Closed Circuit Television Inspection Specifications Sanitary and Storm Sewers

Prepared by Engineering Infrastructure – March 2026

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GENERAL

Purpose

These specifications cover the requirements for inspecting new and existing sanitary sewers, storm sewers using closed-circuit television.

Scope

This procedure is applicable to all contractors undertaking CCTV for sewers owned by the City of Waterloo or to be owned by the City of Waterloo in the future.

References

These specifications refers to the following standards, specifications or publications:

Region of Waterloo and Area Municipal Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS)

Ontario Provincial Standard Specifications

OPSS.MUNI 409 CONSTRUCTION SPECIFICATION FOR CLOSED-CIRCUIT TELEVISION (CCTV) INSPECTION OF PIPELINES

OPSS.MUNI 432 CONSTRUCTION SPECIFICATION FOR ZOOM CAMERA INSPECTIONS

NASSCO National Association of Sewer Service Companies
PACP Pipeline Assessment and Certification Program
LACP Lateral Assessment and Certification Program
MACP Maintenance Hole Assessment and Certification Program

Definitions

CCTV Survey means the televised inspection of sewers using closed circuit television.
MH means the Maintenance Hole
Drainage Structure means a catch basin, maintenance hole, or ditch inlet
Main means the storm, sanitary, or other accessible conduit pipe culverts
Sewer Section means the length of main connecting two (2) maintenance holes
MPEG means movie photographic experts group.
Digital Data Storage Device means non-volatile devices such as USB flash drives, SSD solid state drives.

Traffic Control

All necessary signs, flashers, and warning devices, all properly positioned for the safe control of traffic and execution of the work are necessary. All devices shall be in accordance to the current Highway Traffic Act (HTA), Occupational Health and Safety Act (OHSA) and the Ontario Traffic Manual (OTM) – Book 7 –Temporary Conditions (Field or Office Edition). A copy of the Notice of Project from the Ministry of Labour should be available.
Interference to the normal flow of traffic shall be kept to a minimum. Where possible, equipment shall be located so that a single lane of traffic is maintained in each direction at all times.

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SEWER CLEANING

Intent

The intent of sewer cleaning is to remove foreign materials from the sewer and restore the sewer to a minimum 95% of original capacity immediately prior to CCTV inspection. For routine inspection of existing City sewers, pipelines shall be cleaned and flushed immediately prior to CCTV inspection only by request from the City. For new installations of sewers during development of a property, we expect the pipelines to be cleaned and flushed immediately prior to CCTV inspection.

Cleaning

Cleaning equipment shall be capable of removing dirt, grease, rocks, bricks, sand, and other materials and obstructions from the sewer lines and maintenance holes by the use of a vacuum system. As deemed necessary, multiple passes with a flusher hose might be required, with a minimum of three (3), to restore the sewer to a minimum of 95% of the original capacity to ensure easy passage of the camera through the entire line.

If cleaning of an entire section cannot be successfully performed from one maintenance hole, it can be assumed an obstruction is present and cleaning efforts will cease and further investigations done.

Use of Hydrants and Water

Fire hydrants shall not be used without obtaining a hydrant use permit. When water from the fire hydrant is necessary to avoid delay in normal working procedures, the water shall be conserved and not to be used unnecessarily. In case of a fire no hydrant shall be obstructed, in the area served by the hydrant.

Operation of both public and private hydrants shall comply with the City of Waterloo standard operating procedure. See Appendix E.
When hydrants are opened, they should be slowly flushed free of rust, and should always be allowed to drain after being used.

Water Hammer- To reduce the risk of damage to the water mains, (from the destructive forces of water hammer), City staff will install a gate valve on the hydrant port once the permit is issued. A double check or reduced pressure type back flow prevention device must be installed after the gate valve and before the supply hose. The back flow prevention device must be available at all the times in the truck during a contract period for viewing, upon request by City forces. The back flow prevention device must have a tag attached indicating it has been certified within the past year in accordance with the latest edition of CAN/CSA B64.10. Water hoses connected to hydrants should not be laid across the road and exposed to vehicular traffic, without the protection of a ramp.

A Hydrant Use Permit MUST be obtained for Authorized use. Contact City Utilities Customer Service Representative for Hydrant Use Permit by telephone at 519-747-8613 or in person at the Waterloo Service Centre located at 265 Lexington Court. Water use Bylaw 2013-115 enforced.
The hydrants assigned by a City of Waterloo Representative Appendix E are to be used only. A Contractor is responsible for obtaining the necessary hydrant use permit and having it available for viewing while the hydrant is being used.

Cleaning Precautions

All necessary precautions should be taken to ensure that no flooding of public or private property occurs during the operation. Key principles include taking precautions against flooding, managing water pressure to avoid blow-back, adjusting equipment based on pipe condition, properly managing debris downstream, and not continuing work if it would likely cause damage.

In older sections of the City where clay pipes are prevalent, it is necessary to reduce pressure to maximum 1000 PSI to prevent pipe deterioration and water damage to homes. In other parts of the city a maximum pressure of 1800 PSI will be used to prevent damage to the sewer lines.

