Bridge Inspection Course

OVERVIEW OF TMH19: MANUAL FOR THE VISUAL ASSESSMENT OF ROAD STRUCTURES

Background

- Development of the TMH19 manual started in 2013
- TMH19 was approved as a **Draft Standard** by COTO on 18 August 2020
- The Draft Standard will be implemented in industry for a period of two (2) years, during which written comments may be submitted to the COTO subcommittee. Draft Standards (DS) have full legal standing.
- After the two-year period, comments received are reviewed and where appropriate, incorporated by the COTO subcommittee.
- The document is converted to a Final Standard (FS) and submitted by the Roads Coordinating Body (RCB) to COTO for approval as a final standard.
- This Final Standard is implemented in industry for a period of five (5) years, after which it may again be reviewed. Final Standards (FS) have full legal standing.

Contents of TMH19

- Preface
- Overview of the Manual

- Part A: Road Structure Management Information
- Part B: Visual Assessment Guide

- Part A includes the following appendices:
  - A1 Inventory Information per Structure Type
  - A2 Descriptive Examples of Relevancy and Urgency Ratings per Remedial Activity
  - A3 Inspection Forms per Structure Type
  - A4 Remedial Activities per Structure Type

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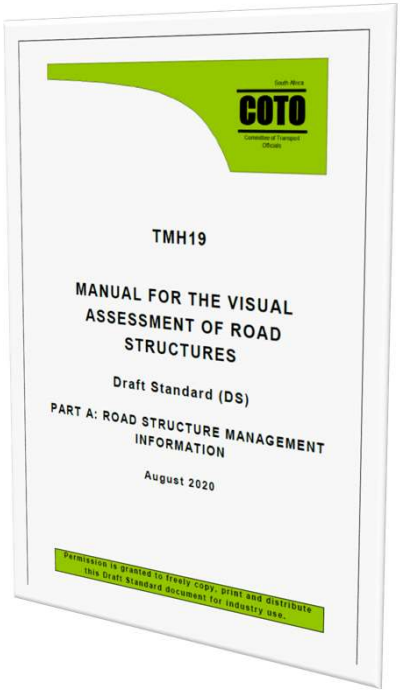

COTO

TMH19

MANUAL FOR THE VISUAL ASSESSMENT OF ROAD STRUCTURES

Draft Standard (DS)

PART A: ROAD STRUCTURE MANAGEMENT INFORMATION

August 2020

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Contents of Part A

A.1 Structure Definitions
A.2 Overview of Structures Management System
A.3 Inventory Information
A.4 The DER Rating System
A.5 Overview of Defects on Structures
A.6 Inspection Items and Inspection Sheets
A.7 Inspection Procedure and Quality Assurance
A.8 Repair Cost Calculations

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A1: Structure Definitions

- Bridges:
  - Bridge (General)
  - Bridge (Arch)
  - Bridge (Cable)
  - Bridge (Cellular)
- Culverts:
  - Major Culvert
  - Lesser Culvert
- Retaining Walls;
- Gantries;
- Tunnels;
- Low level bridges;
- Low level river crossings; and
- Light Masts.

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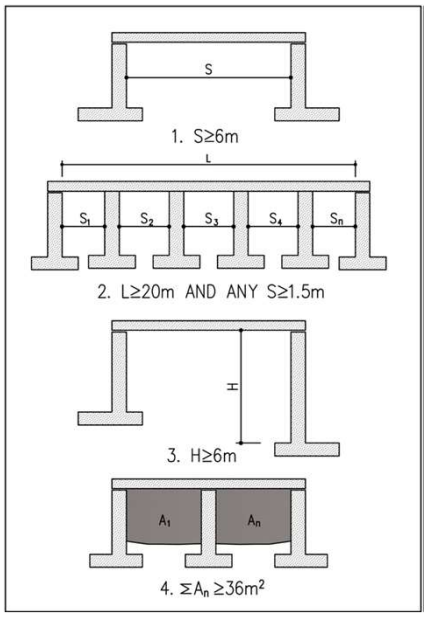
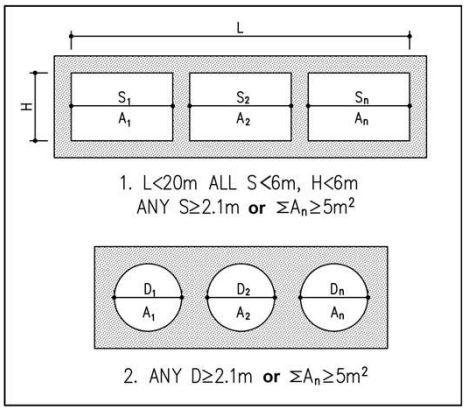
Definition of a Bridge



