

SECTION 811

TELEVISION INSPECTION

I. GENERAL

The Work covered by this section consists of providing all labor, equipment, material and supplies and performing all operations required to conduct the internal closed-circuit television (CCTV) inspection of all designated sewer lines, manholes/structures and laterals. The Contractor shall be responsible for removing his equipment from the sewers and for all associated sewer and restoration repairs necessary as a result of his Work. Sewer laterals shall be televised from the sanitary sewer main or private cleanout and to locate sewer laterals using a sonde (electronic tracking device).

1.1 DEFINITIONS

- A. Pre-installation TV is a video inspection by the Contractor of sewer lines specified for rehabilitation to confirm cleaning, location of service connections, and constructability of line rehabilitation in accordance with the contract documents.
- B. Post-installation TV is a video inspection to determine that rehabilitation and/or replacement of sanitary sewers has been completed in accordance with the contract documents.
- C. Information collected and recorded by each TV operator for any TV inspection effort and shall include all pertinent information for the respective inspection section.
- D. Pipeline Assessment and Certification Program (PACP) is a CCTV Inspection Standardization certification and defect coding system developed by the National Association of Sewer Service Companies (NASSCO).
- E. Manhole Assessment and Certification Program (MACP) is condition assessment protocol for coding defects within manholes developed by NASSCO.
- F. Lateral Assessment and Certification Program (LACP) is a lateral certification and defect coding system developed by NASSCO.
- G. MPEG, which stands for Moving Pictures Expert Group, is the nickname given to a family of international standards fused for coding audio-visual information in a digital compressed format. MPEG coding shall be named using the .mpg as the file extension.

1.2 SUBMITTALS

Submittals shall be made by the Contractor in accordance with the procedures set forth in Section 105 - Control of Work, and as described below.

- A. Compact Disc (CD), or Digital Video Disc (DVD), or as specified by the Owner. See Section 200 - Products and Materials.
- B. Each TV Inspection Log shall be submitted to the Owner accompanied by the respective video tape inspection.
- C. When flow control will be required submit a bypass pumping plan to the Owner in

accordance with Section 812 – Bypass Pumping, to include an overflow prevention, containment and cleanup plan.

- D. Prior to any inspections, submit a detailed description of the software to be used, a sample of the video, and a sample of the television survey log and LACP/PACP-compliant database to be used. Also, submit a detailed description of the camera equipment to be used.
- E. Where indicated in the Contract Documents, all laterals that are inspected need to have location documented with photos of the lateral layout as designated by surface paint markings and flags between the mainline and the face of the building that the lateral services. Submit redlined set of reference drawings indicating location of lateral components including but not limited to; lateral connection to mainline, public lateral alignment, public cleanout, private lateral alignment and private cleanout.
- F. Submit the following qualifications for the CCTV Contractor to the Owner for review and approval:
 1. Name, business address, and telephone number.
 2. Name(s) of all supervisory personnel to be directly involved with this Project.
 3. NASSCO Lateral and Pipeline Assessment Certification Program (LACP/PACP) certifications of on-site operator performing inspections
 4. The Contractor shall sign and date the information provided and certify that to the extent of his knowledge, the information is true and accurate, and that the supervisory personnel will be directly involved with and used on this Project. Substitutions of personnel and/or methods will not be allowed without the written authorization of the Owner.
 5. Specialty technicians shall be certified by the equipment manufacturer and/or its authorized representative. Certifications shall be submitted to the Owner.
 6. Submit the manufacturer's product literature for all proposed equipment, including, but not limited to, cabling, camera, monitor, footage counter, video tilting device, and recorder.

1.3 GENERAL REQUIREMENTS

- A. Cleaning of private laterals shall not be allowed, except as required to facilitate the rehabilitation or replacement of the lateral. Any required cleaning of private laterals shall be approved by the Owner prior to cleaning and at no additional cost to the Owner.
- B. If any Contractor equipment becomes stuck in the main or lateral, the Contractor shall be responsible for all costs associated with extracting the equipment from the main or lateral.
- C. Any damages to public or private property resulting from Contractor activities shall be repaired by the Contractor at no cost to the Owner or property owner.
- D. All laterals rehabilitated with CIPP shall have pre- and post-CCTV inspections performed. All inspections shall be coded according to NASSCO's LACP defect codes. Laterals replaced by open cut excavation shall have post CCTV inspections performed.

