

**Item No. 315
CCTV Inspection****315.1 Description**

- A. This item shall govern the construction, labor, materials, equipment and associated appurtenances for cleaning sanitary sewer mains in preparation for rehabilitation. Cleaning shall remove debris and foreign materials from the mains and manholes in preparation for television inspection of sewer mains.
- B. Provide all television equipment, technical assistance, labor, tools and associated incidentals and appurtenances required to internally inspect the existing sewer mains and new sewer mains shown on the Drawings. Verify the mains are properly cleaned in preparation of inspection and/or rehabilitation. Locate service laterals and identify pipeline segments that require repair prior to the slip lining, pipe bursting or CIPP installation. The internal TV inspection shall also document the post rehabilitation status of the pipe for comparison and total acceptance of Work done. The video must show an inclinometer and the slope of the pipe. After cleaning, visually inspect the main sections by means of a closed-circuit television. Inspect one line section between manholes at a time, during which the sewer flow in that line section is properly controlled according to the flow control requirements of this Section.
- C. Provide control of sewer flow in conjunction with cleaning of sewer mains, and installation of replacement lines. Sewer flow diversion shall not cause surcharging or damage to public or private property. The sewer flow shall be plugged at an upstream manhole for the section of sewer line that is to be rehabilitated (by sliplining, cured in place pipe, or pipe bursting, etc.), for both installation and televised post installation inspection. Provide notification to property owners and tenants on flow control lines a minimum of 48 hours prior to institution of flow control measures.

315.2 Submittals

The submittal requirements of this specification item must include:

- A. Television inspection logs in paper and digital format.
- B. Digital format video of television inspection with an inclinometer visible on the video which notes the slope of inspected pipe.
- C. A graphed report of the inclinometer data gathered for each of the pipe segments.
- D. PACP Report and Top View Report and CD / DVD disks of CCTV completed.
- E. Flow Control Plan.
 - 1. Listing of safety precautions and traffic control measures.
 - 2. Certification that staff to be used for the Work are properly trained in confined space entry and hazardous environments.

315.3 Quality Assurance

- A. Equipment used shall be in good working order and provide continuous operation during TV/video inspection.

- B. CD / DVD disks shall be of good visual quality capable of slow motion and pausing without significant reduction of visual quality.
- C. Inspector(s) must be NASSCO / PACP certified and certification number submitted to NBU prior to commencement of work.
- D. Video image shall be calibrated using a Marconi Resolution Chart No. 1 or equivalent.

315.4 Equipment and Supplies

Cleaning Equipment

- A. Selection of cleaning equipment and method of cleaning must be based on the condition of the sewer mains at the time Work commences and is subject to the Owner's representative's approval. Operation of all cleaning equipment and devices shall be by personnel experienced in the use of such equipment. Owner may require the Contractor to demonstrate the performance capabilities of the proposed cleaning equipment. If the cleaning equipment does not give the desired results required by the Owner, Contractor shall use different equipment that does provide the desired results. More than one type of equipment/attachments may be required at any particular location.

Television Camera

- A. Camera used shall be 360-degree COLOR RVC camera. The television camera used for inspection must be specifically designed and constructed for internal inspection of sanitary sewer pipe with partial liquid flow through it. Lighting for the camera must allow a clear picture of the entire periphery of the pipe above the existing flow. The camera will operate in 100% humidity conditions. The camera, television monitor, and other components of the video system shall produce a picture quality satisfactory to NBU and, if unsatisfactory, equipment shall be removed and replaced with satisfactory equipment.

Video Recording Equipment

- A. Furnish video equipment to provide a visual and audio recording of all areas in the pipe. Video recording system at the site shall be capable of rewind, play back, slow motion and stop motion. The video shall be recorded on a DVD or equal portable storage device whose format is compatible with the latest version of Microsoft Windows. Also, an audio channel for clearly recording the camera locations and operator observations (cracks, leaks, service connections, etc.). The system shall continuously indicate distance, in feet, from manhole to manhole and the manhole-to-manhole run numbers on the video recording.

Communication Equipment

- A. When manually operated winches are used to pull the television camera through the main, set up two-way radio or other suitable means of communication between the two manholes of the line section being inspected to ensure good communications between members of the crew.

Power Supply

- A. Power supply shall be continuous. If night operations occur, supply all labor, power and lighting equipment for operations, traffic safety, permits, etc.

