ACEC – INDOT
BRIDGE INSPECTION COMMITTEE

MEETING NO. 1 MINUTES

December 16, 2008

The meeting was called to order at 9:00 a.m. by Mike Cox. Those in attendance were:

Drew Storey	INDOT, Seymour District
Brian D. Harvey	INDOT, Planning and Production Division
Jim Mickler	INDOT, Greenfield District
Bill Dittrich	INDOT, Planning and Production Division
Keith Hoernschemeyer	Federal Highway Administration
Bill Williams	Monroe County Highway Director/Engineer
Michael Cox	Beam, Longest and Neff, L.L.C.
Mike Obergfell	USI Consultants, Inc.
Pete White	RQAW Corporation
Mary Anne O'Toole	Collins Engineers, Inc.
Adam Post	United Consulting Engineers & Architects
Kurt Fowerbaugh	Shrewsberry & Associates
Jon Sera	Butler, Fairman and Seufert, Inc.

A meeting agenda had previously been distributed and the following items were discussed:

1. Mike Cox started off the meeting with a brief overview of the agenda and begun introductions.

2. Bill Dittrich stated that this group will discuss and recommend policies for bridge inspections. Quality control and training will also be a focus of this group.

3. Mike Cox will be the moderator for this group. Jon Sera volunteered to produce meeting minutes. It is the intent of the group to meet at least on a quarterly bases.

4. Bill Dittrich gave an overview of the bridge inspection software upgrade progress. A consultant was selected and given notice-to-proceed in February of 2007. INDOT Bridge Inspectors have been using the new software to update their inspections since October of this year. Local Public Agency inspections will not be performed using the new software until late summer of 2009 at the earliest. Consultants will not have to purchase a software license to perform inspections. A laptop computer and a wireless internet card will allow the bridge inspection team leader access to update the data for the bridge to be inspected. Bill noted that the software development has been very complicated and the budget has been spent. Bill gave a presentation of the software that was developed. The software does include additional items to be input. The group discussed the usefulness of the additional items to be coded for LPA bridge inspections. Bill stated that this group will have to make recommendations on which items will or will not have to be coded.

5. Mike Obergfell passed around a spreadsheet portraying the additional time required for USI bridge inspectors to input relevant data during some recent inspections on county bridges. On average, an hour of additional time was required per bridge inspection. Keith Hoernschemeyer felt that the 70 page reports produced by the new program may be more than what was originally intended. He questioned the liability of inspections in which not all of the items were filled in. Mike Obergfell stated that if INDOT directed LPA inspections to only include specific additional items each year as budgets allow, then inspectors would be covered legally. Bill Dittrich will continue to update the group on the progress of the software implementation at future meetings.

6. Mike Cox passed around an outline of the QC/QA program, which is in the early stages of implementation. Shadow inspections have just recently begun. (see attachment)

7. Mike Cox displayed a copy of a draft bridge inventory contract from the Michigan DOT. (see attachment)

8. Mike Cox asked if INDOT or the FHWA had a plan for when and how the consultants would eliminate coding for bridges with unknown foundations. Bill Dittrich stated that plans of actions would need to be developed for these structures. He also noted that many of the contracts for the inspections will be over, so this will have to be taken care of under the next cycle of contracts. Bill will send out an e-mail of the memo he received concerning this matter. (see attachment) The group will discuss this in further detail at future meetings.

9. Bill Dittrich displayed pictures of box beams with cracks and corrosion of strands. He recommended that the strands that were visibly corroded and the adjacent strands be omitted from the load rating analysis. Mary Anne O'Toole will supply the group with documents from a study that was performed concerning this matter. (see attached) This will be further discussed at future meeting of this group.

10. Bill Dittrich next discussed the condition ratings of gusset plate connections. INDOT is looking into what type of effort is really required based on a memo from the FHWA. He recommended that inspectors look for any deformations, and document their findings. Mike Obergfell recommended that INDOT screen out certain bridges on county road systems that are already posted for low load limits.

11. Brian Harvey informed the group that there are still three open spots available for the upcoming NHI course to be held January 5th through 16th. There is no plan to hold the three day fracture critical inspection course this coming year.

12. Bill Dittrich would like the group will discuss load limit postings at a future meeting. Pete White will bring some information with him to a future meeting to lead this discussion.

13. Submittal approval process will be discussed at a future meeting.

The next meeting for the ACEC - INDOT Bridge Inspection Committee is scheduled for 9:00 a.m. Tuesday, January 20th, 2009, at the Indiana State Police Museum.

Individuals are invited to comment on items presented in these minutes and/or submit additional topics for discussion at the next meeting. Please E-mail comments to Jon Sera at jsera@bfsengr.com.

This meeting was adjourned at 1:30 p.m.

Prepared by,

BUTLER, FAIRMAN and SEUFERT, INC.

c: Attendees

Superstructure Condition Rating Guidelines for Non-Composite Prestressed Concrete Adjacent Box Beams

Condition Rating	Percent # strands exposed (single beam)	Other Deterioration of P/S Concrete Beams	
9 - Excellent	0%		No cracks, stains or spalls
8 - Very Good	0%		No cracks, stains or spalls
7 - Good	0%		Map cracks and miscellaneous hairline cracks
6 - Satisfactory	0%	Spalls	Minor spalls/delaminations, <5%
		Cracks	Map cracks and misc. hairline cracks
5 - Fair	1-5%	Spalls	Spalls/delaminations, <15%
		Transverse cracks	None
		Longitudinal cracks	Hairline longitudinal cracks in bottom flange
		Longitudinal Joints	Leakage at joints with light efflorescence
4 - Poor	6-15%	Spalls	Spalls/delaminations, 15-25%
		Transverse cracks	Hairline flexure cracks across bot. flange
		Longitudinal cracks	Minor efflorescence and/or minor rust stains
		Longitudinal Joints	Heavy efflorescence and/or minor rust stains
		Transverse Tendons	Loose or heavily rusted
		Web cracks	Initiation of vert. or diag. cracks in P/S beam near open jts. in barrier (< 3" length)
3 - Serious	15-20%	Spalls	Spalls/delaminations, >25%
		Transverse cracks	Open flexure cracks in bot. Flange
		Web cracks	Vert. or diag. cracks in P/S beam near open jts. in barrier
		Camber	Sagging/Loss of camber
		Transverse Tendons	Broken or missing
2 - Critical	>20%	All	Any cond. worse than detailed above

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BRIDGE INSPECTION CONTRACT SCOPE OF SERVICES INSTRUCTIONS FOR USERS

REMOVE THESE INSTRUCTIONS PRIOR TO USING

The purpose of this scope of services template is to provide a foundation for local agency bridge owners to acquire professional consultant services for bridge safety inspection per the Nation Bridge Inspection Standards (NBIS). It describes the minimum level work necessary to meet the requirements of NBIS. It does not provide contractual stipulations and each user is required to add this component through their legal support team to have a complete contract. Also, a cover letter should be attached with the scope of services outlining a timeline for proposal response, to whom and where to send them, and the project manager for the owner.

Local agency bridge owners will find a list of consultants pre-qualified by the Michigan Department of Transportation (MDOT) for bridge safety inspection at the Michigan Bridge Inspection System (MBIS) web page (http://www.michigan.gov/mdot/0,1607,7-151-9625_24768_26077---,00.html). At the time the consultant's package was reviewed and approved, the firm met the stipulations and requirements of this Scope of Services. The pre-qualification is dependent on staffing, and each owner will need to get confirmation from the firm proposing for the project that staffing or other conditions still meet the requirements of the pre-qualification.

Review the Scope of Services document carefully. While many of the changes are necessary to make the scope unique for a given local agency, such as placing the agency name in the document, deletions or changes in some areas will prevent the work from meeting the requirements of the NBIS. This will not only cause the work to have to be repeated, and probably require paying for the same work twice, but if an inspection does not meet NBIS requirements and is used to acquire state or federal funding, the owner could be in legal jeopardy.

To make the document suitable for use in your agency, use the "Find and Replace" function in Word. Search for _Contracting Agency County / City__ and replace it with the name of your organization. Also review all text that has a gray overlay and replace with the appropriate text. Text enclosed by ***(***Text***)*** are instructions for the local agency and must be removed prior to use.

The Table of Contents (TOC) is interactive. If a titled section in the document is removed the TOC can be updated by putting the curser in the TOC and pushing F9 on the keyboard. Also you can navigate the document from the TOC by pushing and holding the "Ctrl" key and clicking the desired section on the TOC. If the coding shows in the document on the screen, it can be suppressed by clicking Tools…Options and in the View tab under formatting… make sure that "Hidden Text" is not selected.

The consultant is requested to provide a cost broken down as a lump-sum for each bridge. This gives the owner a clear picture of the costs for the work, and fixes the contract amount. The users of this scope are free to modify this portion to suit their needs or follow precedent.

This scope is suited only for "Routine" inspections as defined by NBIS and the associated "American Association of Highway and Transportation Officials" (AASHTO) *Manual for Condition Evaluation of Bridges*. However, part of this process may necessitate load rating some of the structures. This scope of services requires the consultant to identify those structures requiring a load rating analysis and to provide a reason for the need. Load rating is required when a load rating does not exist, does not meet current criteria, or when current conditions of the bridge have changed such that the inspector has concerns about load capacity. Because many inspections can be done with just a review and understanding of the existing load rating, it is recommended that this work be independent of this scope.

Many factors effect the time and cost of load rating analysis, and it is typical to pay for this on an hourly basis. The owner may wish to have the consultant provide an hourly rate for this work in conjunction with the inspection proposal. However, the actual estimate of hours should not be requested until after the inspection work has been completed. This will allow the inspector to develop a sound understanding of which structures need the load rating and the amount of time necessary to complete the work. This will result in a more accurate estimate. It is important for the owner to recognize that load rating is not optional, but a necessary component of the program. It is unnecessary however, to have it done with every inspection. When it is needed, it is usually a function of the condition of the structure, which is determined during inspection.

This scope of services does not cover special inspections or other inspection types such as but not limited to as post construction (Initial) inspections, supplemental in-depth inspections, under water or diver inspections (SI&A # 92A), and fracture critical inspections(SI&A # 92B). However, these and other inspection activities such as scour evaluations are still required by NBIS.

Bridge owners may wish to add additional services that can be provided through the Michigan Bridge Reporting System (MBRS), (see §V-C-7). MDOT provides this web based application free of charge and it very efficiently creates reports of the network.

CONTRACTING AGENCY NAME HERE

SCOPE OF SERVICES
FOR
BRIDGE SAFETY INSPECTION

April XX 2007

The _CONTRACTING AGENCY COUNTY / CITY__ is seeking a proposal from qualified consulting engineering firms (CONSULTANT) to perform in-service safety inspection of bridge structures" on local owned bridges in accordance with National Bridge Inspection Standards (NBIS). This is termed "Bridge Inspection." This project will be under the direction of the _CONTRACTING AGENCY COUNTY / CITY__ Project Manager (PM) identified in the accompanying cover letter the bridge owner (Owner).

I. LOCATION

The bridges for this project are situated in various locations within the _CONTRACTING AGENCY COUNTY / CITY__. See Section X, BRIDGE INSPECTION WORK PACKAGE LIST for specific bridge numbers and Section X, LOCATION MAP for locations.

II. PURPOSE

In accordance with the Code of Federal Regulations 23-CFR-650, subpart C, each bridge under _CONTRACTING AGENCY COUNTY / CITY__ jurisdiction is periodically inspected following the Federal Highway Administration (FHWA) NBIS. For the bridges identified on the WORK PACKAGE LIST, a "Routine" inspection will be performed by a qualified consultant. There are several steps in the process of this work and there may be a need to for follow-up action.

The deliverable for this authorization will be the "Inspection Report." This report will have several components as noted below and will be attested to be accurate and complete under seal of a professional engineer.

III. DURATION & SCHEDULE

A. Schedule of Dates and Milestones

The CONSULTANT is required to develop a project schedule for the inspection of the bridges shown on the attached WORK PACKAGE LIST. Each bridge must be inspected within the month of the due date, as established by the date of the previous inspection, and the frequency determined by the previous inspector. These dates are shown on the WORK PACKAGE LIST. In no case shall the inspection date exceed 24 months from the previous date. The Project Schedule must be submitted in the form of a Gantt Chart also showing the meeting dates as milestones***(***A simple list of when the bridges will be inspected, by date, may be adequate for the owner with just a few structures***)***

Any changes to the schedule must be submitted to the _CONTRACTING AGENCY COUNTY / CITY__ PM for approval prior to the change. Failure to progress in alignment with the schedule will be considered as failing to meet the terms of this authorization and may result in the cancellation of the contract.

The CONSULTANT must be prepared to begin the field inspection work within one week after receiving the notice to proceed or an executed contract.

B. Meeting Dates

The CONSULTANT is required to attend an initial pre-inspection meeting, a series of periodic meetings and, several informational meetings. The expected dates for these meetings are shown below; however, these may be adjusted as mutually agreed to by the _CONTRACTING AGENCY COUNTY / CITY__ PM and the CONSULTANT.

See Section V-D, Meetings for a description of the CONSULTANT's responsibilities.
(we recommend a pre-inspection meeting for all contracts but progress meetings and a closeout meeting may not be necessary for the owner with just a few structures***)***

Pre-Inspection Meeting		_____date_____
Biweekly Progress Meetings	1st	_____
	2nd	_____
	3rd	_____
Project Closeout Meeting		_____

IV. STAFF QUALIFICATION REQUIREMENTS

Each bridge on the list must be inspected by a CONSULTANT team composed of a Qualified Team Leader (QTL) and a staff person. The CONSULTANT must have these two individuals present on site during the inspection to fulfill the requirements of the contract. ***(***A two person team is necessary for safety reasons.***)*** The CONSULTANT may utilize additional personnel on any given team, but the _CONTRACTING AGENCY COUNTY / CITY__ will not pay for the additional staff. The CONSULTANT is required to have as many teams as necessary to complete the inspections by the required dates.
(*The contracting agency county / city may wish to use in-house staff as the second person on the inspection team. In this case, the paragraph above will need to be modified to stipulate this and the coordination between the consultant staff and the agency staff.***)**
Following are the minimum qualifications necessary for the required personnel. This must be documented with resumes and submitted with the Fee Proposal.

A. CONSULTANT Project Manager

1. Administrative manager with authoritative control over the inspection teams and demonstrated project management experience.
2. Primary contact between the _CONTRACTING AGENCY COUNTY / CITY__ and the CONSULTANT. One of the inspection QTLs may be delegated Project Manager responsibility.
3. Will perform project contract Quality Control as stipulated in §VI-C

(The owner with just a few structures may wish to combine the PM & TL jobs into one person***)***

B. CONSULTANT Qualified Team Leader, QTL(s):

1. Must meet the requirements of NBIS for a QTL. See Code of Federal Regulations, 23-CFR-650 §650-309.

2. Professional registration as an engineer, licensed to practice in the State of Michigan. ***(***The license is required per the NBIS if the bridge needs a load rating. The owner can allow a QTL who is not a registered PE to do inspection but this person will not be eligible to calculate the load ratings and a section D will have to be added to this part of the contract that outlines the qualifications of the Load Rater. ***)***

3. Minimum of three years of documented experience in the in-service safety inspections of bridges.

4. Completed the NHI # 130055 “Safety Inspection of In-Service Bridges” class within the last five years. If the QTL(s) has attended this class more than five years ago, he / she must have taken the NHI #130053A three day Bridge Inspection Refresher course within the preceding five years, or attended 24 hours of bridge inspection professional development in the preceding five years.

C. Field Staff assisting the CONSULTANT QTL(s):

1. A technical staff person with three years experience in inspection, design, or construction of bridges or:

2. Recent graduate engineer working at the staff engineer or entry level position.

(*As noted above, the contracting agency county / city may wish to provide in-house staff for this purpose. The qualifications and experience requirements for this position will needed to be determined and agreed to by both parties.***)**

The above listed classes for the QTL(s) are encouraged, but not required for the field staff.

If the QTL(s) that is approved under this authorization is unable to finish the work of the entire project, the authorization may be terminated. The CONSULTANT can submit a backup QTL(s) for approval with the initial submission of the proposal. However, if any one person identified in the proposal is rejected by _CONTRACTING AGENCY COUNTY / CITY__, the entire proposal will be considered non-responsive and rejected.

V. GENERAL DESCRIPTION OF THE WORK

Bridge safety inspections are done to insure the safe use of the structures by the motoring public. To accomplish this, the National Bridge Inspection Standards (NBIS), AASHTO, *Manual for Condition Evaluation of Bridges* and, the *Bridge Inspection Reference Manual* are to be used as guidance to complete the inspection and provide necessary information. Additional guidance documents and manuals are listed in the appendix.

For the purposes of this project, bridge inspection is broke into four phases: bridge file review, inspection of the bridge in the field, completion of the reports, and communication of the findings to _CONTRACTING AGENCY COUNTY / CITY__ OWNER. Each of these phases must be completed for successful completion of the project.

A. Bridge File review

In this phase of the work the CONSULTANT will take several steps to review the documentation for each bridge and register on-line to be assigned the forms to complete.

1. The QTL must register on-line with the MDOT Michigan Bridge Inspection System (MBIS) bridge data collection application, at the "New Consultant / Inspector Registration". This person's name will appear on all inspection documents.
2. Find the _CONTRACTING AGENCY COUNTY / CITY__ bridge owner's name and add it to the list on the right.
3. Review the bridge files, and become familiar with the documentation on the structures and the respective load analysis for each bridge at the _CONTRACTING AGENCY COUNTY / CITY__ office.
4. Obtain paper copies of the previous inspection reports for use in the field.

B. Field Inspection

The CONSULTANT team will visit each bridge site and perform an inspection according to the NBIS and AASHTO manual description for a "Routine" inspection. This will be done with a visual inspection and non-destructive tests (NDT). Several reports, described below, will be completed by the QTL while performing this inspection.

1. Observations

The CONSULTANT QTL will observe all of the bridge components and record their findings ratings in red ink on the appropriate inspection report. This information will be entered into the respective form using the Web based application MBIS. The data can be downloaded to a laptop computer for use in the field, but this is not mandatory.

There must be sufficient comments for each element in the reports to outline its condition and to justify the rating given. Some of the previous reports may not have complete comments. The lack of previous information does not exempt the CONSULTANT QTL from providing sufficient comments for each element to outline its condition. Follow the rating guidelines provided in the system, unless there are circumstances, particularly if they are safety related, that in the judgment of the QTL do not fit within these guidelines. In this case, the inspector will document the reason for the deviation in the respective comment section.

NBIS sets a maximum of 24 months between inspection intervals. However, structures in poor condition or with rapidly changing conditions may require inspection sooner than 24 months. It is the responsibility of the CONSULTANT QTL to determine the inspection frequency and notify the _CONTRACTING AGENCY COUNTY / CITY__ PM when a frequency is to be changed. The *Bridge Inspection Frequency Guidelines* will assist the CONSULTANT QTL in setting the frequency.

The CONSULTANT QTL must render a professional judgment as to the need for structural analysis or loading rating of the given structure. It may also be necessary to recommend temporary load restrictions and/or changes to the inspection frequency.

If there is an area of concern that requires traffic control or special inspection / testing, the CONSULTANT must notify the _CONTRACTING AGENCY COUNTY / CITY__ PM with a "Request for Action" (RFA) form. See "Notification for Unusual Situations" below.

Stream and river bed scour must be evaluated to ensure the foundation for the bridge has adequate support. The CONSULTANT QTL will perform a scour inspection around all structural elements that are located in water up to six feet deep utilizing the wade and probe or the boat and probe methods. Substructure elements in water over six feet will be inspected by a diver under a separate contract.

Information on scour must be reported on the Bridge Safety Inspection Report (BSIR). If there is loss of bearing or undermining of a footing that is safety concern, this must be reported to the _CONTRACTING AGENCY COUNTY / CITY__ PM using the RFA. If the loss of bearing is sufficient to be of immediate concern for the component to structurally support the bridge, the CONSULTANT will notify the _CONTRACTING AGENCY COUNTY / CITY__ PM on an emergency basis (See Section V-A-2, "Notification for Unusual Situations" below).

In addition, for every other routine inspection (maximum of every four years), the elevation of the stream or river bed relative to an established datum must be measured for all structures over water. These measurements must be taken at locations along the length of the bridge spans that are over a stream or river bed, and recorded on the "Stream Cross Section Report" form (See Worksheet Instructions). This information must be compared to the previous data in the form of a graph. **(***In order for the consultant to accurately estimate their costs for doing the inspection, the contracting agency county / city must note on the bridge list on the Work Package Listing §X, those structures that are due for the cross sectioning.***)**

The CONSULTANT QTL must determine if the structure has been hit by a vehicle and damaged. If the damage has occurred since the last inspection, this damage must be documented with a description and photographs.

During the inspection, the CONSULTANT QTL will evaluate the structure for long and short term maintenance and repairs, and record this information on the "Work Recommendations" form of the BIR.

2. Notification for Unusual Situations

One of the primary reasons for bridge inspection is to determine if there are any unusual circumstances or situations that could effect the continued safe operation of the bridge, or where it could be costly if repair action is delayed. The CONSULTANT QTL must determine whether the bridge can safely remain in service until the next inspection date. The CONSULTANT QTL must identify the cause of any unusual circumstances or situations and notify the _CONTRACTING AGENCY COUNTY / CITY__ PM within a time frame appropriate for the situation.

Communication of these situations is accomplished formally by using a RFA. The CONSULTANT must properly complete this form and deliver it to the _CONTRACTING AGENCY COUNTY / CITY__ PM in a timely manner to ensure this communication takes place.

This form does not preclude advising the _CONTRACTING AGENCY COUNTY / CITY__ PM immediately by phone, or other means, of imminent circumstances. However, the CONSULTANT is still obligated to complete the form. If the situation

warrants, the form should be delivered on an expedited basis, faxed or e-mailed, and the CONSULTANT must get confirmation of the delivery.

The RFA should not be used to convey the ordinary information that belongs on the BIR. Below are some of the situations that may trigger a RFA:

- Deficient Structural Conditions

  If a condition exists on a structural component that warrants a structural analysis (see "Load Analysis" §V-C below) or further investigation to determine if the capacity of the element in question is capable of safely carrying the intended loads, the CONSULTANT is required to inform the _CONTRACTING AGENCY COUNTY / CITY__ PM with a RFA form. An example is an exposed or broken pre-stressing strand in PCI beams or box beam super-structures.

- Functional Conditions

  Situations that exist in and around the structure that are not a part of a structural element, but could require immediate attention are termed functional problems. Some of these are damaged approach guardrail, erosion of the shoulder, settled approach pavement, missing load posting or height restriction signs, damaged or broken light poles and sign supports.

- Suspect Conditions Requiring Further Consideration or Testing

  The CONSULTANT QTL will perform the routine inspection in the best manner possible on these structures and document any areas that need further consideration or testing.

  The CONSULTANT QTL will inform the _CONTRACTING AGENCY COUNTY / CITY__ PM using a RFA form of the need to perform supplemental in-depth inspections on structures for such things as:
  - ♦ Where a portion of the structure cannot be inspected by routine inspection methods.
  - ♦ Where there are many structural members in need of measurement for excessive loss of section, or need NDT for evaluation.
  - ♦ Where there is a need to mechanically remove a lot of scale to get measurements.
  - ♦ Where there is a need to coordinate with others', such as closing a lane, to closely examine the structure.
  - ♦ If there is a crack or suspected crack in a structural steel component, the CONSULTANT must clearly document this on paper with narrative and photographs.

If testing is to be performed in conjunction with the routine inspection, the CONSULTANT must inform the _CONTRACTING AGENCY COUNTY / CITY__ PM prior to the testing so arrangements may be made to witness the process. The _CONTRACTING AGENCY COUNTY / CITY__ PM will not delay the CONSULTANT in performing this work and will not require a return trip to perform the test. **(***This is a coordination clause to allow the contracting agency county / city staff to witness the process but not hinder or delay the operation.***)**

C. Inspection Reports

As stated in Section II, "PURPOSE", the deliverable for this authorization will be the Inspection Report. The CONSULTANT will be assigned the structures for inspection in MBIS. The assignment will last for 90 days.

