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| Version | Date | Description of Revisions |
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NOTE:

This is a CONTROLLED Document. Any documents appearing in paper form are not controlled and should be checked against the on-line file version prior to use.

**Notice:** This Document hardcopy must be used for reference purpose only.

**The on-line copy is the current version of the document.**

# GENERAL

## Scope of Work

### This specification covers the requirements for inspecting new and existing storm and sanitary sewers by closed-circuit television (CCTV). OPSS.MUNI 409 Construction Specification for Closed-Circuit Television (CCTV) Inspection of Pipelines shall be followed with the following amendments.

## Related Sections

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: [Optional short phrase indicating relationship].

### Section 01531 – Health and Safety

### Section 01060 – Regulatory Requirements

### Section 01300 – Submittals

### Section 01561 – Environmental Protection

## **409.03 Definitions** is amended by addition of the following:

### For the purpose of this specification, the following definitions apply:

#### CCTV Survey: the televised inspection of sewers using closed circuit television

#### MH: Maintenance Hole

#### Sewer Section: length of pipe connecting two (2) maintenance holes

## **409.04 Design and Submission Requirements** is amended by addition of the following:

### Operator Qualifications for Inspection and Coding

#### Provide a minimum of one operator on the site at all times with each inspection unit who holds a valid certificate from NASSCO for PACP. Ensure that each operator is fully trained in all aspects of sewer inspection and capable of making accurate condition coding observations and recording all conditions that may be encountered in the sewer. PACP certificates shall be available on site at all times.

#### Submit a valid copy of the NASSCO PACP Operators Certificate for each operator to the Consultant 10 Working Days prior to the commencement of the inspection work. Operators shall have been certified or re-certified within five years prior to the start of the Contract.

#### All crew members must hold a valid confined space entry certification. This must be submitted 5 Working Days prior to commencing the Work, and a valid copy kept on site.

### Sewer Condition Coding

#### The CCTV inspection shall include condition, feature and defect classification coding according to the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP).

### Sewer Inspection Standards and Defect Coding

#### CCTV inspection and defect coding shall be carried out by NASSCO PACP certified operators. New operators and operators with an expired PACP certification must provide evidence of at least five years experience coding.

#### The Consultant may at any time during this contract request an alternative CCTV operator at their discretion if the quality of the inspection performance or condition coding is not acceptable.

### Data Requirements for Pipes

#### A summary of the data requirements for mainline pipes is provided as follows:

|  |  |
| --- | --- |
| Asset ID | Only pipe IDs provided by York Region to be used.  PipeID-StartMH\_PipeID-FinishMH.mpg  Example: 42-08\_42-09  Note: IDs are not to be truncated |
| Video Resolution | Minimum recorded video resolution must be 1280 x 720 |
| Video Format of digital CCTV | .mp4 |
| Measurement System | Metric system |
| Timestamp | Time and date to be 24 hr military format for all settings. |
| Database/Data Standard/Data Structure | Microsoft Access Database conforming to NASSCO data model. |
| Photograph Files Naming Convention | AssetID\_DateMilitaryTime\_ObservationPosition\_DefectCode.jpg  E.g. 42-08\_42-09\_201303011423\_61.2\_FL.jpg |

### CCTV Video Title Screen Information

#### A sewer information screen shall be displayed with the following information for a minimum of 10 seconds at the start of all inspections. Inspection of the sewer shall not proceed while the information screen is being displayed.

|  |
| --- |
| 1. Contract Number, Date <DD MM YYYY>  2. Asset ID, Time <HH:MM:SS>  3. Street Name, Sewer Use <SS-Sanitary Sewer>  4. Start MH Asset ID, Finish MH Asset ID  5. Start Address, Finish Address (if available)  6. Start Depth in meters, Finish Depth in meters  7. Survey Direction <DS-Downstream or US-Upstream>  8. Material, Diameter in mm (or Height in mm x Width in mm for non-cylindrical pipe)  9. Segment Length in meters, Pre-cleaning (Y-Yes or N-No)  10. Weather  11. CCTV Contractor and Operator Name |

