

Best Practices

1.1 Welcome



Welcome to the Wisconsin Department of Transportation’s Bridge Inspection Refresher Series.

This module details best practices that inspection team leaders should use to improve their inspection planning, preparation, performance and documentation.

1.2 Objectives

Learning Objectives

- Outline common items addressed during the inspection planning phase
- List team leader responsibilities
- List inspection preparation activities
- Define inspection documentation best practices, including photographs and notes
- Describe post inspection responsibilities



At the end of this session, you will be able to:

List the Team Leader responsibilities for an inspection.

Outline common items addressed during the inspection planning phase.

List inspection preparation activities

Define inspection documentation best practices, including photographs and notes.

Describe post inspection responsibilities of the Inspection Team Leader.

1.3 Duties



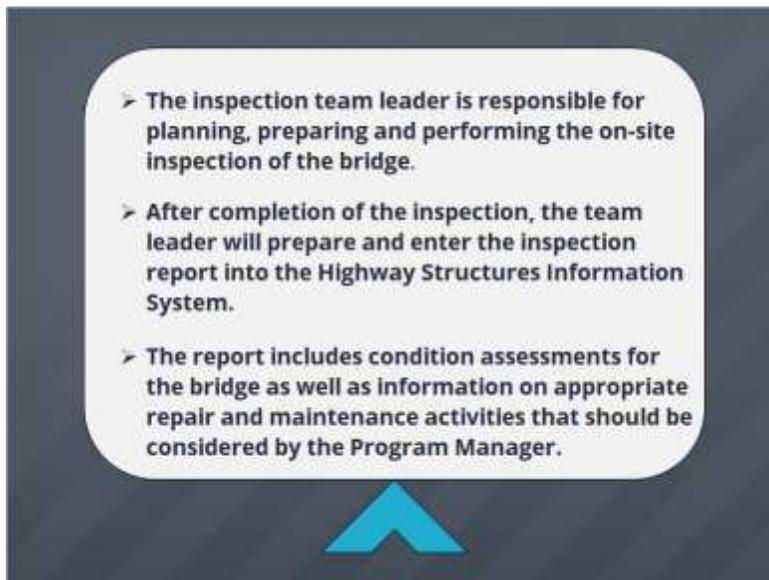
A graphic with a dark background and a blurred image of a man in a suit pointing with a pen. The text is white and includes a title, a list of six numbered items, and a circular button.

Team Leader
Responsibility

- 1 Planning the inspection
- 2 Preparing the inspection
- 3 Performing the inspection
- 4 Preparing the report
- 5 Identifying items for repair/maintenance
- 6 Communicating Critical Findings

Click for Info

1.3a

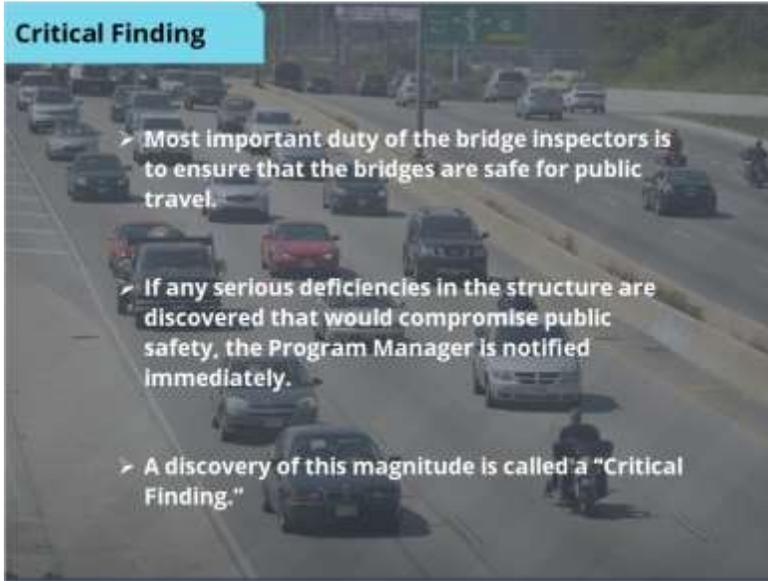


A dark blue rounded rectangle containing a white rounded rectangle with three bullet points and a blue arrow pointing up.