A Bridge Inspection Report (BIR) has several components that will vary from bridge to bridge, but that will include at least the "*Bridge Safety Inspection Report*", MDOT form 2502 (BSIR), the "*Culvert Safety Inspection Report*" (CSIR), the "*Structure Inventory and Appraisal*", MDOT Form 1717a (SI & A), and the "*Work Recommendations*". Additional documents may also be necessary depending on the circumstances at the bridge and its condition. Some of these are the RFA form, the "*Streambed Profile*" form, field notes, sketches, and pictures. The BSIR, SI&A, and the work recommendations are to be completed and the data saved on-line in MBIS. If the field application is used, the data must be submitted back to MDOT using MBIS on-line.

All of the documents created by the inspection will be assembled in a binder and presented under cover of a letter stating that the inspections have been performed in accordance with this scope of services, and that all appropriate procedures and guidelines have been followed. This letter will also have the professional registration seal of the QTL or CONSULTANT PM. An additional unbound black and white copy will be presented with the information separated for each bridge for the bridge owner's bridge files.

The _CONTRACTING AGENCY COUNTY / CITY__ PM will conduct periodic QC checks on the CONSULTANT's work (approximately ten percent of the structures listed in the work package). If these evaluations, in the judgment of the _CONTRACTING AGENCY COUNTY / CITY__ PM, show that the CONSULTANT does not adhere to the policies and guidelines noted above the contract can be terminated and the balance of the structures to be inspected will not be paid for.

The following documents are typical for each bridge. Other reports may be necessary as conditions warrant.

1. Bridge Safety Inspection Report (BSIR), MDOT form 2502

This is the primary inspection report form and is incorporated into MBIS. The CONSULTANT QTL must complete this form in the field at the specific bridge site. This is usually done by red-lining a copy of the previous report. MBIS has a "Field Copy" print option that creates white space on the previous report for noting changed conditions at the site. It is recommended that the CONSULTANT retain this copy in their records as backup in case of failure of the electronic copy.

A new inspection record is created in MBIS using the information from the site visit. This can be done in the field using the field application with downloaded data or entered in the office using the on-line application.

2. Structure Inventory & Appraisal Form (SI&A), MDOT form 1717a

A copy of the previous SI&A will be available to the CONSULTANT from MBIS. The CONSULTANT QTL will verify the information on the SI&A during the inspection. Most of the data on the SI&A is static from inspection to inspection; therefore, MBIS will bring the data forward for the new inspection. However, the CONSULTANT QTL is responsible and accountable for all the information as though entered directly at the time of the inspection.

3. Work Recommendations Report

A key element of the NBI program is the communication of the inspector's judgment of the need for maintenance or rehabilitation work necessary to keep the structure in service. The Work Recommendation Report is completed in MBIS.

4. Stream Cross Section Report Form

The CONSULTANT will record the elevation of the stream bed with reference to an established datum on this form. The data collected must be entered on the form electronically, and the hard copy and electronic form will be submitted to _CONTRACTING AGENCY COUNTY / CITY__.

5. Photographs and Posting Document

Photographs must be taken and submitted as part of the Inspection Report to document any unusual conditions. The photographs can be digital images or traditional photos, printed on photo quality paper and captioned with a description of what the photo is showing. Photos that are over or under exposed so the details in question cannot be seen will be returned to the CONSULTANT, and will have to be taken again until the photos are legible. A copy of the electronic files will also be submitted in jpeg format on CD with the Inspection Report.

Bridges that are load posted must have a picture taken of the correct load posting sign with the bridge in the background. This picture will be stapled to the SI&A form and the

"*Load Analysis Summary*" form, and submitted to MDOT's, Bridge Management Unit. If the signs at the bridge are in place at the time of the field inspection, the CONSULTANT will prepare the documents so the _CONTRACTING AGENCY COUNTY / CITY__ can send them to MDOT.

6. Request for Action Report

As noted above, the CONSULTANT will use this report to document communication to the _CONTRACTING AGENCY COUNTY / CITY__ of circumstances that need more urgent attention than otherwise noted in the Work Recommendations. Examples of this are noted in §V-B-2.

7. Michigan Bridge Reporting System (MBRS) Reports

(The owner can use this section to request data output from MBRS. Owners with a large number of structures may find this very useful to understand the network condition and needs.***)***

The CONSULTANT will provide a matrix of bridge data from MBRS with the following data sets:

- Bridge number
- Route carried
- Feature intersect
- Next inspection date
- Deck rating
- Super-structure rating
- Sub-structure rating
- Maintenance Work
- Contract Work

D. Load Analysis

The NBIS requires that all bridges have an initial load rating calculated, and the rating re-evaluated when the condition or loading of the bridge has changed. Deterioration of structural components over time may get to the point where the structure may have to be load restricted. Overlays, attachment of appurtenances, or situations may also trigger the need to re-evaluate the load rating. It is the Inspection QTL's responsibility to assess the overall condition of the structure, render a judgment as to need for a re-evaluation, and document his/her judgment in the general comments section of the BSIR. **(***This section informs the CONSULTANT of their responsibility to determine the NEED for load rating and to inform the owner of this need. A separate document describing the contractual requirements for performing the load rating is necessary for the consultant to perform the work.***)**

Load rating analysis is not required at every routine inspection and is dependent on conditions determined during the inspection. Therefore, the _CONTRACTING AGENCY COUNTY / CITY__ PM will evaluate the inspector's recommendations and decide on the best course of action based on the circumstances. The CONSULTANT will not proceed with the calculations until authorized by the _CONTRACTING AGENCY COUNTY / CITY__ PM.

If the load rating is necessary, based on the information provided during the inspection, the CONSULTANT will provide the _CONTRACTING AGENCY COUNTY / CITY__ PM the information below.

1. Qualifications of load rating engineer;
   NBIS requires a registered professional engineer be responsible for load rating calculations.
2. Statement of need;
   The CONSULTANT QTL will document the deterioration or conditions that are the cause of the need for load rating the structure. This will include all measurements of loss of section and location on the members where the deterioration is evident. This will be recorded in narrative and sketches with dimensions in sufficient detail that the load analysis can be completed.
   Photographs will be taken, both panoramic and close-up with a ruler or other object in the frame which will give proportion. The photographs will be annotated with a description what is in the photo and it's location.
3. Provide an estimate of engineering hours to complete the necessary calculations. This will be used with the hourly rate stipulated in §VII-A.
4. Procedure
   The procedures in the MDOT Bridge Analysis Guide (BAG), latest edition, will be used to determine the Operating and Inventory ratings.
5. Documentation
   An Assumption Sheet and a Summary sheet will be completed. The Summary Sheet will be sealed by the professional Engineer doing the calculations. All calculation sheets / computer output sheets, etc. become the property of the bridge owner and will be delivered under letter of transmittal for inclusion in the Bridge File.

VI. CONTRACT ADMINISTRATION

(This section is very dependent upon the size and duration of the contract. Each bridge owner / contract PM will need to determine the amount of oversight necessary to insure the contract stipulations are adhered to and balance this against the costs. The costs for meetings and status reports etc, are not broken***

out separately. The consultant is given an estimate of time expected for this work and will average this into the lump sum cost for each bridge. The one meeting that is considered necessary for every contract is the pre-inspection meeting)***

The following meetings are anticipated during this project. Each meeting is expected to take ½ day for the CONSULTANT QTL(s) to attend the meeting, including travel and ½ day to complete the associated paperwork. The meeting location will be at a location determined by the _CONTRACTING AGENCY COUNTY / CITY__ PM.

For all of the periodic meetings listed below, the CONSULTANT will prepare an agenda and submit it to the _CONTRACTING AGENCY COUNTY / CITY__ PM prior to the meeting. The CONSULTANT will also keep notes of the meeting and provide "Meeting Minutes" within one week after the meeting.

A. Pre-Inspection Meeting

This meeting is intended to exchange information regarding the general procedures for communication, review the schedule, discuss emergency procedures and communication, and discuss any open questions to that point before the first inspection begins.

B. Biweekly Status Meetings

(The bridge owner with just a few structures may not need this section.***)***

The CONSULTANT QTL(s) will meet with the _CONTRACTING AGENCY COUNTY / CITY__ PM on a regular basis to review the progress of the inspections and to submit the draft inspection reports from the previous two weeks. The CONSULTANT will have all of the documents completed prior to the meeting and will submit them under letter of transmittal. See § III-B, "DURATION & SCHEDULE", for anticipated dates.

The CONSULTANT will include a copy of all the non-emergency Request for Action forms completed during the previous inspection period and will review these in the meeting with the _CONTRACTING AGENCY COUNTY / CITY__ PM.

The QTL(s) and the _CONTRACTING AGENCY COUNTY / CITY__ PM will review the QC reports and determine if any changes are necessary to the CONSULTANT's procedures.

Project Closeout Meeting

(The bridge owner with just a few structures may not need this section.***)***

This meeting is intended as a review of any outstanding contract requirements and final presentation of the deliverables. The completed "Consultant Performance Evaluation"

form will be given to the CONSULTANT and reviewed. All borrowed bridge file documentation will be returned at this time.

C. Project Quality Control

The CONSULTANT will submit a project quality control plan with their proposal that will accomplish at a minimum the following:

1. Confirm that all QTLs have the required documents and certificates to substantiate their qualifications.
2. Confirm that the inspection process and procedures meet the requirements of the NBIS.
3. Review 10% of the completed work to insure that all reports are complete, accurate, and consistent,.

D. Administrative Reports

(If the contract is of short duration with a small number of bridges, the owner may choose to delete this requirement.***)***

In addition to the inspection reports above, the following administrative report is required if they apply.

Biweekly Inspection Progress Report
CONSULTANT QC reports

This report must be completed and submitted to the _CONTRACTING AGENCY COUNTY / CITY__ PM at the Bi-weekly Status Meetings. This information will be used by the _CONTRACTING AGENCY COUNTY / CITY__ PM to compare progress of the inspections with the schedule.

E. Responsibilities of _CONTRACTING AGENCY COUNTY / CITY__

The following activities and information will be provided by the _CONTRACTING AGENCY COUNTY / CITY__ PM, where applicable, to the CONSULTANT.

- Assign the structures to be inspected to the CONSULTANT in MBIS and MBRS.
- Provide access to the hard copy bridge files which will have:
  - Previous stream bed cross section reports.
  - Previous work recommendations.
- Blank “Request for Action” form

(The bridge owner may choose to do independent QC on the CONSULTANT’s work. The consultant should still do their QC and submit this to the Owner’s PM***)***

The _CONTRACTING AGENCY COUNTY / CITY__ PM will perform QC evaluations with the CONSULTANTS on ten percent of the structures inspected.

Provide access for the CONSULTANT to any pertinent information in the _CONTRACTING AGENCY COUNTY / CITY__ bridge files and database that may be necessary to complete the inspection. See Section VII-D, **Release of Information**, for restrictions on dissemination of the material.

VII. PROPOSAL AND AUTHORIZATION GUIDELINES

(The following contract payment terms provides the owner with a way to evaluate the cost by individual structure and provides a fixed cost for the work. However, the owner has other options such as an hourly rate and a lump sum for the entire work package. The LUMP SUM basis per bridge is differentiated from a UNIT PRICE contract in that each bridge is priced according to cost factors that include size, complexity and condition. A UNIT PRICE contract averages this cost over the network and usually is biased in favor of the consultant to avoid risk.***)***

A. Contract Terms

Lump Sum Authorization

This will be a "LUMP SUM" type of contract based on each structure shown on the "Work Package List" below, with payment upon the completion of all services required on each bridge. The Lump Sum price will include all of the engineering costs and expenses to inspect a given bridge as well as provide the report(s) required above. No added cost will be paid for overtime, weekend, or holiday work.

Stream Bed Cross-Sectioning Premium

In addition, a premium will be paid for those bridges that require Stream Bed Cross-Sectioning. This will be added to the Lump Sum amount for each structure where it is required.

Load Rating calculations

Provide an hourly rate for a registered Professional Engineer (Michigan) for the purpose of performing load rating calculations. This will be utilized on a case by case basis and only after approval of the need and estimate by the _CONTRACTING AGENCY COUNTY / CITY__ PM.

Additional Inspection Needs

It is recognized that the inspection process may uncover the need for additional investigation requiring special non-destructive testing and traffic control. The CONSULTANT will submit a recommendation with justification and documentation of the need for this work, and an estimated cost after completion of the routine inspection.

If approved by the _CONTRACTING AGENCY COUNTY / CITY__ Project Manager, a separate contract for this work will be issued. The CONSULTANT will be required to perform this work expeditiously utilizing the same inspection team. Failure to respond in the necessary time frame will cause _CONTRACTING AGENCY COUNTY / CITY__ to get the work done by other means and could result in cancellation of the remaining work of this contract.

The _CONTRACTING AGENCY COUNTY / CITY__ reserves the right to seek a new RFP for this work.

B. Proposal Requirements

The following information is required of the CONSULTANT in response to this Scope of Services. Failure to provide all of the information will be cause to consider the proposal non-responsive and reject the proposal.

1. Proposal Letter and Fee Estimate

The CONSULTANT must submit a letter agreeing to the stipulations in this Scope of Services. The letter must be signed by officer of the company as stated in the "Guidelines"

2. Resumes

Resumes of the CONSULTANT's staff who will be assigned to the project must be appended to the Proposal Letter. These resumes must document the requirements stated in Section IV, STAFF QUALIFICATION REQUIREMENTS.

Copies of training certificates attesting to re-current training requirements are required.

Previous project information should not be included.

3. Equipment

Appended to the Proposal Letter must be a description or fact sheet of the equipment that will be used during the inspection.

4. Schedule

The CONSULTANT must develop a schedule for the inspections as stated in Section III-A, "Schedule of dates and milestones", and append this to the Proposal Letter.

C. Billing Submittals

(The owner will need to identify the billing procedures used by the agency here identifying the forms to be used and the addresses where they are to be sent.***)***

The CONSULTANT must submit all invoices to the _CONTRACTING AGENCY COUNTY / CITY__ PM for approval. Payment will be monthly based on the work complete to that date.

All invoices will be numbered sequentially and will indicate the invoice period. They must also indicate the Work Package number, the _CONTRACTING AGENCY COUNTY / CITY__ job number, and the agreement number. All invoices include time sheets for all staff engaged on the project during that time period and must list the specific bridges completed.

All invoices will be sent to: XXXXXXXXXXXXXXX
XXXXXXXXXXXXXXX
XXXXXXXX XX XXXXX

Questions pertaining to billing and payment may be directed to _CONTRACTING AGENCY COUNTY / CITY__ PM at XXX-XXX-XXXX

VIII. GENERAL

A. Personal Safety Equipment

The CONSULTANT will be required to provide all personal safety equipment for those people working in the field. Some of the required items are hardhats, safety shoes, safety vests, gloves, safety harnesses, eye protection, etc.

Any person found to not have the required safety equipment will be asked to leave the _CONTRACTING AGENCY COUNTY / CITY__ right of way. If there are repeated cases of this, the authorization with the CONSULTANT will be terminated.

B. Inspection Equipment

The CONSULTANT must provide the following equipment as suitable for the inspection of the bridge. The use of this equipment during the inspection is considered part of the Lump Sum price.

1. Inspection Vehicle

The CONSULTANT will provide a vehicle with high visibility marking and or lighting for use during inspection. This vehicle will provide transportation for the inspection staff and the necessary equipment.

2. Boat

The CONSULTANT is required to have a small boat with a motor available for the purpose of inspecting those bridges which are over water and are too deep to wade. This is typically a small aluminum boat or inflatable Zodiac style of boat with a small motor.

The CONSULTANT will be responsible for insuring the boat is safe for operation and is operated in a safe manner utilizing all required safety equipment.

3. Computer

The CONSULTANT is required to have a computer with internet connection. A laptop computer for use in the field would be helpful but is not required.

The computer must have access to a printer to print the report documents for the field and the final report.

4. Non-Destructive Testing (NDT)

The inspection process does not require a lot of testing but spot checking by sounding concrete for delaminations, checking for suspected cracks in steel, and measuring for section loss in areas of heavy corrosion is required.

The following equipment is necessary to perform these tests:

- Calipers and thickness gauges
- Dye penetrant test kit
- Chain drag or sounding rod or hammer

5. Cell Phone

While in the field, the QTL must have a cellular telephone. The phone numbers must be provided to the _CONTRACTING AGENCY COUNTY / CITY__ PM at the Pre-Inspection meeting.

6. GPS

The CONSULTANT must have a handheld Global Positioning Satellite (GPS) locator to determine the latitude and longitude of the bridge. This will be penned on to the SI&A form for the _CONTRACTING AGENCY COUNTY / CITY__ to forward to MDOT, Bridge Management Unit.

7. Camera

The CONSULTANT must have a digital camera that can clearly record images of pertinent items found during the inspection. One color copy of the pictures must be given to _CONTRACTING AGENCY COUNTY / CITY__ as part of the Inspection Report along with the electronic file.

8. Hand Tools

The CONSULTANT must provide the hand tools necessary to complete the inspection. Some of these are ladders, waders, hammers, lighting, marking paint, measuring tapes, etc.

C. Traffic Control

Traffic control for closing a lane is not required for this project. The inspection is expected to be done from the shoulders or the median. Some safety equipment for working on the shoulder is necessary such as traffic cones, flashers on the vehicles, flexible roll-up sign for "Men Working Ahead", etc. If the shoulders are too narrow to do the inspection safely, the CONSULTANT is to recommend a supplemental in-depth inspection. **(***The agency may want to add a section here that will tell the consultant if the agency will provide traffic control for specific structures that are already known to need traffic control. Sometimes this is just handled within the context of an understanding between the consultant and the known conditions / circumstances of the owners network.***)**

D. Release of Information

The CONSULTANT may not release any information about the bridge or the Inspection to anyone outside of _CONTRACTING AGENCY COUNTY / CITY__. Failure to abide by this stipulation could result in penalties as a result of the Homeland Security Act.

The CONSULTANT is not allowed to make copies of the information in the bridge files unless given written approval from the _CONTRACTING AGENCY COUNTY / CITY__ PM.

E. References

The CONSULTANT is to have the following reference material and be familiar with their contents.

1. National Bridge Inspection Standards (NBIS) Federal Code of Regulations, 23 CFR 650.

2. AASHTO Manual for Condition Evaluation of Bridges, 1994, and subsequent interim changes or the most recent version.

3. Michigan Structure Inventory and Appraisal Coding Guide, latest edition.

4. FHWA Publications:

    a. Bridge Inspector's Reference Manual (BIRM), latest edition.
    b. Culvert Inspection Manual, Report No. FHWA-IP-86-2.
    c. Inspection of Fracture Critical Bridge Members, Report No. FHWA-IP-86-26.
    d. Recording and Coding Guide for the Structure Inventory and Appraisal of Nation's Bridges, Report No. FHWA-PD-96-001, December 95.

F. Terms and definitions

The following terms and definitions apply to this Scope of Services

1. Bridge Owner (Owner)
   The person within the local agency responsible for ensuring bridge inspection is completed to the requirements of the Nation Bridge Inspection Standards.

2. _CONTRACTING AGENCY COUNTY / CITY__
   The local government agency issuing the contract.

3. _CONTRACTING AGENCY COUNTY / CITY__ PM (Project Manager)
   The person administering the contract for the local government agency.

4. CONSULTANT PM (Project Manager)
   The person responsible for administration of the contract for the consulting firm.

5. Inspection QTL
   Person meeting the qualifications of the NBIS to do bridge inspection.

6. NBIS

National Bridge Inspection Standards, 23-CFR-650

7. MBIS
   Michigan Bridge Inspection System, a web site for the entry of bridge inspection reports.

8. MBRS
   Michigan Bridge Reporting System, a web site for the retrieval of bridge inspection data.

9. Bridge Inspection
   Periodic safety inspection of bridge structures to “Routine” standards of the NBIS.

10. sdf
11. sdf
12.

APPENDICES

Forms

Sample Bridge Safety Inspection Report (BSIR), MDOT form 2502

Sample Structure Inventory & Appraisal (SIA), MDOT form 1717a

Sample Wrok Recommendation Form

Sample Request for Action Form

The following Publications and Guidelines can be found at the Michigan Department of transportation, Bridge Operations Webpage
http://www.michigan.gov/mdot/0,1607,7-151-9625_24768---,00.html

MDOT Bridge Analysis Guide, including Assumption & Summary Sheets.

MDOT Bridge Inspection advisory notes.

MDOT Bridge Inspection Frequency Guidelines.

MDOT Bridge Deck Repair Matrix.

MDOT Bridge preservation work activity list.

MDOT Bridge Scour Cross Section Worksheet.

WORK PACKAGE LISTING and LOCATION MAP

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **ACTION**: National Bridge Inspection Standards – Scour Evaluations and Plans of Action for Scour Critical Bridges
(Reply Due: February 29, 2008)
/s/ Original Signed by

Date: January 4, 2008

In Reply Refer To: HIBT-20

From: King W. Gee
Associate Administrator for Infrastructure

To: Associate Administrator for RD&T
Directors of Field Services
Resource Center Director
Division Administrators

The purpose of this memorandum is to request your assistance towards ensuring that State and local agencies (referenced herein as bridge owners) complete the scour evaluation of their bridges over waterways (riverine and tidal). Also, we request your assistance towards ensuring that bridge owners develop and implement a Plan of Action (POA) for each bridge identified as scour critical to meet the requirement set forth in the National Bridge Inspection Standards (NBIS) regulation, 23 CFR 650.313(e)(3).

Status of Bridge Scour Evaluations and POAs for Scour Critical Bridges:

Bridge owners have been working for several years towards the evaluation of their bridges over waterways to determine foundation vulnerability against stream instability and scour. To date, about 93 percent of these bridges have been evaluated. We must, however, make sure that all bridges over waterways are evaluated for their vulnerability to stream instability and scour. As of August 2007, bridge owners reported on their National Bridge Inventory (NBI) data submission a total of 34,900 bridges over waterways that still remain to be evaluated as for their scour vulnerability. These are bridges that have been coded 6, T, or Null for Item 113 of the NBI. The FHWA established a target date of January 1997 for completing all scour evaluations by memorandum dated July 15, 1991; however, as the NBI data shows, we still have work to do to complete this important component of the NBIS. Table 1 presents the number of bridges over waterways on the National Highway System (NHS) and the non-NHS that still need a scour evaluation. Another 67,039 bridges over waterways identified by bridge owners as having unknown foundations remain to be evaluated for their scour vulnerability as of August 2007. We will address the subject of unknown foundations, including a process developed by the FHWA's Office of Bridge Technology to identify bridge foundations characteristics under a separate memorandum.

Table 1 – Number of Bridges over Waterways Needing a Scour Evaluation			
Item 113 Code	NHS	Non-NHS	Total
6	3,311	30,589	33,900*
T	339	661	1,000
Total	3,650**	31,250***	34,900

* Includes 6,606 bridges not coded for Item 113.
** Includes 3,480 State-owned bridges; 162 local-owned bridges; and 8 other-owner bridges.
*** Includes 10,614 State-owned bridges; 20,546 local-owned bridges; and 90 other-owner bridges.

With regards to POA for scour critical bridges, the NBIS regulation, 23 CFR 650.313(e)(3), enacted January 13, 2005, requires that bridge owners prepare a POA to monitor both known and potential deficiencies and to address critical findings for bridges identified to be scour critical. The FHWA's Office of Bridge Technology issued a memorandum dated March 29, 2005, which advised FHWA's field offices of the January 13, 2006, target date for implementing the requirements of the NBIS regulation. In a follow-up memorandum dated March 23, 2006, the Office of Bridge Technology requested the FHWA's field offices to report by May 5, 2006, on their corresponding bridge owners' implementation plan, which should have included a schedule for developing a POA. To date, we have received only a few responses.