Methods of Flow Control

- A. Furnish temporary plugs as required to provide for diversion of flows and temporary isolation of sanitary sewer sections during rehabilitation. The plugs must be designed so all or any portion of the sewer flow can be released at any time. Insert a plug into the upstream manhole of the line section being worked. A plug in the downstream manhole may be required to prevent any backflow.
- B. Furnish bypass pumping equipment as required to provide for diversion of flows and temporary isolation of sanitary sewer sections during rehabilitation. When total bypassing and pumping are required, supply the pumps, conduits, and other equipment to divert the flow of sewer around the line section where rehabilitation work is to be performed. Begin the flow diversion at the upstream manhole. Divert flow to the downstream manhole of the line section being worked. The total bypass system must have sufficient capacity to handle peak flow during a wet weather event. Contractor is responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing. If pumping is required on a 24-hour basis or outside of specified normal work hours, use engines with Hospital Rated noise suppression equipment. A comprehensive bypass pumping plan shall be submitted by the Contractor as required in Paragraph 315.2.E.

315.5 Materials

Cleaning Materials

- A. Use only the type of cleaning material which will not create hazards to health or property or affect treatment plant processes.

315.6 Construction Methods

Cleaning

- A. General:
 - 1. All materials, equipment, and personnel necessary to complete the cleaning of the sanitary sewer main and manholes must be present on the Site prior to isolating the sewer manhole or line segment and beginning the cleaning process.
 - 2. Clean the sewer lines from upstream to downstream, manhole to manhole. Remove dirt, grease, rocks, sand, roots and other materials and obstructions from the sewer lines and manholes or junction boxes. Dispose of removed materials in accordance with applicable federal, state, and local rules and regulations. It is the sole responsibility of the Contractor to secure a licensed legal dump site for the disposal of this material. Under no circumstances shall sewage or solids removed from the main or manhole be dumped onto streets or into ditches, catch basins, storm drains, or sanitary sewers. The cleaning shall leave the interior pipeline suitable for adequate television inspection and installation of replacement materials as applicable for the Project. Multiple passes and different equipment may be required. TV Inspection shall be used to verify acceptable completion of the cleaning.
 - 3. Satisfactory precautions shall be taken to protect the sanitary sewer mains and manholes from damage that might be inflicted by the improper use of the cleaning process or equipment.

4. Any damages done to a sewer main and/or structure by the Contractor shall be repaired by the Contractor at no additional cost and to the satisfaction of the Owner.
5. Cleaning shall also include the manhole wall and junction box wall by high pressure water jet.
6. Contractor may be required to demonstrate the performance capabilities of the cleaning equipment proposed for use on the Project.
 - a. If the results obtained by the proposed sanitary sewer cleaning equipment are not satisfactory, Contractor shall use different equipment and/or attachments, as required, to meet the requirements of the Contract Documents.
 - b. More than one type of equipment/attachments may be required at a location.
7. When hydraulic or high velocity cleaning equipment is used, a suitable sand trap, weir, dam, or suction shall be constructed in the downstream manhole in such a manner that all the solids and debris are trapped for removal.
8. Whenever hydraulically-propelled cleaning tools which depend upon water pressure to provide their cleaning force, or any tool which retard the flow of water in the sanitary sewer lines are used, precautions shall be taken to ensure that the water pressure created does not cause any damage or surcharging to public or private property being served by the manhole section involved.
9. Any damage of property, as a result of surcharging, shall be the liability and responsibility of the Contractor.
10. The flow present in the sanitary sewer main shall be utilized to provide necessary fluid for hydraulic cleaning devices whenever possible.
11. When additional quantities of water from fire hydrants are necessary to avoid delay in normal working procedures, the water shall be conserved and not used unnecessarily.
 - a. No fire hydrant shall be obstructed or used when there is a fire in the area.
 - b. It is the responsibility of the Contractor to obtain the fire hydrant, water meter and all related charges for the set-up, including the water usage bills from respective water purveyor agency.
 - c. All expenses shall be considered incidental to the cleaning of the existing sanitary sewer mains.

B. New Mains:

1. All mains and manholes should be clean of debris prior to televising. The sanitary sewer main shall be flushed within 72 hours of televising and recording. This will assure the main is clean of debris as well as identify any potential sags within the main.
2. All sanitary sewer gravity lines shall be CCTV'd at the Contractor's expense; and a video recording of the subject mains provided prior to preliminary acceptance and at the 1-year warranty inspection by NBU. Televiewing may only occur after the stabilized subgrade has been installed and satisfactory density tests have been submitted to the City of New Braunfels. An NBU authorized representative must be present during the

televiewing, unless otherwise approved by NBU. The sewer video inspection shall include rotating the camera lens to inspect the interior of each sewer lateral.

C. Existing Mains:

1. Recommended Cleaning

Purpose of Inspection	Recommended Cleaning
To determine the serviceability of the pipe, e.g. is the pipe silting up	Do not clean prior to CCTV inspection only clean if the camera cannot travel through the pipeline.
Inspection of structurally suspect pipelines	Do not clean prior to CCTV inspection. Cleaning may damage the pipeline.
To identify the general structural condition of the pipeline. Identification of small severity faults is not a concern.	Light cleaning to remove slime and spider webs.
To identify all faults in the pipeline, including small severity faults, e.g. in order to determine whether the pipeline is suitable of grouting.	Full cleaning of the pipeline to remove all foreign material.

