Overhead sign on bridge, mounted on exterior railings. [2002] Bolts are "working" at stringer #11.

Span #8 (Deck Truss):
Span is 266 FT long with seven floorbeam trusses. [2002] Underside of the deck has 150 SF of water saturation and numerous full depth repairs.

Pier #8:
See NB notes. [1999] West truss bearing shows signs of recent movement.

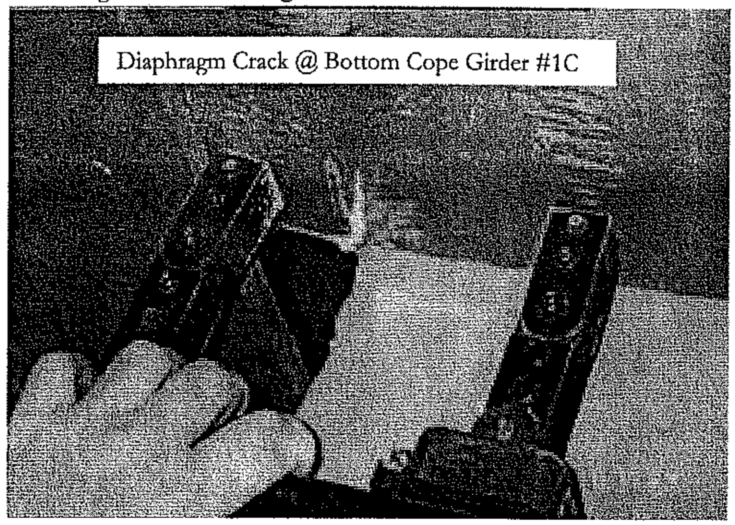
Panel Point #1' (West Truss Pier #8):

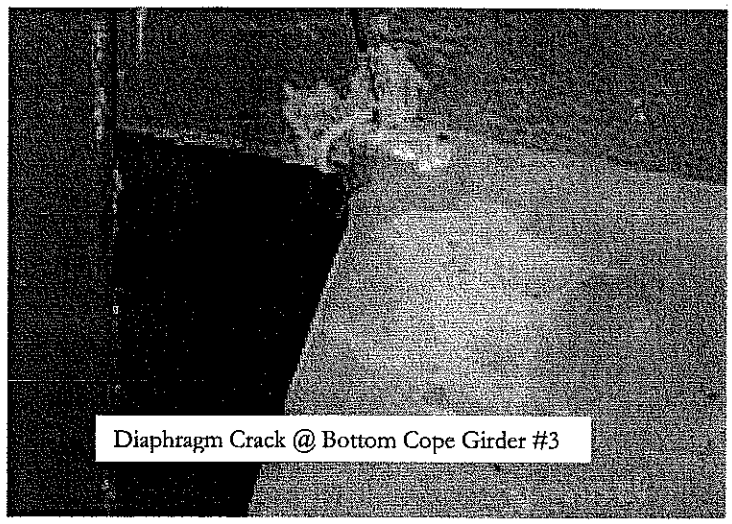
Panel Point #0' (End Floorbeam Beginning West of Truss):
Open finger joint on the deck. [1996] Floorbeam/truss connection has section loss, severe corrosion with surface pitting on plates & bolts. [1997] Conduit running along catwalk is hanging loose, and has pulled out at the floorbeam. [1998] Drain troughs removed. [1998/99] Floorbeam re-painted. Side facing finger joint has section loss on stiffeners. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris; needs to be flushed. [2002] High spots of fingers torched off right lane & shoulder.

Crossbeam:
[1998/99] Crossbeam re-painted. Side facing finger joint has section loss. [1999] Bolted connection between beam #12 and the crossbeam was re-tensioned. Connection had been "working". *[2000] Gap between crossbeam & floorbeam, at rocker bearing, measured at 3-9/16".[2001/03] Gap between crossbeam & floorbeam, at rocker bearing, measured at 3-½".*

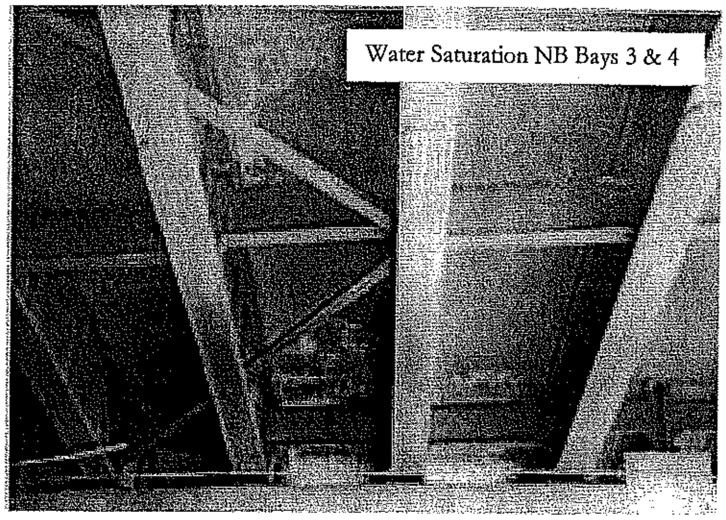
Span #9 (Multi-beam):

Span is 168 FT long with one floorbeam truss at pier #8, fifteen 48" deep welded plate girders bolted onto the crossbeam. Multi-beam spans resume. NB has 8 girders. SB has 7 girders. There are two active railroad tracks below. [1999] Refer to Appendix "A" **First Diaphragm South of Pier #9** graph for crack locations, description & repair to the diaphragm line. Girders 6, 7, 8, 9, & 10 are re-painted. Lateral bracing welded to web & stiffener. [2003] Bottom of deck has conduit on the east side. [2004] Girder 1C (NBL), crack at the diaphragm bottom cope, NE side measures 2" ("front face") and NW side measures 2-½"("Back face"). Girder 3 (NBL), crack at the diaphragm bottom cutout, measures 1-½" (both sides). [1998/2004] Girder #3 has a "tear" in the girder's web at the diaphragm girder connection. The "tear" measured 42" long on one side and 12" long on the other, was caused by out of plane bending between the diaphragm and the girder. Girder Connection Lowered & Girder Web Repaired with Splice Plate. [2002/06] Underside of deck has 260 SF of water saturation, & 4 SF of delamination. [2006] Girder #12 has paint failure from leaking de-icing system.

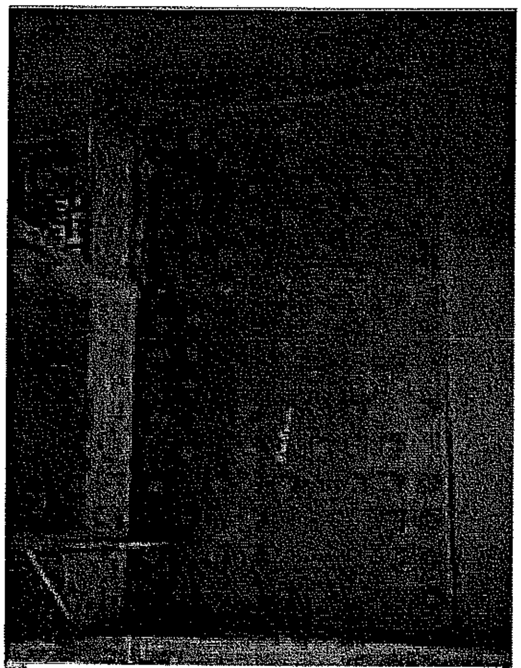

Diaphragm Crack @ Bottom Cope Girder #1C


Diaphragm Crack @ Bottom Cope Girder #3

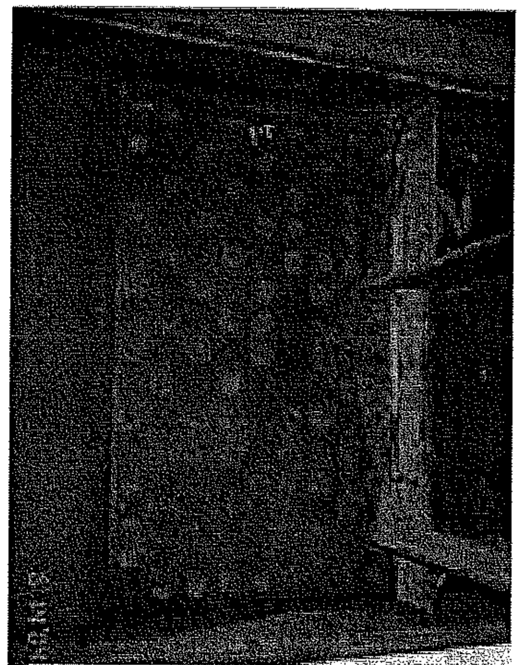

Water Saturation SB Bays 12, 13 & 14



Water Saturation NB Bays 3 & 4



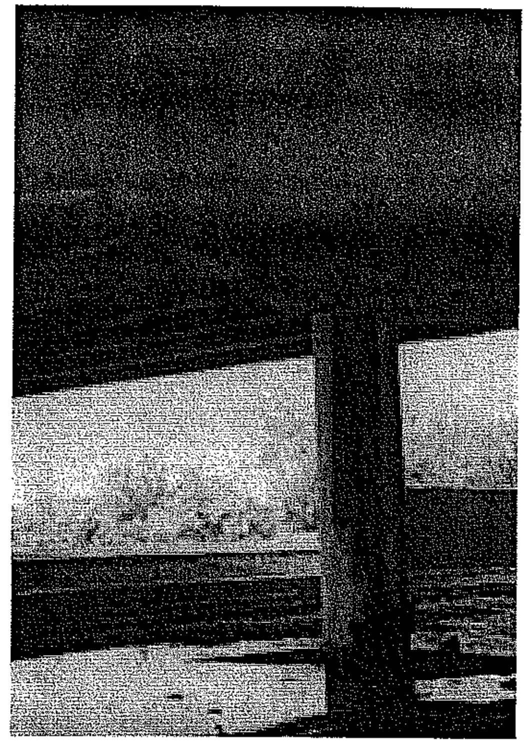
Web "Tear" G #3 @ Diaph Looking West



Web "Tear" G #3 @ Diaph Looking East

Pier #9:

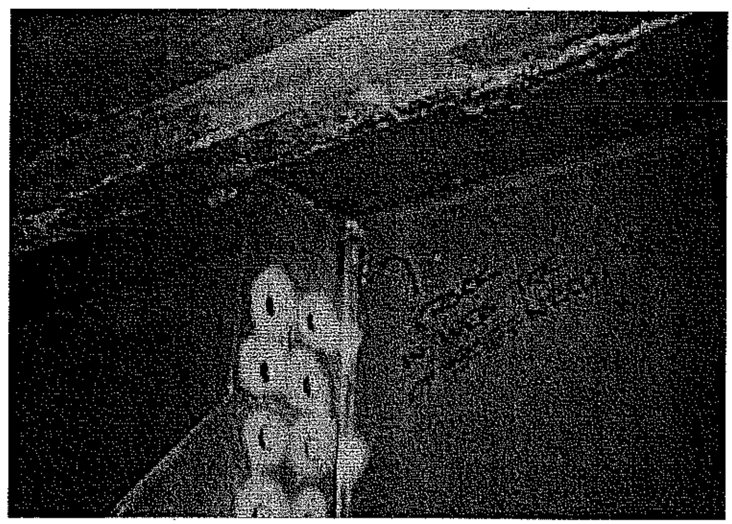
Plate bearing assemblies have 13 fixed, and four sliding. Pier consists of four columns and cap, with a railroad crash strut between the columns. 2 Deck drain: downspouts. [1969] East column damaged by train derailment: the column has minor scrapes and spalls, downspout had to be reconnected. [1999] Bearings 9, 10, 11, &. 12 were re-painted. [2004/05] West vertical & median deck drain plugged.



Median Drain Plugged Pier 9

Span #10 (Steel Multi-beam):

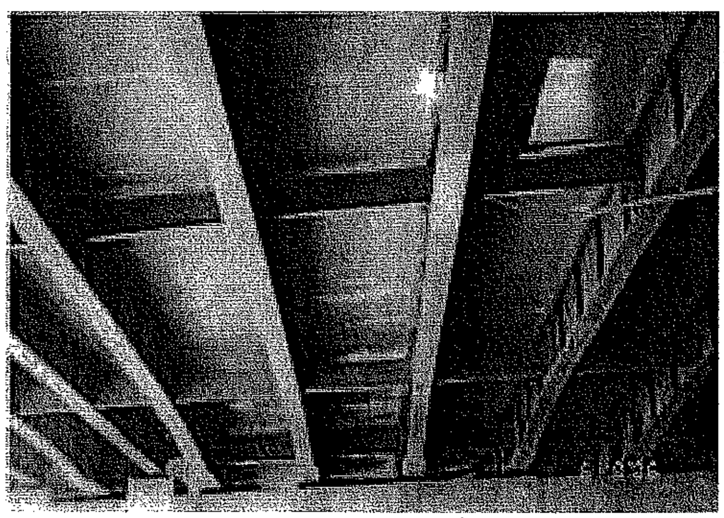
Span is 94 FT long with 17 steel beams. NB has 10 beams; SB has 7 beams (the welded beams transition from 48" to 33" depth just north of pier #9) with active railroad tracks below. One track splits into two. Refer to Appendix "A" **First Diaphragm North of Pier #9** graph for crack locations, description & repair to the diaphragm line. [1999] Beams 9, 10, 11, & 12 were re-painted. Diaphragms were inverted & lowered, even though the beam connections have a "positive moment" configuration. Connections welded to top flange. [2003] Conduit: at east side bottom of deck. [2000] Beam #6 appears to be "working" at the top connection. [2004/06] Underside of the deck has 550 LF of transverse leaching cracks, 500 SF of water saturation, & 8 SF of delamination.



Girder #10 Vertical Stiffener/Girder Web

Girder #10 Vertical Stiffener/Girder Web

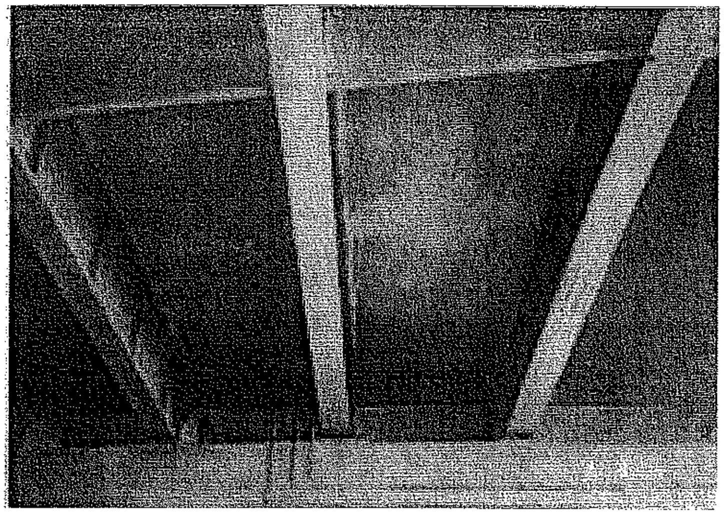
Water Saturation SB Bays 12, 13 & 14



Water Saturation NB Bays 5, 6 & 7

Pier #10:
Pier has 5 columns & cap with a railroad crash strut between the columns and 18 sliding plate expansion bearings. [1999] Bearings 9, 10, 11, & 12 were re-painted. [2003] North face of cap has 20 SF of delamination.

Span #11 (Steel Multi-beam):
Span is 68 ft. long with 18 steel beams. Northbound has 11 beams; southbound has 7 beams, and the parking lot below. [1999] Beams 9, 10, 11, & 12 were re-painted. Connections welded to top flange. Diaphragms were inverted & lowered, even though the beam connections have "positive moment" configuration. [2003] Conduit: east side bottom of deck. [2004] 50 SF of water saturated deck underneath.



Water Saturation SB bays 15 & 16

Pier #11:
Beginning: NB off ramp to University Avenue. (Br. #9340A starts here). Type H: strip seal deck joint above. The pier consists of seven columns & cap and 18 sliding plate expansion bearings. [1998] Extensive shotcrete repairs on pier cap, water stained. [1999] Sliding plate bearings for the steel beams were re-painted. [95/2000] Gland is leaking in several locations (NB & SB). [2000] West column has 1 SF spall. [2004] Cover plate is missing from "J" barrier east rail NBL. [2006] Strip seal is closed to ¾". Shotcrete repair is map cracking. All bearings have moderate corrosion. 3 Under deck lights north face cap.

Span #12 (Concrete Voided Slab Span):
The slab span consists of 15 sliding plate bearings (voided slab). Parking lot: below. [1998] Shotcrete repairs along the median and exterior copings.

Pier #12:
Pier consists of 6 columns (integral with the slab span deck, no bearings). 3 Under deck lights south face cap.

Span #13 (Concrete Voided Slab Span):
2nd St. below, under deck light EB. [1998] Shotcrete repairs along the median and exterior copings. [2006] Underside of the deck has 10 SF of water saturation.

Pier #13:
Pier consists of 6 columns (integral with the slab span deck, no bearings).

Span #14 (Concrete Voided Slab Span):
North slope is below. [1998] Shotcrete repairs were done along median and exterior copings. [2006] Underside of the deck has 12 SF of water saturation & 4 SF of delamination. 2 Under deck lights.

North Abutment:
Type H: strip seal deck joint above with 14 sliding plate bearing assemblies. [2000] NB joint leaking at both ends. Bearings are rusty. [2006] Strip seal is closed to ¾".

PREVIOUS SNOOPER INSPECTIONS

2005 Ken Rand, Mark Pribula, Kurt Fuhrman, Vance Desens, Pete Wilson, Mike Palmer
2004 Mark Pribula, Kurt Fuhrman, Vance Desens, Pete Wilson, Jim Flannigan, John Miller (City of Mpls)
2003 Mark Pribula, Kurt Fuhrman, Vance Desens, Pete Wilson, Bill Nelson
2002* Mark Pribula, Kurt Fuhrman, Pete Wilson, Jerry Oldeen, Bruce Anderson, Mike Palmer
2001 Marl Pribula, Kurt Fuhrman, Vance Desens, Ken Rand, Mike Palmer
2000 Mark Pribula, Kurt Fuhrman, Pete Wilson, Marc Beucler, Mike Palmer, Wayne Tennison Pete Wilson, George Morelli, Rebecca Lane
1999 Kurt Fuhrman, Bill Nelson, Ken Rand, Mike Schadegg, Pete Wilson
1998 Mark Pribula, Terry Moravec, Eric Evens, Kurt Fuhrman, Pete Wilson, Jerry Anderson
1997* Mark Pribula, Terry Moravec, Eric Evens, Kurt Fuhrman, Pete Wilson, John Peterson
1996 Terry Moravec, Eric Evens, Kurt Fuhrman, Pete Wilson
1994 Terry Moravec, Kurt Fuhrman, Pete Wilson
1993 Terry Moravec, Chas Martin, Tom Waks
1991 Chester Martin, Chas Martin, Jerry Anderson
1988 Chester Martin

***Denotes an "In-Depth" Inspection**

APPENDEIX A DIAPHRAGM CRACK LOCATIONS

DIAPHRAGM CRACK LOCATIONS
First Diaphragm South of Pier #3
G1 (East Fascia NB) [99/2000] ¼" crack on top of interior stiffener weld. [2006] No change.
G2 (NB)* [1998] Two 2" holes drilled in web. Crack is contained.
G3 (NB) * [1998] Two ¼" intersecting diagonal holes drilled in top of stiffener welds. [2003] No crack.
G4 (NB)* [1998] Two 2" holes drilled in web. Crack is contained.
G5 (NB)* [1998] Two 2" holes drilled in web. Crack is contained.
G6 (NB) [1998] One 2" hole drilled in web. [2000] Other end of crack is turning downward into the web & was drilled out. Crack is contained.
G7 (NB)* [1998] One 2" hole drilled in web & other end of crack was ground out. [2003] The ground out end is cracked, visible on both sides web, should be drilled out. **[2006] ½" crack exterior beyond drilled hole.**
G8 (SB)
G9 (SB)
G10 (SB)
G11 (SB)
G12 (SB) * [1998] Two 2" holes drilled in web & 1 hole drilled in stiffener. [1999] Crack extends 1" beyond the hole (ground out). [2003] No change.
G13 (SB)
G14 (West Fascia SB)* [1998] One 2" hole drilled in web. [2000] ¾" horizontal crack on exterior flange/web weld (may eventually need drilling), small diagonal crack @ top of interior stiffener weld. [2003] No change.

DIAPHRAGM CRACK LOCATIONS
First Diaphragm North of Pier #3 ***Denotes original 1998 crack locations**
G1 (East Fascia NB)
G2 (NB) Strain gauges on both faces.
G3 (NB)* [98/2000] West side, top flange web weld has ½" crack. Eastside, stiffener weld has a small crack. [2003] No change.
G4 (NB)* [1999] West face, top of stiffener weld small crack, drill out.
G5 (NB)* [2003] Small crack at the top of stiffener weld.
G6 (NB)* [1999] Small crack at top of stiffener weld. Strain gauges on the east face. [2003] No change.
G7 (NB)* [2003] Small crack at the top of the interior stiffener weld.
G8 (SB)
G9 (SB)
G10 (SB)
G11 (SB)* [1998] Two 2" holes drilled in web. Crack is contained.
G12 (SB)* [1998] Two 2" holes drilled in web. Crack is contained.
G13 (SB)
G14 (SB)
G15 (West Fascia SB)* [1998] Two 2" holes drilled in web. Crack is contained.

DIAPHRAGM CRACK LOCATIONS

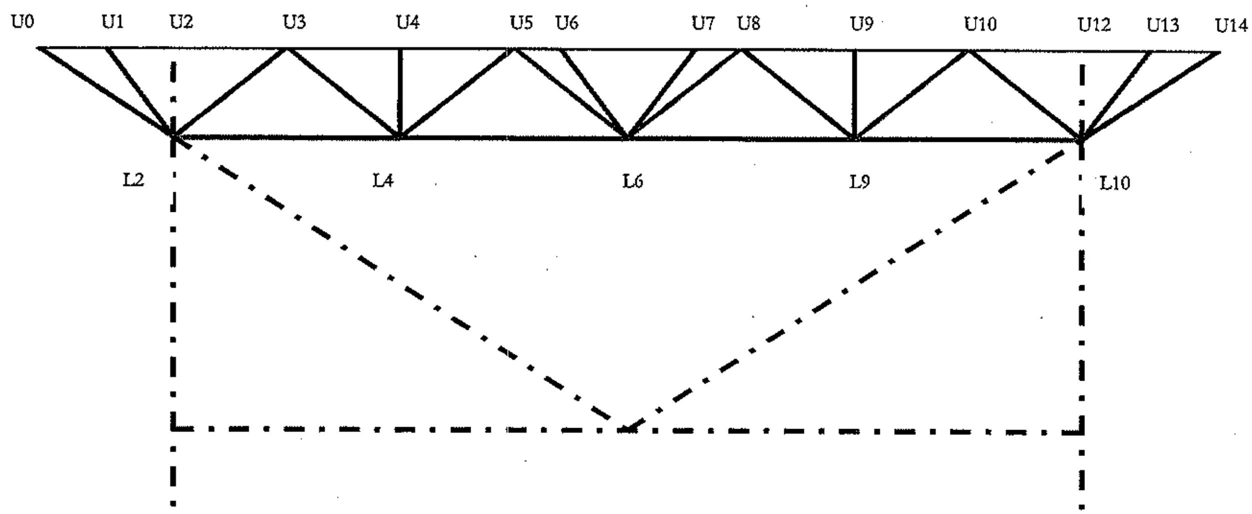
First Diaphragm North of Pier #4 *Denotes original 1998 crack locations
G1 (East Fascia NB)
G2 (NB)
G3 (NB)* [1998] Two 2" holes drilled in web. Crack is contained.
G4 (NB)* [1998] Two 2" holes drilled in web. Crack is contained.
G5 (NB)
G6 (NB)
G7 (NB)* [1998] Two 2" holes drilled in web. [2001/03] Both sides, small crack at top of stiffener weld.
G8 (SB)
G9 (SB)
G10 (SB)* [1998] Two 2" holes drilled in web. Crack is contained.
G11 (SB) [99/2000] Small crack at top of stiffener weld. [2003] No change.
G12 (SB)* [1998] Two 2" holes drilled in web & ¼" hole drilled in stiffener weld. Crack is contained.
G13 (SB) [99/2000] Small crack at top of stiffener weld. [2003] No change.
G14 (West Fascia SB) [1999] Small crack at top of interior stiffener weld. [2003] No change.

DIAPHRAGM CRACK LOCATIONS

First Diaphragm South of Pier #9 *Denotes original 1998 crack locations
G1 (East Fascia NB) [2000] Exterior top flange/web weld has a ½" indication. [03] No change.
G1C (NB)
G2 (NB)* [1998] 4 ft. long inverted "U" shaped crack in web (reinforced with bolted plates).
G3 (NB)
G4 (NB)* [98/2000] Small crack in top flange/web weld. [03] No change.
G5 (NB)
G6 (NB)
G7 (NB)
G8 (SB)
G9 (SB)* [1998] Crack in top of stiffener weld. [2003] No change.
G10 (SB)
G11 (SB)* [98/2000] Small crack in top of stiffener weld (east side). [03] No change.
G12 (SB).* [98/2000] Small crack in top of stiffener weld (east side). [03] No change.
G13 (SB):
G14 (West Fascia SB)

DIAPHRAGM CRACK LOCATIONS
First Diaphragm North of Pier #9 ***Denotes original 1998 crack locations**
G1 (East Fascia NB)
G1B (NB) Stiffeners are welded to the top flange (positive moment).
G1C (NB)
G1D (NB) Stiffeners are welded to the top flange (positive moment)
G2 (NB)
G3 (NB)
G4 (NB* [2000] Two 2" holes drilled in web. Crack contained.
G5 (NB) * [2000] Two 2" holes drilled in web. Crack contained.
G6 (NB)
G7 (NB)
G8 (SB) [2006] Top of west stiffener is working.
G9 (SB)* [98/2000] Crack in top flange/web weld & top of west stiffener weld.
G10 (SB)* [2000] Crack in top flange/ web weld (east side) [2005] No change.
G11 (SB)* [2000] Two 2" holes drilled in web. Crack contained.
G12 (SB).* [2000] Two 2" holes drilled in web. Crack contained.
G13 (SB)
G14 (West Fascia SB)

TRUSS DIAGRAM



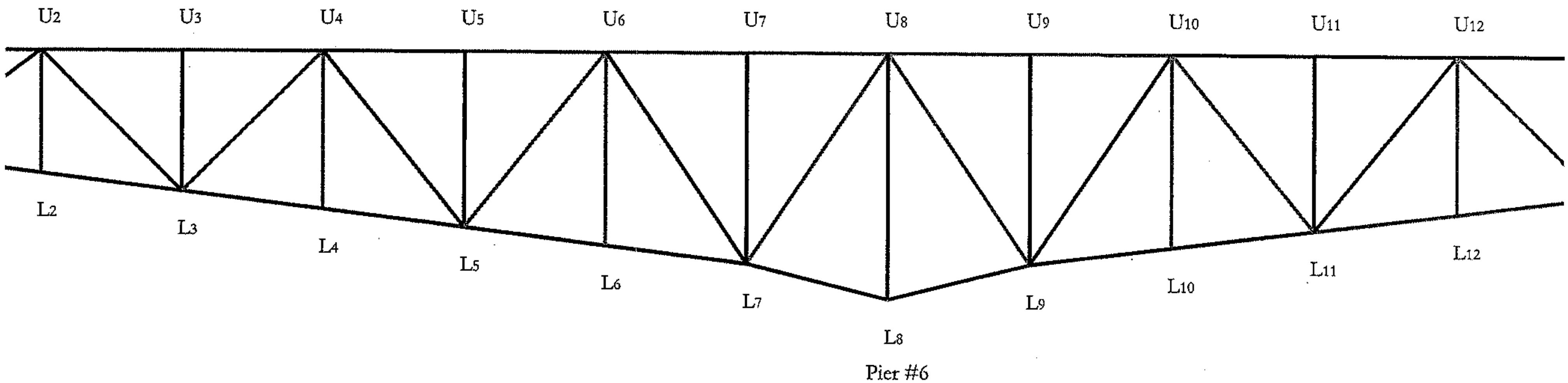
Note

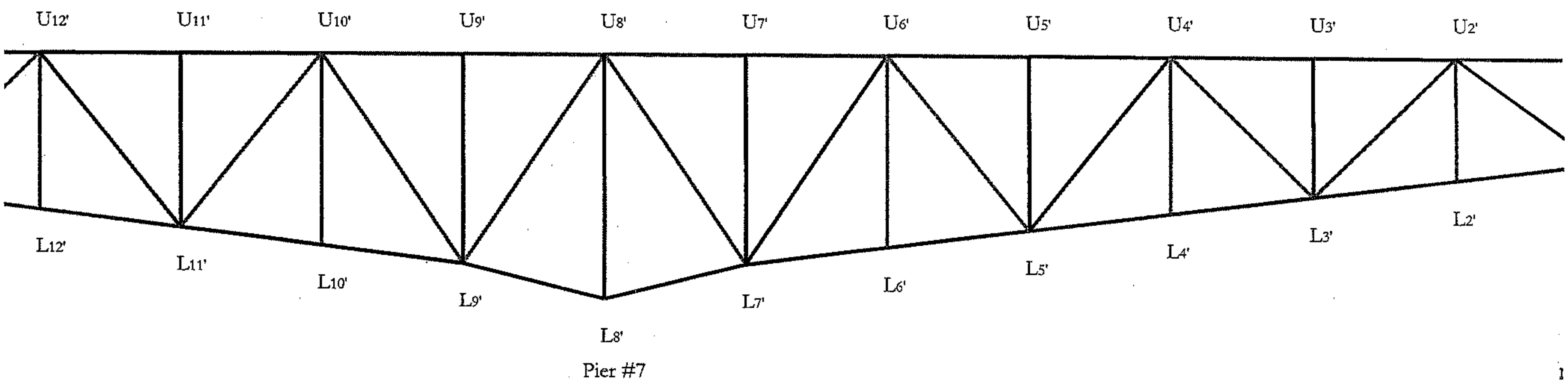
Tension Members in Red
Compression Members in Blue
Reversal Members in Orange
Black Dashed Lines are Secondary Members

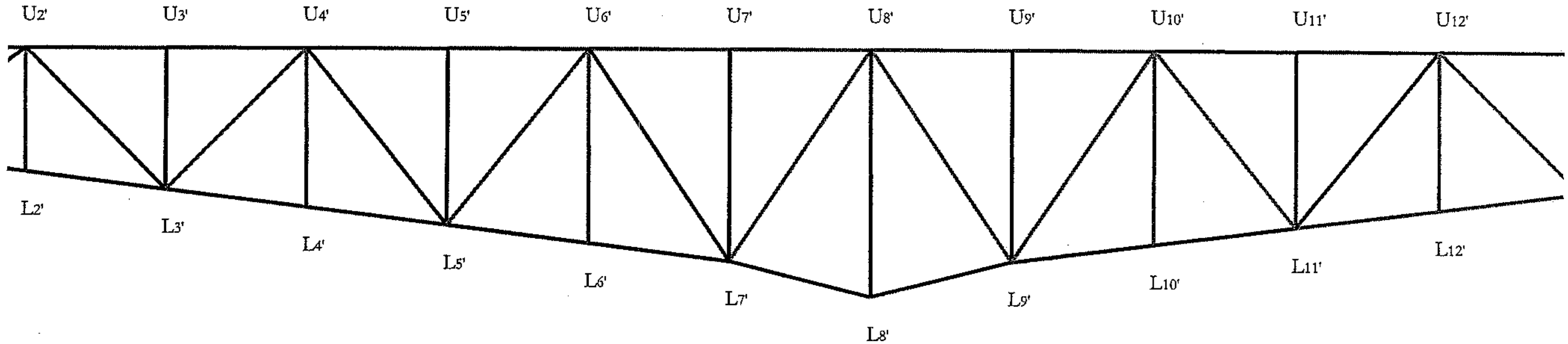
Minnesota Department of Transportation
I-35W over Mississippi River at Mpls., MN

Floorbeam Truss Diagram

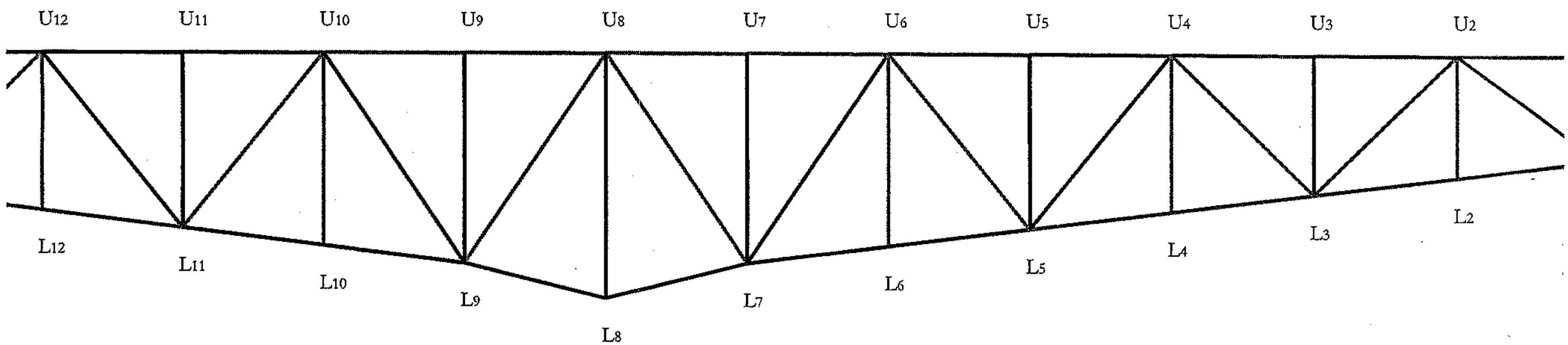
Bridge No.
9340


U2
U3
U4
U5
U6
U7
U8
U9
U10
U11
U12
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12
Pier #6


U12'
U11'
U10'
U9'
U8'
U7'
U6'
U5'
U4'
U3'
U2'
L12'
L11'
L10'
L9'
L8'
L7'
L6'
L5'
L4'
L3'
L2'
Pier #7



Pier #7



Pier #6

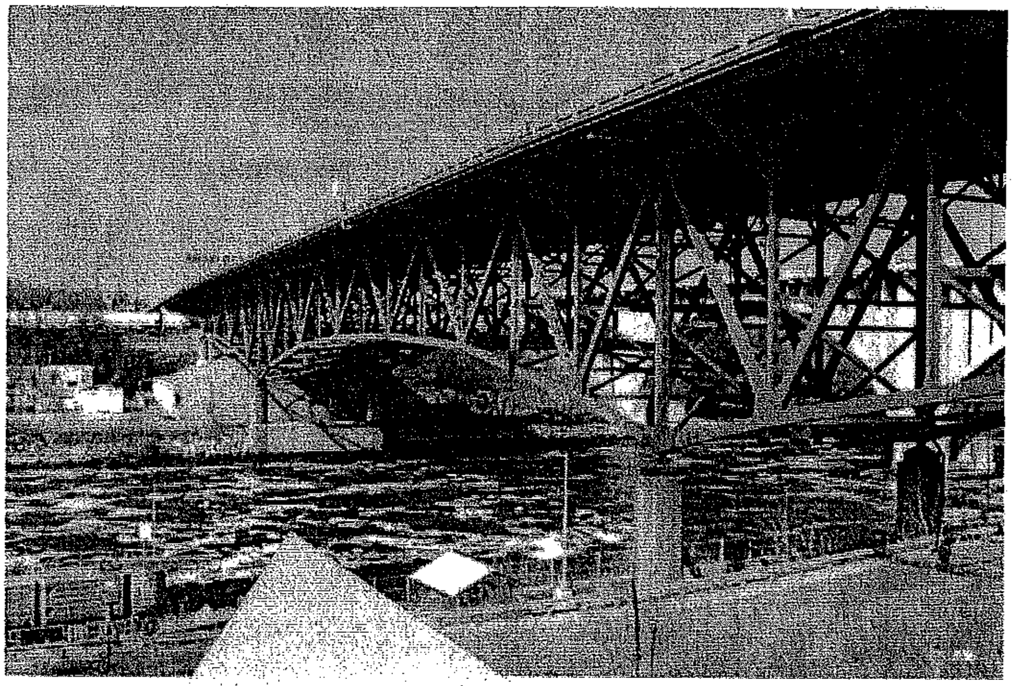
Note

Tension Members in Red
Compression Members in Blue
Reversal Members in Orange

Minnesota De
I-35W over Mi
Truss Dia

FRACTURE CRITICAL BRIDGE INSPECTION

Annual ~~In-Depth~~ Report



BR [illegible] IRT BRIDGE)

Vance

[illegible] inneapolis, MN

May 2007
~~JUNE 2006~~

Done to Here

Prepared For

[illegible] ota Department of Transportation
Office of Bridges & Structures

Prepared By

[illegible] epartment of Transportation Metro District
Maintenance Operations, Bridge Inspection

EXHIBIT
12

STRUCTURE INVESTIGATION INFORMATION

MN/DOT BRIDGE #9340 (SQUIRT BRIDGE)
I-35W OVER THE MISSISSIPPI RIVER AT MINNEAPOLIS, MN

May 2007
~~JUNE 2006~~

Inspection Date: ~~June 5 – 9 & 12 – 15, 2006~~ Special Inspection; April 30 – May 4, 2007 Annual Inspection; Sept 24-28, 2007
Inspection Team: Mark Pribula, Kurt Fuhrman, Vance Desens, ~~Mike Palmer, & Khaled Shouman, Michael Koffski~~ Todd Niemann, B.K. Nelson + Rewland.
Inspection Report Author: Kurt Fuhrman & Vance Desens
Bridge Maintenance Sub Area: Spring Lake Park
Access Equipment Used: Aspen A75 (Mn/DOT)
Reach-All UB50 (Mn/DOT)

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Licensed Professional Engineer under the laws of the State of Minnesota

______________	21102	______________
Mark Pribula	Registration No.	Date

From: Gary Peterson **Sent:** Tue, 19 Dec 2006 09:21:52 GMT

To: Vance Desens

CC: Mark Pribula; Don Flemming;

Subject: Re: Bridge #9340

Vance, The object of doing UT is to locate the tab plates on certain truss members that do not have shop drawings so that bolting patterns in a subsequent plating contract can be detailed to miss those tab plate locations. On members that do have shop drawings we are confident that the consultant is able to locate the tab plates from the shop drawings and to develop a bolting pattern to miss them.

I put a call into URS asking them to identify the members which did not have shop drawings available for them to locate the diaphragm tab plates. I also asked that if they assumed a member was similar to one that did have shop drawings, to identify that member so we can order the corresponding shop drawing for you. I'll get back to you when I have more information.

>>> Vance Desens 12/19/2006 8:18 AM >>>
Gary:
I am on the Metro Fracture Critical Bridge Inspection team under Mark Pribula. I have been given the project of locating the interior diaphragms of the tension members in the upper chord of Bridge #9340. I-35W over the Mississippi River in Minneapolis.

Per your conversation with Mark, I'm looking for the shop drawings for all the panel points of the upper chord of the deck truss. Do you know where I can find them or do have them? I want to set up a "table" showing the locations for UT testing when we do our 2007 inspection in September.

Thank you,

Vance Desens
Engineering Specialist
Fracture Critical Bridge Inspection
Water's Edge
Phone # 651-582-1219
Fax # 651-582-1454

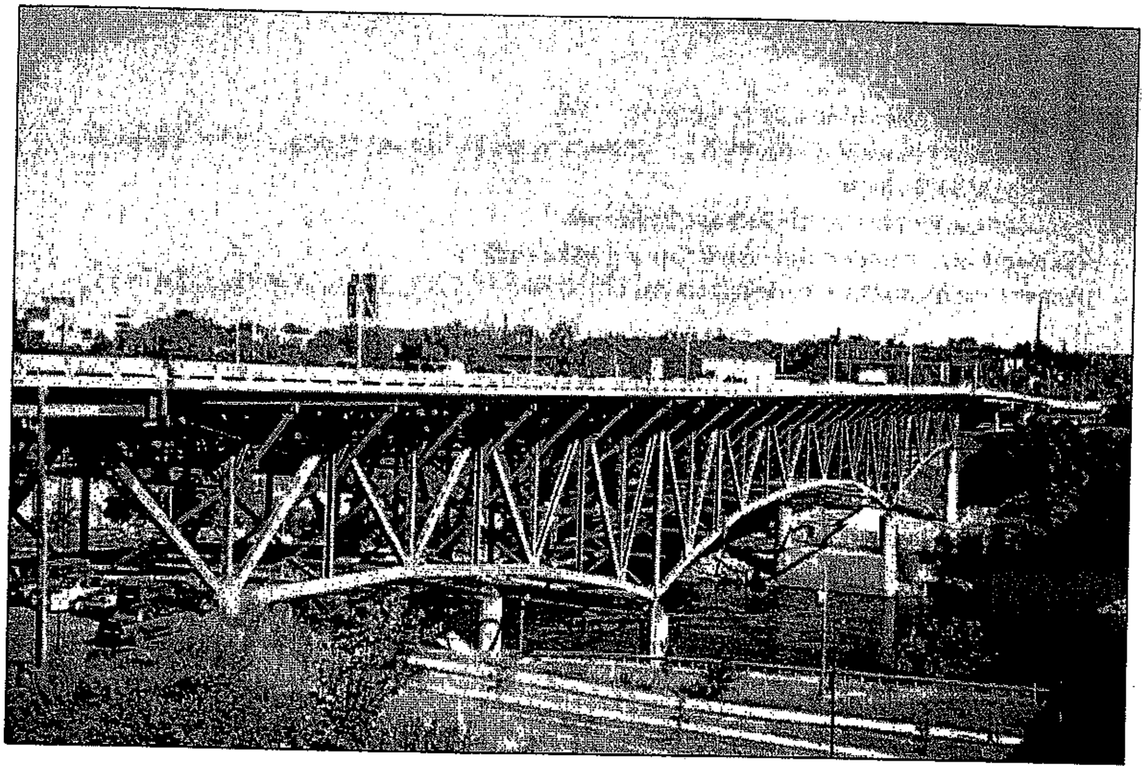
EXHIBIT
13

EXHIBIT

3

FRACTURE CRITICAL BRIDGE INSPECTION

Annual Report



BRIDGE # 9340 (SQUIRT BRIDGE)

I-35W over the Mississippi River at Minneapolis, MN

JUNE 2005

Prepared For

Minnesota Department of Transportation
Office of Bridges & Structures

Prepared By

Minnesota Department of Transportation Metro District
Maintenance Operations, Bridge Inspection

STRUCTURE INVESTIGATION INFORMATION

MN/DOT BRIDGE #9340 (SQUIRT BRIDGE)
I-35W OVER THE MISSISSIPPI RIVER AT MINNEAPOLIS, MN

JUNE 2005

Inspection Date: June 6 & 8, - 9 & 10, 2005
Inspection Team: Ken Rand, Mark Pribula, Kurt Fuhrman, Vance Desens, Pete Wilson, Mike Palmer
Inspection Report Author: Kurt Fuhrman
Bridge Maintenance Sub Area: Spring Lake Park
Access Equipment Used: Reach-All UB50 (Mn/DOT), Aspen A75 (Mn/DOT)

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Licensed Professional Engineer under the laws of the State of Minnesota

______________	21102	______________
Mark Pribula	Registration No.	Date

Table of Contents

EXECUTIVE SUMMARY

The "Federal Aid Highway Act of 1968" directed the establishment a national bridge inspection program. Accordingly, the Minnesota Department of Transportation, Metro Division Bridge Inspection Unit conducted an annual inspection of Bridge # 9340 over the Mississippi River at Minneapolis, Mn. The bridge also crosses over several roadways, Minnesota Commercial Railroad tracks, & parking lots.

Constructed in 1967, the bridge has 14 spans, with a total length of 1,907 feet. The split deck has three through lanes each direction with acceleration/deceleration lanes and 2 ft. shoulders. The bridge deck widens at the north end to accommodate on & off ramps, and curves slightly at the south end. Spans #6 - 8, the main river spans, are "Fracture Critical" steel deck trusses. They are comprised of welded "built-up" members and are 988 ft. long. The truss is approximately 60 ft. deep at piers #6 & 7. The two main trusses are connected by welded floor beam trusses, which cantilever beyond the truss on both sides and support the 27" deep rolled beam roadway stringers. At each end of the main truss spans, the truss supports the adjacent approach spans with a unique "crossbeam" configuration. The approach span beams frame into a "crossbeam", which is supported by rocker bearings on the cantilever truss ends. Spans #1 - 5 & 9 - 11, the approach spans, have 48" deep, welded plate beams, which transition into 33" deep welded & rolled steel beams. Connections are riveted. Spans #12 - 14, the far north spans, are cast-in-place concrete voided slabs.

Due to several factors, including mist from nearby St. Anthony Falls, the bridge deck frequently ices over and becomes quite treacherous. In 1999, an automated de-icing system was installed on the deck with spray nozzles installed in the deck and railings. The systems controls and storage tanks are located on the north end just off the freeway entrance ramp from East University to South I-35W.

- If bridge replacement is significantly delayed, the bridge should be re-decked. The design of the main river spans do not allow for deck widening. Any re-decking contract should also include a complete re-painting of the superstructure, elimination of the hinge joint in span #2, and reconfiguration of the deck drainage system.

- The plastic pigeon screens were removed on all tension and reversal members to visually inspect the member's internal diaphragms any questionable welding flaws discovered during this inspection were tested with magnetic particle equipment. These areas should be inspected on a two year inspection cycle.

- Fatigue cracks at girder #1C (NBL), crack at the diaphragm bottom cutout, NE side measures 2" ("front face") and NW side measures 2-½" ("back face"). Fatigue cracks a girder #3 (NBL), crack at the diaphragm bottom cutout, measures 1-½" (both sides). The cracks are located in negative moment regions where the diaphragm web stiffener was not welded to the top flange and were pervious fatigue cracks occurred and were repaired in1998 and 1999. These areas should be inspected next year for any lengthening of the cracks and drilling of possible stress relief holes.

- Span 3, stringer #7 NB, has a 1-½" crack in the web with one 2" hole drilled. It is recommended to drill a 2" hole at the other end.

- During the 1998 inspection, numerous fatigue cracks were found in spans #3 - 5 and #9 - 10, the approach spans. The cracks were located in negative moment regions where the diaphragm web stiffener was not welded to the top flange. At one location the web had cracked through entirely. Most existing cracks were drilled out, and the fractured beam was reinforced with bolted plates. To reduce the stress levels, the diaphragms were lowered. Due to the widespread cracking, these areas should be inspected in-depth on an annual basis.

BRIDGE INSPECTION RECOMMENDATIONS

This recommendation listing refers to specific areas where fatigue cracks and other deficiencies were located during the 2005 inspection. Bridge inspection lists these deficiencies in the highest priority first.

Long Term Repair Recommendations

- The long term plans for this river crossing need to be defined with replacement, re-decking, etc. Due to the "Fracture Critical" configuration of the main river spans and the problematic "crossbeam" details, and fatigue cracking in the approach spans, eventual replacement of the entire structure would be preferable.

- If bridge replacement is significantly delayed, the bridge should be re-decked. The design of the main river spans do not allow for deck widening. Any re-decking contract should also include a complete re-painting of the superstructure, elimination of the hinge joint in span #2, and reconfiguration of the deck drainage system.

- Depending on the projected date of bridge replacement, the bridge deck will eventually require a partial overlay repair contract. The expansion joints should also be replaced.

Immediate Maintenance Recommendations

- The plastic pigeon screens were removed on all tension and reversal members to visually inspect the member's internal diaphragms any questionable welding flaws discovered during this inspection were tested with magnetic particle equipment. These areas should be inspected during the next in-depth inspection.

- Fatigue cracks at girder #1C (NBL), crack at the diaphragm bottom cutout, NE side measures 2" ("front face") and NW side measures 2-½" ("back face"). Fatigue cracks a girder #3 (NBL), crack at the diaphragm bottom cutout, measures 1-½" (both sides). The cracks are located in negative moment regions where the diaphragm web stiffener was not welded to the top flange and were pervious fatigue cracks occurred and were repaired in1998 and 1999. These areas should be inspected next year for any lengthening of the cracks and drilling of possible stress relief holes.

- Four-stringer connection bolts, all in the NBL, need replacement. At panel point #8, stringer #2 has 2 loose bolts, and the bearing block has rotated. This will likely require jacking the superstructure. Stringer bolts also need replacement at panel point #8, stringer #4, south side, and at panel point #11, stringer #3.

- Several strip seal joints are leaking. The glands have ripped or pulled out. Attempts were made to replace these joints during the 1998 repair contract, but the steel extrusions, which anchor the gland, had severe corrosion, and new glands could not be installed. Instead, a new product was used at the, SBL, south abutment. This utilized a hot pour seal with wire mesh reinforcing. The final product looks similar to a strip seal gland. We should monitor this joint to see how well this new gland repair performs, and consider using it at other locations.

- The rubber "skirts" sections above the truss end rockers, installed in 1999, tend to fill with debris. These should be flushed out annually. The horizontal drain troughs at pier #6 have inadequate slope, and are clogged.

Areas of Concern - Future Inspections

- Span 3, stringer #7 NB, has a 1-½" crack in the web with one 2" hole drilled. It is recommended to drill a 2" hole at the other end.

- During the 1998 inspection, numerous fatigue cracks were found in spans #3 - 5 and #9 - 10, the approach spans. The cracks were located in negative moment regions where the diaphragm web stiffener was not welded to the top flange. At one location the web had cracked through entirely. Most existing cracks were drilled out, and the fractured beam was reinforced with bolted plates. To reduce the stress levels, the diaphragms were lowered. Due to the widespread cracking, these areas should be inspected in-depth on an annual basis.

- The truss end rocker bearings & main truss bearings should be measured for movement during each annual inspection. The truss end floor beams & approach end "crossbeams" should be closely inspected. They have section loss, had flaking rust & fatigue cracks (open finger joint).

- The hinge joint in span #2 is locked in full expansion several beam-ends are contacting, and the hinge bearings are "frozen" and no longer functioning. Consequently, pier #1 has tipped slightly to the north, and the south abutment bearings are in full contraction. This area should be thoroughly inspected.

For information that is more detailed and recommendations, please refer to the appropriate sections in the text of the report.

BRIDGE DESCRIPTION

Bridge #9340 was constructed in 1967, and has 14 spans, with a total length of 1,907 feet. The split deck has three through lanes each direction & also acceleration/deceleration lanes. The shoulders are only 2 ft. wide. The bridge deck widens at the north end to accommodate on & off ramps, and curves slightly at the south end.

Spans #6 - 8 are "Fracture Critical" steel deck trusses, comprised of "built-up" welded members. Steel deck truss spans are 988 ft long. Span #7 is 456 ft. long. The truss is approximately 60 ft. deep at piers #6 & 7. The two main trusses are connected by welded floor beam trusses, which cantilever beyond the truss on both sides, and support the 27" deep rolled beams roadway stringers.

At each end of the main truss spans, the truss supports the adjacent approach spans with a unique "crossbeam" configuration, (open finger joint). The approach span beams frame into a "crossbeam", which is supported by rocker bearings on the cantilever truss ends. Spans #1 - 5 & 9 - 11, the approach spans, have 48" deep welded plate beams, which transition into 33" deep welded & rolled steel beams. The connections are riveted. Spans #12 - 14, the far north spans, are cast-in-place concrete voided slabs.

Due to several factors, including mist from nearby St. Anthony Falls, the bridge deck frequently ices over and becomes quite treacherous. In 1999, an automated de-icing system was installed on the deck, with spray nozzles installed in the deck and railings. Control room is located at the northwest approach corner.

BRIDGE DECK: NBI CONDITION CODE 5

The split deck has 3 through lanes each direction, with acceleration/deceleration lanes. Shoulders are only 2 ft. wide. A low slump concrete overlay, with numerous full-depth deck repairs, was placed on the deck in 1978. In 1998, the median copings were replaced with steel stay-in-place forms, and the exterior copings were patched with shot-crete.

Wearing Surface: The overlay has some minor spalls and patched areas around the finger joints, and 3,000 LF of transverse cracks, sealed in 1998. The overlay has several patched areas, and some spalls. Additional patching is typically required each year. A partial chaining of the northbound deck in 1998 found 1,665 SF of delamination & 47 SF of spall. In 1999, the Federal Highway Administration conducted a ground penetrating radar survey, using the experimental "HERMES" system. The radar survey found the overlay to have 6.14% delamination. [2001] The overlay has 15,250 SF of concrete repair patches.

Structural Slab: The underside of the deck has a moderate amount of transverse leaching cracks, with some areas of leaching map cracks & spalling, particularly in the south approach spans. In 1998, the median coping overhangs were replaced with steel stay-in-place forms, and the exterior copings were repaired with shotcrete. During the median slab removal, the bays adjacent to the median were damaged - some of the "stool" concrete along the stringers & beams has spalled off with exposed rebar; and in some locations, the spalling extends into the underside of the deck. [2001] The structural slab has 1,200 SF full depth repair patches.

Open Finger Expansion Joints: The deck has 3 open finger joints, above the hinge joint in span #2, & at each end of the truss spans. In 1999, rubber "skirts" were installed below the truss end finger joints & the drain troughs were removed.

Strip Seal Expansion Joints: There are strip seal joints at the abutments, pier #11, and at five stringer joints in the main truss spans. These were installed in 1978. The strip seal glands have pulled out, with joints leaking, in several locations. The steel extrusions, which anchor the glands, have severe section loss, making gland replacement impossible. In 1998, the south abutment, SBL, gland was patched using an experimental system. Hot poured seal with wire mesh reinforcement.

Poured Deck Joints: The deck has several transverse poured joints, from staged deck construction. All of these joints are leaching below; & at some joints the deck is spalling below.

Exterior Railings: The original exterior code #12 railings were retrofit in 1998. A 32" high concrete face was installed in front of the existing concrete rail base. The horizontal steel rails were removed. The curb along the railing has moderate cracking, delamination and spalling. The curb has 800 LF reconstructed in 2001.

Median Railings: Code #22, type "J"-rail, was installed along the split median in 1998. The railings above the truss spans have removable pre-cast concrete caps, which are intended to prevent further corrosion damage to the superstructure below.

BRIDGE SUPERSTRUCTURE: NBI CONDITION CODE 4

Paint System: Bridge was originally painted with a lead base system in 1968. In 1999, the bridge was partially re-painted with a zinc system. Areas painted included the entire superstructure below and along the open median, and below the open finger deck joints.

Currently, the overall paint system is approximately 15% unsound. The truss members have surface rust corrosion and pack rust at the floorbeam & sway frame connections, and there is paint failure & surface rust corrosion in scattered locations. The floorbeam trusses & stringer ends have surface rust corrosion at the stringer expansion joints. Some of the areas re-painted in 1999 have severe section loss. This includes the sections of the floorbeam trusses & sway bracing located below the median, and the truss end floor beams & "crossbeams", located below the open finger joints.

Main Truss Members The two steel deck trusses are comprised of "built-up" welded members; connections include both rivets and bolts. While most truss members are welded box beams, some tension vertical & diagonal members are welded "H" beams. The truss members have numerous poor weld details. The vertical "H" beam truss members have transverse welds at the floor beam connections. The box beam truss members have welded interior stiffeners. Some of these have tack-welded tabs. Many of these tack welds have cracked. Some box beams have tack welds, or tack welded backer bars along the interior corners. The truss members have surface rust corrosion at the floor beam and sway frame connections. Pack rust is forming between the connection plates. There is paint failure, surface rust, and section loss, flaking rust in scattered locations. The interiors of the box members have severe pigeon debris. In 1999, screens were placed over openings in the truss members to prevent pigeon access. This unfortunately prevents inspection of the interiors. During the 2004 inspection the plastic pigeon screens were removed on all tension and reversal members to visually inspect the member's internal diaphragms any questionable welding flaws discovered during this inspection were tested with magnetic particle equipment.

Floor Beam Trusses: There are 27 floorbeam trusses connecting the main deck trusses. These trusses are comprised of rolled H-beams with welded connections. The floorbeam trusses cantilever beyond the main truss on both sides. They are connected to the main truss, vertical members with bolts & rivets. The floorbeam truss members have numerous poor welding details, including plug welded web reinforcement plates, and tack welds & welded connection plates located in tension zones. Some of the top chord splices are offset vertically, up to ½" – from original construction. The splice plates are bent. The floorbeam trusses below stringer joints have section loss, severe flaking rust. There is pack rust and surface pitting at the main truss connections. In 1999, the floor beam sections below the median were re-painted. Some areas have section loss with holes.

Stringers: There are 14 steel stringers, 27" deep rolled beams, bearing on the floorbeam trusses. They are continuous except for five stringer expansion joints. The stringer ends have surface rust corrosion at the expansion joints. The stringers adjacent to the median were re-painted in 1999. The bolted connections to the floorbeam trusses are "working" and some bolts are loose or missing.

Lateral & Sway Bracing: The main deck trusses have both upper and lower horizontal diagonal bracing. There is also a vertical sway frame running below each floorbeam truss - the median portion of these sway frames were re-painted in 1999, some areas have section loss with holes. Each floorbeam truss has 2 diagonal braces, which connect the bottom chord to stringers #4 & 11. The pinned connections on these braces are "working" and at least one cotter pin is missing.

Truss Bearing Assemblies: The truss spans have six "geared roller-nest" bearing assemblies, and two fixed bearing assemblies. The truss bearings have section loss, flaking & surface rust; moderate corrosion, the bearings at piers #5 & 8 are functioning properly. They are checked during each annual inspection. The bearings at pier #6 show no obvious signs of movement, difficult to reach with snooper.

End Floor Beams & Crossbeams: At each end of the main truss, the multi-beam approach spans terminate by framing into a "crossbeam". The crossbeams are supported by rocker bearings mounted on the cantilever truss ends. There is an open finger expansion joint above these members, severe section loss on steel. This area was re-painted in 1998 - 1999, and rubber "skirts" were installed below the finger joint in an attempt to prevent future corrosion damage.

End Floor Beams: The two end floor beams are welded plate girders. They connect the main truss ends. The end floor beams were re-painted in 1998/1999. The sides facing the open finger joints have extensive section loss with surface pitting at the base of the web, and holes in the base of the vertical stiffeners. In 1998, fatigue cracks were found in two stiffener welds directly above the NE rocker bearing.

Crossbeams & Rocker Bearings: The two "cross-beams" are welded plate girders each one is supported by two "rocker" bearings attached to the cantilever ends of the main truss. These rocker bearings are built into the crossbeam web except the southeast rocker, which, due to the bridge super-elevation, connects to the bottom flange of the crossbeam. The crossbeams & rocker bearings were re-painted in 1998/1999. The faces exposed to the finger joints have extensive surface pitting with some areas of severe section loss with holes at the base of stiffeners. The rocker bearings are measured & checked for movement during each annual inspection. All four bearings appear to be functioning. They show obvious signs of movement.

