

SECTION 02541
SEWER TELEVISION INSPECTION FOR
PIPE REHABILITATION / REPLACEMENT WORK

PART 1. SCOPE

1.01 GENERAL

- A. The Work to be performed herein includes Closed-circuit television (CCTV) inspection of gravity sewer mains. This section specifies the requirements of CCTV inspection activities in association with sewer rehabilitation/replacement work.

1.02 SUBMITTALS

- A. Action Submittals: Catalog and manufacturer's data sheets for television equipment.
- B. Informational Submittals:
1. References: Contact names and telephone numbers.
 2. List of staff and equipment to be used on Project.
 3. Crew chief qualifications and contact information: name, cell phone number.
 4. Traffic control plan.
 5. Look-ahead inspection schedules, minimum of 7 days in advance of the Work.
 6. Initial first days' CCTV digital videos within 24 hours of start of CCTV inspection.
 7. Log of cable footage counter calibration checks.
 8. Certification that staff to be used for the Work is properly trained in confined space entry and hazardous atmospheres.
 9. Training and inspection plan, 7 days prior to manual inspection.
 10. Bypass pumping submittals shall be in accordance with Section 02542, Sewer Flow Control.
- C. Work Product:
1. External Hard Drive or DVD including:
 - a. Inspection media.
 - b. Inspection database.
 - c. Inspection reports.

1.03 QUALITY ASSURANCE

- A. Qualifications:
 - 1. **CONTRACTOR:** Performed work successfully for at least three other projects, within last 5 years, with pipe lengths and pipe diameters similar to this Project.
 - 2. **Crew Chief:** Minimum of 5 years' experience on projects similar to this Project and experienced using proposed equipment for this Project.
- B. **Prestart up Meeting:** At least 5 days prior to beginning CCTV inspection work, schedule with OWNER to review submittals including but not limited to: proposed sewer flow bypassing plan, traffic control plans, inspection methods, schedule, and overall approach.
- C. At the OWNER's request submit work products for quality review and comment to OWNER within 24 hours after the first days' work is completed. Submit subsequent work products on a routine basis every 7 days. Picture quality and definition shall be to the satisfaction of OWNER. Inspection equipment that fails to produce satisfactory inspection quality shall be removed.

1.04 NOTIFICATIONS

- A. **Notify OWNER:**
 - 1. A minimum of 5 days prior to the anticipated commencement of inspections in any one area and 24 hours in advance of actual start.
 - 2. When obstruction, restricting flow in pipeline, is discovered.
 - 3. If depth of flow in pipeline exceeds 25 percent of pipe diameter.
 - 4. If conditions for CCTV inspection are found to be unsafe or impractical.
 - 5. Pipe configuration in field is different than shown on maps. Notification shall include diagram clearly indicating location of structure in relation to immediately adjacent structures.
 - 6. Unsafe or impractical conditions for manual (walk-through) inspections.
- B. **Public Notifications:**
 - 1. Unless directed otherwise by the OWNER, an OWNER provided notice (door hanger) shall be provided to each residence and business within a minimum of two (2) full working days prior to any CCTV operations.
 - 2. **CONTRACTOR** shall, on a daily basis, document all distribution of flyers by tracking the date & address of the notification.
 - 3. **CONTRACTOR** shall complete work within five (5) working days of notification. If the work is not completed within five (5) working days the affected area must be re-notified.

PART 2. PRODUCTS

2.01 TELEVISION INSPECTION EQUIPMENT

- A. Inspection Vehicle:
 - 1. Equipped with monitoring equipment specifically compatible with the appropriate sewer inspection equipment.
 - 2. Equipped with safety backup alarm.
 - 3. Clearly marked with the inspection company name and phone number.

- B. Inspection Equipment:
 - 1. Monitoring Studio.
 - 2. Equipped with independent power source.
 - 3. Temperature controlled.
 - 4. Sufficient size to allow seating for a minimum of two people in addition to an operating technician.
 - 5. Secure, cable, chains, and other devices used with camera so as not to obstruct camera view or otherwise interfere with proper documentation of sewer conditions.
 - 6. Television Monitor:
 - a. Located in monitoring studio.
 - b. Capable of producing high quality color picture.
 - c. Resolution of no less than 350 lines.
 - d. Continuous display during inspection survey.
 - 7. Camera Transport Platform:
 - a. Self propelled, mounted on skid, or mounted on float.
 - b. Sized for each pipe diameter in accordance with manufacturers recommendations.
 - c. Equipable with tag line suitable for pulling camera backwards.
 - d. Equipable with winch, power winch, TV cable, powered rewind, or other devices used to move camera through pipe.
 - e. Remote Reading Footage Counter:
 - 1) Accuracy to two-tenths of a foot over length of pipe being inspected.
 - 2) Counter display located in monitoring studio.
 - 3) Marking on cable will not be allowed.
 - 4) Calibration shall be conducted each day prior to conducting any inspections.
 - 8. Television Camera:
 - a. Mounted on transport platform.
 - b. Explosion proof and operative in hazardous and corrosive environment.
 - c. Resolution capability: Minimum of 460 lines of horizontal resolution and 400 lines of vertical resolution. Resolution of camera should meet or exceed the resolution of the monitor.