Upon the discovery of any pipe material or backfill material during the cleaning or removal the operation of cleaning shall be stopped and the city personnel shall be notified immediately.

It is recognized that there are conditions such as broken pipe and major blockages where cleaning cannot be accomplished or that additional damage could result if cleaning were attempted or continued. Should such conditions be encountered, the cleaning of these specific sections will not be required.

Material Removal

Debris such as dirt, sand, rocks, grease and other solid or semi-solid material, which is a result of cleaning, shall be removed at the downstream maintenance hole of the section being cleaned. Passing material from maintenance hole to maintenance hole shall not be permitted. This material will be removed using a vacuum system on the combination unit. At the end of each day, back flush the last section of sewer cleaned to ensure no buildup of debris has occurred. Operators are required to decant liquid waste at the last maintenance hole prior to disposal of the solid sludge ONLY at the approved dump site, as per Ministry of the Environment, Conservation and Parks (MECP) location approval documentation for transporting and disposing of waste outside of Waterloo Region.

Reaming and Cutting

This may be achieved by flail reaming or by robotic cutting. Flail reaming will not be allowed for the removal of intruding vitrified clay laterals. These are to be removed by robotic cutting.

Acceptance

Acceptance of sewer line cleaning shall be made upon the successful completion of the television inspection. If the CCTV inspections show the cleaning to be unacceptable, the pipe is required to be re-cleaned and re-inspected until acceptable by the senior Infrastructure Analyst in Engineering Infrastructure..

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INSPECTION

The aim is to inspect new and existing sanitary sewers, storm sewers, maintenance holes, pipe culverts or other accessible conduits. Inspection shall be according to OPSS.MUNI 409 and OPSS.MUNI 432.

NASSCO standards to be used are PACP, MACP and LACP version 7.
Measurement to be Metric System for all measurements and settings. Timestamp Time and date to be 24 hr military format for all settings.

Sewer Main Inspection

Prior to commencing the inspection of a sewer section:

- For Quality Assurance the linear distance of the pipe should be measured between the inside walls of the maintenance holes at each end of the section, using a steel tape. This measurement should be used in the "Total Length" field to be compared with "Survey Length" field..
- Flow in the City owned pipes will be controlled to a maximum depth of 20% of the pipe diameter to permit viewing of the pipe walls. The method of control shall be outlined to the City of Waterloo Utilities Manager and accepted prior to the commencement of work. The flow should be maintained where required, of all sewers, drains, and house or inlet connections encountered during the progress of the work and if necessary provide by-pass pumping.
- Where a structural defect identified as a fractured, broken, missing or collapsed pipe is encountered, the camera shall be stopped and rotated to permit inspection of the defect at an angle of 90 degrees. The camera shall be stopped to ensure accurate recording of all defects or drain connections.

Maintenance Hole Inspection

The inspection will follow NASSCO MACP standard at the level of detail described in Appendix A for all maintenance holes.
Conduct all maintenance hole inspections in accordance with the following:
Start maintenance hole inspection above ground pointing the camera to a permanent feature (building, hydro pole). Inspect from the top of the maintenance hole frame to the bottom of the maintenance hole at the centerline elevation of the existing sewer. Position a graduated survey rod in the maintenance hole that will be visible during the entire inspection to indicate depth.
Block ambient light to reduce lens flare and poor contrast during the inspection.
Ensure the frame of the maintenance hole is visible at the start of the inspection. Keep the picture in focus during the inspection from the point of observation to a minimum of two riser diameters ahead. Stop camera for 2 seconds at major defects and connections.
Rotate and pan the camera a full 360 degrees at the following locations.

-300 mm below the frame and cover. Ensure the base of the frame is clearly visible.
-300mm below the base-to-riser flat top or conical reducer joint.
-300 mm below the top of the base joint.
-The centerline of incoming existing sewers.
Rotate and pan the camera a full 360 degrees and provide a perpendicular view of all major defects and connections. Major defects to include but not be limited to cracked and deformed risers or barrels, displaced bricks, holes, large displaced joints, missing or damaged gaskets between maintenance hole sections, missing bricks or concrete, missing mortar. Contractor may be required to repeat sewer and manhole inspections where the City's Sr. Infrastructure Analyst or Development Engineer has determined the specified tolerance requirements have not been satisfied.
Sewer inspection using equipment in accordance with OPS 432.06 specifications;
At the start of each survey use a video overlay system to clearly display the “on screen display for the start of each sewer section” on the monitor and video recording, as described in Appendix A for a minimum of 10 seconds. The digital media storage device containing data files, videos and the summary reports shall be submitted as stated in section “Video and Data Submission Requirements”, and are to be labeled as shown on Number 2 of Appendix C for maintenance & rehabilitation projects.
For Subdivision reference see Appendix C.

