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## **02760 - TELEVISION AND ASSESSMENT OF GRAVITY SEWER**

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(Revised 4/24/17)

### SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

**PART 1 – GENERAL**

**[DOCUMENTATION](#)**

**[PART 2 – PRODUCTS](#)**

**[PART 3 - EXECUTION](#)**

### **[PART 1](#) – GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the contract, including General Requirements and Supplementary Conditions applicable to this specification.
- B. Section 01000 – GENERAL REQUIREMENTS.
- C. Section 02750 – SEWER LINE CLEANING.
- D. Section 02770 – SEWER FLOW CONTROL.
- E. Section 02780 – LINER FOR SEWER REHABILITATION.

#### **1.2 SUMMARY**

This section includes all the equipment, labor, and materials necessary to perform all work for the Closed Circuit Televising (CCTV) and field assessment of mains, laterals, manholes, and appurtenances that make up the gravity storm sewer and gravity sanitary sewer systems.

#### **1.3 SUBMITTALS**

- A. Submit a written description of procedures to be used to the Owner, including product literature for all digital video equipment including, but not limited to cabling, camera, monitor, footage counter, digital video titling device, and recorder.
- B. Submit digital photographs and digital videos for each coded observation and of all lines to the Owner as per paragraph 3.4 of this specification. All deliverables shall be in Standard PACP, LACP, and/or MACP database format, version 7.0 or later and submitted in an unlocked Microsoft Access Database in accordance with PACP, LACP, and MACP guidelines. All digital submittals shall be on a memory stick or portable hard drive.
- C. Submit a location map outlining facilities inspected and clearly indicate street names, addresses (if needed), manhole numbers, Pipe Segment Reference numbers (Facility ID's), & length surveyed (if CCTV).
- D. Submit a digital copy of television inspection logs to the Owner. Logs shall record defects according to NASSCO's Pipeline Assessment and Certification

Program (PACP) or/and Manhole Assessment and Certification Program (MACP). All digital submittals shall be on a memory stick or portable hard drive.

#### 1.4 QUALITY ASSURANCE

- A. Comply with all codes, laws, ordinances, and regulations of governmental authorities having jurisdiction over this part of the work.
- B. The Contractor shall comply with the latest revision of the Virginia Occupational Safety and Health Standards for the Construction Industry as adopted by the Safety and Health Codes Commission of Virginia.
- C. The Contractor shall comply with Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, "Virginia Erosion and Sedimentation Control Handbook," latest revision.
- D. All main line inspections shall be performed in accordance with the National Association of Sewer Service Companies' (NASSCO) Pipeline Assessment and Certification Program (PACP) version 7.0 format or later. All lateral inspections shall be performed in accordance with the National Association of Sewer Service Companies' (NASSCO) Lateral Assessment Certification Program (LACP) version 7.0 format or later. Inspections conducted or submitted in other formats that do not meet all the requirements of this specification are subject to being rejected. Any survey that is rejected must be re-televised to meet the guidelines for CCTV Inspections.
- E. All manhole inspections shall be performed in accordance with the National Association of Sewer Service Companies' (NASSCO) Manhole Assessment and Certification Program (MACP) version 7.0 format or later. All Manhole inspections shall be MACP level 1 inspections unless an MACP level 2 is ordered and/or more detailed information is needed to accurately assess and inspect a manhole. Inspections conducted or submitted in other formats that do not meet all the requirements of this specification are subject to being rejected. Any survey that is rejected must be re-inspected to meet the guidelines for CCTV Inspections.
- F. All surveyors and/or operators must have a valid PACP and LACP certification from the National Association of Sewer Service Companies prior to assessing and televising sewer mains or laterals within the City of Lynchburg's sewer system.
- G. All surveyors and/or operators must have a valid MACP certification from the National Association of Sewer Service Companies prior to assessing manholes within the City of Lynchburg's sewer system.
- H. Each CCTV survey is to be a full PACP or LACP survey, continuous from a starting manhole or access point to a finishing manhole, access point, or utility feature where possible. Any line that is not televised from a starting manhole, access point, or utility feature to a finishing manhole, access point, or ending utility feature will be considered as a partial or incomplete survey and will be rejected unless specified to do so otherwise or if the camera cannot not pass through the entire line due to an obstacle or other defect.