- E. All inspection videos shall be delivered to the Owner on a CD, DVD, portable hard drive (USB 2.0), or an Owner-approved storage media accompanied with the corresponding TV logs for each televised lateral no more than seven (7) days after the inspections were completed. The video shall be direct from a live video source into a video file, MPEG-2 or Windows Media File format (640x480 resolution, minimum) and, of good quality for viewing.
- F. The Contractor shall utilize a NASSCO Lateral (Pipeline) Assessment Certification Program (LACP/PACP) certified software system for Work under this section, unless otherwise approved by the Owner.

1.4 EQUIPMENT

A. MAINLINES

- 1. Closed Circuit TV Equipment - Select and use closed-circuit television equipment that will produce a color CD, or DVD, or an Owner approved storage media. The television inspection equipment shall be capable of inspecting a minimum of 500 feet of sewer line, when entry into the sewer can be accessed from the upstream and downstream manholes. When entry is at one end only, the inspection equipment shall be capable of inspecting 500 feet by a self-propelled unit. The inspection equipment shall be capable of clearly televising the interior of a 6-inch diameter sewer and larger sizes.
- 2. Pipe Inspection Camera - Produce a video using a pan-and-tilt, radial viewing, pipe inspection camera that pans $\pm 275^\circ$ and rotates 360° . The television camera used for the inspection shall be specifically designed and constructed for such inspection. The camera shall be waterproof and shall be fully operative in 100% humidity conditions and/or in any conditions that may be encountered in the inspection environment. Use a camera with an accurate footage counter that displays on the monitor the exact distance of the camera (to the nearest tenth of a foot) from the centerline of the starting manhole. Use a camera with height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being televised. Provide a color pan, tilt and zoom camera to facilitate the inspection of service laterals, sewer line, manholes, and construction features. The television camera shall be capable of 360° rotational scan indicating salient defects. The tilt arc shall not be less than 225° unless otherwise approved by the Owner. The adjustment of focus and iris shall provide a minimum focal range of 3 inches in front of the camera's lens. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The illumination shall be such as to allow an even distribution of the light shadowing. A reflector in front of the camera may be required to enhance lighting in dark or large diameter pipe.
- 3. The CCTV camera shall be calibrated for accurate length measurements at least once per week with above ground markings every 25 feet for up to 100 feet. The accuracy should be within two tenths of a foot for every 100 feet.
- 4. The video camera shall be capable of showing on the digital inspection the Owner's name, Project name, Contractor name, date, line size and material, line identification (Owner's manhole numbers at both ends) and ongoing footage counter. The camera, television monitor, and other components of the video system shall be capable of

producing picture quality to the satisfaction of the Owner; and if unsatisfactory, equipment shall be removed and replaced with adequate equipment. No payment will be made for an unsatisfactory inspection.

B. LATERALS

1. The television camera used for the lateral survey shall be one specifically designed and constructed for such survey. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing a minimum 700-line resolution color video picture. The Contractor shall maintain the camera in clear focus at all times. Picture quality and definition shall be to the satisfaction of the Owner, and if unsatisfactory, equipment shall be removed and replaced with adequate equipment at no additional cost to the Owner.
2. Cameras used from a cleanout must be capable of being launched from the cleanout and travel down to the sewer mainline up to 100 feet. The camera system must be capable of inspecting 3-, 4-, and 6-inch laterals. Lateral cameras launched from the sewer mainline must be capable of inspecting up to 100 feet of 3-, 4-, and 6-inch laterals.
3. The video camera shall include a titling feature capable of displaying on the video the following information:
 - a. Owner's Name
 - b. Date/Time
 - c. Contractor's Name
 - d. Property Address
 - e. Lateral Segment Reference
 - f. Pipe Size (Diameter) and Material
 - g. Continuous Footage Counter

II. EXECUTION - MAINLINES

2.1 GENERAL

The designated sewer pipe sections shall be televised in accordance with the Contract Documents.

