(Revised October 20, 2021)

# SECTION 01510

# SANITARY SEWER MAIN TELEVISION AND INSPECTION (CCTV)

## PART 1 — GENERAL

### 1.01 SECTION INCLUDES

This section includes guidelines and requirements for CCTV Inspection. CCTV inspection identifies structural defects, maintenance concerns, and actual and potential sources of I/I in mainline sewers, service laterals, and manholes. CCTV inspection will also be used to verify installed assessment, cleaning, rehabilitation and/or replacement work as required.

### 1.02 REFERENCES

**A.** Codes, Specifications, and Standards - NASSCO – National Association of Sewer Service Companies – Pipeline Assessment Certification Program (PACP) Reference Manual, Version 7.0 or latest version.

**B.** Manual for Uniform Traffic Control Devices (MUTCD) standards

**C.** Attachment A – PACP Standard Exchange Database Anticipated Inspection Header Form Attribute Guidance Table (CCTV) (Reference NASSCO PACP Reference Manual, Version 7.0 for related information.

### 1.03 RELATED SECTIONS

**A.** Section 01056 – GPS Data Collection

**B.** Section 01320 - Progress Reports, Video’s & Photographs

**C.** Section 01520 – Sewer Flow Control

**D.** Section 02607 - Manhole Height Adjustment

**E.** Section 02956 – Sanitary Sewer Cleaning

### 1.04 DEFINITIONS

**A.** Television Inspection: Operation necessary to complete a true-color audio-visual inspection verifying existing internal pipe conditions including pipe materials, pipe grade, connections, cracks, leaking joints, seepage and roots. Contractor shall furnish all labor, materials, equipment, tools, and other incidental services for CCTV.

**B.** MPEG: MPEG (pronounced M-peg), which stands for Moving Pictures Experts Group, is the nickname given to a family of International Standards used for coding

audio- visual information in a digital compressed format. For the purposes of this specification, MPEG shall be defined as an ISO-MPEG Level 4 standard (MPEG- 4) digital audio-visual coding having a minimum resolution of 500 lines. All video files shall be named using .mpg or .wmv as the file extension.

**C.** External Hard Drive: For the purposes of this specification, an external hard drive is a peripheral auxiliary device connected to the computer via a high-speed interface cable. The interface cable allows the external hard drive to communicate with the computer so the data may be passed back and forth. The Contractor will deliver all inspection standard exchange databases, digital reports and media to the Owner/Program Manager on an external hard drive compatible with the Owner and Program Manager's equipment and software and will provide adequate storage to contain all deliverables as outlined in the Specifications.

**D.** Buried Manhole: A manhole where the manhole cover (lid) is not visible at ground surface. Buried manholes usually require removing the material (excluding light dirt and plant material) covering the manhole lid and raising the manhole frame and cover (lid). All buried manholes on the sanitary systems shall be reported for rising following their location discovery by the Contractor (Reference Specification Section 02607). Subsequently, the raised manholes shall be inspected.

## 1.05 SUBMITTALS

**A.** Submittals are to be in color PDF format for printed documents as well as other required formats when applicable for digital transfers.

**B.** Submit one example video on external hard drive of previous sewer inspection work that shows operational and structural defects in sewers, complete with audio commentary and inspection log(s).

1. Videos and inspection logs will be reviewed by Program Manager to determine if quality of CCTV image is acceptable, if defects were properly identified, picture clarity, advancement speeds and lighting are acceptable and documented according to industry standards and the Program Manager's requirements.

2. Modify equipment and/or inspection procedures to achieve report material of acceptable quality.

3. Do not commence Work prior to approval of report material quality by the Program Manager. Upon acceptance, report material shall serve as standard for remaining Work.

**C.** Records reports shall include a separate report for each pipe segment showing inspection setup data, each defect and locations of laterals, and other coded information. Also, each report shall include photographs of moderate and severe defects. Each report shall also note the labeling number of the corresponding video recording of that pipe segment. The video record of the pipe inspections shall be provided digitally on an approved mass storage device. These records shall include all video information and narrations. The video files shall have a unique name referenced in the PACP inspection database. The file name shall include manhole

ID numbers for upstream and then downstream manholes as the start of the file name. It is preferred the direction of the inspection and inspection date be included as well.

