

Bridge Inspection Update

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Ministry of Transportation



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Overview

- Purpose of bridge inspections
- Defect assessment
- Areas requiring special attention
- MTO examples
- Summary



Purpose of Bridge Inspections

1. Assess if the bridge is **SAFE**
2. Identify major structural issues and **FOLLOW-UP**
3. Identify routine **MAINTENANCE** needs
4. Quantify the overall **CONDITION**
5. Maintain a **HISTORY** of bridge condition.

Defect Assessment

We need to think about:

1. **RELEVANCY** – Does this directly affect safety?
2. **SEVERITY** – How bad is it?
3. **URGENCY** – How quickly do we need to address this?

Relevancy of Defects

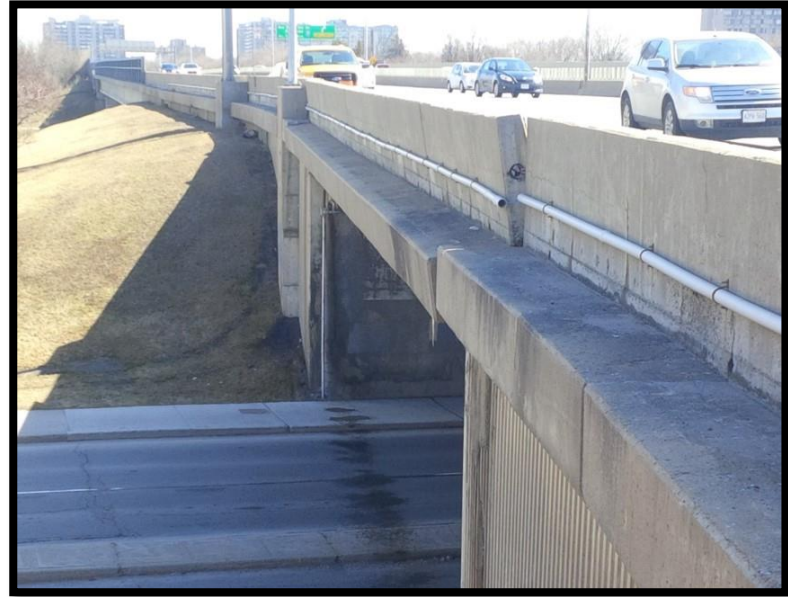
Thinking about the relevancy of a defect is the first step to assessing safety.

Routine issues:

- Asphalt ravelling
- Hairline concrete cracking
- Snowplough damage to curb faces

Non-Routine issues:

- Significant deflection
- Misaligned elements
- Flexural or shear cracks.



Look for defects that are abnormal first. These are indications of a potential safety issue.

Relevancy of Defects

LOW RELEVANCY

Has little to no effect on safety today or in the future

Localized spalls, scaling, etc.

MEDIUM RELEVANCY

May affect safety in the near future if left unaddressed

Loose concrete on soffit, unevenly loaded bearing, etc.

HIGH RELEVANCY

Directly affects safety today or in the immediate future

Shear cracks, impact-damaged girder, flexural cracks.



Severity of Defects

LOW SEVERITY

Defect is very localized or minor:

- Surface defects (scaling, honeycombing, flushing, etc.)

MEDIUM SEVERITY

Defect is more widespread and/or somewhat advanced in state:

- Most medium or localized severe defects

HIGH SEVERITY

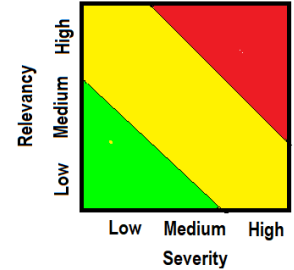
Defect is widespread, and/or advanced:

- Flexural and shear cracks
- Section loss of steel members



Urgency of Defects

Assessed based on its **RELEVANCY** and **SEVERITY**



LOW URGENCY

- Low Relevancy, Low Severity
- Low Relevancy, Medium Severity
- Medium Relevancy, Low Severity

MEDIUM URGENCY

- Low Relevancy, High Severity
- High Relevancy, Low Severity
- Medium Relevancy, Medium Severity

HIGH URGENCY

- High Relevancy, High Severity
- High Relevancy, Medium Severity
- Medium Relevancy, High Severity

Areas Requiring Special Attention

- Hidden Members or Connections
- Difficult to access areas
- Non-redundant Members or Connections
- Uplift Reactions
- Fatigue Inspections