In 1986, the southeast rocker bearing "froze", resulting in damage to the crossbeam with two cracked vertical web stiffeners. The rocker-bearing pin was replaced. This required closing I - 35W and jacking up the span. The crossbeam was repaired and the cracks in the web stiffeners were welded, crack ends drilled out, and stiffeners reinforced with angle plates. Installing braces between the crossbeam and beams #2 & 3 also reinforced the connection.

In 1992, a crack was found in a crossbeam stiffener weld above the northeast rocker bearing, which was drilled out. In 1997, at the same location, a weld between a vertical & horizontal stiffener was found cracked through entirely. Cracks were also discovered at the end of horizontal stiffeners near the northeast & southwest rocker bearings. Strain gauges were installed to analyze stresses, crack ends were drilled out, and installing bracing between the crossbeam and 2 stringers reinforced the northeast connection.

Steel Multi-Beam Approach Spans (spans #1 - 5 & #9 - 11): The approach spans have welded beams - the depth transitions from 48" to 33". Connections are riveted. The south span has 33" deep rolled beams with welded cover plates (square ends). Spans #1 - 5 have 14 beams (with a hinge joint in span #2). In spans-#9 - 11, the deck widens from 15 to 18 beams. The fascia beams have section loss, flaking rust along the bottom flange - the beams adjacent to the median were re-painted in 1999.

In 1998, fatigue cracks were found in several beam webs. These cracks were located in negative moment regions at the top of the diaphragm connections. At one location the web had cracked through entirely and was caused by out of plane bending in locations where the web stiffener was not rigidly connected to the top flange. After stain gauge analysis by the University of Minnesota, the diaphragm connections were modified. They were lowered, using only four bolts at each connection. Most existing cracks were drilled out. Some were too small to reach, and the fractured beam was reinforced with bolted plates.

In span #2, multi-beam approach span, there is a cantilever expansion hinge with sliding plate bearings. The joint is closed beyond tolerable limits, possibly due to substructure movement & pavement thrust and is no longer functioning. Some beam-ends are contacting, and some bearing plates have tipped, preventing the joint from reopening. The hinge area, with open finger joint above, was re-painted in 1999. The beam-ends have section loss, moderate surface pitting.

The north approach spans have lateral & diagonal bracing welded to the web.

Approach Span Bearings: The steel beam approach spans have a total of 90 sliding plate bearing assemblies and 33 fixed plate bearing assemblies. The piers with fixed bearings have expansion bearings on the fascias.

Voided Concrete Slab North Approach Spans (Spans #12 – 14): The far north approach spans consist of cast-in-place concrete continuous "voided" slabs. They are 2 ft deep. Northbound off ramp splits off to form Bridge #9340A. The slab rests on sliding plate bearings at pier #11 and the north abutment. There are 29 bearing assemblies. Piers #12 & #13 are cast directly into the slab with no bearings. These spans are in generally good condition. Spalling along the exterior and median copings was patched with shotcrete in 1998. [2001] Light fixtures at Metal Matic Incorporated parking lot.

BRIDGE SUBSTRUCTURE: NBI CONDITION CODE 6

Abutments: The abutments have vertical cracking, with some staining from leaking deck joints.

Truss Span Piers: Piers #6 & 7, main river span, have two concrete columns resting on a pier wall. The west column on pier #7 has a minor vertical crack. Piers #5 & 8 have two concrete columns connected with an upper strut. The column on pier #8 has been reinforced with a concrete "jacket". [2001] Underwater inspection conducted by Collins Engineers, Inc. in 2000 found pier 7 to be in good condition with no defects of structural significance. A 3 x 3 foot area of light scaling, with a maximum of 1" of penetration was observed on the south side of the upstream pier nose. Collins recommends inspecting the substructure unit at the normal 5 year inspection interval. [2004] The concrete surfaces below the water are in good condition. Minor scaling was found above the, but not of the quantity or depth as noted in the previous report the total area was 2 feet square and ¼" deep penetration. No significant changes in the structure or channel condition since last inspection by Ayres Associates.

Approach Span Piers: Piers #1 - 5 & #9 - 11, piers supporting the steel spans, consist of concrete columns with a cap. Those adjacent to railroad tracks have lower struts. The pier columns supporting the voided slab spans (piers #12 & 13) are cast directly into the slab with no cap. Pier #1 has tipped slightly to the north. This is related to the hinge failure in span #2. The east column on pier #9 has minor scrapes & spalls from a train derailment in 1969. Pier #11 has extensive shotcrete repairs from leaking deck joint above.

OTHER BRIDGE ELEMENTS

Approach Panels: All approach panels are concrete. Each approach panel has a transverse crack, and there are some minor spalls at the joints. The relief joints need to be resealed. North approach, SBL and on ramp, has no relief joint. [2001] South approach panel was scarified and a low slump overlay was installed.

Channel & Protection: NBI code #8 which is very good condition. The bridge is located just downstream from the Lower St. Anthony Lock & falls - the flow is very turbulent. At normal river level, clearance below the truss is approximately 60 feet. Pier #7 is the only pier in the channel, along the east bank. Typically, the water depth along the west face is only 1 - 2 feet. Mn/Dot does not conduct underwater inspections. Due to the extreme turbulence, sonar readings of the channel cross-section cannot be taken.

Signing: There is an overhead sign bridge structure running across the entire deck, mounted on the exterior railings at truss panel point #2' at north end of truss. There is a signpost mounted on the west railing at truss panel point #6 at south end of truss.

Guardrail: In 1998, the approach guardrails were repaired. Impact attenuator was installed at the northbound off ramp to University Avenue. Plate beam guardrail SE, SW corners, south & north approach median I 35W.

Drainage: Several deck drains drop directly into the river. The drain troughs at pier #6 have inadequate slope, and tend to fill up with debris. In 1998-99, the drain troughs below the arch end finger joints were removed, and replaced with rubber "skirts". The skirt sections above the truss end rockers tend to fill with debris. These should be flushed annually.

Slope Protection: The concrete slope paving, at both abutments, is in good condition.

Lighting: Rail mounted deck lighting, under deck lighting in span #13, and river navigation lighting. "Metal Matic Inc." maintains the lighting above the parking lots in spans #11 & 12. A light post, W 5/3 L, on the west railing, has a 6" vertical split from plow damage.

Miscellaneous: The former "U of M" parking lot area below spans #2 - 5 has been barricaded from use while the parking lot area below spans #11 & 12 continues to be used by Metal Matic Inc employees. The U.S. Army Corps of Engineers is stockpiling river dredging material below span #8 this material is approximately 10 to 15 feet below the bottom truss diagonals (2003). The navigation light maintenance catwalk which runs below the median of the truss spans is being accessed by graffiti "artists" at pier #5.

De-icing System: In 1999, an automated de-icing system was installed on the deck, with spray nozzles installed in the deck and railings and a pump house/control room was constructed at the NW approach corner.

BRIDGE SNOOPER FIELD INVESTIGATION

Approach Spans
Northbound & southbound inspection notes are combined. Plans have beams numbered from the east. Exterior of west rail & west coping have conduit full length of bridge.

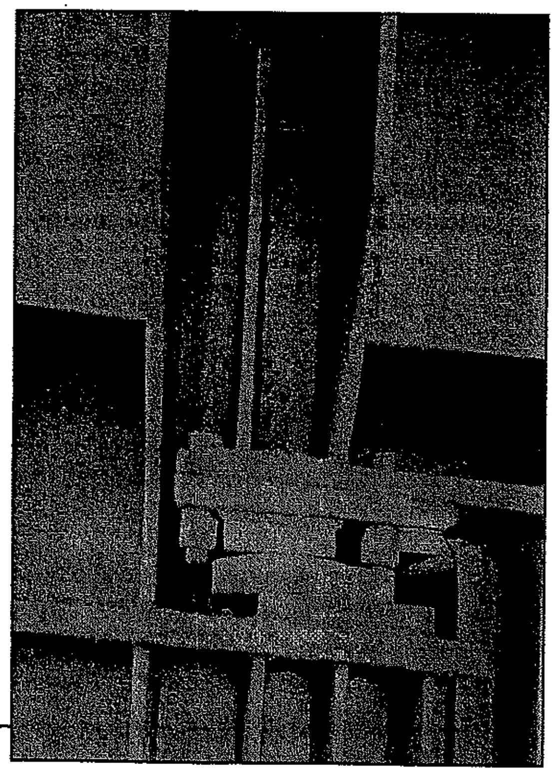
South Abutment:
Strip seal deck joint above. [1998] SBL Gland was patched using an experimental joint, hot poured seal with wire mesh reinforcement, and fourteen sliding plate bearing assemblies. [1995] Bearings are corroded and in full contraction from hinge failure in span #2, and tipping of pier #1. The seat area is cracked and discolored. [2003] 72 LF random cracks: south abutment.

Span #1 (Steel Multi-beam):
Span is 53 FT long with 14 beams, 33" deep rolled beams, with welded cover plates with square ends. [96/2005] East fascia beam has section loss, flaking & surface rust on bottom flange. [2003] Surface rust: on the beams. [1978] 3 West bays have 300 SF full depth deck patches. [1998] "Stool" concrete is spalling off adjacent to median beams. [1999] Beams 6, 7, 8, & 9 were re-painted.

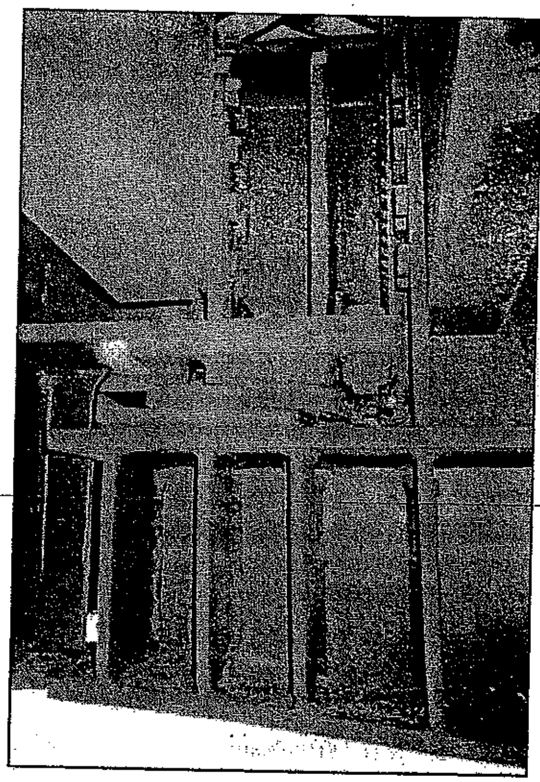
Pier #1:
10 Fixed; & 4 sliding plate bearing assemblies. Pier consists of 4 concrete columns and cap, with a railroad crash strut between the columns. [1996] Pier has tipped slightly to the north (measured with plumb bob). [1999] Bearings 6, 7, 8, &. 9 were re-painted.

Span #2 (Steel Multi-beam):
Span is 72 FT long with 14 beams; 33" rolled beams with welded cover plates, some with square end welded cover plates, the beams transition to 48" welded beams north of the hinge joint. [1978] 350 SF: full depth deck repairs. [1997] Conduit is loose below median. [1998] "Stool" concrete is spalling off adjacent to median beams. [1999] Beams 6, 7, 8, & 9 were re-painted. [96/2003] Bottom flange at girder transitions & at hinge has section loss, flaking rust. [2005] East fascia beam has section loss, flaking & surface rust on bottom flange, peeling paint beam 11 bottom flange.

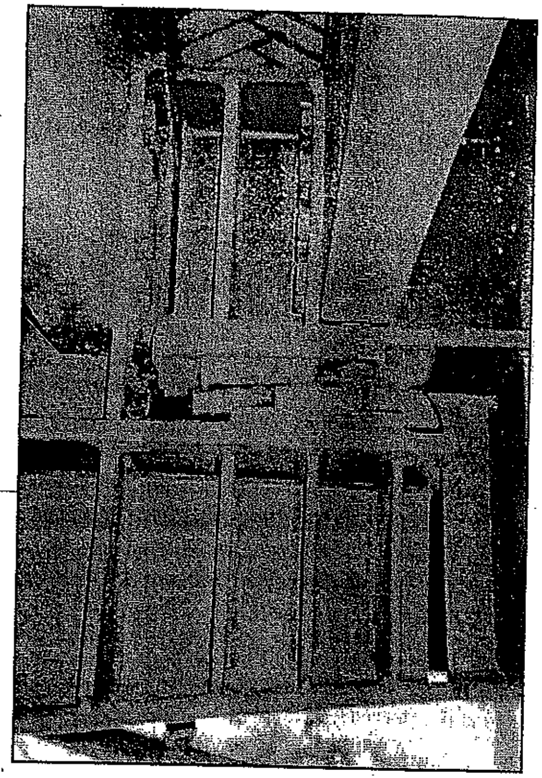
Hinge Joint (12 ft. South of Pier #2):
Hinge joint has open finger joint above. [94/2005] All hinge assemblies are expanded beyond tolerance; sliding plates extend 4" or more beyond the base plates, reducing bearing capacity. At beam #10, the sliding plate has tipped, falling off the base plate, and is preventing the joint from opening. [1999] Hinge area re-painted. [2000] Beam-ends have section loss, moderate surface pitting; debris has begun to build up on hinge area. Additionally, the tops of the beam ends are contacting at the top flange or at the web along this joint. [2005] Hinges should be flushed.



West Fascia SBL Hinge
Bearing Sole Plate



Beam 6 NBL @ Hinge



Beam 5 NBL @ Hinge

Pier #2:
Pier consists of four concrete columns, 14 sliding plate bearing assemblies, and cap, with a railroad crash strut between the columns. [97/2000] Bearings have surface rust corrosion; east end of cap has 6 SF of delamination. [1999] Bearings 6, 7, 8, &. 9 re-painted. [2003] East end of cap, south face has 2 SF delamination, 10 SF of map cracking.

Span #3 (Steel Multi-beam):
Over Bluff St. Span is 110 FT long with fourteen, 48" deep welded plate beams. [1978] The 3 west bays have some full depth deck patches. [1997] Second bay from east has 20 SF of leaching map cracks. [1998] "Stool" concrete: spalling off adjacent to median beams. [1999] Beams 6, 7, 8, & 9 re-painted. [2005] East & west fascia beam has section loss, flaking & surface rust on bottom flange. Diaphragm Line North of Pier #2 [1999] Diaphragms lowered, although the connections have a "positive moment" configuration stiffeners welded to the top flange, no cracks. Refer to Appendix A **First Diaphragm South of Pier #3** graph for crack locations, description & repair to the diaphragm line

Pier #3:
10 fixed plate, and four sliding plate bearing assemblies. Pier has four concrete columns and a cap. [1999] Bearings 6, 7, 8, &. 9 were re-painted. Vertical stiffener working: at girder 11.

Span #4 (Steel Multi-beam):
Over contract parking lot (no access) & Bluff St. Span is 110 FT long with fourteen 48" deep welded plate beams. [1978] Second & third bays from the east have full depth deck repairs. [1998] Underside of deck has 200 LF of transverse leaching cracks, 200 SF of spall with exposed rebar below a transverse poured joint, full width of deck. [2000] Fourth bay from west has 20 SF of severe leaching.

[1999] Beams 6, 7, 8, & 9 were re-painted. [2005] East fascia beam has section loss, flaking & surface rust on bottom flange. [1999] Diaphragms lowered. Refer to Appendix A **First Diaphragm North of Pier #3** graph for crack locations, description & repair to the diaphragm line. [1998/99] Diaphragms lowered with strain gauges placed on beams #2 & 6 (***first diaphragm Line South of Pier #4).*** [1999] Diaphragms lowered, even though the connections have a "positive moment" configuration. Stiffeners are welded to the top flange.

Pier #4:
14 Sliding plate expansion bearing assemblies. [1997] Bearings have surface rust. Pier consists of 4 concrete columns and cap. [1999] Bearings 6, 7, 8, &. 9 were re-painted.

Span #5 (Multi-beam/Deck Truss):
Over contract parking lot; span is 109 FT long with fourteen, 48" deep welded plate beams bolted onto the crossbeam. [1996] 4 conduit clamps missing on NB fascia beam. Median girder has impact damage from parking lot below. [1978] Underside of deck is leaching at the finger joint, has two full depth patches in the west bays. [1998] Bay just east of median has severe spalling on "stool" and the adjacent deck is cracked. [1999] Beams 6, 7, 8, & 9 were re-painted. Refer to Appendix A **First Diaphragm North of Pier #4** graph for crack locations, description & repair to the diaphragm line.

MAIN TRUSS SPANS (NORTHBOUND, EAST TRUSS)

Stringers are numbered from the east (see framing plan).

Crossbeam:
[1986] The SE rocker bearing froze, damaging the east end of the crossbeam, resulting in cracked web stiffeners. The bridge was jacked up. I-35W was closed to traffic. SE rocker pin was replaced, cracks in two stiffeners were welded and drilled out, and bracing was added between the crossbeam and beams #3 & 4. [1998/99] Crossbeam was repainted; the side facing the finger joint has section loss.

CROSSBEAM & FLOORBEAM GAP (EAST END)	
Date	**Measurement**
September, 1998	16-5/8"
April, 1999	17-13/16"
April, 2000	18"
September, 2001	18-1/16"
June, 2003	16-7/8"

Panel Point #0 (Beginning of East Truss):
Expansion joint has open finger joint above. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris; needs to be flushed. [1998/99] End floorbeam was repainted; section loss at the base of the stiffeners. [2002] Water saturation between stringers 2 thru 4 at panel points 0 to 1. [2005] Stringers 2 & 3 have flaking & surface rust.

Panel Point #1 (East Truss, Pier #5):
[2005] Bottom of truss diagonal L1U0 has flaking & surface rust.

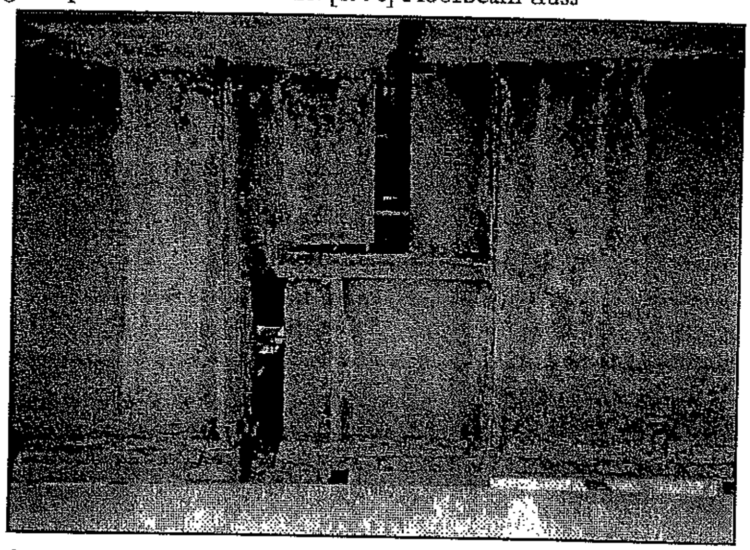
Pier #5:
Bearing assemblies have two "rollernest". Climbing onto the pier strut at this location accesses the catwalk. Debris piled at pier strut base allow for unauthorized access. [2002] Bearings show signs of recent movement.

Span #6 (Deck Truss):
Span is 266 FT long with seven floorbeam trusses. [1997] West River Parkway constructed below bridge. [1999] Floorbeam truss's, sway bracing located below the median and beams 6, 7, 8, & 9 were re-painted.

Panel Point #2 (East Truss):

Panel Point #3 (East Truss):
Floorbeam truss, near center, has an undercut weld in the flange.

Panel Point #4 (East Truss Stringer Joint):
Strip seal deck joint above. [1999] 1 ft. of gland pulled out at centerline. [1996] Floorbeam truss bottom chord/vertical member connection gusset plate has a weld overlap. [1999] Junction box cover is missing at catwalk. [2000] Concrete in joint at east end. [2005] Flaking & surface rust exterior east truss.



Flaking & Surface Rust Exterior East Truss

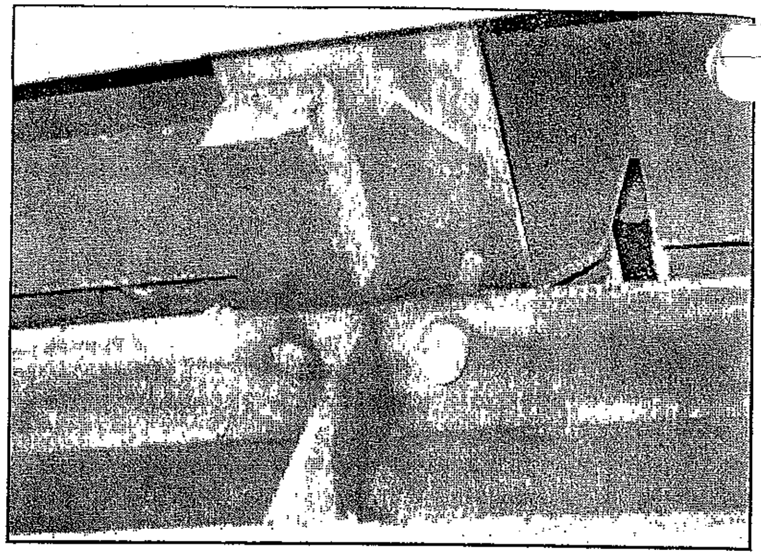
Panel Point #5 (East Truss):
[1997] Cracked tack weld between the floorbeam truss top chord and a stringer bearing pedestal. [1999] Tack welds ground out at stringer #3, cracked tack welds remain at stringer #4.

Panel Point #6 (East Truss):
[1994] Floorbeam truss top chord, bottom flange, has a poor quality weld at the end of a connection plate. [1999] Stringer #5 bearing pedestal has a cracked tack weld. [2000] Floorbeam truss diagonal member U10/L10, near the bottom chord connection, has a 4" long gouge with possible crack along a connection weld, should grind out. [2003] Top chord of the floorbeam truss, just east of east truss, has an old dent on the top flange.

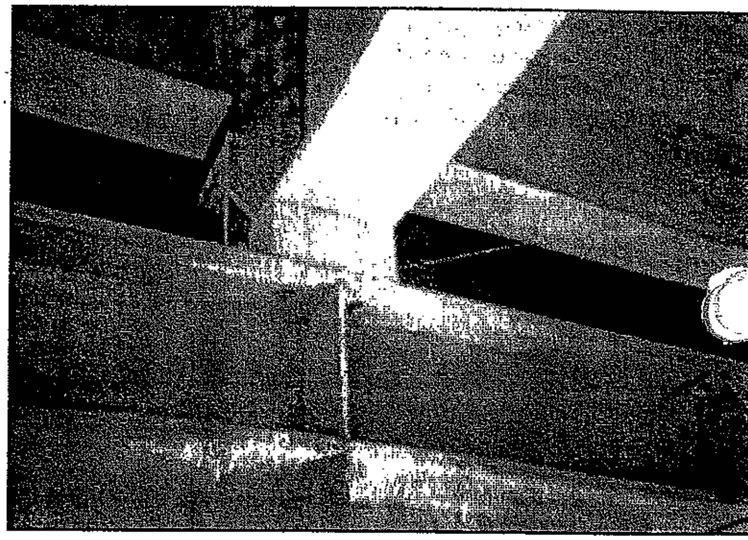
Panel Point #7 (East Truss):
[2003] Top chord of the floorbeam truss, just east of east truss, has an old dent on the top flange.

Panel Point #8 (East Truss Pier #6 Stringer Joint):

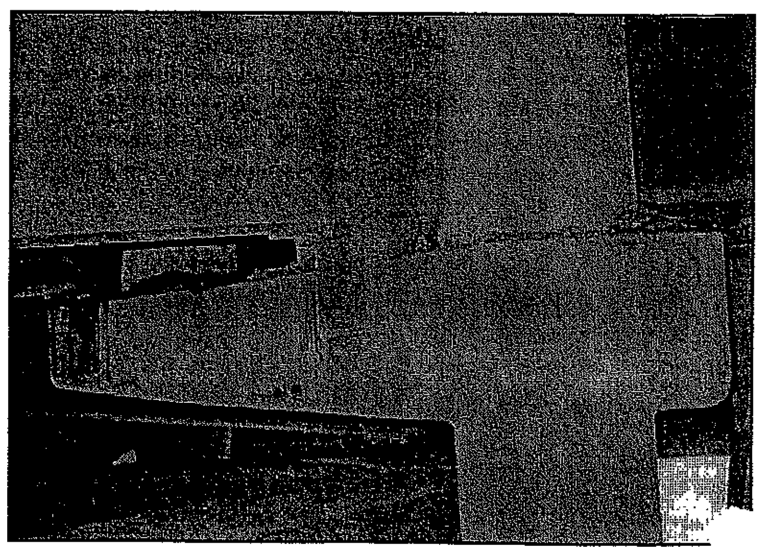
Strip seal and deck drain above. [94/2003] Joint is leaking, small hole & membrane has pulled out. Stringer #4: one bolt broken off at south floorbeam connection. Deck drain is plugged solid. Stringer #2 (south side): one bolt is missing and the nut is missing from the other bolt. The bearing block has rotated 90°. [1999] Missing bolt replaced. [2000] Bolts are loose, needs repair. Vertical truss member has section loss, moderate flaking rust. Floorbeam bottom chord & middle bracing connection plate has moderate section loss, severe flaking rust. Middle bracing connection plate has ½" spread from pack rust. Underside of the deck has 50 SF of water saturation.



Stringer #2 Bearing Block Rotated

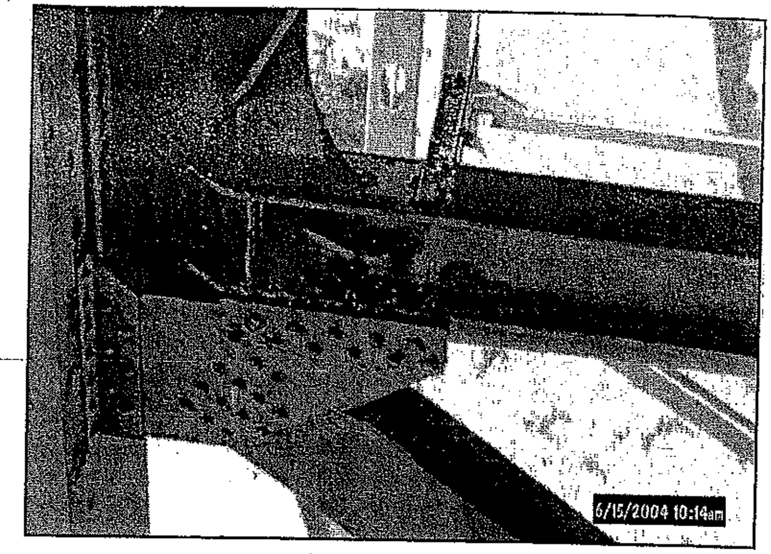


Stringer #4 Bolt Missing



Plugged Horizontal Drain Trough

Pier #6 (Downtown, West Bank of Mississippi):
Pier consists of two concrete columns with a pier wall at the base, two "rollernest" bearing assemblies. [1997] Bearings have surface rust, moderate corrosion and show no signs of movement. [1997] Deck drain downspouts are clogged, top & bottom at median.
[2004] Typical condition & rust at floorbeam connection near deck drain at connection U8.



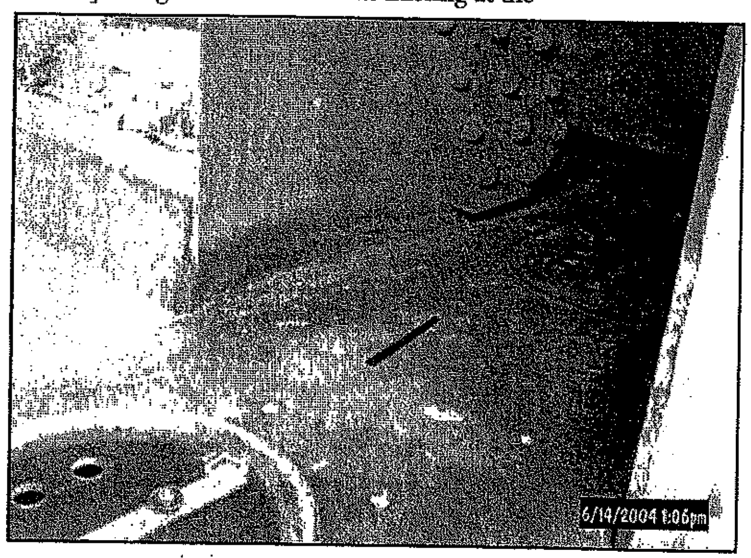
Floorbeam Condition

Span #7 (Deck Truss):
Span is 456 FT long with 12 floorbeam trusses. [1999] Floorbeam truss's, sway bracing located below the median and the beams 6, 7, 8, & 9 were re-painted.

Panel Point #9 (East Truss):
[2003] Floorbeam bottom chord connection plate has a cracked tack weld on the south side. Underside of the deck has 20 SF of water saturation.

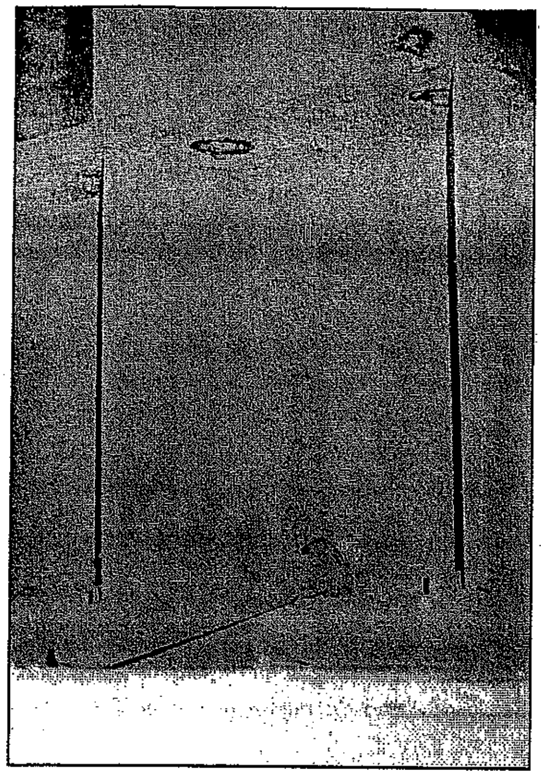
Panel Point #10 (East Truss):
Red navigation light for Mississippi river channel. [1999] Strain gauges installed on truss top chord member U9/U10, L9/U10 &L9/L10 from U of M research project.

Panel Point #11 (East Truss):
Section loss: at gusset plate bottom chord. [2000/05] Stringer #3 has two bolts missing at the floorbeam connection. [2004] Pitting inside gusset plate connection at L11 toward L10



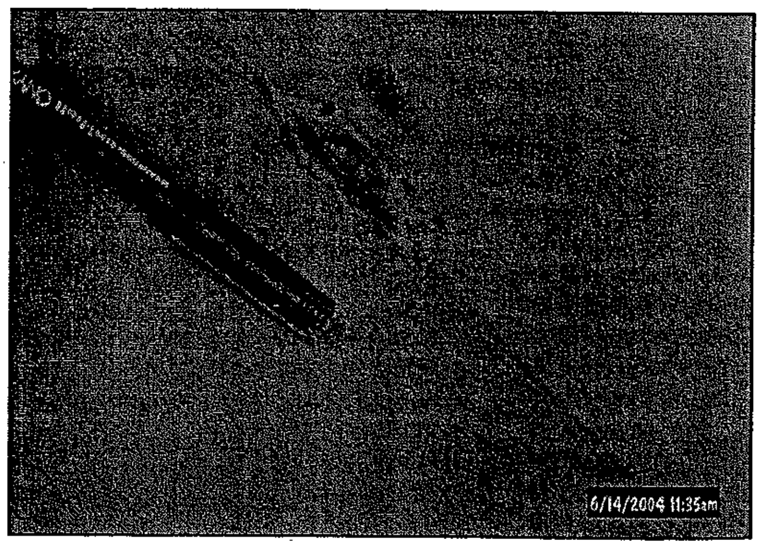
Pitting @ L11/L10 Connection

Bolts Missing @ Floorbeam Connection

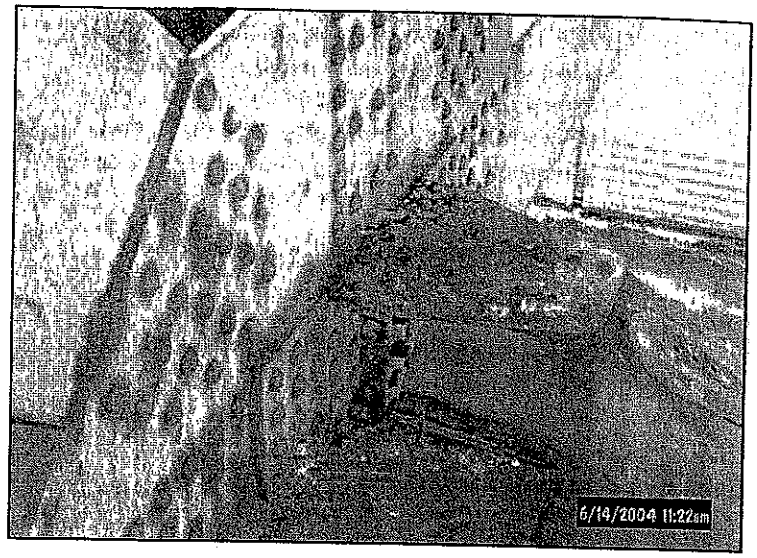


Panel Point #12 (East Truss):
[1999] Truss bottom chord member L12/L13 has a cracked tack weld at an interior stiffener. [2004] Ground out pit from past inspection when???

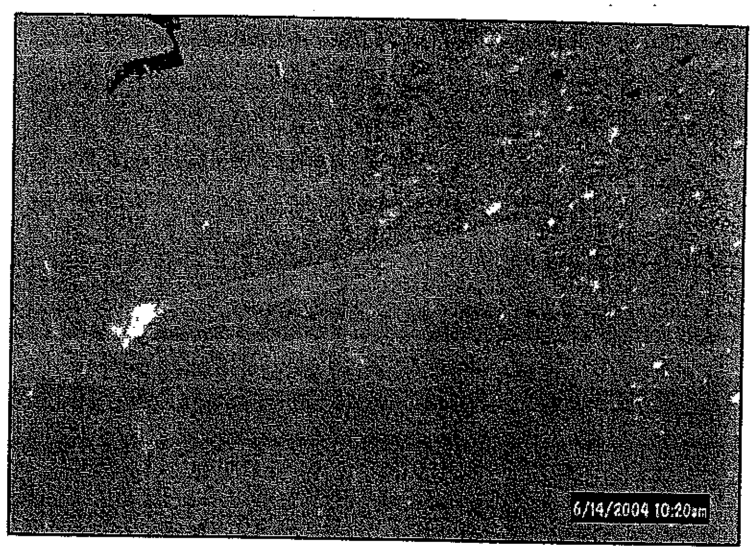
Weld Ground Out When?



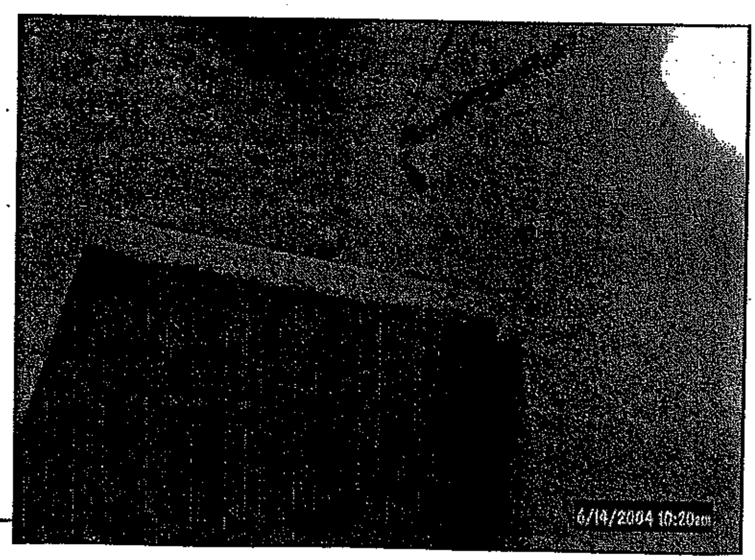
Panel Point #13 (East Truss):
Water from deck drains fall directly into river. [99/2002] Bottom chord gusset plate has section loss, flaking & pack rust. [1999] Truss bottom chord member L13/L14 has cracked tack welds at two interior stiffeners. [2004] Bottom chord member L13/L14 cracked tack weld @ diagram tab (diagram #1?). Cracked tack weld @ diagram tab member L13/U14 see photos.



Condition @Bottom Chord Connection

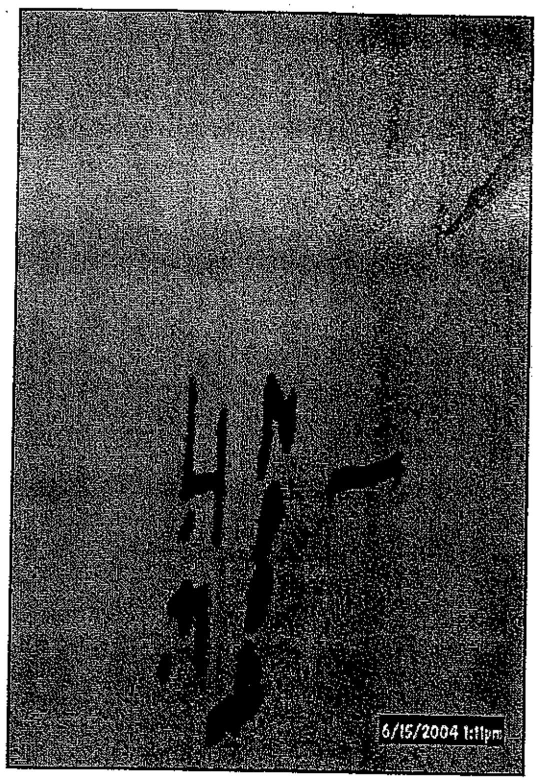


Member L13/L14 Cracked Tack Weld



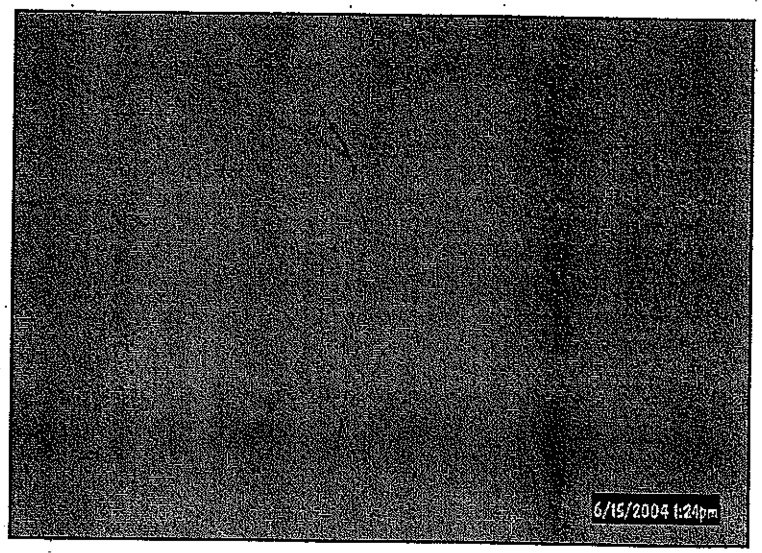
Member L13/U14 Cracked Tack Weld

Panel Point #14 (East Truss Midspan Stringer Joint):
Strip seal expansion joint on the deck. Sway frame rusty. [1999] Truss bottom chord member L14/L13' has a cracked tack weld at an interior stiffener. [2002/03] Floorbeam bottom chord & middle bracing connection plate has ½ " pack rust. Underside of the deck has 4 SF of delamination. [2004] Bottom chord member L14/L13' cracked tack weld at diagram tab (diagram #3?) see photo.



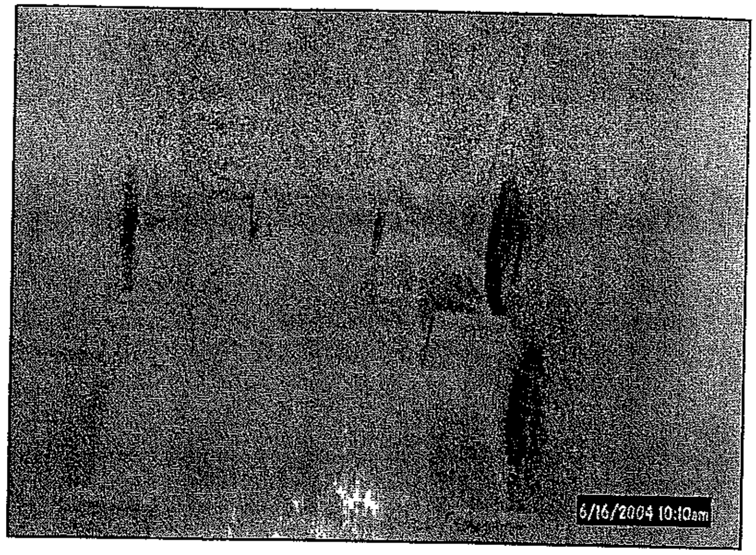
Member L14/L13' Cracked Tack Weld

Panel Point #13' (East Truss):
Floorbeam truss top chord has a ground out spot near stringer #4. [1996] Truss bottom chord member L13'/L12' has a cracked tack weld at an interior stiffener. [2003] Truss bottom chord connection plate has ½" pack rust. Underside of the deck has 20 SF of water saturation. [2004] Bottom chord member L13'/L12' cracked tack weld @ diagram tab (diagram #3?) see photo.



Member L13'/L12' Cracked Tack Weld

Panel Point #12' (East Truss):
[99/2003] Underside of the deck has 65 SF of water saturation. [1998] Truss bottom chord member L12'/L11' has a cracked tack weld at an interior stiffener. [2004] Bottom chord member L12'/L11' two cracked tack weld @ diagram tab (diagram #3?) see photo.



Member L12'/L11' Cracked Tack Weld

Panel Point #11' (East Truss):

Panel Point #10' (East Truss):
[2003] Underside of the deck has 1 SF of spall with exposed rebar. Light pole, W5L3, has 1 LF crack.

Panel Point #9' (East Truss):
Water from deck drains fall onto the steel & directly into river. [2002] Bottom chord member L9'/L8' has section loss, flaking rust.

Panel Point #8' (East Truss Pier #7 Stringer Joint):
Red navigation light for Mississippi river channel. Strip seal expansion joint on the deck. [93/2003] Floorbeam truss has section loss, moderate flaking rust. North side: bolts replaced with "threaded-rod" at stringer #4, bolts replaced at stringer #5. Underside of the deck has 80 SF of water saturation.

Pier #7 (East Bank of Mississippi):
Two fixed bearing assemblies. Pier consists of two concrete columns with a pier wall at the base. [1997] West column has a full height, leaching crack on the south face.

Span #8 (Deck Truss):
Span is 266 FT long with seven floorbeam trusses. [1999] Floorbeam truss's, sway bracing located below the median and the beams 6, 7, 8, & 9 were re-painted.

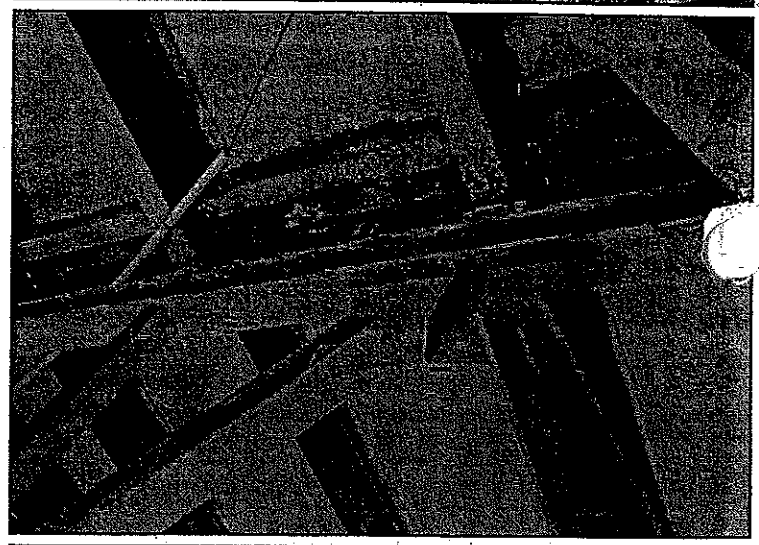
Panel Point #7' (East Truss):
[2003] Underside of the deck has 240 SF of water saturation, & 80 SF of delamination.

Panel Point #6' (East Truss):
[1996/98] Stinger #4 connection to the floorbeam truss is "working". The SW bolt is loose. [2003] Underside of the deck has 10 SF of water saturation.

Panel Point #5' (East Truss):
[2001] Underside of the deck has 30 SF of water saturation.

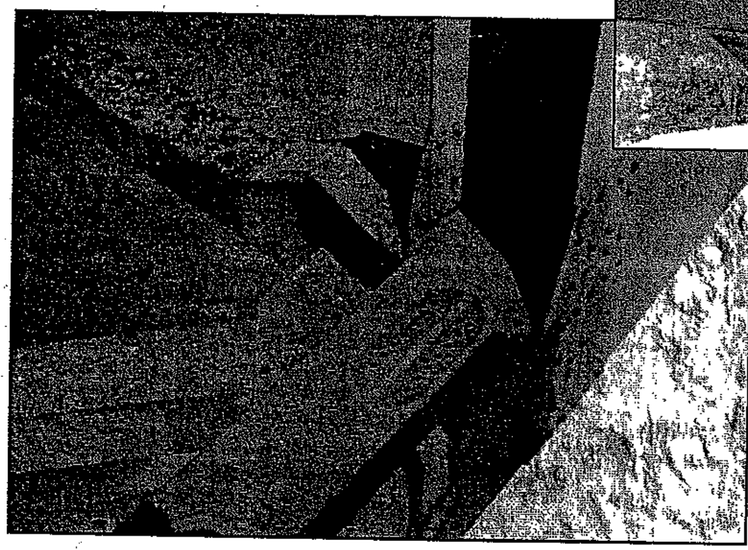
Panel Point #4' (East Truss Stinger Joint):
Strip seal expansion joint on the deck. Truss diagonal member U4'/L3' has backer bars along the interior edges. [01/04] Strip seal has 3 LF of gland pulled out. Truss connection plates, the top chord, and floorbeam have moderate section loss, severe flaking rust. Bottom connection plates have ½" pack rust.


Top Floorbeam Truss Condition


Top Floorbeam Truss Condition


Bottom Floorbeam Truss Condition

Bottom Floorbeam Truss Condition



Bottom Truss Condition

Panel Point #3' (East Truss):
Center lane has road sensors on the deck surface. Top chord of the floorbeam truss has an "incomplete" weld along the top edge of the web reinforcement plate.

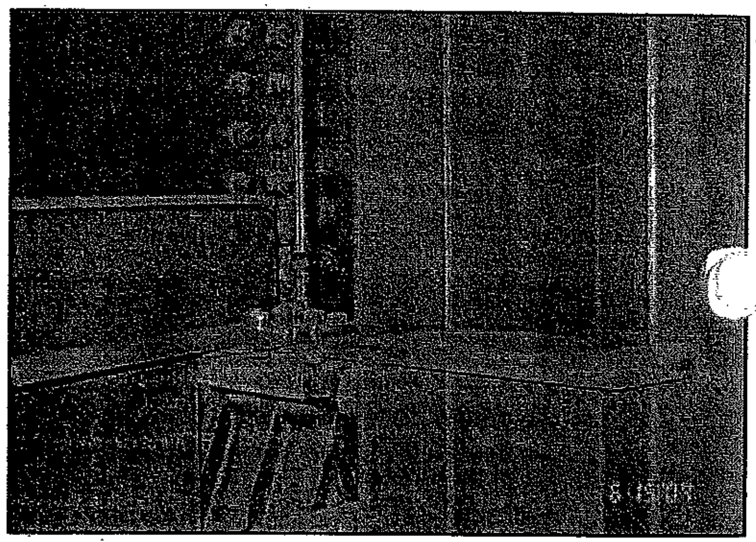
Panel Point #2' (East Truss):
Overhead sign mounted on exterior railings. [1999] Deck in bay #3 has 100 SF of water saturation. [2003] Bottom connection plates have flaking rust. [2004] Area underneath overhead sign has 100 SF of water saturation. [2005] North support beam (stringer ?) has severe section loss at end.

Pier #8:
Two "rollernest" bearing assemblies, have surface rust. [2000/05] East truss rocker shows recent movement. Pier consists of two concrete columns connected by an upper strut. Columns have concrete "jackets" around them with vertical cracks.

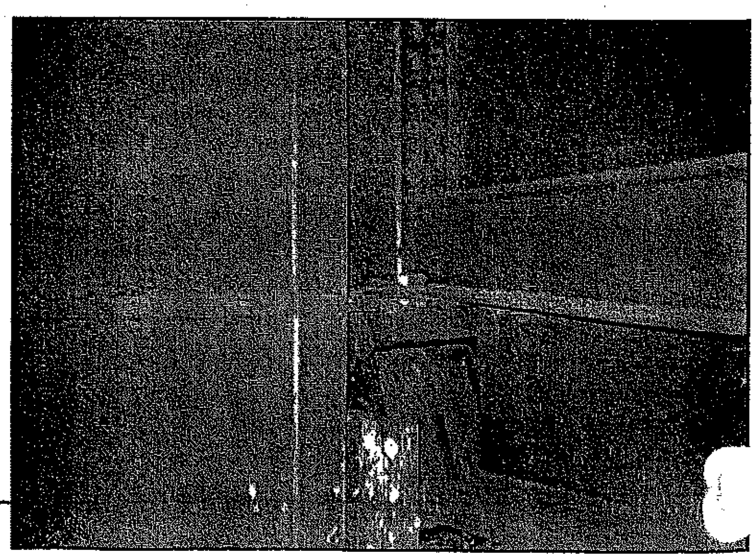
Panel Point #1' (East Truss Pier #8):
[2000] Bottom of truss above bearing has graffiti. [2005] Bottom of deck deteriorated.

Panel Point #0' (End of East Truss):
Joint has open finger joint above. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris, need to be flushed. [1998/99] Floorbeam re-painted, side facing finger joint has section loss with holes in web stiffeners. [1998] North face, directly above east rocker bearing, has two horizontal welds between stiffener plates. They have cracked through entirely. [2004] Finger joint in the SB right lane and shoulder has been ground down to prevent the snow plows catching on the joint.

Crossbeam:
[1998/99] Crossbeam re-painted. Side facing finger joint has section loss, with pitting at base of stiffeners. [1992] North face has crack in the crossbeam web stiffener, above the rocker at the beam #12 connection. This was drilled out. [1997/98] North face: weld above east rocker bearing, between the horizontal & center vertical stiffener, has cracked through entirely. Weld end at the crossbeam web was partially drilled out. [1998] North face has cracks at both ends of the horizontal stiffener, above rocker bearing. They were drilled out with two small holes drilled in crossbeam web at each location. [1998] Bracing installed between crossbeam, above east rocker, and beams #3 & 5. ****[2000] Gap between crossbeam & floorbeam (at rocker bearing) was 3-5/8" at 40° F.* [2005] Movement at east bearing.



Web Stiffener Crack Northwest Side



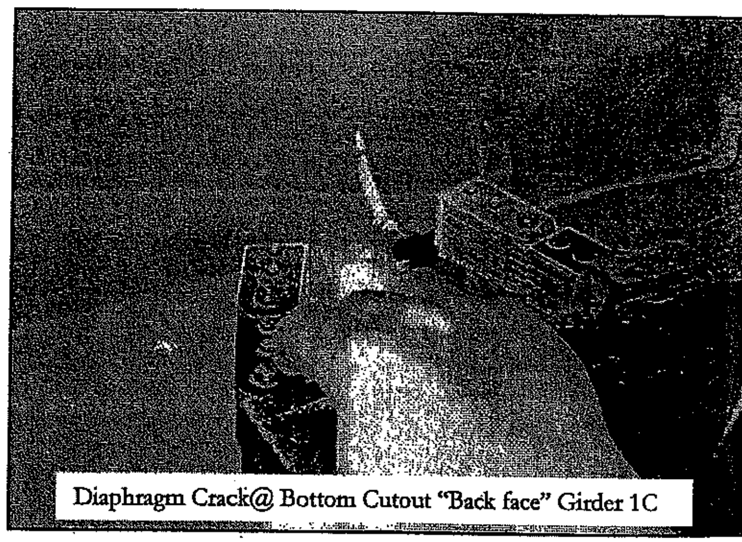
Web Stiffener Crack Northeast Side

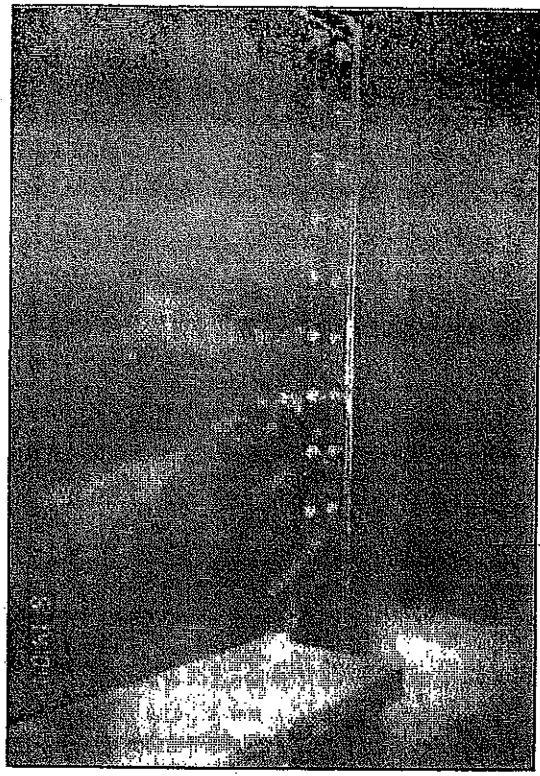
APPROACH SPANS (NB & SB NOTES ARE COMBINED)

Plans have beams numbered from the east.

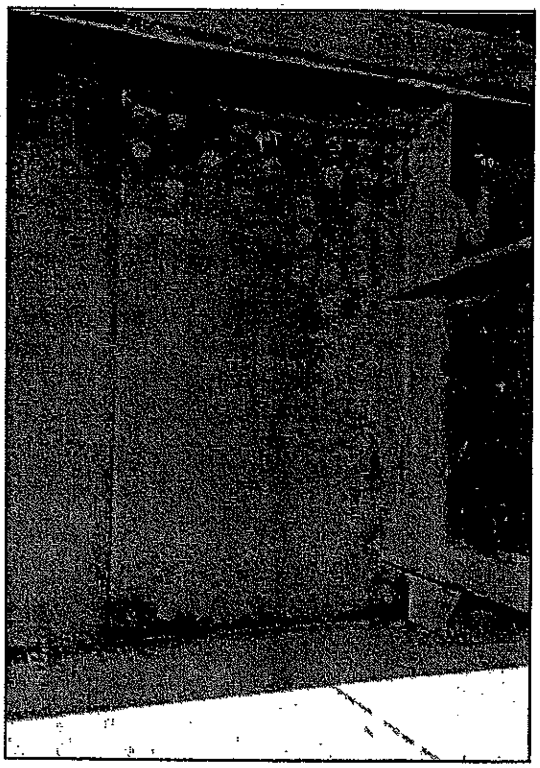
Span #9 (Multi-beam):
Span is 168 FT long with one floorbeam truss at pier #8, fourteen 48" deep welded plate beams bolted onto the crossbeam. Multi-beam spans resume. NB has 8 girders. SB has 7 girders. There are two active railroad tracks below. Refer to Appendix A **First Diaphragm South of Pier #9** graph for crack locations, description & repair to the diaphragm line. [1999] Girders 6, 7, 8, & 9 are re-painted. Lateral bracing welded to web & stiffener. [2003] Conduit: at east side bottom of deck. [2002/04] Underside of deck at the south end, in NBL, has 150 SF of water saturation near the spray head. The 2nd & 3rd bays from west (southbound) have 250 SF of salt and water saturation. [2004] Girder 1C (NBL), crack at the diaphragm bottom cutout, NE side measures 2" ("front face") and NW side measures 2-½" ("Back face"). Girder 3 (NBL), crack at the diaphragm bottom cutout, measures 1-½" (both sides). [1998??] Girder #3 has a "tear" in the girder's web at the diaphragm girder connection. The "tear" measured 42" long on one side and 12" long on the other, was caused by out of plane bending between the diaphragm and the girder. Girder Connection Lowered & Girder Web Repaired with Splice Plate


Diaphragm Crack@ Bottom Cutout "Front face" Girder 1C

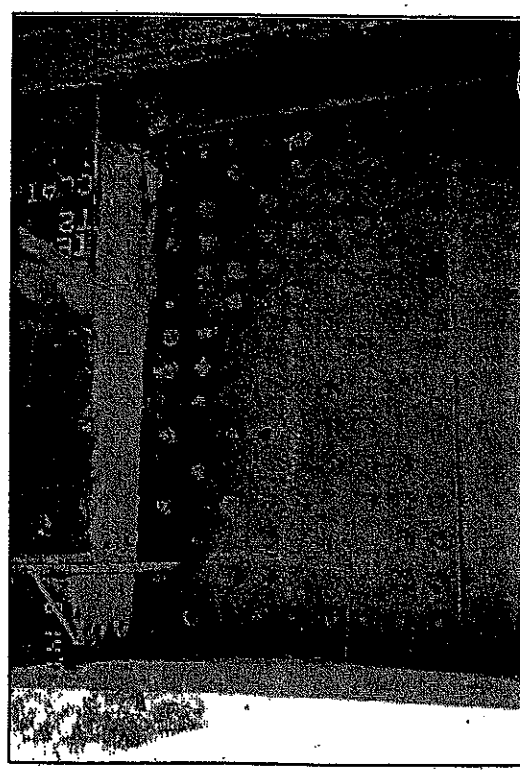

Diaphragm Crack@ Bottom Cutout "Back face" Girder 1C



Diaphragm Crack@ Bottom Cutout "Back face" Girder 3



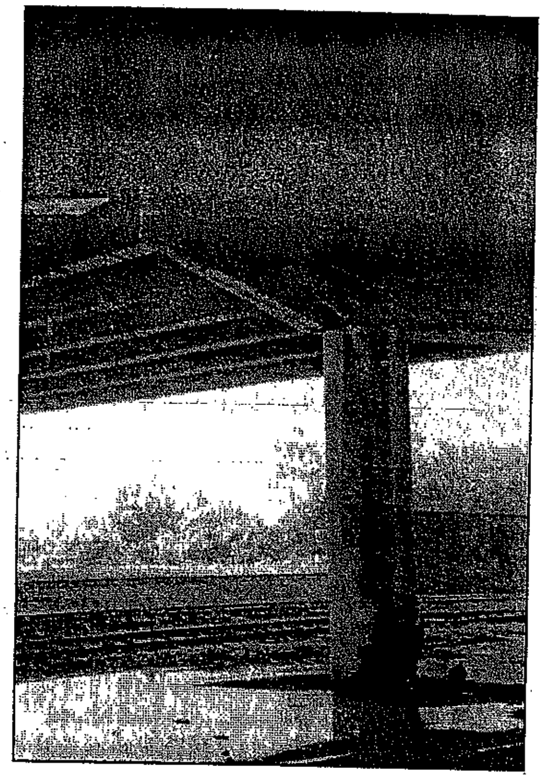
Web "Tear" G # 3 @ Diaphragm Looking East



Web "Tear" G # 3 @ Diaphragm Looking West

Pier #9:

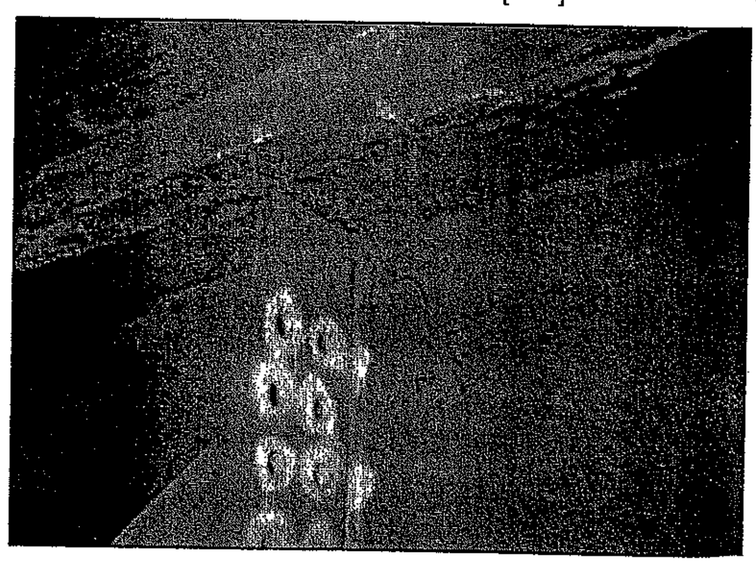
Plate bearing assemblies have 13 fixed, and four sliding. Pier consists of four columns and cap, with a railroad crash strut between the columns. Deck drain: downspout. [1969] East column damaged by train derailment - the column has minor scrapes and spalls. Downspout had to be reconnected. [1999] Bearings 6, 7, 8, &. 9 were re-painted. [2004/05] West vertical & median deck drain plugged.



