

## Section 2651

### Television Inspection

#### **PART 1: General**

- 1.1 *Description* – Provide all labor, materials, tools, equipment and incidentals as shown, specified, and required to perform television (TV) inspection of existing, new and rehabilitated piping including sewer mains and sewer lateral connections.
- 1.2 *Definitions* –
  - 1.2.1 *Pre-Construction Inspection* – TV inspection of sewers and/or laterals to determine the location of construction, structural and O&M features and to ascertain that the condition of the pipe meets acceptable standards for the proposed rehabilitation.
  - 1.2.2 *Post-Construction Inspection* – TV inspection of repaired or rehabilitated sewer mains, lateral connections, and laterals to verify (in association with other specified testing procedures) that all repairs have been performed.
- 1.3 *Requirements* – The Contractor shall be aware that this Contract requires work in active sewers and shall follow all federal, state and local requirements for safety in confined spaces.
- 1.4 *Performance Requirements* –
  - 1.4.1 Inspection shall be performed by a National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) certified operator and shall meet the coding and reporting standards and guidelines as set by PACP. These same standards shall also be used for lateral inspections regardless of whether conducted using cleanout launched or mainline launched lateral camera. All report annotations, pipe conditions and pipe defects shall be identified properly using PACP codes as defined by PACP, and severity ratings shall be calculated according to PACP.
  - 1.4.2 Quality of inspection recording shall be acceptable to ENGINEER when viewed on a standard computer monitor.
- 1.5 *Submittals* –
  - 1.5.1 CCTV equipment, including make, model, age of video systems and tractors, and documentation that CCTV software is PACP v4.2 -certified. PACP-compliant software will not be accepted.
  - 1.5.2 Copies of PACP certificate for inspectors completing the work.
- 1.6 *Reference Standards* – NASSCO prepared Pipeline Assessment and Certification Program, Second Edition Reference Manual, 2001. This manual includes a standard TV inspection form and sewer condition codes.

## **PART 2: Products**

### **2.1 *Television Equipment* –**

2.1.1 *Closed Circuit TV Equipment* – Select and use closed-circuit television equipment that will produce a color recording. The camera and video system components shall have the following properties:

2.1.1.1 Equipped with footage counter accurate to two tenths of a foot that displays on the TV monitor the exact distance of the camera from the starting point of the recording.

2.1.1.2 Lighting system that allows the features and condition of the pipe to be clearly seen. Lighting shall not cause shadows or loss of color within the field of view of the camera.

2.1.1.3 Capable of operating in 100 percent humidity conditions.

2.1.1.4 Capable of producing a minimum 470 lines of vertical resolution color video picture. Picture quality and definition shall be to the satisfaction of the Engineer.

2.1.2 *Pipe Inspection Camera* – The pipe inspection camera and video components shall have the following additional properties:

2.1.2.1 Capable of producing a video recording using a pan-and-tilt, radial viewing, pipe inspection camera that pans  $\pm 275$  degrees and rotates 360 degrees.

2.1.2.2 Camera height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being televised.

2.1.2.3 Include a reflector in front of the camera if necessary to provide acceptable video image quality in large diameter pipe.

2.1.3 *TV Studio* – TV studio is to be contained in an enclosed truck, trailer or van. It shall have room and seating for the operator and the ENGINEER and also room for at least one standing visitor with the doors closed. The studio shall have air conditioning and heating. Normal operation of all equipment, including the TV camera, monitor, and winches is to be from a control panel in the studio. When joint testing and sealing is to be performed, the equipment shall be contained in the same unit as its TV equipment and shall be operated from the same control panel.

2.1.4 *Recording* – All recordings are to be in digital format.

2.1.4.1 *Image Capture* – Digitized picture images shall be stored and be exportable as JPEG formats.

2.1.4.2 *Video Capture* – Full time live video and audio files shall be captured for each pipe segment and lateral inspected. The files shall be delivered in MPEG format on a USB 2.0 external hard drive and viewable at real time and fast forward speeds on an external personal computer that utilizes MicroSoft Media Player, version 9.0. Alternate digital formats will not be accepted unless approved by the Engineer in advance of submittal. The video shall have a minimum resolution of 640 pixels (x) by 480 pixels (y) and an encoded frame rate of 29.97 frames per second. System

shall perform an automatic disk image/file naming structure to allow saved video/data sections to be “Burned” to digital format. It shall have the capability of “burning” a minimum of 120 minutes of recording to the DVDR media. The video recording shall be free of electrical interference and shall produce a clear and stable image. The audio recording shall be sufficiently free of background and electrical noise as to produce an oral report that is clear and discernable. The digital recordings and inspection data shall be cross-referenced to allow instant access to any point of interest within the digital recording.

