DEPARTMENT OF TRANSPORTATION

Phased Array Ultrasonic Steel Corrosion Mapping for Bridges and Ancillary Structures

Barritt Lovelace, Principal Investigator
Collins Engineers, Inc.

August 2017

Research Project
Final Report 2017-33

To request this document in an alternative format, such as braille or large print, call 651-366-4718 or 1-800-657-3774 (Greater Minnesota) or email your request to ADArequest.dot@state.mn.us. Please request at least one week in advance.

Technical Report Documentation Page

1. Report No.	2.	3. Recipients Accession No.
MN/RC 2017-33		

4. Title and Subtitle	5. Report Date
Phased Array Ultrasonic Steel Corrosion Mapping for Bridges and Ancillary Structures	August 2017
	6.

7. Author(s)	8. Performing Organization Report No.
Barritt Lovelace, Jennifer Wells, Kenneth Rand, William Nelson, and Cory Stuber	

9. Performing Organization Name and Address	10. Project/Task/Work Unit No.
Collins Engineers, Inc. 1599 Selby Avenue, Suite 206 St. Paul, MN 55104	11. Contract (C) or Grant (G) No. (C) 1026297

12. Sponsoring Organization Name and Address	13. Type of Report and Period Covered
Minnesota Department of Transportation Research Services & Library 395 John Ireland Boulevard, MS 330 St. Paul, Minnesota 55155-1899	Final Report
	14. Sponsoring Agency Code

15. Supplementary Notes

http:// mndot.gov/research/reports/2017/201733.pdf

16. Abstract (Limit: 250 words)

Steel corrosion on bridges and ancillary structures due to environmental effects and deicing chemicals is a serious problem for Minnesota's infrastructure. The ability to detect, locate, and measure corrosion is an important aspect of structure inspection. Accurate thickness measurements and corrosion mapping are essential for determining load capacity of structural members on bridges and ancillary structures.

The Minnesota Department of Transportation purchased an OmniScan Phased Array Corrosion Mapping System. Unlike conventional ultrasonic equipment, this system provides detailed three-dimensional images of structural members including the remaining section of members that exhibit corrosion. This gives engineers better tools to visualize and evaluate the condition of bridges than was previously possible. With the future purchase of additional transducers, the OmniScan can also be used for enhanced inspection of welds and bridge pins.

17. Document Analysis/Descriptors	18. Availability Statement
Ultrasonic detectors, Phased arrays, Bridges, Structures, Corrosion, Steel, Nondestructive tests, Fracture properties, Transducers	No restrictions. Document available from: National Technical Information Services, Alexandria, Virginia 22312

19. Security Class (this report)	20. Security Class (this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	110	

Phased Array Ultrasonic Steel Corrosion Mapping for Bridges and Ancillary Structures

FINAL REPORT

Prepared by:

Barritt Lovelace, PE
Cory Stuber, PE
Collins Engineers, Inc.

Jennifer Wells, PE
Kenneth Rand
William Nelson
Minnesota Department of Transportation

August 2017

Published by:

Minnesota Department of Transportation
Research Services & Library
395 John Ireland Boulevard, MS 330
St. Paul, Minnesota 55155-1899

ACKNOWLEDGMENTS

This report would not be possible without the support of the professionals at the Minnesota Department of Transportation and Collins Engineers, Inc. Their input, hard work, ideas and enthusiasm for this study were critical to the success of the project. The following team members contributed in a significant way to this project:

Kevin Western, MnDOT Office of Bridges and Structures
Edward Lutgen, MnDOT Office of Bridges and Structures
Bruce Holdhusen, MnDOT Research Services
Rodney Carter, MnDOT Office of Bridges and Structures
Scott Theisen, MnDOT Office of Bridges and Structures
Drew Garceau, Collins Engineers, Inc.
Rebecca Keller, Collins Engineers, Inc.
Thomas J. Collins, Collins Engineers, Inc.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS

NDT – Non-Destructive Testing

UT – Ultrasonic Testing

PAUT – Phased Array Ultrasonic Testing

NDE – Non-Destructive Evaluation

FC – Fracture Critical

PHASED ARRAY GLOSSARY

A-Scan: An ultrasonic waveform plotted as amplitude with respect to time. It may be either rectified or unrectified.

Aperture: In phased array testing, the width of the transducer element or group of elements pulsed simultaneously.

B-Scan: A two-dimensional image of ultrasonic data plotted as reflector depth or distance with respect to beam position. B-scans may be either single value or cross-sectional.

B-scan, single value: A two-dimensional image based on plotting the first or largest reflector within a gate. This format is commonly used in ultrasonic flaw detectors and advanced thickness gages and it shows one reflector at each data point.

B-scan, cross-sectional: A two-dimensional image of ultrasonic data based on full waveform storage at each data, which can be plotted to show all reflectors in a cross-section rather than just the first or largest. This allows visualization of both near and far surface reflectors within the sample.

Calibration, sensitivity: A procedure that electronically equalizes amplitude response across all beam components in a phased array scan. This typically compensates for both element-to-element sensitivity variations, and the varying energy transfer at different refracted angles.

C-Scan: A two-dimensional view of ultrasonic amplitude or time/depth data displayed as a top view of the test piece.

Linear Scan: A scan in which the acoustic beam moves along the major axis of the array without any mechanical movement. A single focal law is multiplexed across groups of active elements, creating either a straight beam or a beam at a single angle that advances the length of the probe.

Phased Array: A multi-element ultrasonic transducer (typically with 16, 32, or 64 elements) used to generate steered beams by means of phased pulsing and receiving.

Sector Scan (S-Scan): A two-dimensional view of all amplitude and time or depth data from all focal laws of a phased array probe corrected for delay and refracted angle.

EXECUTIVE SUMMARY

Steel corrosion on bridges and ancillary structures due to environmental effects and deicing chemicals is a serious problem for Minnesota's infrastructure. The ability to detect, locate, and measure corrosion is an important aspect of structure inspection. Accurate thickness measurements and corrosion mapping are essential for determining load capacity of structural members on bridges and ancillary structures.

The Minnesota Department of Transportation purchased an OmniScan Phased Array Corrosion Mapping System. Unlike conventional ultrasonic equipment, this system provides detailed three dimensional images of structural members including the remaining section of members that exhibit corrosion. This gives engineers better tools to visualize and evaluate the condition of bridges than was previously possible. With the future purchase of additional transducers, the OmniScan can also be used for enhanced inspection of welds and bridge pins.

During this study, corrosion mapping was performed on four structures and test specimens including the Sorlie Bridge, the Baudette Bridge, a High Mast Light and the Silverdale Bridge Test Specimen. An Olympus Omniscan SX Phased Array Ultrasonic Testing System was used to perform the scans. Results showed that using Phased Array Ultrasonic Testing to map corrosion is an effective way to determine the remaining thickness and section of structural steel members. Compared with single-beam ultrasonic and traditional hand-measuring techniques, Phased Array Ultrasonic Testing (PAUT) provides more complete data. This additional data provides engineers more accurate information when determining load capacity and potentially will allow engineers to make better recommendations on repairs and replacement of members or bridges since traditional methods likely underestimate the remaining section of members.

Based on literature research, observations in the field, and data analysis the following conclusions can be made:

- PAUT can provide significant improvements in corrosion mapping when compared to single beam ultrasonic and traditional field measuring methods.
- PAUT is effective in determining the estimated remaining thickness of structural members.
- PAUT equipment has a wide range of capabilities, settings and options and requires proper training and practice to achieve accurate results.
- Traditional field measuring methods often underestimate the remaining thickness of structural members due to the limitations in the amount of data that can be collected. The lack of data points leads to conservative estimates of remaining thickness. Without accurate results, a structural member’s capacity may be underestimated and result in decisions to repair or replace that may be unnecessary and expensive. PAUT can provide data that is orders of magnitude larger leading to more accurate results.
- Rough and irregular surfaces can make it difficult to achieve good measurements in the field.
- The use of PAUT should be considered when determining the remaining section of steel members in order to provide engineers the information needed to make informed decisions on member capacity.

- The use of PAUT can reduce time in the field compared with single beam ultrasonic and traditional measuring techniques.
- The use of PAUT can be used to establish baseline measurements in order to predict future funding and maintenance.

CHAPTER 1: INTRODUCTION

1.1 PROJECT OVERVIEW AND GOALS

1.1.1 Project Overview

Steel corrosion on bridges and ancillary structures due to environmental effects and deicing chemicals is a serious problem for Minnesota's infrastructure. The ability to detect, locate, and measure corrosion is an important aspect of structure inspection. Accurate thickness measurements and corrosion mapping are essential for determining load capacity of structural members on bridges and ancillary structures.

The Minnesota Department of Transportation purchased an OmniScan Phased Array Corrosion Mapping System. Unlike conventional ultrasonic equipment, this system provides detailed three-dimensional images of structural members including the remaining section of members that exhibit corrosion. This gives engineers better tools to visualize and evaluate the condition of bridges than was previously possible. With the future purchase of additional transducers, the OmniScan can also be used for enhanced inspection of welds and bridge pins.

Use of Phased Array Technology requires extensive experience to get accurate results and to interpret the results correctly. Project oversight and field testing are performed by MnDOT staff members William Nelson (ASNT NDT Level III Certification) and Kenneth Rand (ASNT NDT Level II Certification). Both William and Ken are highly experienced bridge inspectors and NDT Technicians.

Figure 1.1 Phased Array Field Data Collection.

1.1.2 Project Goals

The overall goal of this research project is to increase the quality of structural inspection data, which will have the following benefits:

- Decrease engineering and administrative costs by streamlining the mapping of corrosion workflow.
- Increase the useful life of structures by improving the data used to make decisions about repair, rehabilitation and replacement.
- Decrease operation and maintenance costs by using improved data to make better decisions.
- Provide structural engineers with high-quality inspection data necessary to accurately load rate bridges.
- Establish baseline measurements of structural members susceptible to active corrosion to predict future funding and maintenance needs.
- Provide accurate data in a fraction of the time it currently takes using conventional measurement techniques.

CHAPTER 2: PHASED ARRAY TECHNOLOGY

Phased array ultrasonic testing (PAUT) has become a tool of interest for steel bridge inspection, as it takes current ultrasonic and refines the methods and data collection processes. Current ultrasonic (UT) systems utilize single element ultrasonic probes using a single piezometric transducer to send and receive sound waves through a material. Operators are then able to define material properties through the observed behaviors of the sound waves. A phased array ultrasonic probe uses the same principle, but employs several piezometric transducers that send sound waves at separate sequential time-shifts. Each of these time-shifts permit users to change the direction and focus of the sound waves. The focus and direction of each angled sound wave will provide a different observable volume area, allowing users to narrow or widen the swath of area observable with one sweep. The PAUT system also records an electronic log of an inspection, which includes processes used and results obtained, to be reviewed after field work is complete. The technological advances inherent in the PAUT system make it a suitable candidate to inspect steel structures and a possible substitute for current conventional methods.

2.1 ULTRASONIC TESTING OVERVIEW

2.1.1 Ultrasonic Testing Technology History

The first ultrasonic testing instrument was patented in 1940 by Dr. Floyd Firestone, an acoustical physicist. He used the device to locate defects similar to how they are found using modern devices, by measuring transit time of high frequency vibrations through the material. He established that defects could be detected inside the material without any visible signs on the surface. This new form of non-destructive testing was later developed into ultrasonic scanning and phased arrays instruments.

Practical applications of phased array ultrasonic testing occurred in the medical field in the 1970s to produce cross-sectional images of the human body, more commonly known as ultrasound imaging. This has proved to be a powerful tool in monitoring stages in fetal development and identifying heart defects in adults. The accuracy of these findings was easily verified due to the composition and anatomy of the human body being well studied and allowed a simple standard for the images to be compared against.

Due to the wide variety of materials and difficult geometric layouts, applications for phased array in inspection and testing of building materials was not implemented until later. The first ultrasonic system utilized in the construction field was created in the 1980s and required data to be transferred to a computer for processing. This test would take significant resources to analyze given the limitations in computing technology at the time and would not yield results to be viewed instantly in the field. The amount of time required for testing and processing, and the high cost, limited testing to very specific applications. Common uses included testing and/or inspection of in-service power generation devices, areas with possible nuclear radiation contamination, large forged shafts, and low pressure turbine components.

The advancement of computing technology in the 1990s allowed ultrasonic testing to be used more readily in the field. The establishment of cheaper microprocessors allowed for the creation of digital hand

held instruments at a lower cost. It became increasingly more common and practical compared to other outdated testing because of its ability to provide real-time results. Ultrasonic testing is now widely used for routine non-destructive testing of welds, pins, and other connections without invasive procedures.

2.1.2 Ultrasonic Imaging Technology Overview

The traditional single transducer and phased array ultrasonic instrument utilize the same technology. Both emit high frequency sound waves to check the internal structure of a steel element or measure its thickness and provide real-time visual data in the field via a display monitor.

Ultrasonic phased array systems can be utilized in virtually every application where conventional ultrasonic inspection methods have traditionally been used. Detecting crack locations and profile remaining wall thickness in corroded steel elements such as welds, beams, pins or other structural elements are common applications. These inspections are also done across a wide range of disciplines including aerospace, power generation, petrochemical, metal billet and tubular goods suppliers, pipeline construction and maintenance, structural metals, and general manufacturing.

Figure 2.1 Phased array ultrasonic being utilized on steel bridge element.

The main physical difference in the phased array transducer compared to conventional ultrasonic testing equipment is that it contains anywhere from 16 to 256 ultrasonic sound wave emitters in a single housing which are then sequentially pulsed. These transducers can be used with various types of contact modes to angle the beam to the desired location inside the element being inspected.

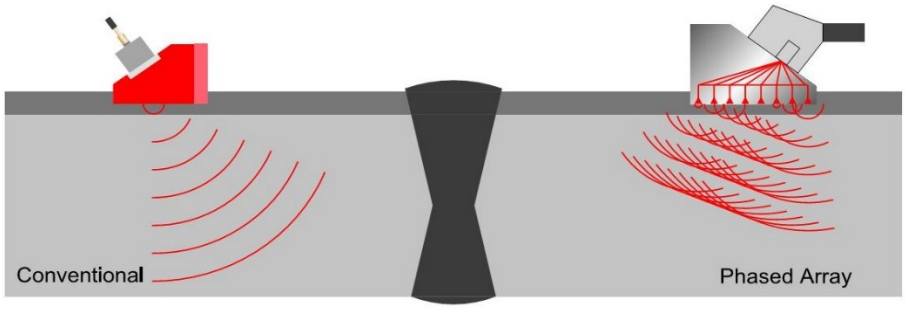


Figure 2.2 Conventional vs Phased Array Ultrasonic.

The angle and timing of the pulsed sound waves play an important role when inspecting elements in phased array applications. With traditional ultrasonic transducers using a single emitter, an angle and material velocity is inputted into the device. Consequently, inaccurate inputs of these physical characteristics will produce errors in locating the defect.

For phased array, the ultrasonic transducers have the ability to sweep through a range of refracted angles. These angles can also be programmed to an interference pattern of time delays in order to focus the sound wave at a specific depth inside the element. The ability to focus at multiple depths improves the ability for sizing and locating defects.

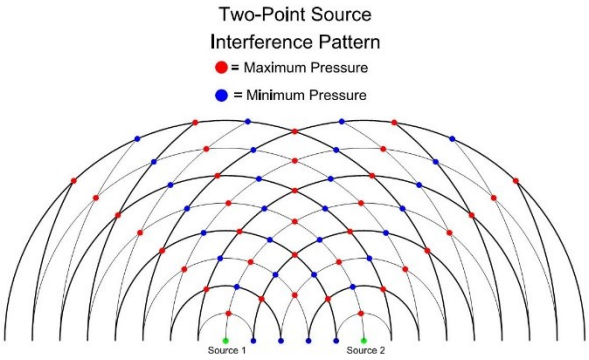


Figure 2.3 Phased Array Interference Pattern.

The result of using multiple transducers in one sweep lets the user create a real-time image of the inspection zone. Utilizing this imaging provides the inspector with the ability to see relative changes inside

the element being inspected. This greatly increases the probability of detection of defects or anomalies and creates a significant advantage compared to traditional ultrasonic methods.

Four different viewing methods or scans are available with ultrasonic phased array testing. They are simply referred to as A-Scan, B-Scan, C-Scan and S-Scan (Sector Scan).

A-Scan is the most basic scanning method. Any ultrasonic instrument typically records two fundamental parameters of a sound wave echo: how large it is (amplitude) and transit time. Transit time is correlated to distance based on the reflected sound velocity of the test material. These results are plotted on a grid with the vertical axis representing amplitude and the horizontal axis representing time.

B-Scan is a two-dimensional image of ultrasonic data plotted as depth with respect to sound wave position. This can be plotted to show all echoes in cross-section rather than just the first or largest which is the method utilized during an A-Scan. This allows visualization of both near and far surface sound wave reflections within the sample.

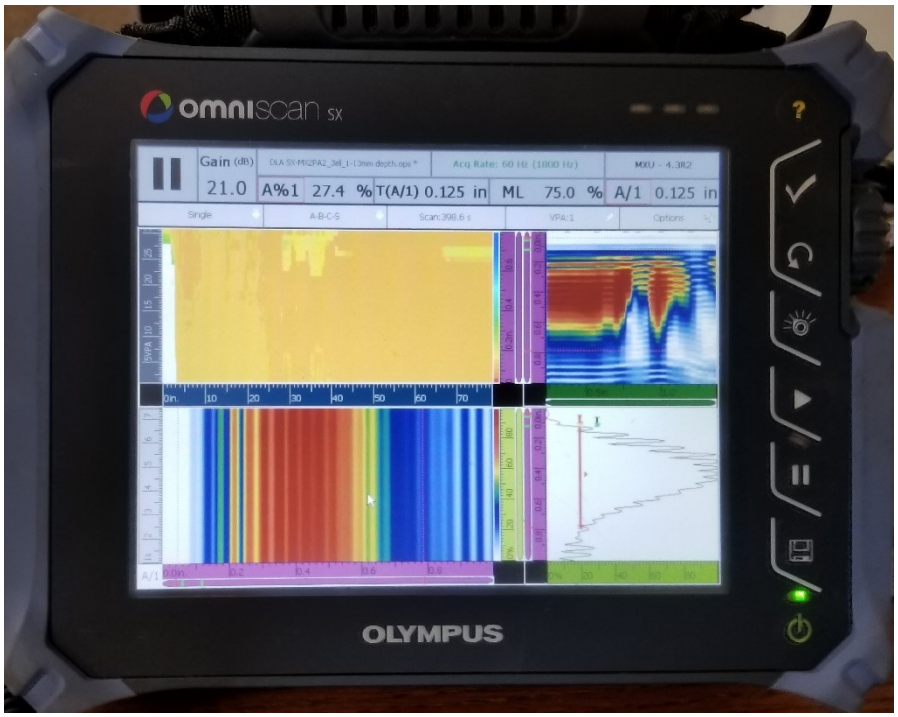


Figure 2.4 Phased array A-scan, B-scan C-scan and S-Scan example.

C-Scan is another two-dimensional presentation of data displayed as a top or planar view of a test piece, similar in its graphic perspective to an x-ray image, where color represents the depth at each point in the test piece mapped to its position.

The final method is S-Scan or sectorial scan. This technique is similar to traditional methods, except that the ultrasonic sound waves sweep through a range of angles rather than a just single fixed angle. The image produced through this scan is a cross-sectional view of the element being inspected.

Since all ultrasonic waveform data is collected, post-analysis enables reconstruction of sectorial scans combining C-scan and B-scans with corresponding A-scan information at any element location.

For this study the Phased Array Ultrasonic Testing unit was used in a corrosion mapping configuration which includes a probe optimized for corrosion mapping. The probe include a wheel to measure the position of the scan to collect thousands of data points that can then be referenced after data is collected. The files are saved and can be referenced at any point in the scan later to determine the remaining section or percentage of material loss of the specimen at any point in the scan. This data can be viewed in the OmniScan software on a PC computer. The data files can be made part of the bridge file for reference at a later date.

CHAPTER 3: LITERATURE REVIEW

3.1 ULTRASONIC PHASED ARRAY INSPECTION FOR INDUSTRIAL APPLICATIONS (PPT)

Paul Hayes and Dave Jankowski, of GE Inspection Technologies, presented information on demonstrating the basic differences in data collection methods and efficiency between conventional ultrasonic equipment (UT) and ultrasonic phased array equipment. A general ultrasonic technology timeline was given: from the early conceptions of being able to observe and use sound waves in the 1800s, to the 1900s where technological advances through portability and materials allowed for commercial uses in the industrial and medical industries, to modern day advances such as handheld portability and phased array capabilities. Focusing on the comparisons between the conventional single element ultrasonic system and the phased array ultrasonic system certain benefits and restrictions can be summarized. Benefits include recordable in-field imaging, improved accuracy of observable material properties, faster evaluations as larger swathes of area are observed at one time, and a method for inspection of confined spaces. Drawbacks include the training of skilled users, the initial investments for equipment, and its relatively new recognition of standards by committees.

3.2 FIELD APPLICATION OF ULTRASONIC PHASED ARRAY FOR STRUCTURAL EVALUATION

Curtis Schroeder and Phil Fish of Fish and Associates presented information on field applications using a PAUT system. Outlined advantages included eliminating most radiographic testing needs, improved resolution and sensitivity, and in-field recordable 2-D cross-sectional view of indications. Implementation of this new technology can provide critical section loss information and immediate defect detection and mensuration. Users are able to calculate remaining section percentages and structural capacity checks. In-field identification of deficiencies' sizes and locations can now be completed more quickly and easily than previously used methods. These findings can then be used by engineers to determine a structure's Fitness-for-service (FSS), which assesses the fracture potential and fatigue life of a structure.

Field applications presented for PAUT systems focused on scan plans, calibration, encoding and interpretation. Scan plans allow the user to choose the appropriate mechanism set-up, or angled sonar projections, to ensure a complete scan of an element. These plans can be generated with sketches or computer software, and provide better scan coverage for welds and pin connections. PAUT systems may be calibrated for typical flaw sizing and identification through the use of known materials and defects, and can be used on thicker materials than were previously detectable. To be able to measure defect locations the transducer's location must be encoded through one of the following: an X-Y location, a translational location, or an angle depending on the element being inspected. A test fixture would be needed for consistency, and could serve as a calibration check as well. The PAUT system provides more detailed information than was previously able to be collected with other methods, and therefore more exact engineering interpretations can be drawn.

The PAUT system allows for better scanning and identification of flaws within welds, pins, and section loss percentages. More advantages of a PAUT system include:

- Weld testing can now be done along the full length of a weld, on both full and partial penetration welds, and can be used to identify fracture critical and electro-slag welds.
- Pins and hangers can be more easily and fully tested than with previous methods.
- Users are now able to test on both pin ends.
- Operators can rotate the transducer allowing for a larger observable area.
- Hangers and link bars near pin holes can now be tested.
- Acoustic coupling reduces error.

Section loss percentages can now be more easily quantified through the ability to encode thickness profiles into the PAUT system. Moving forward, Fish and Associates believe that producing standardized procedures for flaw sizing and an acceptance criteria for pins would further refine the usage of phased array ultrasound technology.

3.3 TECHBRIEF: DEVELOPMENT OF PHASED ARRAY ULTRASONIC TESTING ACCEPTABILITY CRITERIA (PHASE II)

The U.S. Department of Transportation produced a technical summary on the efficiency of phased array ultrasonic technology's ability to correctly identify and measure known defects in butt-weld specimens. This study was conducted with the intention of developing criteria for the testing and verification of welding defects; such as lack of fusion, porosity, and cracking. Four butt-weld specimens were inspected using the PAUT system employing the pulse-echo technique (PE). The PE technique uses the same transducer to send and receive ultrasonic pulses. Through the analyses of the time it takes for a pulse to reflect back and the strength of the returning pulse, mensuration data may be collected.

Phase I of this study, generated scan plans for the studied butt-welds using the Eclipse Scientific BeamTool software. These computer generated plans allow users to plan, visualize, and select the most effective ultrasonic pulse angles and time-shifts, also known as a scan plan. Scan plans produce a more precisely targeted area of interest. Factors considered during scan plan creation were weld thickness and width, weld centerline positioning, complete scanning coverage, and the heat affected zone. Comparable variables were incorporated into the study to further refine the scanning process.

Variables included two types of welding processes electro-slag welding (ESW) and submerged arc welding (SAW) to observe the influence of the microstructure on the movement of the ultrasonic pulses. Differing levels of frequency, 5 and 2.25 MHz, were tested to observe any influence on the results collected. The PAUT system was operated on both sides of the specimen butt-welds, providing for an accuracy check of reflected frequency data through comparison of the data from both the first- and second-legs, and the impact of ultrasonic attenuation on the amplitude of the flaw indication. Test specimens were inspected from several alternate locations (opposite side of weld centerline, etc.) to verify collected results, attenuation effects, and observe the influence of orientation on flaw sizing and identification. All PAUT results were then compared to conventional UT and RT findings.

Through comparative analysis, conventional UT detected some known flaws but not all due to the grid like nature of a conventional raster scan plan. Conventional UT also had issues discerning and quantifying defects close together or at different depths. RT scans were able to locate flaws effectively, but no mensuration data could be inferred due to the nature of the data produced. The PAUT system's simple mobile set-up and the ability to not only locate but to measure defects yields the desired level of detail necessary for a thorough inspection. Different scan types (A-, B-, C-, and S-scans) were used to identify known flaws and compare resulting data. Volume corrected C-scans confirm that a more tailored point scan plan is necessary to observe the entire weld area, further exemplifying the usefulness of the computer generated scan plans. A-, B-, and S-scans were used to further evaluate the orientation and sizing of the known defects.

The PAUT system demonstrated the ability to locate and size defects in butt-welds, but the impact of sound wave attenuation and orientation of the system were evident. Porosity and clusters of slag were poorly identified with the PAUT system, and would be up to an operator's judgement to discern the data collected. A Phase III of this study will focus on transition butt-welds, scanning of known fusion and transverse cracking flaws, investigation into time of flight diffraction (TOFD), and the influence of a material's microstructure on sound wave propagation.

3.4 ENCODED PHASED ARRAY BRIDGE PIN INSPECTION

James Doyle explicitly details the use of a phased array ultrasonic system to inspect bridge pins. By employing three specific scan plans a bridge pin can effectively be inspected with only the ends exposed. The first, or near, group will observe the near side threaded section. The second, or middle, group will inspect the barrel of the pin focusing on the shear planes. The third, or far, group observes the entire length of the pin and is the equivalent of a conventional UT scan. Scans are completed in a clock-wise manner. The report further details the steps and checks to be used for in-field operations, and typical analysis methods for the data collected specific to bridge pins.

3.5 INSPECTION OF TRANSITION BUTT WELDS USING PHASED ARRAY ULTRASONICS

Pranaam Haldipur Ph.D. of the Turner-Fairbank Highway Research Center presented results of a comparative study between conventional UT and RT inspections and PAUT inspections. Transition butt-weld specimens were inspected with known variables taken into account. Variables included the welding process, fabrication, inspection frequency, data from both UT legs, and inspection done from all skew angles from the weld centerline were taken into account and detailed within the report. Findings were similar to the aforementioned *TECHBRIEF: Development of Phased-Array Ultrasonic Testing Acceptability Criteria (Phase II).*

3.6 COMPARATIVE TESTING OF RADIOGRAPHIC TESTING, ULTRASONIC TESTING, AND PHASED ARRAY ADVANCED ULTRASONIC TESTING NON-DESTRUCTIVE TESTING TECHNIQUES IN ACCORDANCE WITH AWS D1.5 BRIDGE WELDING CODE BDK84-977-26

Steven Duke of the Florida Department of Transportation presented a comparable study reviewing conventional UT and RT methods versus the PAUT system. Duke's motivation was to obtain a statistically determinant body of data comparing UT, RT, and PAUT systems. In hopes that the data would provide validation for the PAUT system to replace conventional RT as the accepted non-destructive testing (NDT) method on steel bridge welds. The American Welding Society (AWS) currently only recognizes RT and conventional UT. Data for the study was gathered in a fabricator's shop during the actual construction of steel bridges, and demonstrated that the PAUT system was as successful as the older RT and UT methods, in the majority of cases. Duke believes these findings validate the PAUT system as a substitute for conventional testing, and does not produce unnecessary rejections or is not overly sensitive as to not be efficient. After this study, Florida became the first state to put into effect the use of the PAUT system as a means of inspection on steel bridges.

