

SUBSECTION 02 33 00
CCTV INSPECTION AND CLEANING OF PIPELINES

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Cleaning: Furnish all labor, materials, equipment and incidentals required to perform high pressure water jetting, rodding, brushing, bucketing, and root removal of designated sewer lines prior to internal inspection by closed circuit television.
- B. Sewer Flow Control: The Contractor shall provide all the labor, materials, equipment, and incidentals necessary to divert water and wastewater flows to facilitate placement of CIPP Liners.
- C. Pre-rehabilitation CCTV: The Contractor shall furnish all labor, materials, equipment, and incidentals required for CCTV of all sewer line segments listed in the contract for repair or CIPP Lining.
- D. Post-rehabilitation CCTV: The Contractor shall furnish all labor, materials, equipment, and incidentals required for CCTV inspection as specified herein. The following line segments shall be post-rehabilitation CCTV inspected:
 - 1. Sewer line segments repaired by full-length replacement.
 - 2. Sewer line segments rehabilitated by lining.
 - 3. Sewer line segments rehabilitated by excavated point repair.

1.02 SUBMITTALS

- A. The Contractor shall maintain a master copy of all DVD's and CCTV inspection reports submitted, until final acceptance of contract. All DVDs, and CCTV inspection reports submitted by the Contractor will become the property of the VA.
- B. The Contractor shall submit one (1) DVD, one (1) hard copy, and one (1) electronic copy of pre-habilitation CCTV inspections and inspection reports on a weekly basis for all work accomplished the previous week.
- C. For post-rehabilitation CCTV inspection, the Contractor shall submit to the Engineer for review one (1) set as above of inspection data on all sewer line segments rehabilitated as part of this project.
- D. The Contractor shall submit documentation that the CCTV inspection equipment to be used meets the requirements of this specification.
- E. All forms to be used for recording the cleaning work will be submitted for review and approval by the Engineer.

1.03 QUALITY ASSURANCE

- A. If the quality of the DVD's, and CCTV inspection reports is not adequate as determined by the Engineer, the Contractor shall provide a new DVD, or CCTV report at no additional cost. Camera distortions, inadequate lighting, dirty lenses, blurred/hazy or unsteady pictures will be causes for rejection of a tape and rejection of the video for

the associated line segment. In the case of rejection of the video, the Contractor shall re-inspect the line segment(s) in question and provide the required submittals for these line segment(s) to the Engineer. No additional payment shall be made for re-inspection.

PART 2 - PRODUCTS

2.01 CLEANING ACCESSORIES

- A. Contractor shall coordinate use of water resources needed to perform the work with the Project Engineer. Water shall be furnished to the Contractor at no charge.

2.02 HIGH VELOCITY WATER JET CLEANING EQUIPMENT

- A. All high velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a variety of high velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 degrees to 45 degrees in all size lines to be cleaned. In addition to conventional nozzles, use a nozzle or series of nozzles which direct the cleaning force to the bottom of the pipe for sewers 18 inches and larger. The equipment shall include a water tank, auxiliary engines, pumps and hydraulically driven hose reel all contained within one single unit. All controls shall be located so the equipment can be operated above ground. A gauge shall be installed to indicate working pressure on the discharge of high-pressure water pumps.

PART 3 - EXECUTION

3.01 CCTV INSPECTION

- A. The Contractor shall supply camera skids and floating skids or rafts as required to complete the CCTV portion of the Contract. The Contractor shall inspect sewer lines with pan and tilt conventional television equipment as specified, so as to record all relevant features and defects. The operation of the television equipment shall be controlled by a skilled technician or supervisor who shall be located at the control panel in the mobile television studio. The CCTV equipment including reels and the television studio are to be contained within a single vehicle.

3.02 PRE-REHABILITATION CCTV

- A. Inspection of sewer line segments will accurately locate the defects identified for repair in the contract and provide the pre-rehabilitation condition of the pipe.

3.03 POST-REHABILITATION CCTV

- A. Post Rehabilitation CCTV confirms proper installation of repairs and replacements.
- B. Sewer line segments repaired by full-length replacement, excavated point repair, or by lining require cleaning prior to CCTV inspection.