- I. Each CCTV inspection shall be performed one line segment at a time in accordance with NASSCO guidelines. A line segment is defined as the sewer main or lateral assembly from a manhole, cleanout, special chamber, or utility feature to the next in-line manhole, sewer main, special chamber, or utility feature. Any CCTV survey that contains multiple line segments within a single PACP or LACP inspection and/or video file will be rejected.
- J. Each manhole inspection shall be performed one manhole at a time in accordance with NASSCO guidelines. Any MACP inspection that contains multiple manholes within a single inspection will be rejected.
- K. All media, videos, and images are to be televised and recorded in color and shall correctly reflect the true colors within the pipe and on the video display. Videos and inspection stills televised or submitted in black and white will be rejected.
- L. All media, videos, and images shall provide a clear, accurate, undistorted, and in-focus picture of the entire periphery of the pipeline for all conditions encountered. Every possible means shall be taken to ensure total viewability of the inside periphery of the pipeline.
- M. All digital video files shall be continuous with no evidence of missed footages or “blink- outs”. Proof that the entire pipeline segment was traversed and inspected shall be obvious on the final video recording.
- N. All post construction CCTV surveys and assessments are to be conducted after, and only after, all major construction has been completed and the line segment or manhole has passed all required post construction testing. Any line segment or manhole that has been televised or assessed prior to the full completion or testing of any newly constructed or rehabilitated sewer appurtenance will be rejected.

## 1.5 STANDARD ABBREVIATIONS

<b>AMH</b>	Access Manhole
<b>CCTV</b>	Closed Circuit Televising
<b>LACP</b>	American National Standards Institute
<b>MACP</b>	Manhole Assessment and Certification Program
<b>MGO</b>	Manhole General Observation
<b>NASSCO</b>	National Association of Sewer Service Companies
<b>PACP</b>	Pipeline Assessment and Certification Program
<b>RPZ</b>	Reduced Pressure Principle Backflow Prevention Assembly

## 1.6 COORDINATION

Whenever the contractor desires to use a hydrant for water supply, the contractor shall obtain the permission of the owner. All costs associated with the use of water supplied from hydrants shall not be paid for separately but shall be deemed to be included in the bid. Operation of hydrant shall be in accordance with the City Of Lynchburg Backflow Prevention Program. Use of an RPZ device and/or air gap is required.

## PART 2 - PRODUCTS

### 2.1 DIGITAL VIDEO SYSTEM & EQUIPMENT

#### A. Camera

- 1) The television camera used for the inspection shall be one specifically designed and constructed for such inspection. The camera shall be operative in 100 percent humidity conditions. The camera, television monitor, and other components of the digital video system shall be capable of producing picture quality to the satisfaction of the engineer.
- 2) The camera unit shall be a color pan and tilt unit with autofocusing and zoom features. The television camera shall have a resolution of 480 lines minimum and shall have a source of illumination attached to it. All CCTV equipment must have the capabilities to televise inspections in color & in full detail. With the monitor adjusted for correct saturation, the six colors plus black and white shall be clearly resolved with the primary and complementary colors in order of decreasing luminance. The gray scale shall appear in contrasting shades of gray with no tint. In order to ensure color constancy, no variation in illumination shall take place while the camera or transporter is in motion. The televised image shall be displayed on a monitor, located in an enclosed space in the television inspection vehicle.
- 3) CCTV Focus/Iris/Illumination: The adjustment of focus and iris shall allow optimum picture quality to be achieved and shall be remotely operated. The adjustment of focus and iris shall provide a minimum focal range from 6 inches in front of the camera's lens to infinity. The distance along the sewer in focus from the initial point of observation shall be a minimum of twice the vertical height of the sewer. The illumination must allow an even distribution of the light around the sewer perimeter without the loss of contrast or flare out of picture shadowing.
- 4) The camera shall be self-propelled or mounted on skids and drawn through the sewer by winches for pipelines with an equivalent diameter from 6 to 36 inches. The use of winches and skids shall be approved by the Engineer prior to CCTV inspection services. The inspecting equipment shall be capable of inspecting a length of sewer up to at least 1,000 feet when entry into the sewer may be obtained at each end and up to 750 feet where a self-propelled unit is used, where entry is possible at one end only. The Contractor shall maintain this equipment in full working order.