**D.** Camera specification sheet

**E.** References: Contact names and telephone numbers

**F.** List of staff and equipment to be used on this Project

**G.** Supervisor and field crew leader's contact information including name and mobile telephone numbers

**H.** Confined space entry certification indicating staff to be used on this project have been properly trained should confined space entry be required

**I.** Training and inspection plan a minimum of 7 days prior to the first inspection

**J.** Public notification door hanger based on Program Manager's provided example

**K.** Inspection (See Documentation Section for additional information)

1. Initial first day's inspections within 24 hours after first day's work is completed.

**L.** Include the following with each weekly submittal:

1. Inspection media (videos and photographs)

2. Quality controlled Inspection database (PACP Standard Exchange Access Database)

3. Inspection reports (PDF – Digital format)

**M.** Traffic control plan

**N.** Quality control plan

## 1.06 EXPERIENCE

**A.** Supervisor of the field crews performing these functions shall have the proper training and up- to-date NASSCO PACP certification in these types of equipment and monitoring functions and have a minimum of five (5) years' experience in performing such assignments including safe work practices, etc.

**B.** Field crew leaders performing these functions shall have the proper training and up to date NASSCO PACP certification in these types of equipment and monitoring functions and have a minimum of two (2) years' experience in performing such assignments including safe working practices, etc.

**C.** The Contractor shall provide the Owner with written documentation (certification) indicating the supervisor, field crew leader and all crewmembers responsible for

these assignments have the proper training and the requisite experience.

**D.** No crew members shall enter confined spaces without the necessary certified training and permit.

~~**E.** The required experience shall be documented in the Contractor's Invitation to Bid submittal.~~

~~**F.**~~**E.** A PACP certified technician or supervisor shall control operation of television equipment and encoding of inspection. Should Contractor utilize any personnel to actually document the inspection results not PACP certified, those inspections shall be refused and re-survey shall be completely at the Contractor's sole expense.

## 1.07 RESPONSIBILITY FOR OVERFLOWS/SPILLS AND DAMAGE TO PROPERTY AND UTILITY

**A.** Reference Specification Section 01030 – Special Project Procedures, Para B.

## PART 2 - PRODUCTS

## 2.01 CCTV PERFORMANCE

**A.** The Contractor shall furnish the following, but not limited to: the mobile television inspection studio, television camera, sonar, audio-visual digital encoding equipment/software, and other necessary equipment, materials, power, labor, and technicians as needed to perform the television inspection.

**B.** The surveying/inspecting equipment will be capable of surveying/inspecting a length of sewer up to at least one-thousand five-hundred (1,500) feet when entry onto the sewer may be obtained at each end and up to one-hundred (100) feet by rodding or up to seven-hundred and fifty (750) feet where a self-propelled unit is used, where entry is possible at one (1) end only. This equipment will be maintained in full working order.

**C.** Each survey/inspection unit will contain a means of transporting the CCTV camera and/or sonar equipment in a stable condition through the sewer under survey and/or inspection. Such equipment will ensure the maintained location of the CCTV camera or sonar equipment when used independently on or near to the central axis of a circular shaped sewer when required in the prime position.

**D.** Where the CCTV camera and/or sonar head are towed by winch and bond through the sewer, all winches will be stable with either lockable or ratcheted drums. All bonds will be steel or of an equally non-elastic material to ensure the smooth and steady progress of the CCTV camera and/or sonar equipment. All winches will be inherently stable under loaded conditions. The bonds shall be oriented in such a manner as to enable unhindered extension or retraction through the line. All effort shall be made to prevent damage to the pipe during the television inspection. In the case where damage is caused by the Contractor, for any reason, such as would be caused by incorrect deployment of bonds or retrieval of lodged equipment, the cost of repair or remedy shall be borne solely by the Contractor and repaired immediately

after notification to the Owner's Representative within 24 hours.

**E.** Each unit will carry sufficient numbers of guides and rollers such that, when surveying or inspecting, all bonds are supported away from pipe and manhole structures and all CCTV cables and/or lines used to measure the CCTV camera's head location within the sewer are maintained in a taut manner and set at right angles where possible, to run through or over the measuring equipment.

**F.** Each unit will carry a range of flow control plugs or diaphragms for use in controlling the flow during the survey/inspection. A minimum of one (1) item of each size of plug or diaphragm ranging from the required diameters will be carried. See Sewer Flow Control Specification 01520 for additional details and requirements.