Table 2 shows that bridge owners reported 2,671 bridges over waterways as scour critical based on the observed scour condition at one or more of the bridge foundations (code 0, 1, or 2 for Item 113). Also, Table 2 shows that bridge owners reported 18,233 bridges over waterways as scour critical based on the assessed or calculated scour depths that, if developed, would make one or more of the bridge foundations unstable (code 3 for Item 113). A State-by-State breakdown for NBI Item 113 by NHS and non-NHS is presented in Attachment A. Please note that Attachment A includes tables titled "NHS Other-Owner Bridges" and "Non-NHS Other-Owner Bridges." The data shown on the latter tables represent owner codes identified as private, railroad, unknown and records with the owner code missing.

Table 2 – Number of Scour Critical Bridges				
Scour Condition	**Item 113 Code**	**NHS**	**Non-NHS**	**Total**
Observed	0	2	111	113
	1-2	119	2,439	2,558
Total Observed		121	2,550	2,671
Total Assessed or Calculated	3	2,889	15,344	18,233
Total Scour Critical Bridges		3,010*	17,894**	20,904

* Includes 2,972 State-owned bridges; and 38 local-owned bridges.
** Includes 7,769 State-owned bridges; 10,117 local-owned bridges; and 8 other-owner bridges.

The FHWA's role and responsibility is to ensure that bridge owners complete the scour evaluation of all their remaining bridges over waterways, and that they develop, implement and maintain a POA for each of their bridges over waterways identified as scour critical to comply with the NBIS regulation.

Actions Requested:

After consulting with the FHWA Office of Chief Counsel and conducting a thorough review of the NBI database, there are several bridges that appear to not be in compliance with the NBIS regulation regarding scour. Since State departments of transportation (DOT) are responsible for overall NBIS compliance, we solicit your assistance to obtain the following information:

1. Verify with your corresponding bridge owner manager official that they still have bridges that are vulnerable to scour.

   If bridge owners confirm that they still have bridges that are vulnerable to scour (code 6, T, or Null), we request that you notify them that their jurisdiction is not in compliance with 23 CFR 650.313(e). Noncompliance could lead to suspension of Federal-aid highway funds. Bridge owners that confirm having bridges that are vulnerable to scour must provide the following schedule to avoid possible suspension of Federal-aid highway funds:

   - Schedule for completing the evaluation of all remaining scour vulnerable bridges within your State, local and other-owner jurisdiction. We recommend a target date of November 2008 for completing the scour evaluation of these bridges.

2. Verify with your corresponding bridge owner manager official the number of scour critical bridges (code 0, 1, 2, or 3 for Item 113) reported in the NBI database.

   If bridge owners confirm that they have scour critical bridges, we will appreciate it if your corresponding staff can make sure that bridge owners have developed and implemented POAs for each of their scour critical bridges. If bridge owners have not developed and implemented a POA for each of their scour critical bridges, we request that you notify them that their jurisdiction is not in compliance with 23 CFR 650.313(e)(3). As we have already stated, noncompliance could lead to the suspension of Federal-aid highway funds. These bridge owners must provide the following schedules to avoid possible suspension of Federal-aid funds:

   - Schedule for completing the development of all POAs for bridges identified as scour critical. We recommend a target date of November 2008 for bridges under State jurisdiction, and November 2009 for bridges under local and other-owner jurisdictions.

- Schedule for completing the implementation of all POAs for bridges identified as scour critical. We recommend a target date of April 2009 for bridges under State jurisdiction, and April 2010 for bridges under local and other-owner jurisdictions.

In addition, we request that bridge owners submit a status report to the FHWA Office of Bridge Technology every April and November on their progress made towards developing and implementing POAs. The status report should also include the following information:

- Percent of scour critical bridges with POAs developed by State, local, and other-owner jurisdiction, and
- Percent of scour critical bridges with POAs implemented by State, local and other-owner jurisdiction.

Bridge owners must continue to submit their status report until all bridges identified as scour critical in their corresponding jurisdiction have POAs developed and implemented.

We ask for your assistance in obtaining the information requested on these action items from all bridge owners through your corresponding State DOT manager official since the ultimate responsibility for complying with the NBIS requirement is at the State level. When a bridge owner code is missing or coded unknown, we ask that you work with the State DOT manager official to assign a proper owner code to the bridge record.

Please report the information requested herein regarding any actions taken by your division office to verify that bridges owners have reviewed their NBI data as for the number of bridges needing a scour evaluation (code 6, T, or Null for Item 113), and for the number of scour critical bridges within their jurisdiction (code 0, 1, 2, or 3 for Item 113). Also, please provide the schedules for completing scour evaluations, and for developing and implementing POAs for scour critical bridges. We request that you submit this information to the FHWA Office of Bridge Technology by February 29, 2008.

We are providing additional guidance to assist you in compiling the information requested herein in the document titled “Guidance for Reporting Schedule for Completing Bridge Scour Evaluations and Plans of Action for Scour Critical Bridges” (see Attachment B).

Also, we request that you report progress on these actions using a Web-based template, which can be accessed online at: http://staffnet.fhwa.dot.gov/bridge/attachmentc/. Once all fields are completed on this Web-based template, a summary table similar to that presented in Attachment C will be automatically generated on the Web.

If you have any questions please do not hesitate to contact Mr. Jorge E. Pagán-Ortiz, Principal Bridge Engineer – Hydraulics at (202) 366-4604, (jorge.pagan@dot.gov).

3 Attachments

Attachment A – Item 113 Code For NHS State-Owned Bridges

	0	1	2	3	4	5	6	7	8	9	N	U	T	NULL
AL	0	0	0	64	49	135	8	3	1,606	0	816	67	0	0
AK	0	0	0	26	0	20	7	24	175	4	58	33	16	0
AZ	0	0	0	97	0	15	0	131	1,662	0	684	0	0	2
AR	0	0	0	14	0	693	0	22	776	3	414	7	0	0
CA	0	0	2	49	16	864	30	130	1,658	26	4,529	30	67	4
CO	0	0	0	78	9	319	0	12	830	18	770	10	0	0
CT	0	0	0	30	2	45	10	1	338	2	1,134	0	0	0
DE	0	0	0	2	1	9	0	8	85	0	122	0	0	0
DC	0	0	0	0	0	0	20	2	3	4	79	3	0	0
FL	0	0	2	39	3	610	23	61	1,034	3	2,160	122	17	0
GA	0	0	0	32	0	409	1	0	733	0	900	429	6	3
HI	0	0	2	21	0	1	105	3	154	5	91	0	1	0
ID	0	0	2	88	1	31	5	2	303	15	282	2	0	0
IL	0	0	2	106	9	493	13	67	1,148	27	1,544	0	0	0
IN	0	0	47	13	13	131	0	95	955	4	1,181	0	0	0
IA	0	0	0	0	0	394	4	52	667	0	712	0	0	0
KS	0	0	0	81	0	435	177	2	683	17	986	1	0	0
KY	0	0	6	0	2	22	393	58	272	2	751	0	0	284
LA	0	0	3	155	0	0	86	61	693	1	933	18	0	704
ME	0	0	0	15	2	3	0	4	198	0	202	12	12	0
MD	0	0	0	24	0	17	0	6	471	0	842	8	2	0
MA	0	0	2	141	2	47	20	8	231	1	1,502	27	2	0
MI	1	0	2	215	2	69	72	48	428	3	1,571	53	0	0
MN	0	0	0	27	7	142	3	11	480	0	971	0	0	0
MS	0	0	1	39	38	118	380	0	874	8	691	15	2	0
MO	0	0	0	50	0	43	4	0	1,539	2	1,130	0	0	0
MT	0	0	0	10	212	145	104	15	195	0	578	3	0	0
NE	0	0	3	6	26	40	23	16	817	1	306	1	0	0
NV	0	0	0	41	0	13	5	5	204	3	426	1	0	0
NH	0	0	0	14	1	1	23	1	224	0	385	0	3	0
NJ	0	0	0	106	21	92	44	130	395	3	1,644	8	5	0
NM	0	0	0	19	0	251	4	2	949	0	486	13	0	0
NY	0	0	1	12	74	69	19	20	1,062	6	2,074	1	25	0
NC	0	0	0	19	1	28	5	4	1,254	1	1,257	38	27	0
ND	0	0	0	3	0	5	0	5	352	0	161	0	0	0
OH	0	0	0	1	18	419	36	54	918	25	2,211	6	0	0
OK	0	0	6	14	145	64	21	47	1,407	0	1,018	10	0	0
OR	0	0	2	333	8	161	1	15	283	7	567	75	46	0
PA	0	1	10	258	177	185	276	108	593	35	2,142	11	0	0
RI	0	0	0	7	0	9	2	0	28	11	215	0	0	0
SC	0	0	0	120	2	260	0	3	255	108	524	82	21	0
SD	0	0	0	0	0	0	13	0	491	0	307	0	0	0
TN	0	0	0	121	8	77	58	1	1,396	2	1,375	14	0	0
TX	0	0	3	158	23	478	126	153	7,843	43	5,269	30	16	20
UT	0	0	1	29	11	59	4	8	279	3	707	2	0	0
VT	0	0	0	7	0	0	17	2	153	0	271	1	0	0
VA	0	0	0	3	31	169	0	154	1,073	14	1,563	0	0	0
WA	0	0	18	145	10	227	0	42	396	20	1,213	0	25	8
WV	0	0	0	7	2	28	7	2	597	14	477	0	0	0
WI	0	0	0	6	37	293	4	36	708	3	1,559	18	0	0
WY	0	0	0	0	0	0	4	7	532	0	727	0	0	0
PR	1	0	1	8	2	8	3	82	128	3	338	3	2	0
TOT	2	1	116	2,853	965	8,146	2,160	1,723	40,528	447	52,855	1,154	295	1,025

Attachment A – Item 113 Code for Non-NHS State-Owned Bridges

	0	1	2	3	4	5	6	7	8	9	N	U	T	NULL
AL	0	0	0	55	54	115	6	11	2,011	0	564	159	1	0
AK	0	0	0	137	0	23	9	20	199	3	25	65	26	0
AZ	0	0	0	134	0	16	0	102	1,373	0	406	0	0	0
AR	0	0	0	37	7	1,426	7	44	2,337	1	437	909	0	0
CA	0	0	5	49	14	479	55	47	979	21	2,920	122	38	9
CO	0	0	0	104	8	277	2	5	678	2	300	24	0	0
CT	0	0	1	116	10	123	13	22	445	1	503	0	0	0
DE	0	0	0	68	3	29	1	56	342	0	100	0	0	0
DC	0	0	0	0	0	2	26	0	3	2	64	3	0	0
FL	0	0	1	56	1	423	10	19	953	8	806	280	11	0
GA	0	0	0	35	0	224	10	0	1,645	0	1,015	1,087	17	1
HI	0	0	0	16	0	1	70	9	136	2	86	0	0	2
ID	0	0	3	45	1	23	4	3	290	10	176	9	0	0
IL	0	0	0	160	37	751	61	101	1,978	30	1,517	1	0	0
IN	0	0	132	13	24	280	0	76	1,831	2	775	9	0	0
IA	0	0	0	0	0	609	5	123	834	0	645	0	0	0
KS	0	1	0	179	9	618	141	8	1,233	17	695	26	0	0
KY	2	0	25	21	87	215	2,316	232	1,871	11	628	1	0	1,643
LA	0	0	5	450	0	1	79	48	1,362	4	277	1,465	0	1,508
ME	0	0	1	179	24	21	6	24	1,078	0	245	41	56	0
MD	0	0	0	142	0	22	6	18	739	0	492	35	0	0
MA	3	0	14	189	2	22	34	15	159	3	976	51	2	0
MI	0	0	0	164	6	45	50	44	274	1	1,304	60	0	0
MN	0	0	0	37	30	201	19	18	873	4	796	6	0	0
MS	1	0	1	156	142	271	938	22	1,349	0	487	102	0	0
MO	0	0	0	247	3	132	7	1	5,854	7	1,180	2	0	0
MT	0	0	0	12	404	103	198	12	226	1	201	7	0	1
NE	0	0	3	14	54	98	109	7	1,695	4	267	28	0	0
NV	0	0	2	39	3	14	9	0	138	0	105	3	0	0
NH	1	0	0	24	0	4	18	7	552	1	176	9	3	0
NJ	0	0	0	60	16	20	22	19	178	0	937	4	2	0
NM	0	0	3	49	0	250	17	1	655	3	149	101	0	0
NY	0	0	1	72	152	123	20	33	2,509	3	2,083	0	18	3
NC	0	0	1	71	9	272	126	35	6,978	2	1,642	4,943	52	0
ND	0	0	0	7	1	17	2	2	381	0	190	5	0	0
OH	0	1	0	12	71	1,097	115	151	2,369	97	1,788	6	0	0
OK	0	0	20	39	321	227	69	179	3,047	3	931	6	0	0
OR	0	0	3	254	7	192	1	8	198	8	375	121	18	0
PA	0	1	186	2,428	1,161	1,253	1,431	738	2,575	27	2,273	30	0	0
RI	0	0	0	72	1	3	4	3	39	39	161	6	0	0
SC	0	0	2	265	2	2,185	13	0	809	245	716	2,615	119	0
SD	0	0	0	0	0	1	16	1	813	1	175	0	0	0
TN	0	0	3	315	23	250	79	8	3,324	8	943	114	0	0
TX	0	0	34	326	76	984	167	237	14,168	23	2,316	253	37	9
UT	0	0	2	42	20	54	1	16	258	5	206	6	0	0
VT	0	0	4	21	0	7	131	12	317	1	111	22	0	0
VA	1	0	8	20	400	1,249	1	1,411	4,670	11	951	0	0	0
WA	0	0	21	129	8	201	1	25	257	24	348	1	6	4
WV	0	0	1	134	75	86	540	80	4,546	8	218	0	0	0
WI	0	0	0	28	39	324	11	27	942	2	814	34	0	0
WY	0	0	0	3	1	2	10	1	550	2	97	8	0	0
PR	1	1	17	32	57	95	13	181	564	8	148	89	29	0
TOT	9	4	499	7,257	3,363	15,460	6,999	4,262	83,584	655	35,740	12,868	435	3,180

Attachment A – Item 113 Code for NHS Local-Owned Bridges

	0	1	2	3	4	5	6	7	8	9	N	U	T	NULL
AL	0	0	0	0	1	2	10	0	10	0	1	4	0	0
AK	0	0	0	0	0	1	0	0	0	0	0	0	0	0
AZ	0	0	0	0	0	1	24	0	9	0	5	0	0	0
AR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CA	0	0	0	0	0	1	0	0	5	0	8	0	0	0
CO	0	0	0	0	0	1	0	1	56	0	20	0	0	0
CT	0	0	0	0	0	3	0	0	6	0	0	0	0	0
DE	0	0	0	0	0	0	0	0	2	0	13	0	0	0
DC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FL	0	0	0	0	0	0	0	0	14	0	9	12	0	0
GA	0	0	0	0	0	1	1	0	4	0	1	4	0	0
HI	0	0	0	0	0	1	8	1	15	1	1	2	2	0
ID	0	0	0	1	0	1	0	0	2	0	1	0	0	0
IL	0	0	0	3	0	2	5	0	75	0	122	0	0	0
IN	0	0	0	0	0	1	0	0	3	0	2	0	0	0
IA	0	0	0	0	0	3	3	0	9	0	4	0	0	0
KS	0	0	0	0	0	3	0	1	7	0	3	0	0	0
KY	0	0	0	0	0	0	2	0	1	0	0	0	0	0
LA	0	0	0	0	0	0	0	0	1	0	4	5	0	4
ME	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	0	0	0	8	0	0	2	0	5	0	47	2	0	0
MA	0	0	0	1	1	1	1	1	10	1	13	6	0	0
MI	0	0	0	3	0	14	7	1	33	0	16	2	0	0
MN	0	0	0	0	0	0	2	0	5	0	6	0	0	0
MS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MO	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	19	0	11	0	0	0
NV	0	0	0	3	0	1	1	4	47	0	34	0	0	0
NH	0	0	0	0	0	0	6	0	23	0	2	1	0	0
NJ	0	0	0	0	1	1	3	4	19	0	14	0	0	0
NM	0	0	0	0	0	5	0	0	37	0	12	4	0	0
NY	0	0	0	8	0	1	2	0	26	0	143	2	34	0
NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ND	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OH	0	0	1	0	5	38	15	11	121	4	259	4	0	0
OK	0	0	0	0	0	0	0	0	1	0	0	0	0	0
OR	0	0	0	1	3	3	0	0	3	0	9	2	0	0
PA	0	0	0	0	0	1	0	0	1	0	0	0	0	0
RI	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	1	0	1	1	1	2	0	12	0	0	0
TX	0	0	0	2	3	18	12	59	545	1	231	258	1	0
UT	0	0	0	0	0	0	1	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	5	0	6	0	0	2	0	0
VA	0	0	0	0	1	22	0	10	120	0	126	0	0	0
WA	0	0	1	4	2	36	5	9	65	11	67	12	5	0
WV	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	1	5	12	0	1	33	0	2	2	0	0
WY	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PR	0	0	0	0	0	0	0	0	1	0	0	0	0	0
TOT	0	0	2	36	22	175	116	104	1,341	18	1,198	324	42	4

Attachment A – Item 113 Code for Non-NHS Local-Owned Bridges

	0	1	2	3	4	5	6	7	8	9	N	U	T	NULL
AL	1	0	4	101	164	151	1,363	15	4,588	0	181	3,419	0	0
AK	0	0	1	19	0	13	7	0	27	0	11	45	5	0
AZ	1	0	0	150	6	49	362	19	1,503	9	85	87	0	1
AR	0	0	1	11	5	476	83	7	1,148	1	26	3,478	0	0
CA	1	1	169	209	6	2,177	67	78	6,168	20	787	1,694	41	91
CO	1	0	8	104	191	997	13	101	2,950	23	127	1	0	0
CT	0	0	3	238	15	212	48	10	674	0	25	0	1	0
DE	0	0	0	0	0	1	2	1	3	0	3	0	0	0
DC	0	0	0	0	0	0	0	0	0	0	1	1	0	0
FL	0	0	6	136	13	576	73	32	1,840	6	150	2,018	16	0
GA	4	2	0	5	0	91	12	0	3,526	0	287	3,804	19	1
HI	0	0	1	8	1	6	77	6	217	8	6	5	3	1
ID	0	0	19	74	31	38	64	14	1,551	9	22	480	0	1
IL	0	0	13	203	61	5,345	314	301	10,962	9	355	0	0	0
IN	0	2	376	503	775	5,299	1	518	3,802	11	189	1,350	0	0
IA	11	1	90	290	203	730	397	1,299	14,252	34	143	3,073	0	0
KS	19	3	16	43	966	7,261	861	209	10,131	364	110	13	0	0
KY	1	1	33	6	127	145	1,073	156	1,660	1	78	3	0	1,396
LA	0	0	1	104	0	0	28	0	648	4	64	3,444	0	876
ME	0	0	3	23	1	2	14	3	106	0	3	50	4	0
MD	0	1	5	335	2	83	86	70	1,046	0	188	311	7	0
MA	14	1	37	450	34	42	50	56	511	8	34	271	0	0
MI	9	0	32	144	92	1,135	2,364	102	1,766	11	131	549	10	0
MN	0	0	80	289	108	391	160	20	7,807	11	228	183	0	0
MS	0	0	4	159	20	32	2,421	4	1,874	0	77	6,291	5	0
MO	3	0	2	38	425	3,669	26	397	8,892	19	304	0	0	0
MT	0	0	0	1	74	9	40	1	96	1	16	1,667	0	2
NE	10	2	115	392	294	1,418	167	14	6,125	8	76	3,215	0	0
NV	0	0	2	13	0	14	35	0	375	0	83	35	0	0
NH	0	0	4	9	0	0	31	3	726	0	19	35	0	1
NJ	0	0	4	279	78	194	59	201	1,556	2	90	73	2	0
NM	2	0	1	5	2	22	73	1	220	0	12	296	0	0
NY	1	0	47	572	569	460	50	21	5,907	1	883	34	58	0
NC	0	0	0	0	1	1	30	3	356	2	104	246	0	0
ND	0	0	0	74	13	306	5	288	630	0	13	1,936	0	0
OH	0	2	2	86	507	3,931	3,823	712	7,077	862	729	321	0	0
OK	4	2	79	90	1,097	884	626	610	12,388	4	62	11	1	0
OR	1	1	322	407	33	207	2	79	1,125	7	148	1,635	5	0
PA	4	3	246	1,280	518	532	1,706	332	935	47	387	5	0	0
RI	0	0	0	43	1	4	9	0	32	28	26	1	0	0
SC	0	0	0	0	0	47	2	0	20	0	37	709	3	0
SD	0	0	0	0	0	0	572	1	3,407	0	22	0	0	0
TN	2	0	70	412	34	714	73	26	8,788	4	260	973	0	0
TX	7	3	6	10	23	92	186	295	6,632	27	371	8,468	8	2
UT	1	0	6	81	90	258	86	13	414	9	31	8	0	1
VT	3	2	55	197	3	14	235	60	793	0	15	216	0	1
VA	0	0	2	0	33	131	0	55	565	0	195	0	0	0
WA	0	1	29	420	87	688	41	217	1,623	122	183	203	38	6
WV	0	0	0	3	0	1	36	0	58	0	17	0	0	0
WI	0	0	2	51	152	498	66	364	5,765	11	274	1,546	0	0
WY	0	0	0	0	0	0	16	3	401	0	24	393	0	0
PR	2	2	9	13	14	25	5	77	139	2	15	22	0	0
TOT	102	30	1,905	8,080	6,869	39,371	17,940	6,794	153,805	1,685	7,707	52,618	226	2,380

Attachment A – Item 113 Code for NHS Other-Owner Bridges

	0	1	2	3	4	5	6	7	8	9	N	U	T	NULL
AL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AK	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AZ	0	0	0	0	0	0	1	0	0	0	0	0	0	0
AR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CA	0	0	0	0	0	0	0	0	0	0	3	0	0	0
CO	0	0	0	0	0	0	0	0	38	0	50	0	0	0
CT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HI	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ID	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IL	0	0	0	0	0	2	4	1	1	0	3	0	0	0
IN	0	0	0	0	0	0	0	0	2	0	0	0	0	0
IA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KS	0	0	0	0	0	0	0	0	0	0	1	0	0	0
KY	0	0	0	0	0	0	1	0	0	0	0	0	0	0
LA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ME	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MI	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MN	0	0	0	0	2	0	0	0	0	0	3	0	0	0
MS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MO	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	1	0	0	0	0	0	0	0	0
NV	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NJ	0	0	0	0	0	0	0	0	1	0	10	0	2	0
NM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NY	0	0	0	0	0	0	0	0	0	0	1	0	0	0
NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ND	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OH	0	0	0	0	0	0	0	0	2	0	0	0	0	0
OK	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OR	0	0	0	0	0	0	0	0	0	0	1	0	0	0
PA	0	0	0	0	2	0	0	0	1	0	24	0	0	0
RI	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	1	0	1	2	0	0
UT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	1	0	0	4	0	3	0	0	0
WA	0	0	0	0	0	0	0	0	0	0	1	0	0	0
WV	0	0	0	0	0	0	0	0	1	0	1	0	0	0
WI	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOT	0	0	0	0	4	4	6	1	51	0	102	2	2	0