- B. Where the CCTV camera or transporter is towed by winch and bond through the sewer, all winches shall be stable with either lockable or ratcheted drums. All bonds shall be steel or of an equally non-elastic material to ensure the smooth and steady progress of the CCTV camera and/or Sonar equipment. All winches shall be inherently stable under loaded conditions.
- C. Each inspection unit shall contain a means of transporting the CCTV camera equipment in a stable condition through the sewer under inspection. Such equipment shall ensure the maintained location of the CCTV camera on or near to the central axis of a circular shaped sewer when required in the prime position.
- D. **Software:** CCTV collection software must be PACP, MACP, and LACP version 7.0 certified or better.
- E. Recordings of all sewer line inspections shall be transferred to a memory stick or portable hard drive. The audio portion of the composite digital video shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of the oral report.
- F. **Footage Counter Device:** Measurement for location of defects during the inspection shall be aboveground by means of a footage counter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device. The footage counter device shall be accurate to plus or minus 2 feet in 1,000 feet and be subject to approval by the Engineer.
- G. Digital video equipment shall include genlocking capabilities to the extent that computer generated data (i.e., footage, date, size, address and location, etc.) as determined by the Owner can be overlaid onto digital video, and both indicated on the television monitor and permanently recorded on the digital inspection.

## **PART 3 - EXECUTION**

### **3.1 SEWER LINE CLEANING**

- A. All line segments and manholes shall be clean or be cleaned to the point that the entire pipe or manhole is visible unless if specified otherwise. Very light deposits may, in the opinion of engineer, be acceptable. However, any deposits that obscure a joint, obscure a potential defect, or result in any “holding of flow” shall not be acceptable. Inspections of any pipe sections that are, in the opinion of the engineer, not properly cleaned shall be re-cleaned and re-televised at no additional cost to the Department. The inspection shall be conducted within 36 hours after being cleaned. Under no circumstances shall cleaning or flow control jetting be conducted simultaneously with a CCTV inspection.
- B. The contractor shall completely remove and dispose of all dirt, debris, rubbish and surplus, and unsuitable materials out of the system at the end of each work day at no additional cost to the Department. The disposal will be the responsibility of the Contractor

- C. For all line segments that have been cleaned prior to a CCTV survey, the contractor is to allow enough time for a steady flow rate to return to the line to refill any dips or sags in the line. If a sufficient flow rate into the line cannot be achieved then the contractor must add ample water to the upstream manhole or access point at a rate slow enough to mimic normal flow conditions until flow is visible in the next downstream manhole, wet well, or access point prior to televising the main.
- D. In situations where the section of sewer scheduled to be televised is said to be dry, not in service, or has insufficient flow, the CCTV contractor is to add ample water to the upstream manhole or access point at a rate slow enough to mimic normal flow conditions until flow is visible in the next downstream manhole, wet well, or access point prior to televising the main.

**3.2** The contractor must have the means to access all manholes and lines that are to be surveyed. Additional equipment may be required to access off-road sewer lines or for manholes which require a tripod and harness for entry.

### **3.3 TELEVISION INSPECTION OF SEWER LINE & PROVISIONS**

- A. Operation of the television inspection equipment shall be controlled from above ground, with a skilled technician at the control panel in the television inspection van controlling the movement of the television camera. The technician shall have the capability to: adjust the brilliance of the built-in lighting system; change the focus of the television camera by remote control; control the pan, tilt, and zoom features of the camera; control the forward and reverse motion of the camera; and determine the camera's position, at any time.
- B. Each digitally encoded inspection video shall begin with the camera facing towards the bottom of the manhole and oriented so that the outgoing sewer connection is at the 6 o'clock position. This position shall be held during video recording for a minimum of five (5) seconds then followed by the operator panning then tilting the surrounding above ground area of the entrance manhole prior to lowering the camera to the bottom of the manhole. The CCTV video shall include the view of the camera as it is placed within the manhole, the size measurement of the pipe that is to be inspected, and clearly show which pipe the CCTV camera is inserted. Any notable defects present within the manhole are to be coded as General Observations (MGO's) and to be catalogued only after the initial access point and water level observations have been coded.
- C. When the Contractor elects to "pull through" a manhole during a CCTV and/or Sonar Inspection, a new inspection will be started at the manhole "pulled through", and the footage re-set to zero (0.0) at the manhole wall where the pipe exits/enters the manhole. The video shall begin with the camera being centered within the "pull through" manhole looking down the line segment to be televised. The contractor shall begin the inspection by cataloguing the initial PACP access and water level codes followed by slowly panning then tilting the camera around the manhole for no less than 5 seconds. The contractor shall also be required to visually capture and catalogue the field measurement of the pipe size at any "pulled through" manhole location.
- D. If during an inspection an unmapped manhole is found, follow PACP procedures and code the manhole and close out the inspection. In the corresponding

manhole field of the header page, call out and label the unmapped manhole with the Facility ID of the next concurrent downstream manhole with a suffix of "-A" at the end of the field. When proceeding on, start a new inspection from the said unmapped manhole and note the "Pipe Segment Reference" field in this inspection as "**Gm.** -" if sanitary sewer or "**SWC.** -" for storm sewer to indicate that this is different line segment than the one previously televised as this segment will require a new and unique "Facility Id". Should multiple concurrent manholes be encountered during an inspection, the surveyor shall continue the naming convention of applying the next available letter to the end of the corresponding manhole field.