2.2 TELEVISION INSPECTION

A. Flow Control

1. Perform Bypass Pumping when necessary as specified in Section 812 - Bypass Pumping.
2. If during TV inspection of a sewer section, the wastewater flow depth exceeds 20 percent of the inside pipe diameter, reduce the flow depth to an acceptable level by performing the TV inspection during minimum flow hours, bypass pumping, plugging or by pulling the camera with swab, high-velocity jet nozzle or other acceptable dewatering device. Video inspections performed while floating the camera is not acceptable unless approved by the Owner in advance.

B. Documentation of Television Inspection

1. All Television Inspections shall be documented using a datalogger and reporting system as approved by the Owner. A PACP compliant datalogger and coding system must be used to perform the Work.
2. If television inspection of an entire section cannot be successfully performed from one manhole, perform a reverse setup to obtain a complete television inspection. No additional payment will be made for a reverse setup.
3. Television Inspection Logs: Computer printed location records shall be kept by the Contractor and shall clearly show the location and orientation in relation to an adjacent manhole of each infiltration point observed during inspection. In addition, other points of significance such as locations and orientations of service connections, building sewers, unusual conditions, roots, cross connections, broken pipe, presence of scale and corrosion, and other discernible features shall be recorded and a copy of such records shall be supplied to the Owner.
4. Digital Photographs: Noted defects and lateral connections shall be documented as color digital files and color hard copy print-outs. Photo logs shall accompany each photo submitted.
5. Video Recordings: The purpose of video recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed. Video recordings shall include an audio track recorded by the inspection technician during the actual inspection Work describing the parameters of the line being inspected (i.e. location, depth, diameter, pipe material), as well as describing connections, defects and unusual conditions observed during the inspection. Video recording playback shall be at the same speed that it was recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor. Once inspected, the Owner approved media shall be labeled and become the property of the Owner. Each media shall be labeled, at a minimum, with the following information: Owner, Project Name, Date of Creation, ID number, Sewer Line Sections indicated by MH to MH, and TV Inspection firm's name. The Contractor shall have all video and necessary playback equipment readily accessible for review by the Owner during the project. Unless modified by Owner, digital video shall be defined as ISO-MPEG Level 1 (MPEG-1) coding having a resolution of 352 pixels (x) by 240 pixels (y) (minimum) and an encoded frame rate of 29.97 frames per second. The digital recording shall include both audio and video information that accurately reproduces the original picture and sound of the video inspection. The video portion of the digital recording shall be free of electrical interference and shall produce a clear and stable image. The audio portion shall be sufficiently free of background and electrical noise so as to produce an oral report that is clear and discernible.
6. Separate digital video recordings shall be made for each sewer section, and shall be properly identified, via continuous on-screen display and voice-over recording, with: 1) CIP number, 2) Upstream MH ID and Downstream MH ID, 3) sewer segment being inspected, 4) date of inspection, 5) project name, and 6) distance along the reach from the entering manhole. Contractor shall coordinate with Owner prior to commencement of Work to ensure identification is accomplished in a manner acceptable to Owner. If the video and/or audio recording is of poor quality, the

Owner retains the right to require a re-submittal of the affected sewer sections and no payment will be made until an acceptable video and audio recording is made, submitted to, and accepted by Owner.

C. Pre-Installation Inspection for Sewer Lines to be Rehabilitated

1. Perform pre-installation TV inspection immediately after all point repairs and line cleaning have been completed and immediately before line rehabilitation work. Pre-installation TV inspection is not required for sewer lines designated as remove and replace or point repair only.
2. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line.
3. If, during the inspection operation, the television camera will not pass through the entire pipe section due to blockage or pipe defect, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole. If, again, the camera fails to pass through the entire pipe section, the inspection shall be considered complete and no additional inspection will be required at that time. Improper cleaning will not be a reason for incomplete televising of a line section.
4. When manually operated winches are used to pull the television camera through the line, hand operated radios, telephones, or other suitable means of communication shall be set up between the two manholes of the section being inspected to ensure good communication between members of the crew.
5. During the internal inspection, the television camera shall be temporarily stopped at each defect along the line. The nature, location, and orientation of the defect shall be recorded by the Contractor. Where defects are also active infiltration sources, the rate of infiltration in gallons per minute shall be estimated by the Contractor and recorded. The camera shall also be stopped at all service connections and identified by footage and clock orientation.
6. The camera operator shall slowly pan and tilt at beginning and ending manhole connections, each service connection, joints, visible defects, and at pipe material transitions.
7. TV inspections shall be continuous for pipe segments between manholes. Do not show a single segment on more than one media, unless specifically approved by the Owner.