- d. 360-degree rotation and 270-degree pan and tilt unit, with adjustable supports specifically designed and constructed for operation in connection with pipe inspection.
 - e. Lights shall be mounted on and turn in the direction of the camera head.
 - f. 65-degree viewing angle, minimum, and either automatic or remote focus and iris controls. Remote control adjustment for focus and iris shall be located in the monitoring studio.
 - g. Operative in 100 percent humidity conditions.
 - h. Ability to achieve proper balance of tint and brightness.
 - i. Focal Distance: Adjustable through range from 6 inches to infinity.
 - j. Zoom capable of 40:1 (10x optical, 4 times digital).
 - k. Minimum light sensitivity of > 1.5 lux.
 - l. Cameral Lighting:
 - 1) Minimize reflective glare.
 - 2) Remote variable intensity control.
 - 3) Lighting quality to provide clear, in-focus picture of entire inside periphery of pipe.
- C. Inspection Software:
- 1. The inspection software shall utilize software capable of providing complete survey reports, inspection database, and linked media files.
 - 2. The inspection software shall be the latest version of PACP (Pipeline Assessment and Certification Program) certified by NASSCO.
- D. CONTRACTOR shall maintain back-up equipment in the event that primary equipment fails so that work progress can continue.

2.02 RECORDING AND DOCUMENTATION

- A. Upon completion of CCTV inspection, all inspection data shall be transferred to External Hard Drive (HD) or DVD of sufficient capacity and compatibility with OWNER's equipment. The codec required for proper playback of the video file must be included on the external hard drive. DVDs may be used if approved by the OWNER.
- 1. Labeling: Provide printed label on outside of HD that indicates the following:
 - a. Name of OWNER.
 - b. Project Title.
 - c. Date of Inspection.
 - d. Inspection Company.
 - e. Deliverable Number.
 - f. List of asset IPID numbers included in the deliverable.

- B. Media:
1. Video:
 - a. Provide all inspections with a unique filename per inspection.
 - b. Encoded in .WMV, .MPG, or .AVI format.
 - c. Opening Screen: The following is an example of the required on-screen text display fields:
 - 1) Date & Time: (YYYY/MM/DD), (military time hh:mm).
 - 2) Surveyor's Name.
 - 3) Project Name.
 - 4) Sewer Subbasin No.
 - 5) Street Address & City.
 - 6) Upstream & Downstream MH No.
 - 7) Pipe Segment Reference: IPID.
 - 8) Direction of Inspection (Upstream or Downstream).
 - 9) Pipe Material.
 - 10) Pipe Height/Width (field measured): Height & Width (inches).
 - 11) Purchase Order No.
 - 12) Work Order No.
 - 13) Additional Information as needed.
 - d. Continuous View: The following is a list of required on screen text display fields.
 - 1) Inspection date & time.
 - 2) Continuous forward and reverse readout of camera distance from center of manhole starting reference.
 - 3) Pipe segment reference: IPID.
 - 4) Upstream & downstream manholes.
 - 5) Defect/observation code (when encountered).
 2. Audio:
 - a. Audio shall be embedded in the video file.
 - b. Operator shall include a description of the inspection setup, including related information from log form and unusual conditions.
 - c. Verbal description and location of each defect and service connection.
 - d. Operation changes (for example, remove roots and restart inspection at footage prior to root removal).
 3. Still photographs:
 - a. Provide digital photographs showing the inspection image at all defects, observations, and service connections.
 - b. Photos shall have a unique filename describing image.
 - c. Encoded in .JPEG format.
 - d. Minimum 640 X 480 resolution.
 - e. Provide label on front of photograph with pipe segment reference, upstream & downstream manholes, footage, and defect code.