- E. If the camera lens becomes covered with sewage, grease, deposits etc. resulting in poor picture quality then the inspection shall be suspended and the camera shall be removed and cleaned. The inspection can then be resumed at the last clear camera location.
- F. If the camera fails to pass through the entire pipe section due to the pipeline being inadequately or insufficiently cleaned, this section must be re-cleaned having all the debris removed from the system and the entire length re-televised per this specification. All cleaning shall be performed in accordance with Section 02750- *Sewer Line Cleaning*.
- G. If, and only if, during a normal flow CCTV survey the televising camera cannot pass through the entire pipe section due to a defect, anomaly, or obstruction in the pipe, the contractor shall attempt a reverse setup so that the inspection can be performed from the opposite manhole, wet well, or access point.
- H. When a reverse or second inspection is required to complete the inspection of a sewer, the PACP database field "Reverse\_Setup" shall be populated with corresponding inspection number. The "Reverse\_Setup" field shall be null for all inspections that are not reverse or follow-up inspections.
- I. At the start of each sewer length being surveyed or inspected and each reverse setup, the length of pipeline from zero footage (middle of the man) up to the cable calibration point shall be recorded and reported in order to obtain a full record of the sewer length. If the start manhole wall measures something other than 48" in diameter then this shall be noted in the 'Additional Comments' field of the survey.
- J. The contractor shall adjust the camera height as necessary to ensure that the camera is centered in the pipeline at the beginning of the inspection. A position tolerance of  $\pm 10\%$  of the vertical sewer pipeline diameter dimension will be allowed (i.e. for an 8-inch diameter pipeline the camera shall be centered within  $\pm 0.8$  inches of the center of the pipeline). Inspections of any pipe sections in which the camera, in the opinion of the engineer, is skewed or not properly centered within the main shall be re-televised at no additional cost to the Department.
- K. When beginning a CCTV inspection, the operator shall verify the diameter of the pipeline to be inspected by inserting a tape measure or surveying rod into the manhole and measure the pipeline diameter to the nearest  $1/10^{\text{th}}$  inch. Video proof of this measurement shall be captured during the CCTV inspection after the

camera has been adequately positioned so that this measurement can be clearly read. This measurement is also to be recorded in the “height” field of the inspection database.

- L. All CCTV surveys must list all required PACP information in their respective fields in addition to but not limited to the following information:
  - 1. Drainage Area
  - 2. Pipe Segment Reference
  - 3. Total Length
  - 4. Length Surveyed
  - 5. Pipe Material (Original material if lined)
  - 6. Lining Method (If lined)
  - 7. Year Renewed (If rehabbed / lined)
  - 8. Purpose
  - 9. Media Label (CCTV Contractor Co.)
  - 10. Location Code
  - 11. Weather
  
- M. The contractor shall televise all sanitary and storm sewer mainlines utilizing a crawling camera with full pan, tilt, & zoom capabilities. Inspections televised via other means or methods will be rejected unless directed to do so otherwise. If picture quality is unsatisfactory, the contractor may attempt to re-televise the segment(s) utilizing satisfactory equipment and/or methods. Unsatisfactory inspections will be rejected by the engineer. No payment will be made for an unsatisfactory inspection.
  
- N. All distances and time stamps called out for each PACP code, observation, or defect must be listed as a positive, rational number. Surveys that do not list positive numbers for distances and time stamps will be rejected.
  
- O. At the start of each sewer length, a data generator shall electronically generate and clearly display on the viewing monitor and subsequently on the final recording a record of data in alpha-numeric form containing the following minimum information:
  - 1. Automatic update of the camera’s footage position in the sewer line from adjusted zero.
  - 2. Sewer dimensions in inches
  - 3. Manhole numbers (must conform to Owner’s identification number)
  - 4. Date of survey
  - 5. Road name (nearest)/location
  - 6. Direction of survey, i.e., downstream or upstream
  - 7. Time of start of survey
  - 8. Material of construction of the pipe
  - 9. Contractor
  
- P. The size and position of the data display shall be such as not to interfere with the main subject of the picture.
  
