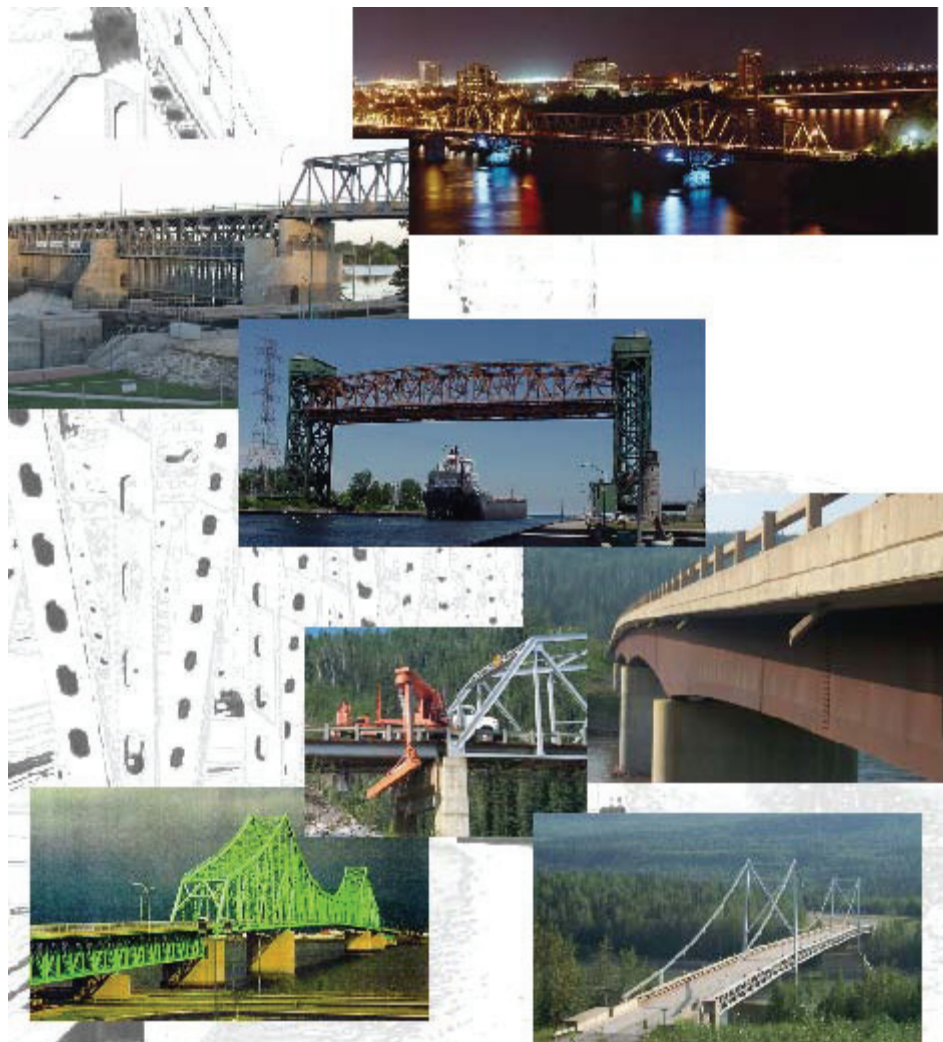


Bridge Inspection Manual



Structures, Marine and Transportation
December 2010





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Public Works and
Government Services
Canada

Travaux publics et
Services gouvernementaux
Canada

Canada

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BRIDGE INSPECTION MANUAL

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- Highways and Bridge Engineering, Public Works and Government Services Canada, Real Property Branch, Professional and Technical Services Management, Gatineau, Qc.

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PREFACE

This manual is largely reproduced (with permission) from the Ministry of Transportation Ontario (MTO) Ontario Structure Inspection Manual (OSIM) January 1991. Part 1 of the manual contains minor revisions only to reflect PWGSC inspections requirements. Part 2, Section 1 has been modified to suit PWGSC requirements and has been expanded to include examples of safety practices associated with bridge inspections. Part 2, Section 2, entitled Condition Rating System, has been rewritten in its entirety. The rating system adopted in **BIM** is very similar to the 1991 OSIM rating system but has been expanded to include a priority code for repairs, assessed on an individual structure basis. The remainder of Part 2 of OSIM has been modified to reflect the changes in the rating system, and has been included in **BIM** as Appendix A. Part 3 of OSIM – Programming Guidelines for Repairs and Rehabilitations has not been included. Part 4 of OSIM – Material Condition Surveys has been included as Appendix D and has been substantially expanded to include sections on Detailed Condition Surveys from the MTO Structural Rehabilitation Manual. Part 5 of OSIM – Underwater Inspections has been included as Appendix E in the **BIM** with some minor revisions.