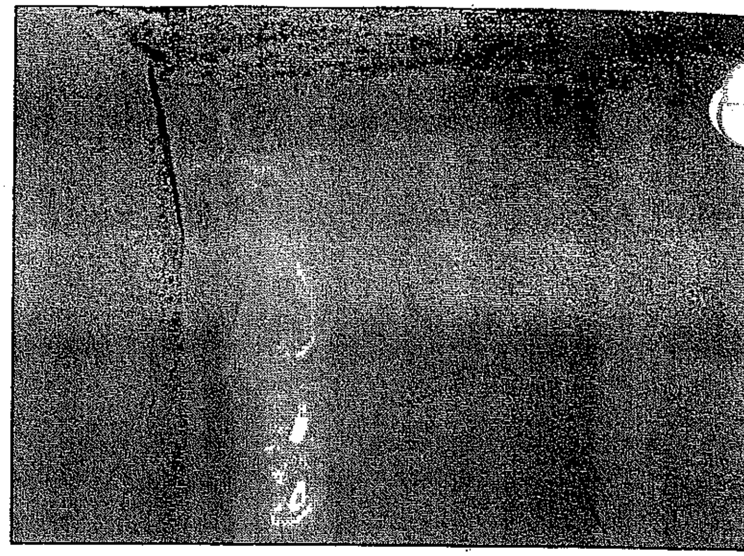
Median Drain Plugged Pier 9

Span #10 (Steel Multi-beam):

Span is 94 FT long with 17 steel beams. NB has 10 beams; SB has 7 beams (the welded beams transition from 48" to 33" depth just north of pier) with active railroad tracks below. One track splits into two. Refer to Appendix A **First Diaphragm North of Pier #9** graph for crack locations, description & repair to the diaphragm line. [1999] Beams 6, 7, 8, & 9 were re-painted. Diaphragms were inverted & lowered, even though the beam connections have a "positive moment" configuration. Connections welded to top flange. [2003] Conduit: at east side bottom of deck. [2000] Beam #6 appears to be "working" at the top connection. [2004] 250LF of leaching cracks underneath



Girder #10 Vertical Stiffener/Girder Web



Girder #10 Vertical Stiffener/Girder Web

Pier #10:
Pier has 5 columns & cap with a railroad crash strut between the columns and 18 sliding plate expansion bearings. [1999] Bearings 6, 7, 8, & 9 were re-painted. [2003] North face of cap has 20 SF of delamination.

Span #11 (Steel Multi-beam):
Span is 68 ft. long with 18 steel beams. Northbound has 11 beams; southbound has 7 beams, and the parking lot below. [1999] Beams 6, 7, 8, & 9 were re-painted. Connections welded to top flange. Diaphragms were inverted & lowered, even though the beam connections have "positive moment" configuration. [2003] Conduit: east side bottom of deck. [2004] 50 SF of water saturated deck underneath.

Pier #11:
Beginning: NB off ramp to University Avenue. (Br. #9340A). Strip seal deck joint above. The slab span consists of 18 sliding plate bearings, (steel beams) and 15 sliding plate bearings (voided slab). The pier consists of seven columns and a cap. [95/2000] Gland is leaking in several locations (NB & SB). [1998] Extensive shotcrete repairs on pier cap. [2000] West column has 1 SF spall. [1999] Sliding plate bearings for the steel beams were re-painted. [2004] Cover plate is missing from "J" barrier east rail NBL.

Span #12 (Concrete Voided Slab Span):
Parking lot: below. [1998] Shotcrete repairs along the median and exterior copings.

Pier #12:
Pier consists of 6 columns (integral with the slab span deck, no bearings).

Span #13 (Concrete Voided Slab Span):
2nd St. passes below. [1998] Shotcrete repairs along the median and exterior copings.

Pier #13:
Pier consists of 6 columns (integral with the slab span deck, no bearings).

Span #14 (Concrete Voided Slab Span):
[1998] Shotcrete repairs were done along median and exterior copings.

North Abutment:
Strip seal deck joint above with 14 sliding plate bearing assemblies. [2000] NB joint leaking at both ends. Bearings are rusty.

MAIN TRUSS SPANS (SOUTHBOUND, WEST TRUSS)

Plans show stringers are numbered from the east.

Crossbeam:
[1998/99] Crossbeam re-painted. Side facing finger joint has section loss. [1999] Bolted connection between beam #12 and the crossbeam was re-tensioned. Connection had been "working".

- [2000] Gap between crossbeam & floorbeam, at rocker bearing, measured at 3-9/16".
- [2001/03] Gap between crossbeam & floorbeam, at rocker bearing, measured at 3-½".

Panel Point #0' (End Floorbeam Beginning West of Truss):
Open finger joint on the deck. [1996] Floorbeam/truss connection has section loss, severe corrosion with surface pitting on plates & bolts. [1997] Conduit running along catwalk is hanging loose, and has pulled out at the floorbeam. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings filled with debris; needs to be flushed. [1998/99] Floorbeam re-painted. Side facing finger joint has section loss on stiffeners. [2002] High spots of fingers torched off right lane & shoulder.

Panel Point #1' (West Truss Pier #8):

Pier #8:
See NB notes. [1999] West truss bearing shows signs of recent movement.

Span #8 (Deck Truss):
Span is 266 FT long with seven floorbeam trusses. [2002] Underside of the deck has 150 SF of water saturation and numerous full depth repairs.

Panel Point #2' (West Truss):
Overhead sign on bridge mounted on exterior railings. [2002] Bolts are "working" at stringer #11.

Panel Point #3' (West Truss):
The floorbeam truss, top flange of upper chord, has an ugly weld below the connection to stringer #11. [2003] Stringer #12 has connection bolts "working".

Panel Point #4' (West Truss Stringer Joint):
Strip seal deck joint above. Truss diagonal member U4'/L3' has backer bars along interior edges. [199?] Two cracked tack welds at elevation block underneath Stinger #11. [2003] Floorbeam truss bottom chord at Stringer #11 connection: have section loss, moderate flaking and surface rust.

Panel Point #5' (West Truss):
[2002] Sprayer fitting corroded.

Panel Point #6' (West Truss):
[96/98] Stringer #11, one bolt replaced in 1998 at the floorbeam connection. [1997] Stringer #10, the two south bolts are loose at the floorbeam connection. [99/2003] Stringer #9, south face, has one bolt loose at the floorbeam connection. [2004] Stringer #11 has one loose bolt south side.

Panel Point #7' (West Truss):
[1997] Top chord/floorbeam truss connection has a cracked tack weld on the diaphragm. [1999] Wind bracing gusset plate, at stringer #14 has loose bolts. [2002] Stringer #14 was installed crooked.

Panel Point #8' (West Truss Pier #7 Stringer Joint):
Strip seal deck joint above. [2005] Gland pulled out for 5 ft and is leaking onto the crossbeam below, between stringer 10 & 11 [1998] Stringer #11: bolt replaced at floorbeam truss connection. [1996] Below stringer #13, the diagonal brace between top and bottom chord of the floorbeam truss is bent, from original construction. [2001] Truss bottom chord/sway frame connection (gusset plates) has section loss, heavy flaking rust. [2004/05] Sway bracing center horizontal has 3" x 8" severe pitting & ½" diameter hole; bottom sway bracing has a 2" x 3" hole between stringer #11 & stringer #10 see photos. [2002] Section loss: heavy flaking rust on truss bottom chord, L8'/L9'.

Center Sway Bracing

Hole in Bottom Member of Sway Bracing

Pier #7:
See NB notes. [2002] West column has vertical leaching cracks.

Span #7 (Deck Truss):
Span is 456 FT long with 12 floorbeam trusses.

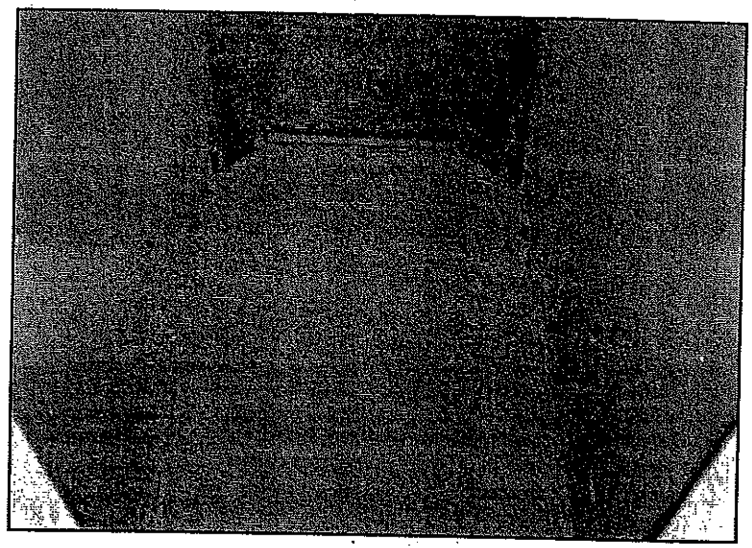
Panel Point #9' (West Truss):
[2001] Truss bottom chord/sway frame connection (gusset plates) has section loss, heavy flaking rust.

Panel Point #10' (West Truss):
[1994] Stringer #13: loose bolt at floorbeam truss connection. Top chord (U10'/U11') has 6 nicks on the exterior, 15 ft. south of U10'. [2005] Pitting bottom sway frame, 1" diameter holes intermediate & horizontal bracing.

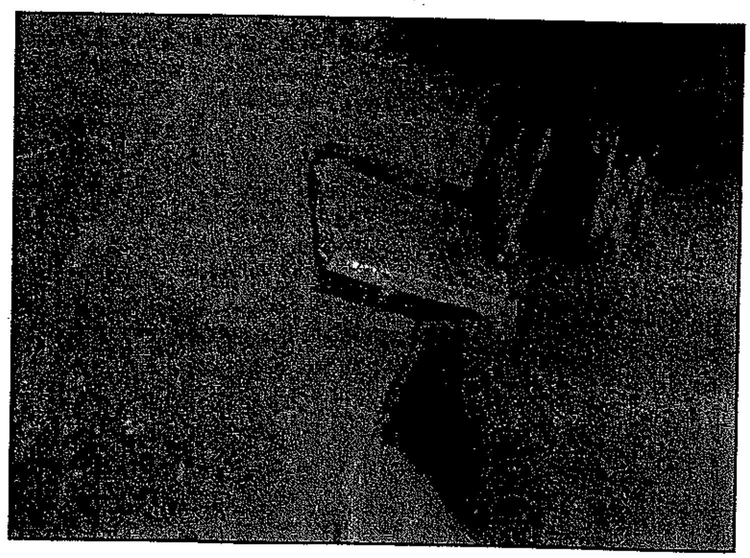
Panel Point #11' (West Truss):
Nick in the truss bottom chord L11'/L12'

Panel Point #12' (West Truss):
Truss diagonal member U12'/L13' has 3 "nicks". The truss bottom chord L12'/L13' has a nick.

Panel Point #13' (West Truss):
[2004] Upper chord member U13'/U12' (diaphragm #2) has no tabs, diaphragm is welded (full length) one side only see photo #1. Bottom chord member L13'/L12' cracked tack weld (diaphragm #1), (not @ diaphragm tab), (clean break) see photo #2.

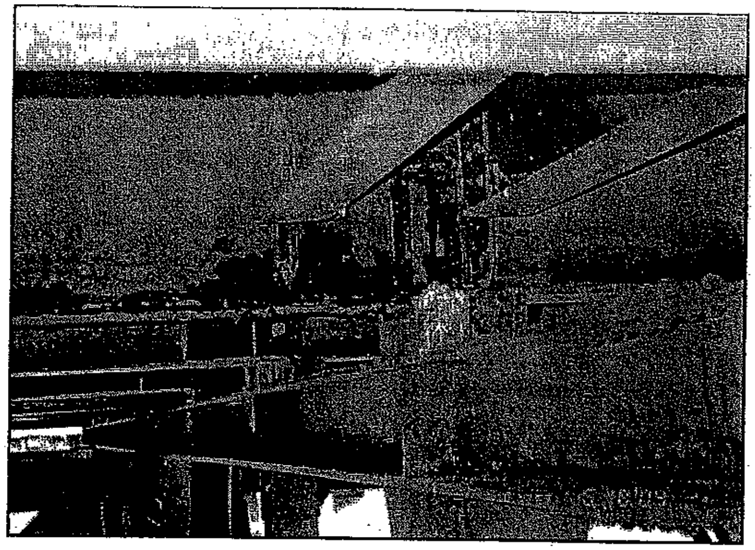


U13'/U12' (Diaphragm #2) Photo #1

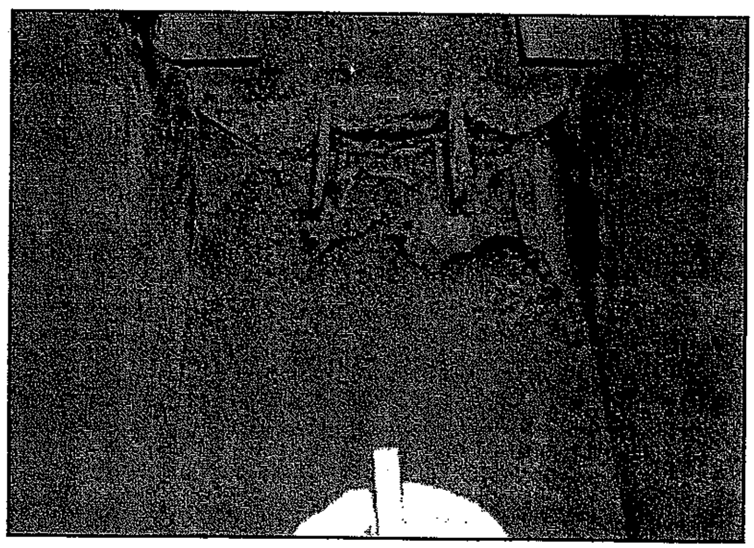


U13'/U12' (Diaphragm #1) Photo #2

Panel Point #14 (West Truss Midspan Stringer Joint):
Strip seal deck joint above. [2005] 10 LF of strip gland pulled out. Deck drains on both sides. [1994] Stringer #11 has section loss, flaking rust near the joint from gland pulled out above. Tack welds along the sway frame/truss, bottom chord, and gusset plate. [1999] Bottom chord member L14/L13' has a cracked tack weld at an interior stiffener. [2003] Stringer #14 connection, south side of the floorbeam, has a cracked tack weld. [2004] Upper chord member U14/U13' has internal tack welds (full length) at interior diaphragm.
Bottom chord member L14/L13' has corrosion from deck drain (?) see photo.

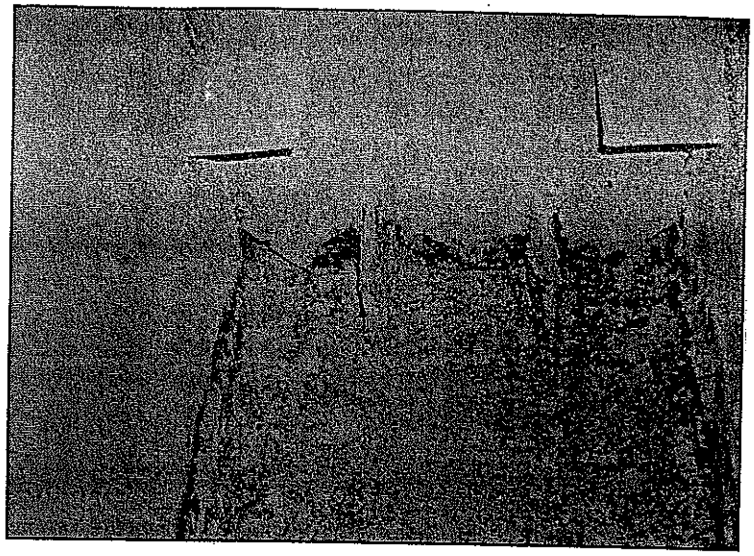


Flaking Rust @ Stringer #11

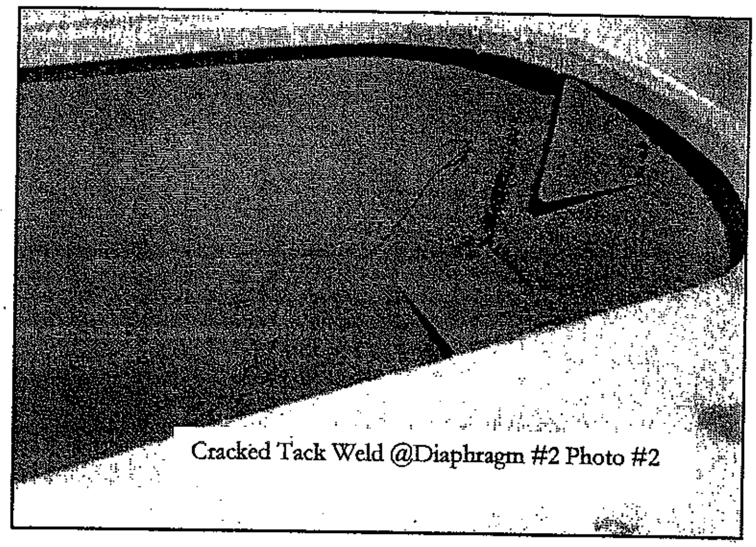


Member L14/L13' Corrosion

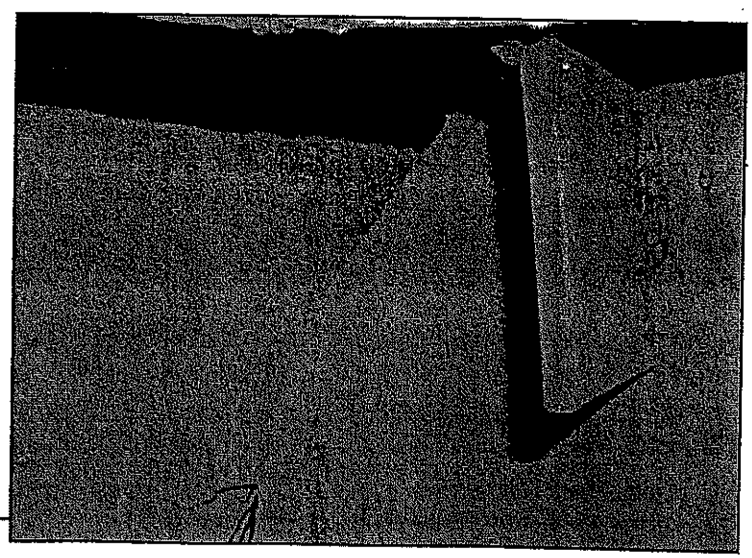
Panel Point #13 (West Truss):
[1999] Truss bottom chord/sway frame connection plates have ¾" pack rust. [1996/99] Bottom chord member L13/L14 has cracked tack welds at two internal stiffeners. [2004] Diagonal L13/U14 has corrosion from deck drain (diaphragm #1). Cracked tack weld (diaphragm #2) (not @ diaphragm tab) see photo #2 & #3. Cracked tack weld (diaphragm #3), (not @ diaphragm tab), (entire tack weld broken cleanly) see photo #4 & #5.



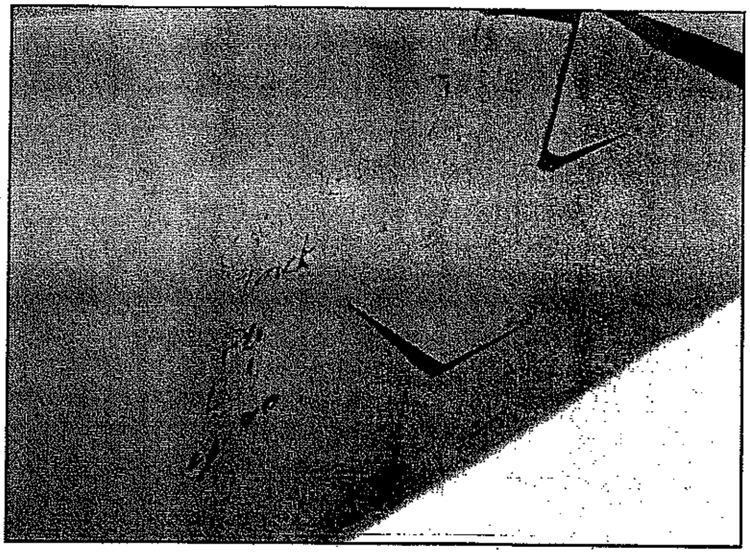
L13/U14 Corrosion @Diaphragm



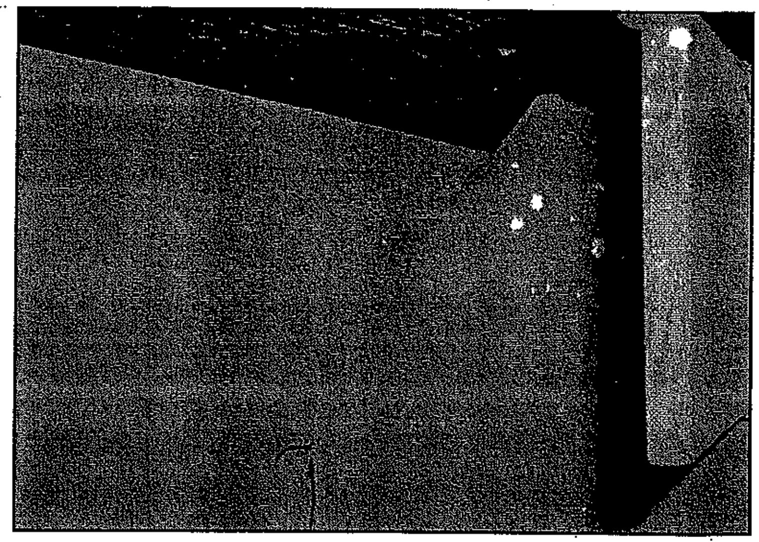
Cracked Tack Weld @Diaphragm #2 Photo #2



Cracked Tack Weld Diaphragm #2
Photo #3

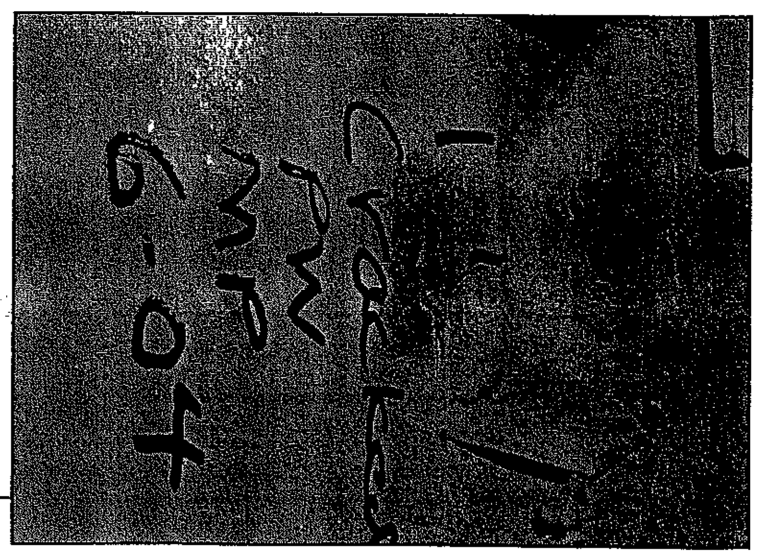


Cracked Tack Weld Diaphragm #3
Photo #4



Cracked Tack Weld Diaphragm #3
Photo #5

Panel Point #12 (West Truss):
[1996] Bottom chord member L12/L13 has a cracked tack weld at the internal stiffener.[2004] Bottom chord member L12/L13 has a cracked tack weld (diagram #2), (not @ diaphragm tab) see photo.



Member L12/L13 Cracked Tack Weld
Diaphragm #2

Panel Point #11 (West Truss):
[1998] Stringer #11 has three bolts replaced at the floorbeam truss connection; the SE bolt is too short with inadequate threads. Stringer has lifted 3/32" off the bearing block on the south side. Stringer #3 has tack welds ground out.

Panel Point #10 (West Truss):
Truss top chord U10/U9 has two spots ground out. [2005] Vertical ladder to access cat walk. Stringer #8 has some loose stool concrete.

Panel Point #9 (West Truss):
Truss diagonal L9/U8 has a spot ground out.

Panel Point #8 (West Truss Pier #6 Stringer Joint):
Strip seal expansion joint on the deck. [96/2005] Gland has 12 ft pulled out in right gutter line. Deck drains. [96/2003] Drain clogged at median, horizontal trough, standing water in east grate. [2004/05] Vertical member L8/U8, bottom chord, & ~~floorbeam connection plates have moderate flaking &~~ surface rust from plugged deck drain. [2005] Stringers #10 & #11 have flaking rust on the north side.

Pier #6:
See NB notes.

Span #6:
Span is 266 FT long with seven floorbeam trusses.

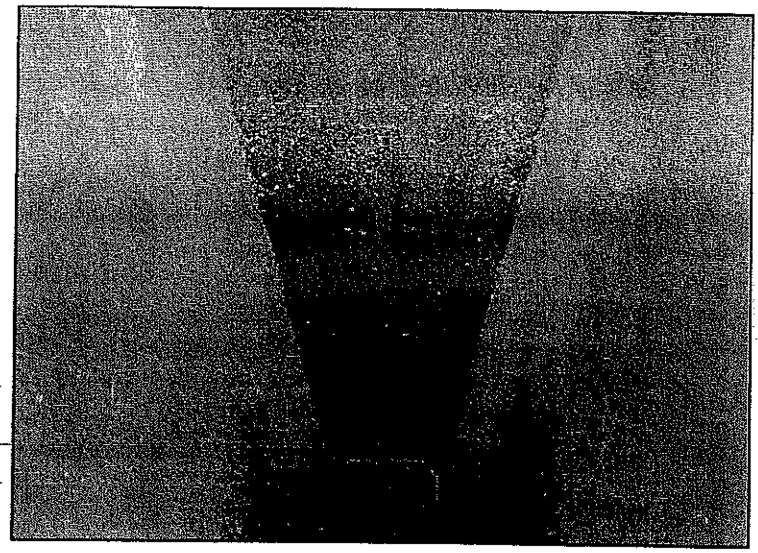
Panel Point #7 (West Truss):
[2002] Underside of the deck has 20 SF of water saturation at stringer 12 thru 14.

Panel Point #6 (West Truss):
Overhead sign mounted on railing. Floorbeam truss top chord (U5/U4) has gouges in the bottom flange at the end of the connection plate; the bottom chord of the floorbeam truss has 3 spots ground out. Floorbeam truss top chord is offset vertically ¼" at the splice from construction.

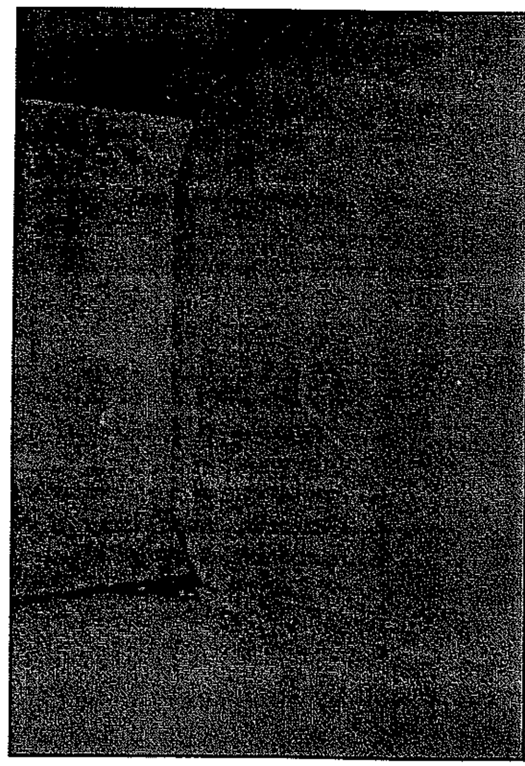
Panel Point #5 (West Truss):
Top chord U5/U6 has backer bars tack welded along the top interior corners of member see photo.
[2004] Truss bottom chord, bottom lateral connection plates have spread 3/16" from pack rust.

Backer Bars Tack Welded Along Top Interior

Panel Point #4 (West Truss Stringer Joint):
Strip seal expansion joint on the deck, Top chord U4/U5 has backer bars tack welded along the top interior corners of member see photo. Bottom chord L4/L5 has no diaphragm tabs, full weld on side and tack welds on other see photo. [1998] Stringer #10: bolt replaced at south floorbeam, truss connection. [2000] Lighting conduit is held up with tie wire. [2004] Stringer #11 floorbeam connection has moderate flaking rust. Truss top chord has flaking rust. Floorbeam top chord, stiffener under stringer #10 has cracked tack weld & is working.



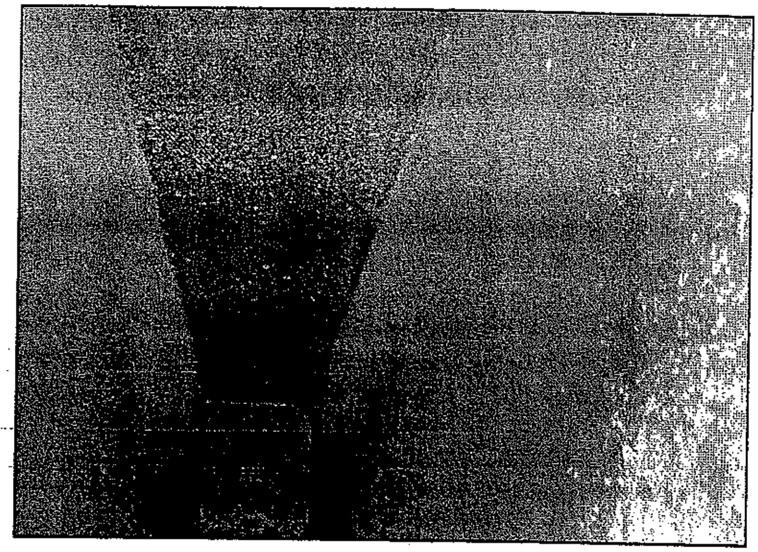
Backer Bars Tack Welded Along Top Interior



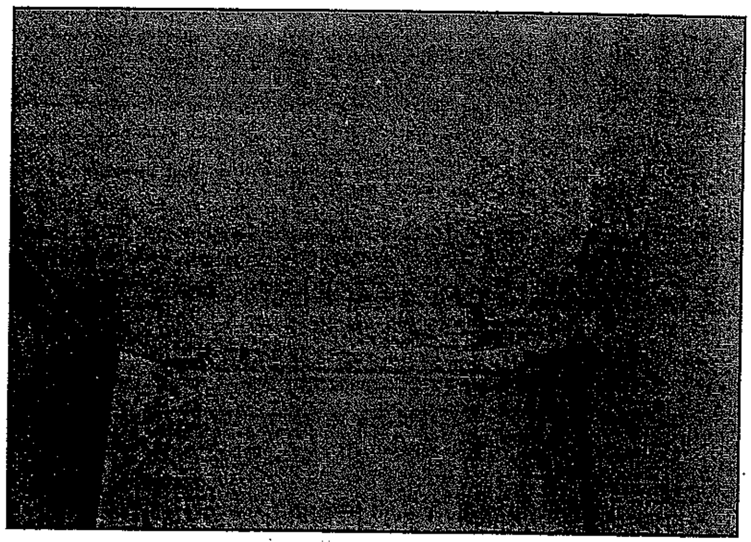
Bottom Chord Full Weld on Diaphragm

Panel Point #3 (West Truss):

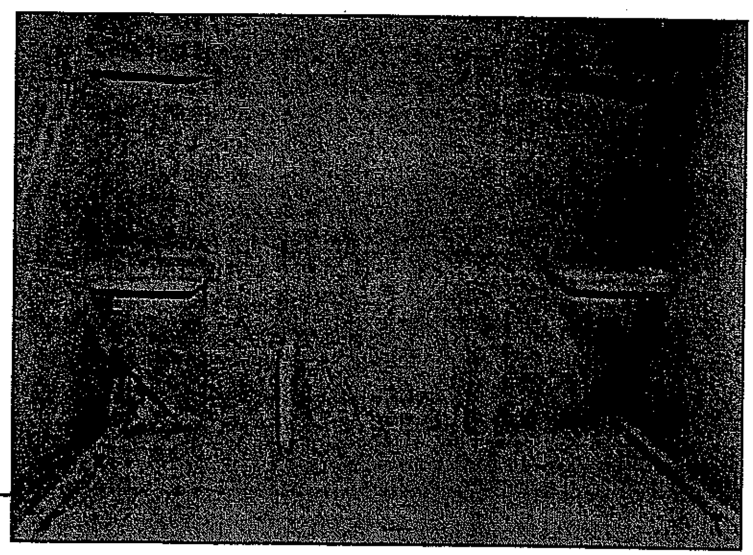
Truss bottom chord L2/L3 has a nick. Top chord U3/U4 has backer bars tack welded along the top interior corners of member see [2004] photo. Bottom chord L4/L5 has no diaphragm tabs, full weld on side and tack welds on other see [2004] photo. Diagonal member L3/U4 has 4 diaphragms with tabs see [2004] photo.



Backer Bars Tack Welded Along Top Interior



Bottom Chord Full Weld on Diaphragm



Diaphragm @ Member L3 U4

Panel Point #2 (West Truss):
[1996] Floorbeam truss member L2/U3 has a welding flaw. [1997] No crack! Magnetic particle tested. [2004] Truss & floorbeam top chords & interior diaphragms have flaking rust.

Pier #5:
See NB notes. Access ladder to catwalk removed.

Panel Point #1 (West Truss Pier #5):
[1994] Diagonal brace, floorbeam to stringer, has a cotter pin missing at the floorbeam truss connection. [1998] Deck drain detached from downspout, originally drained into storm sewer. [2004] Truss & floorbeam top chords & interior diaphragms have flaking rust.

Panel Point #0 (End Floorbeam End of West Truss):
Open finger joint on the deck. [1998] Drain troughs removed. [1999] Rubber "skirts" installed below the finger joint. [2000] Rubber trough above rocker bearings: filled with debris, needs to be flushed. [1997] Floorbeam horizontal stiffener is bent directly above the rocker bearing. [1998/99] Floorbeam re-painted, side facing finger joint has section loss, pitting. [2004] Truss, top chord exterior connection plate has 1/8" deep section loss with pitting. SW rocker bearing has no movement.

Gap between Crossbeam & Floorbeam (East End)	
Date	**Measurement**
September, 1998	16-5/8"
April, 1999	17-13/16"
April, 2000	18"
September, 2001	18-1/16"
June, 2003	16-7/8"

*[2004] Gap between crossbeam & floorbeam, at west end, measures 14-½".
*[2000] Gap between crossbeam & floorbeam, at west end, measures 16-½".

Crossbeam:
[1997] Cracks found at the end of the horizontal crossbeam stiffener near the rocker were partially ground out. [1998/99] Crossbeam re-painted, the side facing finger joint has section loss, pitting with holes in the base of stiffeners, pitting on bottom flange at median.

Span #5(Deck Truss Multi-beam):
The multi-beam spans resume at panel point #0.

See NB Notes for South Approach Spans

PREVIOUS SNOOPER INSPECTIONS

2004 Mark Pribula, Kurt Fuhrman, Vance Desens, Pete Wilson, Jim Flannigan, John Miller (City of Mpls)
2003 Mark Pribula, Kurt Fuhrman, Vance Desens, Pete Wilson, Bill Nelson
2002* Mark Pribula, Kurt Fuhrman, Pete Wilson, Jerry Oldeen, Bruce Anderson, Mike Palmer
2001 Marl Pribula, Kurt Fuhrman, Vance Desens, Ken Rand, Mike Palmer
2000 Mark Pribula, Kurt Fuhrman, Pete Wilson, Marc Beucler, Mike Palmer, Wayne Tennison Pete Wilson, George Morelli, Rebecca Lane
1999 Kurt Fuhrman, Bill Nelson, Ken Rand, Mike Schadegg, Pete Wilson
1998 Mark Pribula, Terry Moravec, Eric Evens, Kurt Fuhrman, Pete Wilson, Jerry Anderson
1997* Mark Pribula, Terry Moravec, Eric Evens, Kurt Fuhrman, Pete Wilson, John Peterson
1996 Terry Moravec, Eric Evens, Kurt Fuhrman, Pete Wilson
1994 Terry Moravec, Kurt Fuhrman, Pete Wilson
1993 Terry Moravec, Chas Martin, Tom Waks
1991 Chester Martin, Chas Martin, Jerry Anderson
1988 Chester Martin

***Denotes an "In-Depth" Inspection**

APPENDEIX A DIAPHRAGM CRACK LOCATIONS

DIAPHRAGM CRACK LOCATIONS
First Diaphragm South of Pier #3
G1 (East Fascia NB) [99/2000] ¼" crack on top of interior stiffener weld. [2003] No change.
G2 (NB)* [1998] Two 2" holes drilled in web. Crack is contained.
G3 (NB) * [1998] Two ¼" intersecting diagonal holes drilled in top of stiffener welds. [2003] No crack.
G4 (NB)* [1998] Two 2" holes drilled in web. Crack is contained.
G5 (NB)* [1998] Two 2" holes drilled in web. Crack is contained.
G6 (NB) [1998] One 2" hole drilled in web. [2000] Other end of crack is turning downward into the web & was drilled out. Crack is contained.
G7 (NB)* [1998] One 2" hole drilled in web & other end of crack was ground out. [2003] The ground out end is cracked, visible on both sides web, should be drilled out.
G8 (SB)
G9 (SB)
G10 (SB)
G11 (SB)
G12 (SB) * [1998] Two 2" holes drilled in web & 1 hole drilled in stiffener. [1999] Crack extends 1" beyond the hole (ground out). [2003] No change.
G13 (SB)
G14 (West Fascia SB)* [1998] One 2" hole drilled in web. [2000] ¾" horizontal crack on exterior flange/web weld (may eventually need drilling), small diagonal crack @ top of interior stiffener weld. [2003] No change.

DIAPHRAGM CRACK LOCATIONS
First Diaphragm North of Pier #3 ***Denotes original 1998 crack locations**
G1 (East Fascia NB)
G2 (NB) Strain gauges on both faces.
G3 (NB)* [98/2000] West side, top flange web weld has ½" crack. Eastside, stiffener weld has a small crack. [2003] No change.
G4 (NB)* [1999] West face, top of stiffener weld small crack. [2003] Crack is growing down toe of weld ¾", drill out.
G5 (NB)* [2003] Small crack at the top of stiffener weld.
G6 (NB)* [1999] Small crack at top of stiffener weld. Strain gauges on the east face. [2003] No change.
G7 (NB)* [2003] Small crack at the top of the interior stiffener weld.
G8 (SB)
G9 (SB)
G10 (SB)
G11 (SB)* [1998] Two 2" holes drilled in web. Crack is contained.
G12 (SB)* [1998] Two 2" holes drilled in web. Crack is contained.
G13 (SB)
G14 (West Fascia SB)* [1998] Two 2" holes drilled in web. Crack is contained.

DIAPHRAGM CRACK LOCATIONS

First Diaphragm North of Pier #4 *Denotes original 1998 crack locations
G1 (East Fascia NB)
G2 (NB)
G3 (NB)* [1998] Two 2" holes drilled in web. Crack is contained.
G4 (NB)* [1998] Two 2" holes drilled in web. Crack is contained.
G5 (NB)
G6 (NB)
G7 (NB)* [1998] Two 2" holes drilled in web. [2001/03] Both sides, small crack at top of stiffener weld.
G8 (SB)
G9 (SB)
G10 (SB)* [1998] Two 2" holes drilled in web. Crack is contained.
G11 (SB) [99/2000] Small crack at top of stiffener weld. [2003] No change.
G12 (SB)* [1998] Two 2" holes drilled in web & ¼" hole drilled in stiffener weld. Crack is contained.
G13 (SB) [99/2000] Small crack at top of stiffener weld. [2003] No change.
G14 (West Fascia SB) [1999] Small crack at top of interior stiffener weld. [2003] No change.

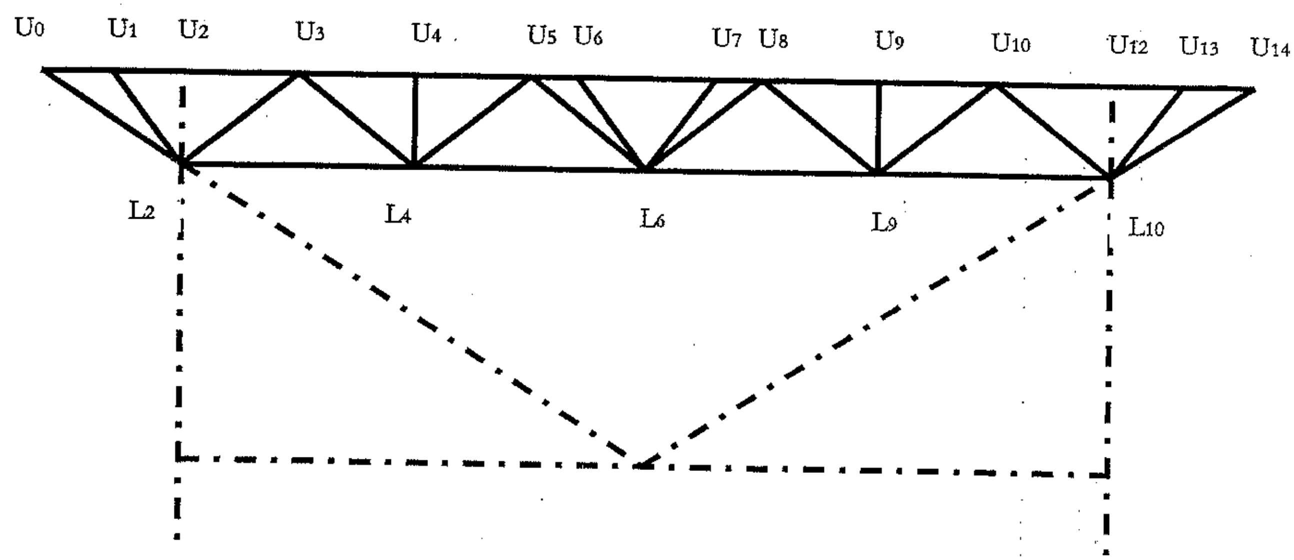
DIAPHRAGM CRACK LOCATIONS

First Diaphragm South of Pier #9 *Denotes original 1998 crack locations
G1 (East Fascia SB) [2000] Exterior top flange/web weld has a ½" indication. [03] No change.
G1C (NB)
G2 (NB)* [1998] 4 ft. long inverted "U" shaped crack in web (reinforced with bolted plates).
G3 (NB)
G4 (NB)* [98/2000] Small crack in top flange/web weld. [03] No change.
G5 (NB)
G6 (NB)
G7 (NB)
G8 (SB)
G9 (SB)* [1998] Crack in top of stiffener weld. [2003] No change.
G10 (SB)
G11 (SB)* [98/2000] Small crack in top of stiffener weld (east side). [03] No change.
G12 (SB).* [98/2000] Small crack in top of stiffener weld (east side). [03] No change.
G13 (SB):
G14 (West Fascia SB)

DIAPHRAGM CRACK LOCATIONS

First Diaphragm North of Pier #9 *Denotes original 1998 crack locations
G1 (East Fascia NB)
G1B (NB) Stiffeners are welded to the top flange (positive moment).
G1C (NB)
G1D (NB)Stiffeners are welded to the top flange (positive moment)
G2 (NB)
G3 (NB)
G4 (NB* [2000] Two 2" holes drilled in web. Crack contained.
G5 (NB) * [2000] Two 2" holes drilled in web. Crack contained.
G6 (NB)
G7 (NB)
G8 (SB)
G9 (SB)* [98/2000] Crack in top flange/web weld & top of stiffener weld (west side). [03] No change.
G10 (SB)* [2000] Crack in top flange/ web weld (east side) [2005] No change.
G11 (SB)* [2000] Two 2" holes drilled in web. Crack contained.
G12 (SB).* [2000] Two 2" holes drilled in web. Crack contained.
G13 (SB)
G14 (West Fascia SB)

TRUSS DIAGRAM



Minnesota Department of Transportation
Bridge Inspection, Maintenance Operations Metro District

Bridge No. 9340

Truss Diagram (Floor Beam)

I-35W over the Mississippi River at Minneapolis, MN

Section 24 & 25 Township T. 29 N Range 24 W
County Hennepin Co. MN

Note

Tension Members in Red
Compression Members in Black
Reversal Members in Blue
Dashed Lines are Secondary Members

A-5 MINUTES OF MEETINGS

Owner Eric Embacher
Shipment 02
Folder EE-02-17

HOLD Do Not Destroy
35W Bridge 9340
These documents are to be held for
The Bridge Legal Hold.
M. Bliss Mn/DOT Records Manager

EXHIBIT NO: 2
Date: 4-14-08
JULIE A RIXE
COURT REPORTER

PRECONSTRUCTION CONFERENCE

Date: 6/6/07- 1:00 p.m.
South Resident Office

Presiding Engineer: E. Embacher

Subject: S.P. 2783-107
Contract No. S07073
In Hennepin Co. on T.H. 35W N. of T.H. 94 to Stinson Blvd.
in the City Minneapolis

Contractor: Progressive Contractors, Inc.

Concrete Crack and Joint Repair, Concrete Planing, Concrete and Bituminous Surfacing, Bituminous Mill and Overlay, Anti-icing System, Lighting, Guardrail, TMS and Bridge Rehabilitation Br. Nos. 27873, 27874, 27902, 27879B, 27879B, 27880A, 27880, 27903, 9340, 27888, 27887, 27893

DELEGATES	REPRESENTING	TELEPHONE
Eric Embacher	Mn/DOT	651/406-4725
Barry Nelson	Mn/DOT	651/406-4725
Mark LeMay	Mn/DOT	651/406-4725
Rae Tressler	Mn/DOT	651/406-4725
Scott Hanson	Mn/DOT - TMS	651/234-7982
Jeff Morey	Mn/DOT - Traffic	651/775-3310
Dale Nelson	Mn/DOT	651/779-1050
Ron Mulvaney	Mn/DOT - Materials	651/366-5575
Bill Olson	Mn/DOT - Maint.	612/520-3560
Brad Estochen	Mn/DOT - Maint.	651/582-1660
Beth Petrowske	Mn/DOT - Public Affairs	651/234-7508
Emmanuel Taye	Mn/DOT - Utilities	651/634-2096
Mark Jensen	Highway Technologies	612-521-4200
Darryl Doughty	Timme	608/587-2765
Ken Larson	Peer Engineering	952/831-3341
Todd Lantto	Peer Engineering	952/831-3341
Steve Weston	PCI	763/350-3539
Tom Sloan	PCI	612/940-0397
Tim Imholte	PCI	612/803-5383
Rich Connoy	PCI	612/875-9023
Steve Lubbert	State Patrol	763/591-4679
Daniel Balling	Killmer Elec.	763/425-2525
Severt Hesch	Killmer Elec.	612/363-5143
David Tiegs	Midwest Land Surveyors	763/712-9099
Helen Baker	Golden Valley Transfer	763/420-6760
Brad Schmidtbayer	North Valley Inc.	763/274-2580
Randy Kline	Boschug America	724/651-3565
Michael Scherber	Hennepin County	612/596-0308
Tiffney Kautz	Mn/DOT	651/234-7641
Tim Sinclair	Mn/DOT	651/234-7354
Alex Govrik	Mn/DOT - Lighting	651/775-9495
Paul Babin	Mn/DOT - Lighting	651/775-8697
Ken Lockaton	Boschung America	724/510-8059
Doug Maday	Minneapolis Traffic	612/673-5755

GENERAL DATA

Eric Embacher, Mn/DOT Project Engineer, summarized the work to be completed under this Contract. The Contract starting date is June 4, 2007 with an Intermittent Completion Date of September 21, 2007 and a Final Completion Date of October 25, 2007. The Mn/DOT Resident Engineer is Liz Benjamin; Project Supervisor (Bridge) Barry Nelson, and Chief Inspector (Grading) Mark LeMay; Chief Inspector (Bridges) Harvey Unruh.

CONTRACTOR'S OPERATIONS

United Rentals will set temporary S.B. 35W right lane closure on Thursday 6/14/07 9:00a.m. for preliminary lane marking/chaining. PCI will begin work on June 18th on S.B.35W ML right lane and ramps. Work Hours will be 6 days/week, 12 hour/days. Midwest Land Surveyors will be doing the surveying for PCI. United Rentals will be performing the traffic control. The baseline schedule is to be given to Eric Embacher today with controlling CPM schedule to be delivered before start of project. Weekly meetings will be held on Tuesdays at 1:00 p.m.

-Bridge Expansion devices to be delivered Friday, June 15th.
-Should be working on NB35W right lane and ramps Wednesday June 20th.
-Bronze Armor delivery to be around Wednesday August 1st.
-PCI selected the 1st 6 weekends allowed for the weekend closures (June 22-25, June 29-July 2, July 6-9, July 27-30, Aug 10-13, Aug 17-20).
-PCI will be working double shifts during weekend closures. (8:00pm Fridays to 5:00am Monday)
-Ramps south of river bridge to be done in stage 3A.
-Deck planning to be done during each stage.
-Sandblasting bridge decks with steel shot.
-PCI requested lower speed limits through active work zone 40 MPH with 45MPH otherwise. Mn/DOT Jeff Morey will check into.
-Killmer Elec. advised MNDOT that 60% of inplace lights are out or damaged.
-MNDOT Paul Babin notified Killmer Electric about salvaging a cabinet and requested that as many inplace lights remain on as possible throughout construction.
-Killmer Electric submitted some rush order electrical submittals - given to ESS
-PCI made MNDOT Lab aware of the concrete plant being mobilized to site and Bituminous plant being used - certification purposes.

UTILITIES - MUNICIPALITIES

It is the Contractor's responsibility to contact all utility companies to ascertain the location of all existing underground utilities, if any, prior to performing any excavation operations. One Call Excavation Notice System can be reached at 1-800-252-1166.

TRAFFIC

Jeff Morey, Mn/DOT Traffic, stressed that if PCI had frequent trucks pulling off of ML, a flagger should be at that location. He also stressed the use of 360 beacons.

X Flagger Trainer's name and Qualification Number - will be submitted.
X NCHRP 350 - Letter of Compliance was submitted. Approved drawings of the signs and devices will be forthcoming.

SAFETY-EEO

PCI submitted a Safety Plan and EEO Policy. Their Safety Officer is Matt Guilderhuis & EEO Officer is William Rosso.

The required posters were given to PCI. The posters will be posted at the Project site along with emergency telephone numbers.

ADMINISTRATIVE ITEMS

The following items were briefly discussed or the Contractor submitted:

1. Bar Chart - will be submitted.
2. Material Supplier list - submitted.
3. Labor payrolls are due weekly.
4. Subcontractor request forms - will be submitted.
5. Ken Larson Peer Engineering (952-831-3341) requested 24hr notice prior to starting any work in contaminated soils area of project - notified to be on site June 18th starting at first contaminated site right away.
6. Cab cards are required on all trucks.
7. OSHA regulations relating to back-up warning devices on vehicles was reviewed.
8. Erosion Control Supervisors Larry Butts & Duayne Fobe.
9. 3 names and numbers of representatives who can be contacted after working hours in regard to traffic control - submitted.
10. Field office likely to be located below bridge south side in fenced area.
11. Eric Embacher notified United rentals that 5 CMS are to be on site at all times.
12. Steve Lubbert 763-591-4679 would like 2 week lead time for request for patrol officers. Planning on having one on site the first week starting Monday, June 18th 9:00am to 3:00pm and through the first weekend closure Friday, June 22nd 8:00pm to Monday 5:00am.

13. Mn/DOT Resident Office, 2229 Pilot Knob Rd., Mendota Heights, Mn.55120.

Note: This report is simply a summary of the main topics of conversation, and it is not intended to be a complete record of all that was said. Please report any discrepancies to me immediately.

Eric Embacher

Eric Embacher
Project Engineer

ATTENDANCE RECORD

DATE: 6/6/07 TIME: 1:00 pm MODERATOR: E. Embacher

SUBJECT: S.P. 2783-107 PCI

NAME/REPRESENTING	TO RECEIVE A COPY OF THE MINUTES, PLEASE INCLUDE COMPLETE MAILING ADDRESS	TELEPHONE
Eric Embacher / MnDOT	2229 Pilot Knob Rd Mendota Hts	651-406-4725
Darryl Doughty	Timme PO Box 200 Endeavor WI 53930	608-587-2765
Ken Larsen / Peer Engineering	7615 Golden Triangle Drive, Ste N Eden Prairie, MN 55344	952-831-3341
TODD M. LANTTO	" "	" "
STEVE WESTON	PCI	763-350-3539
Tom Sloan	"	612.940.0397
STEVE LUBBERT	STATE PATROL 5141 LAKELAND AVE, Crystal 55429	763-591-4679
DANIEL E. BALLING	Killmer Elect.	763-425-2525
SEVERT HESCH	Killmer Elec.	612-363-5143
David Tiegs	Midwest Land Surveyors	763-712-9099
DALE NELSON	MNDOT	651 779-1050
Scott Hansen	MnDOT Traffic Management System	651-234-7982
Bill Olson	MNDOT Maintenance Camden Truck Station	612-520-3560
Helen Baker	14369 93rd Ave No Maple Grove MN 55369 Golden Valley Transfer	763 420 6760
BARRY NELSON	2229 PILOT KNOB RD. MENDOTA HTS	651-406-4725
Brad Schmidtbauer	North Valley Inc.	(763) 274-2580
Ron Mulvaney	MnDOT MATERIALS	651-366-5575
JEFF MOREY	MN/DOT TRAFFIC	651-775-3310
Randy Kline	Boschung America	724-681-3568
NATE TRESSLER	2229 PILOT KNOB RD. MENDOTA HEIGHTS	651 775-1160

ATTENDANCE RECORD

DATE: 6/6/07 TIME: 1:00 pm MODERATOR: E. Embacher

SUBJECT: S.P. 2783-107 PCI

NAME/REPRESENTING	TO RECEIVE A COPY OF THE MINUTES, PLEASE INCLUDE COMPLETE MAILING ADDRESS	TELEPHONE
Beth Petrowske / Mn/DOT	1500 W. County Rd. B Roseville, MN 55	651-234-7508
Mark LeMay	Mn DOT	651 775-1175
MICHAEL N. SCHERBER	HENNEPIN CTY. 1600 PRAIRIE DR MEDINA MN 55340	612-596-0308
Tiffany Kautz / Mn/DOT - Design	1500 W. Cty Rd B2 Roseville, MN 55113	651/234-7641
Tim SINCLAIR	1500 W. CTY Rd B2 ROSEVILLE MN. 55113	(651) 234-7354
Alex Govrik Mn/DOT Lighting	1500 W Cty Rd. B2 Roseville, MN 55113	651-775-9495
Paul Babin MN/DOT Lighting	"	651-755-8697
Emmanuel Taye MN/DOT	"	651-234-7363
Ken Lockaton Bosching Amer.	930 CASS ST. New Castle, Pa. 16101	724-510-8059
Tim Imholte PCI		612-803-5383
MARK Jensen Highway Technologies	4700 Lyndale Ave N. Mpls. MN	(c) 612-383-3940 612-521-4200
Doug MARAY Mpls TRAFFIC	doug.maday@ci.minneapolis.mn.us	612 673 5755 612 221 5274
BRAD ESTOCHEN MNDOT		651-234-7924
Rich Conroy PCI		612-875-9023

State of Minnesota Department of Transportation

Preconstruction Meeting Agenda

S.P. : 2783-107

Date: June 6, 2007 **Time: 1:00pm**

Contractor: PCI

Location: Mendota Resident Office

Contract No.: S07073

Engineer: Eric Embacher, Barry Nelson
Inspector: Mark LeMay-Grading
Inspector: Harvey Unruh-Bridges

INTRODUCTION – pass around sign in sheet

PROJECT DESCRIPTION

S.P.: 2783-107

Location: In Hennepin County on T.H. 35W North of T.H. 94 to Stinson Blvd. In the City of Minnespolis

Work type: Concrete Crack and Joint repair, concrete planning, concrete and bituminous surfacing, bituminous mill and overlay, anti-icing system, lighting, guardrail, TMS and Bridge rehabilitation Br No.'s 27873, 27874, 27902, 27879B, 27879A, 27880A, 27880, 27903, 9340, 27888, 27887, 27893

Letting date: April 27, 2007

Award date: May 17, 2007

Contract Approval date: June 1, 2007

Starting date: June 4, 2007

Intermittent completion dates: September 21, 2007

Completion date: October 26, 2007

CONTRACTOR'S SCHEDULE

Work hours: 6 12hr days begin June 18

Joints not a problem

Superintendent name & phone numbers:

wire issue?