- The inspection team leader is responsible for planning, preparing and performing the on-site inspection of the bridge.
- After completion of the inspection, the team leader will prepare and enter the inspection report into the Highway Structures Information System.
- The report includes condition assessments for the bridge as well as information on appropriate repair and maintenance activities that should be considered by the Program Manager.

↑

1.4 Critical



Critical Finding

- Most important duty of the bridge inspectors is to ensure that the bridges are safe for public travel.
- If any serious deficiencies in the structure are discovered that would compromise public safety, the Program Manager is notified immediately.
- A discovery of this magnitude is called a "Critical Finding."

Though inspectors have many duties, the most important by far is to ensure that bridges are safe for public travel.

If the inspector discovers any serious deficiencies in the structure that could compromise public safety, the inspector shall notify the Program Manager immediately and take all necessary actions to ensure public safety. A discovery of this magnitude is called a "Critical Finding".

1.5 Inspection Planning



Inspection Planning	
<input type="checkbox"/>	Determine inspection types, frequencies and activities.
	Assemble qualified inspection team
	Determine needs for:
<input type="checkbox"/>	Personal Protective Equipment
	Inspection Equipment
	Traffic Control
	Access
<input type="checkbox"/>	

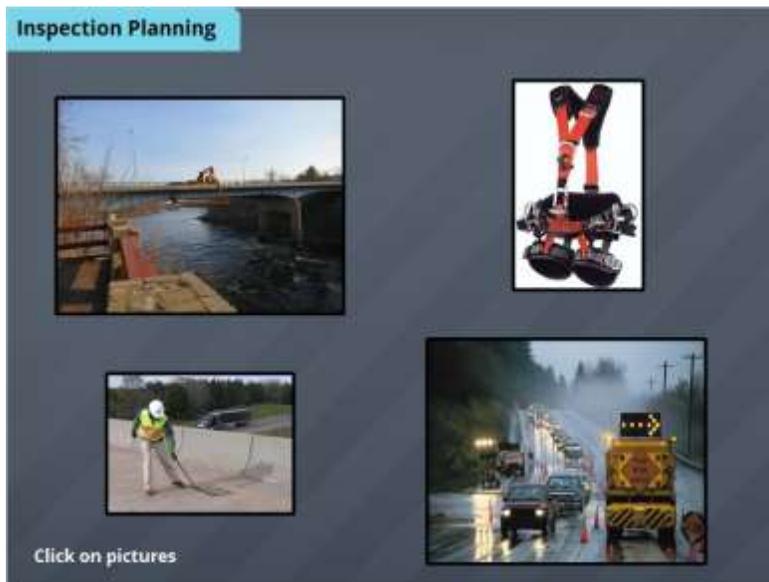
An important aspect of a successful inspection is adequate planning before the inspection team gets to the bridge site. First, and most important, is understanding what needs to be accomplished during the inspection.

The Team Leader should consult with the Inspection Program Manager about all the necessary inspection activities, including inspection frequencies, that are required during the site visit.

Common activities include:

- Structure inventory and appraisal reviews
- Underwater profile measurements
- Vertical clearance measurements
- Load posting sign verification
- Non-destructive evaluation or testing
- Specialized inspections, including fracture critical and underwater dive inspections

1.6 Untitled Slide



Different inspection activities require specialized equipment, access and traffic control set-ups, unique inspector qualifications, etc. for a successful inspection.

After determining the inspection activities that will be performed, the Team Leader should assemble a qualified inspection team. Remember that specialized training is required for both fracture critical and underwater dive inspections, and well as nondestructive evaluations.

Once the team has been identified, the Team Leader should work with the Program Manager to determine needs for personal protective equipment, inspection equipment, access equipment and traffic control.

1.6a Picture Upper Left

The Team Leader should consult with the Inspection Program Manager about all the necessary inspection activities, including inspection frequencies, that are required during the site visit.

Common activities include:

- Structure inventory and appraisal reviews
- Underwater profile measurements
- Vertical clearance measurements
- Load posting sign verification
- Non-destructive evaluation or testing
- Specialized Inspections, Including fracture critical and underwater dive inspections

1.6b Picture lower left

Different inspection activities require specialized equipment, access and traffic control set ups, unique inspector qualifications, etc. for a successful inspection.