Definition of a Major Culvert



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A2: Overview of a Structures Management System

- Inventory Data
- Inspection Data
- Condition Analysis
- Prioritisation and Ranking
- Deterioration Analysis
- Repair Costs
- Validation

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A3: Inventory Information

- Numbering of Structures
- Location Details
- Inventory Data Required for Structures
- Additional Inventory Data for Structures
- Recommended Inventory Photos
  - Bridges
  - Major Culverts
  - Lesser Culverts
  - Retaining Walls
  - Gantries
  - Road Tunnels

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A4: The DER Rating System

- Description of the DER Rating System
- DER Rating Values
- Procedure for Rating of Defects

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A5: Overview of Defects on Structures

- Deficiencies
  - Design deficiencies
  - Construction deficiencies
  - Material performance deficiencies
- Damage
- Deterioration
  - Delamination and spalling
  - Cracking
  - Carbonation
  - Chloride penetration
  - Efflorescence and discolouration
  - Alkali-aggregate reaction
  - Chemical attack
  - Corrosion and fatigue of steel

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A5: Overview of Defects on Structures (cont.)

- Ancillary bridge elements
  - Typical expansion joint defects
  - Typical bearing defects
  - Typical parapet and end block defects
  - Typical drainage defects
  - Typical embankment protection defects
- Typical Retaining Wall Defects
- Typical Gantry Defects
- Typical Road Tunnel Defects

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A6: Inspection Items and Inspection Sheets

- Inspection Items
- Number of Inspection Items per Structure Type
  - Bridge (General, Arch, Cable & Cellular)
  - Major Culvert
  - Lesser Culvert
  - Retaining Wall
  - Gantry
  - Road Tunnel
  - Light Mast
- Inspection Sheets

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A7: Inspection Procedure and Quality Assurance

- Types of inspections
  - Principal Inspections
  - Partial Inspections
  - Completion inspections
  - Waterway inspections
- Qualifications and Experience of Inspectors
  - Bridge Inspector
  - Senior Bridge Inspector
  - Major Culvert Inspector
  - Lesser Culvert Inspector
  - Retaining Wall Inspector
  - Gantry Inspector
  - Tunnel Inspector

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A7: Inspection Procedure and Quality Assurance

- Training of Inspectors
- Procedure for Visual Inspections
- Verification Inspections
- OHS Requirements
- Inspection Photos

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A8: Repair Cost Calculations

- Urgency Ratings
- Remedial Activities
- Position Codes

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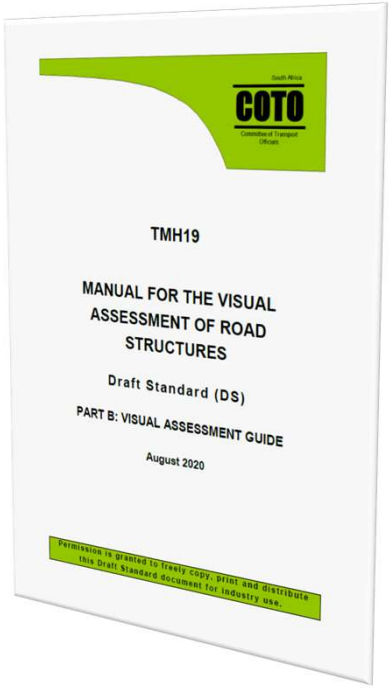

Contents of Part B

B.1 Introduction

B.2 Photographic Guide of Defects per Structure Type and Inspection Item

- B.2.1 Bridge (General)
- B.2.2 Bridge (Cellular) and Major Culvert
- B.2.3 Retaining Walls
- B.2.4 Gantries
- B.2.5 Road Tunnels

B.3 Make Safe Items

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B2: Photographic Guide

Bridge (General)

Item 7 Wing/Retaining Wall Defects

Defects	Observations	D
Shrinkage and restraint cracks including AAR (Crack should be cleaned. Its width and if possible its depth ascertained)	Crack is of the order of 0.3 mm with no signs of water leakage or corrosion of reinforcement.	1
	Crack is greater than 0.3 mm but smaller or equal to 0.6 mm with no signs of water leakage or corrosion of reinforcement.	2
	Crack is of the order of 0.6 mm and there are signs of water passing through crack and evidence of corrosion of reinforcement.	3
	Crack is greater than 0.6 mm	4
Spalling (All loose concrete must be broken away to expose extent of spall)	Spalling is shallow and reinforcement is not visible.	1
	Spalling is shallow. Reinforcement is partly exposed. Minor signs of corrosion. Thus spalling not attributable to corrosion.	2
	Reinforcement is partially or fully exposed and corrosion is a problem	3
	Reinforcement is exposed and significantly corroded. Section loss.	4