**G.** Each survey/inspection unit will have on-call equipment available to carry out the flushing, rodding, and jetting of sewers for "Light Cleaning" See the definition of "Light Cleaning" in Sanitary Sewer Cleaning Specification 02956 for details.

**H.** Television Inspection: The Contractor shall inspect pipelines with pan and tilt conventional television imagery and/or sonar as indicated in the contract documents so as to record all relevant features and defects of the pipeline under inspection. Inspection of pipelines shall be carried out utilizing the Owner approved formats only.

**I.** External Hard Drive (Videos):

1. Audio portion of videos shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of oral report.

2. Store in upright position with temperature range of 45 to 80 degrees F (7 to 27 degrees C).

3. Identify each hard drive with labels showing Owner's name, Contractor's name, the inspection period, and project area or sewer segments on the hard drive.

**J.** Hard Drive Titling:

Each segment shown on the external hard drive should have its own video titled with the beginning and end point of the pipe segment.

**K.** CCTV Camera Head Prime Position:

The CCTV camera head will be positioned to reduce the risk of picture distortion. In circular sewers the CCTV camera lens and/or sonar head will be positioned centrally (i.e. in prime position) within the sewer. In non-circular sewers, picture orientation will be taken at mid-height, unless otherwise agreed, and centered horizontally. In all instances the camera lens head will be positioned looking along the axis of the sewer when in prime position. A positioning tolerance of ± 10% of the vertical sewer dimension will be allowed when the camera is in prime position.

**L.** CCTV Camera Head Speed:

The speed of the CCTV camera in the sewer will be limited to six (6) inches per second or 30 ft/min for surveys. Similar or slightly higher speed may be used on a case-by-case basis. Stop for a minimum of five (5) seconds at every lateral, defect, or adversity. The speed of scanning sonar will be limited to four (4) inches per second.

**M.** CCTV Color Camera:

The television camera used for the pipe line inspection shall be one specifically designed for hazardous and corrosive environments and constructed for pipeline inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall adhere to the following requirements:

1. Waterproof and shall be operative in 100% humidity conditions with lens fogging and any conditions that may be encountered in the inspection environment.

2. Self-leveling, color pan and tilt camera(s) to facilitate the survey and inspection of all laterals, including defects such as hydrogen sulfide corrosion in the soffit of sewers and benching or walls of manholes over and above the standard defects that require reporting.

3. A three-hundred sixty (360) degrees rotational scan indicating general condition must be implemented at every fifty (50) feet interval (min.) along sewers, and at manholes and any salient, specified, defect features.

4. The tilt arc must not be less than two-hundred seventy (270) degrees with adjustable supports designed for operation in connection with pipe inspection with a viewing angle of not less than 65 degrees.

5. The view seen by the television camera shall be transmitted to a monitor of not less than 11 inches in size.

6. The travel speed of the television inspection camera (through the pipe) shall be uniform and shall not exceed the maximum speed herein specified.

7. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the Program Manager; and if unsatisfactory, equipment shall be removed and no payment will be made for an unsatisfactory inspection.

8. The adjustment of focus and iris will allow optimum picture quality to be achieved and will be remotely operated.

9. The adjustment of focus and iris will provide a minimum focal range from six (6) inches in front of the camera's lens to infinity.

10. The distance along the sewer in focus from the initial point of observation will be a minimum of twice the vertical height of the sewer.

11. The illumination must be mounted on and turned in the direction of the camera such as to allow an even distribution of the light around the sewer perimeter without the loss of contrast picture, flare out, or shadowing, light sensitivity to be greater than 1.5 lux minimum, minimize reflective glare, remote variable intensity control, provide a clear in-focus picture of entire inside periphery of pipe and the ability to achieve proper balance of tint and brightness.

**N.** Color CCTV :

All CCTV and/or sonar work will use color CCTV reproduction. CCTV Side Scanning Camera:

The Owner's Representative will consider high resolution digital CCTC side scanning cameras if proposed by the Contractor. The Program Manager may not accept the side scanning camera use for this project if the contractor cannot provide supporting documents showing previous successful application.