Steve Weston
Tim Imbolte

delivery of armor
1st of Aug

outside of river bridge

List of 3 project contacts available 24/7:

1)
2)

3)

Who's doing traffic control: United Rentals

List of 3 traffic contacts available 24/7:

1) submitted

2)

3)

360° rotor beam closures require flagger

Who is responsible during non-work periods? United

List of subcontractors (submitted?) ✓

Proposed schedule (CPM schedule submittal and approval within 20 days of Contract approval date)

no ramp work in 4A
3A + ramp work @ south

UTILITIES

Gopher State One Call 48 hours prior to excavations operations 1-800-252-1166

SUPPLIERS

Material suppliers (submitted?) ✓

Material sources (submitted?) ✓

SAFETY

Safety officer name: Matt Guidernus

Safety plan (submitted?) Health & Safety to be submitted

All OSHA regulations apply

Note: All units with obstructed rear view must have back up warning device <u>audible</u> above surrounding noise

Peer
Todd - contact 24hr notices

EEO

EEO officer name:

EEO policy (submitted?)

Furnish necessary posters to contractor. Need to be posted on jobsite in conspicuous manner.

EROSION/PERMITS

Erosion control plan (submitted?)
Certified Erosion Control Supervisor: Bill Hines; Larry Botts
Certified Erosion Control Foremen: Duane Fobbe

SPECIAL PROVISIONS

DIVISION S (Grading)
PCMS's, CPM requirements, contaminated water, weekend closures 1st 6 weekends
DIVISION SB (Bridge)
DIVISION SL (Lighting)
Light poles
DIVISION SS (Signals)
DIVISION ST (Signs)
DIVISION SZ (TMC)

ADMINISTRATIVE ITEMS

Contractor field office
Location:
Phone number:

Mn/DOT field office Under Bridge
Location:
Phone number:

Send All Correspondence To:
Mendota Resident Office
2229 Pilot Knob Road
Mendota Heights, MN 55120
Phone: 651-406-4725
Fax: 651-406-4724

Partial estimates are processed monthly-working schedule submittal required

Weight Information Cab cards are required on trucks hauling bit, aggregate, concrete and grading materials.

24 hour notice on staking – Contractor staking Midwest

Written request of sublet (submitted?) ✓

Authorized signature form (submitted?) ✓

Haul road requests (submitted?)

Weekly progress meetings
Day: ~~Wednesday~~ Tuesday
Time: ~~11:00 a.m.~~ 1:00 p.m.

ADDITIONAL ISSUES

Temporary traffic control devices to meet NCHRP 350 crash test requirements Coming

Extra ordinary enforcement

retime lights on 280 for closures

trailer under Bridge

loops will be off line

WZ Speed limit
permanent 45 mph?

lots of lighting already out

Concrete to midwest asphalt – old Hwy 8 Belair

~~bit~~ conc milling to TH36

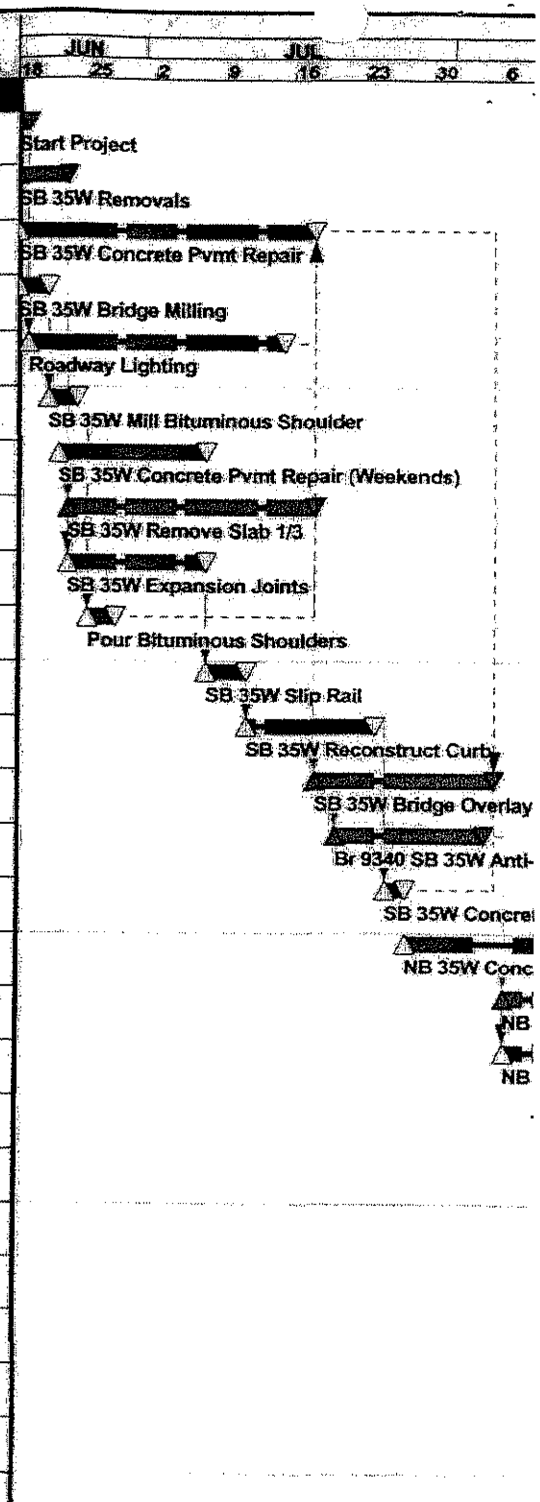
Schedule 6-14-07

ric Embacher
t 02
E-02-07

HOLD Do Not Destroy
35W Bridge 9340
These documents are to be held for
The Bridge Legal Hold.
M. Bliss Mn/DOT Records Manager

EXHIBIT NO: 3
Date: 4-14-08
JULIE A RIXE
COURT REPORTER

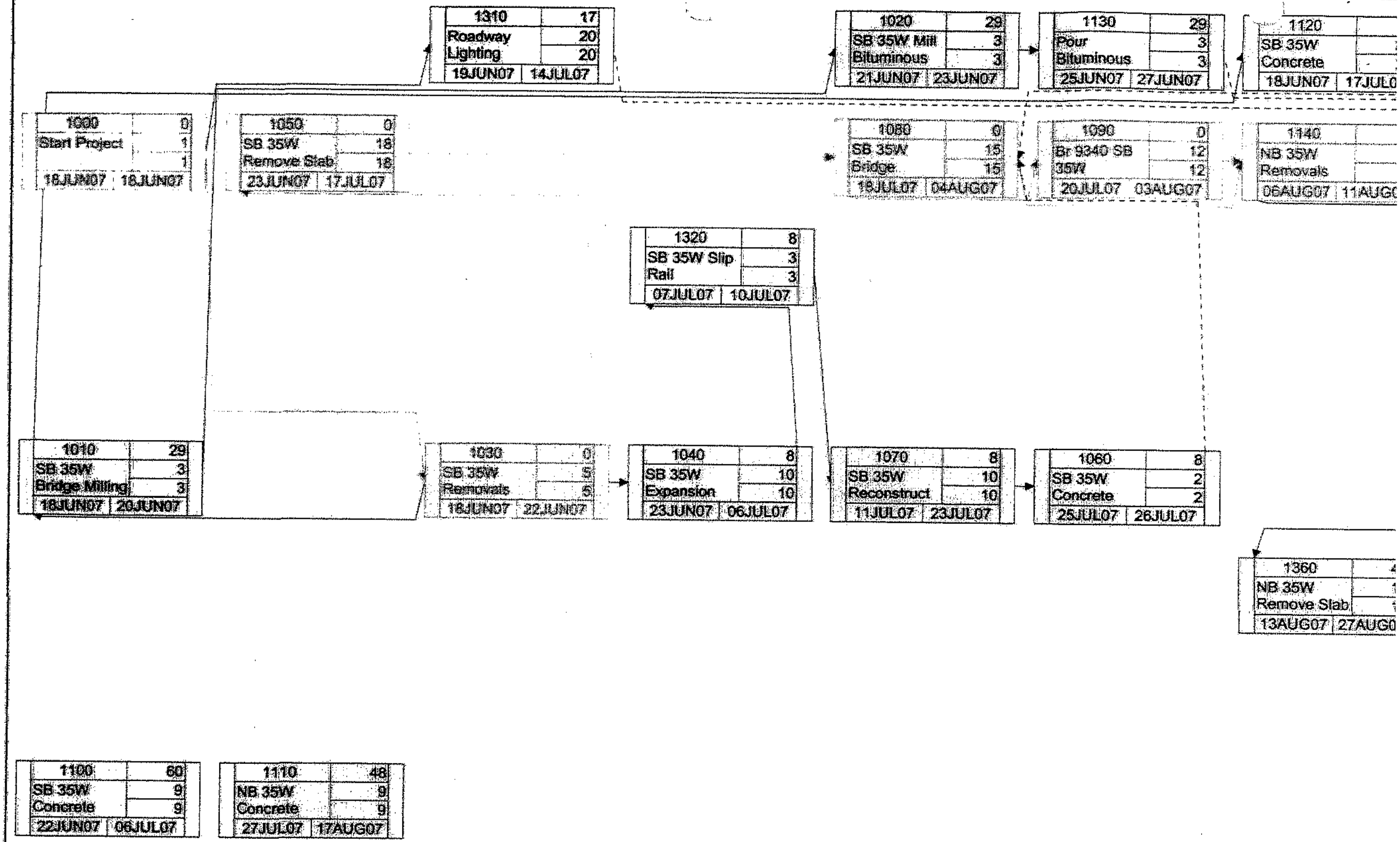
Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Total Float	Predecessors	Successors
1000	Start Project	1	18JUN07	18JUN07	0		1030*, 1310*
1030	SB 35W Removals Bridge + #	5	18JUN07	22JUN07	0	1000*	1010*, 1040*, 1050*
1120	SB 35W Concrete Pvmt Repair split by stage	23	18JUN07	17JUL07	15	1010*, 1130, 1310	1080
1010	SB 35W Bridge Milling Bridge #	3	18JUN07	20JUN07	29	1030*	1020*, 1120*
1310	Roadway Lighting	20	19JUN07	14JUL07	17	1000*	1120
1020	SB 35W Mill Bituminous Shoulder inside + outside	3	21JUN07	23JUN07	29	1010*	1130*
1100	SB 35W Concrete Pvmt Repair (Weekends)	9	22JUN07*	06JUL07	60		
1050	SB 35W Remove Slab 1/3 type better define	18	23JUN07	17JUL07	0	1030*	1080*
1040	SB 35W Expansion Joints split by stage	10	23JUN07	06JUL07	8	1030*	1320*
1130	Pour Bituminous Shoulders inside + outside	3	25JUN07	27JUN07	29	1020*	1120
1320	SB 35W Slip Rail	3	07JUL07	10JUL07	8	1040*	1070*
1070	SB 35W Reconstruct Curb	10	11JUL07	23JUL07	8	1320*	1060*
1080	SB 35W Bridge Overlay split by stage	15	18JUL07	04AUG07	0	1050*, 1060, 1120	1090*, 1140*
1090	Br 9340 SB 35W Anti-icing System	12	20JUL07	03AUG07	0	1080*	1140*
1060	SB 35W Concrete End Posts	2	25JUL07	26JUL07	8	1070*	1080
1110	NB 35W Concrete Pvmt Repair (Weekends)	9	27JUL07*	17AUG07	48		
1140	NB 35W Removals Stages	5	06AUG07	11AUG07	0	1080*, 1090*	1150*, 1230*, 1350*, 1360*
1350	NB 35W Milling	3	06AUG07	09AUG07	14	1140*	1250*
1250	Pipe Removals stage	3	10AUG07	13AUG07	14	1350*	1270*
1150	NB 35W Expansion Joints Stages	4	13AUG07	16AUG07	0	1140*	1160*
1230	NB 35W Concrete Pvmt Repair	20	13AUG07	06SEP07	11	1140*	1280*
1360	NB 35W Remove Slab 1/3	12	13AUG07	27AUG07	44	1140*	1370*
1270	Pipe Work in Median	20	14AUG07	07SEP07	14	1250*	1260*
1160	NB 35W Drill & Grout Anchors	2	17AUG07	18AUG07	0	1150*	1170*, 1180*
1180	NB 35W Reseal E-8's, Slope Paving	2	20AUG07	21AUG07	0	1160*	1190*
1170	NB 35W Slip Rail	2	20AUG07	21AUG07	63	1160*	1190



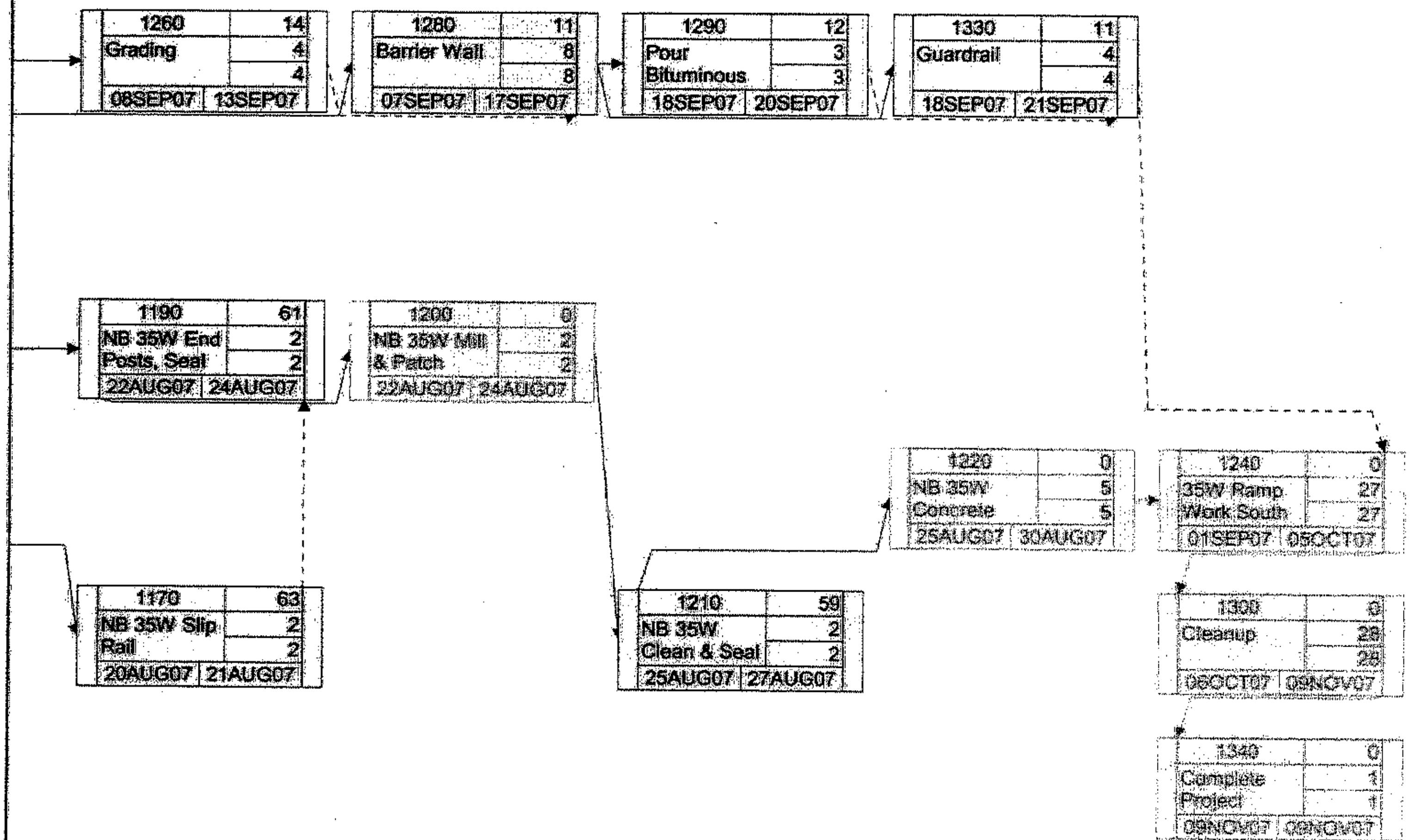
Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Total Float	Predecessors	Successors
1380	Br 9340 NB 35W Anti-icing System	12	30AUG07	14SEP07	45	1370*	
1240	35W Ramp Work South of BR 9340	27	01SEP07	05OCT07	0	1220*, 1330	1300*
1280	Barrier Wall	8	07SEP07	17SEP07	11	1230*, 1260	1290*, 1330*
1260	Grading median	4	08SEP07	13SEP07	14	1270*	1280
1330	Guardrail	4	18SEP07	21SEP07	11	1280*, 1290	1240
1290	Pour Bituminous Shoulders define	3	18SEP07	20SEP07	12	1280*	1330
1300	Cleanup	2[illegible]	06OCT07	09NOV07	0	1240*	1340*
1340	Complete Project	1	09NOV07	09NOV07	0	1300*	

JUN 18 25 | JUL 2 9 16 23 30 | 8

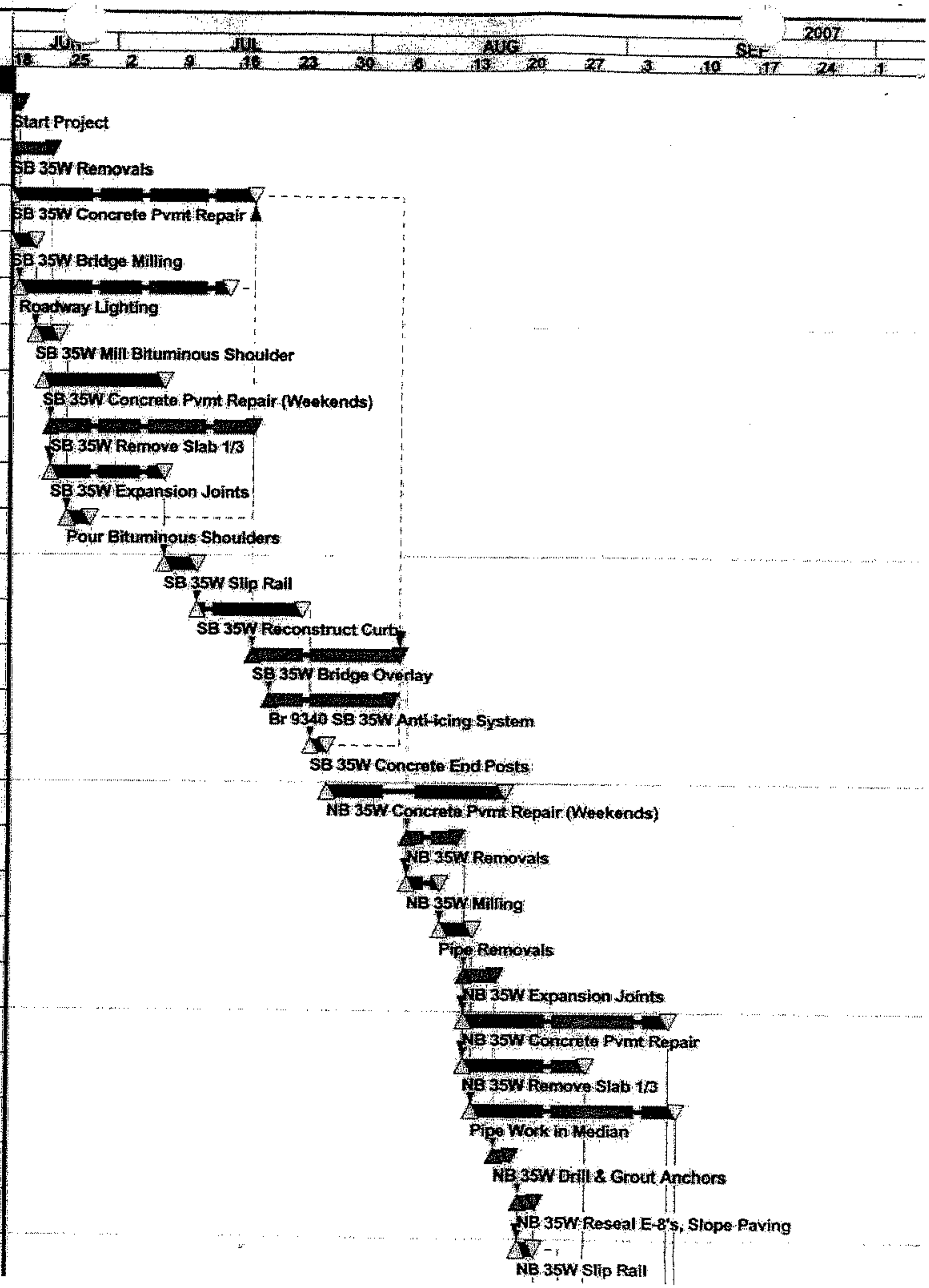
Pier protection items
Split out ramps + tie closures



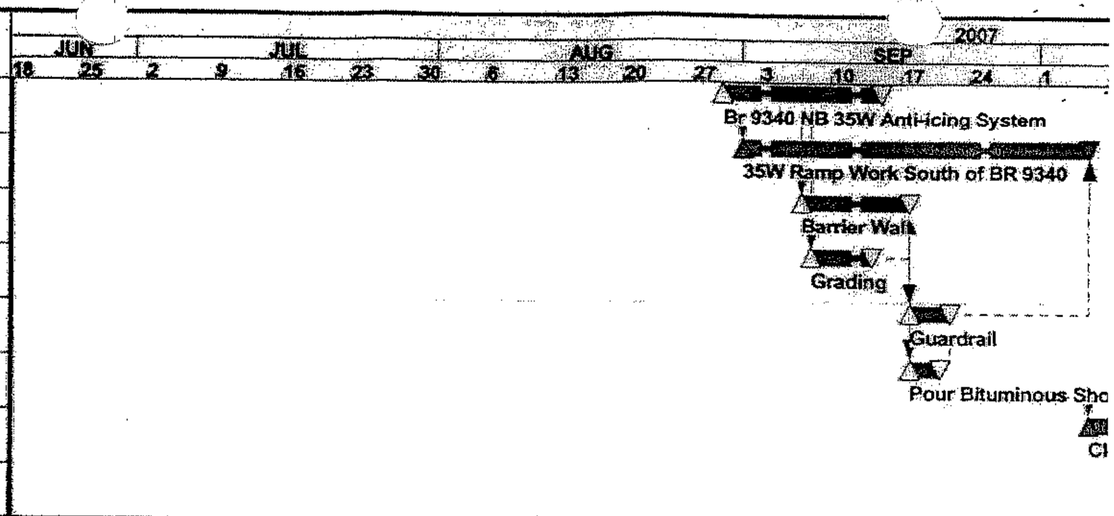
1310 17 Roadway Lighting 20 20 19JUN07 14JUL07
1020 29 SB 35W Mill Bituminous 3 3 21JUN07 23JUN07
1130 29 Pour Bituminous 3 3 25JUN07 27JUN07
1120 SB 35W Concrete 18JUN07 17JUL0
1000 0 Start Project 1 1 18JUN07 18JUN07
1050 0 SB 35W Remove Slab 18 18 23JUN07 17JUL07
1080 0 SB 35W Bridge 15 15 18JUL07 04AUG07
1090 0 Br 9340 SB 35W 12 12 20JUL07 03AUG07
1140 NB 35W Removals 06AUG07 11AUG0
1320 8 SB 35W Slip Rail 3 3 07JUL07 10JUL07
1010 29 SB 35W Bridge Milling 3 3 18JUN07 20JUN07
1030 0 SB 35W Removals 5 5 18JUN07 22JUN07
1040 8 SB 35W Expansion 10 10 23JUN07 06JUL07
1070 8 SB 35W Reconstruct 10 10 11JUL07 23JUL07
1060 8 SB 35W Concrete 2 2 25JUL07 26JUL07
1360 NB 35W Remove Slab 13AUG07 27AUG0
1100 60 SB 35W Concrete 9 9 22JUN07 06JUL07
1110 48 NB 35W Concrete 9 9 27JUL07 17AUG07


1260 14
Grading 4
4
08SEP07 13SEP07
1280 11
Barrier Wall 8
8
07SEP07 17SEP07
1290 12
Pour Bituminous 3
3
18SEP07 20SEP07
1330 11
Guardrail 4
4
18SEP07 21SEP07
1190 61
NB 35W End Posts, Seal 2
2
22AUG07 24AUG07
1200 0
NB 35W Mill & Patch 2
2
22AUG07 24AUG07
1170 63
NB 35W Slip Rail 2
2
20AUG07 21AUG07
1210 59
NB 35W Clean & Seal 2
2
25AUG07 27AUG07
1220 0
NB 35W Concrete 5
5
25AUG07 30AUG07
1240 0
35W Ramp Work South 27
27
01SEP07 05OCT07
1300 0
Cleanup 28
28
06OCT07 09NOV07
1340 0
Complete Project 1
1
09NOV07 09NOV07

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
1000	Start Project	1	18JUN07	18JUN07
1030	SB 35W Removals	5	18JUN07	22JUN07
1120	SB 35W Concrete Pvmt Repair	23	18JUN07	17JUL07
1010	SB 35W Bridge Milling	3	18JUN07	20JUN07
1310	Roadway Lighting	20	19JUN07	14JUL07
1020	SB 35W Mill Bituminous Shoulder	3	21JUN07	23JUN07
1100	SB 35W Concrete Pvmt Repair (Weekends)	9	22JUN07*	06JUL07
1050	SB 35W Remove Slab 1/3	18	23JUN07	17JUL07
1040	SB 35W Expansion Joints	10	23JUN07	06JUL07
1130	Pour Bituminous Shoulders	3	25JUN07	27JUN07
1320	SB 35W Slip Rail	3	07JUL07	10JUL07
1070	SB 35W Reconstruct Curb	10	11JUL07	23JUL07
1080	SB 35W Bridge Overlay	15	18JUL07	04AUG07
1090	Br 9340 SB 35W Anti-icing System	12	20JUL07	03AUG07
1060	SB 35W Concrete End Posts	2	25JUL07	26JUL07
1110	NB 35W Concrete Pvmt Repair (Weekends)	9	27JUL07*	17AUG07
1140	NB 35W Removals	5	06AUG07	11AUG07
1350	NB 35W Milling	3	06AUG07	09AUG07
1250	Pipe Removals	3	10AUG07	13AUG07
1150	NB 35W Expansion Joints	4	13AUG07	16AUG07
1230	NB 35W Concrete Pvmt Repair	20	13AUG07	06SEP07
1360	NB 35W Remove Slab 1/3	12	13AUG07	27AUG07
1270	Pipe Work in Median	20	14AUG07	07SEP07
1160	NB 35W Drill & Grout Anchors	2	17AUG07	18AUG07
1180	NB 35W Reseal E-8's, Slope Paving	2	20AUG07	21AUG07
1170	NB 35W Slip Rail	2	20AUG07	21AUG07



Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
1380	Br 9340 NB 35W Anti-icing System	12	30AUG07	14SEP07
1240	35W Ramp Work South of BR 9340	27	01SEP07	05OCT07
1280	Barrier Wall	8	07SEP07	17SEP07
1260	Grading	4	08SEP07	13SEP07
1330	Guardrail	4	18SEP07	21SEP07
1290	Pour Bituminous Shoulders	3	18SEP07	20SEP07
1300	Cleanup	28	06OCT07	09NOV07
1340	Complete Project	1	09NOV07	09NOV07



SA PRO BASELINE CHECKER

Version 3.48

BASELINE: BL35 Analysis Date: 06-14-2007 at 10:30:49

Project computes durations in Days.

ACTIVITIES

There are a total of 39 activities in this schedule.
Listed by category type, the totals are;

- Fixed Duration CPM Activity:
  - Tasks = 39
- Resource-driven Duration CPM Activities:
  - Independent = 0
  - Meeting = 0
- Zero Duration Mileposts:
  - Start Milestones = 0
  - Finish Milestones = 0
  - Start Flags = 0
  - Finish Flags = 0
- Summary (Non-CPM) Duration Activities:
  - Hammocks = 0
  - WBS = 0

CAUTION: Many contracts specify the maximum or minimum number of activities allowed in the schedule. For this purpose, the first two categories above are usually totaled = 39 activities.

CRITICAL ACTIVITIES: Many specifications limit the percentage of activitiesthat can be critical or near-critical in the Baseline Schedule. A typical upper limit is a maximum of 30% critical and 50% critical or near-critical.

Critical Activities = 35.90%
Critical and Near-
Critical Activities = 46.15% (based upon Total Float less than 11 .)

ACTIVITIES WITH TOO MUCH FLOAT

ACT	CALENDAR	FLOAT	TITLE
1100	2	60	SB 35W Concrete Pvmt Repair (Weekends)
1170	1	63	NB 35W Slip Rail
1190	1	61	NB 35W End Posts, Seal Cracks
1210	1	59	NB 35W Clean & Seal Joints

4 activities have too much float.

NOTE: Activities with too much float are an indication of a missing successor relationship. As a 'rule of thumb,' activities should not have float greater than one half the number of working days in a project. Confirm that these activities truly can begin as late as allowed without delaying the project.

ACTIVITIES ON THE LONGEST PATH

ACT	CALENDAR	FLOAT	TITLE
1000	1	0	Start Project
1030	1	0	SB 35W Removals
1050	1	0	SB 35W Remove Slab 1/3
1080	1	0	SB 35W Bridge Overlay
1090	1	0	Br 9340 SB 35W Anti-icing System
1140	1	0	NB 35W Removals
1150	1	0	NB 35W Expansion Joints
1160	1	0	NB 35W Drill & Grout Anchors
1180	1	0	NB 35W Reseal E-8's, Slope Paving
1190	1	61	NB 35W End Posts, Seal Cracks
1200	1	0	NB 35W Mill & Patch
1210	1	59	NB 35W Clean & Seal Joints
1220	1	0	NB 35W Concrete Surface Repair
1240	1	0	35W Ramp Work South of BR 9340
1300	1	0	Cleanup
1340	1	0	Complete Project

16 activities were on the Longest Path.
NOTE: The most crtical float for this project is 0.
Key to Calendars:

39 activities out of 39 had numeric Activity IDs.
NOTE: Many experienced Schedulers tend to not use numeric Activity IDs but use a combination of letters and numbers. P3 automatically right-justifies numbers (by padding the left with blanks.) Any IDs added with letters are left-justified, making a confusing and jumbled look to any listing. Recommend that you begin IDs with a letter.

Of the 39 CPM-type activities in the schedule,
Average duration of these activities was 8.51 Days.
Mean of the durations was 14.50 Days.
Standard Deviation of the difference was 7.72 Days.

ACTIVITY DURATION HISTOGRAM (excluding Milestones)

DURATION	COUNT	GRAPH
0	0	
1-5	22	###
6-10	5	#############
11-15	5	#############
16-20	4	##########
21-25	1	###
26-30	2	#####

39 of Tasks and Resource Activities (Non-Milestone) are represented above.
19 activities are 1 to 5 Days long.
The shortest duration is 1 Day.
The longest duration is 28 Days.
NOTE: Many contracts specify the minimum or maximum allowable durations of activities included in the schedule. It is best to not consider milestones or summary activities when qualifying durations. The analysis above only considers Task, Independent, and Meeting type

activities and excludes all others.

1-DAY ACTIVITY DURATIONS

ACT	DURATION	FLOAT	ACT TYPE	TITLE
1000	1	0	Task milestone	Start Project
1340	1	0	Task	Complete Project

2 activities had 1-day durations.
CAUTION: 1-day activities are too short to manage properly. You cannot accurately status partial completion of these activities. In addition, you cannot expedite a string of 1-day activities without deleting and re-defining activities. We recommend that you combine this activity with its predecessor or successor activity.

ACTIVITY DURATIONS GREATER THAN 20

ACT	DURATION	FLOAT	ACT TYPE	TITLE
1120	23	15	Task	SB 35W Concrete Pvmt Repair
1240	27	0	Task	35W Ramp Work South of BR 9340
1300	28	0	Task	Cleanup

3 activities had long durations.
CAUTION: Many specifications require activities to be defined with durations less than a set number. The intent of this requirement is to allow for better monitoring and control of the work described by the activity. Typically, the reviewer is allowed to wave this requirement in the case of Hammocks or deliveries, etc.

SUSPICIOUS ACTIVITY DURATIONS

ACT	DURATION	FLOAT	TITLE
1050	18	0	SB 35W Remove Slab 1/3
1090	12	0	Br 9340 SB 35W Anti-icing System
1100	9	60	SB 35W Concrete Pvmt Repair (Weekends)
1110	9	48	NB 35W Concrete Pvmt Repair (Weekends)
1120	23	15	SB 35W Concrete Pvmt Repair
1240	27	0	35W Ramp Work South of BR 9340
1280	8	11	Barrier Wall
1360	12	44	NB 35W Remove Slab 1/3
1380	12	45	Br 9340 NB 35W Anti-icing System

9 activities had suspicious activity durations.
CAUTION: Some schedulers arbitrarily modify activity durations to make various near-critical logic chains match total durations exactly, thus artificially producing multiple critical paths. The above listed activities have 'odd' durations, which should be investigated further, especially if they are critical.

0 activities have percent completes different from duration estimates.

0 activities had 'NOTICE TO PROCEED' in their descriptions.
CAUTION: There does not appear to be a Notice To Proceed in this schedule. All projects run under the concept of"Time Is Of The Essence" require a formal declaration of the start of the project.

0 activities had 'MOBILIZE' in their descriptions.

CAUTION: There does not appear to be a Mobilization in this schedule. It is often required by specification, or specifically called out as a pay item, and can be important legal point in delay disputes.

0 activities had 'SUBSTANTIAL COMPLETION' in their descriptions.

CAUTION: There does not appear to be a Substantial Completion in this schedule. Regardless of whether it is called out by specification, it is widely recognized legally as the termination point for the assessment of Liquidated Damages and thus should be included.

0 REVIEW or APPROVAL activities appear to exist.

CAUTION: It is in the Owner's and Contractor's best interests to include all significant submittals in the schedule. It serves as a checklist, helping the Contractor to remember this important task. More importantly, the Submittal-Review-Deliver process frequently impacts the critical path of projects with major items to install.

CAUTION: You may have submittal activities but they do not say 'SUBMIT.' Sometimes the schedule will just say, 'HVAC DRAWINGS'. This is not enough as it may or may not include the review period. Suggest that you require 'SUBMIT' and 'REVIEW' as separate and distinct acts.

DUPLICATE ACTIVITY DESCRIPTIONS

ACT	DURATION	FLOAT	TITLE
1130	3	29	Pour Bituminous Shoulders
1290	3	12	Pour Bituminous Shoulders

define better

2 duplicate activity descriptions exist.

CAUTION: Activities with duplicate descriptions are confusing to track. Even though they may be coded for different areas, this is not always clear on print-outs. Suggest that you start each description with 'AREA A - (description)' instead.

ACTIVITY DISTRIBUTION HISTOGRAM (using 1/2 Float)

MONTH	ACTIVE	GRAPH
Jun 2007	6	########################
Jul 2007	13	##
Aug 2007	14	###
Sep 2007	14	###
Oct 2007	4	################
Nov 2007	2	########

53 activities are planned to be active during the above months.

NOTE: You should confirm that the schedule is roughly equally detailed from the start to the finish of the project. The above curve should be somewhat flat and balanced on both ends. A lower second half might indicate an under-developed finish plan.

A schedule with an underdeveloped ending indicates that the Contractor has not fully taken into account all issues and is thus less accurate. It won't do you any good to be on schedule just to find out that the finish did not provide enough time to complete.

ACTIVITY CODE ANALYSIS

Activity Code Check:

No Activity ID Fields exist.
NOTE: Activity ID Fields are reserved parts of the Activity ID that can be used to group related activities. Typically, Alpha/Numeric ID is used and the first 1 or 2 spaces are used to define Areas, Phases, etc. This older technique is now less favored than the use of more versatile Activity Codes.

0 account codes are reserved by P3 and should not be used.
ERROR: Internal software failure. File TEMPFILE.SAF not created.
Suggest you delete unused Code Field "Milestone".

Suggest you delete unused Code Field "Item Name".

Suggest you delete unused Code Field "Location".

Suggest you delete unused Code Field "Step".

BLANK ACTIVITY CODES

ACT	CODE FIELD	ACTIVITY TITLE
1000	Responsibility	Start Project
1010	Responsibility	SB 35W Bridge Milling
1020	Responsibility	SB 35W Mill Bituminous Shoulder
1030	Responsibility	SB 35W Removals
1040	Responsibility	SB 35W Expansion Joints
1050	Responsibility	SB 35W Remove Slab 1/3
1060	Responsibility	SB 35W Concrete End Posts
1070	Responsibility	SB 35W Reconstruct Curb
1080	Responsibility	SB 35W Bridge Overlay
1090	Responsibility	Br 9340 SB 35W Anti-icing System
1100	Responsibility	SB 35W Concrete Pvmt Repair (Weekends)
1110	Responsibility	NB 35W Concrete Pvmt Repair (Weekends)
1120	Responsibility	SB 35W Concrete Pvmt Repair
1130	Responsibility	Pour Bituminous Shoulders
1140	Responsibility	NB 35W Removals
1150	Responsibility	NB 35W Expansion Joints
1160	Responsibility	NB 35W Drill & Grout Anchors
1170	Responsibility	NB 35W Slip Rail
1180	Responsibility	NB 35W Reseal E-8's, Slope Paving
1190	Responsibility	NB 35W End Posts, Seal Cracks
1200	Responsibility	NB 35W Mill & Patch
1210	Responsibility	NB 35W Clean & Seal Joints
1220	Responsibility	NB 35W Concrete Surface Repair
1230	Responsibility	NB 35W Concrete Pvmt Repair
1240	Responsibility	35W Ramp Work South of BR 9340
1250	Responsibility	Pipe Removals
1260	Responsibility	Grading
1270	Responsibility	Pipe Work in Median
1280	Responsibility	Barrier Wall
1290	Responsibility	Pour Bituminous Shoulders

*** REMAINING LIST OF ACTIVITIES TERMINATED DUE TO LENGTH ***

78 blank codes exist in this project.
ERROR: It is easy to miss entering a code field when building a schedule. It is important that all activities have a code so that they won't be overlooked in reports, filters, and views. Suggest that you look for a similar activity and use the code found there. If no code applies, consider 'GENERAL' or 'OVERVIEW.'
NOTE: Any Activty Code Fields that are complety unused will not be reported upon in the above listing.

EXPANDED ACTIVITY CODE FIELD LAYOUT (# Activities):

Responsibility
- (0) Diamond Surface
- (0) High Five
- (0) Insituform
- (0) Killmer Electric
- (0) Midwest land Survey
- (0) North Valley
- (0) Progressive Contractors, Inc.
- (0) Terra Services
- (0) Timme
- (0) United Rentals

Tie to activity codes

Area/Department
- (0) Stage 2
- (0) Stage 3
- (0) Stage 4
- (0) Stage 5
- (0) Stage 6

NOTE: Look through the above list for under-represented codes. This might indicate missing activities or a lack of proper detail. Nearly identical descriptions might be in error and will lead to confusion. Missing codes may indicate missing work.

WBS Code Check:

No Work Breakdown (WBS) Assignments exist.
NOTE: Use of WBS assignments is becoming increasingly more prevalent, especially in large, enterprise scheduling situations. It has the built-in ability to summarize groups of activities without adding additional logical relationships, such as required by hammocks.

RELATIONSHIPS

This project has a total of 45 relationships.

0 relationships are bogus.

ACTIVITIES WITHOUT PREDECESSORS

ACT	START	FLOAT	TITLE
1000	18JUN07	0	Start Project
1100	22JUN07	60	SB 35W Concrete Pvmt Repair (Weekends) tie in
1110	27JUL07	48	NB 35W Concrete Pvmt Repair (Weekends)

3 activities were found without logical predecessors.
CAUTION: A perfect schedule will only have one activity without a logical predecessor and that activity should be Notice To Proceed.

Schedules created this way are easier to manage and use for delay analysis. This also prevents activities that start too early.

ACTIVITIES WITHOUT SUCCESSORS

ACT	FINISH	FLOAT	TITLE
1100	06JUL07	60	SB 35W Concrete Pvmt Repair (Weekends)
1110	17AUG07	48	NB 35W Concrete Pvmt Repair (Weekends)
1340	09NOV07	0	Complete Project
1380	14SEP07	45	Br 9340 NB 35W Anti-icing System

4 activities were found without logical successors.
CAUTION: A perfect schedule will only have one activity without a logical successor and that activity should be Project Complete. Schedules created this way are easier to manage and use for delay analysis. This also prevents activities with incorrect float values.

MULTIPLE NEAR-CRITICAL PATH ACTIVITIES

ACT	# PATHS	FLOAT	TITLE
1040	2	8	SB 35W Expansion Joints
1050	3	0	SB 35W Remove Slab 1/3
1060	2	8	SB 35W Concrete End Posts
1070	3	8	SB 35W Reconstruct Curb
1080	2	0	SB 35W Bridge Overlay
1090	2	0	Br 9340 SB 35W Anti-icing System
1320	2	8	SB 35W Slip Rail

7 multiple near-critical activities on independent paths were found.
NOTE: Project Critical Float is 0 and any activity with a float value within 10 of this was considered as near-critical.
As this is a Baseline Schedule, A Project Critical Float of 0 was used.
CAUTION: CPM networks should not have multiple critical paths without through justification. Some Contractors adjust durations, logic, and lead times so as to artificially create multiple paths. This increases the number of critical activities which increases the potential that any Owner-caused delay will look like a delay to the project. Detail analysis of the above activities is recommended.
0 out of a possible of 0 relationship chains are interruptible.
0 multiple relationships are found.
0 apparent odd relationships found.

ODD LAGS OR LEADS USED

PRED ACT	SUCC ACT	LAG	REL	TITLE
1090	----------	----	---	Br 9340 SB 35W Anti-icing System
	1140	1	FS	NB 35W Removals
1220	----------	----	---	NB 35W Concrete Surface Repair
	1240	1	FS	35W Ramp Work South of BR 9340

2 odd lags are listed above.
NOTE: Lags and Leads are time intervals imposed between two activities.

They are legitimately used to describe linked activities which are staggered or to represent a time interval, say for curing concrete.

NOTE: Lags and leads can be also used to 'hide' float or otherwise artificially expand a project schedule without being visible on plots or in most reports. Negative lags can hide an unworkable project schedule by shortening it without changing activity durations.

CAUTION: It is highly unusual for Finish-to-Start (FS) relationships to have positive lags. Recommend that you have the creator of the schedule document what that lead represents.

CAUTION: You must consider the calendar when using lags. Lags use the calendar of the proceeding act. In the case of concrete curing (a 7-day/week event,) the lag would use the calendar of the concrete pour, which is probably a 5-day/week event. Just expanding the length by 7/5 does not fully consider where in the week it falls.

CAUTION: Lags make for poor long-lead times. You cannot status a lag or periodically review its progress. For lags of long duration (such as the delivery of a major piece of equipment,) it would be better to create an activity that would show-up on reports and would need to be statused every update.

ALL OTHER LAGS OR LEADS (OTHER THAN ODD) USED

PRED ACT	SUCC ACT	LAG	REL	TITLE	
1000				Start Project	
	1030	-1	FS	SB 35W Removals	
1080				SB 35W Bridge Overlay	
	1090	2	SS	Br 9340 SB 35W Anti-icing System	cure?
1300				Cleanup	
	1340	-1	FS	Complete Project	
1370				NB 35W Bridge Overlay	
	1380	2	SS	Br 9340 NB 35W Anti-icing System	cure?

4 'standard' lags were found.

NOTE: While usually considered acceptable for use in schedules, lags and leads should always be reviewed for reasonableness. In other words, there should be a reason for having each lag. If that reason is not apparent to you, then you should ask for it.

0 non-overlapping Lags found.

ACTIVITIES WITHOUT A FINISH RELATIONSHIP

ACT	FLOAT	TITLE	
1190	61	NB 35W End Posts, Seal Cracks	add relationship
1210	59	NB 35W Clean & Seal Joints	

2 Activities are missing Finish Relationships.

NOTE: The above activities do not have any constraint on completion, other than perhaps their start day. With the existing configuration a shortening or lengthing of the activity's duration will have no effect on project completion. Confirm that no succeeding activity is limited by this completion of this activity or add a FS or FF relationship to the appropriate activity.

CONSTRAINTS

0 constraints are bogus.

BASELINE SCHEDULE CONSTRAINTS

ACT	C-TYPE	DATE	TITLE
ok 1100	SNET	22JUN07	SB 35W Concrete Pvmt Repair (Weekends)
remove 1110	SNET	27JUL07	NB 35W Concrete Pvmt Repair (Weekends)

2 constraints were found in the project.

CAUTION: Baseline Schedules should only contain constraints that are specifically called out in the plans and specifications. Otherwise, this can be thought of as the Contractor is "reserving float" (which is typically not allowed.)

NOTE: If the Contractor resists removing non-contractual constraints, from the Baseline Schedule, the prudent Scheduler will note each such constraint in the review of the baseline and state that the Owner reserves the right to temporarily delete any such constraint when evaluating the effects of delays.

0 activities were coded for Zero Free Float.
0 Zero Total Float constraints were found in the project.
0 active Expected Finish constraints were found in the project.
0 improper Expected Finish constraints were found in the project.
0 Mandatory Start/Finish constraints were found in the project.
0 active START ON constraints were found in the project.

COST CHECKS

There are no cost accounts in this project to check.

LOG CHECKS

No Logs were found in the schedule.

END OF REPORT

Analysis complete at 10:40:55.

WEEKLY MEETING AT[illegible]NDANCE SHEET

S.P. 2783-107 | DATE 7/31/07 | TIME 1:00pm

NAME	REPRESENTING	EMAIL ADDRESS	PHONE NO.
Eric Embacher	MnDOT		651-406-4725
Tim Imholte	PCI		612-803-5383
Steve Weston	PCI		763-350-3539
JEFF MOREY	MN/DOT		651-775-3310
Mark Jensen	HJ		612-363-3940
TOM SLOAN	PCI		612 940 0397
BARRY NELSON	Mn DOT		651-406-4725
Alex Govrik	Mn/DOT		651-775-5476
[illegible]	Killmer Elec		612-363-5143
HARVEY UHRICH	MNDOT		651-775-1164
Gordon Bruhn	MN/DOT		651-775-1150
Wayne Pankow	MNDOT RTMC		651-341-3198

EXHIBIT NO. 4
Date: 4-14-08
JULIE A RIKE
COURT REPORTER

EXHIBIT NO: 5
Date: 4-14-08
JULIE A RIXE
COURT REPORTER

Minnesota Department of Transportation

Memo

Mendota South Resident Office[1]
2229 Pilot Knob Road
Mendota Heights, MN 55120

Office Tel: 651-406-4725
Fax:

TO: Tim Worke, Minnesota AGC; Matt Zeller, CPAM

FROM: Eric Embacher, Project Engineer

DATE: September 7, 2006

SUBJECT: S.P. 2783-107 I-35W Bridge Rehabilitation and Concrete Pavement Rehabilitation

Mn/DOT is preparing plans for the rehabilitation of bridges and pavement on I-35W from north of T.H. 94 to Stinson Blvd. The project is currently scheduled to be let in March 2007 with an anticipated construction start date in mid May 2007.

A complete closure of I-35W in either direction along with associated ramps on various weekends is being considered. The goal is to maintain two lanes of traffic in each direction on I-35W at all other times during the project except for intermittent temporary nighttime lane closures. Mn/DOT believes this consideration will result in a safer workzone, faster construction time and reduced traffic impacts to the traveling public.

Since reducing I-35W to a single lane for an extended period of time would have significant impacts to the traveling public, Mn/DOT is asking AGC and CPAM to assist in evaluating construction staging and project times. Mn/DOT would like to request one-on-one meetings with AGC and CPAM members to review the proposed concepts and provide feedback. We are tentatively looking at the following date and times:

Date: Tuesday, September 26, 2006
Location: Mendota Resident Office, 2229 Pilot Knob Rd., Mendota Heights, MN 55120
Times:

	Contractor #1	9:00 a.m.	Knish
	Contractor #2	10:15 a.m.	PCI
	Contractor #3	11:30 a.m.	Diamond Surfacing
	Contractor #4	1:15 p.m.	

Mn/DOT is looking for input with regards to:

- If I-35W were to be closed on weekends how many weekends would be needed to complete enough work to maintain two lanes of traffic in each direction throughout the remainder of the project?
- How would cure time of concrete repairs affect weekend production? What are options to minimize cure time?
- Would accelerated work over weekend closures add significant cost?
- Are there other alternatives ways to stage the work in order to maintain two lanes of traffic throughout the project?

Current project estimates consist of:

- 21,830 lin ft. of Joint Repair (Type A-1H) ½"
- 12,535 lin ft. of Longitudinal Joint Repair (Type A-5H) ½"
- 4,440 lin ft of Contraction Joint Repair (Type C-3D)
- 402 sq. yd. of Pavement Replacement (Type CX)
- 200 sq. yd. of Pavement Replacement Two Lane (Type D-2)
- 19,300 sq. ft. of Spot Surface Repair (Type B-2A)

Minnesota Department of Transportation
Metropolitan Division
South Resident Office – Construction
2229 Pilot Knob Road
Mendota Heights, MN 55120
Tel. 651-406-4725 Fax 651-406-4724

EXHIBIT NO: 6
Date: 4-14-08
JULIE A RIXE
COURT REPORTER

June 29, 2007

Mr. Tom Sloan
Progressive Contractors, Inc.
14123 42nd Street NE
St. Michael, Minnesota 55376

Re: S.P. 2783-107
Contract No. S07073
In Hennepin County on T.H. 35W North of T.H. 94 to Stinson Blvd. In the City of Minneapolis

Dear Mr. Sloan:

Enclosed is one copy of reviewed shop drawings for the deicing system for your use and distribution. Two copies of these shop drawings have been mailed directly to Dan Balling at Killmer Electric.

Please sign and date this cover letter below and return a copy to my attention upon receipt of these submittals. If you have any questions feel free to contact me at 651-406-4725.

Sincerely,

Eric Embacher

Eric Embacher
Project Engineer

Encl

Received by:__________________

Date:____________

EXHIBIT NO: 7
Date: 4-14-08
JULIE A RIXE
COURT REPORTER

Southeast (Mendota Heights) Resident Office - 2008

Map	S.P.	TH	Type and Location	Cty	Proj	Crew	Designer	PAC	Survey	Contractor	T&T Due	Est $	Let	Impact	A	M	J	J	A	S	O	N	D	J	F	Comments
	2789-130	394	Twins Ball Park		Consultant	Benjamin							10/15/2007	Medium												
	1980-68	35	At 70 in Lakeville- Reconstruct Brs. & Ramp	CD	Consultant	Benjamin	Herman						3/28/2008	Medium												
	6280-320	35E	T.H. 5 to Kellogg - Mill & Overlay	R	Embacher	Bruhn	R. Koehn				3/21/2008	$4,500,000	2/22/2008	High												
	1982-142	35E	Lexington Br. In Mend Hts - Drainage System	CD	Embacher	Bruhn	Dehdashti				5/16/2008	$200,000	7/25/2008	Low												
	1985-131	494	At 156/Concord in SSP - Signal Rebuild	CD	Embacher	Bruhn	M.Gerbensky				7/18/2008	$300,000	9/26/2008	Low												
	0282-28	35E	Tension Cable Guardrail		Embacher	Daniels	D. Rowe				2/17/2008	$1,034,000	4/25/2008	High												
	1981-110	35W	At Burnsville Pkwy - Sig. Rebuild	CD	Embacher	Daniels	M.Gerbensky				5/16/2008	$500,000	7/25/2008	Low												
	0208-55	35W	CSAH 23 Lino Lakes - Carry Over		Embacher/Nelson	Daniels/Kincade																				
	1908-73	952	At Lothenbach in WSP - Rebuild Traffic Sig.	CD	Graf	Dusterhoft	M.Gerbensky	Walker		Granite Ledge	5/21/2007	$200,000	12/14/2007	Low												15 W.D.
	8825-296	Var	Metrowide - Durable Pavement Markings		Graf	Dusterhoft	Schadegg				2/17/2008	$800,000	4/25/2008	Medium												
	1901-150	13	Fr. CSAH 11 to CSAH 30 in Burnsvile - Bus Shld.	CD	Graf	Dusterhoft	J. Gibbens				3/28/2008	$815,000	5/16/2008	Medium												
	1912-54	156	At Villaume/6th St. SSP - Sig. Rebuild	CD	Graf	Dusterhoft	M.Gerbensky				5/15/2008	$250,000	7/25/2008	Low												
	1907-68	52	Fr. 111th to Old Concord in IGH - Fr. Rd. Const.	CD	Graf	Dusterhoft	Dehdashti				8/9/2008	$6,390,000	10/24/2008	Medium												
	1916-25	149	TH 149 - Carry Over		Graf	Dusterhoft																				
	8825-281	50	Re-Micro surface - Carry Over		Graf	Dusterhoft																				
	1913-61	61	Hastings Historic Wall Rehab		Consultant	Forpahl	D. Rowe				1/31/2008	$660,000	3/28/2008	Low												
	8205-101	61	Wakota Landscaping 1 of 4	W	Consultant	Forpahl	J. Lundquist				12/31/2007	$300,000	5/16/2008	Low												
	8205-114	61	Wakota Landcaping 2 of 4	W	Consultant	Forpahl	J. Lundquist				8/31/2008	$200,000	8/22/2008	Low												
	8825-274	999	Metro Wide - Bit. Crack Seal		Consultant	Forpahl	M. Schadegg			Asphalt Surf.	11/18/2007	$500,000	1/25/2008	High												
	1913-	61	Over Miss. River in Hastings - Repl. Deck & Paint	CD	Nelson	LeMay	Herman				12/31/2007	$500,000	2/22/2008	High												
	1980-76	35	Fr. 60 to 70 in Lakeville - Inst. TMS	CD	Graf	LeMay	Adair				4/25/2008	4.0 ~~$250,000~~	6/6/2008	Medium												
	1985-132	494	Bet. Hardman & Maxwell in SSP & Newport - Bridge		Nelson/Embacher	Nordquist/Bruhn	Herman			Lunda	12/17/2008	$49,000,000	1/25/2008	Medium												
	8285-80	494	Wakota - Carry Over		Nelson	Norquist/Bruhn				Lunda																
	1905-	52	Over Cannon & Vermillion Rivers & Under 88-Bridge Repairs	CD	Nelson	Unruh	Herman				12/31/2007	$2,360,000	2/22/2008	Medium												
	2783-107	35W	Bridge Rehab - Carryover		Embacher/Nelson	Unruh						← 1.9m														
	2716-67	77	At 62 - Rem. WB TH 52 to SB TH 77 Loop, Inst. Sig.	H			J. Gibbens				6/5/2008	$10,000,000	8/22/2008	Medium												
	8825-302	999	Various Locations - Replace Lighting				M.Gerbensky				7/21/2008	$210,000	9/26/2008	Medium												
											Total	$79,169,000														

