CLOSED CIRCUIT TELEVISION (CCTV) INSPECTION MANUAL

This Manual provides instructions and requirements for completing the Closed Circuit Television (CCTV) inspection form and any other related documents. These instructions are divided into two sections: General Information and Inspection Details.

GENERAL INFORMATION

• Closed Circuit Television camera equipment must be waterproof/watertight and capable of inspecting pipes as small as four (4) inches and as large as 36 inches.

• Identification and structure numbers for structures (manholes, storm drain structures, etc.), pipe runs required on this form must match with the same identifying information shown on drawings, maps or other documents provided to the Engineer and CCTV operator. All Stormwater facilities in have been an “Asset” number to identify the facility in the County’s database. The Stormwater facilities asset number and name shall be recorded on all forms and documents associated with the CCTV inspection.

• When forms or documents require an entry in a specific field, by the field is not applicable, enter “N/A” or “Not Applicable” within the field. No fields shall be left blank or empty.

1. DATE
   Fill in the inspection date (day/month/year) on inspection forms and documents in DD/MM/YYYY format. For example, February 1, 2011, shall be written as 02/01/2011.

2. TIME
   Time formats must be recorded in hours and minutes. For example, three-thirty in the afternoon shall be recorded as 3:30 p.m.

3. WEATHER
   The weather at the time of the inspection shall be recorded. The weather shall be recorded and include the following:
   • Sky Conditions; (Sunny, Cloudy, Partly Sunny)
   • Temperature in Fahrenheit; (Forecast High & Low)
   • Any Precipitation at time of Inspection; (Rain, Snow, Sleet, etc.)
   • Wind Speed, only if a factor that affects the CCTV inspection.

4. OPERATOR
   Record the CCTV company name, address and telephone number and the name of the CCTV/camera operator.

5. ADDRESS
   Record the address or nearest road intersection closest to where the inspection is conducted. Record the street name(s) or route numbers exactly as they appear on the street sign(s) at or near the inspection location. Include the full street description “Name & Type (street, drive, road, avenue)”.

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If the pipeline being inspected is located in an open area or easement that cannot be referenced with a street address, then a vicinity map indicating the inspection location shall be attached to the inspection form. The vicinity map may be a photocopy of the plan drawing or other document which clearly identifies the inspection location and the access route to the inspection location. The vicinity map must include a north arrow.

6. ACCESS LOCATION & ROUTE

Record the access location in the same manner as described under item 5. If a specific access route must be followed, record the access route on a vicinity map as described under item 5.

7. FACILITY INFORMATION

The following information shall be recorded on the inspection forms and documents:

- Asset Number, Sequence Number, Facility Name
- Information included under ‘General Information’ above

**Structural Condition**

Enter one of the following codes to indicate the structural condition at the pipe entrance used to pipe opening for the CCTV inspection and camera entry point:

- G - Good (No structural problems, does not impede CCTV Inspection)
- F - Fair (Minor issue easily overcome for performing CCTV inspection)
- P - Poor (Significant issues that require resolution prior to performing CCTV inspection. Issues that may require rescheduling of CCTV inspection. In this case, the significant issues shall be photo documented with still photos and made a part of the CCTV inspection forms and documents)

**Number of Inlets into MH**

Record the number, size and type (e.g., RCP, CMP, etc.) of incoming and outgoing pipes within the structure utilized to access the pipe that is being inspected. This information may be recorded on a sketch attached to and made a part of the CCTV inspection form and reports. Any sketch shall include a north arrow and structure identification information (structure type and number).

**Debris/Sediment**

Enter one of the following codes to indicate the debris condition inside the structure:

- N – None (No debris problems, does not impede CCTV Inspection)
- L – Light (Minor debris, does not impede CCTV inspection)
- M – Medium (Minor debris removal required prior to performing CCTV inspection)
- S – Severe (Significant debris that must be removed to perform CCTV inspection. May require rescheduling of CCTV inspection. In this case, the debris shall be photo documented with still photos and made a part of the CCTV inspection forms and documents)

**Structure Depth**
Indicate the structure depth in feet and tenths of a foot, as measured from the slab or manhole rim of the structure to the invert of the structure. For example, a riser structure that is twelve-and-a-half feet deep should be written as 12.5 feet.

**Base Flow & Illicit Discharge**
Enter one of the following codes to indicate if an apparent illicit discharge is present in the manhole opened for access for the TV camera:

- BF - Clear Water Base Flow
- SW - Sewage, Gray Water
- OS - Oil Sheen
- OD - Odor; indicate the odor, if possible
- CL - Color; indicate the color
- OT - Other; describe the discharge

8. **PIPELINE**

**Upstream & Downstream Structure Identification Numbers**
Indicate the upstream and downstream structure number as noted on the approved as-built plans. The upstream structure is defined by the flow direction and can be determined by reviewing the as-built plans provided to the operator.