3.7 EFFECT OF FOCAL LAW PARAMETERS ON PROBABILITY OF DETECTION IN PHASED ARRAY ULTRASONIC TESTING USING A SIMULATION AND CASE STUDY APPROACH

Materials Evaluation published a study detailing PAUT's detection efficiency by taking into account the effects of focal law parameters. These focal law parameters include element quantity, pitch, focal depth, range of angle, and angle resolution. Scan plans were generated using these principles, and both computer simulated and experimental trials were conducted for comparative results. The study examined face discontinuities, focusing on lack of fusion (LOF), as their detection is heavily reliant on the beam angle of incidence (BIA). The BIA can be determined and set through scan plans, and therefore the study of face discontinuities provides for a quality check of the scan plan and the PAUT system. The study details the scan plans chosen with accompanying illustrations for a good conceptualization of the instruments implementation. Further variability was added to the study by varying specimen geometry and using different sizing methods. Each trial is detailed within the report.

Overall conclusions made include:

- Number of crystals, or elements, employed (32, rather than 16) aids greatly in the probability of detection, resolution and defect sizing.
- Element pitch (1mm, rather than 0.6mm) produces a greater observable quantity, where with a deeper focus the sizing of reflectors and better resolution is attained.
- BIA of 5° (rather than 10°), notably effects detectability of fusion discontinuities.
- An angle range producing a BIA of 5° has proven very productive for fusion bevels.
- Focused beam results are more accurate than unfocused.
- Focusing on the area of interest.
- Simulation results and experimental results had very little variation.

Overall, the study places an emphasis on the importance of a quality scan plan for effective inspection of welds when using a PAUT system.

CHAPTER 4: DATA COLLECTION

4.1 SORLIE BRIDGE 4700

4.1.1 Bridge Description

The Sorlie Memorial Bridge was built in 1929 and carries U.S. Highway 2B over the Red River of the North between East Grand Forks in Polk County, Minnesota, and Grand Forks, North Dakota. The bridge has a total length of 603 feet and is owned by the Minnesota Department of Transportation. It was a joint project of both states and was named as a memorial to North Dakota Governor Arthur Gustav Sorlie. Each of the two main spans is a steel, riveted, Parker through truss. At 283 feet long, the spans are the longest riveted Parker through truss spans in the state. To accommodate the unstable condition of the river banks, the structure design incorporates very large roller bearings that originally allowed the abutments to slide beneath the superstructure (up to 10 feet) without damaging the bridge. The bridge is fracture critical and is inspected and maintained by MnDOT.

Figure 4.1 Sorlie Bridge Overall Photo.

4.1.2 Data Collection and Results

As part of this research study and the fracture critical bridge inspection corrosion measurements were taken at the bottom flange of a floor beam at a horizontal gusset plate. Three C-Scans were performed and are shown below. The C-Scans show the thickness of the member at various locations. The colors

on the scan represent different thicknesses as depicted on the scale to the right. The white areas depict missing data from the scan.

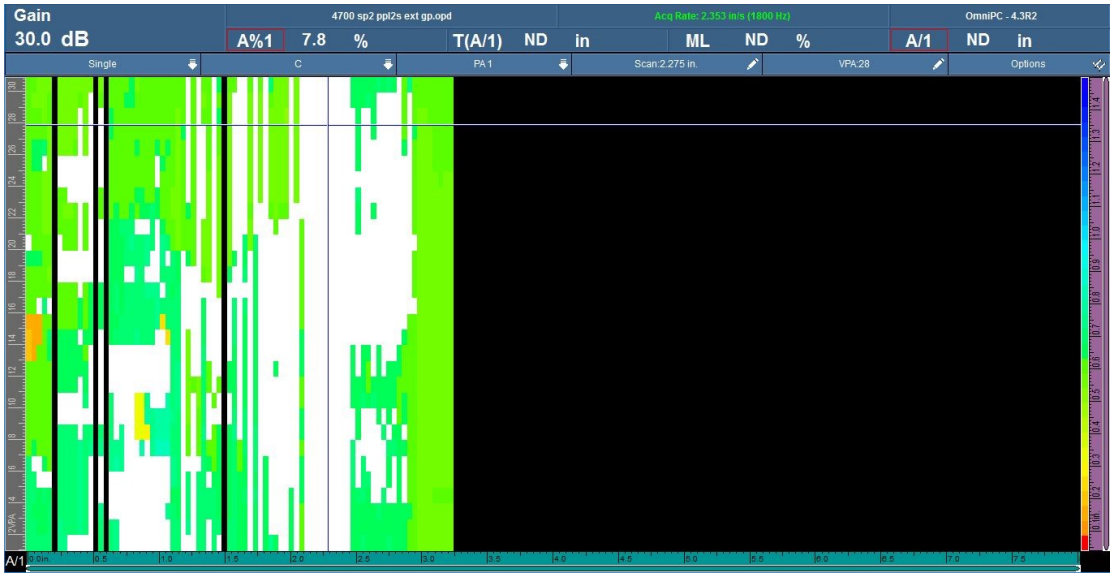


Figure 4.2 Sorlie Bridge Gusset Plate C-Scan.

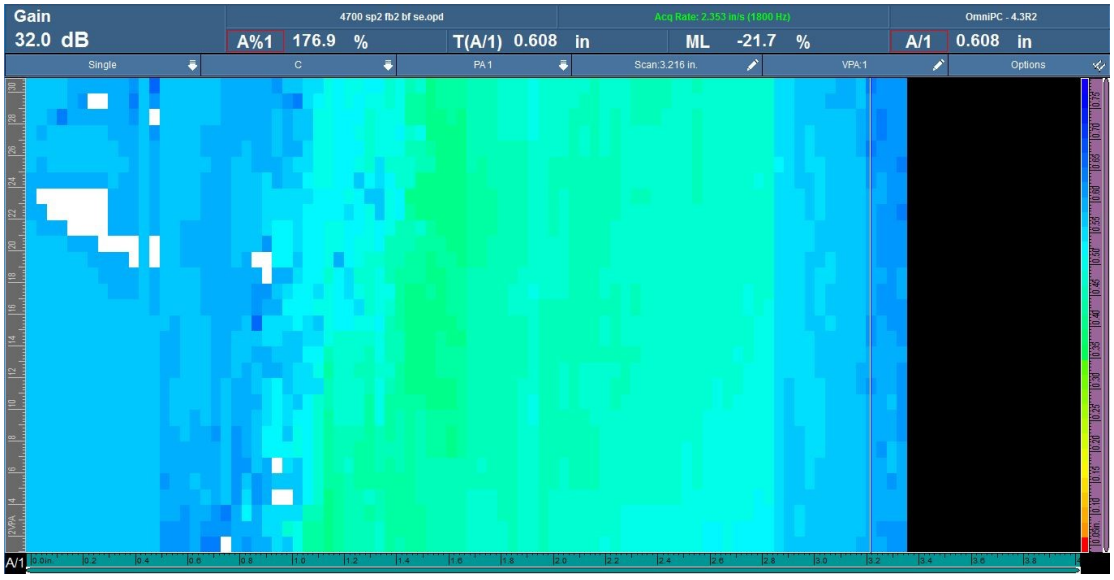


Figure 4.3 Sorlie Bridge Floor Beam 2 Bottom Flange Southeast C-Scan.

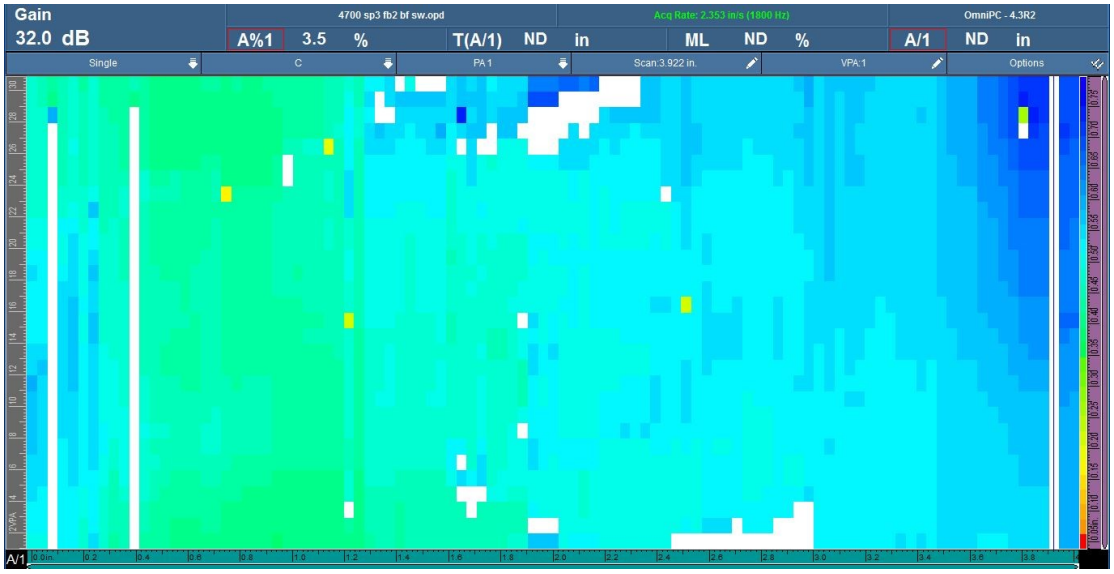


Figure 4.4 Sorlie Bridge Floor Beam 2 Bottom Flange Southwest C-Scan.

4.2 BAUDETTE BRIDGE 9412

4.2.1 Bridge Description

The Baudette is an international bridge connecting Baudette, Minnesota to Rainy River, Ontario and carriers TH 72 over the Rainy River. The bridge was constructed in 1959 and carries two lanes of traffic and includes a sidewalk for pedestrian traffic. There are six main channel spans which are Pennsylvania Steel High Trusses in addition to 6 steel beam approach spans. It has a total length of 1,285 feet. The bridge is fracture critical and is inspected by MnDOT.

Figure 4.5 Baudette Bridge Overall Photo.

4.2.2 Data Collection and Results

As part of this research study a stringer splice plate was scanned with the Phased Array Ultrasonic System to map the corrosion of the steel member. Two scans were performed and are shown below.

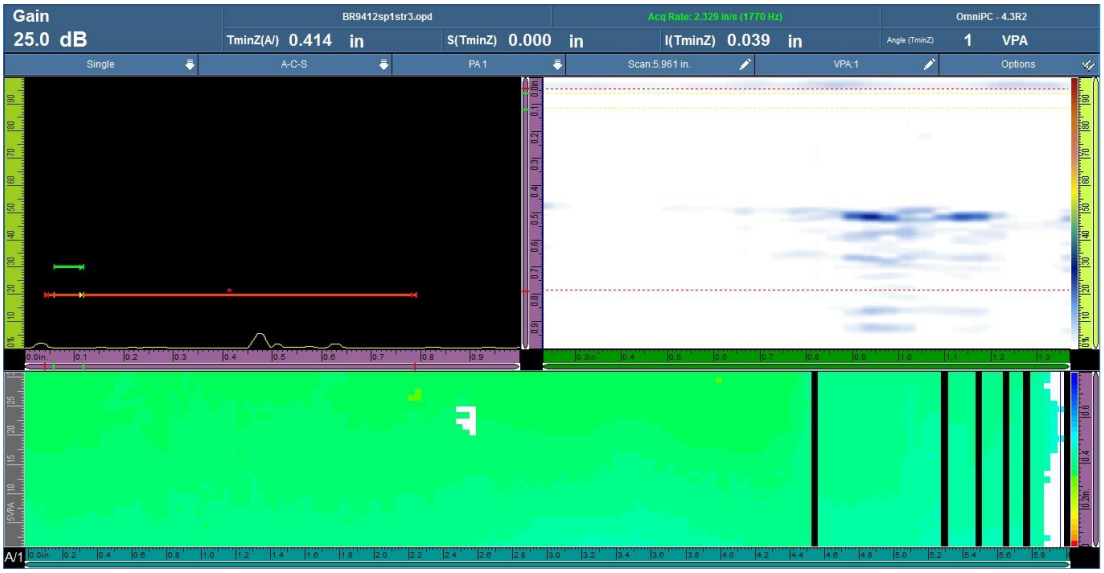


Figure 4.6 Baudette Bridge Stringer Splice Plate Scan 1.

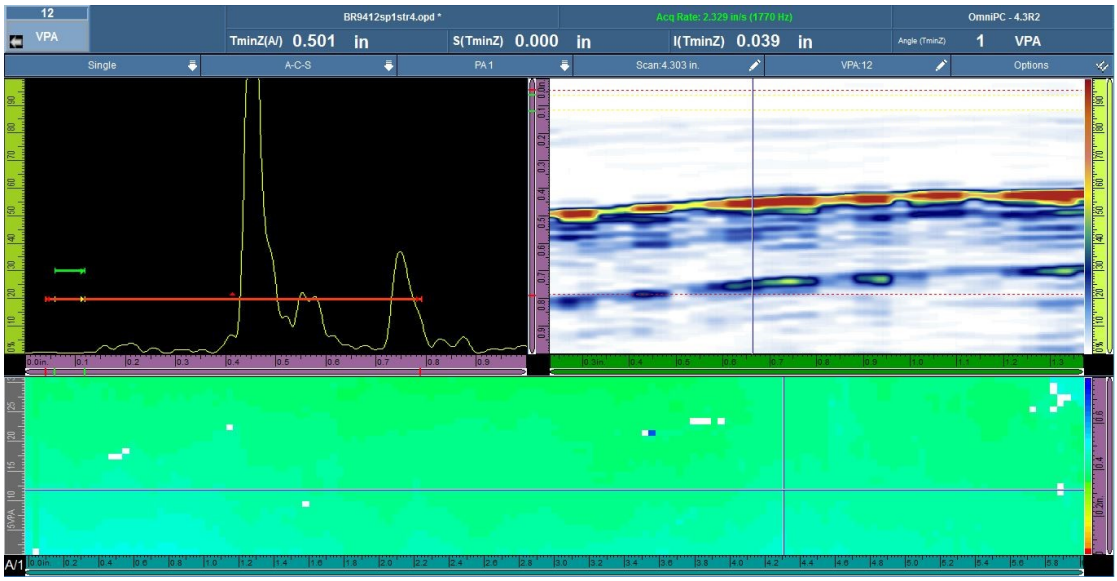


Figure 4.7 Baudette Bridge Stringer Splice Plate Scan 2.

4.3 DULUTH HIGH MAST LIGHT

4.3.1 Structure Description

High mast lights are critical structures on the MnDOT transportation system. High mast lights include a foundation, base plate with anchor rods, tower and luminaire. A high mast light in Duluth, MN with known corrosion issues near the base was chosen to be included in the study to evaluate PUAT's effectiveness on ancillary structures.

Figure 4.8 Duluth High Mast Light Base Photo.

Figure 4.9 Duluth High Mast Light Interior Corrosion Photo.

4.3.2 Data Collection and Results

As part of this research study the base of the high mast light was scanned with the Phased Array Ultrasonic Testing System to map the corrosion. The resulting scan is shown below.

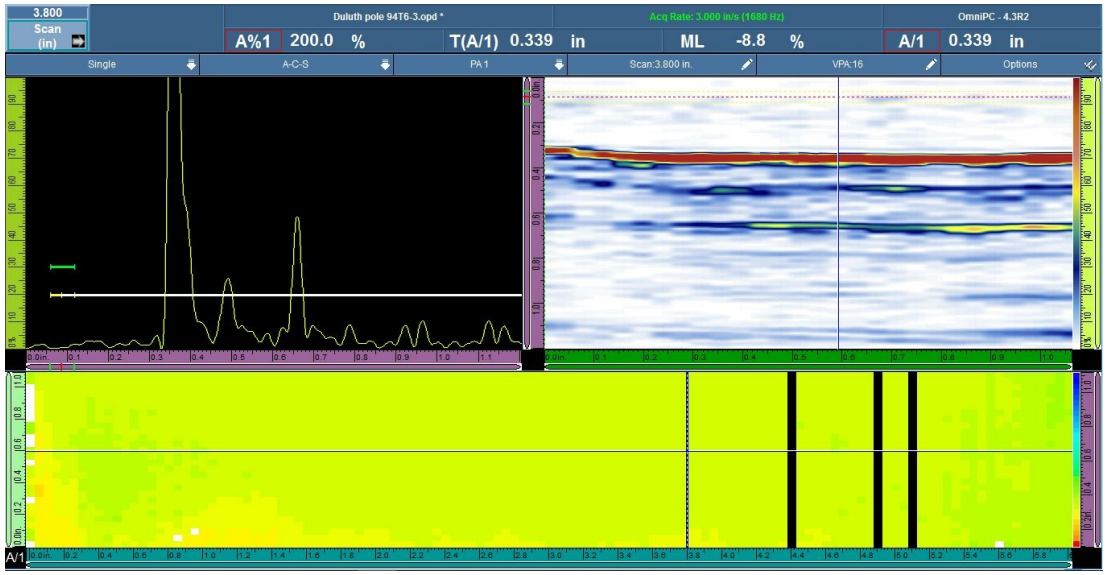


Figure 4.10 Duluth High Mast Light Scan.

4.4 SILVERDALE BRIDGE TEST SPECIMEN

4.4.1 Structure Description

The Silverdale Bridge is a wrought-iron Parker truss that carries Gateway Trail over Manning Avenue (County Road 15) in Washington County. The bridge was originally constructed in 1873 in Sauk Centre. It was relocated to Koochiching County in 1937, where it carried State Highway 65 over the Little Fork River. The bridge was erected at its current location in 2011 to serve as part of a pedestrian/equestrian trail. The Gateway Trail Iron Bridge is significant as an early iron bridge in Minnesota and as an example of an early Parker truss. As part of the relocation and rehabilitation a sample of the bridge was taken and saved as an NDT test specimen.

Figure 4.11 Silverdale Bridge Test Specimen.

4.4.2 Data Collection and Results

As part of this research study corrosion scanning was performed on the Silverdale Bridge Test Specimen. The results of the scan are shown below.

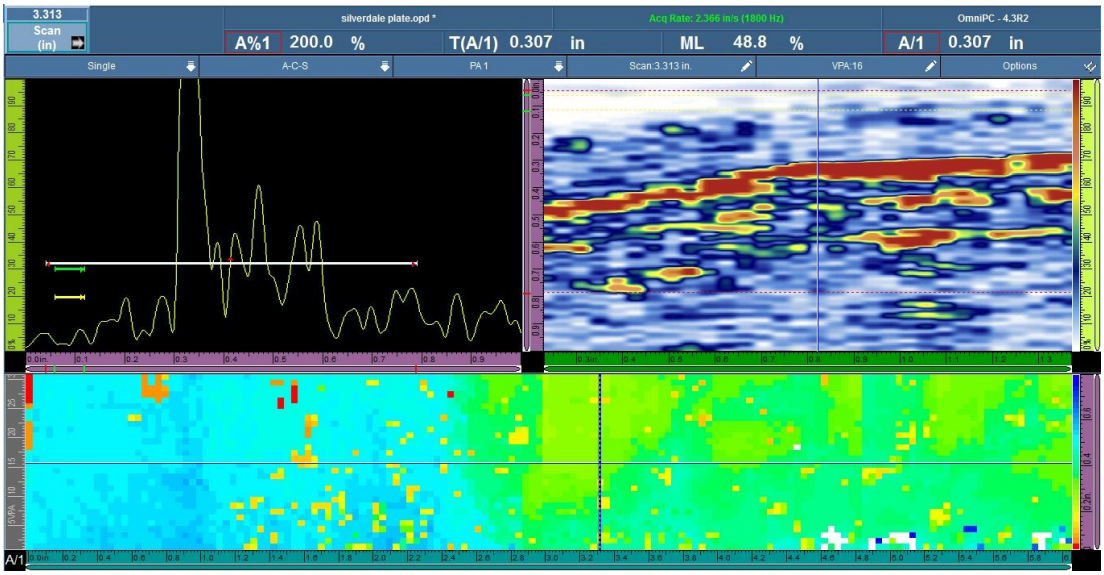


Figure 4.12 Silverdale Bridge Test Specimen.

CHAPTER 5: RESULTS AND CONCLUSIONS

5.1 RESULTS SUMMARY

5.1.1 Results Overview

During this study, corrosion mapping was performed on four structures and test specimens including the Sorlie Bridge, the Baudette Bridge, a High Mast Light and the Silverdale Bridge Test Specimen. An Olympus Omniscan SX Phased Array Ultrasonic Testing System was used to perform the scans. Results generally showed that using Phased Array Ultrasonic Testing to map corrosion is an effective way to determine the remaining thickness and section of structural steel members. Compared with single-beam ultrasonic and traditional hand-measuring techniques PAUT provides more complete data. This additional data provides engineers more accurate information when determining load capacity and potentially will allow engineers to make better recommendations on repairs and replacement of members or bridges since traditional methods likely underestimate the remaining section of members.

Figure 5.1 Phased Array Corrosion Mapping Field Work.

5.1.2 Conclusions

Based on literature research and observations in the field the following conclusions can be made:

- Phased Array Ultrasonic Testing can provide significant improvements in corrosion mapping when compared to single beam ultrasonic and traditional field measuring methods.
- Phased Array Ultrasonic Testing is effective in determining the estimated remaining thickness of structural members.
- Phased Array Ultrasonic Testing equipment has a wide range of capabilities, settings and options and requires proper training and practice to achieve accurate results.
- Traditional field measuring methods often underestimate the remaining thickness of structural members due to the limitations in the amount of data that can be collected. The lack of data points leads to conservative estimates of remaining thickness. Without accurate results, a structural member's capacity may be underestimated and result in decisions to repair or replace that may be unnecessary and expensive. PAUT can provide data that is orders of magnitude larger leading to more accurate results.
- Rough and irregular surfaces can make it difficult to achieve good measurements in the field.
- The use of PAUT should be considered when determining the remaining section of steel members to provide engineers the information needed to make informed decisions on member capacity.
- The use of PAUT can reduce time in the field compared with single-beam ultrasonic and traditional measuring techniques.
- The use of PAUT can be used to establish baseline measurements to predict future funding and maintenance.

REFERENCES

1. Hayes, P., and D. Jankowski. 2013. "Ultrasonic Phased Array Inspection for Industrial Applications." Paper presented at 92nd Annual Meeting of the Transportation Review Board, Washington, DC, January 13-17.
2. Schroeder, C., and P. Fish. 2013. "Field Applications of Ultrasonic Phased Array for Structural Evaluation." Paper presented at 92nd Annual Meeting of the Transportation Review Board, Washington, DC, January 13-17.
3. Ghasemi, H. 2014. "TECHBRIEF: Development of Phased-Array Ultrasonic Testing Acceptability Criteria (Phase II)." FHWA Publication No. HRT-14-075. Washington, DC: Federal Highway Administration.
4. Doyle, J. 2012. "Encoded Phased Array Bridge Pin Inspection." Paper presented at the Structural Materials Technology Conference, August 21.
5. Haldipur, P. 2014. "Inspection of Transition Butt-Welds Using Phased Array Ultrasonics." Paper presented at 93nd Annual Meeting of the Transportation Review Board, Washington, DC, January 12-16.
6. Duke, S. 2014. "Comparative Testing of Radiographic Testing, Ultrasonic Testing, and Phased Array Advanced Ultrasonic Testing Non-Destructive Testing Techniques in Accordance with AWS D1.5 Bridge Welding Code BDK84-977-26." Lecture, April 22.
7. Dheeraj, P. R., I. Mohsin, S. K. Mohiuddin, and S. H. Masroor. 2016. "Effect of Focal Law Parameters on Probability of Detection in Phased Array Ultrasonic Testing Using a Simulation and Case Study Approach." *Materials Evaluation* 74.11: 1574-591.
8. Olympus. 2017. “Phased Array Tutorial.” Accessed June 2017. http://www.olympus-ims.com/en/ndt-tutorials/phased-array/.
9. Olympus. 2017. “A Brief History of Phased Array Testing.” Accessed July 5, 2017. http://www.olympus-ims.com/en/ndt-tutorials/intro/breif-history/

APPENDIX A
PRODUCT INFORMATION

OLYMPUS
Your Vision, Our Future

OmniScan SX

Smaller, Lighter … Still an OmniScan

NEW

- Cost-efficient, single-group
- Two-axis encoding and data archiving capacity
- Conventional UT, TOFD, and 16:64PR PA capabilities
- 8.4 in. (21.3 cm) touch screen with OmniScan interface
- Compact, lightweight design

The Lightest and Most User-Friendly OmniScan

OmniScan SX

Olympus is proud to introduce the OmniScan® SX, a flaw detector that benefits from more than 20 years of phased array experience and shares the OmniScan DNA. For improved ease of use, the OmniScan SX features a new streamlined software interface displayed on an 8.4 in. (21.3 cm) touch screen. A single-group and non-modular instrument, the OmniScan SX is easy to operate and cost-effective for less demanding applications.

The OmniScan SX comes in two models: the SX PA and SX UT. The SX PA is a 16:64PR phased array unit, which, like the UT-only SX UT, is equipped with a conventional UT channel for pulse-echo, pitch-catch or TOFD inspection. Compared to the OmniScan MX2, the SX is 33% lighter and 50% smaller, offering an unprecedented level of portability for an OmniScan.

Setup

Inspection setup can be performed in NDT SetupBuilder, and imported directly, via SD card or USB key, to the OmniScan SX. Then, only a few basic operations are required in the instrument, such as setting the gate and range, before acquisition can begin. It is also very easy to create a setup right in the OmniScan SX, thanks to the following features:

- Automatic probe recognition.
- One-step, preconfigured application Wizard.
- Weld Overlay and RayTracing simulation.

Calibration

To achieve a code-compliant inspection, the Calibration Wizard ensures that every focal law in every group is the direct equivalent of a single-channel conventional flaw detector. The user is guided step-by-step through the required calibrations, including Velocity, Wedge Delay, Sensitivity, TCG, DAC, AWS, and encoder calibrations. Now, TOFD PCS calibration and lateral wave straightening can be performed automatically.

Acquisition

The OmniScan SX enables easy configuration of inspection parameters for either manual, one-line, or raster encoded scans. The acquisition is displayed in real time through user-selectable views and offers the ability to store data on a hot-swappable SD card or USB 2.0 device.

- Intelligent layouts.
- Full-screen mode for better visualization of defects.
- Synchronization and measurements can be processed using different gate combinations.

Data Analysis and Reporting

- Data, reference, and measurement cursors for defect sizing.
- Extensive readings database and predefined lists for trigonometry, flaw statistics on axes, volumetric position information, code-based acceptance criteria, corrosion mapping statistics, and more.
- Views are linked for interactive analysis and automatically updated when performing off-line gate repositioning.
- Optimized preconfigured layouts for quick and simple length, depth, and height sizing of flaws.

Whether you prefer performing data analysis on a computer or simply wish to maximize the time your OmniScan is at work in the field, OmniPC or TomoView are the perfect software companions for your OmniScan.

Affordable and Portable Go a Long Way….

The Omniscan® SX provides Olympus with a new and versatile tool to add to its arsenal of innovative and creative complete market solutions aimed at simplifying your workflow and improving overall productivity.

Phased Array Weld Inspection

The OmniScan PA is at the heart of the manual and semiautomated phased array weld inspection solutions developed by Olympus for the oil and gas industry. These systems can be used for inspection in compliance with ASME, API, and other code criteria, while offering high-speed detection capabilities, and facilitating indication interpretation.

Corrosion Mapping and Composite Inspection

Zero-degree inspection just became even more accessible with the arrival of the OmniScan SX. For corrosion or composite inspection, Olympus offers field-proven solutions for detection of anomalies or wall loss.

