

ITEM 40

SEWER VIDEO RECORDING AND INSPECTION

1.0 DESCRIPTION. The Contractor shall provide all labor, materials, and equipment necessary to perform an internal closed-circuit television (CCTV) inspection of the sewer piping and laterals in accordance with the plans and as specified within, or as designated by the *Engineer*.

- A. The Contractor shall perform the sewer televising work as necessary to thoroughly document the condition of all sewers, and service lateral connections in the study area. The sanitary sewer and service laterals shall be carefully inspected to determine conformance to the drawings and quality of installation.
- B. It is required that the sewer lines to be televised be cleaned and flushed no more than 48 hours before the taping occurs. Cleaning and flushing shall be scheduled 48 hours in advance in order that a Stark County Resident Representative can be present at all times during cleaning and flushing. A “Vac Truck” is required to vacuum up all debris during cleaning and flushing for each reach at the downstream manhole.
- C. New Work - Video recording and inspection shall be performed after new sewer installation work.
 - 1. Permission to initiate inspection must be approved by the *Engineer*. All inspection documents shall be reviewed and approved by the *Engineer* prior to acceptance, which occurs upon project completion.
 - 2. Inspection of newly installed sewers (not yet in service) shall not begin prior to completion of the following:
 - a. Pipe air testing
 - b. All manhole work, including installation of inverts
 - c. Installation of all lateral services
 - d. Vacuum tests of all manholes
 - e. Mandrel Testing of sewers

2.0 SUBMITTALS.

A. Reference Standards.

- 1. All work shall meet or exceed the requirements of the National Association of Sewer Service Companies (NASSCO) Recommended Specifications for Sewer Collection System Rehabilitation (latest edition), except as otherwise specified herein.

B. Shop Drawings. This section is not applicable.

C. Calculations. This section is not applicable.

D. Certifications. This section is not applicable.

E. Deliverable Items. The following deliverables shall be submitted on a USB flash drive at the completion of inspection. Alternatively, a county approved, secure online file transfer platform may be used.

1. Inspection videos in MPEG or Windows Media video format.
2. Electronic version (.pdf) of the pipe inspection reports.
3. PACP export pipe inspection database (.mdb).
4. Map of sub area depicting area inspected, inspection status, asset identification numbers and mark ups.
5. QA/QC report.

F. Inspection Forms.

1. Inspection forms shall be kept by the Contractor showing the location, in relation to adjacent manholes of: each infiltration point, laterals, services, joints, voids, unusual conditions, roots, deposits, scale, corrosion, changes of pipe (material, size, shape, slope), and other discernible features. Each inspection form submitted shall contain header information and an inspection details section, both in accordance with PACP criteria.
2. A separate inspection form shall be provided for each complete sewer length between manholes, unless directed otherwise by the *Engineer*. The inspection forms will be put into a final report. Two copies of the final report shall be submitted to the *Engineer*.

G. Video Recordings.

1. All video recordings shall be identified by location, date of inspection, upstream and downstream MH number (based on **County** nomenclature) of the sewer mains contained on the disk, project name, and Contractor's name in a manner acceptable to the *Engineer*.
2. All media shall be at least high definition quality and premium grade equal or greater than what other contractors regularly engaged in CCTV work produce.
3. All video recordings shall have a continuous on-screen display indicating sewer section identification and distance from the entering manhole, on screen display identifying laterals and any pipe defects which shall be coordinated with the inspection forms. The video recording shall be organized so that line sections are in order from upstream to downstream unless approved by the *Engineer*.
4. The Contractor shall give the *Engineer* a minimum 48-hour notice before beginning any video recording of the sanitary sewers on the subject project so that an owner's representative can be present during video recording.
5. Video recording shall occur **during normal working hours** unless the contractor makes other arrangements with the *Engineer*. Video recordings

submitted for approval shall be the recordings completed with inspector present.

