

AI-03-CCTV INSPECTION OF SEWERS AND DATA COLLECTION

Ver.1

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1. SCOPE

This section covers the gathering asset condition data from sewers, manholes, and other structures, using CCTV (closed circuit television) and still digital camera images to directly inspect the internal surfaces these structures.

It does not include the inspection of newly constructed pipelines before they are put into service, or of existing pipelines before and after lining or other repairs.

The facilities to be inspected and the information required are defined in the Particular Clauses.

2. URGENT WORK

From time to time Watercare may require urgent surveys to be carried out at short notice. This urgent work shall be carried out under a Variation to any longer term CCTV inspection Contract. Urgent work shall always have priority over scheduled works. Delays that urgent surveys cause to concurrent scheduled work may be covered by an extension of time.

3. BACKGROUND INFORMATION

For survey of new facilities that are being inspected before handover, facility information will be available from the construction drawings. Some aspects of this specification e.g. flow management, may not be relevant to new facilities.

For surveys on existing facilities, the Engineer will provide the Contractor with the following information on maps, and relevant tabulated information in GIS Arcview format, or as paper or electronic drawings, to identify the location and scope of work required.

- a) The alignment of the sewer to be inspected;
- b) manhole locations and manhole number labels;
- c) all asset numbers and sewer asset lengths;
- d) street, kerb lines and seal edges and street names;
- e) property boundaries and property addresses;
- f) a scale bar that allows the Contractor to estimate approximate distances;
- g) a north arrow to allow approximate orientation of the map;
- h) any other information that the Engineer considers to be of value in determining the locations of sewers and manholes and other structures, and
- i) representative manhole drawings and dimensions for use in manhole condition inspections.

4. TYPES OF SEWER

The survey may be required in any of these types of pipeline.

4.1 NORMAL GRAVITY SEWERS

These normally operate partly full with "open channel" flow characteristics, and constitute the bulk of the pipeline to be inspected using CCTV. Watercare sewers range in diameter between 150mm and 3,000mm.

4.2 INVERTED SEWER SIPHONS

Inverted siphons operate under hydraulic head and are used to carry flow under obstacles like rivers, harbour inlets and major roads and structures. Most of the siphons are multi-barrelled so that each barrel can be isolated from the flow for inspection. Siphon pipe diameters range from 150mm to 1,550mm.

4.3 PUMPING STATION RISING MAINS

Pump station rising mains operate under hydraulic head. The top end of each rising main is exposed to corrosive gas attack when the pumps stop and the wastewater drains back towards the PS wet-well. CTV inspection at the top end of a rising main will normally be carried out from the discharge manhole immediately downstream of the rising main. The rising main will be drained as far as is necessary, back into the pumping station, and the inspection will extend as far down the rising main as can be reached by the CCTV camera, or such lesser distance as is required by the Engineer. Rising main diameters range from 150mm to 1,067mm.

4.4 OVERFLOW AND STORMWATER CONDUITS

These conduits can always be inspected in dry conditions but some may be susceptible to tidal flooding. Overflows are generally short pipe lengths, and range in diameter from 225mm to 2,400mm.

5 TRAFFIC CONTROL

Many of the Watercare manholes are located in roads, and access into these structures will require diversion of traffic. All work within the road shall be conducted in accordance with the Road Opening Notice issued by the Road Controlling Authority, and with Transit New Zealand's current "Code of Practice for Temporary Traffic Management".

6 ACCESS TO SEWERS AND COORDINATION WITH WATERCARE SERVICES

The Contractor shall co-ordinate the timing of his inspections with the Wastewater Operations Controller to ensure that inspection equipment or personnel safety is not endangered by sudden high flows resulting from the release of stored wastewater, siphon flushing, or pumping station operation. It is imperative that the Wastewater Operations Controller is informed of the presence of personnel and equipment in the sewer system at all times.

7 HOURS OF WORK

The hours of work shall be coordinated with daily or seasonal sewer flows and other site conditions, to utilise the best opportunity to gather the condition information. This will require some work during nights and weekends. When proposing work outside normal daytime working hours full consideration must be given to minimisation of inconvenience to the public. The hours of work shall be subject to the approval of the Engineer or his representative.

The Contractor shall allow in his rates for the working hours that are necessary to satisfactorily carry out the sewer inspections.

8 WORK ON PRIVATE PROPERTY

The work method, equipment used, and the hours of work for inspections and associated work carried out in private property shall be conducted in a manner that will minimise disruption to landowners, tenants, or members of the public. Any damage to private property shall be repaired at the Contractor's cost. Residents of any private properties affected by inspection works are to be kept fully informed of working plans.

9 WASTEWATER FLOW MANAGEMENT

The Contractor shall liaise with Watercare Wastewater Operations prior to implementing any changes to sewer operation or provision of any flow control or diversion measures.

