



DRYDEN

CITY OF DRYDEN 2026 CCTV INSPECTIONS

Tender T-2026-15

Specifications

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1.0 SCOPE

This specification covers the requirements for inspecting new and existing storm and sanitary sewers, pipe culverts or other accessible conduits by closed-circuit television (CCTV).

2.0 REFERENCES

This specification refers to the following standards, specifications, or publications:

- CSA Standards PLUS 4012 (2010) Technical Guide: Visual Inspection of Sewer Pipe
- Water Research Centre (WRC) Publication MSCC Manual of Sewer Condition Classification, Third Edition, 1993.
- Canadian Standards Association Pipeline Assessment and Certification Program (PACP®) Canadian Edition including CSA PLUS 4012 TECHNICAL GUIDE Visual inspection of sewer pipe.

3.0 DEFINITIONS

For this specification, the following definitions apply:

Business Day means any day except Saturdays, Sundays, and statutory holidays.

CCTV means closed-circuit television.

Digital Storage Device means flash memory card, hard drive, or other industry-standard digital storage mediums.

Drainage Structure means a catch basin, maintenance hole, or ditch inlet. DVD means digital videodisc.

MH means maintenance hole.

MPEG means movie photographic experts group.

NASSCO means North American Society of Sewer Service Companies.

PACP means Pipeline Assessment and Certification Program. Pipeline means storm, sanitary, watermains, or other accessible conduit pipe culverts.

Pipeline means storm, sanitary, watermains, pipe culverts or other accessible pipe conduits

USB means universal serial bus.

4.0 SUBMISSION REQUIREMENTS

The following information shall be submitted to the Contract Administrator two weeks prior to the start of the CCTV inspection operations:

- a. A copy of the CCTV operator's NASSCO Certification Certificate. A copy of said certificate is required for each CCTV operator working on the Contract. Operators shall have been certified or re-certified within the three years prior to the start of the Contract.
- b. A sample inspection report and video recording
- c. Resolution tests of digital video recording format, and digital data file. One submission is required for each camera proposed for use on the work. The camera make, model, and serial number shall be clearly identified on each video recording.
- d. The details of the coding accuracy verification system that is to be used to verify inspection accuracy.

5.0 MATERIALS

5.1 GENERAL

Media storage device with minimum USB 2.0 or higher compatibility shall be used.

Digital storage device with minimum USB 2.0 or higher compatibility shall be used with labels displaying the following information:

- a. Sewer Identification Number (Unique City ID number, provided on maps)
- b. Street Name
- c. Inspection Date

The digital storage device shall include a file in either Word or text format including the information provided above. The digital storage device shall be labelled. The label shall include the information in points a, b, and c above to identify the content.

5.2 PHOTOGRAPHS

Digital photograph files shall meet or exceed a resolution of at least 1028 x 740 pixels and be in JPEG format.

6.0 EQUIPMENT

6.1 GENERAL

Inspection and camera equipment used to inspect watermain shall have been used exclusively for work in watermain only.

6.2 INSPECTION VEHICLE

The inspection vehicle shall contain a separate area for viewing, recording, and controlling the CCTV operation.

The viewing and control area shall be insulated against noise and extremes in temperature. Cooling and heating units shall be independent from the main vehicle engine and in good working order. External and internal sources of light shall be controlled in a manner as to ensure the light does not impede the view of the monitor screen. Seating accommodation for one person shall be provided in addition to the operator seating to clearly view the monitor screen.

All equipment used within the pipeline shall be stored outside the viewing, recording, and control area.

The vehicle shall include a cell phone for the duration of the work.

6.3 INSPECTION EQUIPMENT

The inspection equipment shall be capable of inspecting a length of pipeline up to:

- a. 300 m when entry to the pipeline may be obtained at each end of the pipeline.
- b. 30 m when rodding is used.
- c. 150 m when a self-propelled unit is used when entry is at only one end of the pipeline.
- d. 200 m when being towed.

Work shall not commence in a work shift until the Contract Administrator is satisfied that all items of the inspection equipment have been provided and are in full working order.

Each inspection unit shall contain a means of transporting the CCTV camera in a stable condition through the pipeline.