1.6c Picture upper right

Once the team has been identified, the Team Leader should work with the Inspection Program Manager to determine the needs for personal protective equipment, inspection equipment, access equipment and traffic control.

1.6d Picture Lower right

After determining the inspection activities that will be performed, the Team Leader should assemble a qualified inspection team. Remember that specialized training is required for both fracture critical and underwater dive inspections and non-destructive evaluations.

1.7 Inspection Preparation

Inspection Preparation



- Review plans, previous inspection reports, repair work, underwater profiles (if applicable) and other pertinent documents for the bridge.
- Review site specific inspection procedures and update as appropriate.

Hover over icons

Prior to the on-site inspection, the Team Leader should review all plans, previous inspection reports, and all other pertinent documents to determine which bridge members or locations are noted as having deficiencies.

The team leader should also review the site specific inspection procedures and develop an inspection plan for the bridge based on this document, previous inspection findings, and maintenance records.

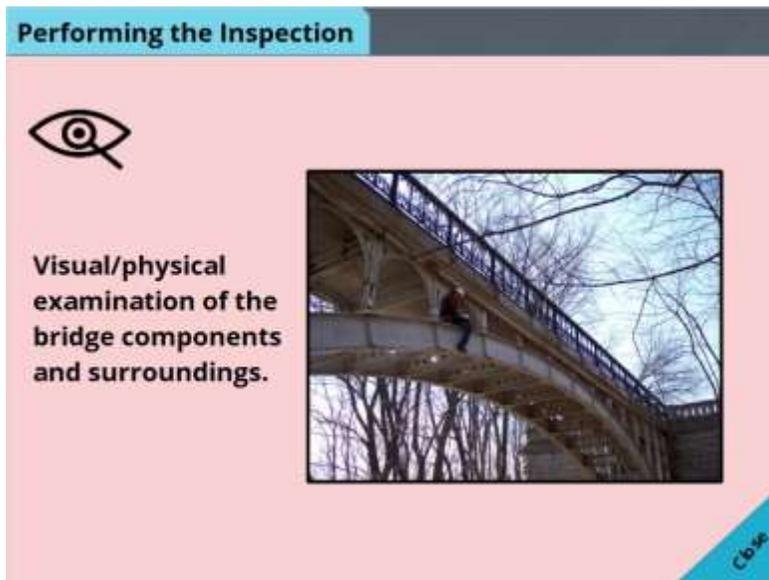
1..8 Performing the Inspection



During the inspection, the team should follow the site-specific inspection procedures as well as good inspection practices documented in the FHWA Bridge Inspection Reference Manual. This includes a visual examination of all components of the bridge. Condition evaluations will be accomplished using the AASHTO element based system put into place by WisDOT in 2014, along with traditional National Bridge Inventory evaluations of major bridge components.

A successful bridge inspection requires thorough documentation. This includes the inspector recording descriptive narratives on findings, as well as sketches or photos of defects.

Visual



Assessment

Performing the Inspection



Evaluation of bridge components using:

- ✓ Elements/defects
- ✓ Assessments
- ✓ NBI ratings

Close

Documentation

Performing the Inspection



Documentation of findings

- ✓ Notes
- ✓ Sketches/photographs



Close

Information

Performing the Inspection



- ✓ During the inspection, the team should follow the site specific inspection procedures as well as good inspection practices documented in the FHWA Bridge Inspection Reference Manual.
- ✓ This includes a visual examination of all bridge components. Condition evaluations will be accomplished using the AASHTO element based system put into place by WisDOT in 2014, along with traditional National Bridge Inventory evaluations of major bridge components.
- ✓ One of the most crucial components to a good bridge inspection is thorough documentation. This includes the inspector recording descriptive narratives on findings, as well as sketches or photos of defect.

Close

1.9 Inspection Notes

Inspection Notes

Hover over icons



Click pictures

During the inspection, team members often observe defects, hazards, and other concerns that need thorough documentation so that follow-up analysis, repairs, or maintenance work can ensue.

For example, defects such as corrosion of a steel beam with measurable section loss require notes to describe the size, quantity, and location of the defect so that load rating engineers can analyze the structure post-inspection to determine the load carrying capacity.

