Guidelines for Managing Stormwater Pipe Defects Identified by CCTV Inspections

Identified by CCTV Inspections

Purpose & Scope

These guidelines provide requirements for a consistent approach in the assessment of CCTV footage for stormwater pipes by City of Ballarat Council's Officers. These guidelines have been developed to simplify the assessment of CCTV footage for stormwater pipes due to different standards set by pipe manufacturers and codes set by the industry.

These guidelines to managing stormwater pipe defects apply to any individual or team in Council involved in the planning, review, delivery and/or supervision of the installation of drainage which requires provision of CCTV footage to prove as-constructed works conform with the relevant standard.

There are multiple techniques and products that can be used to repair defects identified by CCTV inspection, although it is important that many defects are from a lack of or poor quality controls during construction – prevention is better than cure.

Stormwater pipe materials include concrete, vitrified clay, HDPE, polypropylene etc, whose location and use has been approved prior to construction by Council officers.

The Infrastructure Design Manual Appendix H lists acceptance criteria for CCTV inspections and Table 1 lists the defects and repair methodologies, subject to Council's written approval.

Timing of CCTV Inspection

All defects must be made available to Council's review and assessment of approved defect treatment (written approval only).

All CCTV stormwater drainage footage is to be submitted prior to placement of the wearing course. Re-imaging may be requested after 6 months post other works.

Reference Documents

Standards

- AS/NZS 3725-2007;
- Supplement to AS/NZS 3725;
- AS/NZS 4058-2007;
- Guide to Understanding AS/NZS 4058:2007;
- IDM Appendix H;

Guidelines & Codes

- Engineering Guideline Concrete Pipe Association of Australasia – Longitudinal Cracking;
- Engineering Guideline Concrete Pipe Association of Australasia –Circumferential Cracking;
- Engineering Guideline Concrete Pipe Association of Australasia – The Facts About Cracking in Steel Reinforced Concrete Pipes;
- Concrete Pipe Association of Australasia Technical Paper - Concrete stormwater drainage pipelines - acceptance using CCTV inspection;
- Water Services Association of Australia - Conduit Inspection Reporting Code of Australia WSA 05 2013-3.1 and WSA 05-2020-4.1.

