

**STANDARD SPECIFICATIONS FOR
CONSTRUCTING UTILITY FACILITIES**

DIVISION III - CONSTRUCTION SPECIFICATIONS

**SECTION 12
TELEVISION INSPECTION & CLEANING OF SEWERS**

12.01 SCOPE

It is the intent of this specification to define necessary procedures to perform television (TV) inspection of existing, new and rehabilitated piping including sewer mains and sewer lateral connections along with necessary cleaning of sewer mains. The Contractor shall follow all federal, state and local requirements for safety in confined spaces when working in sewers.

12.02 DEFINITIONS FOR TELEVISION INSPECTION

- A. Pre-Cleaning Inspection: TV inspection of sewer mains and/or laterals to determine and document the existing condition of the pipe, lateral connections and manholes and to identify and code any defects.
- B. Post-Cleaning Inspection: TV inspection of sewer mains and/or laterals to verify that the cleaning has been performed in accordance with the Specifications and to document the condition of the pipe, lateral, connections, and manholes after cleaning operations.

12.03 PERFORMANCE REQUIREMENTS FOR TELEVISION INSPECTION

- A. Inspection shall be performed by a National Association of Sewer Service Companies (NASSCO) *Pipeline Assessment Certification Program* (PACP) certified operator and shall meet the coding and reporting standards and guidelines as set by PACP. These same standards shall also be used for lateral inspections regardless of whether conducted using cleanout launched or mainline launched lateral camera. All report annotations, pipe conditions and pipe defects shall be identified properly using PACP codes as defined by PACP, and severity ratings shall be calculated according to PACP.
- B. Quality of inspection recording shall be acceptable to Owner/Engineer when viewed on a standard computer monitor.
- C. NASSCO prepared *Pipeline Assessment and Certification Program*, Reference Manual, latest edition is a reference for these procedures. This manual includes a standard TV inspection form and sewer condition codes.

12.04 SUBMITTALS FOR TELEVISION INSPECTION

- A. CCTV equipment, including make, model, age of video systems and tractors, and documentation that CCTV software is PACP certified, latest version. PACP-compliant software will not be accepted.

- B. Copies of PACP certificate for inspectors completing the work.

12.05 TELEVISION EQUIPMENT

- A. Closed Circuit TV Equipment: Select and use closed-circuit television equipment that will produce a color recording. The camera and video system components shall have the following properties:
 - 1. Equipped with footage counter accurate to two tenths of a foot that displays on the TV monitor the exact distance of the camera from the starting point of the recording.
 - 2. Lighting system that allows the features and condition of the pipe to be clearly seen. Lighting shall not cause shadows or loss of color within the field of view of the camera.
 - 3. Capable of operating in 100 percent humidity conditions.
 - 4. Capable of producing a minimum 470 lines of vertical resolution color video picture. Picture quality and definition shall be to the satisfaction of the Engineer.
- B. Pipe Inspection Camera: The pipe inspection camera and video components shall have the following additional properties:
 - 1. Capable of producing a video recording using a pan-and-tilt, radial viewing, pipe inspection camera that pans ± 275 degrees and rotates 360 degrees.
 - 2. Camera height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being televised.
 - 3. Include a reflector in front of the camera if necessary to provide acceptable video image quality in large diameter pipe.
- C. Autonomous Inspection Equipment: In addition to standard CCTV equipment, television inspection of 8-inch through 12-inch sanitary sewers may be performed using autonomous inspection equipment. The autonomous inspection equipment shall provide 360-degree spherical video capture with full NASSCO PACP reporting capabilities. The autonomous inspection equipment shall be Solo[®] as manufactured by RedZone[®] or Engineer-approved equal.
- D. TV Studio: TV studio is to be contained in an enclosed truck, trailer or van. It shall accommodate the operator, Owner/Engineer and one standing. If enclosed, the studio shall have air conditioning and heating. Normal operation of all equipment, including the TV camera, monitor, and winches is to be from a control panel in the studio. When joint testing and sealing is to be performed, the equipment shall be contained in the same unit as its TV equipment and shall be operated from the same control panel.

