
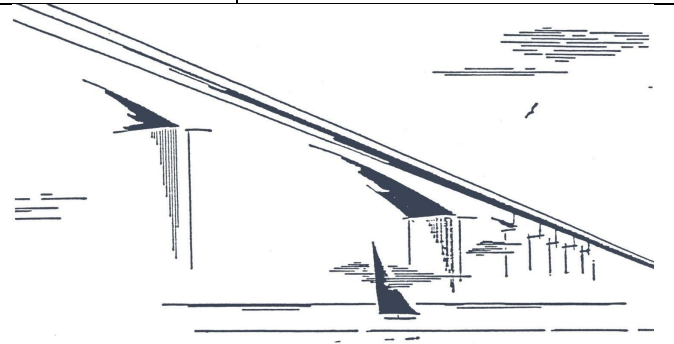
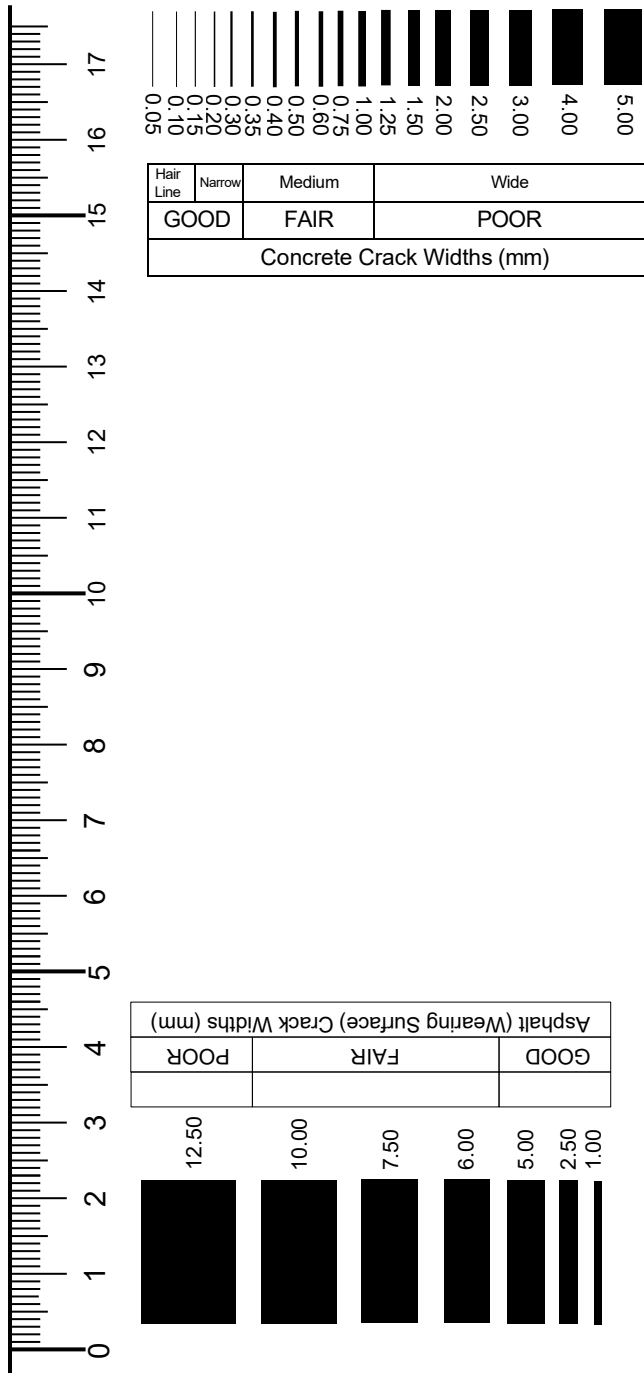


OSIM FIELD INSPECTION GUIDE (OFIG)

 Ontario	Ministry of Transportation
	
<p>ONTARIO STRUCTURAL INSPECTION MANUAL (OSIM)</p>	

April 2026



Suggestions, comments, and requests for changes or revisions to the Field Guide or inquiries about training sources should be directed to:

Ministry of Transportation, Ontario
 Highway Standards Branch
 Bridge Office
 Bridge Management Section
 301 St. Paul Street, 2nd Floor
 St. Catharines, Ontario L2R 7R4

Email: structuresoffice@ontario.ca

April 2026

PREFACE

The "OSIM Field Inspection Guide (OFIG)" is a condensed version of the "Ontario Structure Inspection Manual (OSIM)" with a focus on information that is relevant to the field portion of inspections only.

It summarizes parts of the main manual including inspection procedures, material defects, condition states, maintenance needs and performance deficiencies.

References to the OSIM are also made in this OFIG so that the inspector can obtain more comprehensive information, if required.

As the OFIG is intended as a quick reference, the OSIM should be consulted whenever more detail is required.

DISCLAIMER

This guide is not a substitute for the full OSIM. Inspectors must study the OSIM before any inspection work is undertaken.

Printing: Only print this file using **LETTER** sized paper. Other sizes may cause the measuring page to be inaccurate.

6.6 COATING

		GOOD	FAIR	POOR
DEFECT	Runs	Downward movement of paint. Caused by over-thinning or depositing too much paint at one time ALL		
	Sags	Similar to runs, the downward movement of a "curtain" of paint ALL		
	Pinpoint Rusting	Rusting visible at point locations. Caused by insufficient coating thickness on peaks of blast cleaned substrate		
Application Related Defects		Rate based on appearance and Rust Condition Rating		

6.6 COATING

DEFECT		GOOD	FAIR	POOR
Application Related Defects	Edge Defects	Coating pulls away from sharp edges and corners. Due to insufficient application of coating at edge		
	Shadows		ALL	Coating is applied too thin in the shadow of a rivet, bolts, or other abrupt change in surface
	Overspray		ALL	Some paint particles outside of spray pattern dry prior to full coating. Leads to some absorbed solvent and a more porous surface
	Pinholing		ALL	Air bubbles trapped in coating creating voids. Caused by holding spray gun too close

Table of Contents

1) STRUCTURAL INSPECTIONS..... 5

 1.1 Inspection Objectives..... 6

 1.2 Inspection Accuracy..... 6

 1.3 Site Inspection..... 8

 1.4 Additional Investigations 9

2) HELPFUL HINTS 10

 2.1 Condition States..... 11

 2.2 Maintenance Needs..... 16

 2.3 Performance Deficiencies 17

3) ELEMENT LIST 18

4) PERFORMANCE DEFICIENCIES 22

5) MAINTENANCE NEEDS..... 39

6) COMBINED MATERIAL DEFECTS & CONDITION STATES 44

 6.1 Concrete..... 45

 6.2 Steel / Aluminum..... 50

 6.3 Wood..... 53

 6.4 Masonry 56

 6.5 Asphalt 58

 6.6 Coating..... 67

1) STRUCTURAL INSPECTIONS

6.6 COATING

DEFECT		GOOD	FAIR	POOR
Adhesion Related Defects	Intercoat Delamination	One coat separates from another. Caused by contaminated surfaces or excessive curing between coats	ALL	
	Peeling	Separation of coating from steel due to poor adhesion		ALL
Application Related Defects	Underfilm Corrosion	Corrosion under the coating with the help of from a break. Caused by poor preparation or porous coating		ALL
	Bridging	Coating bridges across tight corners or debris, forming void. Voids can trap moisture and oxygen	ALL	

6.6 COATING

DEFECT		GOOD	FAIR	POOR
Coating Related Defects	Chemical Attack	Coating reacting adversely with air borne chemicals or accidental spills	ALL	
	Chalking	Powdery appearance of coating surface. Caused by reaction of coating resins to sunlight and process of weathering.	ALL	
Adhesion Related Defects	Undercutting	Spreading of corrosion under coating from a break. Caused by poor surface preparation		ALL
	Blisters	Dome shaped projections of coating. Caused by solvent or water trapped within paint film		ALL

1 STRUCTURAL INSPECTIONS

1.1 Inspection Objectives

The goal of structural inspections is to ensure, within an economic framework, an acceptable standard for structures in terms of public safety, comfort, and convenience. The main objectives are to:

- Maintain structures in a safe condition,
- Protect and prolong the useful life of structures
- Identify maintenance and urgent repair needs
- Provide the basis for structure management

1.2 INSPECTION ACCURACY OSIM Section 1.1.3.3

Below is a guide of how long an inspector should spend on a bridge/culvert site to adequately assess the condition of all elements.