#### The sewer information screen shall be displayed in the format below

|  |  |  |
| --- | --- | --- |
| 1 | Contract No.: 42 | Date: 13 05 2019 |
| 2 | Asset ID: 42-08\_42-09 | Time: 11:21:00 |
| 3 | Street Name: DAVIS DRIVE | Sewer Use: SS |
| 4 | Start MH Asset ID: 42-08 | Finish MH Asset ID: 42-09 |
| 5 | Start Address: 15 DAVIS DRIVE | Finish Address: 30 DAVIS DRIVE |
| 6 | Start Depth: 2.5 m | Finish Depth: 2.8 m |
| 7 | Survey Direction: DS |  |
| 8 | Material: PVC | Diameter: 300 mm |
| 9 | Segment Length: 67.2 m | Pre-Cleaning: N |
| 10 | Weather: Dry |  |
| 11 | CCTV Contractor: Drain Ltd | Operator: John Doe |

#### During pipe inspection, where possible, the CCTV camera shall be used to perform a full internal scan of the start, finish and any uncharted maintenance holes found.

### CCTV Video Running Screen

#### Upon commencement of, and throughout the inspection, the following information shall be continuously displayed on-screen and captured on the screen;

##### Start maintenance hole

##### Finish maintenance hole

##### Chainage

##### Defect coding at defects

# PRODUCTS

## **409.05.01 General** is deleted and replaced with the following:

### Media Storage

#### Acceptable media storage devices include USB flash drives and USB hard drives. CD or DVD submissions will no longer be accepted. The media storage device must be USB 3.0 or higher compatible and of reliable quality.

#### USB flash drives and USB hard drives shall be identified with the following information or as specified in the Contract Documents:

##### Owner’s name

##### Contract number or project number

##### Asset ID

##### Local Area Municipality

##### Street name or park name (if available)

##### Inspection date

##### Consultant's/Contractor's name

## **409.05.01.01 Photographs** is deleted and replaced by the following:

### Digital photograph files shall meet or exceed a resolution of at least 640 x 480 pixels and be in JPEG format.

## **409.06.02 Inspection Vehicle** is amended by addition of the following:

### Proper seating accommodation shall be provided to enable two people, in addition to the operator, to clearly view the screen of the monitor screen, which displays the inspection work in the sewer as such work proceeds.

## **409.06.03 Inspection Equipment** is deleted and replaced by the following:

### Self-propelled rubber tired or crawler tractor capable of passing over minor surface imperfections including but not limited to broken joints and solid debris.

### 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.

### The cameras shall be equipped with a self-contained, adjustable, directed light source compatible with the lens angle and dispersed to create even distribution of the light around the pipe perimeter without the loss of contrast, flare out of picture or shadowing.

### The camera shall be self-propelled. The mounting of the camera shall be adjustable such that the central axis of the camera lies at a point equidistant between the invert and obvert of the pipe during inspection of the sewer. In the case of egg shaped sewers, the camera lens must be positioned vertically above the invert at a height two thirds of the vertical dimension of the sewer. In all instances, when transporting the camera through the sewer the camera lens must be positioned on, and looking along the central axis of the sewer. In the case of a diameter change midway through a sewer inspection, the camera must stop, readjust to ensure that the camera lies at a point equidistant between the invert and obvert of the pipe, and then continue with the inspection.

### Float or skid inspections are not permitted unless the sewer environment prevents the use of a tractor. Any float or skid inspections must first be approved by the Consultant and requires a rationale as to why a substitution is recommended or required. Position the towing equipment in a manner that will not impede the view of the sewer from the camera and ensure the float or skid is stable enough to provide a smooth progress and steady video recording.

### Transport equipment and cable shall be capable of inspecting a minimum of the longest point between two access points, for the entirety of the construction work area. *[Consultant Note: Specify the maximum distance between two access points].*

### Transport equipment shall be capable of adjustable camera height.

## **409.06.04.01 Camera** is deleted and replaced by the following:

### The CCTV camera used for inspections shall be colour, pan, tilt and zoom view type capable of radial rotation of 360°, lateral rotation of 270°, and of producing a continuous picture resolution of not less than 1280 x 720.

### 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.

### 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.

## **409.06.04.03 Digital Video Recorder** is deleted and replaced with the following:

### Digital video recorders shall be able to capture in colour from the live video source with .mp4 format.

### The compression technology (codec) used in creating the .mp4 digital video recordings shall be fully compatible with all the mainstream video players listed below:

#### VideoLAN VLC Player, Windows Media Player, Quicktime and Winamp

### Video files that do not play properly and completely on all the above players will not be accepted and will require the CCTV inspection to be repeated or other corrective procedure. Ensure that the entire inspection of a particular sewer is contained on the same media storage device.