- E. Recording: All recordings are to be in digital format.
 - 1. Image Capture: Digitized picture images shall be stored and be exportable as JPEG formats.
 - 2. Video Capture: Full time live video and audio files shall be captured for each pipe segment and lateral inspected. The files shall be delivered in MPEG format on a USB 2.0 external hard drive and viewable at real time and fast forward speeds on an external personal computer that utilizes Windows Media Player, version 12.0. Alternate digital formats will not be accepted unless approved by the Engineer in advance of submittal. The video shall have a minimum resolution of 640 pixels (x) by 480 pixels (y) and an encoded frame rate of 29.97 frames per second. System shall perform an automatic disk image/file naming structure to allow saved video/data sections to be "Burned" to digital format. It shall have the capability of "burning" a minimum of 120 minutes of recording to the DVDR media. The video recording shall be free of electrical interference and shall produce a clear and stable image. The audio recording shall be sufficiently free of background and electrical noise as to produce an oral report that is clear and discernable. The digital recordings and inspection data shall be cross-referenced to allow instant access to any point of interest within the digital recording.

12.06 TELEVISION INSPECTION

- A. Televiser the sewer line prior to cleaning to document the condition of the line. Notify the Engineer 72 hours in advance of any TV inspection so that the Engineer/Owner may observe inspection operations if desired. Provide a color recording showing the completed Work.
- B. Clean sewer lines, laterals and manholes in accordance with Section 02760, Cleaning of Sewers where directed by the Engineer/Owner.
- C. Televiser the sewer line after cleaning to document the sewer line has been properly cleaned and the condition of the line. Notify the Engineer 48 hours in advance of any TV inspection so that the Engineer/Owner may observe inspection operations. Provide a color recording showing the completed Work.
- D. For mainline sewer inspections, inspections shall be from center of the starting manhole to the center of the ending manhole. Record the condition of the entire circumference of the pipe penetration. Measure distances along the pipe from the center of the upstream manhole.
- E. Prior to recording the location of defects, construction features and service connections, remove slack in the cable of the television inspection camera to ensure metering device is designating proper footage. Check accuracy of the measurement meters daily by use of a walking meter, roll-a-tape, or other suitable device.

- F. Perform the preset before starting to record the inspection (i.e. the counter should not suddenly reset or jump during the recording). If a preset point on the CCTV cable is used to set the counter, Contractor shall back up the camera after setting the preset and record the entry to the pipe.
- G. Center the camera in the middle of the pipe.
- H. Move the camera through the line (in the downstream direction whenever possible) at a uniform rate not to exceed 30 feet per minute.
- I. Stop at every joint for three seconds. When infiltration or other defects are evident, use pan and tilt to document pipe condition. Stop elsewhere when necessary to ensure proper documentation of the sewer's condition.
- J. Stop at every lateral connection. Center the camera so that the lighting and the pan and tilt view can be used to inspect as far into the lateral connection as possible. Pan the circumference of the tap, recording all defects found in the service connection. Where lateral flow is observed, observe flows from service connections for approximately two minutes to ascertain if the flow is sanitary or extraneous flow. The video recording may be paused during observation. Record results of the flow observed on video recording and inspection logs.
- K. Capture color still shots of video recordings for all defects encountered.
- L. Use manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions to move the camera through the sewer line.
- M. TV inspection recordings shall be continuous for each pipe segment.
- N. Adjust light levels, clean fouled or fogged lens, and allow vapor to dissipate from camera lights in order to produce acceptable recordings. All TV inspection recordings that do not meet the specified requirements shall be re-televised at no additional cost to the Owner.

12.07 FLOW CONTROL FOR TELEVISION INSPECTION

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

Pipe Diameter (Inches)	Depth of Flow (% of Pipe Diameter)
6-10	10
12-24	15
Over 24	20

- B. Whenever flows in a sewer line are blocked, plugged, pumped, or bypassed, take sufficient precautions to protect the sewer lines from damage that might be inflicted by excess sewer surcharging. Further, take precautions to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved. No overflows are permitted. The Contractor is responsible for all damages.
- C. Contractor is responsible for all damages to Contractor owned and operated equipment, Owner facilities, and privately owned facilities caused by malfunction of plugs, pumps or other Contractor equipment. In the event of a failure or malfunction of Contractor equipment, Contractor is responsible for all work necessary to restore facilities to pre-construction condition including but not limited to excavation and restoration of sewer lines and roadways required to retrieve malfunctioning or stuck cameras, plugs and hoses.
- D. It is anticipated that portions of the sanitary sewer are bowed or bellied and as a result the camera will be submerged. Wherever the camera encounters a submerged condition, or where the wastewater flow depth exceeds the maximum allowable, reduce the flow depth to an acceptable level by performing the survey TV inspection during minimum flow hours, or by pulling a camera with swab, high-velocity jet nozzle or other acceptable dewatering device. Recordings made while floating the camera are not acceptable unless approved by Engineer.

