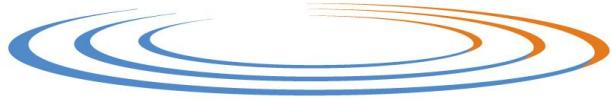




WATER SERVICES ASSOCIATION
OF AUSTRALIA

**CONDUIT INSPECTION REPORTING CODE
OF AUSTRALIA**



WATER SERVICES ASSOCIATION OF AUSTRALIA

Conduit Inspection Reporting Code of Australia

WSA 05—2013

Third Edition

Version 3.1

ORIGINATED AS AUSTRALIAN CONDUIT CONDITION EVALUATION MANUAL 1991
REVISED AND REDESIGNATED AS WSA 05—2002 SEWER INSPECTION REPORTING CODE OF AUSTRALIA
REVISED AND RENAMED AS WSA 05—2006 VERSION 2.1 CONDUIT INSPECTION REPORTING CODE OF
AUSTRALIA
REPLACES WSA 05—2008 VERSION 2.2

CONTENTS

ACKNOWLEDGMENTS

FOREWORD

PREFACE

CODE PURPOSE AND SCOPE

MANDATORY AND INFORMATIVE

APPENDICES

INDUSTRY TRAINING

AMENDMENTS

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

1.2 DEFINITIONS

1.2.2 Adjusting construction

1.2.3 Asset

1.2.4 Asset owner

1.2.5 Benching

1.2.6 Blister

1.2.7 Breaking

1.2.8 Breaking-Displaced

1.2.9 Breaking-Missing

1.2.10 Bulge

1.2.11 Collapse

1.2.12 Chamber

1.2.13 Chamber unit

1.2.14 Combined system

1.2.15 Conduit

1.2.16 Conduit unit

1.2.17 Conduit unit length

1.2.18 Connection

1.2.19 Cracking

1.2.20 Culvert

1.2.21 Exfiltration

1.2.22 Feature

1.2.23 Finished surface level

1.2.24 Gate slot

1.2.25 Grade

1.2.26 Gravity system

1.2.27 Groundwater

1.2.28 Infiltration

1.2.29 Inflow

1.2.30 Inspection length

- 1.2.31** Inspection opening, IO
- 1.2.32** Inspection shaft, IS
- 1.2.33** Invert
- 1.2.34** Joint
- 1.2.35** Junction
- 1.2.36** Landing
- 1.2.37** Maintenance chamber, MC
- 1.2.38** Maintenance hole, MH
- 1.2.39** Maintenance shaft, MS
- 1.2.40** Maintenance structure
- 1.2.41** Masonry
- 1.2.42** Node
- 1.2.43** Operator
- 1.2.44** Outfall
- 1.2.45** Property connection fitting
- 1.2.46** Property connection sewer
- 1.2.47** Pressure main
- 1.2.48** Receiving water
- 1.2.49** Rehabilitation
- 1.2.50** Renovation
- 1.2.51** Repair
- 1.2.52** Roots-Beard
- 1.2.53** Sewage
- 1.2.54** Sewer
- 1.2.55** Sewerage
- 1.2.56** Shaft
- 1.2.57** Shear displacement
- 1.2.58** Soffit
- 1.2.59** Spalling
- 1.2.60** Staging bars
- 1.2.61** Subsoil drain
- 1.2.62** Surface water
- 1.2.63** Taper
- 1.2.64** Terminal maintenance shaft, TMS
- 1.2.65** T-seal or top hat liner
- 1.2.66** Water Agency