D. Methods:

1. Hydraulic Cleaning:

- a. Hydraulic-propelled devices which require a head of water to operate must utilize a collapsible dam.
- b. The dam must be easily collapsible to prevent damage to the sewer main, property, etc.
- c. When using hydraulically-propelled devices, precautions shall be taken to ensure that the water pressure created does not cause damage or flood public or private property.
- d. Do not increase the hydraulic gradient of the sanitary sewers beyond the elevation that could cause overflow of sewage into area waterways or laterals.
- e. The flow present in the sanitary sewer main shall be utilized to provide necessary fluid for hydraulic cleaning devices whenever possible.

2. High-Velocity Cleaning:

- a. Cleaning equipment that uses a high velocity water jet for removing debris shall be capable of producing a minimum volume of 50 gpm, with a pressure of 1500 psi for the sanitary sewer line and 3500 psi for the (manhole) structure at the pump.
- b. Any variations to this pumping rate must be approved, in advance, by the Owner.
- c. To prevent damage to older sewer mains and property, a pressure less than 1500 psi can be used.

- d. A working pressure gauge shall be used on the discharge of all high-pressure water pumps.
- e. For sewers 18 inches and larger in diameter, in addition to conventional nozzles, use a nozzle which directs the cleaning force to the bottom of the pipe.
- f. Operate the equipment so that the pressurized nozzle continues to move at all times.
- g. The pressurized nozzle shall be turned off or reduced anytime the hose is on hold or delayed in order to prevent damage to the line.

3. Mechanical Cleaning:

- a. Mechanical cleaning, in addition to normal cleaning when required, shall be with approved equipment and accessories driven by power winching devices.
- b. Submit the equipment manufacturer's operational manual and guidelines to the Owner, which shall be strictly followed unless modified by the Owner.
- c. All equipment and devices shall be operated by experienced operators so that they do not damage the pipe in the process of cleaning.
- d. Buckets, scrapers, scooters, porcupines, kites, heavy duty brushes, and other debris-removing equipment/accessories shall be used as appropriate and necessary in the field, in conjunction with the approved power machines.
- e. The use of cleaning devices such as rods, metal pigs, porcupines, root saws, snakes, scooters, sewer balls, kites, and other approved equipment, in conjunction with hand winching device, and/or gas, electric rod propelled devices, shall be considered normal cleaning equipment.

E. Considerations - Consideration needs to be given to ensure that:

- 1. Adjacent properties are not damaged or flooded.
- 2. Sewer overflows do not occur.
- 3. The sewer being cleaned is not damaged.
- 4. All debris from the cleaning is collected and removed from the sewer system.

Televising / Inspection

- A. The pipeline should be inspected as soon as possible after it has been cleaned. In any case the inspection should be completed within seven days of cleaning. For pipes that have material with high levels of debris or grease flowing through them seven days may be too long and re-cleaning may be required.
- B. Inspection shall be done one manhole section at a time.
- C. Locate video vehicle on upstream side of manhole. Recording shall begin during the lowering of the camera into the manhole opening. Video in the downstream direction such that camera movement is with the flow. Camera lens shall be positioned looking along the

axis of the sewer. The camera axis should be within $\pm 10\%$ of the vertical sewer centerline of the pipe. For oval shaped pipes, the camera shall be positioned vertically above the invert at a height $\frac{2}{3}$ of the vertical dimension of the pipe.

