CHAPTER 16.5
SEWER CLEANING AND TELEVISION INSPECTION

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PART 1- GENERAL

1.1 SCOPE

A. Work in this section shall consist of furnishing all labor and equipment required to completely clean sewers from manhole to manhole and to inspect and document the interior condition of gravity sanitary sewer mains utilizing closed circuit television (CCTV) equipment.

1.2 RELATED DOCUMENTS

A. CHARLOTTE WATER Water and Sewer Design and Construction Standards and Standard Details.

1.3 DEFINITIONS AND ABBREVIATIONS

A. See Sections iii and iv of the CHARLOTTE WATER Water and Sewer Design and Construction Standards for common abbreviations and definitions.

1.4 SUBMITTALS

A. Contractor shall provide one copy of the CCTV inspections to Engineer. The inspections and submittals shall be in digital format as specified herein. Digital files in MPEG-4 Video file format with the H.264 Codec recording with embedded meta-data is required for the submittal. Each submittal will include the ITpipes software database file within the approved structure along with the MPEG-4 video files. Inspection logs shall be included and in pdf file format. Acceptable formats for submittal include USB flash drives, external hard drive, or via a pre-approved (by CHARLOTTE WATER) file sharing website. Each submittal to the Engineer shall include a transmittal that lists the file names and all sewer segments and video files included with the submittal.

PART 2 - PRODUCTS

A. Only ITpipes video inspection software shall be utilized. Use of other video inspection software and “conversion” to ITpipes is not allowed.

PART 3 - EXECUTION

3.1 CLEANING AND TELEVISION INSPECTION OF SEWERS

A. Contractor shall perform and provide all necessary traffic control measures to complete the work as required by the governing authority having jurisdiction over the work.

B. Prior to starting the clean and TV work, Contractor shall walk the sewers to be cleaned and televised to locate manholes and identify additional manholes not shown on the drawings. Contractor shall note any added manholes and notify Owner/Engineer so manhole numbers can be assigned prior to starting the TV inspections. In general, additional manholes that are found during the inspections

shall be numbered as the downstream manhole number followed by an “A”. Contractor shall also update the drawings to show any changes based on the actual sewer layout. These “red-line” markups shall be submitted to Engineer along with the TV inspections.

C. Contractor shall thoroughly clean and televise the sewers and submit one (1) copy of the final television inspection video and report in pdf file format to Engineer for review as specified herein. The Contractor’s cleaning operations shall fully clean the sewers and remove all roots, grease and debris. The cleaning shall be performed and completed from manhole to manhole prior to the television inspection. Contractor shall also clean the next downstream sewer (if included in the project area) prior to performing the TV to make sure there is no debris in the downstream sewer that may back-up flow and impact the TV inspections. No cleaning equipment shall be in the sewers while the television inspections are being performed.

D. The equipment used for the cleaning operations shall be specifically designed for cleaning sewers. Contractor shall use the appropriate equipment to clean all debris, roots and grease from each sewer segment thoroughly. The required equipment may be high velocity water jet cleaning equipment with various attachments or mechanical cleaning equipment such as power buckets or power rodders. Contractor shall select the cleaning equipment and procedures based on the conditions of the sewers at the time the work commences.

E. All solids shall be removed at the downstream manhole of the section being cleaned. Passing material from one sewer segment to another will not be permitted. Cleaning operations shall begin at the most upstream sewers and proceed downstream. The solids shall be removed from the site and disposed of properly at no cost to Owner. Owner **will not** provide a site for debris disposal. Collection system debris will not be accepted at Owner’s Zone 4 site on Tyvola Road, or any other Owner operated facility.

F. Contractor shall submit a list of permitted sites that will be used for disposal of the waste material. If Contractor elects to do so, debris collected from the Owner’s collection system may be disposed of at the Charlotte Motor Speedway (CMS) Landfill located at 5105 Morehead Road, Concord, NC 28207, pending approval by Republic Services.

G. If Contractor elects to dispose of debris at the CMS Landfill, the following process must be followed:

1. Contractor must establish an account with Republic Services.
2. Work will be assigned to Contractor by Owner or Owner’s representative.
3. Owner will perform inspection of the Contractor’s vactor truck to ensure debris containment tank is empty and clean prior to starting work for Owner.
4. Contractor will be issued a disposal manifest with listed work orders and/or other identifying information.
5. Contractor must contact Republic Services twenty-four (24) hours in advance to make an appointment for debris disposal.
6. Contractor must present the signed manifest to Republic Services at the time of disposal.