- C. Database:
1. Asset information.
 2. Inspection information.
 3. Defect codes and scores.
 4. File type: MSAccess, .MDB, .ACCDB.
 5. Database format: NASSCO PACP Standard Exchange Database.
 6. All inspection media shall be linked to the corresponding asset/inspection/defect information within the database.
- D. Inspection Reports:
1. Provide PDF format inspection reports including:
 - a. Summary of the inspections completed.
 - b. Pipe graphs of each inspection showing asset information and defects/observations.
 - c. Header information listed below:
 - 1) Date & Time: (YYYY/MM/DD),(military time hh:mm).
 - 2) Inspection Company, Address, and Telephone.
 - 3) Surveyor's Name.
 - 4) Project Name.
 - 5) Sewer Basin Name.
 - 6) Sewer Subbasin No.
 - 7) Location Code (Light highway, easement, etc).
 - 8) Street Address & City.
 - 9) Weather:
 - 10) Upstream MH No.
 - 11) Upstream MH depth: (nearest tenth of a foot)
 - 12) Downstream MH No.:
 - 13) Pipe Segment Reference: IPID.
 - 14) Direction of Inspection (Upstream or Downstream).
 - 15) Pipe Material.
 - 16) Pipe Height/Width (field measured): Height & Width (inches).
 - 17) Pre-Cleaning: No / Yes – Jetting.
 - 18) Date Cleaned.
 - 19) Map Length.
 - 20) Surveyed Length.
 - 21) Survey Start & End Time.
 - 22) Purchase Order No.
 - 23) Work Order No.
 - 24) Pipe Shape.
 - 25) Date of Installation (if available).
 - 26) Additional Information as needed.
 2. Field maps corrected to reflect actual field conditions:
 - a. Neatly strike out wrong data using a green pen and clearly mark correct data using a red pen. Show notes that clarify changes in blue.

PART 3. EXECUTION

3.01 GENERAL

- A. Prior to televising, CONTRACTOR shall thoroughly clean the pipelines of debris, grease, roots, sediment, broken pipe, or other obstructions that could retard the movement of the television camera. If debris accumulates in the line prior to televising the pipe shall be cleaned again. Sewer cleaning shall be conducted in accordance with Specification 02540, Sewer Cleaning.
- B. Playback equipment shall be accessible in the monitoring studio for onsite review by the OWNER during the execution of the Work.
- C. TV inspection shall be done one sewer line section at a time, and the flow in the section being televised shall be suitably controlled. The depth of wastewater flow shall not exceed 25% in any pipe diameter. For new sewer lines, post-construction TV inspection shall be performed prior to releasing flow onto the pipe.
- D. When the depth of flow in the section being worked is above the maximum allowable for the television inspection, the flow shall be reduced to allowable levels by performing the inspection during minimum flow hours, with diversion pumping. Diversion pumping shall be conducted in accordance with Section 02542 Sewer Flow Control. Other flow reduction methods such as sewer plugging or pulling a high velocity jet nozzle ahead of the camera must be approved by OWNER.
- E. When flow in a sewer line is plugged, blocked, or bypassed; sufficient precautions must be taken to protect the sewer lines from damage that might result from sewer surcharging. Further, precautions must be taken to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.
- F. CONTRACTOR shall not be allowed to float the camera or conduct flushing activities during a CCTV inspection unless permitted by OWNER.
- G. For CCTV associated with construction projects where existing service laterals are to be connected to new sewers or reinstated to rehabilitated sewers, CONTRACTOR shall provide the street address for each lateral encountered and shall include this information in the inspection records. If there is question as to whether a service is active, CONTRACTOR, shall notify the OWNER and perform necessary investigations, including dye testing, to confirm the status of the existing connection.

- H. As directed by the OWNER, the CONTRACTOR shall record the GPS latitude and longitude (decimal degrees) coordinates using a portable GPS device in the field for the manholes used during the inspection, and include them in the inspection information in the database and summary report.
- I. Unknown manholes identified in the field shall be labeled with the downstream manhole number followed by a letter designation starting with "A". Subsequent upstream structures will be identified by adding "B", "C", and so on.
- J. Poor quality inspections including, but not limited to, loss of color, video distortion, outside interference, etc. will not be accepted by the OWNER. Re-inspection of the pipes that do not meet minimum requirements shall be performed at the CONTRACTOR's expense.