TOFD Weld Inspection

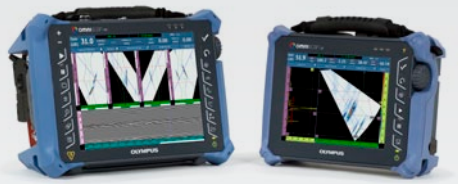
TOFD is an easy and efficient approach for primary detection of weld defects. It is quick, cost-effective and capable of sizing defects present in the volume of the weld, a problematic area for manufacturing defects.

Component Inspection

Using ultrasonic techniques, inspection of components can detect cracks, wall loss, and other damage. With the capacity for both angle and linear zero-degree beams, the OmniScan SX is a very cost-efficient solution for this type of single-group inspection.

OmniScan® SX Specifications*

Housing	
Overall dimensions (W x H x D)	267 mm × 208 mm × 94 mm (10.5 in. × 8.2 in. × 3.7 in.)
Weight	3.4 kg (7.5 lb) with battery
Data Storage	
Storage devices	SDHC card or most standard USB storage devices
Data file size	300 MB
I/O Ports	
USB ports	2 USB ports, compliant with USB 2.0 specifications
Audio alarm	Yes
Video output	Video out (SVGA)
I/O Lines	
Encoder	2-axis encoder line (quadrature, up, down, or clock/direction)
Digital input	4 digital TTL inputs, 5 V
Digital output	3 digital outputs TTL, 5 V, 15 mA maximum per output
Acquisition on/off switch	Yes, through configuration of a digital input
Power output line	5 V, 500 mA power output line (short-circuit protected)
Pace input	5 V TTL pace input
Display	
Display size	21.3 cm (8.4 in.) (diagonal)
Resolution	800 pixels x 600 pixels
Brightness	600 cd/m²
Viewing angles	Horizontal: –80° to 80° Vertical: –60° to 80°
Number of colors	16 million
Type	TFT LCD
Power Supply	
Battery type	Smart Li-ion battery
Number of batteries	1
Battery life	Minimum 6 hours under normal operating conditions
Environmental Specifications	
Operating temperature range	-10 °C to 45 °C (14 °F to 113 °F)
Storage temperature range	–20 °C to 60 °C (–4 °F to 140 °F) with battery –20 °C to 70 °C (–4 °F to 158 °F) without battery
Relative humidity	Max. 70% RH at 45°C noncondensing
Ingress protection rating	Designed to meet requirements of IP66
Shockproof rating	Drop-tested according to MIL-STD-810G 516.6



OmniScan MX2 OmniScan SX

If multigroup inspections (ex: two PA probes or combined PA + UT) are required or anticipated, Olympus recommends the OmniScan MX2. This advanced flaw detector's modular platform facilitates the upgrade path — you can start with the module in your price/performance range and upgrade later to one of the many other modules available.

Ultrasound Specifications (applies to OMNISX-1664PR)

Connectors	1 Phased Array connector: Olympus PA connector 2 UT connectors: LEMO 00	
Number of focal laws	256	
Probe recognition	Automatic probe recognition	
Pulser/Receiver		
Aperture	16 elements	
Number of elements	64 elements	
Pulser	**PA Channels**	**UT Channel**
Voltage	40 V, 80 V, and 115 V	95 V, 175 V, and 340 V
Pulse width	Adjustable from 30 ns to 500 ns; resolution of 2.5 ns	Adjustable from 30 ns to 1,000 ns; resolution of 2.5 ns
Pulse shape	Negative square wave	Negative square wave
Output impedance	35 Ω (pulse-echo mode); 30 Ω (pitch- catch mode)	<30 Ω
Receiver	**PA Channels**	**UT Channel**
Gain	0 dB to 80 dB, maximum input signal 550 mVp-p (full-screen height)	0 dB to 120 dB maximum input signal 34.5 Vp-p (full-screen height)
Input impedance	60 Ω (pulse-echo mode); 150 Ω (pitch- catch mode)	60 Ω (pulse-echo mode); 50 Ω (pulse-receive mode)
System bandwidth	0.6 MHz to 18 MHz (–3 dB)	0.25 MHz to 28 MHz (–3 dB)
Beamforming		
Scan type	Sectorial or linear	
Group quantity	1	
Data Acquisition	**PA Channels**	**UT Channel**
Digitizing frequency	400 MHz (12 bits) after interpolation per 5/4	400 MHz (12 bits) after interpolation per 4
Maximum pulsing rate	Up to 6 kHz (C-scan)	
Data Processing	**PA Channels**	**UT Channel**
Number of data points	Up to 8,192	
Real-time averaging	PA: 2, 4, 8, 16	UT: 2, 4, 8, 16, 32, 64
Rectifier	RF, full wave, half wave +, half wave –	
Filtering	3 low-pass, 3 band-pass, and 5 high-pass filters	3 low-pass, 6 band-pass, and 3 high-pass filters (8 low-pass filters when configured in TOFD)
Video filtering	Smoothing (adjusted to probe frequency range)	
Data Visualization		
A-scan refresh rate	A-scan: 60 Hz; S-scan: 60 Hz	
Data Synchronization		
On internal clock	1 Hz to 6 kHz	
On encoder	On 2 axes: from 1 to 65,536 steps	
Programmable Time-Corrected Gain (TCG)		
Number of points	16: One TCG (time-corrected gain) curve per focal law	
Maximum slope	40 dB/10 ns	
Alarms		
Number of alarms	3	
Conditions	Any logical combination of gates	

www.olympus-ims.com

OLYMPUS NDT INC. is ISO 9001 and 14001 certified

OLYMPUS®

OLYMPUS NDT INC.
48 Woerd Avenue, Waltham, MA 02453, USA, Tel.: (1) 781-419-3900
12569 Gulf Freeway, Houston, TX 77034, USA, Tel.: (1) 281-922-9300

OLYMPUS NDT CANADA INC.
505, boul. du Parc-Technologique, Québec (Québec) G1P 4S9, Tel.: (1) 418-872-1155
1109 78 Ave, Edmonton (Alberta) T6P 1L8

For enquiries - contact
www.olympus-ims.com/contact-us

OmniScan_SX_EN_LTR_201306 • Printed in Canada • P/N: 920-269-EN Rev. A

APPENDIX B

BRIDGE INSPECTION REPORTS

MINNESOTA STRUCTURE INVENTORY REPORT

Bridge ID: 4700 **DEMERS AVE over RED RIVER**

Date: 07/12/2017

+ GENERAL +

Agency Br. No.
District 2 **Maint. Area** 2B
County 60 - POLK
City EAST GRAND FORKS
Township
Desc. Loc. AT N DAKOTA STATE LINE
Sect., Twp., Range 02 - 151N - 50W
Latitude 47d 55m 37.15s
Longitude 97d 01m 42.37s
Custodian STATE HWY
Owner STATE HWY
Inspection By DISTRICT 2
Year Built 1929
MN Year Remodeled 2015
FHWA Year Reconstructed
Bridge Plan Location CENTRAL
Potential ABC YES

+ STRUCTURE +

Service On HWY;PED
Service Under STREAM
Main Span Type STEEL HIGH TRUSS
Main Span Detail PARKER
Appr. Span Type STEEL BM SPAN
Appr. Span Detail
Skew
Culvert Type
Barrel Length
Number of Spans
MAIN: 2 APPR: 2 TOTAL: 4
Main Span Length 279.0 ft
Structure Length 602.6 ft
Deck Width 41.3 ft
Deck Material C-I-P CONCRETE
Wear Surf Type MONOLITHIC CONC
Wear Surf Install Year
Wear Course/Fill Depth
Deck Membrane NONE
Deck Rebars EPOXY COATED REBAR
Deck Rebars Install Year 1986
Structure Area 24,887 sq ft
Roadway Area 24,100 sq ft
Sidewalk Width - L/R 10.0 ft 10.0 ft
Curb Height - L/R 0.92 ft 0.92 ft
Rail Codes - L/R 40 40

+ ROADWAY +

Bridge Match ID (TIS) 1
Roadway O/U Key 1-ON
Route Sys/Nbr USTH 2B
Roadway Name or Description
DEMERS AVE
Roadwav Function MAINLINE
Roadway Type 2 WAY TRAF
Control Section (TH Only) 6015
Ref. Point 000+00.010
Date Opened to Traffic 08-01-1986
Detour Length 4 mi.
Lanes 2 Lanes ON Bridge
ADT (YEAR) 12,700 (2004)
HCADT 1,016
Functional Class. URB/OTH PR ART

+ RDWY DIMENSIONS +

If Divided	NB-EB	SB-WB
Roadway Width	40.0 ft	
Vertical Clearance	16.6 ft	
Max. Vert. Clear.	16.6 ft	
Horizontal Clear.	39.9 ft	
Lateral Clr. - Lt/Rt		
Appr. Surface Width	50.0 ft	
Bridge Roadway Width	40.0 ft	
Median Width on Bridge		

+ MISC. BRIDGE DATA +

Structure Flared NO
Parallel Structure NONE
Field Conn. ID RIVETED
Cantilever ID
Foundations
Abut. CONC - FTG PILE
Pier CONC - FTG PILE
Historic Status ELIGIBLE
On - Off System ON

+ PAINT +

Year Painted 2015 **Pct. Unsound** 40 %
Painted Area 112,720 sf
Primer Type 3309-ORGANIC ZINC
Finish Type URETHANE

+ BRIDGE SIGNS +

Posted Load NOT REQUIRED
Traffic NOT REQUIRED
Horizontal NOT REQUIRED
Vertical NOT REQUIRED

+ INSPECTION +

Deficient Status F.O.
Sufficiency Rating 50.6
Last Inspection Date 05-24-2016
Inspection Frequency 12
Inspector Name DISTRICT 2
Status A-OPEN

+ NBI CONDITION RATINGS +

Deck	6
Superstructure	5
Substructure	6
Channel	6
Culvert	N

+ NBI APPRAISAL RATINGS +

Structure Evaluation	4
Deck Geometry	5
Underclearances	N
Waterway Adequacy	3
Approach Alignment	6

+ SAFETY FEATURES +

Bridge Railing 0-SUBSTANDARD
GR Transition N-NOT REQUIRED
Appr. Guardrail N-NOT REQUIRED
GR Termini N-NOT REQUIRED

+ IN DEPTH INSP. +

Frac. Critical Y 24 mo 06/2015
Underwater 6 02 mo 9/0160
Pinned Asbly. N
Spec. Feat.

+ WATERWAY +

Drainage Area
Waterway Opening 20000 sq ft
Navigation Control NO PRMT REQD
Pier Protection
Nav. Vert./Horz. Clr.
Nav. Vert. Lift Bridge Clear.
MN Scour Code L-STBL;LOW RISK
Scour Evaluation Year 1997

+ CAPACITY RATINGS +

Design Load H 15
Operating Rating HS 23.20
Inventory Rating HS 12.40
Posting
Rating Date 07-22-2008
Overweight Permit Codes
A: 1 B: 1 C: 1

07/12/2017

MINNESOTA BRIDGE INSPECTION REPORT

Inspected by: DISTRICT 2

BRIDGE 4700 DEMERS AVE OVER RED RIVER **INSP. DATE: 05-24-2016**

County: POLK
City: EAST GRAND FORKS
Township:
Section: 02 Township: 151N Range: 50W
Span Type: STEEL HIGH TRUSS
NBI Deck: 6 Super: 5 Sub: 6 Chan: 6 Culv: N

Location: AT N DAKOTA STATE LINE
Route: USTH 2B Ref. Pt.: 000+00.010
Control Section: 15 Maint. Area: 2B
Local Agency Bridge Nbr:

Length: 602.6 ft
Deck Width: 41.3 ft
Rdwy. Area / Pct. Unsnd: 24,100 sq ft
Paint Area / Pct. Unsnd: 112,720 sq ft 40 %
Culvert : N/A

Open, Posted, Closed: OPEN

Appraisal Ratings - Approach: 6 Waterway: 3
MN Scour Code: L-STBL;LOW RISK Def. Stat: F.O. Suff. Rate: 50.6
Required Bridge Signs - Load Posting: NOT REQUIRED Traffic: NOT REQUIRED
Horizontal: NOT REQUIRED Vertical: NOT REQUIRED

ELEM NBR	ELEMENT NAME	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
800	CRITICAL DEFS OR SAFETY HAZARDS	05-24-2016	1 EA	1	0	0	0
		06-01-2015	1 EA	1	0	0	0
	Notes: [2013 - 2015] No critical findings observed during this inspection. [2016] No change						
12	REINFORCED CONCRETE DECK	05-24-2016	24,887 SF	24,541	346	0	0
		06-01-2015	24,887 SF	24,389	0	498	0
	Notes: Hairline cracks on underside w/leaching & efflorescence. [2013 - 2015] No change in condition noted during this inspection. Same in 2014 / GK [2016] Approx. 6 moderate cracks w/ efflor. between stringers per bay.CS2 Hairline, minor cracks are observed under deck at approx. 3 ft. spacing. GK/2016						
510	*WEARING SURFACE*	05-24-2016	24,100 SF	19,300	4,800	0	0
		06-01-2015	24,100 SF	23,618	0	482	0
	Notes: Top of Concrete Deck with Epoxy Reinforcement Notes: Traffic has worn away tining in the wheel tracks. Minor transverse cracking. *[2013] Rating was changed from CS1 to CS2 in 2001. No change in condition noted during this inspection.* *Chain dragged deck in 2014, found 2 sf of delam starting near center gland in the EBL. GK 4/14 [2015] No change noted.* *[2016] Deck shows moderate deterioration, with tining worn away in wheel tracks CS2 GK/2016*						
810	CONC WEAR SURF-CRACKING SEALING	05-24-2016	160 LF	160	0	0	0
		06-01-2015	0 LF	0	0	0	0
	Notes: Cracks in deck have been sealed There is leaching present. Deck cracks could use sealing with epoxy. GK 5/2012 [2013 - 2015] No change in condition noted during this inspection. Minor hairline cracks in deck that may be too tight for epoxy to penatrate,not of moderate size or density, moved to CS1 GK 2014 [2016] Deck cracks have been sealed GK/2016						
300	STRIP SEAL DECK JOINT	05-24-2016	123 LF	41	0	82	0
		06-01-2015	123 LF	82	41	0	0
	Notes: 2009 FC inspection: Damaged steel at joint between spand 2 and span 3 (CS3) Julie J 6/24/2009. ** Bridge Maint. installed a new strip seal on the MN side & re-tucked approx. 5' of gland that had came out of the extrusion; also made a repair to the damaged steel @ jt. btwn. span 2 and 3 on 3/22/2010. DSH Strip seal above center pier has welded repair (eastbound lane). During the 2011 inspection, the east joint was closed to near the limits of expansion (1/2" gap at south end, 1" gap at north end).FC 6/2011 2012 inspection, EBL 12 inch sect. of extrusion broke free. 2014 br crew welded the extrusion that was brokem,east seal still closed, west ok GK 5/14 [2013] The East strip seal is open 1" on the north and 5/8" on the south. The Center strip seal is open 1 3/4" on the north and 2" on the south. the West strip seal is open 2 1/4" on the north and 2" on the south. Measurements were taken at 63 degrees. Quantitiy was changed from 78 in CS1, 42 in CS2, 3 in CS3 to 81 in CS1, 42 in CS2, and 0 in CS3 to reflect repairs made to the steel anchorage in March of 2010. [2015] No significant change noted. [2016] Jts at ends of bridge are closed near there design limits CS3 Center strip seal open 1 3/4 inches at 68 degrees. GK/2016						
301	POURED SEAL JOINT	05-24-2016	164 LF	164	0	0	0
		06-01-2015	164 LF	164	0	0	0

Notes:

Looked good in 2012
[2013] Seal material has scattered areas that have lost adhesion. Quantity was changed from CS1 to CS2 to reflect the change in condition.
Poured jts were resealed in 2014 with hot pour. GK 5/14
[2015] No significant defects noted.
[2016] No change

330	METAL BRIDGE RAILING	05-24-2016	1,204 LF	1,204	0	0	0
		06-01-2015	2,408 LF	1,194	1,214	0	0

Notes: Old rivited steel pedestrian railing needs paint.Rusting throughout.4 sections in the SW quad. appear to have no paint.Some impact damage repaired various locations.Bent near the bottom, kicked out 2-3 inches, various locations.GK 5/11
The element quantity should be doubled to include both the original ornamental sidewalk railings and the galvanized steel tube roadway railing (installed with the new deck in 1986). The ornamental sidewalk railings have paint failure and surface corrosion throughout. The roadway railings have minor impact damage at the truss ends (where the cross-section has been cut away).FC 6/2011
[2013 - 2015] No change in condition noted during this inspection.
At center pier, north steel tube rail has been impacted causing a 125 ft long scrape GK 5/14
[2016] Rails were painted and broken / missing hardware was replaced, rail looked good in 2016/GK

515	*STEEL PROTECTIVE COATING*	05-24-2016	4,816 SF	4,816	0	0	0
		06-01-2015	999 SF	999	0	0	0

Notes: [2016] New paint looks good, very few minor areas of rust bleeding thru at connections GK/2016

321	CONCRETE APPROACH SLAB	05-24-2016	2,000 SF	0	2,000	0	0
		06-01-2015	2,000 SF	0	2,000	0	0

Notes: [2016] Migrator assumed an approach slab length of 20FT and used the inventory quantity of 50FT for the width.
During the 2011 inspection, a contractor performed “mud-jacking” to fill in undermining on the east approach (undermining was observed after flooding in spring of 2011). There is evidence of slight settlement on the east approach (cracking on curbs).FC 6/2011.
[2013 - 2015] No change in condition noted during this inspection.
[2016] Both panels exhibit moderate deterioration w/ moderate abrasion, coarse aggregate exposed and worn. in wheel tracks CS2
Slight settlement to east panel. GK/2016

113	STEEL STRINGER	05-24-2016	8,287 LF	8,287	0	0	0
		06-01-2015	8,287 LF	0	8,287	0	0

Notes: 1/2 inch crack in web of south stringer at coping connection to floor beam at center pier, east span. Paint loss on bottom of top flange where shear studs were welded to stringer during redecking. Remainder of stringers have scattered minor paint loss.
2003 FC Inspection:They are in generally good condition. There is some paint loss on the bottom flange where shear studs were welded to the stringers during re-decking. The remainder of the stringers have some scattered minor paint loss (80% CS2 and 20% CS3).
2007 FC Inspection:No Change from previous inspection.
See notes and pictures on file in the Engineer's office.
Stringers in good shape with scattered rust primarily on bottom flange at connections. GK 5/2012
[2013 -2015] No change in condition noted during this inspection.
[2016]Stringers exhibit no corrosion w/ new paint system. GK/2016

515	*STEEL PROTECTIVE COATING*	05-24-2016	47,650 SF	47,650	0	0	0
		06-01-2015	999 SF	0	0	500	499

Notes: 5.75 SF / Ft.
[2016] Little to none paint deterioration GK/2016

120	STEEL TRUSS	05-24-2016	1,124 LF	980	20	124	0
		06-01-2015	1,124 LF	0	1,000	124	0

Notes: Bottom Chord Notes: East span at L2 50% section loss at connection plate north side of truss. Lower chord north side of truss upper flange 25% section loss. South side at the L3 connection plate at the bottom flange is bent up 1-1/2 inch from pack rust. 3/8 inch plate has 1/4 inch section loss. Some deformation of lower chord built-up members on U/stream side from debris hits. Bottom flange of the bottom chord is bent up in 2 places between Lo-L1 on the south side. Suggest putting cover plates on diagonal penetrations thru sidewalks-possible safety hazzard.
2003 FC Inspection:There is pack rust forming under the batten plates and at the floor beam and cross bracing connections. It is worst at the batten plates on the bottom flanges of the chords. Ultrasonic Thickness measurements taken at the worst batten plate showed a maximum loss of .100" on the bottom flange of one chord angle. That is less that a 5% cross sectional loss of the chord. There is also minor pitting and minor section loss inside the lower panel points and on the bottom flanges. The most significant section loss was at panel point L4 of the east truss. There minor impact damage to the lower chords on the upstream side due to flood debris. THere are also several areas where the bottom chord was bent on the top and bottom flange, probably during the original erection or debris removal.
2007 FC Inspetion:No Change from previous inspection.
See Pictures and Notes in the Fracture Critical Report on file in the Engineers office.
**Bridge Maint. will complete the 3 stage spot painting (1. Clean & Prime 2. 2nd coat 3. Caulk) of the gusset plates on the lower cords the wk. of 7/6/09. DSH
2009 FC inspection: Areas of significant corrosion and flaking rust along bottom chord and at gusset plate connections (CS4). Julie J 6/24/2009
East truss, so. side, mid span, diag. wind bracing impacted causing a 3 inch tear in the bracing top angle at the plate connection.GK 5/12/10
Wind bracing tear was repaired by

515	*STEEL PROTECTIVE COATING*	05-24-2016	50,350 SF	50,350	0	0	0
		06-01-2015	999 SF	0	0	0	999

Notes: [2016] Little to no paint deterioration, few minor rust stains at connections. GK/2106

152	STEEL FLOORBEAM	05-24-2016	800 LF	760	0	40	0
		06-01-2015	800 LF	0	560	240	0

Notes:
2003 FC Inspection:There is section loss on the bottom flange of some of the floor beams at the cross bracing gusset plate. Ultrasonic thickness readings were taken on 2 of the worst areas. Floor beam 3 on the east span had an average loss of .12" on the bottom flange, with a maximum loss of .15". Floor Beam 4 on the east span had a maximum loss of .06", with and average loss of .05" on the bottom flange. None of the floor beams had a total cross sectional loss in excess of 5%. THe remainder of the floor beams had scattered paint loss and surface rust. The floor beams are typically 80% CS2, 15% CS3 and 5% CS4 of the total surface area.
2007 FC Inspection:No change from previous Inspection.
See Notes and Pictures on file in the engineers office.
2009 FC inspection: significant corrosion on top flange of many floorbeams (CS4). In general, paint system has deterioration and surface corrosion. (CS3).
Pack rust, with minor sect. loss at bottom of FB's at gusset plate / wind bracing connections, FB3 typ. GK 5/2012
[2013 - 2015] The section loss on the bottom flange at all floorbeams at horizontal bracing connection plates is about 15 to 20 percent for about 1'. No change in condition state noted during this inspection.
Same in 2014, rust continues on bottom flanges of floorbeams GK 4/14
[2016] New paint in 2015 removed or arrested all rusting steel, but pack rust and section loss still inplace at various locations documented in FC reports. CS3 GK/2016

515	*STEEL PROTECTIVE COATING*	05-24-2016	9,600 SF	9,600	0	0	0
		06-01-2015	999 SF	0	0	0	999

Notes: 12 SF / Ft.
Minor rust bleeding thru pack rust at the FB connections.
[2016]Paint system looks nice w/ no corrosion observed GK/2016

162	STEEL GUSSET PLATE	05-24-2016	76 EA	44	0	32	0
		06-01-2015	76 EA	0	76	0	0

Notes: 2009 FC inspection: New element. The lower panel point gusset plates have areas of surface corrosion, flaking rust, and section loss (CS4). The upper panel point gusset plates have areas of surface corrosion and isolated flaking rust (CS2). ** A (3) stage spot painting of gussets was completed on the wk. of 7/6/09. DSH
Spot painting and caulking was performed on the bottom chord gusset plates in 2009 (they have scattered areas of pitting - condition state 3). The top chord gusset plates have areas of surface corrosion and isolated flaking rust (condition state 3).FC 6/2011
[2013] No change in condition noted during this inspection.
All the gusset plates were looked at by Mn DOT and Consultants" KLJ / EIC Group" with UT being preformed in critical areas.Some areas have measurable section loss CS3 GK 4/14 [2015] There are 4 gusset plates on the "X" bracing between panel 4 and 4'. The paint is failing and surface corrosion is present.

Gusset Plate Distortion Notes: 2009 FC inspection: New element Jule J 6/24/2009
Some truss connection gusset plates have bowing along the free edge (up to 1/8") - this appears to be due to pack rust (bottom chord connections) or initial fit-up.FC 6/2011
[2013 - 2015] No change in condition noted during this inspection.
No change in 2014 / GK
[2016] Lower panel point gusset plates pack rust is present but arrested with 2015 paint project CS3 GK/2016

515	*STEEL PROTECTIVE COATING*	05-24-2016	304 SF	304	0	0	0
		06-01-2015	999 SF	0	0	0	999

Notes: [2016] No corrosion was observed in 2016 /GK

210	REINFORCED CONCRETE PIER WALL	05-24-2016	46 LF	44	2	0	0
		06-01-2015	46 LF	36	10	0	0

Notes: Vertical crack in pierwall. There isa 12" x 8" x 2" spall on the west side of the web wall ledge. The downstream footing was exposed up to 8" vertically during the 2004 underwater inspection. 2009 FC inspection: Vertical cracks and minot spalling on west side of wall (CS2). Julie j 6/24/2009
Crack in Pier wall extends from top to 3/4 of the way to way down, approx 20 ft.. GK 5/2012
[2013] The 2012 Under Water Inspection Report states; The east side of the footing at the downstream column was partially exposed with a maximum vertical exposure of 15 inches. In addition, the top of footing was partially exposed along both sides of the upstream column with no vertical face (edge of footing) exposure present. Moderate to heavy accumulation of timber debris consisting of logs and branches of 1.5 foot diameter and smaller was observed at the upstream nose and on both sides of the pier extending from channel bottom up 4 feet..
[2013 - 2015] No change in condition noted during this inspection.
Vertical moderate crack in center of pier wall extends from top to bottom w / minor spalling along. GK 4/14
[2016]Crack in center pier wall was patched, with repair in sound condition CS2 Minor cracks exists GK/2016
[2016 UW] No defects of structural significance observed. BKS/2016

215	REINFORCED CONCRETE ABUTMENT	05-24-2016	165 LF	145	20	0	0
		06-01-2015	165 LF	145	20	0	0

Notes:

Roller Foundation is cracked @ SE cor. There is a horzontal shear crack in S 1/2 of E abut backwall.
2009 FC inspection: There is a horizontal crack on the east abutment wall approximately 8 feet long by 6 inches wid (CS2).
A 1ft. x 1ft. spall has developed at the east abutment br. seat. GK 5/12/10
We recommend the same ratings as the 2009 FC report (105 LF in condition 1 and 20 LF in condition 2).FC 6/2011
[2013 - 2015] No change in condition noted during this inspection.
4 inch core holes were drilled in both abut backwalls and filled with grout in 2014, / GK

Wingwall notes: [2013 - 2015] Wingwalls are in good shape.
[2016] Abuts had some repair patches in 2015, remain sound and some moderate cracks exists at wing to abut. connections CS2 GK/2016

220	REINFORCED CONCRETE FOOTING	05-24-2016	64 LF	0	64	0	0
		06-01-2015	40 LF	0	40	0	0

Notes: The truss roller bearings are supported by concrete footings that are tied to the abutment with struts (quantity is one for roller each bearing). There is a horizontal steel "rail" below each roller. The concrete footings have some cracking and scaling (condition state 2).FC 6/2011
[2013 - 2015] No change in condition noted during this inspection.
4 inch core holes were taken in each footing approx 10 inches deep and filled with grout.
Looked at after snow and ice melted, no change GK 5/14
[2016] Concrete footing exhibit moderate deterioration/ weathered with moderate scale. GK/2016
[2016 UW] Pier 1 - The east side of the footing at the downstream column was partially exposed with a maximum vertical exposure of 15 inches. In addition, the top of footing was partially exposed along both sides of the upstream column with no vertical face exposure present. The concrete was in good condition with no defects of structural significance observed.