7. A copy of the completed manifest must be provided to Owner.
8. Contractor is made aware that the above process and requirements for completing and submitting the application, obtaining inspections, and acquisition of a permit, can take up to 30 days.
9. Contractor is directed to https://www.republicservices.com/ for additional information and instructions.

H. No outside debris will be allowed for disposal at the CMS Landfill site. Debris must have originated from Owner's collection system. Any Contractor found with outside debris will be suspended from work until the issue is addressed. Continued violation of this requirement will result in extended suspension or termination of the Agreement.

I. Contractor shall provide a landfill scale ticket as proof of proper waste disposal each time sewer debris is disposed of.

J. Prior to inserting any mechanical cutter into the sewer (such as a root cutter), Contractor shall first quickly televise the sewer to make sure there are no other utilities passing through the sewer pipe (such as gas lines, cable lines, power lines, water lines, etc.). This requirement is intended to prevent any damage to other existing utilities and to protect workers. The television inspection does not need to be recorded or submitted to Engineer unless there are existing utilities in the sewer, in which case a snapshot video and an accurate location will be required.

K. Water for use during sanitary sewer cleaning will be available from approved fire hydrants owned and operated by CHARLOTTE WATER only. Use of fire hydrants other than those approved by CHARLOTTE WATER will not be allowed. The Contractor shall meet all Owner requirements for connecting to fire hydrants and **will be charged** for water usage. Prior to connection to, and use of any hydrant, the Contractor must apply for and successfully obtain a temporary fire hydrant use permit (Vehicle Mounted "Tanker Truck" Permit). All instructions and requirements for obtaining the permit are listed under the **Fire Hydrant Program for Temporary Service** section of CHARLOTTE WATER's website. The Contractor is responsible for meeting all requirements whether listed herein or not.

The Contractor shall submit to the Engineer, a copy of the approved permit number for each vehicle prior to connection to, and use of, any fire hydrant.

The Contractor shall be well versed in the proper operation of valves and hydrants and will be responsible for any damage caused by improper operation or usage of hydrants.

L. Contractor shall take precautions to avoid damage or flooding to public or private property being served by the line being cleaned. Contractor shall be responsible for all flooding and pay for cleanup from flooding to the satisfaction of the property owner. Contractor shall document all backups and submit documentation to Engineer including the reason for the backup, the time and date of the backup, the property owner's name, address and phone number, the resolution to problem, the time and date the problem was resolved, and any special cleanup work that had to be performed. This required documentation shall be submitted for all backups

regardless of when they occur. All cleanup shall be completed within four (4) hours of the backup.

M. Contractor shall take care in cleaning older sewers and shall protect existing sewers from damage caused by improper use of cleaning equipment. Contractor is advised that the sewers assigned for cleaning and inspection may be in poor structural condition.

N. After the sewers are completely cleaned, the sewers shall be inspected via closed circuit television (CCTV). As specified previously, no cleaning equipment shall be in the sewers while the television inspections are being performed. The purposes of the CCTV inspections are to verify that the sewers have been thoroughly cleaned, to document the condition of the existing sewers and the locations of service connections, to locate sewer defects that need repaired, and to confirm that the lining (if specified) can be properly installed and cured.

O. The camera equipment used for the CCTV inspections shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera shall be a color, pan-and-tilt camera.

P. The picture quality and definition shall be to the satisfaction of Engineer. Contractor shall submit a sample television inspection after the inspection of the first section(s) of sewer(s) is performed so that Contractor and Engineer can agree on performance and quality of the inspections which must be met. Sewers not inspected to the Engineer's satisfaction shall be re-inspected by Contractor at no additional cost to Owner.

Q. All cameras shall move through the sewers via self-powered tractor assemblies – no skid assemblies shall be permitted. The tractor assemblies used for the inspections shall be the appropriate size assembly for the pipe being televised according to the manufacturer of the television equipment. For example, an 8-inch tractor assembly shall be used to televise 8-inch-diameter sewers.