Table 1 Defects and accepted repair methodologies

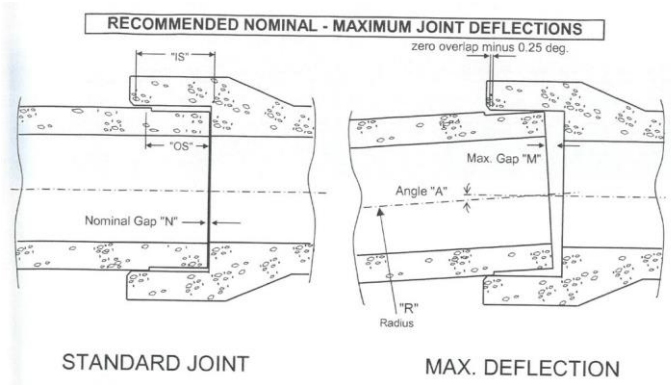
Defect	Description	Recommended Action(s)
Debris obstruction	<5% obstruction of pipe diameter	Accept.
	5% - 20% obstruction of pipe diameter, but no more than 30 mm depth of total debris	Clean out pipe under the supervision of Council.[1]
	>20% of pipe diameter or 30mm depth of total debris, whichever is the lesser	Clean out pipe and re-CCTV pipe.[1]
Circumferential cracks	Up to 2 cracks in a length of pipe, ≤1mm wide or 1 crack in a length of pipe, 1 mm to 2 mm	Monitor. Re-CCTV at the end of the defects liability period to observe condition of pipe before Final Completion is issued. If cracks have worsened, replace section of pipe. If not, accept pipe.
	1 crack in a length of pipe, >2 mm	Replace section of pipe and re-CCTV pipe.
	3 or more cracks in pipe	Replace section of pipe and re-CCTV pipe.
Longitudinal cracks	1 crack in length of pipe, ≤1mm wide	Monitor. Re-CCTV at the end of the defects liability period to observe condition of pipe before FC is issued. If crack has worsened, replace section of pipe. If not, accept pipe.
	1 crack in length of pipe, >1mm wide	Replace section of pipe and re-CCTV pipe.
	2 or more cracks in pipe, any width	Replace section of pipe and re-CCTV pipe.
Combination of cracks	At least 1 circumferential and 1 longitudinal crack in a length of pipe, any width	Replace section of pipe and re-CCTV pipe.
Penetrations/ intrusions	House drain protruding <30mm into pipe[2]	Accept. Unless using saddle connections e.g. Conconect®, in which case the manufacturer specifications will apply.
	House drain protruding ≥30mm into pipe[2]	Remove & reinstate house drain, under the supervision of Council.[3]
	Connection is not watertight[4]	External concrete render, under the supervision of Council.
	Concrete, steel, or foreign material	Remove penetration & render, under the supervision of Council.
	Rubber ring intrusion	External bandaging or quick lock or approved equivalent & remove intrusion, under the supervision of Council.
Fracture/break	Length of pipe fractured or broken	Replace section of pipe and re-CCTV pipe.
Collapsed	Collapsed	Replace section of pipe and re-CCTV pipe.
Deformation	Any pipe deformation	Replace section of pipe and re-CCTV pipe.
Infiltration/exfiltration	Evidence of infiltration/exfiltration	Replace section of pipe and re-CCTV pipe.
Visible reinforcement	Insufficient cover of reinforcement	Replace section of pipe and re-CCTV pipe.[5]
Displaced joint	5-10 degrees angular displacement[6&7]	Monitor. Re-CCTV at the end of the defects liability period to observe condition of displacement before FC is issued
	>10 degrees angular displacement[6&7]	Re-install and re-CCTV pipe.
	10-20 mm longitudinal displacement[8&9]	Accept.
	21-30 mm longitudinal displacement[8&9]	Monitor. Re-CCTV at the end of the defects liability period to observe condition of displacement before FC is issued. [9]
	>30 mm longitudinal displacement[8&9]	Re-install and re-CCTV pipe.

[1] If impacts the subsequent construction milestones of works, re-CCTV before proceeding;
[2] For pipes with small diameter, e.g. household pipe connection to an existing 150mm PVC pipe, a 29mm protruding into a 150mm isa significant obstruction. Request to provide the dimensions in CCTV to confirm protrusion;
[3] The civil contractor is responsible for choosing a methodology to be used for reinstatement, unless otherwise advised by Council;
[4] Connection to existing PVC pipe should be made using a proprietary connector;
[5] If coring of pipe is required to allow a household pipe connection, then the coring should be cleanly done as concrete breakage will not be satisfactorily repaired (it will break again within a short time);
[6] Angular displacement—adjacent conduit segments or pipes are not in line. The conduit changes direction at the joint;
[7] Where a conduit has been formed into an extended deliberate curve using an angular displacement at successive joints, use Code JDA with the continuous feature coding to record the start and finish of the curve. Do not score as a defect unless the angular displacement exceeds the limits of angular displacement for that type of pipe and joint. Note also that some curves in flexible pipe may be achieved by bending the pipe itself;
[8] Longitudinal displacement—the conduit segments or pipes are displaced along the line of the conduit;
[9] Some of the longitudinal or radial displacements may be trivial in large pipes and well within the accepted joint tolerances. Scores indicated in WSA 05 may not be applicable in those cases;

Defect	Description	Recommended Action(s)
	any radial displacement[10&11]	Rectify to Council's satisfaction and re-CCTV pipe.