To permit inspection of defects at any location on the pipe's circumference, inspections should be carried out when flow is very low. If this is not practicable, inspection may be carried out provided that the flow depth does not exceed 15% of the total internal diameter of the conduit. Exceptions may be made to this provision in these particular circumstances.

- The Engineer may authorize inspection to proceed when he considers that reduction of flow to 15% of the pipe depth is impracticable for operational reasons, or unnecessary for the inspection required; or
- At sags or dips in the pipe structure where water is ponded to greater than 15% of pipe diameter.

Where it is necessary to carry out an inspection with the pipe in an empty condition, the Engineer may require the pipe to be emptied. The Contractor shall ensure that this operation does not increase the risk of sewer damage or blockage.

The following methods may be appropriate for locally reducing flow depths in a sewer.

9.1 HYDRO-BLASTING AHEAD OF THE CCTV CAMERA

Accelerating the flow with a water jet can locally reduce the wastewater level immediately in front of the CCTV camera. The Contractor may employ this technique provided that it does not increase the risk of sewer blockage or damage to the pipes, and the operation is approved by the Engineer for the particular section of pipeline.

9.2 USE OF STORAGE WITHIN THE WASTEWATER NETWORK

Pumping stations, wet wells, and some larger diameter sewers may have capacity that can be utilised to contain flow for short periods. The storage time available may be sufficient to complete CCTV condition inspection in the downstream sewer without the presence of a wastewater flow.

Storage may be utilised by shutting down a pump station, or blocking the upstream end of the pipe section with an inflatable bag or plug (Vetter Bag).

Pumping station shutdowns or the installation of any flow-holding device must be authorised by the Wastewater Operations Controller. Alterations to the automatic controls of pumping station will be carried out only by Watercare personnel, and all changes to normal flows must be under the direct supervision of Watercare Wastewater Operations Staff. All possible overflow outlet points, upstream of the installed blockage or shut down pumping station, must be continuously monitored while the sewer flow is isolated or restricted in any such operation.

9.3 BYPASS PUMPING

Bypass pumping may be utilised to temporarily divert flow around a section of pipeline to be inspected. The Contractor shall provide a detailed bypass pumping operational plan for assessment and written approval of the Engineer and the Network Controller. The work must be carried out under the direct supervision of, and in cooperation with, Watercare Operations staff.

10 SEWER CLEANING

The inside surface of the sewer conduit must be clear of fat, sediment and loose material, to the extent that the pipe material surface can be clearly viewed using a CCTV Camera. The Contractor shall investigate the sewer before beginning the recorded CCTV inspection to determine the need for any cleaning.

Where the Contractor identifies any need for cleaning, the method and execution of such cleaning is subject to the approval of the Engineer or his representative, who will continuously monitor all cleaning operations.

The Contractor shall ensure that all debris cleaned from the section of sewer to be inspected is removed from the sewer immediately downstream of the working area, or at such other site as may be approved by the Engineer.

10.1 WATERCARE CLEANING PROGRAM

Watercare carries out a program of routine sewer cleaning. As far as possible the CCTV inspection program should closely follow this operation to minimise the need of extra cleaning.

11 CCTV PIPELINE INSPECTION AND VIDEO RECORD

The video data, pipeline grading and image reports, and any other pipeline inspection information is to be compiled and presented in the current WSL Excel spreadsheet format to be obtained from the Wastewater Operations Point of Contact.

Inspection and reporting of condition data shall conform in general to the standards set out in the "New Zealand Pipe Inspection Manual (Second Edition)".

Watercare may require the use of additional or alternative condition codes or methods for describing and quantifying condition.

The video records shall be submitted on DVD, and inspection log reports shall be provided as files on a separate CD.

11.1 OVERLAYED TEXT INFORMATION

Text Information overlaid on the video record shall follow consistent format and content, and shall be displayed on the video record for 15 seconds. The overlay information provided on the running video view shall be positioned so as to minimise obstruction on the picture of pipeline faults or pipe alignment information.

The Start Header shall include the following information,

- a) Facility code
- b) Asset number
- c) Sewer name
- d) Nearest street address to the setup manhole
- e) Pipe diameter / dimensions as measured in the manhole by the Contractor
- f) The pipe shape, and material designation
- g) The numbers and depths of the upstream and downstream manholes
- h) The setup manhole number
- i) The day, date and time of the inspection

The running video view of the pipe shall display overlay text including the following information:

- j) The running meterage from the start manhole
- k) The upstream and downstream manhole numbers.
- l) camera orientation

- m) inclinometer reading

The end inspection page shall display text that identifies,

- n) The 'End of Inspection' caption and the reason for abandonment where applicable,
- o) Appropriate references to related surveys

11.2 CAMERA SPECIFICATION, POSITIONING, AND TRACTOR SPEED

The CCTV camera shall proceed at a height corresponding to the centreline of the pipeline $\pm 10\%$ of the pipe's internal diameter. The speed of the camera shall not exceed 0.2 m/sec.