**Pipe Shape & Cross-Section**
The shape of the pipe should be selected from the following:

- CIR - Circular
- ELP - Elliptical (Oval)
- RET - Rectangular

**Pipe/Segment Length**
Indicate the length of the pipe, in feet and tenths of a foot, as shown on plans provided to the operator. The segment length is defined as the inlet to outlet reach.

**Material**
The materials for the pipeline should be selected from the following:

- CP... Concrete Pipe (use if specific type of concrete pipe is unknown)
- RCP .......Reinforced Concrete Pipe
- MP .............Smooth Metal Pipe (use if the specific metal type is unknown)
- DIP ..............Ductile Iron Pipe
- CMP ............Corrugated Metal Pipe
- ALCMP .......Aluminized Corrugated Metal Pipe
- BCCMP .......Bituminous Coated Corrugated Metal Pipe
- CIP ..............Cast Iron Pipe
- PVC .............Polyvinyl Chloride Pipe (Plastic)
- HDPE.........High Density Polyethylene Pipe

**Size**
For circular pipes, indicate the inside diameter of the pipe in inches. For elliptical or rectangular conduits, indicate the dimensions in terms of the inside pipe's height and width in inches (for example 13” x 17”).

**Joint Spacing**
Enter the length in feet between pipe joints.

**Joint Numbering**
Pipe joints shall be numbered, beginning with joint #1 at the beginning or entry point of the CCTV inspection.

**Perforated or Solid**
Indicate if the pipeline is perforated or solid

9. **TV SUMMARY**

**Start of Footage**
Indicate whether the footage begins at the inlet (upstream end) or the outlet (downstream end) of the pipeline. The beginning of the footage must be indicated on a counter, shown on the footage and at the controls of the TV inspection vehicle for the recording of the pipe segment. The footage counter must begin at “zero”, at the structure entrance of the pipeline being televised and recorded.

**End Footage**
The ending footage must be indicated on the counter, shown on the footage and at the control of the TV inspection vehicle for the pipe segment recorded. Once the entire pipeline segment is televised and recorded, the difference between the beginning and ending counter readings should be approximately the same distance as the pipe length in feet as shown on the plans.

**Televised Length**
Record the total length of pipe recorded by video in feet and tenths and a foot. If the entire pipe segment is not completely televised, then the length of pipe televised and recorded shall be noted on the CCTV Inspection Form and documents with beginning and ending points.

**Total Segment Televised?**
Indicate whether the entire segment length (end to end length), as measured by the CCTV inspection crew, was televised/recorded by placing an ‘X’ in only one of the boxes. If the ‘Yes’ box is marked, “Yes” indicates that CCTV inspection was conducted for the entire pipe segment. If the ‘No’ box is marked, that indicates that only partial CCTV inspection was conducted. The reason for any partial CCTV inspection shall be indicated in the “Comments” section of the CCTV inspection form.

**Tape Number**
Indicate the tape number for which the pipe segment is being recorded.

**INSPECTION DETAILS**
When a defect is indicated, each column corresponding to the defect code shall be completed in table portion of the CCTV Inspection form. There should be no blanks in any column when a defect is noted.

10. **DEFECT CODE**
Select a Defect Code from Table 1 to describe the defect

11. **START FOOTAGE**
Define the beginning location of the defect as indicated by the footage counter. The beginning of each defect must be referenced by the reading on the footage counter. This column shall be completed if a defect is discovered by the CCTV inspection.

12. **STOP FOOTAGE**
Define the ending location of the defect as indicated by the footage counter. The ending of each defect must be referenced by the reading on the footage counter. This column shall be completed if a defect is indicated. If the defect within the pipe is less that one linear foot in length, enter “< 1.0 LF” in the “Stop Footage” column. If the defect is more than one linear foot in length, the counter reading where the defect ends shall be indicated in the “Stop Footage” column. The “Stop Footage” column must always be completed as previously described for each defect.

13. **DISCRETE versus CONTINUOUS DEFECTS**
This column must be completed if a defect is discovered. Indicate if the defect is a discrete defect (e.g., less than one linear foot in length), or continuous (e.g., more than one linear foot in length), parallel or perpendicular to the pipe axis. All defects shall be coded “D” for discrete or “C” for continuous. Continuous defects shall be noted with the counter readings of the beginning and end of the defect. If a discrete defect is noted, a “< 1.0 LF” shall be indicated in the “Stop Footage” column.