Structure Type	Typical Characteristics	Min. On-Site Insp. Time
Structural Culvert	Length <100m	0.5 hours
	Length > 100m	1.0 hour
Small Bridge	Deck area < 600 m ² ; typically, 1–2 spans	1.0 hour
Medium Bridge	Deck area 600–1,000 m ²	1.5 hours
Large Bridge	Deck area > 1,000 m ²	2.0 hours +
Complex Bridges	Complex structures, or bridges with critical elements	2.0 hours +
Bridge in Poor Condition	Any size w/ widespread, advanced, or critical defects	2.0 – 3.0 hours +

The inspection should be a visual inspection performed “close enough to determine the element condition”, and generally conducted “within arms length” of the element.

In some cases, it may be possible to inspect a portion of the bridge close-up and then estimating the condition of the remaining inaccessible parts by visually comparing them to the partial close-up inspection. If this is done, periodic Enhanced OSIM inspections must be done to closely inspect all components as described in OSIM, Section 1.1.3.5.

Additional equipment should be used to facilitate inspections when necessary (Bridgemaster, bucket truck, ladder, etc.).

Additional specialized testing (NDT, etc.) should be recommended for critical structures (fatigue prone, fracture critical, hangers, etc.).

6.6 COATING

DEFECT	GOOD	FAIR	POOR
Rust Condition Rating	Rust condition rating is a visual rating of the surface appearance and is based on ASTM D610 sketches and is also shown in, Figure 2.5.5.12		
	Rust Condition Rating 2	Rust Condition Rating 3	Rust Condition Rating 3 or more
Coating Related Defects	Checking or Cracking		
	Cracking	ALL	
	Alligatoring	ALL	

6.6 COATING

OSIM Section 2.5.5

- Used to protect the underlying steel
- Not as much of an immediate concern, but a durability concern
- Three main categories of defects:
 1. Coating related defect – related to the composition of the coating
 2. Adhesion related defect – related to the bond between the steel and coating
 3. Application related defect – poor appearance due to improper application

1.3 SITE INSPECTION

OSIM Section 2.1.5.2

The inspector shall:

- Complete an overview inspection of the site to:
 - Assess the **overall integrity** of the structure and identify areas where a more detailed examination may be required
 - Observe the bridge **under truck loading** and identify any abnormal flexibility, deflections or noises (rattling or vibration of members)
 - Look for **abnormal deflections**, settlements or rotations by looking along the rail or barrier wall or other members
- Determine the **quantities** in each condition state based on the severity of material defects in the appropriate units (sq. m, each, etc.) for each element.
- Determine the **performance deficiencies**, maintenance needs, recommended work and time frame for work for each element.
- Take time & date-stamped photographs to **adequately describe** the structure and the defects found including all areas of POOR and general conditions of each element, generally including photos of:
 - Elevation & Cross-Section
 - Each element
 - Up & downstream views
 - Changes of section inside culverts
 - All areas in Poor condition state, both close-up and further out for perspective.
- Update element** quantities/dimensions if required.
- Correct missing/erroneous inventory data

1.4 Additional Investigations OSIM Section 1.1.3.8

If during a detailed visual inspection, the inspector feels that more detailed information is needed, specialized inspections (within a certain timeframe*) can be requested. Some of these investigations are:

- Bridge Deck Condition Survey
- Non-destructive Delamination Survey of Asphalt Covered Decks
- Concrete Substructure Condition Survey
- Detailed Coating Condition Survey
- Detailed Timber Structure Investigation
- Post-Tensioned Strand Investigation
- Underwater Investigation
- Fatigue Investigation
- Seismic Investigation
- Structure Evaluation
- Monitoring of deformations, movements etc.

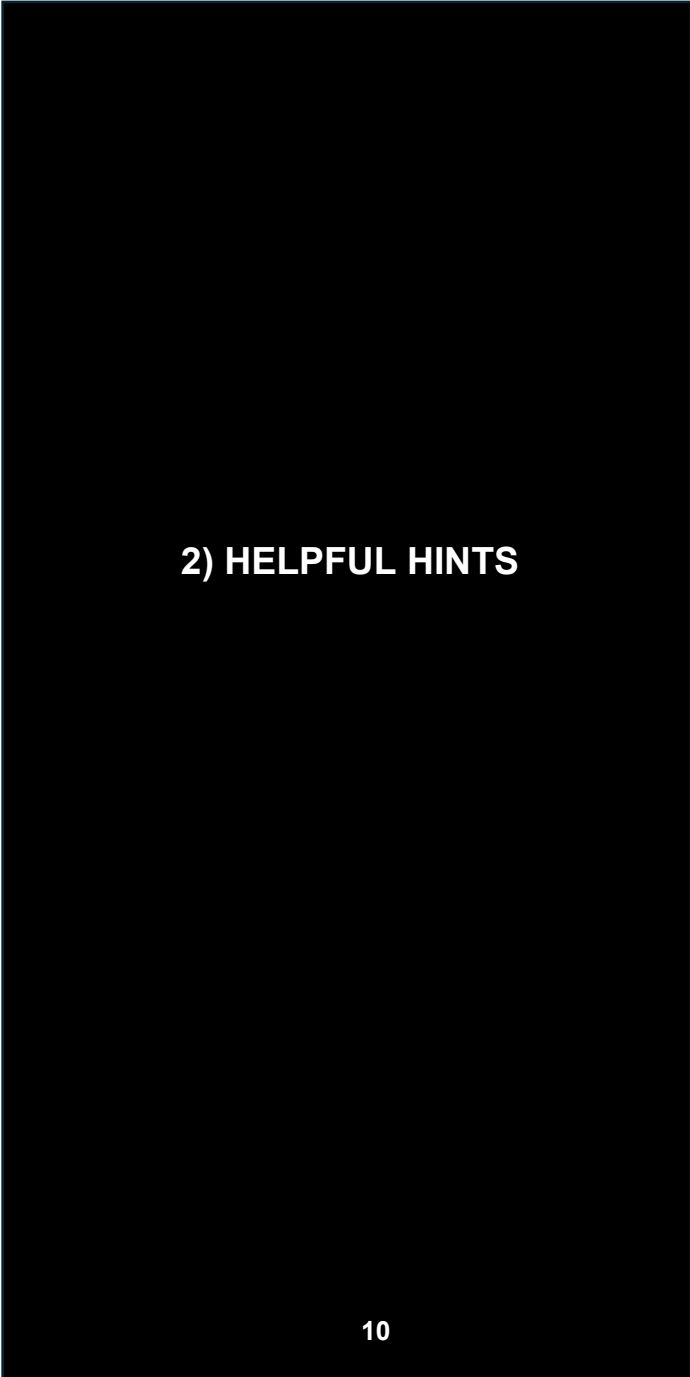
*Normal timeframe is within 2 years

6.5.2 ASPHALT COVERED CONCRETE DECK

POOR/POOR	Linear fracture extending partially or completely through the pavement	
FAIR		
GOOD		< 10 mm
DEFECT	Isolated cracks and Transverse, longitudinal cracks	
	Light and Medium Isolated Cracks	
	<i>Top- Down Defects</i>	

6.5.2 ASPHALT COVERED CONCRETE DECK

DEFECT		GOOD	FAIR	POOR/POOR
Surface Defects	Ravelling	Progressive deterioration and loss of the pavement material from the surface downward ALL		
	Slippery Surface	May result from flushing or from the polishing of the coarse surface aggregates by the action of repetitive vehicular traffic ALL		
	Flushing	The migration of asphalt upwards to the pavement surface in pavements with too much asphalt in the mix. ALL		
	Wheel Track Rutting	The formation of longitudinal depressions in the pavement at the locations of the wheel tracks of vehicles ALL		
Surface Distortion				
Top- Down Defects				



2 HELPFUL HINTS

OSIM Sect. 2.4

2.1 CONDITION STATES

1. First look for areas of POOR

- Concrete
⇒ Spalls, delaminations, > 10 mm deep scaling, wide cracks (4m = 1 m² of defect area)
- Steel
⇒ More than 10% section loss, cracks and deformations
- Actual inspection quantity (e.g. m²) should be used for elements in Poor condition – not percent.