1905-32

1913-64

Gordy Bruhn
Terry Fischer
Rob Ernster

Mark LeMay
Carlos Meza
Gary Wenner

Ted Dusterhoft
Kent Uecker
Matt Lahti
Brett Mahnke

Lisa Daniels
Kerry Sizemore

Don Nordquist
Greg Kincade
Tera Miller

Harvey Unruh
Rae Tressler
Bob Rucker

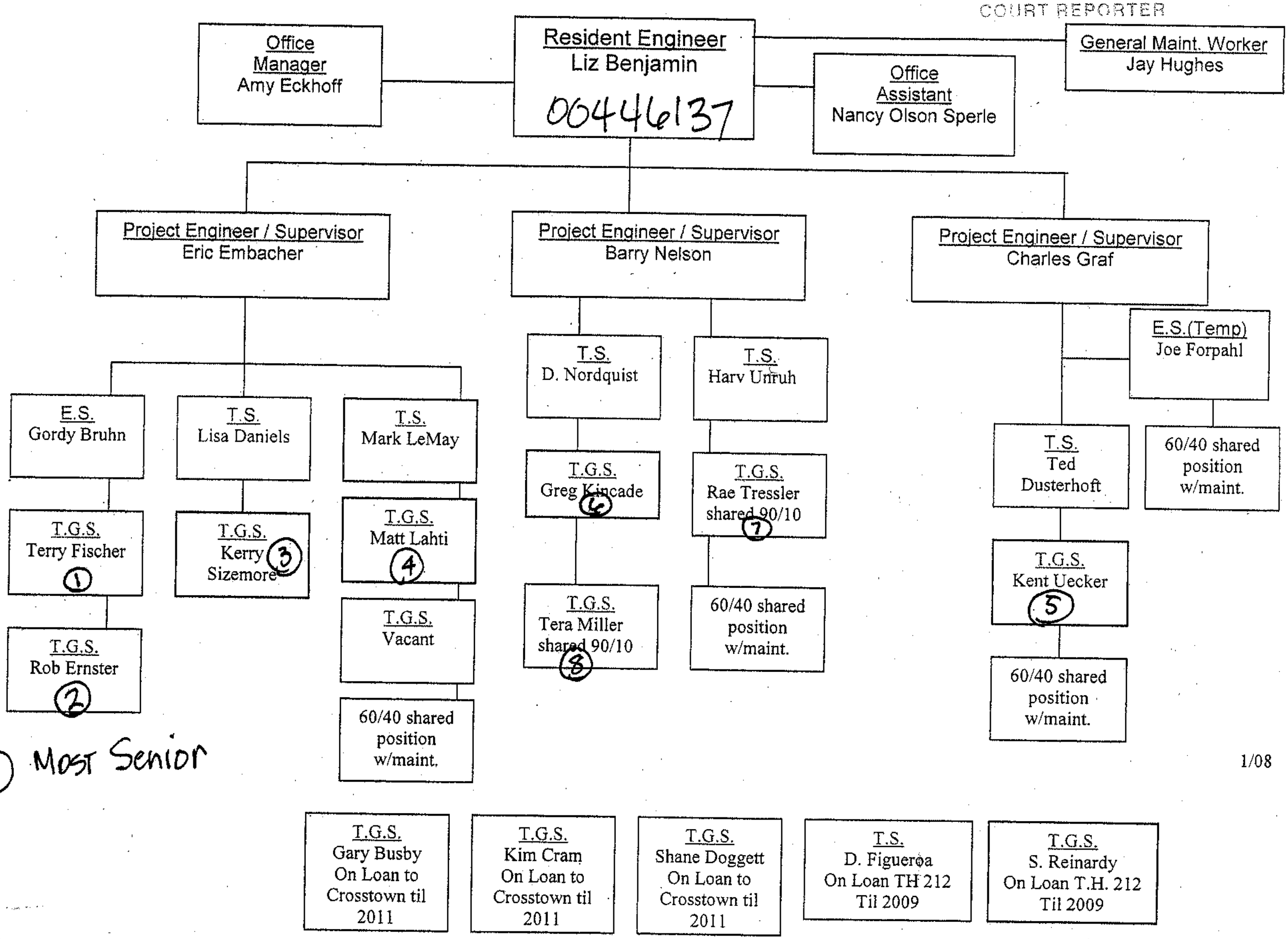
60/40 - Shared Positions
TBN
TBN

1982-136 -
Michael Beer

2/4/2008

Mendota Resident Office
Org #7433

EXHIBIT NO: 8
Date: 4-14-08
JULIE A RIXE
COURT REPORTER



1 Most Senior

1/08

7/10/2007

Maintenance Operations

EXHIBIT NO: 3
Date: 3-24-08
JULIE A RIXE
COURT REPORTER

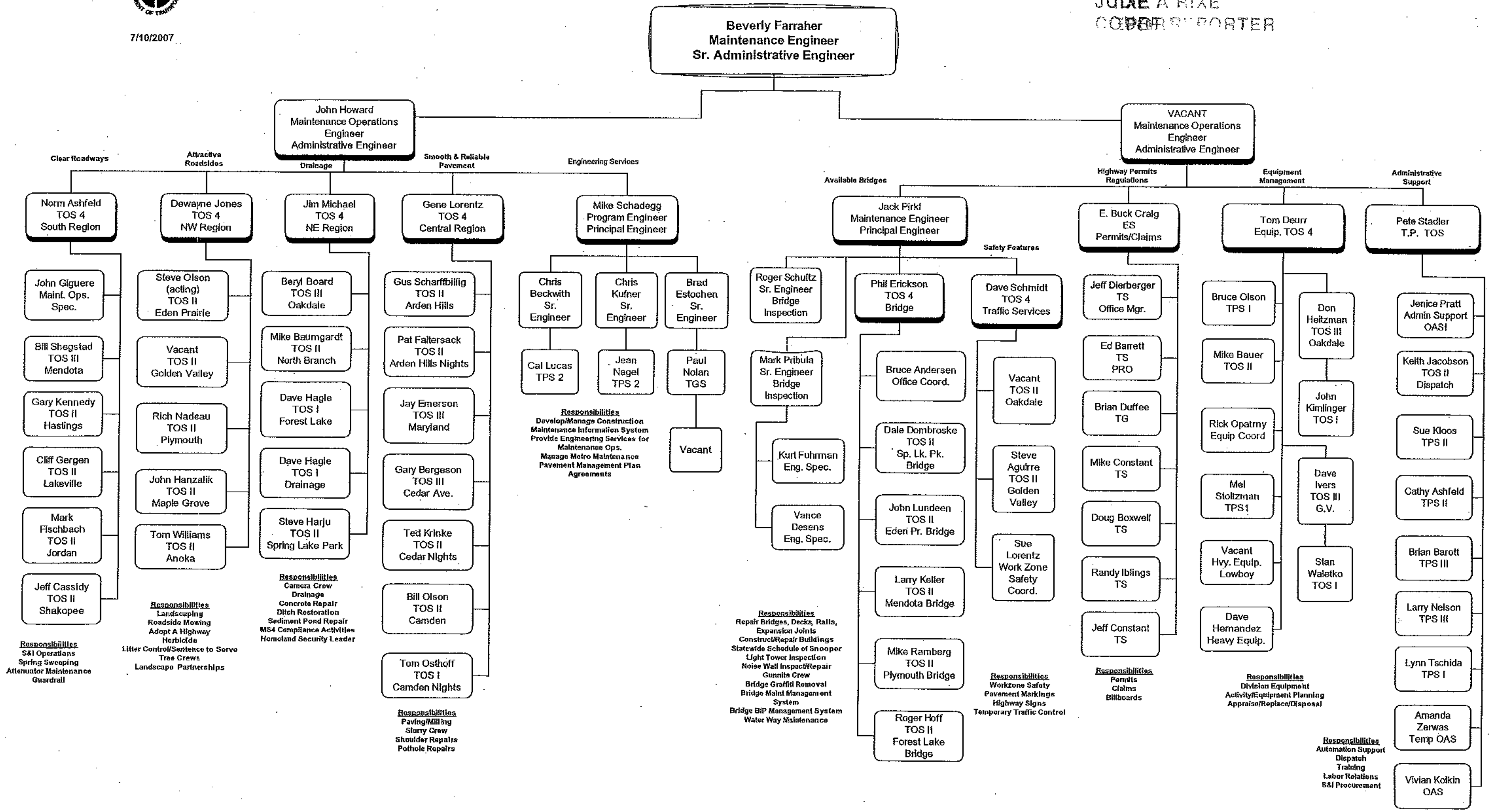
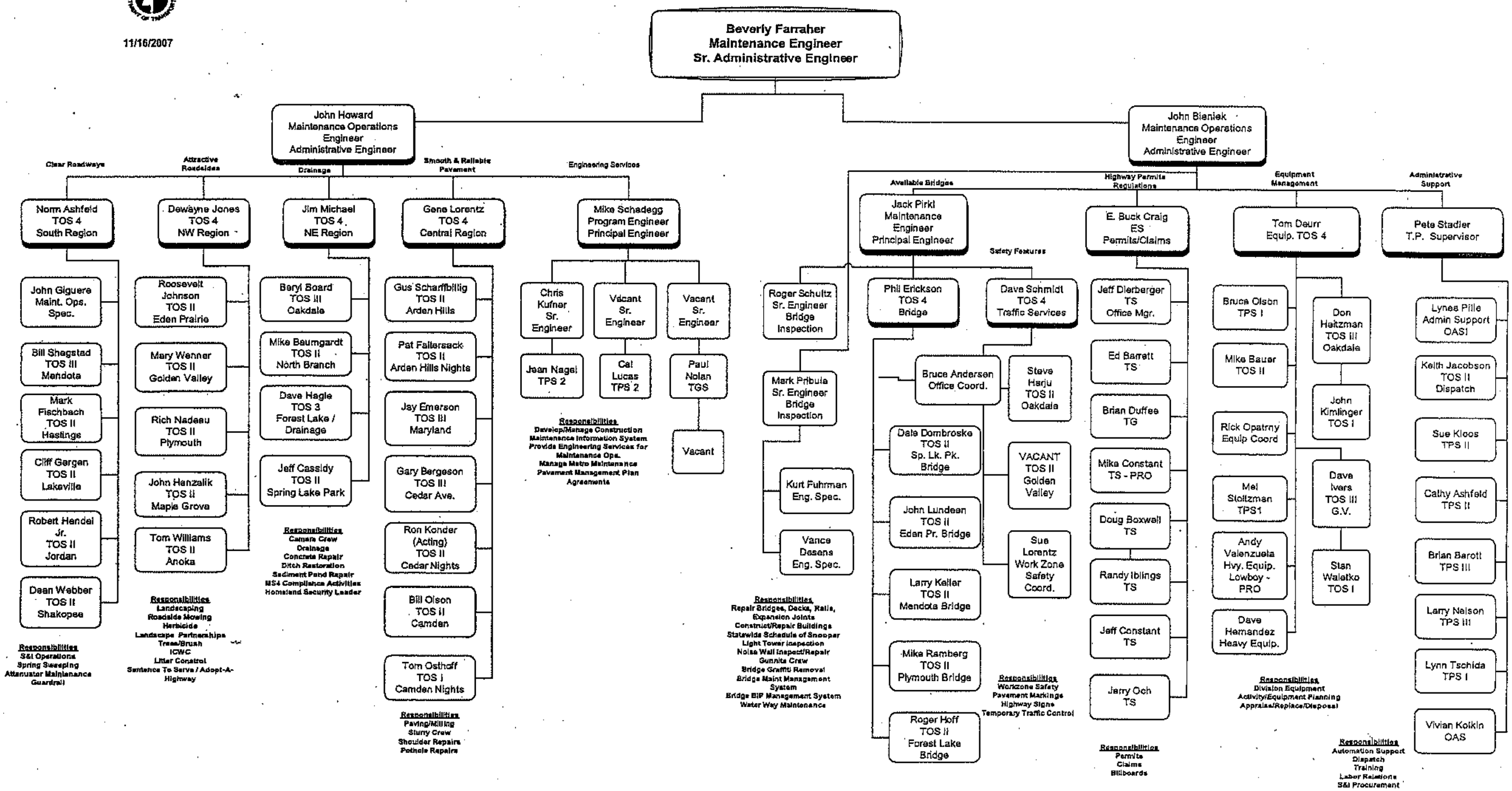


EXHIBIT NO: 4
Date: 3-24-08
JULIE A RIXE
COURT REPORTER

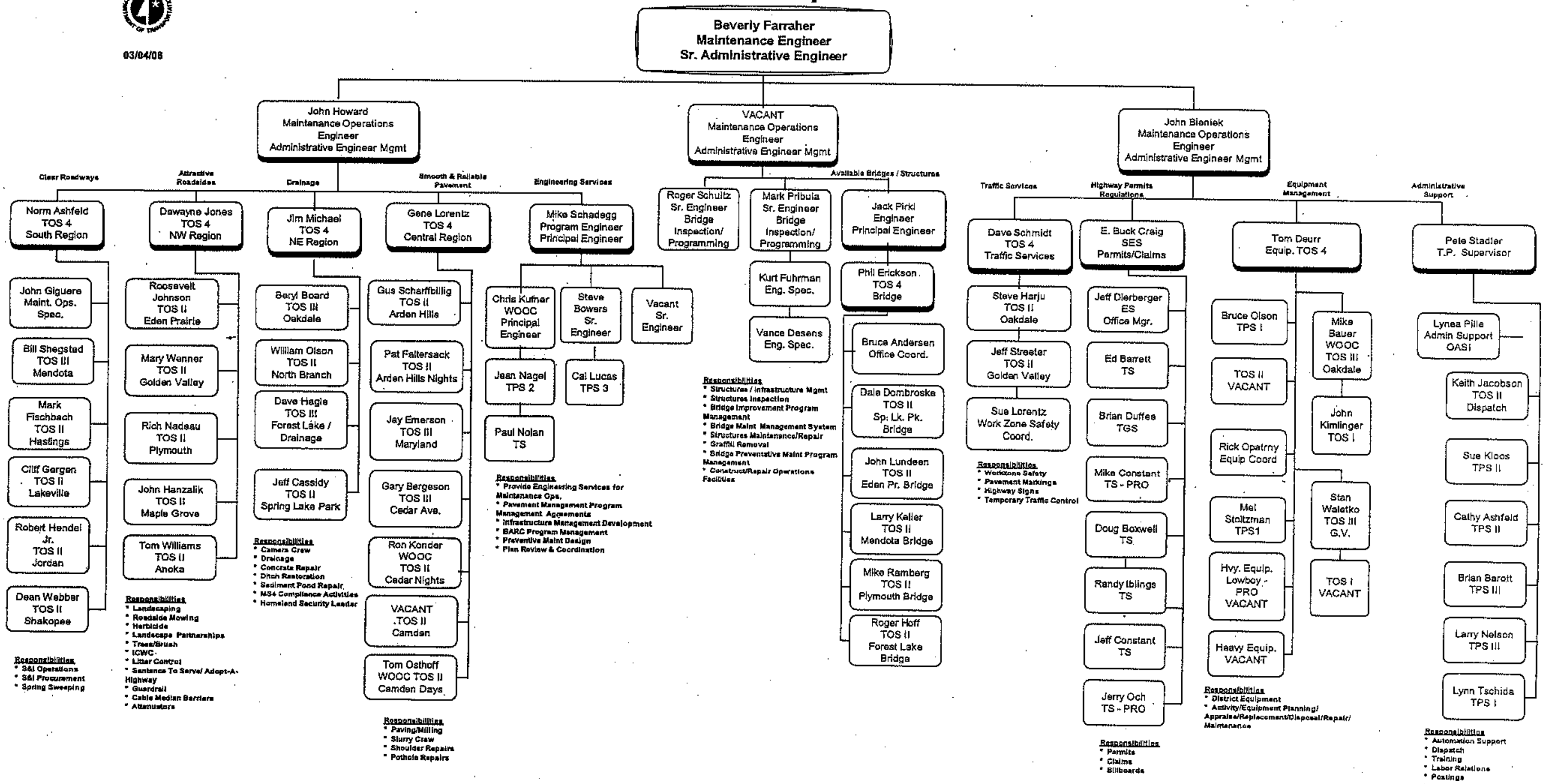
Maintenance Operations

11/16/2007



Maintenance Operations

03/04/08



Metro Bridge

Jack Pirkl
Principal Engineer
651-234-7937

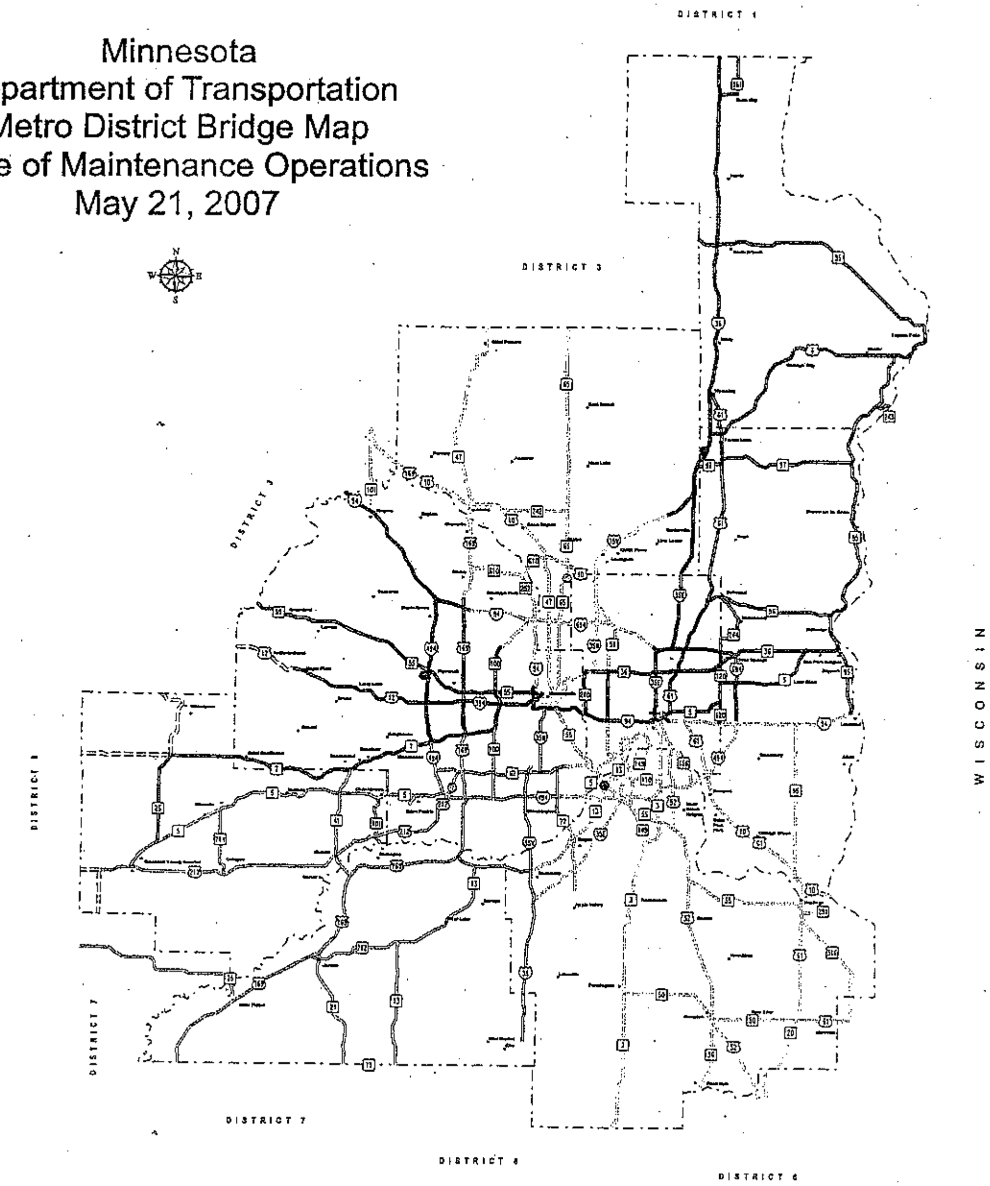
Phillip Erickson
Bridge Superintendent
651-234-7939

Bruce Andersen
Bridge Office Coordinator
651-775-0387

7629 Mike Ramberg Plymouth 952-476-3261	7647 Larry Keller Mendota 651-406-4730	7627 Dale Domdroske Spring Lake Park 763-785-5664	7648 Roger Hoff Forest Lake 651-464-0901	7628 John Lundeen Eden Prairie 952-826-6747
6 Transportation Generaist Seniors	6 Transportation Generaist Seniors	7 Transportation Generaist Seniors	7 Transportation Generaist Seniors	6 Transportation Generaist Seniors
Steve Matis	Kirk Johnson	Farrell Potter	Mike Bruhn	Charles Engels
Pat Stoddard	VACANT	VACANT	VACANT	Merrill Evans
Tim Lasserre	Paul Szurek	VACANT	Jim Koslowski	William Schact
Mark Hafften	Rich Ellinghuysen	Jon Hanson	Glen Haugen	Mike Farrell
Jay Knevel	Mike Anderson	Jerald Oldeen	Wayne Tennison	VACANT
George Hickey	Scott Theisen	VACANT	VACANT	Robert Lehrke
		Michael Koffski	Pat O'Brien	

2/27/2008

Minnesota
Department of Transportation
Metro District Bridge Map
Office of Maintenance Operations
May 21, 2007



Metro Bridge Sub Areas

Bridge Superintendent: Phil Erickson
Office: (651) 234-7939
Mobile: (651) 775-0396

Office Coordinator: Bruce Anderson
Mobile: (651) 775-0387

Eden Prairie
John Lundeen
Office: (952) 826-6747
Mobile: (651) 775-0393

Forest Lake
Roger Hoff
Office: (651) 464-0901
Mobile: (651) 775-0397

Mendota Heights
Larry Keller
Office: (651) 406-4730
Mobile: (651) 775-0395

Plymouth
Mike Ramberg
Office: (952) 476-3261
Mobile: (651) 775-0394

Spring Lake Park
Dale Dombroske
Office: (763) 785-5664
Mobile: (651) 775-0392

Metro Bridge Inspection

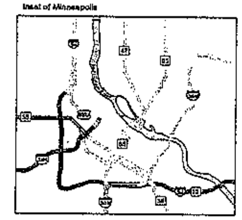
Bridge Inspection Engineer: Roger Schultz
Office: (651) 234-7938

Fracture Critical Engineer: Mark Pribula
Office: (651) 234-7940
Mobile: (651) 775-0389

Saftey Inspector: Kurt Fuhrman
Office: (651) 234-7941
Mobile: (651) 775-0315

Saftey Inspector: Vance Desens
Office: (651) 234-7936
Mobile: (651) 775-0386

Inset of Minneapolis



Inset of St. Paul

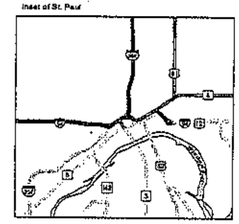


EXHIBIT NO: 2
Date: 3-24-08
JULIE A RIXE
COURT REPORTER

Quality Assurance Plan
Office of Bridges and Structures

Mn/DOT Fracture Critical Bridge Inspection Program
September 23, 2002

Introduction and Purpose
This policy outlines Mn/DOT's Quality Assurance Plan regarding in-depth fracture critical bridge inspections. The Office of Bridges and Structures (OBS) carries overall responsibility for administering the fracture critical inspection program. As detailed in this plan, Quality Assurance will be accomplished via review of all inspection reports, joint inspections of selected bridges, and the Federal Highway Administration (FHWA) auditing for compliance with National Bridge Inspection Standards.

Fracture Critical Inspection Teams in District 6 (Rochester) perform in-depth fracture critical bridge inspections on all bridges (district and local jurisdiction) within their district. Similar teams in the Metro Division perform in-depth fracture critical bridge inspections on all Metro Trunk Highway bridges. OBS performs all other fracture critical inspections for District and Local Agency bridges.

Fracture Critical Definition
The OBS determines which bridges are designated as fracture critical in accordance with Technical Memorandum 02-22-B-01 dated September 23, 2002 and state and federal guidelines. A fracture critical bridge is a steel structure, subject to dynamic cyclic loading, which has at least one tension member or member component, whose failure would be expected to result in the collapse of the bridge.

Inspection Frequency & Scheduling
The OBS determines the frequency of inspections (typically four (4) or five (5) year intervals), and tracks when inspections are due and when they have been completed. At the beginning of each inspection season, the OBS will notify fracture critical inspection teams which bridges are due for in-depth inspections. The Office/District responsible for performing the inspection is responsible for the planning and scheduling during a given season, and submits the schedule to the Bridge Office.

Qualifications of Inspectors
The OBS is responsible for reviewing the inspector's qualifications. The lead inspector must be certified (by Mn/DOT) as a Level 2 bridge inspector, or must be a registered engineer. Completion of the FHWA training class "Inspection of Fracture Critical Bridge Members" is required. Only individuals qualified as American Society for Non-Destructive Testing (ASNT) Level II or III technicians, shall conduct non-destructive testing (NDT), by ultrasonic methods.

Bridge Office Participation in Inspections
The OBS will participate in one or more inspections performed by other Districts. This will typically be on major structures, or on bridges with significant structural deficiencies, deterioration, or damage. The purpose of these joint inspections is two-fold;

1) the utilization of fracture critical inspectors from both the district and the OBS expedites the inspection and reduces the time that traffic restrictions are needed, and,
2) joint inspections allows the OBS to observe inspections procedures for consistency. The OBS will provide NDT assistance as required for the Districts, Counties, or Municipalities.

Review of Inspection Reports
Within 6 months of performing an in-depth inspection the inspection team shall submit a detailed written report, including sketches and photographs, of the inspection, independent of the annual safety inspection report, (PONTIS), to the State Bridge Inspection Engineer. The format of the report shall be similar to the reports developed by the OBS. Due to the safety concerns with bridge fatigue issues the OBS will review all in-depth inspection reports. The OBS Bridge Inspection Engineer and Regional Construction Engineer shall review the reports. Within thirty (30) days of its receipt, the OBS Bridge Inspection Engineer will forward written comments as necessary to the inspection team regarding the findings, recommendations, or conclusions. The OBS Bridge Inspection Engineer and Regional Construction Engineer shall date and sign the file copy of the report upon conclusion of their reviews. The OBS will maintain reports on file for all fracture critical bridges statewide.

"Critical" Findings
A critical finding for the purpose of fracture critical inspection shall be defined as any condition that in the judgment of the inspection team leader, may, if not corrected in a timely manner, cause the failure of all or part of the bridge. Critical findings shall be reported within 24 hours to the District, County, or City Bridge Engineer and to the OBS Bridge Inspection Engineer or Regional Construction Engineer. The Bridge Office will confer with appropriate District/County/City staff to develop short and long-term strategies to correct the problem and will conduct audits to ensure that the bridge owner has completed recommended actions and/or repairs.

FHWA Annual Audits
The Federal Highway Administration (FHWA) conducts annual audits of the bridge inspection programs of Mn/DOT's Central Office, Districts, and Counties. The OBS also participates in these audits. Review of the fracture critical inspection process is included within the scope of these audits.

Form 17108A (1-74)

Minnesota Department of Highways

BRIDGE INSPECTION REPORT

☐ *Original to Area Maintenance Engineer*
☐ *First copy to Bridge Maint. Supv.*
☐ *Second copy to Bridge Inventory Group*

Bridge No.	T.H. No.	Mile Post	Location	Maintenance Area
9340 & 9340A	35W	18.54	0.5 MI. NO. OF JCT. T.H. 12	5A

Type		Posted Limit in Tons	
(404) 11 APPR. SPANS 3 CONT. ST. DK. TRUSS	☒ Over ☐ Under MISS. RIVER		☒ annual inspection ☐ special inspection

I	ITEM	RATING			
	SUBSTRUCTURE	6	6	6	6
1	Abutments	7	7	7	7
2	Piers	6	6	6	6
	SUPERSTRUCTURE	7	7	7	7
3	Trusses	7	7	7	7
4	Girders	N	N	N	N
5	Floor Beams	7	7	7	7
6	Stringers or Beams	8	8	8	8
7	Bearing Devices	7	7	7	7
	DECKS	6	6	6	6
8	Expansion Joints	7	7	7	7
9	Railing CODE 12	6	6	6	6
10	Structural Slab	8	7	6	6
11	Wearing Surface	7	7	7	7
12	Curb & Walk	7	7	7	7
	AREA UNDER BRIDGE	8	8	8	8
13	Channel & Protection	8	8	8	8
14	Roadway, Railway, Other	8	8	8	8
15	Slopes & Berms	8	8	8	8
	CULVERTS	N	N	N	N
16	Barrel & Floor	N	N	N	N
17	Apron & Wings	N	N	N	N
	OTHER		7	7	7
18	Retaining Wall	N	N	N	N
19	Approaches	7	7	7	7
20	Signing	7	7	7	7
21	Paint (yr. ptd.) 1968	7	7	7	7
22	Drainage	7	7	6	6
23	Guard Rail #5	8	8	8	8
24	CONDUIT	8	8	8	8
25					

COMMENTS AND SKETCHES

Refer to item number in comments and sketches
Use additional sheets if necessary

1.) SO. ABUT. BRIDGE SEAT - CRACKING AND DISCOLORED.
2.) PIER 7 (FIXED PIER ON NO. EDGE OF RIVER) WEST COLUMN IS CRACKED VERTICALLY COMPLETELY THROUGH COLUMN.
3) SMALL AREAS OF SEVERE CORROSION OCCURRING ESPECIALLY UNDER MEDIAN JOINT. AND A SMALL AMOUNT OF CORROSION ON LOWER CHORD (EAST) JUST SOUTH OF PIER 8
5) SEE 3) ABOVE.-
8) SOME OF THE JOINTS TOO TIGHT.
7.) DIRT & DEBRI UNDER ROLLER BEARINGS - NO INDICATION THAT BRGS ARE MOVING AS MUCH AS DESIGNED TO MOVE.
9.) 15-20% OF CONC. RAIL BASE IS UNSOUND.-
11.) 2000-3000 L.F. OF TRANSVERSE CRACKS IN LOW SLUMP OVERLAY -
12) FACE OF CURB STARTING TO SPALL IN SPOTS.
19.) SEE 8) ABOVE - MAY BE A PAVEMENT PRESSURE PROBLEM.
20) NO HAZARD MARKERS
21.) 4-5% PAINT UNSOUND
22) DRAINS PERENNIALLY PLUGGED. -

1983
1) 3.) 5.) 7.) 9.) 11.) 12.) 19.) 20) 21.) 22) NO CHANGE.
2) SEE 2) ABOVE. SOME OF THE PIER CAPS AT THE NORTH END OF THE BRIDGE - ASSOCIATED WITH THE SLAB SPANS ARE MODERATELY DETERIORATED -
8) SEE 8) ABOVE. - ALSO STRIP SEAL GLAND IS COMING OUT OF THE RETAINING SLOT IN SEVERAL PLACES (NORTH END OF BRIDGE)
10.) BOTTOM OF SLAB, COPING, & MEDIAN DETERIORATING IN MANY PLACE - ESPECIALLY NORTH END

ESTIMATED COST OF REPAIR (CIRC)				REVIEWED
Labor	Material	Equipment	Total	By Engineer
				MP
				KB

Inspected by [redacted]

Date
6/14/82
5/17/83
5/17/84
11/7/85

Indicate a condition rating from 9 (very good) to 0 (very poor) for conditions noted

Rating of 9 - - - - - - - new condition
Rating of 8 - - - - - - - good condition, no repair necessary
Rating of 7 - - - - - - - non-structural items in need of repair.
Rating of 6 - - - - - - - structural items in need of minor repair
Rating of 5 - - - - - - - structural items in need of major repair
Rating of 4 - - - - - - - minimum adequacy to tolerate present traffic - immediate rehabilitation necessary to keep open
Rating of 3 - - - - - - - inadequacy to tolerate present heavy load - warrants closing bridge to trucks
Rating of 2 - - - - - - - inadequacy to tolerate any live load - warrants closing bridge to all traffic
Rating of 1 - - - - - - - bridge repairable, if desirable to reopen to traffic
Rating of 0 - - - - - - - bridge conditions beyond repair - danger of immediate collapse

Place dash where item is not rated

REMARKS AND SKETCHES

1984

1) 3) 5) 8) 9) 11) 12.) 19.) 20) 21) NOT MUCH CHANGE.

2) PIERS AT THE NORTH END OF BRIDGE ARE STARTING TO SPALL ON CAPS — SEE 2) 1982

7) WEST EXP. BRG ON THE PIER THAT SETS ON THE SOUTH BANK OF THE RIVER IS BEING CONTINUOUSLY BATHED WITH SALT WATER FROM THE PLUGGED DRAIN ABOVE - THE EFFECTS ARE PLAIN TO SEE. - SEE ALSO 7.) 1982

10) NOTED A CONSIDERABLE AMOUNT OF LOOSE CONCRETE UNDER THE MEDIAN AREA - FULL LENGTH OF THE BRIDGE AND BOTTOM OF SLAB SPANS @ NORTH END OF BRIDGE. — PROBABLY SHOULD BE REMOVED AT LEAST IN THOSE AREAS WHERE CARS ARE PARKED.

22) SEE 7) ABOVE. -

1985

NO CHANGE - WITH THE EXCEPTION OF -

2) A CONSIDERABLE AMOUNT OF CONCRETE HAS BEEN REMOVED (SURFACE CONCRETE) FROM THE PIERS AT THE NORTH END OF THE BRIDGE (APPROACH SPANS) AND ALSO FROM THE BOTTOM OF SLAB. - AND

8.) THE METAL TROUGH UNDER THE SOUTH EXP. HINGE JOINT IS BREAKING LOOSE FROM ITS SUPPORT AT THE EAST END OF THE JOINT. -

10.) THE NOTE ABOVE HAS, FOR THE MOST PART, BEEN TAKEN CARE OF BUT. LOOSE CONCRETE OVER PARKED CARS AT THE SOUTH END OF BRIDGE STILL EXISTS. -

3.) PIN CONNECTIONS ON THE DIAGONAL (LONGITUDINAL) STRUTS FROM FLOOR BEAM TO STRINGERS ARE LOOSE AND TURNING IN SOME PLACES.

EXHIBIT NO: 6
Date: 3-24-08
JULIE A RIXE
COURT REPORTER

REPORT

of the

1994 ANNUAL

FRACTURE CRITICAL INSPECTION

for the

BRIDGE NO. 9340

I-35W over the Mississippi River, 2nd Street & Railroad

performed

September 28 - 29, 1994

BRIDGE 9340: I 35W Over Railroad, Mississippi River, 2nd Street.

ANNUAL FRACTURE CRITICAL BRIDGE INSPECTION: Sept. 26 - 29, 1994

Inspection By: Terry Moravec
Kurt Fuhrman
Pete Wilson

Report Prepared By: Kurt Fuhrman

Reviewed & Edited By: Terry Moravec, P.E. - Dated: Feb. 22, '95

RECOMMENDATIONS:

- Repair of the hinged joint in Span #2, allowing expansion.

- Replacement of broken and/or bolts connection stringers to floorbeams.

  Locations:

Direction	Span	Panel Point
No. B'nd.	6	U8
	7	U8'
	8	U6' & U5'
So. B'nd.	8	U6' & U8'
	7	U11

- Replace bolts in connection between Girder #3 and the Floorbeam in Span #9, South Bound.

- Replace the finger joints with modular joins and rework the deck drains to make them operable.

- Rebuild the copings, both at the outboard edges and at the median. Seal the median and replace the median railing with "J - barrier".

- Paint the bridge. This will require a complete cleaning of the pigeon droppings from the interior of the box beams, after which the openings in these members should be screened. Between cleaning and painting an "In-Depth" inspection should be performed and all cracked tack-welds ground out.

- Replace W 5/3 L light pole located South Bound, Span #7, Panel Point U10'.

- Replace cotter pin in the lower connection pin of the vertical brace at Panel Point U1 in Span #6 (over Pier #5).

GENERAL NOTES:

DESCRIPTION: The south approach spans have 14 steel beams, (span 1 - span 5). The truss is numbered south to north (floor truss), west to east (stringer), (span 6 - span 8). The north approach spans widen to accommodate on and off ramps to University Avenue. (15 - 18 steel beams, span 9 - span 11) and (span 12 - span 14, are voided deck slab).

SUPERSTRUCTURE:

GIRDERS: The paint may be chalking, some peeling and a moderate amount of surface rust.

DECK TRUSS: The paint is covered with pigeon manure, a major amount of surface rust, with section loss, pitting and pack rust.

FLOOR BEAM TRUSS: The paint is covered with pigeon manure, a moderate amount of surface rust, with section loss, pitting and pack rust.

STRINGERS: The paint may be chalking, and a moderate amount of surface rust.

BEARING ASSEMBLIES: Corrosion on most bearing, some debris buildup.

SUBSTRUCTURE:

ABUTMENTS: Minor cracks, concrete is discolored.

PIERS: The north approach span piers have had shot-crete applied to repair spalled areas. Vertical crack through west column at pier 7.

BRIDGE DECK:

CONCRETE DECK, SPAN 1 - SPAN 11: Full depth deck repairs, 10% of the deck are visible underneath. Most of the coping has the bottom mat of rebar exposed in the median, random at the outside railing.

CONCRETE SLAB, SPAN 12 - SPAN 14: Most of the coping, some of the slab underneath is spalled with exposed rebar.

WEARING SURFACE: Minor concrete spalls at expansion joints.

EXPANSION JOINTS: Three finger joints, several strip seal joints.

RAILING: Concrete railing is delaminated, spalls with exposed rebar at most post locations. Conduit under metal railing, east side.

OTHER ELEMENTS:

APPROACH PANELS: Some relief joints need to be cut and resealed. One transverse crack in each panel, minor spalling at the ends next to the joints.

CHANNEL AND PROTECTION:

SIGNING: Hazard markers missing, south end.

GUARDRAIL: Plate beam guardrail at the median, length of bridge. Minor traffic impact to plate beam guardrail, (1 post broken, SE quadrant) expansion plate damage at end block, right lane both directions, south end.

DRAINAGE: Deck drains and downspouts are plugged.

SLOPE PROTECTION: Concrete panels at each abutment.

CURB AND WALK: Concrete curb along the outside railing is delaminated, with some scaling and spalling.

MISCELLANEOUS: Rail mounted overhead signs and lighting. One impact attenuator, north bound, at exit ramp to University Avenue. Navigation and under deck lighting. Parking lots under bridge, span 1 - span 4, span 11 - span 13 . Stock piling sand under span 8.

SPECIFIC DEFICIENCIES:

INSPECTION IN THE NORTH BOUND LANE

SOUTH ABUTMENT: Bridge seat cracked and discolored. Bearing plates #1, #2, #3 and #4 are rusted, west side. Expansion bearing assemblies.

SPAN 1:

PIER 1: Four concrete columns and cap, lower strut between columns except in median area. Ten fixed and four expansion bearing assemblies.

SPAN 2: Typical at this expansion joint. See picture #1, #2, #3, #4. The hinged expansion bearings are inoperative. They have expanded beyond their design limit and are unable to move apart. The ends of the beams are in contact allowing no additional expansion. These two situations combine with the result of a completely frozen joint.

The web depth of the steel multi beams (33") increase to (48") up to the truss at the hinge. Hinge 12' south of pier 2. Fourteen expansion bearing assemblies @ hinge. The bottom flange on all beams have severe corrosion, because of the finger joint in the deck above the hinge.

PIER 2: Four concrete columns and cap, lower strut between columns except in median area. Expansion bearings.

SPAN 3:

PIER 3: Four concrete columns and cap. Ten fixed and four expansion bearing assemblies.

SPAN 4:

PIER 4: Four concrete columns and cap. Expansion bearings.

SPAN 5: First 71' steel multi-beam, last 38' deck truss. Repair work at the north floor beam, end of the steel multi-beam span, south end of the bridge. See picture #5. Two corroded rocker bearings support the multi beam span on to the truss. Patches in the overlay at the finger joint.

<u>BEGINNING OF DECK TRUSS</u>

PANEL POINT U0: Finger joint in the deck. Floor beam rusty. Rusty gusset plate, deck truss #2. See picture #6.

PANEL POINT U1, PIER 5: Picture of the moveable bearing, deck truss #2. See picture #7. Picture of the floor beam truss. See picture #8.

The pier has two concrete columns, with upper strut. Downspout from the deck drain at U0.

SPAN 6:

PANEL POINT U2:

PANEL POINT U3: Center floor truss, bad weld, undercut in flange.

PANEL POINT U4: Floor truss, top chord, tack weld cracked. Strip seal joint in the deck.

PANEL POINT U5: Tack weld cracked, floor truss, top chord.

PANEL POINT U6: Top flange of upper floor beam truss and stringer #10, cracked tack weld at gusset plate. See picture #9.

PANEL POINT U7:

PANEL POINT U8, PIER 6: Stringer #10 and upper floor beam truss, bolt missing. See picture #10. Bolt broken off, upper floor beam truss and stringer #11. See picture #11. Bolt broken off, upper floor beam truss and stringer #13, and the block rotated. See picture #12.

This pier has a concrete pier wall base, with two columns in the Mississippi river. It has rusty expansion bearing assemblies. Strip seal joint in the deck. Drain downspout, may be plugged.

SPAN 7:

PANEL POINT U9:

PANEL POINT U10: Navigation light (blue).

PANEL POINT U11: Section loss at gusset plate, bottom chord, truss #2.

PANEL POINT U12: Floor truss, top chord at center has plate welded to bottom flange, longitudinal.

PANEL POINT U13: Section loss at gusset plate, bottom chord, truss #2. Floor truss, top chord at center, there is a four way diagonal member that are welded transverse to the bottom flange.

PANEL POINT U14: Strip seal joint in the deck. Sway frame rusty. Pictures of chipped concrete coping at the median (midspan). See picture #13, #14.

PANEL POINT U13′ (15): Bad detail, 2" - 2 1/2" tack welds in maximum tension area, floor beam truss over the main truss. See picture #15, interior #16, exterior. (typical)

PANEL POINT U12′ (16): Top and bottom chord of floor beam truss rusty in median area.

PANEL POINT U11′ (17): Floor truss, at top of chord, center diagonal stiffener plate has a weld transverse to the bottom flange. Top and bottom chord of floor beam truss rusty in median area.

PANEL POINT U10′ (18): Floor truss, at top of chord, center diagonal stiffener plate has a weld transverse to the bottom flange.

W 5/3 L light pole, traffic impact (wing), split seam vertical 6 inches.

PANEL POINT U9′ (19): Floor truss, at top of chord, center diagonal stiffener plate has a weld transverse to the bottom flange. Deck drains, has rusted sway frame.

PANEL POINT U8′ (20), PIER 7: Condition of the paint under the median, bottom chord of floor beam truss, over pier. See picture #17. Strip seal in the deck. Floor truss, at top of chord, center diagonal stiffener plate has a weld transverse to the bottom flange. Severe rust on floor beam truss at the median. Redi-rod installed to replace broken bolts, stringer #11 and upper floor beam truss, missing nut and washer. See picture #18. Redi-rod installed to replace broken bolts, stringer #10 and upper floor beam truss. See picture #19.

This pier has a concrete pier wall base, with two columns in the Mississippi river. It has fixed bearing assemblies. Red navigation light.

SPAN 8: Condition of the paint under the median, top chord of the floor truss to diagonal bracing connection. (typical) See picture #20.

PANEL POINT U7′ (21): Floor truss top chord at center plate to diagonals has a transverse tack weld to bottom flange.

PANEL POINT U6′ (22): Heavy rust on floor truss with loss of section on top and bottom chord at median and plate to diagonal. Condition of paint, (typical) See picture #21. Bolt from stringer #11 to top chord of floor truss are working. Looks like they are near failure. See picture #22.

PANEL POINT U5′ (23): Floor truss top chord, stringer #8, bolt head broke off at bearing and weld at diagonal plate to bottom flange transverse. Heavy rust on floor truss at the median.

PANEL POINT U4′ (24): Heavy rust on floor truss, and sway frame at the median. Strip seal joint in the deck.

PANEL POINT U3′ (25): Incomplete weld, reinforcement plate to the top flange of the floor truss, stringer #11. See picture #23.

PANEL POINT U2′ (26): Overhead sign, full width of bridge.

PANEL POINT U1′ (27), PIER 8: Pin rotating in east vertical, angle brace connection to the bottom chord of floor truss. See picture #24.

The pier has two concrete columns, with upper strut, moveable bearings. Concrete repair to the base of columns, increased the diameter by 1 foot. Drain downspout from U0′(28).

SPAN 9: First 38′ deck truss, last 130′ steel multi-beam, (15 beam). There are four train tracks under this span.

PANEL POINT U0′ (28): Two rocker bearings support the multi beam span on to the truss. Finger joint in the deck.

__END OF DECK TRUSS__

Pictures of floor beam and girder #12 connection, the rocker at the end of truss #2 underneath, (fatigue crack with ends drilled out). See picture #25, #26, #27.

PIER 9: This pier has 4 columns with lower strut (except in the median) and cap. Thirteen fixed and four expansion bearing assemblies.

SPAN 10: This span has 17 beams.

PIER 10: This pier has 5 columns with lower strut (except in the median) and cap. Eighteen expansion bearing assemblies.

SPAN 11: This span has 18 beams.

PIER 11: This pier has 6 columns and cap. The cap has been repaired with shot-crete. 10 SF spalled and exposed rebar, east side of cap. Eighteen expansion bearing assemblies (steel multi-beam, south side). Fifteen expansion bearing assemblies (slab span, north side). Strip seal in the deck.

SPAN 12: Concrete deck slab span. Delaminated, spalled with exposed rebar in median and outside coping.

PIER 12: This pier has 6 columns, with no cap. (The deck thickness increases by 1 foot for about 6 feet, where a pier cap normally is.) No bearing assemblies, pier poured with the deck.

SPAN 13: Concrete deck slab span. Delaminated, spalled with exposed rebar in median and outside coping. 100 SF of spalled concrete with exposed rebar, bottom of slab span.

PIER 13: This pier has 6 columns, with no cap. (The deck thickness increases by 1 foot for about 6 feet, where a pier cap normally is.) No bearing assemblies, pier poured with the deck.

SPAN 14: Concrete deck slab span. Delaminated, spalled with exposed rebar in median and outside coping. The light cover for a fixture is broken. Sidewalk along north side of roadway underneath.

NORTH ABUTMENT: Fourteen expansion bearing assemblies. Strip seal in the deck.

Concrete approach panel, with 24 LF transverse crack.

INSPECTION IN THE SOUTH BOUND LANE

NORTH ABUTMENT: Strip seal in the deck.

SPAN 14: Continuous voided slab. Concrete slope paving underneath.

PIER 13:

SPAN 13: Continuous voided slab. Roadway underneath the bridge.

PIER 12:

SPAN 12: Continuous voided slab. Metal Matic Inc. uses this area under the bridge for a parking lot. (personnel and commercial vehicles)

PIER 11: Strip seal in the deck.

SPAN 11: Metal Matic Inc. uses this area under the bridge for a parking lot. (personnel and commercial vehicles)

PIER 10:

SPAN 10: Train tracks to businesses, 2 tracks switches down to one track. (C.G.W. Railway Co.)

PIER 9:

SPAN 9: 4 train tracks. (C&N.W. Railway Co.) Retaining wall.

Girder #3 and the connection to the floor beam, joint working. Rocker on truss #1 below. See picture #28.

BEGINNING OF DECK TRUSS

PANEL POINT U0' (28): Finger joint in the deck.

PANEL POINT U1' (27), PIER 8: Floor beam truss rusty in the median. Stringer #8, top flange rusty.

Paint is scraped at the expansion bearing assembly, truss #1 (moving).

SPAN 8:

PANEL POINT U2' (26): Floor beam truss, and sway frame rusty in the median.

PANEL POINT U3' (25): Ugly weld at stringer #11 and the top chord of the floor beam truss. See picture #29.

PANEL POINT U4' (24): Rotating pin in vertical brace (U10 - L10) of the floor beam truss. See picture #30. Strip seal joint in the deck.

PANEL POINT U5' (23): Picture of the paint condition, bottom chord (L7 - L10) of the floor beam truss. See picture #31.

PANEL POINT U6' (22): Bolt missing, top chord floor beam truss, stringer #4, plug welds also. See picture #32. General view of sway frame, looking north. See picture #33. Deck truss #1, top chord, 2 rough tack welds, north of U6' (22).

PANEL POINT U7' (21): Floor truss rusty in median. Stringer #2, top flange rusty. L7' - U7' vertical, (bad cutout, old paint)

PANEL POINT U8' (20), PIER 7: Strip seal joint in the deck. Stringer #4 and upper floor beam truss, broken bolt. See picture #34, #35. Under stringer #2, diagonal brace bent, floor beam truss. On sway frame gusset plates, some rivets are rusty.

SPAN 7: 905 LF transverse cracks with efflorescence. Deck drain, both sides U8' - U9'

PANEL POINT U9' (19): Sway frame and gusset plate connection, some rivets rusty in the median area. View south under median. See picture #36.

PANEL POINT U10' (18): Loose bolt, stringer #2, top chord, floor beam truss (probably never tight). See picture #37.

U18 - U17 (Top Chord) Six inch nicks on exterior, 15' south of U18, truss #1.

PANEL POINT U11' (17): Typical views of underside of the deck. See picture #38, #39.

L17 - L16 (Bottom Chord) Nick in bottom chord, truss #1.

PANEL POINT U12' (16):

U16 - L15 (Diagonal) Nicks on diagonal, 1 inside, 2 outside.

L16 - L15 (Bottom Chord) Nick in bottom chord, truss #1.

PANEL POINT U13' (15): Looking west at downtown Minneapolis. See picture #40.

PANEL POINT U14: Stringer #4 top flange rusty. Bad welds at gusset plate and truss #1 bottom chord. Deck drains both sides. Strip seal joint in the deck.

PANEL POINT U13: Pack rust at connection, bottom chord truss #1 and sway frame. (rusty rivets, gusset plate).

PANEL POINT U12: Bottom chord, floor beam truss rusty in the median.

PANEL POINT U11: Bolt broken, stringer #4 (north side). See picture #41. Two bolts broken, stringer #4 (south side). See picture #42. Stringer #4 (south side) has lifted approximately 3/32". See picture #43.

PANEL POINT U10: Rusty bottom chord of floor beam truss in median area.

U10 - U9 (Top Chord) 2 spots ground out, truss #1.

PANEL POINT U9:

L9 - U8 (Diagonal) One spot ground out, truss #1.

PANEL POINT U8, PIER 6: Deck drains both sides, downspout east side. The sway frame is rusty at the two connection points in the median area. Strip seal joint in the deck.

SPAN 6: 510 LF transverse cracks with efflorescence.

PANEL POINT U7: Pin rotating, vertical brace at the bottom chord of the floor beam truss (U7 - L7). See picture #44.

PANEL POINT U6: Gouges from construction, top flange of floor beam truss (U5 - U4). See picture #45. Overhead sign. Three ground out spots on the lower chord floor beam truss.

PANEL POINT U5:

PANEL POINT U4: Strip seal joint in the deck. Conduit broke at light pole.

PANEL POINT U3:

Nick on bottom chord L2 - L3. [1994]

PANEL POINT U2:

PANEL POINT U1, PIER 5: Cotter pin missing, vertical brace, lower connection to the bottom chord of the floor truss. See picture #46. Downspout from the deck drain at U0.

PANEL POINT U0: Finger joint in the deck, some patches in the overlay. Slope paving between U0 and U1.

END OF DECK TRUSS

SPAN 5: Picture of rocker bearing, on deck truss #1 and the floor beam of the steel multi-span section. See picture #47.
Picture of the multi-beams that tie into the floor beam. See picture #48.

PIER 4:

SPAN 4:

PIER 3:

SPAN 3:

PIER 2:

SPAN 2: Hinge 12' south of pier #2. The bottom flange of beams #1, #5 were tight. At beam #5, see picture #49. Picture #50, below finger joint at beam #5. At hinge and beam #4, picture of the debris. See picture #51. At hinge and beam #1, outside coping west side, see picture #52. 10 SF of spall in overlay at the finger joint. Expansion plate missing, both sides of south bound.

PIER 1:

SPAN 1: Concrete slope paving underneath.

SOUTH ABUTMENT:

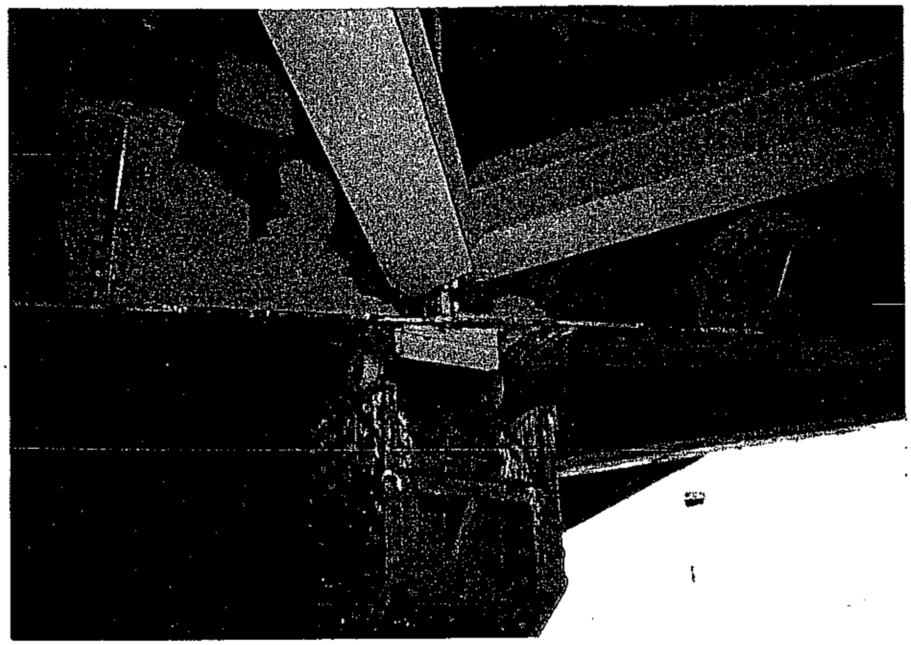
South approach panel is concrete, with one transverse crack in it. Relief joint needs resealing.

Picture #1
Hinge @ Span #2
No. B'nd.

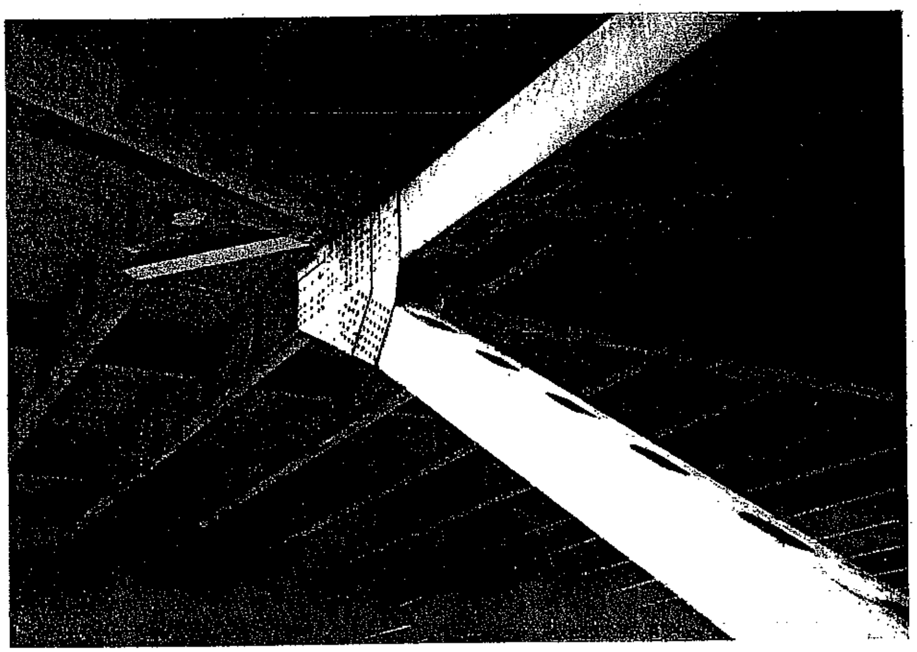
Picture #2
Hinge @ Span #2
No. B'nd.

Picture #3
Hinge @ Span #2
No. B'nd.

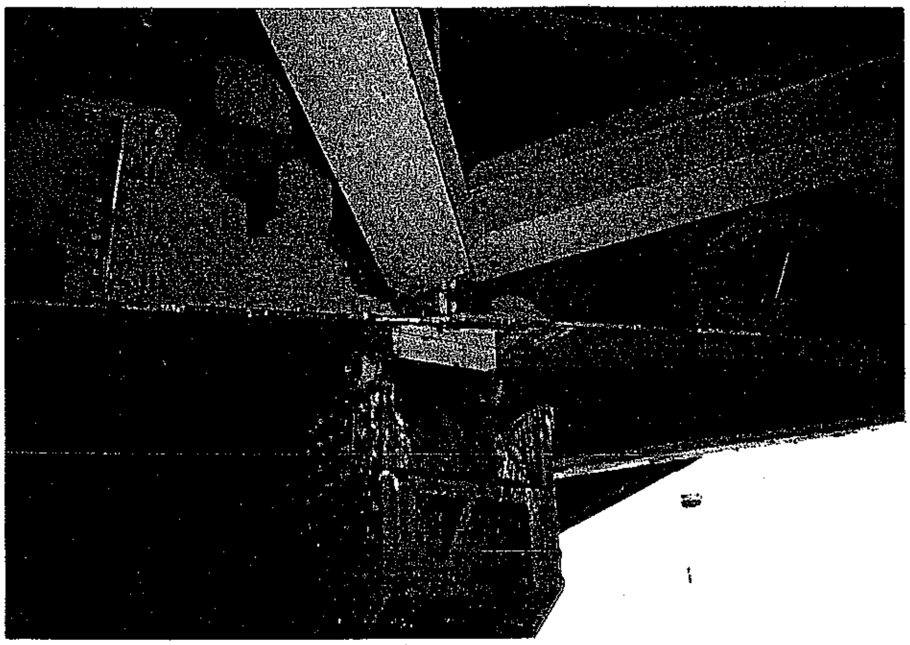
Picture #4
Hinge @ Span #2
No. B'nd.



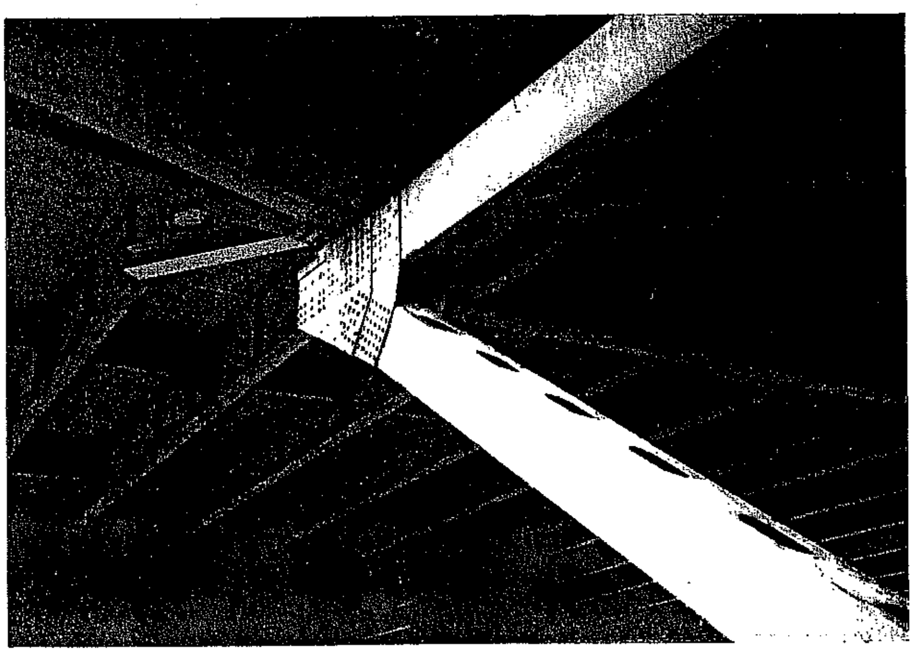
Picture #5
Repair to Floorbeam @ End of Multi-Beam Span
No. B'nd., Span #5, Deck Truss #2



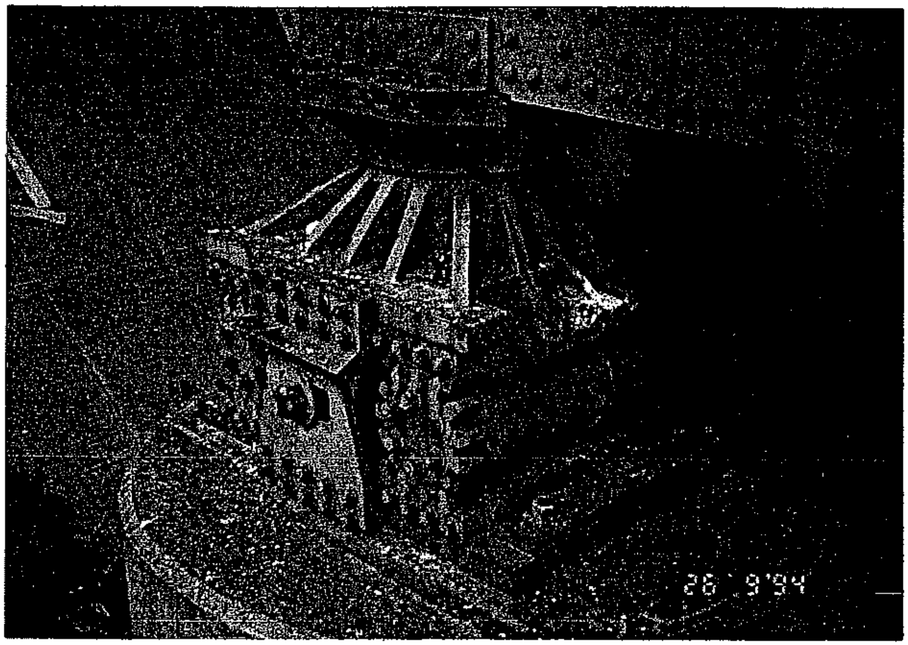
Picture #6
Deck Truss #2
Span #4, P/P-U0, No. B'nd.