**O.** The survey/inspection vehicle for general public streets or assessable locations will comprise two (2) distinct separate areas. One (1) of these, designated as the viewing area, will be insulated against noise and extremes in temperature, include the provision for air conditioning, and will be provided with means of controlling external and internal sources of light in a manner capable of ensuring that the monitor screen display is in accordance with the requirements of this specification. Seating/and or space accommodations will be available to enable additional workers to clearly view the on-site monitor, which will display the survey/inspection as it proceeds.

**P.** The working area will be reserved for equipment, both operational and stored, and no equipment utilized within the sewer will be allowed to be stored in the viewing area.

**Q.** The vehicle will be suitable for carrying the survey team and laborers and the equipment necessary to safely perform the work.

**R.** Off road inspection equipment/easement machine proposed by the Contractor shall be reviewed and approved by the Program Manager before the Contractor utilizes said equipment.

## PART 3 - GENERAL

## 3.01 EXECUTION

**A.** The following guidelines concerning the use of CCTV will be followed:

1. Generally, CCTV alone will be used for internal condition assessment where the depth of flow is less than twenty-five (25%) percent of overall sewer volume at the start of the survey. If the flow volume is greater than 25%, as agreed

upon by the DWM representative, bypass pumping may be required and paid for according to Section 01520

**B.** Confined Space Entry: Crews shall minimize the physical entry into manholes. Manhole entry shall be performed in accordance with Federal, State, Local and any other regulations for confined space entry. Only trained crews and staff may perform confined space entry after obtaining an entry permit. Staff must use safety required equipment, including harnesses, ventilation equipment, etc.

**C.** The Contractor shall make map verifications and record and deliver GIS map corrections as necessary (Refer to Section 01056).

**D.** Traffic Control: The work area shall be protected at all times with an adequate number of cones, barricades, flags, certified flaggers, and other measures necessary to meet the Manual for Uniform Traffic Control Devices (MUTCD) standards and to properly and safely protect both vehicular and pedestrian traffic. Flagmen shall work to secure all affected streets. Further requirement for traffic control may be imposed by the specific agency having jurisdiction. All traffic control measures shall comply with the requirements of MUTCD, Part 6 – Temporary Traffic Control, Latest Edition as published by USDOT/FHWA.

**E.** Site Security: Wear all required safety equipment, such as safety vests, hardhats, safety glasses, and steel toe boots. Follow all applicable state and local traffic safety procedures. Alert the closest fire department/Emergency Medical Services (EMS) as to the location of the day's work and to stand by for emergencies.

**F.** Scheduling Time: Crews shall begin inspections after 8:00 am and terminate inspections no later than 5:00 pm each day unless otherwise directed by the Program Manager in order to address localized special requirements. Authorization should be obtained if work is to be performed outside of the designated hours. Work should be performed by the Contractor in time frames complying with the County's noise ordinance.

**G.** Permits for Rights of Ways & Contract Utility Licensing: The Contractor shall obtain work permits for all work to be performed in State and/or County Right of Ways. The Contractor shall also plan for all other insurances, traffic control measures, and other terms of the permit in advance. The Contractor shall also obtain all necessary and applicable licensing.

**H.** Sequence of Work:

1. Perform Work in the following sequence:

    a. Clean sewer lines and manholes in accordance with "Light Cleaning" requirements of Section 02956, Sanitary Sewer Cleaning.

    b. Contractor shall remove debris in accordance with guidance in Section 02956, Sanitary Sewer Cleaning.

    c. After cleaning, the manhole sections shall be visually inspected by means of CCTV. The inspection then will be done one linear section at a time and the flow in the section being inspected will be suitably controlled as

specified (see Sewer Flow Control Specification Section 01520). All CCTV inspections shall be performed in accordance with PACP standards including the specific date and time of inspection.

**I.** Inspection equipment shall utilize software capable of providing complete survey reports, inspection standard exchange database, and linked media files; equipped with modules necessary for NASSCO Pipeline Assessment and Certification Program inspection.

**J.** If television inspection of an entire manhole to manhole sewer segment cannot be successfully performed from one manhole, a reverse setup shall be performed to obtain a complete inspection. A reverse setup shall be considered incidental to and included in the segment's unit price bid for CCTV inspection. If upstream (reverse) setup, is required, establish new inspection run separate from downstream (normal) setup so two inspection records exist in the software, one with the normal setup and one with the reverse setup.

**K.** Televised pipe segment inspection is represented by one manhole-to-manhole pipe segment or other structural access-to-access point; not multiple manhole-to-manhole segments.