14. **LOCATION**
This column shall be completed if a defect is discovered. Enter one or all clock positions (for example 2 o’clock) where the defect is located in the cross-sectional area of the pipe (when looking up the pipe from where the CCTV inspection began).

15. **NEAREST PIPE JOINT NUMBER**
This column must be completed if a defect is discovered. Enter the joint number preceding the defect.

16. **COMMENTS**
Enter all other comments and observations about the CCTV inspection that cannot be coded as “discrete” or “continuous” (e.g., gasket problem). Enter any comments or observations about the CCTV inspection that may be helpful during quality control review of the inspection and documentation of the inspection (e.g., severe debris was encountered at 20 feet and inspection stopped until cleaning completed). Enter any and all information and observations to which the code list does not adequately apply. For illicit discharge, further describe the odor, color, or other type in the comments line.

16. **COMMENTS, continued**
If necessary, comments, observations and still photographs may recorded on additional documents and attached to the CCTV Inspection Report.
QUALITY CONTROL OF FIELD DATA

The following procedures shall be used to provide quality control of the field data prior to data entry on the CCTV Inspection forms and documents.

Field Forms:

- Verify that all fields on the inspection form are completed.
- Verify that facility asset/sequence numbers and structure ID is valid by checking against as-built plans.
- Verify the upstream and downstream structure numbers are valid by checking against the as-built plans.
- Ensure any map, plans or drawings correctly indicate the pipe segment that was inspected and that all joint numbers and counter readings follow the correct direction.
- Verify that the correct codes have been used within fields.
- Verify all street names are written correctly (complete names).
- Verify that defect codes are valid.
- Verify to see that all defect entries have defect codes, footages, counter readings, a designation of discrete or continuous, and a clock position, entered.

QUALITY CONTROL OF FIELD DATA, Continued

- Verify that all start and end footage and counter readings are entered for continuous defects.
- If an inspection was not completed, ensure there is a defect code of indicating why the inspection could not continue and be completed.

Video Image

- Review beginning of the CCTV video recording to ensure that the opening screen provides the required information such as entrance structure number, upstream structure number, downstream structure number, date, and footage. Following the opening screen, only continuous footage and counter readings need to be shown on the CCTV video recording.
- Verify that the inspection begins in the structure which shows the pipe opening. (A slight lag of counter readings is usually at the start and end of the video recording.)
- Verify the footage and counter readings between pipe joints to verify joint lengths shown on the log.
- Verify that defects are panned and the focus is changed to zoom in on defects (while maintaining video quality) and the focus is changed back to infinity when returning to the forward view inside and forward looking within the pipe.
- Verify the defect coding on the logs as the tape is viewed to ensure that the defects have been correctly coded. Particular attentions shall be given to significant or severe defects.
### CCTV DEFECT INSPECTION CODES

<table>
<thead>
<tr>
<th>Defect Type</th>
<th>Defect Code</th>
<th>Defect Severity</th>
<th>Discrete or Continuous</th>
<th>Description of Defect Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pipe Condition:</strong></td>
<td></td>
<td></td>
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<tr>
<td>Collapse</td>
<td>PC</td>
<td></td>
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<tr>
<td><strong>Deformation (non-rigid pipe only):</strong></td>
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<tr>
<td>Deformation</td>
<td>ML</td>
<td>Light</td>
<td>D or C</td>
<td>Height/Width &gt;0.8</td>
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<tr>
<td></td>
<td>MS</td>
<td>Severe</td>
<td>D or C</td>
<td>Height/Width &lt;0.8</td>
</tr>
<tr>
<td><strong>Hole</strong></td>
<td>HL</td>
<td>Light</td>
<td>D or C</td>
<td>&lt; 60 degree arc</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>Severe</td>
<td>D or C</td>
<td>&gt; 60 degree arc</td>
</tr>
<tr>
<td><strong>Fracture Circular</strong></td>
<td>FC</td>
<td></td>
<td>D</td>
<td></td>
</tr>
<tr>
<td><strong>Fracture Longitudinal</strong></td>
<td>FL</td>
<td></td>
<td>C</td>
<td></td>
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<tr>
<td><strong>Fracture Multiple</strong></td>
<td>FM</td>
<td></td>
<td>D or C</td>
<td></td>
</tr>
<tr>
<td><strong>Fracture Spiral</strong></td>
<td>FS</td>
<td></td>
<td>D or C</td>
<td></td>
</tr>
<tr>
<td><strong>Erosion/Corrosion</strong></td>
<td>EL</td>
<td>Light</td>
<td>D or C</td>
<td>Surface pitting</td>
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<tr>
<td></td>
<td>EM</td>
<td>Medium</td>
<td>D or C</td>
<td>Aggregate exposed (concrete)</td>
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<tr>
<td></td>
<td>EH</td>
<td>Severe</td>
<td>D or C</td>
<td>Rebar or cylinder exposed (concrete). Penetration of pipe wall (metal/plastic)</td>
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</tbody>
</table>

