



**SECTION 02541
SEWER TELEVISION INSPECTION**

PART 1 GENERAL

1.01 SCOPE

- A. The Work covered by this section includes furnishing all labor, equipment, and materials required to clean and inspect the designated sanitary sewer lines specified.
- B. Closed-circuit television inspection of sanitary sewers as follows:
 - 1. TV inspection on all lines proposed for rehabilitation, including root control chemical application, under this contract, shall be performed where no videotape of the sewer is available from OWNER.
 - 2. TV inspection of line segments specified for chemical root removal, shall be required to confirm cleaning and location of service connections. TV inspection shall also be required to confirm the need for mechanical root removal and to determine its location.
 - 3. CONTRACTOR shall use the Television Inspection Form and Rehabilitation Tables approved by OWNER prior to beginning of any inspection.
 - 4. Digital videos, data, photos shall be delivered to the OWNER with an external hard drive which will be returned to the CONTRACTOR.

1.02 SUBMITTALS

- A. Action Submittals: Catalog and manufacturer's data sheets for television equipment.
- B. Informational Submittals:
 - 1. References: Contact names and telephone numbers.
 - 2. List of staff and equipment to be used on Project.
 - 3. Crew chief qualifications.
 - 4. Traffic control plan.
 - 5. Look-ahead inspection schedules, minimum of 7 days in advance of the Work.
 - 6. Initial first days' CCTV digital videos and inspection logs within 24 hours of start of CCTV inspection.
 - 7. Certification that staff to be used for the Work is properly trained in confined space entry and hazardous atmospheres.
 - 8. Training and inspection plan, 7 days prior to manual inspection.



9. Final report.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. CONTRACTOR: Performed work successfully for at least three other projects, within last 5 years, with pipe lengths and pipe diameters similar to this Project.
2. Crew Chief: Minimum of 5 years' experience on projects similar to this Project and experienced using proposed equipment for this Project.

B. Prestartup Meeting: At least 5 days prior to beginning CCTV inspection work, schedule with OWNER to review proposed sewer flow bypassing plan, traffic control plans, and inspection methods.

C. Submit digital videos, photos and logs for quality review and comment to OWNER within 24 hours after the first days' work is completed. Submit tapes and logs on a routine basis within 7 days after completing each tape. Picture quality and definition shall be to the satisfaction of OWNER. Inspection equipment that fails to produce satisfactory inspection quality shall be removed.

1.04 NOTIFICATIONS

A. Notify OWNER:

1. A minimum of 5 days prior to the anticipated commencement of inspections in any one area and 24 hours in advance of actual start.
2. When obstruction, restricting flow in pipeline, is discovered.
3. If depth of flow in pipeline exceeds 33 percent of pipe diameter.
4. If conditions for CCTV inspection are found to be unsafe or impractical.
5. Pipe configuration in field is different than shown on maps. Notification shall include diagram clearly indicating location of structure in relation to immediately adjacent structures.

PART 2 PRODUCTS

2.01 TELEVISION INSPECTION EQUIPMENT

A. CONTRACTOR shall provide a mobile vehicle with video monitoring equipment specifically compatible with the camera equipment being used. The equipment shall include dual video recorders, dual monitors, and picture capture capability. The vehicle shall be large enough to accommodate at least three people at any time for viewing of



the monitor. OWNER shall have unrestricted access to observe the television screen and all other operations at all times.

- B. The basic equipment for use in cleaning and inspection operations shall consist of hydraulically propelled or mechanical cleaning equipment and a self-propelled full color television inspection camera with footage meter, pan, and tilt functions.
- C. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear color picture of the entire periphery of the pipe. The camera shall be capable of a 360° viewing area. Backup camera shall be available on the Project Site. The camera shall be operative in 100% humidity conditions. Camera shall be operative in a hazardous and/or corrosive environment.
- D. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of DESIGN ENGINEER.
- E. The television inspection equipment shall have an accurate footage counter that shall display on the monitor the exact distance of the camera from the centerline of the starting manhole.

