

# TECHNICAL NOTE

TECHNICAL INFORMATION FROM THE CONCRETE PIPE ASSOCIATION OF AUSTRALASIA

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## CRACK MEASUREMENT BY CCTV – THE FACTS

CCTV can be a useful method of general inspection but testing has proven that CCTV is not capable of making meaningful measurements.

### Use of CCTV in Pipelines

Closed Circuit Television (CCTV) is routinely used to inspect installed pipelines to confirm their condition and as a means of informed acceptance of the pipeline asset at the end of the installers maintenance period. It can be an effective method of inspection (particularly in non-man entry pipe sizes) that provides a tangible record of issues such as poor installation, obstructions, misalignment, catastrophic damage, rodent infestations etc. Disturbingly, in some instances, CCTV technology is now being used as a measuring device to assess the serviceability of concrete pipes; something it is not capable of doing.

### Concrete Pipes in service

Concrete pipes are manufactured and installed in accordance with Australian Standards AS/NZS 4058 and AS/NZS 3725. To cater for the service condition in which they will be installed, pipes are supplied in a number of strength classes. The concrete pipe strength class is selected to sustain a proof load while demonstrating only a minor test crack. The Standard requires that the pipe can carry increasing loads up to 150% of the proof load (the Ultimate load) - put simply the selected load class can sustain a load 50% higher than is expected of it without collapse. At the proof load for a particular strength class the pipe is permitted to demonstrate a minor crack no larger than the "test crack" dimensions permitted in the Standard. The measurement of such a crack is done by direct measurement, this requires inserting a feeler gauge into the crack to a depth of 3mm at 50mm spacing along a length of 300mm – it is a detailed method of measurement (refer Appendix C of AS/NZS4058). In the vast majority of cases the permitted test crack width is 0.15mm (such minor cracks have no impact on the 100 year service life indicated in the Standard).

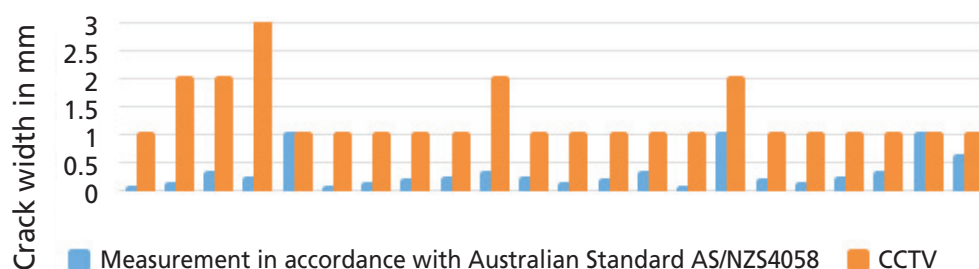
CCTV technology can identify that a crack is present and can magnify it many times (so that it looks enormous!) but is not capable of measuring minor cracks accurately. At best, a poor estimate is possible. The use of scales and lasers has limited effect and fundamentally the results rely on the operator to estimate the crack width.

### CCTV Crack Measurement – Test Results

The CPAA has undertaken testing in a controlled environment to assess the accuracy of CCTV in the estimation of a range of crack widths. CPAA member staff witnessed the estimation of crack widths using current leading edge CCTV technology and experienced operators. The same cracks were then measured using the method specified by the Australian Standard. The results confirmed that CCTV measurements were variable, unreliable and inaccurate.

- Specifically: On average the CCTV readings were 4 times the actual measurement.
- No readings less than 1mm were recorded by the CCTV operator (eg all cracks from 0.05mm to 1mm were recorded as 1mm or more).
- 90% of the CCTV readings were many times greater than the actual readings.

#### Comparison of direct measurement and estimation by CCTV



## Conclusions

The testing demonstrates that current CCTV technology is not fit for the purpose of measurement of crack size in concrete pipe. The CPAA sought input from a number of consulting engineers regarding the accuracy of CCTV to measure cracks. All of the consulting engineers expressed a view that, at best, the resolution that can be obtained is 1mm. We agree with the informed opinions of the consulting engineers and this is supported by test results. It is obvious that CCTV is not able to resolve images to anywhere near the required level of accuracy. Irrespective of views on widths - the point has been made that the width is only part of the matter and that current technology cannot measure the depth of crack. This is exactly why the Standard sets out the method of crack measurement as this encompasses a number of dimensions (width and depth).

## CPAA Policy on CCTV crack measurement

The CPAA does not accept CCTV as a method of crack measurement, in fact such measurements are likely to be false and misleading. The CPAA only endorses the method specified in Appendix C of AS/NZS 4058 as an accurate way to measure crack width. Further reading that may be useful can be found on the CPAA website:

### Cracking in Concrete pipe

### Autogenous healing in Concrete pipe

<http://www.cpaa.asn.au/General/technical-publications.html>



CCTV equipment :  
IPEK Spezial TV SVA500 CCTV  
monitoring system

**DISCLAIMER** The Concrete Pipe Association of Australasia believes the information given within this brochure is the most up-to-date and correct on the subject. Beyond this statement, no guarantee is given nor is any responsibility assumed by the Association and its members.

