

## GDT 136

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### A. Scope

This test method describes the equipment and procedures for video inspection of storm and side drain pipe. This test method is used in conjunction with the GDOT Specification Section 550 (Storm Drain Pipe, Pipe-Arch Culverts, and Side Drain Pipe).

### B. Apparatus

1. **Camera Inspection Equipment:** Provide a pipeline inspection camera having the following features:
  - a. Configured properly in the pipe both vertically and horizontally, and having the ability to pan and tilt to a 90 degree angle with the axis of the pipe and rotate 360 degrees.
  - b. Low barrel distortion camera
  - c. Color image with a minimum standard resolution of 720 x 480 pixels
  - d. Equipped with sufficient lighting to provide a clear image of the full circumference of the pipe
  - e. Capable of recording the station, milepost, distance along the invert of the pipe, or other indicators of location superimposed on the video.
  - f. Capable of moving through the entire length of the pipe.
  - g. Capable of measuring cracks greater than or equal to 0.01 inch and joint separations greater than 0.5 inch.
  - h. Software capable of generating a report that includes the following:
    - i. Actual recorded length and width measurements of all cracks within the pipe.
    - ii. Actual recorded separation measurement of all pipe joints.
    - iii. Pipe ovality report.
    - iv. Deflection measurements and graphical diameter analysis report in terms of x and y axis. e. Flat analysis report.
    - v. Representative diameter of pipe.
    - vi. Pipe deformation measurements, leaks, debris, or other damage or defects.
    - vii. Deviation in pipe line and grade, joint gaps, and joint misalignment.
2. **Laser Deflection Measuring Device:** Provide a laser deflection measuring device, for use of flexible pipe up to 48 inches in diameter, capable of measuring deflection to an accuracy of 0.5% or better and a repeatability of 0.12% or better. References of the equipment calibration are ASTM E 691 and ASTM E 177.
3. **Mandrel:** Provide a mandrel device which are rigid, nonadjustable, odd numbered legged (9 minimum) having the following:
  - a. Length not less than 7/16 of its nominal diameter
  - b. Diameter at any point shall not be less than the diameter specified in Section C.3 Mandrel

- c. Diameter, whether fixed or variable, shall be verified with a proving ring or other method per the manufacturer's guidelines.
4. **Manual Inspection Measuring Devices:** Use contact or non-contact distance instruments.

## C. Procedure

Ensure pipe is clear of water, debris and/or obstructions. Complete the video inspection and any necessary measurement prior to placing the final surface over any pipe. When roadway construction will not be delayed, take measurements 30 days or more after the completion of earthwork to within 1 foot of the finished grade. Notify the engineer a minimum for 7 days in advance of inspection. Notify the engineer immediately if distresses or locations of improper alignment are logged.

### 1. Pipeline Video Inspection for Defects and Distresses:

- a. Begin at the outlet end and proceed through to the inlet at a speed less than or equal to 30 ft/minute. The distance shall have an accuracy of 1 foot per 100 feet. Remove blockages that will prohibit a continuous operation.
- b. Document locations of all observed defects and distresses including cracking, exposed reinforcing steel, sags, joint offsets, joint separations, deflections, improper joints/connections, blockages, leaks, rips, tears, buckling, deviation from line and grade, and other anomalies not consistent with a properly installed pipe.
- c. During the video inspection provide a continuous 360 degree pan of every pipe joint.
- d. Identify and measure all cracks greater than or equal to 0.01 inch and joint separations greater than 0.5 inch. Cracks with a width less than 0.01 inch are considered hairline and minor and only need to be noted in the inspection report.
- e. Video inspections are conducted from junction to junction which defines a pipe run. A junction is defined as a headwall, drop inlet, manhole, junction box, or other structure than disturbs the continuity of the pipe. Each pipe run must be on a separate video file and all locations are to be referenced from the nearest junction relative to that pipe run.
- f. Record and submit all data as per Section D Reporting.

### 2. Pipeline Laser Inspection for Deflection:

- a. Calibrate the laser deflection measuring device according to the manufacturer's specifications. Provide all calibration data and applicable manufacturer's recommendations for calibration and use to the Engineer.
- b. Measure the deflection occurring at the point the projected laser and at a minimum interval of 0.1 feet along the pipe.
- c. All deflection measurements are to be based on the AASHTO Nominal Diameter. Refer to Section C.5.
- d. Inspect at a speed that will provide proper data acquisition to effectively measure the maximum deflection. The inspection speed shall be less than or equal to 30 ft/minute. The laser projection head shall be positioned so that the laser ring fills minimum 75% of the monitor screen height.
- e. Laser inspections are conducted in the same manner as Section C.1.e.
- f. Record and submit all data per Section D. Reporting.