12.08 PASSAGE OF TV CAMERA

- A. If during TV inspection of a pipe segment the camera is unable to pass an obstruction even though flow is unobstructed, televise the pipe segment from the opposite direction in order to obtain a complete recording of the line. Measure the distance between the manholes (centerline to centerline) with a tape or wheel to accurately determine the total length of the segment.

12.09 INSPECTION DELIVERABLES FOR TELEVISION INSPECTION

- A. Written Inspection Reports:
 - 1. Provide printed location records to clearly identify the location of each defect, or lateral connection, in relation to adjacent manholes, using a standard stationing system zeroed on the upstream manhole. Record all information requested using proper NASSCO PACP defect codes. The reports shall include a PACP Inspection form for each pipe segment with all of the mandatory PACP Header sections completed. The following optional PACP Header sections shall also be completed: Owner, Work Order Number, Project, Time, Weather, Date Cleaned, Flow Control, Location Code, Location Details, Total Length, Length Surveyed, Upstream MH Rim to Invert, Upstream MH Grade to Invert, Downstream MH Rim to Invert, and Downstream MH Grade to Invert. The reports shall also provide a summary of the pipes inspected in order of their PACP Overall Pipe Rating. This summary shall include the following information for each segment: Upstream MH number, Downstream MH number, Date,

Total Length, Length Surveyed, Structural Pipe Rating, Structural Quick Rating, Structural Pipe Rating Index, O&M Pipe Rating, O&M Quick Rating, O&M Pipe Rating Index, Overall Pipe Rating, and Overall Pipe Rating Index. Color still shot images of all defects encountered shall be included with each pipe segment.

B. Electronic Inspection Reports:

1. Provide a NASSCO PACP (latest version or PACP 6.0, 4.4, or 4.2) certified database listing all PACP data fields for each pipe segment. The provided database shall be in a .mdb format with no password protection on the file. The database should be able to be uploaded directly to the Owner's RedZone® ICOM3SM Asset Management System.
2. For each type of CCTV deliverable (Pre-Construction, Post-Construction, Warranty), provide a single database containing all the inspections for the Project.
3. Post Construction deliverables will contain a single inspection for each asset, inspected upon completion of all non-warranty Work on the asset.
 - a. Submit two inspection records for a single asset only if the asset cannot be completely inspected from one side due to the physical condition of the pipe. Properly use the PACP "MSA" coding for each such inspection record.

C. Inspection Recordings:

1. Provide digital inspection recordings for all recordings, unless otherwise specified in Paragraph 3.4.D.
2. Recording shall be of a quality sufficient for Engineer to evaluate the condition of the sewer, locate the sewer service connections, and verify cleaning. If Engineer determines that the quality is not sufficient, re-televiser the sewer segment and provide a new recording and report at no additional compensation. Camera distortions, inadequate lighting, dirty lens, or blurred/hazy picture will be cause for rejection. Payment for televised inspection will not be made until Engineer approves the recordings and reports.
3. Only pipe segments from the same work order shall be included on a given hard drive. Multiple deliverable types may be included on a given hard drive, but the files must be organized in individual project folders. TV Inspection recordings shall not be edited.
4. Digital recordings: Each pipe segment must be its own electronic file. Electronic recording file must allow snap scrolling to allow easy and quick access of the entire recording.