Similarly, if the inspector notices a large amount of debris on the upstream nose of a pier, he or she should record this information in the inspection report under the maintenance recommendations so that maintenance crews can be scheduled to remove the debris before undermining of the pier occurs.

Understanding the need for thorough documentation, WisDOT requires a note to be recorded for any element that has a defect in Condition State 2 (Fair), 3 (Poor), or 4 (Severe).

1.9a Picture to the left

During the inspection, team members often observe defects, hazards and other concerns that need thorough documentation that follow-up analysis, repairs or maintenance work can ensure.

For example, defects such as corrosion of a steel beam with measurable section loss require notes to describe the size, quantity and location of the defect for the load rating engineers can analyze the structure post-inspection to determine the load carrying capacity.

1.9b Picture to the right

Similarly, if the inspector notices a large amount of debris on the upstream nose of a pier, (s)he should record this information in the inspection report under maintenance recommendations for maintenance crews can be scheduled to remove the debris before undermining of the pier occurs.

To aid the inspector, the Wisconsin Department of Transportation has developed a policy that requires a note to be recorded for any element that has a defect in Condition State 2 (Fair), 3 (Poor) or 4 (Severe).

The note shall be entered into the HSIS system under the applicable defect for the element.

1.10 Note

The Anatomy of a Note

All defect related notes should have three basic parts:



Click on the icons

1.10a What



Describe the defect

It could be

- corrosion of a steel beam
- the delamination of a concrete deck
- cracking
- impact damage
- splitting, etc.

1.10b Where

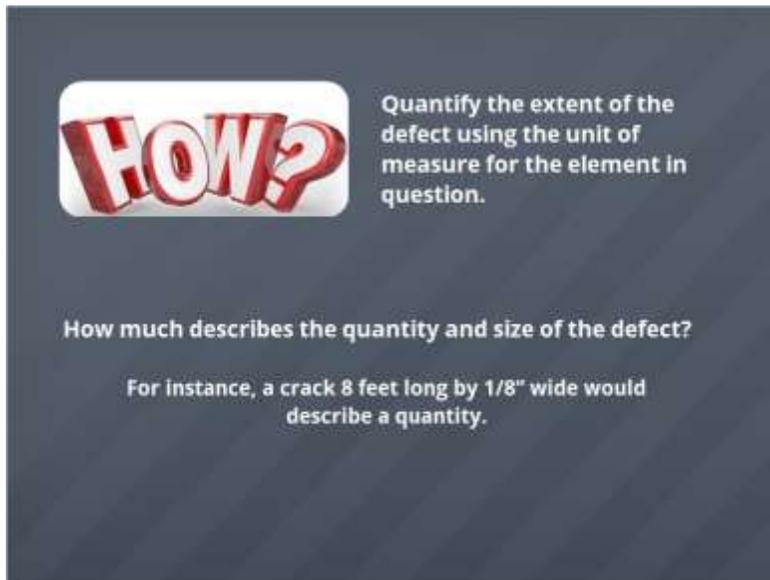


Locate the defect

Use span, pier and girder number nomenclature (as applicable) to locate the defect.

- ✓ Describes the location. The bridge should have the nomenclature developed in the plans and/or the inspection procedures that number of spans, piers and girders where applicable.
- ✓ A proper description of where would include all pertinent location descriptors as well as a distance easily identifiable by a reader.

10.c How



HOW?

Quantify the extent of the defect using the unit of measure for the element in question.

How much describes the quantity and size of the defect?

For instance, a crack 8 feet long by 1/8" wide would describe a quantity.

1.11 Photos #1



WisDOT Policy - Photographs

Condition State 3 and 4 Elements shall have representative photos uploaded to bridge file for each deteriorated and/or distressed location.

All bridges shall have a cover photo uploaded in HSI

Unique features, hazards or potential maintenance needs should be also be included where applicable.

1.12 Photos #2

WisDOT Policy - Photographs

In addition to notes, any elements that have a defect in condition state 3 (poor) or 4 (severe) are required to have an accompanying photograph, sketch or combination of the two. This shall be uploaded into HSI.

The photo documentation should also use the same parameters as we use for notes: describe the "what," the "where," and the "how much."