### 3. Mandrel Testing:

- a. Mandrel Testing will be used for deflection testing if the video measurements are called into question or if limitations in the laser deflection measuring device are exceeded.

- b. Use proving ring or other method recommended by the mandrel manufacturer to verify mandrel diameter prior to inspection. Provide verification documentation for each size mandrel to the Engineer.
- c. All deflection measurements are to be based on the AASHTO Nominal Diameters. Refer to Section C.5.
- d. Begin by using a mandrel set to 5% deflection limit. Place the mandrel in the inlet end of the pipe and pull through the outlet end. If resistance is met prior to completing the entire run, record the maximum distance achieved from the inlet side, then move the mandrel and continue the inspection from the outlet end of the pipe toward the inlet end. Record the maximum distance achieved from the outlet side.
- e. If no resistance is met at 5% then the inspection is complete. If resistance occurred at 5% then repeat 3.b and 3.c with the mandrel set to the 10% deflection limit. If the deflection of the entire pipe run cannot be verified with the mandrel, then notify the Engineer immediately.
- f. Record and submit all data as per Section D. reporting.

4. **Manual Inspection Measurements:**

- a. Alternate method of video inspection and deflection testing when there is available access or the pipe is greater than 48 inches in diameter. For all pipe considered a confined space, provide entry for all project personnel according to OSHA requirements.
- b. Physical measurements may be taken after installation and compared to the AASHTO Nominal Diameter if the pipe as per Section C.5. When this method is used, determine the smallest interior diameter of the pipe as measured through the center point of the pipe (D2). Take the D2 measurement at the most deflected portion of the pipe in question and at intervals no greater than 10 feet through the run. Calculate the deflection as follows;

$$\%Deflection = [(AASHTO\ Nominal\ Diameter - D2) / AASHTO\ Nominal\ Diameter] * 100\%$$

- c. Video and Lase Inspect as per Sections C.1 and C.2.
- d. Record and submit all data as per Section D. reporting.

5. **AASHTO Nominal Diameters and Maximum Deflection Limits:**

These deflection limits are the maximum allowable deflection on any axis within the pipe and not just in the XY plane.

Base Pipe Diameter	AASHTO Nominal Diameter	Maximum Deflection Limit		
		5.0%	7.5%	10%
(inches)	(inches)	(inches)		
15	14.76	14.02	13.65	13.28
18	17.72	16.83	16.39	15.95
24	23.62	22.44	21.85	21.26
30	29.53	28.05	27.32	26.58
36	35.43	33.66	32.77	31.89
48	47.24	44.88	43.70	42.52
54	53.15	50.49	49.16	47.84
60	59.06	56.11	54.63	53.15

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## D. Reporting

Submit all recorded information to the Engineer on standard forms along with the complete video inspection on DVD in digital format. The forms included in this method shall be used for reporting the inspection information. Ensure all video pipe runs on the DVD have the station, milepost, distance into the drain or other indicators of location superimposed on the video. Submit one copy of the paper inspection. A copy of the DVD and one electronic copy of the report. All inspection reports shall be completed on the attached forms and shall be clearly named and organized in the electronic copy.

1. **Pipe Video Inspection Report:** The Pipeline Video Inspection Report shall include the "Pipe Video Inspection Summary Report" form, the "Individual Pipe Video Inspection report" form(s), and the report(s) generated by the inspection software for each pipe run.
  - a. Individual Pipe Video Inspection Report form: Complete Project Information, Inspector Information, and Pipe Information. Under Inspection Information record each defect/distress and joint along with its distance from the inspection entrance software and reference the page number associated with the still image of the joint, distress/defect along with any additional information.
  - b. Pipe Video Inspection Summary Report form: This page is to be used as the cover sheet for the completed video inspection report. Complete Project Information, Inspector Information, and Pipe Information.
2. **Pipeline Deflection Inspection Report:** The Pipeline Deflection Inspection Report shall include the "Pipe Deflection Inspection Summary Report" form, the "Individual Pipe Deflection Inspection Report" form(s), and the report(s) generated by the inspection software for each pipe run. If using manual inspection measurements, then include a copy of all calculations.
  - a. Individual Pipe Deflection Inspection Report form: Complete Project Information and Inspector Information. Under Inspector Information, record each joint location along with the beginning and ending locations where the deflection exceeds 5.0%, 7.5%, and 10.0%. Attach a copy of any supportive information generated from the inspection software and reference the page number where more detailed deflection information may be conveyed.
  - b. Pipe Deflection Inspection Summary Report form: This page is to be used as the cover sheet for the completed deflection inspection report. Complete Project Information, Inspector Information, and Pipe Information.