R. All inspections shall begin above ground with a video look down into the start manhole to completely show the manhole and flow in the invert channel below. The inspections shall then begin from the center of the upstream manhole and end in the center of the downstream manhole. Prior to starting the camera down the line, a tape measure shall be placed at the pipe opening at the upstream manhole to clearly show/verify, on-screen, the pipe diameter of the section of pipe to be televised during the subsequent inspection. The camera shall be moved through the line from upstream to downstream at a uniform rate. The camera shall be stopped at major defects and service connections and shall be panned, tilted and rotated to fully view the defects and connections. All such inspections shall be documented on digital recordings as specified. Particular attention should be paid to service connections and whether the services are active or plugged.

S. Flow levels shall be controlled to a maximum depth of 20% of the pipe diameter. Options for controlling the flow (if it exceeds 20% depth) that will be considered for approval include use of flow-through plugs (with continuous monitoring of upstream flow levels) and bypass pumping. Contractor may also consider

performing the work on off-peak hours when flow is lower (pending approval by Owner); any such alternate work times must not impact residents (noise, lights, general disruption, etc.). If this controlled flow level is too high to allow the sewer pipe to be clearly visible (flow blocking or inhibiting the TV camera and video), then further flow control (further plugging or bypass pumping) shall be immediately implemented at no additional cost.

Every attempt shall be made to avoid any circumstance where the camera goes under water during the video inspection, specifically when televising through pipe sags. For sag areas, if the camera goes under water or will go under water, Contractor shall use jet equipment to pull the water out of the sag prior to videoing through the sag (the jet equipment shall be removed from the line before starting the video inspection). This flow control shall be considered incidental as this is standard practice prior to televising through any area where the camera goes under water and proceeds “blindly”; no additional payment by Owner will be made for performing this work. Some flow needs to remain in the sags if possible so that the extent of the sag (start and end point) is clearly visible. If the camera lens becomes fouled by going under water, the camera shall be removed, cleaned and the inspection shall start over at the start manhole.

T. The inspections shall be complete from manhole to manhole without the need for reverse setups unless approved otherwise by Engineer. If, during the work, the CCTV inspection is blocked by debris, a protruding lateral or sewer system defect, Contractor shall remove the blockage or repair the defect, if possible, as authorized by Engineer and then continue the inspection. No additional payment by Owner will be made for the initial CCTV inspections that were blocked.

U. Reverse setups will only be allowed and accepted per approval by the Engineer. Contractor shall notify Engineer in writing of such situations for Engineer’s review and approval.

V. The accuracy of the measurements cannot be stressed too strongly. Daily calibration of measuring devices shall be performed. Sewer lengths shown and reported on the CCTV inspection video and logs shall be within one percent (plus or minus) of the actual sewer length as measured above ground from center of one manhole to the center of the next manhole. CCTV inspections that do not meet these criteria shall be re-performed and re-submitted to Engineer at no additional cost to Owner.

W. If the Contractor’s cleaning or television equipment become lodged in the sewers during the work, Contractor shall be responsible for removing the equipment, including excavation of the sewer, and paying all costs associated with the removal unless otherwise agreed to by Engineer.

X. Upon completion of the cleaning and television inspection work, Contractor shall submit one copy of the final digital television inspections to Engineer as specified. The inspections must be in order and complete or Engineer will immediately return the inspections to Contractor for corrections. The final inspection shall mean that the sewer has been completely cleaned (no roots, debris, grease, tuberculation, etc.), the inspection is complete from manhole to manhole without the need for a reverse setup unless otherwise approved.

3.2 REMOVAL OF PROTRUDING SERVICE CONNECTIONS

A. Service connections that are protruding into the main sewer shall be cut flush when specified by the Engineer. The cutting shall be accomplished using an internal cutter specifically designed for such work. The internal remote cutter shall be capable of cutting any pipe material including PVC, vitrified clay, cast iron, ductile iron and orangeburg pipe. All cut pieces of the service connection shall be removed from the main sewer pipe.

3.3 DIGITAL VIDEO INSPECTIONS AND CCTV DATABASE

A. All inspections shall be performed using ITpipes software in the field. ITpipes must be installed in the truck that is performing the television inspections and used for the live field inspections. If ITpipes with the specific CHARLOTTE WATER template is not in the truck(s), the work shall immediately cease until it is installed in the truck(s) to be used during the inspection process. All televised sewer inspections performed (including sewer laterals) shall be submitted to Engineer in electronic (digital) format. Use of other video inspection software and "conversion" to ITpipes is not allowed.