2. Next, look for areas of FAIR

- Concrete
⇒ Medium defects (medium scaling, medium cracks, etc.)
- Steel
⇒ 1%to 10% section loss
- Each area of Poor (expect for very large areas) should generally have an equal area of associated Fair surrounding it.

3. Remainder of areas probably in Good or Excellent Condition.

- Actual Good or Excellent depends on visual inspection; however, age of structure can be used as guide, depending on environmental exposure of element (see OFIG Sections 2.1.1 and 2.1.2).
- Similar guidance based on age does not exist for the transition between Good to Fair Condition
⇒ Fair is determined by visual identification of defects.

6.5.2 ASPHALT COVERED CONCRETE DECK

	GOOD	FAIR	POOR
DEFECT	Map, edge, alligator, radial	Incomplete separation into one or more parts with or without space between	ALL
	Pattern Cracks		
	Loss of bond	Widespread loss of bond and delamination may occur between the asphalt pavement and deck surface, between the waterproofing and the deck surface, between the waterproofing and the asphalt pavement or between individual lifts of pavement	ALL
	Bond Defects	The formation of transverse undulations in the pavement surface consisting of closely spaced valleys and crests	ALL
	Rippling		
	Bottom- Up Defects		
			Top- Down Defects

6.5.2 ASPHALT COVERED CONCRETE DECK

DEFECT		GOOD	FAIR	POOR
Transverse, longitudinal cracks	Wide Isolated Cracks	Longitudinal – parallel to the direction of travel, and generally located at or near the centre of the wheel track, pavement edge or centre-line of bridge Transverse – across pavement either fully or partially	> 10 mm wide single cracks	
	Local Underlying Defects	Bowl-shaped holes in the pavement caused by the penetration of water through the pavement and subsequent heaving of the pavement due to freezing of the entrapped water and breaking up of the pavement due to traffic action		ALL
Protrusions (Delaminations)		Local delamination is visible as protrusions or bumps (often circular in shape)		ALL
Bottom- Up Defects				

OSIM Section 2.5.3.1 Transitioning Elements

- All materials must begin in the Excellent condition state
- Once any defect is visible, its area is now Good, Fair or Poor, as its severity dictates.
- Guidance is provided below for the age of components when transition* from Excellent to Good is expected to start:
 - **Harsh Environment – 5 years**
 - **Moderate Environment – 15 years**
 - **Benign Environment – 25 years**

*Transition can be spread over a few inspections (details and examples on next page)

- The **Excellent** condition state:
 - Refers to an element (or part of element) that is “new” (as constructed) condition
 - No visible deterioration type defects and no remedial action is required
 - Minor construction defects do not count as visible deterioration type defects
- The **Good** condition state:
 - Refers to an element (or part of element) where the first sign of “Light” (minor) defects are visible
 - Occurs after the structure has been in service for a number of years.
 - Does not normally trigger remedial action
- **Examples of Excellent condition state:**
 - “Bug Holes” in concrete barrier walls
 - Well-formed patina in ACR steel
- **Examples of Good condition state:**
 - Light corrosion (no section loss)
 - Narrow cracks in concrete
 - Light decay in wood
 - Surface rust

The recommended transition from “Excellent” to “Good” shall begin **AFTER** the timelines listed previously. As a guideline, an element should take **5 years** (for bridge elements) and **10 years** (for culvert elements) to complete their transition from “Excellent” to “Good”. The quantities should be **evenly transitioned** over this time frame to ensure a smooth transition.

If an inspector begins to see minor defects before the recommended transition timeline they shall record the observed defect quantities accordingly. However, during the transition, the quantity of good shall not be less than what is the required transition amount.

Transition Example 1:

A bridge is 16 years old at the time of inspection and the Exterior Soffit is being inspected (Moderate environment). Based on guidelines, the transition starts at year 15 and should finish by year 20. Previously, the quantity was 100% excellent with no defects found.

- ➔ To have an even transition until year 20, 20% of total quantity will be moved to “Good” with 80% remaining in “Excellent”.

Transition Example 2:

A bridge is 37 years old and had a rehab 7 years ago replacing concrete barrier walls. The interior barrier wall is being inspected (Harsh environment). Based on guidelines, transition started year 35 (2 years prior) and will finish by year 40. Previously, the quantity was 10% in fair, 10% in good, and 80% in excellent. Inspector does not observe different findings from last inspection.

- ➔ An even transition means 10% remain in fair, 40% in good (20% per year of transition. It is assumed that the 10% observed defects are included in this amount.), and 50% in excellent (100%-40%-10%).
- ➔ Note: If the observed quantity of Good was more than 40%, that quantity should be used instead. Otherwise, the appropriate transition amount (in this case 40% or 20% per year) should be entered.

6.5.1 ASPHALT WEARING SURFACE

		GOOD	FAIR	POOR
DEFECT	Wheel track rutting	The formation of longitudinal depressions in the pavement at the locations of the wheel tracks of vehicles Rutting < 10 mm deep	Rutting 10 to 20 mm deep	Rutting > 20 mm deep
	Surface Distortion	Bowl-shaped holes in the pavement caused by the penetration of water through the pavement and subsequent heaving of the pavement due to freezing of the entrapped water and breaking up of the pavement due to traffic action < 10 mm deep	10 to 20 mm deep	> 20 mm deep
	Local Underlying Defects	Local delamination is visible as protrusions or bumps (often circular in shape) < 10 mm in height	10 to 20 mm in height	> 20 mm in height

6.5.1 ASPHALT WEARING SURFACE

DEFECT	GOOD	FAIR	POOR
Surface Defects	Raveling	Noticeable loss of pavement material	Shallow to deep disintegration of pavement with small /numerous potholes, open texture and loose surface material
		Slippery Surface	May result from flushing or from the polishing of the coarse surface aggregates by the action of repetitive vehicular traffic There are no severity descriptions given for slippery surfaces as this is a serious and potentially hazardous situation resulting in loss of riding comfort and loss of vehicle control (indicate suspected perform deficiency of slippery surface)
	Flushing	Visible colouring of the pavement surface occurring in localized areas	Distinctive colouring of the pavement surface with excess asphalt free on the pavement surface

OSIM Table 2.8.8.1 Elements & Their Environments

Element Group	Element Name	Environment Category
Abutments (Below Expansion Joints)	All Elements	Moderate
Abutments (within 5m of a travelled lane)	Abutment Walls	Harsh
	Ballast Walls	Moderate
	Bearings	Moderate
	Wingwalls	Moderate
Abutments (No Joints)	All Elements	Benign
Accessories (Attachments & Signs)	All Elements	Moderate
Approaches	Approach Slabs	Moderate
	Barriers (Interior)	Harsh
	Barriers (Exterior)	Moderate
	All Other Elements	Harsh
Barriers	Barrier/Parapet Walls (Interior)	Harsh
	Barrier/Parapet Walls (Exterior)	Moderate
	Hand Railings	Harsh
	Posts	Harsh
	Railing Systems	Harsh
Beams/MLEs (Ends-Uncoated and below expansion joints) ¹	All Elements	Moderate
Beams/MLEs (Intermediate)	All Elements	Benign
Bracing	Bracing	Benign
Coatings	Railing Systems / Hand Railings	Harsh
	Structural Steel (Ends)	Moderate
	Structural Steel (Intermediates)	Benign
Culverts	All Elements	Benign