D. Post - Installation Inspection

1. Post-installation TV inspection shall not be completed until all work, including main line and manhole visual, pressure testing, deflection and leakage testing is complete on a section of line.
2. Post-installation TV inspection shall be completed by the Contractor in the presence

of the Owner.

3. The post-installation TV inspection shall be completed to confirm that rehabilitated lines are free of defects. Provide a color video showing the completed Work. Prepare and submit Television Inspection Logs providing location of service connections along with location of any discrepancies. Manhole Work, including benches, inverts and pipe penetrations into manhole, should be complete prior to post-installation TV Work.
4. For post-installation TV inspection, exercise the full capabilities of the camera equipment to document the completion and the conformance of the Work to the Contract Documents. Provide a full 360-degree view of pipe, joints and service connections.
5. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line.
6. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to ensure good communication between members of the crew.
7. The importance of accurate distance measurements is emphasized. The meter device shall be accurate to one tenth of a foot.
8. TV inspections shall be continuous for pipe segments between manholes. Do not show a single segment on more than one media, unless specifically allowed by the Owner.
9. Prior to inserting the television camera into the pipeline, the Contractor shall flush and clean the pipeline. The Contractor shall introduce a minimum of 1,000 gallons of clear, potable water into the terminal upstream manhole or last access structure on any given gravity sewer branch of the pipeline to be inspected with a television camera. The Contractor is responsible for acquiring, collecting and disposing of the water at no additional cost to the Owner.

E. Acceptance of Television Inspection Results

Television inspection results will be accepted by the Owner when the videos and inspection logs meet the requirements of the Contract Documents.

III. EXECUTION – LATERALS

3.1 GENERAL

The designated lateral pipe sections shall be televised in accordance with the Contract Documents. If at any time during the inspections Orangeburg pipe (bituminous fiber pipe) is found to be the lateral pipe material, the Owner shall be notified.

3.2 TELEVISION INSPECTION

- A. For inspections originating from the sewer main, the upstream manhole number, distance from the upstream manhole, lateral connection to the main line (left, center or right), and address of the customer serviced by the lateral shall be recorded in the CCTV database. Printed and electronically stored location records shall be kept by the Contractor and will clearly show the location in relation to the cleanout or the mainline of each infiltration point observed during survey. Footage shall be shown in the database. In addition, other points of significance such as unusual conditions, roots, broken pipe, presence of scale and corrosion, and other discernible features will be recorded and a copy of such records will be supplied to the Owner.
- B. Video files shall be uniformly formatted and named with the property address and date of inspection. Once recorded, the video shall become the property of the Owner.
- C. Laterals replaced via open cut replacement shall be tested according to State and Local Standards in addition to being inspected via CCTV. Laterals rehabilitated with CIPP shall be CCTV inspected. Fully televise both ends of the liner so that the fit of the liner to the host pipe can be evaluated. If the lateral liner included the mainline connection, the Contractor shall fully televise both ends of the mainline wrap portion of the one-piece main and lateral liner so that the fit of the liner to the sewer main can be evaluated.
- D. On-screen lettering for splash-screen or other on-screen information (e.g., footage) shall appropriately contrast to the pipe material (e.g., dark lettering or black background with white lettering in light-colored pipe material).

IV. MEASUREMENT FOR PAYMENT

- A. Television inspections for new or newly replaced pipeline shall be measured and paid based on the unit price bid per linear feet of mainline sewer or lateral line televised and clearly displayed on Owner approved media.
- B. In Support of Rehabilitation Activities

No separate payment shall be made for pre-installation, post-installation, or warranty inspection footage.
- C. CCTV Only

Payment will be made based on the unit price bid per linear feet of inspection of mainline or lateral sewer accepted by the Owner upon review of the inspection media and logs. Contractor will not be paid for unacceptable television inspection footage.
- D. Flow control will be measured and paid in accordance with Section 812.

End of Section