234	REINFORCED CONCRETE PIER CAP	05-24-2016	47 LF	42	5	0	0
		06-01-2015	47 LF	42	0	5	0

Notes: Vert crack at center line of pier. Vert crack in pier cap under N. bearing pad. Rebar exposed at N end of cap. Del. concrete at the north end of pier cap.
[2013 - 2015] No change in condition noted during this inspection.
Sounded delam along with some core drilling and found area to be confined to the visual area, 2-3 inches deep, under N pier bearing, patch repair may be in order CS3 GK 4/14
[2016] Pier cap delaminated concrete was repaired in 2015 and repairs are sound, cracks w/ leaching still exists. CS2 GK/2016

311	EXPANSION BEARING	05-24-2016	4 EA	4	0	0	0
		06-01-2015	4 EA	4	0	0	0

Notes: There is minor pack rust forming on the bearings.
**Greased bearings on 6/15/2010. DSH
Roller bearings were measured in 2011, 2012 meas. were the same at the east abut and 1 1/2 inch dissplacement at so. end vs. 2 1/2 inches in 2011, and 1 3/4 inches in 2012 vs. 1 1/4 inch in 2011 GK 5/2012
[2013] Bearing measurement are as follows; Southwest bearing displacement is 2 1/4" (2011 2 1/2"), northwest displacement is 3/4" (2010 1 1/4"), southeast displacement 4 3/4" (2010 4 1/2"), northeast displacement 7" (2010 7 1/4").
No change in overall condition noted during this inspection.
2014 the roller bearings were greased and rotated approx 1/4 turn
[2014] Bearing measurement are as follows; Southwest bearing displacement is 1 3/4" (2013 2 1/4"), northwest displacement is 1 1/4" (2013 3/4"), southeast displacement 3" (2013 4 3/4"), northeast displacement 7 1/8" (2013 7") GK 4/14
[2015 /2016] No changes noted.

313	FIXED BEARING	05-24-2016	4 EA	0	4	0	0
		06-01-2015	4 EA	0	4	0	0

Notes: Pack rust on bearings. Mortor is breaking up under bearing plates @ center pier.
Mortar continues to deteriorate with corrosion.GK 5/2012
[2013 - 2015] No change in condition noted during this inspection.
Some of the components of the bearings are moderately worn, few anchor bolts have section loss. CS2 GK 4/14
[2016] Bearings were painted in 2016 but moderate deterioration exists on bolts CS2 GK/2016

850	STEEL HINGE ASSEMBLY	05-24-2016	26 EA	13	13	0	0
		06-01-2015	26 EA	13	13	0	0

Notes: The sliding plate expansion bearings on the approach spans (installed in 1986) are supported by the truss end floorbeams. The hinge element would be more appropriate than the expansion bearing element (the quantity includes the sidewalk stringer hinges). The east hinge bearings are at or near full expansion.FC 6/2011
1 inch gap at south end and 1 1/2 inch gap at the north end at center pier.
East abut has closed tight on the so. side with 1 inch on the north side, West abut. is open 1 1/2 inches north and 1 1/4 inches at the south. GK 5/2012
[2013] No change in condition noted during this inspection.
No change in 2014 / GK
[2016] No change, east still closed GK/2016

855	SECONDARY MEMBERS (SUPER)	05-24-2016	1 EA	0	0	1	0
		06-01-2015	1 EA	0	0	0	1

Notes: 2009 FC inspection: Added element. Rate lower diagonal bracing and sway bracing. Lower lateral diagonal bracing has impact damage from debris.
Flood of 2011, caused bracing to be bent upwards and sideways throughout structure. Comps on file documenting amount of damage. GK 5/11
The lower lateral bracing was damaged during the 2011 flood (some hanger bars broken, several bracing members badly bent). A top batten plate on a sidewalk overhang bracket is fractured (west truss span, south side, L1') - see photo #1.FC 6/2011
[2013] No change in condition noted during this inspection.
Same in 2014 / GK
[2015] The lower lateral bracing horizontal leg at L4N East span is cracked, mostly due to PR. The sway frame at U4' west truss has impact damage above the east bound lane.
[2016] Lateral bracing still bent, moderate damage. CS3 Gk/2016

880	IMPACT DAMAGE	05-24-2016	1 EA	0	1	0	0
		06-01-2015	1 EA	0	1	0	0

Notes: there is evidence that there have been numerous strikes on the Portal sections but not to the extent of affecting the integrity of the strength..
Vertical L3-U3 on the north truss of the west span is bent out of alignment just below the deck---bowing inward on the east side (CS2)
[2013 - 2015] No change in condition noted during this inspection.
No change in 2014 / GK
[2016] No change

881	STEEL SECTION LOSS	05-24-2016	1 EA	0	1	0	0

		06-01-2015	1 EA	0	1	0	0

Notes: There is section loss present on some members but an actual measurement has not bee made to determine the extent. This should be corrected at the next snooper date.
Bottom flange FB /gusset plate wind bracing connections some sect. loss but difficult to measure. GK 5/2012
[2013 - 2015] The section loss on the bottom flange at all floorbeams at horizontal bracing connection plates is about 15 to 20 percent for about 1'.
Same in 2014 / GK
[2016] No change other than arrested with coating of paint. GK

882	STEEL CRACKING	05-24-2016	1 EA	1	0	0	0
		06-01-2015	1 EA	1	0	0	0

Notes: [2016] Fatigue prone details are present on the primary steel superstructure elements, monitor them for cracking. The Steel Fatigue Detail Ranking code for this structure is 6. Check BSIPM section D.7.10 and 'SIA - One Column' in SIMS for additional details regarding this topic.
[2016] No cracks observed in 2016/GK

883	CONCRETE SHEAR CRACKING	05-24-2016	1 EA	1	0	0	0
		06-01-2015	1 EA	1	0	0	0

Notes: Use this element to monitor the presence of shear cracking on concrete elements. Pay particular attention to the concrete pier caps.
[2016] No shear cracks observed in pier caps /GK

884	SUBSTRUCTURE SETTLEMENT & MVMT	05-24-2016	1 EA	0	1	0	0
		06-01-2015	1 EA	0	1	0	0

Notes: E abut B/wall has shear crack & appears to be moving toward end of truss.
[2013 - 2016] No change in condition noted during this inspection.

885	SCOUR	05-24-2016	1 EA	0	1	0	0
		06-01-2015	1 EA	1	0	0	0

Notes: There is a hole developing in the NW slope over the Storm Sewer Outlet. Bridge crew installed Rip Rap on East slope, but there is erosion present Especially in the SE corner at the Foundation of the Abutment, 10 to 20 Cu Yd of Rip Rap is needed.**Additional Rip Rap was added on 7/15/2010 where ersion was present (approx. 30yds.). DSH
Minor footing exposure was observed during the 2008 underwater inspection (center pier).FC 6/2011
[2013] The 2012 Under Water Inspection Report states; The east side of the footing at the downstream column was partially exposed with a maximum vertical exposure of 15 inches. In addition, the top of footing was partially exposed along both sides of the upstream column with no vertical face (edge of footing) exposure present.

[2016] No change, underwater inspection soon , will look at again. GK
[2016 UW] The east side of the footing at the downstream column was exposed with a maximum vertical exposure of 15 inches. BKS

891	OTHER BRIDGE SIGNING	05-24-2016	1 EA	1	0	0	0
		06-01-2015	1 EA	1	0	0	0

Notes: [2013] No signs required.
Orig. Sorlie bridge plaqes are still inplace on ends of truss's GK/ 2014

892	SLOPES & SLOPE PROTECTION	05-24-2016	1 EA	0	1	0	0
		06-01-2015	1 EA	0	1	0	0

Notes: Rip Rap has been added to protect the slopes. There is scour taking place in the SE corner around the Foundation of the East abutment. And a hole developing in the NW corner of the west slope, over the Storm sewer out let pipe. **Refer to element 361 DSH
10 to 20 Cu Yds of Rip Rap is needed in the east slope, and a yard or so in the NW slope.
Hole in NW corner was repaired. GK 5/2012
[2013 - 2015] No change in condition noted during this inspection.
[2016] East slope is kind of a mess w/ many different types of protection from concrete rubble to wood to trees and brush.
Flume pipe exposed end CS2 GK/2016

894	DECK & APPROACH DRAINAGE	05-24-2016	1 EA	1	0	0	0
		06-01-2015	1 EA	1	0	0	0

Notes: Small scour hole at the north end of the center pier.
[2013 - 2015] All deck drains appear to be open and functioning as designed.
[2016] no drainage issues in 2016/GK

895	SIDEWALK, CURB, & MEDIAN	05-24-2016	1 EA	0	1	0	0
		06-01-2015	1 EA	0	1	0	0

Notes: North curb is cracked longitudinally about 25 feet long near east end. There is a 5 foot long spall developing in N curb W of the 1st E vertical. There is pack rust forming at the top plate of the sidewalk overhang brackets at the abutments.
Brick sidewalk has settled at the SW and NW corners,and the concrete walk was ground to minimize the tripping hazard GK 5/11
Sidewalk slide plates were being impacted on the vert. face by snow removal eqip. so they were cut off by br. crew GK 5/11
[2013 - 2015] No change in condition noted during this inspection.
No change in 2014 / GK
[2016] Same in 2016

899	MISCELLANEOUS ITEMS	05-24-2016	1 EA	1	0	0	0
		06-01-2015	1 EA	0	1	0	0

Notes: Cables @ NW cor are exposed in areas. Wooden planking is used for protection-some planks show dry rot. Both ends of conduit connections are deteriorated and separated. Conduits at the east end of the bridge are broken. No longer used, these Conduits, and Planking could be removed.The pigions are using this planking and conduits as there roosting areas. GK 5/11
Piezometer pipe broke off at ground line SE quad with one bent over nearby at rivers edge 5/12/10 GK
Plastic electrical conduits broke at ground level in SE corner of abut. wall GK 5/2012.
[2013] There is a piece of drift wood wedged up inside vertical L1'-U1'N east truss, also there is some cut off electrical wires tucked up between interior gusset and stringer at L4'S east truss.

[2016] Bridge was cleaned up in 2015 and old utilities were removed from under during paint /rehab project GK/2016

900	PROTECTED SPECIES	05-24-2016	1 EA	0	1	0	0
		06-01-2015	1 EA	0	1	0	0

Notes: [2016] No swallows observed in 2016, but they do nest on center pier. GK/2016

General Notes: 11/08 Changed Waterway Adequacy from 3 to 4 per Rog H Has some swallows & pigeons FC inspected by C.O. crew May 2003, report in File. DIVER INSPECTED-SEPT 2000-SEE REPORT. Snooper inspected 5/12/2010 5/17/2011 GK
5/15/2012 62 ft. snooper GK
Snooper / JLG 4/2014 and ground work inspection 5/2014 GK
FC inspection notes entyered into this inspection, FC inspection done June 6th - 9th 2011
Br. layout = East abut., east truss, pier, west truss, west abut.

Deck: [6] There is cracking with efflorescence on the underside.

Superstructure: [5] The paint is failing and surface corrosion is present. Pack rust has caused minor section loss in non-critical areas. cleaning and caulking of panel point connections has slowed or stopped most pack rust in the panel points.
[2016] The bridge was painted in 2015. NBI remains the same. Section loss in critical areas w/ pack rust was arrested with paint, but remains. GK/2016

Substructure: [6] The pierwall has a moderate crack that runs from the top to the bottom. The 2012 Underwater Inspection identified minor exposure of the pier footing in two areas.
[2016] With the painting proj. in 2016 the center pier wall was patched, and crack was arrested, but moderate deterioration to the substructure units remain.GK/2016

Channel: [6] [2013] The 2012 Under Water Inspection Report states; Channel bottom around pier was typically gravel allowing 6 inches of probe rod penetration. Also there is moderate bank erosion on both sides.

Waterway Adeq: [3] During Red River flood events, roadway approaches and ends of deck are overtopped, approx. every 10 yrs or less./ GK

Inventory Notes: Wear surface install year neads to be recorded.

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 4700 DEMERS AVE OVER RED RIVER **INSP. DATE: 06-01-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
26	TOP OF CONC DECK-EPX	2	06-01-2015	24,887 SF	0	24,887	0	0	0
			05-27-2014	24,887 SF	0	24,887	0	0	0

Notes: |Traffic has worn away tining in the wheel tracks. Minor transverse cracking.
[2013] Rating was changed from CS1 to CS2 in 2001. No change in condition noted during this inspection.
Chain dragged deck in 2014, found 2 sf of delam starting,near center gland in the EBL. GK 4/14 [2015] No change noted.|

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	06-01-2015	123 LF	82	41	0	N/A	N/A
			05-27-2014	123 LF	82	41	0	N/A	N/A

Notes: |2009 FC inspection: Damaged steel at joint between spand 2 and span 3 (CS3) Julie J 6/24/2009. ** Bridge Maint. installed a new strip seal on the MN side & re-tucked approx. 5' of gland that had came out of the extrusion; also made a repair to the damaged steel @ jt. btwn. span 2 and 3 on 3/22/2010. DSH
Strip seal above center pier has welded repair (eastbound lane). During the 2011 inspection, the east joint was closed to near the limits of expansion (1/2” gap at south end, 1” gap at north end).FC 6/2011
2012 inspection, EBL 12 inch sect. of extrusion broke free.
2014 br crew welded the extrusion that was brokem,east seal still closed, west ok GK 5/14
[2013] The East strip seal is open 1" on the north and 5/8" on the south. The Center strip seal is open 1 3/4" on the north and 2" on the south. the West strip seal is open 2 1/4" on the north and 2" on the south. Measurements were taken at 63 degrees. Quantitiy was changed from 78 in CS1, 42 in CS2, 3 in CS3 to 81 in CS1, 42 in CS2, and 0 in CS3 to reflect repairs made to the steel anchorage in March of 2010.
[2015] No significant change noted.|

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	06-01-2015	164 LF	164	0	0	N/A	N/A
			05-27-2014	164 LF	164	0	0	N/A	N/A

Notes: |Newly resealed.
Looked good in 2012
[2013] Seal material has scattered areas that have lost adhesion. Quantity was changed from CS1 to CS2 to reflect the change in condition.
Poured jts were resealed in 2014 with hot pour. GK 5/14
[2015] No significant defects noted.|

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	06-01-2015	2 EA	0	2	0	0	N/A
			05-27-2014	2 EA	0	2	0	0	N/A

Notes: |During the 2011 inspection, a contractor performed “mud-jacking” to fill in undermining on the east approach (undermining was observed after flooding in spring of 2011). There is evidence of slight settlement on the east approach (cracking on curbs).FC 6/2011.
[2013 - 2015] No change in condition noted during this inspection.
|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
334	METAL RAIL-COATED	2	06-01-2015	2,408 LF	1,194	0	1,214	0	0
			05-27-2014	2,408 LF	1,194	0	1,214	0	0

Notes: |Old rivited steel pedestrian railing needs paint.Rusting throughout.4 sections in the SW quad. appear to have no paint.Some impact damage repaired various locations.Bent near the bottom, kicked out 2-3 inches, various locations.GK 5/11
The element quantity should be doubled to include both the original ornamental sidewalk railings and the galvanized steel tube roadway railing (installed with the new deck in 1986). The ornamental sidewalk railings have paint failure and surface corrosion throughout. The roadway railings have minor impact damage at the truss ends (where the cross-section has been cut away).FC 6/2011
[2013 - 2015] No change in condition noted during this inspection.
At center pier, north steel tube rail has been impacted causing a 125 ft long scrape GK 5/14|

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 4700 DEMERS AVE OVER RED RIVER **INSP. DATE: 06-01-2015**

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	06-01-2015	8,287 LF	0	4,144	4,143	0	0
			05-27-2014	8,287 LF	0	4,144	4,143	0	0

Notes: |1/2 inch crack in web of south stringer at coping connection to floor beam at center pier, east span. Paint loss on bottom of top flange where shear studs were welded to stringer during redecking. Remainder of stringers have scattered minor paint loss.
2003 FC Inspection:They are in generally good condition. There is some paint loss on the bottom flange where shear studs were welded to the stringers during re-decking. The remainder of the stringers have some scattered minor paint loss (80% CS2 and 20% CS3).
2007 FC Inspection:No Change from previous inspection.
See notes and pictures on file in the Engineer's office.
Stringers in good shape with scattered rust primarily on bottom flange at connections. GK 5/2012
[2013 -2015] No change in condition noted during this inspection.|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
121	P/STL THRU TRUSS/BOT	2	06-01-2015	1,124 LF	0	0	1,000	124	0
			05-27-2014	1,124 LF	0	0	1,000	124	0

Notes: |East span at L2 50% section loss at connection plate north side of truss. Lower chord north side of truss upper flange 25% section loss. South side at the L3 connection plate at the bottom flange is bent up 1-1/2 inch from pack rust. 3/8 inch plate has 1/4 inch section loss. Some deformation of lower chord built-up members on U/stream side from debris hits. Bottom flange of the bottom chord is bent up in 2 places between Lo-L1 on the south side. Suggest putting cover plates on diagonal penetrations thru sidewalks-possible safety hazzard.
2003 FC Inspection:There is pack rust forming under the batten plates and at the floor beam and cross bracing connections. It is worst at the batten plates on the bottom flanges of the chords. Ultrasonic Thickness measurements taken at the worst batten plate showed a maximum loss of .100" on the bottom flange of one chord angle. That is less that a 5% cross sectional loss of the chord. There is also minor pitting and minor section loss inside the lower panel points and on the bottom flanges. The most significant section loss was at panel point L4 of the east truss. There minor impact damage to the lower chords on the upstream side due to flood debris. THere are also several areas where the bottom chord was bent on the top and bottom flange, probably during the original erection or debris removal.
2007 FC Inspetion:No Change from previous inspection.
See Pictures and Notes in the Fracture Critical Report on file in the Engineers office.
**Bridge Maint. will complete the 3 stage spot painting (1. Clean & Prime 2. 2nd coat 3. Caulk) of the gusset plates on the lower cords the wk. of 7/6/09. DSH
2009 FC inspection: Areas of significant corrosion and flaking rust along bottom chord and at gusset plate connections (CS4). Julie J 6/24/2009
East truss, so. side, mid span, diag. wind bracing impacted causing a 3 inch tear in the bracing top angle at the plate connection.GK 5/12/

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
126	P/STL THRU TRUSS/TOP	2	06-01-2015	1,124 LF	0	0	1,100	24	0
			05-27-2014	1,124 LF	0	0	1,100	24	0

Notes: |Minor damage to 1st & 4th lateral braces from the W on the W truss, EBL. Diag brace on the N side, @ the W end of the E truss, is bent. There is peeling paint and localized corrosion. There is minor pack rust at the intersection of the truss diagonals on the southwest truss at U4-L4 connection point.
2003 FC Inspection:The paint system is failing on the upper members of the bridge (80% CS2, 20% CS3). There is peeling paint and localized corrosion, but no significant pack rust of loss of section. THere is minor pack rust at the intersection of the center truss diagonals on the southwest truss.
2007 FC Inspection:The paint continues to fail and surface rust is becoming more prevalent, but there is no signigicant pitting or section loss.
See Pictures and Notes on file in the engineers office.
2009 FC inspection: Vertical L3-U3 on the north truss of the west span is bent out of alignment just below the deck--
-bowing inward on the east side (CS4) Out of alignment approx. 2 inches east side and 1 1/2 inches on the west side of the member. This appears to have been impacted prior to a galvanized rub rail intalled along truss members. GK 5/11
Areas of surface corrosion and flaking rust on top chord and end posts. (CS3). All other areas in CS2
The top cover plate on the top chord has complete paint failure and surface corrosion throughout (condition state 3) FC 6/2011
[2013 - 2015] Minor pack rust forming on all top horizontal connection plates. No change in condition state noted during this inspection.
All connections are sound, inspected by our crew and consultants. GK 4/14 |

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 4700 DEMERS AVE OVER RED RIVER **INSP. DATE: 06-01-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
152	PAINT STL FLOORBEAM	2	06-01-2015	800 LF	0	0	560	240	0
			05-27-2014	800 LF	0	0	560	240	0

Notes: |There is section loss on the bottom flange of some of the floor beams at the cross bracing gusset plate (see photos in 2003 FC report). Thickness readings were taken at two of the worst areas. FB 3 on east span had an average loss of 0.12 inch on the bottom flange with a maximum loss of 0.15 inch. F.B. 4 on the east span had a maximum loss of 0.06 inch with an average of 0.05 inch on the bottom flange. None of the floor beams had a total section loss greater than 5%. The remainder of the floor beams have scattered paint loss and surface rust.
2003 FC Inspection:There is section loss on the bottom flange of some of the floor beams at the cross bracing gusset plate. Ultrasonic thickness readings were taken on 2 of the worst areas. Floor beam 3 on the east span had an average loss of .12" on the bottom flange, with a maximum loss of .15". Floor Beam 4 on the east span had a maximum loss of .06", with and average loss of .05" on the bottom flange. None of the floor beams had a total cross sectional loss in excess of 5%. THe remainder of the floor beams had scattered paint loss and surface rust. The floor beams are typically 80% CS2, 15% CS3 and 5% CS4 of the total surface area.
2007 FC Inspection:No change from previous Inspection.
See Notes and Pictures on file in the engineers office.
2009 FC inspection: significant corrosion on top flange of many floorbeams (CS4). In general, paint system has deterioration and surface corrosion. (CS3).
Pack rust, with minor sect. loss at bottom of FB's at gusset plate / wind bracing connections, FB3 typ. GK 5/2012
[2013 - 2015] The section loss on the bottom flange at all floorbeams at horizontal bracing connection plates is about 15 to 20 percent for about 1'. No change in condition state noted during this inspection.
Same in 2014, rust continues on bottom flanges of floorbeams GK 4/14|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
422	PAINTED BEAM ENDS	1	06-01-2015	3 EA	0	1	2	0	0
			05-27-2014	3 EA	0	1	2	0	0

Notes: |2009 FC inspection: Change quantity to 3 (3 strip seal joints) The beam ends at the abutments are in CS3. The beam ends between the two spans are in CS2. Julie J 6/24/09
[2013] No change in condition noted during this inspection.
No change in 2014 / GK|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
373	STEEL HINGE	2	06-01-2015	26 EA	13	13	0	0	0
			05-27-2014	26 EA	13	13	0	0	0

Notes: |The sliding plate expansion bearings on the approach spans (installed in 1986) are supported by the truss end floorbeams. The hinge element would be more appropriate than the expansion bearing element (the quantity includes the sidewalk stringer hinges). The east hinge bearings are at or near full expansion.FC 6/2011
1 inch gap at south end and 1 1/2 inch gap at the north end at center pier.
East abut has closed tight on the so. side with 1 inch on the north side, West abut. is open 1 1/2 inches north and 1 1/4 inches at the south. GK 5/2012
[2013] No change in condition noted during this inspection.
No change in 2014 / GK|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
423	GUSSET PLATE (PAINT)	1	06-01-2015	76 EA	0	0	76	0	0
			05-27-2014	76 EA	0	0	76	0	0

Notes: |2009 FC inspection: New element. The lower panel point gusset plates have areas of surface corrosion, flaking rust, and section loss (CS4). The upper panel point gusset plates have areas of surface corrosion and isolated flaking rust (CS2). ** A (3) stage spot painting of gussets was completed on the wk. of 7/6/09. DSH
Spot painting and caulking was performed on the bottom chord gusset plates in 2009 (they have scattered areas of pitting - condition state 3). The top chord gusset plates have areas of surface corrosion and isolated flaking rust (condition state 3).FC 6/2011
[2013] No change in condition noted during this inspection.
All the gusset plates were looked at by Mn DOT and Consultants" KLJ / EIC Group" with UT being preformed in critical areas.Some areas have measurable section loss CS3 GK 4/14 [2015] There are 4 gusset plates on the "X" bracing between panel 4 and 4'. The paint is failing and surface corrosion is present.|

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 4700 DEMERS AVE OVER RED RIVER **INSP. DATE: 06-01-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
380	SECONDARY ELEMENTS	1	06-01-2015	1 EA	0	0	0	1	N/A
			05-27-2014	1 EA	0	0	0	1	N/A

Notes: |2009 FC inspection: Added element. Rate lower diagonal bracing and sway bracing. Lower lateral diagonal bracing has impact damage from debris.
Flood of 2011, caused bracing to be bent upwards and sideways throughout structure. Comps on file documenting amount of damage. GK 5/11
The lower lateral bracing was damaged during the 2011 flood (some hanger bars broken, several bracing members badly bent). A top batten plate on a sidewalk overhang bracket is fractured (west truss span, south side, L1') - see photo #1.FC 6/2011
[2013] No change in condition noted during this inspection.
Same in 2014 / GK
[2015] The lower lateral bracing horizontal leg at L4N East span is cracked, mostly due to PR. The sway frame at U4' west truss has impact damage above the east bound lane.|

311	EXPANSION BEARING	2	06-01-2015	4 EA	4	0	0	N/A	N/A
			05-27-2014	4 EA	4	0	0	N/A	N/A

Notes: |There is minor pack rust forming on the bearings.
**Greased bearings on 6/15/2010. DSH
Roller bearings were measured in 2011, 2012 meas. were the same at the east abut and 1 1/2 inch dissplacement at so. end vs. 2 1/2 inches in 2011, and 1 3/4 inches in 2012 vs. 1 1/4 inch in 2011 GK 5/2012
[2013] Bearing measurement are as follows; Southwest bearing displacement is 2 1/4" (2011 2 1/2"), northwest displacement is 3/4" (2010 1 1/4"), southeast displacement 4 3/4" (2010 4 1/2"), northeast displacement 7" (2010 7 1/4"). No change in overall condition noted during this inspection.
2014 the roller bearings were greased and rotated approx 1/4 turn
[2014] Bearing measurement are as follows; Southwest bearing displacement is 1 3/4" (2013 2 1/4"), northwest displacement is 1 1/4" (2013 3/4"), southeast displacement 3" (2013 4 3/4"), northeast displacement 7 1/8" (2013 7") GK 4/14 [2015] No changes noted.|

313	FIXED BEARING	2	06-01-2015	4 EA	0	4	0	N/A	N/A
			05-27-2014	4 EA	0	4	0	N/A	N/A

Notes: |Pack rust on bearings. Mortor is breaking up under bearing plates @ center pier.
Mortar continues to deteriorate with corrosion.GK 5/2012
[2013 - 2015] No change in condition noted during this inspection.
Some of the components of the bearings are moderately worn, few anchor bolts have section loss. CS2 GK 4/14|

210	CONCRETE PIER WALL	2	06-01-2015	46 LF	36	10	0	0	N/A
			05-27-2014	46 LF	36	10	0	0	N/A

Notes: |Vertical crack in pierwall. There isa 12" x 8" x 2" spall on the west side of the web wall ledge. The downstream footing was exposed up to 8" vertically during the 2004 underwater inspection. 2009 FC inspection: Vertical cracks and minot spalling on west side of wall (CS2). Julie j 6/24/2009
Crack in Pier wall extends from top to 3/4 of the way to way down, approx 20 ft.. GK 5/2012
[2013] The 2012 Under Water Inspection Report states; The east side of the footing at the downstream column was partially exposed with a maximum vertical exposure of 15 inches. In addition, the top of footing was partially exposed along both sides of the upstream column with no vertical face (edge of footing) exposure present. Moderate to heavy accumulation of timber debris consisting of logs and branches of 1.5 foot diameter and smaller was observed at the upstream nose and on both sides of the pier extending from channel bottom up 4 feet..
[2013 - 2015] No change in condition noted during this inspection.
Vertical moderate crack in center of pier wall extends from top to bottom w / minor spalling along. GK 4/14|

215	CONCRETE ABUTMENT	2	06-01-2015	125 LF	105	20	0	0	N/A
			05-27-2014	125 LF	105	20	0	0	N/A

Notes: |Roller Foundation is cracked @ SE cor. There is a horzontal shear crack in S 1/2 of E abut backwall.
2009 FC inspection: There is a horizontal crack on the east abutment wall approximately 8 feet long by 6 inches wid (CS2).
A 1ft. x 1ft. spall has developed at the east abutment br. seat. GK 5/12/10
We recommend the same ratings as the 2009 FC report (105 LF in condition 1 and 20 LF in condition 2).FC 6/2011
[2013 - 2015] No change in condition noted during this inspection.
4 inch core holes were drilled in both abut backwalls and filled with grout in 2014, / GK|