2.02 SONAR INSPECTION

- A. Sonar inspection may be used if the technology is proven in the industry and with the approval of the OWNER.
- B. If sonar inspection is approved, it will be done in exception to the requirements of this section.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prior to televising, CONTRACTOR shall thoroughly clean the pipelines of debris, grease, roots, sediment, broken pipe, or other obstructions that could retard the movement of the television camera. Precautions shall be taken to protect the sewer lines being cleaned from damage by the cleaning equipment.
- B. Immediately after cleaning, the sewer line section shall be visually inspected by means of closed-circuit television to determine the condition of the line and to locate existing service connections. The inspection will be done one manhole section at a time and the flow in the section being inspected will be suitably controlled as specified. (See Section 02542, Sewer Flow Control).



- C. All internal pipe damage shall be photographed in color by CONTRACTOR utilizing picture capture equipment, and shall be clearly labeled as to date, each number, footage, and type of defect. The photographs shall be the property of OWNER.

3.02 TELEVISION INSPECTION

- A. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer line section condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. 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 shall be used to move the camera through the sewer line.
- B. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to insure good communications between members of the crew.
- C. The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device, and the accuracy shall be satisfactory to DESIGN ENGINEER.
- D. The camera height shall be adjusted such that the camera lens is always centered (2 I.D. or higher) in the pipe being televised.
- E. Lighting system shall be adequate for quality pictures. A reflector in front of the camera may be required to enhance lighting in black pipe.

3.03 PASSAGE OF TV CAMERA

- A. There may be occasions during the TV inspection of a sewer line section, when the camera will be unable to pass an obstruction even though flow is continuing. CONTRACTOR shall televise the manhole section from the other direction in order to obtain a "full" video of this manhole section. Whenever such condition arises, OWNER shall be notified to determine if a point repair is necessary. No additional payment shall be made for reverse set-ups required due to an obstruction.

- B. TV videos shall be submitted in one continuous section from manhole to manhole, and not in broken pieces, unless specifically approved by OWNER.
- C. When the camera is being pulled from the “other end” and a second repair location is encountered away from the first repair/obstruction location, OWNER shall be notified and allowed to review the TV DVD at the Site in a timely manner. Obtain OWNER’s permission to make the two point repairs. No downtime shall be allowed.
- D. If the two point repairs are allowed and completed, CONTRACTOR shall again proceed to re-televiser the sewer line section. Generally, up to 20 feet of the line from each of the ends of the two point repairs may be lamped or physically inspected at the Site, to verify the condition of the line without further TV.
- E. OWNER makes no guarantee that all of the sanitary sewer mains proposed to be TV inspected after the cleaning, are clear for the passage of the camera set-up. The equipment, tools and method(s) used for securing the passage of the camera are to be at the discretion of CONTRACTOR, with the approval of OWNER. The decision to repair or not to repair a location shall always be made by OWNER.
- F. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be reset on the other manhole and cleaning again attempted. If again, successful cleaning cannot be performed or the equipment fails to traverse the entire pipeline section, it will be assumed a major blockage exists and the cleaning effort shall be terminated only at the direction of OWNER.
- G. 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 on 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 to or flooding of public or private property being served by the sewer section involved.
- H. Roots shall be removed in the sections where root intrusion is a problem. Special precautions should be exercised during the cleaning operation to assure complete removal of visible roots from the joint area. Any visible roots that may impact rehabilitation efforts shall be removed. Procedures may include the use of mechanical devices such as rodding machines,

expanding root cutters and porcupines, and hydraulic procedures such as high-pressure jet cleaners.

- I. To aid in the removal of roots and at the option of CONTRACTOR, sewer sections that have root intrusion may be treated with a OWNER -approved herbicide. The application of the herbicide to the roots shall be done in strict accordance with the manufacturer's recommendations and specifications in such a manner to preclude any damage to the surrounding vegetation. CONTRACTOR shall replace any damaged vegetation so designated by OWNER, at no additional cost to OWNER. All safety precautions as recommended by the manufacturer shall be strictly adhered to concerning handling and application of the herbicide.
- J. CONTRACTOR, after cleaning a section of pipe, shall utilize the television camera to inspect the main. No line shall be considered cleaned until OWNER approves.
- K. The television camera shall be moved through the line in either direction at a uniform rate, stopping when necessary to insure proper documentation of the sewer's condition, but in no case shall the television camera travel at a speed greater than 30 feet per minute.
- L. The television camera shall travel through the lines using its own power. The pictures taken of the entire inside periphery of the pipe shall be clear and visible. Picture quality and definition shall be to the satisfaction of OWNER, and if unsatisfactory, the equipment shall be removed and no payment made for the unsatisfactory inspection.
- M. At all service laterals the camera shall be stopped and panned to such an angle that an internal view of the service lateral is available to determine if the lateral is active or dead or plugged. Where other pipe deficiencies are noted, the camera shall be stopped to observe the condition, record information and take photographs. Any service lateral or deficiency observed in the sewer line shall be photographed and described on the photograph.