When the CCTV camera is towed by winch and cable through the pipeline, all winches shall be stable during the entire CCTV inspection. All cables shall be of steel or of an equally non-elastic material to ensure the smooth and steady progress of the CCTV camera.

Each unit shall carry sufficient number of guides and rollers so that, when inspecting, all cables are supported away from pipe and maintenance hole edges. All CCTV cables and lines used to

measure the camera's location within the pipeline shall be maintained in a taut manner and set at right angles, when possible, to run through or over the measuring equipment.

6.4 VIDEO EQUIPMENT QUALITY

The electronic systems, television camera, and monitor shall be of adequate quality to enable the following to be achieved.

6.4.1 CAMERA

The pan and tilt camera shall have the capability of panning the pipe at 360° with tilt capability of 275° to ensure complete inspections and view of all laterals and deficiencies.

- Resolution: The live picture shall be visible with no interference and capable of registering a minimum number of lines of resolution at the periphery as indicated below:
 - o Fixed view camera 350 lines of resolution.
 - o Pan and tilt camera 400 lines of resolution.
- Colour Constancy: The lighting shall be set prior to commencing the inspection to ensure the camera provides optimum results when used with its own illumination source. To ensure colour constancy, no variation in illumination shall take place during the inspection.
- Focus, Iris, and Illumination: The adjustment of focus and iris shall allow optimum picture quality to be achieved and shall be remotely operated. The illumination shall be such as to allow an even distribution of the light around the pipeline perimeter without the loss of contrast or flare out of picture shadowing.

6.4.2 MONITOR

Monitors shall support resolution equal to or greater than the corresponding video camera resolution.

6.4.3 DIGITAL VIDEO RECORDER

Digital video recorders shall be able to capture in colour from the live video source with the following requirements:

- a. MPEG-2 or higher
- b. NTSC 720 x 480 @ 29.97 frames per second.
- c. Data/Bit Rate: MPEG-1 @ 2.4 M-bits/sec

7.0 CONSTRUCTION

7.1 PIPELINE CLEANING

Pipelines shall be cleaned and flushed immediately prior to CCTV inspection.

7.2 RESOLUTION OF DIGITAL MPEG VIDEO RECORDINGS

Prior to the start of the CCTV inspection, the resolution of digital MPEG video playback for each camera shall be confirmed by recording a resolution chart approved by City Representative, using the following procedure:

- a. Set up the camera as is done for the actual inspection.
- b. Show the camera being introduced and reaching its final position for the test.
- c. Fill the monitoring screen with the resolution chart.
- d. Illuminate the resolution chart evenly and uniformly without reflections ensuring that the illumination source accurately simulates the lighting used in the sewer.
- e. Record a test video for 30 seconds.
- f. Identify the camera make, model, and serial number on the recording.
- g. Record the test at the start of a digital recording.

The resolution test shall be submitted to the Contract Administrator.

7.3 CODING ACCURACY

Prior to commencement of the CCTV inspection, a formal coding accuracy verification system shall be developed and submitted to the Contract Administrator and implemented when approved. The coding accuracy shall be based on accuracy as a function of the number of defects or construction features not recorded, and the correctness of the coding and classification shall be recorded.

Verification of coding accuracy shall be completed on a random basis on a minimum of 10% of the inspection reports. A minimum of two accuracy verifications shall be completed for each operator for each week working.

Inspections not satisfying the accuracy requirements shall be re-coded to meet the accuracy requirements and the accuracy of the inspections, immediately preceding and following the non-compliant inspection, shall be verified. This process shall be repeated until the preceding and subsequent inspections meet the accuracy requirements.

Coding accuracy checks shall be submitted to the Contract Administrator along with the corresponding video recording.

7.4 CCTV INSPECTION

7.4.1 GENERAL

CCTV Camera inspections shall be done by the Contractor in accordance with the pipe condition coding practices as outlined in the Pipeline Assessment and Certification Program (PACP®) Canadian Edition including CSA PLUS 4012 TECHNICAL GUIDE Visual inspection of sewer pipe

The work shall include a CCTV inspection of new and existing pipelines, which include storm and sanitary sewers, pipe culverts or other accessible conduits and the preparation of all video, digital, and written reports.

A certified CCTV operator shall be employed to operate the inspection equipment and code the inspection.