Attachment A – Item 113 Code for Non-NHS Other-Owner Bridges

	0	1	2	3	4	5	6	7	8	9	N	U	T	NULL
AL	0	0	0	0	0	0	6	0	1	0	25	0	0	0
AK	0	0	0	0	0	1	1	0	2	0	0	0	0	0
AZ	0	0	0	0	0	0	0	0	0	0	2	0	0	0
AR	0	0	0	0	0	0	0	0	2	0	2	0	0	0
CA	0	0	0	0	0	1	0	0	1	0	16	0	0	10
CO	0	0	0	0	0	0	0	0	0	0	5	0	0	0
CT	0	0	0	1	0	1	1	0	1	0	133	0	0	0
DE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FL	0	0	0	0	0	0	2	0	0	0	4	7	0	0
GA	0	0	0	0	0	0	0	0	0	0	51	0	0	0
HI	0	0	0	0	0	0	2	0	0	0	0	3	0	0
ID	0	0	0	0	0	0	0	0	0	0	0	1	0	0
IL	0	0	0	0	0	11	19	0	13	0	85	0	0	0
IN	0	0	0	0	1	0	0	0	1	0	14	1	0	0
IA	0	0	0	0	0	1	4	3	43	0	80	17	0	0
KS	0	0	0	1	1	3	0	0	1	2	3	0	0	0
KY	0	0	0	0	0	0	4	0	0	0	20	0	0	3
LA	0	0	0	0	0	0	0	0	0	0	1	5	0	0
ME	0	0	0	0	0	0	0	0	1	0	24	1	0	0
MD	0	0	0	1	0	2	0	0	2	0	2	0	0	0
MA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MI	0	0	0	0	0	0	1	0	0	0	2	0	0	0
MN	0	0	0	0	0	0	1	0	6	1	48	4	0	0
MS	0	0	0	0	0	0	0	0	2	0	25	5	0	0
MO	0	0	0	0	0	0	0	1	6	0	13	0	0	0
MT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	1	1	1	0	28	0	14	0	0	0
NV	0	0	0	0	0	0	1	0	4	0	1	4	0	0
NH	0	0	0	0	0	0	0	0	1	0	1	0	0	0
NJ	0	0	0	0	0	1	2	0	4	0	118	0	0	0
NM	0	0	0	0	0	0	0	0	0	0	3	0	0	0
NY	0	0	0	1	0	0	1	0	14	0	92	1	0	0
NC	0	0	0	0	0	0	0	0	0	0	2	0	0	0
ND	0	0	0	0	0	0	1	0	0	0	8	0	0	0
OH	0	0	0	0	0	0	0	0	5	1	56	0	0	0
OK	0	0	0	0	0	0	0	0	0	0	2	0	0	0
OR	0	0	0	0	0	0	1	0	0	0	3	5	0	4
PA	0	0	1	3	3	7	22	2	9	2	233	4	0	0
RI	0	0	0	0	0	0	0	0	0	0	1	0	0	0
SC	0	0	0	0	0	0	0	0	0	0	19	0	0	0
SD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0	2	0	0	0
TX	0	0	0	0	0	1	0	0	12	1	7	14	0	0
UT	0	0	0	0	0	1	0	0	1	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	1	0	4	0	0	0
VA	0	0	0	0	0	27	0	0	16	0	67	0	0	0
WA	0	0	0	0	0	0	2	0	0	0	2	0	0	0
WV	0	0	0	0	0	1	1	0	2	0	2	0	0	0
WI	0	0	0	0	0	0	0	0	0	0	19	1	0	0
WY	0	0	0	0	0	0	0	0	0	0	1	0	0	0
PR	0	0	0	0	0	0	0	0	1	0	0	0	0	0
TOT	0	0	1	7	6	59	73	6	180	7	1,212	73	0	17

Attachment B

Guidance for Reporting Schedule for Completing Bridge Scour Evaluations and Plans of Action for Scour (POAs) Critical Bridges

- Schedule for completing the evaluation of all remaining scour vulnerable bridges (code 6, T, or Null for Item 113 of the NBI) within your State, local, and other owner jurisdiction.

    1. This must be a firm target date for completing the scour evaluations.
        a) A target date of November 28, 2008, is recommended (e.g., The evaluation of all remaining scour vulnerable bridges within the State, local and other-owner jurisdiction will be completed by November 28, 2008).
        b) Please make sure that bridges with a missing code (null code) on Attachment A are assigned a proper code for Item 113 after a scour evaluation is completed.
    2. Each FHWA division office must review the proposed target date by State, local and other-owner jurisdiction and notify the FHWA Office of Bridge Technology of any action taken such as concurring or nonconcurring with the target date.
        a) Bridge owners must consult with their corresponding FHWA division office in the event that a previously concurred target date must be changed. The FHWA division office must review any information provided in support of the change and notify the FHWA Office of Bridge Technology of any further action(s) taken.
    3. Please continue to report on the progress made by bridge owners towards completing scour evaluations to the FHWA Office of Bridge Technology <u>after your February 29, 2008, report</u>. Bridge owners with less than 90 percent of their scour evaluations completed must report biannually in Calendar Year 2008 (April 30 and November 28), and owners with more than 90 percent of their scour evaluations completed must report by the November 28, 2008, target date.

- Schedule for completing the development of all POAs for bridges identified as scour critical.

    1. This must be a firm target date for completing the development of all POAs.
        a) A target date of November 28, 2008, is recommended for bridges under your State jurisdiction, and November 27, 2009, for bridges under local and other-owner jurisdictions (e.g., POAs for State-owned bridges identified as scour critical will be developed by November 28, 2008; POAs for local-owned and other-owner bridges identified as scour critical will be developed by November 27, 2009).
    2. Each FHWA division office must review the proposed target date by their State, local and other-owner jurisdiction and notify the FHWA Office of Bridge Technology of any action taken such as concurring or nonconcurring with the target date.
        a) Bridge owners must consult with their corresponding FHWA division office in the event that a previously concurred target date must be changed. The FHWA division office must review any information provided in support of the change

and notify the FHWA Office of Bridge Technology of any further action(s) taken.

3. The development of a POA means that bridge owners have held meetings involving the appropriate personnel from internal units within their corresponding agency (design, construction, inspection and maintenance, districts and others as applicable) and with external entities (local authorities such as a commissioner, police department, fire department and others as needed) to identify and document:
   a) General information about the bridge, responsibility for POA, scour vulnerability, recommended countermeasure(s) or alternatives, NBI coding information, countermeasure selection(s) including priority ranking and cost, bridge closure plan, detour route and any other supportive information.
4. Guidance for developing POAs for scour critical bridges is presented in the FHWA's POA training seminar, which was distributed on a CD-ROM to our field offices by memorandum dated May 22, 2007, (see copy of this memorandum at http://www.fhwa.dot.gov/engineering/hydraulics/bridgehyd/20070522.cfm). Copies of this CD-ROM can be obtained from NHI at the following Web site: http://www.nhi.fhwa.dot.gov/training/NHIStoreSearchResults.aspx?get=&COURSE_NO=135085&KEYWORD=&TITLE=. In addition, the POA training seminar is available online at no cost at http://fhwa.acrobat.com/n135085seminar.

- Schedule for completing the implementation of all POAs for bridges identified as scour critical.

1. This must be a firm target date for completing the implementation of all POAs.
   a) A target date of April 29, 2009, is recommended for bridges under your State jurisdiction, and April 29, 2010, for bridges under local and other-owner jurisdictions (e.g., POAs developed for State-owned bridges identified as scour critical will be implemented by April 29, 2009; POAs developed for local-owned and other-owner bridges identified as scour critical will be implemented by April 29, 2010).
2. Each FHWA division office must review the proposed target date by State, local and other-owner jurisdiction and notify the FHWA Office of Bridge Technology of any action taken such as concurring or nonconcurring with the date.
   a) Bridge owners must consult with their corresponding FHWA division office in the event that a previously concurred target date must be changed. The FHWA division office must review any information provided in support of the change and notify the FHWA Office of Bridge Technology of any further action(s) taken.
3. The implementation of a POA means that bridge owners have completed disseminating POAs to the appropriate personnel within their internal offices/units and external entities and have met with these offices/units and with external entities to communicate:
   a) General information and instructions contained in each POA (e.g., individuals responsible for the POA implementation, detour routes, when to close/open a bridge, countermeasure selection, and design and installation schedules).
      1. Bridge owners should make sure that responsible parties identified in the POA understand their roles and responsibilities and that they are provided with periodic training on the implementation of selected components of a POA such as bridge closure/opening procedures.

b) Frequency to conduct periodic reviews and updates of the information presented in a POA.

- Percent of scour critical bridges with POAs developed by State, local and other-owner jurisdiction.

    1. Please report the percent of scour critical bridges that have been developed for Item 113 code 0-2, and for Item 113 code 3.
    2. Please continue to report progress after your February 29, 2008, report on a biannual basis (April and November) to the FHWA Office of Bridge Technology until POAs have been developed for each scour critical bridges.
    3. We encourage bridge owners to prioritize the development of POAs for bridges coded 1 or 2 for Item 113 that are critical to the transportation system of a locality or region such as Interstate bridges and other NHS bridges on arterial and primary routes.

- Percent of scour critical bridges with POAs implemented by State, local and other-owner jurisdiction.

    1. Please report the percent of scour critical bridges that have been implemented for Item 113 code 0-2, and for Item 113 code 3.
    2. Please continue to report progress after your February 29, 2008, report on a biannual basis (April and November) until POAs have been implemented for each scour critical bridge.
    3. We encourage bridge owners to prioritize the implementation of POAs for bridges coded 1 or 2 for Item 113 that are critical for the transportation system of a locality or region such as Interstate bridges and other NHS bridges on arterial and primary routes.

Attachment C: Action Items for Scour Evaluations of Bridges over Waterways and POAs for Scour Critical Bridges								
					Percent of Scour Critical Bridges with POAs Developed		Percent of Scour Critical Bridges with POAs Implemented	
Agency	**System**	**Schedule for Completing all Bridge Scour Evaluations**	**Schedule for Completing the Development of All POAs**	**Schedule for Completing the Implementation of All POAs**	**Codes 0-2**	**Code 3**	**Codes 0-2**	**Code 3**
State DOT	NHS							
	Non-NHS							
Local	NHS							
	Non-NHS							
Other Owner	NHS							
	Non-NHS							
Reporting State:	**Name and Title of Individual Updating Action Items:**			**Telephone Number:**			**Report Date:**	

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **ACTION**: Technical Guidance for Bridges over Waterways with Unknown Foundations
Date: January 9, 2008

/s/ Original Signed by
From: King W. Gee
Associate Administrator for Infrastructure
In Reply Refer To: HIBT-20

To: Associate Administrator for RD&T
Associate Administrator for
Federal Lands Highway Program
Directors of Field Services
Resource Center Director
Division Administrators

The purpose of this memorandum is to provide technical guidance on a process that should be considered by Federal, State and local agencies (referenced herein as bridge owners) to identify foundation characteristics such as width, depth and length for bridge foundations identified as unknown. The goal of this process is to reduce or eliminate the population of bridges over waterways identified as having unknown foundations, which in turn would allow bridge owners to evaluate these bridges for their scour vulnerability.

Background:

The term "unknown foundations" has been traditionally associated with examining the population of existing bridges over waterways (riverine and tidal) where foundation details are unknown and therefore, foundations could not be evaluated against the hydraulic hazards related to scour. Most of the bridges having unknown foundations were identified by owners while screening their bridges over waterways (riverine and tidal) for their scour vulnerability. These bridges received a Code U for Item 113 of the FHWA's Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (Coding Guide).

The FHWA exempted this population of bridges from being evaluated for their scour vulnerability due to the lack of a process and guidance that would have allowed bridge owners to determine their foundation characteristics and therefore, evaluate these bridges. This exemption did not apply to bridges on Interstate designated routes for which FHWA recommended bridge owners to consider technology available to determine their foundation characteristics and evaluate their scour vulnerability. The use of geophysics technology such as non-destructive testing (NDT) has been available for quite some time; however, cost and reliability of results may be the leading reason for their limited use for determining foundation characteristics.

The National Bridge Inspection Standards (NBIS) regulation, 23 CFR 650.313.e.3, requires that bridge owners develop a plan of action (POA) for bridges identified as scour critical bridges. We are concerned that some bridges within the unknown foundation population may be scour critical and as such need to have a POA as required by the NBIS regulation.

An additional growing concern, primarily related to our aging bridge population and increasing load and performance demand on all bridges, is our limited "body of knowledge" to assess the structural and geotechnical load capacity and deterioration mechanisms of foundation elements in both the short and long-term. When examining the "body of knowledge" from a broader view point, a more global definition of unknown foundations appears to be appropriate as we have to consider the potential of having another population of unknown foundations on land bridges currently reported in the Coding Guide. In general, the topic of unknown foundations presents a broad based challenge to bridge owners, which warrants FHWA's attention.

Status of Bridges with Unknown Foundations:

As of September 2007, the National Bridge Inventory (NBI) data showed that bridge owners reported 67,240 bridges over waterways as having unknown foundations. Table 1 presents the number of bridges over waterways on the National Highway System (NHS) and the non-NHS with unknown foundations by Federal, State and local agencies. It is important to highlight that the NHS population of unknown foundation bridges presented in Table 1 includes 144 bridges with Interstate designation. The number of bridges over waterways having unknown foundations is presented by bridge owner in Attachment A.

Table 1 – Number of Bridges over Waterways Coded U (Unknown Foundations) for Item 113 of the NBI

Agency	NHS	Non-NHS	Total
Federal	0	238	238
State	1,155*	12,864	14,019
Local	324	52,577	52,901
Other Bridge Owners	2	80	82
Total	1,481	65,759	67,240

* Includes 144 bridges with Interstate designation

Guidance on Process for Reducing the Number of Bridges with Unknown Foundations:

The following steps outline a process developed by the FHWA Office of Bridge Technology's Hydraulics and Geotechnical Team that bridge owners may consider to reduce or eliminate the population of bridges over waterways identify as having unknown foundations:

1. Screen all bridges coded U to ensure that they are correctly coded as having unknown foundations. In addition, bridges with unknown foundations that may have been coded 6 for

Item 113 should be recoded as U and undergo a screening as well. Bridge owners that assigned a Code 6 to Interstate bridges with unknown foundations based on the current definition of Code U should keep these bridges with a Code 6 and follow the guidance presented in this process. Direct and specific communication between bridge inspection and bridge design and construction units should expedite and improve the results of this activity.

- Most bridge owners may have some form of historical technical inventory of project plans, standard sheets, construction specifications, and design guidance. A concerted effort to "mine" this historical data by cross referencing coded U bridges construction dates should yield valuable preliminary information regarding foundation practices in that period. This information could also be coupled with knowledge on bridges with known foundations constructed in the same time period. Similar to current foundation practices, historical practices were very repetitive and rather simple in concept.

2. For bridges over waterways that are determined to be correctly identified as having unknown foundations:

- Prioritize these bridges based on their functional classification. We recommend that this prioritization be as follows: Principal Arterial – Interstate; Principal Arterial – Other Freeways or Expressways; Other Principal Arterial; Minor Arterial, Major Collector; Minor Collector.

- Consider using the following criteria for determining, with a reasonable accuracy, foundation characteristics:
  a) Collect and document historical knowledge of foundation design and construction practices for the period of original construction.
  b) Consider geologic, subsurface conditions, bridge standards, and information that may be available from nearby bridges.
  c) Consider applying "proven" surface and subsurface NDT tools to confirm foundation type and determine foundation length.
     1. NCHRP 21-05(2) "Determination of Unknown Subsurface Bridge Foundations" specifically examined NDT tools for the application. The unedited final report and accompanying guideline document can be obtained for loan by contacting NCHRP at NCHRP@nas.edu. More information on this project is available at http://www.trb.org/TRBNet/ProjectDisplay.asp?ProjectID=667.
        a) Pertinent results of this study are summarized in FHWA's Geotechnical Notebook Issuance No. 16 (GT-16) of the same title, which is available at http://www.fhwa.dot.gov/engineering/geotech/policymemo/gt-16.pdf.
        b) Since the completion of project NCHRP 21-05(2) further advancements in computer software and hardware have greatly advanced to provide improved result reliability. The current state of knowledge is such that the combined suite of surface and subsurface NDT tools has limitations based on foundation access (surface or down-hole) foundation material type and dimension and the best results require the user to consider each situation for undertaking a testing program.

- Conduct a scour evaluation based on this determination and consider recoding the bridge for Item 113 according to the outcome of the evaluation.

a) A risk-based prioritized schedule for conducting the scour evaluations of these bridges may be considered.
   1. Factors other than functional classification, such as the amount and reliability of the determined information should be considered in a risk-based prioritization schedule in order to target the scour evaluation of the bridges most in need of attention.
   2. It is likely that only partial foundation information may be determined on some bridges and that some information may be qualitative rather than quantitative resulting in some uncertainty in the scour evaluations for that population.
   3. Several projects funded by the NCHRP have addressed the topic of unknown foundations and produced valuable though limited information and guidance. The concept of a risk based approach was addressed in the NCHRP project 24-25, Risk-based Management Guidelines for Scour at Bridges with Unknown Foundations (Web-only document 107). This project advanced a template for a risk-based approach and computer software. While this project might not meet the needs of all bridge owners, it provides a protocol of how a risk-based approach could be structured to manage bridges with unknown foundations. We encourage bridge owners to consider this product as a beginning draft to develop their own risk based approach. The Web-only document 107 could be downloaded at: http://www.trb.org/news/blurb_detail.asp?id=8000.

3. For bridges that were previously coded as U for Item 113 of the NBI and whose foundations are completely and accurately identified after completing the screening:

- Conduct scour evaluations following the guidance presented in the FHWA publication Hydraulic Engineering Circular No. 18, Evaluating Scour at Highway Bridges, Fourth Edition dated May 2001.
  a) Prioritize the scour evaluation of these bridges based on the functional classification previously recommended.

- Code Item 113 according to the outcome of the evaluation.

We request that your appropriate staff disseminate and discuss this technical guidance with their appropriate Federal and State department of transportation management official. We plan to monitor the progress made by bridge owners towards reducing their number of bridges with unknown foundations by reviewing the NBI data every year in April. November 2010 is the target date for eliminating the number of bridges with unknown foundations from the NBI. We are contemplating amending the NBIS regulations so that any remaining bridge reported as having unknown foundations after November 2010 would be kept with a Code U for Item 113, considered scour critical and subject to the plan of action requirement of the NBIS regulation, 23 CFR 650.313(e)(3), until properly designed countermeasures are installed to protect the bridge foundations or until the bridge is replaced.

If you have any questions please do not hesitate to contact Mr. Jorge E. Pagán-Ortiz, Principal Bridge Engineer – Hydraulics at (202) 366-4604 (jorge.pagan@dot.gov), or Jerry DiMaggio, Principal Bridge Engineer – Geotechnical at (202) 366-1569 (jerome.dimaggio@dot.gov).

Attachment

Attachment A

Number of State, Local and Other Bridge Owner Bridges Coded U (Unknown Foundations) for Item 113

	State		Local		Other Bridge Owners			
	NHS	NNHS	NHS	NNHS	NHS	NNHS	Interstate*	Total
AL	67	159	4	3,419	0	0	0	3,649
AK	33	65	0	45	0	0	8	143
AZ	0	0	0	87	0	0	0	87
AR	7	909	0	3,478	0	0	0	4,394
CA	30	122	0	1,694	0	0	4	1,846
CO	10	24	0	1	0	0	2	35
CT	0	0	0	0	0	0	0	0
DE	0	0	0	0	0	0	0	0
DC	3	3	0	1	0	0	1	7
FL	122	280	12	2,018	0	7	13	2,439
GA	429	1,087	4	3,804	0	0	3	5,324
HI	0	0	2	5	0	3	0	10
ID	2	9	0	480	0	1	0	492
IL	0	1	0	0	0	0	0	1
IN	0	9	0	1,350	0	1	0	1,360
IA	0	0	0	3,073	0	17	0	3,090
KS	1	26	0	13	0	0	0	40
KY	0	1	0	3	0	0	0	4
LA	18	1,465	5	3,444	0	11	7	4,943
ME	12	41	0	50	0	1	10	104
MD	8	35	2	311	0	0	9	356
MA	27	51	6	271	0	0	2	355
MI	53	60	2	549	0	0	7	664
MN	0	6	0	183	0	4	0	193
MS	15	102	0	6,291	0	5	0	6,413
MO	0	2	0	0	0	0	0	2
MT	3	7	0	1,667	0	0	2	1,677
NE	1	26	0	3,183	0	0	0	3,210
NV	1	3	0	35	0	4	0	43
NH	0	7	1	28	0	0	0	36
NJ	8	4	0	73	0	1	0	86
NM	13	101	4	296	0	0	1	414
NY	1	0	2	34	0	1	0	38
NC	38	4,943	0	246	0	0	0	5,227
ND	0	5	0	1,936	0	0	0	1,941
OH	6	6	4	321	0	0	4	337
OK	10	6	0	11	0	0	1	27
OR	75	121	2	1,635	0	5	20	1,838
PA	11	30	0	5	0	4	5	50
RI	0	6	0	1	0	0	0	7
SC	82	2,615	0	709	0	0	27	3,406
SD	0	0	0	0	0	0	0	0
TN	14	114	0	973	0	0	4	1,101
TX	30	253	258	8,468	2	14	5	9,025
UT	2	6	0	8	0	0	0	16
VT	1	22	2	216	0	0	0	241
VA	0	0	0	0	0	0	0	0
WA	1	1	12	201	0	0	1	215
WV	0	0	0	0	0	0	0	0
WI	18	34	2	1,546	0	1	5	1,601
WY	0	8	0	393	0	0	0	401
PR	3	89	0	22	0	0	3	114
TOTALS	1,155	12,864	324	52,577	2	80	144	67,002

* Included under State NHS

Attachment A

Federal Bridges Coded U (Unknown Foundations) for Item 113

	NHS Fed	Non NHS Fed	All Fed
ALABAMA	0	0	0
ALASKA	0	2	2
ARIZONA	0	0	0
ARKANSAS	0	2	2
CALIFORNIA	0	4	4
COLORADO	0	13	13
CONNECTICUT	0	0	0
DELAWARE	0	0	0
DIST. OF COL.	0	5	5
FLORIDA	0	30	30
GEORGIA	0	6	6
HAWAII	0	0	0
IDAHO	0	0	0
ILLINOIS	0	1	1
INDIANA	0	0	0
IOWA	0	5	5
KANSAS	0	7	7
KENTUCKY	0	0	0
LOUISIANA	0	0	0
MAINE	0	0	0
MARYLAND	0	7	7
MASSACHUSETTS	0	0	0
MICHIGAN	0	1	1
MINNESOTA	0	0	0
MISSISSIPPI	0	69	69
MISSOURI	0	1	1
MONTANA	0	1	1
NEBRASKA	0	1	1
NEVADA	0	0	0
NEW HAMPSHIRE	0	0	0
NEW JERSEY	0	4	4
NEW MEXICO	0	1	1
NEW YORK	0	4	4
NORTH CAROLINA	0	12	12
NORTH DAKOTA	0	1	1
OHIO	0	0	0
OKLAHOMA	0	1	1
OREGON	0	1	1
PENNSYLVANIA	0	6	6
RHODE ISLAND	0	0	0
SOUTH CAROLINA	0	0	0
SOUTH DAKOTA	0	0	0
TENNESSEE	0	4	4
TEXAS	0	23	23
UTAH	0	1	1
VERMONT	0	0	0
VIRGINIA	0	13	13
WASHINGTON	0	6	6
WEST VIRGINIA	0	0	0
WISCONSIN	0	3	3
WYOMING	0	3	3
PUERTO RICO	0	0	0
TOTALS	0	238	238

I-70 Overpass Beam Failure
Lakeview Drive Bridge

Washington County, PA

NHI Real Solutions Seminar *July 2008*

Raymond A. Hartle, P.E.