3.0 MATERIALS. Only materials approved by the Stark County Metropolitan Sewer District may be used on this project.

A. Video Inspection Reports.

1. Contractor shall provide all video inspection reports and CCTV on USB flash drive(s). Said drive(s) shall be sufficiently sized to handle all reporting and video documentations. Alternatively, a county approved, secure online file transfer platform may be used.
2. USB shall be labeled to properly indicated the reporting and videoing perimeters.
3. NO sewer reaches and/or sewer system reports shall be split between two USBs.

B. Equipment. All equipment utilized in the videoing of the sewer system or creating the sewer reports shall adhere to the following:

1. The television camera shall be specifically designed and constructed for sewer inspection with a capacity for radial viewing (360°) to allow proper inspection of service lateral connections.
 - a. The radial view camera must be solid state color and have remote control of the rotational lens. The camera shall be capable of viewing the complete circumference of the pipe. Cameras incorporating mirrors for viewing sides or using exposed rotating heads are not acceptable.
 - b. The camera lens shall be an auto-iris type with remote controlled manual override. Lighting for the camera shall illuminate the entire periphery of the sewer for a distance of 15 feet ahead of the camera.
 - c. The camera shall have a minimum resolution of 600 lines and shall be operable in 100% humidity conditions. Communications shall be provided for controlling the winches, pumping unit, and monitor control.
2. Picture Quality: The camera, monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the *Engineer*. The television camera, electronic systems and monitor shall provide an image that meets the following specifications, or approved equal.
3. Lateral cameras may be push type or launched from the sewer main line. Lateral cameras shall record in color, be self-leveling, and equipped with a footage counter to provide on screen display of footage measurement.
 - a. Monitor resolution shall be as specified above in Section 3.b.2; Picture Quality, or approved equal.
4. The video and audio recordings of the sewer inspections shall be made using digital video equipment. A video enhancer may be used in conjunction with, but not in lieu of, the required equipment.

The digital recording equipment shall capture sewer inspection on USB flash drives, with each sewer reach inspection recorded as an individual movie file (.MPEG, .MPG, or .WMV) or approved equal. The video files will be named in accordance with the SCMSD file naming convention.

- a. The video file names will be referenced in the inspection database and in an inspection report generated in PDF format. The pipeline collection and real time video capture and data acquisition systems shall be provided.
- b. The system shall use the most current PACP compliant application software and shall be fully object oriented or approved equal. It shall be capable of printing pipeline inspection reports with captured images of defects or other related significant visual information on a standard color printer.
- c. The imaging capture system shall store digitized color picture images and be saved in digital format on a USB flash drive or approved equal. Also, this system shall have the capability to supply the County with inspection data reports for each line segment.
- d. The Contractor shall have the ability to store the compressed video files in industry standard and approved County format and be transferable with the PACP compliant inspection database.
- e. The contractor's equipment shall have the ability to "Link". "Linking" is defined as storing the video time frame code with each observation or defect with the ability to navigate from/to any previously recorded observation or defect instantaneously.
- f. The system shall be able to produce data reports to include, at a minimum, all observation points and pertinent data. All data reports shall match the defect severity codes in accordance with PACP naming conventions.
- g. The data-sorting program shall be capable of sorting all data stored using generic sort key and user defined sort fields.
- h. Camera footage, date & manhole numbers shall be maintained in real time and shall be displayed on the video monitor as well as the video character generators illuminated footage display at the control console.
- i. 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.
- j. The digital recording shall include both audio and video information that accurately reproduces the original picture and sound of the video inspection.
- k. 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 to produce an oral report that is clear and discernible.
- l. Inspection software shall be PACP compliant versions of CUES Granite XP, WinCam,, or approved equal.

- m. The CCTV equipment/software shall be capable of producing digitized images of all sewer line defects, manhole defects, and sewer line service connections in .jpeg format.
- n. The Contractor shall take digital still images of each defect, construction feature and service connection to clearly depict it. More images may be necessary depending upon the condition of the pipe.