Public Works and Government Services Canada gratefully acknowledges the assistance of MTO in the development of the *Bridge Inspection Manual* through the extensive use of OSIM and the Structural Rehabilitation Manual.

2008 Update

The manual was updated in March 2008 to ensure consistency with the Bridge Inspection and Structural Evaluation Policy.

One of the significant changes as a result of this update relates to the modification of the procedures relating to overall ratings of the structure. The overall structural condition as well as functional needs of the structures are to be assessed and rated on a scale of 1 to 6 with the lower end of the scale reflecting a closed, failed or unsafe structure and the high end of the scale representing no problems in terms of current codes and functional standards. This assessment should be based on sound engineering judgement taking into account the severity and extent of component deficiencies and their impact on overall structure. General guidelines are included in Part 2, Section 2, Condition Rating Systems of the updated version.

The title of Appendix B has been changed to Bridge Inspection Reports.

December 2010 Update

General revisions were made to the document and the format was updated.

INTRODUCTION

Bridge structures are key, and often, essential elements of the road network. Public safety is jeopardized, the efficiency of the network impaired, and the public inconvenienced whenever a structure fails or its load carrying capacity is reduced.

In the interests of public safety, cost effectively maintaining the structural integrity of federally owned bridges, and ensuring a minimum of traffic disruptions, Public Works and Government Services Canada (PWGSC) developed and implemented a comprehensive policy on bridge inspection and evaluation (May 2001). This policy contained provisions that all PWGSC owned bridges be inspected by qualified personnel at regular intervals, as specified in the policy.

To ensure national consistency of these inspections and the subsequent management of the structures, this manual was produced. It provides for a uniform standardized approach to detailed comprehensive inspections for PWGSC owned bridges across Canada.

Part 1 of the *Bridge Inspection Manual (BIM)* provides general details of inspection procedures, bridge components, material defects and performance related defects.

Part 2 of **BIM** sets out the requirements for general inspections, comprehensive detailed inspections and the rating systems to be used.

Appendix A of **BIM** provides specific requirements for the inspection of individual components.

Appendix B of **BIM** contains blank structure inspection forms and a sample completed inspection form.

Appendix C of **BIM** details traffic control procedures for inspections.

Appendix D of **BIM** details some of the typical destructive and non-destructive testing performed on structure components.

Appendix E of **BIM** outlines the requirements for underwater inspections.

This document is not applicable to Mechanical and Electrical components, such as those included in movable bridges.

GENERAL DEFINITIONS

Abutment – A substructure unit which supports the end of the structure and retains the approach fill. (*Culée*)

Auxiliary Component – Any component which does not share in the load carrying capacity of the structure. (*Élément accessoire*)

Bridge – Any structure having a span of 3 m or more that forms part of a highway or over, or under which the highway passes. (*Pont*)

Chord – The upper and lower main longitudinal component in trusses or arches extending the full length of the structure. (*Membrane*)

Coating – The generic term for paint, lacquer, enamel, sealers, galvanizing, metalizing, etc. (*Enduit*)

Culvert – Any bridge that is embedded in fill and is used to convey water, pedestrians or animals through it. (*Ponceau*)

Defect – An identifiable, unwanted condition that was not part of the original intent of design. (*Défaut*)

Deficiency – An identifiable, unwanted condition that was not part of the original intent of the design. (*Défectuosité*)

Department – The Department of Public Works and Government Services Canada. (*Ministère*)

Deterioration – A defect that has occurred over a period of time. (*Détérioration*)

Diagonals – Component which spans between the top and bottom chord of a truss or arch in a diagonal direction. (*Diagonales*)

Distress – A defect produced by repetitive loading. (*Défaillance*)