Baker

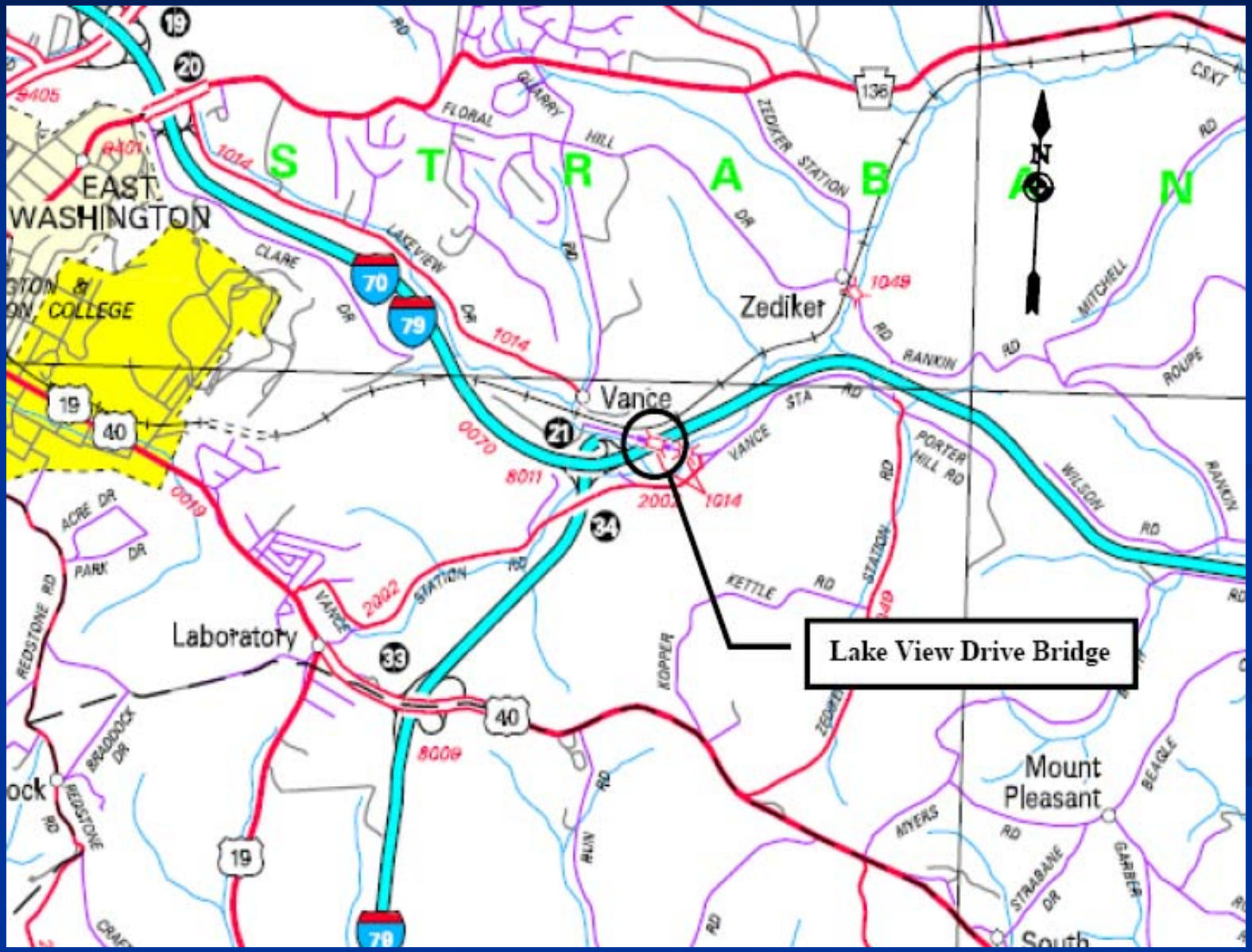
PENNDOT
Pennsylvania
Department of
Transportation

Learning Outcome

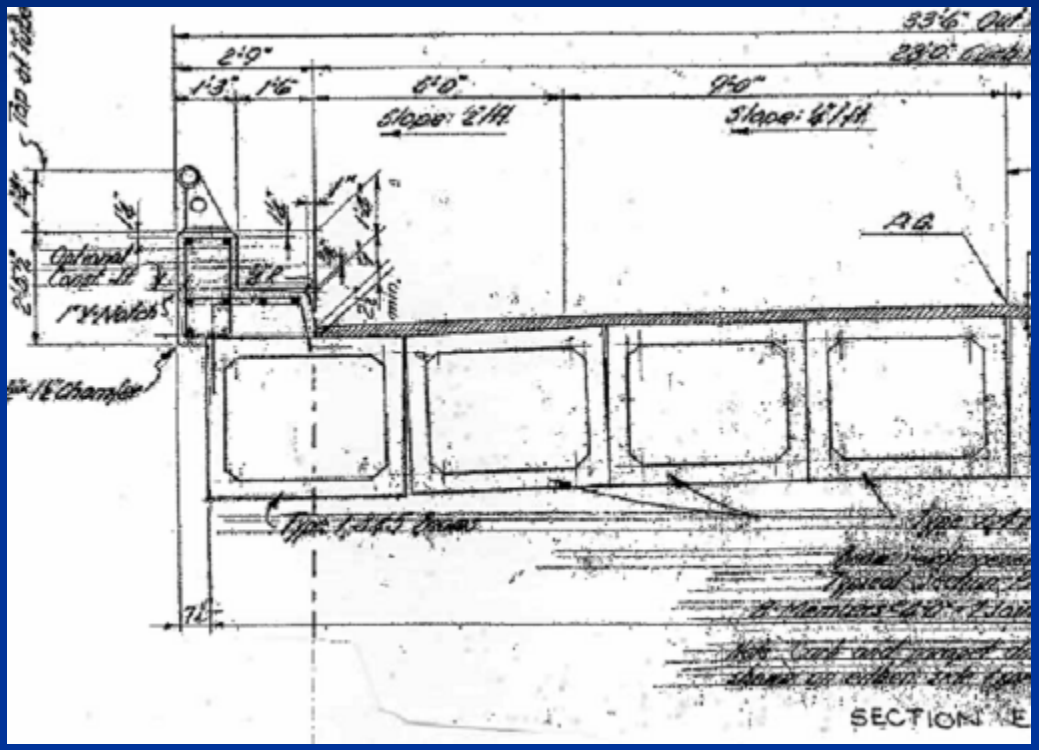
A. Assign an NBI rating to a prestressed, adjacent non-composite box beam superstructure using new rating guidelines

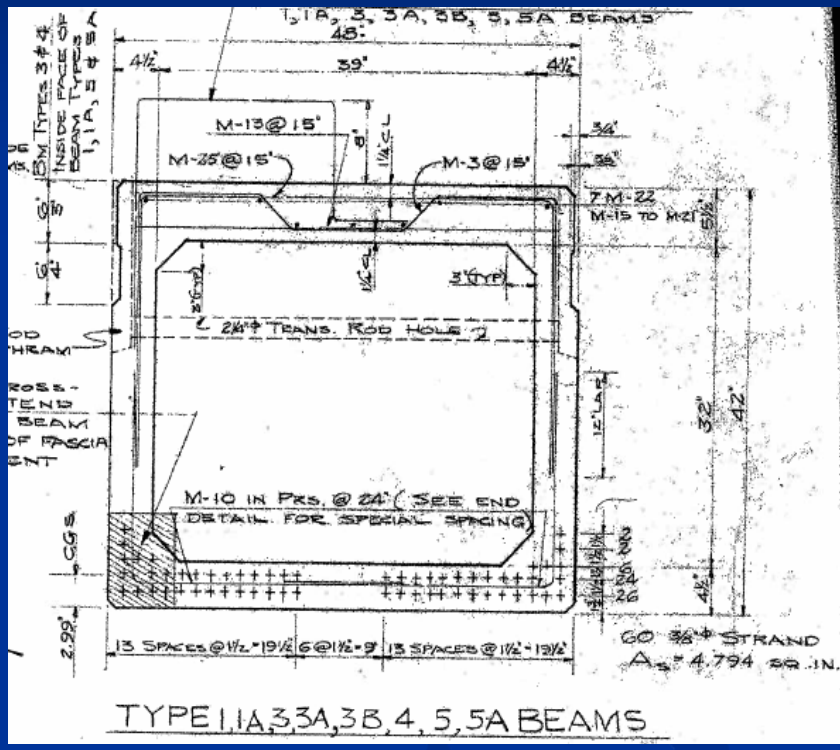
Rating Guidelines

Location Map



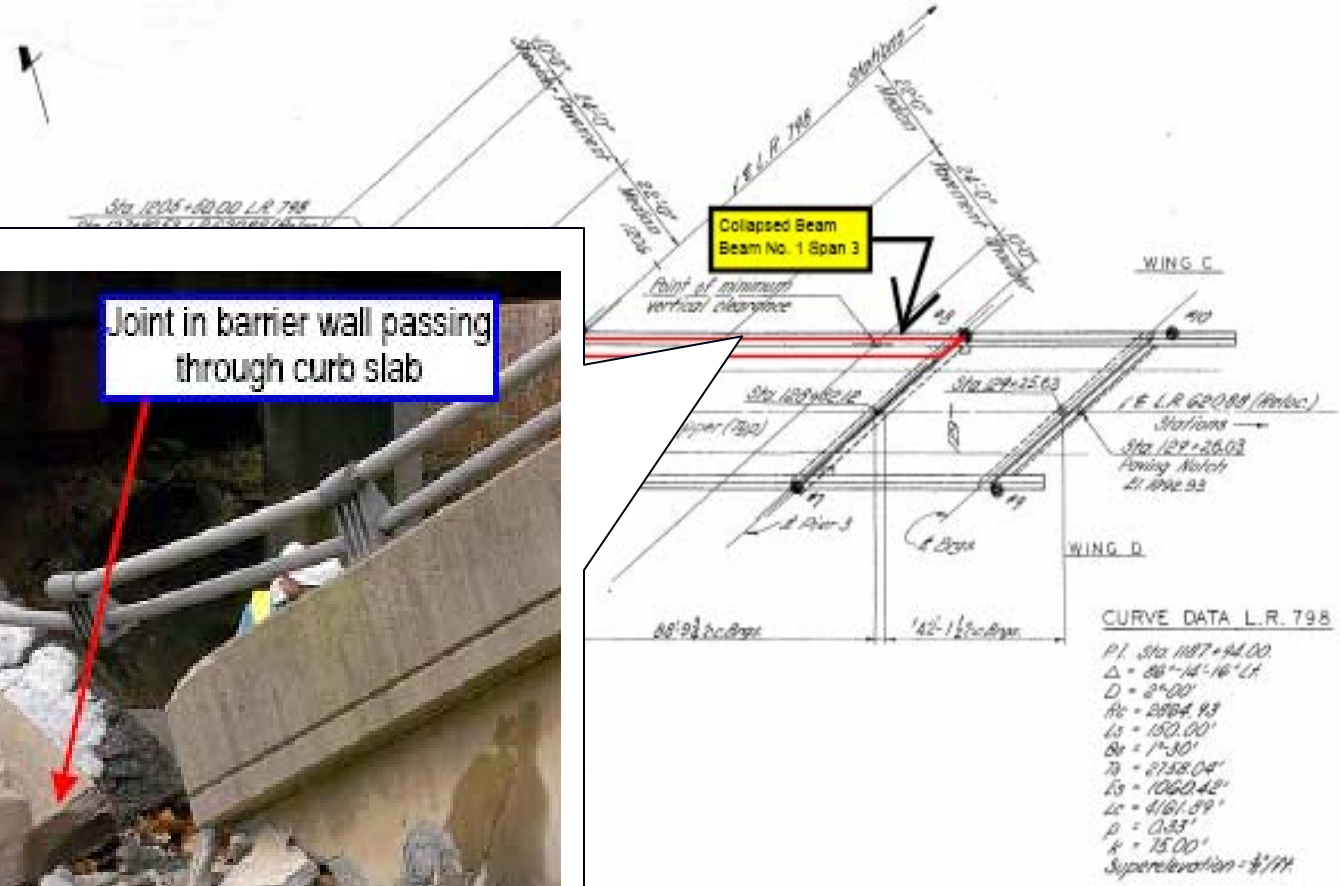
Bridge Cross Section





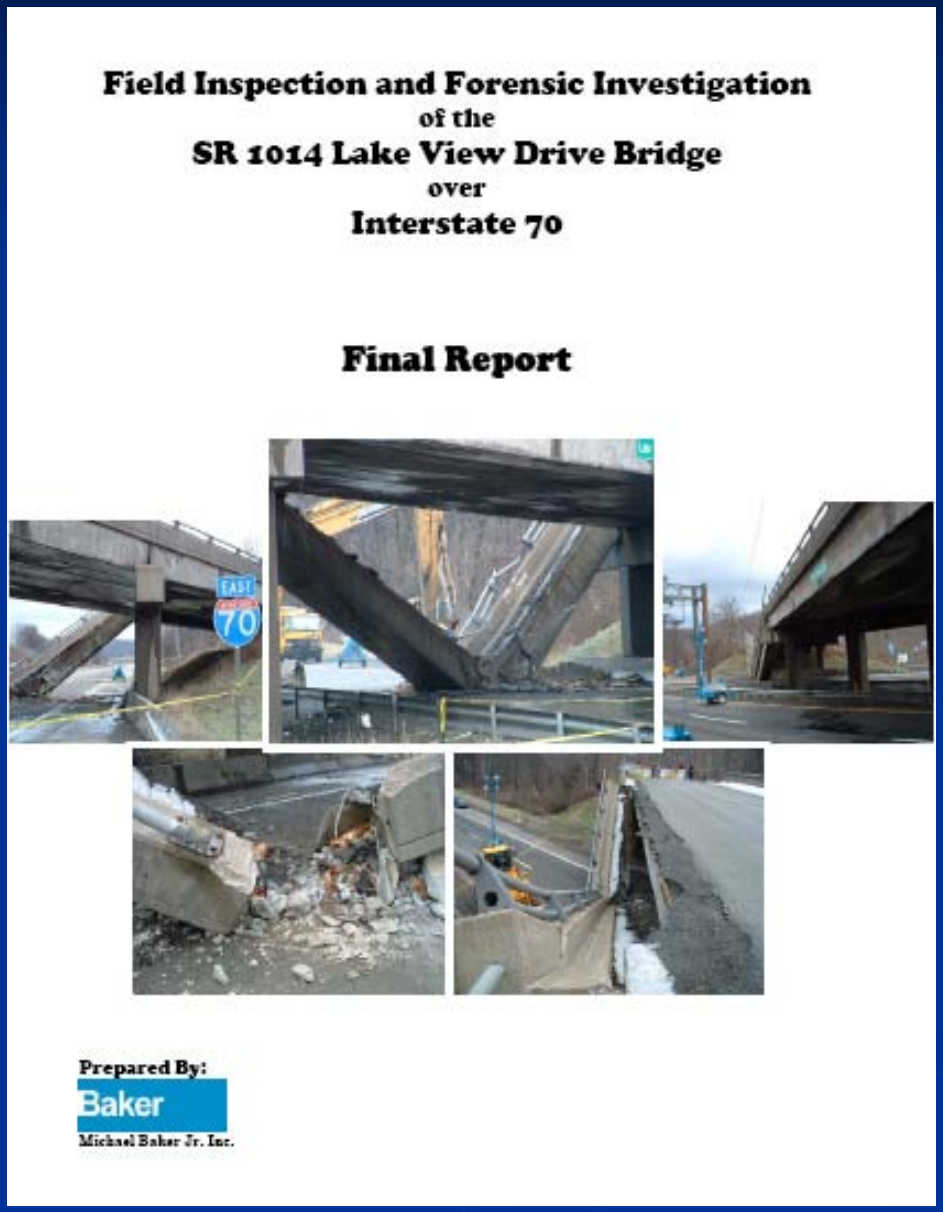
Non-composite

Bridge Plan View



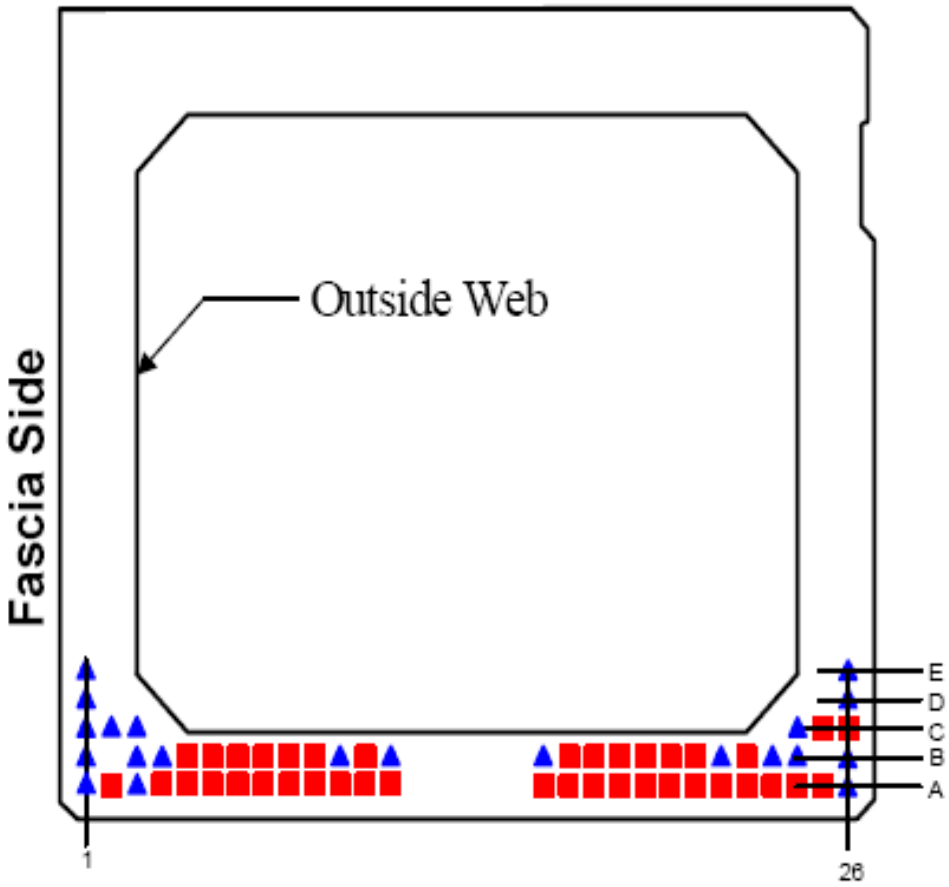

ARMLIFT

Forensic Inspection and Evaluation



- Re-opening I-70 WB
- Safety of other similar bridges in PA

Forensic Evaluation of Materials



More Evaluation and Testing

ATLSS

LEHIGH UNIVERSITY

PENNDOT Project 3900023623

Forensic Evaluation of Prestressed Box Beams from the Lake View Drive over I-70 Bridge

DRAFT REPORT

By
Clay Naito, Ph.D., P.E.
Richard Sause, Ph.D., P.E.
Stephen Pessiki, Ph.D.
Ian Hodgson, S.E.
Chintan Desai

August 2006

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PENNDOT

PITT Report CEIST-33
FHWA-PA-2006-008-EMG001

Submitted to Pennsylvania Department of Transportation

Full-scale Testing Program on De-commissioned Girders from the Lake View Drive Bridge

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Christopher Stull (Chapter 8)

August 2006

school of engineering
civil and environmental engineering
structural engineering and mechanics

Material Properties

Tested concrete and prestressing strands met the design criteria

Concrete Strength f'_c

Design:
5900 psi

Measured:
6200 psi min
8400 psi max

Strand Strength F_y

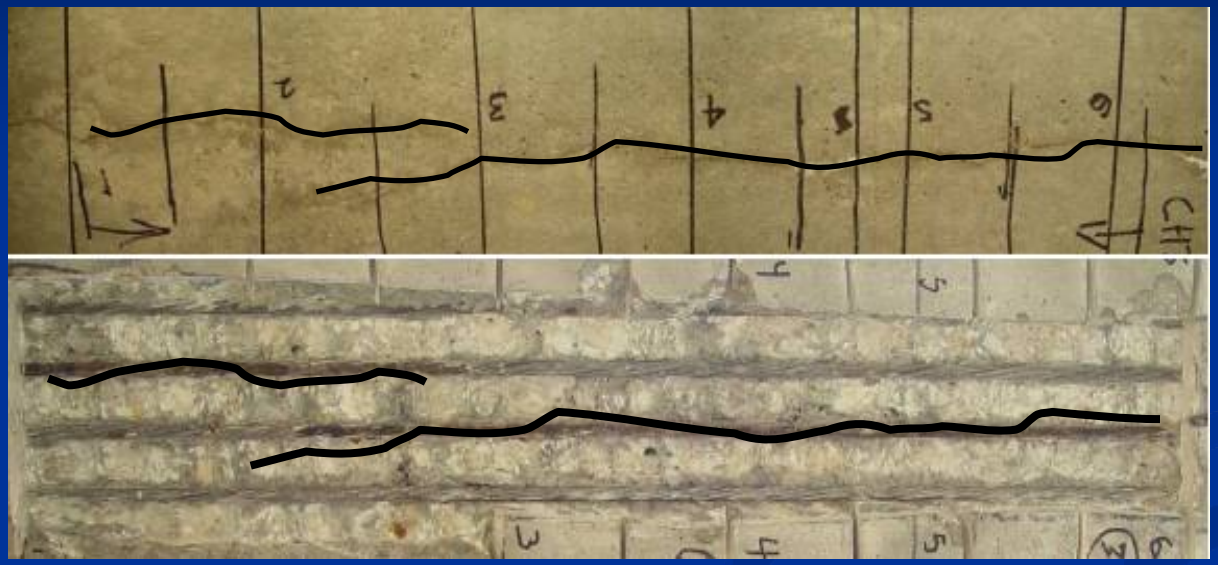
Design:
250 ksi

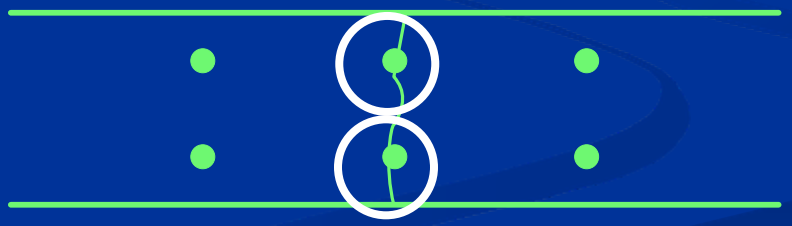
Measured:
276.6 ksi

Unforeseen Fabrication Problems

- Bottom flange thickness
- Bottom concrete cover
- Wall thickness
- Lateral post-tensioning tie rods and shear keys
- Vent holes and drain holes
- Prestress Loss