4.0 EXECUTION. All work shall be done in accordance with the following requirements.

A. Contractor's Qualifications.

- 1. The sewer inspection Contractor shall be a firm having a minimum of three (3) years continuous successful experience in the inspection of sewers similar to that required for this project.
- 2. All internal inspection shall be done by persons and/or firms qualified and approved by the Sanitary Engineering Department.

B. Job Conditions. The Contractor performing video recording and inspection will be required to coordinate his work with other trades.

C. Television Inspection.

- 1. General requirements:
 - a. Prior to inspection the Contractor shall obtain pipe and manhole asset identification numbers from the County to be used during inspections. Inspections performed using identification numbers other than the County-assigned numbers will be rejected.
 - b. Video recording shall be performed after sewer cleaning. (Item 52) The sewer to be televised shall be pumped out so that minimal water is standing in the bottom of pipe and only bellies and depressions will hold water.
 - c. All lines, strings, ropes, plugs or other equipment necessary to the internal inspection of the sewer system shall be removed from the sewer after the work is performed. All damage to the existing county sewer system, the new sewer, county sewer customers, or other incidental damages resulting from the internal inspection or remaining inspection equipment shall be the responsibility of the contractor.
 - d. Where sags or submerged sections of the sewer are encountered during TV inspection, the contractor shall first complete inspection of the entire reach to determine the extent of such areas prior to dewatering the sewer. Dewatered sections of the sewer shall then be TV inspected.
 - e. On all sewer mains which have sags or dips, to an extent that the television camera lens becomes submerged during the television inspection, the contractor shall use a high-pressure cleaner after the dip or sag is discovered to draw the water out of the pipe, or other means, to allow inspection of the

pipe and identification of pipe defects, cracks, holes and location of service connections

2. Televising:
 - a. The Contractor shall perform sewer televising work within 24 hours of said sewer being cleaned. If said sewer is not televised within the required 24-hour time limit, the sewer shall be re-cleaned prior to televising at no additional expense to the Project/County.
 - b. The inspection will be done one sewer section at a time (manhole to manhole) and the section being inspected will be isolated from the remainder of the sewer system.
 - c. Measurement for location of laterals, defects, and other features shall be at the ground level by means of a metering device. Measurement will be accurate to one foot per 100 feet of inspected pipe. The importance of accurate distance measurements is emphasized. Marking on the cable or the like which would require interpolation for depth of manhole, will not be allowed. Accuracy of distance meter shall be checked by use of a Kevlar tape. A measuring target or sealing packer in front of the television camera shall be used as the measurement reference point, and the meter reading shall show the location of the measurement reference point.
 - d. Throughout the duration of this project, should the *Engineer* discover inaccuracies in the videos, the Contractor shall re-video those segments at no additional cost to the County.
 - e. The CCTV camera shall be positioned as close to the spring line as possible while maintaining the required equipment stability.
 - f. Wherever possible the inspections shall be performed in the upstream to downstream direction. All sewer segments shall be recorded in a logical order in the same direction they are cleaned and televised.
 - g. The camera shall be directed through the sewer in a downstream direction, with the flow, at a uniform, slow rate. In no case will the video camera record while moving at a speed greater than one half foot per second (0.5 fps) or 30 feet per minute. If, during the project, the inspection is rejected due to camera speed, the inspection recordings shall be redone, at no additional cost to the County.
 - h. If a manhole is discovered in the field that was not on current maps, a new manhole identification number will be assigned by the Contractor. He shall assign the manhole the next number above the highest manhole number within the sub area. The data / video files shall then be re-named to include the new MH ID, and a new CCTV inspection shall be started from the new MH ID. Contractor shall consult with the *Engineer* for assignment of new manhole identification numbers.
 - i. After the sewer line has been cleaned and prior to videotaping, a minimum of 500 gallons or an amount of water as directed and witnessed by the *Engineer* must be poured into the upstream manhole of the sewer reach to be videotaped to a point that the water can be seen entering the furthest

downstream manhole. Sufficient time shall be allowed, as determined by the *Engineer*, for the water to drain to the downstream manhole before the video recording begins. This work must be scheduled with the *Engineer* 24 hours in advance.