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Reversal and Abandonment of Survey

When the CCTV camera, during sewer inspection (survey), is obstructed in its progression from maintenance hole to maintenance hole, then a reversal must be performed, where the survey is paused and resumed from the opposite maintenance hole.
Abandonment of the survey may be considered in the following circumstances:

- Inability to maintain picture quality due to condition of the sewer;
- Risk to the contractor's equipment;
- Obstruction does not allow further advance of the crawler;
- Inability to locate the maintenance hole;
- Inability to gain access to the maintenance holes once located;
- Risk to the operations due to unsafe conditions.

Flow Control

Blocking of incoming flows may be required to effectively conduct inspections when the flows impede the camera movement, when the invert of the pipe needs to be fully visible, or in other situations as necessary. Prior to blocking sanitary flows, approval must be granted by the Manager of City Utilities - Sanitary. Approval will be at the aforementioned Manager's discretion. The following requirements must be met, at a minimum, and submitted in writing to the Manager of City Utilities - Sanitary as a flow blockage plan:
- A sewer line plug shall be inserted into the line at a maintenance hole upstream from the section to be inspected. Details of the plug including model, dimensions, retrieval method etc. will form part of the submitted plan.
- The plug shall be designed so that all or any portion of the sewage flows can be released during the inspection. - Sewage levels upstream of the plugged section shall be continuously monitored at all times in order to prevent damage to properties and environment. The method of monitoring will form part of the submitted plan.
- Any bypass pumping required for the work shall be documented and submitted with the blockage plan for approval.
- After the work is completed, flows shall be restored to normal.

The Contractor will be fully responsible and liable for any and all damage caused to City-owned assets or private property related to the blockage of the existing sanitary flows or the setup, use and take down of any of the required equipment to complete the work.

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VIDEO AND DATA SUBMISSION REQUIREMENTS

Recording Resolution

Provide a minimum resolution of 640 x 480 @29.97 frames per second for digital MPEG video playback.

Confirm recording resolution if requested by the Contract Administrator by recording a RETMA type resolution chart as follows:

a) Set up camera and accessories for the recording to simulate an actual inspection, for example, video signal routed through the cable reel and video overlay system.

b) Record camera being introduced and reaching its final position for the test.

c) Resolution chart shall fill the monitor screen.

d) Resolution chart shall be illuminated evenly and uniformly without reflection and illumination source shall accurately simulate the lighting used in the sewer inspections.

e) Record test for a minimum of 30 seconds.

f) Identify the camera on the recording.

g) Perform the test at the start of digital recording.

Digital Video Recorder

Digital video recorders shall be able to capture in colour from the live video source with MPEG-4 format.

The compression technology (codec) used in creating the MPEG4 digital video recordings shall be fully compatible with all the mainstream video players listed below:

- Windows Media Player, Windows and Mac
- Apple QuickTime Player, Windows and Mac
- Video LAV VLC Player, Windows and Mac

Video files that do not play properly and completely on all the above players will not be accepted and will require re-doing the CCTV inspection or other corrective procedure. Ensure that the entire inspection of a particular sewer or maintenance hole is contained on the same digital media storage device. Record reverse set-up inspections of a sewer immediately after the original inspection where possible.

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VIDEO's
CCTV Video Title Screen Information

Inspection of the sewer shall not proceed while the information screen is being displayed.

While the camera is stationary at the beginning of the section, the following should appear on the screen for a minimum of 10 seconds at the start of all inspections

For Mains

CCTV Contractor: Drain Ltd
Contract No.: RFT20-01
Date: 13 May 2020
Time: 14:21:00
Street: William St
Sewer Use: SS
From/To MH ID: FWL-2 > FWL-1
Survey Direction: U
Material: PVC
Width: 300 mm
Height: 300 mm
Segment Length: 67.2 m
Pre-Cleaning: H
Weather: Dry
Cable calibration Distance: 0.5 m

For Laterals

CCTV Contractor: Drain Ltd
Contract No: PT-08
Date, Time of inspection: 13 May 2020 Time: 14:21:00
Location /Street Name: 125 King St
From/To: MH/Pipe to CO
Survey Direction: U
Sewer Size: 150 mm
Material: P.V.C

CCTV Continuous on Screen Display Information

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

While the camera is traveling at no more than 9 meters per minute these headings shall appear at the bottom left hand corner of the screen:

For Mains

Street: William St

Sewer *Use:* SS

From/To MH ID: FWL-2 > FWL-1

Survey Direction: U

Footage: Distance from MH wall

For Laterals

Survey Direction: U

Footage: Distance from MH/Pipe/Cleanout

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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, MACP & LACP). Flow type, start and finish depths to be identified in the inspection report.

CCTV inspection and defect coding shall be carried out by NASSCO PACP, MACP & LACP certified operators.

Coding Accuracy

Coding accuracy will be a function of the number of defects or construction features not recorded or omitted and the correctness of the coding and classification recorded. Coding accuracy will satisfy the following requirements.

- Header accuracy – 95%
- Detail accuracy – 85%

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.

Videos that do not meet the accuracy requirements will be rejected by the City and will be required to be recorded again.