### **PART 3: Execution**

#### **3.1 *Television Inspection –***

- 3.1.1 Prior to TV inspection, clean sewer lines, laterals and manholes. Re-clean any sewer line or manhole found to be dirty during the TV inspection process.
- 3.1.2 Perform Post-construction Inspections of cured-in-place mainline liners no sooner than 30 days after the completion of the lining work.
- 3.1.3 Televiser the sewer line to document the condition of the line. Notify the Engineer 48 hours in advance of any TV inspection so that the ENGINEER may observe inspection operations. Provide a color recording showing the completed Work.
- 3.1.4 For mainline sewer inspections, inspections shall be from center of the starting manhole to the center of the ending manhole. Record the condition of the entire circumference of the pipe penetration. Measure distances along the pipe from the center of the upstream manhole.
- 3.1.5 Prior to recording the location of defects, construction features and service connections, remove slack in the cable of the television inspection camera to ensure metering device is designating proper footage. Check accuracy of the measurement meters daily by use of a walking meter, roll-a-tape, or other suitable device.
- 3.1.6 Perform the preset before starting to record the inspection (i.e. the counter should not suddenly reset or jump during the recording). If a preset point on the CCTV cable is used to set the counter, Contractor shall back up the camera after setting the preset and record the entry to the pipe.
- 3.1.7 Center the camera in the middle of the pipe.
- 3.1.8 Move the camera through the line (in the downstream direction whenever possible) at a uniform rate not to exceed 30 feet per minute.
- 3.1.9 Stop at every joint for three seconds. When infiltration or other defects are evident, use pan and tilt to document pipe condition. Stop elsewhere when necessary to ensure proper documentation of the sewer’s condition.
- 3.1.10 Stop at every lateral connection. Center the camera so that the lighting and the pan and tilt view can be used to inspect as far into the lateral connection as possible. Pan the circumference of the tap, recording all defects found in the service connection. Where lateral flow is observed, observe flows from service connections for approximately two

minutes to ascertain if the flow is sanitary or extraneous flow. The video recording may be paused during observation. Record results of the flow observed on video recording and inspection logs.

3.1.11 Capture color still shots of video recordings for all defects encountered.

3.1.12 Use 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 to move the camera through the sewer line.

3.1.13 TV inspection recordings shall be continuous for each pipe segment.

3.1.14 Adjust light levels, clean fouled or fogged lens, and allow vapor to dissipate from camera lights in order to produce acceptable recordings. All TV inspection recordings that do not meet the specified requirements shall be retelevised at no additional cost to the Owner.

3.2 *Flow Control –*

3.2.1 Adequately control the flow in the section being televised. Plugging or bypassing of the flows may be used to accomplish this. Recordings made where the depths of wastewater flow shown below are exceeded will be rejected:

<b>Flow Control During Television Inspection</b>	
<b>Pipe Diameter (Inches)</b>	<b>Depth of Flow (% of Pipe Diameter)</b>
6-10	10
12-24	15
Over 24	20

3.2.2 Whenever flows in a sewer line are blocked, plugged, pumped, or bypassed, take sufficient precautions to protect the sewer lines from damage that might be inflicted by excess sewer surcharging. Further, take precautions to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved. No overflows are permitted. The Contractor is responsible for all damages.

3.2.3 Contractor is responsible for all damages to Contractor owned and operated equipment, Owner facilities, and privately owned facilities caused by malfunction of plugs, pumps or other Contractor equipment. In the event of a failure or malfunction of Contractor equipment, Contractor is responsible for all work necessary to restore facilities to pre-construction condition including but not limited to excavation and restoration of sewer lines and roadways required to retrieve malfunctioning or stuck cameras, plugs and hoses.