Examples of Displaced Joints

Angular displacement



Internal Diameter	External Diameter	Inner Socket(IS)	Outer Spigot(OS)	Maximum Gap (M)	Nominal Gap (N)	Maximum Deflection(A	Bend Radius(R)
	(mm)	(mm)	(mm)	(mm)	(mm)	(deg.)	(m)
220	293	72	55	17	3	3.1	45
295	368	72	55	17	3	2.4	58
370	449	72	55	17	3	1.9	73
444	536	75	60	15	4	1.4	103
519	617	78	60	18	4	1.4	98
594	698	82	60	22	5	1.6	90
669	783	82	60	22	5	1.4	103
744	868	82	60	22	5	1.2	116
819	953	89	60	29	6	1.5	94
894	1038	89	60	29	6	1.4	104
1043	1188	89	60	29	6	1.1	122
1193	1356	89	60	29	7	1.0	143
1343	1510	93	79	14	7	0.3	497
1493	1700	94	79	15	7	0.3	547
1643	1830	102	80	22	8	0.4	319
1793	1990	102	80	22	8	0.4	365
2091	2300	102	80	22	8	0.3	469

Notes:
Calculations of Maximum Gap(M), Maximum deflection(A) and Bend Radius(R) allow for a positive overlap(AS4058-2007 App H) equivalent to 0.25°
The joint assembly is in full compliance with AS 4058 for Maximum Deflections and Gaps detailed above.
The Maximum Deflection figures are determined with one side of the joint in the "fully home" position

Longitudinal displacement

Radial Displacement

WSA 05—2020-4.1 308

I1 ESTIMATING GUIDANCE FOR DEFECT QUANTIFICATION

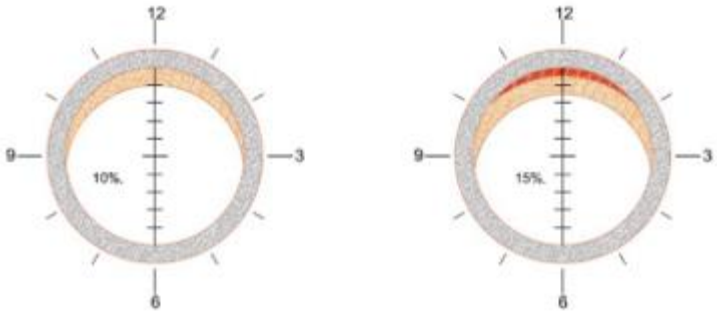
I1.1 ESTIMATING EXTENT OF BREAKING FROM SHEAR DISPLACEMENT (BD)

I1.1.1 APPLICATION

The following figures provide a guide to estimating the magnitude of vertical/shear displacement of a rigid conduit at a failed joint or where circumferential cracking has allowed the 'ends' of the pipe to move significantly from alignment. The feature will be described as broken displaced BD with Quantification 2 recording the magnitude of displacement to the nearest 5%.

Where shear displacement is associated with a joint it should be recorded as a displaced joint, radial displacement (refer to 2.7.5.1 Displaced joint—JD). Further, where radial displacement at a joint is such that a void or soil is visible, the defect is recorded as broken displaced or collapsed depending on the magnitude of the displacement. (Refer to Note 7 of 2.7.5.1 Displaced joint—JD).

[10] Radial displacement—the conduit segments or pipes are displaced in a direction at right angles to the line of the conduit; and
[11] No migration of soil or ingress of external material into a pipe to be allowed.



Accepted Repair Techniques or Products

Prior to undertaking repairs can the subject section of pipeline be replaced within one day of effort, without impacting on services and roads that are in the same location. If so, the pipe needs to be re-laid to specification.

The following table list accepted products and techniques beyond re-laying the pipe section due to site challenges; prior written approval by council is required before proceeding. This approval includes analysis as to

- whether the reduction of pipe diameter reduces hydraulic capacity by greater than 0.5% of the design flows or
- height of the hydraulic grade line increases by 0.05m.

Product/Technique	Approved Applications	Notes/Comments
Quick Lock	1. circumferential cracking 1-2mm in thickness. 2. small sections of exposed reinforcement mesh at pipe joins.	Multiple units can link together
Adhesive fiberglass bandages	1. circumferential cracking 1-2mm in thickness. 2. small sections of exposed reinforcement mesh at pipe joins.	
Spiral-wound solutions	Consider re-laying/replacing section and build to specification	Eg Interflow's range of solution
Pipe-cracking or bursting	Nil – re-lay pipe.	
Slip-lining	Nil – re-lay pipe	
Other	Discuss with Council and written approval required	

Relative to extent of repairs, Council may request reimaging after repairs are made.