Perform accuracy verification for each operator for each week working and submit the results to the Contract Administrator 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.

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.

Contractor to implement a formal coding accuracy verification system before starting the work.

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Data Requirements for Pipes and Maintenance Holes

A summary of the data requirements is provided as follows:

Asset IDs to be used will follow City of Waterloo nomenclature of ENTIDs for pipes and ENTNAMES for MHs. Example: 110001 and FWL-1.

Nomenclature will be provided by the Senior Infrastructure Analyst in City's Engineering Infrastructure section.

Database/Data Standard/Data Structure to be Microsoft Access Database conforming to NASSCO data model.

Video and photograph names will follow the ctf file structure provided by Senior Infrastructure Analyst in City's Engineering Infrastructure section. Contractors without CTspec licences will ensure each digital video file (MPEG4) contains a file name with a maximum of 5 characters in accordance with Appendix F.

Data Requirement for Laterals

A summary of the data requirements for laterals is provided as follows:

Asset IDs to be used will follow City of Waterloo nomenclature of ENTIDs for pipes .

Nomenclature will be provided by the Senior Infrastructure Analyst in City's Engineering Infrastructure section.

Video and photograph names will follow the ctf file structure provided by Senior Infrastructure Analyst in City's Engineering Infrastructure section.

Contractors without CTspec licences will ensure each digital video file (MPEG4) contains a file name in accordance with Appendix F .

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Cable Calibration

The cable calibration distance is the distance between the maintenance hole wall and the periphery of the camera's view. This distance is unique for specific pipe diameters and specific camera set-ups.
The camera is placed inside a pipe of a given diameter so that the back of the camera is zeroed at the MH wall.
For each crew (camera / crawler / float combination) and for each new sewer size and / or shape, the cable calibration distance must be measured. This may also be done above ground with sample pipe sizes laying around the shop.

The cable calibration distance is the intersection point between the camera's widest horizontal viewing angle and the pipe's side periphery (03 and 09 o'clock) when the camera is level and looking forward.

Where possible, the camera should be far enough back in the MH to start an inspection at the maintenance hole wall. The Access Point and Water Level are noted at 0.0 metres. A perspective view or a panned view of the pipe connection at the maintenance hole should be obtained. The CCTV inspection continues into the pipe until the back of the camera is in line with the maintenance hole wall. The cable distance is then set to the cable calibration distance for the size of pipe being surveyed. Any observations recorded between the maintenance hole wall and the cable calibration distance may be estimated or set to 0.0 metres.

All defects are to be circumferentially located based on the side periphery only.
Therefore, distances of defects must be observed and logged at the edge of the screen raster image most preferably, at the side periphery as observations measured from the obvert or invert may introduce errors, especially within non - circular pipe.

Uncharted Assets Naming Convention

Newly found maintenance holes will be assigned Asset IDs by referencing the downstream maintenance hole and an alpha character starting with "A". Example FWL-1A.
After a new maintenance hole is found on an existing sewer main, the two new pipe segments will be assigned an Asset ID by adding a numeric suffix to the original pipe asset id. Example 110020-1, 110020-2.

Deliverables

Code the sewer condition in accordance with the requirements of NASSCO.
The storage device shall contain electronic data that can be imported into the City's "CTspec" Sewer Pipe condition Analysis program in "sewer.mdb" format data file described within Appendix A.
Each CCTV inspection submitted shall be accompanied by an electronic PDF format sewer inspection report generated from the sewer.mdb file and included on the digital media storage device, along with the video files and sewer.mdb file.

Annual Contract
The report is to begin with a front cover and an index as described in Appendix B.

Subdivision / Capital Project for maintenance & rehabilitation projects
The report is to begin with a front cover and an index as described in Appendix C.

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MEASUREMENT OF PAYMENT

Actual Measurement

To be done referencing OPSS.MUNI 409.09.01except the following.

Measurement for CCTV inspection of a sanitary or storm pipe shall be the linear distance of the pipe measured between the inside walls of the maintenance holes at each end of the pipe or outlet end of the pipe sewer measured in metres.

Where reaming is required, payment will be issued for complete inspections only, with an additional hourly payment for the reaming. Payment will not be issued for partial inspections where reaming is required.

Measurement for cleaning and flushing of sewers shall be made at the unit rate in the Schedule of Unit Prices and shall include all labour and equipment necessary for the work requirement. Payment of cleaning and flushing shall be based on steel tape measurement of the sewer section being cleaned.

Plan Quantity Measurement

To be done referencing OPSS.MUNI 409.09.02

BASIS OF PAYMENT

To be done referencing OPSS.MUNI 409.10.

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CONSULTANT / DEVELOPER START OF MAINTENANCE / FINAL INSPECTIONS OF NEW SUBDIVISIONS

The City of Waterloo prefers that these inspections be carried out by the City's current annual CCTV Inspection contractor. Regardless of what contractor is used, the Closed Circuit Television Inspection Specifications for Sanitary and Storm Sewers must be adhered to.