- j. The survey unit shall be slowed, stopped, or reversed to perform detailed inspections of significant features. The camera shall be stopped at all defects, changes in material, water level, size, side connections, manholes, junctions, or other unusual areas. When stopped at the defect or feature, the operator shall pan the camera to the area and along the circumference of the pipe.
- k. The camera unit shall be paused long enough at areas suspected of leaking to determine if a leak exists currently.
- l. The operator shall also record audio of the type of defect or feature, clock position, footage, extent or other pertinent data.
- m. Digital photographs or screen captures shall be taken at all laterals, defects and general condition photographs shall be taken at least every 200 feet.
- n. At the contractor's discretion or direction of the *Engineer*, the camera shall be stopped or backed up (when conditions allow) to view and analyze conditions that appear to be unusual or uncommon for a sound sewer. The lens and lighting shall be readjusted, if need be, in order to ensure a clear, distinct, and properly lighted feature.
- o. Audio shall be recorded during each inspection by the operating technician, electronic voice text recognition or approved equal on the inspection video as the sewer is inspected and shall include the sewer location, identification of beginning and terminating manholes including location (address or cross streets), inspection direction, length of inspection, side sewer identification, flow information, complete descriptions of the sewer line conditions as they are encountered, description of the rehabilitation work, reason for termination, and other relevant commentary to the inspections. Voice descriptions should be made:
 - i. At points of pipe failure or weakness.
 - ii. At Points of infiltration.
 - iii. At points of infiltration.
 - iv. At the location of service connections.
 - v. At points of debris, mud and standing water.
 - vi. At points of deformed pipe, poor joints, bad or damaged fittings
 - vii. At points where unusual conditions are noted.
 - viii. At points where digital still photos are taken.
- p. In addition, the audio reports shall include the distance traveled on the specific run, a description of abnormal conditions in the sewer and side sewer connections as they are encountered, explanations for pausing, reversing, or stopping the inspection, and the final measured center to center distances between consecutive manholes. The audio portion of the composite video shall be sufficiently free from electrical interference and background

noise to provide complete comprehension of the oral report. Audio dubbing after the inspection is prohibited.

- q. Video recordings shall include a continuous video display / readout of similar information, as described in Section 4.0, J., 2., a. A separate digital video file shall be made for each pipe reach inspected.
 - r. Contractor shall coordinate with the *Engineer* prior to commencement of work to ensure inspection is accomplished in a manner acceptable to *Engineer*.
 - s. If any portion of the video and/or audio recording is of poor quality, the *Engineer* has 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 *Engineer*.
 - t. Measurement for location of defects and actual length of pipe shall be by means of a calibrated meter on the camera with a digital readout on the video monitor. This display shall be included in the video recording.
3. Laterals
- a. Lateral inspections shall be performed from the main line using a lateral launch camera. Lateral camera travel measurements shall be displayed on screen and on the captured video.
 - b. If lateral inspections are performed from the sewer main as part of the main line inspection, the lateral shall be logged in the main line inspection report per PACP requirements and the “comment” field of the main line inspection report shall be used to document the lateral identification number, defects observed, location (in feet) of all lateral defects, connecting pipes and clean outs. If lateral inspections are not performed as part of the main sewer inspection, a separate PACP pipe inspection record shall be created for each lateral. Refer to paragraph 4.00.H for numbering requirements.

D. Linear Measurement.

1. Counter Measurement. The CCTV camera footage counter shall be zeroed at the beginning of each inspection. The survey unit location entered on the footage counter at the start of the inspection shall allow for the distance from the accepted start of the length of the sewer to the initial point of observation of the camera (pre-set footage). In the case of resuming an inspection at an intermediate point within a sewer reach, the footage counter shall be set to start at the distance from the upstream maintenance hole to that point, as previously recorded by the counter. The Contractor shall ensure that the footage counter starts to register immediately when the survey unit starts to move.
2. Lateral Camera. The lateral camera shall be pushed from the main camera through the lateral to the termination point and be equipped with a footage counter to display and record inspection footage. Maximum rate of travel shall be 30 feet per minute when recording.