Element Group	Element Name	Environment Category
Decks	Deck Top	Moderate
	Drainage Systems	Harsh
	Soffit -Inside Boxes	Benign
	Soffit - Ends	Moderate
	Soffit – Exterior	Moderate
	Soffit – Interior	Benign
	Wearing Surface	Harsh
Embankments & Streams	All Elements	Benign
Foundation	Foundation (below ground level)	Benign
Joints	All Elements	Harsh
Piers (Uncoated <5 m of travelled lane)	Bearings	Moderate
	Caps	Harsh
	Shafts/Columns/Bents	Harsh
Piers (Coated <5m of travelled lane)	All Elements	Moderate
Piers (>5m of travelled lane)	All Elements	Benign
Retaining Walls (<5 m of travelled lane)	All Elements	Harsh
Sidewalks / Curbs	All Elements	Harsh
Trusses/Arches (Above deck with no or ineffective coating) ²	All Elements	Harsh
Trusses/Arches (Next to deck w/o coating, or ineffective coating) ²	All Elements	Harsh
Trusses/Arches (Below deck, at Ends, & Joints w/o coating)	All Elements	Moderate
Trusses/Arches (Below deck, at Ends w/o Joints, & intermediate w/o coating)	All Elements	Benign

1 For Beams/MLC elements that are coated and at the girder ends and below a joint, the environment will be benign

2 For Truss and Arch elements that are above, or adjacent to the deck and coated, the environment will be moderate

6.5.1 ASPHALT WEARING SURFACE

DEFECT	GOOD	FAIR	POOR	ASPHALT WEARING SURFACE	
				1-5 mm wide	> 10 mm wide
Pattern (e.g. Map, Alligator, radial, edge) and isolated	Linear fracture extending partially or completely through the pavement	6—10 mm wide	> 10 mm wide	Widespread loss of bond and delamination may occur between the asphalt pavement and deck surface, between the waterproofing and the deck surface, between the waterproofing and the asphalt pavement or between individual lifts of pavement	The formation of transverse undulations in the pavement surface consisting of closely spaced valleys and crests
Crack	Bond Defects				
Loss of bond					
Rippling	A few noticeable bumps	Several bumps producing a rough ride	Numerous bumps producing a very rough ride and difficulty maintaining control of vehicle		

ASPHALT - CRACKING

A Linear Fracture extending partially or completely through the pavement caused by:

- Wheel loading
- Poor material
- Poor compaction
- Frost action
- Drainage
- Reflective cracks (from cracks below)

Distinguished by crack appearance and direction

- **Longitudinal crack**
Parallel to the direction of travel, and generally located at or near the centre of the wheel track or pavement edge
- **Transverse crack**
Across pavement either fully or partially
- **Pattern crack**
Series of cracks in close proximity to each other
 - **Alligator**
Network of multi-sided polygons, usually accompanied by depressions in the surface
 - **Map**
Cracks run randomly along pavement
 - **Progressive edge**
Cracks begin parallel to edge of pavement and lead to breaking up the edge of pavement
 - **Radial**
Cracks in a radial pattern, usually about a depression

2.2 MAINTENANCE NEEDS OSIM Section 2.7

There are two types of maintenance work that are performed:

Structural Maintenance

- Is work to improve the structural capacity of a specific element and not part of a larger construction contract.
- Is work generally only done to one element.
- Does work include emergency repairs and holding strategy repairs.
- Does work require engineering drawings to complete.

Routine Maintenance

- Is work for preventative maintenance and minor repairs that can be performed without engineering direction.
- Is work usually carried out by bridge crews or road maintenance contractors.

A maintenance list is then forwarded to maintenance crews for action – either to complete the routine maintenance work or to initiate a structural maintenance contract for those items requiring more complex procedures or engineering design.

2.3 PERFORMANCE DEFICIENCIES OSIM Section 2.6

A Performance Deficiency should be recorded if an element's ability to perform its intended function is in question.

- "Suspected" Performance Deficiencies are recorded for each element
- Potential Deficiencies categorized as "Suspected" are often difficult to ascertain the significance of at the time of inspection.
- "Suspected" Performance Deficiencies usually indicate some follow-up action is required (strength evaluation, specialized inspection, monitoring, etc.).
- Standard List of possible deficiencies are shown on the inspection form (see OFIG Sections 4 and 5).
- Any urgent performance deficiencies need to be brought to the owners' attention immediately

Example:

An extensively corroded girder at the mid-span. Can the girder safely carry traffic loading?

- Inspector cannot determine this in the field
- Inspector can only indicate "Suspected" Performance Deficiency for a follow-up strength evaluation
- Only then can decision be made whether bridge needs strengthening or posting

6.5 ASPHALT OSIM Section 2.5.8

Distinction made between rating the asphalt wearing surface and the deck top beneath the asphalt.

There are two major categories of asphalt defects:

- Top-Down Defects
(Defect originates in asphalt and includes:)
 - ➔ Bond Defects (loss of bond and rippling)
 - ➔ Surface Defects (ravelling, slippery surface and flushing)
 - ➔ Surface Distortions (wheel track rutting)
 - ➔ Isolated Cracks (Light and medium isolated cracks)
- Bottom-Up Defects
(Defect probably originated in concrete deck and reflected in asphalt surface)
 - ➔ Pattern cracking (map, alligator, radial, edge cracking)
 - ➔ Wide isolated cracks (transverse, longitudinal)
 - ➔ Local Underlying Defects (local potholes and protrusions)

6.4 MASONRY

DEFECT	GOOD	FAIR	POOR
Loss of Mortar or Stone	Result of the destructive actions of frost, erosion, plant growth or softening by water containing dissolved sulphates or chlorides Mortar lost from joints in a few places to a depth of 20 mm	Mortar lost from joints over an extended area to a depth of 20 to 50 mm	Extensive mortar/stone loss endangering the stability of the structure

3) ELEMENT LIST

Element Group	Element Name ^{6,7,8}	Unit for Quantity ^{1,2,3,4}	Applicable Condition State Page Number
Abutments	Abutment Walls	m ²	45,56,53
	Ballast Walls	m ²	45,56,53
	Bearings	Each	N/A
	Wingwalls	m ²	45,56,53
Accessories (Attachments and Signs)	Bridge Mounted Sign Supports ⁹	Each	N/A
	Electrical	Each	N/A
	Noise Barriers	m ¹⁰	N/A
	Other	Each	N/A
	Signs	Each	N/A
	Utilities	Each	N/A
Approaches	Approach Slabs	m ²	45
	Barriers	m ¹⁰	50,53
	Curb and Gutters	m ¹⁰	45
	Drainage System	Each	N/A
	Sidewalk / Curbs	m ²	45
	Wearing Surface	m ²	45,58
	Barriers	Barrier / Parapet Walls	m ²
Hand Railings		m ¹⁰	50
Posts		Each	45,50,53
Railing Systems		m ¹⁰	50,53
Beams/Mian Longitudinal Elements	Diaphragms	Each (m ² if Concrete)	45,50,53
	Floor Beams	m ²	45,50,53
	Girders	m ²	45,50,53
	Inside Boxes (Sides & Bottom)	m ²	45,50
	Stringers	Each	45,50,53
Bracing	Bracing	Each	50,53
Coatings	Railing Systems / Hand Railings	m ²	67
	Structural Steel	m ²	67