Copies of the reports and media storage are to be sent directly to Developers or their representatives to review & correct deficiencies before submitting completed and reviewed inspections to the City's Development Engineering Representative. Should repairs be required, the Developer's Engineer is to provide repair methodology for City's approval and re-video is required after approval is granted.
Where a pipe extends into a previous phase, a full-length inspection is required to get the proper condition assessment.
Sanitary sewer CCTV information (electronic copy) is to be submitted separate of the Storm sewer CCTV information (electronic copy).
Labeling for these reports is to be in accordance with APPENDIX C.

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APPENDIX INDEX

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APPENDIX A

CCTV Data Transfer "Sewer.mdb" Data Specification and Inspection Rules

Overview:

(To be read in conjunction with other related documentation, i.e. Client Instructions or the PACP, MACP, LACP Manual):

Database shall be a NASSCO-PACP, MACP, and LACP (Current Version 7) Certified Access Database.

General Reporting Notes

Mains

- Inspection Company Name, Inspector Name and his Certificate number, Reviewer Name and his Certificate number
- Date and accurate time of the inspection
- Street Name
- Direction of survey
- Pipe material, sizes and shape
- Recheck the accuracy of the Pipe ID and maintenance hole Names, as these are the "keys" to the whole inspection.
- Project number, Media Label
- Inspection Status
- Location
- Pre-cleaning and Date of Cleaning
- Weather
- Purpose of inspection
- Inspection Technology Used
- Depth of the start and finish maintenance hole, but as a minimum the start maintenance hole depth
- If the finish maintenance hole cannot be found then enter a sensible distance (100 m as an example) and not the distance of the abandonment. If estimated then just enter the text "Tot Len" in comments.
- If a buried or uncharted maintenance hole is encountered then the inspection report MUST be finished with the MH/FH codes. In the case of an un-identified maintenance hole being found then the numbering of the maintenance hole MUST be as advised by the client prior to the start of the inspection contract.
- Don't just makeup the number. Make the position of the uncharted maintenance hole, with its number, on the site plan also making it obvious.
- If the inspection is abandoned and then inspected from the other direction then the current inspection must be finished using SA (plus a reason for the inspection being abandoned, SA) and a new header must be started.
- If the inspection is not going to be carried out from the other maintenance hole, in the case of a SA, then the header sheet MUST still be completed as if the inspection was to take place, with the reason for failing to carry out the inspection. See the separate "No Access Instructions" appended to these guidelines.

Determine prior to start of the contract, what text (data) the client wants displayed on the monitor (hence recorded). See "CCTV Video Title Screen Information" and "CCTV Continuous on Screen Display Information". Appendixes B and C.

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Maintenance Holes

- Inspection Company Name, Inspector Name and his Certificate number, Reviewer Name and his Certificate number
- Date and accurate time of the inspection
- Street Name
- Project number, Media Label
- Maintenance Hole Use
- Access Type
- Location
- Surface Type
- Depth (Rim to Downstream Invert)
- Inspection Level of Detail- Maintenance Hole diagnosis will follow MACP modified level 1. For each sewer maintenance hole, the mandatory MACP Header section fields to be completed are: 1, 2, 3, 4, 5, 9, 10, 11, 12, 14, 17, 18, 19, 21, 22, 23, 24, 25, 26, 29, 30, 33, 37.

The mandatory data fields to be populated in the MACP Component Observation Section are: 56, 59, 61, 68, 81, 87, 94, 98, 103, 104, 105, 107, 108, 110, 111, 112, 113, , 115, 116, 117, 118. These fields are defined in the Maintenance Hole Assessment Certification Program – Version 7.0.3

- Inspection Status
- Location
- Pre-cleaning and Date of Cleaning
- Weather
- Purpose of inspection
- Inspection Technology Used
- Start maintenance hole inspection above ground pointing the camera to a permanent feature (building, hydro pole)

Laterals

- Inspection Company Name, Inspector Name and his Certificate number, Reviewer Name and his Certificate number
- Date and accurate time of the inspection
- City, Street Name
- Direction of survey
- Pipe Use, Material, Sizes, Lining Method
- Recheck the accuracy of the Pipe ID and/or Maintenance Hole Names, Lateral ID as well the Clean Out Address Name, as these are the "keys" to the whole inspection.
- Project number, Media Label
- Inspection Status
- Location and Location Details
- Length Surveyed
- Access Point ID

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- Pre-cleaning and Date of Cleaning
- Weather
- Purpose of inspection
- A total length (Total Length field) must be entered estimated either from the plan or by measured length on the surface between Pipe/MHs and Clean Out. It is fully understood that, in the case of a Survey Abandoned, the total footage is an estimate.
- Inspection Technology Used
- Colour photos of the front of the lot from the road with traffic cones showing the delineation of the lateral between the main and the front of the house. Colour photo of the clean out with the house civic number on it.