1.3 REFERENCED DOCUMENTS

1.4 ABBREVIATIONS

SECTION 2 REQUIREMENTS FOR THE CONDUCT OF INSPECTIONS

2.1 GENERAL

2.2 TRAINING AND ACCREDITATION OF PERSONNEL

2.2.1 Operators

2.2.2 Asset managers and contract managers

2.3 PLANNING THE INSPECTION

2.4 PREPARATION OF CONDUITS AND MAINTENANCE STRUCTURES**2.5 CAMERA AND SCANNER****2.5.1** General**2.5.2** Capability**2.5.3** Picture quality**2.6 CAMERA AND SCANNER OPERATION****2.6.1** Position**2.6.2** Speed**2.7 LINEAR MEASUREMENT****2.8 DATA DISPLAY DURING VIDEO PLAYBACK OR DIGITAL IMAGE ANALYSIS****2.8.1** Conduits**2.8.2** Maintenance structures**2.9 LASER PROFILING OF CONDUITS****2.9.1** General**2.9.2** Cleaning**2.9.3** Water levels**2.9.4** Camera position**2.9.5** Speed limit**2.9.6** Laser calibration**2.10 SONAR PROFILING OF CONDUITS****2.10.1** General**2.10.2** Cleaning**2.10.3** Water levels**2.10.4** Sonar position**2.10.5** Speed limit**2.10.6** Sonar calibration**2.11 MAXIMUM DEPTH OF FLOW****2.12 INSPECTION REPORT****2.12.1** General**2.12.2** Inspector's report**2.12.3** Video record**2.12.4** Photographs taken during camera inspection**2.12.5** Video clips of camera inspection**2.13 PRELIMINARY GRADING OF INTERNAL CONDITION****SECTION 3 INSPECTION OF CONDUITS — THE DESCRIPTION AND ENCODING OF OBSERVATIONS****3.1 PURPOSE****3.2 METHODS OF INSPECTION****3.3 CONDUITS — CODING SYSTEM****3.4 CONDUITS — HEADER INFORMATION****3.4.1** Recording of information**3.4.2** Mandatory information**3.4.3** Optional information

3.4.4 Information to be provided by the asset owner

3.5 ENCODING OF OBSERVATIONS

3.5.1 General

3.5.2 Observation codes

3.5.3 Main observation codes

3.5.4 Sub-codes

3.5.4.1 Characterisation sub-codes

3.5.4.2 Quantification sub-codes

3.5.4.3 Circumferential location

3.5.4.4 Observation associated with a joint

3.5.4.5 Longitudinal location

3.5.4.6 Features within a specified length

3.5.4.7 Continuous features

3.5.4.8 Photograph reference

3.5.4.9 Video location reference

3.5.4.10 Video clips

3.5.4.11 Specific remarks

3.5.5 Logging procedures

3.5.5.1 Defining location and direction of inspection

3.5.5.2 Start of inspection

3.5.5.3 Finish of inspection

3.5.5.4 Inspection abandoned

3.5.5.5 Inspection recommenced

3.6 CONDUIT HEADER CODES

3.6.1 General

3.6.2 Header codes to describe the location of the inspection

3.6.3 Header codes for reporting inspection details

3.6.4 Header codes for recording conduit details

3.6.5 Header codes for recording miscellaneous information

3.6.6 Change of codes for header information

3.7 CODES FOR REPORTING THE INSPECTION OF CONDUITS

3.7.1 General

3.7.1.1 Additional observations to be recorded

3.7.2 Codes relating to the structural integrity of conduits

3.7.2.1 Cracking—C

3.7.2.2 Breaking—B

3.7.2.3 Dropped invert—DI

3.7.2.4 Deformation—D

3.7.2.5 Collapsed conduit—X

3.7.2.6 Surface damage concrete—SC

3.7.2.7 Surface damage asbestos cement—SAC

3.7.2.8 Surface damage other—SO

3.7.2.9 Soil visible through defect—SV

3.7.2.10 Void visible through defect—VV

3.7.2.11 Porous conduits—PP

3.7.3 Codes specific to masonry conduits

3.7.3.1 Displaced masonry units—DMU

3.7.3.2 Missing masonry units—MMU

3.7.3.3 Masonry unit separation—MUS

3.7.3.4 Masonry conduit collapsed—XM

3.7.3.5 Missing mortar—MM

3.7.4 Codes relating to the blockage and leakage of conduits

- 3.7.4.1 Deposits on the wall and in the invert—DE
- 3.7.4.2 Exfiltration—EX
- 3.7.4.3 Infiltration—I
- 3.7.4.4 Obstruction—OB
- 3.7.4.5 Ingress of soil—ING
- 3.7.4.6 Roots—R