Correlation of Surface and Strand Conditions

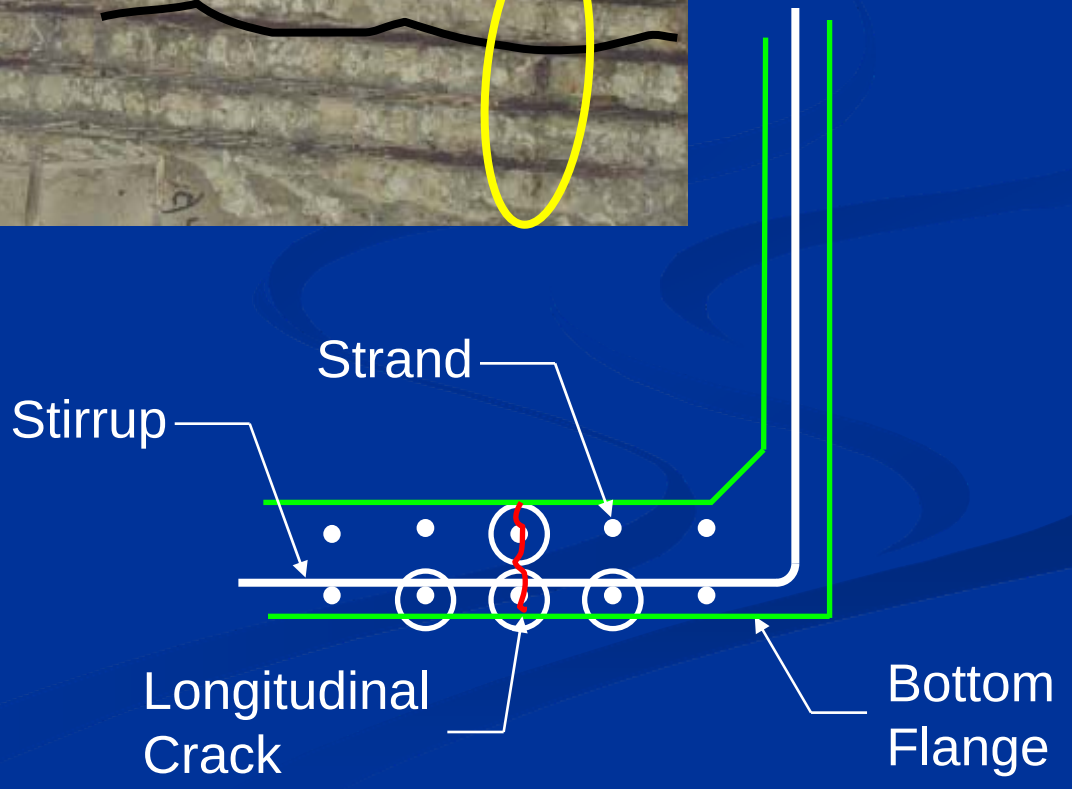




Bottom Flange

Longitudinal Crack

Correlation of Surface and Strand Conditions (continued)



Key Inspection Requirements

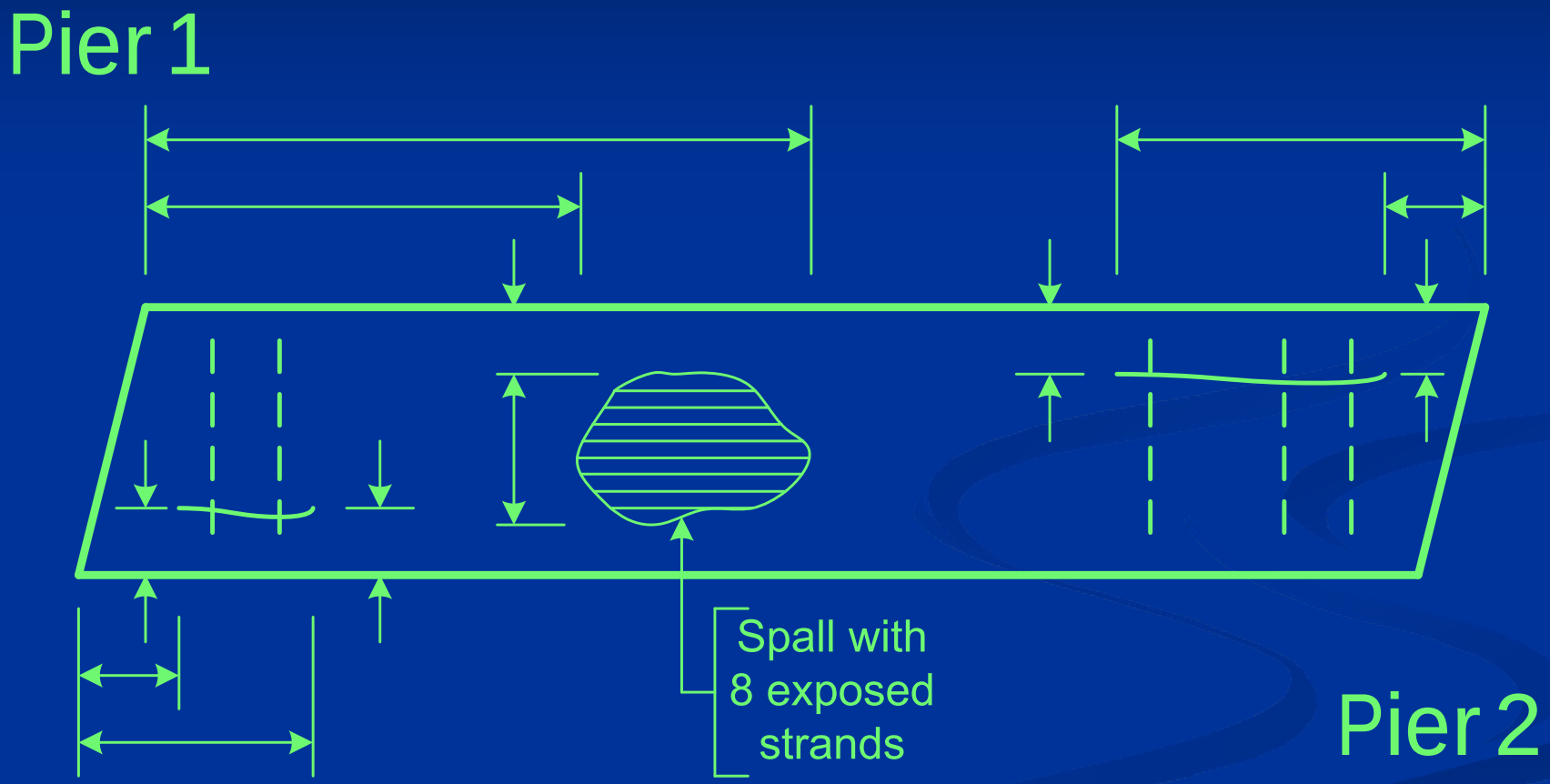
1. Document exposed strands
2. Document cracking patterns
3. Define strand corrosion
4. Measure camber
5. Investigate Independent Beam Action
6. Evaluate barrier and barrier connection
7. Clear clogged drain holes

1. Document Exposed Strands

Collision Damage

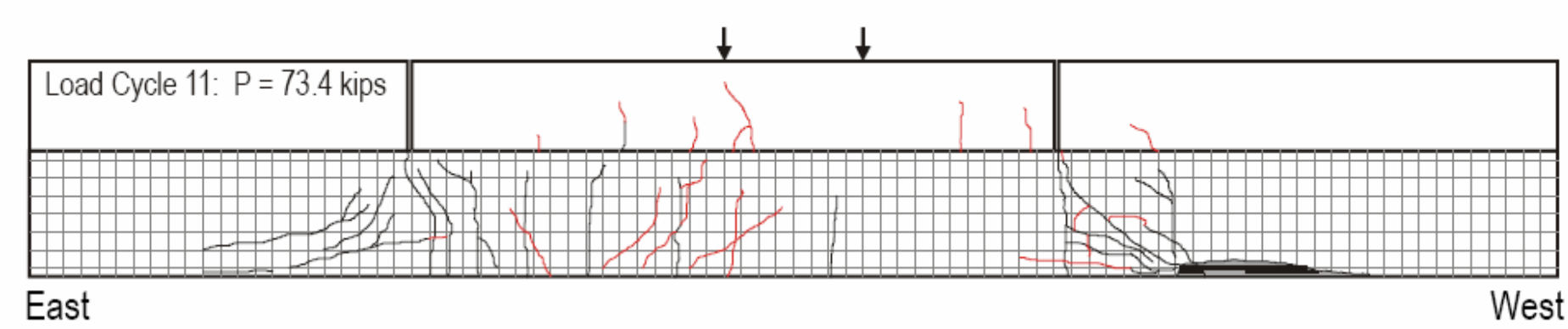
Corrosion Damage

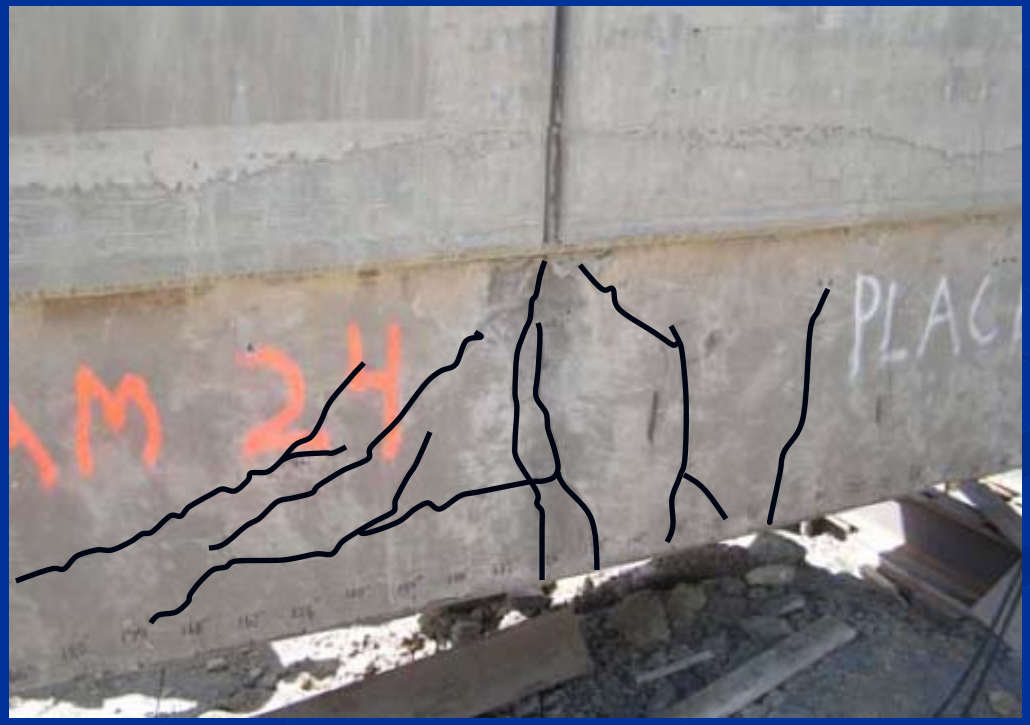
2. Document Cracking Patterns



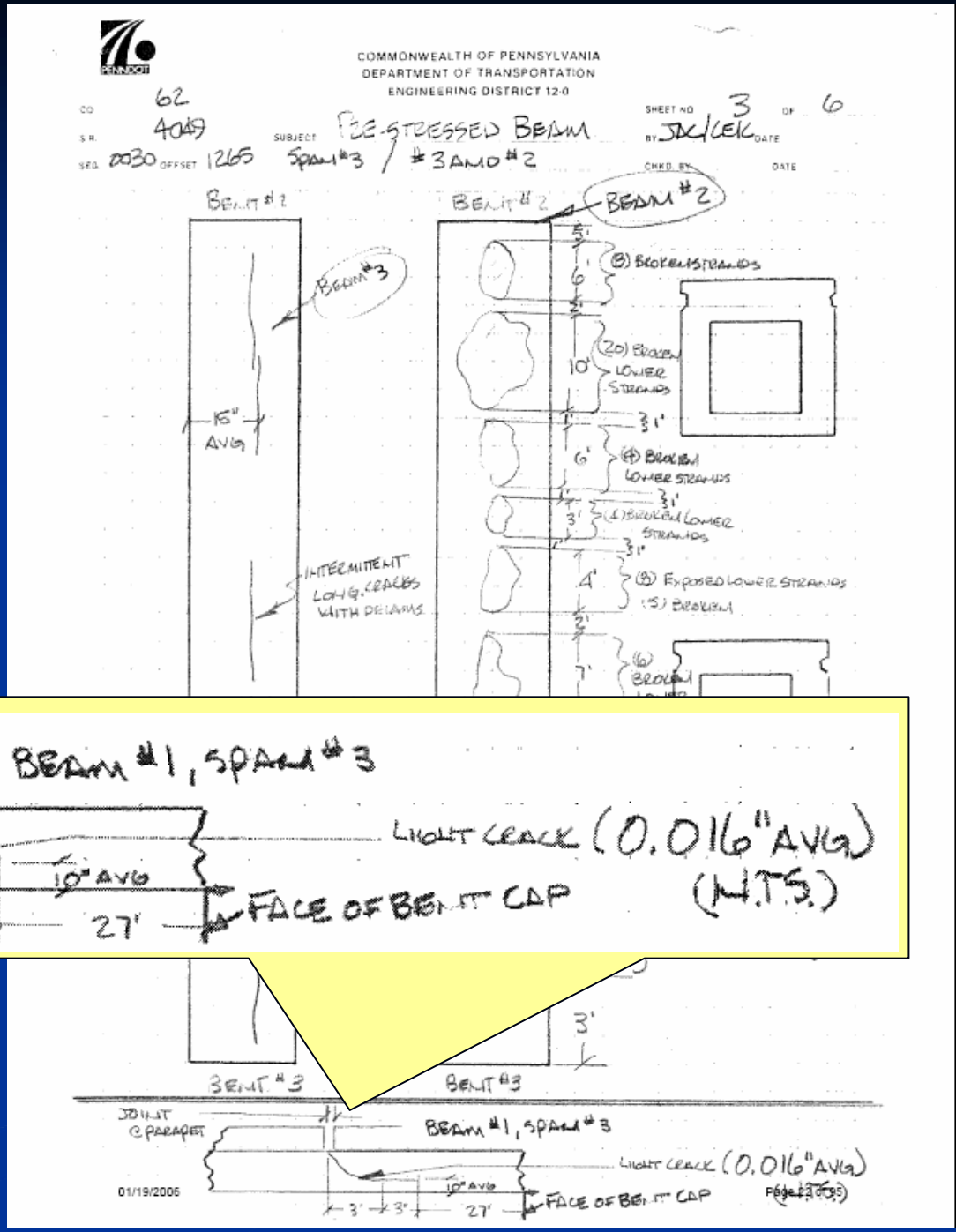
Span 1, Beam 6

Cracking Near Barrier Joints

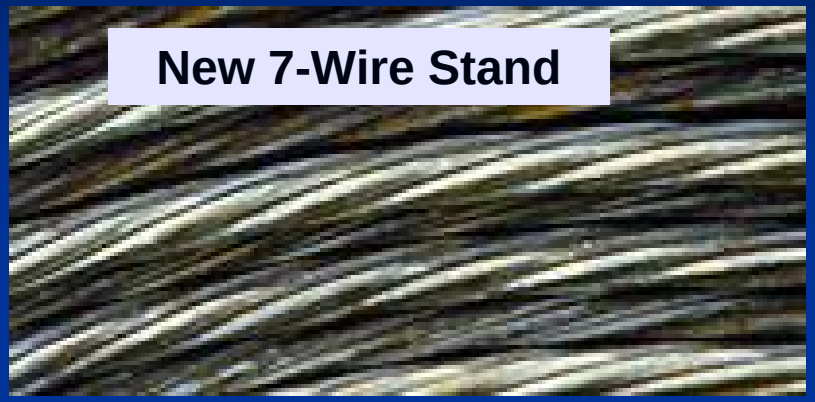


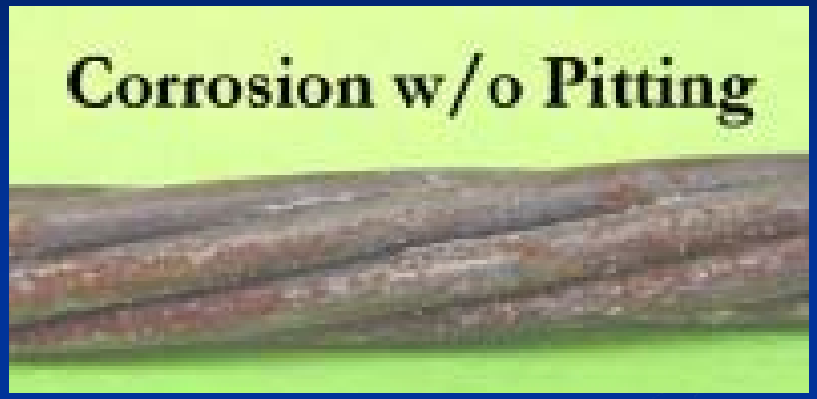


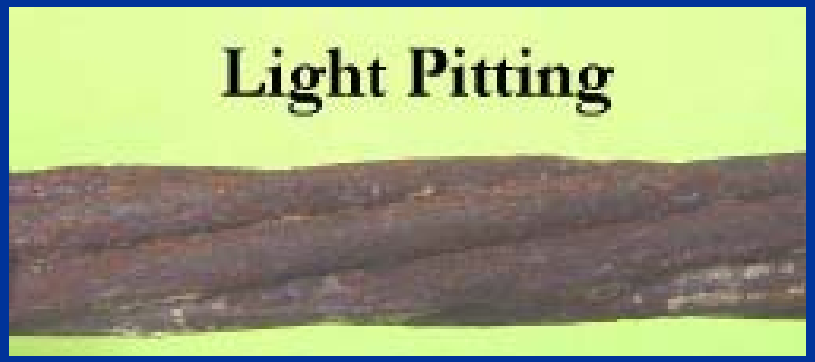
Cracking Near Barrier Joints



3. Define Strand Corrosion

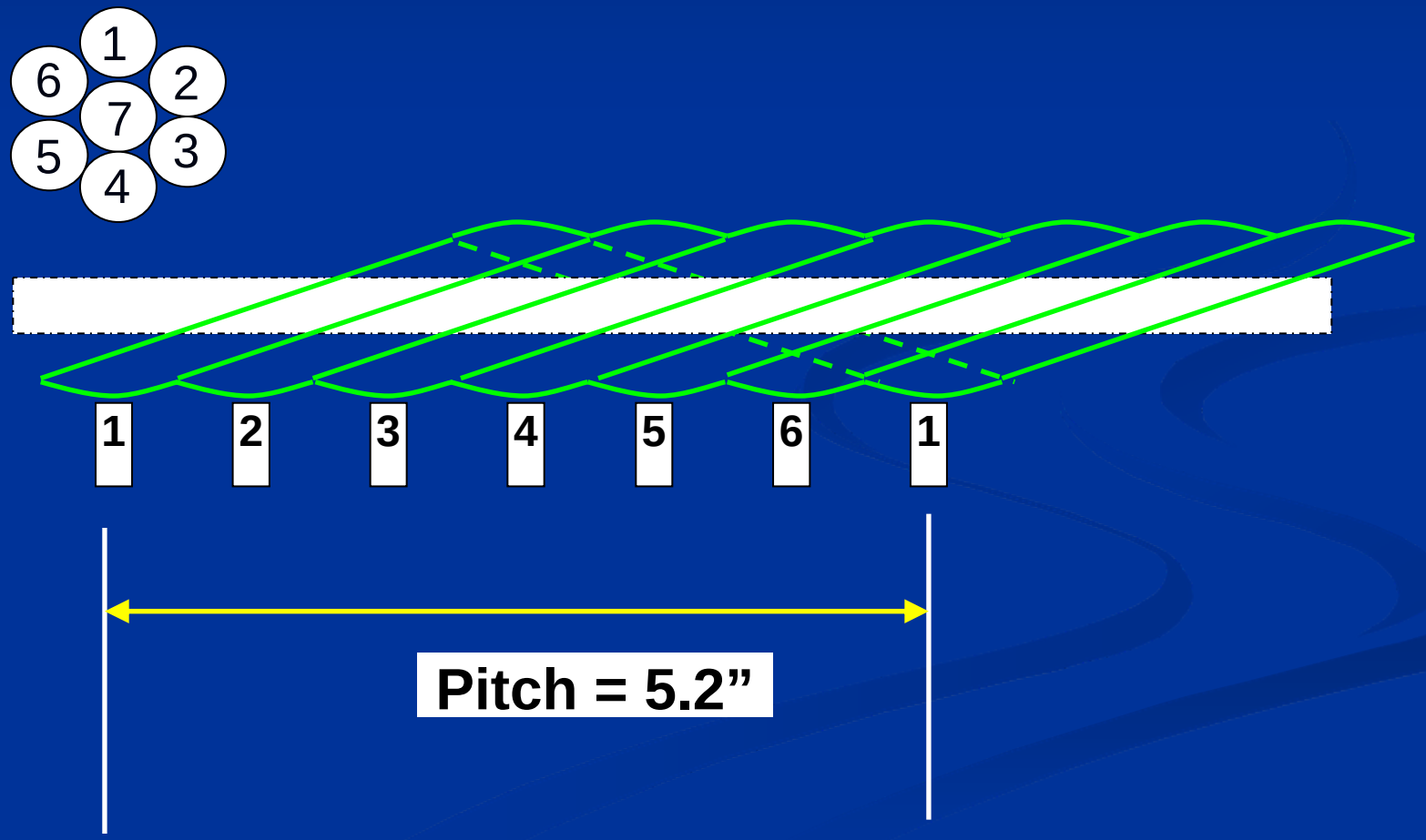




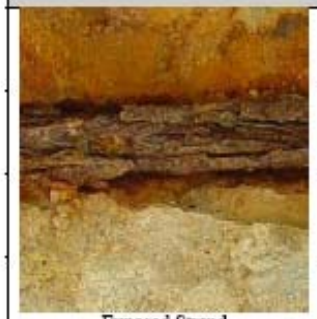


Strand Pitch

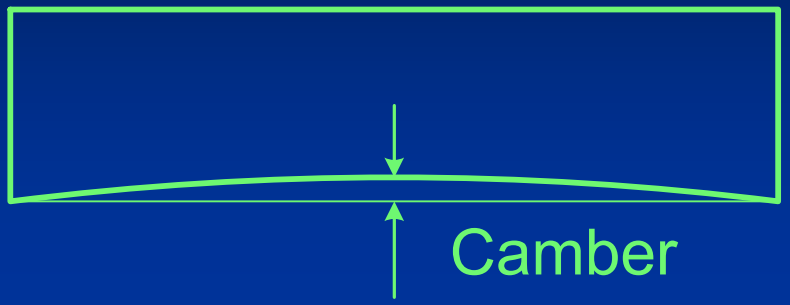
7-wire Strand cross-section



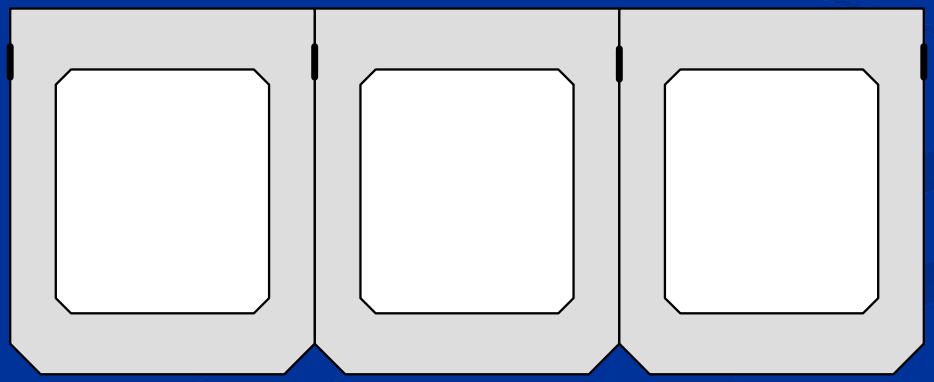
Corrosion Evaluation "Hand Out"

External Surface Condition	Strand Condition (In-situ)	Strand Condition (Removed)	Region Shown	Wire Condition	Average Condition
 Exposed Strand			5A between section 6 & 7 Strand D	Missing 3	# samples 9
				w/ Corrosion 4	w/ Corrosion 4
				Pitted -	Pitted -
				Heavily Pitted 4	Heavily Pitted 2.2
 Heavy Efflorescence w/ Rust			3B between section 1 & 2 Strand E	Missing 0	# samples 1
				Corrosion 6	w/ Corrosion 6
				Pitted 0	Pitted 0
				Heavily Pitted 6	Heavily Pitted 6
 Heavy Efflorescence			3B between section 4 & 5 Strand E	Missing 0	# samples 1
				Corrosion 6	w/ Corrosion 6
				Pitted 0	Pitted 0
				Heavily Pitted 6	Heavily Pitted 6

4. Measure Camber



5. Investigate Independent Beam Action



6. Evaluate Barrier and Barrier Connection

7. Clear Clogged Drain Holes

Rev 02/06

NOTE: The following table supplements the Condition Rating Codes for prestessed concrete adjacent box beam superstructures (Item E18 only)

Superstructure Condition Rating Guidelines for Non-Composite Prestressed Concrete Adjacent Box Beams

Condition Rating	Percent # strands exposed (single beam)	Other Deterioration of P/S Concrete Beams	
9 - Excellent	0%		No cracks, stains or spalls
8 - Very Good	0%		No cracks, stains or spalls
7 - Good	0%		Map cracks and miscellaneous hairline cracks
3 - Serious	15-20%	Spalls	Spalls/delaminations, >25%
		Transverse cracks	Open flexure cracks in bot. Flange
		Web cracks	Vert. or diag. cracks in P/S beam near open jts. in barrier
		Camber	Sagging/Loss of camber
		Transverse Tendons	Broken or missing
5 - Fair		Spalls	Spalls/delaminations, <15%
		Transverse cracks	None
		Longitudinal cracks	Hairline longitudinal cracks in bottom flange
		Longitudinal Joints	Leakage at joints with light efflorescence
		Transverse Tendons	Broken or missing
2 - Critical	>20%	All	Any cond. worse than detailed above

The “Aftermath”

PennDOT’s State Owned Adjacent Box Beam Bridges

As of May 2006	Bridge Count	CLOSED	Load Posted	Restricted
Over Highways	20	3	0	0
Over Streams	778	1	11	15
Grand Totals	798	4	11	15

Participant Exercise

Prestressed Non-Composite Adjacent Box Beam Rating

NBI Rating

- There are delaminations and spalls throughout and several longitudinal cracks up to 1/8” wide. Beam 2 has 30% of its area spalled or delaminated and 7 out of 54 (13%) strands exposed.