5. Each hard drive must have a file index whose name contains the pipe segment reference number.
 6. Maintain a master copy of all recordings and Inspection Reports for two years after delivery of reports and recordings.
 7. Label each hard drive with the following information:
 - a. File Number.
 - b. Contractor's Name.
 - c. Project Name.
 - d. Contract Number.
 - e. Drawing Number
 - f. Inspection Type: Post Cleaning, Repair.
 - g. Date Televised.
 - h. Pipe Segment Asset Identification Number.
- D. Inspection deliverables for different types of inspections are defined below.
1. Pre-Construction Inspection: One copy on a 400mbs USB 2.0 external hard drive of PACP formatted database including, but not limited to, digital inspection recordings, defect call-out tables, defect snapshots, notes fields and asset condition reports.
 2. Post-Construction Inspection:
 - a. Two copies of Written Inspection Reports in bound report with project name on binder spine. Reports to be filed in ascending order by upper manhole number.
 - b. One copy on a 400mbs USB 2.0 external hard drive of the PACP formatted database including, but not limited to, digital inspection recordings, defect call-out tables, defect snapshots, notes fields and asset condition reports.

12.10 CLEANING OF SEWERS

The cleaning of sewer includes, but is not limited to, the following:

- A. Field locating all manholes along the sewer reaches to be cleaned.

- B. Normal and heavy cleaning of existing sanitary sewers.
- C. Cutting of roots, grease, intruding sealing ring material and objects wedged in pipe joints from existing sanitary sewers.
- D. Removal of debris from the sewers.
- E. Disposal of waste and sediment.
- F. Cleaning up as the Work progresses and after the completion of all Work activities.
- G. All other Work required for the complete and satisfactory cleaning of the pipelines.

12.11 DEFINITIONS FOR CLEANING OF SEWERS

- A. Normal Cleaning: Cleaning accomplished using water jets to scour and remove debris, grease, etc. from pipe and manhole in 1 to 3 complete passes of the nozzle.
- B. Root Cutting and Grease Cutting: Removal of roots larger than fine roots (as defined by PACP), hardened grease and intruding sealing ring material using cutting device.
- C. Heavy Cleaning: Cleaning accomplished using water jets to scour and remove debris, grease, etc. from pipe in 4 or more complete passes of the nozzle.

12.12 GENERAL PRECAUTIONS FOR CLEANING SEWERS

- A. This Contract requires work in active sewers. Adhere to all federal, state and local requirements for safety in confined spaces.
- B. Take precautions to protect sewer mains, laterals and manholes from damage that might be inflicted by the improper selection of the cleaning process or improper use of the equipment.
- C. When using hydraulically propelled devices, take precautions to ensure that the water pressure created does not cause damage or flooding to public or private property.
- D. Do not surcharge the sewer beyond the elevation that could cause overflow of sewage into area waterways, homes, or buildings or onto the ground.
- E. Some of the manholes accessing sections of the sewer included in this work are located outside the right-of-way.
- F. Restore or repair any facility, public or private, which is damaged by Contractor actions at no cost to Owner.

12.13 SUBMITTALS

Plan for disposal of debris and sediment removed from the sewer lines.

12.14 QUALIFICATIONS

Contractor shall have experience in the cleaning of sewers. Documentation of experience shall be furnished to the Engineer upon request.

12.15 MAINLINE SEWER CLEANING EQUIPMENT

- A. Sewer cleaning equipment shall consist of truck-mounted, high velocity hydro-cleaning equipment. The equipment shall be provided with a minimum of 500 feet of one-inch inner diameter high-pressure hose with a selection of high velocity nozzles, as required for the cleaning operation. The various nozzles shall produce a scouring action from 10 to 45 degrees in all size sewers to be cleaned. Use nozzles matched to the pumps and the site-specific cleaning requirements. Mount all nozzles with skids. A tiger tail or boot or downhole roller is required. A pressure gauge shall show operating pressure and a flow meter shall show flow rate. A table to translate shown pressures to delivery pressure shall accompany each cleaner unit.
- B. The pumps shall be capable of delivering a minimum 60 gpm at 2,000 psi at the nozzle head. A relief valve shall regulate pressure to the nozzle. The unit shall carry its own water tank, minimum of 1,000 gallons, auxiliary engines and pumps, and a hydraulically-driven hose reel.
- C. All controls shall be located so that the equipment can be operated above ground.
- D. Include appropriate adaptors, hoses and nozzles for cleaning laterals from mainline sewer.

12.16 VACUUM EQUIPMENT

- A. Provide equipment capable of removing all sand, dirt, rocks, roots, and other debris from the sewer and manhole.
- B. Provide screens to prevent scoured debris from migrating downstream of the limits of the Work.