# EXECUTION

## **409.07.01 Pipe Cleaning** is deleted and replaced with the following:

*[Consultant Note: If specialized cleaning is required for a specific repair or rehabilitation work, Consultant to add the required scope and separate pay items to this specification Section.]*

### Each section of pipe shall be thoroughly cleaned of all debris as required in the Contract Documents.

### Selection of sewer cleaning equipment shall be based on field conditions present at the time of cleaning (maintenance hole access, type of debris, quantity of debris, etc.) and shall be provided on a continuous uninterrupted basis for the duration of the cleaning operation.

### The Contractor is responsible for securing a water source and payment for the water for flushing the sewer.

## **409.07.03 Coding Accuracy** is deleted and replaced by the following:

### Implement a formal coding accuracy verification system before starting the work.

### Verify coding accuracy on a random basis on a minimum of 10% of the inspection reports. Submit coding accuracy checks with the corresponding video recording. The Consultant reserves the right to request an update to the accuracy checks at any time. The Contractor shall stipulate the number of random accuracy checks throughout the project. The Contractor shall notify the Consultant prior to mobilization, the number of random reports that will be completed.

### Perform an accuracy verification for each operator for each week working and submit the results to the Consultant for review. Operators failing to meet the accuracy requirements on two occasions will not be permitted to code on the remainder of the Contract until they have successfully re-attained the NASSCO Level of Qualification for PACP Operators. Accuracy reports to be submitted at the end of every inspection week.

### Re-code inspections not satisfying the accuracy requirements and verify the accuracy of the inspection immediately preceding and following the non-compliant inspection. Repeat the process until the proceeding and subsequent inspections meet the accuracy requirements. The Consultant reserves the right to request a re-inspection if the re-coding is not to the satisfaction of the Region.

## **409.07.04.01 General** is amended by addition of the following:

### Internal Pipe Conditions for Inspection

#### For new construction, the sewer section under inspection shall be sufficiently dry so that any remaining fluid does not obscure any part of the interior of the sewer during CCTV inspection.

#### The sewer section under inspection shall be free of fog or vapour that obscures the view. Where required, ventilation or other provisions shall be used to eliminate such fog and vapour.

### Notice to Region of Inspections

#### Notify the Consultant of the locations where sewer inspections will be performed a minimum of 5 Working Days prior to starting inspection work at that location.

#### Notify the Consultant daily if the schedule of planned inspections changes.

### Sewer Pipe Inspections

#### The Contractor shall carry out three CCTV inspections (V1, V2, V3). CCTV inspections shall not be performed immediately after flushing or cleaning.

#### The Contractor shall notify the Consultant if any outfall screens, gates or platforms require removal for CCTV inspections to proceed.

#### Evacuate fog from the sewer and maintenance hole before beginning inspections and keep the sewer and maintenance hole clear of fog during the entire inspection.

#### Keep the camera lens clean during the entire sewer inspection.

#### Ensure that the picture is in focus and there is adequate, even lighting free of shadows and glare ahead of the sewer pipe or maintenance hole riser at all times in order to be able to determine general condition, features and upcoming defects.

#### The CCTV camera shall stop, pan, and tilt each defect, service connection or when a change in pipe direction/geometry occurs clearly and completely for at least 5 seconds.

#### The CCTV camera shall stop, pan, and tilt joints at a frequency of 1 in 50m, or when an apparent defect may be observed clearly and completely for at least 5 seconds.

#### The CCTV camera shall stop, pan, and tilt at all transitions in pipe material, end seals, and end of lining clearly and completely for at least 5 seconds.

#### The CCTV camera shall stop, pan, and tilt every joint for radius pipe clearly and completely for at least 5 seconds.

#### Perform sewer inspections according to the following requirements:

##### With the direction of flow. Inspections against the flow require approval by the Consultant prior to undertaking the inspection.

##### From the centre of the first maintenance hole to be inspected to the centre of the last maintenance hole to be inspected. Counter should be zeroed at the maintenance hole wall.