The camera shall be a pan and tilt type with a zoom capability.

11.3 INSPECTION COMMENCEMENT

The camera shall be set to record immediately before entering the manhole, and shall be kept running until the end of the inspection. The pipeline survey shall start with a clear view of the pipe, with the on-screen display indicating the measured distance the centre of the setup manhole / node to the area of view immediately in front of the camera. A continuous record of the camera picture over the total duration of the inspection shall be made on video and delivered to the Engineer as part of the asset condition information required.

The microphone shall be set to record fault comments and other significant features of the inspection, for the entire duration of the inspection.

11.4 VIDEO IMAGE QUALITY

The video picture shall be clear and free from fog or mist to the extent that it should be possible to clearly judge vertical and horizontal alignment of the pipeline. The video shall be of acceptable visual quality so that the pipe wall material and all associated defects can be clearly and easily identified. The photos in Appendix A provide an indication of a satisfactory standard of general image quality, and also show an unsatisfactory level of quality.

12 DEBRIS ACCUMULATION

Where fat or debris accumulation have a significant bearing on an asset's operational or structural condition, a CCTV record of the asset prior to any cleaning may be requested. The position, quantity, and nature of all materials found in the sewer by the Contractor shall be reported as part of the condition information required in the final condition report.

13 RECORDS AND ASSET CONDITION INFORMATION

13.1 CCTV LOG RECORDS

The inspection log shall be part of an electronic record in the current WSL Excel spreadsheet format (to be obtained from the Wastewater Operations Point of Contact, see Appendix B), and shall identify all of the defects, asset condition information, dimensions, and other data shown on the video record or otherwise required from the inspection.

13.2 VIDEO RECORD

The video record shall comply with all the requirements of Clause 11 CCTV Inspection, and video record,

13.3 STILL PHOTOGRAPHIC IMAGES

The Contractor shall deliver a still image of every fault that is visible on the video record. The facility code, asset number, start manhole, distance in metres from the start manhole and view

orientation of the image shall be clearly readable on each image. These images are to be included on the inspection log CD.

13.4NOTES

The Contractor shall make notes and comments on the maps provided to update or correct information or to add relevant data relating to the sewer's surrounding environment. The Contractor shall return the amended and updated maps to the Engineer as part of the information package. The information added shall be clear and easily readable and the maps shall be returned in flat smooth undamaged condition.

The Contractor shall add the following information to the maps as a minimum.

- a) The lengths of the facility videoed shall be marked using a semi-transparent yellow highlight marker pen. Un-inspected sewer line should be clearly visible.
- b) The locations of large category faults and faults that extend over some distance shall be marked and labelled clearly.
- c) Any road and property development within 50m meters of the sewer alignment shall be marked and labelled in a manner that provides a clear description of its character.
- d) Descriptions of manhole surrounds that will aid in relocation of the manhole at a later date.

14 MANHOLE CONDITION INFORMATION

Every manhole within the length of sewer inspected shall have its condition assessed and recorded using standard Watercare condition coding and quantification techniques in the current WSL Excel spreadsheet format (to be obtained from the Wastewater Operations Point of Contact) Still images or photographs of the interior of every manhole on the length of sewer inspected shall be provided. These images shall satisfy the following requirements.

- a) The camera shall be pointed as close to vertically down into the manhole as is possible when the shutter is released,
- b) Where practical, the photo shall be oriented such that the top edge of the frame is perpendicular to the northerly direction,
- c) All pipe connections to the manhole shall be clearly visible. Where the geometry of the manhole prevents the capture of a single comprehensive view further photographs shall be taken to complete this information.
- d) The surface condition of the manholes benching and lower walls shall be clearly visible.
- e) All images of manhole shall be attached directly to the tabular information recorded in the inspection data.

15 ABANDONMENT OR POSTPONEMENT OF INSPECTION

Where the condition of the sewer is such that the Contractor's equipment is at risk, or when changing flows prevent the Contractor from complying with this specification or other terms of his engagement, he shall take such video recordings as are possible without subjecting his equipment to unreasonable risk, before withdrawing from the sewer. Upon withdrawal of the CCTV camera from the sewer, the Contractor shall immediately advise the Engineer. The Engineer may issue written instruction to the Contractor requiring him to abandon, postpone, or proceed with the inspection.

15.1 ABANDONMENT

Where the Engineer instructs the Contractor to abandon a CCTV inspection, the inaccessible section of sewer shall be removed from the Contract. The Contractor will be paid for all work completed up to the point of abandonment.