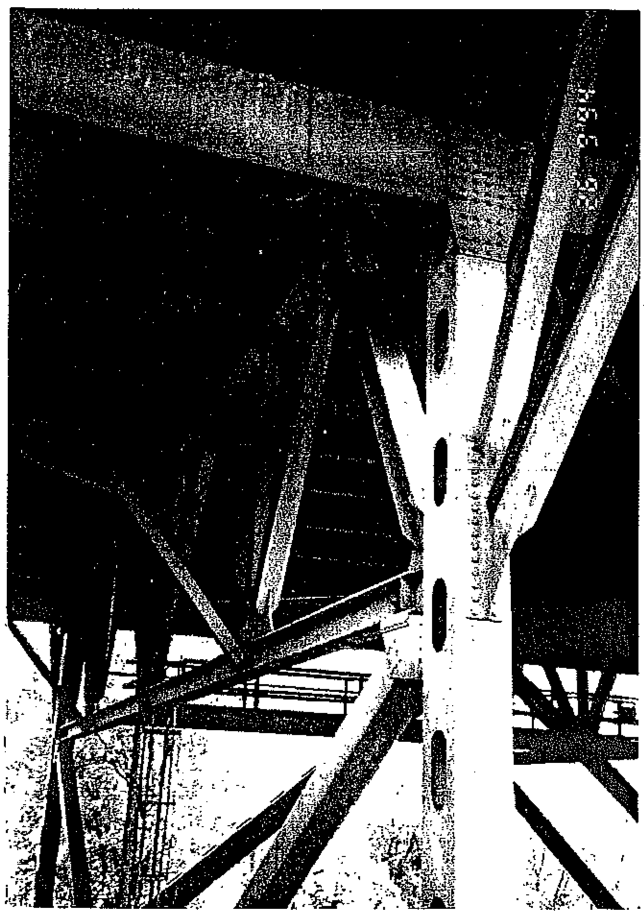
Picture #5
Repair to Floorbeam @ End of Multi-Beam Span
No. B'nd., Span #5, Deck Truss #2



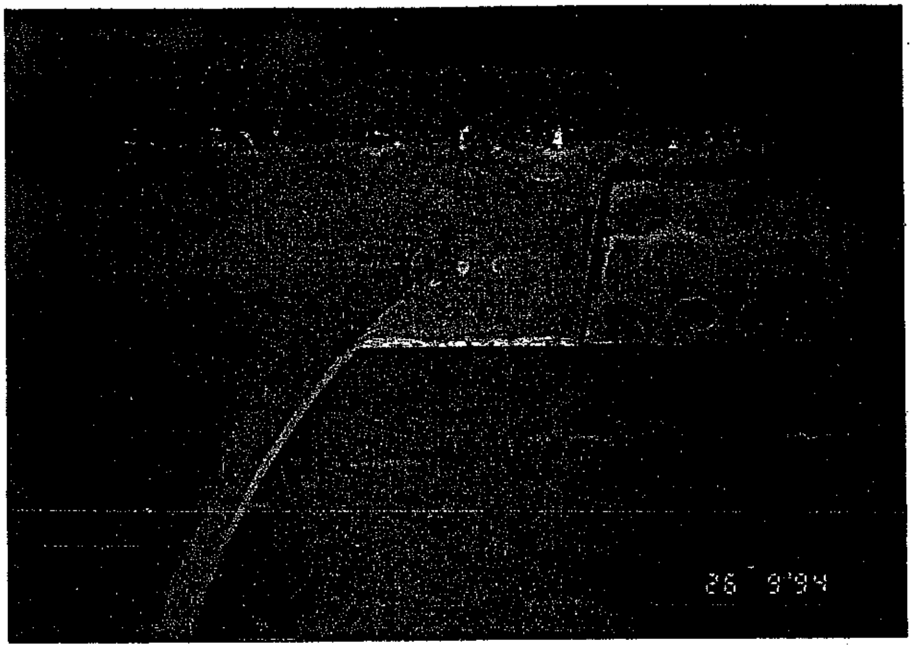
Picture #6
Deck Truss #2
Span #4, P/P-U0, No. B'nd.



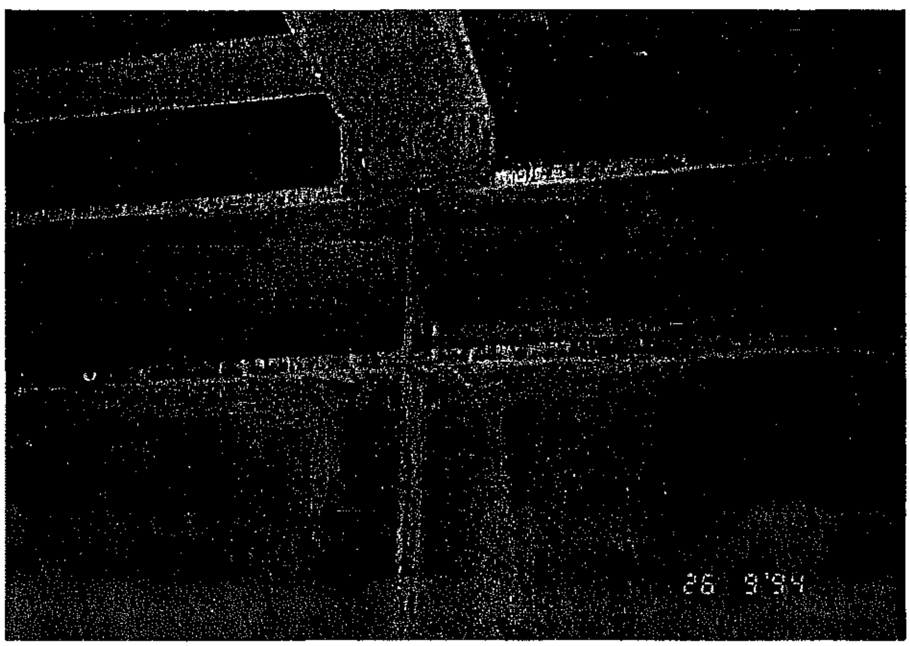
Picture #7
Expansion Bearing
Pier #3, No. B'nd.



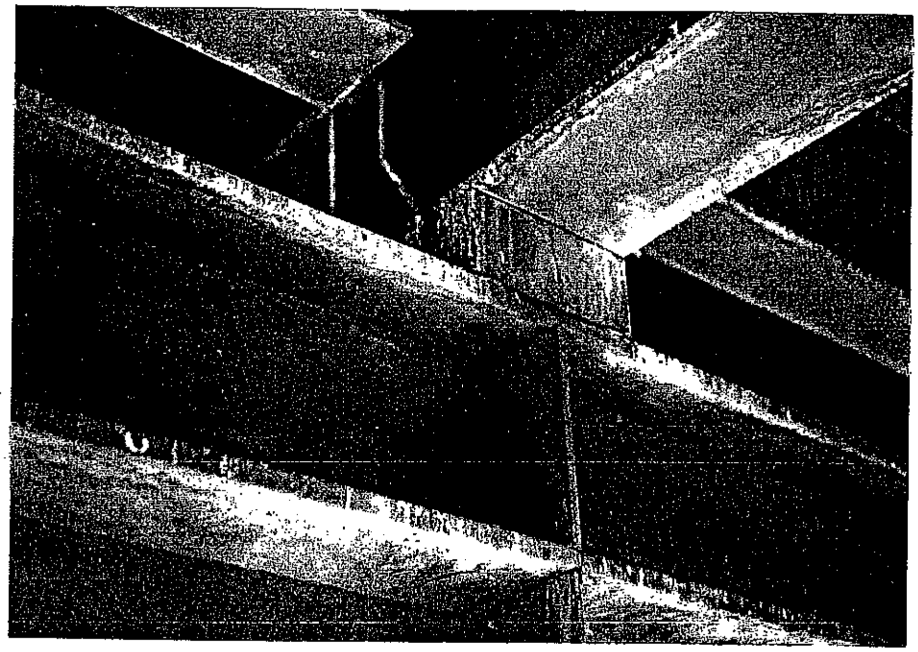
Picture #8
Floor Beam Truss #1
Span #5, P/P-U1
No. B'nd.



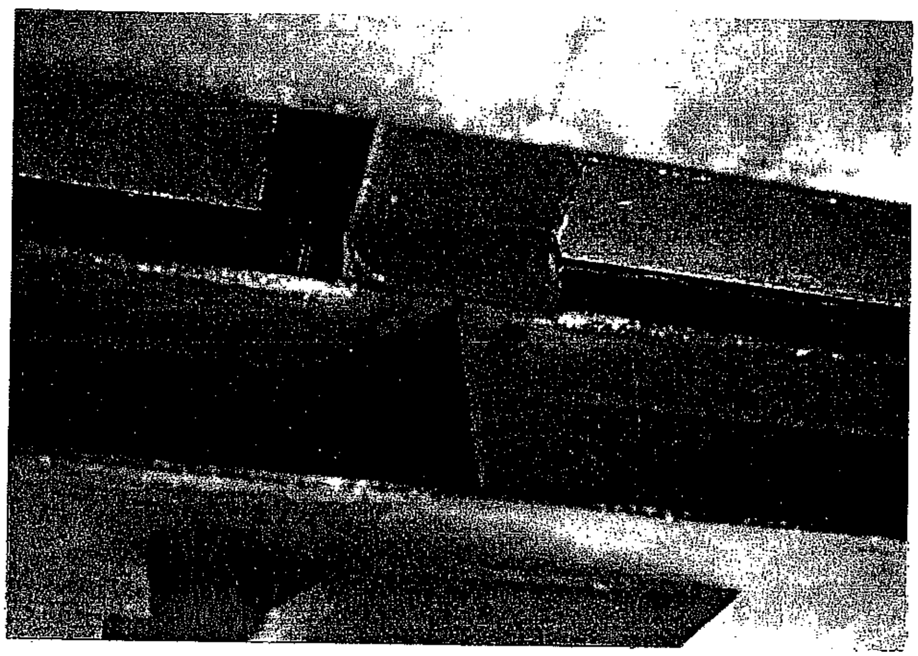
Picture #9
Cracked Weld
Span #6, P/P-6, B'nd.



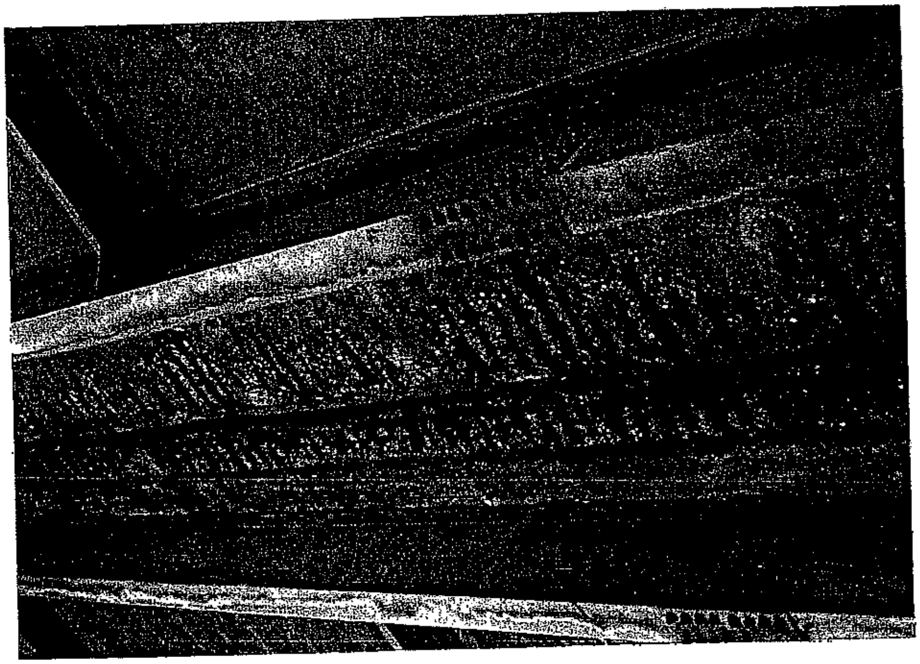
Picture #10
Missing Bolt @ Stringer #10
Span #6, P/P-U8, No. B'nd.



Picture #11
Missing Bolt @ Stringer #11
Span #6, P/P-U8, No. B'nd.

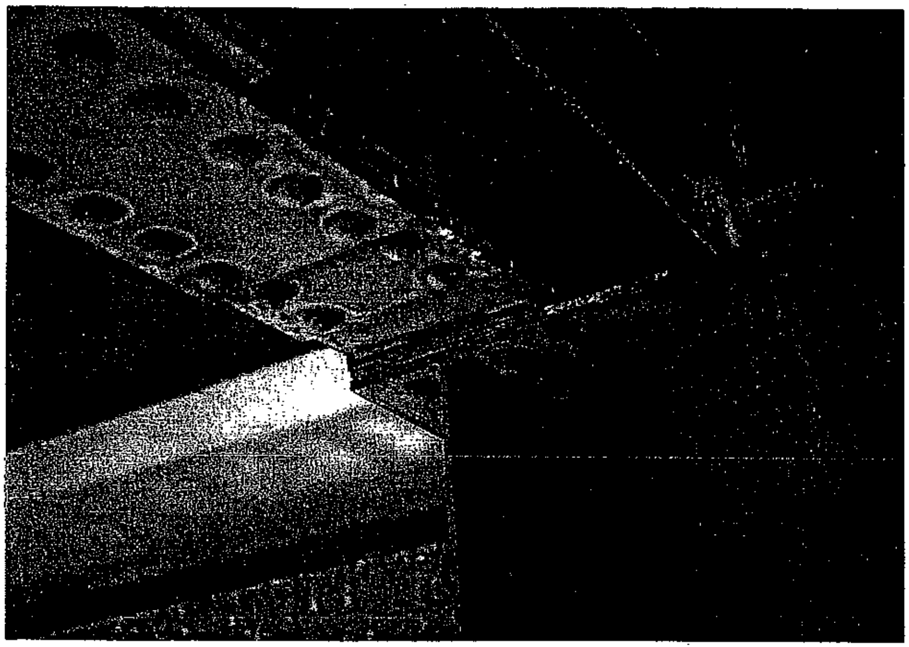


Picture #12
Missing Bolt @ Stringer #13
Span #6, P/P-U8, No. B'nd.

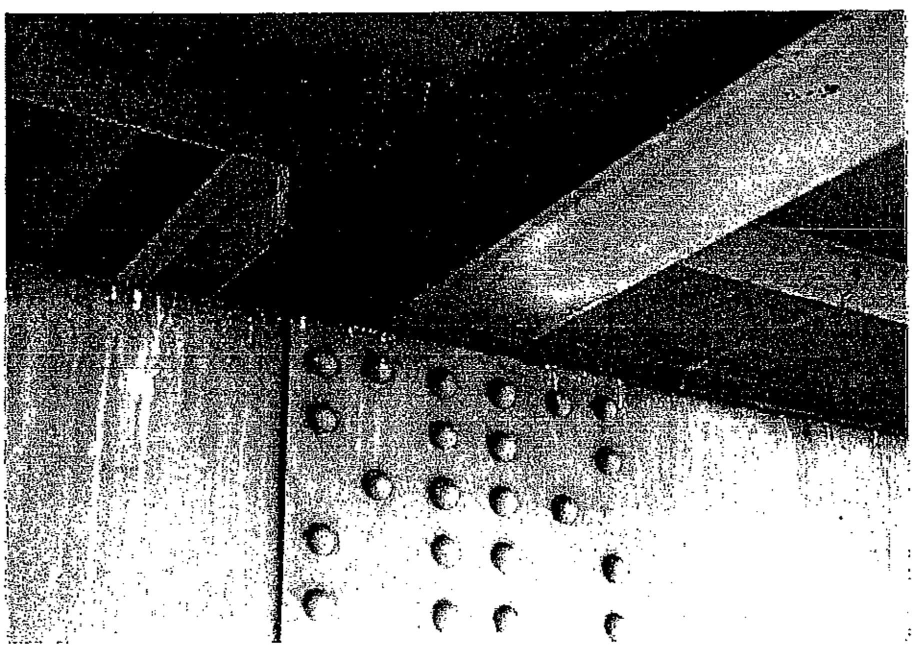


Picture #13
Chipped Concrete - Underside of Deck @ Median
Span #7, P/P-U14(midspan), No. B'nd.

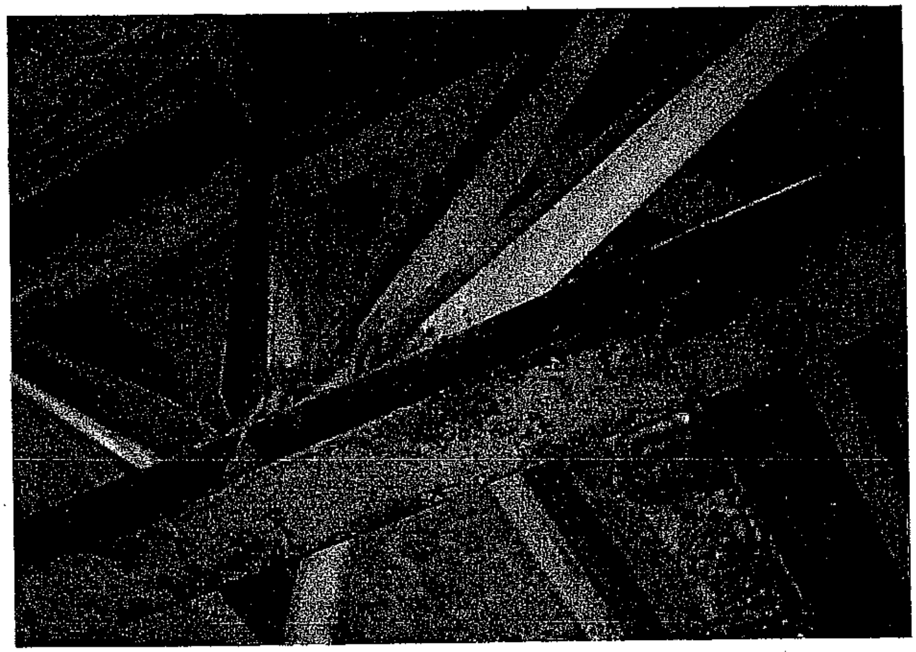
Picture #14
Chipped Concrete - Underside of Deck @ Median
Span #7, P/P-U14(midspan), No. B'nd.



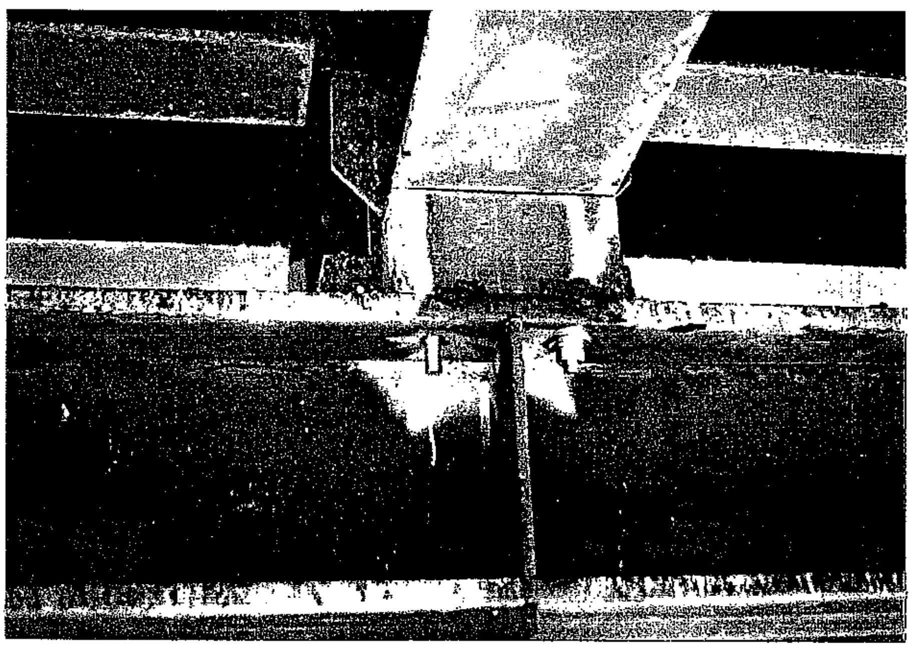
Picture #15
Bad Detail - 2" to 2 1/2" Tack Welds
Max. Tension in Floor Truss over Deck Truss
Span #7, P/P-U13', No. B'nd.



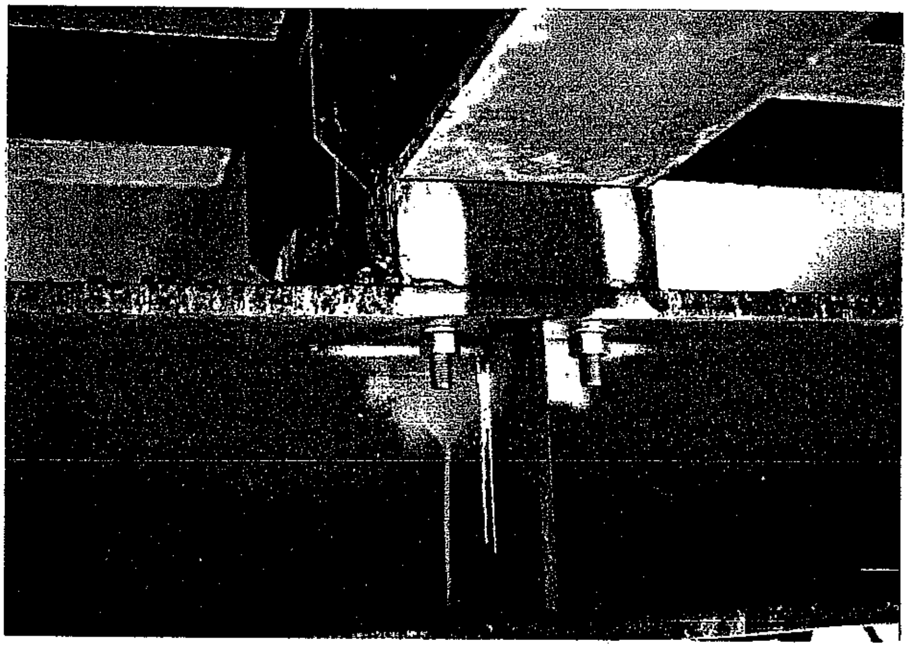
Picture #16
Bad Detail - 2" to 2 1/2" Tack Welds
Max. Tension in Floor Truss over Deck Truss
Span #7, P/P-U13', No. B'nd.



Picture #17
Condition of Paint on Floor Truss
Span #7, P/P-U8', No. B'nd.



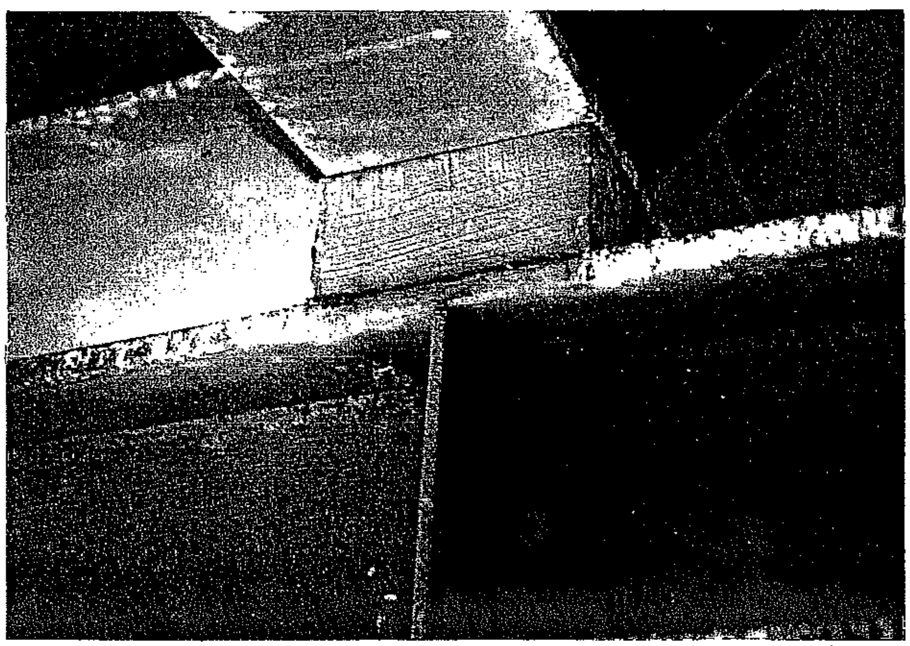
Picture #18
Broken Bolts Repaired with Red-Rod, Nut Missing
Stringer #11, Span #8, P/P-U8', No. B'nd.



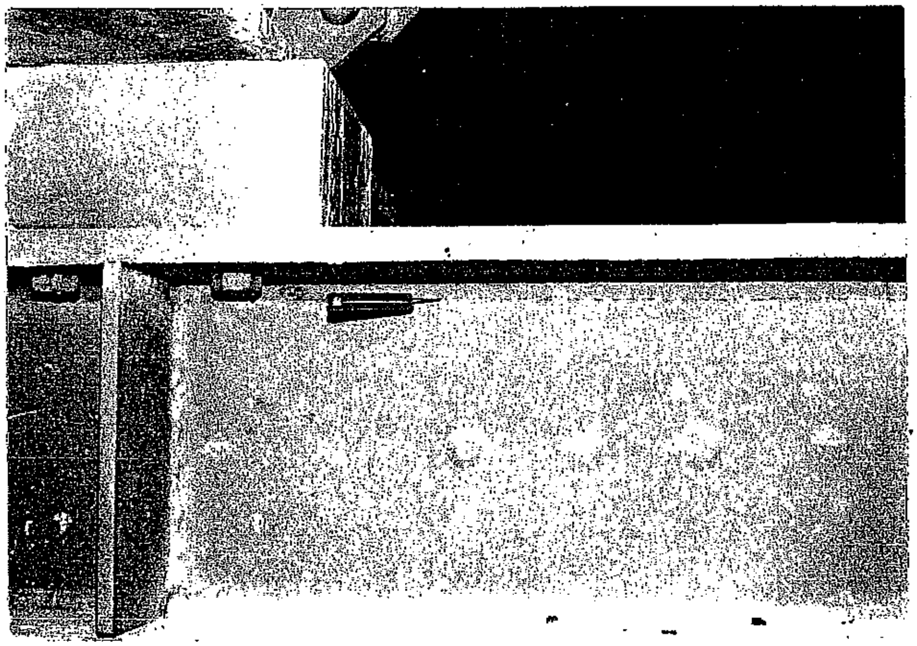
Picture #19
Broken Bolts Repaired with Red-Rod
Stringer #10, Span #8, P/P-U8', No. B'nd.

Picture #20
Typical Condition of Paint Under Median
Top Chord of Floor Truss to Diagonal Bracing Connection
Span #8, No. B'nd.

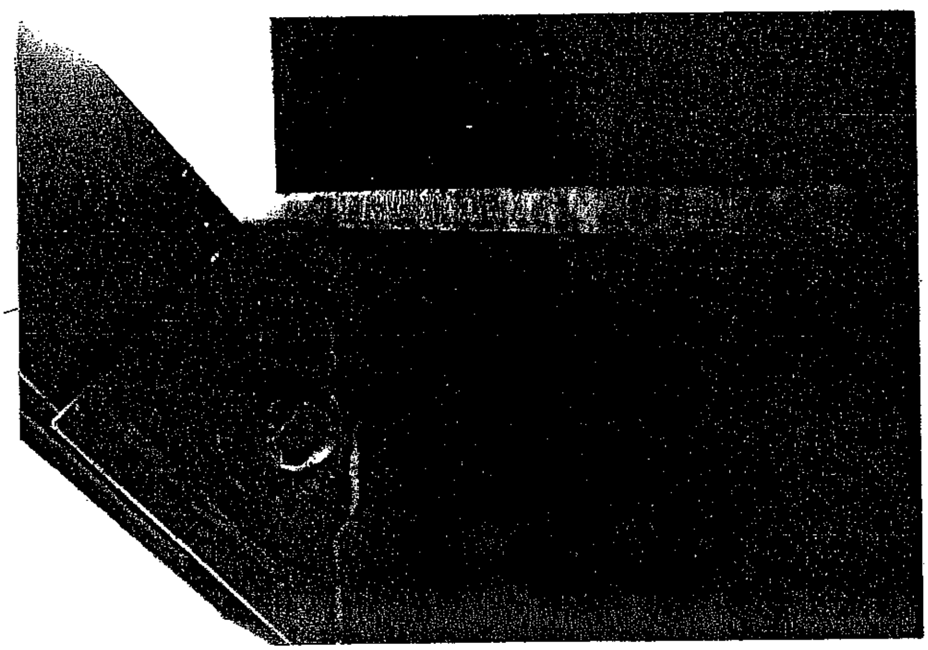
Picture #21
Heavy Rust on Bottom Chord of Floor Truss Under Median
Span #8, P/P-U6', No. B'nd.



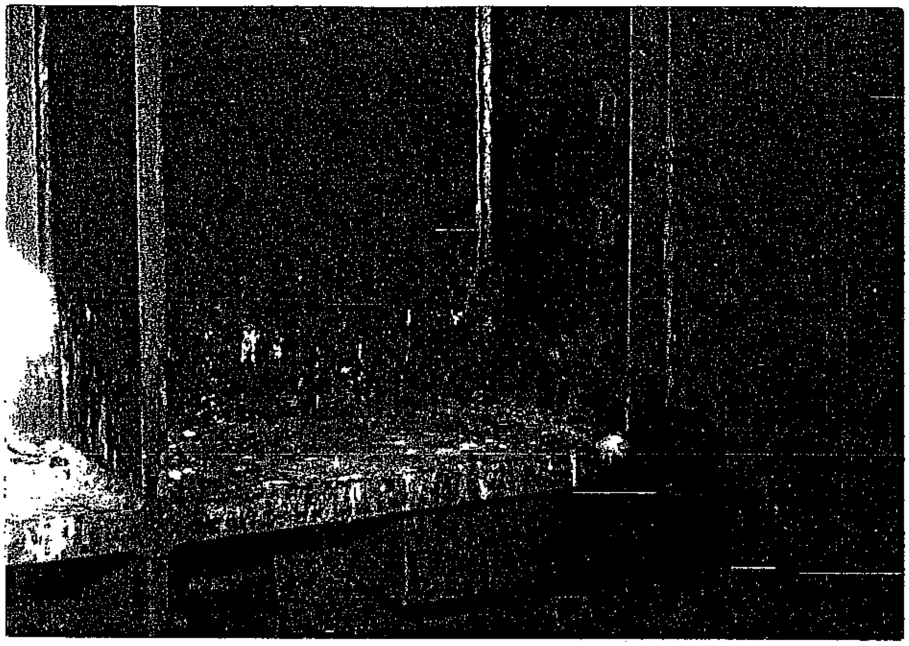
Picture #22
Bolts Working - Probably Near Failure
Stringer #11 to Floor Truss Connection
Span #8, P/P-U6', No. B'nd.



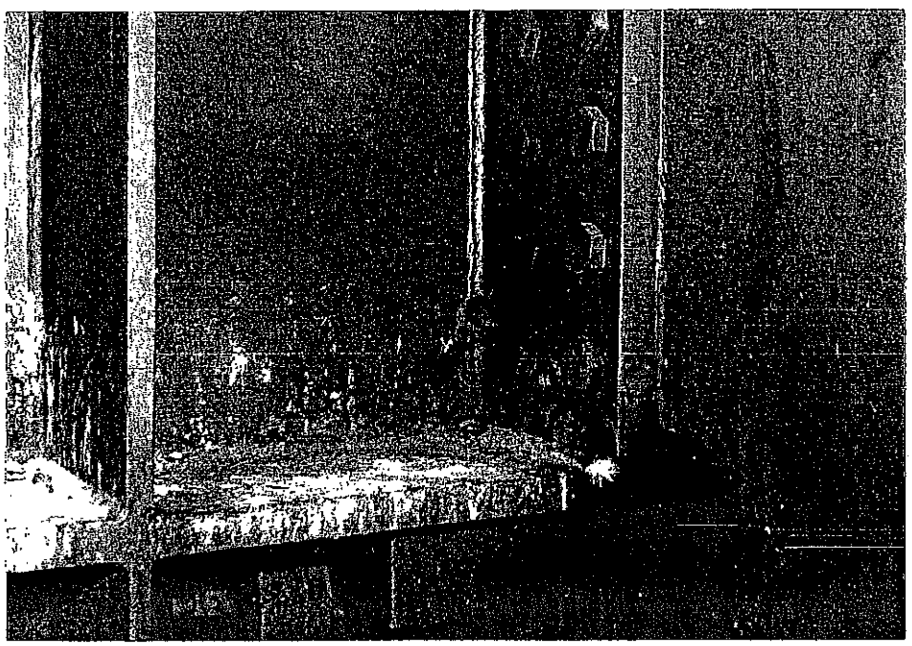
Picture #23
Incomplete Weld of Reinforcement Plate to Top Flange
Floor Truss - Span #8, P/P-U3', No. B'nd.



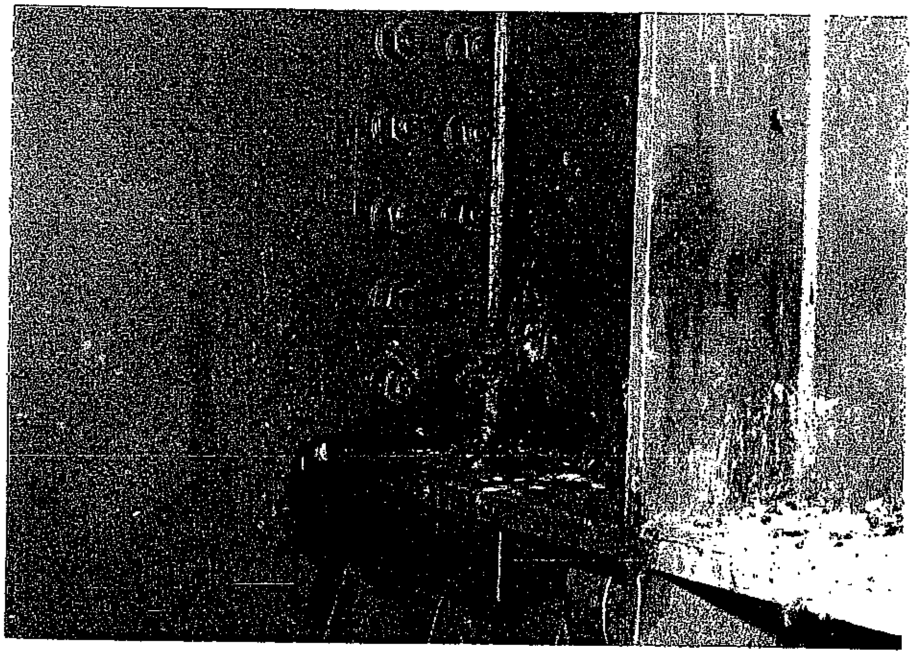
Picture #24
Pin Rotating Angle Brace to Bottom Chord of Floor Truss
Span #8, P/P-U1', No. B'nd.



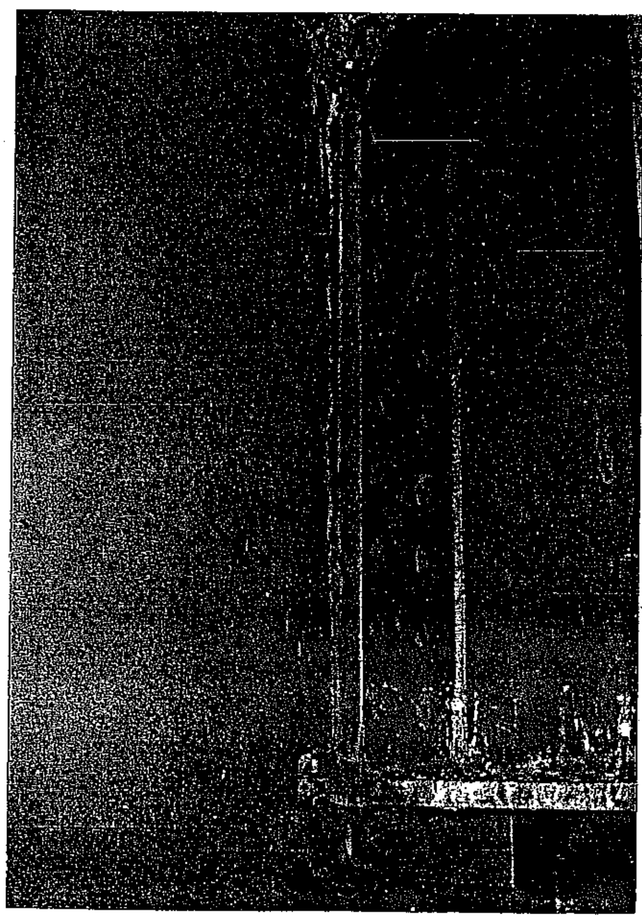
Picture #25
Fatigue Crack Drilled Out
Girder #12 to Floor Beam Connection
Span #9, Deck Truss #2, No. B'nd.



Picture #26
Fatigue Crack Drilled Out
Girder #12 to Floor Beam Connection
Span #9, Deck Truss #2, No. B'nd.

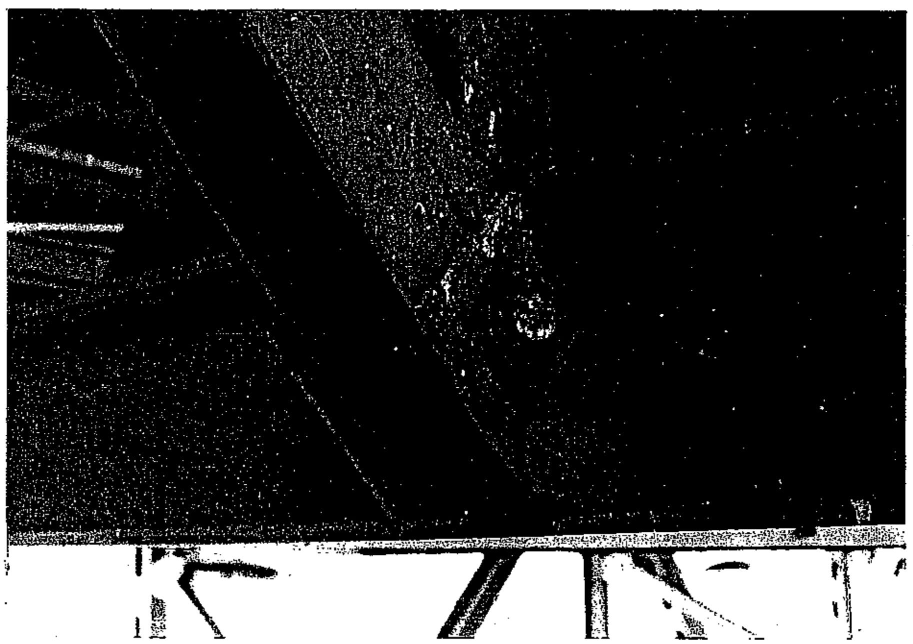


Picture #27
Fatigue Crack Drilled Out
Girder #12 to Floor Beam Connection
Span #9, Deck Truss #2, No. B'nd.

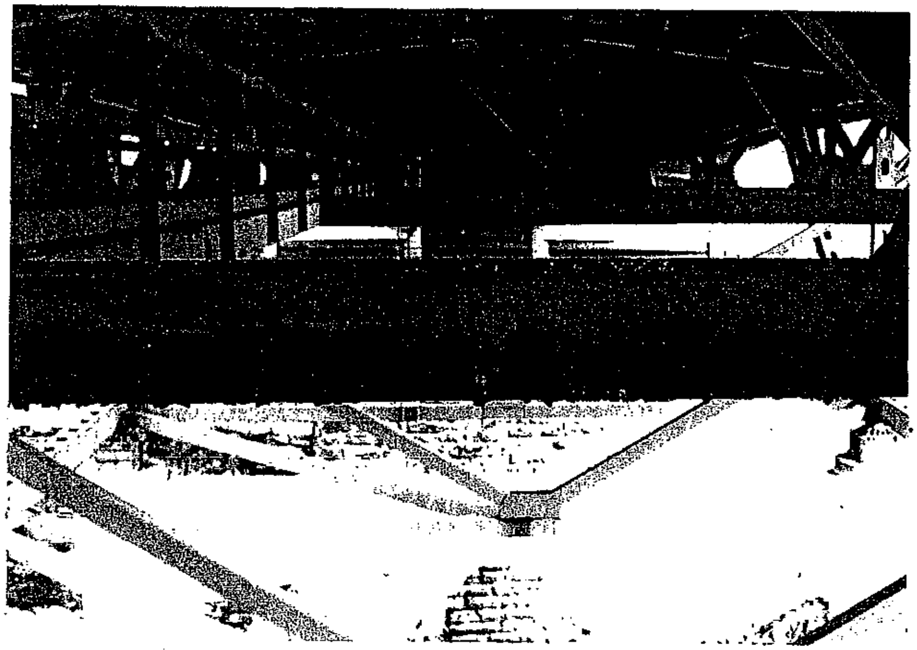


Picture #28
Connection
Working
Girder #3 to
Floor Beam
Span #9
So. B'nd.

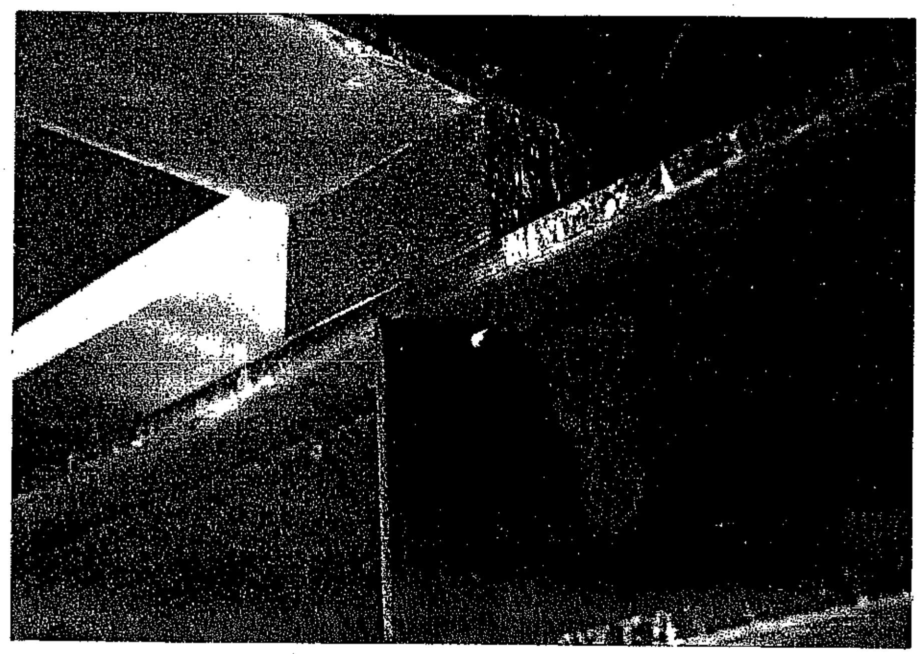
Picture #29
Ugly Weld @ Stringer #11 to Floor Truss Connection
Span #8, P/P-U3', So. B'nd.



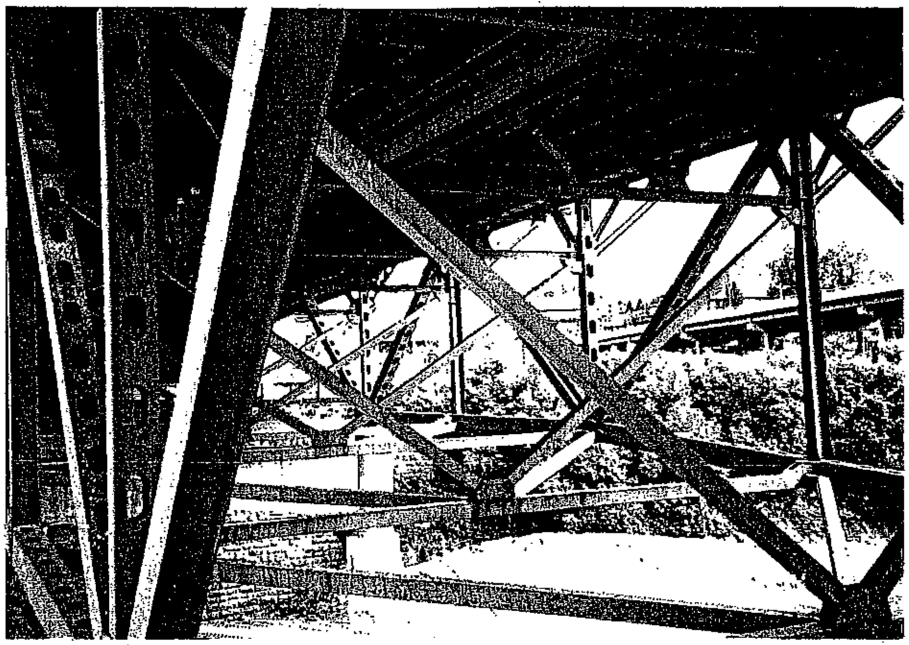
Picture #30
Rotating Pin in Vertical Brace (U10-L10) of Floor Truss
Span #8, P/P-U4', So. B'nd.



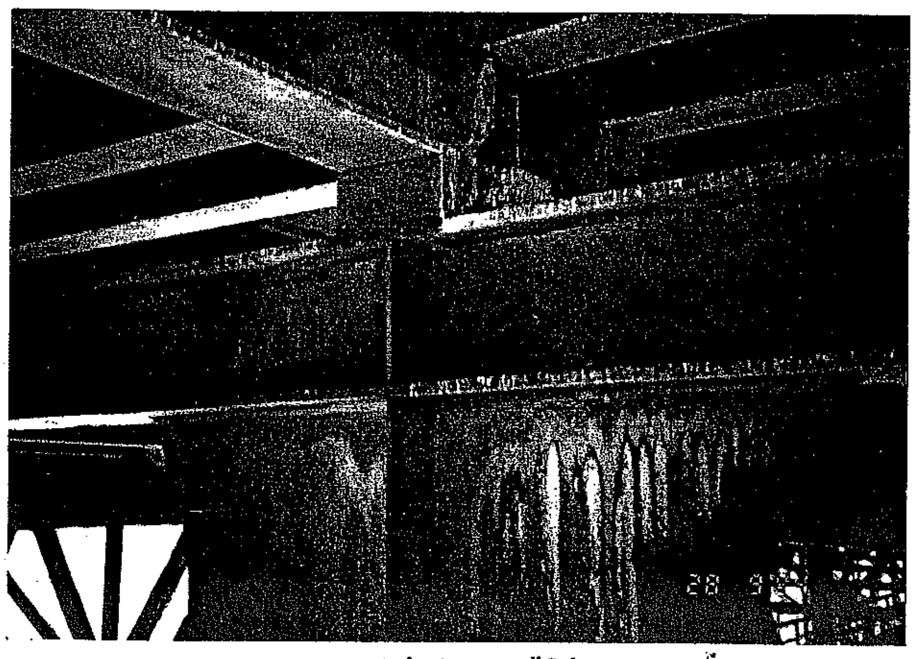
Picture #31
Paint Condition - Bottom Chord of Floor Truss
Span #8, P/P-U5', So. B'nd.



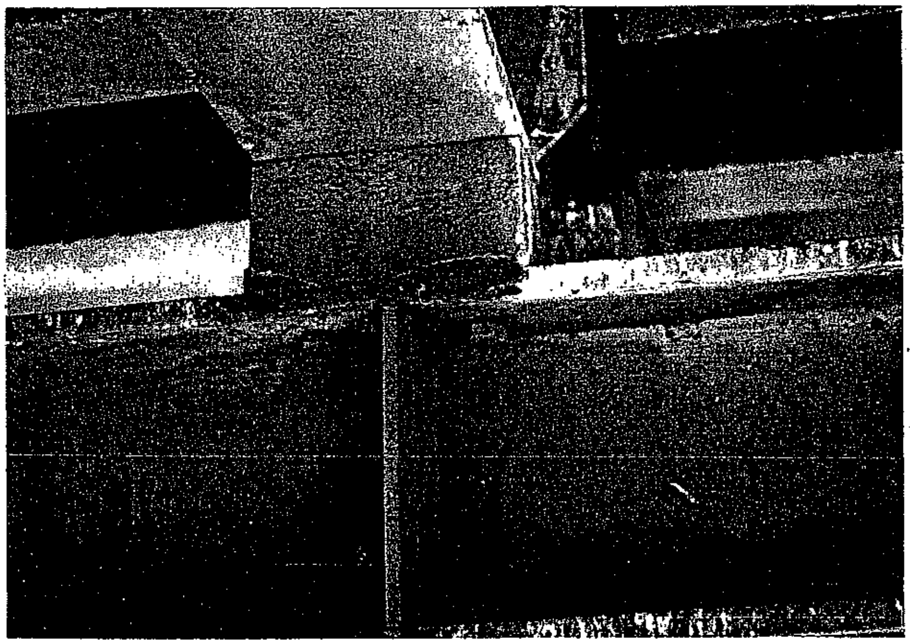
Picture #32
Broken Bolt - Stringer #4 to Floor Truss
Span #8, P/P U6', So. B'nd.



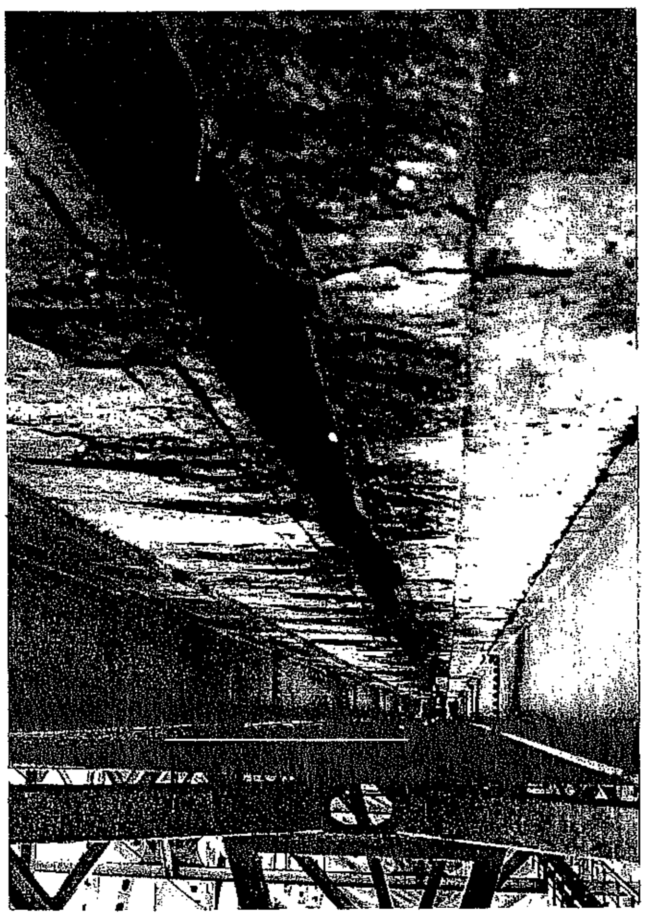
Picture #33
General View of Sway Framing
Looking North, Span #8, P/P-U6', So. B'nd.



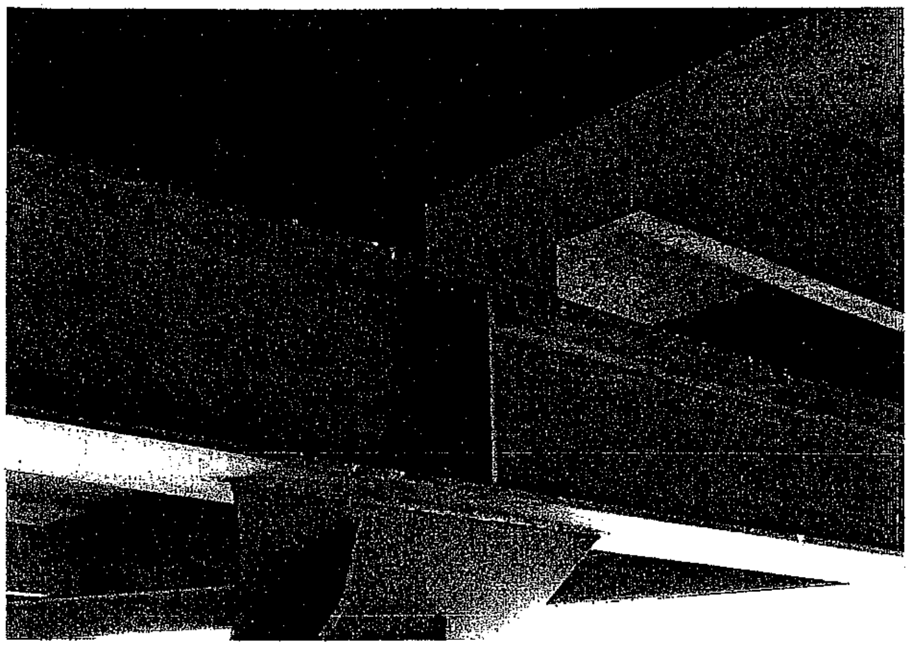
Picture #34
Broken Bolt - Stringer #4 to Floor Truss
Span #8, P/P U8', So. B'nd.



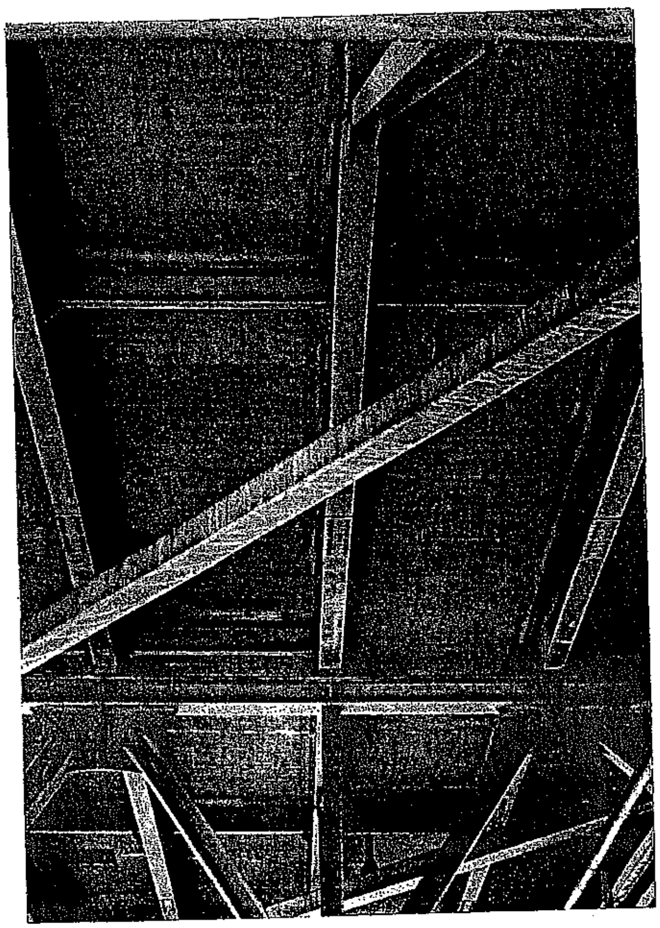
Picture #35
Broken Bolt - Stringer #4 to Floor Truss
Span #8, P/P U8', So. B'nd.



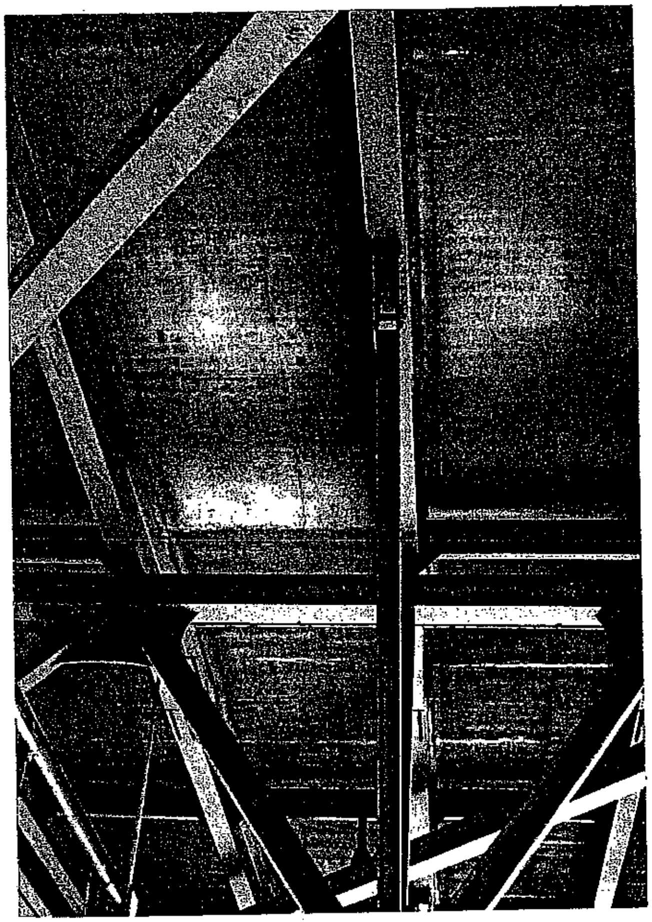
Picture #36
Looking South
Under Median
Span #7, P/P-U9'
So. B'nd



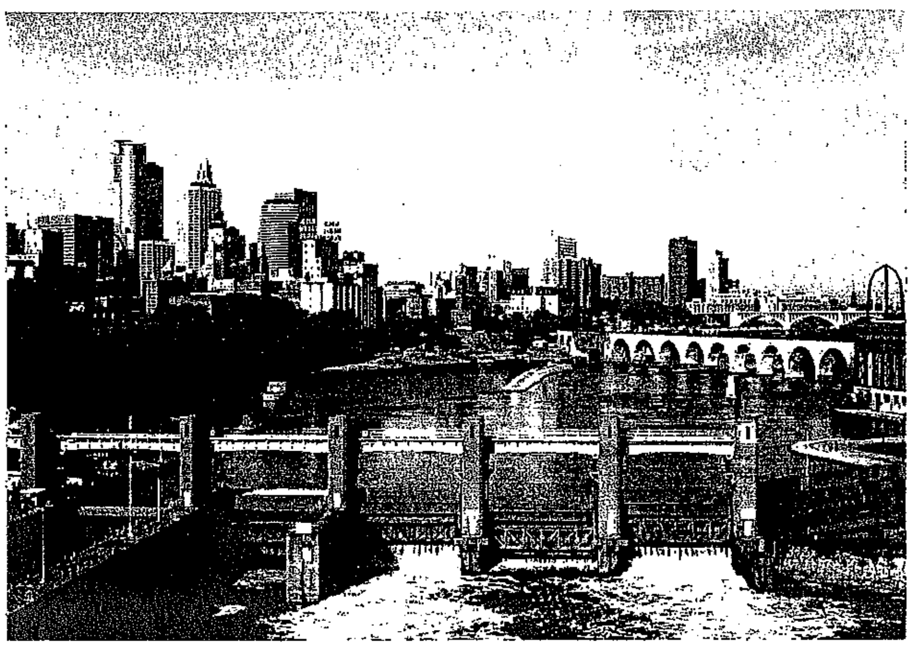
Picture #37
Loose Bolt - Stringer #2 to Floor Truss Connection
Span #7, P/P-U10', So. B'nd.



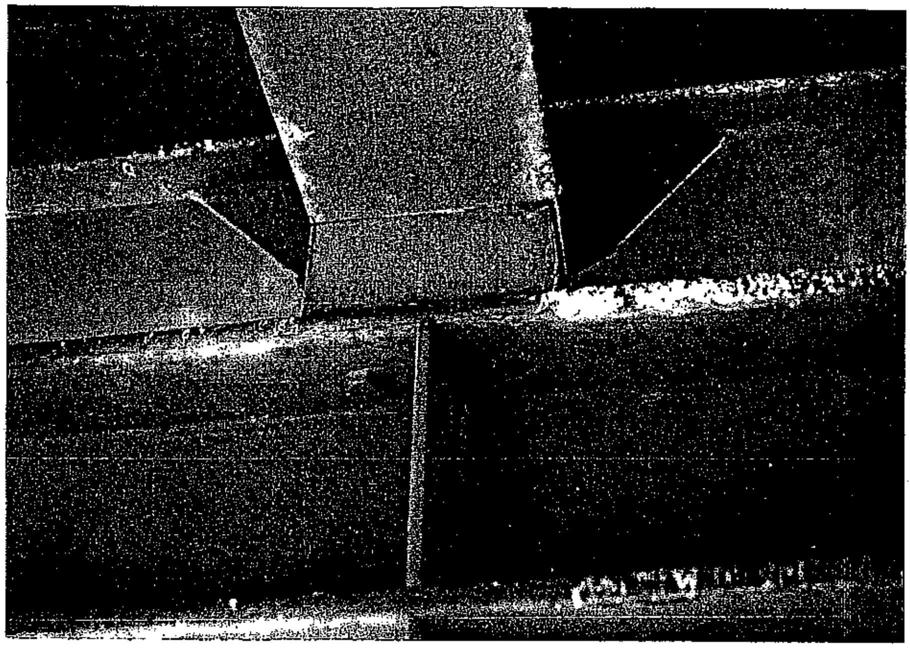
Picture #38
Typical View of
Underside of Deck
Span #7, P/P-11'
So. B'nd.