Inspectors are encouraged to add photos of unique features, hazards or potential maintenance needs as part of the inspection report.

In addition to notes, any elements that have a defect in condition state 3 (poor) or 4 (severe) are required to have an accompanying photograph, sketch or combination of the two. This shall be uploaded into HSI. This photo shall be updated during every inspection.

Inspectors are also encouraged to add photos of unique features, hazards or potential maintenance needs as part of the inspection report.

1.13 Photographs

Photographs

Photograph of a truss lower chord after the inspector discovered measurable section loss in this area.

hover



- ✓ Thickness measurements were record by using an ultrasonic thickness gage.
- ✓ Results were marked on the bridge member in question and photographed for the load rating engineer to access the capacity of the bridge at that location.
- ✓ Many details are included which makes this a very informative documentation photograph.

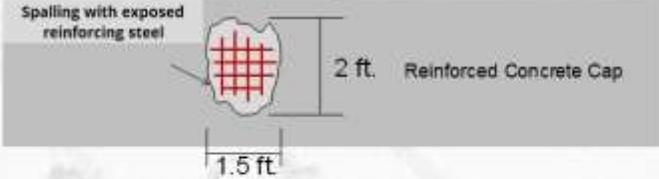
This is a photograph taken of a truss lower chord after the inspector discovered measurable section loss in this area.

The thickness measurements were recorded using an ultrasonic thickness gage, and the results were marked on the bridge member in question and photographed so that the load rating engineer can assess the capacity of the bridge at that location.

Many details are included that make this a very informative documentation photograph.

1.14 Knowledge Check

Knowledge Check



Spalling with exposed reinforcing steel

2 ft. Reinforced Concrete Cap

1.5 ft.

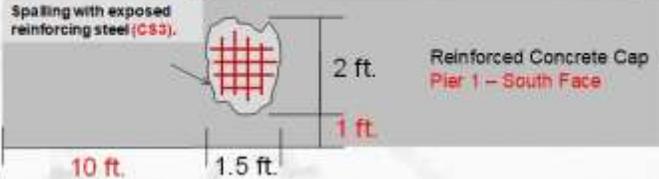
Based on our best practices, what best describes the defect information given above?

- 1. Location of the spall is incomplete
- 2. Quantity of the spall is missing
- 3. Too much information is given
- 4. All pertinent information is included

The best answer is 1.

1.15 Knowledge Check

Knowledge Check – Follow Up



Spalling with exposed reinforcing steel (CS3).

2 ft. Reinforced Concrete Cap
Pier 1 – South Face

10 ft. 1.5 ft. 1 ft.

Note that would be included in 1090 Defect:

(3 SF) spall with exposed reinforcing steel (CS3). Pier 1 – South Face of RC Cap. Located approximately 10' from west end of cap. See sketch for more details.

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1.15a Follow-up

Knowledge Check – Follow Up

By stating "spalling with reinforcing steel exposure.", the note reveals that a spalled section of concrete was found; However, the note does not specifically state the condition state observed by the inspector; by simply adding "CS3" into the note, the defect becomes much better defined [slowly fade in the CS3 in the sketch]

The quantity of the defect is adequate. The sketch indirectly shows the approximate square footage of the spall, which is 1.5 feet times 2 feet, or 3 square feet.

What is unclear from the original sketch is the specific location of the defect. The sketch indicates the defect occurs on a reinforced concrete cap [point out that notation], but it doesn't tell you which substructure unit [add, highlight Pier 1], nor which side of the pier (add, highlight South Face).

Finally, the sketch leaves out important dimensions that locates the defect in relation to the edge of the cap. By adding 10 feet [highlight that] from the West end, then 1' from bottom of cap [highlight that], the specific location of the defect is identified.

1.16a Notification

Standard Notifications

Report to Program Manager

After the inspection has been completed and documented in HSI, it's important to notify the Program Manager if any of the following are valid:

- There were significant changes to the condition ratings that are a cause for concern.
- There are significant repair and/or maintenance needs that need to be addressed as soon as possible.
- There are additional inspections and/or tests that need to be performed to ascertain the overall condition of the structure.