**L.** Show continuous footage reading and other required information on inspections image. Place on screen where it is clearly visible (if black font, do not place on dark background, if white font, do not place on light background).

**M.** Viewing shall be in direction of flow, except while camera is being used in a reverse setup. Inspection shall proceed from upstream to downstream, unless prohibited by obstruction.

**N.** Keep camera lens clean and clear. If material or debris obscures image or causes reduced visibility, clean or replace lens prior to proceeding with recording operation.

**O.** Camera lens shall remain above visible water level and may submerge only while passing through clearly identifiable line sags or vertical misalignments. If flow exceeds 25 percent of diameter and the camera lens becomes obscured, pause inspection until flow subsides. If necessary, reschedule CCTV operation. Surcharging and flooding of camera lens is not an excusable condition if it has been artificially created upstream, i.e., placement of flow plugs or freshwater flushing in pipe.

**P.** Pan the camera to record the inside of each lateral or connecting pipe and the connection of lateral or connecting pipe to sewer pipeline.

**Q.** Recordings shall clearly show all defects and observations, and their severity in addition to obvious features, i.e., laterals and joints.

**R.** Immediately report to Program Manager any obstructions restricting flow and causing inspection to be interrupted. Assure the obstruction is documented in the inspection with the appropriate defect code. Document condition with still photographs, and begin a reverse inspection setup or inspections of other pipelines

to the satisfaction of the Program Manager.

**S.** Televise pipe segments from manhole to manhole on same video in continuous run.

1. Video shall clearly show camera starting and ending at manhole, unless defects do not allow it.

2. Do not perform partial televising on one video and then complete run on another video.

3. If line is partially televised, due to excusable condition, i.e., collapsed line, televised length shall be viewed by the Program Manager.

4. If a portion of the Contractor's inspection is unacceptable to the Owner or Program Manager, the entire pipe segment shall be deemed unacceptable and the Contractor shall re-televise the entire pipe segment at the Contractor's sole expense.

**T.** The Owner or Program Manager may, on occasion, accept a physical inspection not adhering to minimum standards if adverse conditions are encountered and re-inspection is not advised.

## 3.02 CCTV INSPECTION

**A.** Data Transfer: Upon completion of CCTV inspection, transfer inspection data to an external hard drive (HD) of sufficient capacity and compatibility with Owner's and Program Manager's equipment and available programs; include code required for proper playback of video file.

**B.** Labeling: Provide printed label on outside of HD that indicates the following:

1. Name of owner

2. Project title

3. Date of submittal

4. Inspection company

5. Deliverable number

6. Project assignment area (provided by Program Manager)

**C.** Media:

1. Video:

   a. Inspections completed, with a unique filename per manhole to manhole pipe segment inspection.

   b. Continuous digital video recordings of the inspection view as it appears on the television monitor shall be taken. The recording shall also be used as

a permanent record of defects.

c. The recording shall be MPEG-4. Separate MPEG-4 files shall be created for each pipe. In case of a reverse setup, such inspection shall be stored in a separate inspection record and MPEG file. MPEG files shall be written to External Hard Drive media for delivery to the Program Manager.

d. MPEG files shall be named according to the following file specification:

**TV_[PIPEID]_[Direction]_[MMDDYYYY]_[Incremental Number].mpg**

e. The incremental number shall be used if multiple inspections are performed for the same line, such as a reverse inspection setup.

f. The Owner, at its sole discretion, reserves the right to refuse any MPEG, on the basis of poor image quality, excessive bit rates, inconsistent frame rates or any other characteristics that may affect usability by the Owner.

g. The digital video encoding shall include video information that can be reproduced with a video image equal or very close to the quality of the original picture on the television monitor. The replay of the recorded video information shall be free of electrical interference and shall produce a clear, stable image.

2. Audio:

a. Embedded in video file

b. Operator will include description of inspection setup, including related information from log form and unusual conditions.

c. Operation changes (for example, remove roots and restart inspection at footage prior to root removal)

d. Verbal description and location of each defect

e. Verbal description and location of each service connection

**D.** Still Photographs:

1. Provide color digital photographs showing inspection image whenever observation or defect has a moderate or major severity; looking into a lateral or connection pipe; or unless otherwise instructed by the Owner or Program Manager;

2. Each with a unique filename matching the asset ID with a random number;

3. Encoded in .JPEG format;

4. Minimum 1024 x 768 resolution; and

5. Provide label on front of photograph with structure identification number, footage (if not visible on photograph), and defect code (if applicable).