Hidden Members or Connections

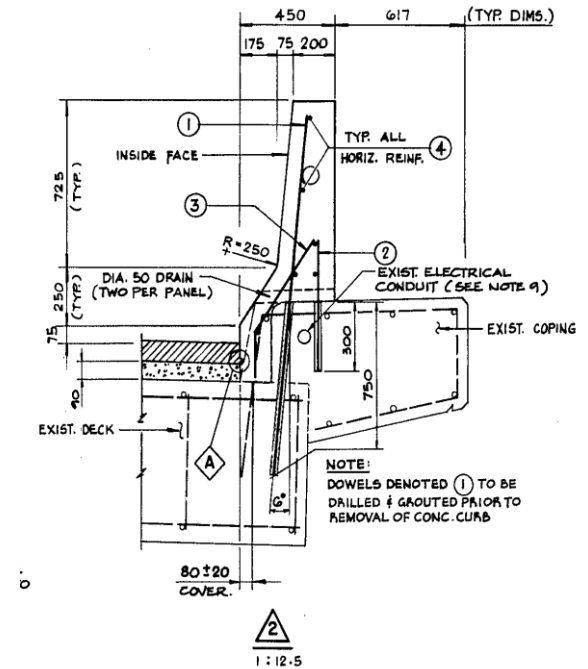
- Critical details or components may be hidden and cannot be visually inspected:
 - Inspection engineer must review all drawings including rehabilitation drawings to make sure if such details exist or not.
 - Effect can be significant if those hidden components are ignored or not inspected

Hidden Members or Connections



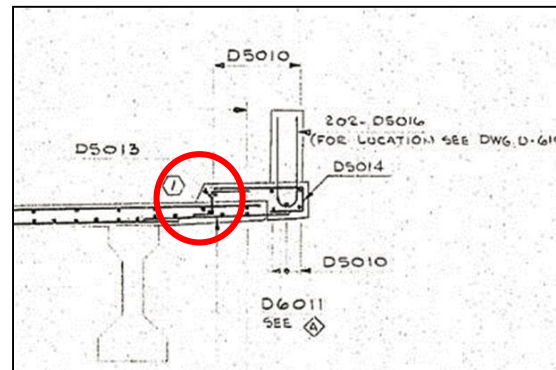
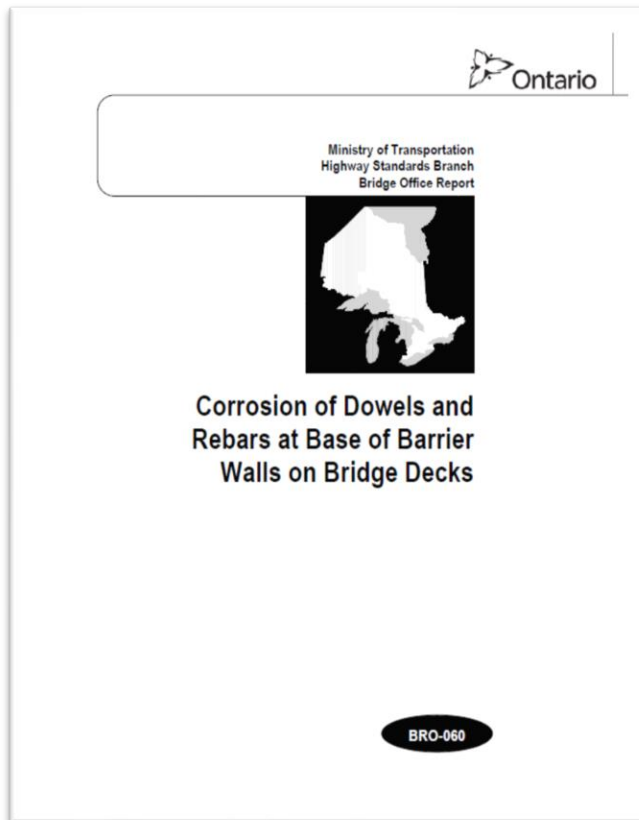
de la Concorde Overpass; Laval, Québec

