

CHAPTER 16.5

SEWER CLEANING AND TELEVISION INSPECTION

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1 **PART 1- GENERAL**

2 **1.1 SCOPE**

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

10 **1.2 RELATED DOCUMENTS**

12 A. Charlotte Water Water and Sewer Design and Construction Standards and
13 Standard Details.

15 **1.3 DEFINITIONS AND ABBREVIATIONS**

17 A. See Sections iii and iv of the Charlotte Water Water and Sewer Design and
18 Construction Standards for common abbreviations and definitions.

20 **1.4 SUBMITTALS**

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

33 **PART 2 - PRODUCTS**

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

38 **PART 3 - EXECUTION**

40 **3.1 CLEANING AND TELEVISION INSPECTION OF SEWERS**

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

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

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

5

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

16

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

24

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

32

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

38

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

41

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

1 7. A copy of the completed manifest must be provided to Owner.
2 8. Contractor is made aware that the above process and requirements for
3 completing and submitting the application, obtaining inspections, and
4 acquisition of a permit, can take up to 30 days.
5 9. Contractor is directed to <https://www.republicservices.com/> for additional
6 information and instructions.
7
8 H. No outside debris will be allowed for disposal at the CMS Landfill site. Debris must
9 have originated from Owner's collection system. Any Contractor found with
10 outside debris will be suspended from work until the issue is addressed. Continued
11 violation of this requirement will result in extended suspension or termination of the
12 Agreement.
13
14 I. Contractor shall provide a landfill scale ticket as proof of proper waste disposal
15 each time sewer debris is disposed of.
16
17 J. Prior to inserting any mechanical cutter into the sewer (such as a root cutter),
18 Contractor shall first quickly teleview the sewer to make sure there are no other
19 utilities passing through the sewer pipe (such as gas lines, cable lines, power lines,
20 water lines, etc.). This requirement is intended to prevent any damage to other
21 existing utilities and to protect workers. The television inspection does not need
22 to be recorded or submitted to Engineer unless there are existing utilities in the
23 sewer, in which case a snapshot video and an accurate location will be required.
24
25 K. Water for use during sanitary sewer cleaning will be available from approved fire
26 hydrants owned and operated by Charlotte Water only. Use of fire hydrants other
27 than those approved by Charlotte Water will not be allowed. The Contractor shall
28 meet all Owner requirements for connecting to fire hydrants and **will be charged**
29 for water usage. Prior to connection to, and use of any hydrant, the Contractor
30 must apply for and successfully obtain a temporary fire hydrant use permit (Vehicle
31 Mounted "Tanker Truck" Permit). All instructions and requirements for obtaining
32 the permit are listed under the **Fire Hydrant Program for Temporary Service**
33 section of Charlotte Water's website. The Contractor is responsible for meeting all
34 requirements whether listed herein or not.
35
36 The Contractor shall submit to the Engineer, a copy of the approved permit number
37 for each vehicle prior to connection to, and use of, any fire hydrant.
38
39 The Contractor shall be well versed in the proper operation of valves and hydrants
40 and will be responsible for any damage caused by improper operation or usage of
41 hydrants.
42
43 L. Contractor shall take precautions to avoid damage or flooding to public or private
44 property being served by the line being cleaned. Contractor shall be responsible
45 for all flooding and pay for cleanup from flooding to the satisfaction of the property
46 owner. Contractor shall document all backups and submit documentation to
47 Engineer including the reason for the backup, the time and date of the backup, the
48 property owner's name, address and phone number, the resolution to problem, the
49 time and date the problem was resolved, and any special cleanup work that had
50 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

1 performing the work on off-peak hours when flow is lower (pending approval by
2 Owner); any such alternate work times must not impact residents (noise, lights,
3 general disruption, etc.). If this controlled flow level is too high to allow the sewer
4 pipe to be clearly visible (flow blocking or inhibiting the TV camera and video), then
5 further flow control (further plugging or bypass pumping) shall be immediately
6 implemented at no additional cost.
7

8 Every attempt shall be made to avoid any circumstance where the camera goes
9 under water during the video inspection, specifically when televising through pipe
10 sags. For sag areas, if the camera goes under water or will go under water,
11 Contractor shall use jet equipment to pull the water out of the sag prior to videoing
12 through the sag (the jet equipment shall be removed from the line before starting
13 the video inspection). This flow control shall be considered incidental as this is
14 standard practice prior to televising through any area where the camera goes
15 under water and proceeds "blindly"; no additional payment by Owner will be made
16 for performing this work. Some flow needs to remain in the sags if possible so that
17 the extent of the sag (start and end point) is clearly visible. If the camera lens
18 becomes fouled by going under water, the camera shall be removed, cleaned and
19 the inspection shall start over at the start manhole.
20

21 T. The inspections shall be complete from manhole to manhole without the need for
22 reverse setups unless approved otherwise by Engineer. If, during the work, the
23 CCTV inspection is blocked by debris, a protruding lateral or sewer system defect,
24 Contractor shall remove the blockage or repair the defect, if possible, as authorized
25 by Engineer and then continue the inspection. No additional payment by Owner
26 will be made for the initial CCTV inspections that were blocked.
27

28 U. Reverse setups will only be allowed and accepted per approval by the Engineer.
29 Contractor shall notify Engineer in writing of such situations for Engineer's review
30 and approval.
31

32 V. The accuracy of the measurements cannot be stressed too strongly. Daily
33 calibration of measuring devices shall be performed. Sewer lengths shown and
34 reported on the CCTV inspection video and logs shall be within one percent (plus
35 or minus) of the actual sewer length as measured above ground from center of
36 one manhole to the center of the next manhole. CCTV inspections that do not
37 meet these criteria shall be re-performed and re-submitted to Engineer at no
38 additional cost to Owner.
39

40 W. If the Contractor's cleaning or television equipment become lodged in the sewers
41 during the work, Contractor shall be responsible for removing the equipment,
42 including excavation of the sewer, and paying all costs associated with the removal
43 unless otherwise agreed to by Engineer.
44

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

1

2 **3.2 REMOVAL OF PROTRUDING SERVICE CONNECTIONS**

3

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

10

11 **3.3 DIGITAL VIDEO INSPECTIONS AND CCTV DATABASE**

12

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

21

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

29

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

38

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

42

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

46

47 1. Owner name
48 2. Project name
49 3. Contractor name
50 4. Street name (if applicable)
51 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

1 merged to reduce the number of individual database files as required by the
2 Engineer. Engineer will specify which files to merge.
3

4 N. Recorded Observations for each inspection shall include observation distance,
5 observation defect/description, video counter time where observation occurs within
6 digital video, and severity rating for each observation/defect.
7

8 O. Charlotte Water has developed customized data fields for its viewing software.
9 Contractor will be required to use these data fields, without any modifications, to
10 enter project information for each inspection. These data fields are available from
11 ITpipes. Observations for each inspection shall include:
12

13 1. Distance (part of the Charlotte Water catalog)
14 2. Defect/description (part of the Charlotte Water catalog)
15 3. Counter time observation occurs within digital video (part of the Charlotte
16 Water catalog)
17 4. Severity rating for each observation/defect (part of the Charlotte Water
18 catalog)
19 5. Infiltration rating (part of the Charlotte Water catalog)
20

21 P. The final inspection shall mean that the sewer has been completely cleaned (no
22 roots, debris or grease), the inspection is complete from manhole to manhole
23 without the need for a reverse setup unless otherwise approved. The inspections
24 must be in order and complete or Engineer will immediately return the
25 inspections to Contractor for corrections.
26
27

28 END OF SECTION

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