3. Measurement Compliance. Prior to commencing inspections, the Contractor shall demonstrate compliance with the linear measurement tolerance specified below:
 - a. The equipment shall measure the location of the camera unit in 1-foot increments from the beginning (upstream end) of each continuous section. This footage location must be displayed on the CCTV monitor and the final video.
 - b. The accuracy of the measured location shall be within + 0.5% of the actual length of the sewer reach being surveyed, or 1 foot, whichever is greater.

E. Measurement of Sags.

1. Depth Measurement. The CCTV camera shall be equipped with a measuring device capable of accurately measuring the depth of standing water up to 3 inches. The measuring device shall be mounted to the front of the unit and the depth shall be capable of being visualized as the unit advances through the pipe.

F. CCTV Monitor Display.

1. View. The images displayed on the CCTV monitors will be a view of the pipe above the water surface as seen by the CCTV camera as the unit is conveyed through the sewer.
2. Lighting. The camera lighting shall be fixed in intensity prior to commencing the survey and the white balance set to the color temperature emitted. To ensure color constancy, no variation in illumination shall take place during the survey.
3. Equipment Test. The video equipment shall be checked using an approved test card with a color bar prior to commencing each day's survey. The camera shall be positioned centrally and parallel to the test card at a distance where the full test card just fills the monitor screen. The card shall be illuminated evenly and uniformly without any reflection.

G. Data Displays.

1. Initial Display. The CCTV display shall include an initial data display that identifies the sewer reach being surveyed and a survey status display that provides continuously updated information on the location of the survey unit as the survey is being performed. The data displays shall be in alphanumeric form. The size and position of the data shall not interfere with the main subject of the monitor picture.
2. Foreground and Background. The on-screen display should be white during inspections where the background behind the display is dark and, conversely, black where the background is light.
3. Required Data Information. At the beginning of each reach of sewer being inspected, the following information shall be electronically generated and displayed on the CCTV monitors as well as included in the audio track:
 - a. Date of survey

- b. Inspection company name and inspector
 - c. Street name or location
 - d. Manhole number to manhole number (in order of inspection)
 - e. Direction of survey (upstream or downstream)
 - f. Time of start of survey
4. Required Electronic Information. **During inspections, the following information shall be electronically generated, automatically updated, and displayed on the CCTV monitors.**
- a. Survey unit location in the sewer line in feet and tenths of feet from adjusted zero.
 - b. Sewer diameter.
 - c. Upstream and downstream manholes reference numbers as per approved drawings or County GIS.
 - d. During lateral inspections the video display shall contain the lateral location and the footage of the camera from the main or cleanout.

H. Deliverables.

1. Required Deliverables: The Contractor shall submit the following deliverables at the completion of inspection.
 - a. Inspection Reports to include:
 - i. Inspection session header information (see required fields below).
 - ii. Defect log report including photo captured from CCTV video.
 - iii. Schematic drawing of pipe showing all observations and defects.
 - b. Inspection video files on USB flash drive(s), typed labels shall be attached to each USB flash drive. Alternatively, a county approved, secure online file transfer platform may be used. The typed index labels shall include the following information.
 - i. Content (CCTV)
 - ii. Contractor name
 - iii. Purpose of Survey
 - iv. Tributary Pump station number
 - v. Reaches included (from Manhole Number ## to Manhole Number ##)
 - vi. Date of survey
 - vii. Contract Number / Delivery Order Number (if applicable)
 - c. Sewer video files shall be MPEG or Windows Media Files and named according to the project number and County assigned manhole numbers separating each sewer reach recorded.
 - d. Lateral connection inspection video files shall also be MPEG or Windows Media File named according to the project number and street address or parcel number served.
 - e. Electronic Inspection Data stored and exported in a NASSCO Pipeline Assessment and Certification Program (PACP) compliant Microsoft Access database (.MDB) version 4.4 or newer delivered on a USB flash drive or county approved, secure online file transfer platform.