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 4700 DEMERS AVE OVER RED RIVER **INSP. DATE: 06-01-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
220	CONCRETE FOOTING	2	06-01-2015	4 EA	0	4	0	0	N/A
			05-27-2014	4 EA	0	4	0	0	N/A

Notes: |The truss roller bearings are supported by concrete footings that are tied to the abutment with struts (quantity is one for roller each bearing). There is a horizontal steel “rail” below each roller. The concrete footings have some cracking and scaling (condition state 2).FC 6/2011
[2013 - 2015] No change in condition noted during this inspection.
4 inch core holes were taken in each footing approx 10 inches deep and filled with grout.
Looked at after snow and ice melted, no change GK 5/14|

234	CONCRETE CAP	2	06-01-2015	47 LF	42	0	5	0	N/A
			05-27-2014	47 LF	42	0	5	0	N/A

Notes: |Vert crack at center line of pier. Vert crack in pier cap under N. bearing pad. Rebar exposed at N end of cap. Del. concrete at the north end of pier cap.
[2013 - 2015] No change in condition noted during this inspection.
Sounded delam along with some core drilling and found area to be confined to the visual area, 2-3 inches deep, under N pier bearing, patch repair may be in order CS3 GK 4/14|

387	CONCRETE WINGWALL	2	06-01-2015	4 EA	4	0	0	0	N/A
			05-27-2014	4 EA	4	0	0	0	N/A

Notes: |[2013 - 2015] Wingwalls are in good shape.|

357	PACK RUST	2	06-01-2015	1 EA	0	0	1	0	N/A
			05-27-2014	1 EA	0	0	1	0	N/A

Notes: |Pack Rust is formed at connections. This needs to be quantified in 2005 and checked for distortion.
Scalloping due to pack rust (up to ¾” spreading) is present at some truss bottom chord connections FC 6/2011
[2013 - 2015] Pack rust up to 2 1/4" thick on some of the bottom horizontal connection plates. No change in condition noted during this inspection.
Same in 2014 GK 4/14|

358	CONC DECK CRACKING	2	06-01-2015	1 EA	1	0	0	0	N/A
			05-27-2014	1 EA	1	0	0	0	N/A

Notes: |Cracks in deck have been sealed There is leaching present.
Deck cracks could use sealing with epoxy. GK 5/2012
[2013 - 2015] No change in condition noted during this inspection.
Minor hairline cracks in deck that may be too tight for epoxy to penatrate,not of moderate size or density, moved to CS1 GK 2014|

359	CONC DECK UNDERSIDE	2	06-01-2015	1 EA	0	1	0	0	0
			05-27-2014	1 EA	0	1	0	0	0

Notes: | Hairline cracks on underside w/leaching & efflorescence.
[2013 - 2015] No change in condition noted during this inspection.
Same in 2014 / GK|

360	SETTLEMENT	2	06-01-2015	1 EA	0	1	0	N/A	N/A
			05-27-2014	1 EA	0	1	0	N/A	N/A

Notes: | E abut B/wall has shear crack & appears to be moving toward end of truss.
[2013 - 2015] No change in condition noted during this inspection.|

361	SCOUR	2	06-01-2015	1 EA	1	0	0	N/A	N/A
			05-27-2014	1 EA	1	0	0	N/A	N/A

Notes: |There is a hole developing in the NW slope over the Storm Sewer Outlet. Bridge crew installed Rip Rap on East slope, but there is erosion present Especially in the SE corner at the Foundation of the Abutment, 10 to 20 Cu Yd of Rip Rap is needed.**Additional Rip Rap was added on 7/15/2010 where ersion was present (approx. 30yds.). DSH
Minor footing exposure was observed during the 2008 underwater inspection (center pier).FC 6/2011
[2013] The 2012 Under Water Inspection Report states; The east side of the footing at the downstream column was partially exposed with a maximum vertical exposure of 15 inches. In addition, the top of footing was partially exposed along both sides of the upstream column with no vertical face (edge of footing) exposure present.
|

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 4700 DEMERS AVE OVER RED RIVER **INSP. DATE: 06-01-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
362	TRAFFIC IMPACT	2	06-01-2015	1 EA	0	1	0	N/A	N/A
			05-27-2014	1 EA	0	1	0	N/A	N/A

Notes: | there is evidence that there have been numerous strikes on the Portal sections but not to the extent of affecting the integrity of the strength..
Vertical L3-U3 on the north truss of the west span is bent out of alignment just below the deck---bowing inward on the east side (CS2)
[2013 - 2015] No change in condition noted during this inspection.
No change in 2014 / GK|

363	SECTION LOSS	2	06-01-2015	1 EA	0	1	0	0	N/A
			05-27-2014	1 EA	0	1	0	0	N/A

Notes: |There is section loss present on some members but an actual measurement has not bee made to determine the extent. This should be corrected at the next snooper date.
Bottom flange FB /gusset plate wind bracing connections some sect. loss but difficult to measure. GK 5/2012
[2013 - 2015] The section loss on the bottom flange at all floorbeams at horizontal bracing connection plates is about 15 to 20 percent for about 1'.
Same in 2014 / GK |

964	CRITICAL FINDING	2	06-01-2015	1 EA	1	0	N/A	N/A	N/A
			05-27-2014	1 EA	1	0	N/A	N/A	N/A

Notes: |[2013 - 2015] No critical findings observed during this inspection.|

966	FRACTURE CRITICAL	2	06-01-2015	1 EA	1	0	0	N/A	N/A
			05-27-2014	1 EA	1	0	0	N/A	N/A

Notes: |See in-depth report for location of F/C members.|

981	SIGNING	2	06-01-2015	1 EA	1	0	0	0	0
			05-27-2014	1 EA	1	0	0	0	0

Notes: |[2013] No signs required.
Orig. Sorlie bridge plaqes are still inplace on ends of truss's GK/ 2014|

984	DRAINAGE	2	06-01-2015	1 EA	1	0	0	N/A	N/A
			05-27-2014	1 EA	1	0	0	N/A	N/A

Notes: |Small scour hole at the north end of the center pier.
[2013 - 2015] All deck drains appear to be open and functioning as designed. |

985	SLOPES	2	06-01-2015	1 EA	0	1	0	N/A	N/A
			05-27-2014	1 EA	0	1	0	N/A	N/A

Notes: |Rip Rap has been added to protect the slopes. There is scour taking place in the SE corner around the Foundation of the East abutment. And a hole developing in the NW corner of the west slope, over the Storm sewer out let pipe. **Refer to element 361 DSH
10 to 20 Cu Yds of Rip Rap is needed in the east slope, and a yard or so in the NW slope.
Hole in NW corner was repaired. GK 5/2012
[2013 - 2015] No change in condition noted during this inspection.|

986	CURB & SIDEWALK	2	06-01-2015	1 EA	0	1	0	N/A	N/A
			05-27-2014	1 EA	0	1	0	N/A	N/A

Notes: |North curb is cracked longitudinally about 25 feet long near east end. There is a 5 foot long spall developing in N curb W of the 1st E vertical. There is pack rust forming at the top plate of the sidewalk overhang brackets at the abutments.
Brick sidewalk has settled at the SW and NW corners,and the concrete walk was ground to minimize the tripping hazard GK 5/11
Sidewalk slide plates were being impacted on the vert. face by snow removal eqip. so they were cut off by br. crew GK 5/11
[2013 - 2015] No change in condition noted during this inspection.
No change in 2014 / GK|

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 4700 DEMERS AVE OVER RED RIVER **INSP. DATE: 06-01-2015**

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	06-01-2015	1 EA	0	1	0	N/A	N/A
			05-27-2014	1 EA	0	1	0	N/A	N/A

Notes: |Cables @ NW cor are exposed in areas. Wooden planking is used for protection-some planks show dry rot. Both ends of conduit connections are deteriorated and separated. Conduits at the east end of the bridge are broken. No longer used, these Conduits, and Planking could be removed.The pigions are using this planking and conduits as there roosting areas. GK 5/11
Piezometer pipe broke off at ground line SE quad with one bent over nearby at rivers edge 5/12/10 GK
Plastic electrical conduits broke at ground level in SE corner of abut. wall GK 5/2012.
[2013] There is a piece of drift wood wedged up inside vertical L1'-U1'N east truss, also there is some cut off electrical wires tucked up between interior gusset and stringer at L4'S east truss.
|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
967	GUSSET DISTORTION	1	06-01-2015	1 EA	0	1	0	0	N/A
			05-27-2014	1 EA	0	1	0	0	N/A

Notes: |2009 FC inspection: New element Jule J 6/24/2009
Some truss connection gusset plates have bowing along the free edge (up to 1/8") - this appears to be due to pack rust (bottom chord connections) or initial fit-up.FC 6/2011
[2013 - 2015] No change in condition noted during this inspection.
No change in 2014 / GK|

General Notes: 11/08 Changed Waterway Adequacy from 3 to 4 per Rog H Has some swallows & pigeons FC inspected by C.O. crew May 2003, report in File. DIVER INSPECTED-SEPT 2000-SEE REPORT. Snooper inspected 5/12/2010 5/17/2011 GK 5/15/2012 62 ft. snooper GK
Snooper / JLG 4/2014 and ground work inspection 5/2014 GK
FC inspection notes entyered into this inspection, FC inspection done June 6th - 9th 2011
Br. layout = East abut., east truss, pier, west truss, west abut.

MINNESOTA STRUCTURE INVENTORY REPORT

Bridge ID: 9412 **TH 72 over RAINY RIVER**

Date: 07/12/2017

+ GENERAL +

Agency Br. No. 45-110
District 2 **Maint. Area** 2A
County 39 - LAKE OF THE WOODS
City BAUDETTE
Township
Desc. Loc. IN BAUDETTE
Sect., Twp., Range 02 - 160N - 31W
Latitude 48d 43m 08.75s
Longitude 94d 35m 25.72s
Custodian STATE HWY
Owner STATE HWY
Inspection By DISTRICT 2
Year Built 1959
MN Year Remodeled
FHWA Year Reconstructed
Bridge Plan Location DISTRICT
Potential ABC YES

+ STRUCTURE +

Service On HWY;PED
Service Under STREAM
Main Span Type STEEL HIGH TRUSS
Main Span Detail PENNSYLVANIA
Appr. Span Type STEEL BM SPAN
Appr. Span Detail
Skew
Culvert Type
Barrel Length

Number of Spans

MAIN: 6 APPR: 6 TOTAL: 12

Main Span Length 192.5 ft
Structure Length 1,285.0 ft
Deck Width 26.5 ft
Deck Material OPEN GRATING
Wear Surf Type OTHER
Wear Surf Install Year
Wear Course/Fill Depth
Deck Membrane NONE
Deck Rebars N/A
Deck Rebars Install Year
Structure Area 34,053 sq ft
Roadway Area 30,839 sq ft
Sidewalk Width - L/R 6.4 ft
Curb Height - L/R 0.75 ft 0.75 ft
Rail Codes - L/R 35 35

+ ROADWAY +

Bridge Match ID (TIS) 1
Roadway O/U Key 1-ON
Route Sys/Nbr MNTH 72

Roadway Name or Description

MN 72

Roadwav Function MAINLINE
Roadway Type 2 WAY TRAF
Control Section (TH Only) 3905
Ref. Point 076+00.864
Date Opened to Traffic 01-01-1959
Detour Length 98 mi.
Lanes 2 Lanes ON Bridge
ADT (YEAR) 1,950 (2006)
HCADT 59
Functional Class. RUR/PR ART OTH

+ RDWY DIMENSIONS +

If Divided	NB-EB	SB-WB
Roadway Width	24.0 ft	
Vertical Clearance	14.6 ft	
Max. Vert. Clear.	14.6 ft	
Horizontal Clear.	23.9 ft	
Lateral Clr. - Lt/Rt		
Appr. Surface Width	36.0 ft	
Bridge Roadway Width	24.0 ft	
Median Width on Bridge		

+ MISC. BRIDGE DATA +

Structure Flared NO
Parallel Structure NONE
Field Conn. ID RIVETED
Cantilever ID

Foundations

Abut. CONC - FTG PILE
Pier CONC - FTG PILE
Historic Status NOT ELIGIBLE
On - Off System ON

+ PAINT +

Year Painted 2003 **Pct. Unsound** 20 %
Painted Area 220,037 sf
Primer Type ORGANIC ZINC
Finish Type CHLORINATED RUBBER ALU

+ BRIDGE SIGNS +

Posted Load NOT REQUIRED
Traffic NOT REQUIRED
Horizontal NOT REQUIRED
Vertical ROADWAY RESTRICTION

+ INSPECTION +

Deficient Status F.O.
Sufficiency Rating 44.8
Last Inspection Date 04-20-2016
Inspection Frequency 12
Inspector Name DISTRICT 2
Status A-OPEN

+ NBI CONDITION RATINGS +

Deck 5
Superstructure 5
Substructure 5
Channel 6
Culvert N

+ NBI APPRAISAL RATINGS +

Structure Evaluation 5
Deck Geometry 4
Underclearances N
Waterway Adequacy 8
Approach Alignment 3

+ SAFETY FEATURES +

Bridge Railing 0-SUBSTANDARD
GR Transition 0-SUBSTANDARD
Appr. Guardrail 1-MEETS STANDARDS
GR Termini 0-SUBSTANDARD

+ IN DEPTH INSP. +

Frac. Critical Y 24 mo 06/2015
Underwater Y 60 mo 08/2016
Pinned Asbly. N
Spec. Feat.

+ WATERWAY +

Drainage Area
Waterway Opening 99999 sq ft
Navigation Control NO PRMT REQD
Pier Protection
Nav. Vert./Horz. Clr.
Nav. Vert. Lift Bridge Clear.
MN Scour Code O-STBL;ACT REQD
Scour Evaluation Year 1998

+ CAPACITY RATINGS +

Design Load H 20
Operating Rating HS 22.50
Inventory Rating HS 15.70
Posting
Rating Date 07-22-2008

Overweight Permit Codes

A: 3 B: X C: X

07/12/2017

MINNESOTA BRIDGE INSPECTION REPORT

Inspected by: DISTRICT 2

BRIDGE 9412 TH 72 OVER RAINY RIVER **INSP. DATE: 04-20-2016**

County: LAKE OF THE WOODS
City: BAUDETTE
Township:
Section: 02 Township: 160N Range: 31W
Span Type: STEEL HIGH TRUSS
NBI Deck: 5 Super: 5 Sub: 5 Chan: 6 Culv: N

Location: IN BAUDETTE
Route: MNTH 72 Ref. Pt.: 076+00.864
Control Section: 05 Maint. Area: 2A
Local Agency Bridge Nbr: 45-110

Length: 1,285.0 ft
Deck Width: 26.5 ft
Rdwy. Area / Pct. Unsnd: 30,839 sq ft
Paint Area / Pct. Unsnd: 220,037 sq ft 20 %
Culvert : N/A

Open, Posted, Closed: OPEN

Appraisal Ratings - Approach: 3 Waterway: 8
MN Scour Code: O-STBL;ACT REQD Def. Stat: F.O. Suff. Rate: 44.8
Required Bridge Signs - Load Posting: NOT REQUIRED Traffic: NOT REQUIRED
Horizontal: NOT REQUIRED Vertical: ROADWAY RESTRICTION

ELEM NBR	ELEMENT NAME	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4
800	CRITICAL DEFS OR SAFETY HAZARDS	04-20-2016	1 EA	1	0	0	0
		06-17-2015	1 EA	1	0	0	0

Notes: NO CRITICAL FINDINGS OBSERVED DURING THE LAST INSPECTION.
No critical findings were identified during this inspection FC 6/2011.
[2015] No critical findings were noted.
[2016] Same in 2016 /GK

28	STEEL GRID DECK OPEN	04-20-2016	34,053 SF	17,027	17,026	0	0
		06-17-2015	34,053 SF	30,648	0	3,405	0

Notes: 1 grid bar missing in the EBL of truss span #6 near the west end, 2 others missing-same span EBL & WBL. Paint has failed on the grid, US side. Canada painted there Grid in 05 & starting to rust in wheel tracks. There are several broken welds in the grid, Canada side, US side was repaired 6/2010. Bottom of grid and support beams corroded with some pack rust. Grid was tack welded to sliding plates @ piers but pulled apart with 1/8 - 1/4 in gap all the way accross deck @ 3 US center piers,cracked with no gap @ pile bents. **Repaired broken grid bars @ various locations on the US side on2/7/06, 6/16/08, 6/14&15/2010. DSH Numerous loose and missing bars throughout deck. Loose bars rattle under traffic. Widespread surface corrosion throughout deck on west approach and truss spans 1-3.Fc 6/2011 Gridbars broken at various locations but br. crew welds grid on an annual basis. GK 5/2012
[2013] No change noted.
2014 br crew tack welded broken grid bars.
Mn side has surface corrosion, Canada portion has moderate paint failure CS3 GK 4/14
[2015] The first section of deck on Span A6 is loose and deflecting up and down when traffic moves over; condition state quantities where changed to reflect this.
[2016] inspection br. crew repaired all broken / cracked tack welds that could be found. Repair included span A6 " Canada approach"
Mn. portion / 1/2 br. deck was not painted under contract in 2003,and grid exhibits surface corrosion CS2 Canadian contract 2004 grid deck was painted. GK/2016

301	POURED SEAL JOINT	04-20-2016	50 LF	0	0	50	0
		06-17-2015	50 LF	0	50	0	0

Notes: Bridge has a steel grid deck, with concrete approach panels west end, with bituminous sealant on ends. GK 6/15/10

**Sealed jts. / pourable on 11/09. DSH
Quantity includes poured joints at west edge and along center of concrete approach slab at west end of bridge.FC 6/2011
[2016] Poured jts on ends of bridge need sealing CS3 GK/2016

305	ASSEMBLY DECK JOINT	04-20-2016	132 LF	0	132	0	0
		06-17-2015	132 LF	0	132	0	0

Notes: The welds holding exp. plates to grid deck are cracked & seperated slightly. 6/15/10 GK

2009 FC inspection: Pier 1 joint closed tight JZink 6-10-2009
Pier 1 joint open 1.00” (was reported closed tight in 2009). Other joints open 1.25” to 2.88”FC 6/2011
Pier 1 joint was open slightly but not much room for expansion looking at angles on end before impacting chanfer on angle plate. GK 5/2012
Assembly deck jts are functioning. GK 4/14
[2015] Deck joint measurements were taken at 60° and are as follows: Span 1-2 South 1 3/4" , North 1 3/4", Span 2-3 South 3", North 2 3/4", Span 3-4 South 3 1/4", North 2 3/4", Span 4-5 South 2 1/2", North 2 1/2", Span 5-6 South 1 3/8", North 1 3/16".
[2016], all jts show evidence of movement.Some areas of br. deck grating were tack welded along jts. GK/2016

330	METAL BRIDGE RAILING	04-20-2016	3,855 LF	3,431	424	0	0

		06-17-2015	3,855 LF	3,431	424	0	0

Notes: Some areas of paint failure & corrosion on pedestrian railing. Rail seperated at Canada end SE corner GK 6/15/2010
2009 FC inspection: impact damage at southeast Canadian approach. JZink6/10/2009
38 LF in CS3 moved to CS2. Traffic impact damage at SE corner has been repaired.FC 6/2011
Metal br rail has minor corrosion near the bases, and a few scattered areas. GK 4/14
[2015] No significant change noted
[2016] Corrosion continues at rail post bases, at concrete rail interface. Scrapes and corrosion along top pipe rail included in CS2 quant. GK/2016

515	*STEEL PROTECTIVE COATING*	04-20-2016	9,061 SF	0	8,731	0	330
		06-17-2015	999 SF	999	0	0	0

Notes: [2016] Rail coating is chalking and fading CS2. Paint failure/corrosion at rail post bases CS4 GK/2016

321	CONCRETE APPROACH SLAB	04-20-2016	720 SF	360	360	0	0
		06-17-2015	720 SF	720	0	0	0

Notes: [2016] Migrator assumed an approach slab length of 20FT and used the inventory quantity of 36FT for the width.
20 foot approach panel added to the west end, scaling.
Minor cracks and small spalls developing @ SE corner of west appr. slab. GK 6/15/2010
West end of bridge. Good condition with minor scaling from tire wear.FC 6/2011
Approach slab looks good with the tining being worn away in the wheel tracks and a few minor spalls along the steel edge of deck. GK 4/14
[2015] No significant change noted.
[2016] Slight movement of Mn. approach, cause for a bit. patch to be placed smoothing out the transition. CS2 because of slight settlement. GK/2016

822	BITUMINOUS APPROACH ROADWAY	04-20-2016	1 EA	0	1	0	0
		06-17-2015	1 EA	1	0	0	0

Notes: East end of bridge. Good condition with a few minor cracks.FC 6/2011
East approach slab has a moderate crack at centerline GK 4/14
[2015] No significant change noted.
[2016] Patched at mn end, moderate deterioration of both ends w/ a few unsealed cracks CS2 GK/2016

107	STEEL GIRDER OR BEAM	04-20-2016	840 LF	180	450	200	10
		06-17-2015	840 LF	0	830	10	0

Notes: 2009 FC inspection: New element Quantity applies to approach span beams that were once included under the stringer element. Approach Span 1 Beam 2 north face at Pile Bent 1 has new through corrosion in web at splice. Approach Span 2: Beam 3 north face, Beam 4 south face and Beam 2 north face has bottom flange and web surface corrosion. J Zink 6/10/2009
Bridge crew added web splices/ stiffeners to several girders where section loss was most prevelant.GK 6/15/2010 Through corrosion at Bent #1 has been repaired, and web splices added to other areas with large amounts of section loss. Active pitting and corrosion at east end of approach span 6 where girders attach to east abutment.FC 6/2011
Paint failed at a few locations where appears paint thickness was not sufficeant, continues to rust at east abut. GK 5/2012
[2013] No significant change noted.
Bottom flanges continue to rust at abuts.Paint pealing bottom flanges beams 5 & 6 between bent 1 & 2 GK 4/14
[2015] Span A4 Beam 3 has a 2 3/4" crack in web just above bottom flange above Pier 1 (Photo 69).

Pack Rust Notes: Pack rust @ bott chord connection points

Minor pack rust distortion (1/16” or less) is present between some gusset plates and lower chord.
Pack rust up to 1/4” present between horizontal shelf plates and floorbeams. A few stringer splice plates over floorbeams/pier cap have pack rust distortion of 1/8” or less.FC 6/2011
Staining from pack rust behind plates. GK 5/2012.
[2015] No significant change noted.
[2016] Top flange MN. portion was not painted in 2003, because grid deck was not painted CS2
Beams at the Mn. approach spans exhibit areas of plated / repaired, surface corrosion /paint peeling. Canada approach spans surface corrosion. These areas are generally found at the ends of the girders and along bottom flanges creeping up the web. CS2
Ends of girders over pier caps exhibit flaking rust and pack rust at splice plates and abut ends of girders. and along top flange at sidewalk connection an

515	*STEEL PROTECTIVE COATING*	04-20-2016	4,704 SF	4,027	0	100	577
		06-17-2015	220,037 SF	0	0	110,019	110,019

Notes: [2016] Girders are computed at 5.6 SF/FT., all sides painted.
Top flange MN. portion was not painted in 2003, because grid deck was not painted, steel exposed CS4
Approach spans finish coat failure, peeling, rust stains. CS3, bottom of flanges and webs.
Paint complete failure, steel exposed CS4, top edge of flanges, fascia girders and splices over pier caps and at abut ends most prevalent. 28 SF Canada approach GK/2016

113	STEEL STRINGER	04-20-2016	8,133 LF	2,505	4,966	660	2

		06-17-2015	8,133 LF	3,067	4,966	100	0

Notes: Paint system new in 2003 on west " US " 1/2 of bridge. Paint system is new 2005 on east " Canada " 1/2 of bridge. corrosion and section loss is most prevalent at floor beam connections.Stringer conection plates,corrosion behind causing deformation of the plates. . 4th base-south fascia stringer west span-electricians drilled 1/4" hole in web. Top flange of sidewalk stringer is rusting under conc curb on S side. East end Span #1, 3rd. stringer from north has 2 popped riviets @ floor beam connection. Paint failing small 5 ft area bottom of stringer,4th from the south mid span, 1st span.Br. crew added gusset plates to several stringers over sect. loss areas, various locations. Approach span 1, S1, bolted repair, 50 % sect. loss.S4, severe pitting bottom flange. App. span 2, S2, pitting and hole in web at bent 1. App. span 4, S2,S3,& S4,pockets of pitting in web over east pier. Truss span 1, bay 5, S4 &S5, light to severe pitting of bottom flanges.Bay 8,S3, moderate pitting over FB9.Bay 10, S1-S5, moderate to severe pittingt on web & bottom flanges, web repair of S3,one rivit missing on S5. Truss span 2, bay 1, S3 & S4, ligth to severe pitting, Bay 3 & 4, S2-S5, light to moderate pitting, web strengh, repair, of S3 @ FB 4.Bay 5, S3,severe sect. loss with holes. Bay 6, S4, light to moderate pitting.Bay 10, S2, web repair, strengh plates, added due to severe sect. loss @ FB 11. Truss span 3, bays 9&10, S3 & S4, light to moderate pitting. Inspect. in 08 detected some stringers in spans 1-3 have surface corosion. 2009 FC inspection: Stringer quantities apply only to truss stringers. Sapn 2 corrosion on Stringer 3 near FB4; new web through corrosion---two 1/4 " diameter holes. Span 2 corrosion on Stringer 4 midpoint bottom flange corrosion.JZink 6/10/2009 Areas of through corrosion in web reported previously have been arrested by cleaning and repainting. Isolated areas of active pitting in bottom flange of STR5, Span 5 near FB0 and in STR4, Span 4 @ FB9. Severe sectio

515	*STEEL PROTECTIVE COATING*	04-20-2016	45,544 SF	43,181	1,073	210	1,080
		06-17-2015	999 SF	377	0	499	123

Notes: *[2016]Stringers are computed at 5.6 SF/FT., all sides painted.*
Top flange MN. portion was not painted in 2003, because grid deck was not painted CS4, 2626 S.F.
Ends of stringers corrosion w pack rust at splice plates, generally /approx. 140 S.F. per span CS4
Between P1 and P7, calculations were done during inspection and CS2 " caulking fading fascia Mn. portion", CS3 and CS4 quantities were documented, various locations. GK/2016

120	STEEL TRUSS	04-20-2016	2,324 LF	1,785	346	193	0
		06-17-2015	2,324 LF	0	2,324	0	0

Notes: Bottom Chord Notes: West 1/2 painted 2003. East 1/2 -Painted by Canada in 2005. Pack rust on some gusset plates on the bottom chord. Pack rust between some connection points @ piers. There are cracked welds between gusset plate & end post channel on the south side @ the W end of the E truss and several other truss end locations(low tension areas). These cracks do not propagate into the structural members. 1 broken rivet at the sidewalk cantilever at the end of the floor beam side at the 4th pier from the U.S. **Bridge Maint. completed the spot painting of the gusset plates (US Side) the wk. of 6/22/09. The paint system that was done in 2003 was still looking good. A couple of areas were touched up with paint and (all gusset seams on the lower cord were caulked to repel moisture. DSH Isolated areas of paint failure, but underlying primer still intact. A few locations (Span 5 @ L9S, Span 6 @ L9N) show evidence of plug-welded mis- drilled holes in lower chord member (also noted in 2009).FC 6/2011
2012 inspection looked at bottom chord closely and no problems found.Paint failing at ends of chords under jts, in areas that were hard to blast and paint, behind rivet heads, and rockers. GK 5/2012.
[2013] The parallel faces of the horizontal legs of the angles were not cleaned and painted and surface corrosion exists. S All connections are sound.
Wind braceing impacting lower chord span 6, FB2 east. GK 4/14
[2015] No significant change noted.