6.4 MASONRY

OSIM Section 2.5.14

DEFECT	GOOD	FAIR	POOR
Cracking	< 0.3 mm wide	Incomplete separation into one or more parts with or without space between	
		0.3 to 1.0 mm wide	> 1.0 mm wide
Splitting	The opening of seams or cracks in the stone leading to the breaking of the stone into large fragments		
Spalling	The breaking or chipping away of pieces of the stone from a larger stone		
Disintegration	Gradual breakdown of the stone into small fragments, pieces or particles		
Splitting, Spalling, Disintegration	Hairline cracking and minor loss of stone surface with section loss < 50 mm	Narrow cracking or chipping away of stone with section loss 50 to 100 mm	Extensive spalling and disintegration of stone with section loss > 100 mm

6.3 WOOD

DEFECT	GOOD	FAIR	POOR
Fire and Chemical Damage	Slight charring or softening with < 5% section loss	Deeper charring or softening with slight loose connectors with 5% - 10% section loss	Extensive damage with loose and badly deformed connectors > 10% section loss
			Fire is evidenced by charring and is usually confined to the wood surface. Chemical damage may result from the use of non preservative chemicals on the wood surface over a long period of time
Connection Deficiencies	< 5% bolts loose or extensively corroded	< 10% bolts loose or extensively corroded	> 10% bolts loose or extensively corroded
			Connections are loosened due to repetitive or dynamic loads, wear or decay of members connected and corrosion of the connectors

Element Group	Element Name ^{6,7,8}	Unit for Quantity ^{1,2,3,4}	Applicable Condition State Page Number
Culverts	Barrels	m ²	45,50
	Inlet Components	m ²	45
	Outlet Components	m ²	45
Decks	Deck Top	m ²	45,53
	Drainage Systems	Each	N/A
	Soffit – Inside Boxes	m ²	45
	Soffit – Thick Slab	m ²	45
	Soffit – Thin Slab	m ²	45,53
	Wearing Surface	m ²	58
Embankments and Streams	Embankments	Each	N/A
	Slope Protection	Each	N/A
	Streams and Waterways	All	N/A
Foundation	Foundation (below ground level)	N/A	Rate performance only
Joints	Armouring / Retaining Devices	m ¹⁰	50
	Concrete End Dams	m ²	45
	Seals / Sealants	Each	N/A
Piers	Bearings	Each	N/A
	Caps	m ²	45,50,53,56
	Shafts / Columns / Pile Bents	m ²	45,50,53,56

Element Group	Element Name ^{6,7,8}	Unit for Quantity ^{1,2,3,4}	Applicable Condition State Page Number
Retaining Walls	Barrier Systems on Walls	m ²	45,50,53
	Railing Systems	m ¹⁰	50,53
	Drainage Systems	All	N/A
	Walls	m ²	45
Sidewalks / Curbs	Curbs	m ²	45
	Sidewalks and Medians	m ²	45
Trusses / Arches	Bottom Chords	m ²	45,50,53
	Connections	Each	50,53
	Top Chords	m ²	45,50,53
	Verticals / Diagonals	m ²	45,50,53

Notes:

- For "All", place the entire component (100%) in one condition state.
- For "Each", give the number of occurrences of the component in each state.
- For cracks in concrete, estimate repair area (**4m of crack = 1 m² of repair**).
- For cracks in steel, estimate required repair area.
- The condition states given in OSIM Section 5 are typical for element. Use appropriate section for applicable material.
- Sub-elements (End/Middle) to be used for the following elements at expansion joint locations: Deck Top, Girders, Inside Boxes. Sub-elements (End/Intermediate) to be used for the following elements at expansion joint locations: Floor Beams, Stringers, Bracing and Diaphragms. Sub-elements (End/Interior/Exterior) to be used for Soffits. Sub-elements (Interior/Exterior) to be used for Barrier/Parapet Walls.
- For an explanation of which bridge components are included in each element, see Section 2.4.1 in the OSIM Manual
- Similar element types should be grouped together (e.g., I-girders, x-frames, etc.)
- Optional element. Not required for MTO use.
- For these elements that are inspected by linear metre, a defect in the post shall be assumed to affect the tributary area for that post.

6.3 WOOD

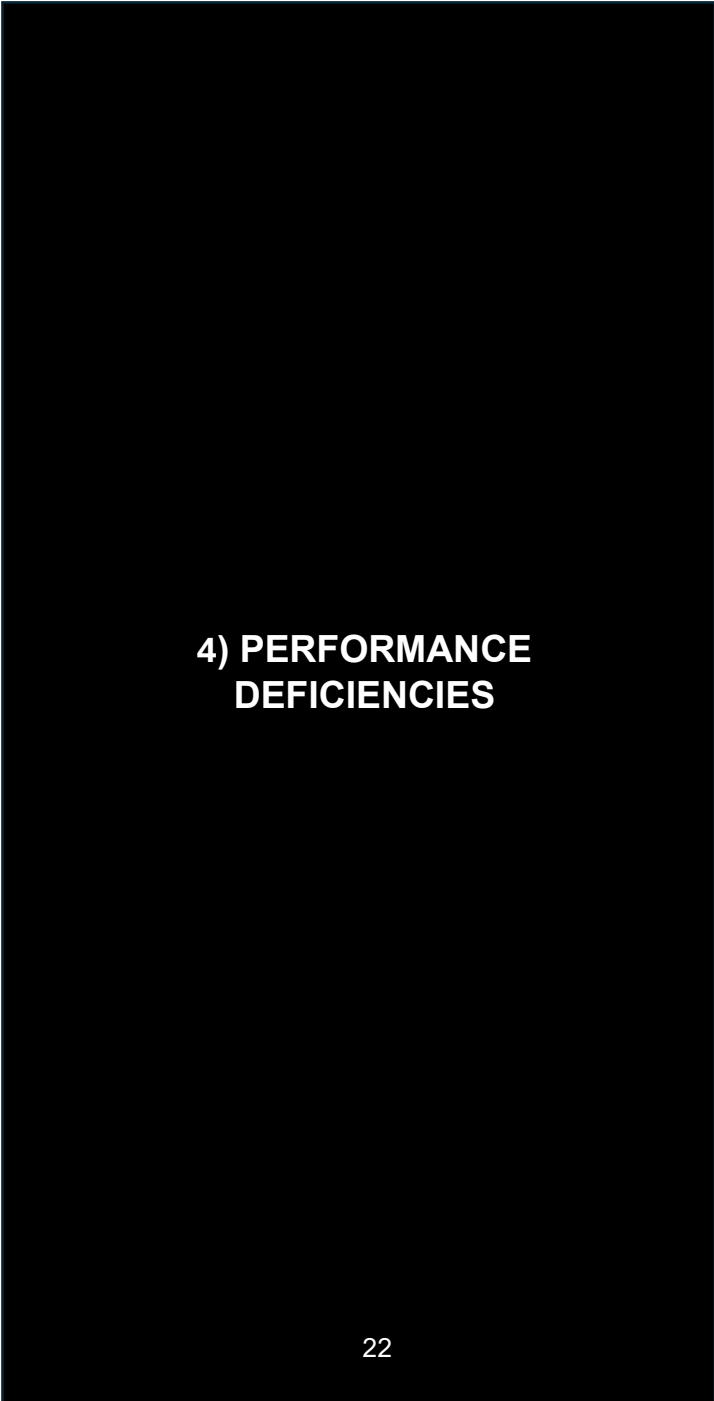
DEFECT	GOOD	FAIR	POOR
Insect Damage	Holes are present (< 5% loss)	Holes and insects present (5% - 10% loss)	Extensive holes and insects (> 10% loss)
Abrasion and Wear	< 5% loss	5% - 10% loss	> 10% loss
Cracking, Splintering, Crushing and Shattering	< 5% loss	5% - 10% loss	> 10% loss

Consequence of the tunnelling/boring by larvae/mature insects through the wood resulting in loss of section

Deterioration of wood brought about by vehicles or snowplough blades scraping against wood surfaces, coupled with the abrasive influence of sand, dirt or debris.