12.17 CUTTING EQUIPMENT

- A. Mainline Sewers: Provide equipment capable of mechanically removing roots, grease, and intruding seal material. Devices shall include a root saw, spring blade root cutter chuck, chaincutter, or approved equal.

12.18 FLUSHING/CLEANING WATER

Provide all flushing water required for the cleaning of sewers either by truck or in accordance with surface water removal requirements. Provide proof that all flushing water was acquired lawfully. The Contractor may request to the Owner a meter for use of hydrant water.

12.19 MAINLINE SEWER CLEANING

- A. Thoroughly clean all pipeline reaches in order to permit an unrestricted inspection by closed circuit television. Particular emphasis shall be afforded to the removal of accumulated grease, roots, sand, rocks, sludge and other debris so that the video inspection will show clearly all portions of the pipe being inspected. Pressure at the nozzle shall be between 1500 psi and 2000 psi and flow rate shall be between 60 gpm and 75 gpm during cleaning operations in the sewer, unless otherwise approved by the Engineer.
- B. Clean upstream reaches of sewers before the downstream reaches.
- C. Insert cleaning equipment into the downstream manhole of a given reach and pull the debris downstream. Reverse setups may be used if all debris is removed (i.e., no material is passed to the adjacent pipe segment).
- D. In mainlines, at a minimum, make one pass with a 30°-45° nozzle at a rate not greater than 20 feet per minute, and one pass with a 10°-15° nozzle at a rate not greater than 30 feet per minute.
- E. Rig winching equipment so as not to damage the existing pipeline or manholes.
- F. During cleaning, restrict the flow level in the pipe to a maximum of 30 percent of the pipe diameter. Take particular care to avoid flooding house connections during cleaning operations.
- G. Remove any blockages of lateral building connections resulting from the cleaning or other items of Work by cleaning of the building connection at no additional cost to the Owner.

12.20 ROOT, GREASE AND INTRUDING SEAL MATERIAL REMOVAL

- A. Remove roots by suitable mechanical cutting devices or by hydraulic procedures such as with high-pressure jet cleaners. No roots of length greater than one and a half inches (1½-inch) shall remain following root removal procedures.
- B. Remove all grease thicker than 1 inch. Use suitable mechanical cutting devices to remove grease.
- C. Remove objects wedged in pipe joints and intruding sealing ring material.

12.21 DEBRIS REMOVAL

- A. Remove all bricks, rocks, debris, sludge, dirt, sand, grease, roots, and other materials from the sewer and manhole and collect and remove the resulting debris from the downstream manholes of the sewer sections being cleaned. Utilize control measures in downstream manholes as necessary to prevent debris, sludge and other materials from

passing through manholes to a downstream sewer section not scheduled for cleaning by Contractor that same day.

- B. When removing materials from manholes, return the discharge and drainage liquid stream to the downstream sewer and discharge downstream for disposal. Under no circumstances shall sewage or solids be dumped onto the ground surface, street, stream, ditches, catch basins, or storm drains. All solids and semi-solids shall be placed in a watertight container so that no spillage or leakage will occur, covered to minimize odors, and disposed by the Contractor. The Contractor is responsible for all operations and costs associated with removal, transportation, and disposal of debris collected during the cleaning operations.

12.22 DISPOSAL

- A. Disposal of the liquid only from mainline cleaning operations shall be decanted into the sanitary sewer system under the supervision of the Owner. The Contractor may utilize the Owner's drying beds at their Water Reclamation Facility located at 29280 North Main Street, Daphne, AL 36526 to temporarily store and dewater the solids prior to final disposal. Disposal of the debris/solids removed from the sanitary sewer system shall be made at an approved disposal facility.
- B. The Contractor shall maintain a log book noting the date, time, and driver for each disposal to approved disposal facility.
- C. All disposals should occur during normal business hours. In the event the Contractor requires disposal after hours, the Owner should be notified and present at time of disposal.

12.23 FIELD QUALITY CONTROL

- A. Acceptance of pipeline cleaning shall be made upon the successful completion of the television inspection documenting that all required debris, roots, and grease are removed to the satisfaction of the Engineer. If television inspection shows debris, solids, sand, grease, or grit remaining in the line, re-clean and re-inspect the pipeline at no additional compensation.

END OF SECTION