- f. Inspection photographs digital files (jpeg) indexed to NASSCO PACP compliant database.
- g. Map of sub area depicting area inspected, inspection status, asset identification numbers and mark ups.
- h. Inspection data noted above shall be provided to the Engineer weekly throughout the inspection work.
- i. Contractor Quality Control report detailing data validation performed, pipe inspection records reviewed and results.
- j. Sections of a single segments of sewer main shall not be recorded to more than one USB. Video footage of recorded segments shall be grouped by area and shall be submitted in sequential order relating to the area mapping designation.
- k. The CCTV data stored, shall be delivered to the County labeled with project information once approved by the Engineer. The video media and file nomenclature shall clearly indicate the date of the inspection, the designated segment(s) of sewer mains(s) contained on the media, the name of the project, the project number, the pump station number, and Contractor name. The video media shall contain separate digital files for each manhole-to-manhole section.
- l. The database shall be comprehensive for the entire project, and additional data shall be added to the database each week.

I. Manhole Numbering, Inspection Forms Observation and Defect Codes.

1. Manhole Numbering. The Contractor will be required to use the manhole numbering as shown on sewer maps provided by the County when performing the inspections for this project.
2. Defect Codes. The County inspection forms and standard defect codes shall be used. The defect codes, inspection forms, inspection database and inspection protocols shall be in accordance with the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP).
3. Inspection Order. When lateral inspections are not performed as part of the main sewer inspection, the main sewer inspection shall be performed first to obtain the distance (in feet) and clock positions needed to identify the lateral.

J. Reporting Format.

1. Report Format. The CCTV system shall be capable of printing pipeline inspection reports with pipeline schematics and captured images of defects and other related significant visual information. The system shall have the ability to display any combination of the following formats and features simultaneously.
2. The following information is mandatory for all inspections:
 - a. Inspection Information – Refers to the area of pipe to be inspected between two manholes or the address of the lateral to be inspected.
 - i. Project Name
 - ii. Surveyed by (Operator/Surveyor’s name)
 - iii. Operator/Surveyor Certification number
 - iv. System Owner

- v. Date
 - vi. Drainage Area (tributary pump station number)
 - vii. Time:
 - viii. Sheet number (report sheet number)
 - ix. Street Name & Number
 - x. Locality (Stark County)
 - xi. Additional Location Information (e.g. backyard, parking lot, etc.)
 - xii. Upstream Manhole Number (County Standard Asset Number)
 - xiii. Upstream MH rim to invert depth
 - xiv. Downstream MH Number (County Standard Asset Number)
 - xv. Downstream MH rim to invert depth
 - xvi. Direction of inspection (Upstream or Downstream)
 - xvii. USB flash drive Identification Number
 - xviii. Flow Control (e.g. plugged, lift station, bypassed, not controlled)
 - xix. Type of Pipe
 - xx. Pipe Height
 - xxi. Pipe Width
 - xxii. Pipe Shape
 - xxiii. Pipe Material
 - xxiv. Pipe Joint Length
 - xxv. Purpose of Inspection (new line, year-end warranty, CIP R/R project etc.)
 - xxvi. Pre-Cleaning (jetted, heavy cleaning, no pre-cleaning)
 - xxvii. Media Number (Video file name)
 - xxviii. Weather
 - xxix. Additional information/Comments
- b. Observation Data – Refers to the portion of pipe where an observation is discovered. Observations shall be noted by text descriptions and defect code number using PACP defects codes, still frame pictures and video clips captured and recorded. Each observation shall include the following.
- i. Actual observation footage
 - ii. Video reference
 - iii. Location of defect; clock position
 - iv. Code (Group/Descriptor/Modifier/Severity)
 - v. Whether it is a continuous defect
 - vi. Whether the defect occurs at a joint
 - vii. Severity level
 - viii. Flash drive Identification number
 - ix. Flash drive counter
 - x. Final footage
 - xi. Video clip ID for each observation
 - xii. Image reference (file name of photos)
 - xiii. Remarks (as appropriate or needed)