Rating = 3, Serious

Rating Reasoning

SOL 431-06-03

Rating: 4

6-15%
Strands Exposed
(single beam)

Rating: 3

Spalls/Delaminations
>25%

Composite Prestressed Concrete Adjacent Box Beams

			Other Deterioration of P/S Concrete Beams
			No cracks, stains or spalls
			No cracks, stains or spalls
			Map cracks and miscellaneous hairline cracks
		Spalls	Minor spalls/delaminations, <5%
		Cr	
		S	
		nsve	
		gitud	
		ngitu	
		S	
		Transve	
		Longitud	
		Longitu	
		Transverse Tendons	vily rusted
		Web cracks	Initi rt. or diag. cracks in P/S beam near open jts. rrier (< 3" length)
3 - Serious	15-20%	Spalls	Spalls/delamin ations, >25%
		Transverse cracks	Open flexure cracks in bot. Flange
		Web cracks	Vert. or diag. cracks in P/S beam near open jts. in barrier
		Camber	Sagging/Loss of camber
		Transverse Tendons	Broken or missing
2 - Critical	>20%	All	Any cond. worse than detailed above




Learning Outcome

A. Assign a NBI rating to a prestressed, adjacent non-composite box beam superstructure using new rating guidelines

I-70 Overpass Beam Failure
Lakeview Drive Bridge

Washington County, PA

Any Questions

Thank You!!

Raymond A. Hartle, P.E.

Baker

PENNDOT
Pennsylvania Department of Transportation

FHWA Bridge Design Guidance No. 1

Revision Date: February 28, 2008

Load Rating Evaluation of Gusset Plates in Truss Bridges

By Firas I. Sheikh Ibrahim, PhD, PE

Part – A
Gusset Plate Resistance in Accordance with the Load and Resistance Factor Rating Method (LRFR)

Gusset connections of non-load-path-redundant steel truss bridges shall be evaluated during a bridge load rating analysis. Non-load-path-redundant bridges are those with no alternate load paths and whose failure of a main component is expected to result in the collapse of the bridge.

The evaluation of gusset connections shall include the evaluation of the connecting plates and fasteners. The resistance of a gusset connection is determined as the smaller resistance of the fasteners or gusset plates.

The following guidance is intended to provide for life safety and thus the resistance of the connection is required to be checked at the strength limit state only. Owners may require that connections be checked at other limit states such as the service limit state to minimize serviceability problems.

THE RESISTANCE OF FASTENERS:

For concentrically loaded bolted and riveted gusset connections, the axial load in each connected member may be assumed to be distributed equally to all fasteners at the strength limit state.

The bolts in bolted gusset connections shall be evaluated to prevent bolt shear and plate bearing failures at the strength limit state. At the strength limit state, the provisions of AASHTO LRFD Article 6.13.2.7 and 6.13.2.9 shall apply for determining the bolts' resistance to prevent bolt shear and plate bearing failures.

The rivets in riveted gusset connections shall be evaluated to prevent rivet shear and plate bearing failures at the strength limit state. The plate bearing resistance for riveted connections shall be in accordance with AASHTO LRFD Article 6.13.2.9 for bearing at bolt holes.

The factored shear resistance of one rivet shall be taken as:

$$\phi R = \phi F m A_r \quad (1)$$

where:

ϕF = Factored shear strength of rivet. The values in the table below may be used for ϕF

Rivet Type or Year of Construction	ϕF ksi
Constructed prior to 1936 or of unknown origin	18
Constructed after 1936 but of unknown origin	21
ASTM A 502 Grade I	25
ASTM A 502 Grade II	30

m = The number of shear planes
A_r = Cross-sectional area of the rivet before driving

The shear resistance of a rivet in connections greater than 50.0 in. in length shall be taken as 0.80 times the value given in Eq. 1.

THE RESISTANCE OF GUSSET PLATES:

The resistance of a gusset plate shall be determined as the plate's least resistance in shear, tension including block shear, compression, and combined flexural and axial loads.

GUSSET PLATES IN TENSION

Gusset plates subjected to axial tension shall be investigated for three conditions:

- Yield on the gross section,
- Fracture on the net section, and
- Block shear rupture

The factored resistance, R_r, for gusset plates in tension shall be taken as the least of the values given by either yielding, fracture, or the block shear rupture resistance.

Gross Section Yielding Resistance

$$P_r = \phi_y P_{ny} = \phi_y F_y A_g \qquad (2)$$

Net Section Fracture Resistance

$$P_r = \phi_u P_{nu} = \phi_u F_u A_n U \qquad (3)$$

where:

ϕ_y = resistance factor for tension yielding = 0.95
ϕ_u = resistance factor for tension fracture = 0.80
P_{ny} = nominal tensile resistance for yielding in gross section
A_g = gross cross-sectional area of the member
A_n = net area of the member as specified in AASHTO LRFD Article 6.8.3. The effective width shall be determined by the Whitmore method explained in this Guidance.

P_{nu} = nominal tensile resistance for fracture in net section
F_y = specified minimum yield strength
F_u = tensile strength
U = reduction factor to account for shear lag = 1.0 for gusset plates

When determining the gross and net section areas, the effective width of the gusset plate in tension should be determined by the Whitmore method. In it, the effective width is located through the last row of fasteners and bound by the closer of the nearest plate edges or the lines constructed from the external fasteners of the first row of fasteners and at 30 degrees with respect to the line of action of the axial load. Figures 1 and 2 provide examples for determining the effective width in tension in accordance with the Whitmore method.

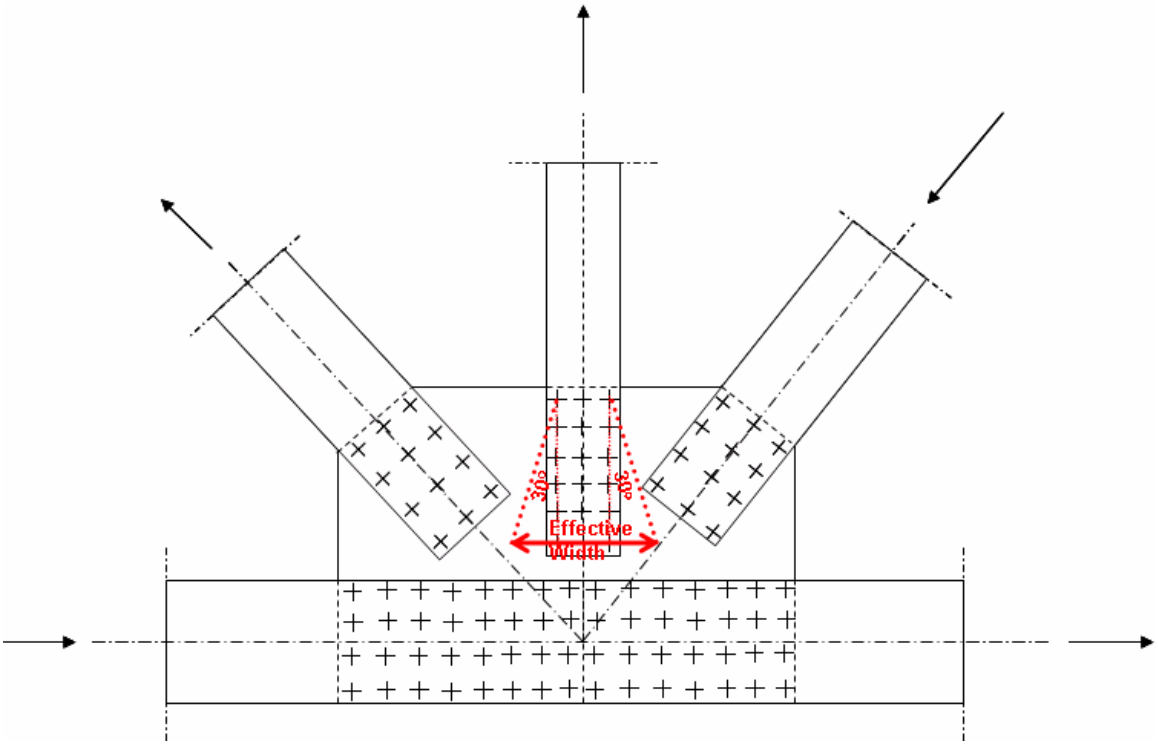


Figure 1 – Example 1 for using the Whitmore method to determine the effective width in tension

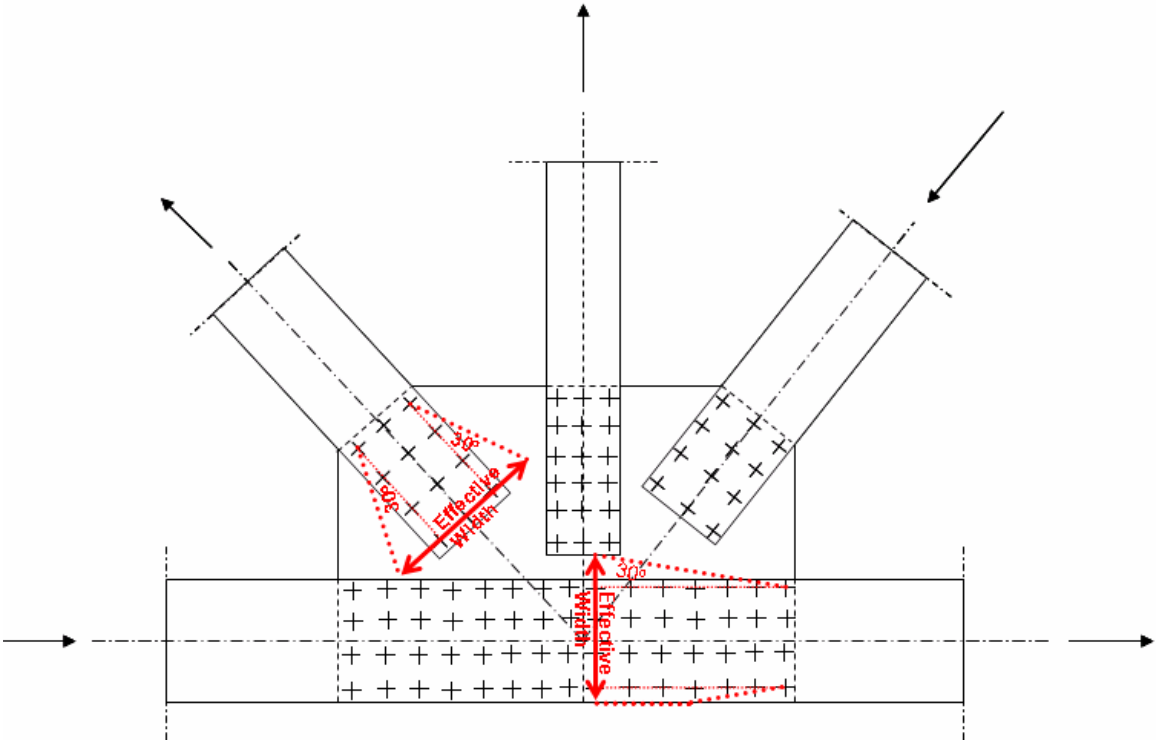


Figure 2 – Example 2 for using the Whitmore method to determine the effective width in tension

When using the Whitmore method, proximity of the connected members can affect the resistance of gusset plates in tension. Therefore, special attention must be exercised in congested areas to evaluate all possible failure modes of gusset connections.

Block Shear Rupture Resistance

The resistance of block shear rupture is that of combination of parallel and perpendicular planes, one in axial tension and the remainder under shear. The factored resistance of the plate for block shear rupture shall be taken as:

- If $A_{tn} \geq 0.58A_{vn}$, then: $R_r = \phi_{bs}\left(0.58F_y A_{vg} + F_u A_{tn}\right)$ (4)
- Otherwise: $R_r = \phi_{bs}\left(0.58F_u A_{vn} + F_y A_{tg}\right)$ (5)

where:

ϕ_{bs} = resistance factor for block shear = 0.80
A_{vg} = gross area along the plane resisting shear stress
A_{tg} = gross area along the plane resisting tension stress
A_{vn} = net area along the plane resisting shear stress
A_{tn} = net area along the plane resisting tension stress
F_y = specified minimum yield strength of the plate
F_u = specified minimum tensile strength of the plate

The analysis of block shear rupture involves the evaluation of several patterns of planes to arrive at the governing pattern. Figure 3 provides some examples of block shear rupture planes in gusset plates in tension.

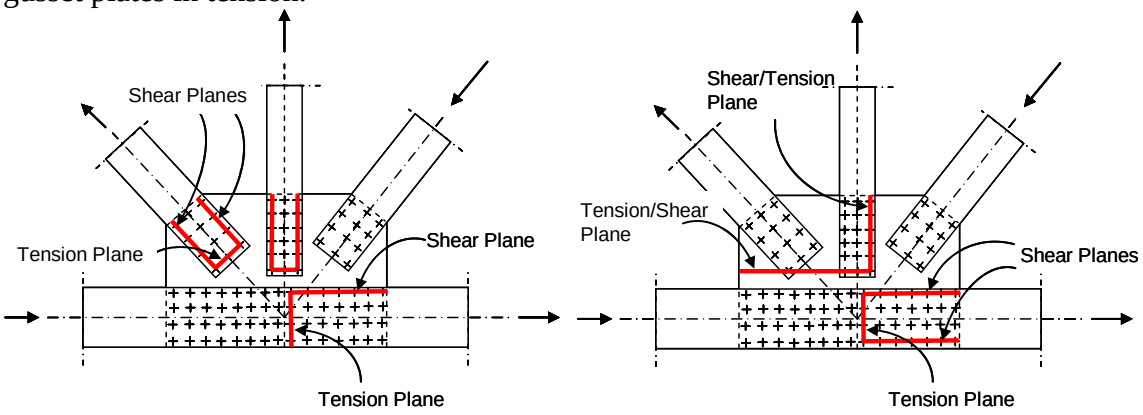


Figure 3 – Examples of block shear rupture planes in gusset plates in tension

GUSSET PLATES IN SHEAR

The factored shear resistance, R_r, for gusset plates in shear shall be taken as the least resistance against shear yielding and net section fracture specified in Equations 6, and 7:

$$R_r = \phi_v R_n = \phi_{vy} \times 0.58 A_g F_y \times 0.74 \quad (6)$$

$$R_r = \phi_v R_n = \phi_{vu} \times 0.58 A_n F_u \times 0.74 \quad (7)$$

where:

ϕ_{vy}	=	resistance factor for shear yielding on the gross section = 0.95
ϕ_{vu}	=	resistance factor for shear fracture on the net section = 0.80
R_n	=	nominal resistance in shear
A_g	=	gross area of the plates resisting shear
A_n	=	net area of the plates resisting shear
F_y	=	specified minimum yield strength of the plates
F_u	=	specified minimum tensile strength of the plates
0.74	=	reduction factor used for determining the flexural shear resistance of gusset connections.

The analysis of gusset plates for shear involves the evaluation of several shear sections to arrive at the governing section. Figures 4 and 5 provide examples of shear sections to be evaluated in gusset plates in gross section shear yielding and net section shear fracture.

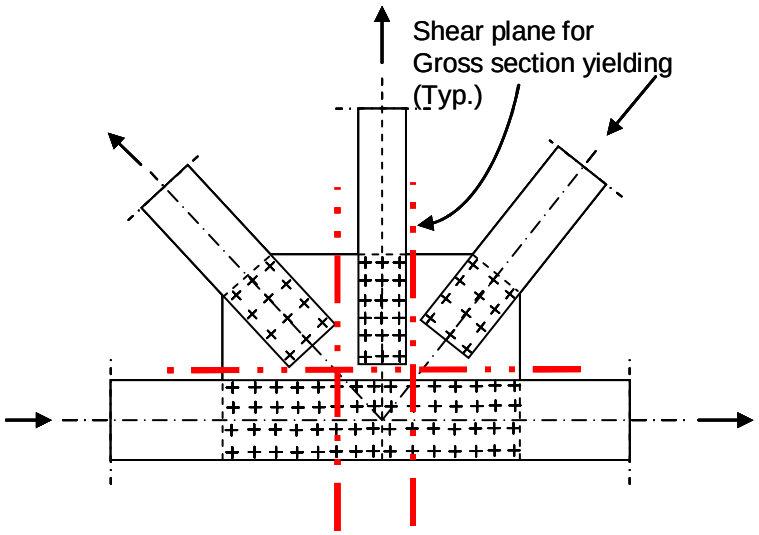


Figure 4 – Examples of gross section shear yielding planes

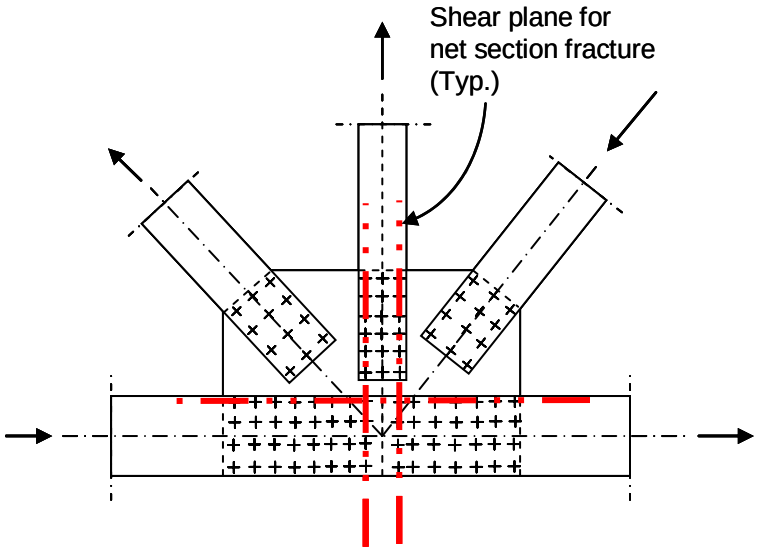


Figure 5 – Examples of net section shear fracture planes

GUSSET PLATES IN COMPRESSION

The resistance of gusset plates in compression shall be determined as that of idealized members in compression in accordance with the provisions of AASHTO LRFD Articles 6.9.2.1 and 6.9.4

The compression member's effective width shall be determined in accordance with the Whitmore method as shown in Figure 6. The unsupported length shall be determined as the distance between the last row of fasteners on one end of the connection to the first row of fasteners on the opposite end of the connection, in the direction of the applied load. Figure 6 provides an example of determining the unsupported length for a gusset plate in compression.

The proximity of connected members may affect the resistance of gusset plates in compression. Therefore, special care must be exercised to properly assess the buckling coefficients and compressive resistance of gusset plates in compression.

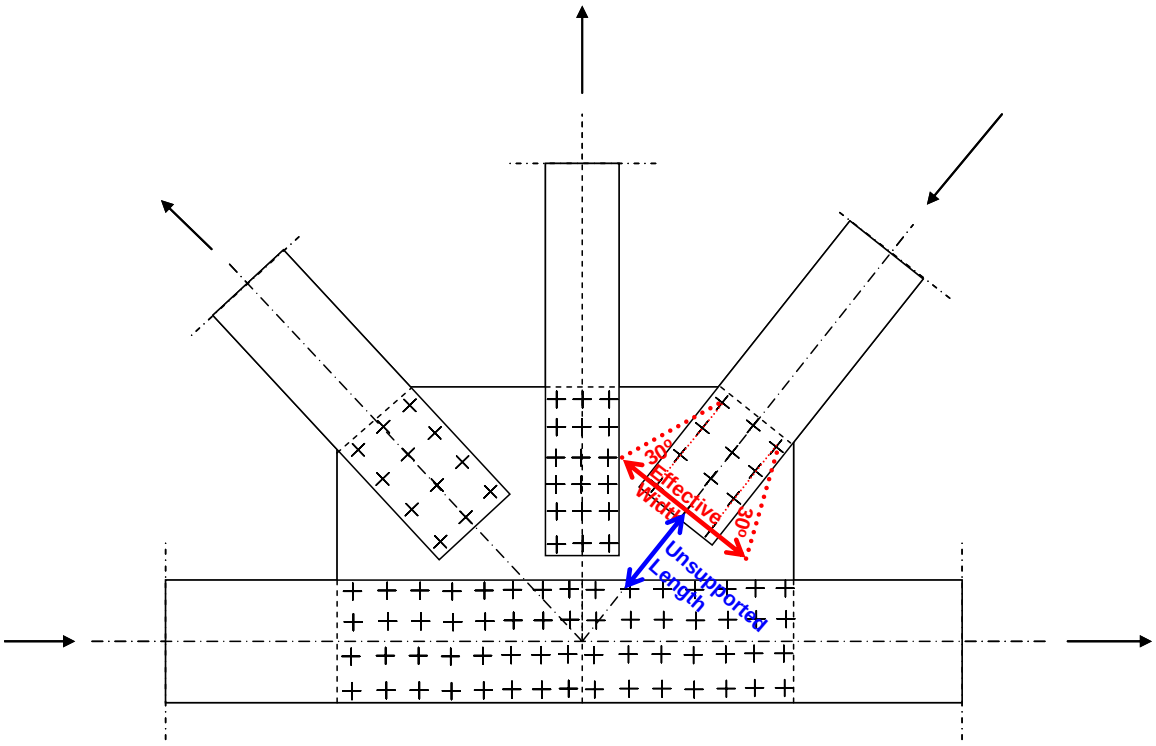


Figure 6 – Example demonstrating the unsupported length and the use of the Whitmore method to determine the effective width for a gusset plate in compression

GUSSET PLATES UNDER COMBINED FLEXURAL AND AXIAL LOADS

The maximum elastic stress from combined factored flexural and axial loads shall not exceed $\phi_f F_y$ based on the gross area of the plate.

where:

ϕ_f = resistance factor for flexure = 1.00
F_y = specified minimum yield strength of the plate

The analysis of gusset plates for combined flexural and axial loads involves the evaluation of several sections to arrive at the critical section. Figure 7 provides examples of sections to be evaluated in gusset plates under combined flexure and axial loads. Note that the sections in Figure 7 are placed such that the applied eccentricity is maximized.