3.04 FLOW CONTROL

- A. TV inspection shall be done one sewer line section at a time, and the flow in the section being televised shall be suitably controlled. The depth of wastewater flow shall not exceed that shown below:

6" - 10" Pipe:	20% of pipe's diameter
12" - 24" Pipe:	25% of pipe's diameter
Over 24" Pipe:	30% of pipe's diameter

- B. When the depth of flow in the section being worked is above the maximum allowable for the television inspection, the flow shall be reduced to allowable levels by performing the inspection during minimum flow hours, with diversion pumping or by pulling camera with swab or a high velocity jet nozzle, as approved by OWNER.
- C. No separate payment shall be made for sewer flow control.
- D. CONTRACTOR shall not be allowed to float the camera unless permitted by OWNER.
- E. When flow in a sewer line is plugged, blocked, or bypassed; sufficient precautions must be taken to protect the sewer lines from damage that might result from sewer surcharging. Further, precautions must be taken to insure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.

3.05 DOCUMENTATION

- A. CONTRACTOR shall submit in electronic format digital videos, photos, and evaluation reports, to OWNER for review. OWNER's review and comment period may require up to 10 working days from the date of submittal.
- B. The digital video shall be recorded at Standard Play and each digital video segment information entered in the software as required under Article Basic Module (1) – Survey/Logging Report.
- C. If digital videos are of such poor quality that OWNER is unable to evaluate the condition of the sanitary sewer main, locate the sewer service connections, or verify the cleaning CONTRACTOR shall be required to



re-televiser the sanitary sewer and provide a new digital video of good quality, at no additional cost to OWNER.

- D. All digital videos will become the property of OWNER.
- E. Payment deduction of \$50 per digital video shall apply for poor and unacceptable quality digital videos or for portions of sewer not televised. Camera distortions, inadequate lighting, dirty lens or blurred/hazy picture will be cause for rejection of the Work.

3.06 BASIC MODULE (1)—SURVEY/LOGGING REPORT

- A. The software's core module shall be capable of providing complete survey reports and be PACP (Pipeline Assessment and Certification Program) certified by NASSCO. The software shall be the latest version of Subcam 2005.
- B. There shall be PACP Complaint codes pre-programmed and grouped by PACP Groups.
- C. The software shall be capable of customization with the ability to modify or add to the pipeline condition and group them for ease of use.
- D. The footage reading from the camera equipment shall be automatically entered into the Survey Log through RS232 cable and shall directly correspond to the noted defect location throughout the pipe graphic and tabular reports generated.
- E. The inspection and reporting software program shall be menu-driven and shall have a complete on-screen help file.
- F. Drop-down boxes shall be utilized to quickly reference common information such as defects, pipe materials, survey purpose, locations, pipe usage, etc.
- G. The browser screen shall allow quick viewing of:
 - 1. Sequential survey/segment as setup number (automatic input by software).
 - 2. User-selected categories.
 - 3. Up-stream and down-stream manhole numbers.
 - 4. Street name.
 - 5. Pipe segment details.
 - 6. Drainage basin number.
- H. All relevant pipe segment information shall be entered prior to the actual survey. The below listed minimum pipe details must be supplied in the software for proper system management. The graphic and tabular survey reports generated shall include the following information:
 - 1. Pipe diameter.