- c. Formats - Standard and/or custom designed reports shall have the following formats available and shall be able to be produced in hard copy or viewed on the monitor.
 - i. Site Observation: Displays detailed site observation reports in landscape or portrait views.
 - ii. Directory Report: Displays a list of all the projects sorted by pump station number and manhole number.
 - iii. Picture Reports: Displays site data and includes full size single photos or half size double photos of discrepancies.
 - iv. Pipe Run: Displays a graphical display of the site indicating distance (in feet), observations, and comments.
 - v. Project Data: Displays the project, client, and contractor information.
 - vi. Custom Sort: Creates user-defined reports of selected site, project, and observation data.

K. Physical Inspection for Man-Entry Size Sewers, 48” and Larger.

- 1. General Illustration of Sewer Interior.
 - a. The CCTV camera shall be positioned to reduce the risk of picture distortion. In circular sewers the camera will be centered and oriented to look along the axis of the sewer. In non-circular sewers, picture orientation shall be taken at mid-height, unless otherwise agreed, and centered horizontally.
 - b. The CCTV camera shall be positioned so that the long side of the photograph or video frame is horizontal.
- 2. Camera Position – Laterals/Specific Defect: A means of accurately locating the photographic or camera’s footage and any recorded lateral or defect, along the sewer shall be provided, to an accuracy of ± 1% or 6 inches whichever is the greater.
- 3. When requested by the Engineer in writing at any time during a survey or inspection, the Contractor shall demonstrate compliance with the above tolerance. The device used by the Contractor to measure the footage along the sewer will be compared with a standard tape measure. The results will be noted.
- 4. If the Contractor fails to meet the required standard of accuracy, the *Engineer* shall instruct the Contractor to provide a new device to measure the footage. The *Engineer* retains the right to instruct the Contractor in writing to re-survey those lengths of sewer inspected with the original measuring device at no extra cost.
- 5. Photographic Quality: The CCTV system and suitable illumination shall be capable of providing an accurate, uniform and clear record of the sewer internal condition. In-sewer lighting standards shall meet the requirements of the PACP and applicable codes regarding safety and power.

L. CCTV and Man-Entry Survey Data Specification.

- 1. Survey Reporting.
 - a. The Contractor shall submit to the Engineer two printed “Full English” reports including summary statistical breakdown of all defects encountered.

All video and survey information shall be provided in electronic form utilizing a Microsoft Access compatible database. The supplied data and information shall remain the property of the *Engineer*.

- b. The report shall be computer validated using PACP-compatible software approved by the *Engineer*.
 - c. When requested, the Contractor shall provide a hard copy output or manually completed site coding sheets at the time of the survey and shall forward copies of these sheets to the *Engineer*, preferably each day, but at least every other day, together with a daily report on progress.
2. Site Coding Sheets.
- a. Each sewer length, i.e. the length of sewer between two consecutive manholes, shall be entered on a separate coding sheet or entered separately electronically.
 - b. Thus where a Contractor elects to “pull through” a manhole during a CCTV Survey or “walk through” during a Man Entry survey a new coding sheet shall be started at the manhole “pulled or walked through” and the footage re-set to zero on the coding sheet. Where a length of sewer between consecutive manholes is surveyed from each end (due to an obstruction) two coding sheets should be used. Where a length of sewer between two consecutive manholes cannot be surveyed or attempted for practical reasons a (complete header) coded sheet shall be made out defining the reason for abandonment.
 - c. At uncharted manholes a new coding sheet must be started and the footage re-set to zero.
3. Measurement Units: All dimensions shall be in feet and tenths of a foot. Measurement of sewers shall be to the nearest tenth of a foot.
4. CCTV and Photographs
- a. Still photographs (JPEG format) shall be taken of all defective laterals and pipeline defects. Where a defect is continuous or repeated the photographs shall be taken at the beginning and end of the defect.
 - b. CCTV Photographs must clearly and accurately show what is displayed on the monitor, which shall be in proper adjustment.
 - c. Still photographs shall be durable and clearly identified in relation to the photograph number (cross referenced to the site survey sheet) street location, sewer dimensions, manhole start and finish numbers, survey direction, footage and date when the photograph was taken.
 - d. The annotation shall be clearly visible and in contrast to its background, shall have a figure size no greater than 14 points, and be type printed in upper case.
 - e. The annotation shall be positioned so as not to interfere with the subject of the photograph.
5. Control Sample Photographs: The *Engineer* may issue a written instruction to the Contractor to provide a sample of the photographs and/or CCTV recording taken during the contract period, which the Contractor shall provide within 5 working days of receiving the written instruction.