- D. Insert the camera in the upstream manhole after flow restrictions required have been accomplished. Flow into the system being inspected shall be stopped, with the exception of service laterals into the system being inspected. Move camera through the pipe lines at a moderate speed not exceeding 30 feet per minute. Excessive use of the pan and tilt features should be avoided. Stop camera at locations where one or more of the following conditions is observed:
1. Infiltration/inflow sources.
 2. Service Laterals.
 3. Structural defects including broken pipe; collapsed or collapsing pipe, cracks, deterioration, punctures, etc.
 4. Abnormal joint conditions such as misalignments, open joints and joints not sealed.
 5. Unusual conditions such as root intrusion, protruding pipes, in-line pipe size changes, mineral deposits, grease and obstructions.
- E. Stop camera long enough for a thorough visual inspection of the conditions. All such conditions as specified above, along with the corresponding PACP code for each condition, shall be audio recorded on video and the inspection log sheet. Move the camera and rotate to obtain optimum view of the conditions. Each condition should be framed as to provide a full perspective. If requested by an NBU representative, view problem areas in the opposite direction by pulling the TV camera from the opposite direction at no additional cost to the NBU.
1. While the camera is stopped at each service connection, rotate the camera so as to be able to view the service connection for a length of time that enables a good visual inspection of the service connection for damage and infiltration. Be responsible for measurements such as service lateral locations, if used for subsequent rehabilitation work.
 2. When, during the inspection operation, the television camera will not pass through the entire manhole-to-manhole section, set up equipment so that the inspection can be performed from the opposite manhole at no additional cost to NBU. All reasonable effort should be given to video the entire segment including the removal of obstructions, reversals, location/exposure of buried manholes, use of more versatile equipment, etc.
 3. Any defects or anomalies detected on new construction that does not meet NBU requirements shall be corrected by the Contractor prior to NBU acceptance. Once corrected, the portion(s) shall be videoed, again, to assure the modification(s) was made correctly.
- F. Move the camera through the main in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer line condition. In no case shall the television camera be pulled at a speed greater than 30 feet per minute. 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 main condition. Identify locations of defects by means of a measurement device (distance meter) above ground. Marking on the cable or similar practices that require interpolation for depth

of manhole is not allowed. Check accuracy of the distance meter with a walking meter, roll-a-tape, or other suitable device satisfactory to the Owner.

Flow Control

- A. Provide flow control measures needed to allow for isolation of individual sanitary sewer sections for rehabilitation work. Prior to beginning Work, Contractor shall submit a written plan for flow control as noted in Paragraph 1.02. In providing this Work, protect the sewer main from damage that might result from sewer surcharging. In addition, take precautions necessary to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewer mains involved. Contractor is advised to schedule its Work in section lengths such that in the event of a wet weather event that might cause an increase in the sewer flow, the Work can be adequately secured, the flow diversion stopped, and flow resumed back in the existing main expeditiously and without damage to the new Work.
1. Notify property owners and tenants a minimum of 48 hours prior to scheduled flow control diversion operations.
 2. Locate flow diversion equipment, facilities, and activities such that local traffic, private property access, or any public activities are not interrupted.
 3. Where diversion piping crosses side streets, alleys and driveways, provide asphalt ramps and covers over the piping to facilitate passage of any traffic. Provide pedestrian cross-over ramps and walkways where needed or requested by the Owner. Do not open cut streets, alleys, or driveways to bury piping.
 4. Divert incoming flow from all service connections and laterals. Provide all the necessary materials and equipment to tie this flow into the main diversion system.
 5. Flow diversion materials and equipment must be in place and successfully operating for a period of 4 hours prior to starting any rehabilitation work requiring flow diversion.
 6. Reduce flow to within the limits required for TV inspection. After the Work has been completed, restore flow to normal.
 7. Keep pumping engine noise complaints from the citizens to a minimum. Owner's representative may terminate all pumping activities if noise control is not adequately addressed.

Repair of Damaged Main

- A. If the main is damaged and requires repair prior to rehabilitation, make such repairs as directed by the Owner's representative. Any pavement cut excavation and repair must comply with the details in the Drawings. If the main is damaged through the negligence of the Contractor, make repairs as approved by the Owner's representative at no additional cost to the Owner.

Documentation

- A. Television Inspection Logs: Keep printed location records that clearly show the camera location in relation to an adjacent manhole for each infiltration point or defect observed during inspection. In addition, record other points of significance such as locations of

service line entry points, unusual conditions, roots, sewer connections, broken pipe, presence of scale and corrosion, and other discernible features. Submit a copy of such records and copies of the video in digital format to the Owner's representative.

- B. Furnish a detailed report and digital video of the system inspected. The minimum information supplied shall be the following:
1. Name and address of Contractor and the Developer.
 2. Name of Project, system(s) inspected, and Project's representative involved.
 3. Log reports:
 - a. PACP Report and Top View Report for each section of pipe using NASSCO's PACP Standards unless otherwise instructed by NBU.
 - b. Separate line for each deficiency and location
 - c. Corresponding video and location of each section of pipe and deficiencies on digital video.
 4. Video shall be labeled with the following information:
 - a. System that is video (street name and manhole to manhole numbers) and log report number corresponding to video
 - b. Date video was recorded
 - c. Contractor's name and representative
 - d. Project's name, if applicable

315.7 Measurement and Payment

Payment for CCTV of lines will be made at the unit price bid per linear foot for the various sizes of pipe, of the materials and type indicated. Payment shall include all labor, materials, equipment, cleaning, by-pass pumping, and all other incidentals and appurtenances necessary to complete the work.

Payment, when included as a Contract pay item, will be made under one of the following:

Pay Item: Pipe, __Dia. ____ (all depths) Per Linear Foot

End