3.04 CLEANING

- A. All interior surfaces of sewer lines shall be cleaned adequately to provide for use of a camera used in internal inspection to discern structural defects, misalignment, and infiltration and inflow sources. Cleaning shall be performed prior to internal inspection to preclude the buildup of debris from infiltration and inflow sources and discharges from upstream sewer line segments sections.
- B. Selection of cleaning equipment shall be based on the conditions of the sewer lines at the time the work commences. The Contractor will determine the most effective method to clean sanitary sewer lines. Equipment and methods selected shall be satisfactory to the Engineer. A daily log shall be maintained to record the location of all sewer lines cleaned, lengths of lines cleaned, method of cleaning, line sizes, and number of passes.
 - 1. Cleaning: Cleaning shall be defined as the use of high velocity jet nozzle cleaning equipment, bucket machines, scrapers or augers necessary to clean the line to the satisfaction of the Engineer.
- C. Each designated sewer line shall be cleaned using hydraulically propelled, high velocity jet. The equipment selected for cleaning shall be capable of removing dirt, grease, rocks, sand and other deleterious materials from the sewer lines and manholes. Cleaning shall be complete when the interior of the sewer is free from dirt, grease, rocks, sand and other deleterious materials.
- D. During all sewer cleaning operations, satisfactory precautions shall be taken to protect the sewer lines from damage that might be inflicted by the improper use of cleaning equipment. Whenever hydraulically propelled cleaning tools which depend upon water pressure to provide their cleaning force or any tools which retard the flow of water in the sewer line are used, precautions shall be taken to ensure that the water pressure created does not cause any damage or flooding.
- E. No fire hydrant shall be obstructed so as to prevent its use in case of a fire in the area served by the hydrant. All cleaning equipment must be equipped with a backflow preventer to prevent any contamination to the water supply. The Contractor shall not waste water supplies due to poor connections or from hydrants left open.
- F. When requested by the Engineer, the Contractor shall demonstrate the performance capabilities of the cleaning equipment and method proposed for use on the project. If results obtained by the demonstration are not satisfactory to the Engineer, the Contractor shall provide other equipment or devices that will clean the sewer line.
- G. For hydraulically propelled or high velocity sewer cleaning equipment, the Contractor shall install a gauge to indicate working pressure on the discharge of high-pressure water pumps.
- H. The Contractor shall use a nozzle that directs the cleaning force to the full circumference of the pipe.

- I. The Contractor shall clean the full circumference of the sewer line segments and associated manholes using mechanical, hydraulically propelled, or high-velocity sewer cleaning equipment.
- J. The Contractor shall take necessary precautions to protect sewer line segments and manholes from damage that might be inflicted by the improper selection of the cleaning process or improper use of the equipment.
- K. The Contractor shall install a suitable sand trap, weir, dam, or suction pipe in the downstream manhole so that solids and debris are trapped for removal. Passing material from manhole section to manhole section which could cause line stoppages, accumulations of sand in wet wells, or damage to pumping equipment shall not be permitted. Load debris from the manholes into an enclosed container that is permitted for liquid waste hauling. Do not accumulate debris, liquid waste, or sludge on the site except in totally enclosed containers approved by the Engineer and in accord with local zoning ordinances. Remove solids or semi-solids resulting from cleaning operation from the site and dispose of it at the end of each workday.
- L. The Contractor is responsible for making arrangements for the disposal of waste from cleaning operations at a licensed disposal site.
- M. Acceptance of sewer cleaning work is contingent upon the successful completion of the television inspection. If television inspection shows debris, solids, sand, grease or grit remaining in the line, the cleaning is considered unsatisfactory. The Contractor, at no additional cost, shall repeat the cleaning, inspection, and televising of the sewer line until cleaning is acceptable by the Engineer.

3.04 TELEVISION EQUIPMENT

- A. Closed Circuit TV Equipment: The Contractor shall select and use closed-circuit television equipment that will produce color videotape. The Contractor shall supply camera skids and floating skids or rafts as required to complete the CCTV portion of the Contract.
- B. Pipe Inspection Camera
 - 1. The television camera used for the sewer line inspection shall be one specifically designed and constructed for sewer line inspection. The camera shall be waterproof and shall be operative in any conditions that may be encountered in the inspection environment. The camera shall be operative in 100% humidity conditions. The Contractor shall produce videotapes using a pan-and-tilt, radial viewing pipe inspection camera that pans ± 275 degrees and rotates 360 degrees.
 - 2. The camera shall be moved through the line segment in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition.
 - 3. When manually operated winches are used to pull the television camera through the line segment, radios or other suitable means of communication shall be set up between the two manholes of the

line segment being inspected to insure good communications between members of the crew.