Engineer – A member or licensee of the Association of Professional Engineers of at least one of the Provinces. (*Ingénieur*)

Evaluation – The determination of the load carrying capacity of structures. (*Évaluation*)

Floor Beam – Transverse beams that span between trusses, arches or girders and transmit loads from the deck and stringers to the trusses, arches or girders. (*Poutres transversales*)

Highway – A common and public thoroughfare including street, avenue, parkway, driveway, square, place, bridge, designed and intended for, or used by, the general public for passage of vehicles, pedestrians or animals. (*Route*)

Lateral Bracing – Bracing which lies in the plane of the top or bottom chords or flanges and provides lateral stability and resistance to wind loads. (*Contreventement horizontal*)

Maintenance – Any action which is aimed at preventing the development of defects or preventing deterioration of a structure or its components. (*Entretien*)

Masonry – Structure made up of natural stones separated by mortar joints, usually in uniform courses. Masonry in existing structures is usually in retaining walls, abutments, piers or arches. (*Maçonnerie*)

Masonry, Ashlar – Stone worked to a square shape or cut square with uniform coursing height and vertical joints staggered. The stone has a minimum course height of 200 mm set in joints with an average thickness of 10 mm or less. (*Maçonnerie en pierres de taille*)

GENERAL DEFINITIONS

Masonry, Squared Stone – Stone in natural bed thicknesses or roughly squared stones with course height less than 200 mm and joints greater than 10 mm but not over 20 mm. (*Maçonnerie en bloc équarris*)

Masonry, Rubble – Stone masonry constructed with rough field stones or only roughly squared stones set in mortar joints with average thickness greater than 20 mm. Also any squared stone masonry in which the joints are greater than 20 mm, but less than 30 mm in thickness. (*Maçonnerie en pierres brutes*)

Minister – The Minister of the Department of Public Works and Government Services Canada or his/her nominee. (*Ministre*)

Owner – A person having jurisdiction and control over the structure. (*Propriétaire*)

Person – An individual, board, commission, department, partnership or corporation, and employees, agents, successors and assigns of any of them. (*Personne physique*)

Plans – All drawings, descriptions and specifications, being parts of the contract, and all drawings and descriptions produced by the constructor for the erection of a bridge or structure, and all revisions thereto. (*Plans*)

Portal Bracing – Overhead bracing at the ends of a through truss or arch and provides lateral stability and shear transfer between trusses. (*Contreventement de portique*)

Primary Components – The main load carrying components of the structure. (*Éléments principaux*)

Rehabilitation – Any modification, alteration, retrofitting or improvement to a structure sub-system or to the structure that is aimed at correcting existing defects or deficiencies. (*Remis en état*)

Repair – Any modification, alteration, retrofitting or improvement to a component of the structure which is aimed at correcting existing defects or deficiencies. (*Réparation*)

Retaining Wall – Any structure that holds back fill and is not connected to a bridge. (*Mur de soutènement*)

Secondary Components – Any components which helps to distribute loads to primary components or carries wind loads, or stabilizes primary components. (*Éléments secondaires*)

Sign Support – A metal, concrete or timber structure, including supporting brackets, service walks and mechanical devices where present, which support a luminaire, sign or traffic signal and which span or extend over a highway. (*Support de panneau de signalisation*)

Span – The horizontal distance between adjacent supports of the superstructure of a bridge, or the longest horizontal dimension of the cross-section of a culvert or tunnel taken perpendicular to the walls. (*Travée*)

Stringers – Stringers span between floor beams and provide the support for the deck above. (*Longeron*)

Structure – Bridge, culvert, tunnel, retaining wall or sign support. (*Ouvrage*)

Sway Bracing – Vertical bracing spanning between through trusses or arches, or outside of half-through trusses or arches and providing lateral stability and shear transfer between the trusses or arches. (*Contreventement oblique*)

Tunnel – Any bridge that is constructed through existing ground, and is used to convey highway or railway traffic through it. (*Tunnel*)

Verticals – Components which span between the top and bottom chords of a truss or arch in the vertical direction. (*Barres verticales*)

PWGSC – Department of Public Works and Government Services Canada. (*TPSGC*)

GENERAL DEFINITIONS

TAC – Transportation Association of Canada. (*ATC*)

CSA – Canadian Standards Association. (*CSA*)