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Item 7 Wing/Retaining Wall Defect Photos

D = 1 Left DER-U 111-2 Right DER-U 111-2		
	Diagonal crack in wing wall	Spalling at wing wall joint
D = 2 Left DER-U 211-2 Right DER-U 211-3		
	Diagonal crack in wing wall	Spalling on wing wall
D = 3 Left DER-U 312-3 Right DER-U 312-3		
	Diagonal crack in wing wall	Spalling at wing wall joint
D = 4 Left DER-U 414-4 Right DER-U 442-3		
	Restraint crack in wing wall	AAR cracking in wing wall

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B3: Make Safe Items

Examples of defects that **should** be marked as "Make Safe"

Visual Assessment Guide Part B2: Make Safe items

3 Make Safe Items

3.1 Defects that should be marked as "Make Safe" Items

If a defect is critical to the structural integrity such that collapse is imminent or where public safety risk is considered high, such a defect should be recorded as Make Safe (MS) and should receive immediate attention. The inspector should immediately alert the authorities to implement appropriate safety measures to ensure the safety of the user. Proof of the communication should be kept clearly indicating the authority and person(s) contacted.

The "Make Safe" box on the inspection form must be ticked.

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Examples of defects that should be marked as "Make Safe" items

D = 4 Left DER-U 424-4 Right DER-U 414-4		
	Pavement layer undermined by stormwater	Manhole cover missing in pedestrian walkway
D = 4 Left DER-U 434-4 Right DER-U 424-4		
	Impact damage to parapet	Impact damage to parapet
D = 4 Left DER-U 424-4 Right DER-U 424-4		
	Impact damage to parapet / end block	Severe erosion at approach embankment
D = 4 Left DER-U 444-4 Right DER-U 414-4		
	Missing handrails on pedestrian bridge	Exposed live wiring on pedestrian walkway

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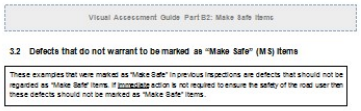
B3: Make Safe Items

Examples of defects that **should not** be marked as “Make Safe”


Visual Assessment Guide Part B2: Make Safe Items

3.2 Defects that do not warrant to be marked as “Make Safe” (M.S) items

These examples that were marked as “Make Safe” in previous inspections are defects that should not be regarded as “Make Safe” items. If immediate action is not required to ensure the safety of the road user then these defects should not be marked as “Make Safe” items.

Examples of Defects that should not be marked as “Make Safe” Items

Left DER-U 412-4 Right DER-U 422-4	Manhole cover missing in median channel	Down chute partly washed away
Left DER-U 333-4 Right DER-U 222-1	Debris blocking wate way	Spacer blocks missing
Left DER-U 212-1 Right DER-U 111-1	Impact damage to guard rail	Nut missing
Left DER-U 313-6 Right DER-U 313-1	Guard rail not attached to end block	Scupper blocked and rusted

Appendix A2: Descriptive Examples of Relevancy and Urgency Ratings per Remedial Activity

- Includes tables with typical Urgency and Relevancy ratings in relation to Remedial Activities
- Remedial activities are grouped according to the following categories:
  - Concrete Items (Structural)
  - Concrete Items (Non-structural)
  - Foundations
  - Embankments
  - Slope Protection
  - Bearings
  - Expansion Joints
  - Structural Steel Members
  - HD Bolts and Base Plates
  - Drainage
  - Guardrails
  - Surfacing
  - Waterway
  - Scour Protection

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Example for Remedial Activity for Slope Protection

Activity Description	Range of "R"	Remarks	U	R
Renew/repair protection works (gabion boxes, stone pitching etc.)	1 to 3	Minor damage to protection works caused by settlement of embankment, vegetation, vandalism etc.	1	1
		Portions of the protection works have been damaged, displaced or removed locally by floodwaters	4	2
		Large portions have been damaged, displaced or removed by floodwaters	4	3

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TMH22: Road Asset Management Manual

- The following aspects relating to road structure asset management are addressed in TMH22:
- Procedure to calculate Condition Indices
- Condition categories
- Proposed weight sets for structure types
- Calculation of Replacement Cost (RC) for asset valuation purposes

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