Hidden Members or Connections

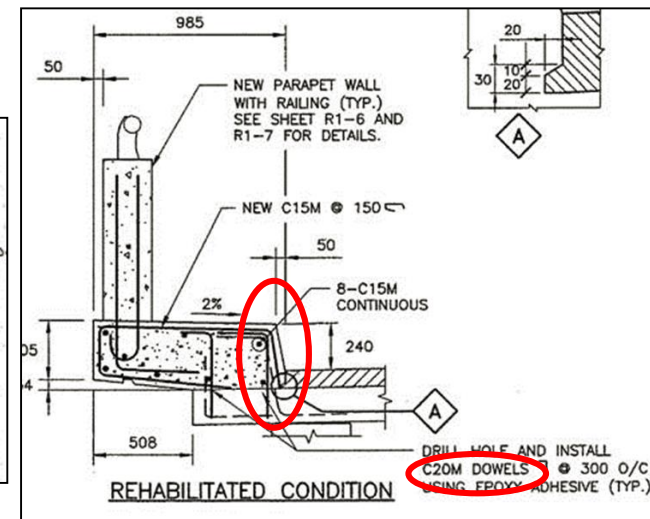


Highway 417/Elgin Street Overpass, Ottawa

Hidden Members or Connections



Example 1



Example 2

Hidden Members or Connections



Highway 21/North Penetangore River Bridge

Difficult to Access Areas

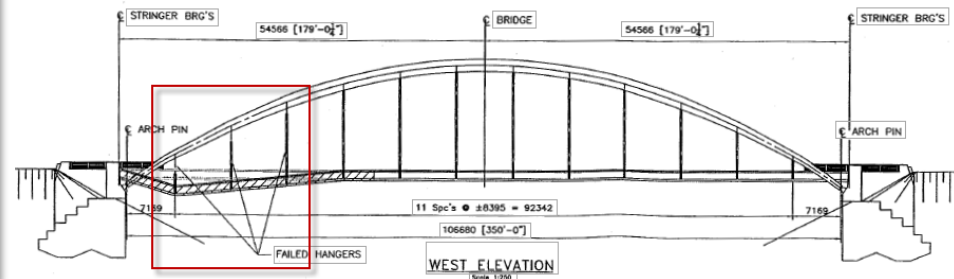
- River piers
- Over traffic
- High locations
- Enclosed or difficult to enter spaces



Non-redundant Members or Connections

3 Types of Redundancy:

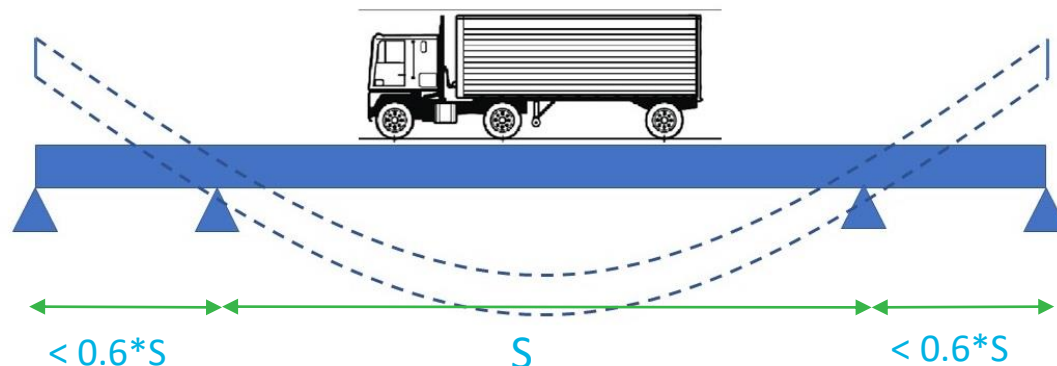
- Internal (rod vs. multi-wire strand)
- Load path (single or multiple)
- Structural (simply supported or continuous).



Highway 11/Sgt. Aubrey Cousins VC Memorial Bridge, Latchford

Uplift Reactions

- End span is 60% or less of the main span(s) for bridges of 3 spans or more.
- Dead load of the end spans are not large enough to counteract the uplift
- Unequal spans for 2 span bridges can also cause uplift.
- Hold down device may not be visible for inspection.