3.7.5 Codes relating to the performance of joints

- 3.7.5.1 Displaced joint—JD
- 3.7.5.2 Defective seal joint—JDS
- 3.7.5.3 Defective joint weld—JDW

3.7.6 Codes relating to connections and junctions

- 3.7.6.1 Connection—CN
- 3.7.6.2 Defective connection—CX
- 3.7.6.3 Junction—JN
- 3.7.6.4 Defective junction—JX

3.7.7 Codes relating to linings and repairs

- 3.7.7.1 Lining defective—LD
- 3.7.7.2 Point repair—PR
- 3.7.7.3 Defective repair—RX

3.7.8 Codes relating to miscellaneous observations concerning the construction and performance of the conduit

- 3.7.8.1 Atmosphere in the conduit—GAS
- 3.7.8.2 Flow in connecting conduit—IF
- 3.7.8.3 Water level—WL
- 3.7.8.4 Line of conduit deviates—L
- 3.7.8.5 Vermin—V

3.7.9 Miscellaneous codes relating to the administration of the inspection

- 3.7.9.1 Start node—ST
- 3.7.9.2 Finish node—FH
- 3.7.9.3 General comment—GC
- 3.7.9.4 General photograph—GP
- 3.7.9.5 Loss of vision—LOV
- 3.7.9.6 Inspection (Survey) abandoned—SA

3.7.10 Codes for changing header information

- 3.7.10.1 Change of lining—LC
- 3.7.10.2 Change of conduit material—MC
- 3.7.10.3 Change in conduit unit length—PC
- 3.7.10.4 Change of cross section—SC
- 3.7.10.5 Change in video volume reference—TC