Top Chord Notes: High loads were impacting knee braces so all knee braces removed. Corrosion beginning at the interface of vertical members. Minor surface corrosion of upper portion of truss. Span #1 , vert. #2 no. truss,cracked tack welds at diag. knee brace, not propagating.Diag. #12, of the no. truss,"fabrication defect, as per disscussion with br. office" in inner flange at midpoint marked for propagation / monitering.Inpact damage of trans. bracing.1st trans.brace bent approx. 7 inches,connect. bent at truss connection , 2d &

515	*STEEL PROTECTIVE COATING*	04-20-2016	138,350 SF	136,967	1,383	0	0
		06-17-2015	999 SF	0	0	999	0

Notes: *[2016] In splash zone corrosion starting to appear, paint beginning to peel but prime coat still intact, approximately 1% CS2 - GK 7/16*

152	STEEL FLOORBEAM	04-20-2016	1,744 LF	174	1,220	350	0
		06-17-2015	1,744 LF	174	1,570	0	0

Notes: West 1/2 repainted in 2003. East 1/2 Painted by Canada in 2005- Was a considerable amount of layered rust w/sect loss. Paint on floor beams & stringers was in very poor condition w/pack rust forming on both flanges section loss in small areas near mid-point. Knee braces (stringer to floor beam) at the east pier have pack rust between angles causing minor deformation. See section loss report in file - 2003.. Between piers 3 & 4 2nd. stringer from the south,2 1/2 in. holes drilled in bottom flange, Canada plated floorbeams over piers 5 & 6 US plated bottom flanges of some floor beams spans 1 & 2. Truss span 1,FB 1 light to moderate pitting of web and bottom flange at center of span.FB4 cracked tack weld so. side,no propagation.FB 7, 8 , 9 & 11,light to moderate pitting on bottom flanges. Truss span 2, FB 1, moderate to severe pitting,FB 2-4, light to moderate pitting of top & bottom flanges, FB 5-7, moderate to severe pitting, strengh. plates bolted to bottom flanges.FB 10,11, moderate to severe pitting on flanges. Truss span 3, FB 5,7,9,10 & 11, light to moderate pitting of flanges and webs. The floor beams have been repainted arresting most corrosion : however there are some connections with active pack rust, & bottom flanges are starting to corrode with paint pealing, most noticeably near west end spans 1 & 2.GK 6/15/2010 Floor beam 8 span 2 had a crack like indication that was stop drilled by D2 br. crew. Many floorbeams have moderate to severe pitting in lower webs and flanges, which has been arrested by repainting. Several floorbeams reinforced with bolted cover plates, with paint failure and active corrosion occurring on Span 4 FB10. Active corrosion present under bottom flange connection to truss panel points at many locations. Span 2, FB8, south end has a crack in the top flange cope that was drilled out in 2008. Other flange copes and tack welds should be monitored for possible cracking.FC 6/2011 2012 inspection, looked closely at all copes and cracked tac

515	*STEEL PROTECTIVE COATING*	04-20-2016	13,080 SF	12,641	200	190	49
		06-17-2015	999 SF	100	0	699	200

Notes: FB' s computed as 7.5 SF /Ft.
[2016] Computations were made during inspection of all FB's and condition states are shown accordingly. Gk/2016

162	STEEL GUSSET PLATE	04-20-2016	276 EA	276	0	0	0
		06-17-2015	276 EA	276	0	0	0

Notes: 2009 FC inspection All gussets exhibit minimal to no pack rust and no paint failure.
Gussets at Piers 3-6 are impacted due to fully expanded bearings (see element #967 notes). Tack welds are present on gusset plate interfaces mainly at the pier locations. Some are cracked, but none have propogated into the base metal. JZink 6/10/2009.
** A (3) stage spot painting of gussets was completed the wk. of 6/22/09. DSH
Several outer gusset plates at L4N locations have plug-welded misdrilled holes (also noted in 2009)FC 6/2011.
No problems noted in 2014 GK
Looked closely at areas where gusset plates impact rocker bearings, minor rust stains, otherwise appear the same as previous inspections GK/2016
[2015 / 2016] No significant change noted.

Gusset Plate Distortion Notes: 2009 FC inspection: Added element Most bottom chord and a few upper chord gusset plates exhibit free edge distortion up to 1/8” attributed to fit-up or very minor pack rust. Span 6 L10N inside gusset is bowed out slightly more than 1/8” that is not attributed to pack rust or fit-up. Possibly due to impact of gusset on fully expanded bearing. This type of distortion should be monitored in the future for all pier gussets due to the impacted gussets. JZink6/10/2009
Most bottom chord and a few upper chord gusset plates exhibit free edge distortion up to 1/8” due to fit-up or very minor pack rust. Eight gusset plate connections (L0S & L0N on spans 3-6) have gouges due to impact from rocker bearings. FC 6/2011.
[2015] There is a bulge at Span 6 M3N Exterior Gusset Plate .125" bulge between members L6-M3 & U6-M3 appears to have been caused by impacts to the back.
[2016] All gusset plates are in good condition, with sound connections GK/2016

515	*STEEL PROTECTIVE COATING*	04-20-2016	2,484 SF	2,484	0	0	0
		06-17-2015	999 SF	999	0	0	0

Notes: [2016] Minor rust stains, at batten plate connections and where gusset plates impact rocker bearings GK/2016

202	STEEL COLUMN	04-20-2016	20 EA	5	15	0	0
		06-17-2015	20 EA	5	15	0	0

Notes: Mn west approach span columns painted 2003, east in 05
Layered/ speckeled rust forming at west approach span.GK 6/15/2010
Quant. reflects 5 columes per bent.3 bents at west end and 1 bent at east end.
West end columes have some diag. bracing, bent to bent.GK 6/15/2010

Steel columns in approach span bents are in good condition. Some corrosion and minor pack rust is present between columns and diagonal bracing members FC 6/2011.
Corrosion along bottoms of columns at connection points,mid and upper connection points beginning to rust, repainted areas have some minor section loss, but all connections are sound and in proper position. GK 4/14
[2015] No significant change noted.
[2016] Corrosion continues at the bottom sections of columns, under the roadway vs. sidewalk column. 15 in CS2 are Mn. columns.
Pack rust w rust staining exists at top connections.
All plumb with sound connections. GK/2016

515	*STEEL PROTECTIVE COATING*	04-20-2016	5,820 SF	5,790	0	0	30
		06-17-2015	999 SF	250	0	749	0

Notes: [2016]Corrosion continues at the bottom sections of columns.
Pack rust w rust staining exists at top connections. CS4 GK/2016

231	STEEL PIER CAP	04-20-2016	142 LF	127	0	15	0
		06-17-2015	142 LF	0	142	0	0

Notes: [2013-2016] Scattered areas of failed paint with surface corrosion, minor pack rust CS3 at column connections.GK/2016

515	*STEEL PROTECTIVE COATING*	04-20-2016	994 SF	974	0	0	20
		06-17-2015	999 SF	0	0	999	0

Notes: Computed at 7 SF /Ft.
[2016] Scattered areas of failed paint with surface corrosion, minor pack rust/coating failure CS4 at column connections GK/2016

205	REINFORCED CONCRETE COLUMN	04-20-2016	14 EA	0	14	0	0
		06-17-2015	14 EA	0	14	0	0

Notes: Base of columns & web walls are are heavily scaled @ E pier.
The top of the pier webs are cracked & deteriorating w/heavy scaling-should be sealed.
Pier 6, top of concrete web / diaph. is scaling badly, both caps map cracked near center.
The bottom of the columns & web walls are heavily scaled up to 3" deep - 2004 underwater inspection.
2009 FC inspection: 2008 UW report---light scaling with .25 inches to 1 inch penetration and exposed aggregate from top of caissons to 1 foot above top of caissons. Scaling around waterline. JZink 6/10/2009

Pier columns have light spalling and staining. Scaling is prevalent near water line above caissons. Due to concerns about possible pier movement, tilt measurements were taken on east and west faces of all pier columns with a 4' level. The numbers represent amount of tilt over 4 feet, with the direction of tilt (East or West). All readings were small, and could partially be the result of uneven placement of forms when they were cast. Meas. in FC report. FC 6/2011
[2013] The 2012 Under Water report identified Light scaling with ¼-inch typical to 1-inch maximum penetration and exposed aggregate was observed at Piers 2 through 7 on the concrete columns from the top of the caissons to 1 foot above the top of the caisson. At Pier 7, scaling was concentrated near and around the waterline.
Sounded columns at various suspect locations and found no delams. GK 4/14
[2015] No significant change noted.
[2016] Minor to moderate width cracks, along with areas of moderate deterioration, aggregate exposed CS2 for all. 2015 GK/2016

210	REINFORCED CONCRETE PIER WALL	04-20-2016	151 LF	0	106	45	0
		06-17-2015	151 LF	0	129	22	0

Notes: The top of the east pier wall is heavily scaled and deteriorated. The bottom of the east pier wall is map-cracked & spalling-approx. 16 sq. ft..
1st pier br. crew repaired top 8-10 in.
Top of pier walls have heavy scaling FC 6/2011
Pier walls are encased at the bottom with a metal caison with shows signs of corrosion at and below the waterline. GK 5/2012.
[2015] No significant change noted.
[2016] Pier walls exhibit minor to moderate cracks along with scaling of the tops CS2
P1 and at various locations of the other walls, coarse aggregate is heavely exposed with some loose CS3 GK/2016

215	REINFORCED CONCRETE ABUTMENT	04-20-2016	106 LF	0	60	46	0
		06-17-2015	106 LF	36	63	7	0

Notes:

12 SQ. FT. of deteriorated concrete @ the NE corner of east abut. (rebar exposed & corroding). Approx. 5 Lin Ft of parapet @ east abut is spalled & cracked. .
West abut. was patched and repaired by br. crew in 2004. east abutment has numerous cracks w/leaching. End blocks are cracked & deteriorated. E end block has been patched. East seat needs to be flushed.

East abutment has moderate staining, spalling and scaling. A vertical crack extends from the bottom to 3/4 of the way up the abutment face between STR5 & STR6. Between STR4 and STR5, there is a 4' X 2' area of delamination below the bearing seat, and another area about 3 feet in diameter below that. Heavy dirt accumulation on bearing ledge holding moisture against beam ends. West abutment has numerous repairs and timber bracing. FC 6/2011
Bridge crew flushed abut in spring of 2012, and abut. ledge was fairly clean and dry but open grated deck allows material to accumulate, and corrosion to continue. GK 5/2012.
Canada did some concrete repair to the top of the east abut, as the surface was crumbleing.
Delams beggining to spall on east abut below bearing seats CS3 GK 4/14
[2015] 2 sq ft of delam in the about 5' up from the bottom. No other changes noted.

Wingwall notes: 1/8IN diag crack in NE w/wall-concrete continues to deteriorate (to a depth of 6IN+) @ top of this w/wall. The SW w/wall was repaired by bridge crew in 2004. 1/4" diagonal crack in the southwest wingwall has been sealed. Top of north east wingwall continues to spall & delaminate. 20 s.f. concrete top of southeast wingwall cracking with efflorescence. Light to moderate cracking, spalling and scaling. No change from 2009. FC 6/2011.
[2015] No significant change noted.
[2016] Both abuts exhibit moderate to wide cracks with delams in the abut faces," when hammer sounded" numerous repairs to west abutment, are somewhat sound.CS2
Corners of abuts at wingwall connections and wingwalls exhibit moderate cracks w/ East abut wings having a heavy map

220	REINFORCED CONCRETE FOOTING	04-20-2016	142 LF	0	82	60	0
		06-17-2015	160 LF	20	140	0	0

Notes:

Bridge crew repaired bent 1 & 2 footings on W. end in 2004. Footings under bents have light to moderate cracking, spalling and scaling.FC 6/2011 ** Bridge crew made repairs to 2nd & 3rd bent footings on10/03/05. DSH
[2013] Element 382 deleted and Under Water Inspection notes moved to this element. The bent footings consist of reinforced concrete supported by driven pile. Pier 1 and 7 footings consist of reinforced concrete supported by driven pile for each column, the footings are below grade and therefore not included in the rated quantity. [2015] Footing at Bent has 6' feet of spall with exposed rebar.
[2016] Footings are located under Bents.
All 4 footings exhibit moderate to wide cracks. Bents 1 & 2 have been repaired on top full length. Concrete on all footing is spalling along with scaling and coarse aggregate exposed various locations GK/2016

234	REINFORCED CONCRETE PIER CAP	04-20-2016	241 LF	0	145	96	0
		06-17-2015	241 LF	0	145	96	0

Notes: Rebar is exposed on the cap @ the center pier. Spall under base plate-N & S side-7IN X 2IN X 2-1/2IN D on N side of pier #2. Caps are also cracked & scaled w/minor spalls. Mortar pad is breaking up under base plate @ SW cor of pier #2. There is a 6 SQ IN spall on the N end of the bottom of the cap @ pier #3.Approx. 4 sq. ft. of spall top of pier 1. Column caps are cracked.Pier 7 top of web has been overlaid with concrete by Canada. Pier caps have moderate to heavy scaling. Vertical cracks through the cap are present in several locations, mostly on the piers on the Canadian side. FC 6/2011 **Bridge crew repaired concrete cap w/ delam in 10/06., approx. 3yds. of concrete MN side. DSH
[2015] No significant change noted.

228	TIMBER PILING	04-20-2016	4 EA	4	0	0	0
		06-17-2015	4 EA	4	0	0	0

Notes: Minor splitting & checking of timber columns under W appr span.
Minor splitting and checking. No change from 2009 FC 6/2011.
Columns tend to see alot of moisture, moderately weathered in 2014 / GK
[2015] No significant change noted.
[2016] Timber pile continues to weather. All in position, and are sound. GK/2016

235	TIMBER PIER CAP	04-20-2016	30 LF	0	30	0	0
		06-17-2015	30 LF	30	0	0	0

Notes: Minor splitting & checking of timber cap under W appr span.
Minor splitting and checking. Unchanged from 2009. FC 6/2011.
Moisture and sand accumulate on this element. GK 4/14
[2015] No significant change noted.
[2016] Underside of cap is black colored with moisture, wood decay on underside, less than 10% CS2 GK/2016

311	EXPANSION BEARING	04-20-2016	12 EA	0	4	0	8
		06-17-2015	12 EA	0	4	0	8

Notes: Rockers could be adjusted, gusset plates @ pier 3 & 4 " USA portion inspected" are restricting bearing movement-attention is needed to this area."see pictuers in Br. 9412 file" Pier 5 SE rocker " 4 in. nut "coming loose, some movement noticed because of rusting of new paint, pics on file 2007 inspect, in 2010 same cond. Br inspect in 08, by Br. office and follow up with snooper on routine inspect. found that all rocker bearings are in maximum expansion with the gusset plate resting on the bearing causing an indentation of the gusset plate. All bearings were measured" with comps on file in D2 br. office" & will moniter for movement over time and temps to see if they are frozen or moving as designed
2009 FC inspection: All bearings in full expansion tipping to the west on piers 3-6; impacting gusset plates at 8 of the 12 locations (not at piers 1 and 2). Full expansion of these bearings was first noted in 2000; however 1995 inspection notes indicate that the bearing displacement was at about 10 - 15 degrees away from center of span at a temperature of 65 degrees. Exp joints in 1995 had about 1 inch of possible additional expansion. In 2008, pier 1 exp joint was closed tight. Sliding movment of the bearings is also evident at pier 4 (fixed bearing bolt hole elongation) and pier 6 (1/2 inch movement to the east from 2008 to 2009) perhaps indicating substructure movment/settlement eastward. Measurements of bearing movment were taken in 2008 and 2009 to establish evidence of movement. There are signs of bearing movement from 2008 to 2009. Meaurements should continue to be taken, especially during different temperature extremes JZink6/10/2009. Measurement grid on file in N drive. All bearings in full expansion tipping to the west on Piers 3-6; impacting gusset plates at these locations. Bent anchor bolt at Span 4 L0S. Short anchor bolt with exposed internal threads on nut at Span 5 L0S. Marks made on bearing at Span 5 L0S in June 2010 shows evidence of bearin

313	FIXED BEARING	04-20-2016	12 EA	0	12	0	0
		06-17-2015	12 EA	0	12	0	0

Notes: Rusting at various locations. Base plates have pack rust @ the W bents.Br. crew installed new base plates @ west abutment. Base plates @ the E abut have pack rust w/minor sect loss-paint failed.

Bearings are in good condition with minimal deterioration (unchanged from 2009).FC 6/2011.
Bearings were painted and look good but anchor bolts have moderate corrosion along with the bearing seat. GK 4/14
[2015] No significant change noted.
[2016] Minor corrosion of Mn. bearings, is beginning to appear. CS2 GK/2016

855	SECONDARY MEMBERS (SUPER)	04-20-2016	1 EA	0	0	1	0
		06-17-2015	1 EA	0	0	1	0

Notes: 2009 FC inspection: New element Used to rate lateral bracing, truss portal, and sway bracing. Most bracing in all spans is bent or loose due to previous impact damage. Bent bracing includes: Span 3 U4, U6; Span 4 U4. Loose bracing includes: Span 3 U8 to U9, Span 4 U8 to U9 and U1 to U2. Portal damage in Span 5. JZink 6/10/2009

Several portal frames and sway frames are bent due to traffic impact.
Maximum distortion is in Span 1, where both sway frames are bent 8” out of plane. Heavy pitting and corrosion present in horizontal member between bents #2 and #3. FC 6/2011
Sway frames continue to get bumped from high loads and bent members are documented but may be bent slightly more from year to year. GK 5/2012.
Below deck, some of the wind bracing threaded ends are impacting lower chord, bolt heads and rivet heads at various locations. GK 4/14
[2015] Span 6 east portal frame has impact damage and is bent out of plane; also the sway frame at L6-U6N has a bow at the bottom of the sway frame and the sway frame is bent 11 ¾” to the west and 2” up.
Same in 2016, some members bent from past impacts. GK/2016

856	SECONDARY MEMBERS (SUB)	04-20-2016	10 EA	0	10	0	0

Notes: This element refers to the caissons below P2 - P6
[2011] Piers 2-7 have caissons visible above the water line. Visible elements have light to moderate surface corrosion on steel shells and moderate to heavy scaling in concrete surface. See 2008 Underwater Report for further details. FC 6/2011.
Piers 2 through 6 consist of 19 driven pile surrounded by a steel tube filled with concrete. The entire footing is generally submerged and is inspected during scheduled under water inspection. (2008 UW Report - Steel caissons exhibit light to moderate surface corrosion extending from top of caisson to 3.5 feet below waterline. From the channel bottom to 3.5’ below the waterline, the caissons exhibit moderate to heavy surface corrosion 1/ 11/2” diameter to 3” diameter nodules and up to 1/16” deep pitting over 50% of the area. Scour holes undercutting the pier steel caissons (mostly at pier 6) have been noted since the mid-1970. The 1991 underwater inspection report recommended a scour and foundation stability analysis of the channel bottom at pier 6 along with reiprap placement. JZink 6/10/2009)
The 2012 Under Water Report identifies surface corrosion on the caissons up to 3 inches in diameter and 1/16 inch deep. Rip rap was observed around 2 through 6, however a scour hole 8 feet in diameter and 2 feet deep exists at the nose of Pier 6.
Concrete on top of main pier caissons is deteriorated up to 3IN deep.
[2016]Surface corrosion of the steel and concrete exposed on the top is scaled and deteriorated CS2 GK/2016

880	IMPACT DAMAGE	04-20-2016	1 EA	0	1	0	0
		06-17-2015	1 EA	0	1	0	0

Notes: **Doug Zarling & Davis Holthusen inspected traffic impact to guard rail on 3/13/08 N. side (middle of the bridge) accident took place on 3/10/08. Very minor damage and no Repair is needed. DSH

Portal frames and sway frames in all spans have distortion from traffic impact. See note for element #380.FC 6/2011.
[2015] Span 6 east portal frame has impact damage and is bent out of plane; also U9-L10 have some distortion.
[2016]Same in 2016 /GK

881	STEEL SECTION LOSS	04-20-2016	1 EA	0	1	0	0
		06-17-2015	1 EA	0	1	0	0

Notes: 2003 Bridge office report details section loss for MN Approach spans and 3 truss spans. 5 corrections have been identified for installation in 2004.
Heavy section loss in floorbeams and stringers due to pitting is present in many areas. Most section loss has been arrested by cleaning and repainting. FC 6/2011.
[2015] No significant change noted.
[2016] Some small scattered areas of section loss that were arrested with painting are now starting to corrode w/ few holes developing in mn stringers. See element 113 GK/2016

882	STEEL CRACKING	04-20-2016	1 EA	0	1	0	0
		06-17-2015	1 EA	0	1	0	0

Notes: 2009 FC inspection: New smart flag Span 2 Floorbeam 8 had crack-like indication found in 2008 at top cope at south truss connection; ¾" hole drilled to arrest. Additional top cope linear fabrication defects found in 2009 at these locations: Sp2 FB2N, Sp2 FB5S, Sp2 FB8N, Sp3 FB3S, Sp3 FB5N, Sp5 FB2S, Sp5 FB7N, Sp6 FB3S – ¼" (cracked tack weld only), Sp6 FB3N – 1/8" (cracked tack weld only), Sp6 FB4N & S (cracked tack welds only), Sp6 FB5S – 5/8". These areas were marked to be monitored during future inspections. Span 6 FB5S indication does originate from top cope into tack weld, but was marked for future inspection as crack did not extend through thickness of web. Jzink 6/10/2009
2010 inspection these areas were inspected with no propagation of cracks.GK 6/15/2010

Span 2 Floorbeam 8 had crack-like indication found in 2008 at top cope at south truss connection; ¾" hole drilled to arrest. No change to that crack or others observed during this inspection.FC 6/2011
Observed cracked tack welds and drilled area and found no changes in 2012 inspection GK.
2014 two FB's appeared to have crack like indications " See element 152" These areas were marked to be monitored during future inspections. GK 4/14
[2015] No significant change noted.
[2016] Marked areas and all fatigue prone details were closely looked at and no new cracks were observed in this inspection GK/2016

883	CONCRETE SHEAR CRACKING	04-20-2016	1 EA	1	0	0	0
		06-17-2015	1 EA	1	0	0	0

Notes: Use this element to monitor the presence of shear cracking on concrete elements. Pay particular attention to the concrete pier caps.
[2016] No shear cracks observed in 2016/GK

884	SUBSTRUCTURE SETTLEMENT & MVMT	04-20-2016	1 EA	0	1	0	0
		06-17-2015	1 EA	0	1	0	0

Notes: 2009 FC inspection: New smart flag Evidence of continuing substructure settlement/slidng (see element #311). Evidence of abutment or pier tipping not apparent at this time. Monitor during all future inspections. JZink 6/10/2009 All truss rocker bearings tipped to the east. Measurement of pier column slopes indicated little or no tipping (see notes for element #205). Continue to monitor. FC 6/2011.
[2013-2015] Substructure movement may have occurred, however movement cannot be confirmed with rudimentary measurement available during inspections. Recommend survey targets be permanently mounted on each pier to enable more accurate monitoring.
[2016]Bridge is sched. for replacement in 2018 GK/2016

885	SCOUR	04-20-2016	1 EA	0	1	0	0
		06-17-2015	1 EA	0	1	0	0

Notes: There has been a pier scour problem. Monitoring in the past 5 years does not indicate any change. See monitoring plan. 2 2009 FC inspection: Scour depressions exist at Pier 6 (see 2008 Underwater Report) – 6' diameter by 5' deep downstream north caisson and 5' diameter by 3' deep upstream south caisson. Scour issues have been troublesome at this bridge in the past since the mid-1970's – see element #311 notes. JZink 6/10/2009
Scour depressions exist at Pier 6 (see 2008 Underwater Report) – 6' diameter by 5' deep downstream north caisson and 5' diameter by 3' deep upstream south caisson. New underwater inspection will be performed in 2012.FC 6/2011.
[2015] 2012 Underwater Report states: Riprap, 2 foot to 3 foot in diameter, was observed around the perimeters of Piers 2 through 5. At the downstream nose of Pier 6 a scour depression was observed, 8 feet in diameter and up to 2 feet deep. Otherwise large riprap was observed around the perimeter of the caissons at Pier 6. No other changes were noted.
[2016]No debris in channel, sched. for underwater inspection GK/2016
[2016 underwater inspection] - a 4 foot deep by 4 foot diameter scour depression was observed around the downstream column of Pier 6.

891	OTHER BRIDGE SIGNING	04-20-2016	1 EA	0	1	0	0

		06-17-2015	1 EA	0	1	0	0

Notes: Signs Required: Vertical Clearance . Vert clearance signs inplace, 14 ft 8 in. Knee brace signs removed, because knee braces removed.
Vertical clearance signs have minor deterioration but are in place and readable. FC 6/2011.
[2015] [2016] No significant change noted.