Physical damage which results from vehicular collision from overloading of a member

DEFECT	GOOD	FAIR	POOR
Weathering	Gradual deterioration of wood due to exposure to the actions of sun, rain, wind, frost and atmospheric pollutants		
	< 5% into member	5—10% into member	> 10% into member
Checks	Longitudinal tissue separations on the side grain of wood members		
Splits	Extensive tissue separations extending from the side into the end		
Shakes	Tissue separations which follow the circular annual growth rings, and are visible on the end grain		
Checks, Splits, Shakes	< 5% into member	5—10% into member	> 10% into member
	Biological decomposition of wood caused by micro-organisms called fungi		
Rot or Decay	Slight change in colour but wood solid (< 5% loss)	Surface is discoloured and slight hollow sound (5% - 10% loss)	Surface is fibrous or crumbly and hollow sounding or surface and interior is crumbly and wood is weak (> 10 % loss)



4 SUSPECTED PERFORMANCE DEFICIENCY

TYPES OSIM Sect. 2.6

4.1 Load Carry Capacity

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Girder, Deck Top, Railing System, etc. Note- deficiencies in most elements can trigger a strength evaluation	<ul style="list-style-type: none"> Material defects leading to loss of strength, or which are indicative of inadequate strength of the component (e.g. 20% section loss at midspan of girder) Detrimental modifications made subsequent to construction. Strong evidence of under design for current loads. 	<ul style="list-style-type: none"> Strength evaluation Monitoring of deformations (displacements or rotations) or cracks
Retaining Walls Examples: slipping or tilting of wall	<ul style="list-style-type: none"> Bulging upward of grade in front of wall. This indicates that a large movement has occurred and failure is imminent If ground in front of wall is disturbed, the wall may have lost passive resistance for sliding stability Material defects leading to loss of strength Possible bearing capacity failure 	<ul style="list-style-type: none"> Excavate an exploratory hole behind the retaining wall in order to prove its thickness and construction (i.e. Are there counterforts built in wall)

6.2 STEEL / ALUMINUM

DEFECT	GOOD	FAIR	POOR
Connection Deficiencies	Loose connections can occur in bolted, riveted or clamped connections. They may be caused by corrosion of the connector, gusset plates or fasteners, excessive vibration, overstressing, cracking, or the lack of proper tightening during construction.		
	Based on the condition of the worst component within the connection		
	Depends on percentage of Loose Bolts or Plan Area with extensive corrosion		
	< 5% bolts loose or extensively corroded	< 10% bolts loose or extensively corroded or	> 10% bolts loose or extensively corroded or

- *For CSP culverts, all portions in the Poor Condition State except corrosion without perforations (i.e. cupping, crimping, deformations, cracks and corrosion with perforations) the area shall be taken to include the entire circumference.

6.2 STEEL / ALUMINUM

DEFECT	GOOD	FAIR	POOR
		Global Deformation <10% of culvert diameter	Global Deformation >10% of culvert diameter and reverse curvature *
Cracking		Bolt Tilting	
		Are linear fracture in the steel extending partially or completely through the member. They are mainly caused by fatigue, which can lead to brittle fracture (member cracks completely) through without prior warning)	
		<i>Cracks perpendicular to stress are very serious and should have immediate action taken.</i>	ALL * (Estimate repair area)

	<ul style="list-style-type: none"> • Detrimental modifications made subsequent to construction • Differential out-of-plumb orientation of wall along its length • Ground pressure under toe of wall is excessive thus forward tilting of wall may result • Old walls are often deficient in toe thickness and this might result in fractures at the toe. This condition does not necessarily signify danger, but if discovered, wall should be kept under observation. • Sloped vegetation on top of wall • Differential settlement or low spot in wall • Overall wall leaning beyond vertical alignment tolerance. • Panel contact, resulting in spalling/cracking • Foundation (subgrade) material is too soft or wet for proper bearing • Fill material of poor quality or not properly compacted. 	<ul style="list-style-type: none"> • A wall which is overturning can be strengthened by building counterforts behind or in front of the wall • Strength evaluation • Drill the wall in a number of selected places measuring the thickness and observing the type and condition of the material penetrated. • Seal these cracks and monitor • Situation should be evaluated by qualified geotechnical specialist
--	---	---

4.2 Excessive Deformations

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Railing System, Deck Top, Truss Chord, Abutment Wall, Bearings, etc.	<ul style="list-style-type: none"> Extensively bent members Overloading, either single or repetitive occurrence, resulting in permanent deformations of the deck or deck components Permanent deformations, especially in compression components Unanticipated or excessive vibration or deflection of components, connections or joints under live loads Unexpected noise from components or connections due to vehicles moving across the structure Mis-alignment, lateral deformation, warping, etc. of components 	<ul style="list-style-type: none"> Strength evaluation Monitoring of deformations (displacements or rotations)

6.2 STEEL / ALUMINUM

OSIM Section 2.5.6

DEFECT	GOOD	FAIR	POOR
Corrosion	Deterioration of steel by chemical/electro-chemical reaction resulting from exposure to air, moisture, de-icing salts, industrial fumes and other chemicals/contaminants in the environment in which it is placed	Deterioration of steel by chemical/electro-chemical reaction resulting from exposure to air, moisture, de-icing salts, industrial fumes and other chemicals/contaminants in the environment in which it is placed	Deterioration of steel by chemical/electro-chemical reaction resulting from exposure to air, moisture, de-icing salts, industrial fumes and other chemicals/contaminants in the environment in which it is placed
	No section loss, loose rust / pitting in paint	< 10% section loss, small scales or flakes	>= 10% section loss, extensive rust / perforations
Permanent Deformations	Early signs of patina damage	Flaking of patina	Flaking of patina
	Steel members can take the form of bending, buckling, twisting or elongation. Corrugate Steel Pipe (CSP) culverts can exhibit cusping (abrupt change in curvature, typically at seam), crimping (local buckling of culvert wall), global deformation (change in original curved shape), and bolt tilting (bearing failure of bolts).	Steel members can take the form of bending, buckling, twisting or elongation. Corrugate Steel Pipe (CSP) culverts can exhibit cusping (abrupt change in curvature, typically at seam), crimping (local buckling of culvert wall), global deformation (change in original curved shape), and bolt tilting (bearing failure of bolts).	Steel members can take the form of bending, buckling, twisting or elongation. Corrugate Steel Pipe (CSP) culverts can exhibit cusping (abrupt change in curvature, typically at seam), crimping (local buckling of culvert wall), global deformation (change in original curved shape), and bolt tilting (bearing failure of bolts).
			For members: ALL (Estimate repair area) *
		Cusping or crimping of culverts <10mm in height.	Cusping or crimping of culverts >10mm in height *

6.1 CONCRETE

DEFECT	GOOD	FAIR	POOR
Slippery Concrete Surface	Smooth surface resulting from the polishing of the concrete deck surface by the action of repetitive vehicular traffic		
		All * Include suspected performance deficiency of "slippery surface"	
Active Wet Areas	Concrete surface is wet or damp due to salt contaminated water		
		Wet but no cracks	Wet with cracks

Retaining Walls Examples: Deflection or rotations,	<ul style="list-style-type: none"> • Inability of the abutment to withstand lateral earth pressures, as indicated by long, medium horizontal cracks in abutments • Deformation of the roof slab, floor slab, or walls of culverts • Deformation of soil-steel structures such as flattening or peaking of the soffit or buckling of he shoulders or haunches • Up-lift at ends of soil-steel structures • Movements causing distress in a bearing or it's components, or in other structure components 	<ul style="list-style-type: none"> • Removal of reinforced fill and reinforcing elements, followed by the resetting of the panel
	<ul style="list-style-type: none"> • Backward tilting of wall • A deep rotational slip is occurring dislodging the retaining wall • Panel not battered sufficiently • Oversized backfill and/or compaction equipment working within 1m (3 ft) zone of back wall facing panels 	