Uplift Reactions



Highway 401/Highbury Avenue Underpass
Spans: 12m; 38m; 12m



Highway 17/Nipigon River Bridge

Fatigue Inspections

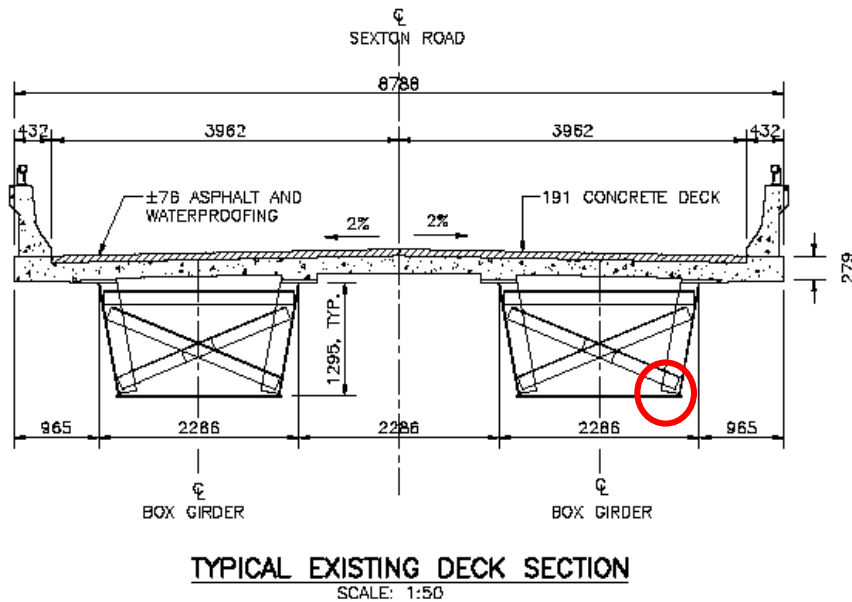


QEW/Ford Drive



Highway 402/Sydenham River

Fatigue Inspections



Highway 402/Sexton Road Underpass

Managing Inspection of Hidden Components

- Identify bridges with hidden components
- Understanding risk features
- Targeted inspection regime to inspect the hidden element regularly
- Additional Investigations:
 - Non-Destructive Testing
 - minimally invasive
- Monitor changes in condition over time:
 - specific measurements or photos.

Risk Remediation Approaches

- Inspect the structure more frequently
- Load restrictions
- Further numerical assessment/evaluation
- Strengthening
- Alternative load path provision
- Component replacement
- Bridge replacement.



MTO Examples

Inspection Defects



Highway 89/South Saugeen River Bridge

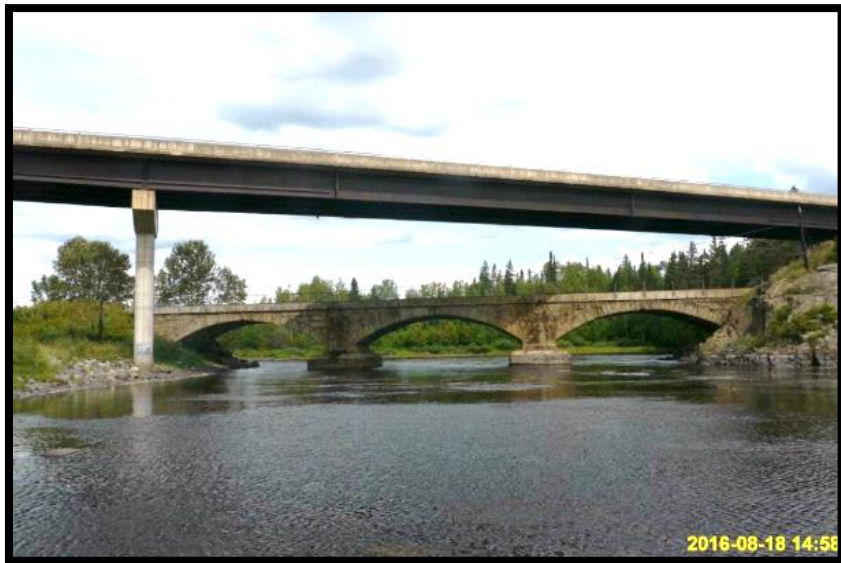


Highway 89/South Saugeen River Bridge



High Relevancy; High Severity; High Urgency

Highway 102/Kaministiquia River Bridge



Medium Relevancy; High Severity; High Urgency

Highway 402/Thames River Bridge



Medium Relevancy; Low Severity; Low Urgency

Highway 401/Grand River Bridge



Medium Relevancy; Medium Severity;
Medium Urgency



Summary

- Primary goal of inspection is **safety**
- Assessing defects:
 - How relevant is this to safety?
 - How severe is this defect?
 - How urgently should this be addressed?
- Schedule enhanced inspections/testing
- Immediately flag urgent inspection items to Owners.

Thank You.