- Q. Once the survey of the pipeline is under way, the following minimum information shall be continually displayed:



1. Automatic update of the camera's footage position in the sewer line from adjusted zero.
  2. Sewer dimensions in inches
  3. Manhole numbers (must conform to Owner's identification number)
  4. Direction of survey, i.e., downstream or upstream
- R. CCTV Camera Speed: The speed of the CCTV camera in the sewer shall be limited to 30 feet per minute (0.5 ft per second) for all inspections in compliance with NASSCO guidelines. Manual winches, power winches, TV cable, and powered rewinds or other devices shall not obstruct the camera view or interfere with proper documentation of the sewer conditions to move the camera through the sewer line.
- S. The inspection shall be performed with the camera traveling in a forward direction. The camera shall only travel backward as needed to allow a fuller view of a defect or observation. Inspections that are accomplished with the camera traversing backward or in reverse will be rejected.
- T. While in motion, the CCTV camera is to be fully zoomed out and fixed to the "home position" where the camera head is kept at the level horizon and is centered and pointed true down the alignment of the pipe for the duration of each CCTV survey. Only when necessary to fully capture defects/observations or to avoid getting the camera lens dirty should the camera be allowed to leave the home position or use the zoom, pan, or tilt features. After the flow conditions have normalized in the pipe or the full extent of an observation/defect has been captured the camera must return to the level home position.
- U. Excessive use of the pan, tilt, or zoom features, including using any of the features simultaneously, shall be avoided. The operator shall not use the pan, tilt, or zoom features of the camera until the camera tractor is at a full and complete stop.
- V. The operator shall bring the camera to a complete stop at all suspected defects, noted observations, and service connections, panning then tilting the camera as necessary to closely view the defect/observation in question. The full extent of the defect/observation shall be observed.
- W. When coding any defect or observation, the operator shall adjust the camera back to the "home position" as best as possible while showing the defect/observation in its entirety in relation to the pipe. The operator shall cease all movements of the camera head and tractor to allow for a clear photograph of the defect/observation while the observation is being cataloged.
- X. At each coded observation, the following minimum information shall be displayed:
1. The PACP code and/or PACP code description.
  2. The footage position of the defect.
  3. The "Additional\_Info" field in any cases where it is utilized.
- Y. During the CCTV inspection, lighting intensity shall be adjusted as necessary to

minimize glare and maximize viewing ability.

- Z. Upon reaching an end point manhole or other access point, the camera shall be maneuvered to the center of the manhole and tilted upward and slowly panned for a minimum of 5 seconds in order to view the interior of the manhole in full detail. Any notable defect observed within the manhole or access point shall be coded as a General Observation (MGO) and be catalogued prior to coding the manhole (AMH) to close out the inspection.

AA.If for any reason the contractor's equipment becomes disabled or lodged inside the sewer and cannot further proceed, the Contractor shall be responsible for retrieving the equipment and restoring the sewer at no additional cost to the Owner.

### 3.4 DOCUMENTATION OF THE TELEVISION RESULTS

A. **Television Inspection Logs:** Develop and keep digital location records that clearly show the location in relation to an adjacent manhole of each infiltration point observed during inspection. In addition, record other points of significance such as locations of building sewers, unusual conditions, roots, storm sewer connections, broken pipe, presence of scale and corrosion, and other discernible features.

B. **Photographs:** A digital photograph or digital video still shall be captured for each coded observation. If no defects are present provide one still image of pipe for information purposes. All digital still images shall be in JPEG file format. For all digital still images, the file naming format shall be generated using a concatenation of standard PACP database fields in the format "Facility\_ID" "Upstream\_MH" "Downstream\_MH" "Direction" "PACP\_Code" "Distance" (multiple digital still images may have "-01", "-02", "-03" at end of file name).

e.g. **GM.5659.04.029\_mh.5659.04.007\_mh.5659.04.003\_D\_CM\_167.2.jpg**

C. **Video Recordings:** A visual and audio recording of all areas of the lines shall be of a single line segment, performed and produced in MPEG 1 file format. Videos shall also be non-proprietary and able to be viewed with Windows Media Player. For all digital encoded inspection videos, the file naming format shall be generated using a concatenation of standard PACP database fields in the format "Facility\_ID" "Upstream\_MH" "Downstream\_MH" "Direction" "Date".

e.g. **GM.5659.04.029\_mh.5659.04.007\_mh.5659.04.003\_D\_7122016.mpg**

**END OF SECTION 02760**

[Back to Top](#)