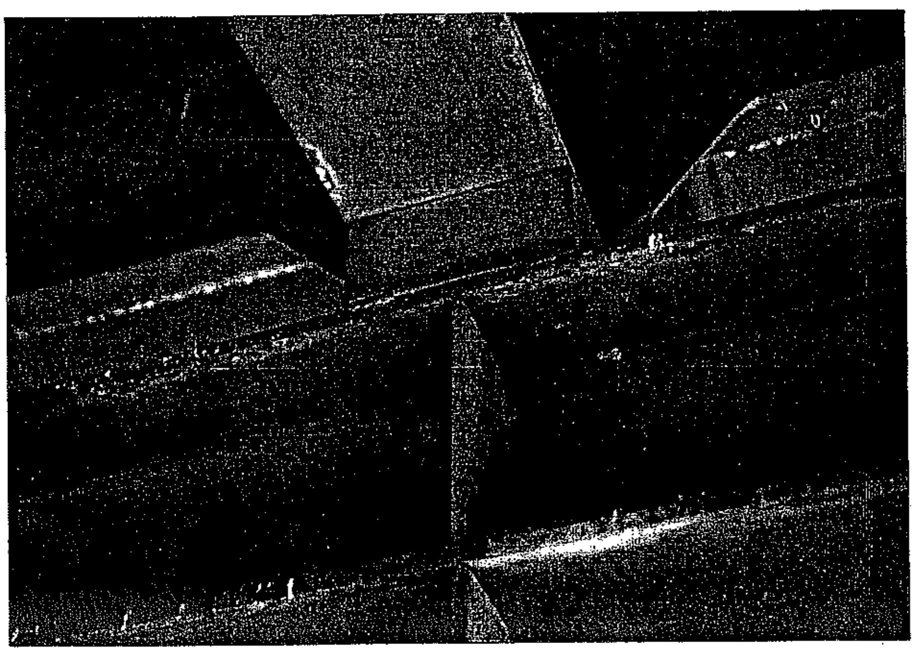
Picture #39
Typical View of
Underside of Deck
Span #7, P/P-11'
So. B'nd.



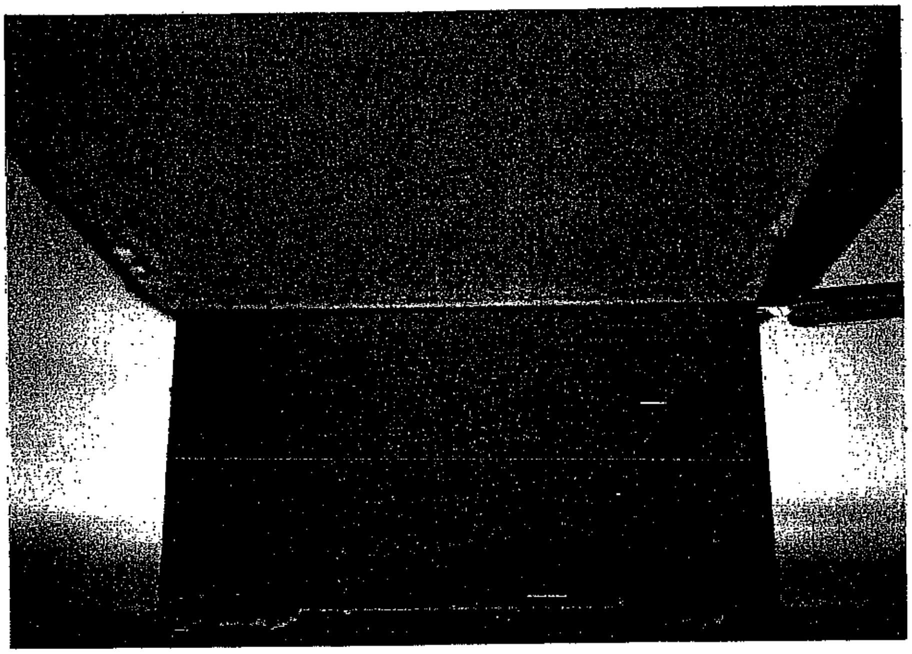
Picture #40
View from Under the Bridge
Looking West at Downtown Minneapolis



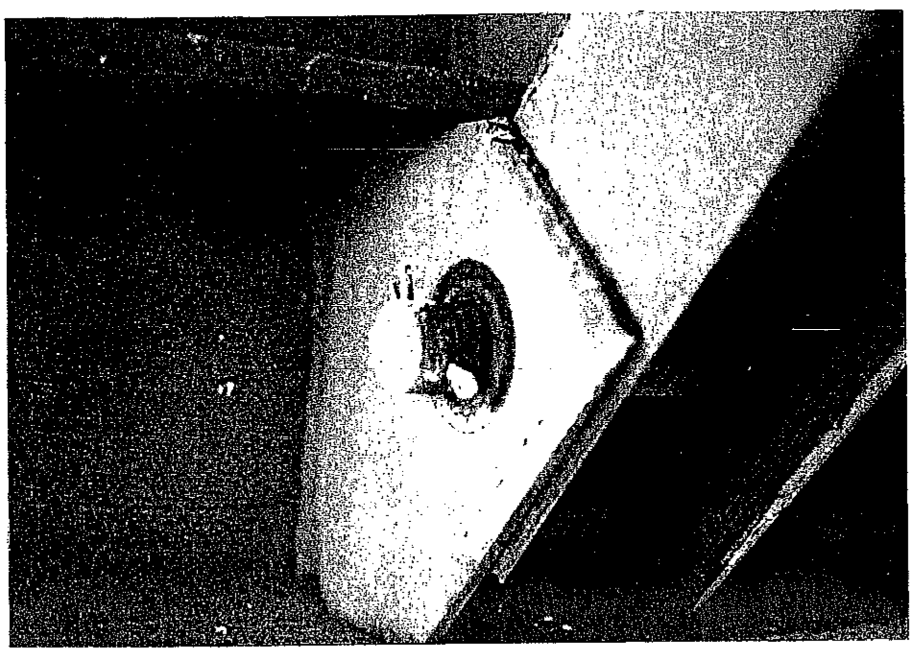
Picture #41
Broken Bolt - Stringer #4 to Floor Truss
Span #7, P/P U11, So. B'nd.



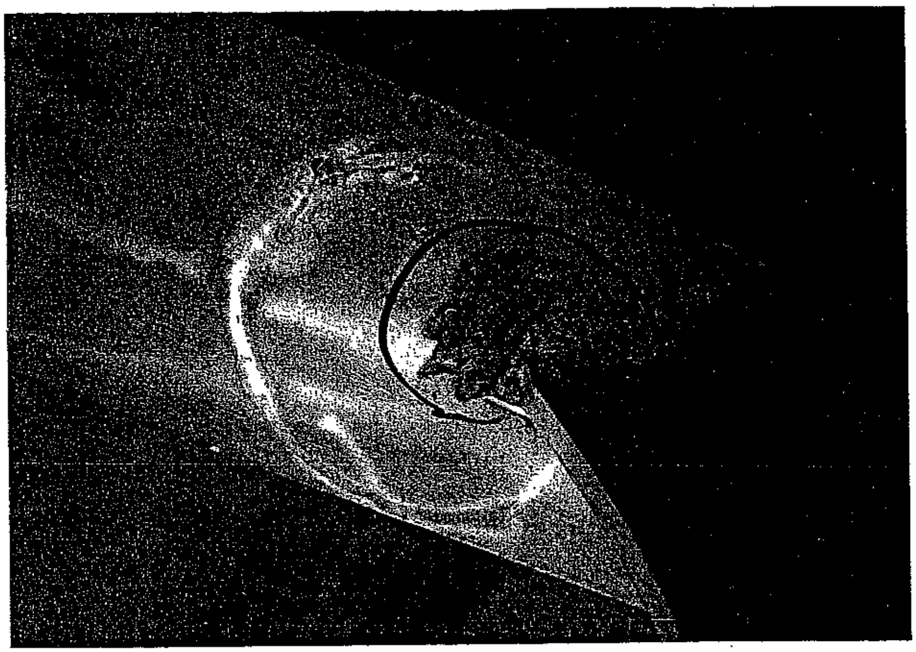
Picture #42
2 Broken Bolts - Stringer #4 to Floor Truss
Span #7, P/P U11, So. B'nd.



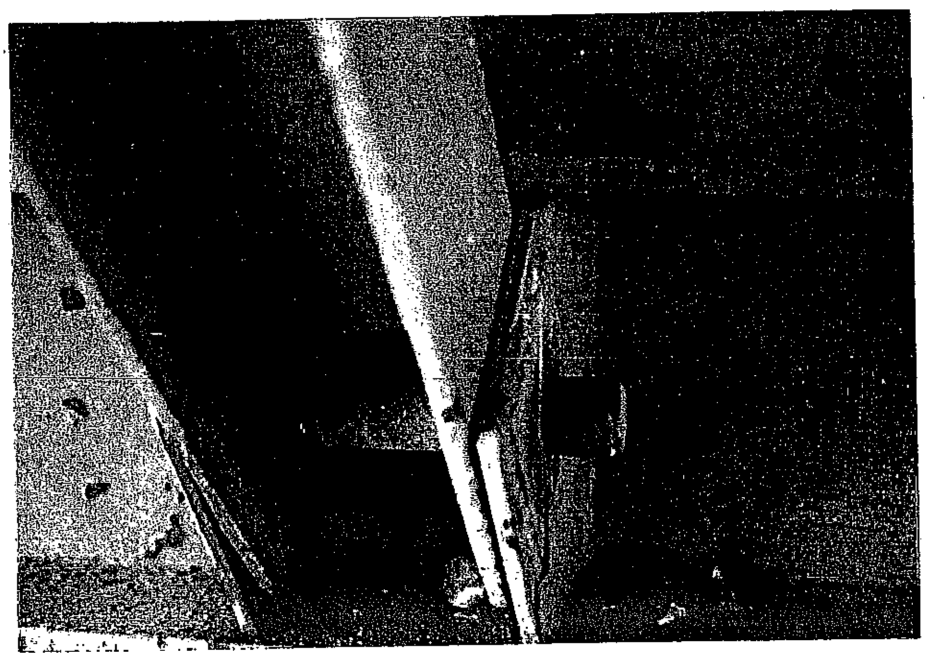
Picture #43
Stringer #4 Lifted 3/32"
Span #7, P/P-11, So. B'nd.



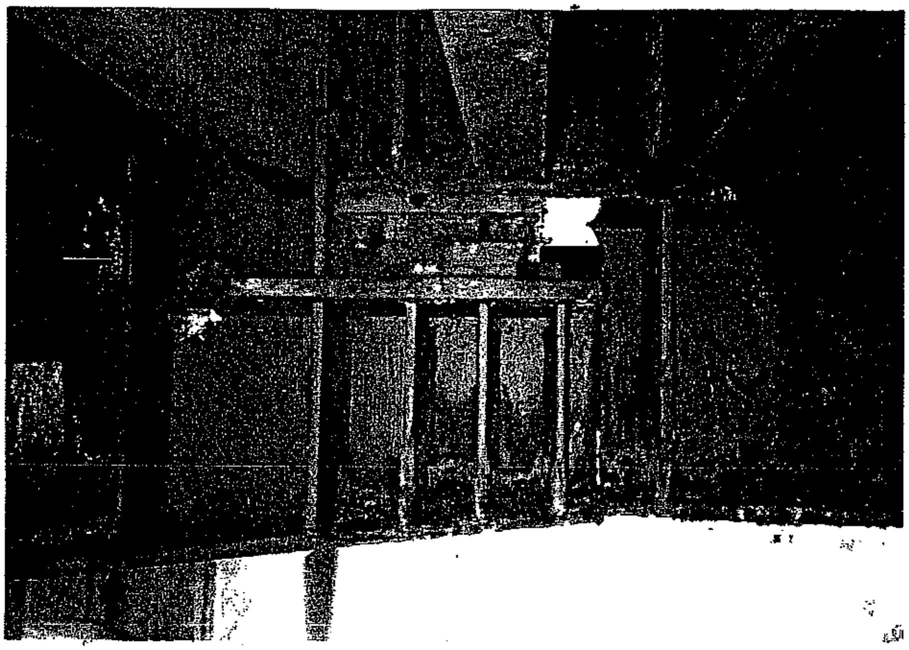
Picture #44
Pin Rotating - Vertical Brace @ Bottom Chord of Floor Truss
Span #6, P/P-U7, So. B'nd.



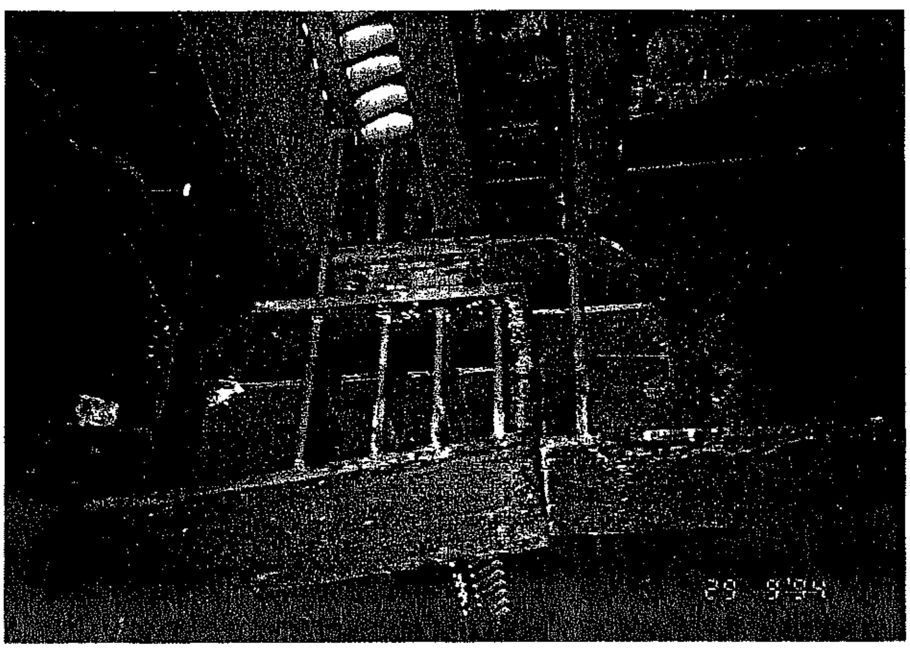
Picture #45
Gouges in Top Chord of Floor Truss
Span #6, P/P-U6, So. B'nd.



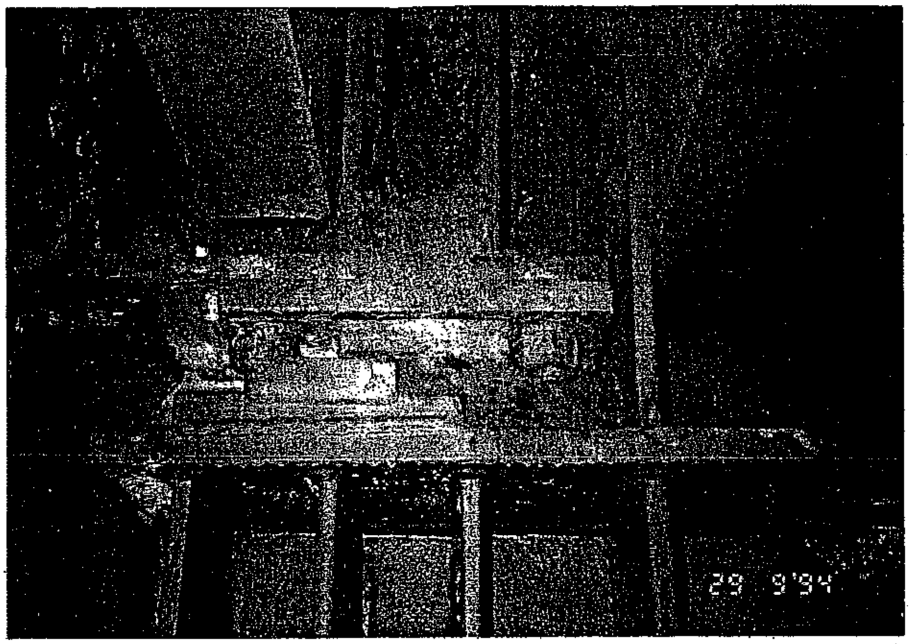
Picture #46
Missing Cotter Pin
Vertical Brace to Lower Chord of Floor Truss
Span #6, P/P-U1, So. B'nd.



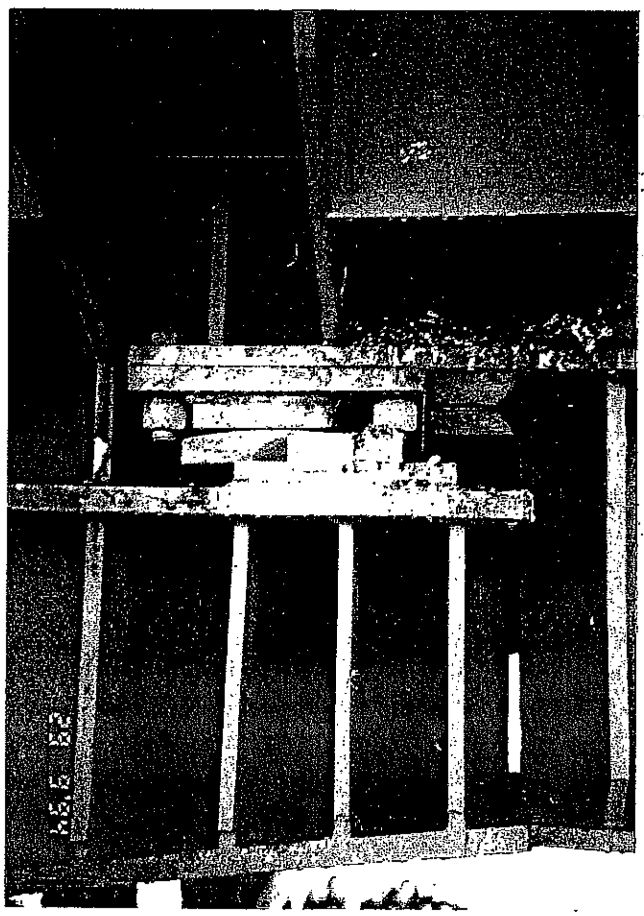
Picture #49
Hinge in Beam #5 - Ends of Beam Touching
Span #2, So. B'nd.



Picture #50
Hinge in Beam #5 - Ends of Beam Touching
Span #2, So. B'nd.



Picture #51
Hinge in Beam #4 - Debris Below Finger Joint
Span #2, So. B'nd.



Picture #52
Hinge in B'm #1
Span #2,
So. B'nd.

EXHIBIT NO: 7
Date: 3-24-08
JULIE A HIXE
COURT REPORTER

08/02/2007
Crew Number: 7627
Inspector: INSPECTOR

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 07-12-1996**

County: HENNEPIN
City: MINNEAPOLIS
Township:
Section: 25 Township: 029N Range: 24W
Span Type: CSTL BEAM SPAN
NBI Deck: 6 Super: 4 Sub: 6 Chan: 8 Culv: N

Location: 1.0 MI NE OF JCT TH 94
Route: ISTH 35W Ref. Pt.: 018+00.538
Control Section: 2783 Maint. Area: METRO
Local Agency Bridge Nbr:

Length: 1,907.0 ft
Deck Width: 113.3 ft (Varies)
Rdwy. Area / Pct. Unsnd: 201,511 sq ft
Paint Area / Pct. Unsnd: 490,200 sq ft 20 %

Open, Posted, Closed: OPEN

Appraisal Ratings - Approach: 8 Waterway: 8
MN Scour Code: L-STBL;LOW RISK
Def. Stat: S.D.
Suff. Rate:

Required Bridge Signs - Load Posting: NOT REQUIRED Traffic: NOT REQUIRED
Horizontal: NOT REQUIRED Vertical: NOT APPLICABLE

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
22	LS O/L (CONC DECK)	2	07-12-1996	219,086 SF	0	219,089	0	0	0
			10-13-1995	219,086 SF	0	219,089	0	0	0
	Notes:								
48	LS O/L (CONC SLAB)	2	07-12-1996	219,086 SF	0	0	0	0	0
	Notes:								
300	STRIP SEAL JOINT	2	07-12-1996	315 LF	315	0	0	N/A	N/A
			10-13-1995	318 LF	318	0	0	N/A	N/A
	Notes:								
301	POURED DECK JOINT	2	07-12-1996	2,924 LF	1,023	0	1,901	N/A	N/A
			10-13-1995	255 LF	255	0	0	N/A	N/A
	Notes:								
303	ASSEMBLY DECK JOINT	2	07-12-1996	326 LF	326	0	0	N/A	N/A
			10-13-1995	326 LF	326	0	0	N/A	N/A
	Notes:								
321	CONC APPROACH SLAB	2	07-12-1996	4 EA	0	4	0	0	N/A
			10-13-1995	2 EA	2	0	0	0	N/A
	Notes:								
333	RAILING - OTHER	2	07-12-1996	3,814 LF	0	3,318	496	N/A	N/A
			10-13-1995	3,814 LF	0	3,318	496	N/A	N/A
	Notes:								
334	METAL RAIL-COATED	2	07-12-1996	3,814 LF	3,814	0	0	0	0
			10-13-1995	3,814 LF	3,814	0	0	0	0
	Notes:								
107	PAINTED STEEL GIRDER	2	07-12-1996	10,596 LF	0	9,113	1,377	106	0
			10-13-1995	10,596 LF	0	9,113	1,377	106	0
	Notes:								

8/20/33/79) [1968] BRIDGE PAINTED WITH LEAD BASE SYSTEM. [1995] THE PAINT SYSTEM IS 20% UNSOUND.

8) SPANS #1-5 AND #9-11. [1995] THE BEAMS HAVE MINOR CHALKING THROUGHOUT. THERE IS FLAKING RUST ON THE BOTTOM FLANGE OF THE BEAMS ADJACENT TO THE MEDIAN; THE BEAMS HAVE SEVERE CORROSION AT THE HINGES (SPAN #2). welded cover plates - multi beam spans.

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 07-12-1996**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
113	PAINT STEEL STRINGER	2	07-12-1996	14,896 LF	0	14,747	0	149	0
			10-13-1995	14,896 LF	0	14,747	0	149	0
	Notes:								
131	PAINT STL DECK TRUSS	2	07-12-1996	2,127 LF	0	0	1,914	213	0
			10-13-1995	2,127 LF	0	0	1,914	213	0
	Notes: 20/157/161) THE TRUSS MEMBERS HAVE NUMEROUS POOR WELDING DETAILS (INCLUDING TACK WELDS ON THE INTERIOR STIFFENER PLATES). [1995] THE INTERIOR OF THE TRUSS MEMBERS HAVE EXTENSIVE SURFACE RUST (SOME PITTING), AND SEVERE PIGEON DEBRIS. THERE IS CORROSION (WITH PACK RUST AND SURFACE PITTING) AT THE FLOORBEAM AND SWAY BRACE CONNECTIONS.								
152	PAINT STL FLOORBEAM	2	07-12-1996	3,348 LF	0	2,645	268	435	0
			10-13-1995	3,348 LF	0	2,645	268	435	0
	Notes: THE FLOORBEAM TRUSSES HAVE NUMEROUS POOR WELDING DETAILS (INCLUDING PLUG WELDED WEB REINFORCEMENT PLATES, AND TACK WELDS & WELDED CONNECTION PLATES IN TENSION ZONES). [1994] THE FLOORBEAM TRUSSES HAVE CHALKING THROUGHOUT, WITH SEVERE FLAKING RUST BELOW THE MEDIAN. [1995] THE END FLOORBEAMS, AND THE "CROSSBEAMS" (BELOW OPEN FINGER JOINTS) HAVE SEVERE CORROSION AND EXTENSIVE DEBRIS (SHOULD BE FLUSHED). [1986] THE SOUTH CROSSBEAM DEVELOPED CRACKS (IN WEB STIFFENER) AT THE EAST ROCKER HINGE (THE HINGE HAD FROZEN) - THE CRACKS WERE DRILLED OUT, AND BRACING WAS ADDED (BEAMS #11 & #12). [1992] THE NORTH CROSSBEAM DEVELOPED A CRACK IN THE WEB STIFFENER WELD (AT EAST ROCKER HINGE) - THIS WAS DRILLED OUT. [1994] AT THE NORTH CROSSBEAM, THE BEAM #3 CONNECTION IS "WORKING" - THE BOLTS SHOULD BE REPLACED.								
373	STEEL HINGE	2	07-12-1996	1 EA	1	0	0	0	0
			10-13-1995	1 EA	1	0	0	0	0
	Notes: 46) [1986] THE HINGE SUPPORTING THE EAST END OF THE SOUTH CROSSBEAM FROZE (DAMAGING THE CROSSBEAM)								
380	SECONDARY ELEMENTS	2	07-12-1996	1 EA	0	0	1	0	N/A
			10-13-1995	1 EA	0	0	1	0	N/A
	Notes:								
311	EXPANSION BEARING	2	07-12-1996	125 EA	83	42	0	N/A	N/A
			10-13-1995	125 EA	125	0	0	N/A	N/A
	Notes:								
313	FIXED BEARING	2	07-12-1996	35 EA	35	0	0	N/A	N/A
			10-13-1995	35 EA	35	0	0	N/A	N/A
	Notes:								
205	CONCRETE COLUMN	2	07-12-1996	52 EA	51	1	0	0	N/A
			10-13-1995	52 EA	51	1	0	0	N/A
	Notes: 41) [1995] PIER #11 HAS EXTENSIVE SHOT-CRETE REPAIRS, WITH 10 SF OF SPALL (EXPOSED REBAR) AT BOTH EAST AND WEST END.								
210	CONCRETE PIER WALL	2	07-12-1996	168 LF	168	0	0	0	N/A
			10-13-1995	168 LF	168	0	0	0	N/A

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 07-12-1996**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
	Notes:								
215	CONCRETE ABUTMENT	2	07-12-1996	255 LF	255	0	0	0	N/A
			10-13-1995	255 LF	255	0	0	0	N/A
	Notes:								
234	CONCRETE CAP	2	07-12-1996	819 LF	680	131	8	0	N/A
			10-13-1995	819 LF	680	139	0	0	N/A
	Notes:								
356	FATIGUE CRACKING	2	07-12-1996	1 EA	1	0	0	N/A	N/A
			10-13-1995	1 EA	1	0	0	N/A	N/A
	Notes:								
357	PACK RUST	2	07-12-1996	1 EA	0	1	0	0	N/A
			10-13-1995	1 EA	0	1	0	0	N/A
	Notes:								
358	CONC DECK CRACKING	2	07-12-1996	1 EA	0	1	0	0	N/A
			10-13-1995	1 EA	0	1	0	0	N/A
	Notes:								
359	CONC DECK UNDERSIDE	2	07-12-1996	1 EA	0	0	0	1	0
			10-13-1995	1 EA	0	0	0	1	0
	Notes:								
360	SETTLEMENT	2	07-12-1996	1 EA	1	0	0	N/A	N/A
	Notes:								
361	SCOUR	2	07-12-1996	1 EA	1	0	0	N/A	N/A
			10-13-1995	1 EA	1	0	0	N/A	N/A
	Notes:								
363	SECTION LOSS	2	07-12-1996	1 EA	0	1	0	0	N/A
			10-13-1995	1 EA	0	1	0	0	N/A
	Notes:								
981	SIGNING	2	07-12-1996	1 EA	0	0	1	0	0
			10-13-1995	1 EA	0	0	1	0	0
	Notes:								
982	GUARDRAIL	2	07-12-1996	1 EA	0	1	0	N/A	N/A
			10-13-1995	1 EA	0	1	0	N/A	N/A
	Notes:								
984	DRAINAGE	2	07-12-1996	1 EA	0	0	1	N/A	N/A
			10-13-1995	1 EA	0	0	1	N/A	N/A
	Notes:								
985	SLOPES	2	07-12-1996	1 EA	1	0	0	N/A	N/A
			10-13-1995	1 EA	1	0	0	N/A	N/A
	Notes:								

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 07-12-1996**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
986	CURB & SIDEWALK	2	07-12-1996	1 EA	0	1	0	N/A	N/A
			10-13-1995	1 EA	0	1	0	N/A	N/A
	Notes:								
988	MISCELLANEOUS	2	07-12-1996	1 EA	0	1	0	N/A	N/A
			10-13-1995	1 EA	0	1	0	N/A	N/A
	Notes:								

General Notes: *BRIDGE #9340 YEAR 1996

NOTE: SEE FRACTURE CRITICAL REPORT FOR ADDITIONAL INFORMATION.

Inspector's Signature

Reviewer's Signature / Date

EXHIBIT NO: 8
Date: 3-24-08
JULIE A RIXE
COURT REPORTER

08/02/2007
Crew Number: 7627
Inspector: INSPECTOR

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 08-04-1997**

County: HENNEPIN
City: MINNEAPOLIS
Township:
Section: 25 Township: 029N Range: 24W
Span Type: CSTL BEAM SPAN
NBI Deck: 6 Super: 4 Sub: 6 Chan: 8 Culv: N

Location: 1.0 MI NE OF JCT TH 94
Route: ISTH 35W Ref. Pt.: 018+00.538
Control Section: 2783 Maint. Area: METRO
Local Agency Bridge Nbr:

Length: 1,907.0 ft
Deck Width: 113.3 ft (Varies)
Rdwy. Area / Pct. Unsnd: 201,511 sq ft
Paint Area / Pct. Unsnd: 490,200 sq ft 20 %

Open, Posted, Closed: OPEN

Appraisal Ratings - Approach: 8 Waterway: 8 MN Scour Code: L-STBL;LOW RISK Def. Stat: S.D. Suff. Rate:

Required Bridge Signs - Load Posting: NOT REQUIRED Traffic: NOT REQUIRED
Horizontal: NOT REQUIRED Vertical: NOT APPLICABLE

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
22	LS O/L (CONC DECK)	2	08-04-1997	219,086 SF	0	219,089	0	0	0
			07-12-1996	219,086 SF	0	219,089	0	0	0
	Notes:								
48	LS O/L (CONC SLAB)	2	08-04-1997	219,086 SF	0	219,089	0	0	0
			07-12-1996	219,086 SF	0	0	0	0	0
	Notes:								
300	STRIP SEAL JOINT	2	08-04-1997	946 LF	908	0	38	N/A	N/A
			07-12-1996	315 LF	315	0	0	N/A	N/A
	Notes:								
301	POURED DECK JOINT	2	08-04-1997	2,924 LF	1,023	0	1,901	N/A	N/A
			07-12-1996	2,924 LF	1,023	0	1,901	N/A	N/A
	Notes:								
303	ASSEMBLY DECK JOINT	2	08-04-1997	326 LF	326	0	0	N/A	N/A
			07-12-1996	326 LF	326	0	0	N/A	N/A
	Notes:								
321	CONC APPROACH SLAB	2	08-04-1997	4 EA	0	4	0	0	N/A
			07-12-1996	4 EA	0	4	0	0	N/A
	Notes:								
107	PAINTED STEEL GIRDER	2	08-04-1997	10,596 LF	0	9,113	1,377	106	0
			07-12-1996	10,596 LF	0	9,113	1,377	106	0
	Notes: 8/20/33/79) [1968] BRIDGE PAINTED WITH LEAD BASE SYSTEM. [1995] THE PAINT SYSTEM IS 20% UNSOUND. 8) SPANS #1-5 & #9-11. WELDED COVER PLATES AT SOUTH END. [1995] BEAMS HAVE MINOR CHALKING THROUGHOUT, WITH FLAKING RUST ON THE BOTTOM FLANGE OF THE BEAMS ADJACENT TO THE MEDIAN. BEAMS HAVE SEVERE CORROSION AT THE HINGES (SPAN #2).								
113	PAINT STEEL STRINGER	2	08-04-1997	14,896 LF	0	14,747	0	149	0
			07-12-1996	14,896 LF	0	14,747	0	149	0
	Notes:								
131	PAINT STL DECK TRUSS	2	08-04-1997	2,127 LF	0	0	1,914	213	0
			07-12-1996	2,127 LF	0	0	1,914	213	0

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 08-04-1997**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
	Notes: 20/157/161) TRUSS MEMBERS HAVE NUMEROUS POOR WELDING DETAILS (INCLUDING TACK WELDS ON THE INTERIOR STIFFENER PLATES). [1995] INTERIOR OF THE TRUSS MEMBERS HAVE EXTENSIVE SURFACE RUST (SOME PITTING), AND SEVERE PIGEON DEBRIS. CORROSION (WITH PACK RUST AND SURFACE PITTING) AT THE FLOORBEAM AND SWAY BRACE CONNECTIONS.								
152	PAINT STL FLOORBEAM	2	08-04-1997	3,348 LF	0	2,645	268	435	0
			07-12-1996	3,348 LF	0	2,645	268	435	0
	Notes: FLOORBEAM TRUSSES HAVE NUMEROUS POOR WELDING DETAILS (INCLUDING PLUG WELDED WEB REINFORCEMENT PLATES, AND TACK WELDS & WELDED CONNECTION PLATES IN TENSION ZONES). [1994] FLOORBEAM TRUSSES HAVE CHALKING THROUGHOUT, WITH SEVERE FLAKING RUST BELOW THE MEDIAN. [1995] END FLOORBEAMS & "CROSSBEAMS" (BELOW OPEN FINGER JOINTS) HAVE SEVERE CORROSION AND EXTENSIVE DEBRIS (SHOULD BE FLUSHED). [1986] SOUTH CROSSBEAM DEVELOPED CRACKS (IN WEB STIFFENER) AT THE EAST ROCKER HINGE (THE HINGE HAD FROZEN) - THE CRACKS WERE DRILLED OUT, AND BRACING WAS ADDED (BEAMS #11 & #12). [1992] NORTH CROSSBEAM DEVELOPED A CRACK IN THE WEB STIFFENER WELD (AT EAST ROCKER HINGE) - THIS WAS DRILLED OUT. [1994] AT THE NORTH CROSSBEAM, THE BEAM #3 CONNECTION IS "WORKING" - THE BOLTS SHOULD BE REPLACED. [1997] NORTH CROSSBEAM HAS ADDITIONAL WELD CRACKING BELOW THE EAST ROCKER (NEEDS REPAIR!).								
373	STEEL HINGE	2	08-04-1997	18 EA	0	0	0	4	14
			07-12-1996	1 EA	1	0	0	0	0
	Notes: 46) [1986] HINGE SUPPORTING THE EAST END OF THE SOUTH CROSSBEAM FROZE (DAMAGING THE CROSSBEAM) - PIN WAS REPLACED.								
380	SECONDARY ELEMENTS	2	08-04-1997	1 EA	0	0	1	0	N/A
			07-12-1996	1 EA	0	0	1	0	N/A
	Notes:								
311	EXPANSION BEARING	2	08-04-1997	125 EA	83	42	0	N/A	N/A
			07-12-1996	125 EA	83	42	0	N/A	N/A
	Notes:								
313	FIXED BEARING	2	08-04-1997	35 EA	35	0	0	N/A	N/A
			07-12-1996	35 EA	35	0	0	N/A	N/A
	Notes:								
205	CONCRETE COLUMN	2	08-04-1997	52 EA	51	1	0	0	N/A
			07-12-1996	52 EA	51	1	0	0	N/A
	Notes: 41) [1995] PIER #11 HAS EXTENSIVE SHOT-CRETE REPAIRS, WITH 10 SF OF SPALL (EXPOSED REBAR) AT BOTH EAST AND WEST END.								
210	CONCRETE PIER WALL	2	08-04-1997	168 LF	168	0	0	0	N/A
			07-12-1996	168 LF	168	0	0	0	N/A
	Notes:								
215	CONCRETE ABUTMENT	2	08-04-1997	255 LF	255	0	0	0	N/A
			07-12-1996	255 LF	255	0	0	0	N/A
	Notes:								

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 08-04-1997**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
234	CONCRETE CAP	2	08-04-1997	819 LF	680	131	8	0	N/A
			07-12-1996	819 LF	680	131	8	0	N/A
	Notes:								
356	FATIGUE CRACKING	2	08-04-1997	1 EA	0	0	1	N/A	N/A
			07-12-1996	1 EA	1	0	0	N/A	N/A
	Notes:								
357	PACK RUST	2	08-04-1997	1 EA	0	1	0	0	N/A
			07-12-1996	1 EA	0	1	0	0	N/A
	Notes:								
358	CONC DECK CRACKING	2	08-04-1997	1 EA	0	1	0	0	N/A
			07-12-1996	1 EA	0	1	0	0	N/A
	Notes:								
359	CONC DECK UNDERSIDE	2	08-04-1997	1 EA	0	0	0	1	0
			07-12-1996	1 EA	0	0	0	1	0
	Notes:								
360	SETTLEMENT	2	08-04-1997	1 EA	1	0	0	N/A	N/A
			07-12-1996	1 EA	1	0	0	N/A	N/A
	Notes:								
361	SCOUR	2	08-04-1997	1 EA	1	0	0	N/A	N/A
			07-12-1996	1 EA	1	0	0	N/A	N/A
	Notes:								
363	SECTION LOSS	2	08-04-1997	1 EA	0	1	0	0	N/A
			07-12-1996	1 EA	0	1	0	0	N/A
	Notes:								
981	SIGNING	2	08-04-1997	1 EA	0	0	1	0	0
			07-12-1996	1 EA	0	0	1	0	0
	Notes:								
982	GUARDRAIL	2	08-04-1997	1 EA	0	1	0	N/A	N/A
			07-12-1996	1 EA	0	1	0	N/A	N/A
	Notes:								
984	DRAINAGE	2	08-04-1997	1 EA	0	0	1	N/A	N/A
			07-12-1996	1 EA	0	0	1	N/A	N/A
	Notes:								
985	SLOPES	2	08-04-1997	1 EA	1	0	0	N/A	N/A
			07-12-1996	1 EA	1	0	0	N/A	N/A
	Notes:								
986	CURB & SIDEWALK	2	08-04-1997	1 EA	0	1	0	N/A	N/A
			07-12-1996	1 EA	0	1	0	N/A	N/A
	Notes:								

Mn/DOT BRIDGE INSPECTION REPORT

BRIDGE 9340 **I 35W OVER RR, MISS R, 2ND ST & RD** **INSP. DATE: 08-04-1997**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
988	MISCELLANEOUS	2	08-04-1997	1 EA	0	1	0	N/A	N/A
			07-12-1996	1 EA	0	1	0	N/A	N/A
	Notes:								

General Notes: *BRIDGE #9340 YEAR 1997

BRIDGE CONSTRUCTED IN 1967. SEE FRACTURE CRITICAL REPORT FOR ADDITIONAL INFORMATION.

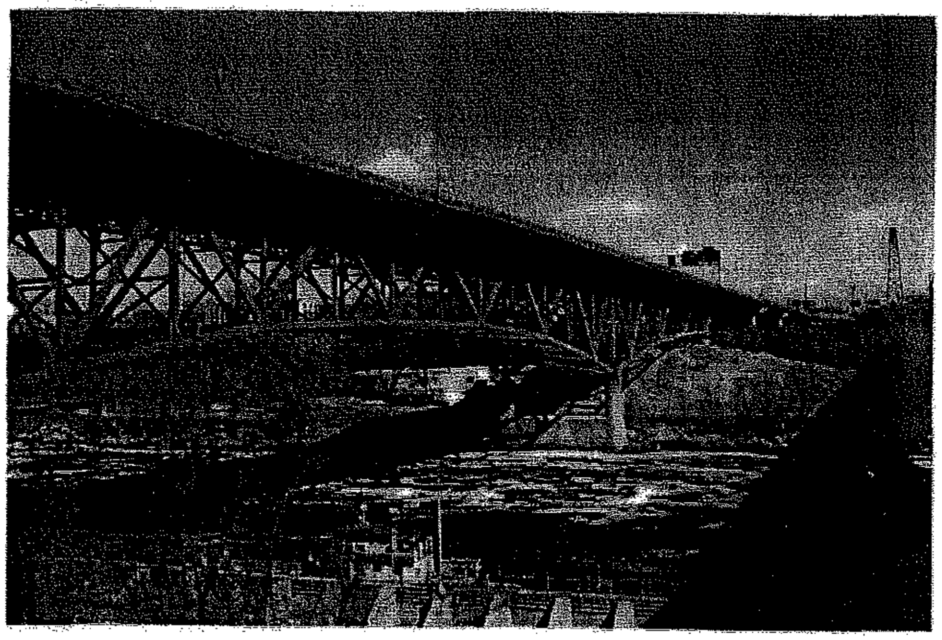
Inspector's Signature

Reviewer's Signature / Date

EXHIBIT NO: 11
Date: 3-24-08
JULIE A RIXE
COURT REPORTER

Initial Inspection Report For:

Fatigue Evaluation
Bridge 9340
35W Over Mississippi River



Prepared for:

Mn/DOT

Prepared by:

URS

Thresher Square
700 Third Street South
Minneapolis, MN 55414-1199

June 9th - June 13, 2003

Page

1. INTRODUCTION

We have completed our limited field inspection of the main truss section of Bridge 9340 (TH 35W over the Mississippi River). The inspection was performed during MnDOT's normal inspection cycle on June 9, 2003 to June 13, 2003. A member of URS's staff participated with MnDOT inspection personnel in MnDOT's inspection to assess the existing structural condition of key superstructure components.

The purpose of the URS limited field inspection was to observe the overall condition of the truss members, floor beams, truss bearings, truss connections, miscellaneous connections and bracing members. URS was to mark the bearing position (for all truss bearings) and record the temperature so that observations of potential movement could be ascertained later. URS was to document the condition of key members and create a photo log of the inspection photographs to document the general condition of the truss on the inspection dates. Finally URS was to comment on the inspection effort of the fracture critical details within the truss.

Information will be presented by breaking the report into major topics followed by a brief discussion of the major items for each topic. The attached photo log and image CD can be referenced for specific pictures of various areas within the truss.

2. OVERALL CONDITION OF THE TRUSS

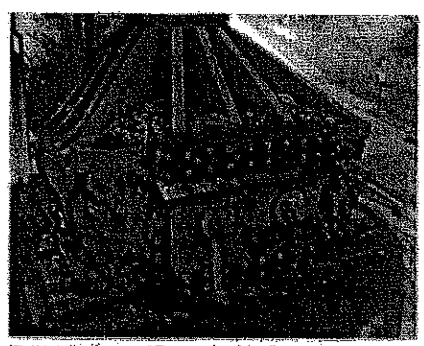
Corrosion and Deterioration of the Truss Members

See Appendix A, B, and C for photo log, inspection photographs, and key plans. The overall condition of the truss members was found to be in relatively good condition from a corrosion standpoint. Minimal surface rusting was found on the exterior of the truss members. Corrosion that was located on the truss members and connections was generally concentrated near the deck joints, leading to the conclusion that leakage from the bridge deck is contributing substantially to the corrosion. There was also corrosion within the truss chord members at the tab connection attachment of the internal diaphragms. This topic will be discussed in greater detail later in the report.

Bearing Conditions

- The roller bearings appeared to not be functioning as intended. There was significant corrosion of the bearing surfaces, debris and dirt packed into various areas of the bearing and very thick coatings of paint. The roller bearings appear to be "frozen" in place.
- The access to observe the rocker bearings was very difficult due to the construction details. The bearings are built into "pockets" in the floor beam with little clearance to the sides of the bearing. Some debris was noted in the pocket and it was impossible to visually determine if the bearings are functioning.
  The bearings were marked so that potential movements could be determined in the future under different temperature conditions. The bearing marking will be discussed in greater detail later in the report.
- Joint Conditions

  The condition of the deck joints was found to be good except for a few bent fingers in the finger joints. However, the condition of the waterproofing was hard to determine. There was evidence that the deck joints had leaked or were currently leaking as indicated by the concentrated corrosion of the members at or near the deck joints.


Typical Condition of Expansion Bearing at Pier 6 (West Truss)

3. BEARING AND JOINT MARKS FOR FUTURE REFERENCE

URS planned to mark the bearings by scribing and by permanent marker in such a manner to determine if the bearings were moving (sliding, rolling or rocking) with changes in temperature. All of the expansion bearings were to be marked to document their current position.

Typical Marking of Rocker Bearings

Typical Field Marking of Roller Bearings

Typical Marking of Finger Joints

Pre-Inspection Concepts

Three lines of reference were planned for marking on the roller bearings.

- Line 1 was to be marked plumb from the upper casting across the center of one of the rollers and onto the lower bearing plate.
- Line 2 was to be marked horizontally across the tooth of the rollers onto the shield/hold down plate.
- Line 3 was to be marked vertically from the shield/hold down plate onto the underside of the upper plate.

Two lines of reference were planned for marking of the rocker bearings.

- Line 1 was to be marked plumb from the center on the rocker pin and extended down onto the supporting casting.
- Line 2 was to be marked along the centerline of one of the ribs of the bearing casting and projected down onto the supporting casting. The angle between the centerline of the rib and plumb line 1 was to be measured.

The deck joints were to be scribed with a line across the joint fingers to determine the relative movement of one set of fingers to the other or if possible two shallow holes were to be drilled and the distance between them measured.

Actual Bearing and Joint Markings

The actual marking of the bearings was much more difficult than anticipated. There were many projections of bolt heads and miscellaneous plates from the surface of the bearing components that made it extremely difficult to scribe lines. The rocker bearings were found to have almost no access to the side surfaces, and markings had to be improvised in the field.

Three lines were marked on the roller bearings.

- Line 1 was marked vertically from the upper casting across the center of one of the rollers, onto the lower bearing plate and extended onto the concrete surface. The line, however, could not be marked as plumb due to obstructions.

9340_F012_001.pdf

- Line 2 was marked horizontally across the tooth of the rollers onto the shield/hold down plate as planned.
- Line 3 was marked vertically from the shield/hold down plate onto the underside of the upper plate as planned.

One line was marked on the rocker bearing. It was not possible to mark the sides of the rocker bearing.

- Line 1 was marked on the rocker portion of the bearing a given distance up from the supporting casting. This line was also extended onto the supporting steel sole plate. The intent is to determine any change in the vertical distance between the rocker and the supporting plate and also any longitudinal displacement of the rocker in reference to the sole plate.

The deck joints were marked with shallow holes drilled into the joint fingers and the distance between the marks was measured.

TABLE OF MEASUREMENTS AND TEMPERATURES

Location		Initial Marking (6-9-03 to 6-13-03)			Future Marking		
		Reference Line	Measurement	Temperature	Reference Line	Measurement	Temperature
Finger Joints	NW Corner	-	6 in	70 deg F	-		
	SW Corner	-	7 in	66 deg F	-		
	SE Corner	-	7 in	62 deg F	-		
	NE Corner	-	5 in	66 deg F	-		
Rocker Bearing	East Truss U0	Line 1	2 13/16 in	67 deg F	Line 1		
	East Truss U28	Line 1	3 15/16 in	68 deg F	Line 1		
	West Truss U0	Line 1	See Note		Line 1		
	West Truss U28	Line 1	See Note		Line 1		
Pier 5	West Truss	Line 1	0	68 deg F	Line 1		
		Line 2	0		Line 2		
		Line 3	0		Line 3		
	East Truss	Line 1	0	66 deg F	Line 1		
		Line 2	0		Line 2		
		Line 3	0		Line 3		
Pier 6	West Truss	Line 1	0	68 deg F	Line 1		
		Line 2	0		Line 2		
		Line 3	0		Line 3		
	East Truss	Line 1	0	67 deg F	Line 1		
		Line 2	0		Line 2		
		Line 3	0		Line 3		

Pier 8	West Truss	Line 1	0	63 deg F	Line 1		
		Line 2	0		Line 2		
		Line 3	0		Line 3		
	East Truss	Line 1	0	68 deg F	Line 1		
		Line 2	0		Line 2		
		Line 3	0		Line 3		

Note: Bearing was not marked on initial visit because the lack of access prohibited the inspector from following the pre-inspection marking plan. After review with office staff, an alternate marking concept was developed. Marking of the bearing on the following inspection days would have required an additional lane closure. Base line marks will be made on the next inspection.

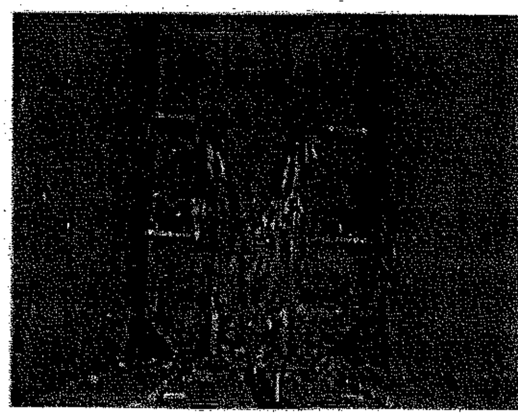
4. INSPECTION EFFORT OF FRACTURE CRITICAL DETAILS

Inspection of Weld Tabs Within the Truss Members at the Diaphragms

The access holes in the truss members are currently covered and are not readily accessible without removal of the cover plates. The cover plates were removed at selected locations for observation of the interior of the truss chord at diaphragm locations. Minor amounts of corrosion were found to be present within the truss member with corrosion being concentrated at the welded tab connections and on the diaphragms themselves.

It was difficult to determine if the diaphragm was welded to the truss chord or only to the tabs within the member. Access holes are not located directly adjacent to the diaphragm locations and the diaphragms were visually observed from a distance. There was also an accumulation of debris/dirt around the perimeter of the diaphragms inspected. It appeared that the tabs were attached to the interior of the truss by welding with fillet welds in the longitudinal direction.

Back Side of Internal Diaphragm (Appears Welded)



Front Side of Internal Diaphragm (Weld Tabs)

Possible Visual Access Methods

Further visual inspection of the tab connections and diaphragms could be made by removal of more of the cover plates.

Probing scopes could also be utilized to provide up close inspection of the tab connections and diaphragms. Scopes with photographic capabilities would prove to be extremely valuable for documenting and determining the condition at these internal tabs.

5. FUTURE INSPECTIONS

Special Emphasis on Inspection of Fracture Critical Details

The length of the longitudinal weld of the tab connection should be determined to determine what stress category is appropriate for this condition. It should also be determined whether or not the diaphragm is welded to the interior of the truss member or just connected with the tab welds. The truss chord members are critical non-redundant members, thus emphasizing the need to fully investigate the fatigue condition.

Removing the cover plates at each of the diaphragm locations to inspect the truss interior at the tab connections is of critical importance. This is one of the primary locations that one would expect a critical fatigue crack to develop in a truss chord member.

MnDOT Assistance for One Additional Inspections

MnDOT will provide access to the bridge with an under bridge inspection unit for one additional inspection of the key truss members during the fatigue study.

Additional Inspections of Bearings and Joints

URS will monitor and record bearing and joint marks, for movement at a minimum of six different seasonal temperatures. URS will determine bearing and joint conditions and movement- temperature relationships based on these inspection records. URS will provide access equipment for a minimum of five additional bearing and joint inspections.

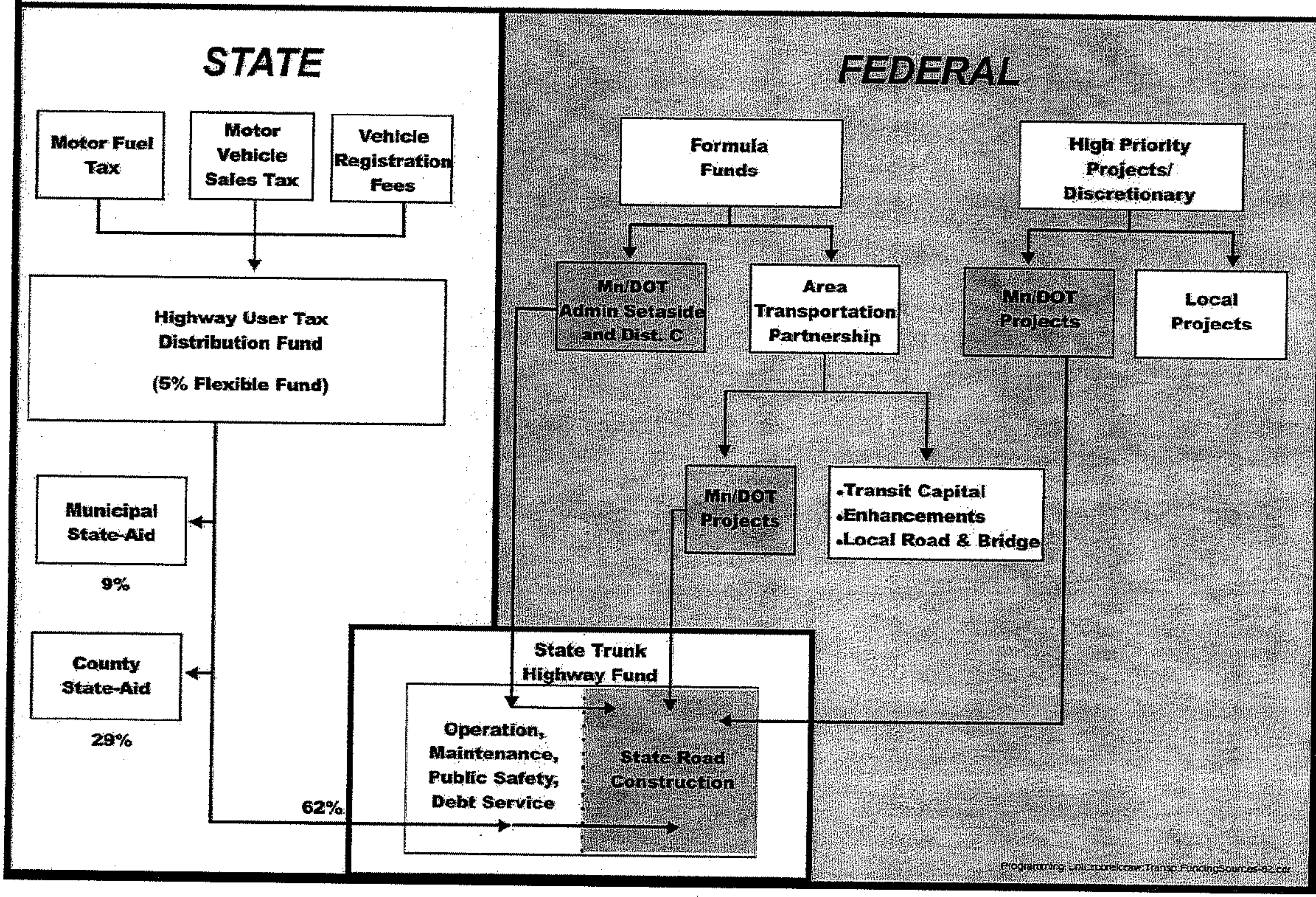
6. SUMMARY AND RECOMMENDATIONS

See Appendix A, B, and C for photo log, inspection photographs, and key plans. The overall condition of the truss members and connections was, from a corrosion standpoint, found to be good. Corrosion was found in localized areas, generally concentrated near the deck joints. Minor corrosion was observed at some of the locations chosen to inspect in the interior of the truss members.

The roller bearings did not appear to be moving freely due to the corrosion, debris and paint build up. The rocker bearings were not accessible for detailed visual observation and assessment of their movement. All of the bearings were marked in their current position and temperature readings were recorded to assist in determining movement-temperature relationships.

The fracture critical details at the tab locations on the interior of the box chord are very difficult to observe. The access openings are covered and observations can only be made after the cover plate is removed. It is our understanding that the cover plates are not being removed as part of MnDOT's regular inspection cycle. MnDOT should consider inspection of all of these fracture critical details as part of the normal inspection cycle due to the fracture potential of these details. Inspection of these details is clearly the most important part of future inspections of this structure. It is also recommended that scope equipment be procured to enable close visual inspection of these details.