##### Ensure the face of the start maintenance hole is clearly visible at the start of the sewer inspection.

##### Indicate on the monitor screen accurate automatic distance measurement that begins to move immediately as the camera moves. Ensure measurement is accurate from the cable calibration point to the last maintenance hole to be inspected.

#### For new sanitary sewer installations and segmental or slip lined sewer relining:

##### Stop, pan and tilt on every pipe joint, grout injection port, material transition and maintenance hole connection.

#### The CCTV inspection of the entire sewer segment shall be repeated at no additional cost to the Region where the Consultant has determined the tolerance requirements for camera position, speed, video quality and internal distance measurement requirements have not been satisfied.

### Sewer and Maintenance Hole Measurements

#### Measure the vertical distance from the sewer obvert to the maintenance hole frame to the nearest 0.10 of a metre with a steel tape before beginning the sewer inspection.

#### Provide a remote reading counter to measure the distance to the nearest 0.10 of a metre that the video camera has travelled within the sewer.

#### Distance measurement within the sewer to be accurate to within 0.5% of the above ground steel tape measurement between start and finish maintenance hole centres.

### Sewer Reversal and Abandonment of Inspection Survey

#### Sewer survey abandonment shall occur for the following reasons:

|  |  |
| --- | --- |
| Category A | Significant loss of forward movement due to loose debris (e.g. silt, sand) |
| Category B | High water level - Where the camera is submerged for greater than 10m and the camera position cannot be adjusted above the water level |
| Category C | Hard debris such as encrustation, grease, concrete, roots, etc. |
| Category D | Obstruction in line |
| Category E | MH inaccessible - For example private area, off-road, buried, etc. |
| Category F | Line deviates - Where the deviation cannot reasonably be passed or tension on the cable causes a significant loss of forward movement |
| Category G | Asset not found |

#### The Contractor shall clearly document the reason for a survey abandonment including a comment in the database file and a photograph.

#### A reversal must be undertaken corresponding to each abandonment. If a reversal must also be abandoned, it too must be documented with a comment in the database and a photograph.

#### A survey abandonment will result in a non-payment. A sewer inspection resulting in a survey abandonment, followed by a reversal up to the defect causing the survey abandonment, will together be equivalent to a single complete inspection and shall be paid through the contract.

#### The Contractor shall notify the Consultant and obtain approval of a planned reversal prior to performing the inspection.

#### Where it is critical to obtain a full and complete inspection of the pipe, the Consultant shall be notified to assess the possibility of undertaking additional steps to complete the survey. These steps may include hydraulic flushing, mechanical cleaning, connection reaming, performing solid debris cutting, removing intruding connections, modifying the camera setup position or method of transport, completion of external emergency repairs, and cross-bore removal.

#### Contractor to note in a log the sewer or maintenance hole Identification number, steel tape measurement, upstream and downstream length inspected, length of missing video and the reason the inspection could not be completed and review with the Consultant on a weekly basis.

#### Where pipe collapse or cross-bores are found during CCTV inspections, the road or surface above shall be marked with spray paint.

### Emergency Notification Requirements

#### Immediately advise the Consultant when a complete sewer inspection cannot be completed due to the following critical defects:

##### Pipe collapse or imminent collapse

##### 90% or more pipe blockage

##### Excessive deformation

##### Large displaced joints

##### Gas cross-bores

##### Missing maintenance hole covers

##### Collapsed maintenance holes or maintenance holes on the verge of collapse

##### Surcharge sewers or maintenance holes that are holding water above the obvert of the sewer entrance.

##### Other observations that may pose risks to public health, property damage or traffic/pedestrian concerns

#### For noncritical defects, promptly by the end of the Working Day notify the Consultant and obtain direction with the discovery of the following:

##### Illegal cross connections, for example sanitary into storm

##### Uncharted maintenance holes

##### Buried maintenance holes

##### Any issues accessing maintenance hole locations

## **409.07.05 Final Documentation** is deleted and replaced by the following:

### Inspection Reports

#### Each CCTV inspection submitted shall be accompanied by an electronic PDF format sewer inspection report that is generated from the sewer.mdb file. The structure of the reports shall be reviewed and adjusted as required by the Consultant. The PDF reports shall be included on the USB flash drive or USB hard drive along with the video file and sewer.mdb file.