Except where the Contractor cannot physically continue with the inspection due to circumstances beyond his control, the Contractor will require the Engineer's written instruction to abandon the inspection before his obligation to complete the work is removed.

15.2 POSTPONEMENT OF THE INSPECTION

Where flows in the sewer, or other conditions such as steam or fog, are such that the quality of the inspection recording falls below the standards required by this specification, the Contractor shall postpone the inspection until such time as acceptable results can be achieved.

15.3 INSTRUCTION BY THE ENGINEER TO PROCEED

Where the Contractor wishes to abandon an inspection and the Engineer issues a written instruction to proceed, the Contractor may elect to abandon the survey only if:

- a) The camera cannot view the pipe conditions into which it will be entering;
- b) The camera may enter into uncontrolled ground conditions; or
- c) The camera may catch on an edge or protrusion, trapping it and preventing retrieval.

16 COPYRIGHT

All video records and asset condition records, including all rights associated with them, shall become the property of Watercare Services immediately upon payment for the work.

APPENDIX A - VIDEO IMAGE QUALITY

Refer to section 11.4

Examples of acceptable quality



Example 1.



Example 2.

Examples of unacceptable quality



Example 1.



Example 2.

APPENDIX B – EXAMPLES OF LOG SHEET

EXAMPLE OF ACCEPTABLE LOG SHEET

WSL Ref No.	Sheet No.	Equip. ID	Date Started	Started	Completed		
9999	01	10004226	17.12.08	12.44	13.45		
Facility Name	Facility Code	Weather	Flow Depth				
Branch 7B Sewer Mount Eden	DSOB7B	Showers	0.1				
Contractor	Operator	Record No.					
Auckland CCTV Ltd.	Johnny Smith	B7B 17.12.08					
Node Type	Upstream MH/Node No.	Street No.	Street Name				
SMH	DSOB7B005	5	Ace Place, Mt Eden				
Node Type	Downstream MH/Node No.	Street No.	Street Name				
SMH	DSOB7B004	Crn of	Alexander Street, Mt Eden				
Set-Up MH U/D	Line Length (M)	Surveyed Length (M)	Diameter (MM)	Joint Spacing (M)	Material	Shape	Use
U	160.91	160.91	300	0.6	EW	CP	F
Currency of Inspection	Status of Pipe	Inspection Completeness	Video Rec Format	Date of Entry			
CI CURRENT	OC ORIGINAL	IC COMPLETE	DVD	17.12.08			

Comments: **Job # 52346 - Various Cracks in line - 300mm PIPE**

Condition Score:

Video Reading	Distance From (m)	Condition Code	Severity	Position		Photo No.	Remarks
				from	to		
0:00:00	0	IS					Starts at DSOB7B005 Going downstream
	0.69	CC	S	1	9		
	5.93	CL	S	3			
	6.5	CL	S	1			
	9.02	ED	S	5			
	10.21	ED	S	5	6		
	12.67	CL	S	5			
	14.55	CM	S	4	5		
	17.55	CM	S	3	9		
	18.8	CM	S	10	1		
	20.13	CL	S	3			
	20.13	GP				9999_01_01.jpg	CONDITION PHOTO
	21.94	CL	S	1			
	23.46	CL	S	8			
	25	CL	S	3			
	25.6	CL	S	8			
	26.22	CM	S	3			
	40.2	GP				9999_01_02.jpg	CONDITION PHOTO
	56.22	GP				9999_01_03.jpg	CONDITION PHOTO

EXAMPLE OF UNACCEPTABLE LOG SHEET

WSL Ref No.	Sheet No.	Equip. ID	Date Started	Time			
		104502	17.12.08	Started	Completed		
				12.44	13.45		
Facility Name		Facility Code	Weather	Flow Depth			
Branch 7B		DSOB7B	Showers	0.1			
Contractor		Operator	Record No.				
Auckland CCTV Ltd.		Jimmy Smith	B7B 17.12.08				
Node Type	Upstream MH/Node No.	Street No.	Street Name				
SMH	MH5		Ace Place, Mt Eden				
Node Type	Downstream MH/Node No.	Street No.	Street Name				
SMH	MH4		Alexander Street, Mt Eden				
Set-Up MH U/D	Line Length (M)	Surveyed Length (M)	Diameter (MM)	Joint Spacing (M)	Material	Shape	Use
	160.91			0.6		CP	F
Currency of Inspection	Status of Pipe	Inspection Completeness	Video Rec Format	Date of Entry			
				17.12.08			
Comments						Condition Score	

Video Reading	Distance From (m)	Condition Code	Severity	Position		Photo No.	Remarks
				from	to		
0:00:00	0	IS					Starts at MH5
	0.4	CC	S	1	9	4256_1_01	
	6.6	CL	S	9		4256_1_02	
	50						End at MH4