Detail Information

(To be read in conjunction with other related documentation, i.e. Clients Instructions or the PACP, MACP, LACP Manual):

- Each inspection Report must only contain one inspection hence, in the case of survey abandonment or buried or uncharted maintenance holes being encountered, a new header and a Detail must be completed. The above are essential for the validation of the data and to tie the data in with the mapping systems.
- When a defect or feature is encountered the camera must be stopped just prior to the defect/feature so that it can be clearly seen.
- The defect/feature must be recorded for a sufficient amount of time to enable the assessment of the observation, without recourse to using the "pause" facility.
- A video digit must be entered against the defect/feature in the format of time elapse into videotape. The format is: s: seconds (explained above).
- If the defect span for more than 3 feet or is repetitive over a number of joints (i.e. ELJ, Encrustation Light at Joint) then a start flag (S1, S2 etc., sequentially up to S9 then SA, SB…SZ! can be used) can be entered against the code at the start footage. When the defect finishes the appropriate finish flag, the flag is inserted against the defect at the finish footage and the same flag number is used to finish the defect off (S1 must finish with an F1 and so on). This will aid the Rig Manager in reporting repeating defects without having to enter the code at every joint footage or every 3 feet.
- Note: The defect that has a start flag against can change its position (i.e. a FL or CL) but not its magnitude (i.e. you cannot start with CL and finish with FL) You must "close", or finish, the defect with the appropriate finish flag and then start the new defect with an UNUSED (in the current inspection) start flag.
- If the inspection was abandoned (SA) then a reason for the abandonment MUST be entered in the remarks column against the SA code. The description of the reason for the survey abandoned should contain the appropriate defect code that has caused the abandonment (i.e. if due to an intruding connection) then the end of the report would read:

1102	342.8	CNI	04	11	02

All defects and features MUST have the relevant support data (i.e. JN/CN must have sizes and positions).

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APPENDIX B

ANNUAL CONTRACTS

Sewer Inspection Title for Report– Front Cover

1st Line	City of Waterloo – 20xx Sanitary Sewer CCTV Inspections
2nd Line	Contract No. - (Ref: APPENDIX F) Ex. 2020 Reports to begin at 20A01
3rd Line	Map No – (City Sanitary Atlas Map #) Provided by Contract Administrator
4th Line	Digital Media Storage Device No- (Ref:APPENDIX F)
5th Line	Street Names

Page 2 of Report – CCTV Inspection Report / Digital Media Storage Device Video Index

1st Line	Digital Media Storage Device Number
2nd Line	Date
3rd Line	Street Name
4th Line	Start MH Finish MH
5th Line	Use (Sanitary or Storm)

Digital Media Storage Device

Sewer Inspection Title for Digital Media Storage Device- Label

1st Line	Digital Media Storage Device No

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APPENDIX C

SUBDIVISION REPORTS
Sewer Inspection Title for Report – Front Cover

1st Line	City of Waterloo
2nd Line	Subdivision Name, Stage, & Phase
3rd Line	Consulting Firm's Name
4th Line	Digital Media Storage Device Number (Ref: Appendix F)
5th Line	Indicate Start or End of Maintenance Period

Page 2 of Report – CCTV Inspection Report/Digital Media Storage Device Video Index

1st Line	Digital Media Storage Device Number
2nd Line	Date
3rd Line	Street Name(s)
4th Line	Start MH Finish MH
5th Line	Use (Sanitary or Storm)

Digital Media Storage Device
Sewer Inspection Title for Digital Media Storage Device- Label

1st Line	Digital Media Storage Device No

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CCTV Continuous on Screen Display Information

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

While the camera is travelling at no more than 9 meters per minute these headings shall appear at the bottom left hand corner of the screen:

Street: William St Sewer Use: SS

From/To MH ID: FWL-2 > FWL-1

Survey Direction: U

Footage: Distance from MH wall

<u>For Laterals</u>
Survey Direction: U
Footage: Distance from MH/Pipe/Cleanout

During pipe inspection, where possible, the CCTV camera shall be used to perform an internal scan of uncharted maintenance holes found.