*Continued, Next Page*
## CCTV DEFECT INSPECTION CODES

<table>
<thead>
<tr>
<th>Defect Type</th>
<th>Defect Code</th>
<th>Defect Severity</th>
<th>Discrete or Continuous</th>
<th>Description of Defect Severity</th>
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<tr>
<td><strong>Joint Condition</strong></td>
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<tr>
<td>Broken</td>
<td>JB</td>
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<td>D</td>
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<tr>
<td>Offset</td>
<td>JL</td>
<td>Light</td>
<td>D</td>
<td>Offset &lt; 1”</td>
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<td>JS</td>
<td>Severe</td>
<td>D</td>
<td>Offset ≥ 1” (estimate size in inches)</td>
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<tr>
<td>Open</td>
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<td>Light</td>
<td>D</td>
<td>Gap &lt; 1/2”</td>
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<td>OS</td>
<td>Severe</td>
<td>D</td>
<td>Gap ≥ 1/2” (estimate size in inches)</td>
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<tr>
<td>Sediment Infiltration</td>
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<td>D</td>
<td>Sediment infiltration at joint</td>
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<th>Defect Type</th>
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<th>Defect Severity</th>
<th>Discrete or Continuous</th>
<th>Description of Defect Severity</th>
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<tr>
<td><strong>Other Conditions</strong></td>
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<tr>
<td>Roots</td>
<td>RL</td>
<td>Light</td>
<td>D or C</td>
<td>Blockage &lt; 20%</td>
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<tr>
<td></td>
<td>RM</td>
<td>Medium</td>
<td>D or C</td>
<td>Blockage 20% - 50%</td>
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<td>RS</td>
<td>Severe</td>
<td>D or C</td>
<td>Blockage &gt; 50%</td>
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<td>Debris</td>
<td>DL</td>
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<td>D or C</td>
<td>Loose debris only</td>
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<td>DM</td>
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<td>D or C</td>
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<td>DS</td>
<td>Severe</td>
<td>D or C</td>
<td>Blockage ≥ 50%</td>
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<tr>
<td>Sediment</td>
<td>SD</td>
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<td>D or C</td>
<td>Record depth (inches)</td>
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### CCTV DEFECT INSPECTION CODES

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<tr>
<th>Defect Type</th>
<th>Defect Code</th>
<th>Defect Severity</th>
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<tr>
<td><strong>Illicit Discharge</strong></td>
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<tr>
<td>Sewage</td>
<td>SW</td>
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<tr>
<td>Oil Sheen</td>
<td>OI</td>
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<tr>
<td>Odor</td>
<td>OI</td>
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<td>Color</td>
<td>OI</td>
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<tr>
<td>Other</td>
<td>OI</td>
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<tr>
<td><strong>Other Inspection Codes</strong></td>
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<tr>
<td>Start TV Inspection</td>
<td>ST</td>
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<tr>
<td>End TV Inspection</td>
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<td>Abandon Survey</td>
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<tr>
<td>Reverse Setup</td>
<td>RV</td>
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CCTV INSPECTION FORM

Date:  
Time: Start:  
Time: Finish:  

Weather:  Sky:  Hi:  Low:  Other:  
Operator:  
Address:  
Access Location:  

FACILITY INFORMATION

Asset No.  Sequence No.  
Asset Name:  

Structural Condition:  
Number of Pipes in Structure:  
Debris/Sediment:  
Base Flow / Illicit Discharge:  

PIPELINE:

Upstream Structure ID #  Downstream Structure ID#  
Shape:  Segment Length:  Material:  
Size:  Joint Spacing (ft.):  Perforated/Solid:  

CCTV SUMMARY

Start Footage:  End Footage:  Televised Length (ft.):  
Total Segment Televised?  Yes □  NO □  Tape Number:  
Problems Performing Inspection:  

<table>
<thead>
<tr>
<th>Defect Code</th>
<th>Footage Start</th>
<th>Footage Stop</th>
<th>Discrete/Continuous</th>
<th>Location</th>
<th>Nearest Pipe Joint Number</th>
<th>Comments</th>
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### CCTV INSPECTION FORM

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<th>Footage Start</th>
<th>Footage Stop</th>
<th>Discrete/Continuous</th>
<th>Location</th>
<th>Nearest Pipe Joint Number</th>
<th>Comments</th>
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