**E.** Database:

1. Include all inspections in a single consolidated PACP Version 6 or newer Access Standard Exchange database. Creating a database per inspection is not acceptable. Each submittal standard exchange database shall be cumulative containing all prior inspections as well as inspections conducted during interim period since previous submittal.

2. Prior to the start of the Work, provide PACP standard exchange database of collected data including anticipated inspection header field attribute information. A PACP Inspection Header Guidance Table will be provided upon request.

3. File Type: MS Access, .MDB, .ACCDB

4. Database Format: PACP Version 6 or newer. NASSCO PACP data will be exported into Standard PACP Standard Exchange database.

5. List inspection media names in corresponding asset/inspection/defect information field within database.

**F.** Linear Measurement:

1. The CCTV monitor display will incorporate an automatically updated record in feet and tenths of a foot of the footage of the camera or center point of the transducer, whichever unit is being metered, from the cable calibration point, the pipe diameter (physical measurement by Contractor), and verified pipe material. The relative positions of the two (2) center points will also be noted.

2. The Contractor shall use a suitable metering devise enabling the cable length to be accurately measured; this shall be accurate to 0.20 feet. The Contractor shall use the footage readings to identify location of defects to the nearest 0.10 feet. Measurement shall be zeroed after each segment inspected. The Contractor shall calibrate the footage meter on a regular basis and demonstrate that the tolerance is being achieved by tape measurement between manholes on the surface. This taped measurement must be included on a quality control form which will be completed and submitted by the Contractor depicting the level of accuracy achieved.

**G.** Data Display, Recording and Start of Survey/Inspection:

1. At the start of each sewer length being surveyed or inspected and each reverse set-up, the length of pipeline from zero (0) footage, the entrance to the pipe, up to the cable calibration point will be recorded and reported in order to obtain a full record of the sewer length. Only one (1) survey will be indicated in the final report. All reverse set-ups, blind manholes, and buried manholes will be logged on a separate log. Video digits will be recorded so every recorded feature has a correct tape elapsed time

stamp. Each log will make reference to a start and finish manhole unless abandonment took place because of blockage.

2. The footage reading entered on to the data display at the cable calibration point must allow for the distance from the start of the survey/inspection to the cable calibration point such that the footage at the start of the survey is zero (0).

3. In the case of surveying through a manhole where a new header sheet and file must be created, the footage will be set at zero (0) with the camera focused on the outgoing pipe entrance.

4. At the start of each manhole length a data generator will electronically generate and clearly display on the viewing monitor and subsequently on the video recording a record of data in alpha-numeric form containing the following minimum information:

    a. Automatic update of the camera's footage position in the sewer line from adjusted zero (0)

    b. Sewer dimensions

    c. Manhole/pipe asset ID number

    d. Date of survey

    e. Road name/location

    f. Direction of survey

    g. Time of start of survey

    h. Sewer use (SS - Sanitary Sewer)

    i. Material of construction of the pipe

    j. The size and position of the data display will be such as not to interfere with the main subject of the picture.

5. Once the survey of the pipeline is under way, the following minimum information will be continually displayed:

    a. Automatic update of the camera's footage position in the sewer line from adjusted zero (0).

    b. Manhole or pipe asset ID number.

    c. Defect/observation code(s) (temporarily display when encountered)

    d. Date and time

6. Before camera enters the pipe, inspection shall provide video of the manhole. Video recording shall begin by facing pipe segment to be televised and then pan/tilt/zoom as necessary to point camera up toward the manhole opening.

**H.** Coding: Defect Coding, as well as material, shape, and lining coding, and conventions used will comply with PACP formats and will be compatible with the Owner's GIS.

## 3.03 MAN ENTRY SURVEY

**A.** Photographic Camera Position - General Illustration of Sewer Interior:

1. The hand-held photographic camera or CCTV camera will be positioned to reduce the risk of picture distortion. In circular sewers the camera lens will be positioned centrally looking along the axis of the sewer. In non-circular sewers picture orientation will be taken at mid-height, unless otherwise agreed, and centered horizontally.