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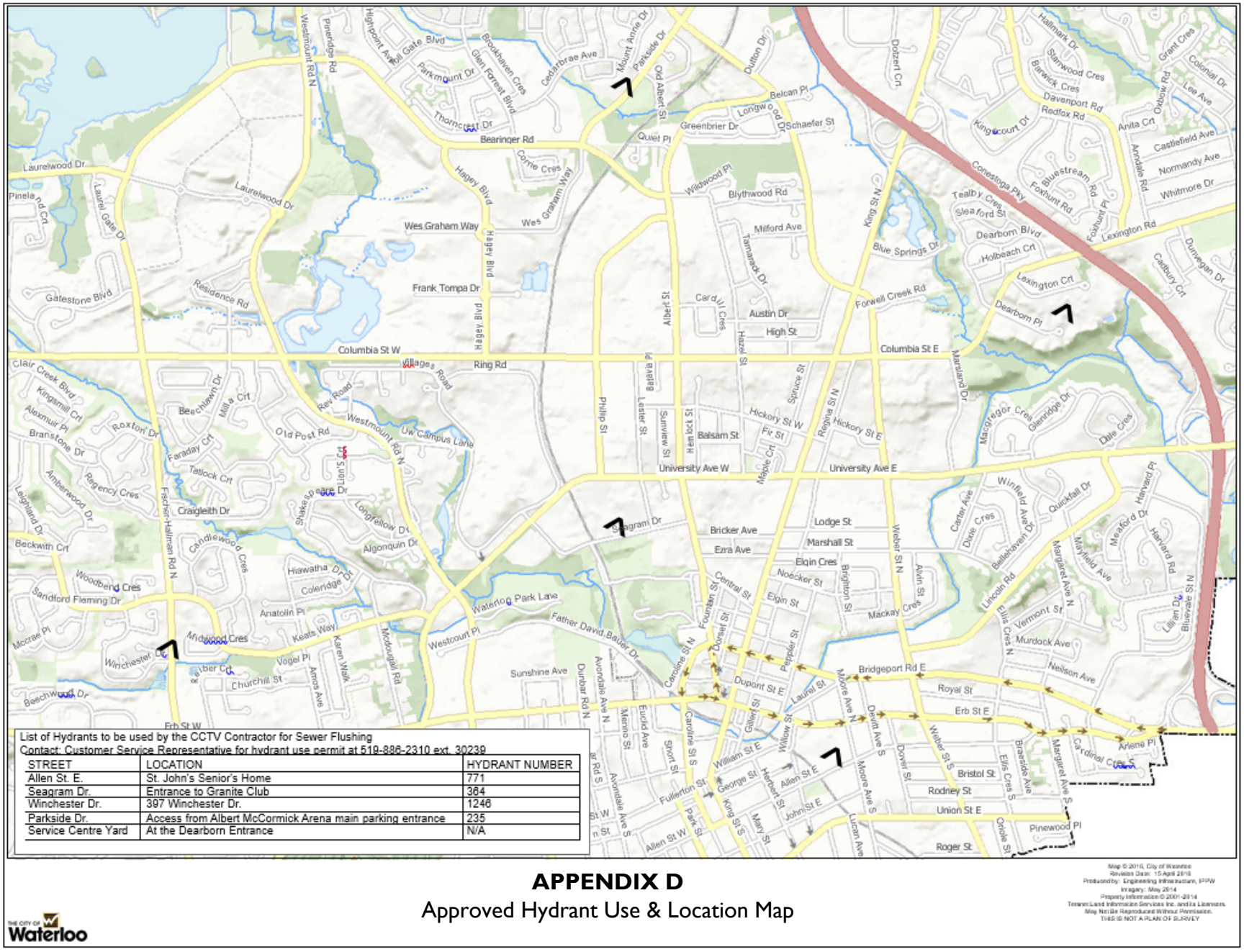

List of Hydrants to be used by the CCTV Contractor for Sewer Flushing
Contact: Customer Service Representative for hydrant use permit at 519-886-2310 ext. 30239

STREET	LOCATION	HYDRANT NUMBER
Allen St. E.	St. John's Senior's Home	771
Seagram Dr.	Entrance to Granite Club	364
Winchester Dr.	397 Winchester Dr.	1246
Parkside Dr.	Access from Albert McCormick Arena main parking entrance	235
Service Centre Yard	At the Dearborn Entrance	N/A

APPENDIX D

Approved Hydrant Use & Location Map

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APPENDIX E

Hydrant Use Operation Procedure

A Hydrant Use Permit **MUST** be obtained for Authorized use. Contact PWS Water Services Customer Service Representative for Hydrant Use Permit by telephone at 519-747-8613 or in person at the Waterloo Service Centre located at 265 Lexington Court. Bylaw 90-62 enforced.

1. **Pick-up hydrant gate valve HANDLE from Customer Service Representative before start of job.**
2. **Remove hydrant cap from the backflow prevention device.**
3. **Connect your fire hose or connection to the backflow prevention device & operate gate valve as needed.**
4. **When water use is completed, close gate valve & disconnect your hose connection from the backflow device. (DO NOT LEAVE HANDLE ON GATE VALVE UNATTENDED)**
5. **Replace hydrant cap on the end of the backflow device.**
6. **Return hydrant gate valve HANDLE at the end of the contract or job completion. (If lost, or not returned, you will be invoiced for a full gate valve replacement cost.)**
7. **Special provisions for hydrant use must be made during the colder or freezing times of the year. Contact the Customer Service Representative for proper use of hydrant during this type of cold weather.**

Contact the Customer Service Representative if there is any damage or problems with the use of the authorized hydrant.

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APPENDIX F

Digital Media Storage Device and Video (MPEG.4)

File Numbering Procedure for CCTV Inspections

Note

This Appendix shall be read in conjunction with APPENDIX A

The following information is provided to assist in the submission of CCTV requirements to the City of Waterloo.

CCTV information is to be submitted in electronic format as a combined package on the Digital Media Storage Device along with the reports and databases. Sanitary information **MUST** BE submitted separate from the storm and will NOT be accepted combined on one Digital Media Storage Device.