2. Starting manhole number.
 3. Ending manhole number.
 4. Starting manhole depth.
 5. Ending manhole depth.
 6. Direction of survey.
 7. Pre-clean (y/n).
 8. Total surveyed length.
 9. Pipe material.
 10. Pipe section length.
 11. Pipe shape.
 12. Road name.
 13. Address or place name.
 14. Work Order number.
 15. Video CD number.
 16. Engineering drawing number.
 17. Purpose of survey.
 18. Pipe age (year of construction).
 19. Inspection of survey date.
- I. Subcam 2005 software shall maintain a database of underground pipe and manhole assets. The database(s) shall have structure similar to the one referencing pipe usage (i.e., sanitary storm drainage, etc.) sections (i.e., projects, areas, or quadrants). Surveys shall include a method of pipe segment numbering and a chronological survey set-up numbering system.
- J. Subcam 2005's basic module database shall have the means to sort in ascending and descending order according to date, pipe segment, reference number, road name, manhole number(s), observed footage, pipe materials, pipe diameters, work order numbers, etc. A filtering system shall also be made available.
- K. The basic module software shall have search capabilities in order to find information about past surveys located in the database(s).
- L. A summary paragraph shall be made available for a conclusive pipe segment assessment.
- M. The graphical reports shall print in color for quick glance referencing of the defect category. The color-coding scheme shall allow for quick reference as to the quality of service, structural, hydraulic, and constructional defects within a particular survey.
- N. A scoring system incorporated in the software will assist the user/management personnel in making proper assessment of pipe conditions. Scoring is to be based upon defect severity entered by the operator.

- O. An inspection “health check” feature shall be incorporated to insure that the information has been correctly entered. The health check allows for verification of essential information to complete a survey. This feature can be implemented individually or on a total selection basis.
- P. A Site sketch feature shall also be supplied so that a drawing or sketch shall indicate special details or locations about a particular set-up Site.
- Q. The software shall also have the capability to import and export survey results in a variety of industry standard formats.

3.07 BASIC MODULE (1)—SUMMARY REPORTING

- A. Summary reports compiling data from multiple inspections shall be available. Such reports shall indicate individual survey results in tabular form and list (sort) surveys based on a user-defined description field.
- B. Defect report shall be programmable to list specific defects observed with corresponding footage, starting and ending manhole number, structural pipe defects (i.e., cracks, offsets, defective laterals, collapsed pipe, etc.) and service-oriented defects (i.e., roots, grease, obstructions, infiltration, etc.).
- C. A drainage schedule report shall include starting and ending manhole numbers, depths, pipe material, total survey length, and pipe diameter.
- D. The grading scores report shall summarize the manhole numbers, pipe material, pipe diameter, and the grade scores for each survey with totals.
- E. Service and structural aspect scoring reports are to list the pipe segment, reference number, total observed length, number of defects, and total score with reference to the condition of the total pipe, average of the pipe, total defects, and average of defects.
- F. Section summary reports are to be made available so that all surveys within a section are listed showing purpose of inspection, date, work order numbers, manholes, road names, and total lengths.
- G. All software shall be compatible with OWNER’s current system.

3.08 EVALUATION REPORTS

- A. Each video shall be accompanied by a TV inspection report, which shall be a written/narrated log of all pipe defects, sags, service connection

locations and conditions, etc., recorded on a footage basis. Report shall be provided in an electronic (computer usable) format that is transferable to a Microsoft Access database.

- B. The pipe defects shall include separate codes for the following: Radial Cracks, Longitudinal Cracks, Misaligned Joints, Broken Joints, Root Intrusion, Laterals, and Infiltration. The size/length of the defect shall be reported. The beginning of all sags of the pipe, the length that is underwater as well as where the camera pulls out of the sag shall be reported. The clock position of each service connection and the condition shall be reported. The condition of each service connection will include the distance protruding when appropriate and the type. All other information required for analysis such as degrees of deterioration, deformation or collapsed pipe shall be reported. All reports and/or submittals shall adhere to Pipeline Assessment Certification Program (PACP) Standards.
- C. This log shall also identify the section being televised, flow and camera direction, type of pipe, pipe condition, weather conditions, type of surface cover, or any other information required by OWNER.
- D. OWNER may provide CONTRACTOR a log form that utilizes codes for the above-mentioned defects.
- E. At the end of the Project CONTRACTOR shall provide a summary listing of all videos provided under this Project.

END OF SECTION