3.2.4 It is anticipated that portions of the sanitary sewer are bowed or bellied and as a result the camera will be submerged. Wherever the camera encounters a submerged condition, or where the wastewater flow depth exceeds the maximum allowable, reduce the flow depth to an acceptable level by performing the survey TV inspection during minimum flow hours, or by pulling a camera with swab, high-velocity jet nozzle or other acceptable dewatering device. Recordings made while floating the camera are not acceptable unless approved by Engineer.

3.3 *Passage of TV Camera –* If during TV inspection of a pipe segment the camera is unable to pass an obstruction even though flow is unobstructed, televise the pipe segment from the opposite

direction in order to obtain a complete recording of the line. Measure the distance between the manholes (centerline to centerline) with a tape or wheel to accurately determine the total length of the manhole segment.

### 3.4 *Inspection Deliverables –*

3.4.1 *Written Inspection Reports –* Provide printed location records to clearly identify the location of each defect, or lateral connection, in relation to adjacent manholes, using a standard stationing system zeroed on the upstream manhole. Record all information requested using proper NASSCO PACP defect codes. The reports shall include at least the minimum amount of information required by PACP, including required PACP header information. Color still shot images of all defects encountered shall be included with each pipe segment.

### 3.4.2 *Electronic Inspection Reports –*

3.4.2.1 Provide a NASSCO PACP v4.2 certified database listing all PACP required data fields for each pipe segment. The provided database shall be in “.mdb” format with no password protection on the file.

3.4.2.2 For each type of CCTV deliverable (Pre-Construction, Post-Construction, Warranty), provide a single database containing all the inspections for the Project.

3.4.2.3 Post Construction deliverables will contain a single inspection for each asset, inspected upon completion of all non-warranty Work on the asset.

3.4.2.3.1 Submit two inspection records for a single asset only if the asset cannot be completely inspected from one side due to the physical condition of the pipe. Properly use the PACP “MSA” coding for each such inspection record.

### 3.4.3 *Inspection Recordings –*

3.4.3.1 Provide digital inspection recordings for all recordings, unless otherwise specified in paragraph 3.4.4.

3.4.3.2 Recording shall be of a quality sufficient for Engineer to evaluate the condition of the sewer, locate the sewer service connections, and verify cleaning. If Engineer determines that the quality is not sufficient, re-televiser the sewer segment and provide a new recording and report at no additional compensation. Camera distortions, inadequate lighting, dirty lens, or blurred/hazy picture will be cause for rejection. Payment for televised inspection will not be made until Engineer approves the recordings and reports.

3.4.3.3 Only pipe segments from the same Project shall be included on a given hard drive. Multiple deliverable types may be included on a given hard drive, but the files must be organized in individual project folders. TV Inspection recordings shall not be edited.

3.4.3.4 Digital recordings: Each pipe segment must be its own electronic file. Electronic recording file must allow snap scrolling to allow easy and quick access of the entire recording.

- 3.4.3.5 Each hard drive must have a file index whose name contains the pipe segment reference number.
- 3.4.3.6 Maintain a master copy of all recordings and Inspection Reports for two years after delivery of reports and recordings.
- 3.4.3.7 Label each hard drive with the following information:
  - 3.4.3.7.1 File Number
  - 3.4.3.7.2 Contractor's Name
  - 3.4.3.7.3 Project Name
  - 3.4.3.7.4 Contract Number
  - 3.4.3.7.5 Drawing Number
  - 3.4.3.7.6 Inspection Type: Post Cleaning, Repair
  - 3.4.3.7.7 Date Televised
  - 3.4.3.7.8 Pipe Segment Asset Identification Number
- 3.4.4 *Inspection* – Inspection deliverables for different types of inspections are defined below:
  - 3.4.4.1 *Pre-Construction Inspection* – One copy on a 400mbs USB 2.0 external hard drive of PACP formatted database including, but not limited to, digital inspection recordings, defect call-out tables, defect snapshots, notes fields and asset condition reports.
  - 3.4.4.2 *Post-Construction Inspection* –
    - 3.4.4.2.1 Two copies of Written Inspection Reports in bound report with project name on binder spine. Reports to be filed in ascending order by upper manhole number.
    - 3.4.4.2.2 One copy on a 400mbs USB 2.0 external hard drive of the PACP formatted database including, but not limited to, digital inspection recordings, defect call-out tables, defect snapshots, notes fields and asset condition reports.