2. The hand held photographic camera or CCTV camera will be positioned so the long side of the photograph or CD-ROM frame is horizontal.

**B.** Photographic 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 will be provided, to an accuracy of ± 1% or six (6) inches, whichever is greater.

**C.** Photographic Quality: The in-sewer photographic camera or hand held CCTV system and suitable illumination will be capable of providing an accurate, uniform and clear record of the sewer's internal condition.

## 3.04 DELIVERABLES

**A.** Digital PACP Standard Exchange database shall be submitted on external hard drive in duplicate to the Program Manager. The database must contain all the data required by this specification.

**B.** Final Television Inspection Reports shall be submitted to the Program Manager in PDF on the same external hard drive referenced above. Corresponding MPEG videos and photos shall also be submitted to the Program Manager as outlined by this specification.

## 3.05 PUBLIC NOTIFICATION – CCTV INSPECTION

**A.** Public notification is critical and compliance with the public notification criteria is a prerequisite for CCTV inspection, especially when conducting inspections on sewers in easements passing through private property. Notification must be provided to all property occupiers/owners likely to be affected including residential, commercial and institutional (schools, hospitals, nursing homes, etc.). At a minimum, the following steps shall be taken:

1. The Contractor shall print and distribute pre-approved advance notice door hangers 72 hours before conducting CCTV inspection. The Contractor shall distribute the door hangers to the property owners (residential, commercial and institutional) in the affected area(s).

2. The advance notice door hangers shall be customized by Public Outreach to suit this project and will be provided to the Contractor for printing prior to project commencement. If CCTV inspection is delayed, the Contractor must re-distribute door hangers.

3. The Contractor is responsible for distributing pre-approved "Right-of-Entry" (ROE) forms and securing signatures from affected property owners on the ROE forms prior to conducting CCTV inspection.

**B.** The Contractor shall keep a daily log of the distribution of the door hangers. This shall be maintained and submitted to the Owner and/or Program Manager upon request.

**C.** The Contractor shall alert the appropriate Owner and Program Manager personnel of their work locations on a daily basis.

**D.** Contractor will provide and place "Right-of-Way" signs in prominent locations where CCTV is planned 24-hours in advance of commencing the inspection. Signs will be a minimum of 24 inches wide by 18 inches high with letters a minimum of 2 inches high. Signs will be supported a minimum of 12 inches above grade by integral metal frames. Wording on the signs shall be similar to the following:

CCTV INSPECTION WILL BE CONDUCTED ON "date" and "time." Contact "person" with "company" at "phone number" for additional information.

## 3.06 QUALITY ASSURANCE/QUALITY CONTROL

**A.** Data Quality Control Procedure:

1. The Contractor shall perform a Quality Control (QC) check of the televised inspection documentation using the QC database provided by the Program Manager.

2. The Contractor shall correct any data conflict, missing data, or other questionable entry identified by the conflict, missing data, or other questionable entry identified by the QC reports prior to submitting the CCTV inspection data to the Program Manager.

**B.** The Contractor shall establish and perform a QA/QC analysis addressing all video and data recorded before the data is submitted to the Owner/Program Manager. The Program Manager will periodically request the Contractor to review the QC results with the Program Manager.

**C.** The data submissions shall undergo the same random review checks for Quality when submitted to the Owner/Program Manager. Should accuracy or qualitative levels fall below those deemed acceptable to the Program Manager, the data

submittal will be refused and no payment will be released. Contractor will be required to correct or re-do inspections until the Program Manager is satisfied with the work.

## 3.07 DOCUMENTATION

**A.** The Contractor shall complete work on each asset as described herein. Refer to the Measurement and Payment Section (Section 01025) for documentation required with each pay request.

**B.** Measurement Units: All dimensions will be in feet and inches. Sewer measurement will be to the nearest inch.

**C.** CCTV and Man-Entry Photographs: Photographs will be taken of all laterals or connecting pipes and moderate or severe pipeline defects. Where a defect is continuous or repeated the photographs will be taken at the beginning of the defect and at not less than ten (10) foot intervals thereafter.

**D.** The Contractor shall complete weekly and end of work television/inspection reports as described herein. These reports shall be per the format and defect codes of NASSCO's Pipeline Assessment and Certification Program (PACP). Prior to beginning work, the Contractor shall submit a digital sample of the television inspection report to the Program Manager for approval.

**END OF SECTION**