For all sewer pipe or culverts, a pan and tilt camera shall be used. Each camera shall have an accepted sample submissions report prior to being used for inspection work. The camera lens shall be kept clean at all times during the inspection.

Flow control measures as specified in the Contract Documents shall be implemented to ensure a minimum of 80% of the height of the pipeline is visible for the entire inspection and shall be approved by the Contract Administrator.

All fog shall be evacuated from the pipeline and the pipeline kept clear of fog during the inspection.

At the start of each pipeline being surveyed, the length of pipeline from zero chainage up to the cable calibration point shall be recorded and reported in order to obtain a full record of one of the following:

- a. Pipe sewer length from the inside face of the maintenance hole to the inside face of the next maintenance hole or outlet end of the pipe sewer.
- b. Pipe culvert length from one end of the pipe culvert to the other.
- c. Watermain length from the valve pit entry point to the valve pit exit point or termination of the cement mortar lining.

The position meter-reading entered on to the data display at the cable calibration point shall allow for the distance from the start of the inspection to the cable calibration point so that the meter-reading at the start of the inspection is zero.

In the case of inspecting through a maintenance hole when a new header sheet is required, the meter reading shall be set at zero with the camera focused on the outgoing pipe entrance.

At the start of each pipe segment to be inspected, a data generator shall electronically generate and clearly display on the viewing monitor and video recording a record of data in alphanumeric form containing the following minimum information:

- a. Automatic update of the camera's meter-reading position in the pipeline from adjusted zero.
- b. Pipeline dimensions.
- c. Maintenance hole and pipe length reference numbers.
- d. Date of inspection.
- e. Road, Park or Highway name and location.
- f. Direction of inspection.

- g. Time of start of inspection.
- h. Pipeline use.

Once the inspection of the maintenance hole length is underway, an automatic update of the camera's meter reading position in the pipeline from zero in metres and tenths of a metre shall be continually displayed.

The camera shall be stopped when defects are being noted on the coding sheet.

Defects in each pipeline length shall be coded according to the standard being used. Any variation from the manual shall be noted in the inspection report.

The inspection shall be restarted at the opposite end of the pipeline if a blockage or obstruction is encountered.

Inspections shall be recorded in colour.

Digital video recordings may be saved to a computer hard drive and transferred to a portable hard drive or flash drive for submission.

A digital format video recording of an inspection shall be produced in colour from a first generation recording by one of the following methods:

- a. A computer system and a video capture card shall be used to capture the recording continuously, regardless of the progression of the inspection. Prior to submission, the raw digital data shall be edited to remove pauses when the inspection progress was not continuous.
- b. A computer system and a video capture card shall be used to intermittently capture the recording. Prior to submission, the raw digital file shall be edited to form one continuous file.
- c. Specialized video recording equipment capable of pausing and resuming live recording shall be used to capture original recording. A single file is to be produced for submission.

Video capture equipment shall be capable of capturing digital video from first generation recordings with no frame loss.

Non-linear video editing software shall be used to edit digital videos. Edited digital files shall not be recompressed.

7.4.2 CAMERA POSITION

The camera lens shall be positioned centrally in a circular pipeline and at two-thirds of the vertical dimension in a non-circular pipeline with a positioning tolerance of $\pm 10\%$ of the vertical pipeline dimension.

In all instances, the camera lens shall be positioned looking along the longitudinal axis of the pipeline.

7.4.3 CAMERA TRAVEL SPEED

The travelling speed of the camera in the pipeline shall be limited to:

- a. 0.1 m/s for pipeline of diameter less than 200 mm.
- b. 0.15 m/s for diameters exceeding 200 mm but not exceeding 310 mm.
- c. 0.20 m/s for diameters exceeding 310 mm.

7.4.4 CAMERA POSITION METER-READING DEVICE

A suitable meter-reading device shall be used that enables the cable length to be accurately measured to indicate the location of the camera. The meter-reading device shall be accurate to $\pm 1\%$ of the length of the sewer being inspected. The tolerance shall be demonstrated using one or both of the following methods in conjunction with a linear measurement audit form that shall be completed each day during the inspection:

- a. Cable calibration device.
- b. Tape measurement of the surface distance between maintenance holes.