Important

The following format must be followed when electronically naming the recordable media using MPEG.4 video file(s). In order to correctly link video MPEG.4(s) to the database file, the inventory number used in naming the Digital Media Storage Device and MPEG.4 file(s) MUST reflect on the sewer.mdb data file in appropriate fields (refer to APPENDIX A)

The CCTV information is to be submitted on Digital Media Storage Device, using the following INVENTORY assignment format:

Column A	Column B	Column C	Column D	Column E	Column F
2	0	R	0	1	A

(ex. 20R01A for sanitary and 20R51A for storm)

Column A & B - Represent the year of Inspection (use the last two numerals of year)

Column C - Represents one of three options:

The Annual Maintenance contract will be assigned letter "A".

The Rehabilitation project will be assigned letter "R".

The Subdivision Consulting Firm/Developer numerical code. Table 1 on page 34.

Column D & E - Represents two pieces of information:

- Sanitary inspections numbers represent 01 to 49 - The sequence numbering for sanitary is to begin with "01" in each year and progress to a maximum of "49" for each project assignment, stage and/or phase.
- Storm Water inspection numbers represent 51 to 99. The sequence numbering for storm is to begin with "51" in each year and progress to a maximum of "99" for each project assignment, stage and/or phase.

Column F - Represents a letter to be assigned for subsequent videos in alphabetical order.

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Table 1 - Consulting Firm/Developer numerical code

Name	Full Name of Company	Company Assigned Number
Braun	Braun Consultants	1
IBI	IBI Group	2
MTE	MTE Consultants Inc.	3
PEIL	Planning & Engineering Initiatives Ltd.	4
STANTEC	States Consulting Ltd.	5
Earth Tech	Earth Tech (Canada) Inc.	6
Meritech	Meritech Engineering	7
Walter Fedy		8

Each Subdivision stage or part of stage or phase must use the same sequence number but indicate that it is the "start of maintenance" or "final of maintenance" on the Digital Media Storage Device.

If any developers consultant is not included in Table 1 above, contact the IPPW Infrastructure Engineering, City of Waterloo at 519 886-1550 ext. 78251 to obtain next available code number.

Each package will include the following:

- Data Files - NASSCO PACP/MACP/LACP compliant Sewer.mdb (Current Version 7)
- Video files - Pipe & Maintenance Hole (MPEG4 - is preferred as it takes less space)
- Reports - MS Word Format or PDF electronic reports, etc. noting defects and observations encountered during the inspection
- OPTIONAL DRAWINGS - (phases and stages marked overall servicing/grading of development phase "6" drawings).

Lateral CCTV information is to be submitted on Digital Media Storage Device, using the following INVENTORY assignment format:

Column A	Column B	Column C	Column D	Column E	Column F	Column G
L	2	0	R	0	1	A

Column A - Represents Lateral

Column B & C - Represent the year of Inspection (use the last two numerals of year)

Column D - Represents one of three options:

The Annual CCTV inspection contract will be assigned letter "A".
The Rehabilitation project will be assigned letter "R".
The Annual Maintenance/Pipe Bursting contract will be assigned the letter "P".

Column E & F - Represents two pieces of information:

- Numbers 01 to 49 represent sanitary inspections. The sequence numbering for sanitary is to begin with "01" in each year - and progress to a maximum of "49"
- Numbers 51 to 99 represent Storm water inspections. The sequence numbering for storm is to begin with "51" in each year and progress to a maximum of "99" for each project assignment

Column G - Represents a letter to be assigned for subsequent videos in alphabetical order.

If you have any comments or concerns with this process, please contact the Infrastructure Engineering Analyst by telephone at 519 886-1550

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APPENDIX G

Subdivision\Capital Project CCTV Submission Checklist

Note: Submisions not meeting the following steps will be returned to the Consultant/Developer

Subdivision Name: _____ Stage:_____ Phase: _____

Consultant Company: _____

Start of two year Maintenance Submission ☐ End of two year Maintenance Submission ☐

Road Reconstruction ☐

City Approved CCTV Contractor **Contact City of Waterloo Contract Administrator – 519-886-1550 ext.78251**	Yes ☐	No ☐
Sanitary & Storm submissions are provided separately **If not, provide separate Reports and Electronic Data**	Yes ☐	No ☐
City's Standard Manhole nomenclature used **If not, complete as per Engineering Manual**	Yes ☐	No ☐
Manhole Inspection Forms completed Sanitary Lateral Information Sheet completed **If not, complete as per CCTV Spec Appendix "A"**	Yes ☐ Yes ☐	No ☐ No ☐
Pipe, Lateral & Manhole Inspection video completed **If not, complete as per CCTV specification**	Yes ☐	No ☐
All repairs have been completed **If not, repair (optional see Deficiency Acceptance Guide)**	Yes ☐	No ☐
Package properly labelled **If not, complete as per CCTV specification Appendix "D" & "G"**	Yes ☐	No ☐
As Recorded overall Drawings in package **If not, submit**	Yes ☐	No ☐

Date: _____ Name: _____

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