3.02 TELEVISION INSPECTION

- A. Prior to beginning inspection, the initial screen text step must have been completed and camera must still be positioned at the center of the manhole and with the axis at the centerline of the pipe. The inspection shall begin by facing the pipe segment to be televised and then pan/tilt/zoom as necessary to point the camera towards the manhole opening.
- B. Inspection shall be conducted in the direction of flow (upstream to downstream), except while the camera is being used in a reverse setup. A reverse is not allowed unless the inspection is prohibited by an obstruction or approved by the OWNER.
- C. If a reverse setup is required, establish new inspection separate from downstream (or normal) setup.
- D. Maintain a clear and clean camera lens. If material or debris obscures image or causes reduced visibility, clean or replace lens prior to proceeding with inspection.
- E. Camera Operation:
 - 1. 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 line section condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute.
 - 2. Stop, for a minimum of 5 seconds, at every lateral, defect, and observation and obtain a still photograph and description.
 - 3. Pan entire diameter or area of pipe at each defect and lateral connection to properly determine each defect condition and lateral status.
 - 4. Lens, lighting, and focus shall be readjusted in order to ensure clear, distinct, and properly lighted image of defect. A reflector in front of the camera may be required to enhance lighting in black pipe.

5. Camera lens shall remain above visible water line and may submerge only while passing through clearly identified line sags or vertical misalignments. Otherwise, the inspection shall be conducted at a time of lower flow or a flow diversion shall be conducted in accordance with this specification and Specification 02542, Sewer Flow Control.
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 communications between members of the crew.
7. The camera height shall be adjusted such that the camera lens is always centered in the pipe being televised.

3.03 REVERSE INSPECTIONS

- A. There may be occasions during the TV inspection of a sewer line section, when the camera will be unable to pass an obstruction even though flow is continuing. CONTRACTOR shall televise the manhole section from the downstream manhole in order to obtain a complete video inspection. Whenever such condition arises, OWNER shall be notified to determine if a point repair is necessary. No additional payment shall be made for reverse set-ups required due to an obstruction.
- B. Inspections shall be submitted in one continuous section from manhole to manhole, and not in broken pieces, unless specifically approved by OWNER.
- C. If an inspection cannot be completed due to multiple obstructions, the CONTRACTOR shall notify and provide the OWNER with the incomplete inspection. At the request of the OWNER the CONTRACTOR shall re-inspect the pipe after the necessary pipe repairs have been made. The decision to repair or not to repair a pipe shall always be made by OWNER. OWNER may accept physical inspection that does not adhere to minimum standards herein if adverse conditions are encountered and re-inspection is not advised. In such a case, enough data shall be provided to permit accurate assessment.
- D. OWNER makes no guarantee that all of the sanitary sewer mains proposed to be TV inspected after the cleaning, are clear for the passage of the camera set-up. The equipment, tools and method(s) used for securing the passage of the camera are to be at the discretion of CONTRACTOR, with the approval of OWNER.

3.04 MEASUREMENT

- A. All measurements shall be recorded in English units.
- B. Obtain pipe diameter by physical measurement in the upstream or downstream manhole by using a calipers or measuring rod.

- C. Continuous Distance Meter:
 - 1. The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed.
 - 2. Accuracy must be within plus or minus 2 tenths of a foot tolerance and shall be checked on a daily basis by use of a walking meter, roll-a-tape, or other suitable device. Accuracy shall be satisfactory to OWNER.
 - 3. Shall be zeroed after each segment inspected.
 - 4. Defect identifications are to be called out and recorded to the nearest tenth of a foot.
 - 5. Inspection will be unacceptable if measurement is inaccurate, or identified defects or features leave doubt as to the accuracy of locations or total length.
 - 6. Measurement shall be zeroed after each segment inspected.

3.05 DOCUMENTATION

- A. Asset and Inspection Information:
 - 1. All asset and inspection information (header information) shall be entered in the database in accordance with the NASSCO PACP version manual.
 - 2. When required by the OWNER, GPS coordinates recorded from the field for the upstream and downstream manholes shall be included in the “Additional Information” fields in the database.
 - 3. All digital videos will become the property of OWNER.
- B. Observation and Defect Coding:
 - 1. All defects and observations shall be coded in the inspection records in the database in accordance with the NASSCO PACP version manual.
 - 2. All defects and observation codes shall be linked to the corresponding media within the database.

3.06 QUALITY CONTROL

- A. CONTRACTOR shall submit in electronic format digital videos, photos, and evaluation reports, to OWNER for review. CONTRACTOR is required to investigate or correct issues noted by the OWNER during review and submit corrected deliverables.

END OF SECTION