TRANSPORTATION FUNDING SOURCES



Minnesota Department of Transportation
Planning, Modal and Data Management Division
OFFICE OF INVESTMENT MANAGEMENT

EXHIBIT NO: 3
Date: 5-2-08
JULIE A RIXE
COURT REPORTER

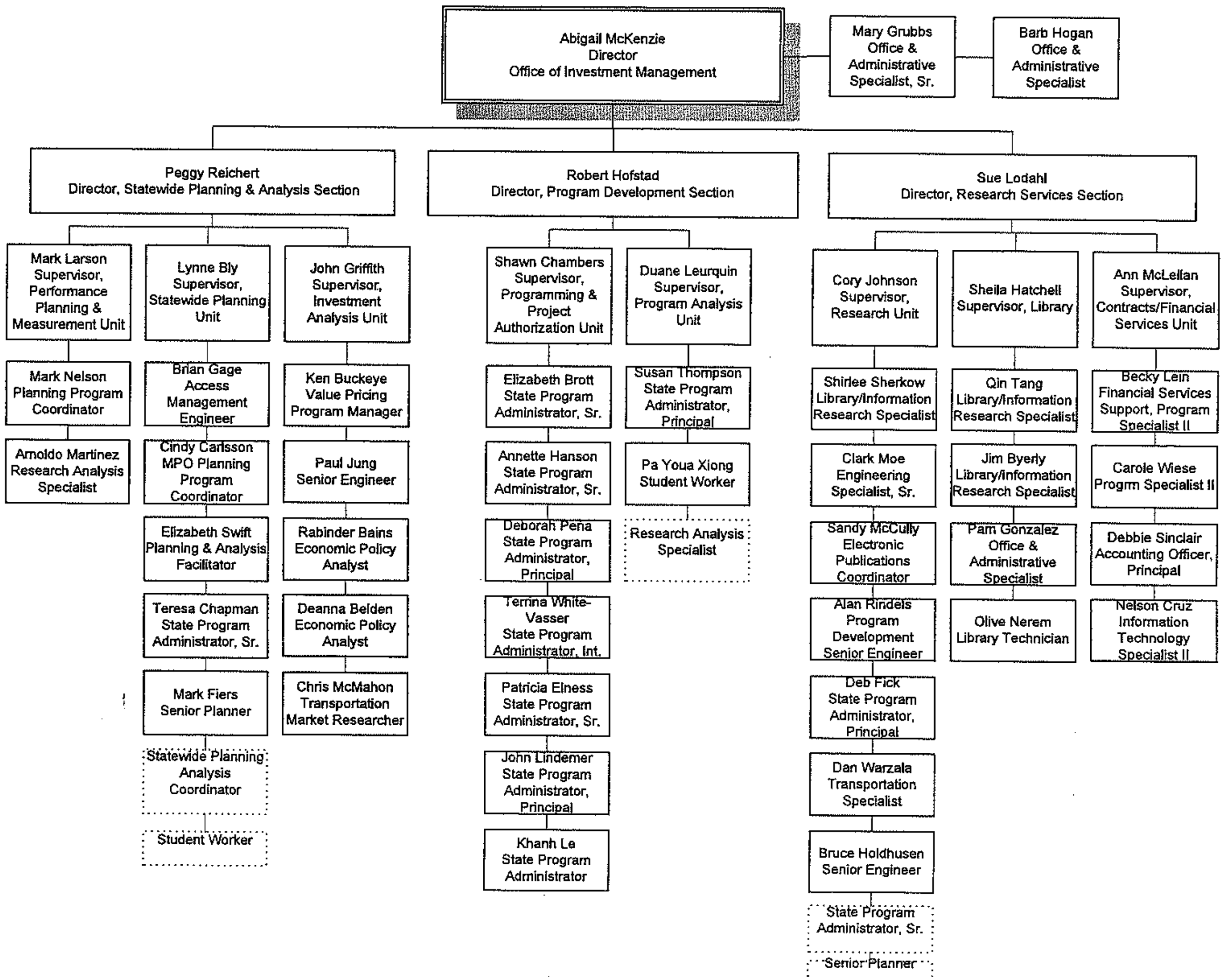
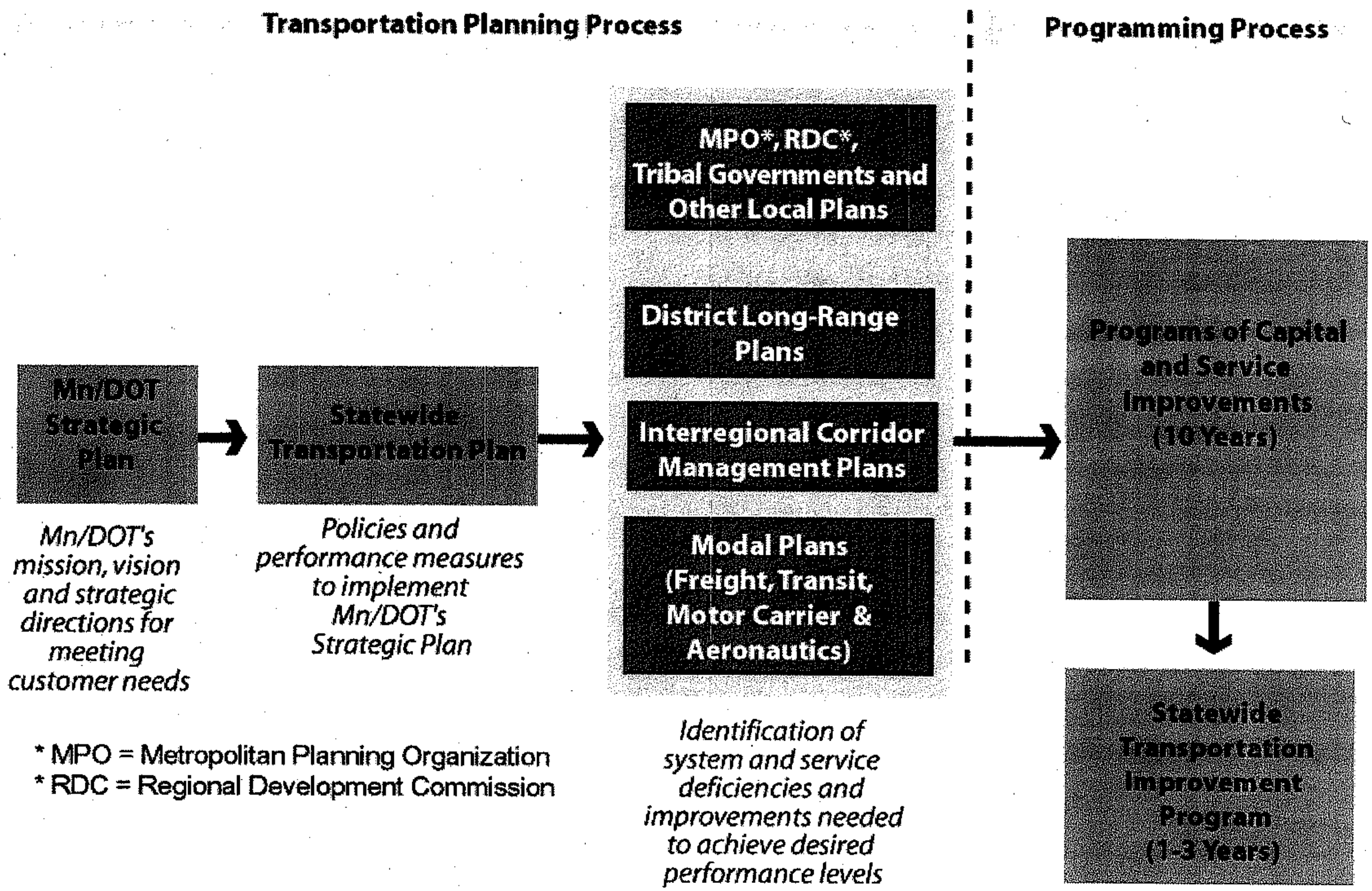


EXHIBIT NO: 5
Date: 5-2-08
JULIE A RIXE
COURT REPORTER

Mn/DOT's Planning & Programming Process



* MPO = Metropolitan Planning Organization
* RDC = Regional Development Commission

GP-21a
Revenue forecast to support MnDOT's update of its statewide transportation plan for 2009-28. Source: Peggy Reichtert, Planning director/OIM

Mn/DOT Revenue Forecast: 2009-2028

Background

- Over 90% of Mn/DOT's revenues come from four different sources of funds: Motor Fuel sales Tax; Motor Vehicle Registration Tax; Motor Vehicle Sales Tax and Federal Aid.

- Other sources such as motor vehicle license and investments are volatile and therefore hard to project. On average they add up to about $100M a year, less than 10% of the total revenues - these may be used to fund other programs, for instance Department of Public safety.

- The amount and share of the four main sources of funds for the Trunk Highway Fund in SFY 2006 were as follows:

    - Motor Vehicle Fuel Tax - $381 million (35.7%)
    - Motor Vehicle Registration Tax - $284 million (26.5%)
    - Motor Vehicle sales tax - $95 million (8.9%)
    - Federal Aid - $309 million (29%)

Trends in Light-Duty Vehicles

- According to the report: *'Light-Duty Automotive Technology and Fuel Economy Trends: 1975 through 2006, Trends'*, published by the U.S. Environment Protection Agency, July 2006, the following trends have been observed that may help to explain some of the growth in transportation related tax revenues. The table below summarizes the findings.

	1975	1987	1997	2006
Adjusted Fuel economy (mpg)	13.1	22.1	20.9	21.0
Weight in Pounds	4060	3220	3727	4142
Percent Light Truck Sales	19%	28%	42%	50%
Percent four Wheel Drive	3%	10%	19%	29%

- The above trends would suggest that decreasing fuel efficiency resulted in an increase in fuel consumption and hence fuel tax revenues.
- Heavier vehicles would increase the motor vehicle registration tax and fees.
- Higher cost of bigger vehicles would increase motor vehicle sales tax.
- Low fuel prices and a booming economy led to a rapid increase in revenues between the years1990 to 2000.

Trend Analysis

The table below summarizes the trends in revenues by source since 1990. The trends are observed over different lengths of periods to understand the factors that may help to explain the changes. To get a long enough period of analysis for the motor vehicle registration tax revenue adjustments are made to data prior to 2001 to be compatible with policy changes of 2000.

Annual Change in Revenue, Population, Minnesota Gross Domestic Product and Price of Gasoline: 1990-2007

	Motor Fuel Tax	Motor Vehicle Registration Tax[1]	Motor Vehicle Sales Tax (Total)	TH Funds	Federal Aid	Constant MN GDP Index[2], 1990=100	Real price of Gasoline, All Grades[2]	Population
1990-2007	***2.1%***	***3.8%***	***3.9%***	***2.7%***	***4.6%***	***3.4%***	***2.7%***	***1.0%***
1990-1991	-1.5%	-6.2%	-9.2%	-3.6%	2.5%	0.1%	-4.7%	0.9%
1991-1995	2.4%	6.6%	8.1%	4.2%	0.8%	3.5%	-2.0%	1.2%
1995-2000	4.3%	6.8%	9.2%	5.5%	8.6%	5.1%	3.6%	1.2%
1990-2000	***2.9%***	***5.4%***	***6.8%***	***4.1%***	***4.8%***	***4.0%***	***1.8%***	***1.2%***
2000-2005	1.5%	3.1%	0.2%	1.8%	3.6%	2.7%	8.4%	0.8%
2005-2007	-0.5%	-2.1%	-1.2%	-1.2%	5.6%	2.9%	9.7%	0.8%
2000-2007	***0.9%***	***1.6%***	***-0.2%***	***0.9%***	***4.2%***	***2.4%***	***6.5%***	***0.8%***

Notes: 1 - Motor Vehicle registration tax Revenue adjusted for change in 2000 tax policy
2 – GDP, gasoline prices and population data available to 2006 only.

- Level of tax revenues depend on consumption of gasoline, the purchases and registrations of motor vehicles.
- Demand for travel, and motor vehicles purchases and prices are influenced by three main factors: economic performance; demographic changes and prices of inputs. The table above is comparing changes in each of these since 1990.

Period of High Growth: 1991-2000

- The following factors have contributed to high rates of growth in transportation tax revenue during this period.
    - 1991-2000 was the period following a recession in 1990.
    - High rates of growth in state income, particularly from 1995-2000.
    - Declining real gasoline prices until 2000, averaging a decline of 1.9% through 1999, followed by an increase of 19.1% in 2000.
    - High growth in population in Minnesota – a high level of immigration, both national and international, 1.2%.
    - High rates of growth in vehicle miles of travel on the Trunk Highway system, 3.3% per annum, lower growth rate on all roads (2.8%).

Period of Slowing Growth: 2000-2006

The slowing of the economy and increases in motor fuel prices has resulted in little increase in total vehicle miles driven, and new vehicle purchases, with a possible shift towards more fuel efficient, smaller or hybrid vehicles.

- The economy experienced a recession in 2001, which has been followed by a period of low growth, below 3% on average.
- Unemployment rates have increased.
- Rate of growth in population went down to less than 1%.
- Crude oil prices increased dramatically, causing real gasoline prices to increase by 45.5% from 2000-2006, an average annual rate of 6.5%.
- Years 2005 and 2006 experienced little to no growth in VMT in Minnesota., after an average growth rate of 2.4% per annum from 2000 to 2004.

Revenue Forecast

Based on the historical trends in motor vehicle tax revenue and the following assumptions, transportation tax revenues have been forecast for the period 2009 to 2028.

- **Assumptions**
    - The following projections assume the current tax law policy continuing into the future.
    - No new one time funding is assumed – only the currently dedicated transportation tax revenues are being forecast.
    - Different scenarios are assuming different economic, demographic and social trends.
    - The two sources of funds – registration and sales tax revenues – are very susceptible to economic conditions.
    - The uncertainty in the economy due to greater world competition and other political instability is likely to result in lower economic growth rates than previously experienced.
    - The average growth rate in VMT is expected to be lower than the average rate experienced since 1992 (2.3%). Increasing gas prices, unstable economy and increase in congestion may deter non-essential trips from taking place or shift in modes.

- **Motor Fuel Tax Revenue**
    - **Trend Scenario – An annual growth rate of 2.1%**

        - In the long run, the growth in revenues will be equal to the average experienced between 1990 and 2007, an annual average growth rate of 2.1%.
        - This growth rate encompasses periods of a booming economy and a period of depression. This scenario is likely if fuel prices level off and driving behavior continues as currently.

    - **Lower Growth Scenario – An annual growth rate of 1.5%.**

        - If motor fuel prices remain high and volatile, there is likely to be a greater shift towards alternative fuel powered vehicles or more fuel efficient vehicles.
        - As the concern for the environment increases, there is likely to be bigger shift toward alternative fuels.
        - Aging of the population, without increased immigrant population may result in less travel by car.

- **Motor Vehicle Registration Tax and Fees**

    - **Trend Growth Scenario – An annual growth rate of 3.1%**

        - Annual Average growth rate from 1990-2007 is 3.8%. This growth rate is heavily weighted by the growth experienced during a period of booming economy and a different tax structure.
        - For the revenue forecast over 2009-2028, an annual growth rate lower than the annual average experienced over the period 1990-2007 will be used. 3.1% annual average growth rate is assumed.

    - **Lower Growth Scenario – An annual growth rate of 1.6%.**
        - It is possible that lower rates of growth may be experienced by this tax revenue due to various reasons discussed below, so a growth rate of 1.6%% will be assumed, based on the growth rate observed since 2000.
        - The change in the tax law in 2000 has made the revenue more dependent on new vehicle purchases, since the rate is significantly reduced for vehicles more than one year old.
        - The revenues are also subject to business cycles.
        - Improved quality of vehicles means less frequent replacement rate, hence fewer newer vehicles.

- **Motor Vehicle Sales Tax Revenue**

    - Incorporate the SFY 2008 constitutional amendment into the projection.
    - Assume current sales tax rates.

- **Trend Projection – An annual growth rate 3%.**

- Assume a growth rate lower than the historical rates of growth.
- The motor vehicle ownership market is saturated, very high level of car ownership.
- Aging population may reduce car ownership rates.
- Economy is unstable, low growth rates may prevail for some time into the future.
- Reduced rate of migration to Minnesota due to a low performing economy may limit growth in this revenue source.
- Concerns about the economy may lead to replacement rates of vehicles to increase over what the market may normally dictate.
- Growth may be significant if more hybrid vehicles are purchased either due to high fuel prices or concerns about the environment.
- Assuming a normal growth in the economy, around 3% per annum.

- **Lower Growth Rates – An annual growth rate of 1.6%.**
  - Assume a lower rate of shift towards hybrid vehicles, so lower replacement rates and less expensive cars.
  - Low performing economy, less than 3% per annum – this tax revenue is very responsive to changes in the economy.

- **Federal Aid to Minnesota**

  - Federal Aid to Minnesota has increased significantly over the last eighteen years (4.6% per annum) due to Federal Funding Bills of ISTEA, TEA21 and SAFETEA-LU. Each of these bills increased transportations funding levels.
  - SAFETEA-LU was particularly good for Minnesota because of the treatment of ethanol under the 2005 Federal Bill – elimination of the lower tax rate for the blended gasoline and ethanol and eliminating some of the funds going into transit.
  - The future revenue levels are unlikely to increase at the rates previously experienced due to the reduced rates of growth in motor fuel revenues.
  - Under current tax policy, Congressional Budget Office is projecting the federal Highway Trust Fund receipts to growth at a rate of 1.8% per annum on average through to 2017.
  - This would be the most optimistic projections under current tax policy.
  - The Federal Highway Account Obligations are expected to grow at about 2.1% per annum through to 2017.

- **High Growth Scenario – An annual growth rate of 2.1%.**

  - Given the observations above, if the Federal government was able to fund its obligations at the level presented in CBO report, Minnesota's Federal Aid could grow at a rate of 2.1% per year.

- To fund this level of funding the federal government would have to identify other sources of revenue than the motor fuel revenues at the current tax rate.
- The shift towards more fuel efficient vehicles or alternative fuels would not be expected to be high.

- **Low Growth Rate Projection – An annual average growth rate of one percent.**
    - Shortfall in the Highway Trust Fund remains an issue.
    - If there are no new sources of funds for revenues and the Federal government has to reduce its obligation authority to balance the Highway Trust Fund.
    - This would require a significant reduction in current revenues.

Projections of Federal Funds

Three scenarios are developed based on a testimony to the U.S. Congress by the Congressional Budget Office on October 25, 2007. The obligation authority is reduced according to the policy options outlined in the Congressional testimony and interpolated to Mn/DOT Formula funds based on historical apportionment.

Scenario 1: Keep the Current Obligation Authority by Change in Tax Policy

- Increase the gas tax by 5 cents per gallon from 2009 onwards.
- Assume the growth in funds after 2011 at the rate of growth assumed in the obligation authority.

Scenario 2: Reduce the obligation Authority and raise the Gas Tax

- Reduce the obligation authority by 10%.
- Increase the gas tax by 3 cents per gallon

Scenario 3: Reduce Obligation Authority to Balance the Highway Trust Fund

- Reduce obligation outlays to balance the Highway Trust Fund, based on current projections of receipts.
- This would reduce the Federal Aid funds by about 40% in 2009 and by about 20% there after.
- After 2017, the growth rate observed in the obligation authority amounts is used.

State Road Construction (SRC) Budget Projections

- The motor vehicle tax revenue projections are converted to the Mn/DOT Trunk Highway Fund by reducing the amount for administrative expenses and the 58.9% share for Mn/DOT.

- The three sources of revenues are aggregated.
- Using the current 2008-2011 STIP numbers, the share of 2011 STIP SRC percent of total revenues is applied to calculate the SRC revenues into the future.
- This assumes that the growth in revenues will be equally distributed between SRC and other programs.
- Current estimates of Federal Aid for Target Formula as outlined by Mn/DOT (Duane) are used through to 2011.
- The historical share of Federal Target Funds to the obligation Authority is used to project Federal Aid to Mn/DOT for distribution via the target formula.
- Mn/DOT's share of Formula Federal Aid is based on current allocation of 68%.
- The Federal Aid to Mn/DOT and the State revenues are aggregated to estimate the revenues for the State Road Construction Budget.

Recommendation

- Based on discussion between Abby, Bob, Peggy and Rabinder, the low growth scenarios were recommended for projecting the state level funds.
- Each of the Federal Funds Scenarios was to be illustrated.
- The numbers were to be rounded to the nearest five million.

EXHIBIT NO: 4
Date: 4-10-08
JULIE A RIXE
COURT REPORTER

FY 2006 HSOP - Bridge

Planned Impacts of HSOP Funds on Preventive Bridge Maintenance

Bridge Office Report

6-6

Overview

- Scope of this Years Report
- Future Reporting
- Overview of this year's HSOP – BPM Plan
- Remarks

2006 Reporting Scope

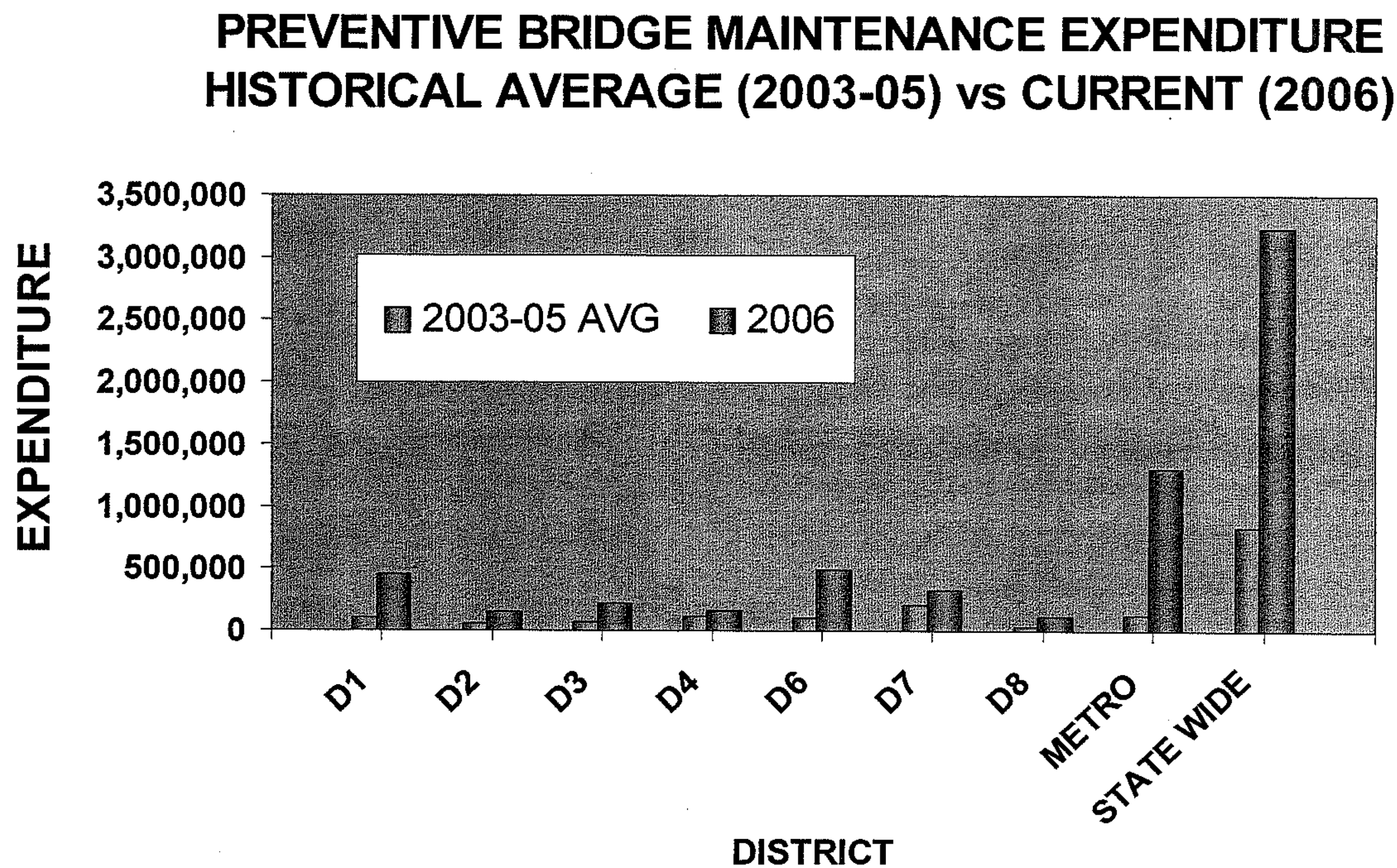
- We have not yet completed the fiscal year,
  - We can only report planned work
- We have added new activity codes
  - Some historical comparisons may be inaccurate
- Target expenditures are equal to the three-year averages of each district plus HSOP Bridge Allotment.

Future Reporting

Next Year we will report:

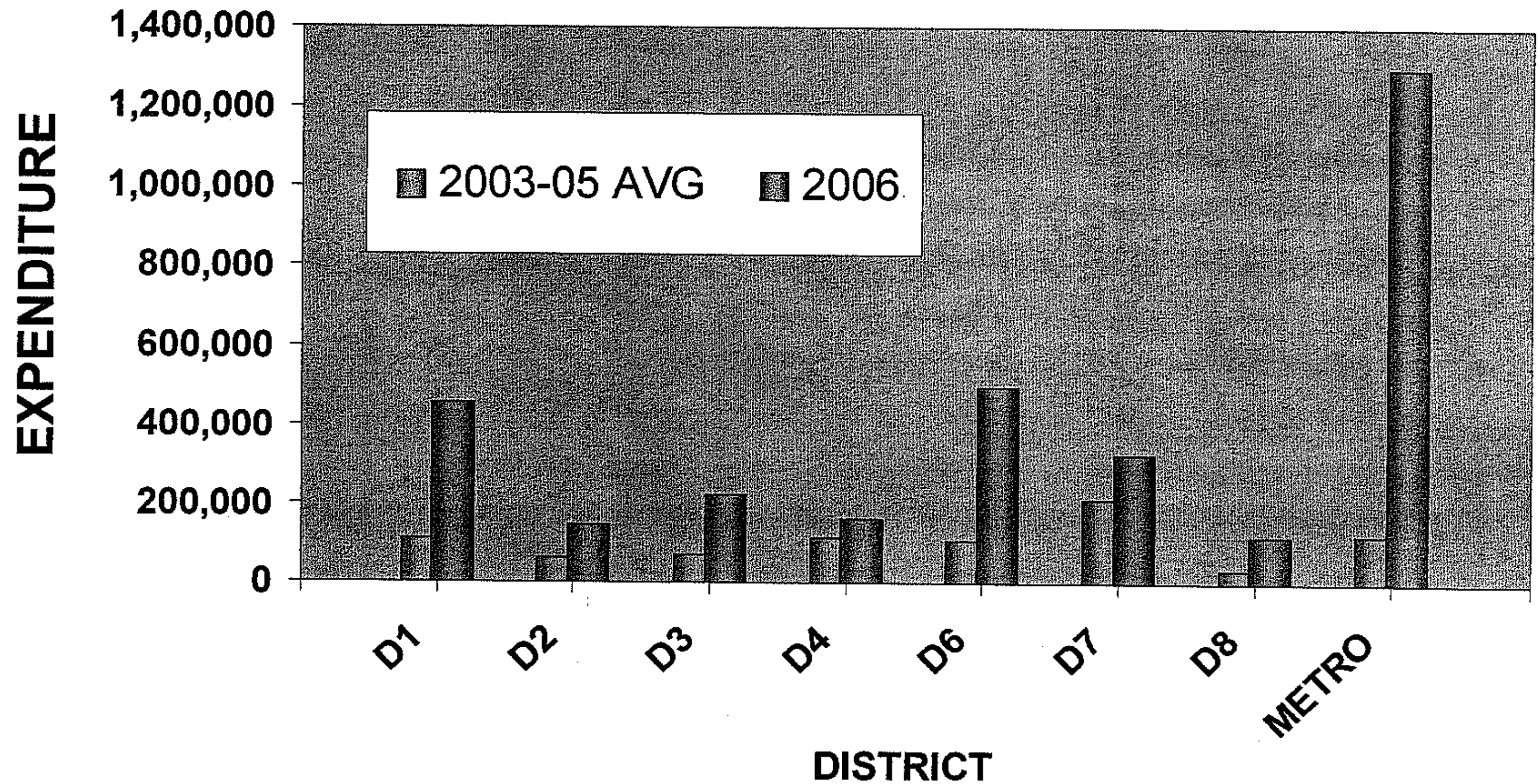
- Dollar ($) inputs on all activities
- Accomplishments (output quantities) on all activities
- Improvements in condition states (outcomes) for four activities
- Performance against Targets –
  - Percentage of Bridges which have receive a PM treatment or are in specified conditions state. (see slide 18)

Planned FY 2006 Investments

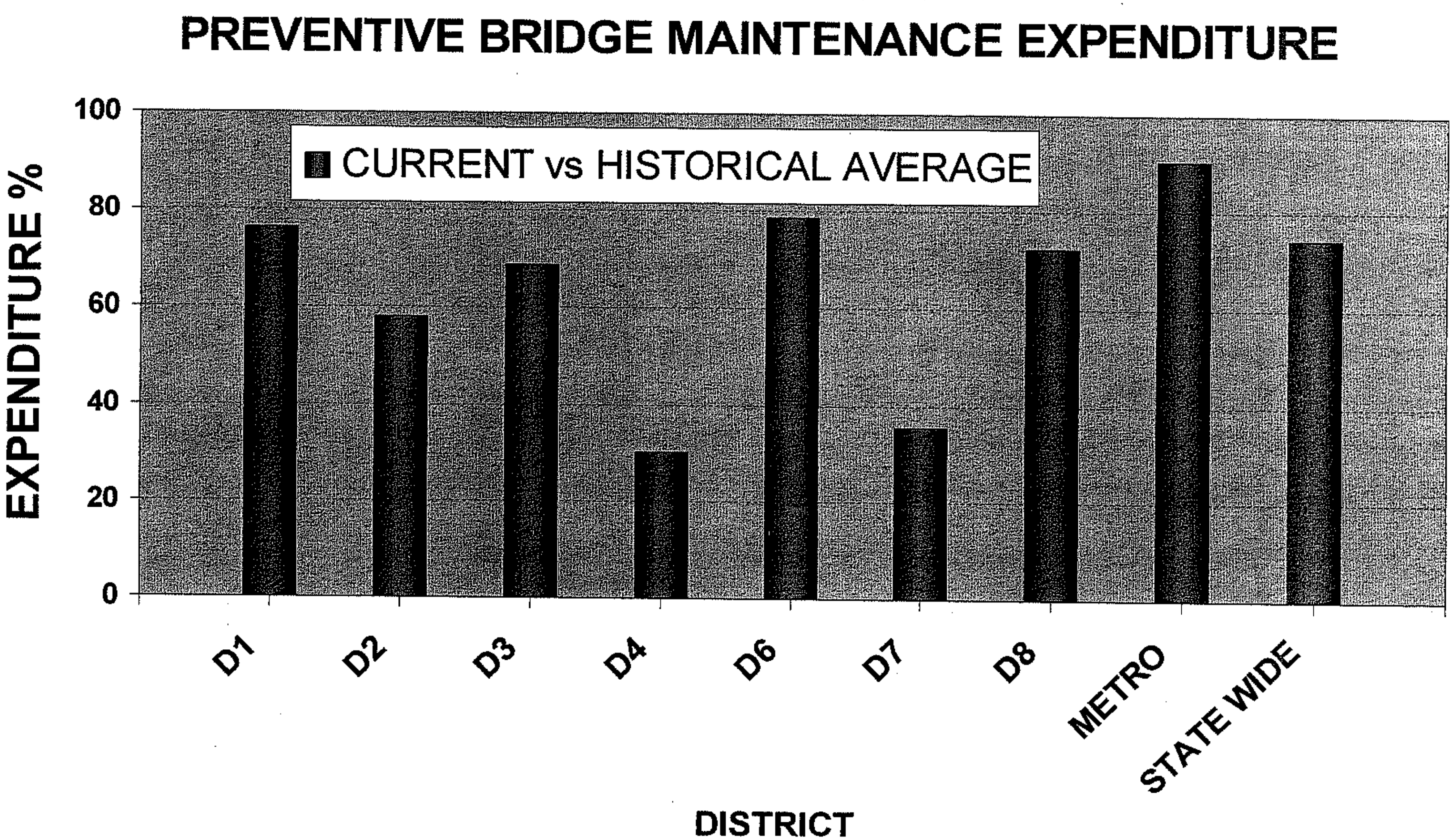


District HSOP Comparison

PREVENTIVE BRIDGE MAINTENANCE EXPENDITURE HISTORICAL AVERAGE (2003-05) vs CURRENT (2006)



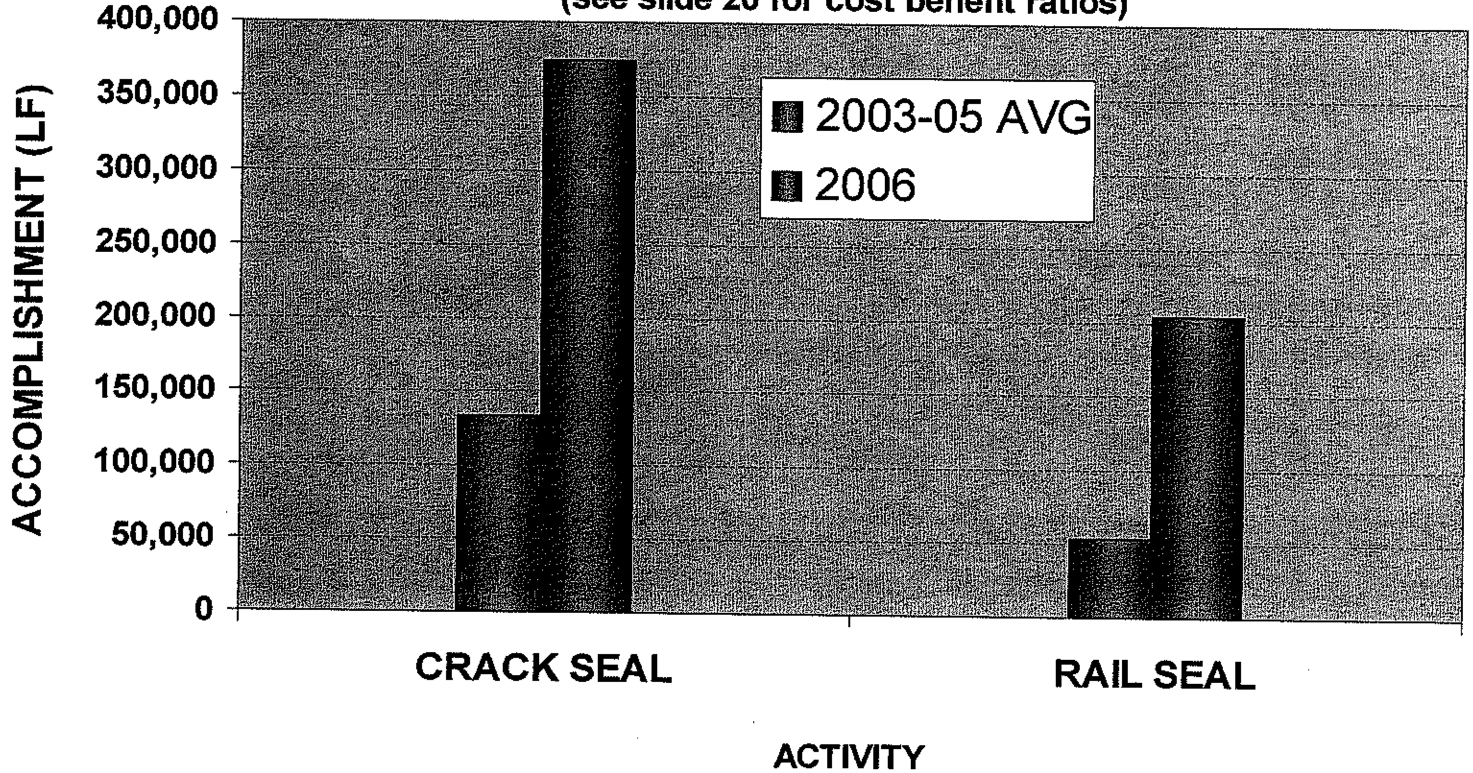
Percentage due to HSOP



Planned Crack Sealing and Concrete Barrier Sealing

PREVENTIVE BRIDGE MAINTENANCE ACCOMPLISHMENT

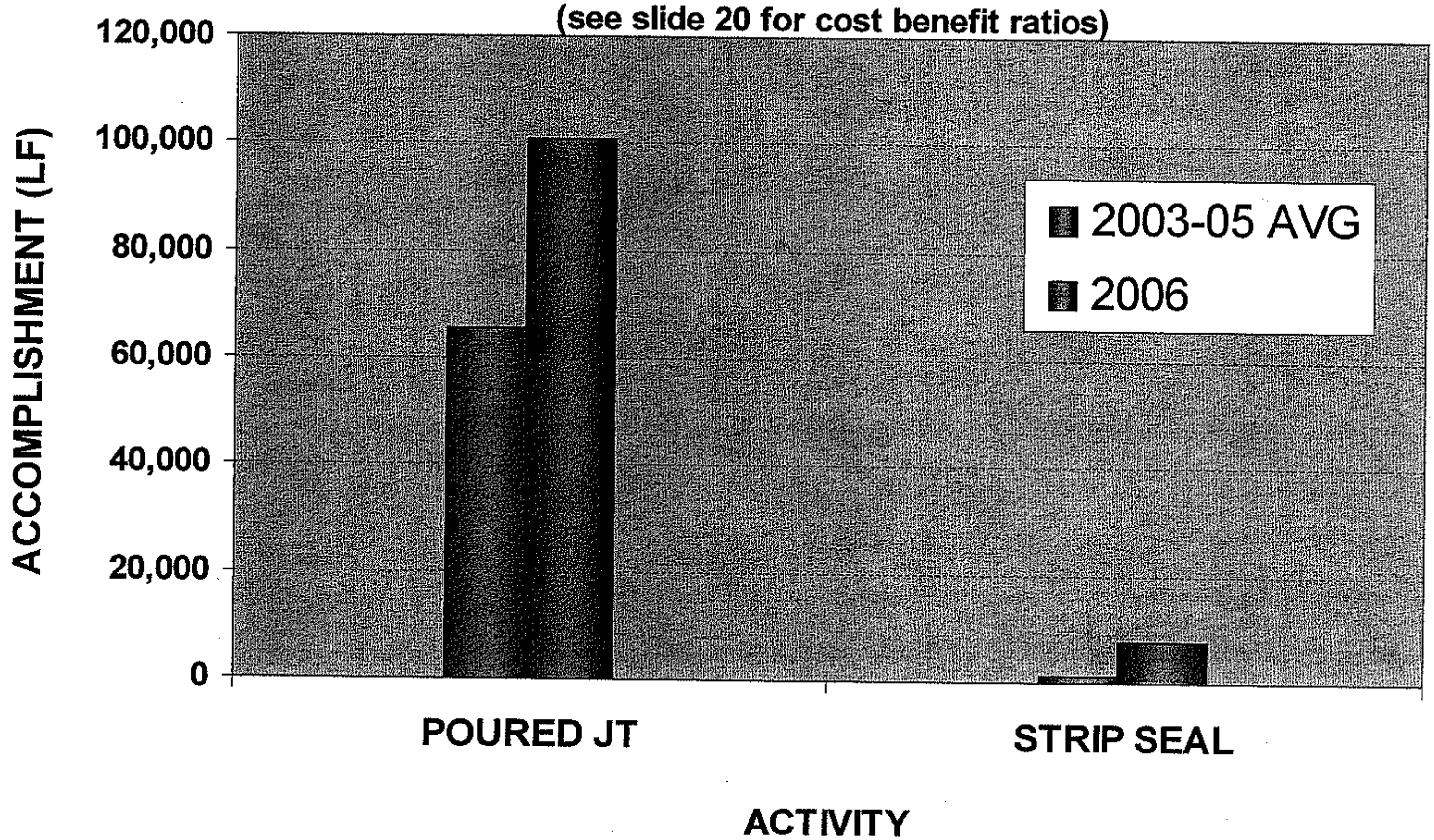
(see slide 20 for cost benefit ratios)



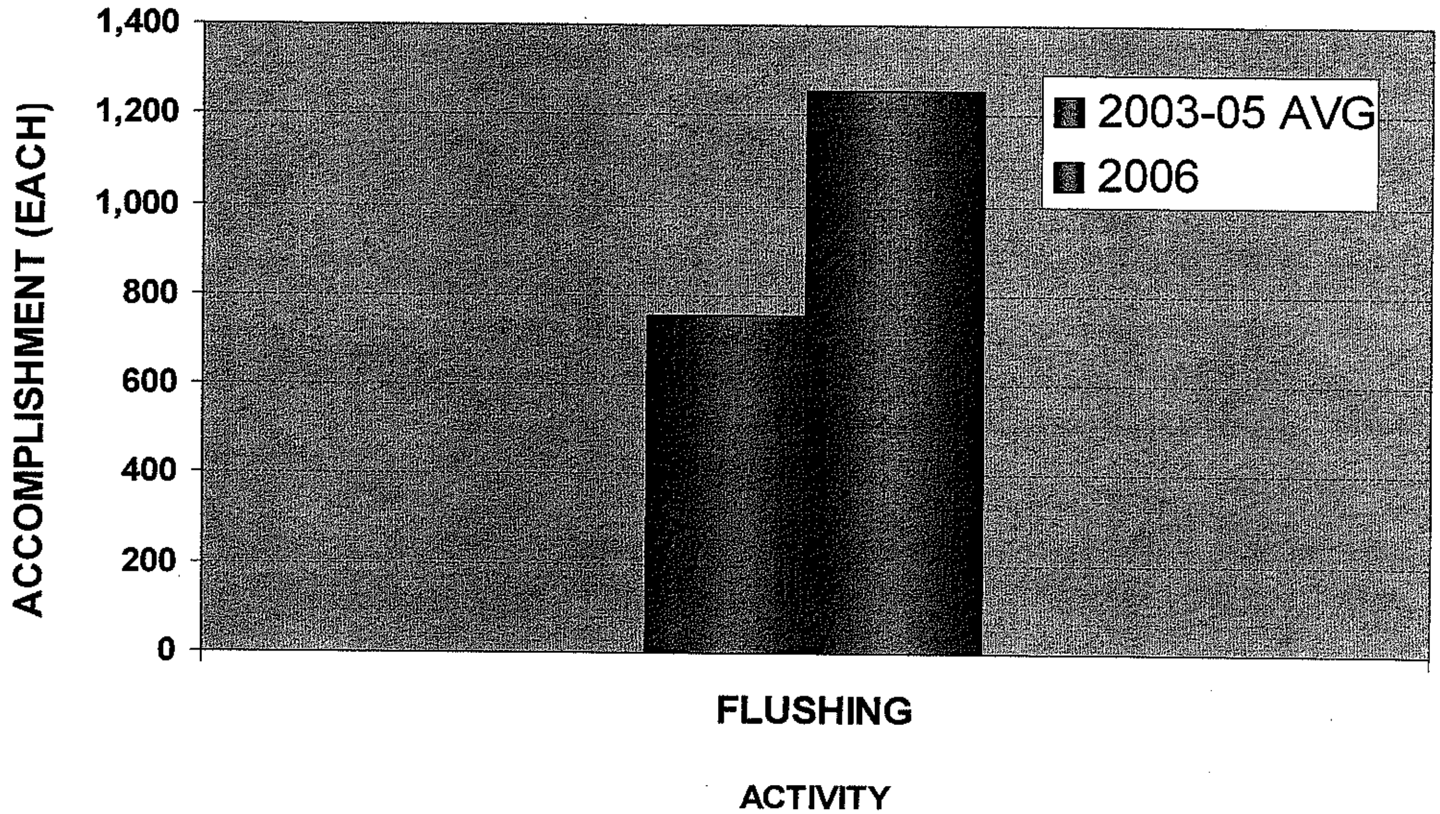
FY2006 Planned Joint Seal

PREVENTIVE BRIDGE MAINTENANCE ACCOMPLISHMENT

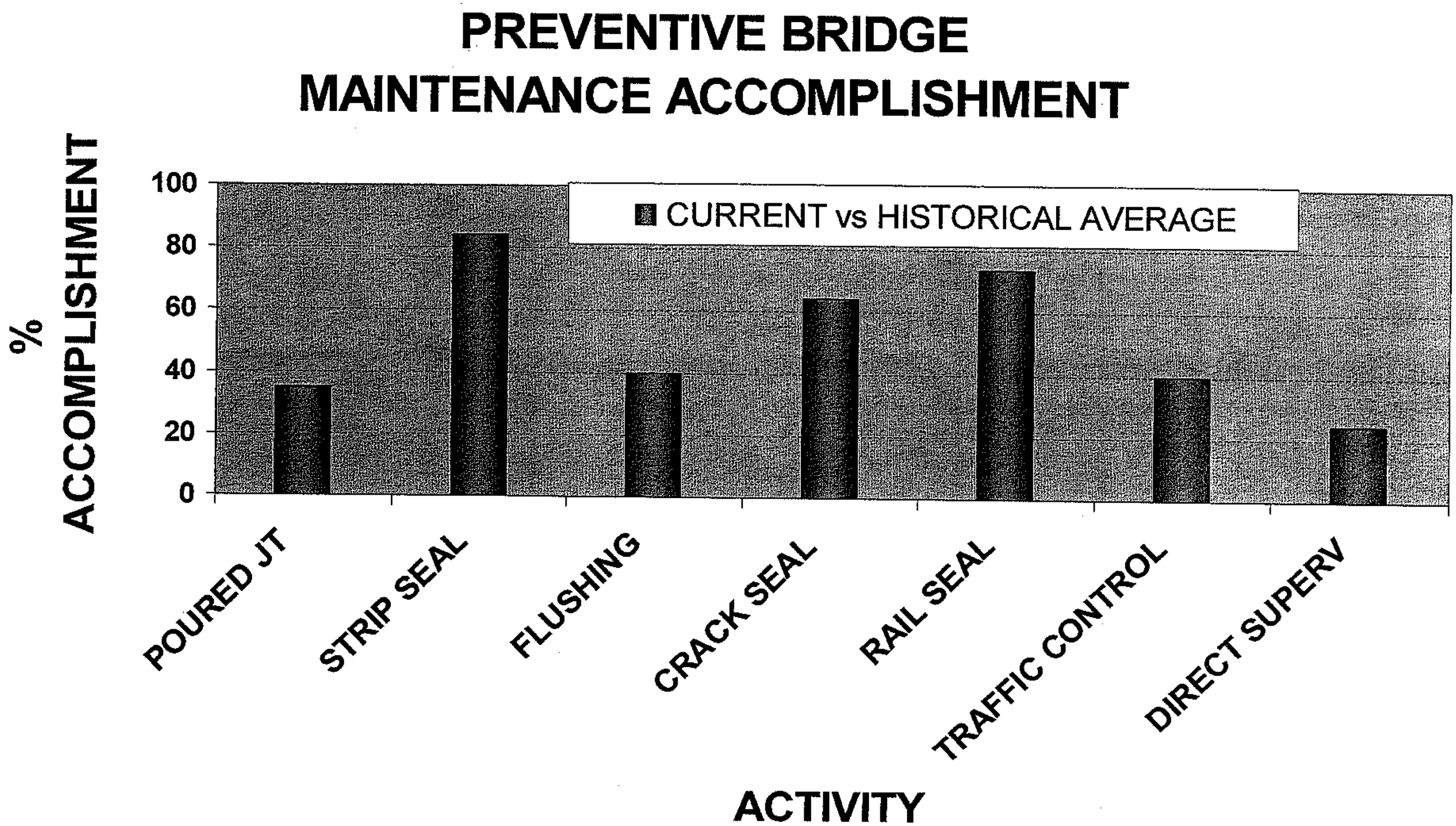
(see slide 20 for cost benefit ratios)



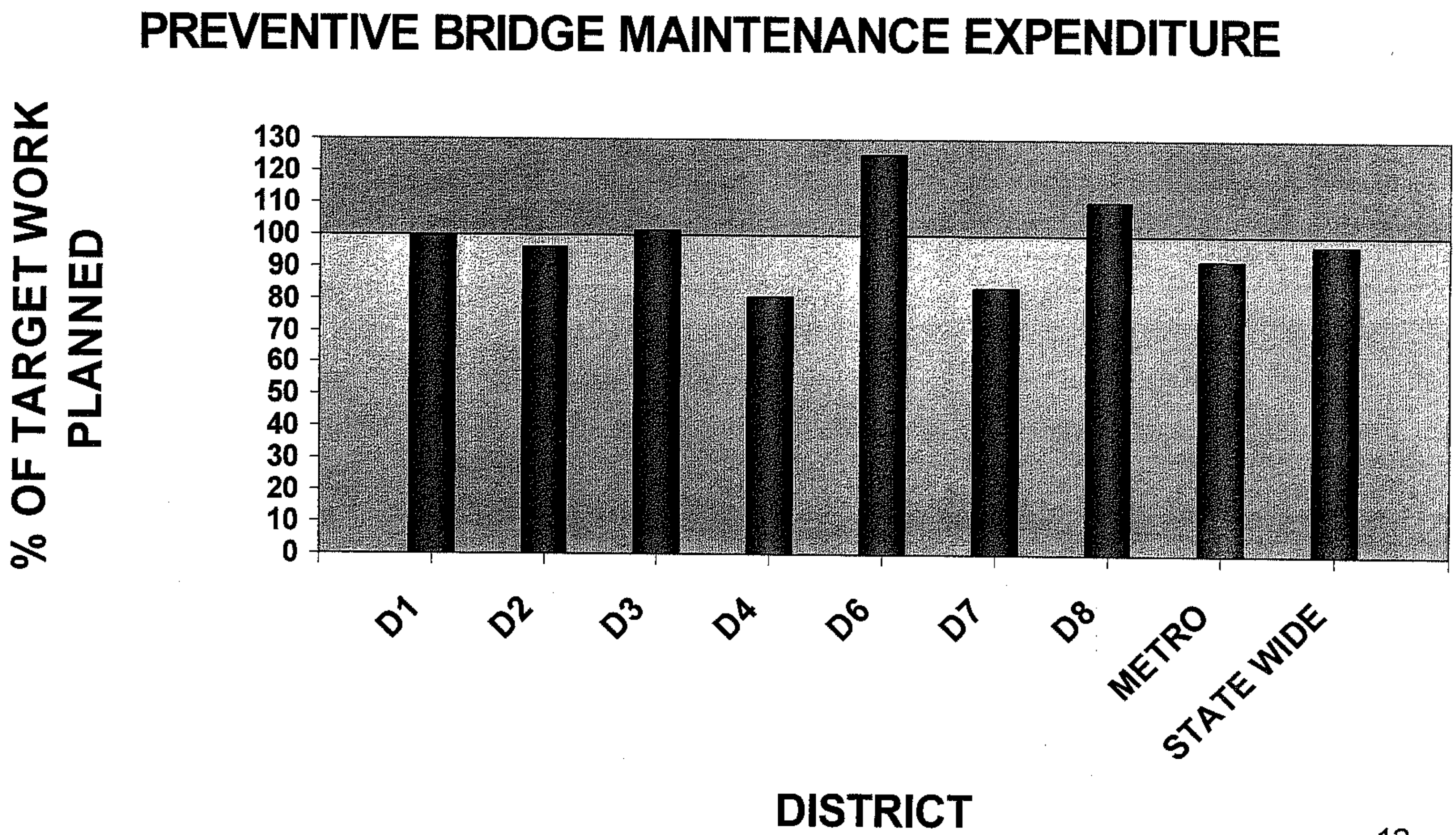
Planned Deck Flushing



Percentage of Outputs due to HSOP



FY2006 Planned vs. Target Spending

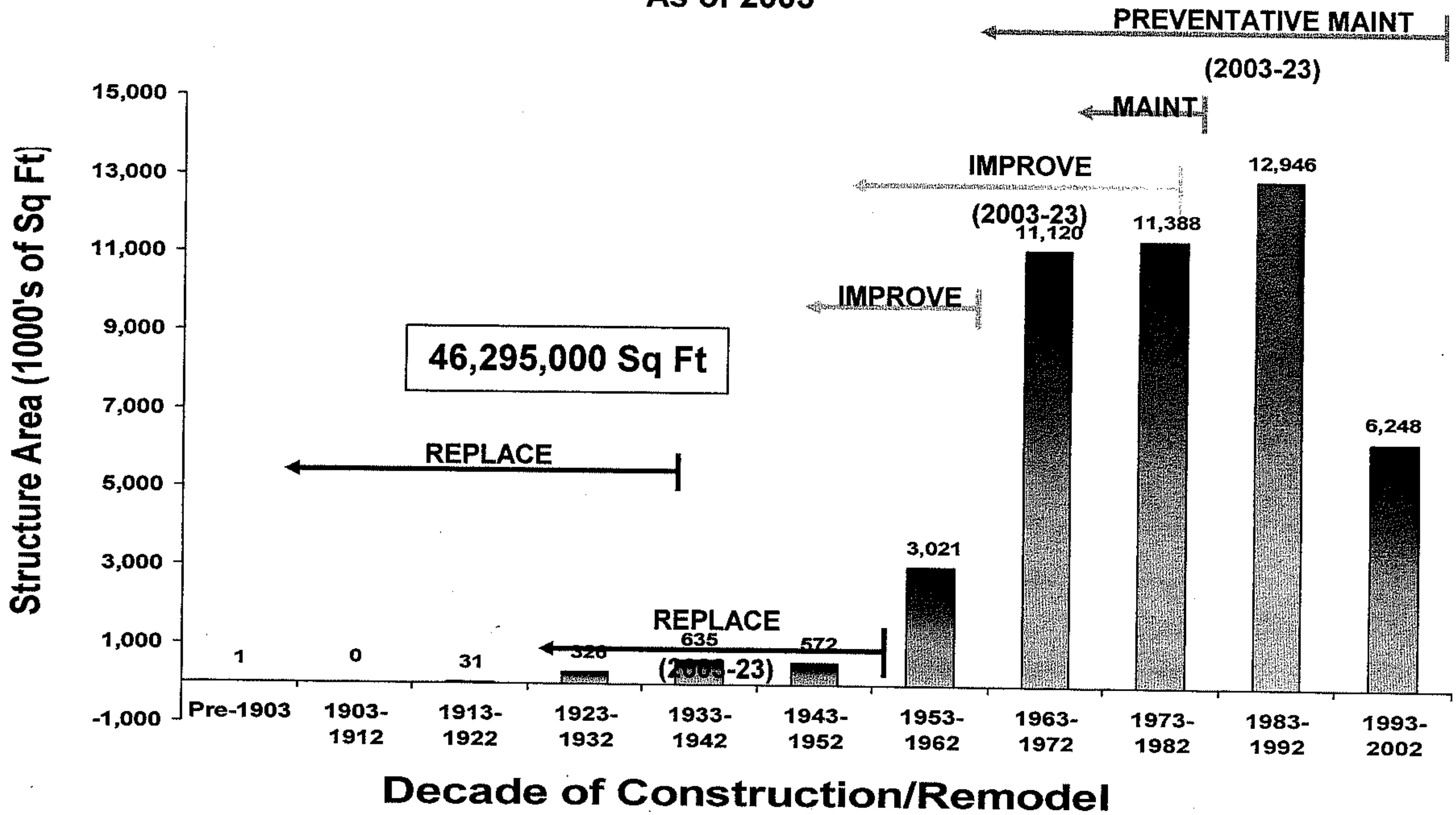


Remarks

All districts reported some changes to their program since their initial submittal in January.

- Excess expenditures for winter snow and ice and other increased operational costs impacted some districts.
- HSOP planned work-activities in some district plans were modified to meet capabilities and needs.
- Planned preventive bridge maintenance in some districts had been reduced prior to allocation of HSOP funds, because of budget constraints and increasing costs.
- Much of the work is being done by contract. It is likely that some of the planned work will not be completed by the end of the fiscal year and therefore, likely that the actual accomplishment reported next year will be less than planned.

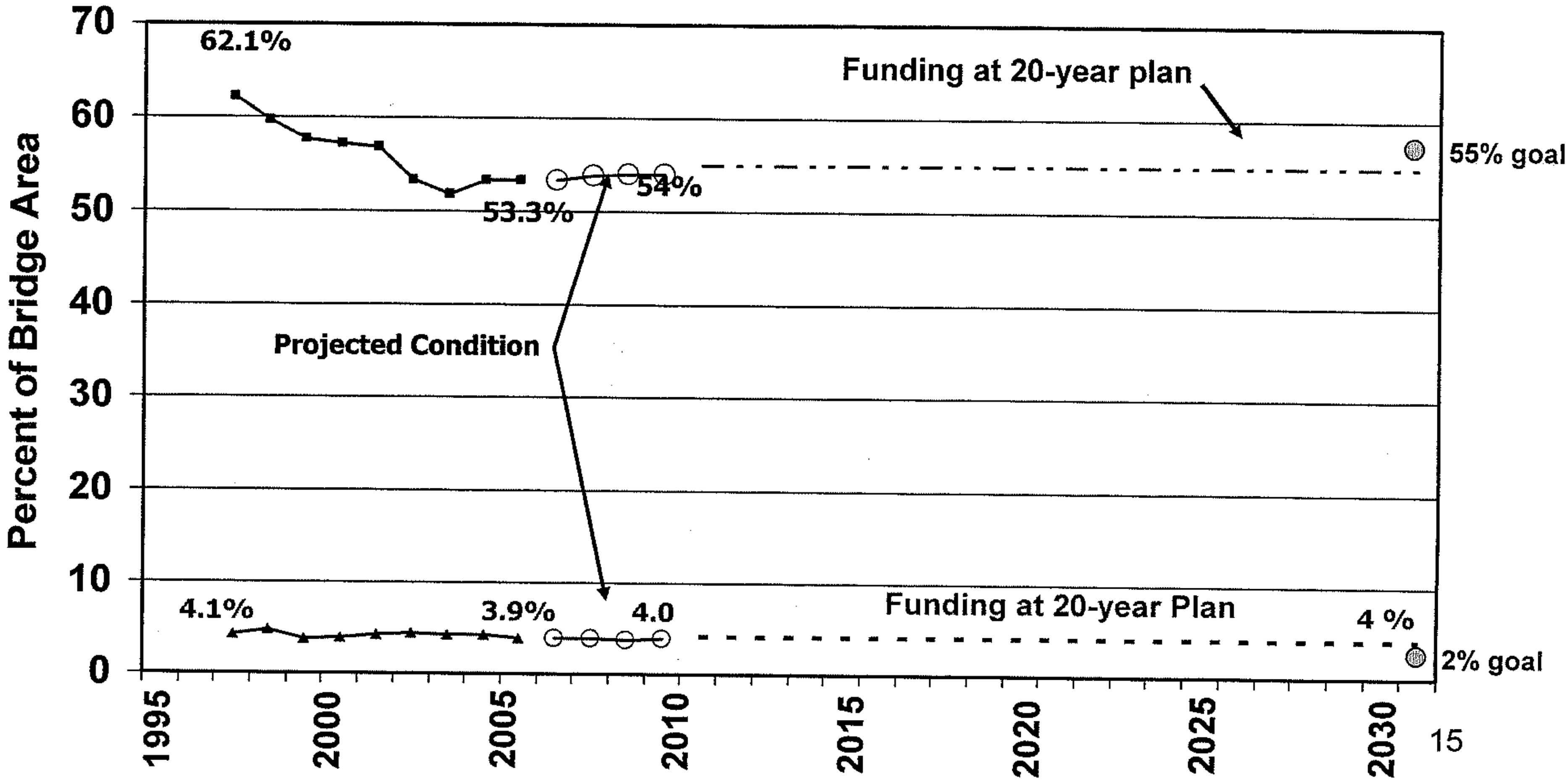
AGE PROFILE BY AREA OF STRUCTURES
TRUNK HIGHWAYS ONLY
STRUCTURES 10 FT AND OVER
As of 2003



Projected Condition Based on 2006-2008 STIP

Structural Condition of Bridges

Principal Arterials



Conclusions

- Planned spending is about 90% of Target
- All HSOP Bridge funds are being directed to planned activities. (Planned $BPM activities > $HSOP + $3-year average.)
- Continued investment in Bridge Preventive Maintenance at target levels, combined with funding the 20 year STIP should maintain system condition targets.
- Rising costs and constrained budgets for both operations and construction jeopardize these goals.
- Long term cost-benefit points to always fully funding Preventive Maintenance in order to maintain the current system for the longest period of time.

Questions:

HSOP Bridge PM Measures

ACTIVITY	% Good Condition	Target
Strip Seal Repairs	91%	96%
Poured Joint Repairs	74%	88%
Crack Sealing	49%	80%

	Frequency	
Deck Sealing	10 yrs	90%
Rail Sealing	10 yrs	90%
Flushing	1 yr	100%

HSOP Bridge PM Reporting

Inputs:

- Captured in PPMS/WMS

  Labor, equipment, Materials

- Work Orders
- Mn/DOT Maintenance Completion Reports

Outputs:

- Non-contract work captured in **PPMS/WMS**

- WMS Reports
- Manual Collection will be required for Contract Work

Outcomes:

- Reported by Pontis

  % in Good Condition and Activity Frequency

- Joint Repairs
- Crack Sealing
- Spot Painting
- Painting

Cost-Benefit for BPM Activities

- <u>**Overall Bridge PM — 4.0 to 1**</u>
- Crack Sealing — 7.9 to 1
- Poured Joint Repair — 3.8 to 1
- Strip Seal Repair — 2.8 to 1
- Flushing — Extends life 10 – 15 yrs
- Deck Sealing — 1.3 to 1
- Rail Sealing — 2.9 to 1
- Partial Painting — 2.2 to 1