892	SLOPES & SLOPE PROTECTION	04-20-2016	1 EA	0	1	0	0
		06-17-2015	1 EA	0	1	0	0

Notes: 2009 FC inspection: Added element 2008 UW Report – downstream sides of caissons, there is minimal ripap. Jzink6/10/2009

According to 2008 Underwater report, the downstream sides of caissons have minimal riprap. New underwater inspection will be performed in 2012. FC 6/2011
A stream x section was preformed in winter of 2011 and found some of the rip rap had migrated downstream of the piers. GK.
[2015] No significant change noted.
[2016] Mn slope has sheet piling holding back soil, both end steep banks w/ moderate erosion CS2 GK/2016

893	GUARDRAIL	04-20-2016	1 EA	0	1	0	0
		06-17-2015	1 EA	0	1	0	0

Notes: Platebeam terminal end has been hit and damaged at the southeast corner. New platebeam installed at the northeast corner, new curb here also.Bolt loose on west rail.
Guardrail on SE corner of bridge has minor damage due to traffic impact. FC 6/2011.
Same in 2014 / GK
[2015] Guardrail end treatments at the Southeast and Northeast are damaged.
[2016] Canada GR repaired, GR has scrapes and minor damage. CS2 GK/2016

894	DECK & APPROACH DRAINAGE	04-20-2016	1 EA	1	0	0	0
		06-17-2015	1 EA	1	0	0	0

Notes: Bridge crew installed sheet pile and drain tile @ west abut. on north bank. drain tile exposed on 8/24/05. DSH
Deck has no drainage system due to open-grid deck. Sheet pile and drain tile on north end of west abutment unchanged from 2009. FC 6/2011.
[2015] No significant change noted.
[2016] CB's in mn approach are functioning GK/2016

895	SIDEWALK, CURB, & MEDIAN	04-20-2016	1 EA	0	1	0	0
		06-17-2015	1 EA	0	1	0	0

Notes: Small void under sidewalk @ SW cor. Sidewalk stringers & planking showing signs of deterioration. Outside face of curbs are spalled w/rebar exposed, whole length of bridge. Inside face of curb @ NE & SW corners heavily scaled. Numerous cracks in curb faces. 1 plank split in sidewalk-2nd span from the W & the 2nd & 3rd spans from the E. There is a 4IN vert lip(new wall on MN side-ok) @ start of the timber walk @ E end. New sidewalk at the southwest corner-new bit in west end in 1997, concrete walk settled 11/2" @ beginning of wood walk in SW corner. Curb fractured from traffic damage at the end of pipe rail-southwest corner. Appr curb scaled from plows-SW corner. Conc walk @ SE cor has settled approx. 3IN-a bit wedge has been placed. 1" opening at sidewalk joint, also settled at wood sidewalk approach.Pier 3 sidewalk slide plate missing 1 of 3 screws holding, plate loose, needs attention. **Br. maint. repaired sidewalk slide plate (screws missing) in 08. DSH
Trees should be pruned/ cut on both east & west ends, north side for snooper bucket access.GK 6/14/2010
Concrete curb is in good condition, with isolated cracking and spalling. Steel stay-in-place form on bottom of curb has extensive pitting, corrosion and rust-through holes. Timber sidewalk has minor cracking and checking, with broken out pieces in some areas. Surface of sidewalk has pitting from snowmobile studs. FC 6/2011
Sidewalk on Mn portion was repaired and or replaced by br. crew. GK 5/2012.
NE and SE curbs continue to deteriorate GK 4/14
[2015] No significant change noted.
[2016] Wooden planks are fastened w/ no loose planks, but continue to weather, w/ minor decay, various locations CS2 GK/2016

899	MISCELLANEOUS ITEMS	04-20-2016	1 EA	0	1	0	0
		06-17-2015	1 EA	0	1	0	0

Notes: Conduit pulled apart on N side-2nd floor beam W of pier #2. 1 light conduit pulled apart on N side(vert member)1st truss span from the E, & 3rd truss span from the E.Top of chain link fence bent in 2 places @ southwest corner.Telephone box on span 4, should have a padlock, " next to sidewalk" 6/09

Conduit along north lower chord has exposed (insulated) wiring between feed conduit, transformer and lighting conduit. This appears to be by design, since it is present at all lighting locations. Feed conduit running along span 6, FB10, has rusted-through holes. FC 6/2011.
[2015] Span 4 at L4N elctical transformer has blown up and there is tar splattered all over.
[2016] Some electrical work has been done to repair electrical system. Corrosion of the conduits continue. CS2 GK/2016

900	PROTECTED SPECIES	04-20-2016	1 EA	1	0	0	0

06-17-2015	1 EA	0	1	0	0

Notes: [2016] No swallows or indications of bats GK/2016

General Notes: Bridge layout =”” USA”” west abut, bent 1, bent 2 , bent 3, Pier 1, P2,P3,P4,P5,P6,P7, bent 4, east abutment ””Canada””

Some pigeon nesting on truss. Swallow nests are inplace. FC INSP-MAY 2000-DIVER INSP-AUG 2000-SEE REPORTS. Inspected with canadian Dept of Province of Ontario & MN. DOT 10/22/2001 snooper inspected USA portion 4/26/2006 GK/DZ & BR.crew, 5/2/07 GK, DZ, & JL/ Snooper Inspect. and with Highlift Canada MTO 9/24-26th/2007 GK & DZ observing " inspect. with Gary Weiss & John Canada MTO" Br. office" ST. Paul" did courtesy reveiw,/ special gusset,inspect June 16th-19th 2008, & D2 did routine snooper inspect. sept. 9th 2008 MN. DOT walk through inspection, USA side 6/09, as fracture crit. crew doing inspection with 2 snoopers and man lift. 6/09 Snooper inspected 6 /14 - 15/ 2010 GK, Mn. DOT & Gary Weiss Canada MOT . FC inspection June 27th - 29th 2011
Snooper inspected 5/1 2012, 4 /29/ 2014 routine

Deck: [5] [2013-2016] No Change

Superstructure: [5] [2013-2016] No Change

Substructure: [5] [2013-2016] No Change

Channel: [6] [2013-2016] No Change

Appr Roadway Alignment: [3] Border xing br. w/ customs facilities alongside roadway.30 mph roadway w/ 15 mph advisory sign as you approach customs.
Approx 10 mph approach speed and fairly steep incline up steel grid deck.
NBI changed from a 7 to a 3 "10 - 20 mph for a typ. vehicle using the roadway " GK/2016

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 9412 **TH 72 OVER RAINY RIVER** **INSP. DATE: 06-17-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
28	STEEL GRID DECK-OPEN	2	06-17-2015	34,053 SF	0	0	34,053	0	0
			04-29-2014	34,053 SF	0	0	34,053	0	0

Notes: |1 grid bar missing in the EBL of truss span #6 near the west end, 2 others missing-same span EBL & WBL. Paint has failed on the grid, US side. Canada painted there Grid in 05 & starting to rust in wheel tracks. There are several broken welds in the grid, Canada side, US side was repaired 6/2010. Bottom of grid and support beams corroded with some pack rust. Grid was tack welded to sliding plates @ piers but pulled apart with 1/8 - 1/4 in gap all the way accross deck @ 3 US center piers,cracked with no gap @ pile bents. **Repaired broken grid bars @ various locations on the US side on2/7/06, 6/16/08, 6/14&15/2010. DSH Numerous loose and missing bars throughout deck. Loose bars rattle under traffic. Widespread surface corrosion throughout deck on west approach and truss spans 1-3.Fc 6/2011 Gridbars broken at various locations but br. crew welds grid on an annual basis. GK 5/2012
[2013] No change noted.
2014 br crew tack welded broken grid bars.
Mn side has surface corrosion, Canada portion has moderate paint failure CS3 GK 4/14
[2015] The first section of deck on Span A6 is loose and deflecting up and down when traffic moves over; condition state quantities where changed to reflect this.|

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	06-17-2015	50 LF	0	50	0	N/A	N/A
			04-29-2014	50 LF	0	50	0	N/A	N/A

Notes: |Bridge has a steel grid deck, with concrete approach panels west end, with bituminous sealant on ends. GK 6/15/10

**Sealed jts. / pourable on 11/09. DSH
Quantity includes poured joints at west edge and along center of concrete approach slab at west end of bridge.FC 6/2011
Poured jts on ends of bridge need sealing|

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	06-17-2015	132 LF	0	132	0	N/A	N/A
			04-29-2014	132 LF	0	132	0	N/A	N/A

Notes: | The welds holding exp. plates to grid deck are cracked & seperated slightly. 6/15/10 GK

2009 FC inspection: Pier 1 joint closed tight JZink 6-10-2009
Pier 1 joint open 1.00” (was reported closed tight in 2009). Other joints open 1.25” to 2.88”FC 6/2011
Pier 1 joint was open slightly but not much room for expansion looking at angles on end before impacting chanfer on angle plate. GK 5/2012
Assembly deck jts are functioning. GK 4/14
[2015] Deck joint measurements were taken at 60° and are as follows: Span 1-2 South 1 3/4" , North 1 3/4", Span 2-3 South 3", North 2 3/4", Span 3-4 South 3 1/4", North 2 3/4", Span 4-5 South 2 1/2", North 2 1/2", Span 5-6 South 1 3/8", North 1 3/16".|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
320	CONC APPR SLAB-BITOL	2	06-17-2015	1 EA	1	0	0	0	N/A
			04-29-2014	1 EA	1	0	0	0	N/A

Notes: |East end of bridge. Good condition with a few minor cracks.FC 6/2011
East approach slab has a moderate crack at centerline GK 4/14
[2015] No significant change noted.

|

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	06-17-2015	1 EA	1	0	0	0	N/A
			04-29-2014	1 EA	1	0	0	0	N/A

Notes: | 20 foot approach panel added to the west end, scaling.
Minor cracks and small spalls developing @ SE corner of west appr. slab. GK 6/15/2010
West end of bridge. Good condition with minor scaling from tire wear.FC 6/2011
Approach slab looks good with the tining being worn away in the wheel tracks and a few minor spalls along the steel edge of deck. GK 4/14
[2015] No significant change noted. |

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 9412 **TH 72 OVER RAINY RIVER** **INSP. DATE: 06-17-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
334	METAL RAIL-COATED	2	06-17-2015	3,855 LF	3,431	424	0	0	0
			04-29-2014	3,855 LF	3,431	424	0	0	0

Notes: | Some areas of paint failure & corrosion on pedestrian railing.Rail seperated at Canada end SE corner GK 6/15/2010
2009 FC inspection: impact damage at southeast Canadian approach. JZink6/10/2009
38 LF in CS3 moved to CS2. Traffic impact damage at SE corner has been repaired.FC 6/2011
Metal br rail has minor corrosion near the bases, and a few scattered areas. GK 4/14
[2015] No significant change noted. |

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	1	06-17-2015	840 LF	0	420	410	10	0
			04-29-2014	840 LF	0	420	410	10	0

Notes: |2009 FC inspection: New element Quantity applies to approach span beams that were once included under the stringer element. Approach Span 1 Beam 2 north face at Pile Bent 1 has new through corrosion in web at splice. Approach Span 2: Beam 3 north face, Beam 4 south face and Beam 2 north face has bottom flange and web surface corrosion. J Zink 6/10/2009
Bridge crew added web splices/ stiffeners to several girders where section loss was most prevelant.GK 6/15/2010
Through corrosion at Bent #1 has been repaired, and web splices added to other areas with large amounts of section loss. Active pitting and corrosion at east end of approach span 6 where girders attach to east abutment.FC 6/2011
Paint failed at a few locations where appears paint thickness was not sufficeant, continues to rust at east abut. GK 5/2012
[2013] No significant change noted.
Bottom flanges continue to rust at abuts.Paint pealing bottom flanges beams 5 & 6 between bent 1 & 2 GK 4/14
[2015] Span A4 Beam 3 has a 2 3/4" crack in web just above bottom flange above Pier 1 (Photo 69).|

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	06-17-2015	8,133 LF	3,067	4,066	900	100	0
			04-29-2014	8,133 LF	3,067	4,066	900	100	0

Notes: |Paint system new in 2003 on west " US " 1/2 of bridge. Paint system is new 2005 on east " Canada " 1/2 of bridge. corrosion and section loss is most prevalent at floor beam connections.Stringer conection plates,corrosion behind causing deformation of the plates. . 4th base-south fascia stringer west span-electricians drilled 1/4" hole in web. Top flange of sidewalk stringer is rusting under conc curb on S side. East end Span #1, 3rd. stringer from north has 2 popped riviets @ floor beam connection. Paint failing small 5 ft area bottom of stringer,4th from the south mid span, 1st span.Br. crew added gusset plates to several stringers over sect. loss areas, various locations. Approach span 1, S1, bolted repair, 50 % sect. loss.S4, severe pitting bottom flange. App. span 2, S2, pitting and hole in web at bent 1. App. span 4, S2,S3,& S4,pockets of pitting in web over east pier. Truss span 1, bay 5, S4 &S5, light to severe pitting of bottom flanges.Bay 8,S3, moderate pitting over FB9.Bay 10, S1-S5, moderate to severe pittingt on web & bottom flanges, web repair of S3,one rivit missing on S5. Truss span 2, bay 1, S3 & S4, ligth to severe pitting, Bay 3 & 4, S2-S5, light to moderate pitting, web strengh, repair, of S3 @ FB 4.Bay 5, S3,severe sect. loss with holes. Bay 6, S4, light to moderate pitting.Bay 10, S2, web repair, strengh plates, added due to severe sect. loss @ FB 11. Truss span 3, bays 9&10, S3 & S4, light to moderate pitting. Inspect. in 08 detected some stringers in spans 1-3 have surface corosion. 2009 FC inspection: Stringer quantities apply only to truss stringers. Sapn 2 corrosion on Stringer 3 near FB4; new web through corrosion---two 1/4 " diameter holes. Span 2 corrosion on Stringer 4 midpoint bottom flange corrosion.JZink 6/10/2009
Areas of through corrosion in web reported previously have been arrested by cleaning and repainting. Isolated areas of active pitting in bottom flange of STR5, Span

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 9412 **TH 72 OVER RAINY RIVER** **INSP. DATE: 06-17-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
121	P/STL THRU TRUSS/BOT	2	06-17-2015	2,324 LF	0	2,324	0	0	0
			04-29-2014	2,324 LF	0	2,324	0	0	0

Notes: |West 1/2 painted 2003. East 1/2 -Painted by Canada in 2005. Pack rust on some gusset plates on the bottom chord. Pack rust between some connection points @ piers. There are cracked welds between gusset plate & end post channel on the south side @ the W end of the E truss and several other truss end locations(low tension areas). These cracks do not propagate into the structural members. 1 broken rivet at the sidewalk cantilever at the end of the floor beam side at the 4th pier from the U.S. **Bridge Maint. completed the spot painting of the gusset plates (US Side) the wk. of 6/22/09. The paint system that was done in 2003 was still looking good. A couple of areas were touched up with paint and (all gusset seams on the lower cord were caulked to repel moisture. DSH Isolated areas of paint failure, but underlying primer still intact. A few locations (Span 5 @ L9S, Span 6 @ L9N) show evidence of plug-welded mis- drilled holes in lower chord member (also noted in 2009).FC 6/2011
2012 inspection looked at bottom chord closely and no problems found.Paint failing at ends of chords under jts, in areas that were hard to blast and paint, behind rivet heads, and rockers. GK 5/2012.
[2013] The parallel faces of the horizontal legs of the angles were not cleaned and painted and surface corrosion exists. S
All connections are sound.
Wind braceing impacting lower chord span 6, FB2 east. GK 4/14
[2015] No significant change noted.|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
126	P/STL THRU TRUSS/TOP	2	06-17-2015	2,324 LF	1,785	346	193	0	0
			04-29-2014	2,324 LF	1,785	346	193	0	0

Notes: |High loads were impacting knee braces so all knee braces removed. Corrosion beginning at the interface of vertical members. Minor surface corrosion of upper portion of truss. Span #1 , vert. #2 no. truss,cracked tack welds at diag. knee brace, not propagating.Diag. #12, of the no. truss,"fabrication defect, as per disscussion with br. office" in inner flange at midpoint marked for propagation / monitering.Inpact damage of trans. bracing.1st trans.brace bent approx. 7 inches,connect. bent at truss connection , 2d & 3rd trans braces are bent,impacted,clip angles bent also. 6/09 Span #2, rivet missing @ diag. brace connection on vert #1 of no. truss.Minor impact damage of trans. bracing. Span #3, cracked tack welds @ diag. bracing, knee brace locations.Vert #2 so. truss, minor impact damage to trans. bracing. Approx 9-08-08 a truck with a load of hay, impacted trans. bracing,span 6 east U4 vert. Trans. bracing bent and pulled away from U4, bending angle connecting,cracking some tack welds and popping one rivit. Three of the diag. braces bent and some minor tearing of the edge of U4 member, D2 br. crew replaced rivet with a bolt.GK 08 Canada br. personel notified and will follow up with there own inspect. & repair. 2009 FC inspection: Paint failure and surface corrosion is prevalent on most rivet heads. Built-up members exhibit localized areas of pack rust which are starting to cause spreading. JZink6/10/2009 Paint failure and surface corrosion is prevalent on most rivet heads. Built-up members exhibit localized areas of pack rust which are starting to cause minor scalloping. No change from 2009. Span 6 member U1S-L1S has slight bend in flange near bottom, probably due to traffic impact. Span 4 member U4NL4N has plug-welded mis-drilled holes in lower portion near L4N (previously noted in 2009).FC 6/2011 Paint faliure bottom side Span 2 SE GK 5/2012. [2013] There are some areas of paint failure with minor surfac

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 9412 **TH 72 OVER RAINY RIVER** **INSP. DATE: 06-17-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
152	PAINT STL FLOORBEAM	2	06-17-2015	1,744 LF	174	1,220	350	0	0
			04-29-2014	1,744 LF	174	1,220	350	0	0

Notes: |West 1/2 repainted in 2003. East 1/2 Painted by Canada in 2005- Was a considerable amount of layered rust w/sect loss. Paint on floor beams & stringers was in very poor condition w/pack rust forming on both flanges section loss in small areas near mid-point. Knee braces (stringer to floor beam) at the east pier have pack rust between angles causing minor deformation. See section loss report in file - 2003.. Between piers 3 & 4 2nd. stringer from the south,2 1/2 in. holes drilled in bottom flange, Canada plated floorbeams over piers 5 & 6 US plated bottom flanges of some floor beams spans 1 & 2. Truss span 1,FB 1 light to moderate pitting of web and bottom flange at center of span.FB4 cracked tack weld so. side,no propagation.FB 7, 8 , 9 & 11,light to moderate pitting on bottom flanges. Truss span 2, FB 1, moderate to severe pitting,FB 2-4, light to moderate pitting of top & bottom flanges, FB 5-7, moderate to severe pitting, strengh. plates bolted to bottom flanges.FB 10,11, moderate to severe pitting on flanges. Truss span 3, FB 5,7,9,10 & 11, light to moderate pitting of flanges and webs. The floor beams have been repainted arresting most corrosion : however there are some connections with active pack rust, & bottom flanges are starting to corrode with paint pealing, most noticeably near west end spans 1 & 2.GK 6/15/2010 Floor beam 8 span 2 had a crack like indication that was stop drilled by D2 br. crew. Many floorbeams have moderate to severe pitting in lower webs and flanges, which has been arrested by repainting. Several floorbeams reinforced with bolted cover plates, with paint failure and active corrosion occurring on Span 4 FB10. Active corrosion present under bottom flange connection to truss panel points at many locations. Span 2, FB8, south end has a crack in the top flange cope that was drilled out in 2008. Other flange copes and tack welds should be monitored for possible cracking.FC 6/2011 2012 insp

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
423	GUSSET PLATE (PAINT)	1	06-17-2015	276 EA	276	0	0	0	0
			04-29-2014	276 EA	276	0	0	0	0

Notes: |2009 FC inspection All gussets exhibit minimal to no pack rust and no paint failure.
Gussets at Piers 3-6 are impacted due to fully expanded bearings (see element #967 notes). Tack welds are present on gusset plate interfaces mainly at the pier locations. Some are cracked, but none have propogated into the base metal. JZink 6/10/2009.
** A (3) stage spot painting of gussets was completed the wk. of 6/22/09. DSH
Several outer gusset plates at L4N locations have plug-welded misdrilled holes (also noted in 2009)FC 6/2011.
No problems noted in 2014 GK
[2015] No significant change noted.|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
380	SECONDARY ELEMENTS	1	06-17-2015	1 EA	0	0	1	0	N/A
			04-29-2014	1 EA	0	0	1	0	N/A

Notes: |2009 FC inspection: New element Used to rate lateral bracing, truss portal, and sway bracing. Most bracing in all spans is bent or loose due to previous impact damage. Bent bracing includes: Span 3 U4, U6; Span 4 U4. Loose bracing includes: Span 3 U8 to U9, Span 4 U8 to U9 and U1 to U2. Portal damage in Span 5. JZink 6/10/2009

Several portal frames and sway frames are bent due to traffic impact.
Maximum distortion is in Span 1, where both sway frames are bent 8” out of plane. Heavy pitting and corrosion present in horizontal member between bents #2 and #3. FC 6/2011
Sway frames continue to get bumped from high loads and bent members are documented but may be bent slightly more from year to year. GK 5/2012.
Below deck, some of the wind bracing threaded ends are impacting lower chord, bolt heads and rivet heads at various locations. GK 4/14
[2015] Span 6 east portal frame has impact damage and is bent out of plane; also the sway frame at L6-U6N has a bow at the bottom of the sway frame and the sway frame is bent 11 ¾” to the west and 2” up. |

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 9412 **TH 72 OVER RAINY RIVER** **INSP. DATE: 06-17-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
311	EXPANSION BEARING	2	06-17-2015	12 EA	0	4	8	N/A	N/A
			04-29-2014	12 EA	0	4	8	N/A	N/A

Notes: |Rockers could be adjusted, gusset plates @ pier 3 & 4 " USA portion inspected" are restricting bearing movement-attention is needed to this area."see pictuers in Br. 9412 file" Pier 5 SE rocker " 4 in. nut "coming loose, some movement noticed because of rusting of new paint, pics on file 2007 inspect, in 2010 same cond. Br inspect in 08, by Br. office and follow up with snooper on routine inspect. found that all rocker bearings are in maximum expansion with the gusset plate resting on the bearing causing an indentation of the gusset plate. All bearings were measured" with comps on file in D2 br. office" & will moniter for movement over time and temps to see if they are frozen or moving as designed 2009 FC inspection: All bearings in full expansion tipping to the west on piers 3-6; impacting gusset plates at 8 of the 12 locations (not at piers 1 and 2). Full expansion of these bearings was first noted in 2000; however 1995 inspection notes indicate that the bearing displacement was at about 10 - 15 degrees away from center of span at a temperature of 65 degrees. Exp joints in 1995 had about 1 inch of possible additional expansion. In 2008, pier 1 exp joint was closed tight. Sliding movment of the bearings is also evident at pier 4 (fixed bearing bolt hole elongation) and pier 6 (1/2 inch movement to the east from 2008 to 2009) perhaps indicating substructure movment/settlement eastward. Measurements of bearing movment were taken in 2008 and 2009 to establish evidence of movement. There are signs of bearing movement from 2008 to 2009. Meaurements should continue to be taken, especially during different temperature extremes JZink6/10/2009. Measurement grid on file in N drive. All bearings in full expansion tipping to the west on Piers 3-6; impacting gusset plates at these locations. Bent anchor bolt at Span 4 L0S. Short anchor bolt with exposed internal threads on nut at Span 5 L0S. Marks made on bearing

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
313	FIXED BEARING	2	06-17-2015	12 EA	0	12	0	N/A	N/A
			04-29-2014	12 EA	0	12	0	N/A	N/A

Notes: | Rusting at various locations. Base plates have pack rust @ the W bents.Br. crew installed new base plates @ west abutment. Base plates @ the E abut have pack rust w/minor sect loss-paint failed.

Bearings are in good condition with minimal deterioration (unchanged from 2009).FC 6/2011.
Bearings were painted and look good but anchor bolts have moderate corrosion along with the bearing seat. GK 4/14
[2015] No significant change noted.|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
202	PAINT STL COLUMN	2	06-17-2015	20 EA	5	15	0	0	0
			04-29-2014	20 EA	5	15	0	0	0

Notes: | Mn west approach span columns painted 2003, east in 05
Layered/ speckeled rust forming at west approach span.GK 6/15/2010
Quant. reflects 5 columes per bent.3 bents at west end and 1 bent at east end.
West end columes have some diag. bracing, bent to bent.GK 6/15/2010

Steel columns in approach span bents are in good condition. Some corrosion and minor
pack rust is present between columns and diagonal bracing members FC 6/2011.
Corrosion along bottoms of columns at connection points,mid and upper connection points beginning to rust, repainted areas have some minor section loss, but all connections are sound and in proper position. GK 4/14
[2015] No significant change noted. |

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 9412 **TH 72 OVER RAINY RIVER** **INSP. DATE: 06-17-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
205	CONCRETE COLUMN	2	06-17-2015	14 EA	0	14	0	0	N/A
			04-29-2014	14 EA	0	14	0	0	N/A

Notes: |Base of columns & web walls are are heavily scaled @ E pier.
The top of the pier webs are cracked & deteriorating w/heavy scaling-should be sealed.
Pier 6, top of concrete web / diaph. is scaling badly, both caps map cracked near center.
The bottom of the columns & web walls are heavily scaled up to 3" deep - 2004 underwater inspection.
2009 FC inspection: 2008 UW report---light scaling with .25 inches to 1 inch penetration and exposed aggregate from top of caissons to 1 foot above top of caissons. Scaling around waterline. JZink 6/10/2009

Pier columns have light spalling and staining. Scaling is prevalent near water line above caissons. Due to concerns about possible pier movement, tilt measurements were taken on east and west faces of all pier columns with a 4' level. The numbers represent amount of tilt over 4 feet, with the direction of tilt (East or West). All readings were small, and could partially be the result of uneven placement of forms when they were cast. Meas. in FC report. FC 6/2011
[2013] The 2012 Under Water report identified Light scaling with ¼-inch typical to 1-inch maximum penetration and exposed aggregate was observed at Piers 2 through 7 on the concrete columns from the top of the caissons to 1 foot above the top of the caisson. At Pier 7, scaling was concentrated near and around the waterline.
Sounded columns at various suspect locations and found no delams. GK 4/14
[2015] No significant change noted. |

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
206	TIMBER COLUMN	2	06-17-2015	4 EA	4	0	0	0	N/A
			04-29-2014	4 EA	4	0	0	0	N/A

Notes: | Minor splitting & checking of timber columns under W appr span.
Minor splitting and checking. No change from 2009 FC 6/2011.
Columns tend to see alot of moisture, moderately weathered in 2014 / GK
[2015] No significant change noted.|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
210	CONCRETE PIER WALL	2	06-17-2015	151 LF	0	129	22	0	N/A
			04-29-2014	151 LF	0	129	22	0	N/A

Notes: | The top of the east pier wall is heavily scaled and deteriorated. The bottom of the east pier wall is map-cracked & spalling-approx. 16 sq. ft..
1st pier br. crew repaired top 8-10 in.
Top of pier walls have heavy scalingFC 6/2011
Pier walls are encased at the bottom with a metal caison with shows signs of corrosion at and below the waterline. GK 5/2012.
[2015] No significant change noted.|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
215	CONCRETE ABUTMENT	2	06-17-2015	66 LF	26	33	7	0	N/A
			04-29-2014	66 LF	26	33	7	0	N/A

Notes: | 12 SQ. FT. of deteriorated concrete @ the NE corner of east abut. (rebar exposed & corroding). Approx. 5 Lin Ft of parapet @ east abut is spalled & cracked. .
West abut. was patched and repaired by br. crew in 2004. east abutment has numerous cracks w/leaching. End blocks are cracked & deteriorated. E end block has been patched. East seat needs to be flushed.