#### 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 inspection report shall identify major defects and shall include photographs when the need for photographs is specified in the Contract Documents.

### CCTV Inspection Submission

#### All submittals to be in accordance with Section 01300 – Submittals.

#### The CCTV Contractor shall submit 3 copies of all CCTV inspections on separate media storage devices; one for the Region, one for the Consultant, and one for the Contractor.

#### When a CCTV inspection has been completed, it shall be submitted to the Consultant on properly identified acceptable media storage devices as specified in section 2.1.1. The submission shall include the CCTV inspection video file, the sewer.mdb file and the PDF report file. These three files shall be grouped together on the media storage devices along with any other information relevant to the specific CCTV inspection such as images from the inspection.

#### A single media storage device may include multiple CCTV inspections. The media storage device shall be properly organized with each CCTV inspection submission in its own folder. Such folders shall clearly and properly identify the sewer section to which it pertains by the Asset ID corresponding to the sewer section inspected. The media storage devices will become the property of Region and will not be returned to the Contractor at the completion of the project.

#### All media storage devices are to include a transmittal word document in accordance with Section 01300 – Submittals, and shall include the following information:

##### Contractor's Name

##### Contract number

##### Contact person and phone number

##### Date

##### Inspection Type: V1, V2, V3

##### Hard drive number: e.g. 1 or 2

#### Payment for CCTV inspections will not be made until the inspection reports, CCTV inspection video files, sewer.mdb files and other deliverables as outlined in this section are inclusive and have been received, reviewed and deemed in compliance with the requirements of this specification.

## **409.08 Quality Assurance** is deleted and replaced by the following:

### The Consultant will review inspection reports, digital .mp4 video recordings and coding accuracy checks to ensure compliance with the Contract Documents.

### Submittals shall be reviewed by the Consultant and their acceptance confirmed within 5 Working 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 to the Contractor for correction. Corrected submissions shall be returned to the Consultant for review within 10 Working 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 based on the Canadian Edition of PACP.

### Repeat sewer inspections where the Consultant has determined the requirements of this specification have not been satisfied at no additional cost to the Region.

### Correct non-compliant inspection submissions and resubmit the corrected inspections to the Contract Administrator within 5 Working Days unless otherwise approved.

### Repeat the process until the inspection submissions are accepted by the Consultant.

## **409.09 Measurement for** **Payment** is deleted and replaced by the following:

### 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.

*[Consultant Note: The Consultant shall tailor the required CCTV inspections to the project specific requirements]*

### Condition Assessment (V1)

#### All costs associated with a condition assessment CCTV inspection shall be included in the price for Item Nos. [ ] in the Bid Form. The condition assessment CCTV inspection shall not include any preliminary flushing. If there is excessive debris and cleaning is required, all costs associated with cleaning shall be included in a separate pay item for Pipe Cleaning.

### Pipe Cleaning (Flushing, Debris Removal)

#### All costs associated with cleaning, flushing and debris removal shall be included in the per meter price for Item Nos. [ ] in the Bid Form.

### Post Cleaning (V2)

#### All costs associated with a post cleaning CCTV inspection shall be included in the price for Item Nos. [ ] in the Bid Form.

### Post Construction (V3)

#### All costs associated with a post construction or post lining CCTV inspection shall be included in the price for Item Nos. [ ] in the Bid Form. The Contractor shall flush and clean the sewer in advance of the CCTV inspection to remove any debris in the line as a result of their construction. All costs associated with the cleaning shall be included in the price for the post construction CCTV inspection, no additional payment will be made for sewer flushing. If any defects are identified that require repairs, the Contractor shall perform an additional CCTV inspection to confirm that the deficiencies have been rectified at no additional cost to the Region. Any temporary measures for infiltration testing must be removed prior to inspection. No payments shall be made for cleaning and removing backfill and debris that may have entered the sewer during subsequent repairs of the sewer. Costs associated with these repairs shall be borne by the Contractor.

### End of Warranty (V4)

#### The end of warranty CCTV inspection shall be completed by the Region, typically under live flow conditions. Cleaning is typically not required; however if it is due to low flow conditions, then cleaning and debris removal should be included as a Provisional Item be paid separately and the CCTV inspection repeated by the Region.

**END OF SECTION**