If the accuracy of the measuring device fails, it is to be replaced. The Contract Administrator may require that the lengths of pipeline first inspected with the original measuring device be re-inspected using the new measuring device.

8.0 FINAL DOCUMENTATION

8.1 INSPECTION REPORTING

Inspection reports shall be submitted to the Contract Administrator in the following formats, with the noted number of copies, within 15 Business Days of the completion of the fieldwork:

- a. (1) printed hard copy of the inspection report.
- b. (2) portable digital drives, each containing the identical inspection report information as in the printed copies.
- c. (2) copies of the digital video recording.
- d. (1) digital excel database of inspection results formatted to match the table provided in Appendix D of tender.

Entire inspections shall be contained within one digital file on a digital storage device, as applicable. When possible, reverse set-up inspections shall be recorded immediately after the original inspection.

Each digital report and video recording file shall contain the file name, and shall include the following:

- a. E <Entity number>
- b. F <From entity number>
- c. T <To entity number>

- d. Street, Park or Highway name
- e. M <Measured length>
- f. I <Inspected length>
- g. <Inspection direction: DS or US> (Downstream or Upstream)
- h. <Letter designating inspection sequence> ("A" indicates partial inspection that would include a "B" or more to this entity for a complete manhole to manhole inspection)

For example: ESTM-2258_FSTM-CBMH-2000_TSTM-CBMH-2001_DUKE-ST_M100.0_I39.2_US_B.MPEG indicates that the pipe segment is referred to as STM2258, inspection is from STM-CBMH-2000 to STM-CBMH-2001 on Duke St, records say 100m long, actual inspection was 39m in the upstream deployment, and this is the second or "B" partial inspection of this entity, of this video recording.

All required header information fields shall be completed and verified for correctness. The software used to produce the inspection report shall not allow the operator to continue inputting information until the preceding field has been completed. The report shall be machine printed and presented in a three-ring binder.

All dimensions in the inspection report shall be metric.

The inspection report shall identify all defects and shall include photographs of major defects.

8.2 DRAWINGS

One clean set of the Owner's drawings showing maintenance hole ID's that coincide with the coding sheets and videotapes shall be returned to the Contract Administrator on completion of the inspection. The drawings shall be clearly annotated to show any discrepancies between the drawings and the inspection report. Such discrepancies shall be brought to the attention of the Contract Administrator during the inspection.

8.2.1 OWNER'S DRAWINGS

The City contact shall supply the contractor with a set of drawings showing maintenance hole unique ID's to be used for this project. This drawing set will be supplied to the successful bidder.

9.0 QUALITY ASSURANCE

Upon submission, printed and digital inspection reports, and digital MPEG video recordings, magnetic data files, and coding accuracy checks shall be reviewed to ensure compliance.

Submittals shall be reviewed by the Contract Administrator and their acceptance confirmed within 10 Business Days of submission. Only inspections with minimum accuracy for header information of 95% and minimum detail accuracy for defects and features of 85% will be accepted. Non-compliant submissions will be returned for correction. Corrected submissions shall be returned to the Contract Administrator for review within 5 Business Days.

Operators failing to meet the coding accuracy requirements on two occasions shall not be permitted to code on the remainder of the Contract, unless they successfully re-attain NASSCO qualification.

10.0 MEASUREMENT FOR PAYMENT

10.1 ACTUAL MEASUREMENT

Measurement for a CCTV inspection of pipeline shall be measured in metres on the ground surface along the centreline of the pipe sewer from the centre of one drainage structure to the centre of another drainage structure or outlet end of the pipe sewer. Measurement for pipe culverts shall be from one end of the pipe culvert to the other end of the pipe.

If a CCTV inspection is terminated due to a blockage or collapsed pipe, or the pipe is inaccessible, measurement shall be in metres for the actual length of pipeline inspected as determined from the chainage indication on the record media.

10.2 PLAN QUANTITY MEASUREMENT

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clause under Actual Measurement.

11.0 BASIS OF PAYMENT

11.1 CCTV INSPECTION – ITEM

Payment at the Contract price for the above tender item shall be full compensation for all Labour, Equipment, and Material, and other expenses to do the work, no additional charges shall be presented beyond those indicated in this tender.

Non-compliant submissions returned for correction shall be corrected and resubmitted at no expense to the Owner.