B. Contractor must use the ITpipes CHARLOTTE WATER template available from ITpipes. This template contains all correct data entry fields, all observation inputs and required parameters, template settings for overlay control and setup, and other settings. Contractor shall obtain the template prior to performing any CCTV inspections. Inspections performed without using the CHARLOTTE WATER template will be rejected, and Contractor will have to re-perform the inspections at no cost to Owner.

C. Digital files in MPEG-4 Video file format with the H.264 Codec recording with embedded meta-data is required. Each submittal to Engineer shall include the ITpipes software database file within the approved structure along with the MP4 video files. Contractor shall make all adjustments necessary to adhere to the required format specified herein including performing the work using the required software at no additional cost to Owner. After the first submittal, Engineer will notify Contractor of any required changes in the data and file format, and Contractor shall make such modifications at no additional cost.

D. The digital recording shall include video information that accurately reproduces the original picture of the video inspection. The video portion of the digital recording shall be free of electrical interference and shall produce a clear and stable image.

E. The final sewer inspection video shall include overlay/text display with an initial display screen and with a continuous running screen. Each inspection start shall include overlay display of section details including at a minimum:

1. Owner name
2. Project name
3. Contractor name
4. Street name (if applicable)
5. Date/time of inspection

6. MH Start #/MH End #
7. Pipe material
8. Pipe size
9. Direction of Video
10. Weather or Flow Level
11. Pipe Identifier Number (GM Number)
12. A constant display of the street name, MH start #/MH End #, date and distance shall appear on screen.

E. Contractor's CCTV inspector shall move or remove overlay display accordingly, so it does not interfere with the inspection review of particular observations/defects as the inspection is occurring. As an observation/defect is noted by the Contractor's CCTV inspector, a text display shall appear with the text describing the observation/defect. Text shall display for a minimum of four (4) seconds. Distance shall appear continuously in the lower left corner of the video image as the camera is traveling down the line. It is imperative that distance is accurate. Contractor's CCTV inspector shall calibrate/test footage at the beginning of each day as incorrect footage will result in return of inspections.

F. Completed work shall consist of MPEG-4 Video files with the H.264 Codec recording with embedded meta-data captured live off the inspection camera. The video file resolution shall be 640 x 480.

G. Each pipe inspection's observations shall be related to a time point within the video.

H. Each pipe inspection MPEG-4 file shall have a related text file, with an identical name but different extension on the file. This file shall contain the distances of each observation and the related time point for that observation.

I. During the inspection, the video file recording shall pause as the operator selects the observation/defect notation, eliminating "on hold" video. In situations of reverse inspection, the reverse inspection shall be in a separate video file.

J. The files shall be named as follows (unless directed otherwise by the Engineer):

EXAMPLE:

Pipe ID is GM-31619 and manhole numbers are (Upstream) MH-249417 to (Downstream) MH-249341

Then, the video filename = GM-31619_MH-249417_MH-249341.mp4

K. The database file and the corresponding video files shall be submitted to Engineer in digital media format.

L. Submittal shall include pdf files of video inspection logs.

M. Each digital submittal shall include a transmittal listing the file names and all sewer segments and video files included. Contractor shall maintain a "master" database that contains all databases and all video files performed. The databases shall be

merged to reduce the number of individual database files as required by the Engineer. Engineer will specify which files to merge.

N. Recorded Observations for each inspection shall include observation distance, observation defect/description, video counter time where observation occurs within digital video, and severity rating for each observation/defect.

O. CHARLOTTE WATER has developed customized data fields for its viewing software. Contractor will be required to use these data fields, without any modifications, to enter project information for each inspection. These data fields are available from ITpipes. Observations for each inspection shall include:

1. Distance (part of the CHARLOTTE WATER catalog)
2. Defect/description (part of the CHARLOTTE WATER catalog)
3. Counter time observation occurs within digital video (part of the CHARLOTTE WATER catalog)
4. Severity rating for each observation/defect (part of the CHARLOTTE WATER catalog)
5. Infiltration rating (part of the CHARLOTTE WATER catalog)

P. The final inspection shall mean that the sewer has been completely cleaned (no roots, debris or grease), the inspection is complete from manhole to manhole without the need for a reverse setup unless otherwise approved. The inspections must be in order and complete or Engineer will immediately return the inspections to Contractor for corrections.

END OF SECTION

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