1 2

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After the inspection has been completed and documented in HSI, it's important to notify the program manager if any of the following were observed:

- There were significant changes to the condition ratings.
- There were significant repair needs.
- There were additional inspections or tests that need to be performed to ascertain the overall condition of the structure.
- The current inspection frequencies are insufficient and need to be re-evaluated.
- And most importantly, if there is a critical finding that needs to be addressed.

1.16b Notification



1.17 Responsibilities



1.17a Maintenance or Repair

Inspector Responsibilities – Maintenance or Repair Actions



- Review work completed on structure since last inspection
 - Verify work documentation in HSI
 - If missing, add in HSI or notify PM to add
- Record maintenance and repair needs found during current inspection.
 - Identify work needed
 - Identify priority (critical, high, medium or low)
 - ✓ Critical (ASAP)
 - ✓ High (Less than 3 months)
 - ✓ Medium (within the year)
 - ✓ Low (prior to next inspection)

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The inspector shall note items that have been completed since the last inspection report was submitted, and note any maintenance items that need to be addressed. The inspector can and should assign priority levels to the work items.

A critical priority level should be assigned to some type of work that needs immediate attention, such as repair of an expansion joint cover plate that has become loose and may endanger vehicles traveling over it.

A high priority level is typically something that is important, and should be done in the next couple of months. A medium priority item would be something that needs to be done within the year, while a low priority is something that should be considered before the next scheduled inspection.

Both identifying maintenance needs and assigning priorities are important functions that the inspector performs during the inspection process. Program managers use the recommendations developed by the inspector to program maintenance and repair work with the goal of keeping all the bridge inventory in a state of good repair.

1.17a1 Critical Findings

If the inspector discovers a critical finding that could compromise public safety, the Program Manager shall be notified immediately and take all necessary actions to ensure public safety on the site. In many cases, this may include temporary closure of the structure.

First, the inspector should be able to describe in detail what was observed to be classified as a critical finding. Some examples would be:

- Significant undermining of a substructure unit that compromises the stability of the bridge.
- A vehicular impact with a primary structural member that has significantly reduced the capacity of the bridge.
- A fractured or significantly deteriorated beam or column.

- The inspector has authority to temporarily close the structure immediately and should do so if public safety is at risk.
- Once the details are known, the inspector shall notify the Program Manager who has jurisdiction over the structure so that the PM can take over the incident response.
- The inspector is not finished with his or her responsibilities at this point.
- The inspector shall fill out the Critical Findings Report (DT-2026) and upload the report to the bridge inspection in the HSI System, noting the Critical Finding.

1.17a2 Maintenance

The inspector shall note items that have been completed since the last inspection report was submitted, and also note any maintenance and/or repair items that need to be addressed. This includes structure specific repairs, approach repairs, railing/beam guard repairs, drainage and erosion issues, debris build-up around piers, etc. The inspector can and should assign priority levels to the work items.

A critical priority level should be assigned to some type of work that needs immediate attention, such as repair of an expansion joint cover plate that has become loose and may endanger vehicles traveling over it. A high priority level is typically something that is important, and should be done in the next couple of months. A medium priority item would be something that needs to be done within the year, while a low priority is something that should be considered before the next scheduled inspection.

Both identifying maintenance needs and assigning priorities are important functions that the inspector performs during the inspection process. Program managers use the recommendations developed by the inspector to program maintenance and repair work with the goal of keeping all the bridge inventory in a state of good repair.

1.17b Critical Findings

Inspector Responsibilities – Critical Findings

Click pictures



A finding which "critically threatens the structural stability of the bridge ...or threatens public safety, and is of such severity that immediate partial or full closure of the structure may be warranted."

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Inspector shall (at initial finding):

- Describe/classify the finding
- Notify the Program Manager (PM)
- Complete Form DT2026 - Critical Findings Report and Upload into HSI along with inspection



By definition, a critical finding is one which *"critically threatens the structural stability of the bridge...or threatens public safety, and is of such severity that immediate partial or full closure of the structure may be warranted."*

If the inspector discovers a critical finding that could compromise public safety, he or she shall notify the Program Manager immediately and take all necessary actions to ensure public safety on the site. In many cases, this may include temporary closure of the structure which the inspector has authority to do if public safety is at risk.

Once the details are known, the inspector shall notify the Program Manager who has jurisdiction over the structure so that the Program Manager can take over the incident response.

1.22 End