4. Provide dewatering as needed.
5. Wherever prevailing conditions allow, the CCTV camera head shall be positioned to reduce the risk of picture distortion. Position the television camera lens centrally within the sewer. Orient the camera along the longitudinal axis of the sewer.
7. The inspection equipment shall be capable of clearly televising the interior of a six-(6) inch diameter sewer and all larger sizes.
8. The adjustment of focus and iris shall provide a minimum focal range from 2 inches in front of the camera's lens to infinity. The distance along the sewer in focus from the initial point of observation shall be a minimum of twice the vertical height of the sewer. The illumination must be such as to allow an even distribution of the light around the sewer perimeter without the loss of contrast, flare out of picture, or shadowing.
9. The Contractor shall use a camera with camera height adjustment so that the camera lens is always centered at one-half the inside diameter or higher in the sewer line being televised. The Contractor shall provide remote and/or automatic focus and aperture control.
10. Provide continuous video recordings of the inspection view as it appears on the television monitor. The intent of the Engineer is for a video recording to be made of the complete television inspection of all the sewer lines included as part of this project. Videotape recording shall be in VHS format at standard play speed. Videotapes shall be high quality. The video recording shall be 90 minutes or less in length. The video recording shall reproduce clearly discernable sound and video information on the television monitor. The recording shall be free of interference and shall produce a clear, stable image.
11. The audio portion of the recording shall be clear and complete, and easily discernible. The audio portion shall record the location or identification of the line segment, the manhole-to-manhole direction of travel, and the distance traveled on the specific inspection.
12. The video recording equipment shall be continuously connected to the television inspection and monitoring equipment. The videotaping and monitoring equipment shall have the built-in capability to allow the Engineer and the Contractor to instantly evaluate both the audio and video quality of the videotape recording at all times during the television survey. Playback speed shall be continuously adjustable from one-third normal speed for slow-motion viewing to normal playback speed. Videotape recordings shall be enclosed in plastic containers which shall clearly indicate the date the tape was recorded and the referenced sewer inspection report covering the sections of the sewer lines so included.

13. The television inspection equipment shall be of such high quality as to enable the following to be achieved:
 - a. Color: With the monitor adjusted for correct saturation, the six colors plus black and white shall be clearly resolved with the primary and complementary colors in order of decreasing luminance.
 - b. Resolution: The live picture must be displayed on a monitor capable of providing a clear, stable image free of electrical interference with a minimum horizontal resolution not less than 450 lines.
14. The Closed Circuit Television monitor display shall incorporate an automatically updated record in feet and tenths of a foot of the distance along the line from the cable calibration point to the center point of the camera. The Contractor shall use a suitable metering device that enables the cable length to be accurately measured; this shall be accurate to $\pm 2\%$. The Contractor shall demonstrate that the tolerance is being complied with, by tape measurement between manholes on the surface. This taped measurement must be included on each television inspection log both written and electronic. If the Contractor fails to meet the required standard of accuracy, the Contractor shall provide a new device to measure the footage.

C. DVD

1. The Contractor shall provide videotapes with audio comments in the DVD format, recorded at Standard Play (SP).
2. Complete sewer line segments can be included on the same videotape (i.e., CCTV inspections for sewer line segments shall not be divided among videotapes).
3. The video format shall be an MPEG-1 compressed video, and resolution video format shall be QSIF (Quarter-size Standard Image Format) of 176 x 112 pixels for NTSC video format.
4. Two labels are required on each DVD. One label shall be placed on the spine of the DVD Cover and the other on the face of the DVD. The Contractor shall permanently label each as follows:

Spine of DVD Cover

PRECONSTRUCTION AUDIO-VIDEO SURVEY

Contract No.

Tape No.

Face of DVD

Project Title: _____ Contractor: _____

Date Televised (MM/YY): _____ Date Submitted _____

Manhole No. From	Manhole No. To	Pipe Diameter	Pipe Length	Starting Counter No.

D. TELEVISION INSPECTION REPORTS

1. The Contractor shall complete a Television Inspection Report covering the television inspection work.
2. At the start of each line segment video recording, record and report the measured length of the sewer line being inspected, to obtain a full record of the sewer length. Begin with zero at the inside face of the start manhole, and end at the inside face of the end manhole.
4. At the start of each line segment video recording, electronically generate and clearly display, on the viewing monitor and video recording, a record of data in alphanumeric form containing the following information:
 - a. Size and Length of Line;
 - b. Automatic update of the camera's position , in feet and tenths, in the sewer line from adjusted zero;
 - c. Type of pipe material;
 - d. Upstream manhole name and downstream manhole name;
 - e. Date of inspection;
 - f. Direction of inspection (upstream or downstream);
 - g. Starting time of the inspection.
5. Once the survey of the sewer line is under way, continuously display specific data on the viewing monitor and video recording. The size and position of the data display shall not interfere with the main subject of the picture yet shall be easily readable when the recording is replayed. At a minimum, the following data should be displayed:
 - a. Automatic update of the camera's position, in feet and tenths, in the sewer line from adjusted zero.
 - b. Upstream manhole name and downstream manhole name.
6. Submit the videotapes and corresponding reports to the Engineer on a weekly basis for all work accomplished the previous week.

3.05 CAMERA OPERATION

- A. Throughout all CCTV inspections, the camera equipment shall be positioned with the camera directed along the longitudinal axis of the sewer. All efforts should be made to prevent damage to the sewer conduit 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 absorbed by the Contractor and shall be considered an incidental part of the Work. No separate measurement or payment will be made.
- B. The CCTV operator shall accomplish simultaneous video and audio recording of defects, services, etc. on site.

3.06 DEPTH OF FLOW

- A. When depth of flow at the upstream manhole for any sewer line segment is above the maximum allowable depth for CCTV inspection, the flow shall be reduced to an acceptable level by flow control methods.

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