SECTION 4 INSPECTION OF MAINTENANCE STRUCTURES — THE DESCRIPTION AND ENCODING OF OBSERVATIONS

4.1 PURPOSE

4.2 METHODS OF INSPECTION

4.3 MAINTENANCE STRUCTURES — CODING SYSTEM

4.4 MAINTENANCE STRUCTURES—HEADER INFORMATION

4.4.1 Recording of information

4.4.2 Mandatory information

4.4.3 Optional information

4.4.4 Information to be provided by the asset owner

4.5 ENCODING OF OBSERVATIONS

4.5.1 General

4.5.2 Recording of information

4.5.3 Main observation codes

4.5.4 Sub-codes

4.5.4.1 Characterisation sub-codes

4.5.4.2 Quantification sub-codes

4.5.4.3 Circumferential location

4.5.4.4 Observation associated with a joint

4.5.4.5 Descriptive location

4.5.4.6 Vertical location

4.5.4.7 Features at the same location

4.5.4.8 Photograph reference

4.5.4.9 Video location reference

4.5.4.10 Video clips

4.5.4.11 Specific remarks

4.5.5 Logging procedures

4.5.5.1 General

4.5.5.2 Start of inspection

4.5.5.3 Inspection abandoned

4.6 MAINTENANCE STRUCTURE HEADER CODES

4.6.1 General

4.6.2 Header codes to describe the location of the inspection

4.6.3 Header codes for reporting inspection details

4.6.4 Header codes for recording maintenance structure details

4.6.5 Header codes for recording miscellaneous information

4.7 CODES FOR REPORTING THE INSPECTION OF MAINTENANCE STRUCTURES

4.7.1 General

4.7.2 Codes relating to structural integrity

4.7.2.1 Cracking—HC

4.7.2.2 Breaking—HB

4.7.2.3 Deformation—HD

4.7.2.4 Collapsed structure—HX

4.7.2.5 Surface damage concrete—HSC

4.7.2.6 Surface damage other—HSO

4.7.2.7 Roots—HR

4.7.3 Codes specific to masonry structures

4.7.3.1 Missing masonry units—HMU

4.7.3.2 Masonry unit separation—HMS

4.7.3.3 Missing mortar—HMM

4.7.3.4 Masonry maintenance structure collapsed—HXM

4.7.4 Codes relating to connections and their flows

4.7.4.1 Connection type—HCN

4.7.4.2 Connecting conduit—HCP

4.7.4.3 Defective connection—HCX

4.7.4.4 Defective drop pipe—HDP

4.7.4.5 Flow in connecting conduit—HIF

4.7.4.6 Sealed conduit through maintenance structure—HSP

4.7.5 Codes relating to observations made above the benching

- 4.7.5.1 Corrosion barrier layer defect—HCB
- 4.7.5.2 Defective cover and/or frame—HCF
- 4.7.5.3 Defective step, ladder or staging bar—HSL
- 4.7.5.4 Devices under cover or grate—HGT
- 4.7.5.5 Defective devices under cover or grate—HGX
- 4.7.5.6 Lifting hole—HLH
- 4.7.5.7 Defective lifting hole—HLX

4.7.6 Codes relating to joints and jointing

- 4.7.6.1 Displaced joint—HJD

4.7.7 Codes relating to linings and repairs

- 4.7.7.1 Defective lining or coating—HLD
- 4.7.7.2 Point repair or rehabilitation—HPR
- 4.7.7.3 Defective repair or rehabilitation—HRX

4.7.8 Codes relating to observations of the benching, channel and main flow

- 4.7.8.1 Defective channel—HCH
- 4.7.8.2 Flow control—HFC
- 4.7.8.3 Defective flow control device—HFX
- 4.7.8.4 Safety bars and chains—HSC
- 4.7.8.5 Defective safety bars and chains—HSX
- 4.7.8.6 Silt trap in invert—HTS
- 4.7.8.7 Water level—HWL

4.7.9 Miscellaneous observations

- 4.7.9.1 Atmosphere within the maintenance structure—HGA
- 4.7.9.2 Deposits—HDE
- 4.7.9.3 Exfiltration—HEX
- 4.7.9.4 General comment—HGC
- 4.7.9.5 General photograph—HGP
- 4.7.9.6 Infiltration—HI
- 4.7.9.7 Other obstacles—HOB
- 4.7.9.8 Vermin—HV

4.7.10 Miscellaneous codes relating to the administration of the inspection

- 4.7.10.1 Start feature—HST
- 4.7.10.2 Inspection completed—HFH
- 4.7.10.3 Inspection (Survey) abandoned—HAS

4.7.11 Codes for changing header information during an inspection

- 4.7.11.1 Change video volume reference—HTC
- 4.7.11.2 Change of material—HMC

TABLES

- 2.1 Maximum Depth Of Flow At Commencement Of Inspection
- 3.1 Values Of Clock Face References

FIGURES

- 1.1 Illustration Of Typical MH Features
- 3.1 Examples Of Clock Face References
- 3.2 Reference Points For Longitudinal Location
- 4.1 Clock Face References In Shafts Of Maintenance Structures

APPENDICES

- A Format for Electronic Transfer of Coded Data
- B Acronyms
- C Scoring of Defects and the Preliminary Grading of Apparent Condition of Sewers
- D Scoring of Defects and the Preliminary Grading of Apparent Condition of Stormwater Drains
- E Scoring of Defects and the Preliminary Grading of Apparent Condition of Maintenance Structures
- F Defect Explanations for Cracking, Fracturing, Breaking and Collapse of Rigid Conduits and Maintenance Structures
- G Summary of Main Codes for Describing Conduit Condition
- H Summary of Main Codes for Describing Maintenance Structures
- I Compendium of Defects and Features