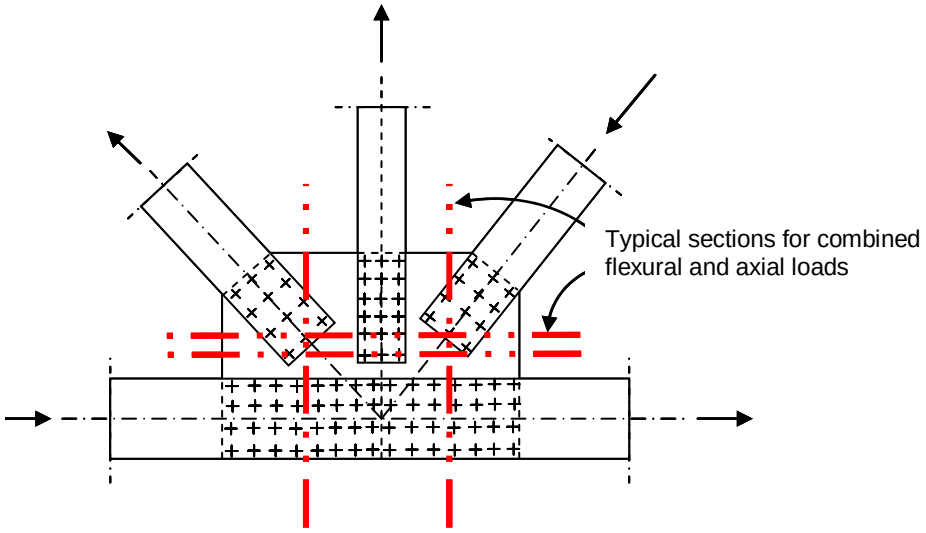


Figure 7 – Examples of combined flexural and axial load planes

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: January 15, 2008

In reply refer to: H-08-1

The Honorable J. Richard Capka
Administrator
Federal Highway Administration
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

On Wednesday, August 1, 2007, about 6:05 p.m. central daylight time, the Interstate 35W (I-35W) highway bridge over the Mississippi River in north Minneapolis, Minnesota, experienced a failure in the superstructure of the 1,000-foot-long deck truss portion of the 1,900-foot-long bridge. Approximately 456 feet of the center span of the deck truss fell about 108 feet into the 15-foot-deep river. Approximately 110 vehicles were on the portion of the bridge that collapsed, and 17 vehicles fell into the water. As a result of the bridge collapse, 13 people died and 145 people were injured.

Roadway construction was being conducted on the deck truss portion of the bridge, and four of the eight lanes were closed for repaving when the bridge collapsed. Machinery and paving materials were being parked and stockpiled on the center span.

The National Transportation Safety Board dispatched investigators within hours of the collapse and continues to investigate the circumstances of the accident. Although the Safety Board's investigation is ongoing and no determination of probable cause has been reached, investigators have a concern regarding certain elements of the bridge (gusset plates), which has prompted issuance of this safety recommendation.

Bridge

Construction of the bridge (Federal bridge identification number 9340) began in 1964, and it was opened to traffic in 1967. The bridge was designed by Sverdrup & Parcel (subsequently acquired by Jacobs Engineering) and was built by Hurcon Incorporated and Industrial Construction Company. The steel deck truss portion of the bridge consisted of two parallel main trusses (east and west) connected through transverse floor trusses supporting the reinforced concrete deck. The ends of the beams in the main trusses were connected by riveted gusset plates at 112 nodes (joints) along the deck truss portion of the bridge. The bridge was considered to be fracture-critical because the load paths in the structure were nonredundant, meaning that a failure of any one of a number of structural elements in the bridge would cause a complete collapse of the entire bridge. This type of bridge is also referred to as a

non-load-path-redundant bridge. The Federal Highway Administration (FHWA) estimates that there are approximately 465 steel deck truss bridges within the National Bridge Inventory.

Since it was built, the deck truss portion of the bridge has undergone at least two major renovations, one in 1977 and one in 1998. As part of these renovations, the average thickness of the concrete deck was increased from 6.5 inches to 8.5 inches, and the center median barrier and outside barrier walls were increased in size. These changes added significantly to the overall weight of the structure.

Gusset Plates

Physical examination of the recovered bridge structure showed that the gusset plates at the east and west nodes U10, U10′, L11, and L11′ were fractured.[1] The other major gusset plates in the main trusses were intact. Design methodology for gusset plates is normally very conservative, with the result that a properly designed gusset plate should generally be stronger than the beams it connects. Accordingly, one would not expect to find fractured gusset plates. However, the damage patterns and fracture features uncovered in the investigation to date suggest that the collapse of the deck truss portion of the bridge was related to the fractured gusset plates and, in particular, may have originated with the failure of the U10 gusset plates. Materials testing performed to date has found no deficiencies in the quality of the steel or concrete used in the bridge. Therefore, the Safety Board, with the FHWA, conducted a thorough review of the design of the bridge, with an emphasis on the design of the gusset plates.

Gusset Plate Design Process Error

The investigation discovered that the original design process led to a serious error in sizing of some of the gusset plates in the main trusses. Engineers working in the investigation used generally accepted calculation methodologies to recalculate the stresses in these gusset plates. Their results indicate that some of the gusset plates were undersized and did not provide the margin of safety expected in a properly designed bridge. These undersized gusset plates were found at 8 (of the 112) nodes on the main trusses of the bridge (east and west upper nodes U10 and U10′, and east and west lower nodes L11 and L11′). These gusset plates were roughly half the thickness required. The results of the calculations are documented in the FHWA's interim report, *Adequacy of the U10 & L11 Gusset Plate Designs for the Minneapolis Bridge No. 9340 (I-35W over the Mississippi River).*

Bridge Design Documentation

The Safety Board obtained copies of the original design and fabrication drawings, as well as a partial set of design calculations from both Jacobs Engineering and the Minnesota Department of Transportation (Mn/DOT), and compared the design documents with the actual bridge structure. So far, this comparison has indicated that the superstructure of the bridge was generally built as specified in the design, with no significant discrepancies identified between the design documents and the as-built condition of the bridge. The gusset plates that were undersized on the bridge were undersized on the drawings.

[1] The symbol ′ is pronounced "prime" and indicates the corresponding node on the opposite end of the bridge.

Design Calculation Methodology

Because the investigation has determined that some of the gusset plates were undersized, the Safety Board examined the design calculation methodology used at the time the bridge was designed, in the 1960s, to verify that the methodology was sound. The design documents reviewed included detailed calculations for the beams in the main trusses and detailed calculations for the welded gusset plates joining the beams in the floor trusses, both of which indicate sound calculation methodology. However, because the detailed calculations for the main truss gusset plates could not be located, the Safety Board was unable to verify the calculation methodology used for those gusset plates. As a result, the Safety Board has not yet determined whether the error was due to a calculation mistake, a drafting error, or some other error in the design process.

Design Review Process

The design error was not detected during the internal review process conducted by Sverdrup & Parcel when the drawings were developed. The Safety Board is still evaluating this review process but notes that any effective review should be sufficient to detect and correct design errors such as the one that resulted in the undersized gusset plates. Nevertheless, the review process in place at the time of the design failed to detect the error.

For the most part, State departments of transportation rely on bridge designers to perform accurate calculations and to check their work. Thus, beyond the designer's internal review, there does not appear to be a process in place to identify original design errors in bridges.

In addition, gusset plate design calculations are not usually reviewed during major modifications on bridges. Generally, the weakest point of a bridge is evaluated to determine if the additional loads or stresses can be accommodated, with the assumption that the remaining portions of the bridge can withstand the change. For example, as previously mentioned, the accident bridge underwent two major renovations, which added significantly to the overall weight of the structure. Information obtained from Mn/DOT indicates that Mn/DOT engineers followed generally accepted practice and recalculated the anticipated stress levels in what they believed at the time were the weakest members of the bridge. Normally, there would be no reason for them to question the strength of the gusset plates relative to these weaker structural members.

In summary, the gusset plate design error identified during this ongoing investigation was not detected by any of the internal review procedures used by Sverdrup & Parcel during the original bridge design, nor was there a reasonable expectation that it would be detected during any review associated with the original submission of the design or any subsequent modifications to the bridge.

Bridge Load Rating Calculations

The error in the design of the gusset plates would not have been identified by routine load rating calculations because gusset plate stresses are not normally part of these calculations. Bridge load rating calculations are used by bridge owners to determine if their bridge can accommodate heavy vehicles and to make critical load posting and permitting decisions. A

number of States use specialized bridge load rating computer programs—BARS or its successor Virtis—to calculate load ratings. Mn/DOT currently uses the BARS program but is in the process of switching to the Virtis software program. Although these two computer programs can be used to evaluate the stresses in the truss beams for a specified load case, they do not consider any aspect of the gusset plates connecting the truss beams. In summary, periodic recalculations of the load ratings of bridges are not intended to verify or confirm the adequacy of gusset plate designs.

Bridge Inspections

Bridge inspections would also not have identified the error in the design of the gusset plates. The National Bridge Inspection Standards (NBIS) are aimed at detecting conditions such as cracks or corrosion that degrade the strength of the existing structure; they do not, and are not intended to, address errors in the original design. Although inspections of the accident bridge identified and tracked some areas of cracking and corrosion, at this point in the investigation, there is no indication that any of those areas played a significant role in the collapse of the bridge.

Summary

The Safety Board is concerned that, for at least this bridge, there was a breakdown in the design review procedures that allowed a serious design error to be incorporated into the construction of the I-35W bridge. The bridge was designed with gusset plates that were undersized, and the design firm did not detect the design error when the plans were created. Because of this design error, the riveted gusset plates became the weakest member of this fracture-critical bridge, whereas normally gusset plates are expected to be stronger than the beams they connect. Further, there are few, if any, recalculations after the design stage that would detect design errors in gusset plates. Finally, other programs to ensure the safety of our Nation's bridges, such as the methods used in calculating load ratings and the inspections conducted through the NBIS program, are not designed or expected to uncover original mistakes in gusset plate designs or calculations.

It is important to note that the Safety Board has no evidence to suggest that the deficiencies in the various design review procedures associated with this bridge are widespread or even go beyond this particular bridge. In fact, this is the only bridge failure of this type of which the Safety Board is aware. However, because of this accident, the Safety Board cannot dismiss the possibility that other steel truss bridges with nonredundant load paths may have similar undetected design errors. Consequently, the Safety Board believes that bridge owners should ensure that the original design calculations for this type of bridge have been made correctly before any future major modifications or operational changes are contemplated.

Therefore, the National Transportation Safety Board makes the following recommendation to the Federal Highway Administration:

For all non-load-path-redundant steel truss bridges within the National Bridge Inventory, require that bridge owners conduct load capacity calculations to verify that the stress levels in all structural elements, including gusset plates, remain within applicable requirements whenever planned modifications or operational changes may significantly increase stresses. (H-08-1)

Please refer to Safety Recommendation H-08-1 in your reply. If you need additional information, you may call (202) 314-6177.

Chairman ROSENKER, Vice Chairman SUMWALT, and Members HERSMAN, HIGGINS, and CHEALANDER concurred in this recommendation.

Original Signed By:

By: Mark V. Rosenker
Chairman

FHWA Technical Advisories

TECHNICAL ADVISORY	DATE ISSUED	TITLE
T5040.17	12/23/80	Skid Accident Reduction Program
T5040.26	1/28/88	Guardrail Transition
T5040.27	3/10/88	Asphalt Concrete Mix Design and Field Control
T5040.28	10/17/88	Developing Geometric Design Criteria and Processes for Nonfreeway RRR Projects
T5040.29	2/2/90	Paved Shoulders
T5040.30	11/30/90	Concrete Pavement Joints
T5040.31	12/26/90	Open Graded Friction Courses
T5040.32	4/13/92	Curved W-Beam Guardrail Installations at Minor Roadway Intersections
T5040.34	6/8/93	Guardrail Transitions
T5040.35	12/20/01	Roadway Shoulder Rumble Strips
T5040.36	06/17/05	Surface Texture for Asphalt and Concrete Pavements
T5040.37	07/03/07	Use of Recycled Concrete Pavement as Aggregate in Hydraulic-Cement Concrete Pavement
T5040.4	8/23/78	Design Details - Tie Plate Connections
T5080.1	5/18/79	Engineering Inspection of Highway and Street Construction on Federal-Aid Projects
T5080.3	12/10/80	Development and Use of Price Adjustment Contract Provisions
T5080.9	5/16/88	Use of Coal Ash In Embankments and Bases
T5080.10	2/8/89	Incentive/Disincentive (I/D) for Early Completion
T5080.12	6/23/89	Specification Conformity Analysis
T5080.14	6/5/90	Continuously Reinforced Concrete Pavement
T5080.15	10/15/02	Construction Contract Time Determination Procedures
T5080.16	8/7/92	Development and Review of Specifications
T5080.17	7/14/94	Portland Cement Concrete Mix Design and Field Control *(PDF, 1,538KB)*
T5140.11	11/27/79	Quality Control and Quality Assurance Inspections on Welded-Steel Fracture-Critical Members
T5140.19	2/11/83	Pier Protection and Warning Systems for Bridges Subject to Ship Collisions
T5140.21	9/16/88	Revisions to The National Bridge Inspection Standards (NBIS)
T5140.22	10/3/89	Uncoated Weathering Steel In Structures
T5140.23	10/28/91	Evaluating Scour at Bridges
T5140.24	10/29/93	Bridge Temporary Works
T5140.25	6/17/94	Cable Stays of Cable-Stayed Bridges
T5140.27	08/02/07	Immediate Inspection of Deck Truss Bridges Containing Fracture Critical Members (FCM)
T5140.28	08/02/07	Construction Loads on Bridges
T5140.29	01/15/08	Load-carrying Capacity Considerations of Gusset Plates in Non-load-path-redundant Steel Truss Bridges
T5140.30	03/21/08	Use and Inspection of Adhesive Anchors in Federal-Aid Projects
T5140.4	9/28/78	Tied Arch Bridges
T6120.3	8/9/04	Use of Contractor Test Results in the Acceptance Decision, Recommended Quality Measures, and the Identification of Contractor/Department Risks

T6640.8A	10/30/87	Guidance for Preparing and Processing Environmental and Section 4(F) Documents
T7570.2	10/31/94	Motor Vehicle Accident Costs

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This page last modified on April 8, 2008

Technical Advisory

U.S. DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

Subject

Load-carrying Capacity Considerations of Gusset Plates in Non-load-path-redundant Steel Truss Bridges

Classification Code	Date	OPI
T 5140.29	**January 15, 2008**	**HIBT**

Par.

1. What is the purpose of this Technical Advisory?
2. Does this Technical Advisory supersede another Technical Advisory?
3. What is this background of this Technical Advisory?
4. What are the recommendations?

1. **What is the purpose of this Technical Advisory?** The purpose of this Technical Advisory is to provide recommendations for supplementing the American Association of State Highway and Transportation Officials (AASHTO) procedures for load rating steel truss bridges with respect to gusset plate considerations.

2. **Does this Technical Advisory supersede another Technical Advisory?** No. This is a new Technical Advisory.

3. **What is this background of this Technical Advisory?**

   a. On August 1, 2007, the I-35W Interstate highway bridge over the Mississippi River in north Minneapolis, Minnesota, experienced a failure in the superstructure of the steel deck truss center portion of the 1,900-foot-long bridge. Approximately 1,000 feet of the deck truss portion collapsed with approximately 456 feet of the main span falling about 108 feet into the 15-foot-deep river. There were approximately 110 vehicles on the collapsed portion, with 17 vehicles falling into the water. Roadway construction was occurring on the deck truss portion of the bridge, and four of the eight lanes were closed for re-paving when the bridge collapsed. Machinery and paving materials were being parked and stockpiled on the center span.

   b. Physical examination of the recovered bridge structure showed that the gusset plates at the east and west joints, identified as U10, U10', L11, and L11', were fractured. The other major structural gusset plates in the main trusses were generally intact. The damage patterns and fracture features

uncovered in the investigation to date suggest that the collapse of the deck truss portion of the bridge was related to the fractured gusset plates and, in particular, may have originated with the failure of the joint U10 gusset plates.

c. So far, the design review has found that the superstructure of the bridge was generally built as designed, with no significant discrepancies between the design documents and the as-built condition of the bridge. Materials testing to-date has found no deficiencies in the quality of steel or concrete used in the bridge.

d. Examination of the design methodology used at the time was found to be sound. Although no problems were identified with the design methodology used for the bridge, the investigation discovered that the gusset plates on the main trusses of the bridge at the east and west joints U10, U10', L11, and L11' were undersized.

e. The bridge underwent two major renovations, one in 1977 and another one in 1998. The average thickness of the concrete deck was increased from 6.5 inches to 8.5 inches, and the center median barrier and outside barrier walls were increased in size. These changes added to the dead weight of the structure. At this point in the investigation, it is not clear whether the general practice in the industry would include recalculating the capacity of gusset plates as part of the renovations.

f. As a result of this accident, the National Transportation Safety Board (NTSB) recommends that bridge owners conduct load capacity calculations for all non-load path-redundant steel truss bridges to verify that the stress levels in all structural elements, including gusset plates, remain within applicable requirements whenever planned modifications or operational changes may significantly increase stresses.

4. **What are the recommendations?**

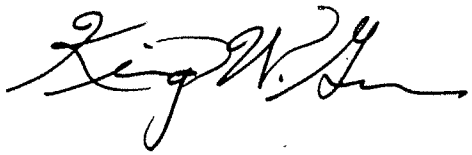
a. Currently, per the National Bridge Inspection Standards (Title 23, Code of Federal Regulations, Section 650.313(c)), bridge owners are required to load rate each bridge as to its safe load-carrying capacity in accordance with the AASHTO Manual for Condition Evaluation of Bridges. As stated in the AASHTO Manual, bridge load rating calculations provide a basis for determining the safe load capacity of a bridge. A load rating result is used to maintain the safe use of a bridge and arrive at posting and permit decisions. The AASHTO Manual further states that bridge load ratings should be reviewed and updated to reflect any relevant changes in condition or dead load noted during inspections of existing bridges.

b. Accordingly, the following actions are recommended to supplement the provisions of the AASHTO Manual.

(1) **New or replaced non-load-path-redundant steel truss bridges.** Bridge owners are strongly encouraged to check the capacity of gusset plates as part of the initial load ratings.

(2) **Future recalculations of load capacity on existing non-load-path-redundant steel truss bridges**. Bridge owners are strongly encouraged to check the capacity of gusset plates as part of the load rating calculations conducted to reflect changes in condition or dead load, to make permit or posting decisions, or to account for structural modifications or other alterations that result in significant changes in stress levels.

(3) **Previous load ratings for non-load-path-redundant steel truss bridges.** Bridge owners are recommended to review past load rating calculations of bridges which have been subjected to significant changes in stress levels, either temporary or permanent, to ensure that the capacities of gusset plates were adequately considered.



King W. Gee
Associate Administrator
for Infrastructure

INDOT Posting Policy

A bridge must be posted to restrict the gross vehicle weight and/or axle weight when the structure can no longer safely support the maximum legal vehicle weight. The maximum weight restrictions for vehicles are described in the Indiana Code. INDOT's policy is to require posting on any structure that rates lower than 16.0 tons for the H20 rating vehicle at the inventory level. Most Indiana Counties follow this policy. However, a bridge may also be posted at other load levels if deemed appropriate by the local authority. Factors that may influence posting levels include practicality of enforcing load limits, traffic volume, and the likelihood of overweight vehicles. The lowest level at which a bridge may be posted is 3 tons using the HS-20 vehicle at either inventory or operating level. Any bridge that is not capable of carrying this minimum load must be closed.

Posting a bridge for weight should be avoided if possible. Bridges that rate low using allowable stress rating (ASR) should be re-rated using load factor rating (LFR) or load and resistance factor rating (LRFR) to determine if the structure can accommodate higher loads based on currently accepted code criteria. Similarly, bridges that rate low using LFR should be re-rated using LRFR prior to posting. If a posting is required or warranted, the gross vehicle weight and/or axle weight allowed should be indicated on signs at each end of the bridge. The signs should conform to the requirements of the Indiana Manual on Uniform Traffic Control Devices (MUTCD) and should be legible from a distance not less than 50 feet, as stated in the Indiana Code. Posting signs should be placed in advance of the structure in accordance with Table 2C-4 of the Manual. Signs must be maintained during the life of the bridge, or until repairs have been made to remove the weight restriction. Postings or closings on INDOT Routes should be done according to INDOT's current Bridge Restriction or Closure Protocol. It is recommended that Indiana Counties follow a similar Protocol.

Comment [pw1]:

Is this policy currently documented anywhere?

Are any counties using a different criteria?

This policy could allow a structure to go un-posted even though it has an HS-20 operating rating below 1.0. Is this policy adequately evaluating the safe load capacity of a bridge for a multitude of vehicles?

Comment [pw2]:

Are INDOT and Counties currently using both gross weight and maximum axle weight signs?

Do any counties use the 3-truck (R12-5) sign? If so, which trucks are used as the basis for these ratings?

Should INDOT allow the 3-truck sign to be used?

"Draft" Interim Guidelines for the Load Capacity Rating of Local Bridges in Indiana.

June, 2008

These Guidelines are to be used until permanent guidelines are developed and published in Bridge Inspection Procedure Manuals currently under development by INDOT.

Beginning on _____, Inspection Consultants shall submit a Load Rating Summary for each bridge rated, in electronic format, and shall include the following information:

1. Date Bridge was Load Rated
2. Person(s) that conducted the calculations and those that reviewed the results
3. Load Rating Method
4. Load Rating Program(s) used
5. Data Sources (Design Plans, As-Built Plans, Measurements, etc.)
6. Basic Data (Deck Thickness, Overlay Thickness, Concrete/Steel Capacity, etc.)
7. H-Vehicle Rating Results (Moment, Shear, Serviceability, etc.)
8. HS-Vehicle Rating Results (Moment, Shear, Serviceability, etc.)
9. Plans and field measurements shall be scanned into a pdf. file

As a minimum, all items on the INDOT Bridge Load Rating sheet that apply shall be submitted, as well as an overall summary of all Load Ratings completed for each County.

This information shall become a part of the permanent bridge file for each bridge and available to other Consultants that may work on the bridge besides the one that developed that information.

Beginning sometime in 2009, most of the required Load Capacity Rating Data shall be included on a form in a new Bridge Inspection Database/Application, and additional or related data can be attached to each bridge. This will allow Inspectors to have access to detailed Load Capacity information in the field during inspections, and help them gather important measurements on deteriorated and damaged structural members.

All County Bridges are required to be Load Rated and/or have their Load Ratings reviewed every two years after Regular Inspections are conducted, or if conditions change on a bridge. A licensed engineer is required to review and sign off on all Load Ratings. Bridges with Design Plans and/or As-Built Plans or those where structural elements can be measured to determined structural capacity, shall be Load Rated using an acceptable AASHTO Load Rating Method. All structural members shall be checked for moment, shear, and where applicable axial loading and serviceability. Deck Elements, Substructure Elements, and Underfill structures such as pipes and boxes shall have either their Load Capacity calculated or "assessed" in a systematic manner, especially when Condition Ratings indicate that there may be a structural capacity concern. Bridges designed using FRFD shall load rated using LRFR.

For bridges where Design Plans exist and are stamped by a Licensed Design Engineer, it can be assumed that the minimum capacities for the Design Vehicle(s) were met when the structure was originally constructed and/or rehabilitated. However, since AASHTO's requirements are constantly being revised, all structures shall be load rated and/or reviewed, including those that have been stamped by a Licensed Design Engineer or if Condition Ratings indicate that there may be a structural capacity concern. All County Bridges that may currently fall under this category are now required to be Load Rated and/or have their Load Ratings reviewed every two years after Regular Inspections are conducted, or if conditions change on a bridge.

As part of the Indiana Bridge Inspection Program's "Quality Assurance Program", each year a number of structures shall have their Load Ratings reviewed in detail to ensure their completeness and accuracy. This review shall also be used to identify areas where deficiencies exist in calculations, records, or processes, for individual bridges, a large segment of bridges, individual Consultants, and Statewide problems.