<p>Wall out of vertical alignment tolerance (plumbness), i.e. leaning in or out,</p>	<ul style="list-style-type: none"> • Backfill material placed wet of optimum moisture content. Backfill contains excessive fine materials (beyond specifications for percent of materials passing a No. 200 sieve) • Backfill material pushed against back of facing panel before, being compact above reinforcing elements. • Excessive or vibratory compaction of uniform, medium-fine sand (more than 60% passing No. 40 sieve) • Backfill material dumped close to free end of reinforcing elements then spread toward back of wall, causing displacement of reinforcements and pushing panel out • Shoulder wedges not seated securely • Shoulder clamps not tight • Slack in reinforcement to facing connections • Inconsistent tensioning of geosynthetic reinforcement to MBW unit. • Localized over-compaction adjacent to MBW unit 	<ul style="list-style-type: none"> • Removal of reinforced fill and reinforcing elements, followed by the resetting of the panel
<p>Wall out of horizontal alignment tolerance, or bulging</p>	<ul style="list-style-type: none"> • Backfill material placed wet of optimum moisture content. Backfill contains excessive fine materials (beyond specifications for percent of materials passing a No. 200 sieve) • Backfill material pushed against back of facing panel before, being compact above reinforcing elements. • Excessive or vibratory compaction of uniform, medium-fine sand (more than 60% passing No. 40 sieve) • Backfill material dumped close to free end of reinforcing elements then spread toward back of wall, causing displacement of reinforcements and pushing panel out • Shoulder wedges not seated securely • Shoulder clamps not tight • Slack in reinforcement to facing connections • Inconsistent tensioning of geosynthetic reinforcement to MBW unit. • Localized over-compaction adjacent to MBW unit 	<ul style="list-style-type: none"> • Removal of reinforced fill and reinforcing elements, followed by the resetting of the panel

6.1 CONCRETE

DEFECT	GOOD	FAIR	POOR
Cold Joints	Caused by hardened concrete prior to the next adjacent pour	All	
Deposits	Water seeped through concrete, leaching chemicals and depositing them on the surface - efflorescence	All	
Abrasion	Wearing caused by vehicles or snow-plough blades	All	
Wear	Result of dynamic and/or frictional forces generated by vehicular traffic, coupled with the abrasive influx of sand, dirt and debris	All	

6.1 CONCRETE

DEFECT	GOOD	FAIR	POOR
Honeycombing	Produced due to the improper or incomplete vibration of the concrete which results in voids being left in the concrete where the mortar failed to completely fill the spaces between the coarse aggregate particles		
	Holes up to 25 mm dia.	Holes 25 – 50 mm dia.	Holes more than 50 mm dia.
Pop-Outs	Shallow conical depressions resulting from the breaking away of small portions of the concrete surface, due to the expansion of some aggregates due to frost action.		
	Holes up to 25 mm dia.	Holes 25 – 50 mm dia.	Holes more than 50 mm dia.
Stratification	Separation of concrete into layers prior to hardening, due to over- vibration.		
		All	
Segregation	Concrete not uniform due to falling concrete (poor placement)		
		All	

Large variations in movement of adjacent panels.	<ul style="list-style-type: none"> Excessive batter set in panels for select granular backfill material being used Inadequate compaction of backfill MBW unit manufactured out of vertical tolerance Backfill saturated by heavy rain or improper grading of backfill after each day's operations Backfill material not uniform Backfill compaction Inconsistent setting of facing panels 	
--	--	--

4.3 Continuing Settlement

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Foundations	<ul style="list-style-type: none"> • Loss of strength or support for applied loads due to material defects • Loss of material supporting foundations due to scour or erosion • Consolidation or failure of underlying soil resulting in cracking or movement of foundations, abutments or piers • Loss of contact between piles and pile cap or pier cap • Changes in the inclination of piles • Rotational movement of pile caps and loss of full contact with piles 	<ul style="list-style-type: none"> • Regular monitoring of settlement, pier and abutment elevations and crack widths • Strength evaluation • Geotechnical investigation • Underwater investigation
Retaining Walls	<ul style="list-style-type: none"> • Sunken grade behind the wall or the top of wall alignment has dropped • Differential settlement between walls and abutment 	

6.1 CONCRETE

DEFECT	GOOD	FAIR	POOR
Delamination	Discontinuity of the surface concrete, which is substantially, but not completely detached from concrete below or above it		All
	Fragments which have been detached from a larger concrete mass		All
Cracking	Linear fracture which extends partly or completely through the member		
	< 0.3 mm	0.3 – 1.0 mm wide	> 1.0 mm wide
Alkali – Aggregate Reaction	Aggregates react adversely with the alkalis in cement to produce a highly expansive alkali-silica gel		
	Hairline pattern cracks < 0.1 mm	Narrow pattern cracks 0.1 – 0.3 mm wide	Medium – wide pattern cracks > 0.3 mm wide

6.1 CONCRETE

OSIM Section 2.5.4

DEFECT	GOOD	FAIR	POOR
Scaling	Local flaking/loss of surface portion of concrete or mortar due to freeze-thaw		
	Up to 5 mm depth	6 – 10 mm depth	> 10 mm depth
Disintegration	Physical deterioration or breaking down of concrete into small fragments		All
Erosion	Deterioration of concrete brought about by water-borne sand and gravel particles scrubbing against surfaces		All
Corrosion of Reinforcement	Deterioration of reinforcement by electrolysis		
		Rust stains from reinforcement	Exposed reinforcement with rust

4.4 Continuing Movements

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Abutment Wall, Pier Deck Top, Bearings Retaining Walls, Etc.	<ul style="list-style-type: none"> Out of plumb of abutment walls, piers, piers or other components supported on them Tilting or bulging of Retained Soil System (RSS) walls Unusual or unexpected substructure movements occurring during the passage of heavy vehicles over the bridge Tapering or misalignment of cracks and joints in foundations, abutments, piers or other components supported on them Sudden drops or kinks in the structure profile over piers or abutment walls when sighting along railings or beam lines Abnormally large or small openings or misalignment of deck expansion joints at abutments and piers Abnormal displacements or inclinations of bearings 	<ul style="list-style-type: none"> Regular monitoring and measurement of movements, inclinations, crack widths, etc. Underwater investigation Geotechnical investigation <p>For retaining walls:</p> <ul style="list-style-type: none"> Drive sheet piling in front of the toe to cut through the slip plane and thus prevent further movement As a temporary measure, excavate soil from the top of the wall and dump it over the wall Place concrete under and in front of the wall toe in short lengths for length required

4.5 Seized Bearings

	<ul style="list-style-type: none"> • Abnormally large or small clearance between ballast wall and superstructure • Cracks in abutment wall and ballast wall • Shift in alignment from original position 	
Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Bearings	Binding or jamming of expansion or rotational components due to corrosion, lack of lubrication or damage to sliding surfaces	<ul style="list-style-type: none"> • Strength evaluation to account for change in articulation • Lubricate Bearings (Maintenance Operation)

6. COMBINED MATERIAL DEFECTS & CONDITION STATES

	Maintenance Need	Description
8	Scaling (Loose Concrete or ACR Steel)	The removal of loose delaminated concrete or delaminated patina of ACR steel girders that pose a risk as a falling hazard to live lanes and pedestrian facilities below.
9	Disconnected Drainage Tubes	Repair and maintenance of drainage tubes such as asphalt drainage tubes.
10	Missing Electrical Covers	The repair of missing electrical box covers.