5.0 ELECTRICAL. This section is not applicable.

6.0 QUALITY ASSURANCE. The contractor shall provide the following quality assurance procedures to assure all CCTV inspection was properly conducted during this project in accordance with the following requirements below.

A. Testing.

1. Inspection deliverables will be validated to check conformance with the specified requirements for file names, formats, quantity, resolution and data table references in addition to checks for null fields, asset numbers, duplicate records, connectivity, material, size, and depth
2. Any data not passing the data validation checks will be rejected and returned to the Contractor.
3. Poor quality videos which do not clearly show the pipe condition will not be accepted.
4. The Contractor shall document all internal sewer inspections via video recordings, digital photos and a database that is compatible with the NASSCO PACP exchange database.
5. Inferior work will be rejected. Repeated inferior work will result in suspension from the approved list of firms for this work. Suspension shall stay in effect until evidence is presented that deficiencies have been corrected.

B. Observation.

1. Inspection submittals will be reviewed for quality control. A minimum of 5% of the submitted inspections will be randomly reviewed. A quality control check will be performed for each CCTV operator and each operator must exceed 90% accuracy.

C. Warranty. This section is not applicable.

D. Re-inspection.

1. Throughout the duration of the project, should the *Engineer* discover inaccuracies in data or quality issues with any of the videos, the Contractor shall re-inspect those segments at no additional cost to the Project.
2. The *Engineer* will provide comments regarding acceptance of the data within 21 days of receiving the data from the Contractor. Neither the CCTV inspections nor the WORK inspected is accepted by the County until such time that an acceptance letter is issued by the County.

7.0 MEASUREMENT. Method of measurement for all work completed under this specification shall be per lineal foot of internal television inspection (CCTV) of repaired and or new sewer mains to include all subsequent reports as indicated in the above specifications.

8.0 PAYMENT. The unit price stipulated per lineal foot for internal television inspection (CCTV) work on repaired and/or new sewer mains televised to include all required reports and deliverables as indicated within the specifications as written.

- A. All costs incurred for internal inspection, re-inspection, repairing, cleaning, etc. shall be paid by the contractor. Any incidental associated costs incurred by the SCMSD shall also be paid by the Contractor prior to sewer system acceptance by the SCMSD.
- B. The unit price stipulated per lineal foot of internal television inspection of new sewers shall be for the final inspection videos of the sanitary sewer included on the project. All initial recording and any re-recording before the videos are accepted by the County shall be at the contractor's expense.
- C. The cost of the CCTV work shall be a separate item on new pipe installations.

<u>Item</u>	<u>Unit</u>	<u>Description</u>
40	LF	Internal Inspection of New __" Gravity Sewer, Complete
40	LF	Pre-Internal Inspection of ___" CIPP Sewer, Complete.
40	LF	Post Internal Inspection of ___" CIPP, Pipe Bursting or Gravity Sewer, Complete.

END OF SECTION