East abutment has moderate staining, spalling and scaling. A vertical crack extends from the bottom to 3/4 of the way up the abutment face between STR5 & STR6. Between STR4 and STR5, there is a 4' X 2' area of delamination below the bearing seat, and another area about 3 feet in diameter below that. Heavy dirt accumulation on bearing ledge holding moisture against beam ends. West abutment has numerous repairs and timber bracing. FC 6/2011
Bridge crew flushed abut in spring of 2012, and abut. ledge was fairly clean and dry but open grated deck allows material to accumulate, and corrosion to continue. GK 5/2012.
Canada did some concrete repair to the top of the east abut, as the surface was crumbleing.
Delams beggining to spall on east abut below bearing seats CS3 GK 4/14
[2015] 2 sq ft of delam in the about 5' up from the bottom. No other changes noted.|

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 9412 **TH 72 OVER RAINY RIVER** **INSP. DATE: 06-17-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
220	CONCRETE FOOTING	2	06-17-2015	16 EA	2	14	0	0	N/A
			04-29-2014	16 EA	2	14	0	0	N/A

Notes: |Bridge crew repaired bent 1 & 2 footings on W. end in 2004. Footings under bents have light to moderate cracking, spalling and scaling.FC 6/2011 ** Bridge crew made repairs to 2nd & 3rd bent footings on10/03/05. DSH [2011] Piers 2-7 have caissons visible above the water line. Visible elements have light to moderate surface corrosion on steel shells and moderate to heavy scaling in concrete surface. See 2008 Underwater Report for further details. FC 6/2011.
[2013] Element 382 deleted and Under Water Inspection notes moved to this element. The bent footings consist of reinforced concrete supported by driven pile. Pier 1 and 7 footings consist of reinforced concrete supported by driven pile for each column, the footings are below grade and therefore not included in the rated quantity. piers 2 through 6 consist of 19 driven pile surrounded by a steel tube filled with concrete. The entire footing is generally submerged and is inspected during scheduled under water inspection. (2008 UW Report - Steel caissons exhibit light to moderate surface corrosion extending from top of caisson to 3.5 feet below waterline. From the channel bottom to 3.5' below the waterline, the caissons exhibit moderate to heavy surface corrosion 1/ 11/2" diameter to 3" diameter nodules and up to 1/16" deep pitting over 50% of the area. Scour holes undercutting the pier steel caissons (mostly at pier 6) have been noted since the mid-1970. The 1991 underwater inspection report recommended a scour and foundation stability analysis of the channel bottom at pier 6 along with reiprap placement. JZink 6/10/2009) The 2012 Under Water Report identifies surface corrosion on the caissons up to 3 inches in diameter and 1/16 inch deep. Rip rap was observed around 2 through 6, however a scour hole 8 feet in diameter and 2 feet deep exists at the nose of Pier 6.
[2015] Footing at Bent has 6' feet of spall with exposed rebar. |

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
231	PAINTED STEEL CAP	2	06-17-2015	142 LF	0	142	0	0	0
			04-29-2014	142 LF	0	142	0	0	0

Notes: |[2013-2015] Scattered areas of failed paint with surface corrosion.|

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	06-17-2015	241 LF	0	145	96	0	N/A
			04-29-2014	241 LF	0	145	96	0	N/A

Notes: |Concrete on top of main pier caissons is deteriorated up to 3IN deep. Rebar is exposed on the cap @ the center pier. Spall under base plate-N & S side-7IN X 2IN X 2-1/2IN D on N side of pier #2. Caps are also cracked & scaled w/minor spalls. Mortar pad is breaking up under base plate @ SW cor of pier #2. There is a 6 SQ IN spall on the N end of the bottom of the cap @ pier #3.Approx. 4 sq. ft. of spall top of pier 1. Column caps are cracked.Pier 7 top of web has been overlaid with concrete by Canada. Pier caps have moderate to heavy scaling. Vertical cracks through the cap are present in several locations, mostly on the piers on the Canadian side. FC 6/2011 **Bridge crew repaired concrete cap w/ delam in 10/06., approx. 3yds. of concrete MN side. DSH
[2015] No significant change noted.|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
235	TIMBER CAP	2	06-17-2015	30 LF	30	0	0	0	N/A
			04-29-2014	30 LF	30	0	0	0	N/A

Notes: | Minor splitting & checking of timber cap under W appr span.
Minor splitting and checking. Unchanged from 2009. FC 6/2011.
Moisture and sand accumulate on this element. GK 4/14
[2015] No significant change noted.|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
387	CONCRETE WINGWALL	2	06-17-2015	4 EA	1	3	0	0	N/A
			04-29-2014	4 EA	1	3	0	0	N/A

Notes: | 1/8IN diag crack in NE w/wall-concrete continues to deteriorate (to a depth of 6IN+) @ top of this w/wall. The SW w/wall was repaired by bridge crew in 2004. 1/4" diagonal crack in the southwest wingwall has been sealed. Top of north east wingwall continues to spall & delaminate. 20 s.f. concrete top of southeast wingwall cracking with efflorescence.
Light to moderate cracking, spalling and scaling. No change from 2009. FC 6/2011.
[2015] No significant change noted.|

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 9412 **TH 72 OVER RAINY RIVER** **INSP. DATE: 06-17-2015**

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	1	06-17-2015	1 EA	1	0	0	N/A	N/A
			04-29-2014	1 EA	1	0	0	N/A	N/A

Notes: |2009 FC inspection: New smart flag Span 2 Floorbeam 8 had crack-like indication found in 2008 at top cope at south truss connection; ¾" hole drilled to arrest. Additional top cope linear fabrication defects found in 2009 at these locations: Sp2 FB2N, Sp2 FB5S, Sp2 FB8N, Sp3 FB3S, Sp3 FB5N, Sp5 FB2S, Sp5 FB7N, Sp6 FB3S – ¼" (cracked tack weld only), Sp6 FB3N – 1/8" (cracked tack weld only), Sp6 FB4N & S (cracked tack welds only), Sp6 FB5S – 5/8". These areas were marked to be monitored during future inspections. Span 6 FB5S indication does originate from top cope into tack weld, but was marked for future inspection as crack did not extend through thickness of web. Jzink 6/10/2009
2010 inspection these areas were inspected with no propagation of cracks.GK 6/15/2010

Span 2 Floorbeam 8 had crack-like indication found in 2008 at top cope at south truss connection; ¾" hole drilled to arrest. No change to that crack or others observed during this inspection.FC 6/2011
Observed cracked tack welds and drilled area and found no changes in 2012 inspection GK.
2014 two FB's appeared to have crack like indications " See element 152" These areas were marked to be monitored during future inspections. GK 4/14
[2015] No significant change noted. |

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
357	PACK RUST	2	06-17-2015	1 EA	0	1	0	0	N/A
			04-29-2014	1 EA	0	1	0	0	N/A

Notes: | Pack rust @ bott chord connection points

Minor pack rust distortion (1/16" or less) is present between some gusset plates and lower chord.
Pack rust up to 1/4" present between horizontal shelf plates and floorbeams. A few stringer splice plates over floorbeams have pack rust distortion of 1/8" or less.FC 6/2011
Staining from pack rust behind plates. GK 5/2012.
Pier 2 and Pier 3 west appeared to have the heaviest pack rust between the shelf plate and floorbeam GK 4/14
[2015] No significant change noted. |

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
360	SETTLEMENT	1	06-17-2015	2 EA	0	2	0	N/A	N/A
			04-29-2014	2 EA	0	2	0	N/A	N/A

Notes: |2009 FC inspection: New smart flag Evidence of continuing substructure settlement/slidng (see element #311). Evidence of abutment or pier tipping not apparent at this time. Monitor during all future inspections. JZink 6/10/2009 All truss rocker bearings tipped to the east. Measurement of pier column slopes indicated little or no tipping (see notes for element #205). Continue to monitor. FC 6/2011.
[2013-2015] Substructure movement may have occurred, however movement cannot be confirmed with rudimentary measurement available during inspections. Recommend survey targets be permanently mounted on each pier to enable more accurate monitoring.|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
361	SCOUR	2	06-17-2015	1 EA	0	1	0	N/A	N/A
			04-29-2014	1 EA	0	1	0	N/A	N/A

Notes: | There has been a pier scour problem. Monitoring in the past 5 years does not indicate any change. See monitoring plan. 2
2009 FC inspection: Scour depressions exist at Pier 6 (see 2008 Underwater Report) – 6' diameter by 5' deep downstream north caisson and 5' diameter by 3' deep upstream south caisson. Scour issues have been troublesome at this bridge in the past since the mid-1970's – see element #311 notes. JZink 6/10/2009
Scour depressions exist at Pier 6 (see 2008 Underwater Report) – 6' diameter by 5' deep downstream north caisson and 5' diameter by 3' deep upstream south caisson. New underwater inspection will be performed in 2012.FC 6/2011.
[2015] 2012 Underwater Report states: Riprap, 2 foot to 3 foot in diameter, was observed around the perimeters of Piers 2 through 5. At the downstream nose of Pier 6 a scour depression was observed, 8 feet in diameter and up to 2 feet deep. Otherwise large riprap was observed around the perimeter of the caissons at Pier 6. No other changes were noted.|

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 9412 **TH 72 OVER RAINY RIVER** **INSP. DATE: 06-17-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
362	TRAFFIC IMPACT	2	06-17-2015	1 EA	0	1	0	N/A	N/A
			04-29-2014	1 EA	0	1	0	N/A	N/A

Notes: |**Doug Zarling & Davis Holthusen inspected traffic impact to guard rail on 3/13/08 N. side (middle of the bridge) accident took place on 3/10/08. Very minor damage and no Repair is needed. DSH

Portal frames and sway frames in all spans have distortion from traffic impact. See note for element #380.FC 6/2011.
[2015] Span 6 east portal frame has impact damage and is bent out of plane; also U9-L10 have some distorion.|

363	SECTION LOSS	2	06-17-2015	1 EA	0	1	0	0	N/A
			04-29-2014	1 EA	0	1	0	0	N/A

Notes: | 2003 Bridge office report details section loss for MN Approach spans and 3 truss spans. 5 corrections have been identified for installation in 2004.
Heavy section loss in floorbeams and stringers due to pitting is present in many areas. Most section loss has been arrested by cleaning and repainting. FC 6/2011.
[2015] No significant change noted.|

964	CRITICAL FINDING	2	06-17-2015	1 EA	1	0	N/A	N/A	N/A
			04-29-2014	1 EA	1	0	N/A	N/A	N/A

Notes: | DO NOT DELETE THIS CRITICAL FINDING SMART FLAG.
No critical findings were identified during this inspection FC 6/2011.
[2015] No critical findings were noted.|

966	FRACTURE CRITICAL	2	06-17-2015	1 EA	0	1	0	N/A	N/A
			04-29-2014	1 EA	0	1	0	N/A	N/A

Notes: |Do Not Remove. See in-depth report for location of F/C members.
2009 FC inspection: Prior to 2003, section loss was prevalent on the bottom flange of numerous truss span floorbeams. As a result, UT thickness testing was preformed in 2003 and repairs were made to many of the bottom flanges by way of bolted cover plates along the bottom flange. The floorbeam top copes at the truss connections are stress risers that should also be monitored during all future inspections. Jzink6/10/2009
[2015] No significant change noted.

Fracture-critical floorbeams have significant section loss, but this has been arrested by cleaning and repainting. Floorbeams with most significant loss have been reinforced with bolted cover plates. FC 6/2011.|

981	SIGNING	2	06-17-2015	1 EA	0	1	0	0	0
			04-29-2014	1 EA	0	1	0	0	0

Notes: |Signs Required: Vertical Clearance . Vert clearance signs inplace, 14 ft 8 in. Knee brace signs removed, because knee braces removed.
Vertical clearance signs have minor deterioration but are in place and readable. FC 6/2011.
[2015] No significant change noted.
|

982	GUARDRAIL	2	06-17-2015	1 EA	0	1	0	N/A	N/A
			04-29-2014	1 EA	0	1	0	N/A	N/A

Notes: | Platebeam terminal end has been hit and damaged at the southeast corner. New platebeam installed at the northeast corner, new curb here also.Bolt loose on west rail.
Guardrail on SE corner of bridge has minor damage due to traffic impact. FC 6/2011.
Same in 2014 / GK
[2015] Guardrail end treatments at the Southeast and Northeast are damaged.|

984	DRAINAGE	2	06-17-2015	1 EA	1	0	0	N/A	N/A
			04-29-2014	1 EA	1	0	0	N/A	N/A

Notes: | Bridge crew installed sheet pile and drain tile @ west abut. on north bank. drain tile exposed on 8/24/05. DSH
Deck has no drainage system due to open-grid deck. Sheet pile and drain tile on north end of west abutment unchanged from 2009. FC 6/2011.
[2015] No significant change noted.|

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 9412 **TH 72 OVER RAINY RIVER** **INSP. DATE: 06-17-2015**

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
985	SLOPES	1	06-17-2015	1 EA	0	1	0	N/A	N/A
			04-29-2014	1 EA	0	1	0	N/A	N/A

Notes: |2009 FC inspection: Added element 2008 UW Report – downstream sides of caissons, there is minimal ripap. Jzink6/10/2009

According to 2008 Underwater report, the downstream sides of caissons have minimal riprap. New underwater inspection will be performed in 2012. FC 6/2011
A stream x section was preformed in winter of 2011 and found some of the rip rap had migrated downstream of the piers. GK.
[2015] No significant change noted.|

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	06-17-2015	1 EA	0	1	0	N/A	N/A
			04-29-2014	1 EA	0	1	0	N/A	N/A

Notes: | Small void under sidewalk @ SW cor. Sidewalk stringers & planking showing signs of deterioration. Outside face of curbs are spalled w/rebar exposed, whole length of bridge. Inside face of curb @ NE & SW corners heavily scaled. Numerous cracks in curb faces. 1 plank split in sidewalk-2nd span from the W & the 2nd & 3rd spans from the E. There is a 4IN vert lip(new wall on MN side-ok) @ start of the timber walk @ E end. New sidewalk at the southwest corner-new bit in west end in 1997, concrete walk settled 11/2" @ beginning of wood walk in SW corner. Curb fractured from traffic damage at the end of pipe rail-southwest corner. Appr curb scaled from plows-SW corner. Conc walk @ SE cor has settled approx. 3IN-a bit wedge has been placed. 1" opening at sidewalk joint, also settled at wood sidewalk approach.Pier 3 sidewalk slide plate missing 1 of 3 screws holding, plate loose, needs attention. **Br. maint. repaired sidewalk slide plate (screws missing) in 08. DSH
Trees should be pruned/ cut on both east & west ends, north side for snooper bucket access.GK 6/14/2010
Concrete curb is in good condition, with isolated cracking and spalling. Steel stay-in-place form on bottom of curb has extensive pitting, corrosion and rust-through holes. Timber sidewalk has minor cracking and checking, with broken out pieces in some areas. Surface of sidewalk has pitting from snowmobile studs. FC 6/2011
Sidewalk on Mn portion was repaired and or replaced by br. crew. GK 5/2012.
NE and SE curbs continue to deteriorate GK 4/14
[2015] No significant change noted.|

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	06-17-2015	1 EA	0	1	0	N/A	N/A
			04-29-2014	1 EA	0	1	0	N/A	N/A

Notes: |Conduit pulled apart on N side-2nd floor beam W of pier #2. 1 light conduit pulled apart on N side(vert member)1st truss span from the E, & 3rd truss span from the E.Top of chain link fence bent in 2 places @ southwest corner.Telephone box on span 4, should have a padlock, " next to sidewalk" 6/09

Conduit along north lower chord has exposed (insulated) wiring between feed conduit, transformer and lighting conduit. This appears to be by design, since it is present at all lighting locations. Feed conduit running along span 6, FB10, has rusted-through holes. FC 6/2011.
[2015] Span 4 at L4N electical transformer has blown up and there is tar splattered all over.|

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
967	GUSSET DISTORTION	1	06-17-2015	1 EA	0	1	0	0	N/A
			04-29-2014	1 EA	0	1	0	0	N/A

Notes: |2009 FC inspection: Added element Most bottom chord and a few upper chord gusset plates exhibit free edge distortion up to 1/8” attributed to fit-up or very minor pack rust. Span 6 L10N inside gusset is bowed out slightly more than 1/8” that is not attributed to pack rust or fit-up. Possibly due to impact of gusset on fully expanded bearing. This type of distortion should be monitored in the future for all pier gussets due to the impacted gussets. JZink6/10/2009
Most bottom chord and a few upper chord gusset plates exhibit free edge distortion up to 1/8” due to fit-up or very minor pack rust. Eight gusset plate connections (L0S & L0N on spans 3-6) have gouges due to impact from rocker bearings. FC 6/2011.
[2015] There is a bulge at Span 6 M3N Exterior Gusset Plate .125" bulge between members L6-M3 & U6-M3 appears to have been caused by impacts to the back.|

MINNESOTA BRIDGE INSPECTION REPORT
OLD ELEMENT SYSTEM

07/12/2017

Inspected by: DISTRICT 2

BRIDGE 9412 **TH 72 OVER RAINY RIVER** **INSP. DATE: 06-17-2015**

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 layout =”” USA”” west abut, bent 1, bent 2 , bent 3, Pier 1, P2,P3,P4,P5,P6,P7, bent 4, east abutment ””Canada””

Some pigeon nesting on truss. Swallow nests are inplace. FC INSP-MAY 2000-DIVER INSP-AUG 2000-SEE REPORTS. Inspected with canadian Dept of Province of Ontario & MN. DOT 10/22/2001 snooper inspected USA portion 4/26/2006 GK/DZ & BR.crew, 5/2/07 GK, DZ, & JL/ Snooper Inspect. and with Highlift Canada MTO 9/24-26th/2007 GK & DZ observing " inspect. with Gary Weiss & John Canada MTO" Br. office" ST. Paul" did courtesy reveiw,/ special gusset,inspect June 16th-19th 2008, & D2 did routine snooper inspect. sept. 9th 2008 MN. DOT walk through inspection, USA side 6/09, as fracture crit. crew doing inspection with 2 snoopers and man lift. 6/09 Snooper inspected 6 /14 - 15/ 2010 GK, Mn. DOT & Gary Weiss Canada MOT .
FC inspection June 27th - 29th 2011
Snooper inspected 5/1 2012, 4 /29/ 2014 routine

APPENDIX C

OMNISCAN REPORT FILES

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2017 / 07 / 12	OmniPC - 4.3R2	4700 sp2 fb2 bf se.opd	2017 / 06 / 07	MXU - 4.3R2	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan SX	QC-006007	OMNISX-PA1664PR	QC-006007	4700 sp2 fb2 bf se	

PA 1

Setup

A:0.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
6.7 µs	0.000 in	0.999 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	2	On	0.00 µs	FW	Band-pass 5.3 MHz (2.5 - 8.0MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
40 (Low)	32.00 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	65.00 ns
Scan Offset	**Index Offset**	**Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	N/A	2.5 ns	100 MHz	20.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	0.059 in	0.059 in	20.00 %	Pulse	Max Peak
A	0.041 in	0.750 in	25.00 %	Pulse	First Peak
B	0.059 in	0.059 in	30.00 %	Pulse	Max Peak

Law

Law File Name	Law Configuration
3 ele.law	Linear

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
3	1	62	2.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focal Depth**	**Law Configuration**	
0.00º	N/A	N/A	0.443 in	Linear	

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	0.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	4.000 in	0.039 in
Synchro.	**Max. scan speed**	
Encoder	2.353 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

Technician Name _____

Technician Signature _____

Contractor _____

Date _____

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2017 / 07 / 12	OmniPC - 4.3R2	4700 sp2 ppl2s ext gp.opd	2017 / 06 / 07	MXU - 4.3R2	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan SX	QC-006007	OMNISX-PA1664PR	QC-006007	4700 SP2 PPL2S EXT GP	

PA 1

Setup

A:0.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
6.7 µs	0.000 in	0.999 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	2	On	0.00 µs	FW	Band-pass 5.3 MHz (2.5 - 8.0MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
40 (Low)	30.00 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	65.00 ns
Scan Offset	**Index Offset**	**Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	N/A	2.5 ns	100 MHz	20.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	0.059 in	0.059 in	20.00 %	Pulse	Max Peak
A	0.041 in	1.750 in	29.00 %	Pulse	First Peak
B	0.059 in	0.059 in	30.00 %	Pulse	Max Peak

Law

Law File Name	Law Configuration
3 ele.law	Linear

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
3	1	62	2.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focal Depth**	**Law Configuration**	
0.00º	N/A	N/A	0.443 in	Linear	

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	0.625 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	8.001 in	0.039 in
Synchro.	**Max. scan speed**	
Encoder	2.353 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

Technician Name _____

Technician Signature _____

Contractor _____

Date _____

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2017 / 07 / 12	OmniPC - 4.3R2	4700 sp3 fb2 bf sw.opd	2017 / 06 / 07	MXU - 4.3R2	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan SX	QC-006007	OMNISX-PA1664PR	QC-006007	4700 SP3 FB2 BF SW	

PA 1

Setup

A:0.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
6.7 µs	0.000 in	0.999 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	2	On	0.00 µs	FW	Band-pass 5.3 MHz (2.5 - 8.0MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
40 (Low)	32.00 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	65.00 ns
Scan Offset	**Index Offset**	**Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	N/A	2.5 ns	100 MHz	20.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	0.059 in	0.059 in	20.00 %	Pulse	Max Peak
A	0.041 in	0.750 in	25.00 %	Pulse	First Peak
B	0.059 in	0.059 in	30.00 %	Pulse	Max Peak

Law

Law File Name	Law Configuration
3 ele.law	Linear

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
3	1	62	2.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focal Depth**	**Law Configuration**	
0.00º	N/A	N/A	0.443 in	Linear	

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	0.500 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	4.000 in	0.039 in
Synchro.	**Max. scan speed**	
Encoder	2.353 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

Technician Name _____

Technician Signature _____

Contractor _____

Date _____

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2017 / 07 / 12	OmniPC - 4.3R2	br9412sp1str3.opd	2017 / 06 / 13	MXU - 4.3R2	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan SX	QC-006007	OMNISX-PA1664PR	QC-006007	BR9412sp1str3	

PA 1

Setup

A:0.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
6.7 µs	0.000 in	0.999 in	59	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	2	On	0.00 µs	FW	Band-pass 5.3 MHz (2.5 - 8.0MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
40 (Low)	25.00 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	65.00 ns
Scan Offset	**Index Offset**	**Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	N/A	2.5 ns	100 MHz	20.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	0.059 in	0.059 in	20.00 %	Pulse	Max Peak
A	0.041 in	0.750 in	20.00 %	Pulse	First Peak
B	0.059 in	0.059 in	30.00 %	Pulse	Max Peak

Law

Law File Name	Law Configuration
3 ele.law	Linear

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
3	1	62	2.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focal Depth**	**Law Configuration**	
0.00º	N/A	N/A	0.443 in	Linear	

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	0.375 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	6.000 in	0.039 in
Synchro.	**Max. scan speed**	
Encoder	2.329 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

Technician Name _____

Technician Signature _____

Contractor _____

Date _____

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2017 / 07 / 12	OmniPC - 4.3R2	BR9412sp1str4.opd	2017 / 06 / 13	MXU - 4.3R2	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan SX	QC-006007	OMNISX-PA1664PR	QC-006007	BR9412sp1str4	

PA 1

Setup

A:0.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
6.7 µs	0.000 in	0.999 in	59	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	2	On	0.00 µs	FW	Band-pass 5.3 MHz (2.5 - 8.0MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
40 (Low)	25.00 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	65.00 ns
Scan Offset	**Index Offset**	**Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	N/A	2.5 ns	100 MHz	20.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	0.059 in	0.059 in	20.00 %	Pulse	Max Peak
A	0.041 in	0.750 in	20.00 %	Pulse	First Peak
B	0.059 in	0.059 in	30.00 %	Pulse	Max Peak

Law

Law File Name	Law Configuration
3 ele.law	Linear

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
3	1	62	2.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focal Depth**	**Law Configuration**	
0.00º	N/A	N/A	0.443 in	Linear	

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	0.375 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	6.000 in	0.039 in
Synchro.	**Max. scan speed**	
Encoder	2.329 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

Technician Name _____

Technician Signature _____

Contractor _____

Date _____

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2017 / 07 / 12	OmniPC - 4.3R2	duluth pole 94t6-1.opd	2017 / 05 / 23	MXU - 4.3R2	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan SX	QC-006007	OMNISX-PA1664PR	QC-006007	duluth pole 94t6-1	

PA 1

Setup

A:0.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
6.8 µs	0.000 in	1.200 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	2	On	0.00 µs	FW	Band-pass 8.0 MHz (4.0 - 12.0MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
40 (Low)	28.00 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	65.00 ns
Scan Offset	**Index Offset**	**Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	N/A	2.5 ns	100 MHz	20.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	0.059 in	0.059 in	20.00 %	Pulse	Max Peak
A	0.086 in	1.150 in	20.00 %	Pulse	First Peak
B	0.059 in	0.059 in	30.00 %	Pulse	Max Peak

Law

Law File Name	Law Configuration
5 ele.law	Linear at 0°

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
5	1	60	2.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focal Depth**	**Law Configuration**	
0.00º	N/A	N/A	0.443 in	Linear at 0°	

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	0.312 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	6.000 in	0.050 in
Synchro.	**Max. scan speed**	
Encoder	3.000 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

Technician Name _____

Technician Signature _____

Contractor _____

Date _____

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2017 / 07 / 12	OmniPC - 4.3R2	Dulut pole 94T6-2.opd	2017 / 05 / 23	MXU - 4.3R2	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan SX	QC-006007	OMNISX-PA1664PR	QC-006007	Dulut pole 94T6-2	

PA 1

Setup

A:0.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
6.8 µs	0.000 in	1.200 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	2	On	0.00 µs	FW	Band-pass 8.0 MHz (4.0 - 12.0MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
40 (Low)	28.00 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	65.00 ns
Scan Offset	**Index Offset**	**Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	N/A	2.5 ns	100 MHz	20.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	0.059 in	0.059 in	20.00 %	Pulse	Max Peak
A	0.086 in	1.150 in	20.00 %	Pulse	First Peak
B	0.059 in	0.059 in	30.00 %	Pulse	Max Peak

Law

Law File Name	Law Configuration
5 ele.law	Linear at 0°

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
5	1	60	2.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focal Depth**	**Law Configuration**	
0.00º	N/A	N/A	0.443 in	Linear at 0°	

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	0.312 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	6.000 in	0.050 in
Synchro.	**Max. scan speed**	
Encoder	3.000 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

Technician Name _____

Technician Signature _____

Contractor _____

Date _____

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2017 / 07 / 12	OmniPC - 4.3R2	Duluth pole 94T6-3.opd	2017 / 05 / 23	MXU - 4.3R2	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan SX	QC-006007	OMNISX-PA1664PR	QC-006007	Duluth pole 94T6-3	

PA 1

Setup

A:0.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
6.8 µs	0.000 in	1.200 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	2	On	0.00 µs	FW	Band-pass 8.0 MHz (4.0 - 12.0MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
40 (Low)	28.00 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	65.00 ns
Scan Offset	**Index Offset**	**Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	N/A	2.5 ns	100 MHz	20.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	0.059 in	0.059 in	20.00 %	Pulse	Max Peak
A	0.086 in	1.150 in	20.00 %	Pulse	First Peak
B	0.059 in	0.059 in	30.00 %	Pulse	Max Peak

Law

Law File Name	Law Configuration
5 ele.law	Linear at 0°

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
5	1	60	2.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focal Depth**	**Law Configuration**	
0.00º	N/A	N/A	0.443 in	Linear at 0°	

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	0.312 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	6.000 in	0.050 in
Synchro.	**Max. scan speed**	
Encoder	3.000 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

Technician Name _____

Technician Signature _____

Contractor _____

Date _____

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2017 / 07 / 12	OmniPC - 4.3R2	silverdale plate 2.opd	2017 / 06 / 15	MXU - 4.3R2	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan SX	QC-006007	OMNISX-PA1664PR	QC-006007	silverdale plate 2	

PA 1

Setup

A:0.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
6.7 µs	0.000 in	0.999 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	2	On	0.00 µs	FW	Band-pass 5.3 MHz (2.5 - 8.0MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
40 (Low)	38.00 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	65.00 ns
Scan Offset	**Index Offset**	**Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	N/A	2.5 ns	100 MHz	20.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	0.059 in	0.059 in	20.00 %	Pulse	Max Peak
A	0.041 in	0.750 in	39.00 %	Pulse	First Peak
B	0.059 in	0.059 in	30.00 %	Pulse	Max Peak

Law

Law File Name	Law Configuration
3 ele.law	Linear

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
3	1	62	2.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focal Depth**	**Law Configuration**	
0.00º	N/A	N/A	0.443 in	Linear	

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	0.600 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	6.034 in	0.039 in
Synchro.	**Max. scan speed**	
Encoder	2.366 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

Technician Name _____

Technician Signature _____

Contractor _____

Date _____

OmniScan Report

Report Date	Report Version	File Name	Inspection Date	Inspection Version	Save Mode
2017 / 07 / 12	OmniPC - 4.3R2	silverdale plate.opd	2017 / 06 / 15	MXU - 4.3R2	Inspection Data
OmniScan Type	**OmniScan Serial #**	**Module Type**	**Module Serial #**	**Data File Name**	
OmniScan SX	QC-006007	OMNISX-PA1664PR	QC-006007	silverdale plate	

PA 1

Setup

A:0.00 Sk:090 L:001

Beam Delay	Start (Half Path)	Range (Half Path)	Max. Acq Rate	Type	Averaging Factor
6.7 µs	0.000 in	0.999 in	60	PA	1
Scale Type	**Scale Factor**	**Video Filter**	**Pretrig.**	**Rectification**	**Filter**
Compression	2	On	0.00 µs	FW	Band-pass 5.3 MHz (2.5 - 8.0MHz)
Voltage	**Gain**	**Mode**	**Wave Type**	**Sound Velocity**	**Pulse Width**
40 (Low)	38.00 dB	PE (Pulse-Echo)	User-Defined	0.232 in./µs	65.00 ns
Scan Offset	**Index Offset**	**Skew**	**C-Scan Time Resolution**	**Digitizing Frequency**	**A-Scan Time Resolution**
0.000 in	0.000 in	N/A	2.5 ns	100 MHz	20.0 ns

Gate	Start	Width	Threshold	Synchro.	Peak Selection
I	0.059 in	0.059 in	20.00 %	Pulse	Max Peak
A	0.041 in	0.750 in	32.00 %	Pulse	First Peak
B	0.059 in	0.059 in	30.00 %	Pulse	Max Peak

Law

Law File Name	Law Configuration
3 ele.law	Linear

Calculator

Element Qty. Used	First Element	Last Element	Resolution	Wave Type	Material Velocity
3	1	62	2.0	User-Defined	0.232 in./µs
Start Angle	**Stop Angle**	**Angle Resolution**	**Focal Depth**	**Law Configuration**	
0.00º	N/A	N/A	0.443 in	Linear	

Part

Material	Geometry	Thickness
STEEL, MILD	Plate	0.600 in

Scan Area

Scan Start	Scan Length	Scan Resolution
0.000 in	6.034 in	0.039 in
Synchro.	**Max. scan speed**	
Encoder	2.366 in/s	

Axis	Encoder	Encoder Type	Encoder Resolution	Polarity
Scan	1	Quadrature	304.801 step/in	Normal

Technician Name _____

Technician Signature _____

Contractor _____

Date _____