4.6 Bearings not Uniformly Loaded / Unstable

4.7 Jammed Expansion Joint

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Elastomeric Bearing, Rocker Bearing, etc.	<ul style="list-style-type: none"> Non-uniform contact of bearing surfaces with each other or with bearing seat Excessive inclinations of bearings 	Regular monitoring of bearing movements

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Armouring/retaining devices, Retaining Walls	<ul style="list-style-type: none"> Inadequate joint gap to accommodate anticipated further movement Surfacing materials have jammed in the joints during resurfacing of deck Design or construction problems not allowing proper movement of multi-seal joints 	<ul style="list-style-type: none"> Regular monitoring of deck movements Clean out gap (Maintenance Operation)

4.8 Pedestrian / Vehicular Hazard

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Armouring/ retaining devices, Sidewalk, Retaining walls	<ul style="list-style-type: none"> Vertical or horizontal misalignment across the joint Severe material defects (e.g. Spalling) Horizontal, vertical or rotational displacements in curbs and sidewalks as they are hazardous to pedestrian and vehicular safety, and present obstructions to snowplows Inadequate curb height, or loss of curb height for sidewalks due to the placement of an additional layer of wearing surface or deck overlay 	<ul style="list-style-type: none"> Remove obstruction (Maintenance operation) Review Code requirements for curb height

	Maintenance Need	Description
4	Timber Repair	The repair of loose or missing bolts or fasteners.
5	Works for Modular Bridges	The works include installation, removal, repair, and maintenance that is unique to modular bridges, but not including work defined by structural maintenance operations.
6	Animal/Pest Control	The installation and maintenance of animal/pest control devices at structures, such as beaver dam removal.
7	Erosion and Vegetation Control at Bridges and Culverts	Operations performed to prevent or repair damage due to erosion, such as scour at abutments and around piers, and washouts on slopes. Includes removal of obstructions to water flow, clearing of vegetation growth, etc., that creates a safety concern.

	Maintenance Need	Description
1	Railing System Repair	Repair and/or replacement of metal handrails, railing systems and posts, as well as securing the railings that have been damaged due to vehicle impacts and pose a risk to the travelling public.
2	Bridge Deck Joint Repair	The repair of expansion joint armouring due to safety issues for the travelling public or pedestrians (Ex. Loose armouring is protruding upwards and can damage vehicles).
3	Structural Steel Repair	The repair of loose or missing bolts and fasteners.

4.9 Rough Riding Surface 4.10 Surface Ponding

Element Group/Name	Description of Deficiency	Possible Follow-up Action
Wearing Surface, Deck Top (exposed), Approach Slabs	<ul style="list-style-type: none"> Rough approaches, settlement or consolidation of approach embankments, or deterioration of the approach slabs or ramps, resulting in vehicles "bouncing" onto the bridge. In addition to applying excessive dynamic loading to the bridge, this may also result in difficulty in maintaining vehicle control Rough surface on bridge Depressions and cracks in the roadway pavement above culverts and soil-steel structures 	<ul style="list-style-type: none"> Smooth out asphalt at approach (Maintenance operation) Patching bridge deck (Maintenance operation) Strength evaluation

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Sidewalk, Wearing Surface	<ul style="list-style-type: none"> Water ponding on sidewalks/wearing surface, as it presents a safety hazard, especially if allowed to freeze 	<ul style="list-style-type: none"> Fill in depression with asphalt (Maintenance Operation)

4.11 Deck / Wall Drainage

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Drainage System	<ul style="list-style-type: none"> • Deck drains not provided where necessary, or have inadequate size of opening • Deck drains and drainage systems improperly constructed with inadequate slopes or sharp directional changes • Drainage system plugged or partially plugged and not allowing for free and unobstructed flow of water • Drainage outlets discharging directly onto embankment without proper provision for collecting, channeling and controlling of discharge with splashpads, spillways or gutters • Inadequate provision for drainage at the structure approaches. <p>Retaining walls: Add water pressure behind wall. Percolate down through the expansion joints and softening the soil under the toe of the wall. Lateral creep of wall can occur</p>	<ul style="list-style-type: none"> • Review deck drainage requirements <p>For retaining walls:</p> <ul style="list-style-type: none"> • Clean wall drains

5 Maintenance Needs

OSIM Sect. 2.7

Maintenance work is defined as any type of work that does not require the issuing of a capital construction project.

Routine Maintenance – preventative maintenance and minor repair work to an element that can be performed without engineering direction. It includes regular work such as cleaning or debris removal, as well as some urgent safety items that are not structural issues. It is usually carried out by bridge crews or road maintenance personnel.

Structural Maintenance Work – is work that improves the structural capacity of a select element and is not part of a larger construction project to improve the entire bridge. It generally requires engineering design drawings to complete the work, but the work must be done in a timeframe that precludes a conventional capital construction contract from being used.

The bridge inspector should note the need for maintenance work when performing a detailed visual inspection. If urgent maintenance needs are observed, the bridge inspector must contact the Owner immediately and have them confirm the urgency of the need. If the Owner agrees that the maintenance need is urgent then the bridge inspector shall note the urgent timeframe in the inspection report. If it is not of an urgent nature then the Owner will be responsible for deciding the timing of the maintenance need.

“**Urgent**” maintenance needs apply to structure, motorist and pedestrian safety items that should be completed as soon as possible. Work in this category typically includes routine maintenance items such as protruding expansion joint armouring, missing electrical covers, damaged railings with a

snag risk, and scaling loose concrete over live lanes or pedestrian facilities. It also includes emergency structural maintenance items such as repairing fatigue cracks in girders, addition of temporary supports to severely corroded beam ends and repairs to severely damaged piles.

The Owner is responsible for assigning appropriate time frames for all other non-urgent maintenance needs.

Minor defects that will most likely never be repaired, need not be identified as a Maintenance Need.

5. MAINTENANCE NEEDS

5.1 Slippery Surfaces

5.2 Flooding / Channel Blockage

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Deck Top	<ul style="list-style-type: none"> Loss in riding comfort and potential loss of vehicle control due to defects in the component materials Loss of protection to underlying surfaces due to defects in the wearing surface materials 	<ul style="list-style-type: none"> Resurface problem area (Maintenance Operation)

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Streams & Waterways, Retaining Walls	<ul style="list-style-type: none"> The inspection should look for the following evidence of high-water levels, inadequate opening at the structure and adverse affects on other components of the structure 	<ul style="list-style-type: none"> Determine historical frequency of flooding and recorded water levels and compare to current high-water elevation Monitor water elevations throughout year

	<ul style="list-style-type: none"> Bending or buckling of the lower chord of steel trusses in the downstream direction by ice or heavy debris Ice scars and damage to substructures Coarse debris, such as branches and small trees, caught or wedged under the superstructure Fine debris, such as grass and twigs, on fences, trees, embankments, structures, etc. Wash lines on bare soil slopes Mud or silt deposited on embankments Marks and stains on structures 	<ul style="list-style-type: none"> Perform hydrology study <p>For retaining walls</p> <ul style="list-style-type: none"> Seal the ground behind the wall Seal these cracks and monitor
--	--	---

Retaining Walls	<ul style="list-style-type: none"> • Slope has started to move and allowing water in cracks thus increasing the pressure behind the wall 	<ul style="list-style-type: none"> • Seal ground behind wall
-----------------	---	---

5.3 Undermining of Foundation
5.4 Unstable Embankments

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Streams & Waterways, Foundations, Retaining Walls	<ul style="list-style-type: none"> • Loss of material supporting foundations due to scour or erosion 	<ul style="list-style-type: none"> • Underwater investigation • Strength elevation

Element Group/Name (Examples)	Description of Deficiency	Possible Follow-up Action
Embankments	<ul style="list-style-type: none"> • Settlement of embankment, slope protections or approach roadway • Sliding failure of the toe or slopes of the embankment • Surface or deep-seated slips • Loss of embankment material from under foundations 	<ul style="list-style-type: none"> • Geotechnical investigation